

### Features

- 7 pin SIP package
- Input / Output Isolation Voltage: 6.4kVDC
- High Efficiency
- Lead Free Design, RoHS Compliant
- Operating temperature: -40°C to +85°C
- Optional Reinforced Isolation 8kVDC
- Safety Standard / Approval: IEC / EN 60950-1

EC / EN 60601-1



### Applications

These converters are well suitable for battery operated equipment, measurement equipment, telecom, wireless network, Industry control system, everywhere where isolated, tightly regulated voltages and compact size are required.

### Technical Specification

All specifications are typical at nominal input, full load and 25°C unless otherwise stated.

Model Number	Reinforced Isolation 8kVDC	Input Voltage Range(V)	Output Voltage (V)	Output Current (mA)	Input Current (mA)		Eff. (%) <sup>(2)</sup>	Capacitive Load, max. <sup>(3)</sup> (uF)
				Full Load	No Load	Full Load		
HBA1-05S0H6	HBA1-05S0H8	4.5 ~ 5.5 Nominal: 5	3.3	303	35	278	76	3300
HBA1-05S1H6	HBA1-05S1H8		5	200		271	78	2200
HBA1-05SBH6	HBA1-05SBH8		7.2	140		273	78	1000
HBA1-05SAH6	HBA1-05SAH8		9	111		263	80	1000
HBA1-05S2H6	HBA1-05S2H8		12	84		262	81	470
HBA1-05S3H6	HBA1-05S3H8		15	66		253	82	470
HBA1-05D0H6	HBA1-05D0H8		±3.3	±151		281	75	±2200
HBA1-05D1H6	HBA1-05D1H8		±5	±100		271	78	±1000
HBA1-05DBH6	HBA1-05DBH8		±7.2	±70		273	78	±470
HBA1-05DAH6	HBA1-05DAH8		±9	±55		264	79	±470
HBA1-05D2H6	HBA1-05D2H8		±12	±41		259	80	±220
HBA1-05D3H6	HBA1-05D3H8		±15	±33		258	81	±220
HBA1-12S0H6	HBA1-12S0H8		10.8 ~ 13.2 Nominal: 12	3.3		303	30	116
HBA1-12S1H6	HBA1-12S1H8	5		200	113	78		2200
HBA1-12SBH6	HBA1-12SBH8	7.2		140	114	78		1000
HBA1-12SAH6	HBA1-12SAH8	9		111	110	80		1000
HBA1-12S2H6	HBA1-12S2H8	12		84	110	81		470
HBA1-12S3H6	HBA1-12S3H8	15		66	106	82		470
HBA1-12D0H6	HBA1-12D0H8	±3.3		±151	117	75		±2200
HBA1-12D1H6	HBA1-12D1H8	±5		±100	113	78		±1000
HBA1-12DBH6	HBA1-12DBH8	±7.2		±70	114	78		±470
HBA1-12DAH6	HBA1-12DAH8	±9		±55	110	79		±470
HBA1-12D2H6	HBA1-12D2H8	±12		±41	108	80		±220
HBA1-12D3H6	HBA1-12D3H8	±15		±33	108	81		±220

Model Number	Reinforced Isolation 8kVDC	Input Voltage Range(V)	Output Voltage (V)	Output Current (mA) Full Load	Input Current (mA)		Eff. <sup>(2)</sup> (%)	Capacitive Load, max. <sup>(3)</sup> (uF)		
					No Load	Full Load				
HBA1-15S0H6	HBA1-15S0H8	13.5 ~ 16.5 Nominal: 15	3.3	303	25	93	76	3300		
HBA1-15S1H6	HBA1-15S1H8		5	200		91	78	2200		
HBA1-15SBH6	HBA1-15SBH8		7.2	140		91	78	1000		
HBA1-15SAH6	HBA1-15SAH8		9	111		88	80	1000		
HBA1-15S2H6	HBA1-15S2H8		12	84		88	81	470		
HBA1-15S3H6	HBA1-15S3H8		15	66		85	82	470		
HBA1-15D0H6	HBA1-15D0H8		±3.3	±151		94	75	±2200		
HBA1-15D1H6	HBA1-15D1H8		±5	±100		91	78	±1000		
HBA1-15DBH6	HBA1-15DBH8		±7.2	±70		91	78	±470		
HBA1-15DAH6	HBA1-15DAH8		±9	±55		88	79	±470		
HBA1-15D2H6	HBA1-15D2H8		±12	±41		87	80	±220		
HBA1-15D3H6	HBA1-15D3H8		±15	±33		86	81	±220		
HBA1-24S0H6	HBA1-24S0H8		21.6 ~ 26.4 Nominal: 24	3.3		303	20	58	76	3300
HBA1-24S1H6	HBA1-24S1H8			5		200		57	78	2200
HBA1-24SBH6	HBA1-24SBH8	7.2		140	57	78		1000		
HBA1-24SAH6	HBA1-24SAH8	9		111	54	80		1000		
HBA1-24S2H6	HBA1-24S2H8	12		84	55	81		470		
HBA1-24S3H6	HBA1-24S3H8	15		66	53	82		470		
HBA1-24D0H6	HBA1-24D0H8	±3.3		±151	59	75		±2200		
HBA1-24D1H6	HBA1-24D1H8	±5		±100	57	78		±1000		
HBA1-24DBH6	HBA1-24DBH8	±7.2		±70	57	78		±470		
HBA1-24DAH6	HBA1-24DAH8	±9		±55	55	79		±470		
HBA1-24D2H6	HBA1-24D2H8	±12		±41	54	80		±220		
HBA1-24D3H6	HBA1-24D3H8	±15		±33	54	81		±220		

### Input Specifications

Input voltage	5V nominal input	4.5~5.5V
	12V nominal input	10.8~13.2V
	15V nominal input	13.5~16.5V
	24V nominal input	21.6~26.4V
Input filter	Capacitor	

### Environmental Specifications

Operating ambient temperature	-40°C to +85°C
Maximum case temperature	+95°C
Storage temperature range	-55°C to +125°C
Relative humidity	95% RH max.

### Output Specifications

Output power	1 Watts max.
Voltage accuracy	Nominal Vin and full load ±5% max.

Voltage balance	Dual output	±1% max.
Minimum load		0A
Line regulation	For Vin charge of 1%	±1.5% max.
Load Regulation	10% load to full load	10% max. 15% max. (3.3&5Vout models)
Ripple and Noise (20MHz Bandwidth)		150mVp-p max.
Maximum capacitive load		See table
Output short circuit protection		1 second

### General Specifications

Efficiency	Nominal input and full load	See table
Isolation voltage	Input to output	6400VDC (1 second)
Isolation resistance	500VDC	15GΩ min.
Isolation capacitance		10pF max.
Switching frequency		80kHz max.
Reliability, calculated MTBF		2×10 <sup>6</sup> Hrs

### Physical Specifications

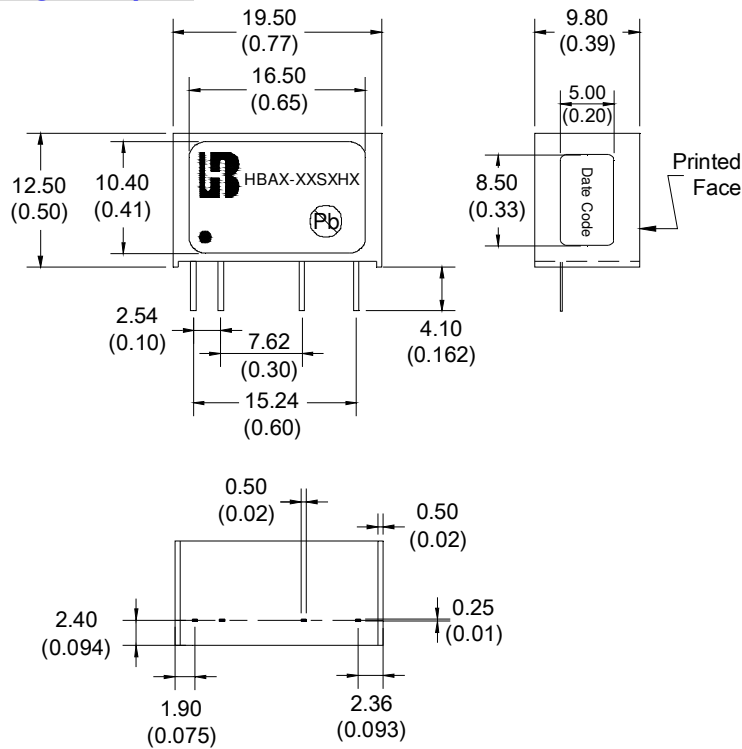
Case material		Plastic (UL94 V-0)
Potting material		Epoxy (UL94 V-0)
Dimensions		0.77 × 0.50 × 0.39 Inch (19.5 × 12.5 × 9.8 mm)
Weight		4.3g (0.15oz) typ.

#### Note

1. Io below this value will not damage these converters, however, they may not meet all listed specifications.
2. Typical value, tested at nominal input and full load.
3. For each output.

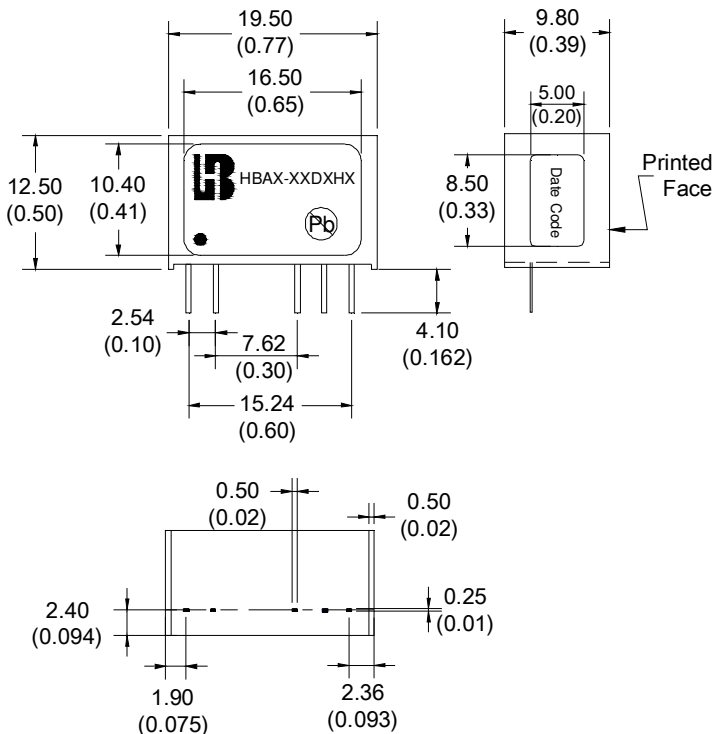
### Mechanical Dimensions

#### Single output



Pin Assignment		
Pin	Single	Dual
1	+Vin	+Vin
2	-Vin	-Vin
5	-Vout	-Vout
6	No pin	Common
7	+Vout	+Vout

#### Dual output

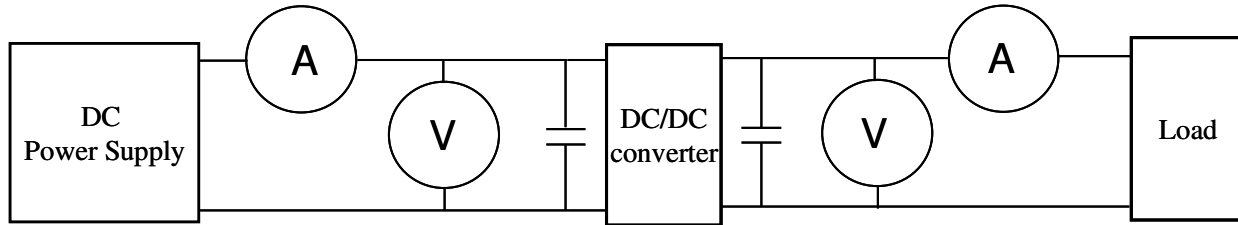


Unit: mm (inch)  
Tolerance: XX.XX ±0.25 (±0.01)

Specifications subject to change without notice.

### Test Configurations

All specifications are typical at nominal input, full load and 25°C unless otherwise stated.



- ⊙DC Power Supply: It offers a wide voltage and current range precisely.
- ⊙Current meter (A): Accuracy → 200μA ~ 200mA 4 ranges ±(0.2% rdg + 2 digits)  
2000mA ~ 20A 2 ranges ±(0.3% rdg + 2 digits).
- ⊙Voltage meter (V): Accuracy → ±(0.03% rdg + 4 digits).
- ⊙Load: At full load.
- ⊙Wires: The resistance of the wires must be small.

1. Input voltage range: Narrow input voltage range (±10%)、wide input voltage range (2:1 and 4:1)。

EX: Narrow input voltage range (±10%)

5V nominal input	→	4.5~5.5V
12V nominal input	→	10.8~13.2V
24V nominal input	→	21.6~26.4V

Wide input voltage range 2:1

5V nominal input	→	4.5~9V
12V nominal input	→	9~18V
24V nominal input	→	18~36V
48V nominal input	→	36~75V

Wide input voltage range 4:1 (W)

24V nominal input	→	9~36V
48V nominal input	→	18~75V

2. Input power :

$$P_{in} = V_{in} \times I_{in}$$

$V_{in}$  : Input voltage  
 $I_{in}$  : Input current

3. Output power :

$$P_{out} = V_{out} \times I_{out}$$

$V_{out}$  : Output voltage  
 $I_{out}$  : Output current

4. Efficiency :

$$\text{Efficiency} = \frac{P_{out}}{P_{in}} \times 100\%$$

$P_{out}$ : Output power  
 $P_{in}$ : Input power

5. Voltage accuracy:

$$\frac{|V_{out} - V_{out(nominal)}|}{V_{out}} \times 100\%$$

$V_{out}$  : Output voltage  
 $V_{out(nominal)}$  : Nominal output voltage

6. Line regulation: (1) Wide input voltage range and regulated output voltage series.

$$\frac{|V_{out(LL)} - V_{out(HL)}|}{V_{out(LL)}} \times 100\%$$

LL: Low Line input voltage  
HL: High Line input voltage

(2) Narrow input voltage range ( $\pm 10\%$ ) and unregulated output voltage series.

$$\text{Line regulation} = \left| \frac{\Delta V_{out}}{\Delta V_{in}} \right|$$

$$\Delta V_{out} = \frac{V_{out(+10\%)} - V_{out(-10\%)}}{V_{out}} \times 100\%$$

$V_{out(+10\%)}$  : Output voltage at  $V_{in} = 1.1 \times V_{in}(\text{nominal})$  & full load

$V_{out(-10\%)}$  : Output voltage at  $V_{in} = 0.9 \times V_{in}(\text{nominal})$  & full load

$V_{out}$  : Output voltage at  $V_{in} = V_{in}(\text{nominal})$  & full load

$$\Delta V_{in} = \frac{V_{in(+10\%)} - V_{in(-10\%)}}{V_{in}(\text{nominal})} \times 100\%$$

$V_{in(+10\%)}$  : Input voltage =  $1.1 \times V_{in}(\text{nominal})$

$V_{in(-10\%)}$  : Input voltage =  $0.9 \times V_{in}(\text{nominal})$

$V_{in}(\text{nominal})$  : Nominal Input voltage

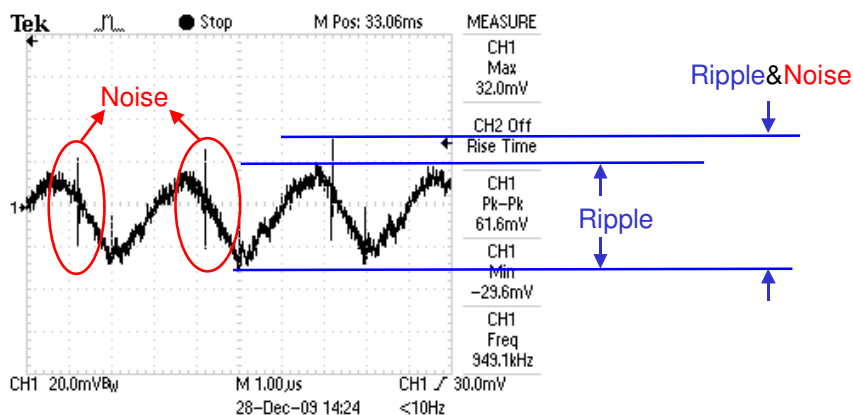
7. Load regulation :

$$\frac{|V_{out(FL)} - V_{out(NL)}|}{V_{out(FL)}} \times 100\%$$

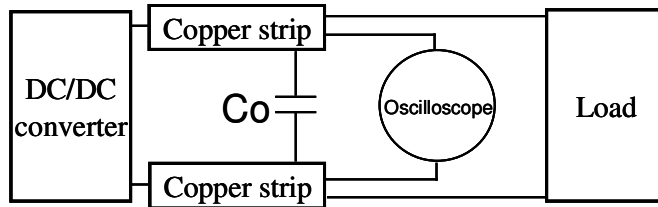
$V_{out(FL)}$ : Output voltage at full load

$V_{out(NL)}$ : Output voltage at 25% full load or 10% full load

8. Ripple and Noise: as shown below. The bandwidth is 0-20MHz.

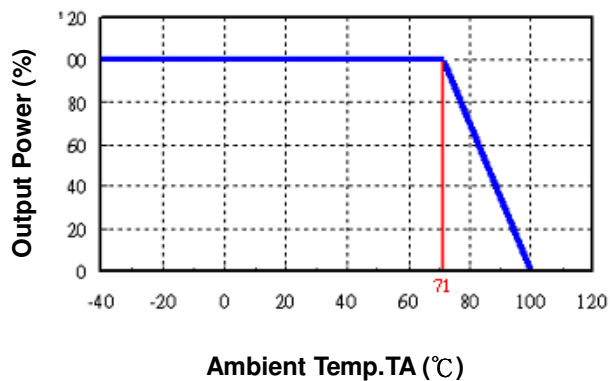


Output Ripple&Noise measurement test circuit: as shown below.



$C_o$ : usually 0.47 $\mu$ F.

9. [Temperature derating curve](#): The DC-DC converter will operate over a wider temperature range if less power is drawn from the output and the device is already running. The temperature derating curve shows the operating power-temperature range. As shown below.



10. [Switching frequency](#): The nominal operating frequency of the DC-DC converters.

11. [Input to output isolation](#): The dielectric breakdown strength test between input and output circuits. This is the isolation voltage the device is capable of withstanding for a specified time, usually 1 second or 1 minute.