

# EPM78Vx

## Non-isolated DC-DC converter



### Product features

- Switching regulator, Non-isolated DC-DC converter
- Convenient 3-Pin SIP Package compatible with LM78xx linear regulator
- Input voltages: 4.75 V to 32 Vdc
- 6 SKU's representing 6 output voltages (1.8 V – 15 V) @ 1A output current
- Efficiency up to 96%
- Operating ambient temperature -40 °C to +90 °C
- Continuous short circuit protection
- EN62368 safety approval

### Engineering tools

- EPM78 Evaluation kit
- PN: EPM78-EVK  
Includes evaluation board and 7 EPM78 part numbers
- [EPM78 Evaluation kit user guide](#)

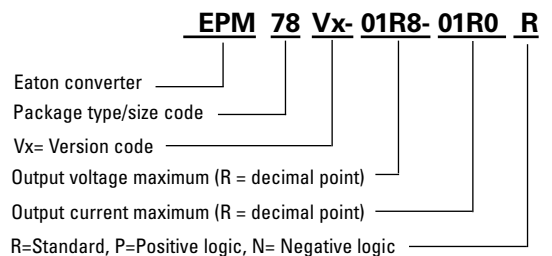
### Applications

- 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              |       |
|-------------------------|-----------------------------|---|-------------------------|-----------------------------------|--------------------------------|-------------------|-------|
| <b>Input</b>            | Input voltage range         |   |                         | 24                                |                                | Vdc               |       |
|                         | <b>Output</b>               | Efficiency                                  | Vo = 1.8 Vdc @ min. Vin |                                   | 86                             |                   | %     |
| Vo = 3.3 Vdc @ min. Vin |                             |   |                         | 90                                |                                | %                 |       |
| Vo = 5.0 Vdc @ min. Vin |                             |   |                         | 93                                |                                | %                 |       |
| Vo = 6.5 Vdc @ min. Vin |                             |   |                         | 94                                |                                | %                 |       |
| Vo = 12 Vdc @ min. Vin  |                             |   |                         | 95                                |                                | %                 |       |
| Vo = 15 Vdc @ min. Vin  |                             |   |                         | 96                                |                                | %                 |       |
| <b>Output</b>           | Minimum load                |   |                         | 1                                 |                                | %                 |       |
|                         | Line voltage regulation     | LL-HL                                       |                         | 0.2                               | 0.4                            | %                 |       |
|                         | Load voltage regulation     | 10-100% Load                                |                         | 0.4                               | 0.6                            | %                 |       |
|                         | Voltage accuracy            |   |                         | ±3                                |                                | %                 |       |
|                         | Operating frequency         | 100% Load at nominal Vin                    |                         | 500                               |                                | kHz               |       |
|                         | Ripple & noise              | Vo = 1.8 Vdc                                |                         |                                   |                                | 50 <sup>(1)</sup> | mVp-p |
|                         |                             | Vo = 3.3 Vdc                                |                         |                                   |                                | 50                | mVp-p |
|                         |                             | Vo = 5.0 Vdc                                |                         |                                   |                                | 50                | mVp-p |
|                         |                             | Vo = 6.5 Vdc                                |                         |                                   |                                | 75 <sup>(2)</sup> | mVp-p |
|                         |                             | Vo = 12 Vdc                                 |                         |                                   |                                | 100               | mVp-p |
|                         |                             | Vo = 15 Vdc                                 |                         |                                   |                                | 100               | mVp-p |
| <b>Environment</b>      | Operating temperature       | With derating                               | -40                     |                                   | +90                            | °C                |       |
|                         | Storage temperature         |   | -55                     |                                   | +125                           | °C                |       |
|                         | Relative humidity           |   |                         |                                   | 95                             | %RH               |       |
|                         | Temperature coefficient     |   |                         | 0.015                             |                                | %/°C              |       |
|                         | Maximum case temperature    |   |                         |                                   | 105                            | °C                |       |
|                         | Vibration                   |   |                         |                                   | MIL-STD-202G                   |                   |       |
|                         | <b>Function</b>             | Short circuit protection                    |                         |                                   | Continuous, automatic recovery |                   |       |
| Safety                  |                             |   |                         | EN 62368-1                        |                                |                   |       |
| MTBF                    |                             | MIL-HDBK217F                                | 13300                   |                                   |                                | hours             |       |
| <b>Physical</b>         | Dimension                   |   |                         | 0.457 (L) x 0.402 (W) x 0.300 (H) |                                | inches            |       |
|                         | Weight                      |   |                         | 1.9                               |                                | g                 |       |
|                         | Cooling method              |   |                         | Free air convection               |                                |                   |       |
|                         | Case material               |   |                         | Non conductive black plastic      |                                |                   |       |
| <b>EMC</b>              | EMI                         | EN 55032                                    |                         | Class A/B                         |                                |                   |       |
|                         | ESD                         | EN61000-4-2<br>Air ± 8 kV<br>Contact ± 6 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. If you use 26 V input and the loading is less 5%, the R&N will be 100 mVp-p maximum

2. With a 4.7 µF/ 50 V X7R MLCC, the R&N will be 50 mVp-p maximum

3. External input capacitor required 1500 µF/ 50 V.

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

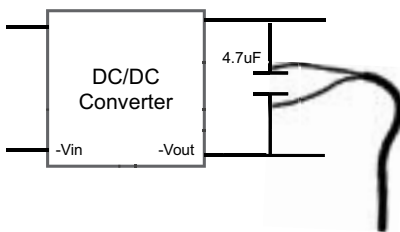
5. All specifications valid at 24 V input, full load and +25 °C after warm-up time unless otherwise stated.

### Selection guide

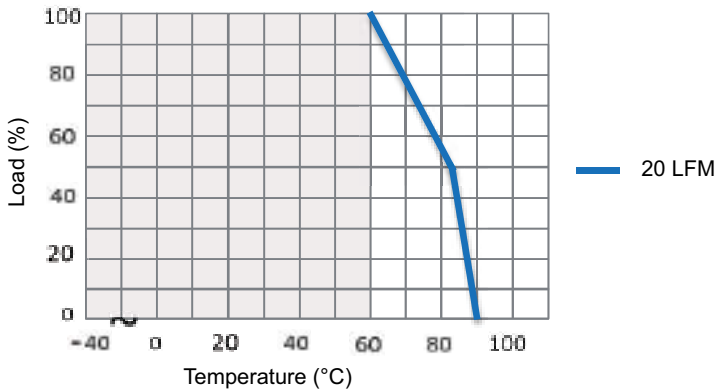
| Part number        | Input voltage | Output voltage | Output current @ full load | Input current @ no load | Efficiency (typical) <sup>1</sup><br>Vin minimum/ Vin maximum | Capacitive load <sup>2</sup><br>maximum |
|--------------------|---------------|----------------|----------------------------|-------------------------|---|---|
| EPM78V1-01R8-01R0R | 4.75 - 26 Vdc | 1.8 Vdc        | 1000 mA                    | 10 mA                   | 86.0/77.5%  | 470 µF                                  |
| EPM78V2-03R3-01R0R | 4.75 - 32 Vdc | 3.3 Vdc        | 1000 mA                    | 12 mA                   | 90.0/82.5%  | 470 µF                                  |
| EPM78V2-05R0-01R0R | 6.5 - 32 Vdc  | 5.0 Vdc        | 1000 mA                    | 16 mA                   | 93.0/86.0%  | 470 µF                                  |
| EPM78V2-06R5-01R0R | 8 - 32 Vdc    | 6.5 Vdc        | 1000 mA                    | 20 mA                   | 94.0/88.0%  | 470 µF                                  |
| EPM78V2-12R0-01R0R | 15 - 32 Vdc   | 12 Vdc         | 1000 mA                    | 23 mA                   | 95.0/92.0%  | 470 µF                                  |
| EPM78V2-15R0-01R0R | 18 - 32 Vdc   | 15 Vdc         | 1000 mA                    | 25 mA                   | 96.0/93.0%  | 330 µF                                  |

1. The efficiency is test by max./ min. input voltage and full load @ +25 °C, and ±2% tolerance
2. The capacitive load is test by minimum input and constant resistive load
3. All specifications valid at 24 V input voltage, full load and +25 °C after warm-up time unless otherwise stated

### Measuring circuit

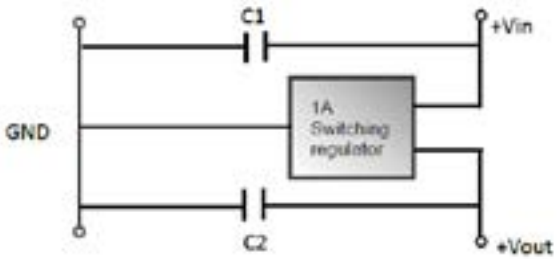


### Derating curve

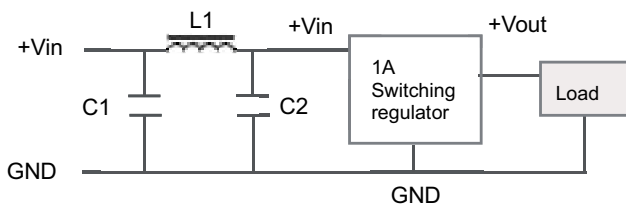


The derating curve was measured at 24 V input

**Standard application circuit**

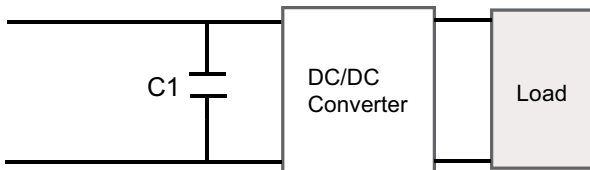


**EMC filtering circuit**



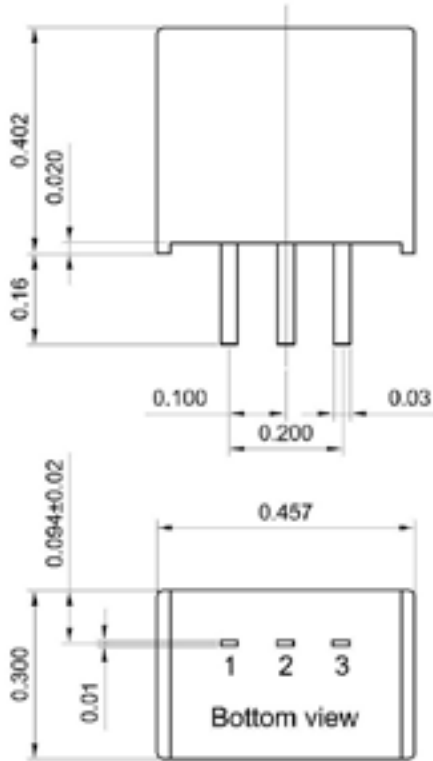
| Class   | C1                         | L1          | C2                         |
|---------|----------------------------|-------------|----------------------------|
| Class A | 1206 4.7 $\mu$ F 50 V MLCC | 3.3 $\mu$ H | x                          |
| Class B | 1210 10 $\mu$ F 50 V MLCC  | 10 $\mu$ H  | 1206 4.7 $\mu$ F 50 V MLCC |

**EFT and surge circuit**



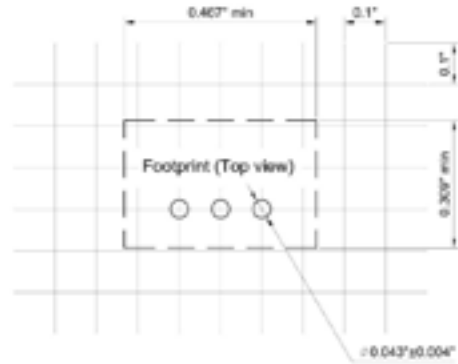
| C1                  |
|---------------------|
| 1500 $\mu$ F / 50 V |

**Mechanical dimension and pinning - inches**



| Pin | Function |
|-----|----------|
| 1   | +Vin     |
| 2   | GND      |
| 3   | +Vout    |

Recommended pad layout



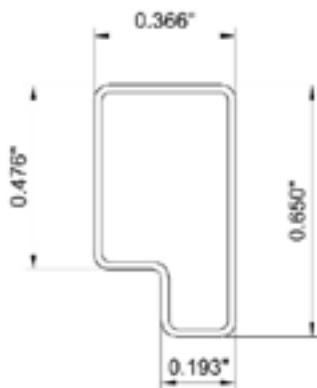
**Marking**



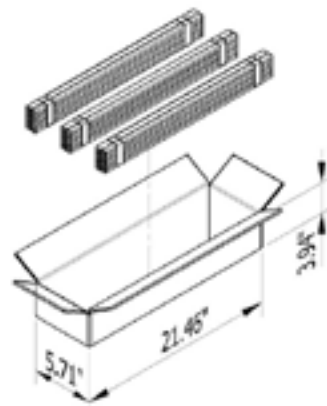
xxx= lot code

Projection: Third angle projection  
Tolerance: X.XX ± 0.02 X.XXX ± 0.01  
PIN tolerance: ± 0.004

**Packaging- Inches**



Tolerance : ±0.02"  
1 Tube = 42 pcs  
Length : 20.47"±0.08"



Carton=21.46\*5.71\*3.94 inch  
MOQ=42(pcs/tube)\*12(tube/bundle)\*3(bundle)=1512pcs~4Kg

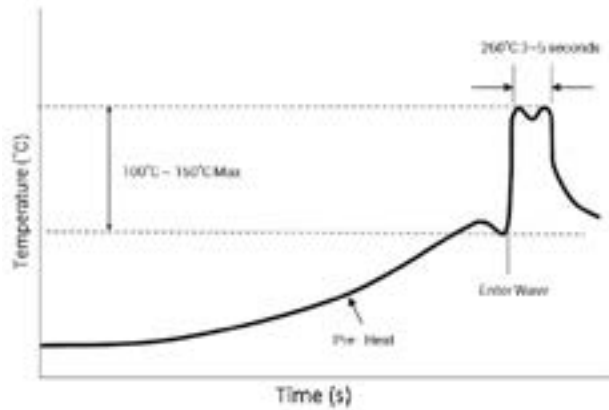
## General information

### Storage and handling

The shelf life will be a minimum of 12 months, when stored at the following conditions: < 40 °C, < 90% relative humidity.

### Wave solder profile

The wave solder profile is measured based on lead temperature. The internal temperature of the solder parts should not exceed +210 °C. The duration of solder dwell time should be between 3 to 5 seconds, and not to exceed 10 seconds.



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