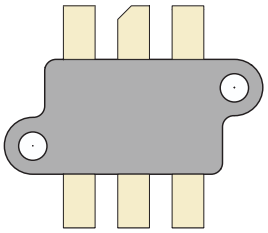
# ARF300

**125V, 300W, 45MHz**

## RF POWER MOSFET
N-CHANNEL ENHANCEMENT MODE



The ARF300 is a N-CHANNEL RF power transistor in a high efficiency flangeless package. It is designed for high voltage operation in narrow band ISM and MRI power amplifiers at frequencies up to 45MHz. The transistor is well matched to the ARF301 P-CHANNEL RF power transistor making the pair well suited for bridge configurations

- **Specified 125 Volt, 27 MHz Characteristics:**
  - **Output Power = 300 Watts.**
  - **Gain = 15dB (Class E)**
  - **Efficiency = 80%**
- **RoHS Compliant**
- **High Performance**
- **High Voltage Breakdown and Large SOA for Superior Ruggedness**
- **Low Thermal Resistance.**
- **Capacitance matched with ARF301 P-Channel**

## Maximum Ratings

**All Ratings: $T_C$=25°C unless otherwise specified**

| Symbol | Parameter | Ratings | Unit |
|---|---|---|---|
| $V_{DSS}$ | Drain-Source Voltage | 500 | V |
| $V_{DGO}$ | Drain-Gate Voltage | 500 | |
| $I_D$ | Continuous Drain Current @ $T_C$ = 25°C | 24 | A |
| $V_{GS}$ | Gate-Source Voltage | ±30 | V |
| $P_D$ | Total Power Dissipation @ $T_C$ = 25°C | 1000 | W |
| $T_J$, $T_{STG}$ | Operating and Storage Junction Temperature Range | -55 to 175 | °C |
| $T_L$ | Lead Temperature: 0.063" from Case for 10 Sec. | 300 | |

## Static Electrical Characteristics

| Symbol | Parameter | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| $BV_{DSS}$ | Drain-Source Breakdown Voltage ($V_{GS}$ = 0V, $I_D$ = 250 µA) | 500 | | | V |
| $V_{DS(ON)}$ | On State Drain Voltage [1] ($I_{D(ON)}$ = 12A, $V_{GS}$ = 10V) | | 3 | 4 | |
| $I_{DSS}$ | Zero Gate Voltage Drain Current ($V_{DS}$ = $V_{DSS}$, $V_{GS}$ = 0V) | | | 25 | µA |
| | Zero Gate Voltage Drain Current ($V_{DS}$ = 50$V_{DSS}$, $V_{GS}$ = 0, $T_C$ = 125°C) | | | 250 | |
| $I_{GSS}$ | Gate-Source Leakage Current ($V_{DS}$ = ±30V, $V_{DS}$ = 0V) | | | ±100 | nA |
| $g_{fs}$ | Forward Transconductance ($V_{DS}$ = 15V, $I_D$ = 12A) | 5 | 8 | | mhos |
| $V_{GS(TH)}$ | Gate Threshold Voltage ($V_{DS}$ = $V_{GS}$, $I_D$ = 10mA) | 2.5 | 4 | 5 | Volts |

## Thermal Characteristics

| Symbol | Parameter | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| $R_{\theta JC}$ | Junction to Case | | | 0.15 | °C/W |
| $R_{\theta JHS}$ | Junction to Sink (High Efficiency Thermal Joint Compound and Planar Heat Sink Surface.) | | | 0.27 | |

**CAUTION:** These Devices are Sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed.

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## Dynamic Characteristics

**ARF300**

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $C_{iss}$ | Input Capacitance | $V_{GS}$ = 0V | | 1890 | 2100 | pF |
| $C_{oss}$ | Output Capacitance | $V_{DS}$ = 50V | | 350 | 390 | |
| $C_{rss}$ | Reverse Transfer Capacitance | f = 1MHz | | 75 | 90 | |

## Functional Characteristics

| Symbol | Characteristic | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $G_{PS}$ | Common Source Amplifier Power Gain | f = 27MHz | 15 | 17 | | dB |
| η | Drain Efficiency | $I_{dq}$ = 0mA $V_{DD}$ = 125V | 80 | 85 | | % |
| Ψ | Electrical Ruggedness VSWR 10:1 | $P_{OUT}$ = 300W | No Damage | | | |

1. Pulse Test: Pulse width < 380 µS, Duty Cycle < 2%.



## Dynamic Characteristics

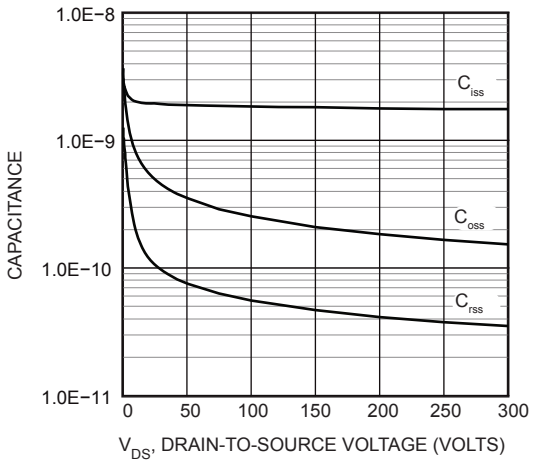



**Figure 1, Typical Capacitance vs. Drain-to-Source Voltage**

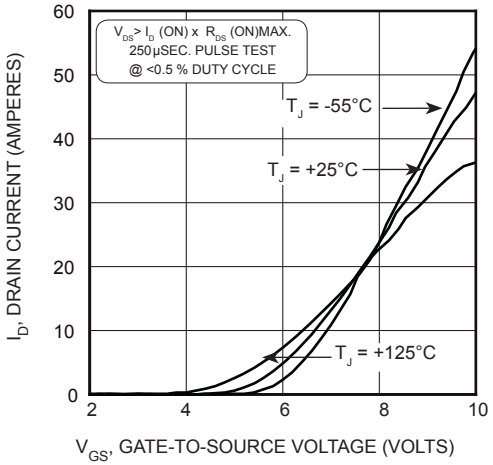



**Figure 2, Typical Transfer Characteristics**

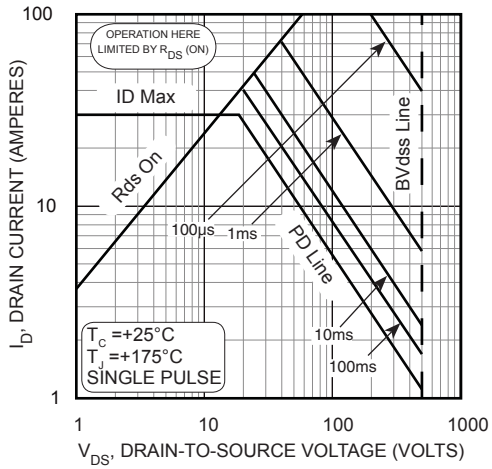



**Figure 3, Typical Maximum Safe Operating Area**

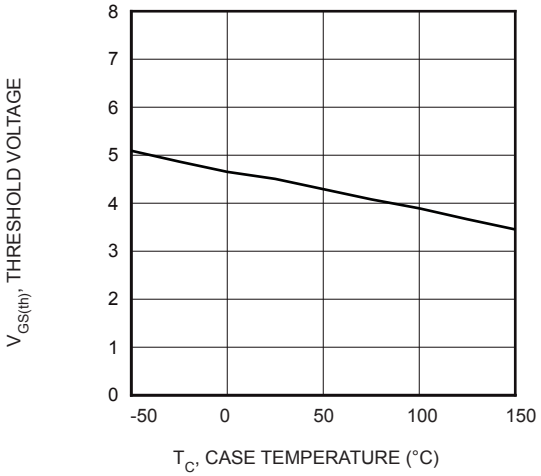



**Figure 4, Typical Threshold Voltage vs Temperature**

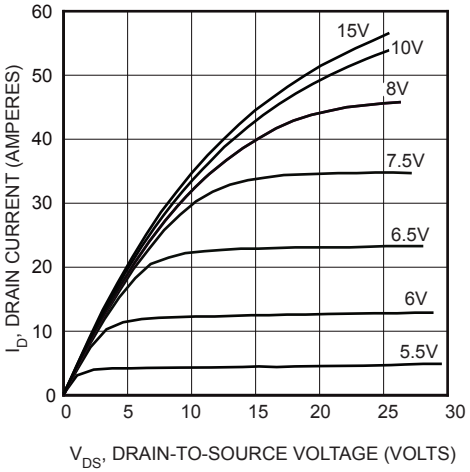



**Figure 5, Typical Output Characteristics**

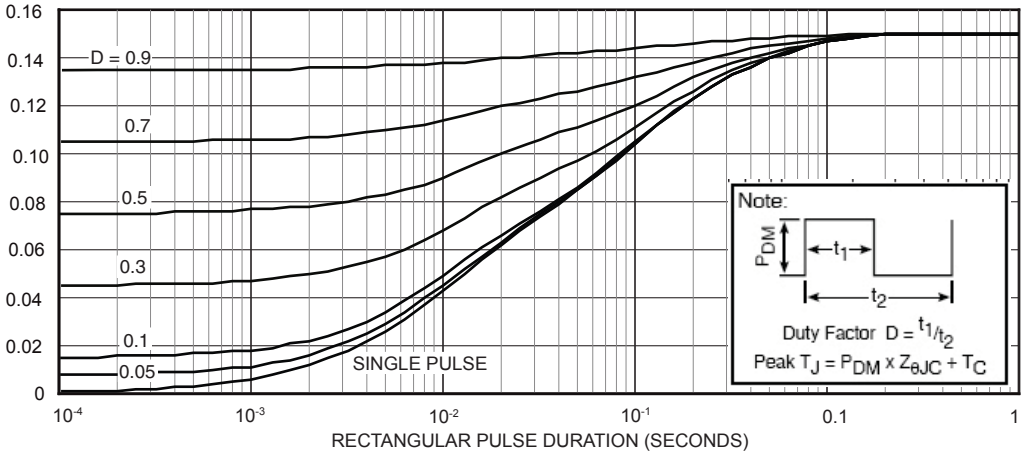



**FIGURE 6a, MAXIMUM EFFECTIVE TRANSIENT THERMAL IMPEDANCE, JUNCTION-TO-CASE vs PULSE DURATION**

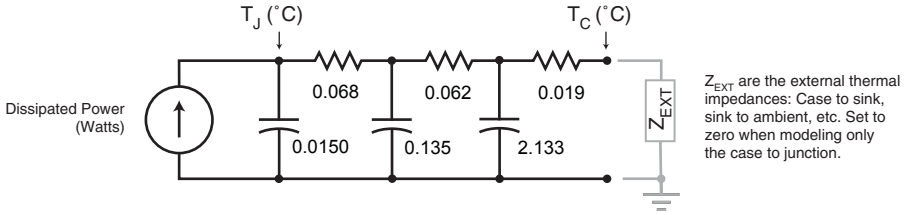


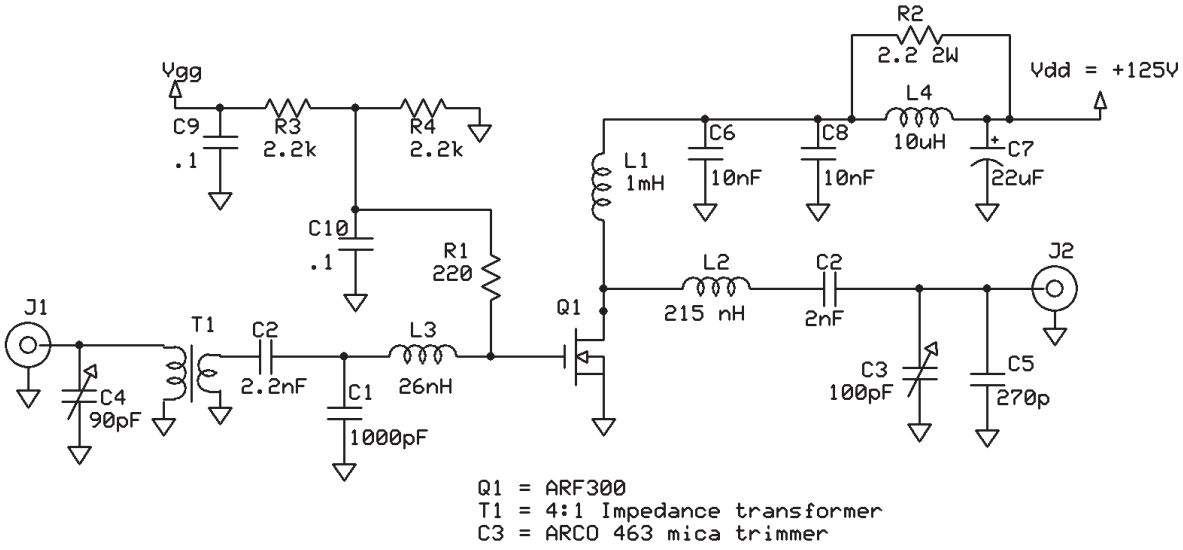

**Figure 6b, TRANSIENT THERMAL IMPEDANCE MODEL**

**Table 1 - Typical Class AB Large Signal Input - Output Impedance**

| Freq. (MHz) | $Z_{in}$ (Ω) | $Z_{OL}$ (Ω) |
|---|---|---|
| 2.0 | 18 - j 10.5 | 21 - j 1.4 |
| 13.56 | 2.66 - j 4.6 | 17.5 - j 7.8 |
| 27.12 | 1.79 - j 1.6 | 11.7 - j 10.4 |
| 40.68 | 1.68 - j 0.14 | 7.7 - j 10 |

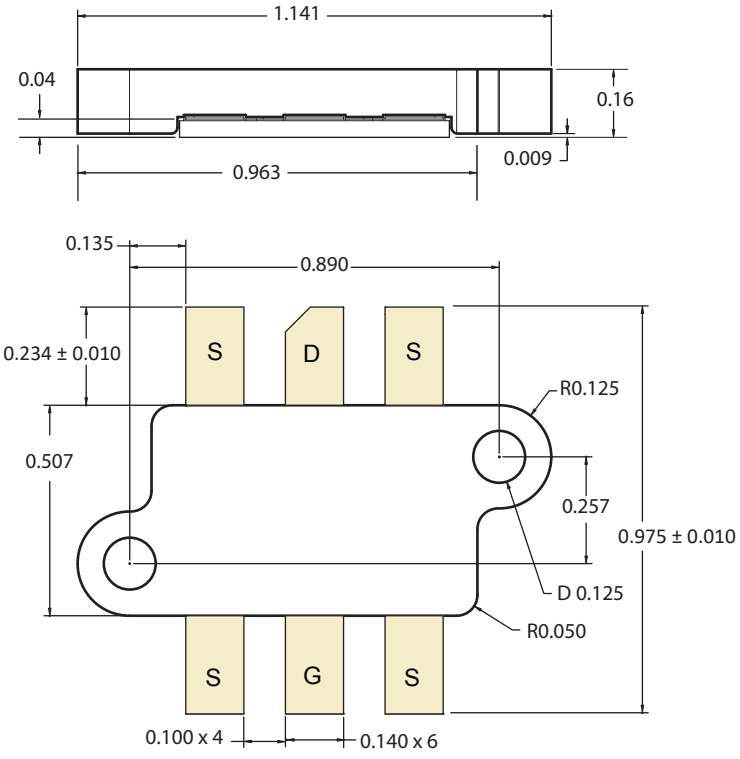
**$Z_{IN}$ - Gate shunted with 25Ω $I_{dq}$ = 0**
**$Z_{OL}$ - Conjugate of optimum load for 300 Watts output at $V_{dd}$=125V**

# Class CE 27.12 MHz amplifier




## T11 Package Outline

Dimensions are in inches (± 0.005" unless otherwise specified)




Use 4-40 (M3) screws for mounting.
Torque = 4-6 in-lb (0.45- 0.7 Nm).

ATTENTION: This is a high power device. Special considerations must be followed in mounting to ensure proper operation of these devices. Incorrect mounting can cause internal temperatures to exceed the maximum allowable operating junction temperature.
Refer to Microchip Application Note #1810 before starting system design.

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