

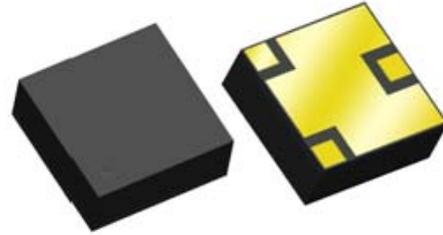
# TQM2M9016

## GPS/ SDARS Diplexer



### Applications

- Splits SDARS & GPS signals
- Ideal for Automotive applications

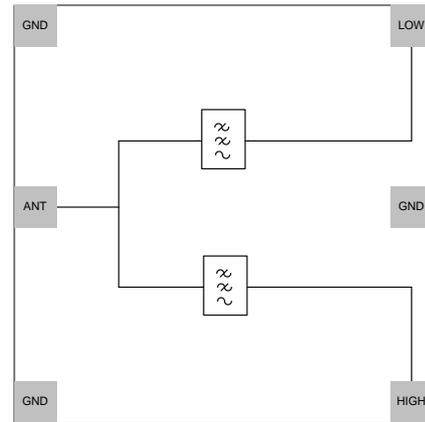


3-pins 3x3mm Leadless LGA Package

### 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

### Functional Block Diagram



### General Description

This module splits SDARS and GPS signals from a single automotive antenna. This is housed in a 3.0 x 3.0 x 1.2mm 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

### Ordering Information

Part No.	Description
TQM2M9016	GPS/SDARS Diplexer
TQM2M9016 EVB	Evaluation Board

Standard T/R size = 2500 pieces on a 13" reel.

### 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	Typ	Max	Units
V <sub>cc</sub>	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

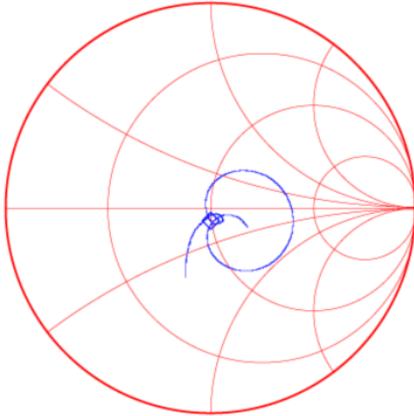
#### Electrical Specifications: High Band (SDARS)

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

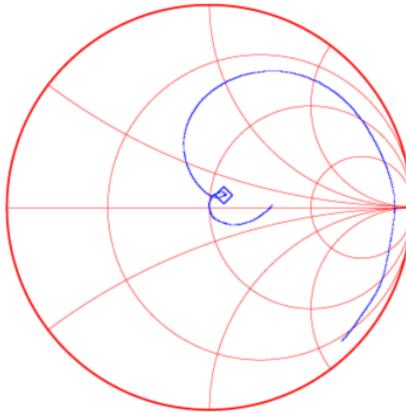
Parameter	Conditions	Min	Typical	Max	Units
Frequency Range		2.32	2.33	2.345	GHz
Insertion Loss		-	0.8	1.0	dB
Return Loss		12	20	-	dB
Attenuation	1.574 – 1.577 GHz	20	31	-	dB
Impedance		-	50	-	Ω

### Device Characterization Data

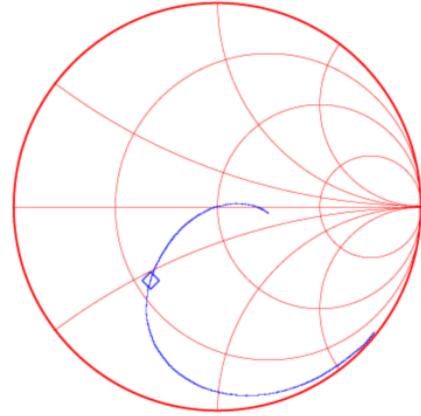
Input Response



Low Band Response



High Band Response



### S-Parameter Data

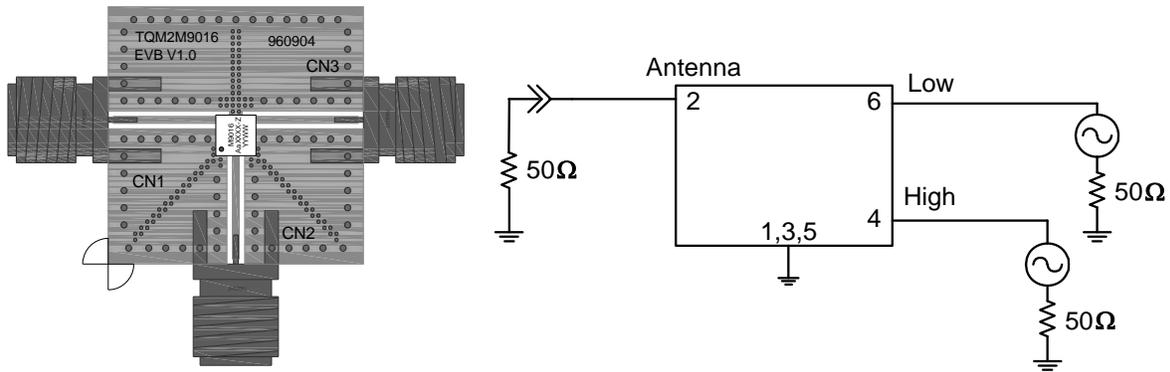
T = 25 °C, Network analyzer power level set to -25 dBm

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)	S33(sng)
1574.144	37.770	-36.419	41.350	-44.060	-148.110	-36.427	41.110	-0.375	-67.220
1577.881	39.450	-36.042	45.200	-42.501	-142.960	-36.079	44.880	-0.381	-67.560
2319.775	4.180	-31.138	-15.790	-0.785	124.570	-31.123	-15.940	-19.647	-151.470
2345.938	0.900	-29.206	-8.400	-0.744	121.150	-29.189	-8.500	-21.106	-155.940

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

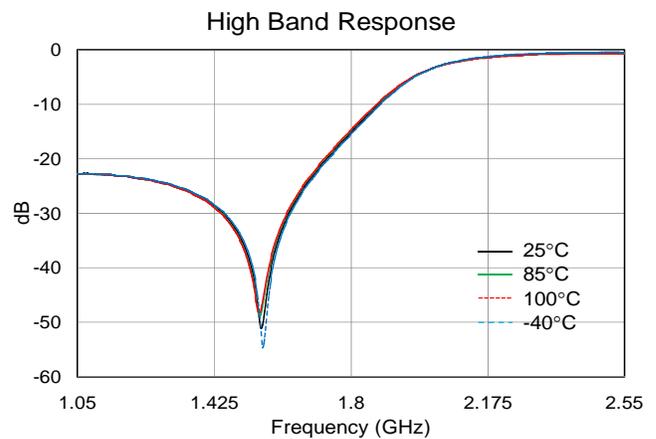
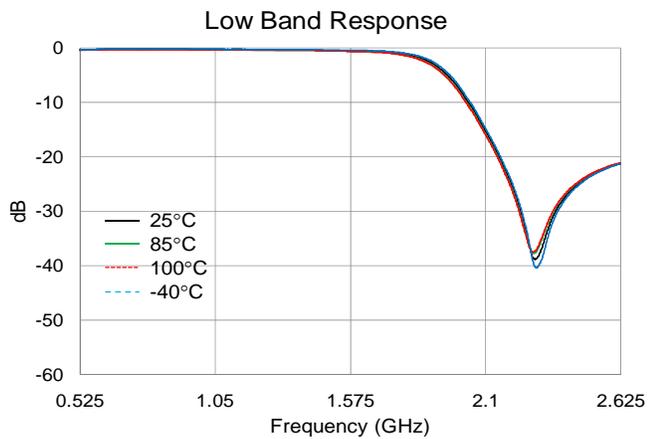
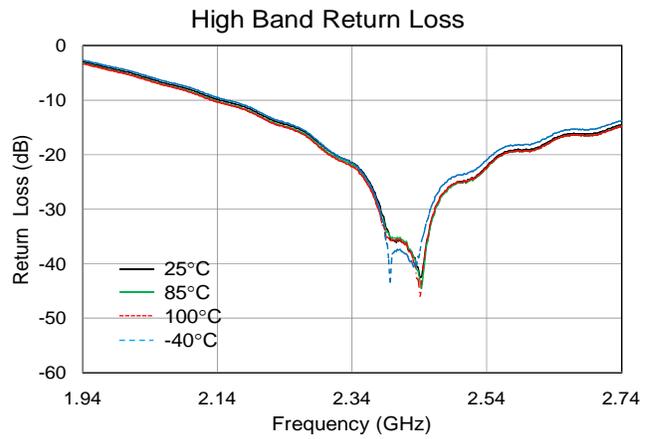
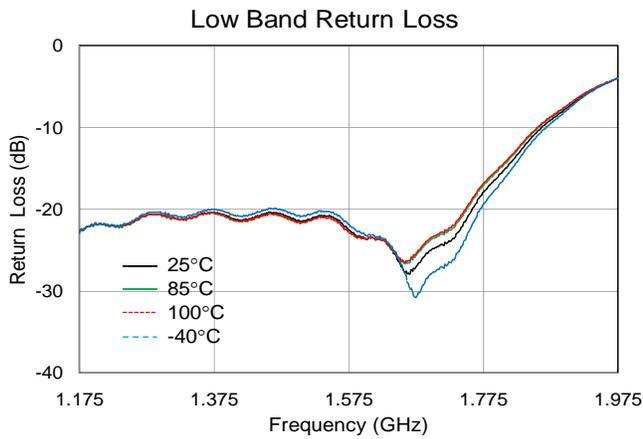
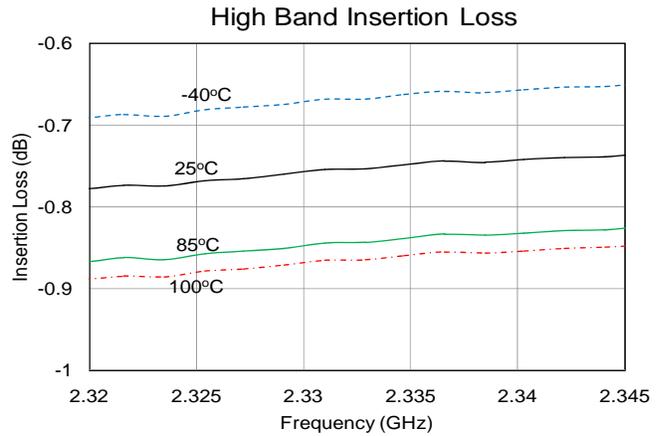
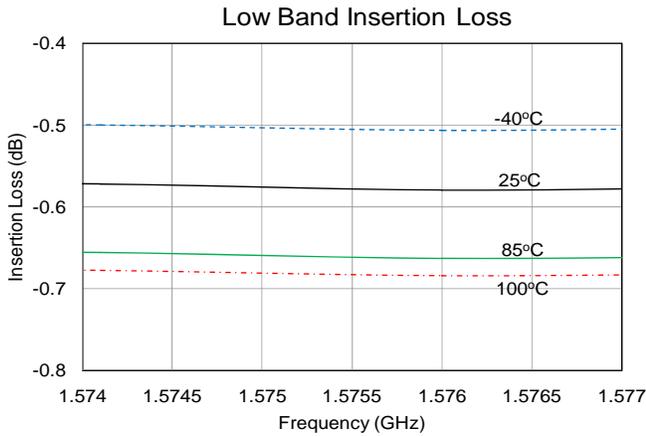
### Typical Performance High Band 2320-2345 MHz (SDARS)

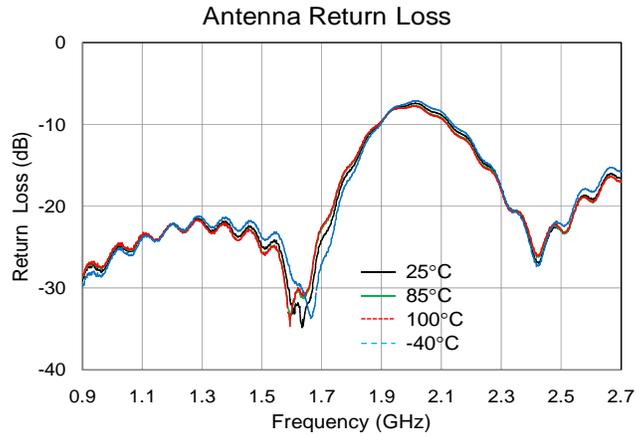
Temperature	°C	-40°C	25°C	85°C	100°C
Insertion Loss	dB	0.7	0.78	0.87	0.89
Return Loss	dB	19.6	19.7	20	20
Attenuation (1.574 – 1.577 GHz)	dB	31.5	30.5	29.7	29.7

Notes:

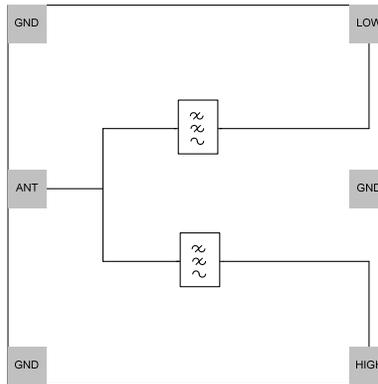
1. Test conditions: 25°C otherwise unless specified, network analyzer power level set to -25 dBm

### Typical Performance





### Pin Description

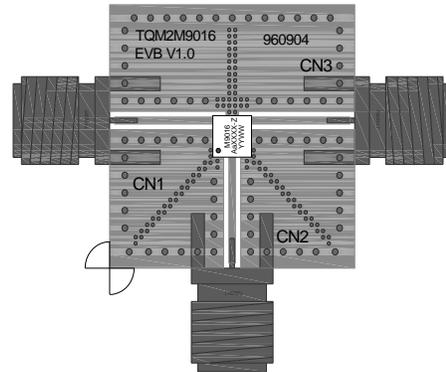


Pin	Symbol	Description
1	GND	Ground
2	ANT	Common In/Out. Contains internal DC blocking capacitor.
3	GND	Ground
4	HIGH	SDARS In/Out. Contains internal DC blocking capacitor.
5	GND	Ground
6	LOW	GPS In/Out. Do not contain internal DC blocking capacitor. DC supply should not be applied to this pin.

### Applications Information

#### PC Board Layout

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

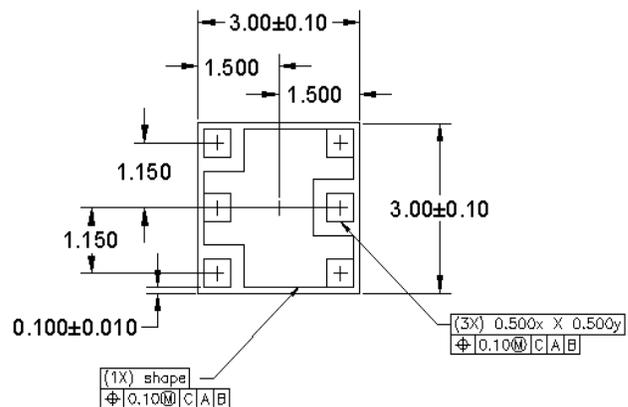


### Mechanical Information

#### Package Information and Dimensions

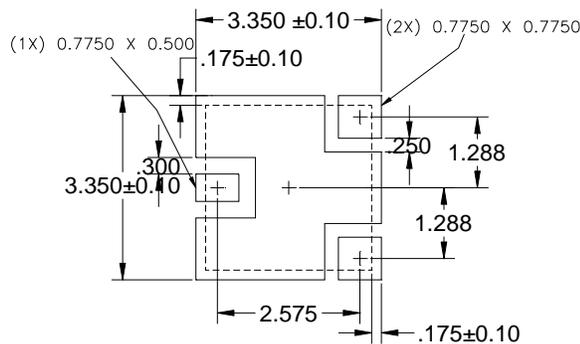
This package is lead-free/RoHS-compliant. The plating material on the leads is Ni/Au. It is compatible with both lead-free (maximum 260 °C reflow temperature) and lead (maximum 245 °C reflow temperature) soldering processes.

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



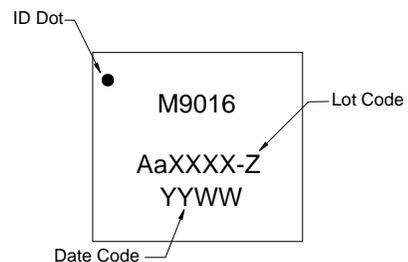
#### Mounting Configuration

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



#### Marking

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 #



## Product Compliance Information

### ESD Information

ESD Rating: Class 3B  
Value: Passes  $\geq 8000$  V  
Test: Human Body Model (HBM)  
Standard: JEDEC Standard JESD22-A114

ESD Rating: Class IV  
Value: Passes  $\geq 1000$  V  
Test: Charged Device Model (CDM)  
Standard: JEDEC Standard JESD22-C101

ESD Rating: Class C  
Value: Passes  $\geq 400$  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.

### 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 ( $C_{15}H_{12}Br_4O_2$ ) Free
- PFOS Free
- SVHC Free

## Contact Information

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

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