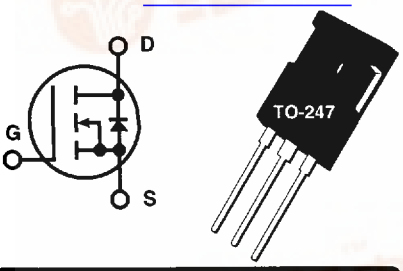

ADVANCED POWER TECHNOLOGY®

APT6030BNR 600V 23.0A 0.30Ω
APT6033BNR 600V 22.0A 0.33Ω

POWER MOS IV® **AVALANCHE RATED**

N-CHANNEL ENHANCEMENT MODE HIGH VOLTAGE POWER MOSFETS

MAXIMUM RATINGS

All Ratings: T_C = 25°C unless otherwise specified.

Symbol	Parameter	APT6030BNR	APT6033BNR	UNIT
V_{DSS}	Drain-Source Voltage	600	600	Volts
I_D	Continuous Drain Current @ T_C = 25°C	23	22	Amps
I_{DM}	Pulsed Drain Current ①	92	88	
V_{GS}	Gate-Source Voltage Continuous	±20		Volts
V_{GSM}	Gate-Source Voltage Transient	±30		
P_D	Total Power Dissipation @ T_C = 25°C	360		Watts
	Linear Derating Factor	2.9		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 ① (Repetitive and Non-Repetitive)	23		Amps
E_{AR}	Repetitive Avalanche Energy ①	30		mJ
E_{AS}	Single Pulse Avalanche Energy ④	1300		

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 µA)		600			Volts
$I_{D(ON)}$	On State Drain Current ②	APT6030BNR	23			Amps
	(V_{DS} > $I_{D(ON)}$ x $R_{DS(ON)}$ Max, V_{GS} = 10V)	APT6033BNR	22			
$R_{DS(ON)}$	Drain-Source On-State Resistance ②	APT6030BNR			0.30	Ohms
	(V_{GS} = 10V, 0.5 I_D [Cont.])	APT6033BNR			0.33	
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°C)				1000	
I_{GSS}	Gate-Source Leakage Current (V_{GS} = ±20V, 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			0.34	°C/W
$R_{\theta JA}$	Junction to Ambient			40	

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

USA
405 S.W. Columbia Street Bend, Oregon 97702-1035 Phone: (503) 382-8028 FAX: (503) 388-0364
EUROPE
Avenue J.F. Kennedy Bât B4 Parc Cadéra Nord F-33700 Merignac - France Phone: (33) 56 34 34 71 FAX: (33) 56 47 97 61

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DYNAMIC CHARACTERISTICS

APT6030/6033BNR

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
C_{iss}	Input Capacitance	V_{GS} = 0V V_{DS} = 25V f = 1 MHz		4270	5120	pF
C_{oss}	Output Capacitance			527	740	
C_{rss}	Reverse Transfer Capacitance			190	285	
Q_g	Total Gate Charge ③	V_{GS} = 10V V_{DD} = 0.5 V_{DSS} I_D = I_D [Cont.] @ 25°C		180	270	nC
Q_{gs}	Gate-Source Charge			18	27	
Q_{gd}	Gate-Drain ("Miller") Charge			81	120	
$t_d(on)$	Turn-on Delay Time	V_{GS} = 15V V_{DD} = 0.5 V_{DSS} I_D = I_D [Cont.] @ 25°C R_G = 1.8Ω		15	30	ns
t_r	Rise Time			35	70	
$t_d(off)$	Turn-off Delay Time			122	180	
t_f	Fall Time			60	120	

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Symbol	Characteristic / Test Conditions / Part Number		MIN	TYP	MAX	UNIT
I_S	Continuous Source Current (Body Diode)	APT6030BNR			23	Amps
		APT6033BNR			22	
I_{SM}	Pulsed Source Current ① (Body Diode)	APT6030BNR			92	
		APT6033BNR			88	
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)			584	1168	ns
Q_{rr}	Reverse Recovery Charge (I_S = -I_D [Cont.], dI_S/dt = 100A/µs)			13	20	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.	360			Watts
SOA2	Safe Operating Area	I_{DS} = I_D [Cont.], V_{DS} = P_D / I_D [Cont.], t = 1 Sec.	360			
I_{LM}	Inductive Current Clamped	APT6030BNR	92			Amps
		APT6033BNR	88			

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

② Pulse Test: Pulse width < 380 µS, Duty Cycle < 2%

③ See MIL-STD-750 Method 3471

④ Starting T_j = +25°C, L = 4.9mH, R_G = 25Ω, Peak I_L = 23A

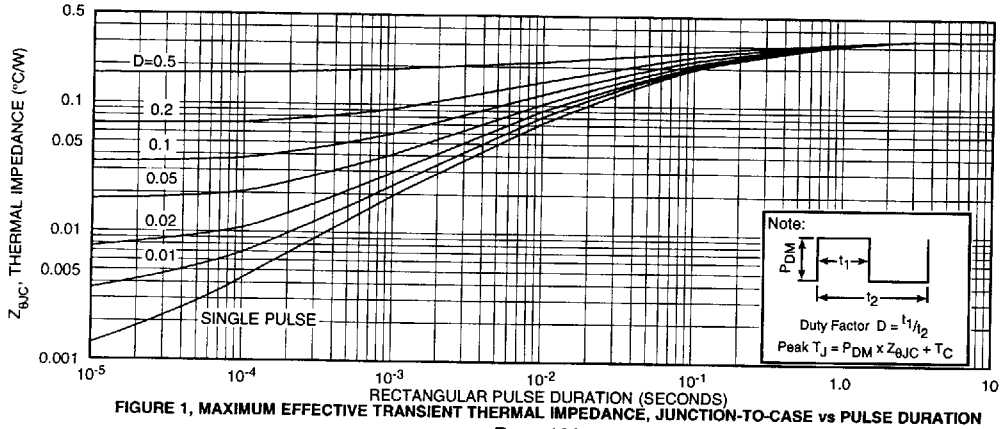

FIGURE 1, MAXIMUM EFFECTIVE TRANSIENT THERMAL IMPEDANCE, JUNCTION-TO-CASE vs PULSE DURATION

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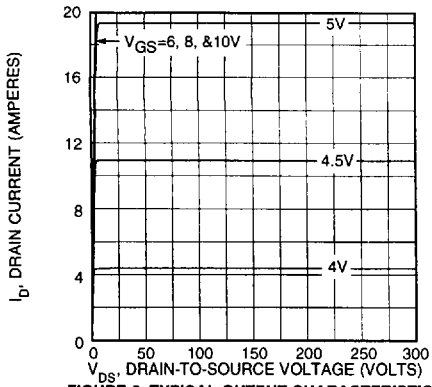

FIGURE 2, TYPICAL OUTPUT CHARACTERISTICS

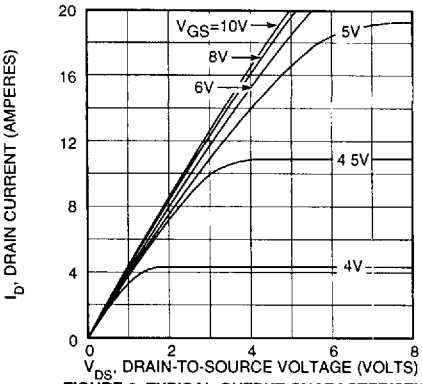

FIGURE 3, TYPICAL OUTPUT CHARACTERISTICS

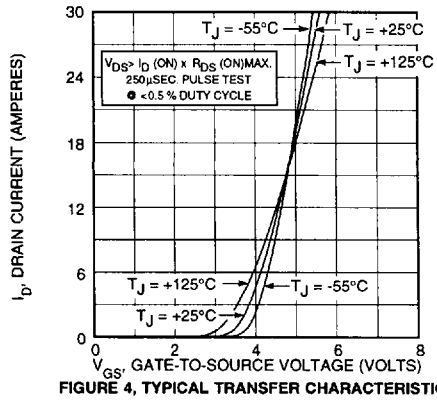

FIGURE 4, TYPICAL TRANSFER CHARACTERISTICS

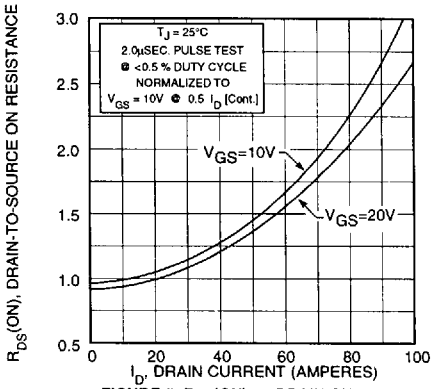

FIGURE 5, R_{DS}(ON) vs DRAIN CURRENT

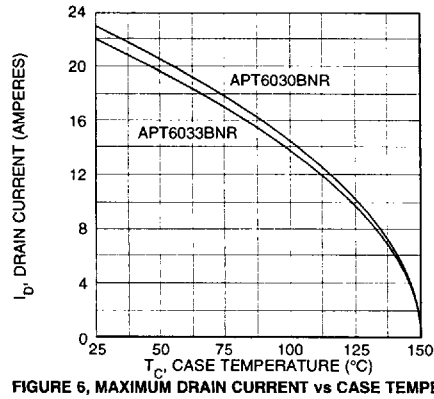

FIGURE 6, MAXIMUM DRAIN CURRENT vs CASE TEMPERATURE

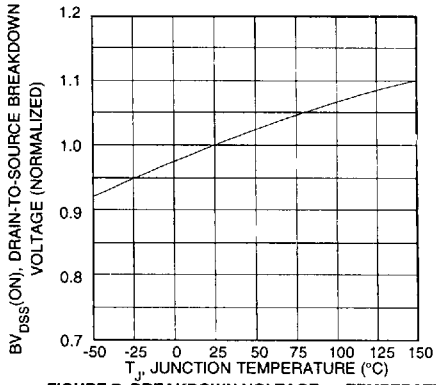

FIGURE 7, BREAKDOWN VOLTAGE vs TEMPERATURE

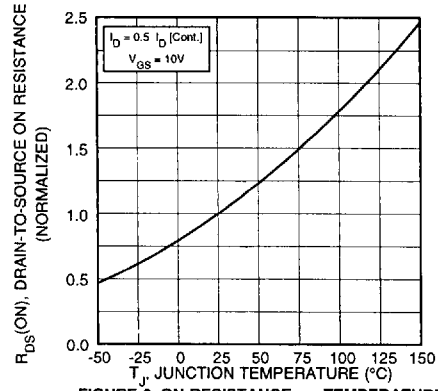

FIGURE 8, ON-RESISTANCE vs. TEMPERATURE

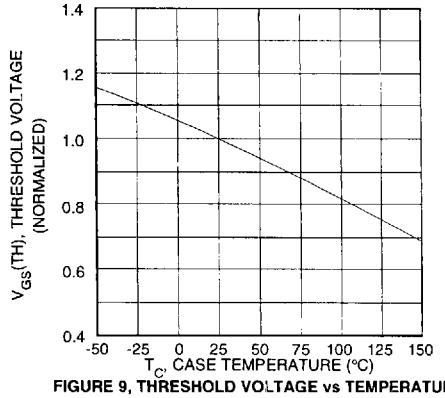

FIGURE 9, THRESHOLD VOLTAGE vs TEMPERATURE

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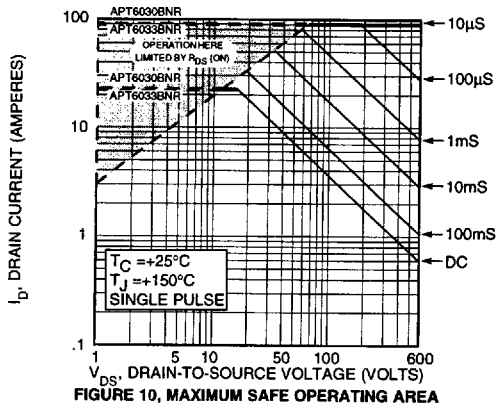


FIGURE 10, MAXIMUM SAFE OPERATING AREA

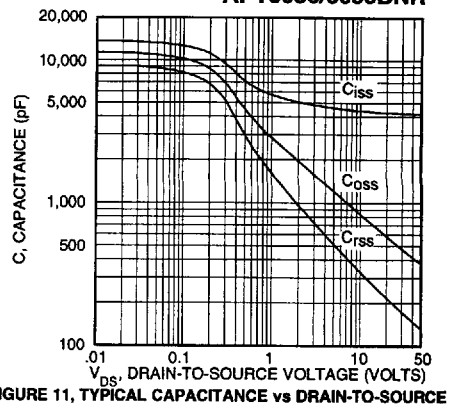


FIGURE 11, TYPICAL CAPACITANCE vs DRAIN-TO-SOURCE VOLTAGE

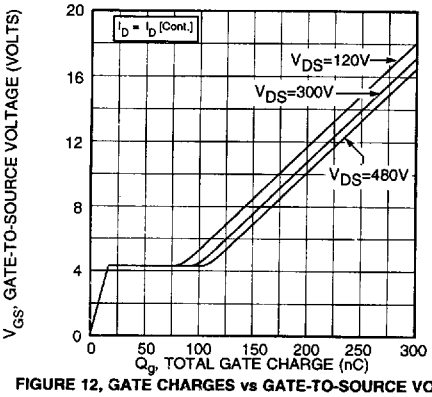


FIGURE 12, GATE CHARGES vs GATE-TO-SOURCE VOLTAGE

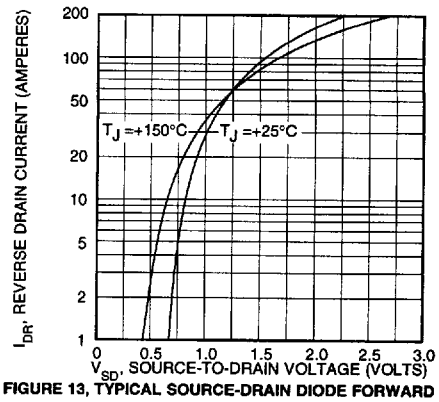
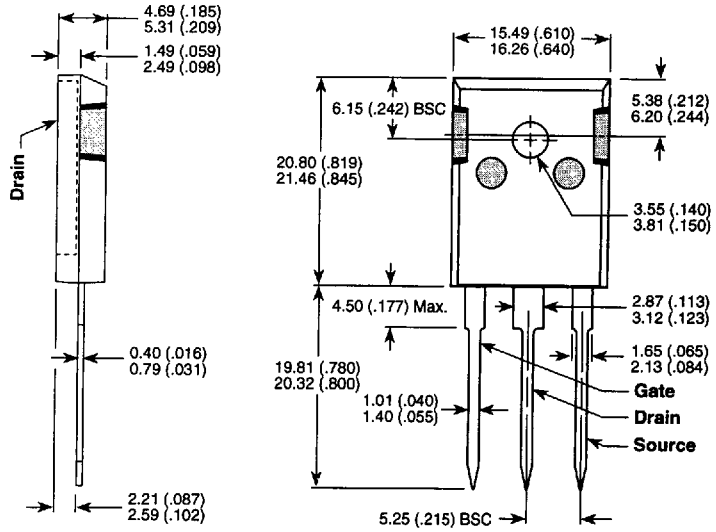


FIGURE 13, TYPICAL SOURCE-DRAIN DIODE FORWARD VOLTAGE

TO-247AD Package Outline



Dimensions in Millimeters and (Inches)