Steuer- und Regeltechnik / Sachsenheim

DC-DC CONVERTER **ACR 45**

RAILWAY CONVERTER.

FOR PCB MOUNTING

HIGHLIGHTS

- **Output Power up to 60 Watts****
- **Efficiency up to 90%**
- **High Power Density**
- **Wide Input Range**
- **Wide Temperature Range**
- **RoHS Compliant**
- **According to EN 50155**

INPUT

Input Voltage Nominal	12/24 VDC, 24 VDC, 110 VDC (other inputs on request)

OUTPUT

Output Voltage	5 V / 12 V / 15 V / 24 V
Initial Set Accuracy	< 1%*
Minimum Load	No minimum load
Line Regulation	< 0,5%
Load Regulation	<1% (0% - 100% load)
Ripple & Noise	<1% pk-pk, 20 MHz bandwidth*
Start Time	< 90 ms
Max. Output Capacitance	500 uF x $I_{out\ max}$
Temperature Coefficient	0.02%/°C

FEATURES

Sync	The switching frequency can be synchronized to –5% (-10%, no positive trimming) and +10% of the nominal frequency. TTL-Level.
Enable	Pulled to low (<0,8V ref. to Vin-) disables the converter. Open pin enables the converter.
Thermal Warning	An open-collector output pulls to Vin- when the baseplate reaches a the temperature of 5 -10°C below the OTP.
Sense + / -	Remote sense to compensate for lead drops of the output line up to 0,5 V.
Trim	A resistor-programmable input to trim the output voltage in the range of +10% / - 20%.
Share	Up to 3 converters can be connected in parallel sharing within < 10% at 90% load. Each converter max. 90% load.

* For T_{amb} = 25°C, $V_{in\ nom}$, $I_{out\ nom}$
** The maximum ambient temperature without additional cooling
T_{amb}=100°C - 9,5 $\frac{°C}{w}$ x P_{out} (w) ($\frac{100}{\eta(\%)}$-1)
P_{out}= (100°C - T_{amb}) / (9,5 x ($\frac{100}{\eta}$-1))
Also with heatsink, ensure that baseplate not exceed 100°C
*** In built-in condition our devices may show different EMC properties

PROTECTION

Over Voltage Protection (OVP)	120-130% $V_{out\ nom}$, latched (independent of the trimmed voltage).
Over Current Protection (OCP)	$I_{out\ nom}$ > 105%. The output switches off when $V_{out\ nom}$ < 70% (at $V_{out\ nom}$ = 5V < 80%) and restarts automatically latest after 0.5 s of elimination of the overload.
Over Temperature Protection (OTP)	Shutdown at +100 -105°C baseplate with approx. 5°C hysteresis and auto recovery.

GENERAL

Product Standard	EN 50155:2007
Isolation	1500 VDC Input to Output 1000 VDC Input to Baseplate 1500 VDC Input to Baseplate for $V_{n\ nom}$=110 V 710 VDC Output to Baseplate
Switching Frequency	440 kHz typ.
Dimensions [mm]	50,8 x 50,8 x 11,0
Weight	approx. 55 g
MTBF	2.000.000h at 25 °C

ENVIRONMENTAL

Operating Ambient Temp.	-40°C to +85°C**
Operating Case Temp.	-40°C to +100°C
Storage Temperature	-40°C to +100°C
Vibration / Shock / Bump	EN 61373:1999

EMC & SAFETY

EMC Standard	EN 50121-3-2:2006
Conducted Emissions	EN 55011:2007+A2:2007:, Class A***
ESD Immunity	EN 61000-4-2:1995+A1:1998+A2:2001, level 3 (6kV/8kV), Criteria B
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, level 1, ±0,5kV (except V_{in} = 110V)
Conducted Immunity	EN 61000-4-6:1996+A1:2001, level 3 (10V), Criteria A
Safety Approvals	CE Mark LVD; EN 60950-1:2001

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Specifications subject to change without notice · 70 21 00 3002 4 a03 · 05.2009

SPECIFICATION Input 9 - 36 VDC* (12/24 Vin nom)

	TYPE		ACR45 12/24S05			ACR45 12/24S12			ACR45 12/24S15**			ACR45 12/24S24		
	ORDER NUMBER		73 21 08 0322 2			73 21 12 0322 6			73 21 15 0322 3			73 21 24 0322 2		
	CHARACTERISTIC	Unit	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max
INPUT	Under Voltage Turn-on	V	< 10											
	Under Voltage Turn-off	V	< 9											
	Input Current @ Vin nom = 24 V	A		1,6			2,01			2,04			2,07	
	Input Current @ Vin nom = 12 V	A		3,2			4,02			4,12			4,2	
	Input Current @ Vin = 9 V	A		4,3			5,7			5,7			5,7	
	Input Current @ no Load (24 V)	mA		130			120			45			45	
	Input Current @ no Load (12 V)	mA		140			160			55			55	
	Disabled Input Current @ (24 V)	mA		3,5			3,7			3,5			3,4	
	Disabled Input Current @ (12 V)	mA		2,4			2,5			2,4			2,3	
	Recommended External Fuse	A	8											
OUTPUT	Output Voltage	V		5,0			12,0			15,0			24,0	
	Output Current	A			6,6			3,5			2,7			1,8
	Output Power	W			33,0			42,0			42,0			43,2
	Efficiency @ Vin nom 24 V	%		87			87			86			86	
	Efficiency @ Vin nom 12 V	%		87			87			85			86	
	Transient Response 25% / 75% Load Step, Recovery Time<500 us	mV		±120			±240			±300			±460	

SPECIFICATION Input 14,4 - 40 VDC (24 Vin nom)

	TYPE		ACR45 24S05			ACR45 24S12			ACR45 24S15**			ACR45 24S24		
	ORDER NUMBER		72 21 08 0522 4			72 21 12 0522 8			72 21 15 0522 5			72 21 24 0522 4		
	CHARACTERISTIC	Unit	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max
INPUT	Under Voltage Turn-on	V	< 14,4											
	Under Voltage Turn-off	V	< 14,0											
	Input Current @ full Load	A		1,65			2,11			2,14			2,13	
	Input Current @ Vin = 14,4 V	A		2,8			3,6			3,7			3,6	
	Input Current @ no Load	mA		75			85			45			40	
	Disabled Input Current	mA		3,5			3,7			3,5			3,4	
	Recommended External Fuse	A	6											
OUTPUT	Output Voltage	V		5,0			12,0			15,0			24,0	
	Output Current	A			7,0			3,8			3,0			1,9
	Output Power	W			35,0			45,6			45,0			45,6
	Efficiency	%		88			90			88			88	
	Transient Response 25% / 75% Load Step, Recovery Time<500 us	mV		±180			±310			±300			±250	

SPECIFICATION Input 66 - 154 VDC (110 Vin nom)

	TYPE		ACR45 110S05			ACR45 110S12			ACR45 110S15**			ACR45 110S24		
	ORDER NUMBER		77 21 08 0522 5			77 21 12 0522 9			77 21 15 0522 6			77 21 24 0522 5		
	CHARACTERISTIC	Unit	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max
INPUT	Under Voltage Turn-on	V	< 77,0											
	Under Voltage Turn-off	V	< 66,0											
	Input Current @ full Load	A		0,36			0,61			0,48			0,48	
	Input Current @ Vin = 66,0 V	A		0,6			1,04			0,79			0,79	
	Input Current @ no Load	mA		25			30			25			25	
	Disabled Input Current	mA		3,0			3,0			3,2			3,1	
	Recommended External Fuse	A	1											
OUTPUT	Output Voltage	V		5,0			12,0			15,0			24,0	
	Output Current	A			7,0			5,0			3,0			1,9
	Output Power	W			35,0			60			45,0			45,6
	Efficiency	%		87			89			87			87	
	Transient Response 25% / 75% Load Step, Recovery Time<500 us	mV		±170			±450			±300			±350	

* Vin =40 V for max 1s
** preliminary

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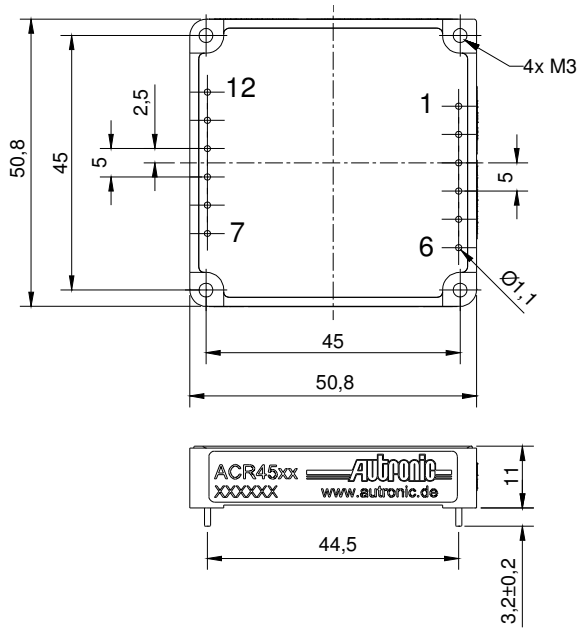
TECHNICAL DATA

For T_{amb}=25°C, $V_{in\ nom}$, $I_{out\ nom}$, unless otherwise specified.

MECHANICAL DETAILS

1. Dimensions are in mm
2. Tolerance: ±0.5 mm

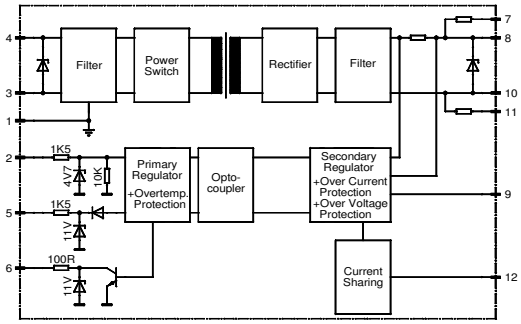


Pin - Material:	Tin plated brass
Case - Frame:	Pocan B4235, 30GF, UL94-V0, black
Baseplate:	Aluminum coated
Resin compound:	Polyurethane black, UL94-V0

PINNING

Pin		Function
1	Baseplate	Potential of the Baseplate
2	Sync	Sync. of Switching Frequency
3	V_{in}-	Negative Input Voltage
4	V_{in}+	Positive Input Voltage
5	EN	Enable
6	TW	Thermal Warning
7	S+	Positive Sense
8	V_{out}+	Positive Output Voltage
9	Trim	Output Voltage Trimming
10	V_{out}-	Negative Output Voltage
11	S-	Negative Sense
12	Share	Current sharing

BLOCK DIAGRAM



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 accidential contact. The mounting surface must be flat and able to remove the thermal energy of the baseplate (baseplate temperature must not exceed +100°C).
The pin 1, baseplate: (⏚ / ⏚), has to be properly connected in order to assure operation.

External Fuse:
For input protection a time-lag fuse corresponding to IEC 60127-2 must be installed. For recommended rating of the fuse refer specification table above.
Pay attention on sufficient current of current source in case of short-circuit!

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