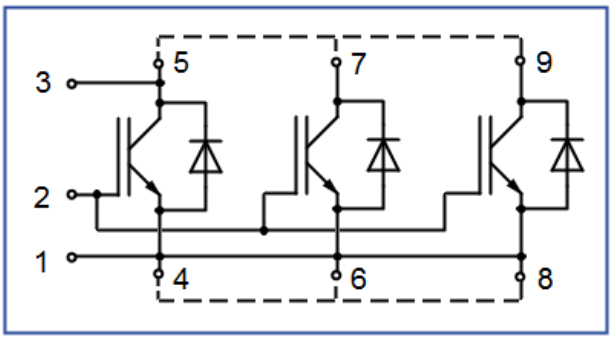
IGBT module high-power & increased rated insulation voltage 10.2 kV

3300 V 1500 A



Chip features

- IGBT chip
  - SPT+
  - low $V_{CE(sat)}$ value
  - low EMI
  - fast and soft reverse recovery

Design features

- AlSiC baseplate
- AlN DBC substrate
- ultrasonically welded power terminals
- high rated insulation voltage – 10200 V
- RoHS compliant

Typical application

- transport (auxiliary power systems for rail and public transport)
- industrial equipment

Maximum rated values

Definition	Symbol	Conditions	Value	Unit
IGBT				
Collector-Emitter voltage	V_{CES}	V_{GE} = 0.	3300	V
Collector current (nominal)	$I_{C\ nom}$	T_c = 80°C	1500	A
Repetitive peak collector current*1	I_{CRM}	I_{CRM} = 2 x $I_{C\ nom}$; t_p = 1 ms.	3000	A
Short-circuit duration	t_{psc}	T_{vj} = 150°C; V_{GE} = ±15 V; V_{CE} = 2500 V; $I_{C\ max}$ < 5500 A.	10	µs
Gate-Emitter voltage	V_{GES}		±20	V
Junction operating temperature	$T_{vj\ (op)}$		-40…+150	°C
Inverse diode \ Freewheeling diode				
Repetitive peak reverse voltage	V_{RRM}	V_{GE} = 0 V.	3300	V
Forward current (nominal)	$I_{F\ nom}$		1500	A
Repetitive peak forward current*1	I_{FRM}	I_{FRM} = 2 x $I_{F\ nom}$; t_p = 1 ms.	3000	A
Junction operating temperature	$T_{vj\ (op)}$		-40…+150	°C
Module				
Storage temperature	T_{stg}		-50…+50	°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

Characteristics

Definition	Symbol	Conditions		Value min.	Value typ.	Value max.	Unit
IGBT							
Collector-Emitter saturation voltage	V_{CEsat}	V_{GE} = +15 V; I_C =1500 A; t_u = 1000 µs.	T_{vj} = 25°C	-	2.00	-	V
			T_{vj} = 150°C	-	2.90	-	V
Gate-Emitter threshold voltage	$V_{GE(th)}$	I_C = 120 mA; V_{CE} = V_{GE}; T_{vj} = 25°C; t_u = 2 ms.		-	5.70	-	V
Collector-Emitter cut-off current	I_{CES}	V_{CE} = 3300 V; t_u = 50 ms; V_{GE} = 0.	T_{vj} = 25°C	-	1.00	-	mA
			T_{vj} = 150°C	-	90.00	-	mA
Gate-Emitter leakage current	I_{GES}	V_{CE} = 0; V_{GE} = ±20 V; T_{vj} = 25°C; t_u = 30 ms		-	1.00	-	µA
Input capacitance	C_{ies}	f = 1 MHz; T_{vj} = 25°C.		-	260	-	nF
Reverse transfer capacitance	C_{res}			-	6.00	-	nF
Total gate charge	Q_G	I_C = 1500 A; V_{CE} = 1800 V; V_{GE} = - 15÷15 V.		-	15.00	-	µC
Turn-on delay time	$t_{d(on)}$	V_{CE} = 1800 V; V_{GE} = ±15 V; $I_{C\,max}$ = 1500 A; $R_{G\,on}$ = 1.5 Ω; $R_{G\,off}$ = 1.5 Ω; C_{GE}=330 nF; L = 150 nH.	T_{vj} = 25°C	-	960	-	µs
			T_{vj} = 150°C	-	-	-	
Rise time	t_{ri}		T_{vj} = 25°C	-	430	-	µs
			T_{vj} = 150°C	-	-	-	
Turn-on energy	E_{on}		T_{vj} = 25°C	-	2400	-	mJ
			T_{vj} = 150°C	-	-	-	
Turn-off delay time	$t_{d(off)}$		T_{vj} = 25°C	-	2700	-	µs
			T_{vj} = 150°C	-	-	-	
Fall time	t_{fi}		T_{vj} = 25°C	-	610	-	µs
			T_{vj} = 150°C	-	-	-	
Turn-off energy	E_{off}		T_{vj} = 25°C	-	3750	-	mJ
			T_{vj} = 150°C	-	-	-	
Collector-emitter threshold voltage	V_{CE0}	V_{GE} = +15 V; T_{vj} = 150°C; I_{CE1} = 75 A; I_{CE2} = 300 A; t_u = 1000 µs.		-	1.13	-	V
On-State slope resistance (IGBT)	r_{CE0}			-	6.05	-	mΩ
Thermal resistance junction to case	$R_{th(j-c)}$	DC; I_{CE} = 900±10 A; I_{test} = 3 A; V_{GE} = +15 V.		-	0.008	-	K/W
Inverse diode \ Freewheeling diode							
Forward voltage drop	V_F	I_F = 1500 A; V_{GE} = 0; t_u = 500 µs.	T_{vj} = 25°C	-	2.40	-	V
			T_{vj} = 150°C	-	2.50	-	V
Peak reverse current	I_{RM}	V_{CE} = 1800 V; I_F = 1500 A; dI_F/dt = 4000 A/µs	T_{vj} = 25°C	-	920	-	A
			T_{vj} = 150°C	-	-	-	A
Recovered charge	Q_r		T_{vj} = 25°C	-	850	-	µC
			T_{vj} = 150°C	-	-	-	µC
Reverse recovery energy	E_{rec}		T_{vj} = 25°C	-	1000	-	J
			T_{vj} = 150°C	-	-	-	J
Thermal resistance junction to case	$R_{th(JC-D)}$	DC; I_{CE} = 900±20 A; I_{test} = 3 A; V_{GE} = +15 V.		-	0.016	-	K/W

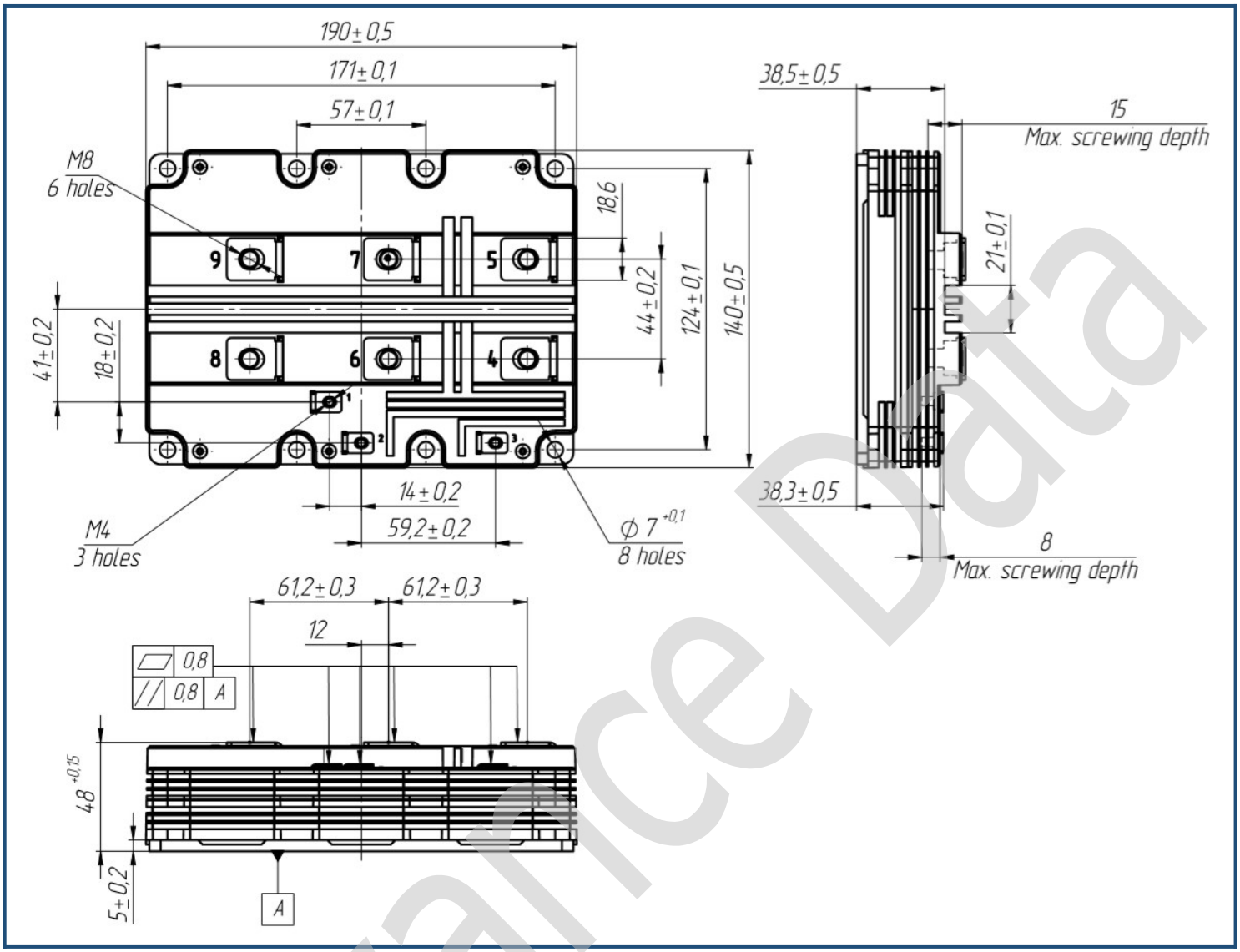
Module						
Parasitic inductance between terminals	L_{Pxy}	T_{vj} = 25°C; f = 1 MHz	-	11.00	-	nH
Thermal resistance case to heatsink	R_{thCH}	per module	-	0.006	-	K/W
Mounting torque for screws to heatsink	M_s	to heatsink M6	-	-	5.00	N*m
Mounting torque for terminal screws	M_t	to terminals M8	-	-	9.00	N*m
Mounting torque for gate terminal	M_t	to terminals M4	-	-	2.00	N*m
Weight	W		-	1700	-	kg

" - " Data will be refined as additional tests are conducted and statistics are collected.

Notes:

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

Overall dimensions: Package type – HV



Part numbering guide

MIHV	-	SS	33	SG	-	1500	N	
MIHV								IGBT module package type: HV
		SS						Single switch
			33					Voltage rating (V_{CES}/100)
				SG				IGBT+FRD chipset modification
						1500		Current Rating
							N	Climatic version: normal climate