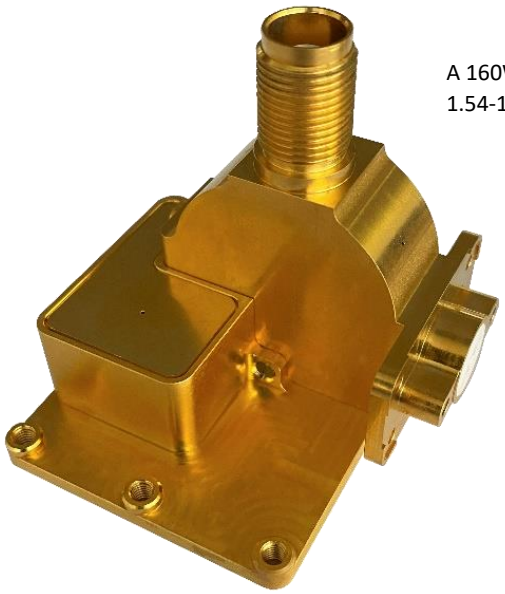
Non-Waveguide Equipment Qualification Status Review

Summary & Device Description

Smiths Interconnect, Dundee

January 2022



A 160W CW (forward power SSSPA Isolator operating from 1.54-1.61GHz. It will be used in a EU GNSS programme.

Notes:

- The non-waveguide products described within have been supplied for flight or are in the process of being qualified for spaceflight [*annotated as "qualified" or "in qualification"]*
- Where further information is required e.g. extracts from EIDPs, qualification documents or additional performance data this should be requested and where possible this will be provided in redacted form.
- Heritage overview data is updated annually at the beginning at the calendar year but changes and expands weekly.
- Site specific capability is described in the briefest details at the end of this document.
- The identification of errors and corrections is a feature of a document of this complexity. All opportunities to enhance this document are welcomed.
- The devices listed within a merely a sample of the 2900+ flight model designs have been delivered over the past ~30 years
- Comprehensive heritage data on FMs supplied is available to select recipients.
- The EQSR is now spilt into 2 documents, this for waveguide and a separate document for non-waveguide and waveguide.

New in version 13.10:

- Heritage for CY2021 now included
- Corrections to entries & typographic errors
- Updates to qualification status of devices under development and to heritage tables
- Heritage tables updated
- Addition of following entries
    - S-Band Stripline Circulator
    - Very high-power E1-Band Isolator
    - High-power 2.0-4.0 stripline Isolator
    - L-Band low power SMA broadband Isolator

Contents

Heritage and capability overview

Over the past 30 years Smiths Interconnect (SINT Microwave Limited) has produced and supplied ~192,600 components and equipments for flight use. With >2900 device types supplied this document contains a survey of the performance & qualification of a fraction of the types supplied.

Briefly the Company has provided high and low-power products operating in the following assigned bands. *Heritage* refers to products supplied for space flight while *capability* refers to demonstrable designs that have been supplied but not for space flight, but which could be. *In development* means in the process of being developed for flight applications.

Non-waveguide heritage & capability

Function	UHF	L	S	C	X	Ku	K	Ka	Q
Coaxial									
Cable assemblies	-	-	-	-	-	-	Heritage	-	-
Circulators	Heritage	Heritage	Heritage	Heritage	Heritage	Heritage	Heritage	In qualification	-
Combiners/splitters	-	-	Heritage	In dev't	Qualified	Qualified	Capability	Capability	-
Iso-Adpater	-	Capability	Heritage	Heritage	Heritage	Heritage	Heritage	Heritage	Heritage
Isolator	Heritage	Heritage	Heritage	Heritage	Heritage	Heritage	Heritage	In qualification	-
Loads & Attenuators	Heritage	Heritage	Heritage	Heritage	Heritage	Heritage	Heritage	-	-
Iso-combiner	-	Capability	Heritage	Capability	Qualified	Qualified	Qualified	-	-
Stripline									
Circulator	Heritage	Heritage	Heritage	Heritage	Heritage	Heritage	Heritage	-	-
Isolators	Heritage	Heritage	Heritage	Heritage	Heritage	Heritage	Heritage	-	-
Loads & Terms.	-	Heritage	-	-	-	-	-	-	-
Microstrip									
Duplexer/Limiters	-	-	-	-	Heritage	-	-	-	-
Isolators	-	Heritage	Heritage	Heritage	Heritage	Heritage	Heritage	Heritage	Capability
Circulators	-	Capability	Heritage	Heritage	Heritage	Heritage	Heritage	Heritage	Capability

Waveguide heritage & capability

Function	S	C	X	Ku	K	Ka	Q	V	E
Circulators	Capability	Heritage	Heritage	Heritage	Heritage	Heritage	Heritage	Heritage	Capability
Couplers (not test Couplers)	Capability	Heritage	Heritage	Capability	Heritage	Heritage	Capability	Capability	-
Hybrids	Capability	Heritage	Heritage	Heritage	Heritage	Heritage	Heritage	Capability	Capability
Iso-Adpaters	Heritage	Heritage	Heritage	Heritage	Heritage	Heritage	Heritage	Heritage	-
Isolators	Heritage	Heritage	Heritage	Heritage	Heritage	Heritage	Heritage	Heritage	Capability
Loads & terminations	Heritage	Heritage	Heritage	Heritage	Heritage	Heritage	Heritage	Heritage	Capability
Test Couplers	Capability	Heritage	Heritage	Capability	Heritage	Heritage	Capability	Capability	-
Transitions	Heritage	Heritage	Heritage	Heritage	Heritage	Heritage	Heritage	Heritage	-
Integrated assemblies	Capability	Heritage	Heritage	Heritage	Heritage	Heritage	Heritage	Heritage	Capability

The following table describes in greater detail the meaning of the bands referred to in the previous table and the core applications into which SINT Dundee products are routinely applied.

Operating frequency band	Common Band	Waveguide band	Applications
0.25 to 1.0 GHz	UHF	-	Satellite Rx & Tx, Over-ride, submarine communications
1.0 to 2.0 GHz	L	-	Satellite Tx & Rx
2.0 to 3.3 GHz	S	WR340	Satellite Tx, data & radar, telemetry links
3.3 to 4.9 GHz	C	WR229	Satellite Rx & Tx, global and regional bands
3.9 to 5.9 GHz	C	WR187	Satellite Rx & Tx, data and radar
4.9 to 7.1 GHz	C	WR159	Satellite Rx & Tx
5.8 to 8.2 GHz	X	WR137	Satellite Rx & Tx
7.0 to 10.0 GHz	X	WR112	Satellite Rx & transmit, TT&C, filtering systems
8.2 to 12.4 GHz	X	WR90	Satellite Rx & Tx, Radar
10.0 to 15.0 GHz	Ku	WR75	Satellite Rx & Tx, communications
12.4 to 18.0 GHz	Ku	WR62	Satellite Rx, frequency conversion/ processing
17.0 to 22.0 GHz	K	WR51	Satellite Tx, frequency conversion/ processing
18.0 to 26.5 GHz	K	WR42	Satellite Tx, inter-satellite links
22.0 to 33.0 GHz	Ka	WR34	Satellite Rx, deep space transmission, deep space data relay
26.5 to 40.0 GHz	Ka	WR28	Satellite Rx, frequency conversion/processing,
33.0 to 50.0 GHz	Q	WR22	Satellite transmit & receive, frequency conversion/ processing
40.0 to 60.0 GHz	V	WR19	Satellite receive, frequency conversion/ processing
60.0 to 90.0 GHz	E	WR12	Satellite transmit and receive, ground station transmit and receive

Non-Waveguide heritage by end application

Application	UHF	L	C	S	X	Ku	K	Ka	Grand Total
TRM/BFN	0	25667	7960	0	60316	2268	177	0	96388
FILTER SYSTEM	0	11	12216	10	1614	14102	2419	97	30469
AIT, GENERIC OR UNCERTAIN	39	1446	4437	2344	3839	11355	4035	20	27515
RECEIVER/CONVERTER/LNA	15	379	7424	372	5029	2583	1087	18	16907
SSPA	0	4466	313	2798	187	375	46	0	8185
CHAMP	0	0	30	0	2872	0	0	0	2902
TRANSPONDER	0	30	0	1462	0	0	0	0	1492
COMBINER	0	0	0	529	14	112	38	0	693
OSCILLATOR	106	36	0	0	24	0	0	0	166
TRANSMISSION	0	3	0	55	0	0	0	0	58
RADIOMETER	0	0	6	0	6	0	0	0	12
Grand Total	**160**	**32038**	**32386**	**7570**	**73901**	**30795**	**7802**	**135**	**184787**

Non-Waveguide heritage by topology

Topology	UHF	L	C	S	X	Ku	K	Ka	Grand Total
MICROSTRIP	0	0	9158	0	60099	271	1321	135	70984
COAXIAL	64	4057	16181	4055	3869	26647	5560	0	60433
STRIPLINE (DROP-IN)	96	27927	5608	3409	5582	1886	426	0	44934
MICPUCK	0	54	1439	106	4351	1991	495	0	8436
Grand Total	**160**	**32038**	**32386**	**7570**	**73901**	**30795**	**7802**	**135**	**184787**

Non-Waveguide heritage by function

Row Labels	UHF	L	C	S	X	Ku	K	Ka	Grand Total
ISOLATOR	121	10692	20009	6367	22113	18411	6338	135	84186
CIRCULATOR	39	18462	12031	444	25750	11143	940		68809
DUPLEXER/LIMITER					25958				25958
LOAD/TERMINATION		2884	346	137	65	312	39		3783
CONNECTOR ASS						918			918
CABLE ASS							366		366
SPLITTER				263					263
ISO-COMBINER				247					247
ISO-ADPATER					15	11	119		145
ATTENUATOR				112					112
Grand Total	**160**	**32038**	**32386**	**7570**	**73901**	**30795**	**7802**	**135**	**184787**

Heritage is calculated based on FMs delivered up to 31st December 2022.

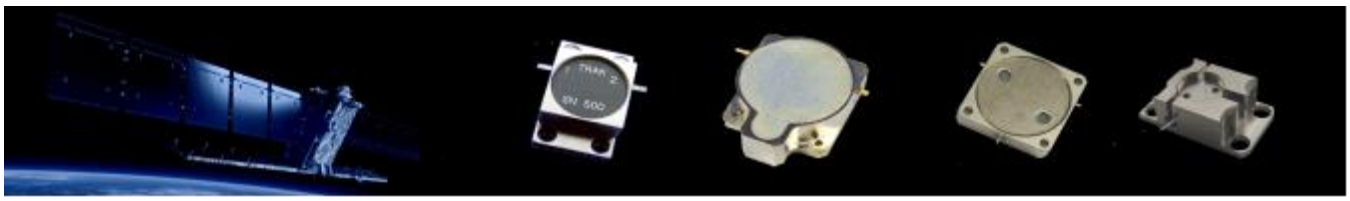
Coaxial Isolator & Circulator options with flight heritage

The following is a limited summary of coaxial Isolators and Circulators that have been supplied for spaceflight. Excluded from the tables are the huge number of variations (connector type & position and orientation, circulation etc.). Items highlighted in bold are included in this EQSR.

Bands	Housing size Excl. conns	Isolator (50 Ohm resistive Load)	Circulator
0.40-0.47 GHz	51.0 mm	☑	☑
1.00-1.10 GHz	25.4 mm	☑	☑
1.16-1.26 GHz	25.4 mm	☑	☑
1.20-1.30 GHz	25.4 mm	☑	☑
1.20-1.40 GHz	25.4 mm	☑	☑
1.30-1.60 GHz	25.4 mm	☑	☑
1.30-1.40 GHz	25.4 mm	☑	☑
1.50-1.60 GHz	25.4 mm	☑	☑
1.90-2.30 GHz	25.4 mm	☑	☑
2.00-2.25 GHz	25.4 mm	☑	☑
2.00-2.30 GHz	25.4 mm	☑	☑
2.00-2.40 GHz	25.4 mm	☑	☑
2.00-4.00 GHz	25.4 mm	☑	☑
2.10-2.70 GHz	25.4 mm	☑	☑
2.17-2.42 GHz	25.4 mm	☑	☑
2.20-2.50 GHz	25.4 mm	☑	☑
2.25-2.55 GHz	25.4 mm	☑	☑
2.30-2.60 GHz	25.4 mm	☑	☑
2.40-2.80 GHz	25.4 mm	☑	☑
2.40-2.80 GHz	25.4 mm	☑	☑
2.55-3.30 GHz	19.05mm	☑	☑
3.00-5.00 GHz	19.05mm	☑	☑
3.10-3.30 GHz	19.05mm	☑	☑
3.10-3.50 GHz	19.05mm	☑	☑
3.20-3.40 GHz	19.05mm	☑	☑
3.40-3.70 GHz	19.05mm	☑	☑
3.40-4.30 GHz	19.05mm	☑	☑
3.70-4.20 GHz	19.05mm	☑	☑
3.80-6.80 GHz	19.05mm	☑	☑
4.10-6.60 GHz	19.05mm	☑	☑
4.20-4.80 GHz	19.05mm	☑	☑
4.40-4.80 GHz	19.05mm	☑	☑
4.60-4.90 GHz	12.8 mm	☑	☑
5.30-6.00 GHz	12.8 mm	☑	☑
5.60-6.40 GHz	12.8 mm	☑	☑
5.70-6.80 GHz	12.8 mm	☑	☑
5.70-7.10 GHz	12.8 mm	☑	☑
5.80-6.70 GHz	12.8 mm	☑	☑
5.90-6.50 GHz	12.8 mm	☑	☑
6.00-7.00 GHz	19.05mm	☑	☑
6.20-18.0 GHz	12.8 mm	☑	☑
6.20-10.4 GHz	12.8 mm	☑	☑
6.50-7.20 GHz	12.8 mm	☑	☑

Bands	Housing size Excl. conns	Isolator (50 Ohm resistive Load)	Circulator
6.50-7.20 GHz	12.8 mm	☑	☑
6.50-10.0 GHz	12.8 mm	☑	☑
7.00-7.90 GHz	12.8 mm	☑	☑
7.20-8.40 GHz	12.8 mm	☑	☑
7.60-11.8 GHz	12.8 mm	☑	☑
7.90-12.1 GHz	12.8 mm	☑	☑
8.00-8.50 GHz	12.8 mm	☑	☑
8.00-10.0 GHz	12.8 mm	☑	☑
8.00-12.0 GHz	12.8 mm	☑	☑
8.00-12.2 GHz	12.8 mm	☑	☑
8.20-10.3 GHz	12.8 mm	☑	☑
9.00-10.0 GHz	12.8 mm	☑	☑
9.00-11.0 GHz	12.8 mm	☑	☑
10.0-15.0 GHz	12.8 mm	☑	☑
10.3-12.4 GHz	12.8 mm	☑	☑
10.5-13.0 GHz	12.8 mm	☑	☑
10.7-11.8 GHz	12.8 mm	☑	☑
10.7-12.8 GHz	12.8 mm	☑	☑
10.7-14.8 GHz	12.8 mm	☑	☑
11.6-12.8 GHz	12.8 mm	☑	☑
14.0-15.0 GHz	12.8 mm	☑	☑
10.7-14.8 GHz	12.8 mm	☑	☑
12.0-18.0GHz	12.8 mm	☑	☑
12.7-14.5 GHz	12.8 mm	☑	☑
13.0-15.0 GHz	12.8 mm	☑	☑
13.5-14.5 GHz	12.8 mm	☑	☑
13.5-15.0 GHz	12.8 mm	☑	☑
17.0-19.0 GHz	12.8 mm	☑	☑
17.3-19.8 GHz	12.8 mm	☑	☑
17.3-20.3 GHz	12.8 mm	☑	☑
17.3 -22.0 GHz	12.8 mm	☑	☑
17.5-20.5 GHz	12.8 mm	☑	☑
17.7-20.2 GHz	12.8 mm	☑	☑
17.7-22.0 GHz	12.8 mm	☑	☑
18.0-20.5 GHz	12.8 mm	☑	☑
18.0-21.0 GHz	12.8 mm	☑	☑
18.0-22.0 GHz	12.8 mm	☑	☑
19.5-22.0 GHz	12.8 mm	☑	☑
20.0-22.0 GHz	12.8 mm	☑	☑
22.0-24.0 GHz	12.8 mm	☑	☑
23.3-23.6 GHz	12.8 mm	☑	-
23.0-25.0 GHz	12.8 mm	☑	-
27.5-30.0 GHz	Non-standard	☑	-

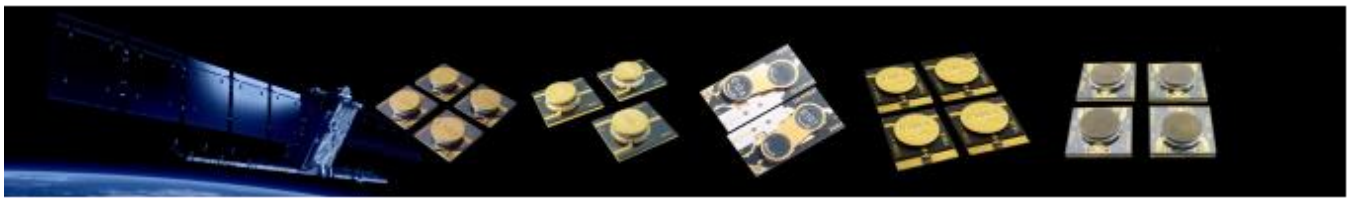
Stripline (tabbed) Isolator & Circulator options with flight heritage



The following is a limited summary of stripline (tabbed) Isolators and Circulators that have been supplied for spaceflight. Excluded from the tables are the huge number of variations (orientation, circulation etc.). Items highlighted in bold are included in this EQSR.

Operating band	Isolator (50 Ohm resistive Load)	Circulator		Operating band	Isolator (50 Ohm resistive Load)	Circulator
1.10-1.20 GHz	☑	☑		5.95-6.55 GHz	☑	☑
1.20-1.30 GHz	☑	☑		6.10-6.70 GHz	☑	☑
1.34-1.48 GHz	☑	☑		6.35-7.05 GHz	☑	☑
1.50-1.70 GHz	☑	☑		6.60-7.30 GHz	☑	☑
1.60-1.70 GHz	☑	☑		6.80-7.60 GHz	☑	☑
1.80-2.30 GHz	☑	☑		7.10-7.90 GHz	☑	☑
2.00-2.10 GHz	☑	☑		7.20-7.80GHz	☑	☑
2.00-2.30 GHz	☑	☑		7.50-7.70 GHz	☑	☑
2.10-2.30 GHz	☑	☑		7.60-8.40 GHz	☑	☑
2.20-2.30 GHz	☑	☑		7.70-8.60 GHz	☑	☑
2.20-2.60 GHz	☑	☑		7.90-8.40 GHz	☑	☑
2.30-2.70 GHz	☑	☑		8.00-9.00 GHz	☑	☑
2.35-2.65 GHz	☑	☑		8.20-8.40 GHz	☑	☑
2.80-2.90 GHz	☑	☑		10.4-11.6 GHz	☑	☑
3.10-3.30 GHz	☑	☑		10.5-13.0 GHz	☑	☑
3.10-3.50 GHz	☑	☑		10.7-12.8 GHz	☑	☑
3.30-3.70 GHz	☑	☑		11.3-12.8 GHz	☑	☑
3.40-4.20 GHz	☑	☑		11.8-13.0 GHz	☑	☑
3.45-3.95 GHz	☑	☑		11.9-13.2 GHz	☑	☑
3.60-4.20 GHz	☑	☑		12.1-12.8 GHz	☑	☑
3.80-4.70 GHz	☑	☑		12.1-13.4 GHz	☑	☑
3.85-4.30 GHz	☑	☑		12.3-13.6 GHz	☑	☑
3.90-4.40 GHz	☑	☑		13.0-14.5 GHz	☑	☑
4.40-4.70 GHz	☑	-		13.2-14.6 GHz	☑	☑
4.45-4.86 GHz	☑	☑		13.6-14.7 GHz	☑	☑
4.95-5.05 GHz	☑	☑		13.7-14.5 GHz	☑	☑
5.25-5.45 GHz	☑	☑		14.4-14.6 GHz	☑	☑
5.50-6.10 GHz	☑	☑		16.5-17.5 GHz	☑	☑
5.85-6.43 GHz	☑	☑		17.2-17.4 GHz	☑	-
5.80-6.50 GHz	☑	☑		17.2-18.5 GHz	☑	-

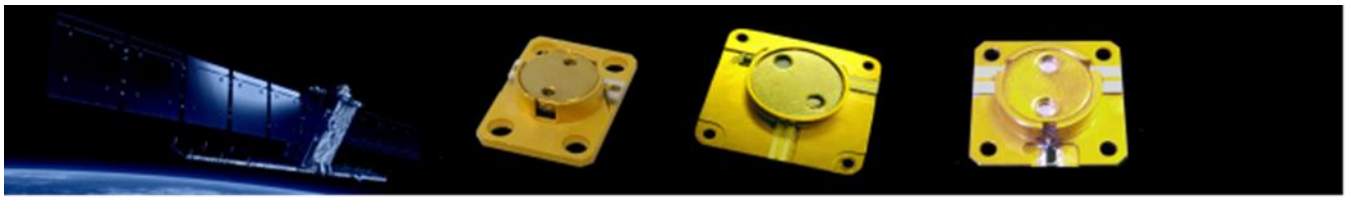
Microstrip Isolator & Circulator options with flight heritage



The following is a limited summary of microstrip Isolators and Circulators with flight heritage or designed for space applications. Items highlighted in bold are included in this EQSR.

Operating band	Isolator (50 Ohm resistive Load)	Circulator		Operating band	Isolator (50 Ohm resistive Load)	Circulator
2.30-2.50 GHz	☑	-		8.90-10.7 GHz	☑	☑
2.40-2.55 GHz	☑	-		9.00-10.0 GHz	☑	☑
2.70-3.30 GHz	☑	-		9.00-10.2GHz	☑	☑
3.40-4.20 GHz	☑	-		8.90-10.1 GHz	☑	☑
4.20-4.80 GHz	☑	-		8.90-10.7 GHz	☑	☑
5.10-5.60 GHz	☑	☑		9.30-10.3 GHz	☑	☑
5.20-5.60 GHz	☑	☑		9.40-11.8 GHz	☑	☑
5.30-5.55 GHz	☑	☑		10.3-12.4 GHz	☑	☑
5.70-6.80 GHz	☑	☑		10.7-12.8 GHz	☑	☑
6.20-8.21 GHz	☑	☑		12.7-14.8 GHz	☑	☑
6.70-8.86 GHz	☑	☑		17.3-18.6 GHz	☑	☑
7.20-8.10 GHz	☑	☑		17.7-22.0 GHz	☑	-
7.50-8.40 GHz	☑	☑		18.3-20.2 GHz	☑	☑
7.60-9.60 GHz	☑	☑		18.4-18.9 GHz	☑	☑
8.00-8.50 GHz	☑	☑		18.4-20.2 GHz	☑	☑
8.00-12.0 GHz	☑	☑		23.5-24.0 GHz	☑	-
8.00-12.2 GHz	☑	☑		25.5-27.0 GHz	☑	-
8.20-12.4 GHz	☑	☑		27.5-29.1 GHz	☑	☑
8.20-10.3 GHz	☑	☑		27.5-31.0 GHz	☑	-
8.50-10.5 GHz	☑	☑		31.1-31.6 GHz	☑	☑
8.50-11.5 GHz	☑	☑		34.0-36.0 GHz	-	In development
8.80-9.50 GHz	☑	☑		-	-	-

MIC type Isolator & Circulator options with flight heritage



The following is a limited summary of MIC Isolators and Circulators that have been supplied for spaceflight. Excluded from the tables are the huge number of variations (connector type & position and orientation, circulation etc.). Items highlighted in bold are included in this EQSR.

Operating band	Isolator (50 or 1MOhm Load)	Circulator
1.00-1.10 GHz	☑	Refer to factory
1.10-1.20 GHz	☑	Refer to factory
1.20-1.40 GHz	☑	Refer to factory
2.20-2.35 GHz	☑	Refer to factory
1.30-1.70GHz	☑	Refer to factory
2.46-2.73 GHz	☑	Refer to factory
2.95-3.30 GHz	☑	Refer to factory
3.15-3.25 GHz	☑	Refer to factory
3.30-3.50 GHz	☑	Refer to factory
3.40-3.80 GHz	☑	Refer to factory
3.50-3.70 GHz	☑	Refer to factory
3.50-4.00 GHz	☑	Refer to factory
3.60-4.30 GHz	☑	Refer to factory
3.70-4.20 GHz	☑	Refer to factory
4.20-4.80 GHz	☑	Refer to factory
4.30-4.90 GHz	☑	Refer to factory
5.29-5.84 GHz	☑	Refer to factory
5.80-6.50 GHz	☑	Refer to factory
5.90-6.70 GHz	☑	Refer to factory
6.40-6.60 GHz	☑	Refer to factory
6.60-6.80 GHz	☑	Refer to factory
6.60-7.30 GHz	☑	Refer to factory
6.70-7.15 GHz	☑	Refer to factory
6.68-7.52 GHz	☑	Refer to factory
7.08-7.52 GHz	☑	Refer to factory
7.20-7.40 GHz	☑	Refer to factory
7.25-7.75 GHz	☑	Refer to factory
7.60-8.40 GHz	☑	Refer to factory
7.90-8.10 GHz	☑	Refer to factory
7.90-8.50 GHz	☑	Refer to factory

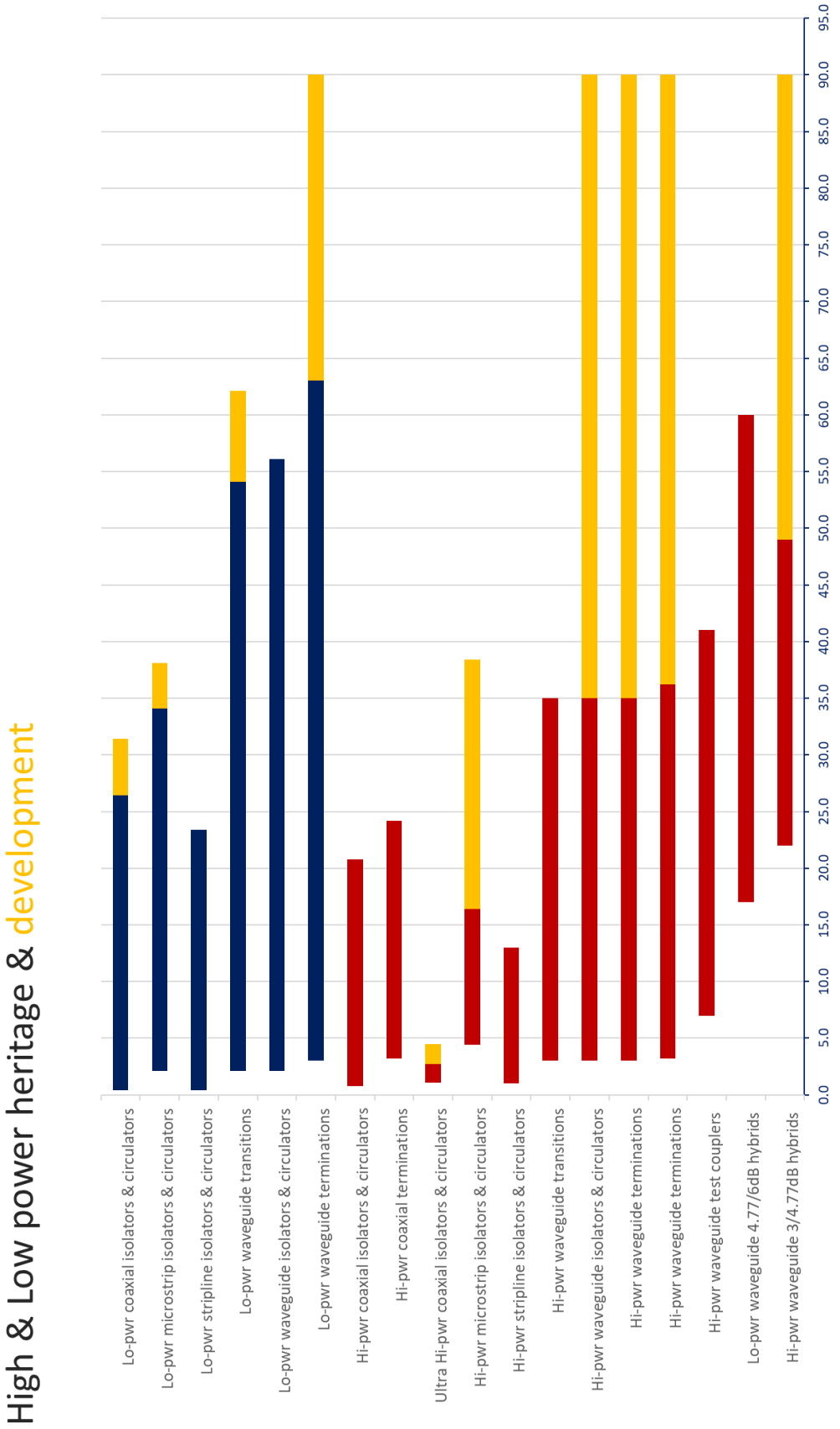
Operating band	Isolator (50 or 1MOhm Load)	Circulator
8.00-8.50 GHz	☑	Refer to factory
8.00-8.80 GHz	☑	Refer to factory
8.15-8.25 GHz	☑	Refer to factory
8.45-8.55 GHz	☑	Refer to factory
9.25-9.95 GHz	☑	Refer to factory
9.50-9.80 GHz	☑	Refer to factory
10.3-10.7 GHz	☑	Refer to factory
10.6-10.8 GHz	☑	Refer to factory
10.8-11.9 GHz	☑	Refer to factory
10.7-11.8 GHz	☑	Refer to factory
10.7-12.8 GHz	☑	Refer to factory
10.9-11.8 GHz	☑	Refer to factory
10.9-12.8 GHz	☑	Refer to factory
11.1-12.6 GHz	☑	Refer to factory
11.4-12.6 GHz	☑	Refer to factory
11.8-12.8 GHz	☑	Refer to factory
12.8-14.5 GHz	☑	Refer to factory
13.2-14.5 GHz	☑	Refer to factory
13.9-14.6 GHz	☑	Refer to factory
13.9-14.9 GHz	☑	Refer to factory
16.9-17.1 GHz	☑	Refer to factory
17.3-18.5 GHz	☑	Refer to factory
18.5-19.0 GHz	☑	Refer to factory
18.8-20.2 GHz	☑	Refer to factory
19.7-20.3 GHz	☑	Refer to factory
19.5-20.5 GHz	☑	Refer to factory
20.0-20.6 GHz	☑	Refer to factory
20.2-21.2 GHz	☑	Refer to factory
21.0-22.0 GHz	☑	Refer to factory
-	-	-

Coaxial Loads & Terminations with flight heritage

The following is a limited summary of coaxial terminations and Loads that have been supplied for spaceflight. Excluded from the tables are the huge number of variations (mounting detail etc.). Items highlighted in bold are included in this.

Connector type	Operating in the band	Low power <3W	Medium power >20W	High-power >50W	Comments
TNC	0.20-0.30 GHz	-	☑	☑	Refer to factory
TNC	0.40-12.7 GHz	-	☑	☑	Refer to factory
SMA	0.40-8.00 GHz	☑	☑	-	Refer to factory
SMA	1.50-1.60 GHz	☑	☑	-	Refer to factory
TNC	1.50-1.80 GHz	-	☑	☑	Refer to factory
SMA	1.50-3.50 GHz	☑	☑	-	Refer to factory
TNC	2.00-2.40 GHz	-	☑	☑	Refer to factory
SMA	2.00-2.50 GHz	☑	☑	☑	Refer to factory
TNC	3.40-4.20 GHz	☑	☑	☑	Refer to factory
TNC	3.40-4.80 GHz	☑	☑	☑	Refer to factory
SMA	7.00-9.00 GHz	☑	☑	-	Refer to factory
TNC	10.7-14.8 GHz	☑	☑	-	Refer to factory
SMA	12.7-14.8 GHz	☑	-	-	Refer to factory
SMA	17.3-17.4 GHz	☑	-	-	Refer to factory
SMA	17.8-20.2 GHz	☑	-	-	Refer to factory

Heritage & current product development roadmap by type and frequency



Heritage by payload (launched)

SINT Dundee products have been launched on 667 payloads covering a wide number of applications and orbits.

Purpose	Elliptical/ Molniya	GEO	LEO	MEO	Total
Communications	3	346	109	20	478
Earth Observation	2	14	112	-	128
Earth Science	-	-	1	-	1
Space Science	8	-	3	-	11
Technology Development	2	-	4	-	6
Communications/ Navigation	-	1	-	-	1
Communications/ Technology Development	-	1	-	-	1
Earth Observation/ Communications	-	1	-	-	1
Earth Observation/ Technology Development	-	-	2	-	2
Navigation/ Global Positioning	2	-	-	24	26
Navigation/ Regional Positioning	-	12	-	-	12
Total	**17**	**375**	**231**	**44**	**667**

List of known payloads in which SINT Dundee products have been used

Including the following programs where the satellites have been launched *[# of payloads in the series*]:

ABS **[6]**	CRYOSAT	HORIZONS	PALAPA	SPAINSAT I
AEOLUS	CSG	HORYU	PAZ	SPIRALE **[2]**
AL YAH	CSO	HYLAS **[2]**	PERUSAT	SPOT **[2]**
AMAZONAS **[4]**	DART	HYSIS	PLÉIADES **[2]**	ST
AMC **[9]**	DAICHI	IBUKI	PRISMA	STAR **[5]**
AMOS **[3]**	DIRECTV **[9]**	IGS **[11]**	PROBA	STAR ONE D2
ANIK **[5]**	DIALOG	INMARSAT **[10]**	QZS **[5]**	SUPERBIRD **[2]**
APSTAR **[4]**	ECHOSTAR **[13]**	INSAT **[4]**	Quantum	SWARM **[3]**
ARABSAT **[3]**	EDRS	INTEGRAL	RADARSAT	SYRACUSE **[2]**
ASIASAT **[3]**	ELECTRO **[3]**	INTELSAT **[32]**	RASCOM	TANDEM
ASIASTAR	ELISA **[4]**	IRIDIUM NEXT **[75]**	RCM **[3]**	TANGO
ASNARO **[2]**	EOS	IRNSS **[8]**	RESOURCESAT	TELKOM **[2]**
ASTRA **[15]**	ERG	JCSAT **[13]**	RISAT **[4]**	TELSTAR **[6]**
ASTROSAT	EROS B	KAZSAT **[2]**	RUMBA	TERRASAR
AT&T	ES'HAIL **[2]**	KOMPSAT **[4]**	SALSA	TERRASTAR
ATHENA **[2]**	EUTELSAT **[30]**	KOREASAT **[4]**	SAMBA	THAICOM **[3]**
AZERSPACE **[2]**	EXACTVIEW **[2]**	LAOSAT	SAOCOM	THURAYA **[2]**
BADR **[5]**	EXPRESS **[14]**	LEO VANTAGE 1	SAR LUPE **[5]**	TURKMEN
BANGABANDHU	GALAXY **[12]**	LUCH **[3]**	SARAL	TURKSAT **[4]**
BRAZILSAT	GALILEO **[26]**	MEASAT **[3]**	SCATSAT	VIASAT **[2]**
BRIO	GCOM **[2]**	MERAH	SCD	VINASAT **[2]**
BRISAT	GEO **[2]**	METEOSAT **[4]**	SDS	WILDBLUE
BSAT **[5]**	GEOEYE	METOP **[3]**	SENTINEL **[8]**	WORLDVIEW **[3]**
BULGARIASAT	GISAT-1	MTSAT	SES **[15]**	XMM
CALIPSO	GLOBALSTAR **[31]**	NIGERIASAT **[2]**	SGDC	XTAR

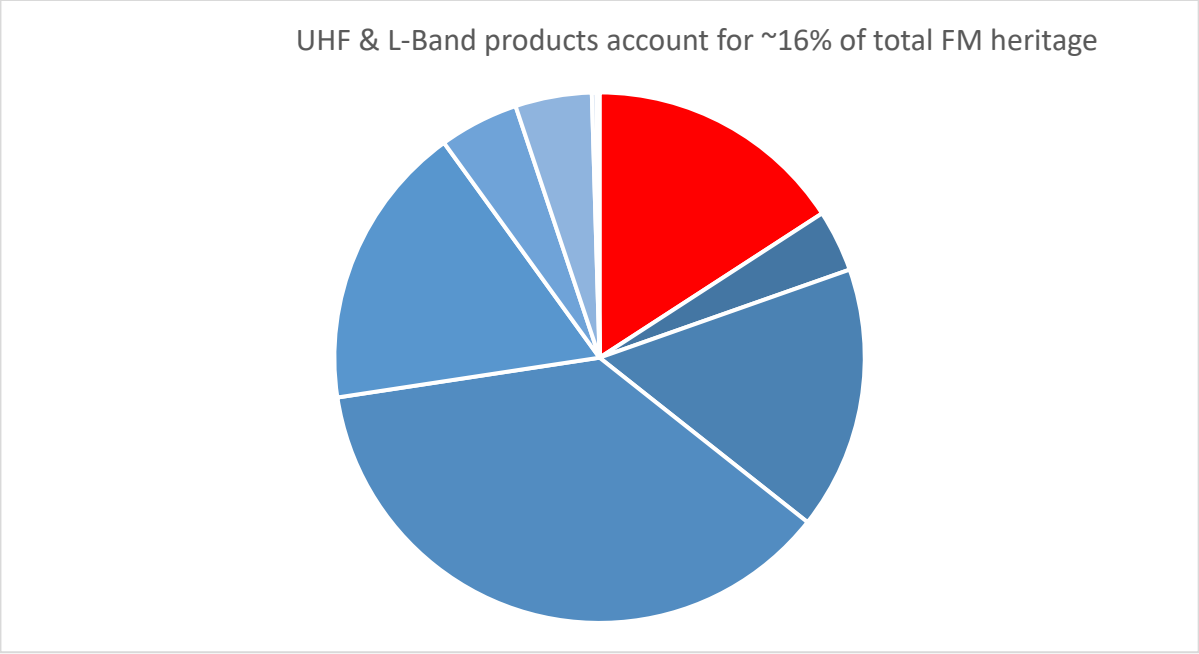
CARTOSAT **[9]**	GÖKTÜRK	NILESAT	SICRAL **[3]**	YAHSAT **[2]**
CBERS **[2]**	GOSAT	NIMIQ **[4]**	SIRIUS **[10]**	YAMAL **[4]**
CHEOPS	GSAT **[16]**	NOVASAR	SKY MUSTER **[2]**	-
CIEL	HELIOS **[2]**	NSS **[7]**	SKYBRASIL	-
CMS	HELLASSAT **[3]**	O3B [20]	SKYNET **[5]**	-
COMS	HIMAWARI **[2]**	OFEQ **[6]**	SKYSAT **[8]**	-
COMSATBW **[2]**	HINODE	OPTOS	SMOS	-
COSMO **[6]**	HISPASAT **[4]**	OPTUS **[5]**	SPACEWAY **[2]**	-

UHF & L-Band Overview

SINT has developed, supplied, and has heritage with many passive devices operating in the band 0.3 to 2.0GHz which have been designed to operate at either low or high RF power. Approximately 122 distinct designs have been supplied for flight. Heritage is dominated by the supplied of medium-power Circulators used hybrid (TRm) applications and high-power Isolators used in SSPA applications. Thus far all parts have been supplied as components. The following is an extract from the heritage database which records sales of flight model hardware from 1994 to December 2020.

FMs supplied	COAXIAL	MICPUCK	STRIPLINE (DROP-IN)	Grand Total
UHF	**64**		**96**	**160**
CIRCULATOR	39			121
ISOLATOR	25		96	39
L	**4057**	**54**	**27927**	**32028**
CIRCULATOR	545		17917	18462
ISOLATOR	3507	54	7131	10692
LOAD/TERMINATION	5		2879	2884
Grand Total	**4121**	**54**	**28023**	**32198**

Heritage in terms of the numbers and types of products supplied changes daily. Please contact the factory to obtain the most up to date information.



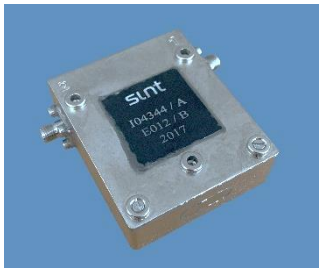
In development/qualification

- Low power E5/E6 miniature stripline Isolator
- Low power L1/L5/L6 low power Isolator
- 240-260MHz LP Isolator
- 240-270MHz HP Isolator
- 290-318MHz LP Isolator

UHF-Band high-power 250MHz TNC Isolator

Used in an SSPA application.

SINT part number	I024026/A
SINT ICD	-
Application	-
Status	*In development*
Program	-



- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Passivated Aluminum housing featuring procured connectors, internal termination.
- Image opposite is a place marker

Basic performance criteria

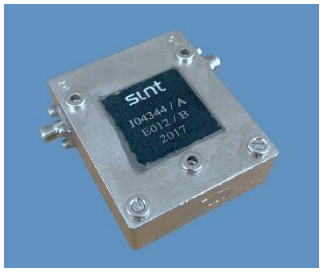
Parameter	Performance
Non-operating	-40 to +70C
Acceptance	-30 to +65C
Operating Frequency	240 to 270 MHz
Insertion Loss	0.45 dB max
Isolation	20 dB min
Return Loss	20 dB min
Power	100W CW
Radiated Emissions	80dBi min
Mass	300g nom

Environmental

Location	Shock response (Q=10), g
	Qualification
Not specified	Screened in accordance with ESA/ SCC 3202 v1 chart II

UHF-Band low power 250MHz SMA Isolator

Used in a receiver application.



SINT part number	I029032/A
SINT ICD	-
Application	-
Status	*In development*
Program	-

- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Passivated Aluminum housing featuring procured connectors.

Basic performance criteria

Parameter	Performance
Non-operating	-40 to +70C
Acceptance	-30 to +65C
Operating Frequency	290 to 318MHz
Insertion Loss	0.45 dB max
Isolation	20 dB min
Return Loss	20 dB min
Power	1W CW
Radiated Emissions	80dBi min
Mass	300g nom

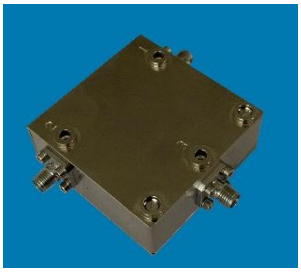
Environmental

Location	Shock response (Q=10), g
	Qualification
Not specified	Screened in accordance with ESA/ SCC 3202 v1 chart II

UHF-Band high-power 250MHz SMA Circulator

Used in a receiver application.

SINT part number	C029032/A
SINT ICD	-
Application	-
Status	*In development*
Program	-



- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Passivated Aluminum housing featuring procured connectors.

Basic performance criteria

Parameter	Performance
Non-operating	-40 to +80C
Acceptance	-30 to +70C
Operating Frequency	240 to 70 MHz
Insertion Loss	0.50 dB max
Return Loss	20 dB min
Power	50W CW
Radiated Emissions	80dBi min
Mass	300g nom

Environmental

Location	Shock response (Q=10), g
	Qualification
Not specified	Screened in accordance with ESA/ SCC 3202 v1 chart II

Environmental

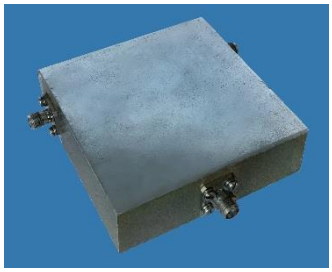
Test	Axis	Frequency (Hz)		Acceptance X-axis	Acceptance Y-axis	Acceptance Z-axis
Sine	All 3 axis	1 to 20		Max shaker amp	Max shaker amp	Max shaker amp
		20 to 100		24g	24g	24g
				2 Oct/min	*2 Oct/min*	*2 Oct/min*
Random		20 to 100		+12.04dB/oct.	-	-
		20 to 80		-	+4.66dB/oct.	+4.66dB/oct.
		100 to 300		0.75g^2/Hz	-	-
		80 to 300		-	0.05g^2/Hz	0.05g^2/Hz
		300 to 425		+4.06 dB/oct.	-	-
		300 to 500		-	+4.08 dB/oct.	+2.39 dB/oct.
		425 to 715		1.2g^2/Hz	-	-
		500 to 925		-	+11.02 dB/oct.	-
		500 to 1100		-	-	+9.59 dB/oct.
		925 to 1325		-	0.95g^2/Hz	-
		1100 to 1500		-	-	0.925g^2/Hz
		715 to 2000		-16.19dB/oct.	-	-
		1325 to 2000		-	-16.46dB/oct.	-
		1500 to 2000		-	-	-23.28dB/oct.
				60 secs/axis	*60 secs/axis*	*180 secs/axis*
		Overall [rms]		**28.78g**	**28.67g**	**28.38g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Not specified	100	30
	1600	2000
	10000	2000
	Number of Events	*3 per axis*

UHF-Band SMA medium-power Circulator

Used as a duplexer in an EOS platform.

SINT part number	C0407/A
SINT ICD	B023260
Application	Radar
Status	In orbit
Program	*CBERS2*



- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Used on the output of a mechanical switch.
- Passivated Aluminum housing featuring procured connectors.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

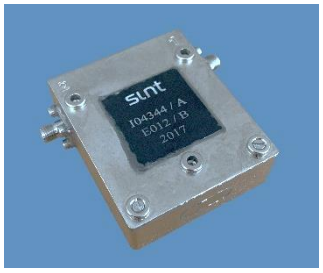
Parameter	Performance
Non-operating	-40 to +80C
Acceptance	-20 to +70C
Operating Frequency	400 to 470 MHz
Insertion Loss	0.30dB max
Return Loss	21 dB min
Power	5W CW
Radiated Emissions	80dBi min
Mass	315g nom

Environmental

Location	Shock response (Q=10), g
	Qualification
Not specified	Screened in accordance with ESA/ SCC 3202 v1 chart II

UHF-Band phase & amplitude matched, low power SMA Isolator

Used in a calibration system in an EOS platform.



SINT part number	I04344/A & I04344/B
SINT ICD	B108920 & B108920
Application	UHF Radar
Status	Supplied as FM
Program	*BIOMASS*

- Phase & amplitude matched – not included in table below
- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Passivated Aluminum housing featuring procured connectors.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-40 to +70C
Acceptance	-30 to +65C
Operating Frequency	432 to 438 MHz
Insertion Loss	0.20dB max
Isolation	25 dB min
Return Loss	25 dB min
Power	1W CW
Radiated Emissions	80dBi min
Mass	296g nom

Environmental

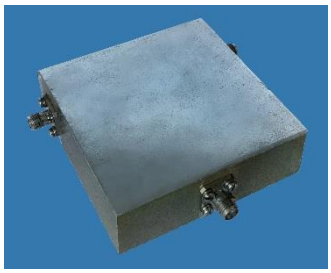
Test	Axis	Frequency (Hz)	Acceptance X-axis	Acceptance Y-axis	Acceptance Z-axis
Sine	All 3 axis	1 to 20	Max shaker amp	Max shaker amp	Max shaker amp
		20 to 100	24g	24g	24g
			2 Oct/min	*2 Oct/min*	*2 Oct/min*
Random		20 to 100	+12.04dB/oct.	-	-
		20 to 80	-	+4.66dB/oct.	+4.66dB/oct.
		100 to 300	$0.75g^2/Hz$	-	-
		80 to 300	-	$0.05g^2/Hz$	$0.05g^2/Hz$
		300 to 425	+4.06 dB/oct.	-	-
		300 to 500	-	+4.08 dB/oct.	+2.39 dB/oct.
		425 to 715	$1.2g^2/Hz$	-	-
		500 to 925	-	+11.02 dB/oct.	-
		500 to 1100	-	-	+9.59 dB/oct.
		925 to 1325	-	$0.95g^2/Hz$	-
		1100 to 1500	-	-	$0.925g^2/Hz$
		715 to 2000	-16.19dB/oct.	-	-
		1325 to 2000	-	-16.46dB/oct.	-
		1500 to 2000	-	-	-23.28dB/oct.
			60 secs/axis	*60 secs/axis*	*180 secs/axis*
		Overall [rms]	**28.78g**	**28.67g**	**28.38g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Not specified	100	30
	1600	2000
	10000	2000
	Number of Events	*3 per axis*

UHF-Band low power SMA Circulator

Used aboard a GEO payload

SINT part number	C03941/A
SINT ICD	B10890
Application	Receiver
Status	Supplied as FM
Program	*withheld*



- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Passivated Aluminum housing featuring procured connectors.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-40 to +85C
Acceptance	-20 to +80C
Operating Frequency	399-403 MHz
Insertion Loss	0.20dB max
Isolation	25 dB min
Return Loss	25 dB min
Power	1W CW
Radiated Emissions	80dBi min
Mass	265g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	LAT
Sine	All 3 axis	1 to 20	Max shaker amp	-
		20 to 100	24g	-
			2 Oct/min	-
Random		20 to 100	+6dB/oct.	+6dB/oct.
		100 to 1000	0.67g^2/Hz	1.54g^2/Hz
		1000 to 2000	-3dB/oct.	-3dB/oct.
			60 secs/axis	*180 secs/axis*
		Overall [rms]	**33.0g**	**50.0g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Not specified	100	60
	1300	2000
	10000	2000
	Number of Events	*3 per axis*

UHF high-power TNC coaxial Load

Generic applications. Key design parameters are *Return Loss* and reliability under fault conditions.

SINT part number	VTE103
SINT ICD	B103382
Application	Generic
Status	In orbit
Program	*Various*

- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Vented Nickel-plated, Stainless-steel housing featuring procured connectors.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-50 to +140C
Qualification	-30 to +85C
Acceptance	-35 to +75C
Operating Frequency	200 to 300 MHz
Return Loss	1.05:1
Power	250W average
	500W peak
Radiated Emissions	70dBi min
Mass	142g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 20		11 mm
		20 to 100		20g
				2 octaves/min
Random	All 3 axis	20 to 50	+6dB/oct.	+6dB/oct.
		50 to 350	$0.8g^2$/Hz	$0.8g^2$/Hz
		350 to 700	-12.0 dB/oct.	-12.0 dB/oct.
		700 to 2000	$0.05g^2$/Hz	$0.05g^2$/Hz
			180 secs/axis	*180 secs/axis*
		Overall [rms]	**20.0g**	**20.0g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Not specified	500	200
	3000	2000
	10000	2000
	Number of Events	*3 per axis*
Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification

Notes:

- The termination is resistive
- A chip resistor is used

0.1 to 18 GHz medium-power coaxial Load

Generic applications. Key design parameters are *Return Loss* and reliability under fault conditions.

SINT part number	TE101
SINT ICD	SKA10426
Application	Generic
Status	In orbit
Program	*Various*

- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Vented Nickel-plated, Stainless-steel housing.
- No anomalies, deviations, waivers nor test or issues affecting the model described.

Basic performance criteria

Parameter	Performance
Non-operating	-65 to +150C
Qualification	-55 to +125C
Acceptance	-55 to +125C
Operating Frequency	0.1 to 18 GHz
Return Loss	1.15:1 (>0.1-4.0 GHz)
	1.17:1 (>4.0-12.0 GHz)
	1.25:1 (>12.0-18.0 GHz)
Power	10W to +80C linearly de-rated to 1.0W CW at+125C
Radiated Emissions	65dBi min
Mass	8g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification XY
Sine	All 3 axis	5 to 20	-	11 mm
		20 to 100	-	20g
				2 octaves/min
Random	All 3 axis	10 to 60	+7dB/oct.	+7dB/oct.
		60 to 75	$0.22g^2/Hz$	$0.50g^2/Hz$
		75 to 100	+10.5dB/oct.	+11.5dB/oct.
		100 to 300	$0.67g^2/Hz$	$1.5g^2/Hz$
		300 to 900	-7.1dB/oct.	-7.4dB/oct.
		900 to 1000	$0.045g^2/Hz$	$0.10g^2/Hz$
		1000 to 2000	-3dB/oct.	3dB/oct.
			60 secs/axis	*180 secs/axis*
		Overall [rms]	**17.2g**	**25.8g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Not specified	100	50
	400	600
	1500	2000
	10000	2500
	Number of Events	*3 per axis*

Notes:

- The termination is resistive
- A 20W BeO rod resistor is used

0.4 to 8.0 GHz medium-power coaxial Load

Generic applications. Key design parameters are *Return Loss* and reliability under fault conditions.

SINT part number	TE102
SINT ICD	B104051
Application	Generic
Status	In orbit
Program	*Various*

- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Vented Nickel-plated, Stainless-steel housing featuring procured connectors.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-55 to +140C
Qualification	-30 to +100C
Acceptance	-20 to +91C
Operating Frequency	0.4 to 8.0 GHz
Return Loss	1.17:1
Power	10W CW, 100W max
Radiated Emissions	70dBi min
Mass	32g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance Z	Acceptance XY	Qualification XY	Qualification Z
Sine		5 to 25			11 mm	11 mm
		25 to 100			20g	2g
					2 octaves/min	*4 octaves/min*
Random		20 to 100	+3dB/oct.	+3dB/oct.	+6dB/oct.	+6dB/oct.
		100 to 300	$1.5g^2/Hz$	$0.60g^2/Hz$	$0.40g^2/Hz$	$2.0g^2/Hz$
		300 to 2000	-6.0 dB/oct.	-6.0 dB/oct.	-3 dB/oct.	-6 dB/oct.
			180 secs/axis	*60 secs/axis*	*180 secs/axis*	*60 secs/axis*
		Overall [rms]	**27.5**	**17.4g**	**25.61g**	**41.04g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
		In accordance with method 213 of MIL-STD-202 condition1

Notes:

- The termination is resistive
- A chip resistor is used

DC to 12.75 GHz medium-power coaxial Load

Generic applications. Key design parameters are *Return Loss* and reliability under fault conditions.

SINT part number	CTE103
SINT ICD	B104051
Application	Generic
Status	In orbit
Program	*Various*

- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Vented Nickel-plated, Stainless-steel housing featuring procured connectors.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-55 to +140C
Qualification	-30 to +100C
Acceptance	-30 to +100C
Operating Frequency	DC to 12.75 GHz
Return Loss	1.25:1
Power	5W CW, 25W max
Radiated Emissions	70dBi min
Mass	32g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance Z	Acceptance XY	Qualification XY	Qualification Z
Sine		5 to 25			11 mm	11 mm
		25 to 100			20g	2g
					2 octaves/min	*4 octaves/min*
Random		20 to 100	+3dB/oct.	+3dB/oct.	+6dB/oct.	+6dB/oct.
		100 to 300	$1.5g^2$/Hz	$0.60g^2$/Hz	$0.40g^2$/Hz	$2.0g^2$/Hz
		300 to 2000	-6.0 dB/oct.	-6.0 dB/oct.	-3 dB/oct.	-6 dB/oct.
			180 secs/axis	*60 secs/axis*	*180 secs/axis*	*60 secs/axis*
		Overall [rms]	**27.5**	**17.4g**	**25.61g**	**41.04g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
		In accordance with method 213 of MIL-STD-202 condition1

Notes:

- The termination is resistive
- A chip resistor is used

DC to 12.75 GHz medium-power SMA Load

Generic applications.

SINT part number	STE111
SINT ICD	B105933
Application	Generic
Status	In orbit
Program	*Various*

- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Vented Nickel-plated, Stainless-steel housing featuring procured connectors.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-55 to +140C
Qualification	-30 to +910C
Acceptance	-20 to +85C
Operating Frequency	1.5 to 3.5 GHz
Return Loss	1.15:1
Power	24W CW, 100W max
Radiated Emissions	70dBi min
Mass	32g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance Z	Acceptance XY	Qualification XY	Qualification Z
Sine		5 to 25			11 mm	11 mm
		25 to 100			20g	2g
					2 octaves/min	*4 octaves/min*
Random		20 to 100	+3dB/oct.	+3dB/oct.	+6dB/oct.	+6dB/oct.
		100 to 300	$1.5g^2$/Hz	$0.60g^2$/Hz	$0.40g^2$/Hz	$2.0g^2$/Hz
		300 to 2000	-6.0 dB/oct.	-6.0 dB/oct.	-3 dB/oct.	-6 dB/oct.
			180 secs/axis	*60 secs/axis*	*180 secs/axis*	*60 secs/axis*
		Overall [rms]	**27.5**	**17.4g**	**25.61g**	**41.04g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
		In accordance with method 213 of MIL-STD-202 condition1

Notes:

1. The termination is resistive –
2. A chip resistor is used

L-Band low-power, broadband SMA Isolator

Used in conjunction with a high-power Circulator to produce an Isolator. Sited remotely to ensure adequate heat dissipation.

SINT part number	I08011/A
SINT ICD	C109213
Application	Converter
Status	Supplied
Program	-

- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Used on the output of a mechanical switch.
- Nickel-plated, Stainless-steel housing featuring procured connectors.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-40 to +85C
Acceptance	-20 to +70C
Operating Frequency	800 to 1050 MHz
Insertion Loss	0.30dB
Isolation	18 dB min
Return Loss	18 dB min
Power	1W CW
Radiated Emissions	80dBi min
Mass	114g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification XY
Sine	All 3 axis	5 to 23.8	-	11 mm
		23.8 to 100	-	25g
				2 octaves/min
Random	All 3 axis	20 to 75	-	+6dB/oct.
		20 to 100	+8.13dB/oct.	-
		75 to 1300	-	$1.50g^2/Hz$
		100 to 350	$1.30g^2/Hz$	-
		350 to 1500	-4.15 dB/oct.	$0.40g^2/Hz$
		1300 to 2000	-	-7.0 dB/oct.
		1500 to 2000	-7.0 dB/oct.	-
			60 secs/axis	*180 secs/axis*
		Overall [rms]	**30.0g**	**50.0g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Not specified	100	30
	3000	2000
	10000	2000
	Number of Events	*3 per axis*

L-Band low-power, broadband SMA Isolator

Used in conjunction with a high-power Circulator to produce an Isolator. Sited remotely to ensure adequate heat dissipation.

SINT part number	I1013/B
SINT ICD	C109216
Application	Converter
Status	Supplied
Program	-

- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Used on the output of a mechanical switch.
- Nickel-plated, Stainless-steel housing featuring procured connectors.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.
- Image opposite is representative of this part

Basic performance criteria

Parameter	Performance
Non-operating	-40 to +85C
Acceptance	-20 to +70C
Operating Frequency	1050 to 1300 MHz
Insertion Loss	0.25dB
Isolation	20 dB min
Return Loss	20 dB min
Power	1W CW
Radiated Emissions	80dBi min
Mass	114g nom

Environmental

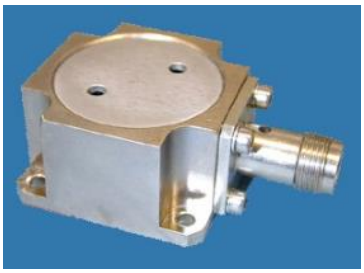
Test	Axis	Frequency (Hz)	Acceptance	Qualification XY
Sine	All 3 axis	5 to 23.8	-	11 mm
		23.8 to 100	-	25g
				2 octaves/min
Random	All 3 axis	20 to 75	-	+6dB/oct.
		20 to 100	+8.13dB/oct.	-
		75 to 1300	-	$1.50g^2/Hz$
		100 to 350	$1.30g^2/Hz$	-
		350 to 1500	-4.15 dB/oct.	$0.40g^2/Hz$
		1300 to 2000	-	-7.0 dB/oct.
		1500 to 2000	-7.0 dB/oct.	-
			60 secs/axis	*180 secs/axis*
		Overall [rms]	**30.0g**	**50.0g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Not specified	100	30
	3000	2000
	10000	2000
	Number of Events	*3 per axis*

L-Band TNC high-power TNC Load

Used in conjunction with a high-power Circulator to produce an Isolator. Sited remotely to ensure adequate heat dissipation.

SINT part number	LTE105
SINT ICD	B107694
Application	Remote Termination for switch
Status	In orbit
Program	*Various*



- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Used on the output of a mechanical switch.
- Nickel-plated, Stainless-steel housing featuring procured connectors.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.
- Analysis & reports: Venting, MP, Corona, Thermal

Basic performance criteria

Parameter	Performance
Non-operating	-40 to +135C
Qualification	-30 to +135C
Acceptance	-20 to +130C
Operating Frequency	1.30 to 1.80 GHz
Return Loss	26 dB min
Power	100W CW
Radiated Emissions	80dBi min
Mass	145g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance XY	Acceptance Z	Qualification XY	Qualification Z
Sine	All 3 axis	5 to 26	-	-	11 mm	11 mm
		26 to 100	-	-	30g	30g
					2 octaves/min	*4 octaves/min*
Random	All 3 axis	20 to 50	6dB/oct.	+9dB/oct.	+6dB/oct.	+6dB/oct.
		50 to 600	$0.30g^2$/Hz	$0.30g^2$/Hz	$0.40g^2$/Hz	$2.0g^2$/Hz
		600 to 2000	-4.5 dB/oct.	-6 dB/oct.	-3 dB/oct.	-6 dB/oct.
			60 secs/axis	*60 secs/axis*	*180 secs/axis*	*60 secs/axis*
		Overall [rms]	**29.08g**	**20.84g**	**25.61g**	**41.04g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Not specified	100	50
	400	600
	1500	2000
	10000	2500
	Number of Events	*3 per axis*

Notes:

1. Several similar versions exist operating in UHF, L, S- & C-Bands
2. The termination is resistive

L-Band SMA low-power Isolator

Generic device.

SINT part number	I1112/F
SINT ICD	B107648
Application	generic
Status	In orbit
Program	-

- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Nickel-plated, Stainless-steel housing featuring SINT designed “solid connectors”.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-40 to +85C
LAT/Qualification	-25 to +80C
Acceptance	-20 to +75C
Operating Frequency	1.16 to 1.26 GHz
Insertion Loss	0.20dB max
Return Loss	23 dB min
Power Handling (fault)	2W CW [PFM]
Radiated Emissions	80dBi min
Mass	52g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	LAT/Qualification
Sine	All 3 axis	5 to 22.6	4.83 mm	6.4 mm
		22.6 to 50	10.0g	13.0g
		50 to 100	7.7g	10.0g
			2 octaves/min	*4 octaves/min*
Random	All 3 axis	20 to 75	+6dB/oct.	+6dB/oct.
		75 to 1300	$1.5g^2/Hz$	$3.35g^2/Hz$
		1300 to 2000	-7 dB/oct.	-7 dB/oct.
			60 secs/axis	*180 secs/axis*
		Overall [rms]	**50g**	**75g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Not specified	100	12
	1000	1200
	5000	5800
	10000	5800
	Number of Events	*3 per axis*

Notes:

3. A number of similar versions exist in FM form with alternative arrangements of male and female SMA
4. Circulator version also exists
5. These devices can be mounted on two faces such that where connector symmetry is present the same device can be provide CW or CCW circulation

L-Band SMA low-power broadband Isolator

Generic device.

SINT part number	I1516/C
SINT ICD	B102682
Application	generic
Status	In orbit
Program	-

- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Nickel-plated, Stainless-steel housing featuring SINT designed “solid connectors”.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-40 to +85C
LAT/Qualification	-25 to +80C
Acceptance	-20 to +85C
Operating Frequency	1.35 to 1.65 GHz
Insertion Loss	0.30 dB max
Return Loss	23 dB min
Power Handling (fault)	2W CW [PFM]
Radiated Emissions	80dBi min
Mass	52g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	LAT/Qualification
Sine	All 3 axis	5 to 22.6	4.83 mm	6.4 mm
		22.6 to 50	10.0g	13.0g
		50 to 100	7.7g	10.0g
			2 octaves/min	*4 octaves/min*
Random	All 3 axis	20 to 75	+6dB/oct.	+6dB/oct.
		75 to 1300	$1.5g^2/Hz$	$3.35g^2/Hz$
		1300 to 2000	-7 dB/oct.	-7 dB/oct.
			60 secs/axis	*180 secs/axis*
		Overall [rms]	**50g**	**75g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Not specified	100	12
	1000	1200
	5000	5800
	10000	5800
	Number of Events	*3 per axis*

Notes:

1. A number of similar versions exist in FM form with alternative arrangements of male and female SMA
2. Circulator version also exists
3. These devices can be mounted on two faces such that where connector symmetry is present the same device can be provide CW or CCW circulation

L-Band stripline medium-power Circulator

TRM duplexer used inside a hybrid

SINT part number	C1213/D
SINT ICD	B105625
Application	TRM (active array)
Status	In Orbit
Program	*EOS*

- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Nickel-plated Stainless-Steel housing
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-45 to +105C
Acceptance	-20 to +50C
Operating Frequency	1.25 to 1.30GHz
Insertion Loss	0.25dB max
Return Loss	21 dB min
Power Handling (fault)	12W CW
Mass	60g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance
Sine	All 3 axis	5 to 22.6	6.4 mm
		22.6 to 50	13.0g
		50 to 100	10.0g
			4 octaves/min
Random	All 3 axis	20 to 100	+6dB/oct.
		100 to 1000	0.67g^2/Hz
		1000 to 2000	-3.0 dB/oct.
			60 secs/axis
		Overall [rms]	**33.0g**

L-Band stripline medium-power Circulator

TRM duplexer used inside a hybrid

SINT part number	C1617/C
SINT ICD	B105661
Application	TRM (active array)
Status	In Orbit
Program	*Large constellation*

- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Nickel-plated Stainless Steel housing
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-25 to +125C
Qualification	-25 to +95C
Acceptance	-20 to +90C
Operating Frequency	1.61 to 1.63GHz
Insertion Loss	0.25dB max
Return Loss	23 dB min
Power Handling (fault)	10W CW
Mass	20g nom

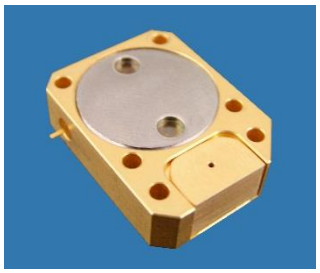
Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification Z	Qualification XY
Sine	All 3 axis	5 to 22.6	4.83 mm	6.4 mm	6.4 mm
		22.6 to 50	10.0g	13.0g	13.0g
		50 to 100	7.7g	10.0g	10.0g
			2 octaves/min	*4 octaves/min*	
Random	All 3 axis	20 to 60	N/A	-	+9dB/oct.
		60 to 150		-	$0.8g^2/Hz$
		20 to 100		+6dB/oct.	-
		100 to 150		$2.0g^2/Hz$	-
		150 to 800		-	+3.1dB/oct.
		150 to 200		+15dB/oct.	-
		200 to 400		$5.0g^2/Hz$	-
		400 to 500		-12.3615dB/oct.	-
		500 to 1000		$2.0g^2/Hz$	-
		800 to 1000		-	$4.5g^2/Hz$
		1000 to 2000		-4.0 dB/oct.	
		1000 to 1400		-	-3.63dB/oct
		1400 to 2000		-	$3.0g^2/Hz$
				180 secs/axis	*180 secs/axis*
		Overall [rms]	**16.7g**	**62.7g**	**77.2g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
	500	300
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

L-Band stripline medium-power inter-stage Isolator

Used within an SSPA inter-stage.



SINT part number	I1213/R
SINT ICD	B104997
Application	GNSS SSPA (inter stage)
Status	In Orbit
Program	*Various*

- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Used on the output of SSPA.
- Gold-plated Stainless-Steel housing featuring SINT designed “solid connectors”.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	**Performance**
Qualification	-60 to +100C
Acceptance	-20 to +90C
Operating Frequency	1.19 to 1.22 GHz
Insertion Loss	0.25dB max
Ins. Loss Phase (tracking and hysteresis)	Consult with factory
Isolation	23 dB min
Return Loss	23 dB min
Power Handling (fault)	10 CW
Mass	15g nom

Environmental

Test	**Axis**	**Frequency (Hz)**	**Acceptance**	**Qualification**
Sine	All 3 axis	5 to 20	11 mm	6.4 mm
		20 to 100	20.0g	13.0g
			2 octaves/min	*4 octaves/min*
Random	All 3 axis	10 to 2000	Flat 0.67g^2/Hz	Flat 1.5g^2/Hz
			60 secs/axis	*180 secs/axis*
		Overall [rms]	**36g**	**55g**

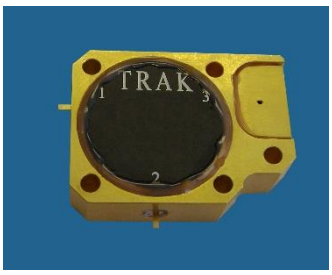
Location	**Frequency (Hz)**	**Shock response (Q=10), g**
		Qualification
	100	40
	300	70
	600	900g
	5000	900g
	10000g	700g
	Number of Events	*3 per axis*

1. Several similar versions exist operating bands
    a. 1.588-1619, 1.232-1.262, 1.187-1.217, 1.588-1.619, 1.162-1.187,1562-1587 GHz
2. Several similar versions exist with arrangements of tabs in 90- and 180-degree orientations
3. The termination is resistive

L-Band stripline medium-power inter-stage Isolator

Used within an SSPA inter-stage.

SINT part number	I1112/E
SINT ICD	B107337
Application	GNSS SSPA (inter stage)
Status	In Orbit
Program	*Various*



- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Used on the output of SSPA.
- Gold-plated Stainless-Steel housing featuring SINT designed “solid connectors”.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	**Performance**
Qualification	-60 to +100C
Acceptance	-20 to +90C
Operating Frequency	1.16 to 1.19 GHz
Insertion Loss	0.25dB max
Ins. Loss Phase (tracking and hysteresis)	Consult with factory
Isolation	23 dB min
Return Loss P1 [P2]	23 [21] dB min
Power Handling (fault)	10 CW
Mass	16g nom

Environmental

Test	**Axis**	**Frequency (Hz)**	**Acceptance**	**Qualification**
Sine	All 3 axis	5 to 20	11 mm	6.4 mm
		20 to 100	20.0g	13.0g
			2 octaves/min	*4 octaves/min*
Random	All 3 axis	10 to 2000	Flat 0.67g^2/Hz	Flat 1.5g^2/Hz
			60 secs/axis	*180 secs/axis*
		Overall [rms]	**36g**	**55g**

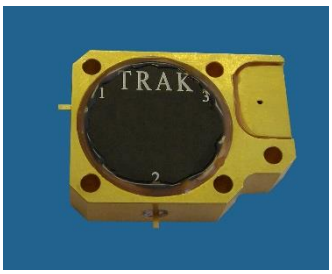
Location	**Frequency (Hz)**	**Shock response (Q=10), g**
		Qualification
	100	40
	300	70
	600	900g
	5000	900g
	10000g	700g
	Number of Events	*3 per axis*

1. A number of similar versions exist operating bands
   a. 1.588-1619, 1.232-1.262, 1.187-1.217, 1.588-1.619, 1562-1587 GHz & 2.20-2.225 GHz
2. A number of similar versions exist with arrangements of tabs in 90- and 180-degree orientations
3. The termination is resistive

L-Band stripline medium-power inter-stage Isolator

Used within an SSPA inter-stage.

SINT part number	I1516/D
SINT ICD	B107338
Application	GNSS SSPA (inter stage)
Status	In Orbit
Program	*Various*



- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Used on the output of SSPA.
- Gold-plated Stainless-Steel housing featuring SINT designed “solid connectors”.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	**Performance**
Qualification	-60 to +100C
Acceptance	-20 to +90C
Operating Frequency	1.56 to 1.59 GHz
Insertion Loss	0.25dB max
Ins. Loss Phase (tracking and hysteresis)	Consult with factory
Isolation	23 dB min
Return Loss P1 [P2]	23 [21] dB min
Power Handling (fault)	10 CW
Mass	16g nom

Environmental

Test	**Axis**	**Frequency (Hz)**	**Acceptance**	**Qualification**
Sine	All 3 axis	5 to 20	11 mm	6.4 mm
		20 to 100	20.0g	13.0g
			2 octaves/min	*4 octaves/min*
Random	All 3 axis	10 to 2000	Flat 0.67g^2/Hz	Flat 1.5g^2/Hz
			60 secs/axis	*180 secs/axis*
		Overall [rms]	**36g**	**55g**

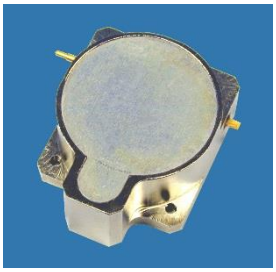
Location	**Frequency (Hz)**	**Shock response (Q=10), g**
		Qualification
	100	40
	300	70
	600	900g
	5000	900g
	10000g	700g
	Number of Events	*3 per axis*

1. A number of similar versions exist operating bands
   b. 1.588-1619, 1.232-1.262, 1.187-1.217, 1.588-1.619, 1.162-1.187 GHz & 2.20-2.225 GHz
2. A number of similar versions exist with arrangements of tabs in 90- and 180-degree orientations
3. The termination is resistive

L-Band stripline to SMA pin high-power Isolator

Used on the output of an SSPA.

SINT part number	I1516/V
SINT ICD	B103066
Application	SSPA
Status	In Orbit
Program	*Various*



- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Used on the output of SSPA.
- Nickel-plated, Stainless-steel housing
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.
- Analysis & reports: Venting, MP

Basic performance criteria

Parameter	Performance
Non-operating	-45 to +90C
Qualification	-25 to +95C
Acceptance	-20 to +70C
Operating Frequency	1.5 to 1.6 GHz
Insertion Loss	0.25dB max
Isolation	23 dB min
Return Loss	23 dB min
Power Handling	28W CW
Mass	36g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 22.6	4.83 mm	6.4 mm
		22.6 to 50	10.0g	13.0g
		50 to 100	7.7g	10.0g
			2 octaves/min	*4 octaves/min*
Random	All 3 axis	20 to 100	+3dB/oct.	+3dB/oct.
		100 to 600	$0.16g^2/Hz$	$0.16g^2/Hz$
		600 to 2000	-6 dB/oct.	-6 dB/oct.
			60 secs/axis	*180 secs/axis*
		Overall [rms]	**16.7g**	**12.46g**

Location	Frequency (Hz)	Shock response (Q=10), g
Not specified		MIL-STD-883
		Method 2002.3 Condition C
		1500g, 0.5ms
		3-axis

1. A number of similar versions exist operating in L- & S-Bands
2. A number of similar versions exist with arrangements of tabs and SMA pins
3. The termination is resistive

L-Band MIC to TNC high-power Circulator

Used on the output of an earth observation radar satellite.

SINT part number	C1214/R
SINT ICD	C104294
Application	SSPA
Status	In orbit
Program	-

- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Used on the output of TRm
- Gold-plated Stainless-Steel housing featuring SINT designed “solid connectors”.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.
- Analysis & reports: Venting, MP

Basic performance criteria

Parameter	Performance
Non-operating	-45 to +125C
Qualification	-40 to +110C
Acceptance	-40 to +60C
Operating Frequency	1.23 to 1.32 GHz
Insertion Loss	0.30dB max
Return Loss (MIC)	23 dB min
Return Loss (TNC)	23 dB min
Power Handling (nominal)	86 CW
Radiated Emissions	N/A
Mass	90g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance
Sine	All 3 axis	10-50	1.5mm
		50-2000	20g
		10 mins duration	-
		3 cycles	-

L-Band TNC high-power Circulator

Used on the output of RadarSat SSPA

SINT part number	C1214/T (CW) and C1214/U (CCW)
SINT ICD	C106624 (CW) & C106625 (CCW)
Application	GNSS SSPA
Status	In orbit
Program	-

- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Gold-plated Stainless-Steel housing featuring SINT designed “solid connectors”.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.
- Analysis & reports: Venting, MP, Power withstanding

Basic performance criteria

Parameter	Performance
Non-operating	-50 to +85C
Qualification	-40 to +90C
Acceptance	-15 to +65C
Operating Frequency	1.20 to 1.40 GHz
Insertion Loss	0.30dB max
Return Loss	20 dB min
Power Handling (nominal)	100W at 25% DC
Mass	120g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification
Random	All 3 axis	20 to 100	+6.0dB/oct.	+6.0dB/oct.
		100 to 500	0.20g^2/Hz	0.67g^2/Hz
		500 to 2000	-6 dB/oct.	-6 dB/oct.
			60 secs/axis	*180 secs/axis*
		Overall [rms]	**18.2g**	**33g**

L-Band TNC high-power Isolator

Used on the output of SSPA

SINT part number	I1112/B
SINT ICD	C106900
Application	SSPA
Status	In orbit
Program	-

- Image shown opposite is representative
- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Gold-plated Stainless-Steel housing featuring SINT designed "*solid connectors*".
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.
- Analysis & reports: Venting, MP, Power withstanding

Basic performance criteria

Parameter	Performance
Non-operating	-55 to +85C
Qualification	-25 to +70C
Acceptance	-20 to +65C
Operating Frequency	1.10 to 1.20 GHz
Insertion Loss	0.15dB max
Isolation	19 dB min
Return Loss	19 dB min
Power Handling (nominal)	50W CW
Mass	140g nom

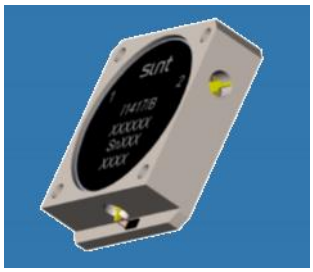
Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification
Random	All 3 axis	20 to 100	+6.0dB/oct.	+6.0dB/oct.
		100 to 500	0.20g^2/Hz	0.67g^2/Hz
		500 to 2000	-6 dB/oct.	-6 dB/oct.
			60 secs/axis	*180 secs/axis*
		Overall [rms]	**18.2g**	**33g**

L-Band stripline medium-power Isolator

Used on the output of an SSPA

SINT part number	I1417/B
SINT ICD	C108823
Application	SSPA
Status	Supplied as FM
Program	-



- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Gold-plated Stainless-Steel housing
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.
- Analysis & reports: power withstanding
- Image shown opposite is representative

Basic performance criteria

Parameter	Performance
Non-operating	-55 to +85C
Qualification	-20 to +70C
Acceptance	-15 to +65C
Operating Frequency	1.45 to 1.65 GHz
Insertion Loss	0.40dB max
Isolation	23 dB min
Return Loss	23 dB min
Power Handling (nominal)	10W CW
Mass	29g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification
Random	All 3 axis	20 to 100	+6.0dB/oct.	+6.0dB/oct.
		100 to 500	0.20g^2/Hz	0.67g^2/Hz
		500 to 2000	-6 dB/oct.	-6 dB/oct.
			60 secs/axis	*180 secs/axis*
		Overall [rms]	**18.2g**	**33g**

L-Band Tab to TNC high-power Circulator (E1)

Used on the output of GNSS SSPA

SINT part number	C1516/C
SINT ICD	C107070
Application	GNSS SSPA
Status	In orbit
Program	-

- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Used on the output of TRm
- Gold-plated Stainless-Steel housing featuring SINT designed “solid connectors”.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.
- Analysis & reports: Venting, MP

Basic performance criteria

Parameter	Performance
Non-operating	-45 to +125C
Qualification	-40 to +90C
Acceptance	-30 to +85C
Operating Frequency	1.56 to 1.64 GHz
Insertion Loss	0.20dB max
Return Loss (TAB)	20.1 dB min
Return Loss (TNC)	20.1 dB min
Power Handling (nominal)	86W CW
Mass	90g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 20		11 mm
		20 to 100		30g
			2 octaves/min	*4 octaves/min*
Random	All 3 axis	20 to 100	+6.0dB/oct.	+6.0dB/oct.
		100 to 500	$0.67g^2$/Hz	$1.50g^2$/Hz
		500 to 2000	-6 dB/oct.	-3.0 dB/oct.
			60 secs/axis	*180 secs/axis*
		Overall [rms]	**24.0g**	**50g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Not specified	500	300
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

L-Band Tab to TNC high-power Circulator (E6)

Used on the output of GNSS SSPA

SINT part number	C1213/F
SINT ICD	C107068
Application	GNSS SSPA
Status	In orbit
Program	-

- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Used on the output of TRm
- Gold-plated Stainless-Steel housing featuring SINT designed “solid connectors”.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.
- Analysis & reports: Venting, MP

Basic performance criteria

Parameter	Performance
Non-operating	-45 to +125C
Qualification	-40 to +90C
Acceptance	-30 to +85C
Operating Frequency	1.21 to 1.29 GHz
Insertion Loss	0.20dB max
Return Loss (TAB)	20.1 dB min
Return Loss (TNC)	20.1 dB min
Power Handling (nominal)	86W CW
Mass	90g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 20		11 mm
		20 to 100		30g
			2 octaves/min	*4 octaves/min*
Random	All 3 axis	20 to 100	+6.0dB/oct.	+6.0dB/oct.
		100 to 500	$0.67g^2$/Hz	$1.50g^2$/Hz
		500 to 2000	-6 dB/oct.	-3.0 dB/oct.
			60 secs/axis	*180 secs/axis*
		Overall [rms]	**24.0g**	**50g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Not specified	500	300
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

L-Band Tab to TNC high-power Isolator (E5)

Used on the output of an SSPA.

SINT part number	I1112/G
SINT ICD	C107805
Application	GNSS SSPA
Status	In orbit
Program	*Various*

- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Used on the output of SSPA
- Gold-plated Stainless-Steel housing featuring SINT designed “solid connectors”.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.
- Analysis & reports: Venting, MP, Corona, Thermal

Basic performance criteria

Parameter	Performance
Non-operating	-60 to +100C
Qualification	-25 to +95C
Acceptance	-20 to +90C
Operating Frequency	1.18 to 1.22 GHz
Insertion Loss	0.17dB max
Isolation	21dB min
Return Loss (tab)	21 dB min
Return Loss (TNC)	23 dB min
Power Handling (nominal)	86 CW
Multipaction (qualified)	1000W pk full reflection, any phase.
Radiated Emissions	N/A
Mass	97g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 20		11 mm
		20 to 100		20g
			2 octaves/min	*4 octaves/min*
Random	All 3 axis	10 to 100	+5.8dB/oct.	+5.8dB/oct.
		100 to 500	0.67g^2/Hz	1.50g^2/Hz
		500 to 2000	-5.3 dB/oct.	-5.3 dB/oct.
			60 secs/axis	*180 secs/axis*
		Overall [rms]	**24.0g**	**35.9g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Not specified	100	70
	1000	3600
	10000	4200
	Number of Events	*3 per axis*

Notes:

1. Versions exist which are the mirror image of the device illustrated and
2. Versions exist centred on 1.25 and 1.55 GHz
3. The termination is resistive

L-Band Tab to TNC high-power Isolator (E6)

Used on the output of an SSPA.

SINT part number	I1213/X
SINT ICD	C107804
Application	GNSS SSPA
Status	In orbit
Program	*Various*

- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Used on the output of SSPA
- Gold-plated Stainless-Steel housing featuring SINT designed “solid connectors”.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.
- Analysis & reports: Venting, MP, Corona, Thermal

Basic performance criteria

Parameter	Performance
Non-operating	-60 to +100C
Qualification	-25 to +95C
Acceptance	-20 to +90C
Operating Frequency	1.23 to 1.27 GHz
Insertion Loss	0.20dB max
Isolation	21dB min
Return Loss (tab)	21 dB min
Return Loss (TNC)	23 dB min
Power Handling (nominal)	86 CW
Multipaction (qualified)	1000W pk full reflection, any phase.
Radiated Emissions	N/A
Mass	97g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 20		11 mm
		20 to 100		20g
			2 octaves/min	*4 octaves/min*
Random	All 3 axis	10 to 100	+5.8dB/oct.	+5.8dB/oct.
		100 to 500	$0.67g^2$/Hz	$1.50g^2$/Hz
		500 to 2000	-5.3 dB/oct.	-5.3 dB/oct.
			60 secs/axis	*180 secs/axis*
		Overall [rms]	**24.0g**	**35.9g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Not specified	100	70
	1000	3600
	10000	4200
	Number of Events	*3 per axis*

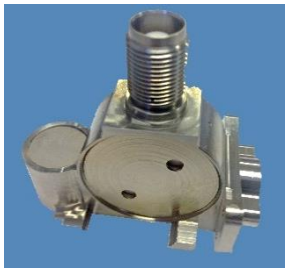
Notes:

4. Versions exist which are the mirror image of the device illustrated and
5. Versions exist centred on 1.25 and 1.55 GHz
6. The termination is resistive

L-Band TNC socket to TNC high-power Isolator (E1)

Used on the output of an SSPA.

SINT part number	I1516/AL
SINT ICD	C106942
Application	SSPA
Status	In orbit
Program	*Various*



- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Used on the output of SSPA.
- Nickel-plated, Stainless-steel housing featuring SINT designed “solid connectors”.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.
- Analysis & reports: PDR, CDR, MRR, TRR, Venting, MP

Basic performance criteria

Parameter	Performance
Non-operating	-40 to +100C
PFM & Qualification	-15 to +95C
Acceptance	-10 to +90C
Operating Frequency	1.52 to 1.56 GHz
Insertion Loss	0.15dB max
Return Loss	23 dB min
Power Handling (fault)	55 CW
Multipaction (qualified)	full reflection, any phase.
Radiated Emissions	75dBi min
Mass	132g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 22.6	4.83 mm	6.4 mm
		22.6 to 50	10.0g	13.0g
		50 to 100	7.7g	10.0g
			2 octaves/min	*4 octaves/min*
Random	All 3 axis	20 to 50	6dB/oct.	6dB/oct.
		50 to 600	$0.25g^2/Hz$	$0.50g^2/Hz$
		600 to 2000	-4.5 dB/oct.	-4.5 dB/oct.
			60 secs/axis	*180 secs/axis*
		Overall [rms]	**16.7g**	**23.6g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Not specified	200	280
	850	1260
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

Notes:

1. A number of similar versions exist operating in S- & C-bands
2. The termination is resistive

L-Band tab to TNC very high-power Isolator (E1)

Used on the output of an SSPA.

SINT part number	I1516/AR
SINT ICD	C107879
Application	SSPA
Status	Qualified
Program	*Various*

- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Used on the output of SSPA
- Gold-plated, Stainless-steel housing featuring SINT designed “solid connectors”.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.
- Analysis & reports: Venting, MP, Corona, Thermal

Basic performance criteria

Parameter	Performance
Non-operating	-60 to +100C
Qualification	-25 to +95C
Acceptance	-20 to +90C
Operating Frequency	1.57 to 1.62 GHz
Insertion Loss	0.15dB max
Isolation	21dB min
Return Loss (tab)	21 dB min
Return Loss (TNC)	23 dB min
Power Handling	160 CW rms
Multipaction (qualified)	1500pk full reflection, any phase.
Radiated Emissions	N/A
Mass	138g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 26		11 mm
		26 to 100		30g
			2 octaves/min	*4 octaves/min*
Random	All 3 axis	10 to 100	+6dB/oct.	+6dB/oct.
		100 to 500	$0.67g^2$/Hz	$1.54g^2$/Hz
		500 to 2000	-3 dB/oct.	-3 dB/oct.
			60 secs/axis	*180 secs/axis*
		Overall [rms]	**33.0g**	**50.0g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Not specified	100	70
	200	250
	500	300
	1000	4200
	10000	4200
	Number of Events	*3 per axis*

Notes:

1. Versions exist which are the mirror image of the device illustrated and
2. Versions exist centred on 1.25 and 1.55 GHz
3. The termination is resistive

L-Band tab to TNC very high-power Circulator (E1)

Used on the output of an SSPA.

SINT part number	Speculative development
SINT ICD	-
Application	SSPA
Status	Qualified
Program	-

- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Used on the output of SSPA
- Gold-plated, Stainless-steel housing featuring SINT designed “solid connectors”.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.
- Analysis & reports: Venting, MP, Corona, Thermal

Basic performance criteria

Parameter	Performance
Non-operating	-60 to +100C
Qualification	-25 to +95C
Acceptance	-20 to +90C
Operating Frequency	1.50 to 1.56 GHz
Insertion Loss	0.15dB max
Return Loss	21 dB min
Power Handling	220 CW
Multipaction (qualified)	1500W pk full reflection, any phase.
Radiated Emissions	-80dBc
Mass	135g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 26	-	11 mm
		26 to 100	-	30g
			2 octaves/min	*4 octaves/min*
Random	All 3 axis	10 to 100	+6dB/oct.	+6dB/oct.
		100 to 500	$0.67g^2$/Hz	$1.54g^2$/Hz
		500 to 2000	-3 dB/oct.	-3 dB/oct.
			60 secs/axis	*180 secs/axis*
		Overall [rms]	**33.0g**	**50.0g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Not specified	100	70
	200	250
	500	300
	1000	4200
	10000	4200
	Number of Events	*3 per axis*

L-Band TNC socket to TNC high-power Isolator (E1)

Used on the output of an SSPA.

SINT part number	I1517/K
SINT ICD	C109335
Application	SSPA
Status	In qualification
Program	-

- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Used on the output of SSPA.
- Gold plated, Stainless-steel housing featuring SINT designed “solid” TNC

Basic performance criteria

Parameter	Performance
Non-operating	-40 to +100C
Qualification	-15 to +100C
Acceptance	-10 to +95C
Operating Frequency	1.54 to 1.61 GHz
Insertion Loss	0.15dB max
Return Loss	23 dB min
Power Handling (fault)	160 CW (145W)
Multipaction	1600W pk
Radiated Emissions	75dBi min
Mass	138g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 22.6	4.83 mm	6.4 mm
		22.6 to 50	10.0g	13.0g
		50 to 100	7.7g	10.0g
			2 octaves/min	*4 octaves/min*
Random	All 3 axis	20 to 50	6dB/oct.	6dB/oct.
		50 to 600	$0.25g^2/Hz$	$0.50g^2/Hz$
		600 to 2000	-4.5 dB/oct.	-4.5 dB/oct.
			60 secs/axis	*180 secs/axis*
		Overall [rms]	**16.7g**	**23.6g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Not specified	200	280
	850	1260
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

L-Band TNC socket to TNC high-power Isolator (E5/6)

Used on the output of an SSPA.

SINT part number	I1114/M
SINT ICD	C109293
Application	SSPA
Status	In qualification
Program	-

- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Used on the output of SSPA.
- Gold plated, Stainless-steel housing featuring SINT designed “solid” TNC

Basic performance criteria

Parameter	Performance
Non-operating	-40 to +100C
Qualification	-15 to +100C
Acceptance	-10 to +95C
Operating Frequency	1.13 to 1.31 GHz
Insertion Loss	0.20dB max
Return Loss	23 dB min
Power Handling (fault)	130 CW (115w)
Multipaction	1300W pk
Radiated Emissions	75dBi min
Mass	180g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 22.6	4.83 mm	6.4 mm
		22.6 to 50	10.0g	13.0g
		50 to 100	7.7g	10.0g
			2 octaves/min	*4 octaves/min*
Random	All 3 axis	20 to 50	6dB/oct.	6dB/oct.
		50 to 600	$0.25g^2/Hz$	$0.50g^2/Hz$
		600 to 2000	-4.5 dB/oct.	-4.5 dB/oct.
			60 secs/axis	*180 secs/axis*
		Overall [rms]	**16.7g**	**23.6g**

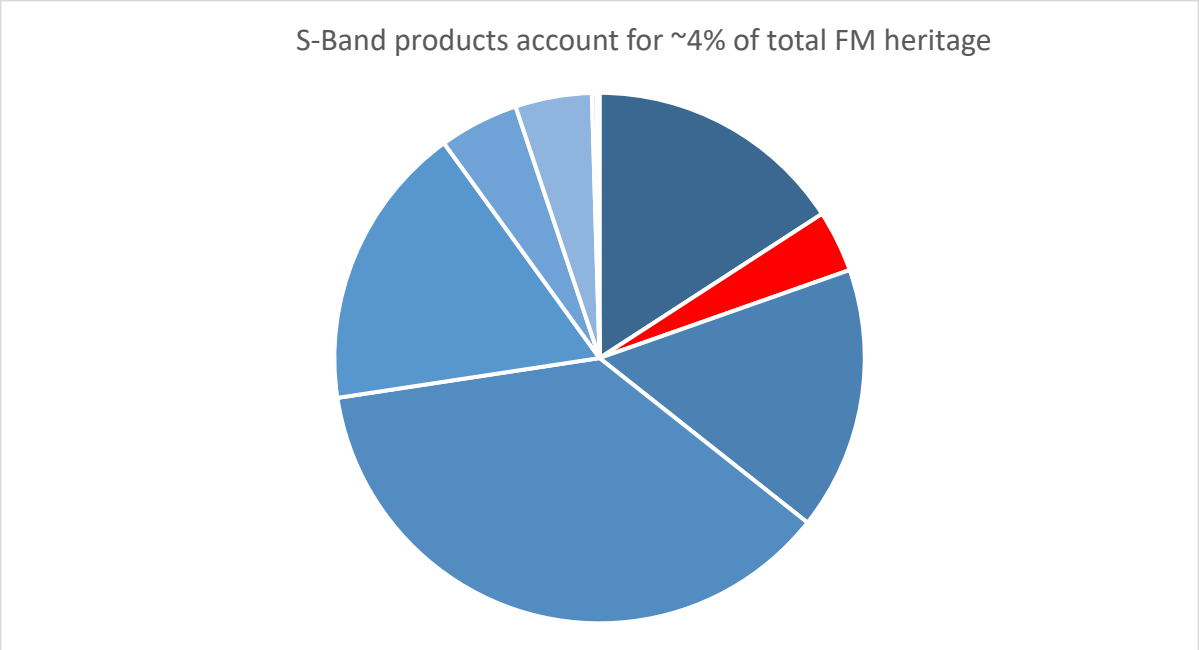
Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Not specified	200	280
	850	1260
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

S-Band Overview

SINT has developed, supplied, and has heritage with many passive devices operating in the 2.0-3.3GHz band designed to operate at either low or high-power. The S-Band range comprises ~116 distinct designs supplied to date. Heritage is dominated by the supplied of high-power Isolators used for SSPA applications. In terms of heritage almost all parts have been supplied as EEE components however an increasing number are supplied classed as equipment with the distinction largely a matter of how the parts are specified and procured. The following is an extract from the heritage database which records sales of flight model hardware from 1994 to December 2020.

FMs supplied	COAXIAL	MICPUCK	STRIPLINE (DROP-IN)	WAVEGUIDE	Grand Total
S	**4055**	**106**	**3409**		**7570**
ISOLATOR	3148	106	3113		6367
CIRCULATOR	148		296		444
SPLITTER	263				263
ISO-COMBINER	247				247
LOAD/TERMINATION	137				137
ATTENUATOR	112				112
S [WR430]				**88**	**88**
ISO-ADPATER				88	88
Grand Total	**4055**	**106**	**3409**	**88**	**7658**

Heritage in terms of the numbers and types of products supplied changes daily. Please contact the factory to obtain the most up to date information.



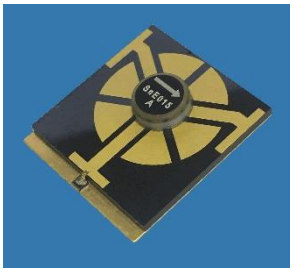
In development/qualification

- 100W CW S-Band stripline to TNC Circulator
- 150W CW S-Band TNC Load
- 150W CW TT&C S-Band TNC to TNC Circulator
- 150W CW TT&C S-Band stripline to TNC Circulator

S-Band microstrip Isolator

Used on the output of a combiner.

SINT part number	-
SINT ICD	B108290
Application	Space [GEO]
Status	Qualified & supplied [PFM & FM]
Program	*Sirius 7/8*



- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Suitable for wire bonding
- Passivated Aluminum housing featuring procured connectors.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-40 to +85C
PFM & Qualification	-20 to +80C
Acceptance	-20 to +75C
Operating Frequency	2.2 to 2.5 GHz
Insertion Loss (including split)	0.35dB
Isolation	17 dB min
Return Loss	19 dB min
Power Handling	6W CW
Mass	3g nom

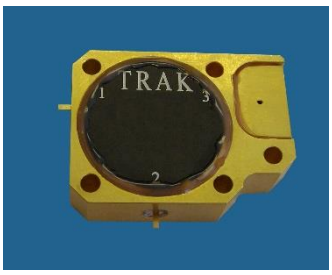
Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 22.6	4.83 mm	6.4 mm
		22.6 to 50	10.0g	13.0g
		50 to 100	7.7g	10.0g
			2 octaves/min	*4 octaves/min*
Random	All 3 axis	20 to 50	+6dB/oct.	6dB/oct.
		50 to 600	$0.25g^2/Hz$	$0.50g^2/Hz$
		600 to 2000	-4.5 dB/oct.	-4.5 dB/oct.
			60 secs/axis	*180 secs/axis*
		Overall [rms]	**16.7g**	**23.6g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Not specified	200	280
	850	1260
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

S-Band stripline medium-power inter-stage Isolator

Used within an SSPA inter-stage.



SINT part number	I2223/L
SINT ICD	B105725
Application	SSPA (inter stage)
Status	Supplied
Program	*Various*

- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Used on the output of SSPA.
- Gold-plated Stainless-Steel housing
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	**Performance**
Qualification	-60 to +100C
Acceptance	-30 to +75C
Operating Frequency	2.20 to 2.225 GHz
Insertion Loss	0.25dB max
Ins. Loss Phase (tracking and hysteresis)	Consult with factory
Isolation	21 dB min
Return Loss P1 [P2]	23 dB min
Power Handling (fault)	10 CW
Mass	16g nom

Environmental

Test	**Axis**	**Frequency (Hz)**	**Acceptance**	**Qualification**
Sine	All 3 axis	5 to 20	11 mm	6.4 mm
		20 to 100	20.0g	13.0g
			2 octaves/min	*4 octaves/min*
Random	All 3 axis	10 to 2000	Flat 0.67g^2/Hz	Flat 1.5g^2/Hz
			60 secs/axis	*180 secs/axis*
		Overall [rms]	**36g**	**55g**

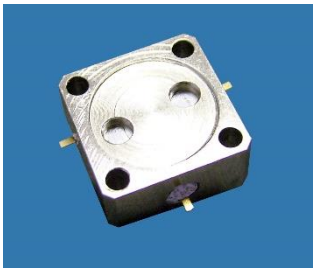
Location	**Frequency (Hz)**	**Shock response (Q=10), g**
		Qualification
	100	40
	300	70
	600	900g
	5000	900g
	10000g	700g
	Number of Events	*3 per axis*

1. A number of similar versions exist operating bands
    a. 1.588-1619, 1.232-1.262, 1.187-1.217, 1.588-1.619, 1562-1587 GHz
2. A number of similar versions exist with arrangements of tabs in 90- and 180-degree orientations
3. The termination is resistive

S-Band stripline medium-power TT&C Circulator

Used within a TT&C system.

SINT part number	C2223//G
SINT ICD	B109080
Application	LEO TT&C
Status	Supplied
Program	---



- Materials and processes have substantial flight heritage.
- Passivated Stainless-Steel housing
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Qualification	-45 to +90C
Acceptance	-30 to +75C
Operating Frequency	2.20 to 2.29 GHz
Insertion Loss	0.25dB max
Return Loss	21 dB min
Power Handling	2W CW
Mass	13g nom

Environmental

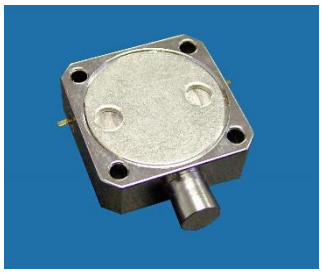
Test	Axis	Frequency (Hz)	Accept. /X-axis	LAT
Sine	All 3 axis	5 to 20	---	Max of shaker
		20	---	24.0g
		125	---	24.0g
			---	*2 octaves/min*
Random	All 3 axis	20 to …	redacted	redacted
		… to 2000	redacted	redacted
			60 secs/axis	*120 secs/axis*
		Overall [rms]	**35g**	**50g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Not specified	100	100
	1000	2000
	10000	2000
	Number of Events	*3 per axis*

S-Band stripline medium-power TT&C Isolator

Used within a TT&C system.

SINT part number	I2124/D
SINT ICD	B103902
Application	TT&C
Status	Supplied
Program	*Various*



- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Used on the output of SSPA.
- Passivated Stainless-Steel housing
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Qualification	-60 to +100C
Acceptance	-30 to +70C
Operating Frequency	2.13 to 2.36 GHz
Insertion Loss	0.40dB max
Isolation	20 dB min
Return Loss P1 [P2]	20 dB min
Power Handling (fault)	1W CW
Mass	16g nom

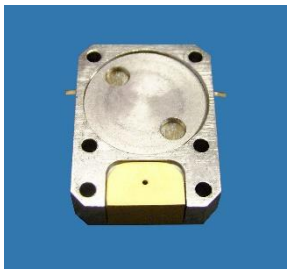
Environmental

Test	Axis	Frequency (Hz)	Acceptance
Sine	All 3 axis	5 to 20	11 mm
		20 to 100	20.0g
			2 octaves/min
Random	All 3 axis	10 to 50	+3dB/oct.
		50 to 1000	$0.80g^2/Hz$
		1000 to 2000	-3dB/oct.
			60 secs/axis
		Overall [rms]	**36g**

S-Band stripline medium-power TT&C Isolator

Used within a TT&C system.

SINT part number	I2124/E
SINT ICD	B103786
Application	TT&C
Status	Supplied
Program	-



- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Used on the output of SSPA.
- Passivated Stainless-Steel housing
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Qualification	-60 to +100C
Acceptance	-30 to +70C
Operating Frequency	2.10 to 2.40 GHz
Insertion Loss	0.50dB max
Isolation	20 dB min
Return Loss P1 [P2]	20 dB min
Power Handling (fault)	10W CW
Mass	18g nom

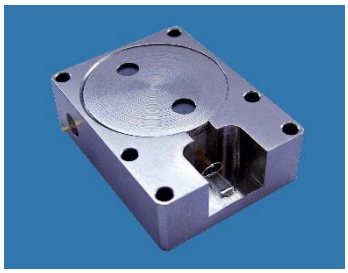
Environmental

Test	Axis	Frequency (Hz)	Acceptance
Sine	All 3 axis	5 to 20	11 mm
		20 to 100	20.0g
			2 octaves/min
Random	All 3 axis	10 to 50	+3dB/oct.
		50 to 1000	0.80g^2/Hz
		1000 to 2000	-3dB/oct.
			60 secs/axis
		Overall [rms]	**36g**

S-Band stripline high-power broadband Isolator

Used in a broadband SSPA.

SINT part number	I2040/D
SINT ICD	B107297
Application	-
Status	Supplied
Program	-



- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Used on the output of SSPA.
- Passivated Stainless-Steel housing
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Qualification	-40 to +80C
Acceptance	-30 to +70C
Operating Frequency	2.00 to 4.00 GHz
Insertion Loss	0.50dB max
Isolation	16 dB min
Return Loss P1 [P2]	16 dB min
Power Handling (fault)	30W pk
Mass	51g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance
Sine	All 3 axis	5 to 20	11 mm
		20 to 100	20.0g
			2 octaves/min
Random	All 3 axis	10 to 50	+3dB/oct.
		50 to 1000	$0.80g^2/Hz$
		1000 to 2000	-3dB/oct.
			60 secs/axis
		Overall [rms]	**36g**

S-Band coaxial low-power TT&C Isolator

Used within a TT&C system.

SINT part number	I2124/B
SINT ICD	B031017
Application	TT&C
Status	Supplied
Program	*Various*

- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Used on the output of SSPA.
- Passivated Stainless-Steel housing
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Qualification	-60 to +100C
Acceptance	-25 to +85C
Operating Frequency	2.13 to 2.36 GHz
Insertion Loss	0.40dB max
Isolation	20 dB min
Return Loss P1 [P2]	20 dB min
Power Handling (fault)	1W CW
Mass	16g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance
Sine	All 3 axis	5 to 20	11 mm
		20 to 100	20.0g
			2 octaves/min
Random	All 3 axis	10 to 50	+3dB/oct.
		50 to 1000	0.80g^2/Hz
		1000 to 2000	-3dB/oct.
			60 secs/axis
		Overall [rms]	**36g**

S-Band coaxial low-power TT&C Isolator

Used within a TT&C system.

SINT part number	I2124/B
SINT ICD	B031017
Application	TT&C
Status	Supplied
Program	*Various*

- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Used on the output of SSPA.
- Passivated Stainless-Steel housing
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Qualification	-60 to +100C
Acceptance	-25 to +85C
Operating Frequency	2.13 to 2.36 GHz
Insertion Loss	0.40dB max
Isolation	20 dB min
Return Loss P1 [P2]	20 dB min
Power Handling (fault)	1W CW
Mass	39g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance
Sine	All 3 axis	5 to 20	11 mm
		20 to 100	20.0g
			2 octaves/min
Random	All 3 axis	10 to 50	+3dB/oct.
		50 to 1000	$0.80g^2/Hz$
		1000 to 2000	-3dB/oct.
			60 secs/axis
		Overall [rms]	**36g**

S-Band broadband coaxial low-power Isolator

Used within a TT&C system.

SINT part number	I2040/C
SINT ICD	B107263
Application	Radar
Status	Developed
Program	*Various*

- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Used on the output of SSPA.
- Passivated Stainless-Steel housing
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

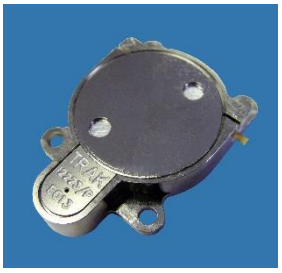
Basic performance criteria

Parameter	Performance
Qualification	-60 to +100C
Acceptance	-20 to +55C
Operating Frequency	2.0 to 4.0 GHz
Insertion Loss	0.50dB max
Isolation	16 dB min
Return Loss P1 [P2]	16 dB min
Power Handling (fault)	1W CW
Mass	39g nom

S-Band high-power stripline Isolator

Used in a TT&C system

SINT part number	I2123/I
SINT ICD	B107293
Application	Space
Status	In orbit
Program	-



- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Suitable for soldering
- Nickel-plated, Stainless-steel housing featuring SINT produced solid connectors.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-45 to +100C
Acceptance	-40 to +85C
Operating Frequency	2.1 to 2.3 GHz
Insertion Loss	0.25dB
Isolator	21 dB min
Return Loss	23 dB min
Power Handling	50W CW
Mass	41g nom

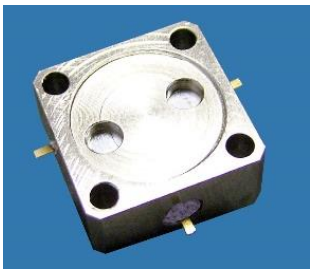
Environmental

Test	Axis	Frequency (Hz)	Acceptance	LAT
Sine	All 3 axis	5 to 22.6	4.83 mm	6.4 mm
		22.6 to 50	10.0g	13.0g
		50 to 100	7.7g	10.0g
			2 octaves/min	*4 octaves/min*
Random	All 3 axis	$0.67g^2$/Hz flat	$0.67g^2$/Hz flat	$0.67g^2$/Hz flat
			60 secs/axis	*180 secs/axis*
		Overall [rms]	**33g**	**33g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Not specified	200	280
	850	1260
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

S-Band high-power stripline Circulator

Used in a TRM in a space-based radar



SINT part number	C3133/A
SINT ICD	B106692
Application	Space [LEO]
Status	In orbit
Program	*NovaSar*

- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Suitable for soldering
- Nickel-plated, Stainless-steel housing featuring SINT produced solid connectors.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-40 to +85C
Acceptance	-20 to +85C
Operating Frequency	3.1 to 3.3 GHz
Insertion Loss	0.45dB
Return Loss	25 dB min
Power Handling	50W CW
Radiated Emissions	80dBi min
Mass	13g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	LAT
Sine	All 3 axis	5 to 22.6	4.83 mm	6.4 mm
		22.6 to 50	10.0g	13.0g
		50 to 100	7.7g	10.0g
			2 octaves/min	*4 octaves/min*
Random	All 3 axis	$0.67g^2$/Hz flat	$0.67g^2$/Hz flat	$0.67g^2$/Hz flat
			60 secs/axis	*180 secs/axis*
		Overall [rms]	**33g**	**33g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Not specified	200	280
	850	1260
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

2.0 to 2.5 GHz medium-power SMA Load

Generic applications. Key design parameters are *Return Loss* and reliability under fault conditions.

SINT part number	STE103
SINT ICD	B104051
Application	Generic
Status	In orbit
Program	*Various*

- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Vented Nickel-plated, Stainless-steel housing featuring procured connectors.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-55 to +140C
Qualification	-30 to +100C
Acceptance	-20 to +91C
Operating Frequency	2.0 to 2.5 GHz
Return Loss	1.15:1
Power	16W CW, 100W max
Radiated Emissions	70dBi min
Mass	32g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance Z	Acceptance XY	Qualification XY	Qualification Z
Sine		5 to 25			11 mm	11 mm
		25 to 100			20g	2g
					2 octaves/min	*4 octaves/min*
Random		20 to 100	+3dB/oct.	+3dB/oct.	+6dB/oct.	+6dB/oct.
		100 to 300	$1.5g^2$/Hz	$0.60g^2$/Hz	$0.40g^2$/Hz	$2.0g^2$/Hz
		300 to 2000	-6.0 dB/oct.	-6.0 dB/oct.	-3 dB/oct.	-6 dB/oct.
			180 secs/axis	*60 secs/axis*	*180 secs/axis*	*60 secs/axis*
		Overall [rms]	**27.5**	**17.4g**	**25.61g**	**41.04g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
		In accordance with method 213 of MIL-STD-202 condition1

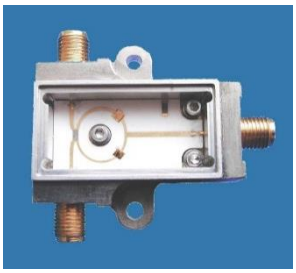
Notes:

- The termination is resistive
- A chip resistor is used

S-Band medium-power hermetic 1:2 SMA Power Splitter

Used either as a Power Splitter or a power combiner this device has a multitude of applications.

SINT part number	SPD301
SINT ICD	C108203
Application	Space [LEO]
Status	Qualified & supplied [PFM & FM]
Program	-



- This device was phase, group delay and amplitude matched.
- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Passivated Aluminum housing featuring procured hermetic connectors.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-40 to +85C
PFM & Qualification	-30 to +80C
Acceptance	-30 to +75C
Operating Frequency	2.3 GHz
Insertion Loss (including split)	3.3dB
Isolation	21 dB min
Return Loss	21 dB min
Power Handling	5W CW
Radiated Emissions	-75dBi
Mass	25g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 22.6	4.83 mm	6.4 mm
		22.6 to 50	10.0g	13.0g
		50 to 100	7.7g	10.0g
			2 octaves/min	*4 octaves/min*
Random	All 3 axis	20 to 50	+6dB/oct.	6dB/oct.
		50 to 600	0.25g^2/Hz	0.50g^2/Hz
		600 to 2000	-4.5 dB/oct.	-4.5 dB/oct.
			60 secs/axis	*180 secs/axis*
		Overall [rms]	**16.7g**	**23.6g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Not specified	200	280
	850	1260
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

S-Band SMA low-power Isolator

Primarily used in Filter assembly applications

SINT part number	I2026/A
SINT ICD	B108248
Application	Space [GEO]
Status	Qualified & supplied [QM & FM]
Program	-

- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Nickel-plated, Stainless-steel housing featuring SINT produced solid connectors.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-40 to +85C
PFM & Qualification	-20 to +80C
Acceptance	-30 to +75C
Operating Frequency	2.25 to 2.55 GHz
Insertion Loss	0.4dB min
Isolation	21 dB min
Return Loss	21 dB min
Power Handling	2W CW
	80dBi min
Radiated Emissions	39g nom
Mass	

Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 22.6	4.83 mm	6.4 mm
		22.6 to 50	10.0g	13.0g
		50 to 100	7.7g	10.0g
			2 octaves/min	*4 octaves/min*
Random	All 3 axis	20 to 50	+6dB/oct.	6dB/oct.
		50 to 600	$0.25g^2/Hz$	$0.50g^2/Hz$
		600 to 2000	-4.5 dB/oct.	-4.5 dB/oct.
			60 secs/axis	*180 secs/axis*
		Overall [rms]	**16.7g**	**23.6g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Not specified	200	280
	850	1260
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

1. The connector orientation and Load can be arranged on any port. ICDs can be supplied upon request.

S-Band SMA low-power Isolator

Primarily used in Filter assembly applications

SINT part number	I2023/C
SINT ICD	B108310
Application	Space [GEO]
Status	In Orbit
Program	*Various*

- Over 20 versions are available with a range of connector orientations
- The devices are used following payload pump down.
- Materials and processes have substantial flight heritage.
- Used on Various filter multiplexing equipments
- Nickel-plated, Stainless-steel housing featuring SINT designed “solid connectors”.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-45 to +125C
PFM & Qualification	-30 to +80C
Acceptance	-30 to +75C
Operating Frequency	2.0 to 2.25 GHz
Insertion Loss	0.40dB max
Return Loss	21 dB min
Return Loss	21 dB min
Power Handling (fault)	2 W CW
Radiated Emissions	80dBi min
Mass	39g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	PFM	Qualification
Sine	All 3 axis	5 to 22.6	-	6.4 mm	6.4 mm
		22.6 to 50	-	130.0g	130.0g
		50 to 100	-	10g	10g
			-	*2 octaves/min*	*4 octaves/min*
Random	All 3 axis	20 to 50	6dB/oct.	6dB/oct.	6dB/oct.
		50 to 600	$0.25g^2/Hz$	$0.50g^2/Hz$	$0.50g^2/Hz$
		600 to 2000	-4.5 dB/oct.	-4.5 dB/oct.	-4.5 dB/oct.
			60 secs/axis	*60 secs/axis*	*180 secs/axis*
		Overall [rms]	**16.6g**	**23.6g**	**23.6g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Shear Web	200	280
	850	1260
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

S-Band SMA low-power Isolator

Used in a space-based radar

SINT part number	I3133/A
SINT ICD	B106725
Application	Space [LEO]
Status	Qualified & supplied
Program	-

- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Nickel-plated, Stainless-steel housing featuring SINT produced solid connectors.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-40 to +85C
Acceptance	-20 to +85C
Operating Frequency	3.1 to 3.3 GHz
Isolation	25 dB min
Insertion Loss	0.45dB
Return Loss	25 dB min
Power Handling	50W CW
Radiated Emissions	80dBi min
Mass	35g nom

Environmental

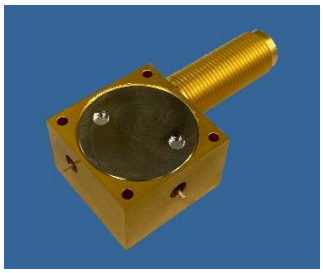
Test	Axis	Frequency (Hz)	Acceptance	LAT
Sine	All 3 axis	5 to 22.6	4.83 mm	6.4 mm
		22.6 to 50	10.0g	13.0g
		50 to 100	7.7g	10.0g
			2 octaves/min	*4 octaves/min*
Random	All 3 axis	$0.67g^2$/Hz flat	$0.67g^2$/Hz flat	$0.67g^2$/Hz flat
			60 secs/axis	*180 secs/axis*
		Overall [rms]	**33g**	**50g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Not specified	200	280
	850	1260
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

S-Band TNC to stripline high-power Circulator

Used on the output of an SSPA.

SINT part number	C2223/J
SINT ICD	C109256
Application	Launcher
Status	In qualification
Program	*Various*



- The devices are used following payload pump down.
- Materials and processes have substantial flight heritage.
- Gold-plated, Stainless-steel housing featuring SINT designed “solid connector”.

Basic performance criteria

Parameter	Performance
Non-operating	-40 to +125C
Acceptance	-30 to +90C
Operating Frequency	2.2 to 2.3 GHz
Insertion Loss	0.30 dB max
Return Loss	23 dB min
Power Handling (fault)	91 W CW
Mass	75g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 22.6	-	-
		22.6 to 50	-	-
		50 to 100	-	-
			-	-
Random			MIL-STD-202, Method 214 Condition II-J, 15 minutes. Each of 3 mutually perpendicular axes	
		Overall [rms]	**16.6g**	**23.6g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
		MIL-STD-202, Method 213. Condition I, Saw tooth test of 100G’s for 6ms, each of 3 mutually perpendicular axes
	Number of Events	

S-Band SMA medium-power attenuator

Available in a range of values these are used to attenuate signals and balance the outputs of adjacent channels.

SINT part number	SAT2xx (range of values)
SINT ICD	C103237
Application	TT & C
Status	In Orbit
Program	*Various*

- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Gold-plated, Stainless-steel housing featuring SINT designed “solid connectors”.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-45 to +125C
PFM & Qualification	-50 to +105C
Acceptance	-40 to +85C
Impedance	50 Ohms
Operating Frequency	2.20 to 2.30 GHz
Return Loss	30dB min
Attenuation dB (range of options)	2, 3, 6, 9, 13, 20
Attenuation drift	7 x 10e-4 dB/dB/C
Power Handling	12W CW
Radiated Emissions	90dBc min
Mass	60g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis			
Random	All 3 axis	20 to 50	-	+6dB/oct.
		20 to 80	+6dB/oct.	-
		50 to 100	-	$1.1g^2$/Hz
		80 to 1000	$0.6g^2$/Hz	-
		1000 to 2000	-6 dB/oct.	-6 dB/oct.
			90 secs/axis	*60 secs/axis*
		Overall [rms]	**28g**	**40g**

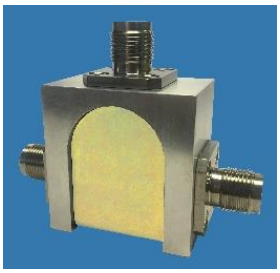
Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Not specified	100-1000	10dB/decade to 2000g
	1000-2000	2000g
	2000-10000	Linear from 2000g to 3000g
	Number of Events	*3 per axis*

- SAT209 = 9dB

S-Band TNC high-power Circulator

Used on the output of an SSPA used in conjunction with a remote termination to produce isolation.

SINT part number	C2325/C
SINT ICD	C108252 iss B
Application	Space [GEO]
Status	Qualified & supplied [PFM & FM]
Program	-



- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Used on the output of SSPA and supplied with a separate remote Load.
- Passivated Aluminum housing featuring SINT designed/produced TNC connectors.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.
- The design was successfully subjected to MP and CP qualification testing at VALSPACE.
- Analysis & reports: PDR, CDR, MRR, TRR, Venting, MP, Corona, Thermal, Worst case, FMECA.

Basic performance criteria

Parameter	Performance
Non-operating	-45 to +125C
PFM & Qualification	-25 to +95C
Acceptance	-20 to +90C
Operating Frequency	2.30 to 2.50 GHz
Insertion Loss	0.25dB max
Return Loss	23 dB min
Power Handling (fault)	80W CW [PFM]
	51W CW [FM]
Multipaction	80W pk by test
	160W pk by analysis
Corona (critical pressure)	80W CW [PFM]
	51W CW [FM]
Radiated Emissions	80dBi min
Mass	160g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	PFM	Qualification
Sine	All 3 axis	5 to 22.6	4.83 mm	6.4 mm	6.4 mm
		22.6 to 50	10.0g	13.0g	13.0g
		50 to 100	7.7g	10.0g	10.0g
			2 octaves/min	*2 octaves/min*	*4 octaves/min*
Random	All 3 axis	20 to 50	6dB/oct.	6dB/oct.	6dB/oct.
		50 to 600	0.25g^2/Hz	0.50g^2/Hz	0.50g^2/Hz
		600 to 2000	-4.5 dB/oct.	-4.5 dB/oct.	-4.5 dB/oct.
			60 secs/axis	*60 secs/axis*	*180 secs/axis*
		Overall [rms]	**16.7g**	**23.6g**	**23.6g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Shear Web	200	280
	850	1260
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

S-Band TNC high-power Circulator

Used on the output of an SSPA.

SINT part number	C2022/A
SINT ICD	C109353
Application	PNT TT&C
Status	In qualification
Program	*Various*

- The devices are used following payload pump down.
- Materials and processes have substantial flight heritage.
- Gold-plated, Stainless-steel housing featuring SINT designed “solid connector”.

Basic performance criteria

Parameter	Performance
Non-operating	--30 to +65C
PFM & Qualification	-20 to +60C
Acceptance	-15 to +55C
Operating Frequency	2.00 to 2.20 GHz
Insertion Loss	0.25dB max
Return Loss	20 dB min
Power Handling	150 W CW
Multipaction (qualified)	full reflection, any phase.
Radiated Emissions	75dBi min
Mass	130g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification
Random	All 3 axis	20 to 100	6dB/oct.	6dB/oct.
		100 to 1000	0.67g^2/Hz	1.54g^2/Hz
		600 to 2000	-3.0 dB/oct.	-3.0 dB/oct.
			60 secs/axis	*180 secs/axis*
		Overall [rms]	**33g**	**50g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Not specified	100	70
	1000	3600
	10000	3600
	Number of Events	*3 per axis*

S-Band SMA high-power Isolator

Used on the output of an SSPA.

SINT part number	I2426/D
SINT ICD	C104341
Application	Space [LEO]
Status	Qualified & supplied [FM]
Program	*GlobalStar II*

- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Used on the output of SSPA.
- BeO termination
- Gold-plated, Stainless-steel housing with SINT designed/produced SMA O/P connector machined integral to the housing.
- Customer specified TNC socket on I/P.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-40 to +125C
Qualification	-30 to +80C
Acceptance	-20 to +70C
Operating Frequency	2.46 to 2.52 GHz
Insertion Loss including test adapter	0.20dB max
Return Loss	23 dB min
Isolation	23 dB min
Power Handling (fault)	60W CW [FM]
Multipaction	240W pk by analysis
Radiated Emissions	65dBi min
Mass including washer and nut assy.)	75g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 22.6	4.83 mm	6.4 mm
		22.6 to 50	10.0g	13.0g
		50 to 100	7.7g	10.0g
			2 octaves/min	*4 octaves/min*
Random	All 3 axis	20 to 100	6dB/oct.	6dB/oct.
		50 to 1000	$0.67g^2/Hz$	$1.54g^2/Hz$
		1000 to 2000	-3.0 dB/oct.	-3.0 dB/oct.
			60 secs/axis	*180 secs/axis*
		Overall [rms]	**33g**	**50g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
	100	70
	1000	3600
	10000	3600
	Number of Events	*3 per axis*

S-Band TNC high-power Isolator

Used on the output of an SSPA.

SINT part number	I2022/Y
SINT ICD	C104736
Application	Space [GEO]
Status	Qualified & supplied [FM]
Program	*Various*

- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- BeO termination
- Customer specified TNC socket on I/P.
- Gold-plated, Stainless-steel housing with SINT designed/produced TNC O/P connector machined integral to the housing.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-45 to +125C
Qualification	-45 to +90C
Acceptance	-15 to +60C
Operating Frequency	2.02 to 2.12 GHz
Insertion Loss at fundamental	0.15dB max
Insertion Loss at 1st harmonic	18dB min
Insertion Loss at 2nd harmonic	3dB min
Return Loss	23 dB min
Isolation	23 dB min
Power Handling (fault)	72W CW [FM]
Multipaction	288W pk by analysis
Radiated Emissions	80dBi min
Mass	112g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 22.6	4.83 mm	6.4 mm
		22.6 to 50	10.0g	13.0g
		50 to 100	7.7g	10.0g
			2 octaves/min	*4 octaves/min*
Random	All 3 axis	20 to 100	6dB/oct.	6dB/oct.
		50 to 1000	$0.67g^2$/Hz	$1.54g^2$/Hz
		1000 to 2000	-3.0 dB/oct.	-3.0 dB/oct.
			60 secs/axis	*180 secs/axis*
		Overall [rms]	**33g**	**50g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
	100	70
	1000	3600
	10000	3600
	Number of Events	*3 per axis*

S-Band TNC high-power Isolator

Used on the output of an SSPA.

SINT part number	I2224/E
SINT ICD	C108989
Application	Space [LEO]
Status	Supplied [FM]
Program	-

- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- BeO termination
- MP test result available at -20, 22 and +82C
- NB this image is representative but not the actual part itself). Actual part features extended PTFE/stripline on I/P)
- Gold-plated, Stainless-steel housing with SINT designed/produced TNC O/P connector machined integral to the housing.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-55 to +125C
Acceptance	-20 to +82C
Operating Frequency	2.22 to 2.32 GHz
Insertion Loss at fundamental	0.15dB max
Insertion Loss at 1st harmonic	18dB min
Insertion Loss at 2nd harmonic	3dB min
Return Loss	23 dB min
Isolation	21 dB min
Power Handling (fault)	20W CW [FM]
Multipaction	80W pk by test
Radiated Emissions	80dBi min
Mass	118g nom

Environmental

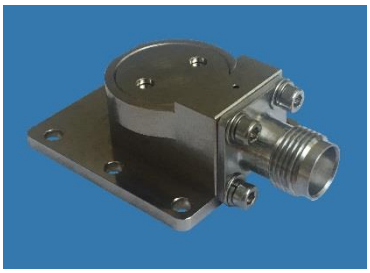
Test	Axis	Frequency (Hz)	Acceptance	LAT
Sine	All 3 axis	5 to 22.6	4.83 mm	6.4 mm
		22.6 to 50	10.0g	13.0g
		50 to 100	7.7g	10.0g
			2 octaves/min	*4 octaves/min*
Random	All 3 axis	50 to 100	6dB/oct.	6dB/oct.
		100 to 2000	$0.30g^2/Hz$	$1.00g^2/Hz$
			900 secs/axis	*180 secs/axis*
		Overall [rms]	**24.06g**	**43.92g**

Location	Frequency (Hz)	Shock response (Q=10), g
		LAT
		In accordance with MIL-STF-202-213. ½ sine of 1000g for 0.5ms in 3 mutually perpendicular axes

S-Band TNC medium-power Termination

Remote Load which can be used to terminate Circulators, high-power hybrids etc. Key performance characteristics are *Return Loss and power handling at elevated baseplate temperatures.*

SINT part number	STE114
SINT ICD	C108158
Application	Space [GEO]
Status	Qualified & supplied [PFM & FM]
Program	*Sirius 7 & 8*



- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Used to terminate a Circulator used after a SSPA
- Nickel-plated, Stainless-steel housing featuring SINT designed/produced TNC connectors.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.
- The design was successfully subjected to MP and CP qualification testing.
- Analysis & reports: PDR, CDR, MRR, TRR, Venting, MP, Corona, Thermal, Worst case, FMECA.

Basic performance criteria

Parameter	Performance
Non-operating	-45 to +125C
PFM & Qualification	-45 to +125C
Acceptance	-40 to +120C
Operating Frequency	2.00 to 2.50 GHz
Return Loss	21 dB min
Power Handling	80W CW [PFM]
	50W CW [FM]
Multipaction	80W pk by test
	160W pk by analysis
Corona (critical pressure)	80W CW [PFM]
	50W CW [FM]
Radiated Emissions	80dBi min
Mass	46g nom

Environmental

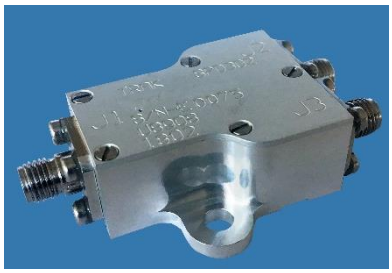
Test	Axis	Frequency (Hz)	Acceptance	PFM	Qualification
Sine	All 3 axis	5 to 22.6	4.83 mm	6.4 mm	6.4 mm
		22.6 to 50	10.0g	13.0g	13.0g
		50 to 100	7.7g	10.0g	10.0g
			2 octaves/min	*2 octaves/min*	*4 octaves/min*
Random	All 3 axis	20 to 50	6dB/oct.	6dB/oct.	6dB/oct.
		50 to 600	0.25g^2/Hz	0.50g^2/Hz	0.50g^2/Hz
		600 to 2000	-4.5 dB/oct.	-4.5 dB/oct.	-4.5 dB/oct.
			60 secs/axis	*60 secs/axis*	*180 secs/axis*
		Overall [rms]	**16.7g**	**23.6g**	**23.6g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Shear Web	200	280
	850	1260
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

S-Band SMA medium 1:2 Power Splitter

Used either as a Power Splitter or a power combiner this device has a multitude of applications. This device was phase, group delay and amplitude matched

SINT part number	SPD302
SINT ICD	C108203
Application	Space [GEO]
Status	Qualified & supplied [PFM & FM]
Program	-



- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Passivated Aluminum housing featuring procured connectors.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-40 to +85C
PFM & Qualification	-20 to +80C
Acceptance	-20 to +75C
Operating Frequency	2.2 to 2.5 GHz
Insertion Loss (including split)	3.3dB
Isolation	21 dB min
Return Loss	21 dB min
Power Handling	6W CW
Radiated Emissions	-80dBi
Mass	30g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 22.6	4.83 mm	6.4 mm
		22.6 to 50	10.0g	13.0g
		50 to 100	7.7g	10.0g
			2 octaves/min	*4 octaves/min*
Random	All 3 axis	20 to 50	+6dB/oct.	6dB/oct.
		50 to 600	$0.25g^2$/Hz	$0.50g^2$/Hz
		600 to 2000	-4.5 dB/oct.	-4.5 dB/oct.
			60 secs/axis	*180 secs/axis*
		Overall [rms]	**16.7g**	**23.6g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Not specified	200	280
	850	1260
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

S-Band SMA medium-power 1:2 isolated Power Splitter

Used as a Power Splitter with Isolators on each channel this device was phase, group delay and amplitude matched.

SINT part number	SPD303
SINT ICD	C108203
Application	Space [GEO]
Status	Qualified & supplied [PFM & FM]
Program	-

- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Passivated Aluminum housing featuring procured connectors an in-house Isolators
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.
- Analysis & reports: PDR, CDR, MRR, TRR, Venting

Basic performance criteria

Parameter	Performance
Non-operating	-40 to +85C
PFM & Qualification	-20 to +80C
Acceptance	-20 to +75C
Operating Frequency	2.2 to 2.5 GHz
Insertion Loss (including split)	3.6dB
Isolation	40 dB min
Return Loss	21 dB min
Power Handling	6W CW
Radiated Emissions	-80dBi
Mass	53g nom

Environmental

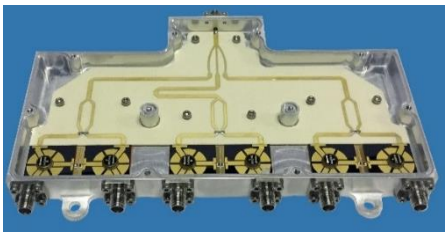
Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 22.6	4.83 mm	6.4 mm
		22.6 to 50	10.0g	13.0g
		50 to 100	7.7g	10.0g
			2 octaves/min	*4 octaves/min*
Random	All 3 axis	20 to 50	+6dB/oct.	6dB/oct.
		50 to 600	$0.25g^2$/Hz	$0.50g^2$/Hz
		600 to 2000	-4.5 dB/oct.	-4.5 dB/oct.
			60 secs/axis	*180 secs/axis*
		Overall [rms]	**16.7g**	**23.6g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Not specified	200	280
	850	1260
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

S-Band SMA medium-power isolated 1:6 Power Splitter

Used as a Power Splitter with Isolators on each channel this device was phase, group delay and amplitude matched

SINT part number	SPD701
SINT ICD	C108203
Application	Space [GEO]
Status	Qualified & supplied [PFM & FM]
Program	-



- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- SINT produced Microstrip Isolators (one per channel)
- Passivated Aluminum housing featuring procured connectors.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.
- Analysis & reports: PDR, CDR, MRR, TRR, Venting, MP, Corona, Thermal, Worst case, FMECA.

Basic performance criteria

Parameter	Performance
Non-operating	-40 to +85C
PFM & Qualification	-20 to +80C
Acceptance	-20 to +75C
Operating Frequency	2.2 to 2.5 GHz
Insertion Loss (including split)	8.6dB
Isolation	40 dB min
Return Loss	21 dB min
Power Handling	6W CW
Radiated Emissions	-80dBi
Mass	150g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 22.6	4.83 mm	6.4 mm
		22.6 to 50	10.0g	13.0g
		50 to 100	7.7g	10.0g
			2 octaves/min	*4 octaves/min*
Random	All 3 axis	20 to 50	+6dB/oct.	6dB/oct.
		50 to 600	$0.25g^2/Hz$	$0.50g^2/Hz$
		600 to 2000	-4.5 dB/oct.	-4.5 dB/oct.
			60 secs/axis	*180 secs/axis*
		Overall [rms]	**16.7g**	**23.6g**

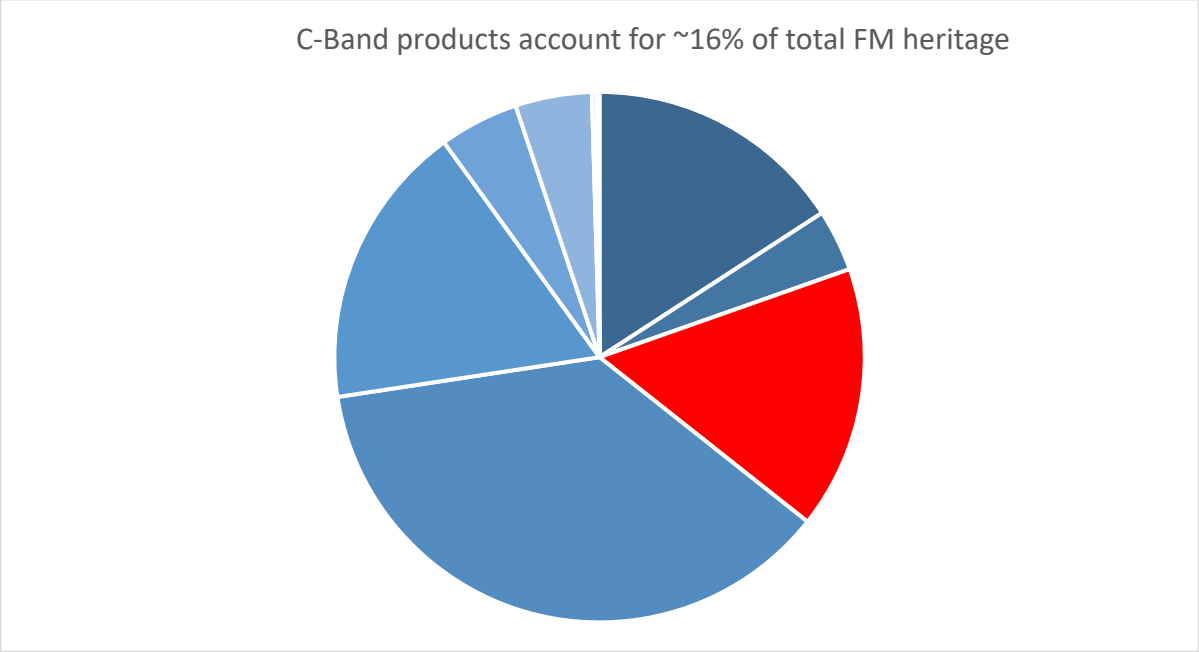
Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Not specified	200	280
	850	1260
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

C-Band Overview

SINT has developed, supplied, and has heritage with many passive devices operating in the 3.2-7.2GHz band designed to operate at either low or high-power. The K-Band range is considered comprehensive with over with ~281 distinct designs supplied to date. In terms of quantities of FMs supplied heritage is dominated by the supplied of miniature microstrip Circulators Isolators used in space based TRm applications and coaxial Isolators used in IMUX and related filter applications. Most parts have been supplied classed as components an increasing number are supplied classed as equipment. This distinction is largely a matter of how the parts are specified and procured. The following is an extract from the heritage database which records sales of flight model hardware from 1994 to December 2020.

FMs supplied	COAXIAL	MICPUCK	MICROSTRIP	STRIPLINE (DROP-IN)	WAVEGUIDE	Grand Total
C	**16181**	**1439**	**9158**	**5608**		**32386**
ISOLATOR	11888	1414	1228	5479		20009
CIRCULATOR	3947	25	7930	129		12031
LOAD/TERMINATION	346					346
C [WR137]					**83**	**83**
ISOLATOR					47	47
TRANSITION					36	36
C [WR159]					**17**	**17**
TRANSITION					17	17
C [WR229]					**83**	**83**
ISOLATOR					83	83
TRANSITION					19	
Grand Total	**16181**	**1439**	**9158**	**5608**	**202**	**32588**

Heritage in terms of the numbers and types of products supplied changes daily. Please contact the factory to obtain the most up to date information.



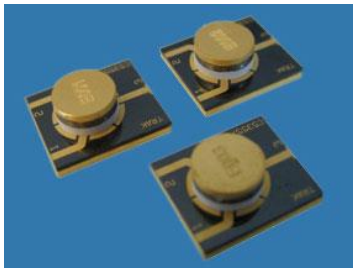
In development/qualification

- -

C-Band microstrip high-power Circulator

Use on a TRM in a LEO active array. The critical requirements were stability over a wide operating temperature, low insertion loss and return loss.

SINT part number	C5355/F
SINT ICD	B107129
Application	Space [LEO]
Status	Qualified & supplied [PFM & FM]
Program	-



- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Suitable for wire bonding
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-65 to +180C
PFM & Qualification	-20 to +80C
Acceptance	-35 to +65C
Impedance	50 Ohms
Operating Frequency	Circa 5.4 GHz
Insertion Loss (including split)	0.30dB
Return Loss	23 dB min
Power Handling (peak/average)	40W/5W
Mass	<1g nom

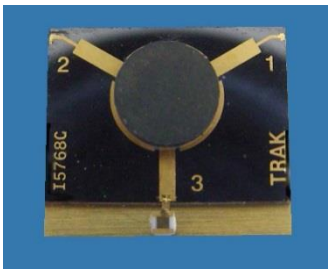
Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 26	-	11mm (0-peak_
		26 to 100	-	30g
			Sweep 2 Oct/min	Sweep 2 Oct/min
Random	All 3 axis	20 to 100	+6dB / octave	+6dB / octave
		100 to 1000	0.67 g^2 / Hz	1.54 g^2 / Hz
		1000 to 2000	-3dB / octave	-3dB / octave
		Overall [rms]	**33g**	**33g**
			60 secs per axis	**60 secs per axis**

Location	Frequency (Hz)	Shock response (Q=10), g
Not specified		MIL-STD-883
		Method2002.3 Condition B
		1500g, 0.5ms
		3-axis

C-Band microstrip low-power Isolator

This device was used in a frequency converter.



SINT part number	I5768/G
SINT ICD	B107800
Application	Space [GEO]
Status	Qualified & supplied
Program	*Hylas I*

- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Suitable for wire bonding
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-40 to +170C
PFM & Qualification	-20 to +80C
Acceptance	-40 to +85C
Impedance	50 Ohms
Operating Frequency	5.7 to 6.8 GHz
Insertion Loss (including split)	0.50dB
Isolation	23 dB min
Return Loss	19 dB min
Power Handling (peak/average)	2 W
Mass	1.2g nom

Environmental

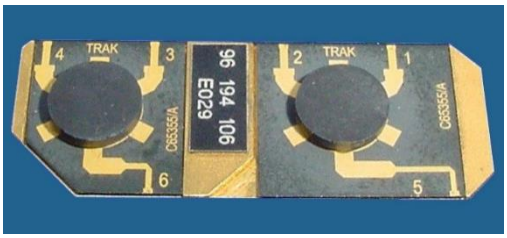
Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 21.5	-	11mm (0-peak)
		21.5 to 100	-	20g
			Sweep 2 Oct/min	Sweep 2 Oct/min
Random	All 3 axis	10 to 60	+6dB / octave	+6dB / octave
		60 to 75	0.22 g^2 / Hz	0.50 g^2 / Hz
		75 to 100	-11.5dB / octave	-11.5dB / octave
		100 to 300	0.67 g^2 / Hz	1.5 g^2 / Hz
		300 to 550	-7.52dB / octave	-7.52dB / octave
		550 to 700	0.15 g^2 / Hz	0.33 g^2 / Hz
		700 to 2000	-5dB / octave	-5dB / octave
		Overall [rms]	**18.2g**	**27.3g**
			60 secs per axis	**60 secs per axis**

Location	Frequency (Hz)	Shock response (Q=10), g
Not specified	100	40
	300	70
	600	900
	5000	900
	10000	700

C-Band Dual junction microstrip high-power Circulators

This device was used in a frequency converter.

SINT part number	I65355/A
SINT ICD	B101348
Application	Space [LEO]
Status	Qualified & supplied
Program	-



- The device is used in a microwave hybrid
- Materials and processes have substantial flight heritage.
- Suitable for wire bonding
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-55 to +125C
Qualification	-30 to +65C
Acceptance	-20 to +60C
Impedance	50 Ohms
Operating Frequency	5.2 to 5.6 GHz
Insertion Loss (including split)	0.35dB
Isolation	20 dB min
Return Loss	21 dB min
Power Handling (peak/average)	15 W/2W
Mass	3.5g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 21.5	-	11mm (0-peak)
		21.5 to 100	-	20g
			Sweep 2 Oct/min	Sweep 2 Oct/min
Random	All 3 axis	10 to 60	+6dB / octave	+6dB / octave
		60 to 75	0.22 g^2 / Hz	0.50 g^2 / Hz
		75 to 100	-11.5dB / octave	-11.5dB / octave
		100 to 300	0.67 g^2 / Hz	1.5 g^2 / Hz
		300 to 550	-7.52dB / octave	-7.52dB / octave
		550 to 700	0.15 g^2 / Hz	0.33 g^2 / Hz
		700 to 2000	-5dB / octave	-5dB / octave
		Overall [rms]	**18.2g**	**27.3g**
			60 secs per axis	**60 secs per axis**

Location	Frequency (Hz)	Shock response (Q=10), g
Not specified	100	40
	300	70
	600	900
	4200	4000

C-Band stripline low-power Isolator

Used in a converter application.

SINT part number	I3440/C
SINT ICD	B107654
Application	Space [LEO/MEO/GEO]
Status	Qualified & supplied
Programs	*Various*

- Materials and processes have substantial flight heritage.
- Suitable for soldering
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-55 to +125C
PFM & Qualification	-50 to +65C
Acceptance	-45 to +60C
Operating Frequency	3.45 to 3.95 GHz
Insertion Loss	0.70dB
Isolation	18 dB min
Return Loss	18 dB min
Power Handling	1W CW
Mass	2.8g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 22.6	-	-
		22.6 to 50	-	-
		50 to 100	-	-
Random	All 3 axis	20 to 50	+3dB/oct.	+3dB/oct.
		50 to 1000	0.80g^2/Hz	0.80g^2/Hz
		1000 to 2000	-4.5 dB/oct.	-4.5 dB/oct.
			60 secs/axis	*240 secs/axis*
		Overall [rms]	**36.0g**	**36.0g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Not specified	200	280
	850	1260
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

C-Band stripline low-power Isolator

Used in a converter application.

SINT part number	I3944/A
SINT ICD	B108393
Application	Space [LEO/MEO/GEO]
Status	Qualified & supplied
Programs	*Various*

- Materials and processes have substantial flight heritage.
- Suitable for soldering
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-55 to +125C
PFM & Qualification	-45 to +65C
Acceptance	-40 to +60C
Operating Frequency	3.9 to 4.40 GHz
Insertion Loss	0.50dB
Isolation	18 dB min
Return Loss	18 dB min
Power Handling	1W CW
Mass	2.8g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 22.6	-	-
		22.6 to 50	-	-
		50 to 100	-	-
Random	All 3 axis	20 to 50	+3dB/oct.	+3dB/oct.
		50 to 1000	0.80g^2/Hz	0.80g^2/Hz
		1000 to 2000	-4.5 dB/oct.	-4.5 dB/oct.
			60 secs/axis	*240 secs/axis*
		Overall [rms]	**36.0g**	**36.0g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Not specified	200	280
	850	1260
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

C-Band stripline low-power Isolator

Used in a converter application.

SINT part number	I5561/B
SINT ICD	B108393
Application	Space [LEO/MEO/GEO]
Status	Qualified & supplied
Programs	*Various*

- Materials and processes have substantial flight heritage.
- Suitable for soldering
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-55 to +125C
PFM & Qualification	-45 to +75C
Acceptance	-40 to +70C
Operating Frequency	5.5-6.10 GHz
Insertion Loss	0.50dB
Isolation	21 dB min
Return Loss	21 dB min
Power Handling	1W CW
Mass	2.8g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 22.6	-	-
		22.6 to 50	-	-
		50 to 100	-	-
Random	All 3 axis	20 to 50	+3dB/oct.	+3dB/oct.
		50 to 1000	0.80g^2/Hz	0.80g^2/Hz
		1000 to 2000	-4.5 dB/oct.	-4.5 dB/oct.
			60 secs/axis	*240 secs/axis*
		Overall [rms]	**36.0g**	**36.0g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Not specified	200	280
	850	1260
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

C-Band stripline low-power Isolator

Used in a converter application.

SINT part number	I6575/A
SINT ICD	B106579
Application	Space [LEO/MEO/GEO]
Status	Qualified & supplied
Programs	*Various*

- Materials and processes have substantial flight heritage.
- Suitable for soldering
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-55 to +125C
PFM & Qualification	-45 to +75C
Acceptance	-40 to +70C
Operating Frequency	6.1-6.70 GHz
Insertion Loss	0.50dB
Isolation	23 dB min
Return Loss	23 dB min
Power Handling	1W CW
Mass	2.8g nom

Environmental

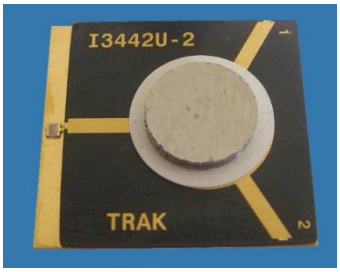
Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 22.6	-	-
		22.6 to 50	-	-
		50 to 100	-	-
Random	All 3 axis	20 to 50	+3dB/oct.	+3dB/oct.
		50 to 1000	0.80g^2/Hz	0.80g^2/Hz
		1000 to 2000	-4.5 dB/oct.	-4.5 dB/oct.
			60 secs/axis	*240 secs/axis*
		Overall [rms]	**36.0g**	**36.0g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Not specified	200	280
	850	1260
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

C-Band microstrip low-power Isolator

This device was used in a frequency processor.

SINT part number	I3442/AT
SINT ICD	B108597
Application	Space [GEO]
Status	Qualified & supplied
Program	*Various*



- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Suitable for soldering
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-40 to +170C
PFM & Qualification	-20 to +80C
Acceptance	-40 to +85C
Impedance	50 Ohms
Operating Frequency	3.4-4.2 GHz
Insertion Loss (including split)	0.50dB
Isolation	19 dB min
Return Loss	19 dB min
Power Handling (peak/average)	2 W
Mass	1.5g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 21.5	-	11mm (0-peak)
		21.5 to 100	-	20g
			Sweep 2 Oct/min	Sweep 2 Oct/min
Random	All 3 axis	10 to 60	+6dB / octave	+6dB / octave
		60 to 75	0.22 g^2 / Hz	0.50 g^2 / Hz
		75 to 100	-11.5dB / octave	-11.5dB / octave
		100 to 300	0.67 g^2 / Hz	1.5 g^2 / Hz
		300 to 550	-7.52dB / octave	-7.52dB / octave
		550 to 700	0.15 g^2 / Hz	0.33 g^2 / Hz
		700 to 2000	-5dB / octave	-5dB / octave
		Overall [rms]	**18.2g**	**27.3g**
			60 secs per axis	**60 secs per axis**

Location	Frequency (Hz)	Shock response (Q=10), g
Not specified	100	40
	300	70
	600	900
	5000	900
	10000	700

C-band 3.4-4.2GHz SMA (M & F) 2W coaxial Load

Generic applications. Key design parameters are *Return Loss* and reliability under fault conditions.

SINT part number	STE112 (M) & STE113 (F)
SINT ICD	A106341 (M) & A106351 (F)
Application	Generic
Status	In orbit
Program	*Various*

- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Vented Nickel-plated, Stainless-steel housing featuring procured connectors.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-55 to +125C
Qualification	-40 to +100C
Acceptance	-40 to +95C
Operating Frequency	3.4-4.2 GHz
Return Loss	27dB min
Power	2W CW
Radiated Emissions	70dBi min
Mass	5g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification XY
Sine	All 3 axis	5 to 20	-	11 mm
		20 to 100	-	20g
				2 octaves/min
Random	All 3 axis	10 to 60	+7dB/oct.	+7dB/oct.
		60 to 75	$0.22g^2/Hz$	$0.50g^2/Hz$
		75 to 100	+10.5dB/oct.	+11.5dB/oct.
		100 to 300	$0.67g^2/Hz$	$1.5g^2/Hz$
		300 to 900	-7.1dB/oct.	-7.4dB/oct.
		900 to 1000	$0.045g^2/Hz$	$0.10g^2/Hz$
		1000 to 2000	-3dB/oct.	3dB/oct.
			60 secs/axis	*180 secs/axis*
		Overall [rms]	**17.2g**	**25.8g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Not specified	100	50
	400	600
	1500	2000
	10000	2500
	Number of Events	*3 per axis*

Notes:

- The termination is resistive
- A BeO rod resistor is used

C-band 4.4-4.9GHz SMA (M & F) 2W coaxial Load

Generic applications. Key design parameters are *Return Loss* and reliability under fault conditions.

SINT part number	CTE104
SINT ICD	A106342 (M) & A106352 (F)
Application	Generic
Status	In orbit
Program	*Various*

- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Vented Nickel-plated, Stainless-steel housing featuring procured connectors.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-55 to +125C
Qualification	-40 to +100C
Acceptance	-40 to +95C
Operating Frequency	4.4-4.9 GHz
Return Loss	27dB min
Power	2W CW
Radiated Emissions	70dBi min
Mass	5g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification XY
Sine	All 3 axis	5 to 20	-	11 mm
		20 to 100	-	20g
				2 octaves/min
Random	All 3 axis	10 to 60	+7dB/oct.	+7dB/oct.
		60 to 75	0.22g^2/Hz	0.50g^2/Hz
		75 to 100	+10.5dB/oct.	+11.5dB/oct.
		100 to 300	0.67g^2/Hz	1.5g^2/Hz
		300 to 900	-7.1dB/oct.	-7.4dB/oct.
		900 to 1000	0.045g^2/Hz	0.10g^2/Hz
		1000 to 2000	-3dB/oct.	3dB/oct.
			60 secs/axis	*180 secs/axis*
		Overall [rms]	**17.2g**	**25.8g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Not specified	100	50
	400	600
	1500	2000
	10000	2500
	Number of Events	*3 per axis*

Notes:

- The termination is resistive
- A BeO rod resistor is used

C-band 5.7-6.5GHz SMA (M & F) 2W coaxial Load

Generic applications. Key design parameters are *Return Loss* and reliability under fault conditions.

SINT part number	CTE106 (M) & CTE107 (F)
SINT ICD	A106343 (M) & A106353 (F)
Application	Generic
Status	In orbit
Program	*Various*

- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Vented Nickel-plated, Stainless-steel housing featuring procured connectors.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-55 to +125C
Qualification	-40 to +100C
Acceptance	-40 to +95C
Operating Frequency	5.7-6.5 GHz
Return Loss	27dB min
Power	2W CW
Radiated Emissions	70dBi min
Mass	5g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification XY
Sine	All 3 axis	5 to 20	-	11 mm
		20 to 100	-	20g
				2 octaves/min
Random	All 3 axis	10 to 60	+7dB/oct.	+7dB/oct.
		60 to 75	0.22g^2/Hz	0.50g^2/Hz
		75 to 100	+10.5dB/oct.	+11.5dB/oct.
		100 to 300	0.67g^2/Hz	1.5g^2/Hz
		300 to 900	-7.1dB/oct.	-7.4dB/oct.
		900 to 1000	0.045g^2/Hz	0.10g^2/Hz
		1000 to 2000	-3dB/oct.	3dB/oct.
			60 secs/axis	*180 secs/axis*
		Overall [rms]	**17.2g**	**25.8g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Not specified	100	50
	400	600
	1500	2000
	10000	2500
	Number of Events	*3 per axis*

Notes:

- The termination is resistive
- A BeO rod resistor is used

C-Band SMA low-power Circulator

Used on an input multiplexer system. This device is broadband with all S-Parameters being of equal importance.

SINT part number	C3442/N
SINT ICD	C108330
Application	MUX
Status	Supplied
Program	*Various*

- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Used on Various filter multiplexing equipments
- Gold-plated, Stainless-steel housing featuring procured connectors.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.
- Analysis & reports: Venting,

Basic performance criteria

Parameter	Performance
Non-operating	-45 to +125C
PFM & Qualification	-305 to +80C
Acceptance	-30 to +75C
Operating Frequency	3.4 to 4.3 GHz
Insertion Loss	0.25dB max
Isolation	21 dB min
Return Loss	21 dB min
Power Handling (fault)	2 W CW
Radiated Emissions	80dBi min
Mass	39g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	PFM	Qualification
Sine	All 3 axis	5 to 22.6	-	6.4 mm	6.4 mm
		22.6 to 50	-	130.0g	130.0g
		50 to 100	-	10g	10g
			-	*2 octaves/min*	*4 octaves/min*
Random	All 3 axis	20 to 50	6dB/oct.	6dB/oct.	6dB/oct.
		50 to 600	$0.25g^2$/Hz	$0.50g^2$/Hz	$0.50g^2$/Hz
		600 to 2000	-4.5 dB/oct.	-4.5 dB/oct.	-4.5 dB/oct.
			60 secs/axis	*60 secs/axis*	*180 secs/axis*
		Overall [rms]	**16.6g**	**23.6g**	**23.6g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Shear Web	200	280
	850	1260
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

C-Band SMA low-power Isolator

Used on an input multiplexer system. This devices is broadband with all S-Parameters being of equal importance.

SINT part number	I3443/A
SINT ICD	B108003
Application	Space [GEO]
Status	In Orbit
Program	*Various*

- The devices are used following payload pump down.
- Materials and processes have substantial flight heritage.
- Used on Various filter multiplexing equipments
- Gold-plated, Stainless-steel housing featuring SINT designed “solid connectors”.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-45 to +125C
PFM & Qualification	-305 to +80C
Acceptance	-30 to +75C
Operating Frequency	3.4 to 4.3 GHz
Insertion Loss	0.25dB max
Isolation	21 dB min
Return Loss	21 dB min
Power Handling (fault)	2 W CW
Radiated Emissions	80dBi min
Mass	39g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	PFM	Qualification
Sine	All 3 axis	5 to 22.6	-	6.4 mm	6.4 mm
		22.6 to 50	-	130.0g	130.0g
		50 to 100	-	10g	10g
			-	*2 octaves/min*	*4 octaves/min*
Random	All 3 axis	20 to 50	6dB/oct.	6dB/oct.	6dB/oct.
		50 to 600	$0.25g^2/Hz$	$0.50g^2/Hz$	$0.50g^2/Hz$
		600 to 2000	-4.5 dB/oct.	-4.5 dB/oct.	-4.5 dB/oct.
			60 secs/axis	*60 secs/axis*	*180 secs/axis*
		Overall [rms]	**16.6g**	**23.6g**	**23.6g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Shear Web	200	280
	850	1260
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

C-Band SMA low-power Isolator

Used on an input multiplexer system. This devices is broadband with all S-Parameters being of equal importance.

SINT part number	I6070/A
SINT ICD	B108012
Application	Space [GEO]
Status	In Orbit
Program	*Various*

- The devices are used following payload pump down.
- Materials and processes have substantial flight heritage.
- Used on Various filter multiplexing equipments
- Gold-plated, Stainless-steel housing featuring SINT designed “solid connectors”.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-45 to +125C
PFM & Qualification	-30 to +80C
Acceptance	-30 to +75C
Operating Frequency	6.0 to 7.0 GHz
Insertion Loss	0.25dB max
Isolation	23dB min
Return Loss	23 dB min
Power Handling (fault)	2 W CW
Radiated Emissions	80dBi min
Mass	39g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	PFM	Qualification
Sine	All 3 axis	5 to 22.6	-	6.4 mm	6.4 mm
		22.6 to 50	-	130.0g	130.0g
		50 to 100	-	10g	10g
			-	*2 octaves/min*	*4 octaves/min*
Random	All 3 axis	20 to 50	6dB/oct.	6dB/oct.	6dB/oct.
		50 to 600	0.25g^2/Hz	0.50g^2/Hz	0.50g^2/Hz
		600 to 2000	-4.5 dB/oct.	-4.5 dB/oct.	-4.5 dB/oct.
			60 secs/axis	*60 secs/axis*	*180 secs/axis*
		Overall [rms]	**16.6g**	**23.6g**	**23.6g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Shear Web	200	280
	850	1260
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

C-Band SMA broad-band low-power Isolator

Used on a broad fractional band converter. The key performance criteria were low loss and return loss.

SINT part number	I4166/A
SINT ICD	B108407
Application	Space [GEO]
Status	Supplied
Program	-

- The devices are used following payload pump down.
- Materials and processes have substantial flight heritage.
- Used on Various filter multiplexing equipments
- Gold-plated, Stainless-steel housing featuring SINT designed “solid connectors”.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-50 to +125C
Qualification	-40 to +80C
Acceptance	-30 to +75C
Operating Frequency	4.1 to 6.6 GHz
Insertion Loss	0.35dB max
Isolation	20dB min
Return Loss	20 dB min
Power Handling (fault)	1 W CW
Radiated Emissions	80dBi min
Mass	34g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 22.6	-	-
		22.6 to 50	-	-
		50 to 100	-	-
			-	-
Random	All 3 axis	20 to 100	6dB/oct.	6dB/oct.
		100 to 1000	0.98g^2/Hz	3.94g^2/Hz
		1000 to 2000	-3.0 dB/oct.	-3.0 dB/oct.
			60 secs/axis	*180 secs/axis*
		Overall [rms]	**39.9g**	**80.0g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Shear Web	100	50
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

C-Band SMA broad-band low-power Isolator

Used on a broad fractional band converter. The key performance criteria were low loss and return loss.

SINT part number	I3868/A
SINT ICD	B108407
Application	Space [GEO]
Status	Supplied
Program	-

- The devices are used following payload pump down.
- Materials and processes have substantial flight heritage.
- Used on Various filter multiplexing equipments
- Gold-plated, Stainless-steel housing featuring SINT designed “solid connectors”.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-50 to +125C
Qualification	-40 to +80C
Acceptance	-30 to +75C
Operating Frequency	3.8 to 6.8 GHz
Insertion Loss	0.30dB max
Isolation	18dB min
Return Loss	20 dB min
Power Handling (fault)	1 W CW
Radiated Emissions	80dBi min
Mass	34g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 22.6	-	-
		22.6 to 50	-	-
		50 to 100	-	-
			-	-
Random	All 3 axis	20 to 100	6dB/oct.	6dB/oct.
		100 to 1000	0.98g^2/Hz	3.94g^2/Hz
		1000 to 2000	-3.0 dB/oct.	-3.0 dB/oct.
			60 secs/axis	*180 secs/axis*
		Overall [rms]	**39.9g**	**80.0g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Shear Web	100	50
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

C-Band SMA broad-band low-power Isolator

Used on a broad fractional band converter. The key performance criteria were low loss and return loss.

SINT part number	I3970/A
SINT ICD	B108407
Application	Space [GEO]
Status	Supplied
Program	-

- The devices are used following payload pump down.
- Materials and processes have substantial flight heritage.
- Used on Various filter multiplexing equipments
- Gold-plated, Stainless-steel housing featuring SINT designed “solid connectors”.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-50 to +125C
Qualification	-40 to +80C
Acceptance	-30 to +75C
Operating Frequency	3.9 to 7.0 GHz
Insertion Loss	0.30dB max
Isolation	18dB min
Return Loss	20 dB min
2224/e/e Power Handling (fault)	1 W CW
Radiated Emissions	80dBi min
Mass	34g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 22.6	-	-
		22.6 to 50	-	-
		50 to 100	-	-
			-	-
Random	All 3 axis	20 to 100	6dB/oct.	6dB/oct.
		100 to 1000	0.98g^2/Hz	3.94g^2/Hz
		1000 to 2000	-3.0 dB/oct.	-3.0 dB/oct.
			60 secs/axis	*180 secs/axis*
		Overall [rms]	**39.9g**	**80.0g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Shear Web	100	50
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

C-Band SMA bulkhead 0.38mm Isolator

Used on the output of a converter.

SINT part number	I5664/B
SINT ICD	B105813
Application	Space [GEO]
Status	In Orbit
Program	*Various*

- The devices are used following payload pump down.
- Materials and processes have substantial flight heritage.
- Used on Various filter multiplexing equipments
- Gold-plated, Stainless-steel housing featuring SINT designed “solid connectors”.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-55 to +125C
Qualification	-55 to +85C
Acceptance	-30 to +80C
Operating Frequency	5.6 to 6.4 GHz
Insertion Loss	0.15 dB max
Isolation	23 dB min
Return Loss (SMA)	23 dB min
Return Loss (SKT)	21 dB min
Power Handling (fault)	1 W CW
Radiated Emissions	-95dBc max
Mass	27g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 22.6	-	6.4 mm
		22.6 to 50	-	130.0g
		50 to 100	-	10g
			-	*4 octaves/min*
Random	All 3 axis	20 to 100	+6dB/oct.	+6dB/oct.
		100 to 1000	$0.67g^2/Hz$	$1.54g^2/Hz$
		1000 to 2000	-3.0 dB/oct.	-3.0 dB/oct.
			60 secs/axis	*180 secs/axis*
		Overall [rms]	**33.0g**	**50.0g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Shear Web	200	280
	850	1260
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

C-Band bulkhead to SMA medium-power Isolator

This device is used in an SSPA.

SINT part number	I4248/C
SINT ICD	B107481
Application	Space [GEO]
Status	Supplied
Program	-

- The devices are used following payload pump down.
- Materials and processes have substantial flight heritage.
- Used on Various filter multiplexing equipments
- Gold-plated, Stainless-steel housing with procured connector
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-55 to +125C
Qualification	-40 to +80C
Acceptance	-23 to +82C
Operating Frequency	4.2 to 4.8 GHz
Insertion Loss	0.25dB max
Isolation	18dB min
Return Loss (bulkhead)	21 dB min
Return Loss (SMA)	23 dB min
Power Handling (fault)	21 W CW
Radiated Emissions	80dBi min
Mass	81g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	-	-	-
		-	-	-
		-	-	-
Random	All 3 axis	50 to 100	6dB/oct.	6dB/oct.
		100 to 2000	$0.30g^2/Hz$	$1.00g^2/Hz$
			180 secs/axis	*180 secs/axis*
		Overall [rms]	**24.06g**	**43.92g**

Location		
		Qualification
	MIL-STD-202, method 213, condition1	SAWTOOTH
		PEAK = 100g
		DURATION = 6mS
	Number of Events	*2 per axis, 6 directions*

C-Band TNC high-power Isolator

This device is used in an SSPA.

SINT part number	I3642/AC
SINT ICD	C108258
Application	Space [GEO]
Status	Supplied
Program	*Generic*

- The devices are used following payload pump down.
- Materials and processes have substantial flight heritage.
- Used on Various filter multiplexing equipments
- Gold plated hybrid Aluminum/Copper housing with procured TNC connector
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-35 to +125C
Qualification	-20 to +100C
Acceptance	-15 to +95C
Operating Frequency	3.7 to 4.2 GHz
Insertion Loss	0.15dB max
Isolation	23 dB min
Return Loss (TNC)	23 dB min
Return Loss (Socket)	23 dB min
Power Handling (fault)	150 W CW (full reflection
Radiated Emissions	80dBi min
Mass	122g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	-	-	-
		-	-	-
		-	-	-
Random	All 3 axis	20 to 100	+6dB/oct.	+6dB/oct.
		100 to 1000	0.67g^2/Hz	1.54g^2/Hz
		1000 to 2000	-3dB/oct.	-3dB/oct.
			1 secs/axis	*180 secs/axis*
		Overall [rms]	**33.0g**	**50.0g**

Location	Frequency	Qualification
		SRS, Q=10
	100	*70g*
	1000	*3600g*
	10000	*3600g*
	Number of Events	*3 shocks per axis*

C-Band TNC medium-power Load

This device is remote termination used in conjunction with a high-power Circulator to form an Isolator on the output of a compact TWTA.

SINT part number	CTE114
SINT ICD	C108150
Application	Space [GEO], termination
Status	Qualified & supplied [PFM & FM]
Program	*Eutelsat 7*

- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Used on the output of SSPA and supplied with a separate remote Load.
- Nickel-plated, Stainless-steel housing featuring SINT designed/produced TNC connectors.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.
- The design was successfully subjected to MP and CP qualification testing at VALSPACE.
- Analysis & reports: PDR, CDR, MRR, TRR, Venting, MP, Corona, Thermal, Worst case, FMECA.

Basic performance criteria

Parameter	Performance
Non-operating	-45 to +125C
PFM & Qualification	-45 to +125C
Acceptance	-40 to +120C
Operating Frequency	3.4 to 4.30GHz
Return Loss	21 dB min
Power Handling	80W CW [PFM]
	50W CW [FM]
Multipaction	80W pk by test
	160W pk by analysis
Corona (critical pressure)	80W CW [PFM]
	50W CW [FM]
Radiated Emissions	80dBi min
Mass	46g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	PFM	Qualification
Sine	All 3 axis	5 to 22.6	4.83 mm	6.4 mm	6.4 mm
		22.6 to 50	10.0g	13.0g	13.0g
		50 to 100	7.7g	10.0g	10.0g
			2 octaves/min	*2 octaves/min*	*4 octaves/min*
Random	All 3 axis	20 to 50	6dB/oct.	6dB/oct.	6dB/oct.
		50 to 600	$0.25g^2/Hz$	$0.50g^2/Hz$	$0.50g^2/Hz$
		600 to 2000	-4.5 dB/oct.	-4.5 dB/oct.	-4.5 dB/oct.
			60 secs/axis	*60 secs/axis*	*180 secs/axis*
		Overall [rms]	**16.7g**	**23.6g**	**23.6g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Shear Web	200	280
	850	1260
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

C-Band TNC high-power Load

This device is remote termination used in conjunction with a high-power Circulator to form an Isolator on the output of a TWTA

SINT part number	G019869-03
SINT ICD	6027905
Application	Space [GEO], termination
Status	Qualified & supplied [PFM & FM]
Program	*VARIOUS (multiple programs)*

- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Nickel plated Aluminum housing featuring procured TNC connectors.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.
- Analysis & reports: PDR, CDR, MRR, TRR, Venting, MP, Corona, Thermal, Worst case, FMECA.

Basic performance criteria

Parameter	Performance
Non-operating	-45 to +125C
PFM & Qualification	-45 to +125C
Acceptance	-40 to +90C
Operating Frequency	3.4 to 4.30GHz
Return Loss	21 dB min
Power Handling	90W CW [PFM]
	90W CW [FM]
Multipaction	180W pk by test
	360W pk by analysis
Corona (critical pressure)	180W CW [PFM]
	180W CW [FM]
Radiated Emissions	80dBi min
Mass	46g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	PFM	Qualification
Sine	All 3 axis	5 to 22.6	4.83 mm	6.4 mm	6.4 mm
		22.6 to 50	10.0g	13.0g	13.0g
		50 to 100	7.7g	10.0g	10.0g
			2 octaves/min	*2 octaves/min*	*4 octaves/min*
Random	All 3 axis	20 to 50	6dB/oct.	6dB/oct.	6dB/oct.
		50 to 600	0.25g^2/Hz	0.50g^2/Hz	0.50g^2/Hz
		600 to 2000	-4.5 dB/oct.	-4.5 dB/oct.	-4.5 dB/oct.
			60 secs/axis	*60 secs/axis*	*180 secs/axis*
		Overall [rms]	**16.7g**	**23.6g**	**23.6g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Shear Web	200	280
	850	1260
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

C-Band TNC high-power Circulator

This device is used in conjunction with a high-power remote termination to form an Isolator on the output of a compact TWTA.

SINT part number	C3443/A
SINT ICD	C107985
Application	Space [GEO], termination
Status	Qualified & supplied [PFM & FM]
Program	*Intelsat 39*

- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Used on the output of SSPA and supplied with a separate remote Load.
- Passivated Aluminum housing featuring SINT designed/produced TNC connectors.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.
- The design was successfully subjected to MP and CP qualification testing at VALSPACE.
- Analysis & reports: PDR, CDR, MRR, TRR, Venting, MP, Corona, Thermal, Worst case, FMECA.

Basic performance criteria

Parameter	Performance
Non-operating	-45 to +125C
PFM & Qualification	-25 to +95C
Acceptance	-20 to +90C
Operating Frequency	3.4 to 4.30GHz
Insertion Loss	0.20dB max
Return Loss	21 dB min
Power Handling (fault)	160 CW [PFM]
	101W CW [FM]
Multipaction	160W pk by test
	320W pk by analysis
Corona (critical pressure)	160W CW [PFM]
	80W CW [FM]
Radiated Emissions	80dBi min
Mass	178g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	PFM	Qualification
Sine	All 3 axis	5 to 22.6	4.83 mm	6.4 mm	6.4 mm
		22.6 to 50	10.0g	13.0g	13.0g
		50 to 100	7.7g	10.0g	10.0g
			2 octaves/min	*2 octaves/min*	*4 octaves/min*
Random	All 3 axis	20 to 50	6dB/oct.	6dB/oct.	6dB/oct.
		50 to 600	$0.25g^2/Hz$	$0.50g^2/Hz$	$0.50g^2/Hz$
		600 to 2000	-4.5 dB/oct.	-4.5 dB/oct.	-4.5 dB/oct.
			60 secs/axis	*60 secs/axis*	*180 secs/axis*
		Overall [rms]	**16.7g**	**23.6g**	**23.6g**

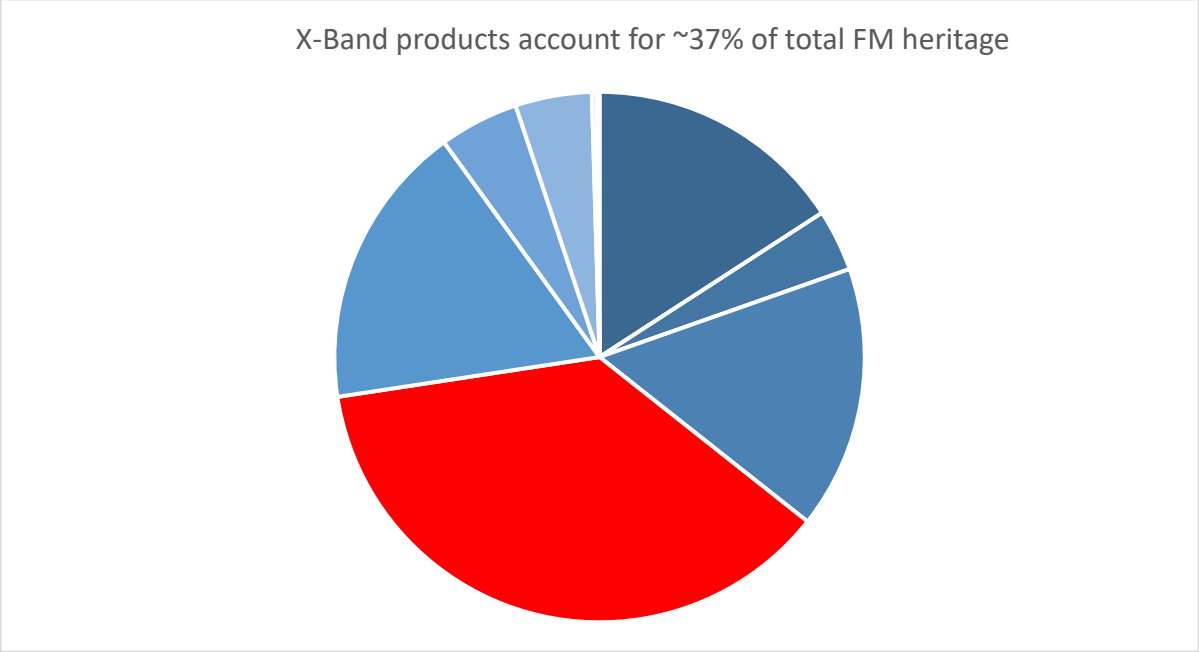
Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Shear Web	200	280
	850	1260
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

X-Band Overview

SINT has developed, supplied, and has heritage with many passive devices operating in the 7.2-12GHz band designed to operate at either low or high-power. The X-Band range is considered comprehensive with over with ~226 distinct designs supplied to date. Heritage is dominated by the supplied of miniature microstrip Circulators Isolators used in space based TRm applications and while most parts supplied are classed as EEE an increasing number are supplied classed as equipments. This distinction is largely a matter of how the parts are specified and procured. The following is an extract from the heritage database which records sales of flight model hardware from 1994 to December 2020.

FMs supplied	COAXIAL	MICPUCK	MICROSTRIP	STRIPLINE (DROP-IN)	WAVEGUIDE	Grand Total
X	**3869**	**4351**	**60099**	**5582**		**73901**
DUPLEXOR/ LIMITER			25958			25958
CIRCULATOR	326	90	25324	10		25750
ISOLATOR	3463	4261	8817	5572		22113
LOAD/TERMINATION	65					65
ISO-ADPATER	15					15
X [WR112]					**486**	**486**
ISOLATOR					283	283
TRANSITION					125	125
LOAD/TERMINATION					39	39
CIRCULATOR					18	18
ISO-ADAPTOR					13	13
SPLITTER					6	6
TEST COUPLER					2	2
X [WR90]					**682**	**682**
CIRCULATOR					591	591
ISOLATOR					56	56
TRANSITION					35	35
Grand Total	**3869**	**4351**	**60099**	**5582**	**1185**	**75086**

Heritage in terms of the numbers and types of products supplied changes daily. Please contact the factory to obtain the most up to date information.



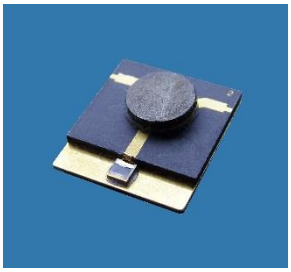
In development/qualification

- 25W, 7.2-8.0GHz, microstrip Isolator - qualification
- Flange mounted SSMA (half détente male SMP) to SMA low power Isolator

X-Band microstrip low-power Isolator

Used in a converter application.

SINT part number	I6277/A
SINT ICD	B108430
Application	Space [LEO/MEO/GEO]
Status	Qualified & supplied
Programs	*Various*



- The device is used within a hybrid construction
- Materials and processes have substantial flight heritage.
- Suitable for wire bonding
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-65 to +180C
Acceptance	-45 to +85C
Impedance	50 Ohms
Operating Frequency	6.2 to 7.7 GHz
Insertion Loss	0.35dB
Isolation	20 dB min
Return Loss	20 dB min
Power Handling	2W CW
Mass	<0.5g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 26	-	11mm (0-peak_
		26 to 100	-	30g
			Sweep 2 Oct/min	Sweep 2 Oct/min
Random	All 3 axis	20 to 100	+6dB / octave	+6dB / octave
		100 to 1000	0.67 g^2 / Hz	1.54 g^2 / Hz
		1000 to 2000	-3dB / octave	-3dB / octave
		Overall [rms]	**33g**	**33g**
			60 secs per axis	**60 secs per axis**

Location	Frequency (Hz)	Shock response (Q=10), g
Not specified		MIL-STD-883
		Method2002.3 Condition B
		1500g, 0.5ms
		3-axis

Note: This image is generic and is used to protect the designing and user party's IP

X-Band stripline low-power Isolator

Used in a converter application.

SINT part number	I6575/A
SINT ICD	B106579
Application	Space [LEO/MEO/GEO]
Status	Qualified & supplied
Programs	*Various*

- Materials and processes have substantial flight heritage.
- Suitable for soldering
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-55 to +125C
PFM & Qualification	-35 to +70C
Acceptance	-30 to +65C
Operating Frequency	5.95-6.05 GHz
Insertion Loss	0.50dB
Isolation	23 dB min
Return Loss	23 dB min
Power Handling	1W CW
Mass	2.8g nom

Environmental

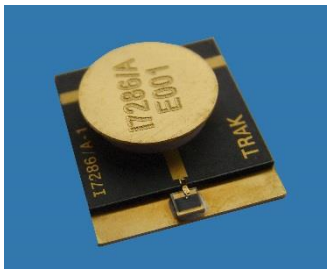
Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 22.6	-	-
		22.6 to 50	-	-
		50 to 100	-	-
Random	All 3 axis	20 to 50	+3dB/oct.	+3dB/oct.
		50 to 1000	0.80g^2/Hz	0.80g^2/Hz
		1000 to 2000	-4.5 dB/oct.	-4.5 dB/oct.
			60 secs/axis	*240 secs/axis*
		Overall [rms]	**36.0g**	**36.0g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Not specified	200	280
	850	1260
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

X-Band microstrip low-power Isolator

Used in a converter application

SINT part number	I7286/A
SINT ICD	B108430
Application	Space [LEO/MEO/GEO]
Status	Qualified & supplied
Programs	*Various*



- The device is Space [GEO] used within a hybrid construction
- Materials and processes have substantial flight heritage.
- Suitable for wire bonding
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-65 to +180C
Acceptance	-45 to +85C
Impedance	50 Ohms
Operating Frequency	7.2 to 8.6 GHz
Insertion Loss	0.35dB
Isolation	20 dB min
Return Loss	20 dB min
Power Handling	2W CW
Mass	<0.5g nom

Environmental

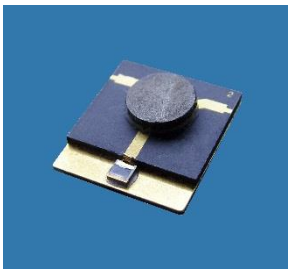
Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 26	-	11mm (0-peak_
		26 to 100	-	30g
			Sweep 2 Oct/min	Sweep 2 Oct/min
Random	All 3 axis	20 to 100	+6dB / octave	+6dB / octave
		100 to 1000	0.67 g^2 / Hz	1.54 g^2 / Hz
		1000 to 2000	-3dB / octave	-3dB / octave
		Overall [rms]	**33g**	**50g**
			60 secs per axis	**60 secs per axis**

Location	Frequency (Hz)	Shock response (Q=10), g
Not specified		MIL-STD-883
		Method2002.3 Condition B
		1500g, 0.5ms
		3-axis

X-Band microstrip low-power Isolator

Used in a converter application

SINT part number	I6277/A
SINT ICD	B108430
Application	Space [LEO/MEO/GEO]
Status	Qualified & supplied
Programs	*Various*



- The device is Space [GEO] used within a hybrid construction
- Materials and processes have substantial flight heritage.
- Suitable for wire bonding
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-65 to +180C
Acceptance	-45 to +85C
Impedance	50 Ohms
Operating Frequency	7.6 to 9.6 GHz
Insertion Loss	0.35dB
Isolation	20 dB min
Return Loss	20 dB min
Power Handling	2W CW
Mass	<0.5g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 26	-	11mm (0-peak_
		26 to 100	-	30g
			Sweep 2 Oct/min	Sweep 2 Oct/min
Random	All 3 axis	20 to 100	+6dB / octave	+6dB / octave
		100 to 1000	0.67 g^2 / Hz	1.54 g^2 / Hz
		1000 to 2000	-3dB / octave	-3dB / octave
		Overall [rms]	**33g**	**50g**
			60 secs per axis	**60 secs per axis**

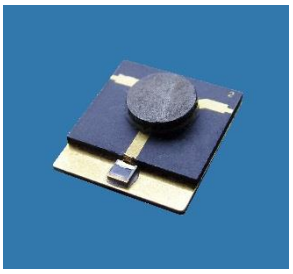
Location	Frequency (Hz)	Shock response (Q=10), g
Not specified		MIL-STD-883
		Method2002.3 Condition B
		1500g, 0.5ms
		3-axis

Note: This image is generic and is used to protect the designing and user party's IP

X-Band microstrip low-power Isolator

Used in a converter application

SINT part number	I94118/A
SINT ICD	B108439
Application	Space [LEO/MEO/GEO]
Status	Qualified & supplied
Programs	*Various*



- The device is Space [GEO] used within a hybrid construction
- Materials and processes have substantial flight heritage.
- Suitable for wire bonding
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-65 to +180C
Acceptance	-45 to +85C
Impedance	50 Ohms
Operating Frequency	9.4 to 11.8 GHz
Insertion Loss	0.35dB
Isolation	20 dB min
Return Loss	20 dB min
Power Handling	2W CW
Peak power handling	25W
Mass	<0.5g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 26	-	11mm (0-peak_
		26 to 100	-	30g
			Sweep 2 Oct/min	Sweep 2 Oct/min
Random	All 3 axis	20 to 100	+6dB / octave	+6dB / octave
		100 to 1000	0.67 g^2 / Hz	1.54 g^2 / Hz
		1000 to 2000	-3dB / octave	-3dB / octave
		Overall [rms]	**33g**	**50g**
			60 secs per axis	**60 secs per axis**

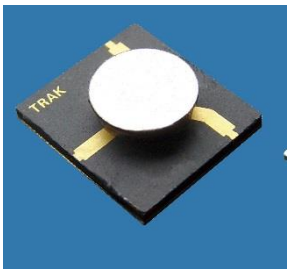
Location	Frequency (Hz)	Shock response (Q=10), g
Not specified		MIL-STD-883
		Method2002.3 Condition B
		1500g, 0.5ms
		3-axis

Note: This image is generic and is used to protect the designing and user party's IP

X-Band microstrip low-power Circulator

Used in a converter application.

SINT part number	C6786/A
SINT ICD	B108439
Application	Space [LEO/MEO/GEO]
Status	Qualified & supplied
Programs	*Various*



- The device is used within a hybrid construction
- Materials and processes have substantial flight heritage.
- Suitable for wire bonding
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-65 to +180C
Acceptance	-45 to +85C
Impedance	50 Ohms
Operating Frequency	6.7 to 8.6 GHz
Insertion Loss	0.35dB
Return Loss	20 dB min
Power Handling	2W CW
Mass	<0.5g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 26	-	11mm (0-peak_
		26 to 100	-	30g
			Sweep 2 Oct/min	Sweep 2 Oct/min
Random	All 3 axis	20 to 100	+6dB / octave	+6dB / octave
		100 to 1000	0.67 g^2 / Hz	1.54 g^2 / Hz
		1000 to 2000	-3dB / octave	-3dB / octave
		Overall [rms]	**33g**	**50g**
			60 secs per axis	**60 secs per axis**

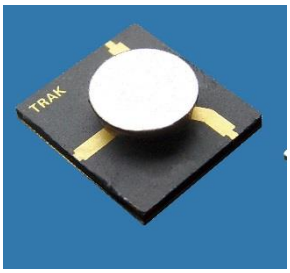
Location	Frequency (Hz)	Shock response (Q=10), g
Not specified		MIL-STD-883
		Method2002.3 Condition B
		1500g, 0.5ms
		3-axis

Note: This image is generic and is used to protect the designing and user party's IP

X-Band microstrip low-power Circulator

Used in a multiplexer application

SINT part number	C7291/A
SINT ICD	B108418
Application	Space [LEO/MEO/GEO]
Status	Qualified & supplied
Programs	*Various*



- The device is used within a hybrid construction
- Materials and processes have substantial flight heritage.
- Suitable for wire bonding
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-65 to +180C
Acceptance	-45 to +85C
Impedance	50 Ohms
Operating Frequency	7.2 to 9.1 GHz
Insertion Loss	0.35dB
Return Loss	20 dB min
Power Handling	2W CW
Mass	<0.5g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 26	-	11mm (0-peak_
		26 to 100	-	30g
			Sweep 2 Oct/min	Sweep 2 Oct/min
Random	All 3 axis	20 to 100	+6dB / octave	+6dB / octave
		100 to 1000	0.67 g^2 / Hz	1.54 g^2 / Hz
		1000 to 2000	-3dB / octave	-3dB / octave
		Overall [rms]	**33g**	**50g**
			60 secs per axis	**60 secs per axis**

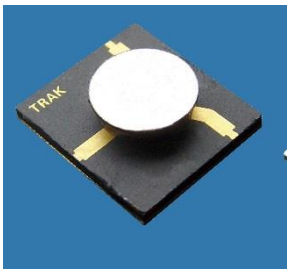
Location	Frequency (Hz)	Shock response (Q=10), g
Not specified		MIL-STD-883
		Method2002.3 Condition B
		1500g, 0.5ms
		3-axis

Note: This image is generic and is used to protect the designing and user party's IP

X-Band microstrip low-power Circulator

Used in a multiplexer application.

SINT part number	C7696/A
SINT ICD	B108421
Application	Space [LEO/MEO/GEO]
Status	Qualified & supplied
Programs	*Various*



- The device is used within a hybrid construction
- Materials and processes have substantial flight heritage.
- Suitable for wire bonding
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-65 to +180C
Acceptance	-45 to +85C
Impedance	50 Ohms
Operating Frequency	7.7 to 9.6 GHz
Insertion Loss	0.35dB
Return Loss	20 dB min
Power Handling	2W CW
Mass	<0.5g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 26	-	11mm (0-peak_
		26 to 100	-	30g
			Sweep 2 Oct/min	Sweep 2 Oct/min
Random	All 3 axis	20 to 100	+6dB / octave	+6dB / octave
		100 to 1000	0.67 g^2 / Hz	1.54 g^2 / Hz
		1000 to 2000	-3dB / octave	-3dB / octave
		Overall [rms]	**33g**	**50g**
			60 secs per axis	**60 secs per axis**

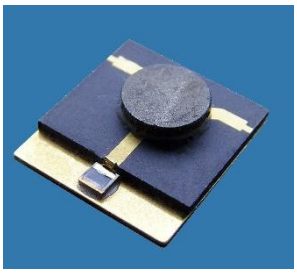
Location	Frequency (Hz)	Shock response (Q=10), g
Not specified		MIL-STD-883
		Method2002.3 Condition B
		1500g, 0.5ms
		3-axis

Note: This image is generic and is used to protect the designing and user party's IP

X-Band microstrip broad-band medium-power Isolator

Used in a multiplexer application

SINT part number	I80120/A
SINT ICD	B107207
Application	Space [LEO/MEO/GEO]
Status	Qualified & supplied
Programs	*Various SAR*



- The device is used within a hybrid construction
- Materials and processes have substantial flight heritage.
- Suitable for wire bonding
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-55 to +125C
Acceptance	-25 to +85C
Impedance	50 Ohms
Operating Frequency	8.0 to 12.0 GHz
Insertion Loss	0.60dB
Isolation	14 dB min
Return Loss	14 dB min
Power Handling	4W CW
Mass	<0.6g nom

Environmental

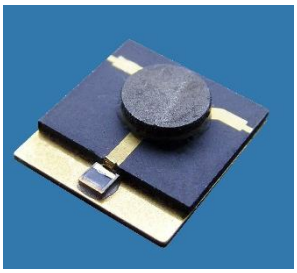
Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 26	-	11mm (0-peak_
		26 to 100	-	30g
			Sweep 2 Oct/min	Sweep 2 Oct/min
Random	All 3 axis	20 to 100	+6dB / octave	+6dB / octave
		100 to 1000	0.67 g^2 / Hz	1.54 g^2 / Hz
		1000 to 2000	-3dB / octave	-3dB / octave
		Overall [rms]	**33g**	**50g**
			60 secs per axis	**60 secs per axis**

Location	Frequency (Hz)	Shock response (Q=10), g
Not specified		MIL-STD-883
		Method2002.3 Condition B
		1500g, 0.5ms
		3-axis

X-Band microstrip broad-band medium-power Isolator

Used in a multiplexer application

SINT part number	I82124/A
SINT ICD	B107303
Application	Space [LEO/MEO/GEO]
Status	Qualified & supplied
Programs	*Various*



- The device is used within a hybrid construction
- Materials and processes have substantial flight heritage.
- Suitable for wire bonding
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-55 to +155C
Acceptance	-25 to +70C
Impedance	50 Ohms
Operating Frequency	8.2 to 12.4 GHz
Insertion Loss	0.60dB
Isolation	14 dB min
Return Loss	14 dB min
Power Handling	4W CW
Mass	<0.6g nom

Environmental

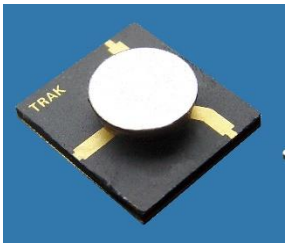
Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 26	-	11mm (0-peak_
		26 to 100	-	30g
			Sweep 2 Oct/min	Sweep 2 Oct/min
Random	All 3 axis	20 to 100	+6dB / octave	+6dB / octave
		100 to 1000	0.67 g^2 / Hz	1.54 g^2 / Hz
		1000 to 2000	-3dB / octave	-3dB / octave
		Overall [rms]	**33g**	**50g**
			60 secs per axis	**60 secs per axis**

Location	Frequency (Hz)	Shock response (Q=10), g
Not specified		MIL-STD-883
		Method2002.3 Condition B
		1500g, 0.5ms
		3-axis

X-Band microstrip broad-band medium-power Circulator

Used in a multiplexer application

SINT part number	C82124/A
SINT ICD	B107302
Application	Space [LEO/MEO/GEO]
Status	Qualified & supplied
Programs	*Various*



- The device is used within a hybrid construction
- Materials and processes have substantial flight heritage.
- Suitable for wire bonding
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-55 to +155C
Acceptance	-25 to +70C
Impedance	50 Ohms
Operating Frequency	8.2 to 12.4 GHz
Insertion Loss	0.60dB
Return Loss	14 dB min
Power Handling	4W CW
Mass	<0.6g nom

Environmental

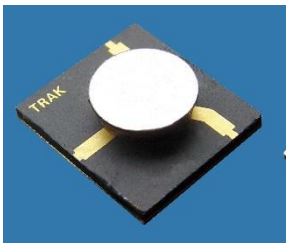
Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 26	-	11mm (0-peak_
		26 to 100	-	30g
			Sweep 2 Oct/min	Sweep 2 Oct/min
Random	All 3 axis	20 to 100	+6dB / octave	+6dB / octave
		100 to 1000	0.67 g^2 / Hz	1.54 g^2 / Hz
		1000 to 2000	-3dB / octave	-3dB / octave
		Overall [rms]	**33g**	**50g**
			60 secs per axis	**60 secs per axis**

Location	Frequency (Hz)	Shock response (Q=10), g
Not specified		MIL-STD-883
		Method2002.3 Condition B
		1500g, 0.5ms
		3-axis

X-Band microstrip low-power Circulator

Used in a multiplexer application

SINT part number	C94118/A
SINT ICD	B108424
Application	Space [LEO/MEO/GEO]
Status	Qualified & supplied
Programs	*Various*



- The device is used within a hybrid construction
- Materials and processes have substantial flight heritage.
- Suitable for wire bonding
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-65 to +180C
Acceptance	-45 to +85C
Impedance	50 Ohms
Operating Frequency	9.4 to 11.8 GHz
Insertion Loss	0.35dB
Return Loss	20 dB min
Power Handling	2W CW
Mass	<0.5g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 26	-	11mm (0-peak_
		26 to 100	-	30g
			Sweep 2 Oct/min	Sweep 2 Oct/min
Random	All 3 axis	20 to 100	+6dB / octave	+6dB / octave
		100 to 1000	0.67 g^2 / Hz	1.54 g^2 / Hz
		1000 to 2000	-3dB / octave	-3dB / octave
		Overall [rms]	**33g**	**50g**
			60 secs per axis	**60 secs per axis**

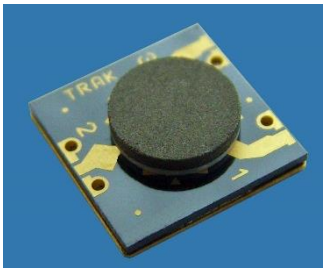
Location	Frequency (Hz)	Shock response (Q=10), g
Not specified		MIL-STD-883
		Method2002.3 Condition B
		1500g, 0.5ms
		3-axis

Note: This image is generic and is used to protect the designing and user party's IP

X-Band microstrip high-power Circulator

Used in a multiplexer application

SINT part number	C89107/C
SINT ICD	B104388
Application	Space [LEO]
Status	Qualified & supplied
Programs	*Various EOS*



- The device is used within a hybrid construction
- Materials and processes have substantial flight heritage.
- Suitable for wire bonding
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-65 to +180C
Acceptance	-45 to +85C
Impedance	50 Ohms
Operating Frequency	8.9 to 10.7 GHz
Insertion Loss	0.30dB
Return Loss	20 dB min
Power Handling	8W CW
Mass	<0.4g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 26	-	11mm (0-peak_
		26 to 100	-	30g
			Sweep 2 Oct/min	Sweep 2 Oct/min
Random	All 3 axis	20 to 100	+6dB / octave	+6dB / octave
		100 to 1000	0.67 g^2 / Hz	1.54 g^2 / Hz
		1000 to 2000	-3dB / octave	-3dB / octave
		Overall [rms]	**33g**	**50g**
			60 secs per axis	**60 secs per axis**

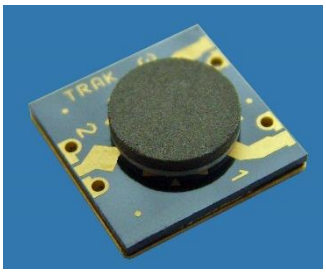
Location	Frequency (Hz)	Shock response (Q=10), g
Not specified		MIL-STD-883
		Method2002.3 Condition B
		1500g, 0.5ms
		3-axis

Note: This image is generic and is used to protect the designing party's IP

X-Band very microstrip high-power Circulator

Used in a multiplexer application

SINT part number	C85105/D
SINT ICD	B104993
Application	Space [LEO/MEO/GEO]
Status	Qualified & supplied
Programs	*Various*



- The device is used within a hybrid construction
- Materials and processes have substantial flight heritage.
- Suitable for wire bonding
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-65 to +180C
Acceptance	-45 to +85C
Impedance	50 Ohms
Operating Frequency	8.5 to 10.5 GHz
Insertion Loss	0.45dB
Return Loss	19 dB min
Power Handling	50W CW @ 8.5 GHz
	100W CW @ 9.0 GHz
Mass	<0.4g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 31.3	12.7mm (pk-pk)	12.7mm (pk-pk)
		31.3 to 100	245g	245g
			Sweep 2 Oct/min	Sweep 4 Oct/min
Random	All 3 axis	20 to 100	+6dB / octave	+6dB / octave
		100 to 1000	0.67 g^2 / Hz	1.54 g^2 / Hz
		1000 to 2000	-3dB / octave	-3dB / octave
		Overall [rms]	**33g**	**50g**
			60 secs per axis	**60 secs per axis**

Location	Frequency (Hz)	Shock response (Q=10), g
Not specified		MIL-STD-202
		Method 213 Condition F
		1500g, 0.5ms
		3-axis

Note: This image is generic and is used to protect the designing party's IP

X-Band microstrip high-power Isolator

Used in a multiplexer application

SINT part number	I90102/D
SINT ICD	B106207
Application	Space [LEO/GEO]
Status	Qualified & supplied
Programs	*Various*

- The device is used within a hybrid construction
- Materials and processes have substantial flight heritage.
- Suitable for wire bonding
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-65 to +180C
Acceptance	-45 to +85C
Impedance	50 Ohms
Operating Frequency	9.0 to 10.2 GHz
Insertion Loss	0.45dB
Return Loss	20 dB min
Power Handling	10W pk, 40% DC
Mass	<0.5g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 31.3	12.7mm (pk-pk)	12.7mm (pk-pk)
		31.3 to 100	245g	245g
			Sweep 2 Oct/min	Sweep 4 Oct/min
Random	All 3 axis	20 to 100	+6dB / octave	+6dB / octave
		100 to 1000	0.67 g^2 / Hz	1.54 g^2 / Hz
		1000 to 2000	-3dB / octave	-3dB / octave
		Overall [rms]	**33g**	**50g**
			60 secs per axis	**60 secs per axis**

Location	Frequency (Hz)	Shock response (Q=10), g
Not specified		MIL-STD-202
		Method 213 Condition F
		1500g, 0.5ms
		3-axis

Note: This image is generic and is used to protect the designing party's IP

X-band 7.9-8.4GHz SMA (M & F) 2W coaxial Load

Generic applications. Key design parameters are *Return Loss* and reliability under fault conditions.

SINT part number	XTE102 (M) & XTE103 (F)
SINT ICD	A106344 (M) & A106354 (F)
Application	Generic
Status	In orbit
Program	*Various*

- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Vented Nickel-plated, Stainless-steel housing featuring procured connectors.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-55 to +125C
Qualification	-40 to +100C
Acceptance	-40 to +95C
Operating Frequency	7.9 to 8.4 GHz
Return Loss	27dB min
Power	2W CW
Radiated Emissions	70dBi min
Mass	5g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification XY
Sine	All 3 axis	5 to 20	-	11 mm
		20 to 100	-	20g
				2 octaves/min
Random	All 3 axis	10 to 60	+7dB/oct.	+7dB/oct.
		60 to 75	0.22g^2/Hz	0.50g^2/Hz
		75 to 100	+10.5dB/oct.	+11.5dB/oct.
		100 to 300	0.67g^2/Hz	1.5g^2/Hz
		300 to 900	-7.1dB/oct.	-7.4dB/oct.
		900 to 1000	0.045g^2/Hz	0.10g^2/Hz
		1000 to 2000	-3dB/oct.	3dB/oct.
			60 secs/axis	*180 secs/axis*
		Overall [rms]	**17.2g**	**25.8g**

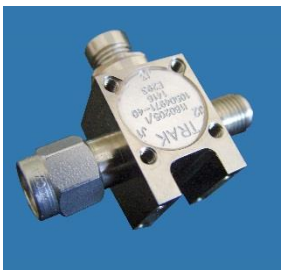
Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Not specified	100	50
	400	600
	1500	2000
	10000	2500
	Number of Events	*3 per axis*

Notes:

- The termination is resistive
- A BeO rod resistor is used

X-Band SMA broadband low-power Isolator

Used in a converter application



SINT part number	I62104/A
SINT ICD	B108503
Application	Space [GEO]
Status	In Orbit
Program	*Various*

- Over 20 versions are available with a range of connector orientations
- The devices are used following payload pump down.
- Materials and processes have substantial flight heritage.
- Used on Various filter multiplexing equipments
- Nickel-plated, Stainless-steel housing featuring SINT designed “solid connectors”.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-45 to +125C
PFM & Qualification	-30 to +80C
Acceptance	-30 to +75C
Operating Frequency	6.2 to 10.4GHz
Insertion Loss	0.35 dB max
Isolation	18 dB min
Return Loss	18 dB min
Power Handling (fault)	2 W CW
Radiated Emissions	80dBi min
Mass	20g nom

Environmental

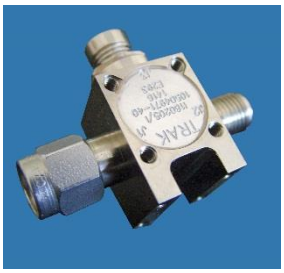
Test	Axis	Frequency (Hz)	Acceptance	PFM	Qualification
Sine	All 3 axis	5 to 22.6	-	6.4 mm	6.4 mm
		22.6 to 50	-	130.0g	130.0g
		50 to 100	-	10g	10g
			-	*2 octaves/min*	*4 octaves/min*
Random	All 3 axis	20 to 50	6dB/oct.	6dB/oct.	6dB/oct.
		50 to 600	$0.25g^2/Hz$	$0.50g^2/Hz$	$0.50g^2/Hz$
		600 to 2000	-4.5 dB/oct.	-4.5 dB/oct.	-4.5 dB/oct.
			60 secs/axis	*60 secs/axis*	*180 secs/axis*
		Overall [rms]	**16.6g**	**23.6g**	**23.6g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Shear Web	200	280
	850	1260
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

X-Band SMA broadband low-power Circulator

Used in a converter application.

SINT part number	I71121/A
SINT ICD	B108463
Application	Space [GEO]
Status	In Orbit
Program	*Various*



- The devices are used following payload pump down.
- Materials and processes have substantial flight heritage.
- Nickel-plated, Stainless-steel housing featuring SINT designed “solid connectors”.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied

Basic performance criteria

Parameter	Performance
Non-operating	-45 to +125C
PFM & Qualification	-30 to +80C
Acceptance	-30 to +75C
Operating Frequency	7.6 to 11.8 GHz
Insertion Loss	0.4 dB max
Isolation	21 dB min
Return Loss	21 dB min
Power Handling (fault)	2 W CW
Radiated Emissions	80dBi min
Mass	20g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	PFM	Qualification
Sine	All 3 axis	5 to 22.6	-	6.4 mm	6.4 mm
		22.6 to 50	-	130.0g	130.0g
		50 to 100	-	10g	10g
			-	*2 octaves/min*	*4 octaves/min*
Random	All 3 axis	20 to 50	6dB/oct.	6dB/oct.	6dB/oct.
		50 to 600	$0.25g^2/Hz$	$0.50g^2/Hz$	$0.50g^2/Hz$
		600 to 2000	-4.5 dB/oct.	-4.5 dB/oct.	-4.5 dB/oct.
			60 secs/axis	*60 secs/axis*	*180 secs/axis*
		Overall [rms]	**16.6g**	**23.6g**	**23.6g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Shear Web	200	280
	850	1260
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

X-Band SMA broad-band low-power Isolator

Used in a converter application

SINT part number	I80122/A
SINT ICD	C106873
Application	Space [GEO]
Status	Qualified & supplied
Programs	*Various GEO*

- The device is used at AIT
- Materials and processes have substantial flight heritage.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-55 to +125C
Acceptance	-20 to +80C
Impedance	50 Ohms
Operating Frequency	8.0 to 12.2 GHz
Insertion Loss	0.35dB
Isolation	20 dB min
Return Loss	20 dB min
Power Handling	2W CW
Mass	<19g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 26	-	11mm (0-peak_
		26 to 100	-	30g
			Sweep 2 Oct/min	Sweep 2 Oct/min
Random	All 3 axis	20 to 100	+6dB / octave	+6dB / octave
		100 to 1000	0.67 g^2 / Hz	1.54 g^2 / Hz
		1000 to 2000	-3dB / octave	-3dB / octave
		Overall [rms]	**33g**	**50g**
			60 secs per axis	**60 secs per axis**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Shear Web	200	280
	850	1260
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

C/X-Band SMA broad-band low-power Isolator

Used in an AIT application

SINT part number	I3868/A
SINT ICD	C108725
Application	Space [GEO]
Status	Qualified & supplied
Programs	*Various GEO*

- The device is used at AIT
- Materials and processes have substantial flight heritage.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-55 to +125C
Acceptance	-15 to +75C
Impedance	50 Ohms
Operating Frequency	3.8 to 6.8 GHz
Insertion Loss	0.30dB
Isolation	20 dB min
Return Loss	20 dB min
Power Handling	2W CW
Mass	<18g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 26	-	11mm (0-peak_
		26 to 100	-	30g
			Sweep 2 Oct/min	Sweep 2 Oct/min
Random	All 3 axis	20 to 100	+6dB / octave	+6dB / octave
		100 to 1000	0.67 g^2 / Hz	1.54 g^2 / Hz
		1000 to 2000	-3dB / octave	-3dB / octave
		Overall [rms]	**33g**	**50g**
			60 secs per axis	**60 secs per axis**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Shear Web	200	280
	850	1260
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

X-Band SMA broad-band low-power Isolator

Used in miscellaneous applications

SINT part number	I70105/A
SINT ICD	C105628
Application	Space [GEO]
Status	Qualified & supplied
Programs	*Various GEO*

- The device is used at AIT
- Materials and processes have substantial flight heritage.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	**Performance**
Non-operating	-55 to +125C
Acceptance	-30 to +80C
Impedance	50 Ohms
Operating Frequency	7.0 to 10.5 GHz
Insertion Loss	0.25dB
Isolation	21 dB min
Return Loss	21 dB min
Power Handling	2W CW
Mass	<18g nom

Environmental

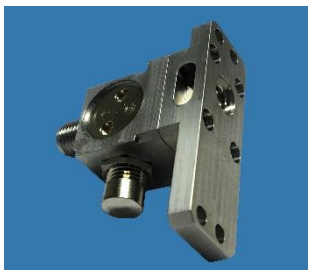
Test	**Axis**	**Frequency (Hz)**	**Acceptance**	**Qualification**
Sine	All 3 axis	5 to 26	-	11mm (0-peak_
		26 to 100	-	30g
			Sweep 2 Oct/min	Sweep 2 Oct/min
Random	All 3 axis	20 to 100	+6dB / octave	+6dB / octave
		100 to 1000	0.67 g^2 / Hz	1.54 g^2 / Hz
		1000 to 2000	-3dB / octave	-3dB / octave
		Overall [rms]	**33g**	**50g**
			60 secs per axis	**60 secs per axis**

Location	**Frequency (Hz)**	**Shock response (Q=10), g**
		Qualification
Shear Web	200	280
	850	1260
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

X-Band SMA broadband low-power SMP Isolator

Used in a filter application.

SINT part number	I7073/A
SINT ICD	C109377
Application	Deep space
Status	Supplied as FM
Program	--



- The devices are used following payload pump down.
- Materials and processes have substantial flight heritage.
- Used on Various filter multiplexing equipments
- Nickel-plated, Stainless-steel housing featuring SINT designed “solid connectors”.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-45 to +125C
PFM & Qualification	-30 to +80C
Acceptance	-20 to +75C
Operating Frequency	7.0 to 7.3 GHz
Insertion Loss	0.30 dB max
Isolation	23 dB min
Return Loss	23 dB min
Power Handling (fault)	2 W CW
Radiated Emissions	80dBi min
Mass	36g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	PFM	Qualification
Sine	All 3 axis	5 to 22.6	-	6.4 mm	6.4 mm
		22.6 to 50	-	130.0g	130.0g
		50 to 100	-	10g	10g
			-	*2 octaves/min*	*4 octaves/min*
Random	All 3 axis	20 to 50	6dB/oct.	6dB/oct.	6dB/oct.
		50 to 600	$0.25g^2$/Hz	$0.50g^2$/Hz	$0.50g^2$/Hz
		600 to 2000	-4.5 dB/oct.	-4.5 dB/oct.	-4.5 dB/oct.
			60 secs/axis	*60 secs/axis*	*180 secs/axis*
		Overall [rms]	**16.6g**	**23.6g**	**23.6g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Shear Web	200	280
	850	1260
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

X-Band TNC to SMA-pin high-power Isolator

Used on the output of an SSPA.

SINT part number	I8084/B
SINT ICD	B107732
Application	Space [GEO]
Status	In Orbit
Program	*Various*

- The devices are used following payload pump down.
- Materials and processes have substantial flight heritage.
- Gold-plated, Stainless-steel housing featuring SINT designed “solid connectors”.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.
- Analysis & reports: Magnetic, Thermal

Basic performance criteria

Parameter	Performance
Non-operating	-55 to +125C
PFM & Qualification	-30 to +85C
Acceptance	-30 to +80C
Operating Frequency	8.0 to 8.4 GHz
Insertion Loss	0.25 dB max
Isolation	23 dB min
Return Loss	23 dB min
Power Handling (fault)	15 W CW
Radiated Emissions	80dBi min
Mass	55g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 22.6	-	-
		22.6 to 50	-	-
		50 to 100	-	-
			-	-
Random			MIL-STD-202, Method 214 Condition II-J, 15 minutes. Each of 3 mutually perpendicular axes	
		Overall [rms]	**16.6g**	**23.6g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
		MIL-STD-202, Method 213. Condition I, Saw tooth test of 100G’s for 6ms, each of 3 mutually perpendicular axes
	Number of Events	

X-Band SMA-tab high-power Isolator

Used on the output of a TT&C SSPA.

SINT part number	I8085/H
SINT ICD	B109126
Application	Space [LEO]
Status	Supplied
Program	---

- Materials and processes have substantial flight heritage.
- Gold-plated, Stainless-steel housing featuring a SINT designed “solid connector”.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.
- Analysis & reports: Multipaction

Basic performance criteria

Parameter	Performance
Non-operating	-40 to +85C
PFM & Qualification	-30 to +85C
Acceptance	-30 to +75C
Operating Frequency	8.0 to 8.5 GHz
Insertion Loss	0.35dB max
Isolation	21 dB min
Return Loss	21 dB min
Power Handling (forward & reverse)	10 W CW
Multipaction	50W pk by test
Radiated Emissions	80dBi min
Mass	27g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5-26 Hz	-	11 mm (0-pk)
		26-100Hz	-	30.0g
				2 octaves/min
Random	All 3 axis	20 to 100	+6dB/oct.	+6dB/oct.
		100 to 1000	$0.67g^2/Hz$	$1.54g^2/Hz$
		1000 to 2000	-3 dB/oct.	-3 dB/oct.
			60 sec/axis	*180 secs/axis*
		Overall [rms]	**33.0g**	**50.0g**

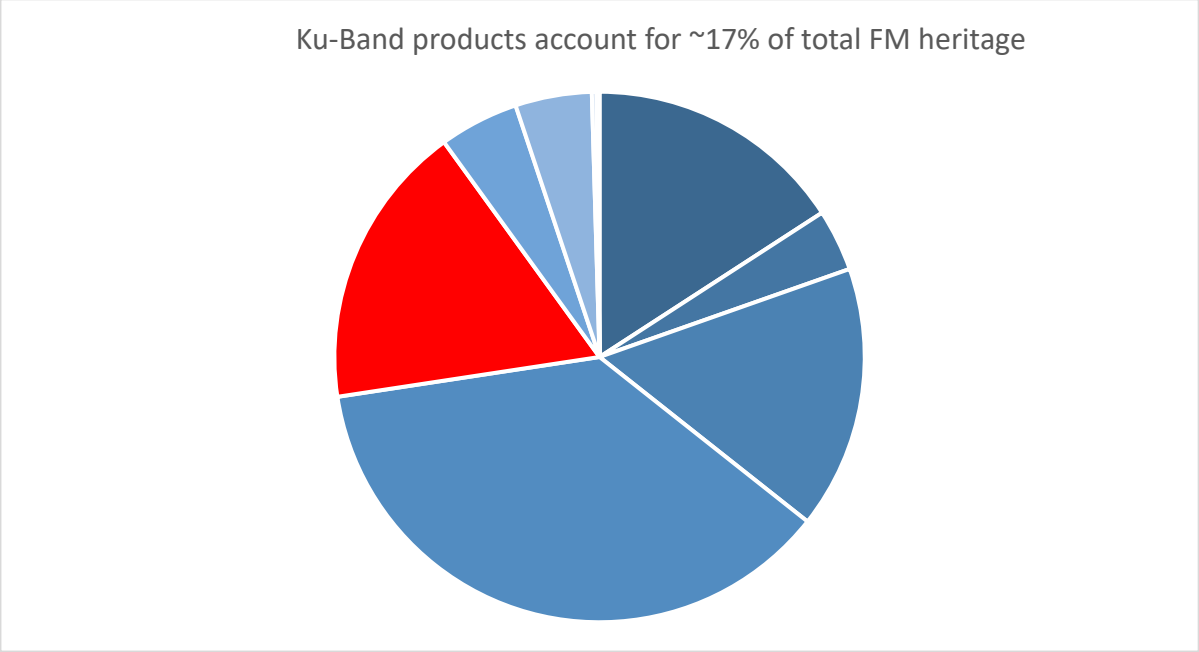
Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
	100	234
	684	790
	1172	1295
	2500	*3000*
	Number of Events	*3 per axis*

Ku-Band Overview

SINT has developed, supplied, and has heritage with many passive devices operating in the 10.7-18GHz band designed to operate at either low or high-power. The K-Band range is considered comprehensive with over with ~449 distinct designs supplied to date. Heritage is dominated by the supply of uniquely compact coaxial Isolators used in MUX applications. Many of the parts supplied are classed as components but an increasing number are supplied classed as equipment. This distinction is largely a matter of how the parts are specified and procured. The following is an extract from the heritage database which records sales of flight model hardware from 1994 to December 2020.

Heritage in terms of the numbers and types of products supplied changes daily. Please contact the factory to obtain the most up to date information.

FMs supplied	COAXIAL	MICPUCK	MICROSTRIP	STRIPLINE (DROP-IN)	WAVEGUIDE	Total
Ku	**26647**	**1991**	**271**	**1886**	**-**	**30795**
ISOLATOR	14292	1991	242	1886	-	10908
CIRCULATOR	11114	-	29	-		11143
CONNECTOR ASSY.	918	-	-	-	-	918
LOAD/TERMINATION	312	-	-	-	-	312
ISO-ADAPTOR	11	-	-	-	-	11
Ku [WR62]					**857**	**857**
ISOLATOR	-	-	-	-	492	492
ISO-ADPATER	-	-	-	-	357	357
LOAD/TERMINATION	-	-	-	-	5	5
SPLITTER	-	-	-	-	3	3
Ku [WR75]					**3757**	**3757**
ISOLATOR	-	-	-	-	1615	1615
ISO-ADPATER	-	-	-	-	1011	1011
TRANSITION	-	-	-	-	491	491
CIRCULATOR	-	-	-	-	346	346
LOAD/TERMINATION	-	-	-	-	268	268
COUPLER/SPLITTER	-	-	-	-	26	26
Total	**26647**	**1991**	**271**	**1886**	**4614**	**35409**



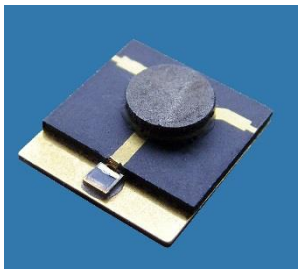
In development/qualification

- -

Ku-Band microstrip low-power Isolator

Used in a converter application.

SINT part number	I104124/A
SINT ICD	B108439
Application	Space [LEO/MEO/GEO]
Status	Qualified & supplied
Programs	*Various*



- The device is used within a hybrid construction
- Materials and processes have substantial flight heritage.
- Suitable for wire bonding
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-65 to +180C
Acceptance	-45 to +85C
Impedance	50 Ohms
Operating Frequency	10.4to 12.4 GHz
Insertion Loss	0.40 dB
Isolation	20 dB min
Return Loss	20 dB min
Power Handling	2W CW
Mass	<0.5g nom

Environmental

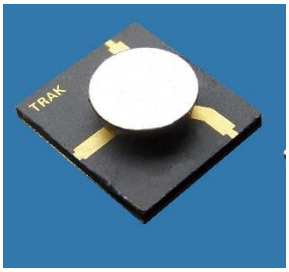
Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 26	-	11mm (0-peak_
		26 to 100	-	30g
			Sweep 2 Oct/min	Sweep 2 Oct/min
Random	All 3 axis	20 to 100	+6dB / octave	+6dB / octave
		100 to 1000	0.67 g^2 / Hz	1.54 g^2 / Hz
		1000 to 2000	-3dB / octave	-3dB / octave
		Overall [rms]	**33g**	**33g**
			60 secs per axis	**60 secs per axis**

Location	Frequency (Hz)	Shock response (Q=10), g
Not specified		MIL-STD-883
		Method2002.3 Condition B
		1500g, 0.5ms
		3-axis

Ku-Band microstrip low-power Circulator

Used in a transmitter application.

SINT part number	C134146/A
SINT ICD	B108738
Application	High Altitude unmanned vehicle
Status	Qualified & supplied
Programs	-



- The device is used within a hybrid construction
- Materials and processes have substantial flight heritage.
- Suitable for wire bonding
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-65 to +180C
Acceptance	-45 to +85C
Impedance	50 Ohms
Operating Frequency	13.4 to 14.6GHz
Insertion Loss	0.40 dB
Isolation	20 dB min
Return Loss	20 dB min
Power Handling	5W CW
Mass	<0.5g nom

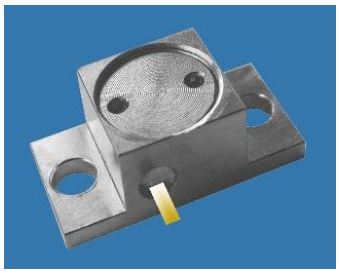
Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 26	-	11mm (0-peak_
		26 to 100	-	30g
			Sweep 2 Oct/min	Sweep 2 Oct/min
Random	All 3 axis	20 to 100	+6dB / octave	+6dB / octave
		100 to 1000	0.67 g^2 / Hz	1.54 g^2 / Hz
		1000 to 2000	-3dB / octave	-3dB / octave
		Overall [rms]	**33g**	**33g**
			60 secs per axis	**60 secs per axis**

Ku-Band stripline low-power Isolator

Used in a converter application.

SINT part number	I105120/A
SINT ICD	B107463
Application	Space [LEO/MEO/GEO]
Status	Qualified & supplied
Programs	*Various*



- Materials and processes have substantial flight heritage.
- Suitable for soldering
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-55 to +125C
PFM & Qualification	-45 to +70C
Acceptance	-40 to +65C
Operating Frequency	10.5 to 12.0 GHz
Insertion Loss	0.40dB
Isolation	20 dB min
Return Loss	20 dB min
Power Handling	1W CW
Mass	1.3g nom

Environmental

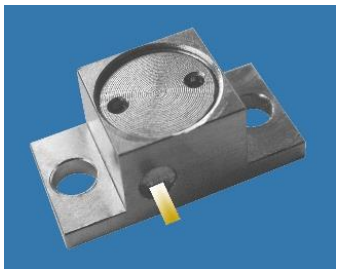
Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 22.6	-	-
		22.6 to 50	-	-
		50 to 100	-	-
Random	All 3 axis	20 to 50	+3dB/oct.	+3dB/oct.
		50 to 1000	$0.80g^2$/Hz	$0.80g^2$/Hz
		1000 to 2000	-4.5 dB/oct.	-4.5 dB/oct.
			60 secs/axis	*240 secs/axis*
		Overall [rms]	**36.0g**	**36.0g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Not specified	200	280
	850	1260
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

Ku-Band stripline low-power Isolator

Used in a converter application.

SINT part number	I121134/A
SINT ICD	B108646
Application	Space [LEO/MEO/GEO]
Status	Qualified & supplied
Programs	*Various*



- Materials and processes have substantial flight heritage.
- Suitable for soldering
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-55 to +125C
PFM & Qualification	-45 to +85C
Acceptance	-40 to +80C
Operating Frequency	12.1 to 13.4 GHz
Insertion Loss	0.40dB
Isolation	20 dB min
Return Loss	20 dB min
Power Handling	1W CW
Mass	1.3g nom

Environmental

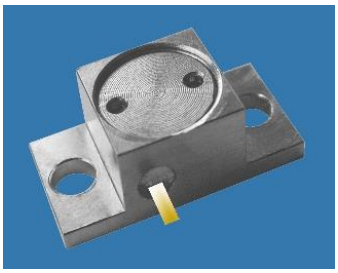
Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 22.6	-	-
		22.6 to 50	-	-
		50 to 100	-	-
Random	All 3 axis	20 to 50	+3dB/oct.	+3dB/oct.
		50 to 1000	0.80g^2/Hz	0.80g^2/Hz
		1000 to 2000	-4.5 dB/oct.	-4.5 dB/oct.
			60 secs/axis	*240 secs/axis*
		Overall [rms]	**36.0g**	**36.0g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Not specified	200	280
	850	1260
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

Ku-Band stripline low-power Isolator

Used in a converter application.

SINT part number	I132146/A
SINT ICD	B107077
Application	Space [LEO/MEO/GEO]
Status	Qualified & supplied
Programs	*Various*



- Materials and processes have substantial flight heritage.
- Suitable for soldering
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-55 to +125C
PFM & Qualification	-45 to +70C
Acceptance	-40 to +65C
Operating Frequency	13.2 to 14.6 GHz
Insertion Loss	0.40dB
Isolation	20 dB min
Return Loss	20 dB min
Power Handling	1W CW
Mass	1.4g nom

Environmental

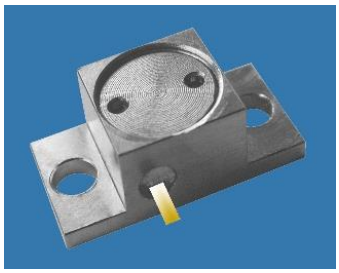
Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 22.6	-	-
		22.6 to 50	-	-
		50 to 100	-	-
Random	All 3 axis	20 to 50	+3dB/oct.	+3dB/oct.
		50 to 1000	0.67g^2/Hz	0.67g^2/Hz
		1000 to 2000	-4.5 dB/oct.	-4.5 dB/oct.
			60 secs/axis	*240 secs/axis*
		Overall [rms]	**33.0g**	**33.0g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Not specified	200	280
	850	1260
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

Ku-Band stripline low-power Isolator

Used in a converter application.

SINT part number	I135155/A
SINT ICD	B106572
Application	Space [LEO/MEO/GEO]
Status	Qualified & supplied
Programs	*Various*



- Materials and processes have substantial flight heritage.
- Suitable for soldering
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-55 to +125C
PFM & Qualification	-45 to +70C
Acceptance	-40 to +65C
Operating Frequency	14.4 to 14.60 GHz
Insertion Loss	0.40dB
Isolation	25 dB min
Return Loss	25 dB min
Power Handling	1W CW
Mass	1.3g nom

Environmental

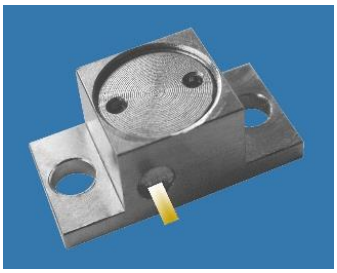
Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 22.6	-	-
		22.6 to 50	-	-
		50 to 100	-	-
Random	All 3 axis	20 to 50	+3dB/oct.	+3dB/oct.
		50 to 1000	0.80g^2/Hz	0.80g^2/Hz
		1000 to 2000	-4.5 dB/oct.	-4.5 dB/oct.
			60 secs/axis	*240 secs/axis*
		Overall [rms]	**36.0g**	**36.0g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Not specified	200	280
	850	1260
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

Ku-Band stripline low-power Isolator

Used in a converter application.

SINT part number	I132146/A
SINT ICD	B107077
Application	Space [LEO/MEO/GEO]
Status	Qualified & supplied
Programs	*Various*



- Materials and processes have substantial flight heritage.
- Suitable for soldering
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-55 to +125C
PFM & Qualification	-45 to +70C
Acceptance	-30 to +65C
Operating Frequency	13.2 to 14.6 GHz
Insertion Loss	0.50dB
Isolation	20 dB min
Return Loss	20 dB min
Power Handling	1W CW
Mass	1.4g nom

Environmental

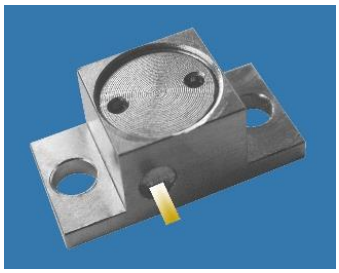
Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 22.6	-	-
		22.6 to 50	-	-
		50 to 100	-	-
Random	All 3 axis	20 to 50	+3dB/oct.	+3dB/oct.
		50 to 1000	0.67g^2/Hz	0.67g^2/Hz
		1000 to 2000	-4.5 dB/oct.	-4.5 dB/oct.
			60 secs/axis	*240 secs/axis*
		Overall [rms]	**33.0g**	**33.0g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Not specified	200	280
	850	1260
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

Ku-Band stripline low-power Isolator

Used in a converter application.

SINT part number	I160180/C
SINT ICD	B106568
Application	Space [GEO]
Status	Qualified & supplied
Programs	*Various*



- Materials and processes have substantial flight heritage.
- Suitable for soldering
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-55 to +125C
PFM & Qualification	-45 to +70C
Acceptance	-30 to +65C
Operating Frequency	17.2 to 17.4 GHz
Insertion Loss	0.50dB
Isolation	20 dB min
Return Loss	20 dB min
Power Handling	1W CW
Mass	1.4g nom

Environmental

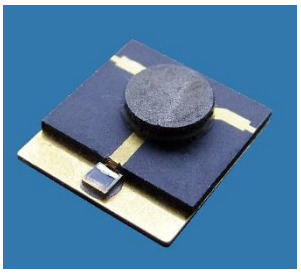
Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 22.6	-	-
		22.6 to 50	-	-
		50 to 100	-	-
Random	All 3 axis	20 to 50	+3dB/oct.	+3dB/oct.
		50 to 1000	0.67g^2/Hz	0.67g^2/Hz
		1000 to 2000	-4.5 dB/oct.	-4.5 dB/oct.
			60 secs/axis	*240 secs/axis*
		Overall [rms]	**33.0g**	**33.0g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Not specified	200	280
	850	1260
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

Ku-Band microstrip low-power Isolator

Used in a converter application.

SINT part number	I107128/AX
SINT ICD	B108590
Application	Space [LEO/MEO/GEO]
Status	Qualified & supplied
Programs	*Various*



- The device is used within a hybrid construction
- Materials and processes have substantial flight heritage.
- Suitable for wire bonding
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-40 to +85C
PFM & Qualification	-30 to +85C
Acceptance	-20 to +80C
Operating Frequency	10.70 to 12.80 GHz
Insertion Loss	0.35dB
Isolation	20 dB min
Return Loss	20 dB min
Power Handling	2W CW
Mass	1.1g nom

Environmental

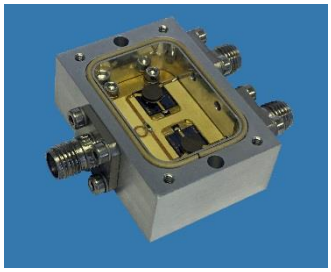
Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 22.6	4.83 mm	6.4 mm
		22.6 to 50	10.0g	13.0g
		50 to 100	7.7g	10.0g
			2 octaves/min	*4 octaves/min*
Random	All 3 axis	20 to 50	+6dB/oct.	6dB/oct.
		50 to 600	$0.25g^2/Hz$	$0.50g^2/Hz$
		600 to 2000	-4.5 dB/oct.	-4.5 dB/oct.
			60 secs/axis	*180 secs/axis*
		Overall [rms]	**16.7g**	**23.6g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Not specified	200	280
	850	1260
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

Ku-Band SMA isolated Power Splitter

Used in a generic applications

SINT part number	XPD303
SINT ICD	B108752
Application	Space [GEO]
Status	In qualification
Programs	-



- Materials and processes have substantial flight heritage.
- Uses in house Isolators available as a stand-alone part.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.
- Analysis & reports: Thermal, Worst case, FMECA.

Basic performance criteria

Parameter	Performance
Non-operating	-40 to +85C
PFM & Qualification	-30 to +85C
Acceptance	-20 to +80C
Operating Frequency	10.70 to 12.80 GHz
Insertion Loss (including coupling loss)	3.9dB
Isolation (O/P 1 to O/P 2)	23 dB min
Isolation (O/P 1 or to I/P 2)	40 dB min
Return Loss	21 dB min
Power Handling	2W CW
Radiated Emissions	-80dBi
Mass	39g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 22.6	4.83 mm	6.4 mm
		22.6 to 50	10.0g	13.0g
		50 to 100	7.7g	10.0g
			2 octaves/min	*4 octaves/min*
Random	All 3 axis	20 to 50	+6dB/oct.	6dB/oct.
		50 to 600	$0.25g^2/Hz$	$0.50g^2/Hz$
		600 to 2000	-4.5 dB/oct.	-4.5 dB/oct.
			60 secs/axis	*180 secs/axis*
		Overall [rms]	**16.7g**	**23.6g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Not specified	200	280
	850	1260
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

PIND	
	Condition A acceleration is 20g peak 40Hz, extract from MIL-STD-883). 3 pre-shocks/vibration/3 off co-shocks (repeat further 3 times)

Ku-band 12.7-14.8GHz SMA (M & F) 2W coaxial Load

Generic applications. Key design parameters are *Return Loss* and reliability under fault conditions.

SINT part number	JTE107 (M) & JTE107 (F)
SINT ICD	A106987 (M) & A106987 (F)
Application	Generic
Status	In orbit
Program	*Various*

- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Nickel-plated, Stainless-steel housing featuring procured connectors.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-55 to +125C
Qualification	-40 to +100C
Acceptance	-40 to +95C
Operating Frequency	12.7-14.8 GHz
Return Loss	27dB min
Power	2W CW
Radiated Emissions	70dBi min
Mass	5g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification XY
Sine	All 3 axis	5 to 20	-	11 mm
		20 to 100	-	20g
				2 octaves/min
Random	All 3 axis	10 to 60	+7dB/oct.	+7dB/oct.
		60 to 75	$0.22g^2/Hz$	$0.50g^2/Hz$
		75 to 100	+10.5dB/oct.	+11.5dB/oct.
		100 to 300	$0.67g^2/Hz$	$1.5g^2/Hz$
		300 to 900	-7.1dB/oct.	-7.4dB/oct.
		900 to 1000	$0.045g^2/Hz$	$0.10g^2/Hz$
		1000 to 2000	-3dB/oct.	3dB/oct.
			60 secs/axis	*180 secs/axis*
		Overall [rms]	**17.2g**	**25.8g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Not specified	100	50
	400	600
	1500	2000
	10000	2500
	Number of Events	*3 per axis*

Notes:

- The termination is resistive
- A BeO rod resistor is used

Ku-band 10.7-12.8GHz SMA (M & F) 2W coaxial Load

Generic applications. Key design parameters are *Return Loss* and reliability under fault conditions.

SINT part number	XTE104 (M) & XTE105 (F)
SINT ICD	A106345 (M) & A106355 (F)
Application	Generic
Status	In orbit
Program	*Various*

- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Nickel-plated, Stainless-steel housing featuring procured connectors.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-55 to +125C
Qualification	-40 to +100C
Acceptance	-40 to +95C
Operating Frequency	10.7 to 12.8 GHz
Return Loss	27dB min
Power	2W CW
Radiated Emissions	70dBi min
Mass	5g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification XY
Sine	All 3 axis	5 to 20	-	11 mm
		20 to 100	-	20g
				2 octaves/min
Random	All 3 axis	10 to 60	+7dB/oct.	+7dB/oct.
		60 to 75	$0.22g^2/Hz$	$0.50g^2/Hz$
		75 to 100	+10.5dB/oct.	+11.5dB/oct.
		100 to 300	$0.67g^2/Hz$	$1.5g^2/Hz$
		300 to 900	-7.1dB/oct.	-7.4dB/oct.
		900 to 1000	$0.045g^2/Hz$	$0.10g^2/Hz$
		1000 to 2000	-3dB/oct.	3dB/oct.
			60 secs/axis	*180 secs/axis*
		Overall [rms]	**17.2g**	**25.8g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Not specified	100	50
	400	600
	1500	2000
	10000	2500
	Number of Events	*3 per axis*

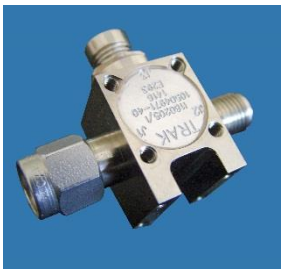
Notes:

- The termination is resistive
- A BeO rod resistor is used

Ku-Band SMA broadband low-power Isolator

Used in an IMUX application.

SINT part number	I107148/E
SINT ICD	C108066
Application	Space [GEO]
Status	In Orbit
Program	*Various*



- The devices are used following payload pump down.
- Materials and processes have substantial flight heritage.
- Used on Various filter multiplexing equipments
- Nickel-plated, Stainless-steel housing featuring SINT designed “solid connectors”.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-45 to +125C
PFM & Qualification	-305 to +80C
Acceptance	-30 to +75C
Operating Frequency	10.7 to 14.8 GHz
Insertion Loss	0.30 dB max
Isolation	23 dB min
Return Loss	23 dB min
Power Handling (fault)	2 W CW
Radiated Emissions	80dBi min
Mass	20g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	PFM	Qualification
Sine	All 3 axis	5 to 22.6	-	6.4 mm	6.4 mm
		22.6 to 50	-	130.0g	130.0g
		50 to 100	-	10g	10g
			-	*2 octaves/min*	*4 octaves/min*
Random	All 3 axis	20 to 50	6dB/oct.	6dB/oct.	6dB/oct.
		50 to 600	$0.25g^2$/Hz	$0.50g^2$/Hz	$0.50g^2$/Hz
		600 to 2000	-4.5 dB/oct.	-4.5 dB/oct.	-4.5 dB/oct.
			60 secs/axis	*60 secs/axis*	*180 secs/axis*
		Overall [rms]	**16.6g**	**23.6g**	**23.6g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Shear Web	200	280
	850	1260
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

Ku-Band SMA broadband low-power Circulator

Used in an IMUX application.

SINT part number	C107148/B
SINT ICD	C108048
Application	Space [GEO]
Status	In Orbit
Program	*Various*

- The devices are used following payload pump down.
- Materials and processes have substantial flight heritage.
- Used on Various filter multiplexing equipments
- Nickel-plated, Stainless-steel housing featuring SINT designed “solid connectors”.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-45 to +125C
PFM & Qualification	-305 to +80C
Acceptance	-30 to +75C
Operating Frequency	10.7 to 14.8 GHz
Insertion Loss	0.30 dB max
Return Loss	23 dB min
Power Handling (fault)	2 W CW
Radiated Emissions	80dBi min
Mass	26g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	PFM	Qualification
Sine	All 3 axis	5 to 22.6	-	6.4 mm	6.4 mm
		22.6 to 50	-	130.0g	130.0g
		50 to 100	-	10g	10g
			-	*2 octaves/min*	*4 octaves/min*
Random	All 3 axis	20 to 50	6dB/oct.	6dB/oct.	6dB/oct.
		50 to 600	$0.25g^2/Hz$	$0.50g^2/Hz$	$0.50g^2/Hz$
		600 to 2000	-4.5 dB/oct.	-4.5 dB/oct.	-4.5 dB/oct.
			60 secs/axis	*60 secs/axis*	*180 secs/axis*
		Overall [rms]	**16.6g**	**23.6g**	**23.6g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Shear Web	200	280
	850	1260
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

X/Ku-Band SMA broadband low-power Isolator

Used in a converter application.

SINT part number	I60180/A
SINT ICD	C106823
Application	Converter
Status	Supplied
Program	-

- The devices are used following payload pump down.
- Materials and processes have substantial flight heritage.
- Used on Various filter multiplexing equipments
- Nickel-plated, Stainless-steel housing featuring SINT designed “solid connectors”.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-45 to +125C
PFM & Qualification	-30 to +75C
Acceptance	-25 to +70C
Operating Frequency	6.0 to 18.0 GHz
Insertion Loss	0.70 dB max
Isolation	12 dB min
Return Loss	12 dB min
Power Handling (fault)	2 W CW
Radiated Emissions	80dBi min
Mass	20g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 22.6	-	-
		22.6 to 50	-	-
		50 to 100	-	-
			-	-
Random	All 3 axis	20 to 100	6dB/oct.	6dB/oct.
		100 to 1000	$0.98g^2$/Hz	$3.94g^2$/Hz
		1000 to 2000	-3.0 dB/oct.	-3.0 dB/oct.
			60 secs/axis	*180 secs/axis*
		Overall [rms]	**39.9g**	**80.0g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
	100	50
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

Ku-Band SMA broadband low-power Isolator

Used in a receiver/converter application.

SINT part number	I120180/A
SINT ICD	C108573
Application	Space [GEO]
Status	Supplied
Program	-

- The devices are used following payload pump down.
- Materials and processes have substantial flight heritage.
- Nickel-plated, Stainless-steel housing featuring SINT designed “solid connectors”.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-45 to +105C
PFM & Qualification	-30 to +85C
Acceptance	-30 to +85C
Operating Frequency	12.0 to 18.0 GHz
Insertion Loss (12-18 GHz)	0.6 dB max
Insertion Loss (13-15 GHz)	0.5 dB max
Isolation (12-18 GHz)	16 dB min
Isolation (13-15 GHz)	18 dB min
Return Loss (12-18 GHz)	16 dB min
Return Loss (13-15 GHz)	18 dB min
Power Handling	2 W CW
Radiated Emissions	80dBi min
Mass	21g nom

Environmental

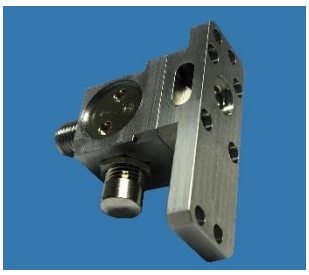
Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 22.6	-	-
		22.6 to 50	-	-
		50 to 100	-	-
			-	-
Random	All 3 axis	20 to 100	6dB/oct.	6dB/oct.
		100 to 1000	$0.98g^2/Hz$	$3.94g^2/Hz$
		1000 to 2000	-3.0 dB/oct.	-3.0 dB/oct.
			60 secs/axis	*180 secs/axis*
		Overall [rms]	**39.9g**	**80.0g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
	100	50
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

Ku-Band SMA to SMP broadband low-power Isolator

Used in a filter application.

SINT part number	I135150/E
SINT ICD	C107740
Application	Space [GEO]
Status	In Orbit
Program	*Various*



- The devices are used following payload pump down.
- Materials and processes have substantial flight heritage.
- Used on Various filter multiplexing equipments
- Nickel-plated, Stainless-steel housing featuring SINT designed “solid connectors”.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-45 to +125C
PFM & Qualification	-30 to +80C
Acceptance	-20 to +75C
Operating Frequency	13.5 to 15.0 GHz
Insertion Loss	0.25 dB max
Isolation	23 dB min
Return Loss	23 dB min
Power Handling (fault)	2 W CW
Radiated Emissions	80dBi min
Mass	36g nom

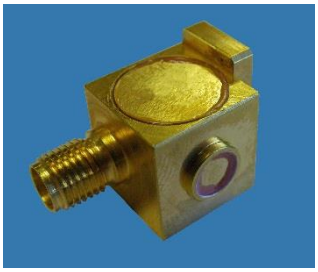
Environmental

Test	Axis	Frequency (Hz)	Acceptance	PFM	Qualification
Sine	All 3 axis	5 to 22.6	-	6.4 mm	6.4 mm
		22.6 to 50	-	130.0g	130.0g
		50 to 100	-	10g	10g
			-	*2 octaves/min*	*4 octaves/min*
Random	All 3 axis	20 to 50	6dB/oct.	6dB/oct.	6dB/oct.
		50 to 600	$0.25g^2/Hz$	$0.50g^2/Hz$	$0.50g^2/Hz$
		600 to 2000	-4.5 dB/oct.	-4.5 dB/oct.	-4.5 dB/oct.
			60 secs/axis	*60 secs/axis*	*180 secs/axis*
		Overall [rms]	**16.6g**	**23.6g**	**23.6g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Shear Web	200	280
	850	1260
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

Ku-Band SMA to 0.38 bulkhead socket Isolator

Used in an LNA application.



SINT part number	I105130/C
SINT ICD	B107400
Application	Space [GEO]
Status	In Orbit
Program	*Various*

- The devices are used following payload pump down.
- Materials and processes have substantial flight heritage.
- Used on Various filter multiplexing equipments
- Gold-plated, Stainless-steel housing featuring SINT designed “solid connectors”.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-55 to +125C
Qualification	-55 to +85C
Acceptance	-30 to +80C
Operating Frequency	10.5 to 13.0 GHz
Insertion Loss	0.40 dB max
Isolation	23 dB min
Return Loss (SMA)	23 dB min
Return Loss (SKT)	21 dB min
Power Handling (fault)	1 W CW
Radiated Emissions	-95dBc max
Mass	29g nom

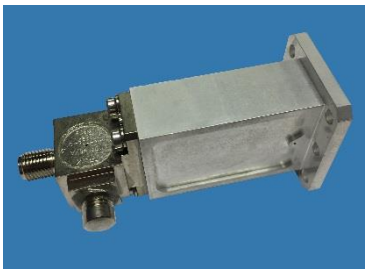
Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 22.6	-	6.4 mm
		22.6 to 50	-	130.0g
		50 to 100	-	10g
			-	*4 octaves/min*
Random	All 3 axis	20 to 100	+6dB/oct.	+6dB/oct.
		100 to 1000	$0.67g^2/Hz$	$1.54g^2/Hz$
		1000 to 2000	-3.0 dB/oct.	-3.0 dB/oct.
			60 secs/axis	*180 secs/axis*
		Overall [rms]	**33.0g**	**50.0g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Shear Web	200	280
	850	1260
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

Ku-Band WR75 to SMA Iso-Adpater

SINT part number	I107148/A
SINT ICD	C107891
Application	Space [GEO]
Status	Qualified & supplied [FM & LAT]
Program	*VARIOUS*



- Full height WR75 Circulator used in a filter application
- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.
- Clear Chromate conversion coated Aluminum Transition and Nickel-plated, Stainless-steel Isolator.

Basic performance criteria

Parameter	Performance
Non-operating	-40 to +85C
LAT	-30 to +80C
Acceptance	-25 to +75C
Operating Frequency	10.7-14.5GHz
Isolation	21dB min
Return Loss	23dB min
Insertion Loss	0.35dB max
Power Handling [FM & LAT]	3W CW forward
	3W CW reverse
Radiated Emissions	80dBi min
Mass	52g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	PFM/Qualification
Sine	All 3 axis	5 to 22.6	4.83 mm	6.4 mm
		22.6 to 50	*10.0g*	*13.0g*
		50 to 100	*7.7g*	*10.0g*
Random	All 3 axis	20 to 50	+6dB/oct.	+6dB/oct.
		50 to 600	0.25g^2/Hz	0.5g^2/Hz
		600 to 2000	-4.5dB/oct	4.5 dB/oct
			60 secs/axis	*240 secs/axis*
		Overall [rms]	**16.6g**	**23.6g**

Frequency (Hz)	Shock response (Q=10), g XYZ
200	280
850	1260
4000	4200
10000	*4200*
Number of Events	*3 per axis*

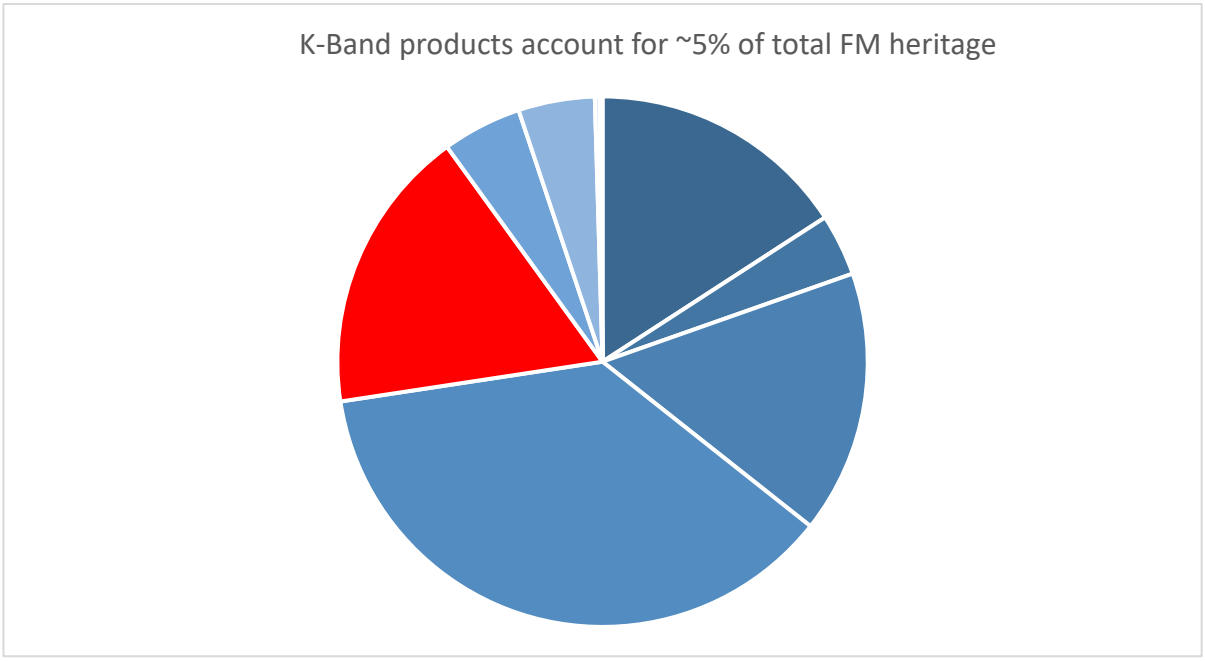
K-Band Overview

SINT has developed, supplied, and has heritage with many passive devices operating in the 17-26GHz band designed to operate at either low or high-power. The K-Band range is considered comprehensive with over with over ~172 distinct designs supplied to date. Heritage is dominated by the supplied of uniquely compact coaxial Isolators used in MUX applications. Most parts supplied have been supplied as components however an increasing number are supplied classed as equipment. This distinction is largely a matter of how the parts are specified and procured.

FMs supplied	COAXIAL	MICPUCK	MICROSTRIP	STRIPLINE (DROP-IN)	WAVEGUIDE	Grand Total
K	**5441**	**495**	**1321**	**426**		**7683**
ISOLATOR	4096	495	1321	426		6338
CIRCULATOR	940					940
CABLE/CONN ASSY	366					366
LOAD/TERMINATION	39					39
K [WR42]	**119**				**751**	**870**
ISOLATOR					498	498
ISO-ADPATER	119				122	241
TRANS/FILT/ISOL					131	131
TRANSITION					7	7
K [WR51]					**1069**	**1069**
ISOLATOR					534	534
CIRCULATOR					404	404
ISO-ADPATER					46	46
LOAD/TERMINATION					45	45
TRANSITION					40	40
Grand Total	**5560**	**495**	**1321**	**426**	**2047**	**9849**

In terms of heritage the following is an extract from the heritage database which records sales of flight model hardware from 1994 to December 2020.

Heritage in terms of the numbers and types of products supplied changes daily. Please contact the factory to obtain the most up to date information.



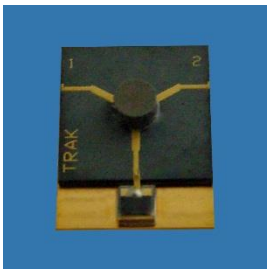
In development/qualification

- -

K-Band microstrip high-power Isolator

Used on the output of a receiver/converter

SINT part number	I183202/I
SINT ICD	B108547
Application	Space [LEO/MEO/GEO]
Status	Qualified & supplied
Programs	*Various*



- The device is Space qualified and used within a hybrid construction
- Materials and processes have substantial flight heritage.
- Suitable for wire bonding
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-65 to +180C
Acceptance	-45 to +85C
Impedance	50 Ohms
Operating Frequency	18.3 to 20.2 GHz
Insertion Loss	0.40 dB
Isolation	20 dB min
Return Loss	20 dB min
Power Handling	25W CW
Mass	<0.5g nom

Environmental

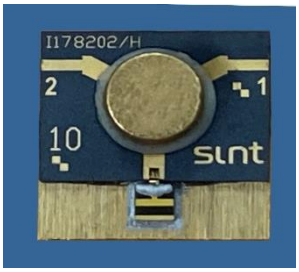
Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 26	-	11mm (0-peak)
		26 to 100	-	30g
			Sweep 2 Oct/min	Sweep 2 Oct/min
Random	All 3 axis	20 to 100	+6dB / octave	+6dB / octave
		100 to 1000	0.67 g^2 / Hz	1.54 g^2 / Hz
		1000 to 2000	-3dB / octave	-3dB / octave
		Overall [rms]	**33g**	**50g**
			60 secs per axis	**60 secs per axis**

Location	Frequency (Hz)	Shock response (Q=10), g
Not specified		MIL-STD-883
		Method2002.3 Condition B
		1500g, 0.5ms
		3-axis

Note: This image is generic and is used to protect the designing and user party's IP

K-Band microstrip high-power Isolator

Used on the output of a receiver/converter



SINT part number	I178202/H
SINT ICD	B108768
Application	Space [LEO/GEO]
Status	In qualification
Programs	-

- The device is Space qualified and used within a hybrid construction
- Materials and processes have substantial flight heritage.
- Suitable for wire bonding

Basic performance criteria

Parameter	Performance
Non-operating	-45 to +125C
Qualification	-30 to +95C
Acceptance	-25 to +80C
Operating Frequency	17.8-20.2.0GHz
Insertion Loss	0.50dB max
Isolation	18dB min
Return Loss	20dB min
Power Handling	2W CW
Mass	0.2g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 22.6	4.83 mm	6.4 mm
		22.6 to 50	10.0g	13.0g
		50 to 100	7.7g	10.0g
			2 octaves/min	*4 octaves/min*
Random	All 3 axis	20 to 50	6dB/oct.	6dB/oct.
		50 to 600	$0.25g^2/Hz$	$0.50g^2/Hz$
		600 to 2000	-4.5 dB/oct.	-4.5 dB/oct.
			60 secs/axis	*180 secs/axis*
		Overall [rms]	**16.7g**	**23.6g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Shear Web	200	280
	850	1260
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

K-Band microstrip low-power Isolator

Used on the output of a receiver/converter

SINT part number	I177220/H
SINT ICD	B105977
Application	Space [GEO]
Status	Qualified & supplied
Programs	*Various*

- The device is Space qualified and used within a hybrid construction
- Materials and processes have substantial flight heritage.
- Suitable for wire bonding
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-55 to +160C
Acceptance	-35 to +95C
Impedance	50 Ohms
Operating Frequency	17.7 to 22.0 GHz
Insertion Loss	0.80 dB
Isolation	16 dB min
Return Loss	16 dB min
Power Handling	1W CW
Mass	<0.5g nom

Environmental

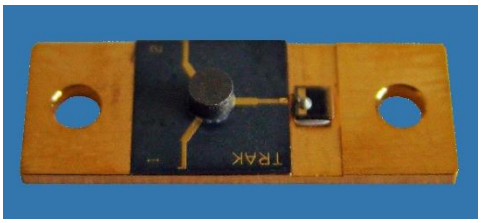
Test	Axis	Frequency (Hz)	Acceptance	LAT
Sine	All 3 axis	5 to 26	-	11mm (0-peak)
		26 to 100	-	30g
			Sweep 2 Oct/min	Sweep 2 Oct/min
Random	All 3 axis	20 to 100	+6dB / octave	+6dB / octave
		100 to 1000	0.67 g^2 / Hz	1.54 g^2 / Hz
		1000 to 2000	-3dB / octave	-3dB / octave
		Overall [rms]	**33g**	**50g**
			60 secs per axis	**60 secs per axis**

Location	Frequency (Hz)	Shock response (Q=10), g
Not specified		MIL-STD-883
		Method2002.3 Condition B
		1500g, 0.5ms
		3-axis

K-Band microstrip medium-power Isolator

Used on the output of a receiver/converter

SINT part number	I255270/A
SINT ICD	B107225
Application	Space [LEO/MEO/GEO]
Status	Qualified & supplied
Programs	*Various*



- The device is Space qualified and used within a hybrid construction
- Materials and processes have substantial flight heritage.
- Suitable for wire bonding
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-50 to +90C
Acceptance	-30 to +70C
Impedance	50 Ohms
Operating Frequency	25.5-27.0 GHz
Insertion Loss	0.50 dB
Isolation	19 dB min
Return Loss	19 dB min
Power Handling forward	20W CW
Power Handling reverse	2W CW
Mass	<0.7g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 26	-	11mm (0-peak)
		26 to 100	-	30g
			Sweep 2 Oct/min	Sweep 2 Oct/min
Random	All 3 axis	20 to 100	+6dB / octave	+6dB / octave
		100 to 1000	0.67 g^2 / Hz	1.54 g^2 / Hz
		1000 to 2000	-3dB / octave	-3dB / octave
		Overall [rms]	**33g**	**50g**
			60 secs per axis	**60 secs per axis**

Location	Frequency (Hz)	Shock response (Q=10), g
Not specified		MIL-STD-883
		Method2002.3 Condition B
		1500g, 0.5ms
		3-axis

K-band 17.2-18.4GHz SMA (M & F) 2W coaxial Load

Generic applications. Key design parameters are *Return Loss* and reliability under fault conditions.

SINT part number	JTE105 (M) & JTE106 (F)
SINT ICD	A106347 (M) & A106357
Application	Generic
Status	In orbit
Program	*Various*

- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Nickel-plated, Stainless-steel housing featuring procured connectors.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-55 to +125C
Qualification	-40 to +100C
Acceptance	-40 to +95C
Operating Frequency	17.2-18.4 GHz
Return Loss	25dB min
Power	2W CW
Radiated Emissions	70dBi min
Mass	5g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification XY
Sine	All 3 axis	5 to 20	-	11 mm
		20 to 100	-	20g
				2 octaves/min
Random	All 3 axis	10 to 60	+7dB/oct.	+7dB/oct.
		60 to 75	0.22g^2/Hz	0.50g^2/Hz
		75 to 100	+10.5dB/oct.	+11.5dB/oct.
		100 to 300	0.67g^2/Hz	1.5g^2/Hz
		300 to 900	-7.1dB/oct.	-7.4dB/oct.
		900 to 1000	0.045g^2/Hz	0.10g^2/Hz
		1000 to 2000	-3dB/oct.	3dB/oct.
			60 secs/axis	*180 secs/axis*
		Overall [rms]	**17.2g**	**25.8g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Not specified	100	50
	400	600
	1500	2000
	10000	2500
	Number of Events	*3 per axis*

Notes:

- The termination is resistive
- A BeO rod resistor is used

K-band 17.8-20.2GHz SMA (M & F) 2W coaxial Load

Generic applications. Key design parameters are *Return Loss* and reliability under fault conditions.

SINT part number	KTE103 (M) & KTE104 (F)
SINT ICD	A106988 (M) & A106990 (F)
Application	Generic
Status	In orbit
Program	*Various*

- The device is used following payload pump down.
- Materials and processes have substantial flight heritage.
- Nickel-plated, Stainless-steel housing featuring procured connectors.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-55 to +125C
Qualification	-40 to +100C
Acceptance	-40 to +95C
Operating Frequency	17.8-20.2 GHz
Return Loss	25dB min
Power	2W CW
Radiated Emissions	70dBi min
Mass	5g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification XY
Sine	All 3 axis	5 to 20	-	11 mm
		20 to 100	-	20g
				2 octaves/min
Random	All 3 axis	10 to 60	+7dB/oct.	+7dB/oct.
		60 to 75	$0.22g^2/Hz$	$0.50g^2/Hz$
		75 to 100	+10.5dB/oct.	+11.5dB/oct.
		100 to 300	$0.67g^2/Hz$	$1.5g^2/Hz$
		300 to 900	-7.1dB/oct.	-7.4dB/oct.
		900 to 1000	$0.045g^2/Hz$	$0.10g^2/Hz$
		1000 to 2000	-3dB/oct.	3dB/oct.
			60 secs/axis	*180 secs/axis*
		Overall [rms]	**17.2g**	**25.8g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Not specified	100	50
	400	600
	1500	2000
	10000	2500
	Number of Events	*3 per axis*

Notes:

- The termination is resistive
- A BeO rod resistor is used

K-Band SMA broadband low-power Circulator

Used in an IMUX application.

SINT part number	C173203/C
SINT ICD	C108507
Application	Space [GEO]
Status	In Orbit
Program	*Various*

- The devices are used following payload pump down.
- Materials and processes have substantial flight heritage.
- Used on Various filter multiplexing equipments
- Nickel plated Stainless-Steel housing featuring SINT designed “solid connectors”.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-45 to +125C
PFM & Qualification	-30 to +80C
Acceptance	-30 to +75C
Operating Frequency	17.3 to 20.3 GHz
Insertion Loss	0.40 dB max
Return Loss	23 dB min
Power Handling (fault)	2 W CW
Radiated Emissions	80dBi min
Mass	26g nom

Environmental

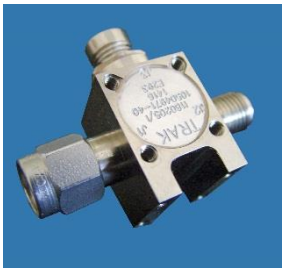
Test	Axis	Frequency (Hz)	Acceptance	PFM	Qualification
Sine	All 3 axis	5 to 22.6	-	6.4 mm	6.4 mm
		22.6 to 50	-	130.0g	130.0g
		50 to 100	-	10g	10g
			-	*2 octaves/min*	*4 octaves/min*
Random	All 3 axis	20 to 50	6dB/oct.	6dB/oct.	6dB/oct.
		50 to 600	$0.25g^2/Hz$	$0.50g^2/Hz$	$0.50g^2/Hz$
		600 to 2000	-4.5 dB/oct.	-4.5 dB/oct.	-4.5 dB/oct.
			60 secs/axis	*60 secs/axis*	*180 secs/axis*
		Overall [rms]	**16.6g**	**23.6g**	**23.6g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Shear Web	200	280
	850	1260
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

K-Band SMA low-power Isolator

Used in an IMUX application

SINT part number	I173220/C
SINT ICD	B108458
Application	Space [GEO]
Status	In Orbit
Program	*Various*



- Over 20 versions are available with a range of connector orientations
- The devices are used following payload pump down.
- Materials and processes have substantial flight heritage.
- Used on Various filter multiplexing equipments
- Nickel-plated, Stainless-steel housing featuring SINT designed “solid connectors”.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-45 to +125C
PFM & Qualification	-30 to +80C
Acceptance	-30 to +75C
Operating Frequency	17.3 to 22.0 GHz
Insertion Loss	0.40 dB max
Isolation	21 dB min
Return Loss	21 dB min
Power Handling (fault)	2 W CW
Radiated Emissions	80dBi min
Mass	20g nom

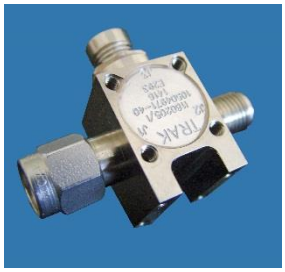
Environmental

Test	Axis	Frequency (Hz)	Acceptance	PFM	Qualification
Sine	All 3 axis	5 to 22.6	-	6.4 mm	6.4 mm
		22.6 to 50	-	130.0g	130.0g
		50 to 100	-	10g	10g
			-	*2 octaves/min*	*4 octaves/min*
Random	All 3 axis	20 to 50	6dB/oct.	6dB/oct.	6dB/oct.
		50 to 600	$0.25g^2$/Hz	$0.50g^2$/Hz	$0.50g^2$/Hz
		600 to 2000	-4.5 dB/oct.	-4.5 dB/oct.	-4.5 dB/oct.
			60 secs/axis	*60 secs/axis*	*180 secs/axis*
		Overall [rms]	**16.6g**	**23.6g**	**23.6g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Shear Web	200	280
	850	1260
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

K-Band SMA low-power Isolator

Used in a converter application



SINT part number	I233236
SINT ICD	C109232
Application	Space [GEO]
Status	In Orbit
Program	*Various*

- Over 20 versions are available with a range of connector orientations
- The devices are used following payload pump down.
- Materials and processes have substantial flight heritage.
- Used on Various filter multiplexing equipments
- Nickel-plated, Stainless-steel housing featuring SINT designed “solid connectors”.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-45 to +125C
PFM & Qualification	-30 to +80C
Acceptance	-30 to +75C
Operating Frequency	23.3-23.6 GHz
Insertion Loss	0.50 dB max
Isolation	20 dB min
Return Loss	20 dB min
Power Handling (fault)	2 W CW
Radiated Emissions	80dBi min
Mass	20g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	PFM	Qualification
Sine	All 3 axis	5 to 22.6	-	6.4 mm	6.4 mm
		22.6 to 50	-	130.0g	130.0g
		50 to 100	-	10g	10g
			-	*2 octaves/min*	*4 octaves/min*
Random	All 3 axis	20 to 50	6dB/oct.	6dB/oct.	6dB/oct.
		50 to 600	$0.25g^2$/Hz	$0.50g^2$/Hz	$0.50g^2$/Hz
		600 to 2000	-4.5 dB/oct.	-4.5 dB/oct.	-4.5 dB/oct.
			60 secs/axis	*60 secs/axis*	*180 secs/axis*
		Overall [rms]	**16.6g**	**23.6g**	**23.6g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Shear Web	200	280
	850	1260
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

K-Band SMA low-power Isolator

Used in an converter application

SINT part number	I246253/A
SINT ICD	C109232
Application	Space [GEO]
Status	In qualification
Program	-

- The devices are used following payload pump down.
- Materials and processes have substantial flight heritage.
- Used on Various filter multiplexing equipments
- Nickel-plated, Stainless-steel housing featuring SINT designed “solid connectors”.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-45 to +125C
PFM & Qualification	-30 to +80C
Acceptance	-30 to +75C
Operating Frequency	24.6-25.3 GHz
Insertion Loss	0.50 dB max
Isolation	21 dB min
Return Loss	21 dB min
Power Handling (fault)	2 W CW
Radiated Emissions	80dBi min
Mass	20g nom

Environmental

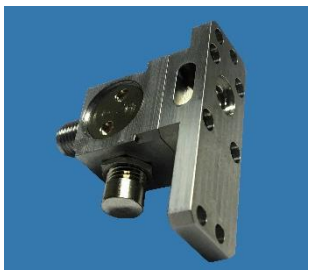
Test	Axis	Frequency (Hz)	Acceptance	PFM	Qualification
Sine	All 3 axis	5 to 22.6	-	6.4 mm	6.4 mm
		22.6 to 50	-	130.0g	130.0g
		50 to 100	-	10g	10g
			-	*2 octaves/min*	*4 octaves/min*
Random	All 3 axis	20 to 50	6dB/oct.	6dB/oct.	6dB/oct.
		50 to 600	$0.25g^2$/Hz	$0.50g^2$/Hz	$0.50g^2$/Hz
		600 to 2000	-4.5 dB/oct.	-4.5 dB/oct.	-4.5 dB/oct.
			60 secs/axis	*60 secs/axis*	*180 secs/axis*
		Overall [rms]	**16.6g**	**23.6g**	**23.6g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Shear Web	200	280
	850	1260
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

K-Band SMA broadband low-power SMP Isolator

Used in a filter application.

SINT part number	I173220/A
SINT ICD	C108052
Application	Space [GEO]
Status	In Orbit
Program	*Various*



- The devices are used following payload pump down.
- Materials and processes have substantial flight heritage.
- Used on Various filter multiplexing equipments
- Nickel-plated, Stainless-steel housing featuring SINT designed “solid connectors”.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-45 to +125C
PFM & Qualification	-30 to +80C
Acceptance	-20 to +75C
Operating Frequency	17.3 to 22.0 GHz
Insertion Loss	0.40 dB max
Isolation	21 dB min
Return Loss	21 dB min
Power Handling (fault)	2 W CW
Radiated Emissions	80dBi min
Mass	35g nom

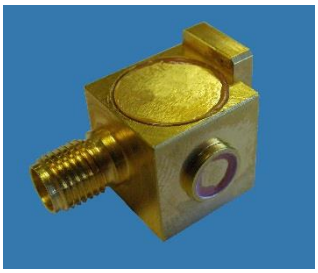
Environmental

Test	Axis	Frequency (Hz)	Acceptance	PFM	Qualification
Sine	All 3 axis	5 to 22.6	-	6.4 mm	6.4 mm
		22.6 to 50	-	130.0g	130.0g
		50 to 100	-	10g	10g
			-	*2 octaves/min*	*4 octaves/min*
Random	All 3 axis	20 to 50	6dB/oct.	6dB/oct.	6dB/oct.
		50 to 600	$0.25g^2$/Hz	$0.50g^2$/Hz	$0.50g^2$/Hz
		600 to 2000	-4.5 dB/oct.	-4.5 dB/oct.	-4.5 dB/oct.
			60 secs/axis	*60 secs/axis*	*180 secs/axis*
		Overall [rms]	**16.6g**	**23.6g**	**23.6g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Shear Web	200	280
	850	1260
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

K-Band SMA to 0.38mm bulkhead socket Isolator

Used in an LNA application.



SINT part number	I170185/A
SINT ICD	C106220
Application	Space [GEO]
Status	In Orbit
Program	*Various*

- The devices are used following payload pump down.
- Materials and processes have substantial flight heritage.
- Used on Various filter multiplexing equipments
- Gold-plated Stainless-Steel housing featuring SINT designed “solid connectors”.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-55 to +125C
Qualification	-55 to +85C
Acceptance	-30 to +80C
Operating Frequency	17.0 to 18.5 GHz
Insertion Loss	0.35 dB max
Isolation	23 dB min
Return Loss (SMA)	23 dB min
Return Loss (SKT)	23 dB min
Power Handling (fault)	1 W CW
Radiated Emissions	-95dBc max
Mass	23g nom

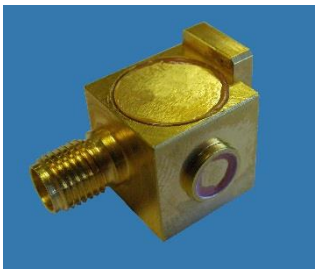
Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 22.6	-	6.4 mm
		22.6 to 50	-	130.0g
		50 to 100	-	10g
			-	*4 octaves/min*
Random	All 3 axis	20 to 100	+6dB/oct.	+6dB/oct.
		100 to 1000	$0.67g^2$/Hz	$1.54g^2$/Hz
		1000 to 2000	-3.0 dB/oct.	-3.0 dB/oct.
			60 secs/axis	*180 secs/axis*
		Overall [rms]	**33.0g**	**50.0g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
	200	280
	850	1260
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

K-Band SMA to 0.38mm bulkhead socket Isolator

Used in an LNA application.



SINT part number	I180210/E
SINT ICD	C105506
Application	Space [GEO]
Status	In Orbit
Program	*Various*

- The devices are used following payload pump down.
- Materials and processes have substantial flight heritage.
- Used on Various filter multiplexing equipments
- Gold-plated Stainless-Steel housing featuring SINT designed “solid connectors”.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-55 to +125C
Qualification	-55 to +85C
Acceptance	-30 to +80C
Operating Frequency	18.0 to 21.0 GHz
Insertion Loss	0.40 dB max
Isolation	23 dB min
Return Loss (SMA)	23 dB min
Return Loss (SKT)	21 dB min
Power Handling (fault)	1 W CW
Radiated Emissions	-95dBc max
Mass	23g nom

Environmental

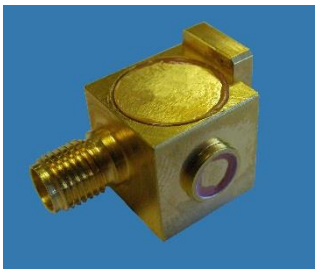
Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 22.6	-	6.4 mm
		22.6 to 50	-	130.0g
		50 to 100	-	10g
			-	*4 octaves/min*
Random	All 3 axis	20 to 100	+6dB/oct.	+6dB/oct.
		100 to 1000	$0.67g^2$/Hz	$1.54g^2$/Hz
		1000 to 2000	-3.0 dB/oct.	-3.0 dB/oct.
			60 secs/axis	*180 secs/axis*
		Overall [rms]	**33.0g**	**50.0g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
	200	280
	850	1260
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

K-Band SMA to 0.38mm bulkhead socket Isolator

Used in an LNA application.

SINT part number	I190220/B
SINT ICD	C105507
Application	Space [GEO]
Status	In Orbit
Program	*Various*



- The devices are used following payload pump down.
- Materials and processes have substantial flight heritage.
- Used on Various filter multiplexing equipments
- Gold-plated Stainless-Steel housing featuring SINT designed “solid connectors”.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-55 to +125C
Qualification	-55 to +85C
Acceptance	-30 to +80C
Operating Frequency	19.0 to 22.0 GHz
Insertion Loss	0.40 dB max
Isolation	23 dB min
Return Loss (SMA)	23 dB min
Return Loss (SKT)	21 dB min
Power Handling (fault)	1 W CW
Radiated Emissions	-95dBc max
Mass	23g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 22.6	-	6.4 mm
		22.6 to 50	-	130.0g
		50 to 100	-	10g
			-	*4 octaves/min*
Random	All 3 axis	20 to 100	+6dB/oct.	+6dB/oct.
		100 to 1000	0.67g^2/Hz	1.54g^2/Hz
		1000 to 2000	-3.0 dB/oct.	-3.0 dB/oct.
			60 secs/axis	*180 secs/axis*
		Overall [rms]	**33.0g**	**50.0g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
	200	280
	850	1260
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

K-Band SMA to WR42 Iso-Adpater

Used in a receiver application.

SINT part number	I190220/A
SINT ICD	C105232
Application	Space [GEO]
Status	In Orbit
Program	*Various*

- The devices are used following payload pump down.
- Materials and processes have substantial flight heritage.
- Used on Various filter multiplexing equipments
- Gold-plated Stainless-Steel housing featuring SINT designed “solid connectors”.
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-55 to +125C
Qualification	-55 to +85C
Acceptance	-30 to +80C
Operating Frequency	19.0 to 22.0 GHz
Insertion Loss	0.40 dB max
Isolation	23 dB min
Return Loss (SMA)	23 dB min
Return Loss (WG)	23 dB min
Power Handling (fault)	1 W CW
Radiated Emissions	-95dBc max
Mass	26g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 22.6	-	6.4 mm
		22.6 to 50	-	130.0g
		50 to 100	-	10g
			-	*4 octaves/min*
Random	All 3 axis	20 to 100	+6dB/oct.	+6dB/oct.
		100 to 1000	$0.67g^2$/Hz	$1.54g^2$/Hz
		1000 to 2000	-3.0 dB/oct.	-3.0 dB/oct.
			60 secs/axis	*180 secs/axis*
		Overall [rms]	**33.0g**	**50.0g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
	200	280
	850	1260
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

K-Band 2.9mm coaxial Isolator

Generic application

SINT part number	I178202/J
SINT ICD	C109100
Application	Space [GEO & LEO]
Status	In qualification
Program	

- The device is intended to be used following payload pump down.
- Materials and processes have substantial flight heritage.
- Clear chromate conversion coated Aluminum housing and 2.9mm connectors

Basic performance criteria

Parameter	Performance
Non-operating	-45 to +125C
Qualification	-30 to +95C
Acceptance	-25 to +80C
Operating Frequency	17.8 to 20.2GHz
Insertion Loss	0.50dB max
Isolation	20dB min
Return Loss	20dB min
Power Handling	1W CW
Radiated Emissions	70dBi min
Mass	30g nom

Environmental

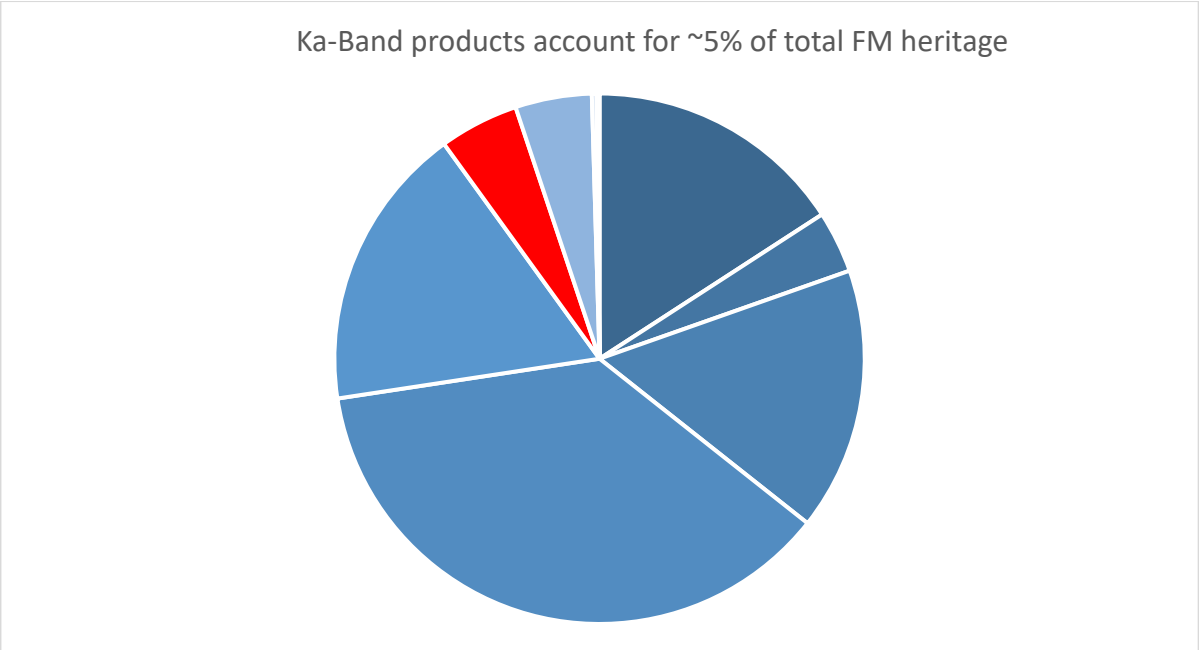
Test	Axis	Frequency (Hz)	Acceptance	PFM	Qualification
Sine	All 3 axis	5 to 22.6	4.83 mm	6.4 mm	6.4 mm
		22.6 to 50	10.0g	13.0g	13.0g
		50 to 100	7.7g	10.0g	10.0g
			2 octaves/min	*2 octaves/min*	*4 octaves/min*
Random	All 3 axis	20 to 50	6dB/oct.	6dB/oct.	6dB/oct.
		50 to 600	$0.25g^2/Hz$	$0.50g^2/Hz$	$0.50g^2/Hz$
		600 to 2000	-4.5 dB/oct.	-4.5 dB/oct.	-4.5 dB/oct.
			60 secs/axis	*60 secs/axis*	*180 secs/axis*
		Overall [rms]	**16.7g**	**23.6g**	**23.6g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Shear Web	200	280
	850	1260
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

Ka-Band Overview

SINT has developed, supplied, and has heritage with many passive devices operating in the 27-37GHz band designed to operate at either low or high-power. The Ka-Band range is considered comprehensive with over with over ~157 distinct designs supplied to date. Heritage is dominated by the supplied of the supply of low loss Isolators for LNA and Receiver applications where the focus has been to offer exceptional electrical performance over a broad operating band and in this respect <0.12dB is a routine performance without resort to precious metal plating. Most of the parts supplied are classed as components however an increasing number are supplied classed as equipment. This distinction is largely a matter of how the parts are specified and procured. The following is an extract from the heritage database which records sales of flight model hardware from 1994 to December 2020. Heritage in terms of the numbers and types of products supplied changes daily. Please contact the factory to obtain the most up to date information.

FMs supplied	MICROSTRIP	WAVEGUIDE	Grand Total
Ka	**135**		**135**
ISOLATOR	135		135
Ka [WR28]		**6931**	**6930**
ISOLATOR		5146	5146
TRANSITION		1037	1037
SPLITTER		495	495
CIRCULATOR		187	187
LOAD/TERMINATION		59	59
COUPLER		4	4
ISO-ADPATER		2	2
Ka [WR34]		**2411**	**2411**
ISOLATOR		2178	2178
TRANSITION		171	171
SPLITTER		51	51
COUPLER		4	4
LOAD/TERMINATION		4	4
TEST COUPLER		3	3
Grand Total	**135**	**9341**	**9476**

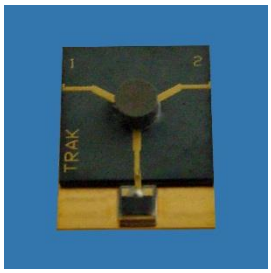


In development/qualification

Ka-Band microstrip low-power Isolator

Used in a converter application

SINT part number	I311316/A
SINT ICD	B107870
Application	Space [LEO/MEO/GEO]
Status	Qualified & supplied
Programs	*METOP*



- The device is used within a hybrid construction
- Materials and processes have substantial flight heritage.
- Suitable for wire bonding
- No anomalies, deviations, waivers nor test or issues affecting any models supplied.

Basic performance criteria

Parameter	Performance
Non-operating	-55 to +125C
Acceptance	-20 to +70C
Impedance	50 Ohms
Operating Frequency	31.1 – 31.7 GHz
Insertion Loss	0.80 dB
Isolation	17 dB min
Return Loss	17 dB min
Power Handling	2W CW
Mass	<0.5g nom

Environmental

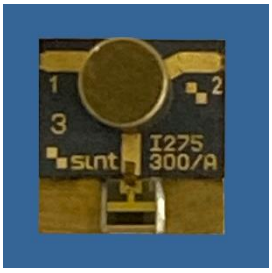
Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 26	-	11mm (0-peak)
		26 to 100	-	30g
			Sweep 2 Oct/min	Sweep 2 Oct/min
Random	All 3 axis	20 to 100	+6dB / octave	+6dB / octave
		100 to 1000	0.67 g^2 / Hz	1.54 g^2 / Hz
		1000 to 2000	-3dB / octave	-3dB / octave
		Overall [rms]	**33g**	**50g**
			60 secs per axis	**60 secs per axis**

Location	Frequency (Hz)	Shock response (Q=10), g
Not specified		MIL-STD-883
		Method2002.3 Condition B
		1500g, 0.5ms
		3-axis

Note: This image is generic and is used to protect the designing and user party's IP

Ka-Band microstrip low-power Isolator

Used in a converter application



SINT part number	I275300/A
SINT ICD	B108773
Application	Space [LEO/GEO]
Status	In qualification
Programs	-

- The device is used within a hybrid construction
- Materials and processes have substantial flight heritage.
- Suitable for wire bonding

Basic performance criteria

Parameter	Performance
Non-operating	-45 to +125C
Qualification	-30 to +95C
Acceptance	-25 to +80C
Operating Frequency	27.5 to 30.0GHz
Insertion Loss	0.50dB max
Isolation	15dB min
Return Loss	19dB min
Power Handling	2W CW
Mass	0.1g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	Qualification
Sine	All 3 axis	5 to 22.6	4.83 mm	6.4 mm
		22.6 to 50	10.0g	13.0g
		50 to 100	7.7g	10.0g
			2 octaves/min	*4 octaves/min*
Random	All 3 axis	20 to 50	6dB/oct.	6dB/oct.
		50 to 600	$0.25g^2$/Hz	$0.50g^2$/Hz
		600 to 2000	-4.5 dB/oct.	-4.5 dB/oct.
			60 secs/axis	*180 secs/axis*
		Overall [rms]	**16.7g**	**23.6g**

Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Shear Web	200	280
	850	1260
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

Ka-Band 2.9mm coaxial Isolator

Generic application

SINT part number	I275300/A
SINT ICD	C109105
Application	Space [GEO & LEO]
Status	In qualification
Program	

- The device is intended to be used following payload pump down.
- Materials and processes have substantial flight heritage.
- Clear chromate conversion coated Aluminum housing and 2.9mm connectors

Basic performance criteria

Parameter	Performance
Non-operating	-45 to +125C
Qualification	-30 to +95C
Acceptance	-25 to +80C
Operating Frequency	27.0 to 30.0GHz
Insertion Loss	0.70dB max
Isolation	19dB min
Return Loss	19dB min
Power Handling	1W CW
Radiated Emissions	70dBi min
Mass	30g nom

Environmental

Test	Axis	Frequency (Hz)	Acceptance	PFM	Qualification
Sine	All 3 axis	5 to 22.6	4.83 mm	6.4 mm	6.4 mm
		22.6 to 50	10.0g	13.0g	13.0g
		50 to 100	7.7g	10.0g	10.0g
			2 octaves/min	*2 octaves/min*	*4 octaves/min*
Random	All 3 axis	20 to 50	6dB/oct.	6dB/oct.	6dB/oct.
		50 to 600	$0.25g^2/Hz$	$0.50g^2/Hz$	$0.50g^2/Hz$
		600 to 2000	-4.5 dB/oct.	-4.5 dB/oct.	-4.5 dB/oct.
			60 secs/axis	*60 secs/axis*	*180 secs/axis*
		Overall [rms]	**16.7g**	**23.6g**	**23.6g**

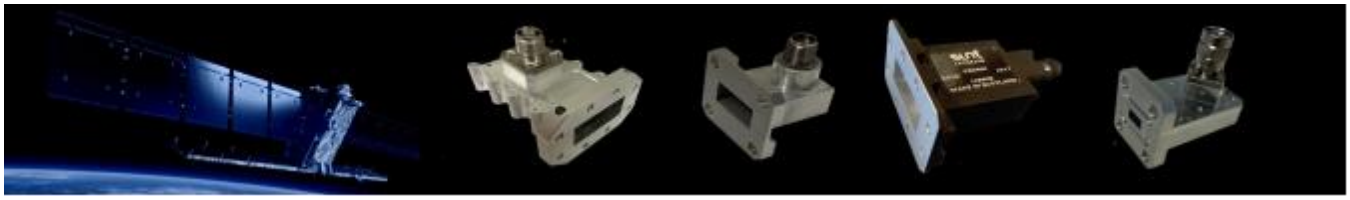
Location	Frequency (Hz)	Shock response (Q=10), g
		Qualification
Shear Web	200	280
	850	1260
	4000	4200
	10000	4200
	Number of Events	*3 per axis*

Waveguide Isolators & Circulators with flight heritage

The following is a limited summary of coaxial Isolators and Circulators that have been supplied for spaceflight. Excluded from the tables are the huge number of variations (Load position and orientation, circulation etc.). Items highlighted in bold are included in this EQSR.

Waveguide size (full height unless stated)	Operating in the band	Low power <3W	Medium power >20W	High-power >100W	Comments
WR229	3.00-4.80 GHz	-	-	☑	Refer to factory
WR137	5.80-6.40 GHz	☑	-	-	Refer to factory
WR112	7.20-9.00 GHz	☑	☑	☑	Refer to factory
WR90	9.20-9.90 GHz	☑	☑	☑	Refer to factory
WR90	8.90-10.2 GHz	☑	☑	☑	Refer to factory
WR75	10.7-12.8 GHz	☑	☑	☑	Refer to factory
WR75	10.7-14.5 GHz	☑	☑	☑	Refer to factory
WR51	17.3-21.2 GHz	☑	☑	☑	Refer to factory
WR51	17.7-20.3 GHz	☑	☑	☑	Refer to factory
WR62	13.5-15.0 GHz	☑	-	☑	Refer to factory
WR62	17.0-18.5 GHz	☑	☑	☑	Refer to factory
WR42	18.0-22.0 GHz	☑	☑	-	Refer to factory
WR42	21.0-25.0 GHz	☑	In development	-	Refer to factory
WR34	21.7-22.4 GHz	☑	In development	-	Refer to factory
WR34	22.0-25.0 GHz	☑	☑	-	Refer to factory
WR34	22.0-27.0 GHz	☑	☑	In development	Refer to factory
WR34	25.5-27.0 GHz	☑	☑	☑	Refer to factory
WR34	27.0-33.0 GHz	☑	☑	-	Refer to factory
WR34	30.0-33.0 GHz	☑	☑	☑	Refer to factory
WR28	27.0-33.0 GHz	☑	☑	☑	Refer to factory
WR28	30.0-33.0 GHz	☑	☑	☑	Refer to factory
WR22	37.5-40.5 GHz	☑	-	-	Refer to factory
WR22	42.5-44.5 GHz	☑	-	-	Refer to factory
WR19	47.0-54.0 GHz	☑	-	-	Refer to factory
WR12	73.0 to 78.0 GHz	-	In development	-	Refer to factory

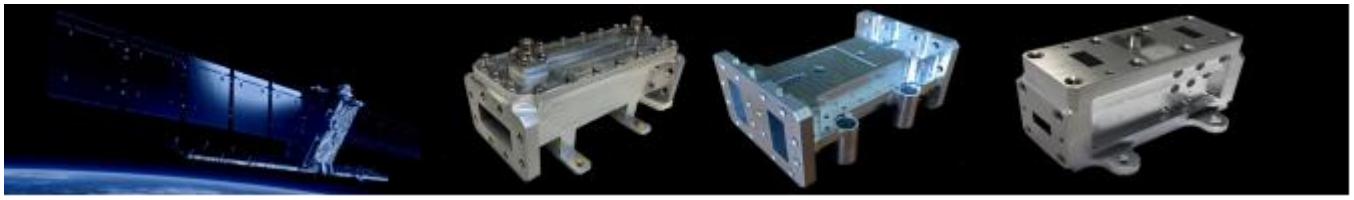
Waveguide Transitions with flight heritage



The following is a limited summary of coaxial to waveguide Transitions that have been supplied for spaceflight. Excluded from the tables are the huge number of variations (connector orientation). Items highlighted in bold are included in this EQSR.

Waveguide size (full height unless stated)	**Operating band**	**High-power Orthogonal (TNC, SMA)**	**Low-power Orthogonal (SMA or SMP)**	**High-power In line (TNC, SMA)**	**Low power in line (SMA,2.9,2.4,1.85)**
WR340 (1/4 ht)	2.02-2.12 GHz	-	☑	-	-
WR229 (1/4 ht)	3.40-4.20 GHz	-	☑	-	-
WR137 (1/4 ht)	5.60-7.20 GHz	-	☑	-	-
WR112	7.00-9.00 GHz	☑ T	☑	☑	☑
WR112	7.10-8.50 GHz	☑	☑	☑	☑
WR90	8.00-12.2 GHz	-	☑	-	☑
WR90	8.30-12.4 GHz	-	-	☑	☑
WR75	10.2-14.8 GHz	☑	☑	☑	☑
WR75	10.7-12.8 GHz	☑	☑	☑	☑
WR75	12.7-14.5 GHz	☑	☑	☑	☑
WR62	13.0-14.5 GHz	-	☑	☑ S	☑
WR51	17.3-22.0 GHz	☑ S	☑	☑ S	☑
WR42	19.2-21.2 GHz	-	☑	☑ S	☑
WR42	18.0-22.0 GHz	-	☑	-	☑
WR34	22.0-24.0 GHz	-	☑	-	☑
WR34	23.0-25.0 GHz	-	☑	-	☑
WR34	25.0-28.0 GHz	-	☑	-	☑
WR34	25.5-31.0 GHz	-	☑	-	☑
WR28-2.9mm	26.5-31.0 GHz	-	☑	-	☑
WR22-2.4mm	36.0-40.5 GHz	-	-	-	☑
WR22-2.9mm	37.5-40.5 GHz	-	☑	-	☑
WR22-2.4mm	42.5-44.5 GHz	-	-	-	☑
WR19-1.85mm	47.5-51.4 GHz	-	-	-	☑

Waveguide Hybrids & Couplers with flight heritage



The following is a limited summary of waveguide hybrid, test and in line Couplers that have been supplied for spaceflight. Excluded from the tables are the huge number of variations (Load position and orientation, etc.). Items highlighted in bold are included in this EQSR.

Waveguide size (full height unless stated)	**Operating band**	**2 x 2**	**2,3,4 x 1 (incl. termination)**	**Test Coupler**	**Other Couplers**
WR112	7.20-8.40 GHz	3dB	-	33dB	-
WR75	10.7-14.5 GHz	3dB	3dB	-	6.5dB
WR62	17.0-18.5 GHz	3dB	3dB	-	-
WR51	17.6-21.2 GHz	3dB	-	-	-
WR34	22.0-25.0 GHz	3dB	-	-	-
WR34	24.5-31.0 GHz	-	-	33dB	-
WR34	25.0-30.0 GHz	-	3dB	-	10dB, 15dB
WR28	26.5-33.0 GHz	3dB	3dB	-	-
WR28	27.0-33.0 GHz	-	4.77dB	-	-
WR28	27.0-33.0 GHz	-	6dB, 4.77dB, 3dB	-	-
WR28	27.0-31.0 GHz	4.77-1.33dB	4.77-1.33dB	-	-
WR22	37.5-40.5 GHz	-	3dB	-	-
WR19	47.4-52.4 GHz	3dB	-	-	-
WR12	80.0 – 88.0 GHz	In development			

Waveguide Iso-Adpaters with flight heritage

The following is a limited summary of coaxial to waveguide Transitions that have been supplied for spaceflight. Excluded from the tables are the huge number of variations (Load position and orientation, circulation etc.). Items highlighted in bold are included in this EQSR.

Waveguide size (full height unless stated)	Operating in the band	Low power <3W	Medium power >10W	High-power >100W	Comments
WR340 QH	2.02-2.12 GHz	☑	-	-	Stripline Isolator
WR112	7.20-8.40 GHz	☑	-	-	Coaxial Isolator
WR90	8.9-10.2 GHz	☑	☑	-	Coaxial Isolator
WR75	10.7-12.8 GHz	☑	☑	-	WG Isolator
WR75	10.7-12.8 GHz	☑	-	-	Coaxial Isolator
WR75	10.7-15.0 GHz	☑	☑	-	Coaxial Isolator
WR51	18.0-22.0 GHz	☑	☑	-	Coaxial Isolator
WR51	17.3-21.0 GHz	☑	☑	-	WG Isolator
WR62	13.5-15.0 GHz	☑	-	-	Coaxial Isolator
WR42	18.0-24.0 GHz	☑	☑	☑	Coaxial Isolator
WR34	21.7-22.4 GHz	☑	☑	-	WG Isolator
WR34	24.5-32.0 GHz	☑	☑	-	WG Isolator
WR34	27.0-33.0 GHz	☑	☑	-	WG Isolator
WR28	27.0-33.0 GHz	☑	☑	-	WG Isolator
WR22	37.5-42.5 GHz	☑	-	-	WG Isolator
WR19	47.0-54.0 GHz	☑	-	-	WG Isolator

Waveguide Loads & Terminations with flight heritage

The following is a limited summary of waveguide terminations and Loads that have been supplied for spaceflight. Excluded from the tables are the huge number of variations (flange detail etc.). Items highlighted in bold are included in this

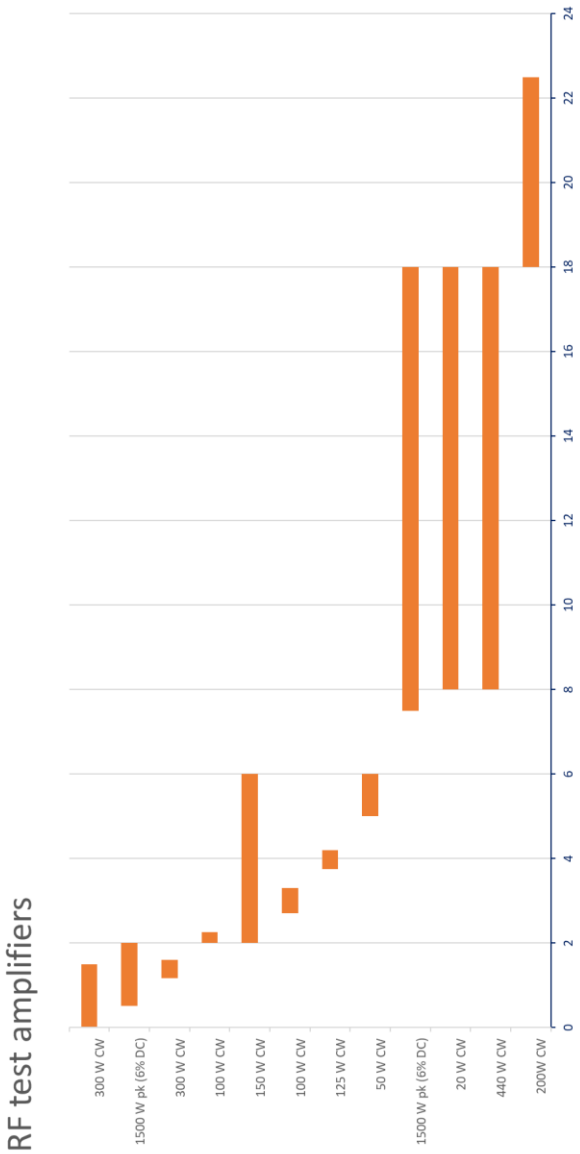
Waveguide size (full height unless stated)	Operating in the band	Low power <3W	Medium power >10W	High-power >100W	Comments
WR229	3.20-4.90 GHz	-	-	☑	Refer to factory
WR229	3.40-4.20 GHz	-	-	☑	Refer to factory
WR229	4.20-4.80 GHz	-	-	☑	Refer to factory
WR112	7.00-10.0 GHz	☑	☑	☑	Refer to factory
WR112	7.20-10.2 GHz	☑	☑	☑	Refer to factory
WR90	9.0-10.0 GHz	☑	☑	☑	Refer to factory
WR75	10.0-15.0 GHz	☑	☑	☑	Refer to factory
WR75	10.7-12.8 GHz	☑	☑	☑	Refer to factory
WR62	12.0-18.5 GHz	☑	☑	☑	Refer to factory
WR51	15.0-22.0 GHz	☑	☑	☑	Refer to factory
WR51	17.3-20.3 GHz	☑	☑	☑	Refer to factory
WR51	17.3-22.0 GHz	☑	☑	☑	Refer to factory
WR42	27.0-36.0 GHz	☑	☑	☑	Refer to factory
WR34	18.0-27.0 GHz	☑	☑	☑	Refer to factory
WR34	20.0-31.0 GHz	☑	☑	☑	Refer to factory
WR34	31.0-33.0 GHz	☑	☑	☑	Refer to factory
WR28	26.5-31.0 GHz	☑	☑	☑	Refer to factory
WR34	31.0-33.0 GHz	☑	☑	☑	Refer to factory
WR22	30.0-50.0 GHz	☑	☑	☑	Refer to factory
WR19	40.0-60.0 GHz	☑	☑	-	Refer to factory
WR12	80.0–88.0 GHz	In development	In development		

RF test capability at-a-glance

A vital capability in the development, qualification and screening of products is the ability to undertake electrical and mechanical testing in as representative a fashion as practically possible.

Being able to do this using in house capability is a crucial advantage to control costs and support programme schedules.

SINT has invested heavily to be to provide in-house high-power RF and EMC testing capability including multipaction and corona testing (immediately below) and EMC testing using a reverberation test chamber (RE and RS) and will commission a 18-22.5GHz TWTA in Q4 2021 while a new 4-port PNA operating from 70-110GHz was commissioned in late July 2021.



The general capability also includes high level mechanical shock and random/sine vibration s detailed overleaf.

Dundee Site Capability

The Dundee site views its capability through 6 lenses. This is a capability that is evolving and through routine investment expanding as the demands from the Space changes. For further details please contact the factory.

Smiths Interconnect, Dundee
Passive EQSR, non-Waveguide

Design & Analysis

- RF modelling and simulation
- Mechanical modelling and drafting
- Magnetic finite element analysis
- Static and dynamic thermal analysis
- Reliability analysis (FMECA, worst case)

Climatic & Environmental

- Temperature Cycling, shock & storage
- Humidity Chamber
- Thermal Vacuum - 3 systems
- SRS/ Mechanical shock
- Dry heat/ bake
- Vibration (random & sine) - 3 systems

RF & Microwave Test

- Low power RF testing (VNA), 2 & 4 port systems to 110 GHz
- High Power RF testing (TVAC, Corona & Multipaction) in assigned bands.
- EMC Reverberation chamber (0.7 - 40GHz)
- Spectrum Analysis to 50GHz
- Magnet Charging & Magnetic moment measurement
- Continuous S-parameter test and data capture (as a function of temperature), 14 channels to 30 GHz
- RF burn-in

DC electrical

- Insulation testing
- Signal measurement
- Dielectric withstanding Voltage measurements
- Continuity testing
- DC burn-in

Inspection & Quality Assurance

- Dynamic 3D X-Ray with colour tomography
- XRF
- X-section
- Automated bond pull test (desructive & non-destuctive testing)
- Visual inspection to 250x
- RF Connector measurement
- Automated epoxy mixing

Operational support

- CNC and ceramic grinding
- Automated co-ordinate measurement
- Laser Etching of labels
- Plasma Cleaning
- 3D wire erosion
- Force guage & die shear testing
- Wire & ribbon bonding
- Cobotic assembly
- PCB Routing
- VHT paint and RF absorber application and high temperature curing
- Prototype circuit photo etching