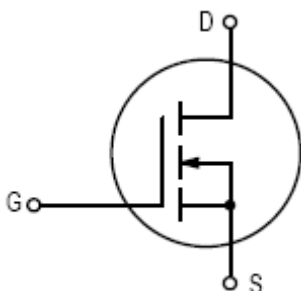


Linear RF Power FET 30W, to 175MHz, 50V

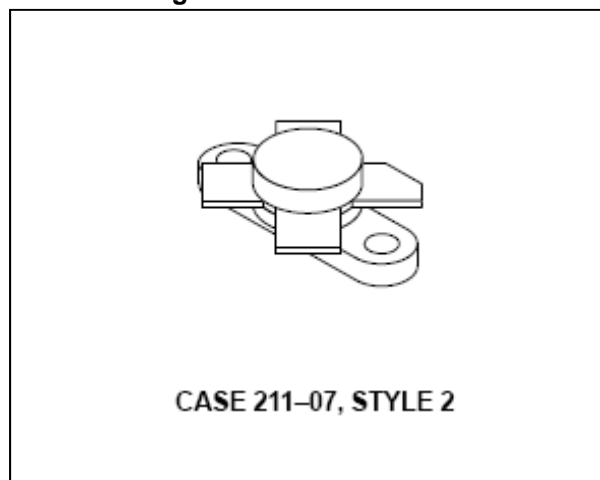
M/A-COM Products
Released - Rev. 062907

Designed for power amplifier applications in industrial, commercial and amateur radio equipment to 175MHz.

- Superior high order IMD
IMD(d3) (30W PEP): -35 dB (Typ.)
IMD(d11) (30W PEP): -60 dB (Typ.)
- Specified 50V, 30MHz characteristics:
Output power: 30W
Gain: 18dB (Typ.)
Efficiency: 40% (Typ.)
- 100% tested for load mismatch at all phase angles with 30:1 VSWR
- Lower reverse transfer capacitance (3.0 pF typ.)



Product Image



MAXIMUM RATINGS

| Rating | Symbol | Value | Unit |
|--|-----------|-------------|------------------------------|
| Drain-Source Voltage | V_{DSS} | 120 | Vdc |
| Drain-Gate Voltage | V_{DGO} | 120 | Vdc |
| Gate-Source Voltage | V_{GS} | ± 40 | Vdc |
| Drain Current — Continuous | I_D | 6.0 | Adc |
| Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C | P_D | 115 0.66 | Watts W/ $^\circ\text{C}$ |
| Storage Temperature Range | T_{stg} | -65 to +150 | $^\circ\text{C}$ |
| Operating Junction Temperature | T_J | 200 | $^\circ\text{C}$ |

THERMAL CHARACTERISTICS

| Characteristic | Symbol | Max | Unit |
|--------------------------------------|-----------------|------|--------------------|
| Thermal Resistance, Junction to Case | $R_{\theta JC}$ | 1.52 | $^\circ\text{C/W}$ |

NOTE – CAUTION – MOS devices are susceptible to damage from electrostatic charge. Reasonable precautions in handling and packaging MOS devices should be observed.

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ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$ unless otherwise noted.)

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

OFF CHARACTERISTICS

| | | | | | |
|---|---------------|-----|---|-----|------------------|
| Drain–Source Breakdown Voltage ($V_{GS} = 0$, $I_D = 10$ mA) | $V_{(BR)DSS}$ | 125 | — | — | Vdc |
| Zero Gate Voltage Drain Current ($V_{DS} = 50$ V, $V_{GS} = 0$) | I_{DSS} | — | — | 1.0 | mA _{dc} |
| Gate–Body Leakage Current ($V_{GS} = 20$ V, $V_{DS} = 0$) | I_{GSS} | — | — | 100 | nA _{dc} |

ON CHARACTERISTICS

| | | | | | |
|--|--------------|-----|-----|-----|------|
| Gate Threshold Voltage ($V_{DS} = 10$ V, $I_D = 10$ mA) | $V_{GS(th)}$ | 1.0 | 2.5 | 5.0 | Vdc |
| Drain–Source On–Voltage ($V_{GS} = 10$ V, $I_D = 2.5$ A) | $V_{DS(on)}$ | 1.0 | 3.0 | 5.0 | Vdc |
| Forward Transconductance ($V_{DS} = 10$ V, $I_D = 2.5$ A) | g_{fs} | 0.8 | 1.2 | — | mhos |

DYNAMIC CHARACTERISTICS

| | | | | | |
|---|-----------|---|-----|---|----|
| Input Capacitance ($V_{DS} = 50$ V, $V_{GS} = 0$, $f = 1.0$ MHz) | C_{iss} | — | 62 | — | pF |
| Output Capacitance ($V_{DS} = 50$ V, $V_{GS} = 0$, $f = 1.0$ MHz) | C_{oss} | — | 35 | — | pF |
| Reverse Transfer Capacitance ($V_{DS} = 50$ V, $V_{GS} = 0$, $f = 1.0$ MHz) | C_{rss} | — | 3.0 | — | pF |

FUNCTIONAL TESTS (SSB)

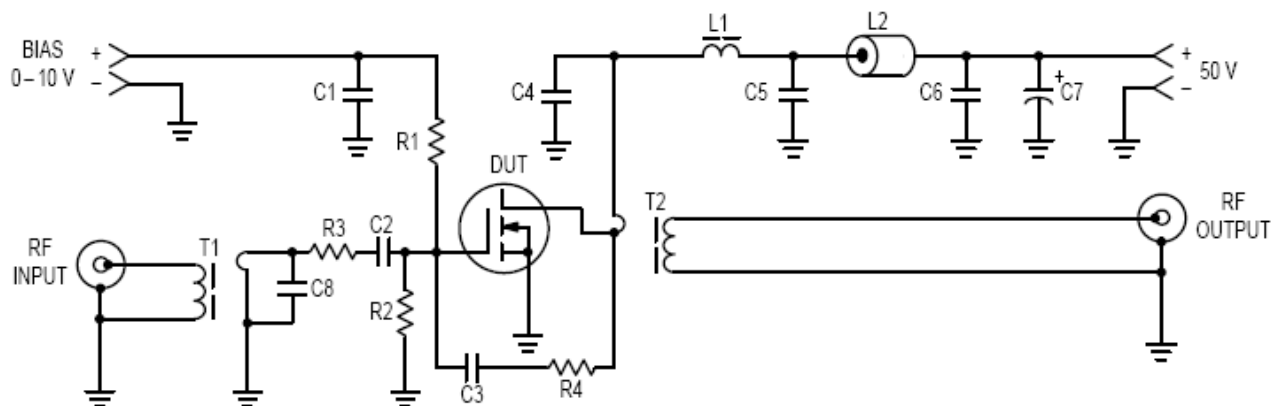
| | | | | | |
|---|-----------------------------------|--------------------------------|------------|--------|----|
| Common Source Amplifier Power Gain ($V_{DD} = 50$ V, $P_{out} = 30$ W (PEP), $I_{DQ} = 100$ mA) | (30 MHz) (175 MHz) G_{ps} | — — | 18 15 | — — | dB |
| Drain Efficiency ($V_{DD} = 50$ V, $f = 30$ MHz, $I_{DQ} = 100$ mA) | (30 W PEP) (30 W CW) η | — — | 40 50 | — — | % |
| Intermodulation Distortion ($V_{DD} = 50$ V, $P_{out} = 30$ W (PEP), $f = 30$; 30.001 MHz, $I_{DQ} = 100$ mA) | $IMD_{(d3)}$ $IMD_{(d11)}$ | — — | –35 –60 | — — | dB |
| Load Mismatch ($V_{DD} = 50$ V, $P_{out} = 30$ W (PEP), $f = 30$; 30.001 MHz, $I_{DQ} = 100$ mA, VSWR 30:1 at all Phase Angles) | ψ | No Degradation in Output Power | | | |

CLASS A PERFORMANCE

| | | | | | |
|--|---|-------------|------------------|-------------|----|
| Intermodulation Distortion (1) and Power Gain ($V_{DD} = 50$ V, $P_{out} = 10$ W (PEP), $f_1 = 30$ MHz, $f_2 = 30.001$ MHz, $I_{DQ} = 1.0$ A) | G_{ps} $IMD_{(d3)}$ $IMD_{(d9-13)}$ | — — — | 20 –50 –70 | — — — | dB |
|--|---|-------------|------------------|-------------|----|

NOTE:

1. To MIL–STD–1311 Version A, Test Method 2204B, Two Tone, Reference Each Tone.



C1, C2, C3, C4, C5, C6 — 0.1 μ F Ceramic Chip or Equivalent
C7 — 10 μ F, 100 V Electrolytic
C8 — 100 pF Dipped Mica
L1 — VK200 20/4B Ferrite Choke or Equivalent (3.0 μ H)
L2 — Ferrite Bead(s), 2.0 μ H

R1, R2 — 200 Ω , 1/2 W Carbon
R3 — 4.7 Ω , 1/2 W Carbon
R4 — 470 Ω , 1.0 W Carbon
T1 — 4:1 Impedance Transformer
T2 — 1:2 Impedance Transformer

Figure 1. 2.0 to 50 MHz Broadband Test Circuit

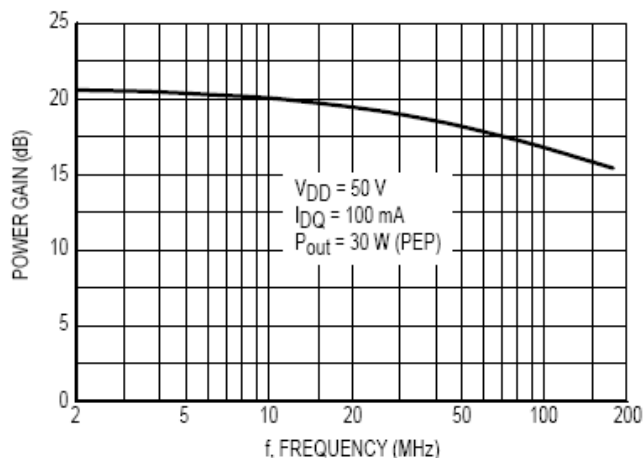


Figure 2. Power Gain versus Frequency

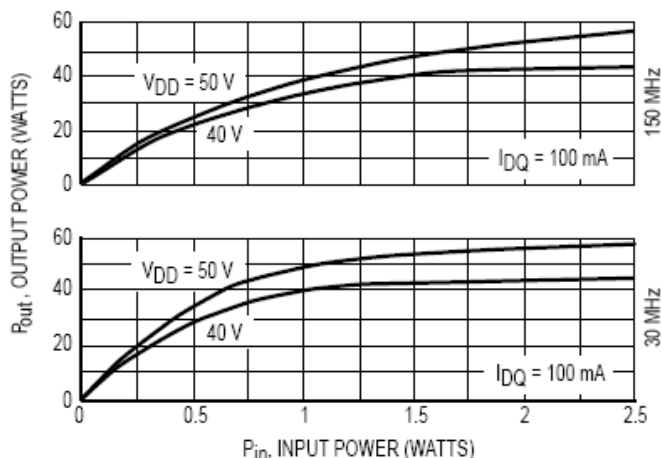


Figure 3. Output Power versus Input Power

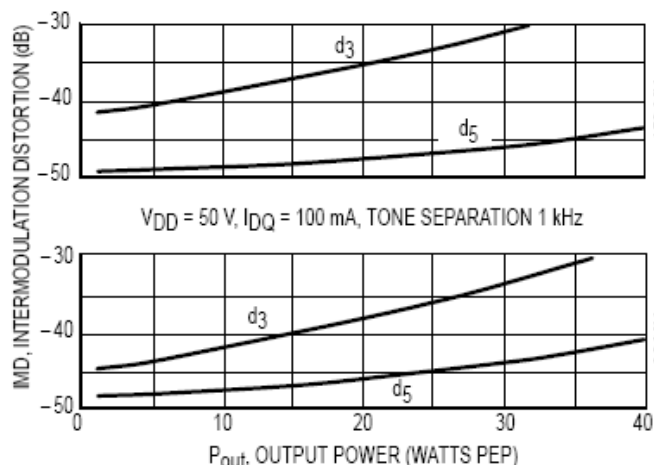


Figure 4. IMD versus P_{out}

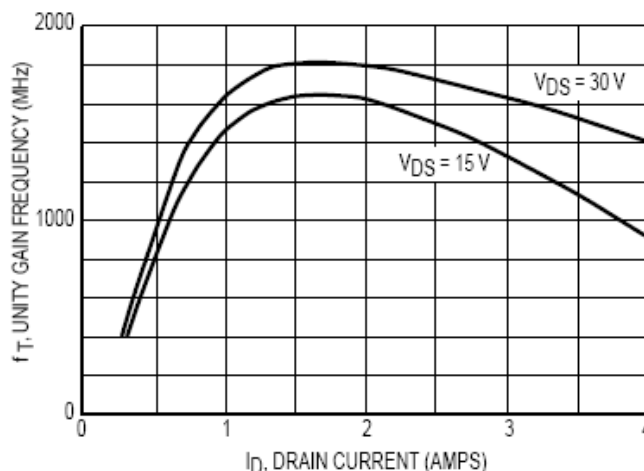


Figure 5. Common Source Unity Gain Frequency versus Drain Current

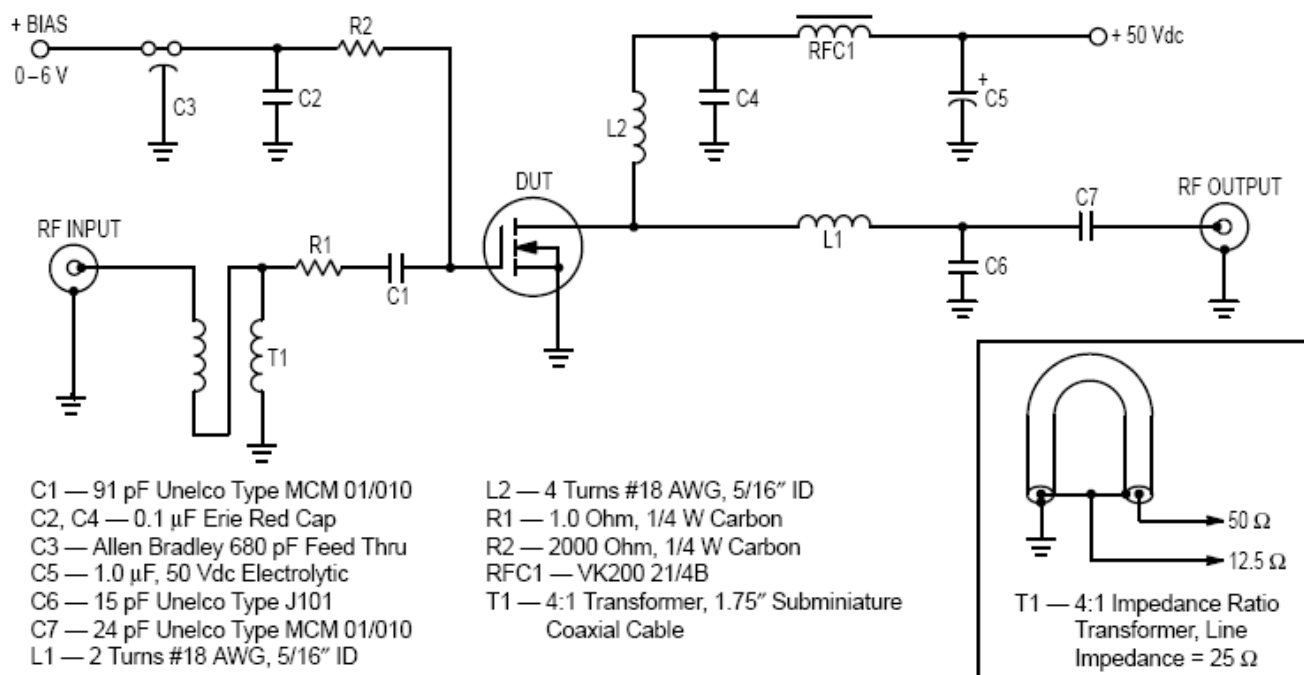


Figure 6. 150 MHz Test Circuit

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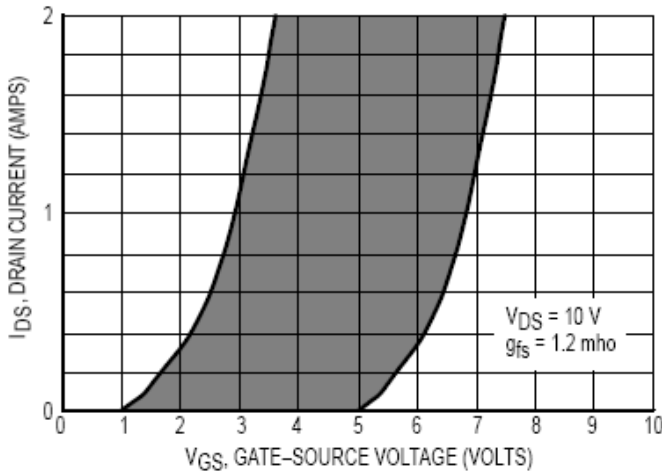


Figure 7. Gate Voltage versus Drain Current

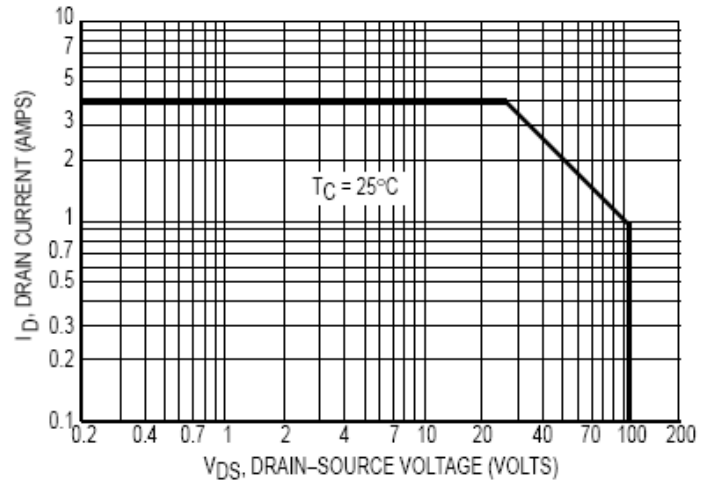


Figure 8. DC Safe Operating Area (SOA)

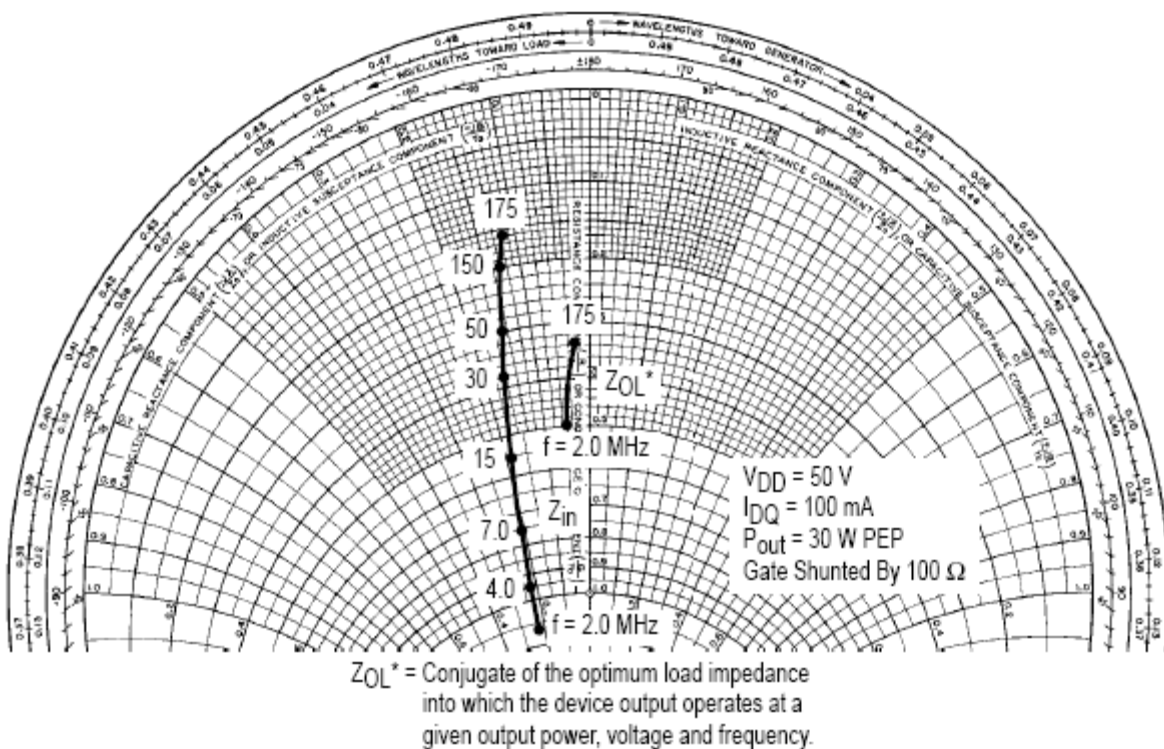


Figure 9. Impedance Coordinates — 50 Ohm Characteristic Impedance

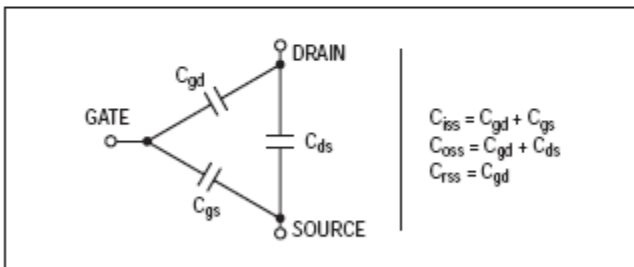
RF POWER MOSFET CONSIDERATIONS

MOSFET CAPACITANCES

The physical structure of a MOSFET results in capacitors between the terminals. The metal oxide gate structure determines the capacitors from gate-to-drain (C_{gd}), and gate-to-source (C_{gs}). The PN junction formed during the fabrication of the RF MOSFET results in a junction capacitance from drain-to-source (C_{ds}).

These capacitances are characterized as input (C_{iss}), output (C_{oss}) and reverse transfer (C_{rss}) capacitances on data sheets. The relationships between the inter-terminal capacitances and those given on data sheets are shown below. The C_{iss} can be specified in two ways:

1. Drain shorted to source and positive voltage at the gate.
2. Positive voltage of the drain in respect to source and zero volts at the gate. In the latter case the numbers are lower. However, neither method represents the actual operating conditions in RF applications.



LINEARITY AND GAIN CHARACTERISTICS

In addition to the typical IMD and power gain data presented, Figure 5 may give the designer additional information on the capabilities of this device. The graph represents the small signal unity current gain frequency at a given drain current level. This is equivalent to f_T for bipolar transistors.

Since this test is performed at a fast sweep speed, heating of the device does not occur. Thus, in normal use, the higher temperatures may degrade these characteristics to some extent.

DRAIN CHARACTERISTICS

One figure of merit for a FET is its static resistance in the full-on condition. This on-resistance, $V_{DS(on)}$, occurs in the linear region of the output characteristic and is specified under specific test conditions for gate-source voltage and drain current. For MOSFETs, $V_{DS(on)}$ has a positive temperature coefficient and constitutes an important design consideration at high temperatures, because it contributes to the power dissipation within the device.

GATE CHARACTERISTICS

The gate of the RF MOSFET is a polysilicon material, and is electrically isolated from the source by a layer of oxide. The input resistance is very high — on the order of 10^9 ohms — resulting in a leakage current of a few nanoamperes.

Gate control is achieved by applying a positive voltage slightly in excess of the gate-to-source threshold voltage, $V_{GS(th)}$.

Gate Voltage Rating — Never exceed the gate voltage rating. Exceeding the rated V_{GS} can result in permanent damage to the oxide layer in the gate region.

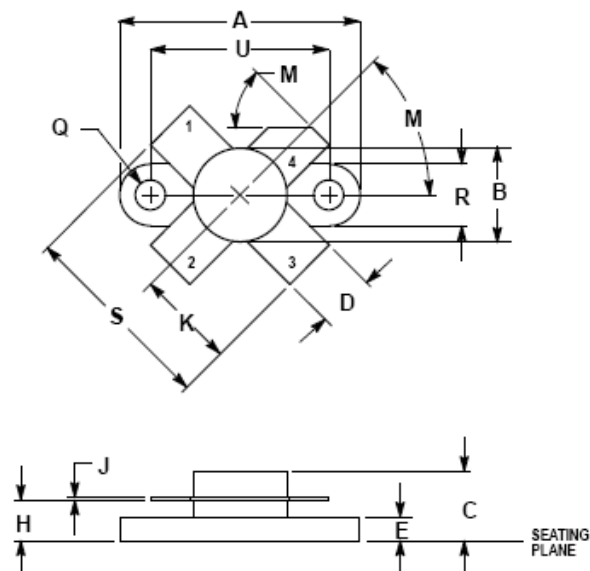
Gate Termination — The gates of these devices are essentially capacitors. Circuits that leave the gate open-circuited or floating should be avoided. These conditions can result in turn-on of the devices due to voltage build-up on the input capacitor due to leakage currents or pickup.

Gate Protection — These devices do not have an internal monolithic zener diode from gate-to-source. If gate protection is required, an external zener diode is recommended.

EQUIVALENT TRANSISTOR PARAMETER TERMINOLOGY

| | | |
|---|-------|---------------------------------------|
| Collector | ..... | Drain |
| Emitter | ..... | Source |
| Base | ..... | Gate |
| $V_{(BR)CES}$ | ..... | $V_{(BR)DSS}$ |
| V_{CBO} | ..... | V_{DGO} |
| I_C | ..... | I_D |
| I_{CES} | ..... | I_{DSS} |
| I_{EBO} | ..... | I_{GSS} |
| $V_{BE(on)}$ | ..... | $V_{GS(th)}$ |
| $V_{CE(sat)}$ | ..... | $V_{DS(on)}$ |
| C_{ib} | ..... | C_{iss} |
| C_{cb} | ..... | C_{oss} |
| h_{fe} | ..... | g_{fs} |
| | | |
| $R_{CE(sat)} = \frac{V_{CE(sat)}}{I_C}$ | ..... | $r_{DS(on)} = \frac{V_{DS(on)}}{I_D}$ |

PACKAGE DIMENSIONS



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1992.
2. CONTROLLING DIMENSION: INCH.

| DIM | INCHES | | MILLIMETERS | |
|-----|--------|-------|-------------|-------|
| | MIN | MAX | MIN | MAX |
| A | 0.990 | 0.990 | 24.39 | 25.14 |
| B | 0.370 | 0.390 | 9.40 | 9.90 |
| C | 0.229 | 0.281 | 5.82 | 7.13 |
| D | 0.215 | 0.235 | 5.47 | 5.96 |
| E | 0.085 | 0.105 | 2.16 | 2.66 |
| H | 0.150 | 0.108 | 3.81 | 4.57 |
| J | 0.004 | 0.008 | 0.11 | 0.15 |
| K | 0.395 | 0.405 | 10.04 | 10.28 |
| M | 40° | 50° | 40° | 50° |
| Q | 0.113 | 0.130 | 2.88 | 3.30 |
| R | 0.245 | 0.255 | 6.23 | 6.47 |
| S | 0.790 | 0.810 | 20.07 | 20.57 |
| U | 0.720 | 0.730 | 18.29 | 18.54 |

- STYLE 2:
PIN 1. SOURCE
2. GATE
3. SOURCE
4. DRAIN

CASE 211-07
ISSUE N

AMEYA360

Components Supply Platform

Authorized Distribution Brand :



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