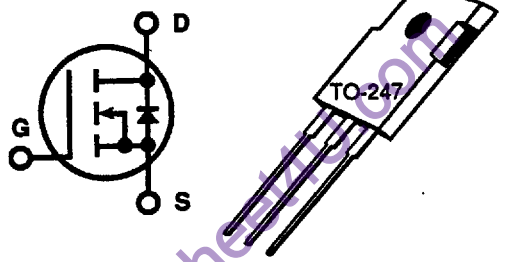


ADVANCED POWER TECHNOLOGY

T-39-15

APT5085BN	500V	9.5A	0.85 Ω
APT4585BN	450V	9.5A	0.85 Ω
APT501R1BN	500V	9.0A	1.10 Ω
APT451R1BN	450V	9.0A	1.10 Ω

POWER MOS IV™

N - CHANNEL ENHANCEMENT MODE HIGH VOLTAGE POWER MOSFETS

MAXIMUM RATINGS

All Ratings: T_C = 25°C unless otherwise specified.

Symbol	Parameter	APT 4585BN	APT 5085BN	APT 451R1BN	APT 501R1BN	UNIT
V_{DSS}	Drain-Source Voltage	450	500	450	500	Volts
I_D	Continuous Drain Current	9.5		9.0		Amps
I_{DM}	Pulsed Drain Current[1]	38		36		Amps
V_{GS}	Gate-Source Voltage	±30				Volts
P_D	Total Power Dissipation @ T_C = 25°C, Derate Above 25°C	180				Watts
T_J,T_{STG}	Operating and Storage Junction Temperature Range	- 55 to 150				°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 µA)	APT5085BN / APT501R1BN	500			Volts
		APT4585BN / APT451R1BN	450			Volts
I_{DSS}	Zero Gate Voltage Drain Current (V_{DS} = V_{DSS}, V_{GS} = 0V)				250	µA
	(V_{DS} = 0.8 V_{DSS}, V_{GS} = 0V, T_C = 125°C)				1000	
I_{GSS}	Gate-Source Leakage Current (V_{GS} = ±30V, V_{DS} = 0V)				±100	nA
$I_{D(ON)}$	On State Drain Current [2] (V_{DS} > $I_{D(ON)}$ x $R_{DS(ON)}$ Max, V_{GS} = 10V)	APT5085BN / APT4585BN	9.5			Amps
		APT501R1BN / APT451R1BN	9.0			Amps
$V_{GS(TH)}$	Gate Threshold Voltage (V_{DS} = V_{GS}, I_D = 1mA)		2		4	Volts
$R_{DS(ON)}$	Static Drain-Source On-State Resistance [2] (V_{GS} = 10V, I_D = 0.5 I_D [Cont.])	APT5085BN / APT4585BN			0.85	Ohms
		APT501R1BN / APT451R1BN			1.10	Ohms

THERMAL CHARACTERISTICS

Symbol	Characteristic	MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Junction to Case			0.68	°C/W
$R_{\theta JA}$	Junction to Ambient			40	°C/W
T_L	Max. Lead Temp. for Soldering Conditions: 0.063" from Case for 10 Sec.			300	°C

405 S.W. COLUMBIA STREET
BEND, OREGON 97702-1035
U.S.A.

PHONE . . . (503) 382-8028
FAX . . . . . (503) 388-0364

DYNAMIC CHARACTERISTICS

APT5085/4585/501R1/451R1BN

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
C_{iss}	Input Capacitance	V_{GS} = 0V V_{DS} = 25V f = 1 MHz		740	950	pF
C_{oss}	Output Capacitance			167	234	pF
C_{rss}	Reverse Transfer Capacitance			63	94	pF
Q_g	Total Gate Charge [3]	V_{GS} = 10V, I_D = I_D [Cont.] V_{DD} = 0.5 V_{DSS}		33	55	nC
Q_{gs}	Gate-Source Charge			5.6	8	nC
Q_{gd}	Gate-Drain ("Miller") Charge			16	24	nC
t_d(on)	Turn-on Delay Time	V_{DD} = 0.5 V_{DSS} I_D = I_D [Cont.], V_{GS} = 15V R_G = 1.8Ω		10	20	ns
t_r	Rise Time			14	28	ns
t_d(off)	Turn-off Delay Time			35	48	ns
t_f	Fall Time			11	22	ns

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Symbol	Characteristic / Test Conditions / Part Number		MIN	TYP	MAX	UNIT
I_S	Continuous Source Current (Body Diode)	APT5085BN / APT4585BN			9.5	Amps
		APT501R1BN / APT451R1BN			9.0	Amps
I_{SM}	Pulsed Source Current [1] (Body Diode)	APT5085BN / APT4585BN			38	Amps
		APT501R1BN / APT451R1BN			36	Amps
V_{SD}	Diode Forward Voltage [2] (V_{GS} = 0V, I_S = -I_D [Cont.])				1.3	Volts
t_{rr}	Reverse Recovery Time (I_S = -I_D [Cont.], dI_S/dt = 100A/µs)		108	216	432	ns
Q_{rr}	Reverse Recovery Charge		1.2	2.5	5.0	µC

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 Sec.	180			Watts
SOA2	Safe Operating Area	I_{DS} = I_D [Cont.], V_{DS} = P_D / I_D [Cont.], t = 1 Sec.	180			Watts
I_{LM}	Inductive Current Clamped	APT5085BN / APT4585BN	38			Amps
		APT501R1BN / APT451R1BN	36			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

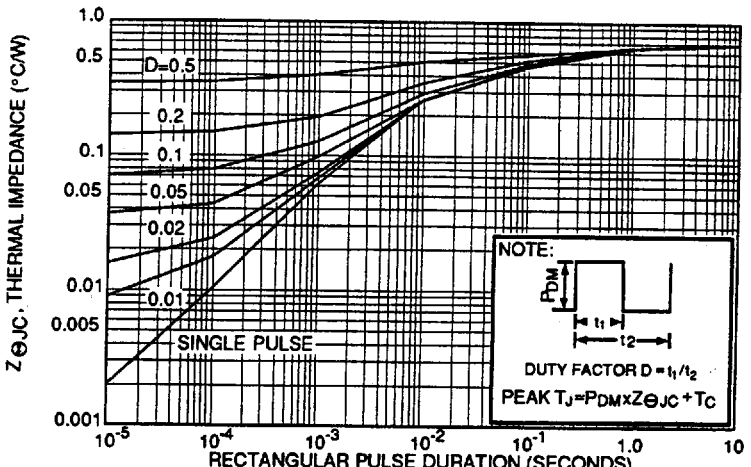


FIGURE 1, MAXIMUM EFFECTIVE TRANSIENT THERMAL IMPEDANCE, JUNCTION-TO-CASE vs PULSE DURATION

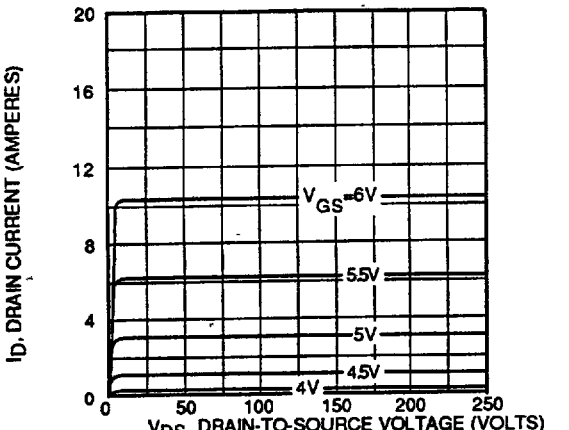


FIGURE 2, TYPICAL OUTPUT CHARACTERISTICS

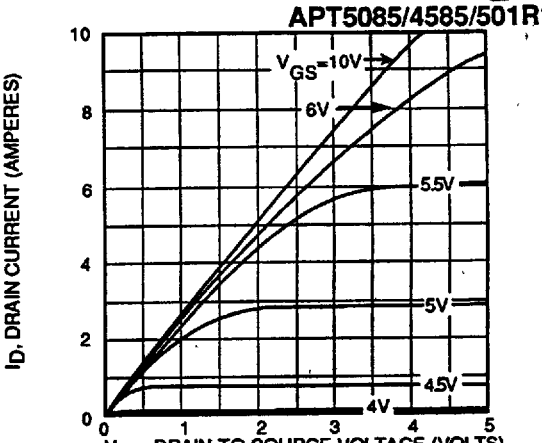


FIGURE 3, TYPICAL OUTPUT CHARACTERISTICS

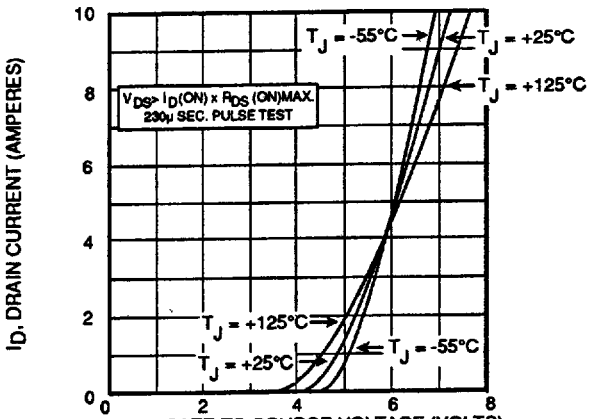


FIGURE 4, TYPICAL TRANSFER CHARACTERISTICS

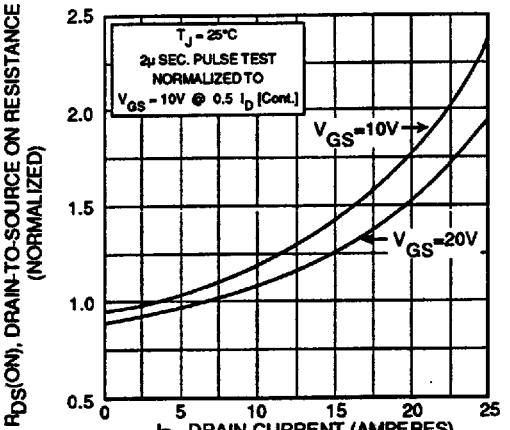


FIGURE 5, $R_{DS(ON)}$ vs DRAIN CURRENT

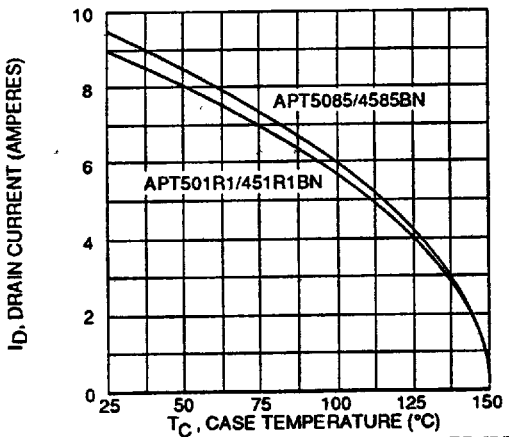


FIGURE 6, MAXIMUM DRAIN CURRENT vs CASE TEMPERATURE

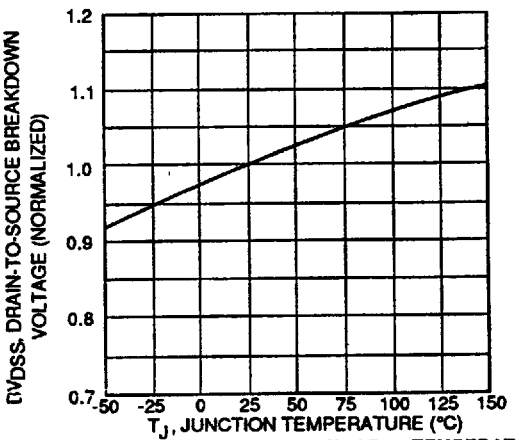


FIGURE 7, BREAKDOWN VOLTAGE vs TEMPERATURE

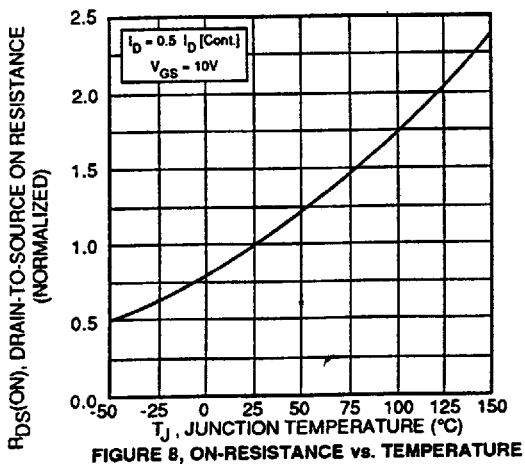


FIGURE 8, ON-RESISTANCE vs. TEMPERATURE

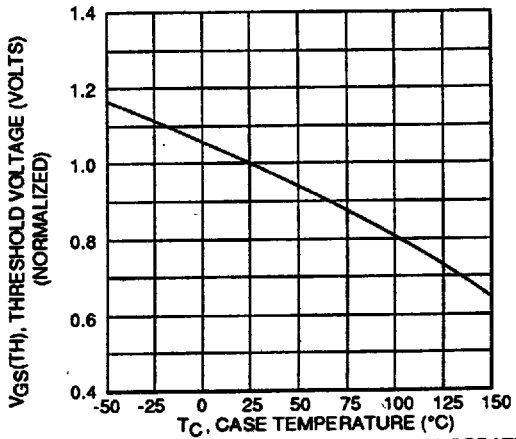


FIGURE 9, THRESHOLD VOLTAGE vs TEMPERATURE

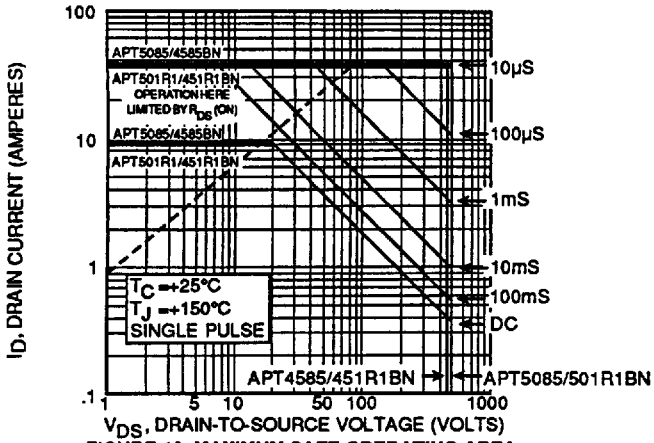


FIGURE 10, MAXIMUM SAFE OPERATING AREA

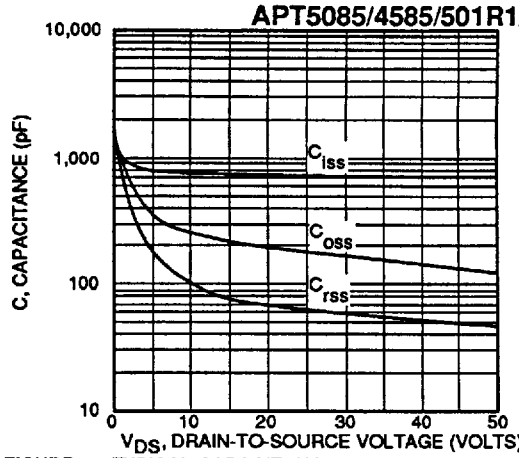


FIGURE 11, TYPICAL CAPACITANCE vs DRAIN-TO-SOURCE VOLTAGE

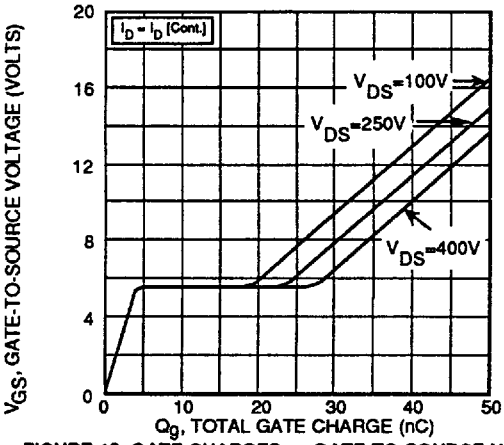


FIGURE 12, GATE CHARGES vs GATE-TO-SOURCE VOLTAGE

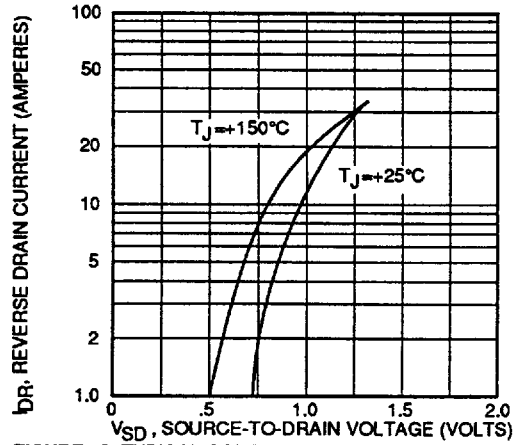
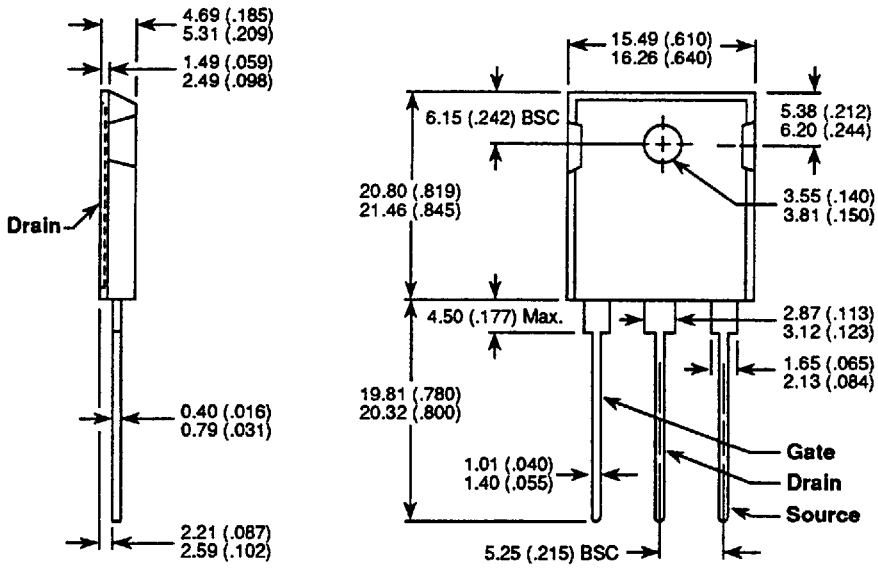


FIGURE 13, TYPICAL SOURCE-DRAIN DIODE FORWARD VOLTAGE

TO-247AD Package Outline



Dimensions in Millimeters and (Inches)

0-5011
-V-