

## RF POWER MOSFET

### N-CHANNEL ENHANCEMENT MODE

**165V 150W 150MHz**

The ARF521 is an RF power transistor designed for high voltage operation in broadband HF, narrow band ISM and MRI power amplifiers up to 150MHz.

- **Specified 125 Volt, 81MHz Characteristics:**
  - Output Power = 150 Watts.**
  - Gain = 13dB (Class AB)**
  - Efficiency = 50%**
- **High Voltage Breakdown and Large SOA for Superior Ruggedness.**
- **Industry standard package**
- **Low Vth thermal coefficient**

#### MAXIMUM RATINGS

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

Symbol	Parameter	ARF521	UNIT
$V_{DSS}$	Drain-Source Voltage	500	Volts
$I_D$	Continuous Drain Current @ $T_C = 25^\circ\text{C}$	10	Amps
$V_{GS}$	Gate-Source Voltage	$\pm 30$	Volts
$P_D$	Total Device Dissipation @ $T_C = 25^\circ\text{C}$	250	Watts
$T_J, T_{STG}$	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	Characteristic / Test Conditions	MIN	TYP	MAX	UNIT
$BV_{DSS}$	Drain-Source Breakdown Voltage ( $V_{GS} = 0V, I_D = 250 \mu\text{A}$ )	500			Volts
$R_{DS(ON)}$	Drain-Source On-State Resistance <sup>①</sup> ( $I_{D(ON)} = 5A, V_{GS} = 10V$ )		0.56	8	Ohms
$I_{DSS}$	Zero Gate Voltage Drain Current ( $V_{DS} = V_{DSS}, V_{GS} = 0V$ )			25	$\mu\text{A}$
	Zero Gate Voltage Drain Current ( $V_{DS} = 50V, V_{GS} = 0, T_C = 125^\circ\text{C}$ )			250	
$I_{GSS}$	Gate-Source Leakage Current ( $V_{GS} = \pm 30V, V_{DS} = 0V$ )			$\pm 100$	nA
$g_{fs}$	Forward Transconductance ( $V_{DS} = 15V, I_D = 5A$ )	3	3.6		mhos
$V_{GS(TH)}$	Gate Threshold Voltage ( $V_{DS} = V_{GS}, I_D = 200\text{mA}$ )	2		4	Volts

#### THERMAL CHARACTERISTICS

Symbol	Characteristic	MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Junction to Case			0.60	°C/W
$R_{\theta CS}$	Case to Sink (Use High Efficiency Thermal Joint Compound and Planar Heat Sink Surface.)		0.1		



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

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
$C_{iss}$	Input Capacitance	$V_{GS} = 0V$ $V_{DS} = 50V$ $f = 1\text{ MHz}$		780	900	pF
$C_{oss}$	Output Capacitance			125	150	
$C_{rss}$	Reverse Transfer Capacitance			7	10	
$t_{d(on)}$	Turn-on Delay Time	$V_{GS} = 15V$ $V_{DD} = 0.5 V_{DSS}$ $I_D = I_{D[Cont.]} @ 25^\circ C$ $R_G = 1.6 \Omega$		5.1	10	ns
$t_r$	Rise Time			4.1	8	
$t_{d(off)}$	Turn-off Delay Time			12	18	
$t_f$	Fall Time			4.0	7	

FUNCTIONAL CHARACTERISTICS

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
$G_{PS}$	Common Source Amplifier Power Gain	$f = 81\text{ MHz}$ $I_{dq} = 50\text{ mA}$ $V_{DD} = 125\text{ V}$ $P_{out} = 150\text{ W}$	14	15		dB
$\eta$	Drain Efficiency		50	55		%
$\Psi$	Electrical Ruggedness VSWR 5:1		No Degradation in Output Power			

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

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

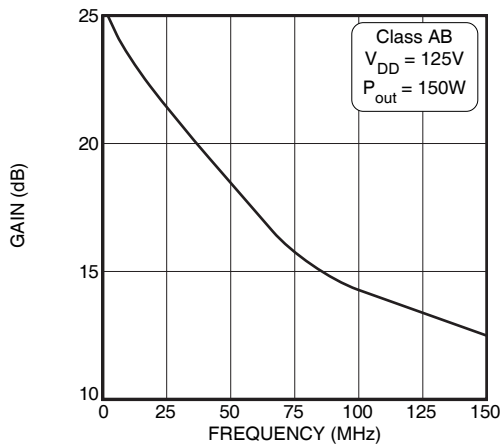


Figure 1, Typical Gain vs. Frequency

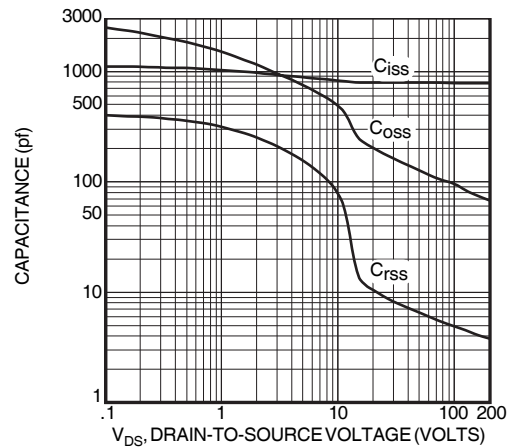


Figure 2, Typical Capacitance vs. Drain-to-Source Voltage

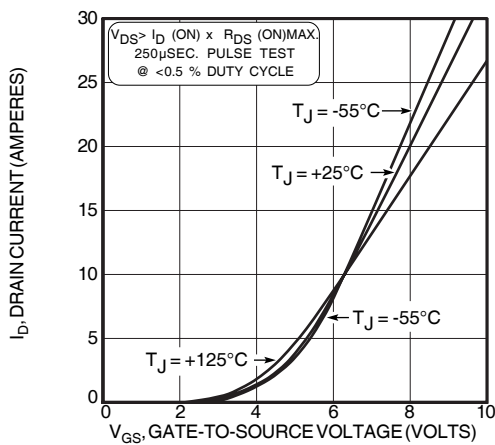


Figure 3, Typical Transfer Characteristics

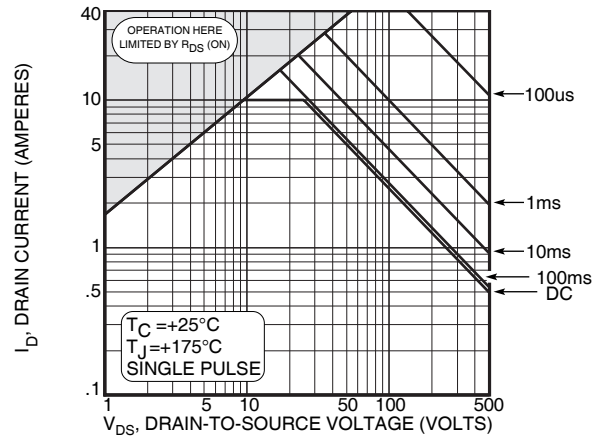


Figure 4, Typical Maximum Safe Operating Area

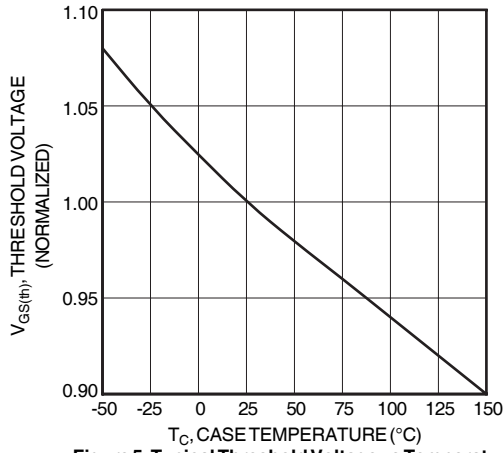


Figure 5, Typical Threshold Voltage vs Temperature

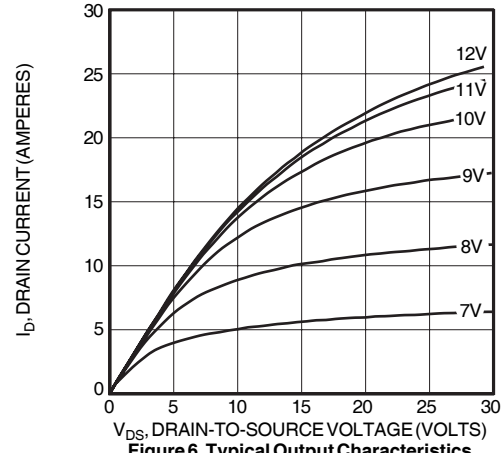


Figure 6, Typical Output Characteristics

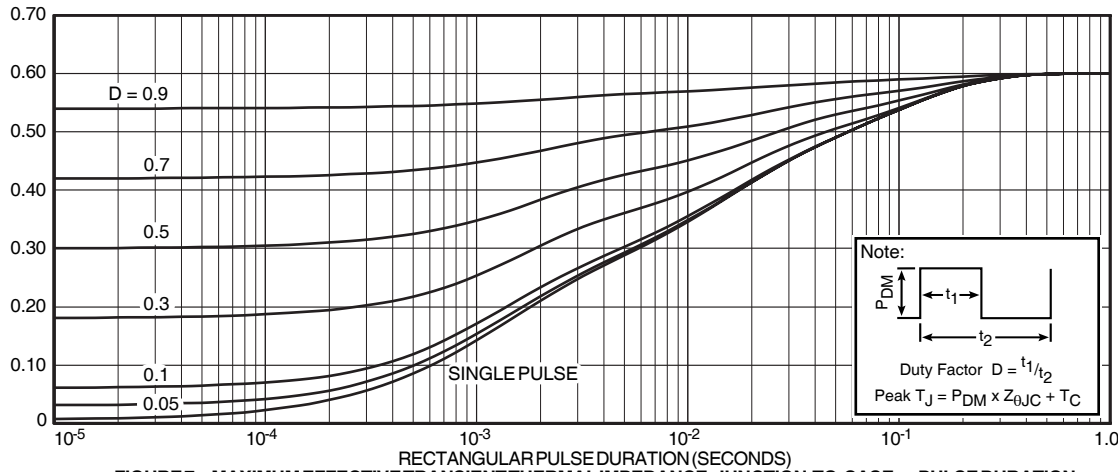


FIGURE 7a, MAXIMUM EFFECTIVE TRANSIENT THERMAL IMPEDANCE, JUNCTION-TO-CASE vs PULSE DURATION

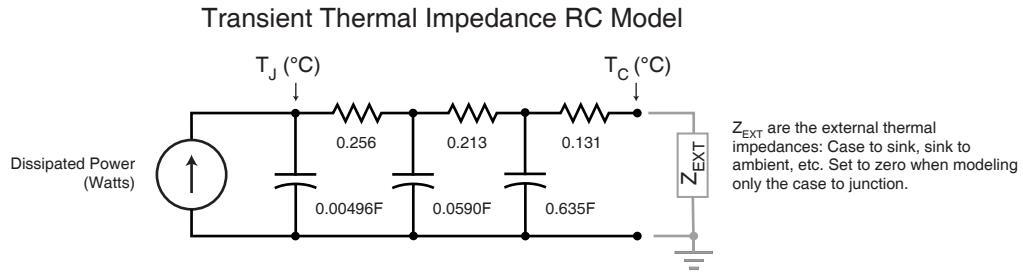


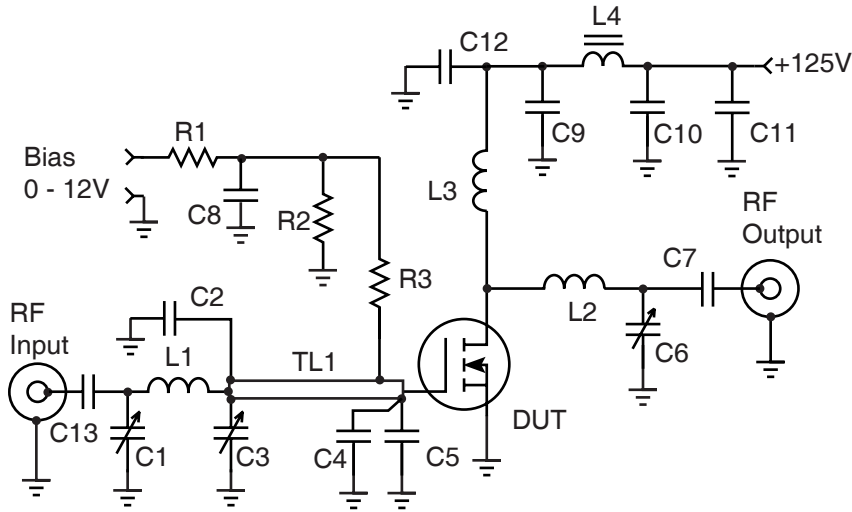
Figure 7b, TRANSIENT THERMAL IMPEDANCE MODEL

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

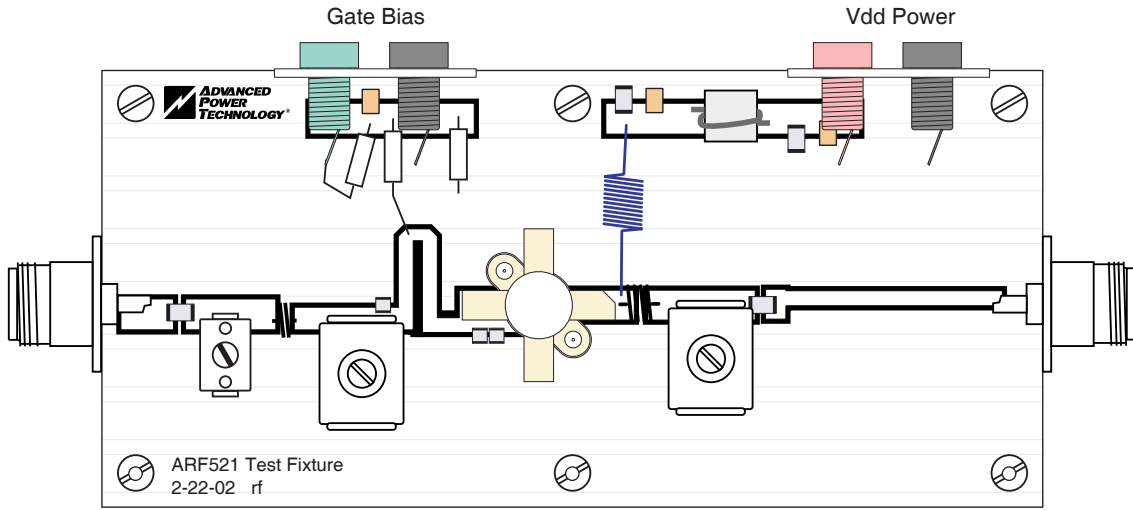
Freq. (MHz)	$Z_{in} (\Omega)$	$Z_{OL} (\Omega)$
2.0	24 - j 4.5	55 - j 4
13.5	8.3 - j 11.6	45 - j 22
27	2.5 - j 7.1	28.7 - j 28
40	1.0 - j 4.2	17.9 - j 26
65	.30 - j 1.1	9.0 - j 20.6
80	.25 + j 0.3	5.8 - j 17
100	.35 + j 1.6	4 - j 14.2

$Z_{in}$  - Gate shunted with  $25\Omega$        $I_{dq} = 50mA$   
 $Z_{OL}$  - Conjugate of optimum load for 150 Watts output at  $V_{dd} = 125V$

# ARF521 Test Circuit 81.36 MHz



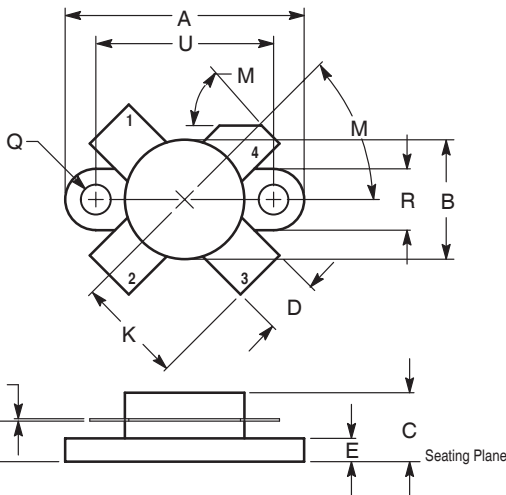
- C1 - Arco 406 Mica trimmer
- C2 - 220pF Semco metal clad
- C3 - Arco 464 Mica trimmer
- C4 - 820pF ATC 700B
- C5- 1000pF ATC 700B
- C6 - Arco 463 Mica trimmer
- C7-C10 10nF 500V chip
- C11-C13 1nF NPO 500V
- TL1 - .23" x 1.5" stripline
- L1 -- 2t #18 .3" ID .2"L ~50nH
- L2 -- 3t #16 AWG .31" ID .3"L ~65nH
- L3 -- 10t #22 AWG .25 ID ~470nH
- L4 -- VK200-4B ferrite choke ~3uH
- R1-R3 -- 1k Ohm 1/4W Carbon
- DUT = ARF521



### Hazardous Material Warning

The ceramic portion of the device between the leads and the mounting flange is beryllium oxide, BeO. BeO dust is toxic when inhaled. Care must be taken during handling and mounting to avoid damage to this area. These devices should never be thrown away with general industrial or domestic waste.

### .5" SOE Package Outline



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

2. CONTROLLING DIMENSION: INCH.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.960	0.990	24.39	25.14
B	0.465	0.510	11.82	12.95
C	0.229	0.275	5.82	6.98
D	0.216	0.235	5.49	5.96
E	0.084	0.110	2.14	2.79
H	0.144	0.178	3.66	4.52
J	0.003	0.007	0.08	0.17
K	0.435		11.0	
M	45°	NOM	45°	NOM
Q	0.115	0.130	2.93	3.30
R	0.246	0.255	6.25	6.47
U	0.720	0.730	18.29	18.54