

IGBT Module

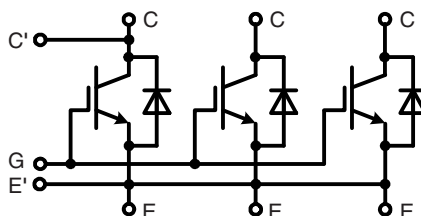
Single switch

Short Circuit SOA Capability
Square RBSOA

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

$$V_{CES} = 2500 \text{ V}$$

$$V_{CE(sat) \text{ typ.}} = 2.5 \text{ V}$$



IGBT

Symbol	Conditions	Maximum Ratings
V_{CES}	$V_{GE} = 0 \text{ V}$	2500 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}	$V_{CC} = 1800 \text{ V}; V_{CEM \text{ CHIP}} \leq 2500 \text{ V}; V_{GE} \leq 15 \text{ V}; T_{VJ} \leq 125^\circ\text{C}$	10 μs

Symbol	Conditions	Characteristic Values ($T_{VJ} = 25^\circ\text{C}$, unless otherwise specified)		
		min.	typ.	max.
$V_{CE(sat)} \star$	$I_C = 1200 \text{ A}; V_{GE} = 15 \text{ V}; T_{VJ} = 25^\circ\text{C}$ $T_{VJ} = 125^\circ\text{C}$		2.5 3.1	V V
$V_{GE(th)}$	$I_C = 240 \text{ mA}; V_{CE} = V_{GE}$	6		7.5 V
I_{CES}	$V_{CE} = 2500 \text{ V}; V_{GE} = 0 \text{ V}; T_{VJ} = 125^\circ\text{C}$			120 mA
I_{GES}	$V_{CE} = 0 \text{ V}; V_{GE} = \pm 20 \text{ V}; T_{VJ} = 125^\circ\text{C}$			500 nA
$t_{d(on)}$ t_r $t_{d(off)}$ t_f E_{on} E_{off}	Inductive load; $T_{VJ} = 125^\circ\text{C}; V_{GE} = \pm 15 \text{ V}; V_{CC} = 1250 \text{ V}; I_C = 1200 \text{ A}; R_G = 1.5 \Omega; L_\sigma = 100 \text{ nH}$		365 250 980 345 1150 1250	ns ns ns ns mJ mJ
C_{ies} C_{oes} C_{res}			186 13.7 3.0	nF nF nF
Q_{ge}			12.2	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}	$T_C = 80^\circ\text{C}$	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^*	$I_F = 1200\text{ A}; T_{VJ} = 25^\circ\text{C}$ $T_{VJ} = 125^\circ\text{C}$		1.75 1.8	V V
I_{RM} t_{rr} Q_{RR} E_{rec}	$V_{CC} = 1250\text{ V}; I_C = 1200\text{ A};$ $V_{GE} = \pm 15\text{ V}; R_G = 1.5\ \Omega; T_{VJ} = 125^\circ\text{C}$ Inductive load; $L_\sigma = 100\text{ nH}$		1180 970 1150 990	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	5000	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. $V = V_F + R_{term-chip} \cdot I_F$

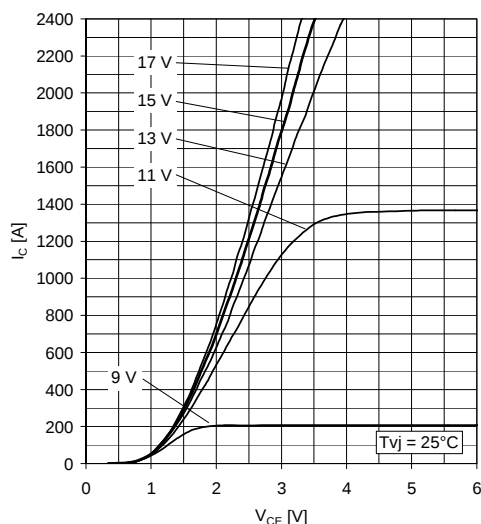


Fig. 1 Typical output characteristics, chip level

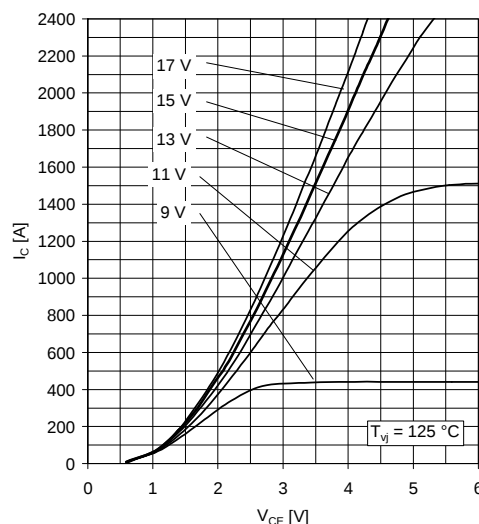


Fig. 2 Typical output characteristics, chip level

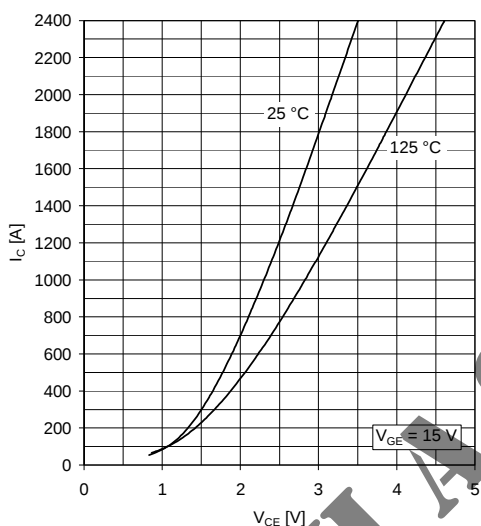


Fig. 3 Typical onstate characteristics, chip level

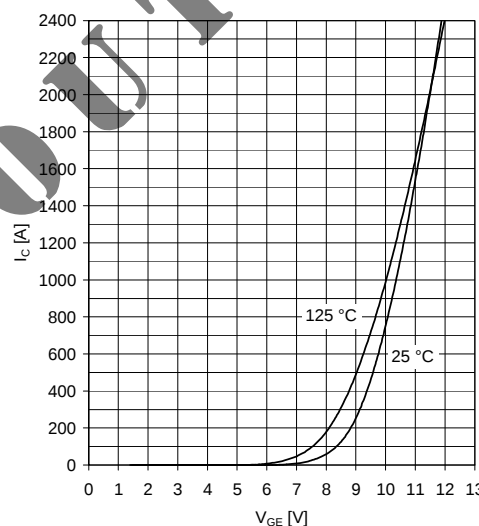


Fig. 4 Typical transfer characteristics, chip level

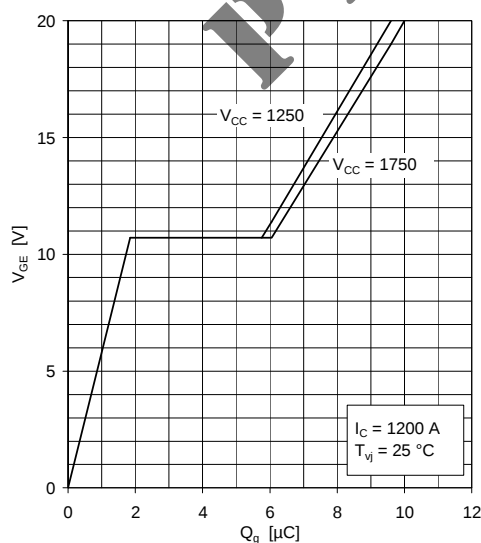


Fig. 5 Typical gate charge characteristics

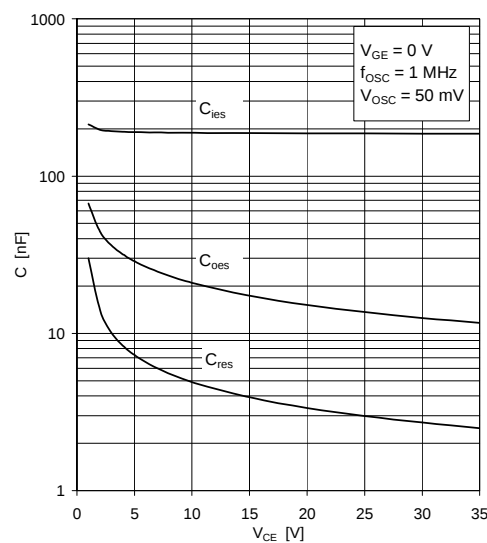


Fig. 6 Typical capacitances vs collector-emitter voltage

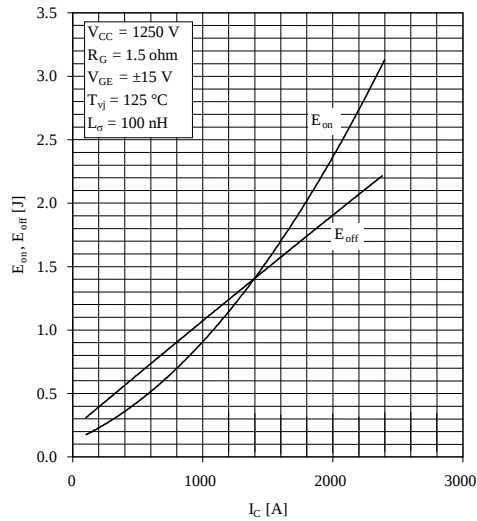


Fig. 7 Typical switching energies per pulse vs collector current

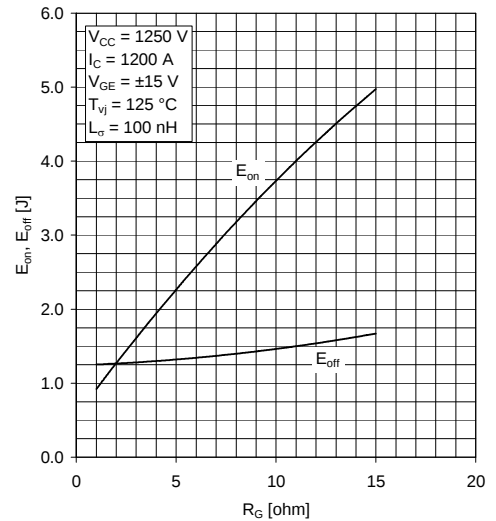


Fig. 8 Typical switching energies per pulse vs gate resistor

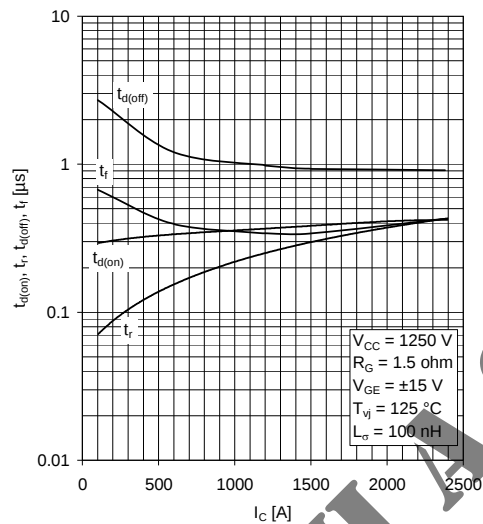


Fig. 9 Typical switching times vs collector current

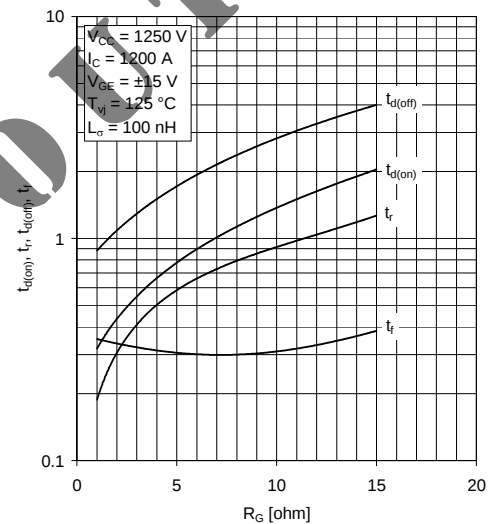


Fig. 10 Typical switching times vs gate resistor

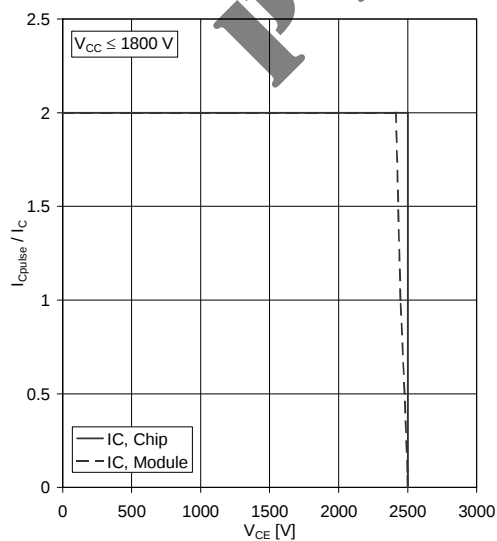


Fig. 11 Turn-off safe operating area (RBSOA)

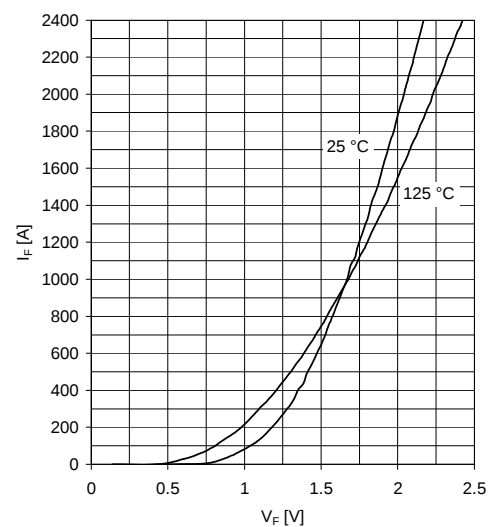


Fig. 12 Typical diode forward characteristics, chip level

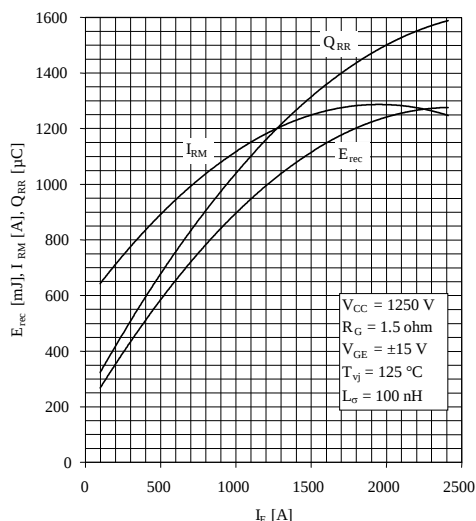


Fig. 13 Typical reverse recovery characteristics vs forward current

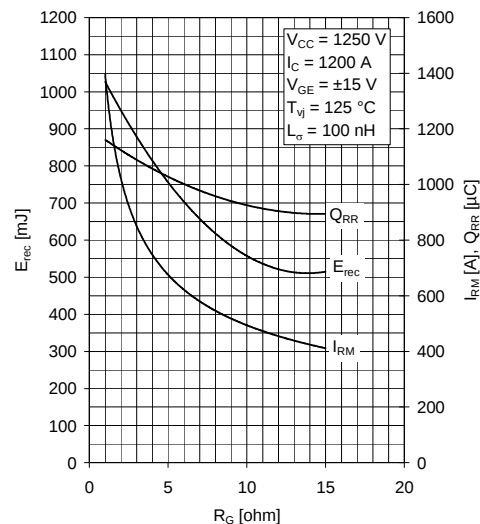


Fig. 14 Typical reverse recovery characteristics vs gate resistor

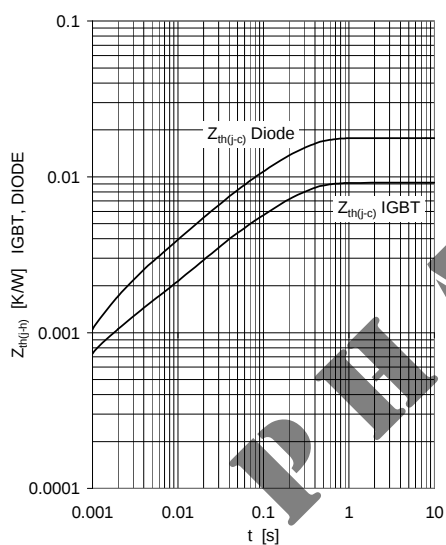


Fig. 15 Thermal impedance vs time

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

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

Technical drawing of a mechanical part, showing three views: a top view, a front view, and a side view.

Top View (Plan View):

- Overall dimensions: 190 (width) x 140 (depth).
- Internal dimensions: 171 (width), 57 (width), 124 (depth), 40 (depth), 79.4 (width), 41.25 (width), 20.25 (width), 6 (width), 5 (width).
- Features: 9 holes (labeled 1-9), 3 M4 (3x) holes, 6 M8 (6x) holes, 8 Ø7 (8x) holes.
- Other labels: 2D, 20, 15, 5.2, 28, 115, 120, 130, 140, 150, 160, 170, 180, 190, 200, 210, 220, 230, 240, 250, 260, 270, 280, 290, 300, 310, 320, 330, 340, 350, 360, 370, 380, 390, 400, 410, 420, 430, 440, 450, 460, 470, 480, 490, 500, 510, 520, 530, 540, 550, 560, 570, 580, 590, 600, 610, 620, 630, 640, 650, 660, 670, 680, 690, 700, 710, 720, 730, 740, 750, 760, 770, 780, 790, 800, 810, 820, 830, 840, 850, 860, 870, 880, 890, 900, 910, 920, 930, 940, 950, 960, 970, 980, 990, 1000.

Front View (Elevation View):

- Overall dimensions: 61.5 (width) x 38 (height).
- Internal dimensions: 13 (width), 16 (height), 5 (height), 2 (height).
- Features: 3 holes (labeled 1-3), 3 M4 (3x) holes, 6 M8 (6x) holes, 8 Ø7 (8x) holes.

Side View (Elevation View):

- Overall dimensions: 28 (width) x 15 (height).
- Internal dimensions: 5.2 (width), 115 (height), 120 (height), 130 (height), 140 (height), 150 (height), 160 (height), 170 (height), 180 (height), 190 (height), 200 (height), 210 (height), 220 (height), 230 (height), 240 (height), 250 (height), 260 (height), 270 (height), 280 (height), 290 (height), 300 (height), 310 (height), 320 (height), 330 (height), 340 (height), 350 (height), 360 (height), 370 (height), 380 (height), 390 (height), 400 (height), 410 (height), 420 (height), 430 (height), 440 (height), 450 (height), 460 (height), 470 (height), 480 (height), 490 (height), 500 (height), 510 (height), 520 (height), 530 (height), 540 (height), 550 (height), 560 (height), 570 (height), 580 (height), 590 (height), 600 (height), 610 (height), 620 (height), 630 (height), 640 (height), 650 (height), 660 (height), 670 (height), 680 (height), 690 (height), 700 (height), 710 (height), 720 (height), 730 (height), 740 (height), 750 (height), 760 (height), 770 (height), 780 (height), 790 (height), 800 (height), 810 (height), 820 (height), 830 (height), 840 (height), 850 (height), 860 (height), 870 (height), 880 (height), 890 (height), 900 (height), 910 (height), 920 (height), 930 (height), 940 (height), 950 (height), 960 (height), 970 (height), 980 (height), 990 (height), 1000.

Note: all dimensions are shown in mm