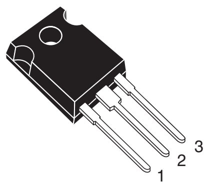
STGW30NC120HD

N-channel 1200V - 30A - TO-247 very fast PowerMESH™ IGBT

Features

Type	V_{CES}	$V_{CE(sat)}$ @25°C	I_C @100°C
STGW30NC120HD	1200V	< 2.75V	30A

- Low on-losses
- Low on-voltage drop (V_{cesat})
- High current capability
- High input impedance (voltage driven)
- Low gate charge
- Ideal for soft switching application



TO-247

Application

- Induction heating

Description

Using the latest high voltage technology based on its patented strip layout, STMicroelectronics has designed an advanced family of IGBTs, with outstanding performances. The suffix “H” identifies a family optimized for high frequency application in order to achieve very high switching performances (reduced tfall) maintaining a low voltage drop.

Figure 1. Internal schematic diagram

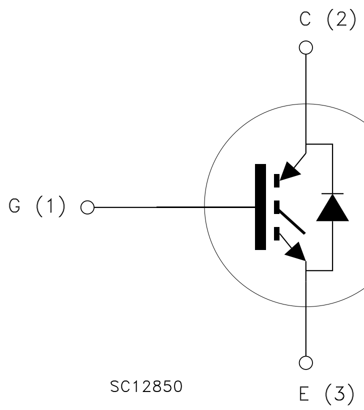


Table 1. Device summary

Order code	Marking	Package	Packaging
STGW30NC120HD	GW30NC120HD	TO-247	Tube

Contents

1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{CES}	Collector-emitter voltage (V_{GS} = 0)	1200	V
I_C (1)	Collector current (continuous) at 25°C	60	A
I_C (1)	Collector current (continuous) at 100°C	30	A
I_{CL} (2)	Collector current (pulsed)	135	A
V_{GE}	Gate-emitter voltage	±25	V
P_{TOT}	Total dissipation at T_C = 25°C	220	W
I_f	Diode RMS forward current at T_C = 25°C	30	A
T_j	Operating junction temperature	–55 to 150	°C

1. Calculated according to the iterative formula:

$$I_C(T_C) = \frac{T_{JMAX} - T_C}{R_{THJ-C} \times V_{CESAT(MAX)}(T_C, I_C)}$$

2. Vclamp=80% of BVces, Tj=150°C, R_G=10Ω, V_{GE}=15V

Table 3. Thermal resistance

Symbol	Parameter	Value	Unit
Rthj-case	Thermal resistance junction-case	0.57	°C/W
Rthj-amb	Thermal resistance junction-ambient (diode)	1.6	°C/W
Rthj-amb	Thermal resistance junction-ambient (IGBT)	30	°C/W

2 Electrical characteristics

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

Table 4. Static

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{BR(CES)}$	Collector-emitter breakdown voltage	I_C = 1mA, V_{GE} = 0	1200			V
$V_{CE(SAT)}$	Collector-emitter saturation voltage	V_{GE}= 15V, I_C= 20A, Tj= 25°C V_{GE}= 15V, I_C= 20A, Tj=125°C		2.2 2.0	2.75	V V
$V_{GE(th)}$	Gate threshold voltage	V_{CE}= V_{GE}, I_C= 250µA	3.75		5.75	V
I_{CES}	Collector-emitter leakage current (V_{GE} = 0)	V_{CE} =Max rating,Tc=25°C V_{CE} =Max rating, Tc=125°C			500 10	µA mA
I_{GES}	Gate-emitter leakage current (V_{CE} = 0)	V_{GE} =± 20V, V_{CE} = 0			± 100	nA
g_{fs}	Forward transconductance	V_{CE} = 25V, I_C= 20A		14		S

Table 5. 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		2510 175 30		pF pF pF
Q_g Q_{ge} Q_{gc}	Total gate charge Gate-emitter charge Gate-collector charge	V_{CE} = 960V, I_C= 20A,V_{GE}=15V		110 16 49		nC nC nC

Table 6. Switching on/off (inductive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r $(di/dt)_{on}$	Turn-on delay time Current rise time Turn-on current slope	V_{CC} = 960V, I_C = 20A R_G= 10Ω, V_{GE}= 15V, Tj=25°C *(see Figure 17)*		29 11 1820		ns ns A/µs
$t_{d(on)}$ t_r $(di/dt)_{on}$	Turn-on delay time Current rise time Turn-on current slope	V_{CC} = 960V, I_C = 20A R_G= 10Ω, V_{GE}= 15V, Tj= 125°C *(see Figure 17)*		27 14 1580		ns ns A/µs
$t_r(V_{off})$ $t_d(_{off})$ t_f	Off voltage rise time Turn-off delay time Current fall time	V_{CC} = 960V, I_C = 20A R_G= 10Ω, V_{GE}= 15V, Tj= 25°C *(see Figure 17)*		90 275 312		ns ns ns
$t_r(V_{off})$ $t_d(_{off})$ t_f	Off voltage rise time Turn-off delay time Current fall time	V_{CC} = 960V, I_C = 20A R_G= 10Ω, V_{GE}= 15V, Tj= 125°C *(see Figure 17)*		150 336 592		ns ns ns

Table 7. 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 losses Total switching losses	V_{CC} = 960V, I_C = 20A R_G= 10Ω, V_{GE}= 15V, Tj= 25°C *(see Figure 17)*		1660 4438 6098		µJ µJ µJ
Eon (1) E_{off} (2) E_{ts}	Turn-on switching losses Turn-off switching losses Total switching losses	V_{CC} = 960V, I_C = 20A R_G= 10Ω, V_{GE}= 15V, Tj= 125°C *(see Figure 17)*		3015 6900 9915		µJ µJ µJ

1. Eon is the turn-on losses when a typical diode is used in the test circuit in figure 2. If the IGBT is offered in a package with a co-pack 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 8. Collector-emitter diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_f	Forward on-voltage	If = 20A, Tj = 25°C If = 20A, Tj = 125°C		1.9 1.7	2.5	V V
t_{rr} Q_{rr} I_{rrm}	Reverse recovery time Reverse recovery charge Reverse recovery current	If = 20A, V_R = 27V, T_j = 125°C, di/dt = 100A/µs *(see Figure 20)*		152 722 9		ns nC A

2.1 Electrical characteristics (curves)

Figure 2. Output characteristics

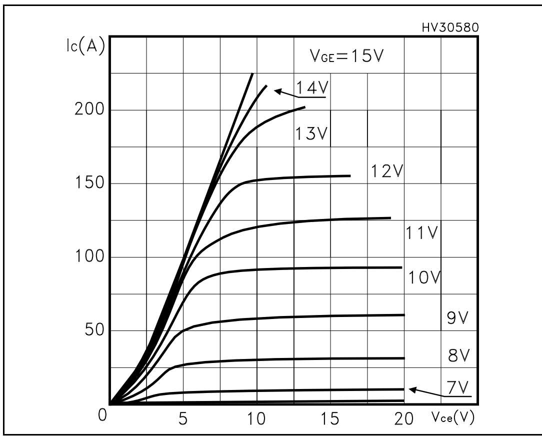


Figure 3. Transfer characteristics

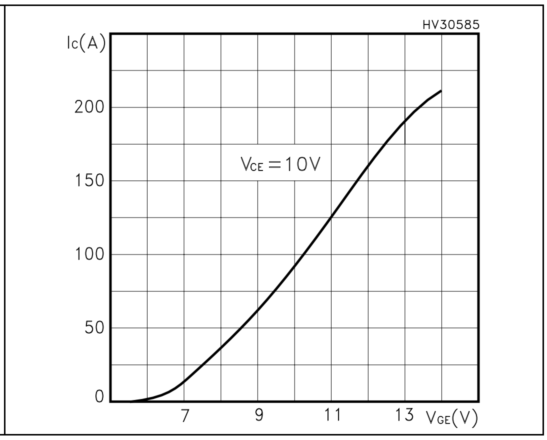


Figure 4. Transconductance

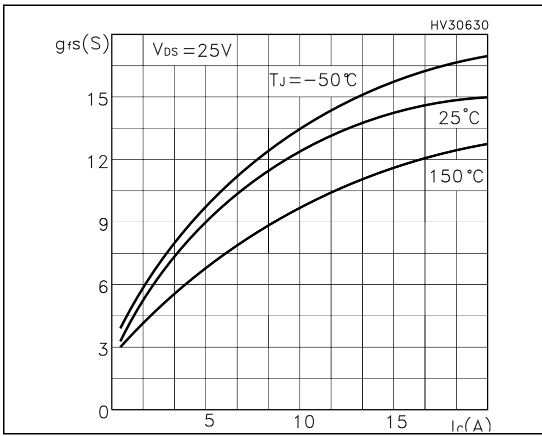


Figure 5. Collector-emitter on voltage vs. temperature

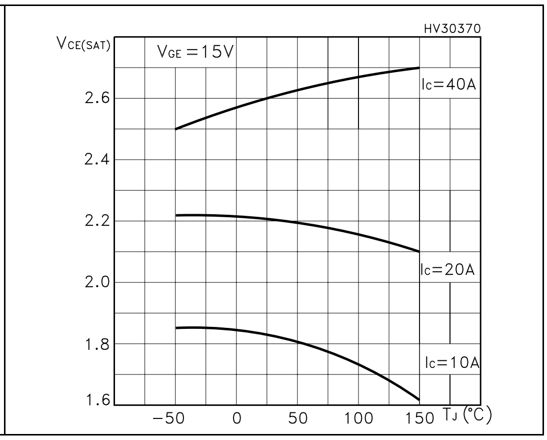


Figure 6. Gate charge vs. gate-source voltage

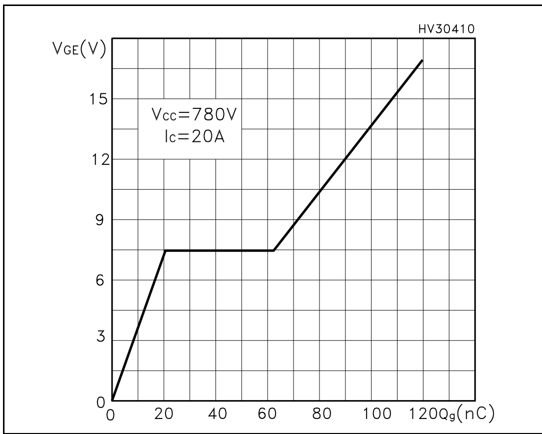


Figure 7. Capacitance variations

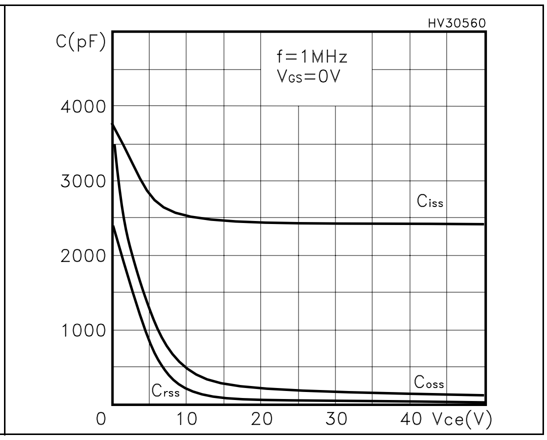


Figure 8. Normalized gate threshold voltage vs. temperature

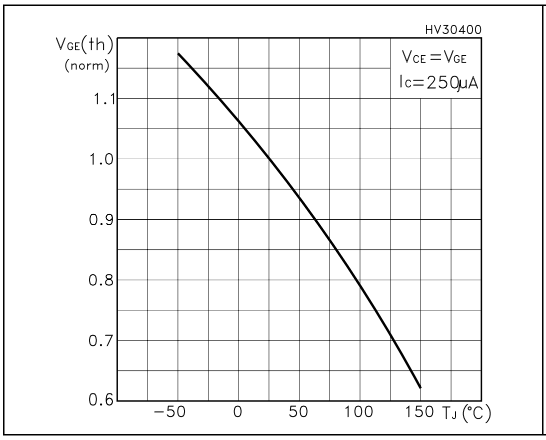


Figure 9. Collector-emitter on voltage vs. collector current

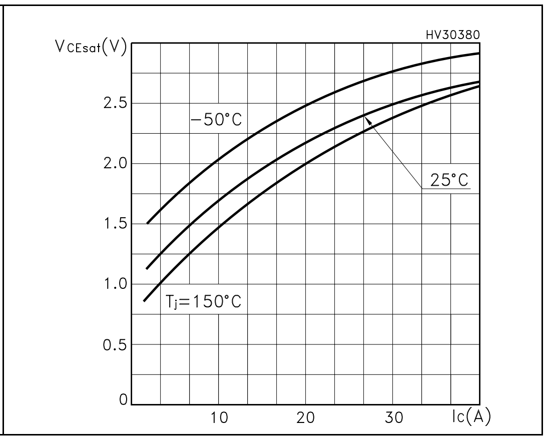


Figure 10. Normalized breakdown voltage vs. temperature

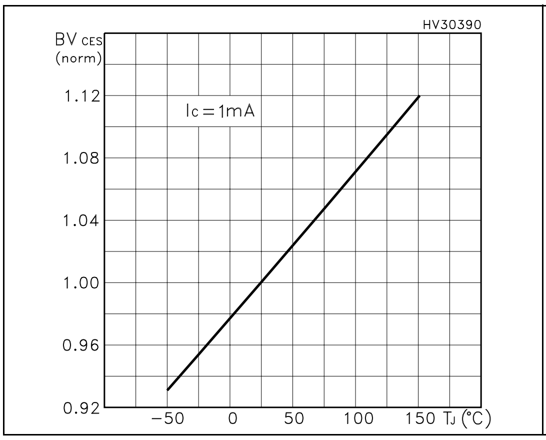


Figure 11. Switching losses vs. temperature

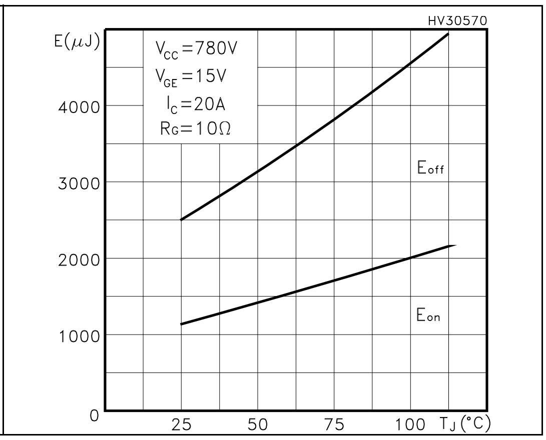


Figure 12. Switching losses vs. gate resistance

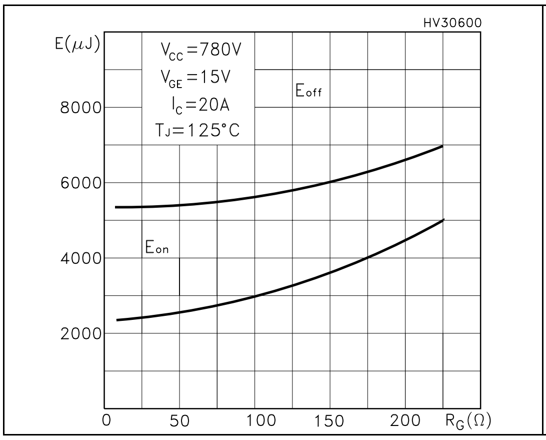


Figure 13. Switching losses vs. collector current

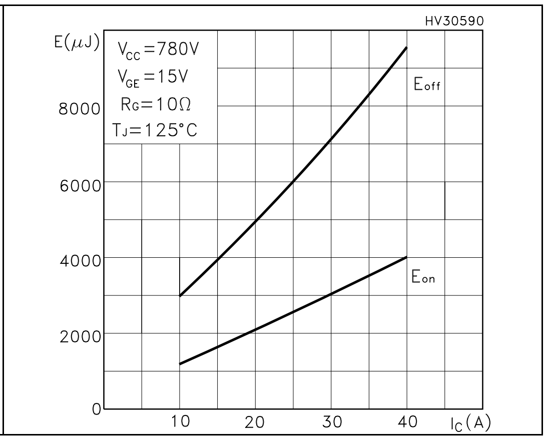


Figure 14. Thermal Impedance

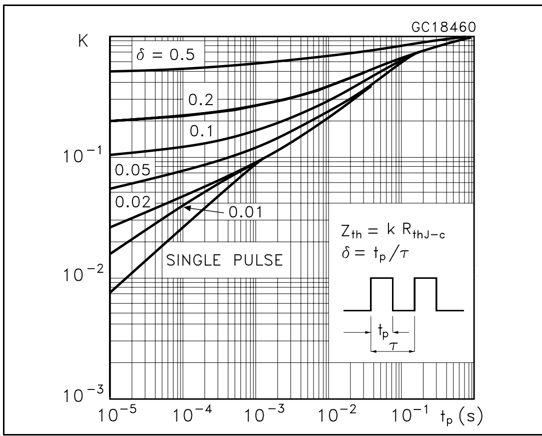


Figure 15. Turn-off SOA

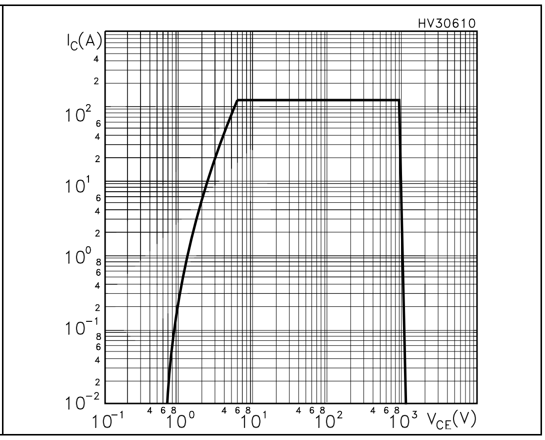
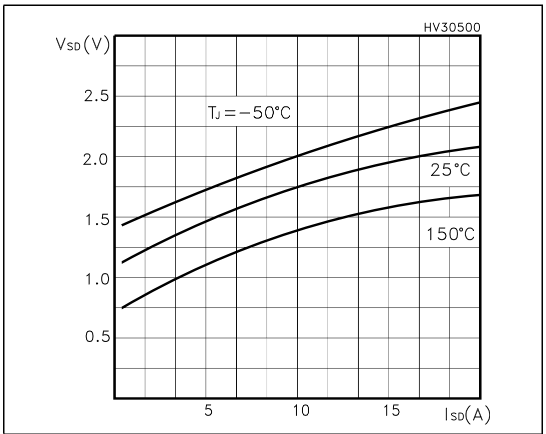


Figure 16. Emitter-collector diode characteristics



3 Test circuit

Figure 17. Test circuit for inductive load switching

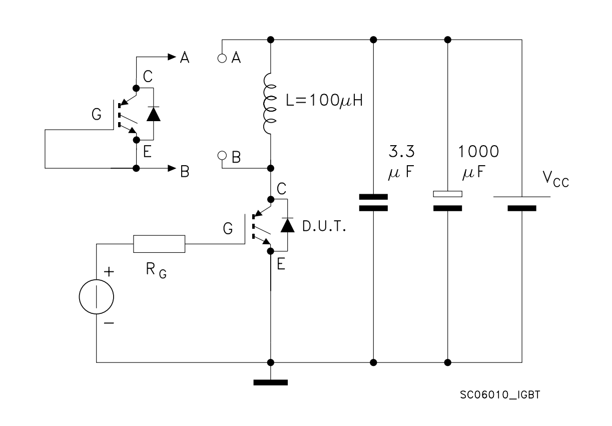


Figure 18. Gate charge test circuit

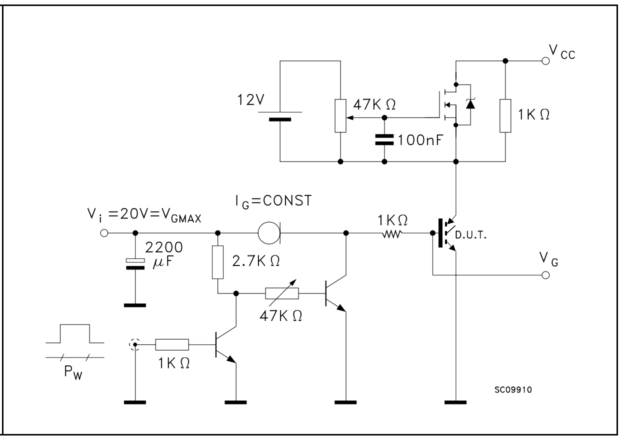


Figure 19. Switching waveform

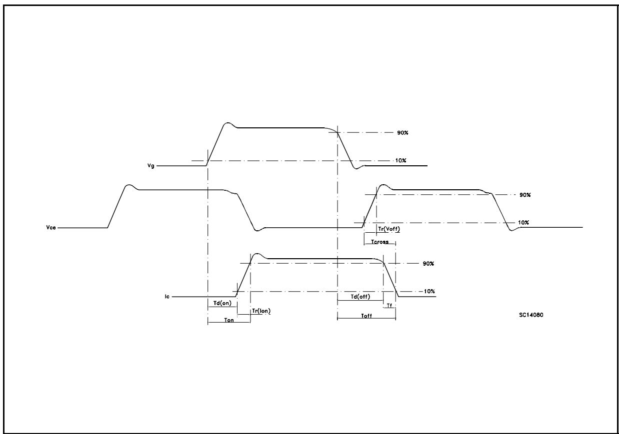
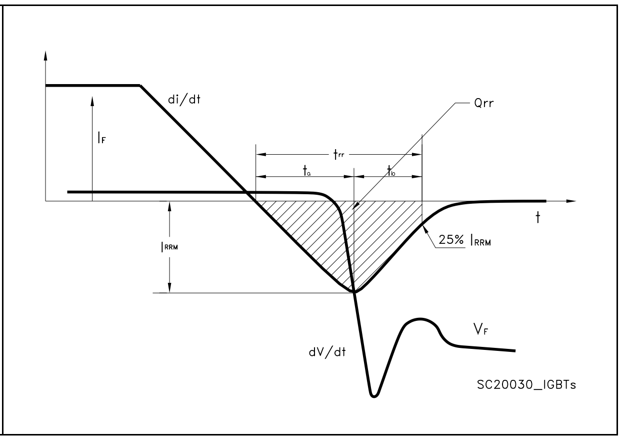


Figure 20. Diode recovery time waveform

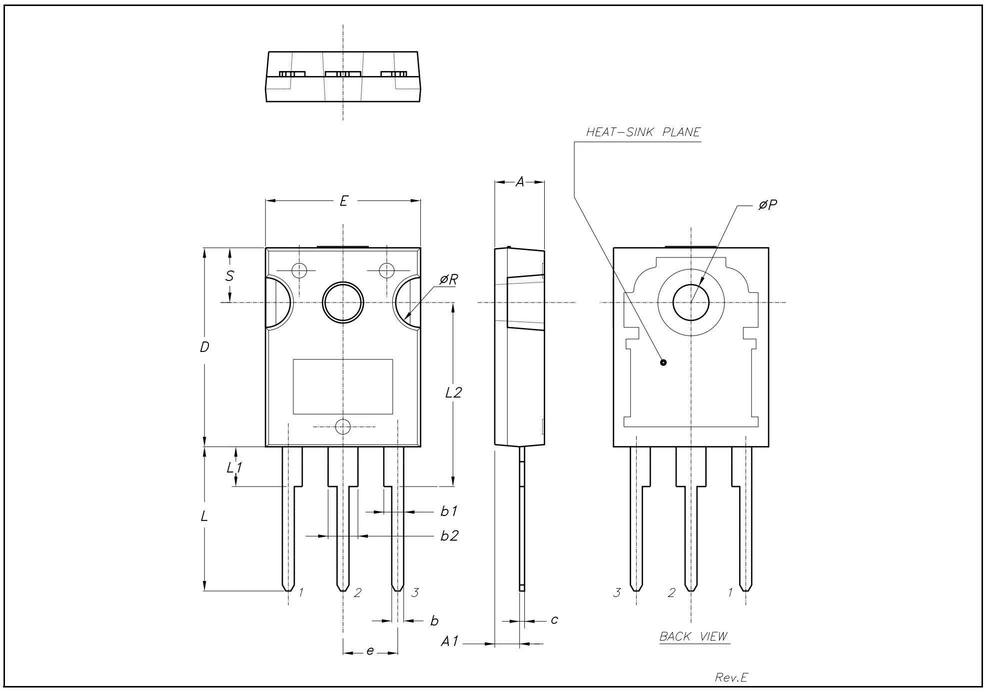


4 Package mechanical data

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-247 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	4.85		5.15	0.19		0.20
A1	2.20		2.60	0.086		0.102
b	1.0		1.40	0.039		0.055
b1	2.0		2.40	0.079		0.094
b2	3.0		3.40	0.118		0.134
c	0.40		0.80	0.015		0.03
D	19.85		20.15	0.781		0.793
E	15.45		15.75	0.608		0.620
e		5.45			0.214	
L	14.20		14.80	0.560		0.582
L1	3.70		4.30	0.14		0.17
L2		18.50			0.728	
øP	3.55		3.65	0.140		0.143
øR	4.50		5.50	0.177		0.216
S		5.50			0.216	



5 Revision history

Table 9. Document revision history

Date	Revision	Changes
23-Nov-2005	1	First issue.
17-Mar-2006	2	Complete version
05-May-2006	3	Modified value on *Table 2.: Absolute maximum ratings*
30-May-2006	4	New values on *Table 3: Thermal resistance*
23-Jun-2006	5	Modified value on *Table 4.: Static*
07-Sep-2006	6	Modified T_J temperature range to 150°C in *Table 2.: Absolute maximum ratings*
14-Nov-2006	7	Modified *Figure 5.* and *Figure 9.*
26-Jan-2007	8	Typing error on first page.
04-Oct-2007	9	Modified test conditions in *Table 4.: Static*

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