



RF Power LDMOS Transistor

N-Channel Enhancement-Mode Lateral MOSFET

This 120 W asymmetrical Doherty RF power LDMOS transistor is designed for cellular base station applications covering the frequency range of 720 to 960 MHz.

900 MHz

- Typical Doherty Single-Carrier W-CDMA Performance: $V_{DD} = 48$ Vdc, $I_{DQA} = 688$ mA, $V_{GSB} = 1.1$ Vdc, $P_{out} = 120$ W Avg., Input Signal PAR = 9.9 dB @ 0.01% Probability on CCDF.

| Frequency | G_{ps} (dB) | η_D (%) | Output PAR (dB) | ACPR (dBc) |
|-----------|---------------|--------------|-----------------|------------|
| 920 MHz | 18.9 | 57.8 | 7.5 | -28.9 |
| 940 MHz | 18.9 | 56.7 | 7.3 | -32.4 |
| 960 MHz | 18.7 | 54.8 | 6.9 | -34.8 |

780 MHz

- Typical Doherty Single-Carrier W-CDMA Performance: $V_{DD} = 48$ Vdc, $I_{DQA} = 700$ mA, $V_{GSB} = 0.9$ Vdc, $P_{out} = 120$ W Avg., Input Signal PAR = 9.9 dB @ 0.01% Probability on CCDF.

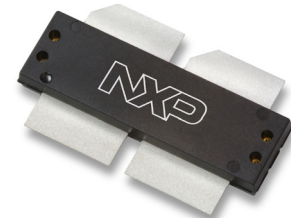
| Frequency | G_{ps} (dB) | η_D (%) | Output PAR (dB) | ACPR (dBc) |
|-----------|---------------|--------------|-----------------|------------|
| 758 MHz | 18.1 | 56.2 | 7.5 | -28.2 |
| 780 MHz | 18.1 | 54.7 | 7.5 | -29.3 |
| 803 MHz | 17.7 | 52.5 | 7.2 | -32.5 |

Features

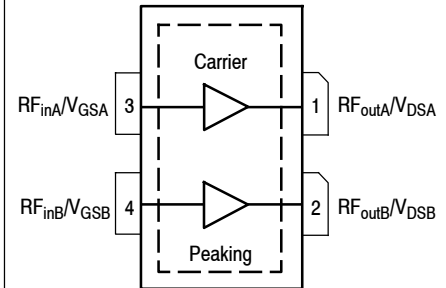
- Advanced high performance in-package Doherty
- Greater negative gate-source voltage range for improved Class C operation
- Designed for digital predistortion error correction systems

A2V09H525-04NR6

**720–960 MHz, 120 W AVG., 48 V
 AIRFAST RF POWER LDMOS
 TRANSISTOR**



**OM-1230-4L
 PLASTIC**



(Top View)

Note: Exposed backside of the package is the source terminal for the transistor.

Figure 1. Pin Connections

Table 1. Maximum Ratings

| Rating | Symbol | Value | Unit |
|--|-----------|-------------|------|
| Drain-Source Voltage | V_{DSS} | -0.5, +105 | Vdc |
| Gate-Source Voltage | V_{GS} | -6.0, +10 | Vdc |
| Operating Voltage | V_{DD} | 55, +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 |

Table 2. Thermal Characteristics

| Characteristic | Symbol | Value (2,3) | Unit |
|--|-----------------|-------------|------|
| Thermal Resistance, Junction to Case Case Temperature 74°C, 120 W Avg., W-CDMA, 48 Vdc, $I_{DQA} = 688$ mA, $V_{GSB} = 1.1$ Vdc, 940 MHz | $R_{\theta JC}$ | 0.23 | °C/W |

Table 3. ESD Protection Characteristics

| Test Methodology | Class |
|---------------------------------------|-------|
| Human Body Model (per JESD22-A114) | 2 |
| Charge Device Model (per JESD22-C101) | C3 |

Table 4. Moisture Sensitivity Level

| Test Methodology | Rating | Package Peak Temperature | Unit |
|--------------------------------------|--------|--------------------------|------|
| Per JESD22-A113, IPC/JEDEC J-STD-020 | 3 | 260 | °C |

Table 5. Electrical Characteristics ($T_A = 25^\circ\text{C}$ unless otherwise noted)

| Characteristic | Symbol | Min | Typ | Max | Unit |
|----------------|--------|-----|-----|-----|------|
|----------------|--------|-----|-----|-----|------|

Off Characteristics (4)

| | | | | | |
|--|-----------|---|---|----|-----------------|
| Zero Gate Voltage Drain Leakage Current ($V_{DS} = 105$ Vdc, $V_{GS} = 0$ Vdc) | I_{DSS} | — | — | 10 | μAdc |
| Zero Gate Voltage Drain Leakage Current ($V_{DS} = 55$ 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, Carrier

| | | | | | |
|--|--------------|-----|-----|-----|-----|
| Gate Threshold Voltage ($V_{DS} = 10$ Vdc, $I_D = 140$ μAdc) | $V_{GS(th)}$ | 1.3 | 1.8 | 2.3 | Vdc |
| Gate Quiescent Voltage ($V_{DD} = 48$ Vdc, $I_{DA} = 688$ mAdc, Measured in Functional Test) | $V_{GSA(Q)}$ | 2.1 | 2.5 | 2.9 | Vdc |
| Drain-Source On-Voltage ($V_{GS} = 10$ Vdc, $I_D = 1.4$ Adc) | $V_{DS(on)}$ | 0.1 | 0.3 | 0.5 | Vdc |

On Characteristics - Side B, Peaking

| | | | | | |
|--|--------------|-----|-----|-----|-----|
| Gate Threshold Voltage ($V_{DS} = 10$ Vdc, $I_D = 280$ μAdc) | $V_{GS(th)}$ | 1.3 | 1.8 | 2.3 | Vdc |
| Drain-Source On-Voltage ($V_{GS} = 10$ Vdc, $I_D = 2.8$ Adc) | $V_{DS(on)}$ | 0.1 | 0.3 | 0.5 | Vdc |

1. Continuous use at maximum temperature will affect MTTF.
2. MTTF calculator available at <http://www.nxp.com/RF/calculators>.
3. Refer to AN1955, *Thermal Measurement Methodology of RF Power Amplifiers*. Go to <http://www.nxp.com/RF> and search for AN1955.
4. Each side of device measured separately.

(continued)

Table 5. Electrical Characteristics ($T_A = 25^\circ\text{C}$ unless otherwise noted) (continued)

| Characteristic | Symbol | Min | Typ | Max | Unit |
|--|-----------------------|------|-------|-------|------|
| Functional Tests ^(1,2) (In NXP Doherty Test Fixture, 50 ohm system) $V_{DD} = 48\text{ Vdc}$, $I_{DQA} = 688\text{ mA}$, $V_{GSB} = 1.1\text{ Vdc}$, $P_{out} = 120\text{ W Avg.}$, $f = 940\text{ MHz}$, 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 @ $\pm 5\text{ MHz}$ Offset. | | | | | |
| Power Gain | G_{ps} | 18.1 | 18.9 | 21.1 | dB |
| Drain Efficiency | η_D | 51.0 | 56.7 | — | % |
| Output Peak-to-Average Ratio @ 0.01% Probability on CCDF | PAR | 6.6 | 7.3 | — | dB |
| Adjacent Channel Power Ratio | ACPR | — | -32.4 | -28.0 | dBc |
| Load Mismatch ⁽²⁾ (In NXP Doherty Test Fixture, 50 ohm system) $I_{DQA} = 688\text{ mA}$, $V_{GSB} = 1.1\text{ Vdc}$, $f = 940\text{ MHz}$, 12 μsec (on), 10% Duty Cycle | | | | | |
| VSWR 10:1 at 55 Vdc, 245 W Pulsed CW Output Power (3dB Backed Off from 492 W Pulsed CW Rated Power) | No Device Degradation | | | | |

Typical Performance ⁽²⁾ (In NXP Doherty Test Fixture, 50 ohm system) $V_{DD} = 48\text{ Vdc}$, $I_{DQA} = 688\text{ mA}$, $V_{GSB} = 1.1\text{ Vdc}$, 920–960 MHz Bandwidth

| | | | | | |
|--|------------------|---|-------|---|-------|
| P_{out} @ 3 dB Compression Point ⁽³⁾ | P3dB | — | 759 | — | W |
| AM/PM (Maximum value measured at the P3dB compression point across the 920–960 MHz frequency range) | Φ | — | -22 | — | ° |
| VBW Resonance Point (IMD Third Order Intermodulation Inflection Point) | VBW_{res} | — | 70 | — | MHz |
| Gain Flatness in 40 MHz Bandwidth @ $P_{out} = 120\text{ W Avg.}$ | G_F | — | 0.29 | — | dB |
| Gain Variation over Temperature (-30°C to +85°C) | ΔG | — | 0.004 | — | dB/°C |
| Output Power Variation over Temperature (-30°C to +85°C) | ΔP_{1dB} | — | 0.014 | — | dB/°C |

Table 6. Ordering Information

| Device | Tape and Reel Information | Package |
|-----------------|---|------------|
| A2V09H525-04NR6 | R6 Suffix = 150 Units, 56 mm Tape Width, 13-inch Reel | OM-1230-4L |

- Part internally input matched.
- Measurement made with device in an asymmetrical Doherty configuration.
- $P_{3dB} = P_{avg} + 7.0\text{ dB}$ 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.

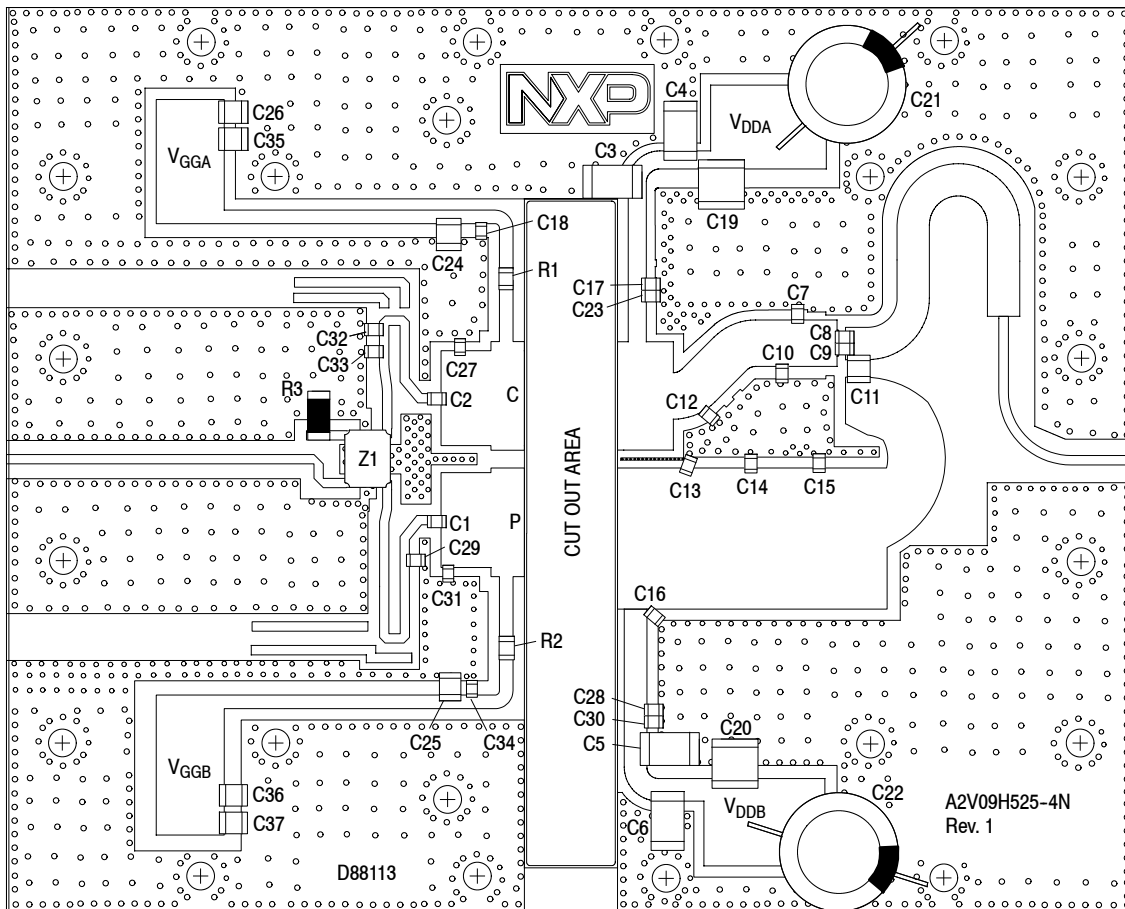


Figure 2. A2V09H525-04NR6 Test Circuit Component Layout

Table 7. A2V09H525-04NR6 Test Circuit Component Designations and Values

| Part | Description | Part Number | Manufacturer |
|--------------------------------------|---|----------------------|-----------------|
| C1, C2, C17, C18, C23, C28, C30, C34 | 56 pF Chip Capacitor | ATC600F560JT250XT | ATC |
| C3, C4, C5, C6 | 4.7 μ F Chip Capacitor | C4532X7S2A475M230KB | TDK |
| C7 | 3.3 pF Chip Capacitor | ATC600F3R3BT250XT | ATC |
| C8, C9 | 5.6 pF Chip Capacitor | ATC600F5R6BT250XT | ATC |
| C10, C14, C29 | 6.8 pF Chip Capacitor | ATC600F6R8BT250XT | ATC |
| C11 | 56 pF Chip Capacitor | ATC100B560JT500XT | ATC |
| C12, C16 | 7.5 pF Chip Capacitor | GQM1875C2E7R5BB12D | Murata |
| C13 | 12 pF Chip Capacitor | ATC600F120JT250XT | ATC |
| C15 | 10 pF Chip Capacitor | ATC600F100JT250XT | ATC |
| C19, C20 | 15 μ F Chip Capacitor | C5750X7S2A156M230KB | TDK |
| C21, C22 | 470 μ F, 63 V Electrolytic Capacitor | MCGPR63V477M13X26-RH | Multicomp |
| C24, C25 | 1000 pF Chip Capacitor | ATC800B102JT50XT | ATC |
| C26, C35, C36, C37 | 10 μ F Chip Capacitor | GRM32ER61H106KA12L | Murata |
| C27, C31 | 8.2 pF Chip Capacitor | ATC600F8R2BT250XT | ATC |
| C32 | 1.8 pF Chip Capacitor | ATC600F1R8BT250XT | ATC |
| C33 | 1.5 pF Chip Capacitor | ATC600F1R5BT250XT | ATC |
| R1, R2 | 3.3 Ω , 1/4 W Chip Resistor | CRCW08053R30JNEA | Vishay |
| R3 | 50 Ω , 10 W Termination Chip Resistor | 81A7031-50-5F | Florida RF Labs |
| Z1 | 800–1000 MHz Band, 90°, 2 dB Asymmetric Coupler | CMX09Q02 | Cemax |
| PCB | Rogers RO4350B, 0.020", $\epsilon_r = 3.66$ | D88113 | MTL |

TYPICAL CHARACTERISTICS — 920–960 MHz

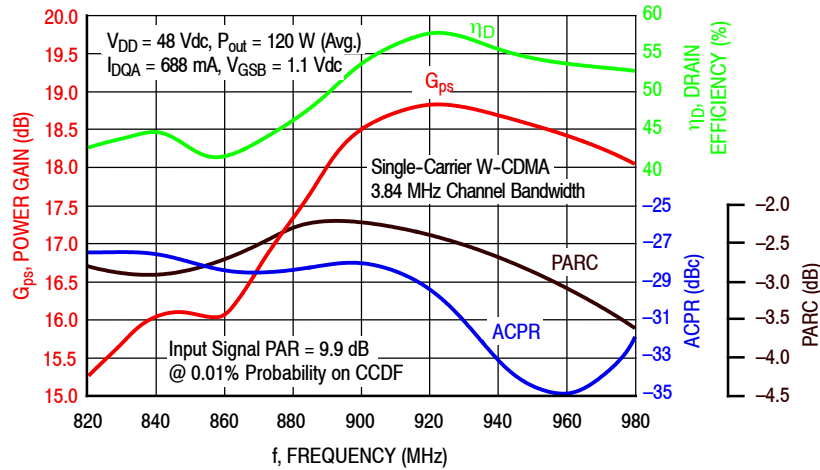


Figure 3. Single-Carrier Output Peak-to-Average Ratio Compression (PARC) Broadband Performance @ $P_{out} = 120$ Watts Avg.

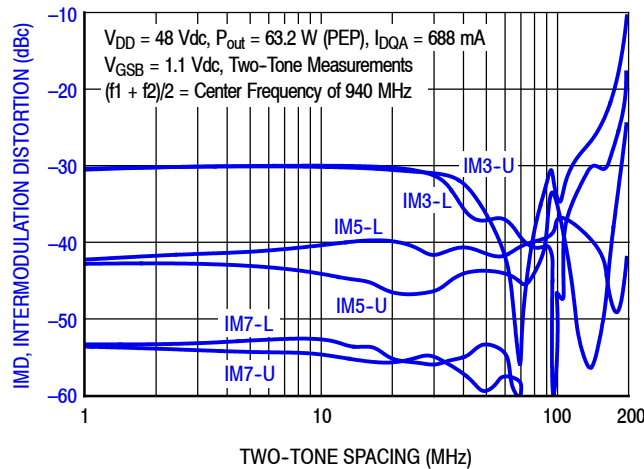


Figure 4. Intermodulation Distortion Products versus Two-Tone Spacing

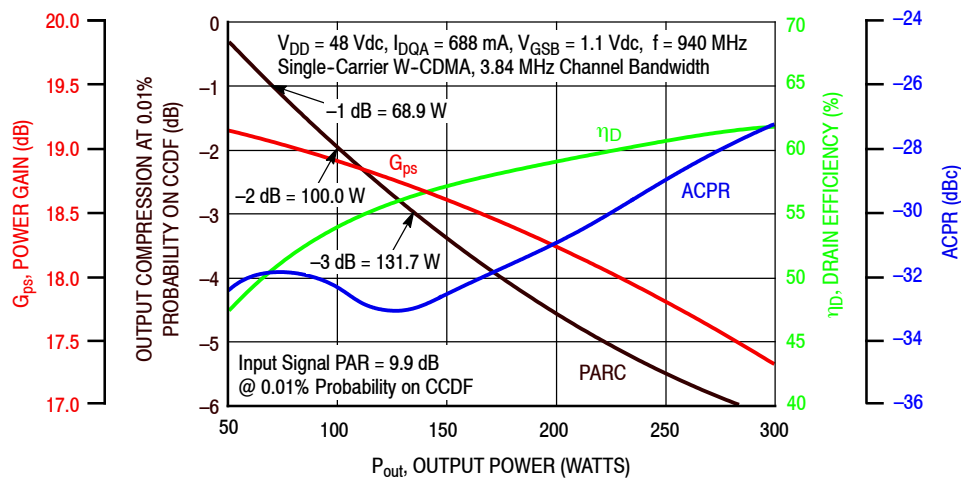


Figure 5. Output Peak-to-Average Ratio Compression (PARC) versus Output Power

TYPICAL CHARACTERISTICS — 920–960 MHz

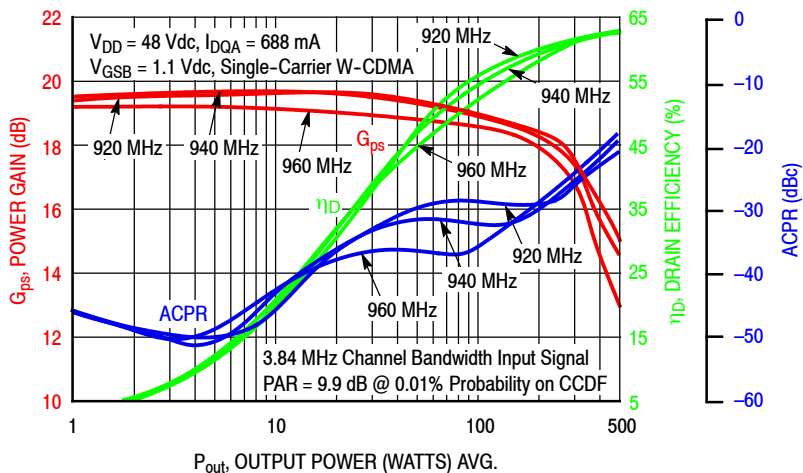


Figure 6. Single-Carrier W-CDMA Power Gain, Drain Efficiency and ACPR versus Output Power

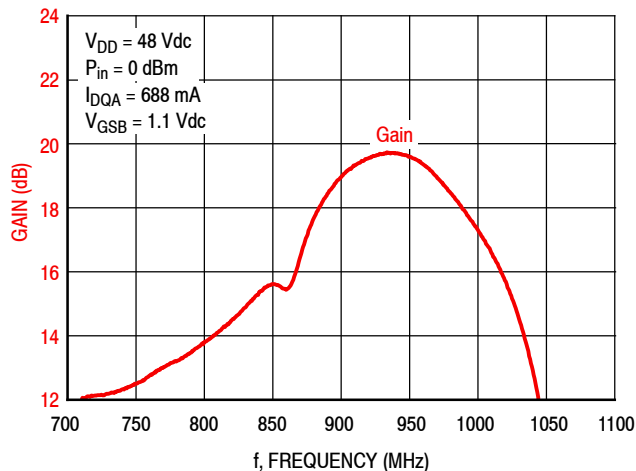


Figure 7. Broadband Frequency Response

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

$V_{DD} = 48 \text{ Vdc}$, $I_{DQA} = 691 \text{ mA}$, Pulsed CW, 10 μsec (on), 10% Duty Cycle

| f (MHz) | $Z_{\text{source}} (\Omega)$ | $Z_{\text{in}} (\Omega)$ | Max Output Power | | | | | |
|---------|------------------------------|--------------------------|----------------------------------|-----------|-------|-----|--------------|-----------|
| | | | P1dB | | | | | |
| | | | $Z_{\text{load}}^{(1)} (\Omega)$ | Gain (dB) | (dBm) | (W) | η_D (%) | AM/PM (°) |
| 920 | 5.02 – j5.30 | 5.03 + j6.04 | 2.26 + j0.05 | 20.3 | 54.2 | 261 | 59.6 | -14 |
| 940 | 5.83 – j5.60 | 6.06 + j6.45 | 2.31 – j0.06 | 20.2 | 54.1 | 256 | 58.2 | -14 |
| 960 | 7.20 – j6.14 | 7.45 + j6.86 | 2.36 – j0.17 | 20.2 | 54.0 | 252 | 57.5 | -15 |

| f (MHz) | $Z_{\text{source}} (\Omega)$ | $Z_{\text{in}} (\Omega)$ | Max Output Power | | | | | |
|---------|------------------------------|--------------------------|----------------------------------|-----------|-------|-----|--------------|-----------|
| | | | P3dB | | | | | |
| | | | $Z_{\text{load}}^{(2)} (\Omega)$ | Gain (dB) | (dBm) | (W) | η_D (%) | AM/PM (°) |
| 920 | 5.02 – j5.30 | 5.02 + j6.91 | 2.44 – j0.08 | 18.2 | 54.8 | 304 | 60.3 | -19 |
| 940 | 5.83 – j5.60 | 6.25 + j7.50 | 2.49 – j0.22 | 18.1 | 54.8 | 299 | 58.6 | -19 |
| 960 | 7.20 – j6.14 | 7.94 + j8.07 | 2.55 – j0.34 | 18.0 | 54.7 | 295 | 57.8 | -19 |

(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. Carrier Side Load Pull Performance — Maximum Efficiency Tuning

$V_{DD} = 48 \text{ Vdc}$, $I_{DQA} = 691 \text{ mA}$, Pulsed CW, 10 μsec (on), 10% Duty Cycle

| f (MHz) | $Z_{\text{source}} (\Omega)$ | $Z_{\text{in}} (\Omega)$ | Max Drain Efficiency | | | | | |
|---------|------------------------------|--------------------------|----------------------------------|-----------|-------|-----|--------------|-----------|
| | | | P1dB | | | | | |
| | | | $Z_{\text{load}}^{(1)} (\Omega)$ | Gain (dB) | (dBm) | (W) | η_D (%) | AM/PM (°) |
| 920 | 5.02 – j5.30 | 4.33 + j6.18 | 1.69 + j1.66 | 22.6 | 52.6 | 181 | 73.3 | -21 |
| 940 | 5.83 – j5.60 | 5.21 + j6.71 | 1.75 + j2.12 | 23.3 | 51.5 | 142 | 70.4 | -20 |
| 960 | 7.20 – j6.14 | 6.77 + j7.07 | 1.97 + j1.45 | 22.4 | 52.6 | 181 | 70.1 | -18 |

| f (MHz) | $Z_{\text{source}} (\Omega)$ | $Z_{\text{in}} (\Omega)$ | Max Drain Efficiency | | | | | |
|---------|------------------------------|--------------------------|----------------------------------|-----------|-------|-----|--------------|-----------|
| | | | P3dB | | | | | |
| | | | $Z_{\text{load}}^{(2)} (\Omega)$ | Gain (dB) | (dBm) | (W) | η_D (%) | AM/PM (°) |
| 920 | 5.02 – j5.30 | 4.34 + j6.97 | 1.69 + j1.66 | 20.6 | 53.1 | 206 | 73.6 | -30 |
| 940 | 5.83 – j5.60 | 5.37 + j7.66 | 1.55 + j1.48 | 20.4 | 53.0 | 202 | 73.1 | -31 |
| 960 | 7.20 – j6.14 | 7.26 + j8.27 | 1.97 + j1.45 | 20.4 | 53.2 | 209 | 70.1 | -26 |

(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.

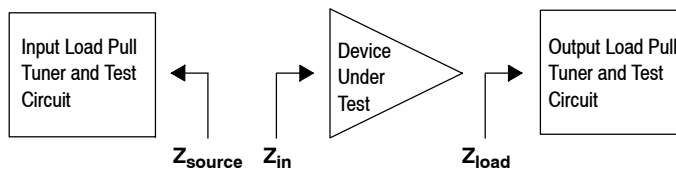


Table 10. Peaking Side Load Pull Performance — Maximum Power Tuning

$V_{DD} = 48$ Vdc, $V_{GSB} = 0.49$ mA, Pulsed CW, 10 μ sec(on), 10% Duty Cycle

| f (MHz) | Z_{source} (Ω) | Z_{in} (Ω) | Max Output Power | | | | | |
|---------|---------------------------|-----------------------|-------------------------------|-----------|-------|-----|--------------|--------------------|
| | | | P1dB | | | | | |
| | | | $Z_{load}^{(1)}$ (Ω) | Gain (dB) | (dBm) | (W) | η_D (%) | AM/PM ($^\circ$) |
| 920 | 2.08 – j2.73 | 2.20 + j3.85 | 0.91 – j0.38 | 15.6 | 57.3 | 540 | 61.5 | –22 |
| 940 | 2.49 – j2.81 | 2.66 + j4.18 | 0.92 – j0.47 | 15.7 | 57.2 | 529 | 60.2 | –21 |
| 960 | 2.70 – j3.04 | 3.34 + j4.59 | 0.97 – j0.57 | 15.7 | 57.2 | 520 | 59.4 | –21 |

| f (MHz) | Z_{source} (Ω) | Z_{in} (Ω) | Max Output Power | | | | | |
|---------|---------------------------|-----------------------|-------------------------------|-----------|-------|-----|--------------|--------------------|
| | | | P3dB | | | | | |
| | | | $Z_{load}^{(2)}$ (Ω) | Gain (dB) | (dBm) | (W) | η_D (%) | AM/PM ($^\circ$) |
| 920 | 2.08 – j2.73 | 2.20 + j4.24 | 1.00 – j0.52 | 13.4 | 57.9 | 622 | 61.4 | –28 |
| 940 | 2.49 – j2.81 | 2.71 + j4.66 | 1.02 – j0.60 | 13.5 | 57.9 | 610 | 60.3 | –27 |
| 960 | 2.70 – j3.04 | 3.51 + j5.17 | 1.05 – j0.69 | 13.4 | 57.8 | 602 | 59.4 | –27 |

(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 11. Peaking Side Load Pull Performance — Maximum Efficiency Tuning

$V_{DD} = 48$ Vdc, $V_{GSB} = 0.49$ mA, Pulsed CW, 10 μ sec(on), 10% Duty Cycle

| f (MHz) | Z_{source} (Ω) | Z_{in} (Ω) | Max Drain Efficiency | | | | | |
|---------|---------------------------|-----------------------|-------------------------------|-----------|-------|-----|--------------|--------------------|
| | | | P1dB | | | | | |
| | | | $Z_{load}^{(1)}$ (Ω) | Gain (dB) | (dBm) | (W) | η_D (%) | AM/PM ($^\circ$) |
| 920 | 2.08 – j2.73 | 1.84 + j3.75 | 1.01 + j0.55 | 16.9 | 55.4 | 348 | 74.8 | –26 |
| 940 | 2.49 – j2.81 | 2.37 + j4.18 | 1.40 + j0.30 | 16.6 | 55.8 | 383 | 73.2 | –21 |
| 960 | 2.70 – j3.04 | 2.76 + j4.48 | 0.94 + j0.38 | 17.0 | 55.2 | 332 | 71.9 | –26 |

| f (MHz) | Z_{source} (Ω) | Z_{in} (Ω) | Max Drain Efficiency | | | | | |
|---------|---------------------------|-----------------------|-------------------------------|-----------|-------|-----|--------------|--------------------|
| | | | P3dB | | | | | |
| | | | $Z_{load}^{(2)}$ (Ω) | Gain (dB) | (dBm) | (W) | η_D (%) | AM/PM ($^\circ$) |
| 920 | 2.08 – j2.73 | 1.92 + j4.16 | 1.13 + j0.42 | 14.8 | 56.4 | 439 | 72.6 | –33 |
| 940 | 2.49 – j2.81 | 2.46 + j4.65 | 1.40 + j0.27 | 14.6 | 56.5 | 450 | 72.9 | –28 |
| 960 | 2.70 – j3.04 | 3.02 + j5.07 | 0.99 + j0.30 | 14.9 | 56.1 | 407 | 71.3 | –35 |

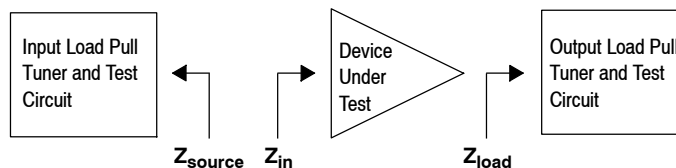
(1) Load impedance for optimum P1dB efficiency.

(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 — 940 MHz

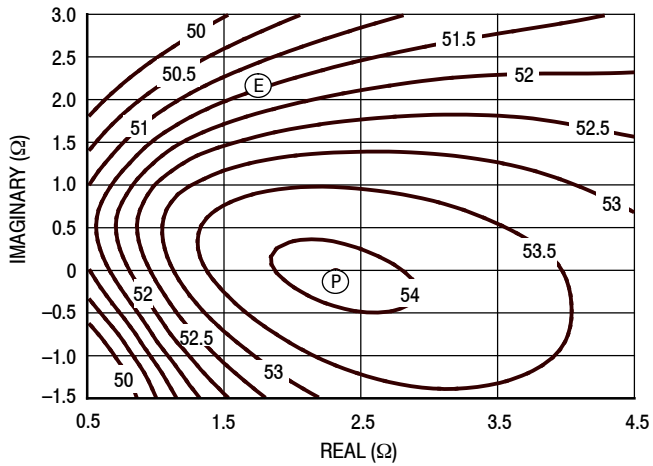


Figure 8. P1dB Load Pull Output Power Contours (dBm)

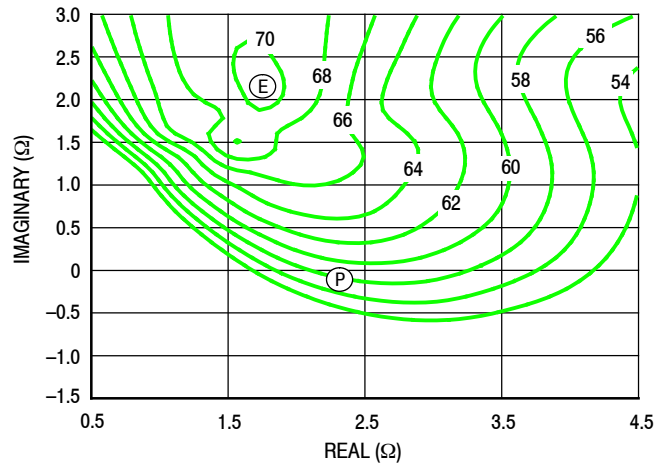


Figure 9. P1dB Load Pull Efficiency Contours (%)

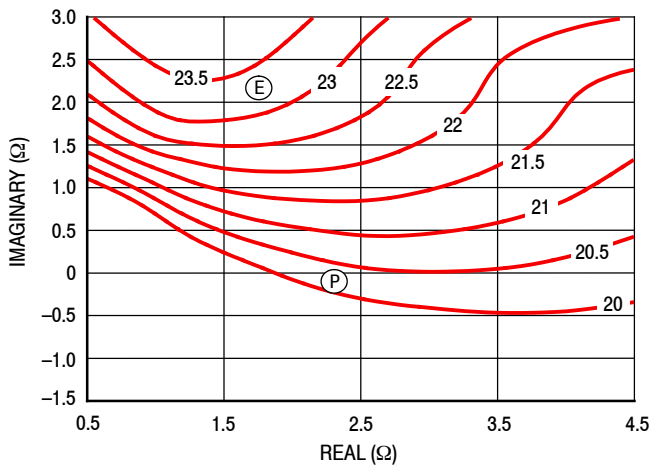


Figure 10. P1dB Load Pull Gain Contours (dB)

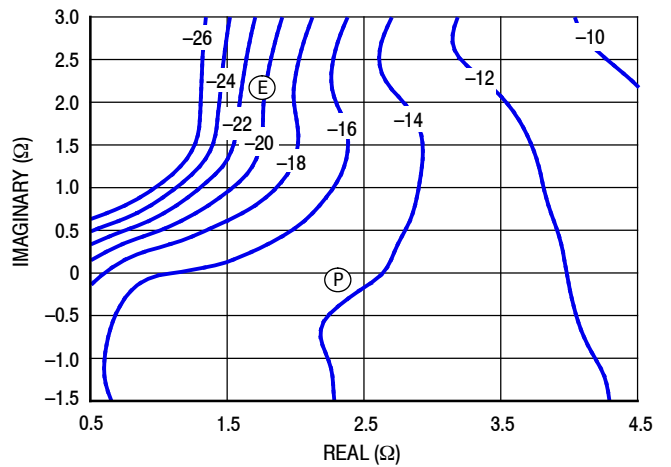


Figure 11. P1dB Load Pull AM/PM Contours (°)

NOTE: (P) = Maximum Output Power

(E) = Maximum Drain Efficiency

- Gain
- Drain Efficiency
- Linearity
- Output Power

P3dB – TYPICAL CARRIER SIDE LOAD PULL CONTOURS — 940 MHz

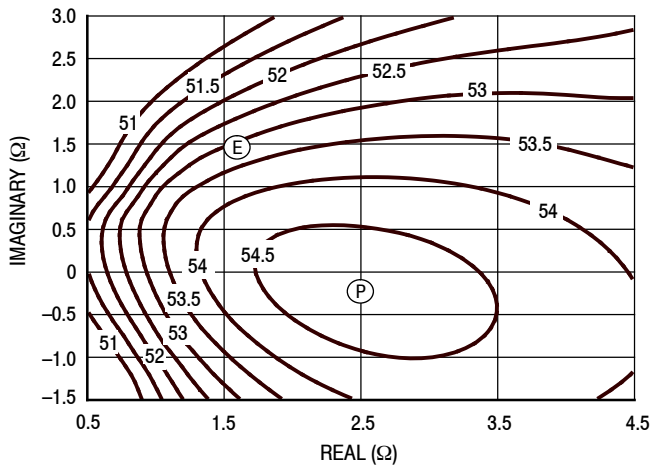


Figure 12. P3dB Load Pull Output Power Contours (dBm)

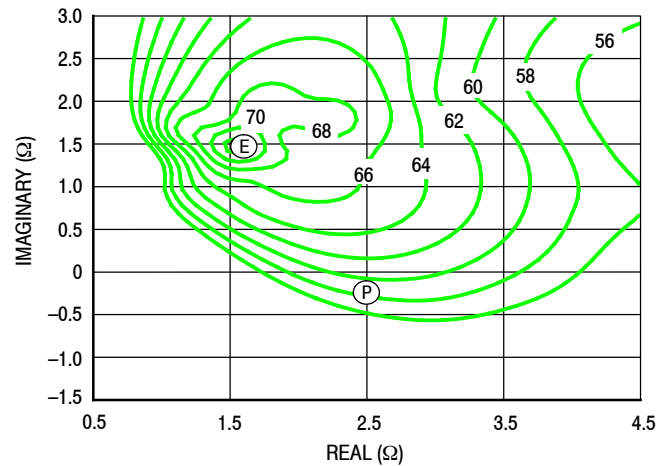


Figure 13. P3dB Load Pull Efficiency Contours (%)

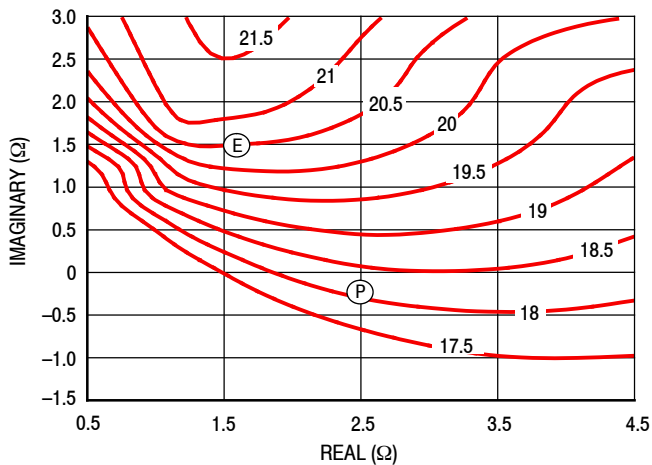


Figure 14. P3dB Load Pull Gain Contours (dB)

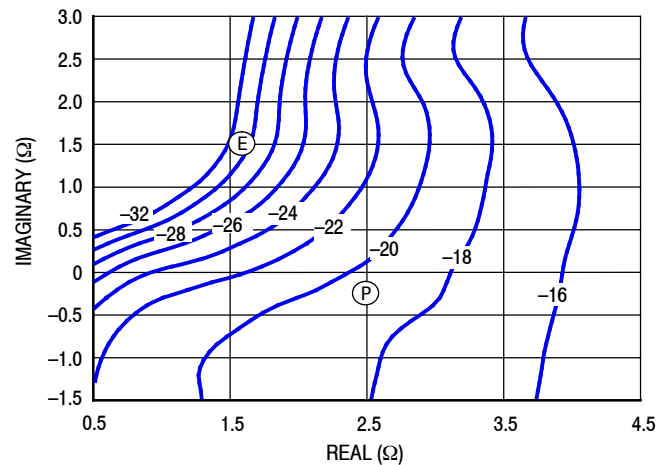


Figure 15. P3dB Load Pull AM/PM Contours (°)

NOTE: (P) = Maximum Output Power
(E) = Maximum Drain Efficiency

- Gain
- Drain Efficiency
- Linearity
- Output Power

P1dB – TYPICAL PEAKING SIDE LOAD PULL CONTOURS — 940 MHz

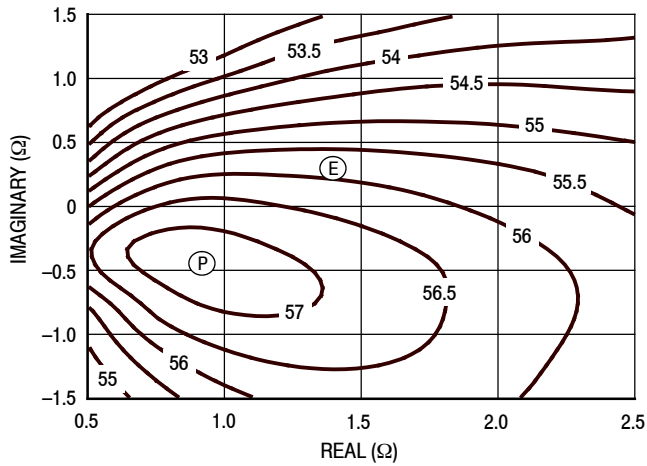


Figure 16. P1dB Load Pull Output Power Contours (dBm)

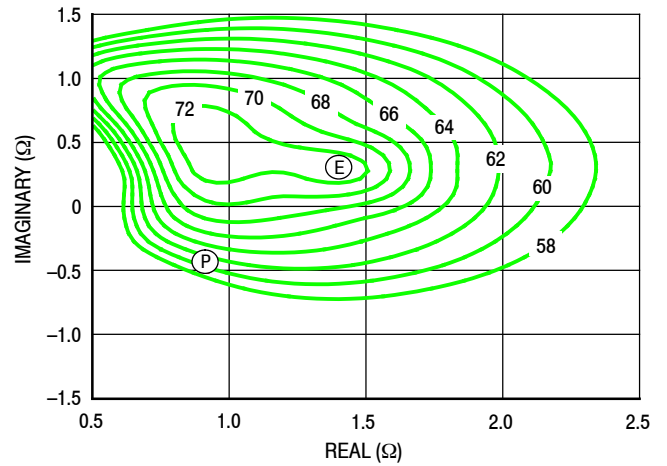


Figure 17. P1dB Load Pull Efficiency Contours (%)

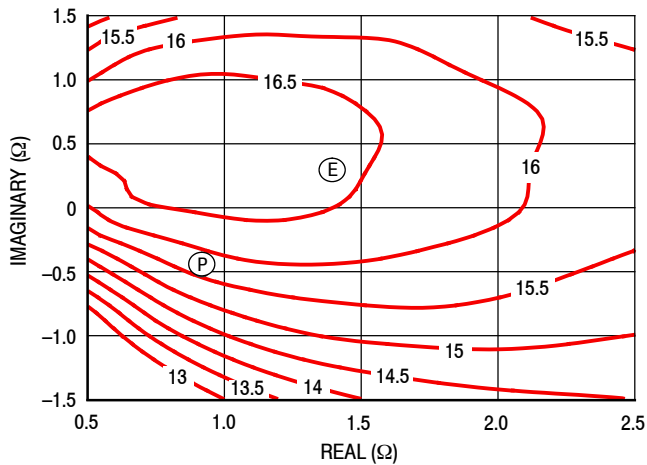


Figure 18. P1dB Load Pull Gain Contours (dB)

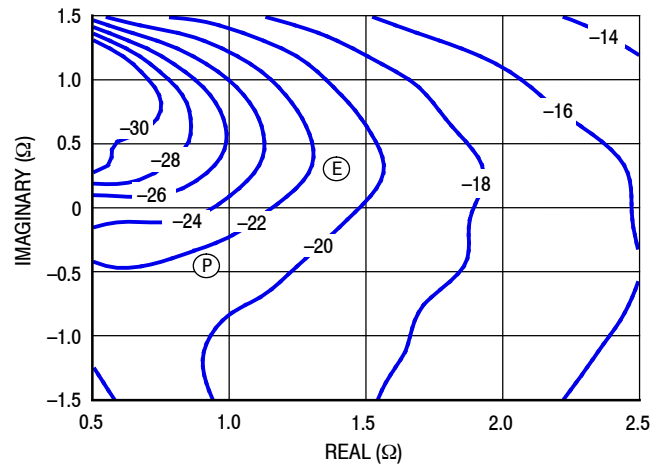


Figure 19. P1dB Load Pull AM/PM Contours (°)

NOTE: (P) = Maximum Output Power
(E) = Maximum Drain Efficiency

- Gain
- Drain Efficiency
- Linearity
- Output Power

P3dB – TYPICAL PEAKING SIDE LOAD PULL CONTOURS — 940 MHz

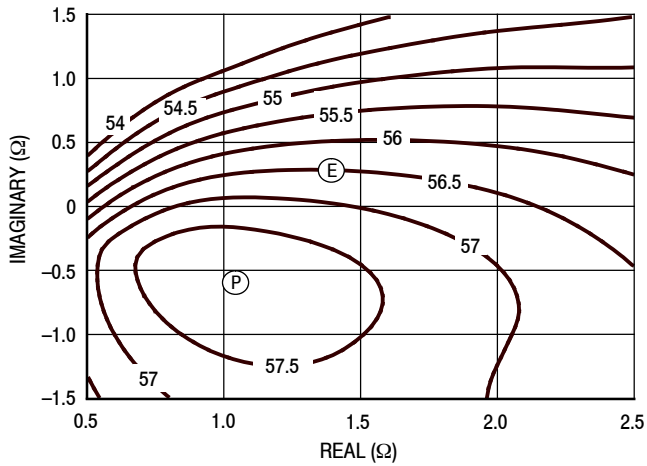


Figure 20. P3dB Load Pull Output Power Contours (dBm)

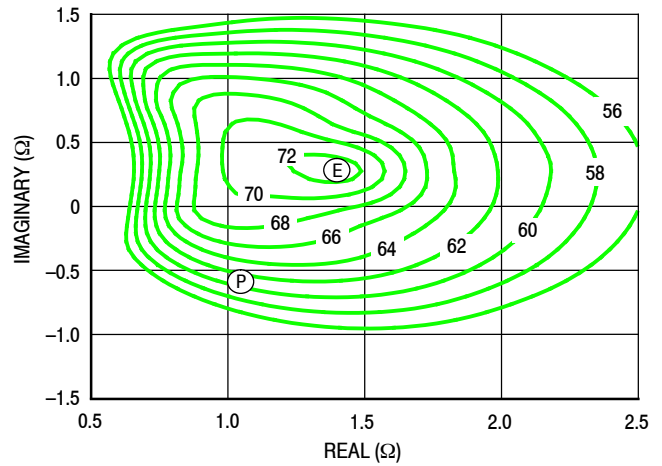


Figure 21. P3dB Load Pull Efficiency Contours (%)

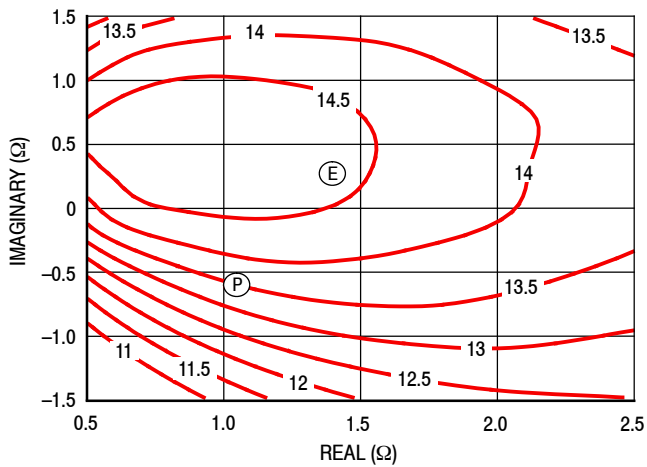


Figure 22. P3dB Load Pull Gain Contours (dB)

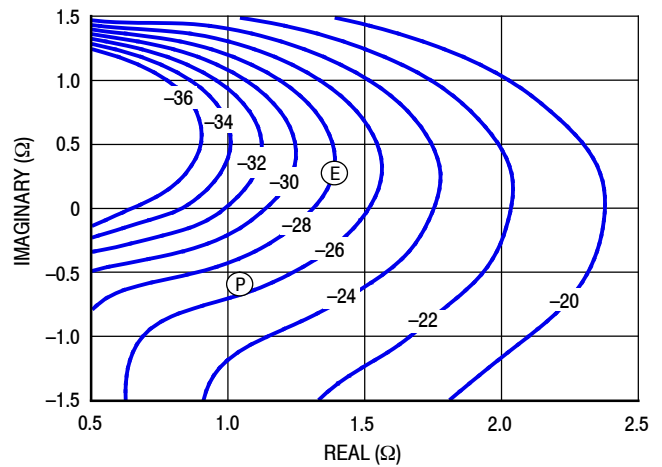


Figure 23. P3dB Load Pull AM/PM Contours (°)

NOTE: (P) = Maximum Output Power
(E) = Maximum Drain Efficiency

- Gain
- Drain Efficiency
- Linearity
- Output Power

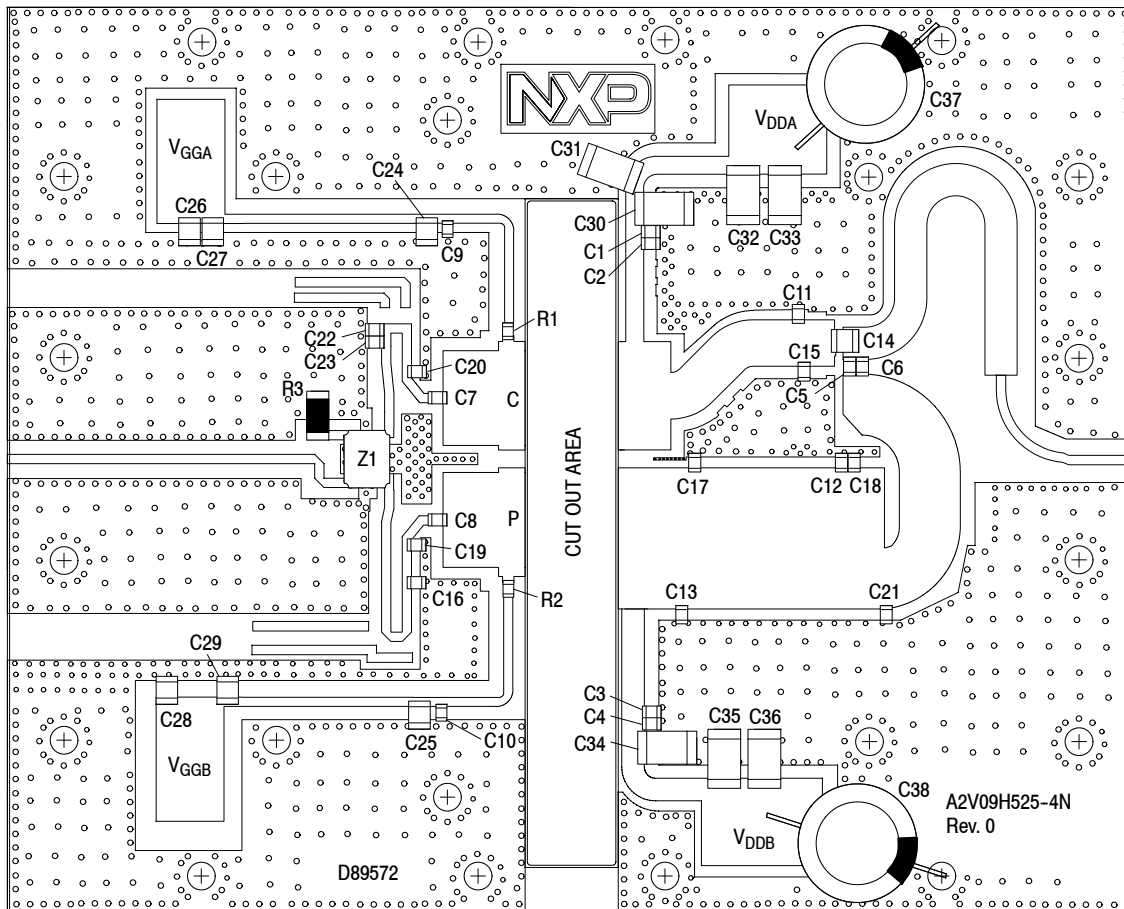


Figure 24. A2V09H525-04NR6 Test Circuit Component Layout — 758–803 MHz

Table 12. A2V09H525-04NR6 Test Circuit Component Designations and Values — 758–803 MHz

| Part | Description | Part Number | Manufacturer |
|---|---|-----------------------|-----------------|
| C1, C2, C3, C4, C5, C6, C7, C8, C9, C10 | 56 pF Chip Capacitor | ATC600F560JT250XT | ATC |
| C11, C12, C13 | 6.8 pF Chip Capacitor | ATC600F6R8BT250XT | ATC |
| C14 | 22 pF Chip Capacitor | ATC800B220JT500XT | ATC |
| C15, C16 | 7.5 pF Chip Capacitor | GQM1875C2E7R5BB12D | Murata |
| C17, C18 | 12 pF Chip Capacitor | ATC600F120JT250XT | ATC |
| C19, C20 | 10 pF Chip Capacitor | ATC600F100JT250XT | ATC |
| C21 | 0.6 pF Chip Capacitor | ATC600F0R6BT250XT | ATC |
| C22 | 2.0 pF Chip Capacitor | ATC600F2R0BT250XT | ATC |
| C23 | 2.4 pF Chip Capacitor | ATC600F2R4BT250XT | ATC |
| C24, C25 | 1000 pF Chip Capacitor | ATC800B102JT50XT | ATC |
| C26, C27, C28, C29 | 10 μ F Chip Capacitor | GRM32ER61H106KA12L | Murata |
| C30, C31, C32, C33, C34, C35, C36 | 15 μ F Chip Capacitor | C5750X7S2A156M230KB | TDK |
| C37, C38 | 220 μ F, 100 V Electrolytic Capacitor | MCGPR100V227M16X26-RH | Multicomp |
| R1, R2 | 4.75 Ω , 1/4 W Chip Resistor | CRCW12064R75FNEA | Vishay |
| R3 | 50 Ω , 10 W Termination Chip Resistor | 81A7031-50-5F | Florida RF Labs |
| Z1 | 800–1000 MHz Band, 90°, 2 dB Asymmetric Coupler | CMX09Q02 | Cemax |
| PCB | Rogers RO4350B, 0.020", $\epsilon_r = 3.66$ | D89572 | MTL |

TYPICAL CHARACTERISTICS — 758–803 MHz

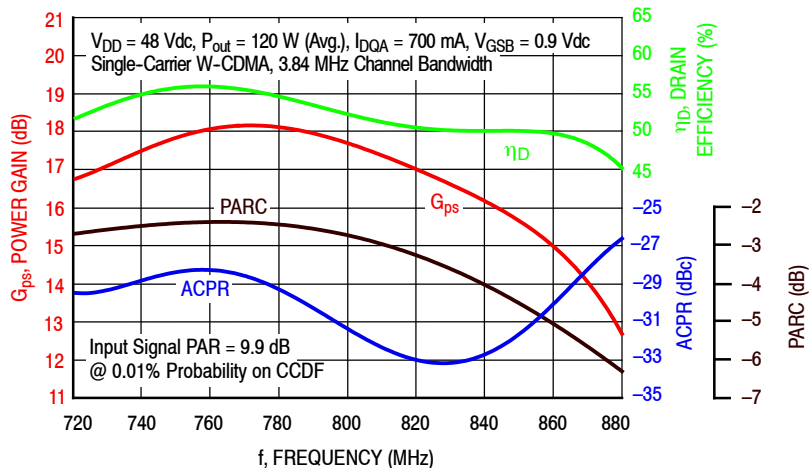


Figure 25. Single-Carrier Output Peak-to-Average Ratio Compression (PARC) Broadband Performance @ P_{out} = 120 Watts Avg.

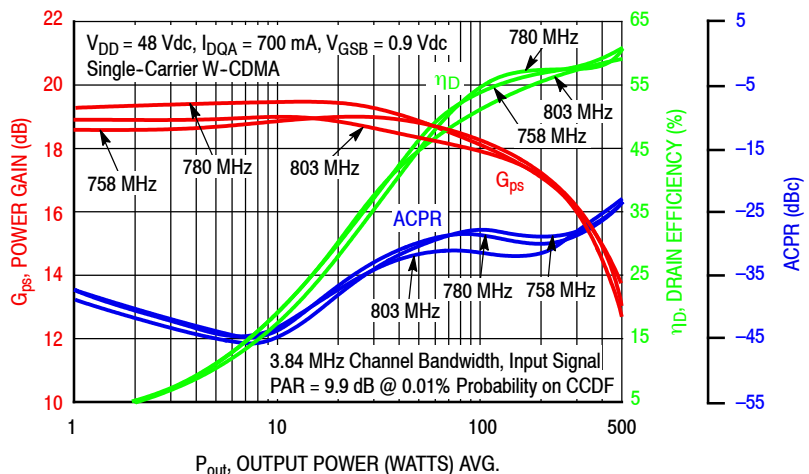


Figure 26. Single-Carrier W-CDMA Power Gain, Drain Efficiency and ACPR versus Output Power

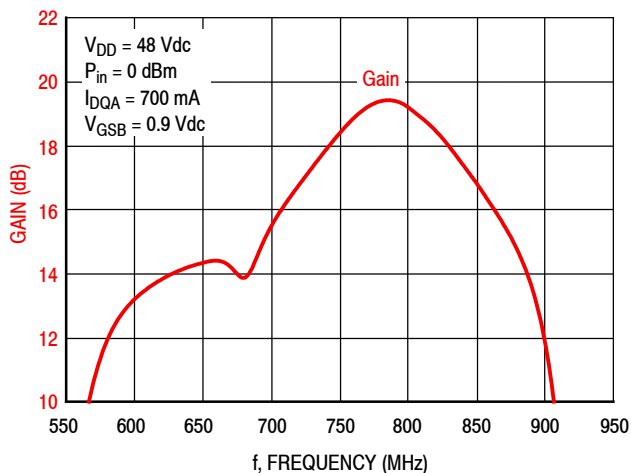


Figure 27. Broadband Frequency Response

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

$V_{DD} = 48$ Vdc, $I_{DQA} = 712$ mA, Pulsed CW, 10 μ sec(on), 10% Duty Cycle

| f (MHz) | Z_{source} (Ω) | Z_{in} (Ω) | Max Output Power | | | | | |
|---------|---------------------------|-----------------------|-------------------------------|-----------|-------|-----|--------------|--------------------|
| | | | P1dB | | | | | |
| | | | $Z_{load}^{(1)}$ (Ω) | Gain (dB) | (dBm) | (W) | η_D (%) | AM/PM ($^\circ$) |
| 733 | 4.26 – j2.42 | 3.95 + j2.45 | 2.65 + j0.05 | 19.3 | 54.4 | 277 | 59.8 | –10 |
| 780 | 3.25 – j3.06 | 3.37 + j2.82 | 2.09 + j0.53 | 19.9 | 54.4 | 273 | 60.3 | –10 |
| 822 | 3.49 – j3.60 | 3.40 + j3.55 | 2.03 + j0.38 | 20.3 | 54.4 | 277 | 61.9 | –13 |

| f (MHz) | Z_{source} (Ω) | Z_{in} (Ω) | Max Output Power | | | | | |
|---------|---------------------------|-----------------------|-------------------------------|-----------|-------|-----|--------------|--------------------|
| | | | P3dB | | | | | |
| | | | $Z_{load}^{(2)}$ (Ω) | Gain (dB) | (dBm) | (W) | η_D (%) | AM/PM ($^\circ$) |
| 733 | 4.26 – j2.42 | 3.66 + j2.68 | 2.70 – j0.04 | 17.2 | 55.0 | 315 | 60.4 | –12 |
| 780 | 3.25 – j3.06 | 3.15 + j3.17 | 2.28 + j0.45 | 17.9 | 55.1 | 324 | 64.1 | –14 |
| 822 | 3.49 – j3.60 | 3.19 + j3.98 | 2.25 + j0.24 | 18.2 | 55.0 | 318 | 63.4 | –17 |

(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. Carrier Side Load Pull Performance — Maximum Efficiency Tuning

$V_{DD} = 48$ Vdc, $I_{DQA} = 712$ mA, Pulsed CW, 10 μ sec(on), 10% Duty Cycle

| f (MHz) | Z_{source} (Ω) | Z_{in} (Ω) | Max Drain Efficiency | | | | | |
|---------|---------------------------|-----------------------|-------------------------------|-----------|-------|-----|--------------|--------------------|
| | | | P1dB | | | | | |
| | | | $Z_{load}^{(1)}$ (Ω) | Gain (dB) | (dBm) | (W) | η_D (%) | AM/PM ($^\circ$) |
| 733 | 4.26 – j2.42 | 3.39 + j2.32 | 2.35 + j1.99 | 21.3 | 52.9 | 196 | 67.8 | –16 |
| 780 | 3.25 – j3.06 | 2.89 + j3.10 | 2.34 + j2.64 | 22.5 | 52.5 | 176 | 71.9 | –15 |
| 822 | 3.49 – j3.60 | 2.90 + j3.71 | 2.01 + j2.03 | 22.6 | 52.8 | 189 | 72.2 | –19 |

| f (MHz) | Z_{source} (Ω) | Z_{in} (Ω) | Max Drain Efficiency | | | | | |
|---------|---------------------------|-----------------------|-------------------------------|-----------|-------|-----|--------------|--------------------|
| | | | P3dB | | | | | |
| | | | $Z_{load}^{(2)}$ (Ω) | Gain (dB) | (dBm) | (W) | η_D (%) | AM/PM ($^\circ$) |
| 733 | 4.26 – j2.42 | 3.31 + j2.52 | 2.36 + j1.67 | 19.0 | 53.9 | 243 | 67.8 | –19 |
| 780 | 3.25 – j3.06 | 2.93 + j3.40 | 2.95 + j2.28 | 19.8 | 53.8 | 238 | 71.6 | –17 |
| 822 | 3.49 – j3.60 | 2.93 + j4.04 | 2.37 + j1.64 | 20.1 | 54.0 | 251 | 72.1 | –22 |

(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.

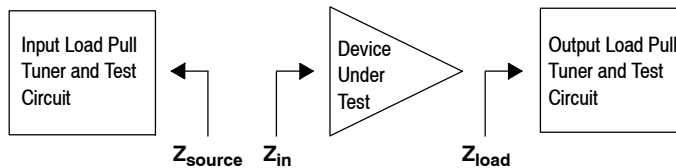


Table 15. Peaking Side Load Pull Performance — Maximum Power Tuning

$V_{DD} = 48$ Vdc, $V_{GSB} = 1.4$ mA, Pulsed CW, 10 μ sec(on), 10% Duty Cycle

| f (MHz) | Z_{source} (Ω) | Z_{in} (Ω) | Max Output Power | | | | | |
|---------|---------------------------|-----------------------|-------------------------------|-----------|-------|-----|--------------|--------------------|
| | | | P1dB | | | | | |
| | | | $Z_{load}^{(1)}$ (Ω) | Gain (dB) | (dBm) | (W) | η_D (%) | AM/PM ($^\circ$) |
| 733 | 1.87 – j1.72 | 1.99 + j1.63 | 1.12 – j0.24 | 15.9 | 57.6 | 576 | 63.1 | –21 |
| 780 | 1.68 – j1.75 | 1.67 + j1.81 | 1.04 – j0.36 | 16.6 | 57.7 | 585 | 63.2 | –22 |
| 822 | 1.64 – j2.13 | 1.57 + j2.10 | 0.99 – j0.54 | 17.0 | 57.6 | 576 | 62.9 | –23 |

| f (MHz) | Z_{source} (Ω) | Z_{in} (Ω) | Max Output Power | | | | | |
|---------|---------------------------|-----------------------|-------------------------------|-----------|-------|-----|--------------|--------------------|
| | | | P3dB | | | | | |
| | | | $Z_{load}^{(2)}$ (Ω) | Gain (dB) | (dBm) | (W) | η_D (%) | AM/PM ($^\circ$) |
| 733 | 1.87 – j1.72 | 1.79 + j1.78 | 1.21 – j0.35 | 13.9 | 58.1 | 653 | 64.5 | –24 |
| 780 | 1.68 – j1.75 | 1.50 + j1.99 | 1.08 – j0.40 | 14.6 | 58.2 | 666 | 65.5 | –27 |
| 822 | 1.64 – j2.13 | 1.42 + j2.35 | 1.10 – j0.65 | 14.9 | 58.2 | 654 | 63.9 | –28 |

(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 16. Peaking Side Load Pull Performance — Maximum Efficiency Tuning

$V_{DD} = 48$ Vdc, $V_{GSB} = 1.4$ mA, Pulsed CW, 10 μ sec(on), 10% Duty Cycle

| f (MHz) | Z_{source} (Ω) | Z_{in} (Ω) | Max Drain Efficiency | | | | | |
|---------|---------------------------|-----------------------|-------------------------------|-----------|-------|-----|--------------|--------------------|
| | | | P1dB | | | | | |
| | | | $Z_{load}^{(1)}$ (Ω) | Gain (dB) | (dBm) | (W) | η_D (%) | AM/PM ($^\circ$) |
| 733 | 1.87 – j1.72 | 1.75 + j1.52 | 1.33 + j0.89 | 17.0 | 55.7 | 374 | 75.2 | –26 |
| 780 | 1.68 – j1.75 | 1.38 + j1.72 | 1.24 + j0.88 | 18.1 | 55.3 | 341 | 76.8 | –27 |
| 822 | 1.64 – j2.13 | 1.21 + j2.00 | 1.02 + j0.71 | 18.6 | 54.8 | 300 | 75.7 | –31 |

| f (MHz) | Z_{source} (Ω) | Z_{in} (Ω) | Max Drain Efficiency | | | | | |
|---------|---------------------------|-----------------------|-------------------------------|-----------|-------|-----|--------------|--------------------|
| | | | P3dB | | | | | |
| | | | $Z_{load}^{(2)}$ (Ω) | Gain (dB) | (dBm) | (W) | η_D (%) | AM/PM ($^\circ$) |
| 733 | 1.87 – j1.72 | 1.63 + j1.67 | 1.38 + j0.87 | 15.0 | 56.2 | 421 | 73.9 | –30 |
| 780 | 1.68 – j1.75 | 1.34 + j1.95 | 1.47 + j0.56 | 15.9 | 56.7 | 466 | 74.9 | –30 |
| 822 | 1.64 – j2.13 | 1.23 + j2.26 | 1.24 + j0.39 | 16.4 | 56.4 | 435 | 74.2 | –34 |

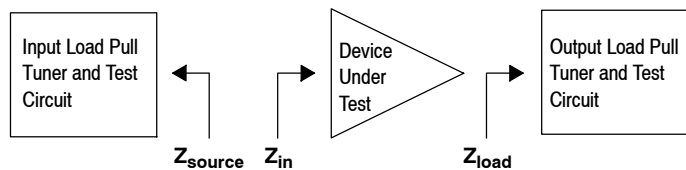
(1) Load impedance for optimum P1dB efficiency.

(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 — 780 MHz

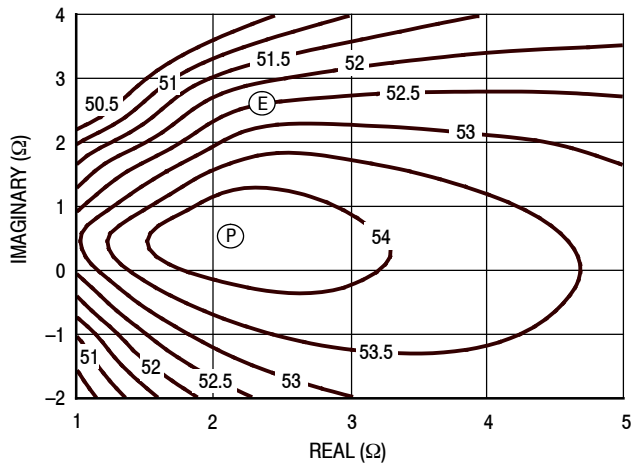


Figure 28. P1dB Load Pull Output Power Contours (dBm)

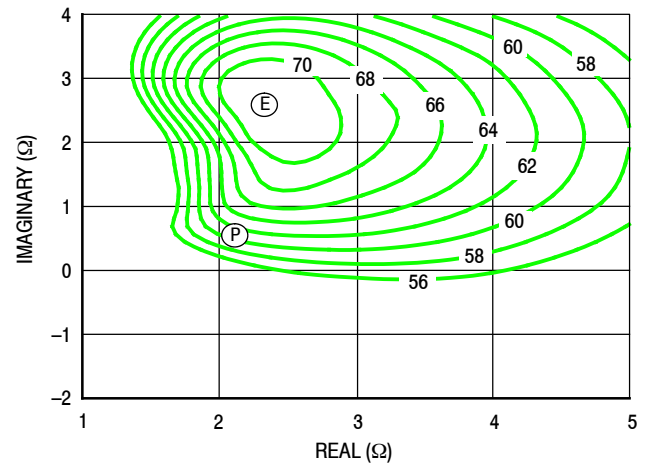


Figure 29. P1dB Load Pull Efficiency Contours (%)

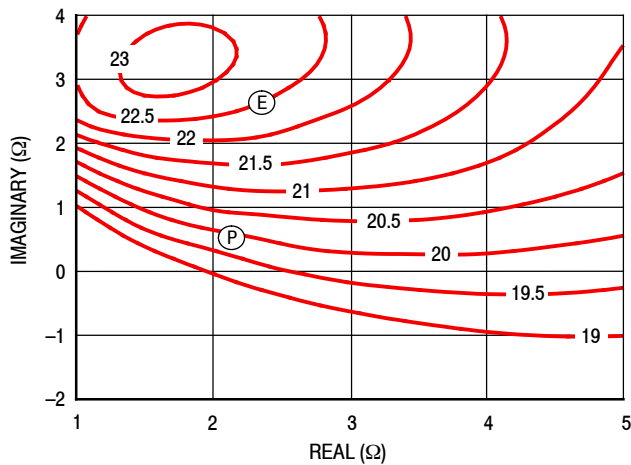


Figure 30. P1dB Load Pull Gain Contours (dB)

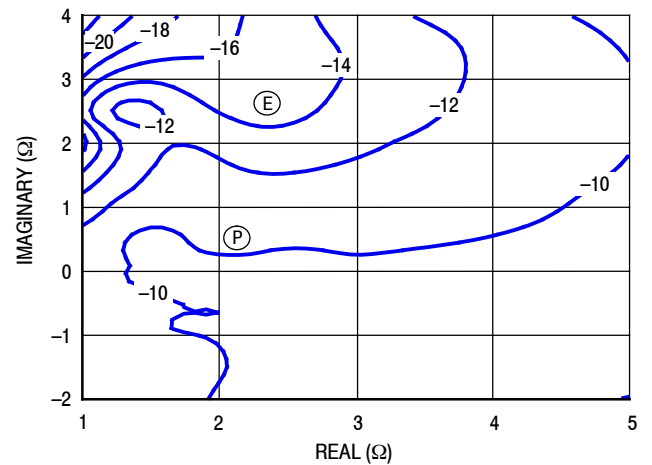


Figure 31. P1dB Load Pull AM/PM Contours (°)

NOTE: (P) = Maximum Output Power
(E) = Maximum Drain Efficiency

- Gain
- Drain Efficiency
- Linearity
- Output Power

P3dB – TYPICAL CARRIER SIDE LOAD PULL CONTOURS — 780 MHz

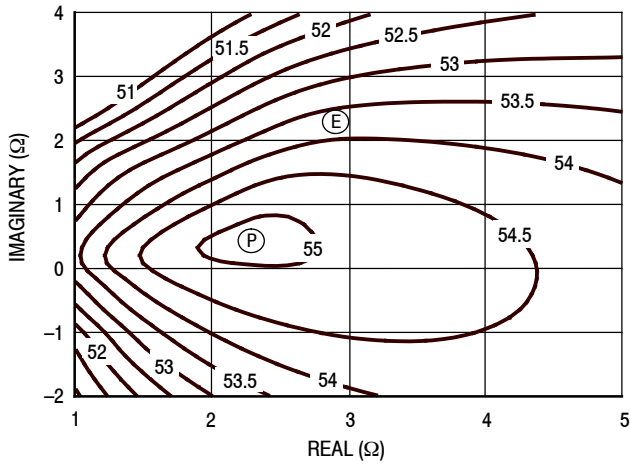


Figure 32. P3dB Load Pull Output Power Contours (dBm)

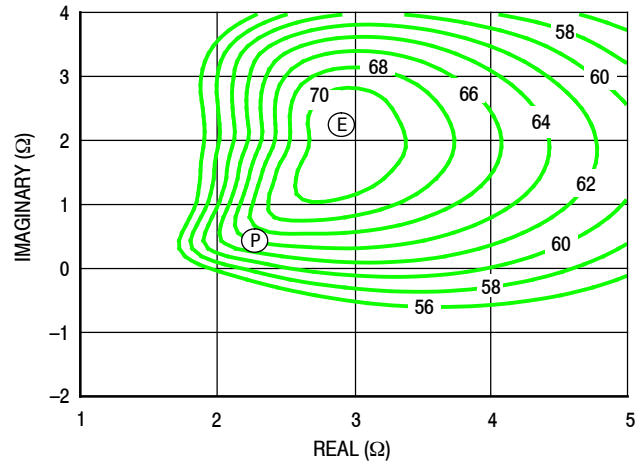


Figure 33. P3dB Load Pull Efficiency Contours (%)

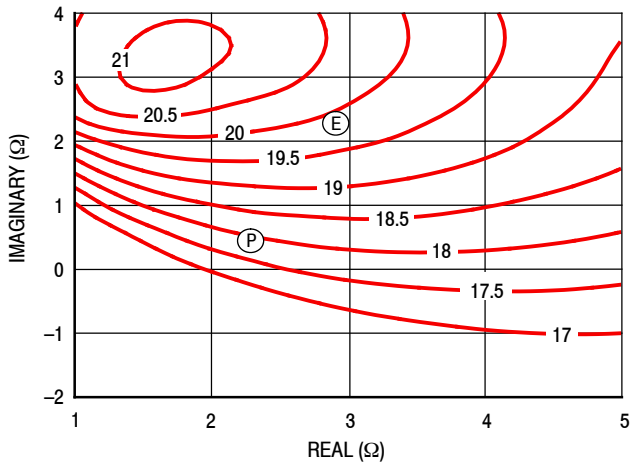


Figure 34. P3dB Load Pull Gain Contours (dB)

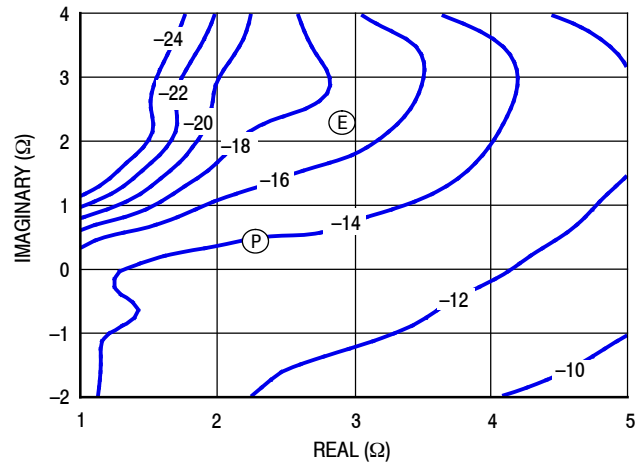


Figure 35. P3dB Load Pull AM/PM Contours (°)

NOTE: (P) = Maximum Output Power
(E) = Maximum Drain Efficiency

- Gain
- Drain Efficiency
- Linearity
- Output Power

P1dB – TYPICAL PEAKING SIDE LOAD PULL CONTOURS — 780 MHz

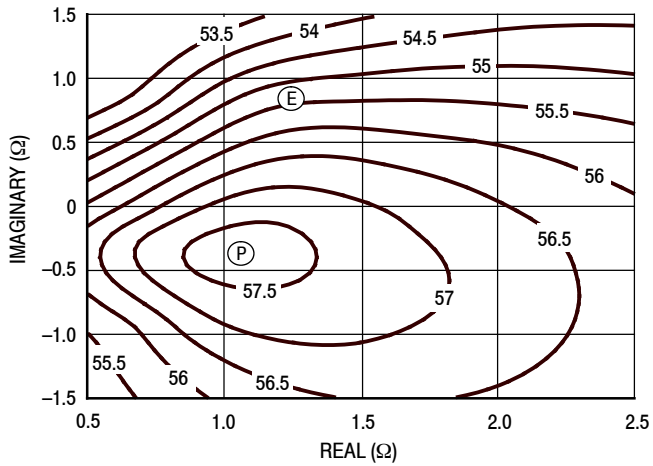


Figure 36. P1dB Load Pull Output Power Contours (dBm)

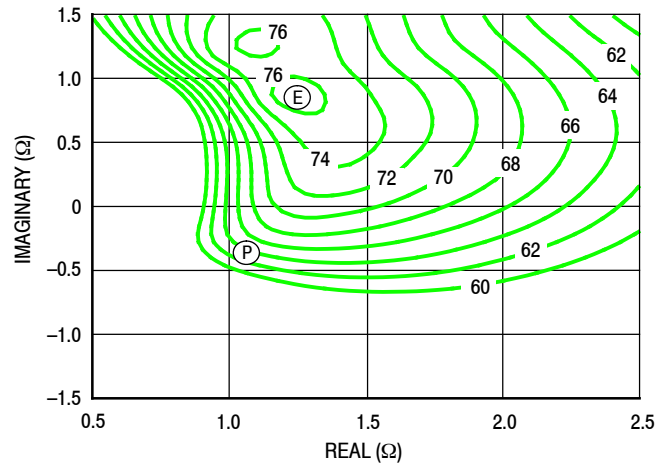


Figure 37. P1dB Load Pull Efficiency Contours (%)

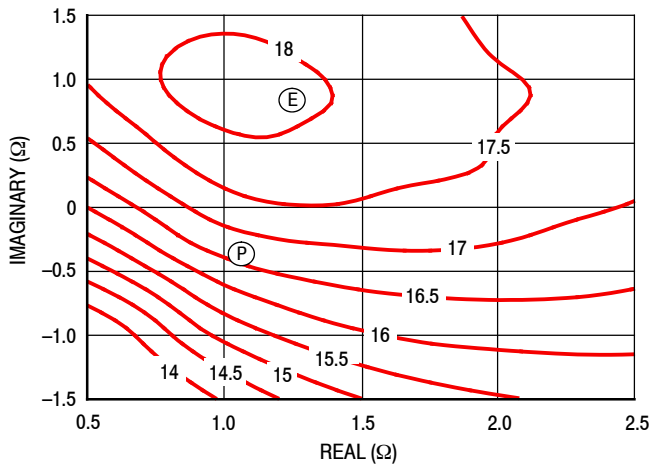


Figure 38. P1dB Load Pull Gain Contours (dB)

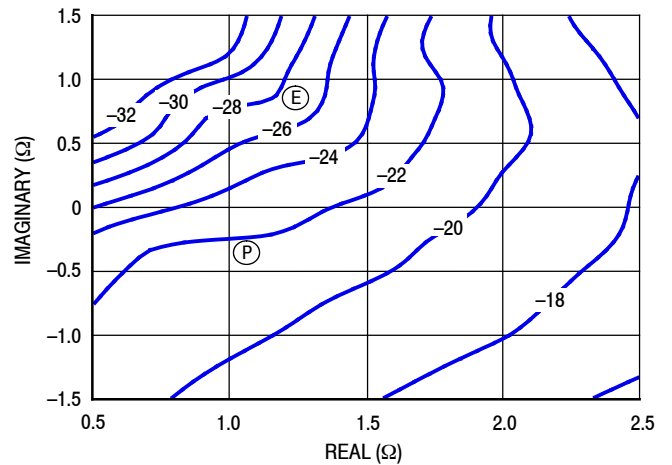


Figure 39. P1dB Load Pull AM/PM Contours (°)

NOTE: (P) = Maximum Output Power
(E) = Maximum Drain Efficiency

- Gain
- Drain Efficiency
- Linearity
- Output Power

P3dB – TYPICAL PEAKING SIDE LOAD PULL CONTOURS — 780 MHz

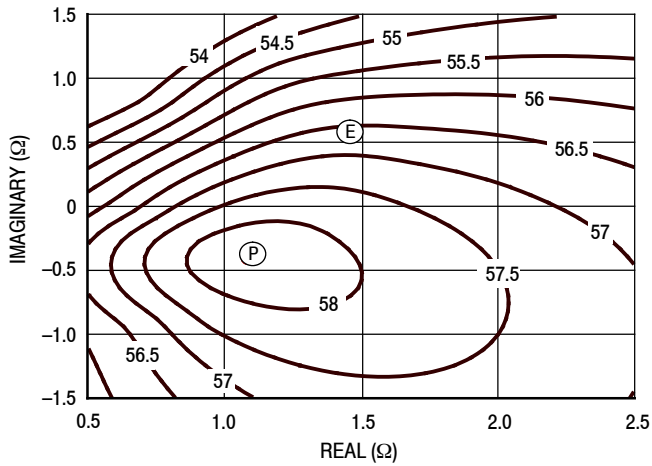


Figure 40. P3dB Load Pull Output Power Contours (dBm)

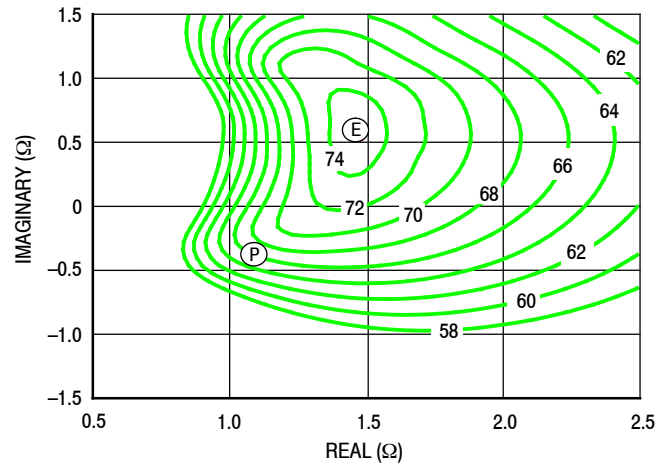


Figure 41. P3dB Load Pull Efficiency Contours (%)

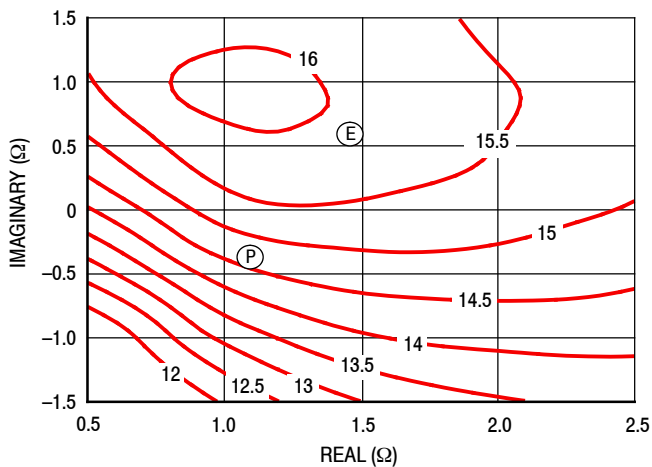


Figure 42. P3dB Load Pull Gain Contours (dB)

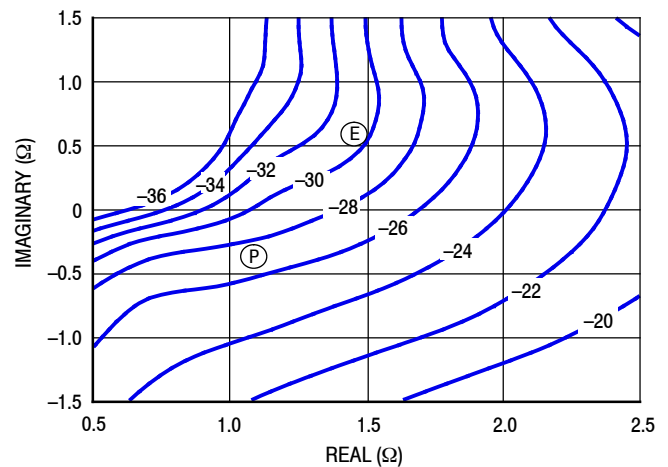
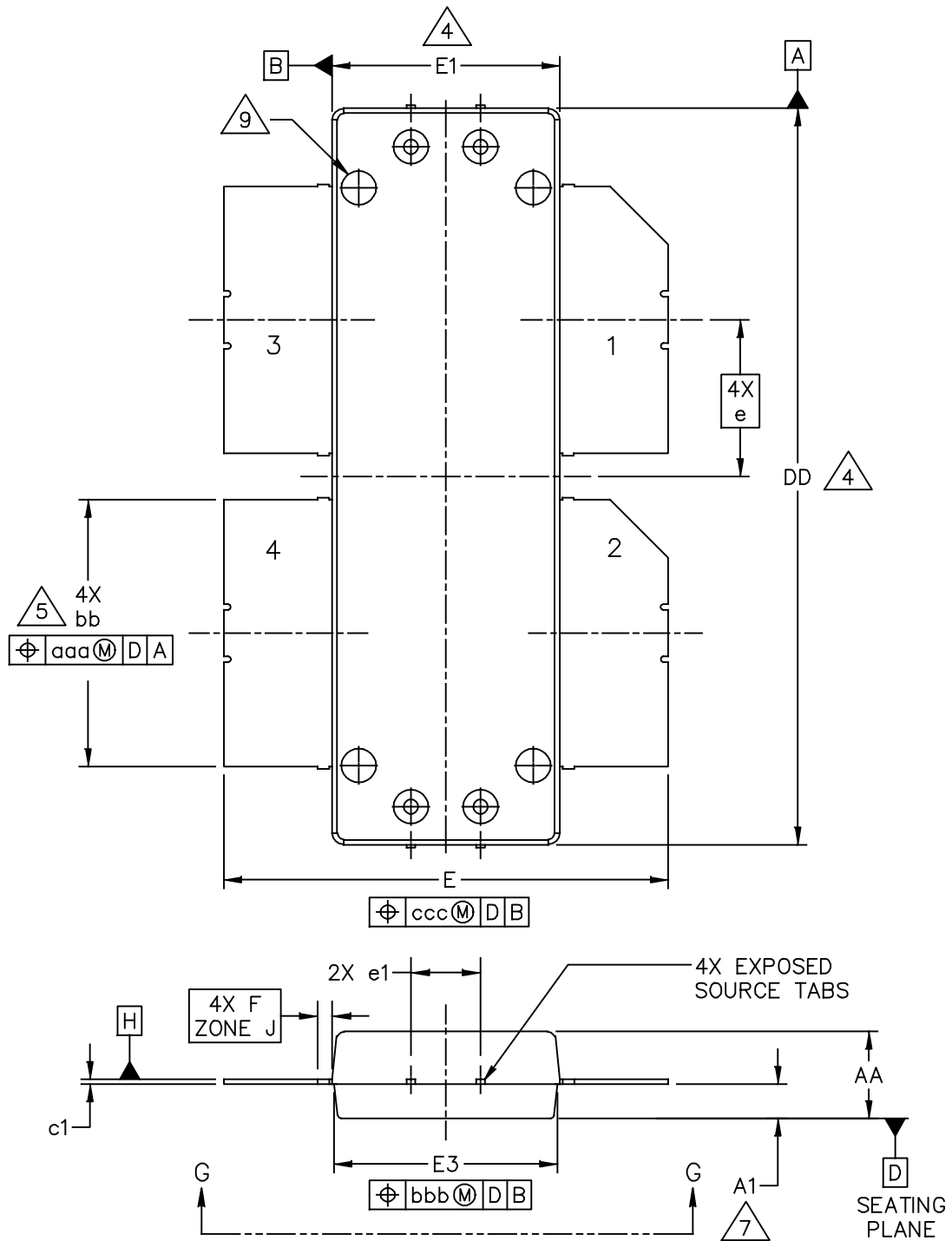


Figure 43. P3dB Load Pull AM/PM Contours (°)

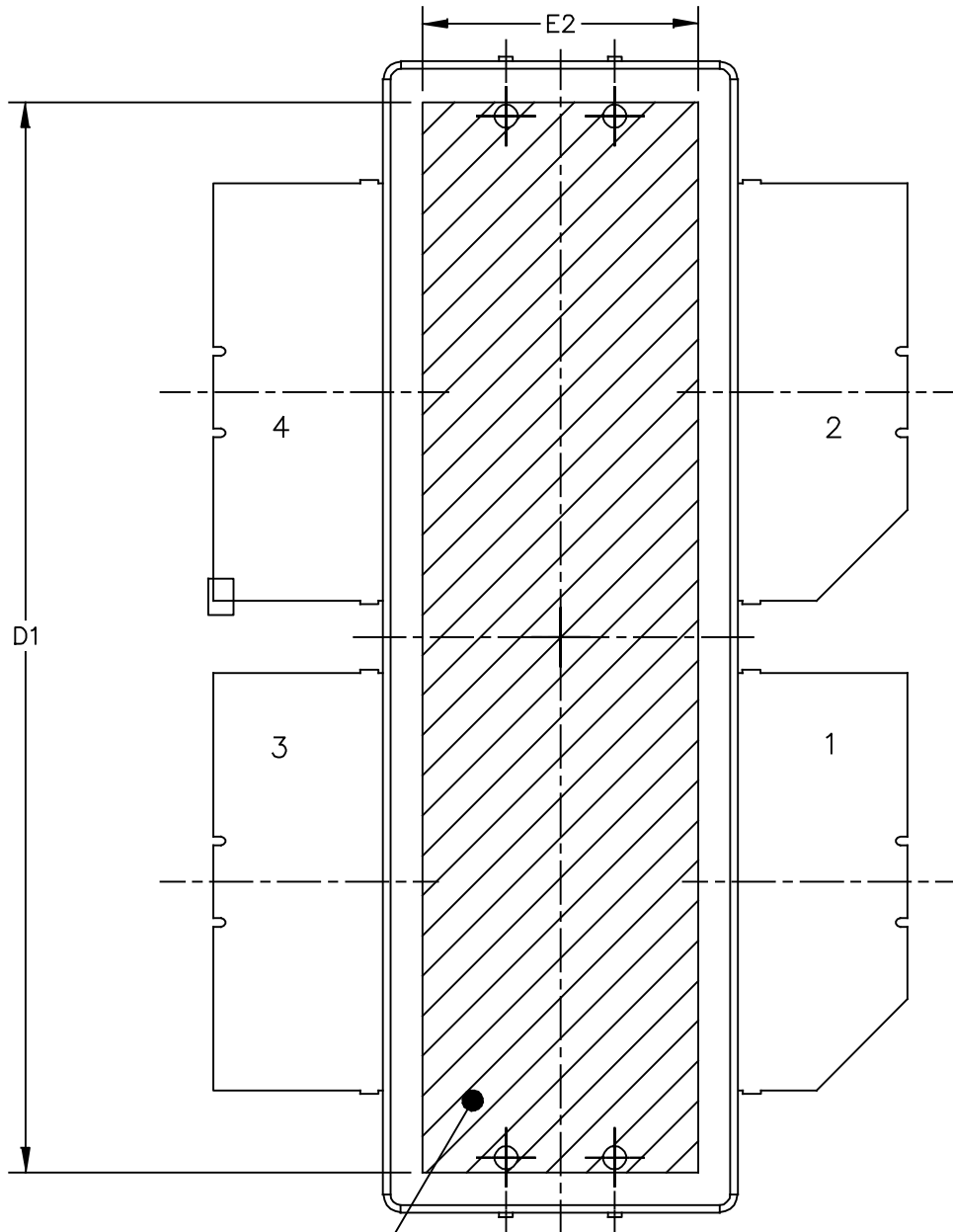
NOTE: (P) = Maximum Output Power
(E) = Maximum Drain Efficiency

- Gain
- Drain Efficiency
- Linearity
- Output Power

PACKAGE DIMENSIONS



| | | |
|--|--------------------------|----------------------------|
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| TITLE: OM-1230-4L | DOCUMENT NO: 98ASA00506D | REV: C |
| | STANDARD: NON-JEDEC | |
| | SOT1816-1 | 08 FEB 2016 |



PIN 5
 8
 BOTTOM VIEW
 VIEW G-G

| | | | |
|--|--------------------|----------------------------|-------------|
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| | | STANDARD: NON-JEDEC | |
| | | SOT1816-1 | 08 FEB 2016 |

NOTES:

1. CONTROLLING DIMENSION: INCH
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M-1994.
3. DATUM PLANE H IS LOCATED AT TOP OF LEAD AND IS COINCIDENT WITH THE LEAD WHERE THE LEAD EXITS THE PLASTIC BODY AT THE TOP OF THE PARTING LINE.
4. DIMENSIONS DD AND E1 DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE PROTRUSION IS .006 INCH (0.15 MM) PER SIDE. DIMENSIONS DD AND E1 DO INCLUDE MOLD MISMATCH AND ARE DETERMINED AT DATUM PLANE H.
5. DIMENSION bb DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE .005 INCH (0.13 MM) TOTAL IN EXCESS OF THE bb DIMENSION AT MAXIMUM MATERIAL CONDITION.
6. DATUMS A AND B TO BE DETERMINED AT DATUM PLANE H.
7. DIMENSION A1 APPLIES WITHIN ZONE J ONLY.
8. HATCHING REPRESENTS THE EXPOSED AREA OF THE HEAT SLUG. THE DIMENSIONS D1 AND E2 REPRESENT THE VALUES BETWEEN THE TWO OPPOSITE POINTS ALONG THE EDGES OF EXPOSED AREA OF HEAT SLUG.
9. DIMPLED HOLE REPRESENTS INPUT SIDE.

| DIM | INCH | | MILLIMETER | | DIM | INCH | | MILLIMETER | |
|--|----------|-------|--------------------|-------|--------------------------------------|----------------------------|-------------|------------|-------|
| | MIN | MAX | MIN | MAX | | MIN | MAX | MIN | MAX |
| AA | .148 | .152 | 3.76 | 3.86 | bb | .457 | .463 | 11.61 | 11.76 |
| A1 | .059 | .065 | 1.50 | 1.65 | c1 | .007 | .011 | 0.18 | 0.28 |
| DD | 1.267 | 1.273 | 32.18 | 32.33 | e | .270 BSC | | 6.86 BSC | |
| D1 | 1.180 | ---- | 29.97 | ---- | e1 | .116 | .124 | 2.95 | 3.15 |
| E | .762 | .770 | 19.35 | 19.56 | | | | | |
| E1 | .390 | .394 | 9.91 | 10.01 | aaa | .004 | | 0.10 | |
| E2 | .306 | ---- | 7.77 | ---- | bbb | .006 | | 0.15 | |
| E3 | .383 | .387 | 9.73 | 9.83 | ccc | .010 | | 0.25 | |
| F | .025 BSC | | 0.635 BSC | | | | | | |
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| TITLE: OM-1230-4L | | | | | DOCUMENT NO: 98ASA00506D REV: C | | | | |
| | | | | | STANDARD: NON-JEDEC | | | | |
| | | | | | SOT1816-1 | | 08 FEB 2016 | | |

PRODUCT DOCUMENTATION, SOFTWARE AND TOOLS

Refer to the following resources to aid your design process.

Application Notes

- AN1907: Solder Reflow Attach Method for High Power RF Devices in Plastic Packages
- 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

To Download Resources Specific to a Given Part Number:

1. Go to <http://www.nxp.com/RF>
2. Search by part number
3. Click part number link
4. Choose the desired resource from the drop down menu

REVISION HISTORY

The following table summarizes revisions to this document.

| Revision | Date | Description |
|----------|-----------|---------------------------------|
| 0 | Mar. 2017 | • Initial release of data sheet |

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