

**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 <sup>①</sup>	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 <sup>②</sup> ( $V_{DS} > I_D(\text{ON}) \times R_{DS(\text{ON})} \text{ Max}, V_{GS} = 10V$ )	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 <sup>②</sup> ( $V_{GS} = 10V, I_D = 0.5 I_D(\text{Cont.})$ )	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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050-5003 Rev.B

**DYNAMIC CHARACTERISTICS**

**APT5040/4540/5050/4550BN**

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> = 0V V <sub>DS</sub> = 25V f = 1 MHz		1430	1800	pF
C <sub>oss</sub>	Output Capacitance			330	465	pF
C <sub>rss</sub>	Reverse Transfer Capacitance			130	200	pF
Q <sub>g</sub>	Total Gate Charge <sup>③</sup>	V <sub>GS</sub> = 10V, I <sub>D</sub> = I <sub>D</sub> [Cont.] V <sub>DD</sub> = 0.5 V <sub>DSS</sub>		64	105	nC
Q <sub>gs</sub>	Gate-Source Charge			8.7	12	nC
Q <sub>gd</sub>	Gate-Drain ("Miller") Charge			34	51	nC
t <sub>d(on)</sub>	Turn-on Delay Time	V <sub>DD</sub> = 0.5 V <sub>DSS</sub> I <sub>D</sub> = I <sub>D</sub> [Cont.], V <sub>GS</sub> = 15V R <sub>G</sub> = 1.8Ω		12	24	ns
t <sub>r</sub>	Rise Time			21	42	ns
t <sub>d(off)</sub>	Turn-off Delay Time			51	77	ns
t <sub>f</sub>	Fall Time			27	54	ns

**SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS**

Symbol	Characteristic / Test Conditions / Part Number	MIN	TYP	MAX	UNIT
I <sub>S</sub>	Continuous Source Current (Body Diode)	APT5040BN / APT4540BN		16	Amps
		APT5050BN / APT4550BN		14	Amps
I <sub>SM</sub>	Pulsed Source Current <sup>①</sup> (Body Diode)	APT5040BN / APT4540BN		64	Amps
		APT5050BN / APT4550BN		56	Amps
V <sub>SD</sub>	Diode Forward Voltage <sup>②</sup> (V <sub>GS</sub> = 0V, I <sub>S</sub> = -I <sub>D</sub> [Cont.])			1.3	Volts
t <sub>rr</sub>	Reverse Recovery Time (I <sub>S</sub> = -I <sub>D</sub> [Cont.], di <sub>s</sub> /dt = 100A/μs)	148	296	592	ns
Q <sub>rr</sub>	Reverse Recovery Charge	2.2	4.4	8.8	μC

**SAFE OPERATING AREA CHARACTERISTICS**

Symbol	Characteristic	Test Conditions / Part Number	MIN	TYP	MAX	UNIT
SOA1	Safe Operating Area	V <sub>DS</sub> = 0.4 V <sub>DSS</sub> , I <sub>DS</sub> = P <sub>D</sub> / 0.4 V <sub>DSS</sub> , t = 1 Sec.	240			Watts
SOA2	Safe Operating Area	I <sub>DS</sub> = I <sub>D</sub> [Cont.], V <sub>DS</sub> = P <sub>D</sub> / I <sub>D</sub> [Cont.], t = 1 Sec.	240			Watts
I <sub>LM</sub>	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 μs, Duty Cycle < 2%
- ③ See MIL-STD-750 Method 3471

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

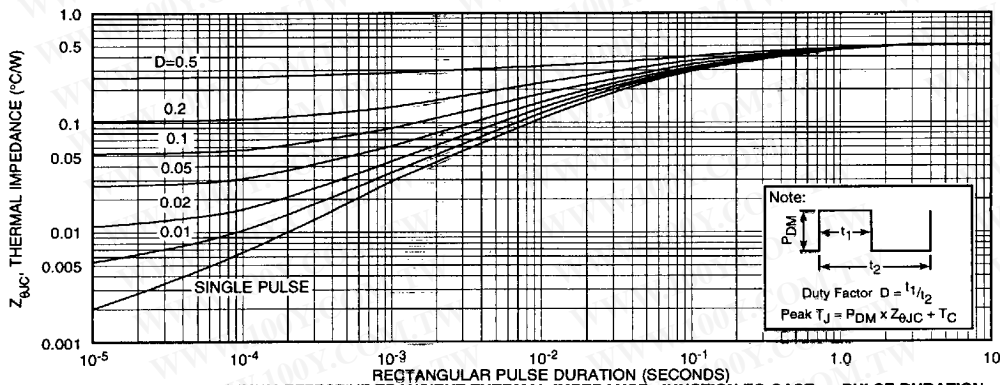
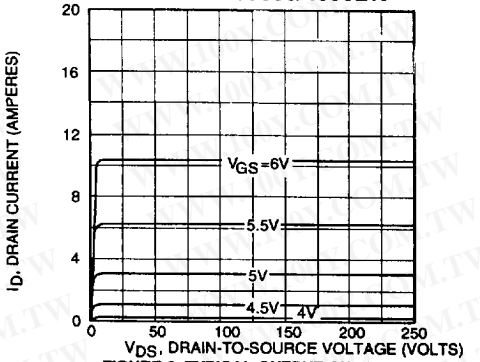


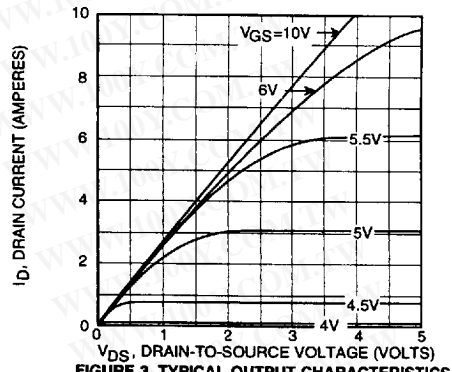
FIGURE 1, MAXIMUM EFFECTIVE TRANSIENT THERMAL IMPEDANCE, JUNCTION-TO-CASE vs PULSE DURATION  
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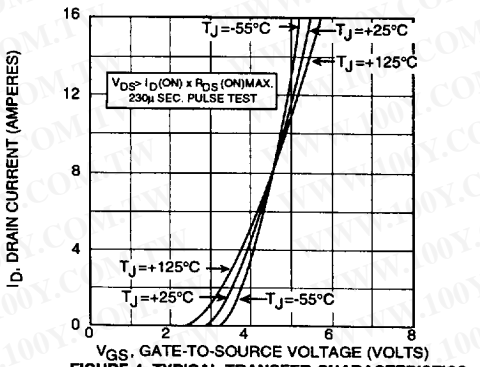
**APT5040/4540/5050/4550BN**



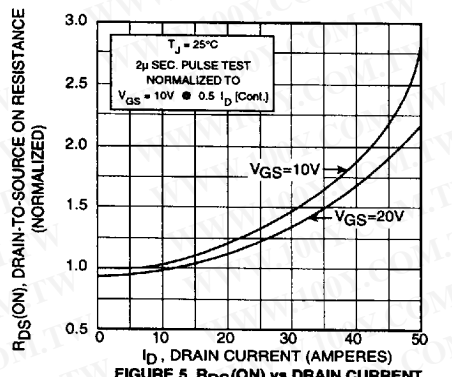
**FIGURE 2, TYPICAL OUTPUT CHARACTERISTICS**



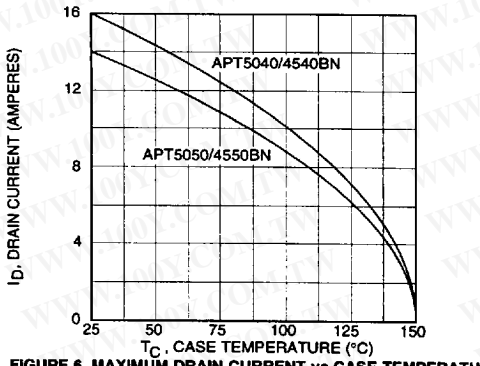
**FIGURE 3, TYPICAL OUTPUT CHARACTERISTICS**



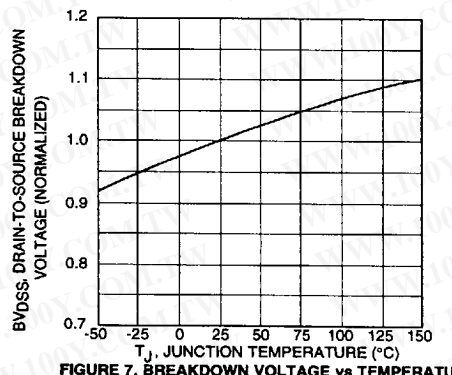
**FIGURE 4, TYPICAL TRANSFER CHARACTERISTICS**



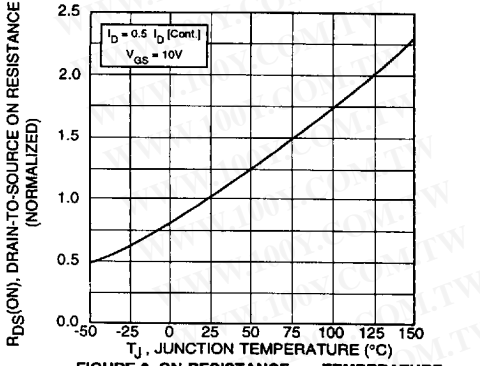
**FIGURE 5, RDS(ON) vs DRAIN CURRENT**



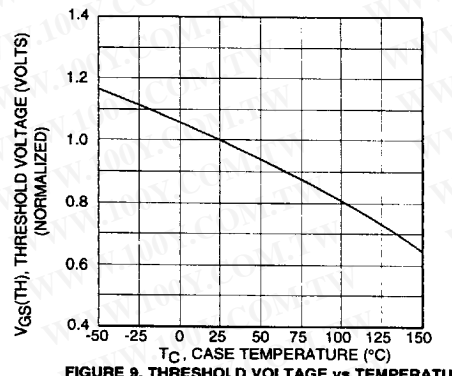
**FIGURE 6, MAXIMUM DRAIN CURRENT vs CASE TEMPERATURE**



**FIGURE 7, BREAKDOWN VOLTAGE vs TEMPERATURE**



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



**FIGURE 9, THRESHOLD VOLTAGE vs TEMPERATURE**

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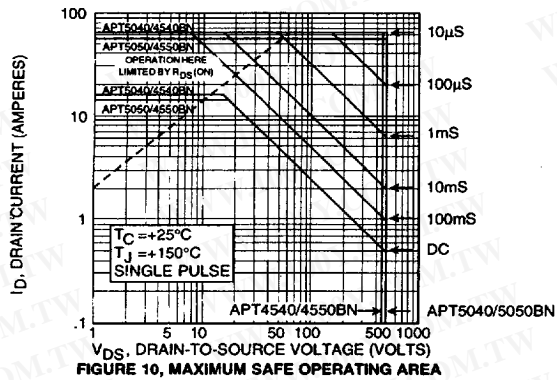


FIGURE 10, MAXIMUM SAFE OPERATING AREA

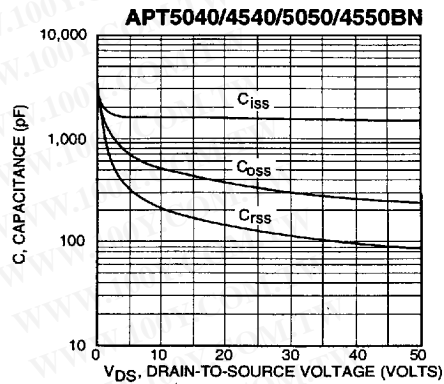


FIGURE 11, TYPICAL CAPACITANCE vs DRAIN-TO-SOURCE VOLTAGE

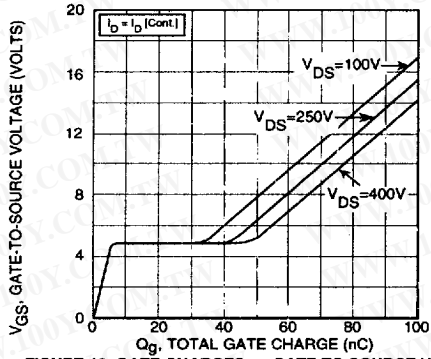


FIGURE 12, GATE CHARGES vs GATE-TO-SOURCE VOLTAGE

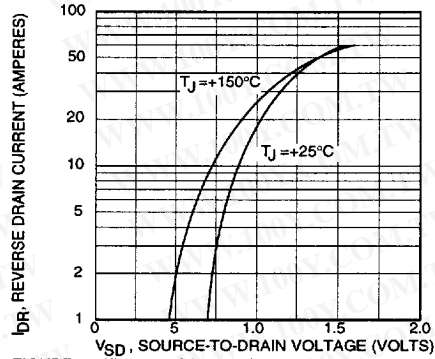
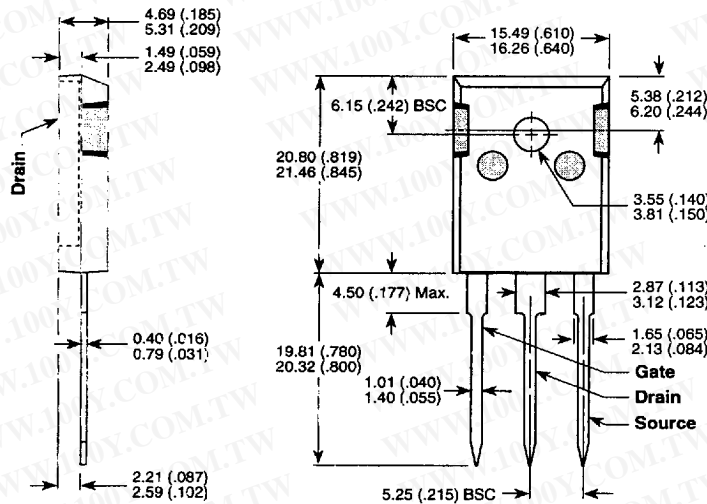


FIGURE 13, TYPICAL SOURCE-DRAIN DIODE FORWARD VOLTAGE

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TO-247AD Package Outline



Dimensions in Millimeters and (Inches)  
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