

## UL TEST REPORT AND PROCEDURE

<b>Standard:</b>	UL 60950-1, 2nd Edition, 2011-12-19 (Information Technology Equipment - Safety - Part 1: General Requirements) CAN/CSA C22.2 No. 60950-1-07, 2nd Edition, 2011-12 (Information Technology Equipment - Safety - Part 1: General Requirements)
<b>Certification Type:</b>	Component Recognition
<b>CCN:</b>	QQGQ2, QQGQ8 (Power Supplies for Information Technology Equipment Including Electrical Business Equipment)
<b>Product:</b>	DC/DC Converter
<b>Model:</b>	High Current VTM Model VIV00wwxFy
<b>Rating:</b>	See Enclosure Miscellaneous for model suffix details. VIV00wwxFy Input:40Vdc (26-55) Output: 1.0 Vdc Power: 150A Max.
<b>Applicant Name and Address:</b>	VICOR CORP 25 FRONTAGE RD ANDOVER MA 01810-5424 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 UL LLC ('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.

The applicant is authorized to reproduce the referenced Test Report provided it is reproduced in its entirety.

UL authorizes the applicant to reproduce the latest pages of the referenced Test Report consisting of the first page of the Specific Technical Criteria through to the end of the Conditions of Acceptability.

Any information and documentation involving UL Mark services are provided on behalf of UL LLC (UL) or any authorized licensee of UL.

Prepared by: Hong Ung

Reviewed by: Dean Baker

### **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 VI Chip High Current VTM series of DC-DC converters are designed for Building-in. The input to the VIV00wwwFy is intended to be supplied from a SELV or other non-hazardous secondary circuit.

The High Current VTM model numbers VIZ0026x, VIZ0027x, VIZ0056x, VIZ0057x, VIZ0063x, and VIZ0064x converters provide Functional Insulation from Input to Output. The output can be considered SELV if the input is SELV.

The High Current VTM model numbers VIZ0037x, VIZ0038x, VIZ0059x, VIZ0060x, VIV0005xFy, VIV0007xFy and all VTM2 models provide Basic Insulation from Input to Output with 1500 Vdc of dielectric withstand.

Customer special model numbers VIZ0026x, VIZ0027x, VIZ0056x, VIZ0057x, VIZ0063x, VIZ0064x are mounted on an interposer PCB and include additional SELV circuitry.

### **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 : 40Vdc(26-55) VTM3 (26-60)
- Tested for IT power systems : No
- IT testing, phase-phase voltage (V) : -
- Class of equipment : Class III (supplied by SELV) VTM3 not classified
- Considered current rating of protective device as part of the building installation (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<sub>ma</sub>) permitted by the manufacturer's specification of: max. case temperature of 125°C.
- The product is intended for use on the following power systems: DC mains supply

### Engineering Conditions of Acceptability

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

- The following Production-Line tests are conducted for this product: Electric Strength
- The following secondary output circuits are SELV: All
- The following secondary output circuits are at non-hazardous energy levels: All
- The investigated Pollution Degree is: 2
- Input Voltage: Both a nominal input voltage and an input voltage range are specified. Operation over the entire range was evaluated
- Max Temperature: See de-rating curve for 1323 VTM3. For VTM1 / VTM2/0623 VTM3. Keep the maximum semiconductor junction temperature of the VI Chip at 125°C or less. There are 3 methods to achieve this condition: Method 1: Monitor Case Temp. Keep Tcasemax 100°C or below when operating the VIV0005TFJ at 130A or less Keep Tcasemax 100°C or below when operating the VIV0007TFJ at 115A or less Tcasemax is the maximum case temperature of the VI Chip Method 2: Calculate Keep Tcasemax equal to or below  $125^{\circ}\text{C} - (P_{\text{dissmax}} \times 1.5)$  under all conditions where  $P_{\text{dissmax}} = P_{\text{input\_max}} - P_{\text{output\_max}}$ .  $P_{\text{dissmax}}$  is the amount of power in Watts dissipated within the device. The thermal resistance of the VI Chip from the internal semiconductor junction to the case is 1.5 °C/W Method 3: Cold plate application Keep Tcasemax 50°C or below when operating the VIV0005TFJ between 130A and 150A. Keep Tcasemax 50°C or below when operating the VIV0007TFJ between 115A and 130A. Tcasemax is the maximum case temperature of the VI Chip
- Over temperature: If the max. rated temperature is exceeded the unit may be damaged
- The VIV00wwxFy series of DC-DC converters are non-isolating. The output can be considered SELV if the input is SELV.
- The VIV00wwxFy series of DC-DC converters provide 2250 Vdc of insulation from Input / Output to the Case.
- Fusing Requirements: VTM1 and VTM2. The High Current VTM and VTM2 series of DC-DC converters were evaluated with Littelfuse Nano<sup>2</sup> SMD fuse rated 10A / 125Vdc. The fuse may be replaced by an external current limiting circuit to be evaluated in the end product. VTM3 overcurrent protection to be evaluated in the end product.
- The VIZ0026x, VIZ0027x, VIZ0056x, VIZ0057x, VIZ0063x, VIZ0064x include a current limiting circuit on the interposer PCB, external to the VI Chip, and do not require external fusing.
- The High Current VTM model numbers VIZ0026x, VIZ0027x, VIZ0056x, VIZ0057x, VIZ0063x, VIZ0064x, and VTM3 converters provide Functional Insulation from Input to Output. The output can be considered SELV if the input is SELV.
- The High Current VTM model numbers VIZ0037x, VIZ0038x, VIZ0059x, VIZ0060x, VIV0005xFy, VIV0007xFy and all VTM2 models provide Basic Insulation from Input to Output with 1500 Vdc of dielectric withstand.

**VI Chip High Current VTM1 series of DC-DC Converters Model Matrix: VIV00wwxFy**

VI =	Constant, VI Chip
------	-------------------

V =	VTM (Voltage Transformation Module)
-----	-------------------------------------

00 =	Constant
------	----------

ww = defines electrical ratings			
Model	Vin Nom (range)	Vout (Nom)	Iout
05	40 (26-55)	1.0	130A / 150A*
07	48 (26-55)	1.5	115A / 130A*

\* Special cooling required. See license conditions.

x =	Product Grade	Temp Range
T	Telecom	-40 to 125 C

F =	Constant, Full VIC Package Size
-----	---------------------------------

y =	Output Lead Designator
J	J-Lead
T	Through-Hole

**Customer Special Model Numbers**

Customer Special Model Numbers	Equivalent Standard Model Number
VIZ0026, VIZ0026x	VIV0005TFJ
VIZ0027, VIZ0027x	VIV0007TFJ
VIZ0037, VIB0037x	VIV0005TFJ
VIZ0038, VIZ0038x	VIV0007TFJ
VIZ0056, VIZ0056x	VIV0005TFJ
VIZ0057, VIZ0057x	VIV0007TFJ
VIZ0059, VIZ0059x	VIV0005TFJ
VIZ0060, VIZ0060x	VIV0007TFJ
VIZ0063, VIZ0063x	VIV0005TFJ
VIZ0064, VIZ0064x	VIV0007TFJ

x = revision, any letter A through Z, non-safety related

**Example part numbers:**

VIV0005TFJ, VIV0007TFJ, VIZ0026, VIZ0027, VIZ0037, VIZ0038, VIZ0056, VIZ0057, VIZ0059, VIZ0060, VIZ0063, VIZ0064

**VI Chip High Current VTM2 series of DC-DC Converters Model Matrix: VTMbbbcddefffxzz**

Example: VTM48EF015T115A00

VTM = Constant

VTM Family (Voltage Transformation Module)	
VTM	Standard version
MVTM	Mil-COTS version

bbb = 48E

Input Voltage	Nominal (range)
48E	48 Vdc (26-55)

c = F

Package Size / Lead Designator	
F	Full VI Chip J-Lead
T	Full VI Chip Though-hole

ddd = 015

Output Voltage Designator			
010	1.0 Vdc	013	1.3 Vdc
011	1.1 Vdc	014	1.4 Vdc
012	1.2 Vdc	015	1.5 Vdc

e = T

Product Grade	
T	-40 to 125C
M	-55 to 125C

fff = 115

Output Current Designator	
115	115A / 130A*
130	130A / 150A*

\* Special cooling required. See license conditions.

x = A

Revision (non-safety related)	
x	Any alphanumeric character

zz = 00

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

**VI Chip Panel Mold High Current VTM3 Model Matix: VTMbbbccddeffxyz**

Example: VTM48KP020T088AA1

VTM = Constant

VTM Family (Voltage Transformation Module)	
VTM	Standard version
MVTM	Mil-COTS version

bbb = 48K

Input Voltage	Nominal (range) (Type)
48R	48 Vdc (0-52)
48K	48 Vdc (0-55)
48M	48 Vdc (0-60)
48L	48 Vdc (26-60)

c = P

Package Type and Lead designator	
P	Panel Mold Through-hole
R	Panel Mold SMT
N / L	Lead-less

ddd = 020

Output Voltage Designator			
010	0.88 Vdc (0.40-1.25)	020	1.8 Vdc (1.0-2.3)
015	1.5 Vdc (0-1.64)		

e = T

Product Grade			
T	-40 to 125°C	C	0 to 100°C
M	-55 to 125°C		

fff = 088

Output Current Designator (Any 3 digit number up to 107, non-exclusive list of examples below)			
050	50 A	095	95 A
076	76 A	100	100 A
088	88 A	107	107 A*
*See attached de-rating curve			

x = A

Revision (non-safety related)	
x	Any alphanumeric character

y = A

Package Size			
A	1323 / 2313	G	0823 / 2308
B	0623 / 2306		

z = 0

Functionality (non-safety related), any alphanumeric character non-inclusive list of examples	
0	No communication
1	Communication enabled
R	Reversible

