Technical Information

ModSTACK™ **6MS10017E41W36460**

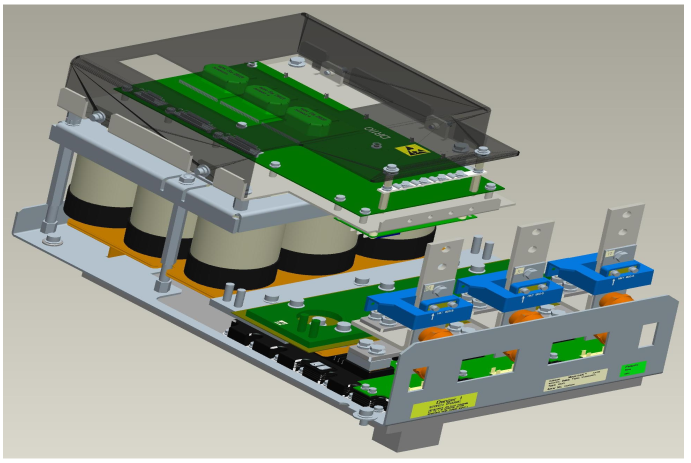
Preliminary data

General information

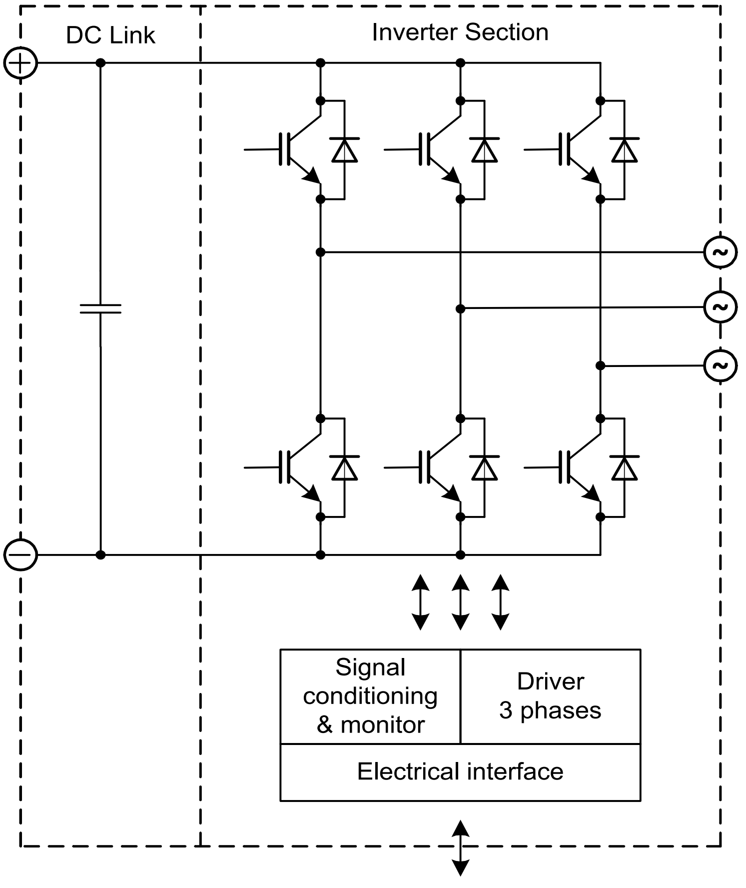
IGBT Stack for typical voltages of up to 690 V_{RMS}
Rated output current 600 A_{RMS}

· High power converter
· Wind power
· Motor drives

· PrimePACK™3 module with integrated NTC
· Extended operational temperature
· Low V_{cesat}



Topology	B6I
Application	Inverter
Load type	Resistive, inductive
Semiconductor (Inverter Section)	3x FF1000R17IE4
DC Link	3.6 mF
Heatsink	Water cooled
Implemented sensors	Current, voltage, temperature
Driver signals IGBT	Electrical
Sales - name	6MS10017E41W36460
SP - No.	SP000939300



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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		V_{DC}	1250	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 = 1 s	V_{ISOL}	2.5	kV_{RMS}
Repetitive peak collector current inverter section (IGBT)	t_p = 1 ms	I_{CRM2}	1250	A
Repetitive peak forward current inverter section (Diode)	t_p = 1 ms	I_{FRM2}	1250	A
I^2t-value inverter section (Diode)		I^2t	140	kA^2s
Continuous current inverter section		I_{AC2}	710	A_{RMS}
Junction temperature	under switching conditions	T_{vjop}	150	°C
Switching frequency inverter section		f_{sw2}	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	1250	V
Over voltage shutdown	within 150 µs			1250		V
Capacitor	1 s, 9 p, rated tol. +/- 10 %	C_{DC}		3.6		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		47		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} = 1100 V, V_{AC} = 690 V_{RMS}, cos(φ) = 0.85, $f_{AC\ sine}$ = 50 Hz, f_{sw} = 3000 Hz, T_{inlet} = 40°C, $T_j \leq$ 150 °C	I_{AC}			600	A_{RMS}
Continuous current at low frequency	V_{DC} = 1100 V, V_{AC} = 690 V_{RMS}, $f_{AC\ sine}$ = 0 Hz, f_{sw} = 3000 Hz, T_{inlet} = 40 °C, $T_j \leq$ 150 °C	$I_{AC\ low}$			295	A_{RMS}
Rated continuous current for 150% overload capability	$I_{AC\ 150\%}$ = 610 A_{RMS}, $t_{on\ over}$ = 60 s, $T_j \leq$ 150 °C	$I_{AC\ over1}$			405	A_{RMS}
Rated continuous current for 150% overload capability	$I_{AC\ 150\%}$ = 670 A_{RMS}, $t_{on\ over}$ = 3 s, $T_j \leq$ 150 °C	$I_{AC\ over2}$			445	A_{RMS}
Over current shutdown	within 15 µs	$I_{AC\ OC}$		1250		A_{peak}
Power losses	I_{AC} = 600 A, V_{DC} = 1100 V, V_{AC} = 690 V_{RMS}, cos(φ) = 0.85, $f_{AC\ sine}$ = 50 Hz, f_{sw} = 3000 Hz, T_{inlet} = 40 °C, $T_j \leq$ 150 °C	P_{loss}		9800		W

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Controller interface

Driver and interface board	ref. to separate Application Note			DR110			
			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, @ 600 A_{RMS}	$V_{IU\ ana2}$ $V_{IV\ ana2}$ $V_{IW\ ana2}$	3.4	3.5	3.6	V
Analog DC link voltage sensor output	load max 1 mA, @ 1100 V	$V_{DC\ ana}$	7.7	7.9	8..1	V
Analog temperature sensor output inverter section (NTC)	load max 1 mA, @T_{NTC} = 72 °C, corresponds to T_j = 148 °C at rated conditions	$V_{Theta\ NTC2}$		8.4		V
Analog temperature sensor output inverter section (Simulated)	load max 1 mA, @T_{NTC} = 72 °C, corresponds to T_j = 148 °C at rated conditions	$V_{Theta\ sim2}$		9		V
Over temperature shutdown inverter section		$V_{Error\ OT2}$		9.3		V

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		80	°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		95	%
Vibration	according to IEC 60721					5	m/s²
Shock	according to IEC 60721					40	m/s²
Protection degree					IP00		
Pollution degree					2		
Dimensions	width x depth x height			590	338	366	mm
Weight					65		kg

Heatsink water cooled

			min.	typ.	max.	
Water flow	according to coolant specification from Infineon	$\Delta V/\Delta t$	15			dm³/min
Water pressure					8	bar
Water pressure drop	at 15 dm³/min water flow	Δp		200		mbar
Coolant inlet temperature		T_{inlet}	-40		55	°C
Thermal resistance heatsink to ambient	per switch	$R_{th,ha}$		0.038		K/W
Cooling channel material				Copper		

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

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Overview of optional components

	Unit 1	Inverter Section	Unit 3
Parallel interface board			
Optical interface board			
Voltage sensor		×	
Current sensor		×	
Temperature sensor		×	
Temperature simulation		×	
DC link capacitors		×	
Collector-emitter Active Clamping		×	

Notes
Setting of Active Clamping TVS-Diodes: V_Z = 1280 V

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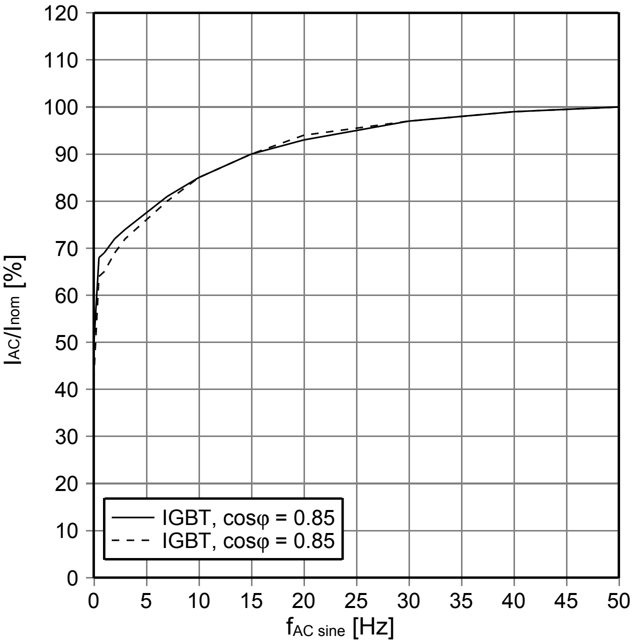
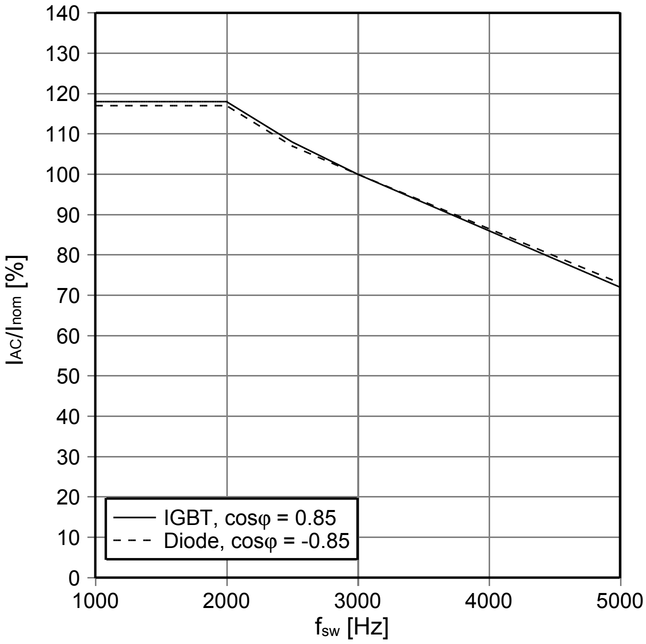
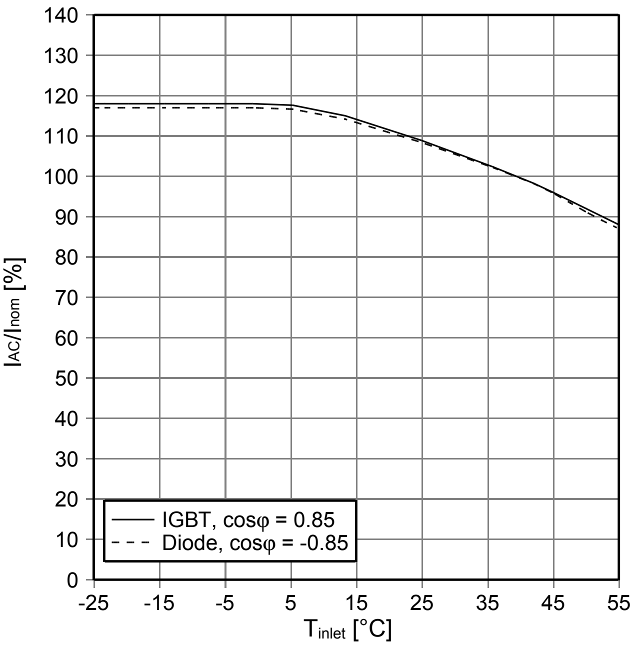
$f_{AC\ sine}$ - derating curve IGBT (motor), Diode (generator)
V_{DC} = 1100 V, V_{AC} = 690 V_{RMS}, f_{sw} = 3 kHz, cosφ = ±0.85
T_{inlet} = 40°C and nom. cooling conditions



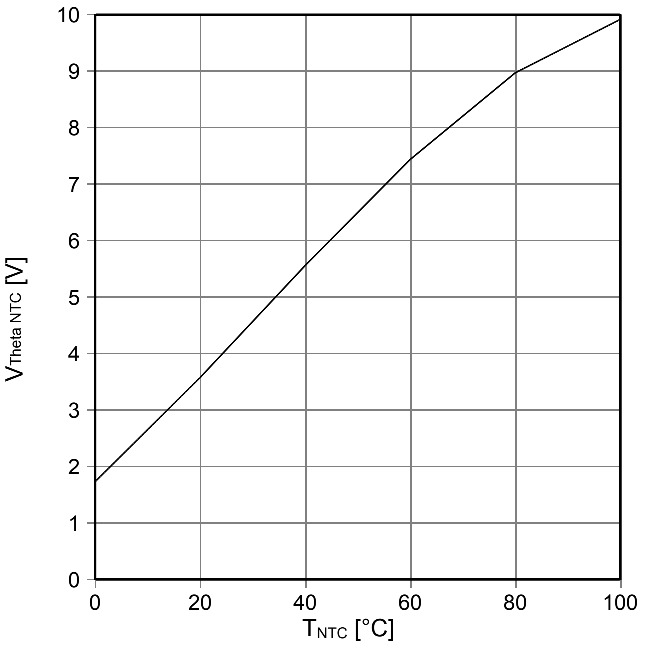
f_{sw} - derating curve IGBT (motor), Diode (generator)
V_{DC} = 1100 V, V_{AC} = 690 V_{RMS}, $f_{AC\ sine}$ = 50 Hz, cosφ = ±0.85
T_{inlet} = 40°C and nom. cooling conditions



T_{inlet} - derating curve IGBT (motor), Diode (generator)
V_{DC} = 1100 V, V_{AC} = 690 V_{RMS}, $f_{AC\ sine}$ = 3 kHz, $f_{AC\ sine}$ = 50 Hz
cosφ = ±0.85 and nom. cooling conditions



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



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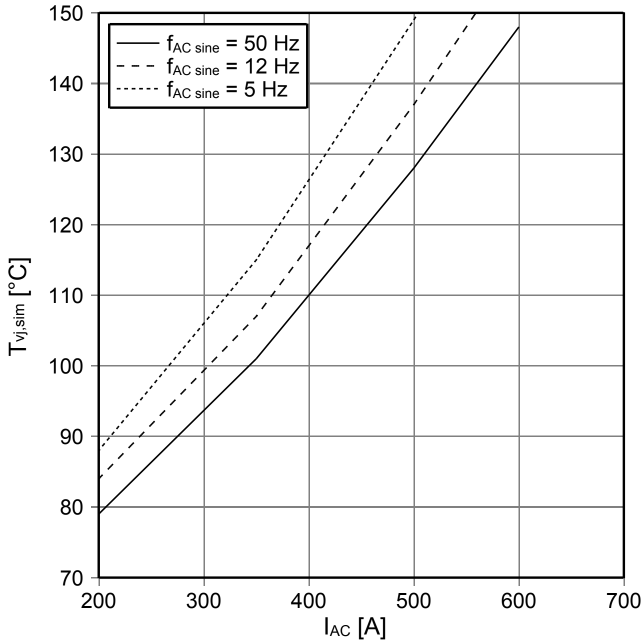
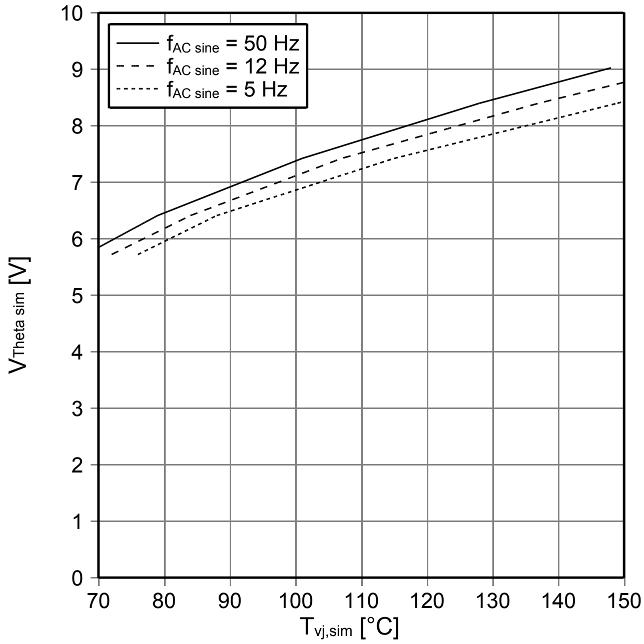
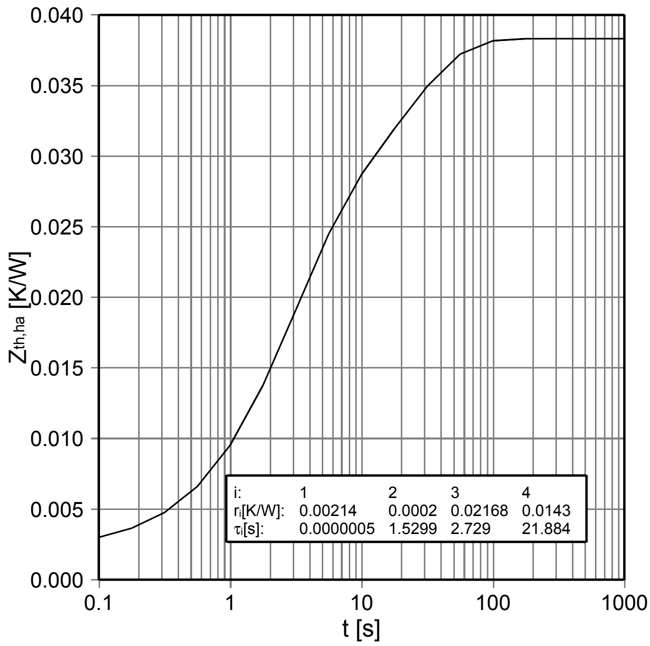
$T_{vj,sim}$ vs. I_{AC} - Simulated junction temperature
V_{DC} = 1100 V, V_{AC} = 690 V_{RMS}, f_{sw} = 3 kHz
T_{inlet} = 40°C and nom. cooling conditions



Analog temperature sensor output $V_{Theta\ sim}$
V_{DC} = 1100 V, V_{AC} = 690 V_{RMS}, f_{sw} = 3 kHz,
T_{inlet} = 40°C and nom. cooling conditions



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



i:	1	2	3	4
r_i[K/W]:	0.00214	0.0002	0.02168	0.0143
τ_i[s]:	0.0000005	1.5299	2.729	21.884

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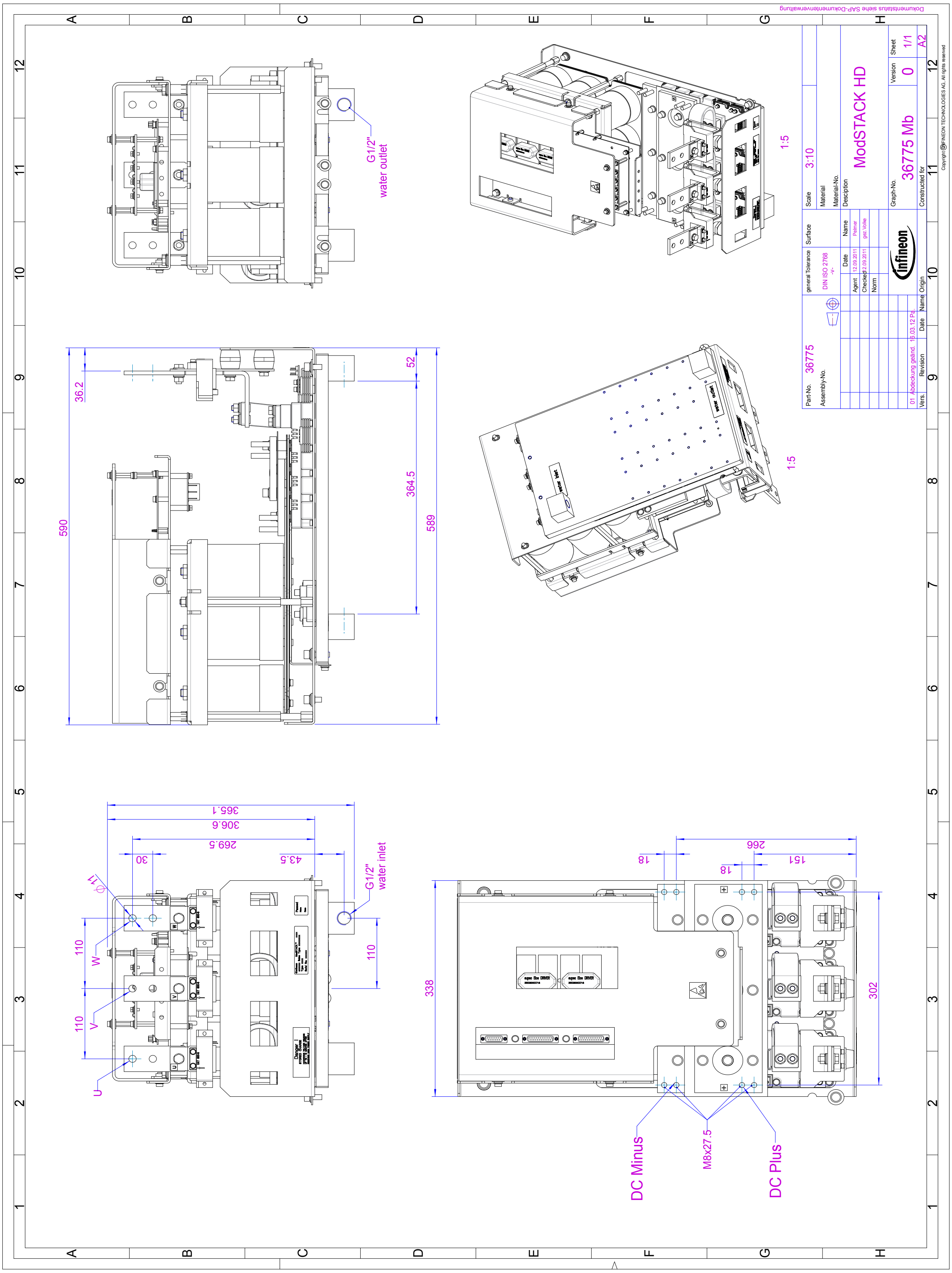
Mechanical drawing



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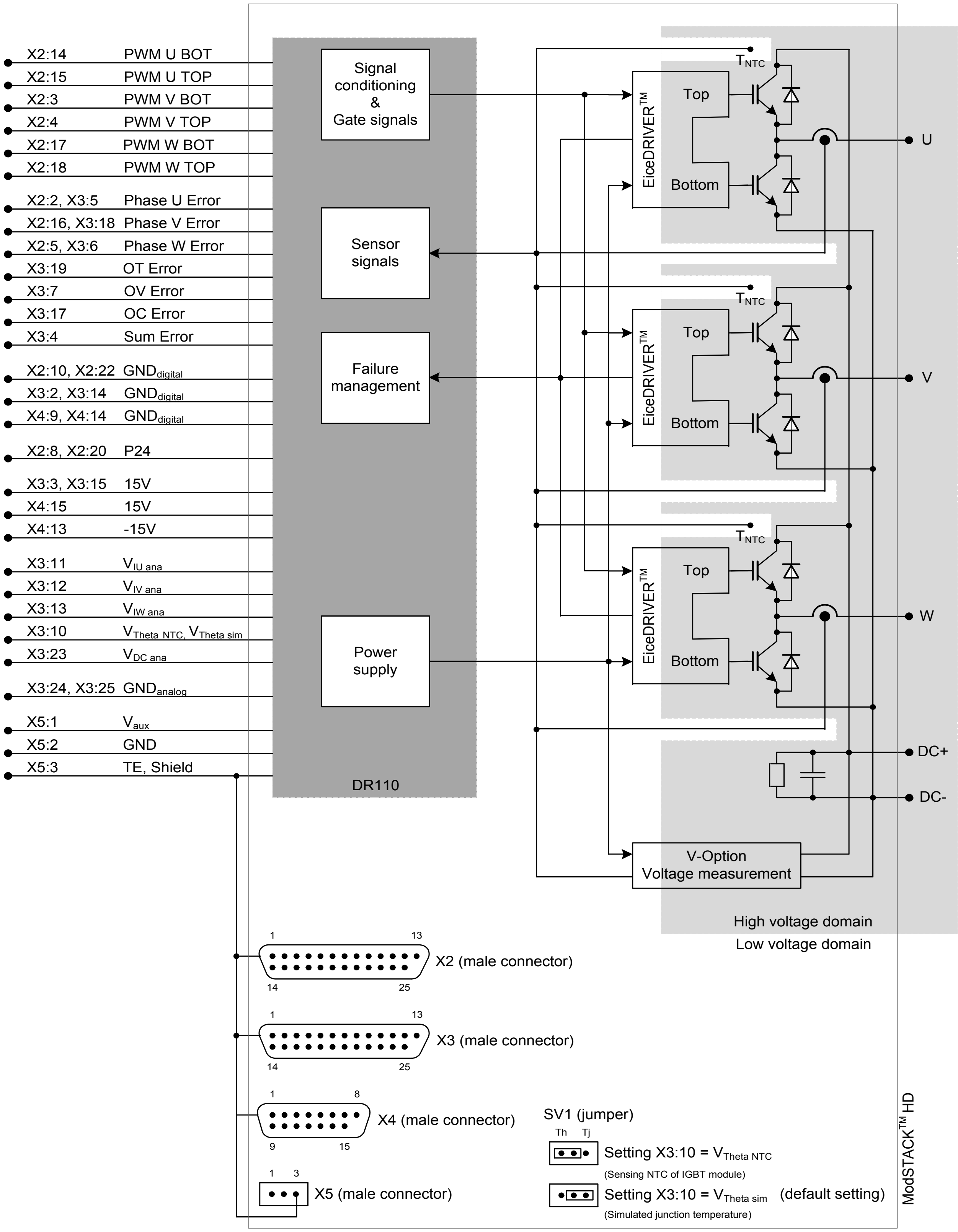
Circuit diagram



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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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