QPA9510 - 400MHz Reference Design for High Output Power

Product Overview

The QPA9510 is a high-power, high-gain, high-efficiency power amplifier. The device is manufactured with Qorvo's advanced GaAs process. The amplifier provides 44 dB of max gain and able to achieve +34 dBm of P1dB along with flexibility in bias settings.

QPA9510 is designed for use as the final RF amplifier in GSM hand-held equipment in 900 MHz band and other applications in the UHF bands. An analog on-board power controller provides over 70 dB range of gain adjustment. This control also allows for power down with a voltage equal to the logic "Low" to set the device in standby mode.

The QPA9510 is tunable over any sub-bands in the operating range to optimize performance. The amplifiers sit in a 3mm x 3mm compact QFN package.

Referenced Documents

The reference documents below take precedence over the contents of this application note and should always be consulted for the latest information.

QPA9510 Data Sheet.

Typical Performance

Parameter	Conditions		Typical Value		Units
Operational Frequency		380	400	420	MHz
Gain	P_{IN} = -30 dBm, Small Signal	44.5	43.9	43.1	dB
Input Return Loss		-15.6	-14.5	-13.5	dB
Output Return Loss		-8.2	-9.2	-9.2	dB
P1dB		32.5	33.6	32.4	dBm
P3dB		33.4	34.1	33.3	dBm
Efficiency	At Maximum Output Power		46		%

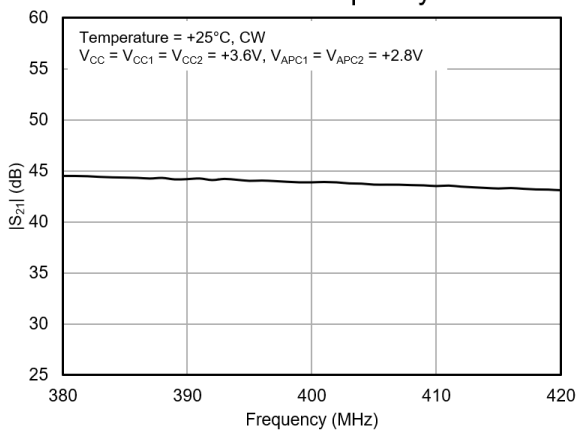
Notes:

1. Test conditions unless otherwise noted: V_{CC} = V_{CC1} = V_{CC2} = +3.6 V; V_{APC1} and V_{APC2} = 2.8V; CW Temp = +25 °C; 50 Ω system.

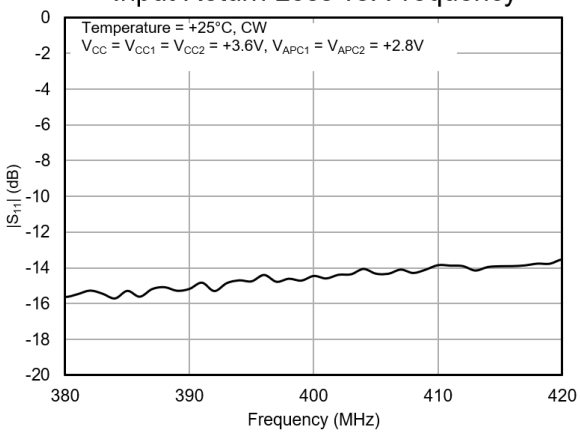
Performance Plots

Test conditions unless otherwise noted: V_{CC} = V_{CC1} = V_{CC2} = +3.6 V, V_{APC1} = V_{APC2} = +2.8 V, I_{CQ} = 230 mA, Temp = +25 °C, 50 Ω system.

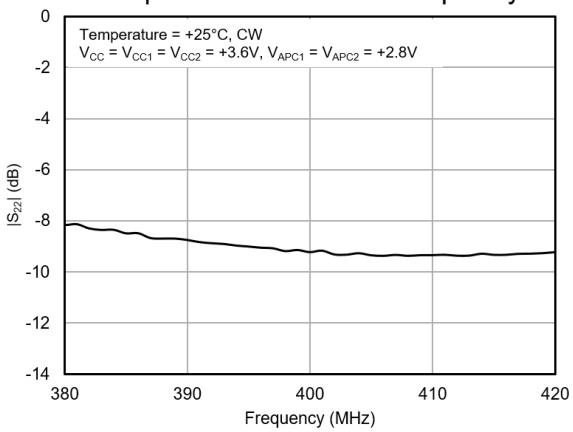
Gain vs. Frequency



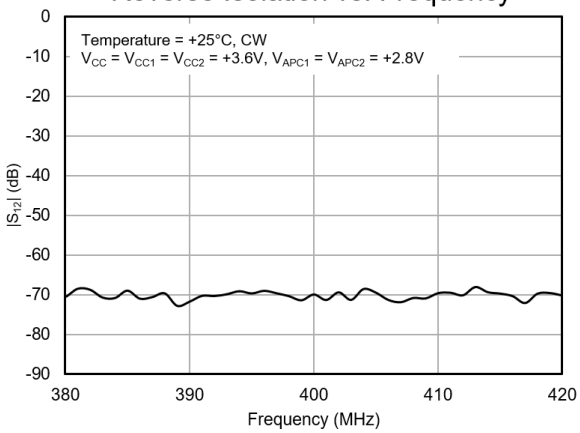
Input Return Loss vs. Frequency



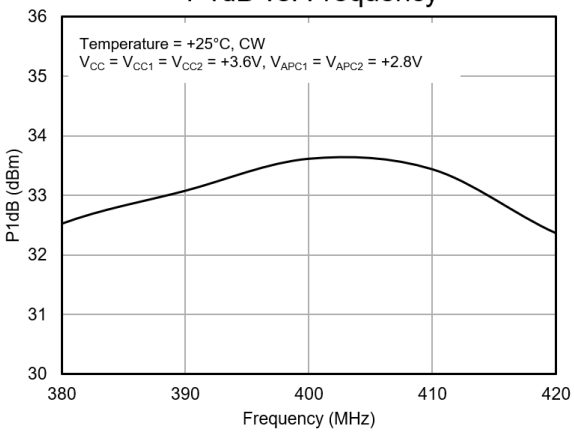
Output Return Loss vs. Frequency



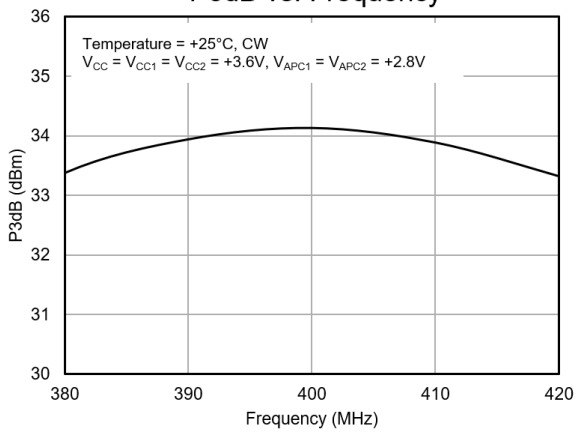
Reverse Isolation vs. Frequency



P1dB vs. Frequency



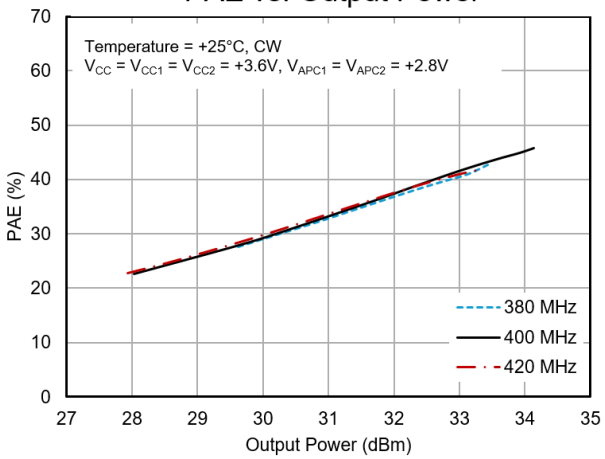
P3dB vs. Frequency



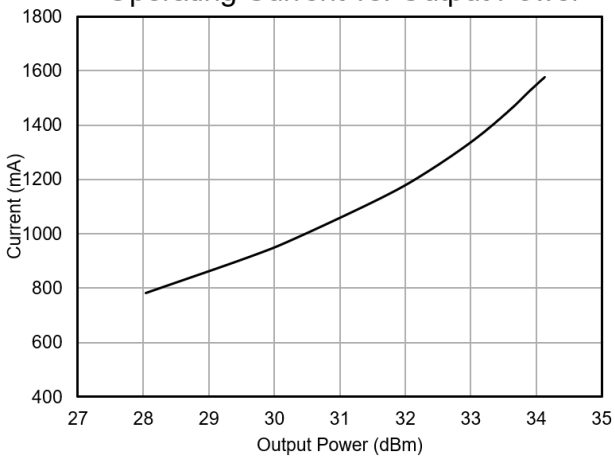
Performance Plots (Continued)

Test conditions unless otherwise noted: V_{CC} = V_{CC1} = V_{CC2} = +3.6 V, V_{APC1} = V_{APC2} = +2.8 V, I_{CQ} = 230 mA, Temp = +25 °C, 50 Ω system.

PAE vs. Output Power



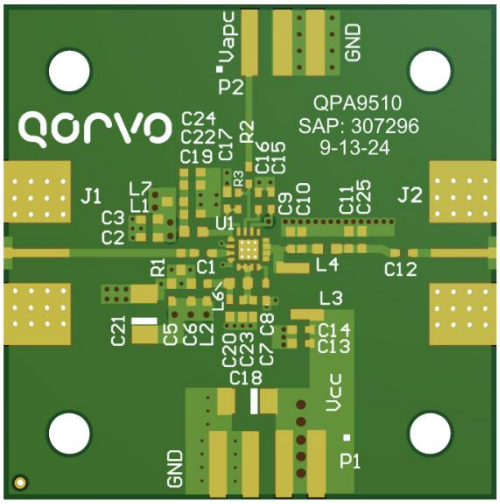
Operating Current vs. Output Power

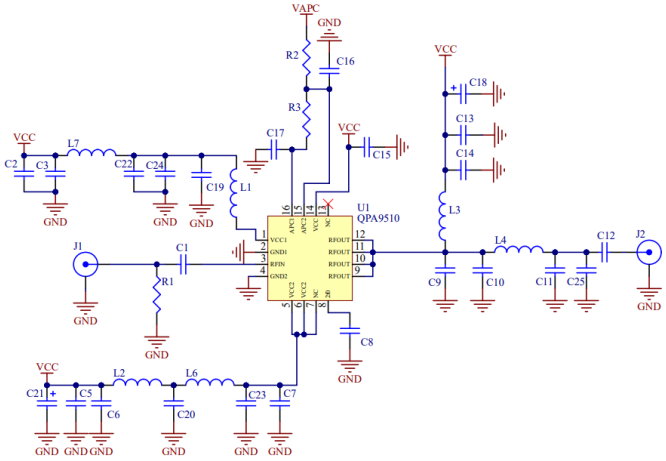


QPA9510 400MHz Reference Design

High Output Power

Evaluation Board





Notes:

1. Components shown on PCB layout but not on the schematic are not used.

Bill of Materials

Reference Des.	Value	Description	Manuf.	Part Number
n/a	n/a	Printed Circuit Board	Qorvo	
U1	n/a	QPA9510 Amplifier, QFN pkg.	Qorvo	QPA9510
C1, C12	56pF	CAP, 56pF, 0402, 5%, 50V, C0G	Murata	GRM1555C1H560JA01D
C3, C6, C13	1000pF	CAP, 1000pF, 0402, 5%, 50V, C0G	Murata	GRM155R71H102KA01D
C2, C5, C16, C17	10000pF	CAP, 10000pF, 0402, 10%, 50V, X7R	Murata	GRM155R71E103KA01D
C10	33pF	CAP, 33pF, 0402, 5%, 50V, C0G	Murata	GRM1555C1H330JZ01
C11	22pF	CAP, 27pF, 0402, 5%, 50V, C0G	Murata	GRM1555C1H270JZ01
C14	47pF	CAP, 47pF, 0402, 1%, 50V, C0G	Murata	GRM1555C1H470JA01D
C15	100pF	CAP, 100pF, 0402, 1%, 50V, C0G	Murata	GRM1555C1H101FA01D
C18, C21	3.3uF	CAP, 3.3uF, TANT-A, 20%, 25V	Kyocera	TAJA335M025RNJ
C19, C20	330pF	CAP, 330pF, ±20%, 100V, X7R, 0402	Taiyo	MSASH105SB7331MFNA01
C25	2pF	CAP, 2pF, 0402, ±0.1pF, 50V, HI-Q	Murata	GJM1555C1H2R0BB01D
R1	180Ω	RES, 180 OHM, 0402, 5%, 1/10W	Kamaya	RMC1/16S-181JTH
R2, R3, L2, L7	0Ω	RES, 0 OHM, 0402, 1/10W	Kamaya	RMC1/16SJPTH
L1	12nH	IND, 12nH, 0603, 5%, W/W	Coilcraft	0603CS-12NXJLW
L3	1uH	IND, 1uH, 1606, 5%, W/W	-	-
L4	2.4nH	IND, 2.4nH, 0603, 5%, W/W	-	-
L6	6.8nH	IND, 6.8nH, 0603, 5%, W/W	Coilcraft	0603CS-6N8XJRW
C7, C8, C9, C22, C23, C24	DNP	n/a	n/a	

Additional Information

For information on ESD, Soldering Profiles, Packaging Standards or Handling and Assembly, please contact Qorvo for general guidelines.

Contact Information

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

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