

# 60 W DC-DC Converter P60A-Series

- Wide 2:1 input range
- Efficiency up to 91 %
- Adjustable output voltage
- On/Off remote control
- 1600 V<sub>DC</sub> isolation
- Continuous short circuit protection
- Over current protection
- Over voltage protection
- Over temperature protection
- Soft start function
- Standard package 2" x 2" x 0.4"
- -40...85 °C operating temperature range
- Integrated EMC filter EN 55032 Class A



## Model guide

| Type       | Input voltage              |                          | Input current     |                     | Output voltage [V <sub>DC</sub> ] | Output current |         | Efficiency [%] | Output capacitor load [μF] max. |
|------------|----------------------------|--------------------------|-------------------|---------------------|-----------------------------------|----------------|---------|----------------|---------------------------------|
|            | Nominal [V <sub>DC</sub> ] | Range [V <sub>DC</sub> ] | no load [mA] typ. | full load [mA] typ. |                                   | [mA] min.      | [A] max |                |                                 |
| P60A243R3S | 24                         | 18...36                  | 80                | 2150                | 3.3                               | 0              | 14      | 91             | 36000                           |
| P60A2405S  | 24                         | 18...36                  | 100               | 2760                | 5.0                               | 0              | 12      | 91             | 20400                           |
| P60A2412S  | 24                         | 18...36                  | 40                | 2795                | 12.0                              | 0              | 5       | 90             | 3550                            |
| P60A2415S  | 24                         | 18...36                  | 40                | 2795                | 15.0                              | 0              | 4       | 90             | 2300                            |
| P60A483R3S | 48                         | 36...75                  | 50                | 1075                | 3.3                               | 0              | 14      | 91             | 36000                           |
| P60A4805S  | 48                         | 36...75                  | 60                | 1390                | 5.0                               | 0              | 12      | 91             | 20400                           |
| P60A4812S  | 48                         | 36...75                  | 40                | 1395                | 12.0                              | 0              | 5       | 91             | 3550                            |
| P60A4815S  | 48                         | 36...75                  | 40                | 1395                | 15.0                              | 0              | 4       | 91             | 2300                            |

## Specifications

| Input                                                 |                                                                                                                                     |
|-------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| Start up voltage                                      | P60A24xxx: 17.8 V <sub>DC</sub> , typ.<br>P60A48xxx: 33.5 V <sub>DC</sub> , typ.                                                    |
| Under voltage lockout                                 | P60A24xxx: 16 V <sub>DC</sub> , typ.<br>P60A48xxx: 30.5 V <sub>DC</sub> , typ.                                                      |
| Filter                                                | π - type                                                                                                                            |
| Reflected ripple current                              | 20 mA/p, typ. (See fig. 1)                                                                                                          |
| Remote control threshold (see figure 3)               | On state: 3...12 V <sub>DC</sub> or open input<br>Off state: 0...1.2 V <sub>DC</sub>                                                |
| Idle current, Rem. Ctrl. Off state                    | 5 mA, typ.                                                                                                                          |
| Isolation:                                            |                                                                                                                                     |
| Rated voltage input / output, input or output to case | 1600 V <sub>DC</sub>                                                                                                                |
| Resistance                                            | 10 <sup>7</sup> Ω, min.                                                                                                             |
| Capacitance                                           | 2000 pF, typ.                                                                                                                       |
| Output                                                |                                                                                                                                     |
| Voltage accuracy                                      | ± 1 %                                                                                                                               |
| Output voltage trim range                             | ± 10 %                                                                                                                              |
| Line regulation                                       | ± 0.5 %                                                                                                                             |
| Load regulation                                       | ± 0.5 % @ 0 %...100 % load                                                                                                          |
| Temperature coefficient                               | ± 0.02 % / °C                                                                                                                       |
| Ripple and noise                                      | P60Axx3R3S, -05S: ≤75 mVp-p<br>P60Axx12S, -15S: ≤100 mVp-p                                                                          |
| Over voltage protection (Z-diode)                     | P60Axx3R3x: 3.9 V <sub>DC</sub><br>P60Axx05x: 6.2 V <sub>DC</sub><br>P60Axx12x: 15 V <sub>DC</sub><br>P60Axx15x: 18 V <sub>DC</sub> |
| Transient recovery time                               | 250 μs, typ. @ 25 % load change steps                                                                                               |
| Transient response deviation                          | ≤3 % @ 25 % load change steps                                                                                                       |
| Short circuit protection                              | Continuous, hiccup, automatic restart                                                                                               |
| Over current protection                               | 135 % of full load, typ.                                                                                                            |
| Start up time                                         | 20 ms, typ. @ R-load, nom. Vin                                                                                                      |

## General

| Switching frequency            | 270 kHz, typ.                                                   |
|--------------------------------|-----------------------------------------------------------------|
| Safety standard                | EN 60950-1, IEC 60950-1                                         |
| Reliability calculated MBTF    | >110000 h                                                       |
| EMC characteristics            |                                                                 |
| Radiated emissions             | EN 55032 Class A                                                |
| Conducted emissions            | EN 55032 Class A                                                |
| ESD                            | EN 61000-4-2 pref criteria A                                    |
| RS                             | EN 61000-4-3 pref criteria A                                    |
| EFT (See fig. 5)               | EN 61000-4-4 pref criteria A                                    |
| Surge (See fig. 5)             | EN 61000-4-5 pref criteria A                                    |
| CS                             | EN 61000-4-6 pref criteria A                                    |
| PFMF                           | EN 61000-4-8 pref criteria A                                    |
| Environmental                  |                                                                 |
| Operating temperatur (ambient) | -40 ... 85 °C (see SOA diagram)                                 |
| Case temperature               | 110 °C, max.                                                    |
| Storage temperature            | -40 ... 125 °C                                                  |
| Over temperature protection    | T <sub>c</sub> 110 °C, typ                                      |
| Cooling                        | Free air convection, 30...65 LFM                                |
| Thermal impedance              | Without heat sink 10.5 K/W<br>With heat sink 8.4 K/W            |
| Storage humidity               | 95 %, non condensing                                            |
| Physical                       |                                                                 |
| Dimensions standard            | 50.8 x 50.8 x 10.16 mm                                          |
| Dimensions heat sink version   | 50.8 x 50.8 x 16.3 mm                                           |
| Weight                         | Standard version: 87 g<br>Heat sink version: 100 g              |
| Case material                  | Copper nickel plated                                            |
| Potting Material               | Epoxy (UL94V-0 rated)                                           |
| Absolute max. ratings          |                                                                 |
| Max. input voltage for ≤0.1 s  | P60A24xxS: 50 V <sub>DC</sub><br>P60A48xxS: 100 V <sub>DC</sub> |
| Pin soldering temperature      | ≤ 260 °C for ≤ 10 s,<br>≥1.5 mm distance from body              |

| Part number structure |        |               |           |                |       |         |                   |
|-----------------------|--------|---------------|-----------|----------------|-------|---------|-------------------|
| Output power          | Series | Input voltage |           | Output voltage |       | Outputs |                   |
| P60                   | A      | 24            |           | 05             |       | S       |                   |
| 60 Watt               |        | 24            | 18...36 V | 3R3            | 3.3 V | S       | single            |
|                       |        | 48            | 36...75 V | 05             | 5 V   |         |                   |
|                       |        |               |           | 12             | 12 V  |         |                   |
|                       |        |               |           | 15             | 15 V  |         |                   |
|                       |        |               |           |                |       | Blank   | Without heat sink |
|                       |        |               |           |                |       | K       | With heat sink    |

Note:

1. The maximum capacitive load is specified at minimal input voltage and constant resistive load.
2. All specifications are typical at 25 °C, nominal input voltage and full load unless otherwise noted.

# 60 W DC-DC Converter P60A-Series

Figure 1 Measure circuit for reflected input ripple current.

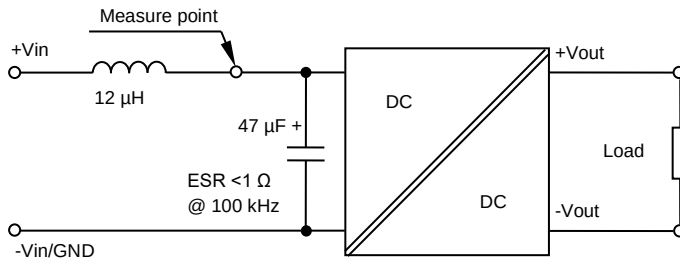


Figure 2 Measure circuit for output ripple & noise.

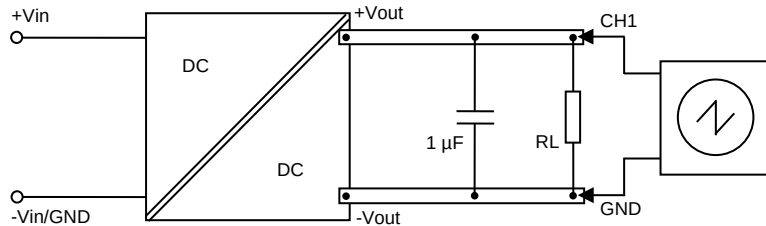


Figure 3 Application circuit remote control.

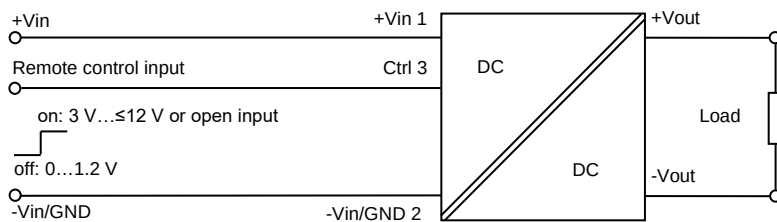
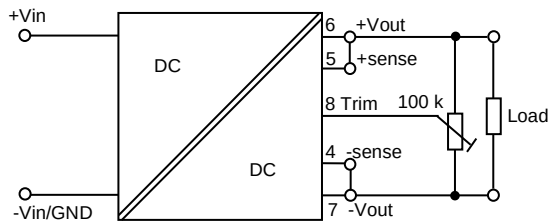
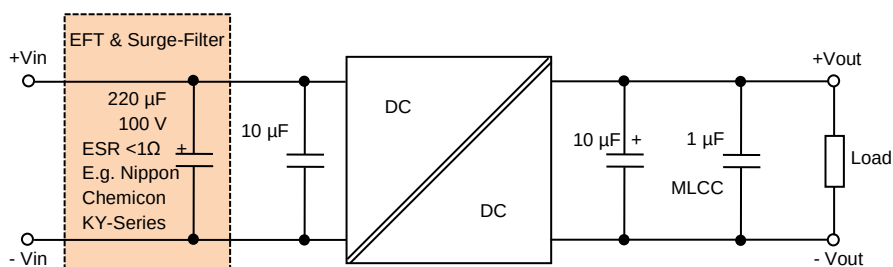


Figure 4 Application circuit output voltage trimming.



The maximum output range is 10 % inclusive of remote sense and trim. If remote sense is not being used, the +SENSE should be connected to it is corresponding +OUTPUT and likewise the -SENSE should be connected to its corresponding -OUTPUT.

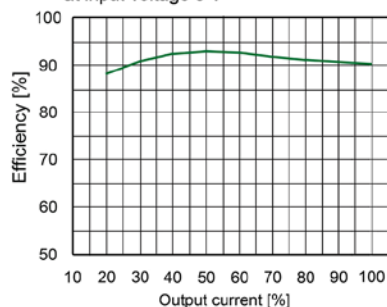
Figure 5 Application circuit to meet IEC 61000-4-4 Class A and IEC 61000-4-5 Class A



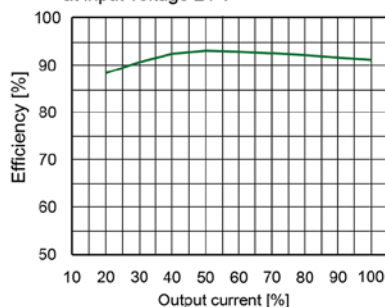
Filter components to meet EN 55032 Class A are integrated in the converter. The input capacitor 220 µF is used as suppressor for fast transient and surge pulse. All other capacitors are for further ripple and noise reduction.

# 60 W DC-DC Converter P60A-Series

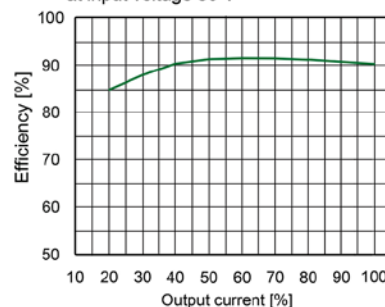
P60A243R3S Efficiency vs output current  
at input voltage 9 V



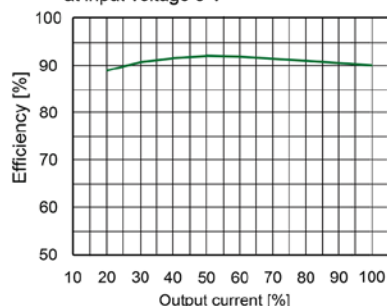
P60A243R3S Efficiency vs output current  
at input voltage 24 V



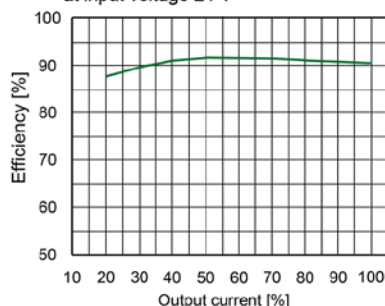
P60A243R3S Efficiency vs output current  
at input voltage 36 V



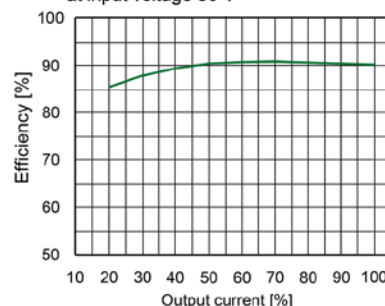
P60A2412S Efficiency vs output current  
at input voltage 9 V



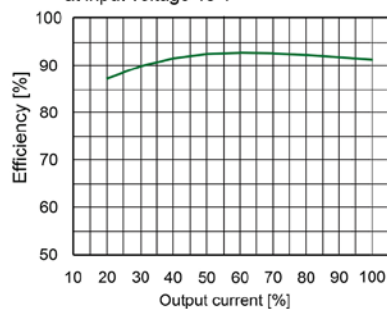
P60A2412S Efficiency vs output current  
at input voltage 24 V



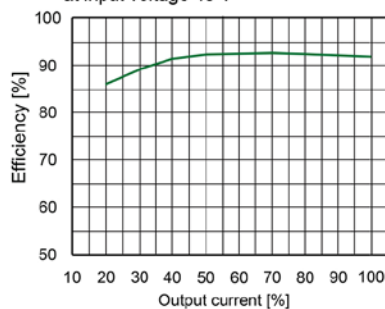
P60A2412S Efficiency vs output current  
at input voltage 36 V



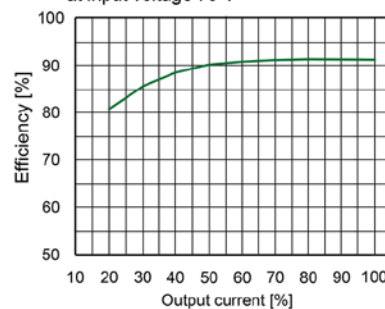
P60A4805S Efficiency vs output current  
at input voltage 18 V



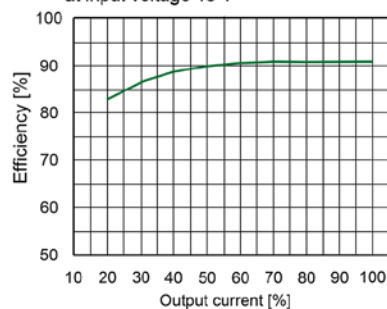
P60A4805S Efficiency vs output current  
at input voltage 48 V



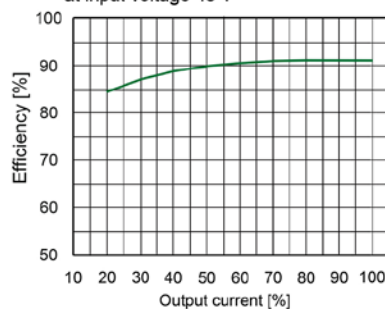
P60A4805S Efficiency vs output current  
at input voltage 75 V



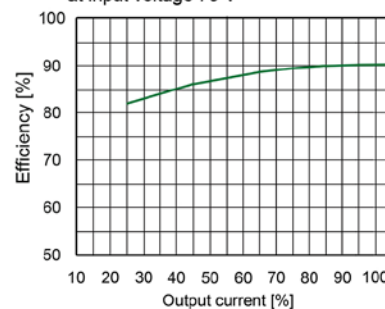
P60A4815S Efficiency vs output current  
at input voltage 18 V



P60A4815S Efficiency vs output current  
at input voltage 48 V

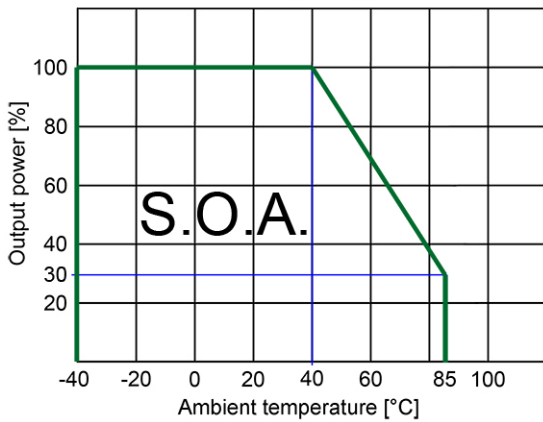


P60A4815S Efficiency vs output current  
at input voltage 75 V

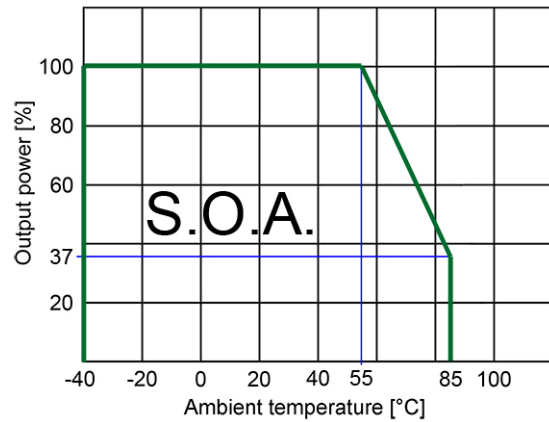


# 60 W DC-DC Converter P60A-Series

Without heat sink  
Derating diagram

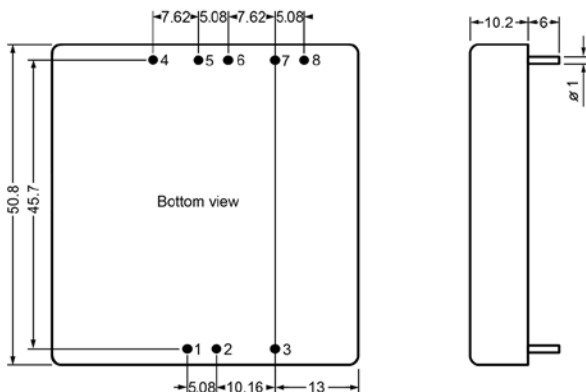


With heat sink  
Derating diagram

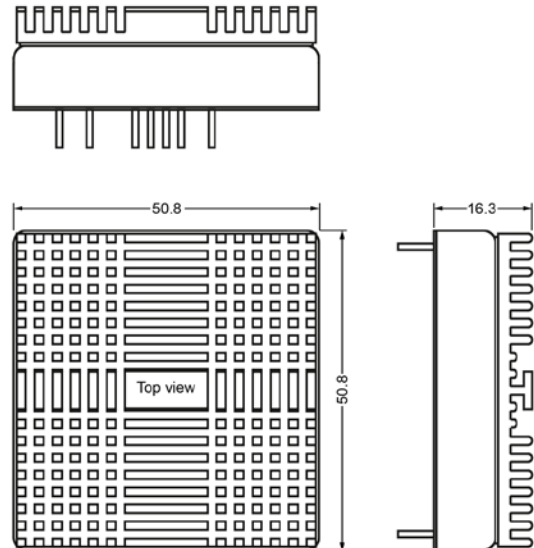


## Mechanical dimensions

Standard version



## Heat sink version



| Pin Assignment |               |             |
|----------------|---------------|-------------|
| Pin            | Single output | Dual output |
| 1              | + Vin         | + Vin       |
| 2              | - Vin         | - Vin       |
| 3              | Rem ctrl      | Rem ctrl    |
| 4              | - Sense       | + Vout      |
| 5              | + Sense       | Common      |
| 6              | + Vout        | Common      |
| 7              | - Vout        | - Vout      |
| 8              | Trim          | Trim        |

## Note:

All dimensions are in mm

1. Pin diameter tolerance  $\pm 0.05$  mm
2. Pin pitch tolerance  $\pm 0.35$
3. Pin length tolerance  $\pm 0.35$
4. Case tolerance  $\pm 0.5$

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Rev: 20180919 f