

APT20M45BNR 200V 58A 0.045Ω
APT20M60BNR 200V 50A 0.060Ω

POWER MOS IV®

AVALANCHE RATED

N-CHANNEL ENHANCEMENT MODE LOW VOLTAGE POWER MOSFETS

MAXIMUM RATINGS

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

Symbol	Parameter	APT20M45BNR	APT20M60BNR	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 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 ($V_{GS} = 0V, I_D = 1.0mA$)	200			Volts
$I_{D(ON)}$	On State Drain Current ②				Amps
	($V_{DS} > I_{D(ON)} \times R_{DS(ON)}$) Max, $V_{GS} = 10V$)	APT20M45BNR	58		
$R_{DS(ON)}$	Drain-Source On-State Resistance ②				Ohms
	($V_{GS} = 10V, 0.5 I_{D(ON)}$)	APT20M45BNR		0.045	
I_{DSS}	Zero Gate Voltage Drain Current ($V_{DS} = 0.8 V_{DSS}, V_{GS} = 0V$)			250	μA
	Zero Gate Voltage Drain Current ($V_{DS} = 0.8 V_{DSS}, V_{GS} = 0V, T_C = 125^\circ\text{C}$)			1000	
I_{GSS}	Gate-Source Leakage Current ($V_{GS} = \pm 20V, V_{DS} = 0V$)			± 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	$^\circ\text{C/W}$
$R_{\theta JA}$	Junction to Ambient			40	

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

USA
 405 S.W. Columbia Street
EUROPE

Bend, Oregon 97702-1035

Phone: (503) 382-8028 FAX: (503) 388-0364

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

Page 20

050-2052 Rev C

0257909 0001424 125

DYNAMIC CHARACTERISTICS

APT20M45/20M60BNR

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
C_{iss}	Input Capacitance	$V_{GS} = 0V$ $V_{DS} = 25V$ $f = 1 \text{ MHz}$		5100	6500	pF
C_{oss}	Output Capacitance			1200	1680	
C_{rss}	Reverse Transfer Capacitance			360	540	
Q_g	Total Gate Charge ^③	$V_{GS} = 10V$ $V_{DD} = 0.5 V_{DSS}$ $I_D = I_D [\text{Cont.}] @ 25^\circ\text{C}$		170	220	nC
Q_{gs}	Gate-Source Charge			26	39	
Q_{gd}	Gate-Drain ("Miller") Charge			75	110	
$t_{d(on)}$	Turn-on Delay Time	$V_{GS} = 15V$ $V_{DD} = 0.5 V_{DSS}$ $I_D = I_D [\text{Cont.}] @ 25^\circ\text{C}$ $R_G = 1.8\Omega$		15	25	ns
t_r	Rise Time			65	100	
$t_{d(off)}$	Turn-off Delay Time			130	190	
t_f	Fall Time			60	90	

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Symbol	Characteristic / Test Conditions / Part Number	MIN	TYP	MAX	UNIT
I_S	Continuous Source Current (Body Diode)	APT20M45BNR		58	Amps
		APT20M60BNR		50	
I_{SM}	Pulsed Source Current ^① (Body Diode)	APT20M45BNR		232	
		APT20M60BNR		200	
V_{SD}	Diode Forward Voltage ^② ($V_{GS} = 0V$, $I_S = -I_D [\text{Cont.}]$)			1.5	Volts
t_{rr}	Reverse Recovery Time ($I_S = -I_D [\text{Cont.}]$, $dI_S/dt = 100A/\mu s$)	150	300	600	ns
Q_{rr}	Reverse Recovery Charge ($I_S = -I_D [\text{Cont.}]$, $dI_S/dt = 100A/\mu s$)	1.5	2.9	6	μC

SAFE OPERATING AREA CHARACTERISTICS

Symbol	Characteristic	Test Conditions / Part Number	MIN	TYP	MAX	UNIT
SOA1	Safe Operating Area	$V_{DS} = 0.4 V_{DSS}$, $I_{DS} = P_D / 0.4 V_{DSS}$, $t = 1 \text{ Sec.}$	360			Watts
SOA2	Safe Operating Area	$I_{DS} = I_D [\text{Cont.}]$, $V_{DS} = P_D / I_D [\text{Cont.}]$, $t = 1 \text{ Sec.}$	360			
I_{LM}	Inductive Current Clamped	APT20M45BNR	232			Amps
		APT20M60BNR	200			

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 $T_J = 25^\circ\text{C}$, $L = 773\mu H$, $R_G = 25\Omega$, Peak $I_L = 58A$

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

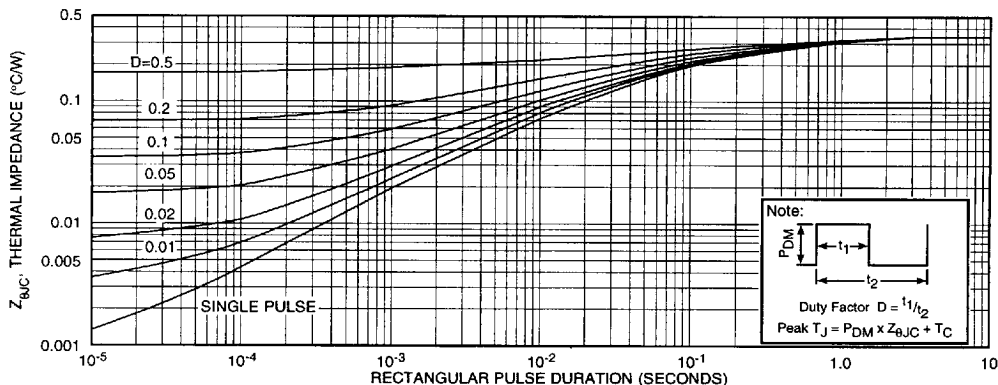


FIGURE 1. MAXIMUM EFFECTIVE TRANSIENT THERMAL IMPEDANCE, JUNCTION-TO-CASE vs PULSE DURATION

Page 21

0257909 0001425 061

APT20M45/20M60BNR

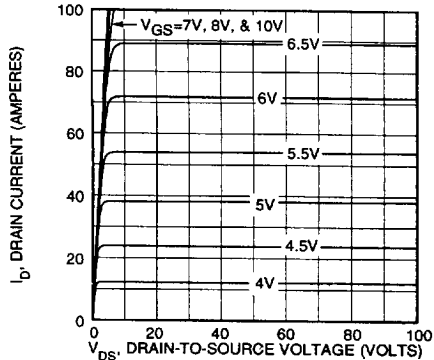


FIGURE 2, TYPICAL OUTPUT CHARACTERISTICS

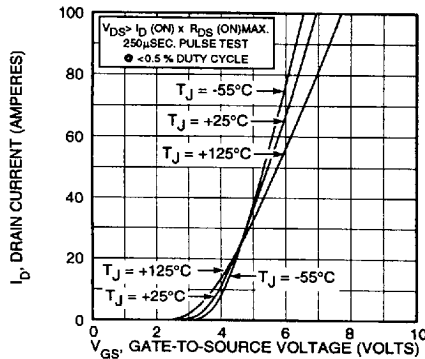


FIGURE 4, TYPICAL TRANSFER CHARACTERISTICS

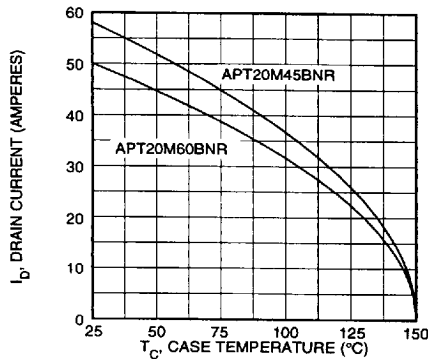


FIGURE 6, MAXIMUM DRAIN CURRENT vs CASE TEMPERATURE

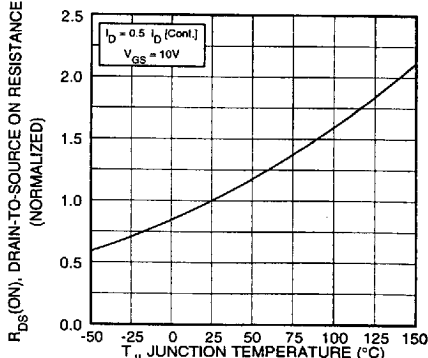


FIGURE 8, ON-RESISTANCE vs. TEMPERATURE

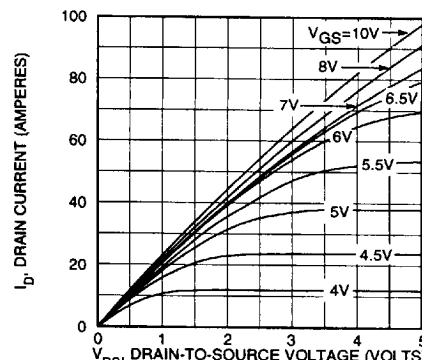


FIGURE 3, TYPICAL OUTPUT CHARACTERISTICS

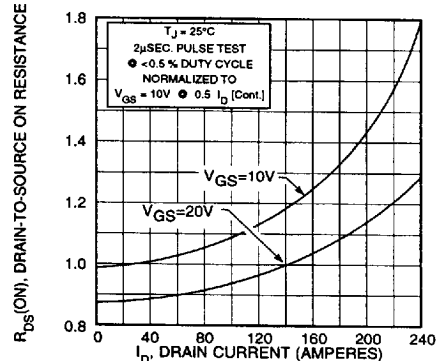


FIGURE 5, $R_{DS}(ON)$ vs DRAIN CURRENT

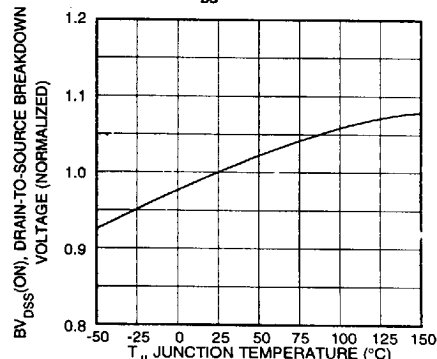


FIGURE 7, BREAKDOWN VOLTAGE vs TEMPERATURE

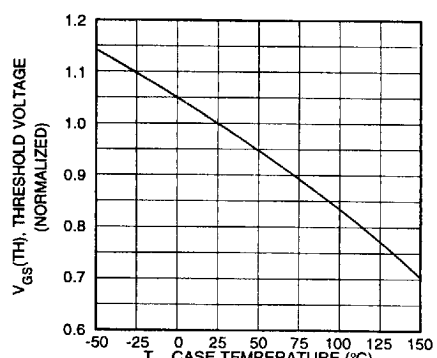
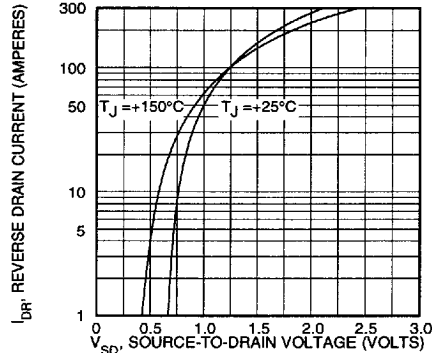
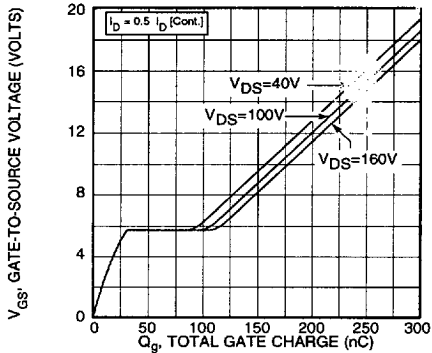
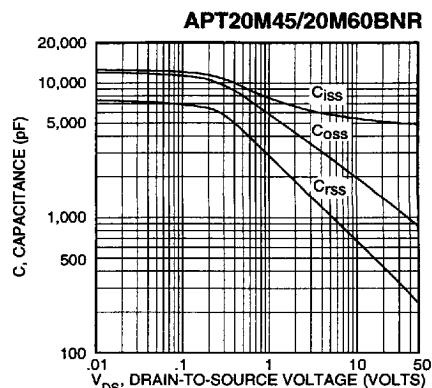
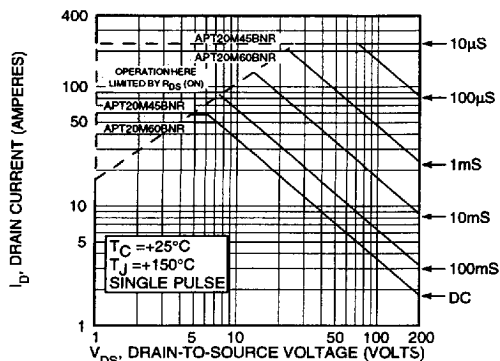
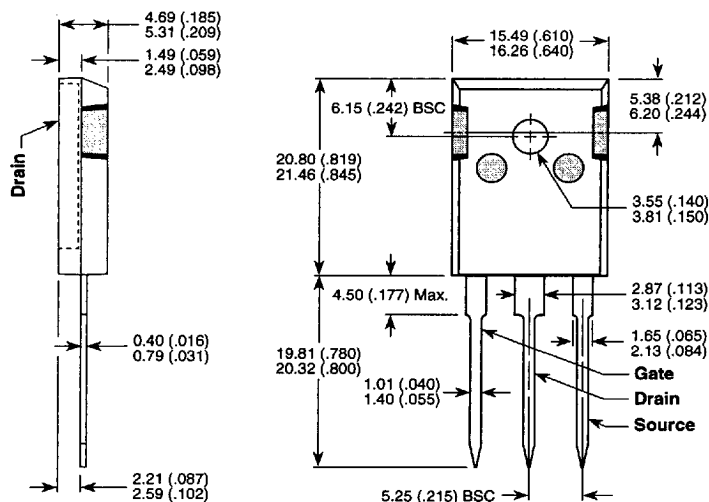


FIGURE 9, THRESHOLD VOLTAGE vs TEMPERATURE



TO-247AD Package Outline



Dimensions in Millimeters and (Inches)
Page 23

0257909 0001427 934