

**APT5020BNFR 500V 28A 0.20Ω**  
**APT5022BNFR 500V 27A 0.22Ω**

## POWER MOS IV®

## AVALANCHE RATED FREDFET

### N-CHANNEL ENHANCEMENT MODE LOW VOLTAGE POWER FREDFETS

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

#### MAXIMUM RATINGS

Symbol	Parameter	APT5020BNFR	APT5022BNFR	UNIT
$V_{DSS}$	Drain-Source Voltage	500	500	Volts
$I_D$	Continuous Drain Current @ $T_C = 25^\circ\text{C}$ (See Fig. 6)	28	27	Amps
$I_{DM}$	Pulsed Drain Current <sup>①</sup>	112	108	
$V_{GS}$	Gate-Source Voltage Continuous	±20		Volts
$V_{GSM}$	Gate-Source Voltage Transient	±30		
$P_D$	Total Power Dissipation @ $T_C = 25^\circ\text{C}$	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 <sup>①</sup> (Repetitive and Non-Repetitive)	28		Amps
$E_{AR}$	Repetitive Avalanche Energy	30		mJ
$E_{AS}$	Single Pulse Avalanche Energy <sup>③</sup>	1300		

#### STATIC ELECTRICAL CHARACTERISTICS

Symbol	Characteristic / Test Conditions / Part Number	MIN	TYP	MAX	UNIT
$BV_{DSS}$	Drain-Source Breakdown Voltage ( $V_{GS} = 0V, I_D = 2.0\text{mA}$ )	500			Volts
$I_{D(ON)}$	On State Drain Current <sup>④</sup>	APT5020BNFR	28		Amps
	( $V_{DS} > I_{D(ON)} \times R_{DS(ON)}$ Max, $V_{GS} = 10V$ )	APT5022BNFR	27		
$R_{DS(ON)}$	Drain-Source On-State Resistance <sup>④</sup>	APT5020BNFR		0.20	Ohms
	( $V_{GS} = 10V, 0.5 I_D$ [Cont.])	APT5022BNFR		0.22	
$I_{DSS}$	Zero Gate Voltage Drain Current ( $V_{DS} = 0.8 V_{DSS}, V_{GS} = 0V$ )			250	μA
	Zero Gate Voltage Drain Current ( $V_{DS} = 0.8 V_{DSS}, V_{GS} = 0V, T_C = 125^\circ\text{C}$ )			2000	
$I_{GSS}$	Gate-Source Leakage Current ( $V_{GS} = \pm 20V, V_{DS} = 0V$ )			±100	nA
$V_{GS(TH)}$	Gate Threshold Voltage ( $V_{DS} = V_{GS}, I_D = 1.0\text{mA}$ )	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  
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

COPY



DYNAMIC CHARACTERISTICS

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
$C_{iss}$	Input Capacitance	$V_{GS} = 0V$		4000	5200	pF
$C_{oss}$	Output Capacitance	$V_{DS} = 25V$		625	870	
$C_{rss}$	Reverse Transfer Capacitance	$f = 1\text{ MHz}$		245	360	
$Q_g$	Total Gate Charge	$V_{GS} = 10V$		175	240	nC
$Q_{gs}$	Gate-Source Charge	$V_{DD} = 0.5 V_{DSS}$		25	38	
$Q_{gd}$	Gate-Drain ("Miller") Charge	$I_D = 0.5 I_D [Cont.] @ 25^\circ C$		90	130	
$t_{d(on)}$	Turn-on Delay Time	$V_{GS} = 15V$		20	35	ns
$t_r$	Rise Time	$V_{DD} = 0.5 V_{DSS}$		45	70	
$t_{d(off)}$	Turn-off Delay Time	$I_D = 0.5 I_D [Cont.] @ 25^\circ C$		60	100	
$t_f$	Fall Time	$R_G = 1.8\Omega$		105	150	

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Symbol	Characteristic / Test Conditions / Part Number	MIN	TYP	MAX	UNIT
$I_S$	Continuous Source Current (Body Diode)	APT5020BNFR		28	Amps
		APT5022BNFR		27	
$I_{SM}$	Pulsed Source Current <sup>①</sup> (Body Diode)	APT5020BNFR		112	Amps
		APT5022BNFR		108	
$V_{SD}$	Diode Forward Voltage <sup>④</sup> ( $V_{GS} = 0V, I_S = -I_D [Cont.]$ )			1.5	Volts
$dv/dt$	Peak Diode Recovery $dv/dt$ <sup>②</sup>			5	V/ns
$t_{rr}$	Reverse Recovery Time ( $I_S = -I_D [Cont.], di/dt = 100A/\mu s$ )	$T_J = 25^\circ C$		250	ns
		$T_J = 125^\circ C$		400	
$Q_{rr}$	Reverse Recovery Charge ( $I_S = -I_D [Cont.], di/dt = 100A/\mu s$ )	$T_J = 25^\circ C$		2.2	$\mu C$
		$T_J = 125^\circ C$		5.8	
$I_{RRM}$	Peak Recovery Current ( $I_S = -I_D [Cont.], di/dt = 100A/\mu s$ )	$T_J = 25^\circ C$		16	Amps
		$T_J = 125^\circ C$		26	

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	$I_{DS} = I_D [Cont.], V_{DS} = P_D / I_D [Cont.], t = 1\text{ Sec.}$	360			Watts
$I_{LM}$	Inductive Current Clamped	APT5020BNFR	112			Amps
		APT5022BNFR	108			

- ① Repetitive Rating: Pulse width limited by maximum junction temperature.
  - ②  $I_S \leq -I_D [Cont.], di/dt = 100A/\mu s, V_{DD} \leq V_{DSS}, T_J \leq 150^\circ C,$
  - ③ Starting  $T_J = 25^\circ C, L = 3.32mH, R_G = 25\Omega, \text{Peak } I_L = 28A$
  - ④ Pulse Test: Pulse width < 380  $\mu s$ , Duty Cycle < 2%
- APT Reserves the right to change, without notice, the specifications and information contained herein.

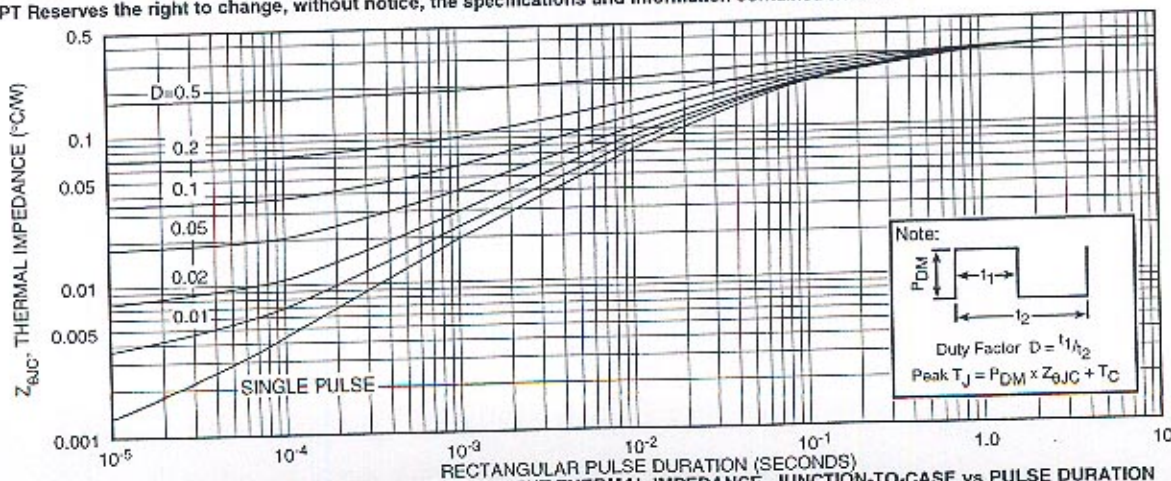
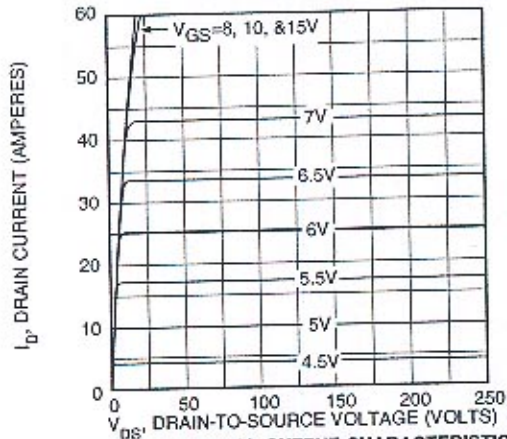


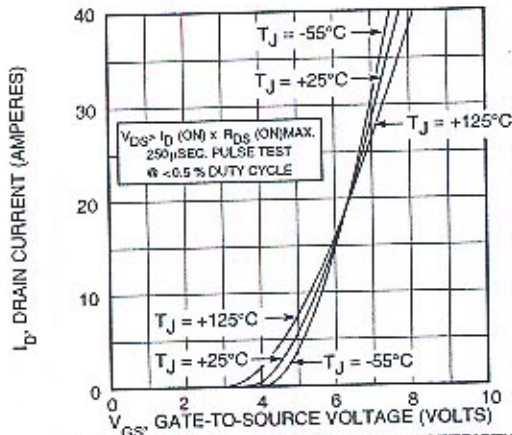
FIGURE 1, MAXIMUM EFFECTIVE TRANSIENT THERMAL IMPEDANCE, JUNCTION-TO-CASE vs PULSE DURATION



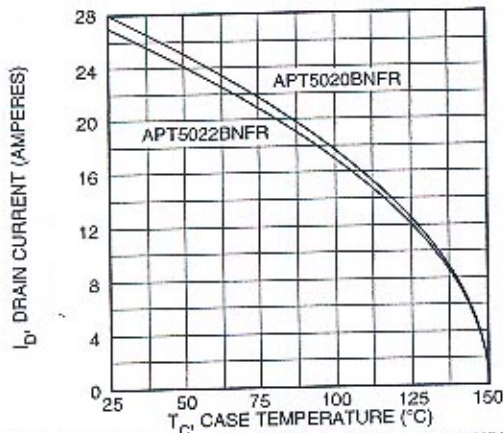
**APT5020/5022BNFR**



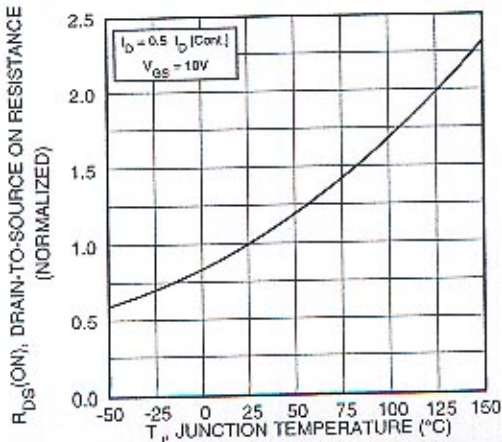
**FIGURE 2, TYPICAL OUTPUT CHARACTERISTICS**



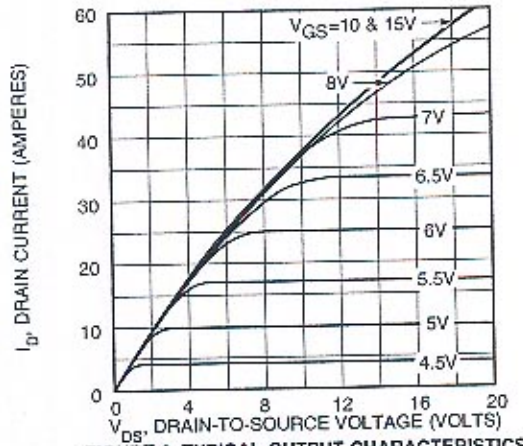
**FIGURE 4, TYPICAL TRANSFER CHARACTERISTICS**



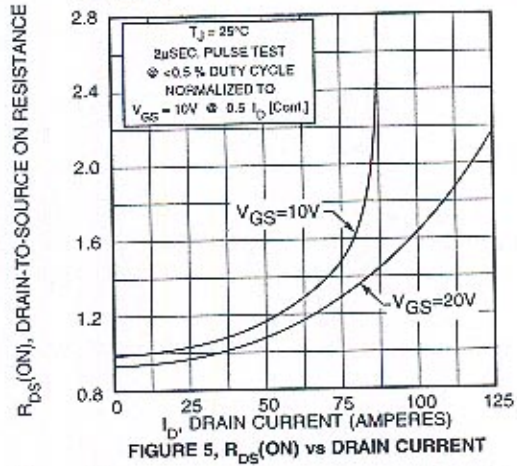
**FIGURE 6, MAXIMUM DRAIN CURRENT vs CASE TEMPERATURE**



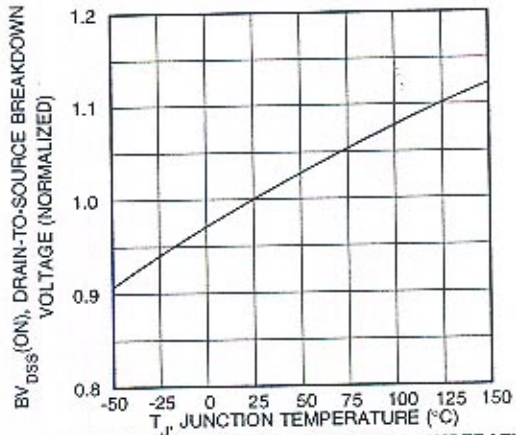
**FIGURE 8, ON-RESISTANCE vs. TEMPERATURE**



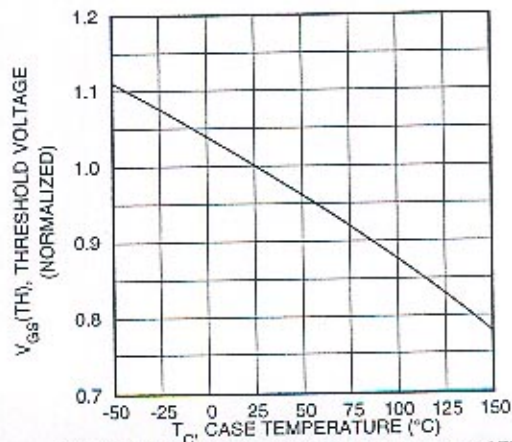
**FIGURE 3, TYPICAL OUTPUT CHARACTERISTICS**



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



**FIGURE 7, BREAKDOWN VOLTAGE vs TEMPERATURE**



**FIGURE 9, THRESHOLD VOLTAGE vs TEMPERATURE**

COPY

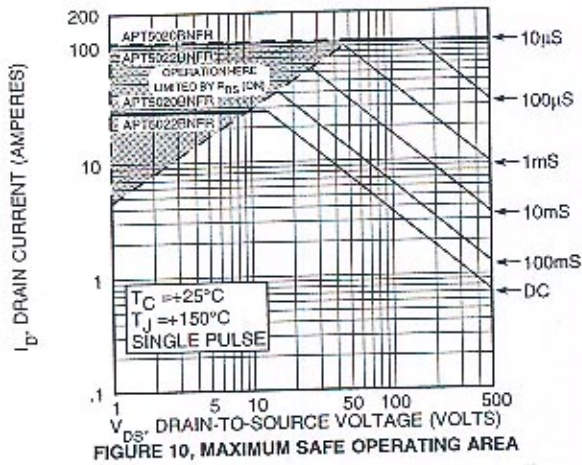


FIGURE 10, MAXIMUM SAFE OPERATING AREA

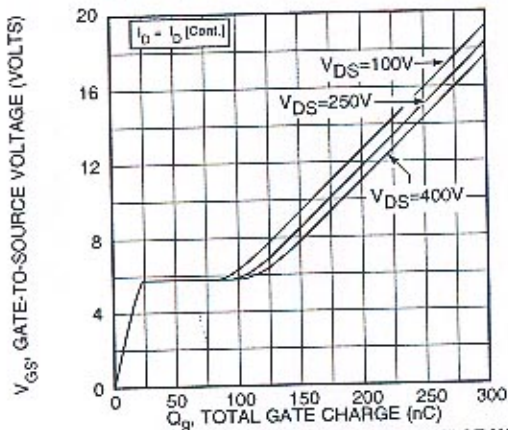


FIGURE 12, GATE CHARGES vs GATE-TO-SOURCE VOLTAGE

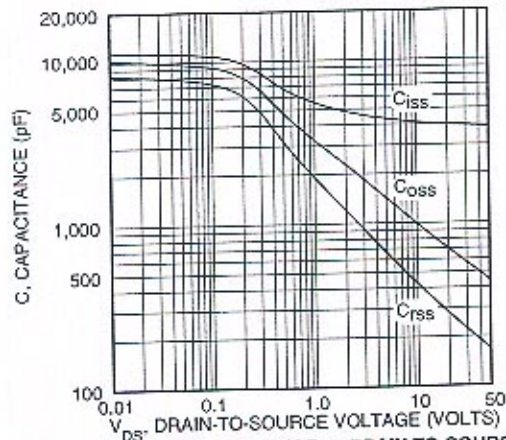


FIGURE 11, TYPICAL CAPACITANCE vs DRAIN-TO-SOURCE VOLTAGE

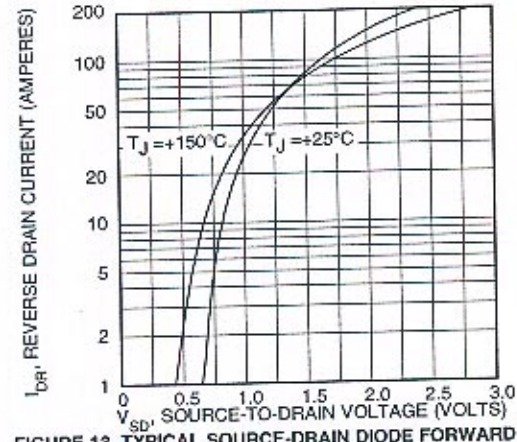
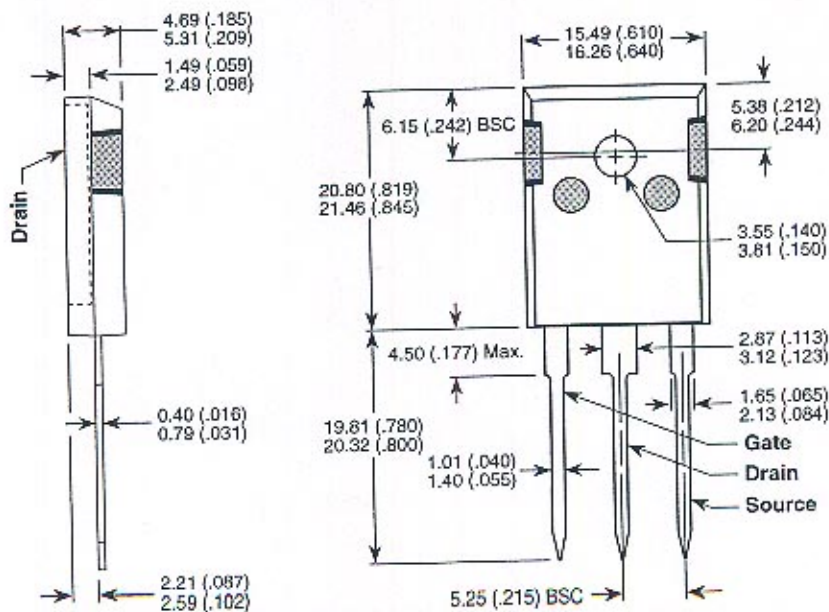


FIGURE 13, TYPICAL SOURCE-DRAIN DIODE FORWARD VOLTAGE

TO-247AD Package Outline



Dimensions in Millimeters and (Inches)

COPY