

intreXis[®]

POWER SUPPLIES

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Datasheet

USB Charger

IC320-IC323, 2x10.7 W, 5.1 V-Outputs

AC-Universal Range or DC-Ultra Wide input

Rev00

This datasheet covers the details of the IC320 and IC323 USB-Chargers, with two output voltages of 5.1 V available on USB type A connectors, with a total output power of 2x10.7 W.

These converters are designed according to EN50155 for railway applications and are ideal for other demanding environments which require the highest performance and reliability, where other commercial chargers are not allowed.

Ordering codes:

- IC320, with universal AC-input range (85 – 264 VAC, 50 – 60 Hz).
- IC323, with ultra wide DC-input range (14.4 – 154 VDC).

FEATURES

- Charges mobile phones and tablets on rail vehicles.
- Two outputs 5.1 V / 2.1 A allow to charge two devices simultaneously.
- Auto-detection of charging devices. The benefit is that you can charge devices by Samsung, Apple, etc. at full-current achieving fast charge, using the same charger.
- Short-circuit with auto-retry protects USB cables from over-heating.
- Two versions available for AC-input or DC battery-input.
- Extremely wide temperature range: -50 – +85 °C.
- These converters cover the widest EN 50155 temperature range (class TX) with additional extension down to -50 °C for extremely cold environments.
- Full power (2x10.7 W, no derating) over the entire temperature range.
- Very high efficiency:
IC320: typically 86.0 % @ 110 VAC, 86.9 % @ 230 VAC at full load.
IC323: typically 84.8 % @ 24 VDC, 87.9 % @ 110 VDC at full load.
- Hold-up time >10 ms: complies with class S2 according to EN 50155 over the entire input voltage range.
- Fully compliant with EN 50155 and EN 45545.
- Outputs comply with EN 60950-1, limited current circuit and EN 62368-1, energy source class 1 (ES1) and power class 1 (PS1).
- Very high galvanic isolation between input and output: 3300 VAC.

Modular design, many advantages:

- Field proven technology.
- Standard model ex stock.
- On request connectors of your choice (Phoenix, Molex, etc).
- On request individual case style.
- On request additional functions as Power fail signal, etc.

INPUT CHARACTERISTICS

IC320, with universal AC-input range

Operating Input Voltage Range	85 – 264 VAC, 50 – 60 Hz	
Input Undervoltage Lockout	Vin_off = 62 VAC typ. Vin_on = 70 VAC typ.	
Inrush Current @ Tambient = 25 °C	32.5 A _{peak} @ 230 VAC Inrush-Current-Integral: $I_{inrush}^2 t < 1.1 A^2 s$ @ Vin=85 – 264 VAC	
Input Capacitance	66 µF	
Input Current typ. @ full Load	110 VAC	230 VAC
	350 mA	155 mA
Input Power @ no Load	110 VAC	230 VAC
	31 mW	70 mW
Internal Input Fuse	Fuse included, therefore no external fuse required. $I^2 t_{fuse} = 9.2 A^2 s$	
Interruptions of Input Voltage Supply (Hold-up time)	Class S2 according to EN50155 @ 110 VAC and 230 VAC: no equipment failure for interruptions of 10 ms over the entire operating input voltage range	
Startup time (Time input voltage ON to output voltage ON)	< 1 s for all input voltages	

IC323, with ultra wide DC-input range

Operating Input Voltage Range	16.8 – 137.5 VDC			
Operating Input Voltage Range dynamic according to EN50155, 5.1.1.1	14.4 – 154 VDC / 1.0 sec			
Input Undervoltage Lockout	Vin_off = 13.2 VDC typ. Vin_on = 15.5 VDC typ.			
Input Reverse Voltage Protection	I _{in_reverse} < 500 µA @ Vin = 137 VDC (converter remains off without being damaged)			
Inrush-Current	11 A _{peak} @ 110 Vin 14 A _{peak} @ 137 Vin Inrush-Current-Integral: I _{inrush} ² t < 0.5 A ² s @ Vin=16.8 – 137.5 VDC			
Input Capacitance	210 µF			
Input Current @ full Load	24 VDC	36 VDC	72 VDC	110 VDC
	1.03 A	688 mA	337 mA	217 mA
Input Power @ no Load	24 VDC	36 VDC	72 VDC	110 VDC
	0.20 W	0.22 W	0.32 W	0.48 W
Internal Input Fuse	Fuse included, therefore no external fuse required. I ² t-fuse = 9.2 A ² s			
Interruptions of Input Voltage Supply (Hold-up time)	Class S2 according to EN 50155: no equipment failure for interruptions of 10 ms over the entire operating input voltage range			
Startup time (Time input voltage ON to output voltage ON)	< 2 s for all input voltages			

OUTPUT CHARACTERISTICS

Output Voltage Nominal	2x +5.1 VDC
Max. Continuous Output Power (no derating over the entire temperature range)	21.4 W
Setpoint Accuracy	< 1.0 %
Load Regulation @ off-load to full load over the entire temperature range	2.0 % typ.
Line Regulation @ full load over the entire temperature range	< 0.1 %
Output Ripple & Noise @ 20 MHz bandwidth, including spikes	< 100 mV _{pp} @ 25 °C < 150 mV _{pp} @ -50 – +85 °C
Overload	The converter is continuous overload and short-circuit proof. If the output is overloaded, the output voltage is reduced and the output current limited (constant-current).
Current Limit (varies due to component tolerances)	4.4 A – 6.5 A
Short-Circuit current	The converter goes into Hiccup-Mode: The output is switched off and then on periodically (auto-retry), until the short-circuit is present. If the short-circuit is removed, the output is switched on at the next attempt. The short-circuit current is < 1.0 Arms. This is particularly important with USB cables to prevent over-heating and fire.
Overvoltage Protection (OVP) output voltage is limited, if main regulation loop fails	<10 VDC
	SELV-compliant according to EN 60950-1
Safety	The two 5.1V-outputs on the USB-connectors (X2,X3) comply with the requirements of: EN 60950-1, limited current circuit and EN 62368-1, energy source class 1 (ES1) and power class 1 (PS1).

EFFICIENCY

IC320:

Conditions / Vin	110 VAC - 50 Hz	230 VAC - 50 Hz
Efficiency typ. @ 100 % Load	86.0 %	86.9 %
Efficiency typ. @ 50 % Load	84.9 %	86.8 %

IC323:

Conditions / Vin	24 VDC	110 VDC
Efficiency typ. @ 100 % Load	84.8 %	87.9 %
Efficiency typ. @ 50 % Load	83.1 %	85.9 %

ELECTROMAGNETIC COMPATIBILITY (EMC)

Test	Standard	Test severity levels	Criteria
Surge immunity test	IEC 61000-4-5 according to EN 50155 (12.2.7) and EN 50121-3-2	1.2/50 μ s 42 Ω , 0.5 μ F DC power supply port \pm 2 kV line to ground \pm 1 kV line to line	Criteria B required, but compliant with more strict criteria A
Electrostatic discharge immunity	IEC 61000-4-2 according to EN 50155 (12.2.7) and EN 50121-3-2	Immunity to ESD 6 kV contact discharge 8 kV air discharge	Criteria B required, but compliant with more strict criteria A
Fast transient burst test	IEC 61000-4-4 according to EN 50155 (12.2.7.3)	\pm 2 kV 5/50 ns tr/th 5 kHz repetition frequency	Criteria A
Conducted radio-frequency field immunity	IEC 61000-4-6 according to EN 50155 (12.2.8) and EN 50121-3-2	150 kHz – 80 MHz 10 Vrms (carrier voltage) 80 % AM, 1 kHz Source impedance 150 Ω	Criteria A
Radiated immunity to RF field	IEC 61000-4-3 according to EN 50155 (12.2.8) and EN 50121-3-2	80 MHz – 1000 MHz 20 Vrms/m 80 % AM, 1 kHz unmodulated carrier; 1400 MHz – 2100 MHz 10 Vrms/m 80 % AM, 1 kHz unmodulated carrier; 2000 MHz – 2700 MHz 5 Vrms/m 80 % AM, 1 kHz unmodulated carrier; 5100 MHz – 6000 MHz 3 Vrms/m 80 % AM, 1 kHz unmodulated carrier	Criteria A
Conducted Emissions	EN 55016-2-1	150 kHz – 500 kHz: 99 dB μ V quasi-peak 500 kHz – 30 MHz: 93 dB μ V quasi-peak	
Radiated Emissions	EN 55016-1-1 (Clause 4, 5)	30 MHz – 230 MHz: 40 dB μ V/m quasi-peak at 10 m 230 MHz – 1000 MHz: 47 dB μ V/m quasi-peak at 10 m	

ENVIRONMENTAL CHARACTERISTICS

Operating Ambient Temperature	-50 °C – +85 °C, temperature class TX, column 4 according to EN 50155, extended down to -50 °C
Storage Ambient Temperature	-50 °C – +100 °C
Cooling	Natural convection
Mounting Position	Mounting in any position allowed
Pollution Degree	PD2 according to EN 50124
Vibration & Shock	According to EN 61373, Cat. 1, class B
Cooling Test	According to EN 50155, T = -50 °C
Dry Heat Test	According to EN 50155, T = +70 °C
Drop Test	Converter in its package dropped from 0.75 m, repeated in 3 drop directions, with no damages.

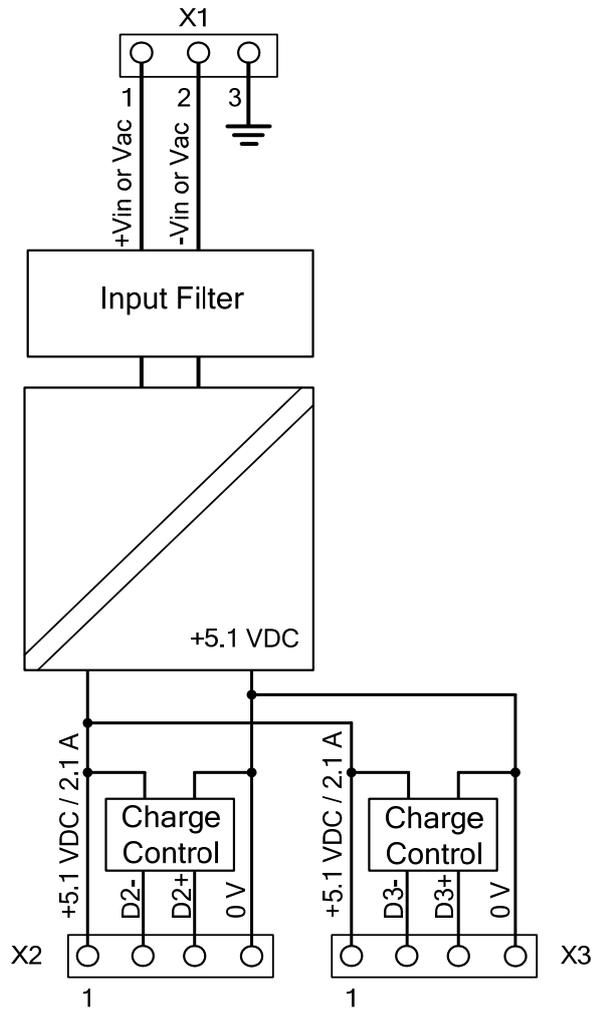
GENERAL CHARACTERISTICS

General Standard	According to EN 50155			
Fire Protection	EN 45545-1, EN 45545-2 compliant with all Hazard Levels HL1-HL3 NF F16-101, NF F16-102			
Prohibited Substances	No substances defined as Prohibited according to the RoHS, REACH, UNIFE (RISL), or Prohibited for the Project, are present. No substances defined as Declarable according to RoHS, REACH, UNIFE (RISL), or Declarable for the Project, are present.			
Protection Degree	IP20 in general. IP40 D on front-panel.			
Coating	The PCB is coated on both sides to prevent deterioration or damage due to moisture.			
MTBF Calculation method: MIL-HDBK-217-F2	Ground Benign (GB), +25 °C	Ground Benign (GB), +40 °C	Ground Fixed (GF), +40°C	Ground Mobile (GM), +40 °C
	7 095 000 h	5 357 000 h	1 147 000 h	693 000 h
Burn-In	Not implemented			
Weight	230 g			
Marking	Label with model, input voltage range and barcode with serial number for identification and traceability.			

ISOLATION CHARACTERISTICS

Input, Output, Chassis	<p>The input is galvanically isolated to the output. The input is galvanically isolated to the chassis.</p>
Input to Output	<p>Isolation Voltage: 3300 Vrms, 60 s Clearance: 5.5 mm Creepage: 5.5 mm</p> <p>For the type test, the Y-capacitors must be removed according to IEC 61287-1. Please ask intreXis AG for advice.</p> <p>For the routine test according to EN 50124-1 of Input to Output and Input to Chassis, intreXis AG recommends the following procedure: connect Output to Chassis, apply a test-voltage of 2125 VDC (or 1500 VAC with trigger threshold >30 mA), 10 s between Input and Chassis. For this test, the Y-capacitors must not be removed. Please ask intreXis AG for advice.</p>
Input to Chassis	<p>Isolation Voltage: 1500 Vrms, 60 s Clearance: 2.5 mm Creepage: 2.5 mm</p> <p>For the routine test, see above.</p>
Output to Chassis	<p>Not applicable</p>
Insulation Resistance	<p>Input-Chassis: >550 MΩ Input-Output: >550 MΩ Test-voltage: 500 VDC</p>

BLOCK DIAGRAM

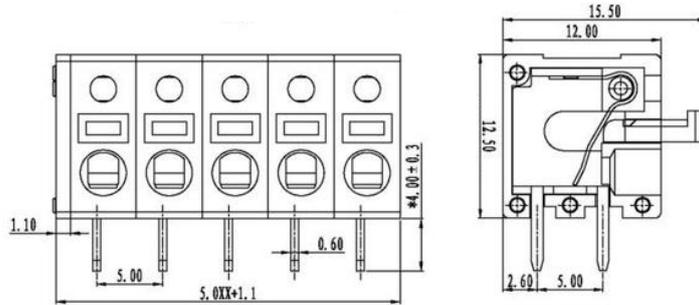


CONNECTOR TYPES

X1

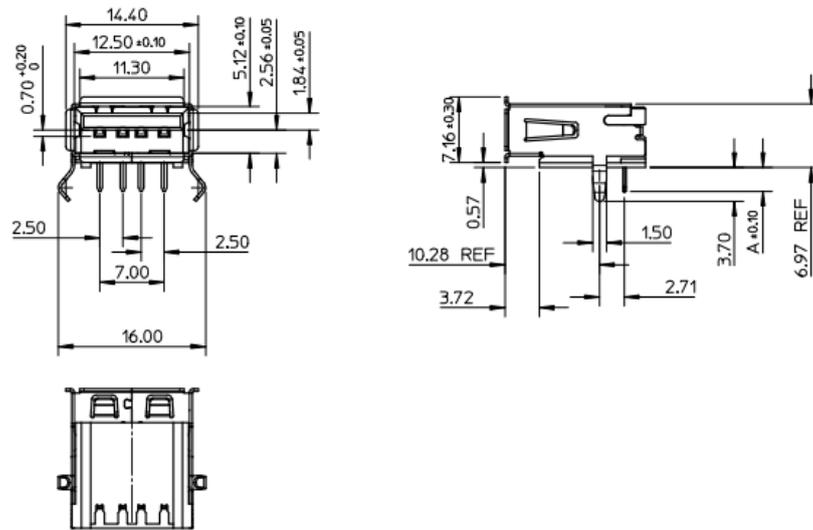
Spring terminal block
Pitch: 5.0 mm,
Number of poles: 3, horizontal

For wire-size of 1.5 mm² max.
Strip length: 8 mm



X2,X3

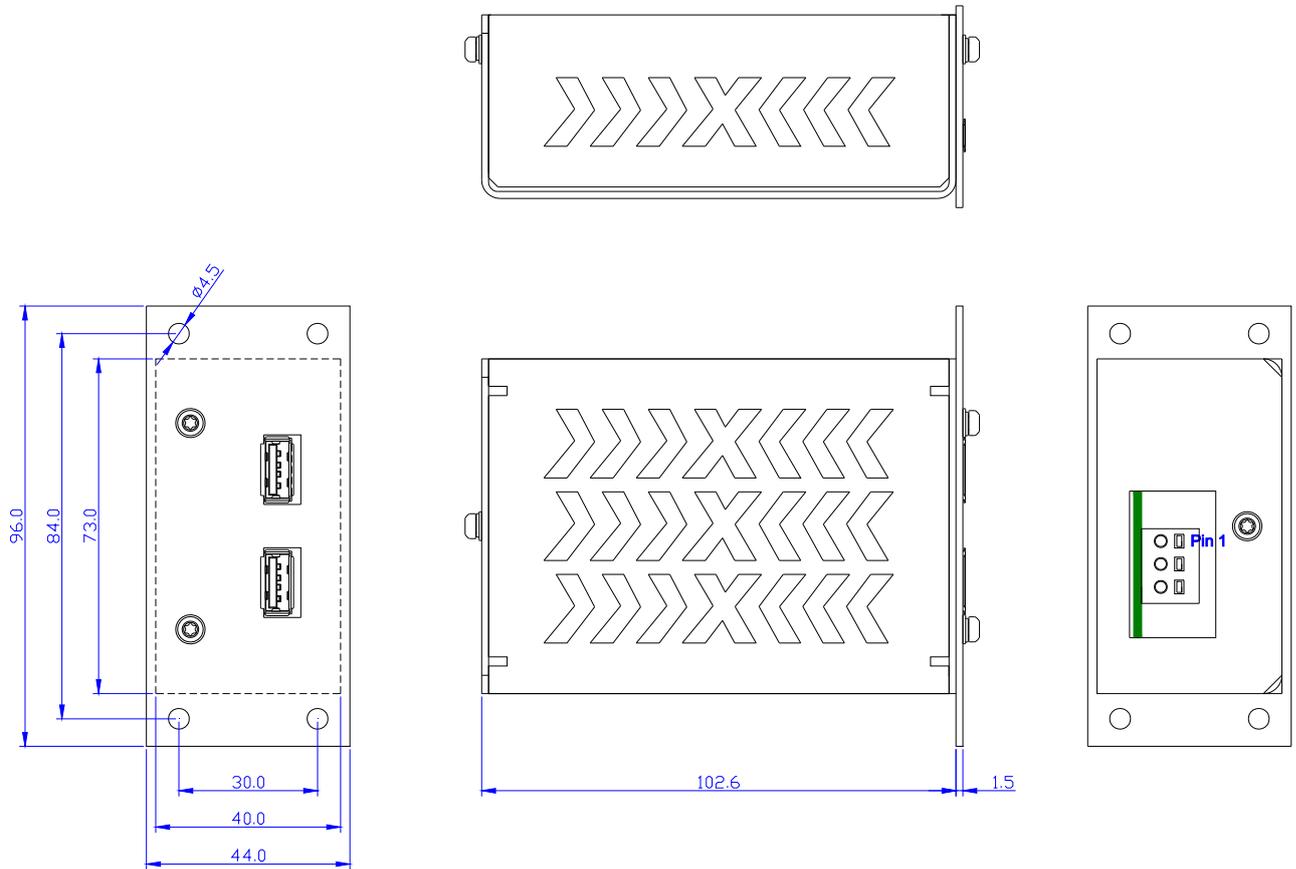
Molex: 67643-0910
USB type A, receptacle, horizontal



Mating connector: USB type A, plug

MECHANICAL CHARACTERISTICS

Chassis-Material: Aluminium: EN AW 5052 - AL5052 - AlMg2.5 or EN AW 5754 - AL5754 - AlMg3
 Millimeters unless otherwise noted.



Input connector X1:

1. +Vin (IC323) or Vac (IC320)
2. -Vin (IC323) or Vac (IC320)
3. Earth

Only the front-panel is black-anodized.

INSTALLATION AND OPERATION

SAFETY



Warning / Caution !

The power supplies should be installed and put into operation only by qualified personnel.

- Before installing or removing the unit, disconnect the power from the system.

SERVICING

In case of failures, malfunctions or defects, the converter must be returned to intreXis for analysis and repair. In particular, the converter should be sent to intreXis for analysis if any damage has occurred to the unit (e.g. the unit dropped). Any attempts to open and repair the unit could void the warranty and could expose the operator to hazardous voltages.

SPARE PARTS

List and drawings of spare parts are not provided, since the failed units have to be returned to intreXis for analysis and repair.

DISPOSAL

Disused units must be collected separately and disposed at a suitable recycling facility.

MOUNTING

The unit must be secured using four M4 screws or bolts (not supplied) in the mounting holes, shown in the mechanical drawings.

CONNECTING THE CABLES

Ensure that proper wires are used according to the input and output current specifications.

Prepare the input-cables with a strip length of 8 mm. Push-in the wires into the connector (no special tools needed).

Ensure correct connection according to the connector pin-out and to the mechanical drawing (pin 1 is shown on the drawing).

OPERATION OF THE UNIT

Once the input power is applied, the output voltage is enabled.