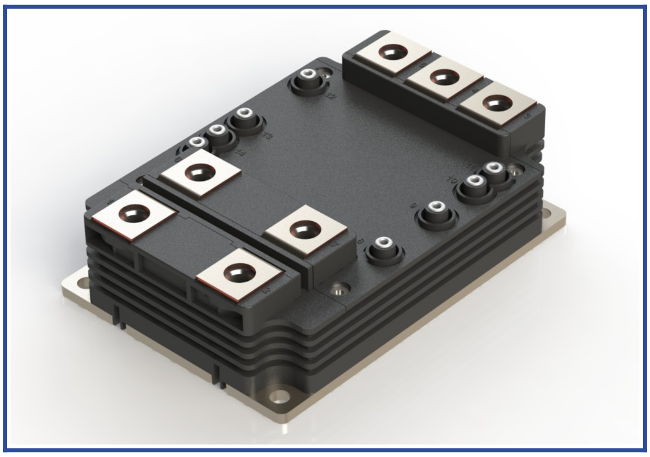
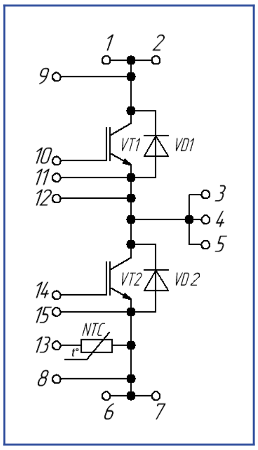
MIXM-HB33SG-450N-A

Low inductance IGBT module in a XM package (100mm*140mm) — 3300 V 450 A





Chip features

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

Design features

- AlSiC baseplate
- AlN substrate
- improved thermal cycling
- RoHS compliant
- low inductance value

Typical application

- AC motor drives
- solar inverter
- wind-powered generator inverters
- high power converters and UPS

Maximum rated values

Definition	Symbol	Conditions	Value	Unit
IGBT				
Collector-Emitter voltage	V_{CES}	V_{GE} = 0.	3300	V
Maximum allowable collector current (continuous)*2	$I_{C\,25}$	$T_{vj\,(max)}$ = 150°C; T_c = 25°C.	654	A
	$I_{C\,80}$	$T_{vj\,(max)}$ = 150°C; T_c = 80°C.	502	A
Repetitive peak collector current*1	I_{CRM}	I_{CRM} = 3 x $I_{C\,nom}$; t_p = 1 ms.	1350	A
Short-circuit duration	t_{psc}	T_{vj} = 25°C; V_{GE} = ±15 V; V_{CE} = 2200 V; $R_{G\,on}$ = $R_{G\,off}$ = 1.2 Ω	10	µs
		T_{vj} = 150°C; V_{GE} = ±15 V; V_{CE} = 2200 V; $R_{G\,on}$ = $R_{G\,off}$ = 1.2 Ω	-	
Gate-Emitter voltage	V_{GES}		±20	V
Junction operating temperature	$T_{vj\,(op)}$		-40…+150	ºC
Inverse diode				
Repetitive peak reverse voltage	V_{RRM}	V_{GE} = 0 V.	3300	V
Maximum allowable forward current (continuous)*2	$I_{F\,25}$	$T_{vj\,(max)}$ = 150°C; T_c = 25°C.	668	A
	$I_{F\,80}$	$T_{vj\,(max)}$ = 150°C; T_c = 80°C.	514	A
Repetitive peak forward current*1	I_{FRM}	I_{FRM} = 3 x $I_{F\,nom}$; 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.	6000	V

*1 Pulse width and repetition rate should be such that device junction temperature does not exceed maximum T_{vj} rating.
*2 $I_{C\,25}$ and $I_{C\,80}$ ($I_{F\,25}$ и $I_{F\,80}$) values were calculated in accordance with typical U_{CE0}, r_{CE0} and $R_{th(j\text{-}c)}$ ($U_{(T0)}$, r_T and $R_{th(JC\text{-}D)}$).

Characteristics

Definition	Symbol	Conditions		Value min.	Value typ.	Value max.	Unit
IGBT							
Collector-Emitter saturation voltage (at terminals)	V_{CEsat}	V_{GE} = +15 V; I_C = 450 A; t_u = 1000 µs.	T_{vj} = 25°C	-	2.80	-	V
			T_{vj} = 125°C	-	3.57	-	V
Gate-Emitter threshold voltage	$V_{GE(th)}$	I_C = 60 mA; V_{CE} = V_{GE}; T_{vj} = 25°C; t_u = 2 ms.		-	6.67	-	V
Collector-Emitter cut-off current	I_{CES}	V_{CE} = 3300 V; t_u = 50ms; V_{GE} = 0;	T_{vj} = 25°C	-	64.76	-	µA
			T_{vj} = 125°C	-	7.25	-	mA
Gate-Emitter leakage current	I_{GES}	V_{CE} = 0; V_{GE} = ±20 V; T_{vj} = 25°C; t_u = 30 ms.		-	177	-	nA
Input capacitance	C_{ies}	V_{CE} = 10 V; V_{GE} = 0 V; f = 1 MHz; T_{vj} = 25°C.		-	-	-	nF
Output capacitance	C_{oes}			-	-	-	
Reverse transfer capacitance	C_{res}			-	-	-	nF
Total gate charge	Q_G	I_C = 450 A; V_{CE} = 1800 V; V_{GE} = - 8÷15 V.		-	-	-	nC
Internal gate resistance	R_{Gint}	T_{vj} = 25°C.		-	-	-	Ω
Turn-on delay time	$t_{d(on)}$	V_{CE} = 920 V; V_{GE} = ±15 V; $I_{C\,max}$ = 378 A; R_G = 1.5 Ω; L_s = 56 nH.	T_{vj} = 25°C	-	105	-	ns
			T_{vj} = 125°C	-	113	-	
Rise time	t_{ri}		T_{vj} = 25°C	-	31	-	ns
			T_{vj} = 125°C	-	36	-	
Turn-on energy	E_{on}		T_{vj} = 25°C	-	165	-	mJ
			T_{vj} = 125°C	-	255	-	
Turn-off delay time	$t_{d(off)}$		T_{vj} = 25°C	-	136	-	ns
			T_{vj} = 125°C	-	159	-	
Fall time	t_{fi}		T_{vj} = 25°C	-	827	-	ns
			T_{vj} = 125°C	-	561	-	
Turn-off energy	E_{off}		T_{vj} = 25°C	-	132	-	mJ
			T_{vj} = 125°C	-	57	-	
Collector-emitter threshold voltage	V_{CE0}	V_{GE} = +15 V; T_{vj} = 125°C; I_{CE1} = 112.5 A; I_{CE2} = 450 A; t_u = 1000 µs.		-	1.16	-	V
On-State slope resistance (IGBT)	r_{CE0}			-	5.38	-	mΩ
Thermal resistance junction to case	$R_{th(j-c)}$	DC; I_{CE} = 300±50 A; I_{test} = 1.5 A; V_{GE} = +15 V.		-	0.049	-	K/W
Inverse diode							
Forward voltage drop (at terminals)	V_F	I_F = 450 A; V_{GE} = 0; t_u = 1000 µs.	T_{vj} = 25°C	-	2.27	-	V
			T_{vj} = 125°C	-	2.62	-	V
Reverse recovery time	t_{rr}	V_{GE} = ±15 V; V_{CE} = 920 V; $I_{C\,max}$ = 252 A; L_s = 56 nH; $R_{G\,on}$ = 1.5 Ω.	T_{vj} = 25°C	-	266	-	ns
			T_{vj} = 125°C	-	387	-	ns
Peak reverse current	I_{RM}		T_{vj} = 25°C	-	938	-	A
			T_{vj} = 125°C	-	884	-	A
Recovered charge	Q_r		T_{vj} = 25°C	-	130	-	µC
			T_{vj} = 125°C	-	164	-	µC
Reverse recovery energy	E_{rec}		T_{vj} = 25°C	-	62	-	mJ
			T_{vj} = 125°C	-	65	-	mJ
Threshold voltage	$V_{(T0)}$	T_{vj} = 125°C; V_{GE} = 0; I_{CE1} = 112.5 A; I_{CE2} = 450 A; t_u = 1000 µs.		-	0.81	-	V
Forward slope resistance	r_T			-	4.04	-	mΩ
Thermal resistance junction to case	$R_{th(JC-D)}$	DC; I_{CE} = 300±50 A; I_{test} = 1.5 A; V_{GE} = +15 V.		-	0.064	-	K/W

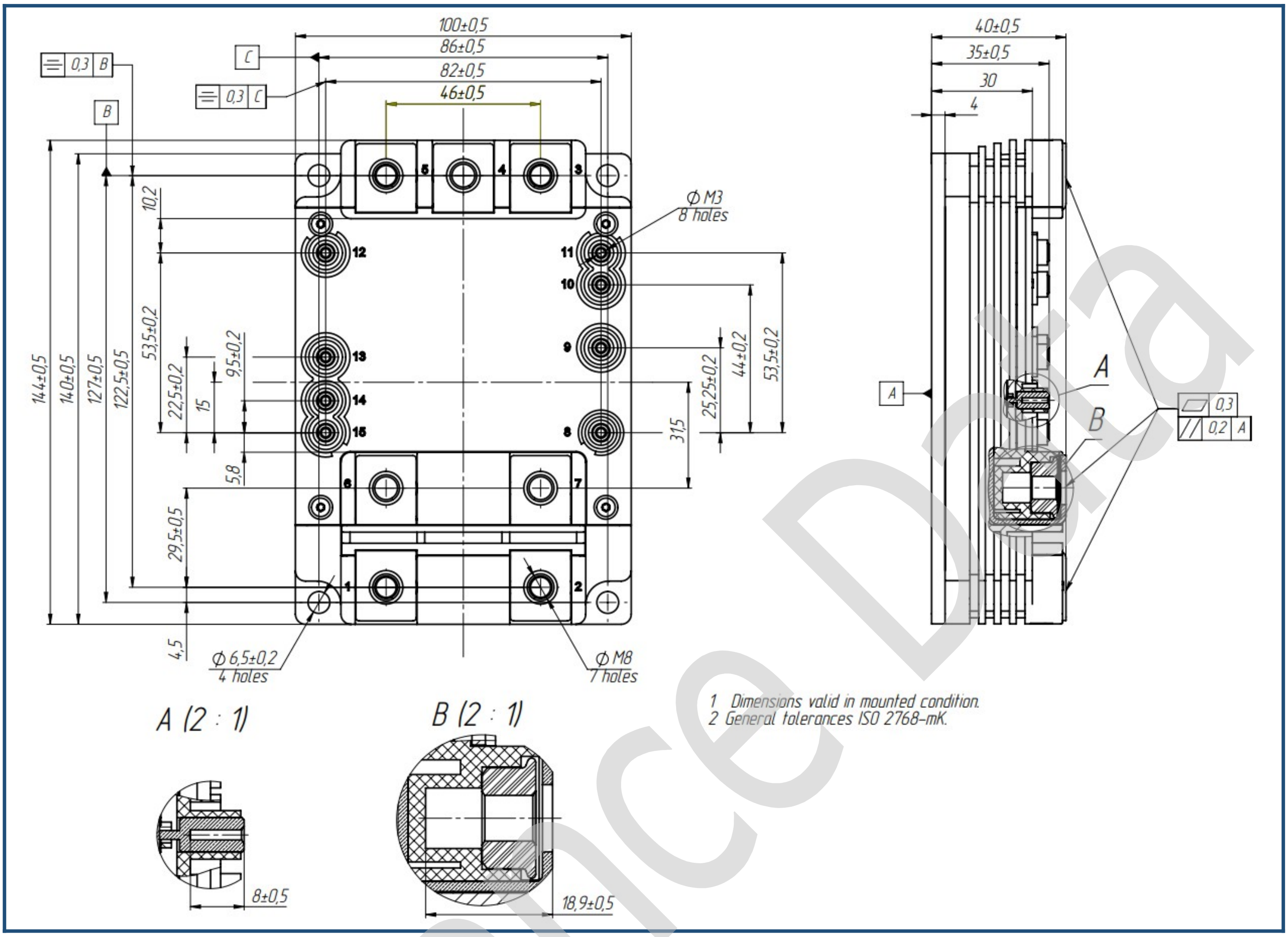
Module							
Pin resistance	R_{Pxy}	T_{vj} = 25°C.	$R_{P1/2-3/4/5}$	-	0.269	-	mΩ
			$R_{P6/7-3/4/5}$	-	0.366	-	
			$R_{P1/2-6/7}$	-	0.516	-	
Parasitic inductance between terminals	L_{Pce}		$L_{P1/2-3/4/5}$	-	16.3	-	nH
			$L_{P6/7-3/4/5}$	-	18.9	-	
			$L_{P1/2-6/7}$	-	8.8	-	
Thermistor resistance	R_{t25}	T_{vj} = 30°C		-	4.06	-	kΩ
		T_{vj} = 100°C		-	0.54	-	
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		-	-	-	K
Thermal resistance case to heatsink	R_{thCH}	per module		-	0.02	-	K/W
Mounting torque for screws to heatsink	M_s	to heatsink M6		4.00	-	6.00	N*m
Mounting torque for terminal screws	M_t	to terminals M8		8.00	-	10.00	N*m
Mounting torque for gate terminal	M_a	to gate terminal M3		0.90	-	1.10	
Weight	W			-	820	-	g

“ - ” — data will be refined as additional tests are conducted and statistics are collected.

Notes:

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

Overall dimensions: Package type – XM



Part numbering guide

MIXM	-	HB	33	SG	-	450	N	-	A	
MIXM										IGBT module package type: XM
		HB								2 switches as Half-Bridge
			33							Voltage rating (V_{CES}/100)
				SG						IGBT+FRD chipset modification
						450				Current Rating
							N			Climatic version: normal climate
									A	AlSiC baseplate