

APT1001RBNR 1000V 11.0A 1.00Ω  
 APT1001R1BNR 1000V 10.5A 1.10Ω

## POWER MOS IV®

**UIS RATED**

### N-CHANNEL ENHANCEMENT MODE HIGH VOLTAGE POWER MOSFETS

#### MAXIMUM RATINGS

All Ratings:  $T_C = 25^\circ\text{C}$  unless otherwise specified.

Symbol	Parameter	APT1001RBNR	APT1001R1BNR	UNIT
$V_{DSS}$	Drain-Source Voltage	1000	1000	Volts
$I_D$	Continuous Drain Current @ $T_C = 25^\circ\text{C}$	11	10.5	Amps
$I_{DM}$	Pulsed Drain Current <sup>(1)</sup>	44	42	
$V_{GS}$	Gate-Source Voltage Continuous	±20		Volts
$V_{GSM}$	Gate-Source Voltage Transient	±30		
$P_D$	Total Power Dissipation @ $T_C = 25^\circ\text{C}$	310		Watts
	Linear Derating Factor	2.5		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		
$I_{AR}$	Avalanche Current <sup>(1)</sup> (Repetitive and Non-Repetitive)	11		Amps
$E_{AR}$	Repetitive Avalanche Energy <sup>(1)</sup>	25		mJ
$E_{AS}$	Single Pulse Avalanche Energy <sup>(4)</sup>	1210		

#### STATIC ELECTRICAL CHARACTERISTICS

Symbol	Characteristic / Test Conditions	MIN	TYP	MAX	UNIT
$BV_{DSS}$	Drain-Source Breakdown Voltage ( $V_{GS} = 0V, I_D = 250 \mu\text{A}$ )	1000			Volts
$I_D(\text{ON})$	On State Drain Current <sup>(2)</sup> ( $V_{DS} > I_D(\text{ON}) \times R_{DS}(\text{ON}) \text{ Max}, V_{GS} = 10V$ )	APT1001RBNR	11		Amps
		APT1001R1BNR	10.5		
$R_{DS}(\text{ON})$	Drain-Source On-State Resistance <sup>(2)</sup> ( $V_{GS} = 10V, 0.5 I_D(\text{Cont.})$ )	APT1001RBNR		1.00	Ohms
		APT1001R1BNR		1.10	
$I_{DSS}$	Zero Gate Voltage Drain Current ( $V_{DS} = V_{DSS}, V_{GS} = 0V$ )			250	$\mu\text{A}$
	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 ( $V_{GS} = \pm 20V, V_{DS} = 0V$ )			±100	nA
$V_{GS}(\text{TH})$	Gate Threshold Voltage ( $V_{DS} = V_{GS}, I_D = 1.0\text{mA}$ )	2		4	Volts

#### THERMAL CHARACTERISTICS

Symbol	Characteristic	MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Junction to Case			0.40	°C/W
$R_{\theta JA}$	Junction to Ambient			40	

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

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DYNAMIC CHARACTERISTICS

APT1001R/1001R1BNR

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
$C_{ISS}$	Input Capacitance	$V_{GS} = 0V$ $V_{DS} = 25V$ $f = 1\text{ MHz}$		3400	4000	pF
$C_{OSS}$	Output Capacitance			330	500	
$C_{rSS}$	Reverse Transfer Capacitance			126	190	
$Q_g$	Total Gate Charge ③	$V_{GS} = 10V$ $V_{DD} = 0.5 V_{DSS}$ $I_D = I_D[\text{Cont.}] @ 25^\circ\text{C}$		150	210	nC
$Q_{gs}$	Gate-Source Charge			16	25	
$Q_{gd}$	Gate-Drain ("Miller") Charge			75	110	
$t_d(\text{on})$	Turn-on Delay Time	$V_{GS} = 15V$ $V_{DD} = 0.5 V_{DSS}$ $I_D = I_D[\text{Cont.}] @ 25^\circ\text{C}$ $R_G = 1.8\Omega$		18	36	ns
$t_r$	Rise Time			22	45	
$t_d(\text{off})$	Turn-off Delay Time			110	160	
$t_f$	Fall Time			42	85	

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Symbol	Characteristic / Test Conditions	MIN	TYP	MAX	UNIT
$I_S$	Continuous Source Current (Body Diode)	APT1001RBNR		11	Amps
		APT1001R1BNR		10.5	
$I_{SM}$	Pulsed Source Current ① (Body Diode)	APT1001RBNR		44	Amps
		APT1001R1BNR		42	
$V_{SD}$	Diode Forward Voltage ② ( $V_{GS} = 0V, I_S = -I_D[\text{Cont.}]$ )			1.3	Volts
$t_{rr}$	Reverse Recovery Time ( $I_S = -I_D[\text{Cont.}], dI_S/dt = 100A/\mu s$ )	250	500	1000	ns
$Q_{rr}$	Reverse Recovery Charge ( $I_S = -I_D[\text{Cont.}], dI_S/dt = 100A/\mu s$ )	2.5	5	10	$\mu\text{C}$

SAFE OPERATING AREA CHARACTERISTICS

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
SOA1	Safe Operating Area	$V_{DS} = 0.4 V_{DSS}, I_{DS} = P_D / 0.4 V_{DSS}, t = 1\text{ Sec.}$	310			Watts
SOA2	Safe Operating Area	$I_{DS} = I_D[\text{Cont.}], V_{DS} = P_D / I_D[\text{Cont.}], t = 1\text{ Sec.}$	310			
$I_{LM}$	Inductive Current Clamped	APT1001RBNR	44			Amps
		APT1001R1BNR	42			

① Repetitive Rating: Pulse width limited by maximum junction temperature.

③ See MIL-STD-750 Method 3471

② Pulse Test: Pulse width < 380  $\mu\text{s}$ , Duty Cycle < 2%

④ Starting  $T_J = +25^\circ\text{C}$ ,  $L = 20\text{mH}$ ,  $R_G = 25\Omega$ , Peak  $I_L = 11\text{A}$

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

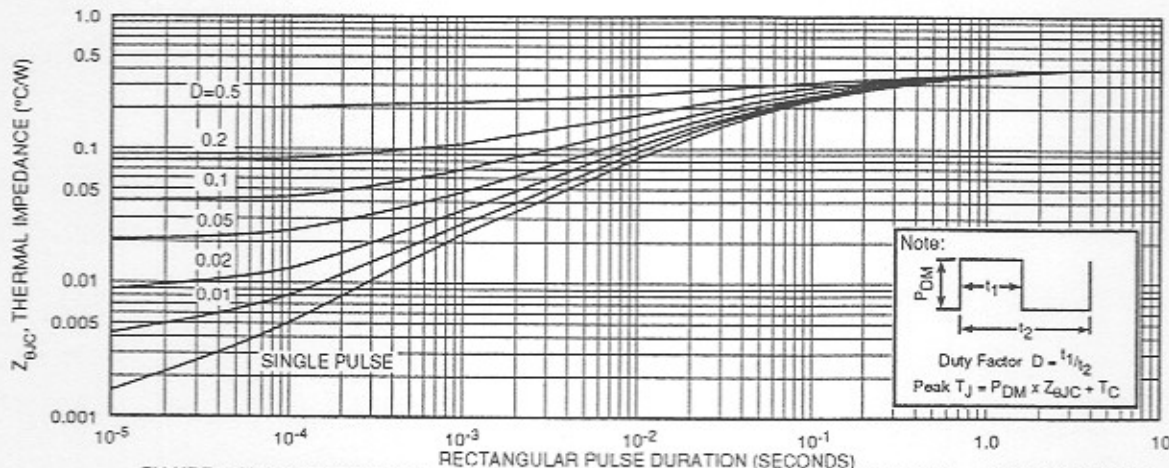


FIGURE 1, MAXIMUM EFFECTIVE TRANSIENT THERMAL IMPEDANCE, JUNCTION-TO-CASE vs PULSE DURATION

APT1001R/1001R1BNR

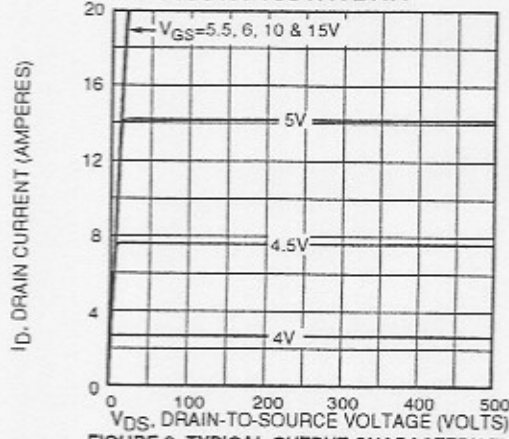


FIGURE 2, TYPICAL OUTPUT CHARACTERISTICS

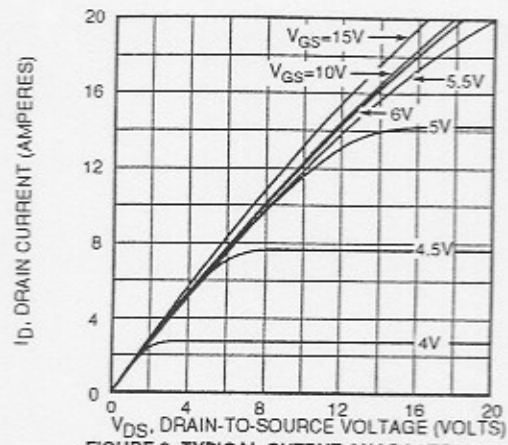


FIGURE 3, TYPICAL OUTPUT CHARACTERISTICS

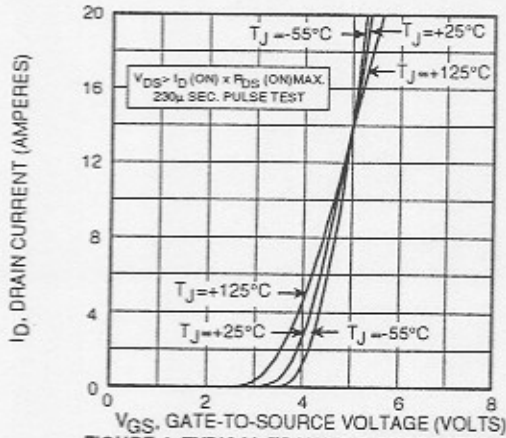


FIGURE 4, TYPICAL TRANSFER CHARACTERISTICS

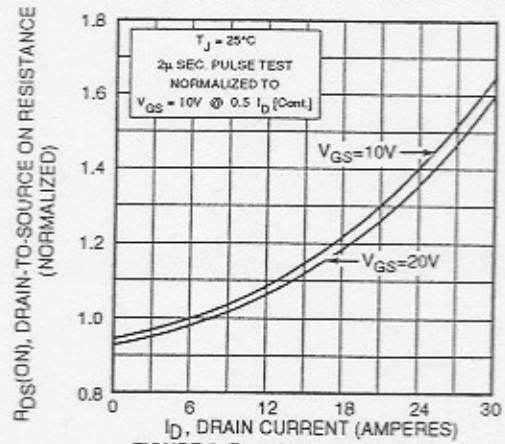


FIGURE 5,  $R_{DS(ON)}$  vs DRAIN CURRENT

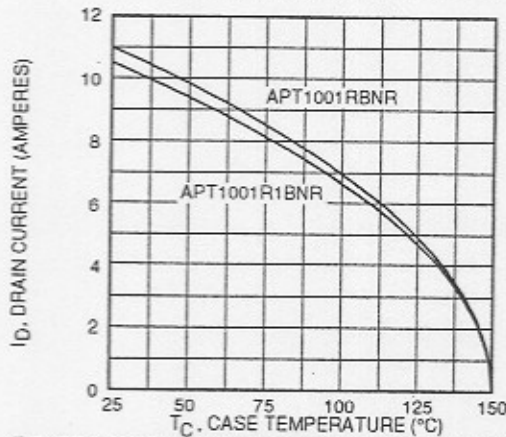


FIGURE 6, MAXIMUM DRAIN CURRENT vs CASE TEMPERATURE

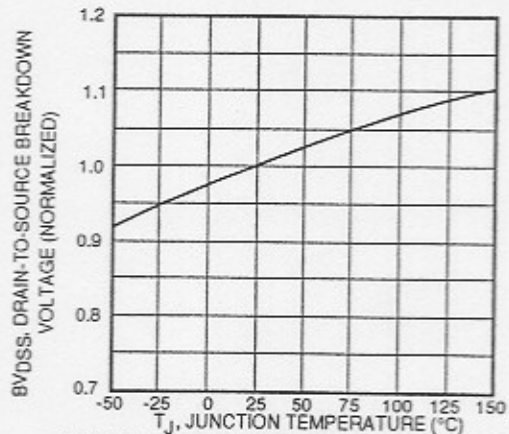


FIGURE 7, BREAKDOWN VOLTAGE vs TEMPERATURE

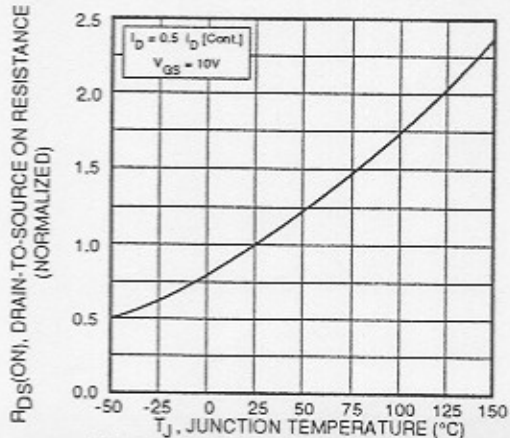


FIGURE 8, ON-RESISTANCE vs. TEMPERATURE

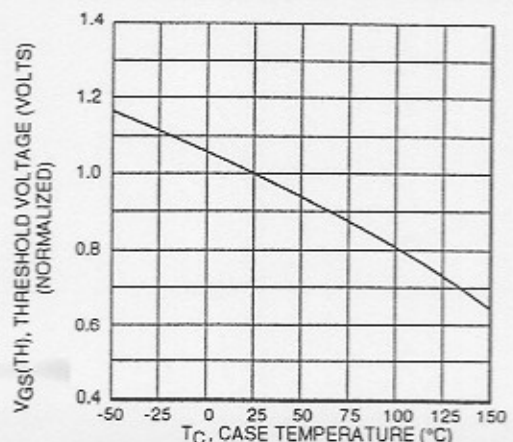


FIGURE 9, THRESHOLD VOLTAGE vs TEMPERATURE

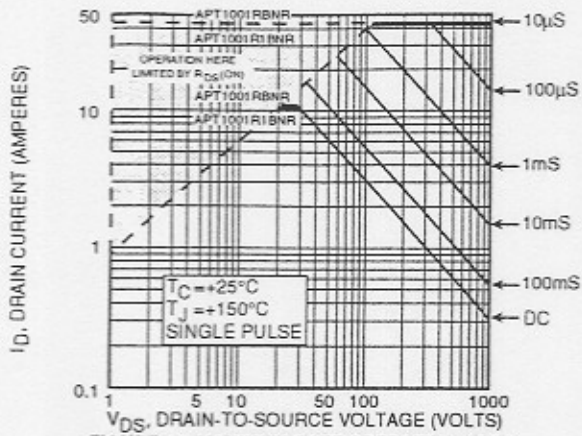


FIGURE 10, MAXIMUM SAFE OPERATING AREA

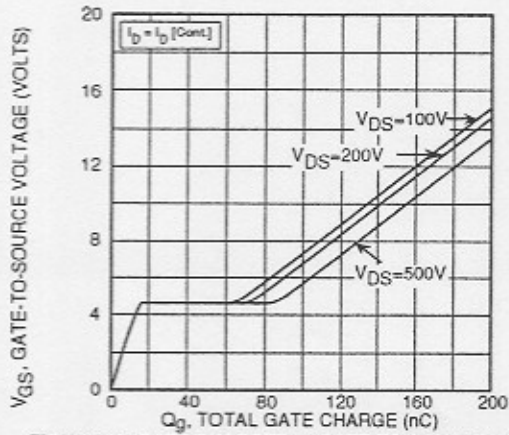


FIGURE 12, GATE CHARGES vs GATE-TO-SOURCE VOLTAGE

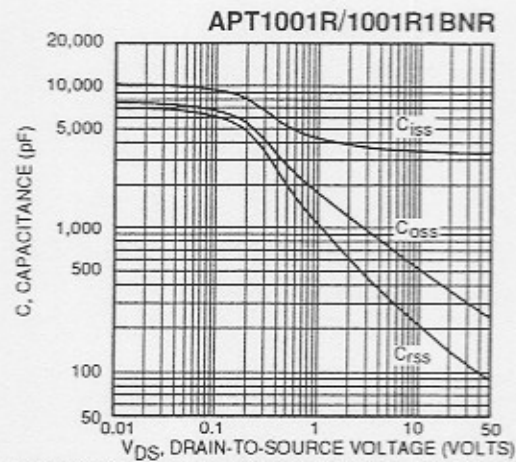


FIGURE 11, TYPICAL CAPACITANCE vs DRAIN-TO-SOURCE VOLTAGE

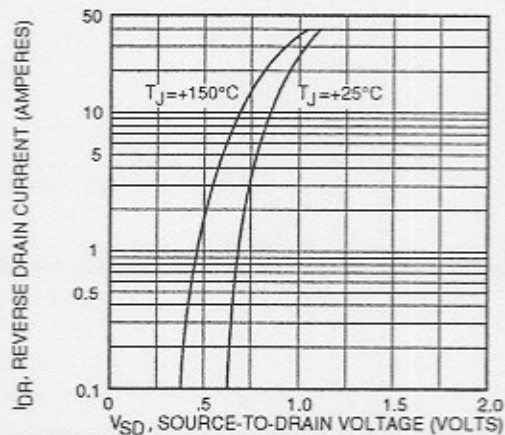


FIGURE 13, TYPICAL SOURCE-DRAIN DIODE FORWARD VOLTAGE

### TO-247AD Package Outline

