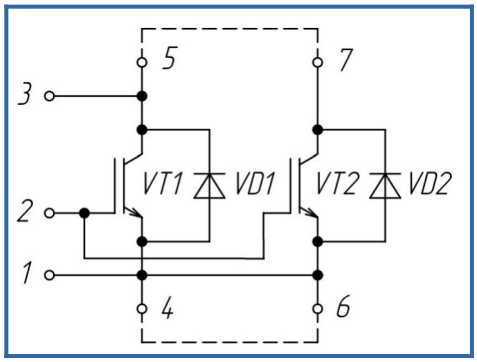
IGBT module high-power & increased rated insulation voltage 10.5 kV

4500 V 1000 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 – 10.5 kV
- 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.	4500	V
Maximum allowable collector current (continuous)	$I_{C\ 100}$	$T_{vj\ (max)}$ = 150°C; T_c = 100°C.	893	A
Repetitive peak collector current*1	I_{CRM}	I_{CRM} = 2 x $I_{C\ nom}$; t_p = 1 ms.	2000	A
Short-circuit duration	t_{psc}	T_{vj} = 150°C; V_{GE} = ±15 V; V_{CE} = 3400 V	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.	4500	V
Maximum allowable forward current (continuous)	$I_{F\ 100}$	$T_{vj\ (max)}$ = 150°C; T_c = 100°C.	764	A
Repetitive peak forward current*1	I_{FRM}	I_{FRM} = 2 x $I_{F\ nom}$; t_p = 1 ms.	2000	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.	10500	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 = 1000 A; t_u = 1 ms.	T_{vj} = 25°C	-	-	3.00	V
			T_{vj} = 150°C	-	-	4.00	V
Gate-Emitter threshold voltage	$V_{GE(th)}$	I_C = 40 mA; V_{CE} = V_{GE}; T_{vj} = 25°C; t_u = 2 ms.		5.50	-	7.50	V
Collector-Emitter cut-off current	I_{CES}	V_{CE} = 4500 V; t_u = 10 ms; V_{GE} = 0.	T_{vj} = 25°C	-	-	5.00	mA
			T_{vj} = 150°C	-	-	40.00	
Gate-Emitter leakage current	I_{GES}	V_{CE} = 0; V_{GE} = ±20 V; T_{vj} =25°C; t_u = const.		-	-	300	nA
Input capacitance	C_{ies}	V_{CE} = 25 V; V_{GE} = 0 V; f = 100 kHz; T_{vj} = 25°C.		-	-	-	nF
Output capacitance	C_{oes}			-	-	-	nF
Reverse transfer capacitance	C_{res}			-	-	-	nF
Total gate charge	Q_G	V_{GE} = -15...+15 V.		-	-	15.00	µC
Internal gate resistance	R_{Gint}	T_{vj} = 25°C.		-	-	-	Ω
Turn-on delay time	$t_{d(on)}$	V_{GE} = ±15 V; V_{CE} = 2800 V; I_C = 1000 A; R_{Gon} = R_{Goff} = 2.4 Ω; L = 150 nH.	T_{vj} = 25°C	-	-	900	ns
			T_{vj} = 150°C	-	-	900	
Rise time	t_{ri}		T_{vj} = 25°C	-	-	385	ns
			T_{vj} = 150°C	-	-	616	
Turn-on energy	E_{on}		T_{vj} = 25°C	-	-	3520	mJ
			T_{vj} = 150°C	-	-	4730	
Turn-off delay time	$t_{d(off)}$		T_{vj} = 25°C	-	-	3300	ns
			T_{vj} = 150°C	-	-	3410	
Fall time	t_{fi}		T_{vj} = 25°C	-	-	660	ns
			T_{vj} = 150°C	-	-	396	
Turn-off energy	E_{off}		T_{vj} = 25°C	-	-	3300	mJ
			T_{vj} = 150°C	-	-	3410	
Collector-emitter threshold voltage	V_{CE0}	V_{GE} = +15 V; T_{vj} = 150°C; I_{CE1} = 250 A; I_{CE2} = 1000 A; t_u = 1 ms		-	-	1.50	V
On-State slope resistance (IGBT)	r_{CE0}			-	-	2.50	mΩ
Thermal resistance junction to case	$R_{th(j-c)}$	DC; I_{CE} = 1000 A; I_{test} = 1 A; V_{GE} = +15 V.		-	-	0.015	K/W
Inverse diode \ Freewheeling diode							
Forward voltage drop	V_F	I_F = 1000 A; V_{GE} = 0; t_u = 1 ms.	T_{vj} = 25°C	-	-	3.10	V
			T_{vj} = 150°C	-	-	3.60	V
Reverse recovery time	t_{rr}	V_{GE} = ±15 V; V_{CE} = 2800 V; I_C = 1000 A; R_{Gon} = R_{Goff} = 2.4 Ω; L = 150 nH.	T_{vj} = 25°C	-	-	740	ns
			T_{vj} = 150°C	-	-	760	ns
Peak reverse current	I_{RM}		T_{vj} = 25°C	-	-	748	A
			T_{vj} = 150°C	-	-	840	A
Recovered charge	Q_r		T_{vj} = 25°C	-	-	668	µC
			T_{vj} = 150°C	-	-	1595	µC
Reverse recovery energy	E_{rec}		T_{vj} = 25°C	-	-	1628	mJ
			T_{vj} = 150°C	-	-	2750	mJ
Threshold voltage	$V_{(T0)}$	T_{vj} = 150°C; V_{GE} = 0; I_{F1} = 250 A; I_{F2} = 1000 A; t_u = 1 ms.		-	-	1.50	V
Forward slope resistance	r_T			-	-	1.60	mΩ
Thermal resistance junction to case	$R_{th(JC-D)}$	DC; I_{CE} = 1000 A; I_{test} = 1 A; V_{GE} = +15 V.		-	-	0.024	K/W

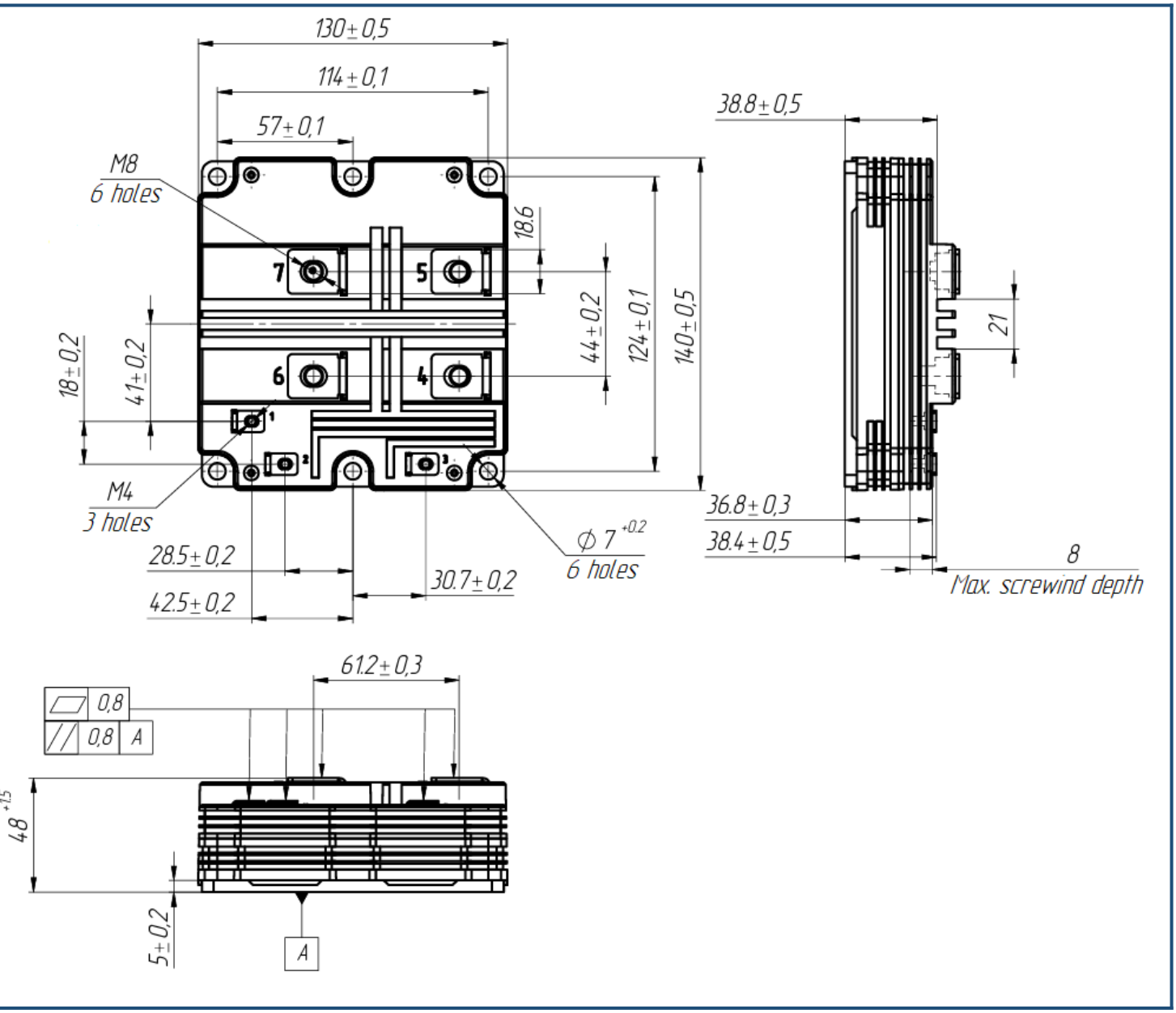
Module							
Pin resistance	R_{Pxy}	T_{vj} = 25°C.	$R_{P5-7/4-6}$	-	0.33	-	mΩ
Parasitic inductance between terminals	L_{Pxy}		$L_{P5-7/4-6}$	-	18.00	-	nH
Thermal resistance case to heatsink	R_{thCH}	per module		-	21.00	-	K/kW
Mounting torque for screws to heatsink	M_s	to heatsink M6		4.25	-	5.75	N*m
Mounting torque for screws to power terminal	M_t	to terminals M8		8.00	-	10.00	N*m
Mounting torque for gate terminal	M_t	to terminals M4		1.80	-	2.20	N*m
Creepage distance	d_s			64.00	-	-	mm
Clearance	d_a			40.00	-	-	mm
Comparative Tracking Index	CTI			600	-	-	
Weight	W			-	-	1100	g

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

Notes:

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

Overall dimensions: package type – SV



Part numbering guide

MISV	-	SS	45	SG	-	1000	N	
MISV								IGBT module package type: SV
		SS						Single switch
			45					Voltage rating (V_{CES}/100)
				SG				IGBT+FRD chipset modification
						1000		Current Rating
							N	Climatic version: normal climate

The information contained herein is protected by Copyright. In the interest of product improvement, Proton-Electrotex reserves the right to change datasheet without notice.