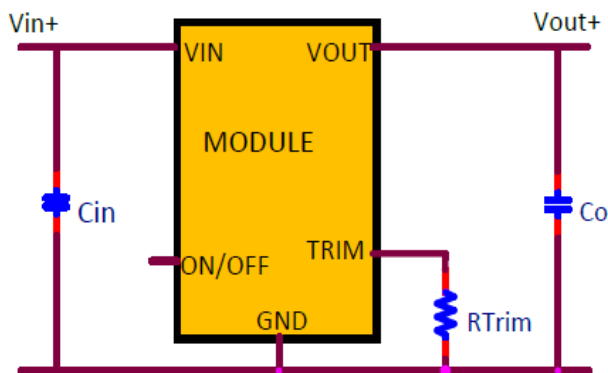
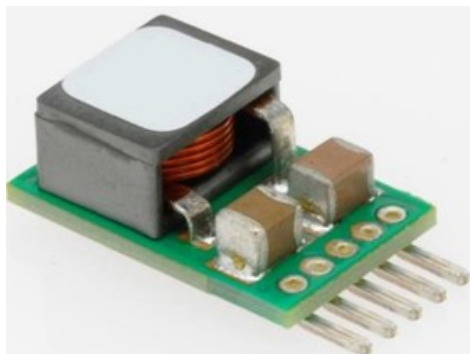


# IND060SIP Hornet: Non-Isolated DC-DC Voltage Regulator Modules

12V<sub>dc</sub> input; 0.6V<sub>dc</sub> to 5.5V<sub>dc</sub> 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<sub>dc</sub> to 5.5V<sub>dc</sub> 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

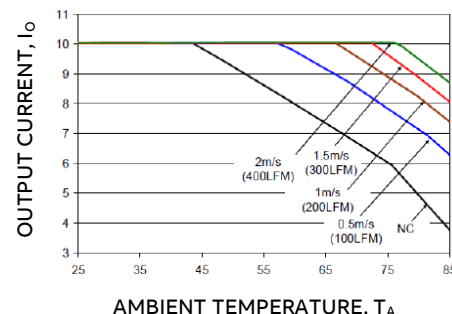
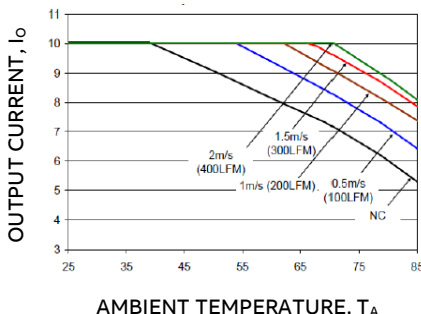
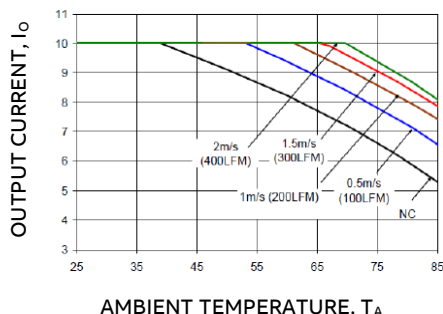
# Technical Specification

## Process and Safety (continued)

Device Code	Input Voltage	Output Voltage	Output Current (Max.)	On/Off Logic	Ordering Code
IND060SIP	9.6 – 14.4V <sub>dc</sub>	0.59 – 5.5V <sub>dc</sub>	10A	Positive	1600102908A

## Thermal Performance

Full rated output with natural convection up to 40°C at 0.6V<sub>out</sub> and up to 45°C at 6V<sub>out</sub>. Thermal curves for 0.6V, 1.8V and 5.5V<sub>out</sub> below.



## Electrical Specifications

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

## Characteristic Curves

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

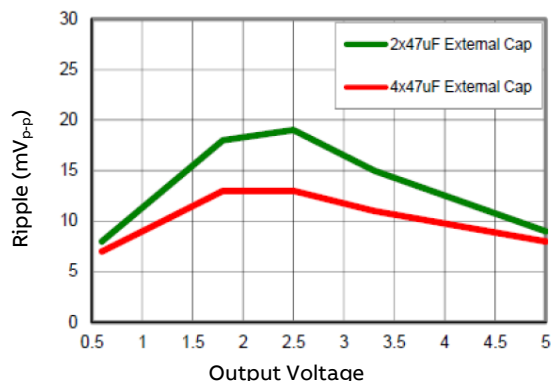


Figure 1. Output Ripple Voltage for various output voltages and external caps @12V<sub>in</sub>. Additional Decoupling cap of 0.01uF used on input and output side

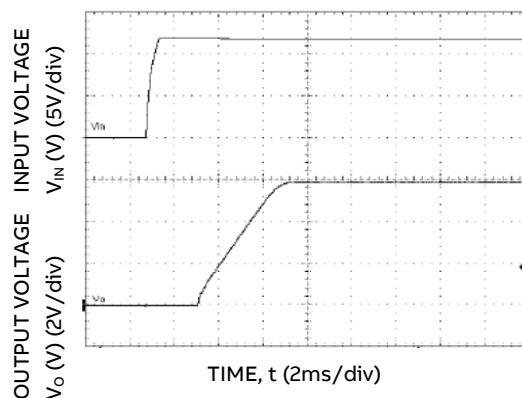


Figure 2. Typical Start-up using Input Voltage (V<sub>in</sub>=12V, V<sub>out</sub> = V<sub>out, max</sub>, I<sub>out</sub> = I<sub>out, max</sub>)

# 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	
$R_{trim}$ (k $\Omega$ )	Open	2.89	1.941	1.3	0.978	0.619	0.436	0.268	$R_{trim} = \left[ \frac{1.182}{(V_o - 0.591)} \right] k\Omega$

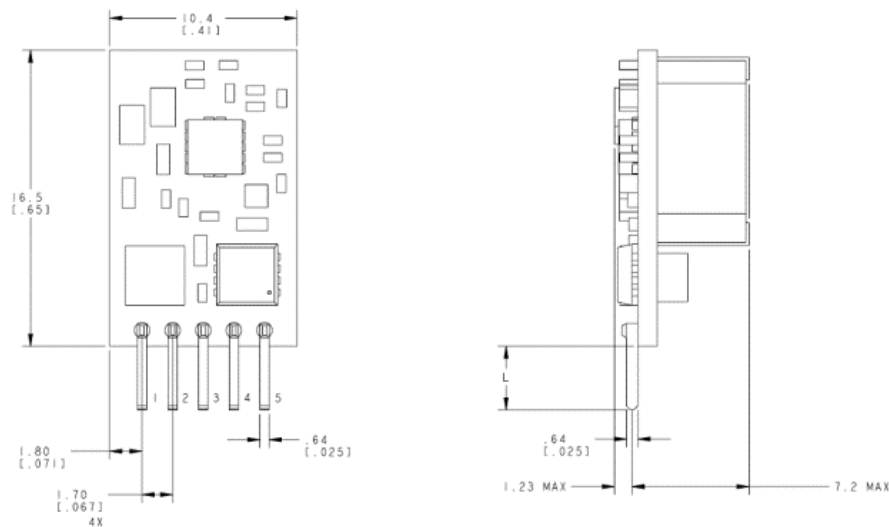
## Safety Considerations

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

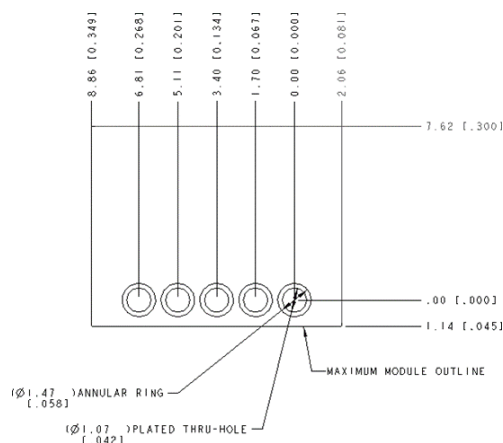
Dimensions are in millimeters and (inches).

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	$V_{IN}$
3	GND
4	$V_{out}$
5	Trim+

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



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## Technical Specification (continued)

### Through-Hole Lead-Free Soldering Information

These RoHS-compliant through-hole products use the SAC (Sn/Ag/Cu) Pb-free solder and 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 Pb or Pb-free reflow process.

### Contact Us

For more information, call us at

1-877-546-3243 (US)

1-972-244-9288 (Int'l)

## Change History (excludes grammar & clarifications)

Version	Date	Description of the change
4.3	10-11-2021	Updated as per template



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