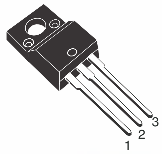
STGF10NB60SD

N-channel 10A - 600V - TO-220FP PowerMESH™ IGBT

General features

Type	V_{CES}	$V_{CE(sat)}$ (Max)@ 25°C	I_C @100°C
STGF10NB60SD	600V	<1.8V	7A

- Hight input impedance (voltage driven)
- Low on-voltage drop
- High current capability
- Co-packaged with turboswitch™ antiparallel diode

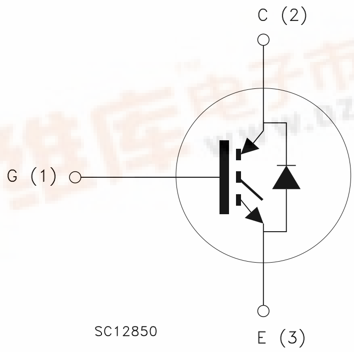


TO-220FP

Description

Using the latest high voltage technology based on a patented strip layout, STMicroelectronics has designed an advanced family of IGBTs, the PowerMESH™ IGBTs, with outstanding performances. The suffix "S" identifies a family optimized achieve minimum on-voltage drop for low frequency applications (<1kHz).

Internal schematic diagram



Applications

- Light dimmer
- Static relays
- Motor control

Order codes

Part number	Marking	Package	Packaging
STGF10NB60SD	GF10NB60SD	TO-220FP	Tube

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1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{CES}	Collector-emitter voltage (V_{GS} = 0)	600	V
I_C	Collector current (continuous) at 25°C	20	A
I_C	Collector current (continuous) at 100°C	7	A
I_{CM} (1)	Collector current (pulsed)	100	A
V_{GE}	Gate-emitter voltage	± 20	V
P_{TOT}	Total dissipation at T_C = 25°C	25	W
V_{ISO}	Insulation withstand voltage A.C.(t = 1sec;Tc=25°C)	2500	V
T_{stg}	Operating junction temperature	– 55 to 150	°C
T_j	Storage temperature		

1. Pulse width limited by max. junction temperature.

Table 2. Thermal resistance

Symbol	Parameter	Value	Unit
Rthj-case	Thermal resistance junction-case Max	5	°C/W
Rthj-amb	Thermal resistance junction-ambient Max	62.5	°C/W

2 Electrical characteristics

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

Table 3. Static

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{BR(CES)}$	Collector-emitter breakdown voltage	I_C = 250µA, V_{GE} = 0	600			V
$V_{BR(CES)}$	Collector-emitter breakdown voltage	I_C = 1mA, V_{GE} = 0	20			V
$V_{CE(SAT)}$	Collector-emitter saturation voltage	V_{GE} =15V, I_C = 5A, Tj= 25°C V_{GE} =15V, I_C = 10A, Tj= 25°C V_{GE} =15V, I_C = 10A, Tj= 125°C		1.15 1.35 1.25	1.8	V V V
$V_{GE(th)}$	Gate threshold voltage	V_{CE} = V_{GE}, I_C = 250µA	2.5		5	V
I_{CES}	Collector-emitter leakage current (V_{CE} = 0)	V_{CE} = Max rating ,T_j =25 °C V_{CE} = Max rating ,T_j =125 °C			10 100	µA µA
I_{GES}	Gate-emitter leakage current (V_{CE} = 0)	V_{GE} = ± 20V , V_{CE} = 0			±100	nA
g_{fs}	Forward transconductance	V_{CE} = 25 V , I_C =10 A	5			S

Table 4. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{ies} C_{oes} C_{res}	Input capacitance Output capacitance Reverse transfer capacitance	V_{CE} = 25V, f = 1 MHz, V_{GE}= 0		610 65 12		pF pF pF
Q_g	Total gate charge	V_{CE} = 400V, I_C = 10 A, V_{GE} = 15V		33		nC
I_{CL}	Turn-off SOA minimum current	V_{clamp}= 480V, RG= 1kΩ, Tj= 125°C	20			A

Table 5. Switching on/off (inductive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r $(di/dt)_{on}$ E_{on} (1)	Turn-on delay time Current rise time Turn-on current slope Turn-on switching losses	V_{CC} = 480 V, I_C = 10 A R_G = 1KΩ, V_{GE} = 15 V Tj= 25°C (see Figure 15)		0.7 0.46 8 0.6		µs µs A/µs mJ
$t_r(V_{off})$ $t_d(off)$ t_f E_{off} (2)	Off voltage rise time Turn-off delay time Current fall time Turn-off switching losses	V_{CC} = 480 V, I_C = 10 A R_G = 1KΩ, V_{GE} = 15 T_J=25°C (see Figure 15)		2.2 1.2 1.2 5.0		µs µs µs mJ
$t_r(V_{off})$ $t_d(off)$ t_f E_{off} (2)	Off voltage rise time Turn-off delay time Current fall time Turn-off switching losses	V_{CC} = 480 V, I_C = 10 A R_G = 1KΩ, V_{GE} = 15 Tj=125 °C (see Figure 15)		3.8 1.2 1.9 8.0		µs µs µs mJ

1. Eon is the tun-on losses when a typical diode is used in the test circuit in figure 2 Eon include diode recovery energy. If the IGBT is offered in a package with a co-pak diode, the co-pack diode is used as external diode. IGBTs & Diode are at the same temperature (25°C and 125°C)
2. Turn-off losses include also the tail of the collector current

Table 6. Collector-emitter diode

Symbol	Parameter	Test conditions	Min	Typ.	Max	Unit
I_f I_{fm}	Forward current Forward current pulsed				7 56	A A
V_f	Forward on-voltage	I_f = 3.5 A I_f = 3.5 A, Tj = 125 °C		1.4 1.15	1.9	V V
t_{rr} Q_{rr} I_{rrm}	Reverse recovery time Reverse recovery charge Reverse recovery current	I_f = 7 A ,V_R = 20 V, Tj =125°C, di/dt =100A/µs (see Figure 18)		50 70 2.7		ns nC A

2.1 Electrical characteristics (curves)

Figure 1. Output characteristics

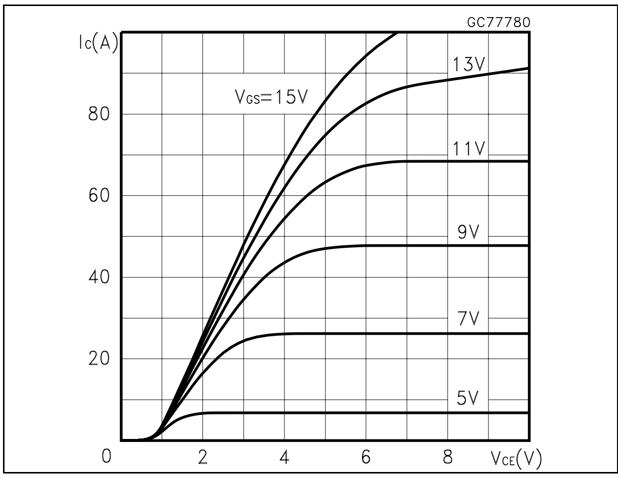


Figure 2. Transfer characteristics

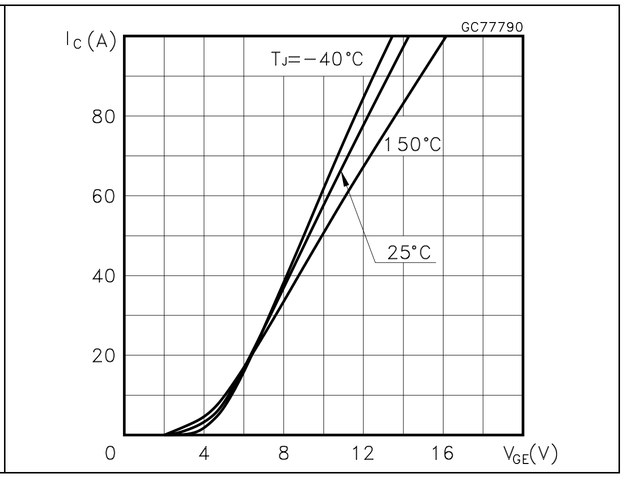


Figure 3. Transconductance

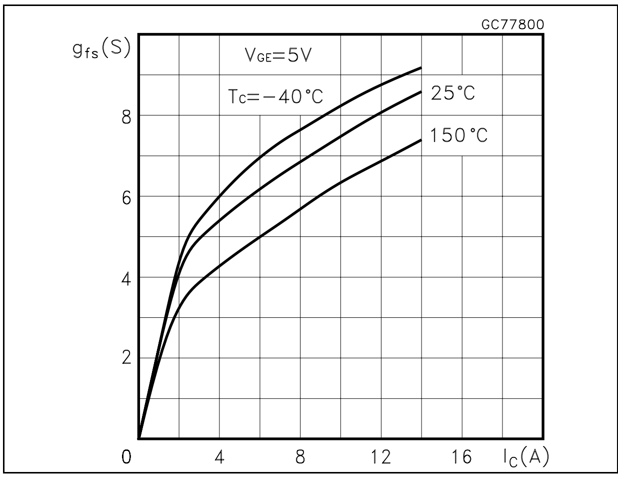


Figure 4. Collector-emitter on voltage vs temperature

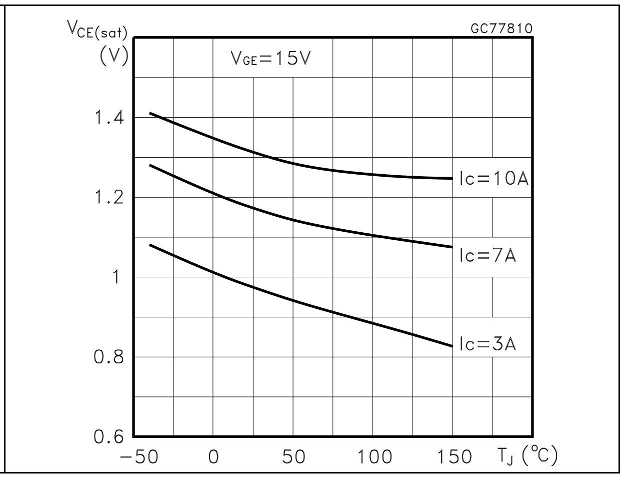


Figure 5. Collector-emitter on voltage vs collector current

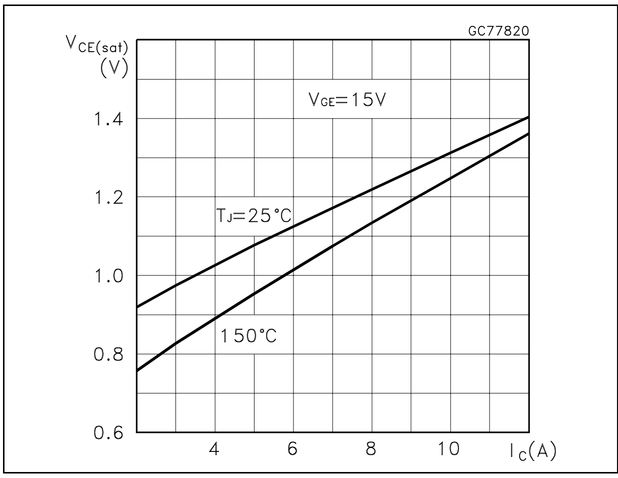


Figure 6. Normalized gate threshold vs temperature

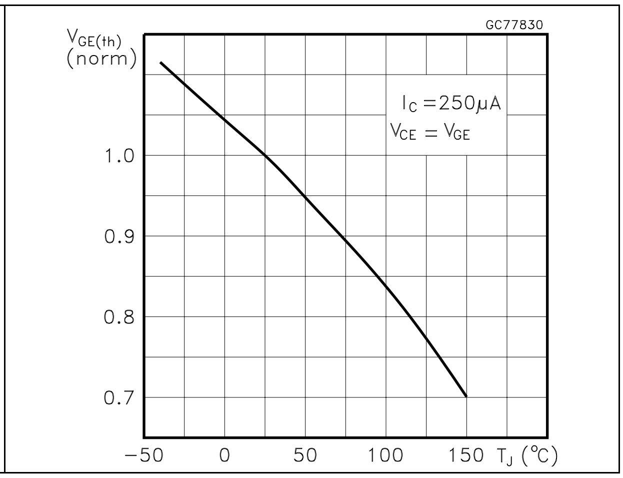


Figure 7. Normalized breakdown voltage vs temperature

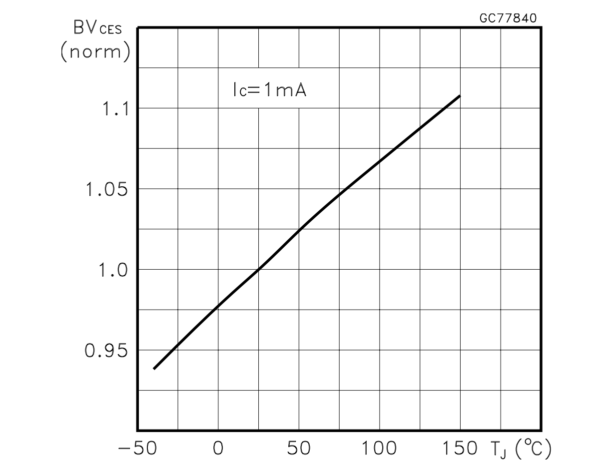


Figure 8. Gate charge vs gate-emitter voltage

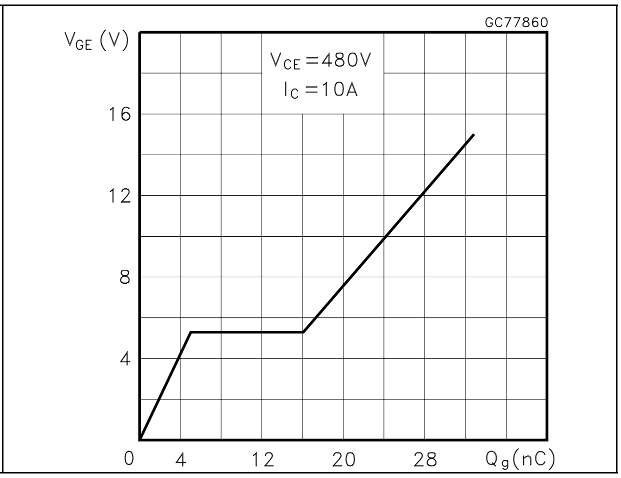


Figure 9. Capacitance variations

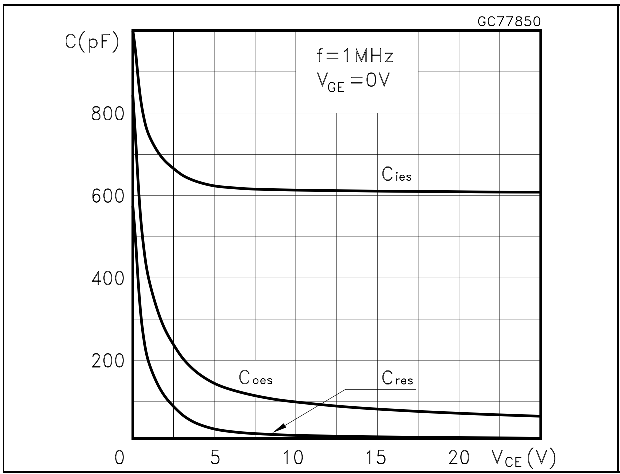


Figure 10. Switching losses vs temperature

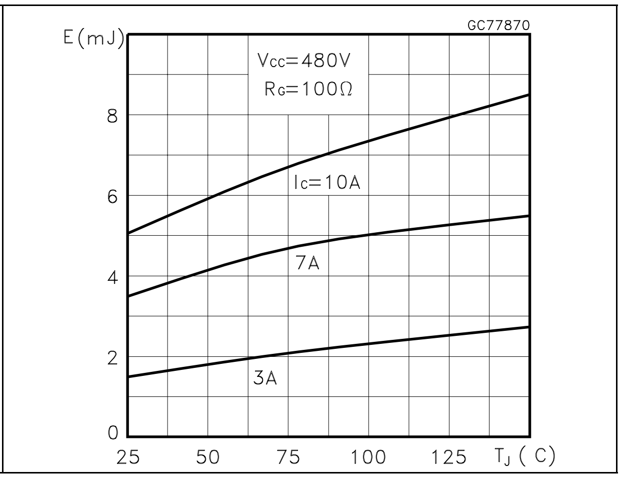


Figure 11. Switching losses vs gate resistance

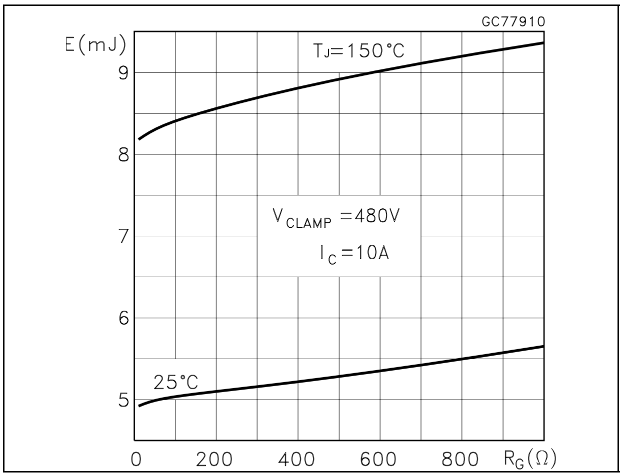


Figure 12. Switching losses vs collector current

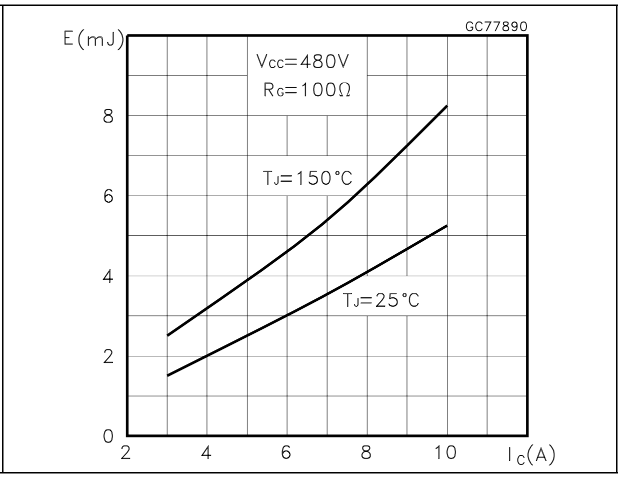


Figure 13. Thermal impedance

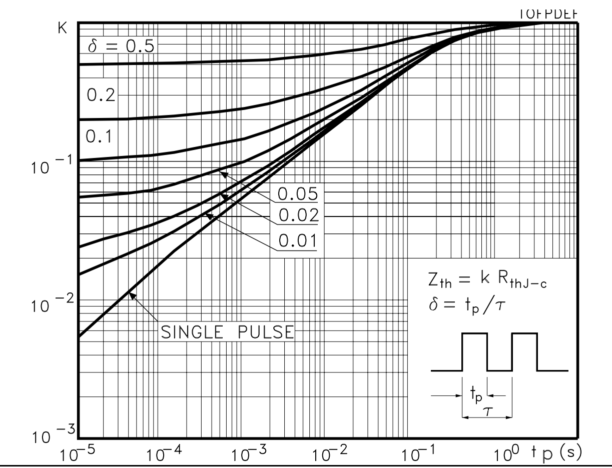
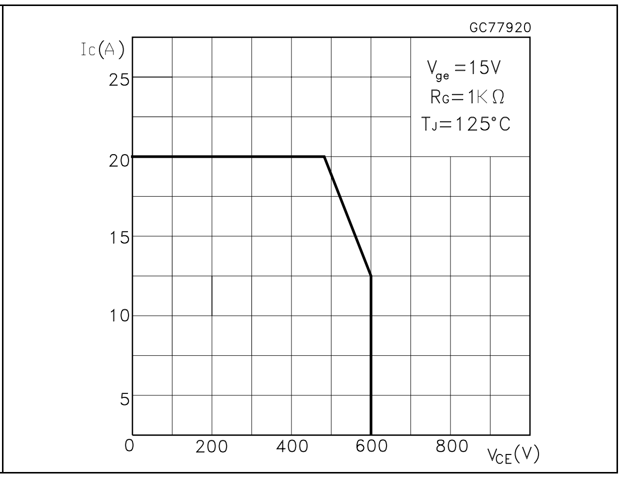


Figure 14. Turn-off SOA



3 Test circuit

Figure 15. Test circuit for inductive load switching

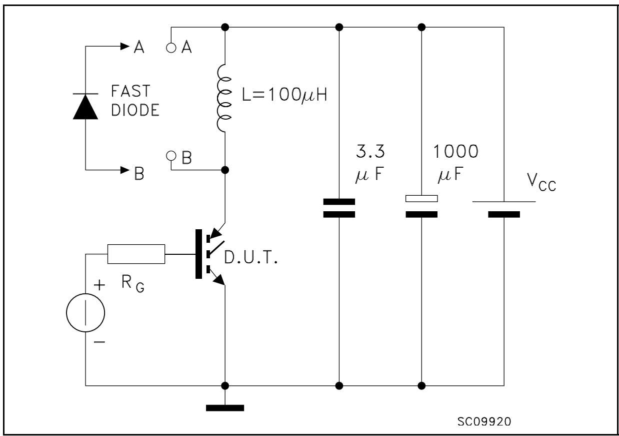


Figure 16. Gate charge test circuit

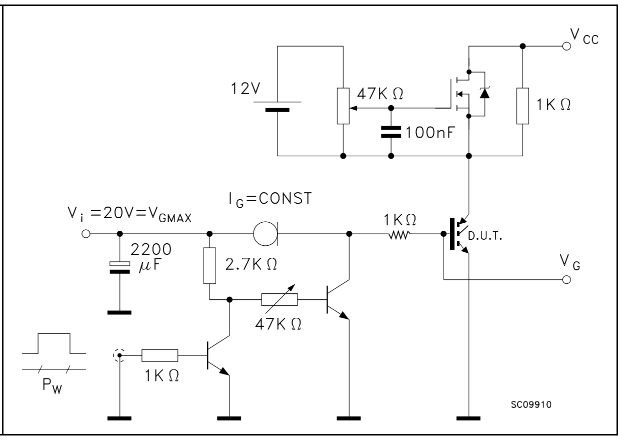


Figure 17. Switching waveforms

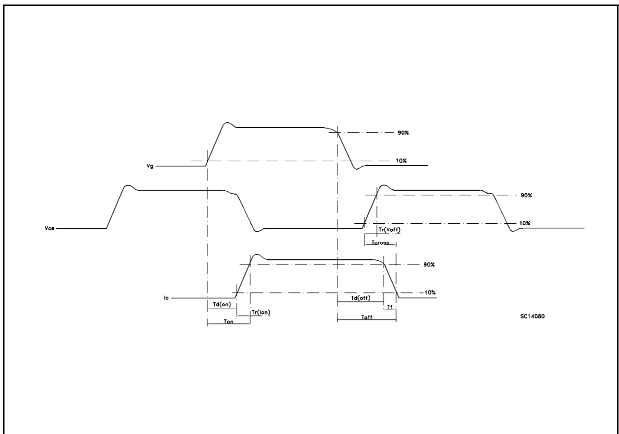
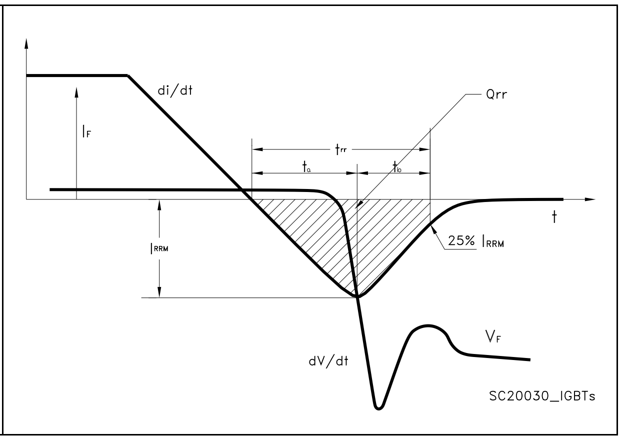


Figure 18. Diode recovery times waveform

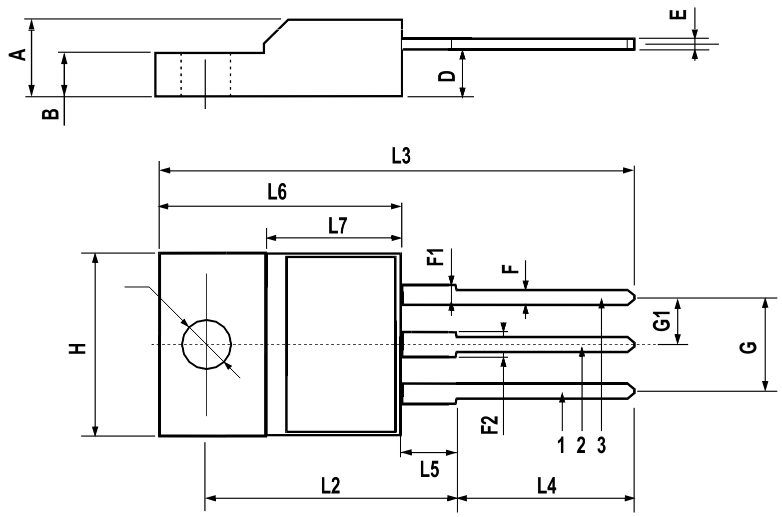


4 Package mechanical data

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-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. Revision history

Date	Revision	Changes
15-May-2006	2	New template