Document Number: AFT18H357-24S
Rev. 0, 3/2014

RoHS

RF Power LDMOS Transistor

N-Channel Enhancement-Mode Lateral MOSFET

This 63 W asymmetrical Doherty RF power LDMOS transistor is designed for cellular base station applications covering the frequency range of 1805 to 1995 MHz.

1800 MHz

- Typical Doherty Single-Carrier W-CDMA Performance: V_{DD} = 28 Vdc, I_{DQA} = 800 mA, V_{GSB} = 0.7 Vdc, P_{out} = 63 W Avg., Input Signal PAR = 9.9 dB @ 0.01% Probability on CCDF.

	G_{ps} (dB)	η_D (%)	Output PAR (dB)	ACPR (dBc)
1805 MHz	17.3	50.3	7.8	-34.6
1840 MHz	17.5	49.7	7.9	-37.4
1880 MHz	17.4	50.3	7.8	-37.6

1900 MHz

- Typical Doherty Single-Carrier W-CDMA Performance: V_{DD} = 28 Vdc, I_{DQA} = 800 mA, V_{GSB} = 0.4 Vdc, P_{out} = 63 W Avg., Input Signal PAR = 9.9 dB @ 0.01% Probability on CCDF.

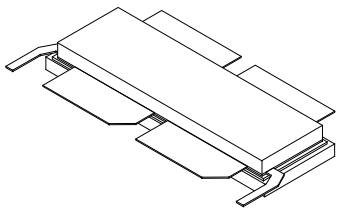
Frequency	G_{ps} (dB)	η_D (%)	Output PAR (dB)	ACPR (dBc)
1930 MHz	17.0	49.1	7.7	-34.6
1960 MHz	17.1	48.9	7.6	-37.4
1995 MHz	17.0	49.1	7.4	-37.6

Features

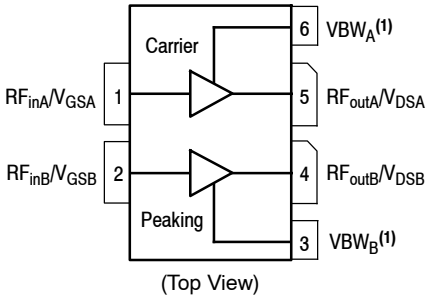
- Advanced High Performance In-Package Doherty
- Greater Negative Gate-Source Voltage Range for Improved Class C Operation
- Designed for Digital Predistortion Error Correction Systems
- In Tape and Reel. R6 Suffix = 150 Units, 56 mm Tape Width, 13-inch Reel.

AFT18H357-24SR6

1805–1995 MHz, 63 W AVG., 28 V AIRFAST RF POWER LDMOS TRANSISTOR



NI-1230S-4L2L



(Top View)

Figure 1. Pin Connections

1. Device cannot operate with the V_{DD} current supplied through pin 3 and pin 6.

freescale Airfast

Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	-0.5, +65	Vdc
Gate-Source Voltage	V_{GS}	-6.0, +10	Vdc
Operating Voltage	V_{DD}	32, +0	Vdc
Storage Temperature Range	T_{stg}	-65 to +150	°C
Case Operating Temperature Range	T_C	-40 to +150	°C
Operating Junction Temperature Range (1,2)	T_J	-40 to +225	°C
CW Operation @ T_C = 25°C Derate above 25°C	CW	378 3.24	W W/°C

Table 2. Thermal Characteristics

Characteristic	Symbol	Value (2,3)	Unit
Thermal Resistance, Junction to Case Case Temperature 79°C, 63 W W-CDMA, 28 Vdc, I_{DQA} = 800 mA, V_{GSB} = 0.7 Vdc, 1840 MHz	$R_{\theta JC}$	0.43	°C/W

Table 3. ESD Protection Characteristics

Test Methodology	Class
Human Body Model (per JESD22-A114)	2
Machine Model (per EIA/JESD22-A115)	IV
Charge Device Model (per JESD22-C101)	B

Table 4. Electrical Characteristics (T_A = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
Off Characteristics (4)					
Zero Gate Voltage Drain Leakage Current (V_{DS} = 65 Vdc, V_{GS} = 0 Vdc)	I_{DSS}	—	—	10	μAdc
Zero Gate Voltage Drain Leakage Current (V_{DS} = 28 Vdc, V_{GS} = 0 Vdc)	I_{DSS}	—	—	1	μAdc
Gate-Source Leakage Current (V_{GS} = 5 Vdc, V_{DS} = 0 Vdc)	I_{GSS}	—	—	1	μAdc
On Characteristics - Side A (4)					
Gate Threshold Voltage (V_{DS} = 10 Vdc, I_D = 140 μAdc)	$V_{GS(th)}$	0.8	1.2	1.6	Vdc
Gate Quiescent Voltage (V_{DD} = 28 Vdc, I_{DA} = 800 mAdc, Measured in Functional Test)	$V_{GSA(Q)}$	1.4	1.8	2.2	Vdc
Drain-Source On-Voltage (V_{GS} = 10 Vdc, I_D = 1.4 Adc)	$V_{DS(on)}$	0.1	0.15	0.3	Vdc
On Characteristics - Side B (4)					
Gate Threshold Voltage (V_{DS} = 10 Vdc, I_D = 240 μAdc)	$V_{GS(th)}$	0.8	1.2	1.6	Vdc
Drain-Source On-Voltage (V_{GS} = 10 Vdc, I_D = 2.4 Adc)	$V_{DS(on)}$	0.1	0.15	0.3	Vdc

1. Continuous use at maximum temperature will affect MTTF.
2. MTTF calculator available at http://www.freescale.com/rf. Select Software & Tools/Development Tools/Calculators to access MTTF calculators by product.
3. Refer to AN1955, *Thermal Measurement Methodology of RF Power Amplifiers.* Go to http://www.freescale.com/rf. Select Documentation/Application Notes - AN1955.
4. Each side of device measured separately.

(continued)

Table 4. Electrical Characteristics (T_A = 25°C unless otherwise noted) **(continued)**

Characteristic	Symbol	Min	Typ	Max	Unit
Functional Tests [1,2] (In Freescale Doherty Test Fixture, 50 ohm system) V_{DD} = 28 Vdc, I_{DQA} = 800 mA, V_{GSB} = 0.7 V, P_{out} = 63 W Avg., f = 1805 MHz, Single-Carrier W-CDMA, IQ Magnitude Clipping, Input Signal PAR = 9.9 dB @ 0.01% Probability on CCDF. ACPR measured in 3.84 MHz Channel Bandwidth @ ±5 MHz Offset.					
Power Gain	G_{ps}	16.6	17.3	19.6	dB
Drain Efficiency	η_D	47.4	50.3	—	%
Output Peak-to-Average Ratio @ 0.01% Probability on CCDF	PAR	7.4	7.8	—	dB
Adjacent Channel Power Ratio	ACPR	—	-34.6	-32.0	dBc
Load Mismatch (In Freescale Test Fixture, 50 ohm system) I_{DQA} = 800 mA, f = 1840 MHz, 10 μsec Pulse Width, 10% Duty Cycle					
VSWR 10:1 at 32 Vdc, 360 W Pulse Output Power (3 dB Input Overdrive from 210 W Pulse Rated Power)	No Device Degradation				
Typical Performance [2] (In Freescale Doherty Test Fixture, 50 ohm system) V_{DD} = 28 Vdc, I_{DQA} = 800 mA, V_{GSB} = 0.7 Vdc, 1805–1880 MHz Bandwidth					
P_{out} @ 1 dB Compression Point, CW	P1dB	—	220	—	W
P_{out} @ 3 dB Compression Point [3]	P3dB	—	320	—	W
AM/PM (Maximum value measured at the P3dB compression point across the 1805-1880 MHz bandwidth)	Φ	—	-15	—	°
VBW Resonance Point (IMD Third Order Intermodulation Inflection Point)	VBW_{res}	—	110	—	MHz
Gain Flatness in 75 MHz Bandwidth @ P_{out} = 63 W Avg.	G_F	—	0.2	—	dB
Gain Variation over Temperature (-30°C to +85°C)	ΔG	—	0.008	—	dB/°C
Output Power Variation over Temperature (-30°C to +85°C) [4]	ΔP1dB	—	0.009	—	dB/°C

1. Part internally matched both on input and output.
2. Measurements made with device in an asymmetrical Doherty configuration.
3. P3dB = P_{avg} + 7.0 dB where P_{avg} is the average output power measured using an unclipped W-CDMA single-carrier input signal where output PAR is compressed to 7.0 dB @ 0.01% probability on CCDF.
4. Exceeds recommended operating conditions. See CW operation data in Maximum Ratings table.

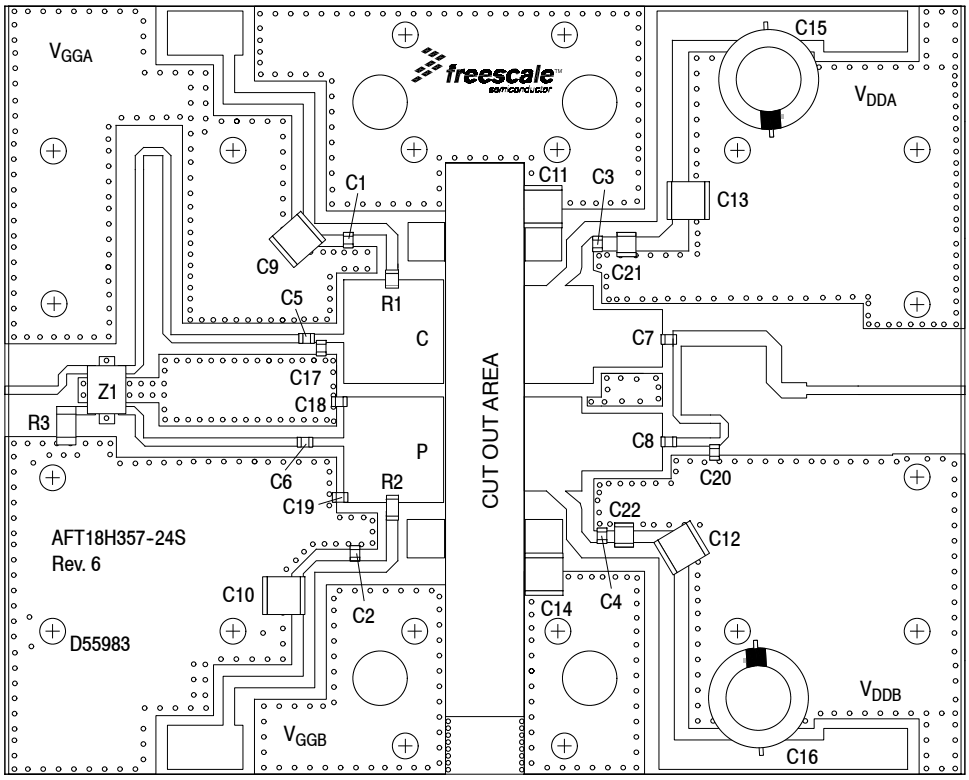


Figure 2. AFT18H357-24SR6 Test Circuit Component Layout — 1805–1880 MHz

Table 5. AFT18H357-24SR6 Test Circuit Component Designations and Values — 1805–1880 MHz

Part	Description	Part Number	Manufacturer
C1, C2, C3, C4	20 pF Chip Capacitors	ATC600F200JT250XT	ATC
C5, C6	12 pF Chip Capacitors	ATC600F120JT250XT	ATC
C7, C8	8.2 pF Chip Capacitors	ATC600F8R2JT250XT	ATC
C9, C10, C11, C12, C13, C14	10 μF Chip Capacitors	C5750X7S2A106K230KB	TDK
C15, C16	220 μF, 63 V Electrolytic Capacitors	SK063M0220B5S-1015	YAGEO
C17	0.8 pF Chip Capacitor	ATC600F0R8BT250XT	ATC
C18	0.9 pF Chip Capacitor	ATC600F0R9BT250XT	ATC
C19	1.2 pF Chip Capacitor	ATC600F1R2BT250XT	ATC
C20	0.2 pF Chip Capacitor	ATC600F0R2BT250XT	ATC
C21, C22	2.2 μF Chip Capacitors	C3225X7R2A225KT	TDK
R1, R2	2.2 Ω, 1/4 W Chip Resistors	CRCW12062R20JNEA	Vishay
R3	50 Ω, 10 W Chip Resistor	CW12010T0050GBK	ATC
Z1	1700–2000 MHz Band 90°, 5 dB Directional Coupler	X3C19P1-05S	Anaren
PCB	Rogers RO4350B, 0.020″, ε_r = 3.66	D55983	MTL

TYPICAL CHARACTERISTICS — 1805–1880 MHz

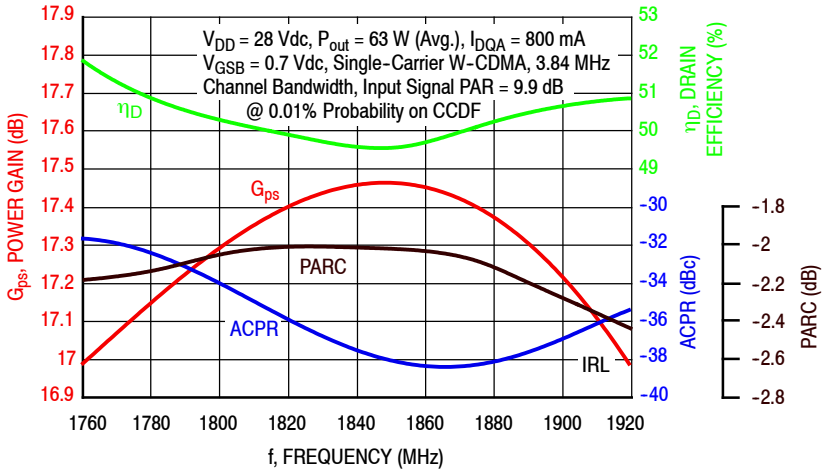


Figure 3. Single-Carrier Output Peak-to-Average Ratio Compression (PARC) Broadband Performance @ P_{out} = 63 Watts Avg.

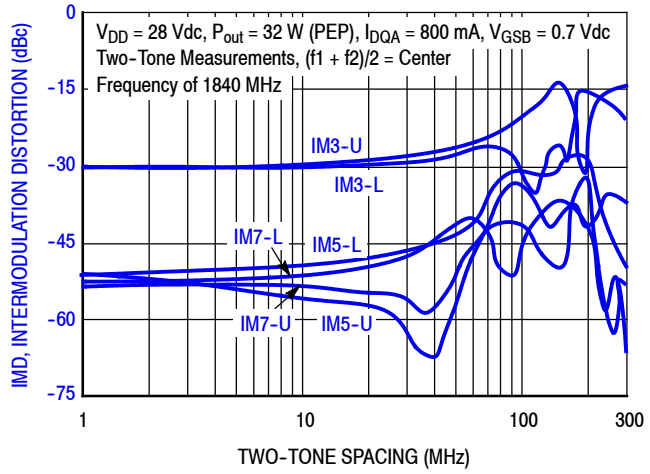


Figure 4. Intermodulation Distortion Products versus Two-Tone Spacing

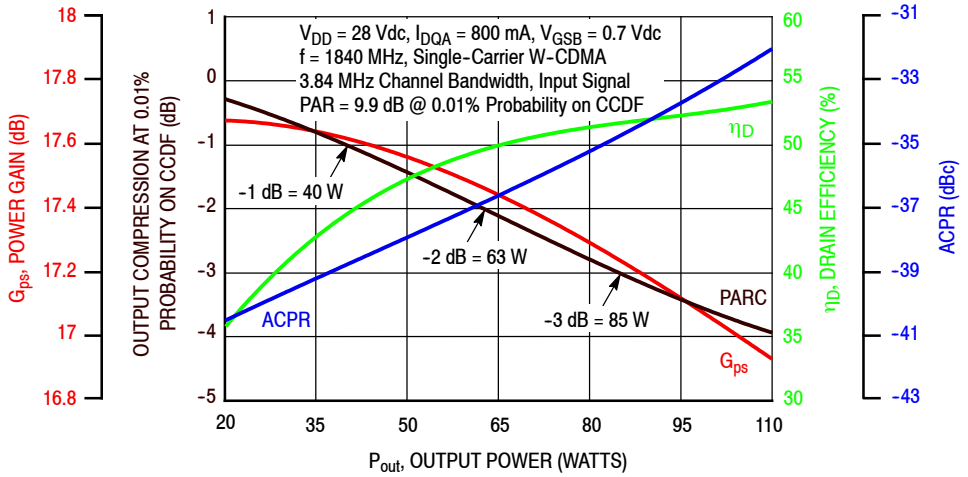


Figure 5. Output Peak-to-Average Ratio Compression (PARC) versus Output Power

TYPICAL CHARACTERISTICS — 1805–1880 MHz

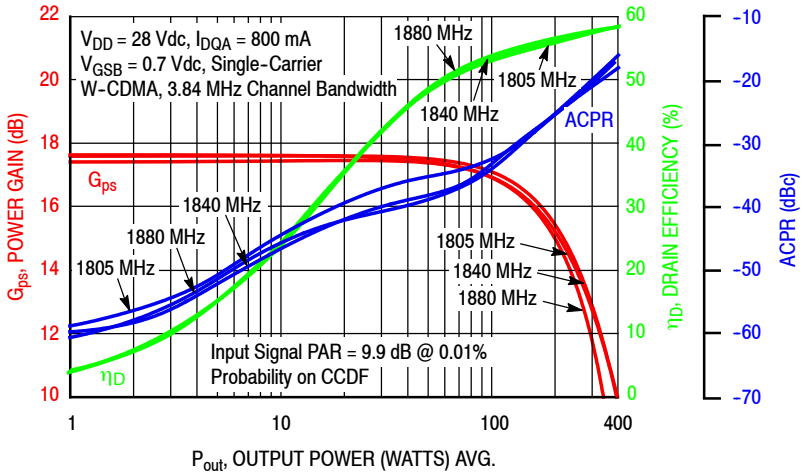


Figure 6. Single-Carrier W-CDMA Power Gain, Drain Efficiency and ACPR versus Output Power

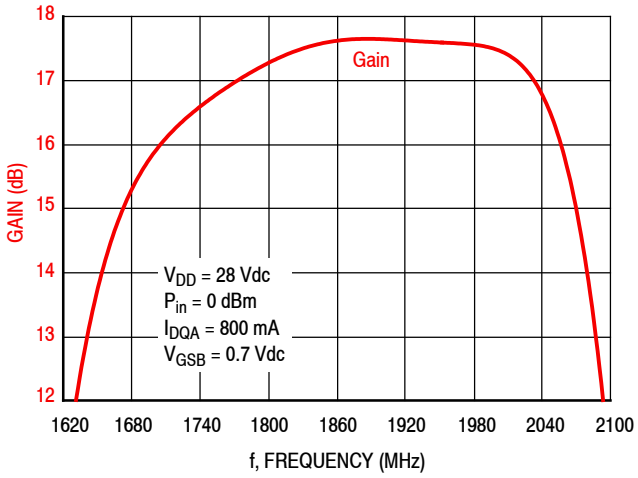


Figure 7. Broadband Frequency Response

Table 6. Carrier Side Load Pull Performance — Maximum Power Tuning

V_{DD} = 28 Vdc, I_{DQA} = 789 mA, Pulsed CW, 10 μsec(on), 10% Duty Cycle

			Max Output Power					
			P1dB					
f (MHz)	Z_{source} (Ω)	Z_{in} (Ω)	Z_{load} (1) (Ω)	Gain (dB)	(dBm)	(W)	η_D (%)	AM/PM (°)
1805	1.22 - j3.38	1.25 + j3.43	1.64 - j4.15	19.7	51.8	152	57.3	-10
1840	1.37 - j3.43	1.38 + j3.55	1.62 - j4.36	19.6	51.8	152	57.2	-10
1880	1.67 - j3.79	1.73 + j3.78	1.58 - j4.51	19.5	51.8	151	56.7	-11

			Max Output Power					
			P3dB					
f (MHz)	Z_{source} (Ω)	Z_{in} (Ω)	Z_{load} (2) (Ω)	Gain (dB)	(dBm)	(W)	η_D (%)	AM/PM (°)
1805	1.22 - j3.38	1.15 + j3.61	1.57 - j4.42	17.4	52.6	183	58.2	-16
1840	1.37 - j3.43	1.29 + j3.76	1.54 - j4.59	17.3	52.6	182	57.8	-16
1880	1.67 - j3.79	1.66 + j4.07	1.57 - j4.80	17.3	52.6	181	57.2	-16

(1) Load impedance for optimum P1dB power.

(2) Load impedance for optimum P3dB power.

Z_{source} = Measured impedance presented to the input of the device at the package reference plane.

Z_{in} = Impedance as measured from gate contact to ground.

Z_{load} = Measured impedance presented to the output of the device at the package reference plane.

Table 7. Carrier Side Load Pull Performance — Maximum Drain Efficiency Tuning

V_{DD} = 28 Vdc, I_{DQA} = 789 mA, Pulsed CW, 10 μsec(on), 10% Duty Cycle

			Max Drain Efficiency					
			P1dB					
f (MHz)	Z_{source} (Ω)	Z_{in} (Ω)	Z_{load} (1) (Ω)	Gain (dB)	(dBm)	(W)	η_D (%)	AM/PM (°)
1805	1.22 - j3.38	1.17 + j3.55	3.59 - j2.59	22.4	49.7	93	69.0	-18
1840	1.37 - j3.43	1.29 + j3.65	3.16 - j2.97	22.1	50.0	101	68.2	-17
1880	1.67 - j3.79	1.65 + j3.89	3.06 - j3.13	22.1	50.0	100	67.5	-17

			Max Drain Efficiency					
			P3dB					
f (MHz)	Z_{source} (Ω)	Z_{in} (Ω)	Z_{load} (2) (Ω)	Gain (dB)	(dBm)	(W)	η_D (%)	AM/PM (°)
1805	1.22 - j3.38	1.07 + j3.65	3.22 - j3.06	20.0	50.9	122	69.5	-24
1840	1.37 - j3.43	1.19 + j3.80	3.07 - j3.01	20.1	50.7	117	68.5	-24
1880	1.67 - j3.79	1.55 + j4.11	3.00 - j3.18	20.0	50.7	117	67.4	-24

(1) Load impedance for optimum P1dB efficiency.

(2) Load impedance for optimum P3dB efficiency.

Z_{source} = Measured impedance presented to the input of the device at the package reference plane.

Z_{in} = Impedance as measured from gate contact to ground.

Z_{load} = Measured impedance presented to the output of the device at the package reference plane.

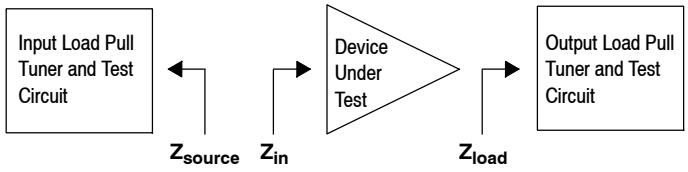


Table 8. Peaking Side Load Pull Performance — Maximum Power Tuning

V_{DD} = 28 Vdc, V_{GSB} = 0.8 Vdc, Pulsed CW, 10 μsec(on), 10% Duty Cycle

			Max Output Power					
			P1dB					
f (MHz)	Z_{source} (Ω)	Z_{in} (Ω)	Z_{load} (1) (Ω)	Gain (dB)	(dBm)	(W)	η_D (%)	AM/PM (°)
1805	0.831 - j3.07	0.799 + j3.11	1.82 - j4.08	16.2	54.1	254	58.0	-30
1840	1.13 - j3.28	0.919 + j3.29	1.90 - j4.32	16.2	54.1	259	58.3	-28
1880	1.40 - j3.52	1.27 + j3.61	2.01 - j4.58	16.2	54.1	257	57.8	-29

			Max Output Power					
			P3dB					
f (MHz)	Z_{source} (Ω)	Z_{in} (Ω)	Z_{load} (2) (Ω)	Gain (dB)	(dBm)	(W)	η_D (%)	AM/PM (°)
1805	0.831 - j3.07	0.787 + j3.23	1.84 - j4.35	14.0	54.7	297	58.6	-37
1840	1.13 - j3.28	0.938 + j3.44	1.98 - j4.65	14.0	54.8	301	58.8	-35
1880	1.40 - j3.52	1.34 + j3.82	2.12 - j4.91	14.0	54.8	299	58.0	-36

(1) Load impedance for optimum P1dB power.
(2) Load impedance for optimum P3dB power.
Z_{source} = Measured impedance presented to the input of the device at the package reference plane.
Z_{in} = Impedance as measured from gate contact to ground.
Z_{load} = Measured impedance presented to the output of the device at the package reference plane.

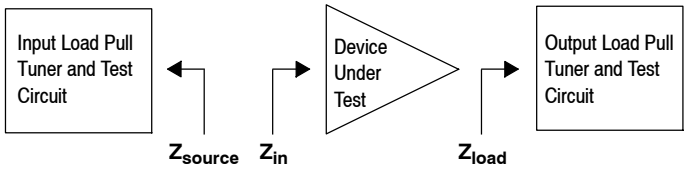
Table 9. Peaking Side Load Pull Performance — Maximum Drain Efficiency Tuning

V_{DD} = 28 Vdc, V_{GSB} = 0.8 Vdc, Pulsed CW, 10 μsec(on), 10% Duty Cycle

			Max Drain Efficiency					
			P1dB					
f (MHz)	Z_{source} (Ω)	Z_{in} (Ω)	Z_{load} (1) (Ω)	Gain (dB)	(dBm)	(W)	η_D (%)	AM/PM (°)
1805	0.831 - j3.07	0.685 + j3.07	3.94 - j2.16	17.7	52.2	165	71.2	-37
1840	1.13 - j3.28	0.768 + j3.24	3.51 - j1.93	17.6	52.1	162	71.2	-36
1880	1.40 - j3.52	1.03 + j3.55	3.00 - j1.81	17.6	51.9	155	71.2	-38

			Max Drain Efficiency					
			P3dB					
f (MHz)	Z_{source} (Ω)	Z_{in} (Ω)	Z_{load} (2) (Ω)	Gain (dB)	(dBm)	(W)	η_D (%)	AM/PM (°)
1805	0.831 - j3.07	0.725 + j3.21	3.80 - j2.97	15.5	53.3	212	70.8	-45
1840	1.13 - j3.28	0.837 + j3.41	3.62 - j2.72	15.5	53.2	208	70.7	-44
1880	1.40 - j3.52	1.19 + j3.79	3.32 - j2.95	15.5	53.4	220	70.5	-44

(1) Load impedance for optimum P1dB efficiency.
(2) Load impedance for optimum P3dB efficiency.
Z_{source} = Measured impedance presented to the input of the device at the package reference plane.
Z_{in} = Impedance as measured from gate contact to ground.
Z_{load} = Measured impedance presented to the output of the device at the package reference plane.



P1dB - TYPICAL CARRIER SIDE LOAD PULL CONTOURS — 1840 MHz

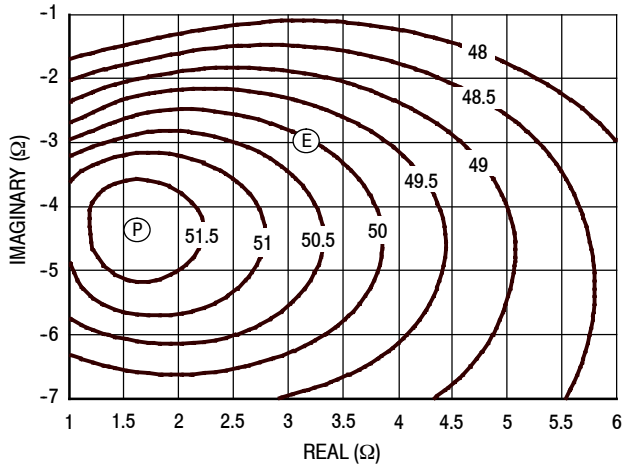


Figure 8. P1dB Load Pull Output Power Contours (dBm)

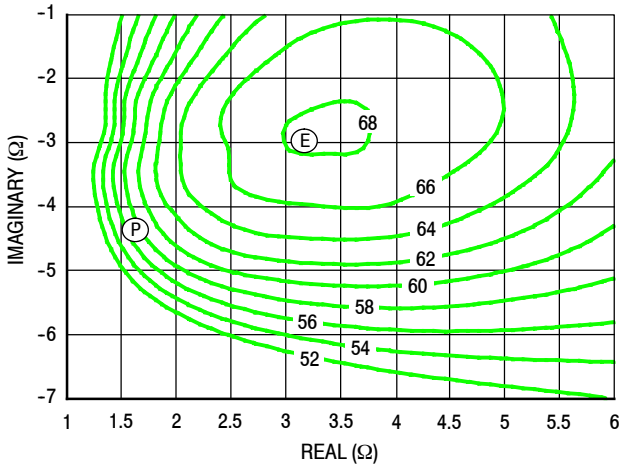


Figure 9. P1dB Load Pull Efficiency Contours (%)

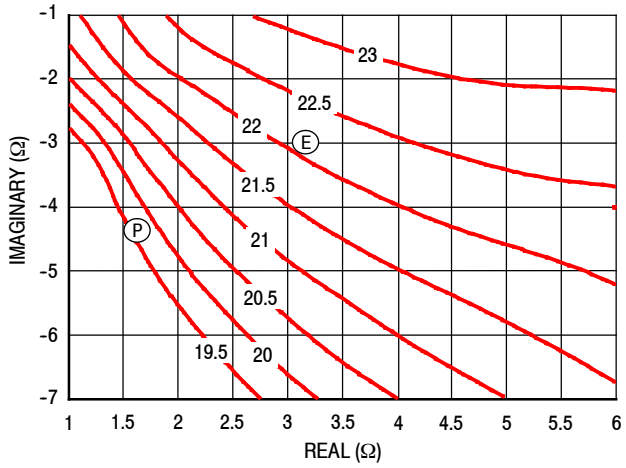


Figure 10. P1dB Load Pull Gain Contours (dB)

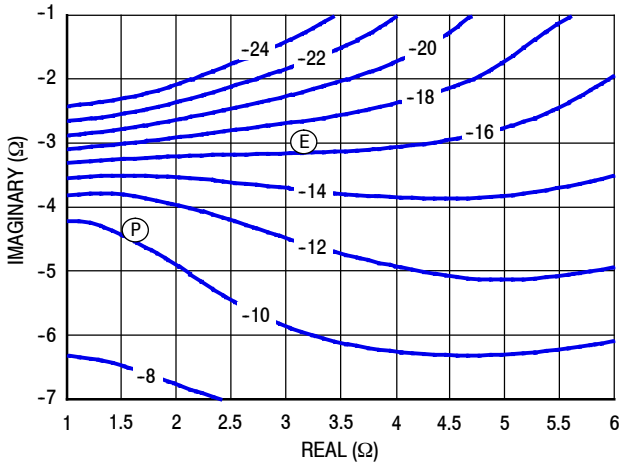


Figure 11. P1dB Load Pull AM/PM Contours (°)

NOTE: Ⓟ = Maximum Output Power

Ⓔ = Maximum Drain Efficiency

Gain

Drain Efficiency

Linearity

Output Power

P3dB - TYPICAL CARRIER SIDE LOAD PULL CONTOURS — 1840 MHz

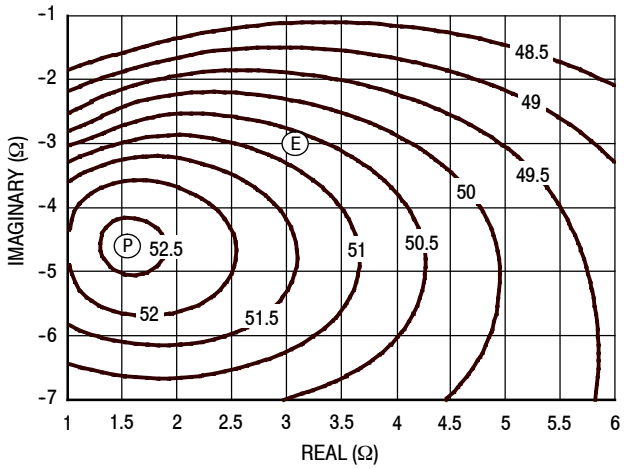


Figure 12. P3dB Load Pull Output Power Contours (dBm)

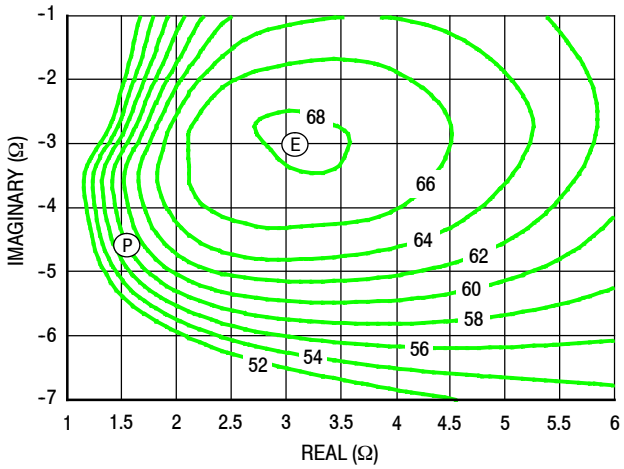


Figure 13. P3dB Load Pull Efficiency Contours (%)

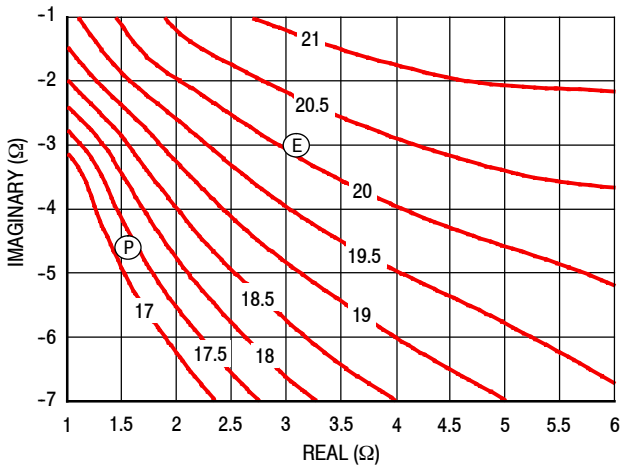


Figure 14. P3dB Load Pull Gain Contours (dB)

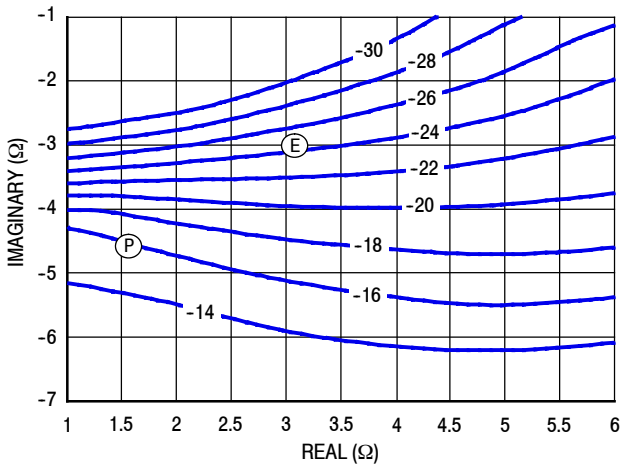


Figure 15. P3dB Load Pull AM/PM Contours (°)

NOTE: Ⓟ = Maximum Output Power

Ⓔ = Maximum Drain Efficiency

Gain

Drain Efficiency

Linearity

Output Power

P1dB - TYPICAL PEAKING SIDE LOAD PULL CONTOURS — 1840 MHz

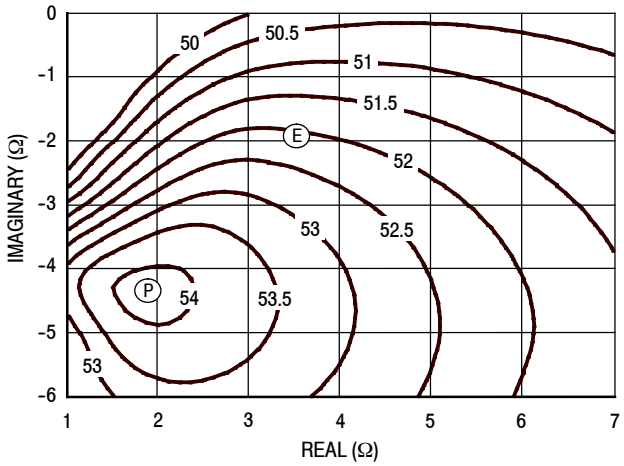


Figure 16. P1dB Load Pull Output Power Contours (dBm)

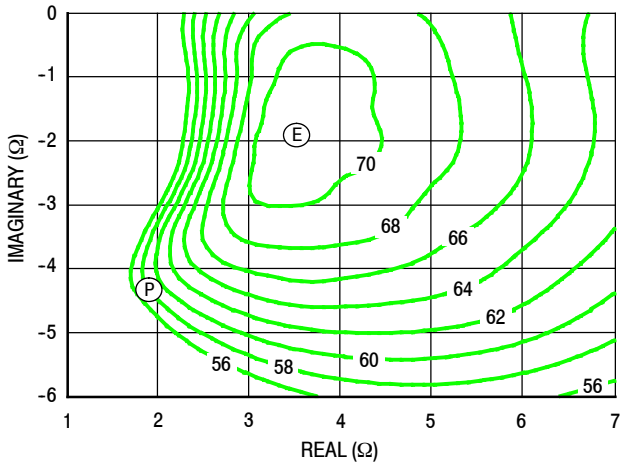


Figure 17. P1dB Load Pull Efficiency Contours (%)

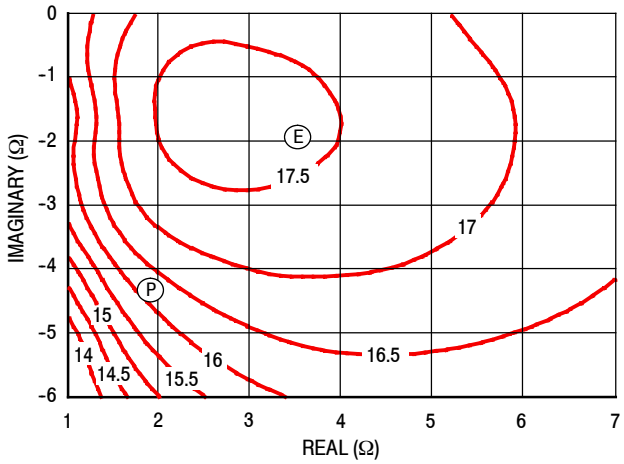


Figure 18. P1dB Load Pull Gain Contours (dB)

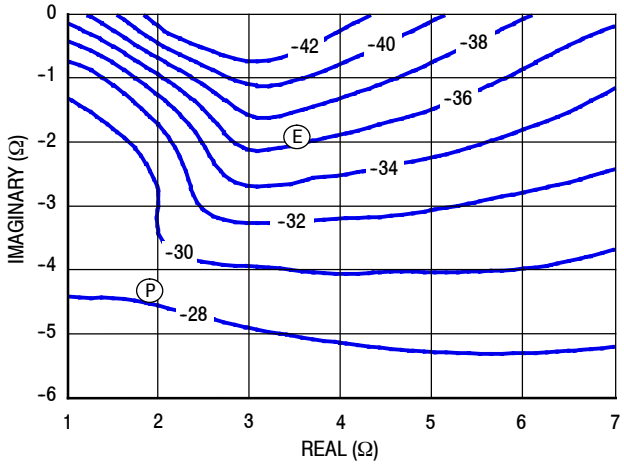


Figure 19. P1dB Load Pull AM/PM Contours (°)

NOTE: Ⓟ = Maximum Output Power

Ⓔ = Maximum Drain Efficiency

Gain

Drain Efficiency

Linearity

Output Power

P3dB - TYPICAL PEAKING SIDE LOAD PULL CONTOURS — 1840 MHz

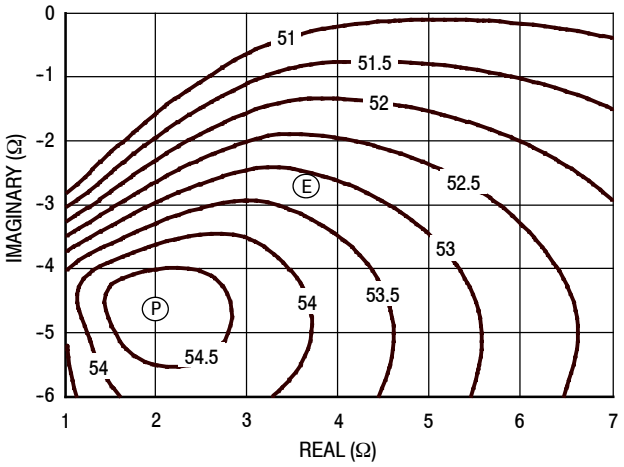


Figure 20. P3dB Load Pull Output Power Contours (dBm)

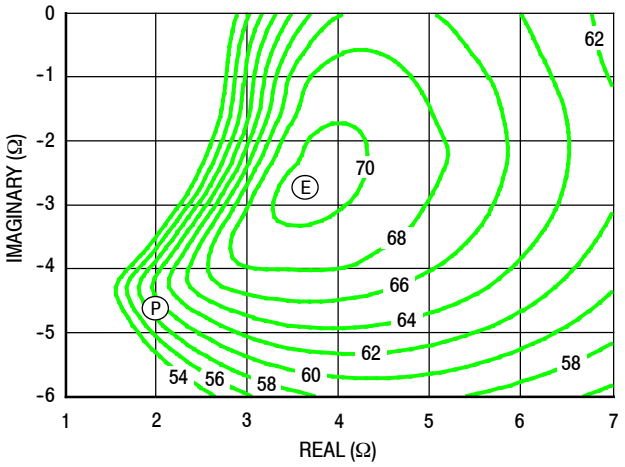


Figure 21. P3dB Load Pull Efficiency Contours (%)

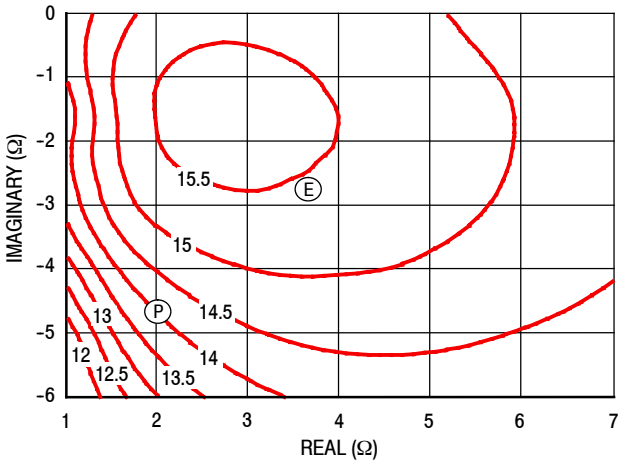


Figure 22. P3dB Load Pull Gain Contours (dB)

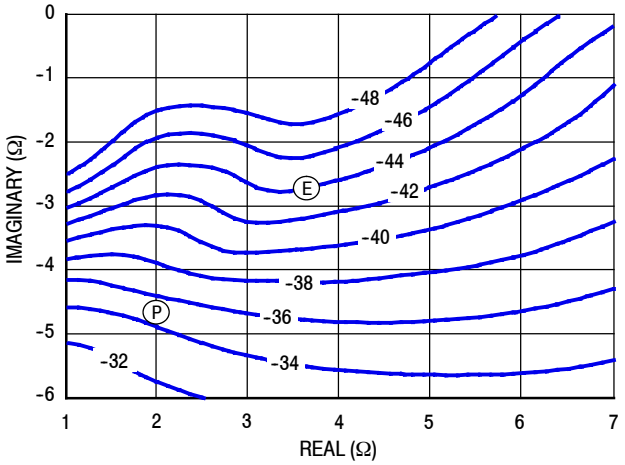


Figure 23. P3dB Load Pull AM/PM Contours (°)

NOTE: Ⓟ = Maximum Output Power

Ⓔ = Maximum Drain Efficiency

Gain

Drain Efficiency

Linearity

Output Power

ALTERNATE CHARACTERIZATION — 1930–1995 MHz

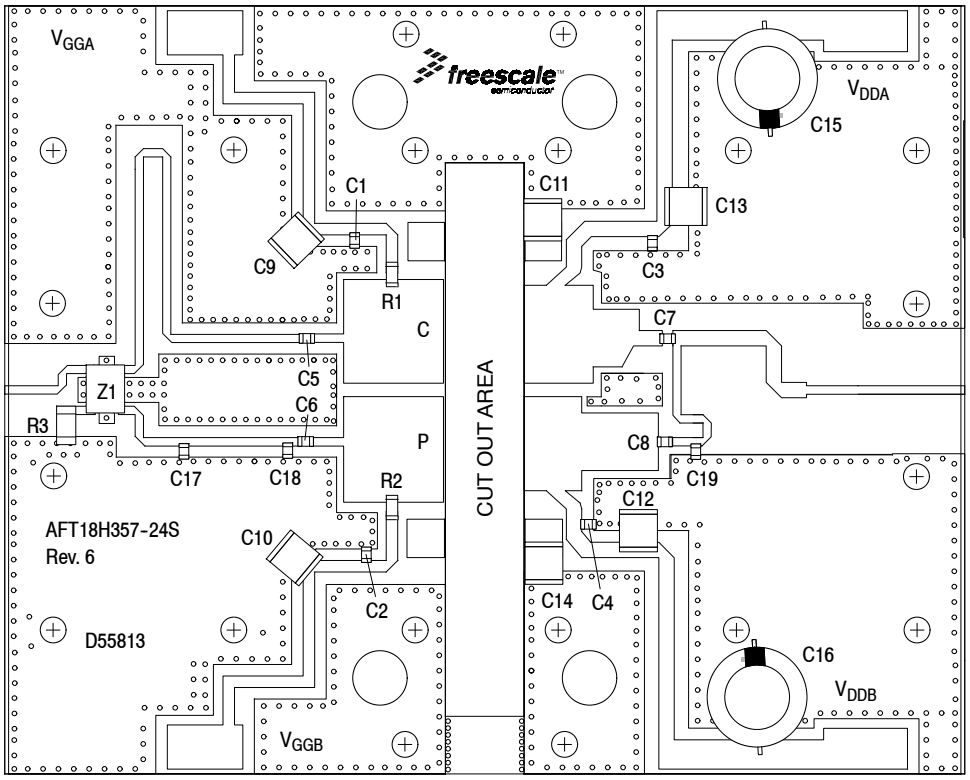


Figure 24. AFT18H357-24SR6 Test Circuit Component Layout — 1930-1995 MHz

Table 10. AFT18H357-24SR6 Test Circuit Component Designations and Values — 1930-1995 MHz

Part	Description	Part Number	Manufacturer
C1, C2, C3, C4	15 pF Chip Capacitors	ATC600F150JT250XT	ATC
C5, C6, C8	8.2 pF Chip Capacitors	ATC600F8R2JT250XT	ATC
C7	3.9 pF Chip Capacitor	ATC600F3R9JT250XT	ATC
C9, C10, C11, C12, C13, C14	10 μF Chip Capacitors	C5750X7SA106K230KB	TDK
C15, C16	220 μF, 63 V Electrolytic Capacitors	SK063M0220B5S-1015	YAGEO
C17, C19	0.2 pF Chip Capacitors	ATC600F0R2BT250XT	ATC
C18	0.9 pF Chip Capacitor	ATC600F0R9BT250XT	ATC
R1, R2	2.2 Ω, 1/4 W Chip Resistors	CRCW12062R20JNEA	Vishay
R3	50 Ω, 10 W Chip Resistor	CW12010T0050GBK	ATC
Z1	1700-2000 MHz Band 90°, 5 dB Directional Coupler	X3C19P1-05S	Anaren
PCB	Rogers RO4350B, 0.020″, ε_r = 3.66	D55813	MTL

TYPICAL CHARACTERISTICS — 1930–1995 MHz

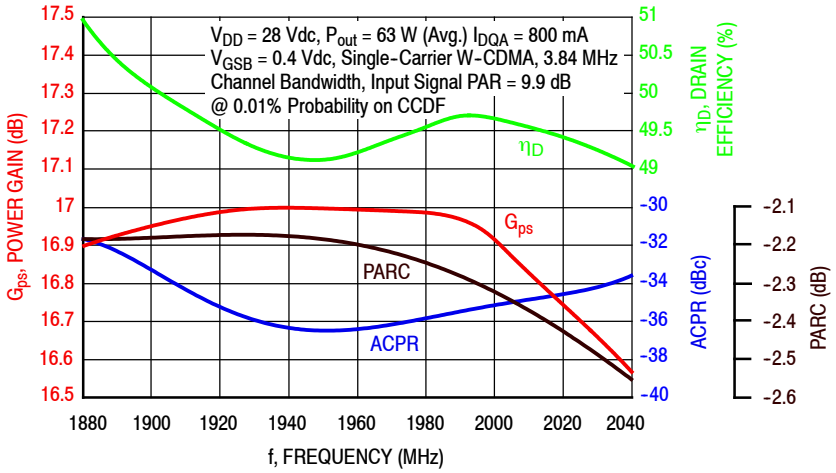


Figure 25. Single-Carrier Output Peak-to-Average Ratio Compression (PARC) Broadband Performance @ P_{out} = 63 Watts Avg.

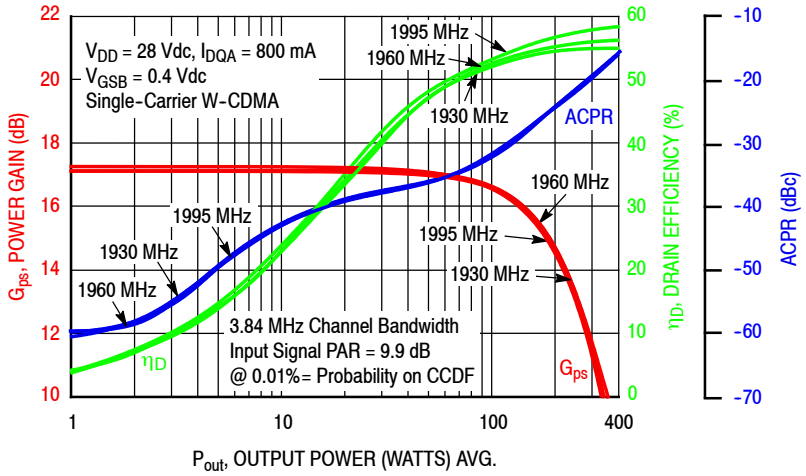


Figure 26. Single-Carrier W-CDMA Power Gain, Drain Efficiency and ACPR versus Output Power

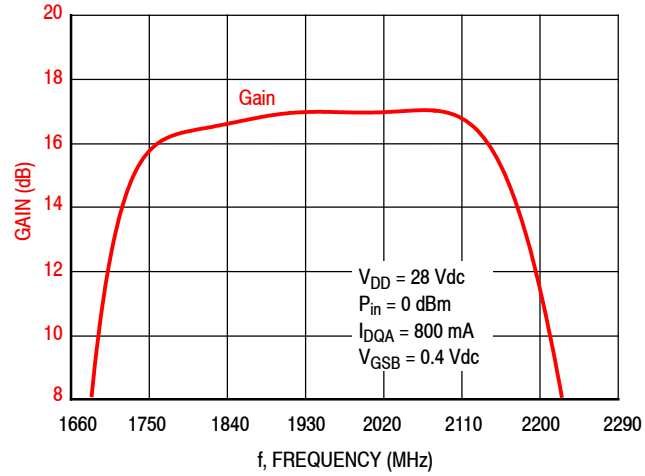


Figure 27. Broadband Frequency Response

Table 11. Carrier Side Load Pull Performance — Maximum Power Tuning

V_{DD} = 28 Vdc, I_{DQA} = 790 mA, Pulsed CW, 10 μsec(on), 10% Duty Cycle

			Max Output Power					
			P1dB					
f (MHz)	Z_{source} (Ω)	Z_{in} (Ω)	Z_{load} (1) (Ω)	Gain (dB)	(dBm)	(W)	η_D (%)	AM/PM (°)
1930	2.31 - j4.08	2.36 + j4.20	1.63 - j4.80	19.5	51.7	149	55.4	-11
1960	2.73 - j4.53	2.83 + j4.49	1.63 - j4.87	19.4	51.7	149	55.2	-11
1995	3.52 - j4.43	3.64 + j4.64	1.72 - j5.06	19.5	51.6	146	54.0	-11

			Max Output Power					
			P3dB					
f (MHz)	Z_{source} (Ω)	Z_{in} (Ω)	Z_{load} (2) (Ω)	Gain (dB)	(dBm)	(W)	η_D (%)	AM/PM (°)
1930	2.31 - j4.08	2.34 + j4.60	1.62 - j5.05	17.2	52.5	178	56.1	-16
1960	2.73 - j4.53	2.89 + j4.97	1.66 - j5.16	17.2	52.5	177	55.7	-17
1995	3.52 - j4.43	3.88 + j5.20	1.76 - j5.34	17.2	52.4	173	54.7	-16

(1) Load impedance for optimum P1dB power.
(2) Load impedance for optimum P3dB power.
Z_{source} = Measured impedance presented to the input of the device at the package reference plane.
Z_{in} = Impedance as measured from gate contact to ground.
Z_{load} = Measured impedance presented to the output of the device at the package reference plane.

Table 12. Carrier Side Load Pull Performance — Maximum Drain Efficiency Tuning

V_{DD} = 28 Vdc, I_{DQA} = 790 mA, Pulsed CW, 10 μsec(on), 10% Duty Cycle

			Max Drain Efficiency					
			P1dB					
f (MHz)	Z_{source} (Ω)	Z_{in} (Ω)	Z_{load} (1) (Ω)	Gain (dB)	(dBm)	(W)	η_D (%)	AM/PM (°)
1930	2.31 - j4.08	2.25 + j4.31	2.94 - j3.26	22.0	49.9	98	65.8	-16
1960	2.73 - j4.53	2.72 + j4.60	2.87 - j3.27	22.0	49.8	95	65.4	-17
1995	3.52 - j4.43	3.52 + j4.76	2.89 - j3.42	22.1	49.7	94	63.6	-15

			Max Drain Efficiency					
			P3dB					
f (MHz)	Z_{source} (Ω)	Z_{in} (Ω)	Z_{load} (2) (Ω)	Gain (dB)	(dBm)	(W)	η_D (%)	AM/PM (°)
1930	2.31 - j4.08	2.15 + j4.68	2.61 - j3.08	20.0	50.5	112	66.1	-26
1960	2.73 - j4.53	2.68 + j5.07	2.58 - j3.15	20.0	50.5	111	65.7	-26
1995	3.52 - j4.43	3.62 + j5.39	2.37 - j3.33	20.0	50.6	114	64.8	-25

(1) Load impedance for optimum P1dB efficiency.
(2) Load impedance for optimum P3dB efficiency.
Z_{source} = Measured impedance presented to the input of the device at the package reference plane.
Z_{in} = Impedance as measured from gate contact to ground.
Z_{load} = Measured impedance presented to the output of the device at the package reference plane.

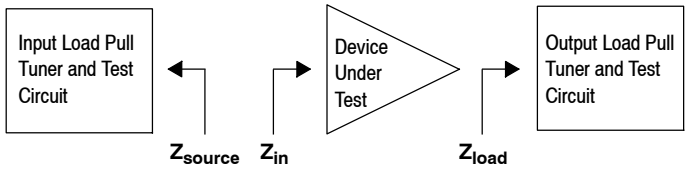


Table 13. Peaking Side Load Pull Performance — Maximum Power Tuning

V_{DD} = 28 Vdc, V_{GSB} = 0.8 Vdc, Pulsed CW, 10 μsec(on), 10% Duty Cycle

			Max Output Power					
			P1dB					
f (MHz)	Z_{source} (Ω)	Z_{in} (Ω)	Z_{load} (1) (Ω)	Gain (dB)	(dBm)	(W)	η_D (%)	AM/PM (°)
1930	2.31 - j4.08	2.00 + j4.23	2.28 - j4.89	16.1	54.1	256	57.5	-30
1960	3.28 - j4.32	2.69 + j4.66	2.54 - j5.11	16.1	54.1	255	57.7	-30
1995	4.55 - j4.25	4.00 + j4.92	2.87 - j5.40	16.1	54.0	250	56.3	-30

			Max Output Power					
			P3dB					
f (MHz)	Z_{source} (Ω)	Z_{in} (Ω)	Z_{load} (2) (Ω)	Gain (dB)	(dBm)	(W)	η_D (%)	AM/PM (°)
1930	2.31 - j4.08	2.23 + j4.52	2.54 - j5.29	13.9	54.7	297	57.6	-36
1960	3.28 - j4.32	3.08 + j4.97	2.79 - j5.46	13.9	54.7	296	57.5	-37
1995	4.55 - j4.25	4.73 + j5.11	3.20 - j5.65	14.0	54.6	291	57.0	-37

(1) Load impedance for optimum P1dB power.
(2) Load impedance for optimum P3dB power.
Z_{source} = Measured impedance presented to the input of the device at the package reference plane.
Z_{in} = Impedance as measured from gate contact to ground.
Z_{load} = Measured impedance presented to the output of the device at the package reference plane.

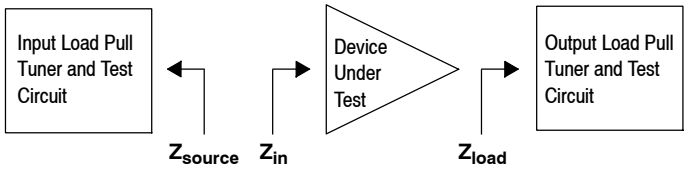
Table 14. Peaking Side Load Pull Performance — Maximum Drain Efficiency Tuning

V_{DD} = 28 Vdc, V_{GSB} = 0.8 Vdc, Pulsed CW, 10 μsec(on), 10% Duty Cycle

			Max Drain Efficiency					
			P1dB					
f (MHz)	Z_{source} (Ω)	Z_{in} (Ω)	Z_{load} (1) (Ω)	Gain (dB)	(dBm)	(W)	η_D (%)	AM/PM (°)
1930	2.31 - j4.08	1.66 + j4.17	2.85 - j2.12	17.5	52.1	162	70.7	-37
1960	3.28 - j4.32	2.17 + j4.63	2.67 - j1.93	17.3	51.7	149	70.6	-39
1995	4.55 - j4.25	3.29 + j5.06	2.76 - j2.21	17.4	51.9	157	69.8	-37

			Max Drain Efficiency					
			P3dB					
f (MHz)	Z_{source} (Ω)	Z_{in} (Ω)	Z_{load} (2) (Ω)	Gain (dB)	(dBm)	(W)	η_D (%)	AM/PM (°)
1930	2.31 - j4.08	1.95 + j4.48	3.18 - j2.71	15.3	53.2	208	70.0	-45
1960	3.28 - j4.32	2.69 + j4.98	3.13 - j2.72	15.3	53.2	207	69.8	-45
1995	4.55 - j4.25	4.09 + j5.32	2.90 - j2.56	15.4	52.8	191	69.0	-47

(1) Load impedance for optimum P1dB efficiency.
(2) Load impedance for optimum P3dB efficiency.
Z_{source} = Measured impedance presented to the input of the device at the package reference plane.
Z_{in} = Impedance as measured from gate contact to ground.
Z_{load} = Measured impedance presented to the output of the device at the package reference plane.



P1dB - TYPICAL CARRIER SIDE LOAD PULL CONTOURS — 1960 MHz

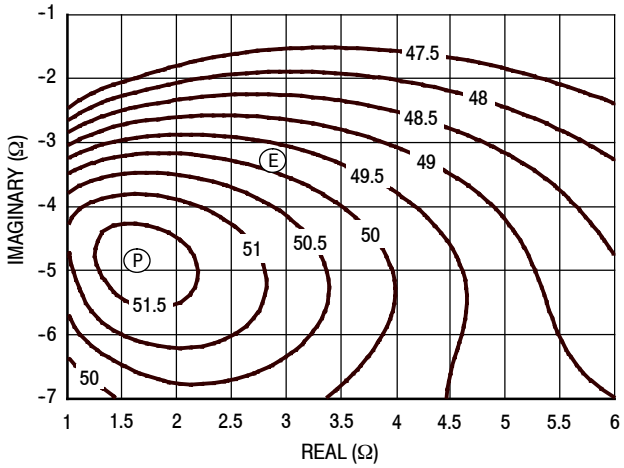


Figure 28. P1dB Load Pull Output Power Contours (dBm)

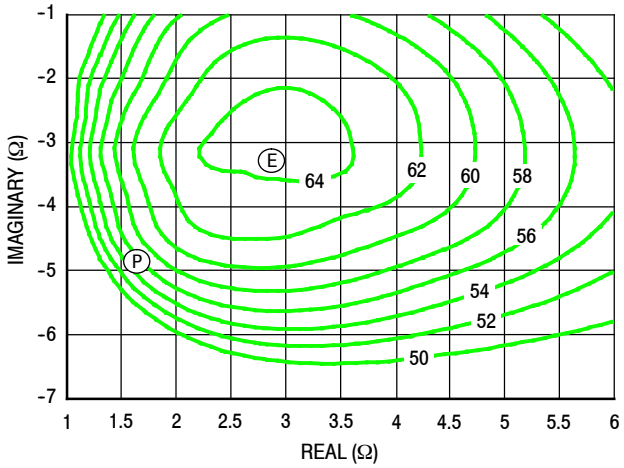


Figure 29. P1dB Load Pull Efficiency Contours (%)

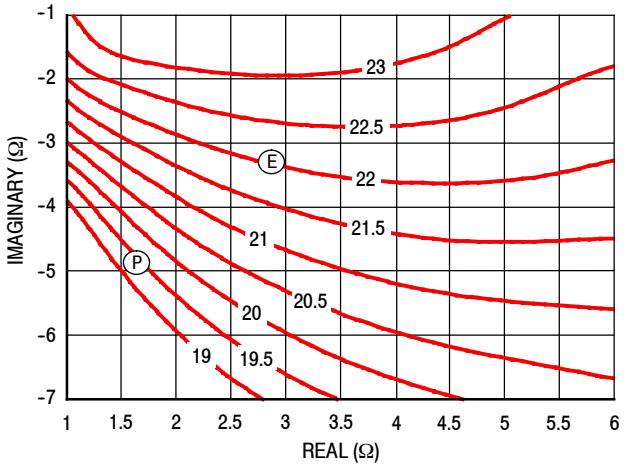


Figure 30. P1dB Load Pull Gain Contours (dB)

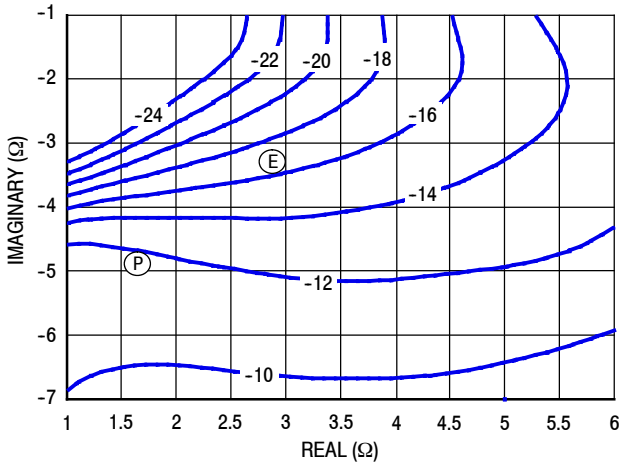


Figure 31. P1dB Load Pull AM/PM Contours (°)

NOTE: Ⓟ = Maximum Output Power

Ⓔ = Maximum Drain Efficiency

Gain

Drain Efficiency

Linearity

Output Power

P3dB - TYPICAL CARRIER SIDE LOAD PULL CONTOURS — 1960 MHz

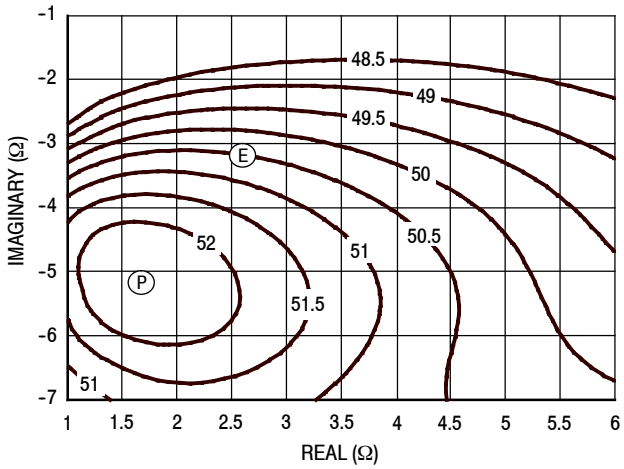


Figure 32. P3dB Load Pull Output Power Contours (dBm)

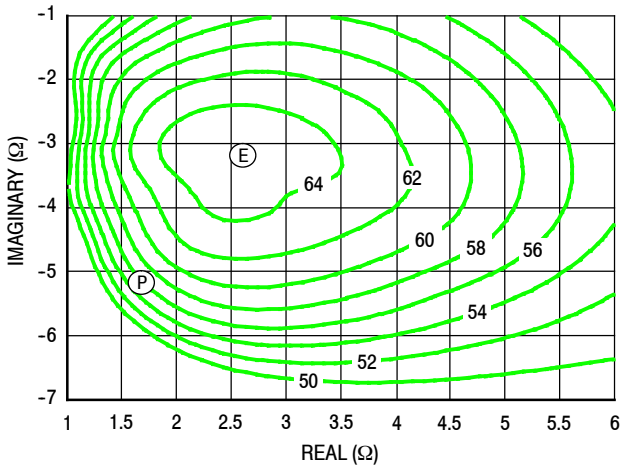


Figure 33. P3dB Load Pull Efficiency Contours (%)

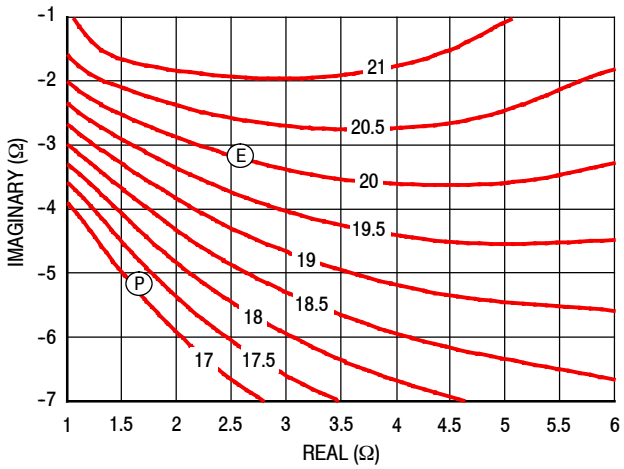


Figure 34. P3dB Load Pull Gain Contours (dB)

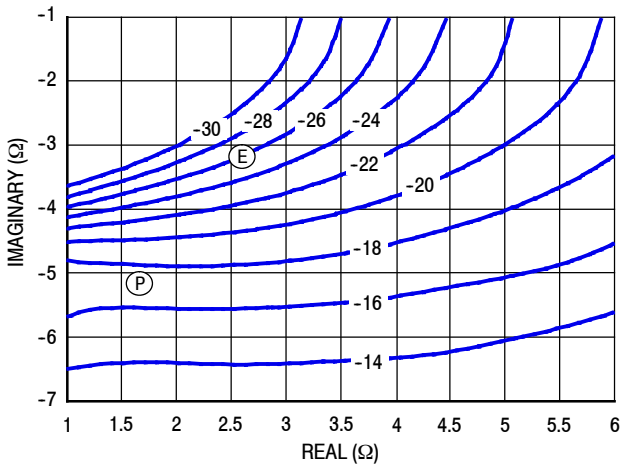


Figure 35. P3dB Load Pull AM/PM Contours (°)

NOTE: Ⓟ = Maximum Output Power

Ⓔ = Maximum Drain Efficiency

Gain

Drain Efficiency

Linearity

Output Power

P1dB - TYPICAL PEAKING SIDE LOAD PULL CONTOURS — 1960 MHz

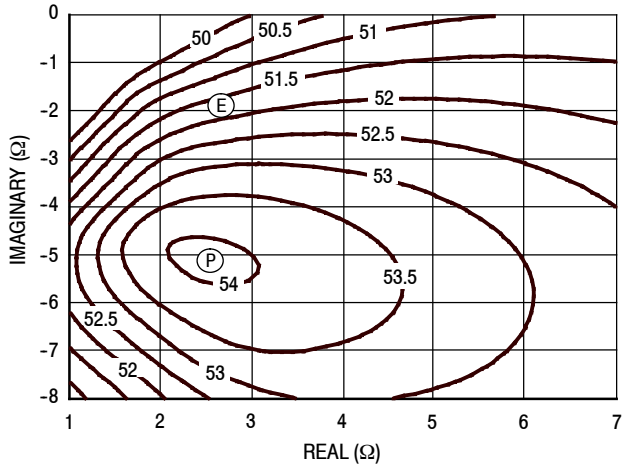


Figure 36. P1dB Load Pull Output Power Contours (dBm)

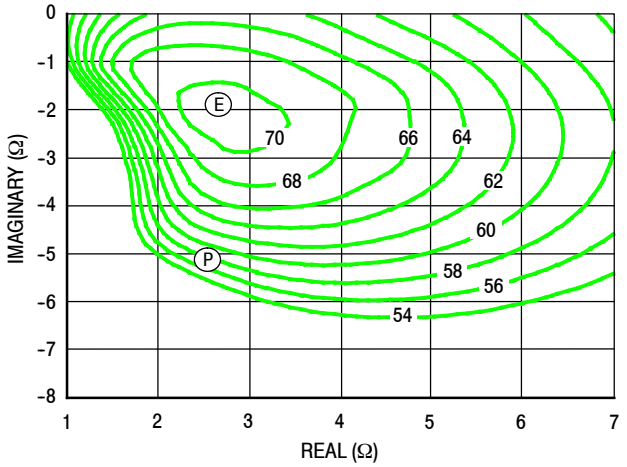


Figure 37. P1dB Load Pull Efficiency Contours (%)

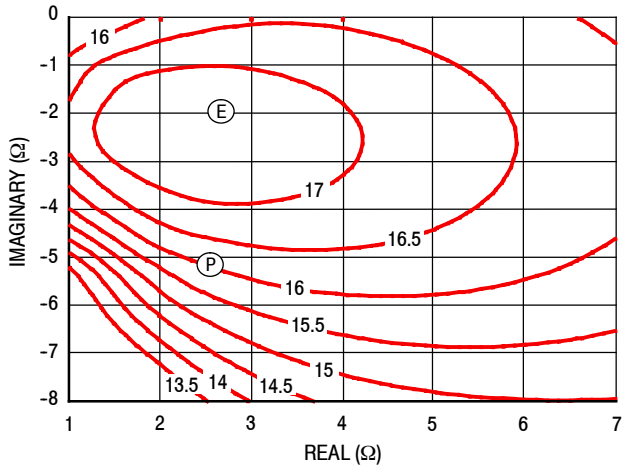


Figure 38. P1dB Load Pull Gain Contours (dB)

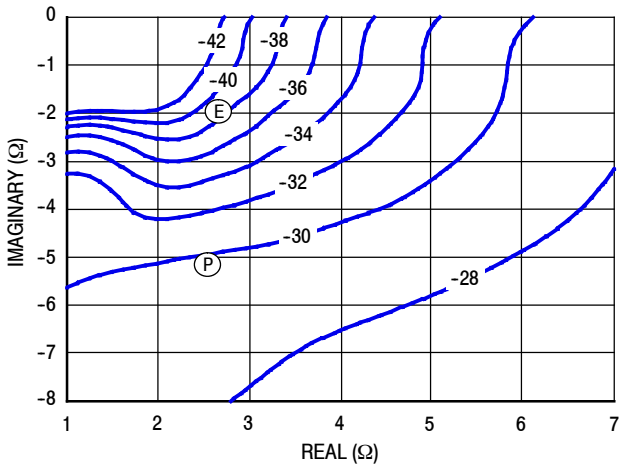


Figure 39. P1dB Load Pull AM/PM Contours (°)

NOTE: Ⓟ = Maximum Output Power

Ⓔ = Maximum Drain Efficiency

Gain

Drain Efficiency

Linearity

Output Power

P3dB - TYPICAL PEAKING SIDE LOAD PULL CONTOURS — 1960 MHz

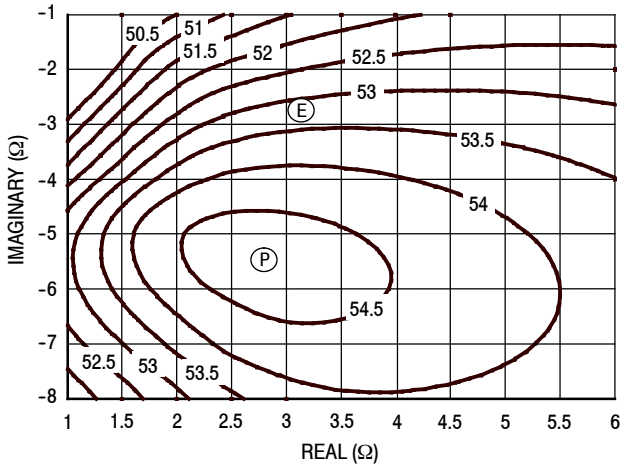


Figure 40. P3dB Load Pull Output Power Contours (dBm)

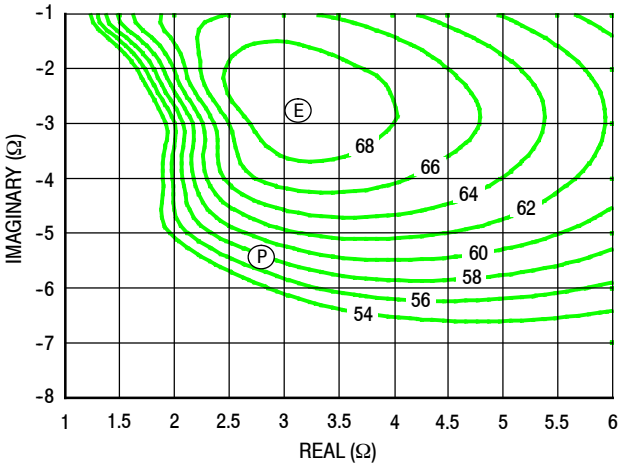


Figure 41. P3dB Load Pull Efficiency Contours (%)

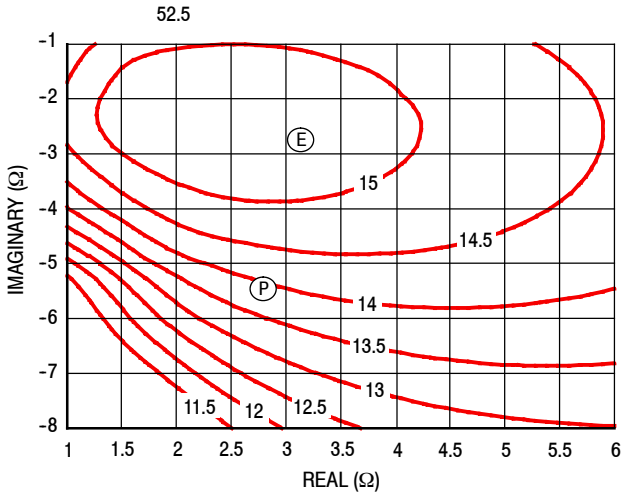


Figure 42. P3dB Load Pull Gain Contours (dB)

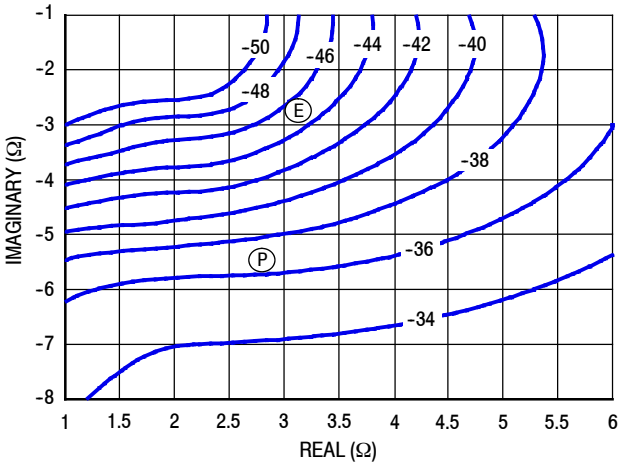


Figure 43. P3dB Load Pull AM/PM Contours (°)

NOTE: Ⓟ = Maximum Output Power

Ⓔ = Maximum Drain Efficiency

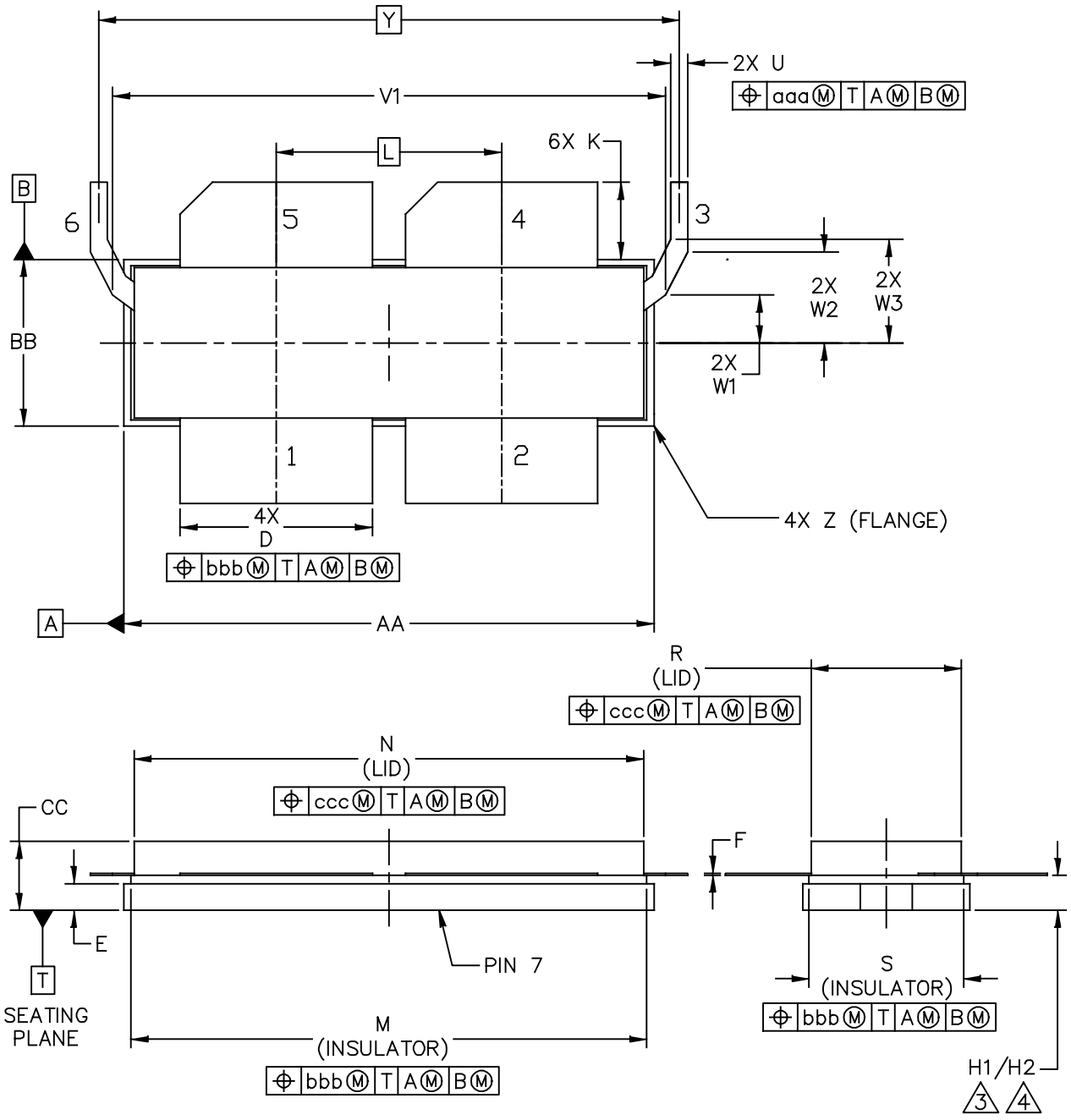
Gain

Drain Efficiency

Linearity

Output Power

PACKAGE DIMENSIONS



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	STANDARD: NON-JEDEC	
	08 MAR 2013	

NOTES:

1. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M–1994.

2. CONTROLLING DIMENSION: INCH

3. DIMENSIONS H1 AND H2 ARE MEASURED .030 INCH (0.762 MM) AWAY FROM FLANGE PARALLEL TO DATUM B. H1 APPLIES TO PINS 1, 2, 4 & 5. H2 APPLIES TO PINS 3 & 6.

4. TOLERANCE OF DIMENSION H2 IS TENTATIVE AND COULD CHANGE ONCE SUFFICIENT MANUFACTURING DATA IS AVAILABLE.

	INCH		MILLIMETER			INCH		MILLIMETER	
DIM	MIN	MAX	MIN	MAX	DIM	MIN	MAX	MIN	MAX
AA	1.265	1.275	32.13	32.39	N	1.218	1.242	30.94	31.55
BB	.395	.405	10.03	10.29	R	.365	.375	9.27	9.53
CC	.170	.190	4.32	4.83	S	.365	.375	9.27	9.53
D	.455	.465	11.56	11.81	U	.035	.045	0.89	1.14
E	.062	.066	1.57	1.68	V1	1.320	1.330	33.53	33.78
F	.004	.007	0.10	0.18	W1	.110	.120	2.79	3.05
H1	.082	.090	2.08	2.29	W2	.213	.223	5.41	5.66
H2	.078	.094	1.98	2.39	W3	.243	.253	6.17	6.43
K	.175	.195	4.45	4.95	Y	1.390 BSC		35.31 BSC	
L	.540 BSC		13.72 BSC		Z	R.000	R.040	R0.00	R1.02
M	1.219	1.241	30.96	31.52	aaa	.015		0.38	
					bbb	.010		0.25	
					ccc	.020		0.51	

MECHANICAL OUTLINE | PRINT VERSION NOT TO SCALE

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PRODUCT DOCUMENTATION, SOFTWARE AND TOOLS

Refer to the following resources to aid your design process.

Application Notes

- AN1955: Thermal Measurement Methodology of RF Power Amplifiers

Engineering Bulletins

- EB212: Using Data Sheet Impedances for RF LDMOS Devices

Software

- Electromigration MTTF Calculator
- RF High Power Model
- .s2p File

Development Tools

- Printed Circuit Boards

For Software and Tools, do a Part Number search at http://www.freescale.com, and select the “Part Number” link. Go to the Software & Tools tab on the part’s Product Summary page to download the respective tool.

REVISION HISTORY

The following table summarizes revisions to this document.

Revision	Date	Description
0	Mar. 2014	• Initial Release of Data Sheet

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