

Product Description

The Qorvo TGC2610-SM is a Ku-Band Image Reject Downconverter. The TGC2610-SM operates over an RF frequency range of 10 to 15.4 GHz and LO from 6 to 19 GHz with IF outputs from DC to 4 GHz. This part is designed using Qorvo's pHEMT production process.

The TGC2610-SM integrates an LNA, and image reject mixer driven by an LO buffer amplifier. It typically provides an Input IP3 of 2 dBm at -25 dBm input power per tone and has a conversion gain of 14 dB and noise figure of 2.5 dB or less.

The TGC2610-SM is available in a low-cost, surface mount 28 lead 5x5 mm QFN package and is ideally suited for Point-to-Point Radio, and Ku-Band VSAT Ground Terminal applications.

Lead-free and RoHS compliant.



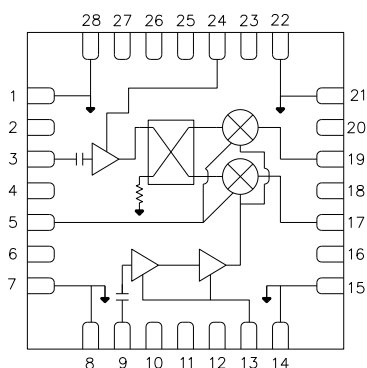
28-pin 5x5 mm QFN package

Product Features

- RF Frequency Range: 10 – 15.4 GHz
- IF Frequency: DC – 4 GHz
- LO Frequency: 6 – 19 GHz
- LO Input Power: 0 to 8 dBm
- Input IP3: 2 dBm
- Conversion Gain: 14 dB
- Noise Figure: ≤ 2.5 dB
- Package Dimensions: 5.0 x 5.0 x 1.3 mm

Performance is typical across frequency. Please reference electrical specification table and data plots for more details.

Function Block Diagram



Applications

- VSAT
- Point-to-Point Radio
- Test Equipment & Sensors

Ordering Information

Part No.	Description
TGC2610-SM	10 GHz – 15.4 GHz Downconverter
TGC2610-SM	1.3 - 2.45 GHz EVAL BOARD
TGC2610-SM	2.5 - 4.0 GHz EVAL BOARD

Standard T/R size = 500 pieces on a 7" reel

Absolute Maximum Ratings

Parameter	Rating
V _{DLNA}	6 V
V _{DLO}	6 V
I _{DRF}	140 mA
I _{DLO}	150 mA
V _{GX}	0 V
Power Dissipation, P _{diss}	1.7 W
RF Input Power, CW, T = 25 °C	16 dBm
Channel Temperature, T _{ch}	200 °C
Mounting Temperature (30 sec)	260 °C
Storage Temperature	-65 to 125 °C

These are stress ratings only, functional operation of the device at these conditions is not implied. Extended application of Absolute Maximum Rating conditions may reduce device reliability. Operation of this device outside the parameter ranges given above may cause permanent damage.

Recommended Operating Conditions

Parameter	Min	Typ.	Max	Units
Operating Temperature Range	-40	+25	+85	°C
V _{DRF}	3	4	5	V
I _{DRF}		88		mA
V _{DLO}	3	4	5	V
I _{DLO}		71		mA
V _{GX}		See Note		
LO Input Power	0	4	8	dBm

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

Note: V_{GX} is connected to 23 ohms resistor to ground

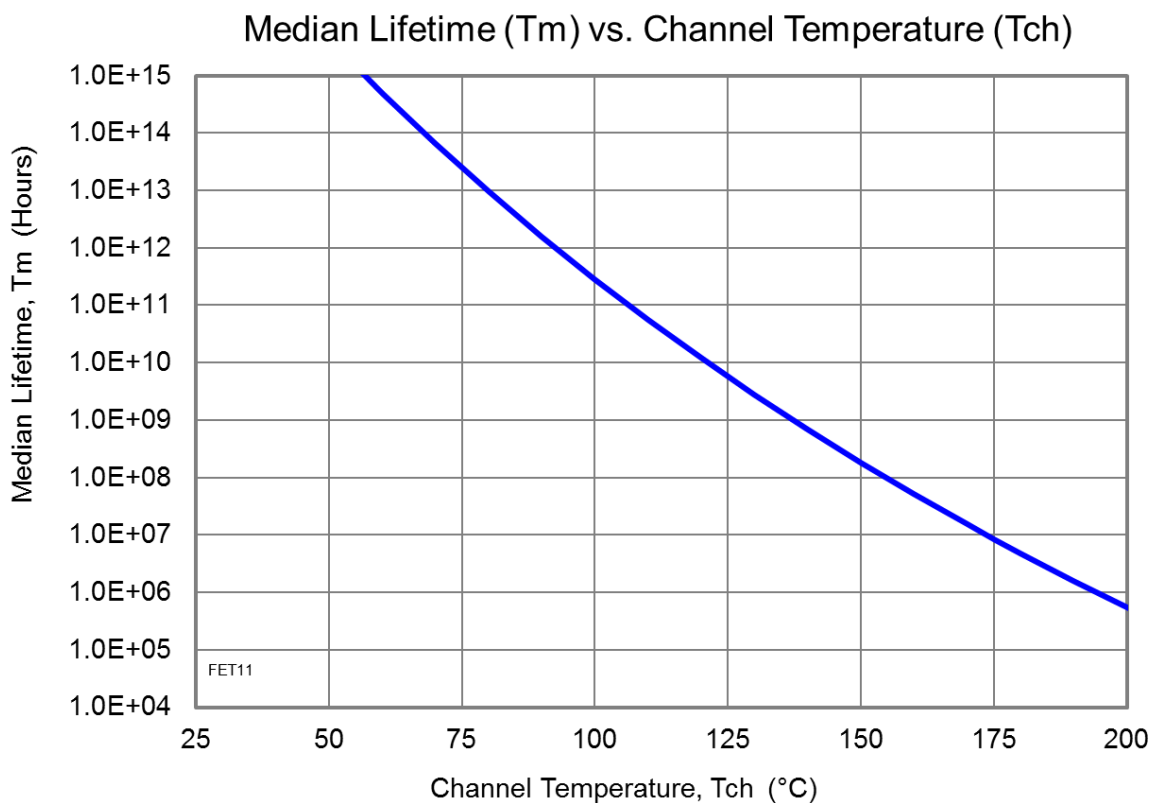
Electrical Specifications

Test conditions unless otherwise noted: IF Input Power = -20 dBm, LO Input Power = 4 dBm, V_{DLO} = 4 V, I_{DLO} = 65 mA, V_{DRF} = 4 V, I_{DRF} = 58 mA.

Parameter	Conditions	Min	Typ.	Max	Units
RF Frequency Range		10		15.4	GHz
LO Frequency Range		6		19	GHz
IF Frequency Range		0		4	GHz
LO Input Power		0	4	8	dBm
Drain Current, LO (I _{DLO})			70		mA
Drain Current, RF (I _{DRF})			90		mA
Conversion Gain			14		dB
Input Third Order Intercept Point (IIP3)			2		dBm
Image Rejection (IMR)			18		dB
Noise Figure			2		dB

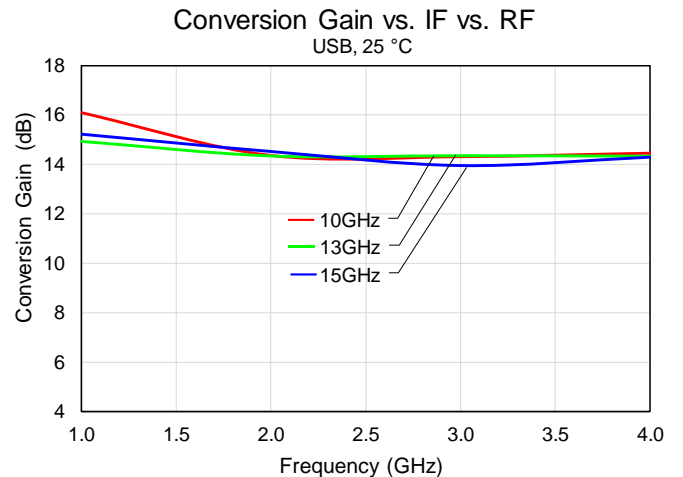
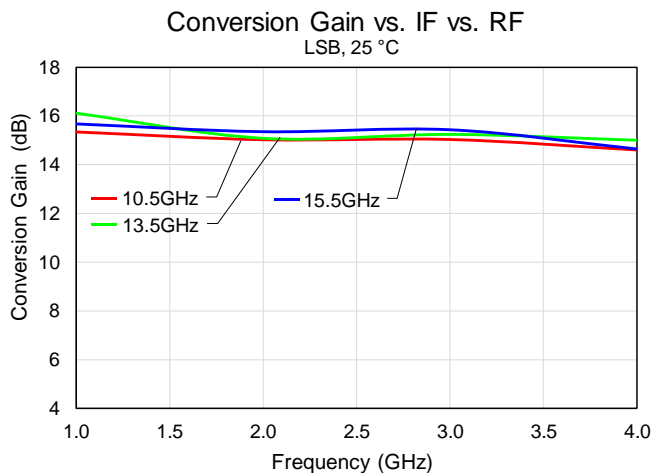
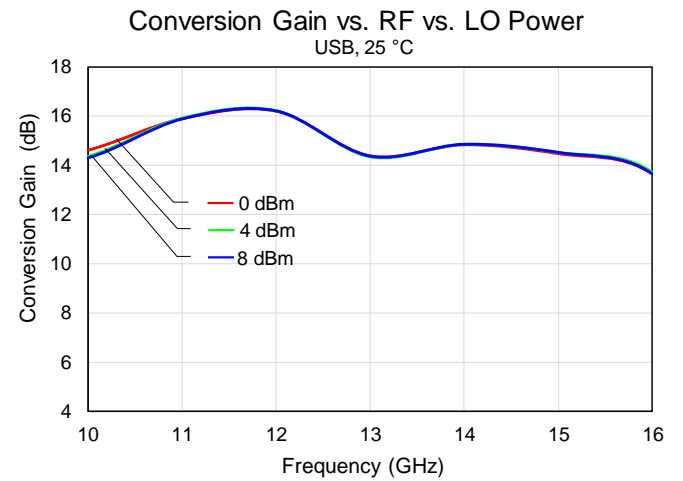
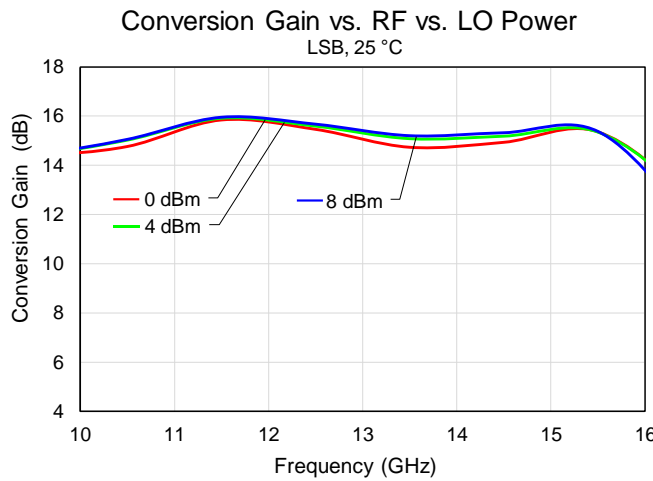
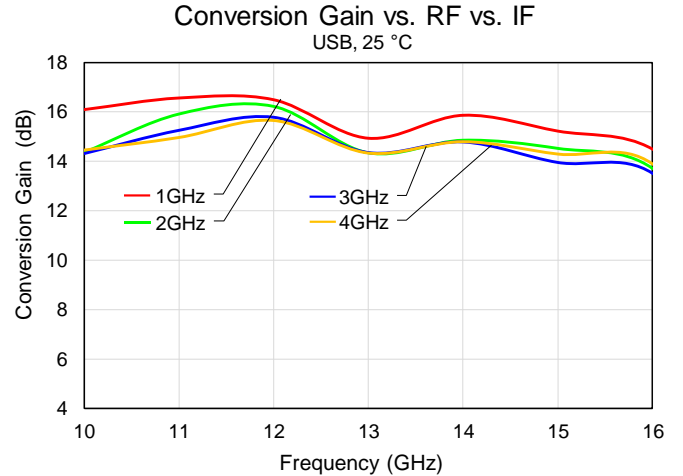
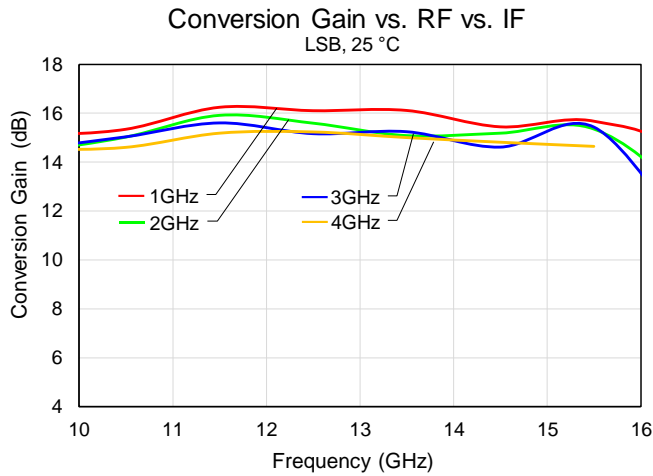
Thermal and Reliability Information

Parameter	Conditions	Rating
Thermal Resistance, θ_{JC} , measured to back of package	Tbase = 85 °C	$\theta_{JC} = 75.5 \text{ }^\circ\text{C/W}$
Channel Temperature (Tch), and Median Lifetime (Tm)	Tbase = 85 °C Vd = 4 V Id = 160 mA LO Power = 4dBm Pdiss = 0.64 W	Tch = 133 °C Tm = 1.8E+9 Hours



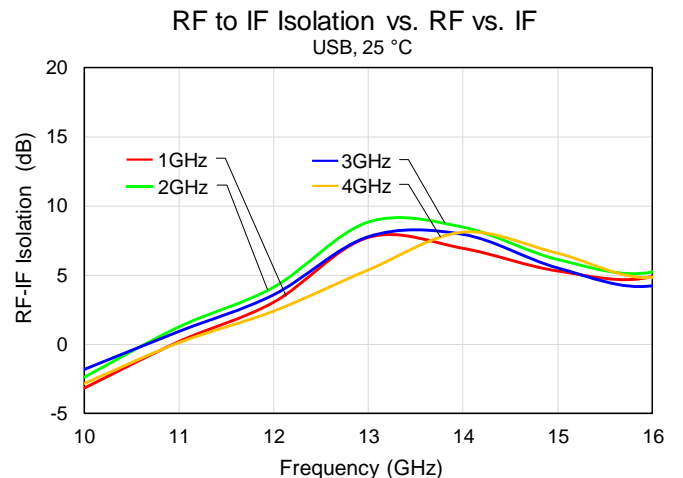
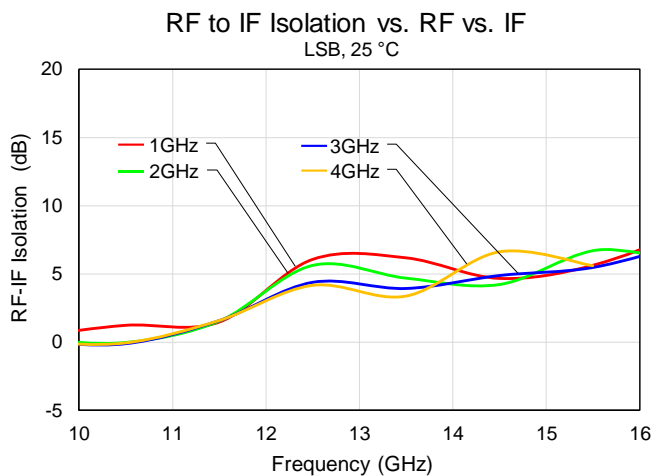
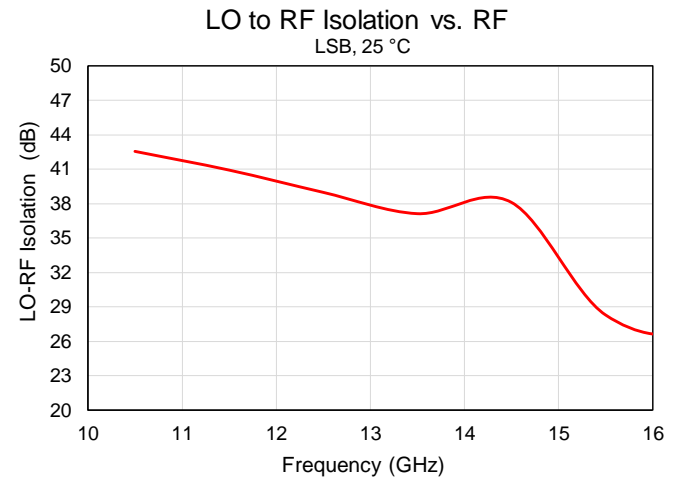
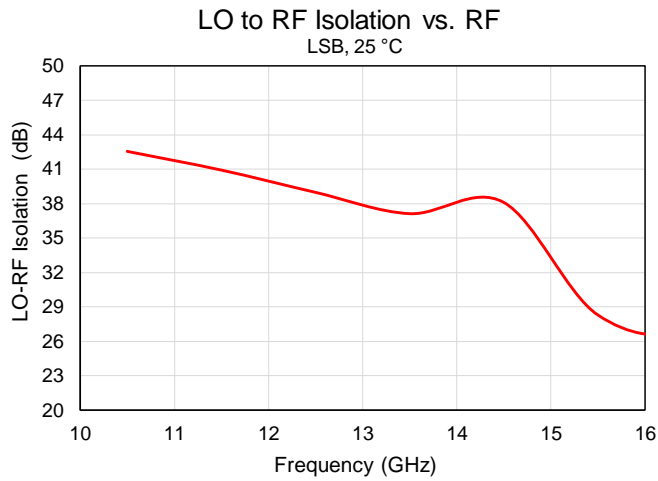
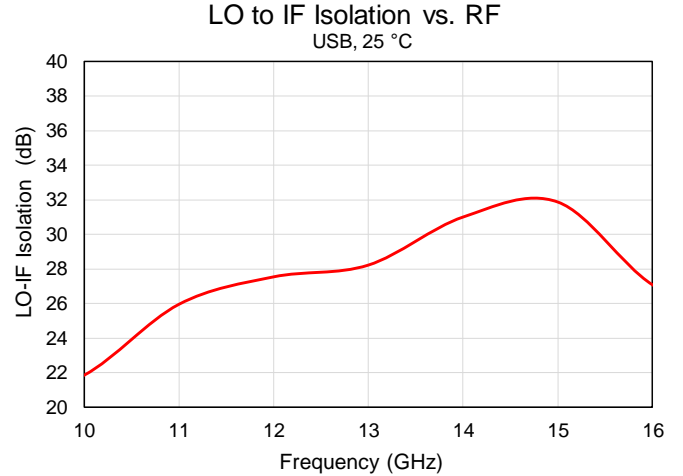
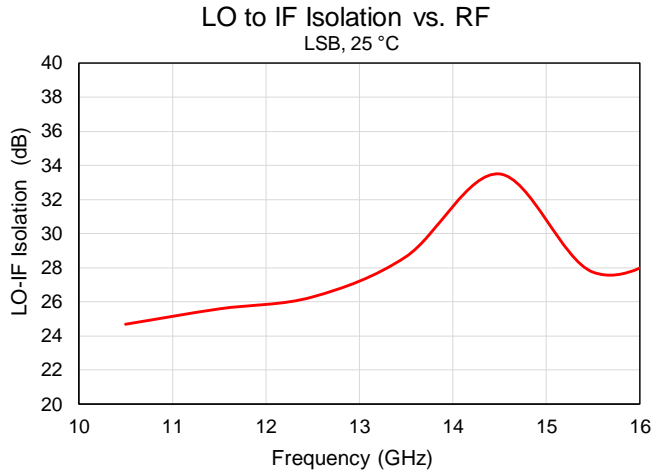
Performance Plots

RF Input Power = -25 dBm, VDLO = 4 V, IDLO = 65 mA, VDRF = 4 V, IDRFB = 85 mA.
Data taken with external IF hybrid.



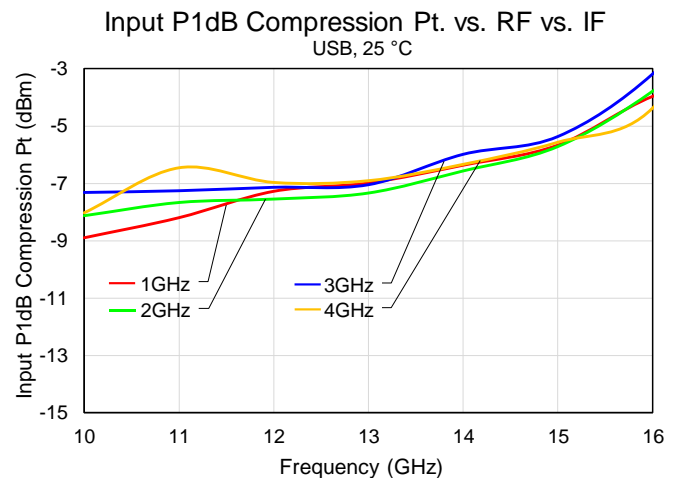
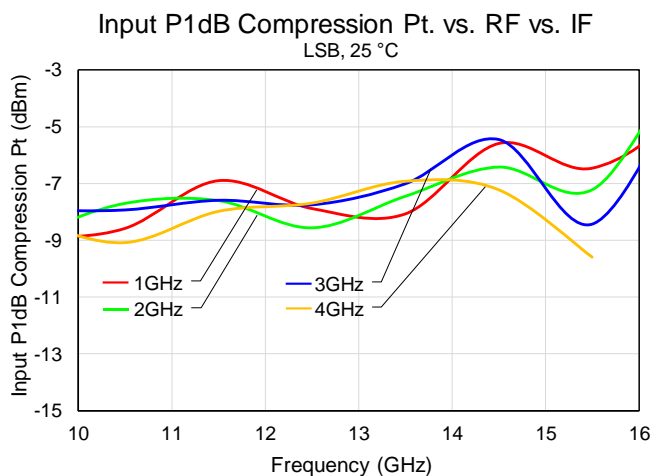
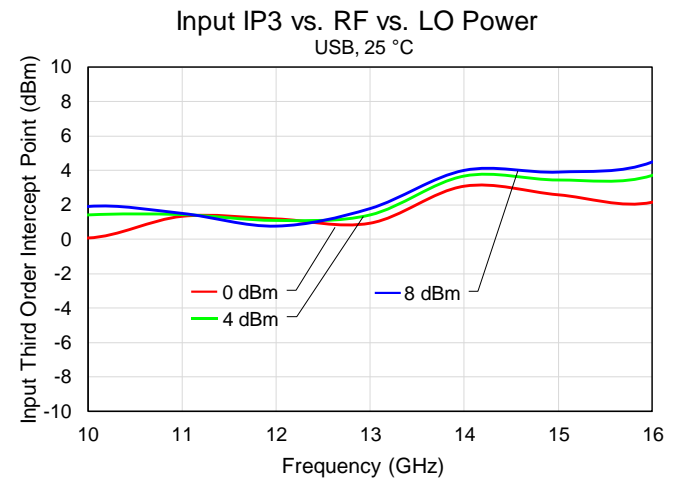
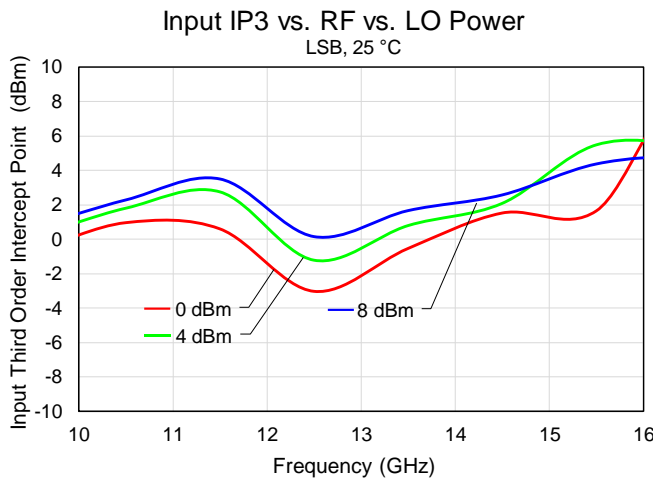
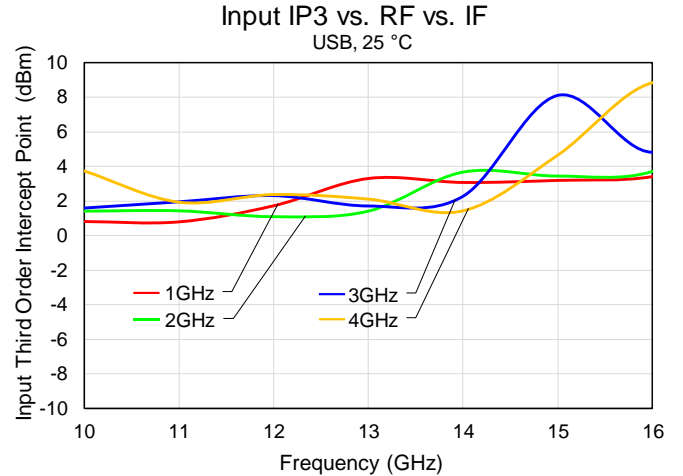
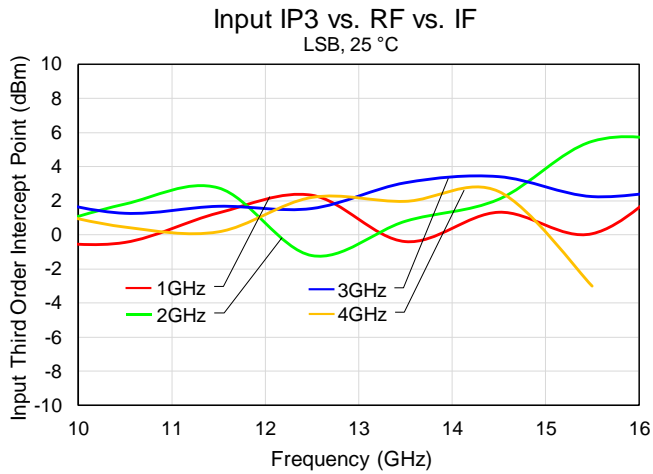
Performance Plots

RF Input Power = -25 dBm, VDLO = 4 V, IDLO = 65 mA, VDRF = 4 V, IDRf = 85 mA.
Data taken with external IF hybrid.



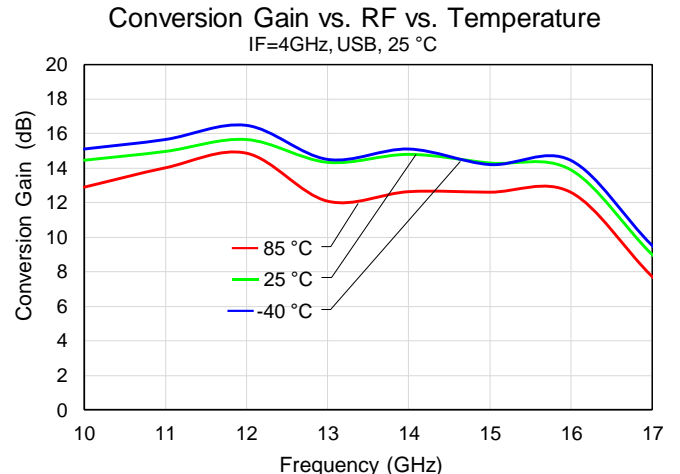
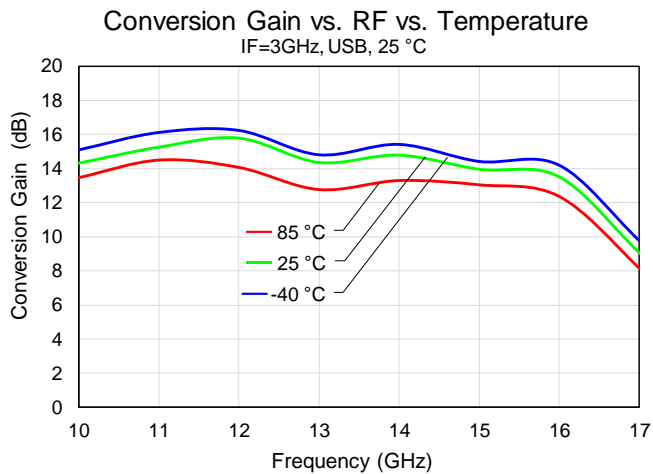
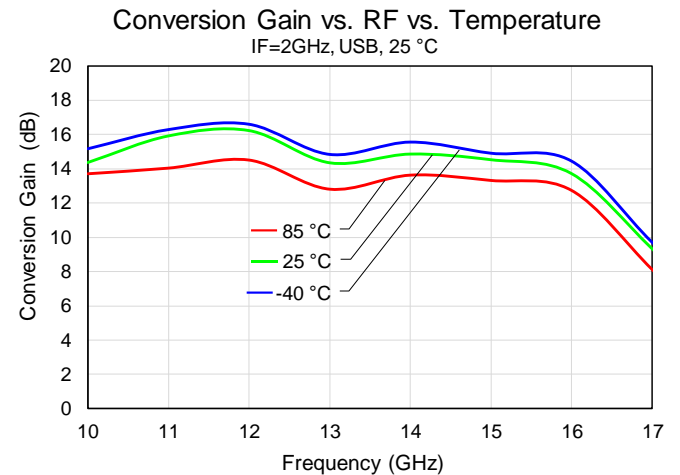
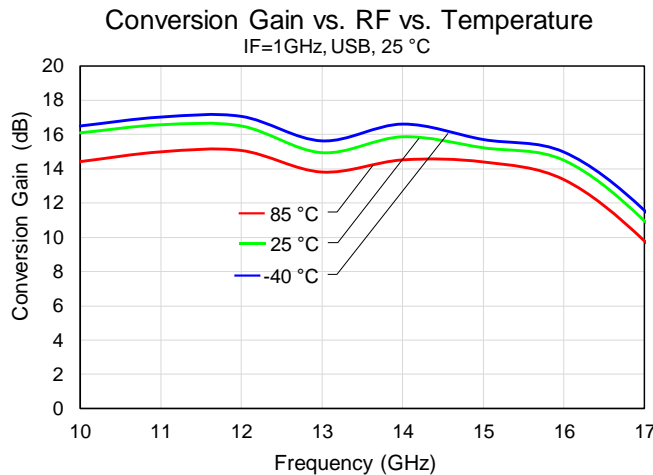
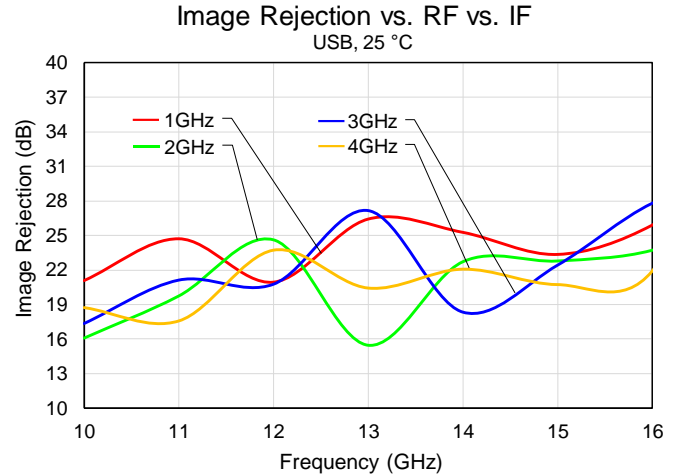
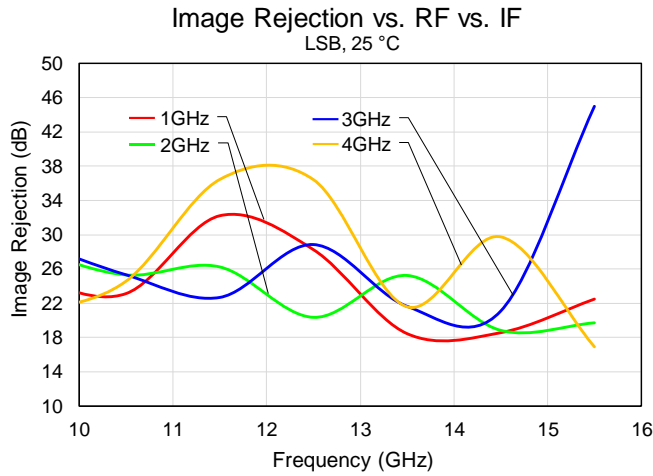
Performance Plots

RF Input Power = -25 dBm, VDLO = 4 V, IDLO = 65 mA, VDRF = 4 V, IDRF = 85 mA.
Data taken with external IF hybrid.



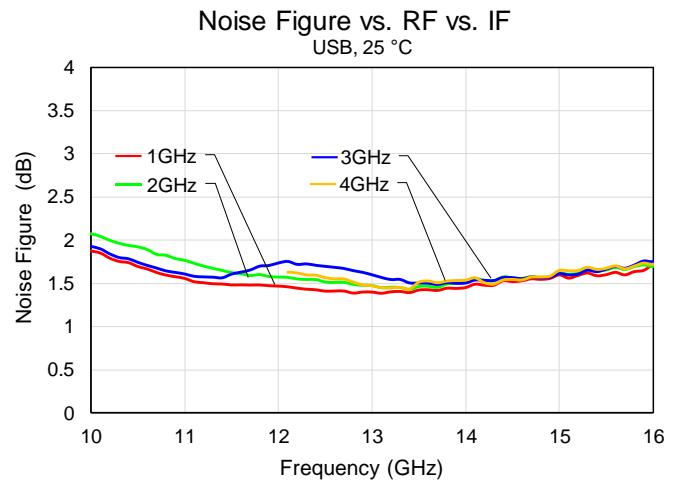
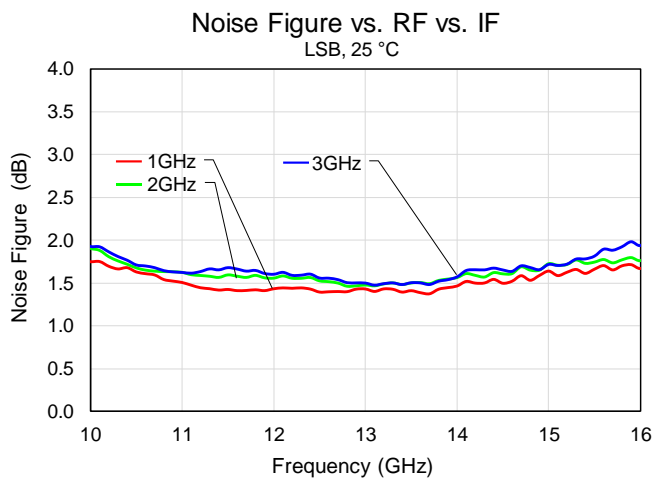
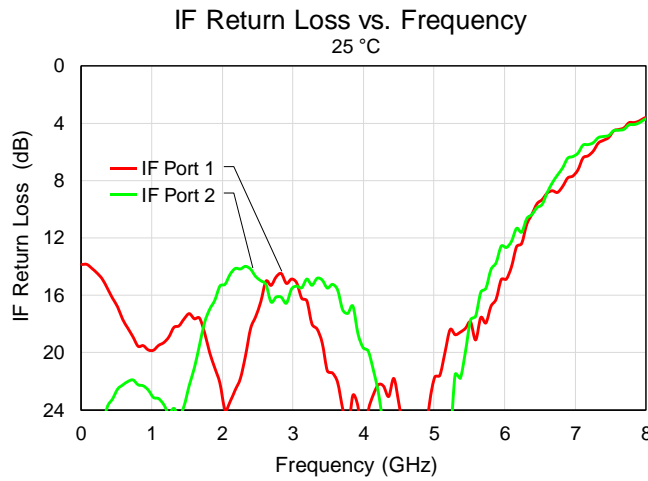
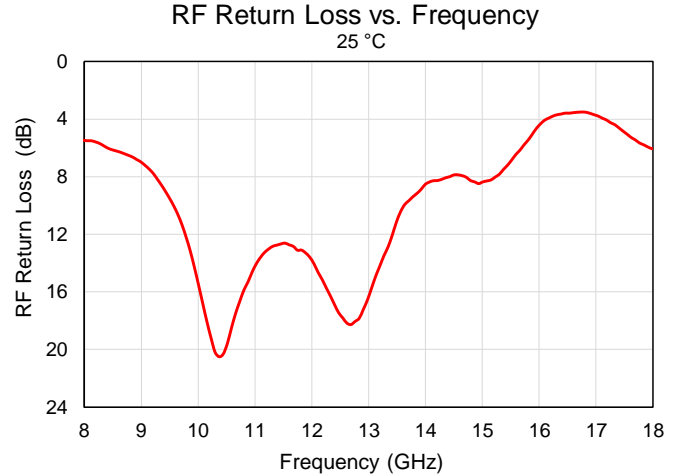
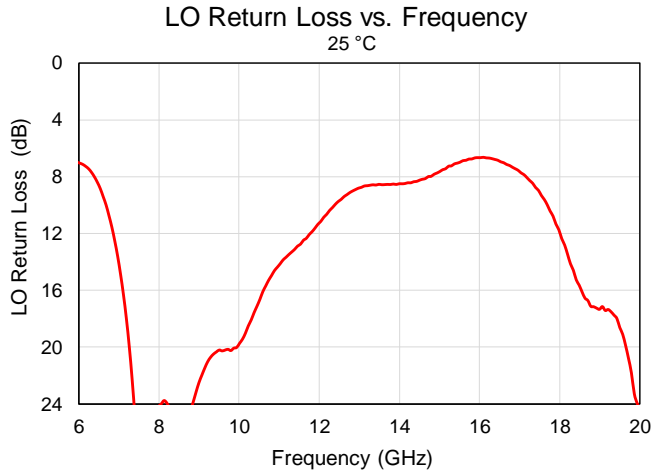
Performance Plots

RF Input Power = -25 dBm, VDLO = 4 V, IDLO = 65 mA, VDRF = 4 V, IDRf = 85 mA.
 Data taken with external IF hybrid.



Performance Plots

RF Input Power = -25 dBm, VDLO = 4 V, IDLO = 65 mA, VDRF = 4 V, IDRf = 85 mA.
Data taken with external IF hybrid.



Performance Plots

RF Input Power = -20 dBm, VDLO = 4 V, IDLO = 71 mA, VDRF = 4 V, IDRf = 88 mA, LO Power = 4 dBm.
Data taken with external IF hybrid.

Spur Tables

Spur tables are $M \times f_{LO} + N \times f_{RF}$ mixer spurious products for -20 dBm RF input power.

Desired IF is at $|1LO - 1RF|$.

All values in dBc below the IF output power level.

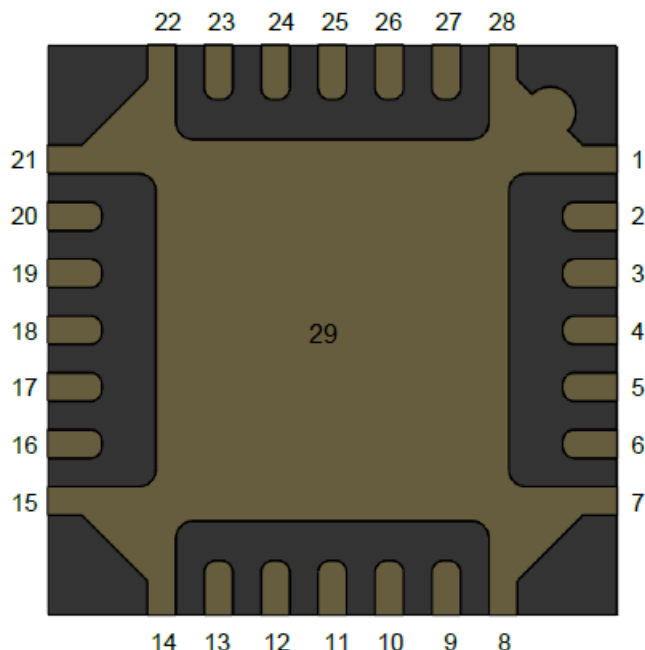
M x N Spurious Outputs for LSB, IF = 2.0 GHz

		M x f _{LO}						
		0	1	2	3	4	5	
N x f _{RF}	-5	--	99	99	99	99	99	99
	-4	--	99	99	99	99	99	99
	-3	--	99	61	48	99	99	99
	-2	--	99	33	48	99	99	99
	-1	--	0	35	29	99	99	99
	0	--	17	10	46	99	99	99
	1	15	15	45	53	99	99	99
	2	40	57	53	99	99	99	99
	3	47	52	99	99	99	99	99
	4	53	55	99	99	99	99	99
5	58	99	99	99	99	99	99	

M x N Spurious Outputs for USB, IF = 2.0 GHz

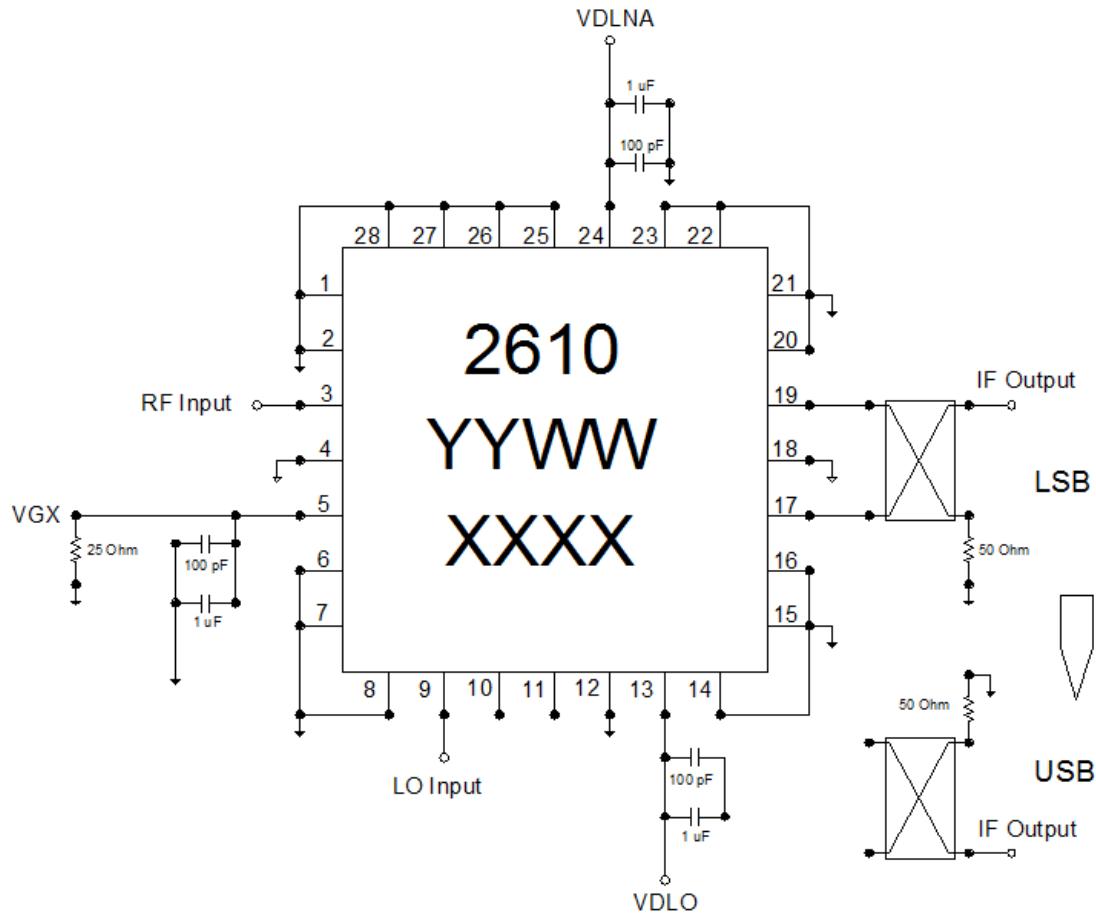
		M x f _{LO}						
		0	1	2	3	4	5	
N x f _{RF}	-5	--	99	99	99	99	99	99
	-4	--	99	99	71	99	99	99
	-3	--	99	99	56	99	99	99
	-2	--	99	38	32	99	99	99
	-1	--	0	21	27	99	99	99
	0	--	11	12	23	99	99	99
	1	12	22	33	45	99	99	99
	2	48	56	55	55	99	99	99
	3	56	52	59	99	99	99	99
	4	54	55	99	99	99	99	99
5	51	99	99	99	99	99	99	

Pin Configuration and Description



Pin No.	Label	Description
1, 2, 4, 6, 7, 8, 12, 14, 15, 16, 18, 20, 21, 22, 23, 25, 26, 27, 28	GND	Internal Grounding; must be grounded on PCB.
3	RF IN	RF Input matched to 50 ohms, AC Coupled.
5	VGX	Mixer Gate Voltage. Bias network is required; see Application Circuit on page 11 as an example.
9	LO IN	LO Input, matched to 50 ohms, AC coupled.
10, 11	NC	No internal connection; must be grounded on PCB.
13	VDLO	LO Drain Voltage. Bias network is required; see Application Circuit on page 11 as an example.
17	IFOUT_LSB	IF Output matched to 50 ohms, DC coupled.
19	IFOUT_USB	IF Output matched to 50 ohms, DC coupled.
24	VDLNA	LNA Drain Voltage. Bias network is required; see Application Circuit on page 11 as an example.

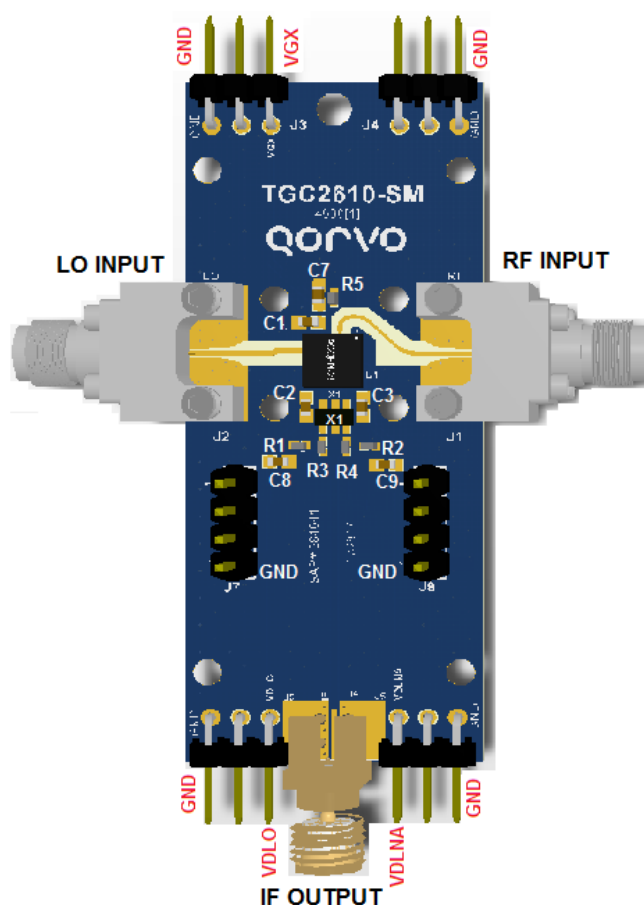
Applications Circuit



Bias-up Procedure	Bias-down Procedure
Turn VDLO to 4 V	Turn off RF and LO signals
Turn VDLNA to 4 V	Turn VDLNA to 0 V
Apply LO and RF signals	Turn VDLO to 0 V

Evaluation Board (EVB) Assembly Layout

Board material is RO4003 0.014" thickness with ½ oz copper cladding.
For further technical information, refer to the [TGC2610-SM](#) Product Information page.

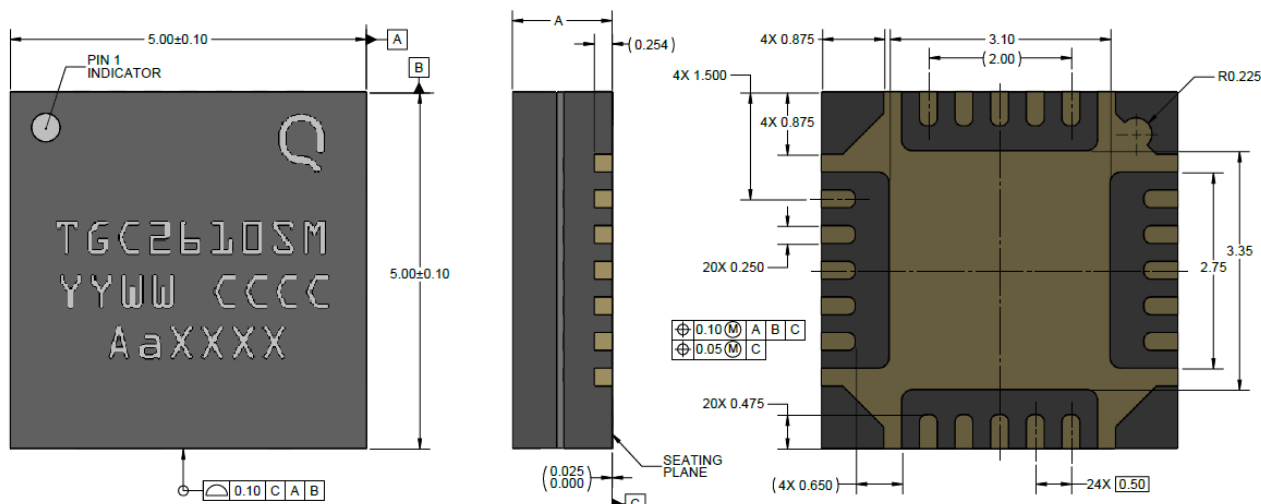


Bill of Material

Ref Des	Value	Description	Manufacturer	Part Number
C1, C2, C3	100 pF	Cap, 0402, 50V, 5%, NPO	various	
C7, C8, C9	1 µF	Cap, 0805, 25V, 5%, X5R	various	
R5	23 ohm	Res, 0402, 1%, 0.05W		
U1		Ku-Band Downconverter	Qorvo	TGC2610-SM
LSB Configuration				
R1	50 ohm	Res, 0402, 0.05W, 5%, SMD	various	
R4	0 ohm	Res, 0402, 0.01W, SMD	various	
R2, R3		DNP		
X1		2-Way 90° Power combiner/Splitter	Mini-circuit	QCN-25+ or QCN-45+

Package Marking and Dimensions

All dimensions are in millimeters.



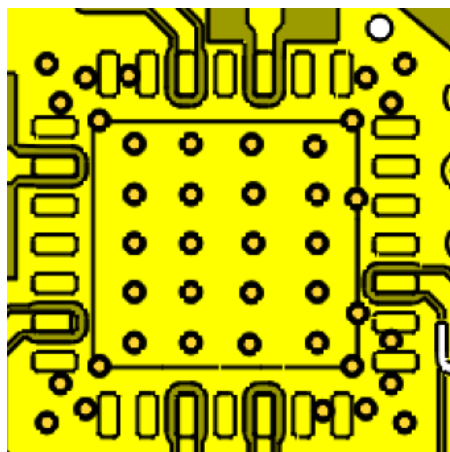
LASER MARK NOTES:

- YY IS THE LAST TWO DIGITS OF THE CALENDAR YEAR AND WW IS THE WEEK NUMBER OF THE ASSEMBLY LOT START.
- CCCC IS COUNTRY CODE.
- Aa IS VENDOR (AC).
- XXXX IS THE BATCH ID.

A	ACSLP
MAX.	1.400
NOM.	1.300
MIN.	1.200

NOTES: UNLESS OTHERWISE SPECIFIED;
1. PACKAGE LEADS ARE GOLD PLATED.

PCB Mounting Pattern



Notes:

1. The pad pattern shown has been developed and tested for optimized assembly at Qorvo. 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.
2. Ground vias are critical for the proper performance of this device. All vias under the DUT should be epoxy-filled, over-plated and planarized. All other plated thru holes to be plated to $0.0014\text{in} \pm 0.0004\text{in}$ minimum thickness.

Assembly Notes

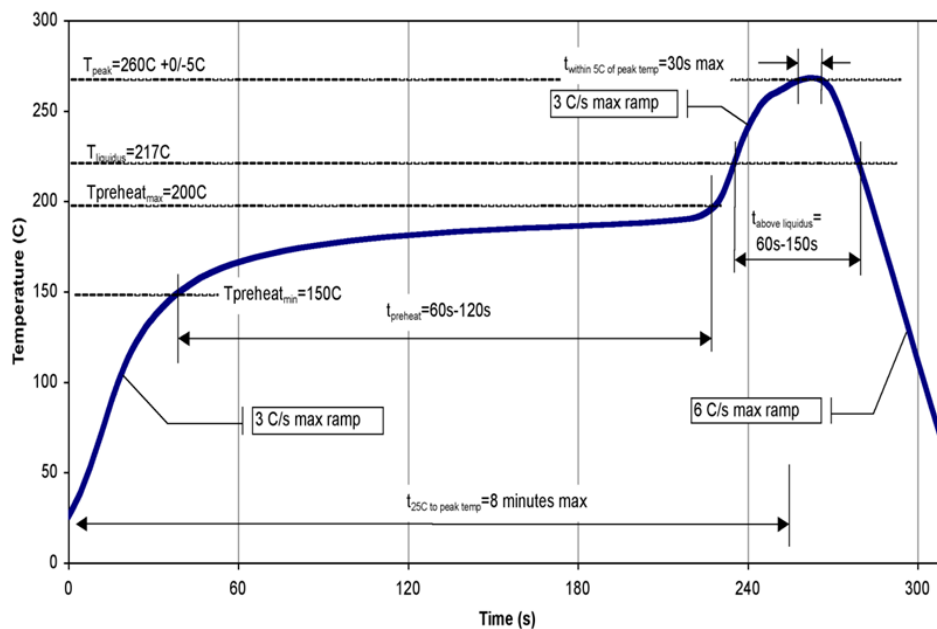
Compatible with lead-free soldering processes with 260°C peak reflow temperature.

This package is air-cavity and non-hermetic, and therefore cannot be subjected to aqueous washing. The use of no-clean solder to avoid washing after soldering is highly recommended.

Contact plating: Ni-Pd-Au.

Solder rework not recommended.

Recommended Soldering Temperature Profile



Handling Precautions

Parameter	Rating	Standard
ESD – Human Body Model (HBM)	Class 0B	ESDA / JEDEC JS-001-2012
ESD – Charge Device Model (CDM)	Class C3	JESD22-C101
MSL – Moisture Sensitivity Level	Level 1	IPC/JEDEC J-STD-020



Caution!
ESD-Sensitive Device

RoHS Compliance

This product is compliant with the 2011/65/EU RoHS directive (Restrictions on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment), as amended by Directive 2015/863/EU. 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:

Tel: 1-844-890-8163

Web: www.qorvo.com

Email: customer.support@qorvo.com

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