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## Universal AC Input Module

### Features & Benefits

- Universal input (85 to 264 Vac, 47 to 63Hz)
- Chassis Mount or PCB Mount Form Factor
- Small robust package
- Low profile
- EMI filtering
- Meets EN61000-4-5 Class 3 surge protection when used with external MOV and paired with Vicor PFM4414 products

### Typical Applications

- Small cell base stations
- Telecom switching equipment
- LED lighting
- Test and Measurement Equipment
- 200 – 400W Industrial Power Systems
- Office Equipment

### Product Description

The AIM in a VIA Package (AC Input Module) is a front end module designed to interface directly with worldwide AC mains and provide a rectified AC input to Vicor's family of VIA PFM4414 products. The AIM combines a bridge rectifier, EMI filter, and surge protection circuitry in an easy to use VIA plastic housing. Together, the AIM and PFM in a VIA Package realize a small, efficient, simple, and cost effective EMI Class B AC-DC solution for a broad range of end applications.

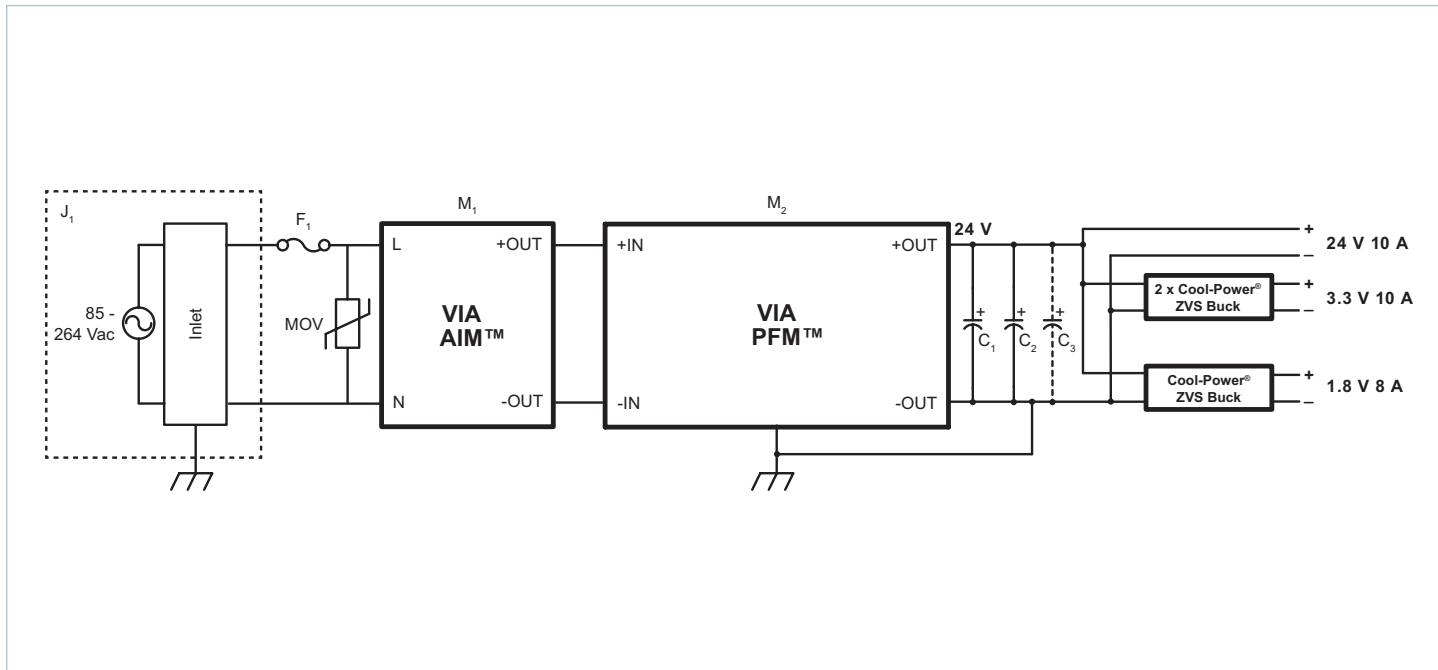


Size:  
1.76 x 1.40 x 0.37 in  
44.6 x 35.5 x 9.3 mm

### Part Ordering Information

| Product Function         | Package Length           | Package Width           | Package Type                     | Input Voltage      | Range Ratio | Output Voltage (Range) | Max Output Power                     | Product Grade   | Option Field |   |
|--------------------------|--------------------------|-------------------------|----------------------------------|--------------------|-------------|------------------------|--------------------------------------|---|--------------|---|
| AIM                      | 17                       | 14                      | x                                | B6                 | M           | C7                     | D5                                   | y   | z            | z |
| AIM =<br>AC Input Module | Length in<br>Inches x 10 | Width in<br>Inches x 10 | B = Board VIA<br>V = Chassis VIA | Internal Reference |             |                        | C = -20 to 100°C<br>T = -40 to 100°C | 00 = Chassis/Always On<br>04 = Short Pin/Always On<br>08 = Long Pin/Always On |              |   |

Typical PCB Mount Applications

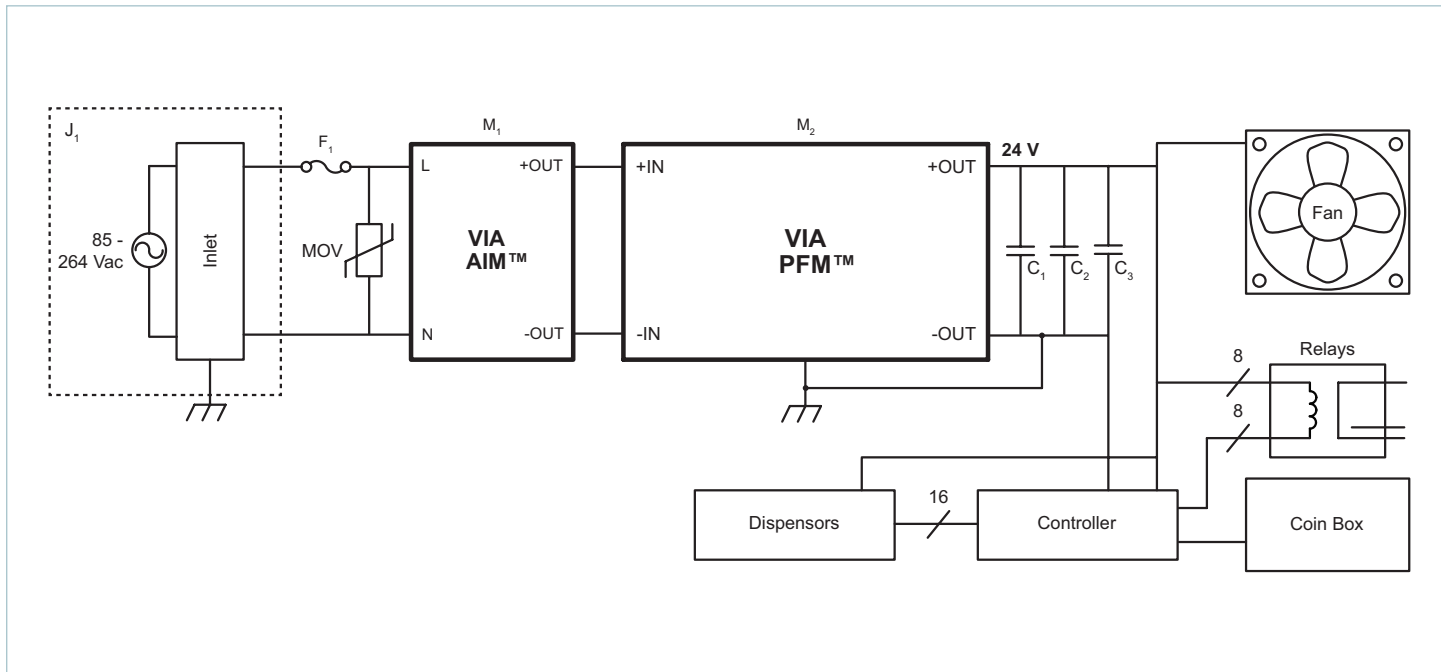


The PCB terminal option allows mounting on an industry standard printed circuit board, with two different pin lengths.

Parts List for Typical PCB Mount Applications

|              |  |
|--------------|--|
| J1           | Qualtek 703W IEC 320-C14 Power Inlet   |
| F1           | Littelfuse 0216008.MXP 8A 250VAC 5 x 20mm holder                                   |
| M1           | Vicor AIM™ AIM1714BB6MC7D5yzz  |
| M2           | Vicor PFM™ PFM4414BB6M24D0yzz  |
| C1, C2, (C3) | Nichicon UVR1V153MRD 15,000µF 35V 4.3A 25 x 50mm bent 90°, x 3 pcs<br>or           |
|              | CDE 380LX153M035A022 15,000µF 35V 5.6A 35 x 30mm snap in, x 3 pcs<br>or            |
|              | Sic Safco Cubisic LP A712062 22,000µF 35V 5.8A 45 x 75 x 12mm rectangular, x 2 pcs |
| MOV          | Littelfuse TMOV20RP300E VARISTOR 10kA 30 V 250 J 20mm                              |

Typical Chassis Mount Applications

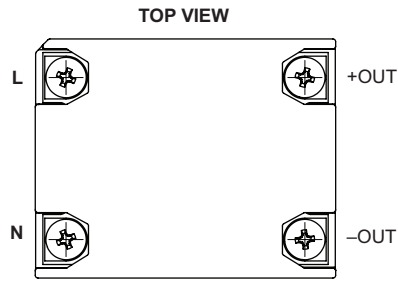


The VIA AIM and VIA PFM are available in Chassis Mount option, saving the cost of a PCB and allowing access to both sides of the power supply for cooling. The parts list below minimizes the number of interconnects required between necessary components, and selects components with terminals traditionally used for point to point chassis wiring.

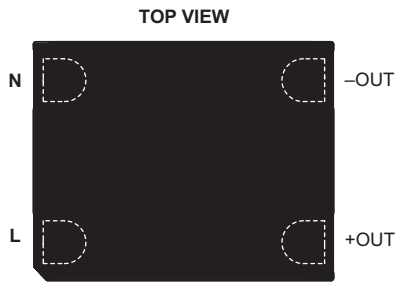
Parts List for Typical Chassis Mount Applications

|            |  |
|------------|--|
| J1         | Qualtek 719W or 723W IEC 320-C14 Power Inlet                               |
| F1         | Littelfuse 0216008.MXP 8A 250VAC 5 x 20mm in a J1, or separate fuse holder |
| M1         | Vicor AIM™ AIM1714VB6MC7D5y00  |
| M2         | Vicor PFM™ PFM4414VB6M24D0y00  |
| C1, C2, C3 | Nichicon LNT1V153MSE 15,000µF 35V 5.1A 35 x 83mm screw terminal<br>or      |
| C1         | Kemet ALS30A473KE040 47,000µF 40V 14.2A 51 x 84mm screw terminal           |
| MOV        | Littelfuse TMOV20RP300E VARISTOR 10kA 300V 250 J 20mm                      |

Pin Configuration



1714 VIA AIM - Chassis Mount - Terminals Up



1714 VIA AIM - PCB Mount - Pins Down

Please note that these Pin drawings are not to scale.

Pin Descriptions

| Signal Name | Type                | Function                       |
|-------------|---------------------|--------------------------------|
| N           | INPUT POWER RETURN  | AC Neutral / Line 2 input      |
| L           | INPUT POWER         | AC Line1 input                 |
| -OUT        | OUTPUT POWER RETURN | Negative output power terminal |
| +OUT        | OUTPUT POWER        | Positive output power terminal |



## Absolute Maximum Ratings

The absolute maximum ratings below are stress ratings only. Operation at or beyond these maximum ratings can cause permanent damage to the device.

| Parameter                                   | Comments | Min | Max      | Unit             |
|---|----------|-----|----------|------------------|
| Input voltage pp at terminals, 1ms max      |          | 0   | 600      | Vpk              |
| Input voltage (AC RMS) continuous           |          | 0   | 275      | V <sub>RMS</sub> |
| Output current (continuous)                 |          | 0   | 5.3      | A <sub>RMS</sub> |
| Operating junction temperature              |          | -40 | 125      | °C               |
| Storage temperature                         |          | -40 | 125      | °C               |
| Input/Output pin torque and mounting torque |          |     | 4 (0.45) | in/lbs (N-m)     |

## Electrical Specifications

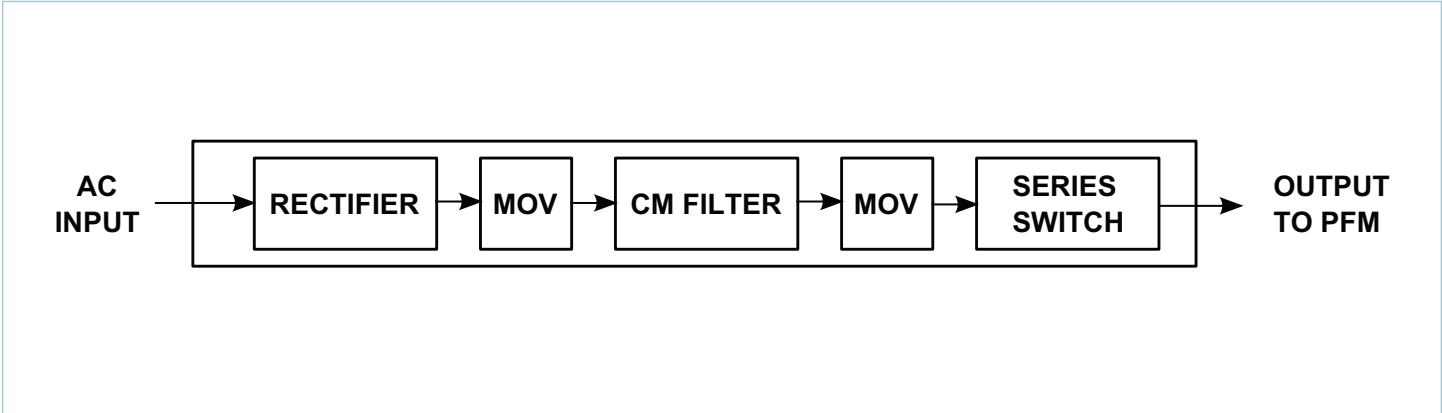
Specifications apply over all line and load conditions, 50 Hz and 60 Hz line frequencies,  $T_J = 25^\circ\text{C}$ , unless otherwise noted.

**Boldface** specifications apply over the temperature range of the specified product grade.

| Attribute  | Symbol     | Conditions / Notes | Min       | Typ | Max        | Unit      |
|--|------------|--------------------|-----------|-----|------------|-----------|
| <b>Input Specification</b>   |            |                    |           |     |            |           |
| Input voltage range, continuous operation                                    | $V_{IN}$   |                    | <b>85</b> |     | <b>264</b> | $V_{RMS}$ |
| Input voltage range, transient, non-operational (peak), 30s minimum interval | $V_{IN}$   |                    |           |     | 600        | V         |
| Source line frequency range  | $f_{line}$ |                    | <b>47</b> |     | <b>63</b>  | Hz        |
| Power factor*  | PF         | See note below     |           |     |            | -         |
| <b>Output Specification</b>  |            |                    |           |     |            |           |
| Output power   | $P_{OUT}$  |                    |           |     | <b>450</b> | W         |
| Output Current (continuous)  | $I_{OUT}$  |                    |           |     | <b>5.3</b> | A         |

\* Please see PFM in VIA package datasheet for power factor

Block Diagram



Application Characteristics

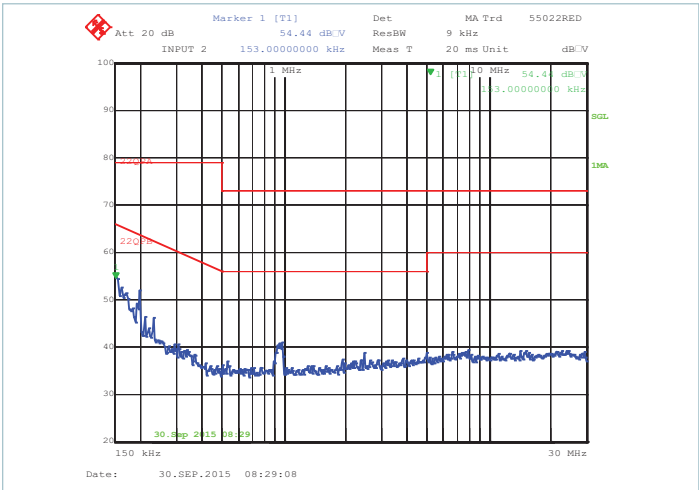


Figure 1 — Typical conducted emissions, peak scan, with VIA PFM4414, 115V, 90% load with VIA PFM-Out connected to GND

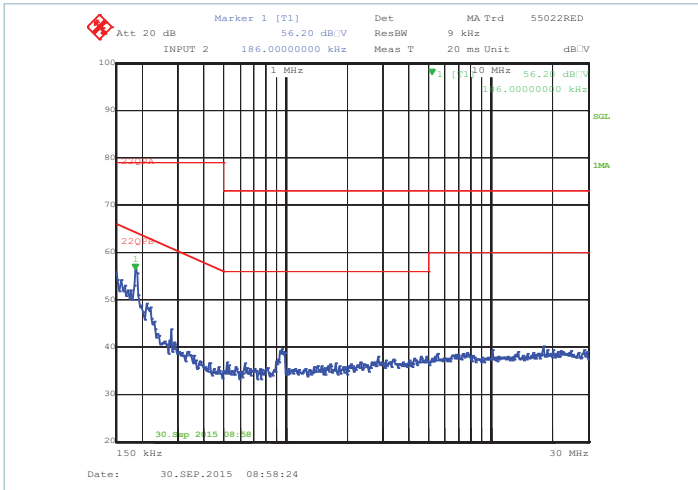


Figure 2 — Typical conducted emissions, peak scan, with VIA PFM4414, 230V, 90% load with VIA PFM-Out connected to GND

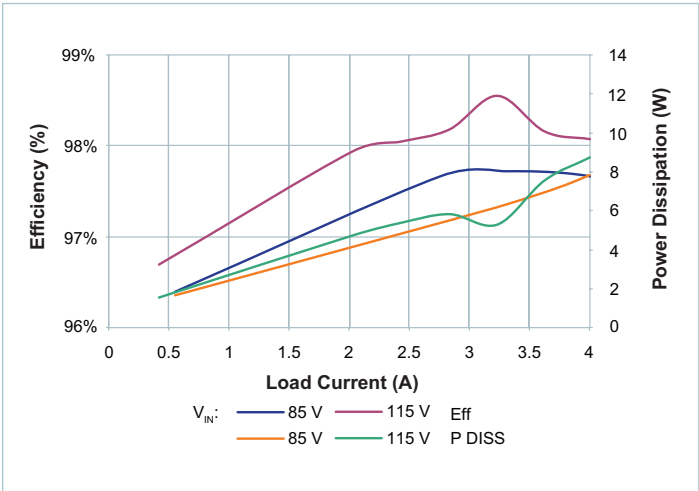


Figure 3 —  $V_{IN}$  to  $V_{OUT}$  efficiency and power dissipation vs.  $V_{IN}$  and  $I_{OUT}$ ,  $T_{CASE} = 20^{\circ}C$



**General Characteristics**

Specifications apply over all line and load conditions, 50 Hz and 60 Hz line frequencies, TC = 25°C, unless otherwise noted.  
**Boldface specifications apply over the temperature range of the specified Product Grade.**

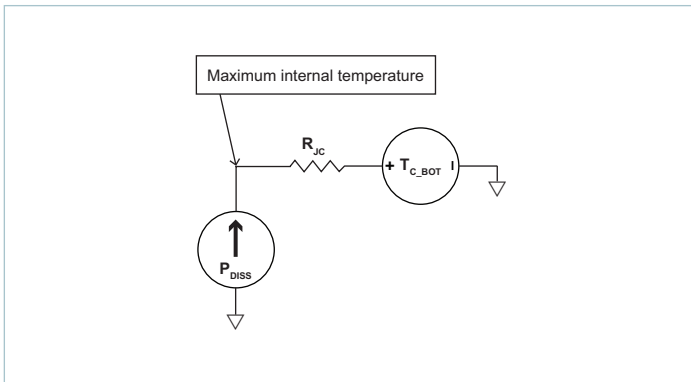
| Attribute   | Symbol              | Conditions / Notes  | Min  | Typ           | Max | Unit                                 |
|---|---------------------|---|------|---------------|-----|--------------------------------------|
| <b>Mechanical</b>   |                     |   |      |               |     |                                      |
| Length  | L                   |   |      | 44.6 / [1.76] |     | mm / [in]                            |
| Width   | W                   |   |      | 35.5 / [1.40] |     | mm / [in]                            |
| Height  | H                   |   |      | 9.3 / [0.37]  |     | mm / [in]                            |
| Volume  | Vol                 | Without heatsink  |      | 14.5 / [0.88] |     | cm <sup>3</sup> / [in <sup>3</sup> ] |
| Mass (Weight)   | M                   |   |      | 35 / [1.2]    |     | g / [oz]                             |
| Pin material  |                     | C145 copper, half hard  |      |               |     |                                      |
| Underplate  |                     | Low stress ductile nickel   | 50   |               | 100 | µin                                  |
| Pin finish  |                     | Palladium   | 0.8  |               | 6   | µin                                  |
|   |                     | Soft Gold   | 0.12 |               | 2   | µin                                  |
| <b>Thermal</b>  |                     |   |      |               |     |                                      |
| Operating case temperature  | T <sub>C</sub>      | C-Grade   | -20  |               | 100 | °C                                   |
|   |                     | T-Grade   | -40  |               | 100 | °C                                   |
| Thermal resistance, junction to case bottom                         | R <sub>JC_BOT</sub> |   |      | 2.2           |     | °C/W                                 |
| Thermal design  |                     | See Thermal Considerations on Page 10   |      |               |     |                                      |
| <b>Soldering</b>  |                     |   |      |               |     |                                      |
| Temperature   |                     | See <a href="#">AN:401 PCB Mount VIA Soldering Guidelines</a>                           |      |               |     |                                      |
| <b>Reliability</b>  |                     |   |      |               |     |                                      |
| MTBF  |                     | MIL-HDBK-217FN2 Parts Count - 25°C Ground Benign, Stationary, Indoors / Computer        |      | 8.2           |     | MHrs                                 |
|   |                     | Telcordia Issue 2 - Method I Case III; 25°C   |      | 28.6          |     |                                      |
|   |                     | MIL-HDBK-217FN2 - 25°C Ground Benign, Stationary, Indoors / Computer                    |      | 7.4           |     |                                      |
| <b>Safety</b>   |                     |   |      |               |     |                                      |
| Agency approvals/standards  |                     | EN60950-1; CE marked for low voltage directive and RoHS recast directive, as applicable |      |               |     |                                      |
| Dielectric withstand (hipot)  |                     | In / Out to Case  | 1500 |               |     | Vac                                  |
| <b>EMI/EMC Compliance</b>   |                     |   |      |               |     |                                      |
| FCC Part 15, EN55022, CISPR22: 2006 + A1: 2007, Conducted Emissions |                     | Class B Limits - with VIA PFM -OUT connected to GND                                     |      |               |     |                                      |
| EN61000-4-5: 2006, Surge Immunity                                   |                     | Level 3, Immunity Criteria A with PFM in a VIA Package with external TMOV               |      |               |     |                                      |

## Environmental Qualification

| Testing Activity                                 | Reference Standard                 | Test Details  |
|--|------------------------------------|---|
| High Temperature Operating Bias/Life (HTOB/HTOL) | JESD22-A108D                       | 1000 hrs. Nominal Full Load at Max operating temperature  |
| Temperature Cycling Test (TCT)                   | IPC-9592B                          | 125°C to -40°C, 700 cycles  |
| Temperature Humidity Bias (THB)                  | JESD22-A101C                       | 1000 hrs. Nominal Input voltage, Minimal load 85°C, 85% RH  |
| High Temperature Storage (HTS)                   | JESD22-A103D                       | 1000 hrs. 125°C   |
| Low Temperature Storage (LTS)                    | JESD22-A119                        | 1000 hrs. -65°C   |
| Random Vibration                                 | MIL-STD-810G                       | Method 514.6, Procedure I, Category 24, 20-2000Hz, @7.7Grms, 1hour /axis for 3 axis. Product mounted on an evaluation board, nominal line 50% load. |
| Mechanical Shock                                 | MIL-STD-810G                       | Method 516.5, Procedure I, Functional shock 40G, total of 18 shocks. Product mounted on an evaluation board, nominal Line 50% load.                 |
| Highly Accelerated Life Test (HALT)              | Internal Vicor Procedure - DP-0265 | Low and high temperature tests, rapid thermal cycling, random vibration testing, combined stress testing and destruct testing.                      |
| Res. Solvents                                    | MIL-STD-202G                       | Method 215K, 3 minutes exposure   |
| ESD Human Body Model                             | JEDEC JS-001-2012                  | Class 1C (HBM) Minimum  |
| ESD Charged Device Model                         | JESD22-C101E                       | Class II (CDM) Minimum  |

## Thermal Considerations

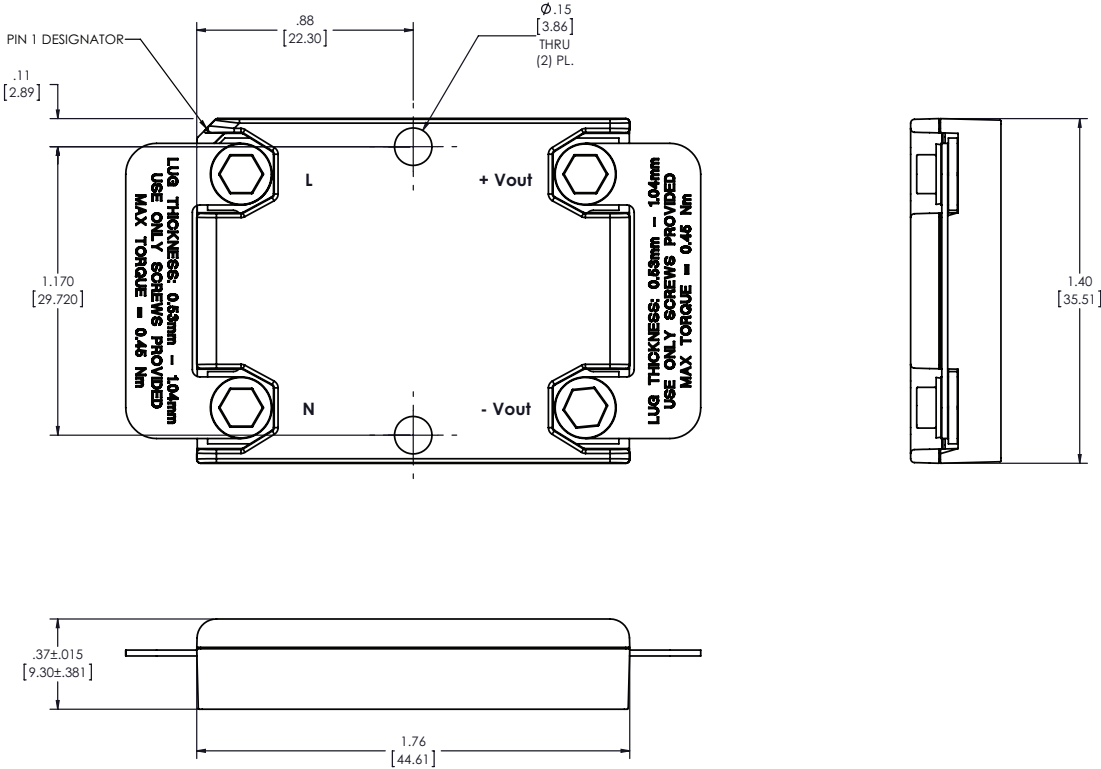
The AIM in a VIA package can be cooled using Single side cooling. Since the AIM has a maximum internal temperature rating, it is necessary to estimate this internal temperature based on a system-level thermal solution. To this purpose, it is helpful to simplify the thermal solution into a roughly equivalent circuit where power dissipation is modeled as a current source, isothermal surface temperatures are represented as voltages sources, and thermal resistances are represented as resistors. Figure 4 shows the bottom side cooling “thermal circuit” for the AIM in VIA package:



**Figure 4** — Bottom-side cooling VIA thermal model

The internal power dissipation is  $P_{DISS}$ ,  $R_{JC\_BOT}$  is the thermal resistance characteristic of the VIA package and the bottom surface temperature is represented as  $T_{C\_BOT}$ . The AIM is best attached to a material with high thermal conductivity (e.g. aluminum or copper) to maintain temperature uniformity across the bottom side.

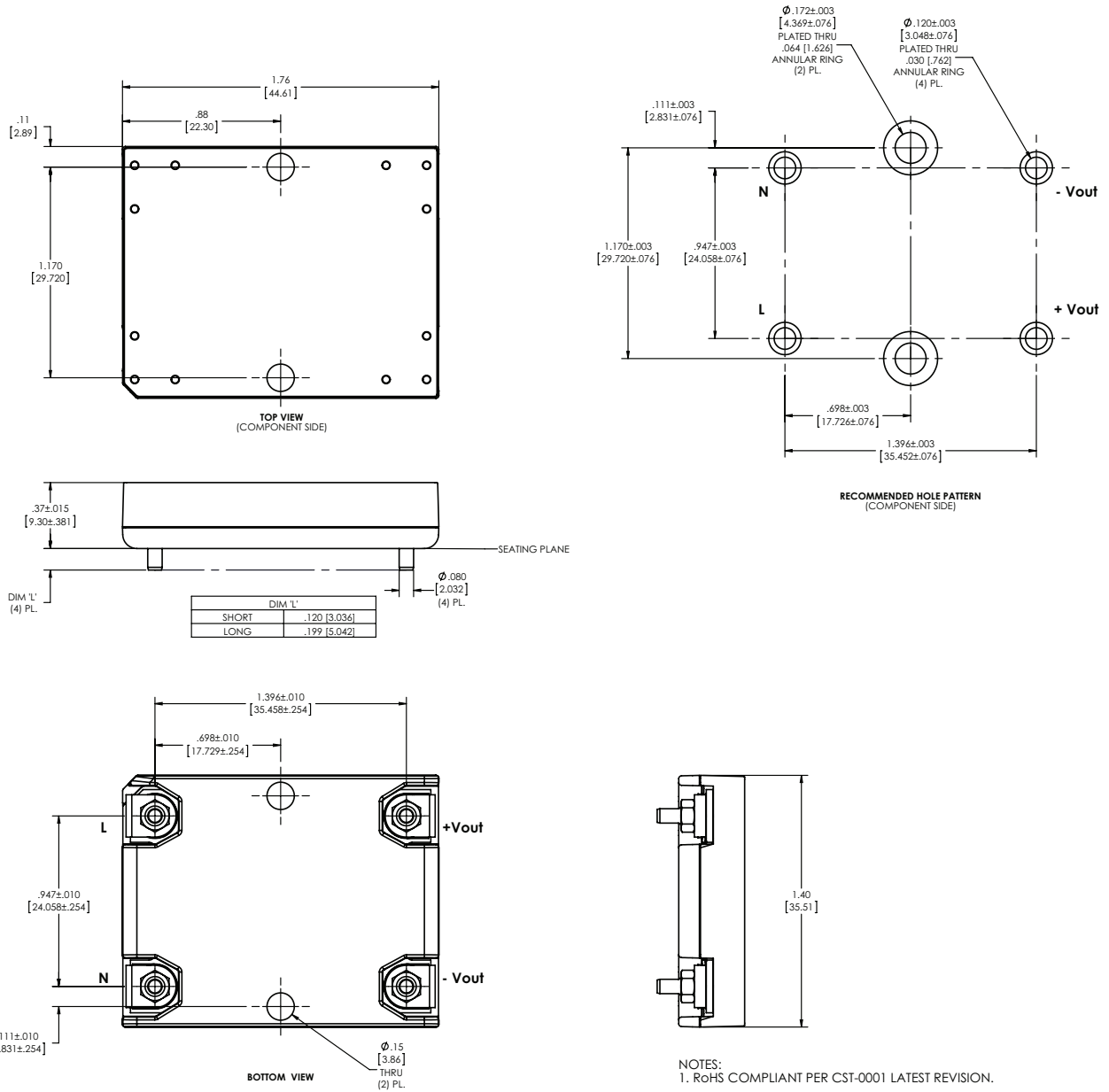
AIM in a VIA Package Chassis Mount Package Mechanical Drawing



NOTE:  
1. RoHS COMPLIANT PER CST-0001 LATEST REVISION.

Product outline drawing; Product outline drawings are available in .pdf and .dxf formats.  
3D mechanical models are available in .pdf and .step formats.

AIM in a VIA Package Board Mount Package Mechanical Drawing



**Revision History**

| Revision | Date     | Description  | Page Number(s)   |
|----------|----------|--|------------------|
| 1.0      | 12/24/15 | Initial release  | n/a              |
| 1.1      | 07/21/16 | Updated dimensions<br>Added "Mass" attribute and soldering temperature note<br>Revised mechanical drawing to show correct PCB pin diameter | 1 & 8<br>8<br>12 |

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