

APT1004RKN 1000V 3.6A 4.00Ω
APT1004R2KN 1000V 3.5A 4.20Ω

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	APT1004R2KN	APT1004RKN	UNIT
V_{DSS}	Drain-Source Voltage	1000	1000	Volts
I_D	Continuous Drain Current	3.5	3.6	Amps
I_{DM}	Pulsed Drain Current ^①	14.0	14.4	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 ($V_{GS} = 0V, I_D = 250\mu\text{A}$)	APT1004RKN	1000		Volts
		APT1004R2KN	1000		Volts
I_{DSS}	Zero Gate Voltage Drain Current ($V_{DS} = V_{DSS}, V_{GS} = 0V$) ($V_{DS} = 0.8 V_{DSS}, V_{GS} = 0V, T_C = 125^\circ\text{C}$)			250	μA
				1000	
I_{GSS}	Gate-Source Leakage Current ($V_{GS} = \pm 30V, V_{DS} = 0V$)			±100	nA
$I_D(ON)$	On State Drain Current ^② ($V_{DS} > I_D(ON) \times R_{DS(ON)}$ Max, $V_{GS} = 10V$)	APT1004RKN	3.6		Amps
		APT1004R2KN	3.5		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 ($V_{GS} = 10V, I_D = 0.5 I_D[\text{Cont.}]$)	APT1004RKN		4.00	Ohms
		APT1004R2KN		4.20	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

APT1004R/1004R2KN

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)	APT1004RKN		3.6	Amps
		APT1004R2KN		3.5	Amps
I _{SM}	Pulsed Source Current ① (Body Diode)	APT1004RKN		14.4	Amps
		APT1004R2KN		14.0	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	APT1004RKN	14.4			Amps
		APT1004R2KN	14.0			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.

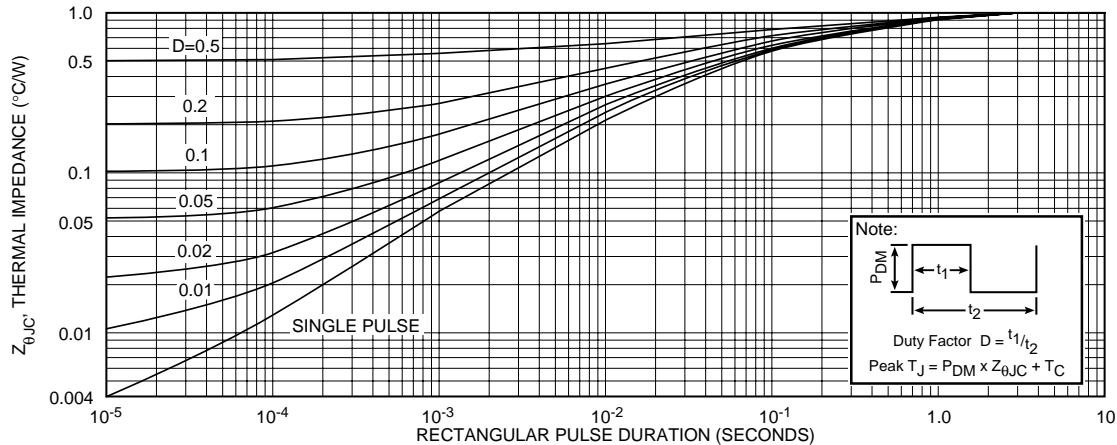


FIGURE 1, MAXIMUM EFFECTIVE TRANSIENT THERMAL IMPEDANCE, JUNCTION-TO-CASE vs PULSE DURATION

APT1004R/1004R2KN

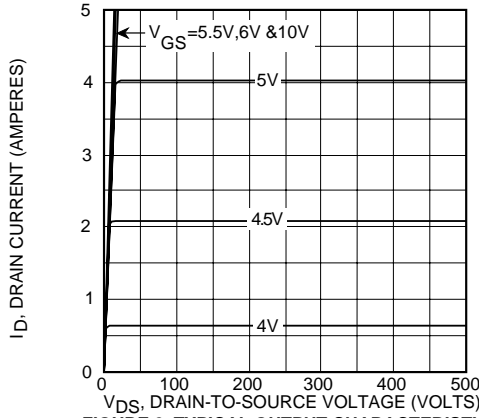


FIGURE 2, TYPICAL OUTPUT CHARACTERISTICS

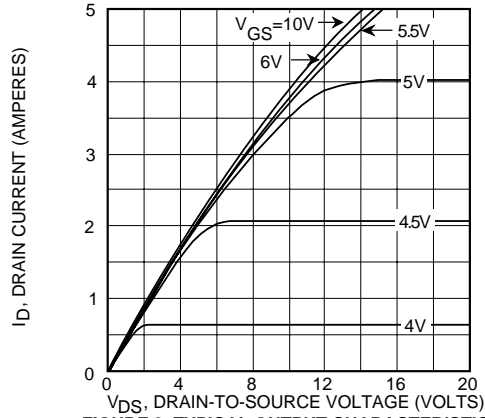


FIGURE 3, TYPICAL OUTPUT CHARACTERISTICS

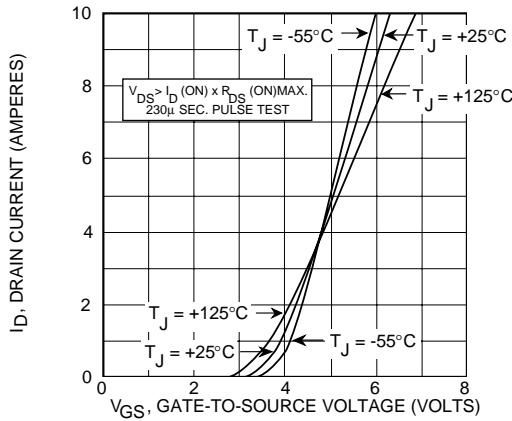


FIGURE 4, TYPICAL TRANSFER CHARACTERISTICS

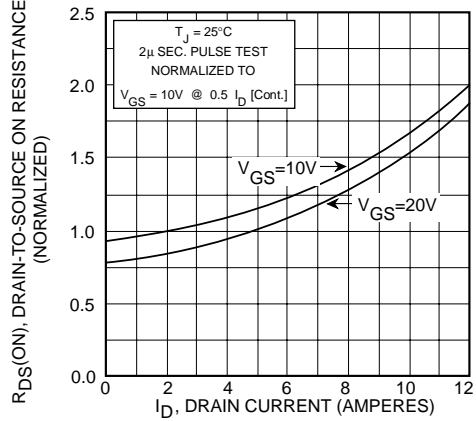


FIGURE 5, RDS(ON) vs DRAIN CURRENT

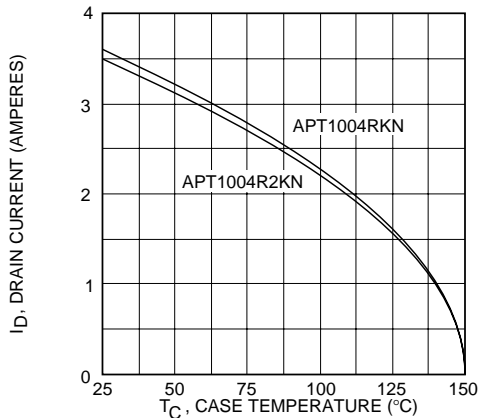


FIGURE 6, MAXIMUM DRAIN CURRENT vs CASE TEMPERATURE

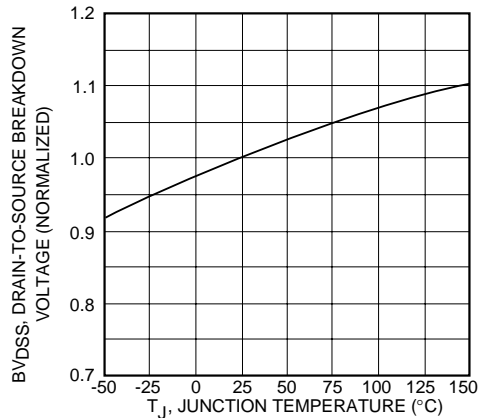


FIGURE 7, BREAKDOWN VOLTAGE vs TEMPERATURE

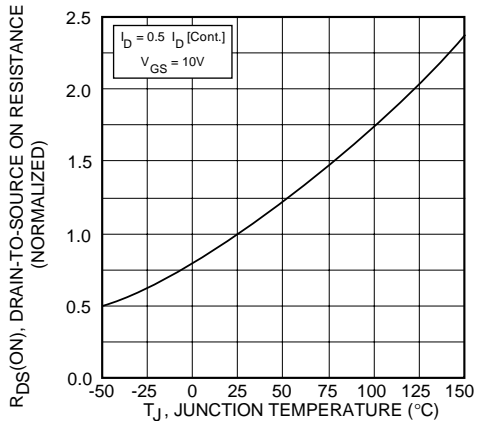


FIGURE 8, ON-RESISTANCE vs. TEMPERATURE

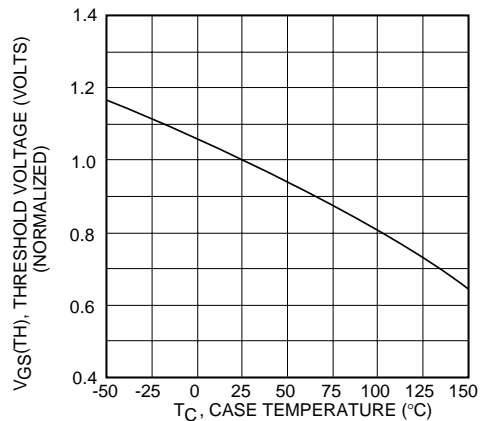


FIGURE 9, THRESHOLD VOLTAGE vs TEMPERATURE

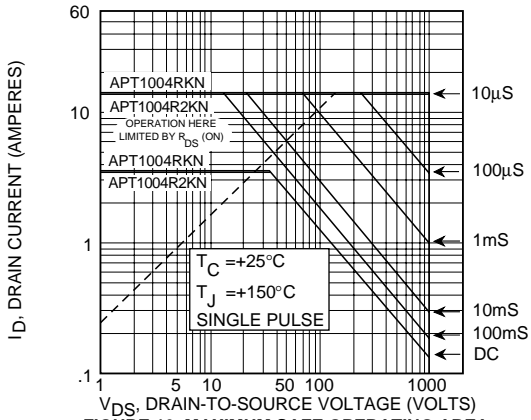


FIGURE 10, MAXIMUM SAFE OPERATING AREA

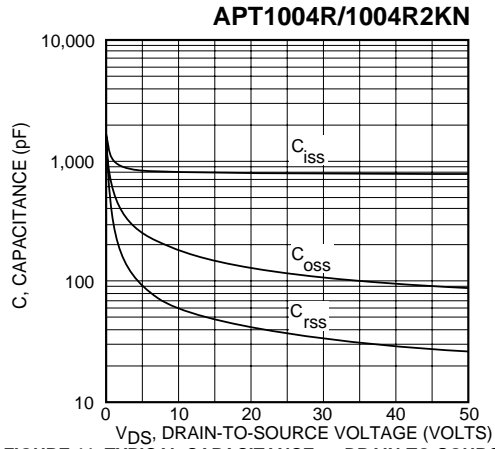


FIGURE 11, TYPICAL CAPACITANCE vs DRAIN-TO-SOURCE VOLTAGE

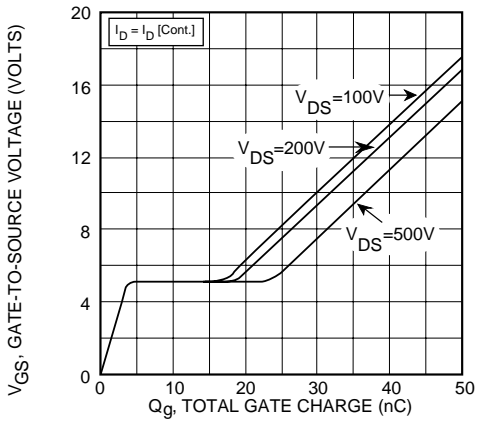


FIGURE 12, GATE CHARGES vs GATE-TO-SOURCE VOLTAGE

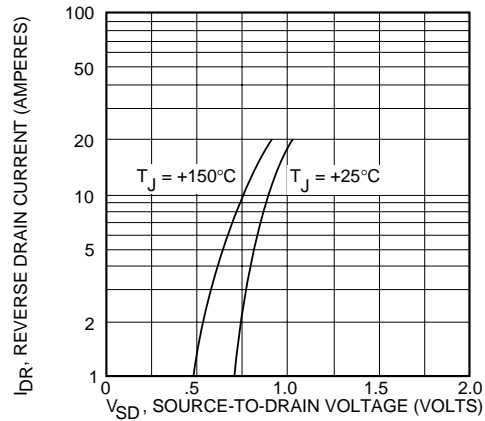
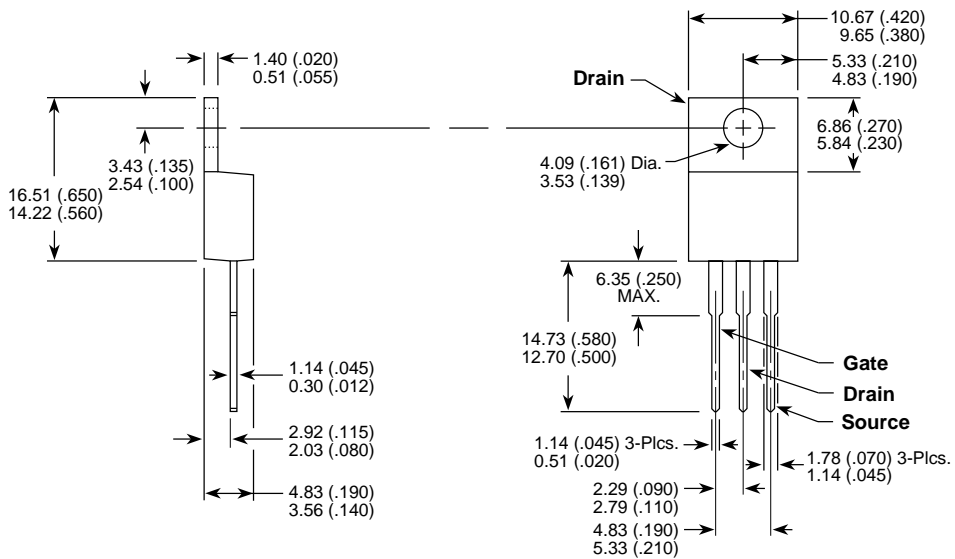


FIGURE 13, TYPICAL SOURCE-DRAIN DIODE FORWARD VOLTAGE

TO-220AB Package Outline



Dimensions in Millimeters and (Inches)