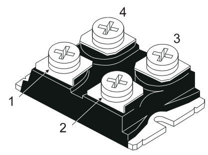
STGE200NB60S

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 1.3V	150A 200A	100°C 25°C

- High input impedance (voltage driven)
- Low on-voltage drop (Vcesat)
- Off losses include tail current
- Low gate charge
- High current capability

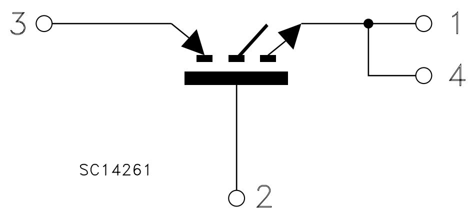


ISOTOP

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 VCE(sat) (@ max frequency of 1KHz).

Internal schematic diagram



Applications

- Low frequency motor controls
- Aluminum welding equipment

Order codes

Part number	Marking	Package	Packaging
STGE200NB60S	GE200NB60S	ISOTOP	Tube

Contents

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°C	200	A
I_C	Collector current (continuous) at T_C = 100°C	150	A
I_{CM} (1)	Collector current (pulsed)	400	A
P_{TOT}	Total dissipation at T_C = 25°C	600	W
	Derating factor	4.8	W/°C
V_{ISO}	Insulation winthstand voltage (DC)	2500	V
T_{stg}	Storage temperature	– 55 to 150	°C
T_j	Operating junction temperature		

1. Pulse width limited by safe operating area

Table 2. Thermal resistance

Symbol	Parameter	Value	Unit
Rthj-case	Thermal resistance junction-case max	0.208	°C/W °C/W
Rthj-amb	Thermal resistance junction-ambient max	30	°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
I_{CES}	Collector cut-off (V_{GE} = 0)	V_{CE} = Max rating, @ 25°C V_{CE} = Max rating, @ 125°C			500 5	µA mA
I_{GES}	Gate-emitterleakage current (V_{CE} = 0)	V_{GE} = ±20V, V_{CE} = 0			±100	nA
$V_{GE(th)}$	Gate threshold voltage	V_{CE} = V_{GE}, I_C = 250µA	3		5	V
$V_{CE(sat)}$	Collector-emitter saturation voltage	V_{GE} = 15V, I_C = 100A V_{GE} = 15V, I_C=150A,@100°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		15600 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 Tj = 125°C , R_G = 10Ω	300			A

Table 5. Switching on/off (inductive load)

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

Table 6. Switching energy (inductive load)

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

1. Eon 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)

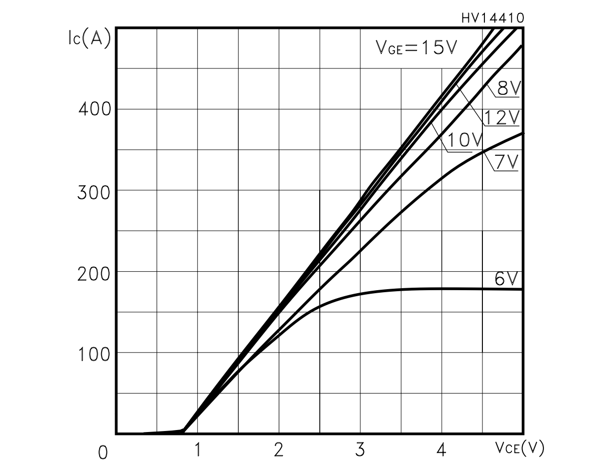


Figure 1. Output characteristics

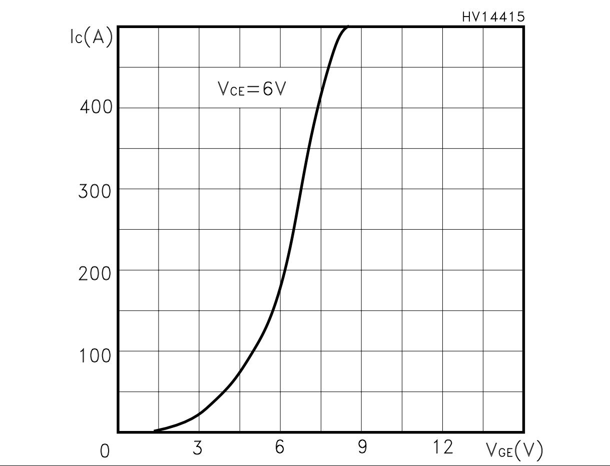


Figure 2. Transfer characteristics

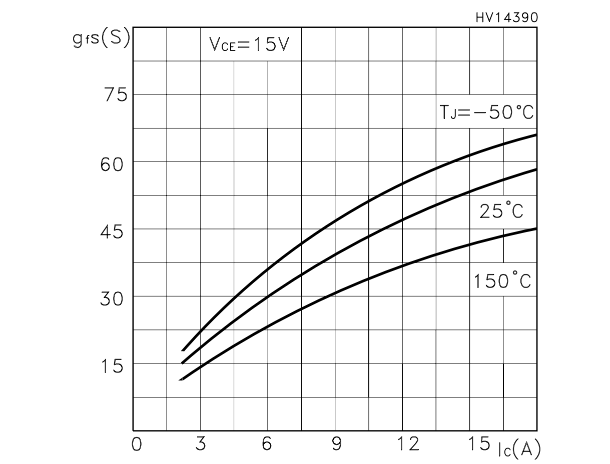


Figure 3. Transconductance

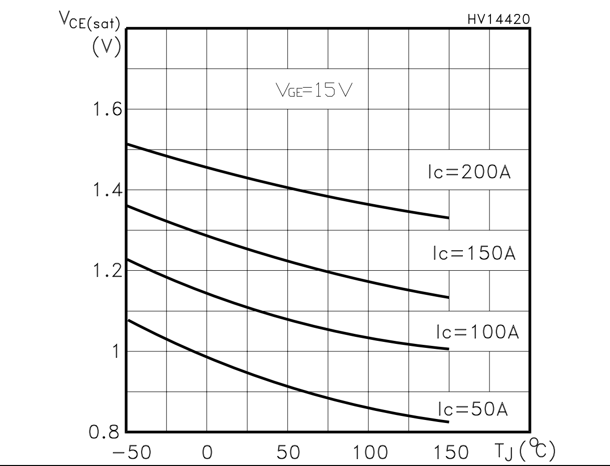


Figure 4. Collector-emitter on voltage vs temperature

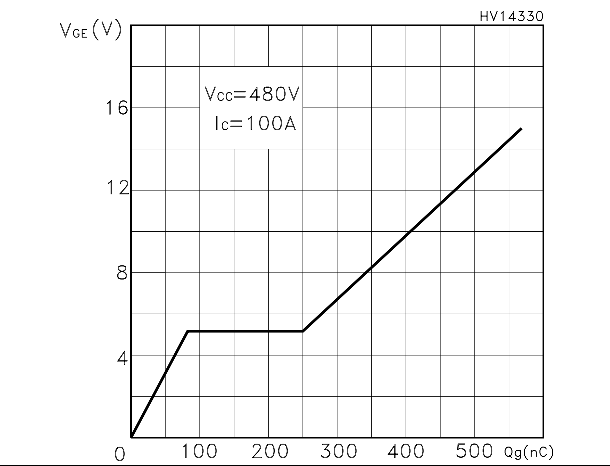


Figure 5. Gate charge vs gate-source voltage

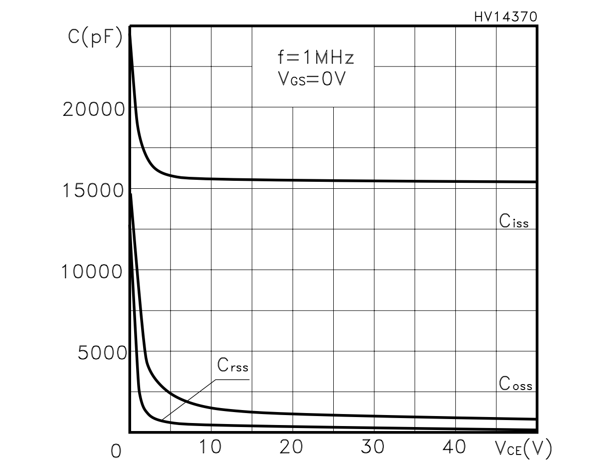


Figure 6. Capacitance variations

Figure 7. Normalized gate threshold voltage vs temperature

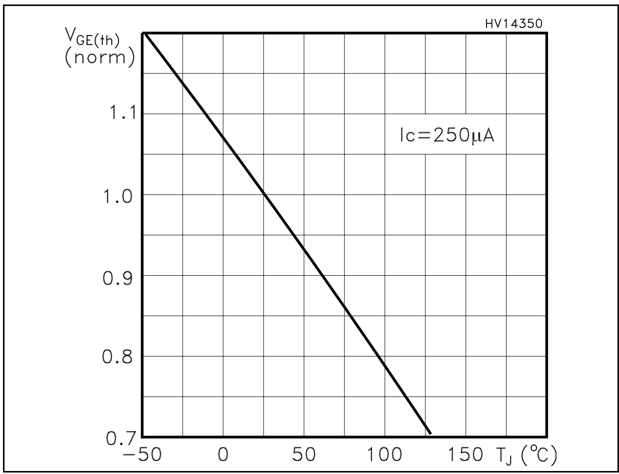


Figure 8. Collector-emitter on voltage vs collector current

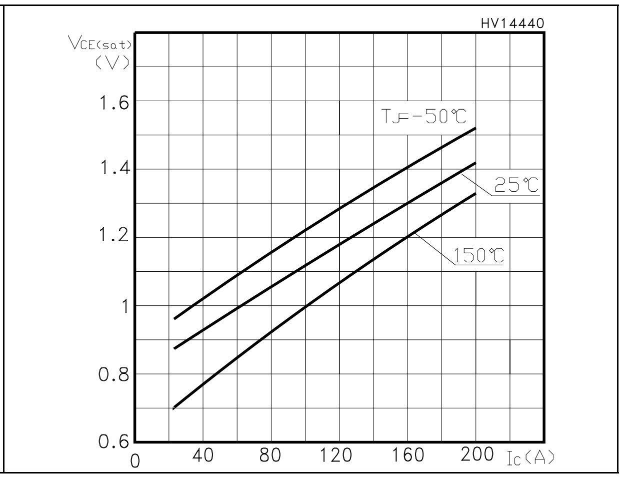


Figure 9. Normalized breakdown voltage vs temperature

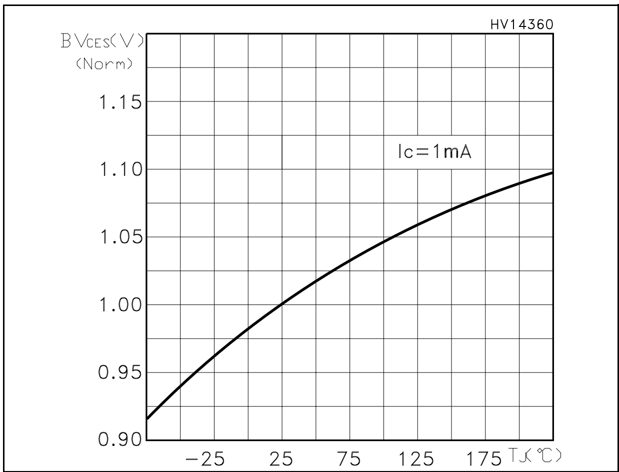


Figure 10. Switching losses vs temperature

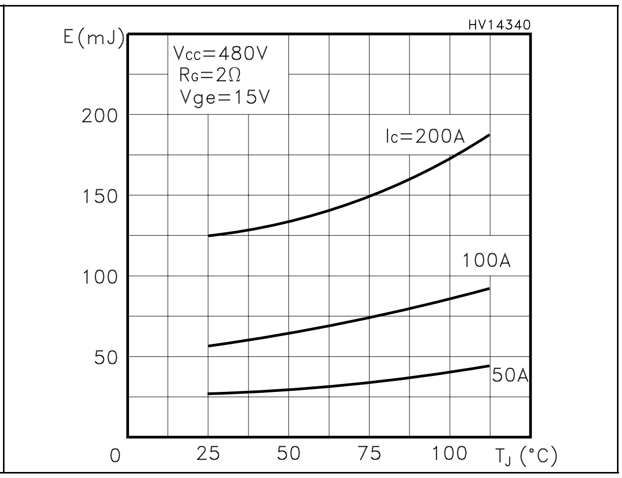


Figure 11. Switching losses vs gate resistance

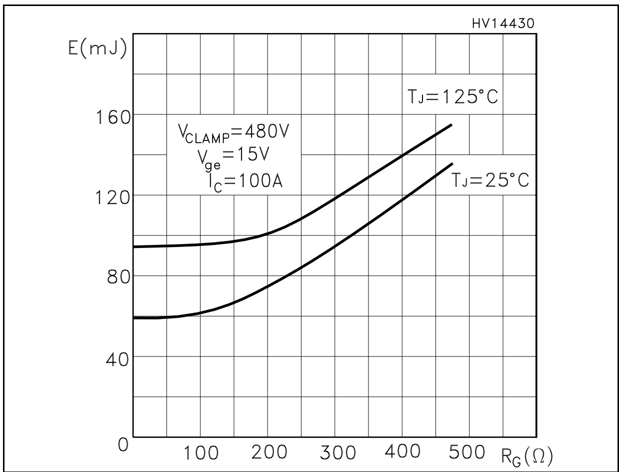


Figure 12. Switching losses vs collector current

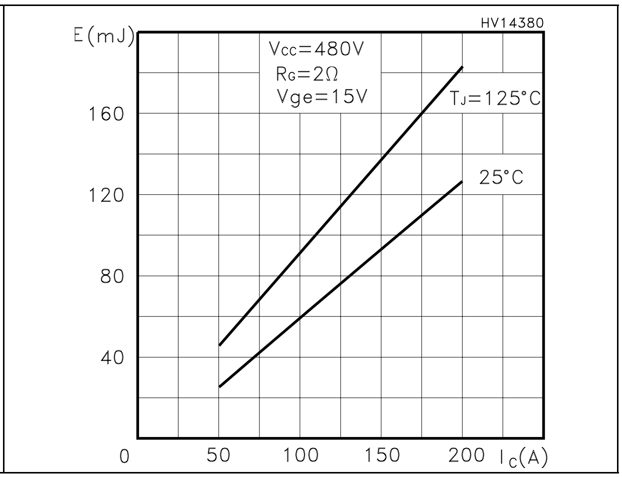


Figure 13. Thermal impedance

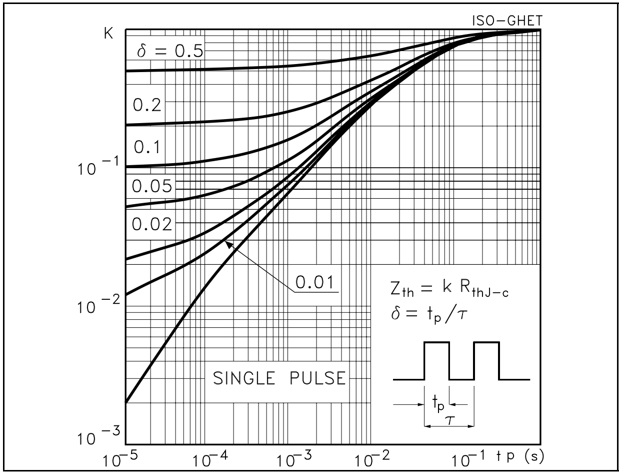
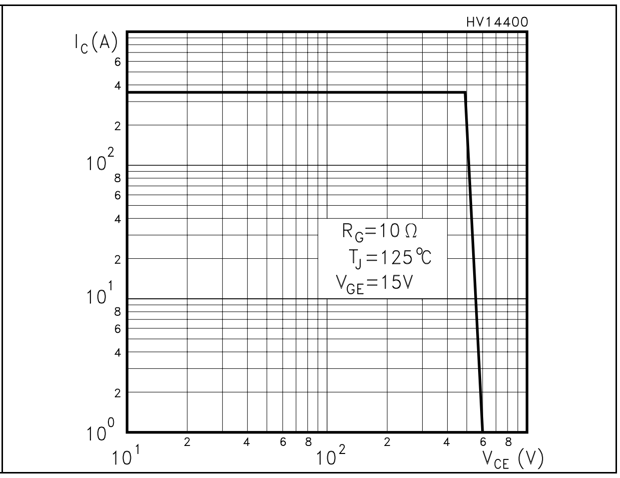


Figure 14. Turn-off SOA



3 Test circuit

Figure 15. Test circuit for inductive load switching

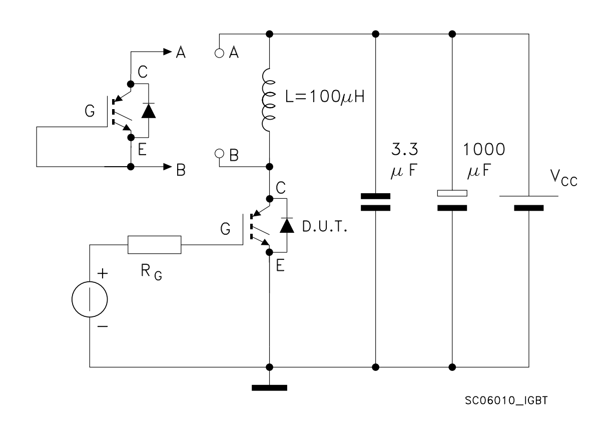


Figure 16. Gate charge test circuit

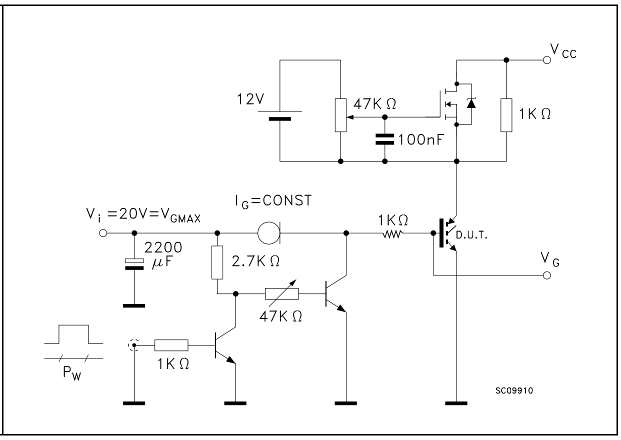


Figure 17. Switching waveform

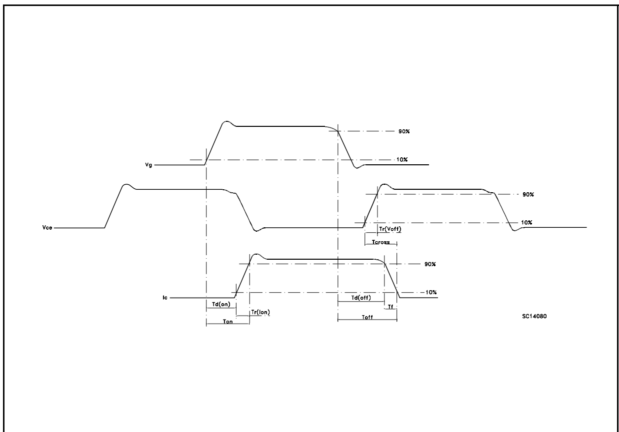
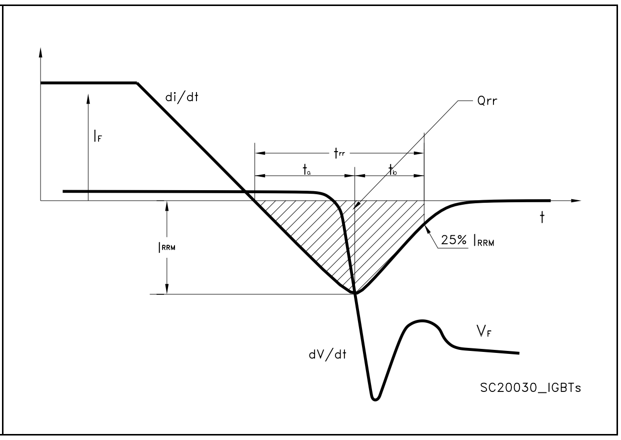


Figure 18. Diode recovery time waveform

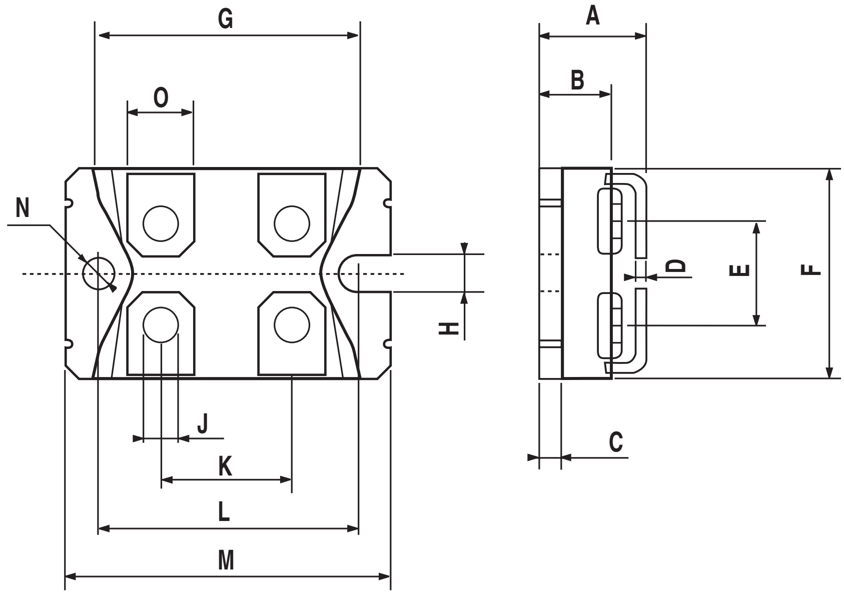


4 Package mechanical data

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*

ISOTOP MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	11.8		12.2	0.466		0.480
B	8.9		9.1	0.350		0.358
C	1.95		2.05	0.076		0.080
D	0.75		0.85	0.029		0.033
E	12.6		12.8	0.496		0.503
F	25.15		25.5	0.990		1.003
G	31.5		31.7	1.240		1.248
H	4			0.157		
J	4.1		4.3	0.161		0.169
K	14.9		15.1	0.586		0.594
L	30.1		30.3	1.185		1.193
M	37.8		38.2	1.488		1.503
N	4			0.157		
O	7.8		8.2	0.307		0.322



5 Revision history

Table 7. Revision history

Date	Revision	Changes
28-Feb-2005	6	Complete version
26-Jul-2006	7	New template
03-Nov-2006	8	New value inserted on *Table 1.: Absolute maximum ratings*