



Low Inductance IGBT Module with 17 mm Height Housing

1200 V 450 A

Chip features

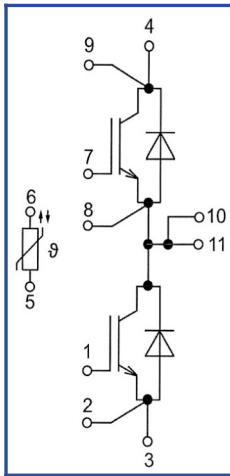
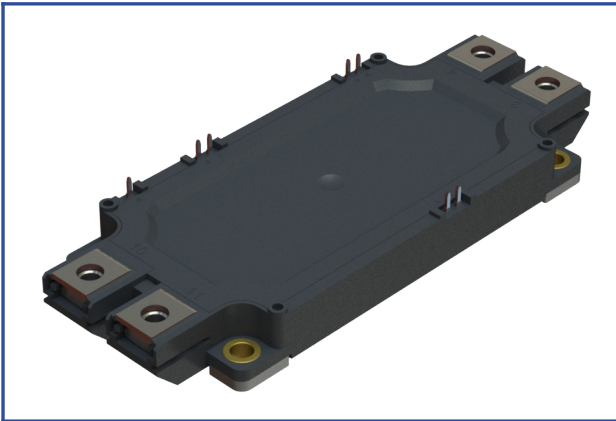
- IGBT chip
 - low $V_{CE(sat)}$ value
 - 10 μ s short circuit duration at 150°C
 - square RBSOA of $2xI_C$
- FRD chip
 - fast and soft reverse recovery
 - low voltage drop

Design features

- copper baseplate
- Al_2O_3 DBC substrate
- ultrasonic welded power terminals
- improved thermal cycling
- RoHS compliant
- low inductance value

Typical application

- AC motor drives
- solar inverters
- air conditioning
- high power converters and UPS
- Inverters for wind energy converters



Maximum rated values

Definition	Symbol	Conditions	Value	Unit
IGBT				
Collector-Emitter voltage	V_{CES}	$V_{GE} = 0$.	1200	V
Maximum allowable collector current (continuous)	$I_{C 25}$	$T_{vj (max)} = 175^{\circ}C; T_c = 25^{\circ}C$.	594	A
	$I_{C 80}$	$T_{vj (max)} = 175^{\circ}C; T_c = 80^{\circ}C$.	450	A
Repetitive peak collector current ^{*1}	I_{CRM}	$I_{CRM} = 3 \times I_{C nom}; t_p = 1 ms$.	1350	A
Short-circuit duration	t_{psc}	$T_{vj} = 25^{\circ}C; V_{GE} = \pm 15 V; V_{CE} = 720 V;$ $R_{G on} = R_{G off} = 1.5 \Omega$	10	μs
		$T_{vj} = 150^{\circ}C; V_{GE} = \pm 15 V; V_{CE} = 720 V;$ $R_{G on} = R_{G off} = 1.5 \Omega$	10	
Gate-Emitter voltage	V_{GES}		± 20	V
Junction operating temperature	$T_{vj (op)}$		-40...+150	°C
Inverse diode				
Repetitive peak reverse voltage	V_{RRM}	$V_{GE} = 0 V$.	1200	V
Maximum allowable forward current (continuous)	$I_{F 25}$	$T_{vj (max)} = 175^{\circ}C; T_c = 25^{\circ}C$.	477	A
	$I_{F 80}$	$T_{vj (max)} = 175^{\circ}C; T_c = 80^{\circ}C$.	362	A
Repetitive peak forward current ^{*1}	I_{FRM}	$I_{FRM} = 3 \times I_{F nom}; t_p = 1 ms$.	1350	A
Junction operating temperature	$T_{vj (op)}$		-40...+150	°C
Module				
Storage temperature	T_{stg}		-55...+50	°C
Isolation voltage	V_{isol}	AC sin 50 Hz; t = 1 min.	4000	V

^{*1} Pulse width and repetition rate should be such that device junction temperature does not exceed maximum T_{vj} rating



Characteristics

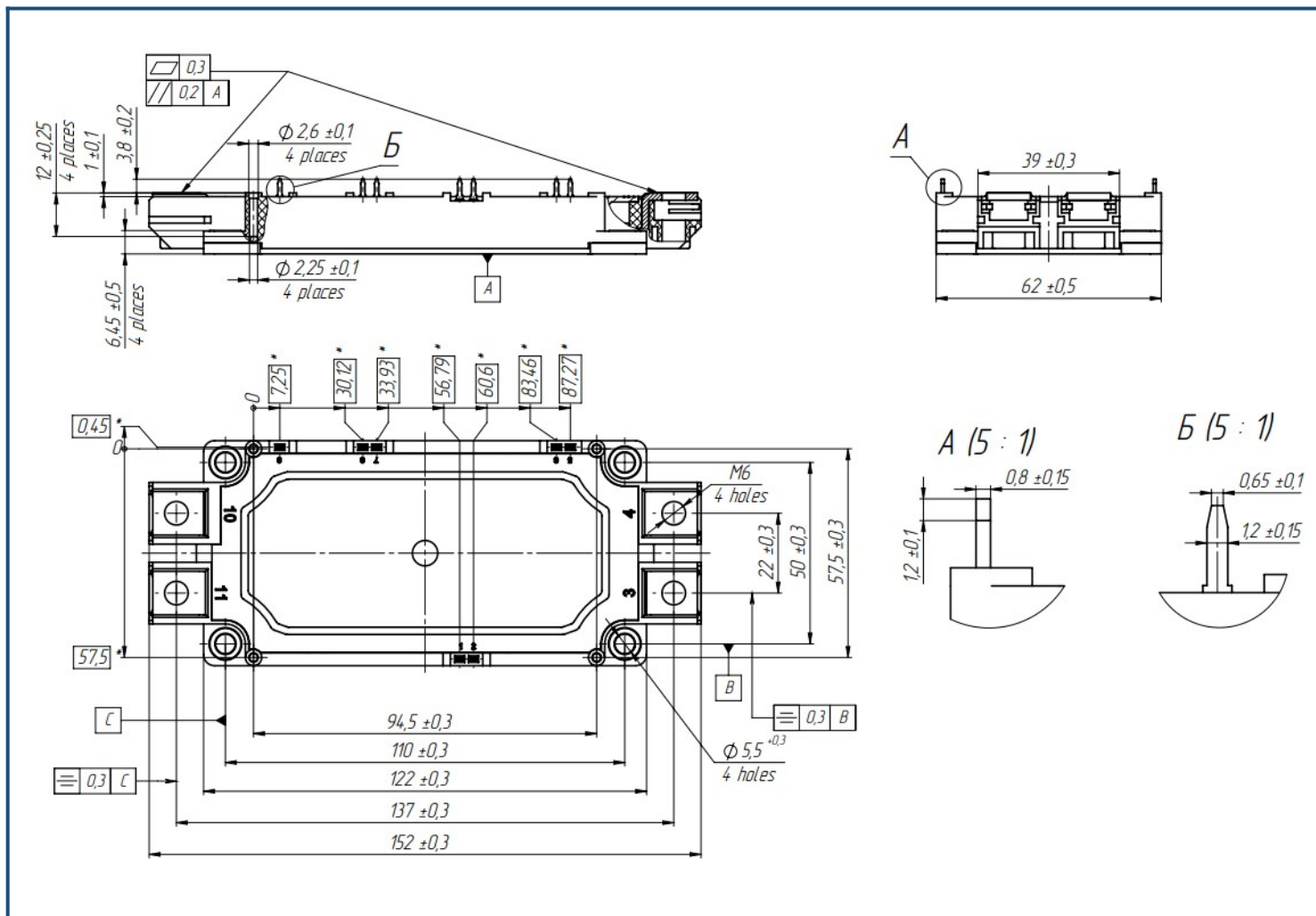
Definition	Symbol	Conditions		Value			Unit	
				min.	typ.	max.		
IGBT								
Collector-Emitter saturation voltage	V_{CEsat}	$V_{GE} = +15\text{ V}; I_C = 450\text{ A};$ $t_u = 1000\text{ }\mu\text{s}.$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	- -	- -	2.30 2.85	V V	
Gate-Emitter threshold voltage	$V_{GE(th)}$	$I_C = 18\text{ mA}; V_{CE} = V_{GE}; T_{vj} = 25^{\circ}\text{C};$ $t_u = 2\text{ ms}.$		4.15	5.80	8.10	V	
Collector-Emitter cut-off current	I_{CES}	$V_{CE} = 1200\text{ V};$ $t_u = 50\text{ ms}; V_{GE} = 0.$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	- -	11.00 0.30	300 5.00	μA mA	
Gate-Emitter leakage current	I_{GES}	$V_{CE} = 0; V_{GE} = \pm 20\text{ V}; T_{vj} = 25^{\circ}\text{C};$ $t_u = 30\text{ ms}.$		-	15.00	200	nA	
Input capacitance	C_{ies}	$V_{CE} = 25\text{ V}; V_{GE} = 0\text{ V};$		-	261.00	-	nF	
Reverse transfer capacitance	C_{res}	$f = 1\text{ MHz}; T_{vj} = 25^{\circ}\text{C}.$		-	2.70	-	nF	
Total gate charge	Q_G	$I_C = 450\text{ A}; V_{CE} = 600\text{ V};$ $V_{GE} = -8...+15\text{ V}.$		-	-	4000	nC	
Internal gate resistance	R_{Gint}	$T_{vj} = 25^{\circ}\text{C}.$		-	0.80	-	Ω	
Turn-on delay time	$t_{d(on)}$	$V_{CE} = 600\text{ V};$ $V_{GE} = \pm 15\text{ V};$ $I_{C\text{ max}} = 450\text{ A};$ $R_G = 1.5\text{ }\Omega;$ $L_s = 56\text{ nH}.$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	- -	- -	288 269	ns	
Rise time	t_{ri}		$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	- -	- -	120 131	ns	
Turn-on energy	E_{on}		$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	- -	- -	18.0 34.5	mJ	
Turn-off delay time	$t_{d(off)}$		$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	- -	- -	708 791	ns	
Fall time	t_{fi}		$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	- -	- -	144 264	ns	
Turn-off energy	E_{off}		$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	- -	- -	56.5 75.0	mJ	
Collector-emitter threshold voltage	V_{CE0}		$V_{GE} = +15\text{ V}; T_{vj} = 150^{\circ}\text{C};$		-	-	0.69	V
On-State slope resistance (IGBT)	r_{CE0}		$I_{CE1} = 112\text{ A}; I_{CE2} = 450\text{ A};$ $t_u = 1000\text{ }\mu\text{s}.$		-	-	4.50	m Ω
Thermal resistance junction to case	$R_{th(j-c)}$		DC; $I_{test} = 1.5\text{ A};$ $V_{GE} = +15\text{ V}.$		-	-	0.075	K/W
Inverse diode								
Forward voltage drop	V_F	$I_F = 450\text{ A};$ $V_{GE} = 0; t_u = 1000\text{ }\mu\text{s}.$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	- -	- -	3.00 3.30	V V	
Reverse recovery time	t_{rr}	$V_{GE} = \pm 15\text{ V};$ $V_{CE} = 600\text{ V};$ $I_{C\text{ max}} = 450\text{ A};$ $R_{G\text{ on}} = 1.5\text{ }\Omega;$ $L_s = 56\text{ nH}.$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	- -	- -	182 488	ns ns	
Peak reverse current	I_{RM}		$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	- -	- -	235 320	A A	
Recovered charge	Q_r		$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	- -	- -	20.0 59.5	μC μC	
Reverse recovery energy	E_{rec}		$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	- -	- -	15.5 28.5	mJ mJ	
Threshold voltage	$V_{(T0)}$		$T_{vj} = 150^{\circ}\text{C}; V_{GE} = 0; I_{F1} = 112\text{ A};$		-	-	0.90	V
Forward slope resistance	r_T		$I_{F2} = 450\text{ A}; t_u = 1000\text{ }\mu\text{s}$		-	-	4.10	m Ω
Thermal resistance junction to case	$R_{th(JC-D)}$		DC; $I_{test} = 1.5\text{ A};$ $V_{GE} = +15\text{ V}.$		-	-	0.110	K/W

Module							
Pin resistance	R _{Pxy}	T _{vj} = 25°C.	RP10/11-3	-	0.95	1.00	mΩ
			RP10/11-4	-	0.68	1.00	
Parasitic inductance between terminals	L _{Pce}			-	22	-	nH
Thermistor resistance	R _t	T _{vj} = 25°C		4850	-	6225	Ω
		T _{vj} = 150°C		160	-	195	
Coefficient of temperature sensitivity	B _{25/50}	R ₂ = R ₂₅ exp [B _{25/50} (1/T ₂ - 1/T ₁)], T ₁ = 298.15 K		-	3375	-	κ
Thermal resistance case to heatsink	R _{thCH}	per module		-	0.009	0.014	K/W
Mounting torque for screws to heatsink	M _s	to heatsink M5		3	-	6	N*m
Mounting torque for terminal screws	M _t	to terminals M6		3	-	6	N*m
Weight	W			-	-	360	g

Notes:

- Insulating material operating temperature 125°C max;
- Case temperature 125°C max;
- The recommended operating junction temperature $T_{vj \text{ op}} = -40...+150^{\circ}\text{C}$;

Overall dimensions: Package type – D2



Part numbering guide

MID2	-	HB	12	SM	-	450	N	
MID2								IGBT module package type: D2
		HB						Half-Bridge
			12					Voltage rating ($V_{CES}/100$)
				SM				IGBT+FRD chipset modification
						450		Current Rating
							N	Climatic version: normal climate

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