TriQuint SEMICONDUCTOR

Advance Product Information

17 - 35GHz MPA/Multiplier

TGA4040SM

TriQuint Recommends the TGA4030-SM or TGA4031-SM be used for New Designs

Key Features

- Frequency: 17 - 35 GHz
- 22 dB Nominal Gain @ Mid-band
- 18 dBm Nominal Output P1dB
- 2x and 3x Multiplier Function
- 30 dBc IMD3 @ 11 dBm Pout/tone
- Package Dimensions: 5.0 x 5.0 x 1.10 mm

Primary Applications

- Point-to-point radio
- EW
- Instrumentation
- Frequency Multiplier

Product Description

The TriQuint TG4040SM is a Medium Power Amplifier and Multiplier for a wide band of 17 – 35GHz applications. The part is designed using TriQuint's 0.15um power pHEMT production process.

The TGA4040SM provides a nominal 22 dB small signal gain with 18 dBm output power @ 1 dB gain compression. For 2x and 3x Multiplier Function, TGA4040SM provides 15 dBm typical of Output Power @ 9 dBm Pin.

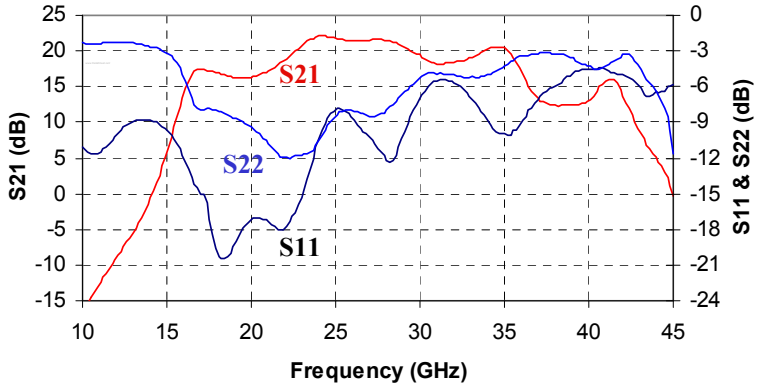
The part is ideally suited for applications such as Point-to-Point Radio, EW, Instrumentation and frequency multipliers.

Evaluation boards are available upon request.

Lead-Free & RoHS compliant.

Amplifier Performance

Bias Conditions: Vd = 5 V, Idq = 139 mA



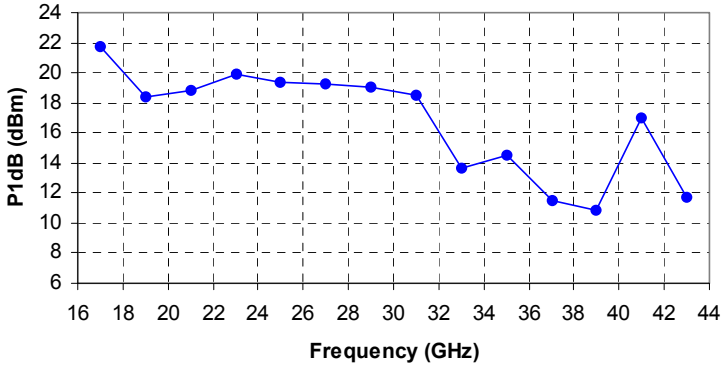


TABLE I
MAXIMUM RATINGS 1/

SYMBOL	PARAMETER	VALUE	NOTES
Vd	Drain Voltage	6 V	2/
Vg	Gate Voltage Range	-2 TO 0 V	
Id	Drain Current	TBD	2/ 3/
$\|Ig\|$	Gate Current	7 mA	3/
P_{IN}	Input Continuous Wave Power	20 dBm	
P_D	Power Dissipation	See note 4/	2/
T_{CH}	Operating Channel Temperature	150 ^{0}C	5/
T_M	Mounting Temperature (30 Seconds)	260 ^{0}C	
T_{STG}	Storage Temperature	-65 to 150 ^{0}C	

1/ These ratings represent the maximum operable values for this device.

2/ Combinations of supply voltage, supply current, input power, and output power shall not exceed P_D.

3/ Total current for the entire MMIC.

4/ For a median life time of 1E+6 hrs, Power dissipation is limited to:

$$P_D(max) = (150\ ^0C - T_{BASE}\ ^0C) / 66.7\ (^0C/W)$$

Where T_{BASE} is the base plate temperature.

5/ Junction operating temperature will directly affect the device median time to failure (MTTF). For maximum life, it is recommended that junction temperatures be maintained at the lowest possibl levels.

TABLE II
ELECTRICAL CHARACTERISTICS
(Ta = 25 ^{0}C Nominal)

PARAMETER	Amplifier	2x Multiplier	3x Multiplier	UNITS
Frequency Range	17 - 35	22 – 38	23 - 31	GHz
Drain Voltage, Vd1*	-	-	1	V
Drain Voltage, Vd*	5	5	5	V
Total Drain Current*	139	120	160	mA
Gate Voltage, Vg1*	-0.65	-1.1	-0.6	V
Gate Voltage, Vg*		-0.65		V
Small Signal Gain, S21	22	-	-	dB
Input Return Loss, S11	8	-	-	dB
Output Return Loss, S22	5	-	-	dB
Output Power @ 1dB Gain compression, P1dB 5V @ 139mA	18	-	-	dBm
IMD3 @ 11 dBm Pout/ Tone	30	-	-	dBc
Output Power @ Pin = 9dBm	-	15	15	dBm
Gain Temperature Coefficient	-0.04	-	-	dB/^{0}C

* See bias plan on page 8 for amplifier and 2x multiplier, page 9 for 3x multiplier

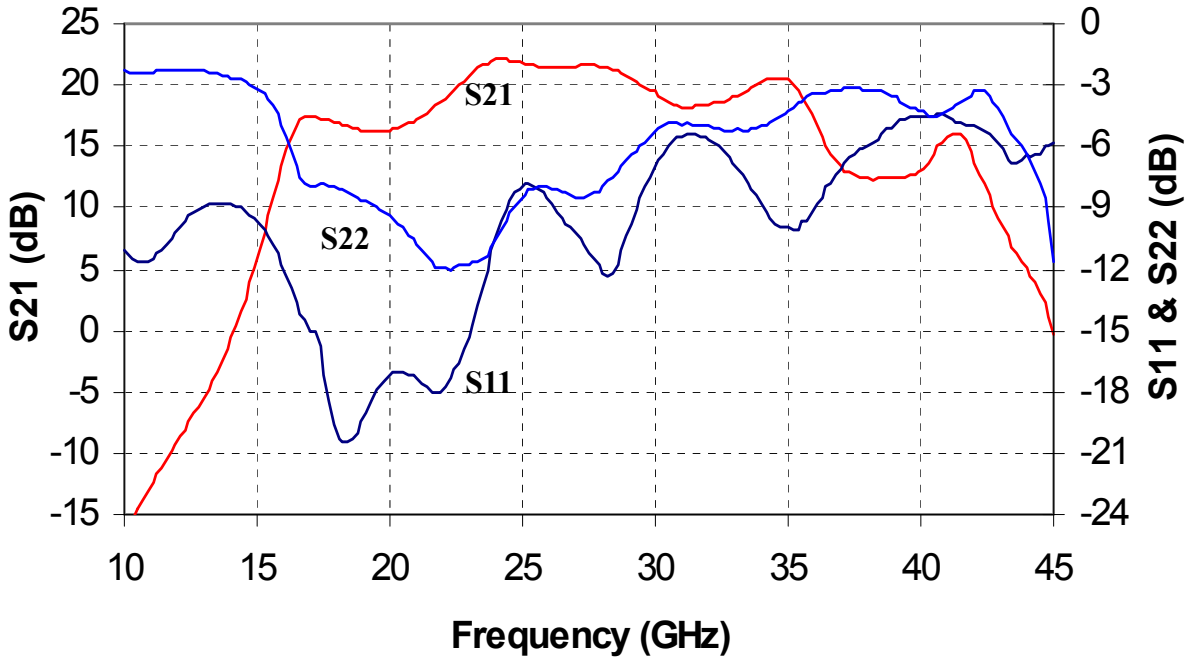
TABLE III
THERMAL INFORMATION

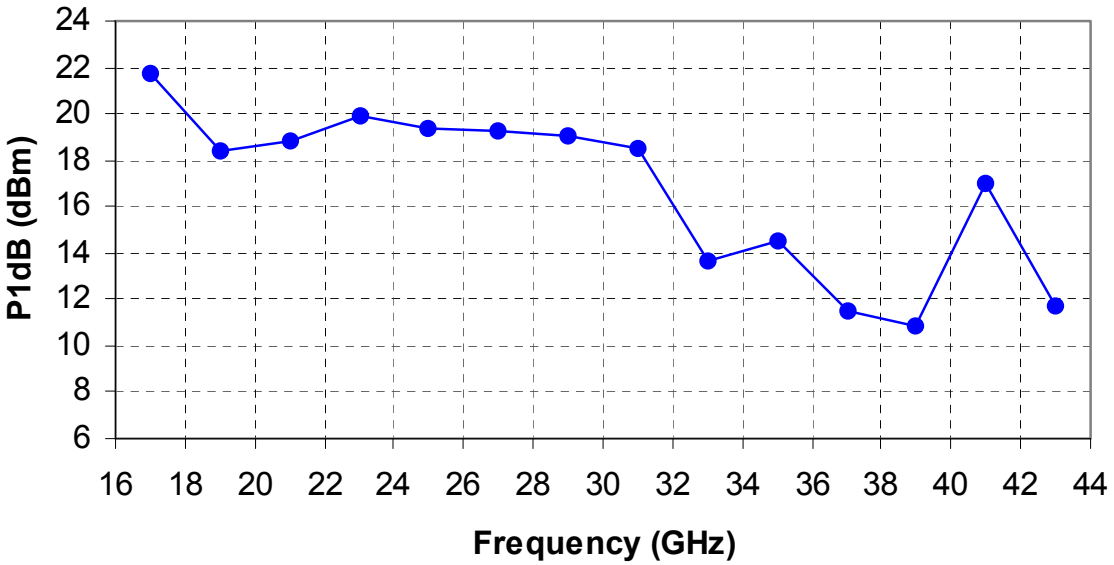
PARAMETER	TEST CONDITIONS	T_{CH} (^{O}C)	θ_{JC} (°C/W)	T_M (HRS)
θ_{JC} Thermal Resistance (channel to Case)	Vd = 5 V Id = 139 mA Pdiss = 0.69 W	116	66.7	2.4E+7

Note: TGA4040SM 8mil board will have 5 to 6 degC higher for T_{CH}.

Measured Amplifier Data

Bias Conditions: Vd = 5 V, Idq = 140 mA





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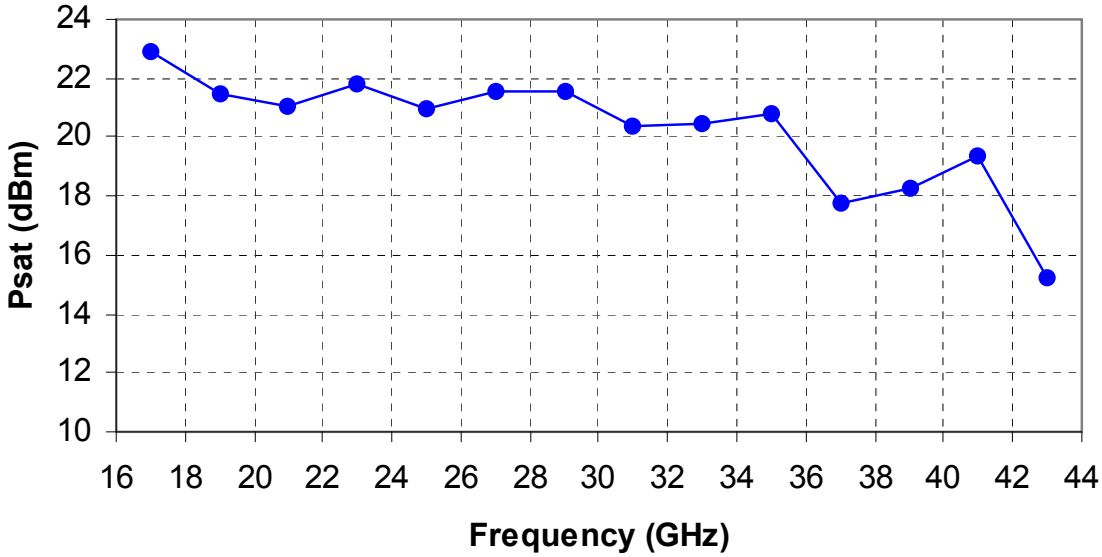

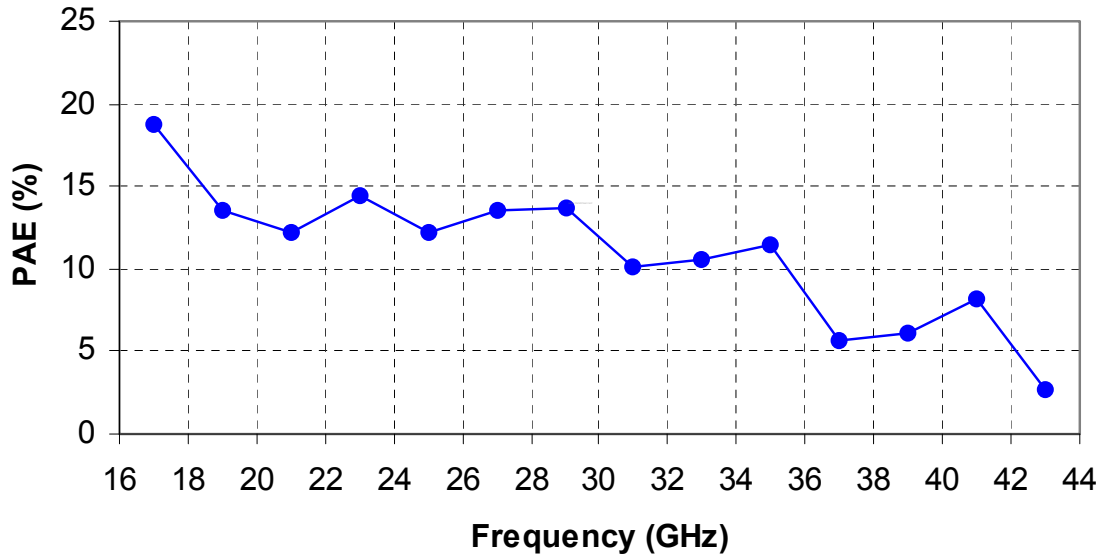

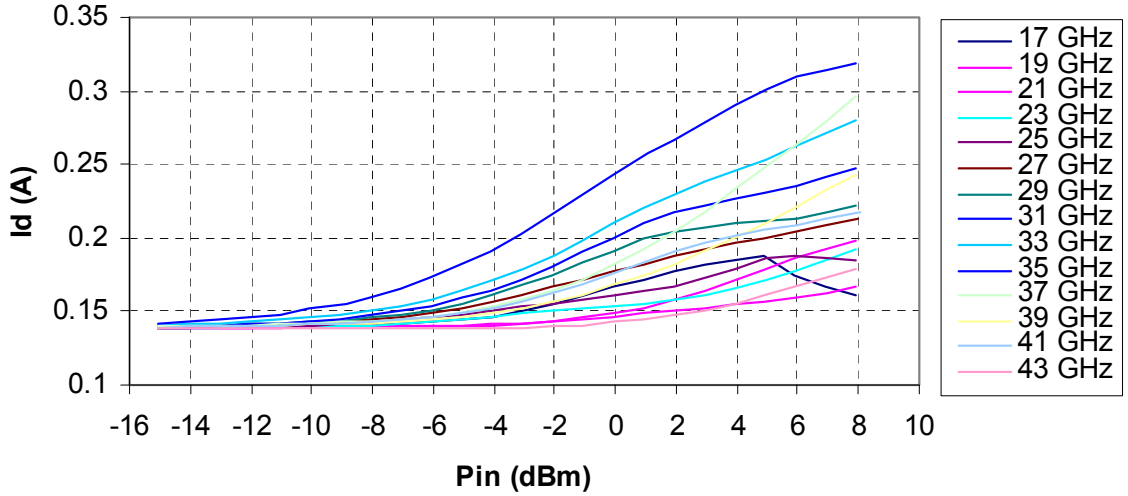

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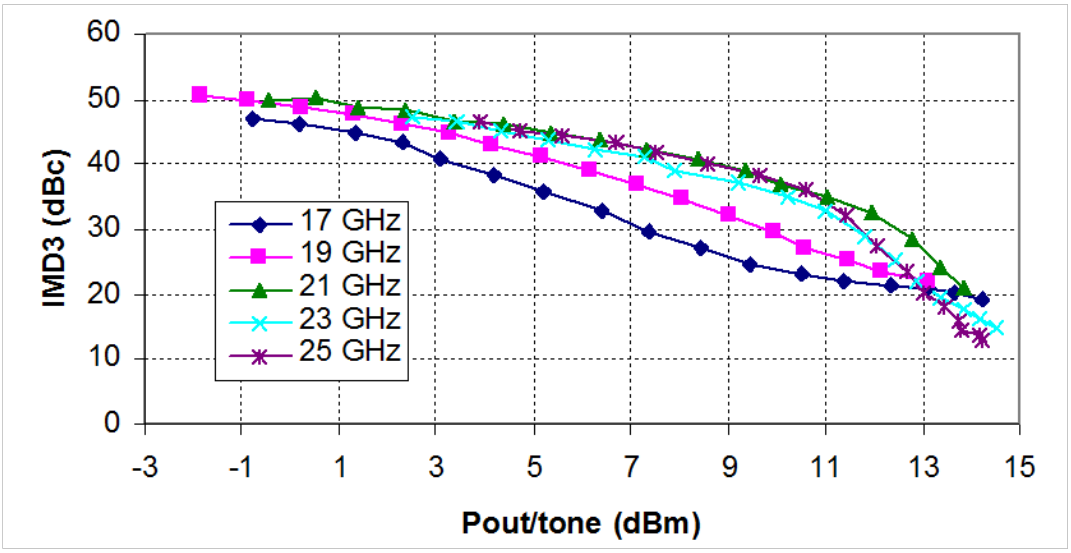
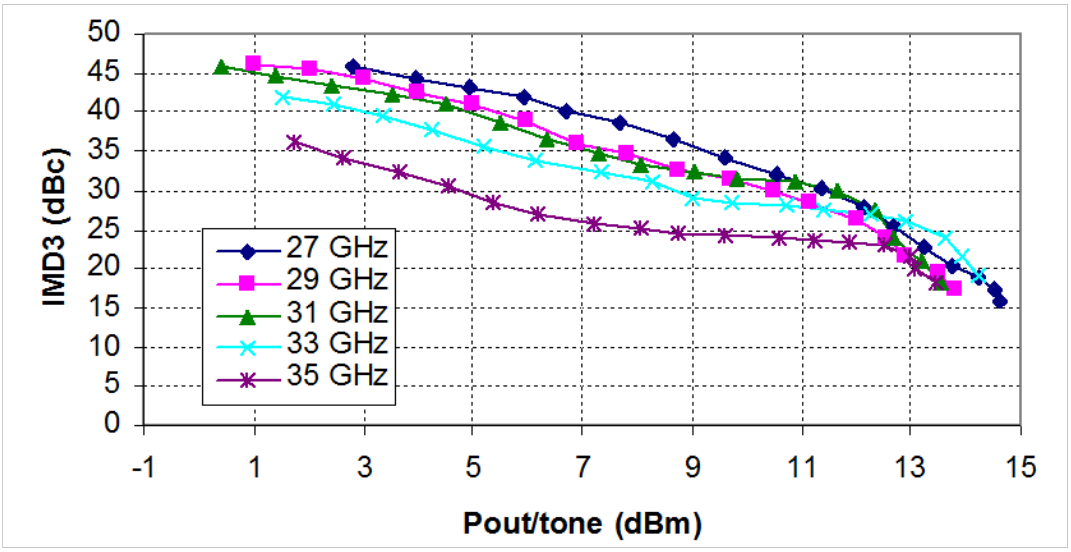
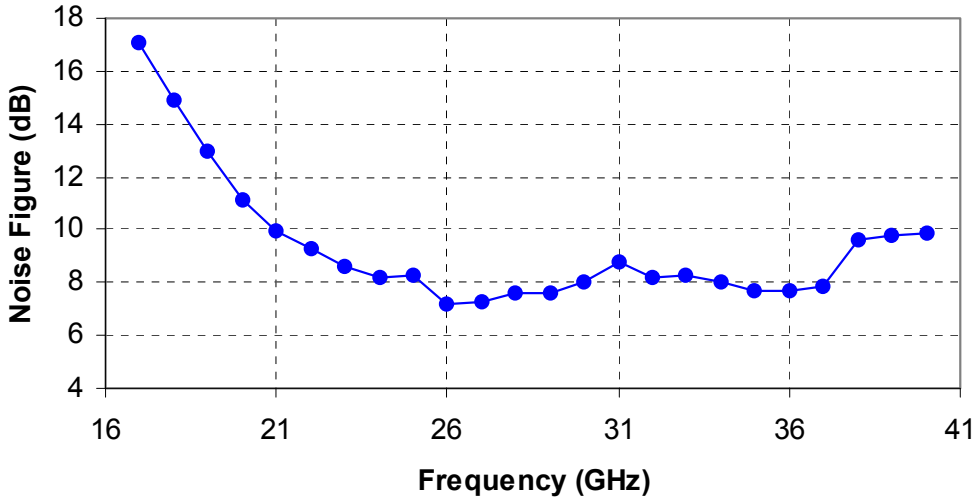


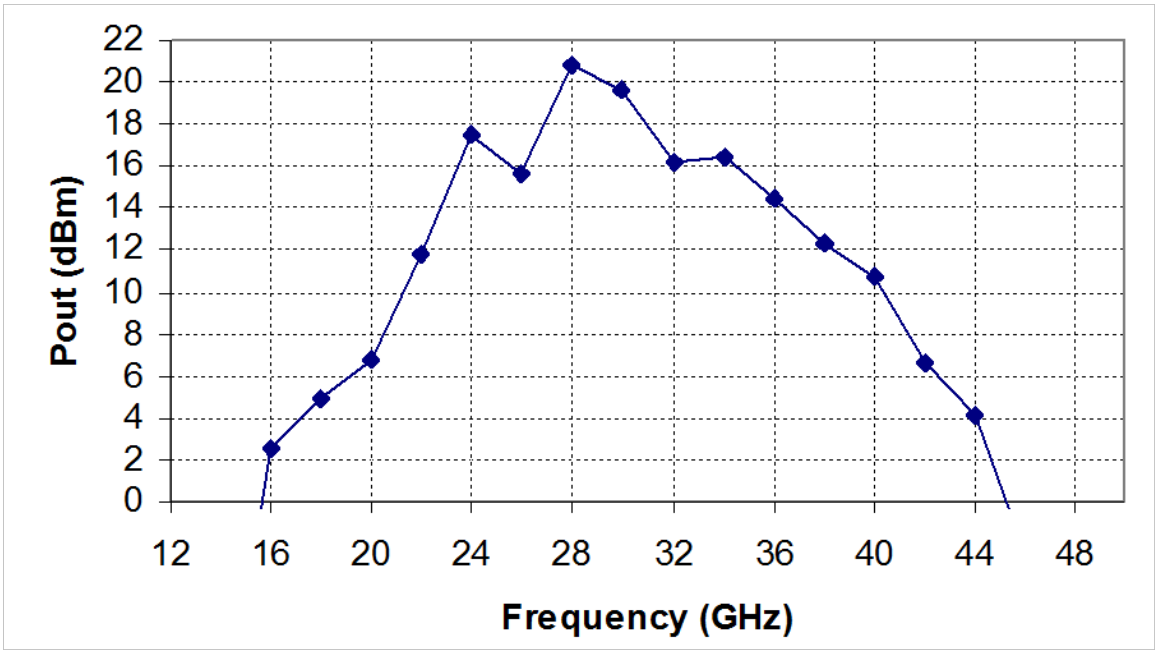


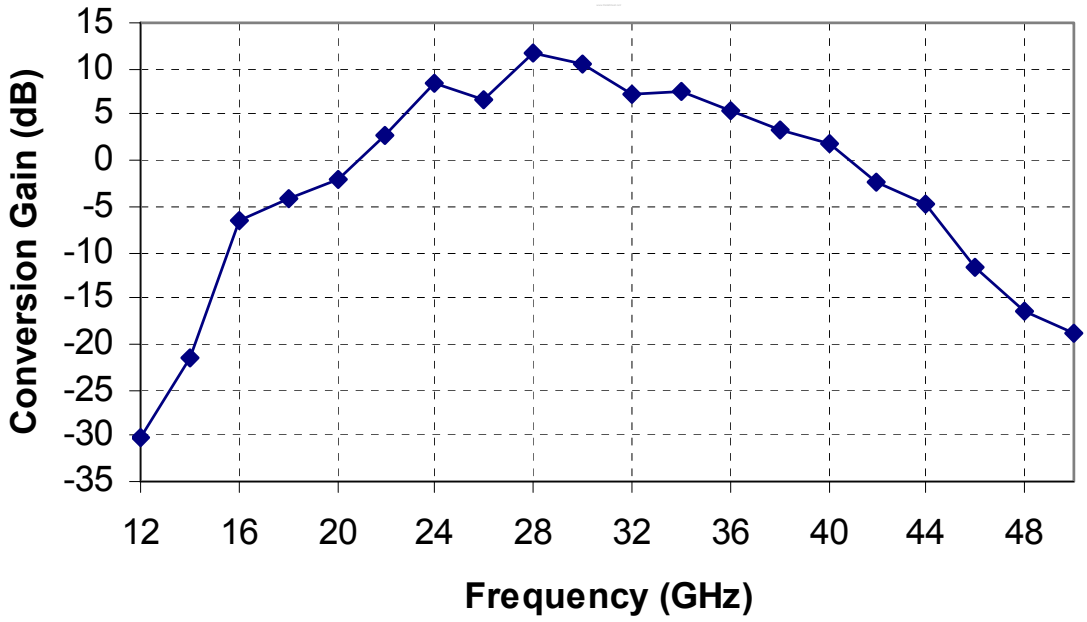


Measured 2X Multiplier Data

TGA4040SM

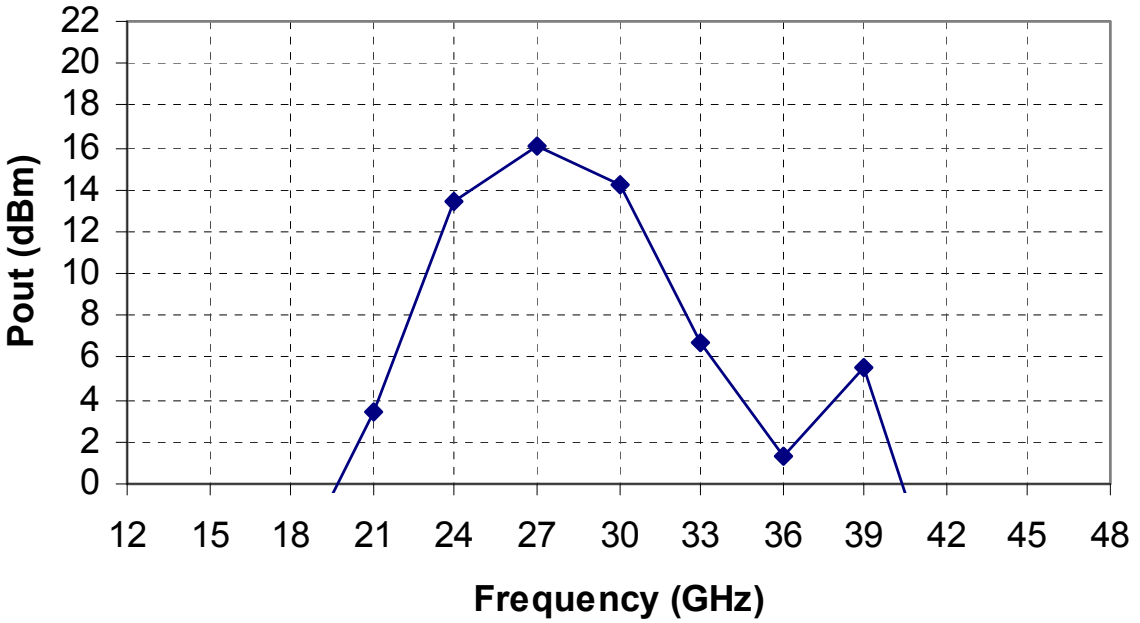
Bias Conditions: Vd = 5 V, Idq = 120mA, Vg1 = -1.1V, Pin = 9dBm

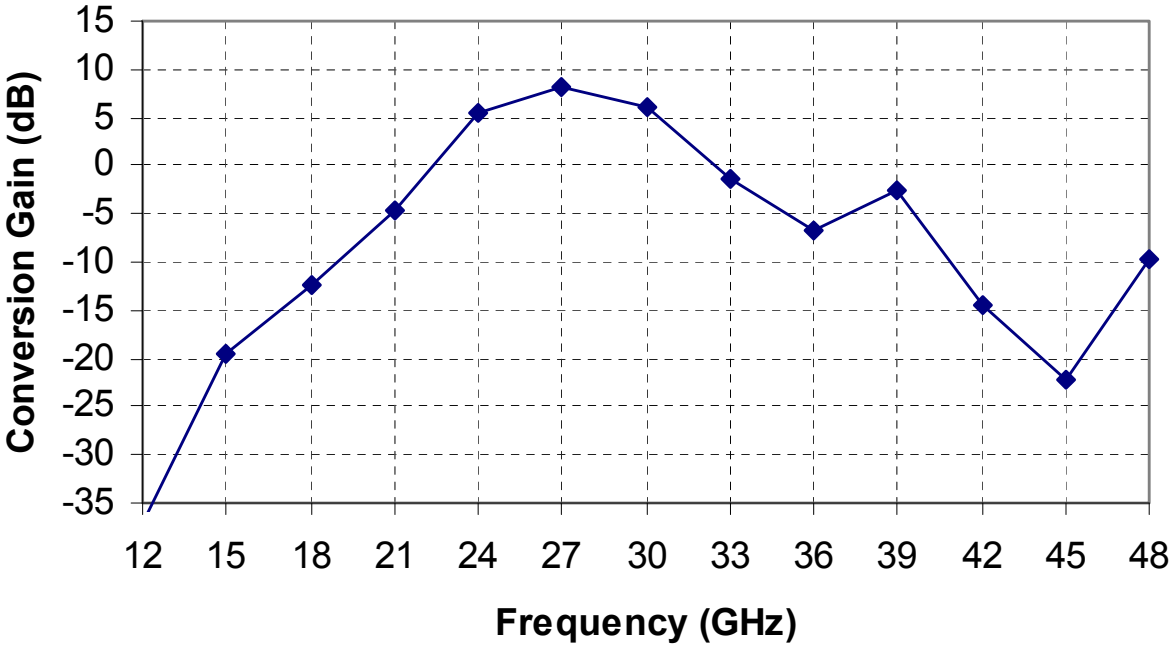




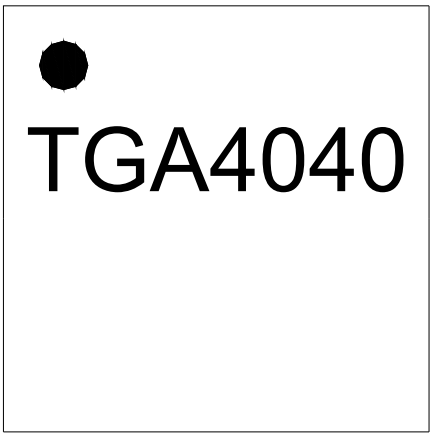
Measured 3X Multiplier Data

Bias Conditions: Vd = 5 V, Vd1 = 1V, Idq = 160mA, Pin = 8dBm

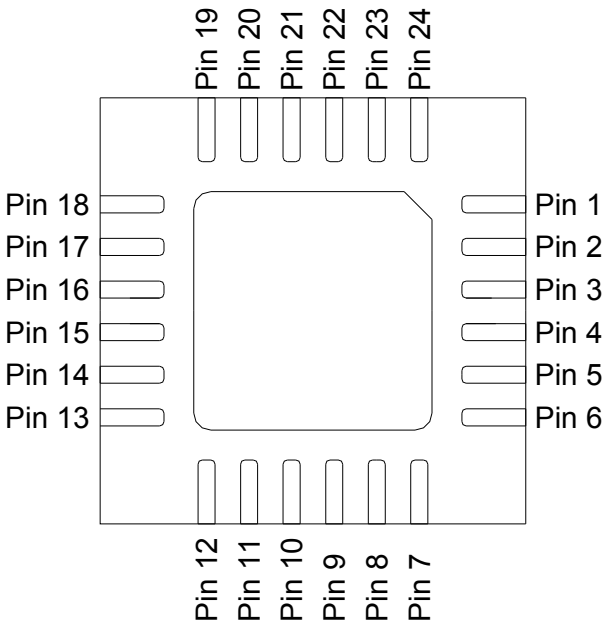




Package Pin out



Top View



Bottom View

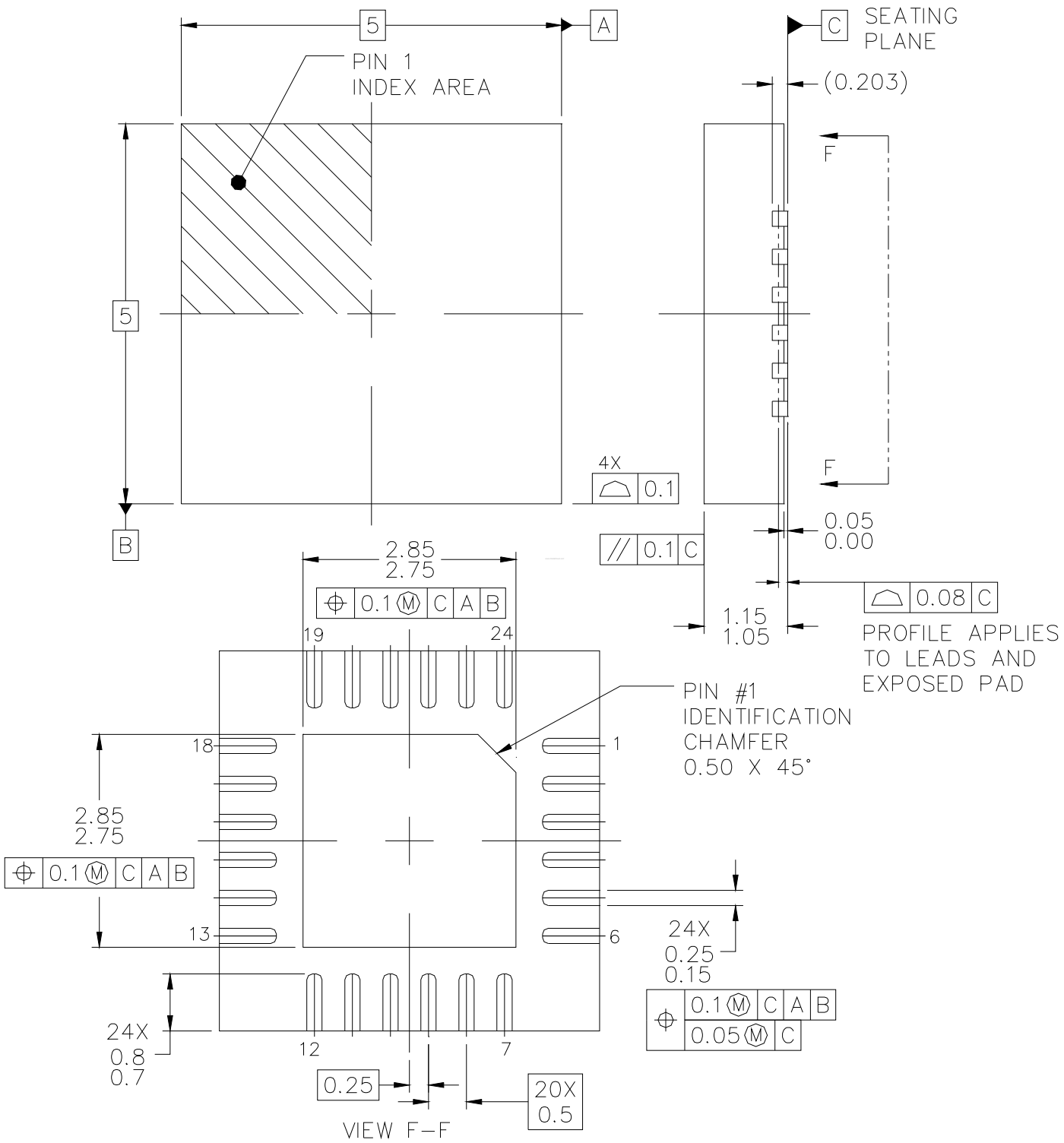
Pin	Description
1	N/C
2	N/C
3	RF In
4	N/C
5	N/C
6	N/C
7	N/C
8	N/C
9	Vg1
10	N/C
11	Vg
12	N/C

Pin	Description
13	N/C
14	N/C
15	N/C
16	RF Out
17	N/C
18	N/C
19	N/C
20	N/C
21	Vd
22	N/C
23	Vd1
24	N/C

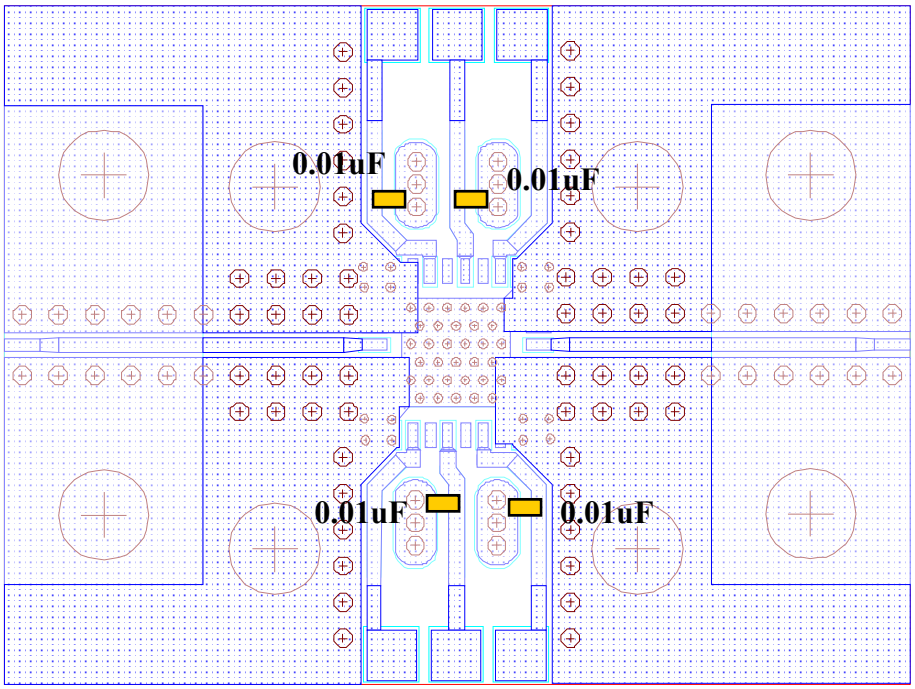
Mechanical Drawing

TGA4040SM

Units: Millimeters

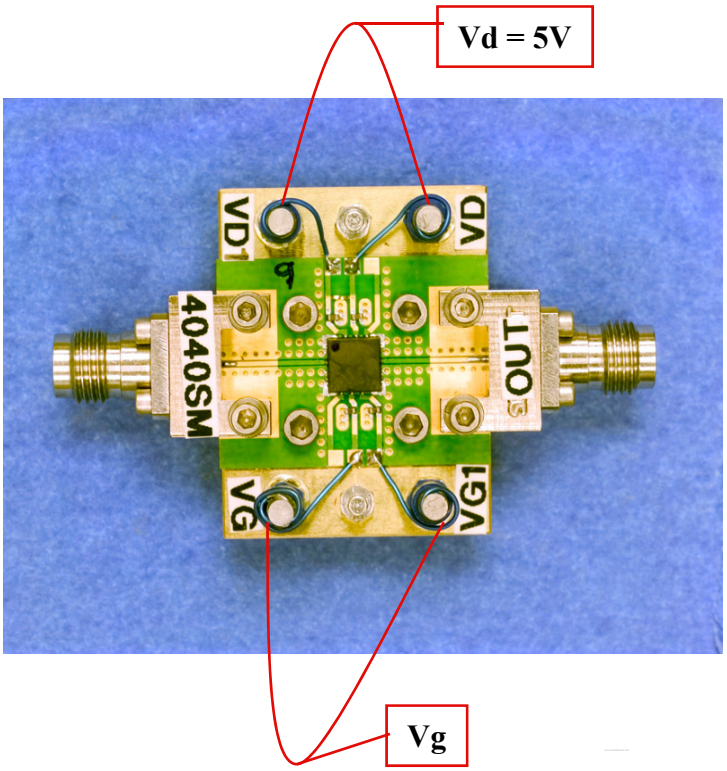


Characterization Board

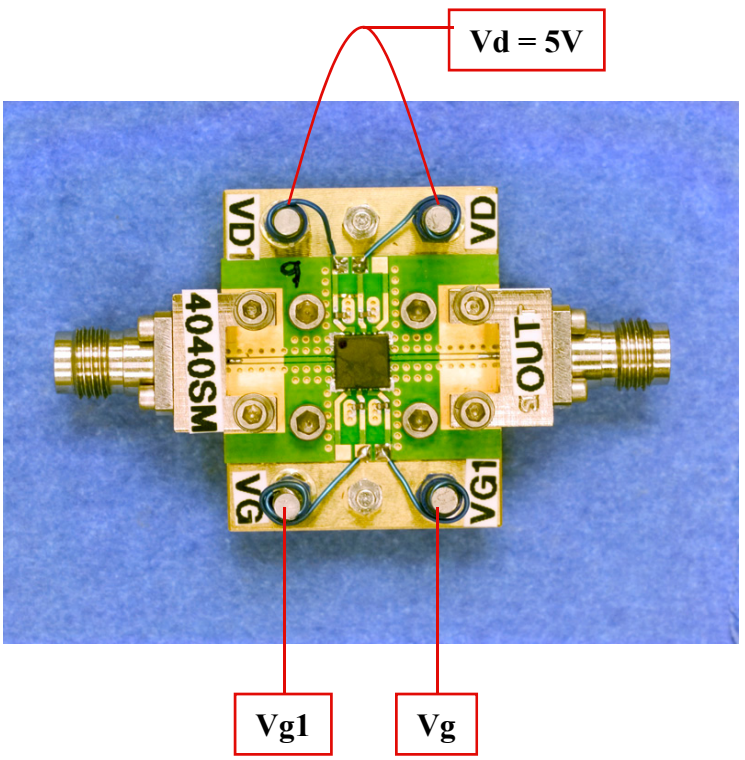


There are 4 0402 0.01 uF capacitor.

Recommended Power Supply Connection Diagram
Amplifier & 2x Multiplier

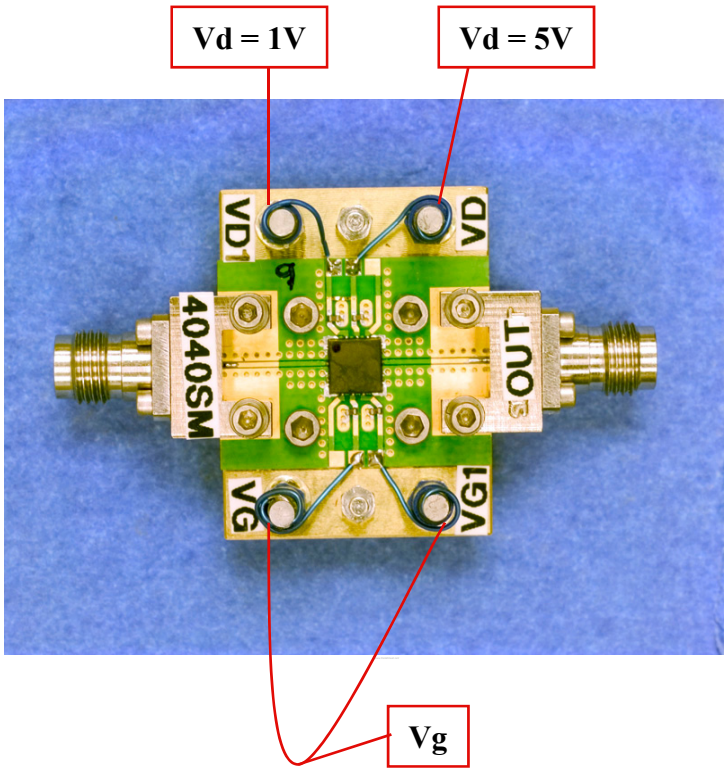


Amplifier
Set Vd = 5.0V
Vary (Vg + Vg1) to achieve Id = 140mA



2x Multiplier
Set Vd = 5.0V
Set Vg1 = -1.1V
Vary Vg to achieve Id = 120mA

Recommended Chip Assembly Diagram
3x Multiplier



3x Multiplier

Set Vd = 5.0V

Set Vd1 = 1.0V

Vary (Vg + Vg1) to achieve(Id + Id1) = 160mA

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