


## RF POWER MOSFETs

### N-CHANNEL ENHANCEMENT MODE

**250V 150W 65MHz**

The ARF461A and ARF461B comprise a symmetric pair of common drain RF power transistors designed for push-pull scientific, commercial, medical and industrial RF power amplifier applications up to 65 MHz. They have been optimized for both linear and high efficiency classes of operation.

- **Specified 250 Volt, 40.68 MHz Characteristics:**
  - Output Power = 150 Watts.**
  - Gain = 13dB (Class AB)**
  - Efficiency = 75% (Class C)**
- **Low Cost Common Source RF Package.**
- **Low V<sub>th</sub> thermal coefficient.**
- **Low Thermal Resistance.**
- **Optimized SOA for Superior Ruggedness.**
- **RoHS Compliant** 

#### MAXIMUM RATINGS

All Ratings: T<sub>C</sub> = 25°C unless otherwise specified.

| Symbol                            | Parameter  | ARF461AG/BG | Unit |
|-----------------------------------|--|-------------|------|
| V <sub>DSS</sub>                  | Drain-Source Voltage                             | 1000        | V    |
| V <sub>DGO</sub>                  | Drain-Gate Voltage                               | 1000        |      |
| I <sub>D</sub>                    | Continuous Drain Current @ T <sub>C</sub> = 25°C | 6.5         | A    |
| V <sub>GS</sub>                   | Gate-Source Voltage                              | ±30         | V    |
| P <sub>D</sub>                    | Total Power Dissipation @ T <sub>C</sub> = 25°C  | 250         | W    |
| R <sub>θJC</sub>                  | Junction to Case                                 | 0.50        | °C/W |
| T <sub>J</sub> , T <sub>STG</sub> | Operating and Storage Junction Temperature Range | -55 to 150  | °C   |
| T <sub>L</sub>                    | Lead Temperature: 0.063" from Case for 10 Sec.   | 300         |      |

#### STATIC ELECTRICAL CHARACTERISTICS

| Symbol              | Parameter   | Min  | Typ | Max  | Unit  |
|---------------------|---|------|-----|------|-------|
| BV <sub>DSS</sub>   | Drain-Source Breakdown Voltage (V <sub>GS</sub> = 0V, I <sub>D</sub> = 250 μA)  | 1000 |     |      | V     |
| V <sub>DS(ON)</sub> | On State Drain Voltage <sup>1</sup> (I <sub>D(ON)</sub> = 3.25A, V <sub>GS</sub> = 10V)                               |      |     | 6.5  |       |
| I <sub>DSS</sub>    | Zero Gate Voltage Drain Current (V <sub>DS</sub> = V <sub>DSS</sub> , V <sub>GS</sub> = 0V)                           |      |     | 25   | μA    |
|                     | Zero Gate Voltage Drain Current (V <sub>DS</sub> = 0.8V <sub>DSS</sub> , V <sub>GS</sub> = 0, T <sub>C</sub> = 125°C) |      |     | 250  |       |
| I <sub>GSS</sub>    | Gate-Source Leakage Current (V <sub>DS</sub> = ±30V, V <sub>GS</sub> = 0V)  |      |     | ±100 | nA    |
| g <sub>fs</sub>     | Forward Transconductance (V <sub>DS</sub> = 25V, I <sub>D</sub> = 3.25A)  | 3    | 4   |      | mhos  |
| V <sub>GS(TH)</sub> | Gate Threshold Voltage (V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 50mA)                                    | 3    |     | 5    | Volts |



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

## Dynamic Characteristics

ARF461A/B

| Symbol       | Parameter                    | Test Conditions   | Min | Typ  | Max | Unit |
|--------------|------------------------------|---|-----|------|-----|------|
| $C_{iss}$    | Input Capacitance            | $V_{GS} = 0V$<br>$V_{DS} = 50V$<br>$f = 1MHz$   |     | 1700 |     | pF   |
| $C_{oss}$    | Output Capacitance           |   |     | 175  |     |      |
| $C_{rss}$    | Reverse Transfer Capacitance |   |     | 50   |     |      |
| $t_{d(on)}$  | Turn-On Delay Time           | $V_{GS} = 15V$<br>$V_{DD} = 0.5V_{DSS}$<br>$I_D = I_{D(Cont.)} @ 25^\circ C$<br>$R_G = 1.6\Omega$ |     | 8    |     | ns   |
| $t_r$        | Rise Time                    |   |     | 5    |     |      |
| $t_{d(off)}$ | Turn-off Delay Time          |   |     | 21   |     |      |
| $t_f$        | Fall Time                    |   |     | 10.1 |     |      |

## Functional Characteristics

| Symbol   | Characteristic                     | Test Conditions   | Min                            | Typ | Max | Unit |
|----------|------------------------------------|---|--------------------------------|-----|-----|------|
| $G_{PS}$ | Common Source Amplifier Power Gain | $f = 40.68MHz$<br>$V_{GS} = 0V$ $V_{DD} = 250V$<br>$P_{OUT} = 150W$ | 13                             | 15  |     | dB   |
| $\eta$   | Drain Efficiency                   |   | 70                             | 75  |     | %    |
| $\Psi$   | Electrical Ruggedness VSWR 10:1    |   | No Degradation in Output Power |     |     |      |

① Pulse Test: Pulse width < 380  $\mu S$ , Duty Cycle < 2%

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

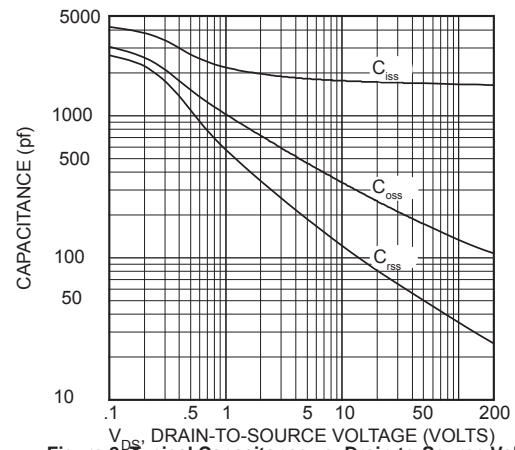


Figure 2, Typical Capacitance vs. Drain-to-Source Voltage

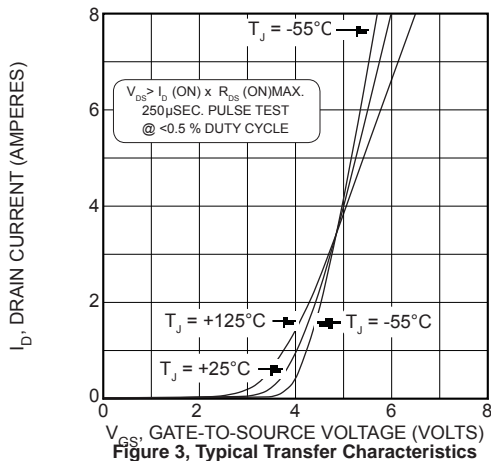


Figure 3, Typical Transfer Characteristics

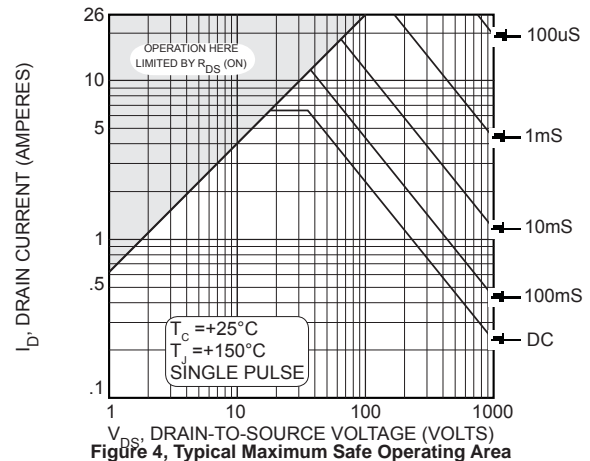


Figure 4, Typical Maximum Safe Operating Area

**ARF461A/B**

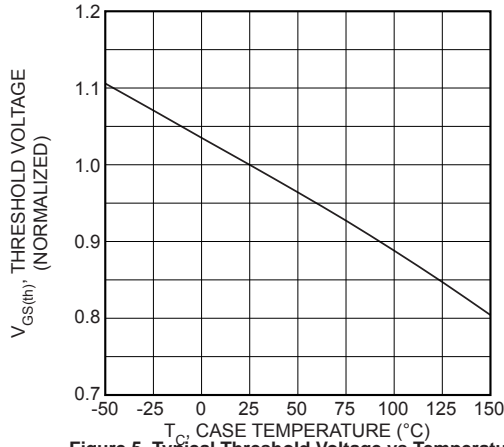


Figure 5, Typical Threshold Voltage vs Temperature

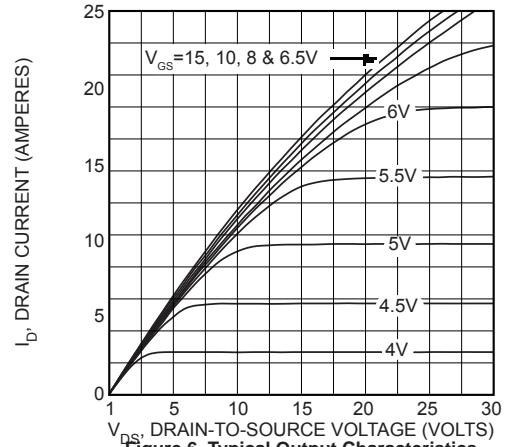


Figure 6, Typical Output Characteristics

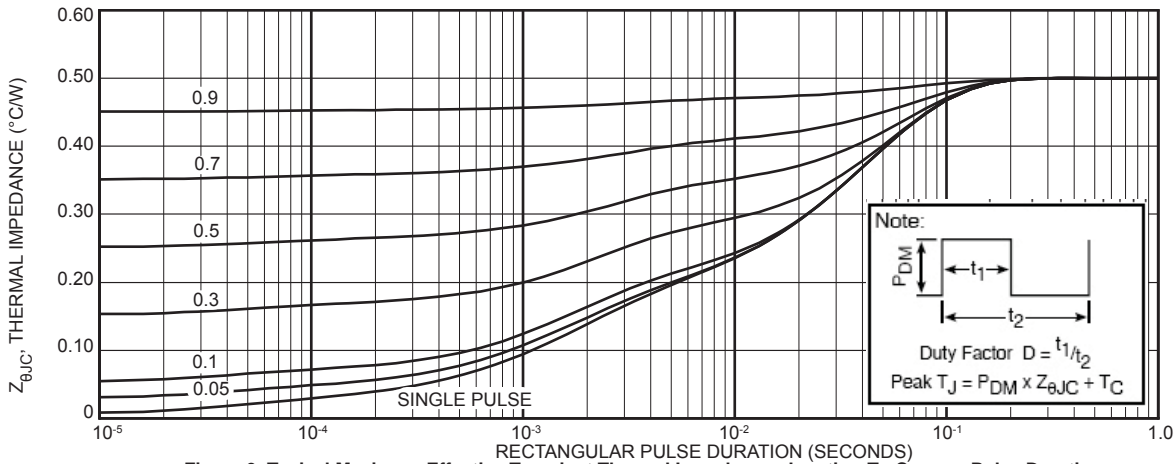


Figure 9, Typical Maximum Effective Transient Thermal Impedance, Junction-To-Case vs Pulse Duration

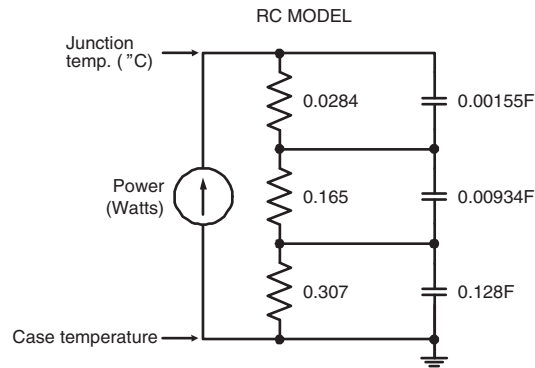


Figure 9a, TRANSIENT THERMAL IMPEDANCE MODEL

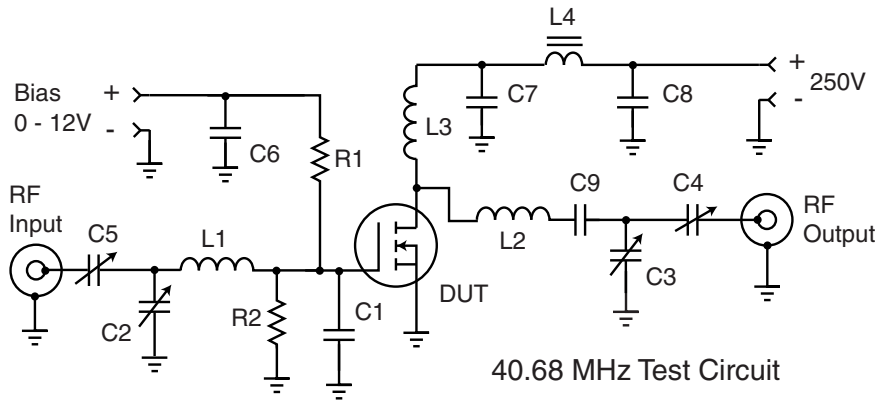
Table 1 - Typical Class AB Large Signal Input - Output Impedance

| Freq. (MHz) | Z <sub>in</sub> (Ω) | Z <sub>OL</sub> (Ω) |
|-------------|---------------------|---------------------|
| 2.0         | 20.9 - j 9.2        | 38 - j 2.6          |
| 13.5        | 2.4 - j 6.8         | 31 - j 14           |
| 27          | .57 - j 2.6         | 19.6 - j 17.6       |
| 40          | .31 - j 0.5         | 12.5 - j 15.8       |
| 65          | .44 + j 1.9         | 6.0 - j 10.5        |

Z<sub>in</sub> - Gate shunted with 25Ω

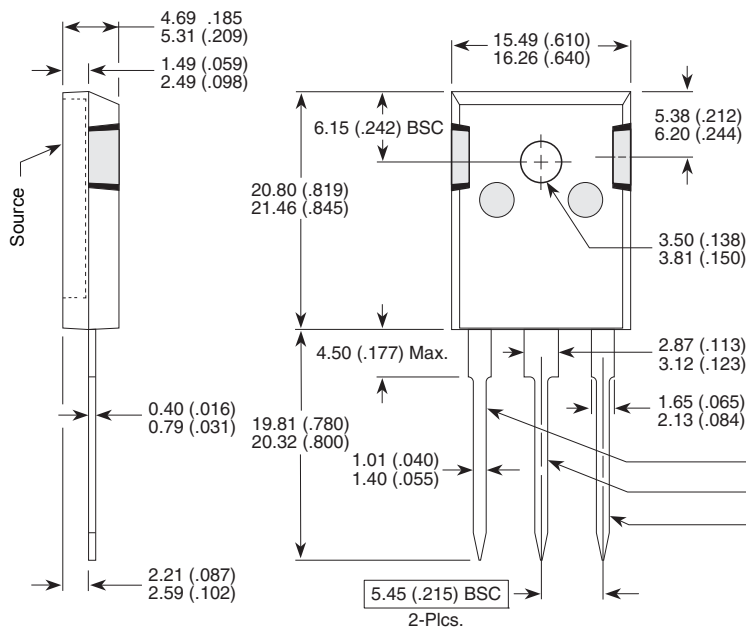
I<sub>DQ</sub> = 100mA

Z<sub>OL</sub> - Conjugate of optimum load for 150 Watts output at V<sub>dd</sub> = 125V



- C1 -- 1800pF + 1000pF 100V chips mounted at gate lead
- C2-C5 -- Arco 463 Mica trimmer
- C6-C8 -- .1  $\mu$ F 500V ceramic chip
- C9 -- 2200 pF 500 V chip
- L1 -- 4t #20 AWG .25"ID .3 "L ~80nH
- L2 -- 7t #16 AWG .4" ID .5"L ~335nH
- L3 -- 25t #24 AWG .25"ID ~2.2uH
- L4 -- VK200-4B ferrite choke 3uH
- R1-R2 -- 51 Ohm 0.5W Carbon
- DUT = ARF461A/B

TO-247 Package Outline



**NOTE:** These two parts 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 |        |
|--------|--------|
| ARF- A | ARF- B |

- Gate ----- Drain
- Source ---- Source
- Drain ----- Gate

Dimensions in Millimeters and (Inches)