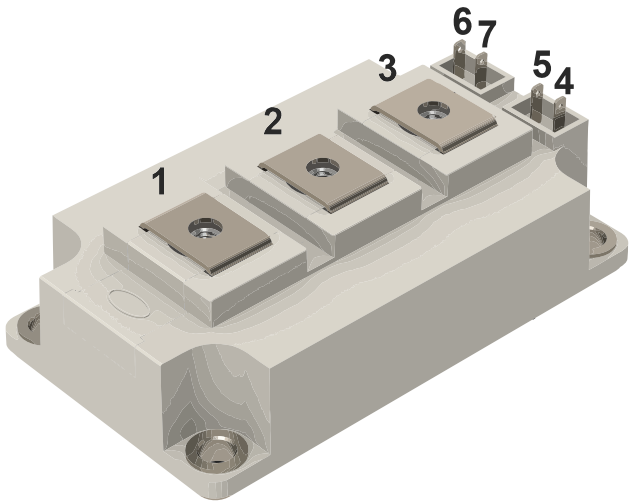
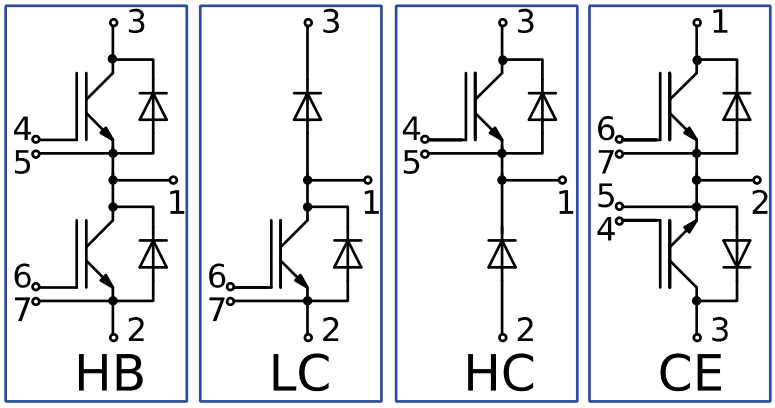
Industry standard 62mm IGBT module

1200V 300A





Chip features

- IGBT Chip
  - low $V_{CE(sat)}$ value
  - 10 µs short circuit @ 150°C
  - square RBSOA @ 2xI_C
  - low EMI
- FRD Chip
  - fast and soft reverse recovery
  - low voltage drop

Design features

- copper baseplate
- Al_2O_3 DBC substrate
- ultrasonically welded power terminals
- improved thermal cycling
- RoHS compliant

Typical application

- AC motor drives
- solar inverter
- air conditioning
- high power converters and UPS

Maximum rated values

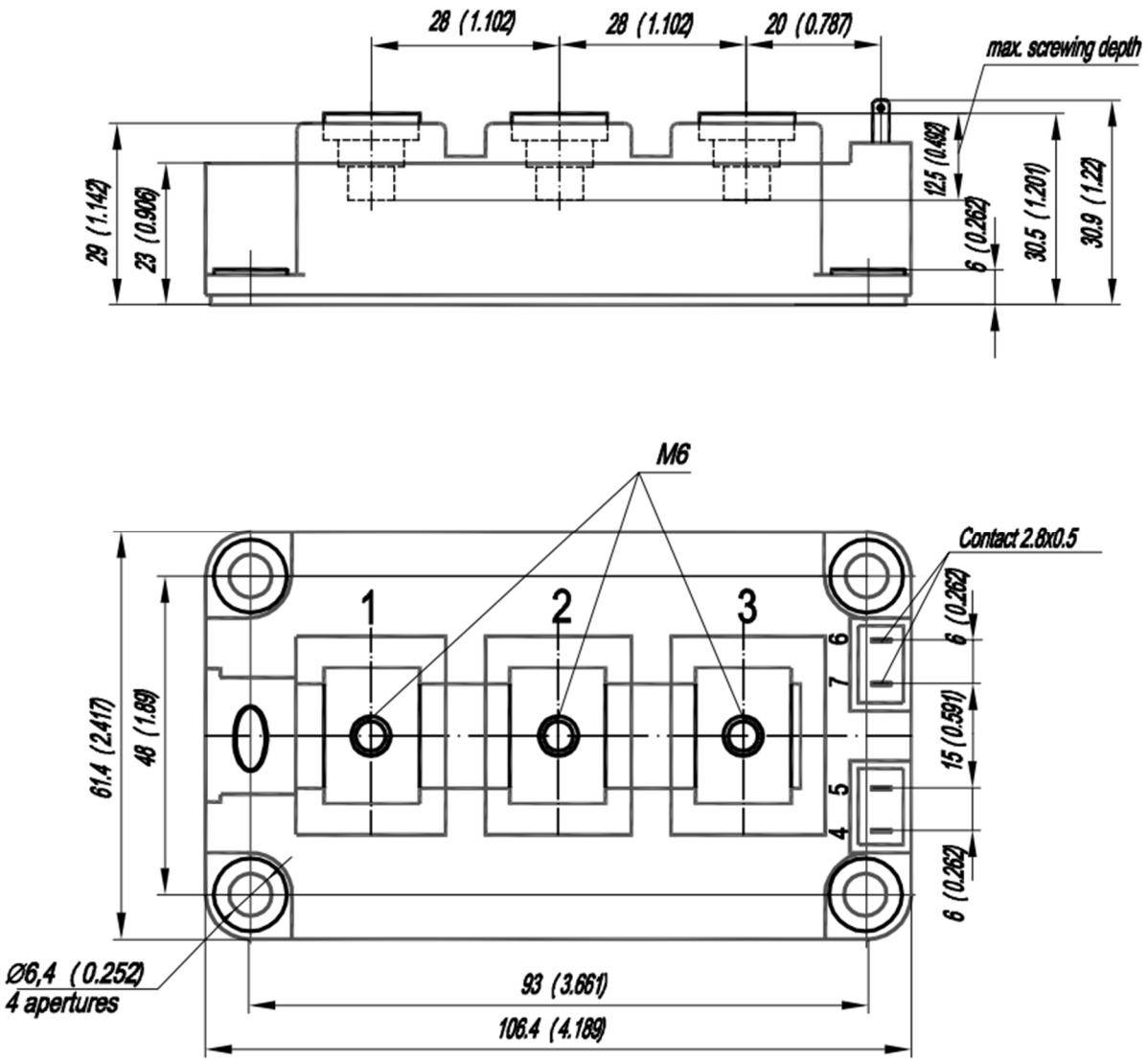
Definition	Symbol	Conditions	Value	Unit
IGBT				
Collector-Emitter voltage	V_{CES}	V_{GE} = 0V	1200	V
Collector current (nominal)	$I_{C\ nom}$		300	A
Collector current (maximum continuous)	$I_{C\ 25}$	T_j = 175°C, T_c = 25°C	420	A
	$I_{C\ 80}$	T_j = 175°C, T_c = 80°C	320	A
Repetitive peak collector current *1	I_{CRM}	I_{CRM} = 3 x I_{Cnom}, t_p = 1ms	900	A
Gate-Emitter voltage	V_{GES}		±20	V
Junction temperature	T_j		-40 … 175	°C
Inverse diode / Freewheeling diode				
Repetitive peak reverse voltage	V_{RRM}	V_{GE} = 0V	1200	V
Forward current (nominal)	$I_{F\ nom}$		300	A
Forward current (maximum continuous)	$I_{F\ 25}$	T_j = 175°C, T_c = 25°C	375	A
	$I_{F\ 80}$	T_j = 175°C, T_c = 80°C	275	A
Repetitive peak forward current *1	I_{FRM}	I_{FRM} = 3 x I_{Fnom} , t_p = 1ms	900	A
Surge (non-repetitive) forward current	I_{FSM}	t_p = 1ms, sin 180°, T_j = 25°C	1540	A
Junction temperature	T_j		-40 … 175	°C
Module				
Storage temperature	T_{stg}		-40 … 125	°C
Isolation voltage	V_{isol}	AC sinus 50 Hz, t = 1min	4000	V

*1 Pulse width and repetition rate should be such that device junction temperature (Tj) does not exceed maximum Tj rating.

Characteristics

Definition	Symbol	Conditions		Value min.	Value typ.	Value max.	Unit
IGBT							
Collector-Emitter saturation voltage	V_{CEsat} (chip)	V_{GE} = 15V, I_C = 300A	T_J = 25°C	-	1.85	2.3	V
			T_J = 150°C	-	2.25	2.55	V
	V_{CEsat} (terminal)		T_J = 25°C	-	2	2.45	V
			T_J = 150°C	-	2.4		V
Gate-Emitter threshold voltage	$V_{GE(th)}$	I_C = 12mA, V_{CE} = V_{GE}, T_J = 25°C		5.5	6	6.5	V
Collector-Emitter cut-off current	I_{CES}	V_{CE} = 1200V, V_{GE} = 0V	T_J = 25°C	-	100	300	µA
			T_J = 150°C	-	-	2000	µA
Gate-Emitter leakage current	I_{GES}	V_{CE} = 0V, V_{GE} = ±20V		-	-	400	nA
Input capacitance	C_{ies}	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz, T_J = 25°C		-	18	-	nF
Output capacitance	C_{oes}			-	1770	-	pF
Reverse transfer capacitance	C_{res}			-	1770	-	pF
Total gate charge	Q_G	I_C = 300A, V_{CE} = 600V, V_{GE} = -8÷20V		-	3310	-	nC
Internal gate resistance	R_{Gint}	T_J = 25°C		-	2.5	-	Ω
Turn-on delay time	$t_{d(on)}$	V_{CE} = 600V, I_C = 300A, R_G = 2.5Ω, V_{GE} = ±15V, T_j = 150°C, di/dt_{on} = 7700A/µS, di/dt_{off} = 3500A/µS, du/dt_{off} = 7500V/µS		-	340	408	ns
Rise time	t_r			-	48	58	ns
Turn-on energy	E_{on}			-	23	28	mJ
Turn-off delay time	$t_{d(off)}$			-	576	691	ns
Fall time	t_f			-	69	83	ns
Turn-off energy	E_{off}			-	33	40	mJ
Short circuit duration	t_{psc}	V_{cc} = 720V, V_{GE} ≤ 20V, T_j = 150°C, non-repetitive		-	-	10	µs
Collector-emitter threshold voltage	V_{CE0}	V_{GE} = 15V, T_J = 150°C, for static power loss calculation		-	0.88	0.98	V
On-State slope resistance (IGBT)	r_{CE0}			-	4.57	5.23	mΩ
Thermal resistance junction to case	$R_{th(j-c)}$	per IGBT		-	-	0.11	K/W
Inverse diode / Freewheeling diode							
Continuous forward voltage	V_F (chip)	I_F = 300A	T_j = 25°C	-	1.9	2.2	V
			T_j = 150°C	-	1.9	-	V
	V_F (terminal)		T_j = 25°C	-	2.05	2.35	V
			T_j = 150°C	-	2.05	-	V
Reverse recovery time	t_{rr}	V_R = 600V, I_F = 300A, di_F/dt = 5000 A/µS	T_j = 25°C	-	200	240	ns
			T_j = 125°C	-	350	420	ns
Peak reverse recovery current	I_{RM}		T_j = 25°C	-	290	348	A
			T_j = 125°C	-	350	420	A
Reverse recovered charge	Q_{rr}		T_j = 25°C	-	19	23	µC
			T_j = 125°C	-	40	48	µC
Reverse recovery energy	E_{rr}		T_j = 25°C	-	7	8.5	mJ
			T_j = 125°C	-	20	24	mJ
Forward threshold voltage (Diode)	V_{F0}	T_J = 175°C, for static power loss calculation		-	1.2	-	V
On-state slope resistance (Diode)	r_F			-	3	-	mΩ
Thermal resistance junction to case	$R_{th(j-c)}$			-	-	0.17	K/W
Module							
Parasitic inductance Collector-Emitter	L_{CE}			-	30	-	nH
Resistance terminal-chip	$R_{CC'+EE'}$	terminal-chip	T_j = 25°C	-	0.5	-	mΩ
Thermal resistance case to heatsink	R_{thCH}	per module		-	0.05	-	K/W
Mounting torque for screws to heatsink	M_s	to heatsink M6		3	-	5	Nm
Mounting torque for terminal screws	M_t	to terminals M5		2.5	-	5	Nm
Weight	W			-	-	340	g

Overall dimensions: Package type AA



Part numbering guide

MIAA	-	HB	12	FA	-	300	N	
MIAA								IGBT module package type: AA
		HB						2 switches as Half-Bridge
		HC						1 switch as High-Side chopper
		LC						1 switch as Low-Side chopper
		CE						2 switches with Common Emitter
			12					Voltage rating (V_{CES}/100)
				FA				IGBT+FRD chipset modification
						300		Current Rating
							N	Climatic version: normal climate

This datasheet is a tentative target data. The information in this document will be updated according to product qualification test results.