Premium
Powering Your Challenge

CTS-60

RAILWAY 50...60W SINGLE OUTPUT DC/DC CONVERTERS

GENERAL FEATURES:

Designed according to EN50155
Fire and smoke: EN45545-2 approved
High input-output isolation
Adjustable output voltage
Remote sensing
Output voltage presence LED
Efficiency up to 85%

5 YEAR WARRANTY
EN45545 fire & smoke
EN50155
ROHS REACH

	24Vin 14,4V ... 30V	36Vin 21,6V ... 47V	48Vin 28,8V ... 60V	72Vin 43,2V ... 90V	110Vin 66V ... 144V
5Vout	**CTS-60-6835** 50W	**CTS-60-6851*** 50W	**CTS-60-6839** 50W	**CTS-60-6843*** 50W	**CTS-60-6847** 50W
12Vout	**CTS-60-6836** 60W	**CTS-60-6852*** 60W	**CTS-60-6840*** 60W	**CTS-60-6844** 60W	**CTS-60-6848** 60W
16Vout	**CTS-60-6856** 60W	Available under request*	Available under request*	Available under request*	**CTS-60-6855** 60W
24Vout	**CTS-60-6837** 60W	**CTS-60-6853** 60W	**CTS-60-6841** 60W	**CTS-60-6845** 60W	**CTS-60-6849** 60W
48Vout	**CTS-60-6838** 60W	**CTS-60-6854*** 60W	**CTS-60-6842** 60W	**CTS-60-6846*** 60W	**CTS-60-6850** 60W

*References subject to special MOQs and lead times

INPUT	
Input voltage range	See table
Maximum allowed input ripple	15% Vin nom (EN50155)
OUTPUT	
Output voltage	See table
Output voltage adjustment range	
Vi min >60% Vi nom	-10% ... +0% Vo nom
Vi min >70% Vi nom	-10% ... +15% Vo nom
Line regulation (Io = nom)	< 0,2 %
Load regulation (Vin = nom)	< 0,2 %
Ripple	< 50 mVpp
Noise (BW = 20MHz)	< 100 mVpp
Maximum remote sensing	0,3V / pole
ENVIRONMENTAL	
Storage temperature	-40ºC ... 85ºC
Operating temperature range at Io = 100%	-25ºC … 60ºC (-40°C … 60°C, see note-1)
Operating temperature range at Io = 75%	-25ºC … 70ºC (-40°C … 70°C, see note-1)
Operating temperature range at Io = 37,5%	-25ºC … 85ºC (-40°C … 85°C, see note-1)
Maximum Relative humidity	95% without condensation
Shock and vibration	EN61373 Category 1 class B body mounted
MTBF	650.000h @ 40°C according to IEC61709
EMC	
Emission	EN50121-4, EN50121-3-2
Immunity	EN50121-4, EN50121-3-2
SAFETY	
Safety	EN-60950-1, EN68368-1, EN50155
Dielectric strength Input / Output	3000Vac, 4200Vdc 1min.
Dielectric strength Input / Earth	1500Vac, 2100Vdc 1min.
Dielectric strength Output / Earth	1500Vac, 2100Vdc 1min.
Fire and smoke	EN45545-2:2013 + A1:2015
MECHANICAL	
Approximate weight	500g
Dimensions	127 x 84.5 x 40mm
PROTECTIONS	
Against overloads and short-circuits	Current limiting
Against reverse input voltage.	Input fuse
Against input under-voltage.	Under-voltage lock-out
Against Input over-currents	Input fuse

Note-1: The unit can start up and work at an ambient temperature of -40°C with the following restrictions:

- Do not handle the connection terminals below -25°C
- The output ripple can rise up to 150mVpp at -40°C

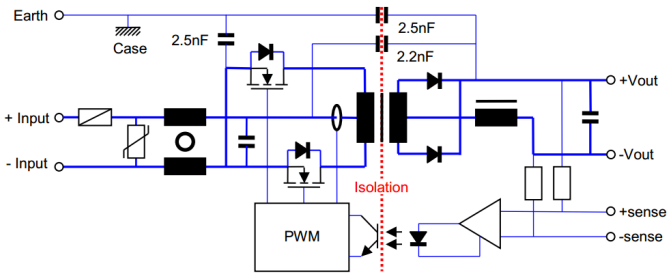
ORDERING CODES

Part Number	Power [W]	Input [V]	Input range [V]	Output [V]	Output current [A]	Efficiency [%]
CTS-60-6835	50	24	14,4 - 30	5	10	78
CTS-60-6836	60	24	14,4 - 30	12	5	83
CTS-60-6856	60	24	14,4 - 30	16	3,75	83
CTS-60-6837	60	24	14,4 - 30	24	2,5	84
CTS-60-6838	60	24	14,4 - 30	48	1,25	85
CTS-60-6851*	50	36	21,6 - 47	5	10	78
CTS-60-6852*	60	36	21,6 - 47	12	5	83
CTS-60-6853	60	36	21,6 - 47	24	2,5	84
CTS-60-6854*	60	36	21,6 - 47	48	1,25	85
CTS-60-6839	50	48	28,8 - 60	5	10	79
CTS-60-6840*	60	48	28,8 - 60	12	5	84
CTS-60-6841	60	48	28,8 - 60	24	2,5	85
CTS-60-6842	60	48	28,8 - 60	48	1,25	85
CTS-60-6843*	50	72	43,2 - 90	5	10	79
CTS-60-6844	60	72	43,2 - 90	12	5	84
CTS-60-6845	60	72	43,2 - 90	24	2,5	85
CTS-60-6846*	60	72	43,2 - 90	48	1,25	85
CTS-60-6847	50	110	66 - 144	5	10	80
CTS-60-6848	60	110	66 - 144	12	5	85
CTS-60-6855	60	110	66 - 144	16	3,75	85
CTS-60-6849	60	110	66 - 144	24	2,5	85
CTS-60-6850	60	110	66 - 144	48	1,25	85

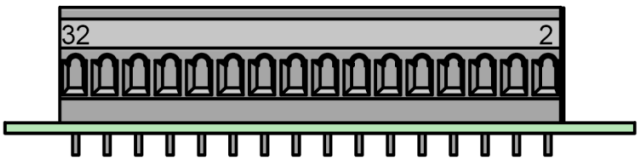
*References subject to special MOQs and lead times

Accessories must be ordered in a separated order line

BLOCKS DIAGRAM

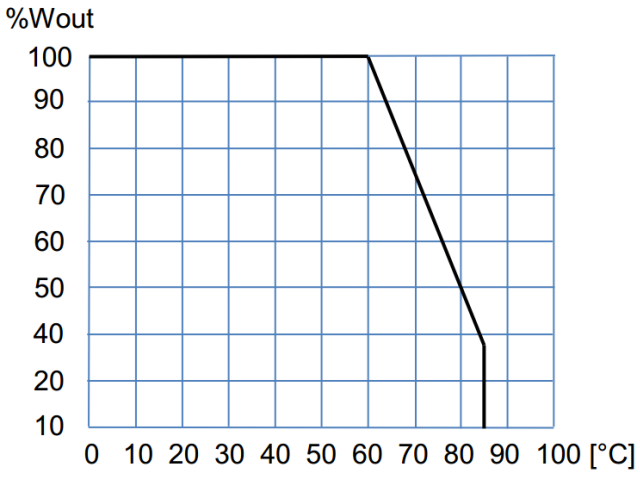


CONNECTIONS



Terminal Function	PCB Marking	Terminal No.
-Input	-In	2, 4, 6
+Input	+In	8,10
Earth	⏚	16
-Sense	-S	18
-Output	-Out	20, 22, 24
+ Output	+Out	26, 28, 30
+Sense	+S	32

POWER DERATING vs AMBIENT TEMP.



DESCRIPTION

The CTS-60 series consists of PWM DC-DC converters, with a galvanic isolation between input and output. The converters operate at a fixed switching frequency and use push-pull converter topology.

Voltage feedback is performed by transferring the error signal from the output to the primary side through an optocoupler, where the PWM circuit changes the pulse width as required to keep the voltage output stable.

For maximum regulation, the remote sensing terminals can be connected to the load. This will allow a power cable voltage drop of up to 0.3 V on each cable to be offset.

The device is protected against overload and short-circuit by means of a current limiting circuit.

The device is also protected against reverse polarity input voltage, and the input fuse blows if an improper connection is made.

When a converter input undervoltage condition occurs, the converter is disabled, thus preventing the battery from becoming totally discharged.

START-UP

Perform connection as per the table. Use of remote sensing is not absolutely necessary, but if this is required, use of a co-axial or a twisted-pair cable is recommended.

WARNING: If the load is connected to the tabs of remote sensing (+/-S) and the connection from the output to this load is missing the remote sensing function could make unusable due to the acting of the internal fuse of protection.

If power levels close to the maximum output are required, make sure the assembly enhances cooling by natural convection and the card is placed in vertical position.

If several converters need to be connected in parallel, do the following:

- Set the output voltage for all converters featuring a mutual difference as small as possible.
- Join the load outputs by using cables with a cross-section no greater than the one required and of equal length.
- Do not use remote sensing.

For safety reasons, the following requirements must be complied with:

- Provide the equipment with some kind of protective enclosure that complies with the electrical safety directives in effect within the country where the equipment is installed.
- Only replace the fuse with another fuse of the same rating and type, and only after disconnecting the converter from DC power.

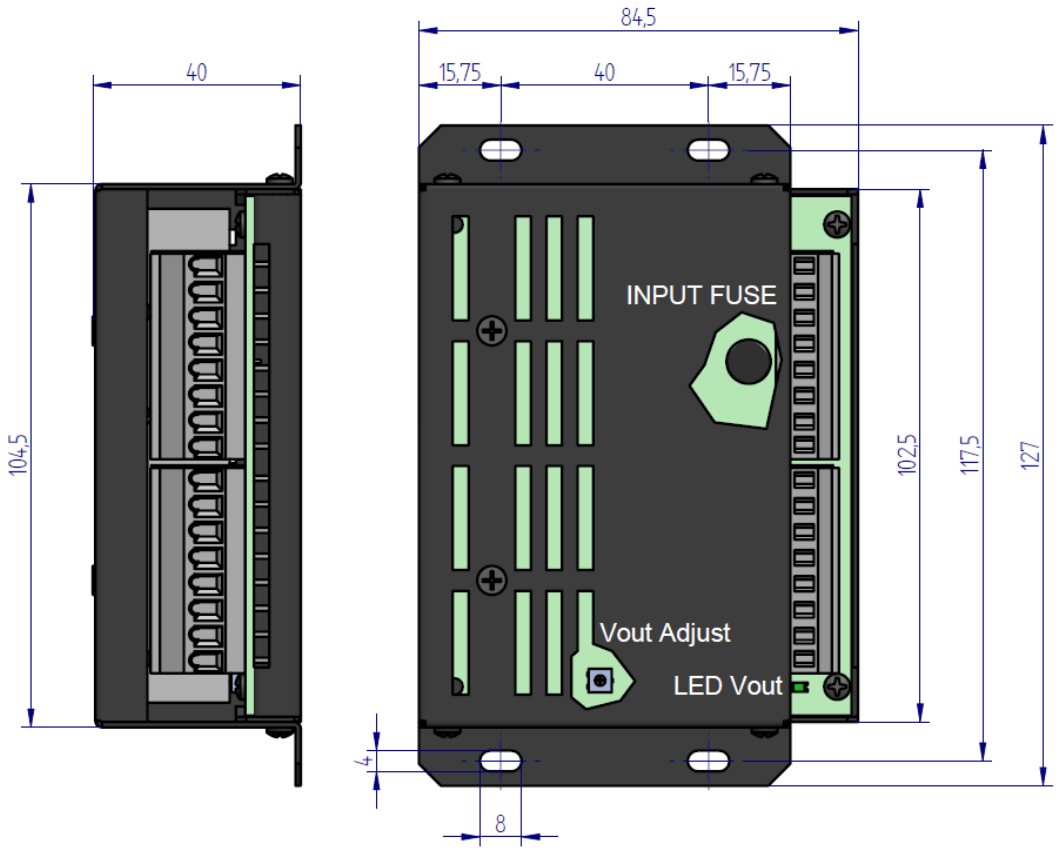
INSTALLATION

Connection: Spring clamp terminal strip

The product can be mounted:

- On a chassis by means of the 4 holes.
- In DIN rail adding the clip accessory **NP-9135**

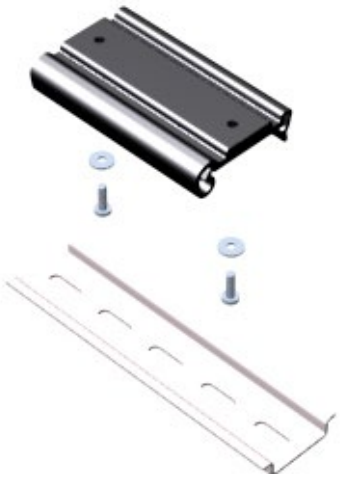
DIMENSIONS



ACCESSORIES

ACCESSORIES	CODE
Din rail clip	NP-9135
Redundant connection for two units (ORing diodes + alarms contacts)	ACD-15

NP-9135



EU, UKCA DECLARATION OF CONFORMITY

The undersigned, representing the following:

Manufacturer: PREMIUM, S. A.,
Address: C/ DolorsAleu 19-21, 08908 L'Hospitalet de Llobregat, SPAIN

herewith declares that the product:

Type: DC/DC converter
Models: **CTS-60-6835 ... 6855**

is in conformity with the provisions of the following EU directive(s):

2014/35/EU SI 2016 No 1101	Low voltage / The electrical equipment (safety) regulations
2014/30/EU SI 2016 No 1091	EMC / Electromagnetic compatibility regulations
2015/863/EU SI 2012 No. 3032	RoHS / Restriction of the use of certain hazardous substances in electrical and electronic equipment

and that standards and/or technical specifications referenced below have been applied:

EN 60950-1: 2005	Safety. Information technology equipment
EN 62368-1: 2014	Safety. Audio/video, information and communication technology equipment
EN 61000-6-3: 2007	Generic emission standard
EN 61000-6-2: 2005	Generic immunity standard
EN 50155: 2017*	Railway applications. Electronic equipment used on rolling stock material
EN 50121-3-2: 2016*	Railway applications. EMC Rolling stock equipment
EN 50121-4: 2016*	Railway applications. EMC of the signalling and telecommunications apparatus

* See annexe

CE marking year: **2009**; UKCA marking year: **2021**

Notes:

For the fulfillment of this declaration the product must be used only for the aim that has been conceived, considering the limitations established in the instructions manual or datasheet.

L'Hospitalet de Llobregat, 31-05-2021

Albert Sole
Technical Director

PREMIUM S.A. is an ISO9001and ISO14001 certified company by **Bureau Veritas**

ANNEXE

<table>
<tr><th colspan="4">Applicable values for the different sections of the norm EN50155: 2017</th></tr>
<tr><td>4.3.1</td><td>Working altitude</td><td colspan="2">Up to 2000m</td></tr>
<tr><td>4.3.2</td><td>Ambient temperature</td><td colspan="2">Class OT1 (-25 to 55°C): load < 100%
Class OT2 (-40 to 55°C): load < 100% (Without connectors handling and output ripple <150mVpp)
Class OT3 (-25 to 70°C): load <75%
Class OT4 (-40 to 70°C): load <75% (Without Connectors handling and output ripple <150mVpp)
Class OT5 (-25 to 85°C): load <37.5%
Class OT6 (-40 to 85°C): load <37.5% (Without Connectors handling and output ripple <150mVpp)</td></tr>
<tr><td>4.3.3</td><td>Switch-on extended operating temp.</td><td colspan="2">ST1</td></tr>
<tr><td>4.3.4</td><td>Rapid temperature variations</td><td colspan="2">H1</td></tr>
<tr><td>4.3.5</td><td>Shocks and vibrations</td><td colspan="2">According EN61373:2010 Category 1 class B</td></tr>
<tr><td>4.3.6</td><td>EMC Electromagnetic Compatibility

EN50121-3-2:2016
EN50121-4:2016</td><td colspan="2">
<table>
<tr><th>Test</th><th>Norm</th><th>Port</th><th>Frequency</th><th>Limits</th></tr>
<tr><td rowspan="4">Radiated emissions</td><td rowspan="4">IEC55016</td><td rowspan="4">Case</td><td>30MHz...230MHz</td><td>40dB(µV/m) Qpk at 10m</td></tr>
<tr><td>230MHz...1GHz</td><td>47dB(µV/m) Qpk at 10m</td></tr>
<tr><td>1...3GHz</td><td rowspan="2">Do not apply
Internal freq. < 108MHz</td></tr>
<tr><td>3...6GHz</td></tr>
<tr><td rowspan="2">Conducted emissions</td><td rowspan="2">IEC55016</td><td rowspan="2">Input</td><td>150kHz...500kHz</td><td>79dB(µV) Qpk, 66dB(µV) Av</td></tr>
<tr><td>500kHz...30MHz</td><td>79dB(µV) Qpk, 60dB(µV) Av</td></tr>
</table>
<table>
<tr><th>Test</th><th>Norm</th><th>Port</th><th>Severity</th><th>Conditions</th><th>P</th></tr>
<tr><td rowspan="2">Electrostatic discharge</td><td rowspan="2">IEC61000-4-2</td><td rowspan="2">Case</td><td>±8kV</td><td>Air (isolated parts)</td><td rowspan="2">B</td></tr>
<tr><td>±8kV</td><td>Contact (conductive parts)</td></tr>
<tr><td rowspan="4">Radiated high-frequency</td><td rowspan="4">IEC61000-4-3</td><td rowspan="4">X/Y/Z Axis</td><td>20V/m</td><td>0.08...1.0GHz M. 80% 1kHz</td><td rowspan="4">A</td></tr>
<tr><td>10V/m</td><td>1.4...2.1GHz M. 80% 1kHz</td></tr>
<tr><td>5V/m</td><td>2.1...2.5GHz M. 80% 1kHz</td></tr>
<tr><td>3V/m</td><td>5.1...6Ghz M. 80% 1kHz</td></tr>
<tr><td rowspan="4">Fast transients</td><td rowspan="4">IEC61000-4-4</td><td>Input</td><td>±2kV</td><td rowspan="4">Tr/Th: 5/50 ns</td><td rowspan="4">A</td></tr>
<tr><td>Output</td><td>±2kV</td></tr>
<tr><td>Signal</td><td>±2kV</td></tr>
<tr><td>PE</td><td>±1kV</td></tr>
<tr><td rowspan="2">Surge</td><td rowspan="2">IEC61000-4-5</td><td>Input L to L</td><td>±1kV</td><td rowspan="2">Tr/Th: 1.2/50µs</td><td rowspan="2">B</td></tr>
<tr><td>Input L to PE</td><td>±2kV</td></tr>
<tr><td rowspan="4">Conducted RF</td><td rowspan="4">IEC61000-4-6</td><td>Input</td><td>10V</td><td rowspan="4">0.15...80MHz M. 80% 1kHz</td><td rowspan="4">A</td></tr>
<tr><td>Output</td><td>10V</td></tr>
<tr><td>Signal</td><td>10V</td></tr>
<tr><td>PE</td><td>10V</td></tr>
<tr><td>Magnetic field</td><td>IEC61000-4-8</td><td>X/Y/Z Axis</td><td>300A/m</td><td>0Hz, 16.7Hz, 50/60Hz</td><td>A</td></tr>
</table>
P= Performance criteria, L= Line, PE= Protective Earth
</td></tr>
<tr><td>4.3.7</td><td>Relative humidity</td><td colspan="2">Up to 95%</td></tr>
<tr><td>5.1.1.2</td><td>DC power supply range</td><td colspan="2">From 0.70 to 1.25 Un continuous</td></tr>
<tr><td>5.1.1.3</td><td>Temporary DC power supply fluctuation</td><td colspan="2">From 0.60 to 1.40 Un 0.1s
From 1.25 to 1.40 Un 1s without damage</td></tr>
<tr><td>5.1.1.4</td><td>Interruptions of voltage supply</td><td colspan="2">Class S1 (without interruptions)</td></tr>
<tr><td>5.1.1.6</td><td>Input ripple factor</td><td colspan="2">10% peak to peak with a DC Ripple Factor of 5 %</td></tr>
<tr><td>5.1.3</td><td>Supply change-over</td><td colspan="2">0,6 Un duration 100 ms (without interruptions). Performance criterion A</td></tr>
<tr><td>7.2.7</td><td>Input reverse polarity protection</td><td colspan="2">By fuse</td></tr>
<tr><td>10.7</td><td>Protective coating for PCB assemblies</td><td colspan="2">Class PC2</td></tr>
<tr><td>13.3</td><td>Tests list</td><td>1 Visual Inspection
2 Performance test
3 Power supply test
4 Insulation test
5 Low temperature storage test
6 Low temperature start-up test
7 Dry heat test
8 Cyclic damp heat test
9 Salt mist test
10 Enclosure protection test (IP code)
11 EMC test
12 Shocks and vibrations test
13 Equipment stress screening test
14 Rapid Temperature variation test</td><td>Routine
Routine
Routine
Routine
-
Type
Type
Type
-
-
Type
Type
Routine: 24h at 40°C and load 100%
Type</td></tr>
</table>