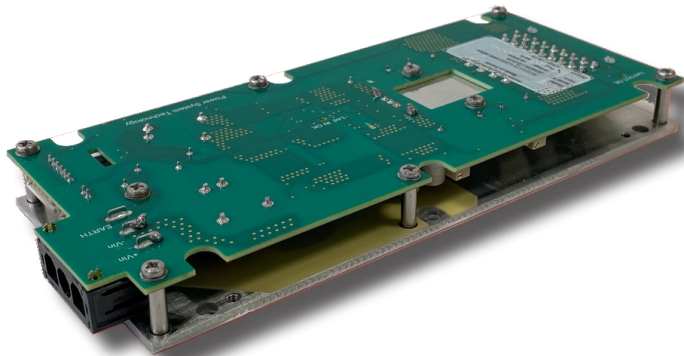


# DC-DC Conduction cooled PST27X

## Single output 320W



### Features

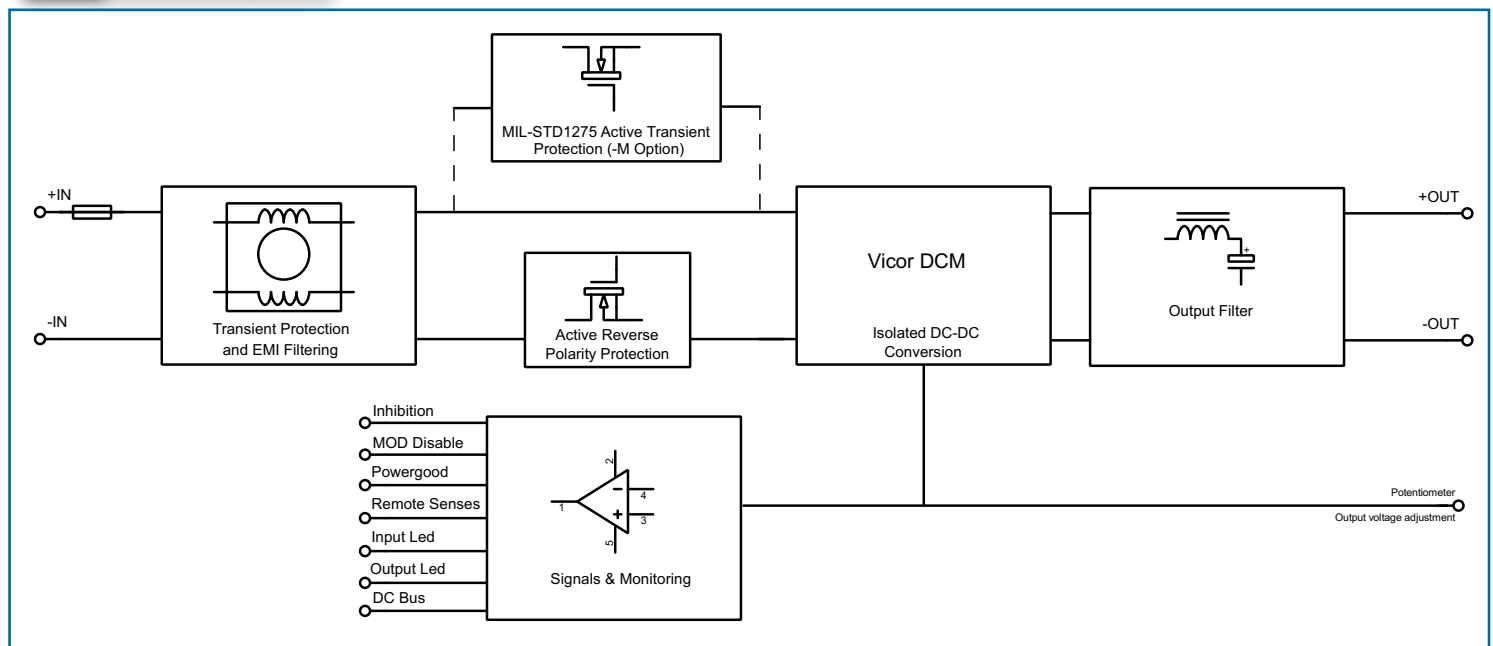
Input ranges : 9-50Vdc, 18-36Vdc, 16-50Vdc  
 1 output 3V3 to 48Vdc, 320W max.  
 80\*190\*21mm  
 Automatic reverse polarity, surge and transient protected  
 -40°C to 90°C baseplate  
 MV Option for MIL-STD 1275 and Severe environments

Safety IEC/EN 62368-1, RoHS lead-free-solder compliant



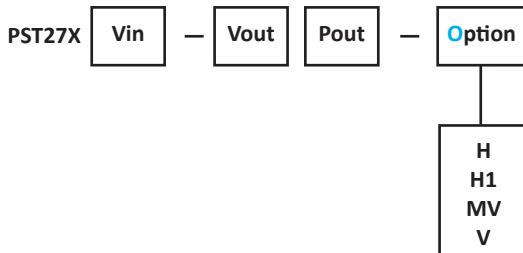
The PST27X, Very low profile DC-DC converter incorporates input filtering, very robust mechanical, conformal coating, required in most of the severe environments. The converter provides high reliability thanks to the integration of Vicor Corp. modules, high efficiency, input-to-output isolation, soft start, input over/undervoltage lockout. The converter is protected against input reverse polarity, surges and transients, EMI filtered built to meet MIL-STD 461, MIL-STD 810, MIL-STD 704 and MIL-STD 1275. The output is continuously short-circuit proof.

### Bloc diagram



### Configurations

For Input and Output configurations see page 2 and 3.



H : Heatsink longitudinal fins  
 H1 : Heatsink transversal fins  
 MV : Ruggedized & Conformal coating  
 V : Conformal coating



## Output

### Electrical Output Data

General conditions : 25°C ambient.

1) Latched shutdown - 2) Output voltage falls < 95 % of nominal - 3) Nominal input, full load, 20MHz bandwidth - 4) Nominal input, full load - 5) No load to full load, nominal input

| Part Number     | Output Voltage | Output Power | Voltage Adjustment |      |      | Overvoltage Protection (1) |      |      | Output Current |      |      | Output Current Limit (2) |      |      | Output Noise (3) |      |      | Efficiency (4) |      |      | Load regulation (5) |
|-----------------|----------------|--------------|--------------------|------|------|----------------------------|------|------|----------------|------|------|--------------------------|------|------|------------------|------|------|----------------|------|------|---------------------|
|                 | V              | W            | V                  |      |      | V                          |      |      | A              |      |      | %                        |      |      | mVpp             |      |      | %              |      |      | V                   |
|                 | Nom.           | Nom.         | Min.               | Typ. | Max. | Min.                       | Typ. | Max. | Min.           | Typ. | Max. | Min.                     | Typ. | Max. | Min.             | Typ. | Max. | Min.           | Typ. | Max. | Typ.                |
| 12Vin           |                |              |                    |      |      |                            |      |      |                |      |      |                          |      |      |                  |      |      |                |      |      |                     |
| PST27X12-3V380  | 3V3            | 80           | 3.00               | 3.63 | 4.1  |                            |      |      | 0              | 24.3 | 100  | 120                      | 136  |      | 70               |      |      | 85             |      |      | 0.1                 |
| PST27X12-580    | 5V             | 80           | 4                  | 5.5  | 6.32 |                            |      |      | 0              | 16   | 100  | 120                      | 145  |      | 80               |      |      | 85.5           |      |      | 0.1                 |
| PST27X12-12160  | 12V            | 160          | 9.6                | 13.2 | 15   |                            |      |      | 0              | 13.4 | 100  | 120                      | 150  |      | 115              |      |      | 89             |      |      | 0.1                 |
| PST27X12-15160  | 15V            | 160          | 12                 | 16.5 | 19   |                            |      |      | 0              | 10.7 | 100  | 120                      | 139  |      | 115              |      |      | 89             |      |      | 0.1                 |
| PST27X12-24160  | 24V            | 160          | 19.2               | 26.4 | 30.3 |                            |      |      | 0              | 6.7  | 100  | 120                      | 145  |      | 170              |      |      | 88             |      |      | 0.1                 |
| PST27X12-28160  | 28V            | 160          | 22.4               | 30.8 | 35.4 |                            |      |      | 0              | 5.8  | 100  | 120                      | 140  |      | 105              |      |      | 89             |      |      | 0.1                 |
| PST27X12-48160  | 48V            | 160          | 38.4               | 52.8 | 60.7 |                            |      |      | 0              | 3.4  | 100  | 120                      | 140  |      | 200              |      |      | 88             |      |      | 0.1                 |
| 24Vin           |                |              |                    |      |      |                            |      |      |                |      |      |                          |      |      |                  |      |      |                |      |      |                     |
| PST27X24-5180   | 5V             | 180          | 4                  | 5.5  | 6.92 |                            |      |      | 0              | 36   | 100  | 120                      | 139  |      | 80               |      |      | 89             |      |      | 0.1                 |
| PST27X24-12320  | 12V            | 320          | 9.6                | 13.2 | 15   |                            |      |      | 0              | 26.6 | 100  | 120                      | 130  |      | 115              |      |      | 90             |      |      | 0.1                 |
| PST27X24-15320  | 15V            | 320          | 12                 | 16.5 | 18.7 |                            |      |      | 0              | 21.4 | 100  | 120                      | 130  |      | 115              |      |      | 90.5           |      |      | 0.1                 |
| PST27X24-24320  | 24V            | 320          | 19.2               | 26.4 | 30   |                            |      |      | 0              | 13.4 | 100  | 120                      | 134  |      | 170              |      |      | 90             |      |      | 0.1                 |
| PST27X24-28320  | 28V            | 320          | 22.4               | 30.8 | 35   |                            |      |      | 0              | 11.4 | 100  | 120                      | 142  |      | 105              |      |      | 91             |      |      | 0.1                 |
| PST27X24-36320  | 36V            | 320          | 28.8               | 39.6 | 45   |                            |      |      | 0              | 8.9  | 100  | 120                      | 137  |      | 105              |      |      | 91             |      |      | 0.1                 |
| PST27X24-48320  | 48V            | 320          | 38.4               | 52.8 | 60   |                            |      |      | 0              | 6.6  | 100  | 120                      | 143  |      | 220              |      |      | 90.5           |      |      | 0.1                 |
| 28Vin           |                |              |                    |      |      |                            |      |      |                |      |      |                          |      |      |                  |      |      |                |      |      |                     |
| PST27X28-3V3120 | 3V3            | 120          | 3                  | 3.6  | 4.17 |                            |      |      | 0              | 36.4 | 100  | 120                      | 145  |      | 90               |      |      | 87             |      |      | 0.1                 |
| PST27X28-5180   | 5V             | 180          | 4                  | 5.5  | 6.92 |                            |      |      | 0              | 36   | 100  | 120                      | 131  |      | 90               |      |      | 88.5           |      |      | 0.1                 |
| PST27X28-12320  | 12V            | 320          | 9.6                | 13.2 | 15.6 |                            |      |      | 0              | 26.6 | 100  | 115                      | 132  |      | 115              |      |      | 89.5           |      |      | 0.1                 |
| PST27X28-15320  | 15V            | 320          | 12                 | 16.5 | 18.7 |                            |      |      | 0              | 21.4 | 100  | 120                      | 130  |      | 115              |      |      | 90             |      |      | 0.1                 |
| PST27X28-24320  | 24V            | 320          | 19.2               | 26.4 | 30   |                            |      |      | 0              | 13.4 | 100  | 120                      | 130  |      | 170              |      |      | 89             |      |      | 0.1                 |
| PST27X28-28320  | 28V            | 320          | 22.4               | 30.8 | 35   |                            |      |      | 0              | 11.4 | 100  | 115                      | 123  |      | 105              |      |      | 90.5           |      |      | 0.1                 |
| PST27X28-48320  | 48V            | 320          | 38.4               | 52.8 | 60   |                            |      |      | 0              | 6.6  | 100  | 120                      | 143  |      | 220              |      |      | 90             |      |      | 0.1                 |

### Output Current Limitation

See Electrical output data for current limitation value according part-number.

The converter output is continuously protected against short-circuit or current limitation by disabling the power train when output current goes above the value from the table page 3. When the default disappear, the converter will go back to normal operation after initialization.

### Output OVP

The PST27X includes output overvoltage protection (OVP) which will stop the converter in the event of an overvoltage and restart when input comes back in its normal range. See table above for the value according output voltages. Nevertheless exceeding these value may damage the converter.

## Parallel and Series Connection

A converter output can be connected in series with an output from a separate converter, a diode across each output may be implemented externally (Cathode to +OUT) to provide continuity in case of one failure. The maximum output current of a serial-connected outputs is limited by the output with the lowest current limit. Output voltages above 48V (SELV - Safety Extra Low Voltage) require additional safety measures in order to comply with international safety requirements.

Parallel operation is possible to increase output power. In standard, the unit is delivered in standalone configuration for single converter use : Switch SW2 in position P2. To Parallelize multiple converters, set the switch SW2 in position P1. The output voltage of each unit must be set separately at the same value, thanks to the P1 potentiometre, with no load at the output, before parallelizing to ensure proper current sharing between the units.

## Hold-up time

The converter provides limited hold-up time. If a hold-up time is required (some railways applications for example), use external input capacitors of adequate size.

Formula for additional external input capacitor :  $C = 2 \cdot P_{out} \cdot t_h \cdot 100 / (V_i^2 - V^2) / n$

whereas :

- C = external input capacitance [mF]
- $P_{out}$  = output power [W]
- n = efficiency [%]
- $t_h$  = hold-up time [ms]
- $V_i$  = minimum input voltage
- V = Input voltage level before interruption

## Thermal Considerations

The converter is designed to be mounted on a dissipative area, in conduction cooling mode. The max. operating temperature is the temperature of the baseplate which should not exceed 90°C.

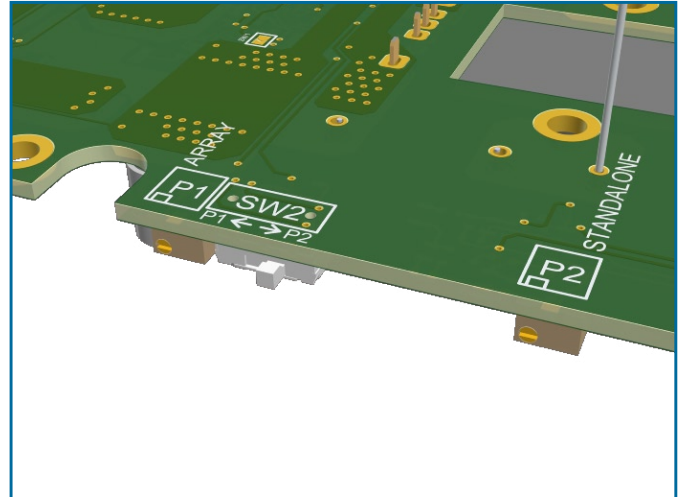
Addition of grease or thermal pad between the converter baseplate and the chassis is mandatory. When used with heatsink in conduction cooled or air forced, the thermal impedance  $R_{th}$  (°C/W) of the heatsink should be calculated taking into account max baseplate temp. 90°C ( $T_b$  max.), max operating ambient ( $T_a$  max.), dissipated power ( $P_{diss}$ ).

$$R_{th} = (T_b \text{ max.} - T_a \text{ max.}) / P_{diss}$$

As an example, see  $R_{th}$  of H and H1 heatsink option in the option description paragraph and graph of power derating.

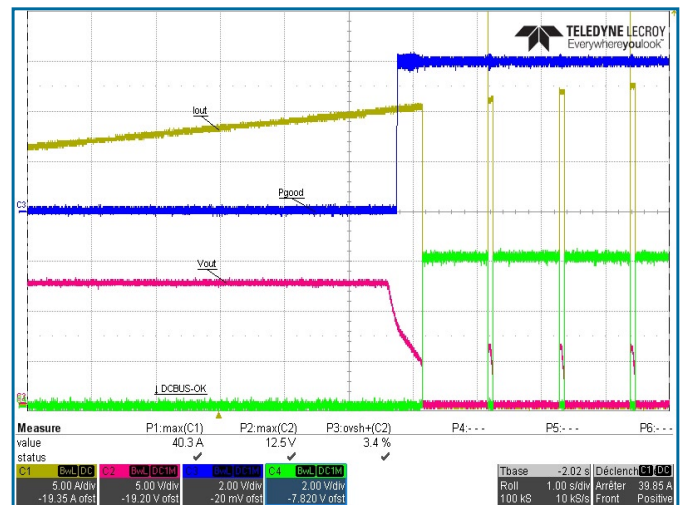
## Thermal protection

A temperature protection is integrated in each Vicor module, disabling output when heatsink temperature exceeds 105°C. The converter automatically restarts, when the temperature drops below this limit. Nevertheless, exceeding the max operating temperature may cause failures of the converter.

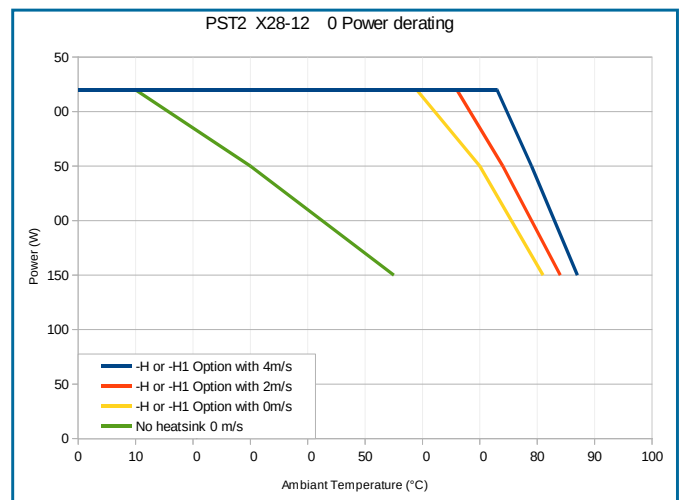


## Waveforms

### Current Limitation PST27X28-12320-MV



### Power vs Ambient temperature (vertical position) PST27X28-12320



## Auxiliary Functions

### MOD Disable / Inhibit (Remote On/Off)

The inhibit input pin enables the converter when logic low or left opened circuit between MOD Disable and MOD Disable RTN. The converter will be disabled when logic high 3.3V-15V between MOD Disable and MOD Disable RTN.

This signal is referenced to the input voltage and will disable the output at the same time when the same signal is used for several converters. In systems consisting of several converters, this feature may be used to sequence the activation of the different converters if inhibition is used separately.

You can also use a potential free contact by connecting INH to SE-.

### Output Voltage Adjustment

The converter output voltage can be adjustable by potentiometer, placed at the output side, between -20% to +10% of the nominal voltage (see page 3).

Adjust potentiometer P1 when used as a single converter and potentiometer P2 when multiple converters are used in parallel.

### Sense Lines

This feature enables compensation of voltage drop across the connector contacts and the load lines by connecting +S and -S at the load location.

The overall voltage compensation in the + and - power lines should not exceed +10% of the nominal output voltage as it may .

### Powergood

An open collector PGood signal (PGD, PGD RTN) is opened when output fails and closed when unit operates properly with output voltages in its normal range. Do not exceed 30Vdc/20mA.

### DC Bus

DC Bus reflects the converter status. An open collector is closed when converter is OK and opened when Fault (input under or over voltage, over current, etc..)

### Input / Output Led

Two green leds status indicate the presence of corresponding input (LED IN OK) and output (LED OUT OK) voltages.

## Options Description

### Heatsink (-H or -H1)

The PST27X is built as standard with an aluminum baseplate as described in the mechanical data. The converter can be delivered with a 15mm height heatsink with longitudinal fins (-H) or transversal fins (-H1). See mechanical drawings. 3D models available on the web site.

In case of using H or H1 option, the thermal impedance (Rth) of the heatsink mentioned below must be considered for the airflow or maximum power calculation. Conditions : 55°C ambient, convection (0m/s vertical mounting) and 2m/s airflow:

PST27X -H : Rth@0m/s: 2.2°C/W, Rth@2m/s: 1°C/W

PST27X -H1: Rth@0m/s: 2.2°C/W, Rth@2m/s: 1°C/W

### Ruggedized (-MV)

The PST27X can be ruggedized to meet MIL-STD810E, MIL-STD461E CE102.

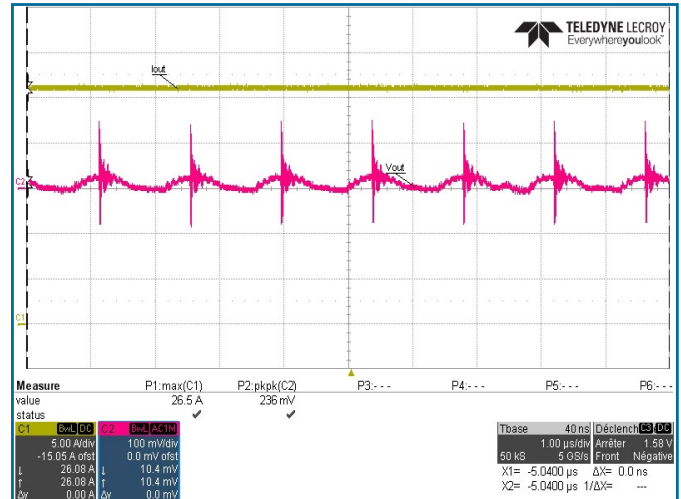
MV option is available for 12 & 28Vin only and will comply with MIL STD 1275A. When -M is selected , the -V has to be selected as well.

### Conformal coating (-V)

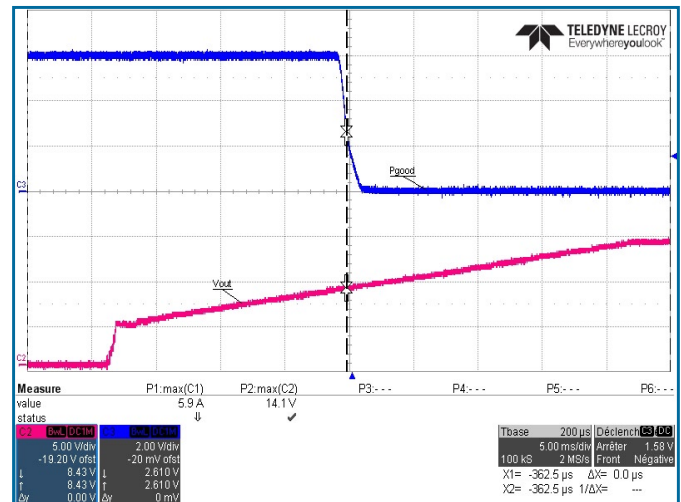
During manufacturing process, when V option is specified, components and pcb are covered with an acrylic coating to address high level of ambient with humidity application.

## Waveforms

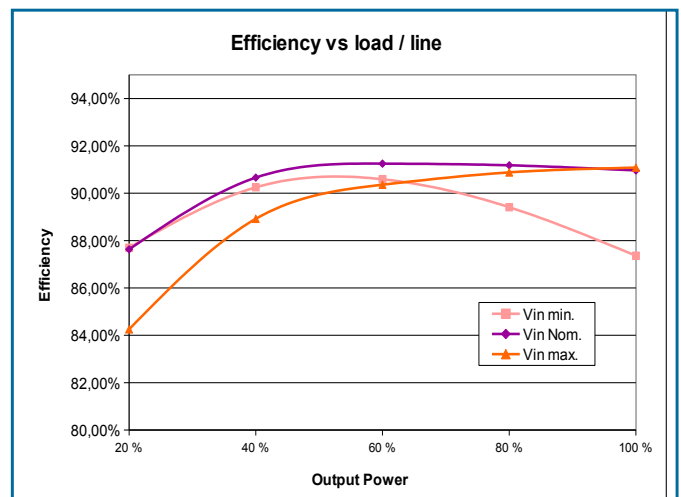
### Output Noise PST27X28-12320-MV



### Powergood Signal PST27X28-12320-MV



### Efficiency PST27X28-12320-MV





## ▼ Environmental

### Functionalities and compliance table

| Functionalities                                            | Conditions                                    | Input 12V      |                   | Input 24V      | Input 28V      |                   |
|------------------------------------------------------------|-----------------------------------------------|----------------|-------------------|----------------|----------------|-------------------|
|                                                            |                                               | PST27X12-xxxxx | PST27X12-xxxxx-MV | PST27X24-xxxxx | PST27X28-xxxxx | PST27X28-xxxxx-MV |
| Remote senses                                              |                                               | ✓              | ✓                 | ✓              | ✓              | ✓                 |
| MIL COTS version                                           | -MV option for 12 & 28 Vin                    |                | ✓                 |                |                | ✓                 |
| Conformal coating                                          | -V option                                     | ✓              | ✓                 | ✓              | ✓              | ✓                 |
| -40°C Operation                                            | standard                                      | ✓              | ✓                 | ✓              | ✓              | ✓                 |
| MIL-STD-704 A,C,D,E,F, 28V Steady State                    | built to meet, -MV option                     |                | ✓                 |                |                | ✓                 |
| MIL-STD-704 A,C,D,E,F 28V Surges High Transients           | built to meet, -MV option                     |                | ✓                 |                |                | ✓                 |
| MIL-STD-704 A,C,D,E,F 28V Surges Low Transients            | built to meet, -MV option                     |                | ✓                 |                |                | ✓                 |
| MIL-STD-704 C,D,E,F 28V Surges Low Transients              | built to meet, -MV option                     |                | ✓                 |                |                | ✓                 |
| MIL-STD-704 A,C,D,E,F 28V Spikes                           | built to meet, -MV option                     |                | ✓                 |                |                | ✓                 |
| MIL-STD-810E (Shocks, Vibrations, Accelerations, Humidity) | built to meet, -MV option                     |                | ✓                 |                |                | ✓                 |
| MIL-STD-461 Conducted Emission CE101, CE102                | See Curves below, built to meet, -MV option   |                | ✓                 |                |                | ✓                 |
| MIL-STD-461 Conducted Susceptibility CS101, 114, 116       | built to meet, -MV option                     |                | ✓                 |                |                | ✓                 |
| MIL-STD-1275 A,B,D Steady State, Surges and Spikes         | 100V/50ms, 250V/70uS                          |                | ✓                 |                |                | ✓                 |
| MIL-STD-1275 A,B,D Surges                                  | 15V operation                                 |                | ✓                 |                |                |                   |
| MIL-STD-1275 A,B,D Starting disturbance                    | 6V/1s                                         |                |                   |                |                |                   |
| MIL-STD-1275 E Steady State, Surges and Spikes             | 100V/50ms, 250V/70uS, 18Vdc/500ms             |                | ✓                 |                |                | ✓                 |
| MIL-STD-1275 E Starting disturbance                        | 12V/1s                                        |                | ✓                 |                |                |                   |
| RTCA-DO-160E sect.16 cat.Z, Surges                         | 80V/100ms, 48V/1s                             |                | ✓                 |                |                | ✓                 |
| DEF STAN 61-5, Part 6 28V                                  | 100V/50ms                                     |                | ✓                 |                |                | ✓                 |
| ABD100.1.8 Surge and Normal Transients                     | built to meet                                 |                | ✓                 |                |                | ✓                 |
| EN50155 Environmental                                      | -V option                                     | ✓              |                   | ✓              | ✓              |                   |
| EN50155, EN5022A, EN5011A, EN50121-3-2                     | See curves below in conduction, built to meet | ✓              |                   | ✓              | ✓              |                   |
| EN 50155 Input Range and Transient                         | built to meet                                 | ✓              |                   | ✓              | ✓              |                   |

### Electromagnetic Immunity

|                                   | Standard     | Level | Value      | Waveform       | Source imped. | Test procedure   | Mode |
|-----------------------------------|--------------|-------|------------|----------------|---------------|------------------|------|
| Supply surge                      | EN50155      | B     | 1,4 * Vin  | 0,1 / 1 / 0,1s | 1 ohm         | 1 positive surge | OP   |
| Direct transients                 | EN50155      | D     | 1800V      | 5 / 50µs       | 5 ohms        | 5 pos., 5 neg.   | OP   |
| Surges                            | EN 61000-4-5 | 3     | 1000V (DM) | 1,2 / 50µs     | 12 ohms       |                  | OP   |
|                                   |              |       | 2000V (CM) |                |               |                  |      |
| Electrostatic discharge (to case) | EN 6100-4-2  | 4     | 8000V      | 1 / 50µs       | 330 ohms      | 10 pos., 10 neg. | OP   |
| Electrical fast transients/burst  | EN 61000-4-4 | 4     | 4000V      | 5 / 50µs       | 50 ohms       |                  | OP   |

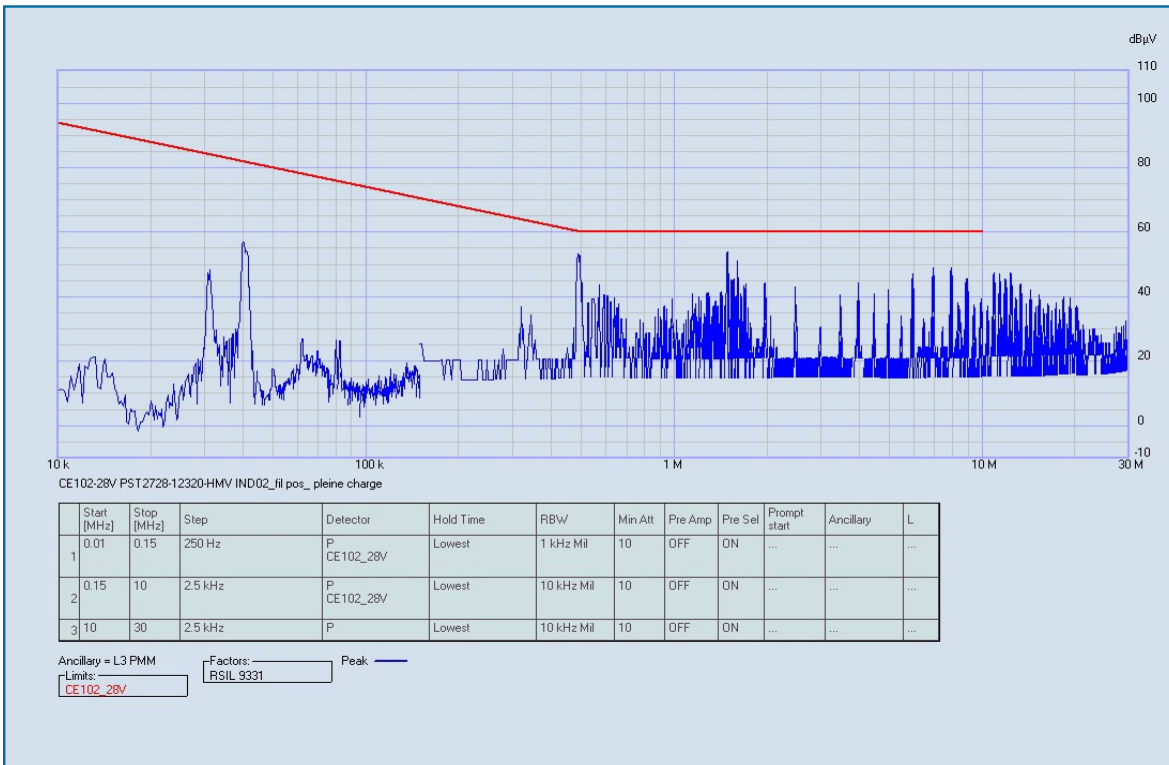
### Immunity to Environmental Conditions

| Test method | Standard                             | Test conditions              | Status                                         |
|-------------|--------------------------------------|------------------------------|------------------------------------------------|
| Damp Heat   | MIL-STD 810E Proc. 507-2             | Humidity 93 %, 40°C, 56 days | Conformal coating option only<br>Built to meet |
| Shock       | MIL-STD 810E Proc. 516.3<br>EN 50155 | 20g / 11ms<br>5g / 30ms      | Built to meet M option<br>M option             |
| Vibrations  | MIL-STD 810E Proc. 514-3             |                              | Built to meet M option                         |

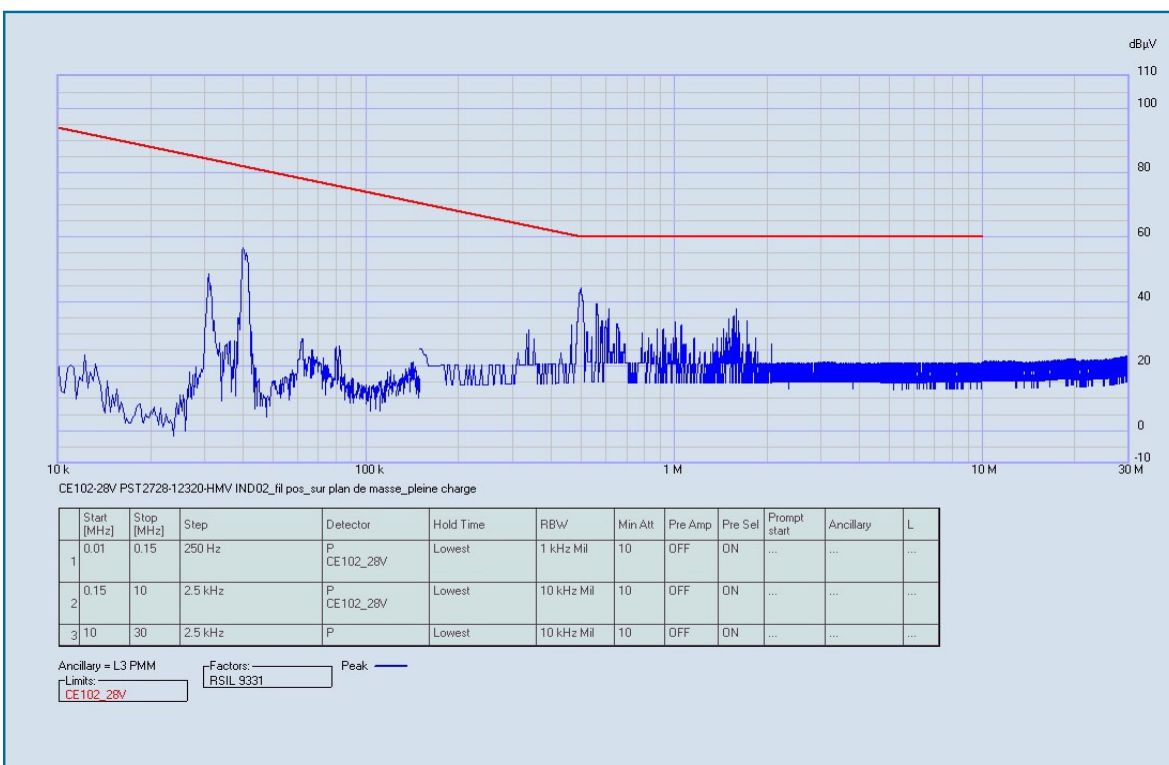
## ▼ Electromagnetic

### Electromagnetic Emissions

MIL STD461 CE102, peak detector, 28V limit, PST27X28-12320-MV, nominal line, full load, cable grounded only



MIL STD461 CE102, peak detector, 28V limit, PST27X28-12320-MV, nominal line, full load, mechanical and cable grounded



## ▼ Signals

- Powergood : Open collector (PG) referenced to PGD RTN.  
Closed if output is in its normal range
- MOD Disable : Disable if 5V TTL between MOD DIS and MOD DIS RTN  
Enable if 0V or open between MOD DIS and MOD DIS RTN
- Inhibit (INH) : Disable if potential free contact INH connected to SE-
- Bus OK : Open collector referenced to BUS OK RTN.  
Closed if converter is enabled and no FAULT is present
- Led status : Two leds on the topside (Pcb side)

## ▼ Isolation

- Dielectric withstand Input/chassis: 2120Vdc
- Dielectric withstand Input/Output : 2120Vdc
- Insulation resistance Output /Chassis: 100Mohms/500Vdc

## ▼ Approvals & Environment

**Built to meet standards - No laboratory certification**

EMI : MIL STD 461E CE102

Temperature :

Stockage : -40 +100°C

Operating : -40 +90°C baseplate, conduction cooled

Option M :

Input voltage spikes : MIL-STD 704- 100V/50ms (12Vin & 28Vin only)

MIL-STD1275D - 100V/50ms (12Vin & 28Vin only)

Altitude: 3000M

Shock & Acceleration : MIL STD 810

Operational shock : MIL STD 810

Crash safety shock (Impulse) : MIL STD 810

## ▼ Mechanical Data

Dimensions : 190 x 80 x 21mm

Weight : 300g (without option H/H1)

555g (with option H/H1)

## ▼ Connector Pin Allocation

**J1 : Molex 172043-0302**

| PIN | signal name | description |
|-----|-------------|-------------|
| 1   | +Vin        | INPUT+      |
| 2   | -Vin        | INPUT -     |
| 3   | EARTH       | EARTH       |

**J2 : MOLEX 39-30-1180**

| PIN | signal name       | description |
|-----|-------------------|-------------|
| 1   | -S                | -Sense      |
| 2   | -V <sub>out</sub> | OUTPUT-     |
| 3   | -V <sub>out</sub> | OUTPUT-     |
| 4   | -V <sub>out</sub> | OUTPUT-     |
| 5   | -V <sub>out</sub> | OUTPUT-     |
| 6   | -V <sub>out</sub> | OUTPUT-     |
| 7   | -V <sub>out</sub> | OUTPUT-     |
| 8   | -V <sub>out</sub> | OUTPUT-     |
|     | -V <sub>out</sub> | OUTPUT-     |
| 10  | +S                | +Sense      |
| 11  | +V <sub>out</sub> | OUTPUT+     |
| 12  | +V <sub>out</sub> | OUTPUT+     |
| 13  | +V <sub>out</sub> | OUTPUT+     |
| 14  | +V <sub>out</sub> | OUTPUT+     |
| 15  | +V <sub>out</sub> | OUTPUT+     |
| 16  | +V <sub>out</sub> | OUTPUT+     |
| 17  | +V <sub>out</sub> | OUTPUT+     |
| 18  | +V <sub>out</sub> | OUTPUT+     |

**J3 : Molex 22-05-7025**

| PIN | signal name | description       |
|-----|-------------|-------------------|
| 1   | INH         | Inhibition        |
| 2   | SE-         | Inhibition Return |

**J4 : Molex 22-05-7065**

| PIN | signal name | description        |
|-----|-------------|--------------------|
| 1   | PG RTN      | Power Good Return  |
| 2   | MOD DIS RTN | MOD Disable Return |
| 3   | MOD DIS     | MOD Disable        |
| 4   | PG          | Power Good         |
| 5   | BUS OK RTN  | Bus OK Return      |
| 6   | BUS OK      | Bus OK             |

