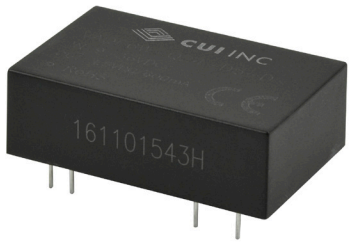
SERIES: VAQE6W-D | **DESCRIPTION:** DC-DC CONVERTER

FEATURES

- industry standard footprint
- high efficiency up to 88%
- single and dual output models available
- board mount
- 3000 Vdc isolation
- industrial operating temp -40~+85 °C
- 4:1 wide input range
- input under voltage protection & over voltage protection
- over current protection
- EN/BS EN 62368-1

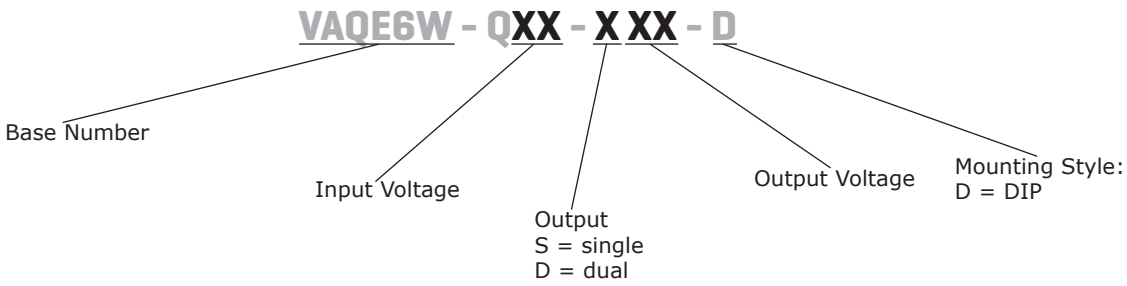


MODEL

MODEL	input voltage		output voltage	output current		output power	ripple & noise[1]	efficiency[2]
	typ (Vdc)	range (Vdc)	(Vdc)	min (mA)	max (mA)	max (W)	max (mVp-p)	typ (%)
VAQE6W-Q24-S3-D[3]	24	9~36	3.3	0	1500	4.95	120	79
VAQE6W-Q24-S5-D[3]	24	9~36	5	0	1200	6	120	82
VAQE6W-Q24-S9-D[3]	24	9~36	9	0	667	6	120	85
VAQE6W-Q24-S12-D[3]	24	9~36	12	0	500	6	120	86
VAQE6W-Q24-S15-D[3]	24	9~36	15	0	400	6	120	88
VAQE6W-Q24-S24-D[3]	24	9~36	24	0	250	6	120	87
VAQE6W-Q24-D5-D[3]	24	9~36	±5	0	±600	6	120	80
VAQE6W-Q24-D12-D[3]	24	9~36	±12	0	±250	6	120	84
VAQE6W-Q24-D15-D[3]	24	9~36	±15	0	±200	6	120	85
VAQE6W-Q48-S3-D	48	18~75	3.3	0	1500	4.95	120	79
VAQE6W-Q48-S5-D	48	18~75	5	0	1200	6	120	83
VAQE6W-Q48-S12-D	48	18~75	12	0	500	6	120	87
VAQE6W-Q48-S15-D	48	18~75	15	0	400	6	120	88
VAQE6W-Q48-S24-D	48	18~75	24	0	250	6	120	87

Notes:
1. From 5~100% load, nominal input, 20 MHz bandwidth oscilloscope, with 10 µF tantalum and 1 µF ceramic capacitors on the output. From 0~5% load, ripple and noise is <5% Vo.
2. Measured at nominal input voltage, full load.
3. Model is not CE certified.
4. All specifications are measured at Ta=25°C, humidity < 75%, nominal input voltage, and rated output load unless otherwise specified.

PART NUMBER KEY



Please read our datasheet & drawing disclaimer here.

INPUT

parameter	conditions/description		min	typ	max	units
operating input voltage	24 Vdc input models 48 Vdc input models		9 18	24 48	36 75	Vdc Vdc
start-up voltage	24 Vdc input models 48 Vdc input models				9 18	Vdc Vdc
surge voltage	for maximum of 1 second 24 Vdc input models 48 Vdc input models		 -0.7 -0.7		 50 100	 Vdc Vdc
under voltage shutdown	24 Vdc input models 48 Vdc input models		5.5 14	6.5 15.5		Vdc Vdc
current	24 Vdc input models	3.3 Vdc output models all other models			268 320	mA mA
	48 Vdc input models	3.3 Vdc output models all other models			134 154	mA mA
filter	Pi filter					
no load power consumption				0.12		W

OUTPUT

parameter	conditions/description		min	typ	max	units
maximum capacitive load[1]	3.3, 5 Vdc output models 9 Vdc output models ±12 Vdc output models ±15 Vdc output models all other models				2,200 1,000 330 220 680	µF µF µF µF µF
voltage accuracy	5% to full load			±1	±3	%
	0%~5% load	single output models dual output models		±1 ±2	±3 ±5	% %
line regulation	from low line to high line, full load positive outputs negative outputs			 ±0.2 ±0.5	 ±0.5 ±1	 % %
load regulation[2]	from 5% to full load positive outputs negative outputs			 ±0.5 ±0.5	 ±1 ±1.5	 % %
voltage balance[3]	dual output models			±0.5	±1.5	%
cross regulation	dual output models: main output 50% load secondary output from 10~100% load				±5	%
switching frequency[4]	PWM mode			300		kHz
transient recovery time	25% load step change, nominal input voltage			300	500	µs
transient response deviation	25% load step change, nominal input voltage			±3	±5	%
temperature coefficient	at full load				±0.03	%/°C

Note: 1. Tested at input voltage range and full load.
2. At 0~100% load, the max load regulation is ±5%.
3. Unbalanced loads should not exceed ±5%. If ±5% is exceeded, the product performance cannot be guaranteed.
4. Value is based on full load. At loads <50%, the switching frequency decreases with decreasing load.

PROTECTIONS

parameter	conditions/description	min	typ	max	units
over voltage protection		110		160	%
over current protection	24 Vdc output models all other models	110 110	220 140	290 190	% %
short circuit protection	continuous, self recovery				

SAFETY AND COMPLIANCE

parameter	conditions/description	min	typ	max	units
isolation voltage	input to output for 1 minute at 1 mA	3,000			Vdc
isolation resistance	input to output at 500 Vdc	1,000			MΩ
isolation capacitance	input to output, 100 kHz / 0.1 V		1,000		pF
safety approvals[5]	certified to 62368-1: EN certified to 60950-1: UL				
conducted emissions	CISPR22/EN55022, class A (no external circuit); class B (external circuit required, see Figure 3-b or 4-b)				
radiated emissions	CISPR22/EN55022, class A (no external circuit); class B (external circuit required, see Figure 3-b or 4-b)				
ESD	IEC/EN61000-4-2, contact ±4 kV, class B				
radiated immunity	IEC/EN61000-4-3, 10 V/m, class A				
EFT/burst	IEC/EN61000-4-4, ±2 kV, class B (external circuit required, see Figure 3-a or 4-a)				
surge	IEC/EN61000-4-5, ±2 kV, class B (external circuit required, see Figure 3-a or 4-a)				
conducted immunity	IEC/EN61000-4-6, 3 Vr.m.s, class A				
voltage dips & interruptions	IEC/EN61000-4-29, 0%-70%, class B				
MTBF	as per MIL-HDBK-217F, 25°C	1,000,000			hours
RoHS	2011/65/EU				

Note: 5. See model table for specific model.

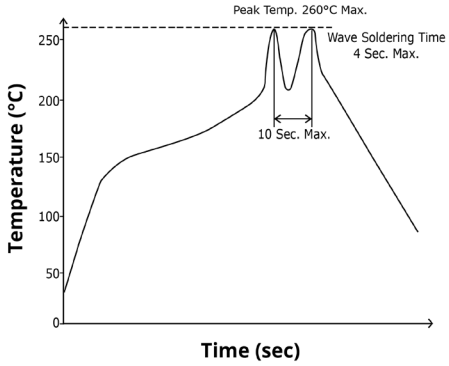
ENVIRONMENTAL

parameter	conditions/description	min	typ	max	units
operating temperature	see derating curve	-40		85	°C
storage temperature		-55		125	°C
storage humidity	non-condensing	5		95	%
vibration	10~55 Hz for 30 minutes on each axis		10		G

SOLDERABILITY

parameter	conditions/description	min	typ	max	units
hand soldering	1.5 mm from case for 10 seconds			300	°C
wave soldering	see wave soldering profile			260	°C

WAVE SOLDERING PROFILE



MECHANICAL

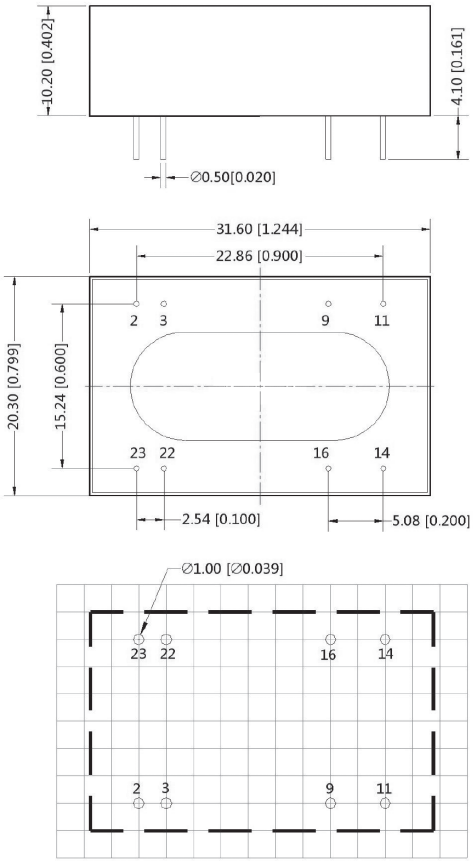
parameter	conditions/description	min	typ	max	units
dimensions	31.60 x 20.30 x 10.20 [1.244 x 0.799 x 0.402 inch]				mm
case material	black flame-retardant heat-proof plastic (UL 94-V0)				
weight			13		g

MECHANICAL DRAWING

units: mm [inch]
tolerance: ±0.50[±0.020]
pin diameter tolerance: ±0.10[±0.004]

PIN CONNECTIONS		
PIN	Function	
	Single	Dual
2, 3	GND	GND
9	No Pin	0V
11	NC	-Vout
14	+Vout	+Vout
16	0V	0V
22, 23	Vin	Vin

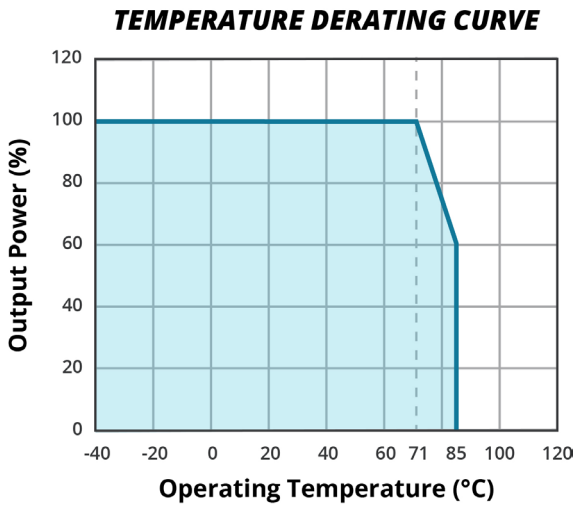
NC=no connection



Recommended PCB Layout
Top View

Note: 2.54 x 2.54 mm grid

DERATING CURVE



APPLICATION CIRCUIT

This series has been tested according to the following recommended circuits (Figures 1 & 2) before leaving the factory. If you want to further reduce the input and output ripple, you can increase the input and output capacitors or select capacitors of low equivalent impedance provided that the capacitance is less than the maximum capacitive load of the model.

Figure 1
Single Output Models

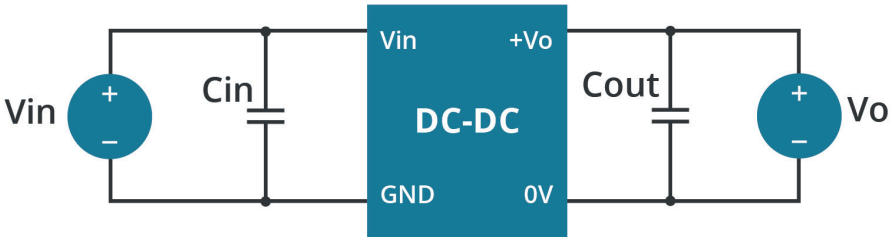


Figure 2
Dual Output Models

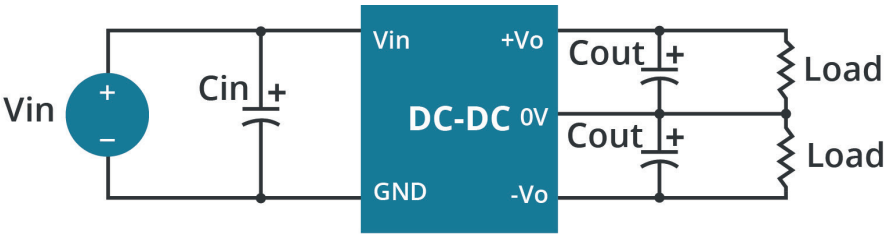


Table 1

Vin (Vdc)	Cin (µF)	Cout (µF)
24	100	10
48	10~47	10

EMC RECOMMENDED CIRCUIT

Figure 3
Single Output Models

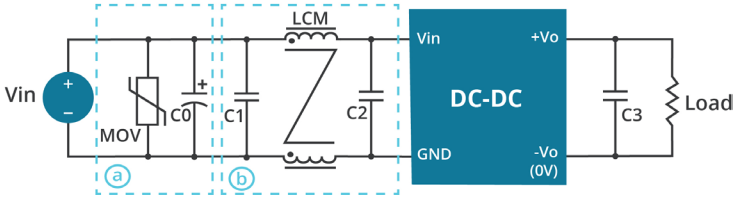


Figure 4
Dual Output Models

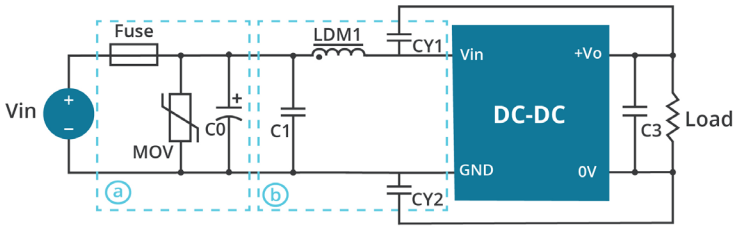


Table 2

Recommended External Circuit Components		
Vin (Vdc)	24	48
FUSE	choose according to actual input current	
MOV	S20K30	S14K60
C0	330 µF / 50 V	330 µF / 100 V
C1, C2	2.2 µF / 50 V	2.2 µF / 100 V
LCM	2.2 mH	
C3	10 µF	

Table 3

Recommended External Circuit Components	
Vin (Vdc)	24
FUSE	choose according to actual input current
MOV	S20K30
C0	1,000 µF / 50 V
C1	1 µF / 50 V
C3	10 µF
LDM1	4.7 µF
CY1, CY2	1 nF / 3 kV

REVISION HISTORY

rev.	description	date
1.0	initial release	02/20/2018
1.01	features and safety line updated, packaging removed	01/14/2021
1.02	derating curve and circuit figures updated	07/22/2021
1.03	CE certification updated for 24V models	12/16/2022

The revision history provided is for informational purposes only and is believed to be accurate.

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