Technical Information

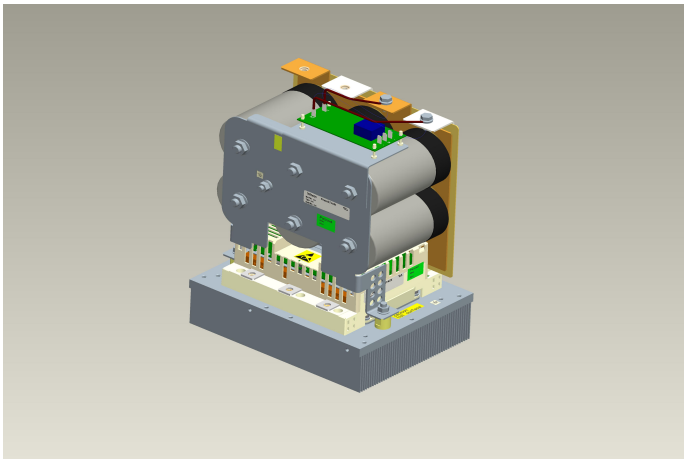
PrimeSTACK™ 6PS04512E43G37986

Preliminary data

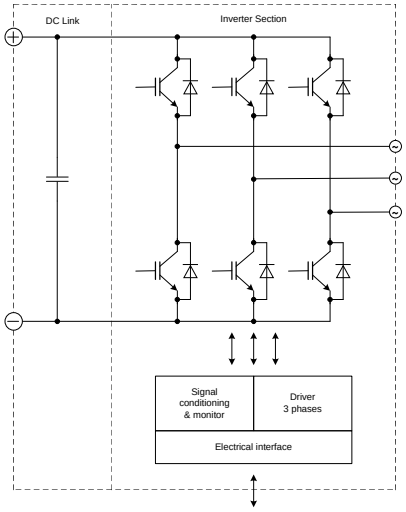
General information

IGBT STACK for typical voltage of up to 400V
Rated output current 217A

- Solar power
- Motor drivers
- 62mm IGBT power module
· Trenchstop™IGBT 4



Topology	B6I
Application	Inverter
Load type	Resistive, inductive
Semiconductor (Inverter Section)	3 x FF450R12KE4
DC Link	2.4 mF
Heatsink	Forced air colled (fan not included)
Implemented sensors	Current,voltage, temperature
Driver signals IGBT	Electrical
Design standards	EN 50178
Sales - name	6PS04512E43G37986
SP - No.	SP001046792



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Absolute maximum rated values

Collector-emitter voltage	IGBT; T_{vj} = 25°C	V_{CES}	1200	V
Repetitive peak reverse voltage	Diode; T_{vj} = 25°C	V_{RRM}	1200	V
DC link voltage	IGBT not swtiching	V_{DC}	900	V
Insulation management	according to installation height of 2000 m	V_{line}	500	V_{RMS}
Insulation test voltage	according to EN 50178, f = 50 Hz, t = 1 s	V_{ISOL}	2	kV_{RMS}
Repetitive peak collector current inverter section (IGBT)	t_p = 1 ms	I_{CRM2}	900	A
Repetitive peak forward current inverter section (Diode)	t_p = 1 ms	I_{FRM2}	900	A
Continuous current inverter section		I_{AC2}	270	A_{RMS}
Junction temperature	under switching conditions	T_{vjop}	150	°C
Switching frequency inverter section		f_{sw2}	14	kHz

Notes
Further maximun ratings are specified in the following dedicated sections

Characteristic values

DC Link

			min.	typ.	max.	
Rated voltage		V_{DC}		600	850	V
Over voltage shutdown	within 1000 µs			850		V
Capacitor	1 s, 6 p	C_{DC}		2.4		mF
Maximum ripple current	per device, T_{amb} = 55 °C	I_{ripple}		49		A_{RMS}
Balance or discharge resistor	per DC link unit	R_b		164		kΩ

Inverter Section

			min.	typ.	max.	
Rated continuous current	V_{DC} = 600 V, V_{AC} = 400 V_{RMS}, cos(φ) = 0.85, $f_{AC\ sine}$ = 50 Hz, f_{sw} = 5000 Hz, T_{inlet} = 40°C, $T_j \leq$ 125 °C	I_{AC}		265		A_{RMS}
Over current shutdown	within 15 µs	$I_{AC\ OC}$		626		A_{peak}
Power losses	I_{AC} = 265 A, V_{DC} = 600 V, V_{AC} = 400 V_{RMS}, cos(φ) = 0.85, $f_{AC\ sine}$ = 50 Hz, f_{sw} = 5000 Hz, T_{inlet} = 40 °C, $T_j \leq$ 125 °C	P_{loss}		2275		W

Inverter Section (specific condition)

			min.	typ.	max.	
Specific continuous current	V_{DC} = 750 V, V_{AC} = 400 V_{RMS}, cos(φ) = 0.8, $f_{AC\ sine}$ = 50 Hz, f_{sw} = 5000 Hz, T_{inlet} = 40 °C, $T_j \leq$ 125 °C	I_{ACsp}		217		A_{RMS}
Continuous current at low frequency	V_{DC} = 750 V, V_{AC} = 400 V_{RMS}, cos(φ) = 0.8, $f_{AC\ sine}$ = 0 Hz, f_{sw} = 5000 Hz, T_{inlet} = 40 °C, $T_j \leq$ 125 °C	I_{ACsp}		105		A_{RMS}
Specific continuous current for 150% overload capability	$I_{AC\ 150\%}$ = 263 A_{RMS}, $t_{on\ over}$ = 3 s, $T_j \leq$ 125 °C	$I_{ACsp\ over1}$		175		A_{RMS}
Specific continuous current for 150% overload capability	$I_{AC\ 150\%}$ = 229 A_{RMS}, $t_{on\ over}$ = 60 s, $T_j \leq$ 125 °C	$I_{ACsp\ over2}$		152		A_{RMS}
Power losses	I_{AC} = 217 A, V_{DC} = 750 V, V_{AC} = 400 V_{RMS}, cos(φ) = 0.8, $f_{AC\ sine}$ = 50 Hz, f_{sw} = 5000 Hz, T_{inlet} = 40 °C, $T_j \leq$ 125 °C	P_{loss}		1975		W

Notes
Maximum junction temperature limited to 125°C under all operating conditions

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Controller interface

Driver and interface board	ref. to separate Application Note			DR210		
			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 10 kΩ, capacitor to GND 1 nF, logic high = on	$V_{in\ low}$	0		1.5	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 5 mA, @ 217 A_{RMS}	$V_{IU\ ana2}$ $V_{IV\ ana2}$ $V_{IW\ ana2}$	3.3	3.5	3.7	V
Analog DC link voltage sensor output	load max 5 mA, @ 850 V	$V_{DC\ ana}$	8.3	8.5	8.7	V
Analog temperature sensor output unit 1 (NTC)	load max 5 mA, @T_{NTC} = 85 °C, corresponds to T_j = 115 °C at rated conditions	$V_{Theta\ NTC1}$	10.7	10.9	11.1	V
Over temperature shutdown inverter section	load max 5 mA, @T_{NTC} = 87 °C	$V_{Error\ OT2}$		11		V

System data

				min.	typ.	max.	
EMC robustness	according to EN 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		85	%
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			216	335	376	mm
Weight					18		kg

Notes
Dimension "depth" does not include the data cables

Heatsink air cooled

			min.	typ.	max.	
Air flow	T_{air} = 25 °C, P_{air} = 1013 hPa, dry and dust free, measured at the side of the heat sink according to DIN 41882	ΔV/Δt		500		m³/h
Air pressure drop	at min. air flow	Δp		190		Pa
Air inlet temperature		T_{inlet}	-40		55	°C

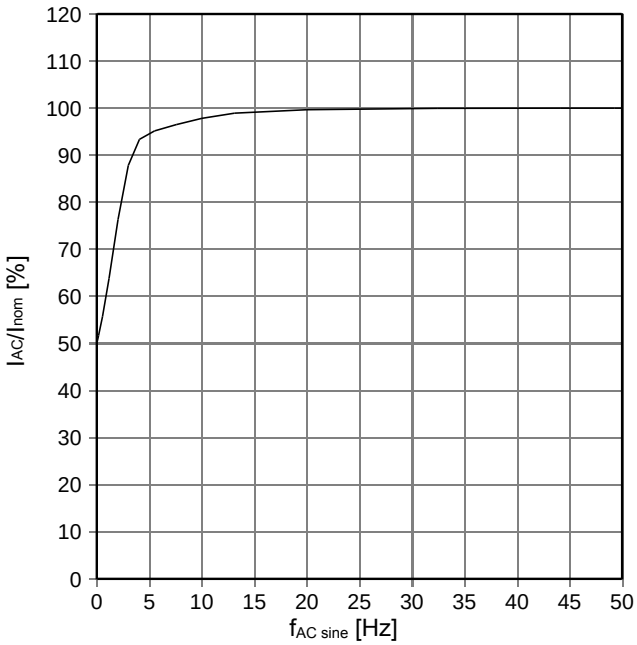
Preliminary data

Overview of optional components

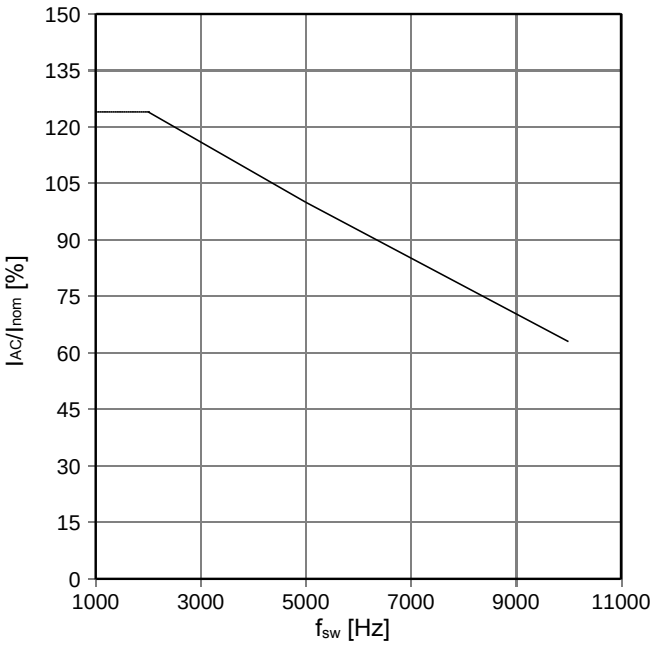
	Unit 1	Inverter Section	Unit 3
Parallel interface board			
Optical interface board			
Chopper controller			
Voltage sensor		×	
Current sensor		×	
Temperature sensor		×	
Temperature simulation			
DC link capacitors		×	
Data cable for control signals			
Fan			
Collector-emitter Active Clamping		×	

Notes
Setting of Active Clamping TVS-Diodes: V_Z = 824 V

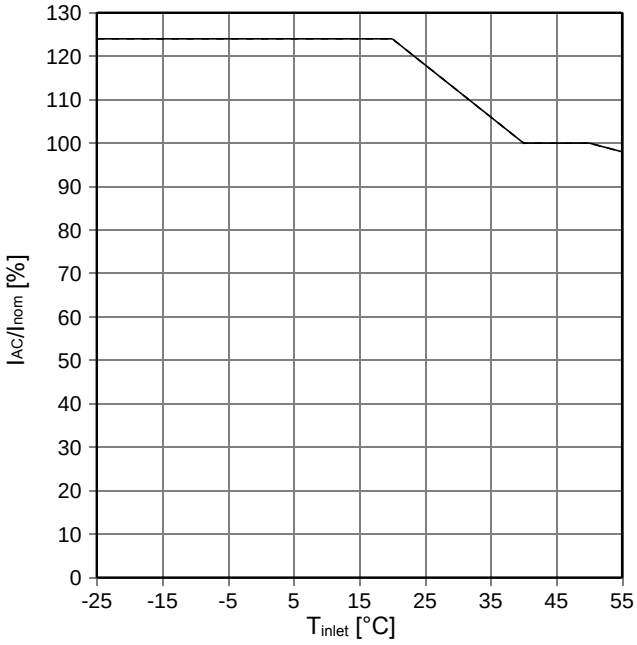
$f_{AC\ sine}$ - derating curve IGBT (motor), Diode (generator)
V_{DC} = 750 V, V_{AC} = 400 V_{RMS}, f_{sw} = 5 kHz, cosφ = ±0.8,
T_{inlet} = 40 °C and nom. cooling conditions



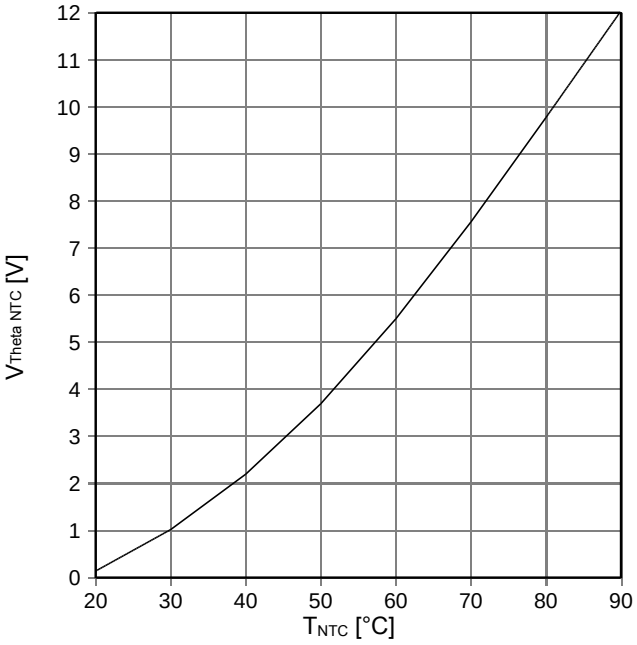
f_{sw} - derating curve IGBT (motor), Diode (generator)
V_{DC} = 750 V, V_{AC} = 400 V_{RMS}, $f_{AC\ sine}$ = 50 Hz, cosφ = ±0.8,
T_{inlet} = 40 °C and nom. cooling conditions



T_{inlet} - derating curve IGBT (motor), Diode (generator)
V_{DC} = 750 V, V_{AC} = 400 V_{RMS}, f_{sw} = 5 kHz, $f_{AC\ sine}$ = 50 Hz,
cosφ = ±0.8 and nom. cooling conditions



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



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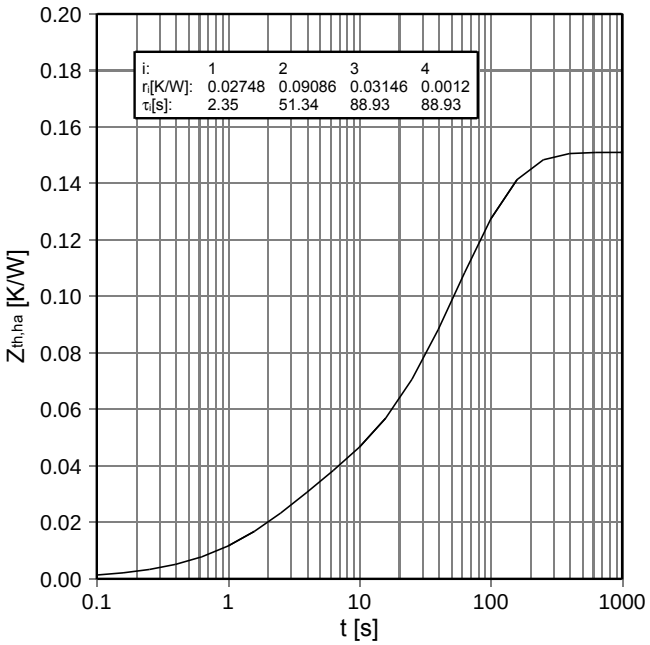
$Z_{th,ha}$ - thermal impedance heatsink to ambient per switch
nom. cooling conditions



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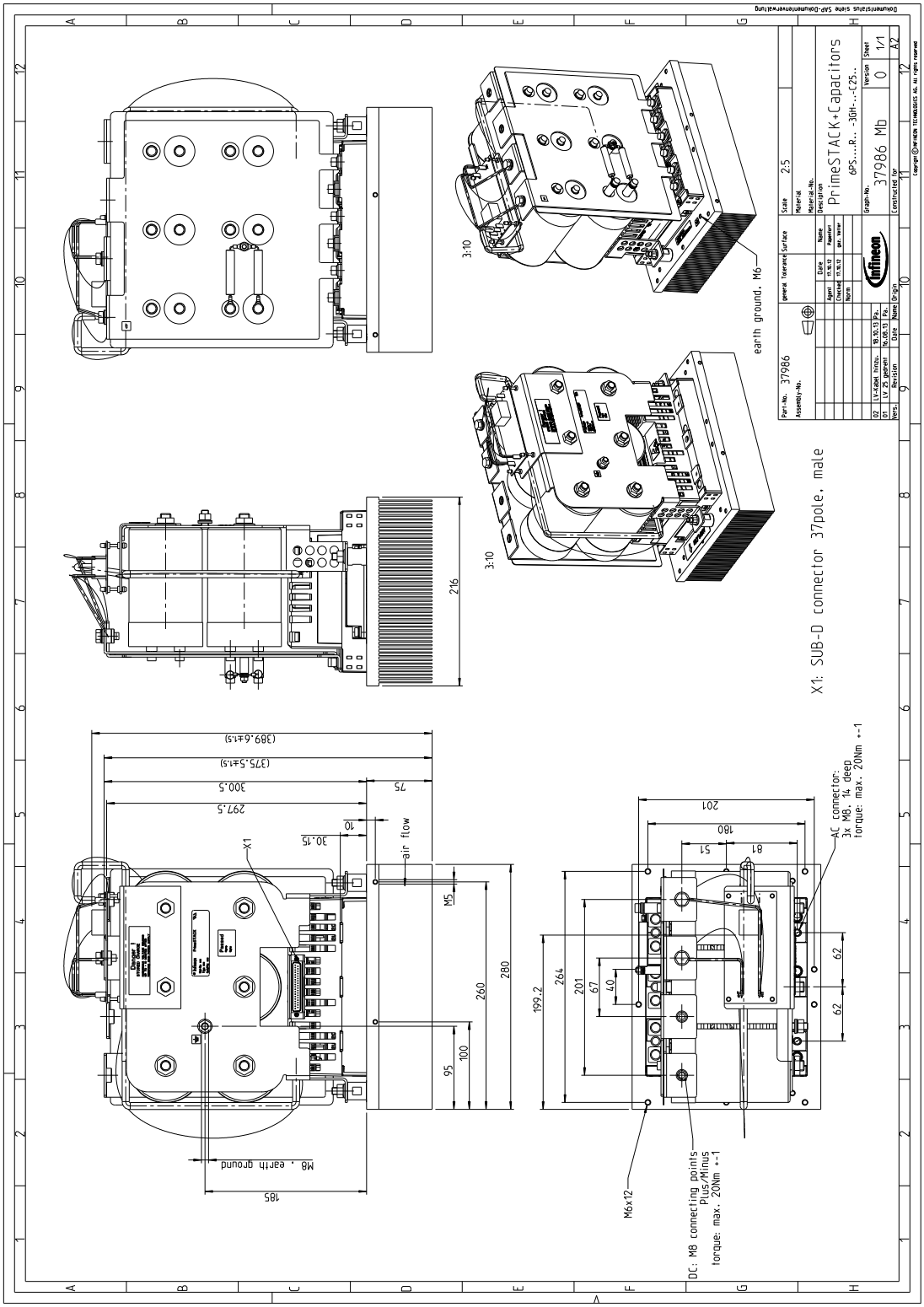
Mechanical drawing



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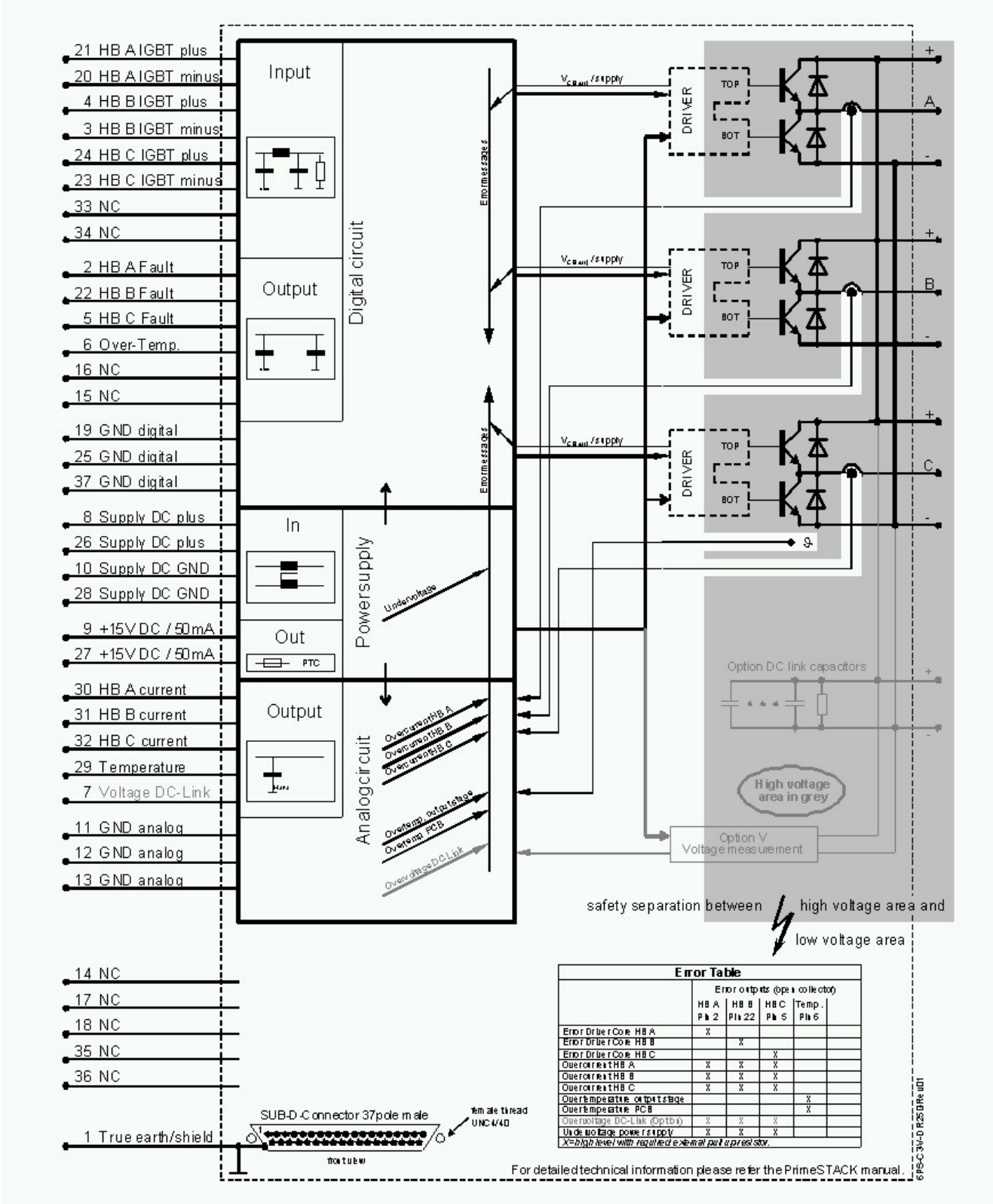
Circuit diagram



Error Table

	Error outputs (open collector)				
	HB A Pin 2	HB B Pin 22	HB C Pin 5	Temp. Pin 6	
Error Driver Core HB A	X				
Error Driver Core HB B		X			
Error Driver Core HB C			X		
Overcurrent HB A	X	X	X		
Overcurrent HB B	X	X	X		
Overcurrent HB C	X	X	X		
Overtemperature output stage				X	
Overtemperature PCB				X	
Overvoltage DC-Link (Option)	X	X	X		
Undervoltage power supply	X	X	X		

X= high level with required external pull up resistor.

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