

CERTIFICATE OF COMPLIANCE

Certificate Number 20131231-E135493
Report Reference E135493-A22-UL
Issue Date 2013-DECEMBER-31

Issued to: VICOR CORP
25 FRONTAGE RD
ANDOVER MA 01810

**This is to certify that
representative samples of**

COMPONENT - POWER SUPPLIES, INFORMATION
TECHNOLOGY EQUIPMENT INCLUDING ELECTRICAL
BUSINESS EQUIPMENT



DC/DC Converter: Model VI Chip High Voltage Panel Mold
DCM Series

Have been investigated by UL in accordance with the
Standard(s) indicated on this Certificate.

Standard(s) for Safety: UL 60950-1 and CSA C22.2 No. 60950-1-07 Information
Technology Equipment - Safety - Part 1: General
Requirements

Additional Information: See the UL Online Certifications Directory at
www.ul.com/database for additional information

Only those products bearing the UL Recognized Component Marks for the U.S. and Canada should be considered as being covered by UL's Recognition and Follow-Up Service and meeting the appropriate U.S. and Canadian requirements.

The UL Recognized Component Mark for the U.S. generally consists of the manufacturer's identification and catalog number, model number or other product designation as specified under "Marking" for the particular Recognition as published in the appropriate UL Directory. As a supplementary means of identifying products that have been produced under UL's Component Recognition Program, UL's Recognized Component Mark: , may be used in conjunction with the required Recognized Marks. The Recognized Component Mark is required when specified in the UL Directory preceding the recognitions or under "Markings" for the individual recognitions. The UL Recognized Component Mark for Canada consists of the UL Recognized Mark for Canada:  and the manufacturer's identification and catalog number, model number or other product designation as specified under "Marking" for the particular Recognition as published in the appropriate UL Directory.

Recognized components are incomplete in certain constructional features or restricted in performance capabilities and are intended for use as components of complete equipment submitted for investigation rather than for direct separate installation in the field. The final acceptance of the component is dependent upon its installation and use in complete equipment submitted to UL LLC.

Look for the UL Recognized Component Mark on the product.



William R. Carney, Director, North American Certification Programs

UL LLC

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UL TEST REPORT AND PROCEDURE

Standard:	UL 60950-1, 2nd Edition, 2014-10-14 (Information Technology Equipment - Safety - Part 1: General Requirements) CAN/CSA C22.2 No. 60950-1-07, 2nd Edition, 2014-10 (Information Technology Equipment - Safety - Part 1: General Requirements)
Certification Type:	Component Recognition
CCN:	QQGQ2, QQGQ8 (Power Supplies for Information Technology Equipment Including Electrical Business Equipment)
Product:	DC/DC Converter
Model:	VI Chip High Voltage Panel Mold DCM Series See Miscellaneous Enclosure for model matrix.
Rating:	Rated Input Voltage: 290 Vdc Rated Output Voltage: 13.8 Vdc Rated Output Power: 600W max or 690W in Array. See Miscellaneous Enclosure for model matrix.
Applicant Name and Address:	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.

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Prepared by: Mengis Tesfay

Reviewed by: Scott Shepler - Reviewer

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 Panel Mold high voltage 4623 DCM family of DC-DC converters are designed for building-in.

Model Differences

See Miscellaneous Enclosure for model nomenclature

Technical Considerations

- Equipment mobility : for building-in
- Connection to the mains : not directly connected to the mains
- Operating condition : continuous
- Access location : for 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 : for building-in (reinforced insulation provided)
- Considered current rating of protective device as part of the building installation (A) : N/A
- Pollution degree (PD) : PD 2
- IP protection class : IP X0
- Altitude of operation (m) : <5000
- Altitude of test laboratory (m) : <2000
- Mass of equipment (kg) : 0.03
- See de-rating curves for maximum output power, case temperature, and input voltage.
- MNL = 600W for a single chip, MNL = 690W per chip when used in an Array

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 DCMs were evaluated with a Bussmann 5A PC-Tron fuse and an 8A Littelfuse 487 series.
- The output is separated from the input by reinforced insulation.
- 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: Input to Output: 300 Vrms, 420 Vpk
- The following secondary output circuits are SELV: All
- The following secondary output circuits are at hazardous energy levels: All
- The investigated Pollution Degree is: 2
- The following end-product enclosures are required: Mechanical/, Fire, /Electrical
- A copy of this pertinent information is attached to this Test Reference.
- See de-rating curves for maximum output power, chip temperature, and input voltage. The de-rating curves represent the maximum operating conditions for the product family.
- Max Output: The DCM has a MNL of 600W as a standalone device or up to 690W when used in an array.

Additional Information

Testing of the DC-DC Converter, The Panel Mold high voltage 4623 DCM family was not considered necessary to update the report to include the following per acceptance of CB scheme conversion. The CB Scheme Test Certificate and Report Ref. No. 72130516-000, and CB certification number DE 3 - 502884 dated 2018-04-16 was prepared by TÜV SUD America, Inc., 10 Technology Drive, Peabody MA 01960, USA.

Testing of the DC-DC Converter, The Panel Mold high voltage 4623 DCM family was not considered necessary based upon previous evaluation under the CB scheme. The CB Scheme Test Certificate DE 3 - 502088 and Report Ref. No. DI1407756-300 dated 2016-09-26 was prepared by TÜV SUD Product Service GmbH, Ridlerstr. 65, D-80339 Munich, Germany.

Markings and instructions

Clause Title	Marking or Instruction Details
1.7.1 Power rating - Company identification	Listee's or Recognized company's name, Trade Name, Trademark or File Number
1.7.1 Power rating - Model	Model Number

Special Instructions to UL Representative

Optional - UR logo may appear on packaging.

High voltage panel mold DCM Model Matrix: DCMbbbwwdddeffxyz

Example: DCM290P138T600A41

DCM = Constant

DCM Family Converter Module	
DCM	Standard version
MDCM	MIL-COTS version

bbb = 290

Nominal Input Voltage (Maximum Voltage Range)							
120	120V (90-150)	210	210V (140-310)	290	290V (160-420)	380	380V (340-420)
175	200V (90-260)	270	270V (160-420)	300	300V (180-420)		
255	210V (90-420)	275	275V (120-420)	360	360V (300-420)		

w = P

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

ddd = 138

Output Voltage Designator, Vout = Designator / 10, any 3 digit number from 000 to 540. Non-inclusive list of examples below.					
033	3.3V	138	13V	280	28V
050	5V	150	15V	420	42V
090	9V	220	22V	480	48V
120	12V	240	24V	528	52.8V

e = T

Product Grade	
T	-40 to 125C
M	-55 to 125C
C	0 to 85C

fff = 600

Output Power, any 3 digit number from 000 – 600. Non-inclusive list of examples below.							
100	100W	250	250W	400	400W	500	500W
150	150W	375	375W	450	450W	600	600W

x = A

Revision (non-safety related)	
x	Any alphanumeric character

y = 4

Package Size	
4	4623

z = 1

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

Alternate: High voltage panel mold DCM Model Matrix: DCM4623cddewwxyzz

Example: DCM4623TD2G53F0T01

DCM = Constant

Product Function	
DCM	DC-DC Converter Module

4623 = Constant

Package Size (mm)	
4623	46 x 23

c = T

Lead Designator			
T	Through-Hole	L / N	Leadless

dd = D2

Maximum Input Voltage = 1 st character + 2 nd character (see table below, not to exceed 420V)							
1 st character		2 nd character					
A	100V	0	0 V	4	40 V	8	80 V
B	200V	1	10 V	5	50 V	9	90 V
C	300V	2	20 V	6	60 V		
D	400V	3	30 V	7	70 V		
Examples: D2 = 420V (400V+20V), B1 = 210 (200V+10V), A2 = 120V (100V+20V)							

e = G

Range Ratio (Vin high / Vin low, defines low line)							
A	1.10	G	1.95	N	3.45	U	6.12
B	1.21	H	2.14	P	3.80	V	6.73
C	1.33	J	2.36	Q	4.18	W	7.40
D	1.46	K	2.59	R	4.60	X	8.14
E	1.61	L	2.85	S	5.05	Y	8.95
F	1.77	M	3.14	T	5.60	Z	9.85

ww = 53

Maximum Output Voltage including trim (any 2 digits up to 60), non-inclusive list of examples			
04	4Vdc (3.3V nominal +10% trim)	26	26Vdc (24V nominal +10% trim)
06	6Vdc (5V nominal +10% trim)	31	31Vdc (28V nominal +10% trim)
13	13Vdc (12V nominal +10% trim)	53	53Vdc (48V nominal +10% trim)
17	17Vdc (15V nominal + 10 trim)		

xx = F0

Maximum Output Power = 1 st character + 2 nd character (see table below, not to exceed 600W)					
1 st character		2 nd character			
A	100 W	0	0 W	5	50 W
B	200 W	1	10 W	6	60 W
C	300 W	2	20 W	7	70 W
D	400 W	3	30 W	8	80 W
E	500 W	4	40 W	9	90 W
F	600 W				
Examples: F0 = 600W (600W+0W), D0 = 400W (400W+0W), B5 = 250W (200W+50W), A5 = 150W (100W+50W)					

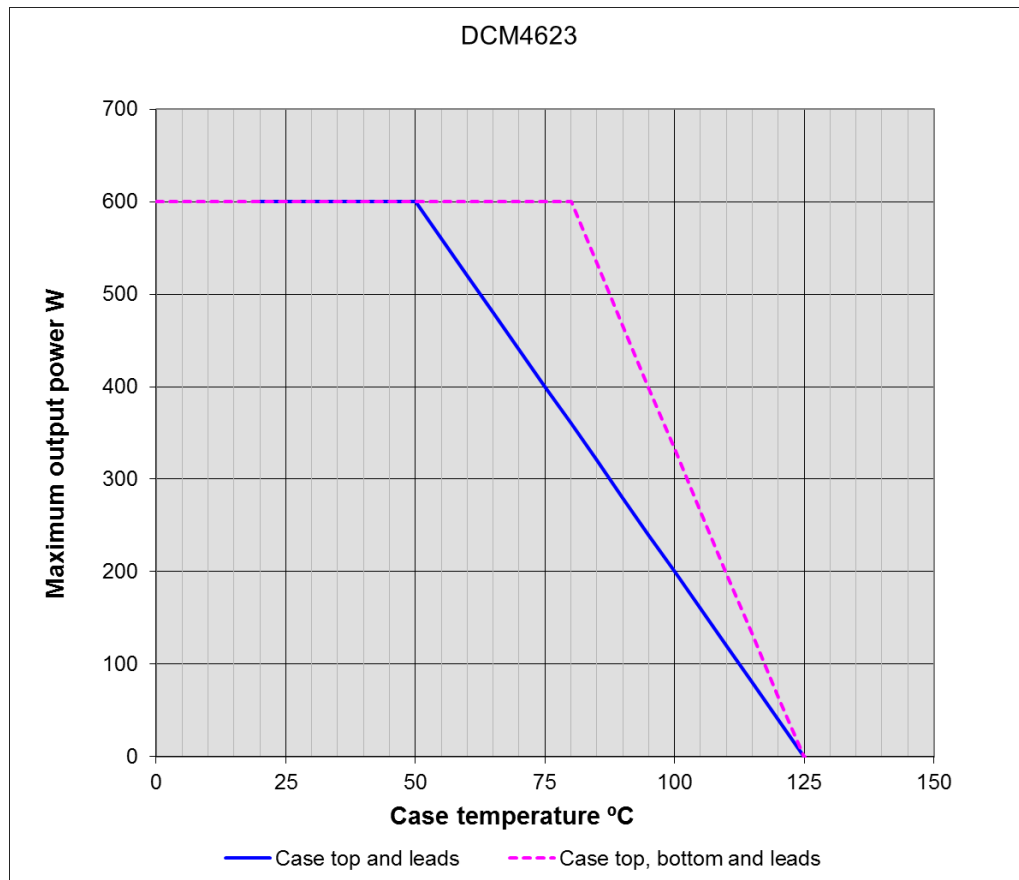
y = T

Product Grade	
C	-20 to 100°C
T	-40 to 100°C
M	-55 to 100°C

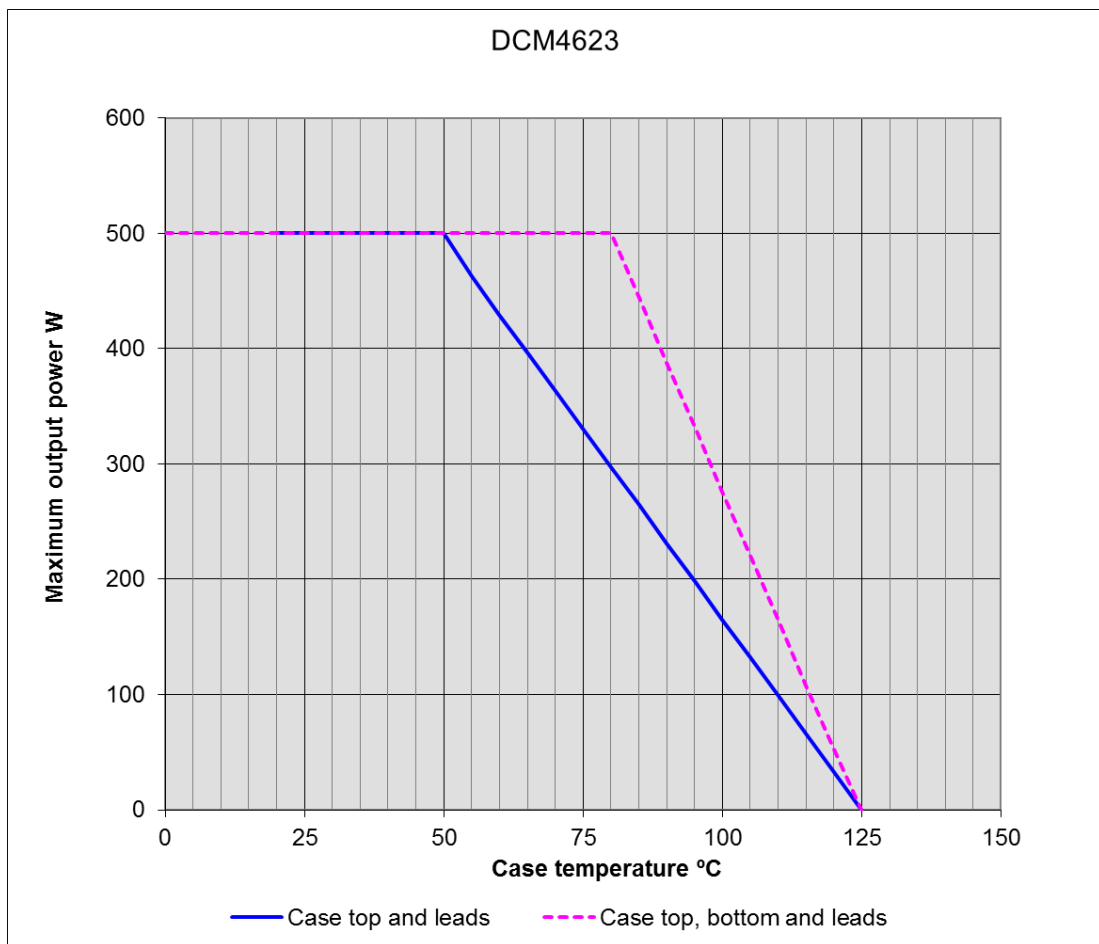
zz = 01

Options (non-safety related), any alphanumeric combination, non-inclusive list of examples below	
00	Analog Communication
01	Digital Communication

600W Special Model Numbers			
Model Number	DCM4623xC8G16F0yzz	Vout	13.8Vdc (nom)
Input Voltage	160 - 199 Vdc / 377 - 420 Vdc	Pout	500W
Input Voltage	200 - 378 Vdc	Pout	600W
Model Number	DCM4623xD2H26F0yzz	Vout	24.0Vdc (nom)
Input Voltage	200 - 420 Vdc	Pout	600W



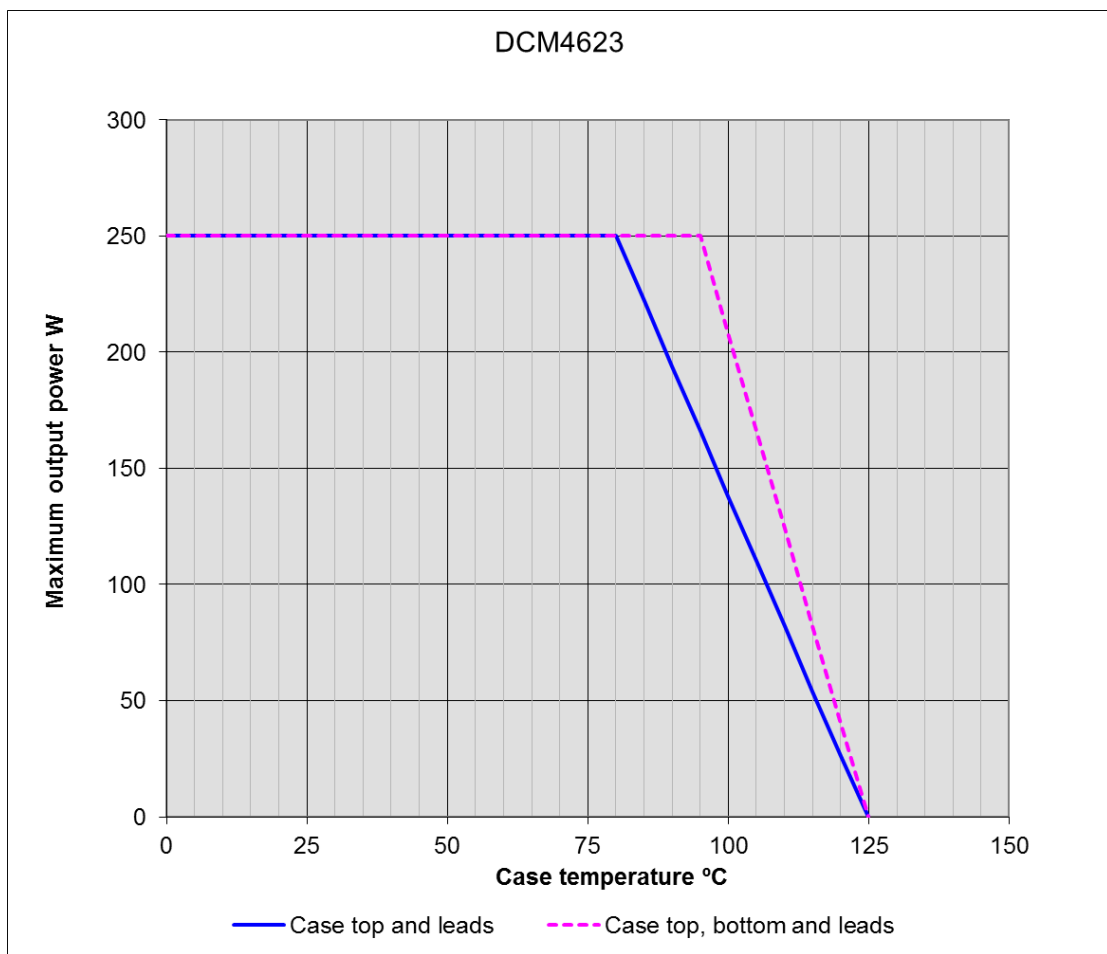
Power vs. Temperature	
Input Voltage	160 - 420 Vdc (Max)
Output Voltage	$V_{out} \geq 12$ Vdc (Nom)
Output Power	500W (Max)
Model Variants: The Input Voltage range may be narrowed and Output Power may be reduced.	



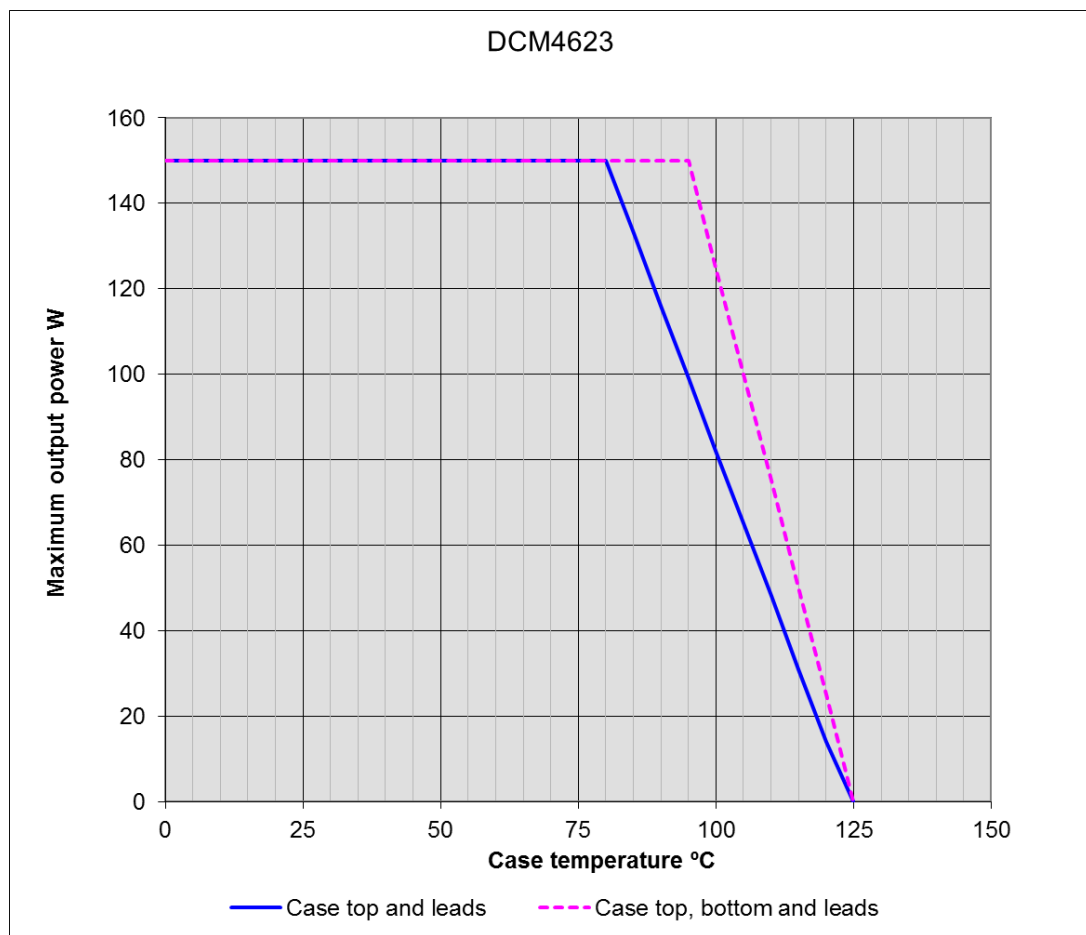
Customer Special: Denotes operation other than reduced Pout or narrow Vin.

Model DCM4623TD2K28E0yAA is rated 100W from 120-160V, 85C/50C DS/SS cooling, standard operation 160-420V.

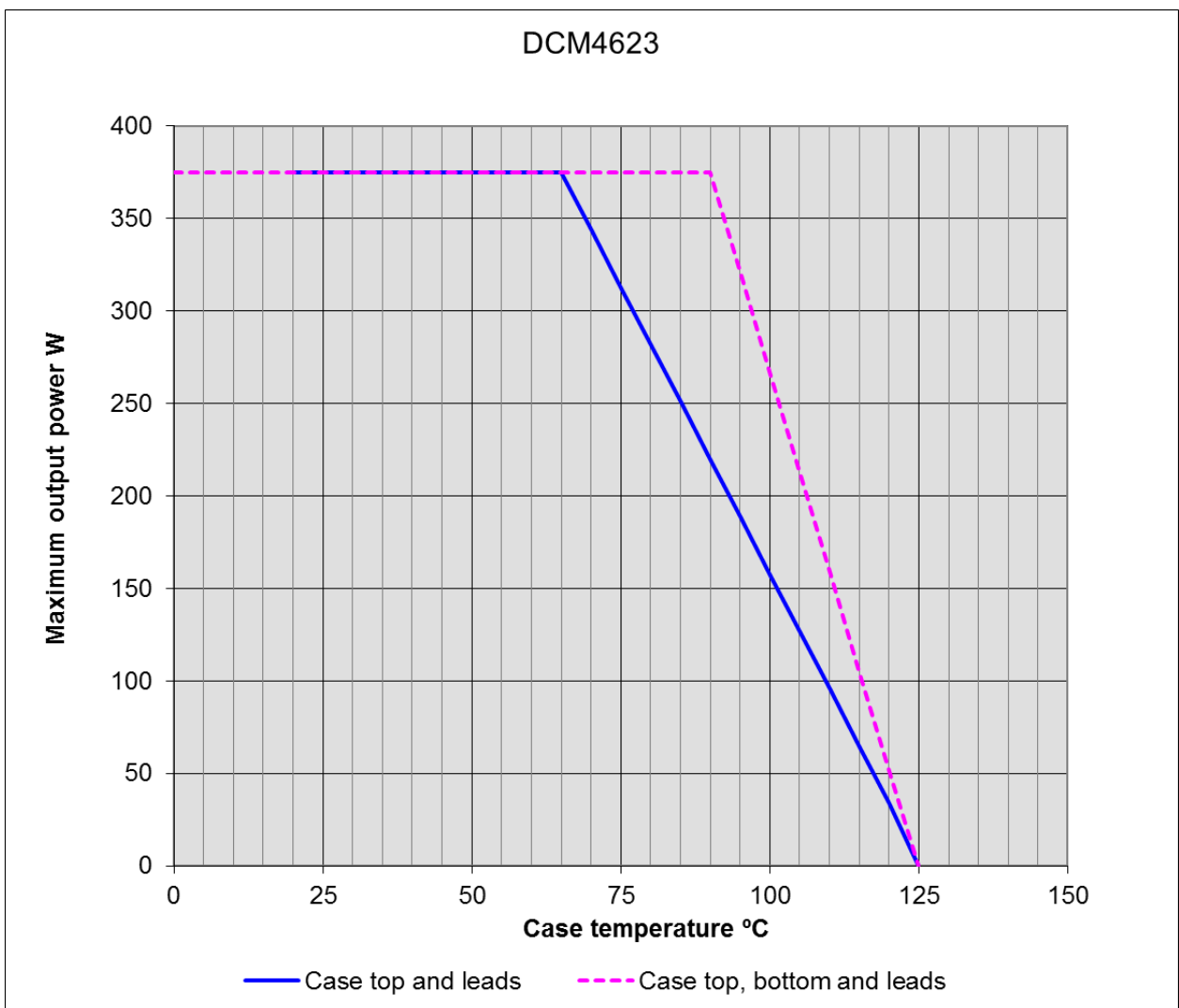
Power vs. Temperature	
Input Voltage	160 - 420 Vdc (Max)
Output Voltage	12 Vdc > Vout ≥ 5 Vdc (Nom)
Output Power	250W (Max)
Model Variants: The Input Voltage range may be narrowed and Output Power may be reduced.	



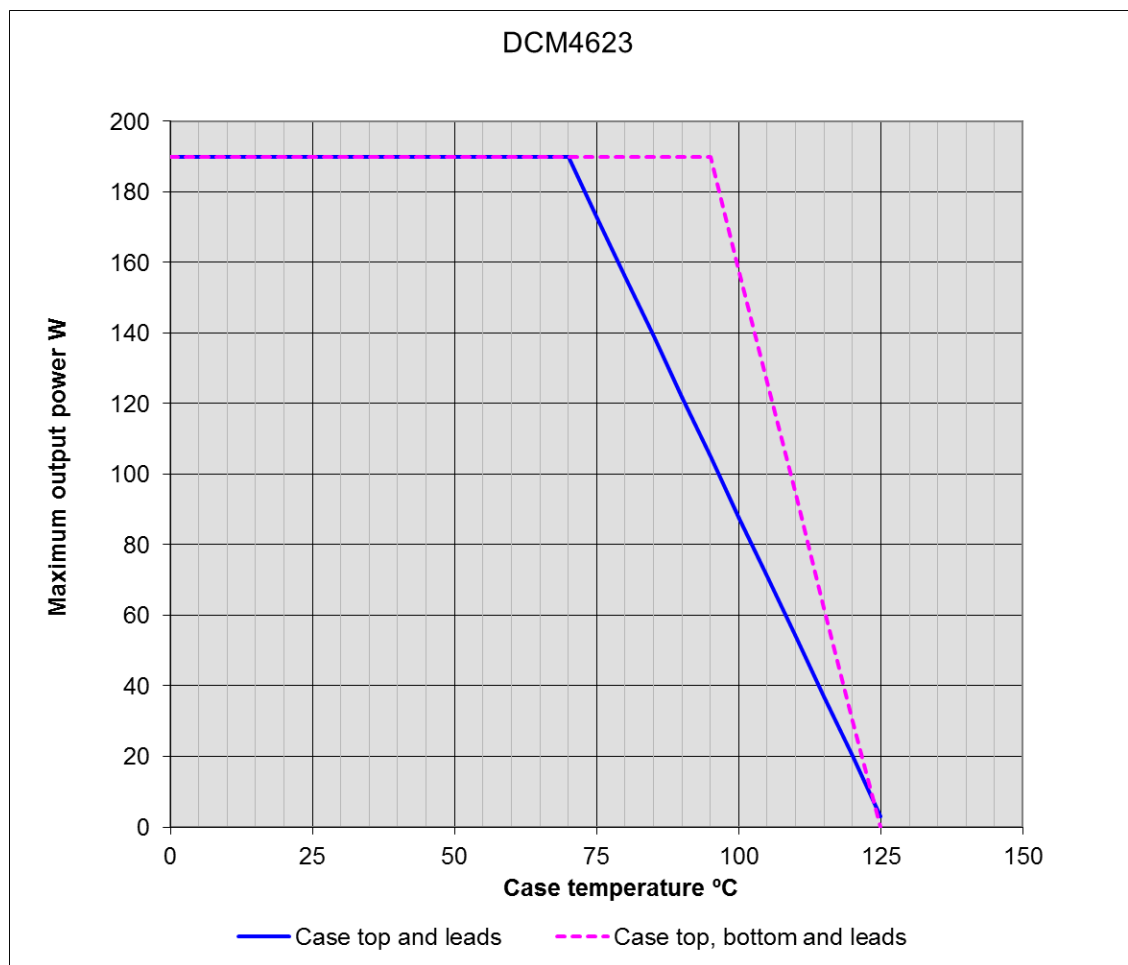
Power vs. Temperature	
Input Voltage	160 - 420 Vdc (Max)
Output Voltage	Vout < 5 Vdc (Nom)
Output Power	150W (Max)
Model Variants: The Input Voltage range may be narrowed and Output Power may be reduced.	



Power vs. Temperature	
Input Voltage	120 - 420 Vdc (Max)
Output Voltage	$V_{out} \geq 12$ Vdc (Nom)
Output Power	375W (Max)
Model Variants: The Input Voltage range may be narrowed and Output Power may be reduced. Example: $V_{in} = 140 - 360V$, $P_{out} = 375W$.	



Power vs. Temperature	
Input Voltage	120 - 420 Vdc (Max)
Output Voltage	12 Vdc > Vout ≥ 5 Vdc (Nom)
Output Power	190W (Max)
Model Variants: The Input Voltage range may be narrowed and Output Power may be reduced.	



Power vs. Temperature	
Input Voltage	120 - 420 Vdc (Max)
Output Voltage	Vout < 5 Vdc (Nom)
Output Power	110W (Max)
Model Variants: The Input Voltage range may be narrowed and Output Power may be reduced.	

