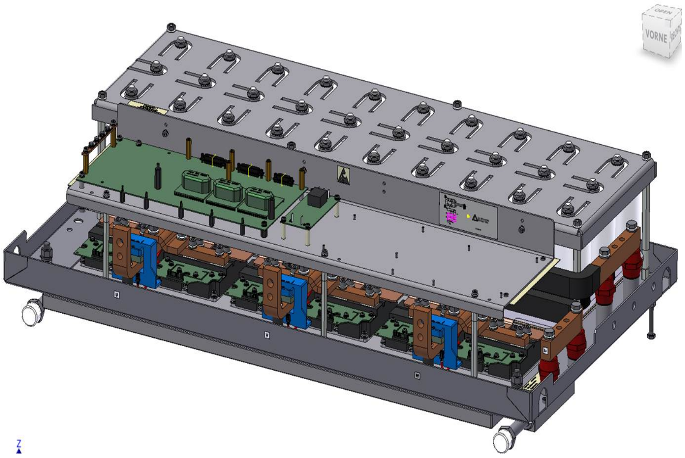
Preliminary data

General information

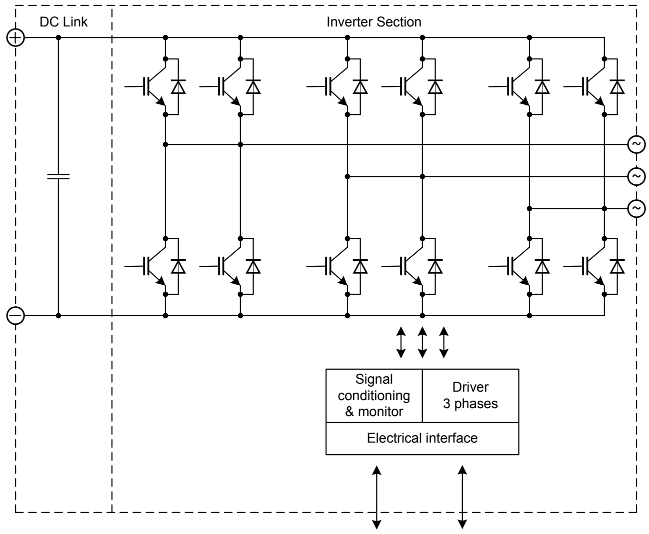
IGBT Stack for typical voltages up to 690 V_{RMS}
Rated output current 1100 A_{RMS}

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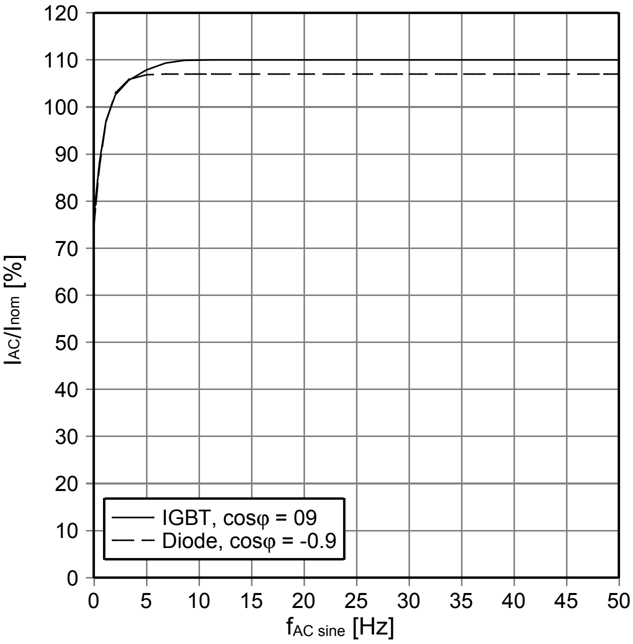
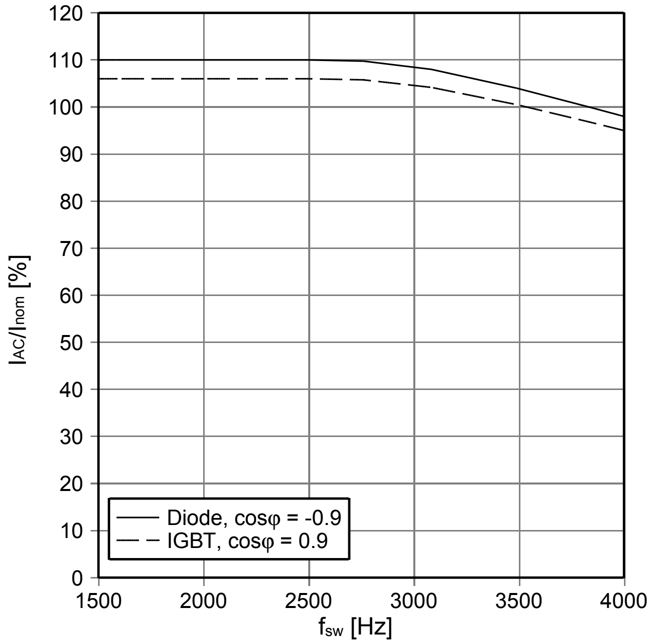
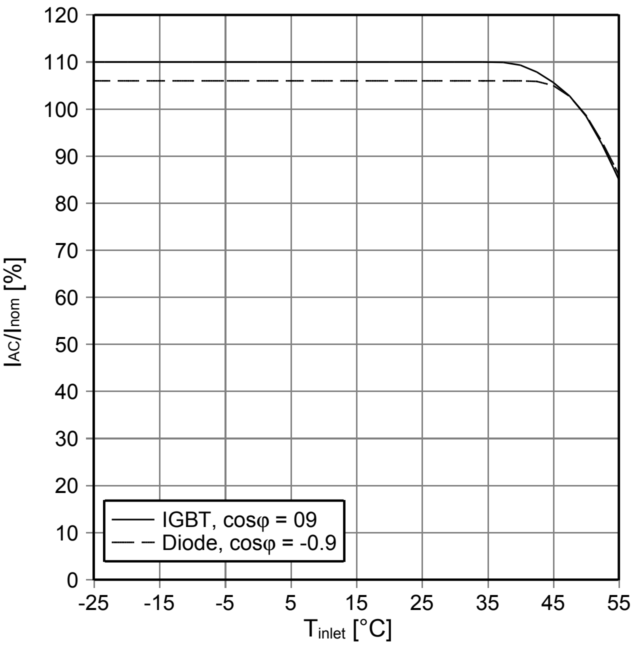
$f_{AC\ sine}$ - derating curve IGBT (motor), Diode (generator)
V_{DC} = 1050 V, V_{AC} = 690 V, f_{sw} = 2.6 kHz, cosφ = 0.9
T_{inlet} = 40 °C and nom. cooling conditions



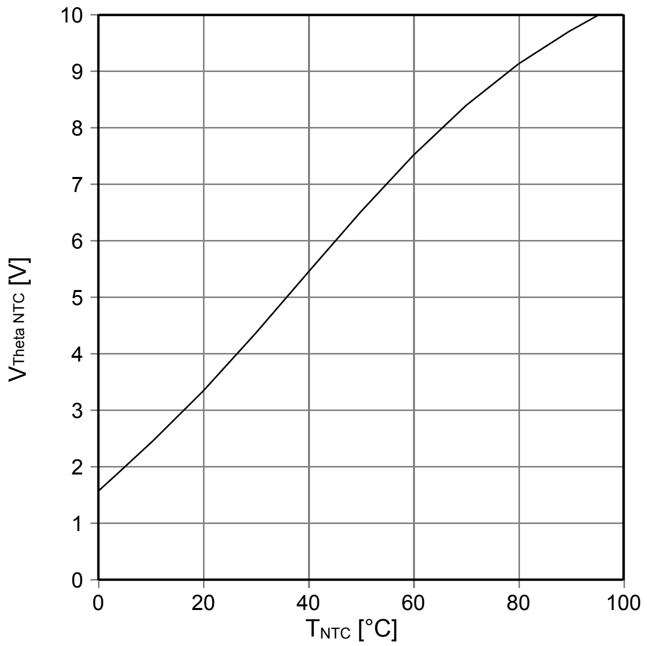
f_{sw} - derating curve IGBT (motor), Diode (generator)
V_{DC} = 1050 V, V_{AC} = 690 V, $f_{AC\ sine}$ = 50 Hz, cosφ = 0.9
T_{inlet} = 40 °C and nom. cooling conditions



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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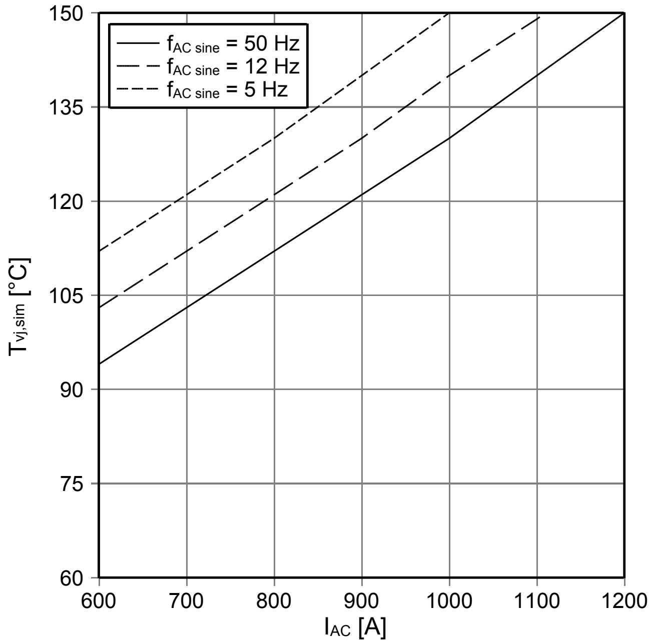
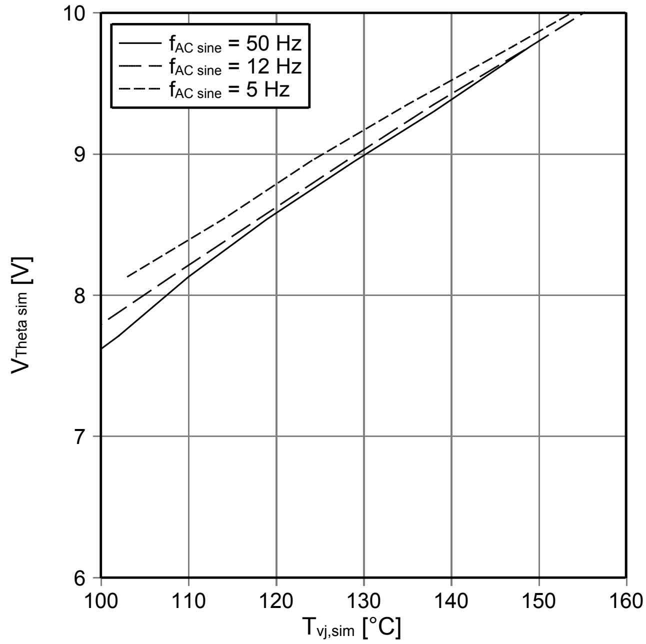
Preliminary data

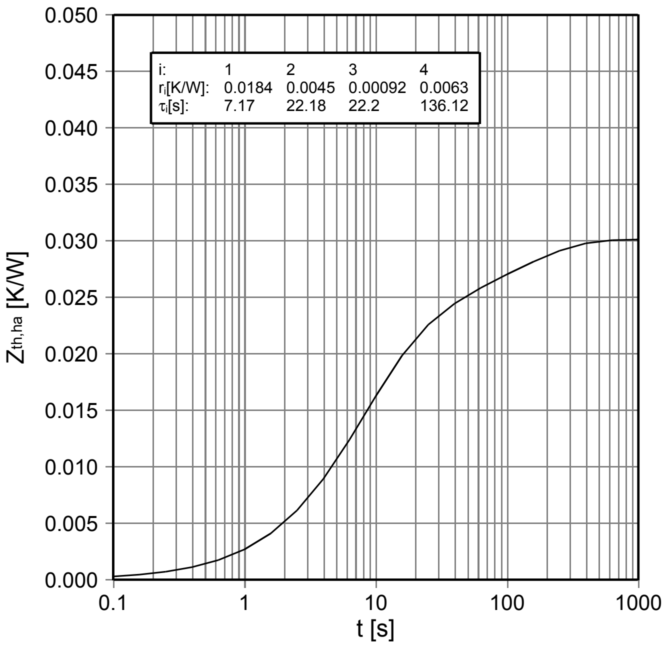
$T_{vj,sim}$ vs. I_{AC} - Simulated junction temperatur
V_{DC} = 1100 V, V_{AC} = 690 V_{RMS}, f_{sw} = 2.6 kHz,
T_{inlet} = 40 °C and nom. cooling conditions



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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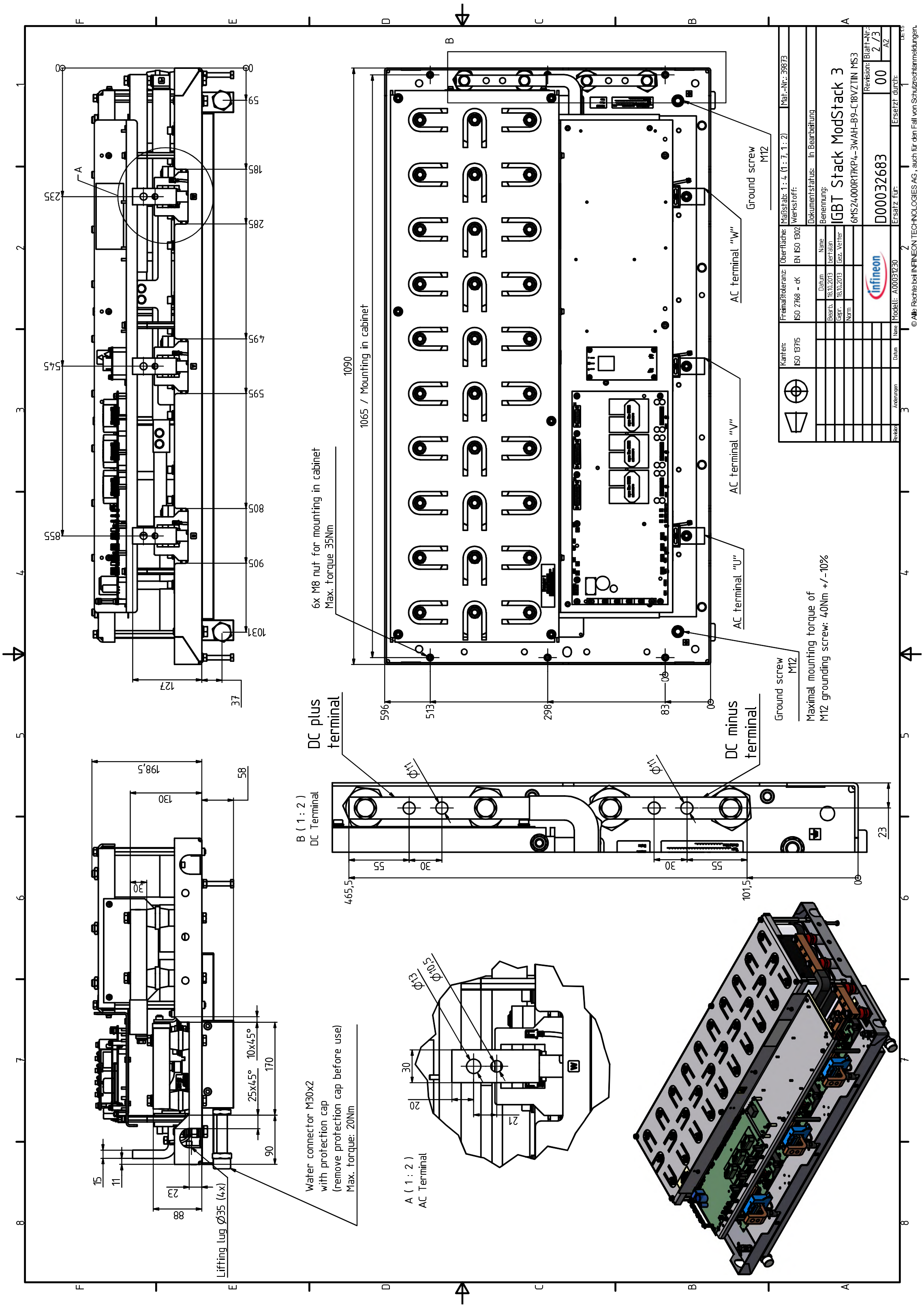
Mechanical drawing



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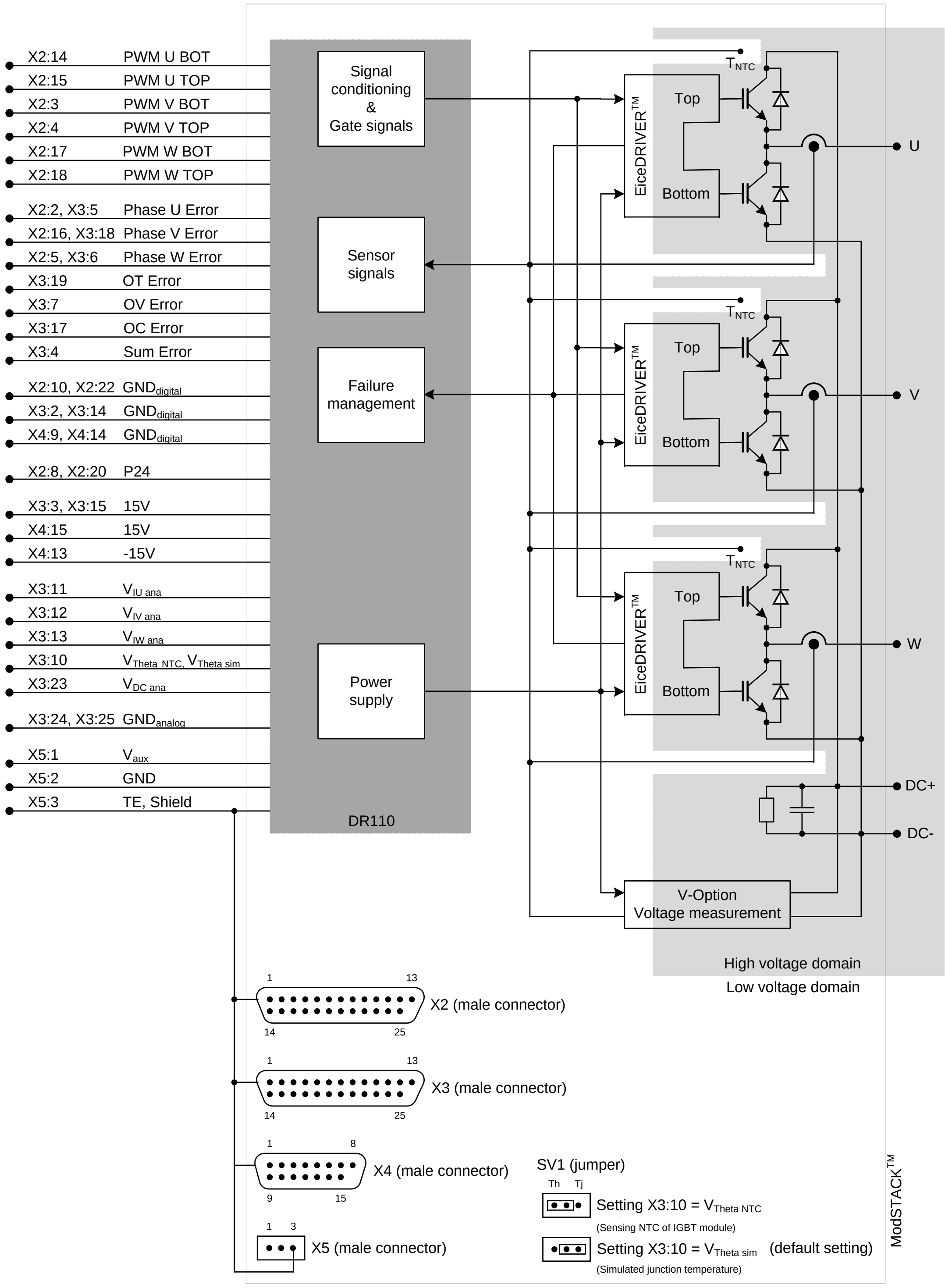
Circuit diagram



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  and that we may make delivery depended on the realization of any such measures.

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