
 Common
Source

RF POWER MOSFETs

N-CHANNEL ENHANCEMENT MODE

150V 140W 65MHz

The ARF448A and ARF448B comprise a symmetric pair of common source RF power transistors designed for push-pull scientific, commercial, medical and industrial RF power amplifier applications up to 65 MHz.

- **Specified 150 Volt, 40.68 MHz Characteristics:**
 - Output Power = 140 Watts.**
 - Gain = 15dB (Class C)**
 - Efficiency = 75%**
- **Low Cost Common Source RF Package.**
- **Very High Breakdown for Improved Ruggedness.**
- **Low Thermal Resistance.**
- **Nitride Passivated Die for Improved Reliability.**

MAXIMUM RATINGS

 All Ratings: $T_C = 25^\circ\text{C}$ unless otherwise specified.

| Symbol | Parameter | ARF448A/448B | UNIT |
|-----------------|---|--------------|--------------------|
| V_{DSS} | Drain-Source Voltage | 450 | Volts |
| V_{DGO} | Drain-Gate Voltage | 450 | |
| I_D | Continuous Drain Current @ $T_C = 25^\circ\text{C}$ | 15 | Amps |
| V_{GS} | Gate-Source Voltage | ± 30 | Volts |
| P_D | Total Power Dissipation @ $T_C = 25^\circ\text{C}$ | 230 | Watts |
| $R_{\theta JC}$ | Junction to Case | 0.55 | $^\circ\text{C/W}$ |
| T_J, T_{STG} | Operating and Storage Junction Temperature Range | -55 to 150 | $^\circ\text{C}$ |
| T_L | Lead Temperature: 0.063" from Case for 10 Sec. | 300 | |

STATIC ELECTRICAL CHARACTERISTICS

| Symbol | Characteristic / Test Conditions | MIN | TYP | MAX | UNIT |
|--------------|--|-----|-----|-----------|---------------|
| BV_{DSS} | Drain-Source Breakdown Voltage ($V_{GS} = 0V, I_D = 250 \mu\text{A}$) | 450 | | | Volts |
| $V_{DS(ON)}$ | On State Drain Voltage ^① ($I_D(ON) = 7.5A, V_{GS} = 10V$) | | | 3 | |
| I_{DSS} | Zero Gate Voltage Drain Current ($V_{DS} = V_{DSS}, V_{GS} = 0V$) | | | 25 | μA |
| | Zero Gate Voltage Drain Current ($V_{DS} = 0.8 V_{DSS}, V_{GS} = 0V, T_C = 125^\circ\text{C}$) | | | 250 | |
| I_{GSS} | Gate-Source Leakage Current ($V_{GS} = \pm 30V, V_{DS} = 0V$) | | | ± 100 | nA |
| g_{fs} | Forward Transconductance ($V_{DS} = 25V, I_D = 7.5A$) | 5 | 8.5 | | mhos |
| $V_{GS(TH)}$ | Gate Threshold Voltage ($V_{DS} = V_{GS}, I_D = 50mA$) | 2 | | 5 | Volts |

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

APT Website - <http://www.advancedpower.com>

DYNAMIC CHARACTERISTICS

ARF448A/448B

| Symbol | Characteristic | Test Conditions | MIN | TYP | MAX | UNIT |
|--------------|------------------------------|--|-----|------|------|------|
| C_{iss} | Input Capacitance | $V_{GS} = 0V$ $V_{DS} = 150V$ $f = 1\text{ MHz}$ | | 1400 | 1700 | pF |
| C_{oss} | Output Capacitance | | | 150 | 200 | |
| C_{rss} | Reverse Transfer Capacitance | | | 65 | 100 | |
| $t_{d(on)}$ | Turn-on Delay Time | $V_{GS} = 15V$ $V_{DD} = 0.5 V_{DSS}$ $I_D = I_{D[Cont.]} @ 25^\circ C$ $R_G = 1.6\Omega$ | | 7 | 15 | ns |
| t_r | Rise Time | | | 5 | 10 | |
| $t_{d(off)}$ | Turn-off Delay Time | | | 23 | 40 | |
| t_f | Fall Time | | | 12 | 25 | |

FUNCTIONAL CHARACTERISTICS

| Symbol | Characteristic | Test Conditions | MIN | TYP | MAX | UNIT |
|----------|------------------------------------|-------------------------------|--------------------------------|-----|-----|------|
| G_{PS} | Common Source Amplifier Power Gain | $f = 40.68\text{ MHz}$ | 13 | 15 | | dB |
| η | Drain Efficiency | $V_{GS} = 0V$ $V_{DD} = 150V$ | 70 | 75 | | % |
| ψ | Electrical Ruggedness VSWR 20:1 | $P_{out} = 140W$ | No Degradation in Output Power | | | |

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

APT Reserves the right to change, without notice, the specifications and information contained herein.

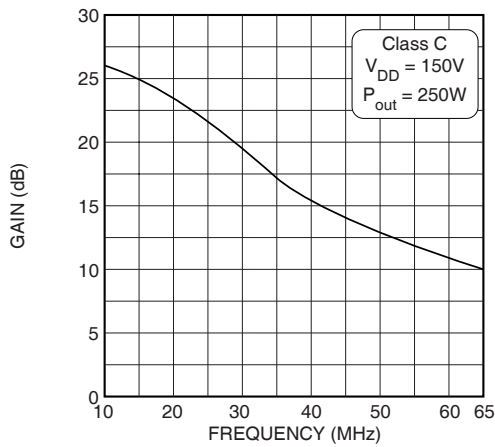


Figure 1, Typical Gain vs Frequency

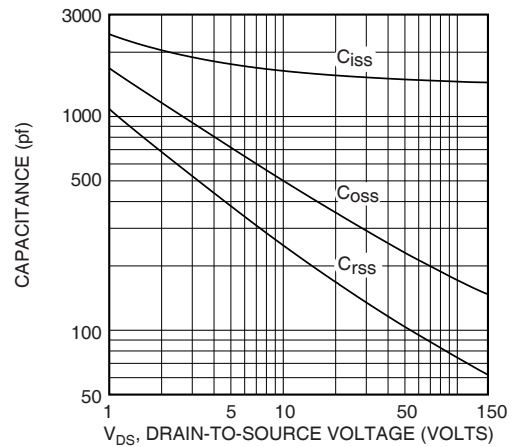


Figure 2, Typical Capacitance vs. Drain-to-Source Voltage

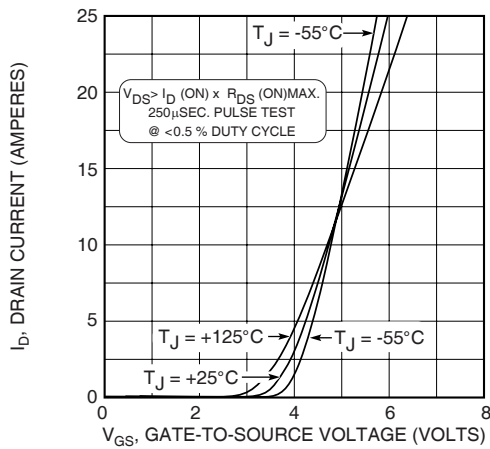


Figure 3, Typical Transfer Characteristics

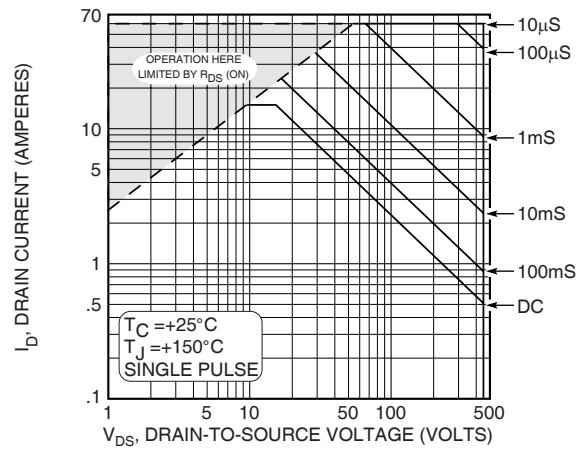


Figure 4, Typical Maximum Safe Operating Area

ARF448A/448B

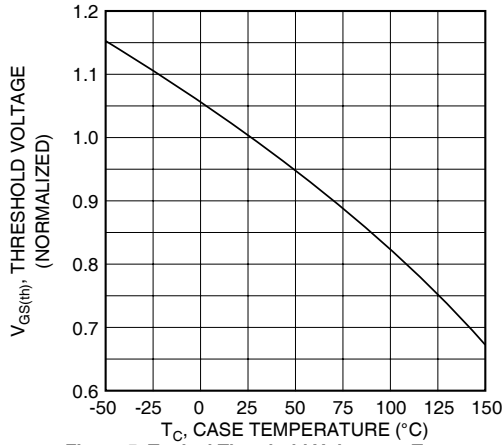


Figure 5, Typical Threshold Voltage vs Temperature

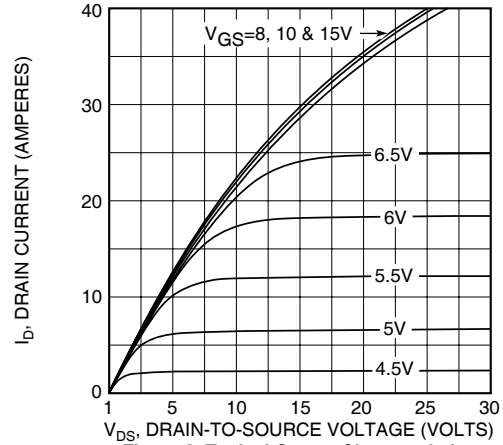


Figure 6, Typical Output Characteristics

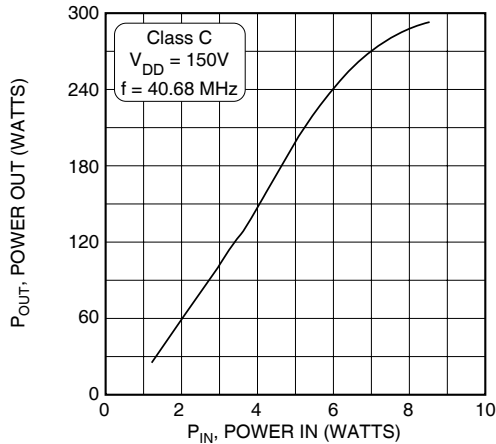


Figure 7, Typical Power Out vs Power In

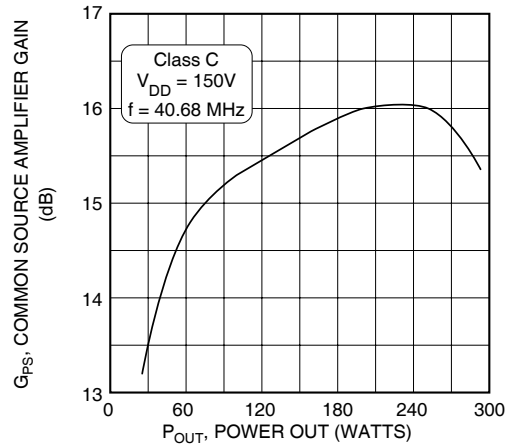


Figure 8, Typical Common Source Amplifier Gain vs Power Out

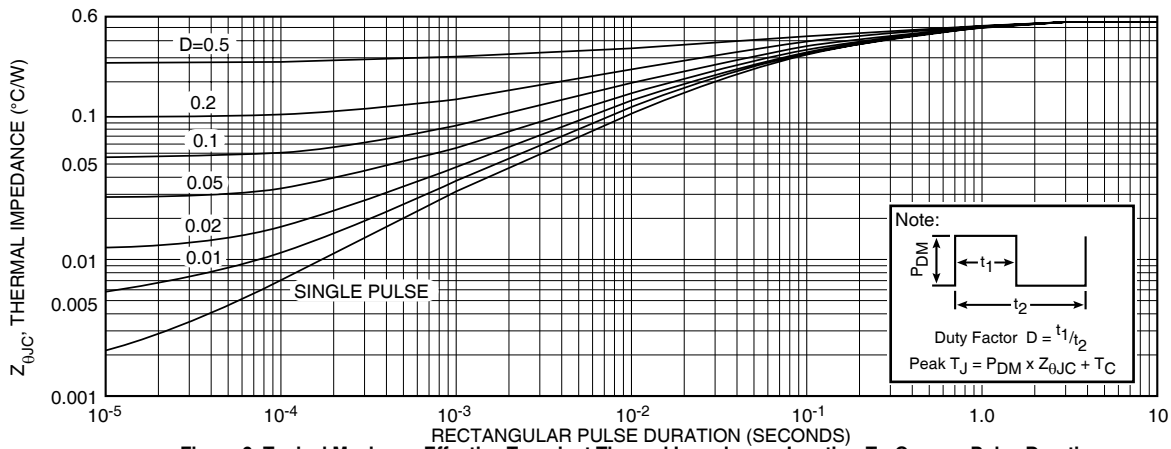


Figure 9, Typical Maximum Effective Transient Thermal Impedance, Junction-To-Case vs Pulse Duration

Table 1 - Typical Class C Large Signal Input-Output Impedance

| Freq. (MHz) | Z _{in} (Ω) | Z _{oL} (Ω) |
|-------------|---------------------|---------------------|
| 2.0 | 20.90 - j 9.2 | 56.00 - j 06.0 |
| 13.5 | 2.40 - j 6.8 | 37.00 - j 26.0 |
| 27.0 | 0.57 - j 2.6 | 18.00 - j 25.0 |
| 40.0 | 0.31 - j 0.5 | 9.90 - j 19.2 |
| 65.0 | 0.44 + j 1.9 | 4.35 - j 11.4 |

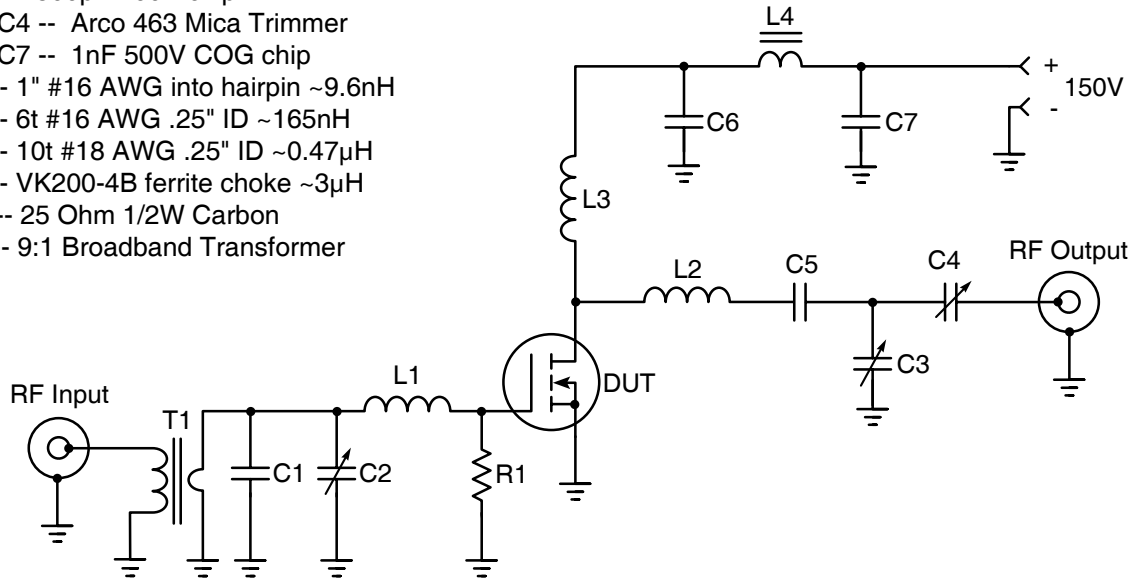
Z_{in} - gate shunted by 25Ω

Z_{oL} - conjugate of optimum load impedance for 250W at 150V

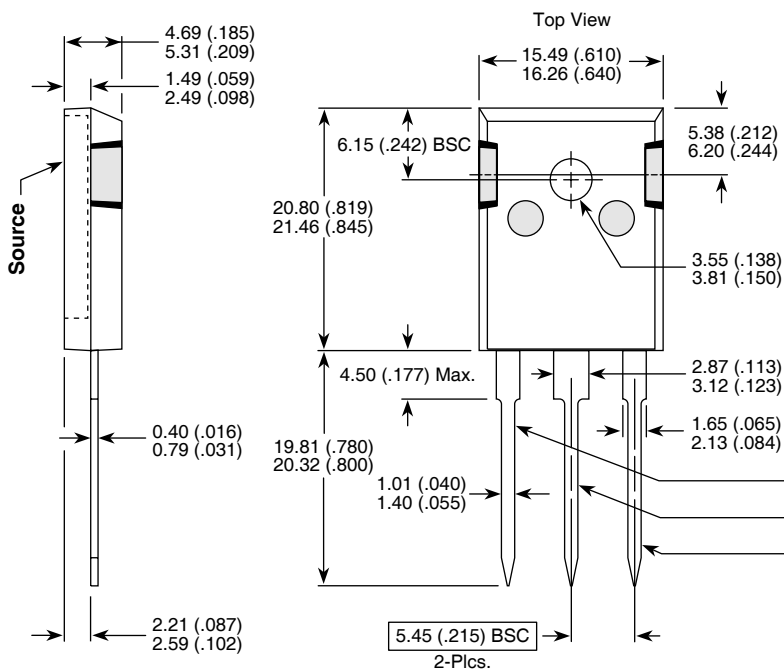
40.68 MHz Test Circuit

Parts List

- C1 -- 1800pF 100V chip
- C2-C4 -- Arco 463 Mica Trimmer
- C5-C7 -- 1nF 500V COG chip
- L1 -- 1" #16 AWG into hairpin ~9.6nH
- L2 -- 6t #16 AWG .25" ID ~165nH
- L3 -- 10t #18 AWG .25" ID ~0.47μH
- L4 -- VK200-4B ferrite choke ~3μH
- R1 -- 25 Ohm 1/2W Carbon
- T1 -- 9:1 Broadband Transformer



TO-247 Package Outline



Dimensions in Millimeters and (Inches)

NOTE: The ARF446 and ARF447 comprise a symmetric pair of RF power transistors and meet the same electrical specifications. The device pin-outs are the mirror image of each other to allow ease of use as a push-pull pair.

| Device | |
|---------|---------|
| ARF448A | ARF448B |
| Gate | Drain |
| Source | Source |
| Drain | Gate |