

RF LDMOS Wideband Integrated Power Amplifiers

The MW6IC2240N wideband integrated circuit is designed with on-chip matching that makes it usable from 2110 to 2170 MHz. This multi-stage structure is rated for 26 to 32 Volt operation and covers all typical cellular base station modulation formats including TD-SCDMA.

Final Application

- Typical 2-Carrier W-CDMA Performance: $V_{DD} = 28$ Volts, $I_{DQ1} = 210$ mA, $I_{DQ2} = 370$ mA, $P_{out} = 4.5$ Watts Avg., $f = 2157$ MHz, Channel Bandwidth = 3.84 MHz, PAR = 8.5 dB @ 0.01% Probability on CCDF.
 Power Gain — 28 dB
 Power Added Efficiency — 15%
 IM3 @ 10 MHz Offset — -43 dBc in 3.84 MHz Bandwidth
 ACPR @ 5 MHz Offset — -46 dBc in 3.84 MHz Bandwidth

Driver Application

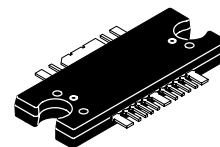
- Typical 2-Carrier W-CDMA Performance: $V_{DD} = 28$ Volts, $I_{DQ1} = 300$ mA, $I_{DQ2} = 320$ mA, $P_{out} = 25$ dBm, Full Frequency Band (2110-2170 MHz), Channel Bandwidth = 3.84 MHz, PAR = 8.5 dB @ 0.01% Probability on CCDF.
 Power Gain — 29 dB
 IM3 @ 10 MHz Offset — -59 dBc in 3.84 MHz Bandwidth
 ACPR @ 5 MHz Offset — -62 dBc in 3.84 MHz Bandwidth
- Capable of Handling 3:1 VSWR, @ 28 Vdc, 2170 MHz, 20 Watts CW Output Power
- Stable into a 3:1 VSWR. All Spurs Below -60 dBc @ 100 mW to 10 Watts CW P_{out} .

Features

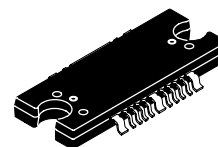
- Characterized with Series Equivalent Large-Signal Impedance Parameters and Common Source Scattering Parameters
- On-Chip Matching (50 Ohm Input, DC Blocked, >3 Ohm Output)
- Integrated Quiescent Current Temperature Compensation with Enable/Disable Function (1)
- Integrated ESD Protection
- 225°C Capable Plastic Package
- RoHS Compliant
- In Tape and Reel. R1 Suffix = 500 Units per 44 mm, 13 inch Reel

MW6IC2240NBR1
MW6IC2240GNBR1

2110-2170 MHz, 4.5 W AVG., 28 V
2 x W-CDMA
RF LDMOS WIDEBAND
INTEGRATED POWER AMPLIFIERS



CASE 1329-09
TO-272 WB-16
PLASTIC
MW6IC2240NBR1



CASE 1329A-04
TO-272 WB-16 GULL
PLASTIC
MW6IC2240GNBR1

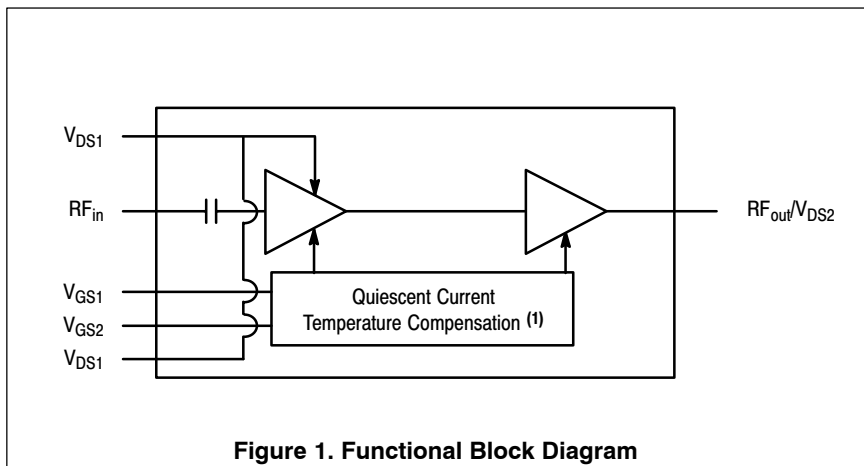


Figure 1. Functional Block Diagram

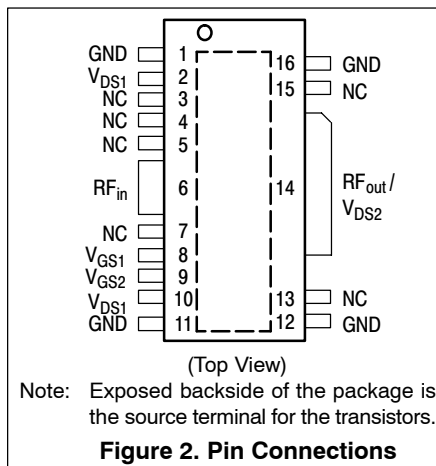


Figure 2. Pin Connections

1. Refer to AN1977, *Quiescent Current Thermal Tracking Circuit in the RF Integrated Circuit Family* and to AN1987, *Quiescent Current Control for the RF Integrated Circuit Device Family*. Go to <http://www.freescale.com/rf>. Select Documentation/Application Notes - AN1977 or AN1987.

Table 1. Maximum Ratings

| Rating | Symbol | Value | Unit |
|--------------------------------------|-----------|-------------|------|
| Drain-Source Voltage | V_{DSS} | -0.5, +68 | Vdc |
| Gate-Source Voltage | V_{GS} | -0.5, +6 | Vdc |
| Storage Temperature Range | T_{stg} | -65 to +150 | °C |
| Case Operating Temperature | T_C | 150 | °C |
| Operating Junction Temperature (1,2) | T_J | 225 | °C |
| Input Power | P_{in} | 23 | dBm |

Table 2. Thermal Characteristics

| Characteristic | Symbol | Value (2,3) | Unit |
|---|--|-------------|------|
| Thermal Resistance, Junction to Case | $R_{\theta JC}$ | | °C/W |
| W-CDMA Application ($P_{out} = 4.5$ W Avg.) | Stage 1, 28 Vdc, $I_{DQ} = 210$ mA Stage 2, 28 Vdc, $I_{DQ} = 370$ mA | 1.8 1.0 | |
| W-CDMA Application ($P_{out} = 40$ W CW) | Stage 1, 28 Vdc, $I_{DQ} = 110$ mA Stage 2, 28 Vdc, $I_{DQ} = 370$ mA | 2.0 0.87 | |

Table 3. ESD Protection Characteristics

| Test Methodology | Class |
|---------------------------------------|---------------|
| Human Body Model (per JESD22-A114) | 1A (Minimum) |
| Machine Model (per EIA/JESD22-A115) | A (Minimum) |
| Charge Device Model (per JESD22-C101) | III (Minimum) |

Table 4. Moisture Sensitivity Level

| Test Methodology | Rating | Package Peak Temperature | Unit |
|---------------------------------------|--------|--------------------------|------|
| Per JESD 22-A113, IPC/JEDEC J-STD-020 | 3 | 260 | °C |

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

| Characteristic | Symbol | Min | Typ | Max | Unit |
|------------------------------|----------|------|-----|-----|------|
| Power Gain | G_{ps} | 25.5 | 28 | 30 | dB |
| Power Added Efficiency | PAE | 13.7 | 15 | — | % |
| Intermodulation Distortion | IM3 | — | -43 | -40 | dBc |
| Adjacent Channel Power Ratio | ACPR | — | -46 | -43 | dBc |
| Input Return Loss | IRL | — | -15 | -10 | dB |

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.

(continued)

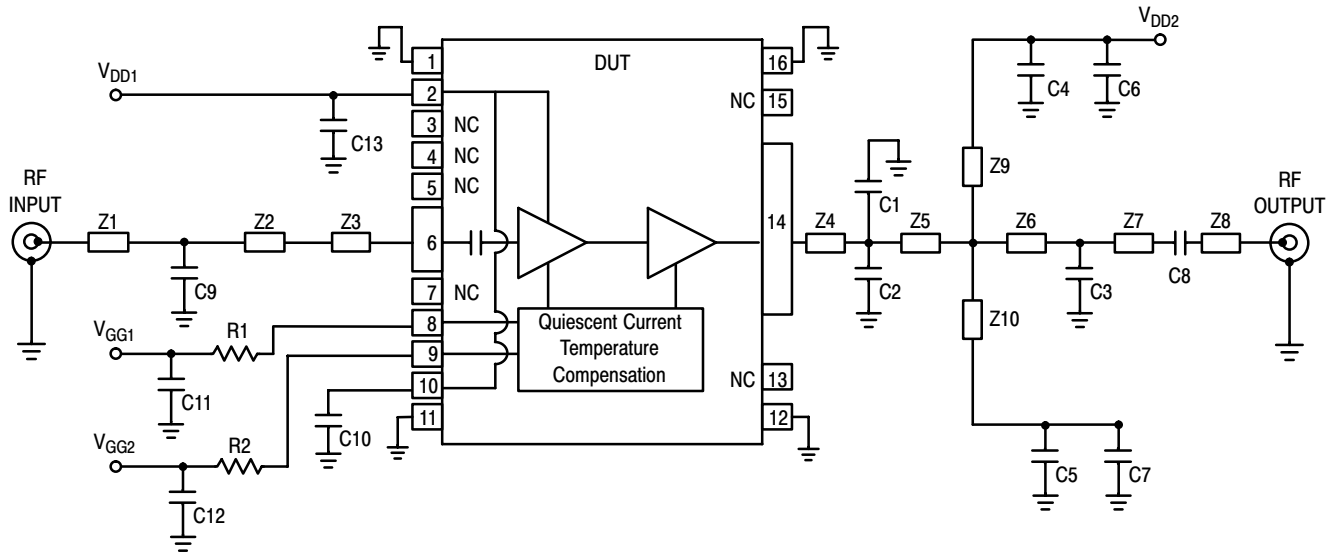
Table 5. Electrical Characteristics ($T_C = 25^\circ\text{C}$ unless otherwise noted) (continued)

| Characteristic | Symbol | Min | Typ | Max | Unit |
|---|-----------------|-----|---------|-----|------|
| Typical Performances (In Freescale Test Fixture, 50 ohm system) $V_{DD} = 28\text{ Vdc}$, $I_{DQ1} = 210\text{ mA}$, $I_{DQ2} = 370\text{ mA}$, 2110 MHz < Frequency < 2170 MHz | | | | | |
| Video Bandwidth (Tone Spacing from 100 kHz to VBW) $\Delta\text{IMD3} = \text{IMD3 @ VBW frequency} - \text{IMD3 @ 100 kHz} < 1\text{ dBc}$ (both sidebands) | VBW | — | 30 | — | MHz |
| Quiescent Current Accuracy over Temperature with 18 k Ω Gate Feed Resistors (-10 to 85°C) (1) | ΔI_{QT} | — | ± 5 | — | % |
| Gain Flatness in 30 MHz Bandwidth @ $P_{out} = 1\text{ W CW}$ | G_F | — | 0.2 | — | dB |
| Deviation from Linear Phase in 30 MHz Bandwidth @ $P_{out} = 1\text{ W CW}$ | Φ | — | ± 1 | — | ° |
| Delay @ $P_{out} = 1\text{ W CW}$ Including Output Matching | Delay | — | 2.8 | — | ns |
| Part-to-Part Phase Variation @ $P_{out} = 1\text{ W CW}$ | $\Delta\Phi$ | — | ± 9 | — | ° |

Table 6. Electrical Characteristics ($T_C = 25^\circ\text{C}$ unless otherwise noted)

| Characteristic | Symbol | Min | Typ | Max | Unit |
|---|-----------|-----|-----|-----|------|
| Typical Performances (In Freescale Test Fixture, 50 ohm system) $V_{DD} = 28\text{ Vdc}$, $I_{DQ1} = 110\text{ mA}$, $I_{DQ2} = 370\text{ mA}$, 2110 MHz < Frequency < 2170 MHz | | | | | |
| Saturated Pulsed Output Power (8 μsec (on), 1 msec (off)) | P_{sat} | — | 60 | — | W |

1. Refer to AN1977, *Quiescent Current Thermal Tracking Circuit in the RF Integrated Circuit Family* and to AN1987, *Quiescent Current Control for the RF Integrated Circuit Device Family*. Go to <http://www.freescale.com/rf>. Select Documentation/Application Notes - AN1977 or AN1987.



Z1* 1.73" x 0.090" Microstrip
 Z2* 0.47" x 0.090" Microstrip
 Z3 0.13" x 0.040" Microstrip
 Z4* 0.22" x 0.315" Microstrip
 Z5* 0.34" x 0.315" Microstrip
 Z6* 0.34" x 0.090" Microstrip

Z7* 0.94" x 0.090" Microstrip
 Z8 0.34" x 0.090" Microstrip
 Z9, Z10 1.00" x 0.080" Microstrip
 PCB Taconic TLX8-0300, 0.030", $\epsilon_r = 2.55$

* Variable for tuning

Figure 3. MW6IC2240NBR1(GNBR1) Test Circuit Schematic

Table 7. MW6IC2240NBR1(GNBR1) Test Circuit Component Designations and Values

| Part | Description | Part Number | Manufacturer |
|----------------------------|--------------------------------------|-------------------|--------------|
| C1, C2 | 1.5 pF Chip Capacitors | ATC100B1R5BT500XT | ATC |
| C3 | 1.8 pF Chip Capacitor | ATC100B1R8BT500XT | ATC |
| C4, C5 | 6.8 pF Chip Capacitors | ATC100B6R8CT500XT | ATC |
| C6, C7, C10, C11, C12, C13 | 4.7 μ F Chip Capacitors | C4532X5R1H475MT | TDK |
| C8 | 8.2 pF Chip Capacitor | ATC100B8R2CT500XT | ATC |
| C9 | 0.5 pF Chip Capacitor | ATC100B0R5BT500XT | ATC |
| R1 | 18 k Ω , 1/4 W Chip Resistor | CRCW12061802FKEA | Vishay |
| R2 | 8.2 k Ω , 1/4 W Chip Resistor | CRCW12068201FKEA | Vishay |

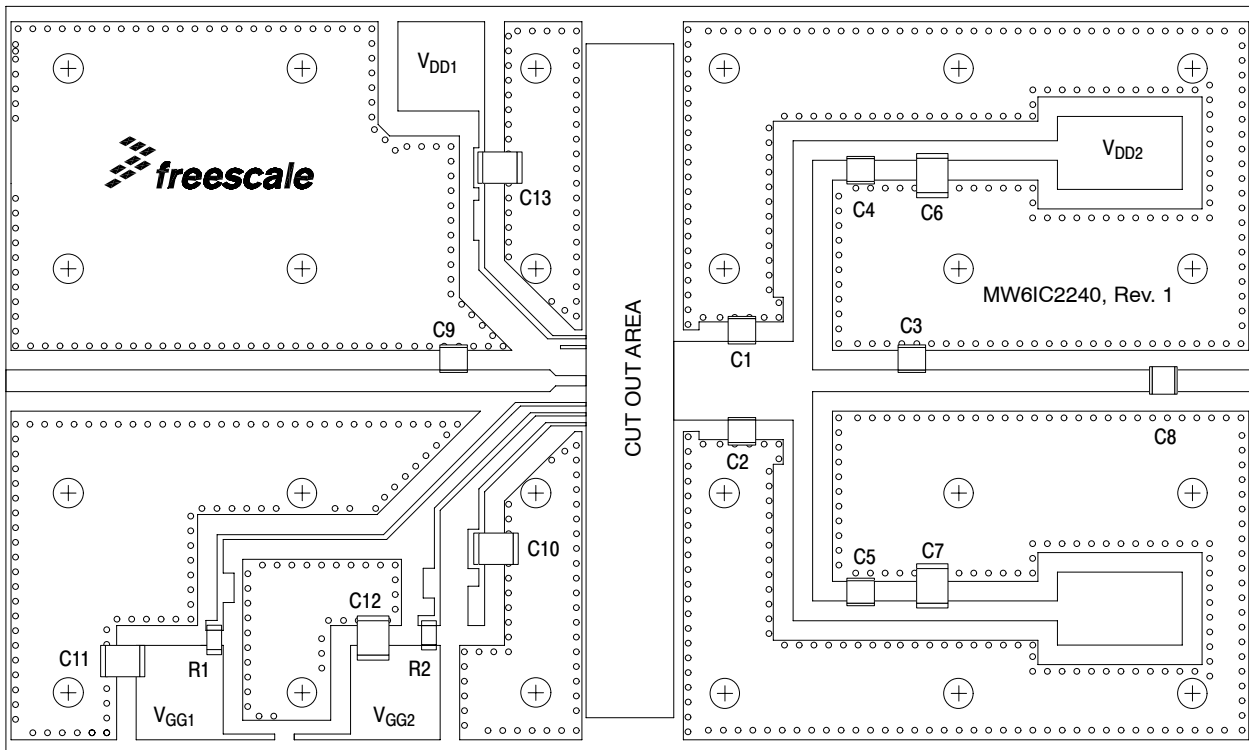


Figure 4. MW6IC2240NBR1(GNBR1) Test Circuit Component Layout

TYPICAL CHARACTERISTICS

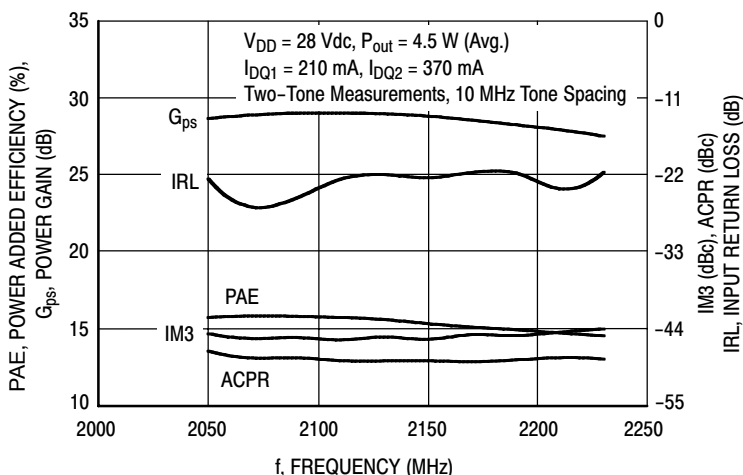


Figure 5. 2-Carrier W-CDMA Wideband Performance @ $P_{out} = 4.5$ Watts Avg.

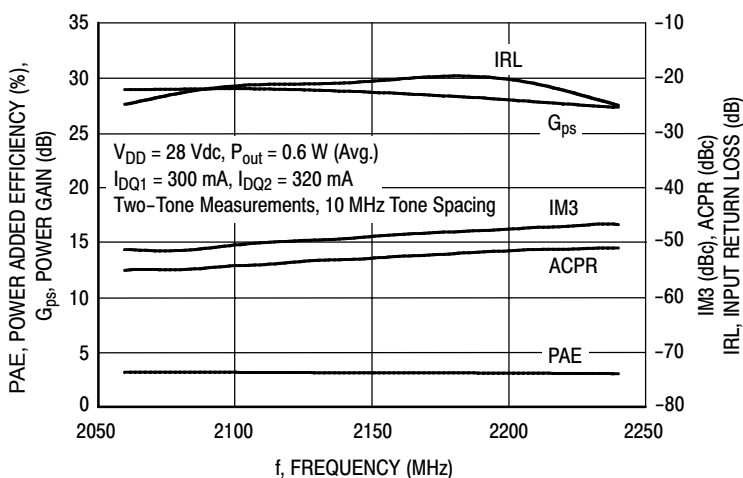


Figure 6. 2-Carrier W-CDMA Wideband Performance @ $P_{out} = 0.6$ Watts Avg.

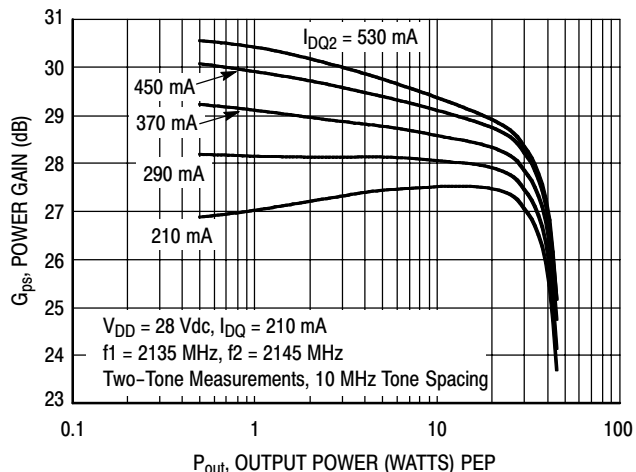


Figure 7. Two-Tone Power Gain versus Output Power

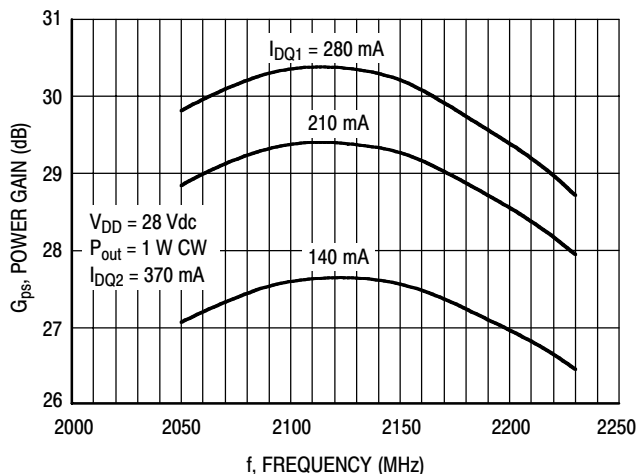


Figure 8. Frequency Response versus Current

TYPICAL CHARACTERISTICS

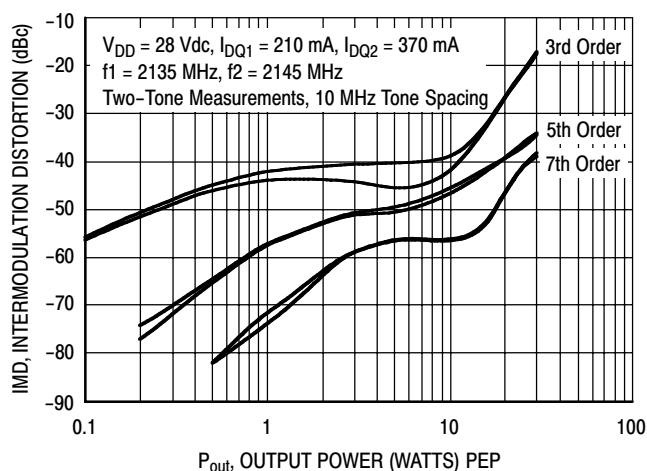


Figure 9. Intermodulation Distortion Products versus Output Power

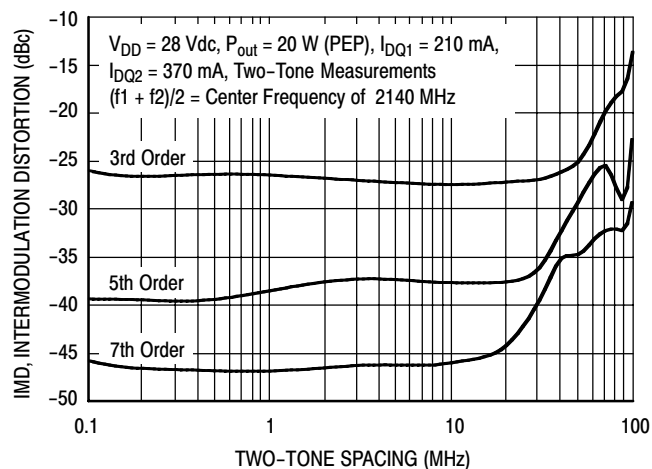


Figure 10. Intermodulation Distortion Products versus Tone Spacing

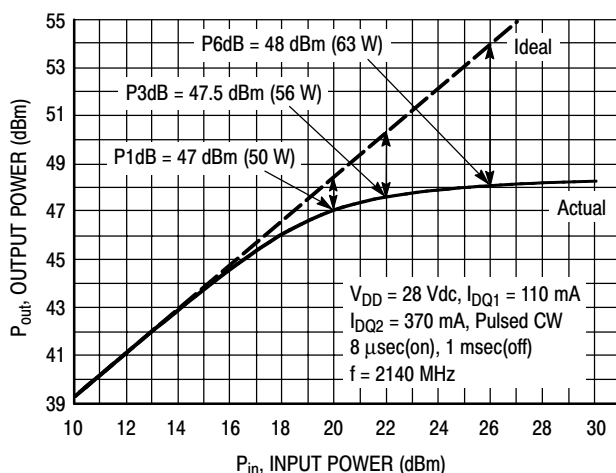


Figure 11. Pulsed CW Output Power versus Input Power

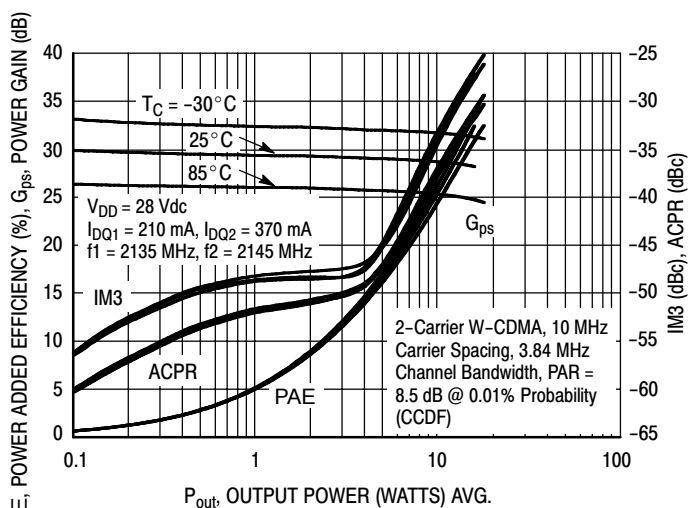


Figure 12. 2-Carrier W-CDMA ACPR, IM3, Power Gain and Power Added Efficiency versus Output Power

TYPICAL CHARACTERISTICS

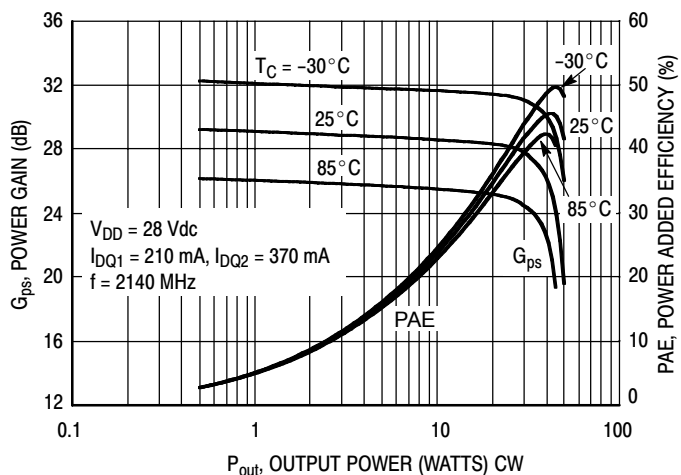


Figure 13. Power Gain and Power Added Efficiency versus Output Power

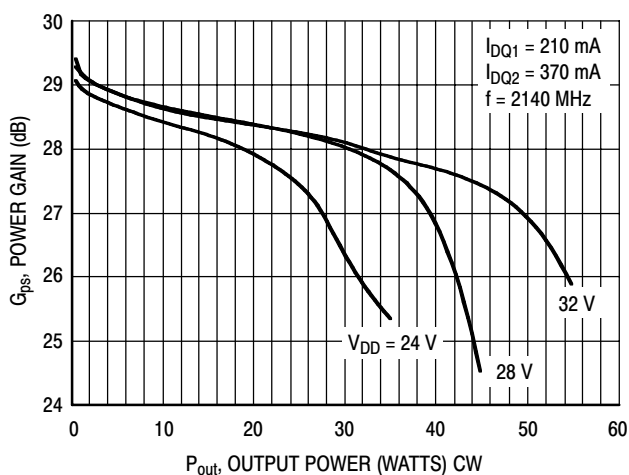
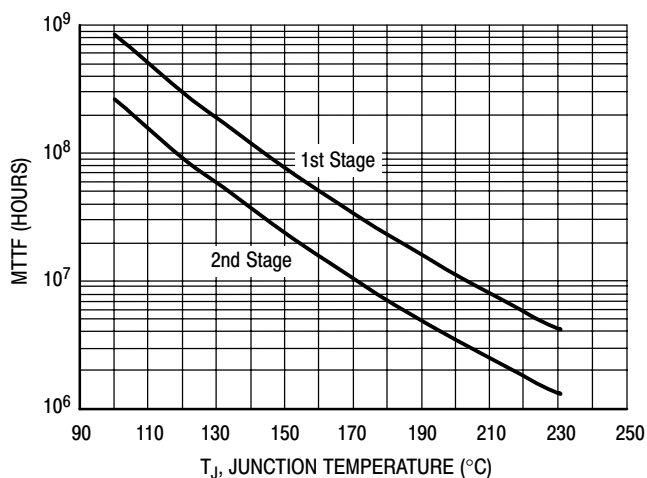


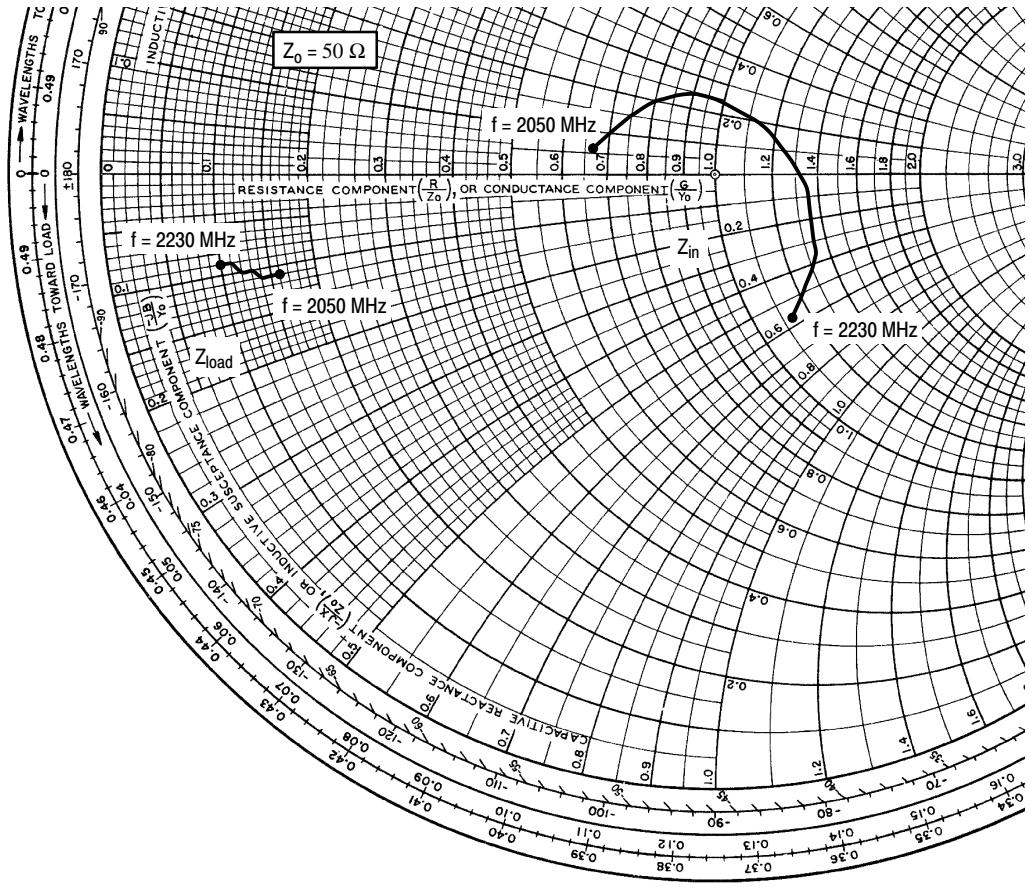
Figure 14. Power Gain versus Output Power



This above graph displays calculated MTTF in hours when the device is operated at $V_{DD} = 28$ Vdc, $P_{out} = 4.5$ W Avg., and PAE = 15%.

MTTF calculator available at <http://www.freescale.com/rf>. Select Tools/Software/Application Software/Calculators to access the MTTF calculators by product.

Figure 15. MTTF versus Junction Temperature



$V_{DD} = 28 \text{ Vdc}$, $I_{DQ1} = 210 \text{ mA}$, $I_{DQ2} = 370 \text{ mA}$, $P_{out} = 4.5 \text{ W Avg.}$

| f MHz | Z_{in} Ω | Z_{load} Ω |
|-------|--------------------|---------------------|
| 2050 | $33.723 + j3.048$ | $7.971 - j5.705$ |
| 2080 | $38.052 + j8.201$ | $7.559 - j5.532$ |
| 2110 | $45.972 + j12.306$ | $7.117 - j5.345$ |
| 2140 | $59.075 + j9.272$ | $6.642 - j5.119$ |
| 2170 | $68.368 - j3.227$ | $6.132 - j4.891$ |
| 2200 | $67.177 - j19.071$ | $5.626 - j4.619$ |
| 2230 | $58.213 - j28.879$ | $5.118 - j4.305$ |

Z_{in} = Device input impedance as measured from gate to ground.

Z_{load} = Test circuit impedance as measured from drain to ground.

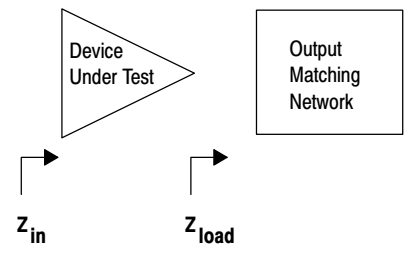
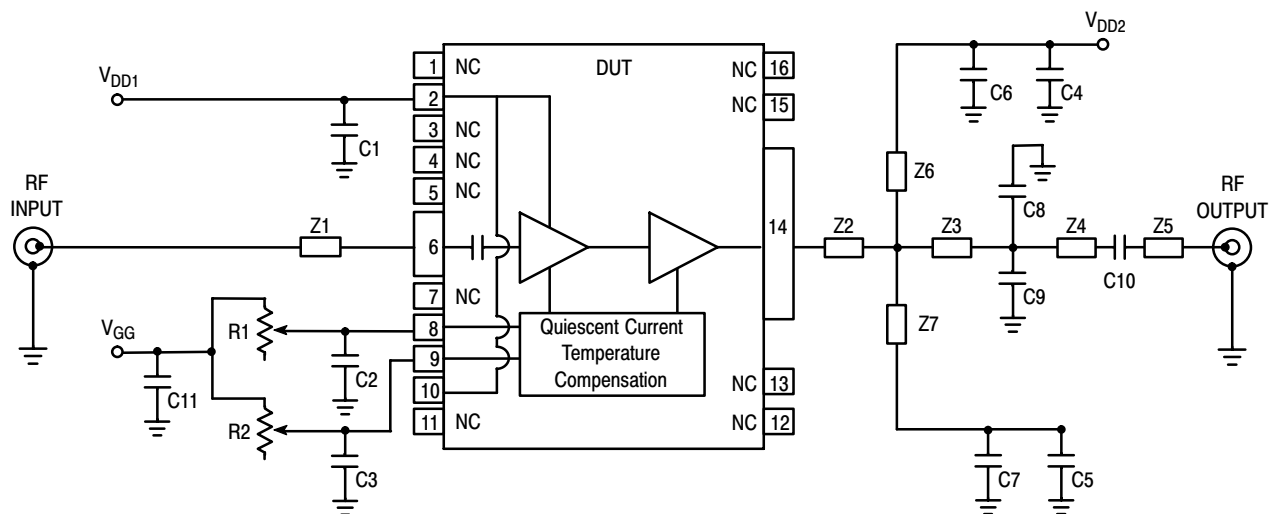


Figure 16. Series Equivalent Input and Load Impedance

Table 8. Common Source Scattering Parameters ($V_{DD} = 28\text{ V}$, $I_{DQ1} = 210\text{ mA}$, $I_{DQ2} = 370\text{ mA}$, 50 Ohm System)

| f MHz | S ₁₁ | | S ₂₁ | | S ₁₂ | | S ₂₂ | |
|----------|-----------------|----------|-----------------|---------|-----------------|----------|-----------------|----------|
| | S ₁₁ | ∠ φ | S ₂₁ | ∠ φ | S ₁₂ | ∠ φ | S ₂₂ | ∠ φ |
| 1000 | 0.788 | 131.360 | 0.0013 | 63.602 | 0.0020 | 25.353 | 0.9940 | 172.664 |
| 1200 | 0.713 | 113.326 | 0.0012 | 42.219 | 0.0094 | 10.742 | 0.9910 | 169.954 |
| 1400 | 0.584 | 86.885 | 0.0007 | 55.210 | 0.1180 | -39.325 | 0.9850 | 166.452 |
| 1600 | 0.389 | 41.593 | 0.0006 | 117.726 | 0.6690 | -92.822 | 0.9780 | 161.752 |
| 1800 | 0.239 | -54.753 | 0.0022 | 122.409 | 4.9300 | -164.584 | 0.9310 | 152.388 |
| 2000 | 0.221 | -162.180 | 0.0036 | 118.178 | 21.396 | 49.432 | 0.6120 | 151.441 |
| 2200 | 0.216 | -38.746 | 0.0057 | 68.626 | 19.739 | -105.946 | 0.7530 | -177.800 |
| 2400 | 0.467 | -113.440 | 0.0043 | 64.758 | 7.8281 | 166.887 | 0.9010 | 171.868 |
| 2600 | 0.539 | -153.020 | 0.0044 | 48.498 | 3.8868 | 113.310 | 0.9350 | 167.252 |
| 2800 | 0.635 | -171.630 | 0.0044 | 52.829 | 2.4331 | 69.460 | 0.9480 | 164.137 |
| 3000 | 0.716 | 169.263 | 0.0049 | 56.398 | 1.6119 | 29.135 | 0.9570 | 161.593 |

TD-SCDMA CHARACTERIZATION



| | | | |
|----|----------------------------|--------|---|
| Z1 | 1.180" x 0.056" Microstrip | Z5 | 0.727" x 0.056" Microstrip |
| Z2 | 0.136" x 0.237" Microstrip | Z6, Z7 | 1.066" x 0.078" Microstrip |
| Z3 | 0.096" x 0.237" Microstrip | PCB | Taconic TLX8, 0.020", $\epsilon_r = 2.55$ |
| Z4 | 0.181" x 0.237" Microstrip | | |

Figure 17. MW6IC2240NBR1(GNBR1) Test Circuit Schematic — TD-SCDMA

Table 9. MW6IC2240NBR1(GNBR1) Test Circuit Component Designations and Values — TD-SCDMA

| Part | Description | Part Number | Manufacturer |
|-----------------|--|-----------------|--------------|
| C1, C4, C5, C11 | 2.2 μ F Chip Capacitors | C3225X5R1H225MT | TDK |
| C2, C3 | 100 nF Chip Capacitors | C1206CK104K5RC | Kemet |
| C8, C9 | 1.2 pF Chip Capacitors | 08051J1R2BBS | AVX |
| C10 | 6.8 pF Chip Capacitor | 08051J6R8CBS | AVX |
| C6, C7 | 5.6 pF Chip Capacitors | 08051J5R6CBS | AVX |
| R1, R2 | 5 k Ω Potentiometer CMS Cermet Multi-turn | 3224W | Bourns |

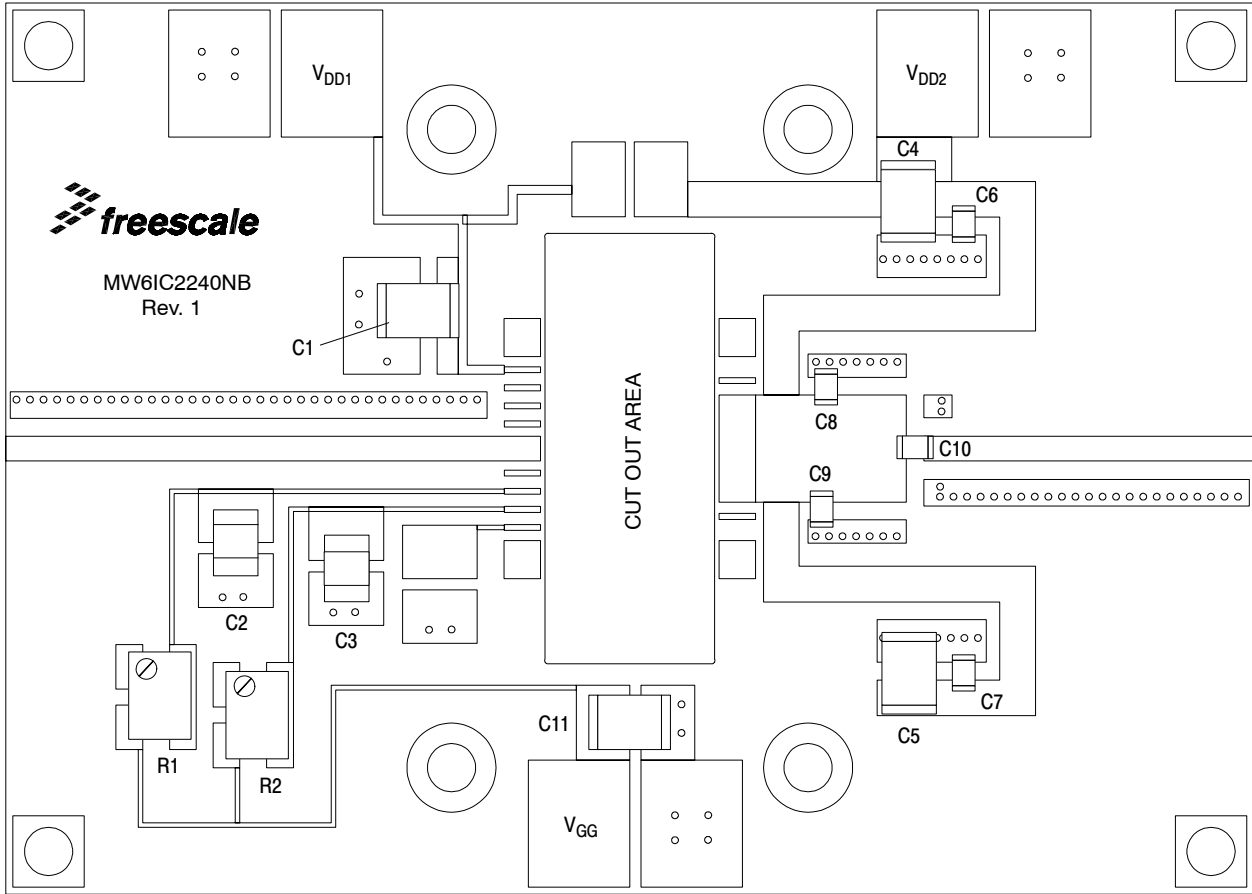


Figure 18. MW6IC2240NBR1(GNBR1) Test Circuit Component Layout — TD-SCDMA

TYPICAL CHARACTERISTICS

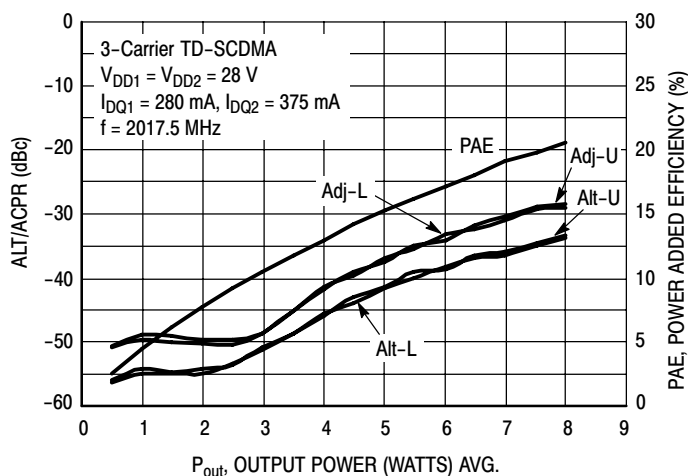


Figure 19. 3-Carrier TD-SCDMA ACPR, ALT and Power Added Efficiency versus Output Power

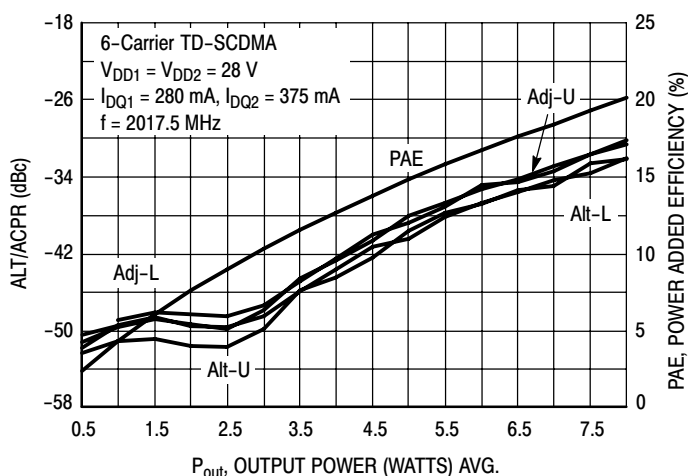


Figure 20. 6-Carrier TD-SCDMA ACPR, ALT and Power Added Efficiency versus Output Power

TD-SCDMA TEST SIGNAL

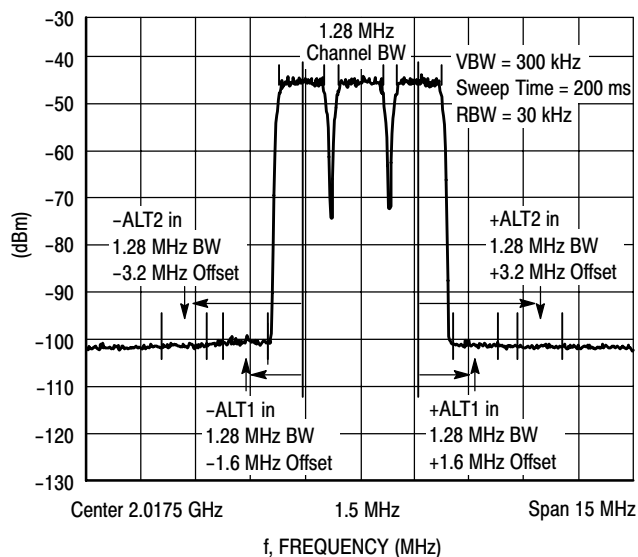


Figure 21. 3-Carrier TD-SCDMA Spectrum

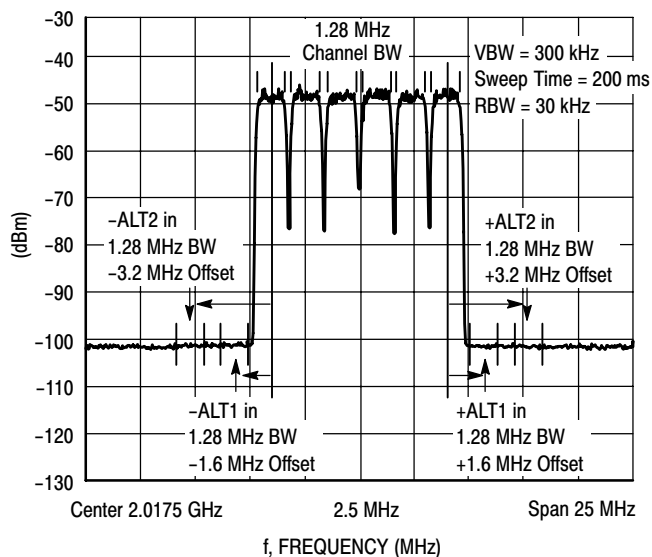
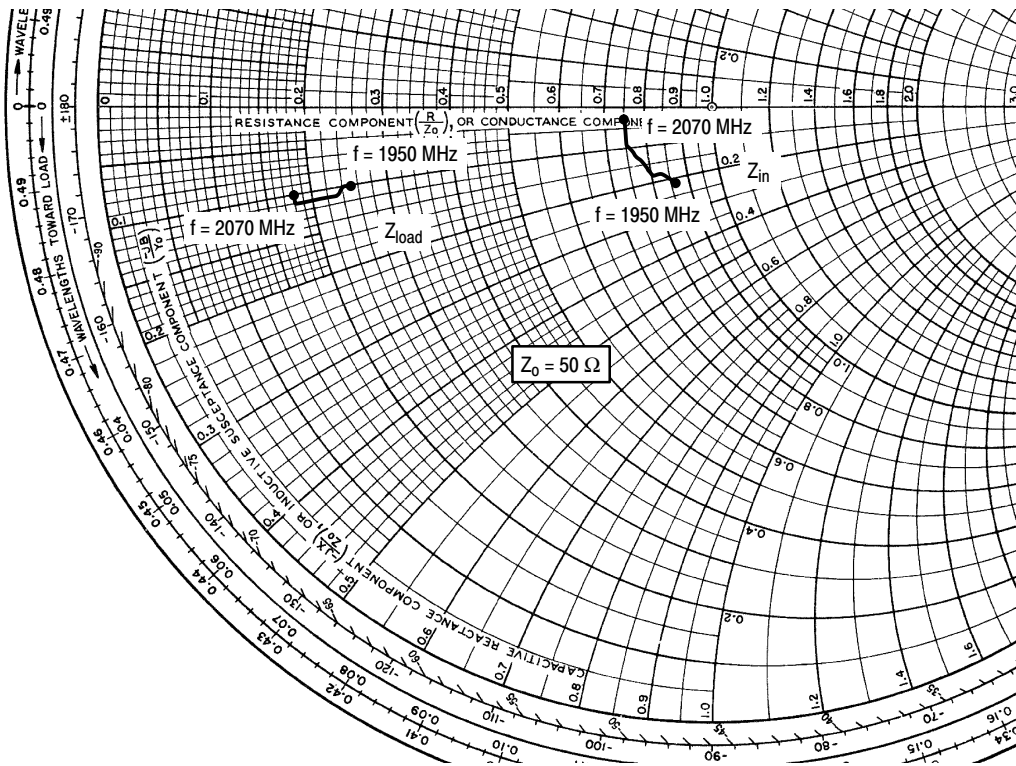


Figure 22. 6-Carrier TD-SCDMA Spectrum



$V_{DD} = 28 \text{ Vdc}$, $I_{DQ1} = 280 \text{ mA}$, $I_{DQ2} = 375 \text{ mA}$

| f MHz | Z_{in} Ω | Z_{load} Ω |
|----------|----------------------|------------------------|
| 1950 | 42.975 - j10.510 | 12.419 - j4.771 |
| 1960 | 41.871 - j9.592 | 12.233 - j5.001 |
| 1970 | 40.898 - j9.050 | 11.983 - j5.104 |
| 1980 | 40.084 - j8.816 | 11.683 - j5.368 |
| 1990 | 39.463 - j7.496 | 11.334 - j5.499 |
| 2000 | 38.859 - j6.587 | 10.959 - j5.585 |
| 2010 | 38.434 - j6.117 | 10.578 - j5.631 |
| 2020 | 38.096 - j4.972 | 10.212 - j5.635 |
| 2030 | 37.748 - j4.486 | 9.877 - j5.596 |
| 2040 | 37.553 - j3.046 | 9.575 - j5.536 |
| 2050 | 37.414 - j2.586 | 9.302 - j5.439 |
| 2060 | 37.369 - j1.918 | 9.053 - j5.319 |
| 2070 | 37.420 - j1.654 | 8.831 - j5.185 |

Z_{in} = Device input impedance as measured from gate to ground.

Z_{load} = Test circuit impedance as measured from drain to ground.

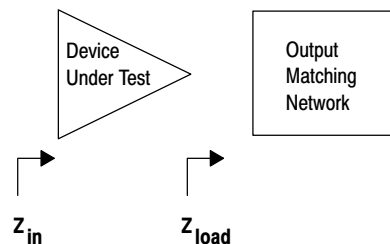
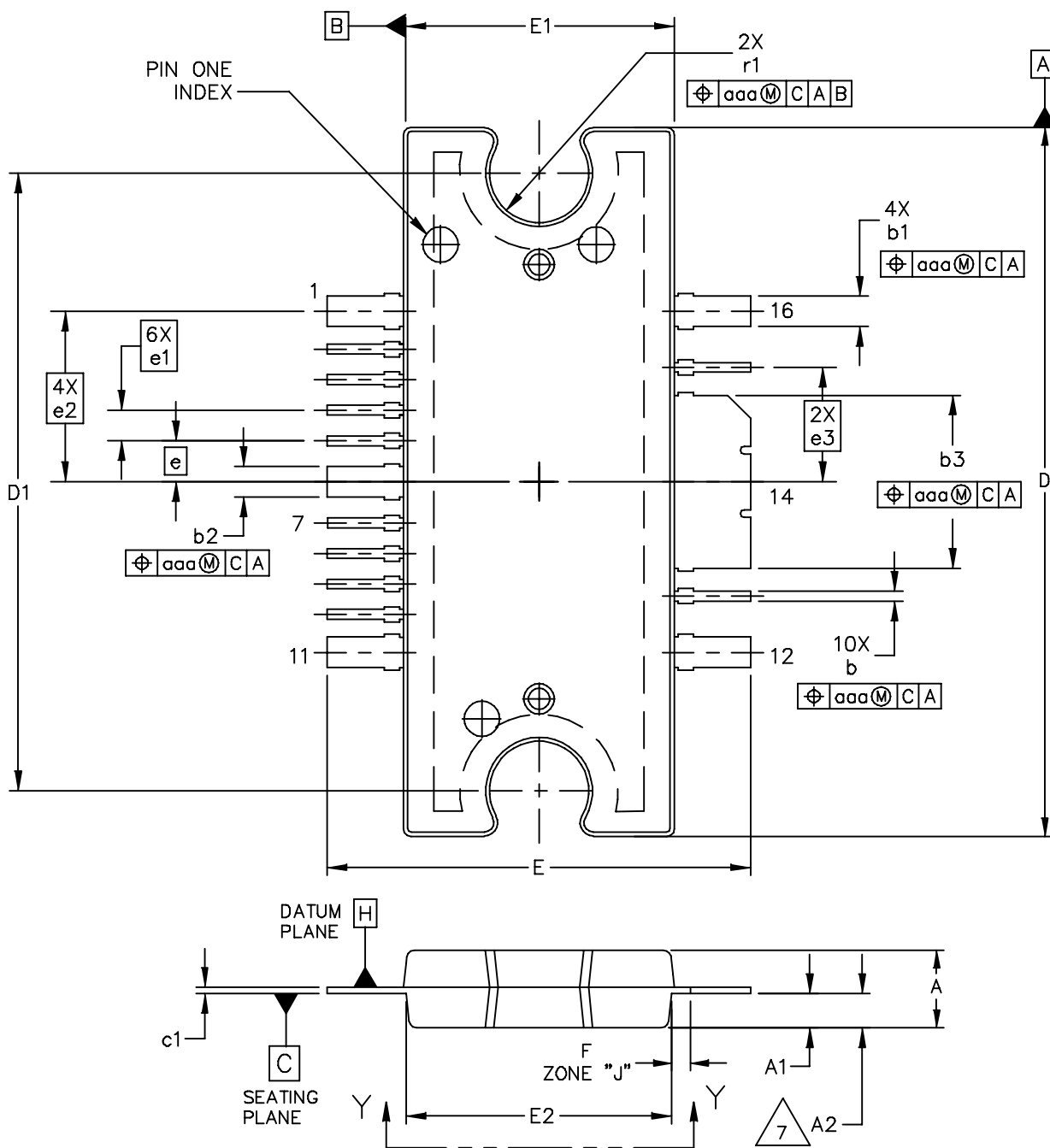
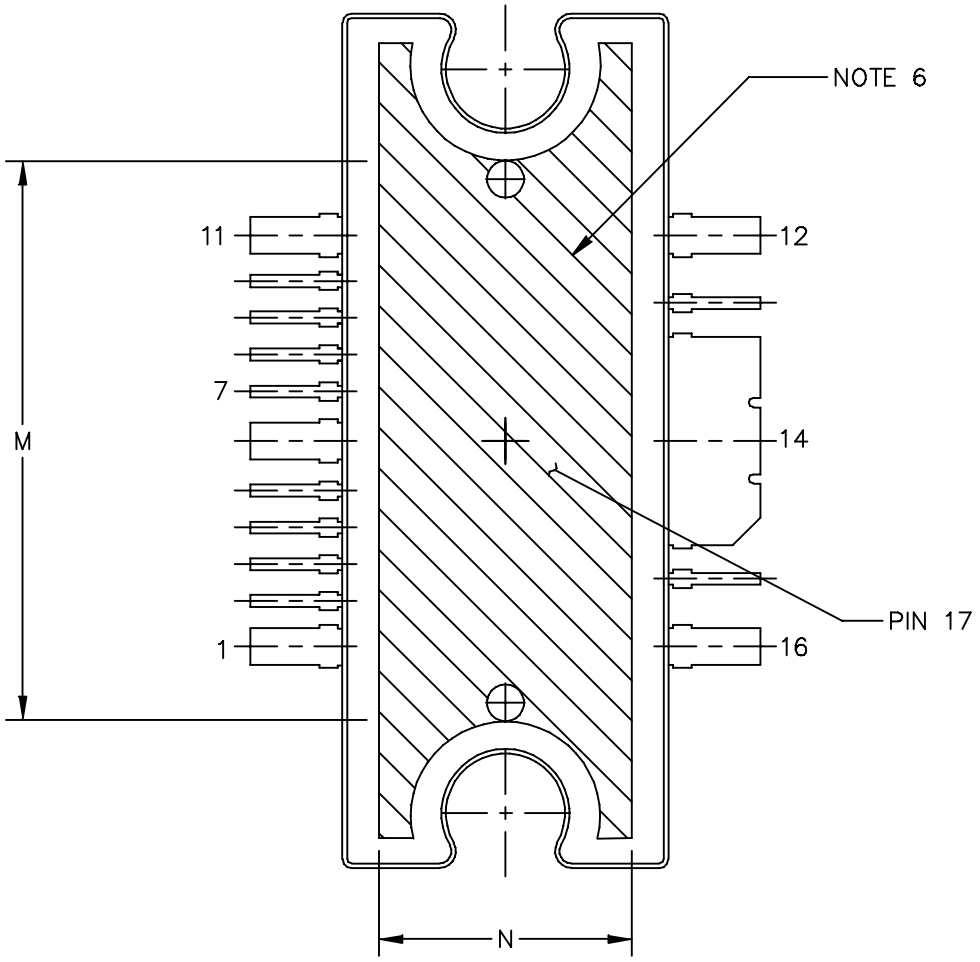


Figure 23. Series Equivalent Input and Load Impedance — TD-SCDMA

PACKAGE DIMENSIONS



| | | | | | |
|---|--|--------------------------|--|----------------------------|--|
| © FREESCALE SEMICONDUCTOR, INC. ALL RIGHTS RESERVED. | | MECHANICAL OUTLINE | | PRINT VERSION NOT TO SCALE | |
| TITLE: TO-272 WIDE BODY MULTI-LEAD | | DOCUMENT NO: 98ARH99164A | | REV: M | |
| | | CASE NUMBER: 1329-09 | | 23 AUG 2007 | |
| | | STANDARD: NON-JEDEC | | | |



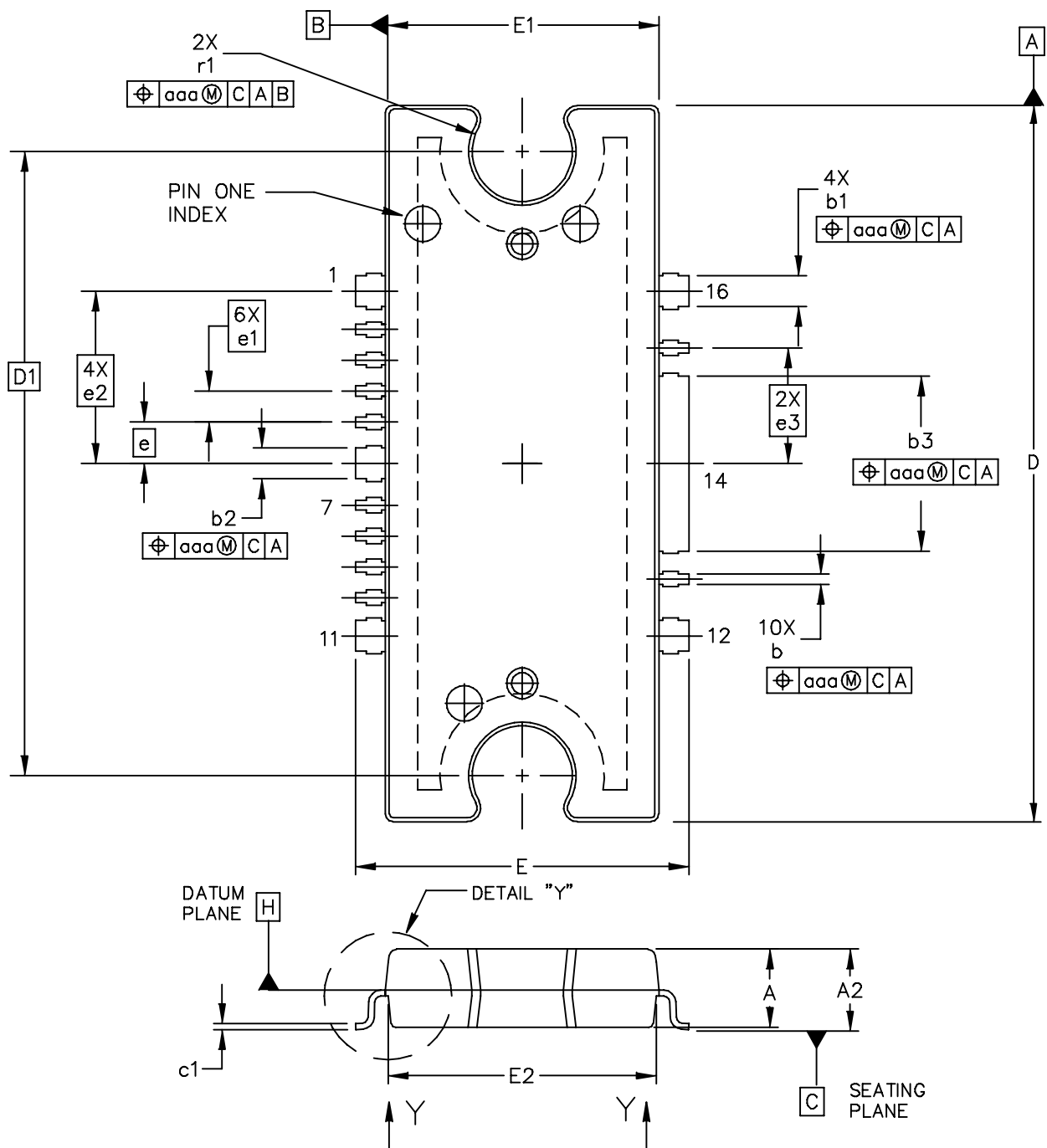
VIEW Y-Y

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|---|--------------------------|----------------------------|--|
| © FREESCALE SEMICONDUCTOR, INC. ALL RIGHTS RESERVED. | MECHANICAL OUTLINE | PRINT VERSION NOT TO SCALE | |
| TITLE: TO-272 WIDE BODY MULTI-LEAD | DOCUMENT NO: 98ARH99164A | REV: M | |
| | CASE NUMBER: 1329-09 | 23 AUG 2007 | |
| | STANDARD: NON-JEDEC | | |

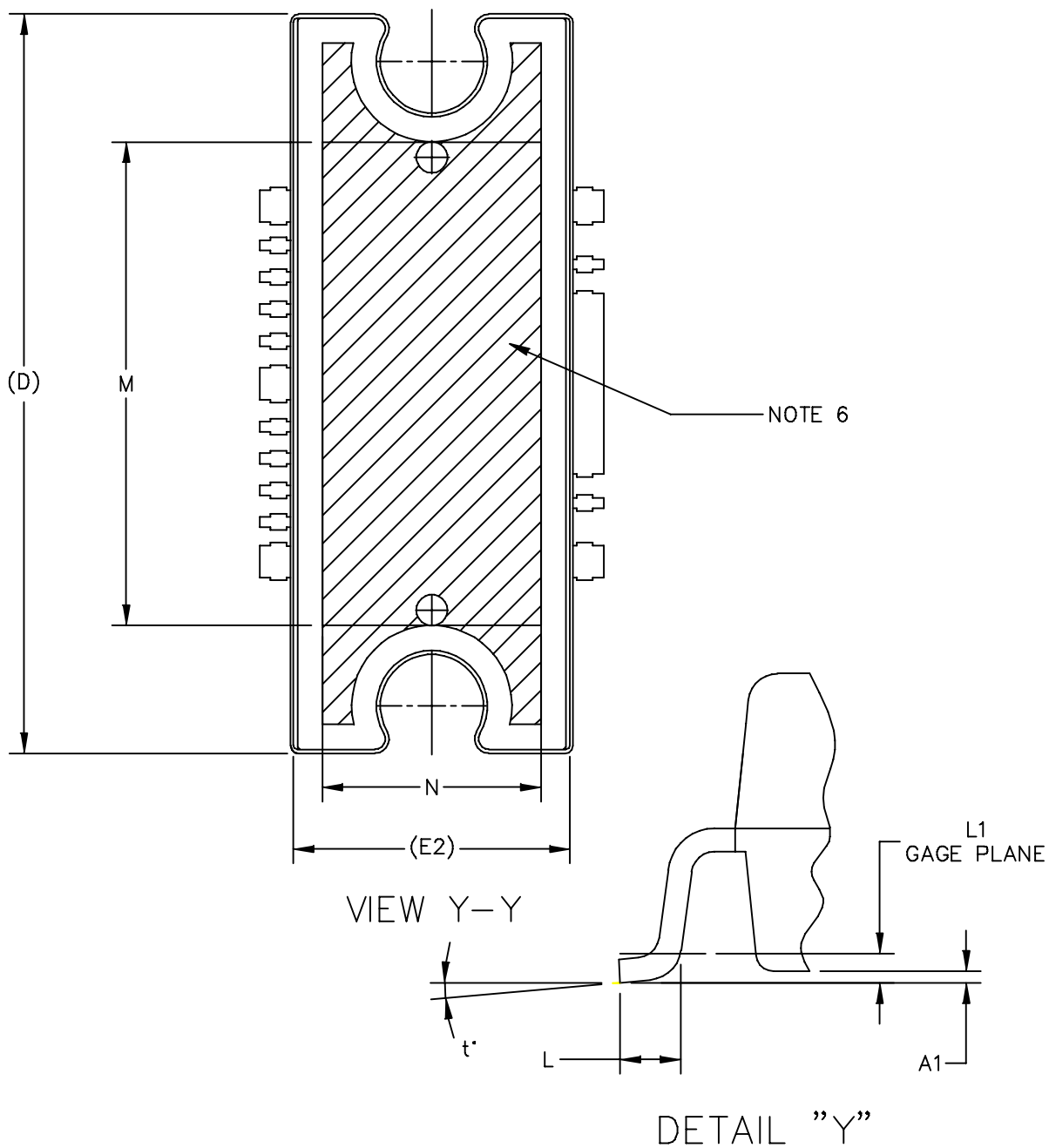
NOTES:

1. CONTROLLING DIMENSION: INCH
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M-1994.
3. DATUM PLANE -H- IS LOCATED AT THE 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 "D" AND "E1" DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE PROTRUSION IS .006 (0.15) PER SIDE. DIMENSIONS "D" AND "E1" DO INCLUDE MOLD MISMATCH AND ARE DETERMINED AT DATUM PLANE -H-.
5. DIMENSIONS "b", "b1", "b2" AND "b3" DO NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE .005 (0.13) TOTAL IN EXCESS OF THE "b", "b1", "b2" AND "b3" DIMENSIONS AT MAXIMUM MATERIAL CONDITION.
6. HATCHING REPRESENTS THE EXPOSED AREA OF THE HEAT SLUG. HATCHED AREA SHOWN IS ON THE SAME PLANE.
7. DIM A2 APPLIES WITHIN ZONE "J" ONLY.

| DIM | INCH | | MILLIMETER | | DIM | INCH | | MILLIMETER | |
|---|----------|------|--------------------|-------|--------------------------|----------------------------|------|-------------|------|
| | MIN | MAX | MIN | MAX | | MIN | MAX | MIN | MAX |
| A | .100 | .104 | 2.54 | 2.64 | b | .011 | .017 | 0.28 | 0.43 |
| A1 | .038 | .044 | 0.96 | 1.12 | b1 | .037 | .043 | 0.94 | 1.09 |
| A2 | .040 | .042 | 1.02 | 1.07 | b2 | .037 | .043 | 0.94 | 1.09 |
| D | .928 | .932 | 23.57 | 23.67 | b3 | .225 | .231 | 5.72 | 5.87 |
| D1 | .810 BSC | | 20.57 BSC | | c1 | .007 | .011 | .18 | .28 |
| E | .551 | .559 | 14.00 | 14.20 | e | .054 BSC | | 1.37 BSC | |
| E1 | .353 | .357 | 8.97 | 9.07 | e1 | .040 BSC | | 1.02 BSC | |
| E2 | .346 | .350 | 8.79 | 8.89 | e2 | .224 BSC | | 5.69 BSC | |
| F | .025 BSC | | 0.64 BSC | | e3 | .150 BSC | | 3.81 BSC | |
| M | .600 | ---- | 15.24 | ---- | r1 | .063 | .068 | 1.6 | 1.73 |
| N | .270 | ---- | 6.86 | ---- | aaa | .004 | | .10 | |
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| | | | | | CASE NUMBER: 1329-09 | | | 23 AUG 2007 | |
| | | | | | STANDARD: NON-JEDEC | | | | |



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|---|--|---------------------------|----------------------------|
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| TITLE: TO-272WB, 16 LEAD GULL WING PLASTIC | | DOCUMENT NO: 98ASA10532D | REV: F |
| | | CASE NUMBER: 1329A-04 | 20 JUN 2007 |
| | | STANDARD: JEDEC MO-253 BA | |



| | | | |
|---|---------------------------|----------------------------|--|
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| TITLE: TO-272WB, 16 LEAD GULL WING PLASTIC | DOCUMENT NO: 98ASA10532D | REV: F | |
| | CASE NUMBER: 1329A-04 | 20 JUN 2007 | |
| | STANDARD: JEDEC MO-253 BA | | |

NOTES:

1. CONTROLLING DIMENSION: INCH
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M-1994.
3. DATUM PLANE -H- IS LOCATED AT THE 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 "D" AND "E1" DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE PROTRUSION IS .006 (0.15) PER SIDE. DIMENSIONS "D" AND "E1" DO INCLUDE MOLD MISMATCH AND ARE DETERMINED AT DATUM PLANE -H-.
5. DIMENSIONS "b", "b1", "b2" AND "b3" DO NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE .005 (0.13) TOTAL IN EXCESS OF THE "b", "b1", "b2" AND "b3" DIMENSIONS AT MAXIMUM MATERIAL CONDITION.
6. HATCHING REPRESENTS EXPOSED AREA OF THE HEAT SLUG. HATCHED AREA SHOWN IS ON THE SAME PLANE.

| DIM | INCH | | MILLIMETER | | DIM | INCH | | MILLIMETER | |
|---|----------|------|--------------------|-------|---------------------------|----------------------------|------|-------------|------|
| | MIN | MAX | MIN | MAX | | MIN | MAX | MIN | MAX |
| A | .100 | .104 | 2.54 | 2.64 | b | .011 | .017 | 0.28 | 0.43 |
| A1 | .001 | .004 | 0.02 | 0.10 | b1 | .037 | .043 | 0.94 | 1.09 |
| A2 | .099 | .110 | 2.51 | 2.79 | b2 | .037 | .043 | 0.94 | 1.09 |
| D | .928 | .932 | 23.57 | 23.67 | b3 | .225 | .231 | 5.72 | 5.87 |
| D1 | .810 BSC | | 20.57 BSC | | c1 | .007 | .011 | .18 | .28 |
| E | .429 | .437 | 10.9 | 11.1 | e | .054 BSC | | 1.37 BSC | |
| E1 | .353 | .357 | 8.97 | 9.07 | e1 | .040 BSC | | 1.02 BSC | |
| E2 | .346 | .350 | 8.79 | 8.89 | e2 | .224 BSC | | 5.69 BSC | |
| L | .018 | .024 | 0.46 | 0.61 | e3 | .150 BSC | | 3.81 BSC | |
| L1 | .01 BSC | | 0.25 BSC | | r1 | .063 | .068 | 1.6 | 1.73 |
| M | .600 | ---- | 15.24 | ---- | t | 2' | 8' | 2' | 8' |
| N | .270 | ---- | 6.86 | ---- | aaa | .004 | | .10 | |
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| TITLE: TO-272 WB 16 LEAD GULL WING PLASTIC | | | | | DOCUMENT NO: 98ASA10532D | | | REV: F | |
| | | | | | CASE NUMBER: 1329A-04 | | | 20 JUN 2007 | |
| | | | | | STANDARD: JEDEC MO-253 BA | | | | |

PRODUCT DOCUMENTATION

Refer to the following documents 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
- AN1977: Quiescent Current Thermal Tracking Circuit in the RF Integrated Circuit Family
- AN1987: Quiescent Current Control for the RF Integrated Circuit Device Family
- AN3263: Bolt Down Mounting Method for High Power RF Transistors and RFICs in Over-Molded Plastic Packages

Engineering Bulletins

- EB212: Using Data Sheet Impedances for RF LDMOS Devices

REVISION HISTORY

The following table summarizes revisions to this document.

| Revision | Date | Description |
|----------|-----------|---|
| 3 | Oct. 2006 | <ul style="list-style-type: none"> • Added "including TD-SCDMA" to data sheet description, p. 1 • Added Part Number and Manufacturer to Resistors in Table 7, Component Designations and Values, p. 4 • Added TD-SCDMA test circuit schematic, component designations and values, component layout, typical characteristic curves, test signal and series impedance, p. 11 - 14 • Added Product Documentation and Revision History, p. 21 |
| 4 | Dec. 2006 | <ul style="list-style-type: none"> • Updated Part Numbers in Table 7, Component Designations and Values, to RoHS compliant part numbers, p. 4 |
| 5 | Feb. 2007 | <ul style="list-style-type: none"> • Corrected V_{BIAS} and V_{SUPPLY} callouts, Fig. 3, Test Circuit Schematic, p. 4, Fig. 4, Test Circuit Component Layout, p. 5 • Updated Part Numbers in Tables 7 and 9, Component Designations and Values, to latest RoHS compliant part numbers, p. 4, 11 • Removed lower voltage tests from Fig. 14, Power Gain versus Output Power, due to fixed tuned fixture limitations, p. 8 • Replaced Fig. 15, MTTF versus Junction Temperature with updated graph. Removed Amps² and listed operating characteristics and location of MTTF calculator for device, p. 8 • Changed callout η_D to PAE (Power Added Efficiency) for Figs. 19 and 20, 3-Carrier and 6-Carrier TD-SCDMA ACPR, ALT and Power Added Efficiency versus Output Power, p. 13 • Corrected Z_{in} data and plot in Fig. 23, Series Impedance, p. 14 |
| 6 | Dec. 2008 | <ul style="list-style-type: none"> • Modified data sheet to reflect RF Test Reduction described in Product and Process Change Notification number, PCN13232, p. 1, 2 • Changed 220°C to 225°C in Capable Plastic Package bullet, p. 1 • Added Footnote 1 to Quiescent Current Temperature bullet under Features section and to callout in Figure 1, Functional Block Diagram, p. 1 • Changed Storage Temperature Range in Max Ratings table from -65 to +200 to -65 to +150 for standardization across products, p. 2 • Added Case Operating Temperature limit to the Maximum Ratings table and set limit to 150°C, p. 2 • Operating Junction Temperature increased from 200°C to 225°C in Maximum Ratings table and related "Continuous use at maximum temperature will affect MTTF" footnote added, p. 2 • Updated Part Numbers in Table 7, Component Designations and Values, to latest RoHS compliant part numbers, p. 4 |

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