

**ADVANCED  
POWER  
TECHNOLOGY®**  
APL501J 500V 43.0A 0.12Ω

"UL Recognized" File No. E145592 (S)

**POWER MOS IV®**

**SINGLE DIE ISOTOP® PACKAGE**

**N-CHANNEL ENHANCEMENT MODE HIGH VOLTAGE POWER MOSFETS**

**MAXIMUM RATINGS**

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

Symbol	Parameter	APL501J	UNIT
$V_{DSS}$	Drain-Source Voltage	500	Volts
$I_D$	Continuous Drain Current @ $T_C = 25^\circ\text{C}$	43	Amps
$I_{DM}, I_{LM}$	Pulsed Drain Current <sup>①</sup> and Inductive Current Clamped	172	
$V_{GS}$	Gate-Source Voltage	±30	Volts
$P_D$	Total Power Dissipation @ $T_C = 25^\circ\text{C}$	520	Watts
	Linear Derating Factor	4.16	W/°C
$T_J, T_{STG}$	Operating and Storage Junction Temperature Range	-55 to 150	°C
$T_L$	Lead Temperature: 0.063" from Case for 10 Sec.	300	

**STATIC ELECTRICAL CHARACTERISTICS**

Symbol	Characteristic / Test Conditions / Part Number	MIN	TYP	MAX	UNIT
$BV_{DSS}$	Drain-Source Breakdown Voltage ( $V_{GS} = 0V, I_D = 250 \mu\text{A}$ )	500			Volts
$I_D(\text{ON})$	On State Drain Current <sup>②</sup> ( $V_{DS} > I_D(\text{ON}) \times R_{DS}(\text{ON}) \text{ Max}, V_{GS} = 8V$ )	43			Amps
$R_{DS}(\text{ON})$	Drain-Source On-State Resistance <sup>②</sup> ( $V_{GS} = 10V, 0.5 I_D [\text{Cont.}]$ )			0.12	Ohms
$I_{DSS}$	Zero Gate Voltage Drain Current ( $V_{DS} = V_{DSS}, V_{GS} = 0V$ )			25	$\mu\text{A}$
	Zero Gate Voltage Drain Current ( $V_{DS} = 0.8 V_{DSS}, V_{GS} = 0V, T_C = 125^\circ\text{C}$ )			250	
$I_{GSS}$	Gate-Source Leakage Current ( $V_{GS} = \pm 30V, V_{DS} = 0V$ )			±100	nA
$V_{GS}(\text{TH})$	Gate Threshold Voltage ( $V_{DS} = V_{GS}, I_D = 2.5\text{mA}$ )	2		4	Volts

**THERMAL CHARACTERISTICS**

Symbol	Characteristic	MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Junction to Case			0.24	°C/W
$R_{\theta CS}$	Case to Sink (Use High Efficiency Thermal Joint Compound and Planer Heat Sink Surface.)		0.06		

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

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

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# DYNAMIC CHARACTERISTICS

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
$C_{iss}$	Input Capacitance	$V_{GS} = 0V$ $V_{DS} = 25V$ $f = 1\text{ MHz}$		6040	7300	pF
$C_{oss}$	Output Capacitance			1220	1710	
$C_{rss}$	Reverse Transfer Capacitance			510	770	
$t_d(\text{on})$	Turn-on Delay Time	$V_{GS} = 15V$ $V_{DD} = 0.5 V_{DSS}$ $I_D = I_D[\text{Cont.}] @ 25^\circ\text{C}$ $R_G = 0.6\Omega$		13	26	ns
$t_r$	Rise Time			20	40	
$t_d(\text{off})$	Turn-off Delay Time			54	81	
$t_f$	Fall Time			11	20	

# SAFE OPERATING AREA CHARACTERISTICS

Symbol	Characteristic	Test Conditions / Part Number	MIN	TYP	MAX	UNIT
SOA1	Safe Operating Area	$V_{DS} = 400\text{ V}, I_{DS} = 0.813\text{A}, t = 20\text{ sec.}, T_C = 60^\circ\text{C}$	325			Watts

- ① Repetitive Rating: Pulse width limited by maximum junction temperature. See Transient Thermal Impedance Curve. (Fig.1)
- ② Pulse Test: Pulse width < 380  $\mu\text{s}$ , Duty Cycle < 2%
- ③ See MIL-STD-750 Method 3471

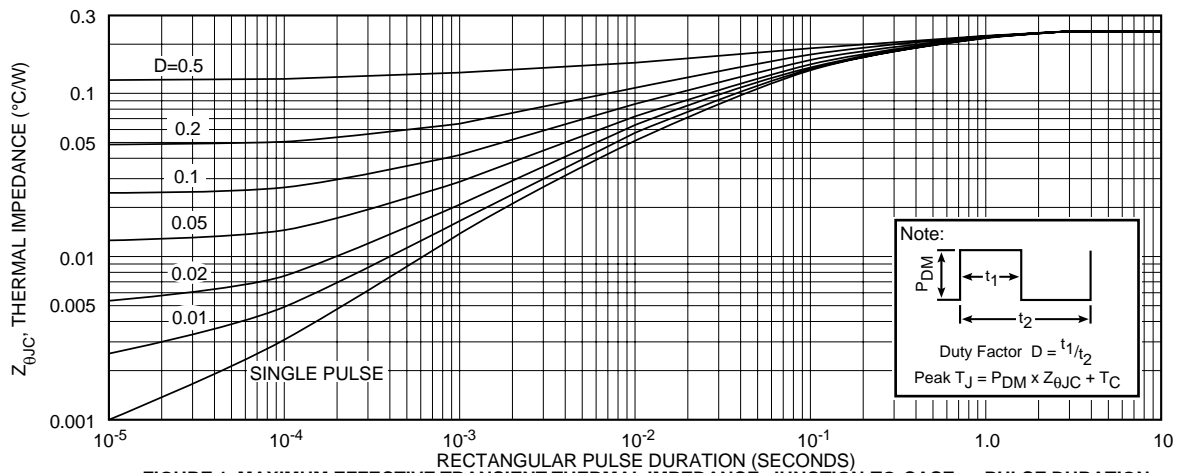


FIGURE 1, MAXIMUM EFFECTIVE TRANSIENT THERMAL IMPEDANCE, JUNCTION-TO-CASE vs PULSE DURATION

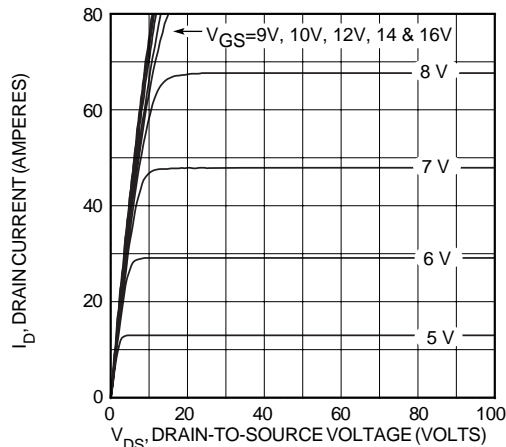


FIGURE2, TYPICAL OUTPUT CHARACTERISTICS

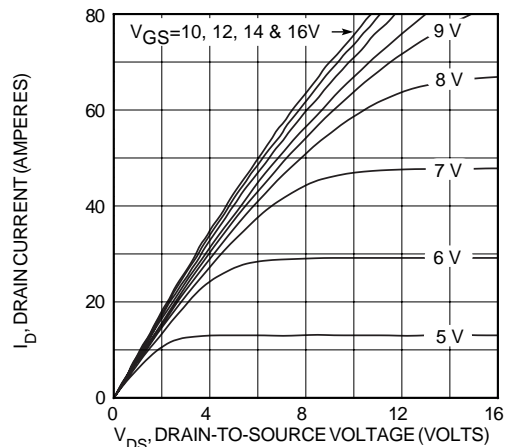
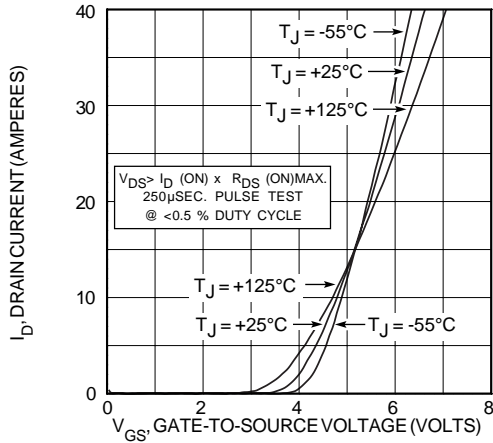
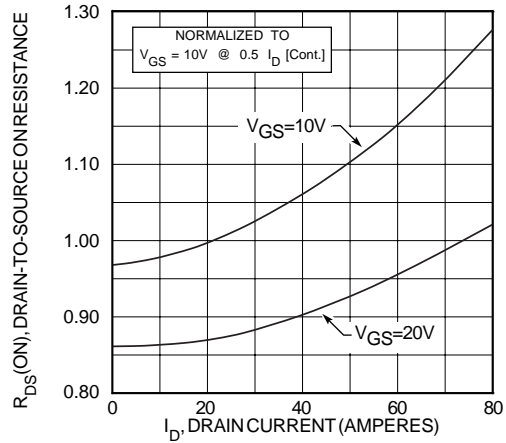


FIGURE3, TYPICAL OUTPUT CHARACTERISTICS

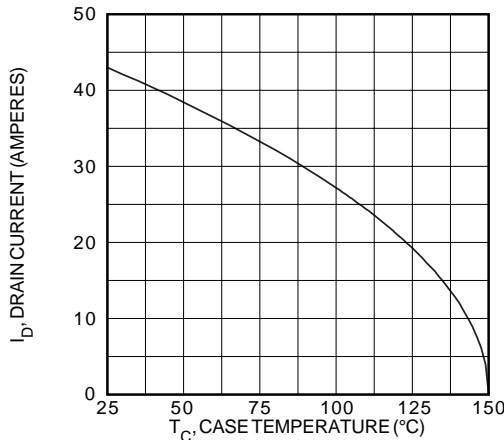
**APL501J**



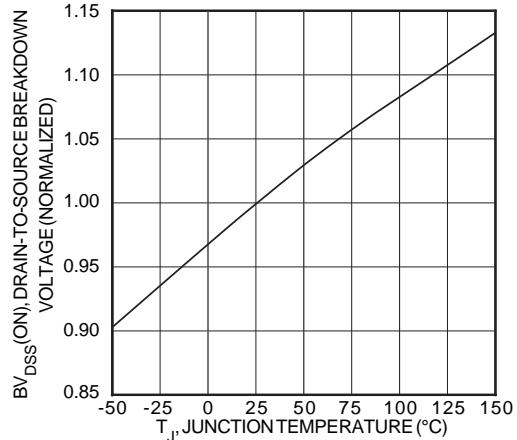
**FIGURE 4, TYPICAL TRANSFER CHARACTERISTICS**



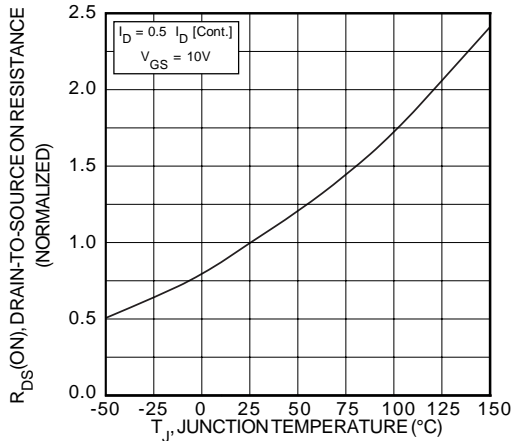
**FIGURE 5,  $R_{DS(ON)}$  vs DRAIN CURRENT**



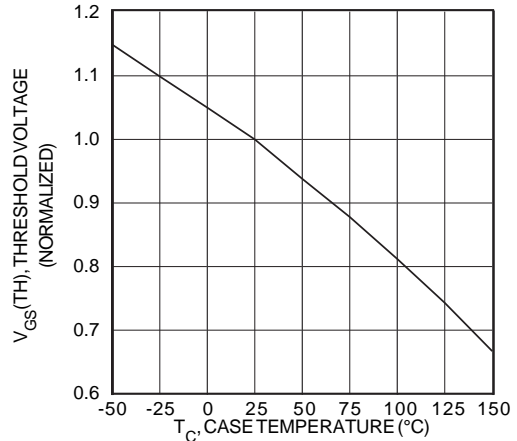
**FIGURE 6, MAXIMUM DRAIN CURRENT vs CASE TEMPERATURE**



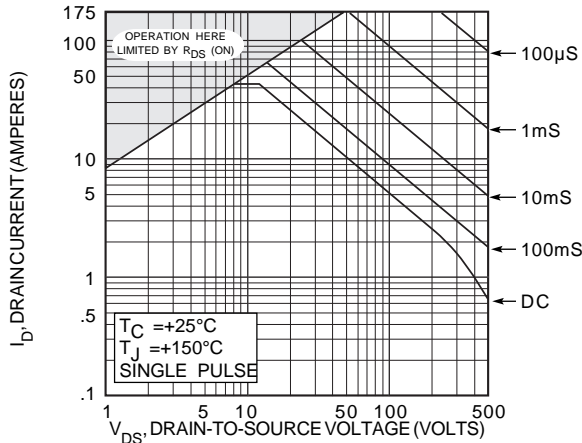
**FIGURE 7, BREAKDOWN VOLTAGE vs TEMPERATURE**



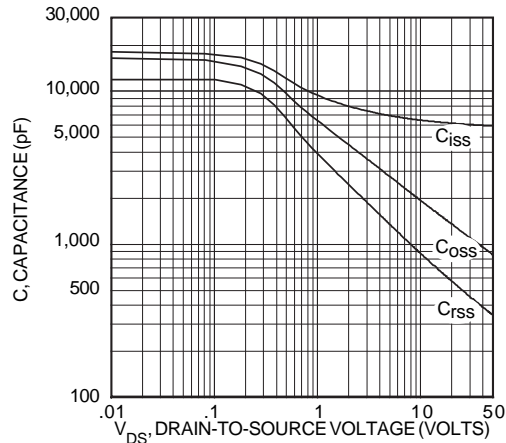
**FIGURE 8, ON-RESISTANCE vs. TEMPERATURE**



**FIGURE 9, THRESHOLD VOLTAGE vs TEMPERATURE**

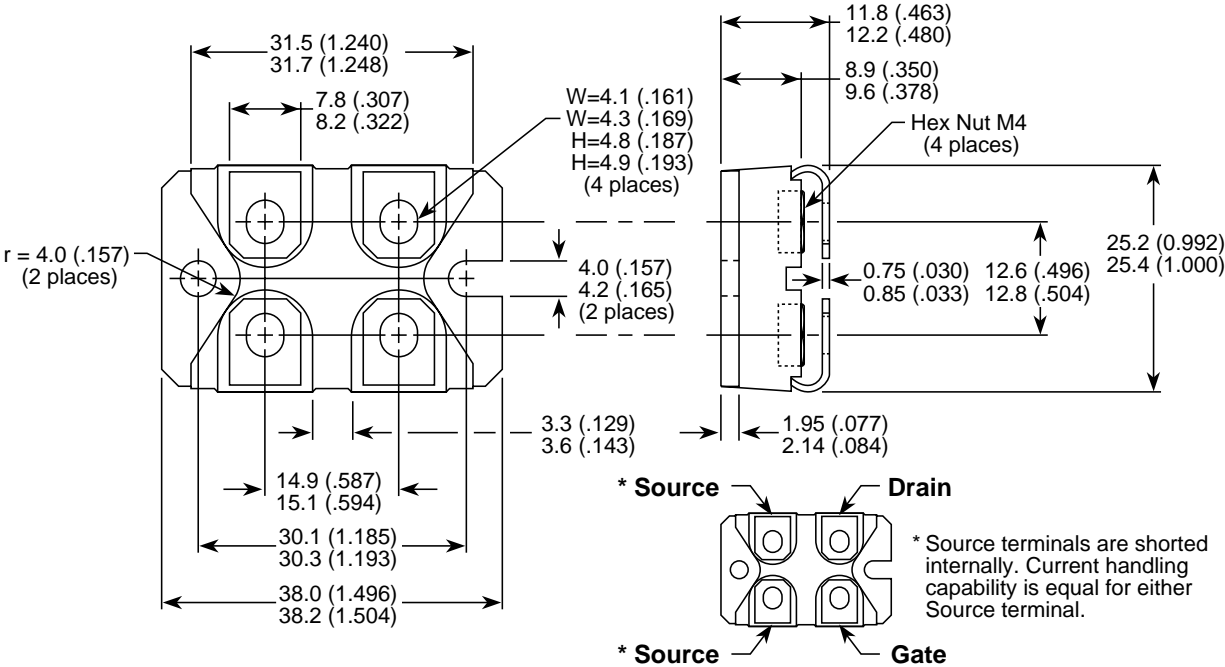


**FIGURE 10, MAXIMUM SAFE OPERATING AREA**



**FIGURE 11, TYPICAL CAPACITANCE vs DRAIN-TO-SOURCE VOLTAGE**

SOT-227 (ISOTOP®) Package Outline



Dimensions in Millimeters and (Inches)

\* Source terminals are shorted internally. Current handling capability is equal for either Source terminal.

050-5903 Rev C 9-2001

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APT's devices are covered by one or more of the following U.S. patents: 4,895,810 5,045,903 5,089,434 5,182,234 5,019,522 5,262,336  
 5,256,583 4,748,103 5,283,202 5,231,474 5,434,095 5,528,058