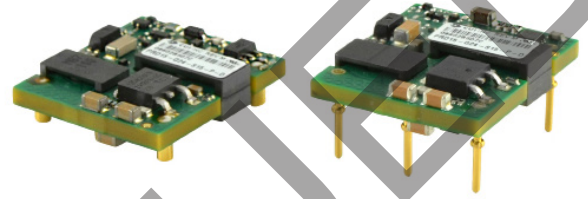


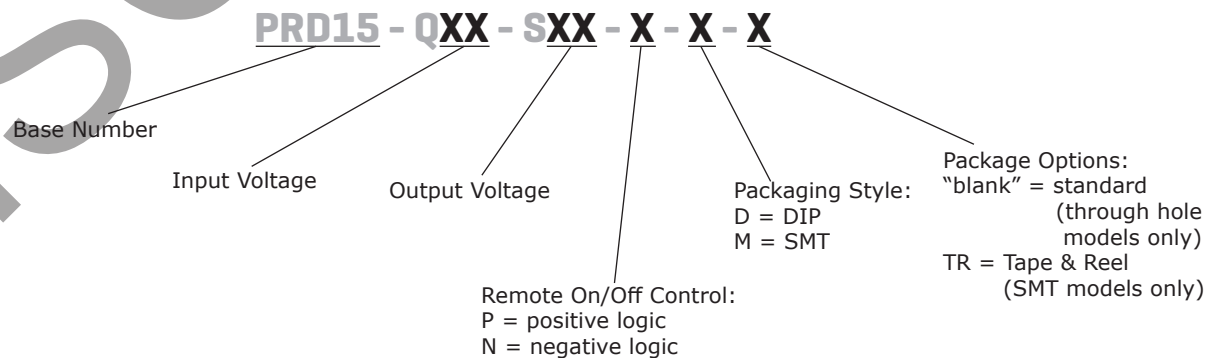
**SERIES:** PRD15 | **DESCRIPTION:** DC-DC CONVERTER**FEATURES**

- up to 15 W isolated output
- industry standard 1" x 1" package
- 4:1 input range
- low ripple & noise
- over voltage, over current, short circuit, and over temperature protections
- remote on/off control
- output trim
- -40 to 85°C temperature range
- efficiency up to 89%
- UL/cUL safety approval



| MODEL         | input voltage |                | output voltage<br>(Vdc) | output current |            | output power<br>max<br>(W) | ripple & noise <sup>1</sup><br>max<br>(mVp-p) | efficiency<br>typ<br>(%) |
|---------------|---------------|----------------|-------------------------|----------------|------------|----------------------------|---|--------------------------|
|               | typ<br>(Vdc)  | range<br>(Vdc) |                         | min<br>(A)     | max<br>(A) |                            |   |                          |
| PRD15-Q24-S3  | 24            | 9~36           | 3.3                     | 0.45           | 4.5        | 14.85                      | 90  | 89                       |
| PRD15-Q24-S5  | 24            | 9~36           | 5                       | 0.3            | 3          | 15                         | 125   | 87.3                     |
| PRD15-Q24-S12 | 24            | 9~36           | 12                      | 0.13           | 1.3        | 15.6                       | 150   | 84.5                     |
| PRD15-Q24-S15 | 24            | 9~36           | 15                      | 0.11           | 1.1        | 16.5                       | 175   | 85                       |
| PRD15-Q48-S3  | 48            | 18~75          | 3.3                     | 0.5            | 5          | 16.5                       | 90  | 88                       |
| PRD15-Q48-S5  | 48            | 18~75          | 5                       | 0.3            | 3          | 15                         | 95  | 86                       |
| PRD15-Q48-S12 | 48            | 18~75          | 12                      | 0.13           | 1.3        | 15.6                       | 120   | 85                       |
| PRD15-Q48-S15 | 48            | 18~75          | 15                      | 0.11           | 1.1        | 16.5                       | 120   | 85.3                     |

Notes: 1. At full load, nominal input, 20 MHz bandwidth oscilloscope, input terminated with a 100  $\mu$ F capacitor for 24 Vdc input models and a 4.7  $\mu$ F capacitor for 48 Vdc input models. Output terminated with 1  $\mu$ F and 10  $\mu$ F low ESR capacitors.  
 2. All specifications are measured at  $T_a=25^\circ\text{C}$ , nominal input voltage, and rated output load unless otherwise specified. All models are tested and specified with a 100  $\mu$ F capacitor for 24 Vdc input models and a 4.7  $\mu$ F capacitor for 48 Vdc input models on the input, and with 1  $\mu$ F and 10  $\mu$ F low ESR capacitors on the output.

**PART NUMBER KEY**

**INPUT**

| parameter                         | conditions/description   | min                                    | typ  | max | units |
|-----------------------------------|--|--|------|-----|-------|
| operating input voltage           | 24 Vdc input models  | 9                                      | 24   | 36  | Vdc   |
|                                   | 48 Vdc input models  | 18                                     | 48   | 75  | Vdc   |
| current                           | 24 Vdc input models  |  |      | 2.1 | A     |
|                                   | 48 Vdc input models  |  |      | 1.1 | A     |
| start-up voltage                  | 24 Vdc input models  | 8.8                                    |      |     | Vdc   |
|                                   | 48 Vdc input models  |  | 16.7 |     | Vdc   |
| under voltage shutdown            | PRD15-Q24-S3   |  | 8.6  |     | Vdc   |
|                                   | PRD15-Q24-S5   |  | 8.5  |     | Vdc   |
|                                   | PRD15-Q24-S12, PRD15-Q24-S15   |  | 8.4  |     | Vdc   |
|                                   | PRD15-Q48-S15  |  | 16.2 |     | Vdc   |
|                                   | all other models   |  | 15.6 |     | Vdc   |
| remote on/off <sup>1</sup>        | positive logic   | models ON (10~15 Vdc or open circuit)  |      |     |       |
|                                   |  | models OFF (-0.7~0.7 Vdc)              |      |     |       |
|                                   | negative logic   | models ON (-0.7~0.8 Vdc)               |      |     |       |
|                                   |  | models OFF (10~15 Vdc or open circuit) |      |     |       |
| filter                            | PRD15-Q48-S5: inductance filter<br>all other models: capacitance filter  |  |      |     |       |
| input reverse polarity protection | no   |  |      |     |       |
| input fuse                        | recommended to add fuse:<br>4 A fast blow fuse for 24 Vdc input models<br>2 A fast blow fuse for 48 Vdc input models<br>1.5 A fast blow fuse for PRD15-Q48-S12 model |  |      |     |       |

Notes: 1. On/Off current is 1 mA.

**OUTPUT**

| parameter                  | conditions/description                                   | min | typ   | max    | units |
|----------------------------|--|-----|-------|--------|-------|
| maximum capacitive load    | low ESR <0.02 Ω  |     |       | 1,000  | μF    |
|                            | PRD15-Q24-S3, S5, S12 & PRD15-Q48-S3<br>all other models |     |       | 470    | μF    |
| line regulation            | PRD15-Q48-S3   |     |       | ±0.2   | %     |
|                            | PRD15-Q48-S12  |     |       | ±0.075 | %     |
|                            | all other models   |     |       | ±0.05  | %     |
| load regulation            | PRD15-Q24-S3   |     |       | ±0.1   | %     |
|                            | PRD15-Q24-S5   |     |       | ±0.075 | %     |
|                            | PRD15-Q48-S3   |     |       | ±0.2   | %     |
|                            | PRD15-Q48-S5   |     |       | ±0.06  | %     |
|                            | all other models   |     |       | ±0.05  | %     |
| voltage accuracy           | at 50% load  |     | ±1    |        | %     |
| start-up time              |  |     |       | 50     | ms    |
| adjustability <sup>2</sup> | see application notes                                    |     | ±10   |        | %     |
| switching frequency        | PRD15-Q24-S12, PRD15-Q24-S15                             |     | 340   |        | kHz   |
|                            | PRD15-Q48-S5   |     | 375   |        | kHz   |
|                            | PRD15-Q48-S15  |     | 380   |        | kHz   |
|                            | all other models   |     | 350   |        | kHz   |
| dynamic load response      | 50-75-50% load change to 1% Vout                         |     | 150   |        | μs    |
|                            | PRD15-Q24-S3, PRD15-Q24-S12<br>all other models          |     | 100   |        | μs    |
| temperature coefficient    |  |     | ±0.02 |        | %/°C  |

Note: 2. For input voltage &lt; 20 Vdc, PRD15-Q48-S5 can only be trimmed down.

**PROTECTIONS**

| parameter                   | conditions/description                | min | typ  | max | units |
|-----------------------------|---------------------------------------|-----|------|-----|-------|
| over voltage protection     | auto restart                          |     |      |     |       |
|                             | PRD15-Q24-S3                          |     | 4.5  |     | Vdc   |
|                             | PRD15-Q24-S5                          |     | 5.9  |     | Vdc   |
|                             | PRD15-Q24-S12                         |     | 14.1 |     | Vdc   |
|                             | PRD15-Q24-S15                         |     | 19.5 |     | Vdc   |
|                             | PRD15-Q48-S3                          |     | 3.9  |     | Vdc   |
|                             | PRD15-Q48-S5                          |     | 5.9  |     | Vdc   |
|                             | PRD15-Q48-S12                         |     | 15   |     | Vdc   |
|                             | PRD15-Q48-S15                         |     | 20   |     | Vdc   |
| over current protection     | current limiting, auto restart        |     |      |     |       |
|                             | PRD15-Q24-S3                          |     | 6.0  |     | A     |
|                             | PRD15-Q24-S5                          |     | 4.6  |     | A     |
|                             | PRD15-Q24-S12                         |     | 2.0  |     | A     |
|                             | PRD15-Q24-S15                         |     | 1.6  |     | A     |
|                             | PRD15-Q48-S3                          |     | 7.2  |     | A     |
|                             | PRD15-Q48-S5                          |     | 4.5  |     | A     |
|                             | PRD15-Q48-S12                         |     | 1.8  |     | A     |
|                             | PRD15-Q48-S15                         |     | 1.7  |     | A     |
| short circuit protection    | current limiting, hiccup auto restart |     | 0.3  |     | A     |
| over temperature protection | PRD15-Q48-S12                         |     | 135  |     | °C    |
|                             | all other models                      |     | 115  |     | °C    |

**SAFETY AND COMPLIANCE**

| parameter             | conditions/description  | min       | typ   | max | units |
|-----------------------|---|-----------|-------|-----|-------|
| isolation voltage     | input to output, basic insulation   |           |       |     |       |
|                       | 24 Vdc input models   |           | 2,000 |     | Vdc   |
|                       | 48 Vdc input models   |           | 2,250 |     | Vdc   |
| isolation resistance  |   | 10        |       |     | MΩ    |
| isolation capacitance | PRD15-Q24-S5, PRD15-Q24-S15, PRD15-Q48-S3   |           | 1,500 |     | pF    |
|                       | all other models  |           | 1,000 |     | pF    |
| safety approvals      | UL 60950-1, 2nd Edition   |           |       |     |       |
| LVD <sup>1</sup>      | 2006/95/EC (CE mark)  |           |       |     |       |
| MTBF                  | as per Telcordia SR-332 Method 1, Case 3, ground fixed conditions, Tpcboard = 25 °C, full load, natural air convection. | 2,000,000 |       |     | hours |
| RoHS                  | 2011/65/EU  |           |       |     |       |

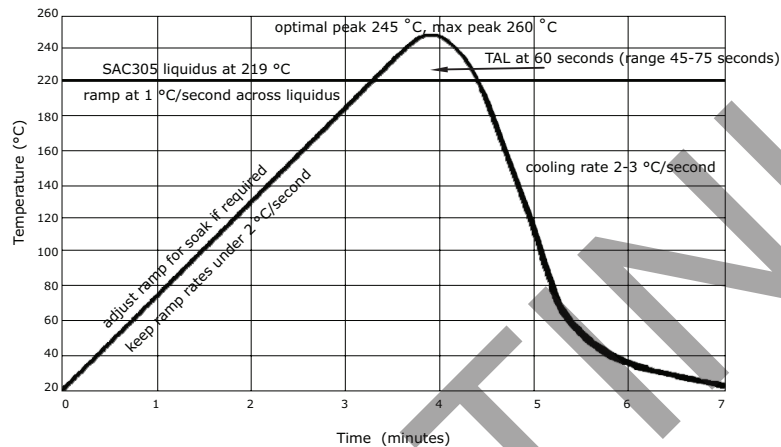
Note: 1. CE mark only on 48 Vdc input models.

**ENVIRONMENTAL**

| parameter             | conditions/description | min | typ | max | units |
|-----------------------|------------------------|-----|-----|-----|-------|
| operating temperature | see derating curves    | -40 |     | 85  | °C    |
| storage temperature   |                        | -55 |     | 125 | °C    |

**SOLDERABILITY**

| parameter        | conditions/description   | min | typ | max | units |
|------------------|--|-----|-----|-----|-------|
| wave soldering   | for Sn/Ag/Cu based solders (for through hole models):  |     |     |     |       |
|                  | preheat temperature  |     |     | 115 | °C    |
|                  | solder pot temperature   |     |     | 270 | °C    |
|                  | solder dwell time  |     |     | 7   | s     |
| reflow soldering | reflow solder profile below is suitable for SAC305 type lead-free solders (for surface mount models) |     | 245 | 260 | °C    |

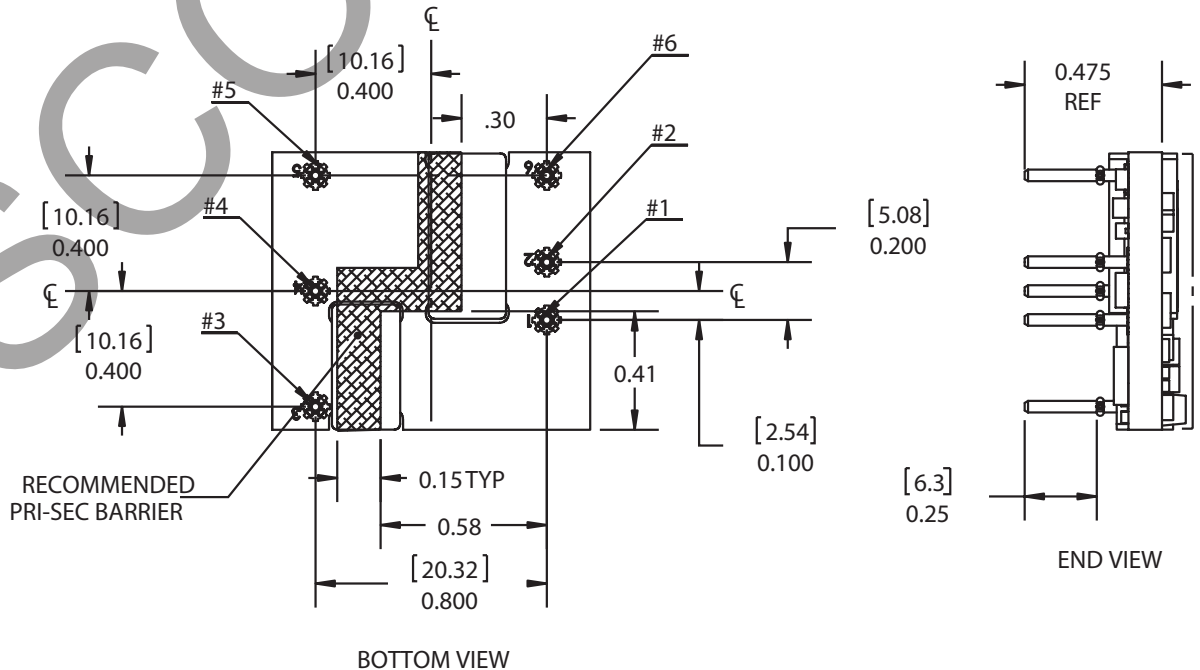
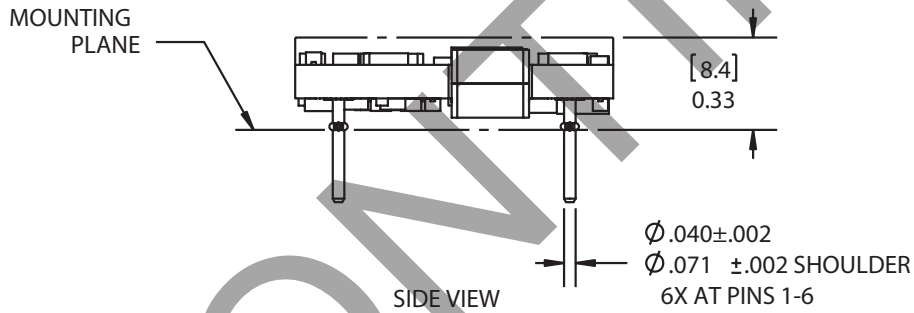
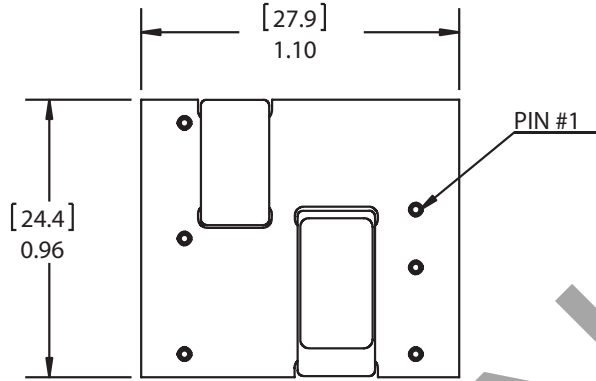
**MECHANICAL**

| parameter  | conditions/description                                   | min | typ  | max | units  |
|------------|--|-----|------|-----|--------|
| dimensions | through hole: 1.10 x 0.96 x 0.33 [27.9 x 24.4 x 8.4 mm]  |     |      |     | inches |
|            | surface mount: 1.10 x 0.96 x 0.33 [27.9 x 24.4 x 8.4 mm] |     |      |     | inches |
| weight     | through hole mount models                                |     | 10   |     | g      |
|            | surface mount models                                     |     | 10.2 |     | g      |

## MECHANICAL DRAWING (THROUGH HOLE)

units: inches [mm]  
 tolerance: X.XX ±0.02 [0.5]  
 X.XXX ±0.010 [0.25]

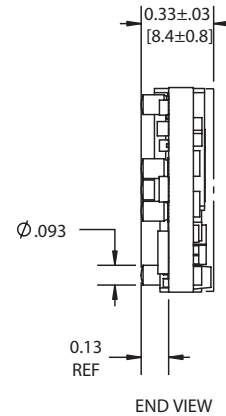
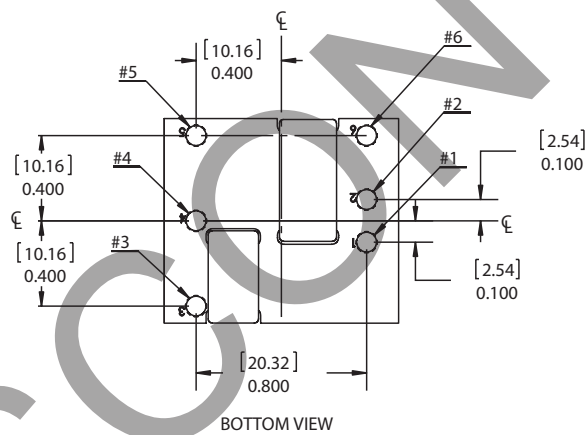
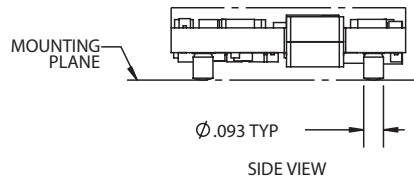
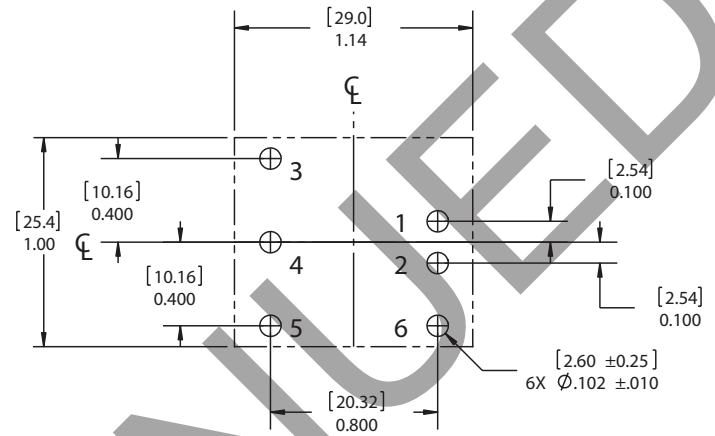
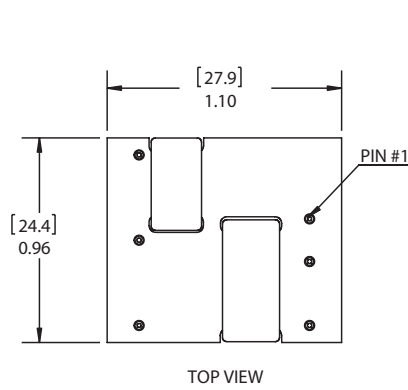
| PIN CONNECTIONS |                |
|-----------------|----------------|
| PIN             | Function       |
| 1               | +Vin           |
| 2               | -Vin           |
| 3               | +Vout          |
| 4               | output trim    |
| 5               | -Vout          |
| 6               | on/off control |



## MECHANICAL DRAWING (SURFACE MOUNT)

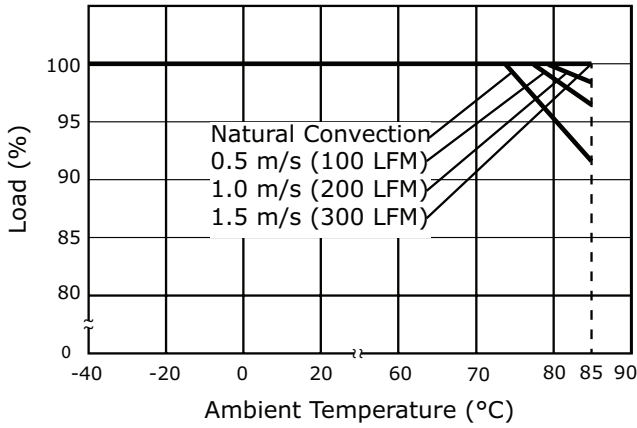
units: inches [mm]  
 tolerance: X.XX ±0.02 [0.5]  
 X.XXX ±0.010 [0.25]

| PIN CONNECTIONS |                |
|-----------------|----------------|
| PIN             | Function       |
| 1               | +Vin           |
| 2               | -Vin           |
| 3               | +Vout          |
| 4               | output trim    |
| 5               | -Vout          |
| 6               | on/off control |

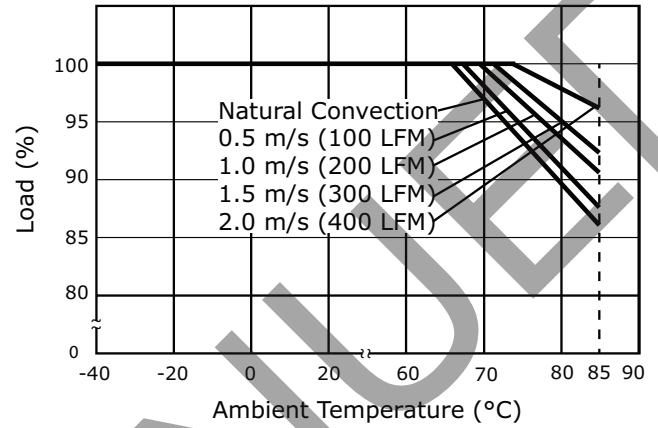


## DERATING CURVES

PRD15-Q48-S3 Derating Curves @ Sea Level  
(Vin=24, airflow from input to output)



PRD15-Q48-S3 Derating Curves @ Sea Level  
(Vin=48, airflow from input to output)



All other models, Derating Curves @ Sea Level  
(See conditions in Table 1)

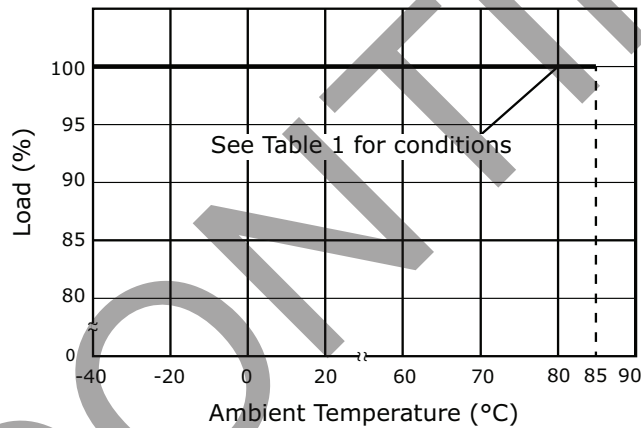
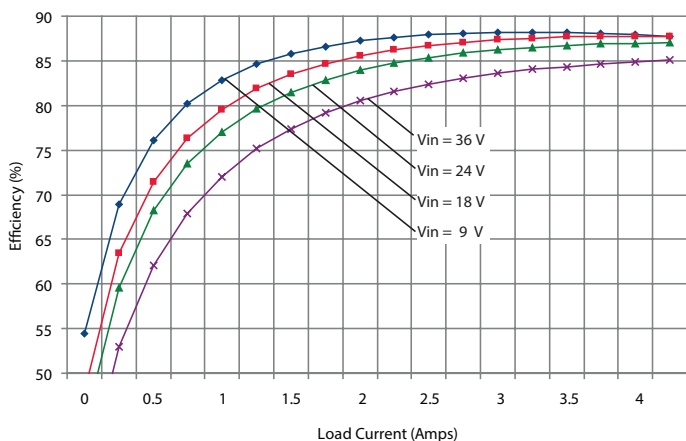


Table 1

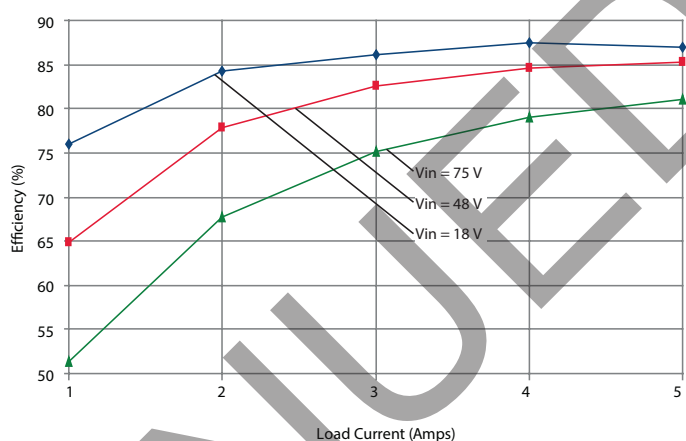
| Model         | Input (Vdc) | Direction of airflow | Airflow            |
|---------------|-------------|----------------------|--------------------|
| PRD15-Q24-S3  | 12/24       | Input to output      | Natural Convection |
| PRD15-Q24-S5  | 24          | Input to output      | 0.33 m/s (65 LFM)  |
| PRD15-Q24-S12 | 24          | Input to output      | 0.33 m/s (65 LFM)  |
| PRD15-Q24-S15 | 12/24       | Input to output      | Natural Convection |
| PRD15-Q48-S5  | 24/48       | Input to output      | Natural Convection |
| PRD15-Q48-S12 | 24/48       | Pin 2 to Pin 1       | Natural Convection |
| PRD15-Q48-S15 | 24/48       | Input to output      | Natural Convection |

## EFFICIENCY CURVES

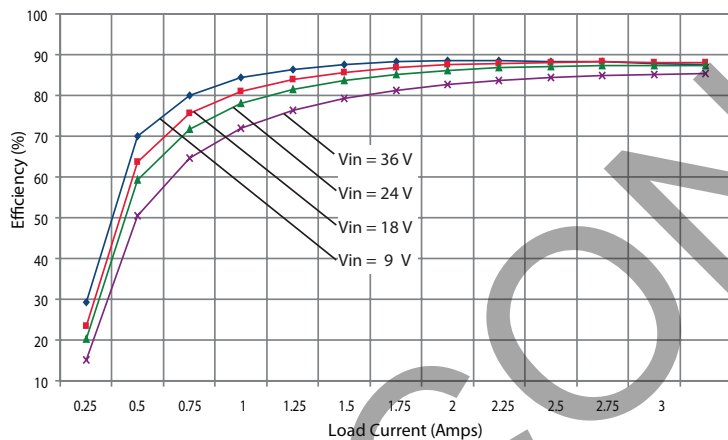
PRD15-Q24-S3 Efficiency Curve  
(Efficiency vs. Line Voltage and Load Current @ 25°C)



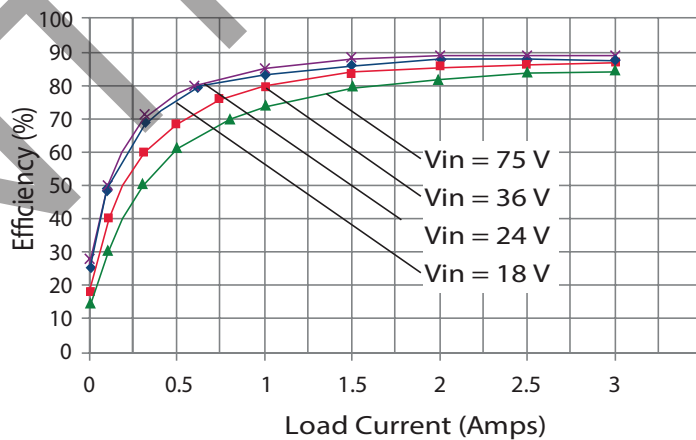
PRD15-Q48-S3 Efficiency Curve  
(Efficiency vs. Line Voltage and Load Current @ 25°C)



PRD15-Q24-S5 Efficiency Curve  
(Efficiency vs. Line Voltage and Load Current @ 25°C)



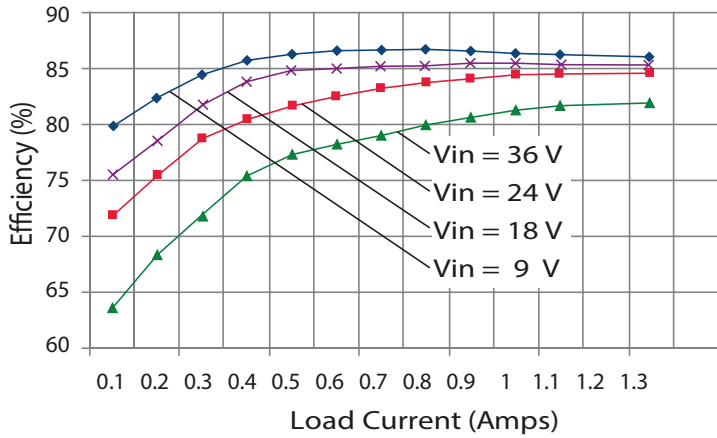
PRD15-Q48-S5 Efficiency Curve  
(Efficiency vs. Line Voltage and Load Current @ 25°C)



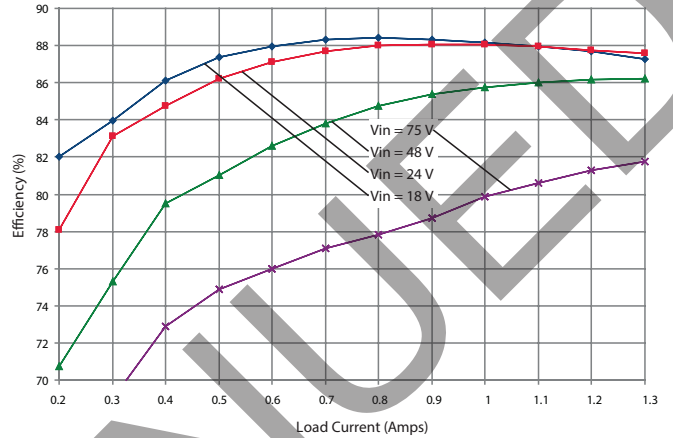


## EFFICIENCY CURVES (CONTINUED)

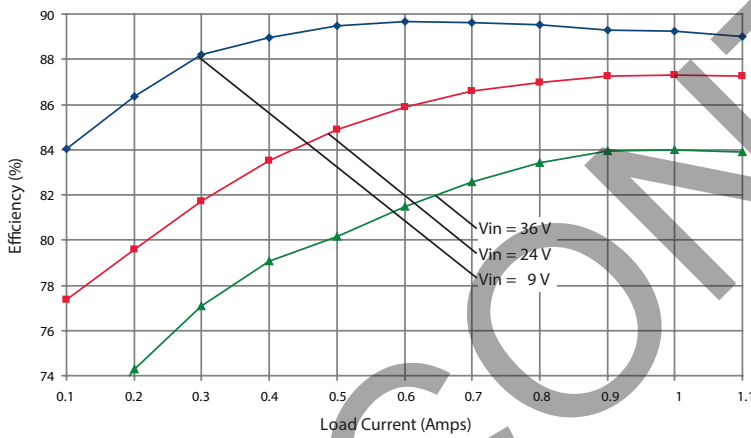
PRD15-Q24-S12 Efficiency Curve  
(Efficiency vs. Line Voltage and Load Current @ 25°C)



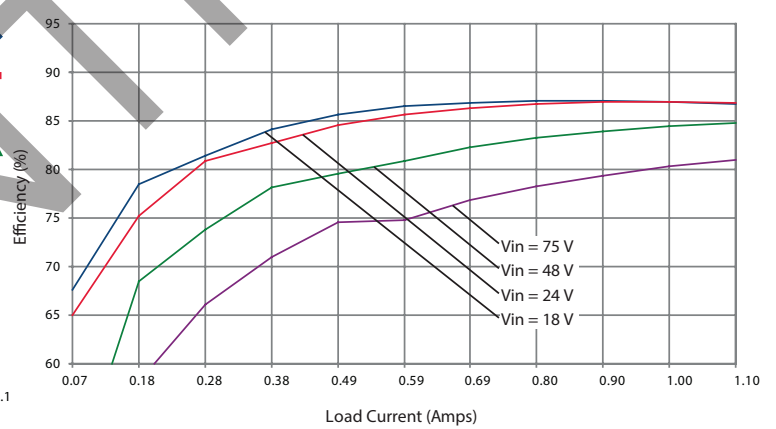
PRD15-Q48-S12 Efficiency Curve  
(Efficiency vs. Line Voltage and Load Current @ 25°C)



PRD15-Q24-S15 Efficiency Curve  
(Efficiency vs. Line Voltage and Load Current @ 25°C)



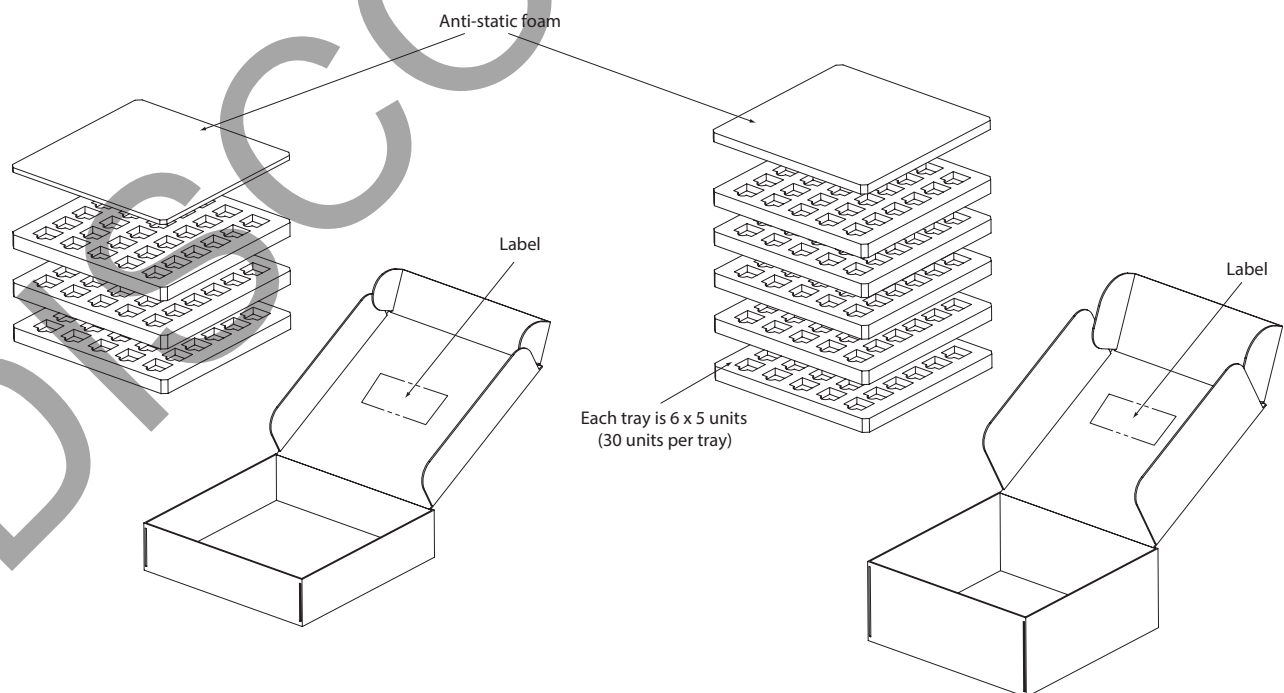
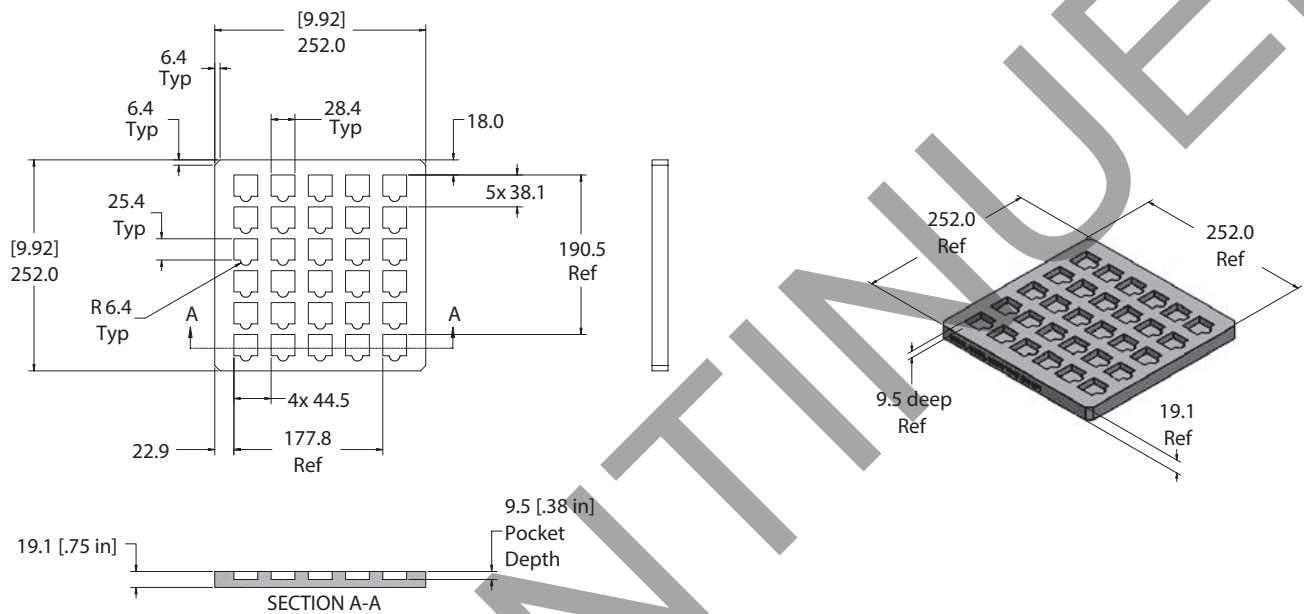
PRD15-Q48-S15 Efficiency Curve  
(Efficiency vs. Line Voltage and Load Current @ 25°C)



## PACKAGING (THROUGH HOLE)

units: mm [inches]  
tolerance: +1/-0 mm

Tray Material: Dow 220 anti-static ethafoam  
Tray Size: 252 x 252 x 19.1 mm  
QTY: 30 pcs per tray (6 x 5)



## PACKAGING (SURFACE MOUNT)

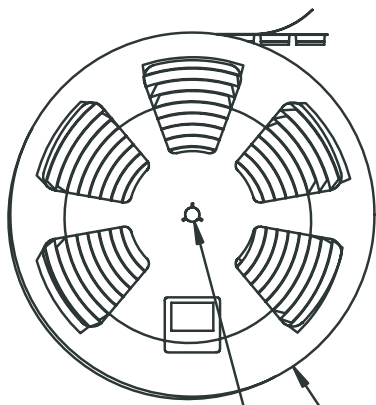
units: inches [mm]

Tape & Reel: Conforms to EIA-481

Reel Size: Ø13"

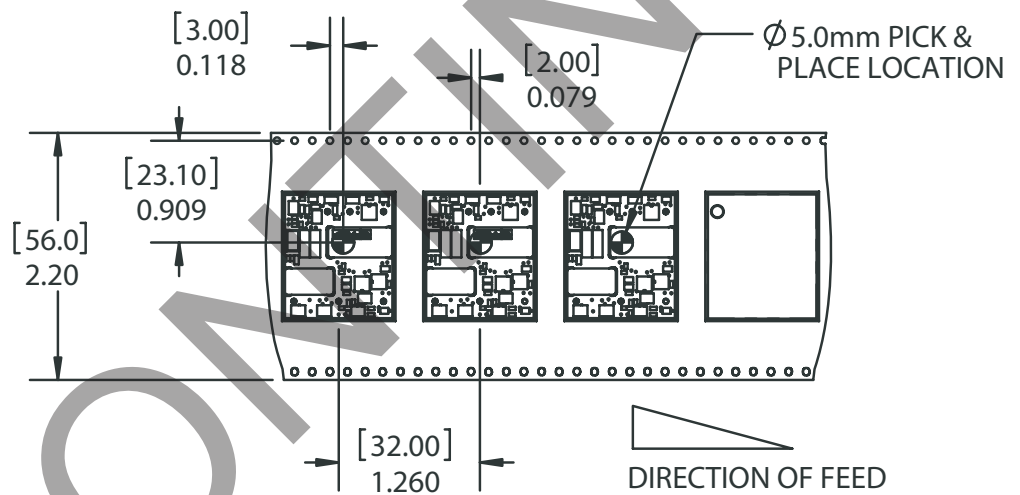
QTY: 100 pcs per reel

Note: The SMT package has an MSL 2 rating



Ø13.0

R.256



COVER TAPE



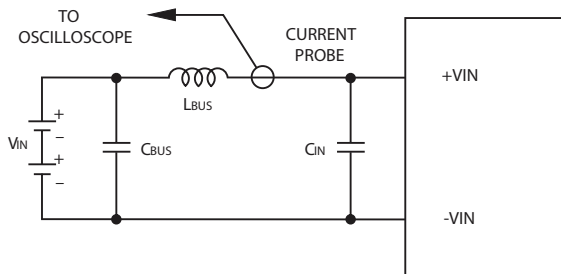
[9.27]  
0.365

## TEST CONFIGURATIONS

### Input Ripple Current & Output Noise

All models are tested and specified for input reflected ripple current and output noise as per layouts shown in Figures 1 & 2. The Cbus and Lbus components simulate a typical DC voltage bus. However, your specific system configuration may require additional considerations.

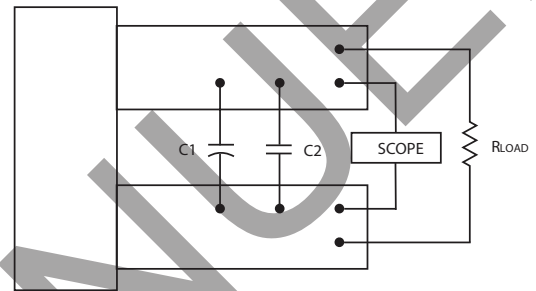
**Figure 1 Measuring Input Ripple Current**



**Table 1**

|           |   |
|-----------|---|
| $C_{IN}$  | 33 $\mu$ F, ESR < 700m $\Omega$ @ 100kHz  |
| $C_{BUS}$ | 220 $\mu$ F, ESR < 100m $\Omega$ @ 100kHz |
| $L_{BUS}$ | 12 $\mu$ H                                |

**Figure 2 Measuring Output Ripple and noise (PARD)**



**Table 2**

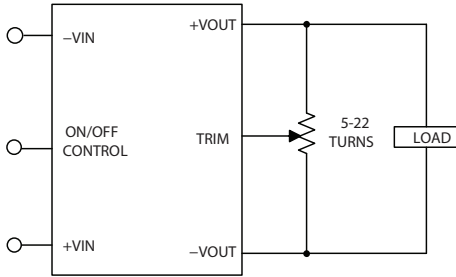
|                                       |            |
|---------------------------------------|------------|
| $C1$                                  | 1 $\mu$ F  |
| $C2$                                  | 10 $\mu$ F |
| load 2-3 inches (51-76mm) from module |            |

## APPLICATION NOTES

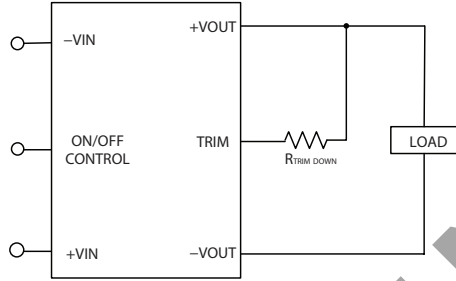
### Output Voltage Trimming

The output voltage can be adjusted by using the trim pin and the use of either an external trimpot or the use of a single fixed resistor (See Figures 3~5 below). Trimming resistors should have a low temperature coefficient ( $\pm 100$  ppm/ $^{\circ}$ C or less) and be mounted close to the converter. For input voltage < 20 Vdc, PRD15-Q48-S5 can only be trimmed down. If the trim function is not needed, leave the trim pin open.

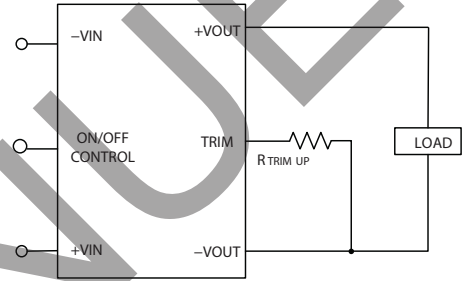
**Figure 3 Trim Adjustments Using A Trimpot**



**Figure 4 Trim Adjustments To Decrease Output Voltage Using A Fixed Resistor**



**Figure 5 Trim Adjustments To Increase Output Voltage Using A Fixed Resistor**



$$R_{trim - up} = \frac{A}{V_o - V_{o, nom}} - B$$

$$R_{trim - down} = \frac{C(V_o - 2.5)}{V_{o, nom} - V_o} - B$$

Note:  $R_{trim-up}$  is the external resistor in  $\Omega$   
 $R_{trim-down}$  is the external resistor in  $\Omega$   
 $V_{o, nom}$  is the nominal output voltage  
 $V_o$  is the desired output voltage

| Vout | A     | B    | C     |
|------|-------|------|-------|
| 3.3  | 12775 | 2050 | 5110  |
| 5    | 12775 | 2050 | 5110  |
| 12   | 25000 | 5110 | 10000 |
| 15   | 25000 | 5110 | 10000 |

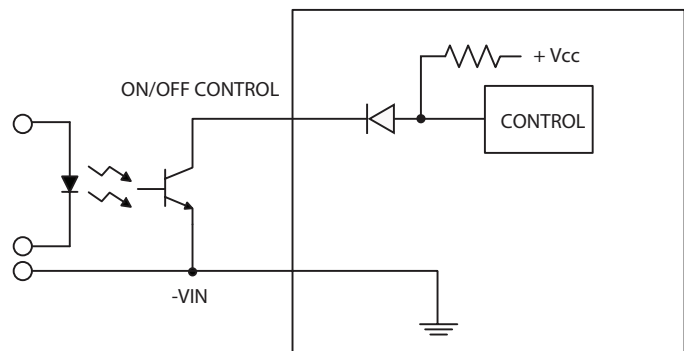
### Remote On/Off Control

The DC-DC converter can be ordered with either positive or negative logic. See page 2 for enable/disable details for both positive and negative logic options. Dynamic control of the On/Off function should be able to sink appropriate signal current when brought low and withstand appropriate voltage when brought high. Be aware that there is a finite time in milliseconds between the the time of On/Off control activation and stable, regulated output. This time will vary slightly with output load type and current and input conditions.

Cautions when using the On/Off control:

1. To retain full output circuit isolation, control the On/Off from the input side only.
2. While it is possible to control the On/Off with external logic if you carefully observe the voltage levels, the preferred circuit is either an open drain/open collector transistor, a switch, or a relay.
3. Do not apply voltages to the On/Off pin when there is no input power voltage, otherwise the converter may be permanently damaged.

**Figure 6. Driving The On/Off Control Pin (Suggested Circuit)**



## REVISION HISTORY

---

| rev. | description         | date       |
|------|---------------------|------------|
| 1.0  | initial release     | 03/28/2016 |
| 1.01 | company logo update | 10/26/2020 |

The revision history provided is for informational purposes only and is believed to be accurate.



**Headquarters**  
20050 SW 112th Ave.  
Tualatin, OR 97062  
**800.275.4899**

Fax 503.612.2383  
**cui.com**  
techsupport@cui.com

CUI offers a two (2) year limited warranty. Complete warranty information is listed on our website.

CUI reserves the right to make changes to the product at any time without notice. Information provided by CUI is believed to be accurate and reliable. However, no responsibility is assumed by CUI for its use, nor for any infringements of patents or other rights of third parties which may result from its use.

CUI products are not authorized or warranted for use as critical components in equipment that requires an extremely high level of reliability. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.