



# IRF634 IRF634FP

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

## General features

Type	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
IRF634	250V	<0.45Ω	8 A
IRF634FP	250V	<0.45Ω	8 A

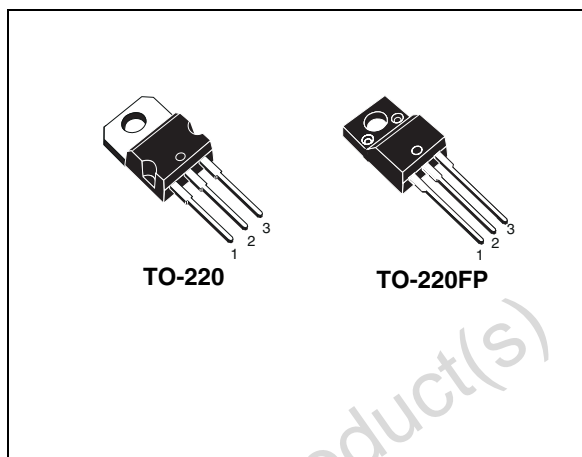
- Extremely High dv/dt Capability
- 100% Avalanche Tested

## Description

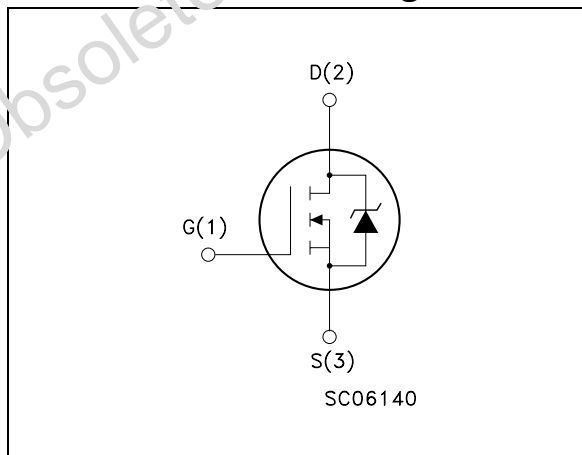
Using the latest high voltage MESH OVERLAY™ process, STMicroelectronics has designed an advanced family of power MOSFETs with outstanding performance. The new patented STrip layout coupled with the Company's proprietary edge termination structure, makes it suitable in converters for lighting applications.

## Applications

- Switching application



## Internal schematic diagram



## Order codes

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

# Contents

<b>1</b>	<b>Electrical ratings</b> .....	<b>3</b>
<b>2</b>	<b>Electrical characteristics</b> .....	<b>4</b>
	2.1 Electrical characteristics (curves) .....	6
<b>3</b>	<b>Test circuit</b> .....	<b>9</b>
<b>4</b>	<b>Package mechanical data</b> .....	<b>10</b>
<b>5</b>	<b>Revision history</b> .....	<b>13</b>

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# 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 ( $R_{GS} = 20 \text{ k}\Omega$ )	250		V
$V_{GS}$	Gate- source voltage	$\pm 20$		V
$I_D$	Drain current (continuous) at $T_C = 25^\circ\text{C}$	8	8 <sup>(1)</sup>	A
$I_D$	Drain current (continuous) at $T_C = 100^\circ\text{C}$	5	5 <sup>(1)</sup>	A
$I_{DM}^{(2)}$	Drain current (pulsed)	32	32 <sup>(1)</sup>	A
$P_{TOT}$	Total dissipation at $T_C = 25^\circ\text{C}$	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

- Limited only by maximum temperature allowed
- Pulse width limited by safe operating area
- $I_{SD} \leq 8\text{A}$ ,  $di/dt \leq 300 \text{ A/ms}$ ,  $V_{DD} \leq V_{(BR)DSS}$ ,  $T_j \leq T_{jmax}$

**Table 2. Thermal data**

		TO-220	TO-220FP	
$R_{thj-case}$	Thermal resistance junction-case max	1.56	4.11	°C/W
$R_{thj-amb}$	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 $T_j$ max)	8	A
$E_{AS}$	Single pulse avalanche energy (starting $T_j = 25^\circ\text{C}$ , $I_D = I_{AR}$ , $V_{DD} = 50 \text{ V}$ )	300	mJ

## 2 Electrical characteristics

( $T_{CASE}=25^{\circ}C$  unless otherwise specified)

**Table 4. On/off states**

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

**Table 5. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$g_{fs}^{(1)}$	Forward transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max},$ $I_D = 4A$	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	$V_{DD} = 125V, I_D = 4A$ $R_G = 4.7\Omega, V_{GS} = 10V$		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  $\mu s$ , 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	$I_{SD} = 8 \text{ A}, V_{GS} = 0$			1.7	V
$t_{rr}$ $Q_{rr}$ $I_{RRM}$	Reverse recovery time Reverse recovery charge Reverse recovery current	$I_{SD} = 8 \text{ A}, di/dt = 100 \text{ A}/\mu\text{s}$ $V_{DD} = 30 \text{ V}, T_j = 150^\circ\text{C}$		198 1.1 11.3		ns nC A

1. Pulsed: Pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5 %

2. Pulsed: Pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5 %

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## 2.1 Electrical characteristics (curves)

Figure 1. Safe operating area for TO-220/ DPAK/ D<sup>2</sup>PAK

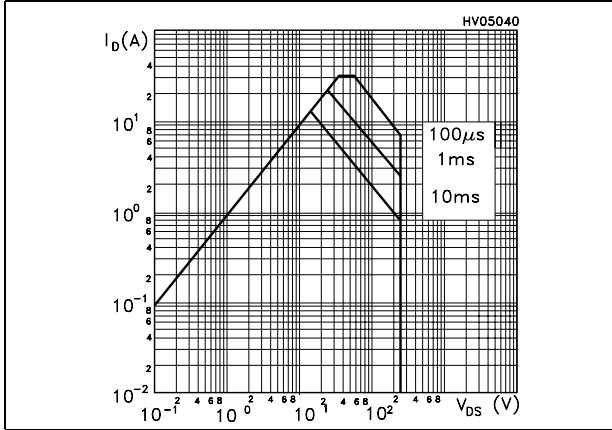


Figure 2. Thermal impedance for TO-220/ DPAK/ D<sup>2</sup>PAK

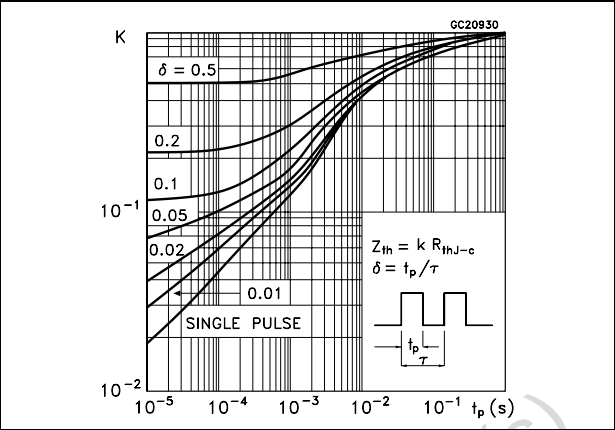


Figure 3. Safe operating area for TO-220FP

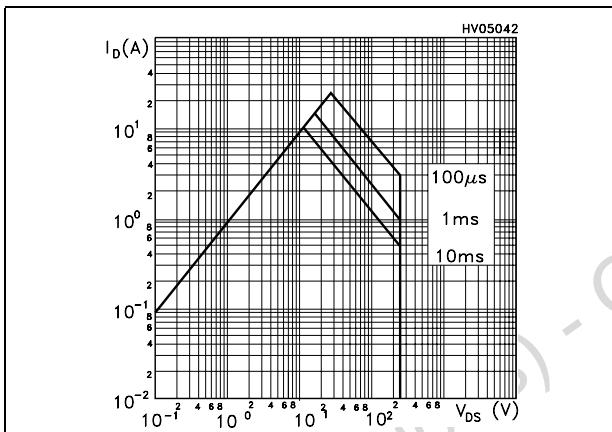


Figure 4. Thermal impedance for TO-220FP

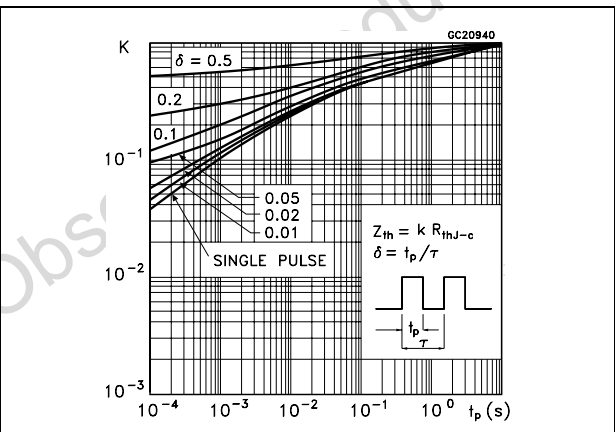


Figure 5. Output characteristics

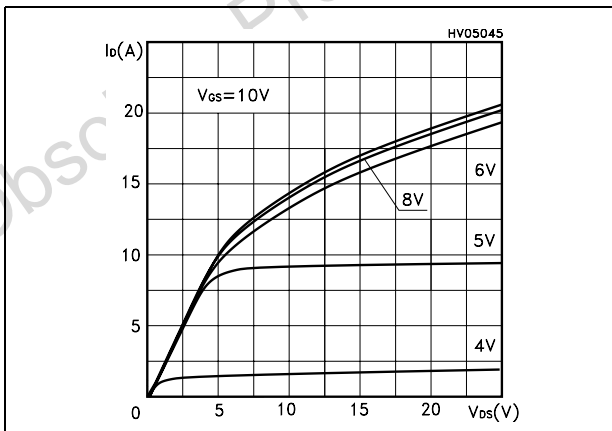


Figure 6. Transfer characteristics

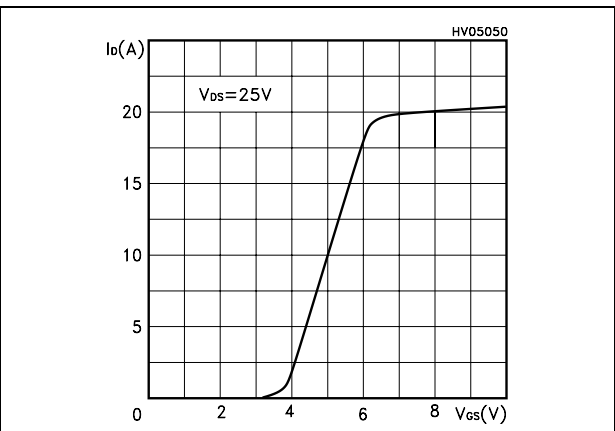


Figure 7. Transconductance

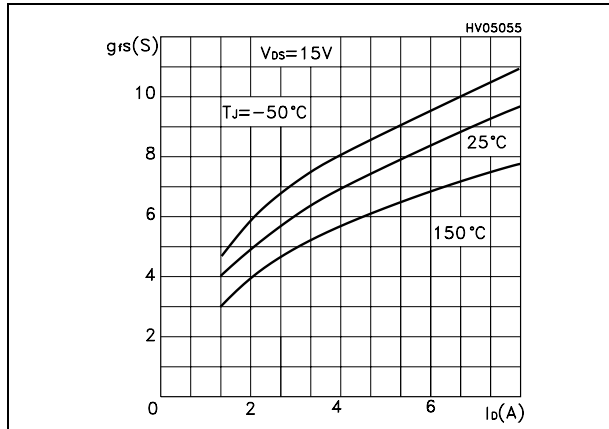


Figure 8. Static drain-source on resistance

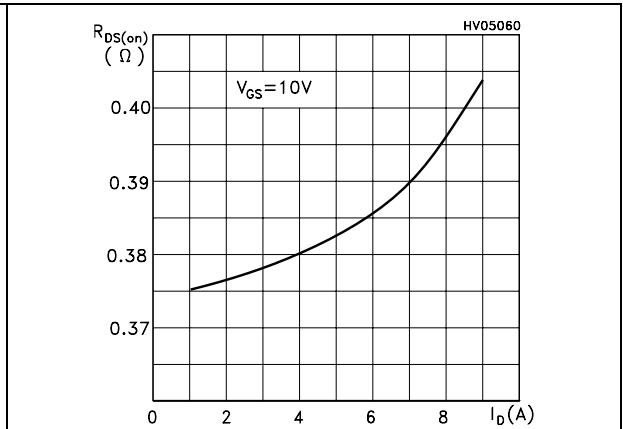


Figure 9. Gate charge vs gate-source voltage Figure 10. Capacitance variations

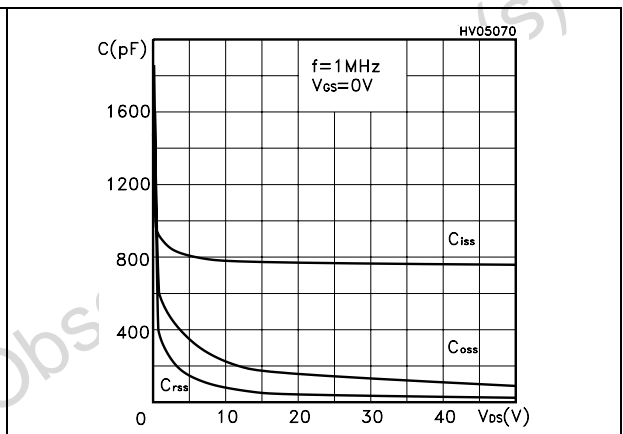
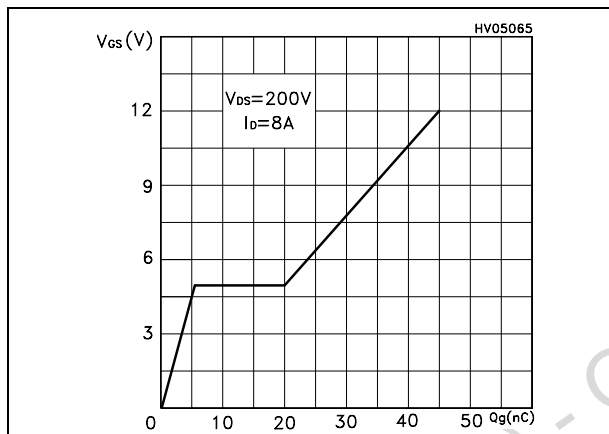


Figure 11. Normalized gate threshold voltage vs temperature

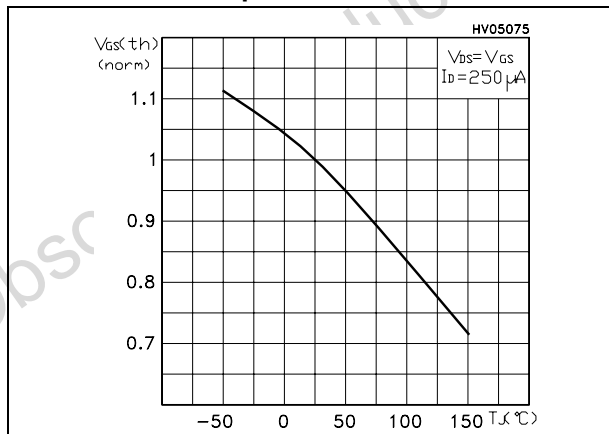
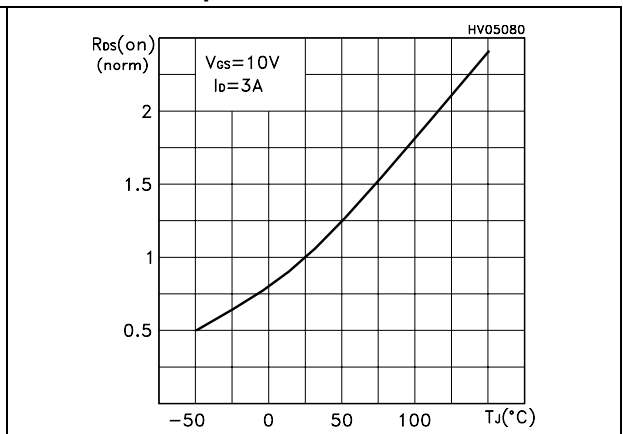
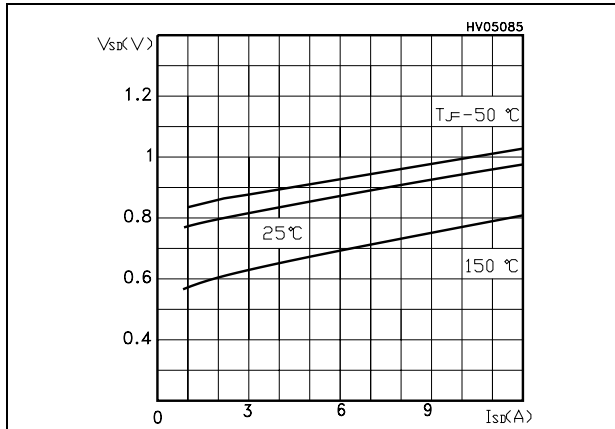


Figure 12. Normalized on resistance vs temperature



**Figure 13. Source-drain diode forward characteristics**



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### 3 Test circuit

Figure 14. Unclamped Inductive load test circuit

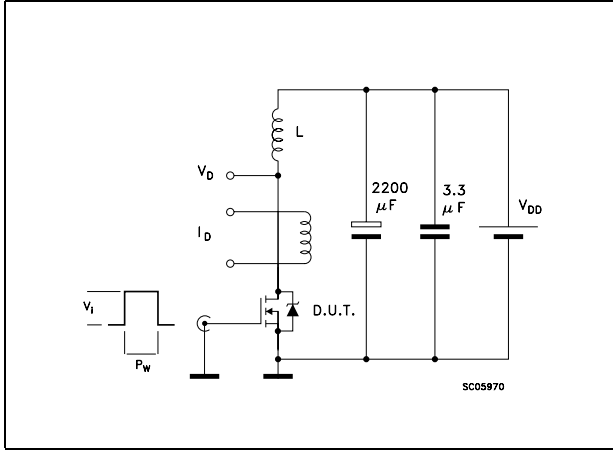


Figure 15. Unclamped inductive waveform

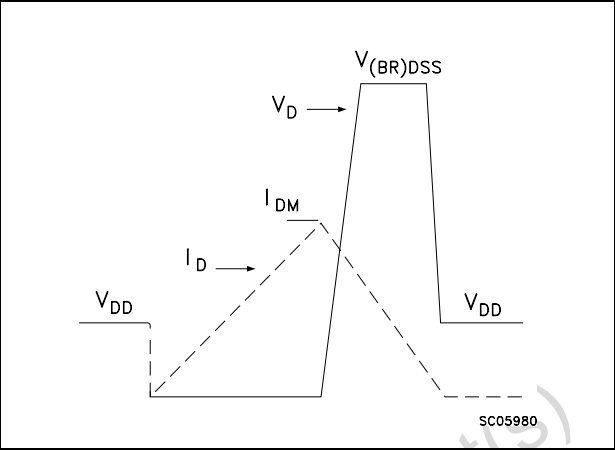


Figure 16. Switching times test circuit for resistive load

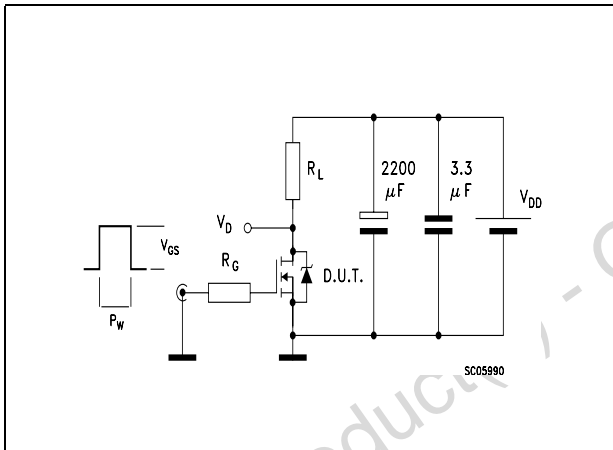


Figure 17. Gate charge test circuit

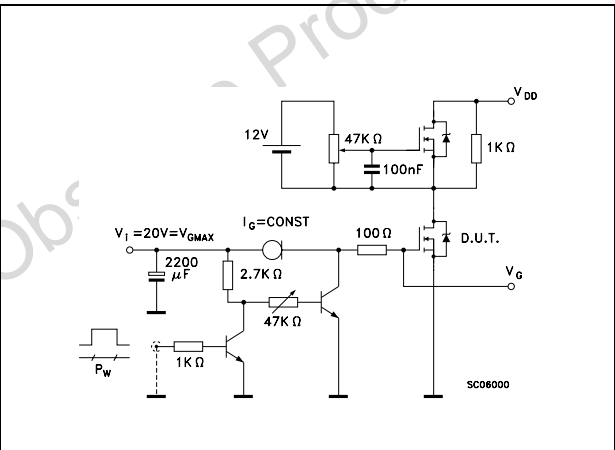
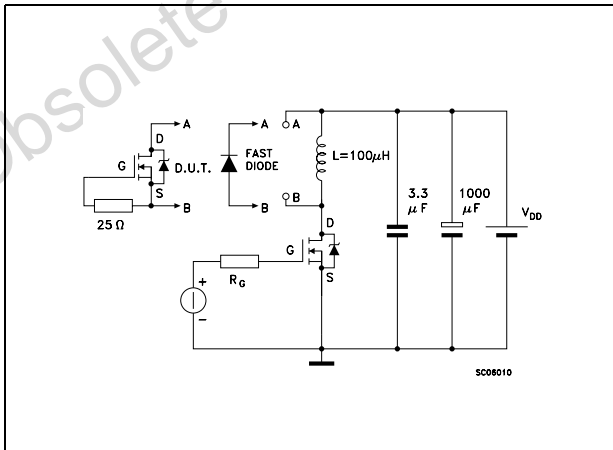


Figure 18. Test circuit for inductive load switching and diode recovery times



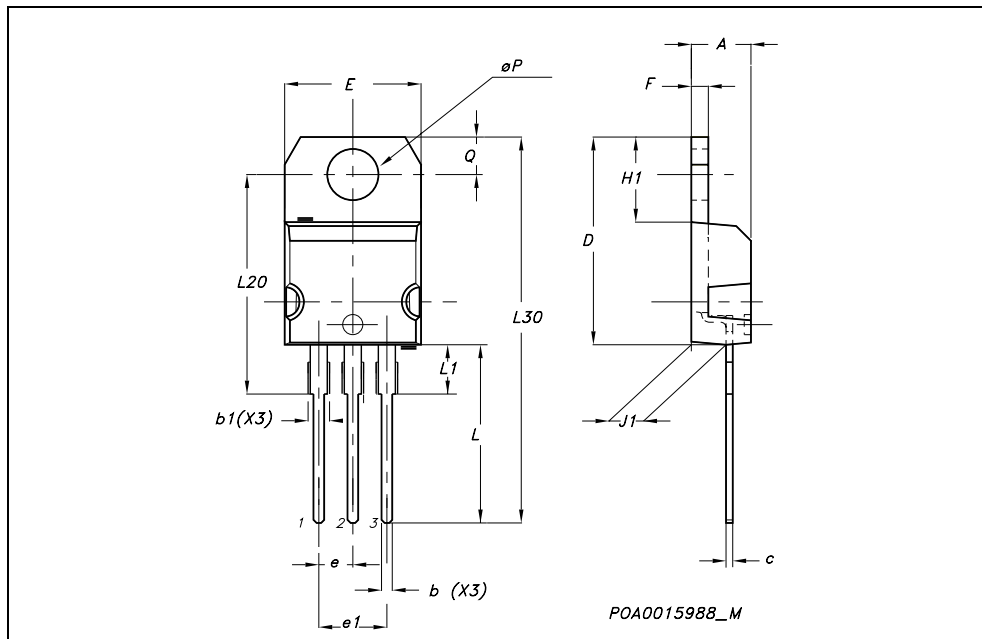
## 4 Package mechanical data

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](http://www.st.com)

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**TO-220 MECHANICAL DATA**

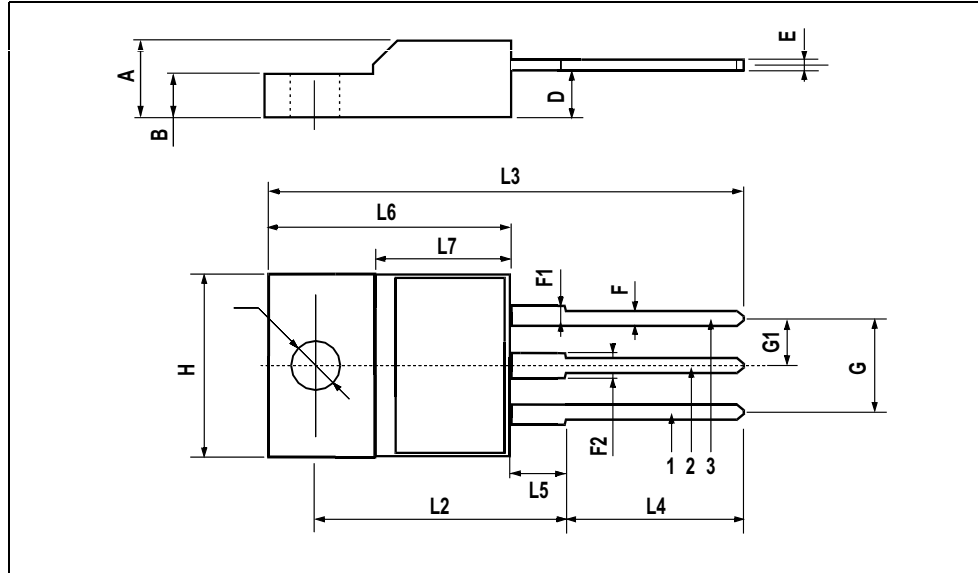
DIM.	mm.			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.40		4.60	0.173		0.181
b	0.61		0.88	0.024		0.034
b1	1.15		1.70	0.045		0.066
c	0.49		0.70	0.019		0.027
D	15.25		15.75	0.60		0.620
E	10		10.40	0.393		0.409
e	2.40		2.70	0.094		0.106
e1	4.95		5.15	0.194		0.202
F	1.23		1.32	0.048		0.052
H1	6.20		6.60	0.244		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



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**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



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## 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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