

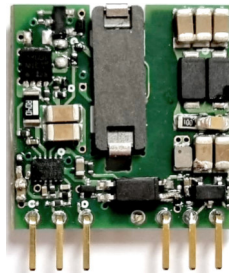
VPS6-Q12 Series : Isolated DC/DC Converters
9 - 36V Input Voltage Range, Maximum Power : 6W

Data Sheet
May. 31, 2022

VPS6-Q12 : Vertical type isolated DC/DC converters

Features

- Compact SIP8 Package
- Regulated outputs
- Wide input voltage range (4 : 1)
- High efficiency up to 88.6%
- 3000Vdc input to output isolation
- Remote On/off control
- Input under voltage protection
- Short circuit protection (Hiccup)
- Fixed switching frequency
- No tantalum capacitor inside
- Low no load power consumption
- Wide operating temperature range
(-40°C to 85°C with derating)
- RoHS directive



Applications

- Telecommunication
- Datacom
- Instrumentation / Equipments
- Distributed Power Systems

VPS6 series are a high efficiency, 6watt isolated DC/DC converters in a SIP-8 package.

They offer designers low cost and space-efficient solution, wide input voltage range 4:1, Remote on/off , precisely regulated, short circuit protection(Hiccup), low no load power consumption, and 3000Vdc I/O-isolation .

The -40°C to 85°C operating temperature range makes the VPS series ideal for mixed analog/digital subsystems, data communication equipments, distributed power systems. They are an excellent choice for both new design-information network and upgrading older systems

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Absolute Maximum Ratings

Parameter	Min.	Typ.	Max.	Unit	Notes
Input voltage continuous	9		36	Vdc	
Operating temperature	-40		85	°C	
Storage temperature	-40		105	°C	
I/O isolation voltage			3000	Vdc	

Stresses in excess of the absolute maximum ratings can cause permanent damage to the device.

Electrical Specifications

Ta=25°C, Vin=12Vdc unless otherwise noted.

Input Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit
Operating voltage range	Vin	9	12 or 24	36	Vdc
Input under voltage lockout					
Turn-on threshold			8.4		Vdc
Turn-off threshold			7.8		Vdc
Maximum Input current (Vin = Vin,min, Io = Io,max)	Iin		0.78		A
Disabled input current (Remote on/off control, module disabled)					
VPS6-Q12-3R3			3		mA
VPS6-Q12-5			3		mA
VPS6-Q12-12			3		mA
VPS6-Q12-15			3		mA
No load input current (Io = 0, Module enabled)					
VPS6-Q12-3R3			7		mA
VPS6-Q12-5			7		mA
VPS6-Q12-12			7		mA
VPS6-Q12-15			11		mA

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Output Characteristics

Parameter	Symbol	Min	Typ	Max	Unit
Output voltage tolerance	V_o			± 2	%
Output current	I_o				
VPS6-Q12-3R3			1.5		A
VPS6-Q12-5			1.2		A
VPS6-Q12-12			0.5		A
VPS6-Q12-15			0.4		A
Output regulation;					
- Line regulation($V_{in}=V_{in_min}$ to V_{in_max})				± 1	%
- Load regulation($I_o=I_{o_min}$ to I_{o_max})				± 1	%
Output current limit(Automatic recovery)		>105			%
Output ripple and noise, ($V_{in} = 5V$, $I_o = I_{o_max}$, Bandwidth 20MHz , 1 μ F ceramic cap + 15 μ F Tantalum)				2% of V_o	mV
Efficiency ($V_{in} = 5V$, 100% Load)					
VPS6-Q12-3R3			80.4		%
VPS6-Q12-5			84.1		%
VPS6-Q12-12			88.4		%
VPS6-Q12-15			88.6		%
Dynamic load response (Load change from $I_o = 50\%$ to 100% , 100% to 50% of $I_{o,max}$, Slew rate=0.1A/ μ s , 1 μ F ceramic cap + 15 μ F Tantalum)				5% of V_o	mV
Start-up time ($I_o=I_{o_max}$, $V_{in} : on$)				20	ms
Turn-on overshoot				5	%
Maximum output capacitance					μ F

Isolation Specifications

Parameter	Symbol	Min	Typ	Max	Unit
I/O isolation voltage (1 min)				3000	Vdc
Isolation Capacitance	Ciso		50		pF

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9 - 36V Input Voltage Range, Maximum Power : 6WData Sheet
May. 31, 2022**General Specifications**

Parameter	Symbol	Min	Typ	Max	Unit
Switching Frequency			215		KHz
Remote On/off control(CNT) pin voltage		Short to Vin- or 0 - 0.5Vdc			Vdc
Off		Open or 4.5 - 15Vdc			Vdc
On					Vdc
MTBF		5.6 × 10 ⁵			hrs
Dimensions		22.6 × 6 × 22 (L × W × H)			mm
Weight					g

Environmental

Parameter	Symbol	Min	Typ	Max	Unit
Operating temperature		-40		85	°C
Operating Humidity (RH non-condensing)		5		95	%
Storage Temperature		-40		105	°C

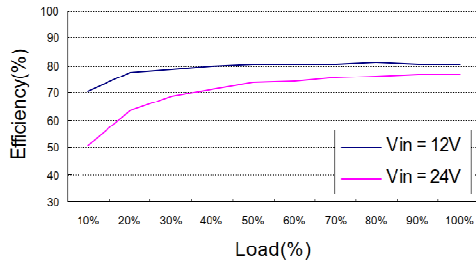
Characteristic Curves

Efficiency

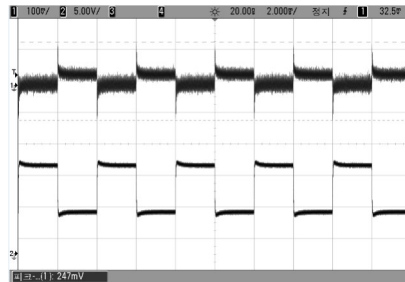
Output Load Transient Response

(Load step: 50%-100%-50% of Io, 0.1A/us)

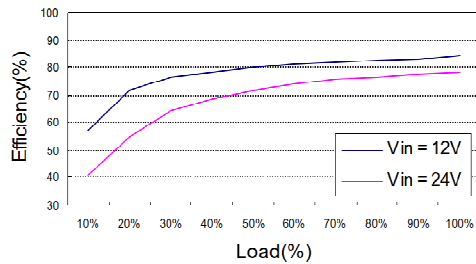
VPS6-Q12-3R3



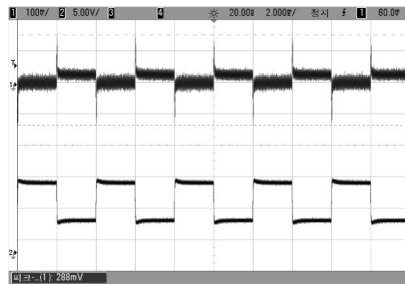
VPS6-Q12-3R3



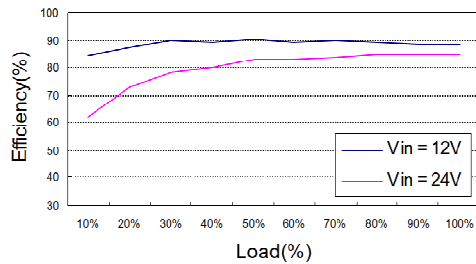
VPS6-Q12-5



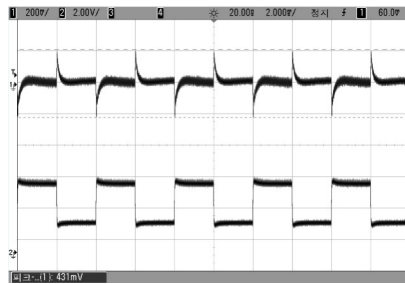
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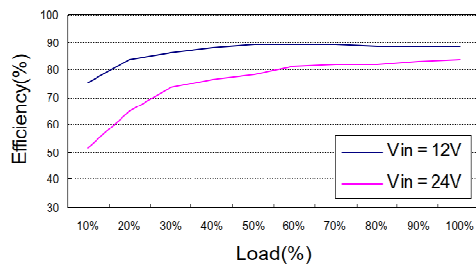
VPS6-Q12-12



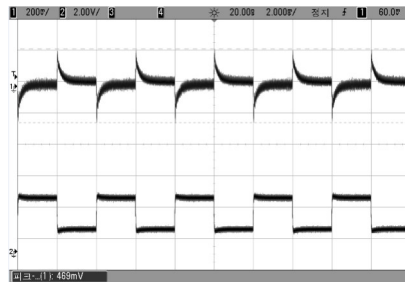
VPS6-Q12-12



VPS6-Q12-15



VPS6-Q12-15



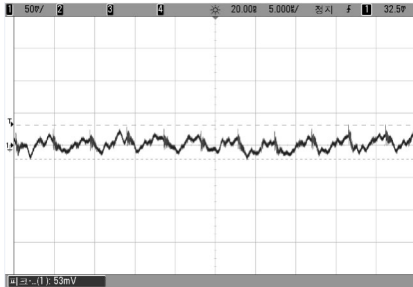
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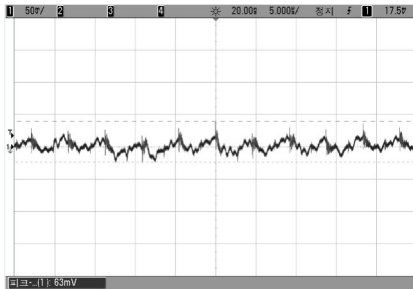
Output Ripple/Noise

Start-up from Vin

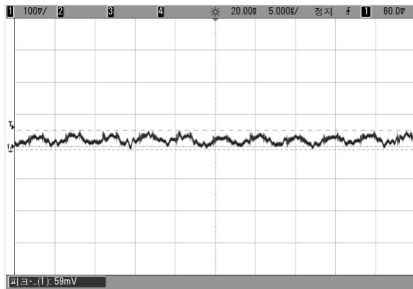
VPS6-Q12-3R3



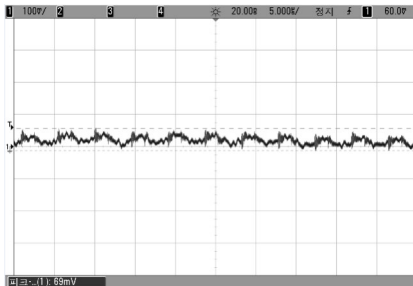
VPS6-Q12-5



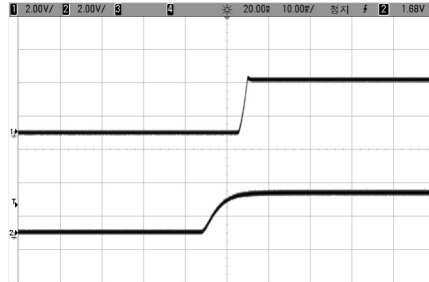
VPS6-Q12-12



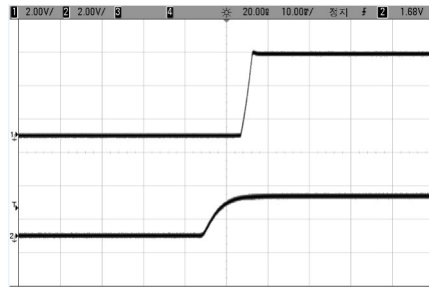
VPS6-Q12-15



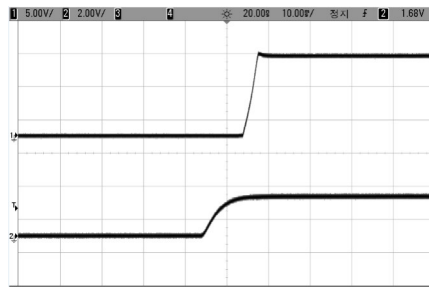
VPS6-Q12-3R3



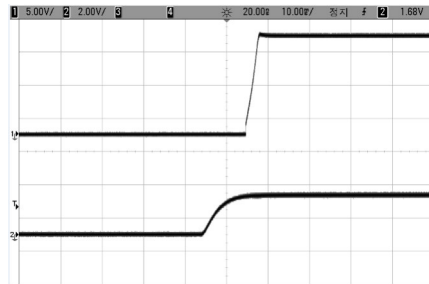
VPS6-Q12-5



VPS6-Q12-12



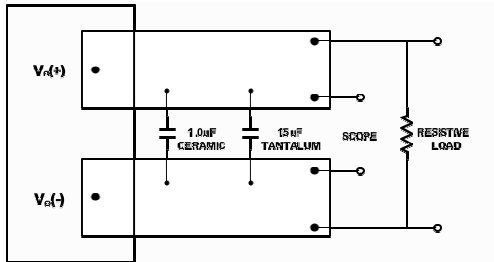
VPS6-Q12-15



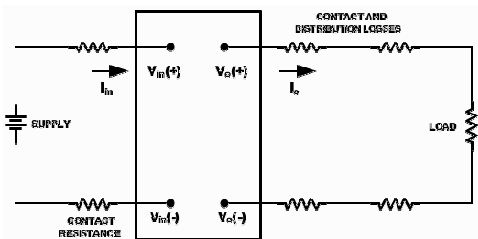
TEST Configurations

Output ripple & noise Test

The probe ground should be less than 1/2 inch and oscilloscope is set up 20MHz bandwidth to measure exact data.



Output Voltage and Efficiency Test



*All measurements are taken at the module terminals when socketing, place Kelvin connections at module terminals to Avoid measurement errors due to socket contact resistance.

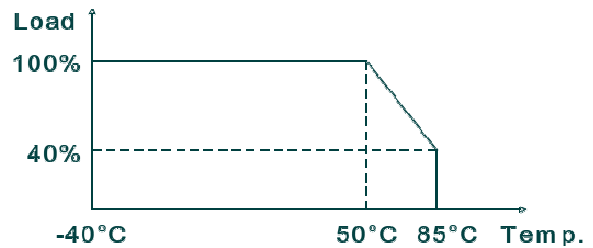
Efficiency

$$\eta = \left(\frac{[V_o(+)-V_o(-)] \times I_o}{[V_{in}(+)-V_{in}(-)] \times I_{in}} \right) \times 100 \%$$

Thermal Considerations

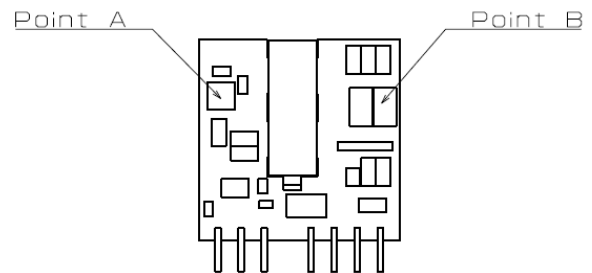
VPS series has wide operating temperature range from -40°C to +85°C.

However, it should be required an enough air flow for more reliable operation. Output derating curve provide designers with a quantity of a current under the desired ambient temperature and velocity of airflow.



If the device is installed in a system, the device's temperature of Point_A and Point_B should be checked if does not exceed 110°C.

Please make sure that the ambient temperature does not exceed 85°C.



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Feature Description

Input Fuse

VPS series has not a fuse built in.

In order to comply with safety requirements, you can set up a fuse externally.

	Q5	Q12	Q24
VPS6	6A	4A	2.5A

Input Filter / Output Filter

VPS series have an internal input filter. To minimize the ripple and noise of the input voltage, additional external capacitor is required 10uF~680uF.

To reduce a output ripple and noise, external capacitor is required at the output of the device.

Remote ON/OFF control (CNT)

VPS series have negative logic CNT.

Negative logic turns module on during a logic high voltage on the CNT pin, and off during a logic low voltage on the CNT pin.

CNT	OUTPUT
OPEN	ON
SHORT TO VIN(-)	OFF

Input under-voltage Lockout (UVLO)

At input voltages below the input under-voltage lockout(UVLO), the module operation is disabled. The module will begin to operate, when the input voltage is raised above UVLO voltage.

Input Over Voltage Protection

VPS series has not built in Input over voltage

protection circuit. So, you need to set up a circuit externally which can protect the input over voltage if necessary

Over current Protection (OCP)

VPS series built in over current protection circuit which operates when the output current is over 105%

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of rating and automatically recovers when over current condition is removed.

If load is connected to a inductive or constant current load such as lamp or motor, output may not start up.

Short Circuit Protection (SCP)

At the point of current-limit inception, the unit enters hiccup mode.

Also the module automatically recovers when over current condition is removed.

Output Over Voltage Protection (OVP)

VPS series has not built in output over voltage protection circuit. So, you need to set up a circuit externally which can protect the output over voltage if necessary.

Over Temperature Protection (OTP)

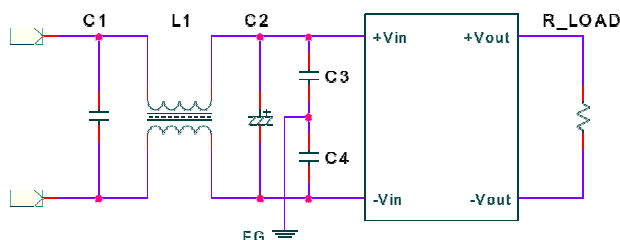
VPS series has not built in over temperature protection circuit. So, you need to set up a circuit externally which can protect the output over voltage if necessary

Soldering information

The product is intended for through hole mounting in a PCB. When wave soldering is used, the temperature on the pins is specified to maximum 260°C for maximum 10seconds. When hand soldering is used, care should be taken to avoid direct contact between the hot soldering iron tip and the pins for more than a few seconds in order to prevent overheating.

EMI characteristic (conducted emission)

In order to reduce conducted noise install an external input filter as shown in below.



Model	L1	C1	C2	C3,C4
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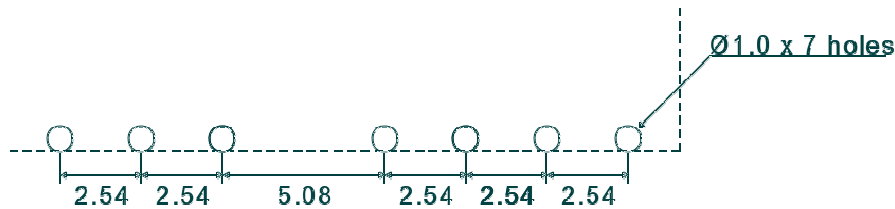
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VPS6-Q5-5				
VPS6-Q12-5				
VPS6-Q24-5				

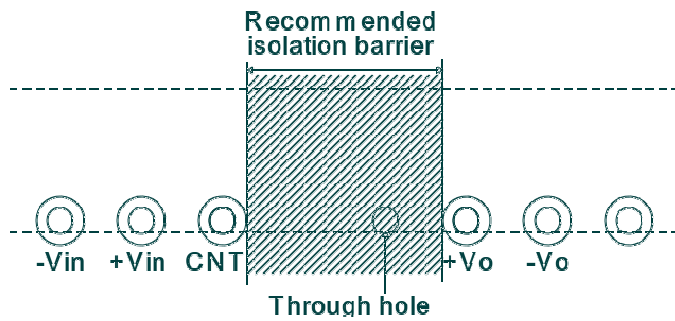
(To be continued)

Recommended Footprint Details (SIP8)



(* All dimensions in mm)

Recommended Layout (SIP8)

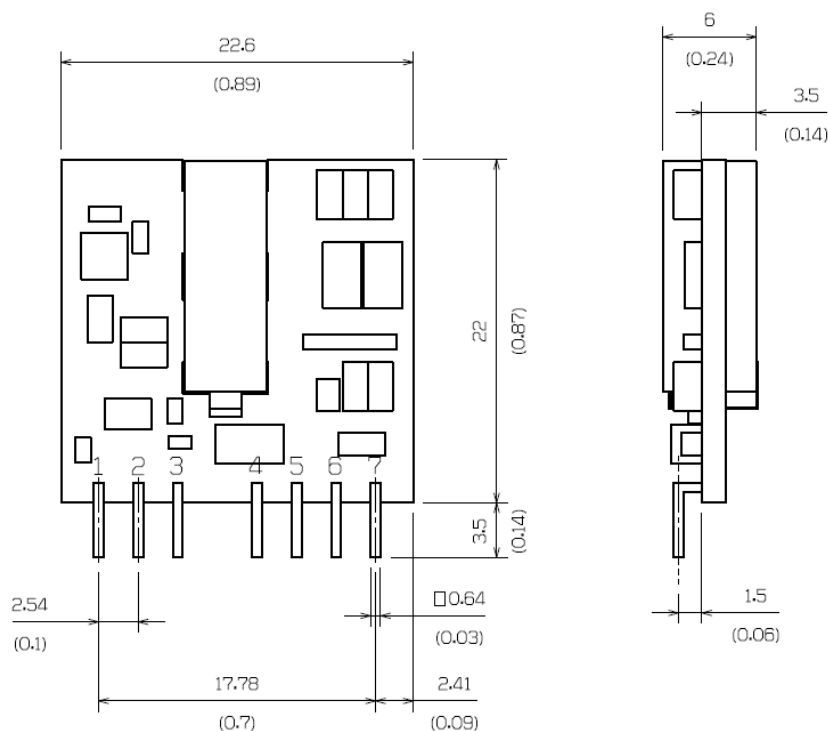


(* 2.2nF/3000Vdc capacitor can be connected between -Vin to -Vo for the more small noise.)

Mechanical Specification

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Pin Assignments

PIN	Function
1	-Vin
2	+Vin
3	CNT
4	No connection
5	+Vout
6	-Vout
7	No connection

Ordering Information

Input	Output	Maximum	Ripple & Noise	Efficiency	Model
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		Power	Max.	Typ.	Number
4.5 - 18V	3.3V@1.5A	4.95W	100mVp-p	79.2%	VPS6-Q5-3R3
	5V @1.2A	6W	100mVp-p	83.9%	VPS6-Q5-5
	12V @0.5A	6W	240mVp-p	86.7%	VPS6-Q5-12
	15V @0.4A	6W	240mVp-p	85.5%	VPS6-Q5-15
9 - 36V	3.3V@1.5A	4.95W	100mVp-p	80.4%	VPS6-Q12-3R3
	5V @1.2A	6W	100mVp-p	84.1%	VPS6-Q12-5
	12V @0.5A	6W	240mVp-p	88.4%	VPS6-Q12-12
	15V @0.4A	6W	240mVp-p	88.6%	VPS6-Q12-15
18 - 72V	3.3V@1.5A	4.95W	100mVp-p	78.5%	VPS6-Q24-3R3
	5V @1.2A	6W	100mVp-p	83.0%	VPS6-Q24-5
	12V @0.5A	6W	240mVp-p	87.4%	VPS6-Q24-12
	15V @0.4A	6W	240mVp-p	87.5%	VPS6-Q24-15

Part Number Structure

VPS6 – Q5 – 3R3

Model Name _____ **Output Voltage**
Series Output Power _____ **Nominal Input Voltage**

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