

DC-DC CONVERTER HFBC60-W/Ks, .../Ksl

RAILWAY CONVERTER.

FOR CHASSIS MOUNTING



HIGHLIGHTS

- + Output Power up to 60 Watts*
- + Efficiency up to 90%
- + Ultra Wide Input Range
- + Wide Temperature Range
- + Hold-up-time > 10ms
- + RoHS compliance
- + According to EN50155

INPUT

| | |
|-------------------------|-----------------------------|
| Input Voltage Nominal | 24, 36, 48, 72 and 110 VDC |
| Input Voltage Operating | 16,8-137,5 VDC |
| Input Voltage Range | 14,4-154 VDC (t ≤ 1,0 sec.) |
| No Load Input Current | See table page 2 |

OUTPUT

| | |
|-------------------------|--|
| Output Voltage | 5,1 V, 12 V and 24 V (other voltages on request) |
| Initial Set Accuracy | < 2 % (no load) |
| Minimum Load | No minimum load |
| Short circuit | Continuous short circuit proof |
| Line Regulation | < 0,5 % |
| Load Regulation | < 2 % (0% - 100% load) |
| Ripple & Noise | < 2 % pk-pk, 20 MHz bandwidth |
| Start Time | < 900 ms |
| Max. Output Capacitance | 500 uF x I _{out nom} |
| Temperature Coefficient | < 0.01 %/°C |

FEATURES

| | |
|----------------------------------|----------------------|
| Enable Signal | See page 4 |
| Active Inrush Current Limitation | Max. 8 A |
| Reverse Polarity Protection | Max.160 V |
| Hold-up-time | > 10 ms at full load |
| Adjust | See page 4 |
| Tracking | See page 4 |

PROTECTION

| | |
|-----------------------------------|---|
| Over Voltage Protection (OVP) | 110-130 % V _{out nom} (latched, reset through EN or power off) |
| Over Current Protection (OCP) | See table page 2 |
| Over Temperature Protection (OTP) | Shutdown at +105-110°C PCB-temp. with about 5°C hysteresis and auto recovery. |

GENERAL

| | |
|---------------------|--|
| Product Standard | EN 50155:2007 |
| Isolation | 2200 VDC Input to Output 2200 VDC Input to Earth (PE) 710 VDC Output to Earth (PE) |
| Switching Frequency | Typ. 120 kHz |
| Dimensions [mm] | 113,5 x 35 x 46 |
| Weight | approx. 320 g |
| MTBF | 6.200.000 h acc. to MIL-HDBK-217F (GB, 25°C) 1.300.000 h acc. to MIL-HDBK-217F (GF, 25°C) |

ENVIRONMENTAL

| | |
|--------------------------|------------------------|
| Operating Ambient Temp. | -40°C to +85°C* |
| Storage Temperature | -55°C to +100°C |
| Vibration / Shock / Bump | EN 61373:1999, Cat. 1B |

EMC

| | |
|---------------------|--|
| EMC Standard | EN 50121-3-2:2006 |
| Conducted Emissions | EN 55011:2009+A1:2010, Class A** |
| Radiated Emissions | EN 55011:2009+A1:2010, Class A** |
| ESD Immunity | EN 61000-4-2:2009, level 3 (6kV/8kV), Criteria A |
| Burst | EN 61000-4-4:2004, level 3 (2kV), Criteria A |
| Surge | EN 50121-3-2:2006, line to line ±1kV, 42R, and line to case ±2kV, 42R, Criteria B EN 61000-4-5:2006, line to line ±0,5kV, and line to case ±1kV |
| Conducted Immunity | EN 61000-4-6:2009, level 3 (10V), Criteria A |
| Radiated Immunity | EN 61000-4-3:2006+A1:2008+A2:2010, 20V/m, Criteria A |
| Safety Approvals | EN 60950-1:2006+A11:2009+A1:2010 +A12:2012 |

* +70°C continuously, +85°C max. 10 minutes at full load (baseplate temp. must not exceed +90°C).

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

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 | | HFBC60-W/Ks | | | | | |
|----------------|---|-----------------|---|-----------|-------------|------------|----------|
| ORDER NUMBER | | 87 71 08 0112 6 | | | | | |
| 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 | <15,0...16,8 | | | | |
| | Under Voltage Turn-off | V | <12,0...14,4 (14,4V < V_{in} < 16,8V at $t > 1$ sec.) | | | | |
| | Input Current @ Full Load | A | 3,0 | 2,0 | 1,4 | 0,95 | 0,62 |
| | Input Current @ No Load | A | 0,09 | 0,06 | 0,05 | 0,03 | 0,02 |
| | Recommended External Fuse | A | 6,0 | | | | |
| OUTPUT | Output Voltage Nominal | V | 5,1 | | | | |
| | Output Current Nominal | A | 12,0 | | | | |
| | Output Power | W | 60 | | | | |
| | Efficiency @ Full Load (typical) | % | 85 | 86 | 87 | 88 | 89 |
| | Output Current limit | A | 13,0...18,0 | | | | |
| | Short Circuit Current (typical) | | 20 (pulse approx. 3Hz)* | | | | |
| | Transient Response 25 % / 75 % Load Step Recovery Time < 1 ms | mV | ± 150 | | | | |

SPECIFICATION Input 14,4 - 154 VDC

| TYPE | | HFBC60-W/Ks | | | | | |
|----------------|---|-----------------|---|-----------|-------------|------------|----------|
| ORDER NUMBER | | 87 71 12 0112 1 | | | | | |
| 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 | <15,0...16,8 | | | | |
| | Under Voltage Turn-off | V | <12,0...14,4 (14,4V < V_{in} < 16,8V at $t > 1$ sec.) | | | | |
| | Input Current @ Full Load | A | 2,93 | 1,9 | 1,4 | 0,95 | 0,62 |
| | Input Current @ No Load | A | 0,05 | 0,035 | 0,03 | 0,015 | 0,01 |
| | Recommended External Fuse | A | 6,0 | | | | |
| OUTPUT | Output Voltage Nominal | V | 12 | | | | |
| | Output Current Nominal | A | 5 | | | | |
| | Output Power | W | 60 | | | | |
| | Efficiency @ Full Load (typical) | % | 86 | 88 | 88 | 89 | 90 |
| | Output Current limit | A | 6,0...7,0 | | | | |
| | Short Circuit Current (typical) | A | 10 (pulse approx. 3Hz)* | | | | |
| | Transient Response 25 % / 75 % Load Step Recovery Time < 1 ms | mV | ± 180 | | | | |

SPECIFICATION Input 14,4 - 154 VDC

| TYPE | | HFBC60-W/Ks / HFBC60-W/Ksl / HFBC60-W/Ksl* | | | | | |
|----------------|---|--|---|-----------|-------------|------------|----------|
| ORDER NUMBER | | 87 71 24 0112 6 / 87 71 24 0113 1 / 87 71 24 0119 7* | | | | | |
| 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 | <15,0...16,8 | | | | |
| | Under Voltage Turn-off | V | <12,0...14,4 (14,4V < V_{in} < 16,8V at $t > 1$ sec.) | | | | |
| | Input Current @ Full Load | A | 2,9 | 1,9 | 1,3 | 0,9 | 0,6 |
| | Input Current @ No Load | A | 0,05 | 0,03 | 0,025 | 0,015 | 0,01 |
| | Recommended External Fuse | A | 6,0 | | | | |
| OUTPUT | Output Voltage Nominal | V | 24 | | | | |
| | Output Current Nominal | A | 2,5 | | | | |
| | Output Power | W | 60 | | | | |
| | Efficiency @ Full Load (typical) | % | 87 | 88 | 89 | 90 | 91 |
| | Output Current limit | A | 2,8...3,8 | | | | |
| | Short Circuit Current (typical) | A | 5 (pulse approx. 3Hz)* | | | | |
| | Transient Response 25 % / 75 % Load Step Recovery Time < 1 ms | mV | ± 250 | | | | |

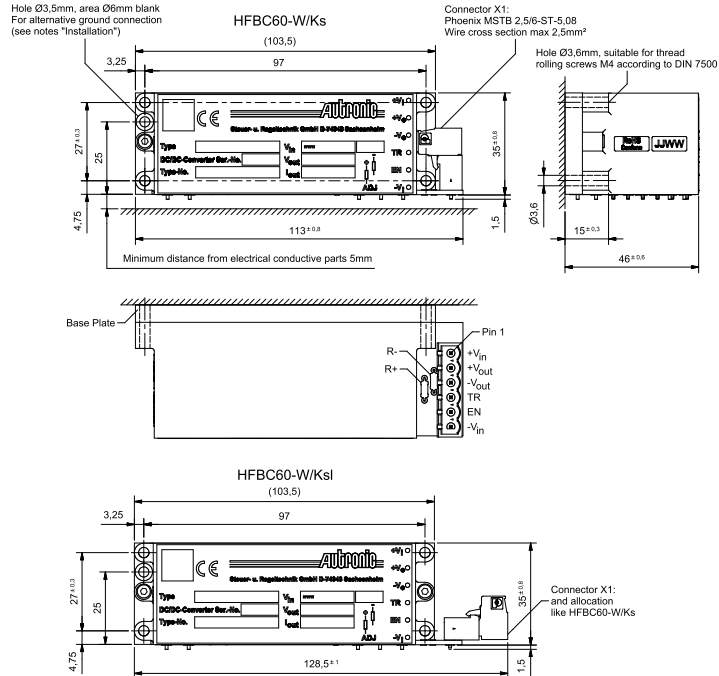
*without mating connector

TECHNICAL DATA

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

MECHANICAL DETAILS

1. Dimensions are in mm
2. Unless otherwise specified, general tolerances $\pm 0,5$ are for values in brackets (XX)
Values not in brackets are according to ISO-2768-1m



Resin compound: Polyurethane black, UL94-V0, EN45545-2:2016-02 HL-HL2-HL3 (R24)

PINNING

| Pin | Function |
|------|------------|
| X1-1 | $+V_{in}$ |
| X1-2 | $+V_{out}$ |
| X1-3 | $-V_{out}$ |
| X1-4 | TR |
| X1-5 | EN |
| X1-6 | $-V_{in}$ |

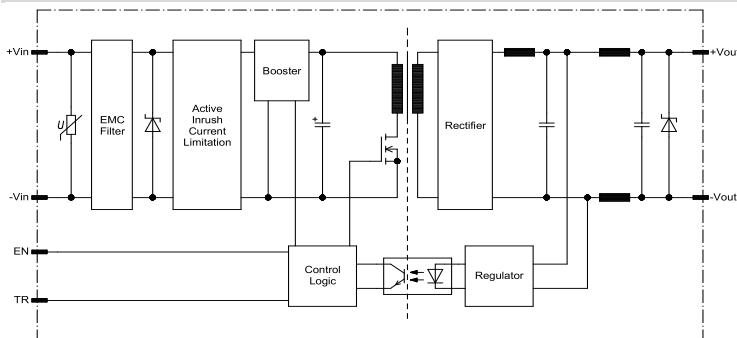
NOTES

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. Plug in not under voltage. The base plate has to be grounded by using thread rolling screws M 4 according to DIN 7500. An alternative connection to ground can be realized by a special mounting hole, which is free of anodizing surface.

Fault protection: For input protection a time-lag fuse corresponding to IEC 60127-2 must be installed. For recommended rating of the fuse refer to specification table above. Pay attention on sufficient current source in case of short circuit. In some applications 2 fuses would be necessary, one in each input line.

BLOCK DIAGRAM



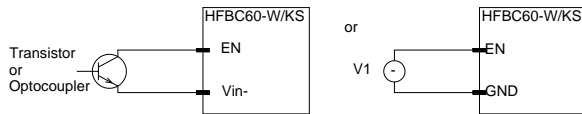
DESCRIPTION OF FEATURES

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

ENABLE SIGNAL

The module may be disabled by pulling EN below 1,0 V with respect to the –Input.

This may be done with an open collector transistor, relay, optocoupler, or an external control voltage (V1).



Open-collector:

Leakage current $\leq 100\ \mu\text{A}$

Min. $V_{CE0} \geq 20\ \text{V}$

V1:

3...5 V (Enable active)

0...0,8 V (Enable inactive)

When not in use, leave Enable pin not-connected.

ADJUST

Inserting a wire to "R+" increases the output voltage of about 8%. Intermediate values are obtained by means of a resistor. Adding a resistor for "R-" ensures that the output may be lowered by max. 8%.

When not in use, leave Adjust pin not-connected.

TRACKING

If the TR pins of two or more converters are connected, the output voltages in case of short-circuit or overload go synchronously down.

The module may be disabled by pulling EN below 0,8 V with respect to the –Input.

This may be done with an open collector transistor, relay, optocoupler, or an external control voltage (V1).

When not in use, leave Tracking pin not-connected.