

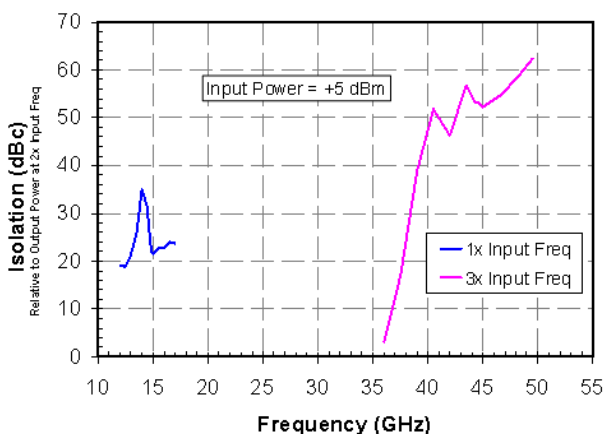
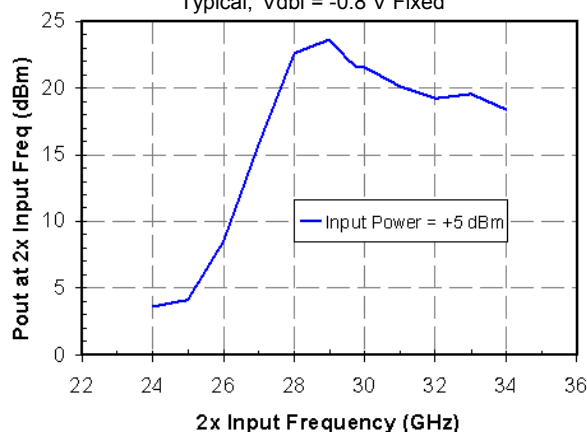
14 - 17 GHz Packaged Doubler with Amplifier



Measured Performance

Bias conditions: $V_d = 5\text{ V}$, $I_d = 150\text{ mA}$, $V_g = -0.5\text{ V}$

Typical, $V_{dbl} = -0.8\text{ V}$ Fixed



Key Features

- RF Output Frequency Range: 28 - 34 GHz
- Input Frequency Range: 14 - 17 GHz
- Output Power: 20 dBm Nominal
- Conversion Gain: 15 dB Nominal
- Input Frequency Isolation: 25 dBc
- Bias: $V_d = 5\text{ V}$, $I_d = 150\text{ mA}$, $V_g = -0.5\text{ V}$
Typical, $V_{dbl} = -0.8\text{ V}$ Fixed,
- Package Dimensions: 4 x 4 x 0.9 mm

Primary Applications

- Point-to-Point Radio
- Ka Band Satcom

Product Description

The TriQuint TGC4406-SM packaged MMIC combines a frequency doubler operating at input frequencies of 14 - 17 GHz, with a 3-stage output amplifier. The TGC4406-SM achieves typically 25 dBc input frequency isolation and 20 dBm output power with 5 dBm input power. This performance makes this doubler ideally suited for Point to Point Radios and Ka-Band satellite ground terminal applications. The TGC4406-SM provides the frequency doubling function in an compact 4 mm x 4 mm package footprint.

Each device is 100% DC and RF tested on-wafer to ensure performance compliance.

Evaluation boards are available upon request.

Lead-free and RoHS compliant.

Datasheet subject to change without notice.

Table I
Absolute Maximum Ratings 1/

Symbol	Parameter	Value	Notes
Vd-Vg	Drain to Gate Voltage	12 V	
Vd	Drain Voltage	8 V	2/
Vdbl	Doubler Voltage Range	-2 to 0 V	
Vg	Gate Voltage Range	-2 to 0 V	
Id	Positive Current	280 mA	2/
Ig	Gate Current Range	-1 to 23 mA	
Idbl	Doubler Current Range	-0.6 to 16.8 mA	
Pin	Input Continuous Wave Power	18.2 dBm	2/

- 1/ These ratings represent the maximum operable values for this device. Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device and / or affect device lifetime. These are stress ratings only, and functional operation of the device at these conditions is not implied.
- 2/ Combinations of supply voltage, supply current, input power, and output power shall not exceed the maximum power dissipation listed in Table IV.

Table II
Recommended Operating Conditions

Symbol	Parameter 1/	Value
Vd	Drain Voltage	5 V
Id	Quiescent Drain Current	150 mA
Id_drive	Drain Current with RF input = 5 dBm	180 mA
Vg	Typical Gate Voltage	-0.5 V
Vdbl	Fixed Doubler Voltage	-0.8 V

- 1/ See assembly diagram for bias instructions.

Table III
RF Characterization Table

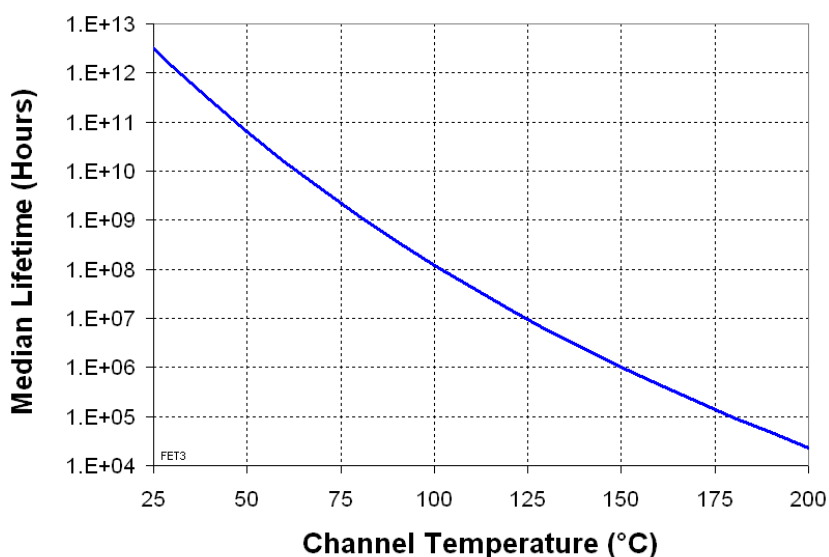
Bias: $V_d = 5\text{ V}$, $I_d = 150\text{ mA}$, $V_g = -0.5\text{ V}$ Typical, $V_{dbl} = -0.8\text{ V}$ Fixed

SYMBOL	PARAMETER	TEST CONDITIONS	MIN	NOM	UNITS
F_{in}	Input Frequency Range			14 - 17	GHz
F_{out}	Doubler Output Frequency Range			28 – 34	GHz
CG	Conversion Gain	$F_{in} = 14 - 17\text{ GHz}$ $F_{out} = 28 - 34\text{ GHz}$		15	dB
CG	Conversion Gain	$F_{in} = 14.75 - 15\text{ GHz}$ $F_{out} = 29.5 - 30\text{ GHz}$	13	15	dB
IRL	Input Return Loss	$F_{in} = 14 - 17\text{ GHz}$		6	dB
ORL	Output Return Loss	$F_{out} = 28 - 34\text{ GHz}$		8	dB
P_{out}	Output Power ($P_{in}=+5\text{ dBm}$)	$F_{in} = 14 - 17\text{ GHz}$ $F_{out} = 28 - 34\text{ GHz}$		20	dBm
1xFin Iso	Isolation – F_{out} at 2xFin relative to F_{out} at 1xFin	$F_{in} = 14 - 17\text{ GHz}$ $F_{out} = 14 - 17\text{ GHz}$		25	dBc
3xFin Iso	Isolation - F_{out} at 2xFin relative to F_{out} at 3xFin	$F_{in} = 14 - 17\text{ GHz}$ $F_{out} = 42 - 51\text{ GHz}$		40	dBc

Table IV
Power Dissipation and Thermal Properties

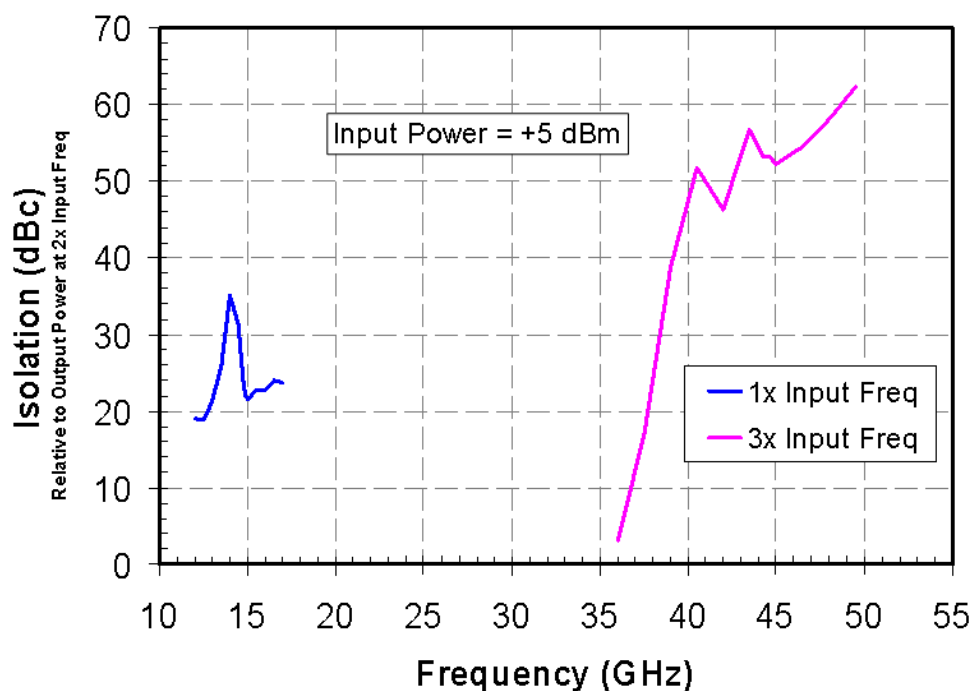
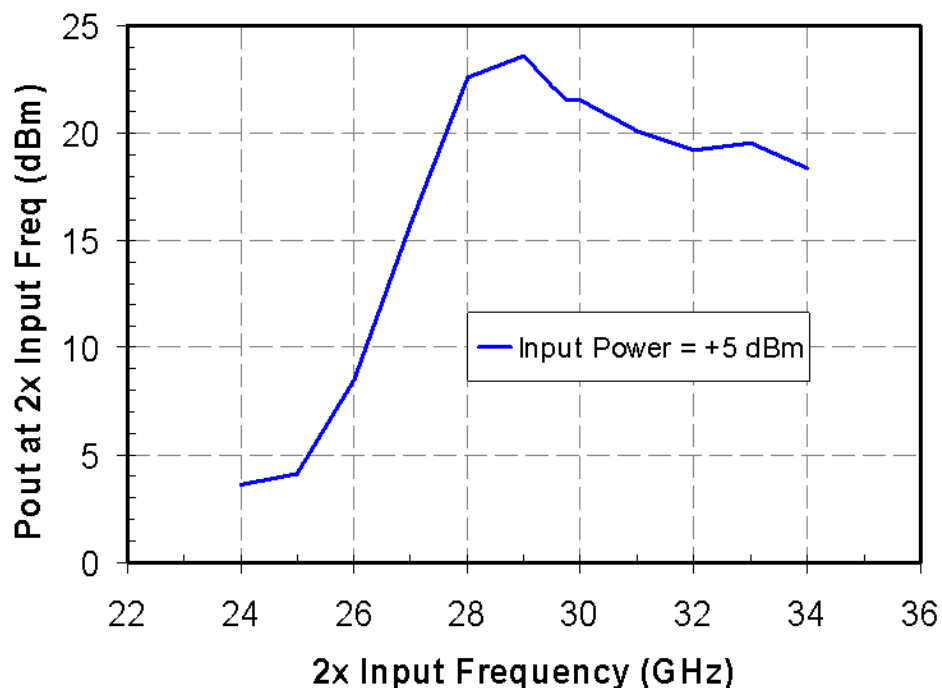
Parameter	Test Conditions	Value
Maximum Power Dissipation	Tbaseplate = 85 °C	Pd = 1.51 W Tchannel = 200 °C
Thermal Resistance, θ_{jc}	Vd = 5 V Id = 150 mA Pd = 0.75 W Tbaseplate = 85 °C	$\theta_{jc} = 76$ (°C/W) Tchannel = 142 °C Tm = 2.1E+6 Hrs
Thermal Resistance, θ_{jc} Under RF Drive	Vd = 5 V Id = 180 mA Pout = 20 dBm Pd = 0.80 W Tbaseplate = 85 °C	$\theta_{jc} = 69$ (°C/W) Tchannel = 140 °C Tm = 2.4E+6 Hrs
Mounting Temperature	30 Seconds	320 °C
Storage Temperature		-65 to 150 °C

Median Lifetime (Tm) vs. Channel Temperature



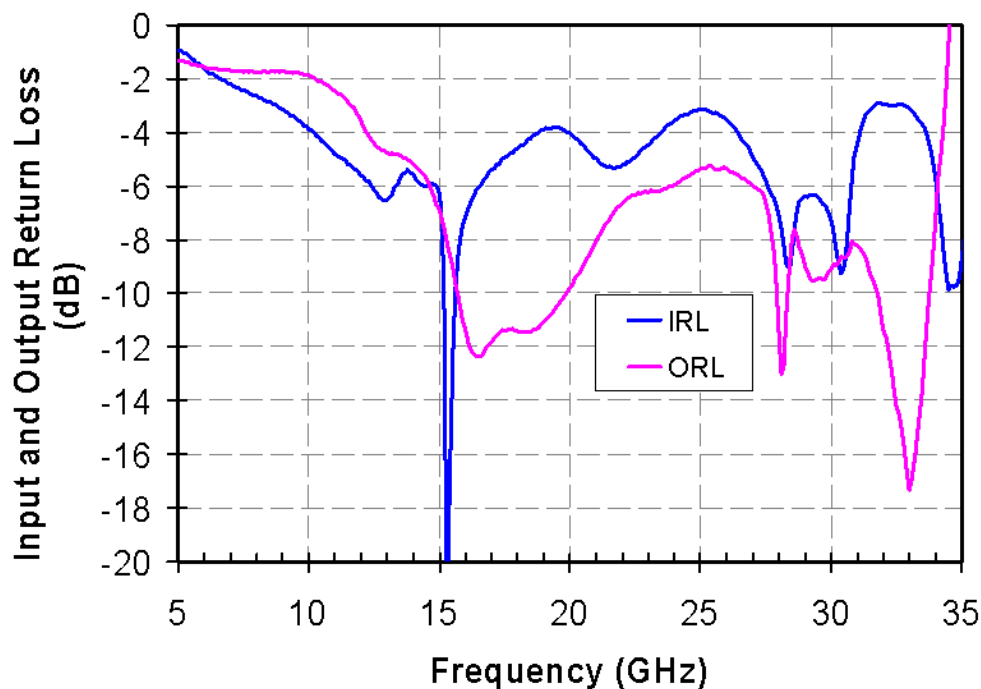
Measured Data

Bias conditions: $V_d = 5\text{ V}$, $I_d = 150\text{ mA}$, $V_g = -0.5\text{ V}$ Typical, $V_{dbl} = -0.8\text{ V}$ Fixed

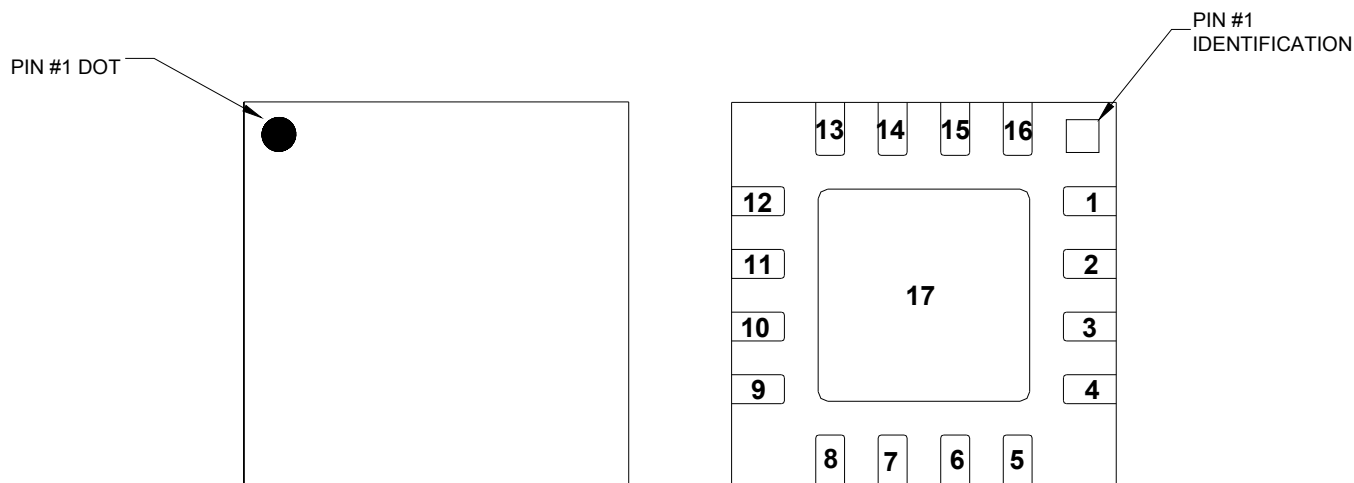


Measured Data

Bias conditions: $V_d = 5\text{ V}$, $I_d = 150\text{ mA}$, $V_g = -0.5\text{ V}$ Typical, $V_{dbl} = -0.8\text{ V}$ Fixed



Package Pinout

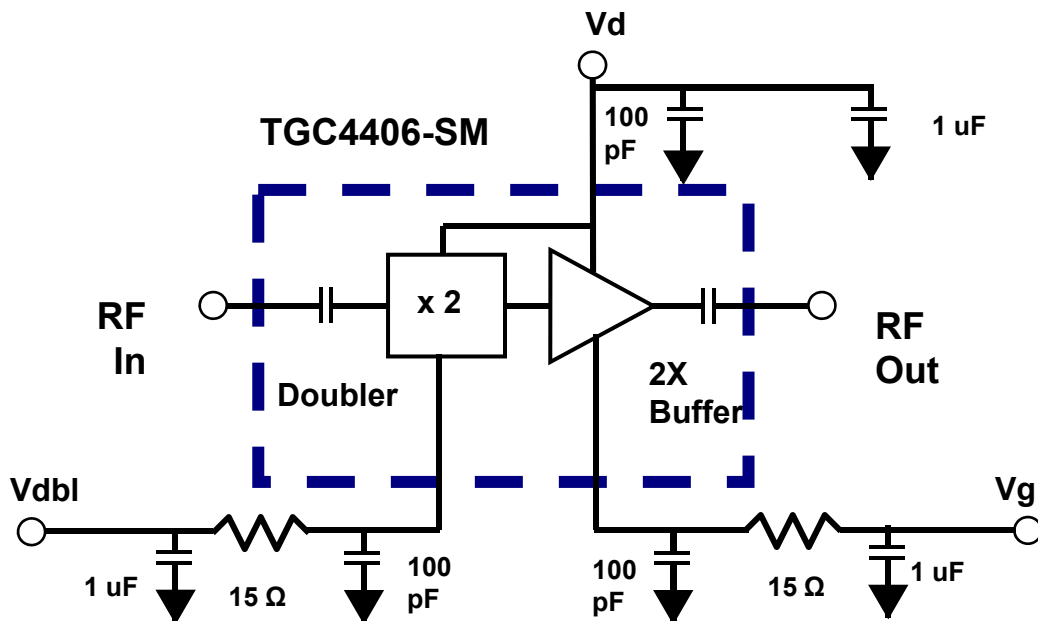


TOP VIEW

BOTTOM VIEW

Pin	Description
1, 2, 4, 7, 8, 9, 11, 12, 13, 15, 16	N/C
3	RF Input
5	Vdbl
6	Vg
10	RF Out
14	Vd
17	GND

Electrical Schematic



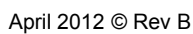
Bias Procedures

Bias-up Procedure

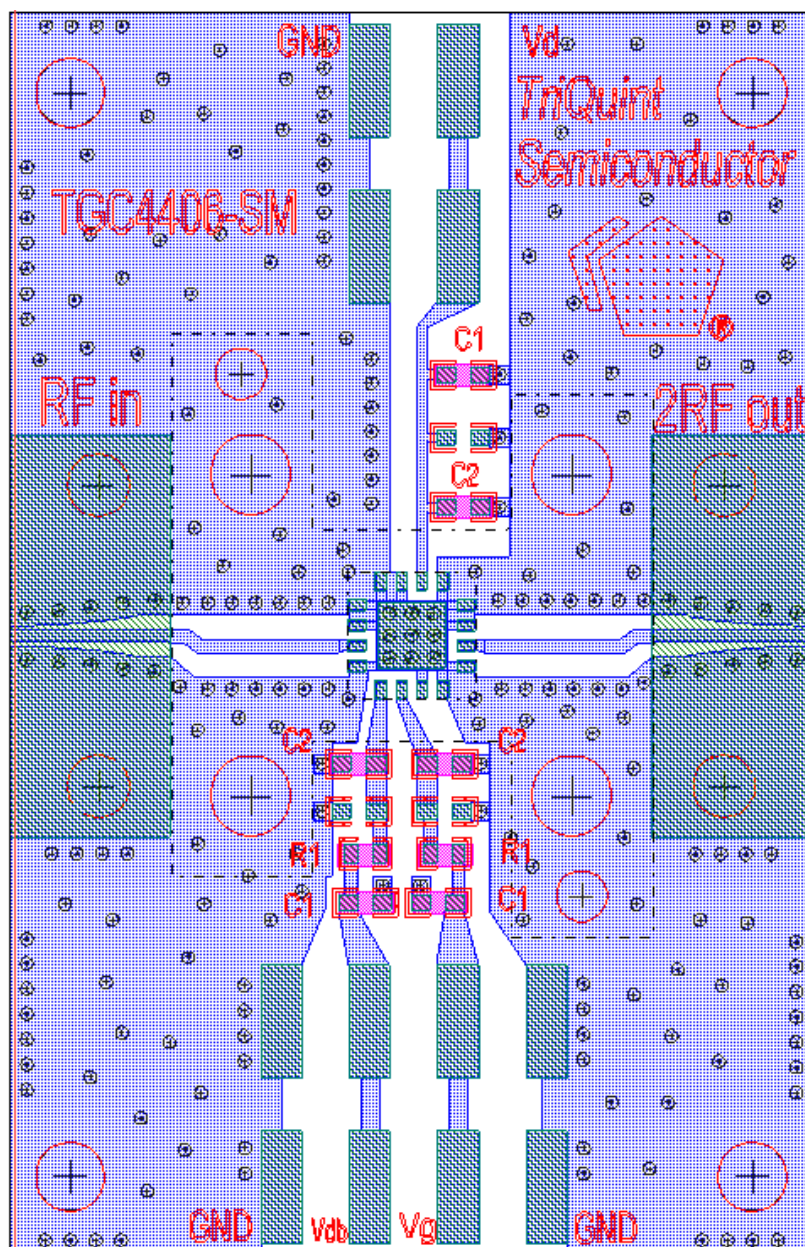
- Vdbl set to -0.8 V
- Vg set to -1.5 V
- Vd set to +5 V
- Adjust Vg more positive until Id is 150 mA. This will be Vg = ~ -0.5 V
- Apply signal to input, Id will increase

Bias-down Procedure

- Turn off signal
- Reduce Vg to -1.5 V. Ensure Id ~ 0 mA
- Turn Vd to 0 V
- Turn Vdbl to 0 V
- Turn Vg to 0 V



Recommended Assembly Diagram



Part	Qty	Description
C1	3	1 uF Capacitor (0402)
C2	3	100 pF Capacitor (0402)
R1	2	15 ohm Resistor (0402)

Assembly Notes

Recommended Surface Mount Package Assembly

- Proper ESD precautions must be followed while handling packages.
- Clean the board with acetone. Rinse with alcohol. Allow the circuit to fully dry.
- TriQuint recommends using a conductive solder paste for attachment. Follow solder paste and reflow oven vendors' recommendations when developing a solder reflow profile. Typical solder reflow profiles are listed in the table below.
- Hand soldering is not recommended. Solder paste can be applied using a stencil printer or dot placement. The volume of solder paste depends on PCB and component layout and should be well controlled to ensure consistent mechanical and electrical performance.
- Clean the assembly with alcohol.

Typical Solder Reflow Profiles

Reflow Profile	SnPb	Pb Free
Ramp-up Rate	3 °C/sec	3 °C/sec
Activation Time and Temperature	60 – 120 sec @ 140 – 160 °C	60 – 180 sec @ 150 – 200 °C
Time above Melting Point	60 – 150 sec	60 – 150 sec
Max Peak Temperature	240 °C	260 °C
Time within 5 °C of Peak Temperature	10 – 20 sec	10 – 20 sec
Ramp-down Rate	4 – 6 °C/sec	4 – 6 °C/sec

Environmental Ratings

Moisture Sensitivity Rating
1

Ordering Information

Part	ECCN	Package Style
TGC4406-SM	3A001b.2.d	QFN 4x4 Surface Mount

GaAs MMIC devices are susceptible to damage from Electrostatic Discharge. Proper precautions should be observed during handling, assembly and test.

AMEYA360

Components Supply Platform

Authorized Distribution Brand :



Website :

Welcome to visit www.ameya360.com

Contact Us :

➤ Address :

401 Building No.5, JiuGe Business Center, Lane 2301, Yishan Rd
Minhang District, Shanghai , China

➤ Sales :

Direct +86 (21) 6401-6692

Email amall@ameya360.com

QQ 800077892

Skype ameyasales1 ameyasales2

➤ Customer Service :

Email service@ameya360.com

➤ Partnership :

Tel +86 (21) 64016692-8333

Email mkt@ameya360.com