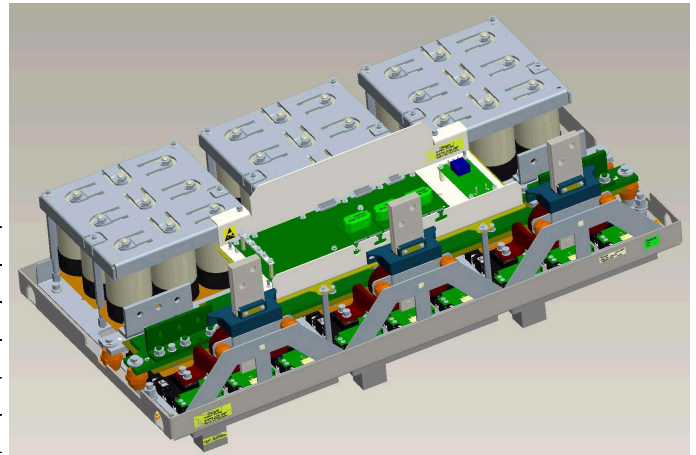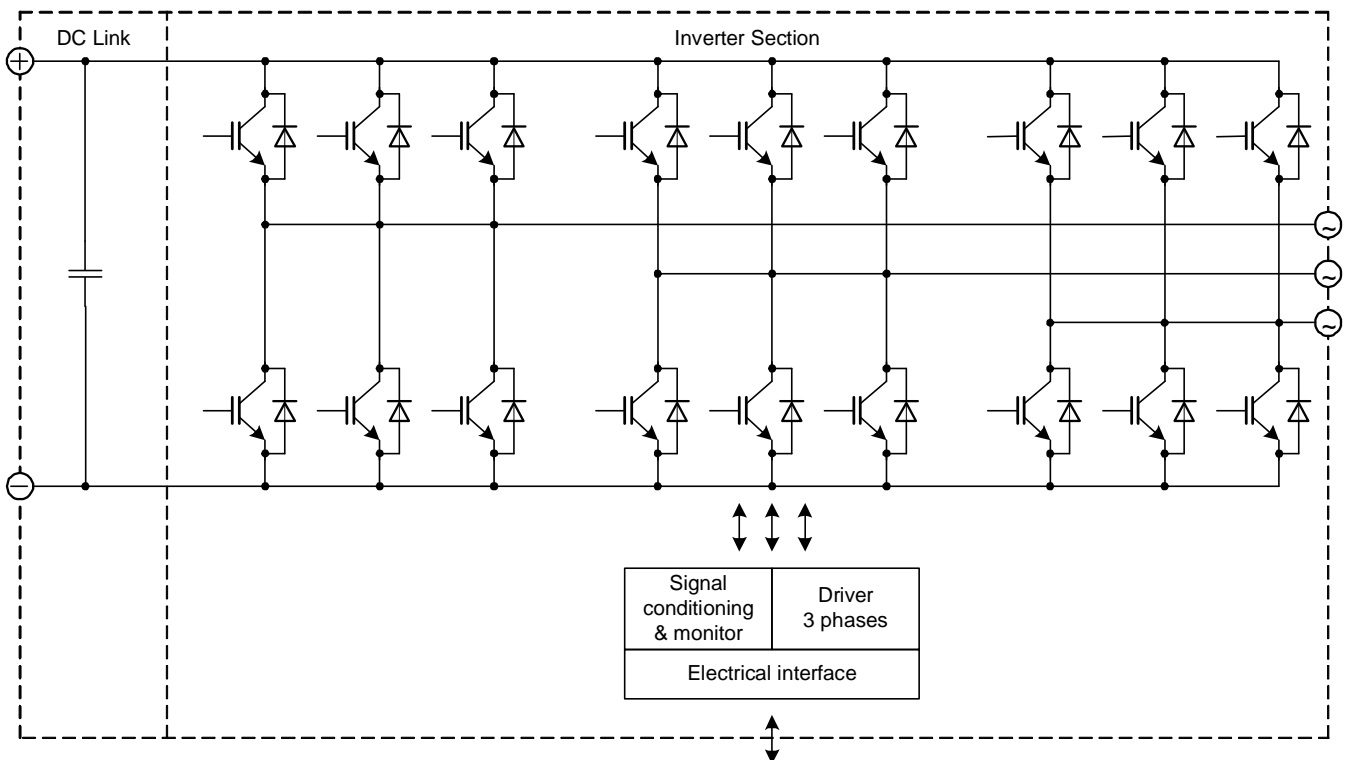**Preliminary data**

General information

IGBT Stack for typical voltages of up to 690 V$_{RMS}$
Rated output current 1800 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)	9x FF1000R17IE4
DC Link	10.8 mF
Heatsink	Water cooled
Implemented sensors	Current, voltage, temperature
Driver signals IGBT	Electrical
Sales - name	6MS30017E43W33015
SP - No.	SP000840440

prepared by: AV	date of publication: 2012-04-04
approved by: AR	revision: 2.3

Technical Information

ModSTACK™ HD **6MS30017E43W33015**

Infineon

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}	4280	A
Repetitive peak forward current inverter section (Diode)	t_p = 1 ms	I_{FRM2}	4280	A
I²t-value inverter section (Diode)	V_R = 0 V, t_p = 10 ms, T_{vj} = 125 °C	I²t	378	kA²s
Continuous current inverter section		I_{AC2}	1800	A_{RMS}
Junction temperature	under switching conditions	T_{vjop}	150	°C
Switching frequency inverter section		f_{sw2}	3	kHz

Notes
Further maximum ratings are specified in the following dedicated sections

Characteristic values

DC Link

			min.	typ.	max.	
Rated voltage		V_{DC}		1100	1200	V
Over voltage shutdown	within 150 µs			1250		V
Capacitor	1 s, 27 p, rated tol. ±10 %	C_{DC}		10.8		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		15.7		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}, $\cos(\varphi)$ = 0.85, $f_{AC\ sine}$ = 50 Hz, f_{sw} = 3000 Hz, T_{inlet} = 40°C, T_j ≤ 150 °C	I_{AC}			1800	A_{RMS}
Continuous current at low frequency	V_{DC} = 1100 V, $f_{AC\ sine}$ = 0 Hz, f_{sw} = 3000 Hz, T_{inlet} = 40 °C, T_j ≤ 150 °C	$I_{AC\ low}$			880	A_{RMS}
Rated continuous current for 150% overload capability	$I_{AC\ 150\%}$ = 2047 A_{RMS}, $t_{on\ over}$ = 60 s, T_j ≤ 150 °C	$I_{AC\ over1}$			1365	A_{RMS}
Rated continuous current for 150% overload capability	$I_{AC\ 150\%}$ = 2203 A_{RMS}, $t_{on\ over}$ = 3 s, T_j ≤ 150 °C	$I_{AC\ over2}$			1468	A_{RMS}
Over current shutdown	within 15 µs	$I_{AC\ OC}$		4280		A_{peak}
Power losses	I_{AC} = 1800 A, V_{DC} = 1100 V, V_{AC} = 690 V_{RMS}, $\cos(\varphi)$ = 0.85, $f_{AC\ sine}$ = 50 Hz, f_{sw} = 3000 Hz, T_{inlet} = 40 °C, T_j ≤ 150 °C	P_{loss}		29140		W

prepared by: AV	date of publication: 2012-04-04
approved by: AR	revision: 2.3

Technical Information

ModSTACK™ HD **6MS30017E43W33015**

Controller interface

			min.	typ.	max.	
Driver and interface board	ref. to separate Application Note			DR110		
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, @ 1800 A_{RMS}	$V_{IU\ ana2}$ $V_{IV\ ana2}$ $V_{IW\ ana2}$	4.1	4.2	4.3	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} = 62 °C, corresponds to T_j = 135 °C at rated conditions	$V_{Theta\ NTC2}$		7.2		V
Analog temperature sensor output inverter section (Simulated)	load max 1 mA, @T_{NTC} = 62 °C, corresponds to T_j = 135 °C at rated conditions	$V_{Theta\ sim2}$		8.9		V
Over temperature shutdown inverter section		$V_{Error\ OT2}$		9.2		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			1090	596	339	mm
Weight					137		kg

Infineon

Preliminary data

Heatsink water cooled

			min.	typ.	max.	
Water flow	according to coolant specification from Infineon	$\Delta V/\Delta t$	45			dm³/min
Water pressure					8	bar
Water pressure drop	at 45 dm³/min water flow	Δp		200		mbar
Coolant inlet temperature		T_{inlet}	-40		55	°C
Thermal resistance heatsink to ambient	per switch	$R_{th,ha}$		0.03		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)
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

Preliminary data

$f_{AC\ sine}$ - derating curve IGBT (motor), Diode (generator)
V_{DC} = 1100 V, V_{AC} = 690 V_{RMS}, f_{sw} = 3 kHz, $\cos_\varphi$ = ±0.85,
T_{inlet} = 40 °C and nom. cooling conditions
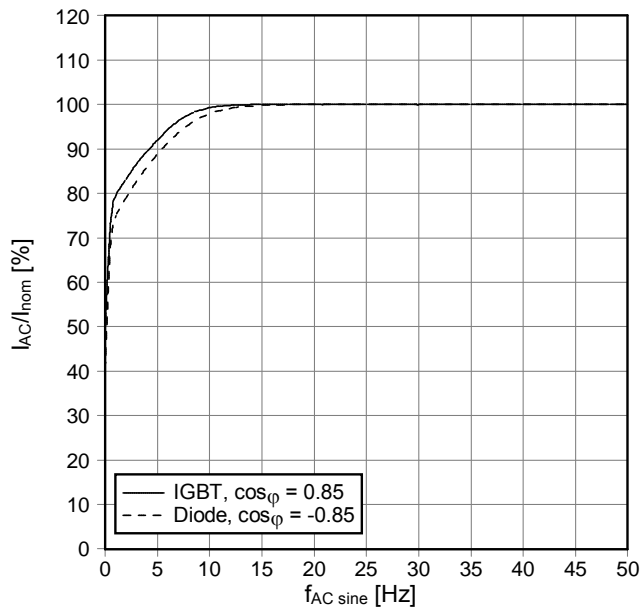
f_{sw} - derating curve IGBT (motor), Diode (generator)
V_{DC} = 1100 V, V_{AC} = 690 V_{RMS}, $f_{AC\ sine}$ = 50 Hz, $\cos_\varphi$ = ±0.85,
T_{inlet} = 40 °C and nom. cooling conditions
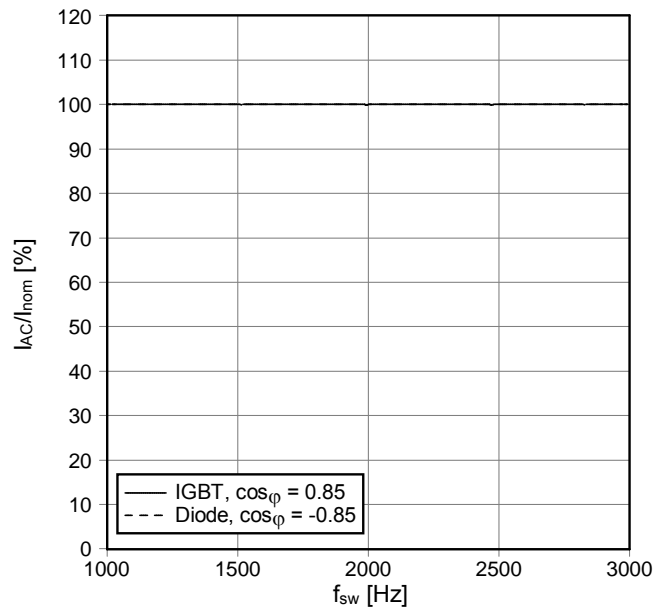
T_{inlet} - derating curve IGBT (motor), Diode (generator)
V_{DC} = 1100 V, V_{AC} = 690 V_{RMS}, f_{sw} = 3 kHz, $f_{AC\ sine}$ = 50 Hz,
$\cos_\varphi$ = ±0.85 and nom. cooling conditions
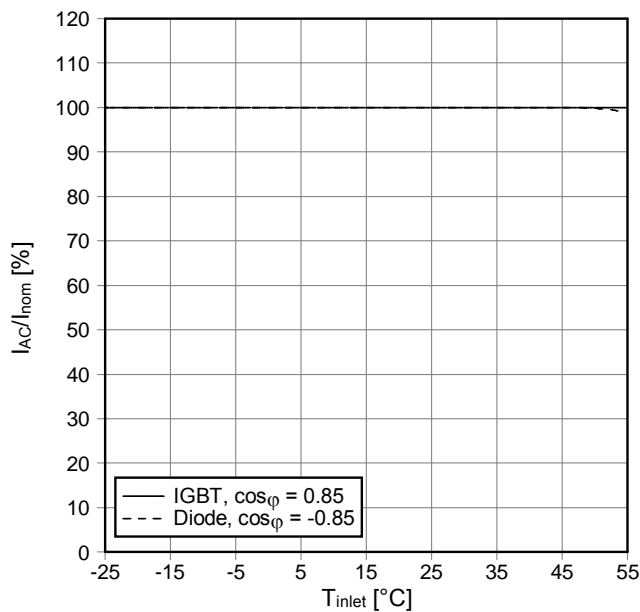
Analog temperature sensor output $V_{Theta\ NTC}$
Sensing NTC of IGBT module

prepared by: AV	date of publication: 2012-04-04
approved by: AR	revision: 2.3

T$_{vj,sim}$ vs. I$_{AC}$ - Simulated junction temperatur
V$_{DC}$ = 1100 V, V$_{AC}$ = 690 V$_{RMS}$, f$_{sw}$ = 3 kHz,
T$_{inlet}$ = 40 °C and nom. cooling conditions
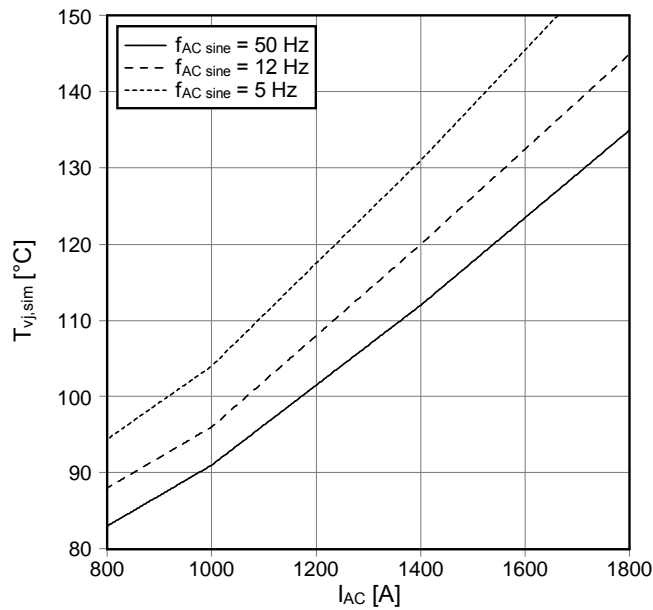
Analog temperature sensor output V$_{Theta\ sim}$
V$_{DC}$ = 1100 V, V$_{AC}$ = 690 V$_{RMS}$, f$_{sw}$ = 3 kHz,
nom. cooling conditions
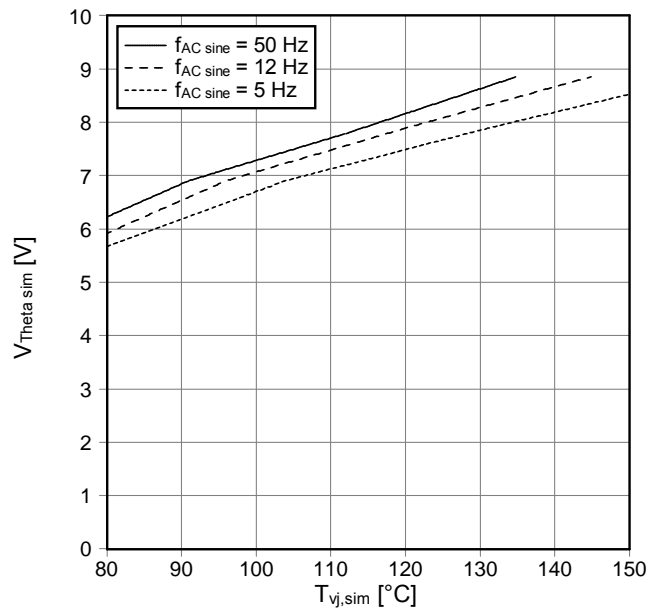
Z$_{th,ha}$ - thermal impedance heatsink to ambient per switch
nom. cooling conditions
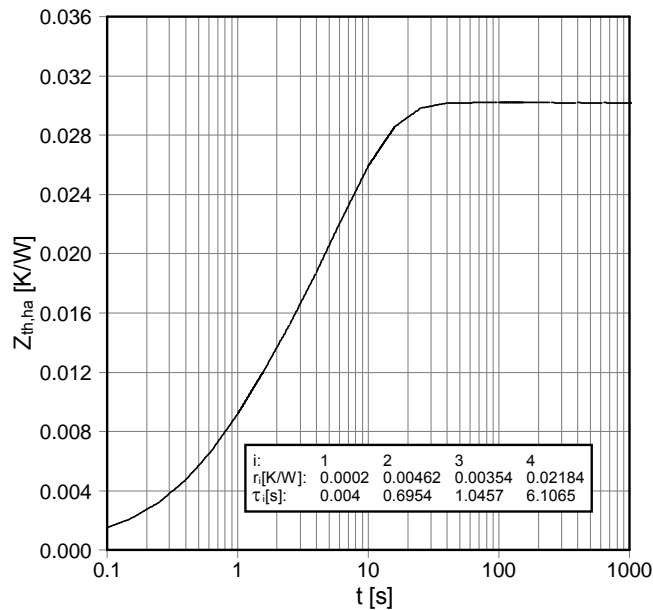
i:	1	2	3	4
r$_i$[K/W]:	0.0002	0.00462	0.00354	0.02184
τ$_i$[s]:	0.004	0.6954	1.0457	6.1065

prepared by: AV	date of publication: 2012-04-04
approved by: AR	revision: 2.3

Preliminary data

Mechanical drawing

Outline ModSTACK HD

Scale	1:5	
Graph-No.	33015 Mb	Version 0	Sheet 1/2

DC-Minus
3 connecting points
Ø13mm

DC-Plus
3 connecting points
Ø13mm

lifting lug

lifting lug

338.5±2

125.96

35.2

183

76

202.5

241.9

53.5

connection G1/2"
water outlet

connection G1/2"
water inlet

6x connection
G1/2"-15deep

DC-Minus

DC-Plus

285

43

17

26

340

Ø13.5

340

60

Ø13

1090

596

AC

AC

AC

DC-Minus

DC-Plus
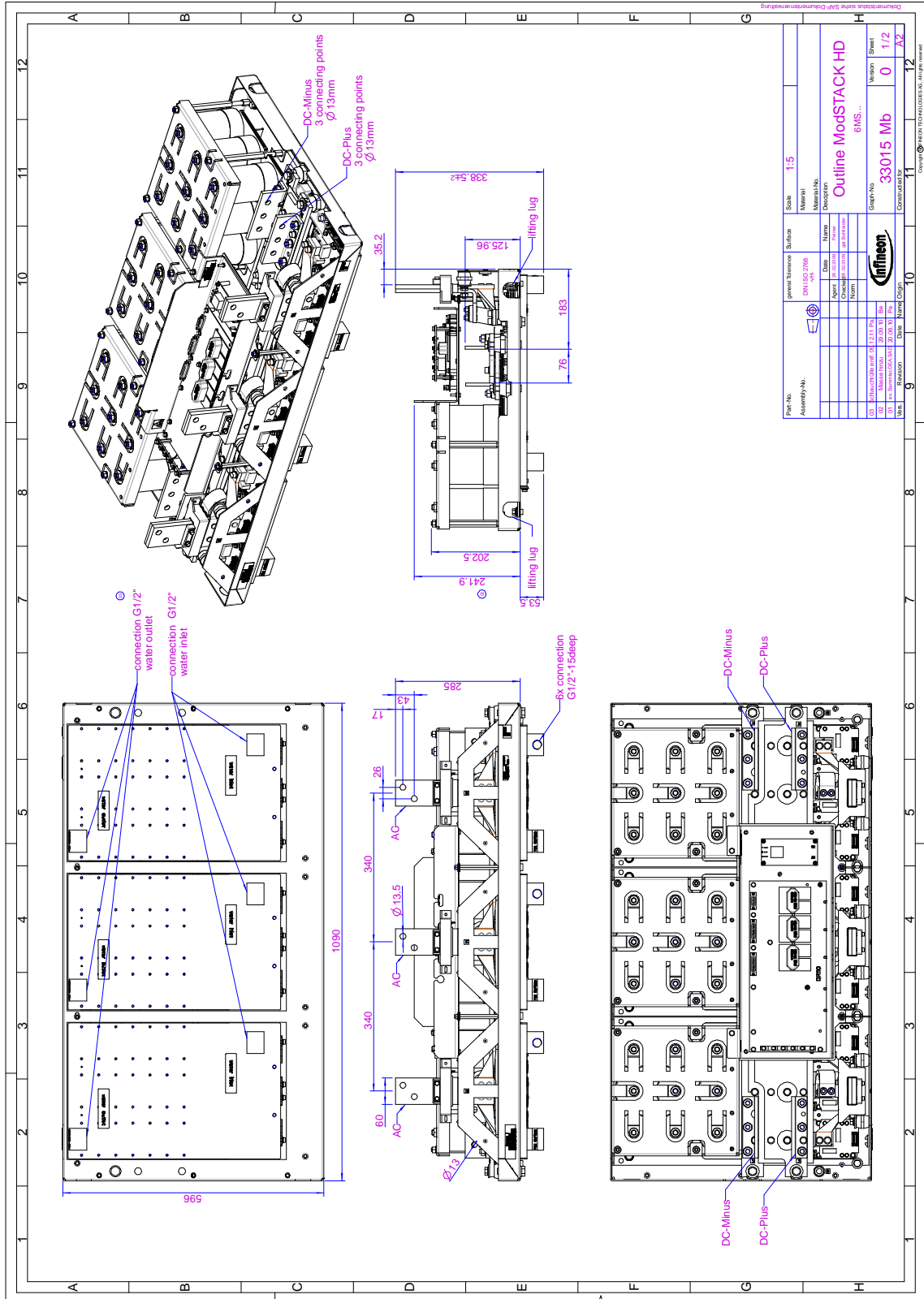
prepared by: AV	date of publication: 2012-04-04
approved by: AR	revision: 2.3

Circuit diagram

X2:14	PWM U BOT	
X2:15	PWM U TOP	
X2:3	PWM V BOT	
X2:4	PWM V TOP	
X2:17	PWM W BOT	
X2:18	PWM W TOP	
X2:2, X3:5	Phase U Error	
X2:16, X3:18	Phase V Error	
X2:5, X3:6	Phase W Error	
X3:19	OT Error	
X3:7	OV Error	
X3:17	OC Error	
X3:4	Sum Error	
X2:10, X2:22	$GND_{digital}$	
X3:2, X3:14	$GND_{digital}$	
X4:9, X4:14	$GND_{digital}$	
X2:8, X2:20	P24	
X3:3, X3:15	15V	
X4:15	15V	
X4:13	-15V	
X3:11	$V_{IU\ ana}$	
X3:12	$V_{IV\ ana}$	
X3:13	$V_{IW\ ana}$	
X3:10	$V_{Theta\ NTC}$, $V_{Theta\ sim}$	
X3:23	$V_{DC\ ana}$	
X3:24, X3:25	GND_{analog}	
X5:1	V_{aux}	
X5:2	GND	
X5:3	TE, Shield	

Signal conditioning & Gate signals

Sensor signals

Failure management

Power supply

DR110

T_{NTC}

EiceDRIVER™ Top Bottom — U

EiceDRIVER™ Top Bottom — V

EiceDRIVER™ Top Bottom — W

DC+
DC-

V-Option
Voltage measurement

High voltage domain
Low voltage domain

X2 (male connector)   1 ... 13 / 14 ... 25

X3 (male connector)   1 ... 13 / 14 ... 25

X4 (male connector)   1 ... 8 / 9 ... 15

X5 (male connector)   1 ... 3

SV1 (jumper)
Th   Tj

Setting X3:10 = $V_{Theta\ NTC}$
(Sensing NTC of IGBT module)

Setting X3:10 = $V_{Theta\ sim}$ (default setting)
(Simulated junction temperature)

ModSTACK™ HD

prepared by: AV	date of publication: 2012-04-04
approved by: AR	revision: 2.3

Terms & Conditions of usage

The data contained in this product data sheet is exclusively intended for technically trained staff. You and your technical departments will have to evaluate the suitability of the product for the intended application and the completeness of the product data with respect to such application.

This product data sheet is describing the characteristics of this product for which a warranty is granted. Any such warranty is granted exclusively pursuant the terms and conditions of the supply agreement. There will be no guarantee of any kind for the product and its characteristics.

Should you require product information in excess of the data given in this product data sheet or which concerns the specific application of our product, please contact the sales office, which is responsible for you (see www.infineon.com, sales&contact). For those that are specifically interested we may provide application notes.

Due to technical requirements our product may contain dangerous substances. For information on the types in question please contact the sales office, which is responsible for you.

Should you intend to use the Product in aviation applications, in health or live endangering or life support applications, please notify. Please note, that for any such applications we urgently recommend
 - to perform joint Risk and Quality Assessments;
 - 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.

If and to the extent necessary, please forward equivalent notices to your customers.

Changes of this product data sheet are reserved.

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.

prepared by: AV	date of publication: 2012-04-04
approved by: AR	revision: 2.3