

IGBT Module

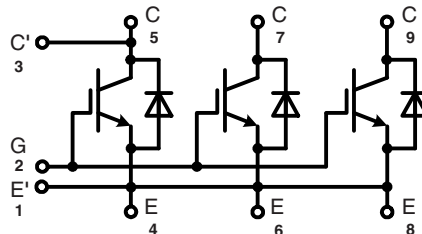
Single switch

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.
$V_{CE(sat)} \star$	$I_C = 600 \text{ A}; V_{GE} = 15 \text{ V}; T_{VJ} = 25^\circ\text{C}$ $T_{VJ} = 125^\circ\text{C}$		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 7.57 1.46	nF nF 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

$\star$ 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

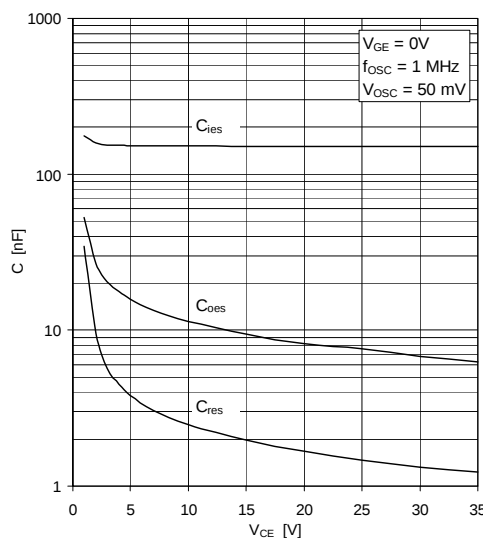
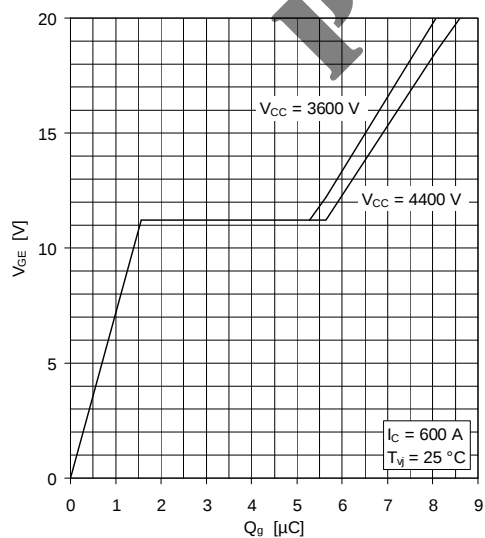
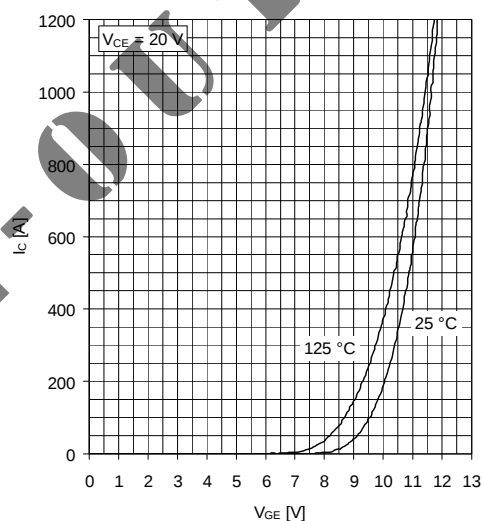
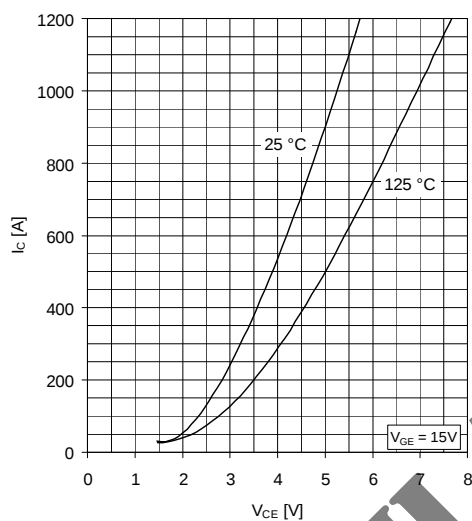
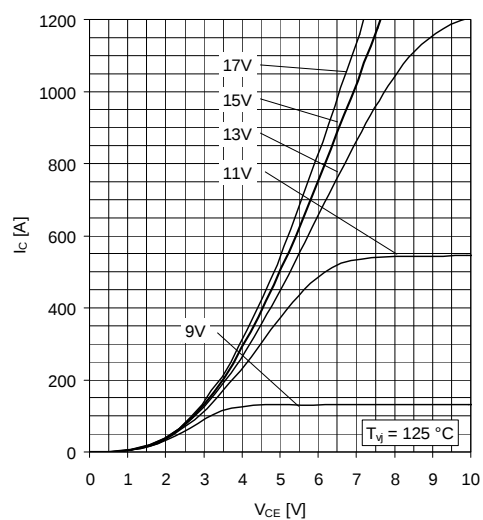
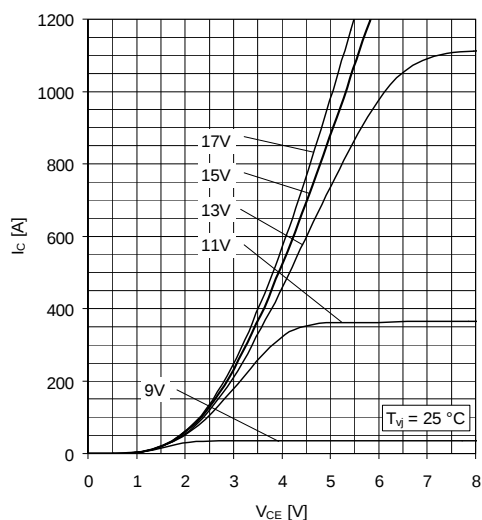
Symbol	Conditions	Maximum Ratings	
I_{F80}	$T_C = 80^\circ\text{C}$	600	A
I_{FSM}	$V_R = 0\text{ V}; T_{VJ} = 125^\circ\text{C}; t_p = 10\text{ ms}; \text{half-sinewave}$	6000	A

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

* Forward voltage is given at chip level

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

Symbol	Conditions	Characteristic Values		
		min.	typ.	max.
d_A	Clearance distance	terminal to base	40	mm
	IEC 60664-1/EN 50124-1	terminal to terminal	26	mm
d_S	Surface creepage dist.	terminal to base	64	mm
	IEC 60664-1/EN 50124-1	terminal to terminal	56	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



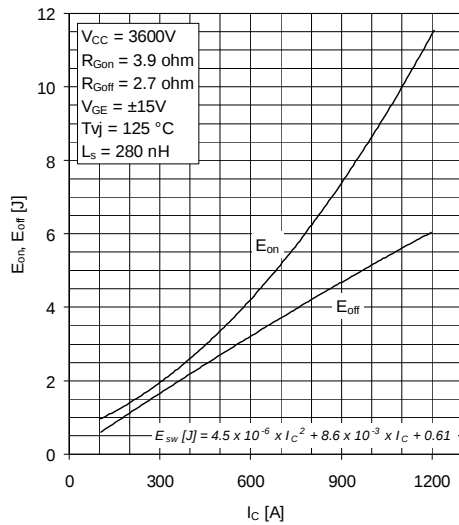


Fig. 7 Typical switching energies per pulse versus collector current

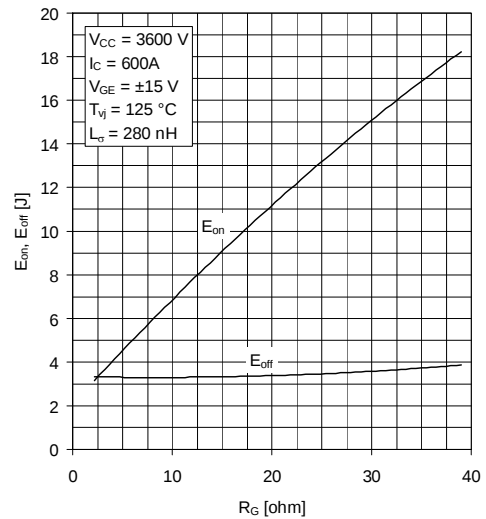


Fig. 8 Typical switching energies per pulse versus gate resistor

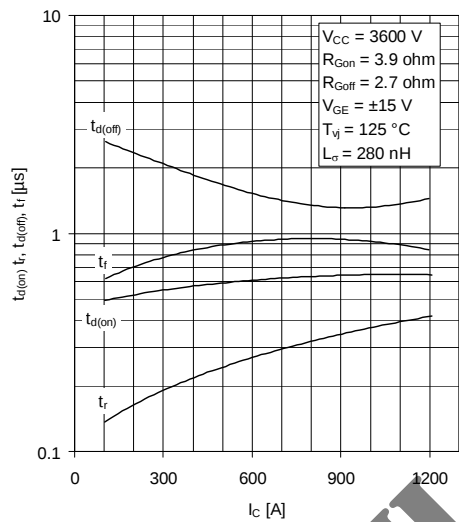


Fig. 9 Typical switching times vs. collector current

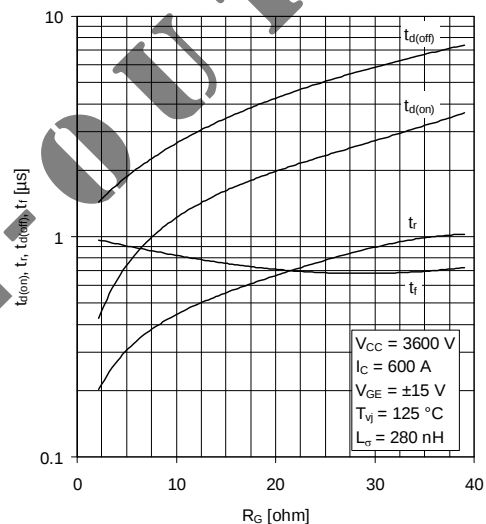


Fig. 10 Typical switching times vs. gate resistor

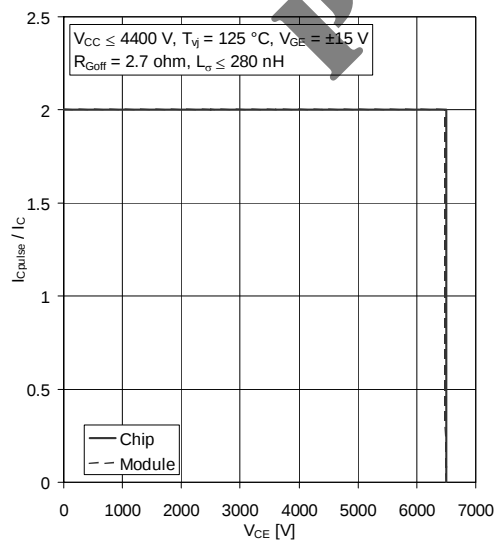


Fig. 11 Turn-off safe operating area (RBSOA)

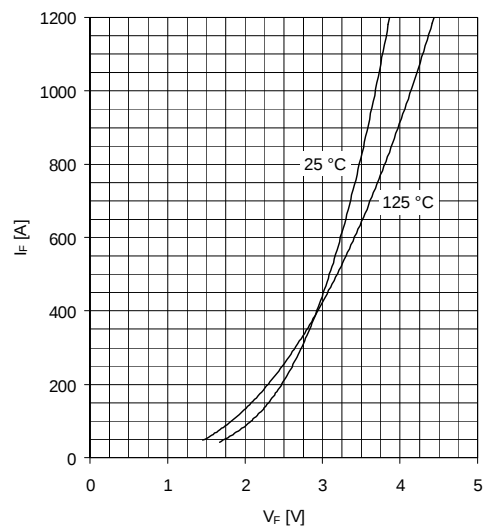


Fig. 12 Typ. diode forward characteristics, chip level

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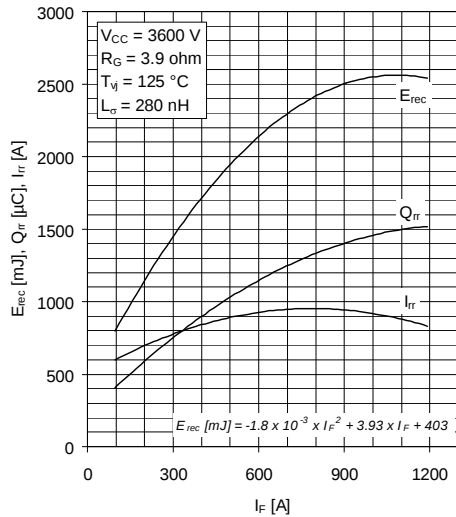


Fig. 13 Typ. reverse recovery characteristics versus forward current

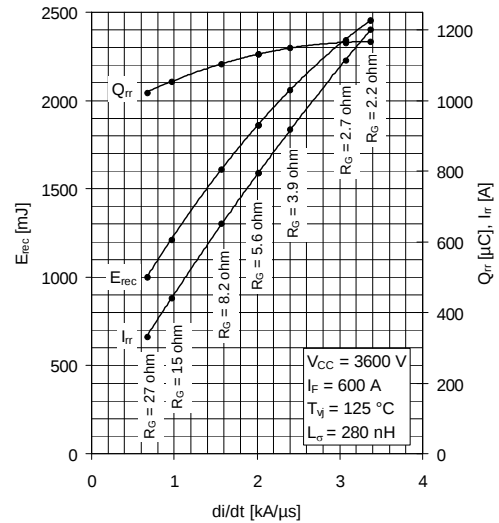


Fig. 14 Typ. reverse recovery characteristics versus di/dt

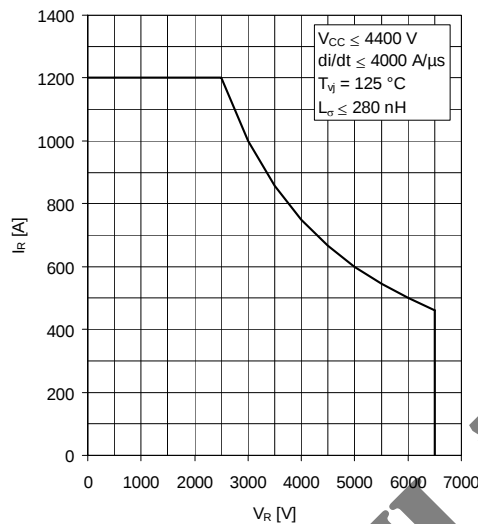


Fig. 15 Safe operating area diode (SOA)

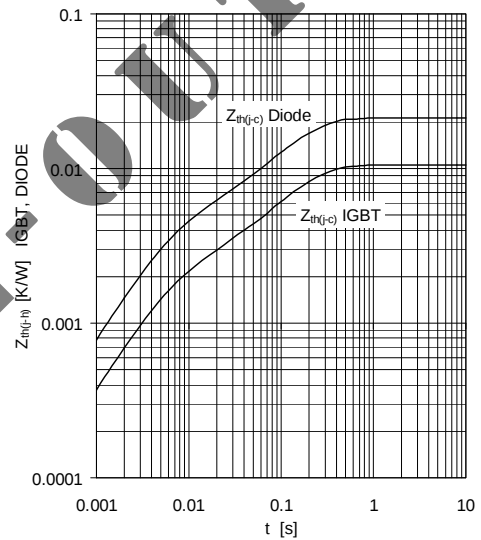
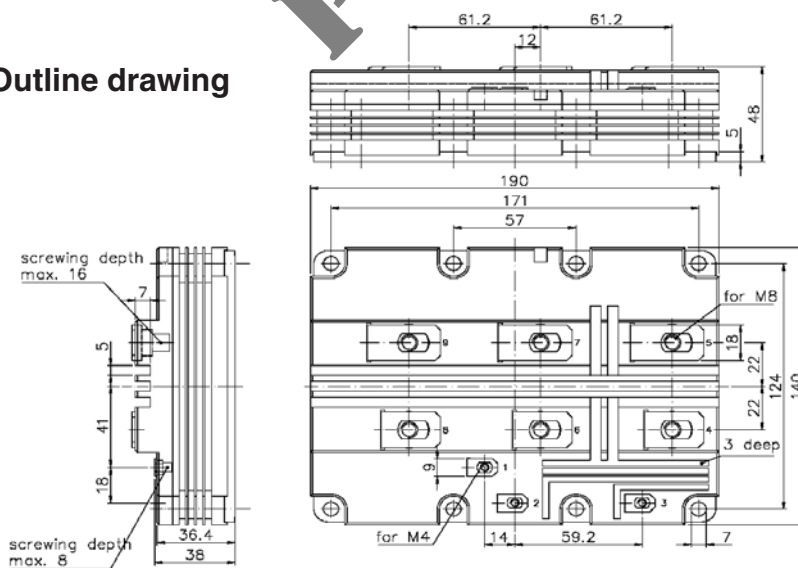


Fig. 16 Thermal impedance vs. time

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