

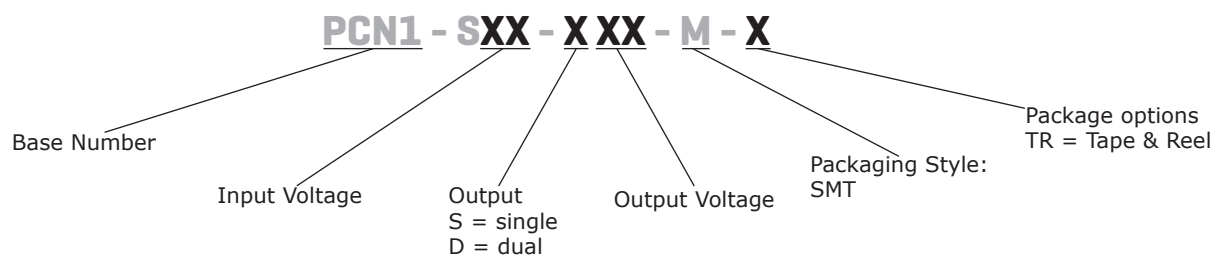
**SERIES: PCN1-M | DESCRIPTION: DC-DC CONVERTER**
**FEATURES**

- up to 1 W isolated output
- industry standard surface mount package
- nominal input voltages: 5, 12 Vdc
- single/dual unregulated output
- 1,500 Vdc isolation voltage
- low ripple and noise
- -40 to 100°C
- efficiency up to 81%
- EN 62368


**MODEL**

| 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 (%) |
|----------------|---------------|----------------|-------------------------|----------------|-------------|----------------------------|-----------------------------------------------|-----------------------|
|                | typ<br>(Vdc)  | range<br>(Vdc) |                         | min<br>(mA)    | max<br>(mA) |                            |                                               |                       |
| PCN1-S5-S5-M   | 5             | 4.5~5.5        | 5                       | 0              | 200         | 1                          | 75                                            | 79                    |
| PCN1-S5-S12-M  | 5             | 4.5~5.5        | 12                      | 0              | 84          | 1                          | 75                                            | 79                    |
| PCN1-S5-S15-M  | 5             | 4.5~5.5        | 15                      | 0              | 67          | 1                          | 75                                            | 79                    |
| PCN1-S5-D5-M   | 5             | 4.5~5.5        | ±5                      | 0              | ±100        | 1                          | 75                                            | 74                    |
| PCN1-S5-D12-M  | 5             | 4.5~5.5        | ±12                     | 0              | ±42         | 1                          | 75                                            | 78                    |
| PCN1-S5-D15-M  | 5             | 4.5~5.5        | ±15                     | 0              | ±33         | 1                          | 75                                            | 78                    |
| PCN1-S12-S5-M  | 12            | 10.8~13.2      | 5                       | 0              | 200         | 1                          | 75                                            | 80                    |
| PCN1-S12-S12-M | 12            | 10.8~13.2      | 12                      | 0              | 84          | 1                          | 75                                            | 81                    |
| PCN1-S12-S15-M | 12            | 10.8~13.2      | 15                      | 0              | 67          | 1                          | 75                                            | 81                    |
| PCN1-S12-D5-M  | 12            | 10.8~13.2      | ±5                      | 0              | ±100        | 1                          | 75                                            | 77                    |
| PCN1-S12-D12-M | 12            | 10.8~13.2      | ±12                     | 0              | ±42         | 1                          | 75                                            | 80                    |
| PCN1-S12-D15-M | 12            | 10.8~13.2      | ±15                     | 0              | ±33         | 1                          | 75                                            | 81                    |

Notes: 1. At full load, nominal input, 20 MHz bandwidth oscilloscope, with a 0.33  $\mu$ F ceramic capacitor on the output.  
 2. Required to add a 2.2  $\mu$ F ceramic capacitor to the input to reduce input voltage stress.  
 3. All specifications are measured at Ta=25°C, nominal input voltage, and rated output load unless otherwise specified.

**PART NUMBER KEY**


## INPUT

| parameter                         | conditions/description                             | min  | typ | max  | units |
|-----------------------------------|----------------------------------------------------|------|-----|------|-------|
| operating input voltage           | 5 Vdc input models                                 | 4.5  | 5   | 5.5  | Vdc   |
|                                   | 12 Vdc input models                                | 10.8 | 12  | 13.2 | Vdc   |
| surge voltage                     | for maximum of 100 ms                              |      |     |      |       |
|                                   | 5 Vdc input models                                 |      |     | 9    | Vdc   |
|                                   | 12 Vdc input models                                |      |     | 18   | Vdc   |
| current                           | 5 Vdc input models                                 |      | 250 |      | mA    |
|                                   | 12 Vdc input models                                |      | 110 |      | mA    |
| filter                            | capacitive                                         |      |     |      |       |
| input reverse polarity protection | no                                                 |      |     |      |       |
| input fuse                        | 0.5 A time delay fuse for all models (recommended) |      |     |      |       |

Notes: 1. Required to add a 2.2  $\mu$ F ceramic capacitor to the input to reduce input voltage stress.

## OUTPUT

| parameter               | conditions/description       | min | typ | max        | units           |
|-------------------------|------------------------------|-----|-----|------------|-----------------|
| maximum capacitive load | single output models         |     |     | 220        | $\mu$ F         |
|                         | dual output models           |     |     | 100        | $\mu$ F         |
| voltage accuracy        |                              |     |     | $\pm 3.0$  | %               |
| line regulation         | 1.0% change in input voltage |     |     | $\pm 1.2$  | %               |
| load regulation         | from 20% load to full load   |     |     | $\pm 10$   | %               |
| switching frequency     | at nominal Vin, full load    |     | 100 |            | kHz             |
| temperature coefficient |                              |     |     | $\pm 0.05$ | %/ $^{\circ}$ C |

## PROTECTIONS

| parameter                | conditions/description | min | typ | max | units |
|--------------------------|------------------------|-----|-----|-----|-------|
| short circuit protection | momentary              |     |     | 1   | s     |

## SAFETY AND COMPLIANCE

| parameter             | conditions/description                                     | min   | typ       | max | units      |
|-----------------------|------------------------------------------------------------|-------|-----------|-----|------------|
| isolation voltage     | input to output for 1 minute                               | 1,500 |           |     | Vdc        |
| isolation resistance  | input to output                                            | 1,000 |           |     | M $\Omega$ |
| isolation capacitance | input to output                                            |       | 10        |     | pF         |
| safety approvals      | 62368-1: EN                                                |       |           |     |            |
| conducted emissions   | EN 55022 Class B (external circuit required, see Figure 4) |       |           |     |            |
| MTBF                  | as per MIL-HDBK-217F, full load, GB, 25 $^{\circ}$ C       |       | 1,500,000 |     | hours      |
| RoHS                  | 2011/65/EU                                                 |       |           |     |            |

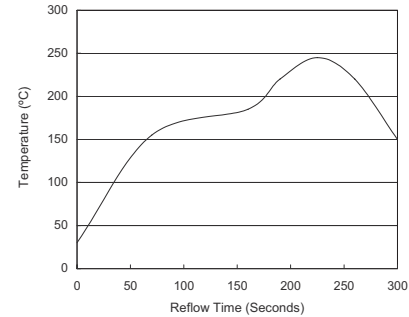
## ENVIRONMENTAL

| parameter             | conditions/description | min | typ | max | units        |
|-----------------------|------------------------|-----|-----|-----|--------------|
| operating temperature | see derating curve     | -40 |     | 100 | $^{\circ}$ C |
| storage temperature   |                        | -55 |     | 125 | $^{\circ}$ C |
| operating humidity    | non-condensing         |     |     | 95  | %            |

## SOLDERABILITY

| parameter        | conditions/description    | min | typ | max | units |
|------------------|---------------------------|-----|-----|-----|-------|
| reflow soldering | see reflow solder profile |     |     | 245 | °C    |

- Notes:
1. Soldering paste: SHENMAO PF610-P (Sn/Ag/Cu)
  2. Ramp up rate during preheat: 1.79°C/second (from 30°C~155°C)
  3. Soaking temperature: 0.33°C/second (from 155°C~185°C)
  4. Ramp up rate during reflow: 0.71°C/second (from 220°C~245°C)
  5. Peak temperature: 245°C (10 seconds max), above 220°C 40 to 70 seconds
  6. Ramp up rate during cooling: -1.75°C/second (from 220°C~150)



## MECHANICAL

| parameter     | conditions/description                                                                                                         | min | typ        | max | units            |
|---------------|--------------------------------------------------------------------------------------------------------------------------------|-----|------------|-----|------------------|
| dimensions    | single output models: 0.54 x 0.36 x 0.29 [13.7 x 9.2 x 7.4 mm]<br>dual output models: 0.64 x 0.36 x 0.29 [16.2 x 9.2 x 7.4 mm] |     |            |     | inches<br>inches |
| case material | non-conductive black plastic                                                                                                   |     |            |     |                  |
| weight        | single output models<br>dual output models                                                                                     |     | 1.4<br>1.5 |     | g<br>g           |

## MECHANICAL DRAWING

### Single output models

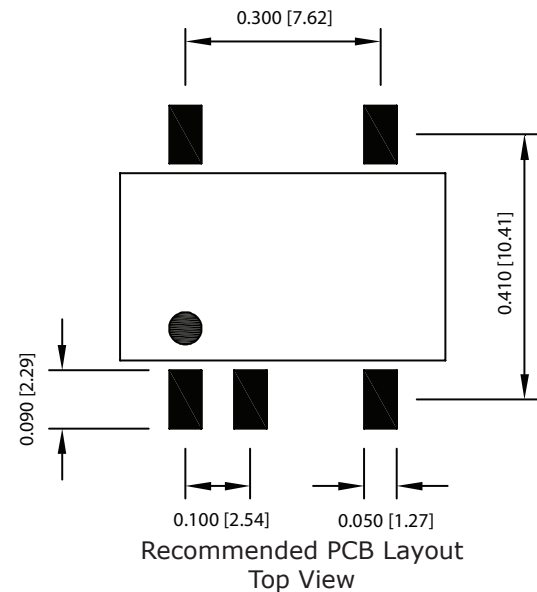
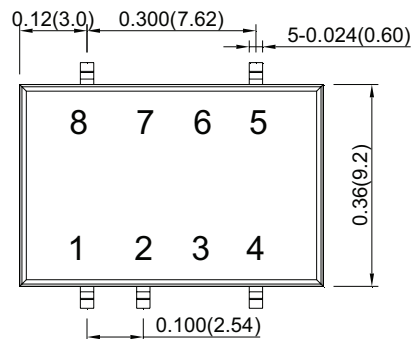
units: inches [mm]

tolerance: X.XX ±0.01 [±0.25]

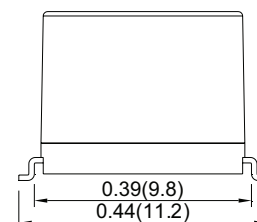
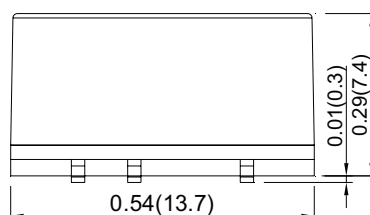
X.XXX ±0.005 [±0.13]

pin section tolerance: ±0.002[±0.05]

| PIN CONNECTIONS |          |
|-----------------|----------|
| PIN             | Function |
|                 | Single   |
| 1               | -Vin     |
| 2               | +Vin     |
| 3               | No pin   |
| 4               | -Vout    |
| 5               | +Vout    |
| 6               | No pin   |
| 7               | No pin   |
| 8               | NC       |



NC=no connection



## MECHANICAL DRAWING (CONTINUED)

### Dual output models

units: inches [mm]

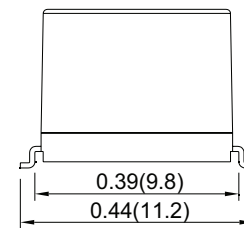
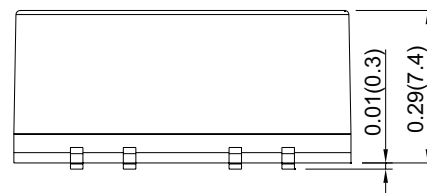
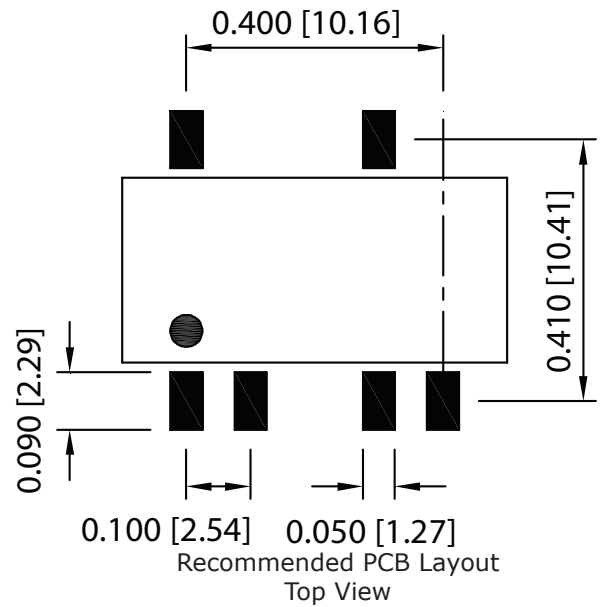
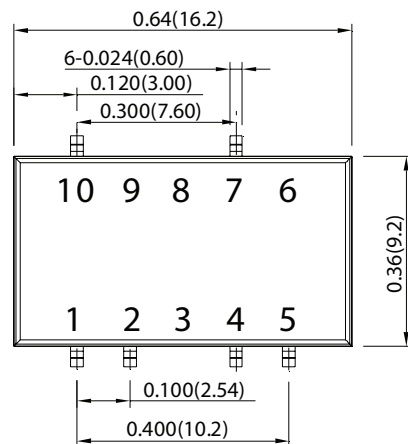
tolerance: X.XX ±0.01 [±0.25]

X.XXX ±0.005 [±0.13]

pin section tolerance: ±0.002[±0.05]

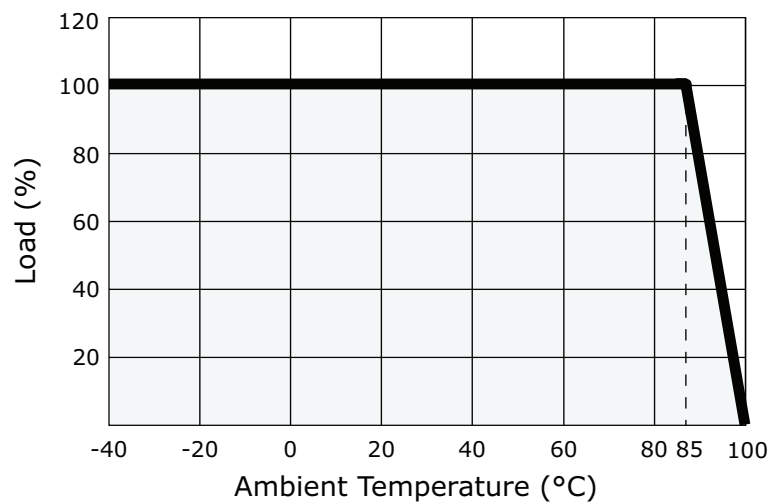
| PIN CONNECTIONS |          |
|-----------------|----------|
| PIN             | Function |
|                 | Dual     |
| 1               | -Vin     |
| 2               | +Vin     |
| 3               | No pin   |
| 4               | Common   |
| 5               | -Vout    |
| 6               | No pin   |
| 7               | +Vout    |
| 8               | No pin   |
| 9               | No pin   |
| 10              | NC       |

NC=no connection



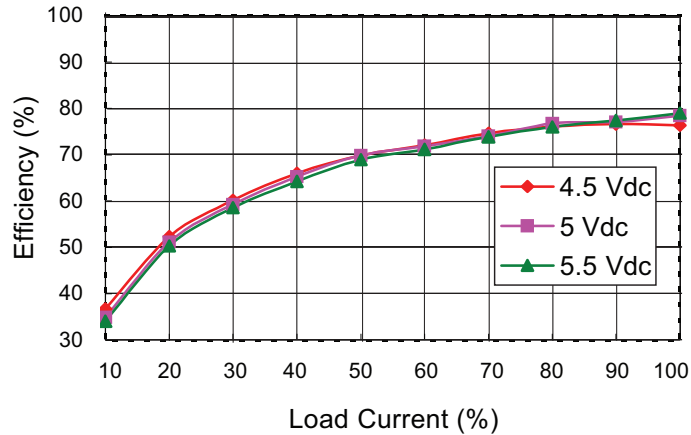
## DERATING CURVE

Temperature Derating Curve  
(Natural Convection)

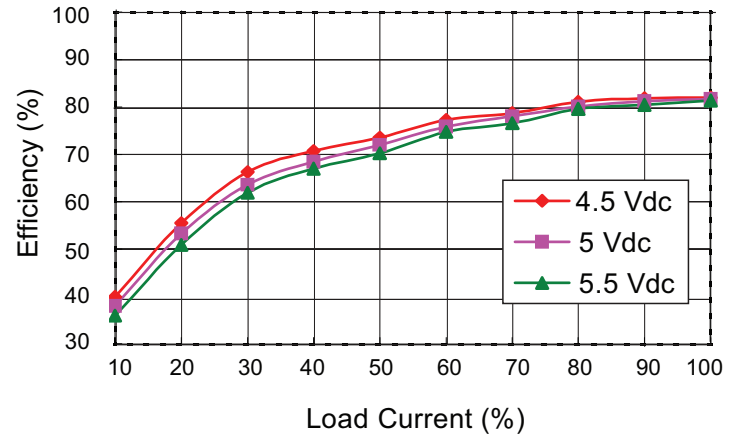


## EFFICIENCY CURVES

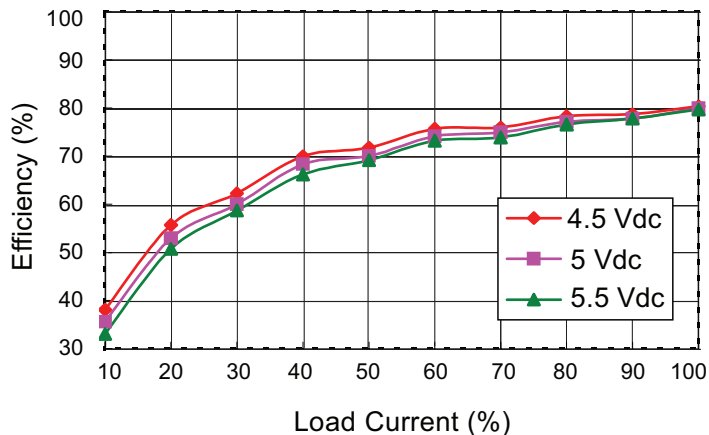
PCN1-S5-S5-M Efficiency Curve  
(Efficiency vs. Line Voltage and Load Current)



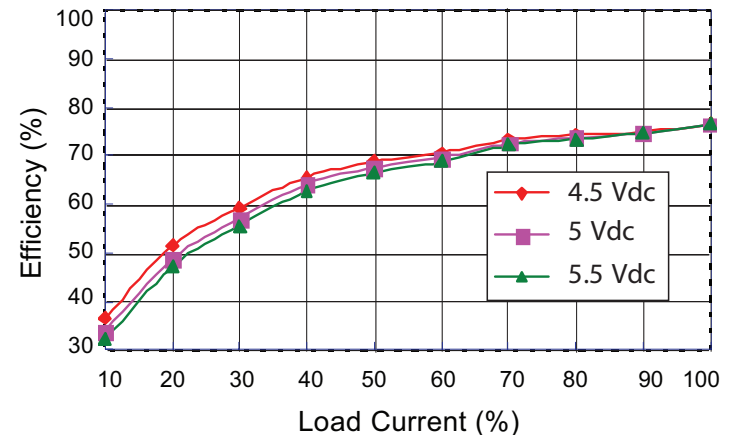
PCN1-S5-S12-M Efficiency Curve  
(Efficiency vs. Line Voltage and Load Current)



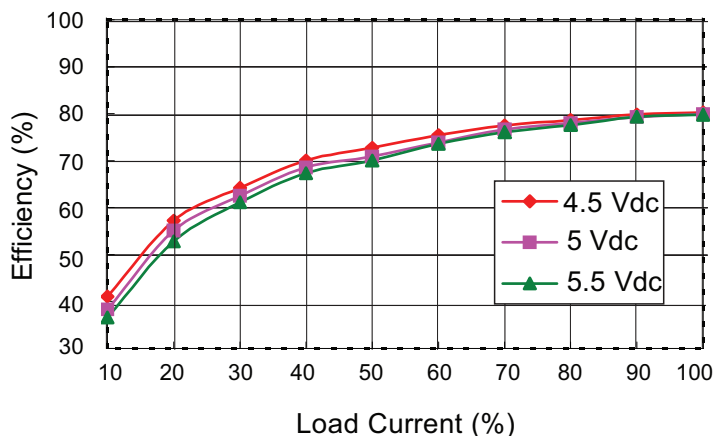
PCN1-S5-S15-M Efficiency Curve  
(Efficiency vs. Line Voltage and Load Current)



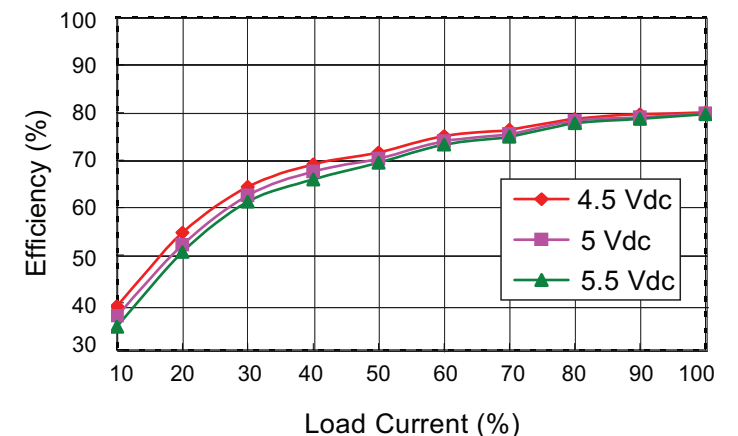
PCN1-S5-D5-M Efficiency Curve  
(Efficiency vs. Line Voltage and Load Current)



PCN1-S5-D12-M Efficiency Curve  
(Efficiency vs. Line Voltage and Load Current)

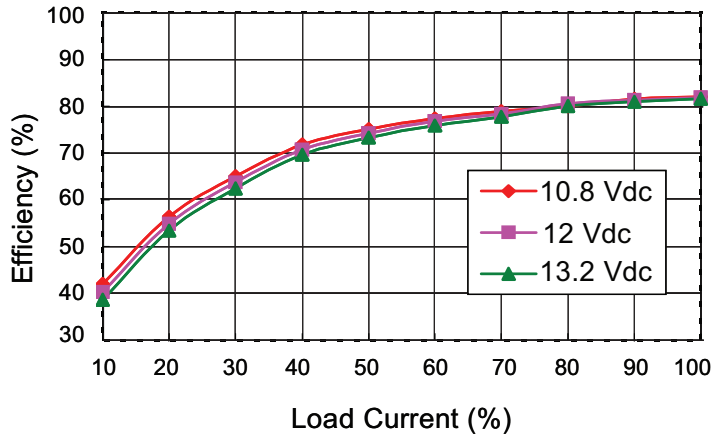


PCN1-S5-D15-M Efficiency Curve  
(Efficiency vs. Line Voltage and Load Current)

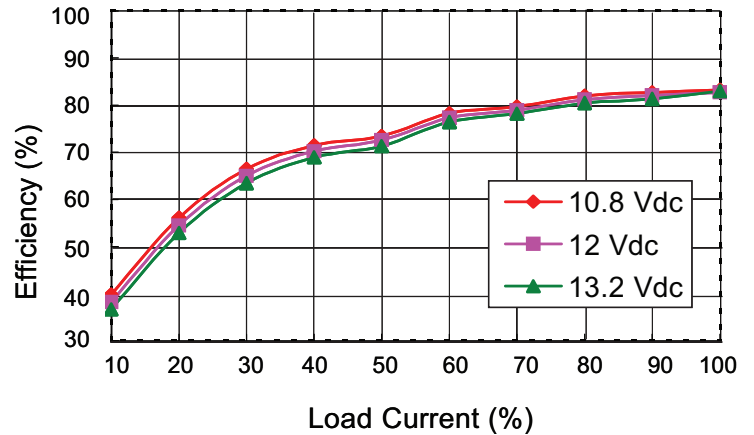


## EFFICIENCY CURVES (CONTINUED)

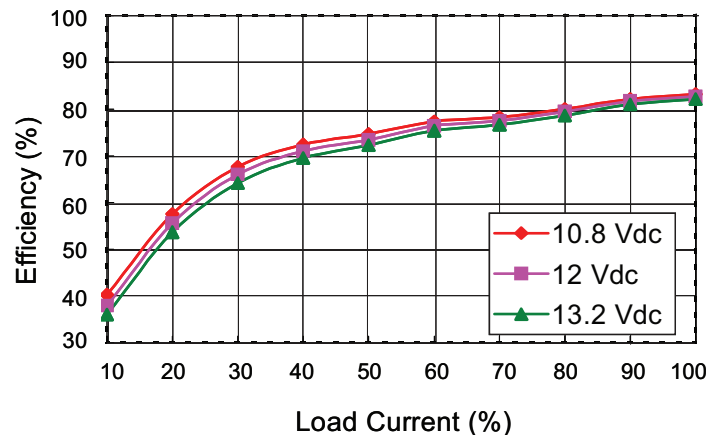
PCN1-S12-S5-M Efficiency Curve  
(Efficiency vs. Line Voltage and Load Current)



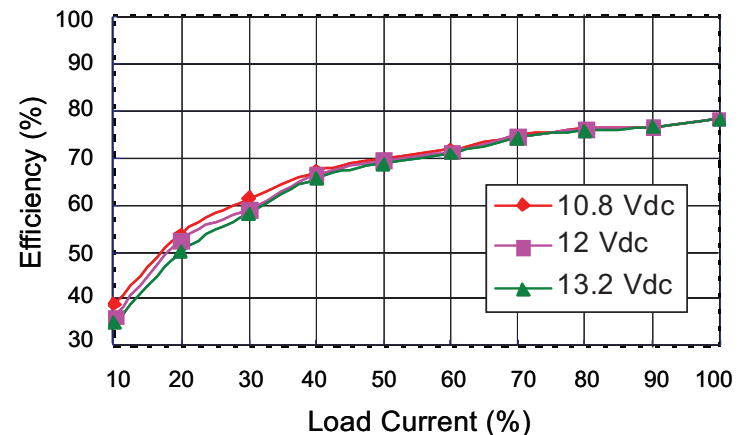
PCN1-S12-S12-M Efficiency Curve  
(Efficiency vs. Line Voltage and Load Current)



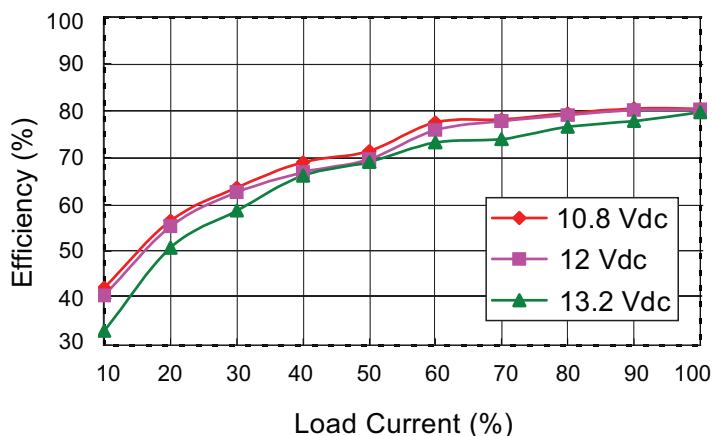
PCN1-S12-S15-M Efficiency Curve  
(Efficiency vs. Line Voltage and Load Current)



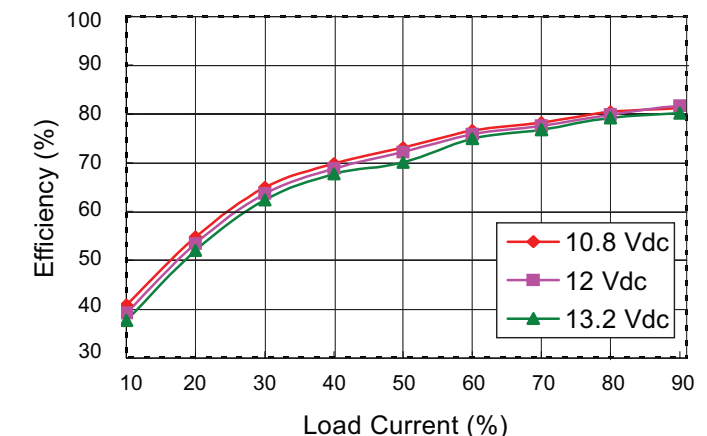
PCN1-S12-D5-M Efficiency Curve  
(Efficiency vs. Line Voltage and Load Current)



PCN1-S12-D12-M Efficiency Curve  
(Efficiency vs. Line Voltage and Load Current)



PCN1-S12-D15-M Efficiency Curve  
(Efficiency vs. Line Voltage and Load Current)



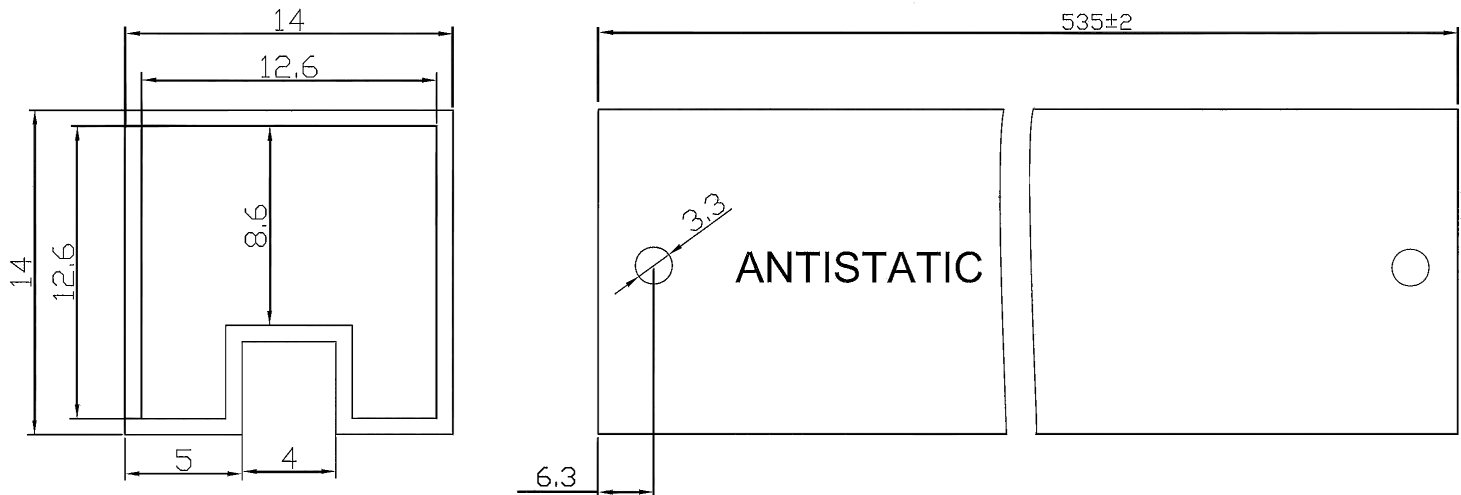
## PACKAGING (TUBE)

units: mm

Tube Size: 14 x 14 x 535 mm

Single Output Models QTY: 36 pcs per tube

Dual Output Models QTY: 30 pcs per tube



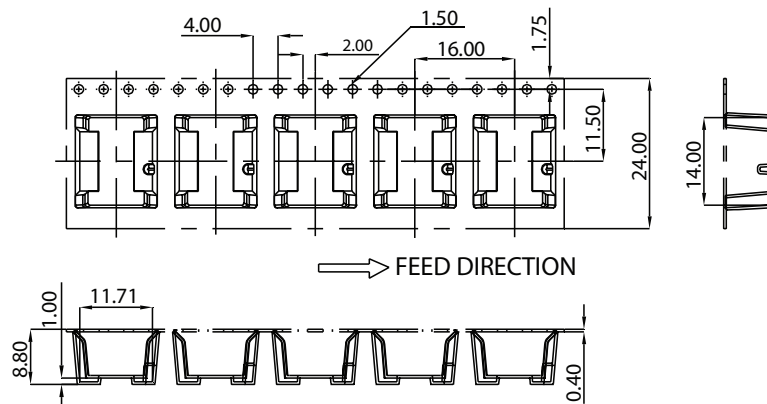
## PACKAGING (TAPE & REEL)

Single output models

units: mm

Reel Size: Ø13"

QTY: 430 pcs per reel

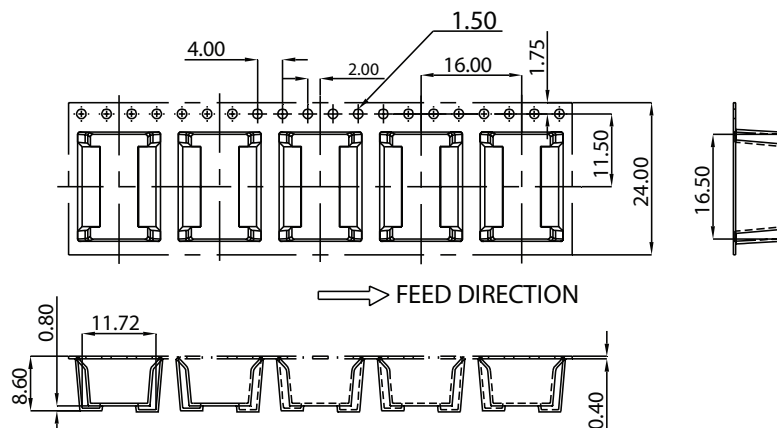


Dual output models

units: mm

Reel Size: Ø13"

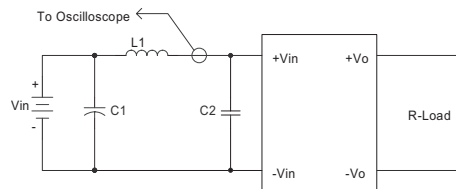
QTY: 430 pcs per reel



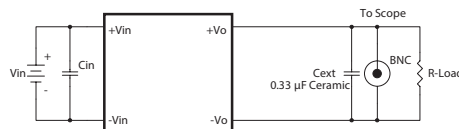
## TEST CONFIGURATIONS

### Input Ripple Current & Output Noise

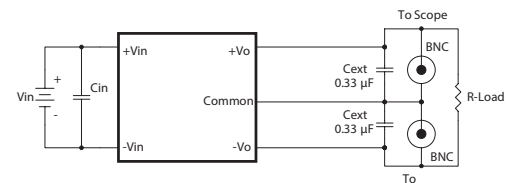
**Figure 1 Measuring Input Ripple Current**



**Figure 2 Measuring Output Ripple & Noise for Single Output Models**



**Figure 3 Measuring Output Ripple & Noise for Dual Output Models**



**Table 1**

|    |                           |
|----|---------------------------|
| L1 | 12 µH                     |
| C1 | 2.2 µF tantalum capacitor |
| C2 | NC                        |

**Table 2**

| Input Voltage (Vdc) | Cin                      |
|---------------------|--------------------------|
| 5                   | 2.2 µF ceramic capacitor |
| 12                  | 2.2 µF ceramic capacitor |

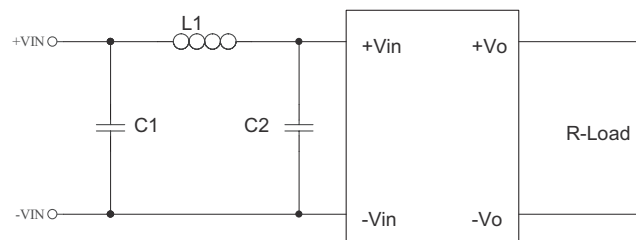
## EMC RECOMMENDED CIRCUIT

### Test Condition

Input Voltage: Nominal

Output Load: Full Load

**Figure 4 Conducted Emissions Test Circuit**



**Table 3**

| EN55022 Class B<br>Recommended External Circuit Components |                 |                 |       |
|------------------------------------------------------------|-----------------|-----------------|-------|
| Input Voltage (Vdc)                                        | C1 <sup>1</sup> | C2 <sup>1</sup> | L1    |
| 5                                                          | 4.7 µF / 25 V   | 4.7 µF / 25 V   | 10 µH |
| 12                                                         | 4.7 µF / 25 V   | 4.7 µF / 25 V   | 10 µH |

Notes: 1. Ceramic Capacitor

## REVISION HISTORY

| rev. | description                   | date       |
|------|-------------------------------|------------|
| 1.0  | initial release               | 07/26/2016 |
| 1.01 | added tube packaging option   | 06/09/2017 |
| 1.02 | removed tube packaging option | 02/14/2020 |
| 1.03 | safeties updated              | 05/26/2021 |

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



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