

IGBT Module

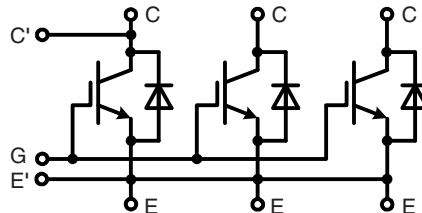
Single switch

Short Circuit SOA Capability
Square RBSOA

$$I_{C80} = 1200 \text{ A}$$

$$V_{CES} = 3300 \text{ V}$$

$$V_{CE(sat) \text{ typ.}} = 3.1 \text{ V}$$



IGBT

Symbol	Conditions	Maximum Ratings
V_{CES}	$V_{GE} = 0 \text{ V}$	3300 V
V_{GES}		$\pm 20 \text{ V}$
I_{C80}	$T_C = 80^\circ\text{C}$	1200 A
I_{CM}	$t_p = 1 \text{ ms}; T_C = 80^\circ\text{C}$	2400 A
t_{SC}	$V_{CC} = 2500 \text{ V}; V_{CEM \text{ CHIP}} \leq 3300 \text{ V};$ $V_{GE} \leq 15 \text{ V}; T_{VJ} \leq 125^\circ\text{C}$	10 μs

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

Symbol	Conditions	Characteristic Values ($T_{VJ} = 25^\circ\text{C}$, unless otherwise specified)		
		min.	typ.	max.
$V_{CE(sat)}^*$	$I_C = 1200 \text{ A}; V_{GE} = 15 \text{ V}; T_{VJ} = 25^\circ\text{C}$ $T_{VJ} = 125^\circ\text{C}$		3.1 3.8	V V
$V_{GE(th)}$	$I_C = 240 \text{ mA}; V_{CE} = V_{GE}$	6		8 V
I_{CES}	$V_{CE} = 3300 \text{ V}; V_{GE} = 0 \text{ V}; T_{VJ} = 125^\circ\text{C}$			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; $T_{VJ} = 125^\circ\text{C};$ $V_{GE} = \pm 15 \text{ V}; V_{CC} = 1800 \text{ V};$ $I_C = 1200 \text{ A}; R_G = 1.5 \Omega;$ $L_\sigma = 100 \text{ nH}$		400	ns
t_r			200	ns
$t_{d(off)}$			1070	ns
t_f			440	ns
E_{on}			1890	mJ
E_{off}			1950	mJ
C_{ies}	$V_{CE} = 25 \text{ V}; V_{GE} = 0 \text{ V}; f = 1 \text{ MHz}$		187	nF
C_{oes}			11.6	nF
C_{res}			2.2	nF
Q_{ge}	$I_C = 1200 \text{ A}; V_{CE} = 1800 \text{ V}; V_{GE} = \pm 15 \text{ V}$		12.1	μC
R_{thJC}				0.0085 K/W

* Collector emitter saturation voltage is given at chip level

IXYS reserves the right to change limits, test conditions and dimensions.

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Diode

Symbol	Conditions	Maximum Ratings	
I_{F80}	$T_C = 80^\circ\text{C}$	1200	A
I_{FSM}	$V_R = 0\text{ V}; T_{VJ} = 125^\circ\text{C}; t_p = 10\text{ ms}; \text{half-sinewave}$	11000	A

Symbol	Conditions	Characteristic Values		
		min.	typ.	max.
$V_F *$	$I_F = 1200\text{ A}; T_{VJ} = 25^\circ\text{C}$ $T_{VJ} = 125^\circ\text{C}$		2.30 2.35	V V
I_{RM} t_{rr} Q_{RR} E_{rec}	$V_{CC} = 1800\text{ V}; I_C = 1200\text{ A};$ $V_{GE} = \pm 15\text{ V}; R_G = 1.5\ \Omega; T_{VJ} = 125^\circ\text{C}$ Inductive load; $L_\sigma = 100\text{ nH}$		1350 1450 1280 1530	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	6000	V~
M_d	Mounting torque	Base-heatsink, M6 screws Main terminals, M8 screws	4 - 6 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·K		0.006	K/W
Weight			1500	g

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

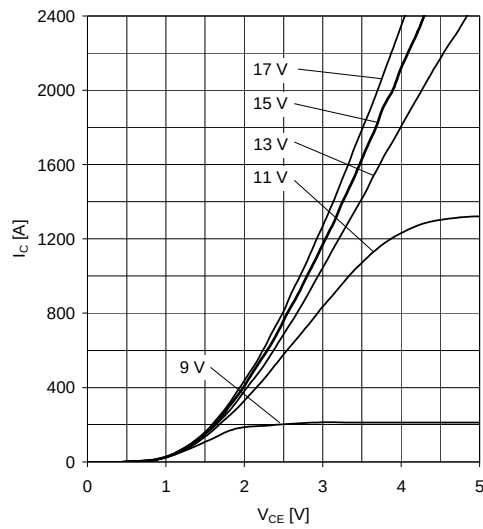


Fig. 1 Typical output characteristics, chip level

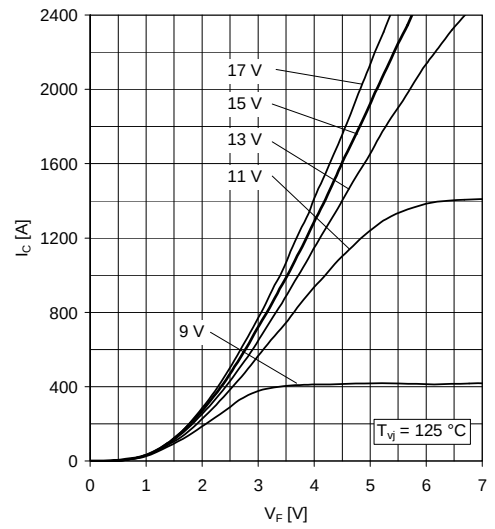


Fig. 2 Typical output characteristics, chip level

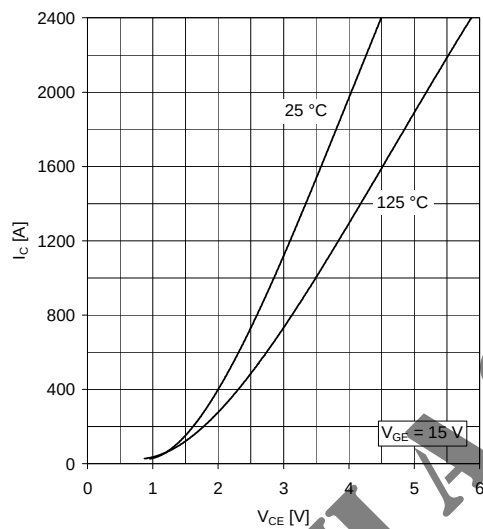


Fig. 3 Typical onstate characteristics, chip level

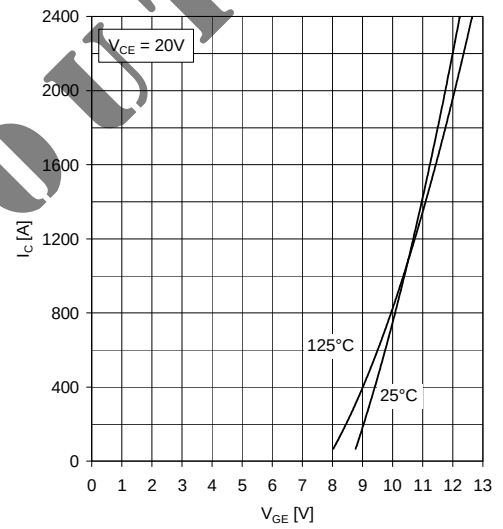


Fig. 4 Typical transfer characteristics, chip level

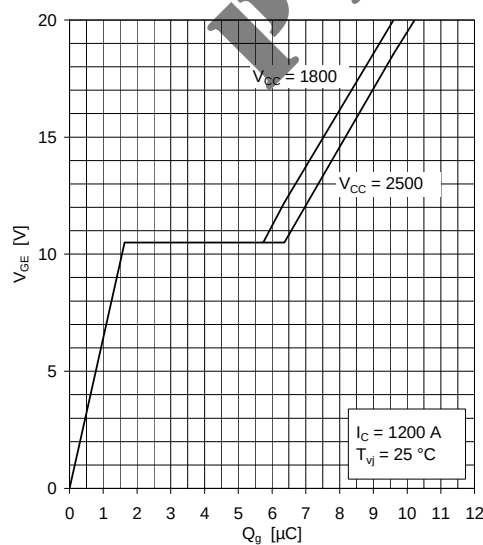


Fig. 5 Typical gate charge characteristics

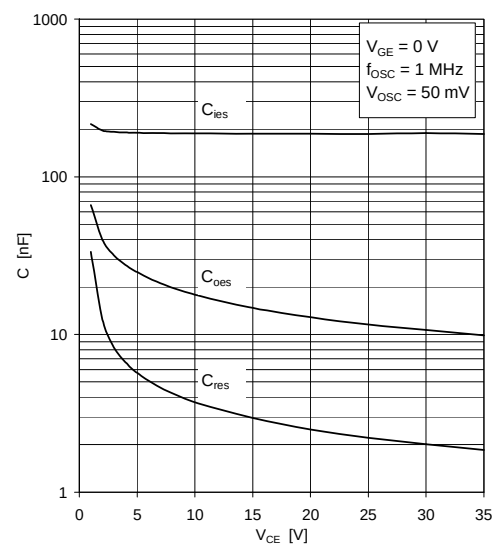


Fig. 6 Typical capacitances vs collector-emitter voltage

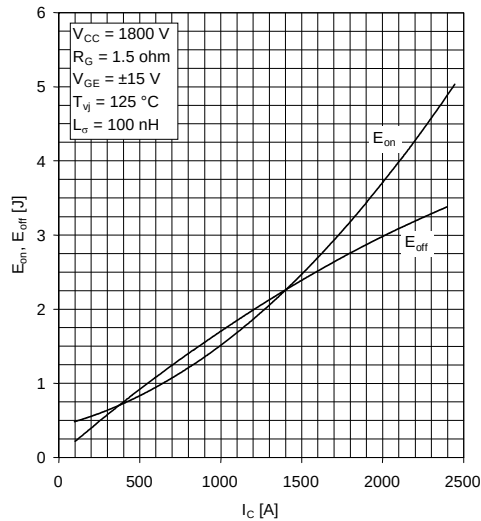


Fig. 7 Typical switching energies per pulse vs collector current

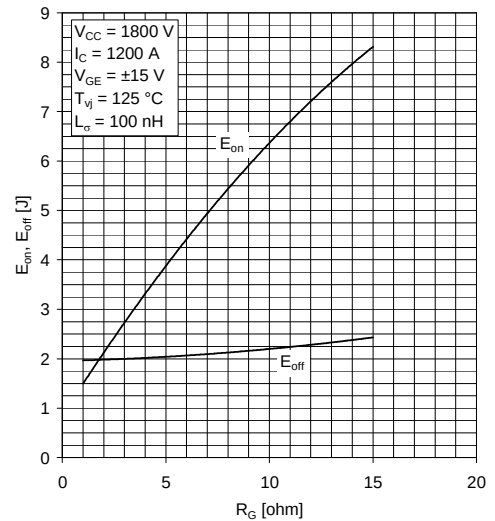


Fig. 8 Typical switching energies per pulse vs gate resistor

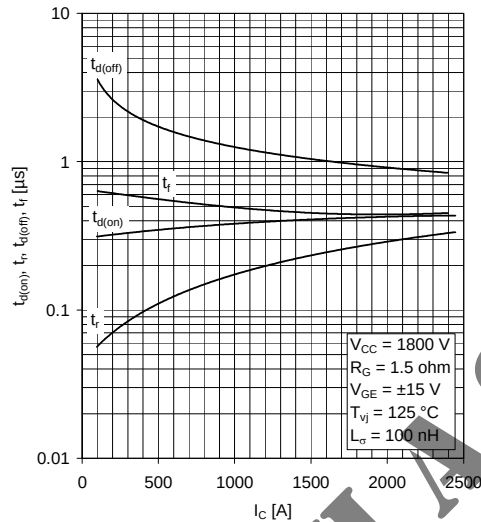


Fig. 9 Typical switching times vs collector current

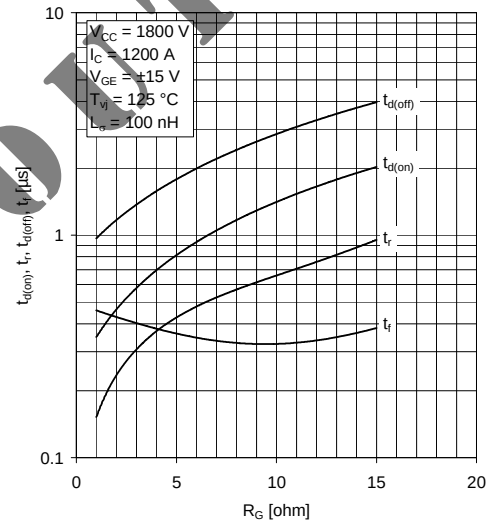


Fig. 10 Typical switching times vs gate resistor

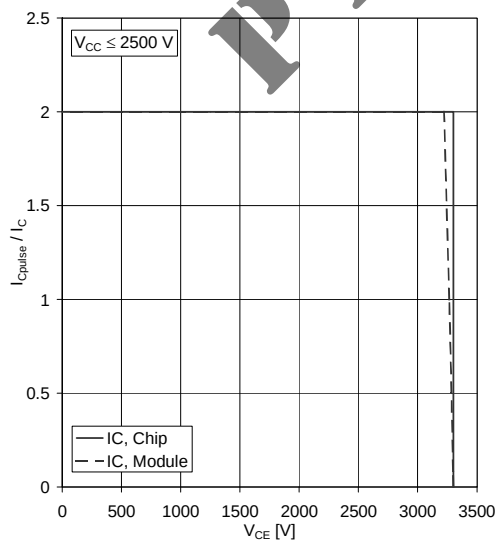


Fig. 11 Turn-off safe operating area (RBSOA)

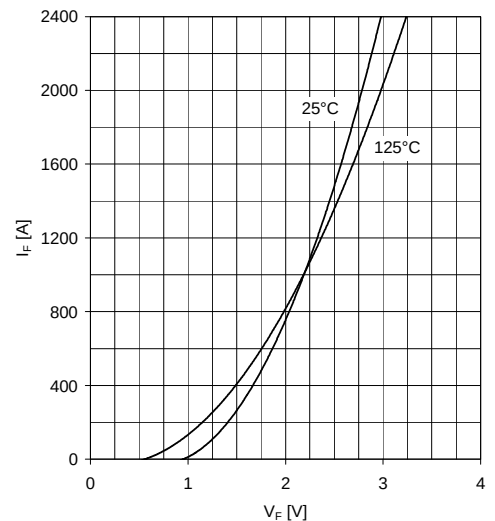


Fig. 12 Typical diode forward characteristics, chip level

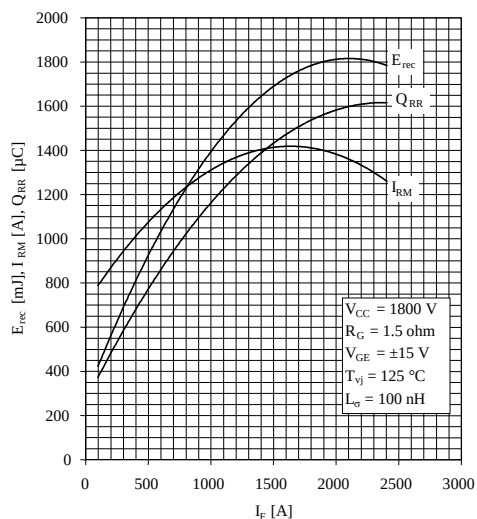


Fig. 13 Typical reverse recovery characteristics vs forward current

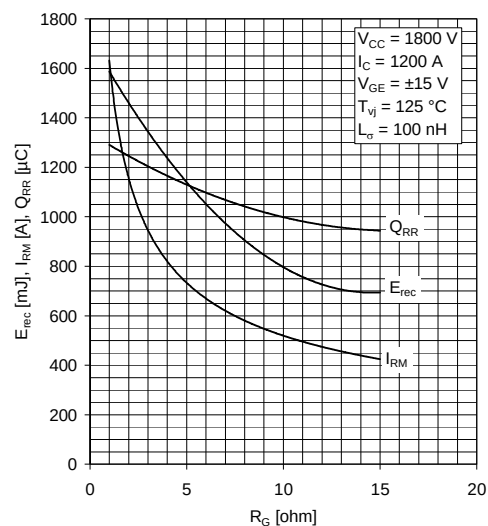


Fig. 14 Typical reverse recovery characteristics vs gate resistor

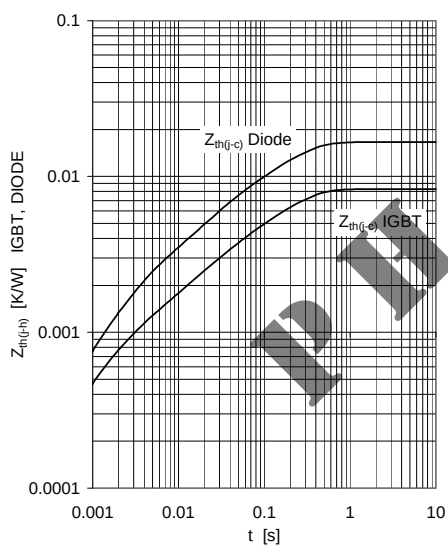


Fig. 15 Thermal impedance vs time

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

i	1	2	3	4
Ri(K/kW)	5.50	1.53	0.621	0.646
τi(ms)	193	31.2	8.0	1.48
Ri(K/kW)	11.2	3.73	1.30	0.42
τi(ms)	189	24.5	2.69	2.36

