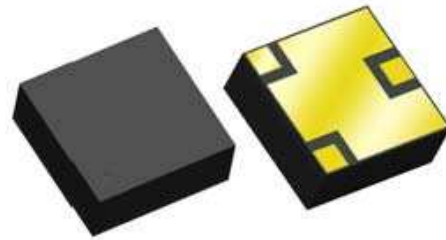


TQM2M9016

GPS/ SDARS Diplexer

Applications

- Splits SDARS & GPS signals
- Ideal for Automotive applications

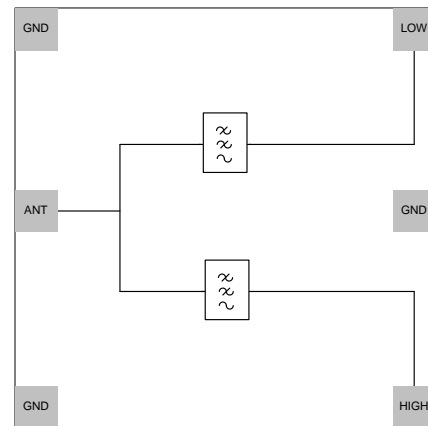


3-pins 3x3mm Leadless LGA Package

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 _{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 |

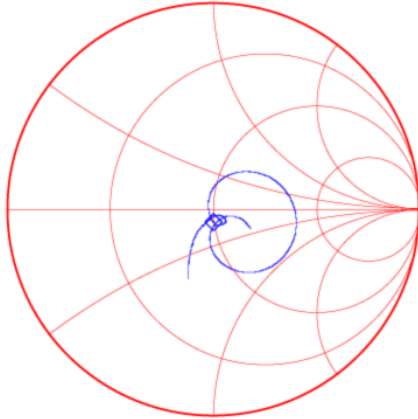
Electrical Specifications: High Band (SDARS)

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

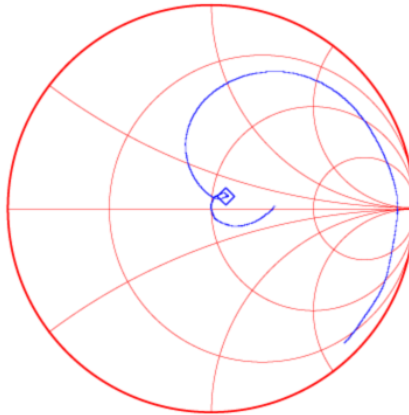
| Parameter | Conditions | Min | Typical | Max | Units |
|-----------------|-------------------|------|---------|-------|-------|
| Frequency Range | | 2.32 | 2.33 | 2.345 | GHz |
| Insertion Loss | | - | 0.8 | 1.0 | dB |
| Return Loss | | 12 | 20 | - | dB |
| Attenuation | 1.574 – 1.577 GHz | 20 | 31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

Device Characterization Data

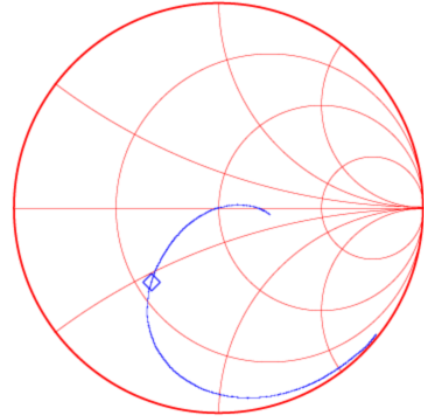
Input Response



Low Band Response



High Band Response



S-Parameter Data

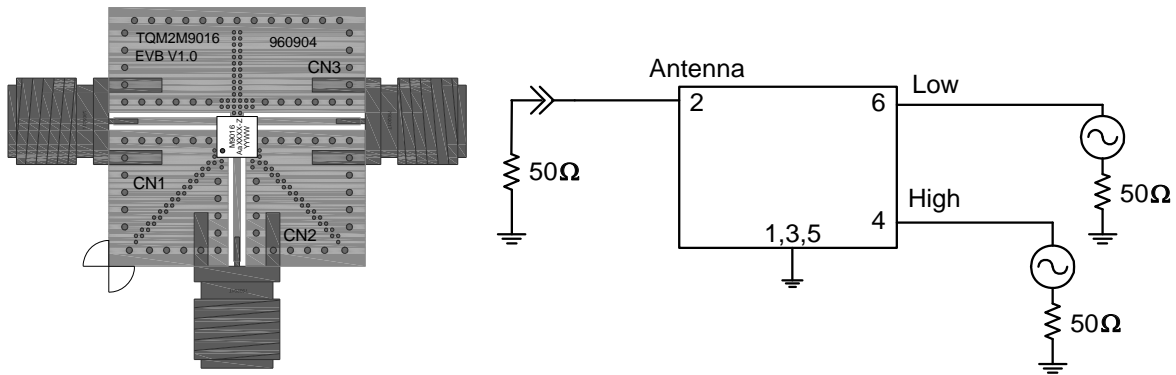
T = 25 °C, Network analyzer power level set to -25 dBm

| 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(ang) |
| 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 |

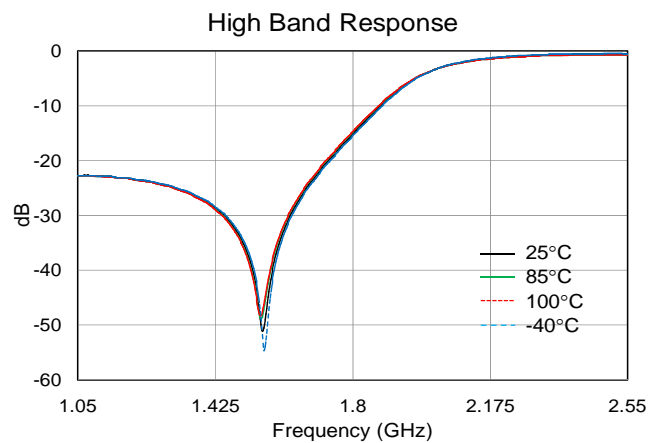
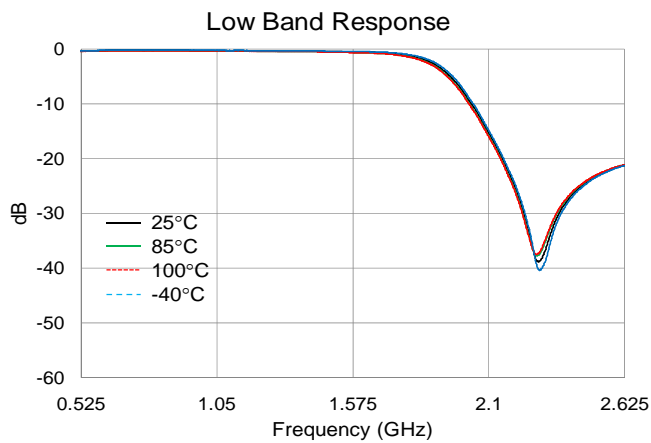
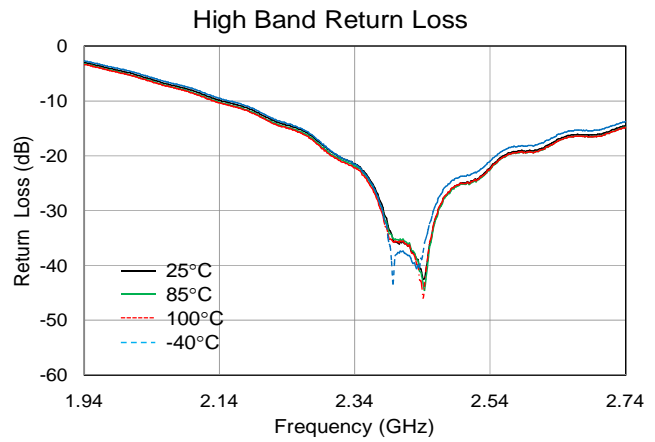
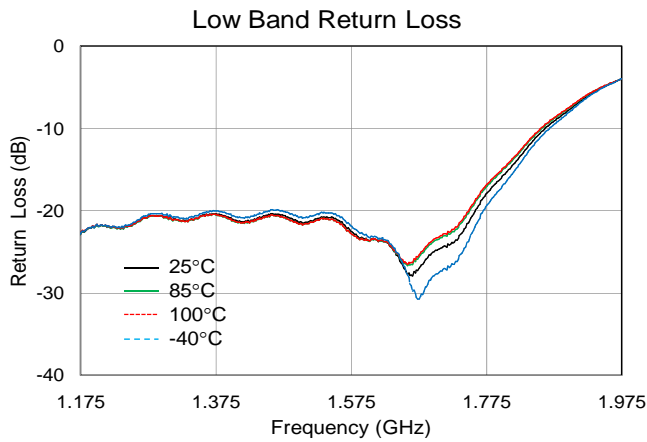
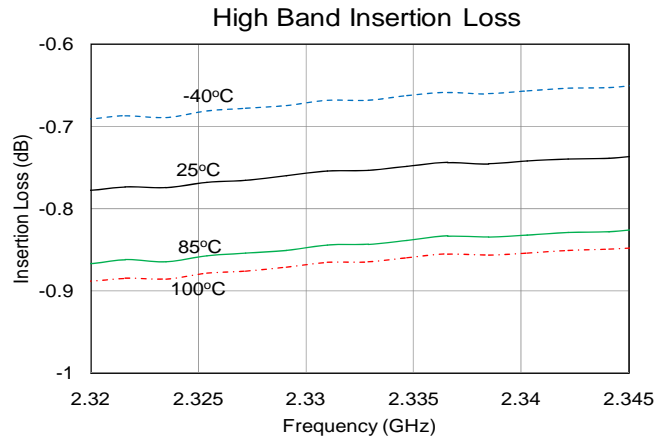
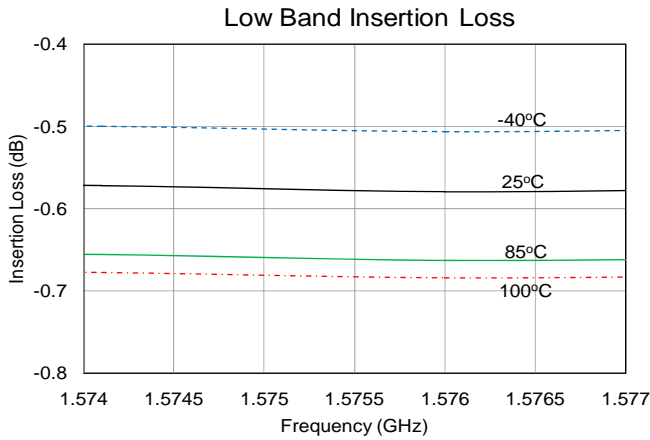
Typical Performance High Band 2320-2345 MHz (SDARS)

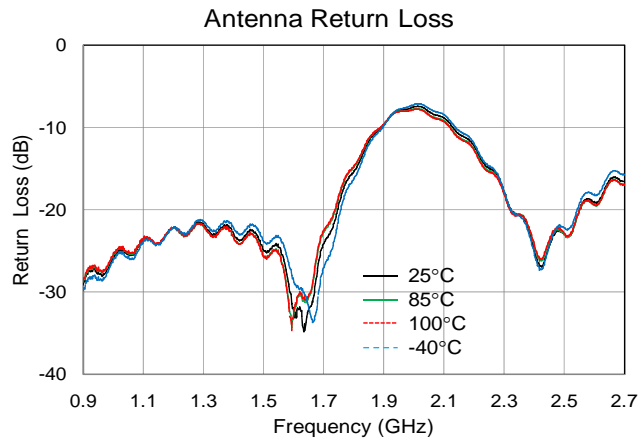
| Temperature | °C | -40°C | 25°C | 85°C | 100°C |
|---------------------------------|----|-------|------|------|-------|
| Insertion Loss | dB | 0.7 | 0.78 | 0.87 | 0.89 |
| Return Loss | dB | 19.6 | 19.7 | 20 | 20 |
| Attenuation (1.574 – 1.577 GHz) | dB | 31.5 | 30.5 | 29.7 | 29.7 |

Notes:

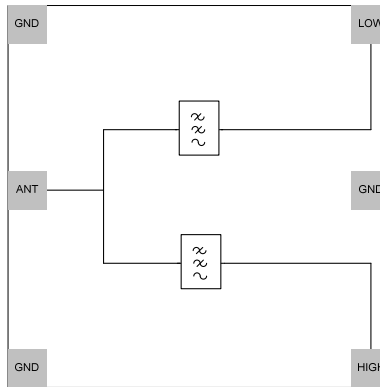
1. Test conditions: 25°C otherwise unless specified, network analyzer power level set to -25 dBm

Typical Performance





Pin Description

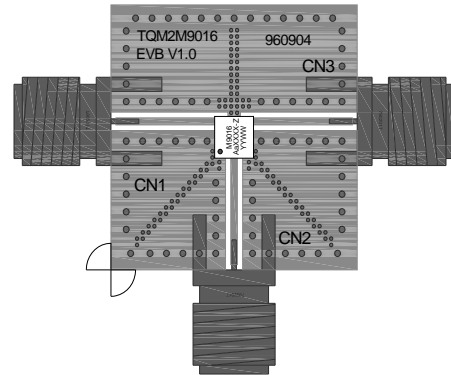


| Pin | Symbol | Description |
|-----|--------|---|
| 1 | GND | Ground |
| 2 | ANT | Common In/Out. Contains internal DC blocking capacitor. |
| 3 | GND | Ground |
| 4 | HIGH | SDARS In/Out. Contains internal DC blocking capacitor. |
| 5 | GND | Ground |
| 6 | LOW | GPS In/Out. Do not contain internal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

Applications Information

PC Board Layout

The board material is ½ oz Cu Top layer, .0075 Taconic TLY-5A dielectric, ½ oz Cu middle layer, FR4 dielectric, ½ oz Cu Bottom layer. Finished board thickness to be .062 +/- .004

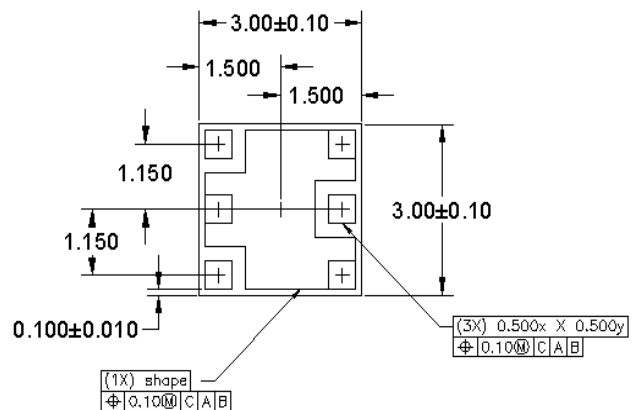


Mechanical Information

Package Information and Dimensions

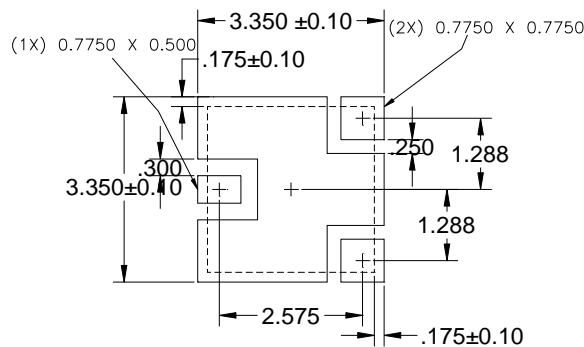
This package is lead-free/RoHS-compliant. The plating material on the leads is Ni/Au. It is compatible with both lead-free (maximum 260 °C reflow temperature) and lead (maximum 245 °C reflow temperature) soldering processes.

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



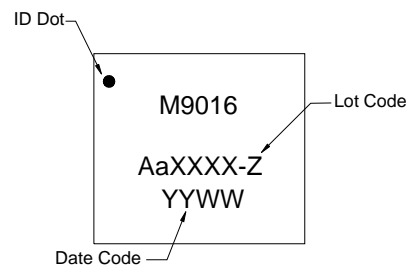
Mounting Configuration

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 ≥ 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

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 (C₁₅H₁₂Br₄O₂) Free
- PFOS Free
- SVHC Free

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

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

Web: www.triquint.com
Email: info-sales@tqs.com

Tel: +1.503.615.9000
Fax: +1.503.615.8902

For technical questions and application information:

Email: sjcapplcations.engineering@tqs.com

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