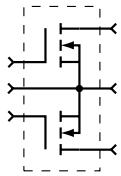
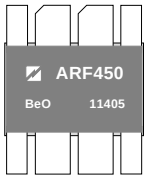
ADVANCED POWER TECHNOLOGY®

Common Source
Push-Pull Pair

ARF450





RF POWER MOSFET

N-CHANNEL ENHANCEMENT MODE

150V 500W 120MHz

The ARF450 is a matched pair of RF power transistors in a common source configuration. It is designed for push-pull or parallel operation in scientific, commercial, medical and industrial RF power amplifier applications up to 120 MHz.

- **Specified 150 Volt, 81.36 MHz Characteristics:**
  - **Output Power = 500 Watts.**
  - **Gain = 13dB (Class C)**
  - **Efficiency = 75%**
- **High Performance Push-Pull RF Package.**
- **Very High Breakdown for Improved Ruggedness.**
- **Low Thermal Resistance.**
- **Nitride Passivated Die for Improved Reliability.**

MAXIMUM RATINGS All Ratings: T_C = 25°C unless otherwise specified.

Symbol	Parameter	ARF450	UNIT
V_{DSS}	Drain-Source Voltage	450	Volts
V_{DGO}	Drain-Gate Voltage	450	
I_D	Continuous Drain Current @ T_C = 25°C	11	Amps
V_{GS}	Gate-Source Voltage	±30	Volts
P_D	Total Device Dissipation @ T_C = 25°C	650	Watts
T_J,T_{STG}	Operating and Storage Junction Temperature Range	-55 to 200	°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 µA)	500			Volts
$V_{DS(ON)}$	On State Drain Voltage ① ($I_{D(ON)}$ = 5.5A, V_{GS} = 10V)			5	
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°C)			250	
I_{GSS}	Gate-Source Leakage Current (V_{GS} = ±30V, V_{DS} = 0V)			±100	nA
g_{fs}	Forward Transconductance (V_{DS} = 25V, I_D = 5.5A)	3	5.8		mhos
g_{fs1}/ g_{fs2}	Forward Transconductance Ratio (V_{DS} = 25V, I_D = 5.5A)	0.9		1.1	
$V_{GS(TH)}$	Gate Threshold Voltage (V_{DS} = V_{GS}, I_D = 50mA)	3		5	Volts
$\Delta V_{GS(TH)}$	Delta Gate Threshold Voltage (V_{DS} = V_{GS}, I_D = 50mA)			0.1	

THERMAL CHARACTERISTICS

Symbol	Characteristic (per package unless otherwise noted)	MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Junction to Case (per section)			0.54	°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.

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

USA: 405 S.W. Columbia Street Bend, Oregon 97702-1035 Phone: (541) 382-8028 FAX: (541) 388-0364

EUROPE: Chemin de Magret F-33700 Merignac - France Phone: (33) 5 57 92 15 15 FAX: (33) 5 56 47 97 61

050-4910 Rev C 12-2000

DYNAMIC CHARACTERISTICS (per section)

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
C_{iss}	Input Capacitance	V_{GS} = 0V V_{DS} = 150V f = 1 MHz		980	1200	pF
C_{oss}	Output Capacitance			87	120	
C_{rss}	Reverse Transfer Capacitance			25	40	
$t_{d(on)}$	Turn-on Delay Time	V_{GS} = 15V V_{DD} = 0.5 V_{DSS} I_D = $I_{D[Cont.]}$ @ 25°C R_G = 1.6 Ω		5	10	ns
t_r	Rise Time			3.0	7	
$t_{d(off)}$	Turn-off Delay Time			15	25	
t_f	Fall Time			3	7	

FUNCTIONAL CHARACTERISTICS (Push-Pull Configuration)

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
G_{PS}	Common Source Amplifier Power Gain	f = 81.36 MHz V_{GS} = 0V V_{DD} = 150V P_{out} = 500W	12	13		dB
η	Drain Efficiency		70	75		%
ψ	Electrical Ruggedness VSWR 10:1		No Degradation in Output Power			

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

Per each transistor side unless otherwise specified.

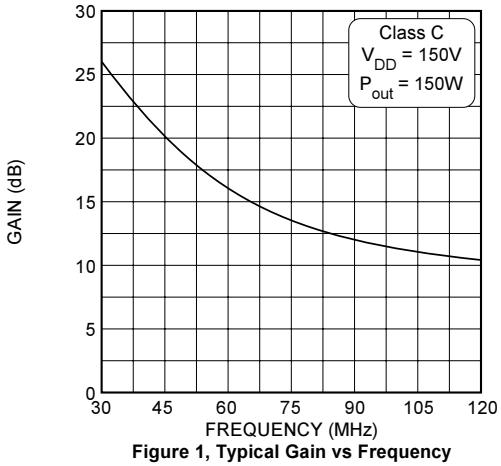


Figure 1, Typical Gain vs Frequency

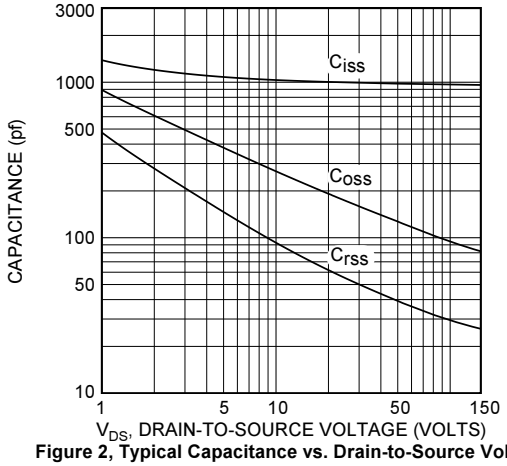


Figure 2, Typical Capacitance vs. Drain-to-Source Voltage

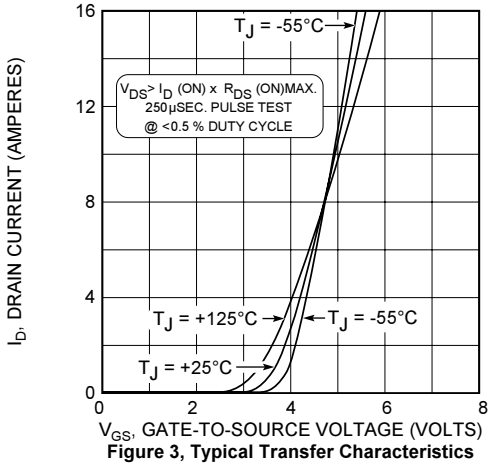


Figure 3, Typical Transfer Characteristics

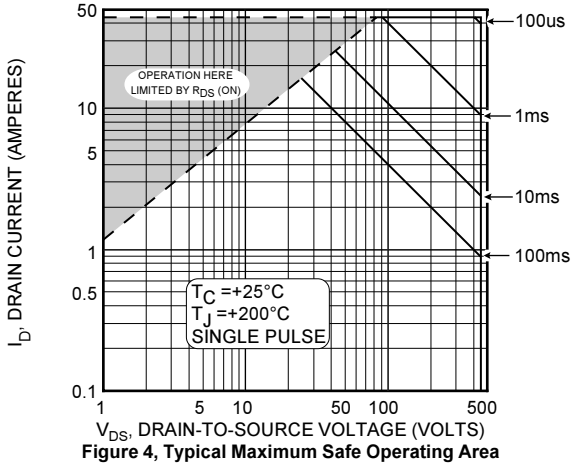


Figure 4, Typical Maximum Safe Operating Area

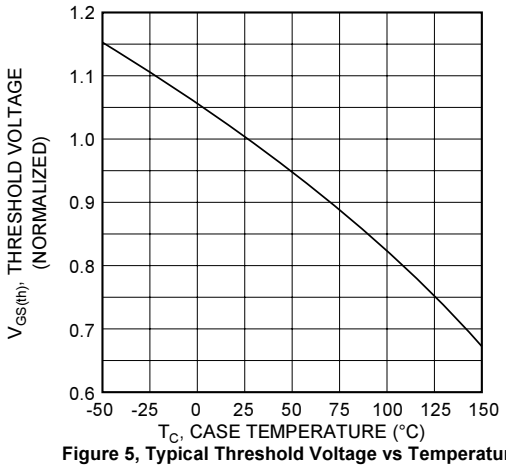


Figure 5, Typical Threshold Voltage vs Temperature

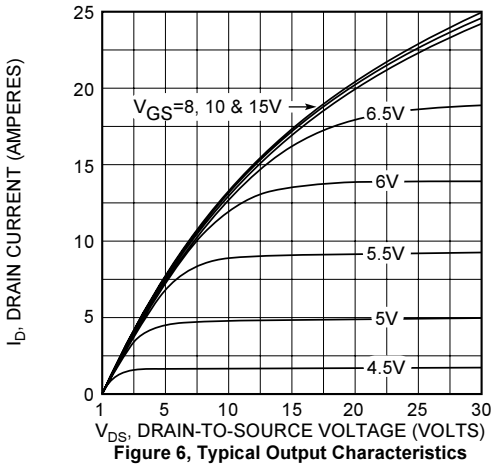


Figure 6, Typical Output Characteristics

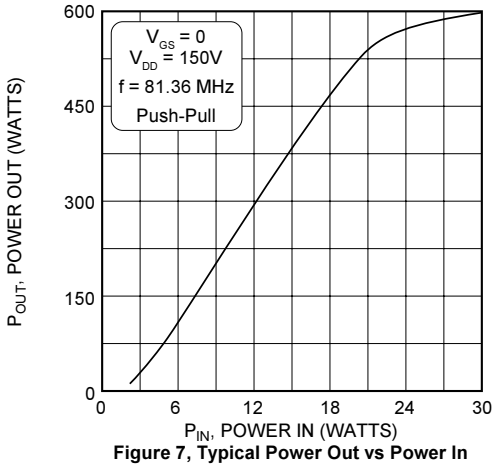


Figure 7, Typical Power Out vs Power In

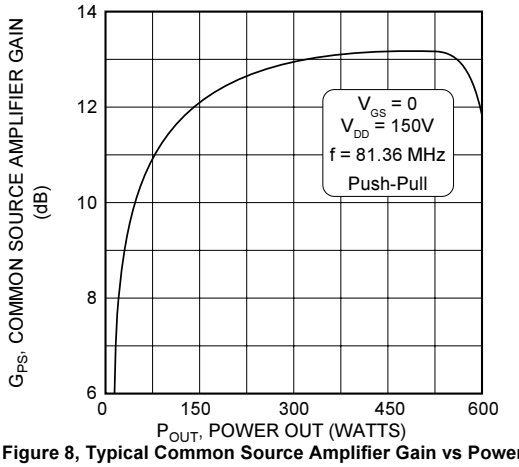


Figure 8, Typical Common Source Amplifier Gain vs Power Out

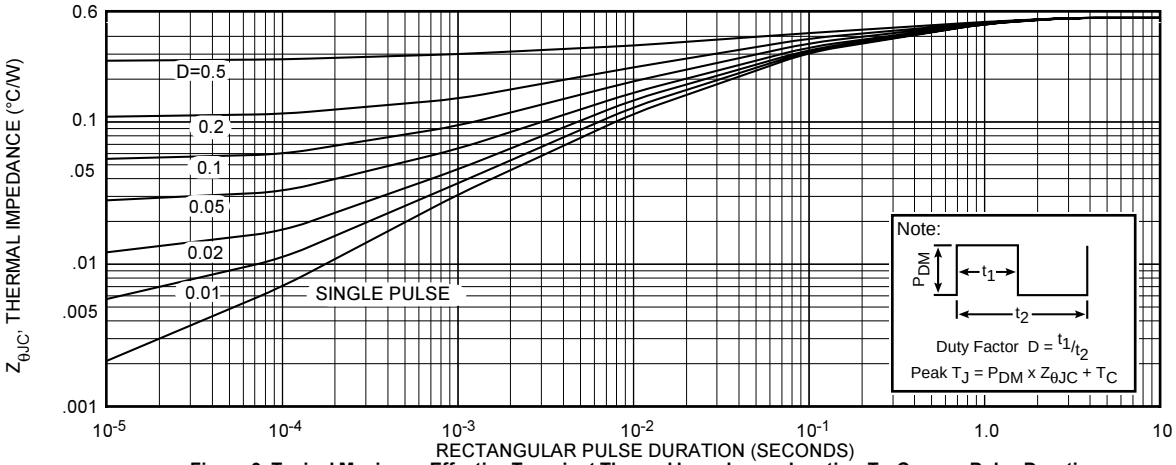


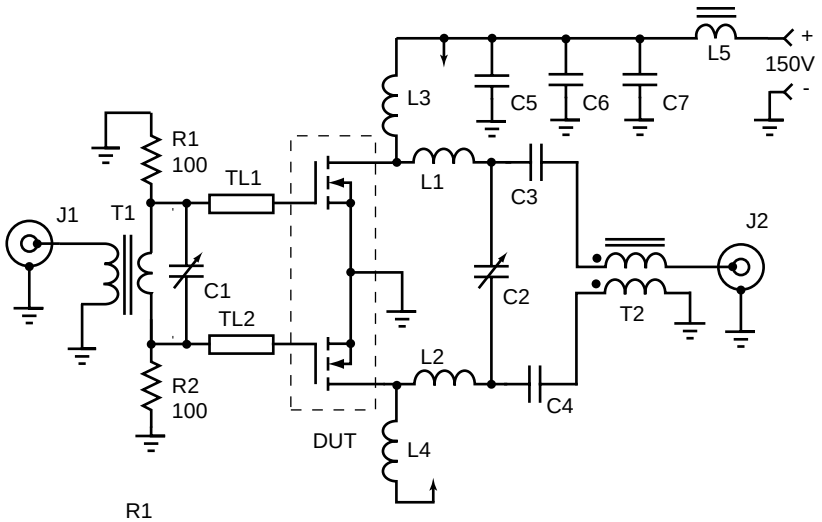
Figure 9, Typical Maximum Effective Transient Thermal Impedance, Junction-To-Case vs Pulse Duration

Table 1 - Typical Class C Large Signal Input-Output Impedance (per section)

Freq. (MHz)	Z_{in} (Ω)	Z_{OL} (Ω)
2.0	23.00 - j 7.0	93.0 - j 10
13.5	4.30 - j 9.1	63.0 - j 43
27.0	1.00 - j 4.2	32.0 - j 43
40.0	0.42 - j 1.7	17.5 - j 34
65.0	0.35 + j 1.1	7.7 - j 22
80.0	0.56 + j 2.5	5.1 - j 16
100.0	0.90 + j 3.8	3.4 - j 12

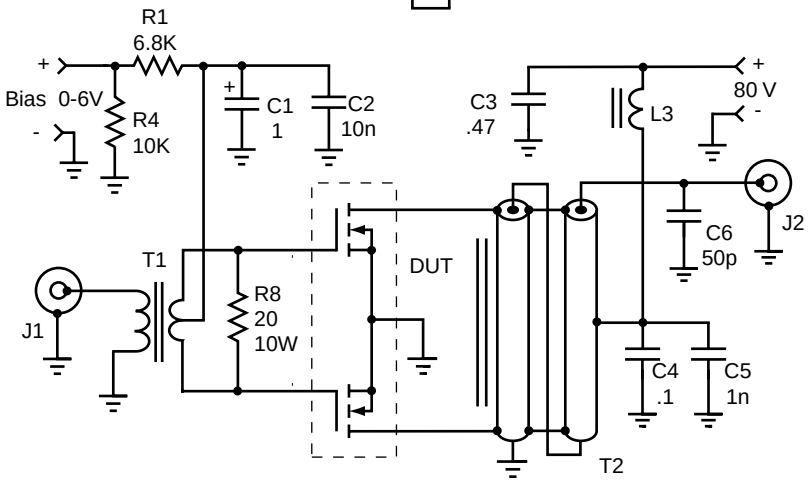
Z_{in} - gate shunted by 25Ω

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



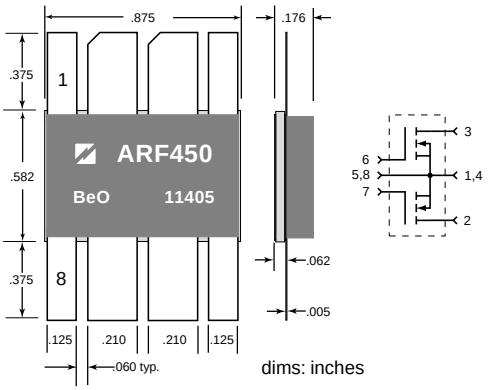
C1 75-380 pF ARCO 465
C2 25-115 pF ARCO 462
C3 -C5 2 nF NPO 500V chip
C6 10 nF 500V chip
C7 .47 uF Ceramic 500V
L1-L2 50 nH 3t # 14 ga .3" dia
L3-L4 .68 uH 12t #24 enam
L5 2t #20 on bead approx 2 uH
R1-R2 100 ohm 1 W
T1 9:1 RF transformer
T2 1:1 coax balun
TL1-TL2 Printed line 1" long

81.36 MHz Test Circuit

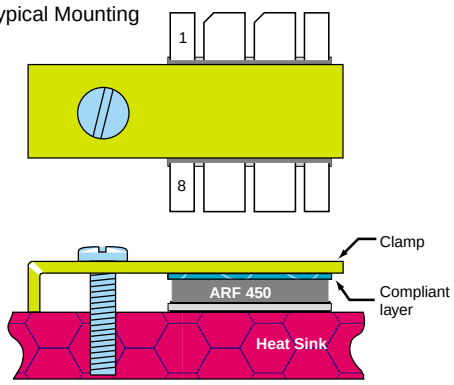


T1 9:1 RF Transformer on type 43 beads
T2 4:1 RF Transformer. Made from two pieces of 25 ohm semi-rigid coax with type 43 ferrite bead loading.

30 MHz Linear Test Circuit



Typical Mounting



HAZARDOUS MATERIAL WARNING

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

Thermal Considerations and Package Mounting:

The rated 650W power dissipation is only available when the package mounting surface is at 25˚C and the junction temperature is 200˚C. The thermal resistance between junctions and case mounting surface is 0.27 ˚C/W. When installed, an additional thermal impedance of 0.05 ˚C/W between the package base and the mounting surface is typical. Insure that the mounting surface is smooth and flat. Thermal joint compound must be used to reduce the effects of small surface irregularities. The heatsink should incorporate a copper heat spreader to obtain best results.

The package is designed to be clamped to a heatsink. A clamped joint maintains the required mounting pressure while allowing for thermal expansion of both the device and the heat sink. An L-clamp, a compliant layer of plastic or rubber, and a 6-32 (M3.5) screw can provide the minimum 35 lb required mounting force. T = 4 in-lb.

050-4910 Rev C 12-2000

USA: 405 S.W. Columbia Street Bend, Oregon 97702-1035 Phone: (541) 382-8028 FAX: (541) 388-0364

EUROPE: Chemin de Magret F-33700 Merignac - France Phone: (33) 5 57 92 15 15 FAX: (33) 5 56 47 97 61