

**ADVANCED
POWER
TECHNOLOGY**

T-39-13

APT5085AN	500V	8.5A	0.85 Ω
APT4585AN	450V	8.5A	0.85 Ω
APT501R1AN	500V	7.5A	1.10 Ω
APT451R1AN	450V	7.5A	1.10 Ω

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
		4585AN	5085AN	451R1AN	501R1AN	
V _{DSS}	Drain-Source Voltage	450	500	450	500	Volts
I _D	Continuous Drain Current	8.5		7.5		Amps
I _{DM}	Pulsed Drain Current ¹	34		30		Amps
V _{GS}	Gate-Source Voltage	±30				Volts
P _D	Total Power Dissipation @ T _C = 25°C, Derate Above 25°C	150				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 ($V_{GS} = 0V, I_D = 250 \mu\text{A}$)	APT5085AN / APT501R1AN		500	Volts
		APT4585AN / APT451R1AN		450	Volts
I_{DSS}	Zero Gate Voltage Drain Current ($V_{DS} = V_{DSS}, V_{GS} = 0V$)			250	μA
	($V_{DS} = 0.8 V_{DSS}, V_{GS} = 0V, T_C = 125^\circ\text{C}$)			1000	
I_{GSS}	Gate-Source Leakage Current ($V_{GS} = \pm 30V, V_{DS} = 0V$)			± 100	nA
$I_{D(ON)}$	On State Drain Current ²	APT5085AN / APT4585AN		8.5	Amps
	($V_{DS} > I_{D(ON)} \times R_{DS(ON)}$ Max, $V_{GS} = 10V$)	APT501R1AN / APT451R1AN		7.5	Amps
$V_{GS(TH)}$	Gate Threshold Voltage ($V_{DS} = V_{GS}, I_D = 1\text{mA}$)	2		4	Volts
$R_{DS(ON)}$	Static Drain-Source On-State Resistance ²	APT5085AN / APT4585AN		0.85	Ohms
	($V_{GS} = 10V, I_D = 0.5 I_{D(ON)}$)	APT501R1AN / APT451R1AN		1.10	Ohms

THERMAL CHARACTERISTICS

Symbol	Characteristic	MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Junction to Case			0.85	$^\circ\text{C/W}$
$R_{\theta JA}$	Junction to Ambient			30	$^\circ\text{C/W}$
T_L	Max. Lead Temp. for Soldering Conditions: 0.063" from Case for 10 Sec.			300	$^\circ\text{C}$

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DYNAMIC CHARACTERISTICS

APT5085/4585/501R1/451R1AN

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

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

T-39-13

Symbol	Characteristic / Test Conditions / Part Number	MIN	TYP	MAX	UNIT
I_S	Continuous Source Current (Body Diode)	APT5085AN / APT4585AN		8.5	Amps
		APT501R1AN / APT451R1AN		7.5	Amps
I_{SM}	Pulsed Source Current ¹ (Body Diode)	APT5085AN / APT4585AN		34	Amps
		APT501R1AN / APT451R1AN		30	Amps
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	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	$V_{DS} = 0.4 V_{DSS}, I_{DS} = P_D / 0.4 V_{DSS}, t = 1 \text{ Sec.}$	150			Watts
SOA2	Safe Operating Area	$I_{DS} = I_D [\text{Cont.}], V_{DS} = P_D / I_D [\text{Cont.}], t = 1 \text{ Sec.}$	150			Watts
I_{LM}	Inductive Current Clamped	APT5085AN / APT4585AN	34			Amps
		APT501R1AN / APT451R1AN	30			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

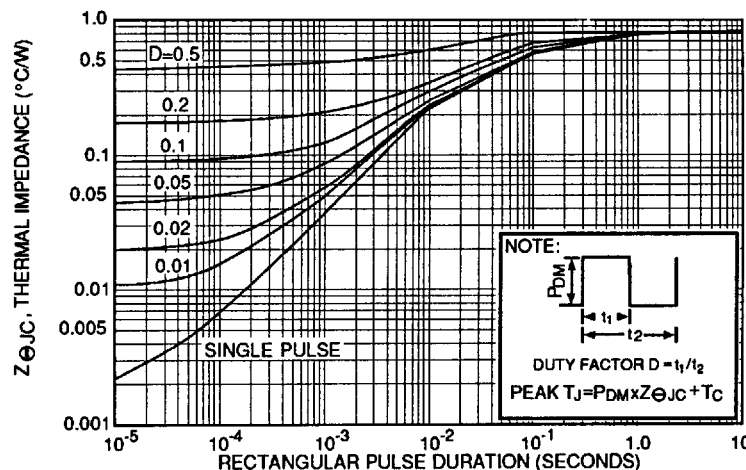
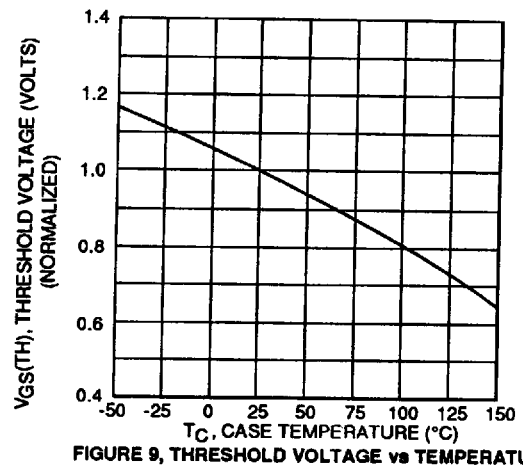
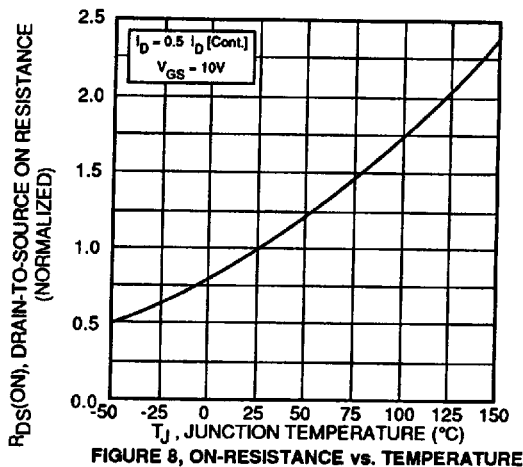
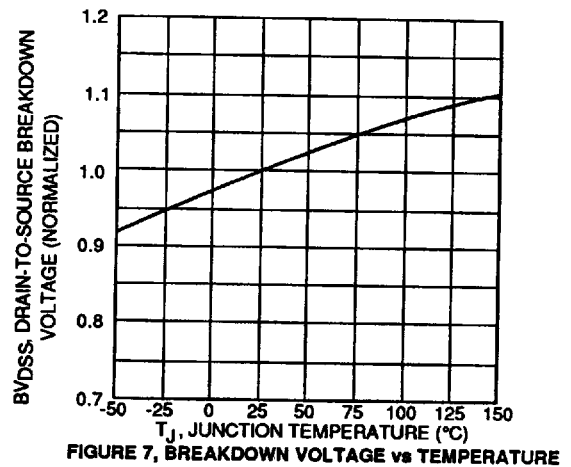
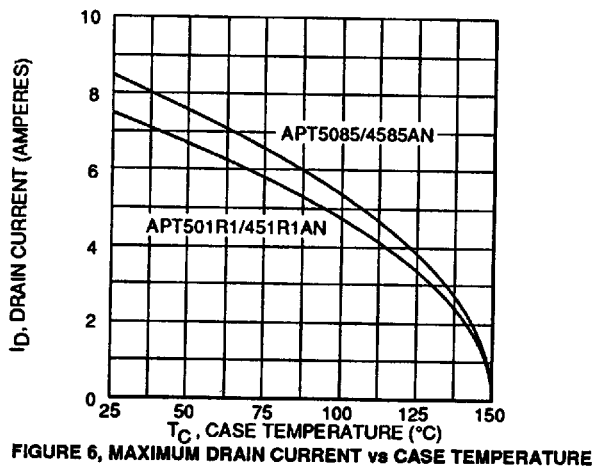
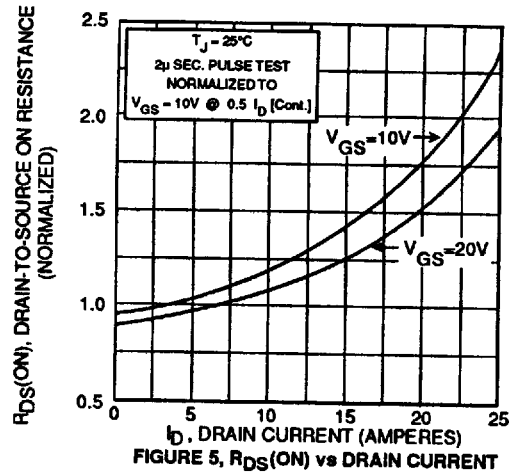
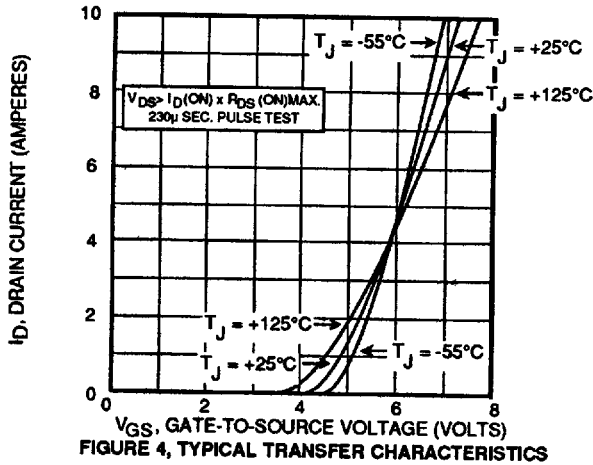
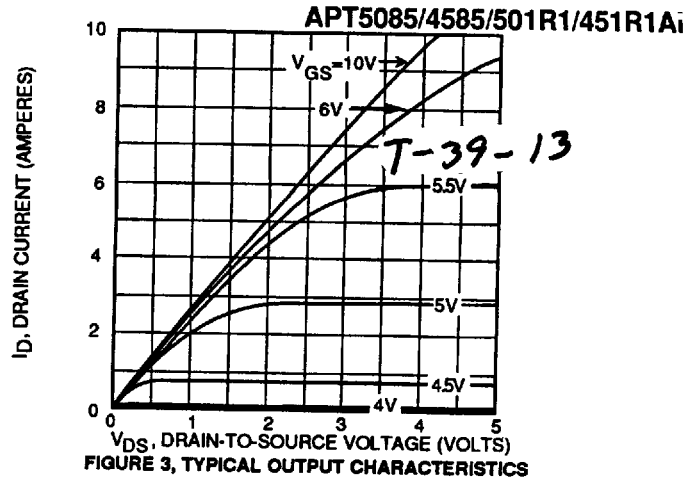
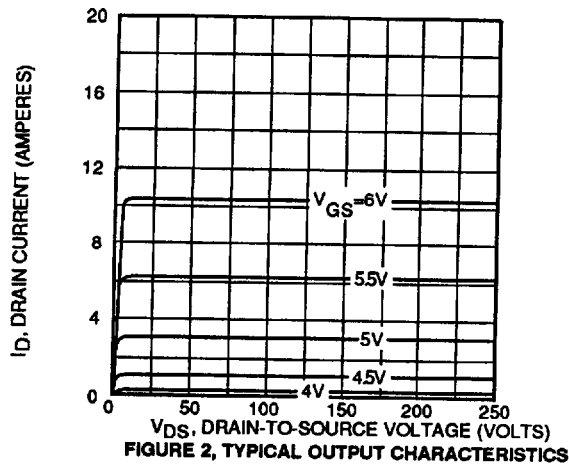


FIGURE 1, MAXIMUM EFFECTIVE TRANSIENT THERMAL IMPEDANCE, JUNCTION-TO-CASE vs PULSE DURATION



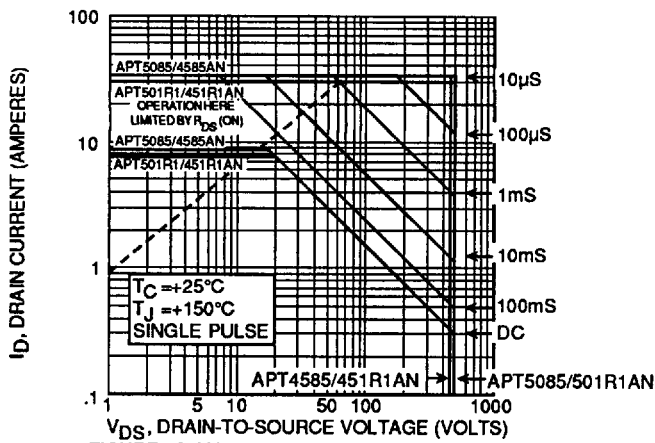


FIGURE 10, MAXIMUM SAFE OPERATING AREA

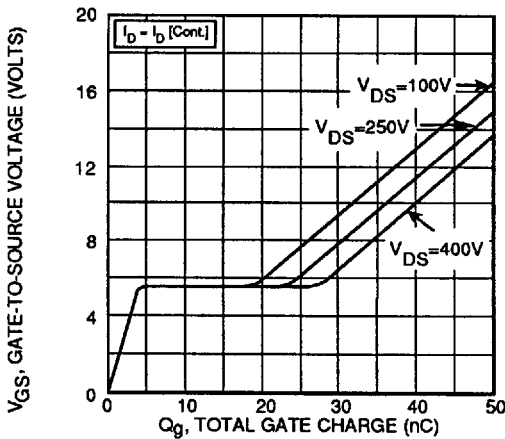


FIGURE 12, GATE CHARGES vs GATE-TO-SOURCE VOLTAGE

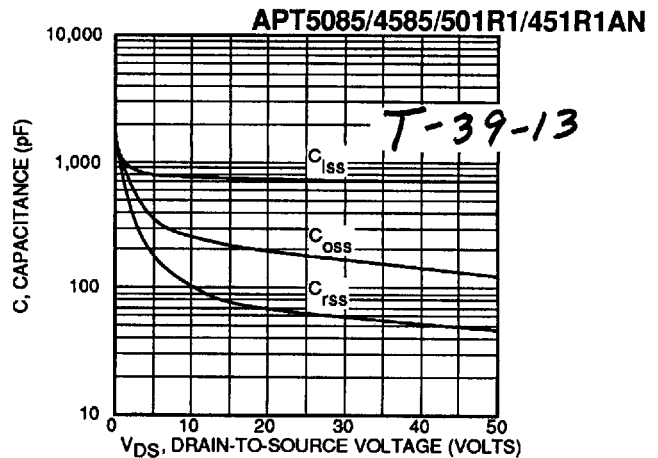


FIGURE 11, TYPICAL CAPACITANCE vs DRAIN-TO-SOURCE VOLTAGE

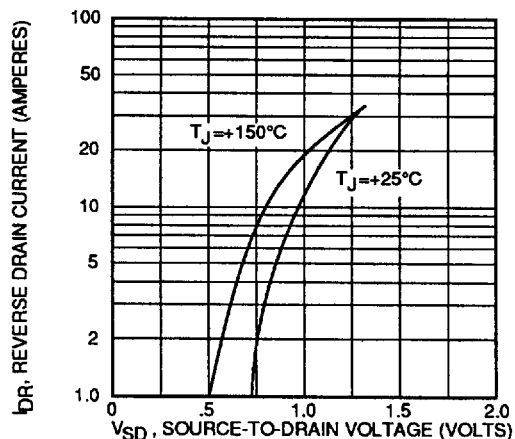
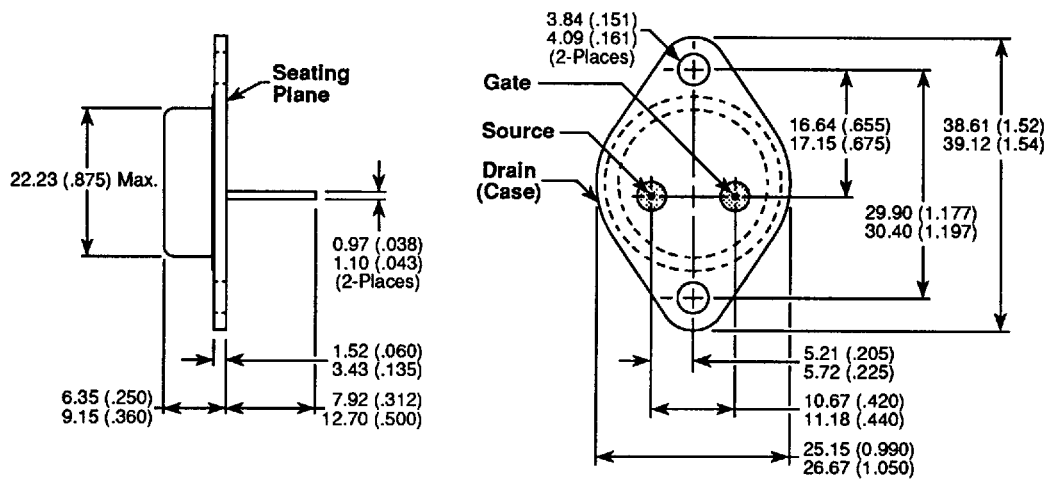


FIGURE 13, TYPICAL SOURCE-DRAIN DIODE FORWARD VOLTAGE

TO-3 Package Outline (TO-204AA)



Dimensions in Millimeters and (Inches)