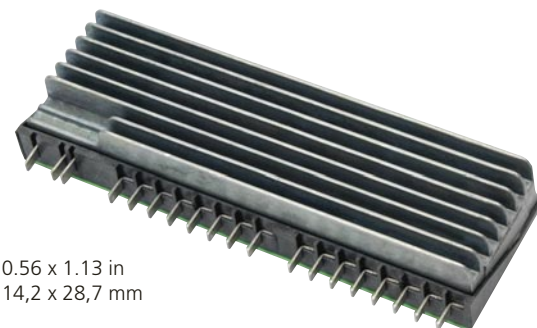


## Features

- 384 V to 12 V VI BRICK™ BCM Array
- 300 Watt (450 Watt for 1 ms)
- Vertical mount package reduces footprint
- Integrated heat sink simplifies thermal management
- ZVS / ZCS isolated sine amplitude converter
- Typical efficiency 95%
- <1  $\mu$ s transient response
- >3.5 million hours MTBF
- Internal fuse and filter
- No output filtering required

$V_{in} = 360 - 400 \text{ V}$   
 $V_{out} = 11.3 - 12.5 \text{ V}$   
 $I_{out} = 25 \text{ A}$   
 $K = 1/32$   
 $R_{out} = 20.0 \text{ m}\Omega \text{ max}$



Size:  
 3.54 x 0.56 x 1.13 in  
 89,9 x 14,2 x 28,7 mm

## Product Description

The BC384R120T030VM-00 contains two high efficiency, narrow input range Sine Amplitude Converter (SAC) converters operating from a 360 to 400 Vdc primary bus to deliver an isolated low voltage secondary. The module provides an isolated 11.3 -12.5 V distribution bus and is packaged in a thermally efficient VI BRICK BCM Array package. Due to the fast response time and low noise, the need for limited life aluminum electrolytic or tantalum capacitors at the input of POL converters is reduced—or eliminated—resulting in savings of board area, materials and total system cost.

The BC384R120T030VM-00 achieves a power density of 134 W/in<sup>3</sup> in a VI BRICK BCM Array package utilizing an integrated heat sink. Owing to its high conversion efficiency and safe operating temperature range, the VI BRICK BCM Array does not require additional heat sinking or high airflow velocities. Low junction-to-heat sink thermal impedance assures low junction temperatures and long life in the harshest environments.

## Absolute Maximum Ratings

| Parameter                                     | Values       | Unit | Notes           |
|---|--------------|------|-----------------|
| +In to -In                                    | -1.0 to 440  | Vdc  |                 |
| +In to -In                                    | 500          | Vdc  | For 100 ms      |
| PC to -In                                     | -0.3 to 7.0  | Vdc  |                 |
| +Out to -Out                                  | -0.5 to 16.0 | Vdc  |                 |
| Isolation voltage                             | 4242         | Vdc  | Input to Output |
| Output current                                | 27.7         | A    | Continuous      |
| Peak output current                           | 37.5         | A    | For 1 ms        |
| Output power                                  | 300          | W    | Continuous      |
| Peak output power                             | 450          | W    | For 1 ms        |
| Operating junction temperature <sup>(1)</sup> | -40 to 125   | °C   | T-Grade         |
| Storage temperature                           | -40 to 125   | °C   | T-Grade         |

### Note:

- (1) The referenced junction is defined as the semiconductor having the highest temperature. This temperature is monitored by a shutdown comparator.

## SPECIFICATIONS

### Input Specifications *(Conditions are at 384 V<sub>in</sub>, full load, and 25°C ambient unless otherwise specified)*

| Parameter                   | Min | Typ | Max | Unit | Note   |
|-----------------------------|-----|-----|-----|------|--------|
| Input voltage range         | 360 | 384 | 400 | Vdc  |        |
| Input dV/dt                 |     |     | 1   | V/μs |        |
| Input undervoltage turn-on  |     |     | 320 | Vdc  |        |
| Input undervoltage turn-off | 280 |     |     | Vdc  |        |
| Input overvoltage turn-on   | 400 |     |     | Vdc  |        |
| Input overvoltage turn-off  |     |     | 440 | Vdc  |        |
| Input quiescent current     |     | 1.1 |     | mA   | PC low |
| Input current               |     |     | 0.9 | Adc  |        |
| No load power dissipation   |     | 5.8 | 8.3 | W    |        |
| Internal input capacitance  |     | 0.2 |     | μF   |        |
| Internal input inductance   |     | 5.0 |     | μH   |        |

### Output Specifications *(Conditions are at 384 V<sub>in</sub>, full load, and 25°C ambient unless otherwise specified)*

| Parameter                          | Min    | Typ  | Max    | Unit   | Note  |
|------------------------------------|--------|------|--------|--------|---|
| Output voltage                     | 11.3   |      | 12.5   | Vdc    | No load; 360 – 400 V <sub>IN</sub>                          |
|                                    | 10.8   |      | 12.0   | Vdc    | Full load; 360 – 400 V <sub>IN</sub>                        |
| Output power                       | 0      |      | 300    | W      | 360 - 400 V <sub>IN</sub> ; 100°C heat sink max. temp.      |
| Rated DC current                   | 0      |      | 27.7   | Adc    | P <sub>OUT</sub> ≤ 300 W                                    |
| Peak repetitive power              |        |      | 450    | W      | Max pulse width 1ms, max duty cycle 10%, baseline power 50% |
| Current share accuracy             |        | 5    | 10     | %      |   |
| Efficiency                         |        |      |        |        |   |
| Half load                          | 94.1   | 95.2 |        | %      |   |
| Full load                          | 94.2   | 95.3 |        | %      |   |
| Internal output inductance         |        | 1.1  |        | nH     |   |
| Internal output capacitance        |        | 31   |        | μF     | Effective value   |
| Load capacitance                   |        |      | 1,000  | μF     |   |
| Output overvoltage setpoint        | 12.5   |      |        | Vdc    |   |
| Output ripple voltage              |        |      |        |        |   |
| No external bypass                 |        | 197  | 400    | mV p-p |   |
| Short circuit protection set point | 28.2   |      |        | Adc    | Module will shut down                                       |
| Average short circuit current      |        | 0.23 |        | A      |   |
| Effective switching frequency      | 3.3    | 3.4  | 3.5    | MHz    | Fixed, 1.7 MHz per phase per each BCM                       |
| Line regulation                    |        |      |        |        |   |
| K                                  | 0.0309 | 1/32 | 0.0316 |        | V <sub>OUT</sub> = K•V <sub>IN</sub> at no load             |
| Load regulation                    |        |      |        |        |   |
| R <sub>OUT</sub>                   |        | 15.0 | 20.0   | mΩ     |   |
| Output overshoot                   |        |      |        |        |   |
| Input turn-on                      |        | 50   |        | mV     | No output filter  |
| PC enable                          |        | 50   |        | mV     | No output filter  |
| Output turn-on delay               |        |      |        |        |   |
| From application of power          |        | 1180 |        | ms     | No output filter  |
| From release of PC pin             |        | 240  |        | ms     | No output filter  |

## SPECIFICATIONS (CONT.)

| General  |      |           |           |       |   |
|--|------|-----------|-----------|-------|---|
| Parameter  | Min  | Typ       | Max       | Unit  | Note  |
| MTBF   |      | 3.5       |           | Mhrs  | 25°C, GB  |
| MIL-HDBK-217F  |      |           |           |       |   |
| Isolation specifications   |      |           |           |       |   |
| Voltage  | 4242 |           |           | Vdc   | Input to Output   |
| Capacitance  |      | 500       |           | pF    | Input to Output   |
| Resistance   | 10   |           |           | MΩ    | Input to Output   |
| Agency approvals   |      |           |           |       |   |
|  |      | cTÜVus    |           |       | Safety agency approvals pending   |
|  |      | CE Mark   |           |       | Low Voltage Directive   |
| Mechanical   |      |           |           |       |   |
| Weight   |      | 3.2/92    |           | oz/g  | See Mechanical Drawings   |
| Dimensions   |      |           |           |       |   |
| Length   |      | 3.54/89,9 | 3.55/90,1 | in/mm |   |
| Width  |      | 0.56/14,2 | 0.57/14,6 | in/mm |   |
| Height   |      | 1.13/28,7 | 1.18/30,0 | in/mm |   |
| Thermal  |      |           |           |       |   |
| Over temperature shutdown  | 125  | 130       | 135       | °C    | Junction temperature  |
| Operating temperature - heatsink                                   |      |           | 100       | °C    | See thermal curve, Figure 1   |
| Junction-to-heatsink thermal impedance ( $R_{\theta JC}$ )         |      | 0.50      | 0.65      | °C/W  | Heatsink temperature measured in location shown in Figure 2   |
| Heatsink to ambient thermal impedance ( $R_{\theta HA}$ ) free air |      |           | 6.50      |       | <a href="http://www.vicorpower.com/technical_library/calculators/calc_t~1.xls">http://www.vicorpower.com/technical_library/calculators/calc_t~1.xls</a> |

| Auxiliary Pins (Conditions are at 384 Vin, full load, and 25°C ambient unless otherwise specified) |     |     |     |      |                                |
|--|-----|-----|-----|------|--------------------------------|
| Parameter  | Min | Typ | Max | Unit | Note                           |
| Enable / Disable (CNTRL)   |     |     |     |      |                                |
| DC voltage   | 4.8 | 5.0 | 5.2 | Vdc  |                                |
| Module disable voltage   | 2.4 | 2.5 |     | Vdc  |                                |
| Module enable voltage  |     | 2.5 | 2.6 | Vdc  |                                |
| Current limit  | 2.4 | 2.5 | 2.9 | mA   | Source only                    |
| Enable delay time  |     | 240 |     | ms   |                                |
| Disable delay time   |     | 40  |     | μs   | Time from PC low to output low |

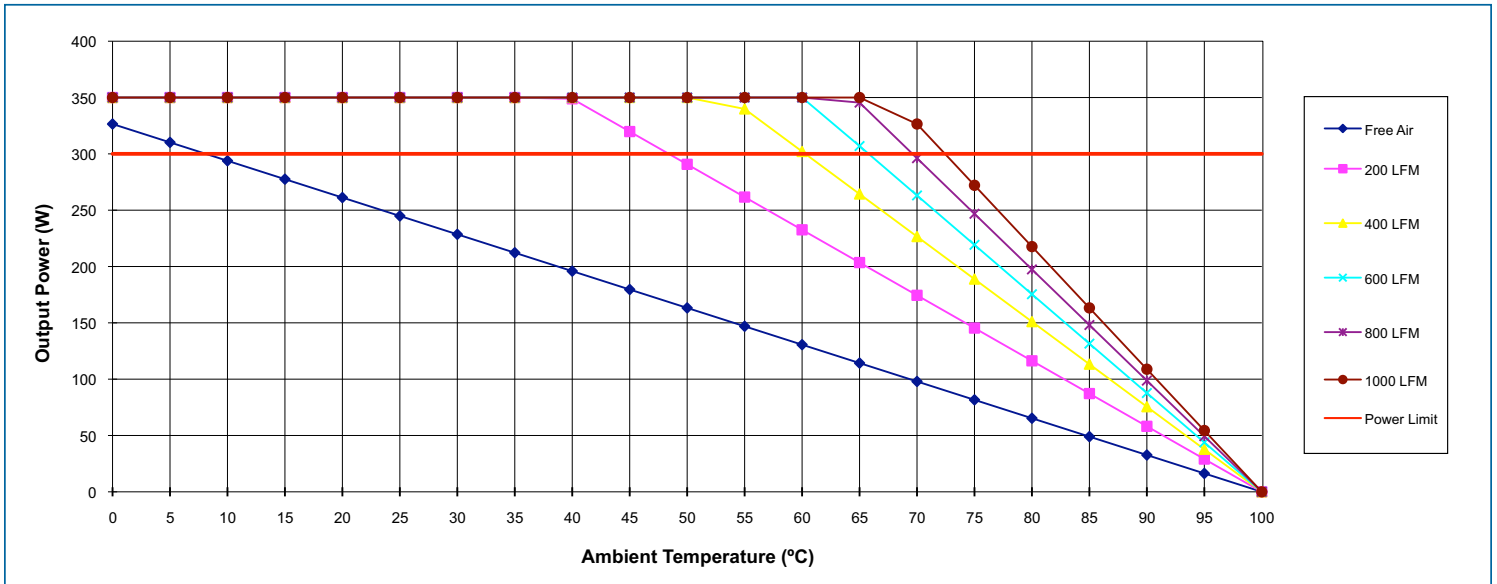


Figure 1 – Typical thermal curve – verify all thermal management systems experimentally.

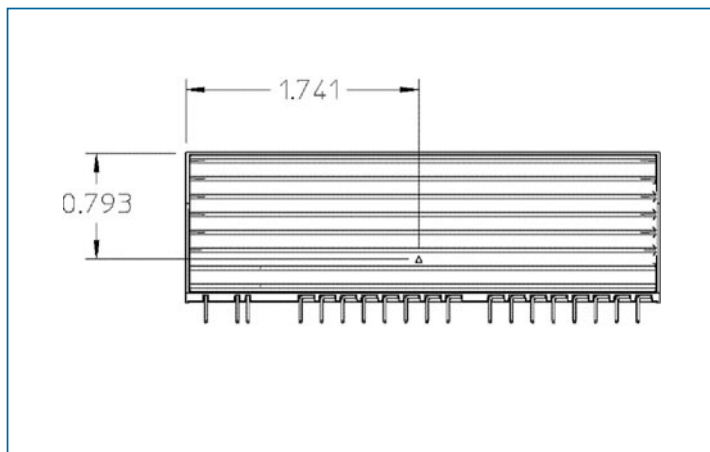


Figure 2 — Temp measurement location

## +In / -In – DC Voltage Input Ports

The BCM Array input voltage range should not be exceeded. An internal under / over voltage lockout-function prevents operation outside of the normal operating input range. The module turns on within an input voltage window bounded by the “Input under-voltage turn-on” and “Input over-voltage turn-off” levels, as specified. The module may be protected against accidental application of a reverse input voltage by the addition of a rectifier in series with the positive input, or a reverse rectifier in shunt with the positive input located on the load side of the input fuse.

## CNTRL – Enable / Disable

The Enable / Disable signal is a multifunction node that provides the following functions:

**Enable / Disable** – If CNTRL is left floating, the module output is enabled. Once this port is pulled lower than 2.4 Vdc with respect to –In, the output is disabled. This action can be realized by employing a relay, opto-coupler, or open collector transistor. This signal should not be toggled at a rate higher than 1 Hz. CNTRL should also not be driven by or pulled up to an external voltage source.

**Primary Auxiliary Supply** – CNTRL can source up to 2.4 mA at 5.0 Vdc. CNTRL should never be used to sink current.

**Alarm** – The module contains circuitry that monitors output overload, input over voltage or under voltage, and internal junction temperatures. In response to an abnormal condition in any of the monitored parameters, CNTRL will toggle.

## +Out / -Out – DC Voltage Output Ports

Multiple pins are provided for the +Out and –Out connections. They must be connected in parallel with low interconnect resistance. Note that –Out 1B and +Out 2B shown in Figure 3 and 4 are not connected for this model.

The low output impedance of the module reduces or eliminates the need for limited life aluminum electrolytic or tantalum capacitors at the input of POL converters.

Total load capacitance at the output of the device should not exceed the specified maximum. Owing to the wide bandwidth and low output impedance of the BCM Array, low frequency bypass capacitance and significant energy storage may be more densely and efficiently provided by adding capacitance at the input.

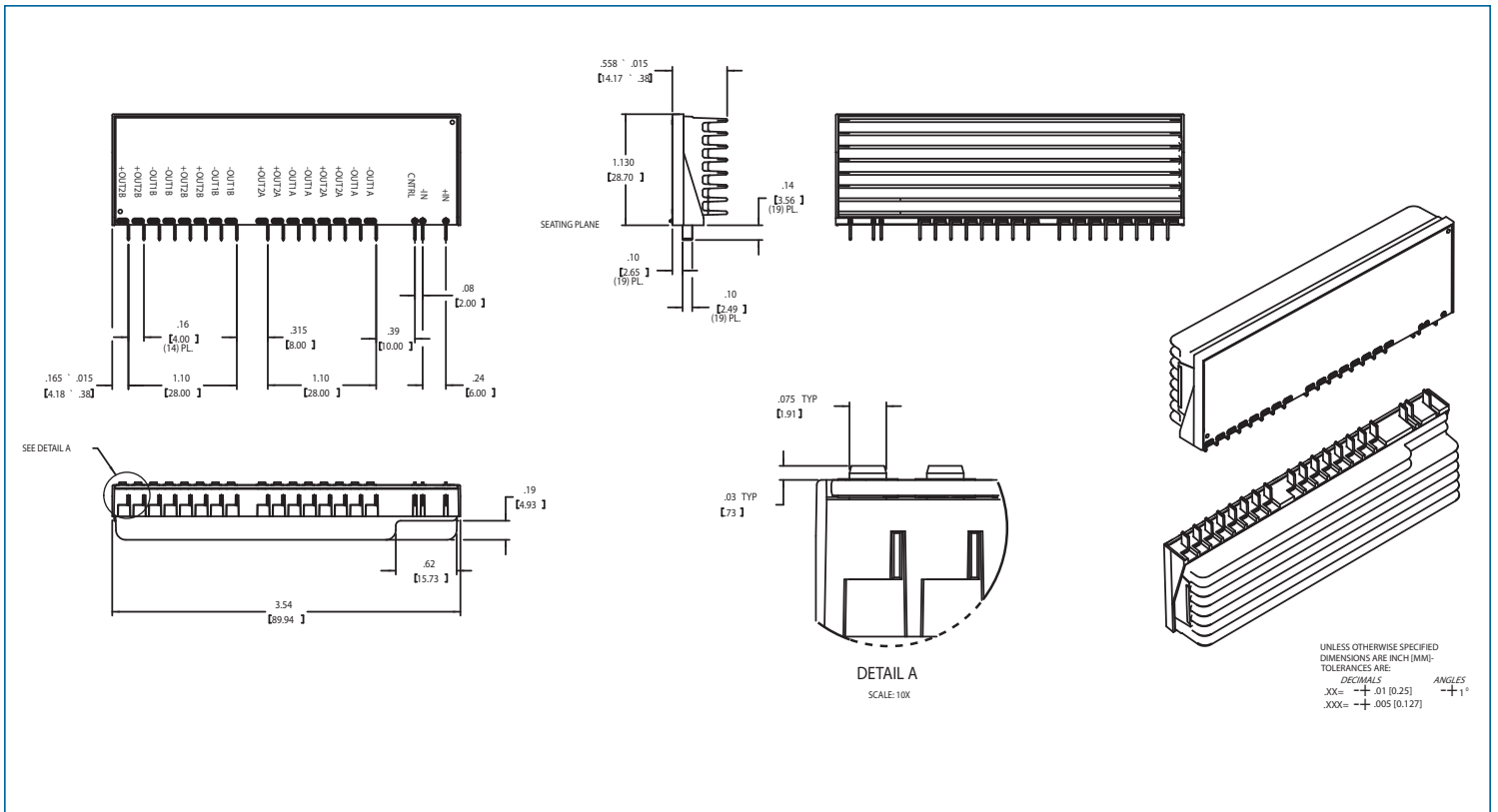


Figure 3 – BC384R120T030VM-00 mechanical outline

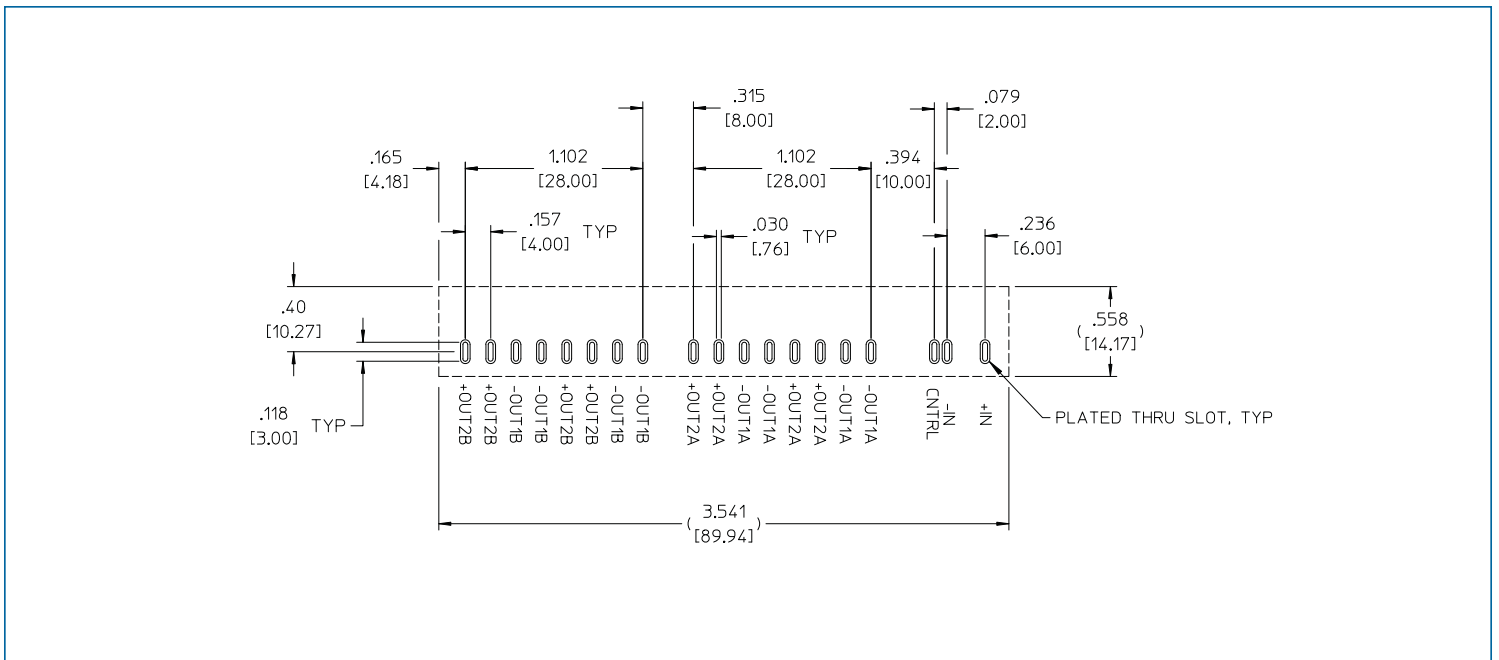


Figure 4 – BC384R120T030VM-00 footprint

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