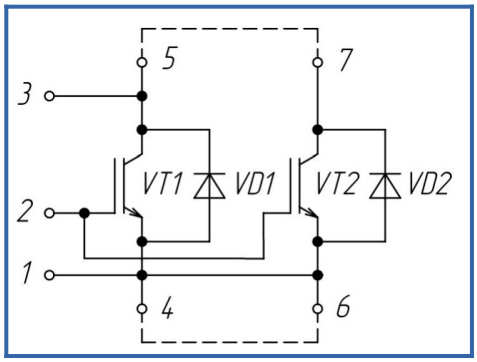
IGBT module high-power & increased rated insulation voltage 10.5 kV

3300 V 1200 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.	3300	V
Maximum allowable collector current (continuous)	$I_{C\ 100}$	$T_{vj\ (max)}$ = 150°C; T_c = 100°C.	896	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} = 150°C; V_{GE} = ±15 V; V_{CE} = 2500 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.	3300	V
Maximum allowable forward current (continuous)	$I_{F\ 100}$	$T_{vj\ (max)}$ = 150°C; T_c = 100°C.	931	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…+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 = 1200 A; t_u = 1 ms.	T_{vj} = 25°C	-	-	2.45	V
			T_{vj} = 150°C	-	-	3.20	V
Gate-Emitter threshold voltage	$V_{GE(th)}$	I_C = 48 mA; V_{CE} = V_{GE}; T_{vj} = 25°C; t_u = 2 ms.		5.60	6.25	6.90	V
Collector-Emitter cut-off current	I_{CES}	V_{CE} = 3300 V; t_u = 10 ms; V_{GE} = 0.	T_{vj} = 25°C	-	0.20	5.00	mA
			T_{vj} = 150°C	-	22.00	100.00	
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.		-	102.00	-	nF
Output capacitance	C_{oes}			-	8.00	-	nF
Reverse transfer capacitance	C_{res}			-	2.00	-	nF
Total gate charge	Q_G	V_{GE} = -15...+15 V.		-	17.00	-	µC
Internal gate resistance	R_{Gint}	T_{vj} = 25°C.		-	1.59	-	Ω
Turn-on delay time	$t_{d(on)}$	V_{GE} = ±15 V; V_{CE} = 1800 V; I_C = 1200 A; R_{Gon} = R_{Goff} = 2.7 Ω; L = 150 nH.	T_{vj} = 25°C	-	-	560	ns
			T_{vj} = 150°C	-	-	550	
Rise time	t_{ri}		T_{vj} = 25°C	-	-	360	ns
			T_{vj} = 150°C	-	-	430	
Turn-on energy	E_{on}		T_{vj} = 25°C	-	-	1300	mJ
			T_{vj} = 150°C	-	-	1750	
Turn-off delay time	$t_{d(off)}$		T_{vj} = 25°C	-	-	1900	ns
			T_{vj} = 150°C	-	-	2000	
Fall time	t_{fi}		T_{vj} = 25°C	-	-	520	ns
			T_{vj} = 150°C	-	-	580	
Turn-off energy	E_{off}		T_{vj} = 25°C	-	-	1800	mJ
			T_{vj} = 150°C	-	-	2100	
Collector-emitter threshold voltage	V_{CE0}	V_{GE} = +15 V; T_{vj} = 150°C; I_{CE1} = 300 A; I_{CE2} = 1200 A; t_u = 1 ms		-	-	0.84	V
On-State slope resistance (IGBT)	r_{CE0}			-	-	2.72	mΩ
Thermal resistance junction to case	$R_{th(j-c)}$	DC; I_{CE} = 1000 A; I_{test} = 1 A; V_{GE} = +15 V.		-	-	0.017	K/W
Inverse diode \ Freewheeling diode							
Forward voltage drop	V_F	I_F = 1200 A; V_{GE} = 0; t_u = 1 ms.	T_{vj} = 25°C	-	-	2.51	V
			T_{vj} = 150°C	-	-	2.60	V
Reverse recovery time	t_{rr}	V_{GE} = ±15 V; V_{CE} = 1800 V; I_C = 1200 A; R_{Gon} = R_{Goff} = 2.7 Ω; L = 150 nH.	T_{vj} = 25°C	-	-	650	ns
			T_{vj} = 150°C	-	-	680	ns
Peak reverse current	I_{RM}		T_{vj} = 25°C	-	-	680	A
			T_{vj} = 150°C	-	-	825	A
Recovered charge	Q_r		T_{vj} = 25°C	-	-	600	µC
			T_{vj} = 150°C	-	-	1100	µC
Reverse recovery energy	E_{rec}		T_{vj} = 25°C	-	-	750	mJ
			T_{vj} = 150°C	-	-	1450	mJ
Threshold voltage	$V_{(T0)}$	T_{vj} = 150°C; V_{GE} = 0; I_{CE1} = 300 A; I_{CE2} = 1200 A; t_u = 1 ms.		-	-	1.12	V
Forward slope resistance	r_T			-	-	1.20	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

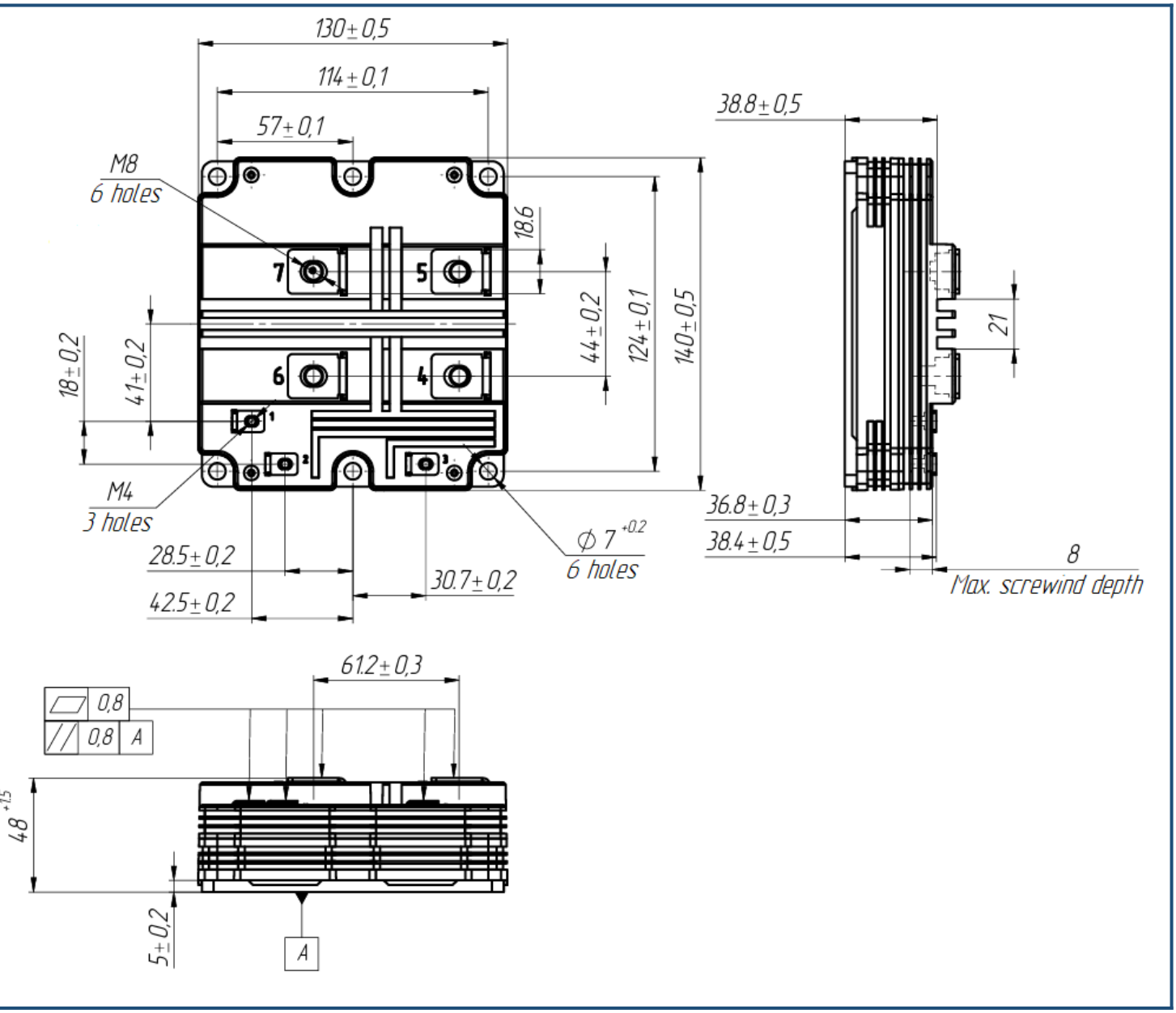
Module							
Pin resistance	R_{Pxy}	T_{vj} = 25°C.	$R_{P5-7/4-6}$	-	0.33	-	mΩ
Parasitic inductance between terminals	L_{Pxy}		$L_{P5-7/4-6}$	-	18.00	-	nH
Thermal resistance case to heatsink	R_{thCH}	per module		-	21.00	-	K/kW
Mounting torque for screws to heatsink	M_s	to heatsink M6		4.25	-	5.75	N*m
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	33	SG	-	1200	N	
MISV								IGBT module package type: SV
		SS						Single switch
			33					Voltage rating (V_{CES}/100)
				SG				IGBT+FRD chipset modification
						1200		Current Rating
							N	Climatic version: normal climate