

T-39-15

APT4007FN 400V 60A 0.07 Ω
 APT3507FN 350V 60A 0.07 Ω

POWER MOS IVTM

N - CHANNEL ENHANCEMENT MODE HIGH VOLTAGE POWER MOSFETS

MAXIMUM RATINGS

All Ratings: $T_C = 25^\circ\text{C}$ unless otherwise specified.

Symbol	Parameter	APT3507FN	APT4007FN	UNIT
V_{DSS}	Drain-Source Voltage	350	400	Volts
I_D	Continuous Drain Current	60		Amps
I_{DM}	Pulsed Drain Current ¹	240		Amps
V_{GS}	Gate-Source Voltage	± 30		Volts
P_D	Total Power Dissipation @ $T_C = 25^\circ\text{C}$, Derate Above 25°C	595		Watts
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to 150		$^\circ\text{C}$

STATIC ELECTRICAL CHARACTERISTICS

Symbol	Characteristic / Test Conditions	MIN	TYP	MAX	UNIT
BV_{DSS}	Drain-Source Breakdown Voltage ($V_{GS} = 0V, I_D = 250\mu\text{A}$)	APT4007FN	400		Volts
		APT3507FN	350		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 ($V_{DS} > I_D(ON) \times R_{DS(ON)}$ Max, $V_{GS} = 10V$)	60			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 ($V_{GS} = 10V, I_D = 0.5 I_D(\text{Cont.})$)			0.07	Ohms

THERMAL CHARACTERISTICS

Symbol	Characteristic	MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Junction to Case			0.21	$^\circ\text{C/W}$
$R_{\theta JA}$	Junction to Ambient			20	$^\circ\text{C/W}$
T_L	Maximum Lead Temp. for Soldering Conditions: 0.063" from Case for 10 Sec.			300	$^\circ\text{C}$

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DYNAMIC CHARACTERISTICS

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APT4007/3507FN

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
C_{iss}	Input Capacitance	$V_{GS} = 10V$ $V_{DS} = 25V$ $f = 1MHz$	4500		6300	pF
C_{oss}	Output Capacitance		960		1450	pF
C_{rss}	Reverse Transfer Capacitance		400		600	pF
Q_g	Total Gate Charge ³	$V_{GS} = 10V, I_D = I_D(Cont.)$ $V_{DD} = 0.5 V_{DSS}$	160		260	nC
Q_{gs}	Gate-Source Charge		25		40	nC
Q_{gd}	Gate-Drain ("Miller") Charge		130		160	nC
$t_d(on)$	Turn-on Delay Time	$V_{DD} = 0.5 V_{DSS}$ $V_{GS} = 15V, I_D = I_D(Cont.)$ $R_G = 1.8\Omega$			30	nS
t_r	Rise Time				60	nS
$t_d(off)$	Turn-off Delay Time				120	nS
t_f	Fall Time				70	nS

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Symbol	Characteristic / Test Conditions	MIN	TYP	MAX	UNIT
I_S	Continuous Source Current (Body Diode)			60	Amps
I_{SM}	Pulsed Source Current ¹ (Body Diode)			240	Amps
V_{SD}	Diode Forward Voltage ² ($V_{GS} = 0V, I_S = -I_D(Cont.)$)			1.0	Volts
t_{rr}	Reverse Recovery Time ($I_S = -I_D(Cont.)$, $dI_S/dt = 100A/\mu s$)			550	nS
Q_{rr}	Reverse Recovery Charge			16	μC

SAFE OPERATING AREA CHARACTERISTICS

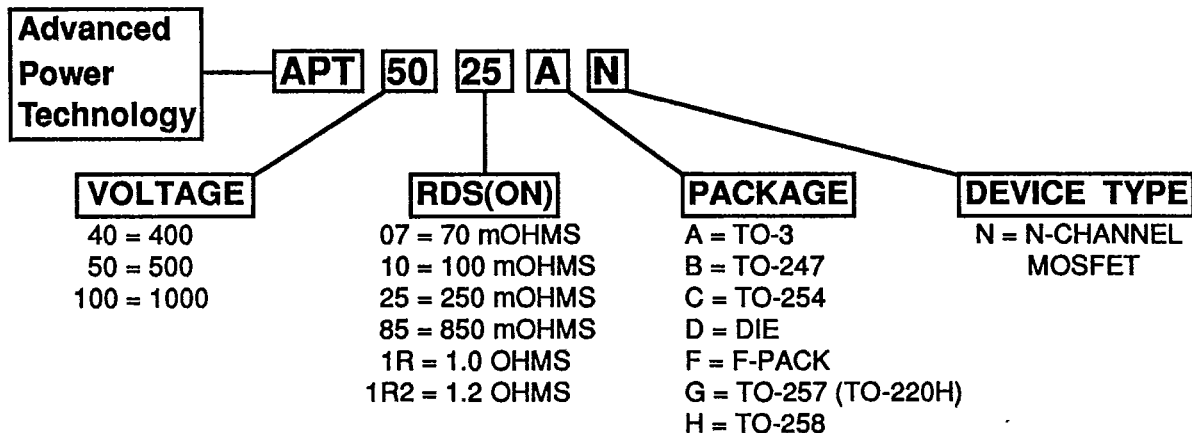
Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
SOA1	Safe Operating Area	$V_{DS} = 0.4 V_{DSS}, I_{DS} = P_D / 0.4 V_{DSS}, t = 1 \text{ Sec.}$	595			Watts
SOA2	Safe Operating Area	$V_{DS} = P_D / I_D(Cont.), I_{DS} = I_D(Cont.), t = 1 \text{ Sec.}$	595			Watts
I_{LM}	Inductive Current Clamped		240			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%

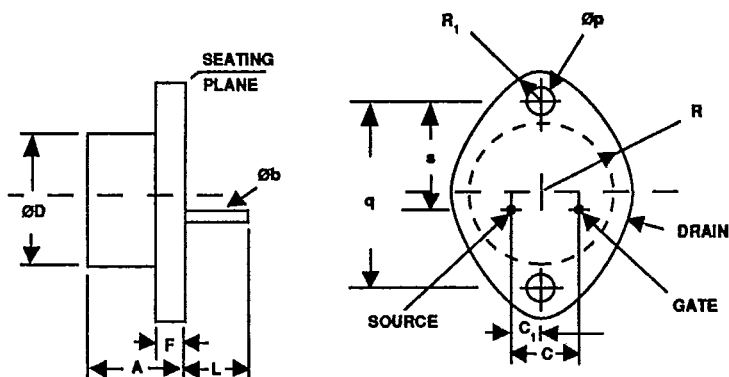
3.) See JEDEC MIL-STD-750C Method 3471

APT PART NUMBERING SYSTEM - EXAMPLES



PACKAGE OUTLINES

Package A TO-3 (TO-204AA)

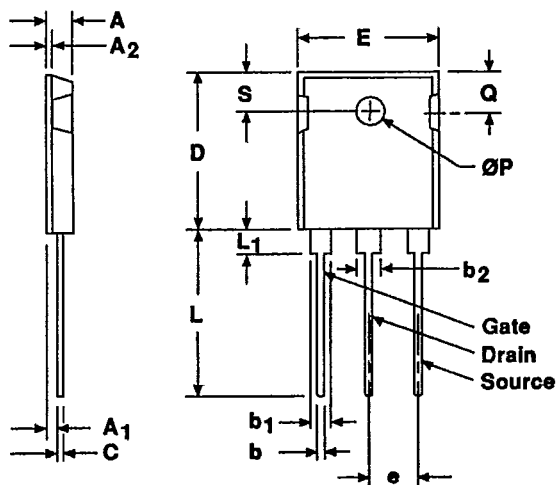


SYMBOL	INCHES		MILLIMETERS		NOTES
	MIN.	MAX.	MIN.	MAX.	
A	.250	.360	6.35	9.15	2
Øb	.038	.043	.97	1.10	
ØD		.875		22.23	
C	.420	.440	10.67	11.18	2
C1	.205	.225	5.21	5.72	
F	.060	.135	1.52	3.43	
L	.312	.500	7.92	12.70	
Øp	.151	.161	3.84	4.09	
q	1.177	1.197	29.90	30.40	
R	.495	.525	12.57	13.34	
R1	.131	.188	3.33	4.78	
s	.655	.675	16.64	17.15	
					1

Notes:

- These dimensions should be measured at points .050" (1.27 mm) to .55" (1.40 mm) below seating plane. When gate is not used, measurement will be made at seating plane.
- Two leads.

Package B TO-3P (TO-247 Type AD Proposed)



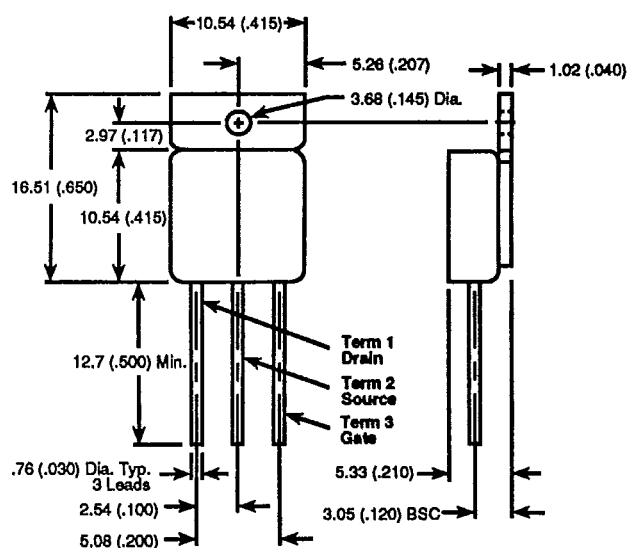
SYMBOL	INCHES		MILLIMETERS		NOTES
	MIN	MAX	MIN	MAX	
A	.185	.209	4.69	5.31	4
A1	.087	.102	2.21	2.59	
A2	.059	.098	1.49	2.49	
b	.040	.055	1.01	1.40	
b1	.065	.084	1.65	2.13	
b2	.113	.123	2.87	3.12	
C	.016	.031	0.40	0.79	
D	.819	.845	20.80	21.46	
E	.610	.640	15.49	16.26	
ØP	.215 BSC		5.25 BSC		
L	.780	.800	19.81	20.32	4
L1		.177		4.50	
ØP	.140	.144	3.55	3.66	
S	.212	.244	5.38	6.20	

Notes:

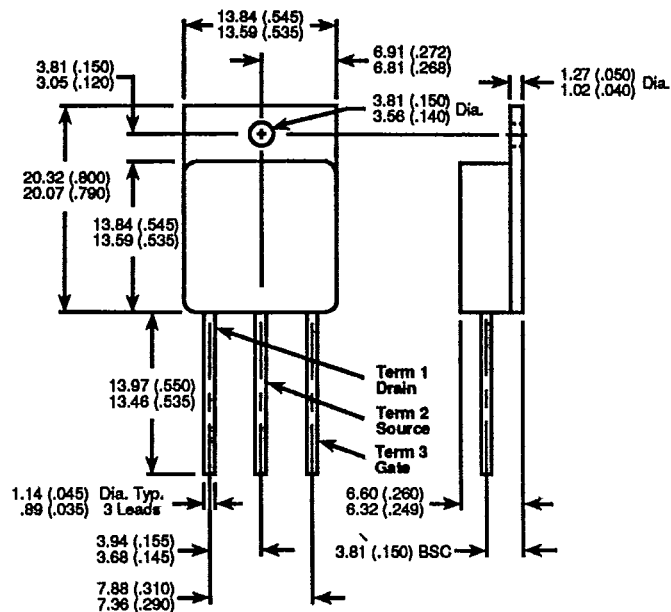
- Refer to applicable symbol list.
- Dimensions and tolerances per ANSI V14.5, 1982.
- Maximum radius of .050 on all boot edges and corners.
- Lead dimensions uncontrolled in L
- Controlling dimension: Metric.

PACKAGE OUTLINES (Continued)

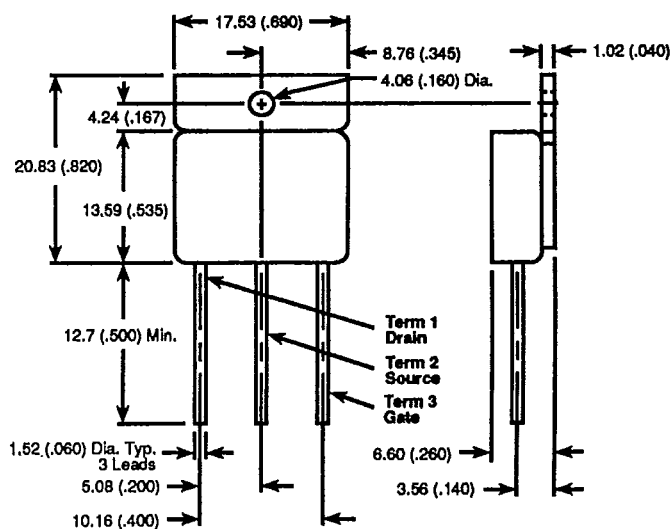
Package G TO-257AA (TO-220 Herm.)



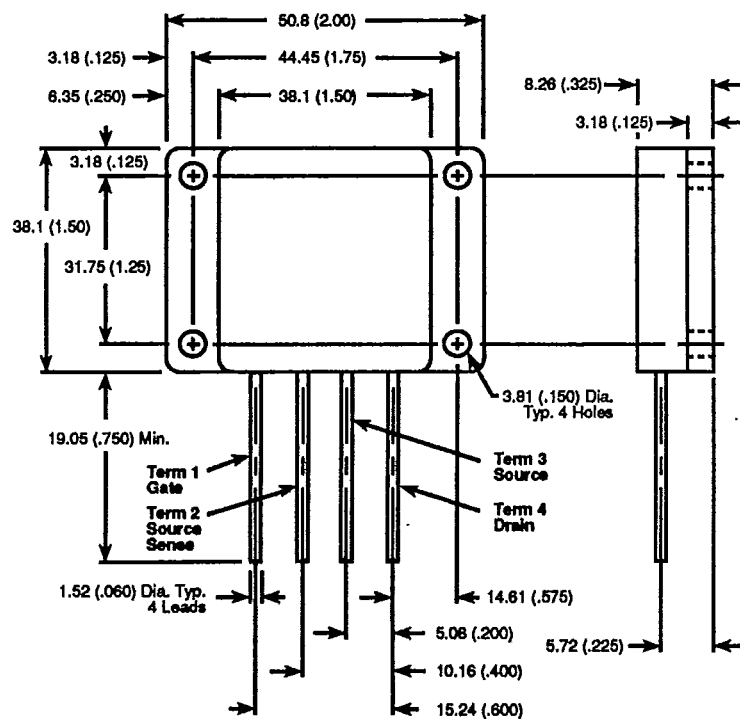
Package C TO-254AA



Package H TO-258AA (TO-247 Herm.)



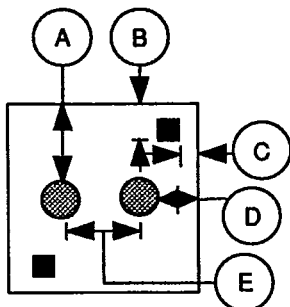
Package F (F-Pack)



DIE TOPOGRAPHICAL LAYOUT DETAILS FOR APT POWER MOS IV™ DIE

APT - 104 = .199 x .203 In.

- Source Pads = .036 In. diam
- Gate pads = .018 x .019 In.



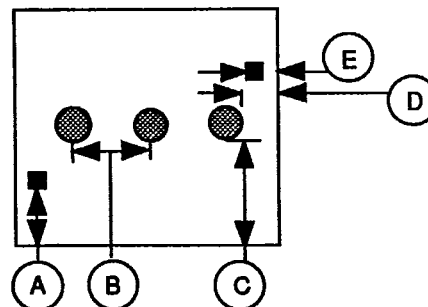
Letters = Internal dimensions

A = .081 In. B = .039 In. C = .018 In.

D = .040 In. E = .082 In.

APT - 105 = .290 x .250 In.

- Source Pads = .036 In. diam
- Gate pads = .018 x .019 In.



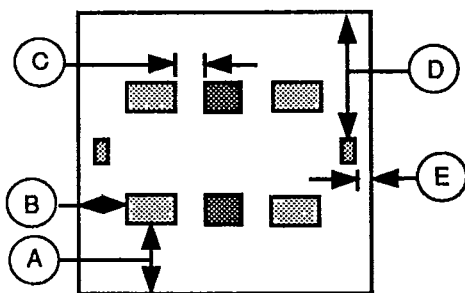
Letters = Internal dimensions

A = .055 In. B = .085 In. C = .105 In.

D = .042 In. E = .018 In.

APT - 101 = .320 x .320 In.

- ▨ Source Pads = .037 x .024 In.
- Source Pads = .030 x .024 In.
- Gate pads = .014 x .019 In.



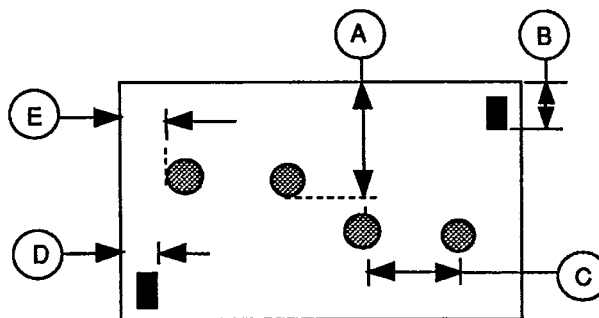
Letters = Internal dimensions

A = .077 In. B = .062 In. C = .048 In.

D = .149 In. E = .018 In.

APT - 102 = .414 x .254 In.

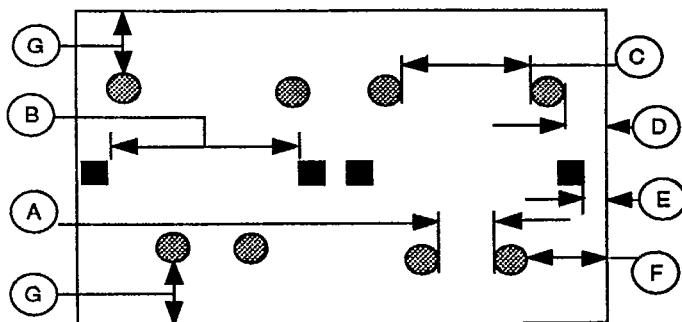
- Source Pads = .036 In. diam
- Gate pads = .012 x .019 In.



Letters = Internal dimensions

A = .117 In. B = .037 In. C = .097 In.

D = .031 In. E = .046 In.



APT - 107 = .588 x .388 In.

- Source pads = .036
- Gate pads = .017 x .018

Letters = Internal dimensions

A = .057 In. B = .240 In. C = .151 In.

D = .045 In. E = .017 In. F = .091 In. G = .088 In.