

APT5085GN	500V	7.0A	0.85Ω
APT4585GN	450V	7.0A	0.85Ω
APT501R1GN	500V	6.5A	1.10Ω
APT451R1GN	450V	6.5A	1.10Ω

# 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 4585GN	APT 5085GN	APT 451R1GN	APT 501R1GN	UNIT
$V_{DSS}$	Drain-Source Voltage	450	500	450	500	Volts
$I_D$	Continuous Drain Current @ $T_C = 25^\circ\text{C}$	7.0		6.5		Amps
$I_{DM}$	Pulsed Drain Current ①	28		26		
$V_{GS}$	Gate-Source Voltage	±30				Volts
$P_D$	Total Power Dissipation @ $T_C = 25^\circ\text{C}$	100				Watts
	Linear Derating Factor	0.8				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 ( $V_{GS} = 0V, I_D = 250 \mu\text{A}$ )	APT5085GN / APT501R1GN	500			Volts
		APT4585GN / APT451R1GN	450			
$I_{D(ON)}$	On State Drain Current ② ( $V_{DS} > I_{D(ON)} \times R_{DS(ON)}$ Max, $V_{GS} = 10V$ )	APT5085GN / APT4585GN	7.0			Amps
		APT501R1GN / APT451R1GN	6.5			
$R_{DS(ON)}$	Drain-Source On-State Resistance ② ( $V_{GS} = 10V, 0.5 I_{D(ON)}$ )	APT5085GN / APT4585GN			0.85	Ohms
		APT501R1GN / APT451R1GN			1.10	
$I_{DSS}$	Zero Gate Voltage Drain Current ( $V_{DS} = V_{DSS}, V_{GS} = 0V$ )			250	$\mu\text{A}$	
	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 ( $V_{DS} = V_{GS}, I_D = 1.0mA$ )	2		4	Volts	

### THERMAL CHARACTERISTICS

Symbol	Characteristic	MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Junction to Case			1.20	°C/W
$R_{\theta JA}$	Junction to Ambient			80	

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**DYNAMIC CHARACTERISTICS**

APT5085/4585/501R1/451R1GN

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
$C_{DC}$	Drain-to-Case Capacitance	$f = 1 \text{ MHz}$		8	12	pF
$C_{iss}$	Input Capacitance	$V_{GS} = 0V$		740	950	
$C_{oss}$	Output Capacitance	$V_{DS} = 25V$		167	234	
$C_{rss}$	Reverse Transfer Capacitance	$f = 1 \text{ MHz}$		63	94	
$Q_g$	Total Gate Charge ③	$V_{GS} = 10V$		33	55	nC
$Q_{gs}$	Gate-Source Charge	$V_{DD} = 0.5 V_{DSS}$		5.6	8	
$Q_{gd}$	Gate-Drain ("Miller") Charge	$I_D = I_D [\text{Cont.}] @ 25^\circ\text{C}$		16	24	
$t_{d(on)}$	Turn-on Delay Time	$V_{GS} = 15V$		9	18	ns
$t_r$	Rise Time	$V_{DD} = 0.5 V_{DSS}$		14	28	
$t_{d(off)}$	Turn-off Delay Time	$I_D = I_D [\text{Cont.}] @ 25^\circ\text{C}$		35	52	
$t_f$	Fall Time	$R_G = 1.8\Omega$		11	22	

**SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS**

Symbol	Characteristic / Test Conditions	MIN	TYP	MAX	UNIT
$I_S$	Continuous Source Current (Body Diode)	APT5085GN / APT4585GN		7.0	Amps
		APT501R1GN / APT451R1GN		6.5	
$I_{SM}$	Pulsed Source Current ① (Body Diode)	APT5085GN / APT4585GN		28	Amps
		APT501R1GN / APT451R1GN		26	
$V_{SD}$	Diode Forward Voltage ② ( $V_{GS} = 0V, I_S = -I_D [\text{Cont.}]$ )			1.3	Volts
$t_{rr}$	Reverse Recovery Time ( $I_S = -I_D [\text{Cont.}], di_S/dt = 100A/\mu s$ )	108	216	432	ns
$Q_{rr}$	Reverse Recovery Charge ( $I_S = -I_D [\text{Cont.}], di_S/dt = 100A/\mu s$ )	1.2	2.5	5.0	$\mu C$

**SAFE OPERATING AREA CHARACTERISTICS**

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
SOA1	Safe Operating Area	$V_{DS} = 0.4 V_{DSS}, I_{DS} = P_D / 0.4 V_{DSS}, t = 1 \text{ Sec.}$	100			Watts
SOA2	Safe Operating Area	$I_{DS} = I_D [\text{Cont.}], V_{DS} = P_D / I_D [\text{Cont.}], t = 1 \text{ Sec.}$	100			
$I_{LM}$	Inductive Current Clamped	APT5085GN / APT4585GN	28			Amps
		APT501R1GN / APT451R1GN	26			

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

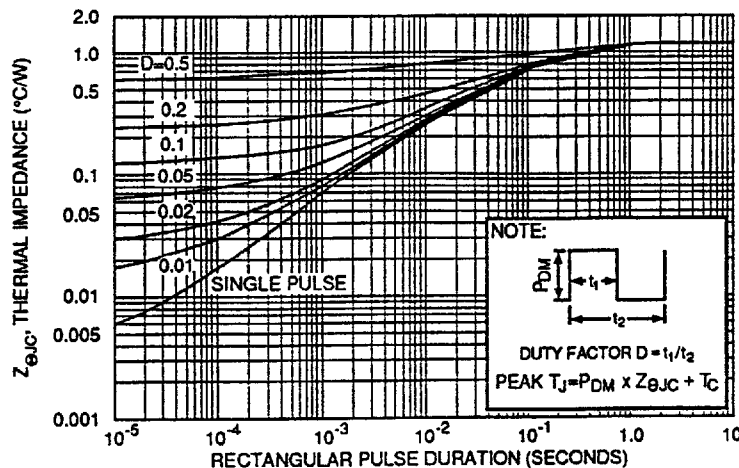


FIGURE 1, MAXIMUM EFFECTIVE TRANSIENT THERMAL IMPEDANCE, JUNCTION-TO-CASE vs PULSE DURATION

APT5085/4585/501R1/451R1GN

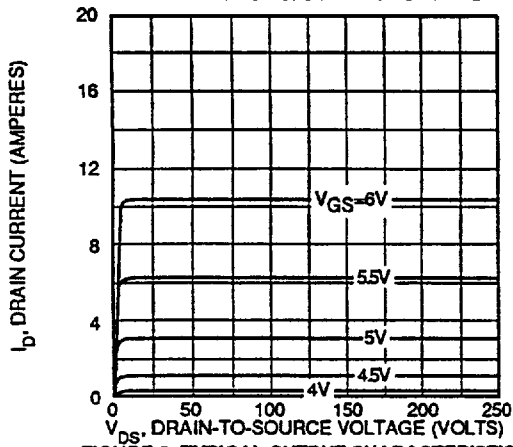


FIGURE 2, TYPICAL OUTPUT CHARACTERISTICS

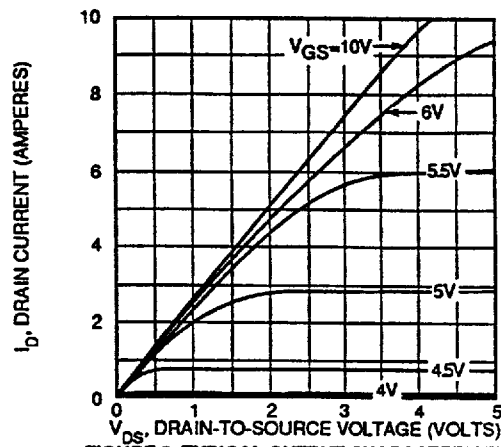


FIGURE 3, TYPICAL OUTPUT CHARACTERISTICS

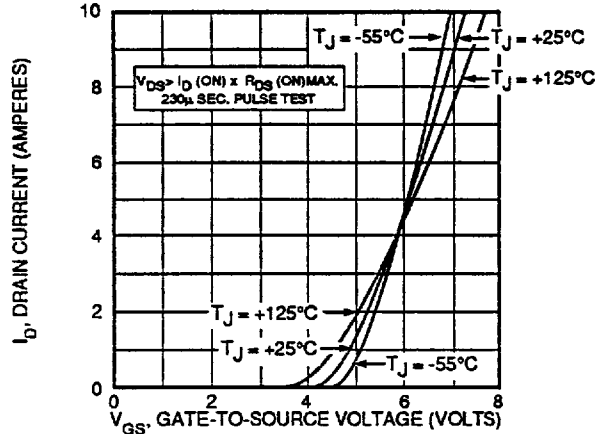


FIGURE 4, TYPICAL TRANSFER CHARACTERISTICS

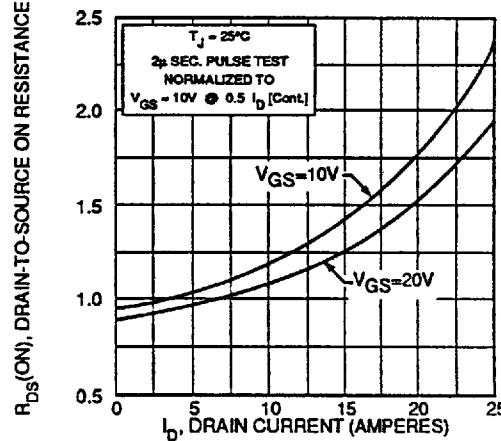


FIGURE 5,  $R_{DS}(ON)$  vs DRAIN CURRENT

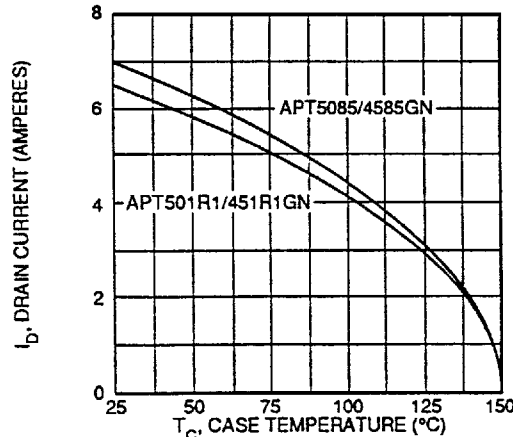


FIGURE 6, MAXIMUM DRAIN CURRENT vs CASE TEMPERATURE

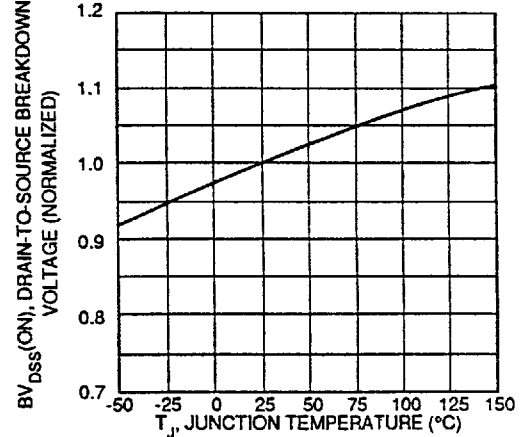


FIGURE 7, BREAKDOWN VOLTAGE vs TEMPERATURE

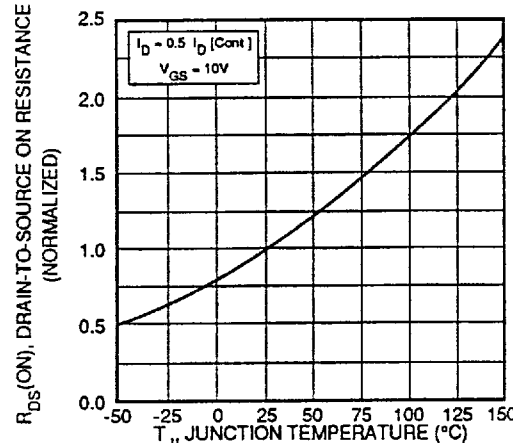


FIGURE 8, ON-RESISTANCE vs. TEMPERATURE

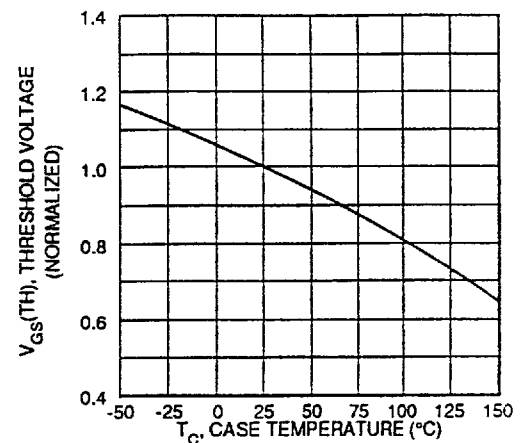


FIGURE 9, THRESHOLD VOLTAGE vs TEMPERATURE

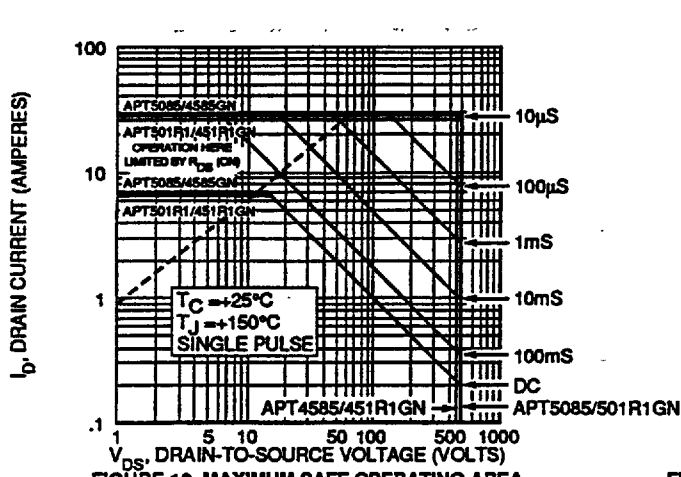


FIGURE 10, MAXIMUM SAFE OPERATING AREA

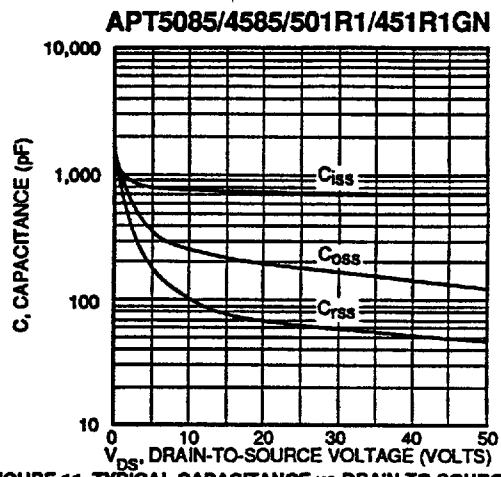


FIGURE 11, TYPICAL CAPACITANCE vs DRAIN-TO-SOURCE VOLTAGE

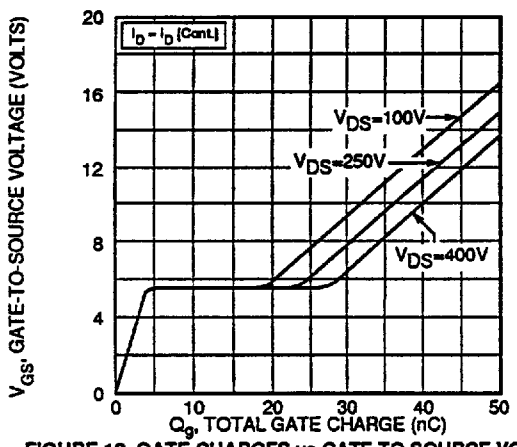


FIGURE 12, GATE CHARGES vs GATE-TO-SOURCE VOLTAGE

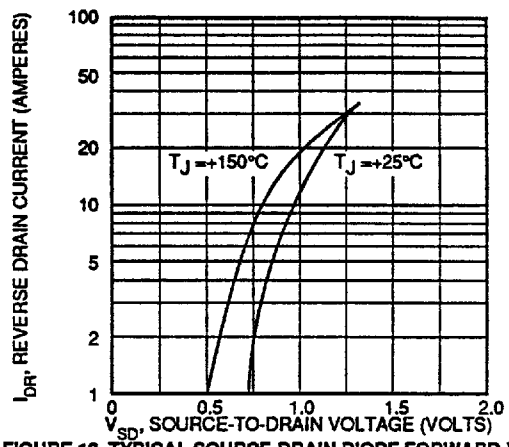
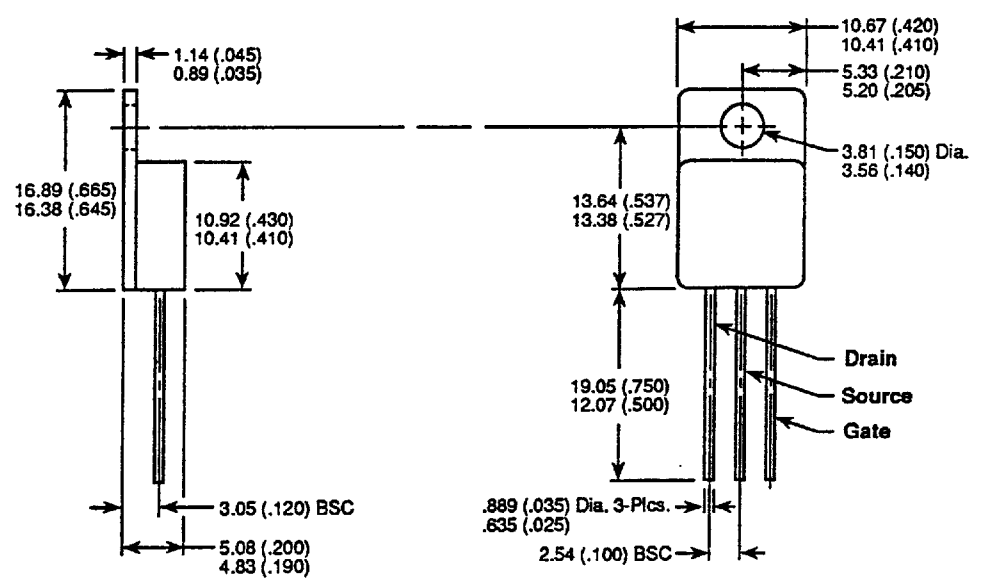


FIGURE 13, TYPICAL SOURCE-DRAIN DIODE FORWARD VOLTAGE

TO-257AA Package Outline



Dimensions in Millimeters and (Inches)