

Applications

- Splits SDARS & GPS signals
- Ideal for Automotive applications



3-pins 3x3mm Leadless LGA Package Functional Block Diagram

Product Features

- GPS/SDARS Diplexer
- Size : 3.0 X 3.0 X 1.2 mm
- Laminate based over molded module
- No external matching required for 50Ω operation
- To be qualified for Automotive Applications



General Description

This module splits SDARS and GPS signals from a single automotive antenna. This is housed in a $3.0 \times 3.0 \times 1.2$ mm laminate-based over-molded module. Device provides excellent insertion loss for both the GPS and SDARS signals while effectively protecting

each band from the other. This diplexer is designed to match natively to 50 Ohms. No external matching is required.

Pin Configuration

Pin #	Symbol
1	Gnd
2	Antenna
3	Gnd
4	High
5	Gnd
6	Low
4 5 6	Gnd Low

Ordering Information

Part No.	Description
TQM2M9016	GPS/SDARS Diplexer
TQM2M9016 EVB	Evaluation Board
Standard T/R size = 2500 pi	eces on a 13" reel.

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Specifications

Absolute Maximum Ratings

Parameter	Rating
Storage Temperature	-40 to 150°C
RF Input Power, CW, 50Ω , T = 25° C	+10 dBm

Operation of this device outside the parameter ranges given above may cause permanent damage.

Recommended Operating Conditions

Parameter	Min	Тур	Max	Units
V _{cc}	0	5	25	V

Electrical specifications are measured at specified test conditions. Specifications are not guaranteed over all recommended operating conditions.

Pin2 and Pin4 have internal DC blocking capacitor. Pin 6 does not contain internal DC blocking capacitor. So DC should not be applied to low band port pin#6.

Electrical Specifications: Low Band (GPS)

Test conditions unless otherwise noted: 25°C, Network Analyzer power level=-25 dBm

Parameter	Conditions	Min	Typical	Max	Units
Frequency Range		1.574	1.575	1.577	GHz
Insertion Loss		-	0.6	0.9	dB
Return Loss		12	20	-	dB
Attenuation	2.320 - 2.345 GHz	20	40	-	dB
Impedance		-	50	-	Ω

Electrical Specifications: High Band (SDARS)

Test conditions unless otherwise noted: 25°C, Network Analyzer power level=-25 dBm

Parameter	Conditions	Min	Typical	Max	Units
Frequency Range		2.32	2.33	2.345	GHz
Insertion Loss		-	0.8	1.0	dB
Return Loss		12	20	-	dB
Attenuation	1.574 – 1.577 GHz	20	31	-	dB
Impedance		-	50	-	Ω

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Device Characterization Data



S-Parameter Data

T = 25 °C, Network analyzer power level set to -25 dBm

Freq MHz	S11(dB)	S11(ang)	S12(dB)	S12(ang)	S13(dB)	S13(ang)	S21(dB)	S21(ang)	S22(dB)	
1574.144	-24.019	-86.340	-0.579	-113.720	-43.986	-147.660	-0.579	-113.670	-20.479	
1577.881	-24.384	-87.250	-0.585	-114.300	-42.491	-143.310	-0.583	-114.280	-20.689	
2319.775	-19.414	-99.230	-33.674	-108.330	-0.789	124.570	-33.680	-108.540	-0.836	
2345.938	-20.106	-103.820	-30.499	-99.620	-0.755	121.220	-30.475	-99.570	-0.810	
Freq MHz	S22(ang)	S23(dB)	S23(ang)	S31(dB)	S31(ang)	S32(dB)	S32(ang)	S33(dB)	\$33(sng)	
_	~(~		Dor (ung)	~~~(~~~)	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~ ()	Dee (bing)	
1574.144	37.770	-36.419	41.350	-44.060	-148.110	-36.427	41.110	-0.375	-67.220	
1574.144 1577.881	37.770 39.450	-36.419 -36.042	41.350 45.200	-44.060 -42.501	-148.110 -142.960	-36.427 -36.079	41.110 44.880	-0.375 -0.381	-67.220 -67.560	
1574.144 1577.881 2319.775	37.770 39.450 4.180	-36.419 -36.042 -31.138	41.350 45.200 -15.790	-44.060 -42.501 -0.785	-148.110 -142.960 124.570	-36.427 -36.079 -31.123	41.110 44.880 -15.940	-0.375 -0.381 -19.647	-67.220 -67.560 -151.470	

Notes:

1. All the specifications are based on the test circuit shown below in reference design

2. In production, devices will be tested at room temperature to a guard banded ensure electrical compliance over the temperature

3. Electrical margin has been built into the design to account for the variations due to temperature drift and manufacturing tolerances

4. Typical values are based on average measurements at room temperature

5. This is optimum impedance in order to achieve the performance shown



Reference Design



Bill of Material

Reference Desg.	Value	Description	Manufacturer	Part Number
U1		GPS/SDARS Diplexer	TriQuint	TQM2M9016
CN1, CN2, CN3		SMA connector	Radiall USA Inc.	9602-1111-018

Typical Performance Low Band 1574-1577 MHz (GPS)

Temperature	°C	-40°C	25°C	85°C	100°C
Insertion Loss	dB	0.51	0.58	0.67	0.68
Return Loss	dB	20	20.5	20.7	20.7
Attenuation (2.320 – 2.345 GHz)	dB	45.5	43	40.7	40.3

Typical Performance High Band 2320-2345 MHz (SDARS)

Temperature	°C	-40°C	25°C	85°C	100°C
Insertion Loss	dB	0.7	0.78	0.87	0.89
Return Loss	dB	19.6	19.7	20	20
Attenuation (1.574 – 1.577 GHz)	dB	31.5	30.5	29.7	29.7

Notes:

1. Test conditions: 25°C otherwise unless specified, network analyzer power level set to -25 dBm



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Typical Performance



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Pin Description



Pin	Symbol	Description
1	GND	Ground
2	ANT	Common In/Out. Contains internal DC blocking capacitor.
3	GND	Ground
4	HIGH	SDARS In/Out. Contains internal DC blocking capacitor.
5	GND	Ground
6	LOW	GPS In/Out. Do not contain internal DC blocking capacitor. DC supply should not be applied to this pin.





Applications Information

PC Board Layout

The board material is $\frac{1}{2}$ oz Cu Top layer, .0075 Taconic TLY-5A dielectric, $\frac{1}{2}$ oz Cu middle layer, FR4 dielectric, $\frac{1}{2}$ oz Cu Bottom layer. Finished board thickness to be .062 +/- .004



Mechanical Information

Package Information and Dimensions

This package is lead-free/RoHS-compliant. The plating material on the leads is Ni/Au. It is compatible with both lead-free (maximum 260 $^{\circ}$ C reflow temperature) and lead (maximum 245 $^{\circ}$ C reflow temperature) soldering processes.

This device will be marked with an "M9016" designator with an alphanumeric lot code on the top surface of the package.



Mounting Configuration

All dimensions are in millimeters. This footprint represents a recommendation only.



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The date code consists of: current year (YY), last 2 digits of the week (WW), Aa = Vendor code + XXXX = TriQuint Lot Number + Z = Sub lot #



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Product Compliance Information

ESD Information

ESD Rating:	Class 3B
Value:	Passes ≥ 8000 V
Test:	Human Body Model (HBM)
Standard:	JEDEC Standard JESD22-A114
ESD Rating:	Class IV
Value:	Passes ≥ 1000 V
Test:	Charged Device Model (CDM)
Standard:	JEDEC Standard JESD22-C101
ESD Rating:	Class C
Value:	Passes ≥ 400 V
Test:	Machine Model (MM)
Standard:	JEDEC Standard JESD22-A115

MSL Rating

MSL rating 3 at +260 °C convection reflow The part is rated Moisture Sensitivity Level 3 at 260°C per JEDEC standard IPC/JEDEC J-STD-020.

Contact Information

Solderability

Compatible with the latest version of J-STD-020, Lead free solder, 260°

This part is compliant with EU 2002/95/EC RoHS directive (Restrictions on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment).

This product also has the following attributes:

- Lead Free
- Halogen Free (Chlorine, Bromine)
- Antimony Free
- TBBP-A $(C_{15}H_{12}Br_40_2)$ Free
- PFOS Free
- SVHC Free

For the latest specifications, additional product information, worldwide sales and distribution locations, and information about TriQuint:

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