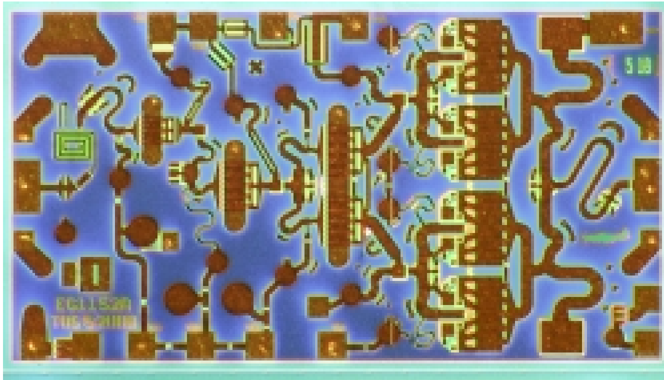
TriQuint SEMICONDUCTOR

Advance Product Information

August 28, 2001

13.5 - 15 GHz 2 Watt Power Amplifier TGA1152-EPU



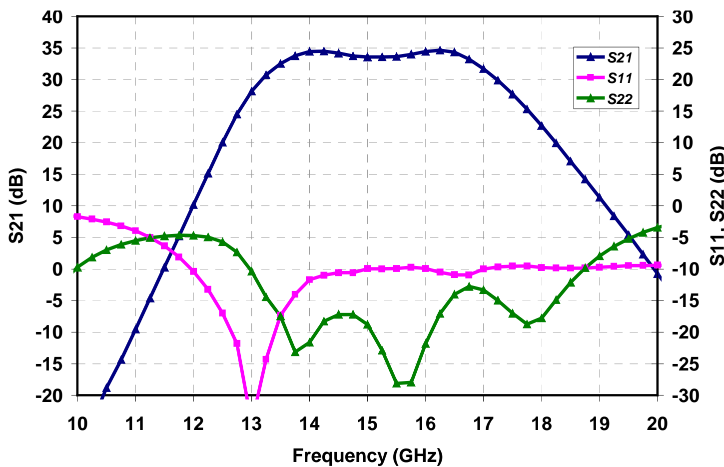
Key Features

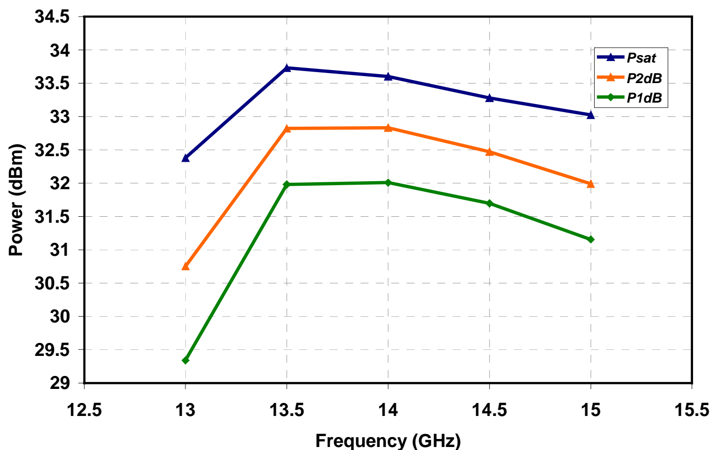
- 0.5 um pHEMT Technology
- 34 dB Nominal Gain
- 31.7dBm Nominal Pout @ P1dB
- >2W Psat at 14.5GHz
- OTOI 39dBm Typical
- Bias 7V @ 680 mA
- Chip Dimensions 1.390mm x 2.495mm

Primary Applications

- Ku Band Sat-Com
- Point-to-Point Radio

Preliminary Measured Performance





Samples Available Q201

Measured Performance Summary

PARAMETER	UNITS	TYPICAL
FREQUENCY	GHz	13.5-15
SMALL SIGNAL GAIN	dB	34
NOISE FIGURE	dB	N/A
INPUT RETURN LOSS	dB	-10
OUTPUT RETURN LOSS	dB	-17
P1db @ 14.5 GHz	dBm	32 (25C)
GAIN FLATNESS 14-14.5 GHz	dB	+/- 0.25
GAIN FLATNESS 13.5-14.5 GHz	dB	+/- 1.0
IMP3@SCL = P1dB – 10dB	dBc	35
OIP3 (P1dB-10dB)	dBc	39
V_{dd}	V	7
NOMINAL SMALL SIGNAL BIAS CURRENT	mA	680
BIAS CURRENT AT P1dB	mA	870
SIZE	mm^2	3.46

Note: Devices designated as EPU are typically early in their characterization process prior to finalizing all electrical and process specifications. Specifications are subject to change without notice

TABLE I
MAXIMUM RATINGS

SYMBOL	PARAMETER 5/	VALUE	NOTES
V^+	POSITIVE SUPPLY VOLTAGE	8 V	4/
V^-	NEGATIVE SUPPLY VOLTAGE RANGE	-5V TO 0V	
I^+	POSITIVE SUPPLY CURRENT (QUIESCENT)	1.023 A	4/
$\| I_G \|$	GATE SUPPLY CURRENT	35.2 mA	
P_{IN}	INPUT CONTINUOUS WAVE POWER	21.4 dBm	
P_D	POWER DISSIPATION	9.404 W	3/ 4/
T_{CH}	OPERATING CHANNEL TEMPERATURE	150 ^{0}C	1/ 2/
T_M	MOUNTING TEMPERATURE (30 SECONDS)	320 ^{0}C	
T_{STG}	STORAGE TEMPERATURE	-65 to 150 ^{0}C	

1/ These ratings apply to each individual FET.

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

3/ When operated at this bias condition with a base plate temperature of 70 ^{0}C, the median life is reduced from 8.9E+6 to 4.2 E+4 hours.

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

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

DC SPECIFICATIONS (100%)
(T_A = 25 °C ± 5 °C)

NOTES	SYMBOL	TEST CONDITIONS 2/	LIMITS		UNITS
			MIN	MAX	
	I_{DSS}	STD	Info only	200	mA
	Gm	STD	Info only	252	mS
1/	$\|V_{P1}\|$	STD	0.5	1.5	V
1/	$\|V_{P2}\|$	STD	0.5	1.5	V
1/	$\|V_{P3}\|$	STD	0.5	1.5	V
1/	$\|V_{BVGD}\|$	STD	13	30	V
1/	$\|V_{BVGS}\|$	STD	13	30	V

1/ V_P, V_{BVGD}, and V_{BVGS} are negative.

2/ The measurement conditions are subject to change at the manufacture's discretion

PRELIMINARY RF SPECIFICATIONS
(T_A = 25°C ± 5°C)

NOTE	TEST	MEASUREMENT CONDITIONS 7V @ 682mA +/- 5%	VALUE			UNITS
			MIN	TYP	MAX	
	SMALL-SIGNAL GAIN MAGNITUDE	13.5 – 16.5 GHz		34		dB
	POWER OUTPUT AT Pin = +3 dBm	14.5 GHz	31			dBm
	PAE at Pin = +3 dBm	14.5 GHz	23			%
	INPUT RETURN LOSS MAGNITUDE	13.5 – 16.5 GHz		-10		dB
	OUTPUT RETURN LOSS MAGNITUDE	13.5 – 16.5 GHz		-10		dB

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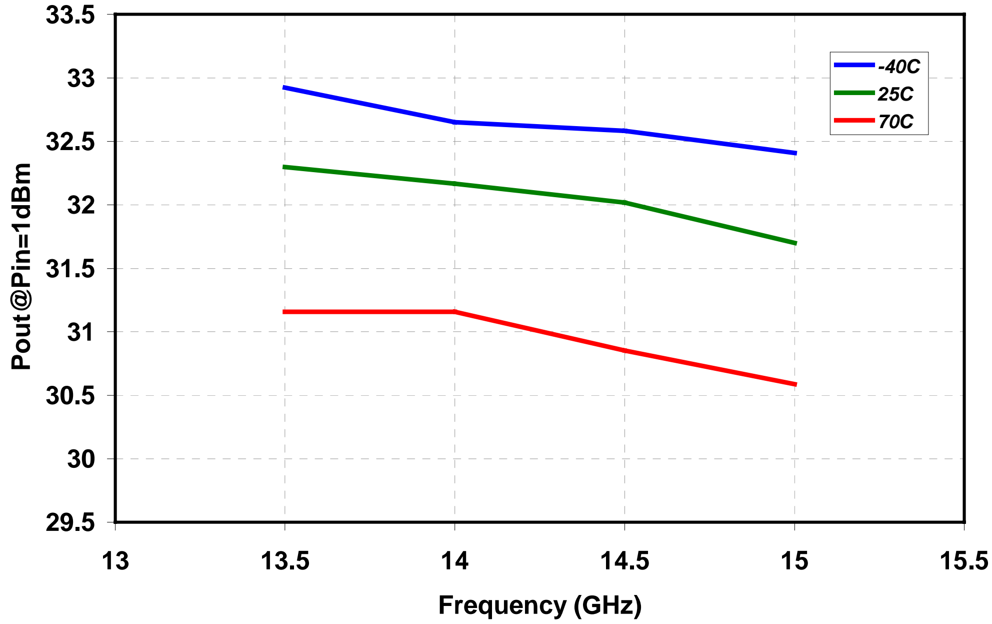
THERMAL INFORMATION*

Parameter	Test Conditions	T_{CH} (°C)	$R_{\theta JC}$ (°C/W)	T_M (HRS)
$R_{\theta JC}$ Thermal Resistance (channel to backside of carrier)	Vd = 7V I_D = 682 mA Pdiss = 4.774 W	125.74	11.67	8.9E+6

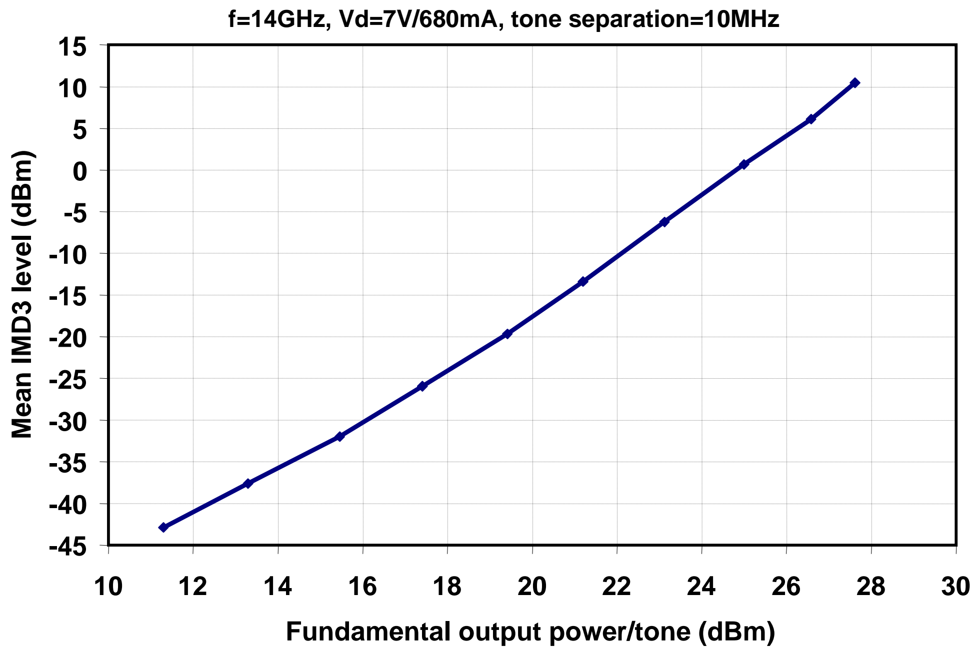
Note: Assumes eutectic attach using 1.5 mil 80/20 AuSn mounted to a 20 mil CuMo Carrier at 70°C baseplate temperature. Worst case condition with no RF applied, 100% of DC power is dissipated.

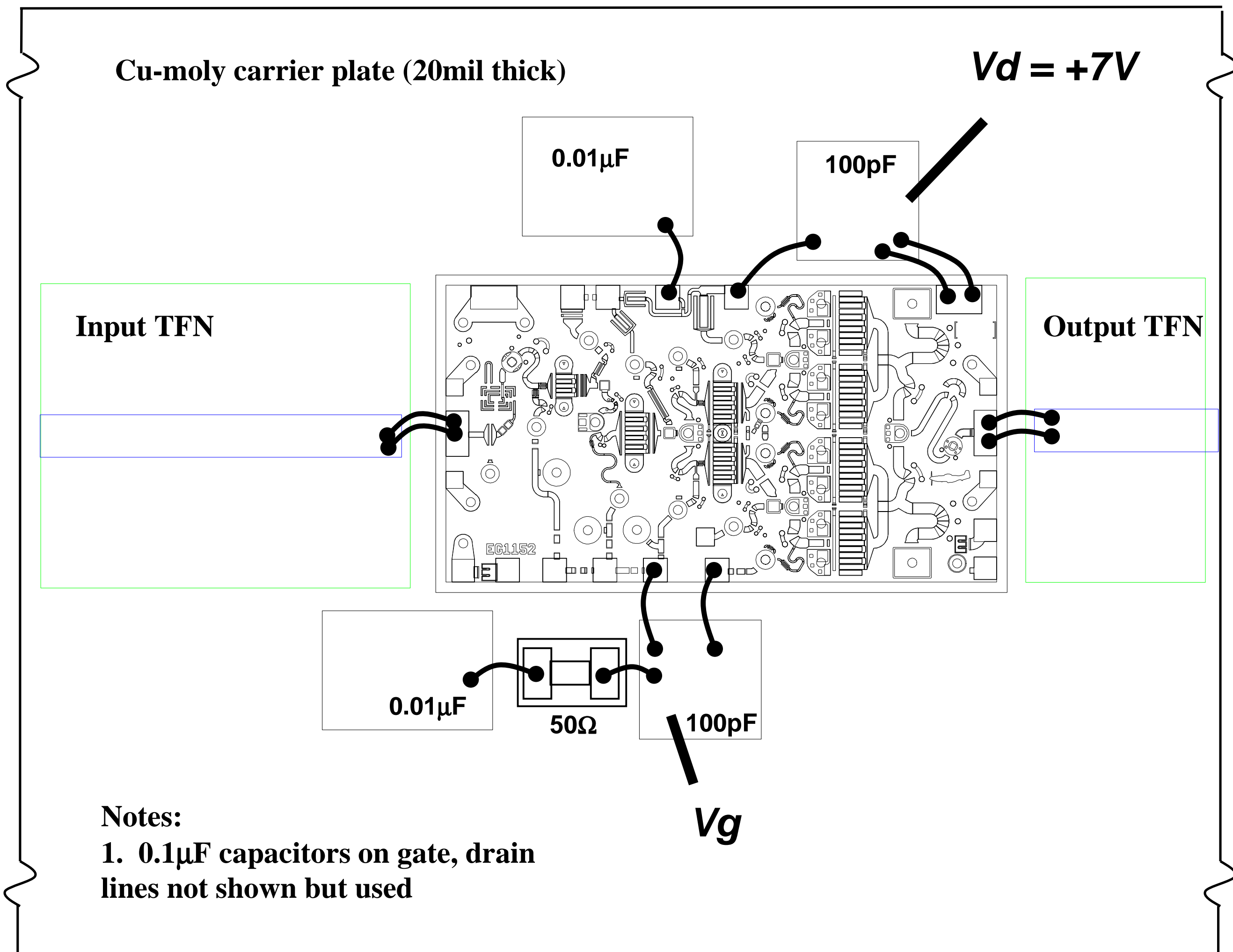
* The thermal information is a result of a detailed thermal model.

TGA1152 Over Temperature Measured Performance
6V @ 680mA



TGA1152 IMD3 Performance





Recommended Assembly Diagram

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

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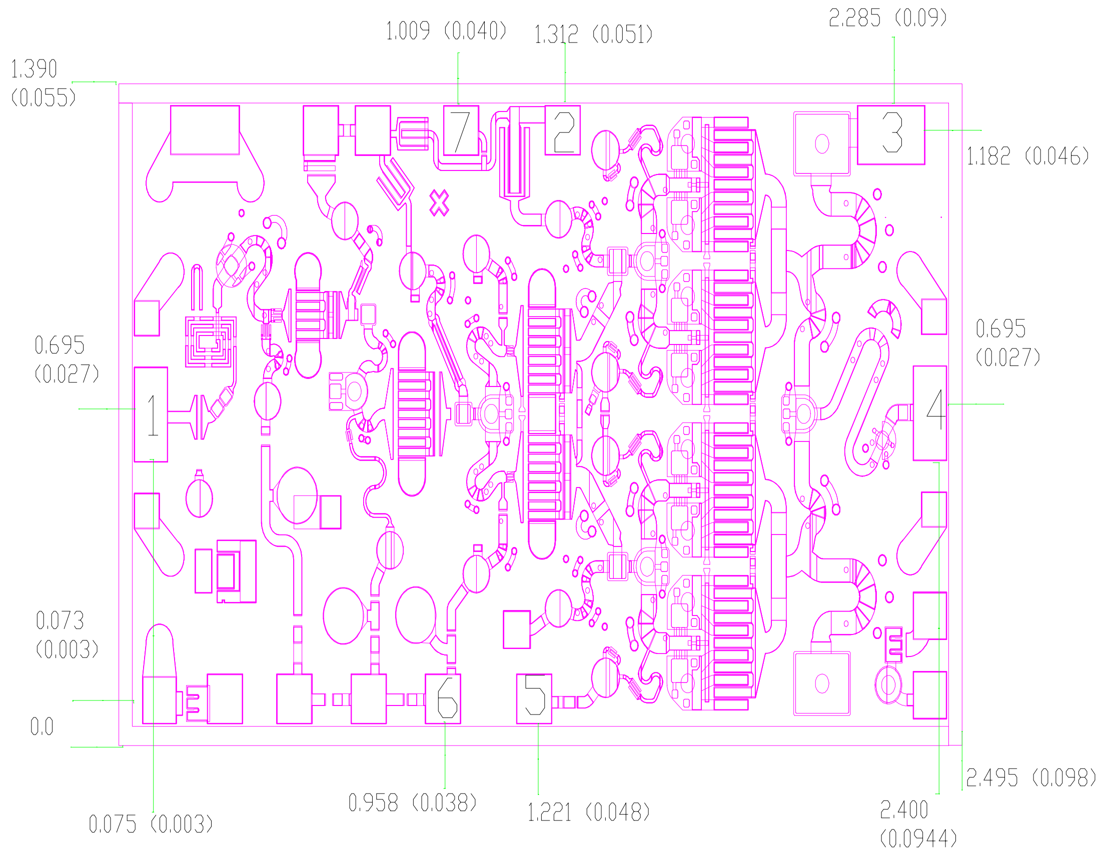

Units: millimeters (inches)
Thickness: 0.1016 (0.004)
Chip edge to bond pad dimensions are shown to center of bond pad
Chip size tolerance: +/- 0.051 (0.002)

Bond pad #1 (RF Input)	0.100 x 0.200 (0.004 x 0.008)
Bond pad #2 (Vd)	0.100 x 0.100 (0.004 x 0.004)
Bond pad #3 (Vd)	0.125 x 0.200 (0.005 x 0.008)
Bond pad #4 (RF Output)	0.100 x 0.200 (0.004 x 0.008)
Bond pad #5, #6 (Vg)	0.100 x 0.100 (0.004 x 0.004)
Bond pad #7 (Bypass)	0.100 x 0.100 (0.004 x 0.004)

Reflow process assembly notes:

- AuSn (80/20) solder with limited exposure to temperatures at or above 300°C
- alloy station or conveyor furnace with reducing atmosphere
- no fluxes should be utilized
- coefficient of thermal expansion matching is critical for long-term reliability
- storage in dry nitrogen atmosphere

Component placement and adhesive attachment assembly notes:

- vacuum pencils and/or vacuum collets preferred method of pick up
- avoidance of air bridges during placement
- force impact critical during auto placement
- organic attachment can be used in low-power applications
- curing should be done in a convection oven; proper exhaust is a safety concern
- microwave or radiant curing should not be used because of differential heating
- coefficient of thermal expansion matching is critical

Interconnect process assembly notes:

- thermosonic ball bonding is the preferred interconnect technique
- force, time, and ultrasonics are critical parameters
- aluminum wire should not be used
- discrete FET devices with small pad sizes should be bonded with 0.0007-inch wire
- maximum stage temperature: 200°C

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