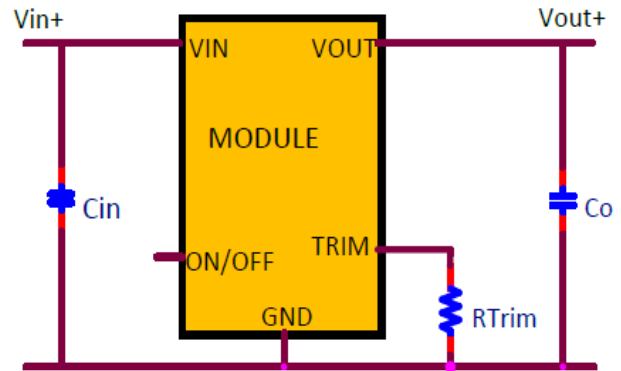
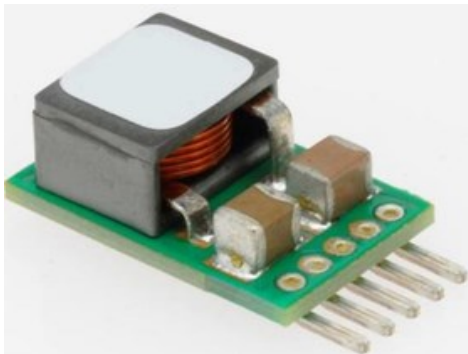


DATASHEET

IND060SIP Hornet: Non-Isolated DC-DC Voltage Regulator Modules

12V_{dc} input; 0.59V_{dc} to 5.5V_{dc} output; 60W Max Power



Applications

- Industrial Equipment
- Control Boards
- Test Equipment

Electrical Features

- 12V Input voltage with wide Tolerance
- Output voltage programmable from 0.59V_{dc} to 5.5V_{dc} via external resistor
- Remote On/Off for optional external control
- Fixed switching frequency
- Output overcurrent protection (non-latching)

Mechanical Features

- Small size: 10.4 mm x 16.5 mm x 8.4 mm (0.41 in x 0.65 in x 0.33 in)
- Operating range: -40°C to 85°C ambient

Process and Safety

- ANSI/UL* 62368-1 and CAN/CSA† C22.2 No. 62368-1 Recognized, DIN VDE‡ 0868-1/A11:2017 (EN62368-1:2014/A11:2017)
- ISO** 9001 and ISO 14001 certified manufacturing facilities
- Compliant to RoHS Directive 2011/65/EU and amended Directive (EU) 2015/863
- Compliant to REACH Directive (EC) No 1907/2006
- Compatible in a Pb-free or SnPb reflow environment.
- Suitable for aqueous clean.
- Suitable for conformal coating with dip and vapor deposition. Conformal coating can provide the protection to meet Salt Fog Test per IEC 60068-2-52 (Severity 3) and Mixed Gas Flow test per Telcordia GR-3108 Outdoor Levels.
- 3 year warranty

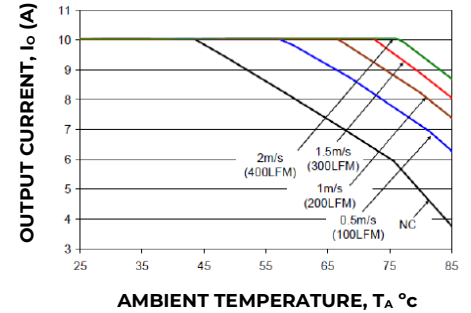
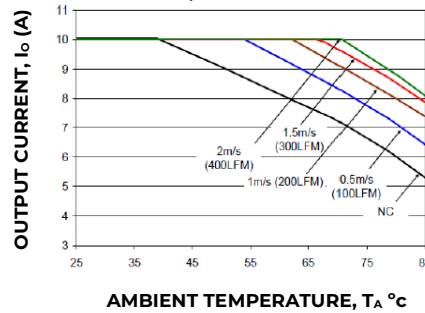
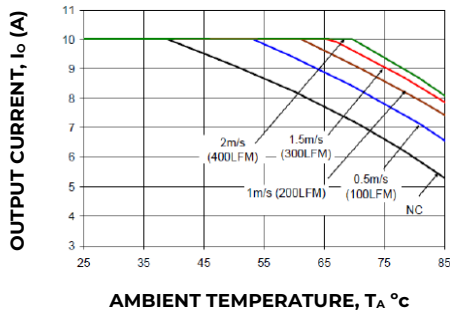
Technical Specification

Process and Safety (continued)

| Device Code | Input Voltage | Output Voltage | Output Current (Max.) | On/Off Logic | Ordering Code |
|-------------|---------------------------|---------------------------|-----------------------|--------------|---------------|
| IND060SIP | 9.6 – 14.4V _{dc} | 0.59 – 5.5V _{dc} | 10A | Positive | 1600102908A |

Thermal Performance

Full rated output with natural convection up to 40°C at 0.6V_{out} and up to 45°C at 6V_{out}. Thermal curves for 0.6V, 1.8V and 5.5V_{out} below.



Electrical Specifications

| Parameter | Device | Symbol | Min | Typ | Max | Unit |
|---|---|-------------------------|-----------------------------|-----|------|----------------------|
| Operating Input Voltage | All | V _{IN} | 9.6 | 12 | 14 | V _{dc} |
| Input No Load Current (V _{IN} = 12.0V _{dc} , I _o = 0, module enabled) | V _{O,set} = 0.6V _{dc} | I _{IN,No load} | | 29 | | mA |
| | V _{O,set} = 5V _{dc} | I _{IN,No load} | | 58 | | mA |
| External Capacitance, Ceramic ESR ≥ 1 mΩ | All | C _{O,max} | 100 | - | 1500 | μF |
| Efficiency 12V _{INDC} , T _A =25°C, I=12A, V _o =32 to 54V _{dc} | | η | 73(0.59V), 87(1.8V), 95(6V) | | | % |
| Switching Frequency | All | f _{sw} | - | 600 | - | kHz |
| Output Voltage (Over all line, load, and temperature conditions) | All | V _{O,set} | -3.0 | - | +3.0 | % V _{O,set} |
| On/Off Logic High (MODULE OFF) Input High Voltage | All | V _{IH} | 1 | - | 14 | V _{dc} |
| On/ Off Logic Low (MODULE ON) Input Low Voltage | All | V _{IL} | -0.3 | - | 0.4 | V _{dc} |

Characteristic Curves

The following figures provide typical characteristics for the 10A Hornet at 25°C.

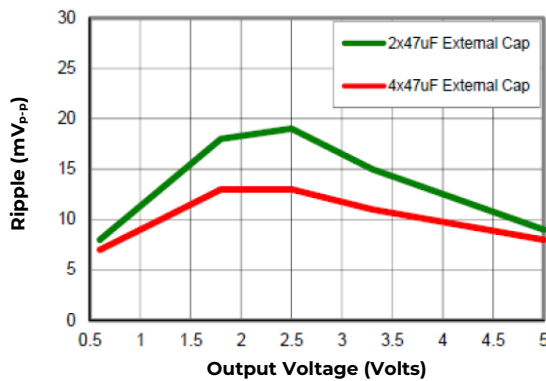


Figure 1. Output Ripple Voltage for various output voltages and external caps @12V_{in}. Additional Decoupling cap of 0.01uF used on input and output side

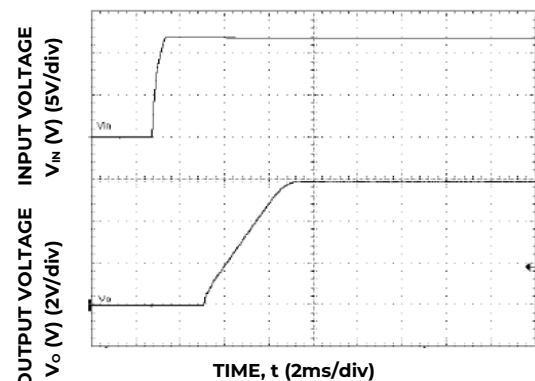


Figure 2. Typical Start-up using Input Voltage (V_{in}=12V, V_{out} = V_{out, max}, I_{out} = I_{out, max})

Technical Specification (continued)

Trim

Without an external resistor between Trim and GND pins, the output of the module will be $0.6V_{dc}$. R_{trim} for a desired output voltage, should be as per the following table. The formula in the last column helps determine R_{trim} for other voltages.

| | | | | | | | | | |
|--------------------------|------|------|-------|-----|-------|-------|-------|-------|--|
| V_o (V) | 0.59 | 1.0 | 1.2 | 1.5 | 1.8 | 2.5 | 3.3 | 5.0 | $R_{trim} = \left[\frac{1.182}{(V_o - 0.59)} \right] k\Omega$ |
| R_{trim} (k Ω) | Open | 2.89 | 1.941 | 1.3 | 0.978 | 0.619 | 0.436 | 0.268 | |

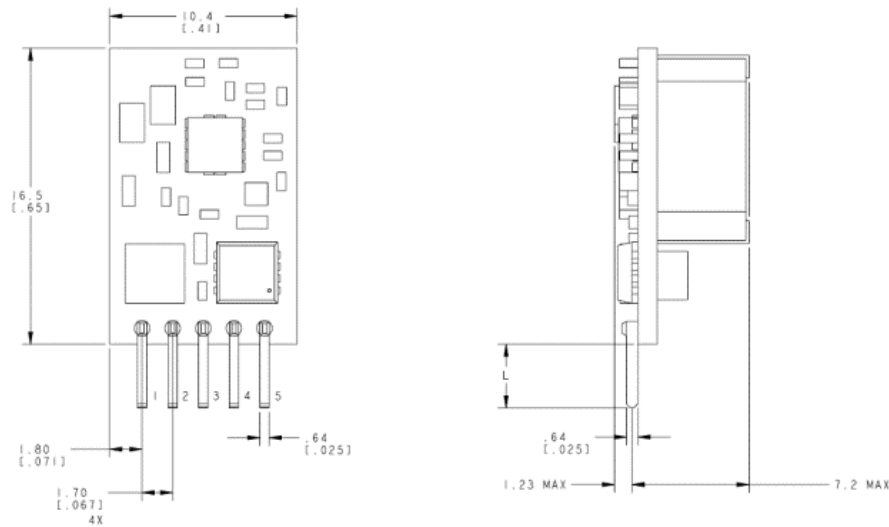
Safety Considerations

For safety agency approval, the power module must be installed in compliance with the spacing and separation requirements of the end-use safety agency standards listed on the first page of this document. For the converter output to be considered meeting the requirements of safety extra-low voltage (SELV) or ES1, the input must meet SELV/ES1 requirements. The power module has extra-low voltage (ELV) outputs when all inputs are ELV. A 15A quick acting input fuse for the module is required.

Recommended Pad Layout

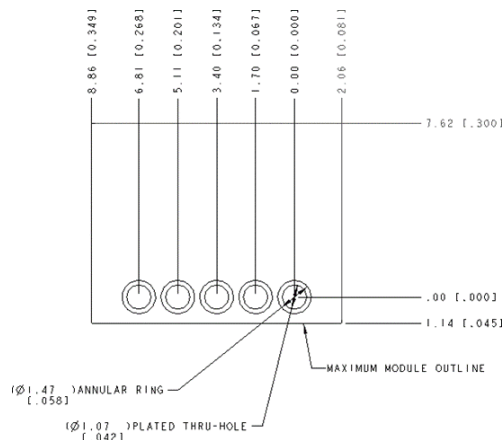
Dimensions are in millimeters and (inches).

Tolerances: x.x mm \pm 0.5 mm (x.xx in. \pm 0.02 in.) [unless otherwise indicated] x.xx mm \pm 0.25 mm (x.xxx in \pm 0.010 in.)



| Pin | Function |
|-----|----------|
| 1 | On/Off |
| 2 | VIN |
| 3 | GND |
| 4 | Vout |
| 5 | Trim+ |

$L = 3.29$ [0.13] \pm 0.25 [0.112 \pm 0.01]



Technical Specification (continued)

Through-Hole Lead-Free Soldering Information

These RoHS-compliant through-hole products use the SAC (Sn/Ag/Cu) Pb-free solder a RoHS-compliant components. They are designed to be processed through single or dual wave soldering machines. The pins have an RoHS-compliant finish that is compatible with both Pb and Pb-free wave soldering processes. A maximum preheat rate of 3°C/s is suggested. The wave preheat process should be such that the temperature of the power module board is kept below 210°C. For Pb solder, the recommended pot temperature is 260°C, while the Pb-free solder pot is 270°C max. Not all RoHS-compliant through-hole products can be processed with paste-through-hole

Contact Us

For more information, call us at
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1-972-244-9288 (Int'l)

Change History (excludes grammar & clarifications)

| Revision | Date | Description of the change |
|----------|------------|--|
| 4.3 | 10-11-2021 | Updated as per template |
| 4.4 | 1-4-2023 | Corrected Vout, min in page header from 0.6 to 0.59 already correctly noted in electrical specification table. |
| 4.5 | 11-09-2023 | Updated as per OmniOn template |

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