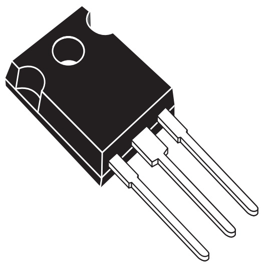
STGW35NB60S

N-channel 35A - 600V - TO-247
Low drop PowerMESH™ IGBT

Features

Type	V_{CES}	$V_{CE(sat)}$ (Max)@ 25°C	I_C @100°C
STGW35NB60S	600V	< 1.7V	35A

- Low on-voltage drop (V_{CEsat})
- Low input capacitance
- High current capability

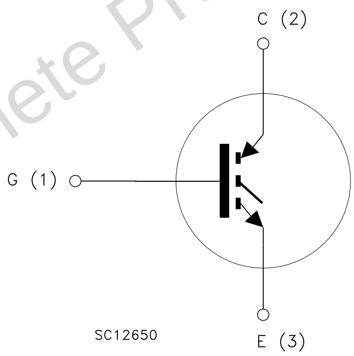


TO-247

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.

Internal schematic diagram



Applications

- Light dimmer
- HID
- Welding
- Motor control
- Static relays

Order code

Part number	Marking	Package	Packaging
STGW35NB60S	GW35NB60S	TO-247	Tube

Contents

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{CES}	Collector-emitter voltage (V_{GS} = 0)	600	V
I_C (1)	Collector current (continuous) at 25°C	70	A
I_C (1)	Collector current (continuous) at 100°C	35	A
I_{CM} (2)	Collector current (pulsed)	250	A
V_{GE}	Gate-emitter voltage	± 20	V
P_{TOT}	Total dissipation at T_C = 25°C	200	W
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. Pulse width limited by max. junction temperature

Table 2. Thermal resistance

		Value	Unit
Rthj-case	Thermal resistance junction-case max	0.625	°C/W
Rthj-amb	Thermal resistance junction-ambient max	50	°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 = 1mA, V_{GE} = 0	600			V
$V_{CE(SAT)}$	Collector-Emitter Saturation Voltage	V_{GE}= 15V, I_C= 20A, V_{GE}= 15V, I_C= 20A, Tj= 125°C		1.25 1.2	1.7	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_{GE} = 0)	V_{CE} = Max Rating, V_{CE} = Max Rating, Tc=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} = 10V, I_C= 18A		20		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		1820 167 27		pF pF pF
Q_g Q_{ge} Q_{gc}	Total Gate Charge Gate-Emitter Charge Gate-Collector Charge	V_{CE} = 480V, I_C = 20A, V_{GE} = 15V, (see Figure 16)		83 10 27	115	nC nC nC
I_{CL}	Turn-Off SOA Minimum Current	V_{clamp} = 480V , Tj = 125°C R_G = 100Ω	80			A

Table 5. 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} = 480V, I_C = 20A R_G= 100Ω, V_{GE}= 15V, see *Figure 15* and *17*		92 70 340		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} = 480V, I_C = 20A R_G= 100Ω, V_{GE}= 15V, Tj= 125°C see *Figure 15* and *17*		80 73 320		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} = 480V, I_C = 20A, R_{GE} = 100Ω , V_{GE} = 5V, see *Figure 15* and *17*		0.78 1.1 0.79		µs µs µs
$t_r(V_{off})$ $t_d(_{off})$ t_f	Off Voltage Rise Time Turn-off Delay Time Current Fall Time	V_{cc} = 480V, I_C = 20A, R_{GE}=100ΩV_{GE} =15V, Tj=125°C see *Figure 15* and *17*		1.1 2.4 1.2		µs µs µs

Table 6. Switching energy (inductive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
Eon E_{off}(1) E_{ts}	Turn-on Switching Losses Turn-off Switching Losses Total Switching Losses	V_{CC} = 480V, I_C = 20A R_G=100Ω, V_{GE}= 15V, see *Figure 15* and *17*		0.84 7.4 8.24		mJ mJ mJ
Eon E_{off}(1) E_{ts}	Turn-on Switching Losses Turn-off Switching Losses Total Switching Losses	V_{CC} = 480V, I_C = 20A R_G=100Ω, V_{GE}= 15V, Tj= 125°C see *Figure 15* and *17*		0.86 11.5 12.4		mJ mJ mJ

1. Turn-off losses include also the tail of the collector current

2.1 Electrical characteristics (curves)

Figure 1. Output characterisics

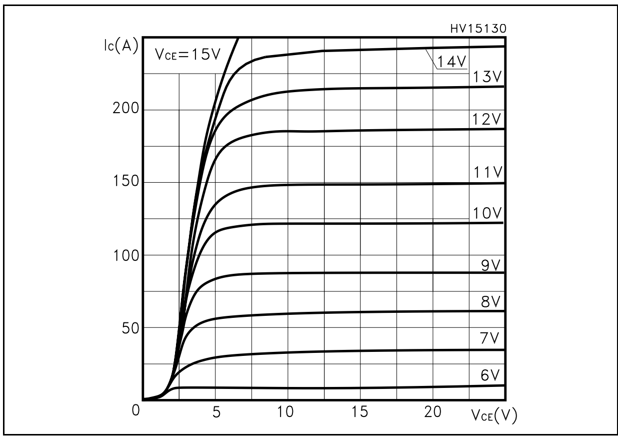


Figure 2. Transfer characteristics

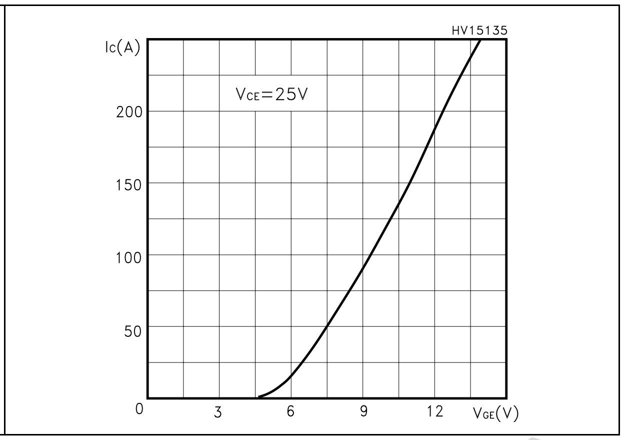


Figure 3. Transconductance

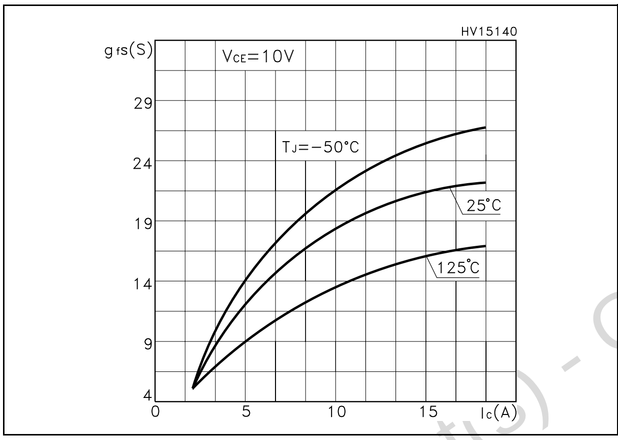


Figure 4. Normalized collector-emitter on voltage vs temperature

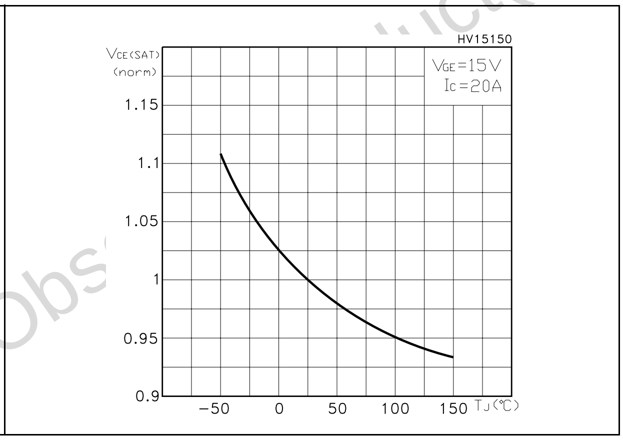


Figure 5. Collector-emitter on voltage vs collector current

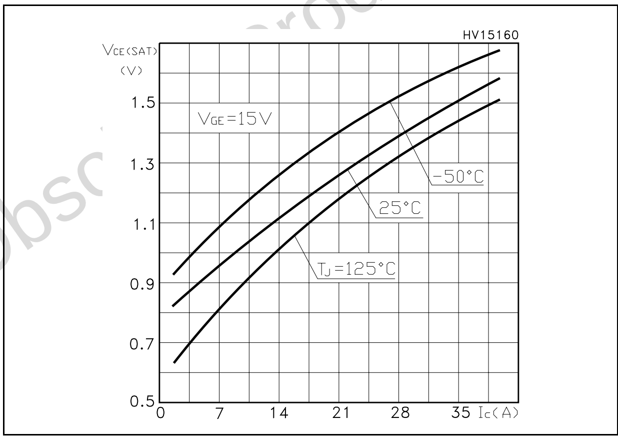


Figure 6. Gate threshold vs temperature

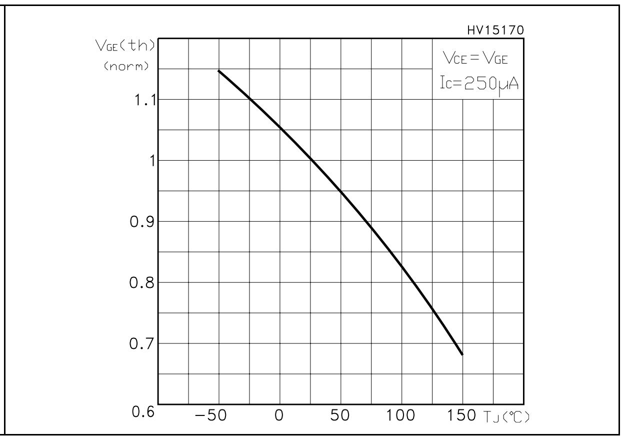


Figure 7. Normalized breakdown voltage vs temperature

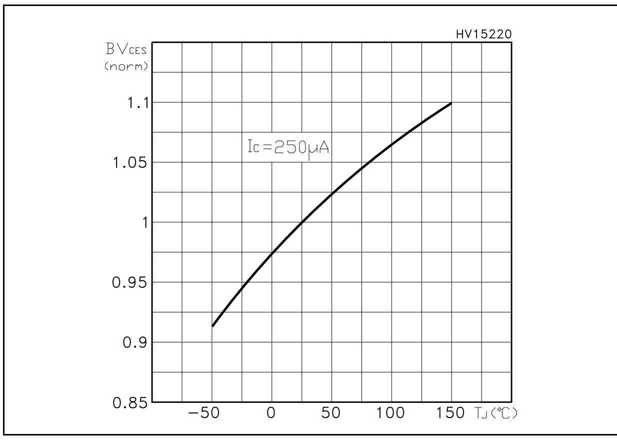


Figure 8. Gate charge vs gate-emitter voltage

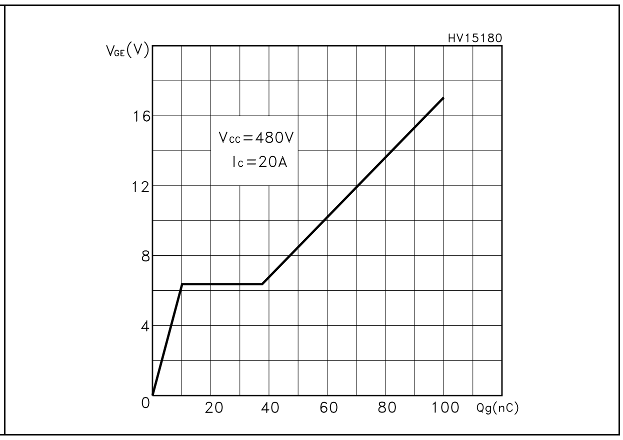


Figure 9. Capacitance variations

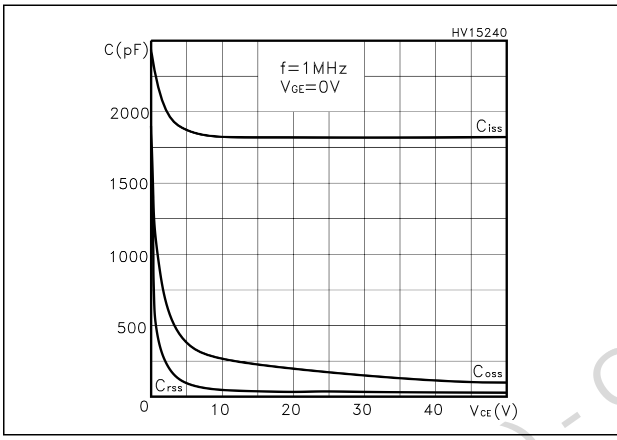


Figure 10. Switching losses vs gate charge

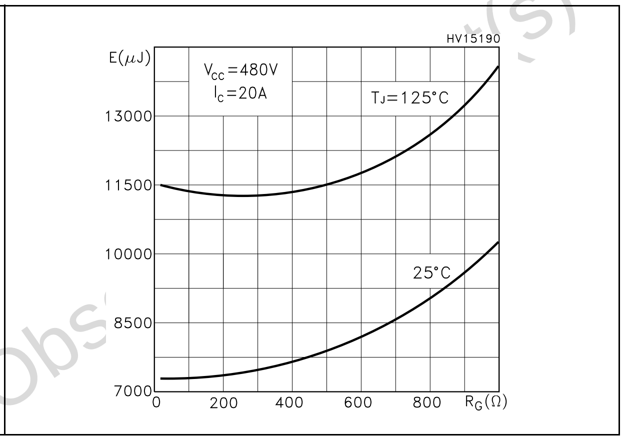


Figure 11. Switching losses vs temperature

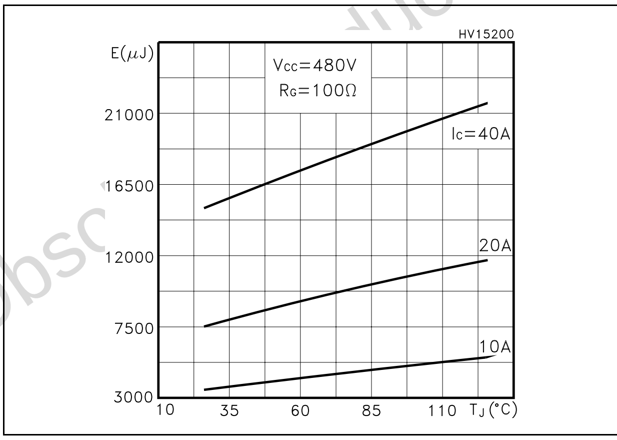


Figure 12. Switching losses vs collector current

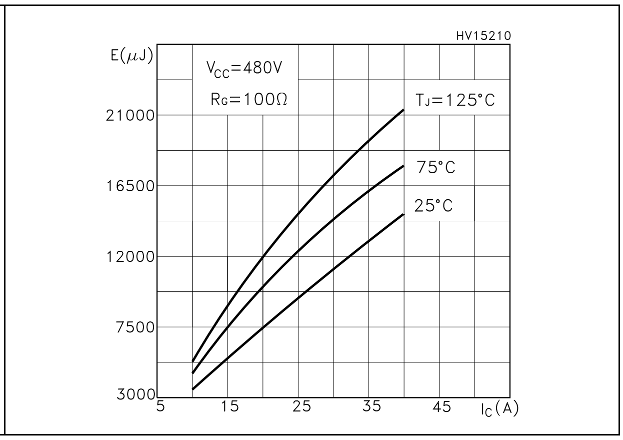


Figure 13. Thermal impedance

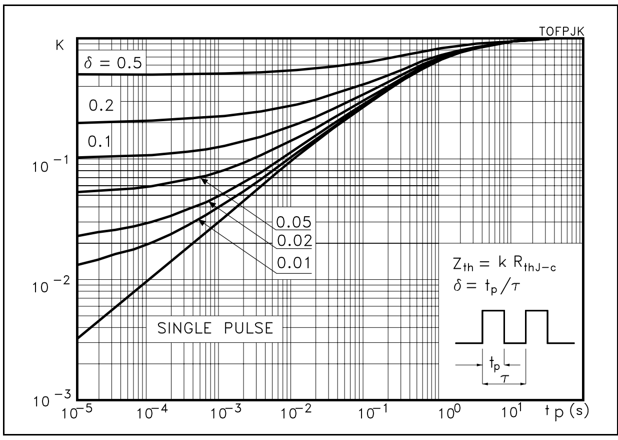
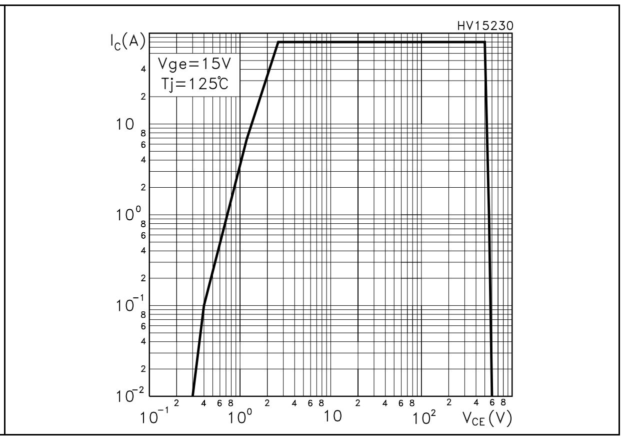


Figure 14. Turn-off SOA



3 Test Circuits

Figure 15. Test circuit for inductive load switching

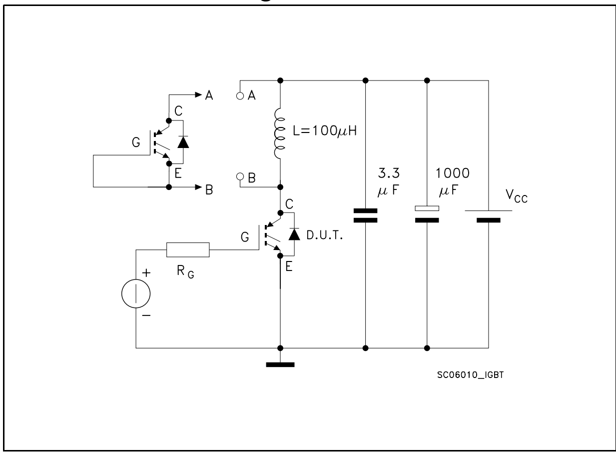


Figure 16. Gate charge test circuit

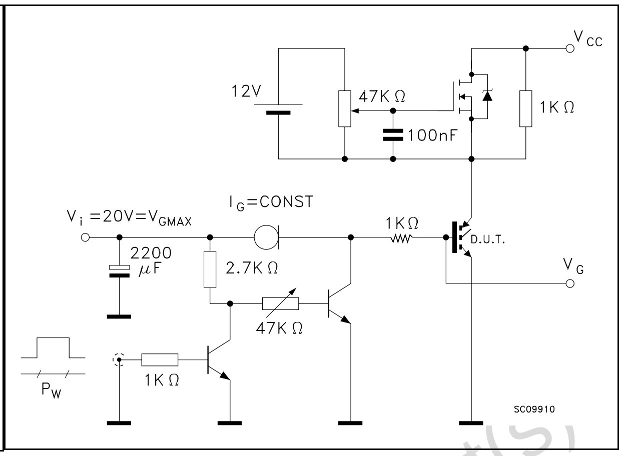
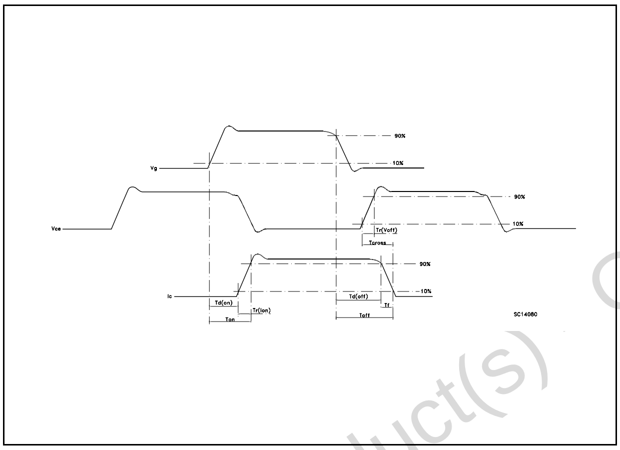


Figure 17. Switching waveform

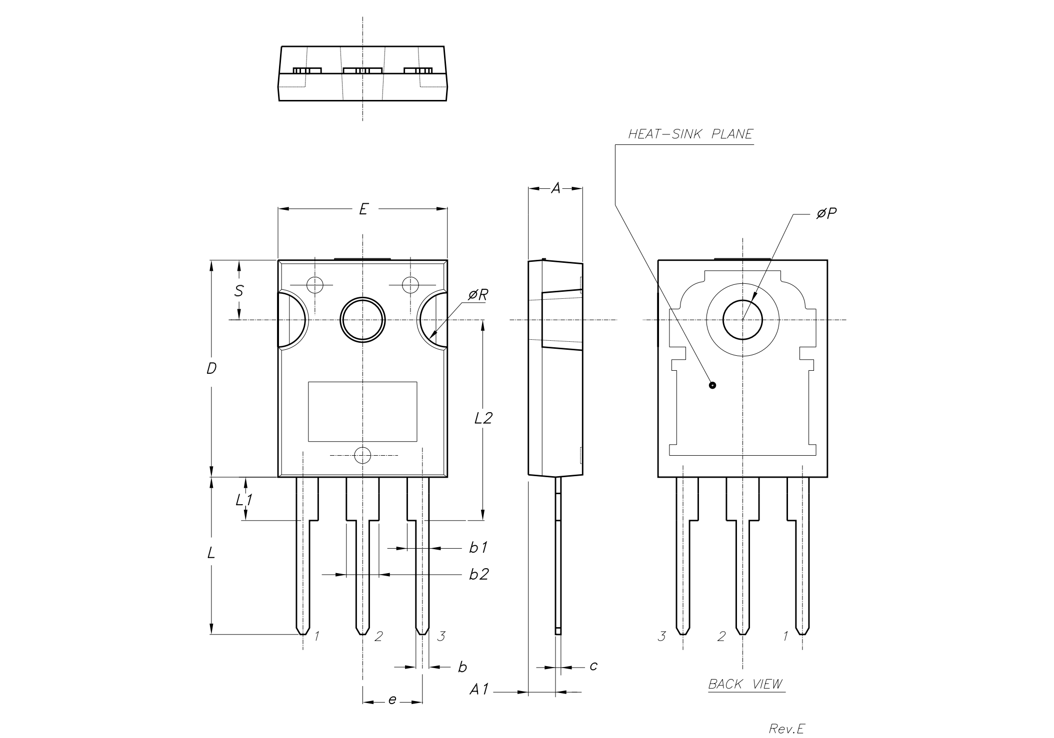


4 Package mechanical data

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 7. Revision history

Date	Revision	Changes
28-Mar-2007	1	Initial release.

STMicroelectronics group of companies

Australia - Belgium - Brazil - Canada - China - Czech Republic - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan - Malaysia - Malta - Morocco - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States of America

www.st.com