



BYD Microelectronics Co., Ltd.

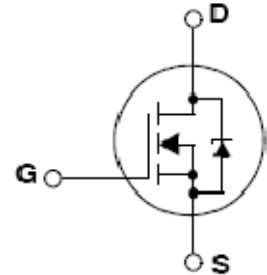
BF96N60/ BF96N60L

600V N-Channel MOSFET

General Description

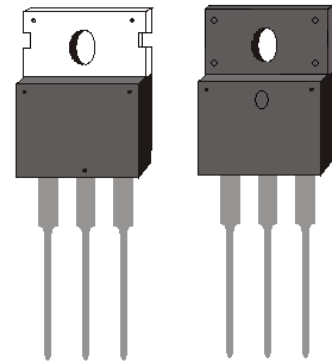
These N-Channel enhancement mode power field effect transistors are produced using DMOS technology.

This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficiency switched mode power supplies, active power factor correction, electronic lamp ballasts based on half bridge topology.



Features

- $V_{DS} = 600\text{ V}$
- $I_D = 5.5\text{ A}$
- $R_{DS(ON)} = 1.7\ \Omega$ TYP ($V_{GS} = 10\text{ V}, I_D = 2.75\text{ A}$)
- C_{RSS} (typical 7.0pF)
- Fast switching



TO220

TO220F

Absolute Maximum Ratings

Symbol	Parameter	BF96N60L	BF96N60	Unit
V_{DS}	Drain-Source Voltage	600		V
I_D	Drain Current(continuous)at $T_c=25^\circ\text{C}$	5.5		A
I_{DM}	Drain Current (pulsed) (Note1)	22		A
V_{GS}	Gate-Source Voltage	± 30		V
E_{AS}	Single Pulse Avalanche Energy (Note2)	190		mJ
I_{AR}	Avalanche Current (Note1)	5.5		A
E_{AR}	Repetitive Avalanche Energy (Note1)	12.5	4	mJ
dv/dt	Peak Diode Recovery dv/dt (Note3)	5		V/ns
P_D	Power Dissipation ($T_c = 25^\circ\text{C}$)	125	40	W
T_{stg}	Storage Temperature Range	-55 to +150		$^\circ\text{C}$
T_L	Maximum Lead Temperature for Soldering Purpose	300		$^\circ\text{C}$

**Ordering Information**

Part Number	Package	Packaging
BF96N60	TO-220F	Tube
BF96N60L	TO-220	Tube

Thermal Data

Symbol	Parameter	TO-220F	TO-220	Unit
Rthj-case	Thermal Resistance Junction-case	3.1	1.0	°C /W
Rthj-amb	Thermal Resistance Junction-ambient	62.5	62.5	°C /W

Electrical Characteristics(T_c = 25°C)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V _{(BR)DSS}	Drain-Source Breakdown Voltage	I _D =250uA, V _{GS} =0V	600			V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =600V, V _{GS} =0V			10	uA
		V _{DS} =600V, V _{GS} =0, T _c =125°C			100	uA
I _{GSS}	Gate-Body Leakage Current	V _{GS} =±30V, V _{DS} =0V			±100	nA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _D =250uA	2.0		4.0	V
R _{DS(on)}	Static Drain-Source On Resistance	V _{GS} =10V, I _D =2.75A		1.7	2.4	Ω
C _{iss}	Input Capacitance	V _{DS} =25V, f=1MHZ, V _{GS} =0V		938		pF
C _{oss}	Output Capacitance			64		pF
C _{rss}	Reverse Transfer Capacitance			7.0		pF
t _{d(on)}	Turn-On Delay Time	V _{DD} =300V, I _D =2.75A V _{GS} =10V, R _G =4.7Ω (Note4,5)		25		ns
t _r	Rise Time			15		ns
t _{d(off)}	Turn-Off Delay Time			60		ns
t _f	Fall Time			15		ns
Q _g	Total Gate Charge	V _{DD} =480V, I _D =5.5A V _{GS} =10V (Note4,5)		23.4		nC
Q _{gs}	Gate-Source Charge			8.2		nC
Q _{gd}	Gate-Drain Charge			6.4		nC
V _{SD} (*)	Forward On Voltage	I _F =5.5A, V _{GS} =0V		0.82	1.2	V
T _{rr}	Reverse Recovery Time	I _F =5.5A, di/dt=100A/us (Note4)		400		ns

Notes:

1. Repetitive Rating : Pulse width limited by maximum junction temperature
 2. L = 12mH, I_{AS} = 5.5 A, V_{DD} = 50V, R_G = 25 Ω, Starting T_J = 25°C
 3. I_{SD} ≤ 5.5A, di/dt ≤ 200A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°C
 4. Pulse Test : Pulse width ≤ 300μs, Duty cycle ≤ 2%
 5. Essentially independent of operating temperature
- (*).Pulsed:Pulse duration



Typical characteristics (25°C unless noted)

Figure 1 Output Characteristics

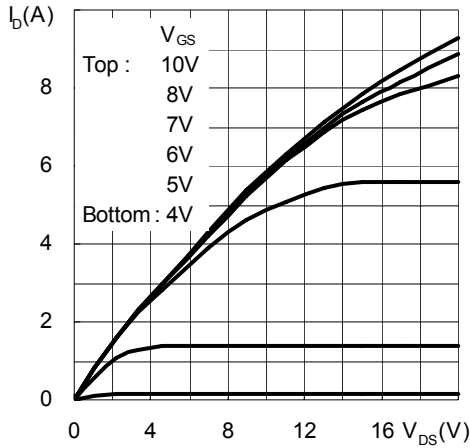


Figure 2 Transfer Characteristics

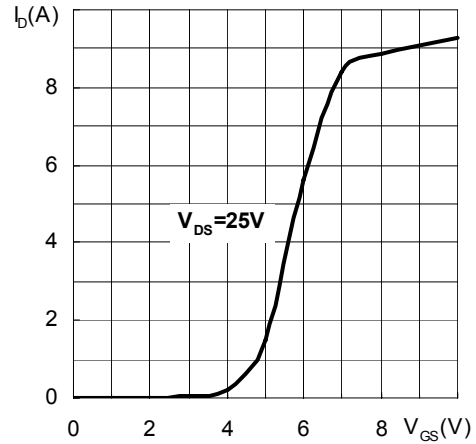


Figure 3 Normalized Threshold Voltage vs. Temperature

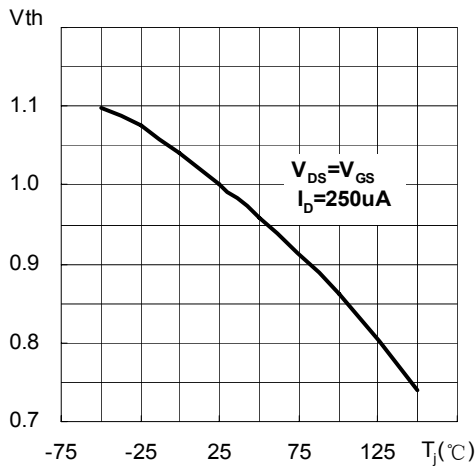


Figure 4 Normalized BV_{DSS} vs. Temperature

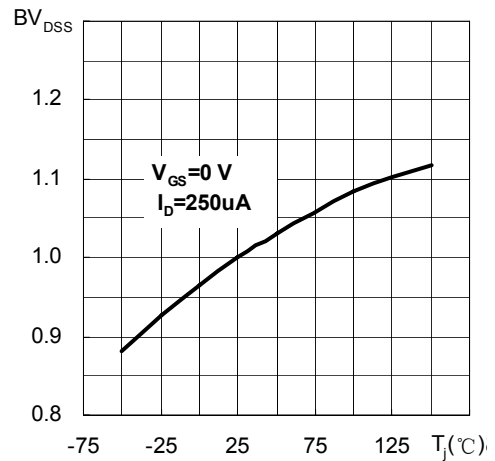


Figure 5 Normalized on Resistance vs Temperature

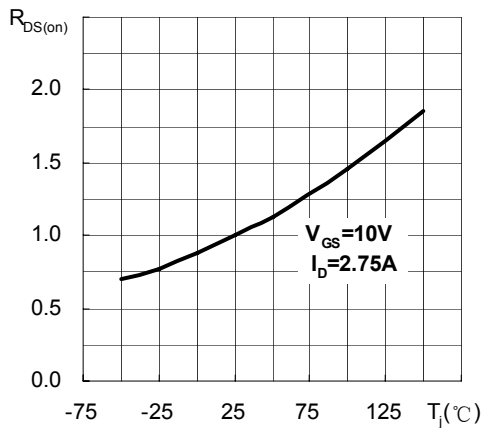


Figure 6 Source-Drain Diode Forward Characteristics

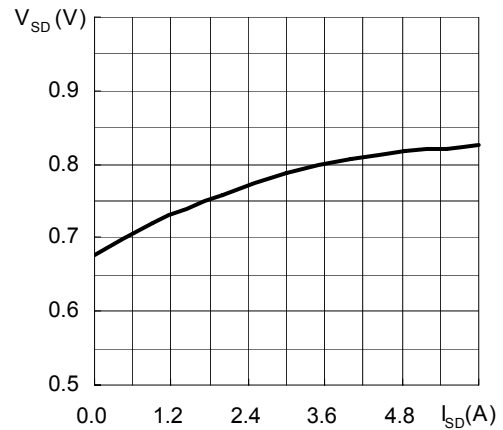




Figure 7 Capacitance

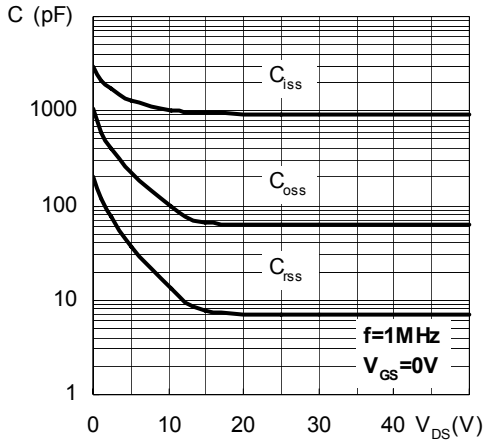


Figure 8 Gate Charge

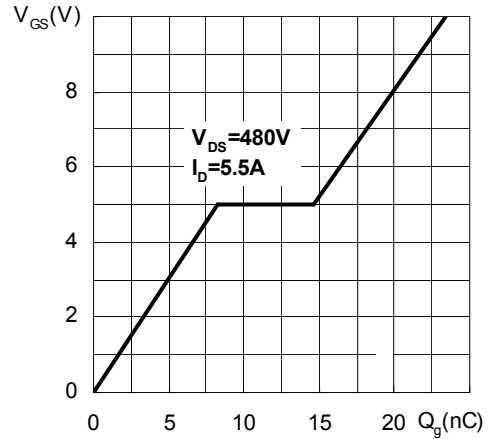


Figure 9-1 Safe Operating Area For BF96N60

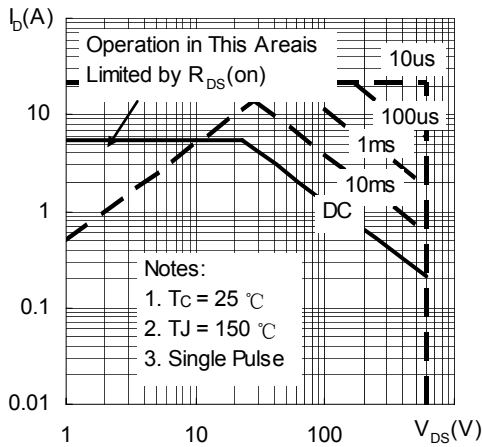


Figure 9-2 Safe Operating Area For BF96N60L

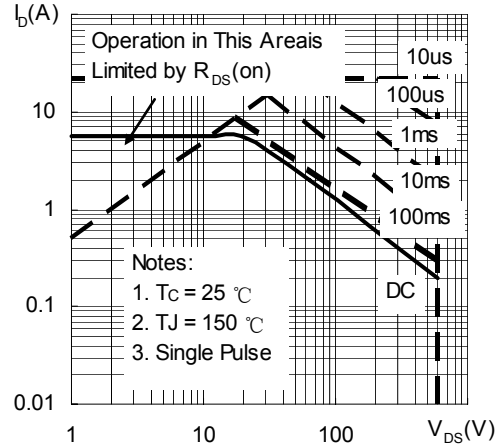


Figure 10 Maximum Drain Current vs Case Temperature

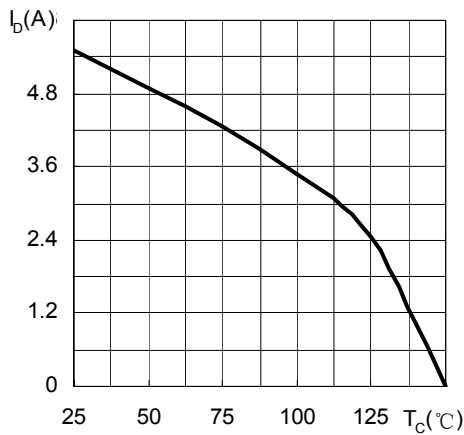


Figure 11-1 Maximum Transient Thermal Impedance For BF96N60

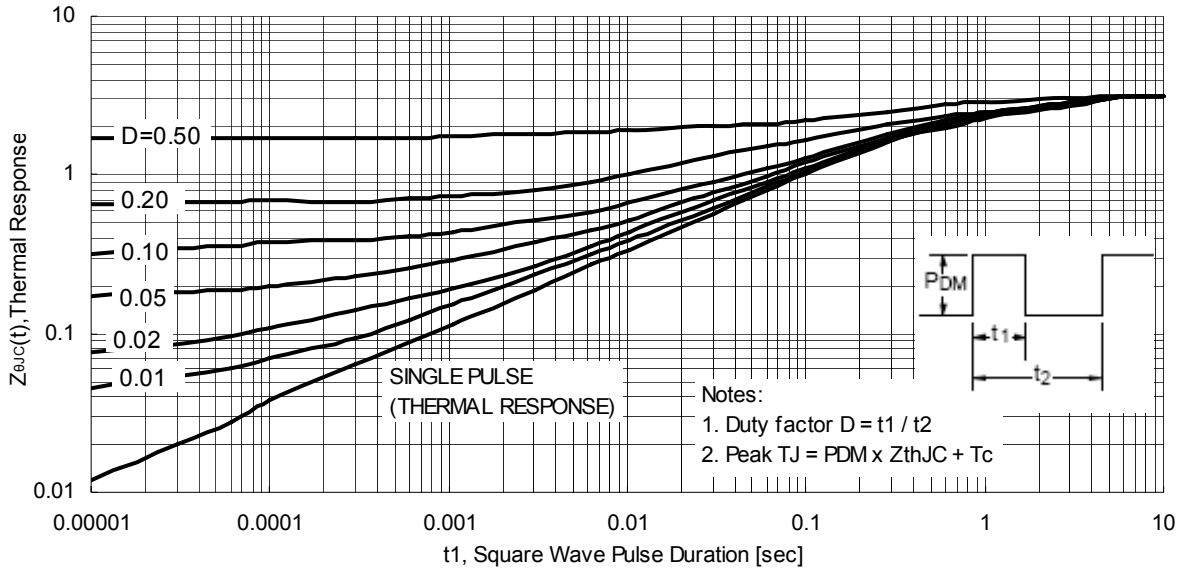
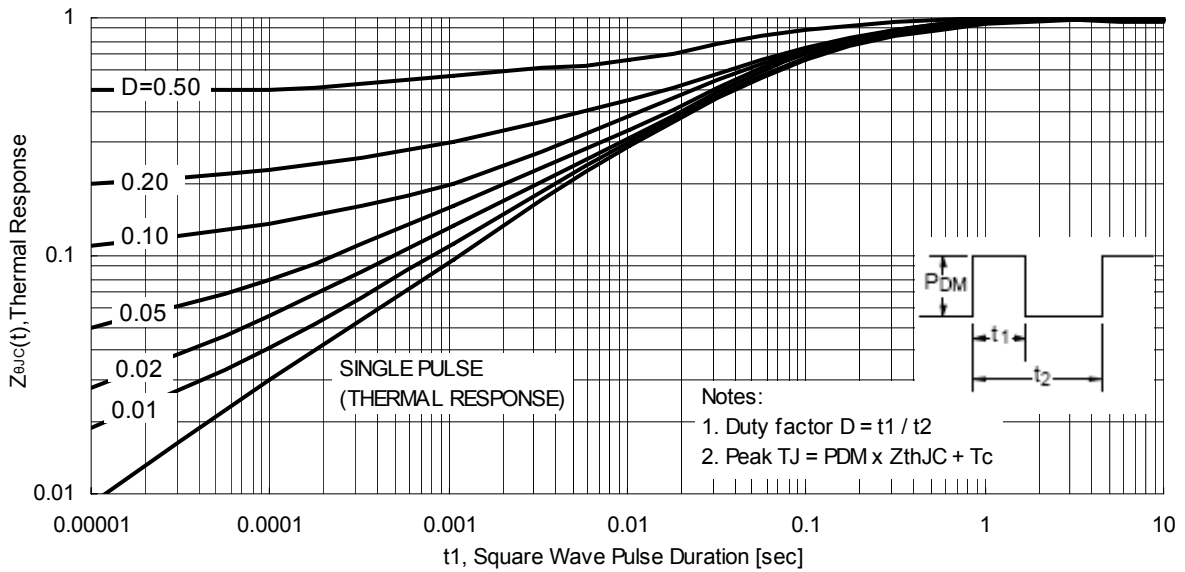
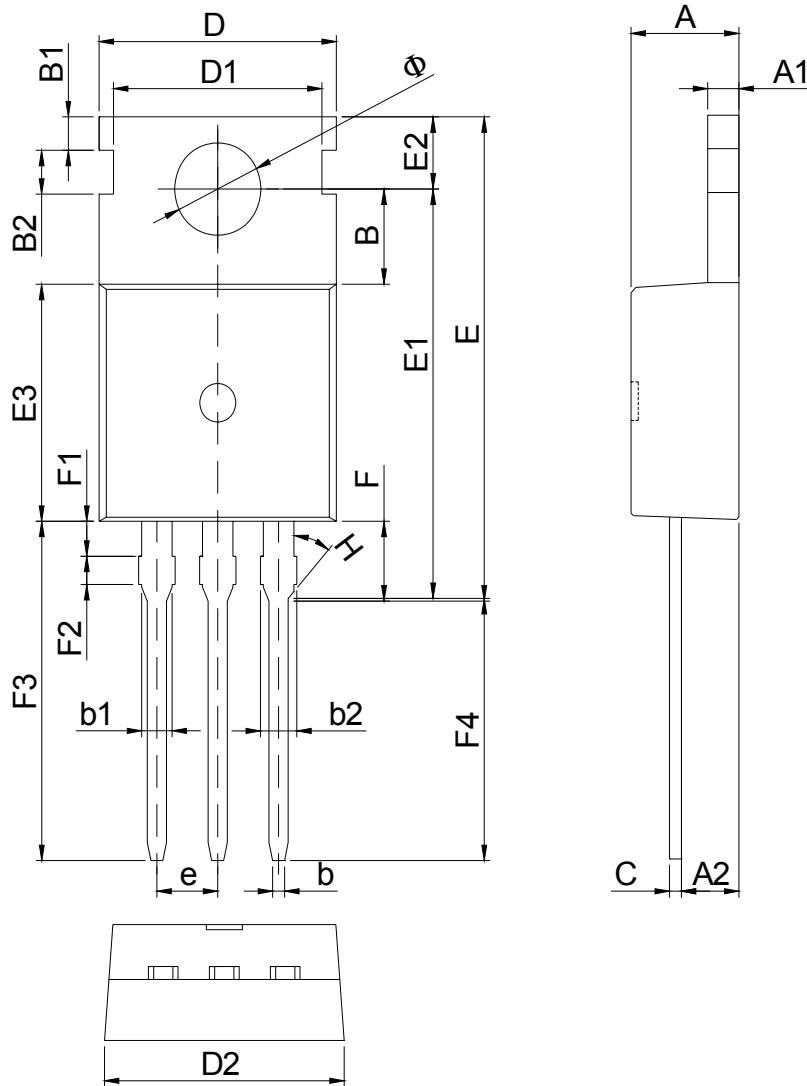


Figure 11-2 Maximum Transient Thermal Impedance For BF96N60L





Package Drawing
TO-220

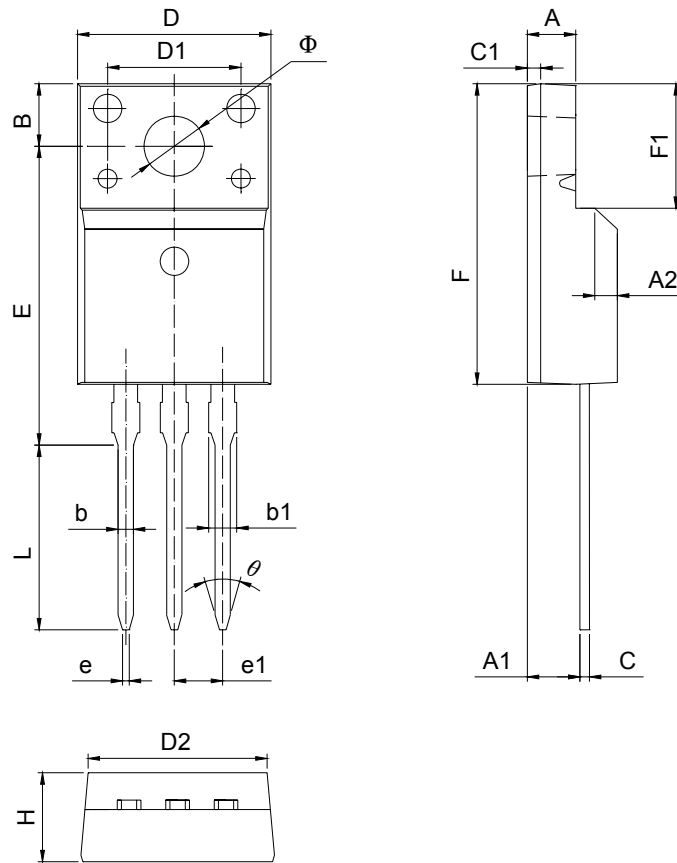




Symbol	Dimensions In Millimeters			Dimensions In Inches		
	Min	Nom	Max	Min	Nom	Max
A	4.45	4.50	4.55	0.175	0.177	0.179
A1	1.25	1.30	1.35	0.049	0.051	0.053
A2	2.20	2.40	2.60	0.087	0.094	0.102
B	-	3.70	-	-	0.146	-
B1	-	1.30	-	-	0.051	-
B2	-	1.70	-	-	0.067	-
b	0.70	0.80	0.90	0.028	0.031	0.035
b1	1.25	1.27	1.29	0.049	0.050	0.051
b2	1.42	1.52	1.62	0.056	0.060	0.064
C	0.45	0.50	0.55	0.018	0.020	0.022
D	9.85	9.90	9.95	0.388	0.390	0.392
D1	-	8.70	-	-	0.343	-
D2	9.98	10.00	10.02	0.393	0.394	0.394
E	-	-	18.95	-	-	0.746
E1	-	15.90	-	-	0.626	-
E2	-	2.80	-	-	0.110	-
E3	-	9.20	-	-	0.362	-
e	2.54 TYP			0.1 BSC		
F	-	3.00	-	-	0.118	-
F1	-	1.36	-	-	0.054	-
F2	-	1.10	-	-	0.043	-
F3	-	13.08	-	-	0.515	-
F4	10.03	10.08	10.13	0.395	0.397	0.399
φ	2.58	3.60	3.62	0.102	0.142	0.143
H	45°			45°		



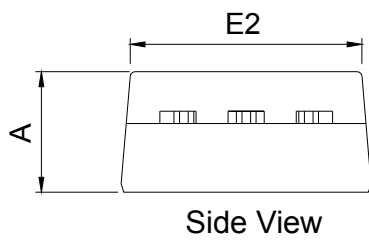
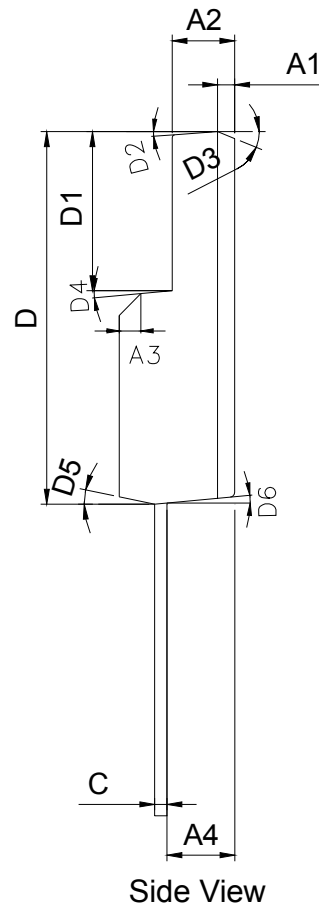
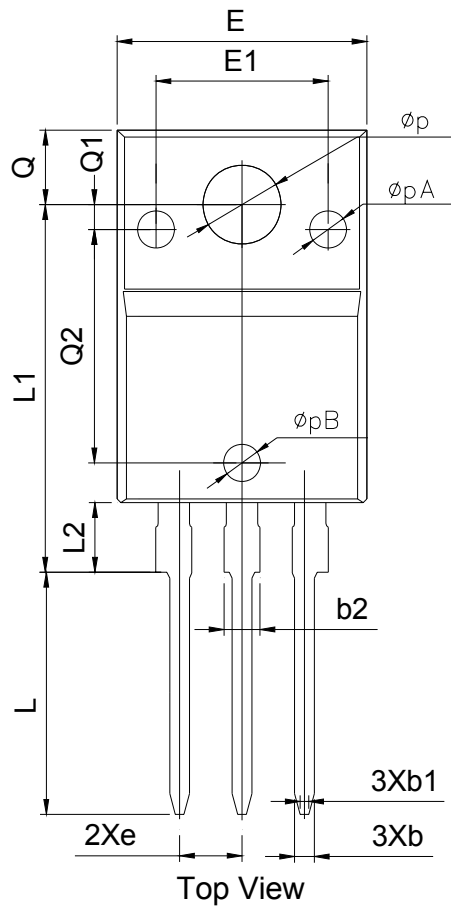
TO-220F(A)



Symbol	Dimensions In Millimeters			Dimensions In Inches		
	Min	Nom	Max	Min	Nom	Max
A	-	2.54	-	-	0.100	-
A1	-	2.76	-	-	0.109	-
A2	1.10*45°			1.10*45°		
B	-	3.3	-	-	0.130	-
b	0.78	0.80	0.82	0.031	0.031	0.032
b1	-	-	1.45	-	-	0.057
C	0.48	0.50	0.52	0.019	0.020	0.020
C1	-	0.70	-	-	0.028	-
D	10.15	10.16	10.17	0.400	0.400	0.400
D1	-	7.00	-	-	0.276	-
D2	-	9.32	-	-	0.367	-
e1	2.54 TYP			0.1 BSC		
e	0.30	0.35	0.40	0.012	0.014	0.016
E	15.52	15.57	15.62	0.611	0.613	0.615
F	15.55	15.60	15.65	0.612	0.614	0.616
F1	-	6.68	-	-	0.263	-
L	9.75	9.80	9.85	0.384	0.386	0.388
H	4.55	4.60	4.65	0.179	0.181	0.183
ϕ	3.19	3.24	3.29	0.126	0.128	0.130
θ	30°			30°		



TO-220F(B)





Symbol	Dimensions In Millimeters			Dimensions In Inches		
	Min	Nom	Max	Min	Nom	Max
A	4.50	4.70	4.90	0.177	0.185	0.193
A1	-	0.70	-	-	0.028	-
A2	2.34	2.54	2.74	0.092	0.100	0.108
A3	-	-	-	-	-	-
A4	2.66	2.76	2.86	0.105	0.109	0.113
b	0.70	0.80	0.90	0.028	0.031	0.035
b1	0.25	0.35	0.45	0.010	0.014	0.018
b2	-	-	1.47	-	-	0.058
C	0.40	0.50	0.60	0.016	0.020	0.024
D	14.80	15.00	15.20	0.583	0.591	0.598
D1	6.20	6.40	6.60	0.244	0.252	0.260
D2	-	-	-	-	-	-
D3	-	-	-	-	-	-
D4	-	-	-	-	-	-
D5	-	-	-	-	-	-
D6	-	-	-	-	-	-
e	2.54 BSC			0.1 BSC		
E	9.96	10.16	10.36	0.392	0.400	0.408
E1	-	-	-	-	-	-
E2	9.26	9.46	9.66	0.365	0.372	0.380
L	9.55	9.75	9.95	0.376	0.384	0.392
L1	14.60	14.80	15.00	0.575	0.583	0.591
L2	2.60	2.80	3.00	0.102	0.110	0.118
Q	2.90	3.00	3.10	0.114	0.118	0.122
Q1	-	-	-	-	-	-
Q2	-	-	-	-	-	-
∅P	3.08	3.18	3.28	0.121	0.125	0.129
∅PA	-	-	-	-	-	-
∅PB	-	-	-	-	-	-



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