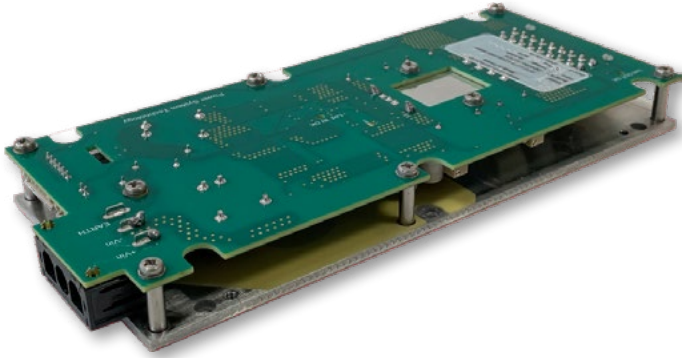


# PST27X 320W

## DC-DC Conduction cooled



Input ranges : 9-50Vdc, 18-36Vdc, 16-50Vdc  
1 output 3V3 to 48Vdc, 320W max.

80\*190\*21mm

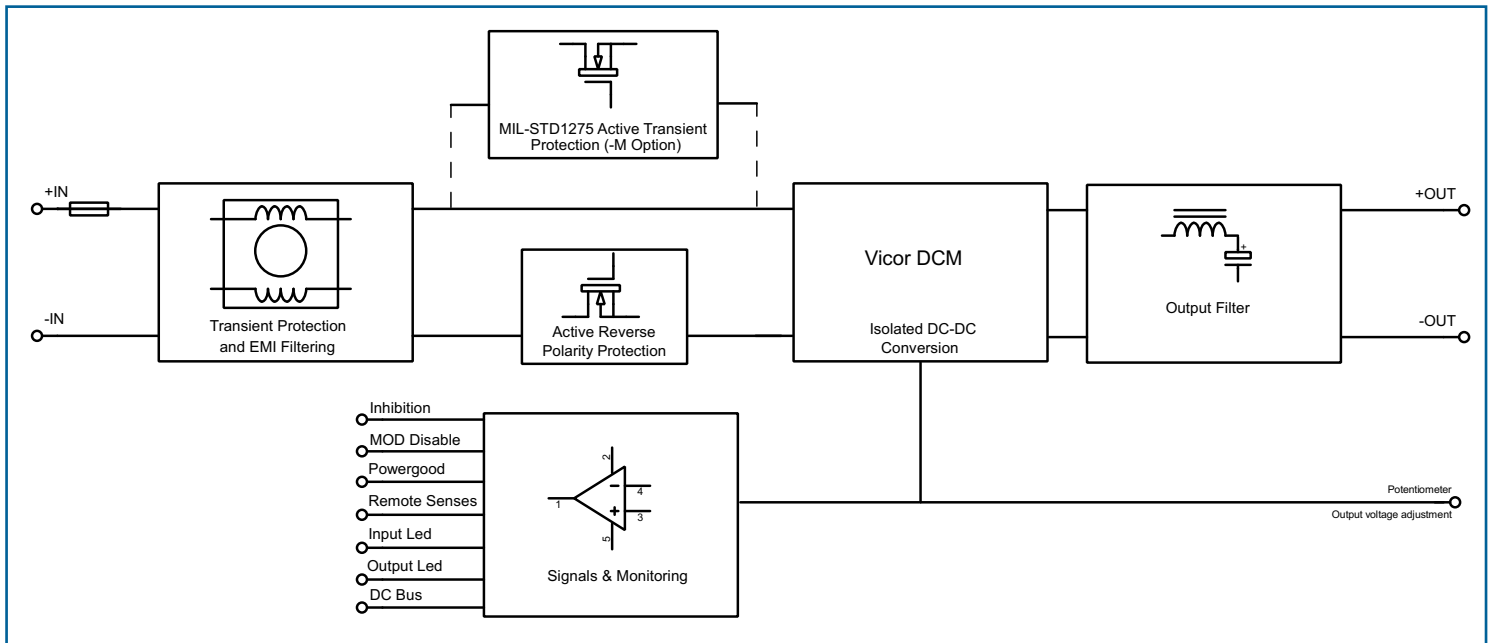
Automatic reverse polarity, surge and transient protected  
-40°C to 90°C baseplate

MV Option for MIL-STD 1275 and Severe environments

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

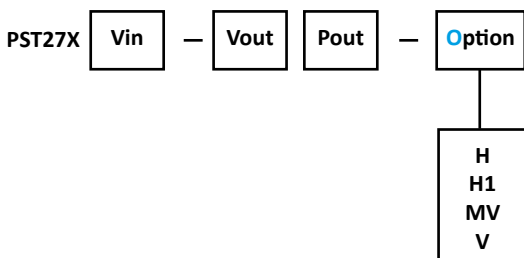


The PST27X, Very low profile DC-DC converter incorporates input filtering, very robust mechanical, conformal coating, required in most of the severe environments. The converter provides high reliability thanks to the integration of Vicor Corp. modules, high efficiency, input-to-output isolation, soft 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.



### Configurations

For Input and Output configurations see page 2 and 3.



## Input

### Electrical Input Data

Input Characteristics	Conditions	12V			24V			28V			Units
		min	typ.	max	min	typ.	max	min	typ.	max	
Operating input voltage		9		50	18		36	16		50	V
Absolute Max. Rating				65			65			65	
Undervoltage lockout				8,55			17,1	9,6		15,2	V
Undervoltage Recovery				9			18			16	V
Overvoltage lockout	If no -M option			55			45			55	V
Overvoltage Recovery	If no -M option	50			36			50			V
Input current	Vin min			20			20			20	A
Input power	No load			11			11			12	W
	Disabled			1			1			1	W
Inrush current	Peak			25			22			25	A
Start-up time				100			100			100	ms

### Input Transient Protection

A Transil diode and a common mode input filter form an effective protection against input fast transients in severe environments like railways.

The unit incorporates an active protection circuit against high energy transient MIL STD 1275, DO160.

### Input Fuse

A fuse mounted inside the converter protects against damages in case of a failure. The fuse is not user-accessible.

### Input Reverse Polarity

An active Mosfet circuit placed internally at the input will block the current in case of reversed polarity, no damage to the unit and unit will come back to normal operation when resumed.

### Input Inrush Current

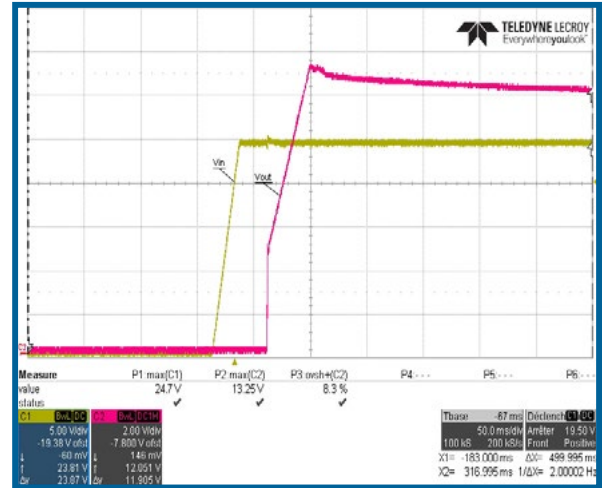
They are no inrush limitation other than input serial choke from EMI filter and these included into the Vicor DCM converter as the input capacitors are quite limited. See above table for the values.

### Input UVP/ OVP

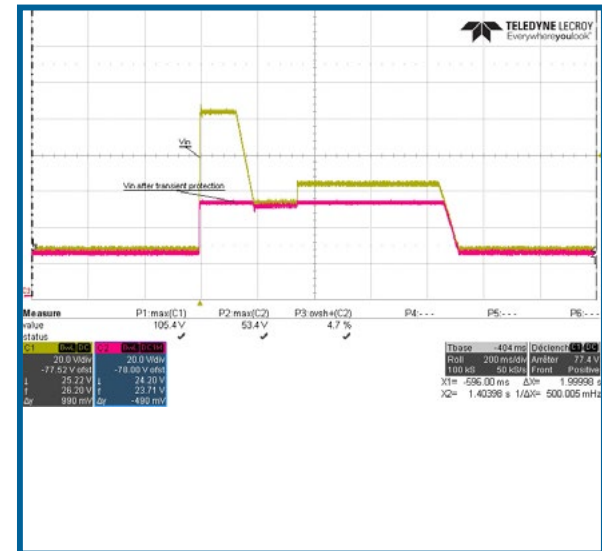
The PST27X includes input undervoltage protection (UVP) and overvoltage protection (OVP) which will stop the converter in the event of an under/overvoltage and restart when input comes back in its normal range. See table above for the value according input range. Do not exceed absolute maximum rating in any case.

### Waveforms

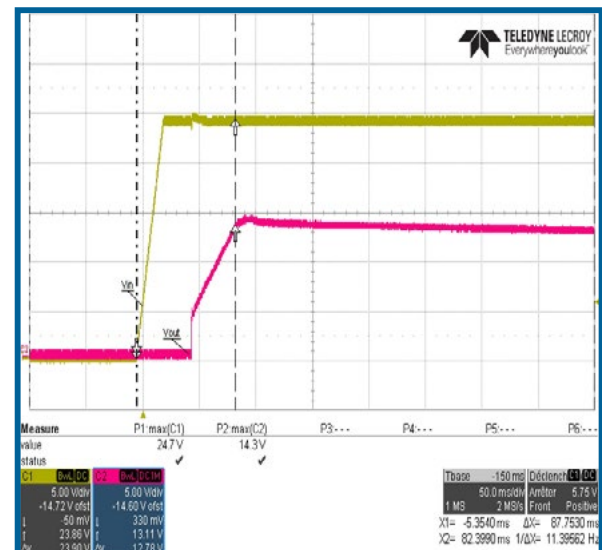
Overshoot : PST27X28-12320-MV



100V 50ms Transient protection (-M option) : PST27X28-12320-MV



Start-up time : PST27X28-12320-MV



## 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.	Min.	Typ.	Max.	Typ.
<b>12Vin</b>																								
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											
<b>24Vin</b>																								
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											
<b>28Vin</b>																								
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 :  $C = 2 * P_{out} * t_h * 100 / (V_i^2 - V^2) / n$

whereas :

- C = external input capacitance [mF]
- P<sub>out</sub> = output power [W]
- n = efficiency [%]
- t<sub>h</sub> = hold-up time [ms]
- V<sub>i</sub> = 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.

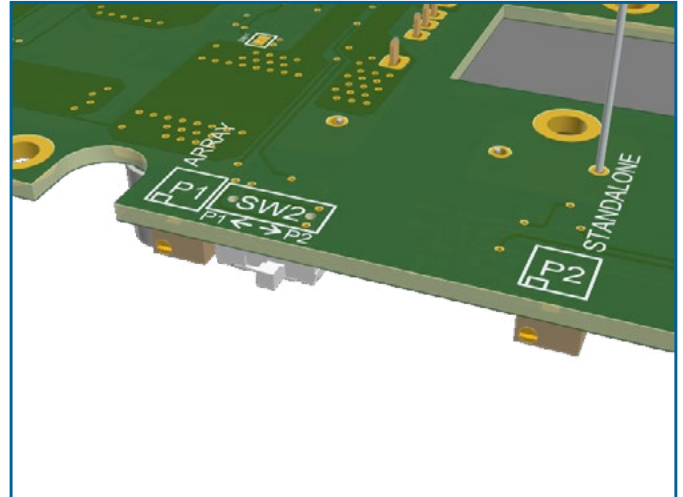
Addition of grease or thermal pad between the converter baseplate and the chassis is mandatory. When used with heatsink in conduction cooled or air forced, the thermal impedance R<sub>th</sub> (°C/W) of the heatsink should be calculated taking into account max baseplate temp. 90°C (T<sub>b</sub> max.), max operating ambient (T<sub>a</sub> max.), dissipated power (P<sub>diss</sub>).

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

As an example, see R<sub>th</sub> of H and H1 heatsink option in the option description paragraph and graph of power derating .

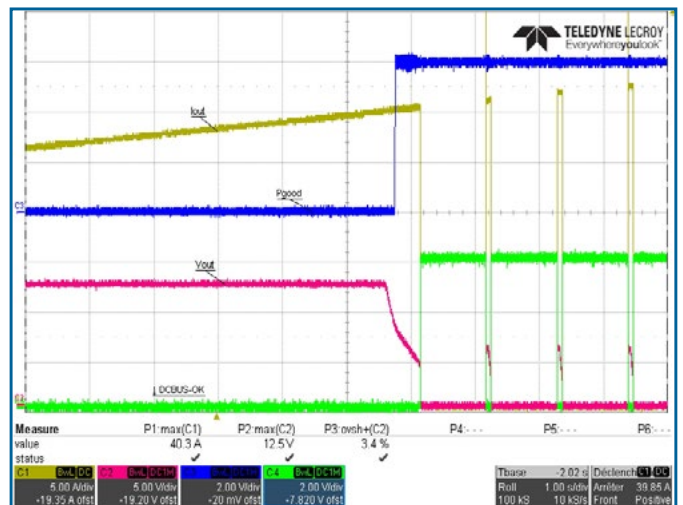
### Thermal protection

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.

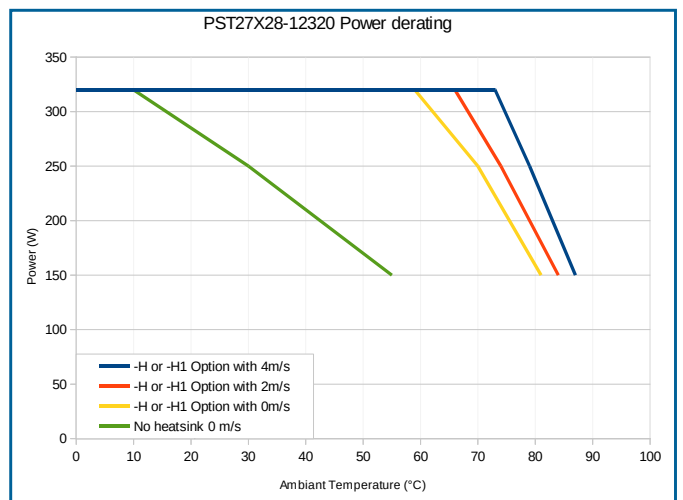


### Waveforms

#### 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.

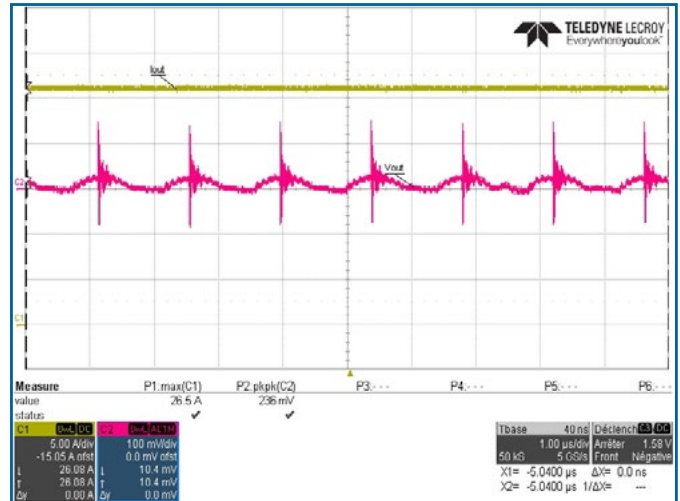
MV option is available for 12 & 28V<sub>in</sub> only and will comply with MIL STD 1275A. When -M is selected , the -V has to be selected as well.

### Conformal coating (-V)

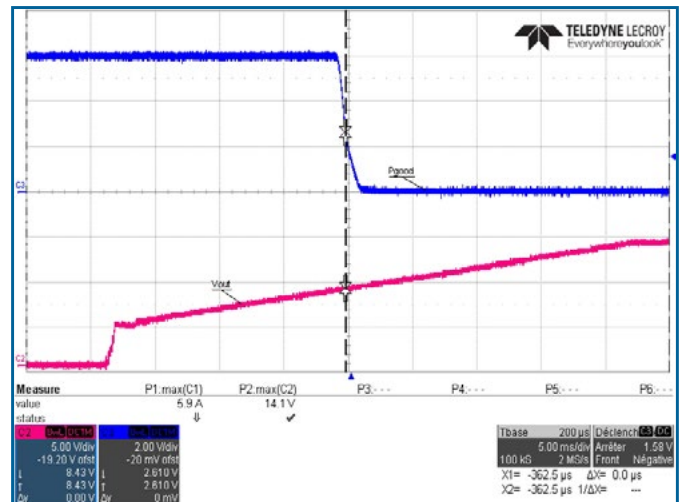
During manufacturing process, when V option is specified, components and pcb are covered with an acrylic coating to address high level of ambient with humidity application.

## Waveforms

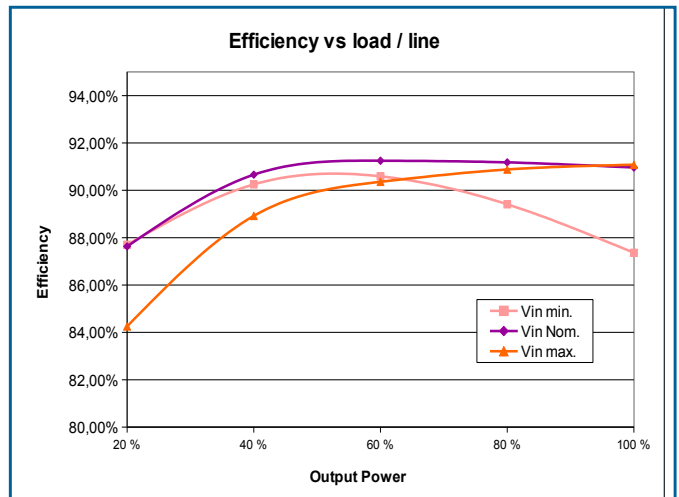
### Output Noise PST27X28-12320-MV



### 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, EN55022A, EN55011A, 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

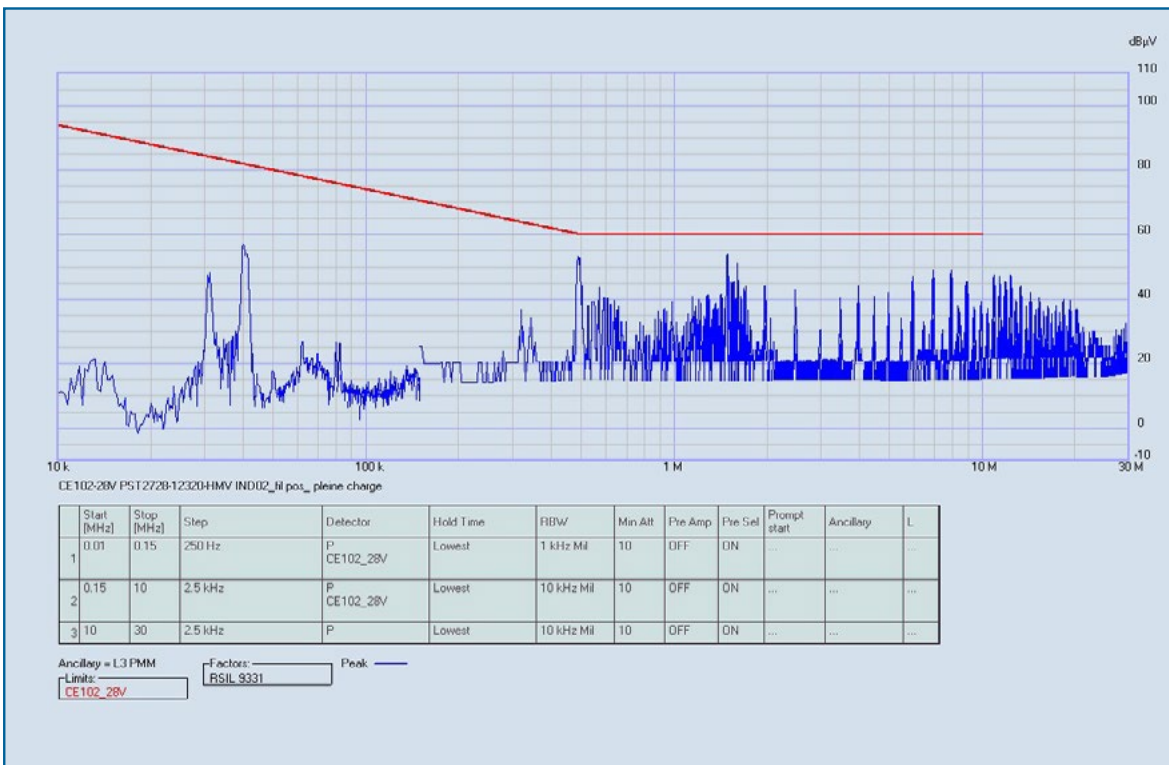
### Immunity to Environmental Conditions

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

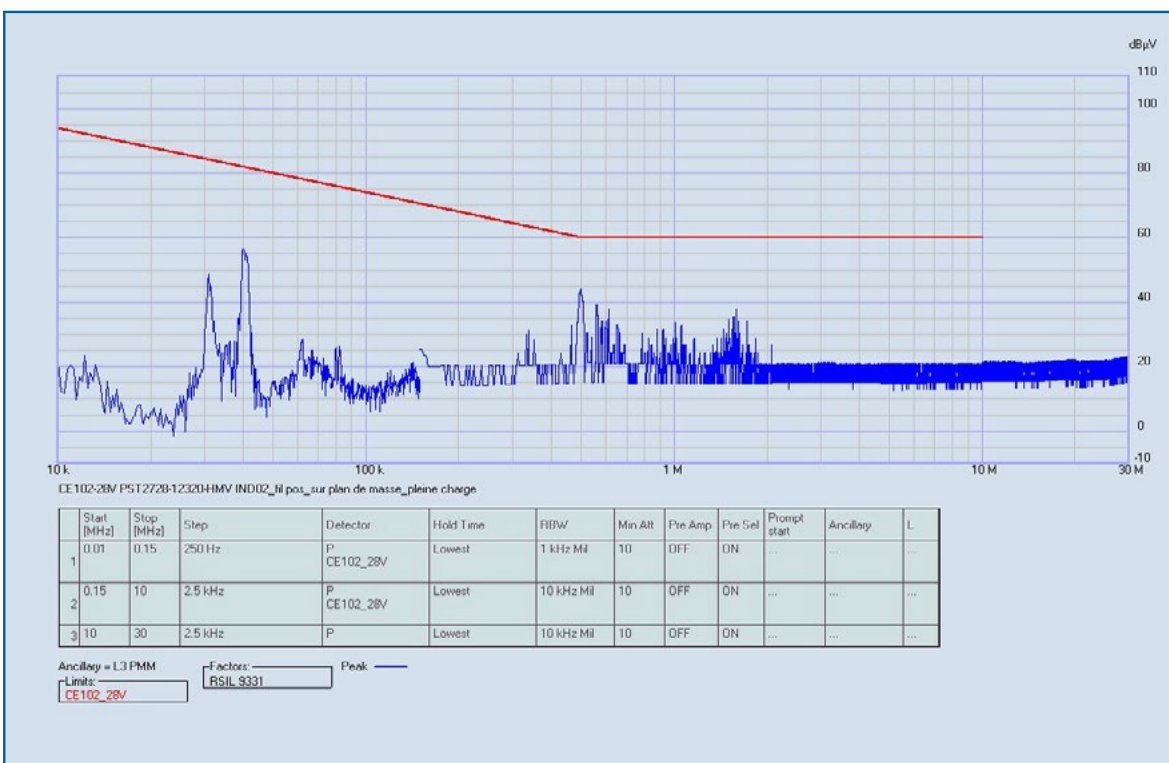
▼ **Electromagnetic**

**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



- 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)

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

### 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

Dimensions : 190 x 80 x 21mm

Weight : 300g (without option H/H1)

555g (with option H/H1)

**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_out	OUTPUT-
3	-V_out	OUTPUT-
4	-V_out	OUTPUT-
5	-V_out	OUTPUT-
6	-V_out	OUTPUT-
7	-V_out	OUTPUT-
8	-V_out	OUTPUT-
9	-V_out	OUTPUT-
10	+S	+Sense
11	+V_out	OUTPUT+
12	+V_out	OUTPUT+
13	+V_out	OUTPUT+
14	+V_out	OUTPUT+
15	+V_out	OUTPUT+
16	+V_out	OUTPUT+
17	+V_out	OUTPUT+
18	+V_out	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

