

UL TEST REPORT AND PROCEDURE

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| Standard: | UL 60950-1, 2nd Edition, 2007-03-27 (Information Technology Equipment - Safety - Part 1: General Requirements) CSA C22.2 No. 60950-1-07, 2nd Edition, 2007-03 (Information Technology Equipment - Safety - Part 1: General Requirements) |
| Certification Type: | Power Supplies for Information Technology Equipment Including Electrical Business Equipment |
| CCN: | QQGQ2, QQGQ8 |
| Product: | DC/DC Converter |
| Model: | BCM Series BCM2 Series |
| Rating: | See Miscellaneous Enclosure for model nomenclature. Input:48V Output: 48V Max Power: 300W Max. |
| Applicant Name and Address: | VICOR CORP 25 FRONTAGE RD ANDOVER MA 01810 UNITED STATES |

This is to certify that representative samples of the products covered by this Test Report have been investigated in accordance with the above referenced Standards. The products have been found to comply with the requirements covering the category and the products are judged to be eligible for Follow-Up Service under the indicated Test Procedure. The manufacturer is authorized to use the UL Mark on such products which comply with this Test Report and any other applicable requirements of Underwriters Laboratories Inc. ('UL') in accordance with the Follow-Up Service Agreement. Only those products which properly bear the UL Mark are considered as being covered by UL's Follow-Up Service under the indicated Test Procedure.

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Supporting Documentation

The following documents located at the beginning of this Procedure supplement the requirements of this Test Report:

- A. Authorization - The Authorization page may include additional Factory Identification Code markings.
- B. Generic Inspection Instructions -
 - i. Part AC details important information which may be applicable to products covered by this Procedure. Products described in this Test Report must comply with any applicable items listed unless otherwise stated in the body of this Test Report.
 - ii. Part AE details any requirements which may be applicable to all products covered by this Procedure. Products described in this Test Report must comply with any applicable items listed unless otherwise stated in the body of each Test Report.
 - iii. Part AF details the requirements for the UL Certification Mark which is not controlled by the technical standard used to investigate these products. Products are permitted to bear only the Certification Mark(s) corresponding to the countries for which it is certified, as indicated in each Test Report.

Product Description

The full size VI Chip BCM and BCM2 are isolating DC-DC Bus Converter Module. These DC-DC converters are designed for building-in and the input is intended to be derived from a TNV-2, SELV, or other non-hazardous secondary circuit.

Model Differences

See Miscellaneous Enclosure for model nomenclature.

Technical Considerations

- Equipment mobility : for building-in
- Connection to the mains : N/A
- Operating condition : continuous
- Access location : building-in
- Over voltage category (OVC) : OVC II
- Mains supply tolerance (%) or absolute mains supply values : No direct connection
- Tested for IT power systems : No
- IT testing, phase-phase voltage (V) : -
- Class of equipment : Class II
- Considered current rating (A) : -
- Pollution degree (PD) : PD 2
- IP protection class : IP X0
- Altitude of operation (m) : 2000
- Altitude of test laboratory (m) : 150
- Mass of equipment (kg) : 0.0125
- The product was submitted and evaluated for use at the maximum ambient temperature (T_{ma}) permitted by the manufacturer's specification of: semiconductor junction temperature of the VI Chip not exceeding 125°C

Engineering Conditions of Acceptability

For use only in or with complete equipment where the acceptability of the combination is determined by Underwriters Laboratories Inc. When installed in an end-product, consideration must be given to the following:

- The input to the BCM is intended to be supplied from a TNV-2 circuit, or other non-hazardous secondary circuit
- The BCM provides 2250 Vdc of isolation from input to output with the exception of the B048F120T20 and the B048K120T20 which only provide 1500Vdc isolation.
- The output of the BCM is considered SELV.
- Max Temperature: Keep the maximum semiconductor junction temperature of the VI Chip at 125°C or less. There are three methods to demonstrate compliance. Method 1: Keep $T_{casemax} < 100^{\circ}\text{C}$ under all conditions where $T_{casemax}$ is the maximum case temp of the VI chip. Method 2: Keep $T_{casemax} < 125^{\circ}\text{C} - (P_{dissmax} \times 1.5)$ under all conditions where $P_{dissmax} = P_{inputmax} - P_{outputmax}$. $P_{dissmax}$ is the amount of power in Watts dissipated within the device. The thermal resistance of the full size VI Chip from the internal semiconductor junction to the case is 1.5°C/Watts. Method 3: Maintain the internal semiconductor junction temperature at $T_j = 125^{\circ}\text{C}$ or less. This can be achieved by measuring the dc voltage at the TM (temperature monitor) lead and converting the voltage to temperature The TM has a nominal +27C set point of 3.0 Vdc and a nominal gain of 10mV / °C. Example; $TM = 3.4\text{Vdc}$, $T_j = (27 + 40) 67^{\circ}\text{C}$
- The BCM requires a Littelfuse Nano²Fuse rated 10A or less.
- The following Production-Line tests are conducted for this product: Electric Strength
- The end-product Electric Strength Test is to be based upon a maximum working voltage of: Primary-SELV: 57.9 Vrms, 88.8 Vpk
- The following secondary output circuits are SELV: All
- The following secondary output circuits are at non-hazardous energy levels: All
- The power supply terminals and/or connectors are: Not investigated for field wiring
- The investigated Pollution Degree is: 2
- The following end-product enclosures are required: Mechanical , Fire , Electrical

VI Chip BCM Model Number: Bbbbcdddeff

Example: B048F480T30

B = B

| BCM (Buss converter module) | |
|------------------------------------|--------------|
| B | Standard BCM |

bbb = 048

| INPUT VOLTAGE | |
|----------------------|----------------|
| 048 | 48 Vdc (38-55) |

c = F

| Package Size | In Board BGA | On Board J-Lead | Through Hole |
|---------------------|---------------------|------------------------|---------------------|
| FULL VIC | K | F | T |

ddd = 480

| Output Voltage Designator | | | |
|----------------------------------|---------|-----|--------|
| 010 | 1.0 Vdc | 120 | 12 Vdc |
| 015 | 1.5 Vdc | 160 | 16 Vdc |
| 030 | 3.0 Vdc | 180 | 18 Vdc |
| 040 | 4.0 Vdc | 240 | 24 Vdc |
| 060 | 6.0 Vdc | 320 | 32 Vdc |
| 080 | 8.0 Vdc | 360 | 36 Vdc |
| 096 | 9.6 Vdc | 480 | 48 Vdc |

e = T

| PRODUCT GRADE | |
|----------------------|-------------|
| T | -40 to 125C |
| M | -55 to 125C |

ff = 30

| OUTPUT POWER DESIGNATOR | |
|--------------------------------|-------|
| 12 | 120 W |
| 14 | 140 W |
| 17 | 170 W |
| 20 | 200 W |
| 21 | 210 W |
| 24 | 240 W |
| 30 | 300 W |

VI CHIP BCM2 Model Number: BCMbbbccdddefffxzz

Example: BCM48BF240T300A00

BCM = Constant

| BCM Family (Buss Converter Module) | |
|---|------------------|
| BCM | Standard version |
| MBCM | Mil-COTS version |

bbb = 48B

| Input Voltage | Nominal (range) |
|----------------------|------------------------|
| 48B | 48 Vdc (38-55) |
| 48C | 48 Vdc (42-53) |
| 48D | 48 Vdc (38-60) |

c = F

| PACKAGE SIZE AND LEAD DESIGNATOR | |
|---|--------------------------|
| F | Full VI Chip J-Lead |
| T | Full VI Chip Though-hole |

ddd = 240

| Output Voltage Designator (can be any three digits from 010 to 480) | | | |
|--|---------|------------|--------|
| Vout = (designator / 10), non-inclusive list of examples below | | | |
| 010 | 1.0 Vdc | 120 | 12 Vdc |
| 015 | 1.5 Vdc | 160 | 16 Vdc |
| 030 | 3.0 Vdc | 180 | 18 Vdc |
| 040 | 4.0 Vdc | 240 | 24 Vdc |
| 060 | 6.0 Vdc | 320 | 32 Vdc |
| 080 | 8.0 Vdc | 360 | 36 Vdc |
| 096 | 9.6 Vdc | 480 | 48 Vdc |

e = T

| PRODUCT GRADE | |
|----------------------|-------------|
| T | -40 to 125C |
| M | -55 to 125C |

fff = 300

| Output Power Designator (can be any three digits from 120 to 300) | | | |
|--|-------|------------|-------|
| non-inclusive list of examples below | | | |
| 120 | 120 W | 210 | 210 W |
| 140 | 140 W | 240 | 240 W |
| 170 | 170 W | 300 | 300 W |
| 200 | 200 W | | |

x = A

| Revision (non-safety related) | |
|--------------------------------------|----------------------------|
| x | Any alphanumeric character |

zz = 00

| Customer reference (non-safety related) | |
|--|----------------------------|
| zz | Any alphanumeric character |