

Product Description:

The TQP2420B is a linear, high performance, medium-power amplifier designed for 802.11b WLAN and other applications in the 2.4GHz ISM band. The device exhibits industry-leading power added efficiency under 802.11b CCK modulation while meeting ACP requirements. 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 |
| Linear Output Power (guaranteed ACP under 802.11b modulation) | 22 | 23 | | dBm |
| Power Gain (Pin = -6 dBm) | 28 | 28.8 | 31 | dB |
| Power Added Efficiency | | 35 | | % |
| 802.11b ACP; +22.0 dBm Output; 1 st Side Lobe | | -35 | | dBc |
| 802.11b ACP; +22.0 dBm Output; 2 nd Side Lobe | | -56 | | dBc |

Test Conditions: Ta=25°C; Vref= 2.95V; Vcc=Vc1=Vc2=3.3V; 802.11b modulation

2.4GHz ISM Band InGaP HBT Power Amplifier

Features

- High-Efficiency, 2.4 GHz ISM Band PA for 802.11b WLAN Systems
- Integrated Output Power Detector
- Leadless 3.0 x 3.0 mm SMT Package
- Temperature Compensated Bias Network with Bias Shutdown Mode
- +23 dBm Linear Output Power

Applications

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

TQP2420B

Preliminary Datasheet

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 | Ta | -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 |
| Linear Output Power (guaranteed ACP under 802.11b modulation) | 22 | 23 | | dBm |
| Power Gain (Pin=-6dBm) | 28 | 28.8 | 31 | dB |
| Gain Variation vs. Frequency | | 0.4 | | dB p-p |
| Power Added Efficiency | | 35 | | % |
| 802.11b Adjacent Channel Power @ +22.0 dBm Output power – 1 st Side Lobe | | -35 | | dBc |
| 802.11b Adjacent Channel Power @ +22.0 dBm Output power – 2 nd Side Lobe | | -56 | | dBc |
| Input VSWR with external matching) | | | 2:1 | |

¹Test Conditions: $T_a=25^{\circ}\text{C}$, $V_{ref}=2.95\text{V}$, $V_{cc}=V_{c1}=V_{c2}=3.3\text{V}$ 802.11b modulation

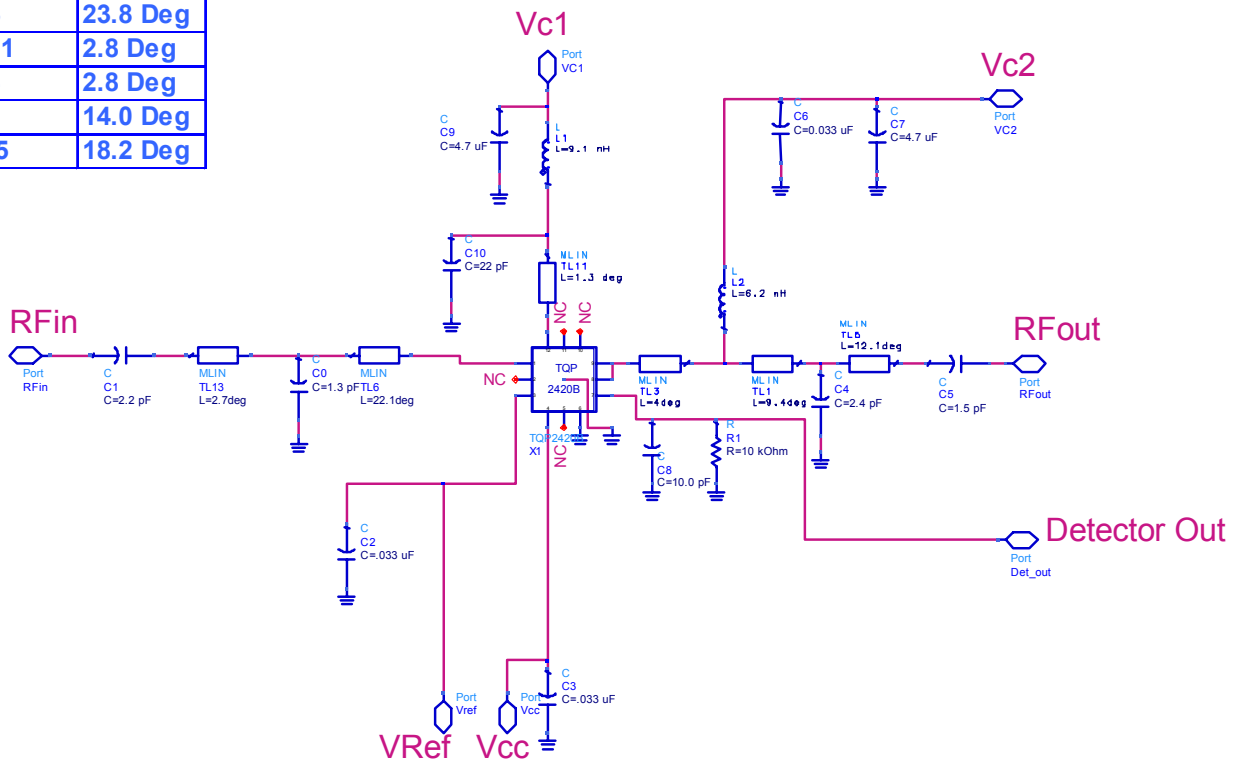
²AC performance is guaranteed at 25 Deg-C, $V_{cc}=V_{c1}=V_{c2}=3.3\text{V}$, $V_{ref}=2.95\text{V}$

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: $T_a = 25^{\circ}\text{C}$, $V_{cc}=V_{ref}=2.95$ $V_{c1}=V_{c2}= 3.3\text{V}$ Linear Output Power = 22dBm, with 802.11b CCK modulation | | 160 | | mA |
| Vref | 2.85 | 2.95 | 3.0 | |
| Ivref | | 2 | | mA |
| Shutdown Mode Current | | <1 | | uA |
| Quiescent current* | | 60 | | mA |

Schematic

| | |
|------|----------|
| TL13 | 3.5 Deg |
| TL6 | 23.8 Deg |
| TL11 | 2.8 Deg |
| TL3 | 2.8 Deg |
| TL1 | 14.0 Deg |
| TL 5 | 18.2 Deg |



Pin Assignments

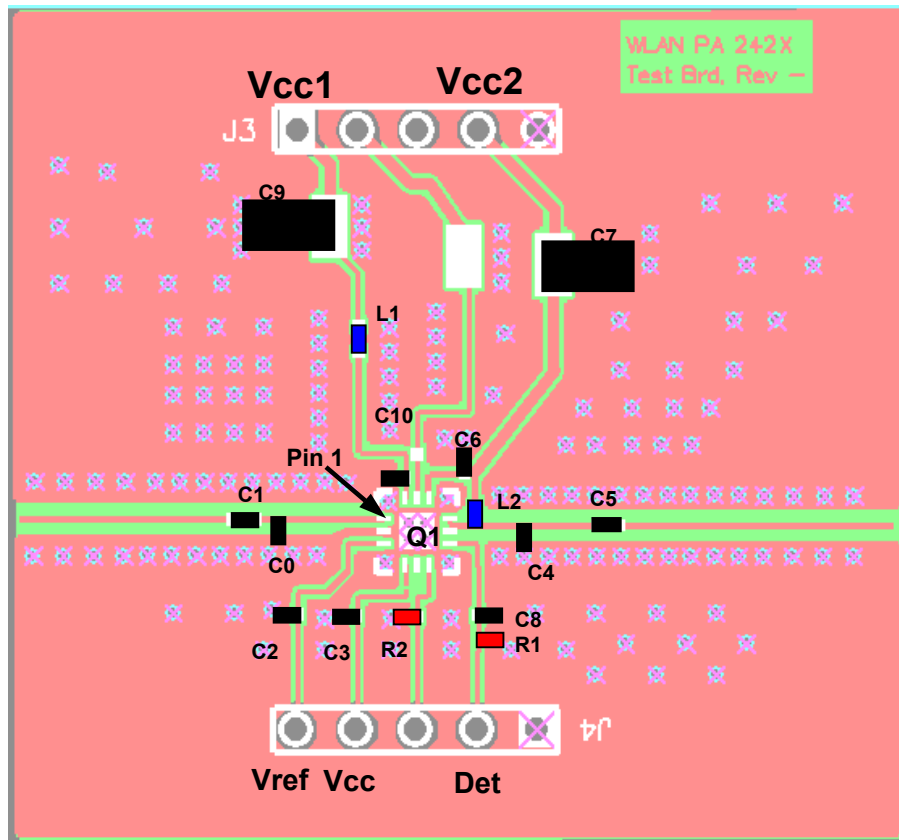
| Pin | Symbol | Description |
|-----|-------------|--|
| 1 | RFIn | RF Input |
| 2 | N/C | |
| 3 | Vref | Bias Reference voltage |
| 4 | Vcc* | Bias circuit supply voltage, |
| 5 | N/C | |
| 6 | GND | Ground |
| 7 | Vdet | Power detector output voltage |
| 8 | RFout, Vcc2 | RF Output and 2 nd stage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

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

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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

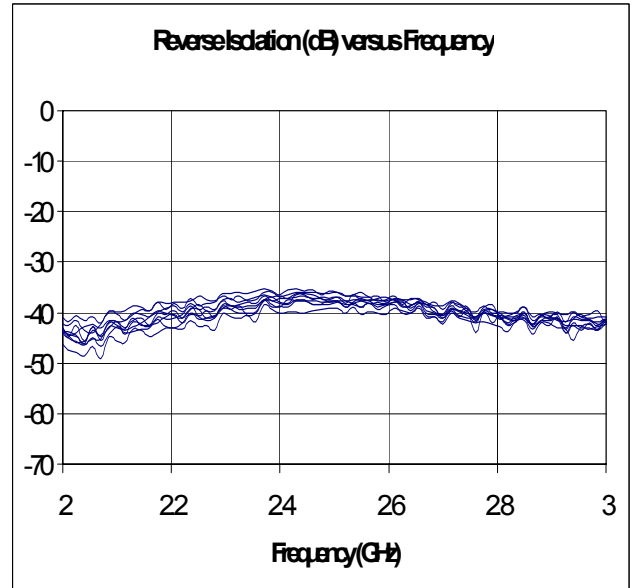
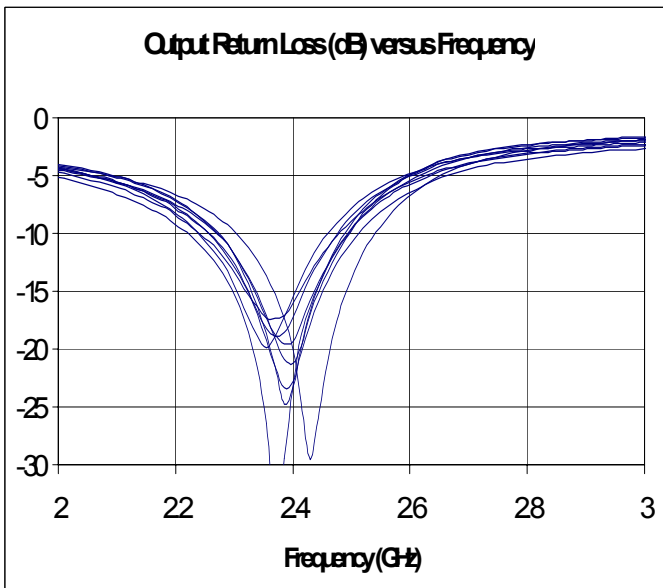
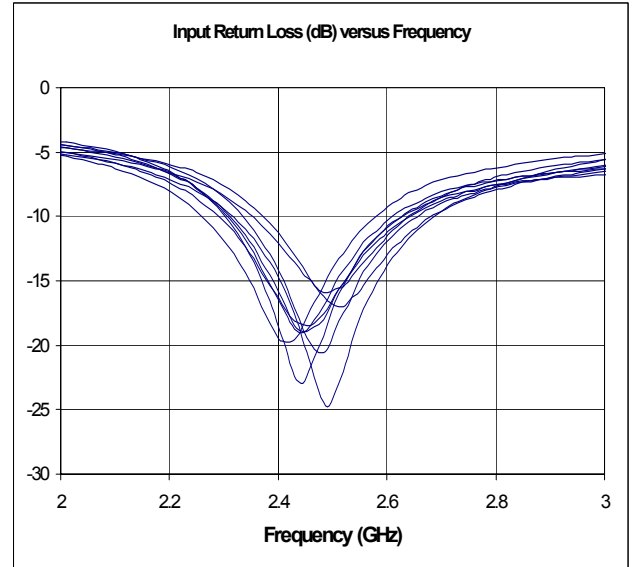
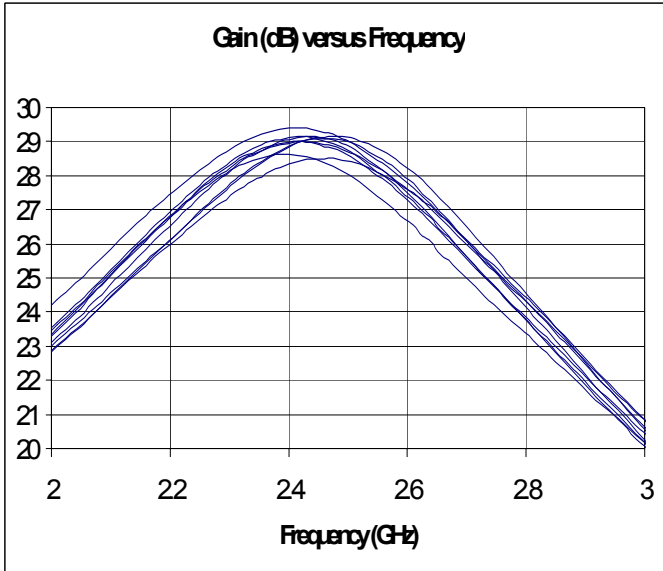
Bill of Materials

| | | Evaluation Board | | 242X | | | | | |
|--------|----------|-----------------------|-----------|----------|-------|--------------|--------------------|-----------------------|--|
| | | Integrated Circuit ID | | TQP2420 | | | | | |
| Part # | Quantity | Component ID | Size | Value | Units | Manufacturer | P/N | Comments | |
| 1 | 1 | C0 | 0402 | 1.3 | pF | AVX | 04023J1R3BBW | | |
| 2 | 1 | C5 | 0402 | 1.5 | pF | AVX | 04023J1R5BBW | | |
| 3 | 1 | C1 | 0402 | 2.2 | pF | AVX | 04023J2R2BBWTR | | |
| 4 | 2 | C3,C6 | 0402 | 0.033 | uF | Murata | GRP155R71A333KA01B | | |
| 5 | 1 | C4 | 0402 | 2.40 | pF | AVX | 04023J2R4BBW | | |
| 6 | 2 | C7,C9 | .130x.070 | 4.70 | uF | AVX | TRJR475M016R | | |
| 7 | 1 | C10 | 0402 | 22.00 | pF | Murata | GRP1555C1H220JZ01B | | |
| 8 | 1 | R1 | 0402 | 10000.00 | ohms | Rhom | MCR01J133 | | |
| 9 | 1 | R2 | 0402 | 0.00 | ohms | Rhom | | | |
| 10 | 1 | L1 | 0402 | 9.10 | nH | Murata | LQW15AN9N1H | | |
| 11 | 1 | L2 | 0402 | 6.20 | nH | Murata | LQW15AN6N2C | | |
| 12 | 2 | C8,C2 | 0402 | 10.00 | pF | Murata | GRP1555C1H100JZ01B | | |
| 13 | 1 | Q1 | MLF | | N/A | Triquint | TQP2420B | | |
| 14 | 2 | J1,J2 | | | | Johnson | 142-0711-881 | | |
| 15 | 2 | J3,J4 | | | | | | DC Connector | |
| 16 | 1 | PCB | | | | | 242X | Printed circuit board | |

TQP2420B Preliminary Datasheet

TQP2420B measured performance; in TriQuint WLAN242X Evaluation Board

Measurement conditions $T_a = 25^\circ\text{C}$, $V_{ref}=2.95$ $V_{cc}=V_{c1}=V_{c2}= 3.3\text{V}$, Sample size 9 Units

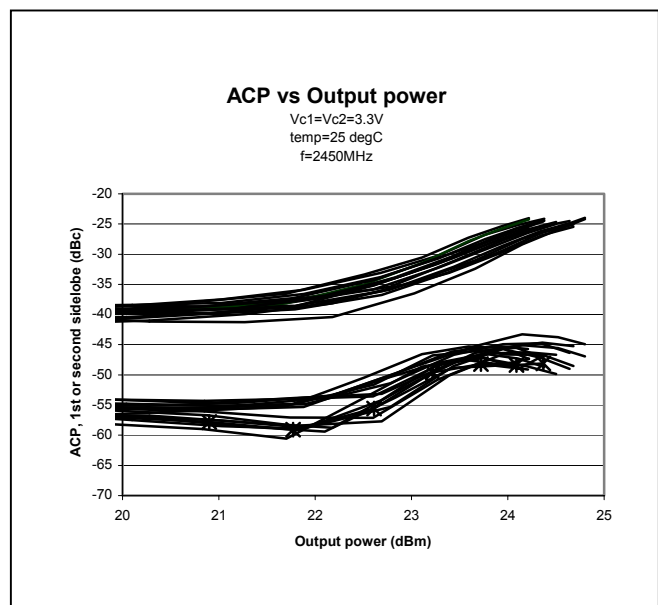
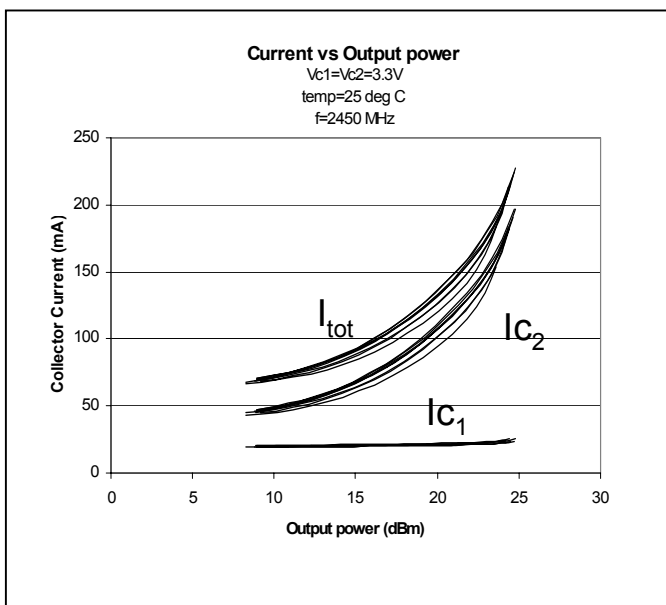
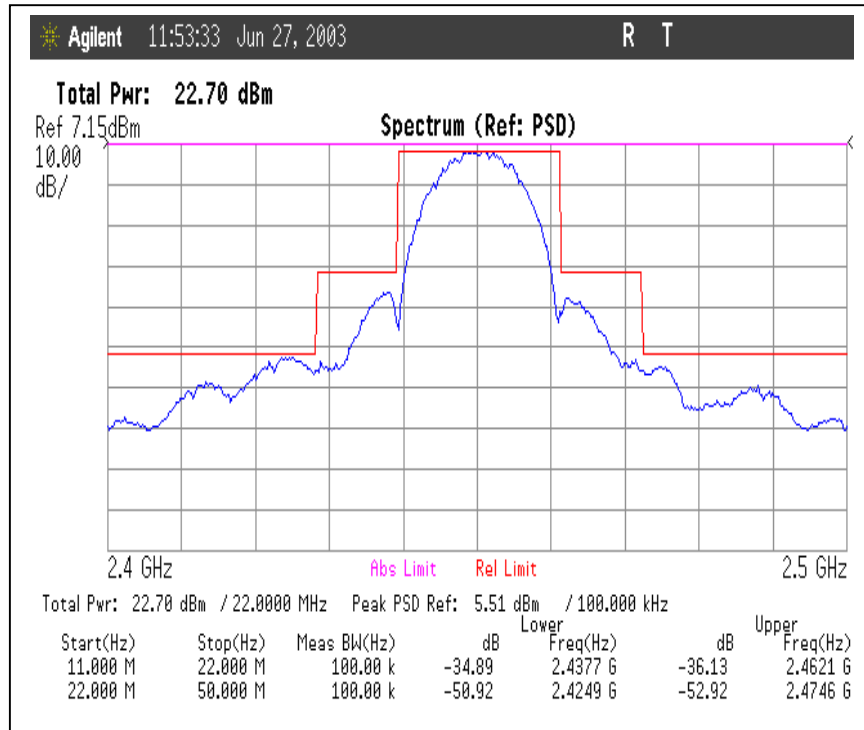


TQP2420B

Preliminary Datasheet

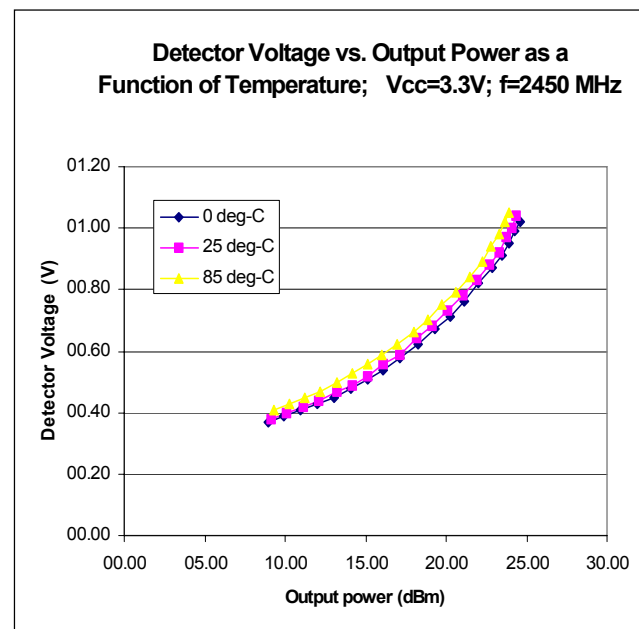
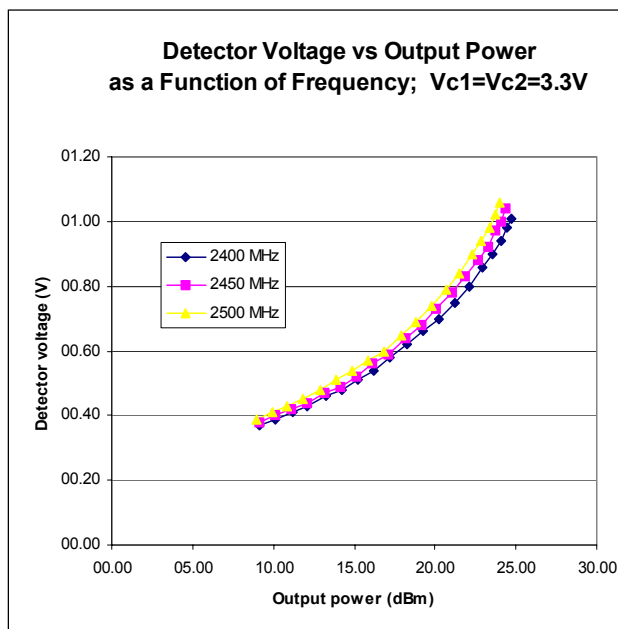
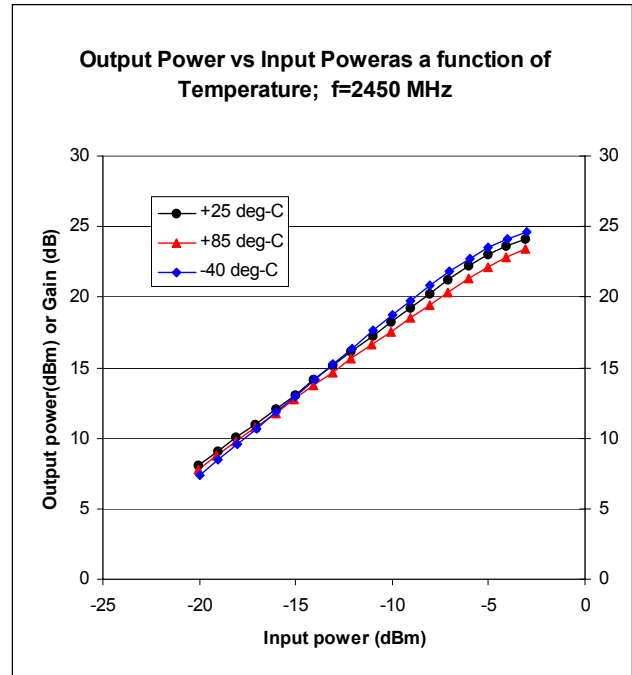
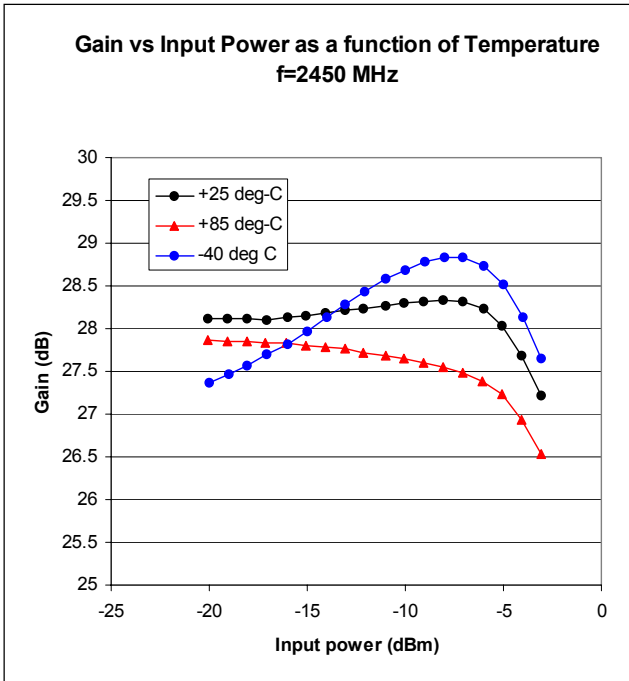
TQP2420B measured performance; in TriQuint WLAN242X Evaluation Board
 Measurement conditions $T_a = 25^\circ\text{C}$, $V_{ref}=2.95$, $V_{cc}=V_{c1}=V_{c2}= 3.3\text{V}$, 802.11b Modulation

Transmit Spectral Mask-Typical performance



TQP2420B measured performance; in TriQuint WLAN242X Evaluation Board- Continued

Measurement conditions $T_a = 25^\circ\text{C}$, $V_{ref}=2.9$, $V_{cc}=V_{c1}=V_{c2}= 3.3\text{V}$



TQP2420B

Preliminary Datasheet

Application Data

External matching

•The 50 Ohm match of the input and output ports of the TQP2420B 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.

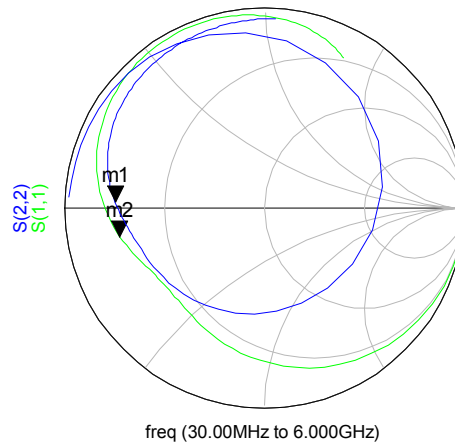
•The impedance shown can be achieved by a number of topologies. The preferred topology selected for Triquint 242x evaluation board is shown in the schematic.

Source

m1
freq=2.480GHz
S(2,2)=0.750 / 177.603
impedance = $Z_0 * (0.143 + j0.020)$

Load

m2
freq=2.480GHz
S(1,1)=0.739 / -168.987
impedance = $Z_0 * (0.151 - j0.094)$



Source

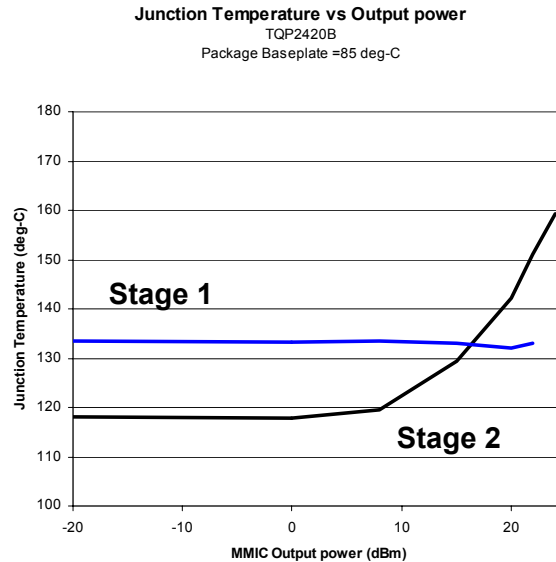
| freq | S(1,1) |
|----------|------------------|
| 30.00MHz | 0.999 / -3.957 |
| 230.0MHz | 0.967 / -29.806 |
| 430.0MHz | 0.903 / -53.507 |
| 630.0MHz | 0.829 / -74.166 |
| 830.0MHz | 0.761 / -91.703 |
| 1.030GHz | 0.706 / -106.400 |
| 1.230GHz | 0.666 / -118.632 |
| 1.430GHz | 0.640 / -128.809 |
| 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

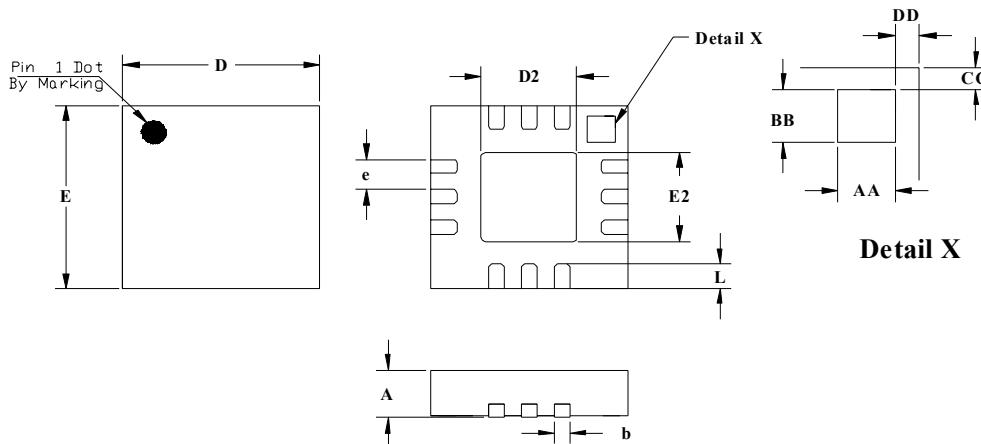
| freq | S(2,2) |
|----------|------------------|
| 30.00MHz | 0.981 / 176.647 |
| 230.0MHz | 0.972 / 155.219 |
| 430.0MHz | 0.950 / 127.187 |
| 630.0MHz | 0.844 / 82.634 |
| 830.0MHz | 0.601 / 10.089 |
| 1.030GHz | 0.509 / -68.802 |
| 1.230GHz | 0.556 / -114.349 |
| 1.430GHz | 0.598 / -138.063 |
| 1.630GHz | 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 |

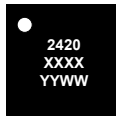
Notes:
1. PRIMARY DIMENSIONS ARE IN METRIC MILLIMETERS. THE ENGLISH EQUIVALENTS ARE CALCULATED AND SUBJECT TO ROUNDING ERROR.

TQP2420B

Preliminary Datasheet

Package Marking

Pin 1



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

Caution: Electrostatic discharge sensitive. Observe handling Precautions!

Part Ordering Information

| Type | Marking | Ordering code (tape and reel) | Package |
|----------|---------|----------------------------------|-------------------------|
| TQP2420B | 2420 | TBD | VQFN12 3x3mm 12 Lead |

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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