

**ADVANCED
POWER
TECHNOLOGY®**

APT1004RCN	1000V	3.6A	4.00Ω
APT904RCN	900V	3.6A	4.00Ω
APT1004R2CN	1000V	3.3A	4.20Ω
APT904R2CN	900V	3.3A	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	APT 904RCN	APT 1004RCN	APT 904R2CN	APT 1004R2CN	UNIT
V _{DSS}	Drain-Source Voltage	900	1000	900	1000	Volts
I _D	Continuous Drain Current @ T _C = 25°C	3.6		3.3		Amps
I _{DM}	Pulsed Drain Current ①	14.4		13.2		
V _{GS}	Gate-Source Voltage	±30				Volts
P _D	Total Power Dissipation @ T _C = 25°C	125				Watts
	Linear Derating Factor	1.0				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 ($V_{GS} = 0V, I_D = 250 \mu A$)	APT1004RCN/APT1004R2CN	1000			Volts
		APT904RCN/APT904R2CN	900			
$I_{D(ON)}$	On State Drain Current ② ($V_{DS} > I_{D(ON)} \times R_{DS(ON)} \text{ Max}, V_{GS} = 10V$)	APT1004RCN/APT904RCN	3.6			Amps
		APT1004R2CN/APT904R2CN	3.3			
$R_{DS(ON)}$	Drain-Source On-State Resistance ② ($V_{GS} = 10V, 0.5 I_D [\text{Cont.}]$)	APT1004RCN/APT904RCN			4.00	Ohms
		APT1004R2CN/APT904R2CN			4.20	
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 ($V_{DS} = V_{GS}, I_D = 1.0mA$)		2		4	Volts

THERMAL CHARACTERISTICS

Symbol	Characteristic	MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Junction to Case			1.00	°C/W
$R_{\theta JA}$	Junction to Ambient			50	

405 S.W. COLUMBIA STREET
BEND, OREGON 97702-1035
U.S.A.

PHONE . . . (503) 382-8028

FAX (503) 388-0364

DYNAMIC CHARACTERISTICS

APT1004R/904R/1004R2/904R2CN

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
C_{DC}	Drain-to-Case Capacitance	$f = 1 \text{ MHz}$		15	22	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 ③	$V_{GS} = 10V$		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	$V_{GS} = 15V$		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)	APT1004RCN / APT904RCN		3.6	Amps
		APT1004R2CN / APT904R2CN		3.3	
I_{SM}	Pulsed Source Current ① (Body Diode)	APT1004RCN / APT904RCN		13.2	
		APT1004R2CN / APT904R2CN		12	
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 ($I_S = -I_D [\text{Cont.}]$, $dI_S/dt = 100A/\mu s$)	0.8	1.65	3.3	μC

SAFE OPERATING AREA CHARACTERISTICS

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
SOA1	Safe Operating Area	$V_{DS} = 0.4 V_{DSS}, I_{DS} = P_D / 0.4 V_{DSS}, t = 1 \text{ Sec.}$	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			
I_{LM}	Inductive Current Clamped	APT1004RCN / APT904RCN	14.4			Amps
		APT1004R2CN / APT904R2CN	13.2			

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

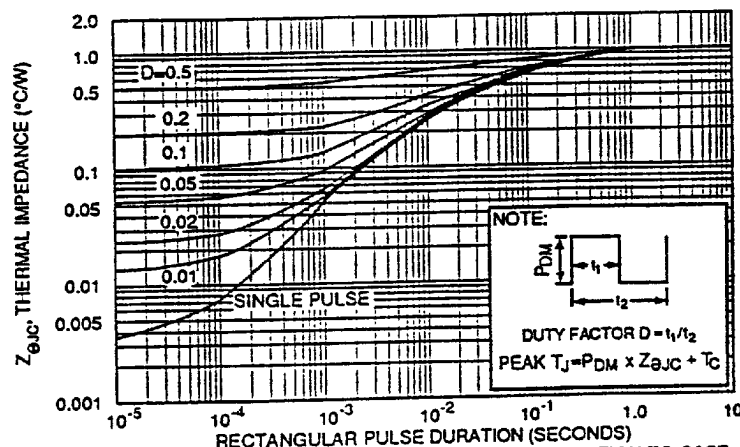


FIGURE 1, MAXIMUM EFFECTIVE TRANSIENT THERMAL IMPEDANCE, JUNCTION-TO-CASE vs PULSE DURATION

APT1004R/904R/1004R2/904R2CN

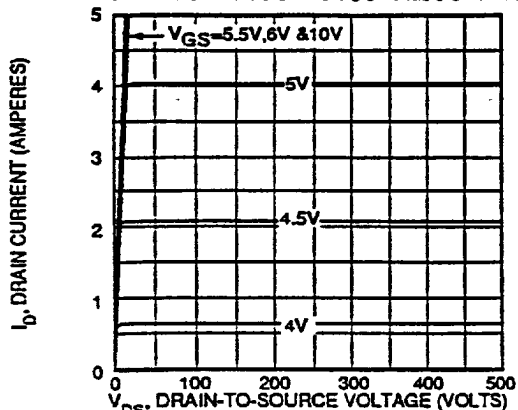


FIGURE 2, TYPICAL OUTPUT CHARACTERISTICS

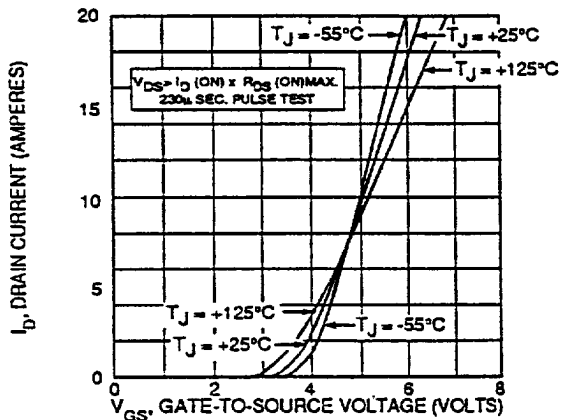


FIGURE 4, TYPICAL TRANSFER CHARACTERISTICS

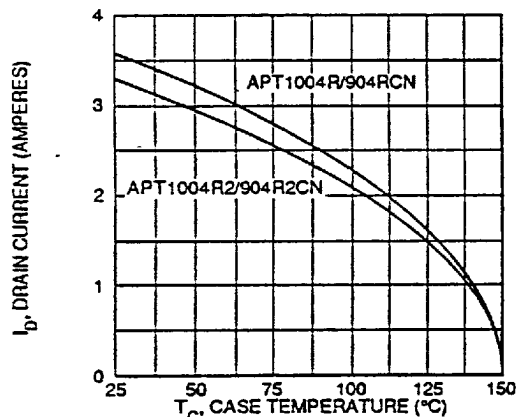


FIGURE 6, MAXIMUM DRAIN CURRENT vs CASE TEMPERATURE

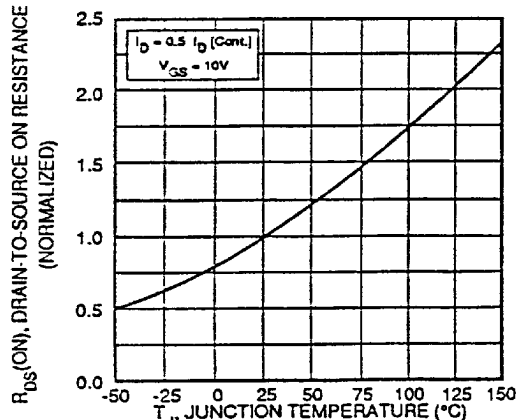


FIGURE 8, ON-RESISTANCE vs. TEMPERATURE

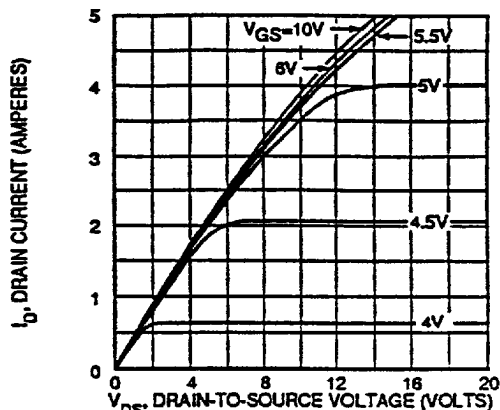


FIGURE 3, TYPICAL OUTPUT CHARACTERISTICS

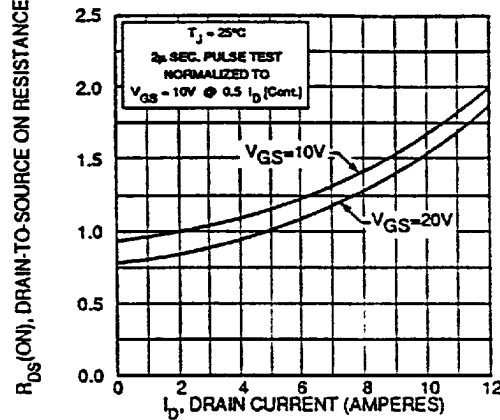


FIGURE 5, $R_{DS(ON)}$ vs DRAIN CURRENT

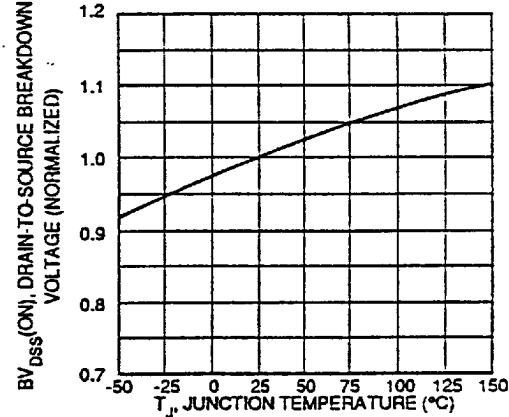


FIGURE 7, BREAKDOWN VOLTAGE vs TEMPERATURE

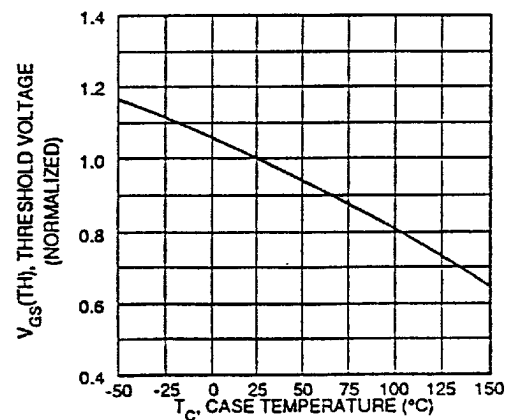


FIGURE 9, THRESHOLD VOLTAGE vs TEMPERATURE

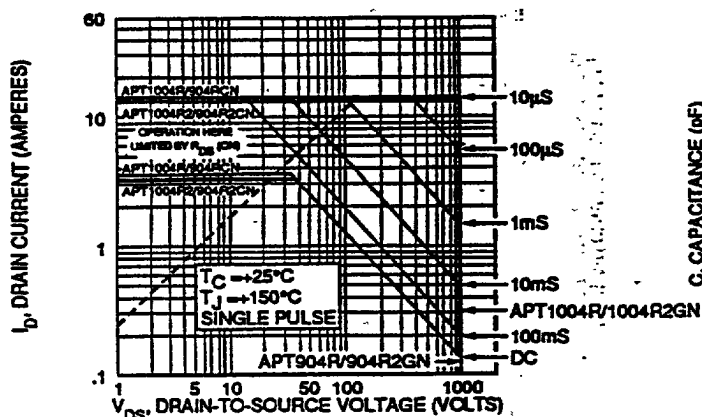


FIGURE 10, MAXIMUM SAFE OPERATING AREA

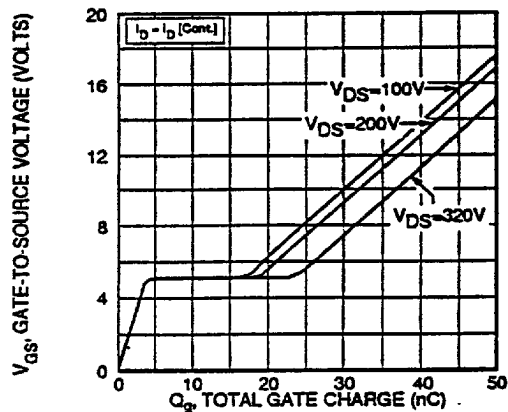


FIGURE 12, GATE CHARGES vs GATE-TO-SOURCE VOLTAGE

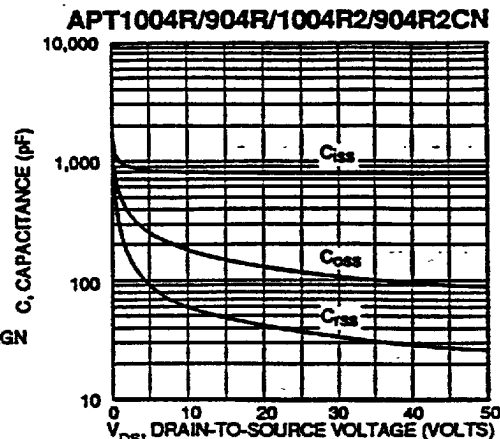


FIGURE 11, TYPICAL CAPACITANCE vs DRAIN-TO-SOURCE VOLTAGE

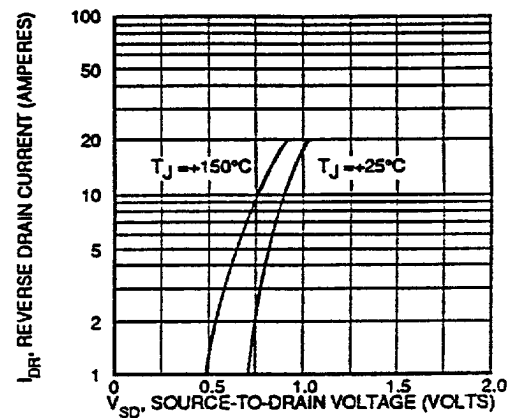
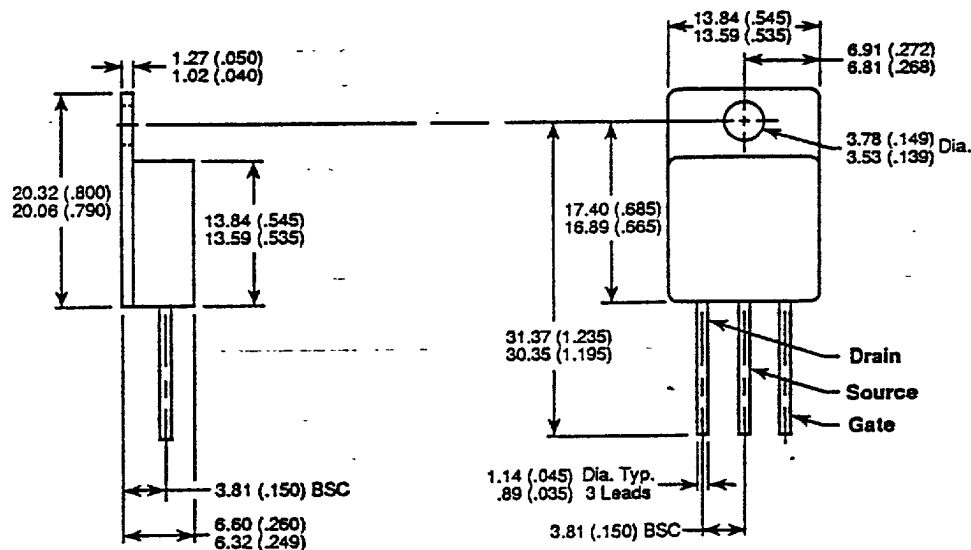


FIGURE 13, TYPICAL SOURCE-DRAIN DIODE FORWARD VOLTAGE

TO-254AA Package Outline



Dimensions in Millimeters and (Inches)