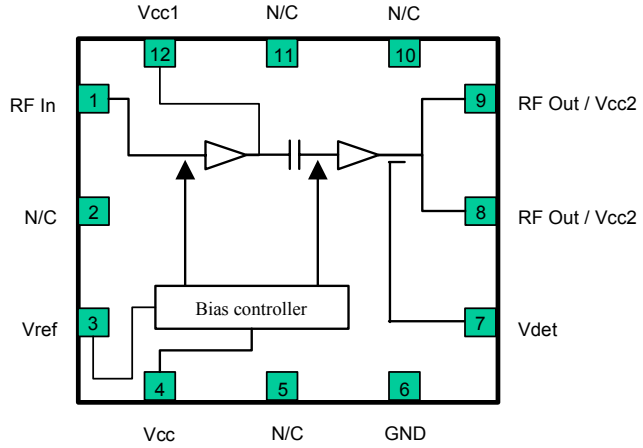
TriQuint SEMICONDUCTOR

WLAN PRODUCTS

TQP2420G
Datasheet



2.4GHz ISM Band InGaP HBT Power Amplifier

Features

- *High Linearity, 2.4 GHz ISM Band PA for 802.11b/g WLAN Systems*
- *Integrated Output Power Detector*
- *Leadless 3.0 x 3.0 mm SMT Package*
- *Temperature Compensated Bias Network with Bias Shutdown Mode*
- *EVM < 2% @ +19dBm Linear Output Power 802.11g modulation*
- *+23 dBm Linear Output Power 802.11b modulation*

Applications

- *802.11b/g WLAN*
- *2.4GHz ISM Band Applications*
- *Cordless Phones*
- *Broadband Systems*

Product Description:

The TQP2420G is a high performance, high linearity, medium-power amplifier designed for 802.11b/g WLAN and other applications in the 2.4GHz ISM band. The device exhibits industry-leading power added efficiency under 802.11b and 802.11g modulated signals. The power amplifier is manufactured using TriQuint's InGaP HBT process and is packaged in an industry standard 3mm x 3mm VQFN-12 package.

Selected Electrical Specifications:

Parameter	min	typ	max	units
Frequency Range	2400	-	2500	MHz
Power Gain	28	29		dB
Linear Output Power (802.11g modulation)		19		dBm
Error Vector Magnitude (Pout = +19dBm, 54Mbps OFDM Signal)		2		%
Linear Output Power (guaranteed ACP under 802.11b modulation)	22	23		dBm
802.11b ACP; +22.0 dBm Output; 1st Side Lobe		-35		dBc
802.11b ACP; +22.0 dBm Output; 2nd Side Lobe		-56		dBc

Test Conditions: Ta=25°C; Vref= 2.95V; Vcc=Vc1=Vc2=3.3V

Absolute Maximum Ratings

Parameter	Symbol	Value		Unit
		min	max	
Power Supply Voltage (no RF applied)	Vc1, Vc2,Vcc		6.0	V
Power Supply Voltage (RF applied)	Vc1, Vc2, Vcc		5.0	V
Reference Voltage	Vref		3.0	V
Power Dissipation	Pdiss			W
Case Temperature, Survival	Tc	-40	100	°C
Storage Temperature	T_a	-40	150	°C
Operating Temperature Range	Toper	-40	85	°C
RF Input Power	Pin		+5dBm	dBm

General Electrical Characteristics[1,2]

Parameter	min	typ	max	Unit
Frequency Range	2400	-	2500	Mhz
Output Power @ 1dB Gain Compression		24		dBm
Power Gain	28	29		dB
Linear Output Power (802.11g modulation)		19		dBm
Error Vector Magnitude (Pout=+19dBm, 54Mbps OFDM Signal)		2		%
Linear Output Power (guaranteed ACP under 802.11b modulation)	22	23		dBm
Gain Variation vs. Frequency		0.4		dB p-p
Power Added Efficiency @ Linear Output Power = +22dBm, with 802.11b CCK modulation		35		%
802.11b Adjacent Channel Power @ +22.0 dBm Output power – 1st Side Lobe		-35		dBc
802.11b Adjacent Channel Power @+22.0 dBm Output power – 2nd Side Lobe		-56		dBc
Input VSWR with external matching)			2:1	

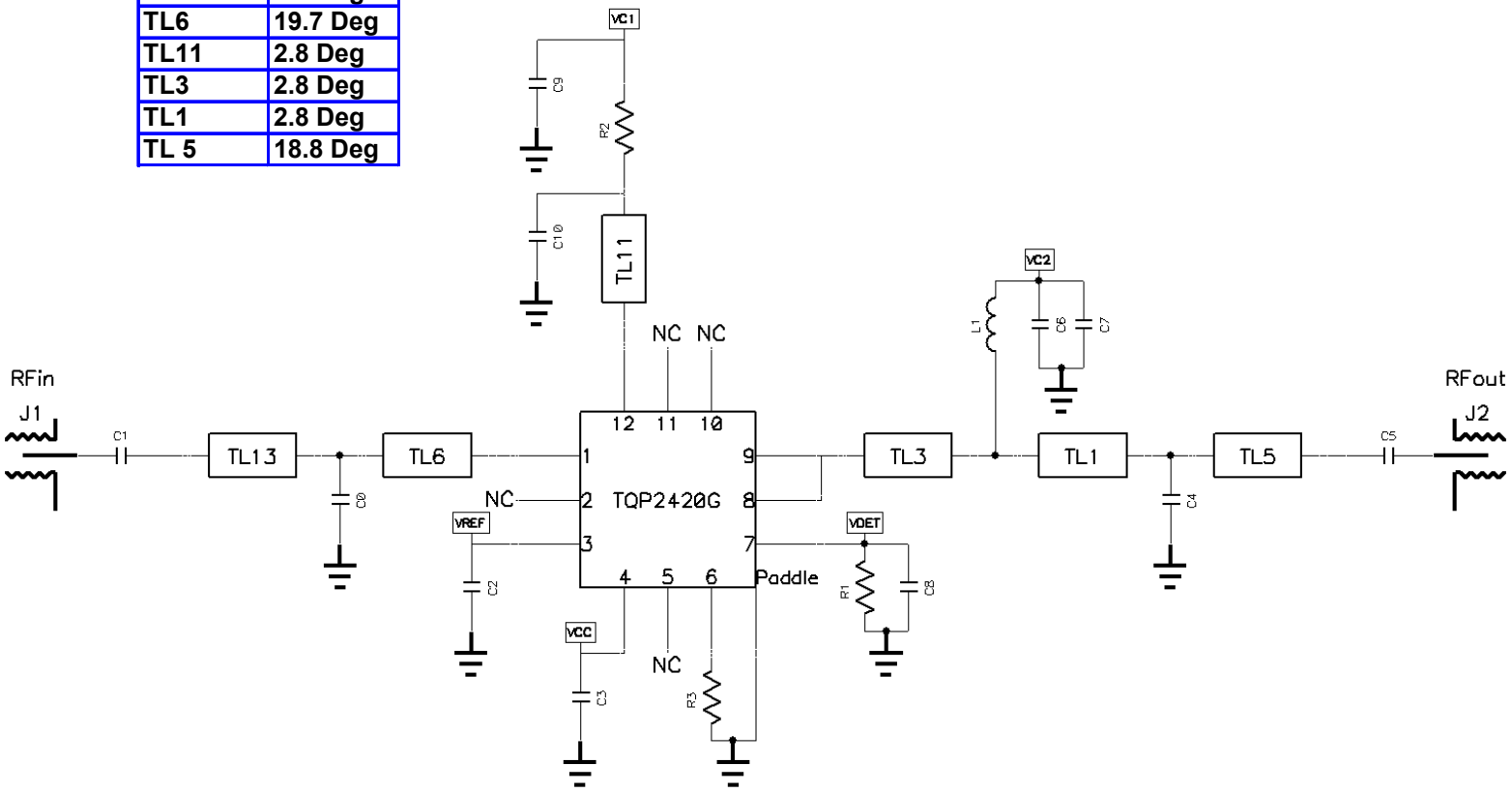
[1]Test Conditions: *T_a=25ºC, Vref=2.95V, Vcc=Vc1=Vc2=3.3V*
[2]*AC performance is guaranteed at 25 Deg-C, Vcc=Vc1=Vc2=3.3V, Vref=2.95V*

*DC Electrical Performance** At Vref=2.95V typical

Parameter,	min	typ	max	Unit
Operating Voltage Supply Range	3.0	3.3	3.6	V
Supply Current: T_a = 25°C, Vcc=Vref=2.95 *Vc1=Vc2*= 3.3V Linear Output Power = 19dBm, with 802.11g 54Mbps modulation		130		mA
Supply Current: T_a = 25°C, Vcc=Vref=2.95 *Vc1=Vc2*= 3.3V Linear Output Power = 22dBm, with 802.11b CCK modulation		180		mA
Vref	2.85	2.95	3.0	
I_{vref}		2		mA
Shutdown Mode Current		<1		uA
Quiescent current*		60		mA

Schematic

TL13	**2.8 Deg**
TL6	**19.7 Deg**
TL11	**2.8 Deg**
TL3	**2.8 Deg**
TL1	**2.8 Deg**
TL 5	**18.8 Deg**

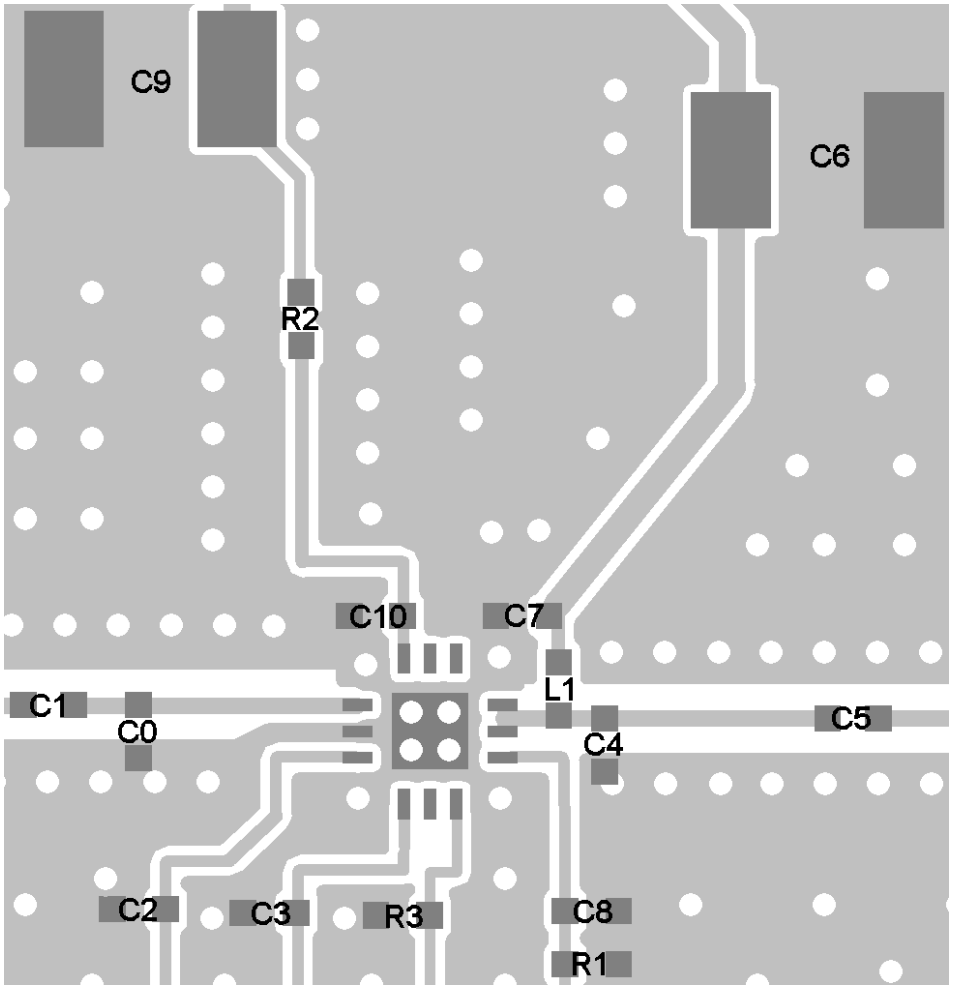


Pin Assignments

Pin	Symbol	Description
1	RFin	RF Input
2	N/C	
3	Vref	Bias Reference voltage
4	Vcc*	Bias circuit supply voltage,
5	N/C	
6	GND	Ground
7	Vdet	Power detector output voltage
8	RFout, Vcc2	RF Output and 2nd stage collector supply voltage
9	RFout, Vcc2	RF Output and 2nd stage collector supply voltage
10	N/C	
11	N/C	
12	Vcc1	1st stage collector supply voltage
	GND	Backside Paddle

*Vcc may be connected directly to Vc1 or Vc2 on DC side of RF Choke

Evaluation Board-WLAN PA; 242x Evaluation board



Layer/Descriptions
Dielectric: FR4: Er=4.6
Top: 1 oz. Plated Copper
Dielectric 1 : 6 mils
Mid 1: 1 oz. Copper
Dielectric 2: 28 mils
Mid 2: 1 oz. Copper
Dielectric 3: 6 mils
Bottom: 1 oz. Plated Copper

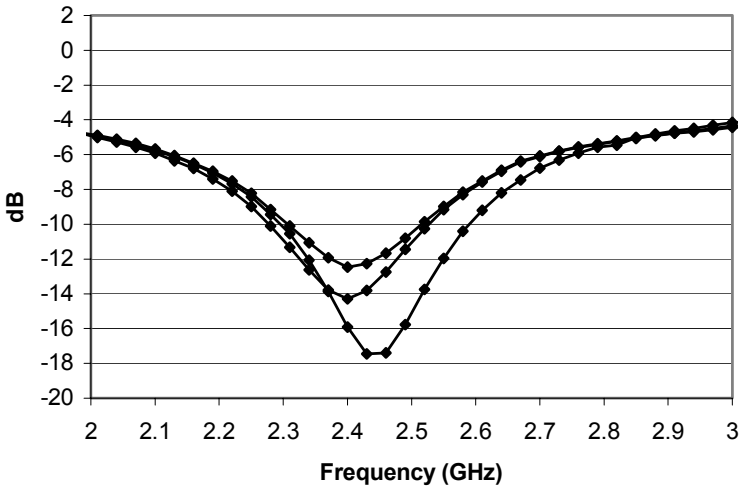
Bill of Materials

		Evaluation Board		242X				
		Integrated Circuit ID		TQP2420				
Part #	**Quantity**	**Component ID**	**Size**	**Value**	**Units**	**Manufacturer**	**P/N**	**Comments**
1	1	C0	0402	1.2	pF	Skywell	042CG1R2C500BA	
2	1	C5	0402	1.5	pF	Skywell	042CG1R5C500BA	
3	1	C1	0402	2.2	pF	Rohm	MCH155A2R2CK	
4	3	C2,C3,C7	0402	0.033	uF	Murata	GRP155R71A333KA01B	
5	1	C4	0402	2.7	pF	Rohm	MCH155A2R7CK	
6	2	C6,C9	.130x.070	10	uF	Murata	GJ232RF51E106ZD01K	
7	1	C10	0402	22	pF	Murata	GRP1555C1H220JZ01B	
8	1	R1	0402	10000	ohms	Rhom	MCR01J133	
9	1	R2	0402	0	ohms	Rhom		
10	1	R3	0402	0	ohms	Rohm		
11	1	L2	0402	6.8	nH	Toko	LL1005-FH6N8J	
12	1	C8	0402	10	pF	Murata	GRP1555C1H100JZ01B	
13	1	Q1	MLF		N/A	Triquint	TQP2420G	
14	2	J1,J2				Johnson	142-0711-881	
15	2	J3,J4						DC Connector
16	1	PCB					242X	Printed circuit board

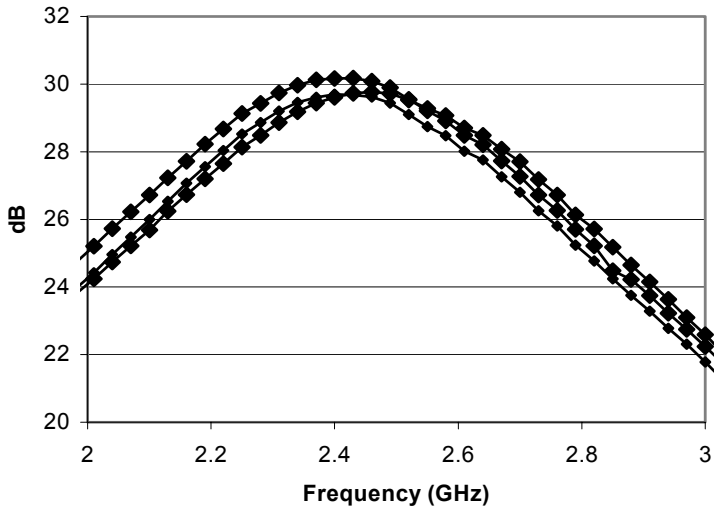
TQP2420G measured Small Signal performance; in TriQuint WLAN242X Evaluation Board

Measurement Conditions: Ta = 25°C, Vref=2.95 Vcc=Vc1=Vc2= 3.3V, Sample size 9 Units

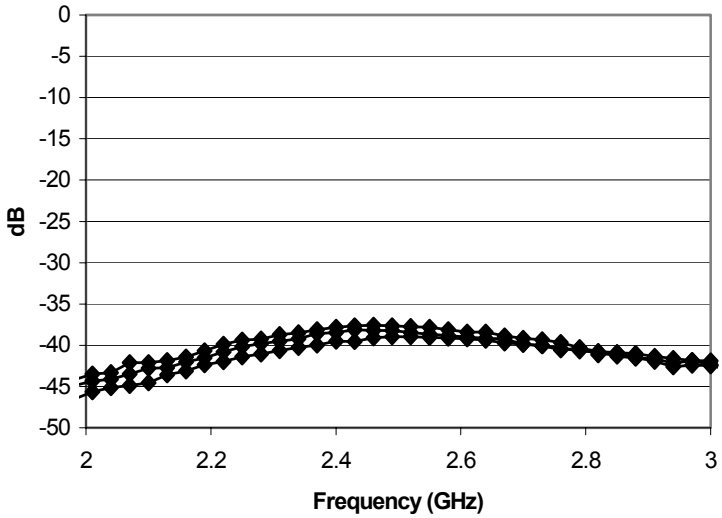
S11
TQP2420G
3 samples



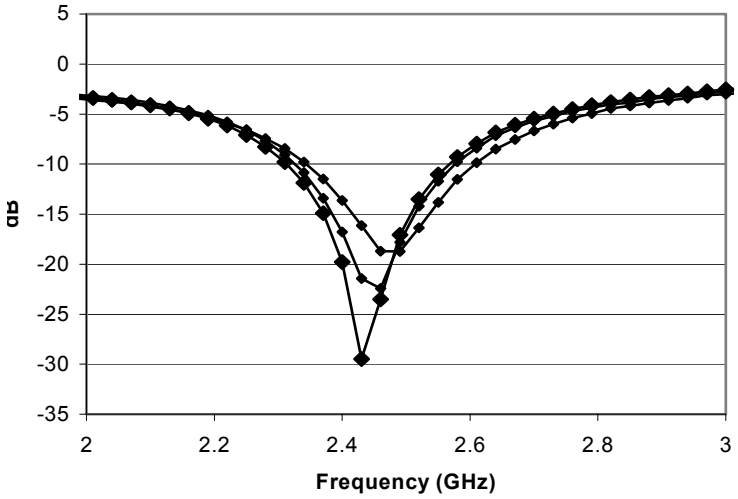
S21
TQP2420G
3 samples



S12
TQP2420G
3 samples

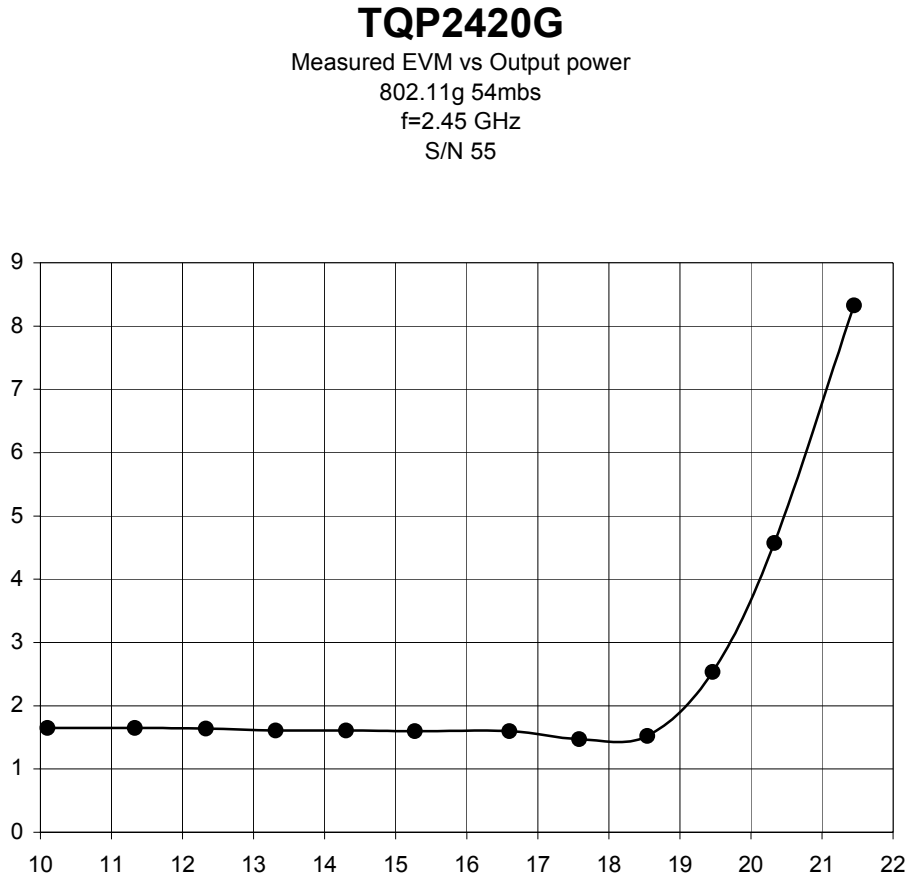


S22
TQP2420G
3 samples



TQP2420G measured 802.11g performance; in TriQuint WLAN242X Evaluation Board- Continued

Measurement conditions: Ta = 25°C, Vref=2.9, Vcc=Vc1=Vc2= 3.3V, f=2450Mhz

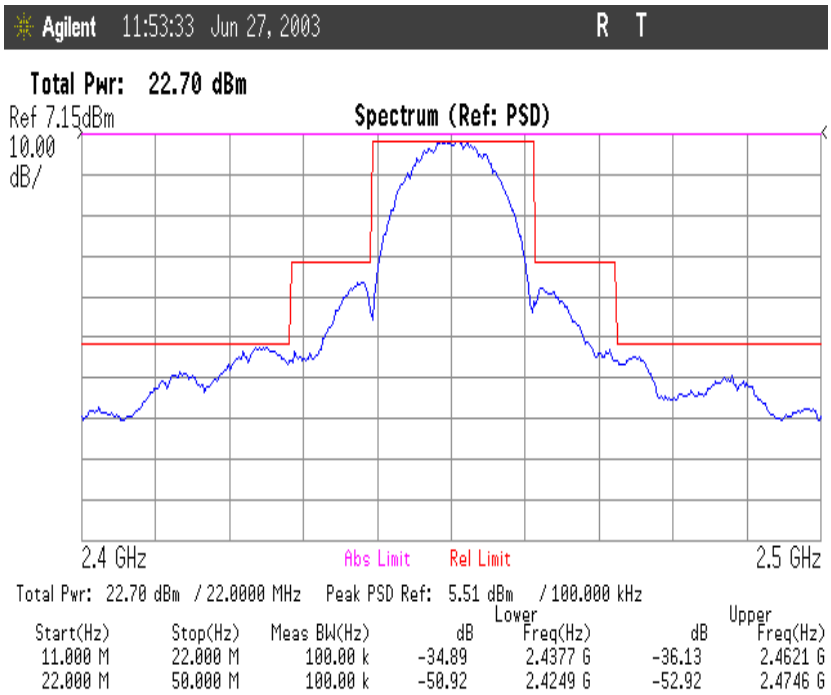


Itot = 132mA @ Pout = +19dBm, 54Mbps OFDM Signal

TQP2420G measured 802.11b performance; in TriQuint WLAN242X Evaluation Board- Continued

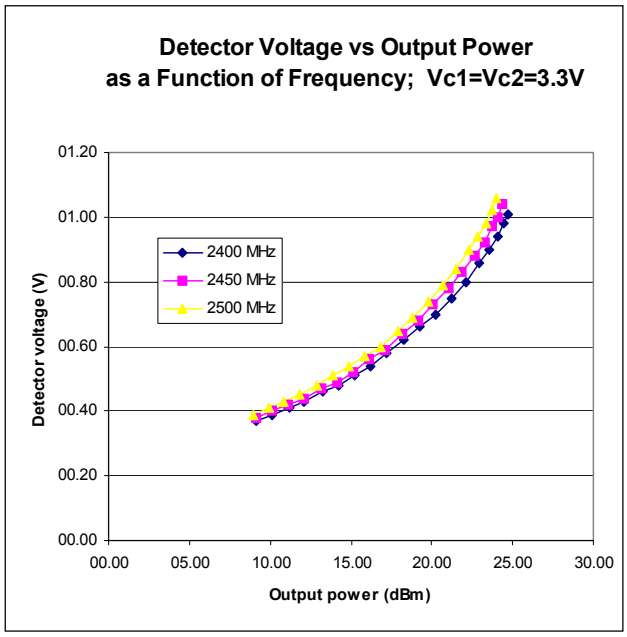
Measurement conditions: Ta = 25°C, Vref=2.9, Vcc=Vc1=Vc2= 3.3V, f=2450Mhz

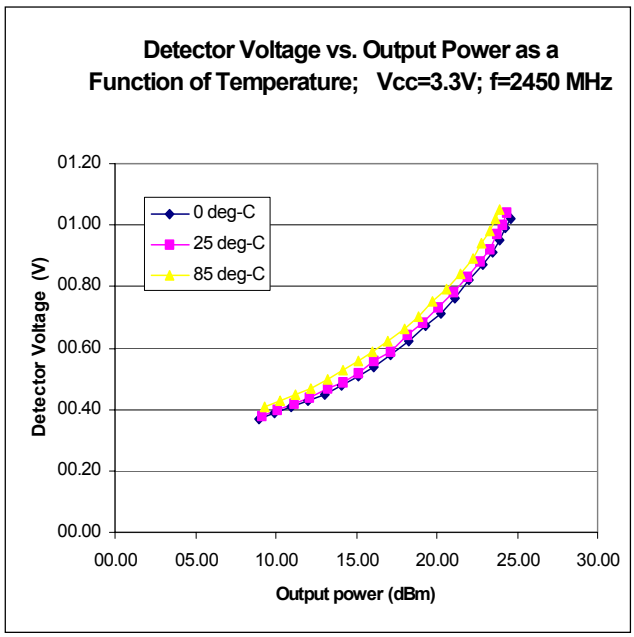
Transmit Spectral Mask-Typical performance



TQP2420G measured performance; in TriQuint WLAN242X Evaluation Board- Continued

Measurement conditions Ta = 25°C, Vref=2.9, Vcc=Vc1=Vc2= 3.3V





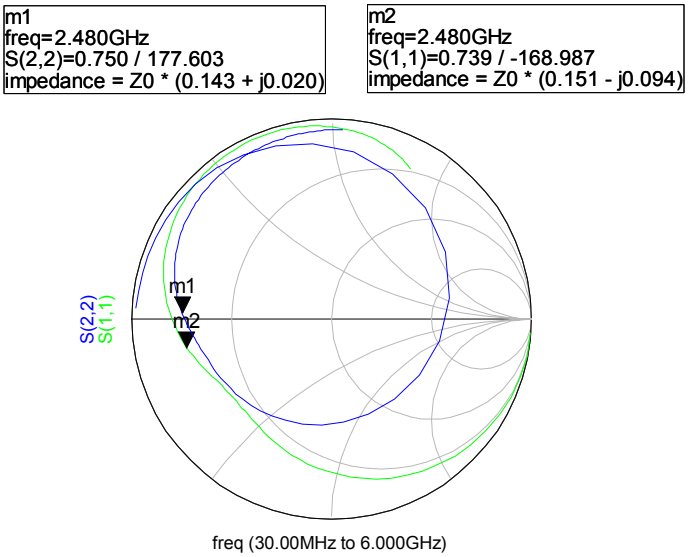
Application Data

External matching

•The 50 Ohm match of the input and output ports of the TQP2420G is completed by the addition of a small number of external components. The optimum impedance presented to the respective ports is described in the Smith Chart plot at the right.

•The impedance shown can be achieved by a number of topologies. The preferred topology selected for Triquint 242x evaluation board is shown in the schematic.

Source **Load**



Source

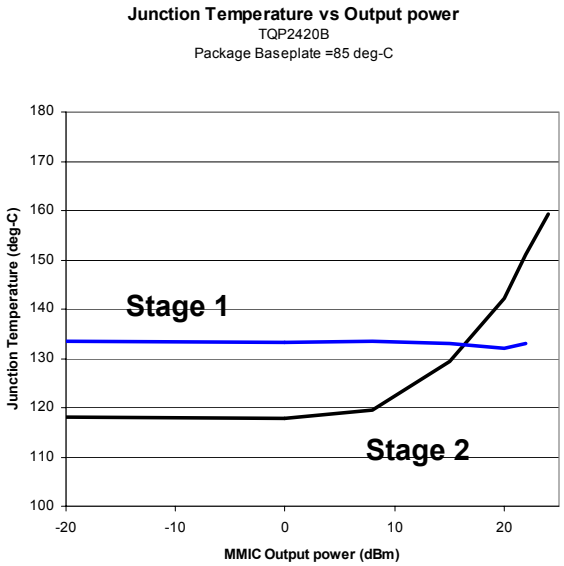
freq	S(1,1)
30.00MHz	0.999 / -3.957
230.0MHz	0.967 / -29.806
430.0MHz	0.903 / -53.507
630.0MHz	0.829 / -74.166
830.0MHz	0.761 / -91.703
1.030GHz	0.706 / -106.400
1.230GHz	0.666 / -118.632
1.430GHz	0.640 / -128.809
1.630GHz	0.630 / -137.406
1.830GHz	0.635 / -144.982
2.030GHz	0.654 / -152.132
2.230GHz	0.687 / -159.368
2.430GHz	0.728 / -167.002
2.630GHz	0.773 / -175.121
2.830GHz	0.819 / 176.361
3.030GHz	0.860 / 167.614
3.230GHz	0.896 / 158.820
3.430GHz	0.925 / 150.128
3.630GHz	0.948 / 141.643
3.830GHz	0.964 / 133.423
4.030GHz	0.975 / 125.491
4.230GHz	0.981 / 117.850
4.430GHz	0.982 / 110.485
4.630GHz	0.980 / 103.380
4.830GHz	0.973 / 96.518
5.030GHz	0.963 / 89.892
5.230GHz	0.948 / 83.512
5.430GHz	0.929 / 77.411
5.630GHz	0.905 / 71.655
5.830GHz	0.877 / 66.344
6.000GHz	0.852 / 62.271

Load

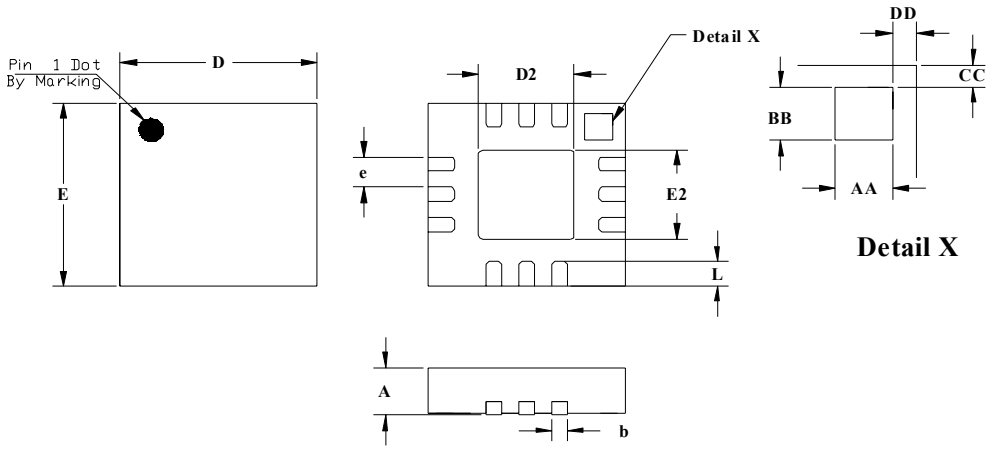
freq	S(2,2)
30.00MHz	0.981 / 176.647
230.0MHz	0.972 / 155.219
430.0MHz	0.950 / 127.187
630.0MHz	0.844 / 82.634
830.0MHz	0.601 / 10.089
1.030GHz	0.509 / -68.802
1.230GHz	0.556 / -114.349
1.430GHz	0.598 / -138.063
1.630GHz	0.627 / -152.220
1.830GHz	0.651 / -161.741
2.030GHz	0.678 / -168.936
2.230GHz	0.708 / -175.101
2.430GHz	0.741 / 179.055
2.630GHz	0.774 / 173.238
2.830GHz	0.804 / 167.397
3.030GHz	0.830 / 161.580
3.230GHz	0.852 / 155.844
3.430GHz	0.870 / 150.230
3.630GHz	0.884 / 144.755
3.830GHz	0.895 / 139.422
4.030GHz	0.905 / 134.221
4.230GHz	0.912 / 129.140
4.430GHz	0.919 / 124.164
4.630GHz	0.924 / 119.274
4.830GHz	0.929 / 114.457
5.030GHz	0.933 / 109.694
5.230GHz	0.937 / 104.969
5.430GHz	0.941 / 100.267
5.630GHz	0.944 / 95.573
5.830GHz	0.948 / 90.874
6.000GHz	0.951 / 86.866

Device Junction Temperature

•The plot is an estimate of the first and second stage transistor temperatures for an amplifier biased at a collector voltage of 3.3V and Vref= 2.95V. The paddle temperature is +85 deg-C. The actual temperature will vary dependent on the method used to attach the package to the final assembly board.



Package Outline



JEDEC DESIGNATION	DESCRIPTION	METRIC	ENGLISH	NOTE
A	OVERALL HEIGHT	0.90 +/-.10 mm	.035 +/-.004 in	1
b	TERMINAL WIDTH	0.23 +/-.07 mm	.009 +/-.003 in	1
D	PACKAGE LENGTH	3.00 mm BSC	.118 in	1
D2	EXPOSED PAD LENGTH	1.45 +/-.10 mm	.057 +/-.004 in	1
e	TERMINAL PITCH	0.50 mm BSC	.020 in	1
E	PACKAGE WIDTH	3.00 mm BSC	.118 in	1
E2	EXPOSED PAD WIDTH	1.45 +/-.10 mm	.057 +/-.004 in	1
L	TERMINAL LENGTH	0.40 +/-.10 mm	.016 +/-.004 in	1
AA	PIN 1 ID LENGTH	0.43 mm BSC	.017 in	1
BB	PIN 1 ID WIDTH	0.43 mm BSC	.017 in	1
CC	PIN 1 ID TO EDGE	0.18 mm BSC	.007 in	1
DD	PIN 1 ID TO EDGE	0.18 mm BSC	.007 in	1

Notes:
1. PRIMARY DIMENSIONS ARE IN METRIC MILLIMETERS. THE ENGLISH EQUIVALENTS ARE CALCULATED AND SUBJECT TO ROUNDING ERROR.

Package Marking

Pin 1

Line 1: 2420
Line 2: XXXX TriQuint Assembly Lot Number
Line 3: Manufacturing year and work week

Ordering Information:

Type	Marking	Package
TQP2420G	**2420**	**VQFN-12**

Caution: Electro**s**tatic **d**ischarge sensitive. Observe handling Precautions!

Additional Information

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

Web: www.triquint.com **Tel: (503) 615-9000**
Email: info_wireless@tqs.com **Fax: (503) 615-8902**

For technical questions and additional information on specific applications:

Email: info_wireless@tqs.com

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