



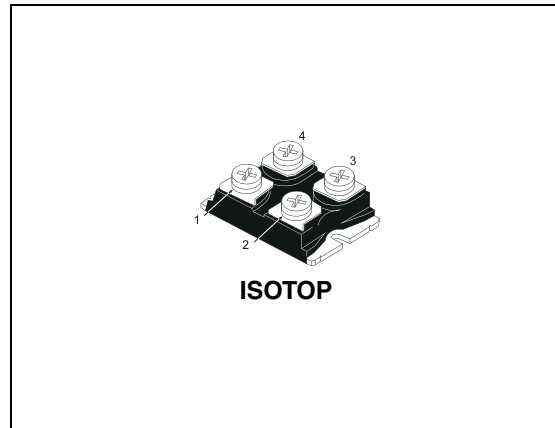
STGE200NB60S

N-channel 150A - 600V - ISOTOP
Low drop PowerMESH™ IGBT

General features

TYPE	V _{CES}	V _{CE(sat)} (typ.)	I _C	T _C
STGE200NB60S	600V	1.2V	150A	100°C
		1.3V	200A	25°C

- High input impedance (voltage driven)
- Low on-voltage drop (V_{cesat})
- Off losses include tail current
- Low gate charge
- High current capability



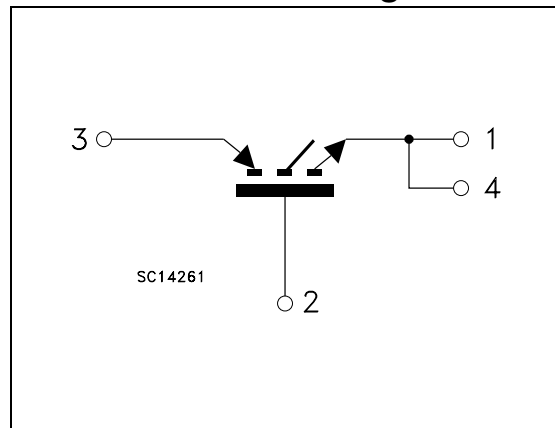
Description

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 to achieve very low V_{CE(sat)} (@ max frequency of 1KHz).

Applications

- Low frequency motor controls
- Aluminum welding equipment

Internal schematic diagram



Order codes

Part number	Marking	Package	Packaging
STGE200NB60S	GE200NB60S	ISOTOP	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
V_{GE}	Gate-emitter voltage	± 20	V
I_C	Collector current (continuous) at $T_C = 25^\circ\text{C}$	200	A
I_C	Collector current (continuous) at $T_C = 100^\circ\text{C}$	150	A
$I_{CM}^{(1)}$	Collector current (pulsed)	400	A
P_{TOT}	Total dissipation at $T_C = 25^\circ\text{C}$	600	W
	Derating factor	4.8	W/ $^\circ\text{C}$
T_{stg}	Storage temperature	- 55 to 150	$^\circ\text{C}$
T_j	Operating junction temperature		

1. Pulse width limited by safe operating area

Table 2. Thermal resistance

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case max	0.208	$^\circ\text{C}/\text{W}$ $^\circ\text{C}/\text{W}$
$R_{thj-amb}$	Thermal resistance junction-ambient max	30	$^\circ\text{C}/\text{W}$

2 Electrical characteristics

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

Table 3. Static

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{BR(CES)}$	Collector-emitter breakdown voltage	$I_C = 250\mu A, V_{GE} = 0$	600			V
I_{CES}	Collector cut-off ($V_{GE} = 0$)	$V_{CE} = \text{Max rating, @ } 25^{\circ}C$ $V_{CE} = \text{Max rating, @ } 125^{\circ}C$			500 5	μA mA
I_{GES}	Gate-emitterleakage current ($V_{CE} = 0$)	$V_{GE} = \pm 20V, V_{CE} = 0$			± 100	nA
$V_{GE(th)}$	Gate threshold voltage	$V_{CE} = V_{GE}, I_C = 250\mu A$	3		5	V
$V_{CE(sat)}$	Collector-emitter saturation voltage	$V_{GE} = 15V, I_C = 100A$ $V_{GE} = 15V, I_C = 150A, @ 100^{\circ}C$		1.2 1.2	1.6	V V
g_{fs}	Forward transconductance	$V_{CE} = 15V, I_C = 100A$		80		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	$V_{CE} = 25V, f = 1MHz, V_{GE} = 0$		1560 0 1100 95		pF pF pF
Q_g Q_{ge} Q_{gc}	Total gate charge Gate-emitter charge Gate-collector charge	$V_{CE} = 480V, I_C = 100A,$ $V_{GE} = 15V$		560 70 170		nC nC nC
I_{CL}	Latching current	$V_{clamp} = 480V$ $T_j = 125^{\circ}C, R_G = 10\Omega$	300			A

Table 5. Switching on/off (inductive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Delay time	$I_C = 100A, V_{CC} = 480V$		64		ns
t_r	Current rise time	$V_{GE} = 15V, R_G = 3\Omega$		112		ns
$(di/dt)_{on}$	Turn-on current slope	$T_j = 25^\circ C$ (see Figure 17)		1840		A/ μs
$t_{d(on)}$	Dealy time	$I_C = 100A, V_{CC} = 480V$		56		ns
t_r	Current rise time	$V_{GE} = 15V, R_G = 3\Omega$		114		ns
$(di/dt)_{on}$	Turn-on current slope	$T_j = 125^\circ C$ (see Figure 17)		1800		A/ μs
t_c	Cross-over time	$I_C = 100A, V_{CC} = 480V$		2.98		μs
$t_r(V_{off})$	Off voltage rise time	$V_{GE} = 15V, R_G = 3\Omega$		1.7		μs
$t_{d(off)}$	Delay time	$T_j = 25^\circ C$ (see Figure 17)		2.4		μs
t_f	Current fall time			1.23		μs
t_c	Cross-over time	$I_C = 100A, V_{CC} = 480V$		4.52		μs
$t_r(V_{off})$	Off voltage rise time	$V_{GE} = 15V, R_G = 3\Omega$		2.6		μs
$t_{d(off)}$	Delay time	$T_j = 125^\circ C$ (see Figure 17)		2.8		μs
t_f	Current fall time			1.8		μs

Table 6. Switching energy (inductive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$E_{on}^{(1)}$	Turn-on switching losses	$V_{CC} = 480V, I_C = 100A$		11.7		mJ
$E_{off}^{(2)}$	Turn-off switching loss	$R_G = 3\Omega, V_{GE} = 15V, T_j = 25^\circ C$		59		mJ
E_{ts}	Total switching loss	(see Figure 17)		70.7		mJ
$E_{on}^{(1)}$	Turn-on switching losses	$V_{CC} = 480V, I_C = 100A$		12		mJ
$E_{off}^{(2)}$	Turn-off switching loss	$R_G = 3\Omega, V_{GE} = 15V,$		92		mJ
E_{ts}	Total switching loss	$T_j = 125^\circ C$ (see Figure 17)		104		mJ

1. E_{on} is the turn-on losses when a typical diode is used in the test circuit in Figure 17
2. Turn-off losses include also the tail of the collector current.

2.1 Electrical characteristics (curves)

Figure 1. Output characteristics

Figure 2. Transfer characteristics

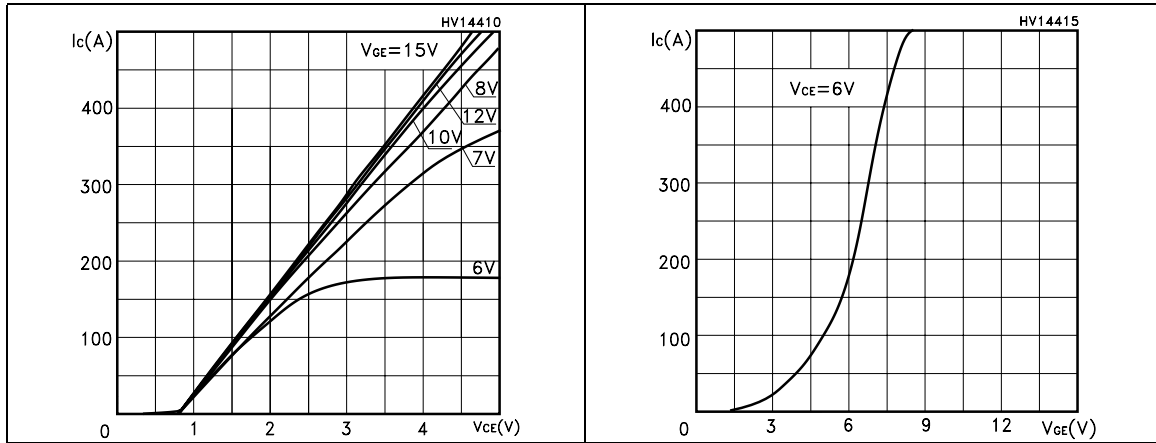


Figure 3. Transconductance

Figure 4. Collector-emitter on voltage vs temperature

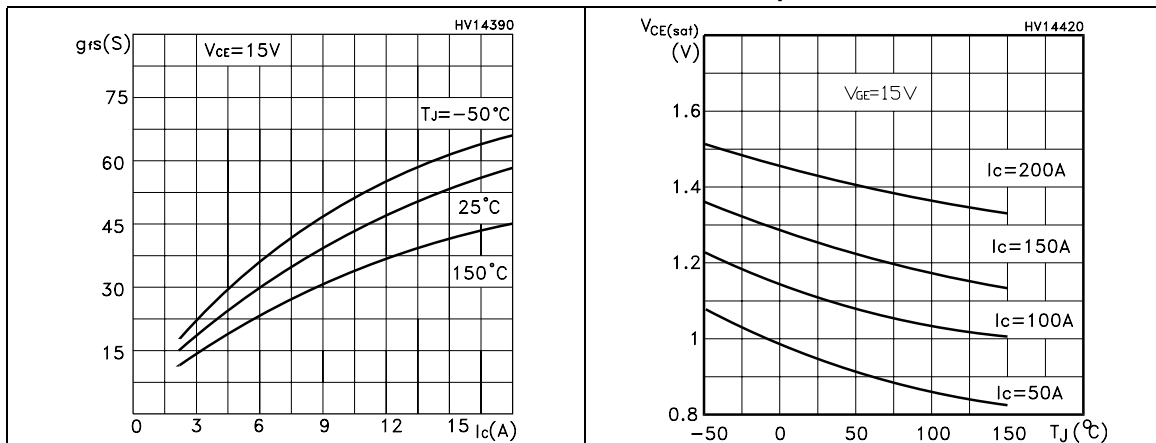


Figure 5. Gate charge vs gate-source voltage

Figure 6. Capacitance variations

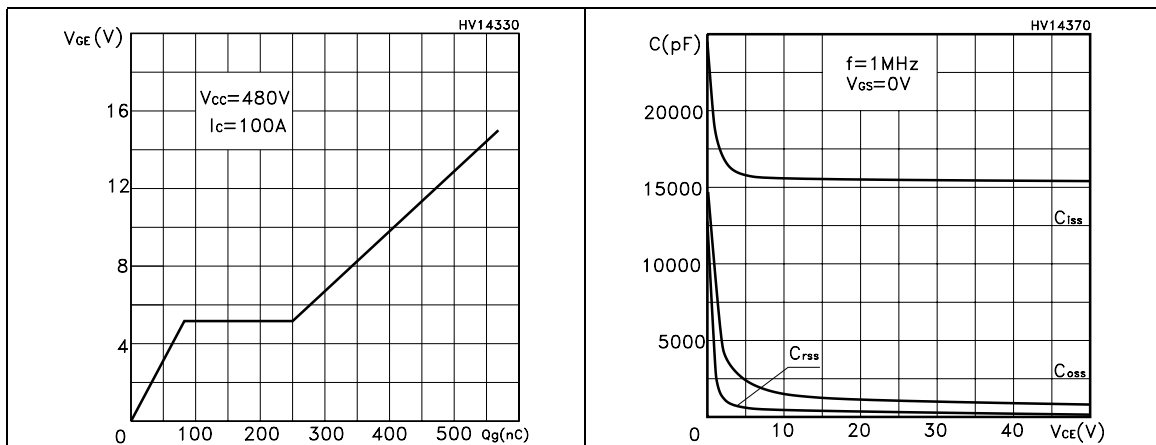


Figure 7. Normalized gate threshold voltage vs temperature

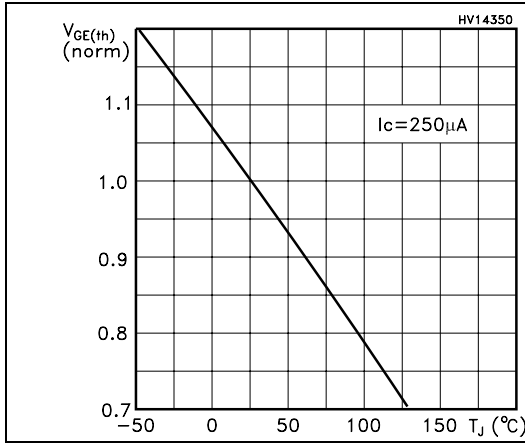


Figure 8. Collector-emitter on voltage vs collector current

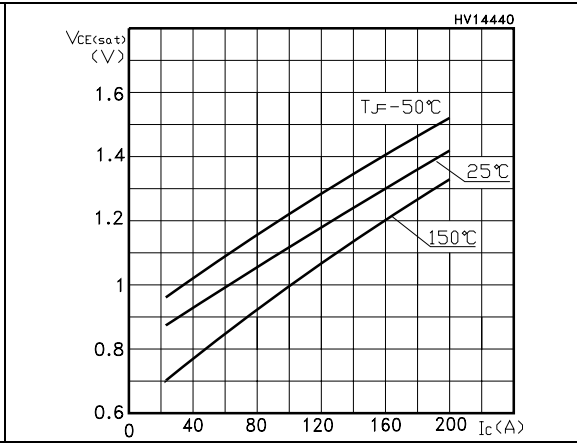


Figure 9. Normalized breakdown voltage vs temperature

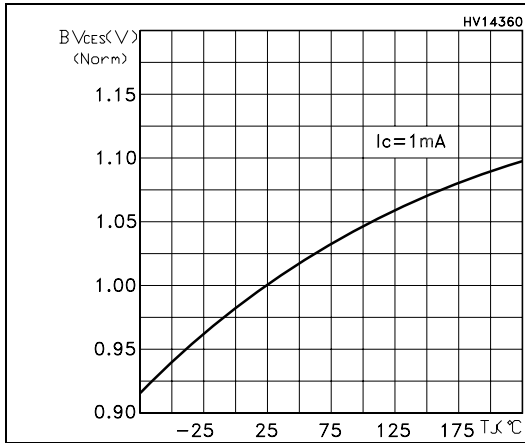


Figure 10. Switching losses vs temperature

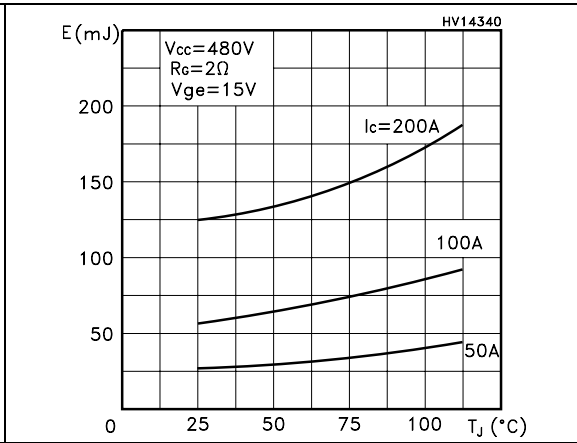


Figure 11. Switching losses vs gate resistance

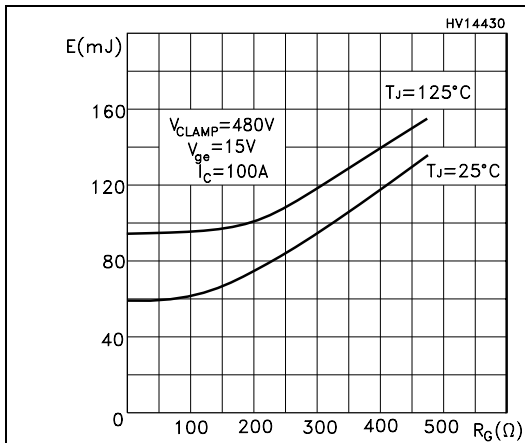


Figure 12. Switching losses vs collector current

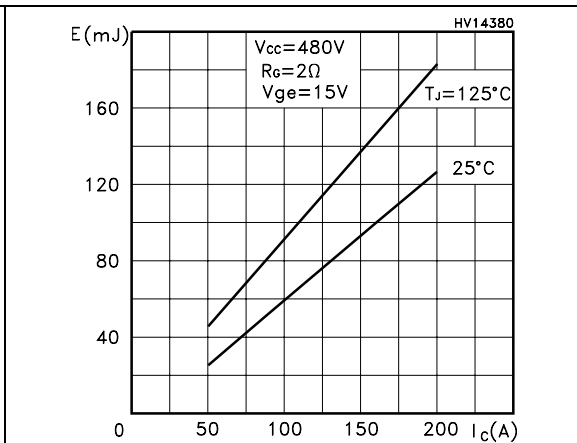


Figure 13. Thermal impedance

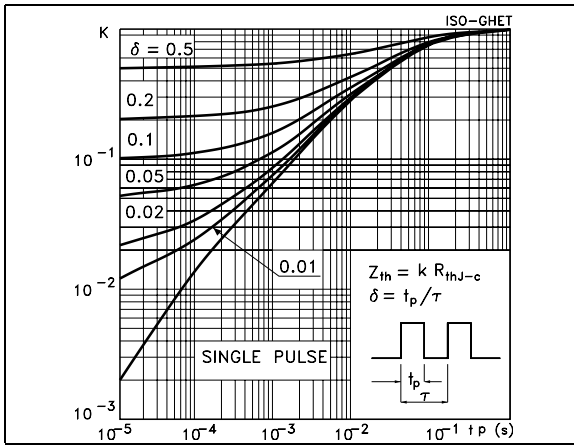
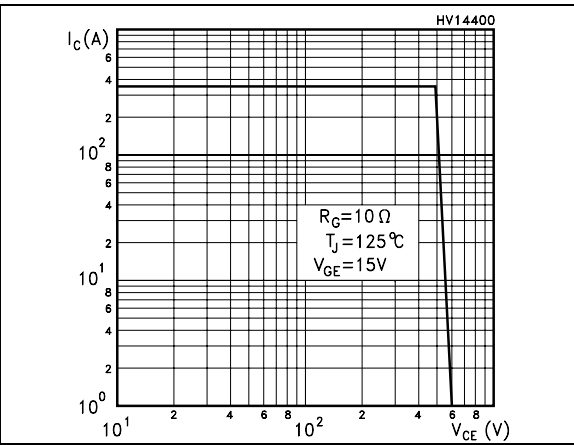


Figure 14. Turn-off SOA



3 Test circuit

Figure 15. Test circuit for inductive load switching

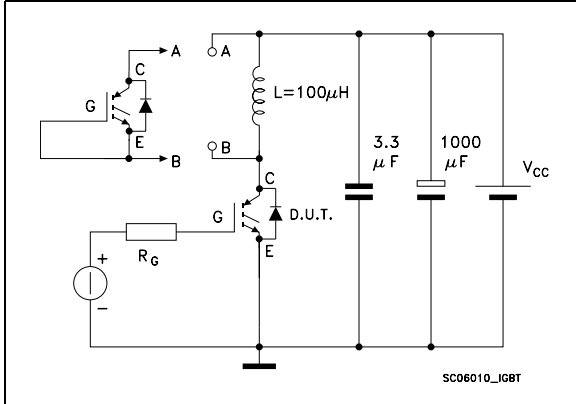


Figure 16. Gate charge test circuit

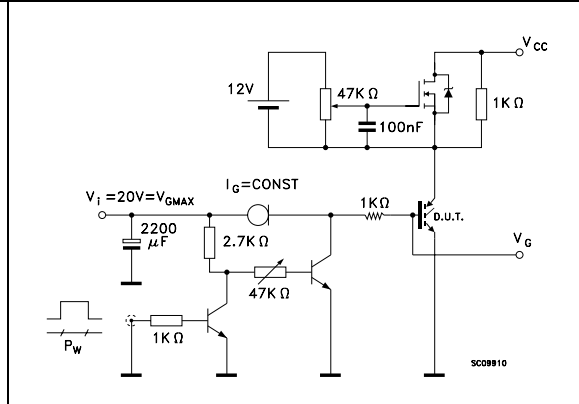


Figure 17. Switching waveform

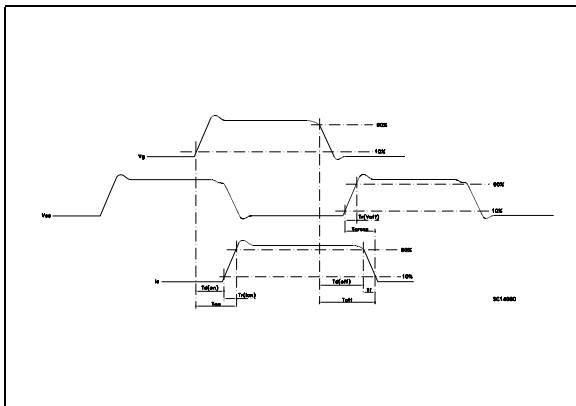
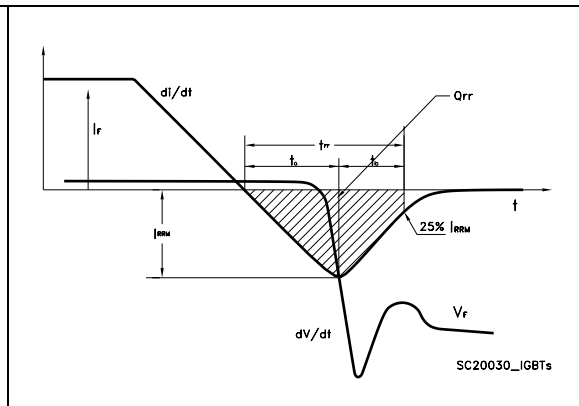


Figure 18. Diode recovery time waveform

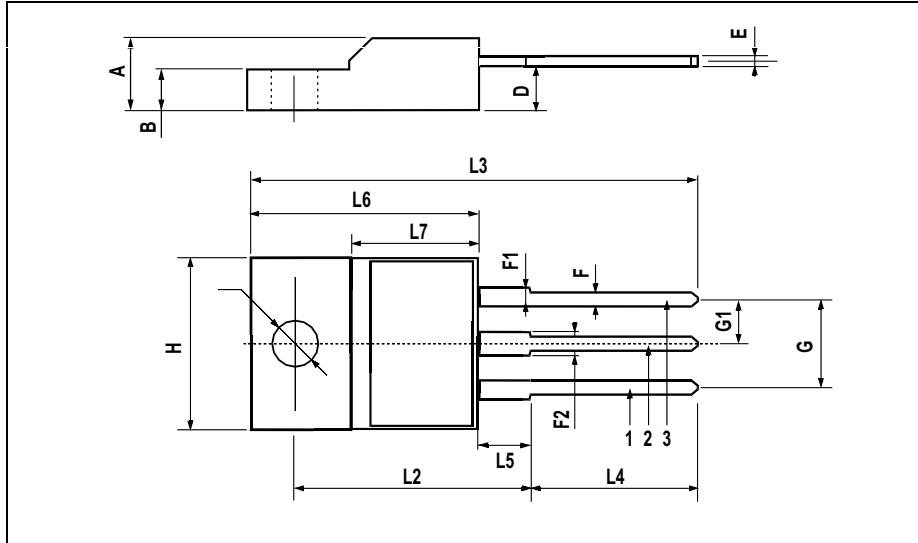


4 Package mechanical data

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

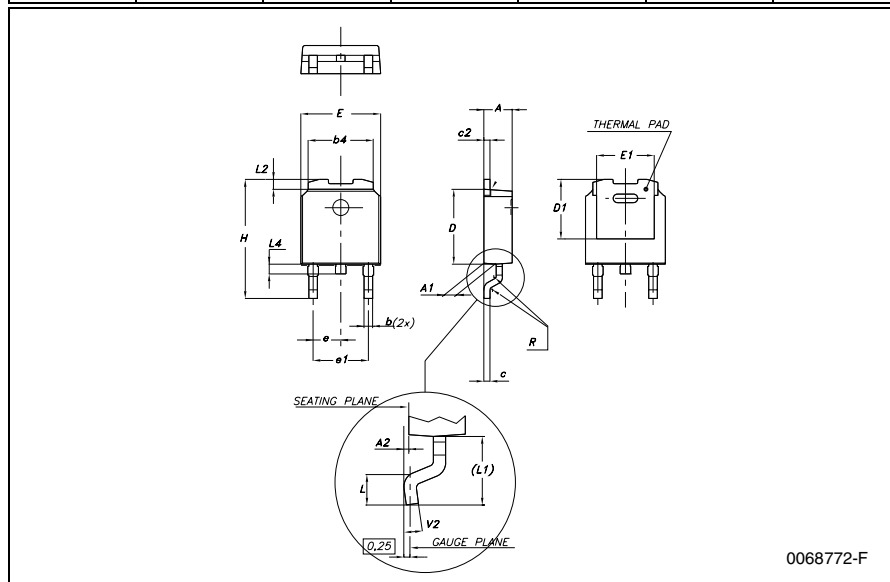
TO-220FP MECHANICAL DATA

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



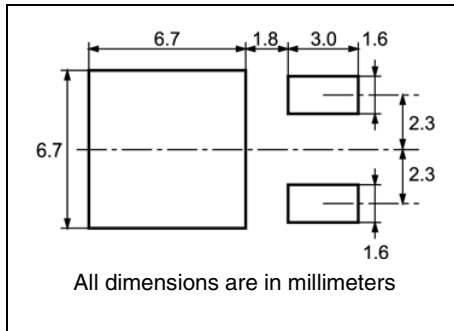
DPAK MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	2.2		2.4	0.086		0.094
A1	0.9		1.1	0.035		0.043
A2	0.03		0.23	0.001		0.009
B	0.64		0.9	0.025		0.035
b4	5.2		5.4	0.204		0.212
C	0.45		0.6	0.017		0.023
C2	0.48		0.6	0.019		0.023
D	6		6.2	0.236		0.244
D1		5.1			0.200	
E	6.4		6.6	0.252		0.260
E1		4.7			0.185	
e		2.28			0.090	
e1	4.4		4.6	0.173		0.181
H	9.35		10.1	0.368		0.397
L	1			0.039		
(L1)		2.8			0.110	
L2		0.8			0.031	
L4	0.6		1	0.023		0.039
R		0.2			0.008	
V2	0°		8°	0°		8°



5 Packaging mechanical data

DPAK FOOTPRINT



TAPE AND REEL SHIPMENT

DIM.	mm		inch	
	MIN.	MAX.	MIN.	MAX.
A		330		12.992
B	1.5		0.059	
C	12.8	13.2	0.504	0.520
D	20.2		0.795	
G	16.4	18.4	0.645	0.724
N	50		1.968	
T		22.4		0.881

BASE QTY	BULK QTY
2500	2500

DIM.	mm		inch	
	MIN.	MAX.	MIN.	MAX.
A0	6.8	7	0.267	0.275
B0	10.4	10.6	0.409	0.417
B1		12.1		0.476
D	1.5	1.6	0.059	0.063
D1	1.5		0.059	
E	1.65	1.85	0.065	0.073
F	7.4	7.6	0.291	0.299
K0	2.55	2.75	0.100	0.108
P0	3.9	4.1	0.153	0.161
P1	7.9	8.1	0.311	0.319
P2	1.9	2.1	0.075	0.082
R	40		1.574	
W	15.7	16.3	0.618	0.641

6 Revision history

Table 7. Revision history

Date	Revision	Changes
28-Feb-2005	6	Complete version
26-Jul-2006	7	New template

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