Document Number: AFT05MS006N
Rev. 0, 2/2014

RoHS

# RF Power LDMOS Transistor

## High Ruggedness N-Channel Enhancement-Mode Lateral MOSFET

Designed for handheld two-way radio applications with frequencies from 136 to 941 MHz. The high gain, ruggedness and wideband performance of this device make it ideal for large-signal, common-source amplifier applications in handheld radio equipment.

**Narrowband Performance** (7.5 Vdc, $I_{DQ}$ = 100 mA, $T_A$ = 25°C, CW)

| Frequency (MHz) | $G_{ps}$ (dB) | $\eta_D$ (%) | $P_{out}$ (W) |
|---|---|---|---|
| 520 (1) | 18.3 | 73.0 | 6.0 |

**Wideband Performance** (7.5 Vdc, $T_A$ = 25°C, CW)

| Frequency (MHz) | $P_{in}$ (W) | $G_{ps}$ (dB) | $\eta_D$ (%) | $P_{out}$ (W) |
|---|---|---|---|---|
| 136–174 | 0.19 | 15.5 | 60.0 | 6.0 |
| 440-520 (2) | 0.15 | 16.3 | 65.0 | 6.4 |
| 760-870 (3) | 0.20 | 15.2 | 58.5 | 6.7 |

**Load Mismatch/Ruggedness**

| Frequency (MHz) | Signal Type | VSWR | $P_{in}$ (W) | Test Voltage | Result |
|---|---|---|---|---|---|
| 520 (1) | CW | > 65:1 at all Phase Angles | 0.12 (3 dB Overdrive) | 10.8 | No Device Degradation |

1. Measured in 520 MHz narrowband test circuit.
2. Measured in 440–520 MHz UHF broadband reference circuit.
3. Measured in 760–870 MHz UHF broadband reference circuit.

### Features

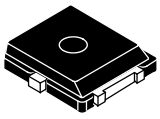
- Characterized for Operation from 136 to 941 MHz
- Unmatched Input and Output Allowing Wide Frequency Range Utilization
- Integrated ESD Protection
- Integrated Stability Enhancements
- Wideband — Full Power Across the Band
- Exceptional Thermal Performance
- Extreme Ruggedness
- High Linearity for: TETRA, SSB
- In Tape and Reel. T1 Suffix = 1,000 Units, 16 mm Tape Width, 7-inch Reel.

### Typical Applications

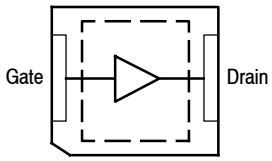
- Output Stage VHF Band Handheld Radio
- Output Stage UHF Band Handheld Radio
- Output Stage for 700–800 MHz Handheld Radio

**AFT05MS006NT1**

**136–941 MHz, 6.0 W, 7.5 V**
**WIDEBAND**
**RF POWER LDMOS TRANSISTOR**



**PLD-1.5W**




Note: The center pad on the backside of the package is the source terminal for the transistor.

**Figure 1. Pin Connections**

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freescale Airfast

**Table 1. Maximum Ratings**

| Rating | Symbol | Value | Unit |
|---|---|---|---|
| Drain-Source Voltage | $V_{DSS}$ | -0.5, +30 | Vdc |
| Gate-Source Voltage | $V_{GS}$ | -6.0, +12 | Vdc |
| Operating Voltage | $V_{DD}$ | 12.5, +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 +150 | °C |
| Total Device Dissipation @ $T_C$ = 25°C<br>Derate above 25°C | $P_D$ | 125<br>1.0 | W<br>W/°C |

**Table 2. Thermal Characteristics**

| Characteristic | Symbol | Value (2,3) | Unit |
|---|---|---|---|
| Thermal Resistance, Junction to Case<br>Case Temperature 79° C, 6.0 W CW, 7.5 Vdc, $I_{DQ}$ = 100 mA, 520 MHz | $R_{\theta JC}$ | 1.0 | °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 | Typ | Max | Unit |
|---|---|---|---|---|---|
| **Off Characteristics** | | | | | |
| Zero Gate Voltage Drain Leakage Current<br>($V_{DS}$ = 30 Vdc, $V_{GS}$ = 0 Vdc) | $I_{DSS}$ | — | — | 10 | μAdc |
| Zero Gate Voltage Drain Leakage Current<br>($V_{DS}$ = 7.5 Vdc, $V_{GS}$ = 0 Vdc) | $I_{DSS}$ | — | — | 2 | μAdc |
| Gate-Source Leakage Current<br>($V_{GS}$ = 5 Vdc, $V_{DS}$ = 0 Vdc) | $I_{GSS}$ | — | — | 600 | nAdc |
| **On Characteristics** | | | | | |
| Gate Threshold Voltage<br>($V_{DS}$ = 10 Vdc, $I_D$ = 78 μAdc) | $V_{GS(th)}$ | 1.8 | 2.2 | 2.6 | Vdc |
| Drain-Source On-Voltage<br>($V_{GS}$ = 10 Vdc, $I_D$ = 0.78 Adc) | $V_{DS(on)}$ | — | 0.15 | — | Vdc |
| Forward Transconductance<br>($V_{DS}$ = 7.5 Vdc, $I_D$ = 4.7 Adc) | $g_{fs}$ | — | 4.4 | — | S |

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** ($T_A$ = 25°C unless otherwise noted) **(continued)**

| Characteristic | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| **Dynamic Characteristics** | | | | | |
| Reverse Transfer Capacitance ($V_{DS}$ = 7.5 Vdc ± 30 mV(rms)ac @ 1 MHz, $V_{GS}$ = 0 Vdc) | $C_{rss}$ | — | 1.7 | — | pF |
| Output Capacitance ($V_{DS}$ = 7.5 Vdc ± 30 mV(rms)ac @ 1 MHz, $V_{GS}$ = 0 Vdc) | $C_{oss}$ | — | 47 | — | pF |
| Input Capacitance ($V_{DS}$ = 7.5 Vdc, $V_{GS}$ = 0 Vdc ± 30 mV(rms)ac @ 1 MHz) | $C_{iss}$ | — | 75 | — | pF |
| **Functional Tests** (In Freescale Test Fixture, 50 ohm system) $V_{DD}$ = 7.5 Vdc, $I_{DQ}$ = 100 mA, $P_{in}$ = 19.5 dBm, f = 520 MHz | | | | | |
| Common-Source Amplifier Output Power | $P_{out}$ | — | 6.0 | — | W |
| Drain Efficiency | $\eta_D$ | — | 73.0 | — | % |

**Load Mismatch/Ruggedness** (In Freescale Test Fixture, 50 ohm system) $I_{DQ}$ = 100 mA

| Frequency (MHz) | Signal Type | VSWR | $P_{in}$ (W) | Test Voltage, $V_{DD}$ | Result |
|---|---|---|---|---|---|
| 520 | CW | > 65:1 at all Phase Angles | 0.12 (3 dB Overdrive) | 10.8 | No Device Degradation |

## TYPICAL CHARACTERISTICS

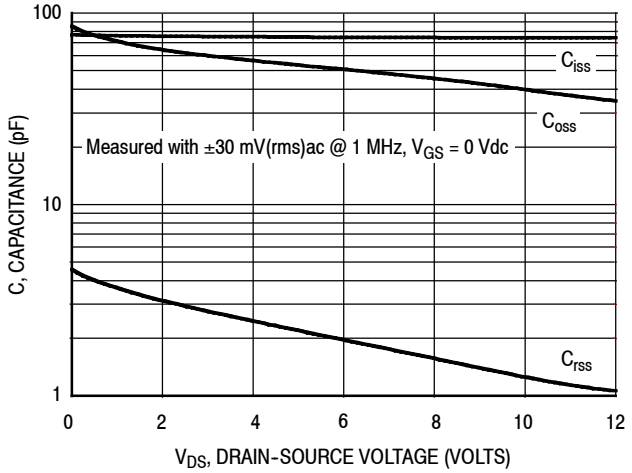
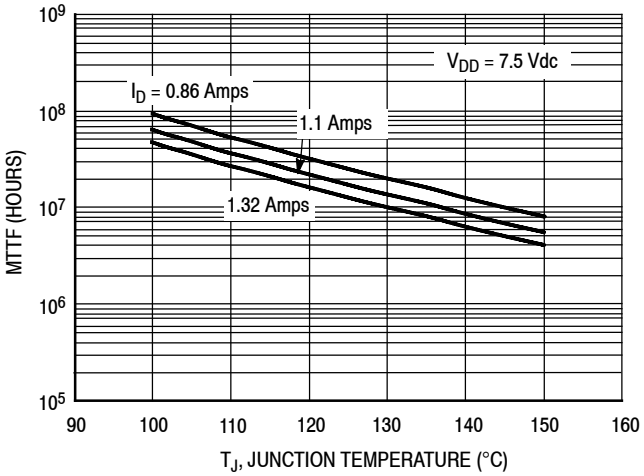



**Figure 2. Capacitance versus Drain-Source Voltage**




**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.

**Figure 3. MTTF versus Junction Temperature — CW**

## 520 MHz NARROWBAND PRODUCTION TEST FIXTURE

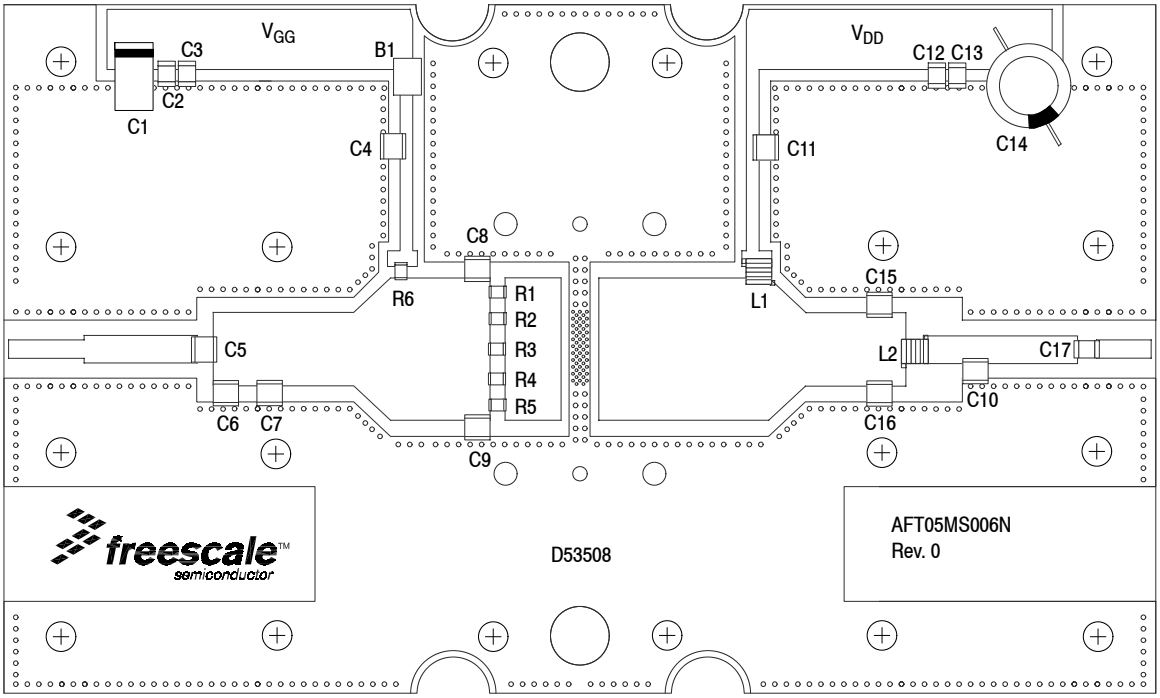



**Figure 4. AFT05MS006NT1 Narrowband Test Circuit Component Layout — 520 MHz**

**Table 6. AFT05MS006NT1 Narrowband Test Circuit Component Designations and Values — 520 MHz**

| Part | Description | Part Number | Manufacturer |
|---|---|---|---|
| B1 | Short RF Bead | 2743019447 | Fair-Rite |
| C1 | 22 μF, 35 V Tantalum Capacitor | T491X226K035AT | Kemet |
| C2, C13 | 0.1 μF Chip Capacitors | CDR33BX104AKWS | AVX |
| C3, C12 | 0.01 μF Chip Capacitors | C0805C103K5RAC | Kemet |
| C4, C11 | 180 pF Chip Capacitors | ATC100B181JT300XT | ATC |
| C5 | 9.1 pF Chip Capacitor | ATC100B9R1CT500XT | ATC |
| C6, C7 | 15 pF Chip Capacitors | ATC100B150JT500XT | ATC |
| C8, C9 | 27 pF Chip Capacitors | ATC100B270JT500XT | ATC |
| C10 | 2.7 pF Chip Capacitor | ATC100B2R7BT500XT | ATC |
| C14 | 330 μF, 35 V Electrolytic Capacitor | MCGPR35V337M10X16-RH | Multicomp |
| C15, C16 | 20 pF Chip Capacitors | ATC100B200JT500XT | ATC |
| C17 | 16 pF Chip Capacitor | ATC100B160JT500XT | ATC |
| L1 | 8.0 nH, 3 Turn Inductor | A03TKLC | Coilcraft |
| L2 | 5 nH, 2 Turn Inductor | A02TKLC | Coilcraft |
| R1, R2, R3, R4, R5 | 1.5 Ω, 1/4 W Chip Resistors | RC1206FR-071R5L | Yageo |
| R6 | 27 Ω, 1/4 W Chip Resistor | CRCW120627R0FKEA | Vishay |
| PCB | Rogers RO4350B, 0.030″, $\varepsilon_r$ = 3.66 | D53508 | MTL |

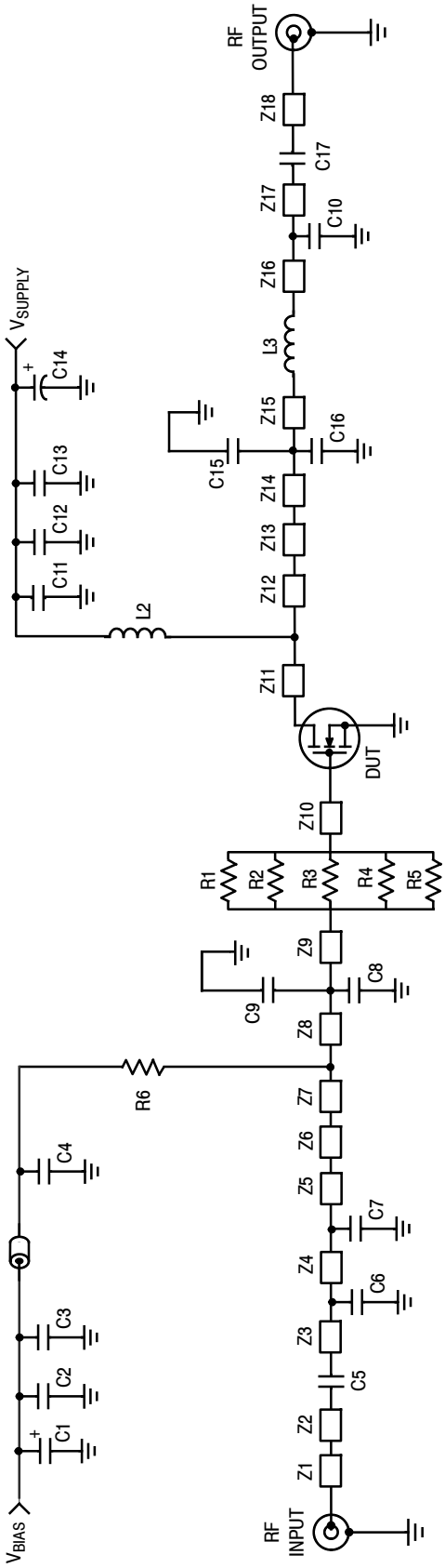



**Figure 5. AFT05MS006NT1 Narrowband Test Circuit Schematic — 520 MHz**

**Table 7. AFT05MS006NT1 Narrowband Test Circuit Microstrips — 520 MHz**

| Microstrip | Description |
|---|---|
| Z1 | 0.328″ × 0.080″ Microstrip |
| Z2 | 0.490″ × 0.120″ Microstrip |
| Z3 | 0.055″ × 0.320″ Microstrip |
| Z4 | 0.190″ × 0.320″ Microstrip |
| Z5 | 0.365″ × 0.320″ Microstrip |
| Z6 | 0.160″ × 0.320″ × 0.620″ Taper Microstrip |
| Z7 | 0.045″ × 0.620″ Microstrip |
| Z8 | 0.332″ × 0.620″ Microstrip |
| Z9 | 0.055″ × 0.620″ Microstrip |

| Microstrip | Description |
|---|---|
| Z10 | 0.243″ × 0.620″ Microstrip |
| Z11 | 0.692″ × 0.620″ Microstrip |
| Z12 | 0.045″ × 0.620″ Microstrip |
| Z13 | 0.162″ × 0.320″ × 0.620″ Taper Microstrip |
| Z14 | 0.319″ × 0.320″ Microstrip |
| Z15 | 0.115″ × 0.320″ Microstrip |
| Z16 | 0.222″ × 0.120″ Microstrip |
| Z17 | 0.443″ × 0.120″ Microstrip |
| Z18 | 0.238″ × 0.080″ Microstrip |

## TYPICAL CHARACTERISTICS — 520 MHz NARROWBAND REFERENCE CIRCUIT

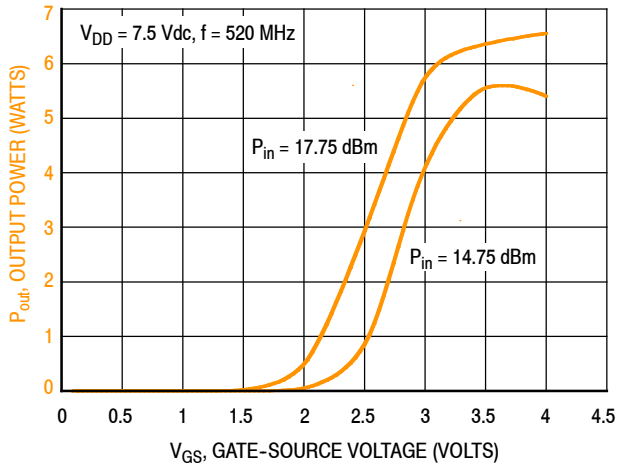



**Figure 6. Output Power versus Gate-Source Voltage**

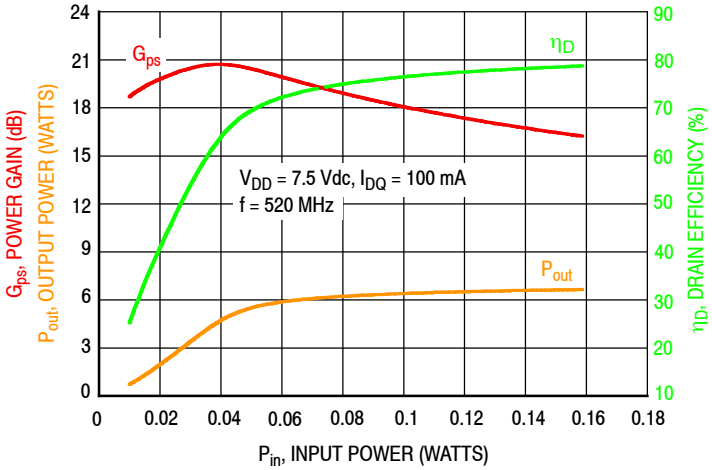



**Figure 7. Power Gain, Drain Efficiency and Output Power versus Input Power**

$V_{DD}$ = 7.5 Vdc, $I_{DQ}$ = 100 mA, $P_{out}$ = 6.0 W Avg.

| f MHz | $Z_{source}$ Ω | $Z_{load}$ Ω |
|---|---|---|
| 520 | 1.14 + j2.28 | 1.78 + j1.71 |

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

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

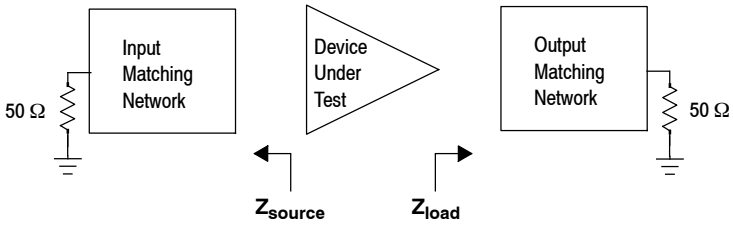



**Figure 8. Narrowband Series Equivalent Source and Load Impedance — 520 MHz**

**Table 8. 440–520 MHz UHF Broadband Performance** (In Freescale Reference Circuit, 50 ohm system)

$V_{DD}$ = 7.5 Volts, $I_{DQ}$ = 100 mA, $T_A$ = 25°C, CW

| Frequency (MHz) | $P_{in}$ (W) | $G_{ps}$ (dB) | $\eta_D$ (%) | $P_{out}$ (W) |
|---|---|---|---|---|
| 440 | 0.13 | 16.7 | 63.7 | 5.9 |
| 480 | 0.08 | 18.6 | 68.5 | 6.1 |
| 520 | 0.11 | 17.5 | 73.1 | 6.0 |

**Table 9. Load Mismatch/Ruggedness** (In Freescale Reference Circuit)

| Frequency (MHz) | Signal Type | VSWR | $P_{in}$ (W) | Test Voltage, $V_{DD}$ | Result |
|---|---|---|---|---|---|
| 480 | CW | > 65:1 at all Phase Angles | 0.19 (3 dB Overdrive) | 10.8 | No Device Degradation |

## 440–520 MHz UHF BROADBAND REFERENCE CIRCUIT

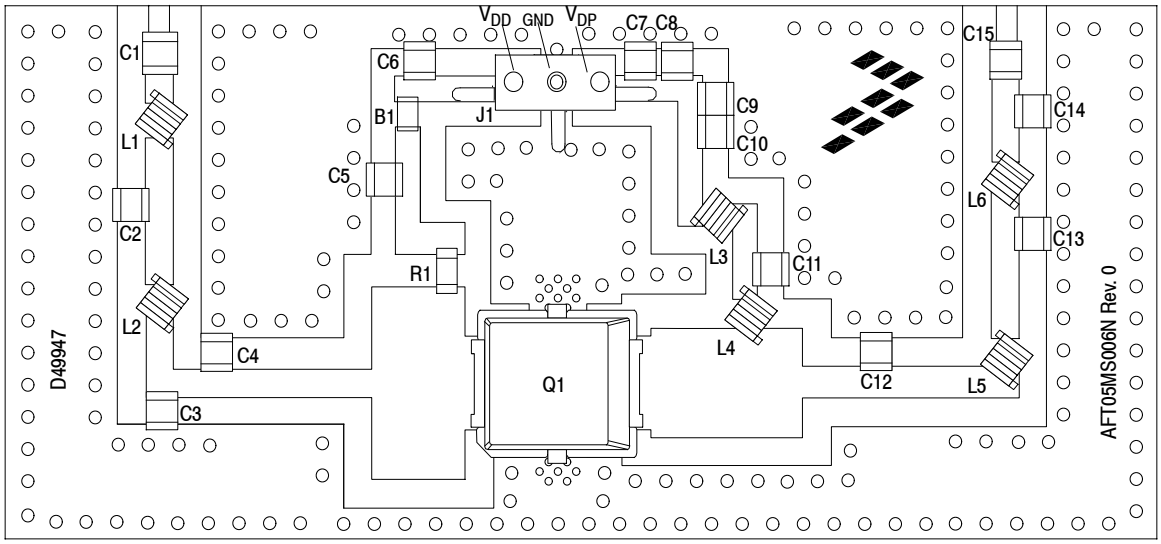



**Figure 9. AFT05MS006NT1 UHF Broadband Reference Circuit Component Layout — 440–520 MHz**

**Table 10. AFT05MS006NT1 UHF Broadband Reference Circuit Component Designations and Values — 440–520 MHz**

| Part | Description | Part Number | Manufacturer |
|---|---|---|---|
| B1 | 30 Ω, 6 A Ferrite Bead | MPZ2012S300A | Fair-Rite |
| C1 | 18 pF Chip Capacitor | ATC600F180JT250XT | ATC |
| C2, C3, C11 | 15 pF Chip Capacitors | ATC600F150JT250XT | ATC |
| C4 | 56 pF Chip Capacitor | ATC600F560JT250XT | ATC |
| C5 | 100 pF Chip Capacitor | ATC600F100JT250XT | ATC |
| C6, C7 | 0.1 μF Chip Capacitors | GRM21BR71H104KA01B | Murata |
| C8 | 0.01 μF Chip Capacitor | GRM21BR72A103KA01B | Murata |
| C9 | 240 pF Chip Capacitor | ATC600F241JT250XT | ATC |
| C10 | 2.2 μF Chip Capacitor | GRM31CR71H225KA88L | Murata |
| C12 | 39 pF Chip Capacitor | ATC600F390JT250XT | ATC |
| C13 | 18 pF Chip Capacitor | ATC600F180JT250XT | ATC |
| C14 | 5.1 pF Chip Capacitor | ATC600F5R1BT250XT | ATC |
| C15 | 100 pF Chip Capacitor | ATC600F101JT250XT | ATC |
| J1 | Right-Angle Breakaway Headers (3 pins) | 22-28-8360 | Molex |
| L1 | 5.5 nH Inductor | 0806SQ5N5 | Coilcraft |
| L2 | 6 nH Inductor | 0806SQ6N0 | Coilcraft |
| L3, L4 | 16.6 nH Inductors | 0908SQ17N | Coilcraft |
| L5 | 1.65 nH Inductor | 0906-2JLC | Coilcraft |
| L6 | 8.1 nH Inductor | 0908SQ8N1 | Coilcraft |
| Q1 | RF Power LDMOS Transistor | AFT05MS006NT1 | Freescale |
| R1 | 20 Ω, 1/4 W Chip Resistor | CRCW120620R0FKEA | Vishay |
| PCB | 0.020″, $\varepsilon_r$ = 4.8, Shengyi S1000-2 | D49947 | MTL |

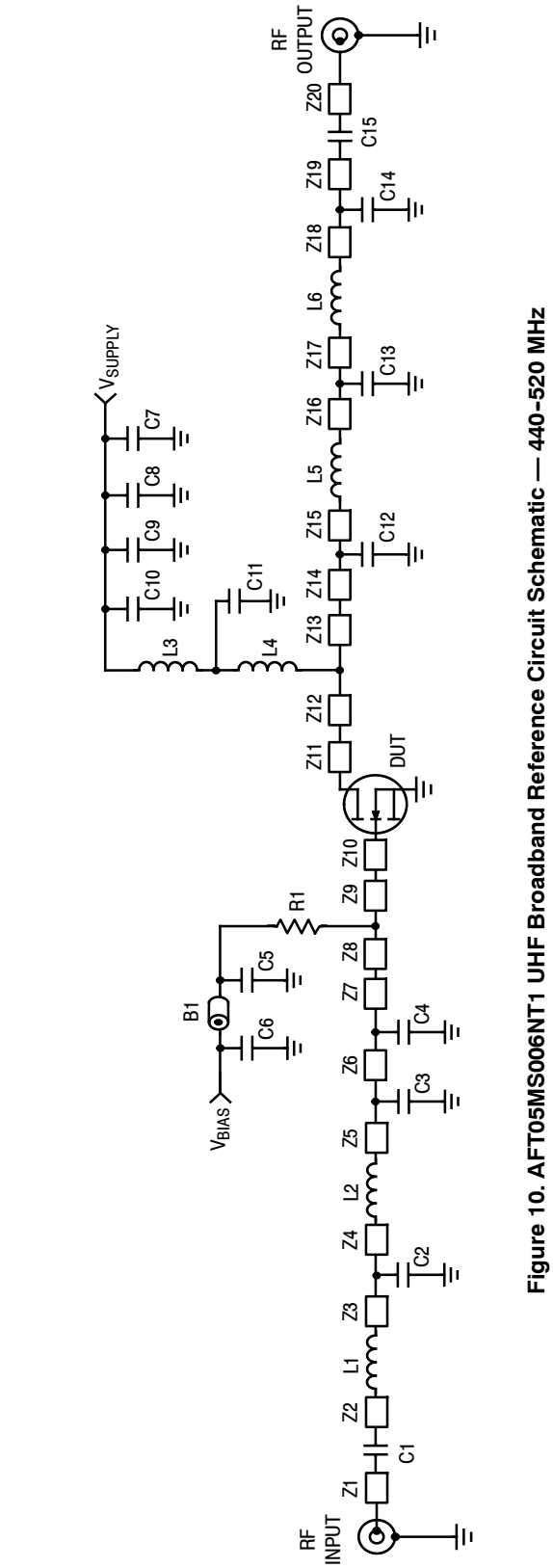



**Figure 10. AFT05MS006NT1 UHF Broadband Reference Circuit Schematic — 440–520 MHz**

**Table 11. AFT05MS006NT1 UHF Broadband Reference Circuit Microstrips — 440–520 MHz**

| Microstrip | Description |
|---|---|
| Z1 | 0.060″ × 0.034″ Microstrip |
| Z2 | 0.052″ × 0.046″ Microstrip |
| Z3 | 0.105″ × 0.046″ Microstrip |
| Z4 | 0.124″ × 0.046″ Microstrip |
| Z5 | 0.127″ × 0.044″ Microstrip |
| Z6 | 0.093″ × 0.044″ Microstrip |
| Z7 | 0.253″ × 0.044″ Microstrip |

| Microstrip | Description |
|---|---|
| Z8 | 0.123″ × 0.300″ Microstrip |
| Z9 | 0.029″ × 0.300″ Microstrip |
| Z10 | 0.070″ × 0.146″ Microstrip |
| Z11 | 0.070″ × 0.146″ Microstrip |
| Z12 | 0.153″ × 0.170″ Microstrip |
| Z13 | 0.094″ × 0.170″ Microstrip |
| Z14 | 0.120″ × 0.049″ Microstrip |

| Microstrip | Description |
|---|---|
| Z15 | 0.235″ × 0.049″ Microstrip |
| Z16 | 0.163″ × 0.046″ Microstrip |
| Z17 | 0.065″ × 0.046″ Microstrip |
| Z18 | 0.079″ × 0.044″ Microstrip |
| Z19 | 0.056″ × 0.044″ Microstrip |
| Z20 | 0.060″ × 0.034″ Microstrip |

## TYPICAL CHARACTERISTICS — 440–520 MHz UHF BROADBAND REFERENCE CIRCUIT

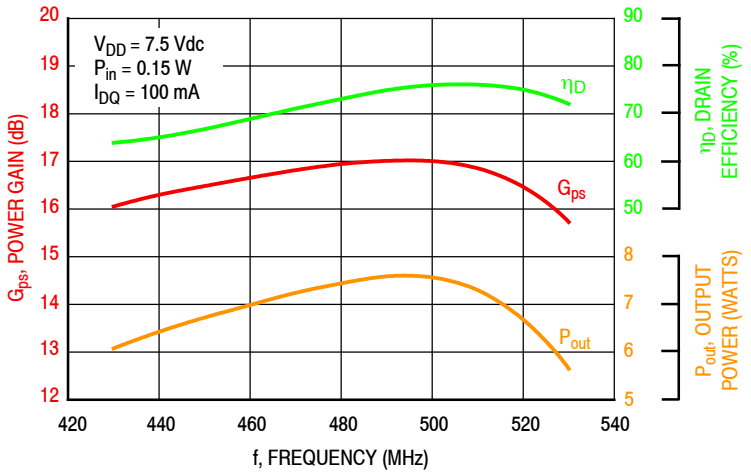



**Figure 11. Power Gain, Drain Efficiency and Output Power versus Frequency at a Constant Input Power**

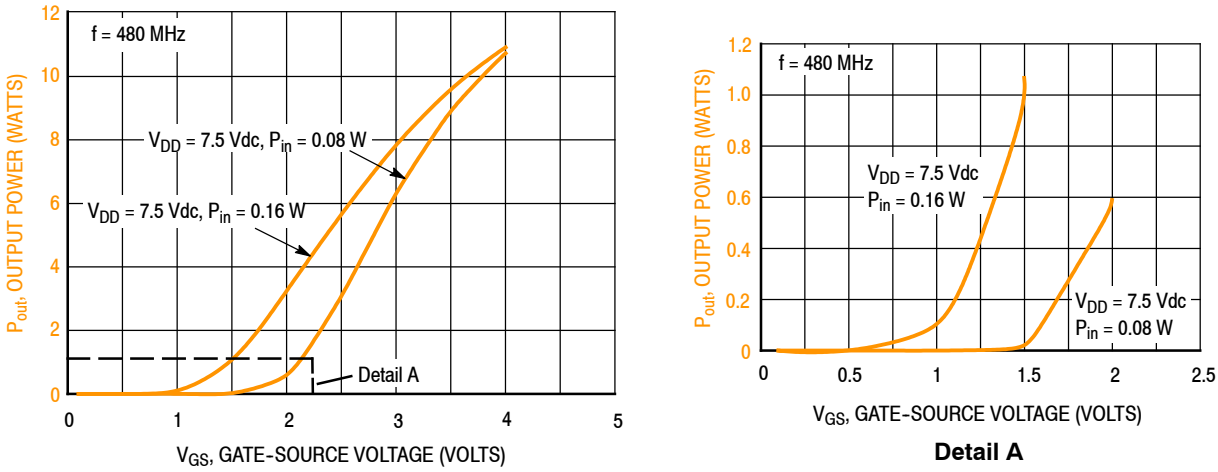



**Figure 12. Output Power versus Gate-Source Voltage**

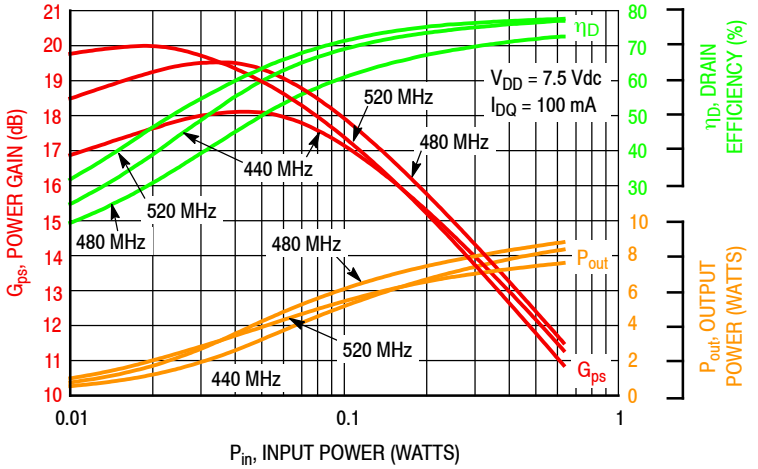
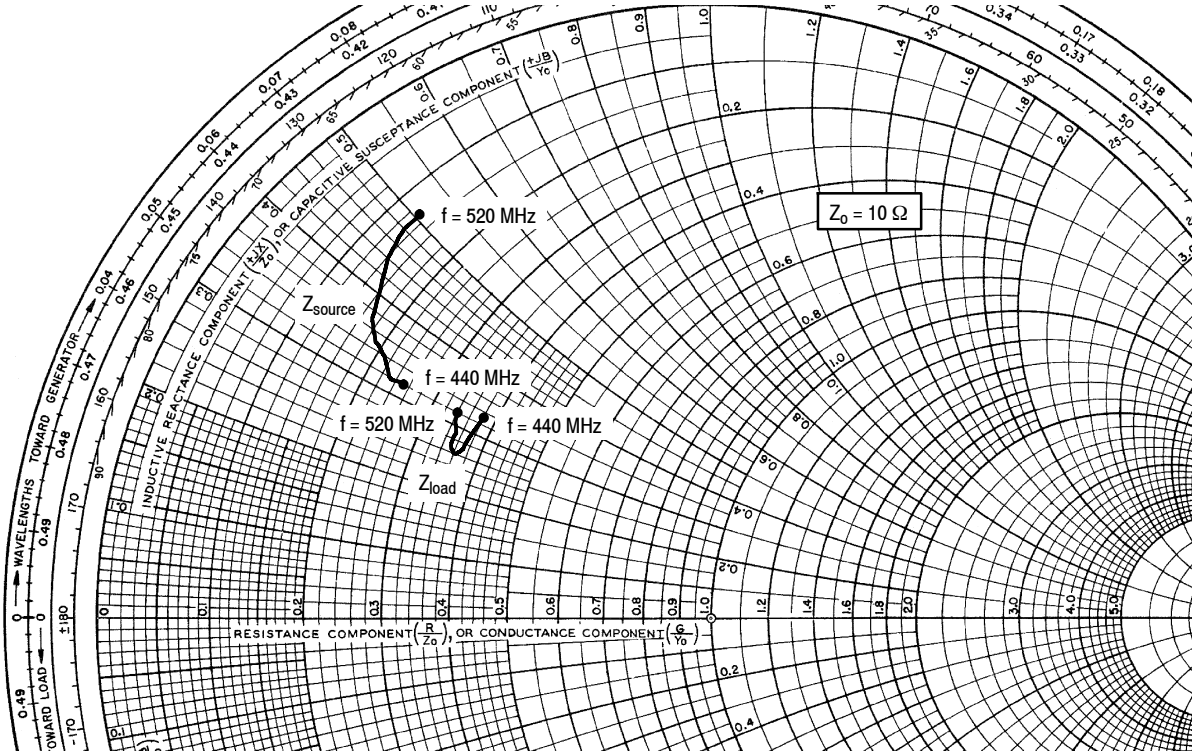



**Figure 13. Power Gain, Drain Efficiency and Output Power versus Input Power and Frequency**




$V_{DD}$ = 7.5 Vdc, $I_{DQ}$ = 100 mA, $P_{out}$ = 6 W Avg.

| f MHz | $Z_{source}$ Ω | $Z_{load}$ Ω |
|---|---|---|
| 440 | 2.46 + j3.15 | 3.80 + j3.27 |
| 450 | 2.30 + j3.23 | 3.70 + j2.77 |
| 460 | 2.11 + j3.35 | 3.69 + j2.66 |
| 470 | 1.90 + j3.48 | 3.60 + j2.61 |
| 480 | 1.71 + j3.72 | 3.54 + j2.68 |
| 490 | 1.56 + j4.01 | 3.50 + j2.78 |
| 500 | 1.43 + j4.37 | 3.46 + j2.92 |
| 510 | 1.33 + j4.75 | 3.42 + j3.09 |
| 520 | 1.28 + j5.10 | 3.37 + j3.22 |

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

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

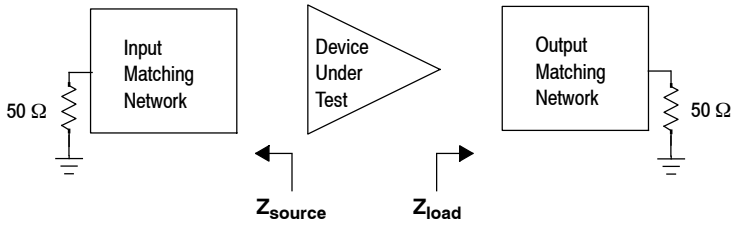



**Figure 14. UHF Broadband Series Equivalent Source and Load Impedance — 440–520 MHz**

**Table 12. 760–870 MHz UHF Broadband Performance** (In Freescale Reference Circuit, 50 ohm system)

$V_{DD}$ = 7.5 Volts, $I_{DQ}$ = 100 mA, $T_A$ = 25°C, CW

| Frequency (MHz) | $P_{in}$ (W) | $G_{ps}$ (dB) | $\eta_D$ (%) | $P_{out}$ (W) |
|---|---|---|---|---|
| 760 | 0.12 | 16.6 | 50.4 | 6.0 |
| 815 | 0.13 | 16.1 | 58.1 | 6.0 |
| 870 | 0.16 | 15.0 | 60.0 | 6.0 |

**Table 13. Load Mismatch/Ruggedness** (In Freescale Reference Circuit)

| Frequency (MHz) | Signal Type | VSWR | $P_{in}$ (W) | Test Voltage, $V_{DD}$ | Result |
|---|---|---|---|---|---|
| 815 | CW | > 65:1 at all Phase Angles | 0.4 (3 dB Overdrive) | 9.0 | No Device Degradation |

## 760–870 MHz UHF BROADBAND REFERENCE CIRCUIT

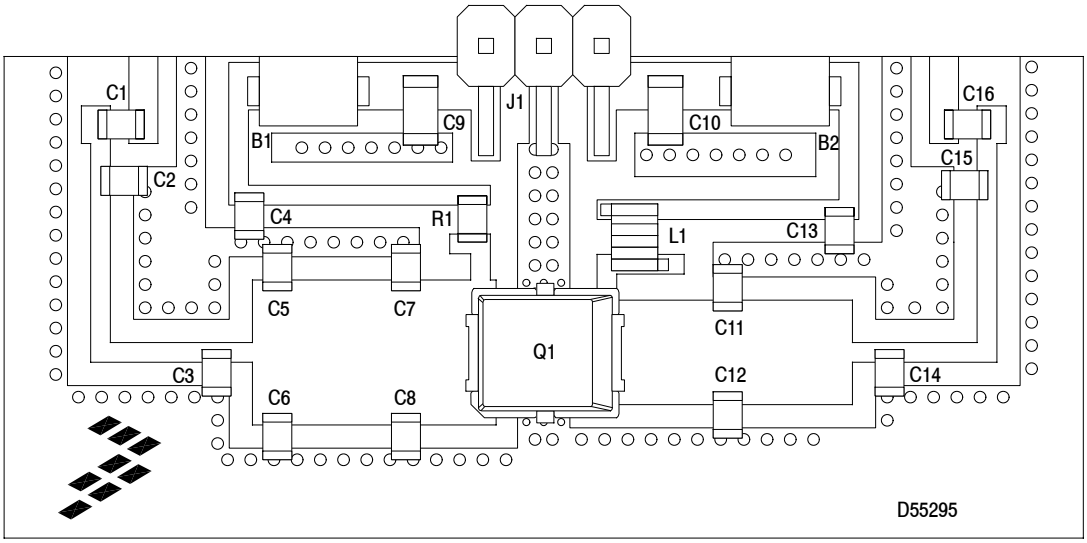



**Figure 15. AFT05MS006NT1 UHF Broadband Reference Circuit Component Layout — 760–870 MHz**

**Table 14. AFT05MS006NT1 UHF Broadband Reference Circuit Component Designations and Values — 760–870 MHz**

| Part | Description | Part Number | Manufacturer |
|---|---|---|---|
| B1, B2 | RF Beads | 2743019447 | Fair–Rite |
| C1, C5, C6, C7, C8 | 20 pF Chip Capacitors | GQM2195C2E200GB12D | Murata |
| C2 | 8.2 pF Chip Capacitor | GQM2195C2E8R2BB12D | Murata |
| C3 | 10 pF Chip Capacitor | GQM2195C2E100FB12D | Murata |
| C4, C13 | 56 pF Chip Capacitors | GQM2195C2E560GB12D | Murata |
| C9 | 1 μF Chip Capacitor | GRM31MR71H105KA88L | Murata |
| C10 | 10 μF Chip Capacitor | GRM31CR61H106KA12L | Murata |
| C11, C12 | 15 pF Chip Capacitors | GQM2195C2E150FB12D | Murata |
| C14, C15 | 5.6 pF Chip Capacitors | GQM2195C2E5R6BB12D | Murata |
| C16 | 100 pF Chip Capacitor | GQM2195C2E101GB12D | Murata |
| J1 | Right–Angle Breakaway Headers (3 pins) | 22–28–8360 | Molex |
| L1 | 22 nH Air Core Inductor | 0908SQ–22NJL | Coilcraft |
| Q1 | RF Power LDMOS Transistor | AFT05MS006NT1 | Freescale |
| R1 | 200 Ω, 1/8 W Chip Resistor | CRCW0805200RJNEA | Vishay |
| PCB | 0.020″, $\varepsilon_r$ = 4.8, FR4 | D55295 | MTL |

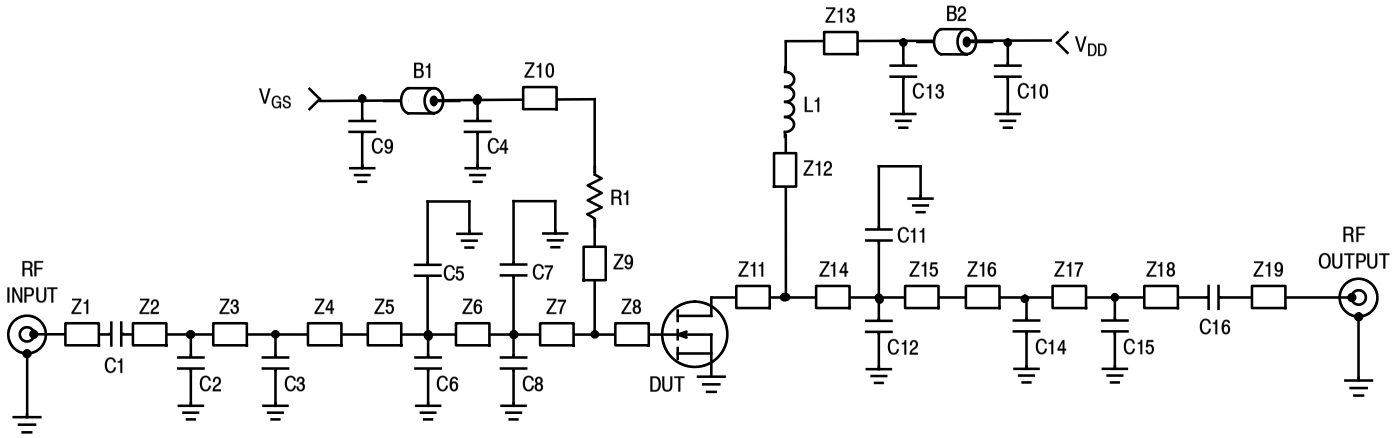



**Figure 16. AFT05MS006NT1 UHF Broadband Reference Circuit Schematic — 760-870 MHz**

**Table 15. AFT05MS006NT1 UHF Broadband Reference Circuit Microstrips — 760-870 MHz**

| Microstrip | Description |
|---|---|
| Z1 | 0.150″ × 0.050″ Microstrip |
| Z2 | 0.155″ × 0.034″ Microstrip |
| Z3 | 0.430″ × 0.034″ Microstrip |
| Z4 | 0.065″ × 0.034″ Microstrip |
| Z5 | 0.040″ × 0.250″ Microstrip |
| Z6 | 0.222″ × 0.250″ Microstrip |
| Z7 | 0.130″ × 0.250″ Microstrip |

| Microstrip | Description |
|---|---|
| Z8 | 0.027″ × 0.250″ Microstrip |
| Z9 | 0.066″ × 0.034″ Microstrip |
| Z10 | 0.386″ × 0.034″ Microstrip |
| Z11 | 0.027″ × 0.180″ Microstrip |
| Z12 | 0.160″ × 0.034″ Microstrip |
| Z13 | 0.350″ × 0.034″ Microstrip |
| Z14 | 0.210″ × 0.180″ Microstrip |

| Microstrip | Description |
|---|---|
| Z15 | 0.215″ × 0.180″ Microstrip |
| Z16 | 0.065″ × 0.034″ Microstrip |
| Z17 | 0.430″ × 0.034″ Microstrip |
| Z18 | 0.120″ × 0.034″ Microstrip |
| Z19 | 0.150″ × 0.050″ Microstrip |

## TYPICAL CHARACTERISTICS — 760–870 MHz UHF BROADBAND REFERENCE CIRCUIT

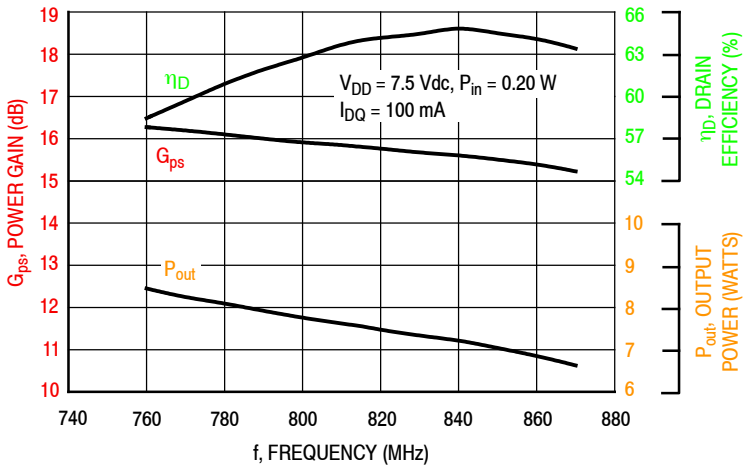



**Figure 17. Power Gain, Drain Efficiency and Output Power versus Frequency at a Constant Input Power**

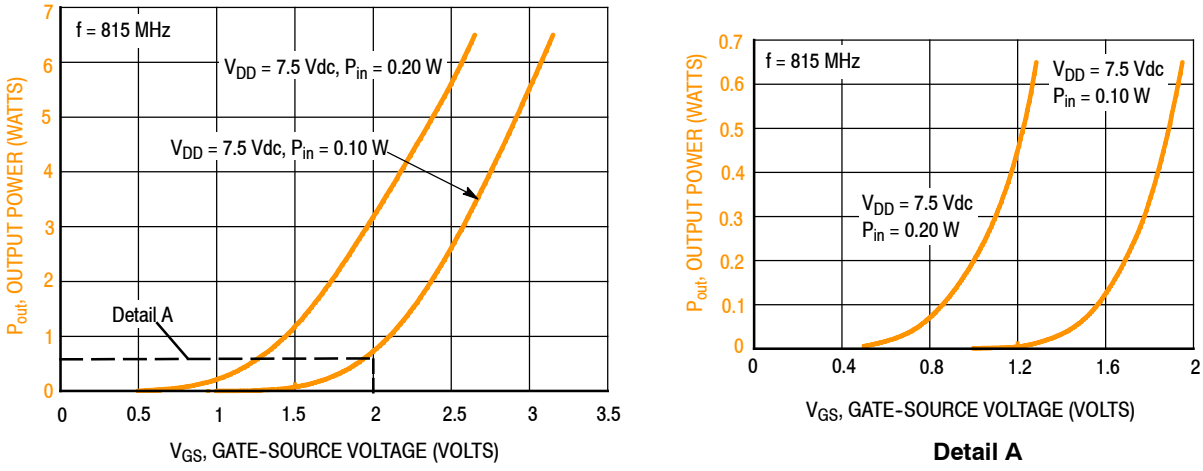



**Figure 18. Output Power versus Gate-Source Voltage**

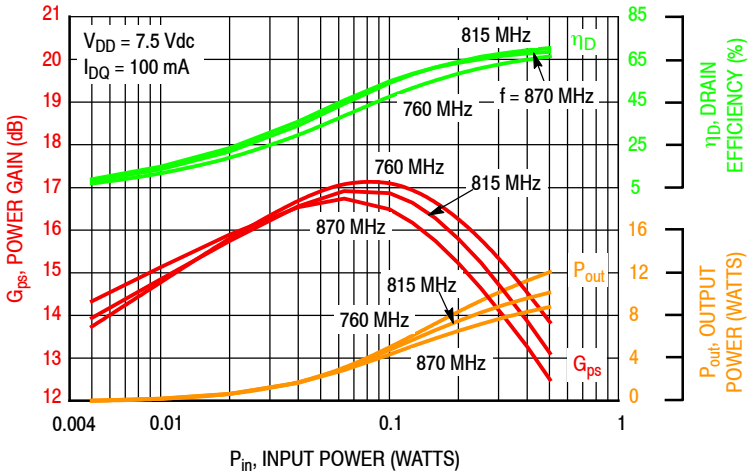
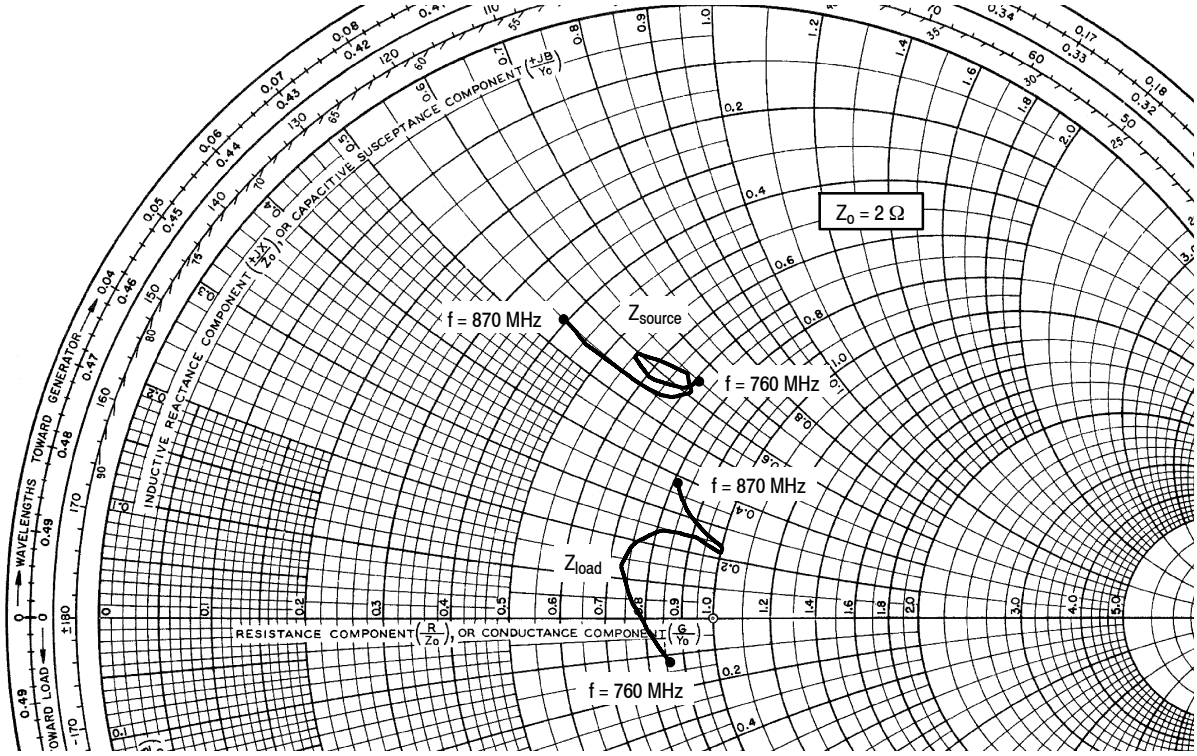



**Figure 19. Power Gain, Drain Efficiency and Output Power versus Input Power and Frequency**

## 760–870 MHz UHF BROADBAND REFERENCE CIRCUIT




$V_{DD}$ = 7.5 Vdc, $I_{DQ}$ = 100 mA, $P_{out}$ = 6 W Avg.

| f MHz | $Z_{source}$ Ω | $Z_{load}$ Ω |
|---|---|---|
| 760 | 1.42 + j1.30 | 1.72 - j0.24 |
| 770 | 1.37 + j1.21 | 1.65 - j0.11 |
| 780 | 1.21 + j1.16 | 1.53 + j0.08 |
| 790 | 1.10 + j1.17 | 1.46 + j0.25 |
| 800 | 1.09 + j1.19 | 1.49 + j0.38 |
| 810 | 1.17 + j1.24 | 1.61 + j0.47 |
| 820 | 1.33 + j1.27 | 1.82 + j0.50 |
| 830 | 1.42 + j1.22 | 1.99 + j0.46 |
| 840 | 1.35 + j1.14 | 1.99 + j0.48 |
| 850 | 1.12 + j1.10 | 1.84 + j0.56 |
| 860 | 0.90 + j1.08 | 1.69 + j0.66 |
| 870 | 0.77 + j1.10 | 1.62 + j0.73 |

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

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

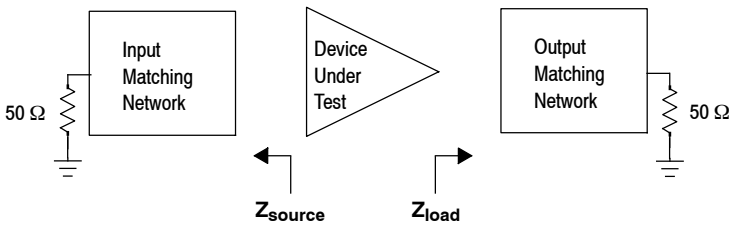



**Figure 20. UHF Broadband Series Equivalent Source and Load Impedance — 760–870 MHz**

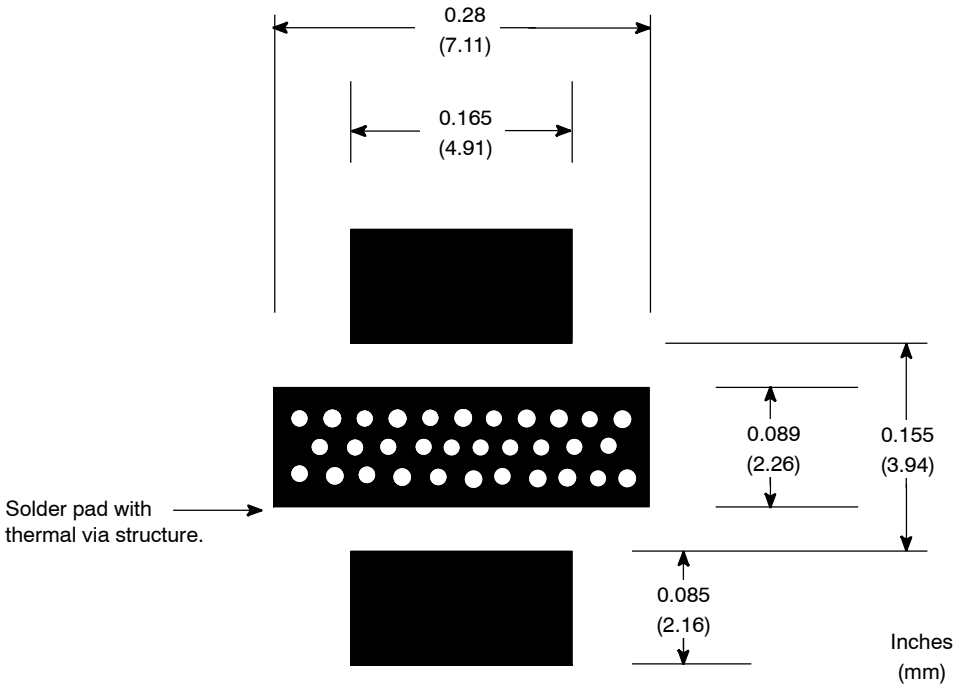



**Figure 21. PCB Pad Layout for PLD-1.5W**

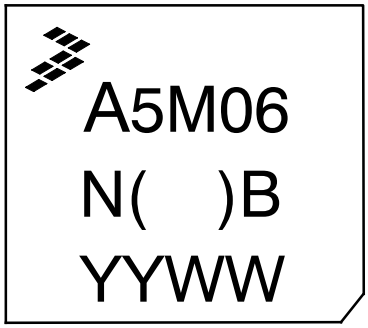
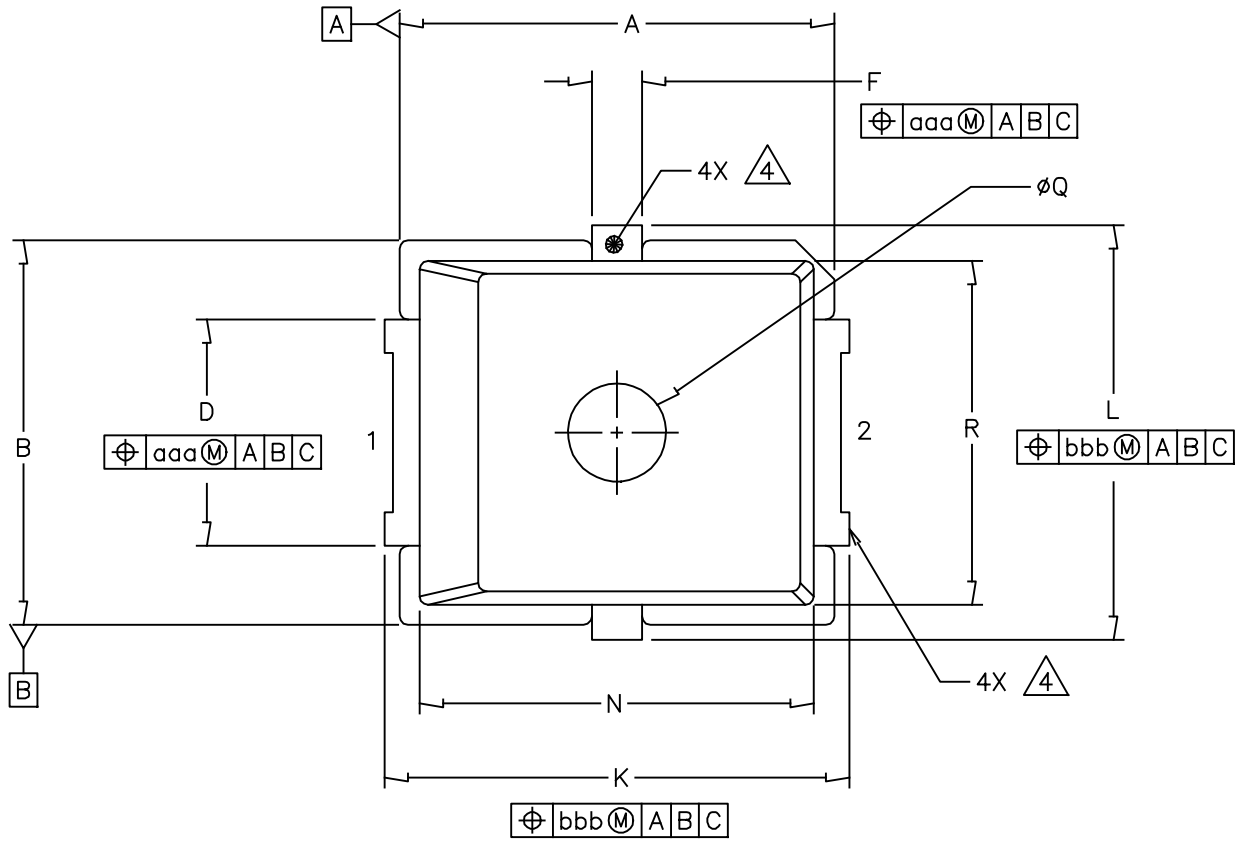
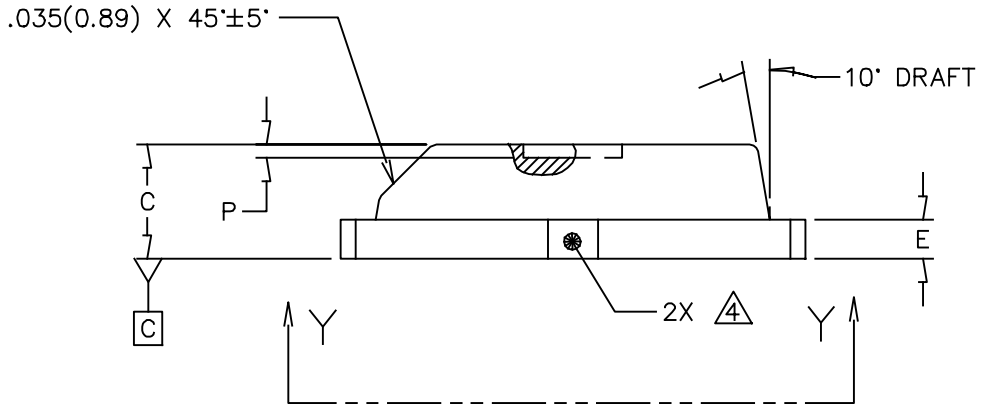


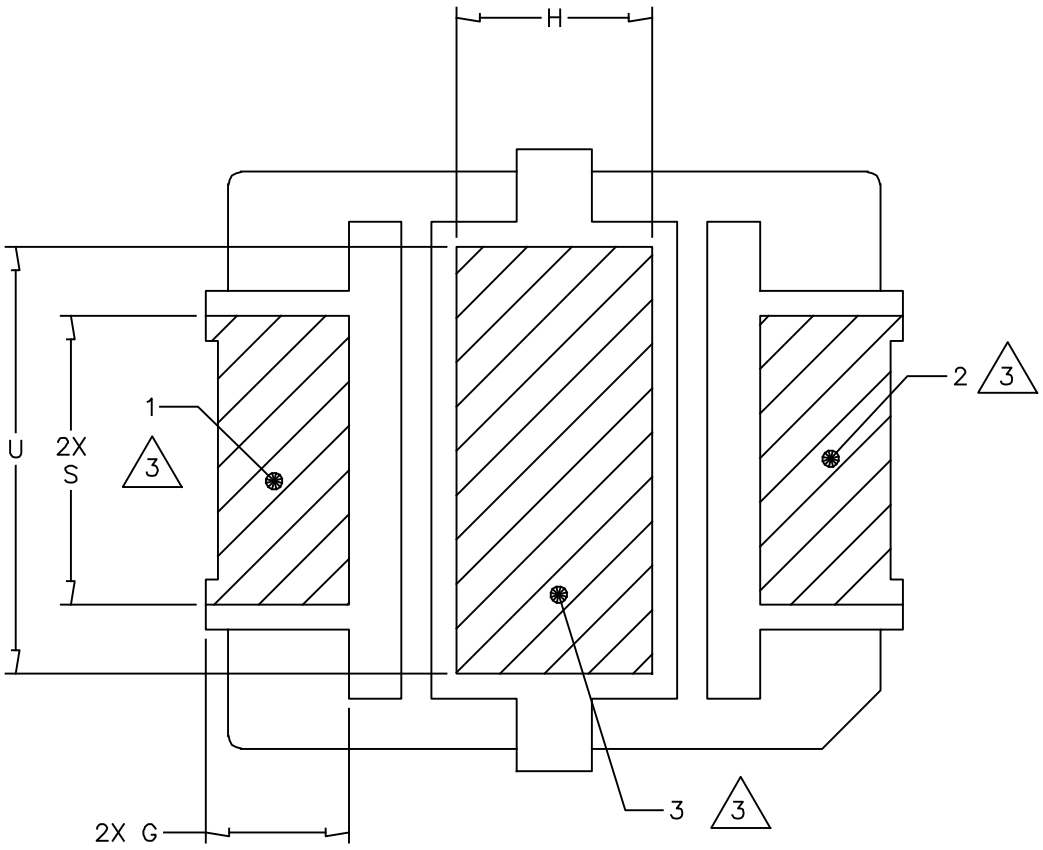

**Figure 22. Product Marking**

## PACKAGE DIMENSIONS




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|---|---|---|
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| | CASE NUMBER: 2297–01 | 14 JUN 2012 |
| | STANDARD: NON–JEDEC | |




VIEW Y–Y

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| | CASE NUMBER: 2297–01 | 14 JUN 2012 |
| | STANDARD: NON–JEDEC | |

NOTES:

1. CONTROLLING DIMENSION: INCH.
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M–1994.
3. HATCHING REPRESENTS THE EXPOSED AND SOLDERABLE AREA. DIMENSIONS G, S, H AND U REPRESENT THE VALUES BETWEEN THE TWO OPPOSITE POINTS ALONG THE EDGES OF EXPOSED AREA.
4. THESE SURFACES ARE NOT PART OF THE SOLDERABLE SURFACES AND MAY REMAIN UNPLATED.

| DIM | INCH MIN | INCH MAX | MILLIMETER MIN | MILLIMETER MAX | DIM | INCH MIN | INCH MAX | MILLIMETER MIN | MILLIMETER MAX |
|---|---|---|---|---|---|---|---|---|---|
| A | .255 | .265 | 6.48 | 6.73 | Q | .055 | .063 | 1.40 | 1.60 |
| B | .225 | .235 | 5.72 | 5.97 | R | .200 | .210 | 5.08 | 5.33 |
| C | .065 | .072 | 1.65 | 1.83 | S | .110 | – | 2.79 | – |
| D | .130 | .150 | 3.30 | 3.81 | U | .156 | – | 3.96 | – |
| E | .021 | .026 | 0.53 | 0.66 | aaa | | .004 | | 0.10 |
| F | .026 | .044 | 0.66 | 1.12 | bbb | | .005 | | 0.13 |
| G | .038 | – | 0.97 | – | | | | | |
| H | .069 | – | 1.75 | – | | | | | |
| J | .160 | .180 | 4.06 | 4.57 | | | | | |
| K | .273 | .285 | 6.93 | 7.24 | | | | | |
| L | .245 | .255 | 6.22 | 6.48 | | | | | |
| N | .230 | .240 | 5.84 | 6.10 | | | | | |
| P | .000 | .008 | 0.00 | 0.20 | | | | | |

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|---|---|---|
| PLD–1.5W | CASE NUMBER: 2297–01 | 14 JUN 2012 |
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## PRODUCT DOCUMENTATION, SOFTWARE AND TOOLS

Refer to the following documents, software and tools to aid your design process.

**Application Notes**

- AN1907: Solder Reflow Attach Method for High Power RF Devices in Over-Molded 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

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

## REVISION HISTORY

The following table summarizes revisions to this document.

| Revision | Date | Description |
|---|---|---|
| 0 | Feb. 2014 | • Initial Release of Data Sheet |

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