

**ARF440 125W 50V 13.56MHz**  
**ARF441 125W 50V 13.56MHz**

THE ARF440 PIN-OUTS ARE MIRROR IMAGE OF THE ARF441.

## RF OPERATION (1-15MHz)

**POWER MOS IV®**

### N-CHANNEL ENHANCEMENT MODE RF POWER MOSFET

The ARF440 and ARF441 comprise a symmetric pair of RF power transistors designed for narrow-band push-pull commercial, medical and industrial RF power amplifier applications.

- Specified 50 Volt, 13.56 MHz Characteristics:
- Output Power = 125 Watts.
- Gain = 21dB (Typ.)
- Efficiency = 63% (Typ.)
- 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	ARF440/441	UNIT
$V_{DSS}$	Drain-Source Voltage	150	Volts
$V_{DGO}$	Drain-Gate Voltage	150	
$I_D$	Continuous Drain Current @ $T_C = 25^\circ\text{C}$	11	Amps
$V_{GS}$	Gate-Source Voltage	$\pm 30$	Volts
$P_D$	Total Power Dissipation @ $T_C = 25^\circ\text{C}$	167	Watts
$R_{\theta JC}$	Junction to Case	0.75	$^\circ\text{C}/\text{W}$
$T_J, T_{STG}$	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 ( $V_{GS} = 0\text{V}, I_D = 250 \mu\text{A}$ )	150			Volts
$V_{DS(ON)}$	On State Drain Voltage ① ( $I_D(ON) = 10\text{A}, V_{GS} = 10\text{V}$ )			6	
$I_{DSS}$	Zero Gate Voltage Drain Current ( $V_{DS} = V_{DSS}, V_{GS} = 0\text{V}$ )			250	$\mu\text{A}$
	Zero Gate Voltage Drain Current ( $V_{DS} = 0.8 V_{DSS}, V_{GS} = 0\text{V}, T_C = 125^\circ\text{C}$ )			1000	
$I_{GSS}$	Gate-Source Leakage Current ( $V_{GS} = \pm 30\text{V}, V_{DS} = 0\text{V}$ )			$\pm 100$	nA
$g_{fs}$	Forward Transconductance ( $V_{DS} = 10\text{V}, I_D = 5.5\text{A}$ )	4	5		mhos
$V_{GS(TH)}$	Gate Threshold Voltage ( $V_{DS} = V_{GS}, I_D = 200\text{mA}$ )	2		5	Volts

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

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## DYNAMIC CHARACTERISTICS

ARF440/441

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
$C_{iss}$	Input Capacitance	$V_{GS} = 0V$ $V_{DS} = 50V$ $f = 1\text{ MHz}$		755	900	pF
$C_{oss}$	Output Capacitance			155	215	
$C_{rss}$	Reverse Transfer Capacitance			55	90	

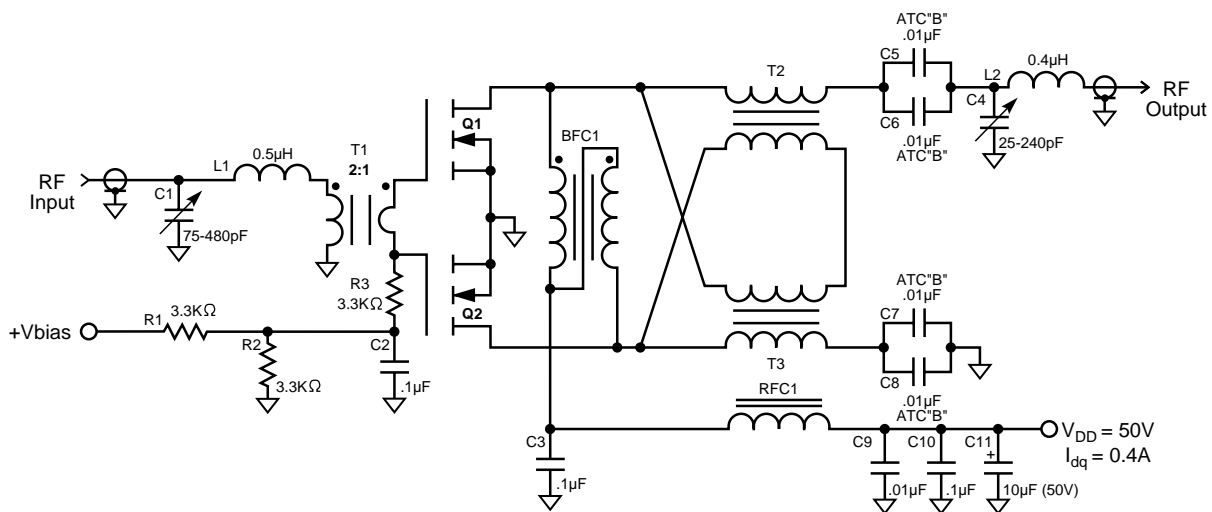
## FUNCTIONAL CHARACTERISTICS

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
$G_{PS}$	Common Source Amplifier Power Gain	$V_{DD} = 50V$ $P_{out} = 125W$ $I_{DQ} = 200mA$ $f = 13.56MHz$	18	21		dB
$\eta$	Drain Efficiency			63		%
$\psi$	Electrical Ruggedness VSWR 30:1		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.

### TYPICAL 13.56 MHz, 250 WATT PUSH-PULL POWER AMPLIFIER CIRCUIT



#### Parts List

C1 = 75-480pF Compression Mica  
 C2, C3 & C10 = .1 $\mu$ F @ 50V, Novacap #1210B104K500N  
 C4 = 25-240pF Compression Mica  
 C5, C6, C7, C8 & C9 = .01 $\mu$ F @ 50V, Novacap #1210B103K500N  
 C11 = 10 $\mu$ F @ 50V Electrolytic  
 R1, R2 & R3 = 1K $\Omega$ , 5%, 1/4W, Carbon  
 Q1 = ARF440  
 Q2 = ARF441

L1 = 7.5 T of #18AWG, ID = .438", L = 0.5 $\mu$ H  
 L2 = 6.5 T of #18AWG, ID = .438", L = 0.4 $\mu$ H

BFC1 = Balanced DC Feed Choke; 7 T of #18 stranded PTFE twisted pair on an Indiana General #F624-19-Q1 toroid.  $\mu$ i = 125  
 RFC1 = 2 T of #18 stranded PTFE on a Fair-Rite #2677006301 shield bead.  $\mu$ i = 2000

T1 = 4:1 Z Conventional Transformer; 2:1 T of #22 stranded PTFE on a Fair-Rite #2843000202 Balun Core.  $\mu$ i = 850  
 T2 & 3 = 1:4 Z Transmission Line Transformer; 6 T of mini 25 $\Omega$  PTFE coax on a Fair-Rite #2643102002 shield bead.  $\mu$ i = 2000

PCB = .062" G10 Epoxy Glass.

# ARF440/441

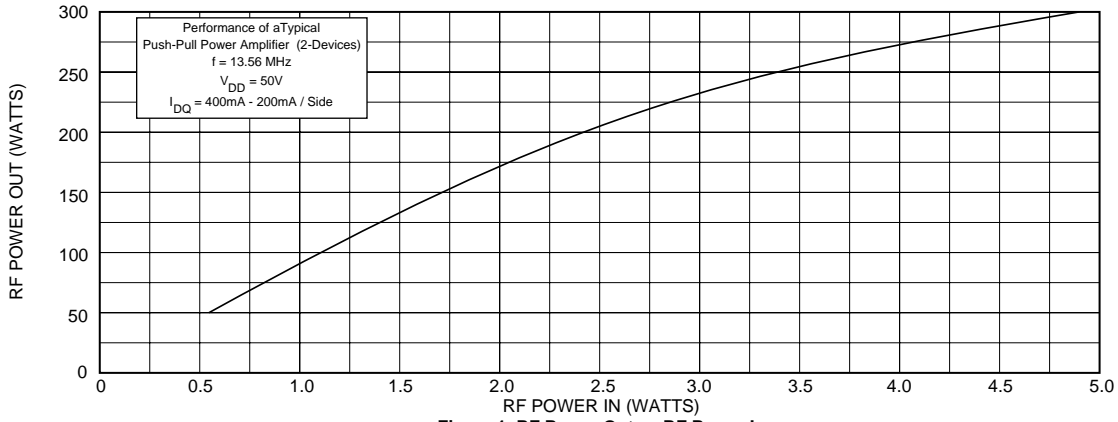


Figure 1, RF Power Out vs RF Power In

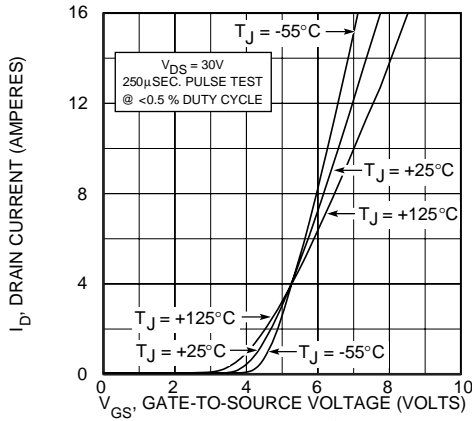


Figure 2, Typical Transfer Characteristics

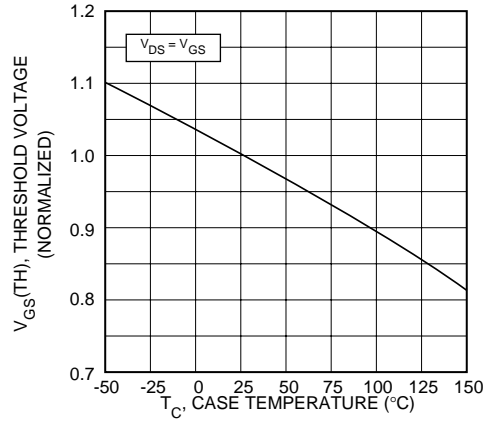


Figure 3, Threshold Voltage vs Temperature

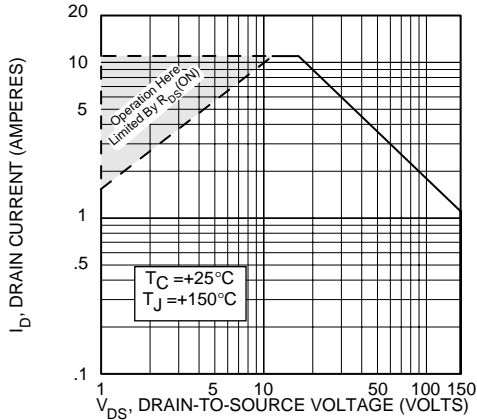


Figure 4, Maximum DC Safe Operating Area

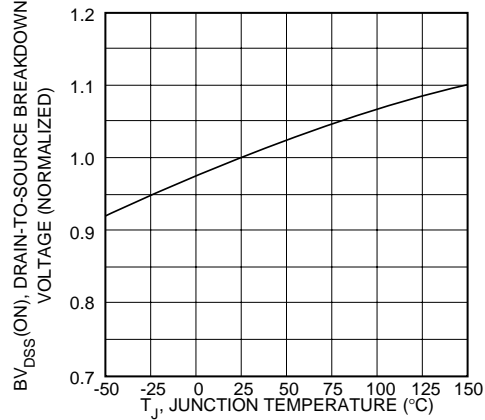


Figure 5, Breakdown Voltage vs Temperature

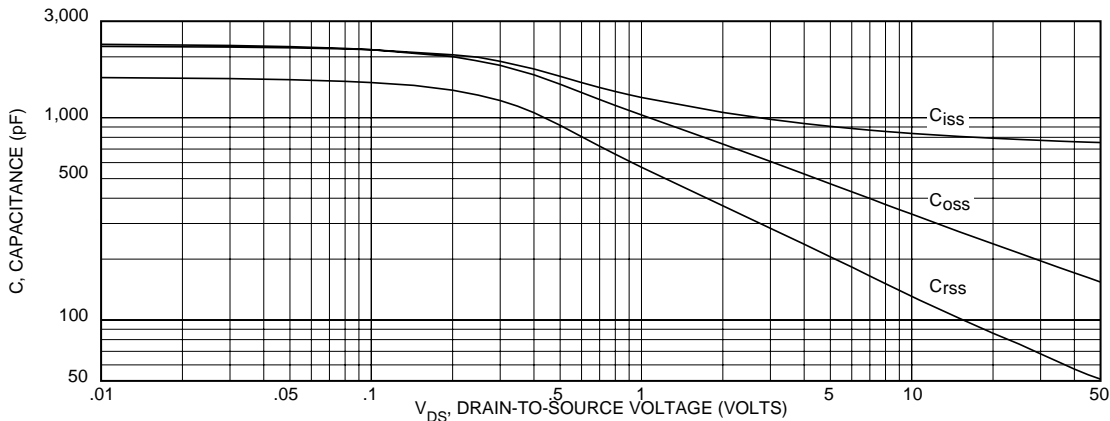
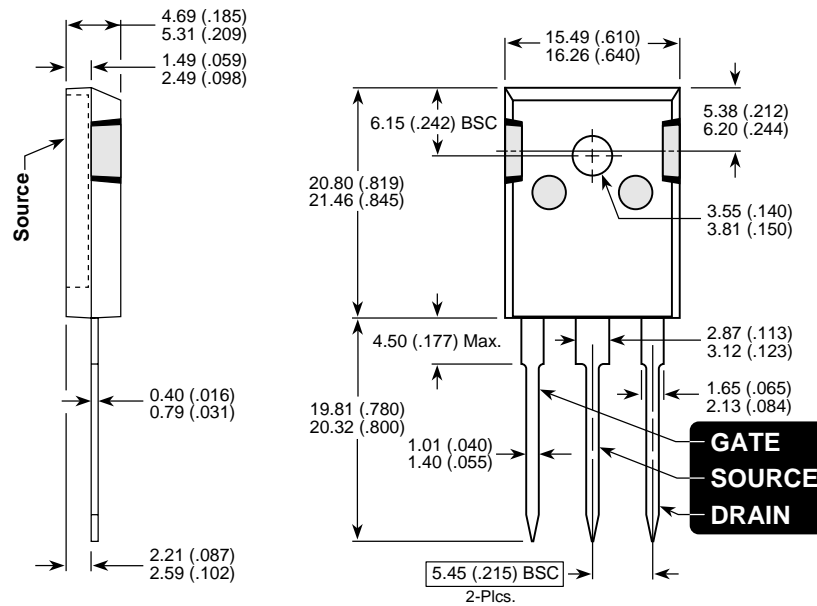


Figure 6, Typical Capacitance vs. Drain-To-Source Voltage

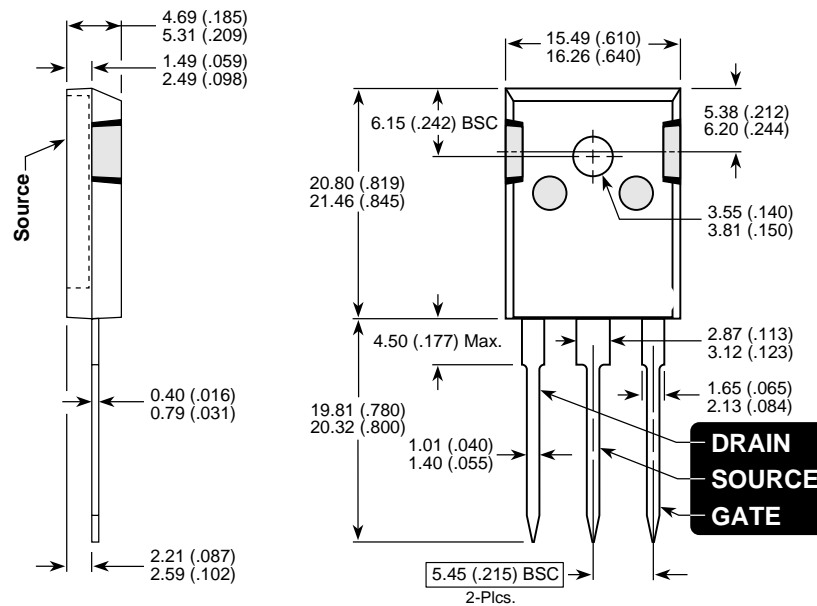
## TO-247AD Package Outline

## ARF440



Dimensions in Millimeters and (Inches)

## ARF441



**NOTE:** The ARF440 and ARF441 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.

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