

Technical documentation Last changed on: 2023-09-01

# **BPS** series

Small High Voltage Module for PCB mounting up to 4 Watt

- Versions from 300 V 6 kV, 1W / 3W / 4W available
- patented resonance converter technology
- controlled by analog set voltage
- analog monitor voltage
- wide supply range
- low ripple and noise, low EMI





### **Document history**

Version	Date	Major changes
2.7	2023-09-01	Renaming to manual, addition of "Voltage monitor accuracy" and "Current monitor accuracy" in the technical data, Configurations Guide Sample for revision, Glossary insert, insert table of content
2.6	2021-03-01	Fixed Figure 4, Figure 5, Item code revision and customization
2.5	2020-12-02	Corrections of documentation (item code BP060674x12)
2.4	2020-11-05	Improved documentation Intended Use, Depiction of the safety instructions, Modules BPx 25 404 5, BPx 25 125 12 discontinued, new item Code (Table 3: Technical data: Options and order information) for modified dimensions for 1W / 3W modules (Figure 1: dimensional drawing BPS 1/3W),
2.3	2020-07-08	Improved documentation
2.2	2019-06-03	Corrections of documentation
2.1	2018-09-04	Extended operation temperature
	2018-09-25	Fixed typo
2.0	2017-02-28	Relayouted documentation
	2018-06-13	Corrections of documentation
	2018-11-01	Fixed typo BPx60 674 12

### Disclaimer / Copyright

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The information in this manual is subject to change without notice. We take no responsibility for any mistake in the document. We reserve the right to make changes in the product design without reservation and without notification to the users. We decline all responsibility for damages and injuries caused by an improper use of the device.



# Safety

This section contains important security information for the installation and operation of the device. Failure to follow safety instructions and warnings can result in serious injury or death and property damage.

Safety and operating instructions must be read carefully before starting any operation.

We decline all responsibility for damages and injuries caused which may arise from improper use of our equipment.

## Depiction of the safety instructions



#### WARNING!



"Warning!" indicates an injury hazard. The non-observance of safety instructions marked as "Warning!" could lead to possible injury or death.

### **CAUTION!**



Advices marked as "Caution!" describe actions to avoid possible damages to property.

### INFORMATION



Advices marked as "Information" give important information.



Attention high voltage!

Read the manual.

HIGH VOLTAGE



Important information.





### Intended Use

The device may only be operated within the limits specified in the data sheet. The permissible ambient conditions (temperature, humidity) must be observed. The device is designed exclusively for the generation of high voltage as specified in the data sheet. Any other use not specified by the manufacturer is not intended. The manufacturer is not liable for any damage resulting from improper use.

### Qualification of personnel

A qualified person is someone who is able to assess the work assigned to him, recognize possible dangers and take suitable safety measures on the basis of his technical training, his knowledge and experience as well as his knowledge of the relevant regulations.

### General safety instructions

- Observe the valid regulations for accident prevention and environmental protection.
- Observe the safety regulations of the country in which the product is used.
- Observe the technical data and environmental conditions specified in the product documentation.
- You may only put the product into operation after it has been established that the high-voltage device complies with the country-specific regulations, safety regulations and standards of the application.
- The high-voltage power supply unit may only be installed by qualified personnel.



## Important safety instructions

### WARNING!



Do not operate the unit in wet or damp conditions.

#### WARNING!



Do not operate the unit in an explosive atmosphere.

### WARNING!



Do not operate the unit if you suspect the unit or the connected equipment to be damaged.

#### INFORMATION



It is strongly recommended to read the manual before operation!



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# 1 General description

The BPS High Voltage Power Supply module is a small DC/DC converter which can be mounted and soldered on printed circuit boards (PCB). The output voltage is controllable with an analog control voltage. Therefore a potentiometer or fixed resistor can be used. The patented resonance converter technology and moulded metal box shielding guarantee lowest electromagnetic interference and low ripple and noise of the output voltage.

Customized versions can be produced on request



# 2 Technical Data

SPECIFICATIONS	BPS 1 W	BPS 3W	BPS 4W	
Polarity	Fac	ve		
Ripple and noise (f > 10 Hz) <sup>(1</sup>	typ. < 10 mV max. 25 mV <sub>p-p</sub>	typ.< 20 mV <sub>p-p</sub> max. 60 mV <sub>p-p</sub>	typ. < 5 mV <sub>p-p</sub> max. 10 mV <sub>p-p</sub>	
Stability [ $\Delta V_{out}$ vs. $\Delta V_{in}$ ] <sup>(1</sup>	< 5 • 10	<sup>-4</sup> • V <sub>nom</sub>	< 2 • 10 <sup>-4</sup> • V <sub>nom</sub>	
Stability - [ $\Delta V_{out}$ vs. $\Delta r_{load}$ ] (1	< 2 • 10	<sup>-3</sup> • V <sub>nom</sub>	< 5 • 10 <sup>-4</sup> • V <sub>nom</sub>	
Temperature coefficient		50 ppm/K <sup>(2</sup>		
Supply voltage V <sub>in</sub>	4.5 – 5.5 V	11.5 – 15.5 V	11.4 – 12.6 V	
Supply current $I_{in}$ at $V_{out} = 0$ at $V_{out} = V_{nom}$ / no load at $V_{out} = V_{nom}$ / with load	< 10 mA < 50 mA < 400 mA	< 10 mA < 50 mA < 500 mA	< 10 mA < 40 mA < 500 mA	
Set / Monitor voltage	0 – 2.5 V	0 -	5 V	
Adjustment accuracy <sup>(2</sup>		1 %		
Voltage monitor accuracy <sup>(2</sup>		1 %		
Current monitor accuracy <sup>(2</sup>			1 %	
Signal - ON	TTL-Pegel LOW $\rightarrow$ HV = 0, HIGH or open $\rightarrow$ HV according to V <sub>set</sub>			
Signal - /ON	TTL-Pegel HIGH $\rightarrow$ HV LOW or open $\rightarrow$ HV according to V <sub>set</sub>			
Reference voltage V <sub>REF</sub> (internal)	2.5 V / 0.5 mA 5 V / 0.5 mA			
Control V <sub>set</sub> - version 1	Remote control with an ext. potentiometer (10 – 100k $\Omega$ ) between REF and GND, sliding contact on V <sub>set</sub>			
Control V <sub>set</sub> - version 2	with $V_{set}$ $0 \le V_{set} \le V_{ref} \rightarrow 0 \le V_{out} \le  V_{nom}  \pm 1 \%$ <sup>(2)</sup>			
	<b>Atten</b> Output voltage is int Do not use V <sub>set</sub> > 2.: Output current is internally	Attention! Output voltage and output current are internally limited to 1.1•V <sub>nom</sub> resp. I <sub>nom</sub>		
Protection	Overload and short circuit protected			
HV connector	Pin			
Case	Metal box, moulded			
Dimensions – L/W/H	40 / 40 / 18mm <sup>3</sup> 50 (55) / 40 / 17mm <sup>3</sup>			
Operating temperature	-20 – 60 °C			
Storage temperature	torage temperature -20 – 60 °C			
<sup>1)</sup> Specifications for stability, ripple and noise are guaranteed in the range $2\% \cdot V_{nom} < V_{out} \le V_{nom}$ <sup>2)</sup> Temperature coefficient and accuracy are guaranteed in the temperature range 0 – 40 °C; for -20 – 60°C max. 150 ppm/K and ± 1.5 % resp.				

Table 1: Technical data: Specifications

CONFIGURATIONS						
Туре	V <sub>nom</sub>	I <sub>nom</sub>	Ripple / Noise typ. (mV <sub>p-p</sub> )	Ripple / Noise max. (mV <sub>p-p</sub> )	Length (mm)	ltem code
BPS 1 W						
BPx 05 205 5	500 V	2 mA	< 10	< 20	40	BP005205x05A0
BPx 10 105 5	1 kV	1 mA	< 10	< 20	40	BP010105x05A0
BPx 15 604 5	1.5 kV	0.6 mA	< 10	< 20	40	BP015604x05A0
BPx 20 504 5	2 kV	0.5 mA	< 10	< 20	40	BP020504x05A0
BPx 30 304 5	3 kV	0.3 mA	< 15	< 25	40	BP030304x05A0
BPS 3 W						
BPx 03 106 12	300 V	10 mA	< 15	< 30	40	BP003106x12A0
BPx 05 605 12	500 V	6 mA	< 15	< 30	40	BP005605x12A0
BPx 10 305 12	1 kV	3 mA	< 20	< 40	40	BP010305x12A0
BPx 15 205 12	1.5 kV	2 mA	< 25	< 50	40	BP015205x12A0
BPx 20 155 12	2 kV	1.5 mA	< 30	< 55	40	BP020155x12A0
BPx 30 105 12	3 kV	1 mA	< 35	< 60	40	BP030105x12A0
BPS 4 W						
BPx 05 805 12	500 V	8 mA	< 5	< 10	50	BP005805x12
BPx 10 405 12	1 kV	4 mA	< 5	< 10	50	BP010405x12
BPx 20 205 12	2 kV	2 mA	< 5	< 10	50	BP020205x12
BPx 30 135 12	3 kV	1.3 mA	< 5	< 10	50	BP030135x12
BPx 40 105 12	4 kV	1 mA	< 5	< 10	50	BP040105x12
BPx 60 674 12	6 kV	0.67 mA	< 5	< 10	55	BP060674x12
Notes: x – polarity (negative/positive)						

Table 2: Technical data: Configurations

CONFIGURATION ORDER GUIDE (item code parts)						
BP	005	805	Ρ	12	0	0
Туре	V <sub>nom</sub>	I <sub>nom</sub> (nA)	Polarity	Input Voltage	Revision	Customized Version
	three significante digits • 100V	two significante digits + number of zeros	P = positive N = negative	two significante digits 05 = 5 Volt 12 = 12 Volt	one digit	one digit
	For Example: 005 = 500V	For Example: 805 = 8mA				

Table 3: Technical data: Options and order information





# 3 Dimensional drawing

Figure 3: dimensional drawing BPS 4W/6kV



# 4 PIN assignment

## 4.1 BPS 1W / 3W

PIN	NAME	DESCRIPTION	VALUE
1	VIN	V <sub>in</sub> supply voltage	+5 V / +12 V DC
2	GND	Ground	
3	ON	Signal ON	TTL-level:
			LOW → HV OFF
			HIGH or n.c. $\rightarrow$ HV ON
4	VSET	V <sub>set</sub> Set value of output voltage	0 2.5 V   0 5 V
5	REF	V <sub>ref</sub> Internal reference voltage	2.5 V   5V
6	VMON	V <sub>mon</sub> Monitor voltage	0 2.5 V   0 5 V
7	HV	V <sub>out</sub> High voltage output	
Note: Case is connected to GND			

Table 4: PIN Assignment BPS 1/3W

### 4.2 BPS 4W

PIN	NAME	DESCRIPTION	VALUE
1	<b>OV</b> (1	Supply ground	
2	+VIN	V <sub>in</sub> Supply voltage	+12 V DC
3	IMON	I <sub>mon</sub> Monitor voltage of output current	0 5 V
4	VMON	V <sub>mon</sub> Monitor voltage	0 5 V
5	/ON	Signal ON	TTL-level:
			LOW or n.c. $\rightarrow$ HV ON
			HIGH → HV OFF
6	VSET	V <sub>set</sub> Set value of output voltage	0 5 V
7	REF	V <sub>ref</sub> Internal reference voltage	5 V
8	GND <sup>(1</sup>	Signal ground	
9	GND <sup>(1</sup>	HV ground	
10	HV	V <sub>out</sub> High voltage output	
Note: <sup>1)</sup> Case is connected to GND, internally connected			

Table 5: PIN Assignment BPS 4W



# 5 Control principle



Figure 4: Control principle BPS 1/3W



Figure 5: Control principle BPS 4W



# 6 Glossary

SHORTCUT	MEANING		
0V	Supply ground		
V <sub>nom</sub>	nominal output voltage		
V <sub>out</sub>	output voltage		
V <sub>set</sub>	set value of output voltage		
V <sub>mon</sub>	monitor voltage of output voltage		
V <sub>meas</sub>	digital measured value of output voltage		
V <sub>p-p</sub>	peak to peak ripple voltage		
V <sub>in</sub>	input / supply voltage		
V <sub>type</sub>	type of output voltage (AC, DC)		
V <sub>ref</sub>	internal reference voltage		
V <sub>max</sub>	limit (max.) value of output voltage		
V <sub>limit</sub>	voltage limit		
$\Delta V_{out} - [\Delta V_{in}]$	deviation of V <sub>out</sub> depending on variation of supply voltage		
$\Delta V_{out} - [\Delta R_{load}]$	deviation of $V_{out}$ depending on variation of output load		
I <sub>nom</sub>	nominal output current		
l <sub>out</sub>	output current		
I <sub>set</sub>	set value of output current		
I <sub>mon</sub>	monitor voltage of output current		
I <sub>meas</sub>	digital measured value of current		
I <sub>trip</sub>	current limit to shut down the output voltage		
l <sub>in</sub>	input / supply current		
I <sub>max</sub>	limit (max.) value of output current		
I <sub>limit</sub>	current limit		
I <sub>bounds</sub>	current bounds, a tolerance tube $I_{\text{set}} \pm I_{\text{bounds}}$ around $I_{\text{set}}$		
P <sub>nom</sub>	nominal output power		
P <sub>in</sub>	input power		
P <sub>in_nom</sub>	nominal input power		
Т	temperature		
T <sub>REF</sub>	reference temperature		
ON	HV ON		
OFF	HV OFF		
СН	channel(s)		
HV	high voltage		
LV	low voltage		
GND	signal ground		
INH	Inhibit		
POL	Polarity		
KILL	KillEnable		



# 7 Appendix

For more information please use the following download links:

### This document

http://download.iseg-hv.com/DC\_DC/BPS/iseg\_datasheet\_BPS\_en.pdf

#### Archive

https://iseg-hv.com/download/?dir=DC\_DC/BPS/archive/

## 8 Warranty & Service

This device is made with high care and quality assurance methods. The standard factory warranty is 12 months. Please contact the iseg sales department if you wish to extend the warranty.

#### **CAUTION!**



Repair and maintenance may only be performed by trained and authorized personnel.

For repair please follow the RMA instructions on our website: <u>www.iseg-hv.com/en/support/rma</u>

# 9 Disposal

### INFORMATION



All high-voltage equipment and integrated components are largely made of recyclable materials. Do not dispose the device with regular residual waste. Please use the recycling and disposal facilities for electrical and electronic equipment available in your country.

## 10 Manufacturer contact

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