60 W DC-DC Converter P60A-Series

PHI-CON

- Wide 2:1 input range
- Efficiency up to 91 %
- Adjustable output voltage
- On/Off remote control
- 1600 V_{DC} 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	Output current		Efficiency	Output capacitor load
	Nominal [V_{DC}]	Range [V_{DC}]	no load [mA] typ.	full load [mA] typ.	[V_{DC}]	[mA] min.	[A] max	[%]	[µF] 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_{DC}, typ. P60A48xxx: 33.5 V_{DC}, typ.
Under voltage lockout	P60A24xxx: 16 V_{DC}, typ. P60A48xxx: 30.5 V_{DC}, typ.
Filter	π - type
Reflected ripple current	20 mAp-p, typ. (See fig. 1)
Remote control threshold (see figure 3)	On state: 3…12 V_{DC} or open input Off state: 0…1.2 V_{DC}
Idle current, Rem. Ctrl. Off state	5 mA, typ.
Isolation:	
Rated voltage input / output, input or output to case	1600 V_{DC}
Resistance	10^9 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 P60Axx12S, -15S: ≤100 mVp-p
Over voltage protection (Z-diode)	P60Axx3R3x: 3.9 V_{DC} P60Axx05x: 6.2 V_{DC} P60Axx12x: 15 V_{DC} P60Axx15x: 18 V_{DC}
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	Tc 110 °C, typ
Cooling	Free air convection, 30..65 LFM
Thermal impedance	Without heat sink 10.5 K/W 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 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_{DC} P60A48xxS: 100 V_{DC}
Pin soldering temperature ≥1.5 mm distance from body	≤ 260 °C for ≤ 10 s, ≥1.5 mm distance from body

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

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.

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Figure 1 Measure circuit for reflected input ripple current.

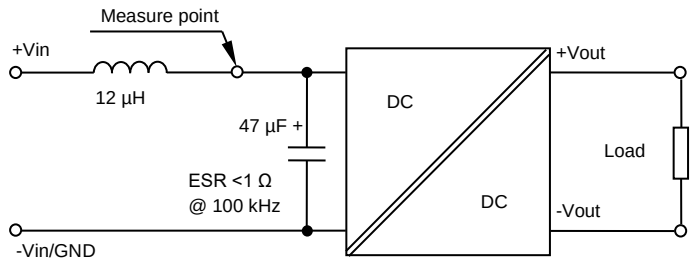


Figure 2 Measure circuit for output ripple & noise.

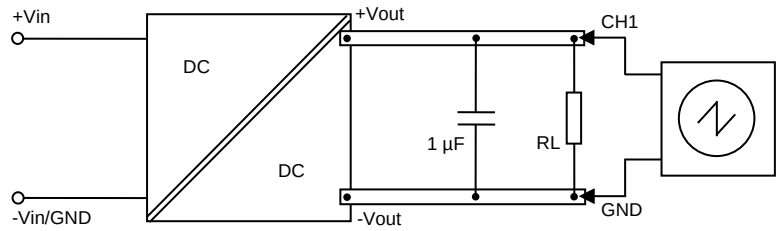


Figure 3 Application circuit remote control.

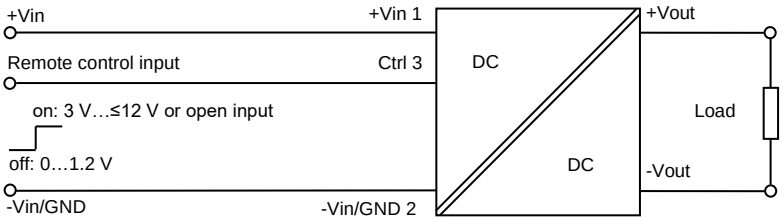
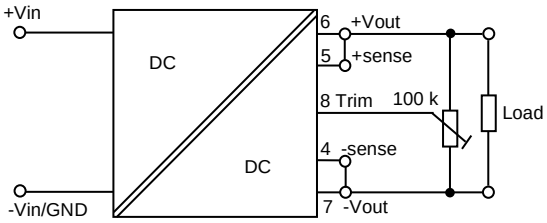
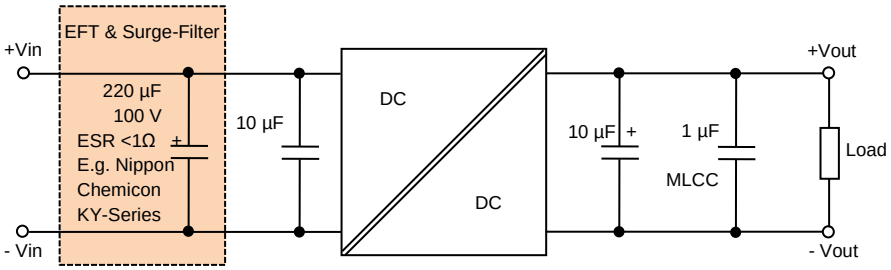


Figure 4 Application circuit output voltage trimming.



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.

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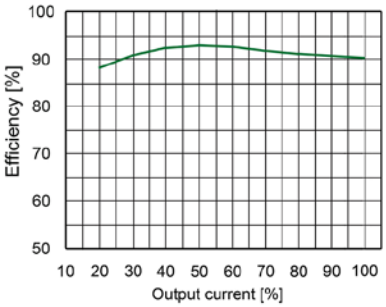
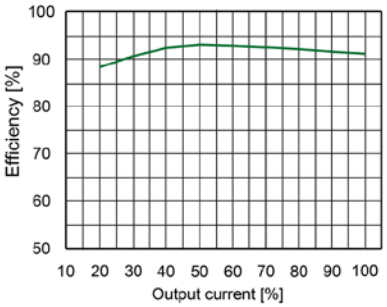
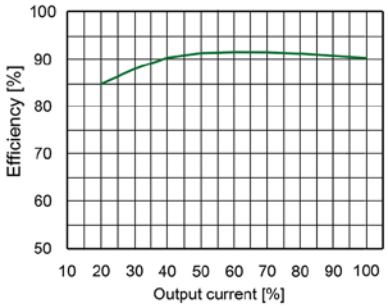
P60A243R3S Efficiency vs output current at input voltage 9 V



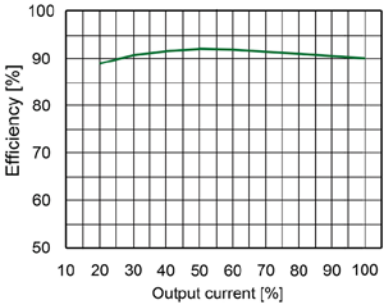
P60A243R3S Efficiency vs output current at input voltage 24 V



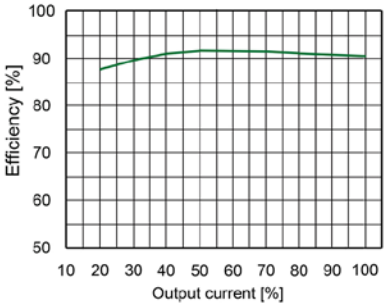
P60A243R3S Efficiency vs output current at input voltage 36 V



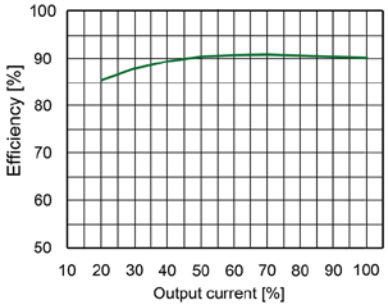
P60A2412S Efficiency vs output current at input voltage 9 V



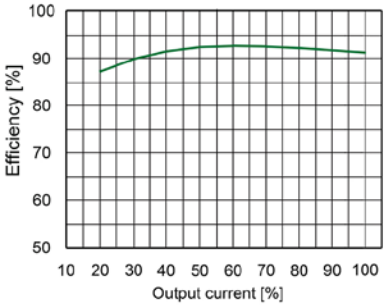
P60A2412S Efficiency vs output current at input voltage 24 V



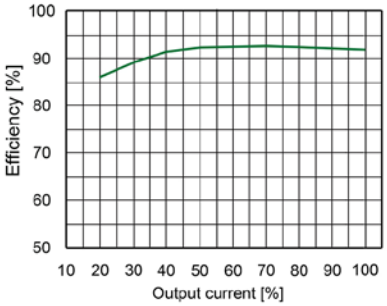
P60A2412S Efficiency vs output current at input voltage 36 V



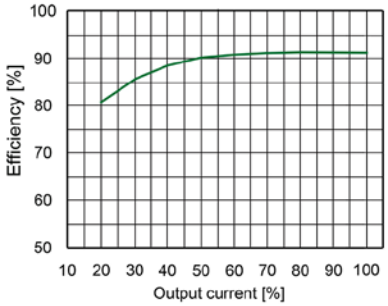
P60A4805S Efficiency vs output current at input voltage 18 V



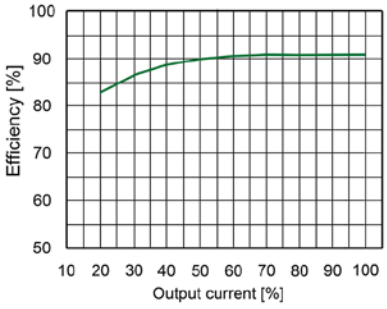
P60A4805S Efficiency vs output current at input voltage 48 V



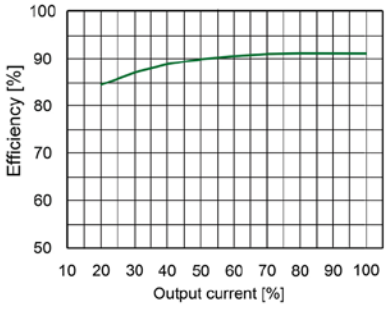
P60A4805S Efficiency vs output current at input voltage 75 V



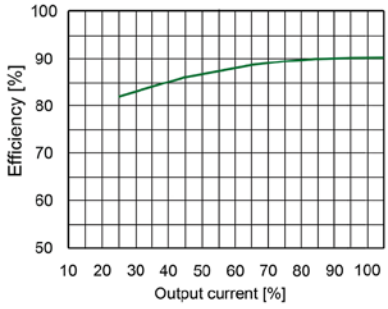
P60A4815S Efficiency vs output current at input voltage 18 V



P60A4815S Efficiency vs output current at input voltage 48 V



P60A4815S Efficiency vs output current at input voltage 75 V



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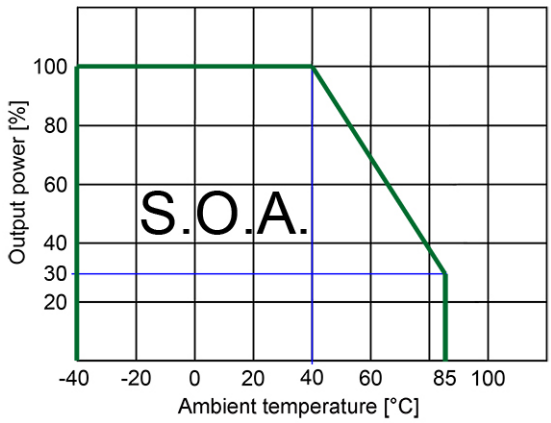
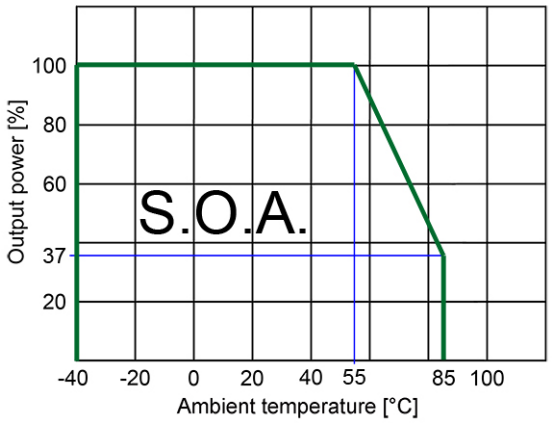
Without heat sink
Derating diagram

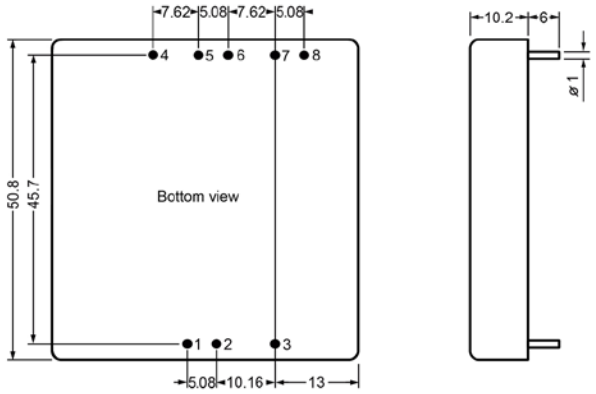


With heat sink
Derating diagram

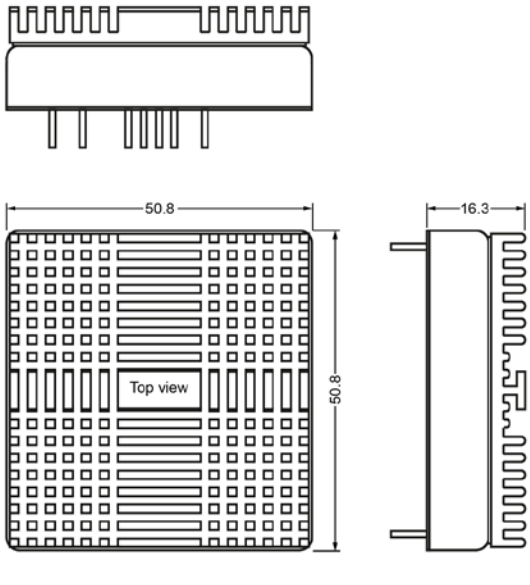


Mechanical dimensions

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 ± 0.05 mm
2. Pin pitch tolerance ± 0.35
3. Pin length tolerance ± 0.35
4. Case tolerance ± 0.5

Rev: 20180919 f

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