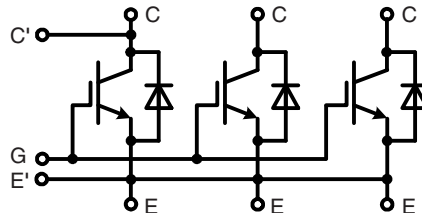


IGBT Module Single switch

Short Circuit SOA Capability
Square RBSOA

$$\begin{aligned} I_{C80} &= 1800 \text{ A} \\ V_{CES} &= 1700 \text{ V} \\ V_{CE(sat) \text{ typ.}} &= 2.3 \text{ V} \end{aligned}$$



IGBT

Symbol	Conditions	Maximum Ratings		
V_{CES} V	$V_{GE} = 0 \text{ V}$	1700		
V_{GES} V		± 20		
I_{C80} A	$T_C = 80^\circ\text{C}$	1800		
I_{CM} A	$t_p = 1 \text{ ms}; T_C = 80^\circ\text{C}$	3600		
Symbol	Conditions	Characteristic Values		
t_{SC} μs	$V_{CC} = 1000 \text{ V}; V_{CEM \text{ CHIP}} = \leq 1700 \text{ V};$ ($T_{VJ} = 25^\circ\text{C}$, unless otherwise specified)	min.	typ.	max.
$V_{CE(sat)}^*$	$V_{GE} \leq 15 \text{ V}; T_{VJ} \leq 125^\circ\text{C}$			
	$I_C = 1800 \text{ A}; V_{GE} = 15 \text{ V}; T_{VJ} = 25^\circ\text{C}$	2.3	2.6	V
	$T_{VJ} = 125^\circ\text{C}$	2.6	2.9	V
$V_{GE(th)}$	$I_C = 240 \text{ mA}; V_{CE} = V_{GE}$	4.5		6.5 V
I_{CES}	$V_{CE} = 1700 \text{ V}; V_{GE} = 0 \text{ V}; T_{VJ} = 125^\circ\text{C}$			120 mA
I_{GES}	$V_{CE} = 0 \text{ V}; V_{GE} = \pm 20 \text{ V}; T_{VJ} = 125^\circ\text{C}$			500 nA
$t_{d(on)}$	Inductive load; $T_{VJ} = 125^\circ\text{C};$ $V_{GE} = \pm 15 \text{ V}; V_{CC} = 900 \text{ V};$ $I_C = 1800 \text{ A}; R_G = 0.82 \Omega;$ $L_\sigma = 60 \text{ nH}$	285		ns
t_r		230		ns
$t_{d(off)}$		950		ns
t_f		240		ns
E_{on}		530		mJ
E_{off}		670		mJ
C_{ies}	$V_{CE} = 25 \text{ V}; V_{GE} = 0 \text{ V}; f = 1 \text{ MHz}$	166		nF
C_{oes}		16.5		nF
C_{res}		7.0		nF
Q_{ge}	$I_C = 1800 \text{ A}; V_{CE} = 900 \text{ V}; V_{GE} = \pm 15 \text{ V}$	15.1		μC
R_{thJC}				0.009 K/W

* Collector emitter saturation voltage is given at chip level

Features

- NPT³ IGBT
- Low-loss
- Smooth switching waveforms for good EMC
- Industry standard package
- High power density
- AISiC base-plate for high power cycling capacity
- AlN substrate for low thermal resistance

Typical Applications

- AC power converters for
- industrial drives
- windmills
- traction
- LASER pulse generator

Diode

Symbol	Conditions	Maximum Ratings	
I_{F80}	$T_C = 80^\circ\text{C}$	1800	A
I_{FSM}	$V_R = 0\text{ V}; T_{VJ} = 125^\circ\text{C}; t_p = 10\text{ ms}; \text{half-sinewave}$	16500	A

Symbol	Conditions	Characteristic Values		
		min.	typ.	max.
$V_F *$	$I_F = 1800\text{ A}; T_{VJ} = 25^\circ\text{C}$ $T_{VJ} = 125^\circ\text{C}$	1.65 1.70		2.0 V V
I_{RM} t_{rr} Q_{RR} E_{rec}	$V_{CC} = 900\text{ V}; I_C = 1800\text{ A};$ $V_{GE} = \pm 15\text{ V}; R_G = 1.5\ \Omega; T_{VJ} = 125^\circ\text{C}$ Inductive load; $L_\sigma = 60\text{ nH}$	1470 870 770 530		A ns μC mJ
R_{thJC}				0.017 K/W

* Forward voltage is given at chip level

Module

Symbol	Conditions	Maximum Ratings	
T_{JM}	max. junction temperature	+150	$^\circ\text{C}$
T_{VJ}	Operating temperature	-40...+125	$^\circ\text{C}$
T_{stg}	Storage temperature	-40...+125	$^\circ\text{C}$
V_{ISOL}	50 Hz	4000	V~
M_d	Mounting torque	Base- heatsink, M6 screws Main terminals, M8 screws	4 - 6 Nm 8 - 10 Nm

Symbol	Conditions	Characteristic Values		
		min.	typ.	max.
d_A	Clearance distance	terminal to base terminal to terminal	23 19	mm mm
d_s	Surface creepage distance	terminal to base terminal to terminal	33 33	mm mm
L_σ	Module stray inductance, C to E terminal		10	nH
$R_{term-chip}^{*)}$	Resistance terminal to chip		0.085	m Ω
R_{thCH}	per module; λ grease = 1 W/m $\cdot$ K		0.006	K/W
Weight			1500	g

*) $V = V_{CE(sat)} + R_{term-chip} \cdot I_C$ resp. $V = V_F + R_{term-chip} \cdot I_F$

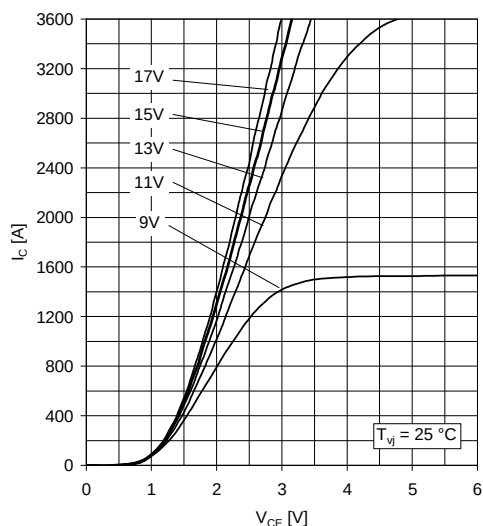


Fig. 1 Typical output characteristics, chip level

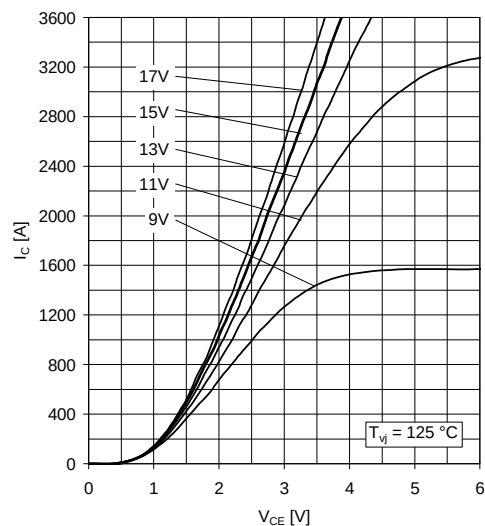


Fig. 2 Typical output characteristics, chip level

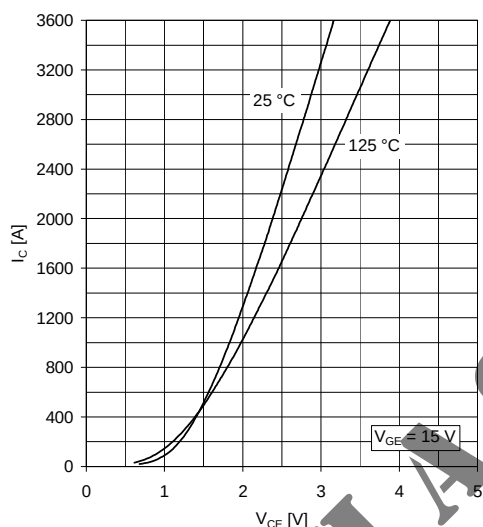


Fig. 3 Typical onstate characteristics, chip level

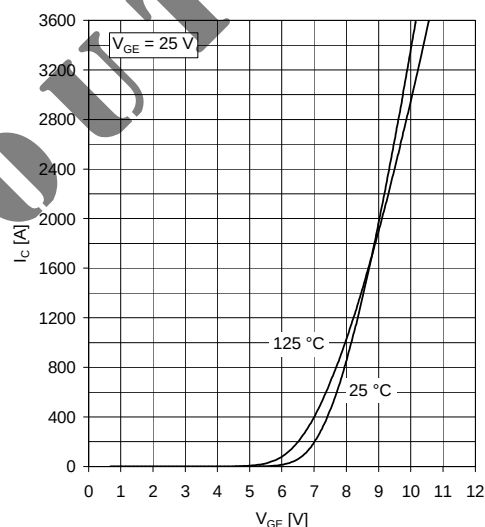


Fig. 4 Typical transfer characteristics, chip level

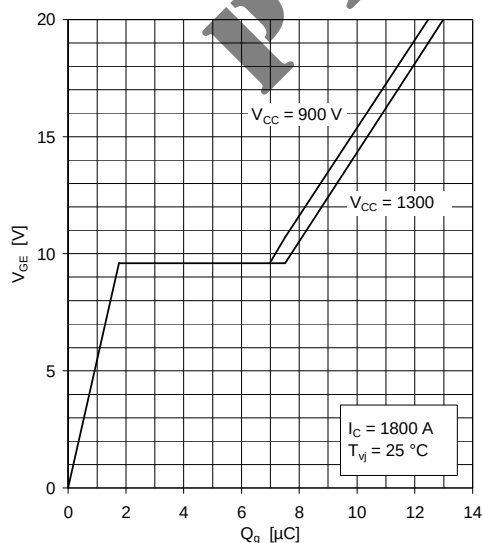


Fig. 5 Typical gate charge characteristics

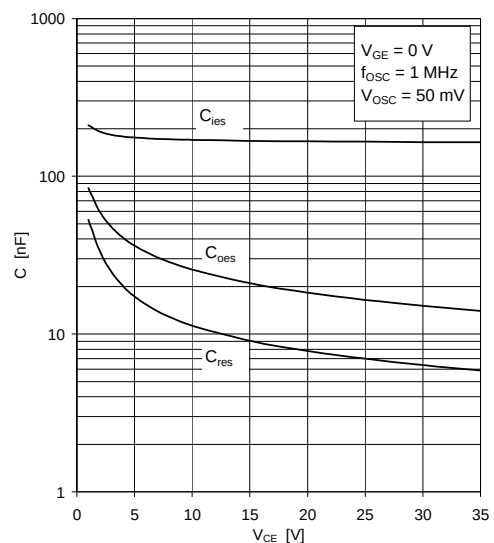


Fig. 6 Typical capacitances vs collector-emitter voltage

20110119a

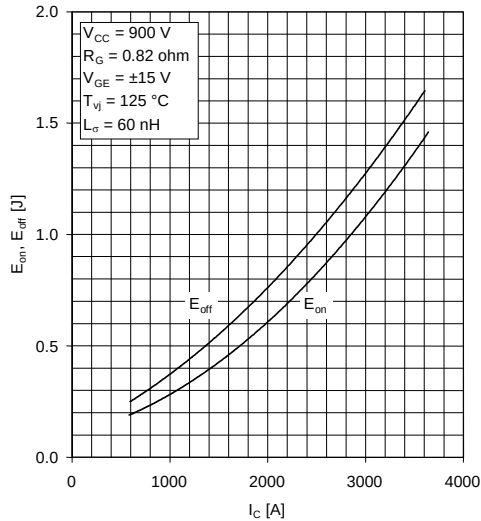


Fig. 7 Typical switching energies per pulse vs collector current

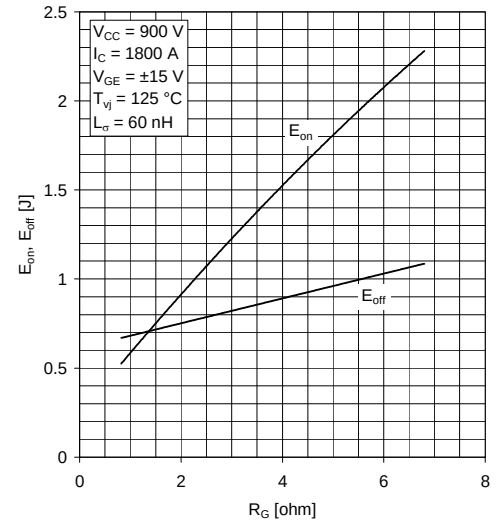


Fig. 8 Typical switching energies per pulse vs gate resistor

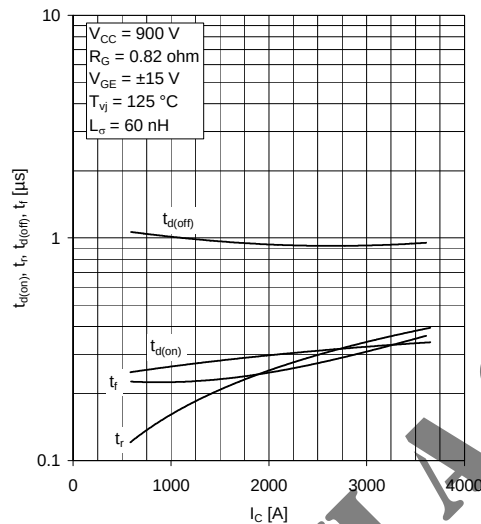


Fig. 9 Typical switching times vs collector current

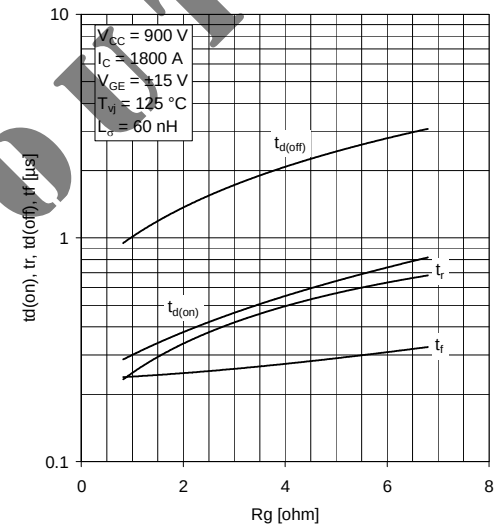


Fig. 10 Typical switching times vs gate resistor

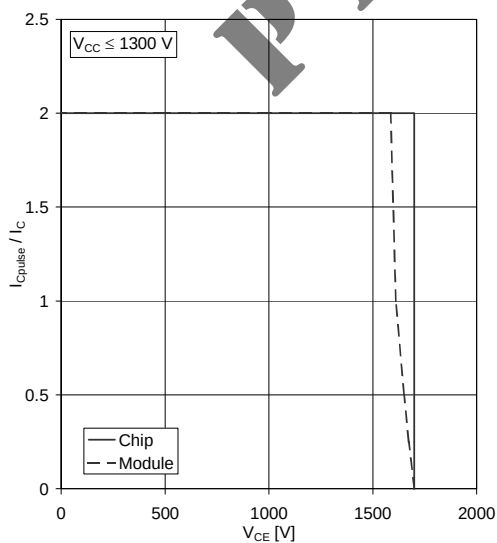


Fig. 11 Turn-off safe operating area (RBSOA)

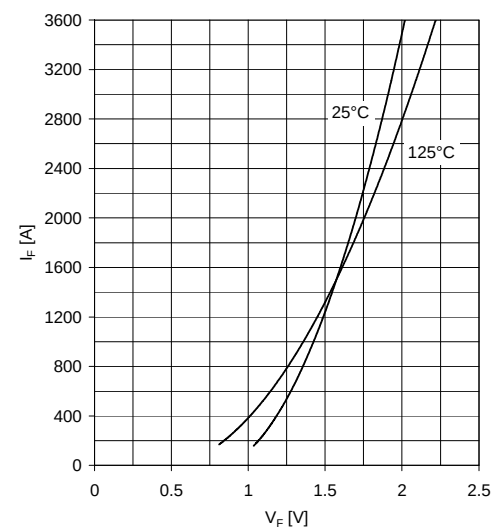


Fig. 12 Typical diode forward characteristics, chip level

20110119a

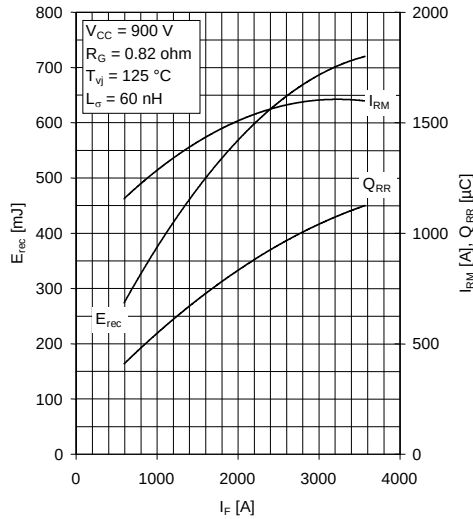


Fig. 13 Typical reverse recovery characteristics vs forward current

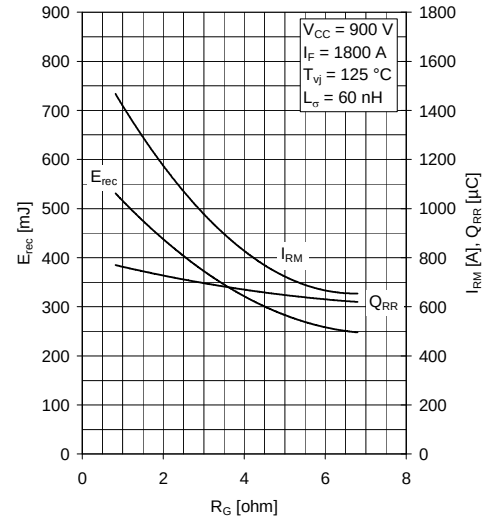


Fig. 14 Typical reverse recovery characteristics vs gate resistor

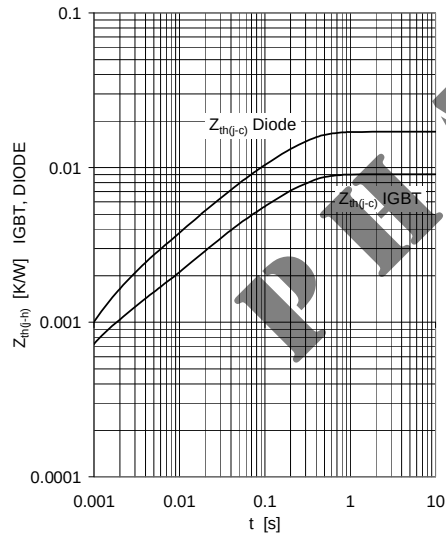


Fig. 15 Thermal impedance vs time

$$Z_{th(j-c)}(t) = \sum_{i=1}^n R_i (1 - e^{-t/\tau_i})$$

IGBT	i	1	2	3	4
	R _i (K/kW)	5.97	1.99	0.619	0.465
	τ _i (ms)	179	22	2.4	0.54
DIODE	R _i (K/kW)	11.1	3.36	1.27	1.34
	τ _i (ms)	189	30	7.4	1.4

Note: all dimensions are shown in mm