

**ADVANCED
POWER
TECHNOLOGY®**

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 ($V_{DS} = V_{DSS}, V_{GS} = 0V$)			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	APT1004RKN	3.6		Amps
	($V_{DS} > I_{D(ON)} \times R_{DS(ON)}$ Max, $V_{GS} = 10V$)	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	APT1004RKN		4.00	Ohms
	($V_{GS} = 10V, I_D = 0.5 I_{D(Cont.)}$)	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	$V_{GS} = 0V$ $V_{DS} = 25V$ $f = 1 \text{ MHz}$		805	950	pF
C_{oss}	Output Capacitance			115	160	pF
C_{rss}	Reverse Transfer Capacitance			37	60	pF
Q_g	Total Gate Charge ③	$V_{GS} = 10V, I_D = I_D [\text{Cont.}]$ $V_{DD} = 0.5 V_{DSS}$		35	55	nC
Q_{gs}	Gate-Source Charge			4.3	6.5	nC
Q_{gd}	Gate-Drain ("Miller") Charge			18	27	nC
$t_d(\text{on})$	Turn-on Delay Time	$V_{DD} = 0.5 V_{DSS}$ $I_D = I_D [\text{Cont.}], V_{GS} = 15V$ $R_G = 1.8\Omega$		10	20	ns
t_r	Rise Time			9	18	ns
$t_d(\text{off})$	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 ($V_{GS} = 0V, I_S = -I_D [\text{Cont.}]$)			1.3	Volts
t_{rr}	Reverse Recovery Time ($I_S = -I_D [\text{Cont.}], dI_S/dt = 100A/\mu s$)	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	$V_{DS} = 0.4 V_{DSS}, I_{DS} = P_D / 0.4 V_{DSS}, t = 1 \text{ Sec.}$	125			Watts
SOA2	Safe Operating Area	$I_{DS} = I_D [\text{Cont.}], V_{DS} = P_D / I_D [\text{Cont.}], t = 1 \text{ Sec.}$	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.

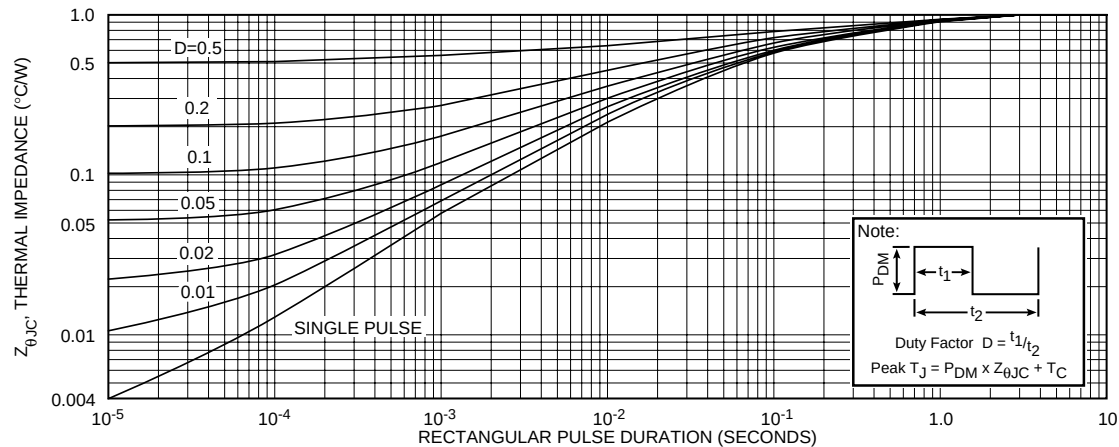


FIGURE 1, MAXIMUM EFFECTIVE TRANSIENT THERMAL IMPEDANCE, JUNCTION-TO-CASE vs PULSE DURATION

APT1004R/1004R2KN

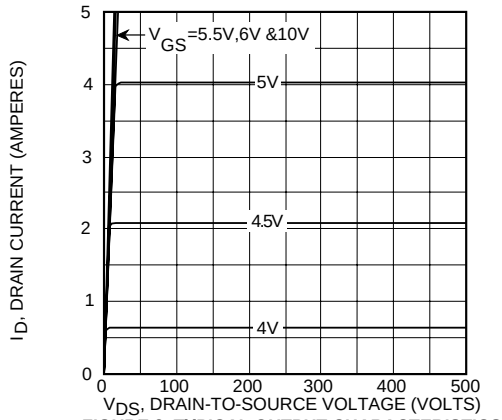


FIGURE 2, TYPICAL OUTPUT CHARACTERISTICS

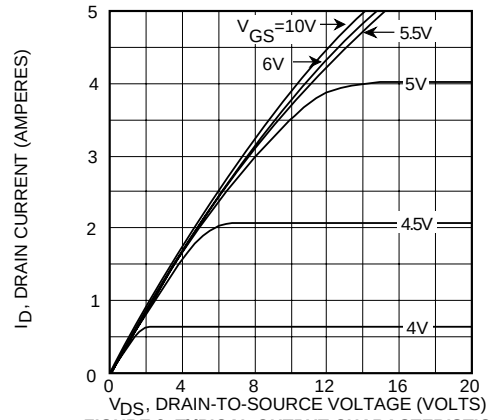


FIGURE 3, TYPICAL OUTPUT CHARACTERISTICS

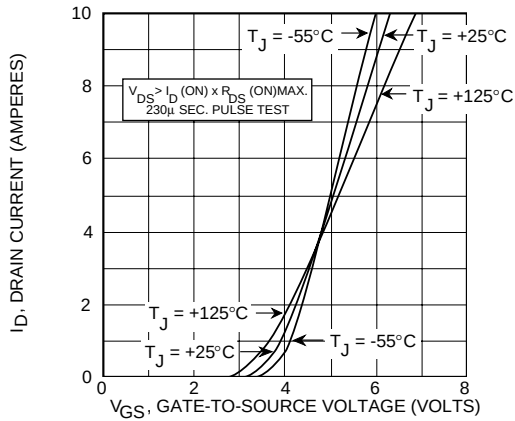


FIGURE 4, TYPICAL TRANSFER CHARACTERISTICS

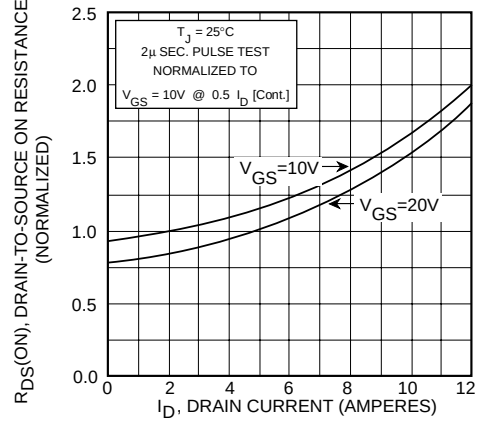


FIGURE 5, $R_{DS(ON)}$ vs DRAIN CURRENT

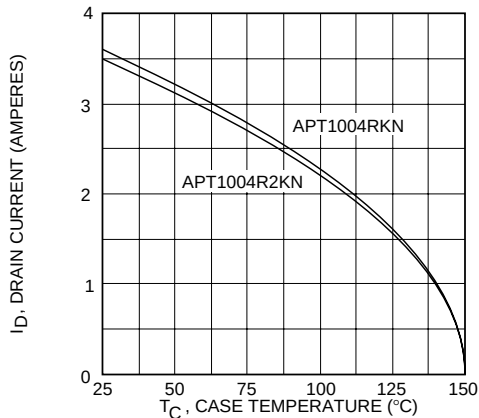


FIGURE 6, MAXIMUM DRAIN CURRENT vs CASE TEMPERATURE

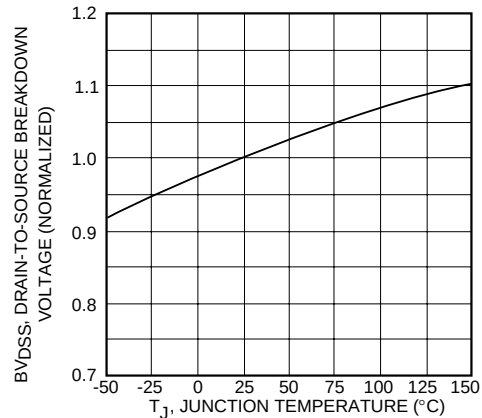


FIGURE 7, BREAKDOWN VOLTAGE vs TEMPERATURE

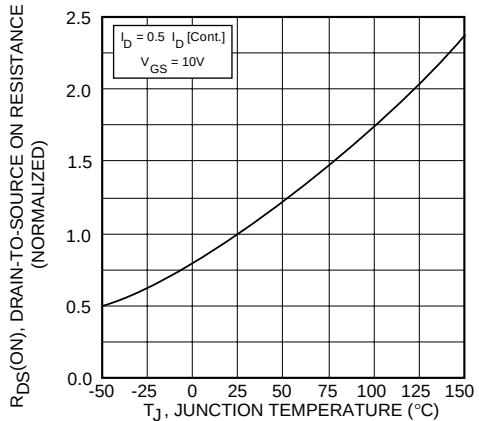


FIGURE 8, ON-RESISTANCE vs. TEMPERATURE

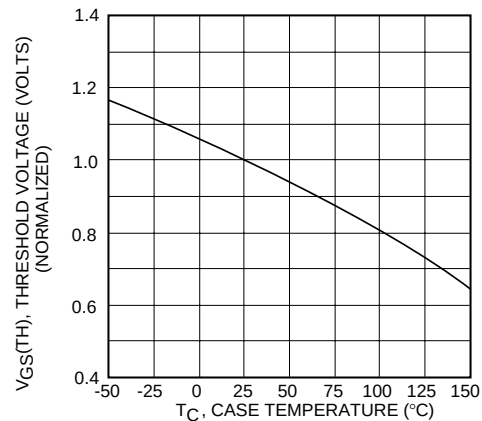
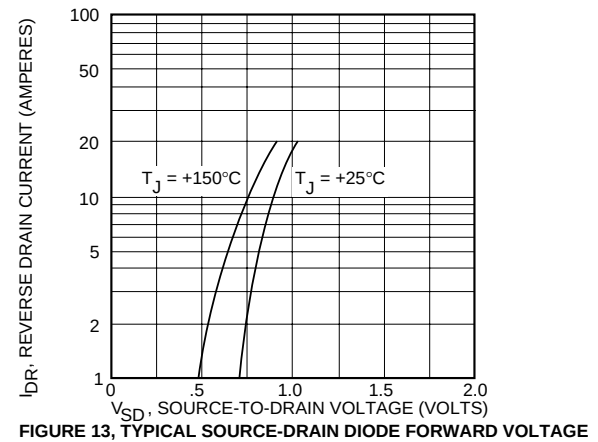
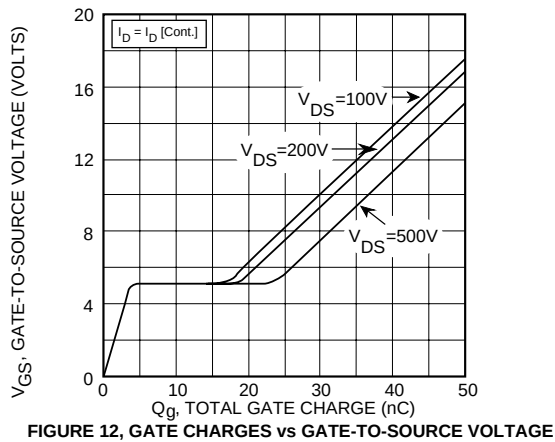
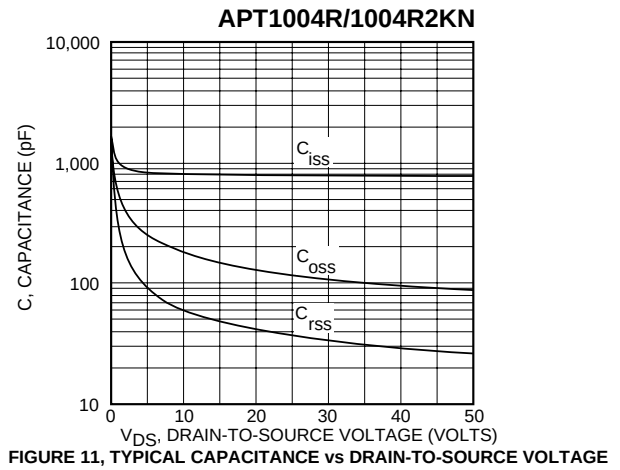
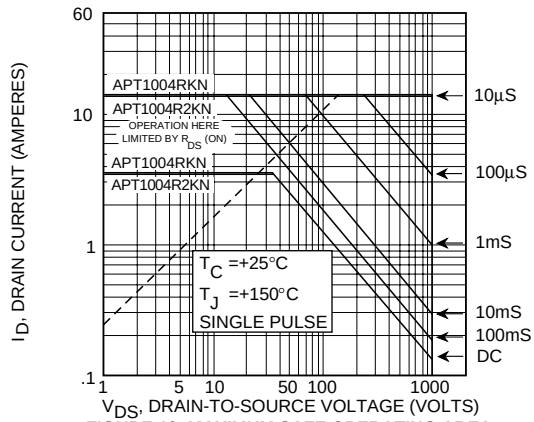
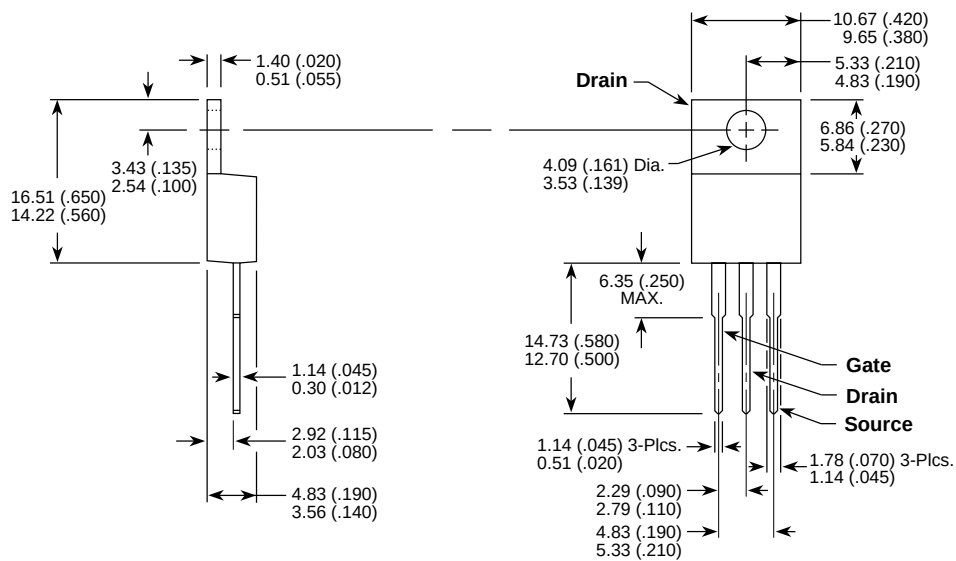


FIGURE 9, THRESHOLD VOLTAGE vs TEMPERATURE



TO-220AB Package Outline



Dimensions in Millimeters and (Inches)