

APT6040HN	600V	16.5A	0.40Ω
APT5540HN	550V	16.5A	0.40Ω
APT6045HN	600V	15.5A	0.45Ω
APT5545HN	550V	15.5A	0.45Ω

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 5540HN	APT 6040HN	APT 5545HN	APT 6045HN	UNIT
V _{DSS}	Drain-Source Voltage	550	600	550	600	Volts
I _D	Continuous Drain Current @ T _C = 25°C	16.5		15.5		Amps
I _{DM}	Pulsed Drain Current ①	66		62		
V _{GS}	Gate-Source Voltage	±30				Volts
P _D	Total Power Dissipation @ T _C = 25°C	250				Watts
	Linear Derating Factor	2.0				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_{DS}	Drain-Source Breakdown Voltage ($V_{GS} = 0V, I_D = 250 \mu\text{A}$)	APT6040HN / APT6045HN	600		Volts
		APT5540HN / APT5545HN	550		
$I_{D(ON)}$	On State Drain Current ② ($V_{DS} > I_{D(ON)} \times R_{DS(ON)}$ Max, $V_{GS} = 10V$)	APT6040HN / APT5540HN	16.5		Amps
		APT6045HN / APT5545HN	15.5		
$R_{DS(ON)}$	Drain-Source On-State Resistance ② ($V_{GS} = 10V, 0.5 I_D$ [Cont.])	APT6040HN / APT5540HN		0.40	Ohms
		APT6045HN / APT5545HN		0.45	
I_{DSS}	Zero Gate Voltage Drain Current ($V_{DS} = V_{DSS}, V_{GS} = 0V$)			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 ($V_{GS} = \pm 30V, V_{DS} = 0V$)			± 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			0.50	$^\circ\text{C/W}$
$R_{\theta JA}$	Junction to Ambient			40	

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DYNAMIC CHARACTERISTICS

APT6040/5540/6045/5545HN

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
C_{DC}	Drain-to-Case Capacitance	$f = 1 \text{ MHz}$		24	36	pF
C_{iss}	Input Capacitance	$V_{GS} = 0V$ $V_{DS} = 25V$ $f = 1 \text{ MHz}$		2440	2950	
C_{oss}	Output Capacitance			405	565	
C_{rss}	Reverse Transfer Capacitance			140	210	
Q_g	Total Gate Charge ③	$V_{GS} = 10V$ $V_{DD} = 0.5 V_{DSS}$ $I_D = I_D [\text{Cont.}] @ 25^\circ\text{C}$		87	130	nC
Q_{gs}	Gate-Source Charge			11	16	
Q_{gd}	Gate-Drain ("Miller") Charge			46	69	
$t_{d(on)}$	Turn-on Delay Time	$V_{GS} = 15V$ $V_{DD} = 0.5 V_{DSS}$ $I_D = I_D [\text{Cont.}] @ 25^\circ\text{C}$ $R_G = 1.8\Omega$		14	28	ns
t_r	Rise Time			16	32	
$t_{d(off)}$	Turn-off Delay Time			60	90	
t_f	Fall Time			17	34	

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Symbol	Characteristic / Test Conditions	MIN	TYP	MAX	UNIT
I_S	Continuous Source Current (Body Diode)	APT6040HN / APT5540HN		16.5	Amps
		APT6045HN / APT5545HN		15.5	
I_{SM}	Pulsed Source Current ① (Body Diode)	APT6040HN / APT5540HN		66	
		APT6045HN / APT5545HN		62	
V_{SD}	Diode Forward Voltage ② ($V_{GS} = 0V$, $I_S = -I_D [\text{Cont.}]$)			1.3	Volts
t_{rr}	Reverse Recovery Time ($I_S = -I_D [\text{Cont.}]$, $di_S/dt = 100A/\mu s$)	152	334	668	ns
Q_{rr}	Reverse Recovery Charge ($I_S = -I_D [\text{Cont.}]$, $di_S/dt = 100A/\mu s$)	2.5	5	10	μC

SAFE OPERATING AREA CHARACTERISTICS

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
SOA1	Safe Operating Area	$V_{DS} = 0.4 V_{DSS}$, $I_{DS} = P_D / 0.4 V_{DSS}$, $t = 1 \text{ Sec.}$	250			Watts
SOA2	Safe Operating Area	$I_{DS} = I_D [\text{Cont.}]$, $V_{DS} = P_D / I_D [\text{Cont.}]$, $t = 1 \text{ Sec.}$	250			
I_{LM}	Inductive Current Clamped	APT6040HN / APT5540HN	66			Amps
		APT6045HN / APT5545HN	62			

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

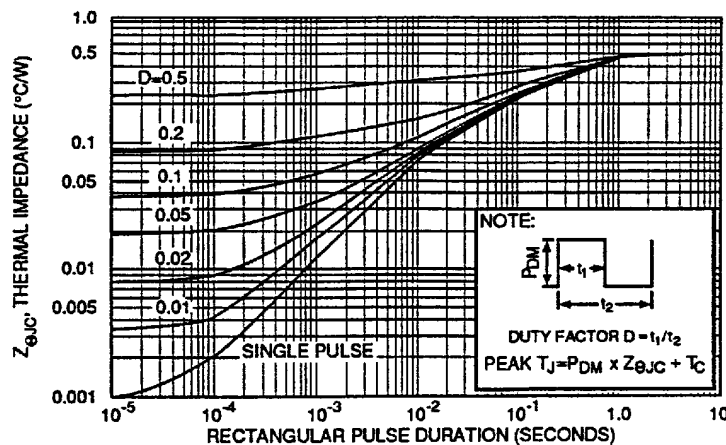


FIGURE 1, MAXIMUM EFFECTIVE TRANSIENT THERMAL IMPEDANCE, JUNCTION-TO-CASE vs PULSE DURATION

APT6040/5540/6045/5545HN

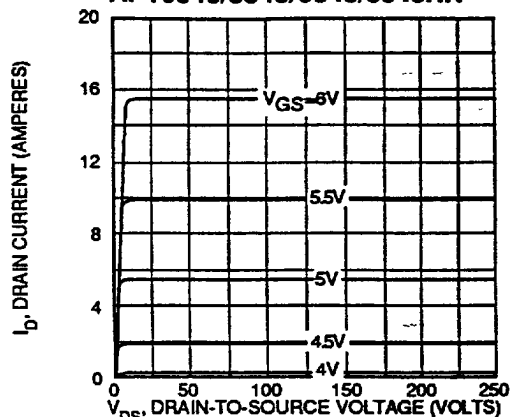


FIGURE 2, TYPICAL OUTPUT CHARACTERISTICS

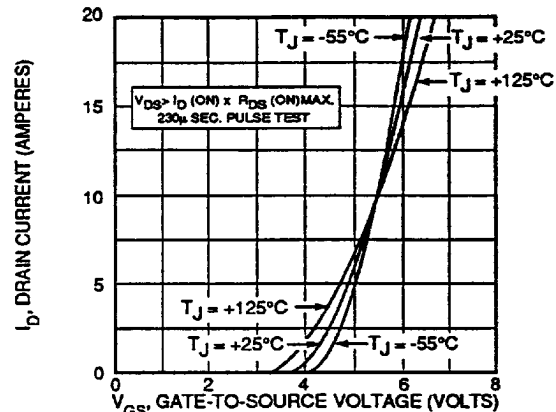


FIGURE 4, TYPICAL TRANSFER CHARACTERISTICS

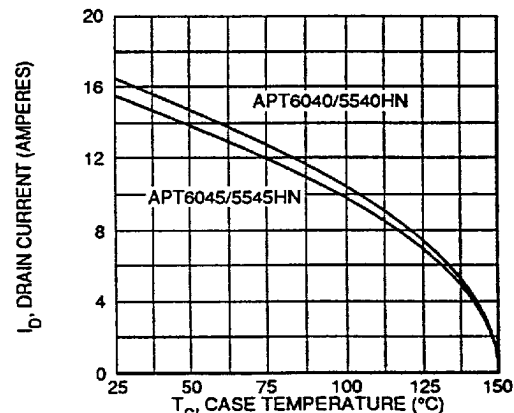


FIGURE 6, MAXIMUM DRAIN CURRENT vs CASE TEMPERATURE

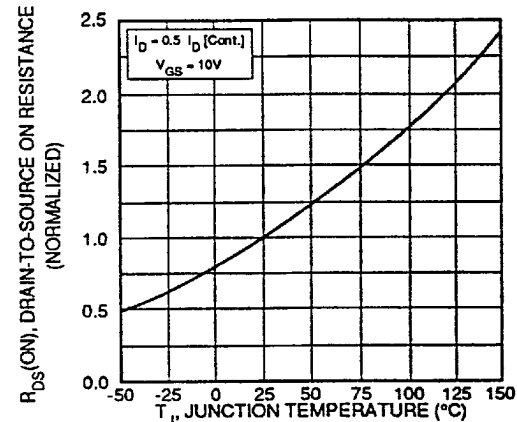


FIGURE 8, ON-RESISTANCE vs. TEMPERATURE

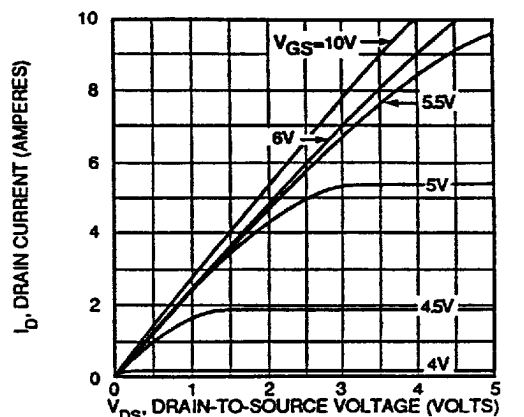


FIGURE 3, TYPICAL OUTPUT CHARACTERISTICS

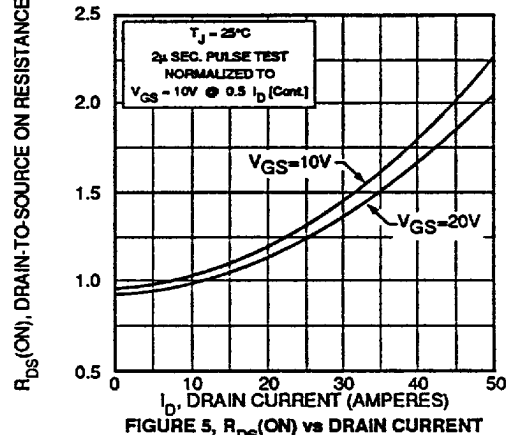


FIGURE 5, $R_{DS(ON)}$ vs DRAIN CURRENT

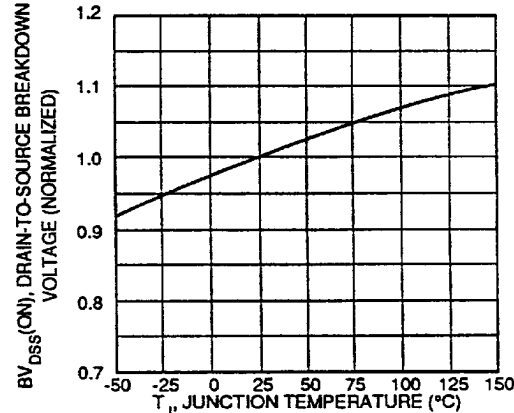


FIGURE 7, BREAKDOWN VOLTAGE vs TEMPERATURE

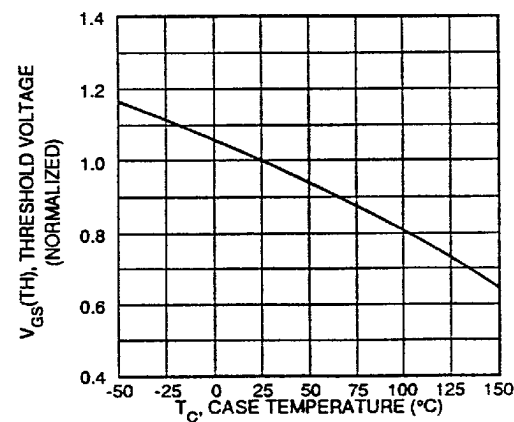


FIGURE 9, THRESHOLD VOLTAGE vs TEMPERATURE

APT6040/5540/6045/5545HN

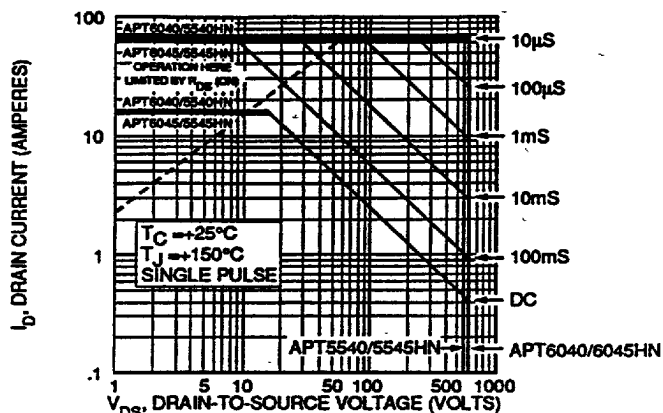


FIGURE 10, MAXIMUM SAFE OPERATING AREA

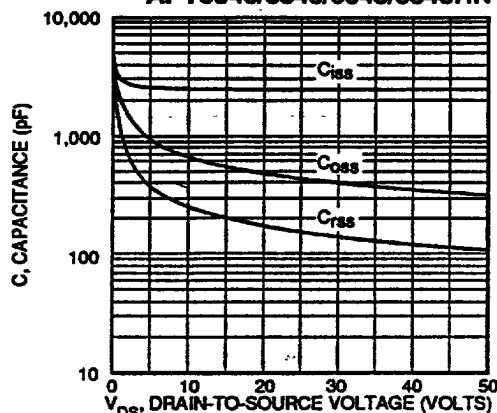


FIGURE 11, TYPICAL CAPACITANCE vs DRAIN-TO-SOURCE VOLTAGE

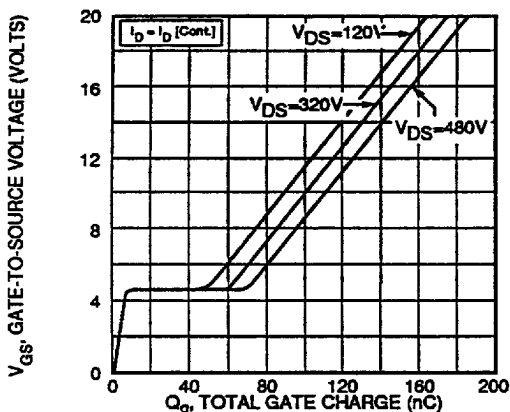


FIGURE 12, GATE CHARGES vs GATE-TO-SOURCE VOLTAGE

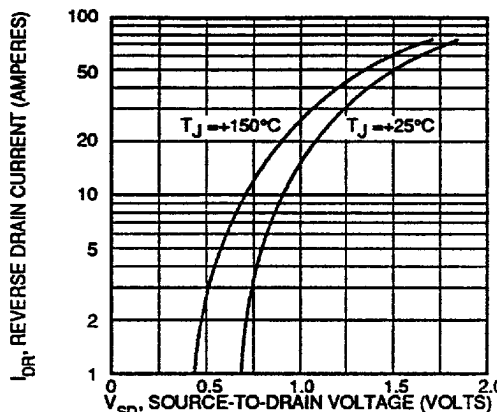
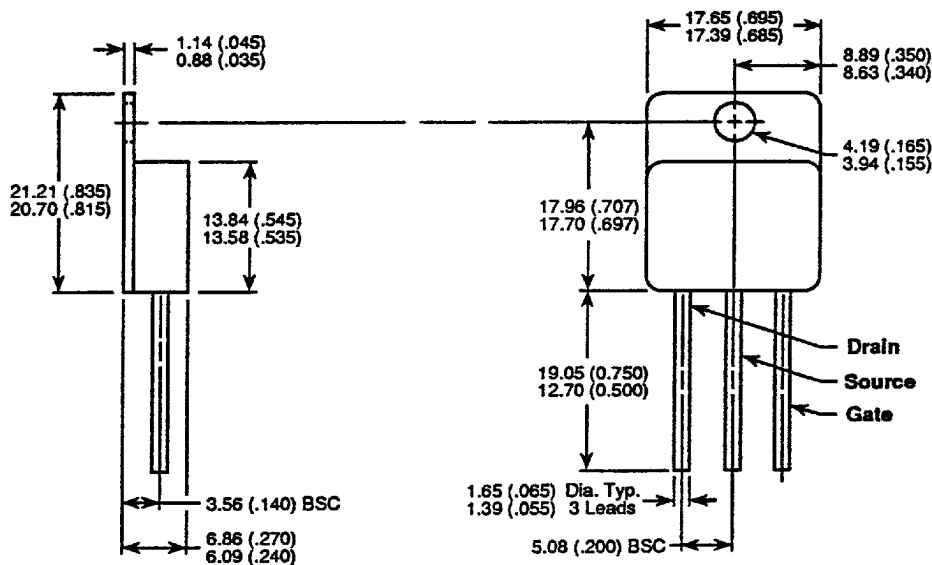


FIGURE 13, TYPICAL SOURCE-DRAIN DIODE FORWARD VOLTAGE

TO-258AA Package Outline



Dimensions in Millimeters and (Inches)