

Applications

- 802.11a/n/ac Wireless LAN Systems
- CPE (Set Top Box, Gateways)
- Access Points
- Telematics
- Gaming and Infotainment
- Portable Devices

Product Features

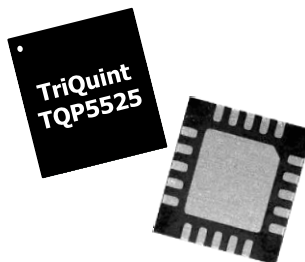
- Fully Integrated, 802.11ac power amplifier module
- Internally matched input/output
- Temperature Compensated Bias Network
- High Gain = 32dB
- Integrated CMOS compatible logic and shutdown
- Typ. $P_{OUT} = 25$ dBm, EVM = -35 dB, MCS9/VHT80 802.11ac
- Typ. $P_{OUT} = 26$ dBm, EVM = -30 dB MCS7/HT40 802.11n
- Typ. $P_{OUT} = 18$ dBm, EVM = -40 dB MCS9/VHT80 802.11ac
- Leadless 4.0 x 4.0 x 0.85 mm SMT Pb-Free

General Description

The TQP5525 is high power WLAN power amplifier module that contains internally matched 3-stage PA, compensated DC biasing circuit and output power detector. This PA module provides high gain (32dB), high linearity, industry leading EVM floor, and excellent spectral purity for wideband OFDM applications. The architecture and interface are optimized for most stringent VM requirements of next generation 802.11ac WLAN devices.

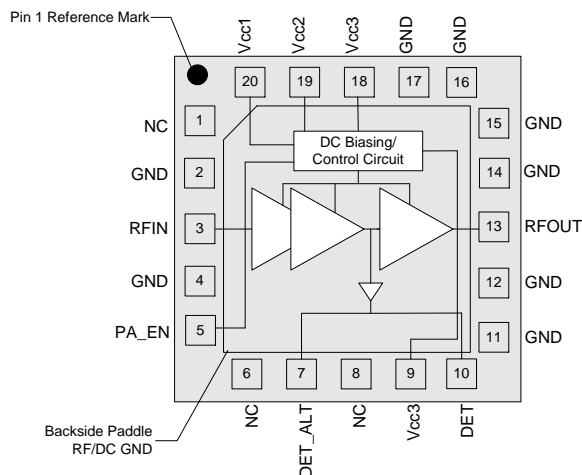
The PA module features chipset logic compatible control voltages that draw very low current to facilitate ease of use and compatibility with current and future transceiver generation. With its optimized power dissipation, the amplifier module is well suited for implementation into next generation MIMO configurations and well designed to work with or without digital pre-distortion (DPD).

The TQP5525 is manufactured in TriQuint's high-reliability HBT technology and is assembled in a small footprint 4.0 x 4.0 x 0.85 mm 20-pin QFN package.



4x4mm 20-pin leadless SMT Package

Functional Block Diagram



Pin Configuration

Pin No.	Label
2, 4, 11, 12, 14, 15, 16, 17	GND
3	RFIN
5	PA_EN
1, 6, 8	NC
7	DET_ALT
9, 18	VCC3
10	DET
13	RFOUT
19	VCC2
20	VCC1
Backside Paddle	RF/DC Ground

Ordering Information

Part No.	Description
TQP5525	High Power WLAN PA
TQP5525-EVB	Evaluation Board

Standard T/R size = TBD

Absolute Maximum Ratings

Parameter	Rating
Storage Temperature	-40 to 150°C
Case Temperature, Survival	-40 to 100°C
RF Input Power, CW, 50 Ω , T = 25°C	+5 dBm
Device Voltage	+6.0 V

Operation of this device outside the parameter ranges given above may cause permanent damage.

Recommended Operating Conditions

Parameter	Min	Typ	Max	Units
V_{CC1} , V_{CC2} , V_{CC3}	3.3	5	5.25	V
T_{AMB}	-40	25	+85	°C
T_j			160	°C

Electrical performance is measured under conditions noted in the electrical specifications table. Specifications are not guaranteed over all recommended operating conditions.

Electrical Specifications – DC Characteristics

Test conditions unless otherwise noted: V_{DD1} , V_{DD2} , V_{DD3} = +5.0 V, Temp = +25°C.

Parameter	Conditions	Min	Typ	Max	Units
Quiescent Current	No RF		350		mA
Operational Current	Pout = +24dBm, 11ac, MCS9, HT80		600		mA
	Pout = +27.5dBm, 11ac, MCS0, HT20		800		mA
TX Shut Down Current	PA_EN = Low, No RF		8		μ A
PA Enable Voltage	Input Voltage for High State	1.8	3.0	V_{CC1}	V
	Input Voltage for Low State		0	0.45	V
PA Enable Current			20	100	μ A
Rise/Fall Time			0.4	0.8	μ S
Thermal Resistance, θ_{jc}	Junction to backside paddle		20		°C/W

Electrical Specifications

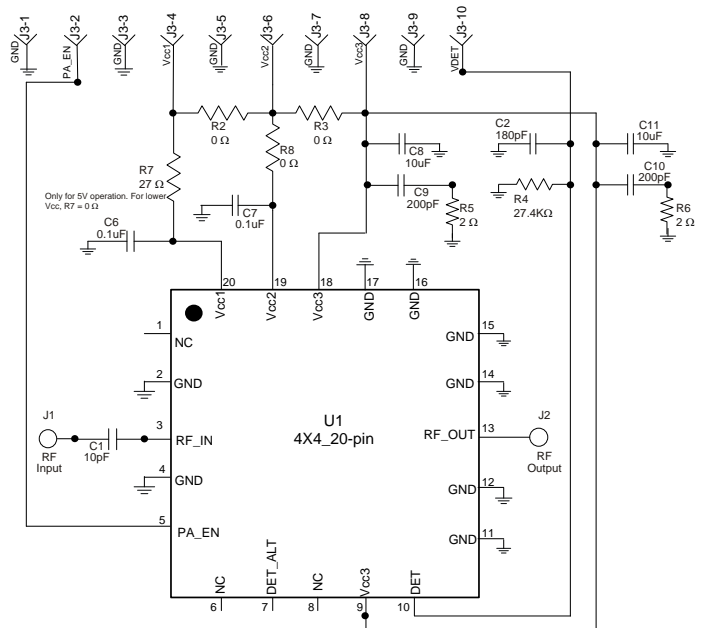
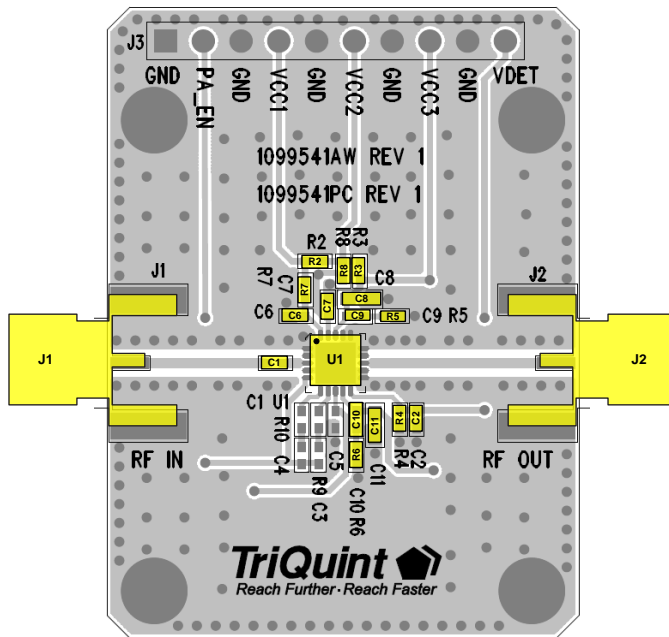
Test conditions unless otherwise noted: 25°C, Vcc1, Vcc2, Vcc3 = 5.0V, PA Enable High = 3.0V, TQ EVB, -45dBm EVM source

Parameter	Conditions	Min	Typ	Max	Units
Operational Freq. Range		4900		5925	MHz
3dB Bandwidth	At each 11ac VHT80 channel	4740		6100	MHz
Saturation Power (Psat)	f =4900-5250 MHz		31.5		dBm
	f =5250-5925 MHz		34		dBm
Small Signal Gain	f =4900-5250 MHz		30		dB
	f =5250-5925 MHz		32		dB
Gain OoB	Absolute gain, f =3433–3917 MHz		0		dB
	Absolute gain, f=1716–1959 MHz		-50		dB
Gain Flatness Across Band	For any 80MHz BW, 11ac VHT80		+/- 0.25		dB
Spectral Emission Mask Margin Relative to 11ac standard 11ac, MCS0, HT20	Pout = +24 dBm, f =5150-5250 MHz		5		dB
	Pout = +26.5 dBm, f =5250-5725 MHz		5		dB
	Pout = +27.5 dBm, f =5725-5925 MHz		5		dB
PA Noise Figure			7		dB
Input Return Loss			10		dB
Output Return Loss			12		dB
CW Signal Phase Variation	Pout = 18dBm to 24dBm		1.0		deg
TX Harmonics (2fo) 11ac, MCS0, HT20	Pout = +22 dBm, f =5150-5250 MHz		-45		dBm/MHz
	Pout = +26.5 dBm, f =5250-5725 MHz		-45		dBm/MHz
	Pout = +27.5 dBm, f =5725-5925 MHz		-45		dBm/MHz
TX Harmonics (3fo) 11ac, MCS0, HT20	Pout = +22 dBm, f =5150-5250 MHz		-45		dBm/MHz
	Pout = +26.5 dBm, f =5250-5725 MHz		-45		dBm/MHz
	Pout = +27.5 dBm, f =5725-5925 MHz		-45		dBm/MHz
DEVM (11n / VHT40 / MCS7)	Pout = +25 dBm		-33		dB
DEVM (11ac / VHT80 / MCS9)	Pout = +18 dBm		-40		dB
	Pout = +24 dBm		-37		dB
DEVM (11ac / HT20 / MCS0)	Pout = +27 dBm		-26		dB
Detector Voltage	No RF		0.35		V
	Pout = +27.5dBm		0.9		V
Stability	Pout = +28 dBm, VSWR = 6:1, all phases	All non-harmonically related outputs < -50 dBc/100 kHz			-

Logic Truth Table

PA Mode	PA_EN
Disabled	Low
Enabled	High

Application Circuit

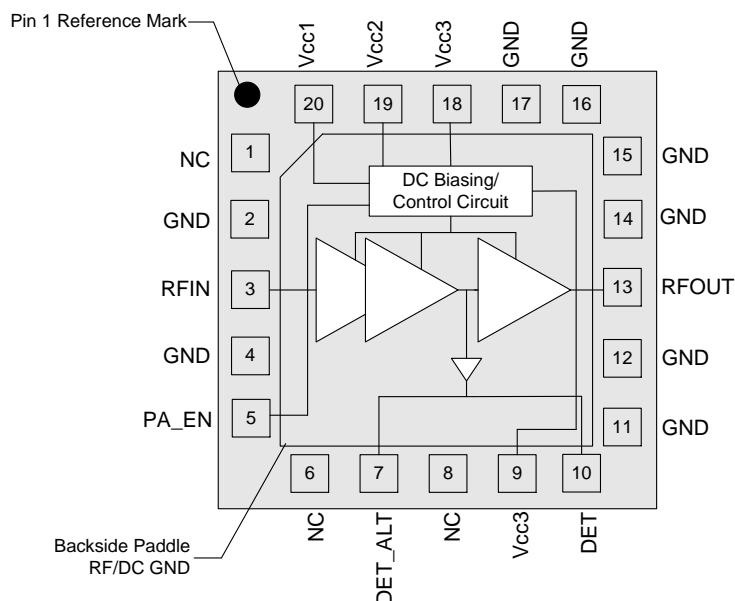


Bill of Material

Ref Des	Value	Description	Manuf.	Part Number
n/a	n/a	Printed Circuit Board		1099541
U1	n/a	High Power WLAN 5GHz PA	TriQuint	TQP5525
R2, R8, R3	0 Ω	Resistor, Chip, 04023, 5%	various	
C1	10 pF	Capacitor, Chip, 0402, 5%	various	
C6, C7	0.1 uF	Capacitor, Chip, 0402, 10%	various	
C8, C11	10 uF	Capacitor, Chip, 0402, 10%	various	
C9, C10	200 pF	Capacitor, Chip, 0402, 10%	various	
C2	180 pF	Capacitor, Chip, 0402, 10%	various	
R7	27 Ω	Resistor, Chip, 0402, 5%, 1/16W, See Note 1.	various	
R5, R6	2 Ω	Resistor, Chip, 0402, 5%, 1/16W	various	
R4	27.4 KΩ	Resistor, Chip, 0402, 5%, 1/16W	various	

Note 1: R7 is only required for 5V operation. Replace with 0ohm for lower voltage operation.

Pin Configuration and Description

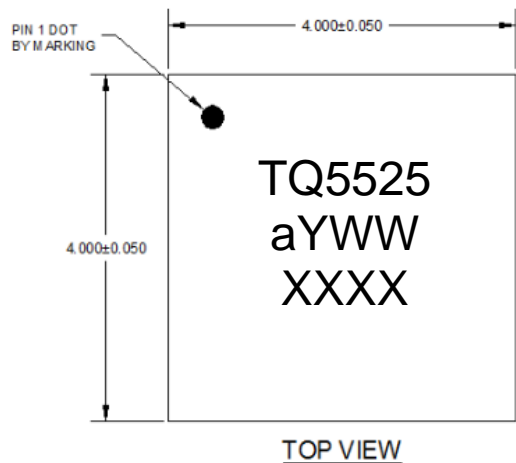


Pin No.	Label	Description
1	NC	No Connection (Can be GND or Floating)
2	GND	Ground
3	RF_IN	RF Input
4	GND	Ground
5	PA_EN	PA Enable
6	NC	No Connection (Can be GND or Floating)
7	DET_ALT	Alternate Detector Output
8	NC	No Connection (Can be GND or Floating)
9	Vcc3	Supply voltage for third stage PA
10	DET	Detector Output
11	GND	Ground
12	GND	Ground
13	RF_OUT	RF Output
14	GND	Ground
15	GND	Ground
16	GND	Ground
17	GND	Ground
18	VCC3	Supply voltage for third stage PA
19	VCC2	Supply voltage for second stage PA
20	VCC1	Supply voltage for first stage PA

Backside Paddle	RF/DC GND	FEM RF/DC ground. Use recommended via pattern to minimize inductance and thermal resistance. See PCB Mounting Pattern for suggested footprint.
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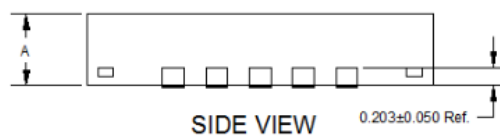
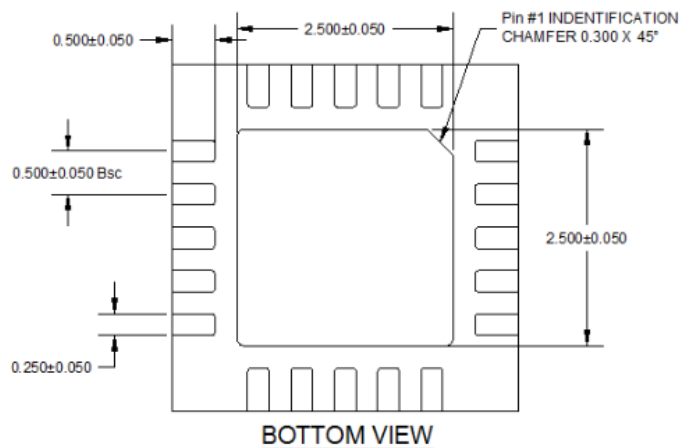
Package Marking and Dimensions

Marking: Part number: TQ5525
 Assembly code: aYWW
 a = C or T
 Y = Last # in Year (ex. 2013= 3)
 WW = workweek
 Lot code: XXXX



A	MAX.	0.900
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NOTE: DIMENSION "A" EXCLUDING BURR.



Notes:

1. All dimensions are in millimeters.
2. Contact plating: NiPdAu.

Product Compliance Information

ESD Sensitivity Ratings



Caution! ESD-Sensitive Device

ESD Rating: 1C
Value: Passes 1000V to <2000V
Test: Human Body Model (HBM)
Standard: JEDEC Standard JESD22-A114

ESD Rating: C3
Value: Passes ≥ 1000 V
Test: Charged Device Model (CDM)
Standard: JEDEC Standard JESD22-C101

MSL Rating

MSL Rating: Level 1
Test: 260°C convection reflow
Standard: JEDEC Standard IPC/JEDEC J-STD-020

Solderability

Compatible with both lead-free (260°C maximum reflow temperature) and tin/lead (245°C maximum reflow temperature) soldering processes.

Contact plating: NiPdAu

RoHS Compliance

This part is compliant with EU 2002/95/EC RoHS directive (Restrictions on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment).

This product also has the following attributes:

- Lead Free
- Halogen Free (Chlorine, Bromine)
- Antimony Free
- TBBP-A (C₁₅H₁₂Br₄O₂) Free
- PFOS Free
- SVHC Free

Contact Information

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

Web: www.triquint.com
Email: info-sales@triquint.com

Tel: +1.503.615.9000
Fax: +1.503.615.8902

For technical questions and application information:

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