Overview
Our BLA series isolated-type DC-DC converters feature a small package (14x20.3x9.7mm) and light weight (3.2g) capable of 1.5W output. As ultralow noise and extremely high efficiency are made possible by this new circuit, it is ideal for analog circuits as well as analog and digital hybrid circuits.

Features
- Ultralow noise
- Adjustable Output Voltage
- ON/OFF Control
- Dual power supply usable as single power supply
- Withstand voltage AC500V
- Built-in Over Current Protection Circuit
- No tantalum capacitor or electrolytic capacitor
- Covered with a metal shield
- Surface Mount Package
- No heat sink needed
- Operating Temp Range −40°C to +85°C (Temperature derating required)
- RoHS Compliant

Specifications
- Input voltage range
- Rated output voltage
- Adjustable output voltage range
- Line regulation
- Temperature regulation
- Ripple noise
- Efficiency
- Over current protection
- Over voltage protection
- Under Voltage Lock Out
- Input over current protection
- Remote ON/OFF control
- Standby current
- Withstand voltage
- Insulation resistance
- Capacitance between P and S
- Operating temp range
- Storage temp range
- Humidity range
- Storage conditions
- Cooling conditions
- Vibration
- Impact
- Weight
- Outer dimensions

Table 1

<table>
<thead>
<tr>
<th>Models</th>
<th>Input V Vdc</th>
<th>Output V Vdc</th>
<th>Output I mA</th>
<th>Line Reg. mV(max.)</th>
<th>Load Reg. mV(max.)</th>
<th>Ripple Noise mVpp(typ.)</th>
<th>Efficiency % (typ.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BLA05-05S30</td>
<td>5</td>
<td>0 to 300</td>
<td>20</td>
<td>40</td>
<td>5</td>
<td>80</td>
<td></td>
</tr>
<tr>
<td>BLA05-12S12</td>
<td>12(15)</td>
<td>0 to 125(100)</td>
<td>40</td>
<td>100</td>
<td>5</td>
<td>82</td>
<td></td>
</tr>
<tr>
<td>BLA05-12W06</td>
<td>±12(±15)</td>
<td>0 to 60(50)</td>
<td>80</td>
<td>600</td>
<td>5</td>
<td>82</td>
<td></td>
</tr>
</tbody>
</table>

Note 1: Output voltage in parentheses is when Vadj and −Vout are short-circuited.
Note 2: Output current in parentheses is at the maximum output voltage.
Note 3: Ripple noise and efficiency are on the basis of 5V input voltage and load rating.
Note 4: Ripple noise is measured at 20MHz bandwidth, with a multi layered ceramic capacitor of 10μF at input and 0.1μF at output.

Specifications
- Input voltage range
- Rated output voltage
- Adjustable output voltage range
- Line regulation
- Temperature regulation
- Ripple noise
- Efficiency
- Over current protection
- Over voltage protection
- Under Voltage Lock Out
- Input over current protection
- Remote ON/OFF control
- Standby current
- Withstand voltage
- Insulation resistance
- Capacitance between P and S
- Operating temp range
- Storage temp range
- Humidity range
- Storage conditions
- Cooling conditions
- Vibration
- Impact
- Weight
- Outer dimensions

Table 2

*The above specifications are provided with rated value and ambient temp. 25°C±5°C, unless otherwise specified.
*The contents provided in this datasheet may be changed at any time without prior notice.
1. **Scope**

These specifications shall apply to the isolated type DC-DC converter BLA05 series.

2. **Model/Rating**

<table>
<thead>
<tr>
<th>Model name</th>
<th>Rated input voltage</th>
<th>Rated output</th>
<th>Shape</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>BLA05-05S30</td>
<td>DC5.0V</td>
<td>5.0V,300mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BLA05-12S12</td>
<td>DC12V</td>
<td>12.0V,125mA</td>
<td>SMD</td>
<td></td>
</tr>
<tr>
<td>BLA05-12W06</td>
<td>±12V,each 60mA</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Unless otherwise mentioned in these specifications, input shall be rated input, output shall be rated output, and ambient temperature shall be 25°C±5°C.

3. **Environmental conditions**

3-1 **Temperature range**

- In operation: −40°C to +85°C (Derating required)
- In storage: −40°C to +85°C

3-2 **Humidity range**

- In operation: 20 to 95%R.H. (However, max. wet bulb temperature 35°C, no condensation)
- In storage: 20 to 95%R.H. (However, max. wet bulb temperature 35°C, no condensation)

Note) For storage before mounting, store in a place below 30°C and 60% R.H.
4. Specifications & Standards

This product is RoHS compliant.

### 4-1 Input conditions and output characteristics

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>BLA05-05S30</td>
<td>3.0 to 9.0</td>
<td>5±3%</td>
<td>0 to 300</td>
<td>20 / 40</td>
<td>5/15</td>
<td>80</td>
</tr>
<tr>
<td>BLA05-12S12</td>
<td>3.0 to 9.0</td>
<td>12±3%</td>
<td>0 to 125</td>
<td>40 / 100</td>
<td>5/15</td>
<td>82</td>
</tr>
<tr>
<td>BLA05-12W06</td>
<td>3.0 to 9.0 ±12±5%</td>
<td>0 to 60 x 2</td>
<td>80 / 600</td>
<td>150 / 300</td>
<td>5/15</td>
<td>82</td>
</tr>
</tbody>
</table>

*1 With the measurement circuit of 4-4. Unless otherwise mentioned in these specifications, input and output shall be rated and ambient temperature shall be 25°C±5°C.

*2 Minimum input voltage varies according to the ambient temperature. Refer to 7-5.

*3 Input: For variation of input voltage = min to max.
Load: For variation of output current = 0 to rated.
Temperature: For variation of ambient temperature = -40 to Tamax.
For within ambient temperature range with 100% load at temperature derating of 4-3.
A two output product is when + output current and – output current are equal.

*4 Measured frequency bandwidth 20MHz. At both ends of external capacitor (C2, or C4,C5).

### 4-2 Capacitance of external capacitor

This product has a limited capacitance for an output external capacitor. Limit the capacitance of an external capacitor as follows:

<table>
<thead>
<tr>
<th>Model name</th>
<th>Capacitance Plus output side</th>
<th>Minus output side</th>
</tr>
</thead>
<tbody>
<tr>
<td>BLA05-05S30</td>
<td>0 to 100μF</td>
<td>-</td>
</tr>
<tr>
<td>BLA05-12S12</td>
<td>0 to 47μF</td>
<td>-</td>
</tr>
<tr>
<td>BLA05-12W06</td>
<td>0 to 22μF</td>
<td>0 to 22μF</td>
</tr>
</tbody>
</table>

*1 Total of C2 and C3 in the Standard Connection Circuit of 6. (1)
*2 Total of C2 and C4 in the Standard Connection Circuit of 6. (2)
*3 Total of C3 and C5 in the Standard Connection Circuit of 6. (2)
4-3 Temperature derating

![Temperature derating graph]

**Natural cooling**

Note: at rated output

4-4 Measurement circuit

![Measurement circuit diagram]

C1: 10 \( \mu \)F (Multi layered ceramic capacitor)

C2: 0.1 \( \mu \)F (Multi layered ceramic capacitor)

C3: 10 \( \mu \)F (Multi layered ceramic capacitor)

C4, C5: 0.1 \( \mu \)F (Multi layered ceramic capacitor)

Oscilloscope (Measurement of ripple noise)
4-5 Additional functions

<table>
<thead>
<tr>
<th>Item</th>
<th>Specifications &amp; Standards</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Over current protection circuit</td>
<td>Operate at 105% or above, auto restart type.</td>
<td></td>
</tr>
<tr>
<td>Over voltage protection circuit</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>Adjustable output voltage range</td>
<td>4.75 to 6.0V (BLA05-05S30)</td>
<td>By external resistor</td>
</tr>
<tr>
<td></td>
<td>11.4 to 15V (BLA05-12S12)</td>
<td>Refer to 7-3</td>
</tr>
<tr>
<td></td>
<td>±11.4 to ±15V (BLA05-12W06)</td>
<td></td>
</tr>
<tr>
<td>ON/OFF control</td>
<td>Open for output ON</td>
<td>Refer to 7-1</td>
</tr>
<tr>
<td></td>
<td>Low (0 to 0.3V, 4mA max.) for output OFF</td>
<td></td>
</tr>
</tbody>
</table>

4-6 Withstand voltage and Insulation resistance

1) Withstand voltage
- Between input and output, input and case, output and case: One minute at AC500V

2) Insulation resistance
- Between input and output, input and case, output and case: 50MΩ or more (at DC500V)

5. Outer dimensions and description of terminals

5-1 Shape and dimensions

Pin mark

![Company logo](image)

Material of terminals and case
- Terminal pin: Material: Copper, Plating: Gold plating after nickel plating
- Case: Material: Nickel silver

- Unit: mm
- Dimensional tolerance (unless specified): ±0.3
- Weight: 3.2g typ.
- Tolerance on terminals 0.2 mm max. (Max. lifting of the terminal part when placed on a plane)
5-2 Recommended footprint dimensions

Note) Recommended dimensions are shown above. Use your design standard for your specific design.

5-3 Lot indication

| 1 | 1 |
| 1 | D | 2 |

(Manufactured in January 2011)
(Manufactured in December 2011)

Production code for manufacturing control (may not be indicated)

Manufacturing month (Jan to Sep = 1 to 9, Oct = O, Nov = N, Dec = D)
Manufacturing year (the last digit of A.D.)

6. Standard connection circuit

(1) BLA-S series

(2) BLA-W series

Note) This product has no built-in fuse. Always connect a fuse to the +Vin line. Allow enough capacity in the power supply for a fuse to blow.
7. Various functions

7-1 ON/OFF control

The ON/OFF control function enables users to control ON/OFF of the output voltage without inputting or cutting it off.

Between –Vin terminal (No. 2 pin) and ON/OFF terminal (No. 3 pin)
- Open (2V max.): Output ON
- Short (0 to 0.3V 4mA max.): Output OFF

7-2 Output over current protection

If output current has become an over current status, output voltage is lowered and the over current protection circuit is activated. (Over current protection circuit actuating current: 105% or above of the rated load current.)

The converter automatically returns to normal operation as soon as the over current status is resolved. Holding of the over current status for over 30 seconds may result in damage, so resolve the over current status within 30 seconds.

Also, if the converter does not return to normal operation automatically even if the over current status has been resolved, turn off the power once or turn the output OFF with an ON/OFF control and reactivate.

Characteristics in the over current mode

Note) A drooping characteristic may be seen in the over current protection characteristics as shown on the left. Note that output voltage may not come up upon the activation if connected to a nonlinear load such as a lamp, motor, etc., or a constant current load.
7-3  Output voltage adjustment

7-3-1  Short circuit Vadj and –Vout terminal

Output voltage can be set in maximum as per the following table by short-circuiting Vadj and –Vout terminals. In case of no variable output voltage, open the terminal.

<table>
<thead>
<tr>
<th>Model name</th>
<th>Open Voltage</th>
<th>Short-circuit with -Vout Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>BLA05-05S30</td>
<td>5.0V</td>
<td>6.0V</td>
</tr>
<tr>
<td>BLA05-12S12</td>
<td>12.0V</td>
<td>15.0V</td>
</tr>
<tr>
<td>BLA05-12W06</td>
<td>±12.0V</td>
<td>±15.0V</td>
</tr>
</tbody>
</table>

7-3-2  Resistor adjustment control

The output voltage is adjustable by inserting a resistor between Vadj terminal and +Vout terminal or –Vout terminal.

**To decrease the output voltage**

<table>
<thead>
<tr>
<th>Model name</th>
<th>Output voltage: Vo[V], Connecting resistor: Rb[kΩ]</th>
</tr>
</thead>
<tbody>
<tr>
<td>BLA05-05S30</td>
<td>Vo = (2490 Rb + 7221) / (500 Rb + 1700)</td>
</tr>
<tr>
<td></td>
<td>Rb = (7221 - 1700 Vo) / (500 Vo - 2490)</td>
</tr>
<tr>
<td></td>
<td>Variable range: Vo=4.75V min.</td>
</tr>
<tr>
<td>BLA05-12S12</td>
<td>Vo = (2996 Rb + 17643) / (250 Rb + 2605)</td>
</tr>
<tr>
<td></td>
<td>Rb = (17643 - 2605 Vo) / (250 Vo - 2996)</td>
</tr>
<tr>
<td></td>
<td>Variable range: Vo=11.4V min.</td>
</tr>
<tr>
<td>BLA05-12W06</td>
<td>Vo = (10607 Rb + 67006) / (440 Rb + 12012)</td>
</tr>
<tr>
<td></td>
<td>Rb = (67006 - 12012 Vo) / (440 Vo - 10607)</td>
</tr>
<tr>
<td></td>
<td>Variable range: Vo=22.8V min. (±11.4V min.)</td>
</tr>
</tbody>
</table>

**To increase the output voltage**

<table>
<thead>
<tr>
<th>Model name</th>
<th>Output voltage: Vo[V], Connecting resistor: Ra[kΩ]</th>
</tr>
</thead>
<tbody>
<tr>
<td>BLA05-05S30</td>
<td>Vo = (2490 Ra + 7221) / (500 Ra + 1200)</td>
</tr>
<tr>
<td></td>
<td>Ra = (7221 - 1200 Vo) / (500 Vo - 2490)</td>
</tr>
<tr>
<td></td>
<td>Variable range: Vo=6.0V max.</td>
</tr>
<tr>
<td>BLA05-12S12</td>
<td>Vo = (2996 Ra + 17643) / (250 Ra + 1175)</td>
</tr>
<tr>
<td></td>
<td>Ra = (17643 - 1175 Vo) / (250 Vo - 2996)</td>
</tr>
<tr>
<td></td>
<td>Variable range: Vo=15.0V max.</td>
</tr>
<tr>
<td>BLA05-12W06</td>
<td>Vo = (2652 Ra + 26977) / (110 Ra + 902)</td>
</tr>
<tr>
<td></td>
<td>Ra = (26977 - 902 Vo) / (110 Vo - 2652)</td>
</tr>
<tr>
<td></td>
<td>Variable range: Vo=30.0V max. (±15.0V max.)</td>
</tr>
</tbody>
</table>

Note) If output voltage is made variable, use at the maximum power (1.5W) or less.

If output voltage is made lower, do not connect Rb with resistor which is less than Vo min. setting resistor value.
7-4 Activation and deactivation voltage

The activation voltage and deactivation voltage of this product varies according to the ambient temperature. Refer to the following table.

<table>
<thead>
<tr>
<th>Ambient temperature</th>
<th>Range of activation and deactivation voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>-40 to 0°C</td>
<td>2.2 to 3.15V</td>
</tr>
<tr>
<td>0 to 85°C</td>
<td>1.5 to 2.9V</td>
</tr>
</tbody>
</table>

7-5 Minimum input voltage

The minimum input voltage of this product varies according to the ambient temperature. Refer to the following table.

<table>
<thead>
<tr>
<th>Ambient temperature</th>
<th>Minimum input voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>-40 to 0°C</td>
<td>3.2V</td>
</tr>
<tr>
<td>0 to 85°C</td>
<td>3.0V</td>
</tr>
</tbody>
</table>

8. Protection against reverse connection of input power supply (example)

This product will be damaged if erroneously connected with reverse input polarity. To cope with possible reverse connection, add a protection circuit as shown in the following figure.

The following is an example using a fuse and a diode.

9. Common mode noise reduction method (example)

To reduce common mode noise of this product, connect a capacitor of 1000pF or so (C4) between primary and secondary terminals as follows. In this case, note that using a capacitor of too much capacitance may result in the increase of coupling capacitance between primary and secondary terminals.
10. Input noise reduction method (example)

Input noise from converter can reduce by designing Pi filter on input side.

![Diagram of Pi filter]

11. Serial operation method (example)

Serial operation is possible by wiring this product as per the following figure. Limit the output current to not exceed the smaller rated current of the power supplies connected in series in order to avoid more current than rating to run into the power supply.

![Diagram of serial operation]

Schottky diodes of low forward voltage are recommended for D1 and D2

*Note) This product is not suitable for parallel operation.*
12. Soldering conditions

Observe the following conditions for soldering temperature and time. Flow mounting is not possible for this product.

Reflow method
Reflow temperature profile
In the case of Sn-3Ag-0.5Cu series solder

Refrain from causing a vibration of the product during the reflow. The number of reflows shall be once (no mounting of the reverse side).

* Eutectic solder may be used so far as within the above profile conditions.

13. Vibration and impact tests

Vibration: 10~55Hz Total amplitude 1.52mmp-p (2H for each of three directions)
Sweep time 15min
Impact: Acceleration 100G (3 times for each of three directions, total 18 times)
Impact time 6ms

14. Cleaning

This product is not for immersible cleaning. Use of no-clean flux is recommended.
15. Precautions for use

To ensure user’s safety, check specifications before using the product and always observe the following precautions for use.

- This product is intended for use in general electronics equipment (office equipment, communication equipment, measurement equipment). Do not use the product for medical equipment, nuclear equipment, trains, etc., whereby human life or property may be directly affected by damaged product. Consult with us for any use other than for such general electronics equipment.
- Minor changes and component parts changes that do not affect contents of the specifications will be made due to characteristic improvement of the product and other reasons without prior notice.
- This product is not suitable for parallel operation.
- Do not use connectors and sockets for mounting the product. Contact resistance may have an adverse effect on the performance. Use the soldering method for mounting on the printed circuit board.
- This equipment has a built-in over current protection circuit but avoid a prolonged short circuit which may lead to failure.
- This product may be damaged if used under nonstandard electrical conditions or nonstandard environmental conditions including temperature. Ensure use within the standards.
- Avoid using this product in a place that generates corrosive gas or is dusty.
- This product may be damaged by static electricity. Make sure that the workplace is guarded against static buildup and static electricity on operators by use of proper grounding.
- A fuse mechanism is not built in this product. Connect a fuse to the + input line to guard against excessive input current under abnormal circumstances. Allow enough capacity in the power supply for a fuse to blow.
- This product has no built-in function for over voltage protection.
- This product does not come with a test report.

16. Warranty

The warranty term of the product is one year after shipment. Should the product become defective within the warranty period due to our design or workmanship, the product will be repaired free of charge or replaced. However, this warranty does not cover products which have been subjected to unauthorized inner modifications, etc.

The scope of our warranty is limited to that of the said product.

17. Contact

If you have any further technical questions for this product, please contact us.
E-mail: info@bellnix.com
URL: http://www.bellnix.com