

APT1004RGN 1000V 3.3A 4.00Ω

POWER MOS IV™

N - CHANNEL ENHANCEMENT MODE HIGH VOLTAGE POWER MOSFETS

MAXIMUM RATINGS

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

Symbol	Parameter	APT1004RGN	UNIT
V_{DSS}	Drain-Source Voltage	1000	Volts
I_D	Continuous Drain Current @ $T_C = 25^\circ\text{C}$	3.3	Amps
I_{DM}	Pulsed Drain Current ①	13.2	
V_{GS}	Gate-Source Voltage	± 30	Volts
P_D	Total Power Dissipation @ $T_C = 25^\circ\text{C}$	100	Watts
	Linear Derating Factor	0.8	W/ $^\circ\text{C}$
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 ($V_{GS} = 0V, I_D = 250\mu\text{A}$)	1000			Volts
$I_{D(ON)}$	On State Drain Current ② ($V_{DS} > I_{D(ON)} \times R_{DS(ON)}$ Max, $V_{GS} = 10V$)	3.3			Amps
$R_{DS(ON)}$	Drain-Source On-State Resistance ② ($V_{GS} = 10V, 0.5 I_{D(ON)}$)			4.00	Ohms
I_{DSS}	Zero Gate Voltage Drain Current ($V_{DS} = V_{DSS}, V_{GS} = 0V$)			250	μA
	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 ($V_{DS} = V_{GS}, I_D = 1.0\text{mA}$)	2		4	Volts

SAFE OPERATING AREA CHARACTERISTICS

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
SOA1	Safe Operating Area	$V_{DS} = 0.4 V_{DSS}, I_{DS} = P_D / 0.4 V_{DSS}, t = 1 \text{ Sec.}$	100			Watts
SOA2	Safe Operating Area	$I_{DS} = I_{D(ON)}, V_{DS} = P_D / I_{D(ON)}, t = 1 \text{ Sec.}$	100			
I_{LM}	Inductive Current Clamped		3.3			Amps

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

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DYNAMIC CHARACTERISTICS

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Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
C_{DC}	Drain-to-Case Capacitance	$f = 1 \text{ MHz}$		8	12	pF
C_{iss}	Input Capacitance	$V_{GS} = 0V$		805	950	
C_{oss}	Output Capacitance	$V_{DS} = 25V$		115	160	
C_{rss}	Reverse Transfer Capacitance	$f = 1 \text{ MHz}$		37	60	
Q_g	Total Gate Charge	$V_{GS} = 10V$		35	55	nC
Q_{gs}	Gate-Source Charge	$V_{DD} = 0.5 V_{DSS}$		4.3	7	
Q_{gd}	Gate-Drain ("Miller") Charge	$I_D = I_D [\text{Cont.}] @ 25^\circ\text{C}$		18	27	
$t_{d(on)}$	Turn-on Delay Time	$V_{GS} = 10V$		10	20	ns
t_r	Rise Time	$V_{DD} = 0.5 V_{DSS}$		12	24	
$t_{d(off)}$	Turn-off Delay Time	$I_D = I_D [\text{Cont.}] @ 25^\circ\text{C}$		33	50	
t_f	Fall Time	$R_G = 1.8\Omega$		16	32	

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Symbol	Characteristic / Test Conditions	MIN	TYP	MAX	UNIT
I_S	Continuous Source Current (Body Diode)			3.3	Amps
I_{SM}	Pulsed Source Current ^① (Body Diode)			13.2	
V_{SD}	Diode Forward Voltage ^② ($V_{GS} = 0V, I_S = -I_D [\text{Cont.}]$)			1.3	Volts
t_{rr}	Reverse Recovery Time ($I_S = -I_D [\text{Cont.}], dI_S/dt = 100A/\mu s$)		290	580	ns
Q_{rr}	Reverse Recovery Charge ($I_S = -I_D [\text{Cont.}], dI_S/dt = 100A/\mu s$)		1.65	3.3	μC

THERMAL CHARACTERISTICS

Symbol	Characteristic	MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Junction to Case			1.20	W/°C
$R_{\theta JA}$	Junction to Ambient			80	

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

② Pulse Test: Pulse width < 380 μs , Duty Cycle < 2%

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

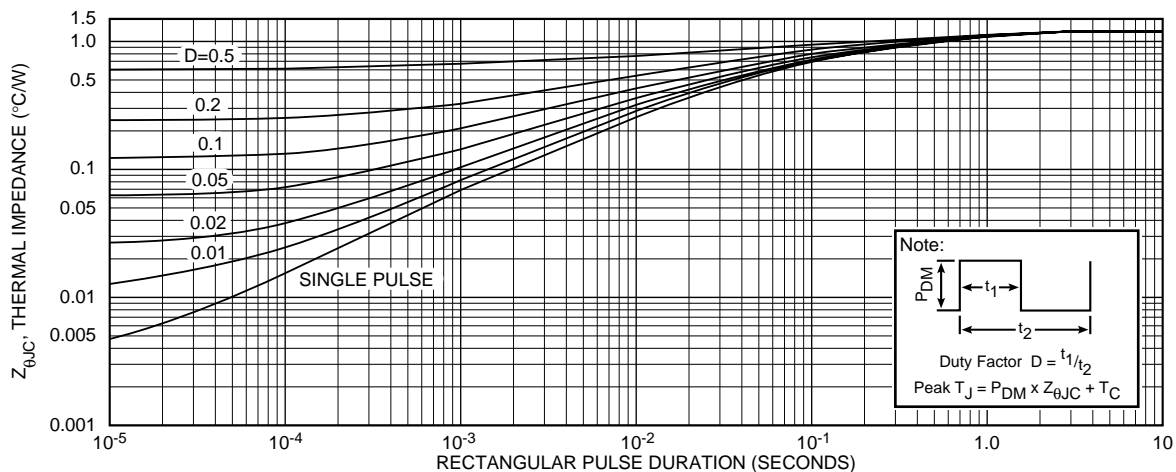


FIGURE 1, MAXIMUM EFFECTIVE TRANSIENT THERMAL IMPEDANCE, JUNCTION-TO-CASE vs PULSE DURATION

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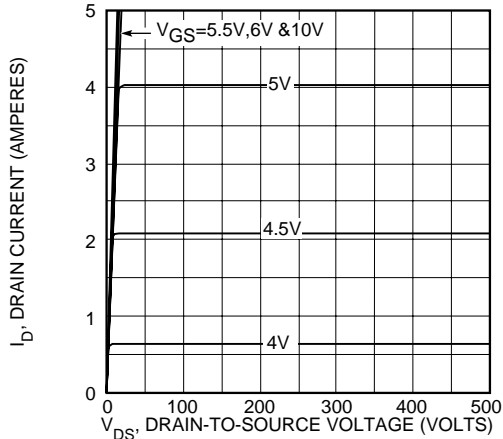


FIGURE 2, TYPICAL OUTPUT CHARACTERISTICS

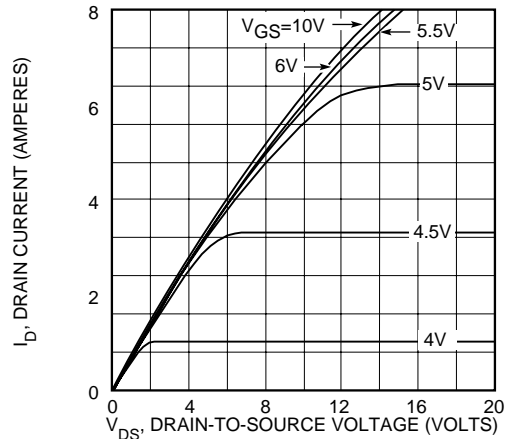


FIGURE 3, TYPICAL OUTPUT CHARACTERISTICS

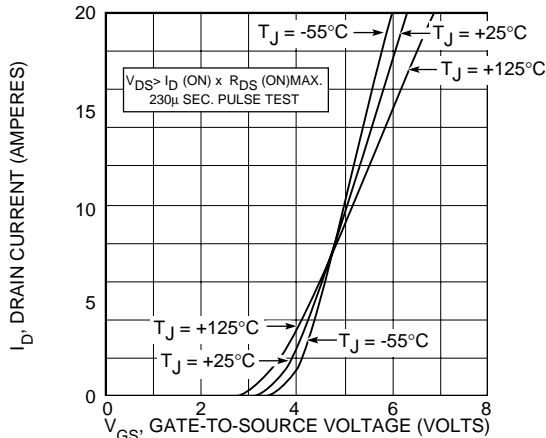


FIGURE 4, TYPICAL TRANSFER CHARACTERISTICS

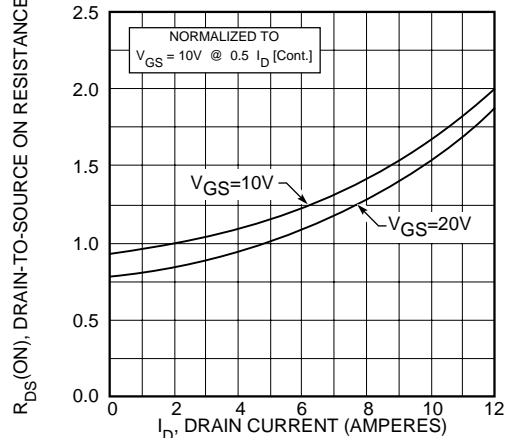


FIGURE 5, $R_{DS(ON)}$ vs DRAIN CURRENT

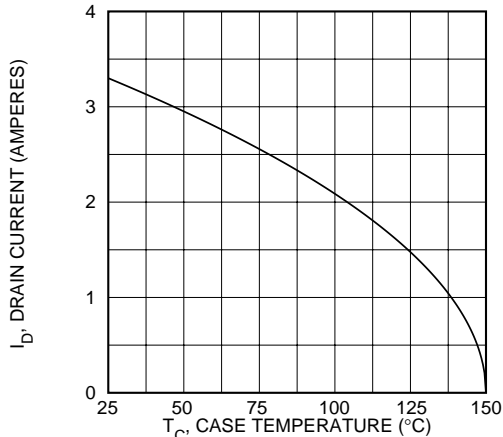


FIGURE 6, MAXIMUM DRAIN CURRENT vs CASE TEMPERATURE

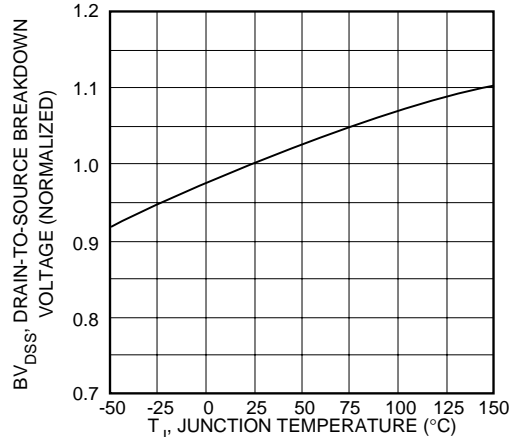


FIGURE 7, BREAKDOWN VOLTAGE vs TEMPERATURE

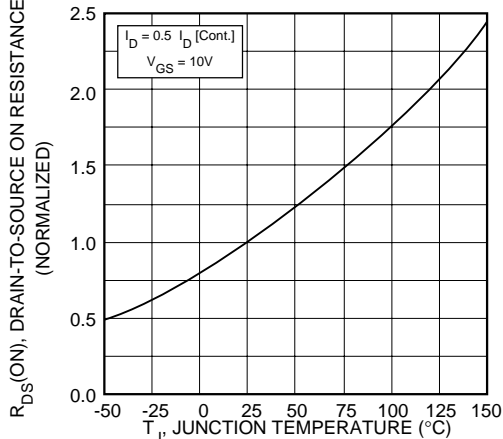


FIGURE 8, ON-RESISTANCE vs. TEMPERATURE

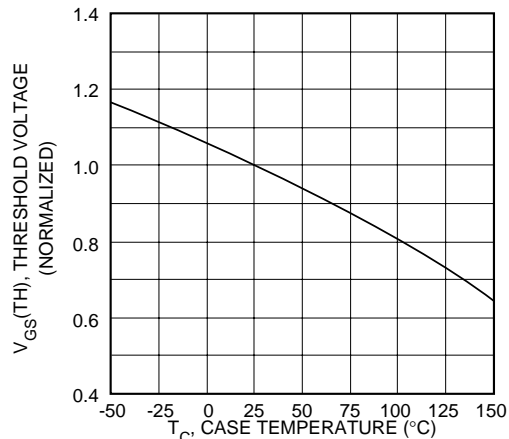


FIGURE 9, THRESHOLD VOLTAGE vs TEMPERATURE

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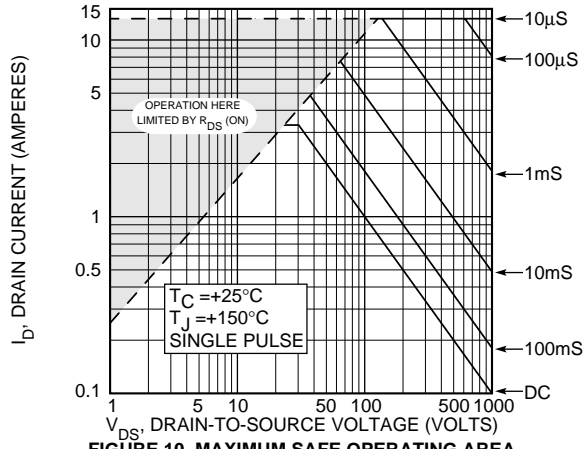


FIGURE 10, MAXIMUM SAFE OPERATING AREA

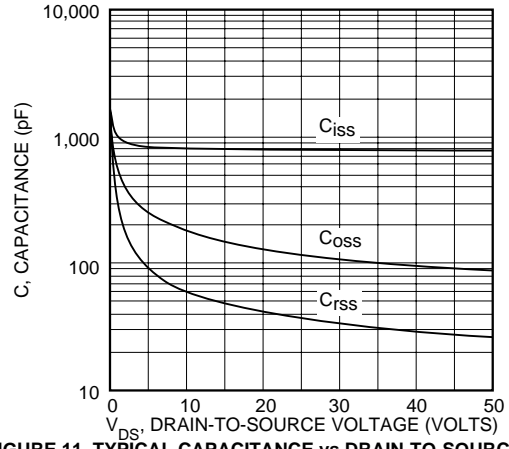


FIGURE 11, TYPICAL CAPACITANCE vs DRAIN-TO-SOURCE VOLTAGE

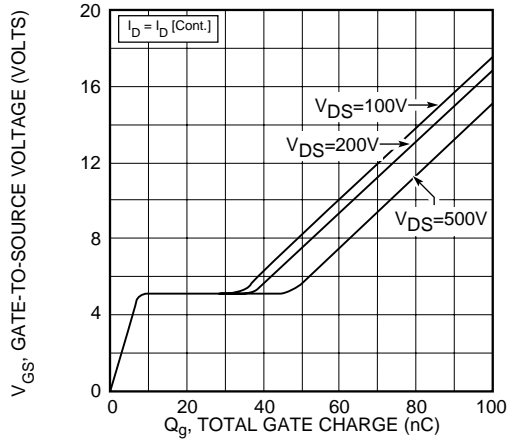


FIGURE 12, GATE CHARGES vs GATE-TO-SOURCE VOLTAGE

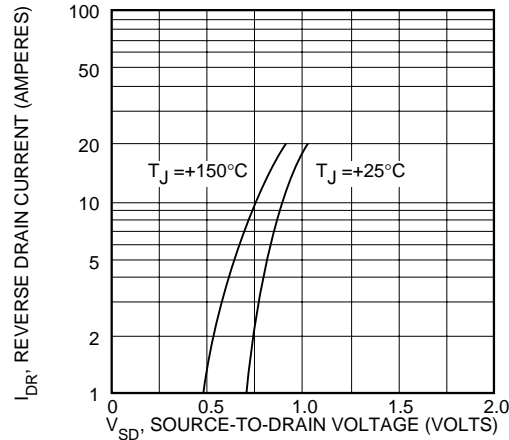
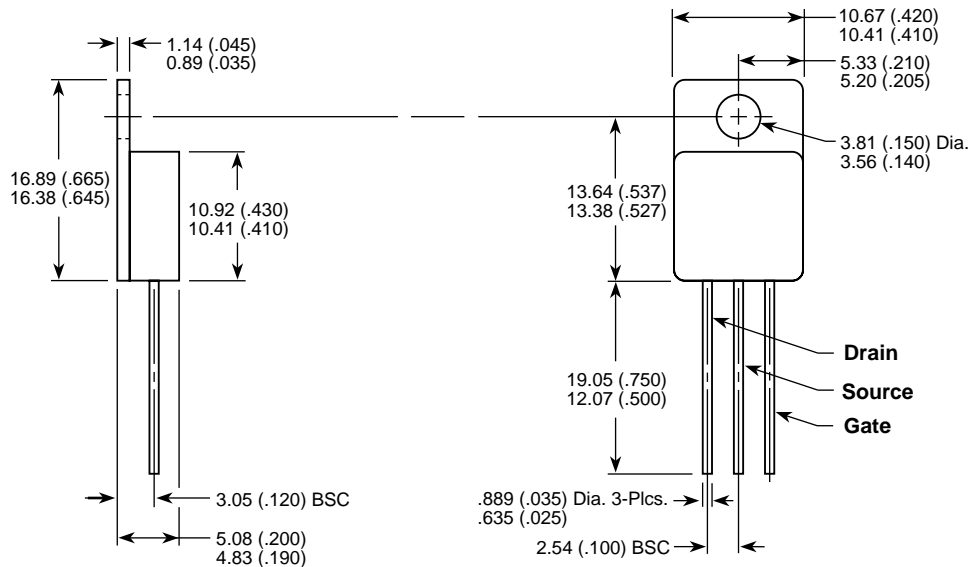


FIGURE 13, TYPICAL SOURCE-DRAIN DIODE FORWARD VOLTAGE

TO-257AA Package Outline



Dimensions in Millimeters and (Inches)