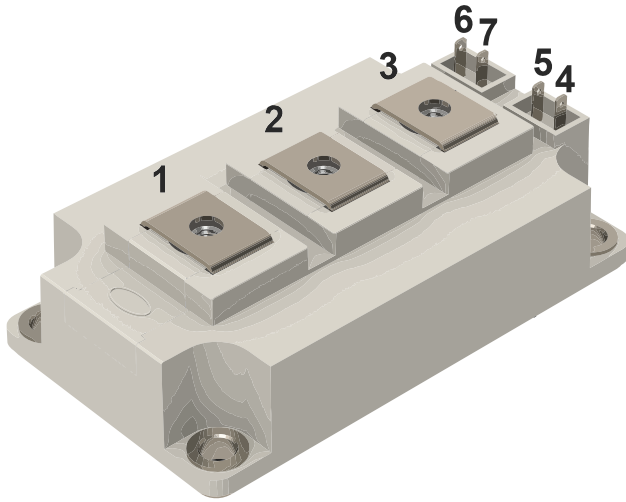


Industry standard 62mm IGBT module
1200V 400A

Chip features

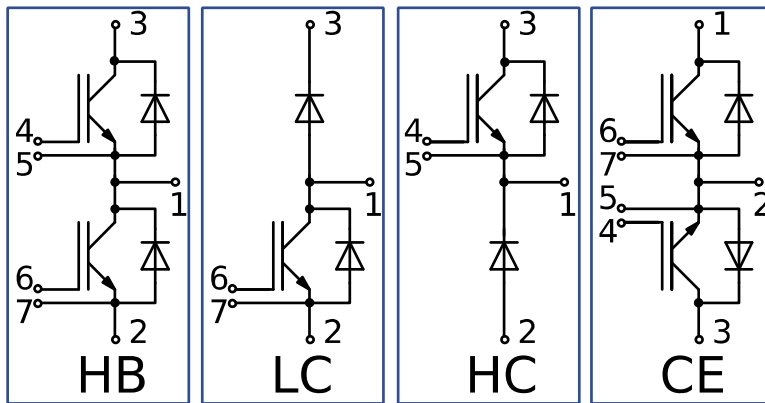
- IGBT Chip
 - low $V_{CE(sat)}$ value
 - 10 μs short circuit @ 150°C
 - square RBSOA @ $2 \times I_c$
 - low EMI
- FRD Chip
 - fast and soft reverse recovery
 - low voltage drop

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

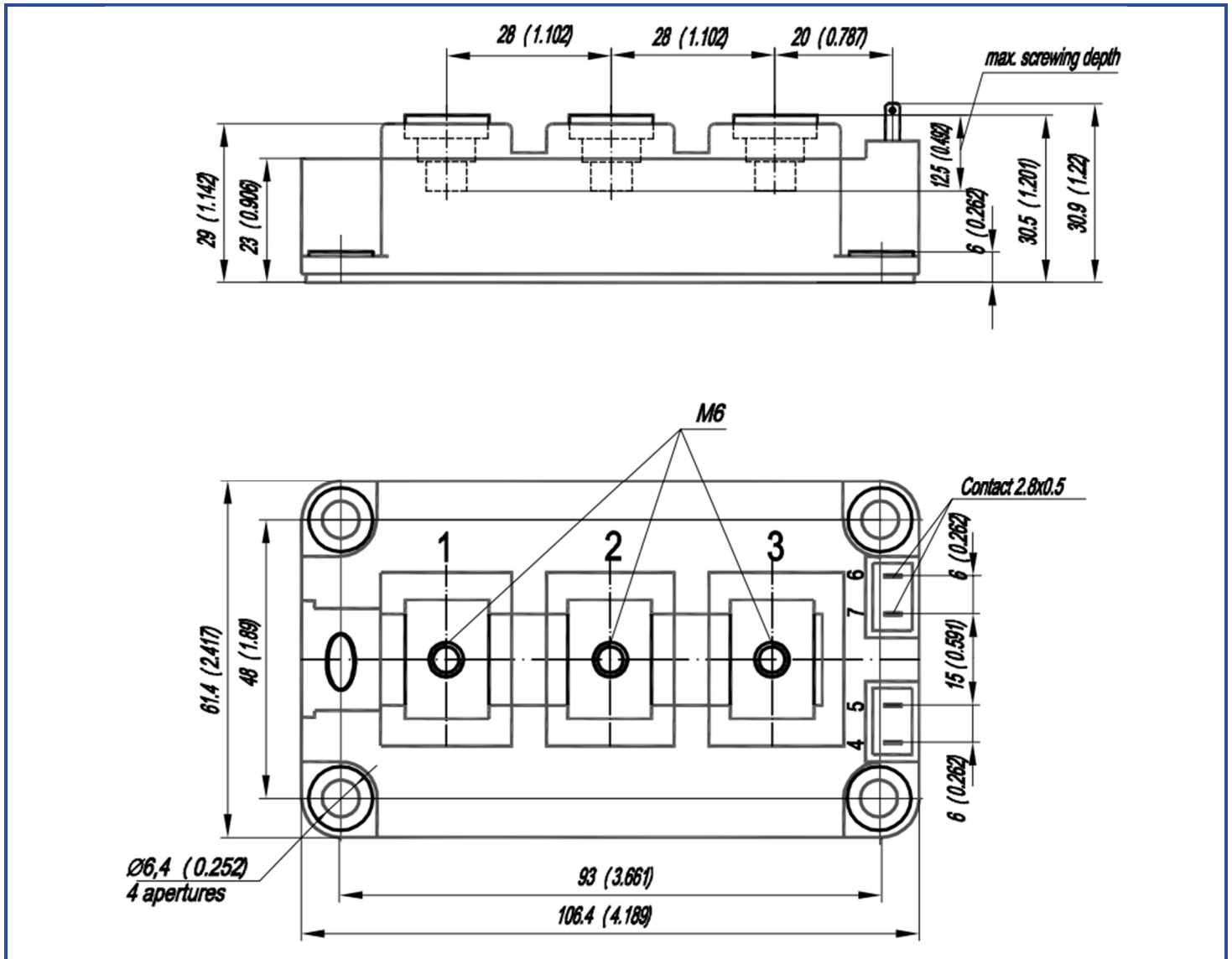
Definition	Symbol	Conditions	Value	Unit
IGBT				
Collector-Emitter voltage	V_{CES}	$V_{GE} = 0V$	1200	V
Collector current (nominal)	$I_{C\ nom}$		400	A
Collector current (maximum continuous)	$I_{C\ 25}$	$T_j = 175^\circ C, T_c = 25^\circ C$	612	A
	$I_{C\ 80}$	$T_j = 175^\circ C, T_c = 80^\circ C$	467	A
Repetitive peak collector current *1	I_{CRM}	$I_{CRM} = 3 \times I_{C\ nom}, t_p = 1ms$	1200	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)	$I_{F\ nom}$		400	A
Forward current (maximum continuous)	$I_{F\ 25}$	$T_j = 175^\circ C, T_c = 25^\circ C$	468	A
	$I_{F\ 80}$	$T_j = 175^\circ C, T_c = 80^\circ C$	338	A
Repetitive peak forward current *1	I_{FRM}	$I_{FRM} = 3 \times I_{F\ nom}, t_p = 1ms$	1200	A
Surge (non-repetitive) forward current	I_{FSM}	$t_p = 1ms, \sin 180^\circ, T_j = 25^\circ C$	1980	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 (T_j) does not exceed maximum T_j rating.



Characteristics

Definition	Symbol	Conditions	Value			Unit	
			min.	typ.	max.		
IGBT							
Collector-Emitter saturation voltage	V_{CEsat} (chip)	$V_{GE} = 15V$ $I_C = 400A$	$T_J = 25^\circ C$	-	1.75	2.2	V
			$T_J = 150^\circ C$	-	2.2	2.5	V
	V_{CEsat} (terminal)		$T_J = 25^\circ C$	-	1.95	2.4	V
			$T_J = 150^\circ C$	-	2.4		V
Gate-Emitter threshold voltage	$V_{GE(th)}$	$I_C = 16mA, V_{CE} = V_{GE}, T_J = 25^\circ C$	5.5	6	6.5	V	
Collector-Emitter cut-off current	I_{CES}	$V_{CE} = 1200V$ $V_{GE} = 0V$	$T_J = 25^\circ C$	-	100	300	μA
			$T_J = 150^\circ C$	-	-	2000	μA
Gate-Emitter leakage current	I_{GES}	$V_{CE} = 0V, V_{GE} = \pm 20V$	-	-	400	nA	
Input capacitance	C_{ies}	$V_{CE} = 25V, V_{GE} = 0V$ $f = 1MHz, T_J = 25^\circ C$	-	24	-	nF	
Output capacitance	C_{oes}		-	2360	-	pF	
Reverse transfer capacitance	C_{res}		-	2356	-	pF	
Total gate charge	Q_G		$I_C = 400A, V_{CE} = 600V, V_{GE} = -8 \div 20V$	-	4420	-	nC
Internal gate resistance	R_{Gint}	$T_J = 25^\circ C$	-	1.9	-	Ω	
Turn-on delay time	$t_{d(on)}$	$V_{CE} = 600V, I_C = 400A,$ $R_G = 3.0\Omega, V_{GE} = \pm 15V,$ $T_J = 150^\circ C,$ $di/dt_{on} = 9800 A/\mu S,$ $di/dt_{off} = 5000 A/\mu S,$ $du/dt_{off} = 7600 V/\mu S$	-	350	420.0	ns	
Rise time	t_r		-	60	72.0	ns	
Turn-on energy	E_{on}		-	39	46.8	mJ	
Turn-off delay time	$t_{d(off)}$		-	700	840.0	ns	
Fall time	t_f		-	65	78.0	ns	
Turn-off energy	E_{off}		-	42	50.4	mJ	
Short circuit duration	t_{psc}		$V_{CC} = 720V, V_{GE} \leq 20V,$ $T_J = 150^\circ C, \text{non-repetitive}$	-	-	10	μs
Collector-emitter threshold voltage	V_{CE0}		$V_{GE} = 15V, T_J = 150^\circ C$	-	0.88	0.98	V
On-State slope resistance (IGBT)	r_{CE0}	for static power loss calculation	-	3.3	3.8	m Ω	
Thermal resistance junction to case	$R_{th(j-c)}$	per IGBT	-	-	0.072	K/W	
Inverse diode / Freewheeling diode							
Continuous forward voltage	V_F (chip)	$I_F = 400A$	$T_J = 25^\circ C$	-	1.9	2.2	V
			$T_J = 150^\circ C$	-	1.9	-	V
	V_F (terminal)		$T_J = 25^\circ C$	-	2.1	2.4	V
			$T_J = 150^\circ C$	-	2.1	-	V
Reverse recovery time	t_{rr}	$V_R = 600V$ $I_F = 500A$ $di_F/dt = 5000 A/\mu S$	$T_J = 25^\circ C$	-	200	ns	
Peak reverse recovery current	I_{RM}		$T_J = 125^\circ C$	-	350	ns	
			$T_J = 25^\circ C$	-	380	A	
Reverse recovered charge	Q_{rr}		$T_J = 125^\circ C$	-	540	A	
			$T_J = 25^\circ C$	-	30	μC	
Reverse recovery energy	E_{rr}		$T_J = 125^\circ C$	-	70	μC	
			$T_J = 25^\circ C$	-	10	mJ	
			$T_J = 125^\circ C$	-	30	mJ	
Forward threshold voltage (Diode)	V_{F0}	$T_J = 175^\circ C$	-	1.2	-	V	
On-state slope resistance (Diode)	r_F	for static power loss calculation	-	2	-	m Ω	
Thermal resistance junction to case	$R_{th(j-c)}$		-	-	0.15	K/W	
Module							
Parasitic inductance Collector-Emitter	L_{CE}		-	30	-	nH	
Resistance terminal-chip	$R_{CC'+REE'}$	terminal-chip	$T_J = 25^\circ C$	-	0.5	-	m Ω
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	-	400	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
						400		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.

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