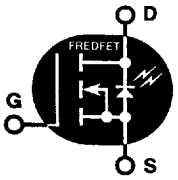

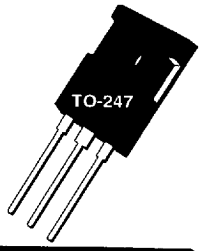

ADVANCED POWER TECHNOLOGY®

APT20M45BNFR 200V 58A 0.045Ω
APT20M60BNFR 200V 50A 0.060Ω

POWER MOS IV® — **AVALANCHE RATED FREDFET**

N-CHANNEL ENHANCEMENT MODE LOW VOLTAGE POWER FREDFETS

MAXIMUM RATINGS

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

Symbol	Parameter	APT20M45BNFR	APT20M60BNFR	UNIT
V_{DSS}	Drain-Source Voltage	200	200	Volts
I_D	Continuous Drain Current @ $T_C = 25°C$	58	50	Amps
I_{DM}	Pulsed Drain Current ①	232	200	
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)	58		Amps
E_{AR}	Repetitive Avalanche Energy	30		mJ
E_{AS}	Single Pulse Avalanche Energy ③	1300		

STATIC ELECTRICAL CHARACTERISTICS

Symbol	Characteristic / Test Conditions / Part Number		MIN	TYP	MAX	UNIT
BV_{DSS}	Drain-Source Breakdown Voltage ($V_{GS} = 0V$, $I_D = 1.0mA$)		200			Volts
$I_{D(ON)}$	On State Drain Current ④	APT20M45BNFR	58			Amps
	($V_{DS} > I_{D(ON)} \times R_{DS(ON)}$ Max, $V_{GS} = 10V$)	APT20M60BNFR	50			
$R_{DS(ON)}$	Drain-Source On-State Resistance ④	APT20M45BNFR			0.045	Ohms
	($V_{GS} = 10V$, 0.5 I_D [Cont.])	APT20M60BNFR			0.060	
I_{DSS}	Zero Gate Voltage Drain Current ($V_{DS} = 0.8\ V_{DSS}$, $V_{GS} = 0V$)				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
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DYNAMIC CHARACTERISTICS

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
C_{iss}	Input Capacitance	V_{GS} = 0V		5510	6500	pF
C_{oss}	Output Capacitance	V_{DS} = 25V		1090	1400	
C_{rss}	Reverse Transfer Capacitance	f = 1 MHz		290	450	
Q_g	Total Gate Charge	V_{GS} = 10V		160	210	nC
Q_{gs}	Gate-Source Charge	V_{DD} = 0.5 V_{DSS}		32	50	
Q_{gd}	Gate-Drain ("Miller") Charge	I_D = 0.5 I_D [Cont.] @ 25°C		65	95	
$t_d(on)$	Turn-on Delay Time	V_{GS} = 15V		25	35	ns
t_r	Rise Time	V_{DD} = 0.5 V_{DSS}		50	85	
$t_d(off)$	Turn-off Delay Time	I_D = 0.5 I_D [Cont.] @ 25°C		130	180	
t_f	Fall Time	R_G = 1.8Ω		60	95	

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Symbol	Characteristic / Test Conditions / Part Number		MIN	TYP	MAX	UNIT
I_S	Continuous Source Current (Body Diode)	APT20M45BNFR			58	Amps
		APT20M60BNFR			50	
I_{SM}	Pulsed Source Current ① (Body Diode)	APT20M45BNFR			232	
		APT20M60BNFR			200	
V_{SD}	Diode Forward Voltage ④ (V_{GS} = 0V, I_S = -I_D [Cont.])				1.5	Volts
dv/dt	Peak Diode Recovery dv/dt ②				5	V/ns
t_{rr}	Reverse Recovery Time (I_S = -I_D [Cont.], di/dt = 100A/µs)	T_j = 25°C		150	200	ns
		T_j = 125°C		225	300	
Q_{rr}	Reverse Recovery Charge (I_S = -I_D [Cont.], di/dt = 100A/µs)	T_j = 25°C		1.1		µC
		T_j = 125°C		2.5		
I_{RRM}	Peak Recovery Current (I_S = -I_D [Cont.], di/dt = 100A/µs)	T_j = 25°C		14		Amps
		T_j = 125°C		22		

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	APT20M45BNFR	232			Amps
		APT20M60BNFR	200			

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

② $I_S \le -I_D$ [Cont.], di/dt = 100A/µs, $V_{DD} \le V_{DSS}$, $T_j \le 150°C$, R_G = 1.8Ω, V_R = 150V.

③ Starting T_j = 25°C, L = 773µH, R_G = 25Ω, Peak I_L = 58A

④ Pulse Test: Pulse width < 380 µS, Duty Cycle < 2%

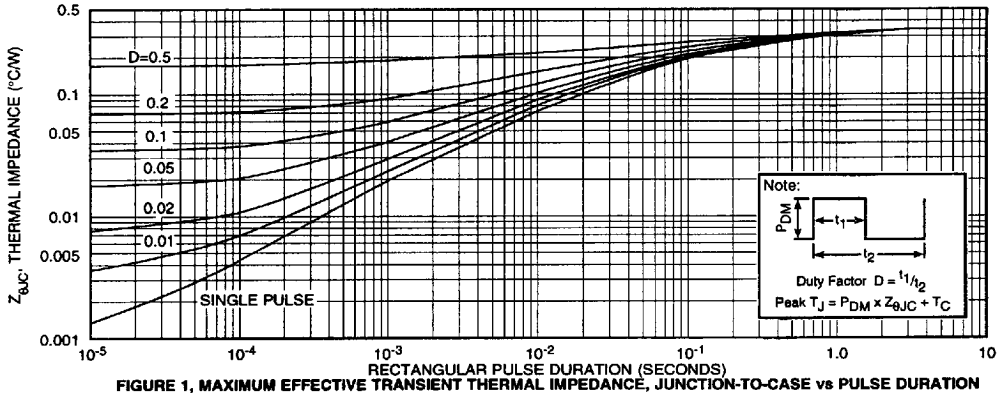

FIGURE 1, MAXIMUM EFFECTIVE TRANSIENT THERMAL IMPEDANCE, JUNCTION-TO-CASE vs PULSE DURATION

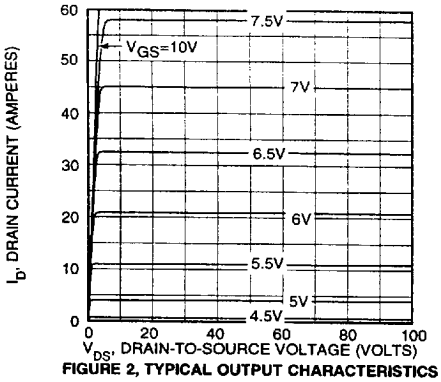

FIGURE 2, TYPICAL OUTPUT CHARACTERISTICS

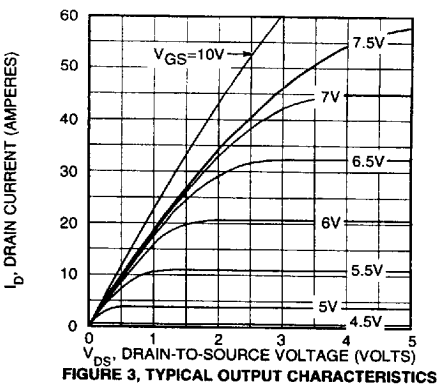

FIGURE 3, TYPICAL OUTPUT CHARACTERISTICS

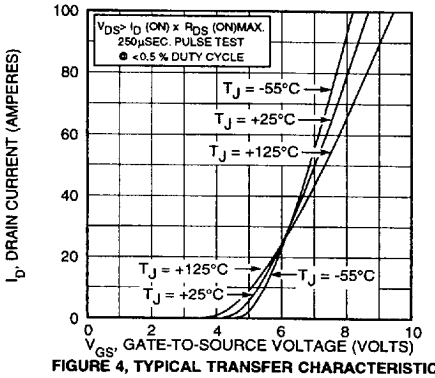

FIGURE 4, TYPICAL TRANSFER CHARACTERISTICS

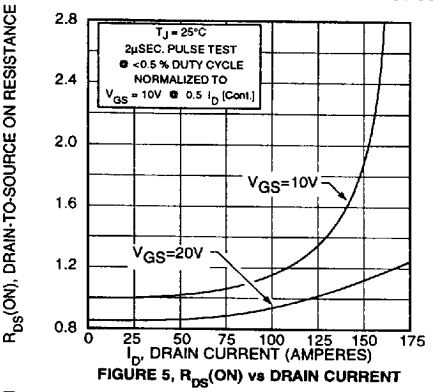

FIGURE 5, R_{DS}(ON) vs DRAIN CURRENT

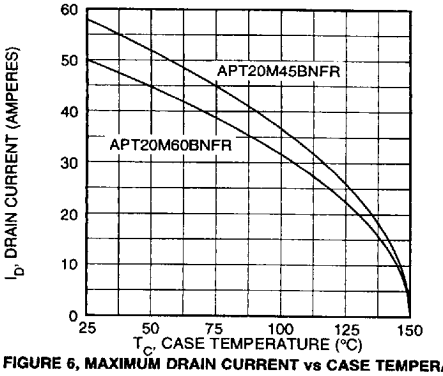

FIGURE 6, MAXIMUM DRAIN CURRENT vs CASE TEMPERATURE

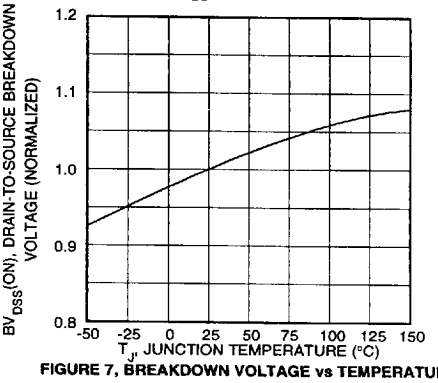

FIGURE 7, BREAKDOWN VOLTAGE vs TEMPERATURE

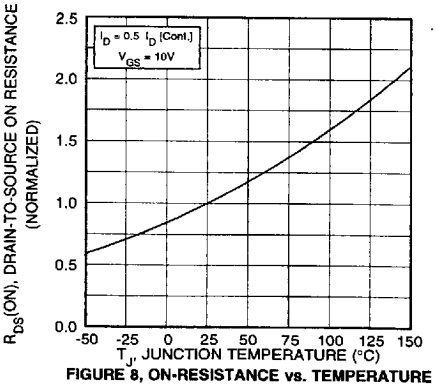

FIGURE 8, ON-RESISTANCE vs. TEMPERATURE

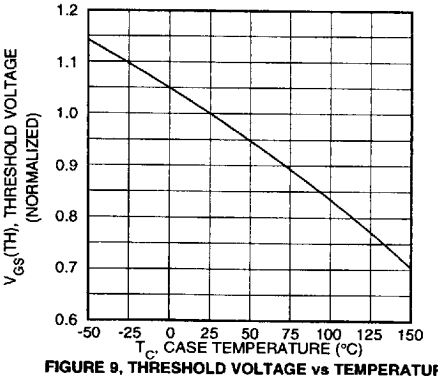

FIGURE 9, THRESHOLD VOLTAGE vs TEMPERATURE

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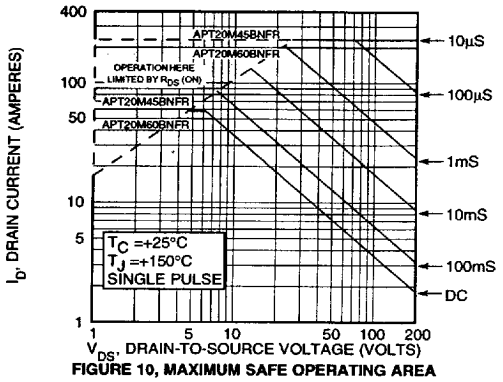


FIGURE 10, MAXIMUM SAFE OPERATING AREA

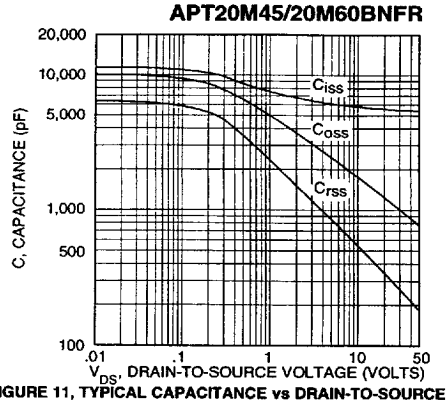


FIGURE 11, TYPICAL CAPACITANCE vs DRAIN-TO-SOURCE VOLTAGE

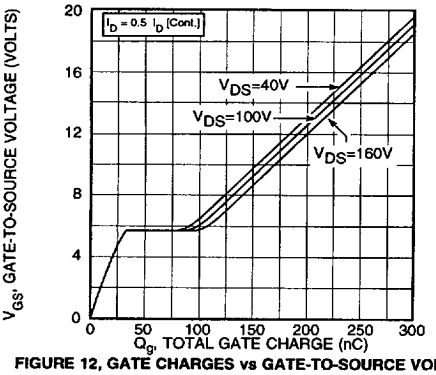


FIGURE 12, GATE CHARGES vs GATE-TO-SOURCE VOLTAGE

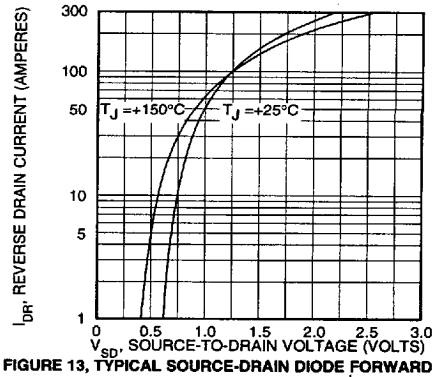
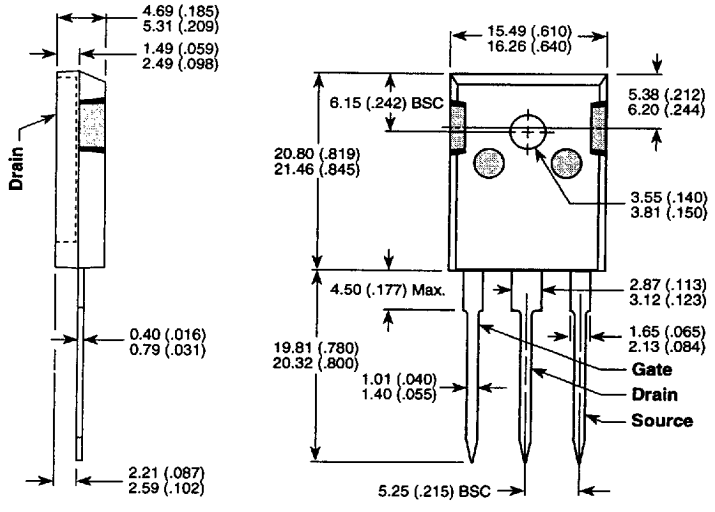


FIGURE 13, TYPICAL SOURCE-DRAIN DIODE FORWARD VOLTAGE

TO-247AD Package Outline



Dimensions in Millimeters and (Inches)

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