

Features

- Low on-losses
- Low on-voltage drop ($V_{CE(sat)}$)
- High current capability
- Low gate charge
- Ideal for soft switching application

Application

- Induction heating

Description

This IGBT utilizes the advanced PowerMESH™ process resulting in an excellent trade-off between switching performance and low on-state behavior.

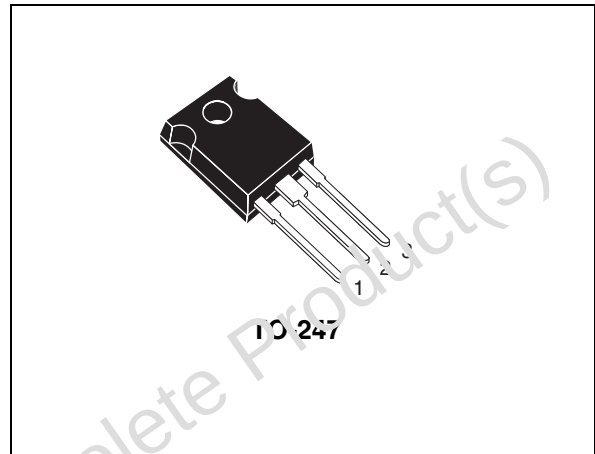


Figure 1. Internal schematic diagram

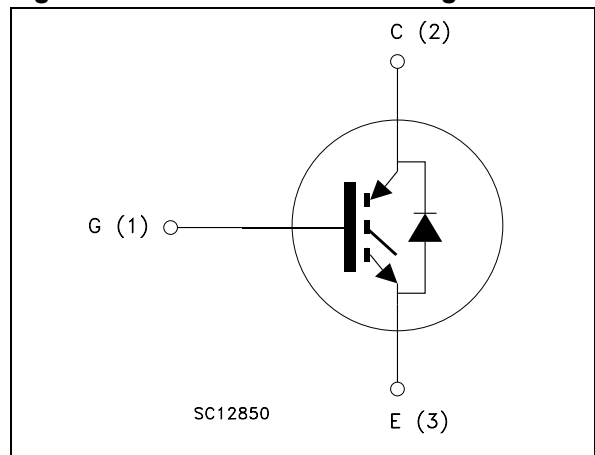


Table 1. Device summary

Order code	Marking	Package	Packaging
STGW30N90D	GW30N90D	TO-247	Tube

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Obsolete Product(s) - Obsolete Product(s)



1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{CES}	Collector-emitter voltage ($V_{GE} = 0$)	900	V
$I_C^{(1)}$	Collector current (continuous) at $T_C = 25\text{ }^{\circ}\text{C}$	60	A
$I_C^{(1)}$	Collector current (continuous) at $T_C = 100\text{ }^{\circ}\text{C}$	30	A
$I_{CL}^{(2)}$	Turn-off latching current	135	A
$I_{CP}^{(3)}$	Pulsed collector current	135	A
V_{GE}	Gate-emitter voltage	± 25	V
P_{TOT}	Total dissipation at $T_C = 25\text{ }^{\circ}\text{C}$	220	W
I_F	Diode RMS forward current at $T_C = 25\text{ }^{\circ}\text{C}$	30	A
I_{FSM}	Surge non repetitive forward current $t_p=10\text{ ms}$ sinusoidal	100	A
T_J	Operating junction temperature	-55 to 150	$^{\circ}\text{C}$

1. Calculated according to the iterative formula:

$$I_C(T_C) = \frac{T_{J(max)} - T_C}{R_{thj-c} \times V_{CE(sat)(max)}(T_{J(max)}, I_C(T_C))}$$

2. $V_{clamp}=900\text{ V}$, $T_J=125\text{ }^{\circ}\text{C}$, $R_G=10\text{ }\Omega$, $V_{GE}=15\text{ V}$

3. Pulse width limited by maximum junction temperature and turn-off within RBSOA

Table 3. Thermal data

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case IGBT	0.57	$^{\circ}\text{C/W}$
	Thermal resistance junction-case (diode)	1.6	$^{\circ}\text{C/W}$
$R_{thj-amb}$	Thermal resistance junction-ambient	50	$^{\circ}\text{C/W}$

2 Electrical characteristics

($T_J = 25\text{ °C}$ unless otherwise specified)

Table 4. Static electrical characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)CES}$	Collector-emitter breakdown voltage ($V_{GE} = 0$)	$I_C = 1\text{ mA}$	900			V
$V_{CE(sat)}$	Collector-emitter saturation voltage	$V_{GE} = 15\text{ V}$, $I_C = 20\text{ A}$ $V_{GE} = 15\text{ V}$, $I_C = 20\text{ A}$, $T_J = 125\text{ °C}$		2.2 2.0	2.75	V
$V_{GE(th)}$	Gate threshold voltage	$V_{CE} = V_{GE}$, $I_C = 250\mu\text{A}$	3.75		5.75	V
I_{CES}	Collector-emitter cut-off current ($V_{GE} = 0$)	$V_{CE} = 600\text{ V}$ $V_{CE} = 600\text{ V}$, $T_J = 125\text{ °C}$			500 10	μA mA
I_{GES}	Gate-emitter leakage current ($V_{CE} = 0$)	$V_{GE} = \pm 20\text{ V}$			± 100	nA
$g_{fs}^{(1)}$	Forward transconductance	$V_{CE} = 25\text{ V}$, $I_C = 20\text{ A}$		14		S

1. Pulse duration: 300 μs , duty cycle 1.5%

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{ies}	Input capacitance	$V_{CE} = 25\text{ V}$, $f = 1\text{ MHz}$, $V_{GE} = 0$	-	2510	-	pF
C_{oes}	Output capacitance			175		pF
C_{res}	Reverse transfer capacitance			30		pF
Q_g	Total gate charge	$V_{CE} = 900\text{ V}$, $I_C = 20\text{ A}$, $V_{GE} = 15\text{ V}$	-	110	-	nC
Q_{ge}	Gate-emitter charge			16		nC
Q_{gc}	Gate-collector charge			49		nC

Table 6. Switching on/off (inductive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{CC} = 900\text{ V}$, $I_C = 20\text{ A}$		29		ns
t_r	Current rise time	$R_G = 10\ \Omega$, $V_{GE} = 15\text{ V}$, (see Figure 17)	-	11	-	ns
$(di/dt)_{on}$	Turn-on current slope			1820		A/ μ s
$t_{d(on)}$	Turn-on delay time	$V_{CC} = 900\text{ V}$, $I_C = 20\text{ A}$		27		ns
t_r	Current rise time	$R_G = 10\ \Omega$, $V_{GE} = 15\text{ V}$,	-	14	-	ns
$(di/dt)_{on}$	Turn-on current slope	$T_J = 125\text{ }^\circ\text{C}$ (see Figure 17)		1580		A/ μ s
$t_r(V_{off})$	Off voltage rise time	$V_{CC} = 900\text{ V}$, $I_C = 20\text{ A}$		90		ns
$t_{d(off)}$	Turn-off delay time	$R_G = 10\ \Omega$, $V_{GE} = 15\text{ V}$,	-	275	-	ns
t_f	Current fall time	(see Figure 17)		312		ns
$t_r(V_{off})$	Off voltage rise time	$V_{CC} = 900\text{ V}$, $I_C = 20\text{ A}$		150		ns
$t_{d(off)}$	Turn-off delay time	$R_G = 10\ \Omega$, $V_{GE} = 15\text{ V}$,	-	333	-	ns
t_f	Current fall time	$T_J = 125\text{ }^\circ\text{C}$ (see Figure 17)		592		ns

Table 7. Switching energy (inductive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$E_{on}^{(1)}$	Turn-on switching losses	$V_{CC} = 900\text{ V}$, $I_C = 20\text{ A}$		1660		μ J
$E_{off}^{(2)}$	Turn-off switching losses	$R_G = 10\ \Omega$, $V_{GE} = 15\text{ V}$,	-	4438	-	μ J
E_{ts}	Total switching losses	(see Figure 17)		6098		μ J
$E_{on}^{(1)}$	Turn-on switching losses	$V_{CC} = 900\text{ V}$, $I_C = 20\text{ A}$		3015		μ J
$E_{off}^{(2)}$	Turn-off switching losses	$R_G = 10\ \Omega$, $V_{GE} = 15\text{ V}$,	-	6900	-	μ J
E_{ts}	Total switching losses	$T_J = 125\text{ }^\circ\text{C}$ (see Figure 17)		9915		μ J

1. E_{on} 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	$I_F = 20\text{ A}$ $I_F = 20\text{ A}$, $T_J = 125\text{ }^\circ\text{C}$	-	1.9 1.7	2.5	V V
t_{rr}	Reverse recovery time	$I_F = 20\text{ A}$, $V_R = 27\text{ V}$,		152		ns
Q_{rr}	Reverse recovery charge	$T_J = 125\text{ }^\circ\text{C}$, $di/dt = 100$	-	722		nC
I_{rrm}	Reverse recovery current	A/ μ s (see Figure 20)		9		A

2.1 Electrical characteristics (curves)

Figure 2. Output characteristics

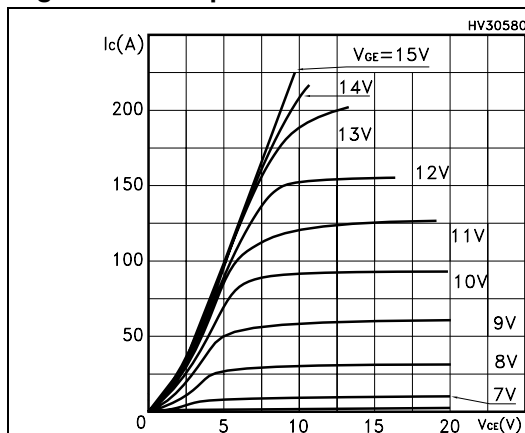


Figure 3. Transfer characteristics

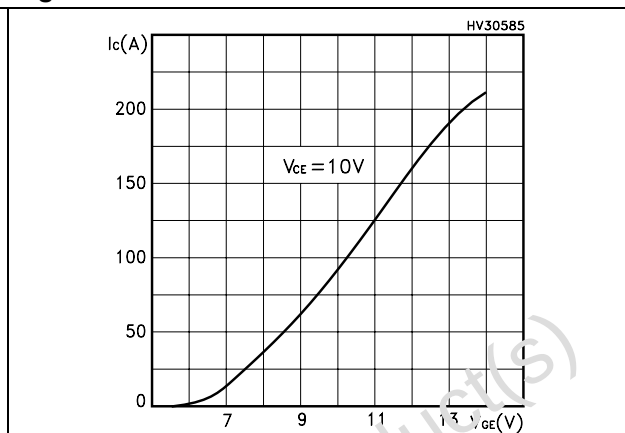


Figure 4. Transconductance

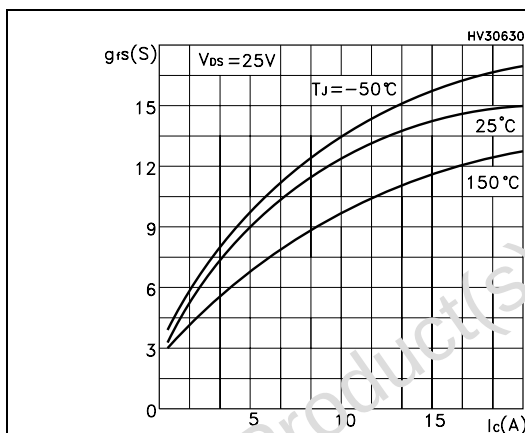


Figure 5. Collector-emitter on voltage vs. temperature

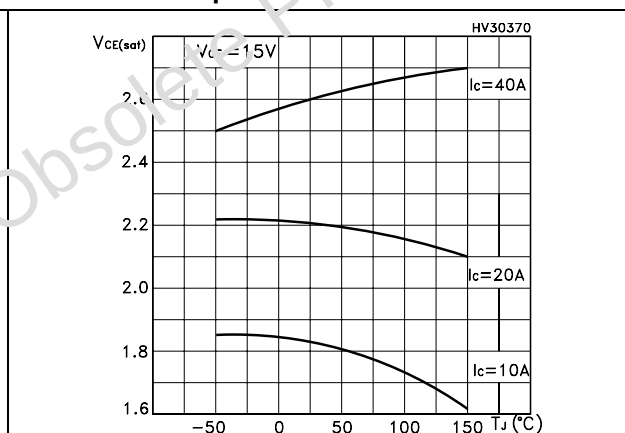


Figure 6. Gate charge vs. gate-source voltage

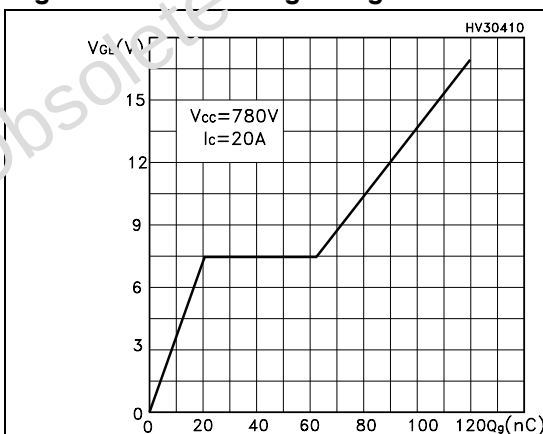


Figure 7. Capacitance variations

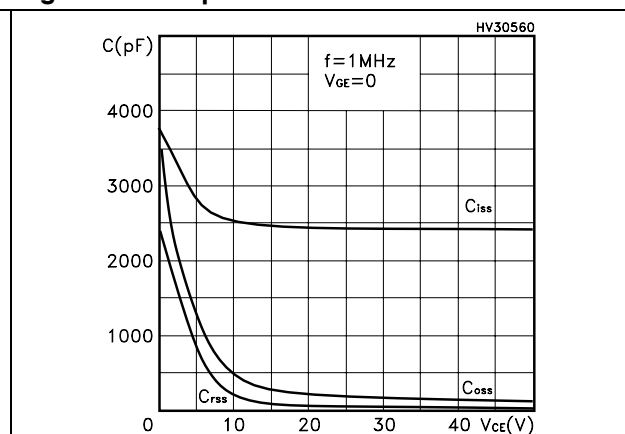


Figure 8. Normalized gate threshold voltage vs. temperature

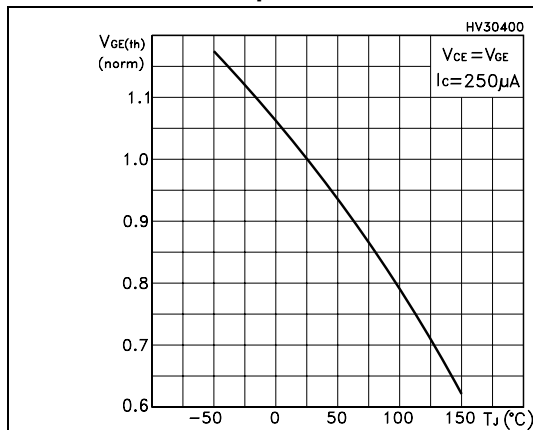


Figure 9. Collector-emitter on voltage vs. collector current

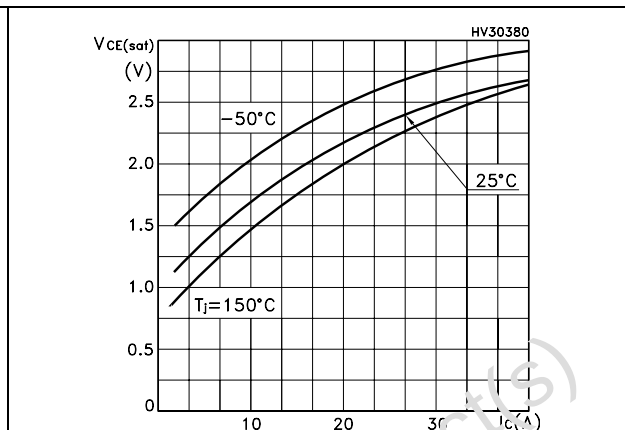


Figure 10. Normalized breakdown voltage vs. temperature

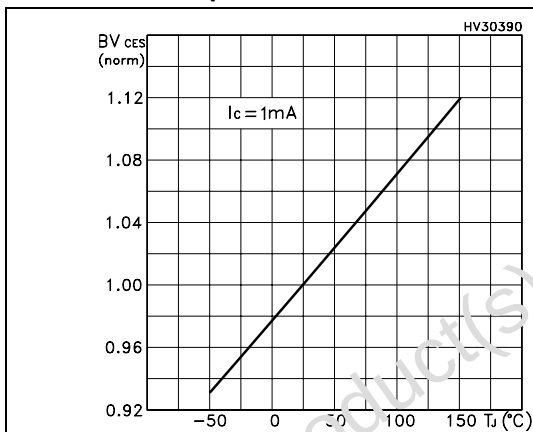


Figure 11. Switching losses vs. temperature

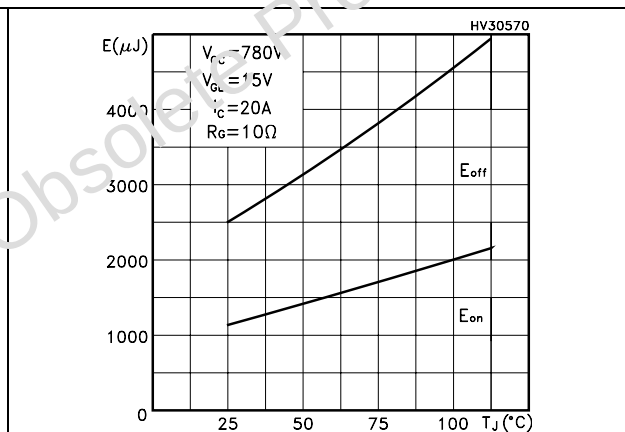


Figure 12. Switching losses vs. gate resistance

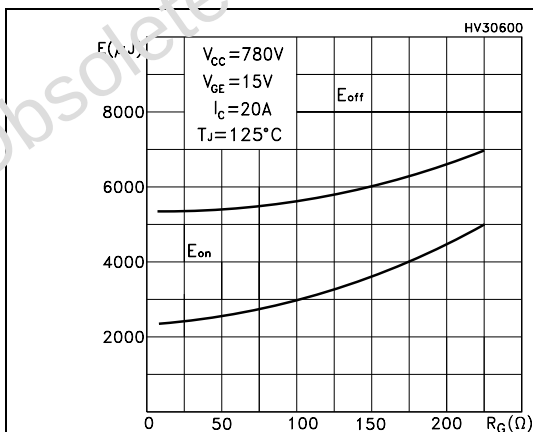


Figure 13. Switching losses vs. collector current

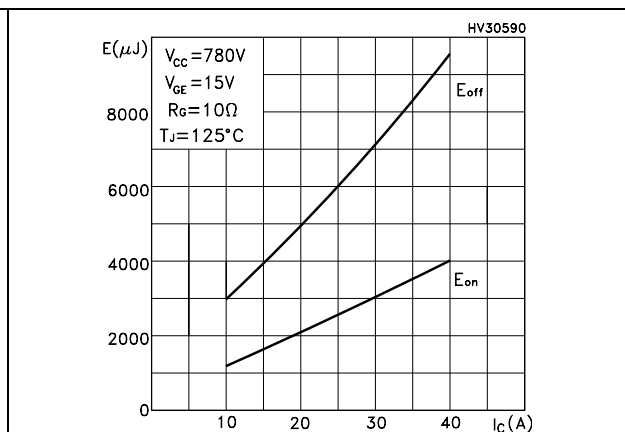


Figure 14. Thermal Impedance

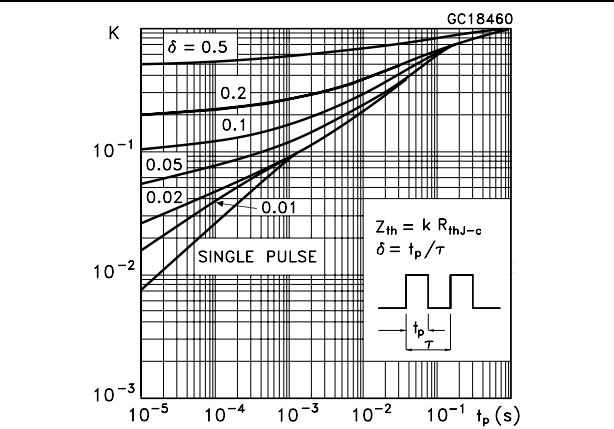


Figure 15. Reverse biased SOA

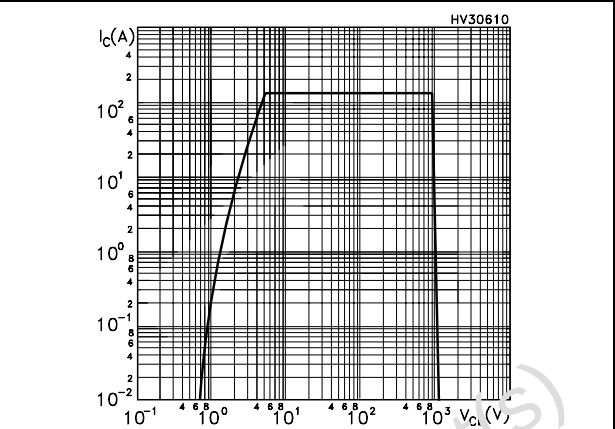
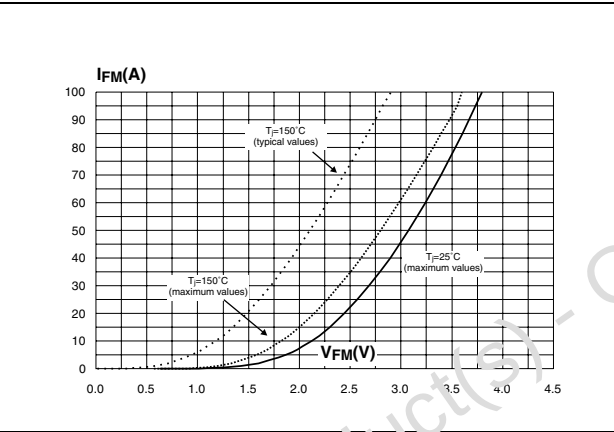


Figure 16. Forward voltage drop vs. forward current



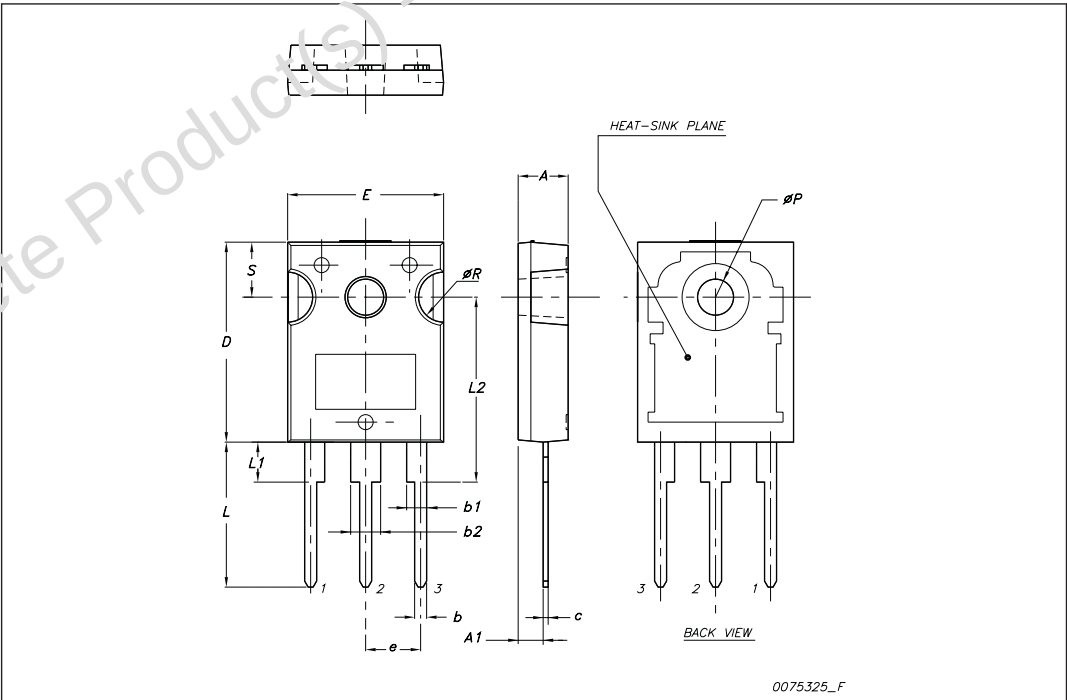
4 Package mechanical data

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: www.st.com. ECOPACK is an ST trademark.

Obsolete Product(s) - Obsolete Product(s)

TO-247 mechanical data

Dim.	mm.		
	Min.	Typ.	Max.
A	4.85		5.15
A1	2.20		2.60
b	1.0		1.40
b1	2.0		2.40
b2	3.0		3.40
c	0.40		0.80
D	19.85		20.15
E	15.45		15.75
e		5.45	
L	14.20		14.80
L1	3.70		4.30
L2		16.50	
øP	3.55		3.65
øR	4.50		5.50
S		5.50	



5 Revision history

Table 9. Document revision history

Date	Revision	Changes
19-Jul-2006	1	First issue.
02-Sep-2009	2	– Document status promoted from preliminary data to datasheet – Section 4: Package mechanical data has been updated

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