

# DC-DC CONVERTER HFBC30-xxW/O

RAILWAY CONVERTER.

## FOR CHASSIS MOUNTING



## HIGHLIGHTS

- + Output Power up to 33 Watts\*
- + Ultra Wide Input Range
- + Wide Temperature Range
- + Hold-up-time > 10ms
- + RoHS compliance
- + According to EN50155

## INPUT

<b>Input Voltage Nominal</b>	24, 36, 48, 72 and 110 VDC
<b>Input Voltage Operating</b>	16,8-137,5 VDC
<b>Input Voltage Range</b>	14,4-154 VDC ( $\pm 1,0$ sec.)
<b>No Load Input Current</b>	See table page 2
<b>Internal Fusing</b>	3,15 AT

## OUTPUT

<b>Output Voltage</b>	5,1 V / 12 V
<b>Initial Set Accuracy</b>	< 1 % (no load)
<b>Minimum Load</b>	No minimum load
<b>Short circuit</b>	Continuous short circuit proof
<b>Line Regulation</b>	< 0,5 %
<b>Load Regulation</b>	< 1 % (0% - 100% load)***
<b>Ripple &amp; Noise</b>	< 1 % pk-pk, 20 MHz bandwidth
<b>Start Time</b>	< 250 ms
<b>Max. Output Capacitance</b>	500 $\mu$ F x $I_{out, nom}$
<b>Temperature Coefficient</b>	< 0.01 %/°C ( $V_{out1}$ and $V_{out2}$ )

## FEATURES

<b>Enable Signal Primary</b>	EN connected to Vin+ : ON; EN open or connected to Vin- : OFF.
<b>Active Reverse Polarity Protection</b>	Max. 160 V
<b>Inrush Current Limitation</b>	Max. 5 A
<b>Hold-up-time</b>	> 10 ms (typ. 15 ms) at full load
<b>Input Power Fail Signal</b>	Isolated Output. Active Level: Low
<b>Thermal Warning Signal</b>	Isolated Output. Active level: Low. T=70-75°C PCB with 5°C hysteresis
<b>Power Good Signal</b>	Open-collector Output

## PROTECTION

<b>Output Over Voltage Protection (OVP)</b>	110-130 % $V_{out, nom}$ (output 2 latched, reset through EN or power off)
<b>Over Current Protection (OCP)</b>	See table page 2
<b>Over Temperature Protection (OTP)</b>	Shutdown at +100-105°C PCB-temp. with 5°C hysteresis and auto recovery.

## GENERAL

<b>Product Standard</b>	EN 50155:2007
<b>Isolation</b>	2200 VDC Input to Output 1500 VDC Input to Earth (PE) 710 VDC Output to Earth (PE)
<b>Switching Frequency</b>	Typ. 100 / 135 / 260 kHz****
<b>Dimensions [mm]</b>	120 x 100 x 28
<b>Weight</b>	approx. 180 g
<b>MTBF</b>	1.400.000h at 40°C

## ENVIRONMENTAL

<b>Operating Ambient Temp.</b>	-40°C to +85°C*
<b>Operating PCB Temp.</b>	-40°C to +100°C
<b>Storage Temperature</b>	-40°C to +100°C
<b>Vibration / Shock / Bump</b>	EN 61373:1999, Cat. 1B

## EMC

<b>EMC Standard</b>	EN 50121-3-2:2006
<b>Conducted Emissions</b>	EN 55011:2007+A2:2007, Class A**
<b>ESD Immunity</b>	EN 61000-4-2 :1995+A1 :1998+A2 :2001, level 3 (6kV/8kV), Criteria A
<b>Burst</b>	EN 61000-4-4:2004, level 3 (2kV), Criteria A
<b>Surge</b>	EN 50121-3-2:2006, line to line $\pm$ 1kV, 42R, and line to case $\pm$ 2kV, 42R, Criteria B
<b>Conducted Immunity</b>	EN 61000-4-6:2007+A1:2001, level 3 (10V), Criteria A

\* +70°C continuously, +85°C max. 10 minutes. With additional thermal conductive pads between PCB and heat sinking mounting surface at free convection in vertical position.

\*\* In built-in condition the devices may show different EMC properties.

\*\*\* Value could be higher, depending on the voltage drop of the connector.

\*\*\*\* Booster / Converter / Step-down

# TECHNICAL DATA

For  $T_{amb} = 25^{\circ}\text{C}$ ,  $V_{in\ nom}$ ,  $I_{out\ nom}$ , unless otherwise specified

## SPECIFICATION Input 14,4 - 154 VDC

TYPE		HFBC30-2DW/O					
ORDER NUMBER		87 63 65 0112 3 connector horizontal					
		87 63 65 0113 7 connector vertical					
CHARACTERISTIC		Unit					
INPUT	Input Voltage Nominal	V	24	36	48	72	110
	Input Voltage Range	V	14,4...36	21,6...51	28,8...67,2	43,2...101	66...154
	Under Voltage Turn-on	V	<16,8				
	Under Voltage Turn-off	V	<14,4 (14,4V < Vin < 16,8V at t > 1 sec.)				
	Input Current @ Full Load	A	1,75	1,1	0,85	0,55	0,35
	Input Current @ No Load*	A	0,128	0,085	0,065	0,043	0,028
	Input Current disabled mode	mA	9	6,5	5,5	4,5	4,5
OUTPUT			Output 1		Output 2		
	Output Voltage Nominal	V	5,1		12		
	Output Current Nominal	A	4		1...2,75***		
	Output Power	W	20		33***		
	Efficiency @ Full Load (typical)	%	80	82	83,5	84	85
	Output Current limit	A	5,0...5,5		1,9...3,9***		
	Short Circuit Current (typical)	A	4,8		5 (pulse approx. 8 Hz)**		
Transient Response 25 % / 75 % Load Step Recovery Time < 1 ms	mV	±50		±120			

\* Enable Primary on

\*\* Peak current pulsating

\*\*\* Power Distribution with  $V_{out1}$

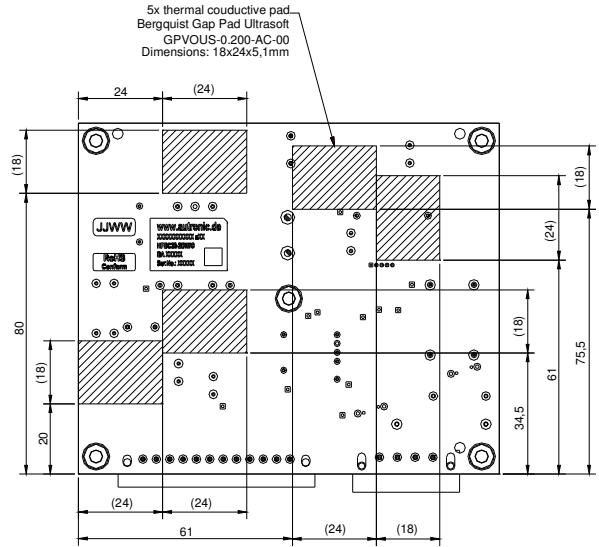
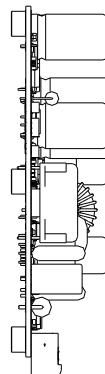
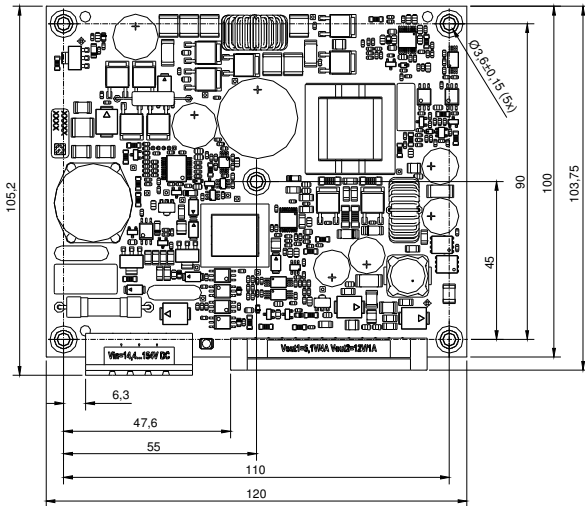
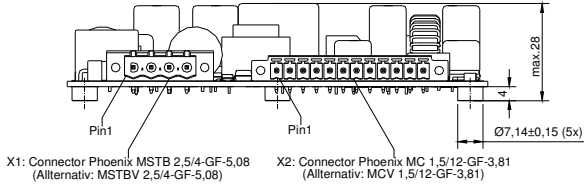
# TECHNICAL DATA

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## MECHANICAL DETAILS

- Dimensions in mm
- General tolerance  $\pm 0,5\text{mm}$

Coating: Lackwerke Peters ELPEGUARD SL 1307-FLZ/342



## PINNING

Pin	Function	Pin	Function
X1-1	$V_{in-}$	X2-1	+Input Power Fail
X1-2	$V_{in+}$	X2-2	-Input Power Fail
X1-3	Enable Primary	X2-3	Internal Connected
X1-4	Case (PE)	X2-4	Internal Connected
		X2-5	+Thermal Warning
		X2-6	-Thermal Warning
		X2-7	Power Good
		X2-8	GND (0 V)
		X2-9	$V_{out1}$ (5 V)
		X2-10	GND (0 V)
		X2-11	$V_{out2}$ (12 V)
		X2-12	GND (0 V)

## NOTES

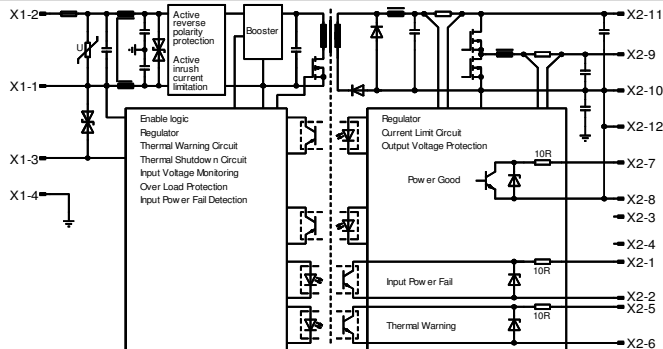
Installation instructions:

The converters have to be installed according to the guidelines currently in force, like other open electronic component assemblies. Attention must be paid to sufficient ventilation, carry off heat, fastening and protection against accidental contact. Additional thermal conductive pads might be necessary to get a thermal coupling to the mounting-surface. The mounting surface must be flat and able to remove the thermal energy of the PCB (PCB temperature must not exceed  $+100^{\circ}\text{C}$ ).

Fault protection:

The converters are equipped with a soldered-in-time-lag fuse corresponding to IEC 60127-2 for input protection. In case at fault the supplying current source must be capable to blow the fuse.

## BLOCK DIAGRAM



## DESCRIPTION OF FEATURES

For  $T_{amb} = 25^{\circ}\text{C}$ ,  $V_{in\ nom}$ ,  $I_{out\ nom}$ , unless otherwise specified

### ENABLE SIGNAL PRIMARY

If the Enable Signal is activated, the converter starts operating.

Enable Primary (X1-3) is activated by a voltage between 10 VDC and 160 VDC referenced to  $V_{in-}$  (X1-1).

Typically it is directly switched to  $V_{in+}$  to enable the converter. The pin sinks about 1,7 mA.

### INPUT POWER FAIL SIGNAL

The Input Power Fail is a potential-free open-collector output realized by an optocoupler. Maximum current = 5 mA, maximum voltage = 20 V, saturation voltage < 1,2 V. The Input Power Fail becomes active when the input voltage < 16,8 V. Input Power Fail could be provided, to inform the system about power loss, for a safe shutdown while the hold-up-time is running.

### THERMAL WARNING SIGNAL

The Thermal Warning is a potential-free open-collector output realized by an optocoupler.

Maximum current = 5 mA, maximum voltage = 20 V, saturation voltage < 1,2 V.

The Thermal Warning becomes active when the temperature of the PCB rises above typ.  $75^{\circ}\text{C}$ , with a hysteresis of about  $5^{\circ}\text{C}$ .

### POWER GOOD SIGNAL

The Power Good is an open-collector output to inform the system if the output voltages are under 95 % of  $V_{out\ nom}$ .

### OVER CURRENT PROTECTION

The output power of the converter is limited to about 40 W. The power is distributed to the both output voltages, 12 V and 5 V.

The main output is 12 V and can carry up to 2,75 A continuously. At overload and current limit, the voltage decreases down to 8 V, then the converter switches-off and tries to restart after 100 ms. Out of the 12 V, the 5 V output is made. It has a nominal current of 4 A and current limit of about 5 A. If 12 V switches-off, 5 V goes down, too.

### On request:

### STATUS LED

Between the two connectors a LED can be activated, to show internal states or errors with a customer specific blinking code. The functionality is user-configurable with the integrated microprocessor.

### SECONDARY STANDBY VOLTAGE

Instead of the Power Good Signal a standby voltage of 5 V can be realized on X2-7, independent of the status of the converter. When the input voltage is above 15 V, the auxiliary power supply starts. The standby voltage is on the same potential as the other outputs. This output can carry load up to 75 mA, has a current limit at about 150 mA and is short circuit proof.

### ENABLE SIGNAL SECONDARY

Enable Secondary can be realized as a potential-free-input on (X2-3 / X2-4) with a voltage between 3 VDC and 12 VDC to activate the signal.