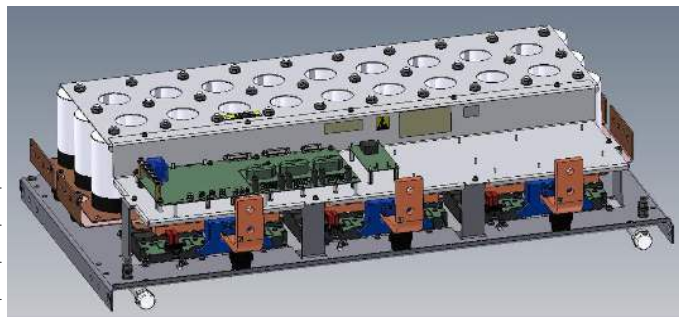


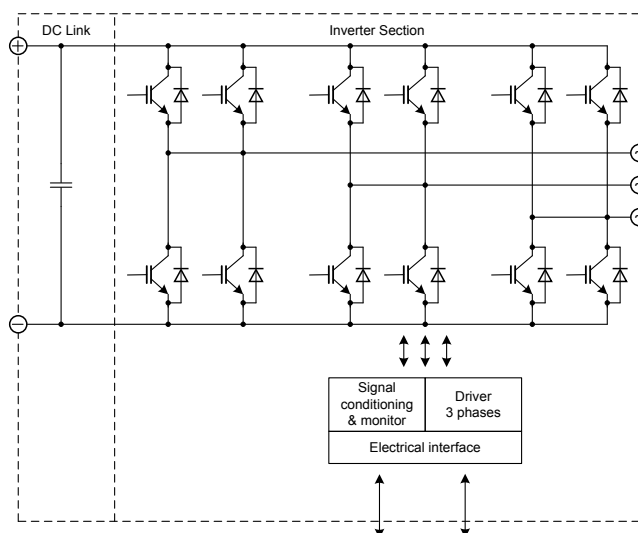
**General information**

**IGBT Stack for typical voltages up to 690 V<sub>RMS</sub>**  
**Rated output current 1175<sub>RMS</sub>**

- 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	6MS24017P43W41646
SP - No.	SP001420674



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**Absolute maximum rated values**

Collector-emitter voltage	IGBT; $T_{vj} = 25^{\circ}\text{C}$	$V_{CES}$	1700	V
Repetitive peak reverse voltage	Diode; $T_{vj} = 25^{\circ}\text{C}$	$V_{RRM}$	1700	V
DC link voltage	No switching; $t=5\text{s}$ , 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, $f = 50\text{ Hz}$ , $t = 5\text{ s}$	$V_{ISOL}$	2.5	$kV_{RMS}$
Junction temperature	under switching conditions	$T_{vjop}$	150	$^{\circ}\text{C}$
Storage temperature min.		$T_{stor}$	-40	$^{\circ}\text{C}$
Storage temperature max.		$T_{stor}$	65	$^{\circ}\text{C}$
Operational ambient temperature min.		$T_{amb}$	-25	$^{\circ}\text{C}$
Operational ambient temperature max.		$T_{amb}$	55	$^{\circ}\text{C}$
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	Continuous mode	$V_{DC}$		1050		V
Over voltage shutdown	within 150 $\mu\text{s}$			1300		V
Capacitor	1 s, 30 p, rated tol. $\pm 10\%$	$C_{DC}$		12		mF
		type	Foil			
Maximum ripple current	per device, $T_{amb} = 55^{\circ}\text{C}$	$I_{ripple}$			49	$A_{RMS}$
Balance or discharge resistor	per DC link unit	$R_b$	6			k $\Omega$

**Notes**

Operation above 1100 V subject to reduced operating time according to EN 61071  
Reduce short circuit protection over 1200V

**Inverter Section**

			min.	typ.	max.	
Rated continuous current	$V_{DC} = 1050\text{ V}$ , $V_{AC} = 690\text{ V}_{RMS}$ , $\cos(\varphi) = 0.9$ , $f_{AC\ sine} = 50\text{ Hz}$ , $f_{sw} = 2600\text{ Hz}$ , $T_{inlet} = 50^{\circ}\text{C}$	$I_{AC}$		1175		$A_{RMS}$
Rated continuous current for 150% overload capability	$I_{AC\ 150\%} = 1100\text{ A}_{RMS}$ , $t_{on\ over} = 0.01\text{ s}$ , $t_{recovery} = 135\text{ s}$	$I_{AC\ over1}$			1767	$A_{RMS}$
Over current shutdown	within 15 $\mu\text{s}$	$I_{AC\ OC}$		2500		$A_{peak}$
Power losses	$I_{AC} = 1175\text{ A}$ , $V_{DC} = 1050\text{ V}$ , $V_{AC} = 690\text{ V}_{RMS}$ , $\cos(\varphi) = 0.9$ , $f_{AC\ sine} = 50\text{ Hz}$ , $f_{sw} = 2600\text{ Hz}$ , $T_{inlet} = 50^{\circ}\text{C}$	$P_{loss}$		14500		W

**Inverter Section (specific condition)**

			min.	typ.	max.	
Specific continuous current	$V_{DC} = 1050\text{ V}$ , $V_{AC} = 690\text{ V}_{RMS}$ , $\cos(\varphi) = -0.9$ , $f_{AC\ sine} = 12\text{ Hz}$ , $f_{sw} = 2100\text{ Hz}$ , $T_{inlet} = 50^{\circ}\text{C}$ , $T_j \leq 150^{\circ}\text{C}$	$I_{ACsp}$		1400		$A_{RMS}$

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Controller interface

Driver and interface board	ref. to separate Application Note	DR112				
		min.	typ.	max.		
Auxiliary voltage		$V_{aux}$	18	24	30	V
Auxiliary power requirement	$V_{aux} = 24\text{ V}$	$P_{aux}$		40		W
Digital input level	resistor to GND 1.8 k $\Omega$ , 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, @ 1175 $A_{RMS}$	$V_{IU\ ana2}$ $V_{IV\ ana2}$ $V_{IW\ ana2}$		3.6		V
Analog DC link voltage sensor output	load max 1 mA, @ 1100 V	$V_{DC\ ana}$		7.6		V
Analog temperature sensor output inverter section (NTC)	@ $T_{NTC} = 72\text{ }^{\circ}\text{C}$ , corresponds to $T_j = 138\text{ }^{\circ}\text{C}$ at rated conditions	$V_{Theta\ NTC2}$		8.6		V
Analog temperature sensor output inverter section (Simulated)	@ $T_{NTC} = 72\text{ }^{\circ}\text{C}$ , corresponds to $T_j = 138\text{ }^{\circ}\text{C}$ at rated conditions	$V_{Theta\ sim2}$		8.7		V
Over temperature shutdown inverter section	load max 1 mA	$V_{Error\ OT2}$		10		V
Minimum on time (IGBT)		$t_{on\ min}$	5			$\mu\text{s}$
Minimum off time (IGBT)		$t_{off\ min}$	5			$\mu\text{s}$

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	$^{\circ}\text{C}$
Operational ambient temperature	PCB, DC link capacitor, bus bar, excluding cooling medium	$T_{op\ amb}$	-25		55	$^{\circ}\text{C}$
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	$\text{m/s}^2$
Shock	according to IEC 60721				100	$\text{m/s}^2$
Protection degree			IP00			
Pollution degree			2			
Dimensions	width x depth x height		1090	625	250	mm
Weight				90		kg

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**Heatsink water cooled**

			min.	typ.	max.	
Water flow	according to coolant specification from Infineon	$\Delta V/\Delta t$	35			dm <sup>3</sup> /min
Water pressure					8	bar
Coolant inlet temperature		T <sub>inlet</sub>	-40		45	°C
Thermal resistance heatsink to ambient	per switch	R <sub>th,ha</sub>		0.024		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		x	
Current sensor		x	
Temperature sensor		x	
Temperature simulation		x	
DC link capacitors		x	
Collector-emitter Active Clamping		x	

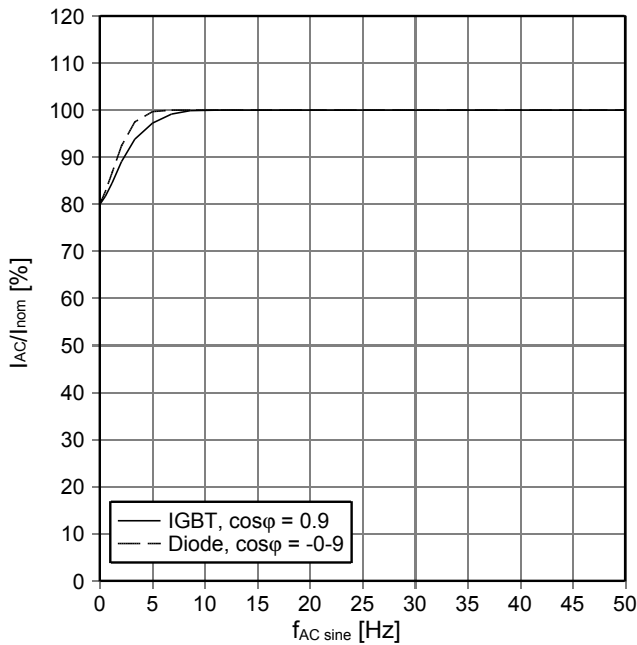
**Notes**

Setting of Active Clamping TVS-Diodes: V<sub>Z</sub> = 1200V/1600V MA111. Reduce short circuit protection above 1200V DC.

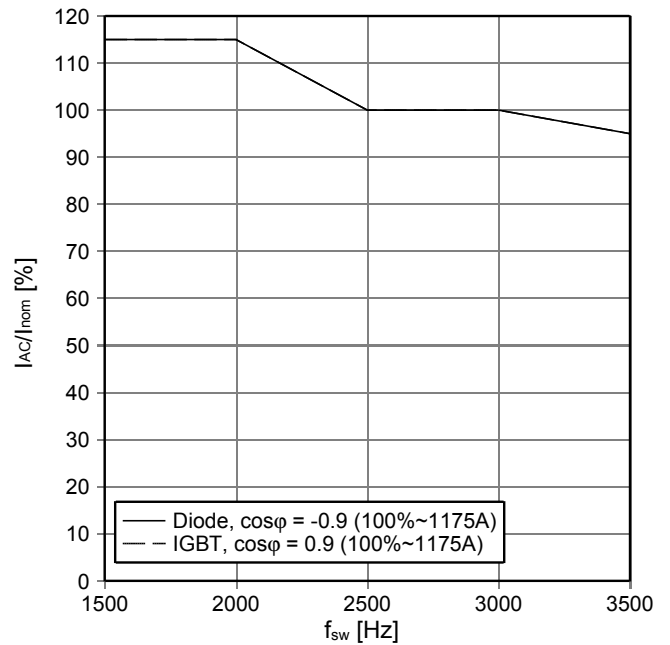
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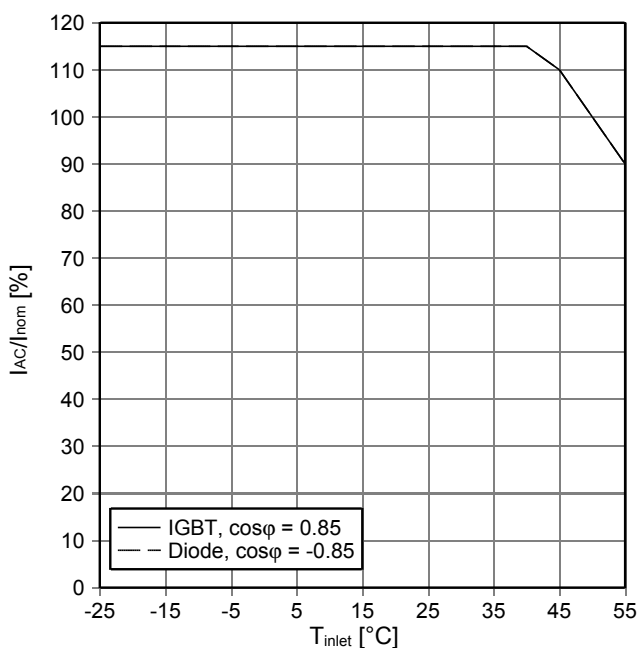
$f_{AC\ sine}$  - derating curve IGBT (motor), Diode (generator)  
 $V_{DC} = 1050\ V$ ,  $V_{AC} = 690\ V$ ,  $f_{sw} = 2.6\ kHz$ ,  $\cos\phi = \pm 0.9$   
 $T_{inlet} = 50\ ^\circ C$  and nom. cooling conditions



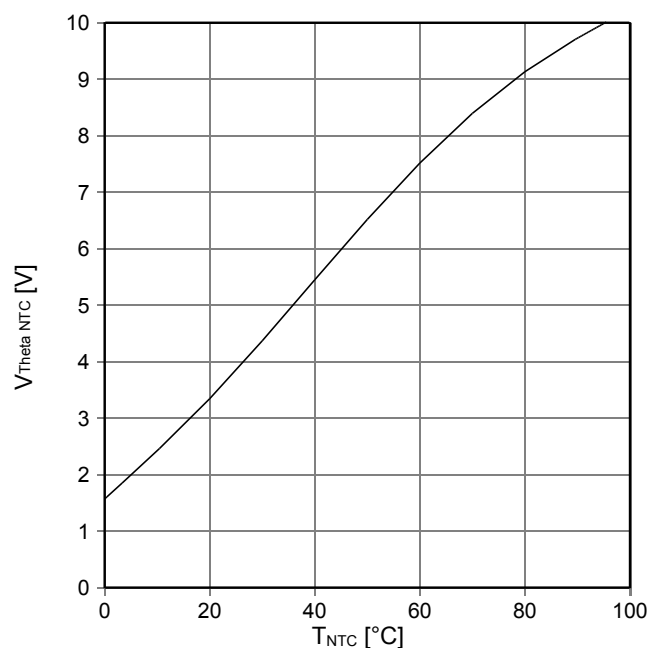
$f_{sw}$  - derating curve IGBT (motor), Diode (generator)  
 $V_{DC} = 1050\ V$ ,  $V_{AC} = 690\ V$ ,  $f_{AC\ sine} = 50/12\ Hz$ ,  $\cos\phi = \pm 0.9$   
 $T_{inlet} = 50\ ^\circ C$  and nom. cooling conditions



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



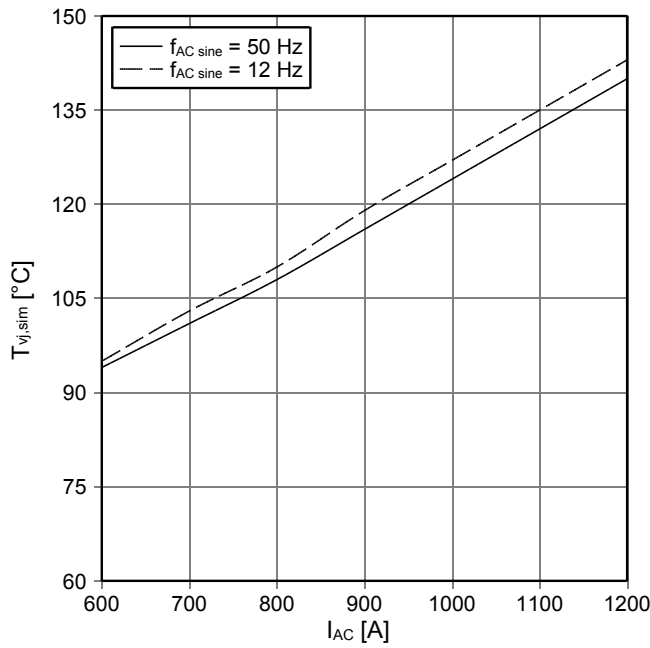
Analog temperature sensor output  $V_{Theta\ NTC}$   
 Sensing NTC of heatsink



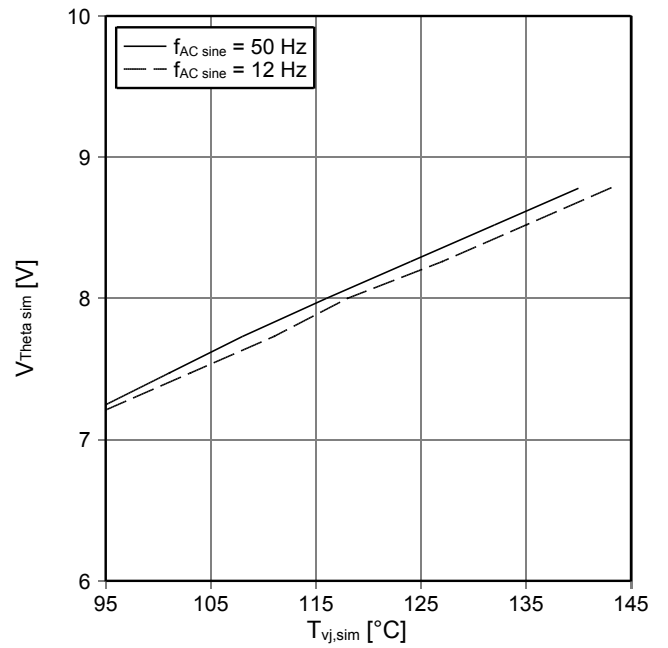
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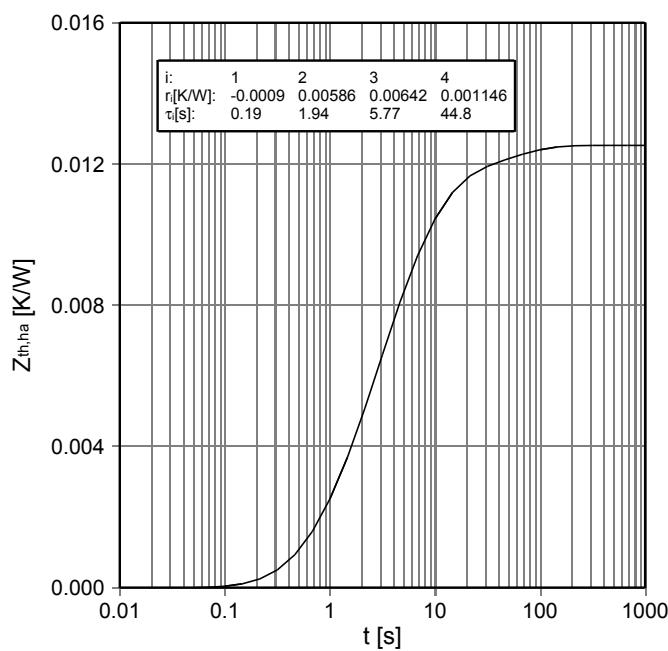
$T_{vj, sim}$  vs.  $I_{AC}$  - Simulated junction temperatur  
 $V_{DC} = 1050\text{ V}$ ,  $V_{AC} = 690\text{ V}_{RMS}$ ,  $f_{sw} = 2.6\text{ kHz}$ ,  
 $T_{inlet} = 50\text{ }^{\circ}\text{C}$  and nom. cooling conditions



Analog temperature sensor output  $V_{Theta\ sim}$   
 $V_{DC} = 1050\text{ V}$ ,  $V_{AC} = 690\text{ V}_{RMS}$ ,  $f_{sw} = 2.6\text{ kHz}$ ,  
 nom. cooling conditions

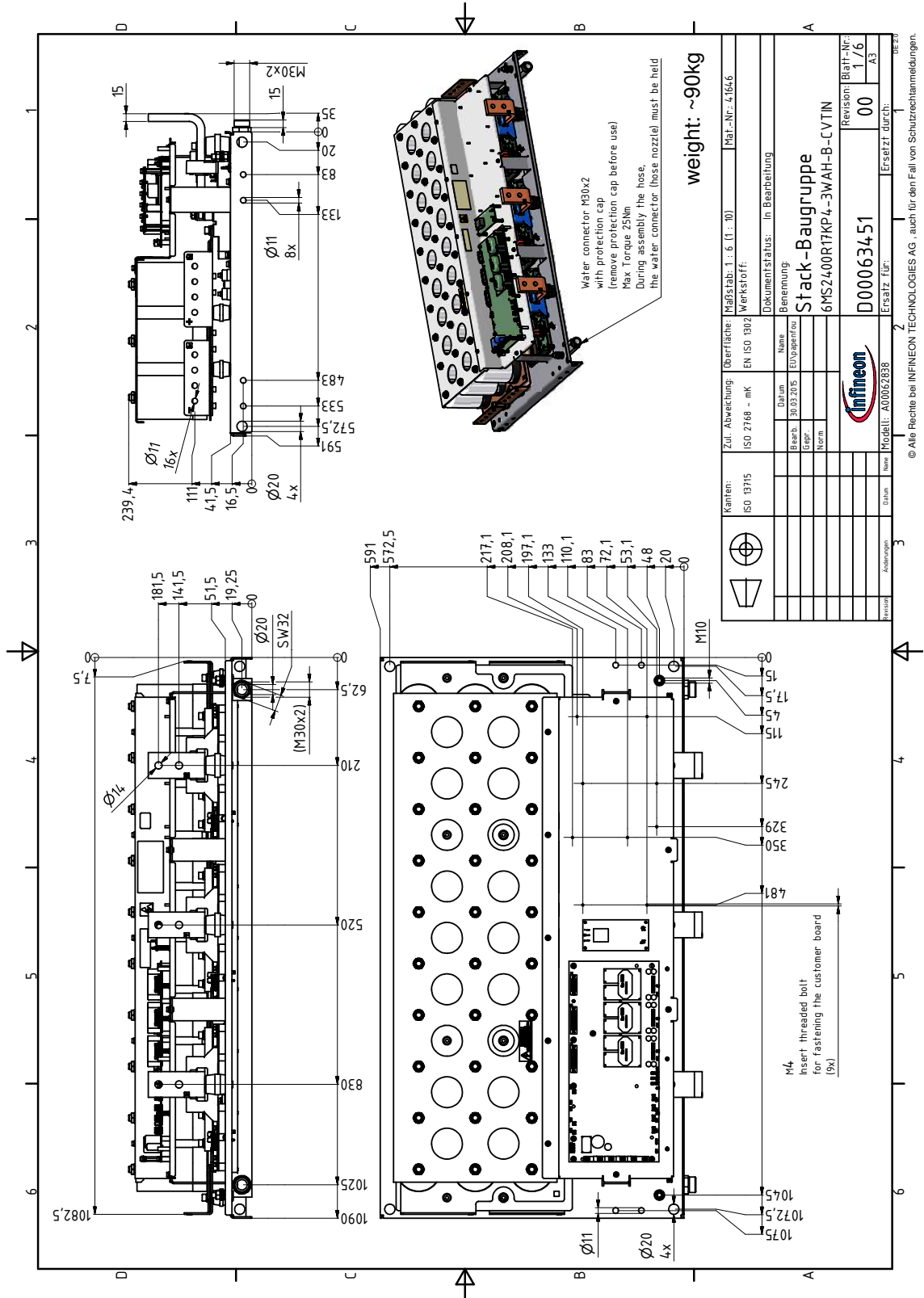


$Z_{th, ha}$  - thermal impedance heatsink to ambient per switch  
 nom. cooling conditions



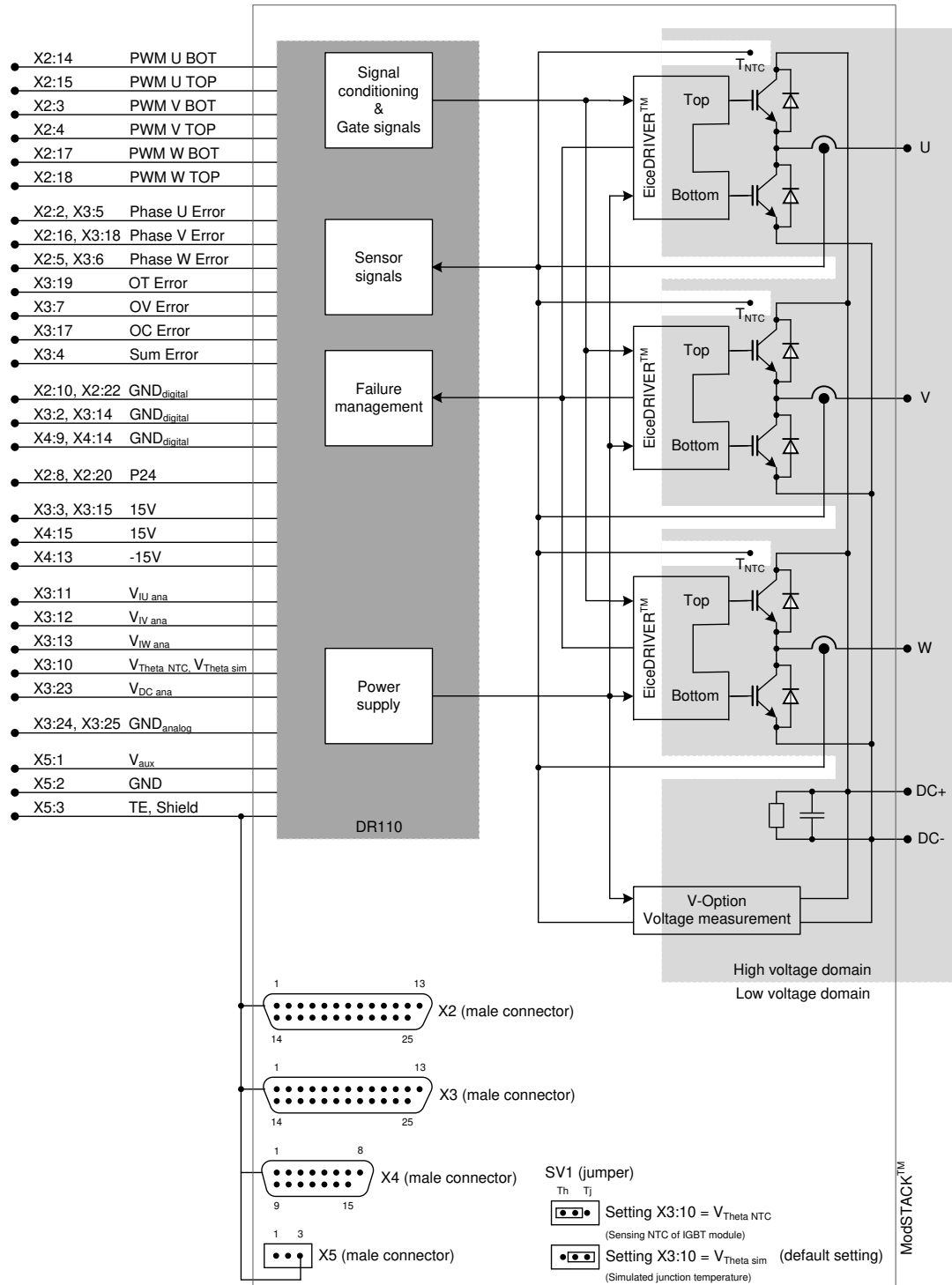
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Mechanical drawing



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Circuit diagram



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- the conclusion of Quality Agreements;
- to establish joint measures of an ongoing product survey, and that we may make delivery depended on the realization of any such measures.

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Safety Instructions

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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