

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: $T_C = 25^\circ\text{C}$ 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_{DS}	Drain-Source Breakdown Voltage ($V_{GS} = 0V, I_D = 1.0mA$)	200			Volts
$I_{D(ON)}$	On State Drain Current ^④ ($V_{DS} > I_{D(ON)} \times R_{DS(ON)}$ Max, $V_{GS} = 10V$)	APT20M45BNFR	58		Amps
		APT20M60BNFR	50		
$R_{DS(ON)}$	Drain-Source On-State Resistance ^④ ($V_{GS} = 10V, 0.5 I_D$ (Cont.))	APT20M45BNFR		0.045	Ohms
		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 ($V_{DS} = 0.8 V_{DSS}, V_{GS} = 0V, T_C = 125^\circ\text{C}$)			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

Avenue J.F. Kennedy Bât B4 Parc Cadéra Nord F-33700 Merignac - France

Bend, Oregon 97702-1035

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

Phone: (33) 56 34 34 71 FAX: (33) 56 47 97 61

Page 16

0257909 0001420 58T

050-2045 Rev C

DYNAMIC CHARACTERISTICS

APT20M45/20M60BNFR

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
C_{iss}	Input Capacitance	$V_{GS} = 0V$ $V_{DS} = 25V$ $f = 1 \text{ MHz}$		5510	6500	pF
C_{oss}	Output Capacitance			1090	1400	
C_{rss}	Reverse Transfer Capacitance			290	450	
Q_g	Total Gate Charge	$V_{GS} = 10V$ $V_{DD} = 0.5 V_{DSS}$ $I_D = 0.5 I_D [\text{Cont.}] @ 25^\circ\text{C}$		160	210	nC
Q_{gs}	Gate-Source Charge			32	50	
Q_{gd}	Gate-Drain ("Miller") Charge			65	95	
$t_{d(on)}$	Turn-on Delay Time	$V_{GS} = 15V$ $V_{DD} = 0.5 V_{DSS}$ $I_D = 0.5 I_D [\text{Cont.}] @ 25^\circ\text{C}$ $R_G = 1.8\Omega$		25	35	ns
t_r	Rise Time			50	85	
$t_{d(off)}$	Turn-off Delay Time			130	180	
t_f	Fall Time			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	Amps
		APT20M60BNFR		200	
V_{SD}	Diode Forward Voltage ^③ ($V_{GS} = 0V$, $I_S = -I_D [\text{Cont.}]$)			1.5	Volts
dv/dt	Peak Diode Recovery dv/dt ^②			5	V/ns
t_{rr}	Reverse Recovery Time ($I_S = -I_D [\text{Cont.}]$, $di/dt = 100A/\mu s$)	$T_J = 25^\circ\text{C}$	150	200	ns
		$T_J = 125^\circ\text{C}$	225	300	
Q_{rr}	Reverse Recovery Charge ($I_S = -I_D [\text{Cont.}]$, $di/dt = 100A/\mu s$)	$T_J = 25^\circ\text{C}$	1.1		μC
		$T_J = 125^\circ\text{C}$	2.5		
I_{RRM}	Peak Recovery Current ($I_S = -I_D [\text{Cont.}]$, $di/dt = 100A/\mu s$)	$T_J = 25^\circ\text{C}$	14		Amps
		$T_J = 125^\circ\text{C}$	22		

SAFE OPERATING AREA CHARACTERISTICS

Symbol	Characteristic	Test Conditions / Part Number	MIN	TYP	MAX	UNIT
SOA1	Safe Operating Area	$V_{DS} = 0.4 V_{DSS}$, $I_{DS} = P_D / 0.4 V_{DSS}$, $t = 1 \text{ Sec.}$	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	APT20M45BNFR	232			Amps
		APT20M60BNFR	200			

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

$R_G = 1.8\Omega$, $V_R = 150V$.

③ Starting $T_J = 25^\circ\text{C}$, $L = 773\mu\text{H}$, $R_G = 25\Omega$, Peak $I_L = 58A$

② $I_S \leq -I_D [\text{Cont.}]$, $di/dt = 100A/\mu s$, $V_{DD} \leq V_{DSS}$, $T_J \leq 150^\circ\text{C}$,

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

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

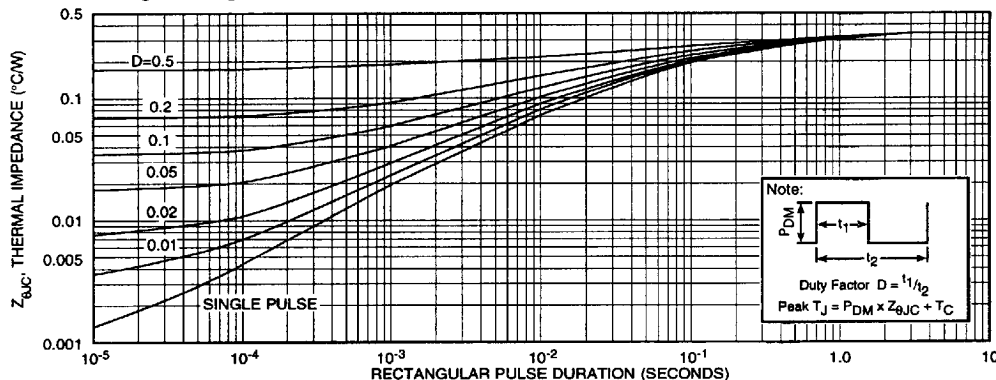


FIGURE 1. MAXIMUM EFFECTIVE TRANSIENT THERMAL IMPEDANCE, JUNCTION-TO-CASE vs PULSE DURATION

0257909 0001421 416

APT20M45/20M60BNFR

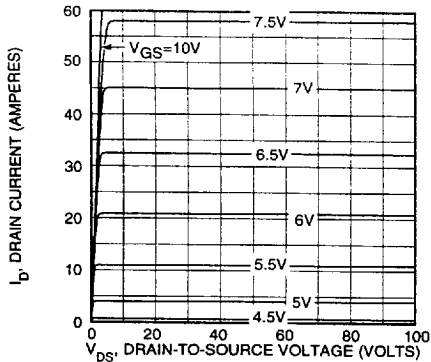


FIGURE 2, TYPICAL OUTPUT CHARACTERISTICS

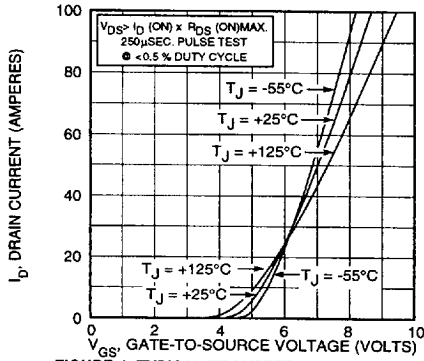


FIGURE 4, TYPICAL TRANSFER CHARACTERISTICS

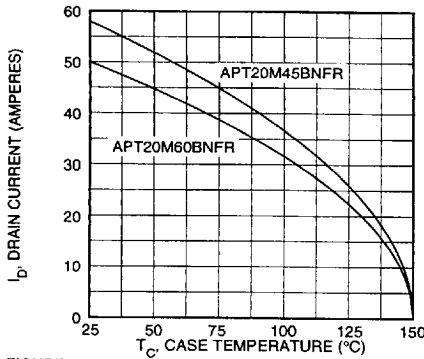


FIGURE 6, MAXIMUM DRAIN CURRENT vs CASE TEMPERATURE

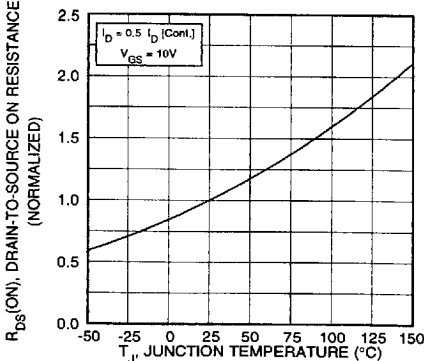


FIGURE 8, ON-RESISTANCE vs. TEMPERATURE

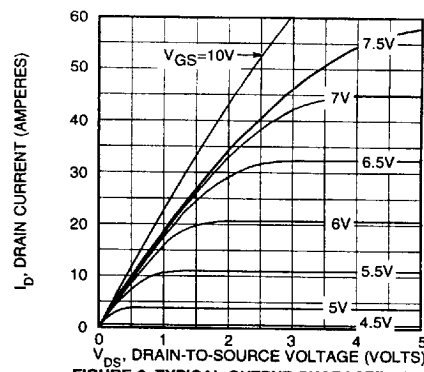


FIGURE 3, TYPICAL OUTPUT CHARACTERISTICS

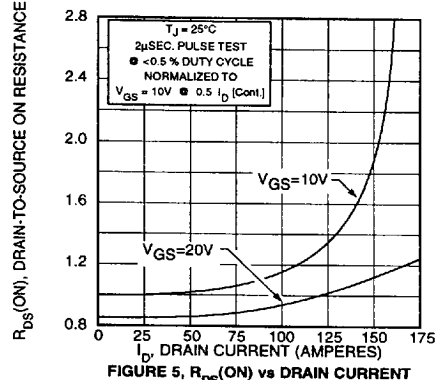


FIGURE 5, $R_{DS(ON)}$ vs DRAIN CURRENT

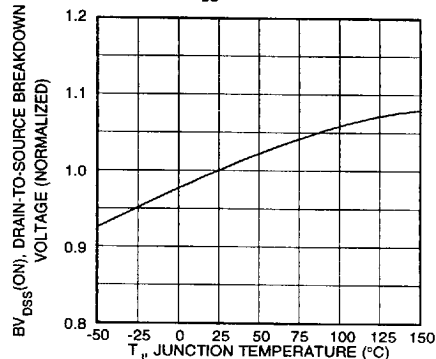


FIGURE 7, BREAKDOWN VOLTAGE vs TEMPERATURE

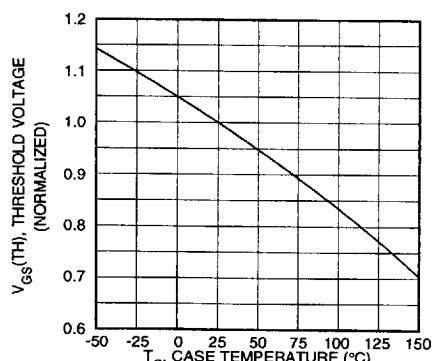


FIGURE 9, THRESHOLD VOLTAGE vs TEMPERATURE

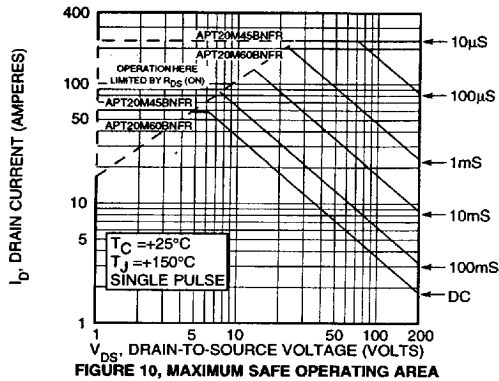


FIGURE 10, MAXIMUM SAFE OPERATING AREA

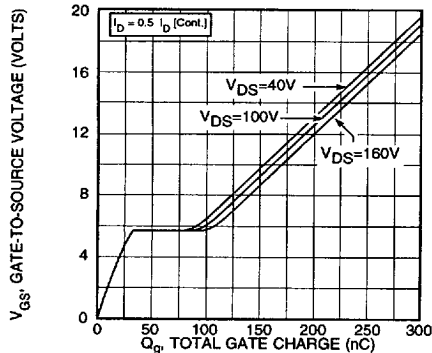


FIGURE 12, GATE CHARGES vs GATE-TO-SOURCE VOLTAGE

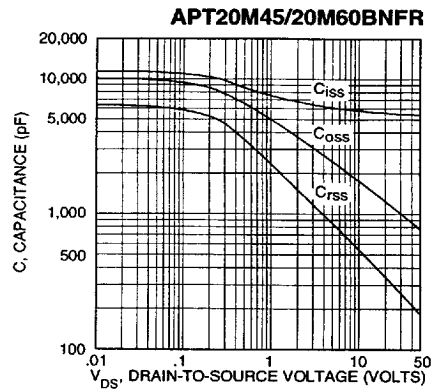


FIGURE 11, TYPICAL CAPACITANCE vs DRAIN-TO-SOURCE VOLTAGE

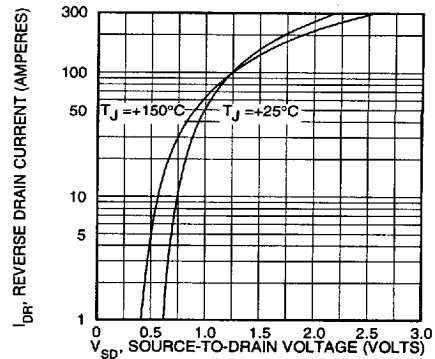
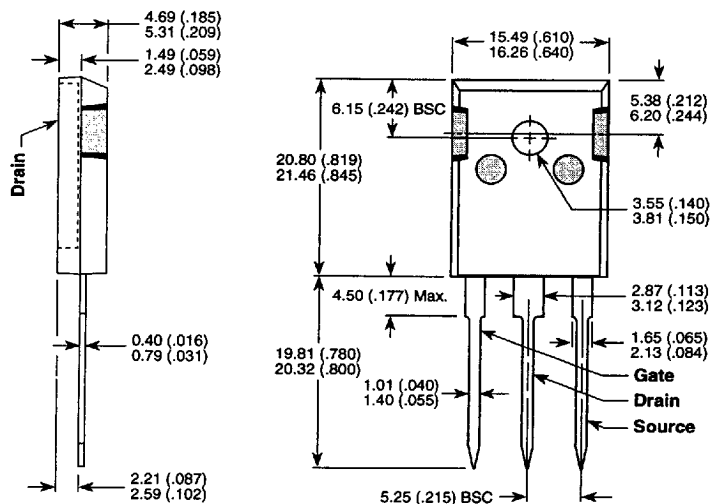


FIGURE 13, TYPICAL SOURCE-DRAIN DIODE FORWARD VOLTAGE

TO-247AD Package Outline



Dimensions in Millimeters and (Inches)
Page 19

0257909 0001423 299