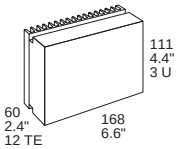
power-one™
Changing the Shape of Power

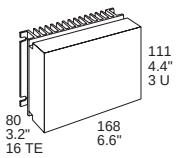


Input voltage up to 60 VDC
Single output of 5.1 to 24 VDC
No input to output isolation

- High efficiency up to 94%
- Wide input voltage range
- Low input-to-output differential voltage
- Very good dynamic properties
- Input undervoltage lock-out
- Active current sharing for parallel operation
- Output voltage adjustment, inhibit and sense lines
- Fast dynamic response
- Continuous no-load and short-circuit proof
- No derating

Safety according to IEC/EN 60950, UL 1950

c UL us CE



Summary

The PSS/PSK series of positive switching regulators is designed as power supply modules for electronic systems. Their major advantages include a high level of efficiency that remains virtually constant over the entire input range, high reliability, low ripple and excellent dynamic response. Modules with input voltages up to 60 V are specially designed for secondary switched and battery-driven applications. The standard case design with heat sink allows operation at nominal load up to 50°C without additional cooling, suitable for 19" rack or chassis mounting.

Replacing the heat sink by an optional cooling plate B or B1, allows chassis or wall mounting on top of a metal surface, acting as heat sink.

Connector type: H15 (according to DIN 41612).

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Model Selection and Key Data

Table 1: Type survey

Output voltage $V_{o\,nom}$ [V]	Output current $I_{o\,nom}$ [A]	Input voltage range V_i [V] [1]	Input voltage $V_{i\,nom}$ [V]	Efficiency at $V_{i\,nom}$, $I_{o\,nom}$ η_{min} [%]	Type designation	Options
5.1	14	8...40	20	83	PSS 5A14-2	B
5.1	18	8...40	20	82	PSK 5A18-2	B1
12	14	15...40	30	90	PSS 1214-2	
12	18	15...40	30	90	PSK 1218-2	
15	14	19...40	30	90	PSS 1214-2	
15	18	19...40	30	90	PSK 1218-2	
24	14	29...60	40	94	PSS 2414-2	
24	18	29...60	40	94	PSK 2418-2	

[1] See also: *Electrical Input Data:* $\Delta V_{io\,min}$.

Part Number Description and Product Marking

Type Key

PSK 12 18 -2 B

Positive switching regulator in case S01, K01 - PSS, PSK
Nominal output voltage in volt (5A for 5.1 V) ..... 5A,...24
Nominal output current in ampere 14, 18
Operational ambient temperature range –10 to 50°C ... -2
Options: Cooling plate large / small ..... B / B1

Example: PSK 1218-2B = A positive switching regulator with a 12 V, 18 A output, ambient temperature range of –10 to 50°C and large cooling plate option B.

Note: All units features the following auxiliary functions which are not shown in the type designation: Input filter, inhibit, R control, sense lines and current sharing.

Produkt Marking

Basic type designation, applicable safety approvals and recognition marks, warnings, pin allocation, Power-One patents and company logo.

Specific type designation, input voltage range, nominal output voltage and current, protection degree, batch no., serial no. and data code including production site, modification status and date of production.

Functional Description

The switching regulators are designed using the buck converter topology. The input is not electrically isolated from the output. During the on period of the switching transistor, current is transferred to the output and energy is stored in the output choke. During the off period, this energy forces the current to continue flowing through the output chocke to the load and back through the freewheeling diode. Regulation is accomplished by varying on/off duty cycle.

These regulators are ideal for a wide range of applications, where input to output isolation is not necessary, or where already provided by an external front end (e.g. a transformer with rectifier). To optimise customer's needs, additional options and accessories are available.

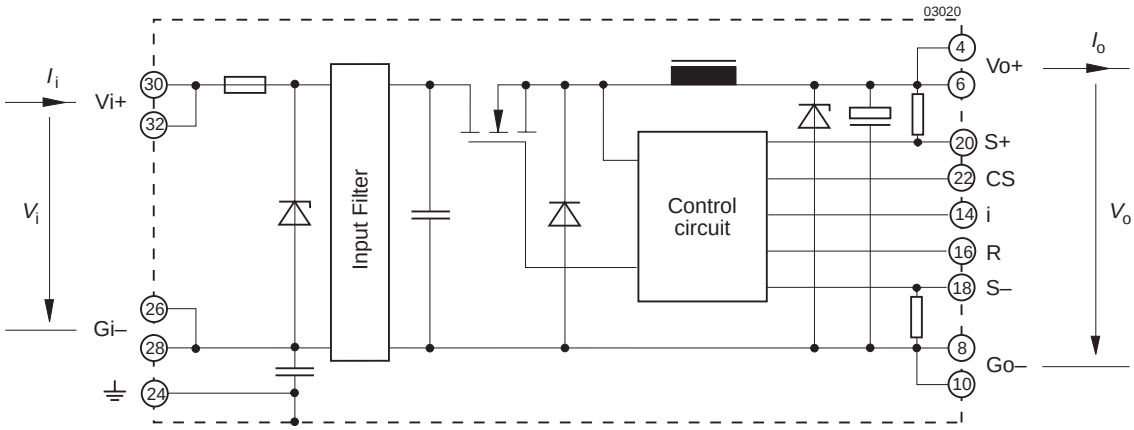


Fig. 1
Block diagram

Electrical Input Data

General Conditions: T_A = 25 °C, unless T_C is specified

Table 2: Input data

Input			PSS 5A14 PSK 5A18			PSS 1214 PSK 1218			PSS 1214 [1] PSK 1218 [1]			PSS 2414 PSK 2418			
Characteristics		**Conditions**	**min**	**typ**	**max**	**min**	**typ**	**max**	**min**	**typ**	**max**	**min**	**typ**	**max**	**Unit**
V_i	Operating input voltage	I_o = 0 – $I_{o\,nom}$ $T_{C\,min}$ – $T_{C\,max}$	8		40	15		40	19		40	29		60	VDC
$\Delta V_{io\,min}$	Min. diff. voltage V_i – V_o				2.9			3			4			5	
$V_{i\,o}$	Undervoltage lock-out			7.3			7.3			7.3			12		
$I_{i\,0}$	No load input current	I_o = 0, $V_{i\,min}$ – $V_{i\,max}$			50			50			50			50	mA
$u_{i\,RFI}$	Input RFI level, EN 55011/22 0.15...30 MHz	$V_{i\,nom}$, $I_{o\,nom}$			A			A			A			A	dB (µV)

[1] Output set to 15 V at R control input, see: *Auxiliary Functions*.

Input Filter and Fuse

An input filter and a fuse are incorporated in all modules as standard. The filter reduces emitted electrical noise and prevents oscillations caused by the negative input impedance characteristic of a switched mode regulator. The input fuse protects against severe defects.

The maximum permissible additionally superimposed ripple v_i of the input voltage (rectifier mode) at a specified input frequency f_i has the following values:

$v_{i\,max}$ = 10 V_{pp} at 100 Hz, or V_{pp} = 1000 Hz/f_i • 1 V

Inrush Current

The inrush current can reach very high values depending on the source and input line conditions. The inrush current into a switching regulator is limited by parasitic components of the voltage source and power supply input only. This input presents a very low impedance to such currents and when driven from a low impedance source, e.g. a battery, the inrush current can peak at several orders of magnitude above the continuous DC input current. To protect series elements such as switches or circuit brakers and rectifiers the use of additional external current limitation device is recommended.

Electrical Output Data

General Conditions:
– T_A = 25 °C, unless T_C is specified
– With R control output voltage V_o = $V_{o\,nom}$ at $I_{o\,nom}$
– Sense lines connected at female connector

Table 3a: Output data PSS

Output				PSS 5A14		PSS 1214		PSS 1214 [1]		PSS 2414		
Characteristics			**Conditions**	**min**	**typ max**	**min**	**typ max**	**min**	**typ max**	**min**	**typ max**	**Unit**
V_o	Output voltage		$V_{i\,nom}$, $I_{o\,nom}$	5.05	5.15	11.60	12.40	14.50	15.50	23.30	24.70	V
I_o	Output current [2]		$V_{i\,min}$ – $V_{i\,max}$ $T_{C\,min}$ – $T_{C\,max}$	0	14.0	0	14.0	0	14.0	0	14.0	A
I_{oL}	Output current limitation response			14.0	17.5	14.0	17.5	14.0	17.5	14.0	17.5	
v_o	Output voltage noise	Switching freq.	$V_{i\,nom}$, $I_{o\,nom}$ IEC/EN 61204 [3] BW = 20 MHz		55		150		200		300	mV_{pp}
		Total			60		160		210		310	
$\Delta V_{o\,U}$	Static line regulation		$V_{i\,min}$ – $V_{i\,max}$, $I_{o\,nom}$		100		240		300		480	mV
$\Delta V_{o\,I}$	Static load regulation		$V_{i\,nom}$, I_o = 0 – $I_{o\,nom}$		100		120		150		240	
$v_{o\,d}$	Dynamic load regulation	Voltage deviat.	$V_{i\,nom}$ $I_{o\,nom} \leftrightarrow {}^1/_3\, I_{o\,nom}$ IEC/EN 61204	150		360		450		700		
t_d		Recovery time		40		60		60		60		µs
α_{Uo}	Temperature coefficient $\Delta V_o/\Delta T_C$ ($T_{C\,min}$ – $T_{C\,max}$)		$V_{i\,min}$ – $V_{i\,max}$ I_o = 0 – $I_{o\,nom}$		±1		±2		±3		±5	mV/K
					±0.02		±0.02		±0.02		±0.02	%/K

Table 3b: Output data PSK

Output				PSK 5A18		PSK 1218		PSK 1218 [1]		PSK 2418		
Characteristics			**Conditions**	**min**	**typ max**	**min**	**typ max**	**min**	**typ max**	**min**	**typ max**	**Unit**
V_o	Output voltage		$V_{i\,nom}$, $I_{o\,nom}$	5.05	5.15	11.60	12.40	14.50	15.50	23.30	24.70	V
I_o	Output current [2]		$V_{i\,min}$ – $V_{i\,max}$ $T_{C\,min}$ – $T_{C\,max}$	0	18.0	0	18.0	0	18.0	0	18.0	A
I_{oL}	Output current limitation response			18.0	22.5	18.0	22.5	18.0	22.5	18.0	22.5	
v_o	Output voltage noise	Switching freq.	$V_{i\,nom}$, $I_{o\,nom}$ IEC/EN 61204 [3] BW = 20 MHz		55		150		200		300	mV_{pp}
		Total			60		160		210		310	
$\Delta V_{o\,U}$	Static line regulation		$V_{i\,min}$ – $V_{i\,max}$, $I_{o\,nom}$		100		240		300		480	mV
$\Delta V_{o\,I}$	Static load regulation		$V_{i\,nom}$, I_o = 0 – $I_{o\,nom}$		100		120		150		240	
$v_{o\,d}$	Dynamic load regulation	Voltage deviat.	$V_{i\,nom}$ $I_{o\,nom} \leftrightarrow {}^1/_3\, I_{o\,nom}$ IEC/EN 61204	150		360		450		700		
t_d		Recovery time		40		60		60		60		µs
α_{Uo}	Temperature coefficient $\Delta V_o/\Delta T_C$ ($T_{C\,min}$ – $T_{C\,max}$)		$V_{i\,min}$ – $V_{i\,max}$ I_o = 0 – $I_{o\,nom}$		±1		±2		±3		±5	mV/K
					±0.02		±0.02		±0.02		±0.02	%/K

[1] Output set to 15 V at R control input, see: *Auxiliary Functions.*
[2] See also: *Thermal Considerations.*

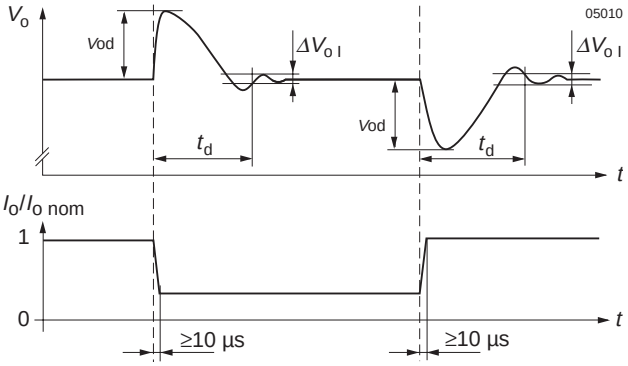


Fig. 2
Dynamic load regulation.

Thermal Considerations

When a switching regulator is located in free, quasi-stationary air (convection cooling) at a temperature T_A = 50 °C and is operated at its nominal output current $I_{o\,nom}$, the case temperature T_C will be about 80 °C after the warm-up phase, measured at the *Measuring point of case temperature* T_C (see: *Mechanical Data*).

Under practical operating conditions, the ambient temperature T_A may exceed 50 °C, provided additional measures (heat sink, fan, etc.) are taken to ensure that the case temperature T_C does not exceed its maximum value of 80 °C.

Example: Sufficient forced cooling allows $T_{A\,max}$ = 65 °C. A simple check of the case temperature T_C (T_C ≤80 °C) at full load ensures correct operation of the system.

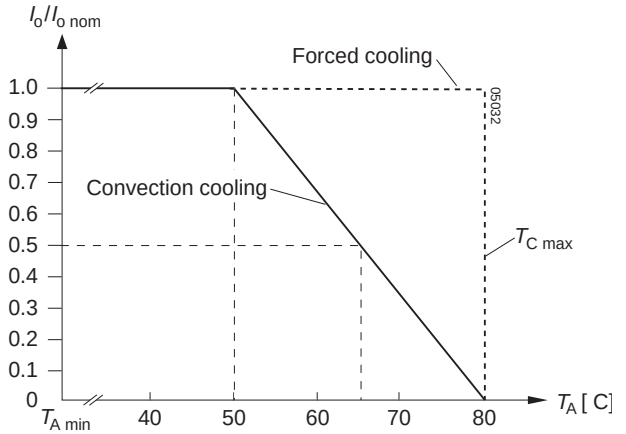


Fig. 3
Output current derating versus temperature.

Overtemperature Protection

The unit is self-protecting by an internal temperature monitor, which inhibits the output above $T_{C\,max}$. The output is automatically enabled again after temperature has dropped below $T_{C\,max}$.

Output Protection

A voltage suppressor diode which in worst case conditions fails into a short circuit, protects the output against an internally generated overvoltage. Such an overvoltage could occur due to a failure of either the control circuit or the switching transistor. The output protection is not designed to withstand externally applied overvoltages. The user should ensure that systems with Power-One power supplies, in the event of a failure, do not result in an unsafe condition (fail-safe).

Parallel and Series Connection

Outputs of equal nominal voltage can be parallel-connected. Use the current sharing feature (CS) for even distribution of the output current. See also: *Auxiliary Functions.*

Outputs can be series-connected with any other module. In series-connection the maximum output current is limited by the lowest current limitation. Electrically isolated source voltages are needed for each module!

Short Circuit Behaviour

A constant current limitation circuit holds the output current almost constant whenever an overload or a short circuit is applied to the regulator's output. It acts self-protecting and recovers – in contrary to the fold back method – automatically after removal of the overload or short circuit condition.

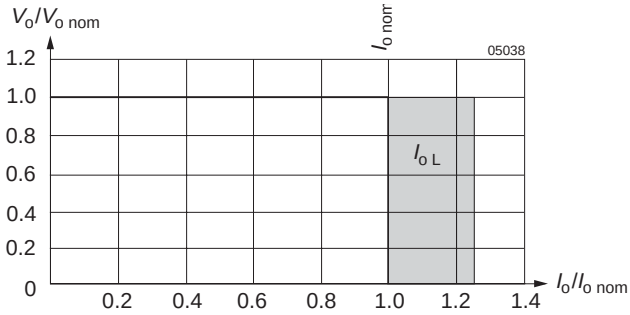


Fig. 4
Overload, short-circuit behaviour V_o versus I_o.

Auxiliary Functions

S Sense Lines

Note: Sense lines should always be connected! It is recommended to connect the sense lines directly at the female connector. See also: *Technical Information.*

This feature enables compensation of voltage drop across the connector contacts and the load lines. In case the sense lines are connected at the load rather than directly at the connector, the user must ensure that $V_{o\,max}$ (between Vo+ and Go– set at R control input) is not exceeded.

Applying generously dimensioned cross-section load leads avoids troublesome voltage drop. To minimize noise pick-up wire sense lines in parallel or twisted.

To ensure correct operation, both sense lines must be connected to their respective power output potential. The voltage difference between any sense line and its respective power output pin (as measured on the connector) should not exceed the values given in the following table.

Table 4: Maximum allowed voltage compensation

Nominal output voltage	Total voltage difference between both sense lines and their respective output	Voltage difference between Go– and S–
5.1 V	<0.5 V	<0.25 V
12, 15, 24 V	<1.0 V	<0.25 V

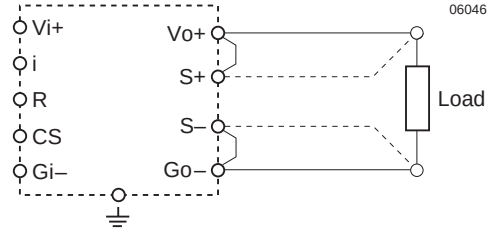


Fig. 5
Sense lines connection

i Inhibit (Remote On / Off)

Note: With open i input, output is enabled (V_o = on)

The inhibit input allows the switching regulator output to be disabled via a control signal. In systems with several units, this feature can be used, for example, to control the activation sequence of the regulators by a logic signal (TTL, C-MOS, etc.). An output voltage overshoot will not occur when switching on or off. The inhibit characteristics are referenced to the S– remote sense terminal.

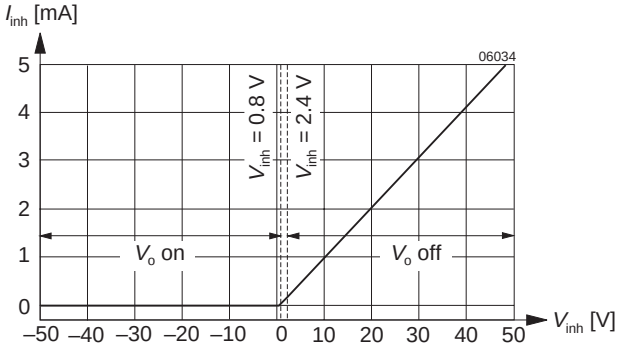


Fig. 6
Typical inhibit current I_{inh} versus inhibit voltage V_{inh}

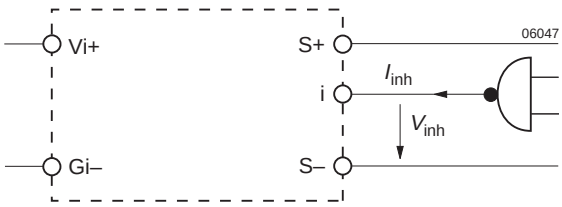


Fig. 7
Definition of I_{inh} and V_{inh}

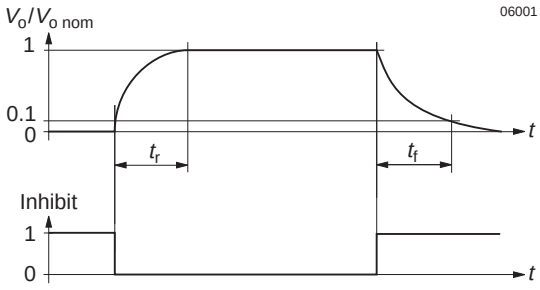


Fig. 8
Output response as a function of inhibit signal

Table 5: Inhibit characteristics

Characteristics			Conditions	min	typ	max	Unit
V_{inh}	Inhibit input voltage to keep regulator output voltage...	V_o = on	$V_{i\,min}$ – $V_{i\,max}$ $T_{C\,min}$ – $T_{C\,max}$	–50		+0.8	VDC
		V_o = off		+2.4		+50	
t_r	Switch-on time after inhibit command		$V_i = V_{i\,nom}$ $R_L = V_{o\,nom}/I_{o\,nom}$		100		ms
t_f	Switch-off time after inhibit command				5		
$I_{i\,inh}$	Input current when inhibited		$V_i = V_{i\,nom}$		25		mA

R Control for Output Voltage Adjustment

Note: With open R input, $V_o \approx V_{o\,nom}$.

The output voltage V_o can either be adjusted with an external reference voltage (V_{ext}) or with an external resistor (R_1 or R_2). The adjustment range is 0 - $V_{o\,max}$. The minimum differential voltage $\Delta V_{io\,min}$ between input and output (see: *Electrical Input Data*) should be maintained. Undervoltage lock-out = minimum input voltage.

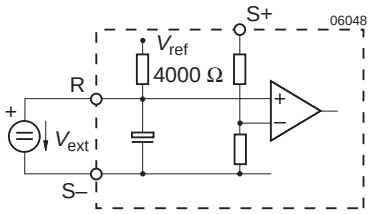


Fig. 9
Voltage adjustment with V_{ext} between R and S–

a) V_o = 0 - $V_{o\,max}$, using V_{ext} between R and S–:

$$V_{ext} \approx 2.5\ V \bullet \frac{V_o}{V_{o\,nom}} \qquad V_o \approx V_{o\,nom} \bullet \frac{V_{ext}}{2.5\ V}$$

Caution: To prevent damage V_{ext} should not exceed 20 V, nor be negative, and R_2 should never be less than 47 kΩ.

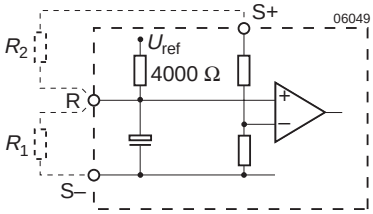


Fig. 10
Voltage adjustment with external resistor R_1 or R_2

b) V_o = 0 - 100% $V_{o\,nom}$, using R_1 between R and S–:

$$R_1 \approx \frac{4000\ \Omega \bullet V_o}{V_{o\,nom} - V_o} \qquad V_o \approx \frac{V_{o\,nom} \bullet R_1}{R_1 + 4000\ \Omega}$$

c) $V_o = V_{o\,nom}$ - $V_{o\,max}$, using R_2 between R and S+:

$$R_2 \approx \frac{4000\ \Omega \bullet V_o \bullet (V_{o\,nom} - 2.5\ V)}{2.5\ V \bullet (V_o - V_{o\,nom})}$$

$$V_o \approx \frac{V_{o\,nom} \bullet 2.5\ V \bullet R_2}{2.5\ V \bullet (R_2 + 4000\ \Omega) - V_{o\,nom} \bullet 4000\ \Omega}$$

Table 6: Maximum adjustable output voltage

Characteristics		Conditions	PSS 5A14 PSK 5A18			PSS 1214 PSK 1218			PSS 2414 PSK 2418			Unit
			min	typ	max	min	typ	max	min	typ	max	
$V_{o\,max}$	Maximum adjustable output at R control input	$V_{i\,nom}$, $I_{o\,nom}$	5.6			16.0			26.0			V

CS Current Sharing

For parallel operation of several modules, interconnecting all CS pins ensures that the output currents are evenly distributed. This feature improves transient load performance and increases system reliability. All paralleled units should be supplied by equal input voltage (V_i) and interconnecting leads should have equal length and cross section to ensure equal voltage drop.

Electromagnetic Compatibility (EMC)

Electromagnetic Immunity

General condition: Case not earthed.

Table 7: Immunity type tests

Phenomenon	Standard [1]	Class Level	Coupling mode [2]	Value applied	Waveform	Source Imped.	Test procedure	In oper.	Per-form. [3]
Electrostatic discharge	IEC/EN 61000-4-2	3	contact discharge to case	6000 V_p	1/50 ns	330 Ω	10 positive and 10 negative discharges	yes	A
Electromagnetic field	IEC/EN 61000-4-3	2	antenna	3 V/m	AM 80% 1 kHz		80 - 1000 MHz	yes	A
Electrical fast transient/burst	IEC/EN 61000-4-4	2	i/c, +i/–i	1000 V_p	bursts of 5/50 ns 5 kHz rep. rate transients with 15 ms burst duration and a 300 ms period	50 Ω	60 s positive 60 s negative bursts per coupling mode	yes	A
		3		2000 V_p					B
Surge	IEC/EN 61000-4-5	2	i/c	1000 V_p	1.2/50 µs	12 Ω	5 pos. and 5 neg. surges per coupling mode	yes	A
			+i/–i	500 V_p		2 Ω			
Conducted disturbances	IEC/EN 61000-4-6	2	i, o, signal wires	3 VAC (130 dBµV)	AM 80% 1 kHz	150 Ω	0.15 - 80 MHz	yes	A

[1] For related and previous standards see: *Technical Information: Safety & EMC*. [2] i = input, o = output, c = case.
[3] A = Normal operation, no deviation from specifications, B = Normal operation, temporary deviation from specs possible.

For emission levels refer to *Electrical Input Data.*

Immunity to Environmental Conditions

Table 8: Mechanical stress

Test	Method	Standard	Test Conditions		Status
Ca	Damp heat steady state	IEC/DIN IEC 60068-2-3 MIL-STD-810D section 507.2	Temperature: Relative humidity: Duration:	$40^{\pm 2}$ °C $93^{+2/-3}$ % 21 days	Unit not operating
Ea	Shock (half-sinusoidal)	IEC/EN/DIN EN 60068-2-27 MIL-STD-810D section 516.3	Acceleration amplitude: Bump duration: Number of bumps:	15 g_n = 147 m/s^2 11 ms 18 (3 each direction)	Unit operating
Eb	Bump (half-sinusoidal)	IEC/EN/DIN EN 60068-2-29 MIL-STD-810D section 516.3	Acceleration amplitude: Bump duration: Number of bumps:	10 g_n = 392 m/s^2 16 ms 6000 (1000 each direction)	Unit operating
Fc	Vibration (sinusoidal)	IEC/EN/DIN EN 60068-2-6 MIL-STD-810D section 514.3	Acceleration amplitude: Frequency (1 Oct/min): Test duration:	0.15 mm (10 - 60 Hz) 2 g_n = 20 m/s^2 (60 - 150 Hz) 10 - 150 Hz 3.75 h (1.25 h each axis)	Unit operating

Table 9: Temperature specifications, valid for an air pressure of 800...1200 hPa (800...1200 mbar)

Temperature			Standard		
Characteristics		Conditions	min	max	Unit
T_A	Ambient temperature	Operational [1]	–10	50	°C
T_C	Case temperature		–10	80	
T_S	Storage temperature	Non operational	–25	85	

[1] See: *Thermal Considerations* and: *Overtemperature Protection.*

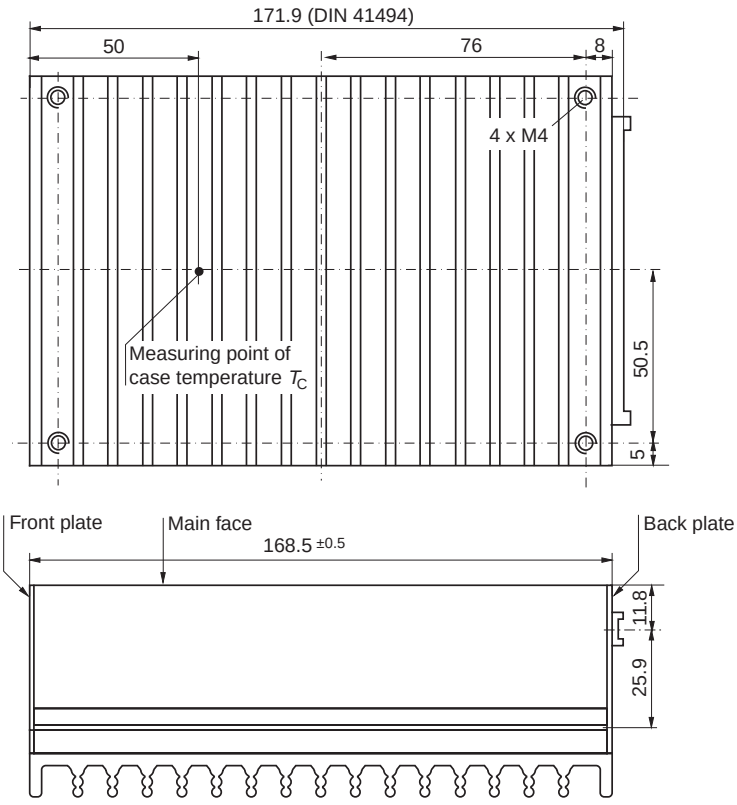
Table 10: MTBF

MTBF	Ground Benign
MTBF acc. to MIL-HDBK-217F	T_C = 40°C
	335'000 h

Mechanical Data

The converters are designed to be inserted into a rack according to IEC 60297-3.

European Projection



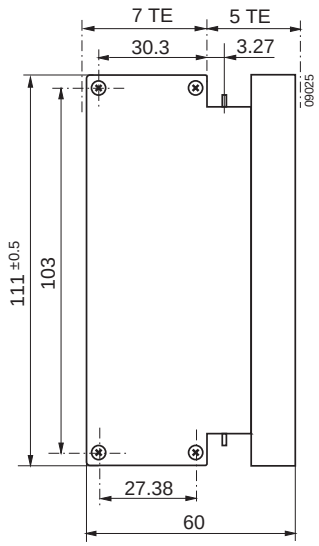
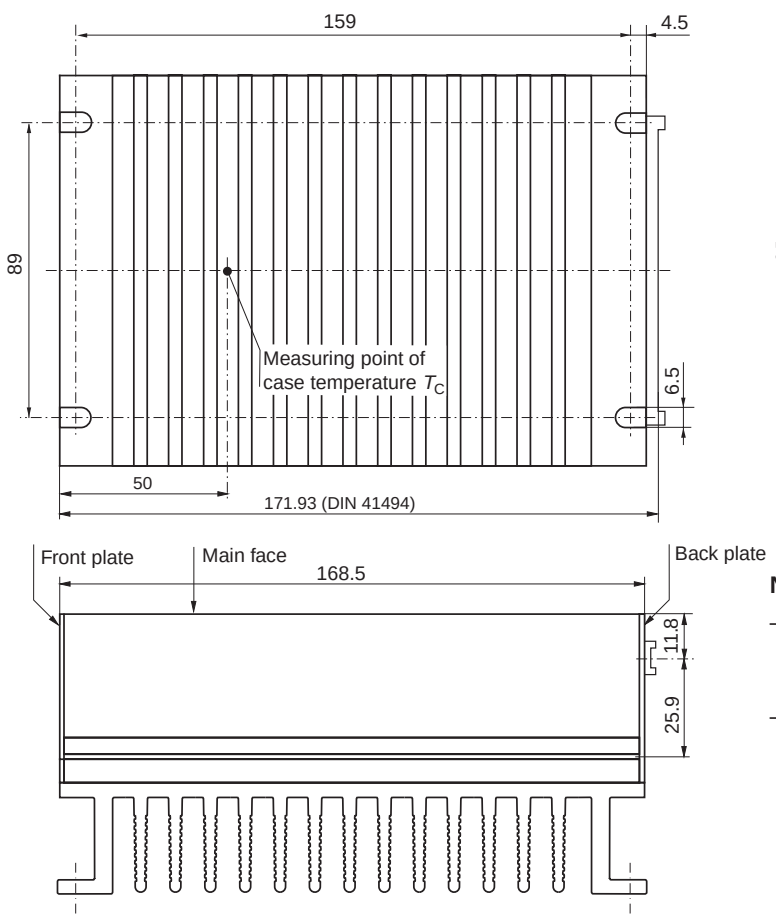


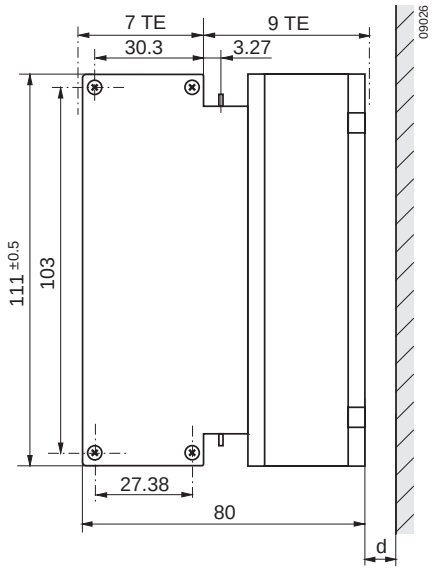
Fig. 11
Case S01, weight 1.3 kg
Aluminium, fully enclosed,
black finish and self cooling.

Mechanical Data

The converters are designed to be inserted into a rack according to IEC 60297-3.

European Projection





Note:

- d ≥15 mm, recommended minimum distance to next part to ensure proper air circulation at full output power.
- free air locations: the module should be mounted with fins in vertical position to achieve a maximum air flow through heat sink.

Fig. 12
Case K01, weight 1.6 kg
Aluminium, fully enclosed,black finish and self cooling.

Safety and Installation Instructions

Connector pin allocation

The connector pin allocation table defines the electrical potentials and the physical pin position on the connector. Pin 24 (protective earth) is the leading pin, which provides electrical contact first. The modules should only be wired via the female connector H15 (according to DIN 41612) to ensure requested safety!

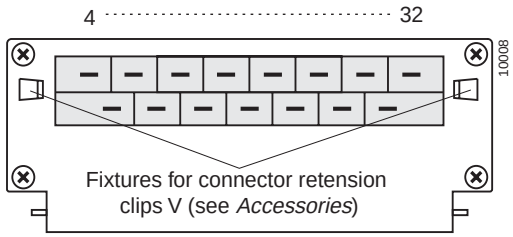


Fig. 13
View of male H15 connector

Installation Instruction

Installation of the switching regulators must strictly follow the national safety regulations in compliance with the enclosure, mounting, creepage, clearance, casualty, markings and segregation requirements of the end-use application.

Check for hazardous voltages before altering any connections.

The input and the output circuit are not separated. i.e. the negative path is internally interconnected!

The units should be connected to a secondary circuit.

Do not open any module.

Ensure that a unit failure (e.g. by an internal short-circuit) does not result in a hazardous condition. See also: *Safety of operator accessible output circuit.*

Note: Additional information on input circuitry, grounding and parallel operation of units is given in: *Technical Information: Application Notes.*

Protection Degree

The protection degree is IP 30. It applies only if the module is plugged-in or the female connector is properly attached to the module.

Isolation

Electric strength test voltage between input interconnected with output and case: 500 VDC, 1 s.

This test is performed in the factory as routine test in accordance with IEC/EN 60950 and UL 60950 and should not be repeated in the field. Power-One will not honour any guarantee claims resulting from electric strength field tests.

Table 11: H15 connector pin allocation

Electrical Determination	Type H15	
	Pin No.	Ident.
Output voltage (positive)	4	Vo+
Output voltage (positive)	6	Vo+
Output voltage (negative)	8	Go–
Output voltage (negative)	10	Go–
Not connected	12	n.c.
Inhibit input	14	i
R-input (output voltage programming)	16	R
Sense line (negative)	18	S–
Sense line (positive)	20	S+
Current sharing control input	22	CS
Protective ground (leading pin)	24	⏚
Input voltage (negative)	26	Gi–
Input voltage (negative)	28	Gi–
Input voltage (positive)	30	Vi+
Input voltage (positive)	32	Vi+

Standards and Approvals

All switching regulators are UL recognized according to UL 60950, CAN/CSA C22.2 No. 234-M90 and IEC/EN 60950.

The units have been evaluated for:

- Building in
- Operational insulation from input to output and input/output to case
- The use in a pollution degree 2 environment
- Connecting the input to a secondary circuit which is subject to a maximum transient rating of 500 V

The switching regulators are subject to manufacturing surveillance in accordance with the above mentioned UL, CSA and ISO 9001 standards.

Safety of Operator Accessible Output Circuit

If the output circuit of a switching regulator is operator accessible, it shall be an SELV circuit according to IEC/EN 60950 related safety standards.

The following table shows some possible installation configurations, compliance with which causes the output circuit of the switching regulator to be an SELV circuit according to IEC/EN 60950 up to a configured nominal output voltage of 30 V.

However, it is the sole responsibility of the installer or user to assure the compliance with the relevant and applicable safety regulations.

More information is given in: *Technical Information: Safety.*

Table 12: Insulation concept leading to an SELV output circuit

Conditions	Front end			Switching regulator	Result
Supply voltage	Minimum required grade of isolation, to be provided by the AC-DC front end, including mains supplied battery charger	Maximum DC output voltage from the front end [1]	Minimum required safety status of the front end output circuit	Measures to achieve the specified safety status of the output circuit	Safety status of the switching regulator output circuit
Battery supply, considered as secondary circuit	Double or Reinforced	≤60 V	SELV circuit	None	SELV circuit
Mains ≤250 V AC	Basic	≤60 V	Earthed SELV circuit [2]	None	Earthed SELV circuit
			ELV circuit	Input fuse [3] and earthed output circuit [2] and earthed [2] or non user accessible case	
	Double or reinforced	≤60 V	SELV circuit	None	SELV circuit

[1] The front end output voltage should match the specified input voltage range of the switching regulator.
[2] The earth connection has to be provided by the installer according to the relevant safety standard, e.g. IEC/EN 60950.
[3] The installer shall provide an approved fuse (slow blow type with the lowest current rating suitable for the application, max. 12.5 A) in a non-earthed input conductor directly at the input of the switching regulator. If Vo+ is earthed, insert the fuse in the Gi- line. For UL's purpose, the fuse needs to be UL-listed.

Description of Options

B, B1 Cooling Plate

Where a cooling surface is available, a cooling plate (option B, or option B1) can be used instead of the standard heatsink. The mounting system must ensure sufficient cooling capacity to guarantee that the maximum case temperature $T_{C\ max}$ is not exceeded. The required cooling capacity can be calculated by the following formula:

$$P_{Loss} = \frac{100\% - \eta}{\eta} \bullet (V_o \bullet I_o)$$

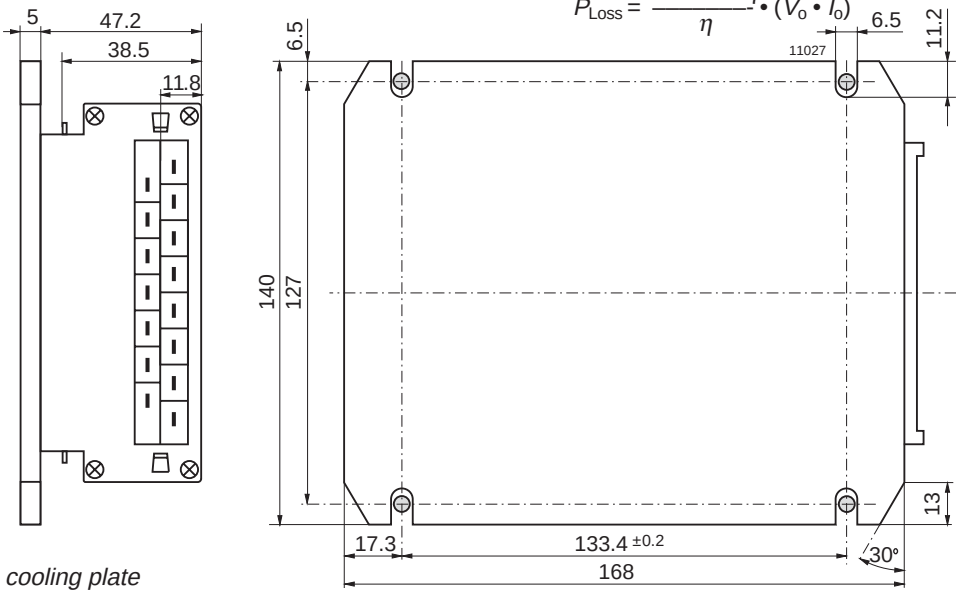


Fig. 14
Option B, large cooling plate
Weight: 1.2 kg

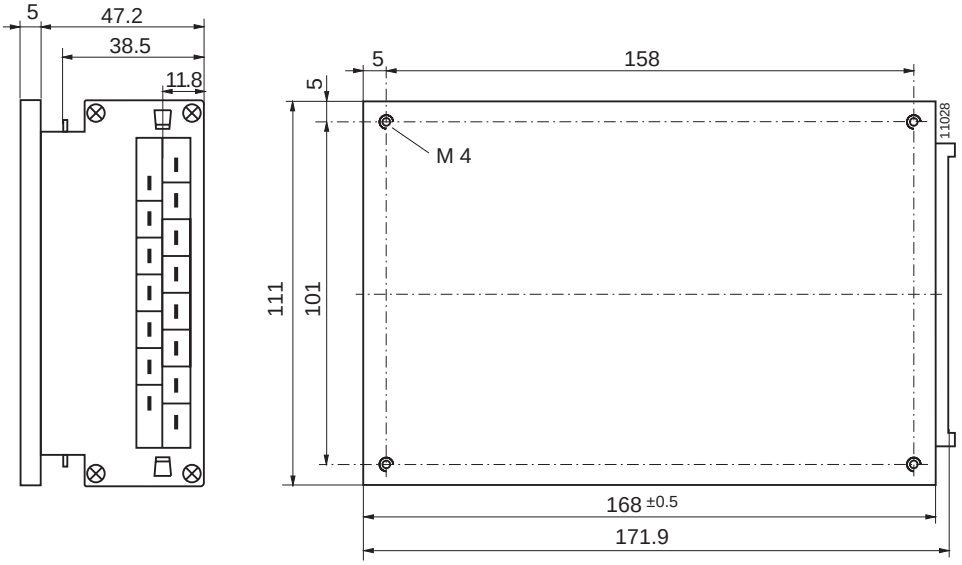


Fig. 15
Option B1, small cooling plate
Weight: 1.2 kg

Accessories

A variety of electrical and mechanical accessories are available including:

– Front panels for 19" rack mounting, Schroff and Intermas systems, 12 and 16 TE.
– Mating H15 connectors with screw, solder fast-on or press-fit terminals.
– Connector retention facilities (V-clips).
– DIN-rail mounting adaptor.

For more detailed information please refer to: *Accessory Products.*

power-one™ Changing the Shape of Power

EC Declaration of Conformity

We

Power-One AG
Ackerstrasse 56 CH-8610 Uster

declare under our sole responsibility that all PSx Series switching regulators carrying the CE-mark are in conformity with the provisions of the Low Voltage Directive (LVD) 73/23/EEC of the European Communities.

Conformity with the directive is presumed by conformity wih the following harmonized standards:

- EN 61204: 1995 (= IEC 61204: 1993, modified)
  Low-voltage power supply devices, d.c. output - Perfomance characteristics and safety requirements

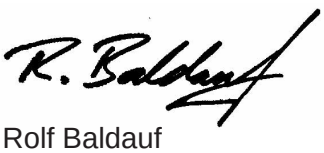
- EN 60950: 1992 + A1: 1993 + A2 (= IEC 950 second edition 1991 + A1: 1992 + A2: 1993)
  Safety of information technology equipment

The installation instructions given in the corresponding data sheet describe correct installation leading to the presumption of conformity of the end product with the LVD. All PSx Series Switching Regulators are components, intended exclusively for inclusion within other equipment by an industrial assembly operation or by professional installers. They must not be operated as stand alone products.

Hence conformity with the Electromagnetic Compatibility Directive 89/336/EEC (EMC Directive) needs not to be declared. Nevertheless, guidance is provided in most product application notes on how conformity of the end product with the indicated EMC standards under the responsibility of the installer can be achieved, from which conformity with the EMC directive can be presumed.

Uster, 1 Sep. 2003

Power-One AG



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