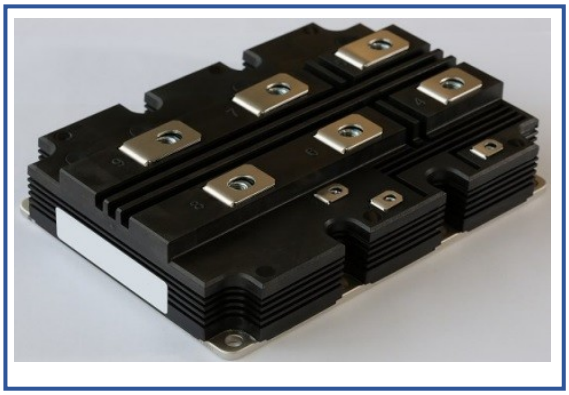
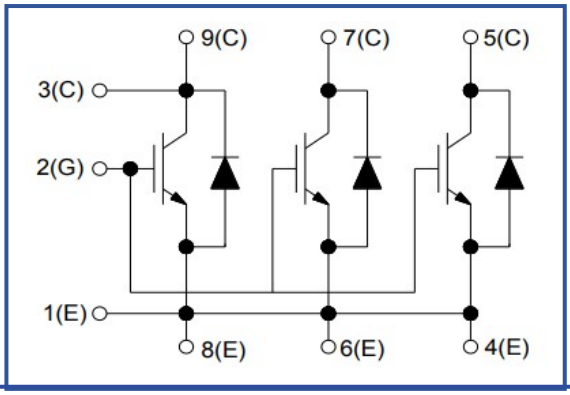
High Voltage IGBT Module

4500 V 1200 A





Chip features

- IGBT chip
  - Low $V_{CE(sat)}$ value
  - 10 µs short circuit of 125°C
  - Square RBSOA of 2xI_C
- FRD chip
  - Fast and soft reverse recovery
  - Low voltage drop

Design features

- AlSiC baseplate
- AlN DBC substrate
- Improved termal cycling
- RoHS compliant

Typical application

- Traction motor drives
- High power converters
- Multilevel inverters

Maximum rated values

Definition	Symbol	Conditions	Value	Unit
IGBT				
Collector-Emitter voltage	V_{CES}	V_{GE} = 0.	4500	V
Maximum allowable collector current (continuous)*2	$I_{C\ 25}$	$T_{vj\ (max)}$ = 150°C; T_c = 25°C.	2770	A
	$I_{C\ 85}$	$T_{vj\ (max)}$ = 150°C; T_c = 85°C.	1200	A
Repetitive peak collector current*1	I_{CRM}	I_{CRM} = 2 x $I_{C\ nom}$; t_p = 1 ms.	2400	A
Short-circuit duration	t_{psc}	T_{vj} = 25°C; V_{GE} = ±15 V; V_{CE} = 3400 V; $I_{C\ max}$ < 5300 A.	10	µs
		T_{vj} = 125°C; V_{GE} =±15 V; V_{CE} = 3400 V; $I_{C\ max}$ < 5300 A.	10	
Gate-Emitter voltage	V_{GES}		±20	V
Junction operating temperature	$T_{vj\ (op)}$		-40…+125	°C
Inverse diode \ Freewheeling diode				
Repetitive peak reverse voltage	V_{RRM}	V_{GE} = 0 V.	4500	V
Maximum allowable forward current (continuous)*2	$I_{F\ 25}$	$T_{vj\ (max)}$ = 150°C; T_c = 25°C.	2039	A
	$I_{F\ 85}$	$T_{vj\ (max)}$ = 150°C; T_c = 85°C.	1200	A
Repetitive peak forward current*1	I_{FRM}	I_{FRM} = 2 x $I_{F\ nom}$; t_p = 1 ms.	2400	A
Junction operating temperature	$T_{vj\ (op)}$		-40…+125	°C
Module				
Storage temperature	T_{stg}		-40…+60	°C
Isolation voltage	V_{isol}	AC sin 50 Hz; t = 1 min.	10200	V

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

*2 $I_{C\ 25}$, $I_{F\ 25}$ и $I_{F\ 85}$ values were calculated in accordance with typical U_{CE0}, r_{CE0}, $U_{(T0)}$ and r_T.

Characteristics

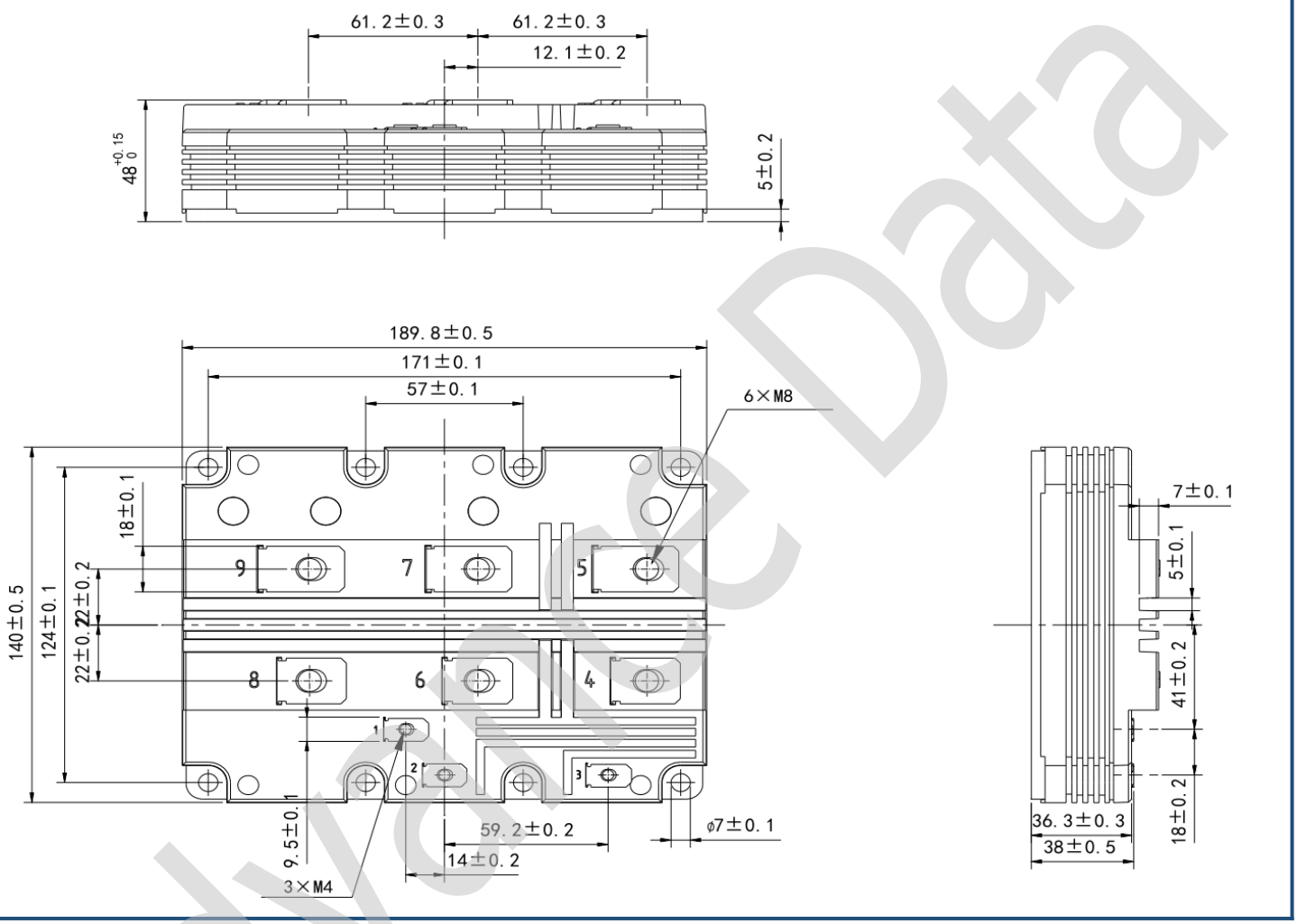
Definition	Symbol	Conditions		Value min.	Value typ.	Value max.	Unit
IGBT							
Collector-Emitter saturation voltage	V_{CEsat}	V_{GE} = +15 V; I_C =1200 A;	T_{vj} = 25°C	-	2.30	2.80	V
			T_{vj} = 125°C	-	3.00	3.50	V
Gate-Emitter threshold voltage	$V_{GE(th)}$	I_C = 120 mA; V_{CE} = V_{GE}; T_{vj} = 25°C; t_u = 2 ms.		5.00	6.00	7.00	V
Collector-Emitter cut-off current	I_{CES}	V_{CE} = 4500 V; t_u = 20 ms; V_{GE} = 0.	T_{vj} = 25°C	-	-	1.00	mA
			T_{vj} = 125°C	-	-	90.00	mA
Gate-Emitter leakage current	I_{GES}	V_{CE} = 0; V_{GE} = ±20 V; T_{vj} = 25°C;				1.00	µA
Input capacitance	C_{ies}	V_{CE} = 25 V; V_{GE} = 0 V; f = 1 MHz; T_{vj} = 25°C.		-	135	-	nF
Reverse transfer capacitance	C_{res}			-	3.4	-	nF
Total gate charge	Q_G	V_{GE} = -15...+15 V.		-	11.9	-	µC
Internal gate resistance	R_{Gint}	T_{vj} = 25°C.		-	90.0	-	µΩ
Turn-on delay time	$t_{d(on)}$	V_{CE} = 2800 V; V_{GE} = ±15 V; $I_{C\,max}$ = 1200 A; R_G = 1.5 Ω; L = 180 µH.	T_{vj} = 25°C	-	0.72	-	µs
			T_{vj} = 125°C	-	0.74	-	µs
Rise time	t_{ri}		T_{vj} = 25°C	-	0.27	-	µs
			T_{vj} = 125°C	-	0.29	-	µs
Turn-on energy	E_{on}		T_{vj} = 25°C	-	3.20	-	J
			T_{vj} = 125°C	-	4.56	-	J
Turn-off delay time	$t_{d(off)}$		T_{vj} = 25°C	-	2.70	-	µs
			T_{vj} = 125°C	-	2.65	-	µs
Fall time	t_{fi}		T_{vj} = 25°C	-	0.70	-	µs
			T_{vj} = 125°C	-	0.72	-	µs
Turn-off energy	E_{off}		T_{vj} = 25°C	-	5.80	-	J
			T_{vj} = 125°C	-	6.25	-	J
Collector-emitter threshold voltage	V_{CE0}	V_{GE} = +15 V; T_{vj} = 125°C; I_{CE1} = 300 A; I_{CE2} = 1200 A; t_u = 10 µs.		-	1.07	-	V
On-State slope resistance (IGBT)	r_{CE0}			-	1.65	-	mΩ
Thermal resistance junction to case	$R_{th(j-c)}$	DC; V_{GE} = +15 V.		-	-	8.00	K/kW
Inverse diode \ Freewheeling diode							
Forward voltage drop	V_F	I_F = 1200 A; V_{GE} = 0;	T_{vj} = 25°C	-	2.40	2.90	V
			T_{vj} = 125°C	-	2.70	3.20	V
Reverse recovery time	t_{rr}	V_{GE} = ±15 V; V_{CE} = 2800 V; $I_{C\,max}$ = 1200 A; $R_{G\,on}$ = 1.5 Ω; L = 180 µH.	T_{vj} = 25°C	-	-	-	µs
			T_{vj} = 125°C	-	-	-	µs
Peak reverse current	I_{RM}		T_{vj} = 25°C	-	1350	-	A
			T_{vj} = 125°C	-	1720	-	A
Recovered charge	Q_r		T_{vj} = 25°C	-	1200	-	µC
			T_{vj} = 125°C	-	1980	-	µC
Reverse recovery energy	E_{rec}		T_{vj} = 25°C	-	1.75	-	J
			T_{vj} = 125°C	-	3.25	-	J
Threshold voltage	$V_{(T0)}$	T_{vj} = 125°C; V_{GE} = 0; I_{CE1} = 300 A; I_{CE2} = 1200 A; t_u = 10 µs		-	1.10	-	V
Forward slope resistance	r_T			-	1.34	-	mΩ
Thermal resistance junction to case	$R_{th(JC-D)}$	DC; V_{GE} = +15 V.		-	-	16.0	K/kW

Module							
Pin resistance	R_{Pxy}	T_{vj} = 25°C.	R_P	-	-	-	mΩ
Parasitic inductance between terminals	L_{Pxy}	T_{vj} = 25°C; f = 1 MHz	L_P	-	10.0	-	nH
Thermal resistance case to heatsink	R_{thCH}	per module		-	-	6.00	K/kW
Mounting torque for screws to heatsink	M_s	to heatsink M6		-	-	5.00	N*m
Mounting torque for terminal screws	M_t	to terminals M8		-	-	10.0	N*m
Mounting torque for gate terminal	M_t	to terminals M4		-	-	2.00	N*m
Creepage distance	d_s			-	-	56.00	mm
Clearance	d_a			-	-	26.00	mm
Comparative Tracking Index	CTI			-	-	600	
Weight	W			-	-	1.70	kg

Notes:

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

Overall dimensions: Package type – HV



Part numbering guide

MIHV	-	SS	45	CA	-	1200	N	
MIHV								IGBT module package type: HV
		SS						Single switch
			45					Voltage rating (V_{CES}/100)
				CA				IGBT+FRD chipset modification
						1200		Current Rating
							N	Climatic version: normal climate