

### GENERAL DESCRIPTION

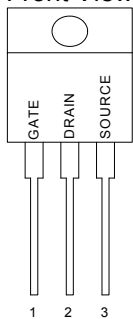
This advanced high voltage MOSFET is designed to withstand high energy in the avalanche mode and switch efficiently. This new high energy device also offers a drain-to-source diode with fast recovery time. Designed for high voltage, high speed switching applications such as power supplies, converters, power motor controls and bridge circuits.

### FEATURES

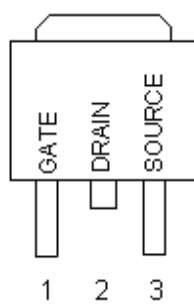
- ◆ Higher Current Rating
- ◆ Lower  $R_{ds(on)}$
- ◆ Lower Capacitances
- ◆ Lower Total Gate Charge
- ◆ Tighter VSD Specifications
- ◆ Avalanche Energy Specified

### PIN CONFIGURATION

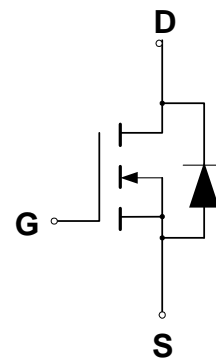
TO-220/TO-220FP  
Front View



TO-252  
Front View



### SYMBOL



N-Channel MOSFET

### ABSOLUTE MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Drain to Current – Continuous	$I_D$	4.0	A
– Pulsed	$I_{DM}$	14	
Gate-to-Source Voltage – Continue	$V_{GS}$	$\pm 30$	V
– Non-repetitive	$V_{GSM}$	$\pm 40$	V
Total Power Dissipation	$P_D$		W
TO-220		83	
TO-220FP		30	
Operating and Storage Temperature Range	$T_J, T_{STG}$	-55 to 150	$^{\circ}C$
Single Pulse Drain-to-Source Avalanche Energy – $T_J = 25^{\circ}C$ ( $V_{DD} = 100V, V_{GS} = 10V, I_L = 4A, L = 10mH, R_G = 25\Omega$ )	$E_{AS}$	80	mJ
Thermal Resistance – Junction to Case	$\theta_{JC}$	1.30	$^{\circ}C/W$
– Junction to Ambient	$\theta_{JA}$	100	
Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 10 seconds	$T_L$	260	$^{\circ}C$

### ORDERING INFORMATION

Part Number	Package
CMT04N60GN220*	TO-220
CMT04N60XN220*	TO-220
CMT04N60GN220FP*	TO-220 Full Package
CMT04N60XN220FP*	TO-220 Full Package
CMT04N60GN252*	TO-252
CMT04N60XN252*	TO-252

\*Note: G : Suffix for Pb Free Product

X : Suffix for Halogen and Pb Free Product

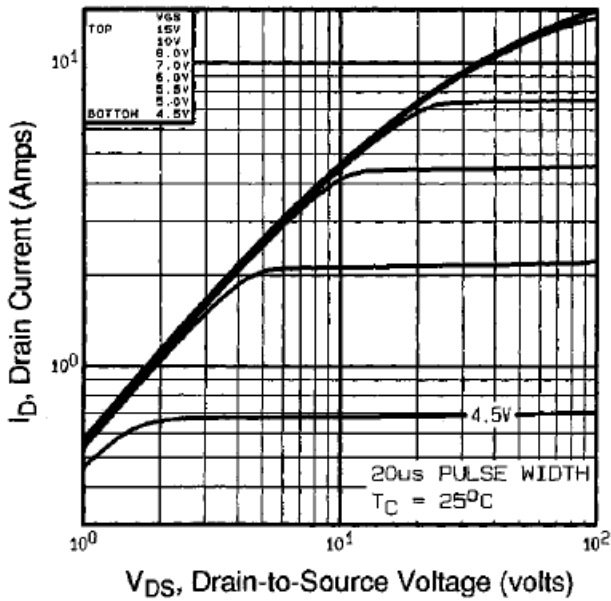
### ELECTRICAL CHARACTERISTICS (Unless otherwise specified, T<sub>J</sub> = 25°C.)

		CMT04N60				
Characteristic	Symbol	Min	Typ	Max	Units	
Drain-Source Breakdown Voltage (V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA)	V <sub>(BR)DSS</sub>	600			V	
Drain-Source Leakage Current (V <sub>DS</sub> = 600 V, V <sub>GS</sub> = 0 V)	I <sub>DSS</sub>			1	μA	
Gate-Source Leakage Current-Forward (V <sub>gsf</sub> = 30 V, V <sub>DS</sub> = 0 V)	I <sub>GSSF</sub>			100	nA	
Gate-Source Leakage Current-Reverse (V <sub>gsr</sub> = -30 V, V <sub>DS</sub> = 0 V)	I <sub>GSSR</sub>			100	nA	
Gate Threshold Voltage (V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA)	V <sub>GS(th)</sub>	2.0		4.0	V	
Static Drain-Source On-Resistance (V <sub>GS</sub> = 10 V, I <sub>D</sub> = 2.0A) *	R <sub>DS(on)</sub>			2.2	Ω	
Forward Transconductance (V <sub>DS</sub> = 50 V, I <sub>D</sub> = 2.0 A) *	g <sub>FS</sub>	2.5			mhos	
Input Capacitance	C <sub>iSS</sub> (V <sub>DS</sub> = 25 V, V <sub>GS</sub> = 0 V, f = 1.0 MHz)		540	760	pF	
Output Capacitance		C <sub>oSS</sub>		125	180	pF
Reverse Transfer Capacitance		C <sub>rSS</sub>		8.0	20	pF
Turn-On Delay Time	t <sub>d(on)</sub> (V <sub>DD</sub> = 300 V, I <sub>D</sub> = 4.0 A, V <sub>GS</sub> = 10 V, R <sub>G</sub> = 9.1Ω) *		12	20	ns	
Rise Time		t <sub>r</sub>		7.0	10	ns
Turn-Off Delay Time		t <sub>d(off)</sub>		19	40	ns
Fall Time		t <sub>f</sub>		10	20	ns
Total Gate Charge	Q <sub>g</sub> (V <sub>DS</sub> = 480 V, I <sub>D</sub> = 4.0 A, V <sub>GS</sub> = 10 V)*		5.0	10	nC	
Gate-Source Charge		Q <sub>gs</sub>		2.7		nC
Gate-Drain Charge		Q <sub>gd</sub>		2.0		nC
Internal Drain Inductance (Measured from the drain lead 0.25" from package to center of die)	L <sub>D</sub>		4.5		nH	
Internal Drain Inductance (Measured from the source lead 0.25" from package to source bond pad)	L <sub>S</sub>		7.5		nH	
<b>SOURCE-DRAIN DIODE CHARACTERISTICS</b>						
Forward On-Voltage(1)	V <sub>SD</sub> (I <sub>S</sub> = 4.0 A, d <sub>IS</sub> /d <sub>t</sub> = 100A/μs)			1.5	V	
Forward Turn-On Time		t <sub>on</sub>		**	ns	
Reverse Recovery Time		t <sub>rr</sub>		655		ns

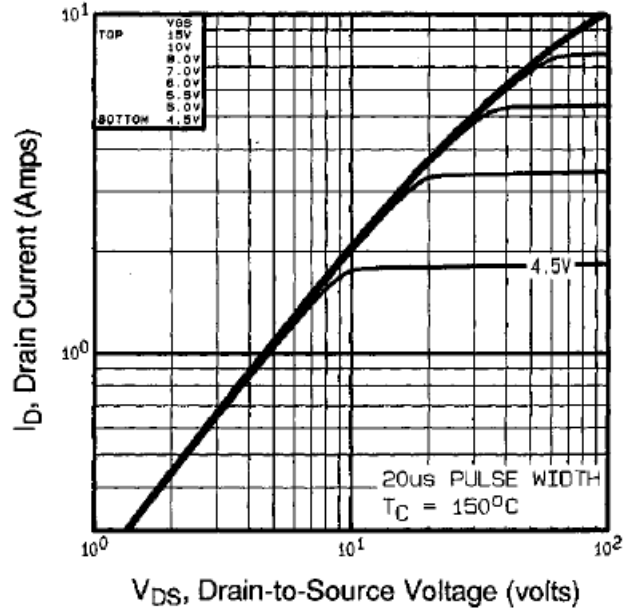
\* Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%

\*\* Negligible, Dominated by circuit inductance

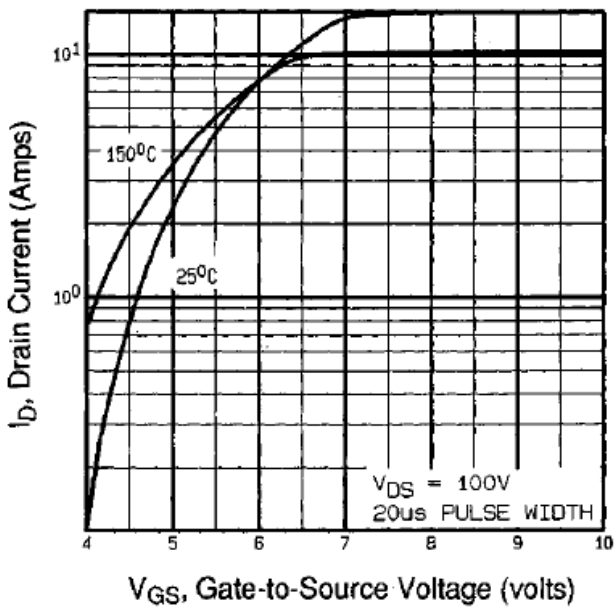
### TYPICAL CHARACTERISTICS



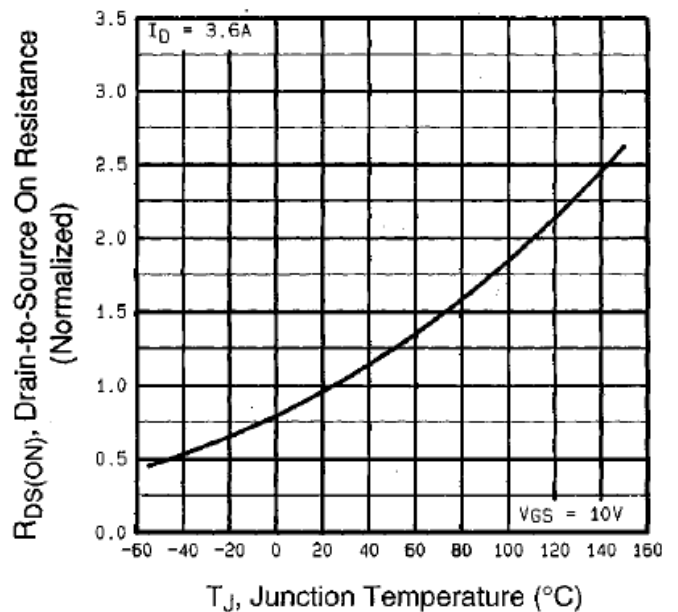
**Fig 1.** Typical Output Characteristics,  $T_C=25^\circ\text{C}$



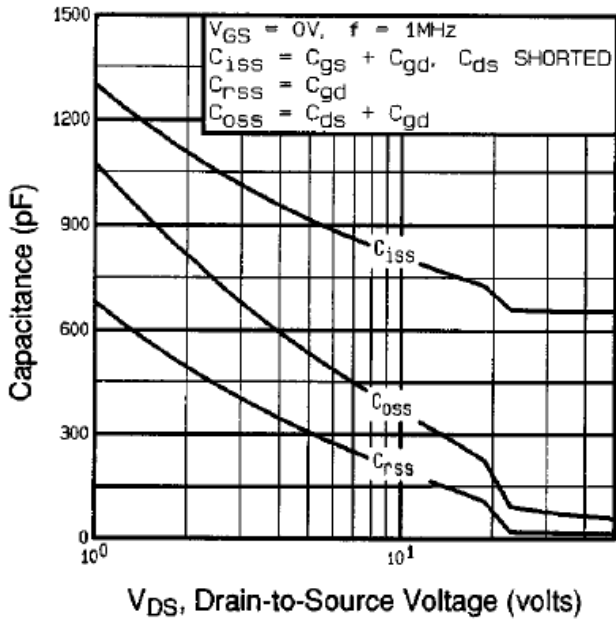
**Fig 2.** Typical Output Characteristics,  $T_C=150^\circ\text{C}$



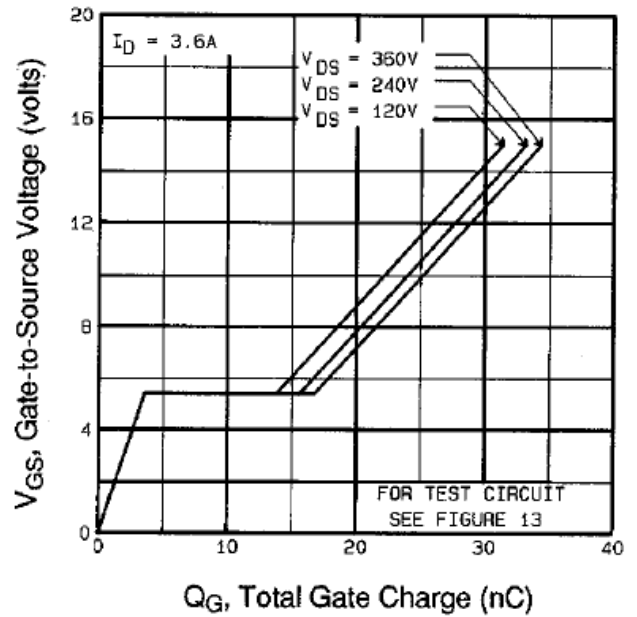
**Fig 3.** Typical Transfer Characteristics



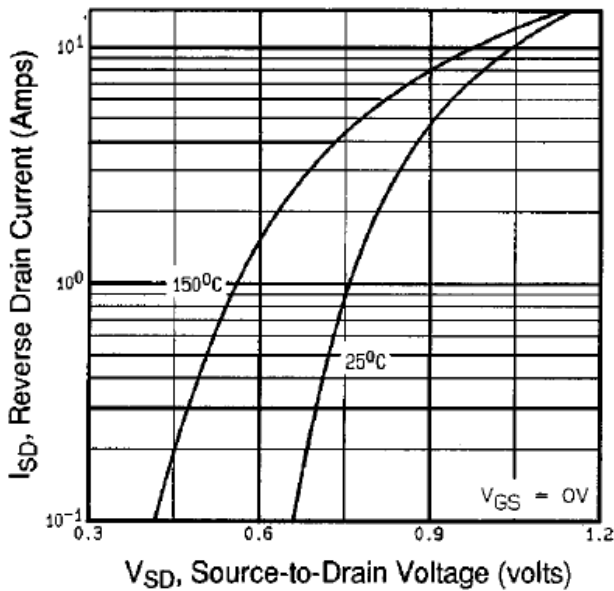
**Fig 4.** Normalized On-Resistance Vs. Temperature



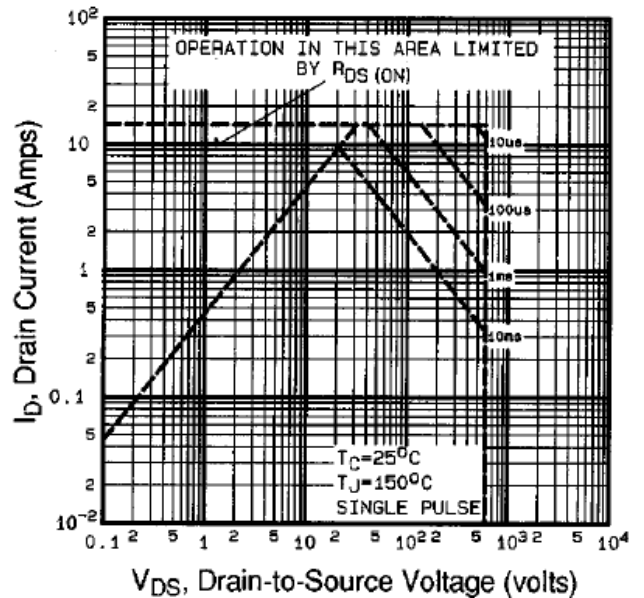
**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage



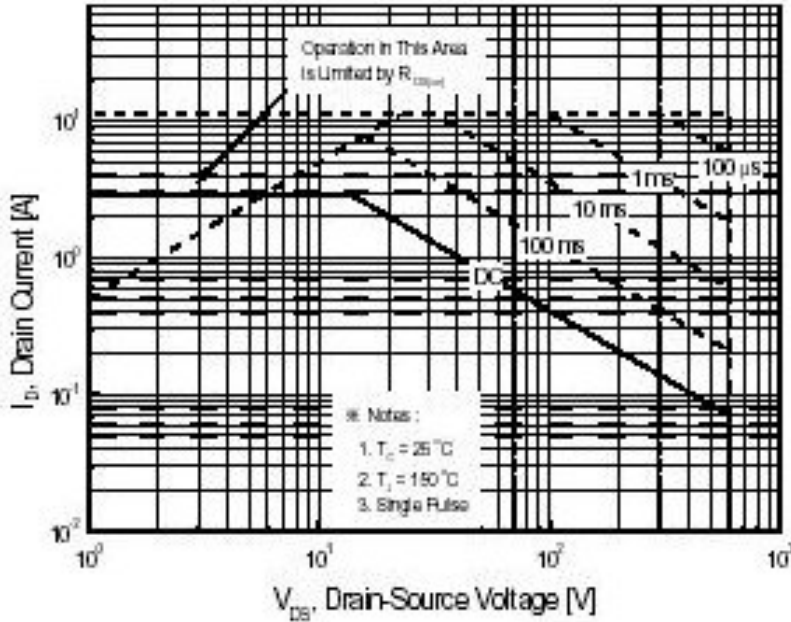
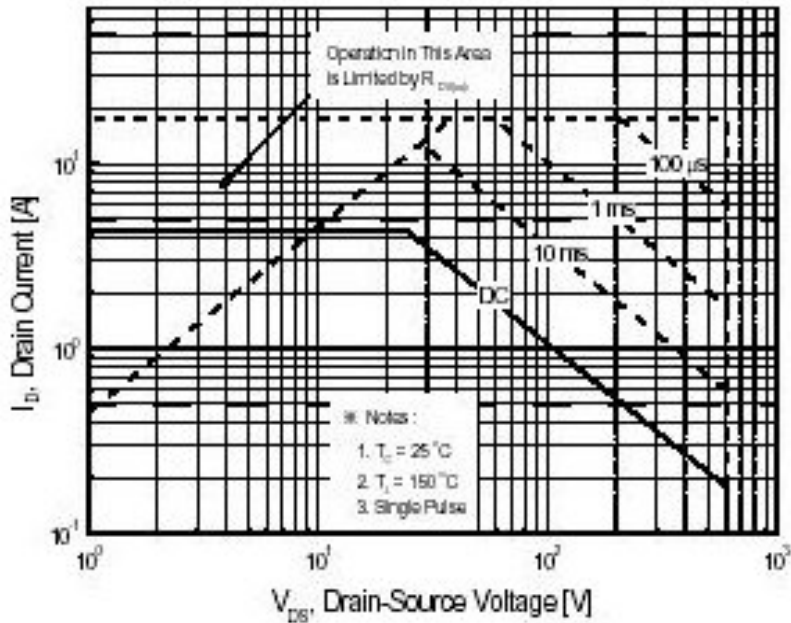
**Fig 6.** Typical Gate Charge Vs. Gate-to-Source Voltage



**Fig 7.** Typical Source-Drain Diode Forward Voltage

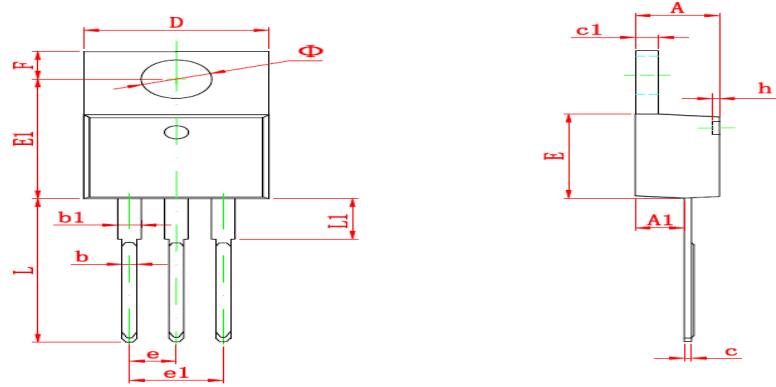


**Fig 8.** Maximum Safe Operating Area



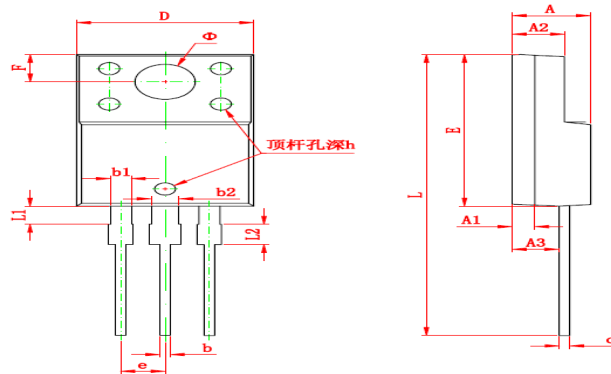
### PACKAGE DIMENSION

#### TO-220



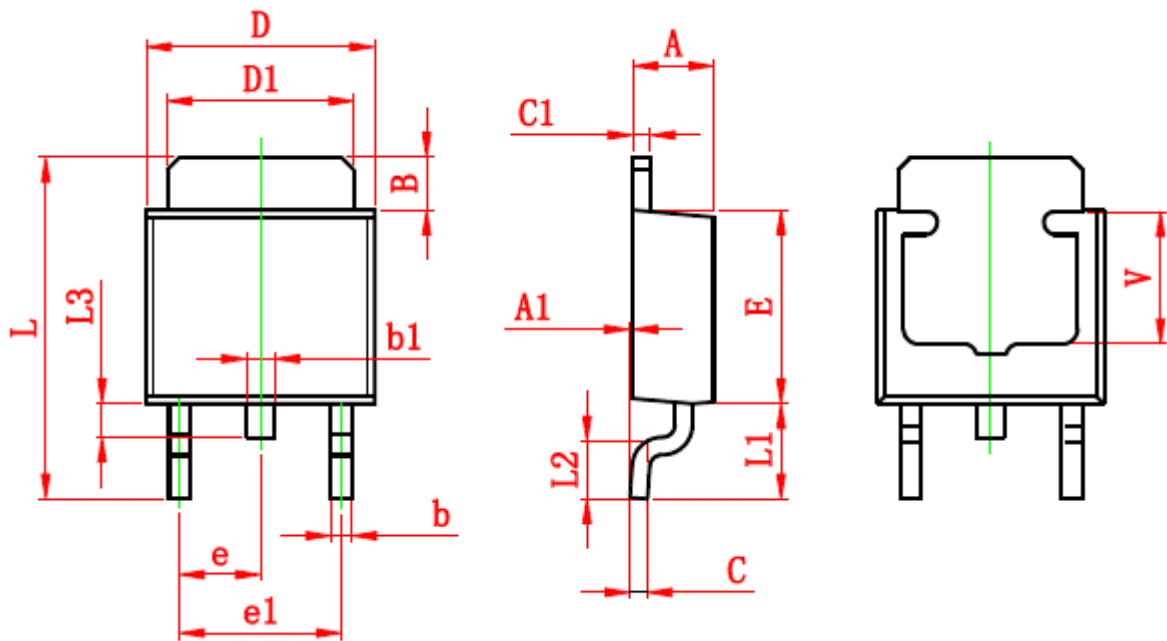
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	4.470	4.670	0.176	0.184
A1	2.520	2.820	0.099	0.111
b	0.710	0.910	0.028	0.036
b1	1.170	1.370	0.046	0.054
c	0.310	0.530	0.012	0.021
c1	1.170	1.370	0.046	0.054
D	10.010	10.310	0.394	0.406
E	8.500	8.900	0.335	0.350
E1	12.060	12.460	0.475	0.491
e	2.540 TYP		0.100 TYP	
e1	4.980	5.180	0.196	0.204
F	2.590	2.890	0.102	0.114
h	0.000	0.300	0.000	0.012
L	13.400	13.800	0.528	0.543
L1	3.560	3.960	0.140	0.156
phi	3.735	3.935	0.147	0.155

#### TO-220FP



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	4.300	4.700	0.169	0.185
A1	1.300 REF		0.051 REF	
A2	2.800	3.200	0.110	0.126
A3	2.500	2.900	0.098	0.114
b	0.500	0.750	0.020	0.030
b1	1.100	1.350	0.043	0.053
b2	1.500	1.750	0.059	0.069
c	0.500	0.750	0.020	0.030
D	9.960	10.360	0.392	0.408
E	14.800	15.200	0.583	0.598
e	2.540 TYP		0.100 TYP	
e1	2.700 REF		0.106 REF	
phi	3.500 REF		0.138 REF	
h	0.000	0.300	0.000	0.012
L	28.000	28.400	1.102	1.118
L1	1.700	1.900	0.067	0.075
L2	1.900	2.100	0.075	0.083

TO-252



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.200	2.400	0.087	0.094
A1	0.000	0.127	0.000	0.005
B	1.350	1.650	0.053	0.065
b	0.500	0.700	0.020	0.028
b1	0.700	0.900	0.028	0.035
c	0.430	0.580	0.017	0.023
c1	0.430	0.580	0.017	0.023
D	6.350	6.650	0.250	0.262
D1	5.200	5.400	0.205	0.213
E	5.400	5.700	0.213	0.224
e	2.300 TYP.		0.091 TYP.	
e1	4.500	4.700	0.177	0.185
L	9.500	9.900	0.374	0.390
L1	2.550	2.900	0.100	0.114
L2	1.400	1.780	0.055	0.070
L3	0.600	0.900	0.024	0.035
V	3.800 REF.		0.150 REF.	

## IMPORTANT NOTICE

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