



**SERIES:** VQA | **DESCRIPTION:** DC-DC CONVERTER

**FEATURES**

- designed for IGBT driver modules
- small footprint
- 3,000 Vac isolation
- short circuit protection
- temperature range (-40~105°C)
- UL 60950-1 approval
- efficiency up to 80%

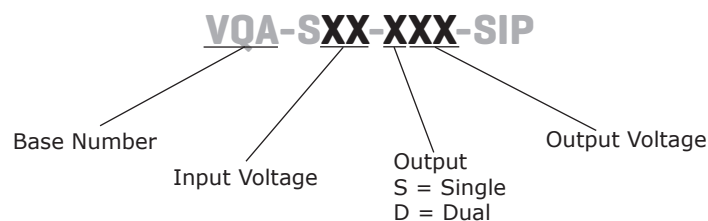


**MODEL**

MODEL	input voltage		output voltage (Vdc)	output current max (mA)	ripple and noise <sup>2</sup> max (mVp-p)	efficiency <sup>3</sup> typ (%)
	typ (Vdc)	range (Vdc)				
VQA-S9-D15-SIP <sup>1</sup>	12	9~15	15 -8	100 -80	200	80
VQA-S12-D15-SIP <sup>1</sup>	12	11.6~12.4	15 -8.7	80 -40	200	80
VQA-S15-S9-SIP	15	14.5~15.5	9	111	200	80
VQA-S15-D9-SIP	15	14.5~15.5	9 -9	55 -55	200	80
VQA-S15-D15-SIP <sup>1</sup>	15	14.5~15.5	15 -8.7	80 -40	200	80
VQA-S15-D17-SIP <sup>1</sup>	15	14.5~15.5	17 -8.7	80 -40	200	80
VQA-S24-D15-SIP <sup>1</sup>	24	23.3~24.7	15 -8.7	80 -40	200	80

Notes: 1. UL approved  
 2. Ripple and noise are measured at 20 MHz BW by "parallel cable" method with 1 μF ceramic and 10 μF electrolytic capacitors on the output.  
 3. at full load

**PART NUMBER KEY**



## INPUT

parameter	conditions/description	min	typ	max	units
input voltage	VQA-S9-D15-SIP	9	12	15	Vdc
	VQA-S12-D15-SIP	11.6	12	12.4	Vdc
	VQA-S24-D15-SIP	23.3	24	24.7	Vdc
	all other models	14.5	15	15.5	Vdc
surge voltage	VQA-S9-D15-SIP	-0.7		15	Vdc
	VQA-S12-D15-SIP	-0.7		13	Vdc
	VQA-S24-D15-SIP	-0.7		26	Vdc
	all other models	-0.7		16	Vdc
temperature coefficient	at full load			±0.03	%/°C

## OUTPUT

parameter	conditions/description	min	typ	max	units
capacitive load				200	µF
line regulation	for Vin change of ±1%		1.2	1.5	%
switching frequency	at full load, nominal input		100	200	kHz

## PROTECTIONS

parameter	conditions/description	min	typ	max	units
short circuit protection <sup>1</sup>				1	s

Notes: 1. The supply voltage must be discontinued at the end of the short circuit duration

## SAFETY AND COMPLIANCE

parameter	conditions/description	min	typ	max	units
isolation voltage	input to output for 1 minute at 1 mA max. leakage	3,000			Vac
isolation resistance	input to output at 500 Vdc	1,000			MΩ
isolation capacitance	input to output, 100 kHz/0.1 V		6.6		pF
safety approvals <sup>2</sup>	UL 60950-1				
conducted emissions	CISPR22/EN55022, class B, external circuit required (see figure 1)				
radiated emissions	CISPR22/EN55022, class B, external circuit required (see figure 1)				
ESD	IEC/EN61000-4-2, contact ±8kV, class B				
MTBF	as per MIL-HDBK-217F @ 25°C	3,500,000			hours
RoHS	2011/65/EU				

Notes: 2. See specific models listed on page 1

## ENVIRONMENTAL

parameter	conditions/description	min	typ	max	units
operating temperature	see derating curve	-40		105	°C
storage temperature		-55		125	°C
storage humidity	non-condensing			95	%

## SOLDERABILITY

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

## MECHANICAL

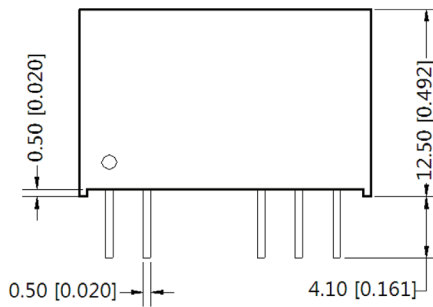
parameter	conditions/description	min	typ	max	units
dimensions	19.50 x 9.80 x 12.5 (0.768 x 0.386 x 0.492 inch)				mm
material	plastic (UL94V-0)				
weight			4.3		g
temperature rise	Ta=25°C		25		°C

## MECHANICAL DRAWING

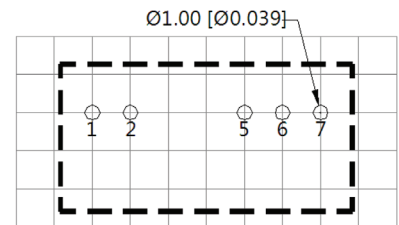
units: mm [inches]  
 tolerance: ±0.50 [±0.020]  
 pin section tolerance: ±0.10 [±0.004]

PIN CONNECTIONS	
PIN	FUNCTION
1	Vin
2	GND
5*	-Vo
6	0 V
7	+Vo

Note: \*VQA-S15-S9-SIP has no connection

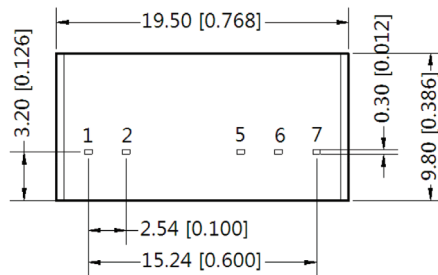


Front View



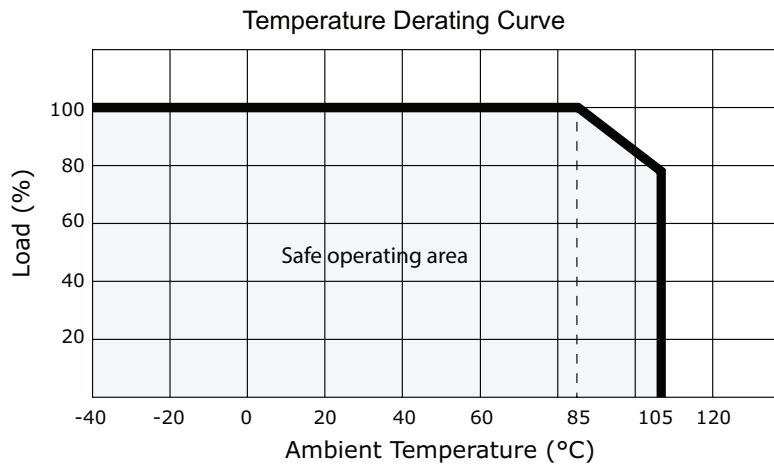
Grid size: 2.54mm x 2.54mm

Top View  
PCB LAYOUT



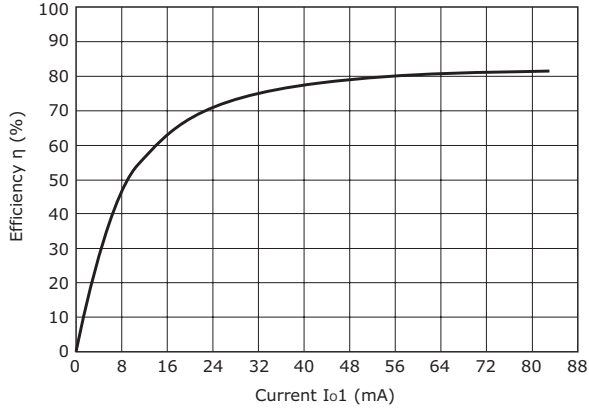
Bottom View

## DERATING CURVES



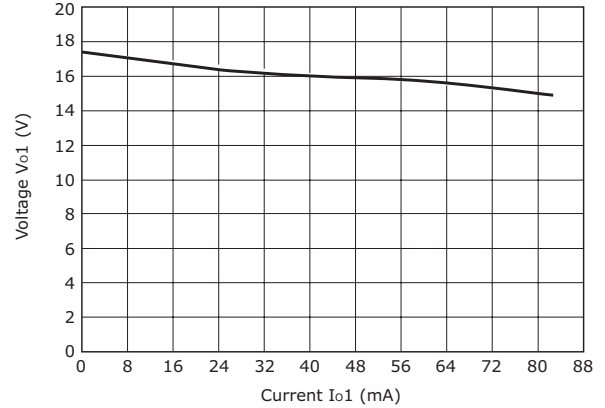
## PERFORMANCE CURVES

1. output current vs. efficiency

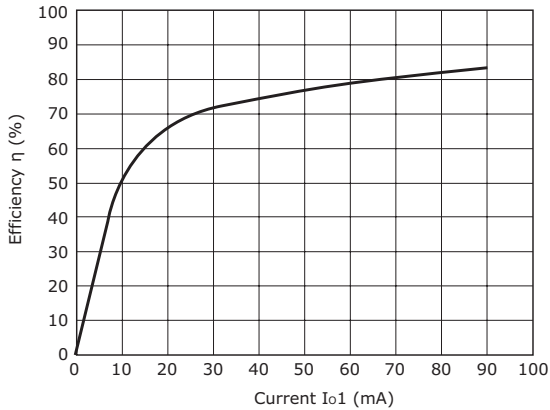


VQA-S12-D15-SIP, VQA-S15-D15-SIP, VQA-S24-D15-SIP

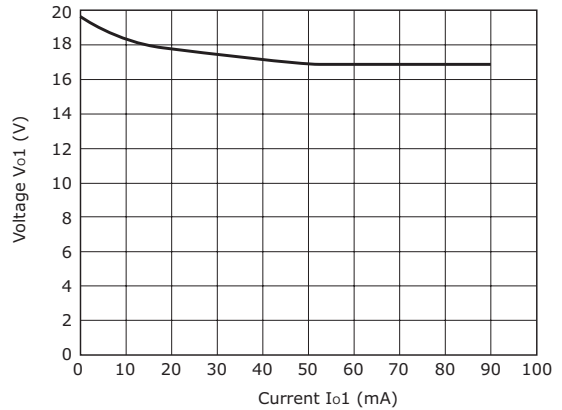
2. output current vs. output voltage



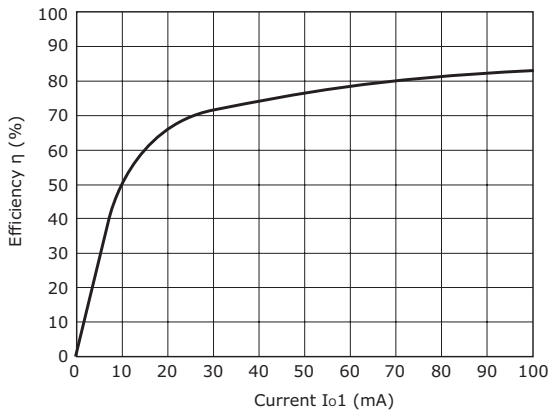
VQA-S12-D15-SIP, VQA-S15-D15-SIP, VQA-S24-D15-SIP



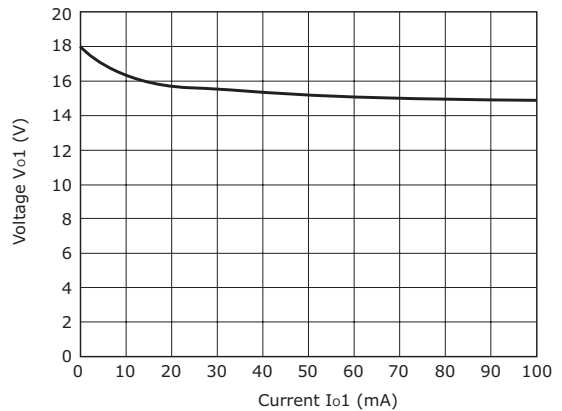
VQA-S15-D17-SIP



VQA-S15-D17-SIP



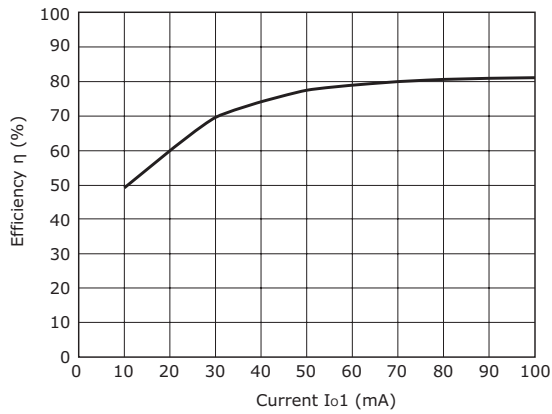
VQA-S9-D15-SIP



VQA-S9-D15-SIP

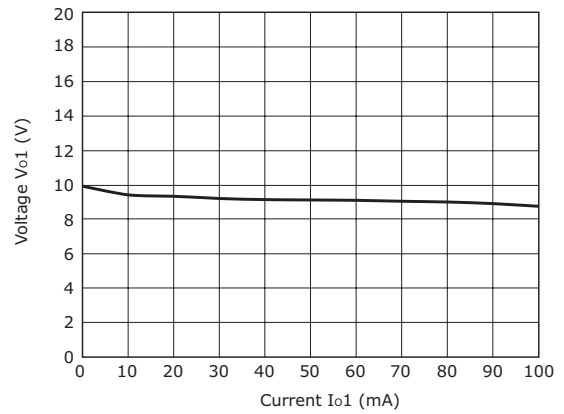
## PERFORMANCE CURVES (CONTINUED)

1. output current vs. efficiency

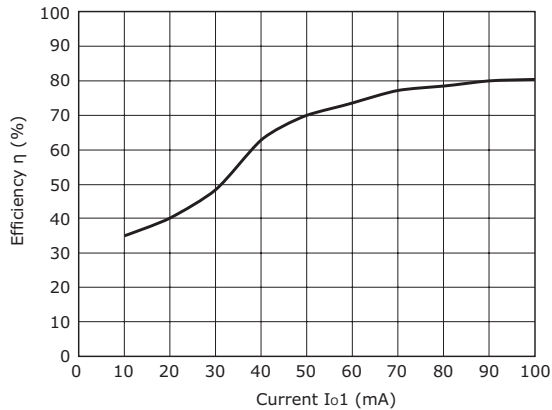


VQA-S15-S9-SIP

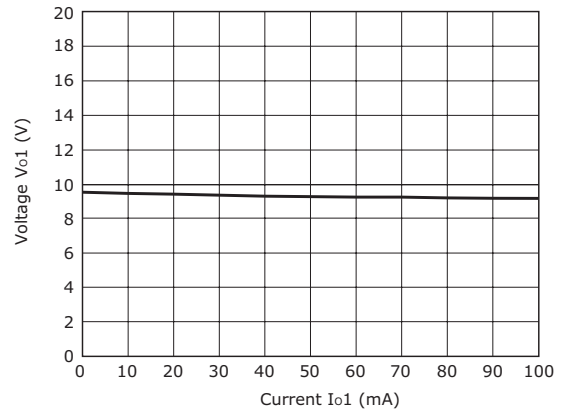
2. output current vs. output voltage



VQA-S15-S9-SIP



VQA-S15-D9-SIP



VQA-S15-D9-SIP

## EMC RECOMMENDED CIRCUIT

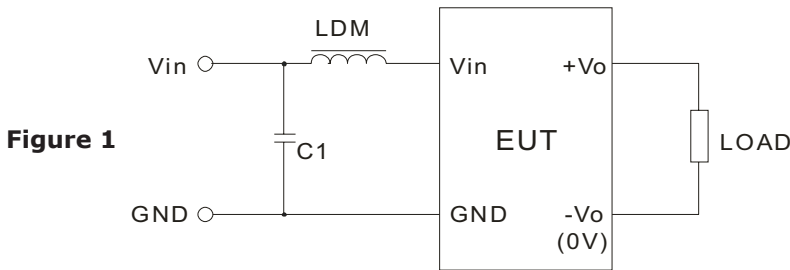


Figure 1

Table 1

Recommended external circuit components		
$V_{in}$ (Vdc)	C1	LDM
12	4.7 $\mu$ F/50V	12 $\mu$ H
15	4.7 $\mu$ F/50V	12 $\mu$ H
24	4.7 $\mu$ F/50V	12 $\mu$ H

## TEST CONFIGURATION

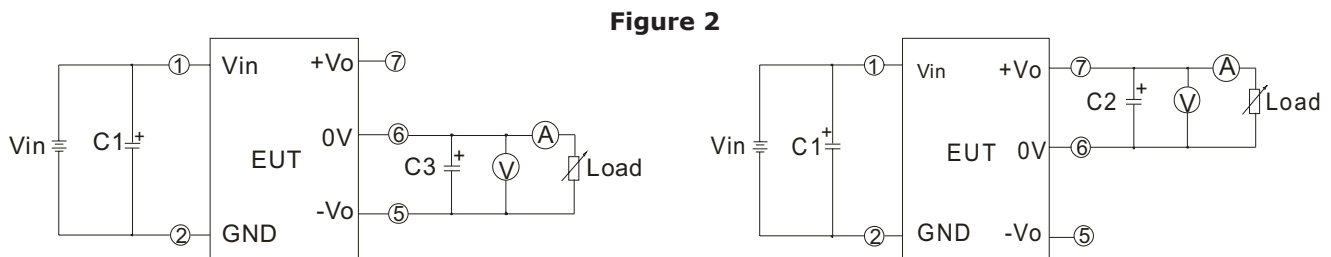
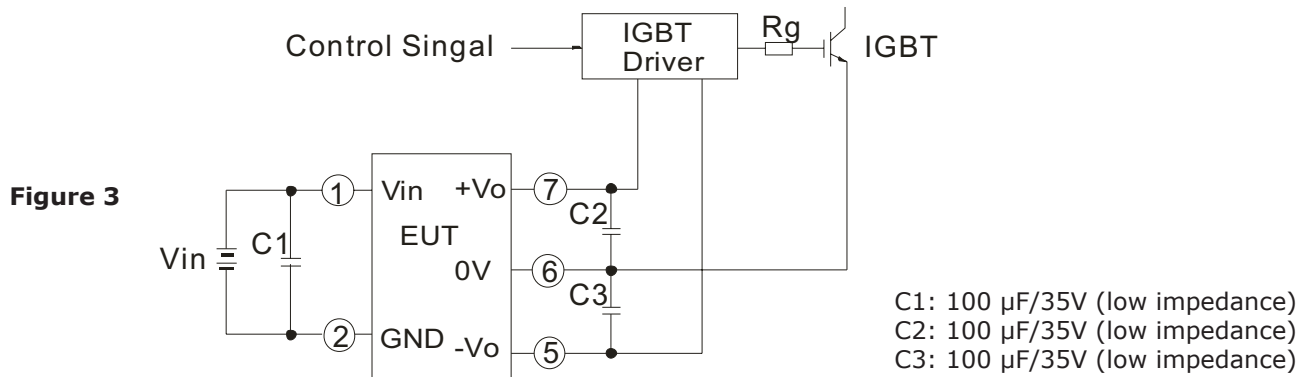


Figure 2

C1, C2, C3: 100  $\mu$ F/35V (low impedance)

## APPLICATION CIRCUIT



- Notes:
1. The wire between the converter and IGBT driver must as short as possible.
  2. External filter capacitors should be connected as close as possible to the converter and the IGBT driver.
  3. The output average power of the IGBT driver should be less than the output power of DC-DC module.
  4. Maximum capacitive load is tested at nominal input voltage and full load.

## REVISION HISTORY

rev.	description	date
1.0	initial release	08/16/2012
1.01	updated features	09/20/2012
1.02	updated product photograph	11/13/2012
1.03	various updates	02/05/2013
1.04	added switching frequency to spec	07/01/2013
1.05	added models, updated spec	09/23/2013
1.06	added UL to some models	02/12/2015

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



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