

**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 <sup>1</sup>	34		30		Amps
$V_{GS}$	Gate-Source Voltage	±30				Volts
$P_D$	Total Power Dissipation @ $T_C = 25^\circ\text{C}$ , Derate Above $25^\circ\text{C}$	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 ( $V_{GS} = 0V, I_D = 250 \mu A$ )	APT5085AN / APT501R1AN		500	Volts	
		APT4585AN / APT451R1AN		450	Volts	
$I_{DSS}$	Zero Gate Voltage Drain Current ( $V_{DS} = V_{DSS}, V_{GS} = 0V$ )			250	$\mu A$	
	( $V_{DS} = 0.8 V_{DSS}, V_{GS} = 0V, T_C = 125^\circ\text{C}$ )			1000		
$I_{GSS}$	Gate-Source Leakage Current ( $V_{GS} = \pm 30V, V_{DS} = 0V$ )			±100	nA	
$I_{D(ON)}$	On State Drain Current <sup>2</sup> ( $V_{DS} > I_{D(ON)} \times R_{DS(ON)}$ Max, $V_{GS} = 10V$ )	APT5085AN / APT4585AN		8.5	Amps	
		APT501R1AN / APT451R1AN		7.5	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 <sup>2</sup> ( $V_{GS} = 10V, I_D = 0.5 I_D$ [Cont.])	APT5085AN / APT4585AN			0.85	Ohms
		APT501R1AN / APT451R1AN			1.10	Ohms

### THERMAL CHARACTERISTICS

Symbol	Characteristic	MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Junction to Case			0.85	°C/W
$R_{\theta JA}$	Junction to Ambient			30	°C/W
$T_L$	Max. Lead Temp. for Soldering Conditions: 0.063" from Case for 10 Sec.			300	°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 <sup>3</sup>	$V_{GS} = 10V, I_D = I_D [\text{Cont.}]$ $V_{DD} = 0.5 V_{DSS}$		33	55	nC
$Q_{gs}$	Gate-Source Charge			5.6	8	nC
$Q_{gd}$	Gate-Drain ("Miller") Charge			16	24	nC
$t_{d(on)}$	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
$t_{d(off)}$	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 <sup>1</sup> (Body Diode)	APT5085AN / APT4585AN			34	Amps
		APT501R1AN / APT451R1AN			30	Amps
$V_{SD}$	Diode Forward Voltage <sup>2</sup> ( $V_{GS} = 0V, I_S = -I_D [\text{Cont.}]$ )			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	$\mu C$	

**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  $\mu s$   
Duty Cycle < 2%  
3.) See MIL-STD-750 Method 3471

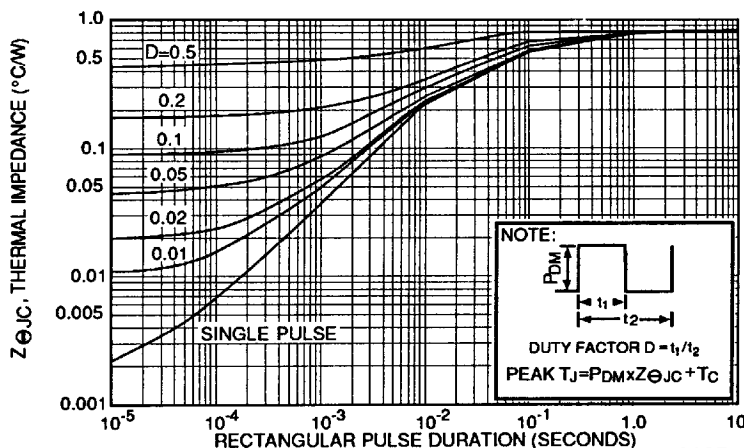
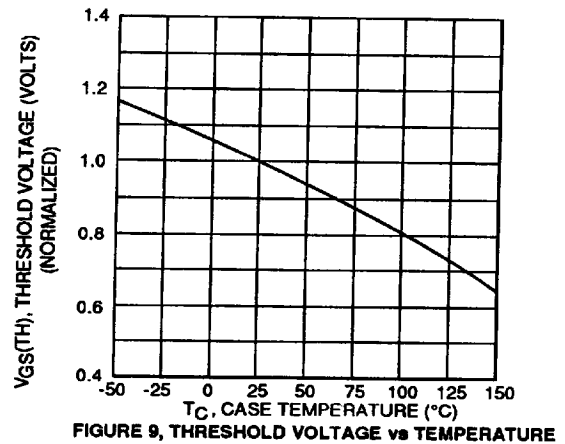
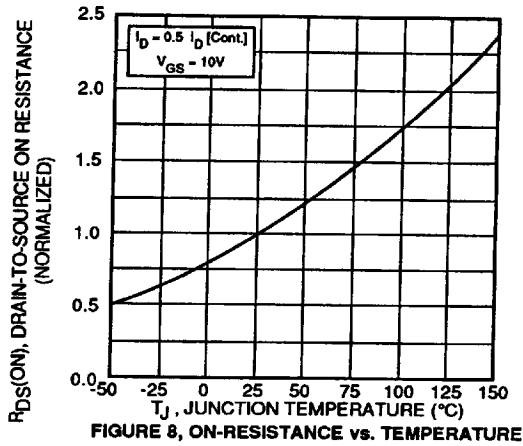
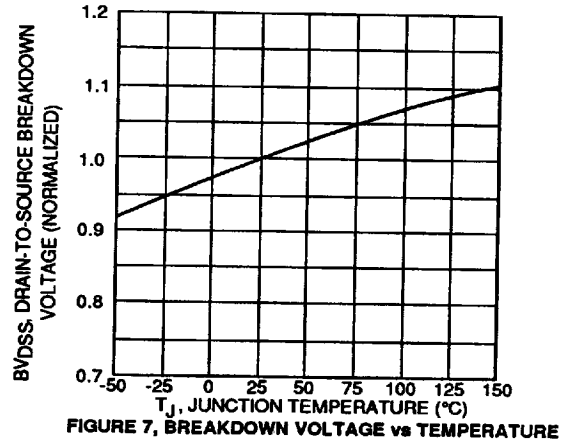
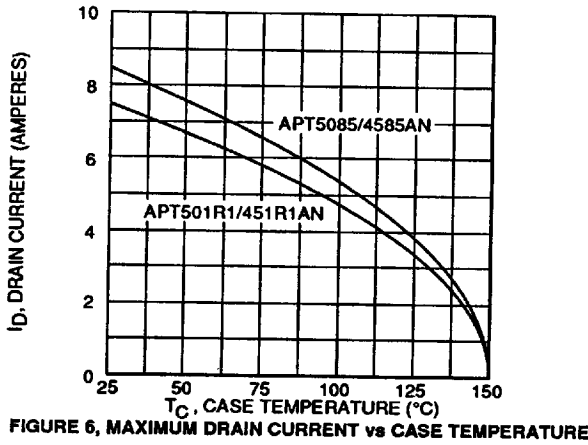
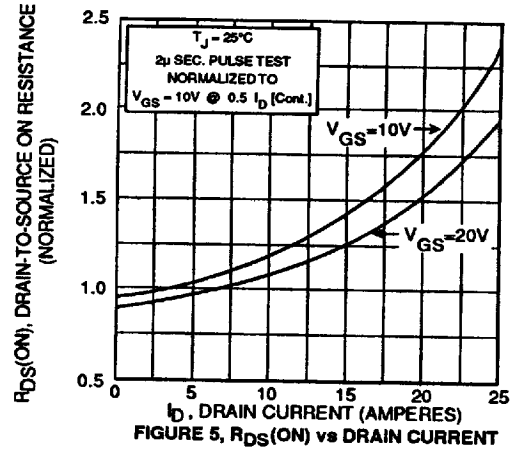
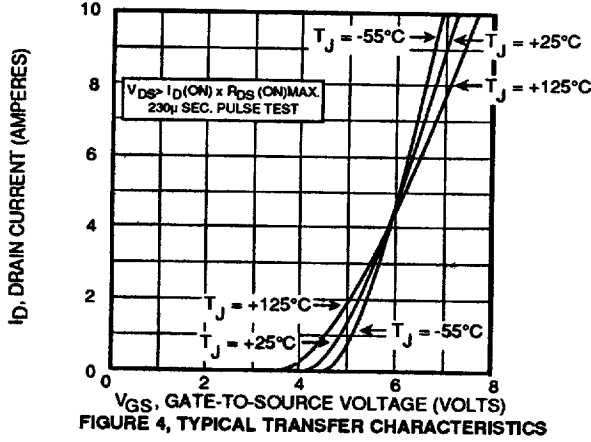
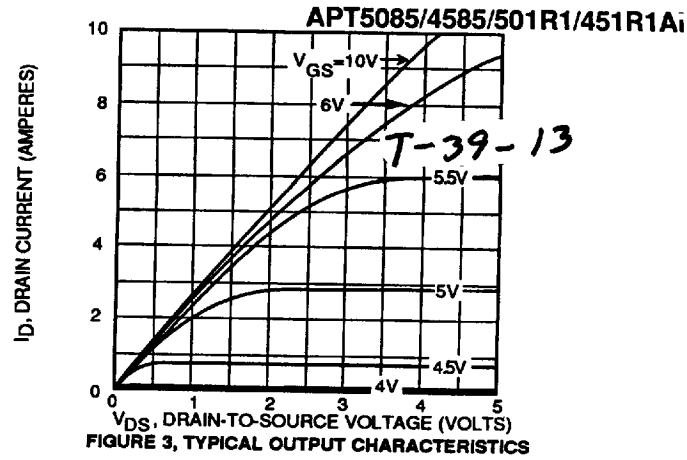
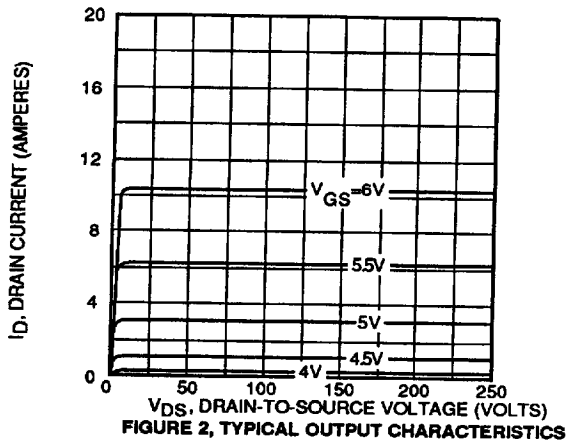
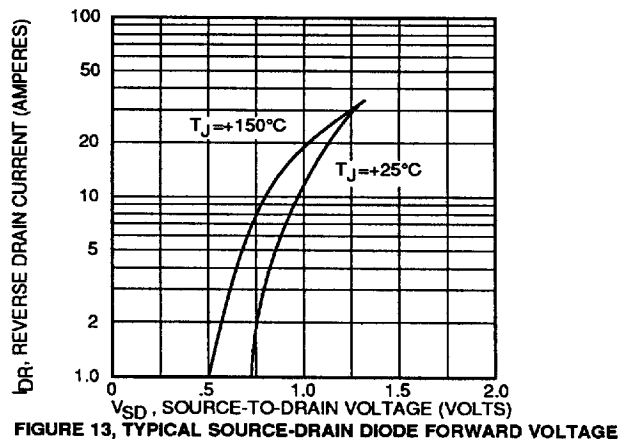
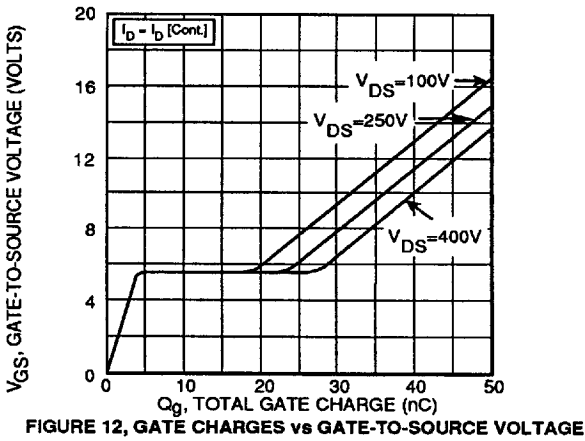
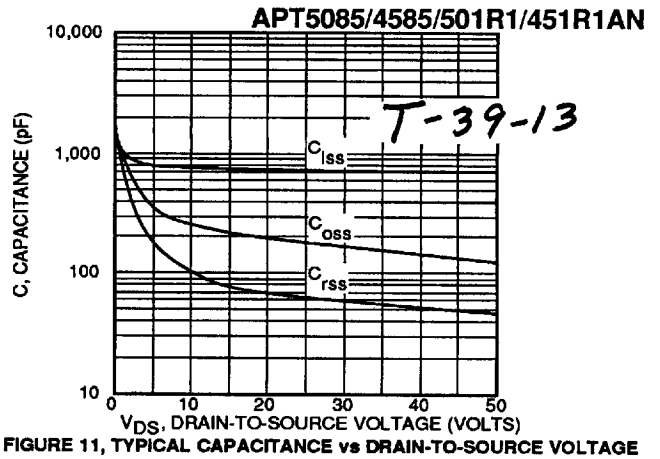
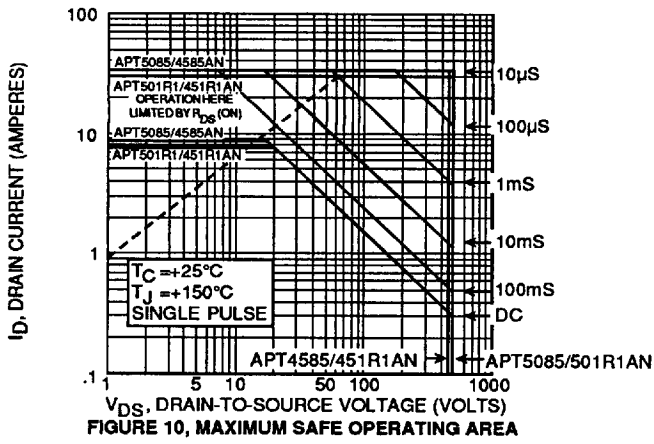
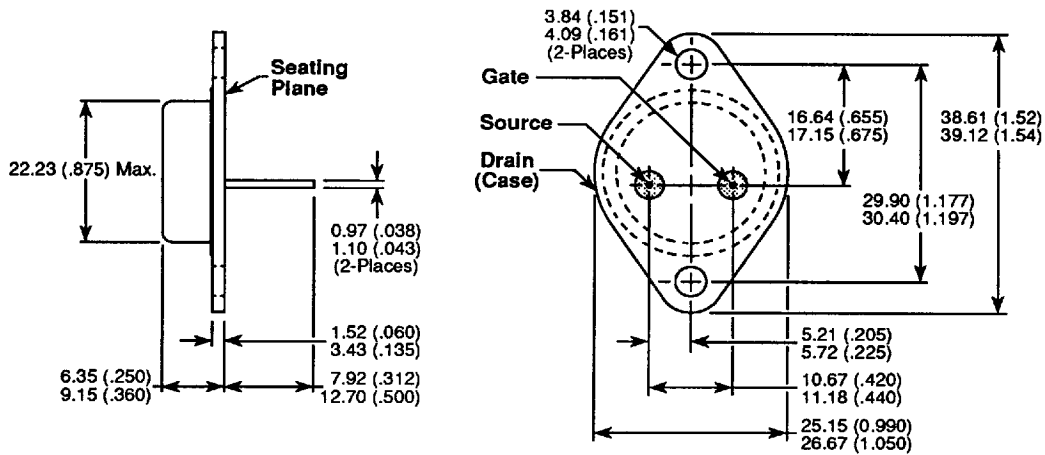


FIGURE 1, MAXIMUM EFFECTIVE TRANSIENT THERMAL IMPEDANCE, JUNCTION-TO-CASE vs PULSE DURATION





TO-3 Package Outline (TO-204AA)



Dimensions in Millimeters and (Inches)