

**ADVANCED
POWER
TECHNOLOGY®**

APT1004RKNG 1000V 3.6A 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	APT1004R2KNG	UNIT
V_{DSS}	Drain-Source Voltage	1000	Volts
I_D	Continuous Drain Current	3.5	Amps
I_{DM}	Pulsed Drain Current ^①	14.0	Amps
V_{GS}	Gate-Source Voltage	±30	Volts
P_D	Total Power Dissipation @ $T_C = 25^\circ\text{C}$, Derate Above 25°C	125	Watts
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to 150	$^\circ\text{C}$

STATIC ELECTRICAL CHARACTERISTICS

Symbol	Characteristic / Test Conditions / Part Number	MIN	TYP	MAX	UNIT
BV_{DSS}	Drain-Source Breakdown Voltage ($V_{GS} = 0V, I_D = 250\mu\text{A}$)	APT1004RKNG	1000		Volts
I_{DSS}	Zero Gate Voltage Drain Current ($V_{DS} = V_{DSS}, V_{GS} = 0V$)			250	μA
	($V_{DS} = 0.8 V_{DSS}, V_{GS} = 0V, T_C = 125^\circ\text{C}$)			1000	
I_{GSS}	Gate-Source Leakage Current ($V_{GS} = \pm 30V, V_{DS} = 0V$)			±100	nA
$I_{D(ON)}$	On State Drain Current ^② ($V_{DS} > I_{D(ON)} \times R_{DS(ON)} \text{ Max}, V_{GS} = 10V$)	APT1004RKNG	3.6		Amps
$V_{GS(TH)}$	Gate Threshold Voltage ($V_{DS} = V_{GS}, I_D = 1.0\text{mA}$)		2	4	Volts
$R_{DS(ON)}$	Static Drain-Source On-State Resistance ^② ($V_{GS} = 10V, I_D = 0.5 I_D [\text{Cont.}]$)	APT1004RKNG		4.00	Ohms

THERMAL CHARACTERISTICS

Symbol	Characteristic	MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Junction to Case			1.00	$^\circ\text{C/W}$
$R_{\theta JA}$	Junction to Ambient			80	$^\circ\text{C/W}$
T_L	Max. Lead Temp. for Soldering Conditions: 0.063" from Case for 10 Sec.			300	$^\circ\text{C}$



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

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DYNAMIC CHARACTERISTICS

APT1004RKNG

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
C _{iss}	Input Capacitance	V _{GS} = 0V V _{DS} = 25V f = 1 MHz		805	950	pF
C _{oss}	Output Capacitance			115	160	pF
C _{rss}	Reverse Transfer Capacitance			37	60	pF
Q _g	Total Gate Charge ③	V _{GS} = 10V, I _D = I _D [Cont.] V _{DD} = 0.5 V _{DSS}		35	55	nC
Q _{gs}	Gate-Source Charge			4.3	6.5	nC
Q _{gd}	Gate-Drain ("Miller") Charge			18	27	nC
t _{d(on)}	Turn-on Delay Time	V _{DD} = 0.5 V _{DSS} I _D = I _D [Cont.], V _{GS} = 15V R _G = 1.8Ω		10	20	ns
t _r	Rise Time			9	18	ns
t _{d(off)}	Turn-off Delay Time			32	48	ns
t _f	Fall Time			23	46	ns

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Symbol	Characteristic / Test Conditions / Part Number	MIN	TYP	MAX	UNIT
I _S	Continuous Source Current (Body Diode)	APT1004RKNG		3.6	Amps
I _{SM}	Pulsed Source Current ① (Body Diode)	APT1004RKNG		14.4	Amps
V _{SD}	Diode Forward Voltage ② (V _{GS} = 0V, I _S = -I _D [Cont.])			1.3	Volts
t _{rr}	Reverse Recovery Time (I _S = -I _D [Cont.], di _S /dt = 100A/μs)	150	290	580	ns
Q _{rr}	Reverse Recovery Charge	0.8	1.65	3.3	μC

SAFE OPERATING AREA CHARACTERISTICS

Symbol	Characteristic	Test Conditions / Part Number	MIN	TYP	MAX	UNIT
SOA1	Safe Operating Area	V _{DS} = 0.4 V _{DSS} , I _{DS} = P _D / 0.4 V _{DSS} , t = 1 Sec.	125			Watts
SOA2	Safe Operating Area	I _{DS} = I _D [Cont.], V _{DS} = P _D / I _D [Cont.], t = 1 Sec.	125			Watts
I _{LM}	Inductive Current Clamped	APT1004RKNG	14.4			Amps

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%

③ See MIL-STD-750 Method 3471

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

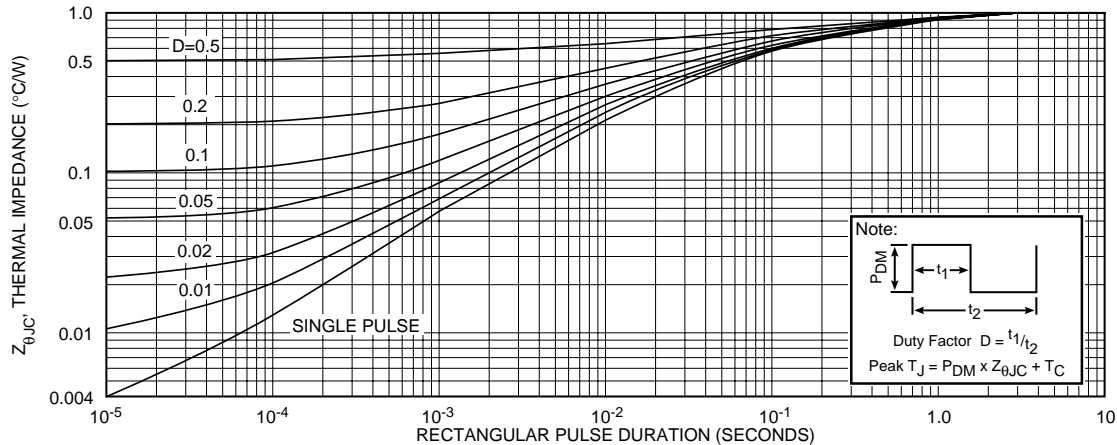


FIGURE 1, MAXIMUM EFFECTIVE TRANSIENT THERMAL IMPEDANCE, JUNCTION-TO-CASE vs PULSE DURATION

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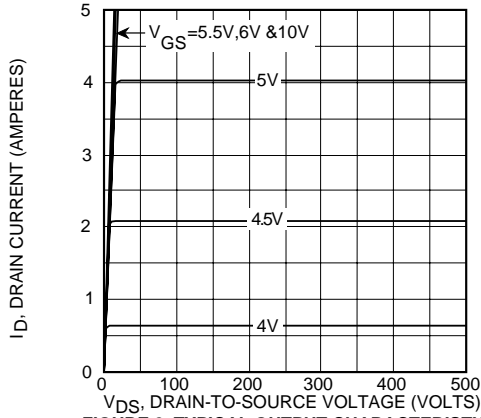


FIGURE 2, TYPICAL OUTPUT CHARACTERISTICS

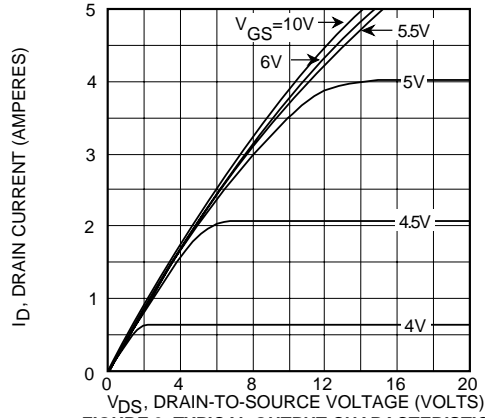


FIGURE 3, TYPICAL OUTPUT CHARACTERISTICS

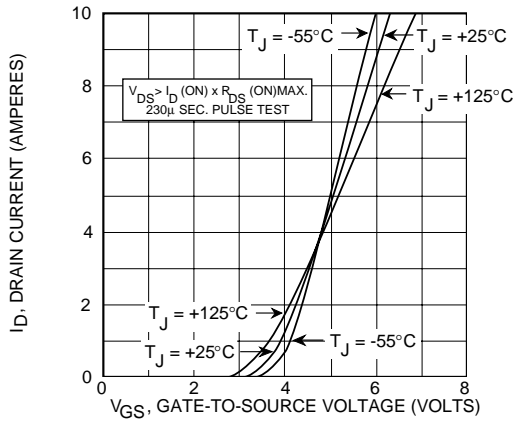


FIGURE 4, TYPICAL TRANSFER CHARACTERISTICS

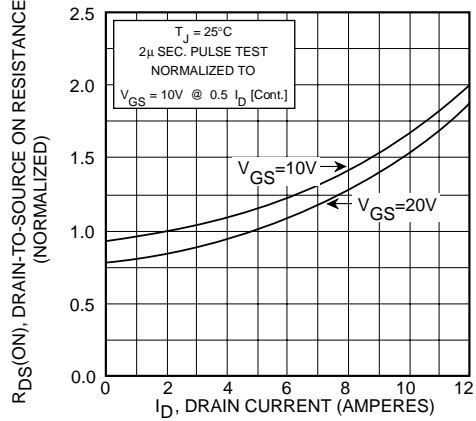


FIGURE 5, $R_{DS(ON)}$ vs DRAIN CURRENT

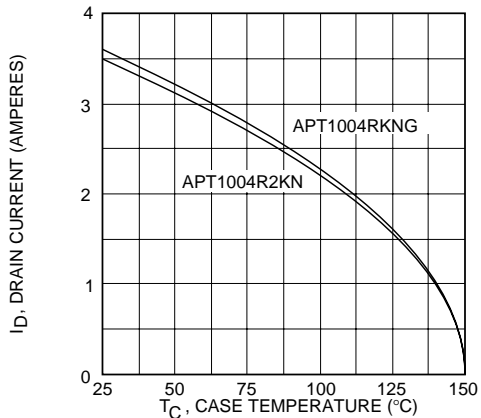


FIGURE 6, MAXIMUM DRAIN CURRENT vs CASE TEMPERATURE

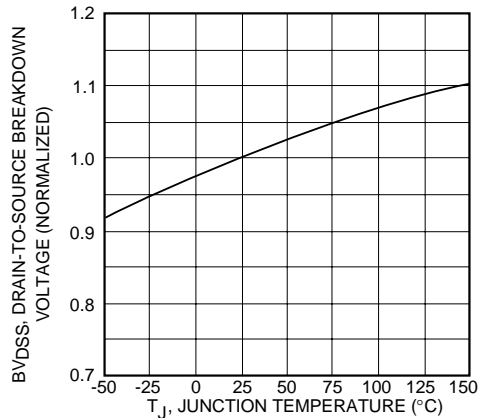


FIGURE 7, BREAKDOWN VOLTAGE vs TEMPERATURE

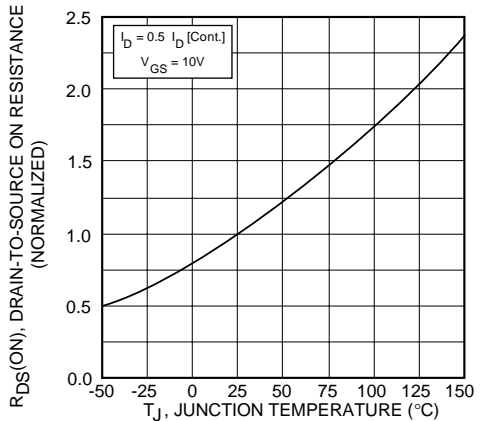


FIGURE 8, ON-RESISTANCE vs. TEMPERATURE

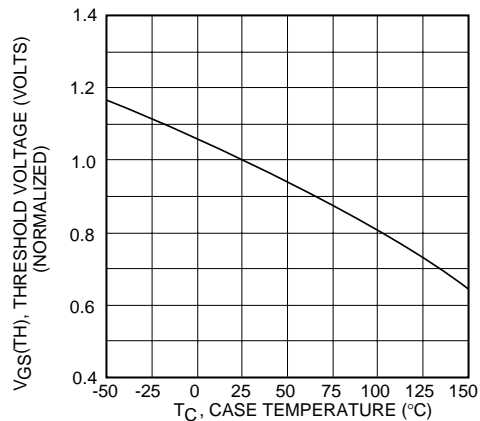


FIGURE 9, THRESHOLD VOLTAGE vs TEMPERATURE

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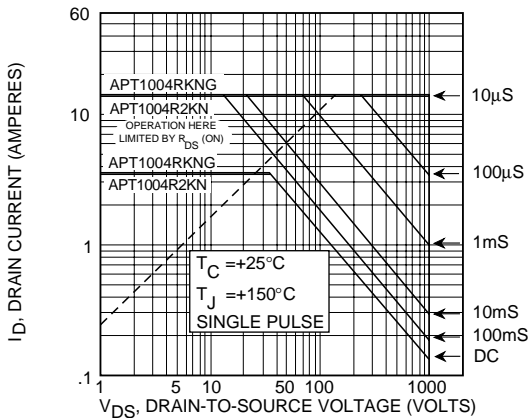


FIGURE 10, MAXIMUM SAFE OPERATING AREA

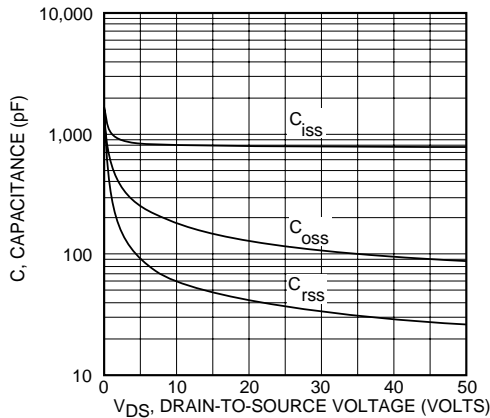


FIGURE 11, TYPICAL CAPACITANCE vs DRAIN-TO-SOURCE VOLTAGE

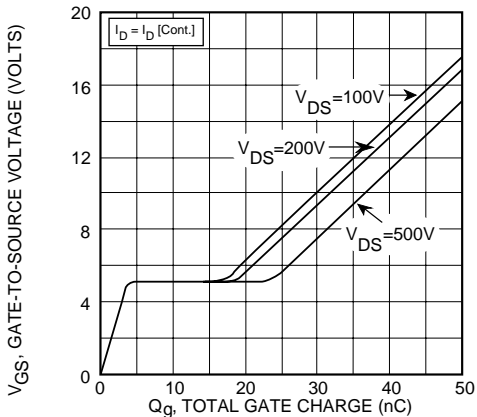


FIGURE 12, GATE CHARGES vs GATE-TO-SOURCE VOLTAGE

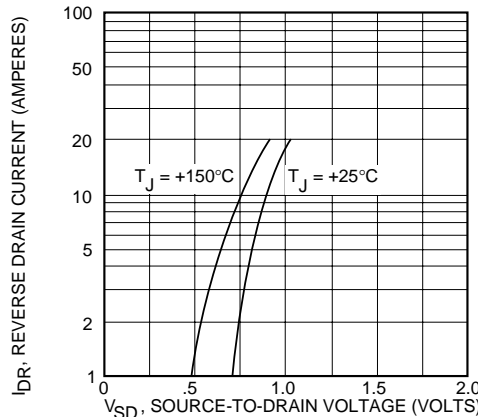
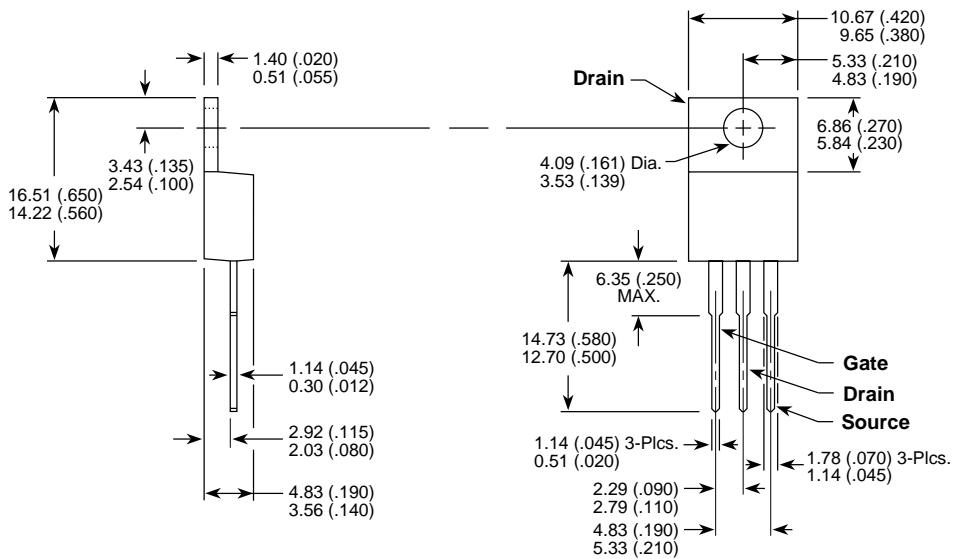


FIGURE 13, TYPICAL SOURCE-DRAIN DIODE FORWARD VOLTAGE

TO-220AB Package Outline



Dimensions in Millimeters and (Inches)