

SERIES: PCN2-S | **DESCRIPTION:** DC-DC CONVERTER

FEATURES

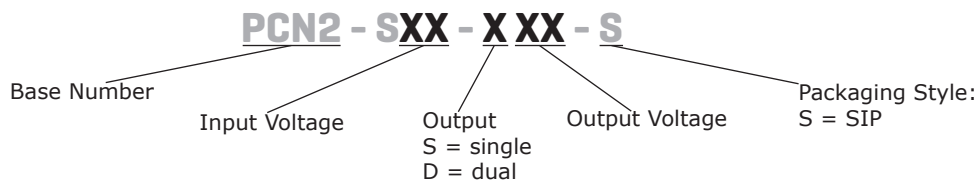
- up to 2 W isolated output
- industry standard SIP package
- nominal input voltages: 5, 12, 24 Vdc
- single/dual unregulated output
- 1,000 Vdc isolation voltage
- low ripple and noise
- -40 to 100°C
- efficiency up to 86%



| MODEL | input voltage | | output voltage | output current | | output power | ripple & noise ¹ | efficiency |
|----------------|---------------|-------------|----------------|----------------|----------|--------------|-----------------------------|------------|
| | typ (Vdc) | range (Vdc) | (Vdc) | min (mA) | max (mA) | max (W) | max (mVp-p) | typ (%) |
| PCN2-S5-S5-S | 5 | 4.5~5.5 | 5 | 0 | 400 | 2 | 100 | 82 |
| PCN2-S5-S12-S | 5 | 4.5~5.5 | 12 | 0 | 167 | 2 | 150 | 86 |
| PCN2-S5-S15-S | 5 | 4.5~5.5 | 15 | 0 | 134 | 2 | 150 | 85 |
| PCN2-S5-D5-S | 5 | 4.5~5.5 | ±5 | 0 | ±200 | 2 | 150 | 83 |
| PCN2-S5-D12-S | 5 | 4.5~5.5 | ±12 | 0 | ±83 | 2 | 150 | 86 |
| PCN2-S5-D15-S | 5 | 4.5~5.5 | ±15 | 0 | ±67 | 2 | 150 | 86 |
| PCN2-S12-S5-S | 12 | 10.8~13.2 | 5 | 0 | 400 | 2 | 100 | 82 |
| PCN2-S12-S12-S | 12 | 10.8~13.2 | 12 | 0 | 167 | 2 | 150 | 83 |
| PCN2-S12-S15-S | 12 | 10.8~13.2 | 15 | 0 | 134 | 2 | 150 | 84 |
| PCN2-S12-D5-S | 12 | 10.8~13.2 | ±5 | 0 | ±200 | 2 | 150 | 82 |
| PCN2-S12-D12-S | 12 | 10.8~13.2 | ±12 | 0 | ±83 | 2 | 150 | 82 |
| PCN2-S12-D15-S | 12 | 10.8~13.2 | ±15 | 0 | ±67 | 2 | 150 | 84 |
| PCN2-S24-S5-S | 24 | 21.6~26.4 | 5 | 0 | 400 | 2 | 100 | 79 |
| PCN2-S24-S12-S | 24 | 21.6~26.4 | 12 | 0 | 167 | 2 | 150 | 81 |
| PCN2-S24-S15-S | 24 | 21.6~26.4 | 15 | 0 | 134 | 2 | 150 | 82 |
| PCN2-S24-D5-S | 24 | 21.6~26.4 | ±5 | 0 | ±200 | 2 | 150 | 79 |
| PCN2-S24-D12-S | 24 | 21.6~26.4 | ±12 | 0 | ±83 | 2 | 150 | 81 |
| PCN2-S24-D15-S | 24 | 21.6~26.4 | ±15 | 0 | ±67 | 2 | 150 | 82 |

Notes: 1. At full load, nominal input, 20 MHz bandwidth oscilloscope, with a 0.33 μF ceramic capacitor on the output.
 2. Required to add a 2.2 μF (5 & 12 Vdc input models) or 10 μF (24 Vdc input models) 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 |
| | 24 Vdc input models | 21.6 | 24 | 26.4 | Vdc |
| surge voltage | for maximum of 100 ms | | | | |
| | 5 Vdc input models | | | 9 | Vdc |
| | 12 Vdc input models | | | 18 | Vdc |
| | 24 Vdc input models | | | 30 | Vdc |
| current | 5 Vdc input models | | 500 | | mA |
| | 12 Vdc input models | | 210 | | mA |
| | 24 Vdc input models | | 110 | | mA |
| filter | capacitive | | | | |
| input reverse polarity protection | no | | | | |
| input fuse | 1 A time delay fuse for 5 Vdc input models (recommended) | | | | |
| | 500 mA time delay fuse for 12 Vdc input models (recommended) | | | | |
| | 250 mA time delay fuse for 24 Vdc input models (recommended) | | | | |

Notes: 1. Required to add a 2.2 μ F (5 & 12 Vdc input models) or 10 μ F (24 Vdc input models) ceramic capacitor to the input to reduce input voltage stress.

OUTPUT

| parameter | conditions/description | min | typ | max | units |
|-------------------------|---------------------------------|-----|-----|------------|-----------------|
| maximum capacitive load | at full load | | | 470 | μ F |
| voltage accuracy | | | | ± 3.0 | % |
| line regulation | 1.0% change in input voltage | | | ± 1.2 | % |
| load regulation | from full load to 20% load | | | ± 10 | % |
| switching frequency | at nominal V_{in} , full load | | 80 | | kHz |
| temperature coefficient | | | | ± 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 | 1,000 | | | Vdc |
| isolation resistance | input to output | 1,000 | | | M Ω |
| isolation capacitance | input to output | | 15 | | pF |
| conducted emissions | EN 55022 Class A & Class B (external circuit required, see Figure 4) | | | | |
| MTBF | as per MIL-HDBK-217F, full load, GB, 25 $^{\circ}$ C | | 3,300,000 | | hours |
| RoHS | 2011/65/EU | | | | |

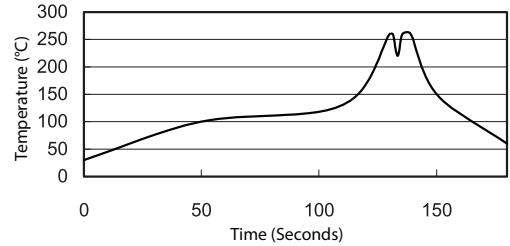
ENVIRONMENTAL

| 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 |
|----------------|----------------------------|-----|-----|-----|-------|
| wave soldering | see wave soldering profile | | | 260 | °C |

- Notes:
1. Soldering materials: Sn/Cu/Ni
 2. Ramp up rate during preheat: 1.4°C/s (from 50°C to 100°C)
 3. Soaking temperature: 0.5°C/s (from 100°C to 130°C), 60±20 seconds
 4. Peak temperature: 260°C, above 250°C for 3~6 seconds
 5. Ramp down rate during cooling: -10°C/s (from 260°C to 150°C)



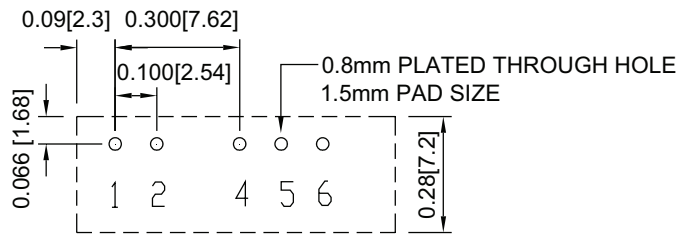
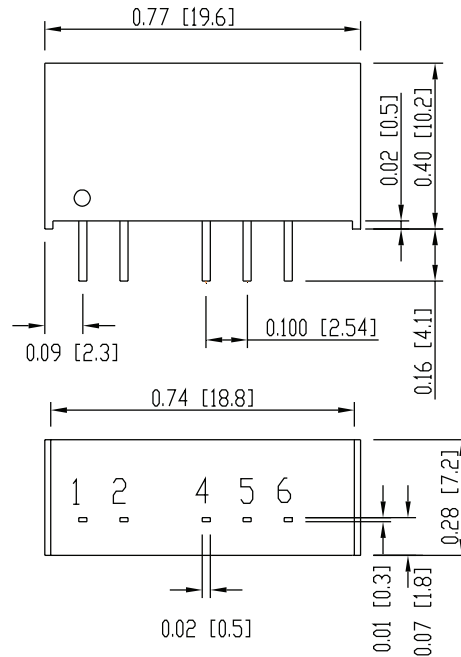
MECHANICAL

| parameter | conditions/description | min | typ | max | units |
|---------------|---|-----|-----|-----|--------|
| dimensions | 0.77 x 0.28 x 0.40 [19.6 x 7.2 x 10.2 mm] | | | | inches |
| case material | non-conductive black plastic | | | | |
| weight | | | 2.7 | | g |

MECHANICAL DRAWING

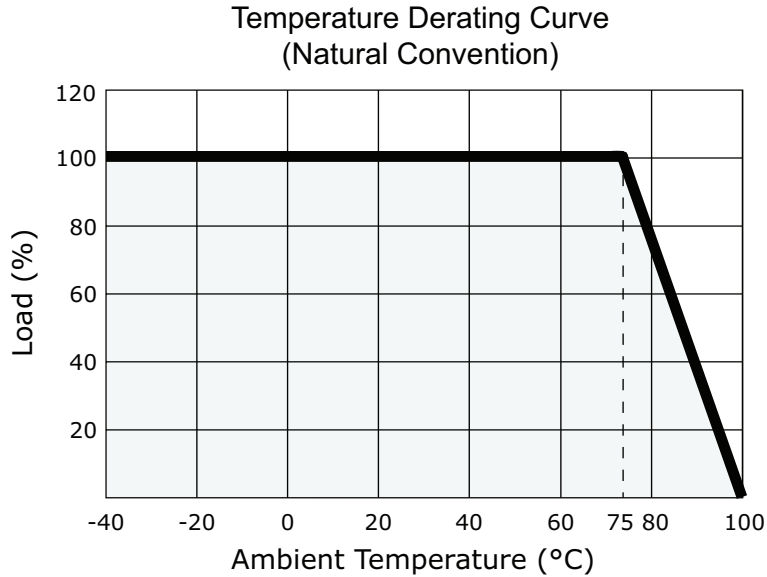
units: inches [mm]
 tolerance: X.XX ±0.01 [±0.25]
 X.XXX ±0.005 [±0.13]
 pin section tolerance: ±0.002[±0.05]

| PIN CONNECTIONS | | |
|-----------------|----------|--------|
| PIN | Function | |
| | Single | Dual |
| 1 | +Vin | +Vin |
| 2 | -Vin | -Vin |
| 4 | -Vout | -Vout |
| 5 | No pin | Common |
| 6 | +Vout | +Vout |



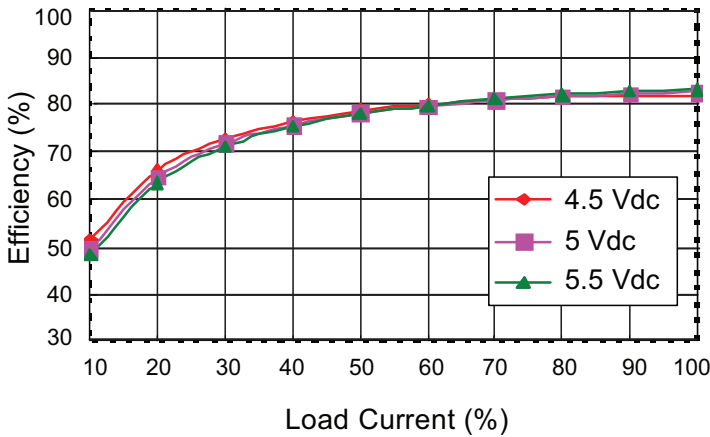
Recommended PCB Layout
Top View

DERATING CURVE

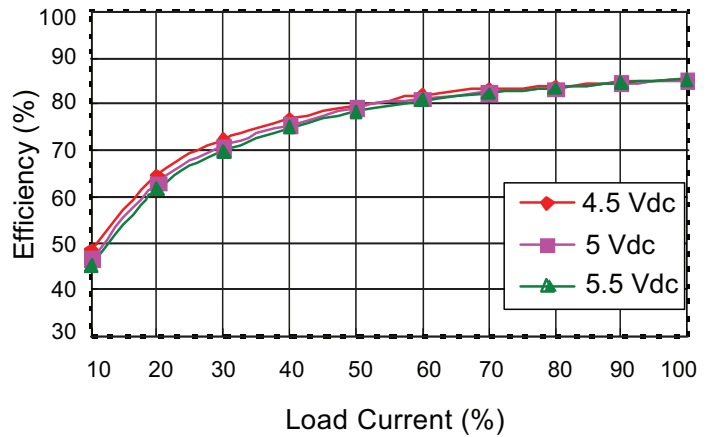


EFFICIENCY CURVES

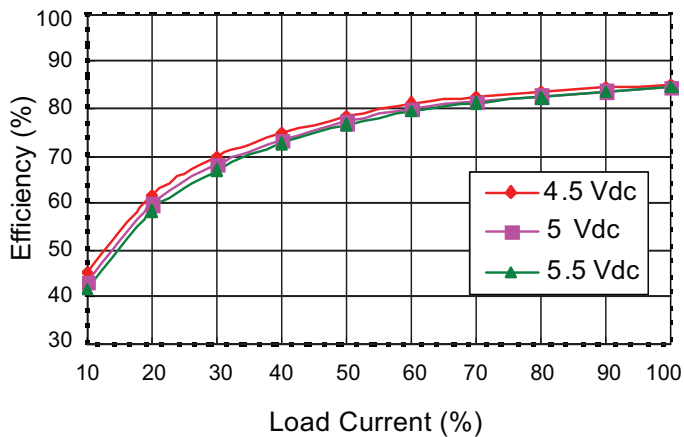
PCN2-S5-S5-S Efficiency Curve
(Efficiency vs. Line Voltage and Load Current)



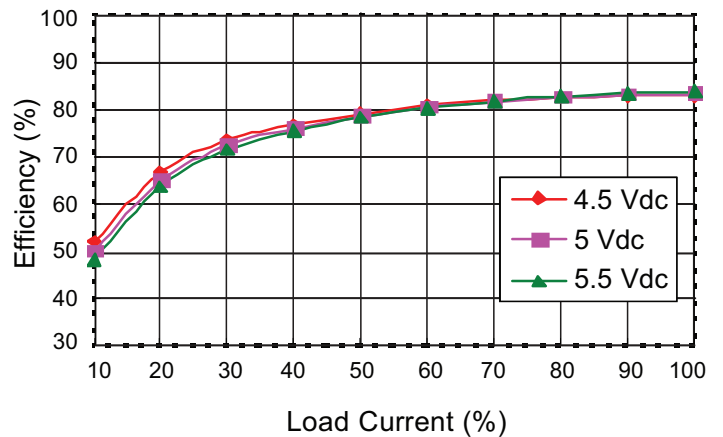
PCN2-S5-S12-S Efficiency Curve
(Efficiency vs. Line Voltage and Load Current)



PCN2-S5-S15-S Efficiency Curve
(Efficiency vs. Line Voltage and Load Current)

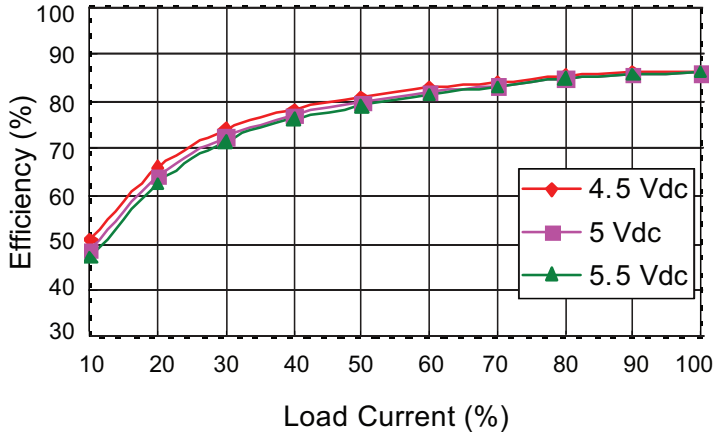


PCN2-S5-D5-S Efficiency Curve
(Efficiency vs. Line Voltage and Load Current)

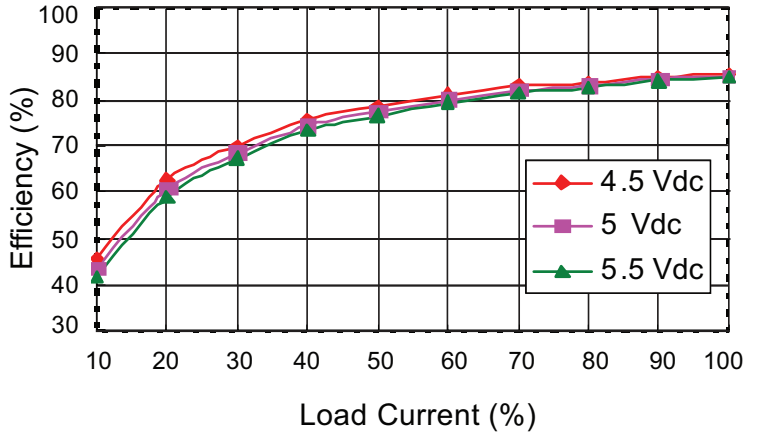


EFFICIENCY CURVES (CONTINUED)

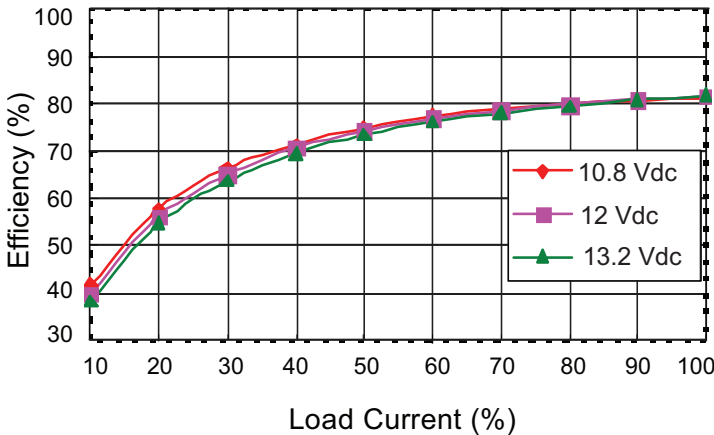
PCN2-S5-D12-S Efficiency Curve
(Efficiency vs. Line Voltage and Load Current)



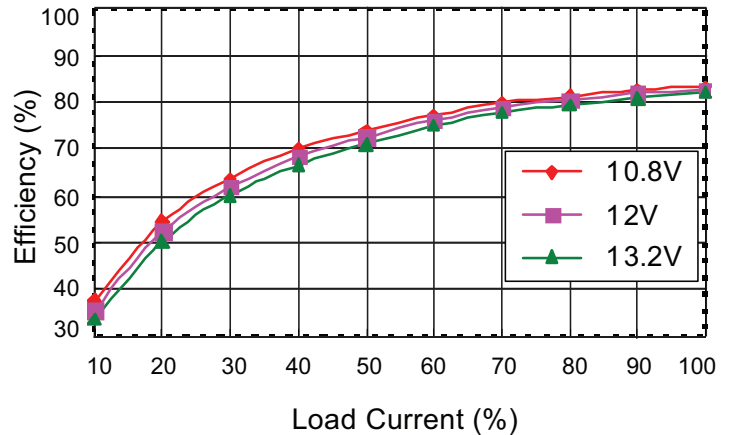
PCN2-S5-D15-S Efficiency Curve
(Efficiency vs. Line Voltage and Load Current)



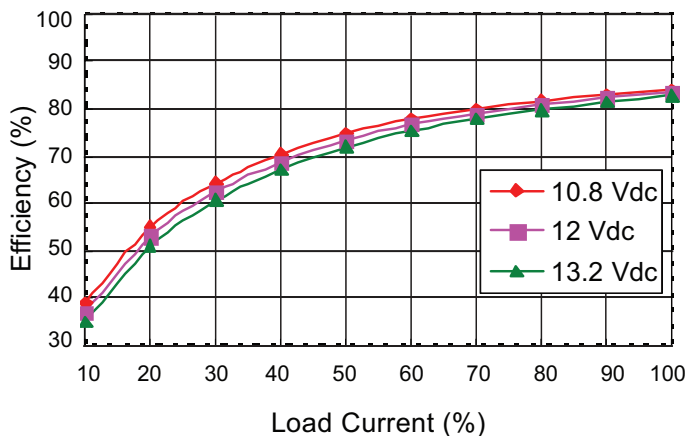
PCN2-S12-S5-S Efficiency Curve
(Efficiency vs. Line Voltage and Load Current)



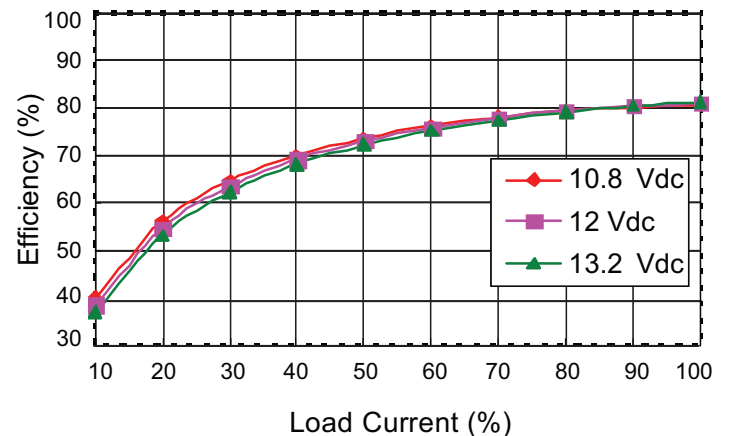
PCN2-S12-S12-S Efficiency Curve
(Efficiency vs. Line Voltage and Load Current)



PCN2-S12-S15-S Efficiency Curve
(Efficiency vs. Line Voltage and Load Current)

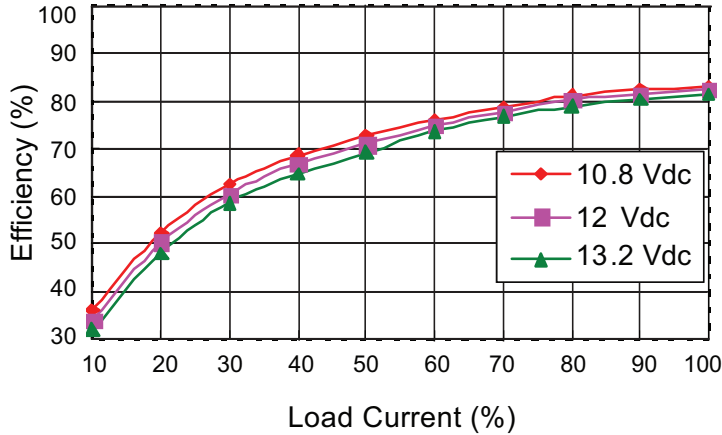


PCN2-S12-D5-S Efficiency Curve
(Efficiency vs. Line Voltage and Load Current)

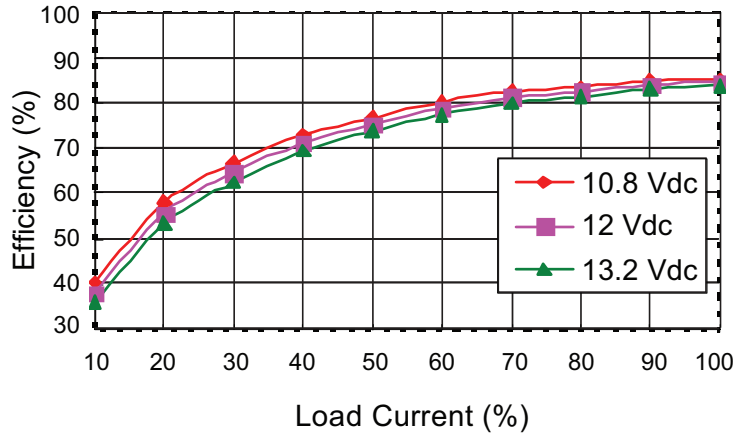


EFFICIENCY CURVES (CONTINUED)

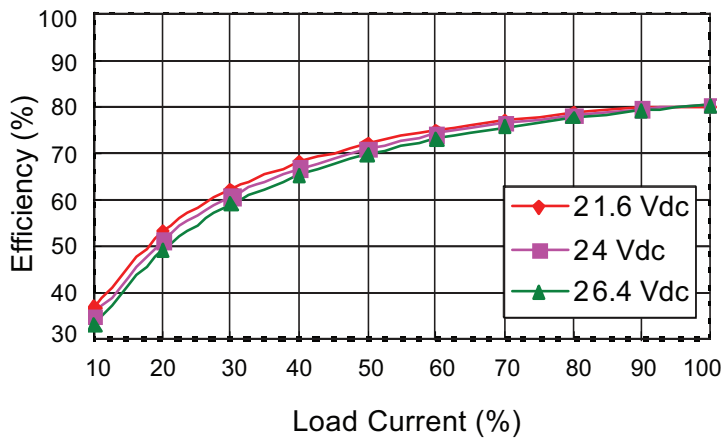
PCN2-S12-D12-S Efficiency Curve
(Efficiency vs. Line Voltage and Load Current)



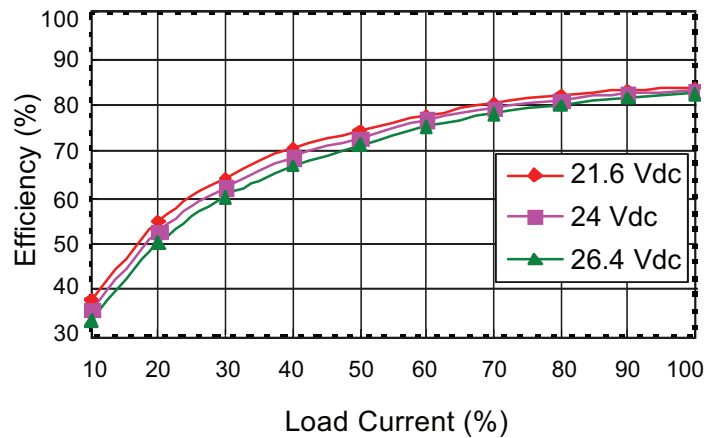
PCN2-S12-D15-S Efficiency Curve
(Efficiency vs. Line Voltage and Load Current)



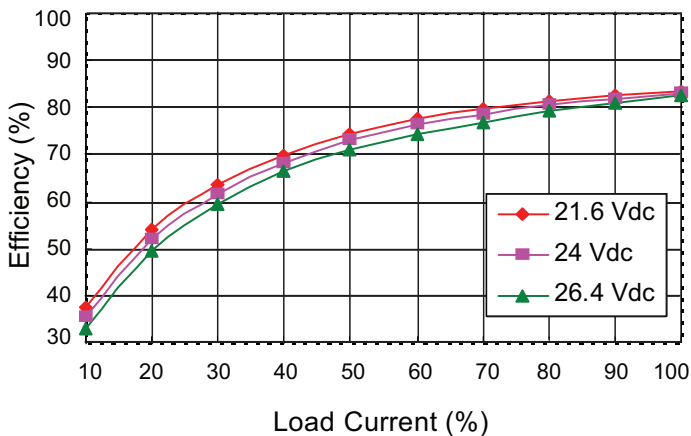
PCN2-S24-S5-S Efficiency Curve
(Efficiency vs. Line Voltage and Load Current)



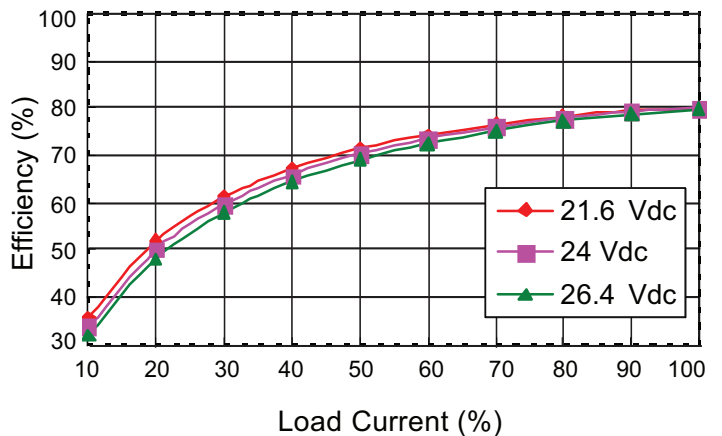
PCN2-S24-S12-S Efficiency Curve
(Efficiency vs. Line Voltage and Load Current)



PCN2-S24-S15-S Efficiency Curve
(Efficiency vs. Line Voltage and Load Current)

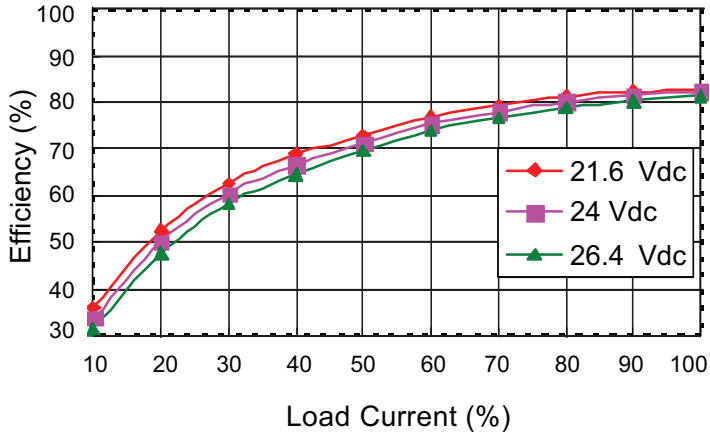


PCN2-S24-D5-S Efficiency Curve
(Efficiency vs. Line Voltage and Load Current)

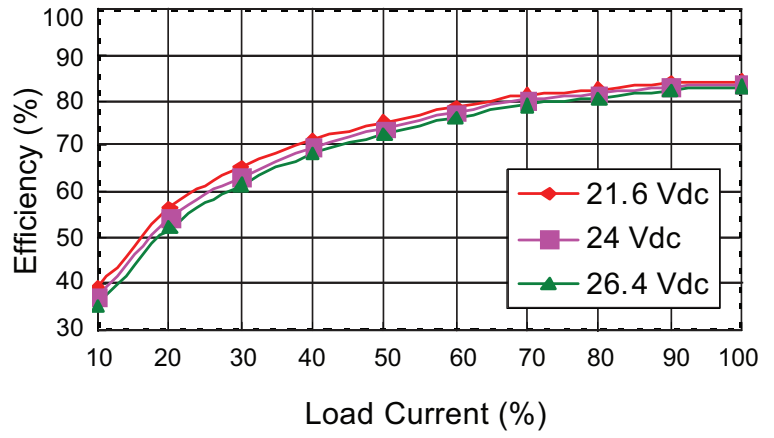


EFFICIENCY CURVES (CONTINUED)

PCN2-S24-D12-S Efficiency Curve
(Efficiency vs. Line Voltage and Load Current)



PCN2-S24-D15-S Efficiency Curve
(Efficiency vs. Line Voltage and Load Current)

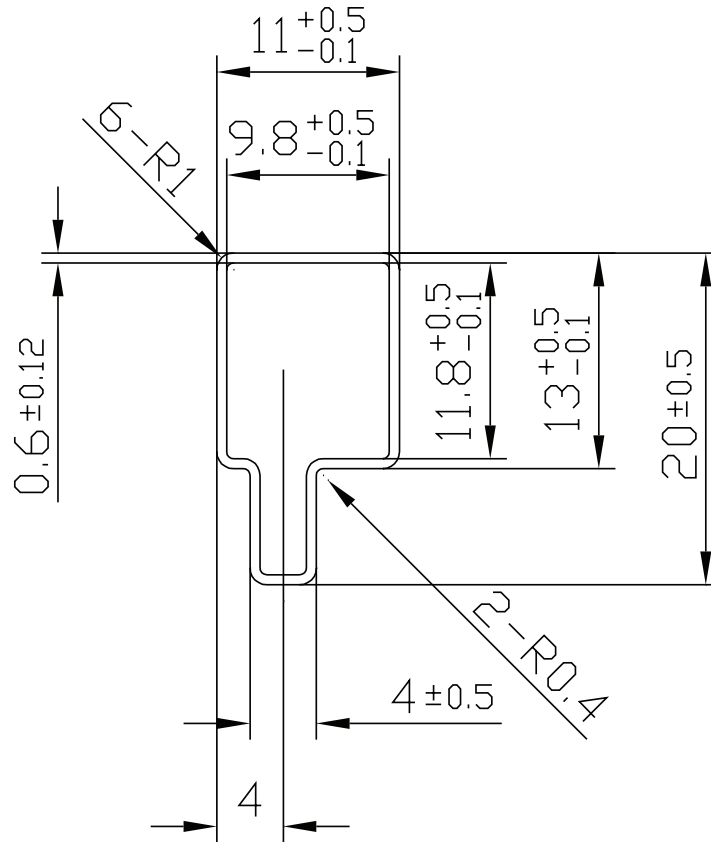


PACKAGING

units: mm

Tube size: 20 x 11 x 330 mm

QTY: 14 pcs



TEST CONFIGURATIONS

Input Ripple Current & Output Noise

Figure 1 Measuring Input Ripple Current

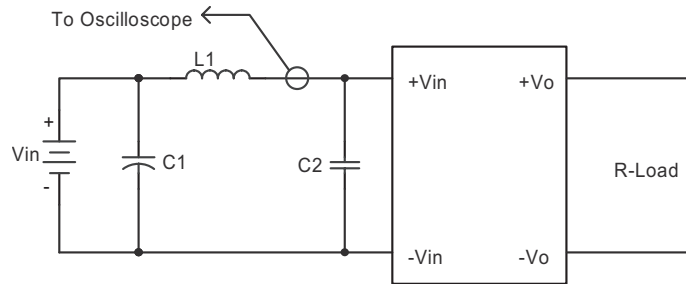


Table 1

| Input Voltage (Vdc) | L1 | C1 | C2 |
|---------------------|------------|--------------------------------|----|
| 5 | 12 μ H | 2.2 μ F tantalum capacitor | NC |
| 12 | 12 μ H | 2.2 μ F tantalum capacitor | NC |
| 24 | 12 μ H | 10 μ F ceramic capacitor | NC |

Figure 2 Measuring Output Ripple & Noise for Single Output Models

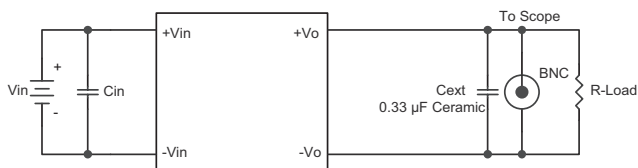


Figure 3 Measuring Output Ripple & Noise for Dual Output Models

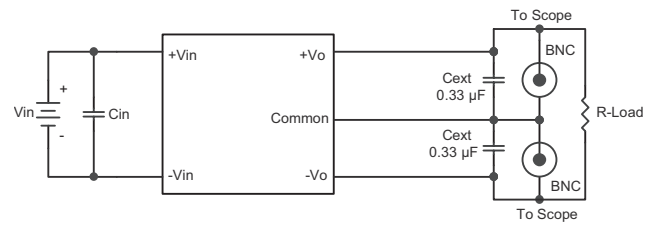


Table 2

| Input Voltage (Vdc) | Cin |
|---------------------|-------------------------------|
| 5 | 2.2 μ F ceramic capacitor |
| 12 | 2.2 μ F ceramic capacitor |
| 24 | 10 μ F ceramic capacitor |

EMC RECOMMENDED CIRCUIT

Test Condition

Input Voltage: Nominal

Output Load: Full Load

Figure 4 Conducted Emissions Test Circuit

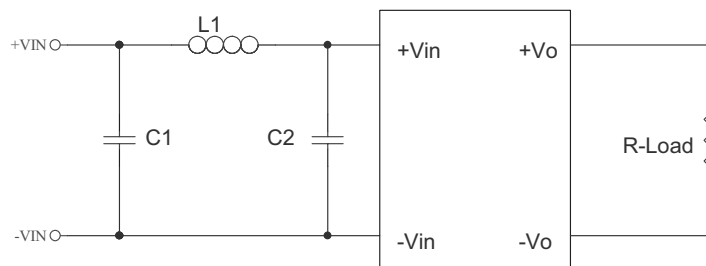


Table 3

| EN55022 Class A Recommended External Circuit Components | | | |
|--|--------------------|--------------------|-------------|
| Model | C1 ¹ | C2 ¹ | L1 |
| PCN2-S5-S5-S | 4.7 μ F / 50 V | NC | 2.2 μ H |
| PCN2-S5-S12-S | 4.7 μ F / 50 V | NC | 2.2 μ H |
| PCN2-S5-S15-S | 10 μ F / 25 V | NC | 5.6 μ H |
| PCN2-S5-D5-S | 4.7 μ F / 50 V | NC | 2.2 μ H |
| PCN2-S5-D12-S | 4.7 μ F / 50 V | NC | 2.2 μ H |
| PCN2-S5-D15-S | 10 μ F / 25 V | NC | 5.6 μ H |
| PCN2-S12-S5-S | 10 μ F / 25 V | NC | 5.6 μ H |
| PCN2-S12-S12-S | 4.7 μ F / 50 V | NC | 5.6 μ H |
| PCN2-S12-S15-S | 4.7 μ F / 50 V | NC | 5.6 μ H |
| PCN2-S12-D5-S | 10 μ F / 25 V | NC | 5.6 μ H |
| PCN2-S12-D12-S | 4.7 μ F / 50 V | NC | 5.6 μ H |
| PCN2-S12-D15-S | 4.7 μ F / 50 V | NC | 5.6 μ H |
| PCN2-S24-S5-S | 4.7 μ F / 50 V | 4.7 μ F / 50 V | 5.6 μ H |
| PCN2-S24-S12-S | 4.7 μ F / 50 V | 4.7 μ F / 50 V | 5.6 μ H |
| PCN2-S24-S15-S | 4.7 μ F / 50 V | 4.7 μ F / 50 V | 5.6 μ H |
| PCN2-S24-D5-S | 4.7 μ F / 50 V | 4.7 μ F / 50 V | 5.6 μ H |
| PCN2-S24-D12-S | 4.7 μ F / 50 V | 4.7 μ F / 50 V | 5.6 μ H |
| PCN2-S24-D15-S | 4.7 μ F / 50 V | 4.7 μ F / 50 V | 5.6 μ H |

Notes: 1. Ceramic Capacitor

Table 4

| EN55022 Class B Recommended External Circuit Components | | | |
|--|-------------------|-------------------|-------------|
| Model | C1 ¹ | C2 ¹ | L1 |
| PCN2-S5-S5-S | 10 μ F / 25 V | NC | 5.6 μ H |
| PCN2-S5-S12-S | 10 μ F / 25 V | NC | 5.6 μ H |
| PCN2-S5-S15-S | 10 μ F / 25 V | 10 μ F / 25 V | 5.6 μ H |
| PCN2-S5-D5-S | 10 μ F / 25 V | NC | 5.6 μ H |
| PCN2-S5-D12-S | 10 μ F / 25 V | NC | 5.6 μ H |
| PCN2-S5-D15-S | 10 μ F / 25 V | 10 μ F / 25 V | 5.6 μ H |
| PCN2-S12-S5-S | 10 μ F / 25 V | 10 μ F / 25 V | 5.6 μ H |
| PCN2-S12-S12-S | 10 μ F / 25 V | 10 μ F / 25 V | 5.6 μ H |
| PCN2-S12-S15-S | 10 μ F / 25 V | 10 μ F / 25 V | 5.6 μ H |
| PCN2-S12-D5-S | 10 μ F / 25 V | 10 μ F / 25 V | 5.6 μ H |
| PCN2-S12-D12-S | 10 μ F / 25 V | 10 μ F / 25 V | 5.6 μ H |
| PCN2-S12-D15-S | 10 μ F / 25 V | 10 μ F / 25 V | 5.6 μ H |
| PCN2-S24-S5-S | 10 μ F / 50 V | 10 μ F / 50 V | 5.6 μ H |
| PCN2-S24-S12-S | 10 μ F / 50 V | 10 μ F / 50 V | 5.6 μ H |
| PCN2-S24-S15-S | 10 μ F / 50 V | 10 μ F / 50 V | 5.6 μ H |
| PCN2-S24-D5-S | 10 μ F / 50 V | 10 μ F / 50 V | 5.6 μ H |
| PCN2-S24-D12-S | 10 μ F / 50 V | 10 μ F / 50 V | 5.6 μ H |
| PCN2-S24-D15-S | 10 μ F / 50 V | 10 μ F / 50 V | 5.6 μ H |

Notes: 1. Ceramic Capacitor

REVISION HISTORY

| rev. | description | date |
|-------------|--------------------|-------------|
| 1.0 | initial release | 07/26/2016 |

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



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