

APT1004RAN	1000V	3.9A	4.00 Ω
APT904RAN	900V	3.9A	4.00 Ω
APT1004R2AN	1000V	3.5A	4.20 Ω
APT904R2AN	900V	3.5A	4.20 Ω

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				UNIT
		904RAN	1004RAN	904R2AN	1004R2AN	
V_{DSS}	Drain-Source Voltage	900	1000	900	1000	Volts
I_D	Continuous Drain Current	3.9		3.5		Amps
I_{DM}	Pulsed Drain Current ¹	15.6		14		Amps
V_{GS}	Gate-Source Voltage	±30				Volts
P_D	Total Power Dissipation @ $T_C = 25^\circ\text{C}$, Derate Above 25°C	150				Watts
T_J, T_{STG}	Operating and Storage Junction Temperature Range	- 55 to 150				°C

STATIC ELECTRICAL CHARACTERISTICS

Symbol	Characteristic / Test Conditions / Part Number	MIN	TYP	MAX	UNIT	
BV_{DSS}	Drain-Source Breakdown Voltage ($V_{GS} = 0V, I_D = 250 \mu\text{A}$)	APT1004RAN / APT1004R2AN		1000	Volts	
		APT904RAN / APT904R2AN		900	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 ($V_{DS} > I_{D(ON)} \times R_{DS(ON)} \text{ Max}, V_{GS} = 10V$)	APT1004RAN / APT904RAN		3.9	Amps	
		APT1004R2AN / APT904R2AN		3.5	Amps	
$V_{GS(TH)}$	Gate Threshold Voltage ($V_{DS} = V_{GS}, I_D = 1\text{mA}$)	2		4	Volts	
$R_{DS(ON)}$	Static Drain-Source On-State Resistance ² ($V_{GS} = 10V, I_D = 0.5 I_D \text{ [Cont.]}$)	APT1004RAN / APT904RAN			4.00	Ohms
		APT1004R2AN / APT904R2AN			4.20	Ohms

THERMAL CHARACTERISTICS

Symbol	Characteristic	MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Junction to Case			0.85	°C/W
$R_{\theta JA}$	Junction to Ambient			30	°C/W
T_L	Max. Lead Temp. for Soldering Conditions: 0.063" from Case for 10 Sec.			300	°C

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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	$V_{DD} = 0.5 V_{DSS}$ $I_D = I_D [Cont.], V_{GS} = 15V$ $R_G = 1.8$		12	23	ns
t_r	Rise Time			10	20	ns
$t_d(off)$	Turn-off Delay Time			33	50	ns
t_f	Fall Time			14	27	ns

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Symbol	Characteristic / Test Conditions / Part Number	MIN	TYP	MAX	UNIT	
I_S	Continuous Source Current (Body Diode)	APT1004RAN / APT904RAN			3.9	Amps
		APT1004R2AN / APT904R2AN			3.5	Amps
I_{SM}	Pulsed Source Current ¹ (Body Diode)	APT1004RAN / APT904RAN			15.6	Amps
		APT1004R2AN / APT904R2AN			14	Amps
V_{SD}	Diode Forward Voltage ² ($V_{GS} = 0V, I_S = -I_D [Cont.]$)				1.3	Volts
t_{rr}	Reverse Recovery Time ($I_S = -I_D [Cont.], di_S/dt = 100A/\mu s$)	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	$V_{DS} = 0.4 V_{DSS}, I_{DS} = P_D / 0.4 V_{DSS}, t = 1 Sec.$	150			Watts
SOA2	Safe Operating Area	$I_{DS} = I_D [Cont.], V_{DS} = P_D / I_D [Cont.], t = 1 Sec.$	150			Watts
I_{LM}	Inductive Current Clamped	APT1004RAN / APT904RAN	15.6			Amps
		APT1004R2AN / APT904R2AN	14			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

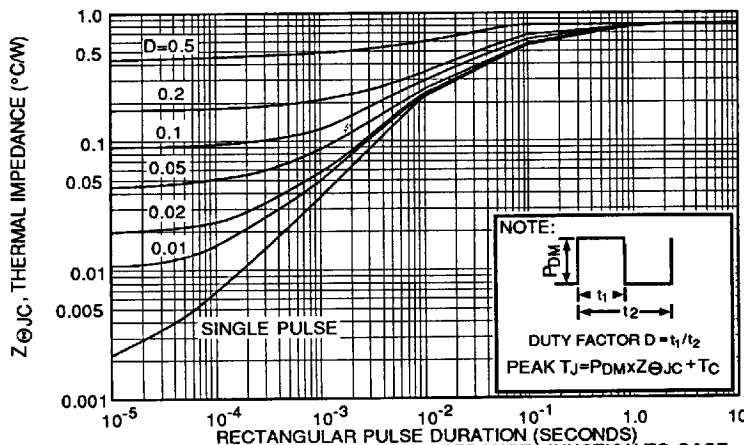


FIGURE 1, MAXIMUM EFFECTIVE TRANSIENT THERMAL IMPEDANCE, JUNCTION-TO-CASE vs PULSE DURATION

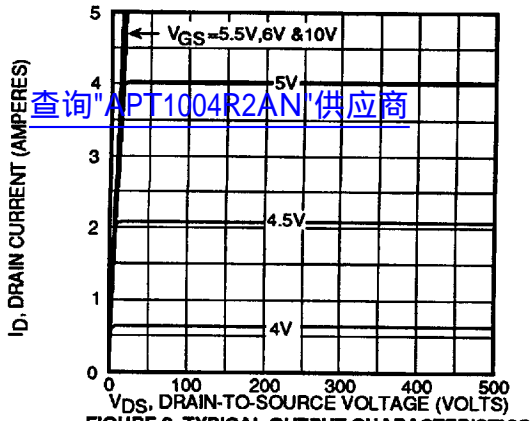


FIGURE 2, TYPICAL OUTPUT CHARACTERISTICS

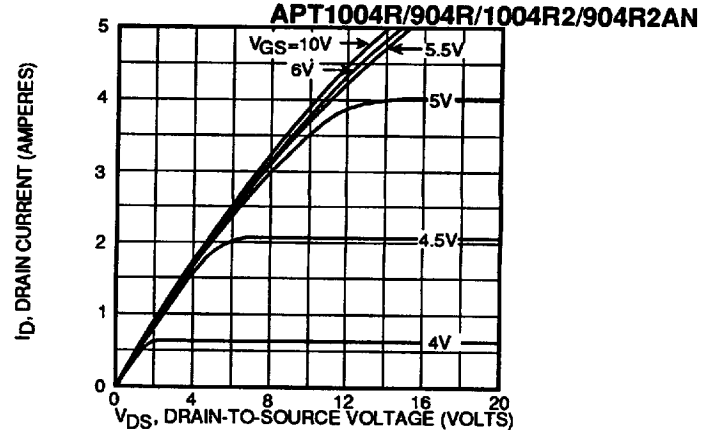


FIGURE 3, TYPICAL OUTPUT CHARACTERISTICS

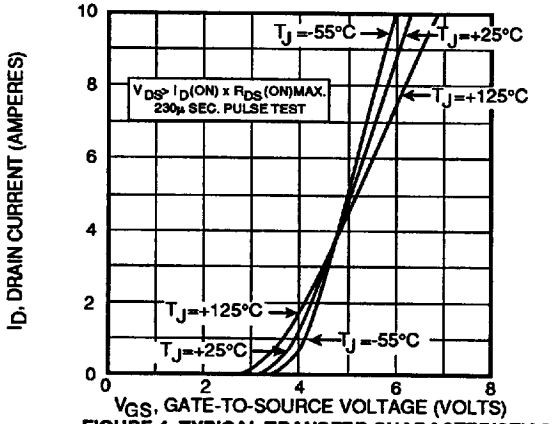


FIGURE 4, TYPICAL TRANSFER CHARACTERISTICS

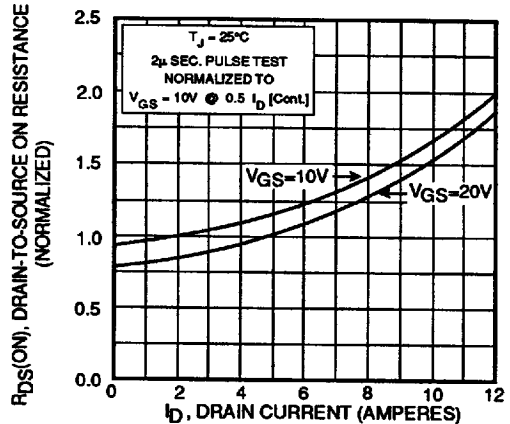


FIGURE 5, $R_{DS(ON)}$ vs DRAIN CURRENT

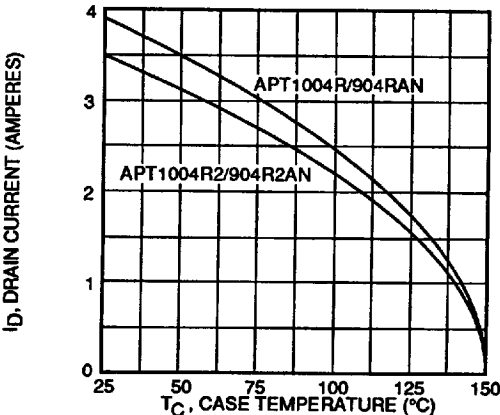


FIGURE 6, MAXIMUM DRAIN CURRENT vs CASE TEMPERATURE

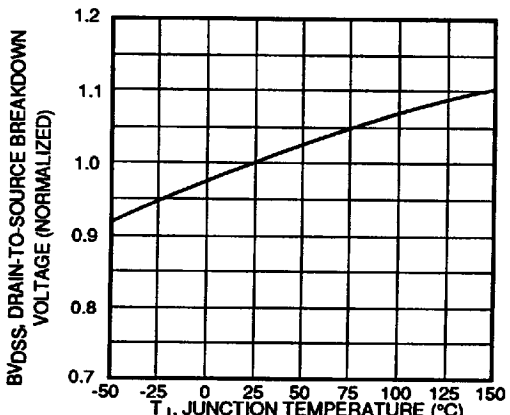


FIGURE 7, BREAKDOWN VOLTAGE vs TEMPERATURE

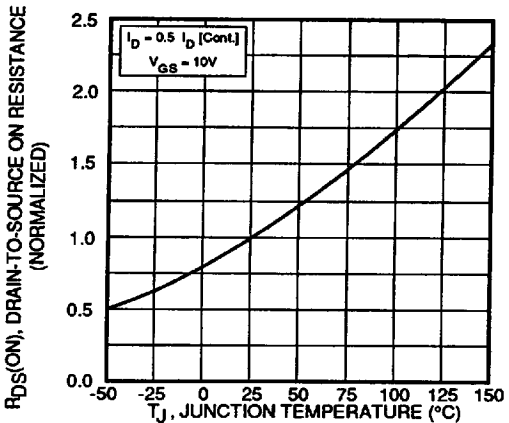


FIGURE 8, ON-RESISTANCE vs. TEMPERATURE

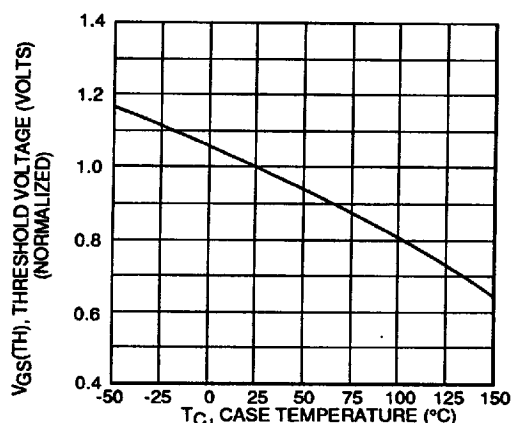


FIGURE 9, THRESHOLD VOLTAGE vs TEMPERATURE

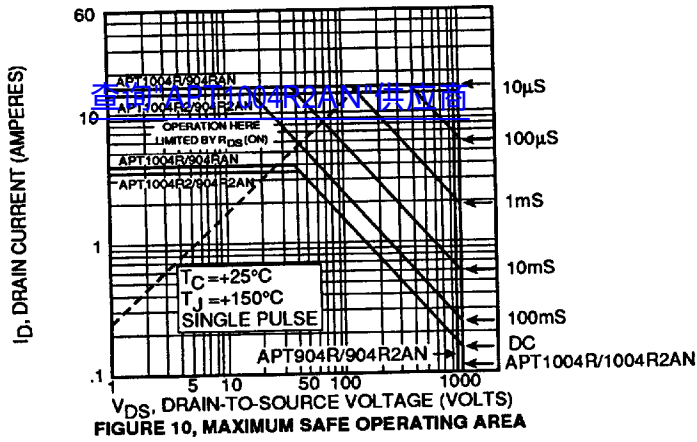


FIGURE 10, MAXIMUM SAFE OPERATING AREA

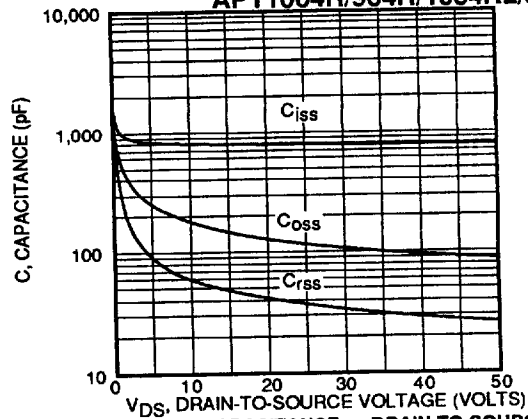


FIGURE 11, TYPICAL CAPACITANCE vs DRAIN-TO-SOURCE VOLTAGE

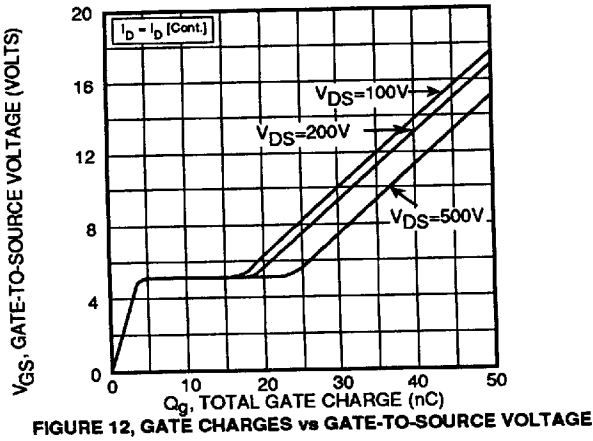


FIGURE 12, GATE CHARGES vs GATE-TO-SOURCE VOLTAGE

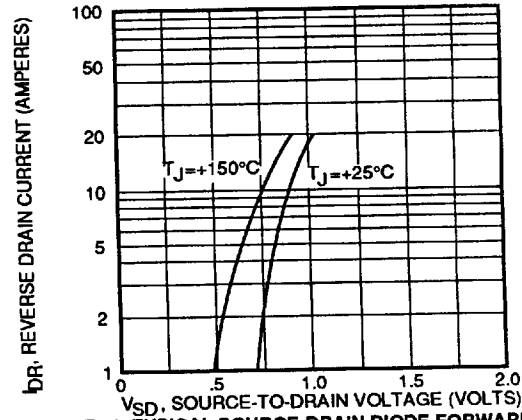
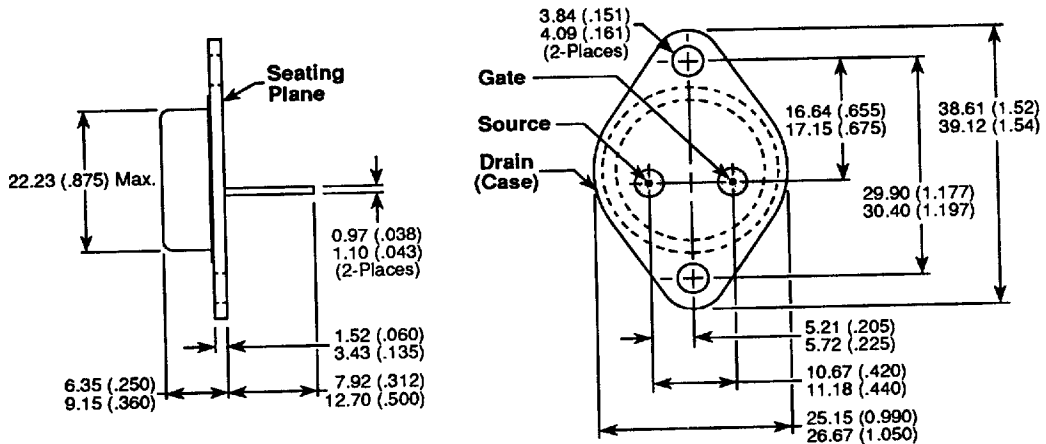


FIGURE 13, TYPICAL SOURCE-DRAIN DIODE FORWARD VOLTAGE

TO-3 Package Outline (TO-204AA)



Dimensions in Millimeters and (Inches)