

Applications

- Commercial and Military Radar
- Electronic Warfare
- Satellite Communications
- Point to Point Radio
- Instrumentation
- General Purpose

Product Features

- Frequency Range: 2 – 25 GHz
- Attenuation Range: 20 dB
- Insertion Loss (Ref. State): < 2 dB
- Control Voltage: 0.0 – 1.5 V
- Reference Voltage: 1.5 V
- Die Size: 1.170 x 0.980 x 0.100 mm

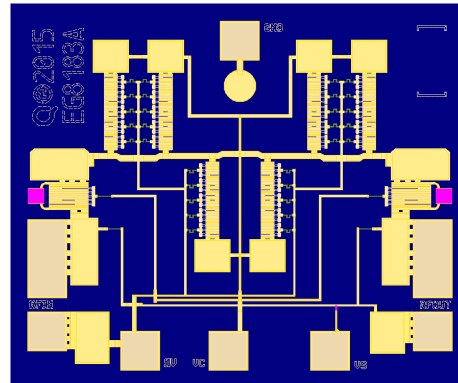
General Description

The TGL2767 is a wideband voltage-variable attenuator using Qorvo's production 0.15um GaAs pHEMT process (QPHT15). Operating from 2 – 25GHz, the TGL2767 offers > 20 dB of attenuation range with < 2 dB insertion loss in the reference state. The TGL2767's broadband performance allows it to be a single solution for a number of radar and communication bands; as well as, electronic warfare, instrumentation and other general RF-based applications.

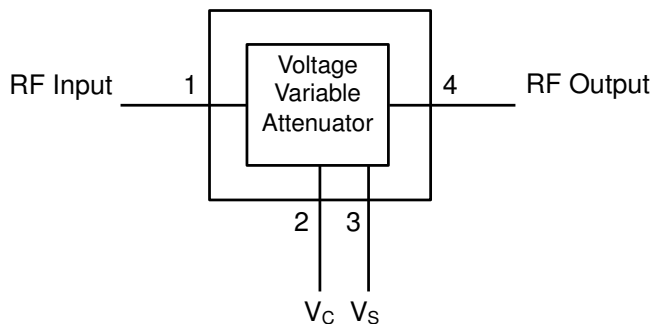
The TGL2767 is fully matched to 50 ohms and offered in a small 1.17 x 0.98 mm footprint. This along with using standard control and reference voltages, allows users to integrate the TGL2767 into their system with minimal effort.

Lead-free and RoHS compliant.

Evaluation Boards available on request.



Functional Block Diagram



Pad Configuration

Pad Number	Symbol
1	RF Input
2	V _c
3	V _s
4	RF Output

Ordering Information

Part	ECCN	Description
TGL2767	EAR99	2 – 25 GHz Voltage Variable Attenuator
TGL2767_EVB	EAR99	2 – 25 GHz Voltage Var. Attenuator Evaluation Board

Absolute Maximum Ratings

Parameter	Value
Control Voltage (V_C , V_S)	± 3.0 V
Control Current (I_C , I_S)	5 mA
Input Power (P_{IN})	30 dBm
Power Dissipation (P_{DISS})	1 W
Operating Channel Temperature	150 °C

Operation of this device outside the parameter ranges given above may cause permanent damage. These are stress ratings only, and functional operation of the device at these conditions is not implied.

Recommended Operating Conditions

Parameter	Value
Control Voltage (V_C)	0 – 1.5 V
Reference Voltage (V_S)	1.5 V

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

Electrical Specifications

Test conditions, unless otherwise noted: 25 °C, $V_C = 0 - 1.5$ V, $V_S = 1.5$ V

Parameter	Min	Typical	Max	Units
Frequency Range	2		25	GHz
Attenuation Range		20		dB
Reference State Insertion Loss ($V_C = 1.5$ V)		< 2.0		dB
Input Return Loss		> 12		dB
Output Return Loss		> 12		dB
IIP3 (10 MHz tone spacing, $P_{IN}/\text{Tone} = 10$ dBm)				
V_C set for 0 dB		> 38		dBm
V_C set for 5 dB		> 25		dBm
V_C set for 10 dB		> 22		dBm
V_C set for 15 dB		> 22		dBm
V_C set for 20 dB		> 30		dBm

Specifications

Thermal and Reliability Information

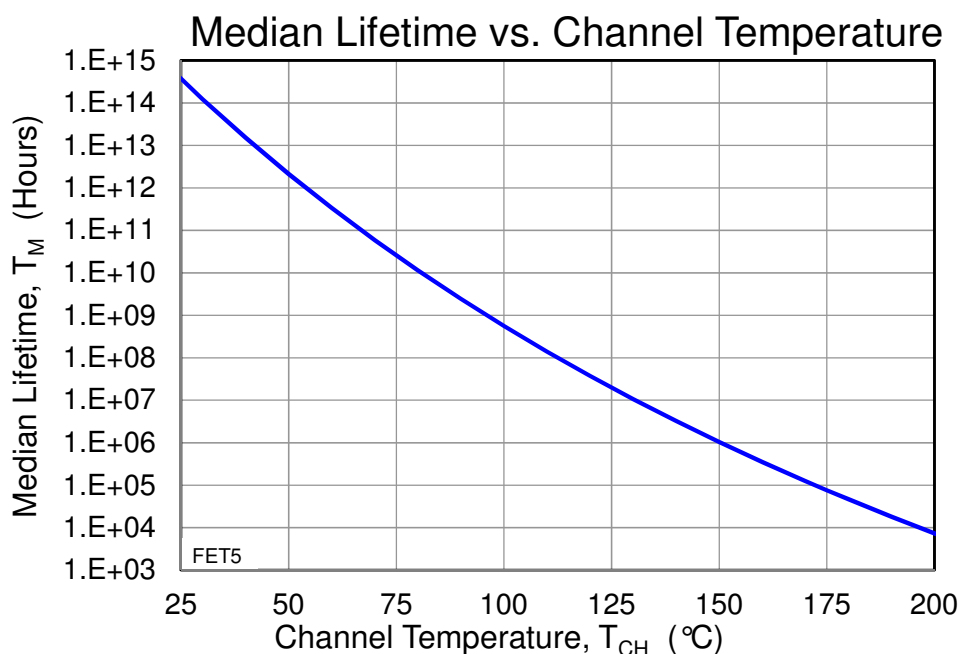
Parameter	Conditions	Value	Units
Thermal Resistance (θ_{JC}) ⁽¹⁾	$T_{BASE} = 85\text{ }^{\circ}\text{C}$, $V_C = 0\text{ V}$, $P_{DISS} = 1.0\text{ W}$	40.0	$^{\circ}\text{C/W}$
Channel Temperature (T_{CH}) ⁽¹⁾		125.0	$^{\circ}\text{C}$
Median Lifetime (T_M)		2.4E+7	Hrs

Note:

1. Die mounted to 40 mil thick CuMo carrier plate, with carrier plate backside temperature fixed at 85 $^{\circ}\text{C}$.

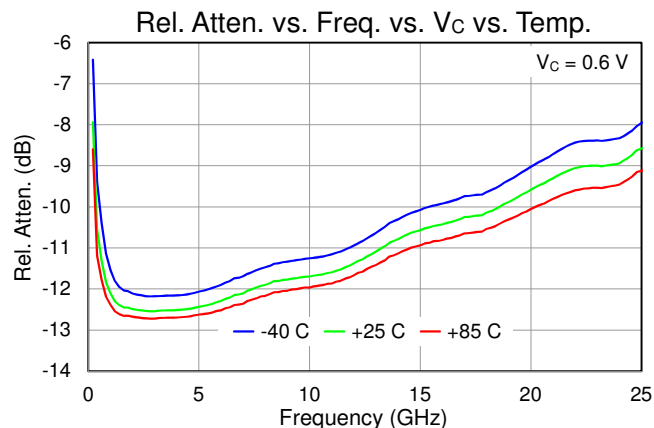
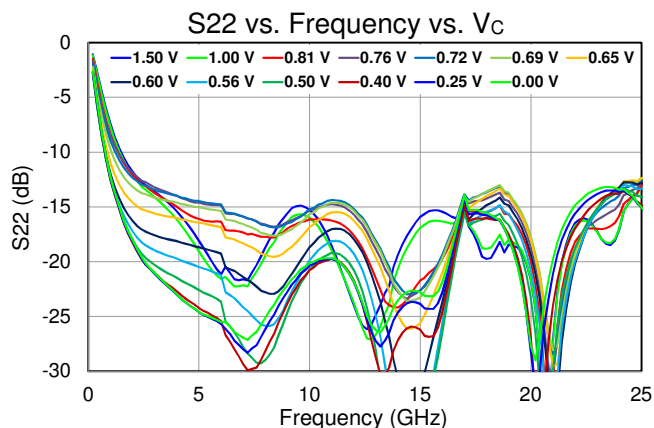
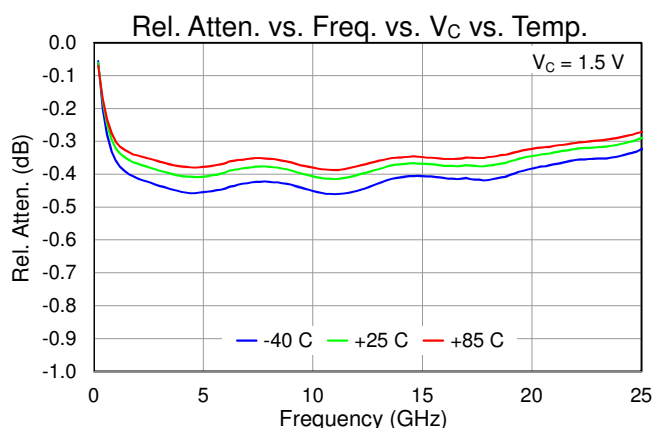
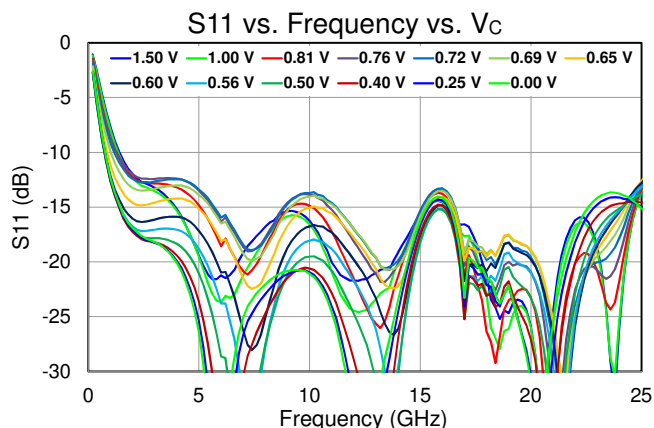
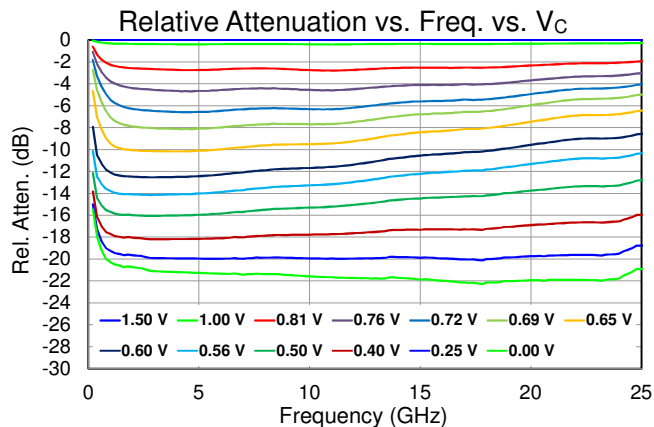
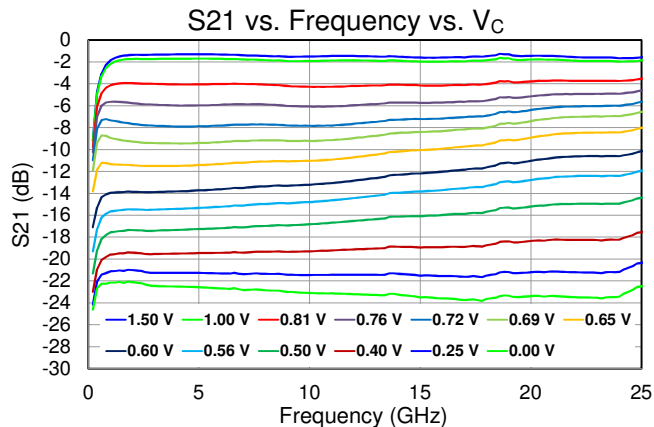
Median Lifetime

Test Conditions: 6.0 V; Failure Criterion = 10% reduction in $I_{D\text{ MAX}}$



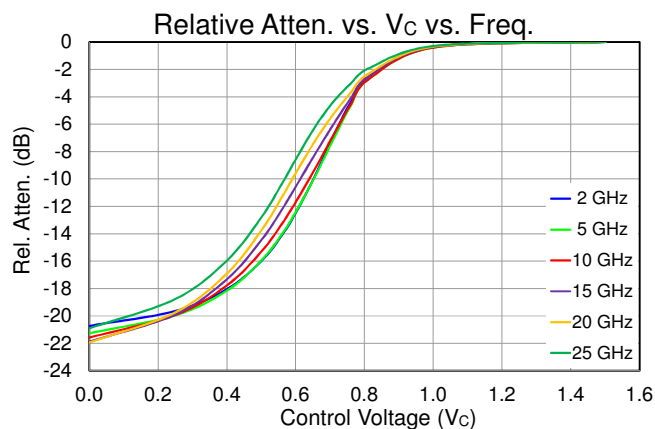
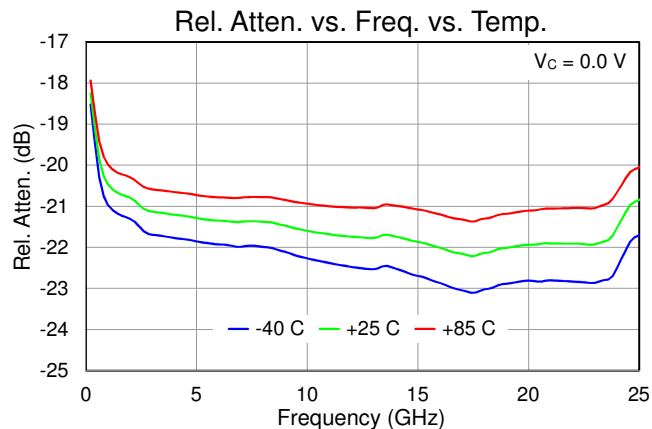
Typical Performance – Small Signal

Test conditions unless otherwise noted: Temp. = 25 °C, $V_S = 1.5$ V, tested with DUT mounted to EVB



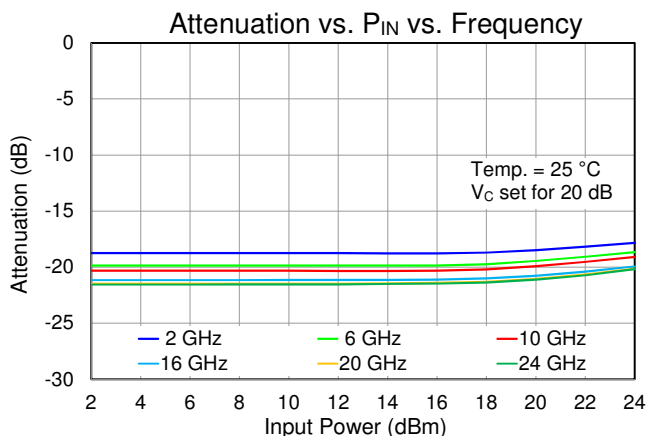
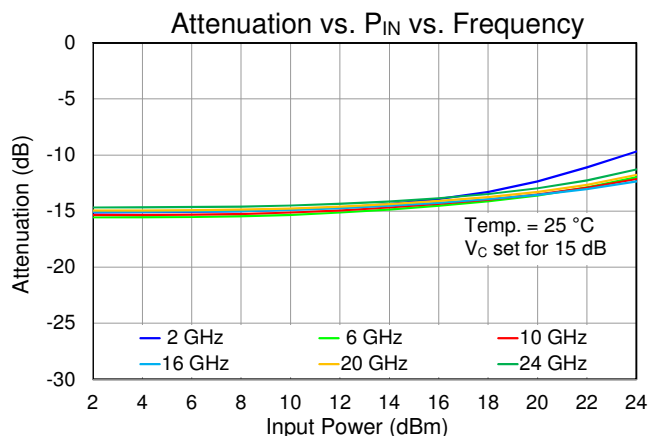
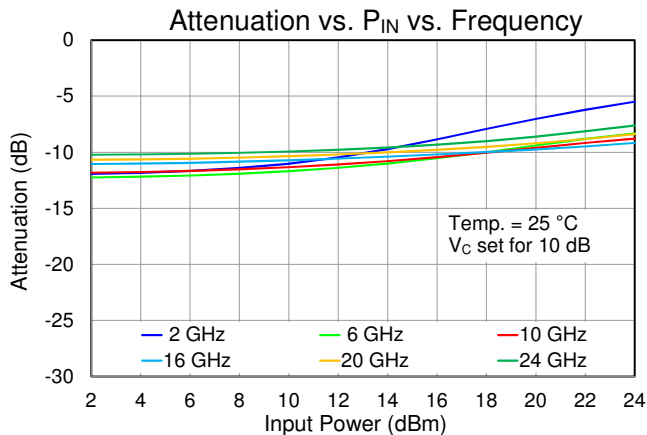
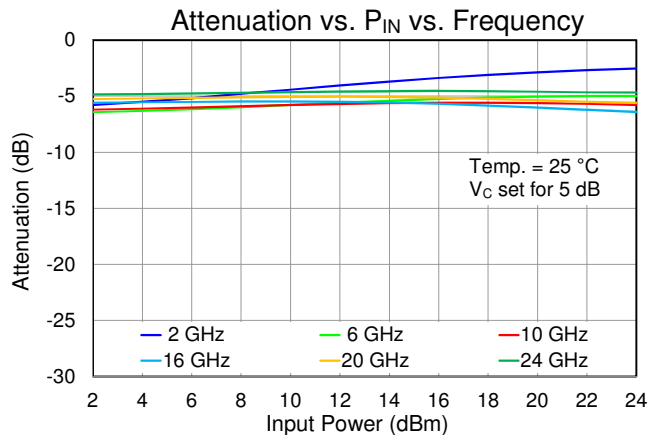
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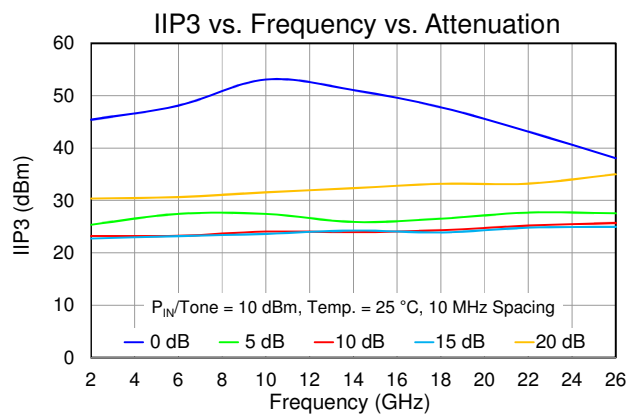
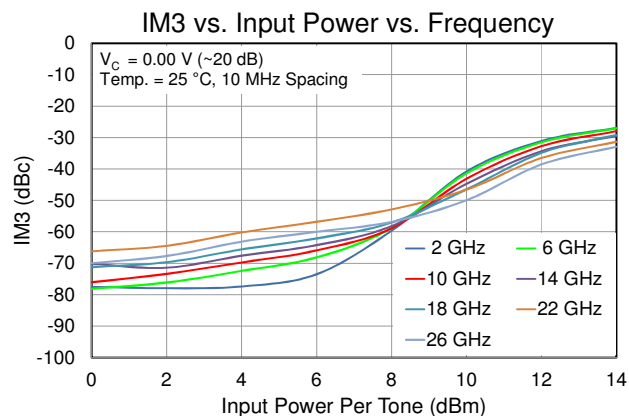
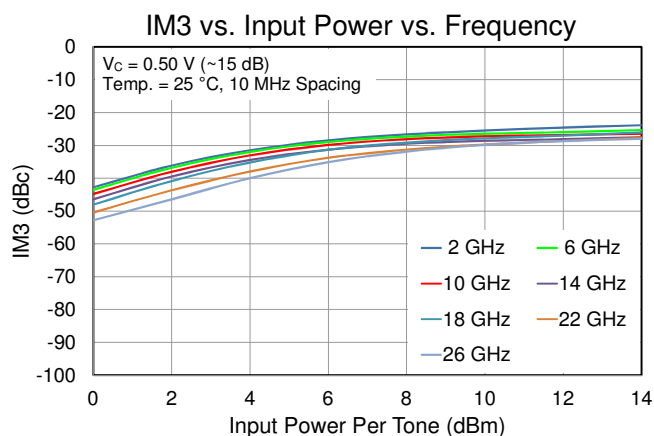
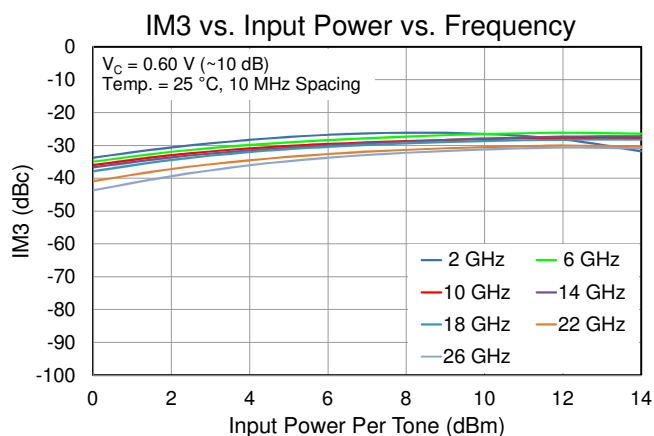
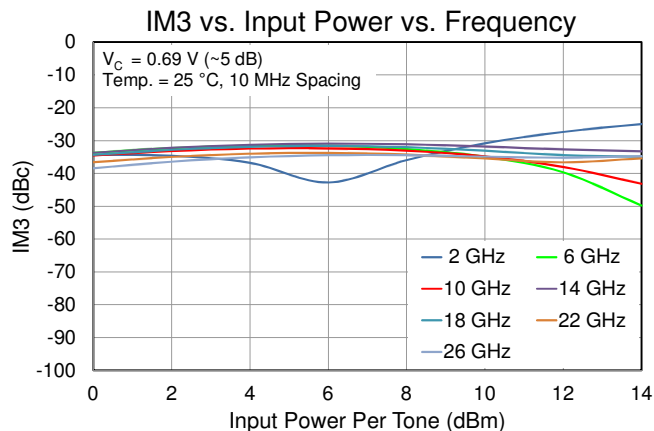
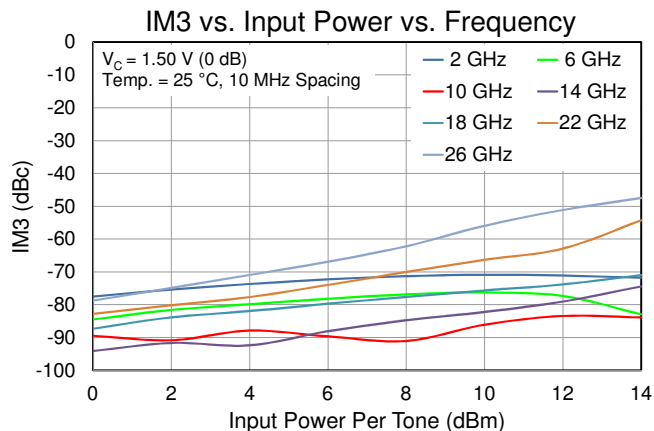
Typical Performance – Power Performance

Test conditions unless otherwise noted: Temp. = 25 °C, $V_S = 1.5$ V, tested with DUT mounted to EVB

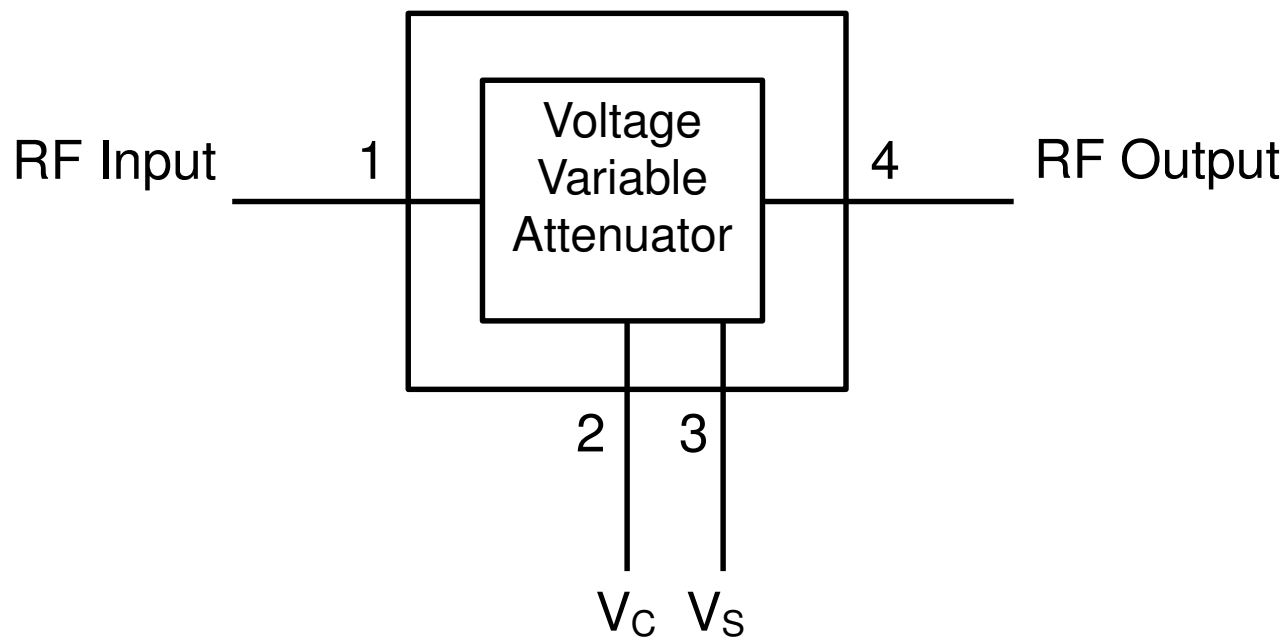


Typical Performance – Linearity

Test conditions unless otherwise noted: Temp. = 25 °C, $V_S = 1.5$ V, tested with DUT mounted to EVB



Application Circuit

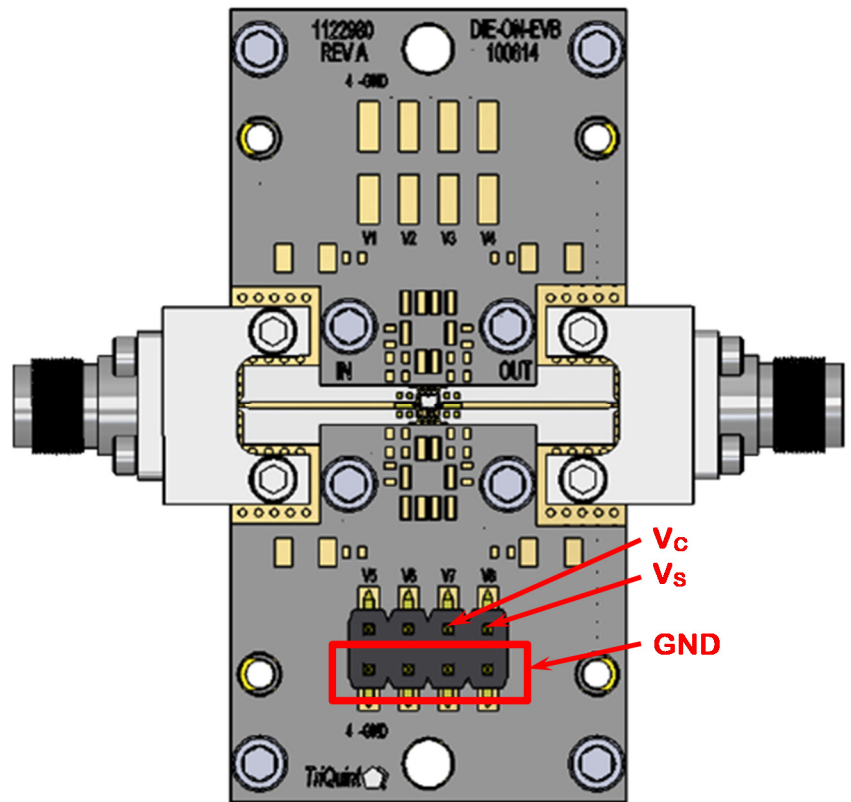


Applications Information

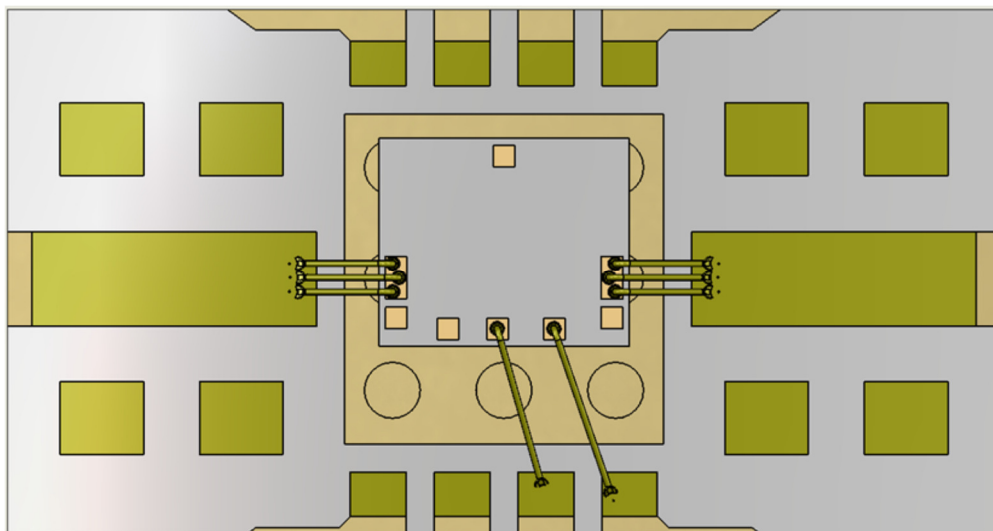
Evaluation Board Layout

RF Layer is 0.008" thick Rogers Corp. RO4003C, $\epsilon_r = 3.38$. Metal layers are 0.5 oz. copper. The microstrip line at the connector interface is optimized for the Southwest Microwave end launch connector 1092-01A-5.

The pad pattern shown has been developed and tested for optimized assembly at TriQuint Semiconductor. The PCB land pattern has been developed to accommodate lead and package tolerances. Since surface mount processes vary from company to company, careful process development is recommended.



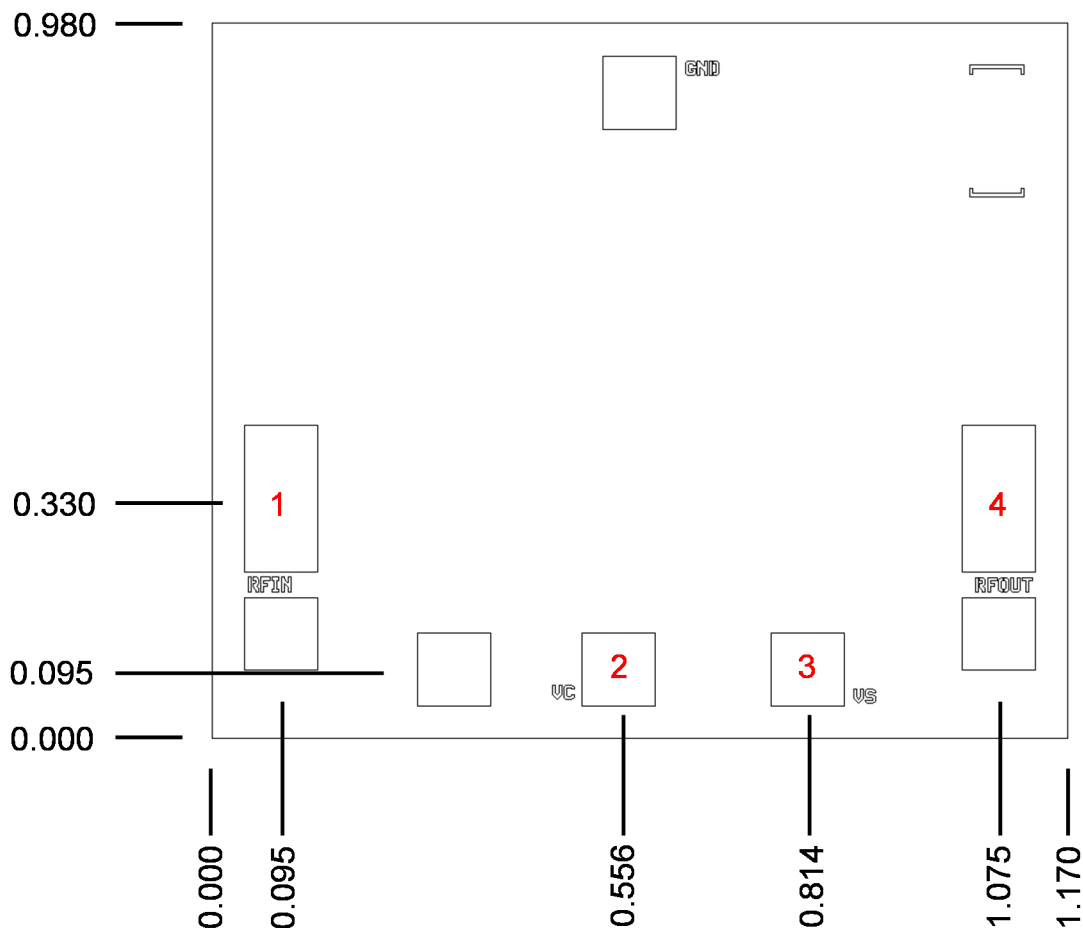
EVB Die Mounting Detail



Note:

Multiple copper-filled vias should be employed under die to minimize inductance and thermal resistance.

Mechanical Drawing and Bond Pad Description



Pin No.	Symbol	Description	Pad Size (um x um)
1	RF Input	RF Input, 50 Ω , AC coupled	100 x 200
2	V _c	V _c , control voltage	100 x 100
3	V _s	V _s , reference voltage	100 x 100
4	RF Output	RF Output, 50 Ω , AC coupled	100 x 200

Assembly Notes

Component placement and adhesive attachment assembly notes:

- Vacuum pencils and/or vacuum collets are the preferred method of pick up.
- Air bridges must be avoided during placement.
- The force impact is critical during auto placement.
- Organic attachment (i.e., conductive epoxy) can be used in low-power or PCB mounted applications.
- Curing should be done in a convection oven; proper exhaust is a safety concern.

Reflow process assembly notes:

- Use AuSn (80/20) solder and limit exposure to temperatures above 300°C to 3-4 minutes, maximum.
- An alloy station or conveyor furnace with reducing atmosphere should be used.
- Do not use any kind of flux.
- Coefficient of thermal expansion matching is critical for long-term reliability.
- Devices must be stored in a dry nitrogen atmosphere.

Interconnect process assembly notes:

- Thermosonic ball bonding is the preferred interconnect technique.
- Force, time, and ultrasonic levels are critical parameters.
- Aluminum wire should not be used.
- Devices with small pad sizes should be bonded with 0.0007-inch wire.

Product Compliance Information

ESD Sensitivity Ratings



Caution! ESD-Sensitive Device

ESD Rating: TBD
Value: TBD
Test: Human Body Model (HBM)
Standard: JEDEC Standard JESD22-A114

ECCN

US Department of Commerce: EAR99

Solderability

Use only AuSn (80/20) solder and limit exposure to temperatures above 300 °C to 3-4 minutes, maximum.

Conductive epoxy die attach is recommended for PCBs.

RoHS-Compliance

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

Contact Information

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

Web: www.triquint.com Tel: +1.972.994.8465
Email: customer.support@qorvo.com

For information about the merger of RFMD and TriQuint as Qorvo:

Web: www.qorvo.com

For technical questions and application information: Email: info-products@tgs.com

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