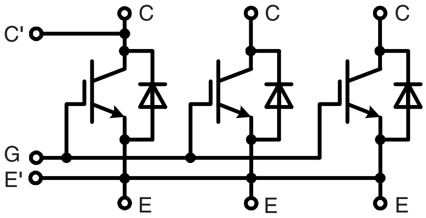
IXYS | Advanced Technical Information | **MIO 1200-33E10**

IGBT Module
Single switch

I_{C80} = 1200 A
V_{CES} = 3300 V
$V_{CE(sat)\ typ.}$ = 3.1 V

Short Circuit SOA Capability
Square RBSOA



IGBT

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

Symbol	Conditions	Characteristic Values (T_{VJ} = 25°C, unless otherwise specified) min.	typ.	max.	
$V_{CE(sat)}$ ①	I_C = 1200 A; V_{GE} = 15 V; T_{VJ} = 25°C T_{VJ} = 125°C		3.1 3.8		V V
$V_{GE(th)}$	I_C = 240 mA; V_{CE} = V_{GE}	6		8	V
I_{CES}	V_{CE} = 3300 V; V_{GE} = 0 V; T_{VJ} = 125°C			120	mA
I_{GES}	V_{CE} = 0 V; V_{GE} = ± 20 V; T_{VJ} = 125°C			500	nA
$t_{d(on)}$	Inductive load; T_{VJ} = 125°C; V_{GE} = ±15 V; V_{CC} = 1800 V; I_C = 1200 A; R_G = 1.5 Ω; L_σ = 100 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 V; V_{GE} = 0 V; f = 1 MHz		187		nF
C_{oes}			11.6		nF
C_{res}			2.2		nF
Q_{ge}	I_C = 1200 A; V_{CE} = 1800 V; V_{GE} = ± 15 V		12.1		µC
R_{thJC}				0.0085	K/W

① 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
  - AlSiC 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°C	1200	A
I_{FSM}	V_R = 0 V; T_{VJ} = 125°C; t_p = 10 ms; half-sinewave	11000	A

Symbol	Conditions	Characteristic Values min.	typ.	max.	
V_F ②	I_F = 1200 A; T_{VJ} = 25°C		2.30		V
	T_{VJ} = 125°C		2.35		V
I_{RM}	V_{CC} = 1800 V; I_C = 1200 A; V_{GE} = ±15 V; R_G = 1.5 Ω; T_{VJ} = 125°C Inductive load; L_σ = 100nH		1350		A
t_{rr}			1450		ns
Q_{RR}			1280		µC
E_{rec}			1530		mJ
R_{thJC}				0.017	K/W

② Forward voltage is given at chip level

Module

Symbol	Conditions		Maximum Ratings	
T_{JM}	max junction temperature		+150	°C
T_{VJ}	Operating temperature		-40...+125	°C
T_{stg}	Storage temperature		-40...+125	°C
V_{ISOL}	50 Hz		6000	V~
M_d	Mounting torque	Base-heatsink, M6 screws	4 - 6	Nm
		Main terminals, M8 screws	8 - 10	Nm

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

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

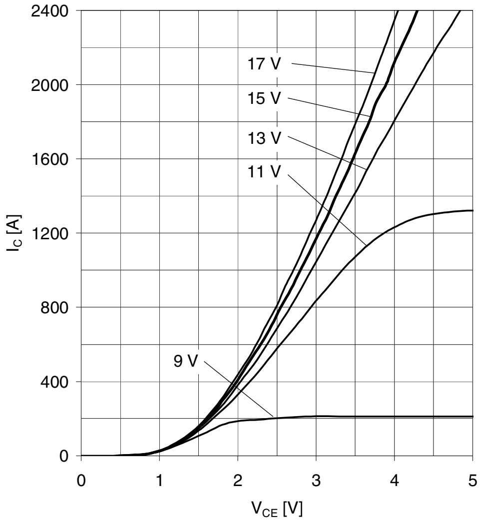


Fig. 1 Typical output characteristics, chip level

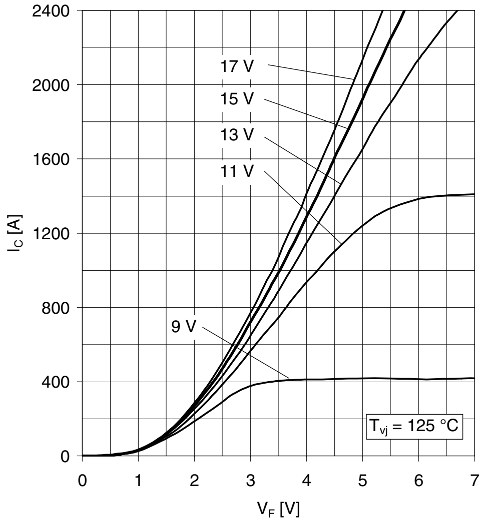


Fig. 2 Typical output characteristics, chip level

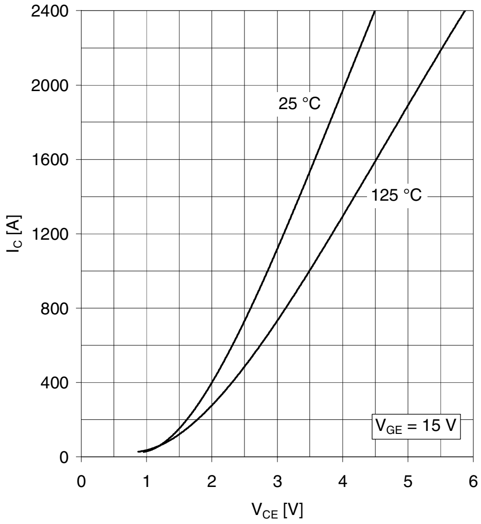


Fig. 3 Typical onstate characteristics, chip level

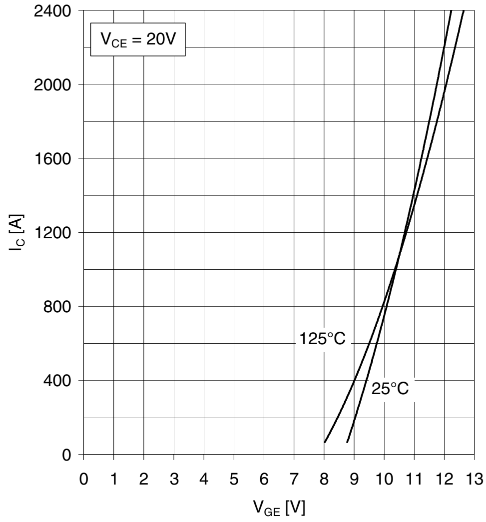


Fig. 4 Typical transfer characteristics, chip level

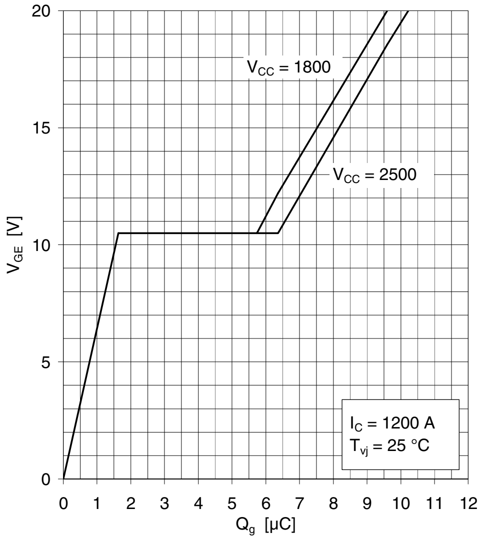


Fig. 5 Typical gate charge characteristics

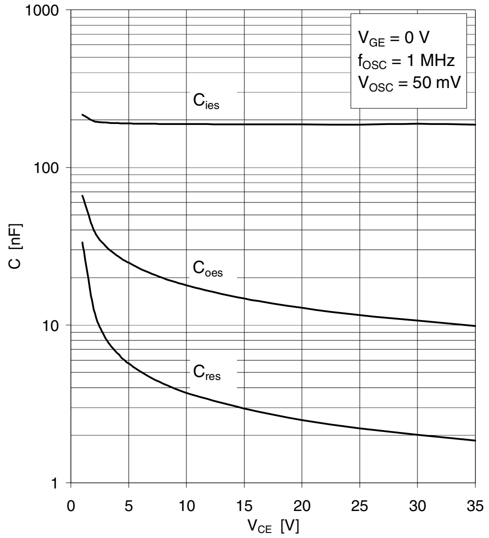


Fig. 6 Typical capacitances vs collector-emitter voltage

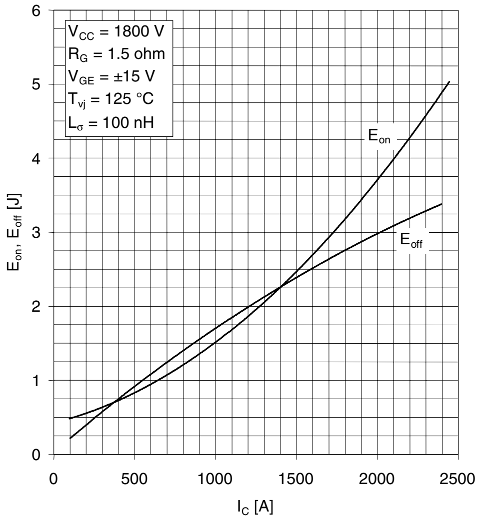


Fig. 7 Typical switching energies per pulse vs collector current

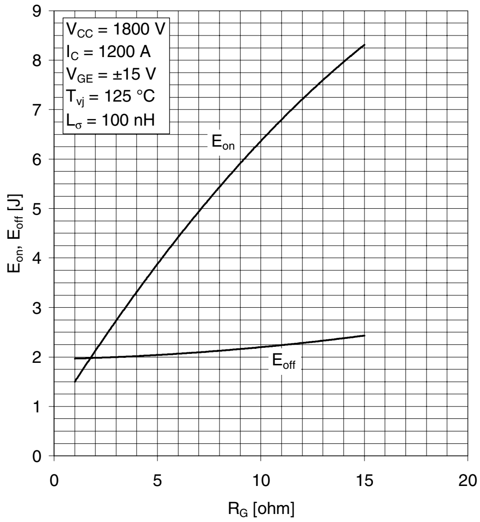


Fig. 8 Typical switching energies per pulse vs gate resistor

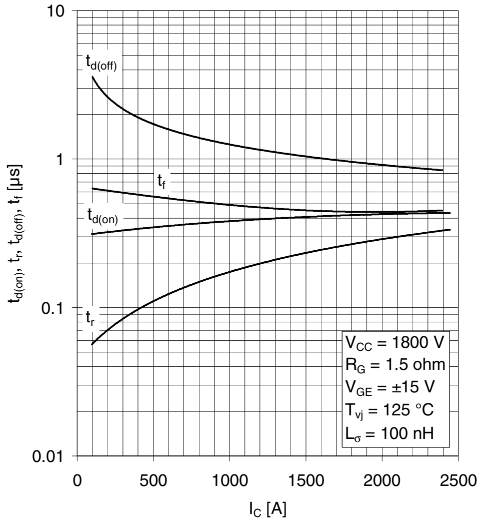


Fig. 9 Typical switching times vs collector current

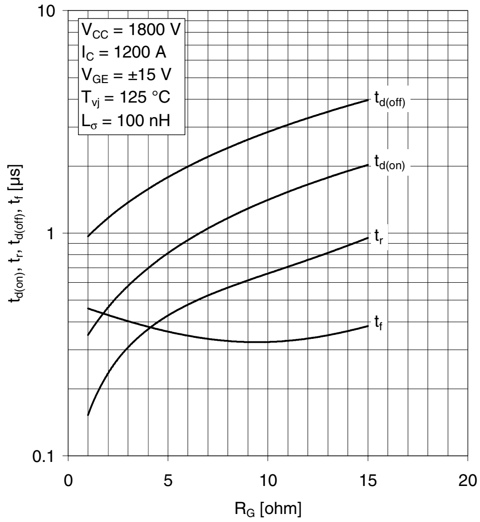


Fig. 10 Typical switching times vs gate resistor

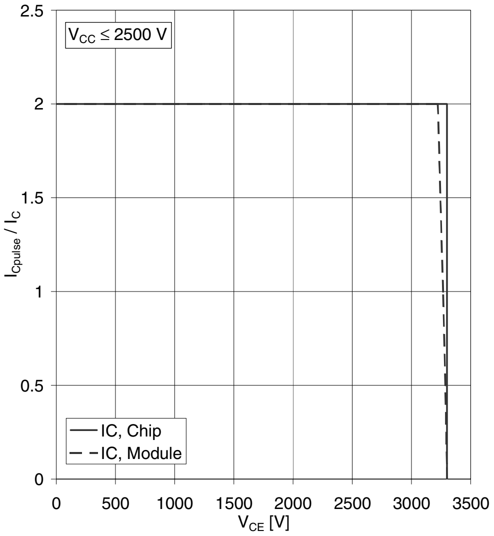


Fig. 11 Turn-off safe operating area (RBSOA)

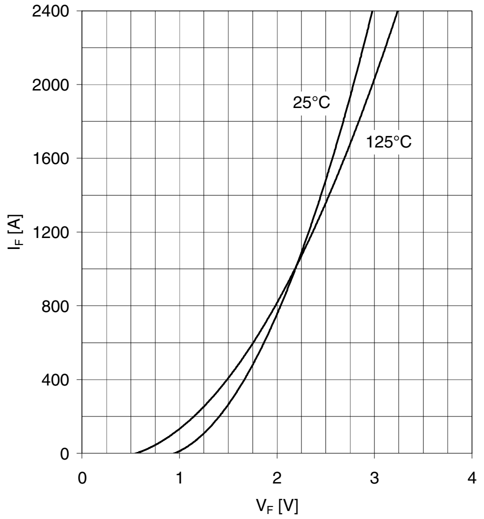


Fig. 12 Typical diode forward characteristics, chip level

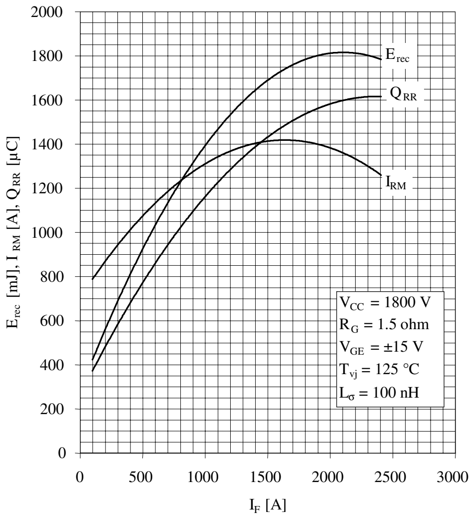


Fig. 13 Typical reverse recovery characteristics vs forward current

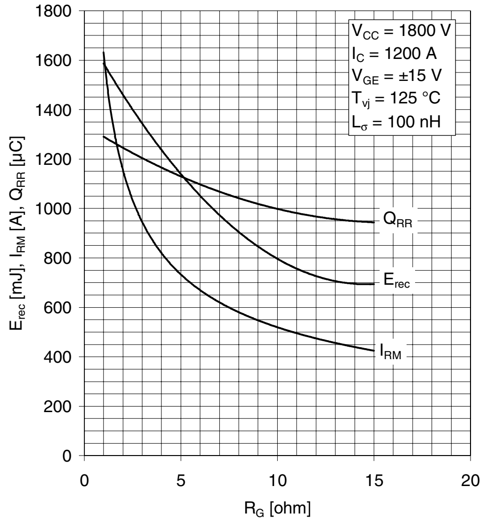


Fig. 14 Typical reverse recovery characteristics vs gate resistor

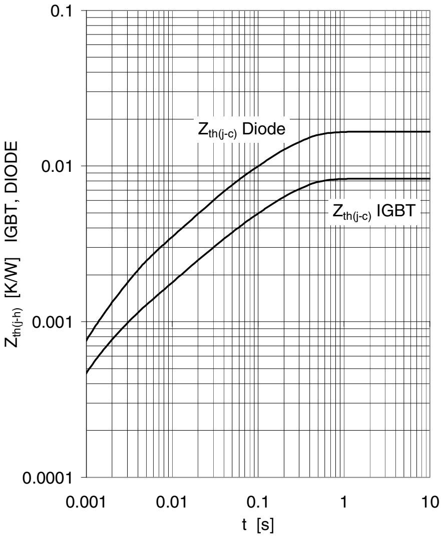
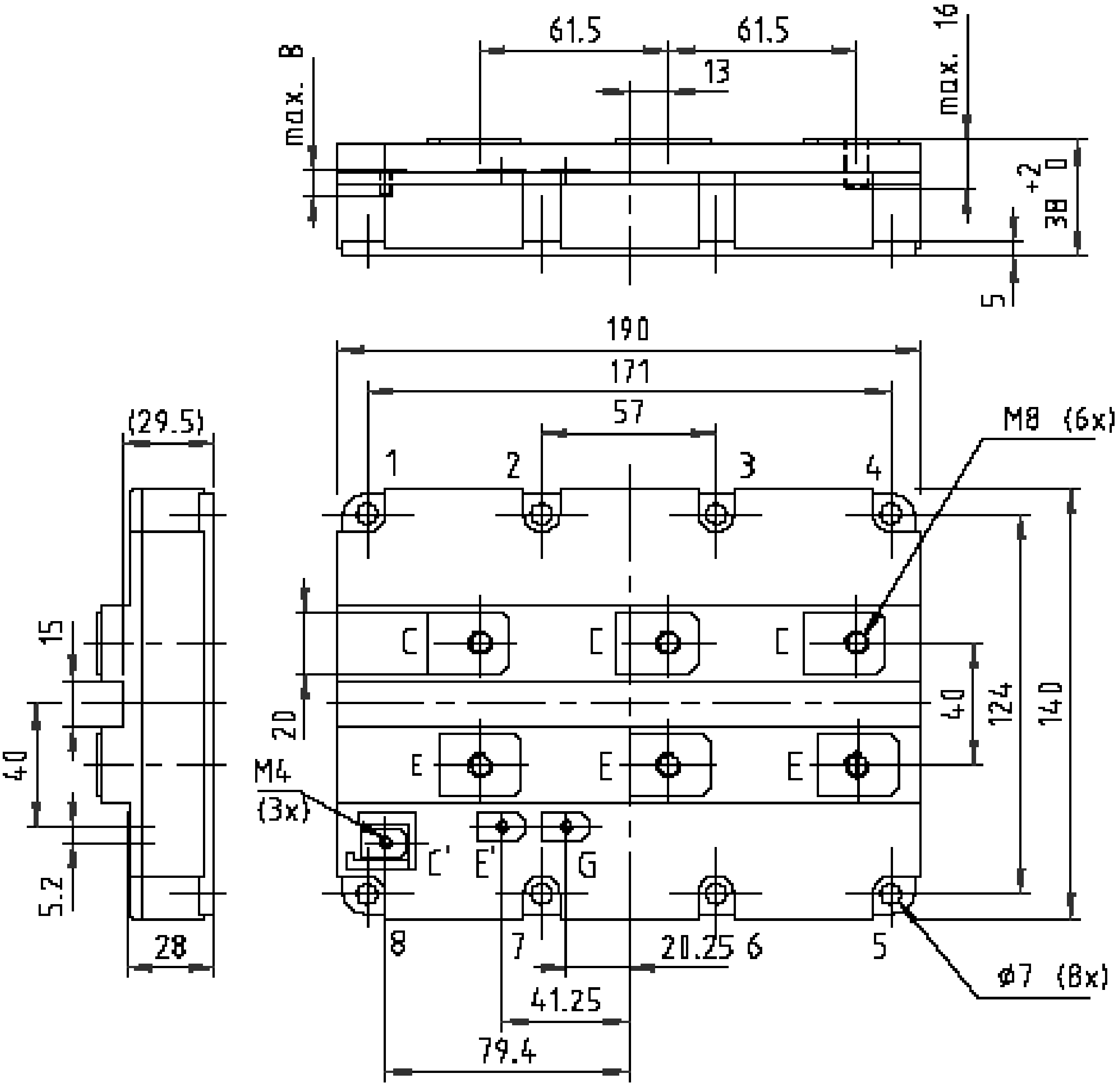


Fig. 15 Thermal impedance vs time

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

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

Outline drawing



Note: all dimensions are shown in mm