Technical Information

ModSTACK™

6MS24017P43W39873

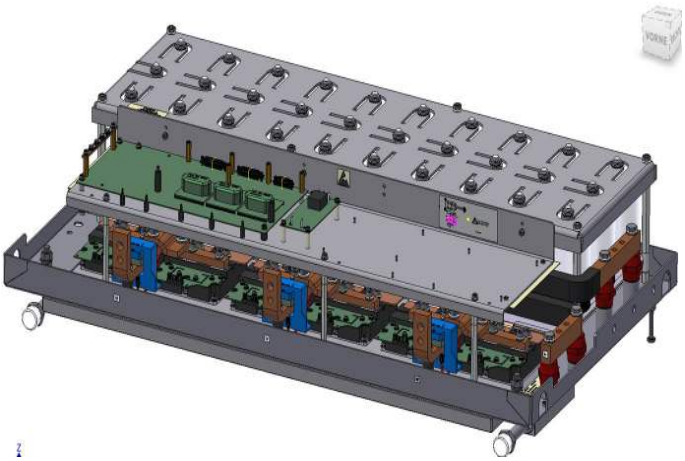
Preliminary data

General information

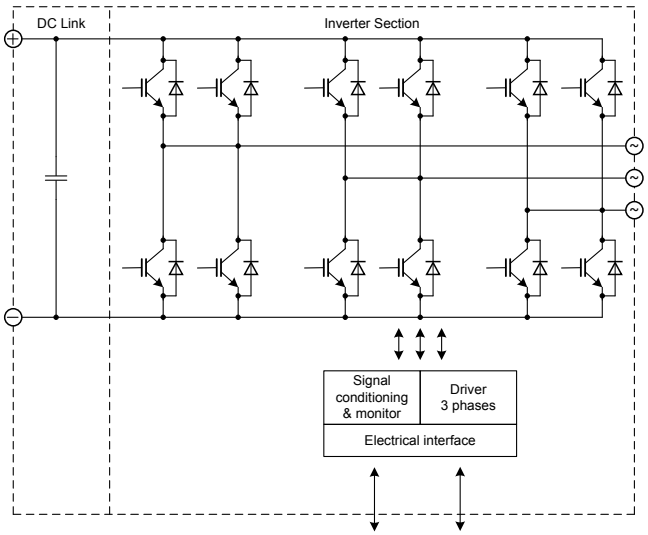
IGBT Stack for typical voltages up to 690 V_{RMS}
Rated output current 1100 A_{RMS}

· High power converter
· Wind power
· Motor drives

· IHM module with IGBT4
· AlSiC baseplate



Topology	B6I
Application	Inverter
Load type	Resistive, inductive
Semiconductor (Inverter Section)	6x FF1200R17KP4_B2
DC Link	12 mF
Heatsink	Water cooled
Implemented sensors	Current, voltage, temperature
Driver signals IGBT	Electrical
Sales - name	6MS24017P43W39873
SP - No.	SP001151298



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Absolute maximum rated values

Collector-emitter voltage	IGBT; T_{vj} = 25°C	V_{CES}	1700	V
Repetitive peak reverse voltage	Diode; T_{vj} = 25°C	V_{RRM}	1700	V
DC link voltage	No switching; t= 5s, once a day	V_{DC}	1450	V
Insulation management	according to installation height of 2000 m	V_{line}	690	V_{RMS}
Insulation test voltage	according to EN 50178, f = 50 Hz, t = 5 s	V_{ISOL}	2.5	kV_{RMS}
Continuous current inverter section		I_{AC2}	1100	A_{RMS}
Junction temperature	under switching conditions	T_{vjop}	150	°C
Storage temperature min.		T_{stor}	-40	°C
Storage temperature max.		T_{stor}	65	°C
Operational ambient temperature min.		T_{amb}	-25	°C
Operational ambient temperature max.		T_{amb}	55	°C
Inlet temperature coolant min.		T_{inlet}	-25	°C
Inlet temperature coolant max.		T_{inlet}	65	°C
Auxiliary voltage		V_{aux}	30	V
Switching frequency inverter section		f_{sw2}	3.5	kHz

Notes
Further maximum ratings are specified in the following dedicated sections

Characteristic values

DC Link

			min.	typ.	max.	
Rated voltage		V_{DC}		1100		V
Over voltage shutdown	within 150 µs			1250		V
Capacitor	1 s, 30 p, rated tol. ±10 %	C_{DC}		12		mF
		type		Foil		
Maximum ripple current	per device, T_{amb} = 55 °C	I_{ripple}			49	A_{RMS}
Balance or discharge resistor	per DC link unit	R_b		6		kΩ

Notes
Operation above 1100 V subject to reduced operating time according to EN 61071

Inverter Section

			min.	typ.	max.	
Rated continuous current	V_{DC} = 1050 V, V_{AC} = 690 V_{RMS}, cos(φ) = 0.9, $f_{AC\ sine}$ = 50 Hz, f_{sw} = 2600 Hz, T_{inlet} = 40°C, $T_j \leq$ 150 °C	I_{AC}		1000		A_{RMS}
Continuous current at low frequency	V_{DC} = 1050 V, V_{AC} = 690 V_{RMS}, cos(φ) = -0.9, $f_{AC\ sine}$ = 12 Hz, f_{sw} = 2300 Hz, T_{inlet} = 40 °C, $T_j \leq$ 150 °C	$I_{AC\ low}$		1100		A_{RMS}
Rated continuous current for 150% overload capability	$I_{AC\ 150\%}$ = 1100 A_{RMS}, $t_{on\ over}$ = 0.01 s, $t_{recovery}$ = 135 s	$I_{AC\ over1}$			1767	A_{RMS}
Over current shutdown	within 15 µs	$I_{AC\ OC}$		2500		A_{peak}
Power losses	I_{AC} = 1000 A, V_{DC} = 1050 V, V_{AC} = 690 V_{RMS}, cos(φ) = 0.9, $f_{AC\ sine}$ = 50 Hz, f_{sw} = 2600 Hz, T_{inlet} = 40 °C, $T_j \leq$ 150 °C	P_{loss}			14500	W

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Controller interface

Driver and interface board	ref. to separate Application Note			DR111		
				min.	typ.	max.	
Auxiliary voltage		V_{aux}	18	24	30	V
Auxiliary power requirement	V_{aux} = 24 V	P_{aux}		40		W
Digital input level	resistor to GND 1.8 kΩ, capacitor to GND 4 nF, logic high = on, min. 15 mA	$V_{in\ low}$	0		4	V
		$V_{in\ high}$	11		15	V
Digital output level	open collector, logic low = no fault, max. 15 mA	$V_{out\ low}$	0		1.5	V
		$V_{out\ high}$		15		V
Analog current sensor output inverter section	load max 1 mA, @ 1100 A_{RMS}	$V_{IU\ ana2}$ $V_{IV\ ana2}$ $V_{IW\ ana2}$		5		V
Analog DC link voltage sensor output	load max 1 mA, @ 1100 V	$V_{DC\ ana}$		7.9		V
Analog temperature sensor output inverter section (NTC)	@T_{NTC} = 65 °C, corresponds to T_j = 137 °C at rated conditions	$V_{Theta\ NTC2}$		8.5		V
Analog temperature sensor output inverter section (Simulated)	@T_{NTC} = 68 °C, corresponds to T_j = 137 °C at rated conditions	$V_{Theta\ sim2}$		9.4		V
Over temperature shutdown inverter section	load max 1 mA	$V_{Error\ OT2}$		9.9		V

Minimum on time (IGBT)		$t_{on\ min}$	10			µs
Minimum off time (IGBT)		$t_{off\ min}$	11			µs

System data

				min.	typ.	max.	
EMC robustness	according to IEC 61800-3 at named interfaces	power	V_{Burst}		2		kV
		control	V_{Burst}		1		kV
		aux (24V)	V_{surge}		1		kV
Storage temperature			T_{stor}	-40		65	°C
Operational ambient temperature	PCB, DC link capacitor, bus bar, excluding cooling medium		$T_{op\ amb}$	-25		55	°C
Cooling air velocity	PCB, DC link capacitor, bus bar, standard atmosphere		V_{air}	2			m/s
Humidity	no condensation		Rel. F	0		85	%
Vibration	according to IEC 60721					10	m/s²
Shock	according to IEC 60721					100	m/s²
Protection degree					IP00		
Pollution degree					2		
Dimensions	width x depth x height			1090	596	260	mm
Weight						105	kg

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Heatsink water cooled

			min.	typ.	max.	
Water flow	according to coolant specification from Infineon	$\Delta V/\Delta t$	20			dm³/min
Water pressure					8	bar
Coolant inlet temperature		T_{inlet}	-40		45	°C
Thermal resistance heatsink to ambient	per switch	$R_{th,ha}$		0.03		K/W
Cooling channel material			Aluminum			

Notes
Composition of coolant: Water and 52 vol. % Antifrogen N

Overview of optional components

	Unit 1 (not installed	Inverter Section	Unit 3 (not installed)
Voltage sensor		×	
Current sensor		×	
Temperature sensor		×	
Temperature simulation		×	
DC link capacitors		×	
Collector-emitter Active Clamping		×	

Notes
Setting of Active Clamping TVS-Diodes: V_Z = 1200V/1600V MA111. Reduce short circuit protection above 1200V DC.

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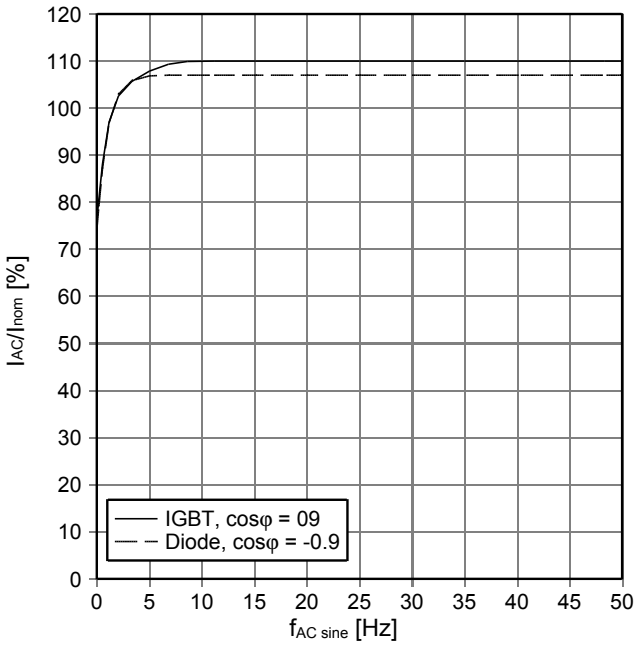
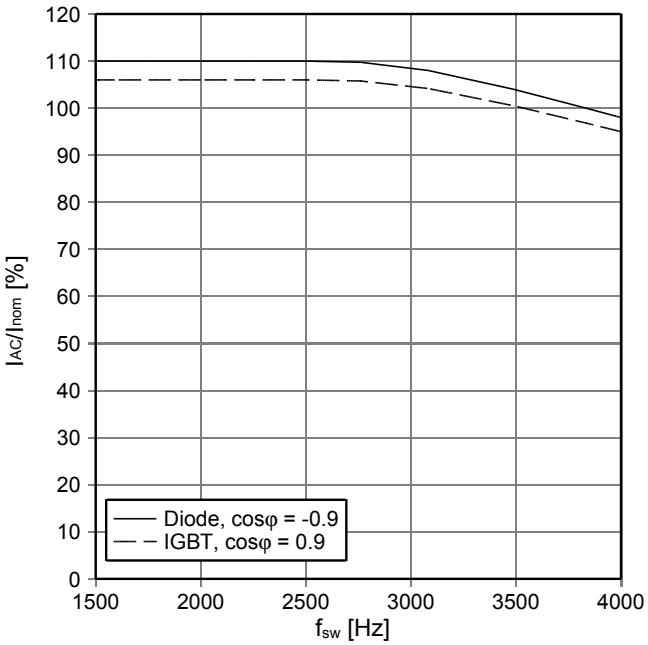
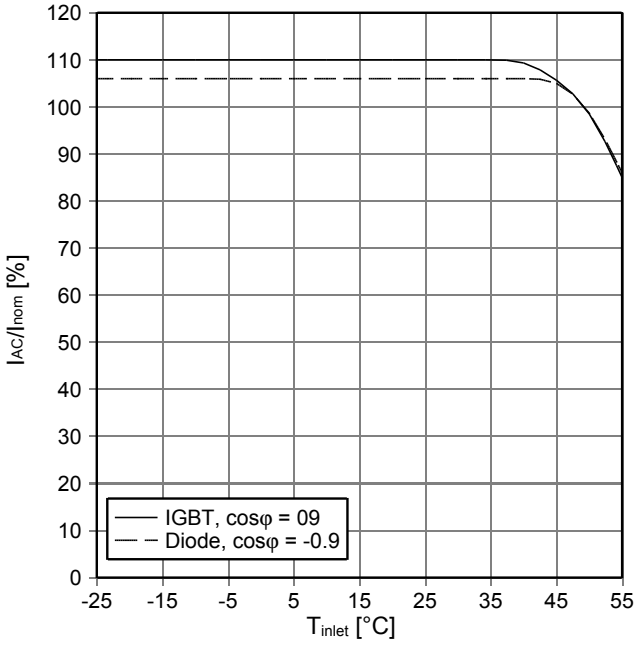
$f_{AC\ sine}$ - derating curve IGBT (motor), Diode (generator)
V_{DC} = 1050 V, V_{AC} = 690 V, f_{sw} = 2.6 kHz, cosφ = 0.9
T_{inlet} = 40 °C and nom. cooling conditions



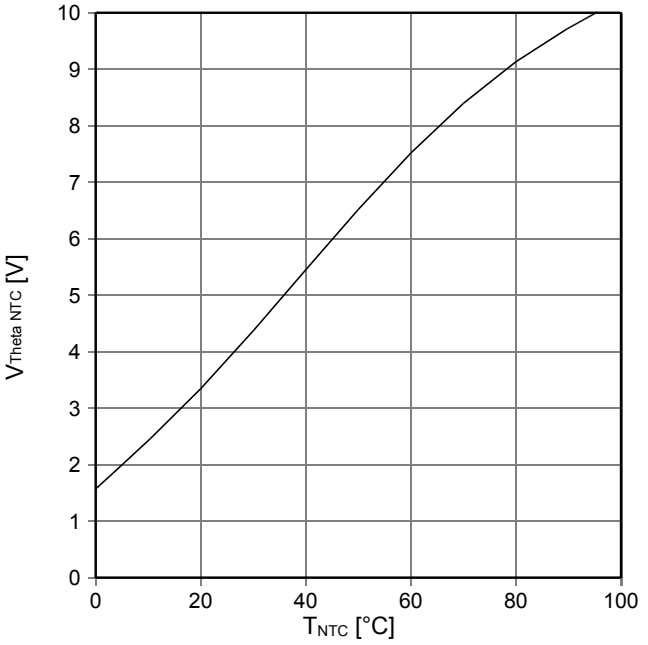
f_{sw} - derating curve IGBT (motor), Diode (generator)
V_{DC} = 1050 V, V_{AC} = 690 V, $f_{AC\ sine}$ = 50 Hz, cosφ = 0.9
T_{inlet} = 40 °C and nom. cooling conditions



T_{inlet} - derating curve IGBT (motor), Diode (generator)
V_{DC} = 1050 V, V_{AC} = 690 V_{RMS}, $f_{AC\ sine}$ =V_{DC} = 1050 V, V_{AC} = 690 V_{RMS}, $f_{AC\ sine}$ = 50 Hz, cosφ = 0.9
nom. cooling conditions



Analog temperature sensor output $V_{Theta\ NTC}$
Sensing NTC of IGBT module



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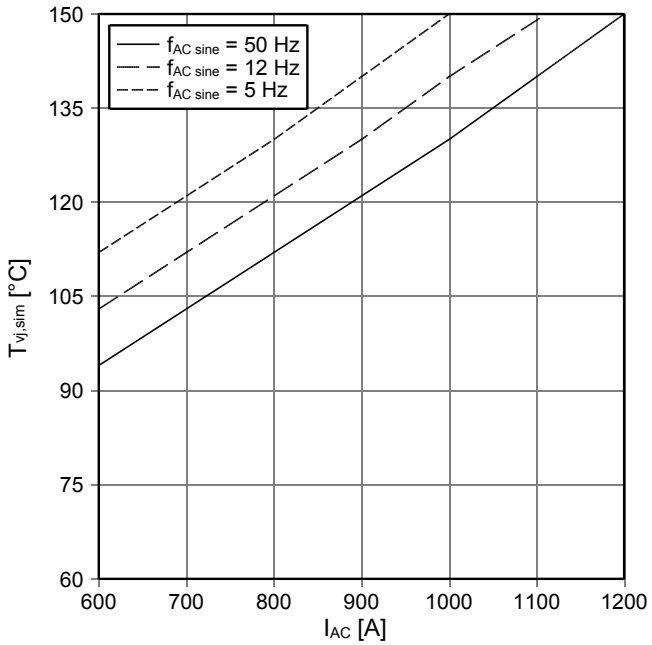
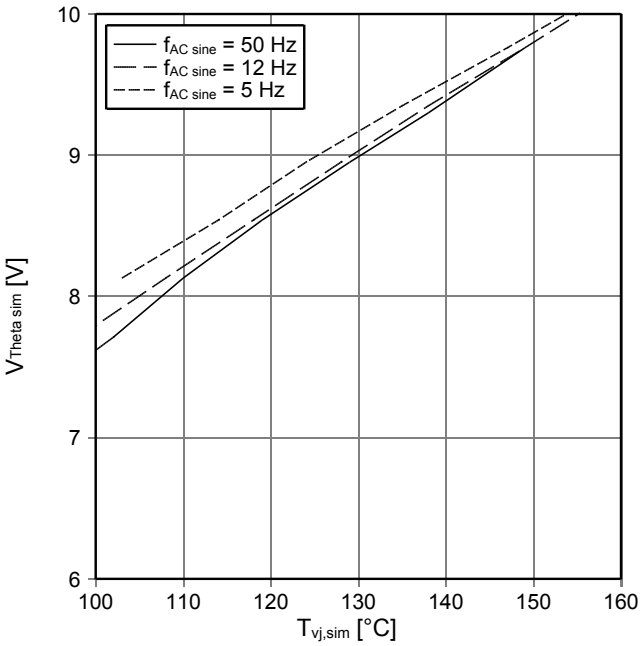
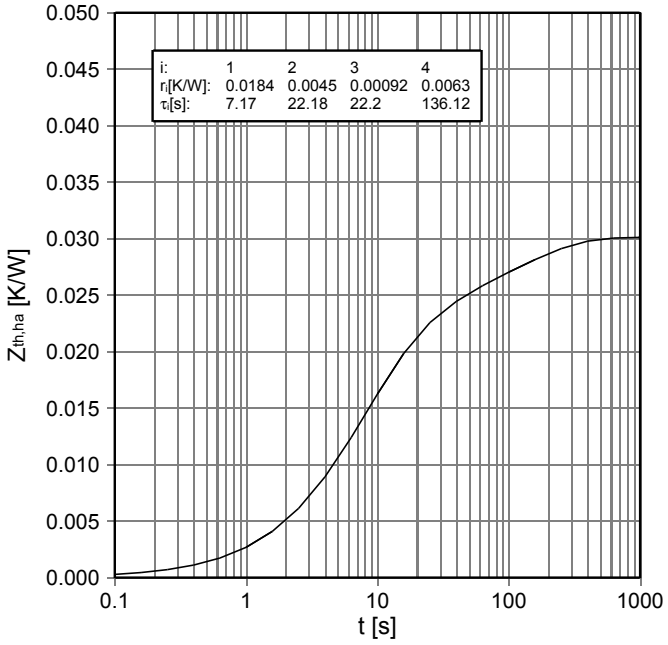
$T_{vj,sim}$ vs. I_{AC} - Simulated junction temperatur
V_{DC} = 1100 V, V_{AC} = 690 V_{RMS}, f_{sw} = 2.6 kHz,
T_{inlet} = 40 °C and nom. cooling conditions



Analog temperature sensor output $V_{Theta\ sim}$
V_{DC} = 1100 V, V_{AC} = 690 V_{RMS}, f_{sw} = 2.6 kHz,
nom. cooling conditions



$Z_{th,ha}$ - thermal impedance heatsink to ambient per switch
nom. cooling conditions



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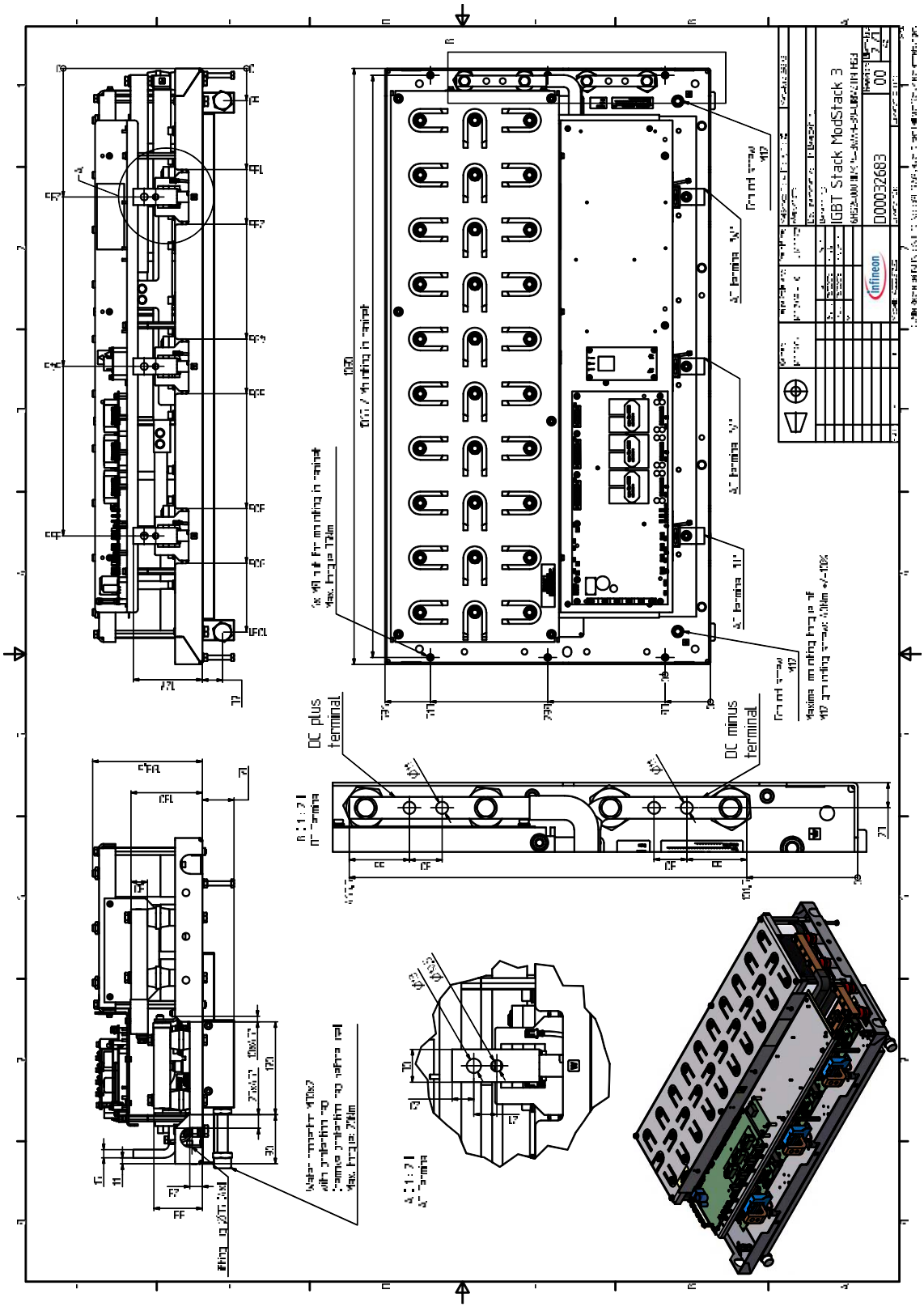
Mechanical drawing



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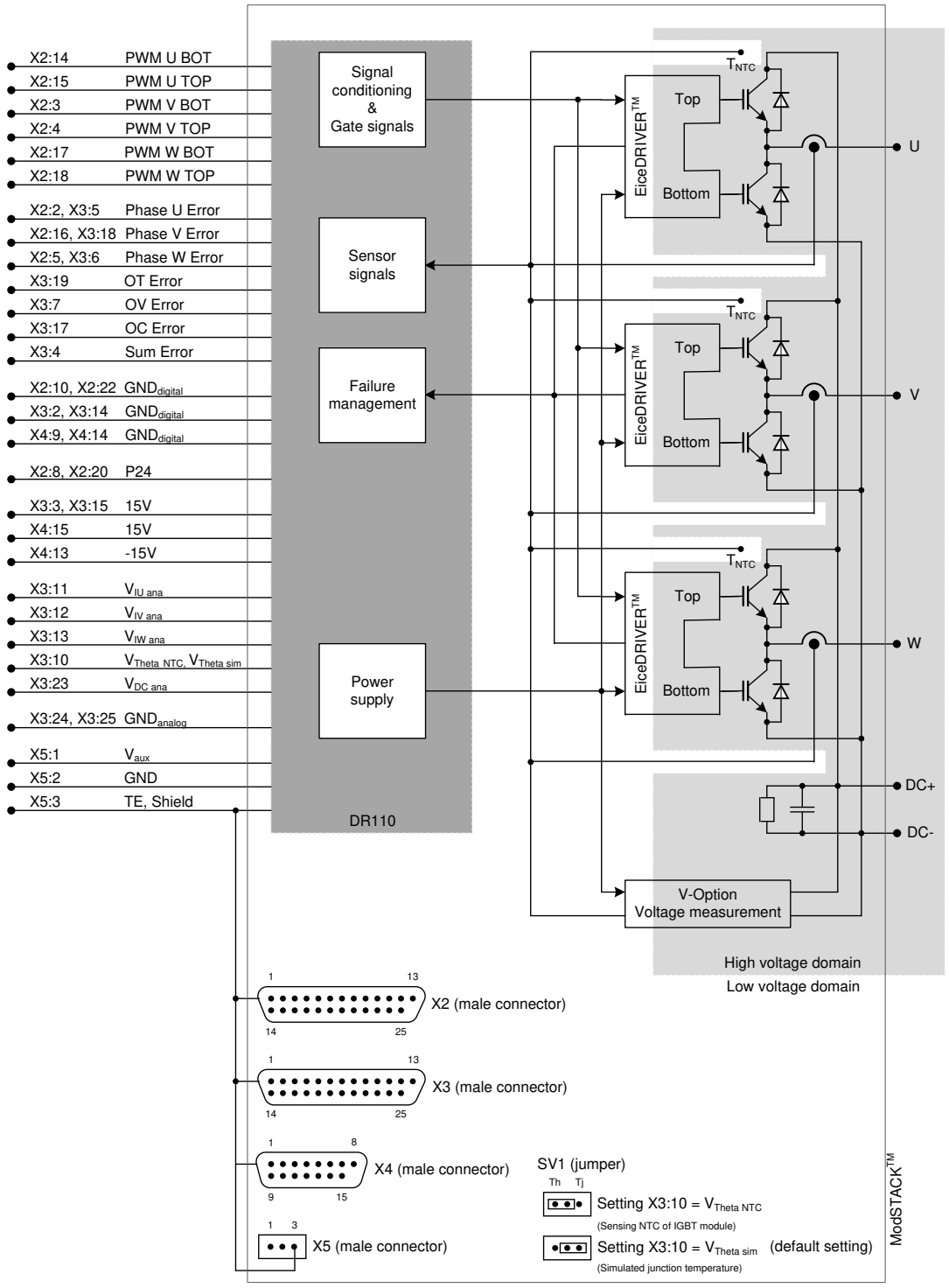
Circuit diagram



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- the conclusion of Quality Agreements;
- to establish joint measures of an ongoing product survey,
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Prior to installation and operation, all safety notices and warnings and all warning signs attached to the equipment have to be carefully read. Make sure that all warning signs remain in a legible condition and that missing or damaged signs are replaced. To installation and operation, all safety notices and warnings and all warning signs attached to the equipment have to be carefully read. Make sure that all warning signs remain in a legible condition and that missing or damaged signs are replaced.

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