Document Number: MWE6IC9100N
Rev. 3, 12/2008

RoHS

# RF LDMOS Wideband Integrated Power Amplifiers

**MWE6IC9100NR1**
**MWE6IC9100GNR1**
**MWE6IC9100NBR1**

The MWE6IC9100N wideband integrated circuit is designed with on-chip matching that makes it usable from 869 to 960 MHz. This multi-stage structure is rated for 26 to 32 Volt operation and covers all typical cellular base station modulations.

**960 MHz, 100 W, 26 V**
**GSM/GSM EDGE**
**RF LDMOS WIDEBAND**
**INTEGRATED POWER AMPLIFIERS**

### Final Application

- Typical GSM Performance: $V_{DD}$ = 26 Volts, $I_{DQ1}$ = 120 mA, $I_{DQ2}$ = 950 mA, $P_{out}$ = 100 Watts CW, f = 960 MHz
  Power Gain — 33.5 dB
  Power Added Efficiency — 54%

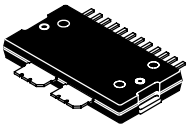
### GSM EDGE Application

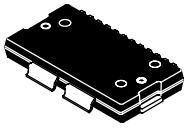
- Typical GSM EDGE Performance: $V_{DD}$ = 28 Volts, $I_{DQ1}$ = 230 mA, $I_{DQ2}$ = 870 mA, $P_{out}$ = 50 Watts Avg., Full Frequency Band (869-960 MHz)
  Power Gain — 35.5 dB
  Power Added Efficiency — 39%
  Spectral Regrowth @ 400 kHz Offset = -63 dBc
  Spectral Regrowth @ 600 kHz Offset = -81 dBc
  EVM — 2% rms
- Capable of Handling 10:1 VSWR, @ 32 Vdc, 960 MHz, 3 dB Overdrive, Designed for Enhanced Ruggedness
- Stable into a 5:1 VSWR. All Spurs Below -60 dBc @ 1 mW to 120 W CW $P_{out}$.

### Features

- Characterized with Series Equivalent Large-Signal Impedance Parameters and Common Source S-Parameters
- On-Chip Matching (50 Ohm Input, DC Blocked)
- 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.

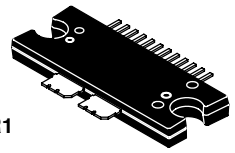
**CASE 1618-02**
**TO-270 WB-14**
**PLASTIC**
**MWE6IC9100NR1**





**CASE 1621-02**
**TO-270 WB-14 GULL**
**PLASTIC**
**MWE6IC9100GNR1**

**CASE 1617-02**
**TO-272 WB-14**
**PLASTIC**
**MWE6IC9100NBR1**



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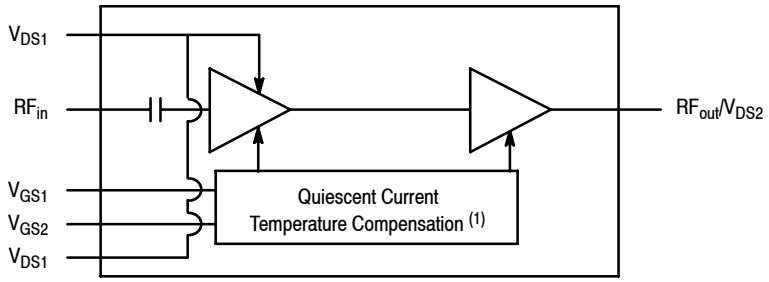
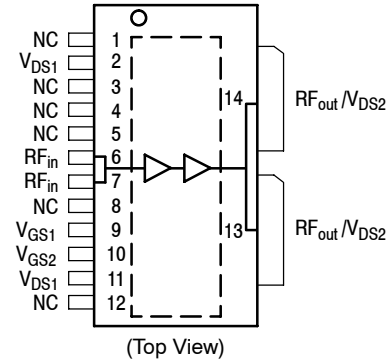



**Figure 1. Functional Block Diagram**




(Top View)

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

**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.

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**Table 1. Maximum Ratings**

| Rating | Symbol | Value | Unit |
|---|---|---|---|
| Drain-Source Voltage | $V_{DSS}$ | -0.5, +66 | 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 |

**Table 2. Thermal Characteristics**

| Characteristic | | Symbol | Value (2,3) | Unit |
|---|---|---|---|---|
| Thermal Resistance, Junction to Case | | $R_{\theta JC}$ | | °C/W |
| GSM Application<br>($P_{out}$ = 100 W CW) | Stage 1, 26 Vdc, $I_{DQ1}$ = 120 mA<br>Stage 2, 26 Vdc, $I_{DQ2}$ = 950 mA | | 1.82<br>0.38 | |
| GSM EDGE Application<br>($P_{out}$ = 50 W Avg.) | Stage 1, 28 Vdc, $I_{DQ1}$ = 230 mA<br>Stage 2, 28 Vdc, $I_{DQ2}$ = 870 mA | | 1.77<br>0.44 | |

**Table 3. ESD Protection Characteristics**

| Test Methodology | Class |
|---|---|
| Human Body Model (per JESD22-A114) | 2 (Minimum) |
| Machine Model (per EIA/JESD22-A115) | B (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°C unless otherwise noted)

| Characteristic | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| **Stage 1 — Off Characteristics** | | | | | |
| Zero Gate Voltage Drain Leakage Current ($V_{DS}$ = 66 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) | $I_{GSS}$ | — | — | 10 | μAdc |
| **Stage 1 — On Characteristics** | | | | | |
| Gate Threshold Voltage ($V_{DS}$ = 10 Vdc, $I_D$ = 35 μAdc) | $V_{GS(th)}$ | 1.5 | 2 | 3.5 | Vdc |
| Gate Quiescent Voltage ($V_{DS}$ = 26 Vdc, $I_D$ = 120 mAdc) | $V_{GS(Q)}$ | — | 2.7 | — | Vdc |
| Fixture Gate Quiescent Voltage ($V_{DD}$ = 26 Vdc, $I_D$ = 120 mAdc, Measured in Functional Test) | $V_{GG(Q)}$ | 6 | 9.4 | 12 | 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.

(continued)

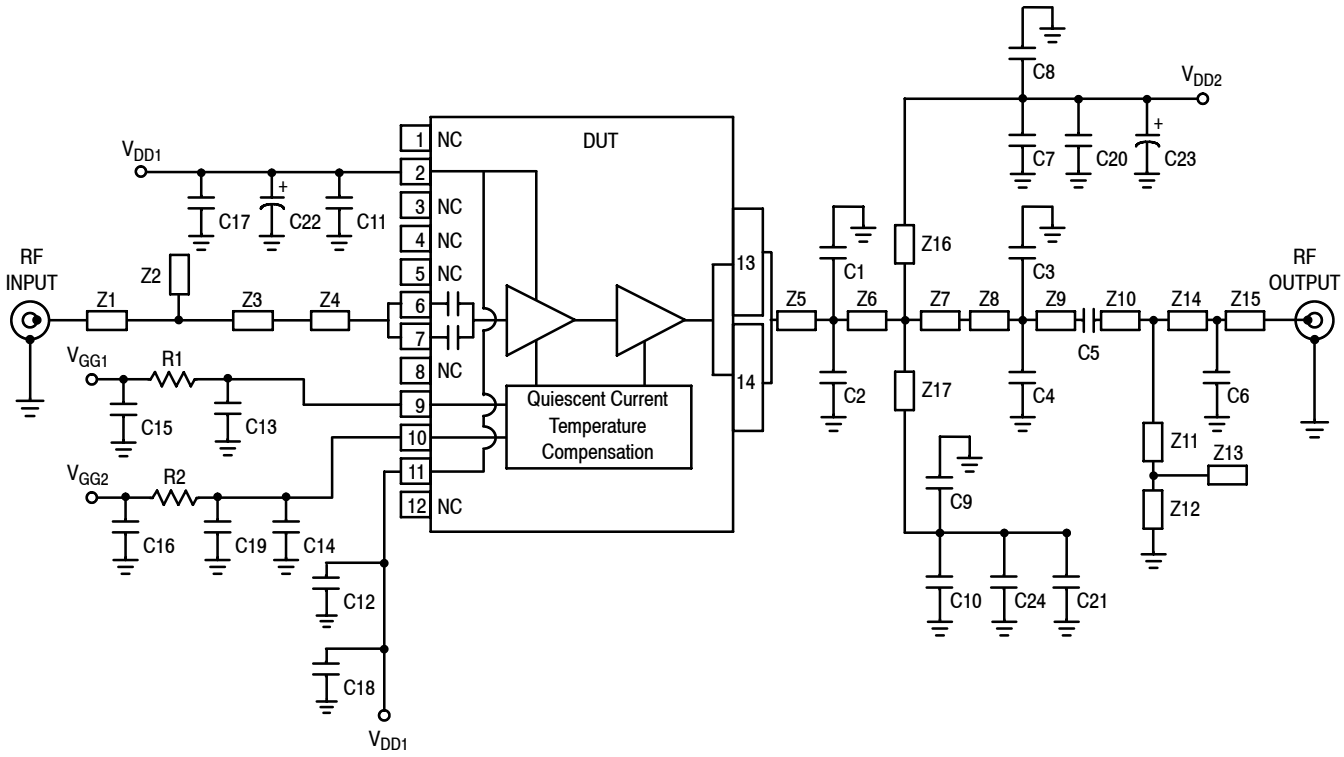


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**Table 5. Electrical Characteristics** ($T_C$ = 25°C unless otherwise noted) **(continued)**

| Characteristic | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| **Stage 2 — Off Characteristics** | | | | | |
| Zero Gate Voltage Drain Leakage Current ($V_{DS}$ = 66 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) | $I_{GSS}$ | — | — | 10 | μAdc |
| **Stage 2 — On Characteristics** | | | | | |
| Gate Threshold Voltage ($V_{DS}$ = 10 Vdc, $I_D$ = 290 μAdc) | $V_{GS(th)}$ | 1.5 | 2 | 3.5 | Vdc |
| Gate Quiescent Voltage ($V_{DS}$ = 26 Vdc, $I_D$ = 950 mAdc) | $V_{GS(Q)}$ | — | 2.7 | — | Vdc |
| Fixture Gate Quiescent Voltage ($V_{DD}$ = 26 Vdc, $I_D$ = 950 mAdc, Measured in Functional Test) | $V_{GG(Q)}$ | 6 | 8.6 | 12 | Vdc |
| Drain-Source On-Voltage ($V_{GS}$ = 10 Vdc, $I_D$ = 1 Adc) | $V_{DS(on)}$ | 0.05 | 0.4 | 0.8 | Vdc |
| **Functional Tests** (In Freescale Test Fixture, 50 ohm system) $V_{DD}$ = 26 Vdc, $P_{out}$ = 100 W CW, $I_{DQ1}$ = 120 mA, $I_{DQ2}$ = 950 mA, f = 960 MHz | | | | | |
| Power Gain | $G_{ps}$ | 31 | 33.5 | 36 | dB |
| Input Return Loss | IRL | — | -15 | -10 | dB |
| Power Added Efficiency | PAE | 52 | 54 | — | % |
| $P_{out}$ @ 1 dB Compression Point, CW | P1dB | 100 | 112 | — | W |
| **Typical GSM EDGE Performances** (In Freescale GSM EDGE Test Fixture, 50 ohm system) $V_{DD}$ = 28 Vdc, $P_{out}$ = 50 W Avg., $I_{DQ1}$ = 230 mA, $I_{DQ2}$ = 870 mA, 869-894 MHz and 920-960 MHz EDGE Modulation | | | | | |
| Power Gain | $G_{ps}$ | — | 35.5 | — | dB |
| Power Added Efficiency | PAE | — | 39 | — | % |
| Error Vector Magnitude | EVM | — | 2 | — | % rms |
| Spectral Regrowth at 400 kHz Offset | SR1 | — | -63 | — | dBc |
| Spectral Regrowth at 600 kHz Offset | SR2 | — | -81 | — | dBc |

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| | | | |
|---|---|---|---|
| Z1 | 0.089″ x 0.083″ Microstrip | Z10 | 0.117″ x 0.083″ Microstrip |
| Z2 | 0.157″ x 0.315″ Microstrip | Z11 | 0.067″ x 0.431″ Microstrip |
| Z3 | 0.157″ x 0.397″ Microstrip | Z12 | 0.067″ x 0.084″ Microstrip |
| Z4 | 0.139″ x 0.060″ Microstrip | Z13 | 0.381″ x 0.067″ Microstrip |
| Z5 | 0.024″ x 0.386″ Microstrip | Z14 | 0.418″ x 0.084″ Microstrip |
| Z6 | 0.352″ x 0.902″ Microstrip | Z15 | 0.421″ x 0.084″ Microstrip |
| Z7 | 0.039″ x 0.607″ Microstrip | Z16, Z17 | 2.550″ x 0.157″ Microstrip |
| Z8 | 0.555″ x 1.102″ Microstrip | PCB | Taconic TLX8-0300, 0.030″, $\varepsilon_r$ = 2.55 |
| Z9 | 0.343″ x 0.083″ Microstrip | | |

**Figure 3. MWE6IC9100NR1(GNR1)(NBR1) Test Circuit Schematic**

**Table 6. MWE6IC9100NR1(GNR1)(NBR1) Test Circuit Component Designations and Values**

| Part | Description | Part Number | Manufacturer |
|---|---|---|---|
| C1, C2 | 10 pF Chip Capacitors | ATC100B100GT500XT | ATC |
| C3, C4, C5 | 3.9 pF Chip Capacitors | ATC100B3R9BT500XT | ATC |
| C6 | 0.5 pF Chip Capacitor | ATC100B0R5BT500XT | ATC |
| C7, C8, C9, C10, C11, C12, C13, C14 | 33 pF Chip Capacitors | ATC100B330JT500XT | ATC |
| C15, C16, C17, C18, C19, C20, C21 | 6.8 μF Chip Capacitors | C4532X5R1H685MT | TDK |
| C22, C23 | 470 μF, 63 V Electrolytic Capacitors, Radial | 222212018470 | Vishay |
| C24 | 330 pF Chip Capacitor | ATC100B331JT200XT | ATC |
| R1, R2 | 4.7 kΩ, 1/8 W Chip Resistors | CRCW08054701FKEA | Vishay |

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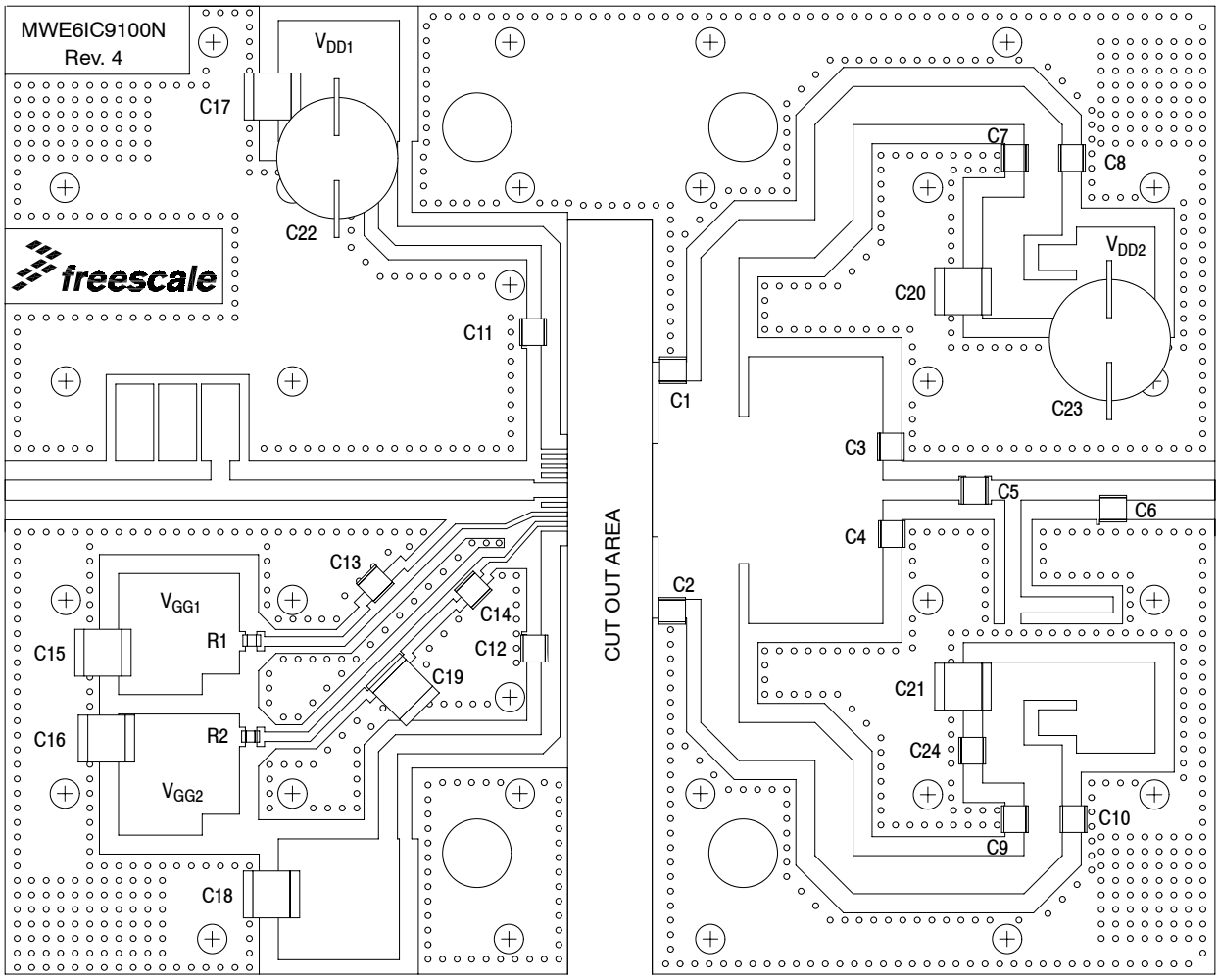



**Figure 4. MWE6IC9100NR1(GNR1)(NBR1) Test Circuit Component Layout**

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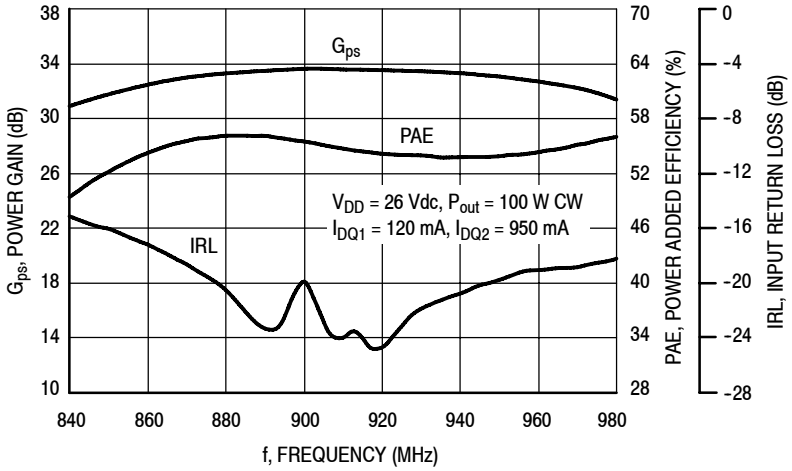



**Figure 5. Power Gain, Input Return Loss and Power Added Efficiency versus Frequency @ $P_{out}$ = 100 Watts CW**

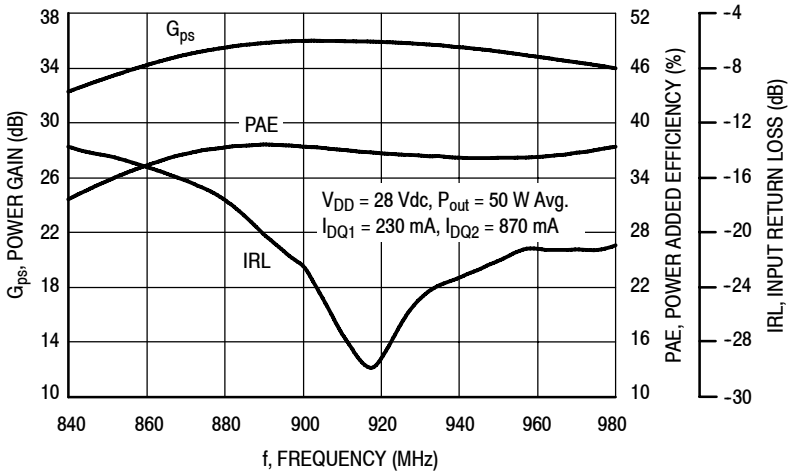



**Figure 6. Power Gain, Input Return Loss and Power Added Efficiency versus Frequency @ $P_{out}$ = 50 Watts Avg.**

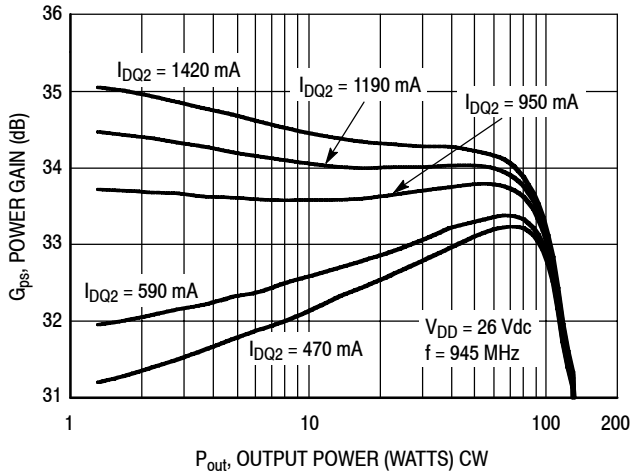



**Figure 7. Power Gain versus Output Power @ $I_{DQ1}$ = 120 mA**

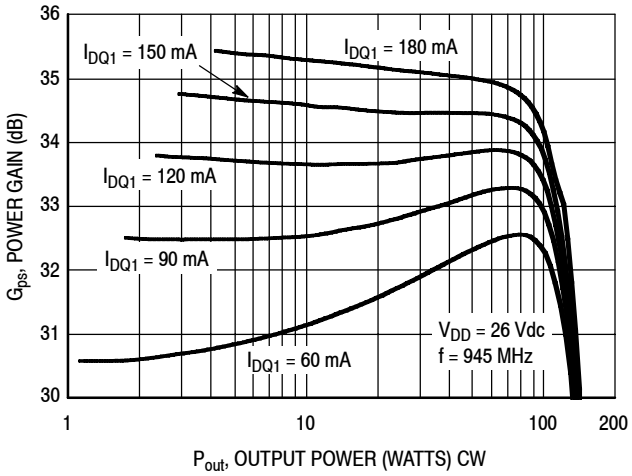



**Figure 8. Power Gain versus Output Power @ $I_{DQ2}$ = 950 mA**

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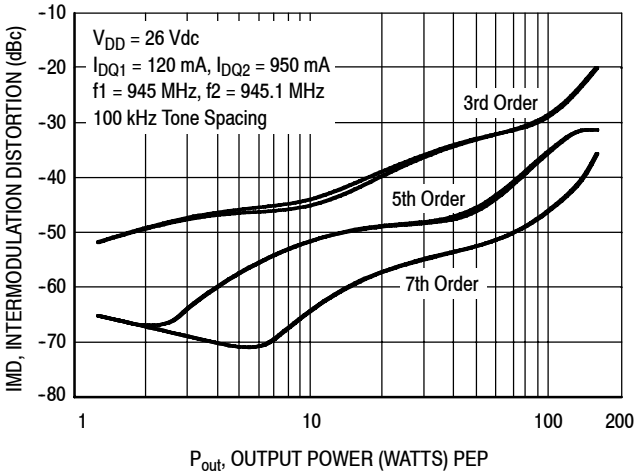



**Figure 9. Intermodulation Distortion Products versus Output Power**

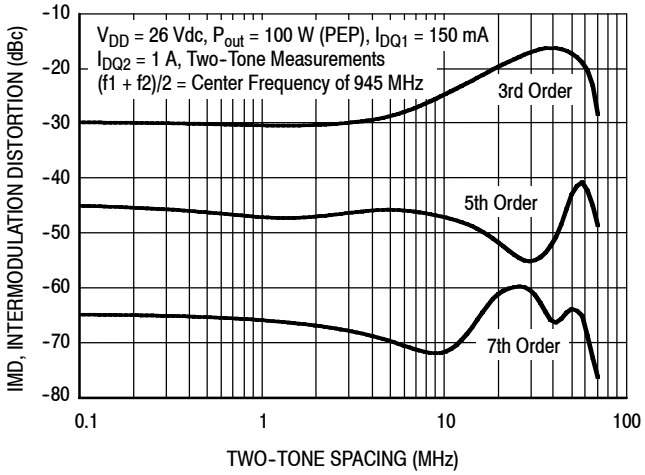



**Figure 10. Intermodulation Distortion Products versus Tone Spacing**

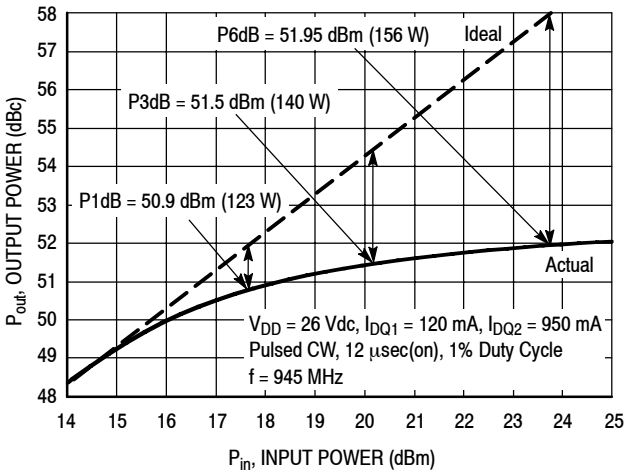



**Figure 11. Pulsed CW Output Power versus Input Power**

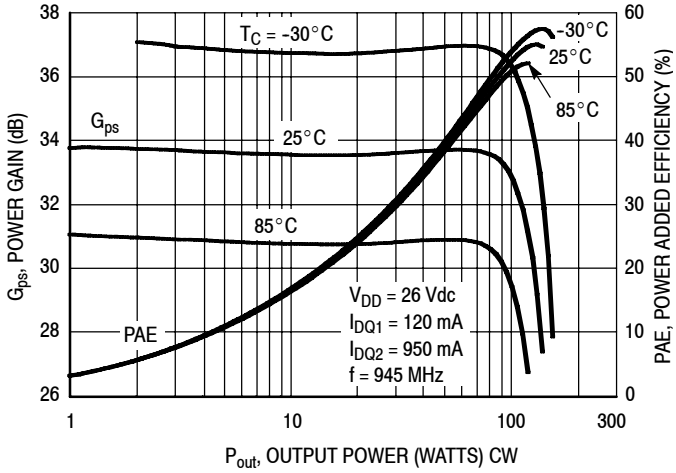



**Figure 12. Power Gain and Power Added Efficiency versus Output Power @ 945 MHz**

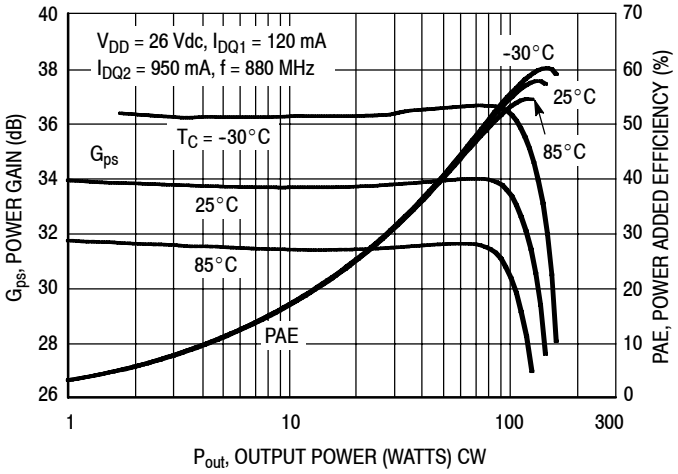



**Figure 13. Power Gain and Power Added Efficiency versus Output Power @ 880 MHz**

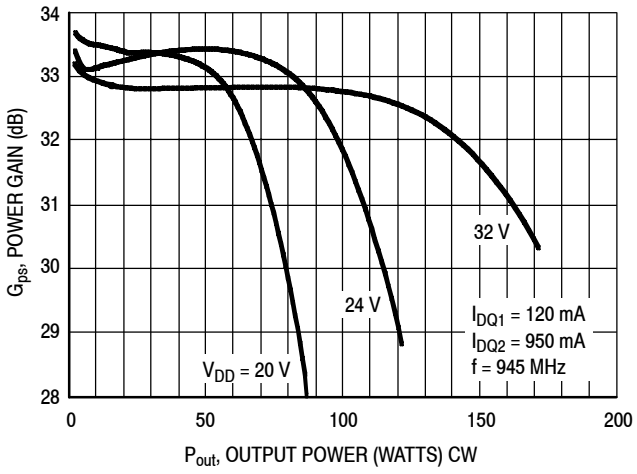



**Figure 14. Power Gain versus Output Power**

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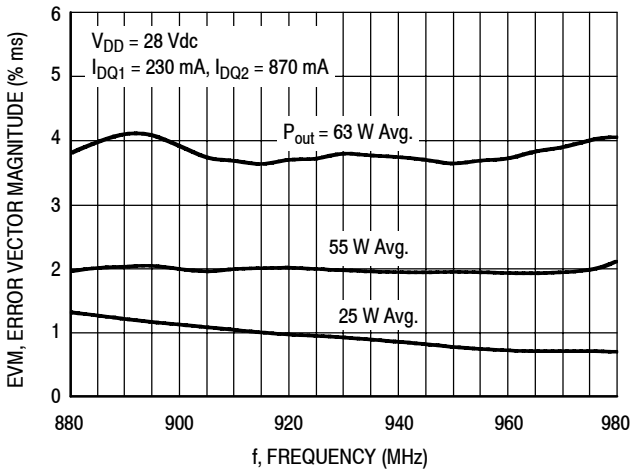



**Figure 15. EVM versus Frequency**

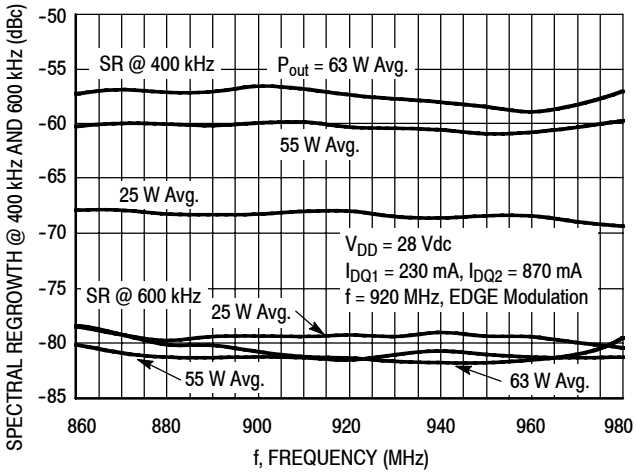



**Figure 16. Spectral Regrowth at 400 kHz and 600 kHz versus Frequency**

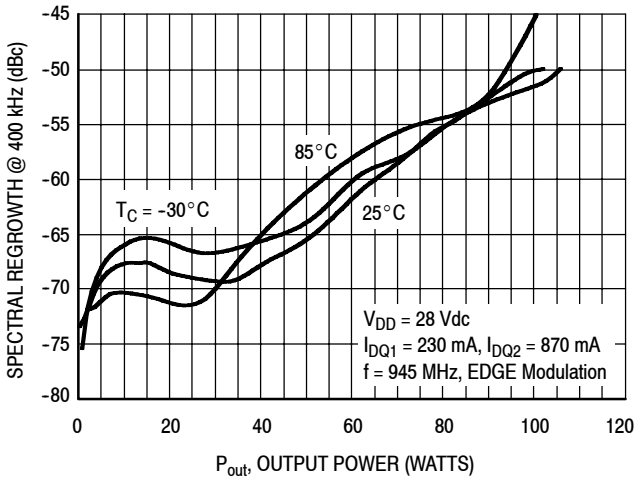



**Figure 17. Spectral Regrowth at 400 kHz versus Output Power @ 945 MHz**

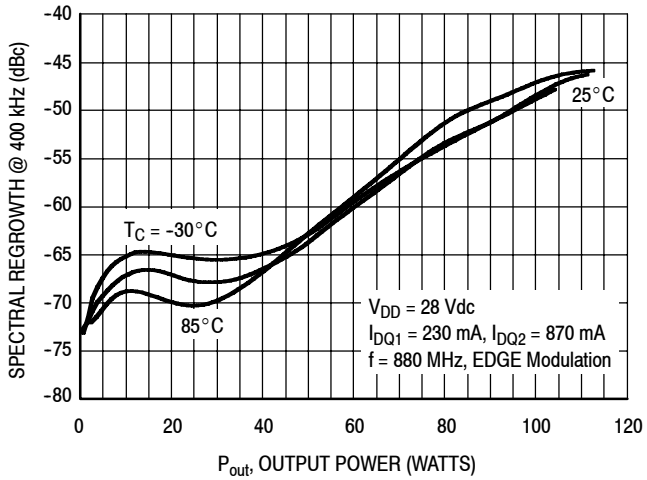



**Figure 18. Spectral Regrowth at 400 kHz versus Output Power @ 880 MHz**

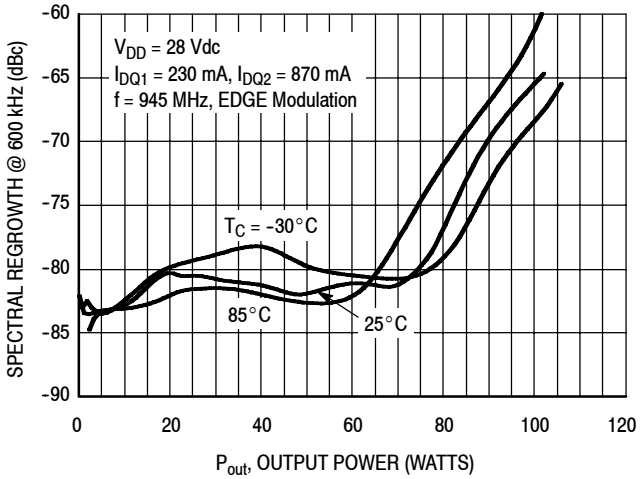



**Figure 19. Spectral Regrowth at 600 kHz versus Output Power @ 945 MHz**

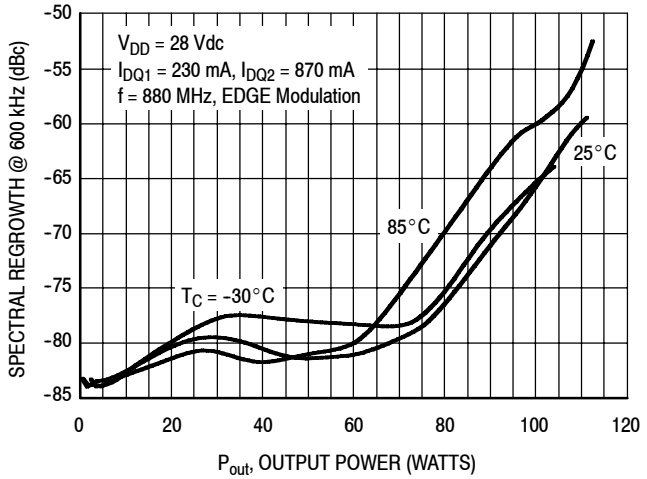



**Figure 20. Spectral Regrowth at 600 kHz versus Output Power @ 880 MHz**

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## TYPICAL CHARACTERISTICS

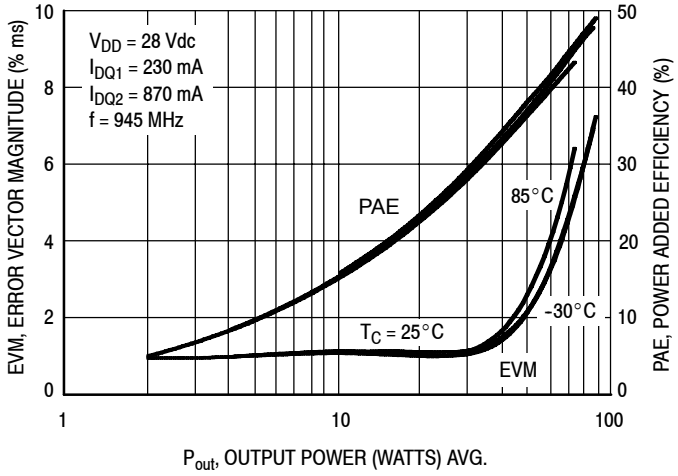



**Figure 21. EVM and Power Added Efficiency versus Output Power @ 945 MHz**

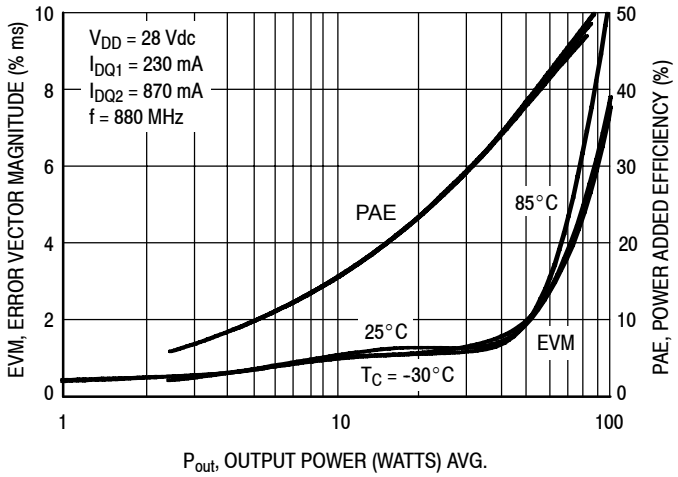



**Figure 22. EVM and Power Added Efficiency versus Output Power @ 880 MHz**

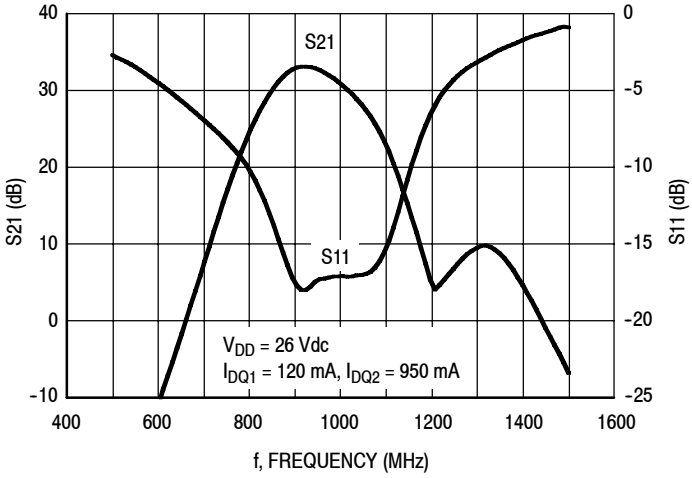



**Figure 23. Broadband Frequency Response**

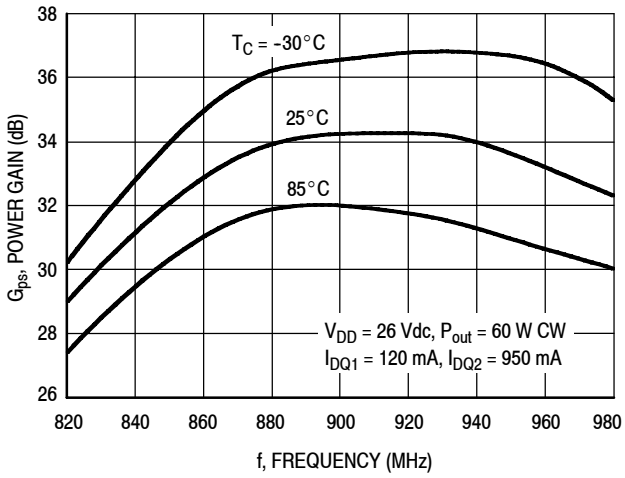
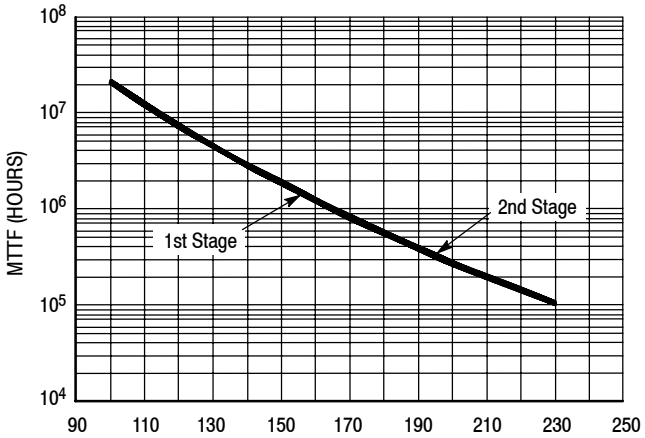



**Figure 24. Power Gain versus Frequency**

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## TYPICAL CHARACTERISTICS




This above graph displays calculated MTTF in hours when the device is operated at $V_{DD}$ = 26 Vdc, $P_{out}$ = 100 W CW, and PAE = 54%.

MTTF calculator available at http://www.freescale.com/rf. Select Software & Tools/Development Tools/Calculators to access MTTF calculators by product.

**Figure 25. MTTF versus Junction Temperature**

## GSM TEST SIGNAL

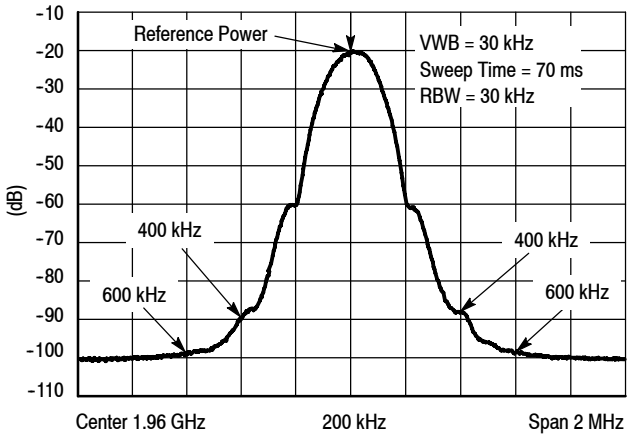
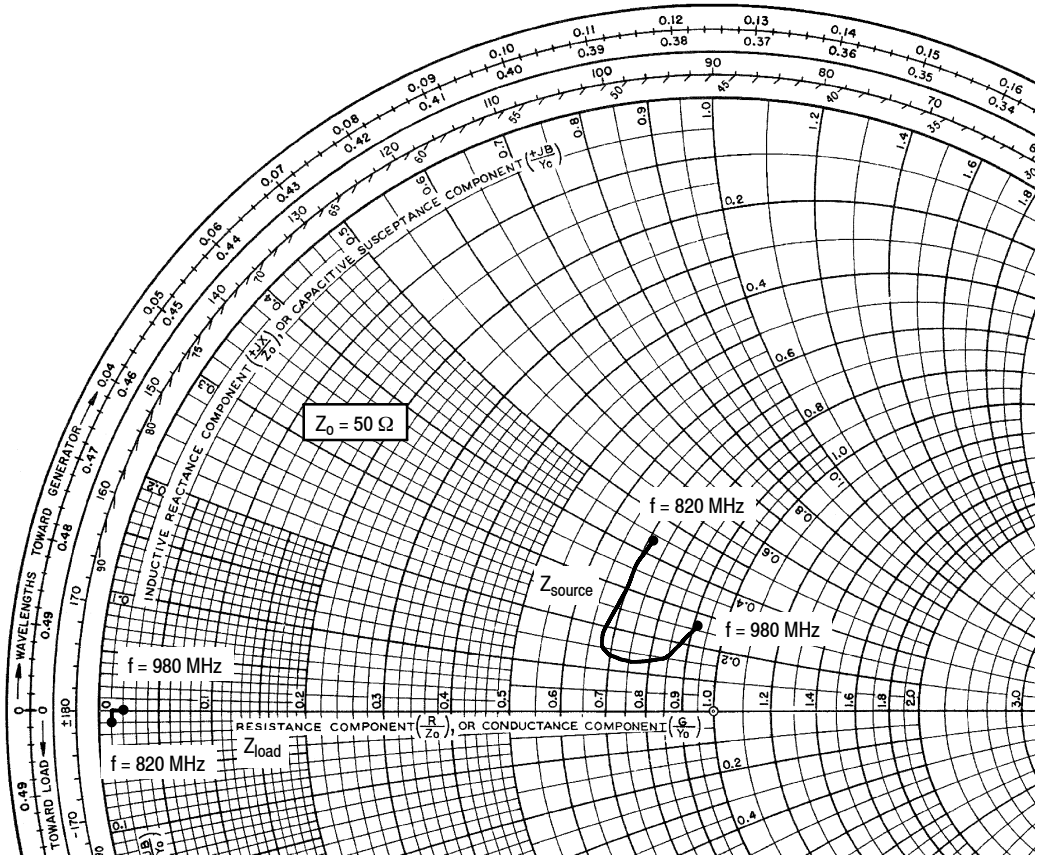



**Figure 26. EDGE Spectrum**

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$V_{DD}$ = 26 Vdc, $I_{DQ1}$ = 120 mA, $I_{DQ2}$ = 950 mA, $P_{out}$ = 100 W CW

| f MHz | $Z_{source}$ Ω | $Z_{load}$ Ω |
|---|---|---|
| 820 | 35.40 + j21.50 | 0.516 – j0.365 |
| 840 | 35.00 + j18.00 | 0.638 – j0.172 |
| 860 | 35.00 + j15.50 | 0.768 – j0.010 |
| 880 | 34.50 + j12.20 | 0.874 + j0.071 |
| 900 | 34.00 + j9.00 | 1.030 + j0.133 |
| 920 | 34.30 + j7.20 | 1.101 + j0.082 |
| 940 | 38.50 + j6.00 | 1.088 + j0.037 |
| 960 | 42.00 + j7.40 | 1.011 + j0.018 |
| 980 | 45.55 + j12.75 | 0.872 + j0.051 |

$Z_{source}$ = Test circuit impedance as measured from gate to ground.

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

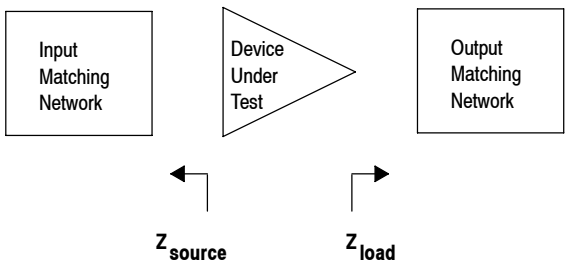



**Figure 27. Series Equivalent Source and Load Impedance**

**Table 7. Common Source Scattering Parameters** ($V_{DD}$ = 26 V, 50 ohm system, $I_{DQ1}$ = 120 mA, $I_{DQ2}$ = 950 mA)

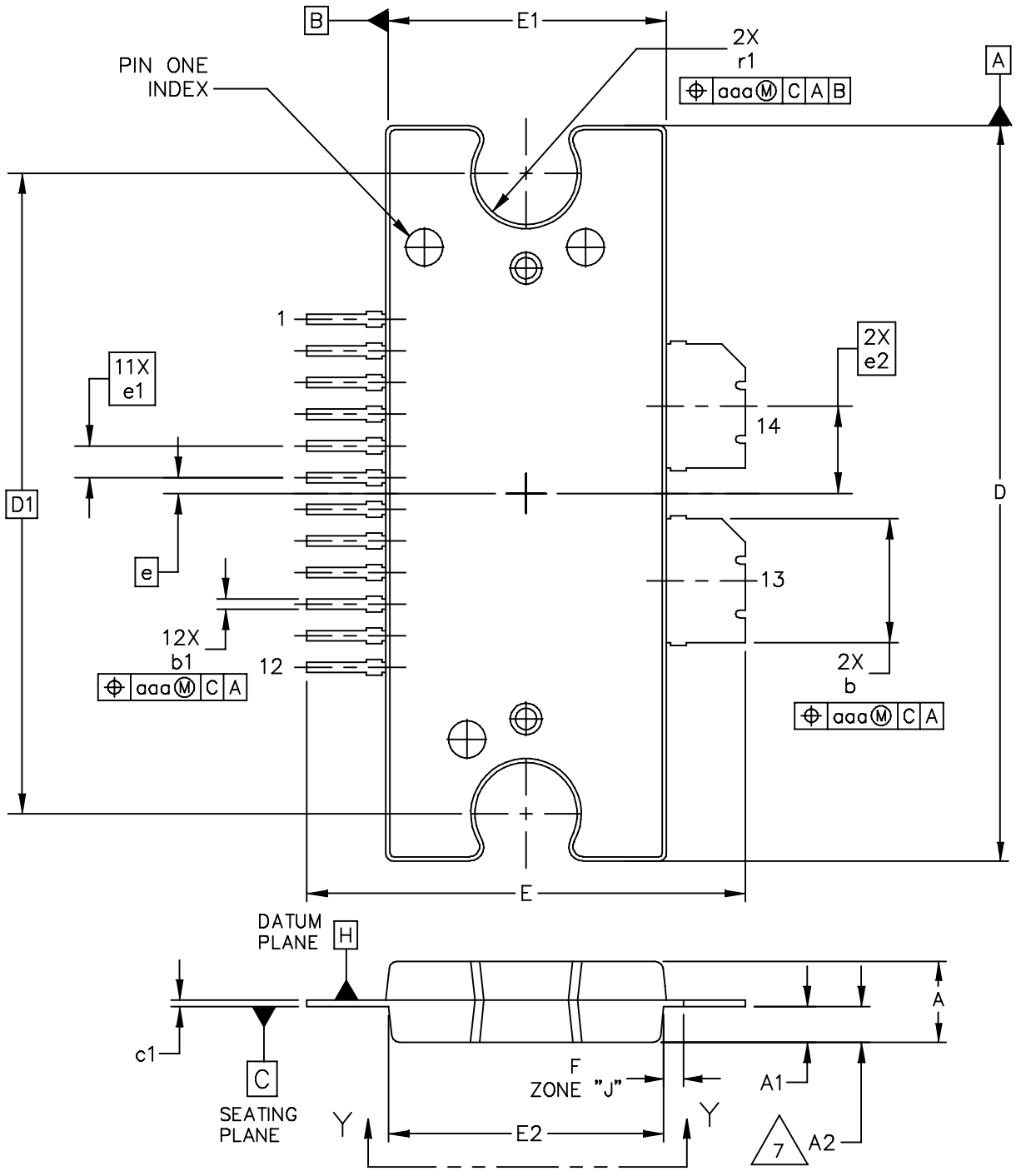
| f | $S_{11}$ | | $S_{21}$ | | $S_{12}$ | | $S_{22}$ | |
|---|---|---|---|---|---|---|---|---|
| MHz | $\|S_{11}\|$ | ∠ ϕ | $\|S_{21}\|$ | ∠ ϕ | $\|S_{12}\|$ | ∠ ϕ | $\|S_{22}\|$ | ∠ ϕ |
| 750 | 0.230 | 95 | 5.81 | -87 | 0.0007 | -119 | 0.989 | -180 |
| 760 | 0.188 | 93 | 6.48 | -97 | 0.0007 | -116 | 0.987 | 180 |
| 770 | 0.149 | 92 | 7.18 | -107 | 0.0007 | -111 | 0.985 | 180 |
| 780 | 0.114 | 92 | 7.88 | -117 | 0.0007 | -110 | 0.983 | 180 |
| 790 | 0.085 | 96 | 8.56 | -128 | 0.0008 | -109 | 0.981 | 180 |
| 800 | 0.063 | 104 | 9.22 | -139 | 0.0008 | -108 | 0.979 | 180 |
| 810 | 0.047 | 117 | 9.82 | -150 | 0.0009 | -109 | 0.978 | 180 |
| 820 | 0.037 | 134 | 10.37 | -161 | 0.0009 | -110 | 0.978 | -180 |
| 830 | 0.031 | 156 | 10.85 | -172 | 0.0009 | -111 | 0.977 | -180 |
| 840 | 0.029 | -177 | 11.27 | 178 | 0.0010 | -113 | 0.977 | -180 |
| 850 | 0.033 | -152 | 11.60 | 167 | 0.0010 | -114 | 0.978 | -180 |
| 860 | 0.041 | -134 | 11.87 | 156 | 0.0010 | -117 | 0.978 | -180 |
| 870 | 0.052 | -123 | 12.07 | 146 | 0.0010 | -119 | 0.979 | -180 |
| 880 | 0.063 | -116 | 12.20 | 135 | 0.0010 | -122 | 0.979 | -180 |
| 890 | 0.074 | -112 | 12.25 | 125 | 0.0010 | -123 | 0.979 | 180 |
| 900 | 0.084 | -109 | 12.23 | 115 | 0.0010 | -126 | 0.980 | 180 |
| 910 | 0.094 | -106 | 12.15 | 106 | 0.0010 | -129 | 0.979 | 180 |
| 920 | 0.104 | -103 | 12.01 | 96 | 0.0010 | -131 | 0.978 | 180 |
| 930 | 0.113 | -99 | 11.82 | 86 | 0.0009 | -133 | 0.978 | 180 |
| 940 | 0.125 | -95 | 11.57 | 77 | 0.0009 | -135 | 0.977 | 180 |
| 950 | 0.141 | -91 | 11.28 | 68 | 0.0008 | -138 | 0.976 | 180 |
| 960 | 0.160 | -88 | 10.97 | 59 | 0.0008 | -136 | 0.976 | 180 |
| 970 | 0.183 | -86 | 10.62 | 50 | 0.0007 | -135 | 0.976 | 180 |
| 980 | 0.209 | -85 | 10.23 | 42 | 0.0006 | -133 | 0.976 | 180 |
| 990 | 0.238 | -85 | 9.83 | 34 | 0.0006 | -130 | 0.975 | 180 |
| 1000 | 0.268 | -86 | 9.41 | 26 | 0.0006 | -125 | 0.975 | 180 |

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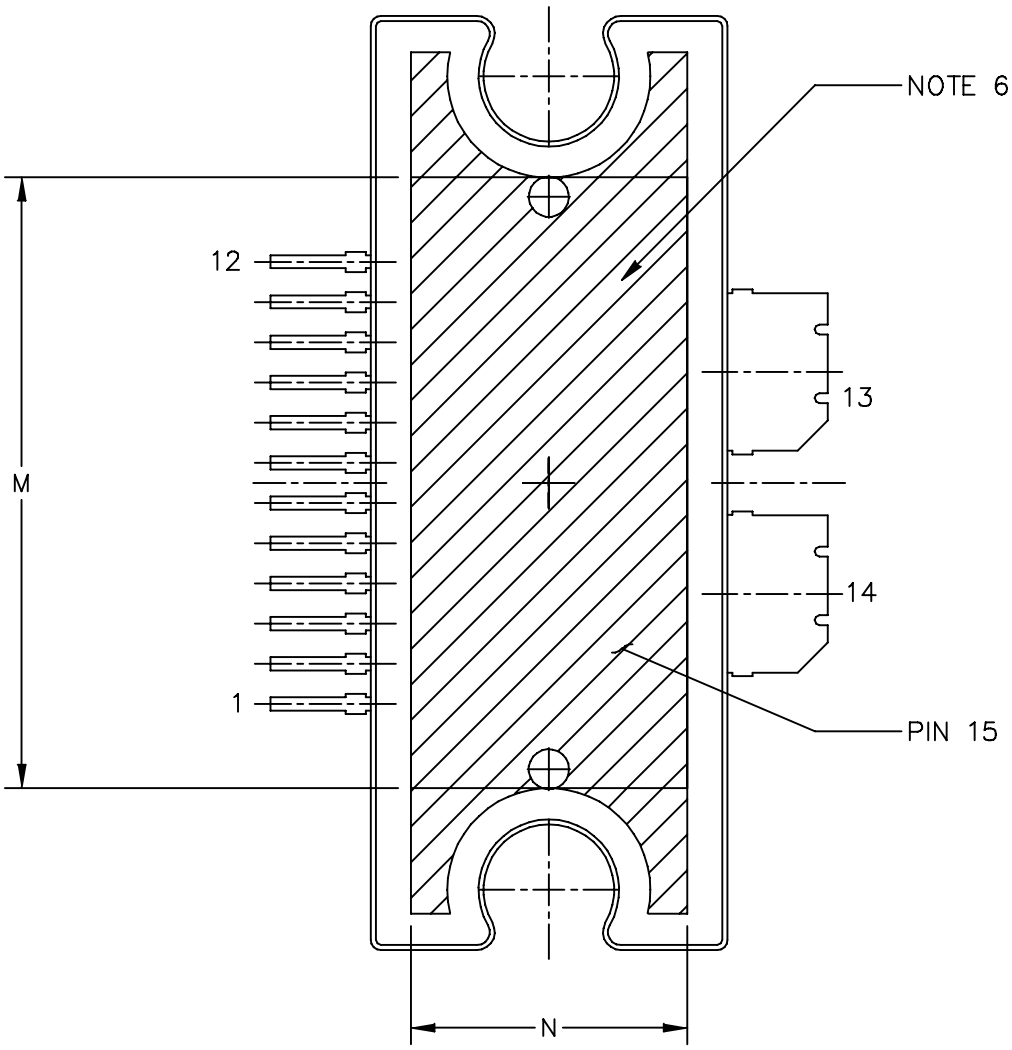
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3. DATUM PLANE –H– IS LOCATED AT THE TOP OF LEAD AND IS COINCIDENT WITH THE LEAD WHERE THE LEAD EXITS THE PLASTIC BODY AT THE TOP OF THE PARTING LINE.

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" AND "b1" DO NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE .005 (0.13) TOTAL IN EXCESS OF THE "b" AND "b1" DIMENSIONS AT MAXIMUM MATERIAL CONDITION.

6. HATCHING REPRESENTS THE EXPOSED AREA OFTHE HEAT SLUG.

7. DIM A2 APPLIES WITHIN ZONE "J" ONLY.

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| DIM | INCH MIN | INCH MAX | MILLIMETER MIN | MILLIMETER MAX | DIM | INCH MIN | INCH MAX | MILLIMETER MIN | MILLIMETER MAX |
|---|---|---|---|---|---|---|---|---|---|
| A | .100 | .104 | 2.54 | 2.64 | b | .154 | .160 | 3.91 | 4.06 |
| A1 | .039 | .043 | 0.99 | 1.09 | b1 | .010 | .016 | 0.25 | 0.41 |
| A2 | .040 | .042 | 1.02 | 1.07 | c1 | .007 | .011 | 0.18 | 0.28 |
| D | .928 | .932 | 23.57 | 23.67 | e | .020 BSC | | 0.51 BSC | |
| D1 | .810 BSC | | 20.57 BSC | | e1 | .040 BSC | | 1.02 BSC | |
| E | .551 | .559 | 14.00 | 14.20 | e2 | .1105 BSC | | 2.807 BSC | |
| E1 | .353 | .357 | 8.97 | 9.07 | r1 | .063 | .068 | 1.6 | 1.73 |
| E2 | .346 | .350 | 8.79 | 8.89 | | | | | |
| F | .025 BSC | | 0.64 BSC | | aaa | .004 | | 0.10 | |
| M | .600 | ---- | 15.24 | ---- | | | | | |
| N | .270 | ---- | 6.86 | ---- | | | | | |

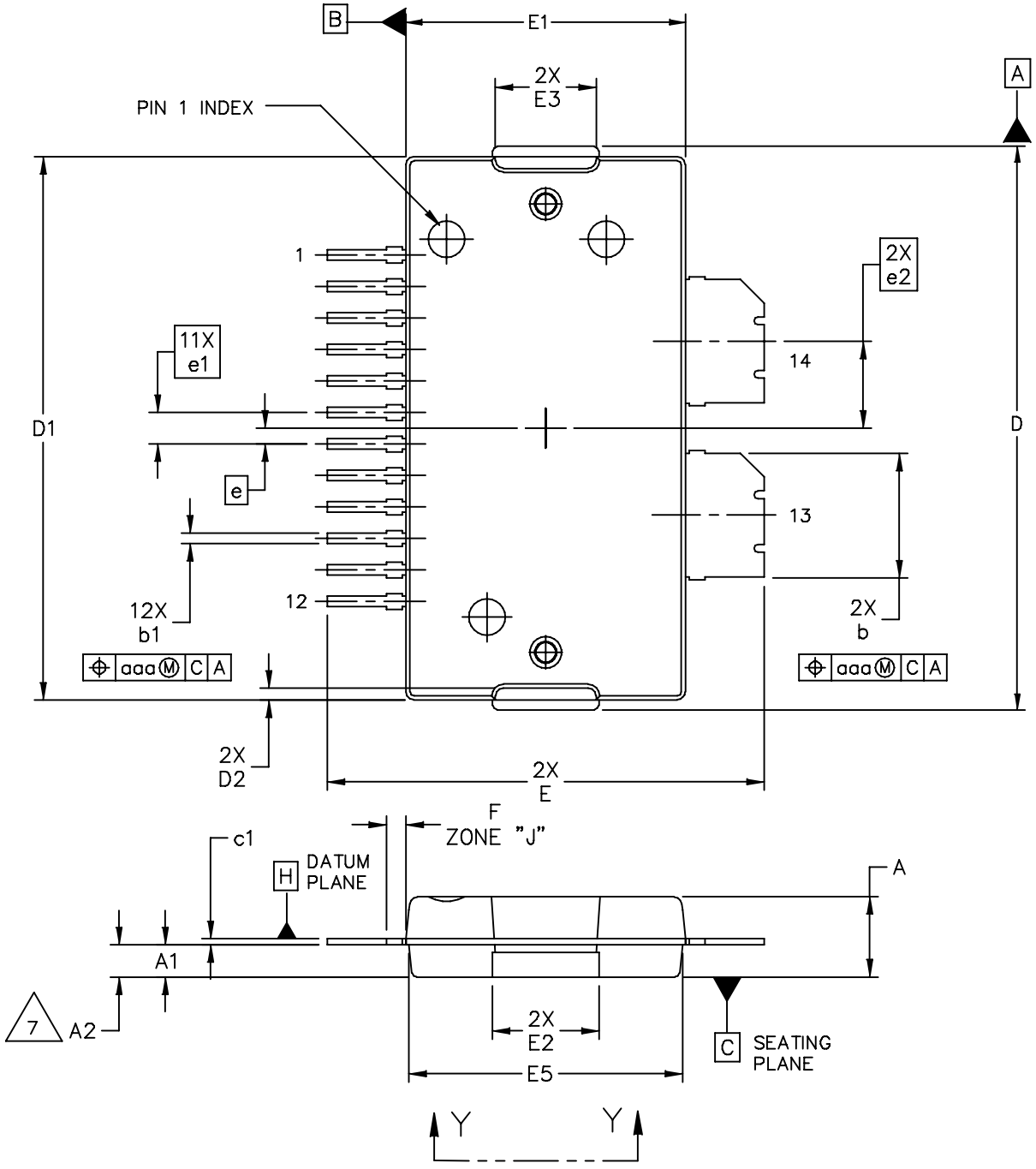
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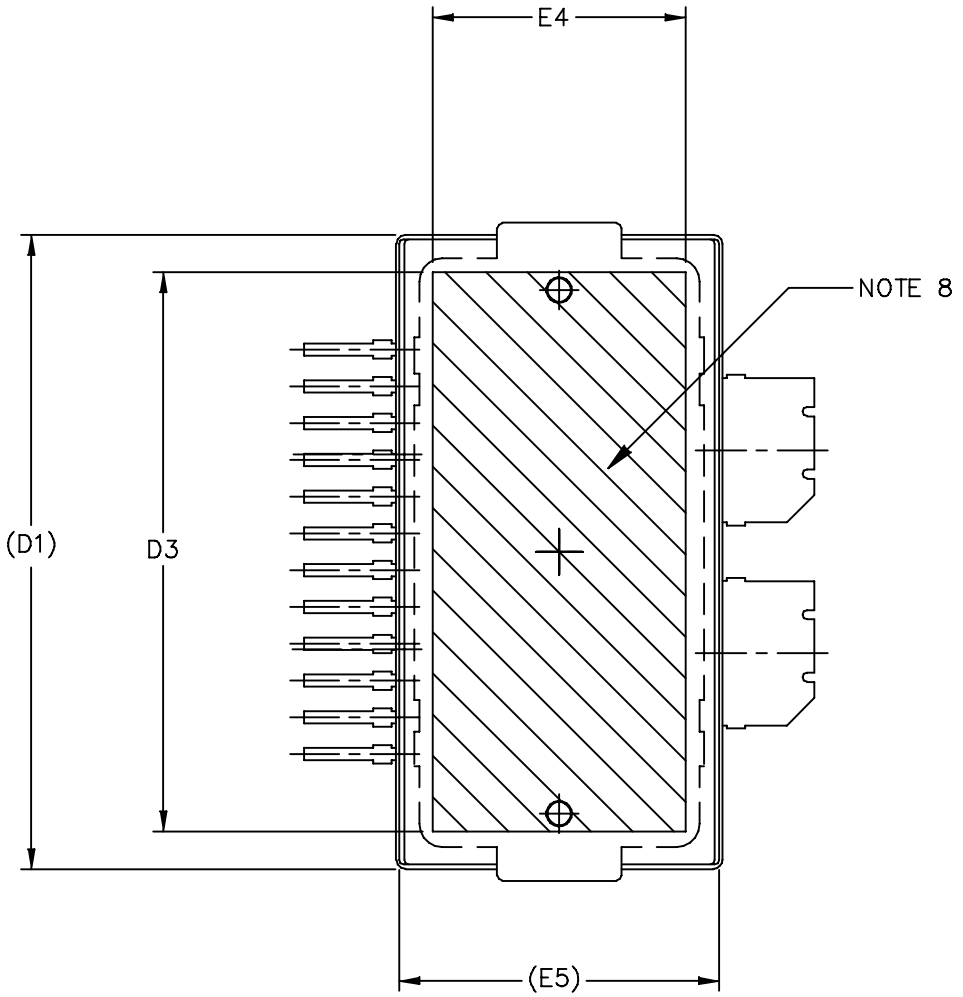
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5. DIMENSIONS "b" AND "b1" DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE .005 TOTAL IN EXCESS OF THE "b" AND "b1" DIMENSION AT MAXIMUM MATERIAL CONDITION.

6. DATUMS –A– AND –B– TO BE DETERMINED AT DATUM PLANE –H–.

7. DIMENSION A2 APPLIES WITHIN ZONE "J" ONLY.

8. HATCHING REPRESENTS THE EXPOSED AREA OF THE HEAT SLUG.

| DIM | INCH MIN | INCH MAX | MILLIMETER MIN | MILLIMETER MAX | DIM | INCH MIN | INCH MAX | MILLIMETER MIN | MILLIMETER MAX |
|---|---|---|---|---|---|---|---|---|---|
| A | .100 | .104 | 2.54 | 2.64 | F | .025 BSC | | 0.64 BSC | |
| A1 | .039 | .043 | 0.99 | 1.09 | b | .154 | .160 | 3.91 | 4.06 |
| A2 | .040 | .042 | 1.02 | 1.07 | b1 | .010 | .016 | 0.25 | 0.41 |
| D | .712 | .720 | 18.08 | 18.29 | c1 | .007 | .011 | .18 | .28 |
| D1 | .688 | .692 | 17.48 | 17.58 | e | .020 BSC | | 0.51 BSC | |
| D2 | .011 | .019 | 0.28 | 0.48 | e1 | .040 BSC | | 1.02 BSC | |
| D3 | .600 | --- | 15.24 | --- | e2 | .1105 BSC | | 2.807 BSC | |
| E | .551 | .559 | 14 | 14.2 | | | | | |
| E1 | .353 | .357 | 8.97 | 9.07 | aaa | .004 | | .10 | |
| E2 | .132 | .140 | 3.35 | 3.56 | | | | | |
| E3 | .124 | .132 | 3.15 | 3.35 | | | | | |
| E4 | .270 | --- | 6.86 | --- | | | | | |
| E5 | .346 | .350 | 8.79 | 8.89 | | | | | |

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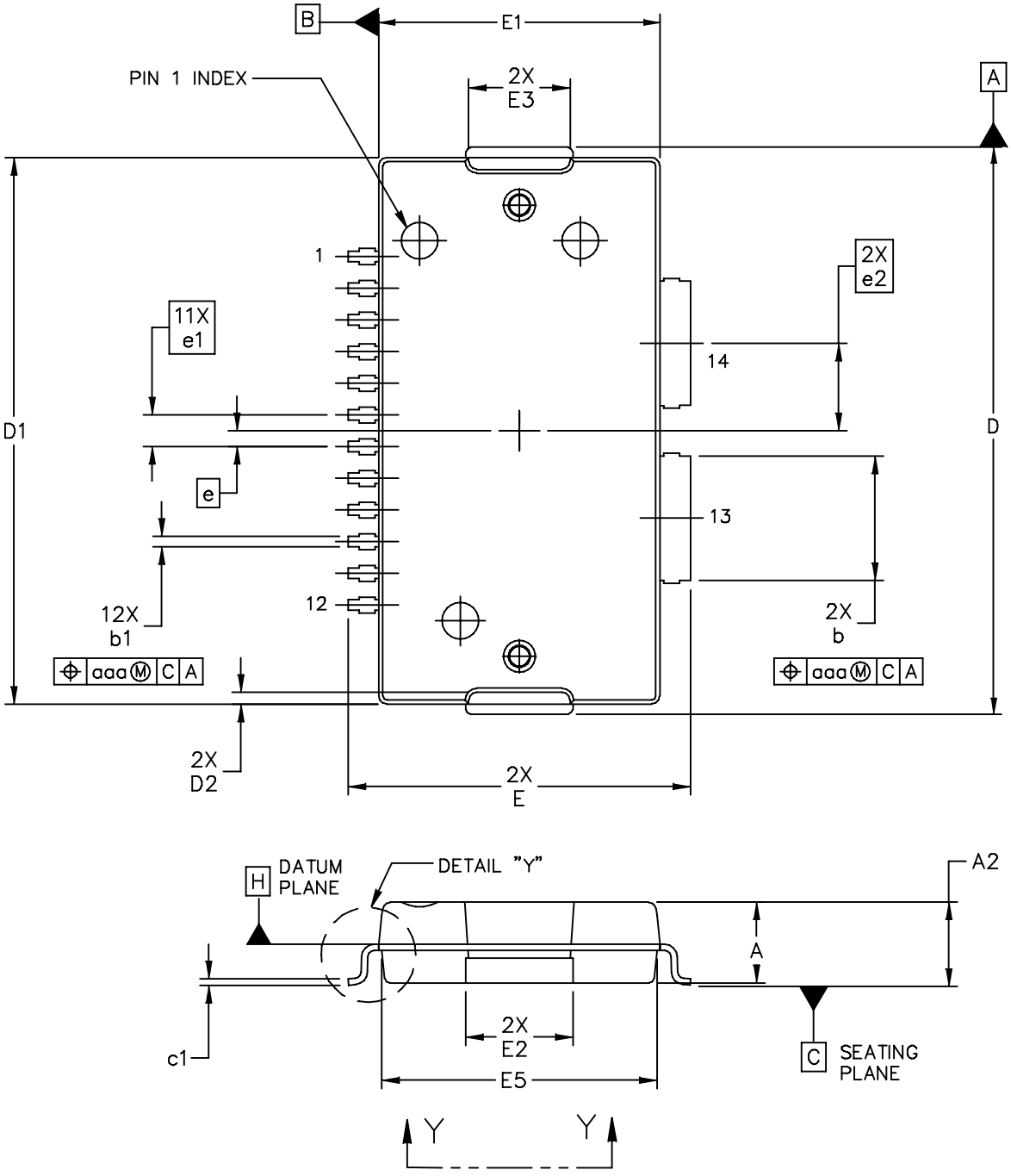
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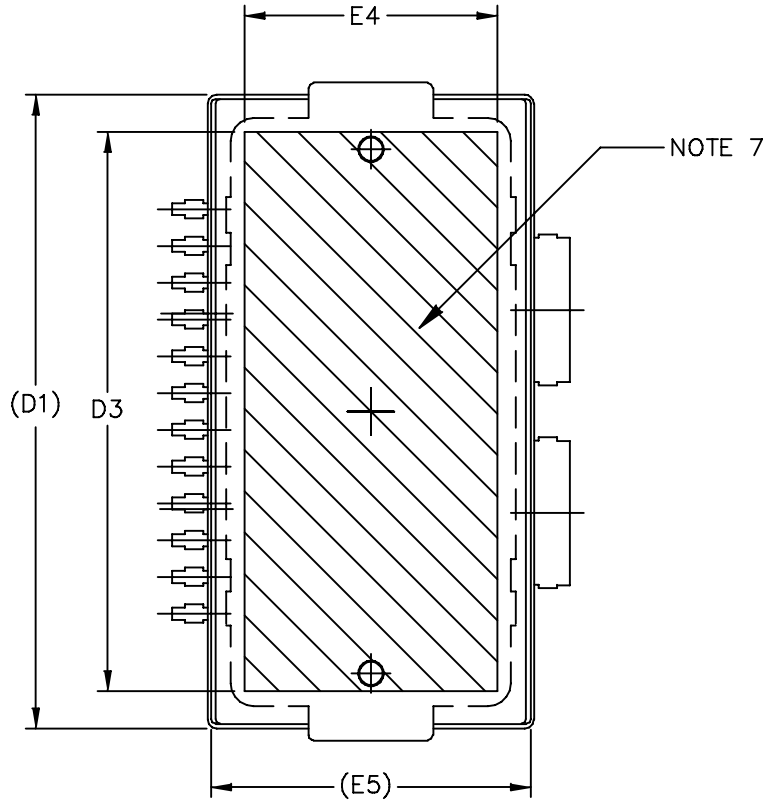



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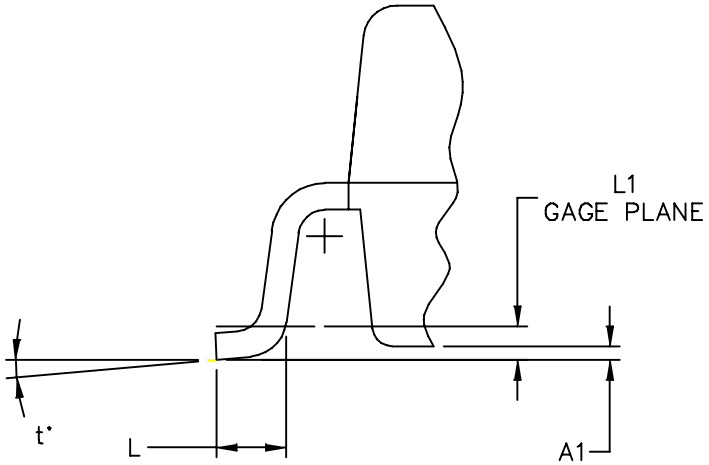
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DETAIL "Y"

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| DIM | INCH MIN | INCH MAX | MILLIMETER MIN | MILLIMETER MAX | DIM | INCH MIN | INCH MAX | MILLIMETER MIN | MILLIMETER MAX |
|---|---|---|---|---|---|---|---|---|---|
| A | .100 | .104 | 2.54 | 2.64 | L | .018 | .024 | 0.46 | 0.61 |
| A1 | .001 | .004 | 0.02 | 0.10 | L1 | .010 BSC | | 0.25 BSC | |
| A2 | .099 | .110 | 2.51 | 2.79 | b | .154 | .160 | 3.91 | 4.06 |
| D | .712 | .720 | 18.08 | 18.29 | b1 | .010 | .016 | 0.25 | 0.41 |
| D1 | .688 | .692 | 17.48 | 17.58 | c1 | .007 | .011 | .18 | .28 |
| D2 | .011 | .019 | 0.28 | 0.48 | e | .020 BSC | | 0.51 BSC | |
| D3 | .600 | --- | 15.24 | --- | e1 | .040 BSC | | 1.02 BSC | |
| E | .429 | .437 | 10.9 | 11.1 | e2 | .1105 BSC | | 2.807 BSC | |
| E1 | .353 | .357 | 8.97 | 9.07 | t | 2° | 8° | 2° | 8° |
| E2 | .132 | .140 | 3.35 | 3.56 | | | | | |
| E3 | .124 | .132 | 3.15 | 3.35 | aaa | .004 | | .10 | |
| E4 | .270 | --- | 6.86 | --- | | | | | |
| E5 | .346 | .350 | 8.79 | 8.89 | | | | | |

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## 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
- 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 |
|---|---|---|
| 0 | Feb. 2007 | • Initial Release of Data Sheet |
| 1 | May 2007 | • Changed Device box to 960 MHz to reflect functional test frequency, p. 1<br>• Added Power Added Efficiency to GSM EDGE Application Typical Performances, p. 1<br>• Changed “5:1 VSWR, @ 28 Vdc” to “10:1 VSWR, @ 32 Vdc” in the Capable of Handling bullet, p. 1<br>• Added Footnote (1) to Quiescent Current Thermal Tracking bullet under Features section and to Quiescent Current Temperature Compensation in Fig. 1, Functional Block Diagram, p. 1<br>• Added top-level, 2-stage block diagram depiction to Fig. 2, Pin Connections; updated Note, p. 1<br>• Added Case Operating Temperature limit to the Maximum Ratings table and set limit to 150°C, p. 2<br>• Added Stage 1 and Stage 2 DC Electrical Characteristics tables, p. 2, 3<br>• In Table 6, Component Designations and Values, corrected Part Number ATC100B331JT500XT to ATC100B331JT200XT for C24 capacitor, p. 4<br>• Updated Figs. 7 and 8, Power Gain versus Output Power, to remove non-variable $I_{DQ}$ value, p. 6<br>• Updated Fig. 9, Intermodulation Distortion Products versus Output Power, to show PEP and not CW; corrected frequency value to show 100 kHz Tone Spacing, p. 7<br>• Updated graphical representation of Ideal/Actual in Fig. 11, Pulsed CW Output Power versus Input Power, to show correct 3 and 6 dB compression points, p. 7 |
| 2 | June 2007 | • Removed Case Operating Temperature from Maximum Ratings table, p. 2. Case Operating Temperature rating will be added to the Maximum Ratings table when parts’ Operating Junction Temperature is increased to 225°C. |
| 3 | Dec. 2008 | • Changed full frequency band in Typical GSM Performance bullet to f = 960 MHz to match actual production test, p. 1<br>• Changed Storage Temperature Range in Max Ratings table from -65 to +200 to -65 to +150 for standardization across products, p. 2<br>• Added Case Operating Temperature limit to the Maximum Ratings table and set limit to 150°C, p. 2<br>• Operating Junction Temperature increased from 200°C to 225°C in Maximum Ratings table, related “Continuous use at maximum temperature will affect MTTF” footnote added and changed 200°C to 225°C in Capable Plastic Package bullet, p. 1, 2<br>• Corrected Z10 from 1.17” to 0.117” in the Test Circuit Schematic Z list, p. 4<br>• Updated Part Numbers in Table 6, Component Designations and Values, to latest RoHS compliant part numbers, p. 4<br>• Replaced Case Outline 1617-01 with 1617-02, Issue A, p. 1, 13-15. Revised cross-hatched area for exposed heat spreader. Added pin numbers 1, 12, 13, and 14 to Sheets 1 and 2. Corrected mm Min and Max values for dimension A1 to 0.99 and 1.09, respectively.<br>• Replaced Case Outline 1618-01 with 1618-02, Issue A, p. 1, 16-18. Added pin numbers 1, 12, 13, and 14 and Pin 1 Index designation to Sheet 1. Corrected dimensions e and e1 on Sheet 1. Removed Pin 5 designation from Sheet 2.<br>• Replaced Case Outline 1621-01 with 1621-02, Issue A, p. 1, 19-21. Added pin numbers 1, 12, 13, and 14 and Pin 1 Index designation to Sheet 1. Corrected dimensions e and e1 on Sheets 1 and 3. Removed Pin 5 designation from Sheet 2.<br>• Added Product Documentation and Revision History, p. 22 |

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