

**APT5040BN 500V 16.0A 0.40Ω**  
**APT4540BN 450V 16.0A 0.40Ω**  
**APT5050BN 500V 14.0A 0.50Ω**  
**APT4550BN 450V 14.0A 0.50Ω**

## POWER MOS IV®

### N-CHANNEL ENHANCEMENT MODE HIGH VOLTAGE POWER MOSFETS

#### MAXIMUM RATINGS

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

Symbol	Parameter	APT				UNIT
		4540BN	5040BN	4550BN	5050BN	
$V_{DSS}$	Drain-Source Voltage	450	500	450	500	Volts
$I_D$	Continuous Drain Current	16		14		Amps
$I_{DM}$	Pulsed Drain Current ①	64		56		Amps
$V_{GS}$	Gate-Source Voltage	±30				Volts
$P_D$	Total Power Dissipation @ $T_C = 25^\circ\text{C}$ , Derate Above $25^\circ\text{C}$	240				Watts
$T_J, T_{STG}$	Operating and Storage Junction Temperature Range	- 55 to 150				$^\circ\text{C}$

#### STATIC ELECTRICAL CHARACTERISTICS

Symbol	Characteristic / Test Conditions / Part Number	MIN	TYP	MAX	UNIT	
$BV_{DSS}$	Drain-Source Breakdown Voltage ( $V_{GS} = 0V, I_D = 250 \mu\text{A}$ )	APT5040BN / APT5050BN		500	Volts	
		APT4540BN / APT4550BN		450	Volts	
$I_{DSS}$	Zero Gate Voltage Drain Current ( $V_{DS} = V_{DSS}, V_{GS} = 0V$ ) ( $V_{DS} = 0.8 V_{DSS}, V_{GS} = 0V, T_C = 125^\circ\text{C}$ )			250	$\mu\text{A}$	
				1000		
$I_{GSS}$	Gate-Source Leakage Current ( $V_{GS} = \pm 30V, V_{DS} = 0V$ )			±100	nA	
$I_D(\text{ON})$	On State Drain Current ② ( $V_{DS} > I_D(\text{ON}) \times R_{DS}(\text{ON}) \text{ Max}, V_{GS} = 10V$ )	APT5040BN / APT4540BN		16	Amps	
		APT5050BN / APT4550BN		14	Amps	
$V_{GS}(\text{TH})$	Gate Threshold Voltage ( $V_{DS} = V_{GS}, I_D = 1\text{mA}$ )	2		4	Volts	
$R_{DS}(\text{ON})$	Static Drain-Source On-State Resistance ② ( $V_{GS} = 10V, I_D = 0.5 I_D(\text{Cont.})$ )	APT5040BN / APT4540BN			0.40	Ohms
		APT5050BN / APT4550BN			0.50	Ohms

#### 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	$^\circ\text{C/W}$
$T_L$	Max. Lead Temp. for Soldering Conditions: 0.063" from Case for 10 Sec.			300	$^\circ\text{C}$

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

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DYNAMIC CHARACTERISTICS

APT5040/4540/5050/4550BN

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
$C_{iss}$	Input Capacitance	$V_{GS} = 0V$ $V_{DS} = 25V$ $f = 1\text{ MHz}$		1430	1800	pF
$C_{oss}$	Output Capacitance			330	465	pF
$C_{rss}$	Reverse Transfer Capacitance			130	200	pF
$Q_g$	Total Gate Charge <sup>③</sup>	$V_{GS} = 10V, I_D = I_D[\text{Cont.}]$ $V_{DD} = 0.5 V_{DSS}$		64	105	nC
$Q_{gs}$	Gate-Source Charge			8.7	12	nC
$Q_{gd}$	Gate-Drain ("Miller") Charge			34	51	nC
$t_d(\text{on})$	Turn-on Delay Time	$V_{DD} = 0.5 V_{DSS}$ $I_D = I_D[\text{Cont.}], V_{GS} = 15V$ $R_G = 1.8\Omega$		12	24	ns
$t_r$	Rise Time			21	42	ns
$t_d(\text{off})$	Turn-off Delay Time			51	77	ns
$t_f$	Fall Time			27	54	ns

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Symbol	Characteristic / Test Conditions / Part Number	MIN	TYP	MAX	UNIT
$I_S$	Continuous Source Current (Body Diode)	APT5040BN / APT4540BN		16	Amps
		APT5050BN / APT4550BN		14	Amps
$I_{SM}$	Pulsed Source Current <sup>①</sup> (Body Diode)	APT5040BN / APT4540BN		64	Amps
		APT5050BN / APT4550BN		56	Amps
$V_{SD}$	Diode Forward Voltage <sup>②</sup> ( $V_{GS} = 0V, I_S = -I_D[\text{Cont.}]$ )			1.3	Volts
$t_{rr}$	Reverse Recovery Time ( $I_S = -I_D[\text{Cont.}], di_s/dt = 100A/\mu s$ )	148	296	592	ns
$Q_{rr}$	Reverse Recovery Charge	2.2	4.4	8.8	$\mu C$

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			Watts
$I_{LM}$	Inductive Current Clamped	APT5040BN / APT4540BN		64		Amps
		APT5050BN / APT4550BN		56		Amps

- ① Repetitive Rating: Pulse width limited by maximum junction temperature. See Transient Thermal Impedance Curve. (Fig.1)
- ② Pulse Test: Pulse width < 380  $\mu s$ , Duty Cycle < 2%
- ③ See MIL-STD-750 Method 3471

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

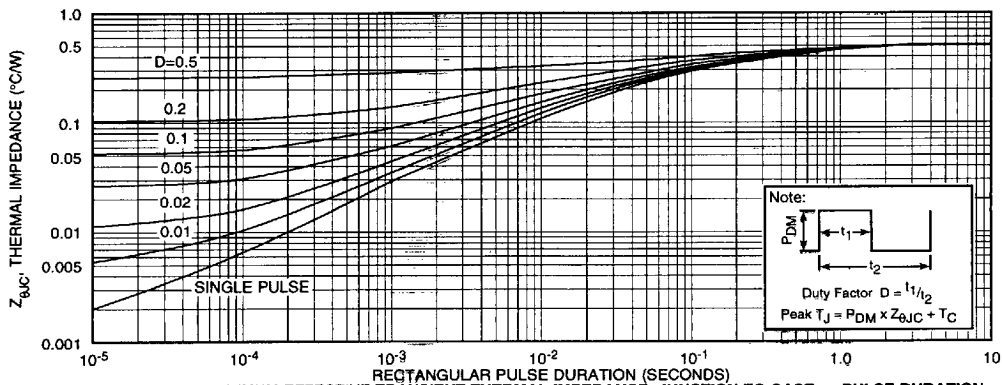
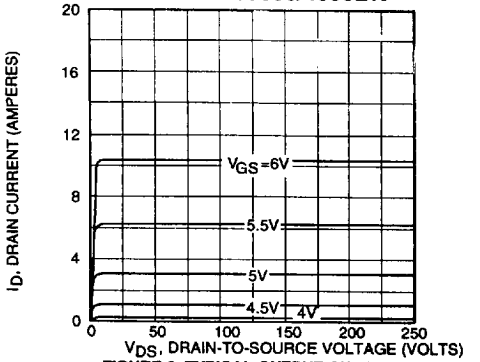


FIGURE 1, MAXIMUM EFFECTIVE TRANSIENT THERMAL IMPEDANCE, JUNCTION-TO-CASE vs PULSE DURATION  
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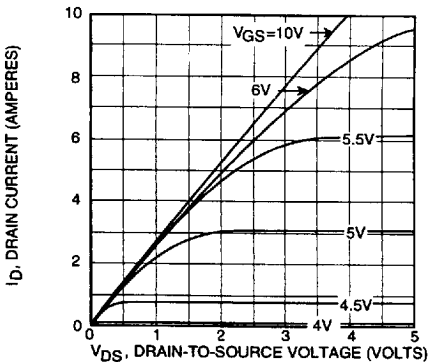
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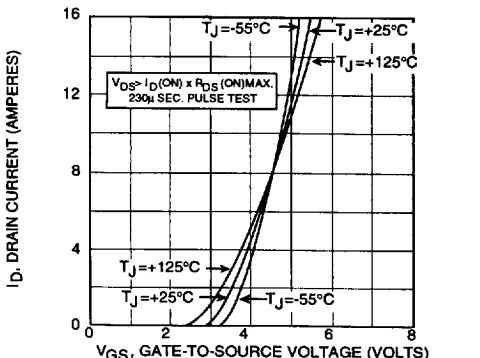
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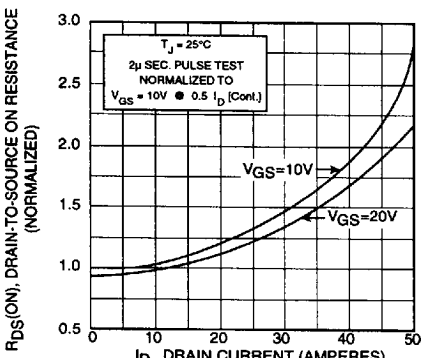
**FIGURE 2, TYPICAL OUTPUT CHARACTERISTICS**



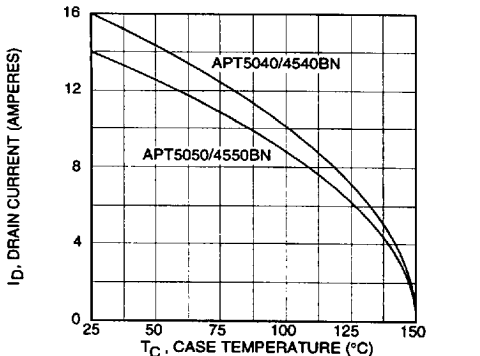
**FIGURE 3, TYPICAL OUTPUT CHARACTERISTICS**



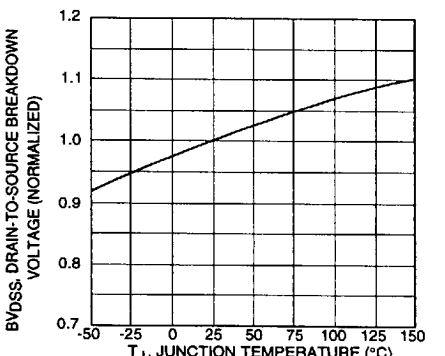
**FIGURE 4, TYPICAL TRANSFER CHARACTERISTICS**



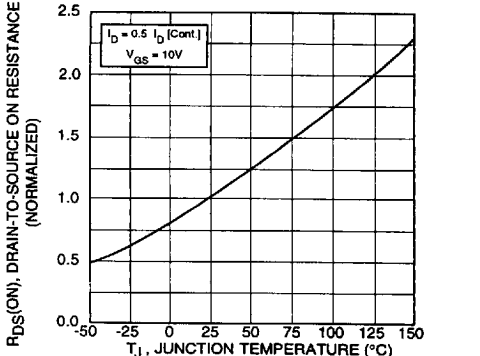
**FIGURE 5, RDS(ON) vs DRAIN CURRENT**



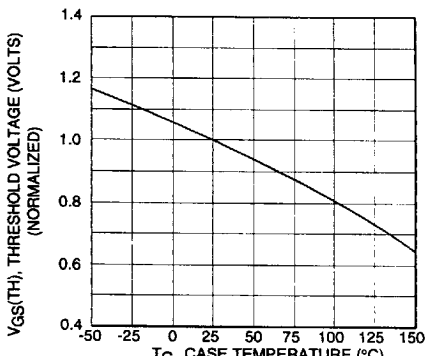
**FIGURE 6, MAXIMUM DRAIN CURRENT vs CASE TEMPERATURE**



**FIGURE 7, BREAKDOWN VOLTAGE vs TEMPERATURE**



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



**FIGURE 9, THRESHOLD VOLTAGE vs TEMPERATURE**

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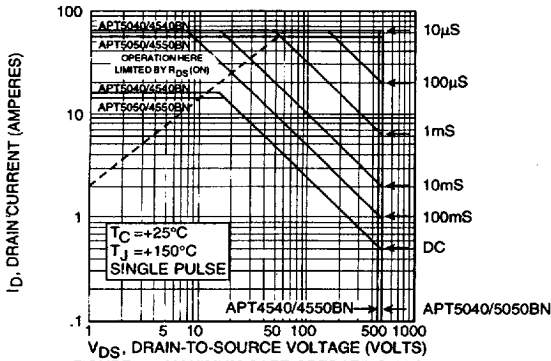


FIGURE 10, MAXIMUM SAFE OPERATING AREA

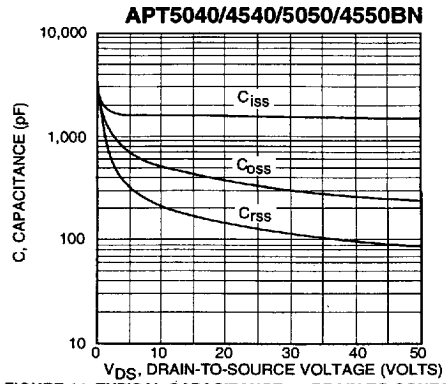


FIGURE 11, TYPICAL CAPACITANCE vs DRAIN-TO-SOURCE VOLTAGE

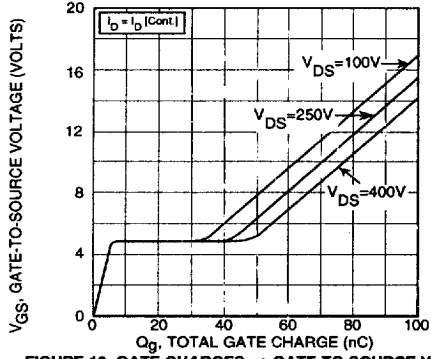


FIGURE 12, GATE CHARGES vs GATE-TO-SOURCE VOLTAGE

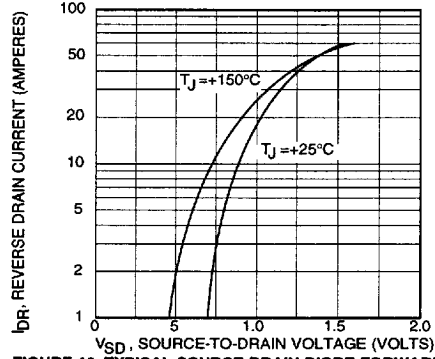
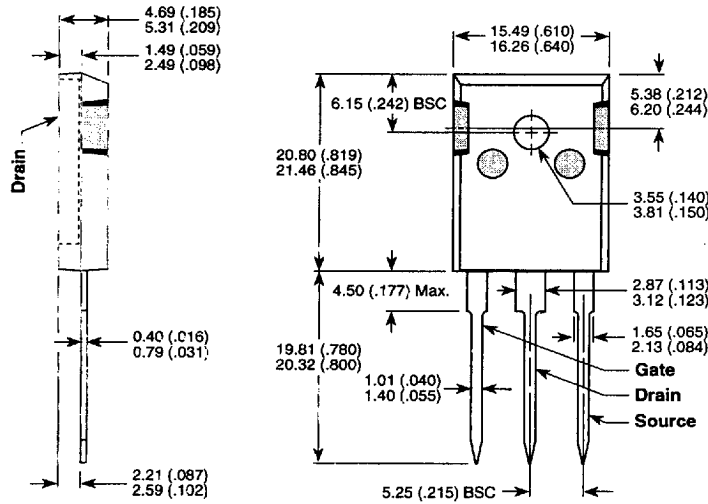


FIGURE 13, TYPICAL SOURCE-DRAIN DIODE FORWARD VOLTAGE

TO-247AD Package Outline



Dimensions in Millimeters and (Inches)  
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