

# EPM12V1

## Non-isolated DC-DC converter



### Product features

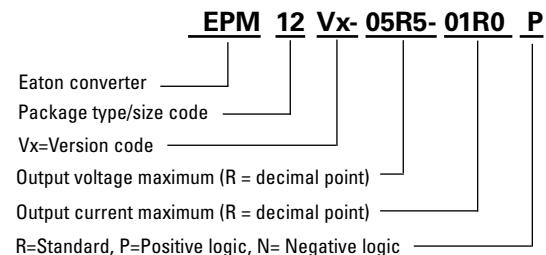
- Non-isolated DC-DC converter
- 3 - 14 Vdc input voltage range
- Efficiency up to 89.5%
- Operating ambient temperature from -40 °C to +82 °C
- Short circuit protection and remote ON/OFF function
- Programmable output voltage from 0.9 - 5.5 Vdc
- EN62368 safety approval

### Applications

- Industrial
  - Automation & testing equipment
  - Displays
  - Lighting
  - IoT
  - Power Supply
- Energy
  - Solar and wind inverters
  - Battery management
- Medical
  - Hospital & home care equipment
  - Inventory tracking
  - Diagnostics
- Telecom
  - Networking and telecommunications
  - Infrastructure

### Environmental compliance

### Ordering part number



## Specifications

	Parameter	Conditions	Minimum	Typical	Maximum	Unit
Input	Input voltage range		3	12	14	Vdc
	Start-up voltage		3			Vdc
	Start-up time			6		ms
Output	Remote ON/OFF	DC-DC ON DC-DC OFF		Open or 1.6 V < Vctrl < 5 V Short or 0 V < Vctrl < 0.1 V		
	Efficiency	V <sub>o</sub> = 0.9 Vdc V <sub>o</sub> = 5 Vdc V <sub>o</sub> = 5.5 Vdc		64 89.5 90		%
	Output voltage trim <sup>1</sup>		0.9	5.5		Vdc
	Minimum load		0			%
	Line regulation	LL-HL		±0.3		%
	Load regulation	10-100% Load		±0.3		%
	Voltage accuracy			±0.3		
	Operating frequency	100% Load at Nominal V <sub>in</sub>		800		kHz
	Ripple & Noise <sup>2</sup>	20 MHz BW	10	40		mVp-p
Environment	Input current	Remote off mode		1		mA
	Operating temperature	Derating curve	-40	82		°C
	Storage temperature		-55	125		°C
Function	Vibration			MIL-STD-202G-55		
	Short circuit protection			continuous, automatic recovery		
	Safety			EN 62368-1		
Physical	MTBF	MIL-HDBK217F	2600			k hours
	Dimension		0.488 (L) x 0.488 (W) x 0.157 (H)			inches
	Weight			1		g
	Case material			Open frame		
EMC	Cooling method			Free air convection		
	EMI	EN 55032		Class A with external circuit		
	ESD	EN61000-4-2 Air ± 8 kV Contact ± 8 kV		Criteria A		
	Fast transient <sup>3</sup>	EN 61000-4-4, ±2 kV		Criteria A		
	Surge <sup>3</sup>	EN 61000-4-5, ±2 kV		Criteria A		

1. The output voltage range is limited by V<sub>in</sub> (V<sub>out</sub> < V<sub>in</sub> \* 0.7)2. The ripple & noise are measured with 0.1 µF capacitor at 20 MHz BW, show at V<sub>out</sub>= 1 V.

3. External input capacitor required 2200 µF/ 25 V with TVS.

4. All specifications valid at nominal input voltage, full load and +25 °C after warm-up time unless otherwise stated.

5. The product information and specifications are subject to change without prior notice.

## Selection guide

Part number	Input voltage	Output voltage	Output current @ full load	Input current @ no load	Efficiency <sup>1</sup> typical	Capacitive load <sup>2</sup> maximum
EPM12V1-05R5-01ROP	3 - 14 Vdc 12 Vdc nominal	0.9 - 5.5 Vdc 5 Vdc nominal	1000 mA	15 mA	89.5%	200 µF

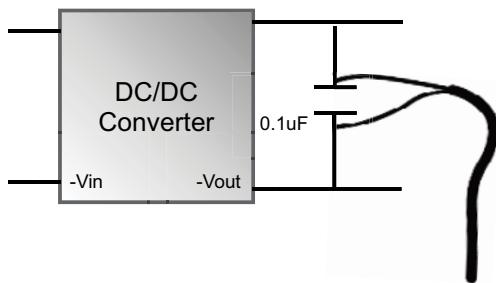
1. The efficiency is test by nominal input and maximum full load at +25 °C.

2. The capacitive load is test by minimum input and constant resistive load.

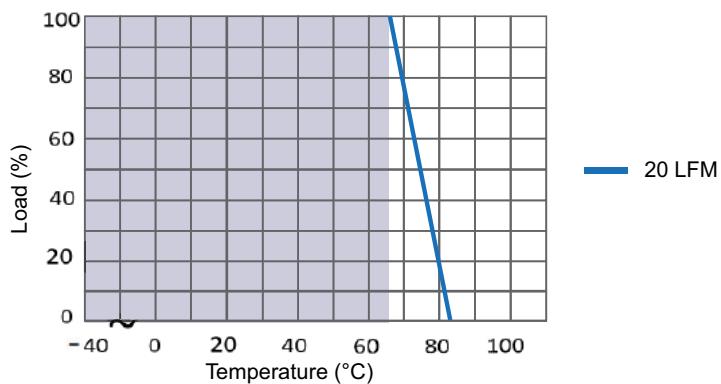
3. All specifications valid at nominal input voltage, full load and +25 °C after warm-up time unless otherwise stated.

4. Special input and output voltage combinations available by request, please contact your local sales representative.

### Measure method

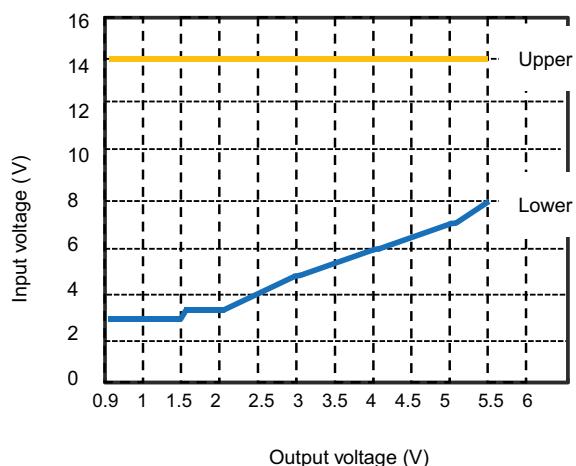


### Derating curve



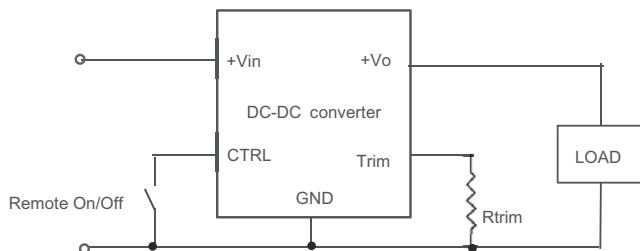
The derating curve was measured at 12 V input and 5 V output.

### Output voltage vs. input voltage



## Application information

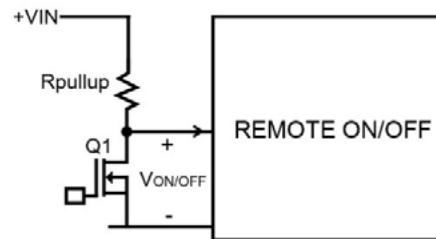
### Output voltage trim



Trim resistor equation

$$R_{trim}(\text{k}\Omega) = \left(\frac{49.1355}{V_o - 0.895}\right) - 10.7$$

### Remote On/OFF



Logic type active mode:

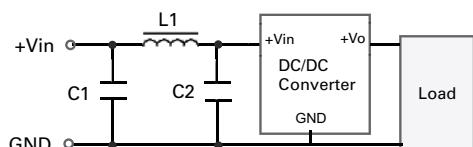
DC/DC ON : Q1 OFF

DC/DC OFF : Q1 ON

Output voltage	Calculated Rtrim (kΩ)
5.5 V	0
5 V	1.3
3.3 V	9.8
2.5 V	20.2
1.8 V	44.2
1.5 V	71.3
1.2 V	150
0.895 V	∞ (Open)

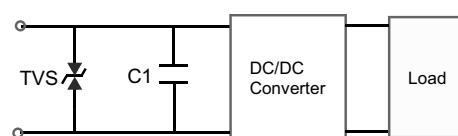
The output voltage may be adjusted over a limited range by connection an external trim resistor (Rtrim) between the trim pin and ground.

### EMC filtering circuit



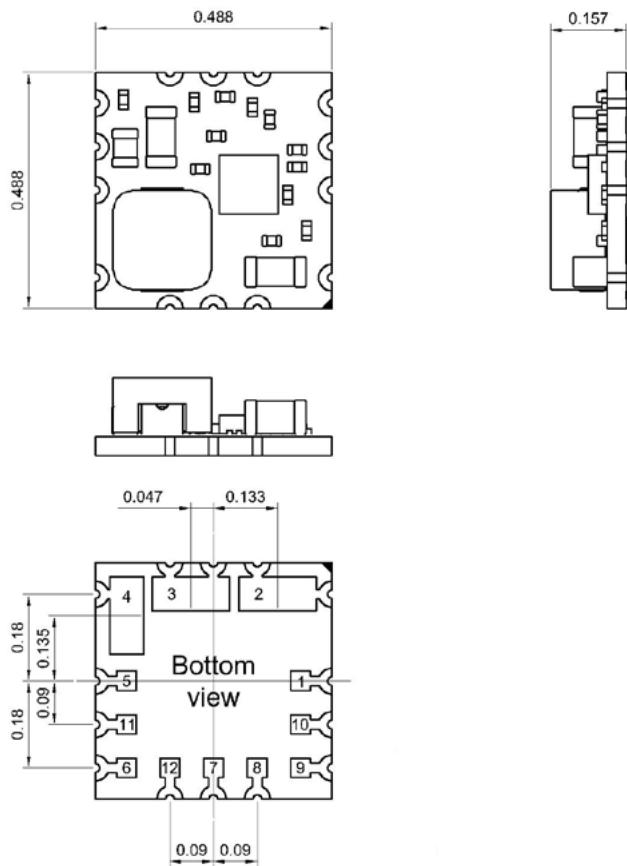
Class	C1	L1	C2
Class A	2.2 μF	10 μH	X

### EFT and surge circuit



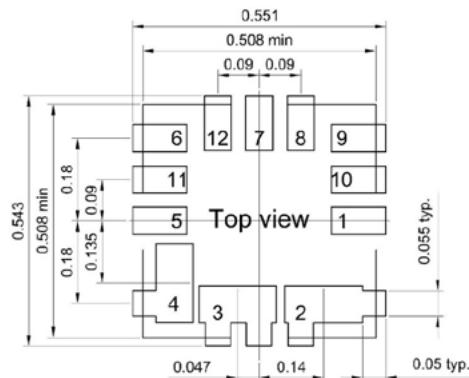
TVS	C1
Eaton 5-0SMDJ22CA	2200 μF

Dimensions - inches



Projection: Third angle projection  
Tolerance:  $\pm 0.02$   
Pad 1&5~12 =  $0.04 \times 0.04$   
Pad 2~4 =  $0.16 \times 0.07$

Recommended pad layout



Pad 1&5~12 =  $0.118 \times 0.059$ "  
Pad 2&4 =  $0.17 \times 0.08$ "  
Pad 3 =  $0.168 \times 0.08$ "

Marking

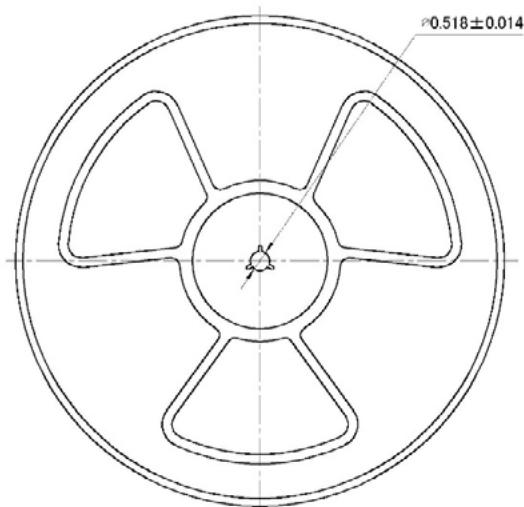
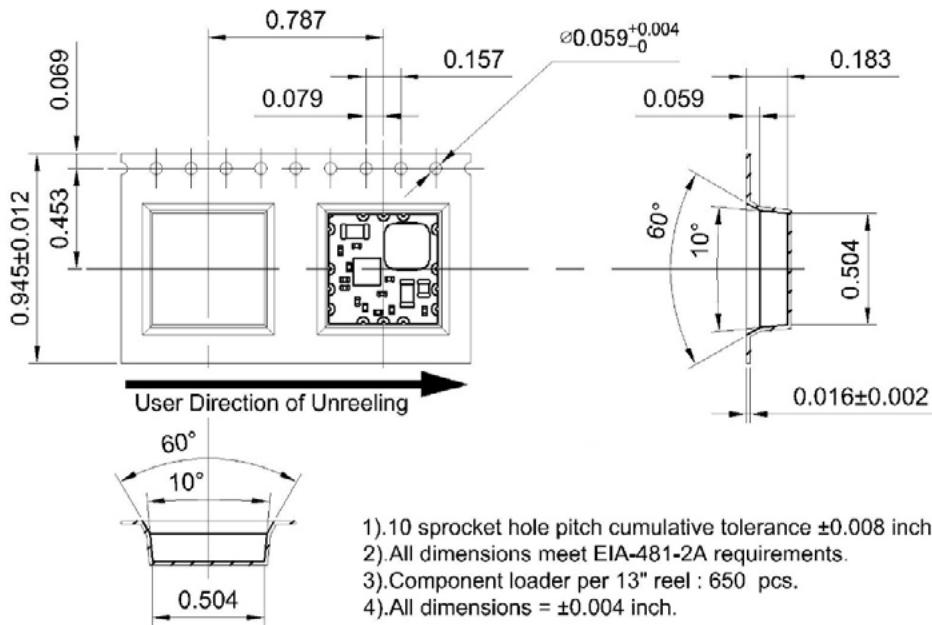
EPM12V1-  
05R5-01R0P  
XXX

XXX = lot code

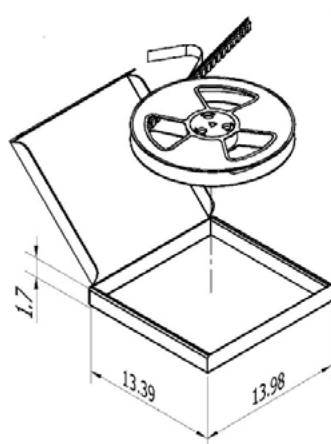
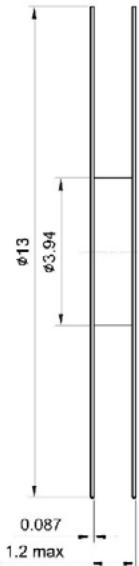
Pin	Function	Pin	Function
1	CTRL	7	GND
2	Vin	8	NC
3	GND	9	NC
4	Vout	10	NC
5	NC	11	GND
6	TRIM	12	NC

NC = no connection

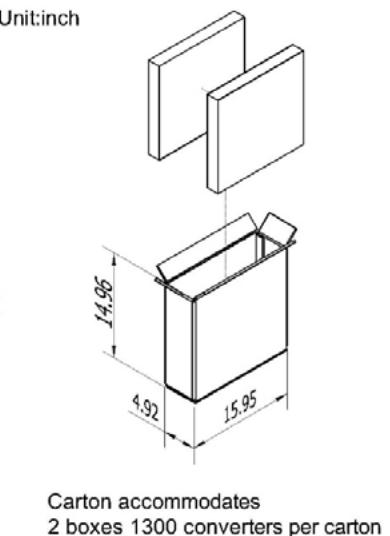
Packaging- Inches



Unit : inch  
Package : 1 Tape Reel = 650 pcs



1 Tape Reel = 650 converters



Carton accommodates  
2 boxes 1300 converters per carton

## General information

### Pick and place

The 1A Open Frame modules use an open frame construction and are designed for a fully automated pick and place assembly process.

### MSL rating

The 1A Open Frame modules have a MSL rating of 3.

### Storage and handling

The recommended storage environment and handling procedures for moisture-sensitive surface mount packages is detailed in J-STD-033 (Handling, Packing, Shipping and Use of Moisture/Reflow Sensitive Surface Mount Devices).

Moisture barrier bags (MBB) with desiccant are required for MSL ratings of 3 or greater. These sealed packages should not be broken until time of use. Once the original package is broken, the floor life of the product at conditions of 30 °C and 60% relative humidity 168 hours varies according to the MSL rating (see J-STD-033). The shelf life for dry packed SMT packages will be a maximum of 12 months from the bag seal date, when stored at the following conditions: < 40 °C, < 90% relative humidity.

### Post solder cleaning and drying considerations

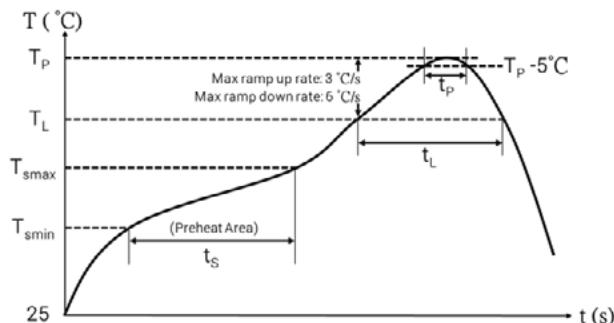
To avoid contamination on the soldering pads extra care has to be taken when handling the boards. Clean soldering surfaces do not generate as many gases when the flux reduce the metal oxides or react with contaminants during the soldering process.

### Nozzle

The module weight has been kept to a minimum by using open frame construction. Variables such as nozzle size, tip style, vacuum pressure and placement speed should be considered to optimize this process.

### Lead-free reflow profile

Power Systems will comply with J-STD-020 (Moisture/Reflow Sensitivity Classification for Nonhermetic Solid State Surface Mount Devices) for both Pb-free solder profiles and MSL classification procedures. This standard provides a recommended forced-air-convection reflow profile based on the volume and thickness of the package. The suggested Pb-free solder paste is Sn/Ag/Cu (SAC). The recommended linear reflow profile using Sn/Ag/Cu solder is shown. Soldering outside of the recommended profile requires testing to verify results and performance.



Profile	Pb-free assembly
Average ramp-up rate ( $T_{smax}$ to $T_p$ )	3 °C/s max.
Preheat	
Temperature min. ( $T_{smin}$ )	150 °C
Temperature max. ( $T_{smax}$ )	200 °C
$T_s$ ( $T_{smin}$ to $T_{smax}$ )	60-120 s
Temperature ( $T_p$ )	245°C
Time maintained above Temperature ( $T_p$ )	217°C
Time ( $t_p$ )	60-150 s
Time within 5 °C of the specified Peak temperature ( $T_p$ )	20-40 s
Ramp down rate ( $T_p$ to $T_L$ )	6 °C/s max
Time 25 °C to peak temperature	8 minutes max.

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