

Document Number: MMRF1316N Rev. 0, 7/2014

√RoHS

RF Power LDMOS Transistor

N-Channel Enhancement-Mode Lateral MOSFET

This high ruggedness device is designed for use in high VSWR military, aerospace and defense, radar and radio communications applications. It is an unmatched input and output design allowing wide frequency range utilization, between 1.8 and 600 MHz.

Typical Performance: V_{DD} = 50 Vdc

| Frequency (MHz) | Signal Type | P _{out} (W) | G _{ps} (dB) | η _D (%) |
|-------------------------|-------------------------------------|-------------------------|-------------------------|-----------------------|
| 87.5-108 (1, 3) | CW | 361 | 23.8 | 80.1 |
| 230 (2) | CW | 300 | 25.0 | 70.0 |
| 230 (2) | Pulse (100 μsec, 20% Duty Cycle) | 300 Peak | 27.0 | 71.0 |

Load Mismatch/Ruggedness

| Frequency (MHz) | Signal Type | VSWR | P _{in} (W) | Test Voltage | Result |
|--------------------|--|----------------------------------|----------------------------------|-----------------|--------------------------|
| 98 (1) | CW | > 65:1 at all Phase Angles | 3 (3 dB Overdrive) | 50 | No Device Degradation |
| 230 (2) | Pulse (100 μsec, 20% Duty Cycle) | | 1.16 Peak (3 dB Overdrive) | | |

1. Measured in 87.5-108 MHz broadband reference circuit.

2. Measured in 230 MHz narrowband test circuit.

3. The values shown are the minimum measured performance numbers across the indicated frequency range.

Features

- Wide Operating Frequency Range
- Extreme Ruggedness
- Unmatched Input and Output Allowing Wide Frequency Range Utilization
- Integrated Stability Enhancements
- Low Thermal Resistance
- Integrated ESD Protection Circuitry
- In Tape and Reel. R1 Suffix = 500 Units, 44 mm Tape Width, 13-inch Reel.



1.8–600 MHz, 300 W CW, 50 V WIDEBAND RF POWER LDMOS TRANSISTOR



TO-270WB-4 PLASTIC



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







Table 1. Maximum Ratings

| Rating | Symbol | Value | Unit |
|---|------------------|-------------|-----------|
| Drain-Source Voltage | V _{DSS} | -0.5, +133 | Vdc |
| Gate-Source Voltage | V _{GS} | -6.0, +10 | 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) | TJ | -40 to +225 | °C |
| Total Device Dissipation @ T _C = 25°C Derate above 25°C | PD | 909 4.55 | W W/°C |

Table 2. Thermal Characteristics

| Characteristic | Symbol | Value ^(2,3) | Unit |
|--|-----------------------|------------------------|------|
| Thermal Resistance, Junction to Case CW: Case Temperature 81°C, 305 W CW, 50 Vdc, I _{DQ(A+B)} = 100 mA, 230 MHz | $R_{	extsf{	heta}JC}$ | 0.22 | °C/W |
| Thermal Impedance, Junction to Case Pulse: Case Temperature 59°C, 300 W Peak, 100 μsec Pulse Width, 20% Duty Cycle, 50 Vdc, I _{DQ(A+B)} = 100 mA, 230 MHz | $Z_{\theta JC}$ | 0.034 | °C/W |

Table 3. ESD Protection Characteristics

| Test Methodology | Class |
|---------------------------------------|-------------------|
| Human Body Model (per JESD22-A114) | 2, passes 2500 V |
| Machine Model (per EIA/JESD22-A115) | A, passes 150 V |
| Charge Device Model (per JESD22-C101) | IV, passes 2000 V |

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°C unless otherwise noted)

| Characteristic | Symbol | Min | Тур | Max | Unit |
|--|----------------------|-----|------|-----|------|
| Off Characteristics ⁽⁴⁾ | | | | | |
| Gate-Source Leakage Current $(V_{GS} = 5 \text{ Vdc}, V_{DS} = 0 \text{ Vdc})$ | I _{GSS} | _ | _ | 1 | μAdc |
| Drain-Source Breakdown Voltage $(V_{GS} = 0 \text{ Vdc}, I_D = 50 \text{ mA})$ | V _{(BR)DSS} | 133 | 140 | _ | Vdc |
| Zero Gate Voltage Drain Leakage Current $(V_{DS} = 50 \text{ Vdc}, V_{GS} = 0 \text{ Vdc})$ | I _{DSS} | | | 5 | μAdc |
| Zero Gate Voltage Drain Leakage Current (V _{DS} = 100 Vdc, V _{GS} = 0 Vdc) | I _{DSS} | — | _ | 10 | μAdc |
| On Characteristics | | | | | |
| Gate Threshold Voltage (V_{DS} = 10 Vdc, I_D = 960 μ Adc) | V _{GS(th)} | 1.8 | 2.3 | 2.8 | Vdc |
| Gate Quiescent Voltage (V _{DD} = 50 Vdc, I _D = 100 mAdc, Measured in Functional Test) | V _{GS(Q)} | 2.2 | 2.7 | 3.2 | Vdc |
| Drain-Source On-Voltage (V _{GS} = 10 Vdc, I _D = 2 Adc) | V _{DS(on)} | | 0.26 | _ | Vdc |

1. Continuous use at maximum temperature will affect MTTF.

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

 Refer to AN1955, Thermal Measurement Methodology of RF Power Amplifiers. Go to <u>http://www.freescale.com/rf</u>. Select Documentation/Application Notes - AN1955.

4. Each side of device measured separately.

(continued)



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

| Characteristic | Symbol | Min | Тур | Мах | Unit |
|--|------------------|-----|-----|-----|------|
| Dynamic Characteristics ⁽¹⁾ | | | | | |
| Reverse Transfer Capacitance (V _{DS} = 50 Vdc ± 30 mV(rms)ac @ 1 MHz, V _{GS} = 0 Vdc) | C _{rss} | _ | 1.4 | _ | pF |
| Output Capacitance (V _{DS} = 50 Vdc ± 30 mV(rms)ac @ 1 MHz, V _{GS} = 0 Vdc) | C _{oss} | _ | 63 | — | pF |
| Input Capacitance (V _{DS} = 50 Vdc, V _{GS} = 0 Vdc ± 30 mV(rms)ac @ 1 MHz) | C _{iss} | _ | 168 | _ | pF |

Functional Tests ⁽²⁾ (In Freescale Test Fixture, 50 ohm system) $V_{DD} = 50$ Vdc, $I_{DQ(A+B)} = 100$ mA, $P_{out} = 300$ W Peak (60 W Avg.), f = 230 MHz, 100 μ sec Pulse Width, 20% Duty Cycle

| Power Gain | G _{ps} | 26.0 | 27.0 | 28.5 | dB |
|-------------------|-----------------|------|------|------|----|
| Drain Efficiency | η _D | 69.0 | 71.0 | — | % |
| Input Return Loss | IRL | — | -20 | -9 | dB |

Table 6. Load Mismatch/Ruggedness (In Freescale Test Fixture, 50 ohm system) $I_{DQ(A+B)} = 100 \text{ mA}$

| Frequency (MHz) | Signal Type | VSWR | P _{in} (W) | Test Voltage, V _{DD} | Result |
|--------------------|-------------------------------------|-------------------------------|-------------------------------|-------------------------------|-----------------------|
| 230 | Pulse (100 μsec, 20% Duty Cycle) | > 65:1 at all Phase Angles | 1.16 Peak (3 dB Overdrive) | 50 | No Device Degradation |

1. Each side of device measured separately.

2. Measurements made with device in straight lead configuration before any lead forming operation is applied. Lead forming is used for gull wing (GN) parts.



TYPICAL CHARACTERISTICS



Figure 3. Normalized V_{GS} versus Quiescent Current and Case Temperature

-1.787

2500



Note: MTTF value represents the total cumulative operating time under indicated test conditions.

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





230 MHz NARROWBAND PRODUCTION TEST FIXTURE



Figure 5. MMRF1316NR1 Narrowband Test Circuit Component Layout - 230 MHz



230 MHz NARROWBAND PRODUCTION TEST FIXTURE

| Part | Description | Part Number | Manufacturer |
|--------------------|--|----------------------|--------------|
| B1, B2 | Small Ferrite Beads, Surface Mount | 2743019447 | Fair-Rite |
| C1, C2 | 22 µF, 35 V Tantulum Capacitors | T491X226K035AT | Kemet |
| C3, C4 | 0.1 μF Chip Capacitors | CDR33BX104AKWS | AVX |
| C5, C6 | 220 nF Chip Capacitors | C1812C224K5RACTU | Kemet |
| C7, C8 | 2.2 μF Chip Capacitors | C1825C225J5RACTU | Kemet |
| C9, C10, C11, C12 | 1000 pF Chip Capacitors | ATC100B102JT50XT | ATC |
| C13 | 75 pF Chip Capacitor | ATC100B750JT500XT | ATC |
| C14, C15 | 680 pF Chip Capacitors | ATC100B681JT200XT | ATC |
| C16 | 82 pF Chip Capacitor | ATC100B820JT500XT | ATC |
| C17 | 8.2 pF Chip Capacitor | ATC100B8R2CT500XT | ATC |
| C18 | 11 pF Chip Capacitor | ATC100B110JT500XT | ATC |
| C19, C20 | 240 pF Chip Capacitors | ATC100B241JT200XT | ATC |
| C21, C22 | 0.10 μF Chip Capacitors | C1812F104K1RACTU | Kemet |
| C23, C24 | 0.1 µF Chip Capacitors | CDR33BX104AKWS | AVX |
| C25, C26 | 2.2 μF Chip Capacitors | 2225X7R225KJT3AB | ATC |
| C27, C28, C29, C30 | 470 μF, 63 V Electrolytic Capacitors | MCGPR63V477M13X26-RH | Multicomp |
| Coax1, 2, 3, 4 | 25 Ω Semi Rigid Coax, 2.4" | UT-141C-25 | Micro-Coax |
| L1, L2 | 12 nH Inductors, 3 Turns | GA3094-ALC | Coilcraft |
| L3 | 22 nH Inductor | 1812SMS-22NJLC | Coilcraft |
| L4, L5 | 17.5 nH Inductors, 4 Turns | GA3095-ALC | Coilcraft |
| PCB | Arlon AD255A 0.030", $\epsilon_r = 2.55$ | D49840 | MTL |

Table 7. MMRF1316NR1 Narrowband Test Circuit Component Designations and Values — 230 MHz







| MHz |
|--------------------|
| 230 |
| |
| Microstrips |
| Circuit |
| Test |
| Narrowband |
| MMRF1316NR1 |
| ole 8. |
| Tab |

| Microstrip | Description | Microstrip | Description | Microstrip | Description |
|------------|-------------------------------------|------------|----------------------------|---------------|----------------------------|
| Z1 | 0.366" × 0.082" Microstrip | Z12, Z13 | 0.361" × 0.746" Microstrip | Z24, Z25 | 0.057" × 0.230" Microstrip |
| Z2, Z3 | 0.169" × 0.120" Microstrip | Z14, Z15 | 0.289" × 0.522" Microstrip | Z26, Z27 | 0.199" × 0.230" Microstrip |
| Z4, Z5 | 0.432" × 0.120" Microstrip | Z16, Z17 | 0.347" × 0.150" Microstrip | Z28 | 0.155" × 0.082" Microstrip |
| Z6*, Z7* | $0.655" \times 0.058"$ Microstrip | Z18, Z19 | 0.329" × 0.150" Microstrip | Z29 | 0.110" × 0.082" Microstrip |
| Z8, Z9 | $0.252'' \times 0.068''$ Microstrip | Z20, Z21 | 0.060" × 0.230" Microstrip | Z30 | 0.100″ × 0.082″ Microstrip |
| Z10, Z11 | $0.078'' \times 0.746''$ Microstrip | Z22, Z23 | 1.040" × 0.230" Microstrip | * Line length | include microstrip bends |



TYPICAL CHARACTERISTICS — 230 MHz



Figure 7. Output Power versus Gate-Source Voltage at a Constant Input Power







Figure 9. Power Gain and Drain Efficiency versus Output Power and Quiescent Current



MMRF1316NR1



230 MHz NARROWBAND PRODUCTION TEST FIXTURE

| f | Z _{source} | Z _{load} |
|-----|---------------------|-------------------|
| MHz | Ω | Ω |
| 230 | 1.50 – j10.70 | 8.30 + j6.90 |

 V_{DD} = 50 Vdc, $I_{DQ(A+B)}$ = 100 mA, P_{out} = 300 W Peak

 Z_{source} = Test circuit impedance as measured from gate to gate, balanced configuration.

Z_{load} = Test circuit impedance as measured from drain to drain, balanced configuration.



Figure 12. Narrowband Series Equivalent Source and Load Impedance — 230 MHz



87.5–108 MHz BROADBAND REFERENCE CIRCUIT

 Table 9. 87.5–108 MHz Broadband Performance (In Freescale Reference Circuit, 50 ohm system)

 V_{DD} = 50 Vdc, $I_{DQ(A+B)}$ = 100 mA, P_{in} = 1.5 W, CW

| Frequency (MHz) | G _{ps} (dB) | η _D (%) | P _{out} (W) |
|--------------------|-------------------------|------------------------------|-------------------------|
| 87.5 | 24.4 | 80.1 | 415 |
| 98 | 24.3 | 81.8 | 404 |
| 108 | 23.8 | 80.5 | 361 |

Table 10. Load Mismatch/Ruggedness (In Freescale Reference Circuit, 50 ohm system) I_{DQ(A+B)} = 100 mA

| Frequency (MHz) | Signal Type | VSWR | P _{in} (W) | Test Voltage, V _{DD} | Result |
|--------------------|-------------|-------------------------------|------------------------|-------------------------------|--------------------------|
| 98 | CW | > 65:1 at all Phase Angles | 3 (3 dB Overdrive) | 50 | No Device Degradation |



87.5–108 MHz BROADBAND REFERENCE CIRCUIT



Note: Component number C10 is not used.

*Bias Regulator and Temperature Compensation. Refer to AN1643, *RF LDMOS Power Modules for GSM Base Station Application: Optimum Biasing Circuit*. Go to http://www.freescale.com/rf. Select Documentation/Application Notes – AN1643.

Figure 13. MMRF1316NR1 Broadband Reference Circuit Component Layout — 87.5–108 MHz



87.5–108 MHz BROADBAND REFERENCE CIRCUIT

| Part | Description | Part Number | Manufacturer | |
|------------|---|-----------------------|---------------------|--|
| C1, C2 | 1 μF Chip Capacitors | GRM31CR72A105KA01L | Murata | |
| C3 | 10 nF Chip Capacitor | ATC200B103KT50XT | ATC | |
| C4 | 150 pF Chip Capacitor ATC100B151JT300XT ATC | | | |
| C5 | 20 pF Chip Capacitor | ATC100B200JT500XT ATC | | |
| C6, C8, C9 | 1000 pF Chip Capacitors | ATC200B102KT50XT | ATC | |
| C7 | 560 pF Chip Capacitor ATC100B561KT50XT ATC | | | |
| C11 | 10 nF Chip Capacitor GCJ216R72A103KA01D Murata | | | |
| C12 | 47 nF Chip Capacitor | GCJ21BR72A473KA01L | R72A473KA01L Murata | |
| C13 | 470 nF Chip Capacitor GRM31MR72A474KA01L Murata | | | |
| C14, C15 | 10 μF Chip Capacitors | C5750X7S2A106M230KB | ТДК | |
| C16 | 470 μF, 63 V Electrolytic Capacitor | MCGPR63V477M13X26 | Multicomp | |
| C17 | 20 pF Chip Capacitor | ATC100B200JT500XT ATC | | |
| Coax1, 2 | 35 Ω Flex Cable, 4.72" | HSF-141 | Hongsen Cable | |
| Coax3 | 50 Ω Flex Cable, 6.3" | SM141 | Huber Suhner | |
| L1 | 5 Turns, #16 AWG ID = 0.315"/8 mm Inductor, Hand Wound | Copper Wire | | |
| Q1 | RF Power LDMOS Transistor | MMRF1316NR1 | Freescale | |
| R1 | 2.2 kΩ, 1/8 W Chip Resistor | CRCW08052K20FKEA | Vishay | |
| R2 | 390 Ω, 1/8 W Chip Resistor | CRCW0805390RFKEA | Vishay | |
| R3 | 10 Ω, 1/8 W Chip Resistor | CRCW080510R0FKEA | Vishay | |
| R4 | 1.0 kΩ, 1/8 W Chip Resistor | CRCW08051K00FKEA | Vishay | |
| R5 | 2.7 kΩ, 1/8 W Chip Resistor | CRCW08052K70FKEA | Vishay | |
| R6 | 200 Ω, 1/8 W Chip Resistor | CRCW0805200RFKEA | Vishay | |
| R7 | 5.0 kΩ Multi-turn Cermet Trimmer Potentiometer | 3224W-1-502E | Bourns | |
| R8 | 10 Ω, 1/4 W Chip Resistor | CRCW120610R0FKEA | Vishay | |
| R9 | 240 Ω, 1/4 W Chip Resistor | CRCW1206240RFKEA | Vishay | |
| R10 | 4.7 kΩ, 1/2 W Chip Resistor | CRCW12104K70FKEA | Vishay | |
| R11 | 5.1 kΩ, 1/2 W Chip Resistor | CRCW12105K10FKEA | Vishay | |
| T1 | 61 Material Binocular Core Ferrite (9:1) with 24 AWG 1 Turn Primary, 24 AWG 3 Turns Secondary, Hand Wound | 2861000202 | Fair-Rite | |
| U1 | Voltage Regulator 5 V, Micro8 | LP2951ACDMR2G | ON Semiconductor | |
| U2 | NPN Bipolar Transistor | BC847ALT1G | ON Semiconductor | |
| PCB | Rogers RO4350B, 0.030″, ε _r = 3.66 | D59349 | MTL | |

Table 11. MMRF1316NR1 Broadband Reference Circuit Component Designations and Values - 87.5-108 MHz

Note: Component number C10 is not used.





Note: Component number C10 is not used.

Figure 14. MMRF1316NR1 Broadband Reference Circuit Schematic — 87.5–108 MHz

| Description | Microstrip | Description |
|-----------------------|--|--|
| " × 0.150" Microstrip | Z11, Z12 | 0.400" × 0.240" Microstrip |
| " × 0.080" Microstrip | Z13, Z14 | 0.170" × 0.210" Microstrip |
| " × 0.080" Microstrip | Z15 | 0.680" × 0.140" Microstrip |
| " × 0.170" Microstrip | Z16*, Z17* | 0.200" × 0.100" Microstrip |
| ″ × 0.240″ Microstrip | Z18, Z19 | 0.230" × 0.300" Microstrip |
| " × 0.630" Microstrip | Z20 | 0.190" × 0.170" Microstrip |
| " × 0.630" Microstrip | * Line length | includes microstrip bends |
| | × 0.080″ Microstrip × 0.170″ Microstrip × 0.240″ Microstrip × 0.630″ Microstrip | x 0.080" Microstrip Z15 x 0.170" Microstrip Z16, Z17* x 0.240" Microstrip Z18, Z19 x 0.630" Microstrip Z20 x 0.630" Microstrip Z20 |

Table 12. MMRF1316NR1 Broadband Reference Circuit Microstrips — 87.5–108 MHz



TYPICAL CHARACTERISTICS — 87.5–108 MHz BROADBAND REFERENCE CIRCUIT







Figure 16. CW Output Power versus Gate-Source Voltage at a Constant Input Power



Figure 17. CW Output Power versus Gate-Source Voltage at a Constant Input Power



TYPICAL CHARACTERISTICS — 87.5–108 MHz BROADBAND REFERENCE CIRCUIT







versus CW Output Power



87.5–108 MHz BROADBAND REFERENCE CIRCUIT



 V_{DD} = 50 Vdc, $I_{DQ(A+B)}$ = 100 mA, P_{out} = 300 W CW

| f MHz | Z _{source} Ω | Z _{load} Ω |
|----------|--------------------------|------------------------|
| 87.5 | 10.3 + j14.4 | 13.7 + j8.15 |
| 92 | 11.5 + j15.8 | 14.2 + j8.09 |
| 96 | 12.6 + j17.0 | 14.7 + j8.04 |
| 100 | 13.9 + j18.2 | 15.2 + j7.99 |
| 104 | 15.5 + j19.6 | 15.7 + j7.94 |
| 108 | 17.2 + j20.9 | 16.2 + j7.89 |

Z_{source} = Test circuit impedance as measured from gate to gate, balanced configuration.

Z_{load} = Test circuit impedance as measured from drain to drain, balanced configuration.



Figure 20. Broadband Series Equivalent Source and Load Impedance — 87.5–108 MHz



HARMONIC MEASUREMENTS — 87.5–108 MHz BROADBAND REFERENCE CIRCUIT



Figure 21. 100 MHz Harmonics @ 300 W CW

H5

(500 MHz)

-29.0 dB



PACKAGE DIMENSIONS



| © FREESCALE SEMICONDUCTOR, INC. ALL RIGHTS RESERVED. | MECHANICAL OU | TLINE | PRINT VERSION NOT | TO SCALE |
|---|---------------|---------|--------------------|-------------|
| TITLE: | | DOCUME | NT NO: 98ASA10577D | REV: E |
| TO-270WB-4 | | STANDAF | RD: NON-JEDEC | |
| | | | 2 | .7 AUG 2013 |

MMRF1316NR1



VIEW Y-Y

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|---|---------------|---------|------------------------|---------|
| TITLE: | | DOCUME | NT NO: 98ASA10577D R | EV: E |
| TO-270WB-4 | | STANDAF | RD: NON-JEDEC | |
| | | | 27 AUG | \$ 2013 |

NP

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.
- A DIMENSIONS D1 AND E1 D0 NOT INCLUDE MOLD PROTRUSION. ALLOWABLE PROTRUSION IS .006 INCH (0.15MM) PER SIDE. DIMENSIONS D1 AND E1 D0 INCLUDE MOLD MISMATCH AND ARE DETERMINED AT DATUM PLANE H.
- DIMENSIONS 61 DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE .005 INCH (0.13MM) TOTAL IN EXCESS OF THE 61 DIMENSION AT MAXIMUM MATERIAL CONDITION.
- 6. DATUMS A AND B TO BE DETERMINED AT DATUM PLANE H.
- / DIMENSION A2 APPLIES WITHIN ZONE J ONLY.
- AL HATCHING REPRESENTS THE EXPOSED AREA OF THE HEAT SLUG. DIMENSIONS D3 AND D4 REPRESENT THE VALUES BETWEEN THE TWO OPPOSITE POINTS ALONG THE EDGES OF EXPOSED AREA OF HEAT SLUG.

DIMPLED HOLE REPRESENTS INPUT SIDE.

 $\frac{10}{100}$ these surfaces of the heat slug are not part of the solderable surfaces and may remain unplated.

| | IN | СН | MIL | LIMETER | | | INCH | MILLIMETER | |
|--------|-------------|------------------------------|-------|-----------|------|--------------|---------------|------------|----------|
| DIM | MIN | MAX | MIN | MAX | DIM | MIN | MAX | MIN | MAX |
| AA | .100 | .104 | 2.54 | 2.64 | F | .0 | .025 BSC | | 4 BSC |
| A1 | .039 | .043 | 0.99 | 1.09 | b1 | .164 | .170 | 4.17 | 4.32 |
| A2 | .040 | .042 | 1.02 | 1.07 | c1 | .007 | .011 | 0.18 | 0.28 |
| D | .712 | .720 | 18.08 | 18.29 | е | .1 | 06 BSC | 2.69 | 9 BSC |
| D1 | .688 | .692 | 17.48 | 17.58 | e1 | .239 | INFO ONLY | 6.07 IN | IFO ONLY |
| D2 | .011 | .019 | 0.28 | 0.48 | aaa | | .004 | c |).10 |
| D3 | .600 | | 15.24 | | bbb | | .008 | c |).20 |
| Е | .551 | .559 | 14.00 | 14.20 | | | | | |
| E1 | .353 | .357 | 8.97 | 9.07 | | | | | |
| 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 | | | | | |
| © I | REESCALE SE | MICONDUCTOR, IS RESERVED. | INC. | MECHANICA | L 0U | ILINE | PRINT VERS | SION NOT | TO SCALE |
| TITLE: | | | | | | DOCUME | NT NO: 98ASA1 | 0577D | REV: E |
| | T | TO-270W | /B-4 | | | STANDA | RD: NON-JEDEC | | |
| | | | | | | | | 27 | AUG 2013 |



PRODUCT DOCUMENTATION AND SOFTWARE

Refer to the following resources to aid your design process.

Application Notes

- AN1955: Thermal Measurement Methodology of RF Power Amplifiers
- · AN1643: RF LDMOS Power Modules for GSM Base Station Application: Optimum Biasing Circuit

Engineering Bulletins

• EB212: Using Data Sheet Impedances for RF LDMOS Devices

Software

• Electromigration MTTF Calculator

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

REVISION HISTORY

The following table summarizes revisions to this document.

| Revision | Date | Description |
|----------|-----------|-------------------------------|
| 0 | July 2014 | Initial Release of Data Sheet |



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Вы можете разместить у нас заказ для любого Вашего проекта, будь то серийное производство или разработка единичного прибора.

В нашем ассортименте представлены ведущие мировые производители активных и пассивных электронных компонентов.

Нашей специализацией является поставка электронной компонентной базы двойного назначения, продукции таких производителей как XILINX, Intel (ex.ALTERA), Vicor, Microchip, Texas Instruments, Analog Devices, Mini-Circuits, Amphenol, Glenair.

Сотрудничество с глобальными дистрибьюторами электронных компонентов, предоставляет возможность заказывать и получать с международных складов практически любой перечень компонентов в оптимальные для Вас сроки.

На всех этапах разработки и производства наши партнеры могут получить квалифицированную поддержку опытных инженеров.

Система менеджмента качества компании отвечает требованиям в соответствии с ГОСТ Р ИСО 9001, ГОСТ РВ 0015-002 и ЭС РД 009

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