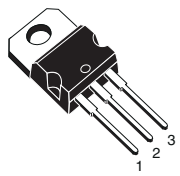
IRF634
IRF634FP

N-channel 250V - 0.38Ω - 8A TO-220 /TO-220FP
Mesh Overlay™ Power MOSFET

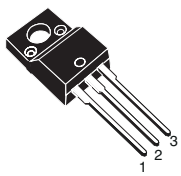
General features

Type	V_{DSS}	$R_{DS(on)}$	I_D
IRF634	250V	<0.45Ω	8 A
IRF634FP	250V	<0.45Ω	8 A

- Extremely High dv/dt Capability
- 100% Avalanche Tested



TO-220

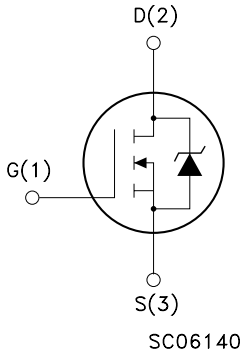


TO-220FP

Description

Using the latest high voltage MESH OVERLAY™ process, STMicroelectronics has designed an advanced family of power MOSFETs with outstanding performance. The new patented STrip layout coupled with the Company's proprietary edge termination structure, makes it suitable in coverters for lighting applications.

Internal schematic diagram



Applications

- Switching application

Order codes

Part number	Marking	Package	Packaging
IRF634	IRF634	TO-220	Tube
IRF634FP	IRF634FP	TO-220FP	Tube

Contents

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value		Unit
		IRF634	IRF634FP	
V_{DS}	Drain-source voltage (V_{GS} = 0)	250		V
V_{DGR}	Drain-gate voltage (R_{GS} = 20 kΩ)	250		V
V_{GS}	Gate- source voltage	± 20		V
I_D	Drain current (continuos) at T_C = 25°C	8	8(1)	A
I_D	Drain current (continuos) at T_C = 100°C	5	5(1)	A
I_{DM} (2)	Drain current (pulsed)	32	32(1)	A
P_{TOT}	Total dissipation at T_C = 25°C	80	30	W
	Derating factor	0.64	0.24	W/°C
dv/dt (3)	Peak diode recovery voltage slope	5		V/ns
V_{ISO}	Insulation withstand voltage (DC)	-	2000	V
T_{stg}	Storage temperature	–65 to 150		°C
T_j	Max. operating junction temperature	150		°C

1. Limited only by maximum temperature allowed
2. Pulse width limited by safe operating area
3. I_{SD} ≤8A, di/dt ≤300 A/ms, V_{DD} ≤$V_{(BR)DSS}$, Tj ≤T_{jmax}

Table 2. Thermal data

		TO-220	TO-220FP	
Rthj-case	Thermal resistance junction-case max	1.56	4.11	°C/W
Rthj-amb	Thermal resistance junction-ambient max	62.5		°C/W
T_l	Maximum lead temperature for soldering purpose	300		°C

Table 3. Avalanche characteristics

Symbol	Parameter	Max value	Unit
I_{AR}	Avalanche current, repetitive or not-repetitive (pulse width limited by Tj max)	8	A
E_{AS}	Single pulse avalanche energy (starting T_j = 25°C, I_D = I_{AR}, V_{DD} = 50 V)	300	mJ

2 Electrical characteristics

(T_{CASE}=25°C unless otherwise specified)

Table 4. On/off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA, V_{GS} = 0	250			V
I_{DSS}	Zero gate voltage drain current (V_{GS} = 0)	V_{DS} = max rating V_{DS} = max rating, T_C = 125 °C			1 10	µA µA
I_{GSS}	Gate-body leakage current (V_{DS} = 0)	V_{GS} = ±20V			±100	nA
$V_{GS(th)}$	Gate threshold voltage	V_{DS} = V_{GS}, I_D = 250µA	2	3	4	V
$R_{DS(on)}$	Static drain-source on resistance	V_{GS} = 10V, I_D = 4 A		0.38	0.45	Ω

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
g_{fs} (1)	Forward transconductance	V_{DS} > $I_{D(on)}$ x $R_{DS(on)max}$, I_D = 4A	7	8		S
C_{iss} C_{oss} C_{rss}	Input capacitance Output capacitance Reverse transfer capacitance	V_{DS} = 25V, f = 1MHz, V_{GS} = 0		770 118 48		pF pF
$t_{d(on)}$ t_r $t_{d(Voff)}$ t_f	Turn-on delay time Rise time Turn-off- delay time Fall time	V_{DD} = 125V, I_D = 4A R_G = 4.7Ω V_{GS} = 10V		13 18 51 16		ns ns ns ns
Q_g Q_{gs} Q_{gd}	Total gate charge Gate-source charge Gate-drain charge	V_{DD} = 200V, I_D = 8A, V_{GS} = 10V		37 5.2 14.8	51.8	nC nC nC

1. Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %.

Table 6. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM} (1)	Source-drain current Source-drain Current (pulsed				8 32	A A
V_{SD} (2)	Forward on voltage	I_{SD} = 8 A, V_{GS} = 0			1.7	V
t_{rr} Q_{rr} I_{RRM}	Reverse recovery time Reverse recovery charge Reverse recovery current	I_{SD} = 8A, di/dt = 100A/µs V_{DD} = 30V, T_j = 150°C		198 1.1 11.3		ns nC A

1. Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %
2. Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %

2.1 Electrical characteristics (curves)

Figure 1. Safe operating area for TO-220/ DPAK/ D²PAK

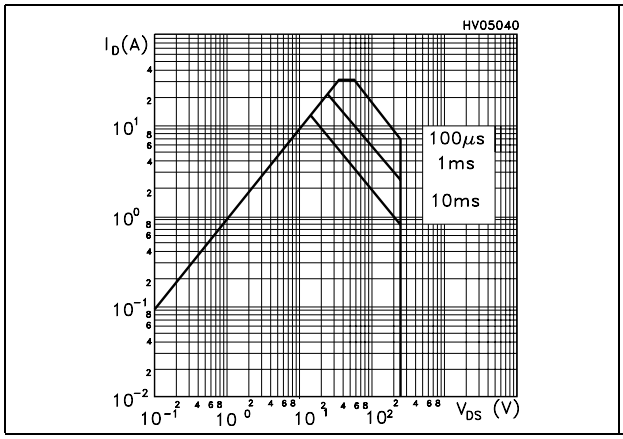


Figure 2. Thermal impedance for TO-220/ DPAK/ D²PAK

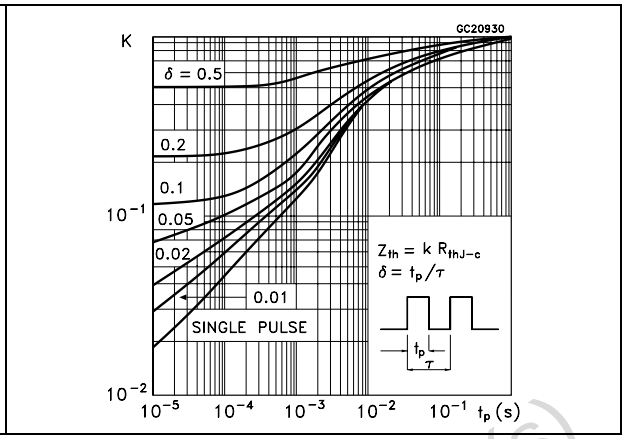


Figure 3. Safe operating area for TO-220FP

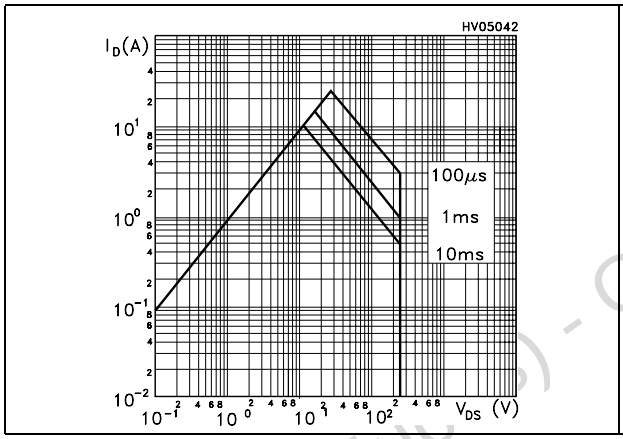


Figure 4. Thermal impedance for TO-220FP

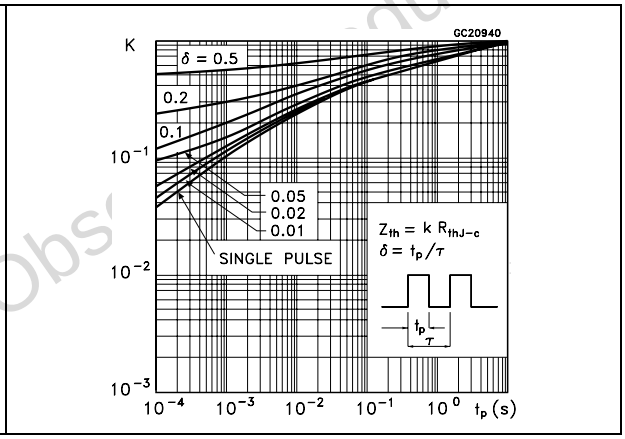


Figure 5. Output characterisics

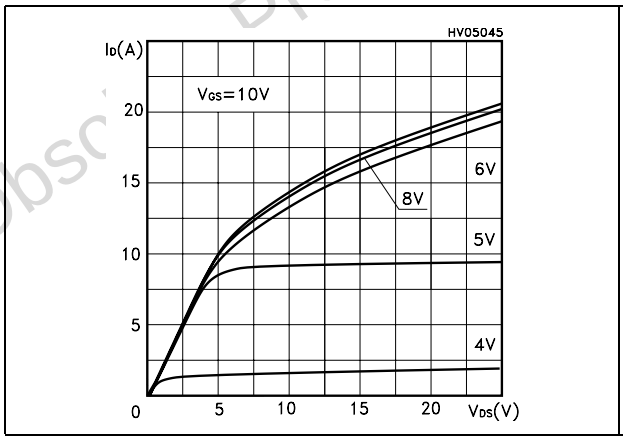


Figure 6. Transfer characteristics

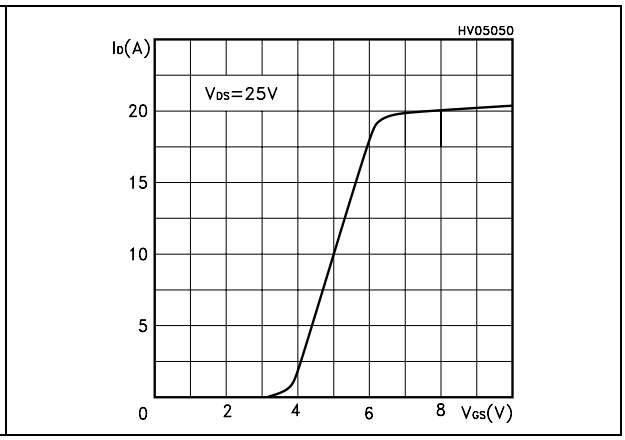


Figure 7. Transconductance

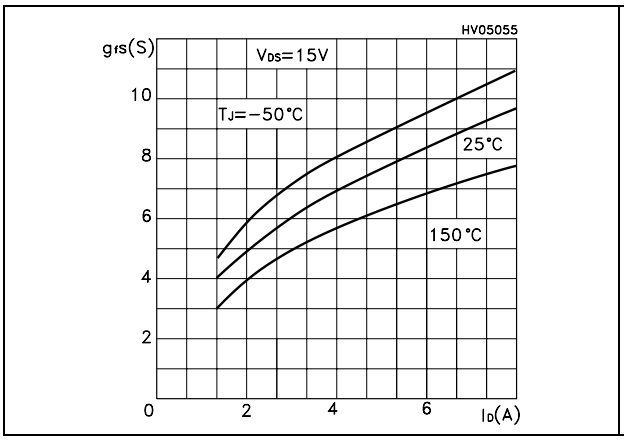


Figure 8. Static drain-source on resistance

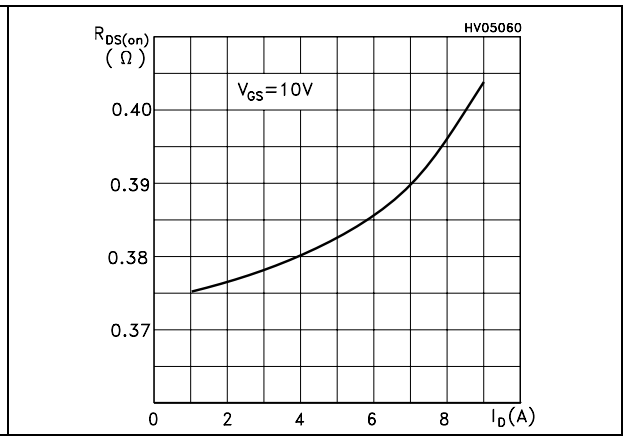


Figure 9. Gate charge vs gate-source voltage

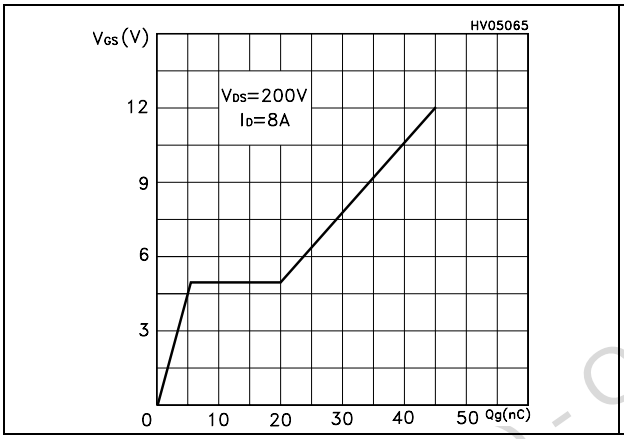


Figure 10. Capacitance variations

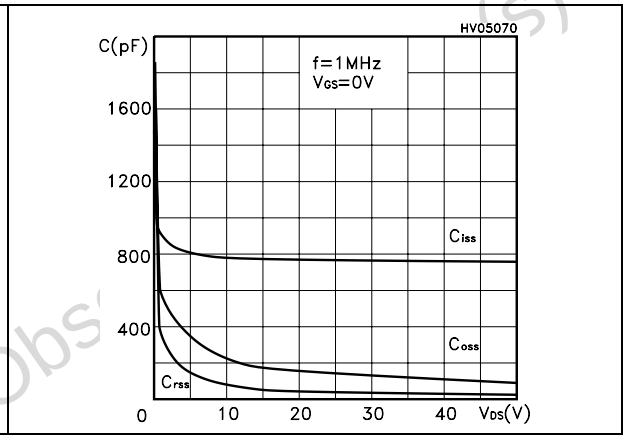


Figure 11. Normalized gate threshold voltage vs temperature

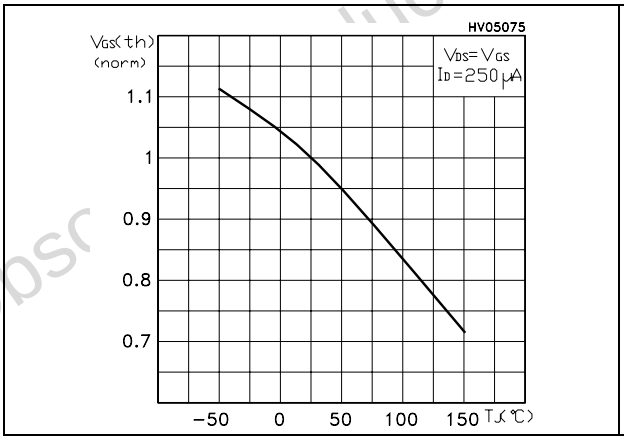


Figure 12. Normalized on resistance vs temperature

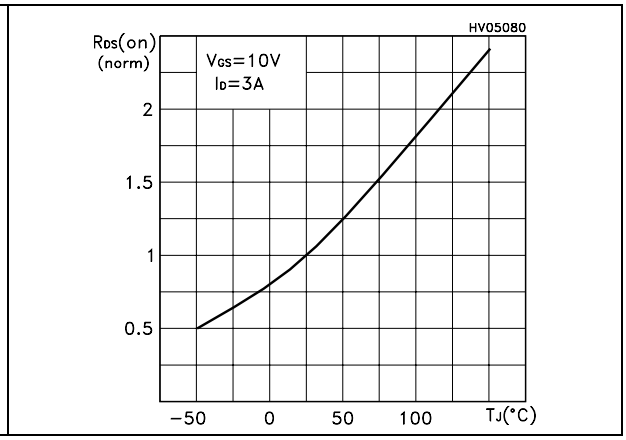
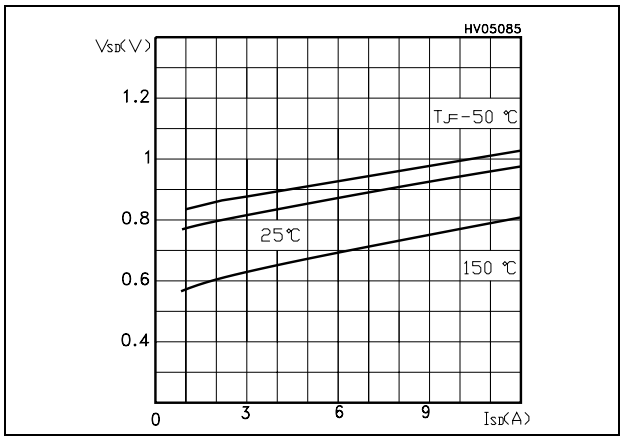


Figure 13. Source-drain diode forward characteristics



3 Test circuit

Figure 14. Unclamped Inductive load test circuit

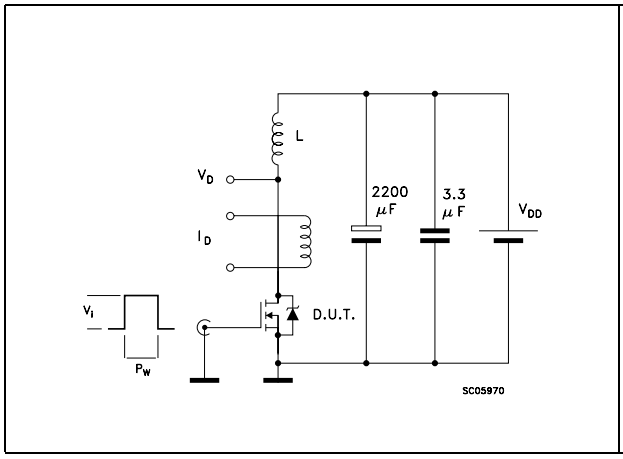


Figure 15. Unclamped inductive waveform

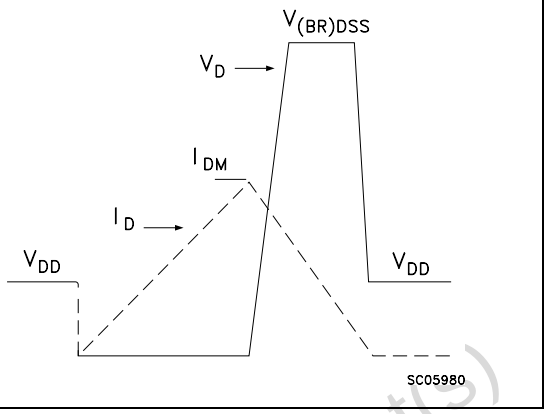


Figure 16. Switching times test circuit for resistive load

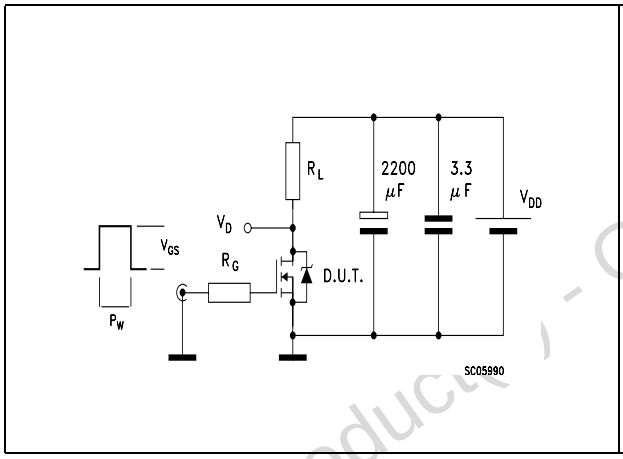


Figure 17. Gate charge test circuit

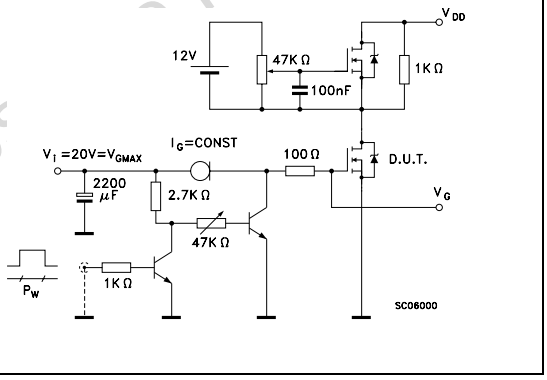
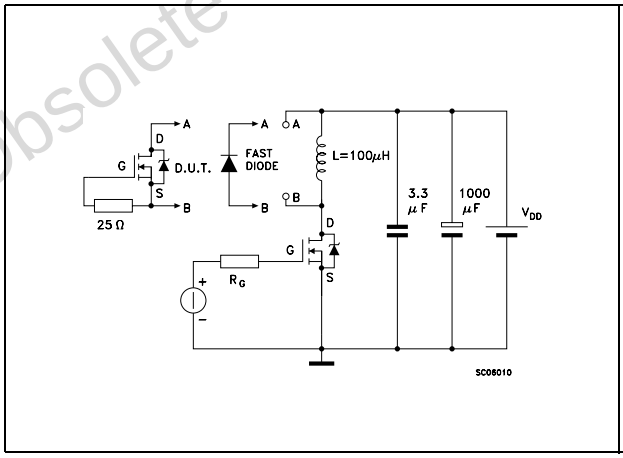


Figure 18. Test circuit for inductive load switching and diode recovery times

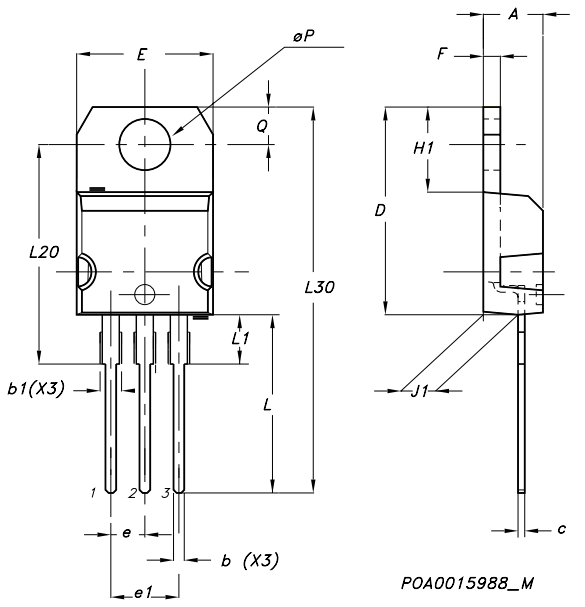


4 Package mechanical data

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a Lead-free second level interconnect . The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: www.st.com

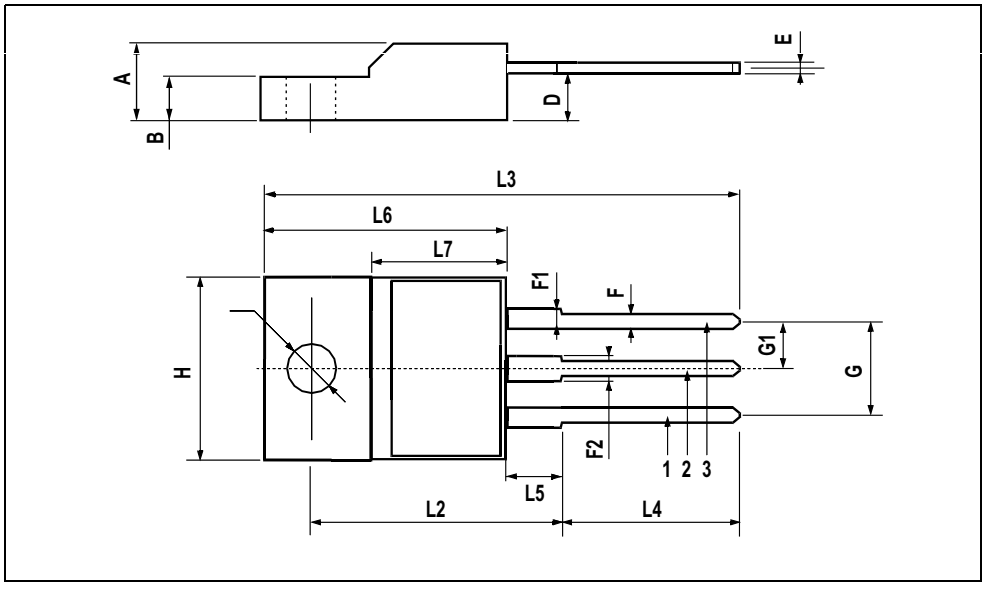
TO-220 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	4.40		4.60	0.173		0.181
b	0.61		0.88	0.024		0.034
b1	1.15		1.70	0.045		0.066
c	0.49		0.70	0.019		0.027
D	15.25		15.75	0.60		0.620
E	10		10.40	0.393		0.409
e	2.40		2.70	0.094		0.106
e1	4.95		5.15	0.194		0.202
F	1.23		1.32	0.048		0.052
H1	6.20		6.60	0.244		0.256
J1	2.40		2.72	0.094		0.107
L	13		14	0.511		0.551
L1	3.50		3.93	0.137		0.154
L20		16.40			0.645	
L30		28.90			1.137	
øP	3.75		3.85	0.147		0.151
Q	2.65		2.95	0.104		0.116



TO-220FP MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
B	2.5		2.7	0.098		0.106
D	2.5		2.75	0.098		0.108
E	0.45		0.7	0.017		0.027
F	0.75		1	0.030		0.039
F1	1.15		1.7	0.045		0.067
F2	1.15		1.7	0.045		0.067
G	4.95		5.2	0.195		0.204
G1	2.4		2.7	0.094		0.106
H	10		10.4	0.393		0.409
L2		16			0.630	
L3	28.6		30.6	1.126		1.204
L4	9.8		10.6	.0385		0.417
L5	2.9		3.6	0.114		0.141
L6	15.9		16.4	0.626		0.645
L7	9		9.3	0.354		0.366
Ø	3		3.2	0.118		0.126



5 Revision history

Table 7. Document revision history

Date	Revision	Changes
21-Jun-2004	1	Preliminary version
28-Jun-2006	2	New template, no content change

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