

APT5040BNF 500V 16A 0.40Ω
APT5050BNF 500V 14A 0.50Ω

POWER MOS IV®

FAST RECOVERY MOSFET FAMILY

N-CHANNEL ENHANCEMENT MODE HIGH VOLTAGE POWER FREDFETS

MAXIMUM RATINGS

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

Symbol	Parameter	APT 5040BNF	APT 5050BNF	UNIT
V _{DSS}	Drain-Source Voltage	500	500	Volts
I _D	Continuous Drain Current @ T _C = 25°C	16	14	Amps
I _{DM}	Pulsed Drain Current ①	64	56	
V _{GS}	Gate-Source Voltage	±30		Volts
P _D	Total Power Dissipation @ T _C = 25°C	240		Watts
	Linear Derating Factor	1.9		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		

STATIC ELECTRICAL CHARACTERISTICS

Symbol	Characteristic / Test Conditions / Part Number	MIN	TYP	MAX	UNIT
BV_{DSS}	Drain-Source Breakdown Voltage ($V_{GS} = 0V, I_D = 1.0\text{ mA}$)	APT5040BNF	500		Volts
		APT5050BNF	500		
$I_{D(ON)}$	On State Drain Current ② ($V_{DS} > I_{D(ON)} \times R_{DS(ON)}$ Max, $V_{GS} = 10V$)	APT5040BNF	16		Amps
		APT5050BNF	14		
$R_{DS(ON)}$	Drain-Source On-State Resistance ② ($V_{GS} = 10V, 0.5 I_D$ [Cont.])	APT5040BNF		0.40	Ohms
		APT5050BNF		0.50	
I_{DSS}	Zero Gate Voltage Drain Current ($V_{DS} = V_{DSS}, V_{GS} = 0V$)			1	mA
	Zero Gate Voltage Drain Current ($V_{DS} = 0.8 V_{DSS}, V_{GS} = 0V, T_C = 125^\circ\text{C}$)			1	
I_{GSS}	Gate-Source Leakage Current ($V_{GS} = \pm 30V, V_{DS} = 0V$)			± 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			0.51	$^\circ\text{C/W}$
$R_{\theta JA}$	Junction to Ambient			40	

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

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DYNAMIC CHARACTERISTICS

APT5040/5050BNF

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
C_{iss}	Input Capacitance	$V_{GS} = 0V$ $V_{DS} = 25V$ $f = 1 \text{ MHz}$		1630	1900	pF
C_{oss}	Output Capacitance			360	485	
C_{rss}	Reverse Transfer Capacitance			135	200	
Q_g	Total Gate Charge ③	$V_{GS} = 10V$ $V_{DD} = 0.5 V_{DSS}$ $I_D = I_D [\text{Cont.}] @ 25^\circ\text{C}$		70	105	nC
Q_{gs}	Gate-Source Charge			10	15	
Q_{gd}	Gate-Drain ("Miller") Charge			34	51	
$t_d(\text{on})$	Turn-on Delay Time	$V_{GS} = 15V$ $V_{DD} = 0.5 V_{DSS}$ $I_D = I_D [\text{Cont.}] @ 25^\circ\text{C}$ $R_G = 1.8\Omega$		12	24	ns
t_r	Rise Time			25	50	
$t_d(\text{off})$	Turn-off Delay Time			50	75	
t_f	Fall Time			35	70	

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Symbol	Characteristic / Test Conditions	MIN	TYP	MAX	UNIT
I_S	Continuous Source Current (Body Diode)	APT5040BNF		16	Amps
		APT5050BNF		14	
I_{SM}	Pulsed Source Current ① (Body Diode)	APT5040BNF		64	
		APT5050BNF		56	
V_{SD}	Diode Forward Voltage ② ($V_{GS} = 0V$, $I_S = -I_D [\text{Cont.}]$)			1.3	Volts
dv/dt	Peak Diode Recovery dv/dt ④			5	V/ns
t_{rr}	Reverse Recovery Time ($I_S = -I_D [\text{Cont.}]$, $di/dt = 100A/\mu s$)	$T_j = 25^\circ\text{C}$	130	170	ns
		$T_j = 125^\circ\text{C}$	230	330	
Q_{rr}	Reverse Recovery Charge ($I_S = -I_D [\text{Cont.}]$, $di/dt = 100A/\mu s$)	$T_j = 25^\circ\text{C}$	0.55	1	μC
		$T_j = 125^\circ\text{C}$	1.8	3.0	
I_{RRM}	Peak Recovery Current ($I_S = -I_D [\text{Cont.}]$, $di/dt = 100A/\mu s$)	$T_j = 25^\circ\text{C}$	8.3	11	Amps
		$T_j = 125^\circ\text{C}$	15.4	19	

SAFE OPERATING AREA CHARACTERISTICS

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
SOA1	Safe Operating Area	$V_{DS} = 0.4 V_{DSS}$, $I_{DS} = P_D / 0.4 V_{DSS}$, $t = 1 \text{ Sec.}$	240			Watts
SOA2	Safe Operating Area	$I_{DS} = I_D [\text{Cont.}]$, $V_{DS} = P_D / I_D [\text{Cont.}]$, $t = 1 \text{ Sec.}$	240			
I_{LM}	Inductive Current Clamped	APT5040BNF	64			Amps
		APT5050BNF	56			

① Repetitive Rating: Pulse width limited by maximum junction temperature. See Transient Thermal Impedance Curve. (Fig. 1)

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

③ See MIL-STD-750 Method 3471

④ $I_S \leq -I_D [\text{Cont.}]$, $di/dt = 100A/\mu s$, $V_{DD} \leq V_{DSS}$, $T_j \leq 150^\circ\text{C}$, $R_G = 2.0\Omega$, $V_R = 200V$.

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

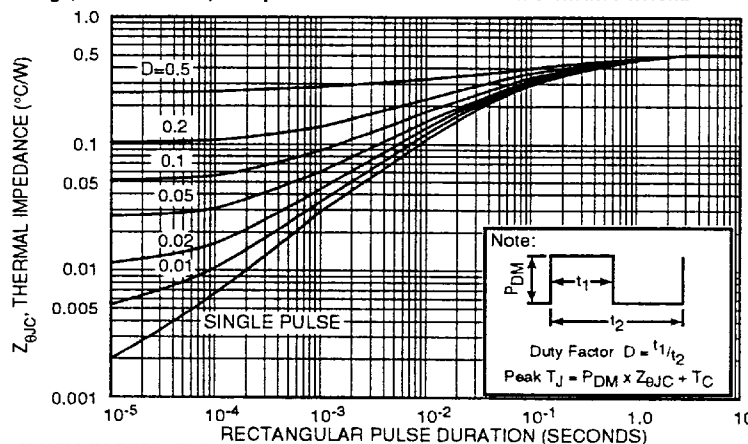


FIGURE 1, MAXIMUM EFFECTIVE TRANSIENT THERMAL IMPEDANCE, JUNCTION-TO-CASE vs PULSE DURATION

APT5040/5050BNF

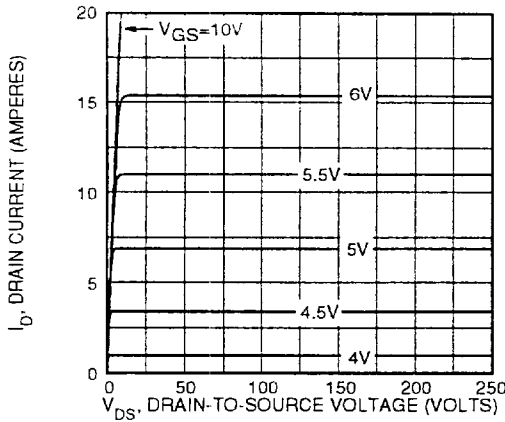


FIGURE 2, TYPICAL OUTPUT CHARACTERISTICS

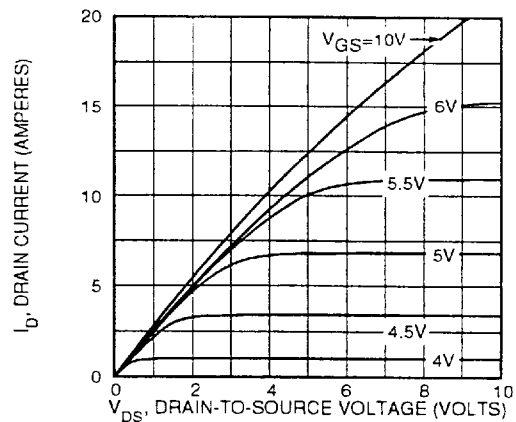


FIGURE 3, TYPICAL OUTPUT CHARACTERISTICS

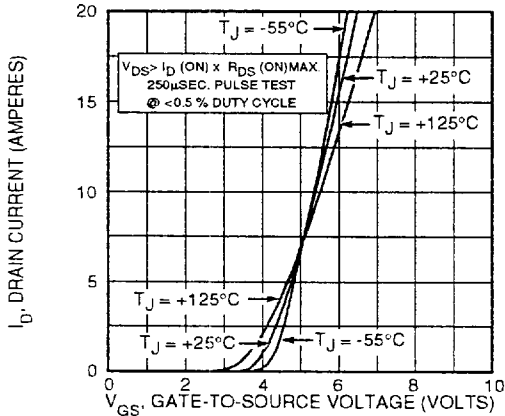


FIGURE 4, TYPICAL TRANSFER CHARACTERISTICS

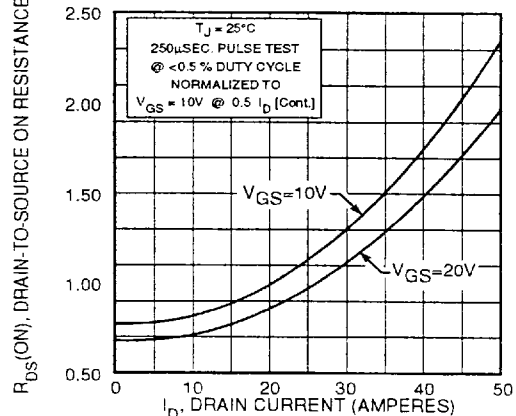


FIGURE 5, $R_{DS(ON)}$ vs DRAIN CURRENT

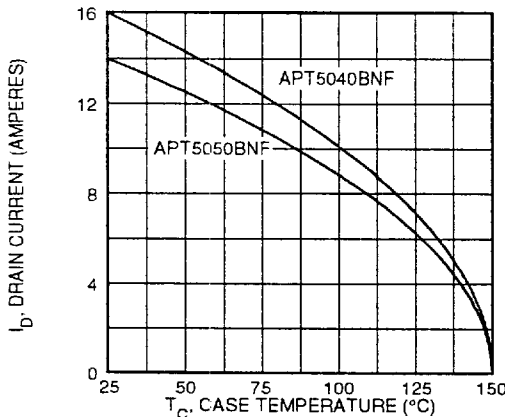


FIGURE 6, MAXIMUM DRAIN CURRENT vs CASE TEMPERATURE

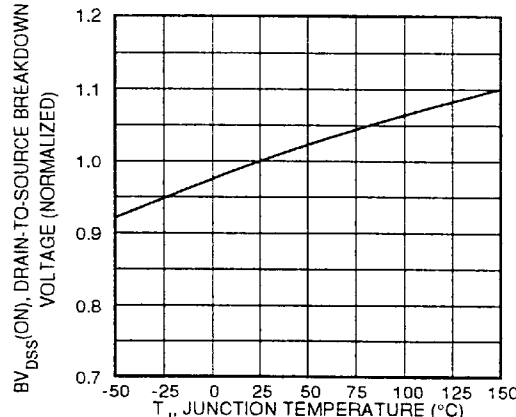


FIGURE 7, BREAKDOWN VOLTAGE vs TEMPERATURE

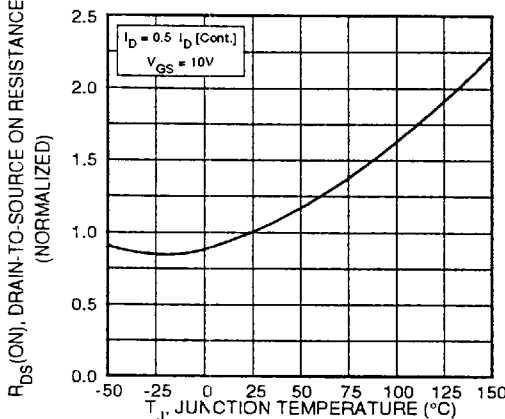


FIGURE 8, ON-RESISTANCE vs. TEMPERATURE

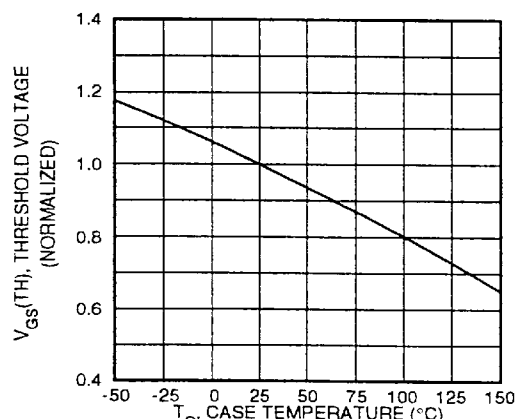


FIGURE 9, THRESHOLD VOLTAGE vs TEMPERATURE

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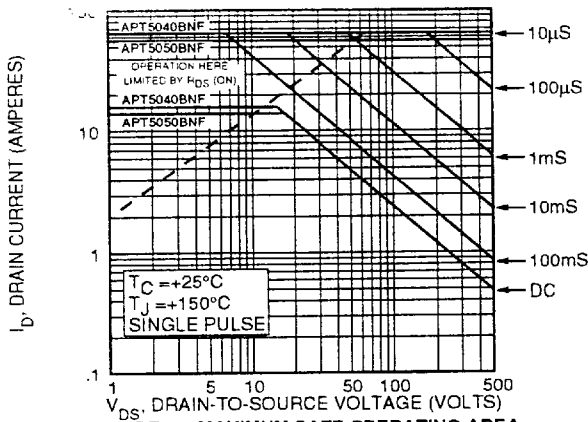


FIGURE 10, MAXIMUM SAFE OPERATING AREA

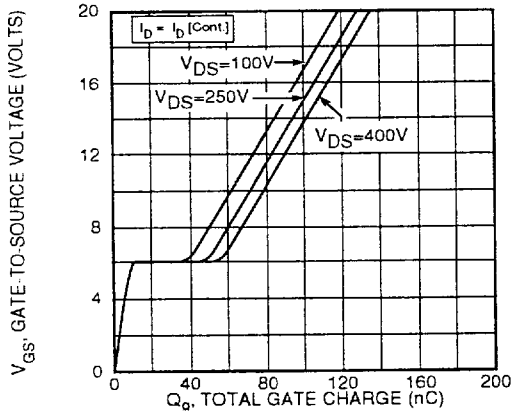


FIGURE 12, GATE CHARGES vs GATE-TO-SOURCE VOLTAGE

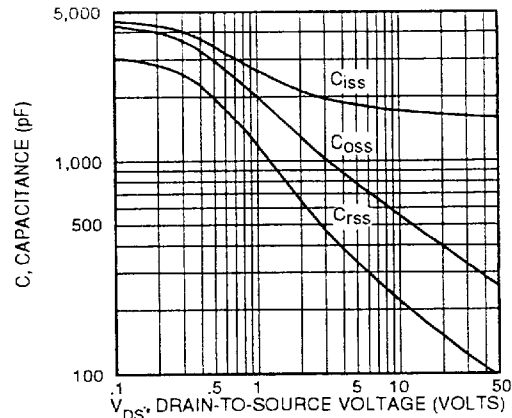


FIGURE 11, TYPICAL CAPACITANCE vs DRAIN-TO-SOURCE VOLTAGE

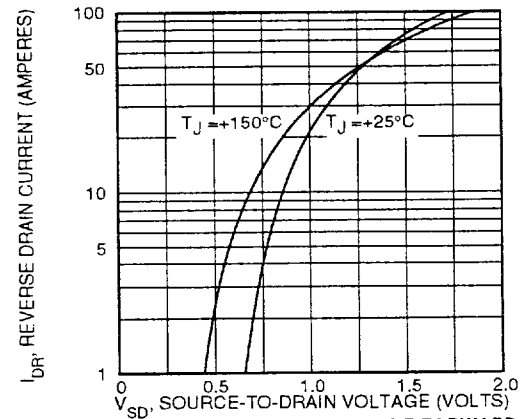
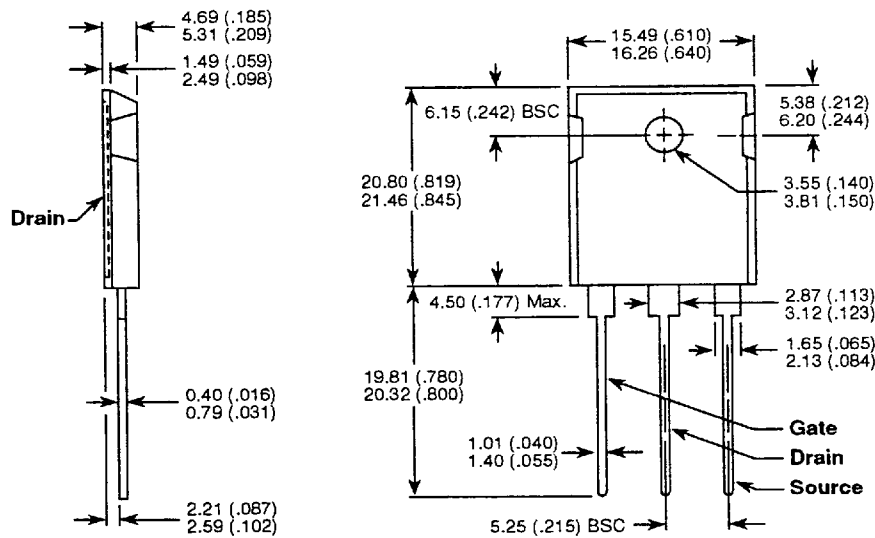


FIGURE 13, TYPICAL SOURCE-DRAIN DIODE FORWARD VOLTAGE

TO-247AD Package Outline



Dimensions in Millimeters and (Inches)