

APT5010JN 500V 48.0A 0.10Ω  
 APT5012JN 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	APT 5010JN	APT 5012JN	UNIT
$V_{DSS}$	Drain-Source Voltage	500	500	Volts
$I_D$	Continuous Drain Current @ $T_C = 25^\circ\text{C}$	48	43	Amps
$I_{DM}, I_{LM}$	Pulsed Drain Current <sup>①</sup> and Inductive Current Clamped	192	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 ( $V_{GS} = 0V, I_D = 250 \mu\text{A}$ )	APT5010JN	500		Volts
		APT5012JN	500		
$I_{D(ON)}$	On State Drain Current <sup>②</sup> ( $V_{DS} > I_{D(ON)} \times R_{DS(ON)}$ Max, $V_{GS} = 10V$ )	APT5010JN	48		Amps
		APT5012JN	43		
$R_{DS(ON)}$	Drain-Source On-State Resistance <sup>②</sup> ( $V_{GS} = 10V, 0.5 I_D$ [Cont.])	APT5010JN		0.10	Ohms
		APT5012JN		0.12	
$I_{DSS}$	Zero Gate Voltage Drain Current ( $V_{DS} = V_{DSS}, V_{GS} = 0V$ )			250	$\mu\text{A}$
	Zero Gate Voltage Drain Current ( $V_{DS} = 0.8 V_{DSS}, V_{GS} = 0V, T_C = 125^\circ\text{C}$ )			1000	
$I_{GSS}$	Gate-Source Leakage Current ( $V_{GS} = \pm 30V, V_{DS} = 0V$ )			±100	nA
$V_{GS(TH)}$	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.

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**DYNAMIC CHARACTERISTICS**

**APT5010/5012JN**

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
$C_{iss}$	Input Capacitance	$V_{GS} = 0V$ $V_{DS} = 25V$ $f = 1\text{ MHz}$		5570	6500	pF
$C_{oss}$	Output Capacitance			1170	1640	
$C_{rss}$	Reverse Transfer Capacitance			440	660	
$Q_g$	Total Gate Charge ③	$V_{GS} = 10V$ $V_{DD} = 0.5 V_{DSS}$ $I_D = I_D [\text{Cont.}] @ 25^\circ\text{C}$		240	370	nC
$Q_{gs}$	Gate-Source Charge			32	48	
$Q_{gd}$	Gate-Drain ("Miller") Charge			116	170	
$t_d(\text{on})$	Turn-on Delay Time	$V_{GS} = 15V$ $V_{DD} = 0.5 V_{DSS}$ $I_D = I_D [\text{Cont.}] @ 25^\circ\text{C}$ $R_G = 0.6\Omega$		15	30	ns
$t_r$	Rise Time			25	50	
$t_d(\text{off})$	Turn-off Delay Time			48	75	
$t_f$	Fall Time			12	25	

**SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS**

Symbol	Characteristic / Test Conditions	MIN	TYP	MAX	UNIT
$I_S$	Continuous Source Current (Body Diode)	APT5010JN		48	Amps
		APT5012JN		43	
$I_{SM}$	Pulsed Source Current ① (Body Diode)	APT5010JN		192	Amps
		APT5012JN		172	
$V_{SD}$	Diode Forward Voltage ② ( $V_{GS} = 0V, I_S = -I_D [\text{Cont.}]$ )			1.8	Volts
$t_{rr}$	Reverse Recovery Time ( $I_S = -I_D [\text{Cont.}], di_S/dt = 100A/\mu s$ )		415	830	ns
$Q_{rr}$	Reverse Recovery Charge ( $I_S = -I_D [\text{Cont.}], di_S/dt = 100A/\mu s$ )		8.3	16	$\mu\text{C}$

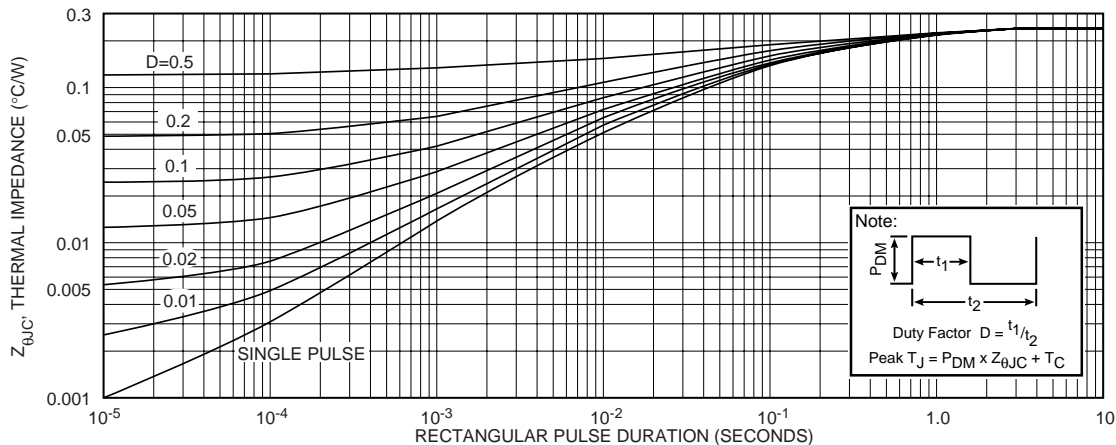
**PACKAGE CHARACTERISTICS**

Symbol	Characteristic / Test Conditions	MIN	TYP	MAX	UNIT
$L_D$	Internal Drain Inductance (Measured From Drain Terminal to Center of Die.)		3		nH
$L_S$	Internal Source Inductance (Measured From Source Terminals to Source Bond Pads)		5		
$V_{isolation}$	RMS Voltage (50-60 Hz Sinusoidal Waveform From Terminals to Mounting Base for 1 Min.)	2500			Volts
$C_{isolation}$	Drain-to-Mounting Base Capacitance ( $f = 1\text{MHz}$ )		35		pF
Torque	Maximum Torque for Device Mounting Screws and Electrical Terminations.			13	in-lbs

① Repetitive Rating: Pulse width limited by maximum junction temperature. See Transient Thermal Impedance Curve. (Fig.1)

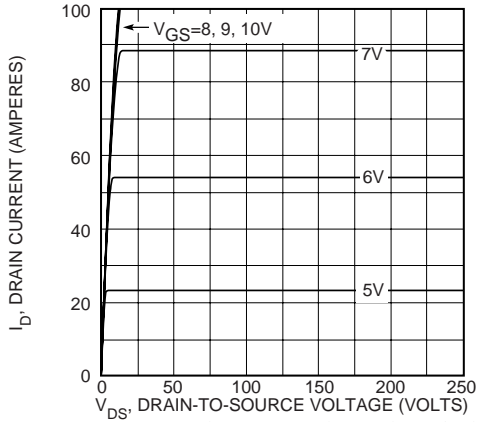
② Pulse Test: Pulse width < 380  $\mu\text{s}$ , Duty Cycle < 2%

③ See MIL-STD-750 Method 3471

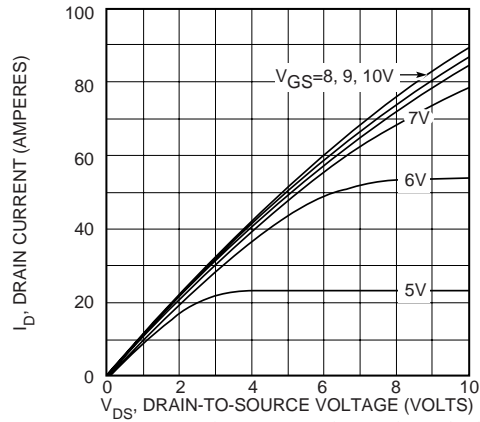


**FIGURE 1, MAXIMUM EFFECTIVE TRANSIENT THERMAL IMPEDANCE, JUNCTION-TO-CASE vs PULSE DURATION**

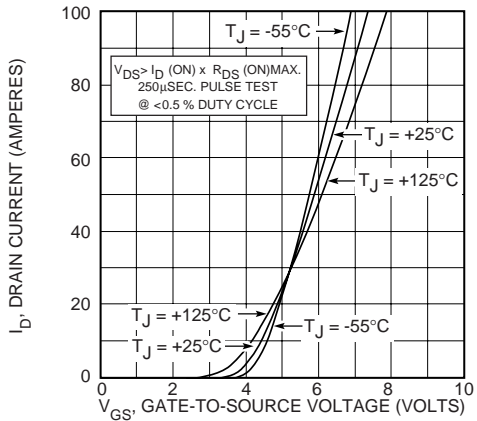
**APT5010/5012JN**



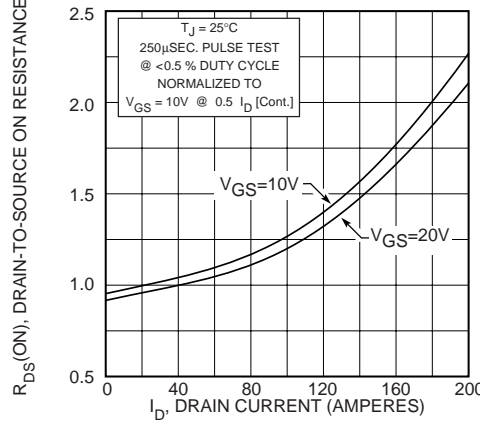
**FIGURE 2, TYPICAL OUTPUT CHARACTERISTICS**



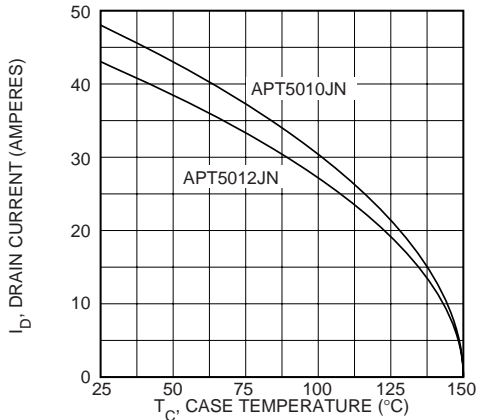
**FIGURE 3, TYPICAL OUTPUT CHARACTERISTICS**



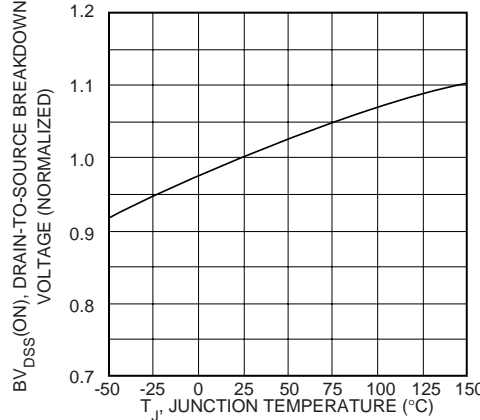
**FIGURE 4, TYPICAL TRANSFER CHARACTERISTICS**



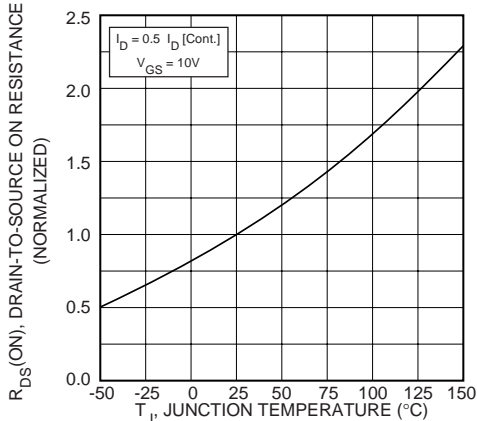
**FIGURE 5,  $R_{DS(ON)}$  vs DRAIN CURRENT**



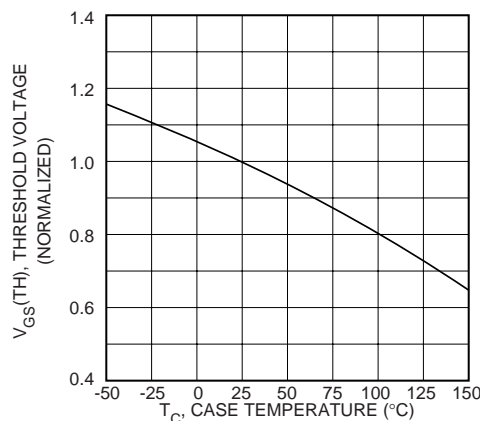
**FIGURE 6, MAXIMUM DRAIN CURRENT vs CASE TEMPERATURE**



**FIGURE 7, BREAKDOWN VOLTAGE vs TEMPERATURE**

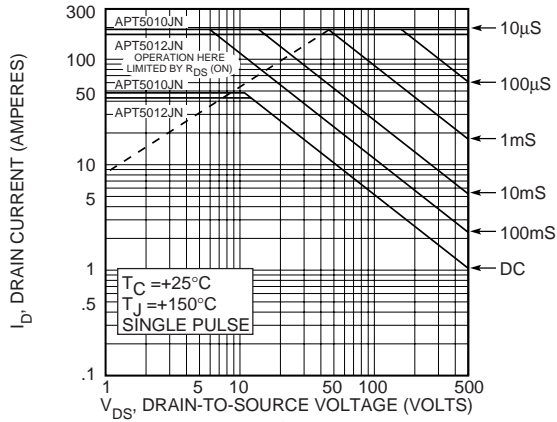


**FIGURE 8, ON-RESISTANCE vs. TEMPERATURE**

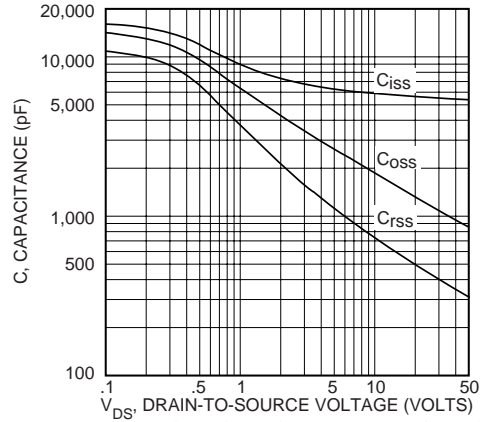


**FIGURE 9, THRESHOLD VOLTAGE vs TEMPERATURE**

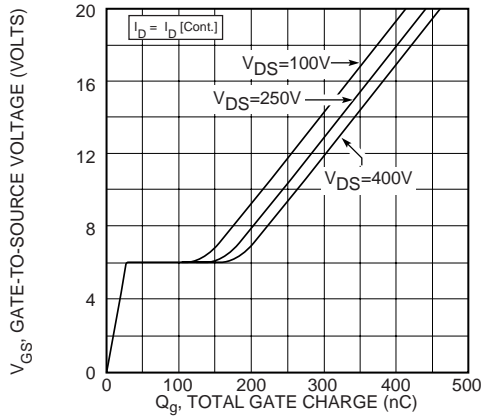
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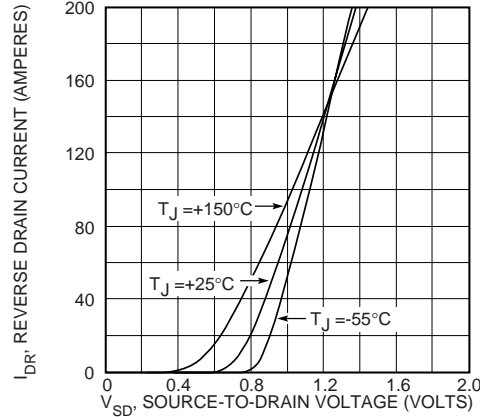
**FIGURE 10, MAXIMUM SAFE OPERATING AREA**



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



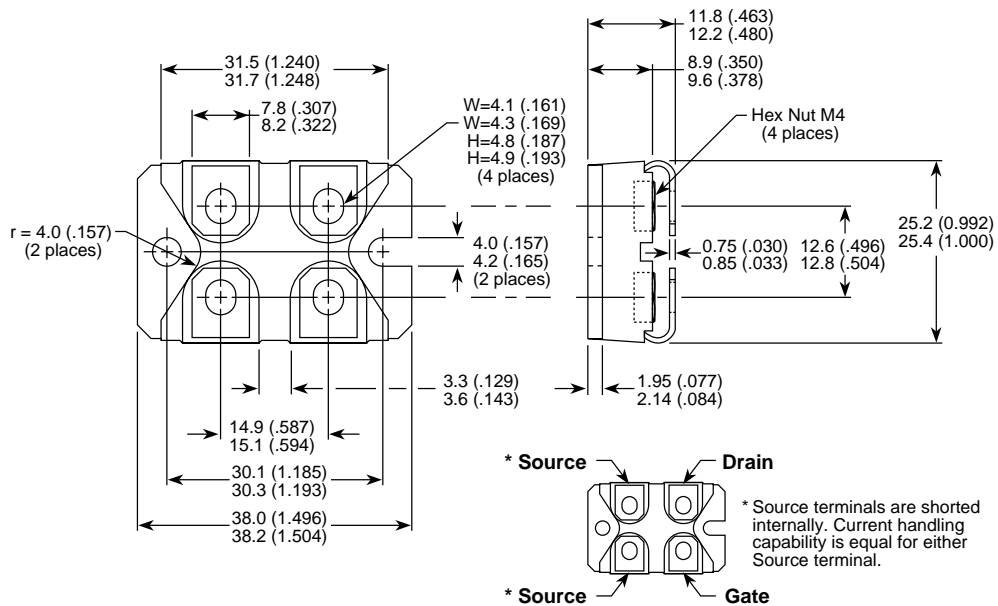
**FIGURE 12, GATE CHARGES vs GATE-TO-SOURCE VOLTAGE**



**FIGURE 13, TYPICAL SOURCE-DRAIN DIODE FORWARD VOLTAGE**

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

**SOT-227 (ISOTOP®) Package Outline**



Dimensions in Millimeters and (Inches)

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