

IGBT Module

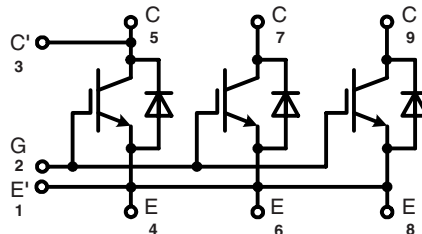
Single switch

Short Circuit SOA Capability
Square RBSOA

$$I_{C80} = 600 \text{ A}$$

$$V_{CES} = 6500 \text{ V}$$

$$V_{CE(sat) \text{ typ}} = 4.2 \text{ V}$$



IGBT

Symbol	Conditions	Maximum Ratings
V_{CES}	$V_{GE} = 0 \text{ V}$	6500 V
V_{GES}		$\pm 20 \text{ V}$
I_{C85}	$T_C = 85^\circ\text{C}$	600 A
I_{CM}	$t_p = 1 \text{ ms}; T_C = 85^\circ\text{C}$	1200 A
t_{SC}	$V_{CC} = 4400 \text{ V}; V_{CEM \text{ CHIP}} \leq 6500 \text{ V};$ $V_{GE} \leq 15 \text{ V}; T_{VJ} \leq 125^\circ\text{C}$	10 μs

Symbol	Conditions	Characteristic Values ($T_{VJ} = 25^\circ\text{C}$, unless otherwise specified)		
		min.	typ.	max.
$V_{CE(sat)} \text{ ①}$	$I_C = 600 \text{ A}; V_{GE} = 15 \text{ V}; T_{VJ} = 25^\circ\text{C}$ $T_{VJ} = 125^\circ\text{C}$		4.2 5.4	V V
$V_{GE(th)}$	$I_C = 240 \text{ mA}; V_{CE} = V_{GE}$	6		8 V
I_{CES}	$V_{CE} = 6500 \text{ V}; V_{GE} = 0 \text{ V}; T_{VJ} = 125^\circ\text{C}$			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; $T_{VJ} = 125^\circ\text{C};$ $V_{GE} = \pm 15 \text{ V}; V_{CC} = 3600 \text{ V};$ $I_C = 600 \text{ A}; L_\sigma = 280 \text{ nH}$	$R_G = 3.9 \Omega$		620 ns
		$R_G = 3.9 \Omega$		270 ns
		$R_G = 2.7 \Omega$		1500 ns
		$R_G = 2.7 \Omega$		930 ns
		$R_G = 3.9 \Omega$		4250 mJ
		$R_G = 2.7 \Omega$		3250 mJ
C_{ies} C_{oes} C_{res}	$V_{CE} = 25 \text{ V}; V_{GE} = 0 \text{ V}; f = 1 \text{ MHz}$			150 nF
				7.57 nF
				1.46 nF
Q_{ge}	$I_C = 600 \text{ A}; V_{CE} = 3600 \text{ V}; V_{GE} = \pm 15 \text{ V}$			9.65 μC
R_{thJC}				0.011 K/W

① Collector emitter saturation voltage is given at chip level

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

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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}	$T_C = 80^\circ\text{C}$	600 A
I_{FSM}	$V_R = 0\text{ V}; T_{VJ} = 125^\circ\text{C}; t_p = 10\text{ ms}; \text{half-sinewave}$	6000 A

Symbol	Conditions	Characteristic Values		
		min.	typ.	max.
V_F ②	$I_F = 600\text{ A}; T_{VJ} = 25^\circ\text{C}$ $T_{VJ} = 125^\circ\text{C}$		3.2 3.4	V V
I_{RM} t_{rr} Q_{RR} E_{rec}	$V_{CC} = 3600\text{ V}; I_C = 600\text{ A};$ $V_{GE} = \pm 15\text{ V}; R_G = 3.9\ \Omega; T_{VJ} = 125^\circ\text{C}$ Inductive load; $L_\sigma = 280\text{ nH}$		930 2200 1150 2100	A ns μC mJ
R_{thJC}				0.021 K/W

② Forward voltage is given at chip level

Symbol	Conditions	Maximum Ratings
T_{JM}	max junction temperature	+125 °C
T_{VJ}	Operating temperature	-40...+125 °C
T_{stg}	Storage temperature	-40...+125 °C
V_{ISOL}	50 Hz, 1 min	10200 V~
M_d	Mounting torque Base-heatsink, M6 screws Main terminals, M8 screws Auxiliary terminals, M4 screws	4 - 6 Nm 8 - 10 Nm 2 - 3 Nm

Symbol	Conditions	Characteristic Values		
		min.	typ.	max.
d_A	Clearance distance terminal to base IEC 60664-1 / EN 50124-1 terminal to terminal	40 26		mm mm
d_S	Surface creepage dist. terminal to base IEC 60664-1 / EN 50124-1 terminal to terminal	64 56		mm mm
V_E	Partial discharge extinction voltage $f = 50\text{ Hz}, Q_{PD} \leq 10\text{ pC}$ (IEC 61287)	5100		V
CTI	Comperative tracking index	600		
L_σ	Module stray inductance, C to E terminal		18	nH
$R_{term-chip}^*$	Resistance terminal to chip		0.12	m Ω
R_{thCH}	per module; λ grease = 1 W/m $\cdot$ K		0.006	K/W
Weight			1760	g

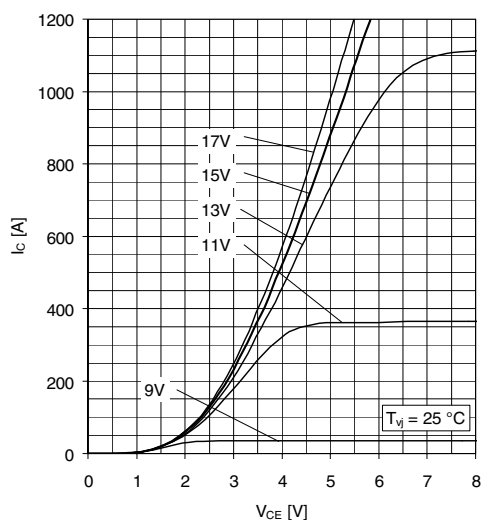


Fig. 1 Typical output characteristics, chip level

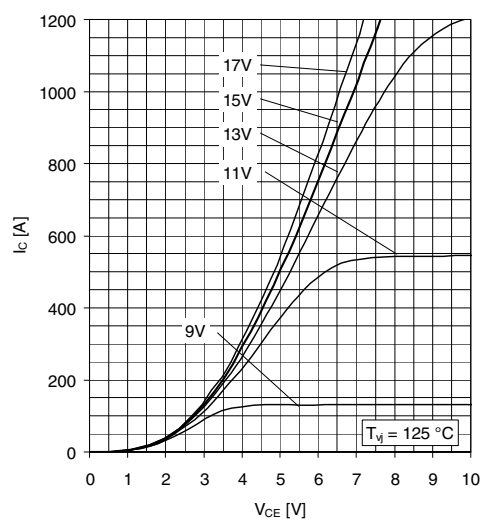


Fig. 2 Typical output characteristics, chip level

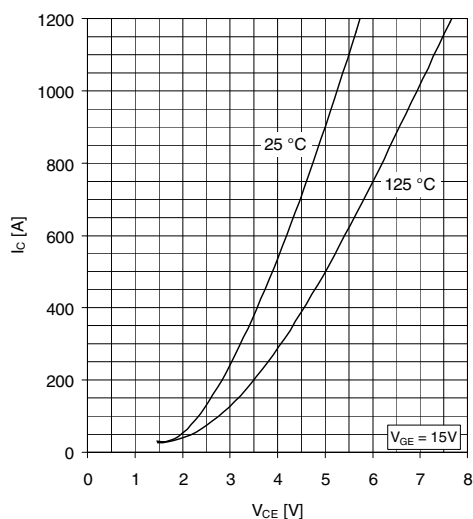


Fig. 3 Typical on-state characteristics, chip level

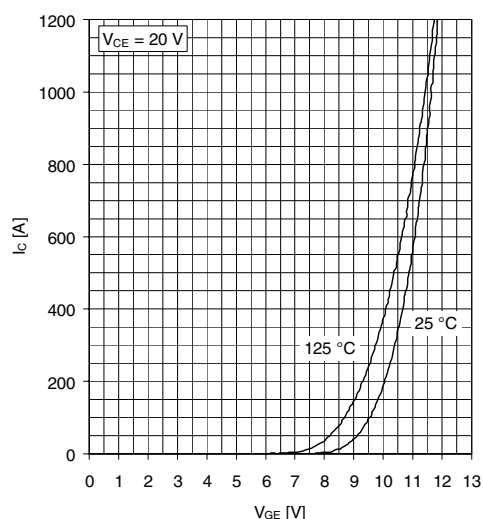


Fig. 4 Typical transfer characteristics, chip level

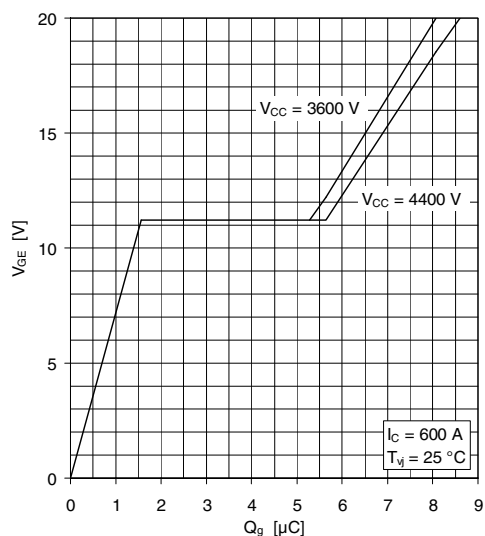


Fig. 5 Typical gate charge characteristics

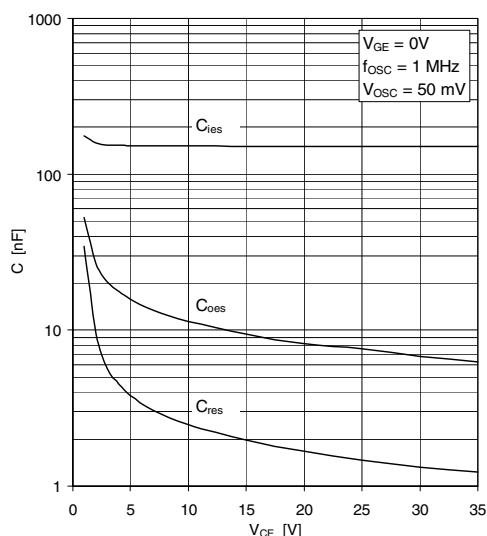


Fig. 6 Typical capacitances vs collector-emitter voltage

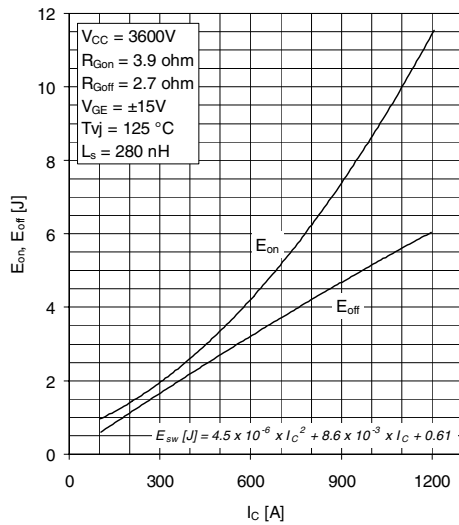


Fig. 7 Typical switching energies per pulse versus collector current

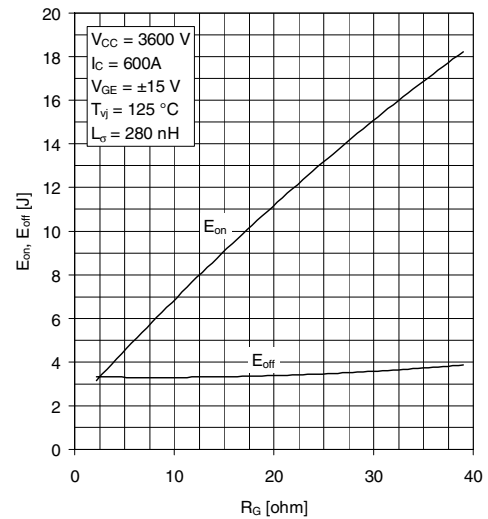


Fig. 8 Typical switching energies per pulse versus gate resistor

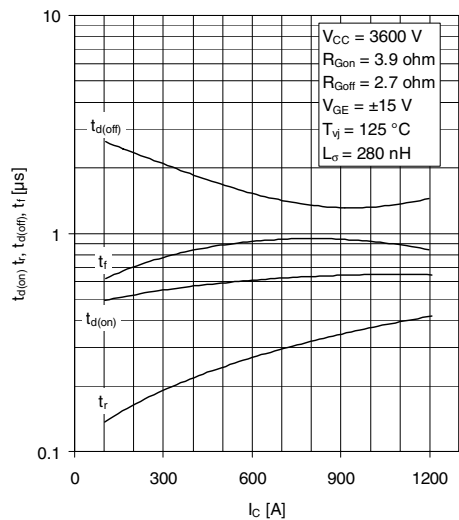


Fig. 9 Typical switching times vs. collector current

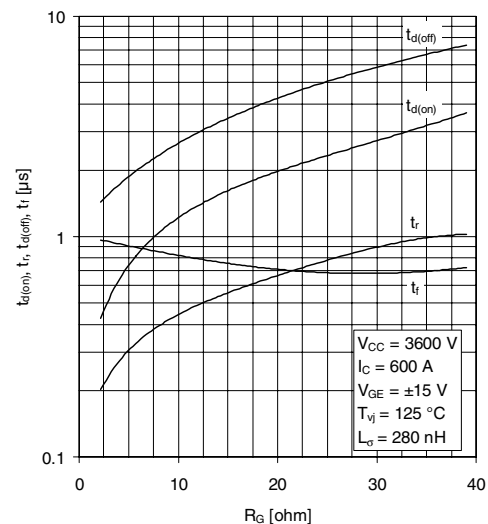


Fig. 10 Typical switching times vs. gate resistor

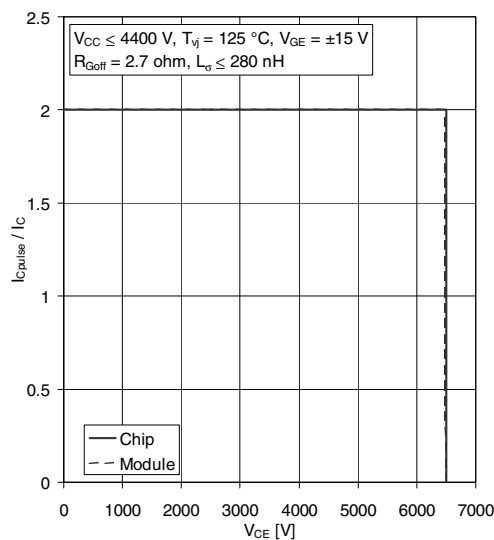


Fig. 11 Turn-off safe operating area (RBSOA)

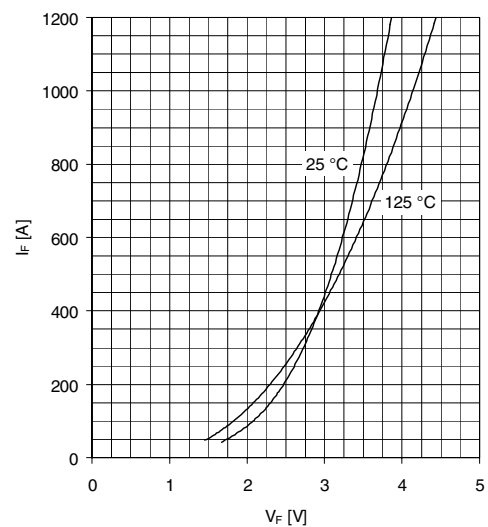


Fig. 12 Typ. diode forward characteristics, chip level

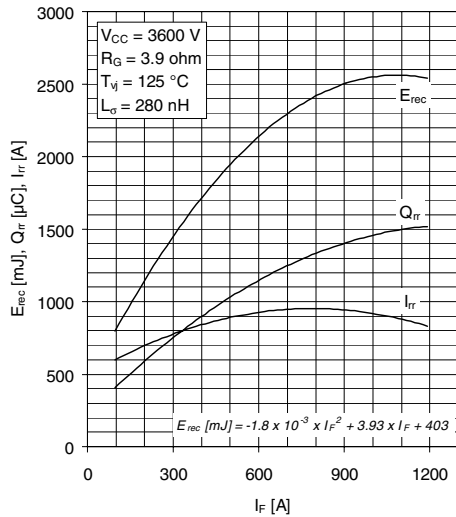


Fig. 13 Typ. reverse recovery characteristics versus forward current

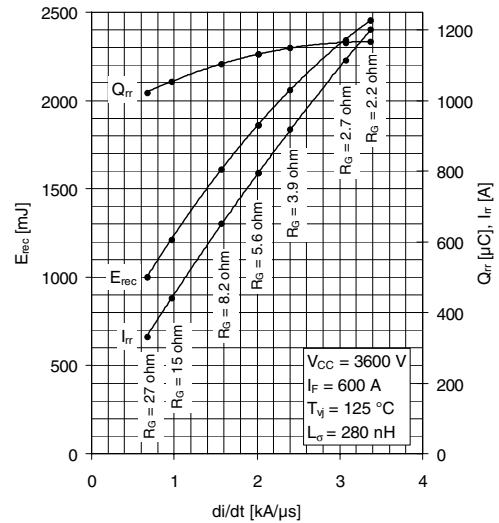


Fig. 14 Typ. reverse recovery characteristics versus di/dt

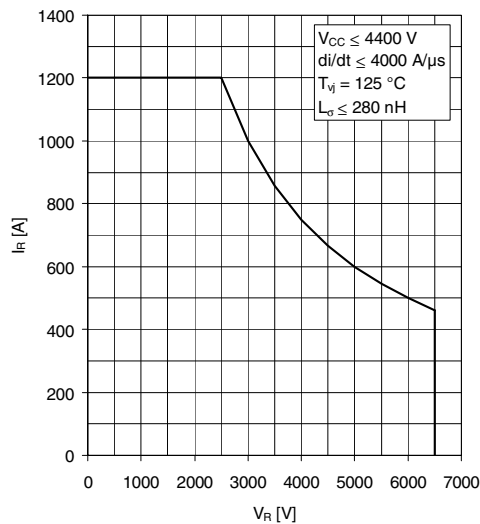


Fig. 15 Safe operating area diode (SOA)

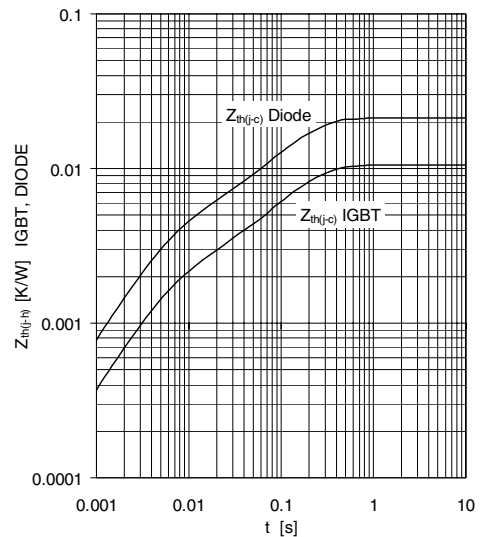
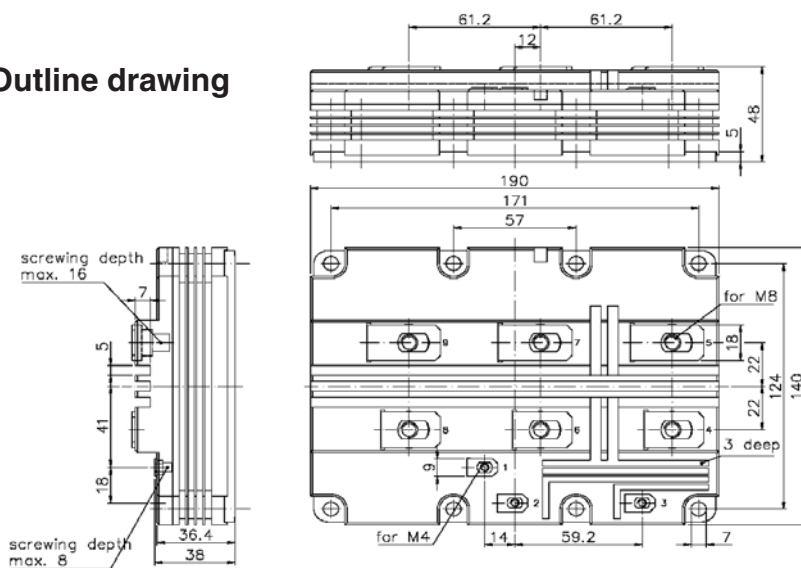


Fig. 16 Thermal impedance vs. time

Outline drawing



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

	i	1	2
IGBT	R_i [K/kW]	8.5	2
	t_i [ms]	151	5.84
DIODE	R_i [K/kW]	17	4.2
	t_i [ms]	144	5.83