1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{CES}	Collector-emitter voltage (V_{GE} = 0)	1200	V
I_C	Continuous collector current at T_C = 25 °C	50	A
I_C	Continuous collector current at T_C = 100 °C	25	A
I_{CP} (1)	Pulsed collector current	75	A
I_F	Continuous collector current at T_C = 25 °C	50	A
	Continuous collector current at T_C = 100 °C	25	A
I_{FP} (1)	Pulsed forward current	75	A
V_{GE}	Gate-emitter voltage	±20	V
P_{TOT}	Total dissipation at T_C = 25 °C	313	W
T_J	Operating junction temperature	– 55 to 150	°C

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

Table 3. Thermal data

Symbol	Parameter	Value	Unit
R_{thJC}	Thermal resistance junction-case IGBT	0.40	°C/W
R_{thJC}	Thermal resistance junction-case diode	1.1	°C/W
R_{thJA}	Thermal resistance junction-ambient	50	°C/W

2 Electrical characteristics

T_J = 25 °C unless otherwise specified.

Table 4. Static

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)CES}$	Collector-emitter breakdown voltage (V_{GE} = 0)	I_C = 1 mA	1200			V
$V_{CE(sat)}$	Collector-emitter saturation voltage	V_{GE} = 15 V, I_C = 25 A V_{GE} = 15 V, I_C = 25 A, T_J = 150 °C		2.15 2.30		V V
$V_{GE(th)}$	Gate threshold voltage	V_{CE} = V_{GE}, I_C = 1 mA		6		V
V_F	Forward on-voltage	I_F = 25 A I_F = 25 A, T_J = 150 °C	-	2.15 1.7	2.85	V V
I_{CES}	Collector cut-off current (V_{GE} = 0)	V_{CE} = 1200 V V_{CE} = 1200 V, T_J = 150 °C			100 1	µA mA
I_{GES}	Gate-emitter leakage current (V_{CE} = 0)	V_{GE} = ± 20 V			250	nA

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} = 25 V, f = 1 MHz, V_{GE} = 0	-	4880 125 65	-	pF pF pF
Q_g Q_{ge} Q_{gc}	Total gate charge Gate-emitter charge Gate-collector charge	V_{CE} = 600 V, I_C = 25 A, V_{GE} = 15 V	-	144 36 64	-	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} = 600 V, I_C = 25 A R_G = 22 Ω, V_{GE} = 15 V *(see Figure 21)*	-	75 24 1100	-	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} = 600 V, I_C = 25 A R_G = 22 Ω, V_{GE} = 15 V, T_J = 150 °C *(see Figure 21)*	-	70 32 950	-	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} = 600 V, I_C = 25 A R_G = 22 Ω, V_{GE} = 15 V *(see Figure 21)*	-	50 285 46	-	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} = 600 V, I_C = 25 A R_G = 22 Ω, V_{GE} = 15 V, T_J = 150 °C *(see Figure 21)*	-	72 335 125	-	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} = 600 V, I_C = 25 A R_G = 22 Ω, V_{GE} = 15 V *(see Figure 21)*	-	1.48 0.78 2.26	-	mJ mJ mJ
Eon (1) E_{off} (2) E_{ts}	Turn-on switching losses Turn-off switching losses Total switching losses	V_{CC} = 600 V, I_C = 25 A R_G = 22 Ω, V_{GE} = 15 V T_J = 150 °C *(see Figure 21)*	-	2.5 1.36 3.86	-	mJ mJ mJ

1. Energy losses include reverse recovery of the diode
2. Turn-off losses include also the tail of the collector current

Table 8. Collector-emitter diode dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
t_{rr} Q_{rr} I_{rrm}	Reverse recovery time Reverse recovery charge Reverse recovery current	I_F = 25 A, V_R = 600 V, di/dt = 1050 A/µs *(see Figure 5)*	-	88 1.52 30	-	ns µC A
t_{rr} Q_{rr} I_{rrm}	Reverse recovery time Reverse recovery charge Reverse recovery current	I_F = 25 A, V_R = 600 V, T_J = 150 °C, di/dt = 900 A/µs *(see Figure 5)*	-	185 4.46 44	-	ns µC A

2.1 Electrical characteristics (curves)

Figure 2. Output characteristics (T_J = -40 °C)

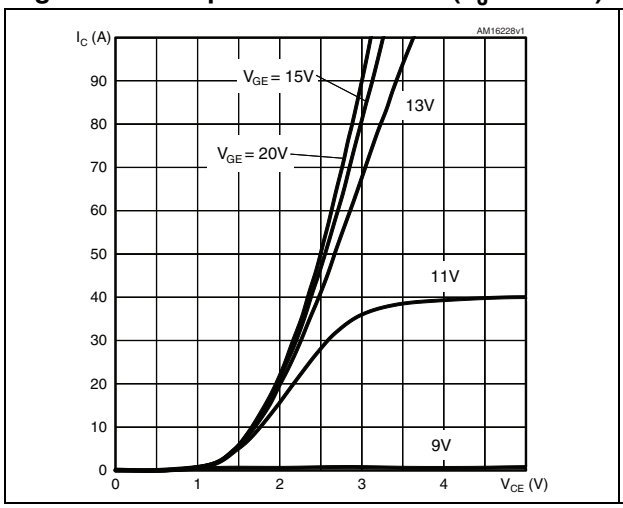


Figure 3. Output characteristics (T_J = 25 °C)

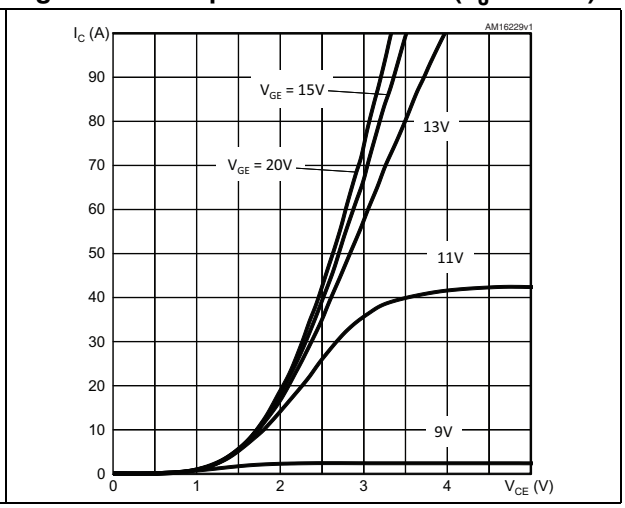


Figure 4. Output characteristics (T_J = 150 °C)

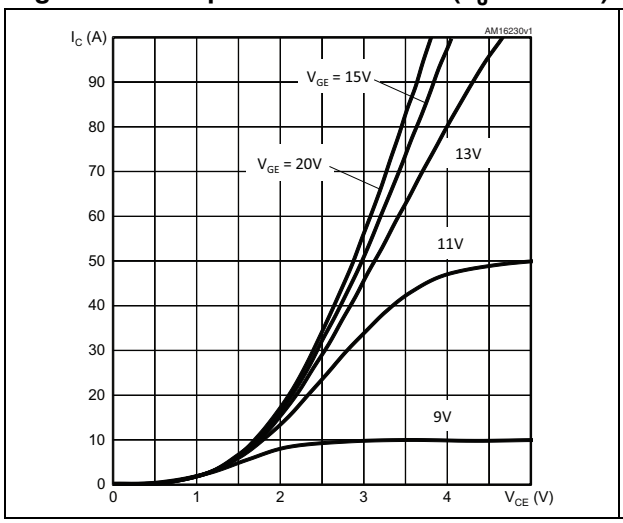


Figure 5. Transfer characteristics (V_{CE} = 4 V)

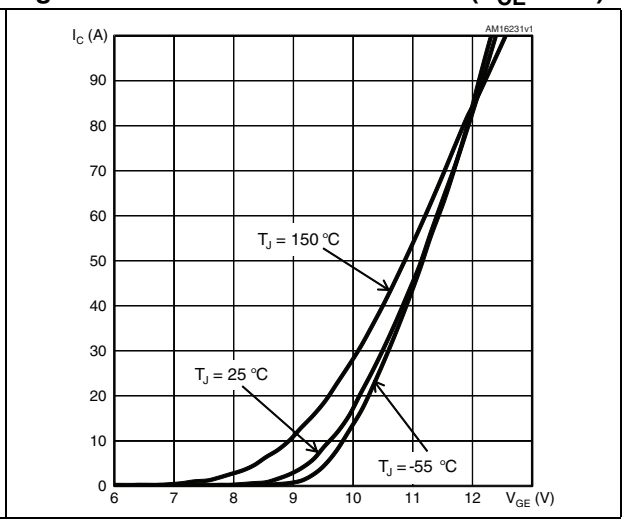


Figure 6. $V_{CE(SAT)}$ vs. junction temperature

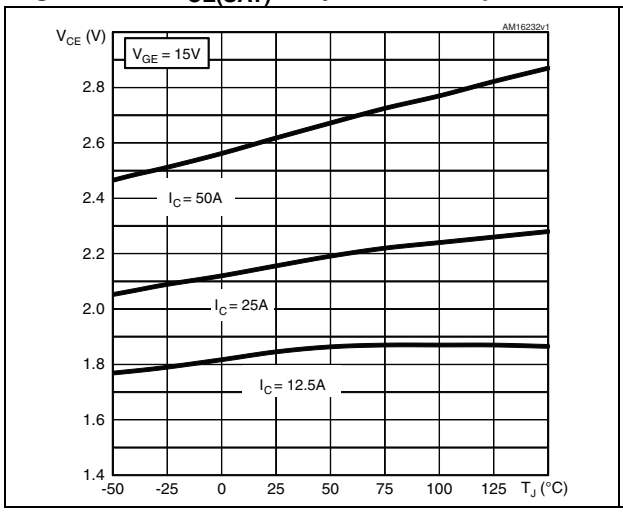


Figure 7. $V_{CE(SAT)}$ vs. collector current

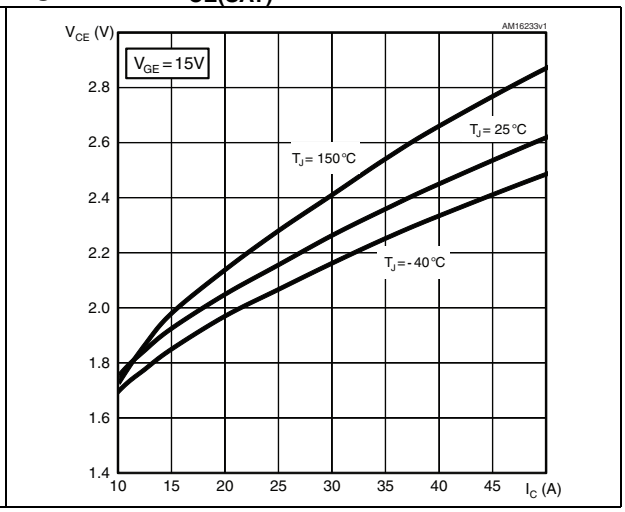


Figure 8. Normalized $V_{GE(th)}$ vs. junction temperature

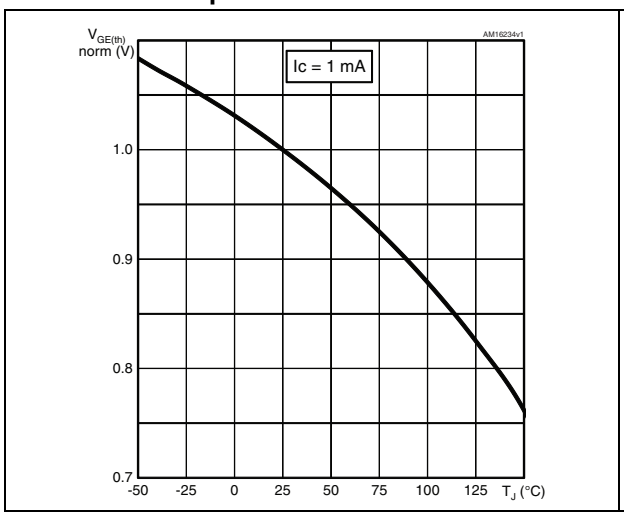


Figure 9. Gate charge vs. gate-emitter voltage (V_{CC} = 600 V, I_C = 25 A)

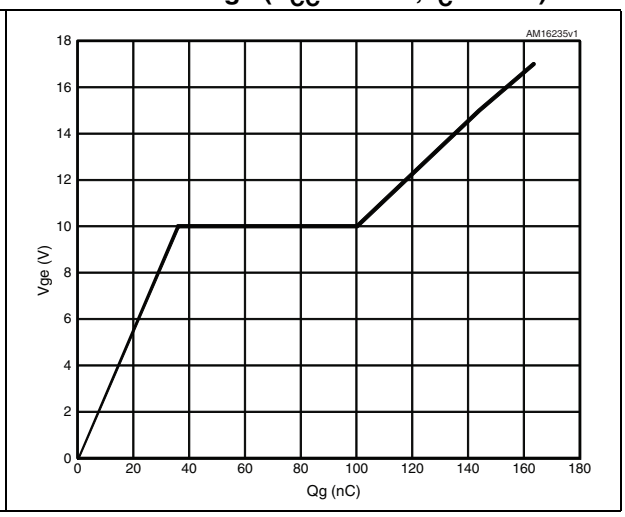


Figure 10. Capacitance variations (f = 1 MHz, V_{GE} = 0)

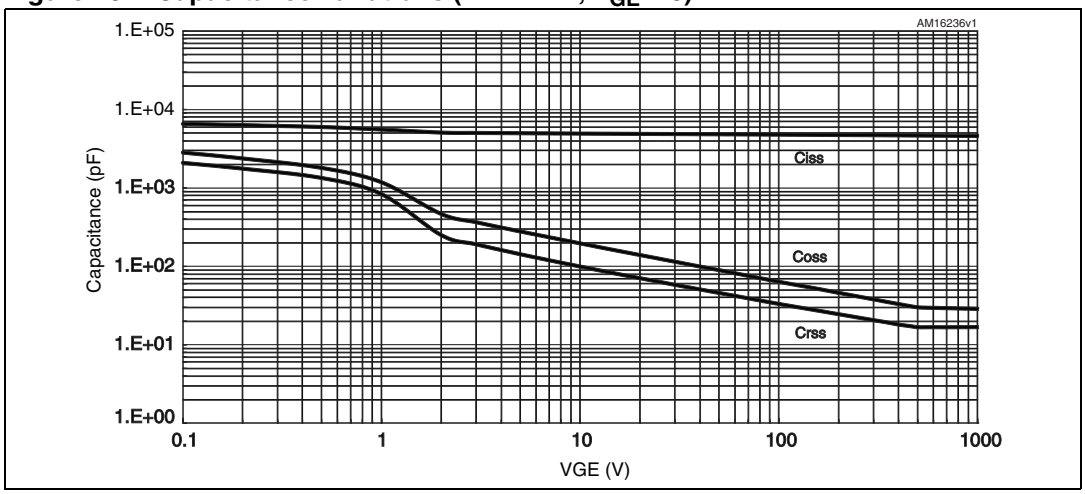


Figure 11. Switching losses vs. collector current

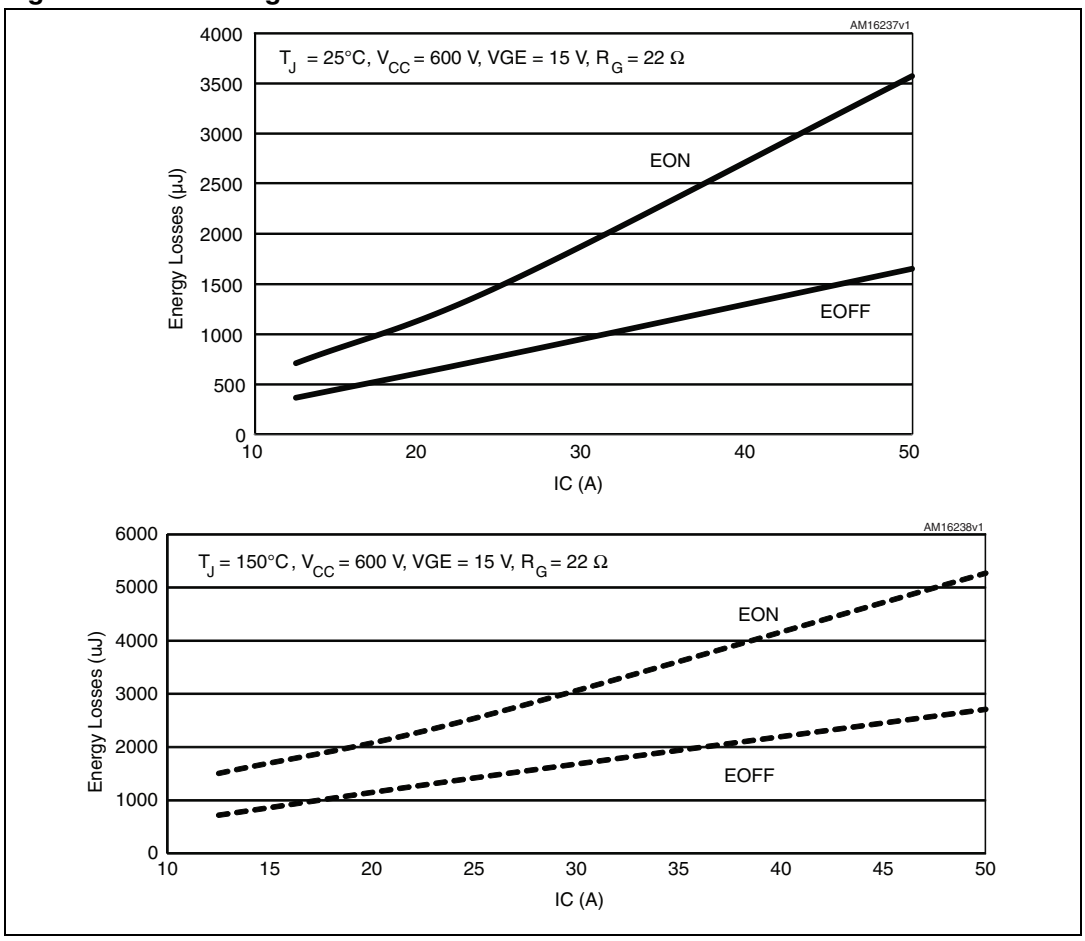


Figure 12. Switching losses vs. gate resistance

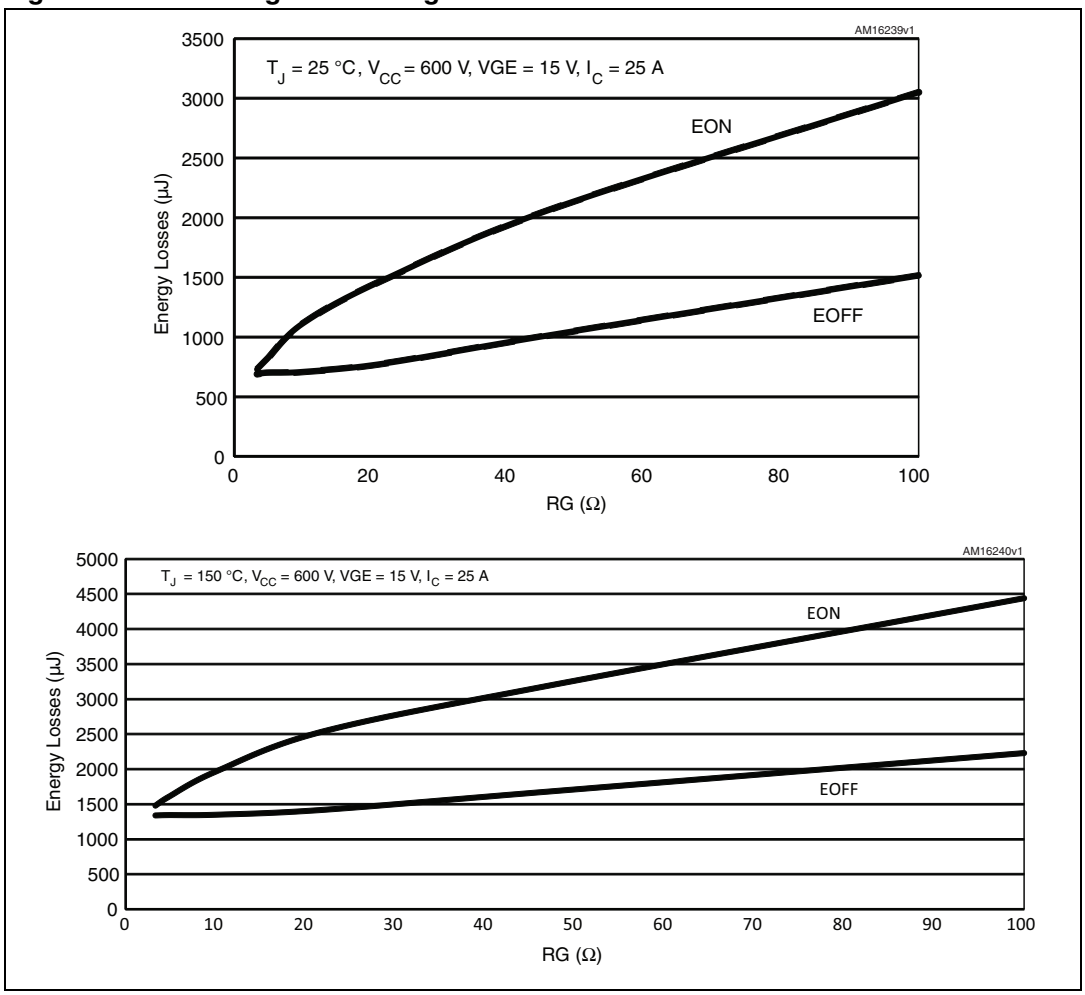


Figure 13. Switching losses vs. temperature

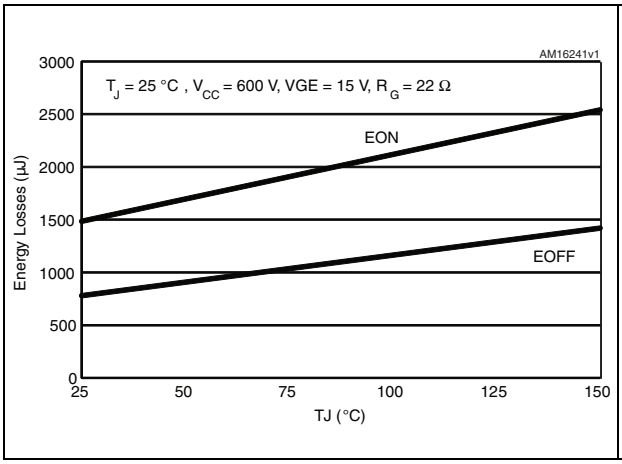


Figure 14. Switching losses vs. V_{CC}

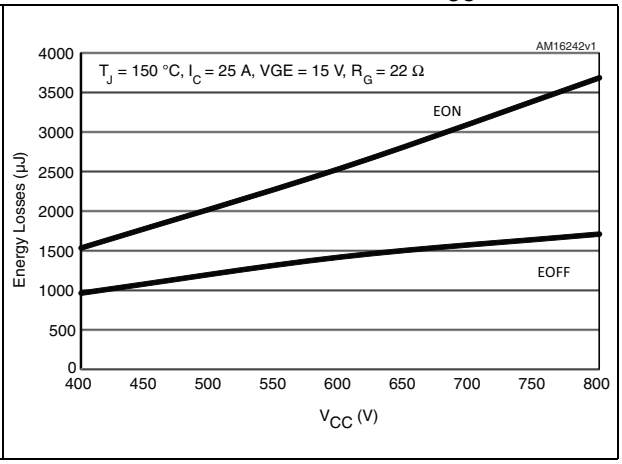


Figure 15. Turn-OFF SOA

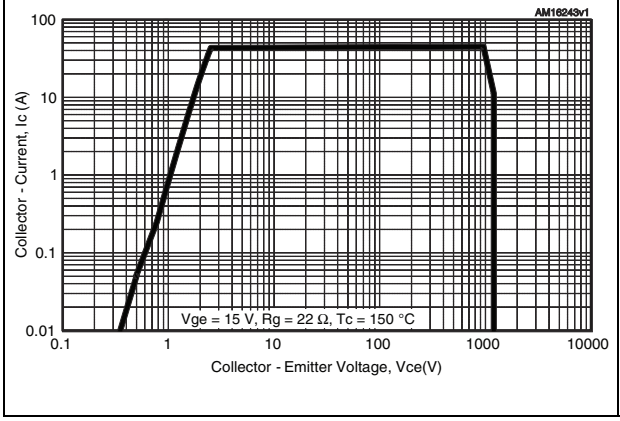


Figure 16. Diode forward voltage vs. forward current

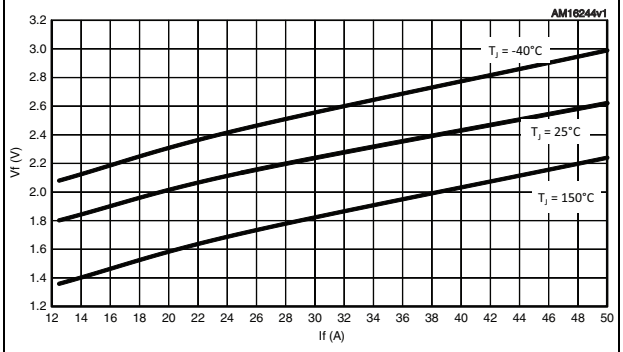


Figure 17. Diode forward voltage vs. junction temperature

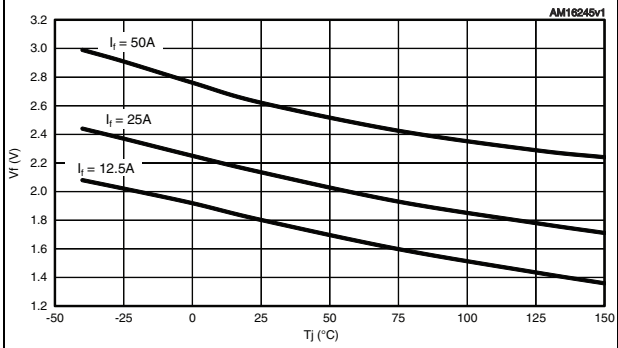


Figure 18. Reverse recovery charge, time and current, vs. diode current slope

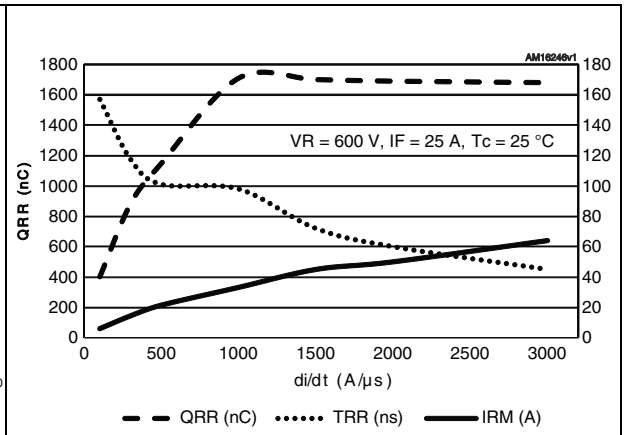


Figure 19. Maximum normalized Z_{th} junction to case (IGBT)

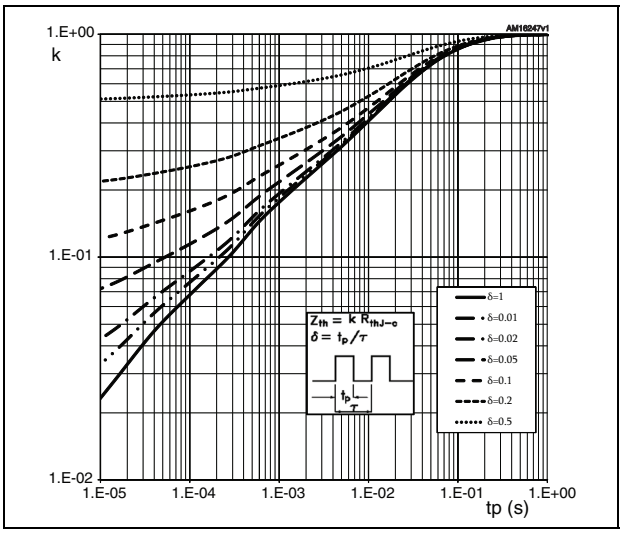
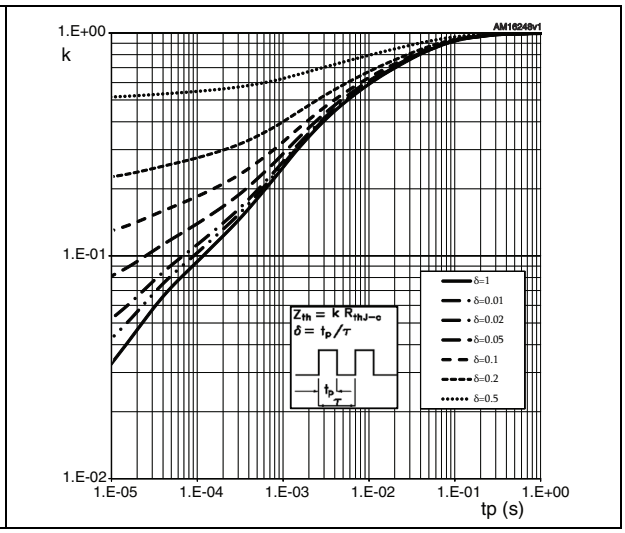


Figure 20. Maximum normalized Z_{th} junction to case (diode)



3 Test circuits

Figure 21. Test circuit for inductive load switching

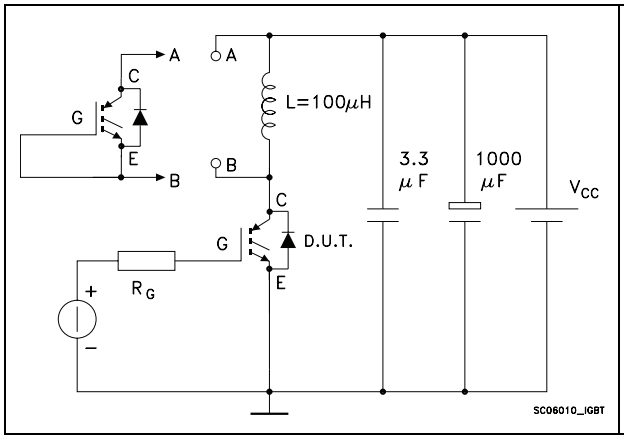


Figure 22. Switching waveform

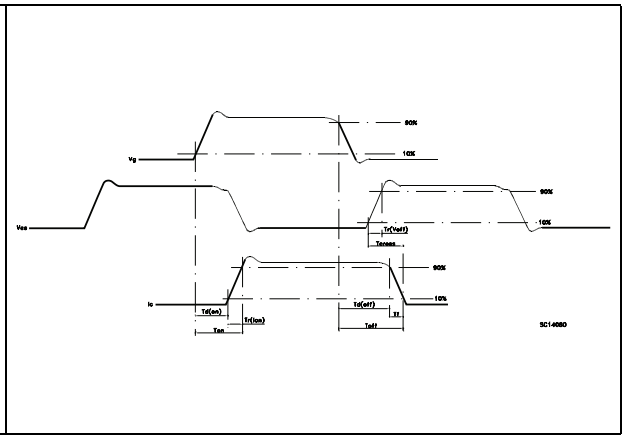
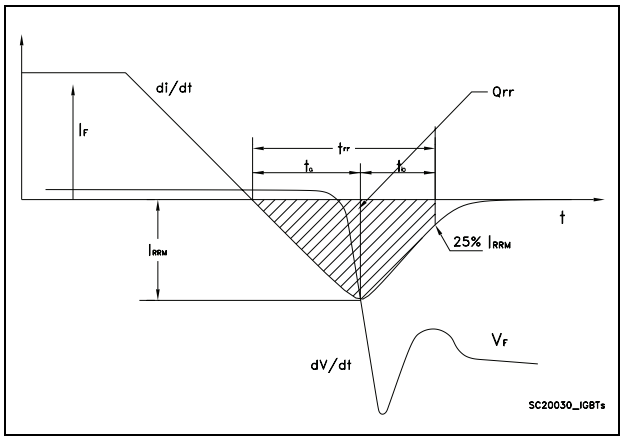


Figure 23. Diode recovery time waveform



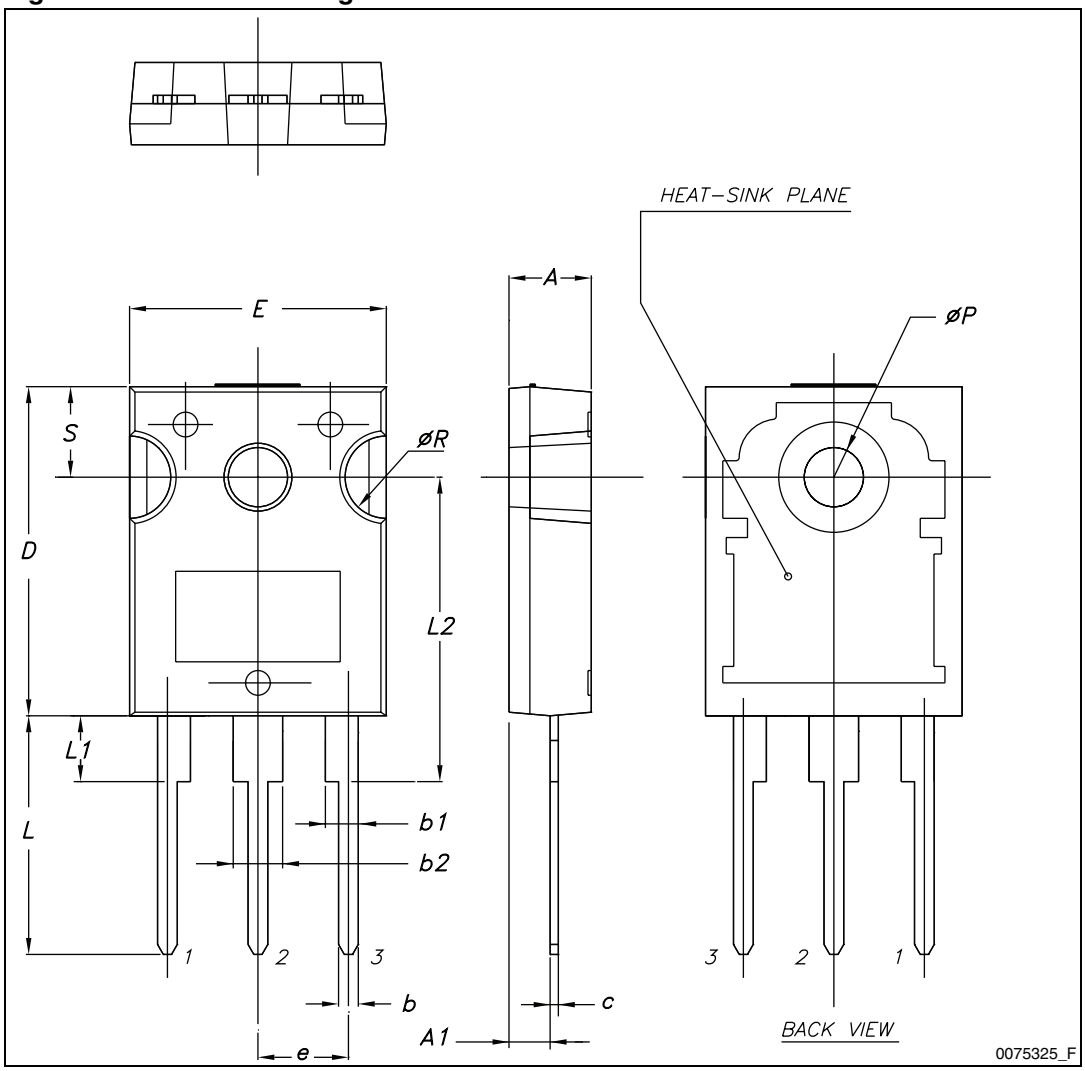
4 Package mechanical data

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.

Table 9. 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		18.50	
∅P	3.55		3.65
∅R	4.50		5.50
S		5.50	

Figure 24. TO-247 drawing



5 Revision history

Table 10. Document revision history

Date	Revision	Changes
07-May-2010	1	Initial release.
05-Apr-2011	2	Document status promoted from target specification to preliminary data.
23-Jul-2012	3	Modified: Title in cover page, *Description on page 1*, typical values *Table 4 on page 3*, *Table 5 on page 3*, *Table 6 on page 4*, *Table 7 on page 4* and *Table 8 on page 4*.
28-Nov-2012	4	Added *Section 2.1: Electrical characteristics (curves)*.

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