

**ADVANCED
POWER
TECHNOLOGY®**

APT5040BNFR 500V 16A 0.40Ω
APT5050BNFR 500V 14A 0.50Ω

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	APT5040BNFR	APT5050BNFR	UNIT
V _{DSS}	Drain-Source Voltage	500	500	Volts
I _D	Continuous Drain Current @ T _C = 25°C (See Fig. 6)	16	14	Amps
I _{DM}	Pulsed Drain Current ①	64	56	
V _{GS}	Gate-Source Voltage Continuous	±20		Volts
V _{GSM}	Gate-Source Voltage Transient	±30		
P _D	Total Power Dissipation @ T _C = 25°C	240		Watts
	Linear Derating Factor	1.9		
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)	16		Amps
E _{AR}	Repetitive Avalanche Energy	20		mJ
E _{AS}	Single Pulse Avalanche Energy ③	800		

STATIC ELECTRICAL CHARACTERISTICS

Symbol	Characteristic / Test Conditions / Part Number	MIN	TYP	MAX	UNIT
BV_{DSS}	Drain-Source Breakdown Voltage ($V_{GS} = 0V, I_D = 1.0mA$)	500			Volts
$I_{D(ON)}$	On State Drain Current ^④ ($V_{DS} > I_{D(ON)} \times R_{DS(ON)}$ Max, $V_{GS} = 10V$)	APT5040BNFR	16		Amps
		APT5050BNFR	14		
$R_{DS(ON)}$	Drain-Source On-State Resistance ^④ ($V_{GS} = 10V, 0.5 I_D$ [Cont.])	APT5040BNFR		0.40	Ohms
		APT5050BNFR		0.50	
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			0.51	$^\circ\text{C/W}$
$R_{\theta JA}$	Junction to Ambient			40	



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

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DYNAMIC CHARACTERISTICS

APT5040/5050BNFR

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
C_{iss}	Input Capacitance	$V_{GS} = 0V$ $V_{DS} = 25V$ $f = 1\text{ MHz}$		2230		pF
C_{oss}	Output Capacitance			315		
C_{rss}	Reverse Transfer Capacitance			120		
Q_g	Total Gate Charge	$V_{GS} = 10V$ $V_{DD} = 0.5 V_{DSS}$ $I_D = 0.5 I_D [\text{Cont.}] @ 25^\circ\text{C}$		87		nC
Q_{gs}	Gate-Source Charge			12		
Q_{gd}	Gate-Drain ("Miller") Charge			39		
$t_d(\text{on})$	Turn-on Delay Time	$V_{GS} = 15V$ $V_{DD} = 0.5 V_{DSS}$ $I_D = 0.5 I_D [\text{Cont.}] @ 25^\circ\text{C}$ $R_G = 1.8\Omega$		13		ns
t_r	Rise Time			21		
$t_d(\text{off})$	Turn-off Delay Time			71		
t_f	Fall Time			31		

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Symbol	Characteristic / Test Conditions / Part Number	MIN	TYP	MAX	UNIT
I_S	Continuous Source Current (Body Diode)	APT5040BNFR		16	Amps
		APT5050BNFR		14	
I_{SM}	Pulsed Source Current ^① (Body Diode)	APT5040BNFR		64	Amps
		APT5050BNFR		56	
V_{SD}	Diode Forward Voltage ^④ ($V_{GS} = 0V$, $I_S = -I_D [\text{Cont.}]$)			1.5	Volts
dv/dt	Peak Diode Recovery dv/dt ^②			5	V/ns
t_{rr}	Reverse Recovery Time ($I_S = -I_D [\text{Cont.}]$, $di/dt = 100A/\mu s$)	$T_J = 25^\circ\text{C}$	130		ns
		$T_J = 125^\circ\text{C}$	230		
Q_{rr}	Reverse Recovery Charge ($I_S = -I_D [\text{Cont.}]$, $di/dt = 100A/\mu s$)	$T_J = 25^\circ\text{C}$	0.55		μC
		$T_J = 125^\circ\text{C}$	1.8		
I_{RRM}	Peak Recovery Current ($I_S = -I_D [\text{Cont.}]$, $di/dt = 100A/\mu s$)	$T_J = 25^\circ\text{C}$	8.3		Amps
		$T_J = 125^\circ\text{C}$	15.4		

SAFE OPERATING AREA CHARACTERISTICS

Symbol	Characteristic	Test Conditions / Part Number	MIN	TYP	MAX	UNIT
SOA1	Safe Operating Area	$V_{DS} = 0.4 V_{DSS}$, $I_{DS} = P_D / 0.4 V_{DSS}$, $t = 1\text{ Sec.}$	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	APT5040BNFR	64			Amps
		APT5050BNFR	56			

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

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

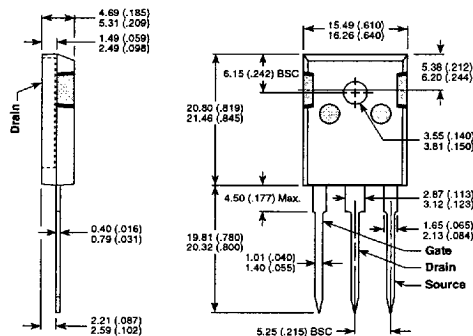
APT Reserves the right to change, without notice, the specifications and information contained herein.

$R_G = 1.8\Omega$, $V_R = 50V$.

③ Starting $T_J = 25^\circ\text{C}$, $L = 6.25\text{mH}$, $R_G = 25\Omega$, Peak $I_L = 16A$

④ Pulse Test: Pulse width $< 380\mu s$, Duty Cycle $< 2\%$

TO-247AD Package Outline



Dimensions in Millimeters and (Inches)

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