

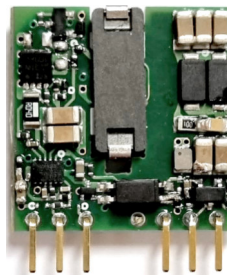
**VPS6-Q5 Series : Isolated DC/DC Converters**  
**4.5 - 18V Input Voltage Range, Maximum Power : 6W**

Data Sheet  
May. 31, 2022

## VPS6-Q5 : Vertical type isolated DC/DC converters

### Features

- Compact SIP8 Package
- Regulated outputs
- Wide input voltage range ( 4 : 1 )
- High efficiency up to 86.7%
- 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

**VPS6-Q5 Series : Isolated DC/DC Converters**  
**4.5 - 18V Input Voltage Range, Maximum Power : 6W**

 Data Sheet  
 May. 31, 2022

## Absolute Maximum Ratings

Parameter	Min.	Typ.	Max.	Unit	Notes
Input voltage continuous	4.5		18	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=5Vdc unless otherwise noted.

### Input Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit
Operating voltage range	Vin	4.5	5 or 12	18	Vdc
Input under voltage lockout					
Turn-on threshold			4.46		Vdc
Turn-off threshold			4.44		Vdc
Maximum Input current (Vin = Vin,min, Io = Io,max)	Iin		1.7		A
Disabled input current (Remote on/off control, module disabled)					
VPS6-Q5-3R3			2		mA
VPS6-Q5-5			2		mA
VPS6-Q5-12			2		mA
VPS6-Q5-15			2		mA
No load input current (Io = 0, Module enabled)					
VPS6-Q5-3R3			8		mA
VPS6-Q5-5			10		mA
VPS6-Q5-12			17		mA
VPS6-Q5-15			22		mA

**VPS6-Q5 Series : Isolated DC/DC Converters**  
**4.5 - 18V Input Voltage Range, Maximum Power : 6W**

 Data Sheet  
 May. 31, 2022

**Output Characteristics**

Parameter	Symbol	Min	Typ	Max	Unit
Output voltage tolerance	$V_o$			$\pm 2$	%
Output current	$I_o$				
VPS6-Q5-3R3			1.5		A
VPS6-Q5-5			1.2		A
VPS6-Q5-12			0.5		A
VPS6-Q5-15			0.4		A
Output regulation;					
- Line regulation( $V_{in}=V_{in\_min}$ to $V_{in\_max}$ )				$\pm 1$	%
- Load regulation( $I_o=I_{o\_min}$ to $I_{o\_max}$ )				$\pm 1$	%
Output current limit(Automatic recovery)		>105			%
Output ripple and noise, ( $V_{in} = 5V$ , $I_o = I_{o\_max}$ , Bandwidth 20MHz , 1 $\mu$ F ceramic cap + 15 $\mu$ F Tantalum)				2% of $V_o$	mV
Efficiency ( $V_{in} = 5V$ , 100% Load)					
VPS6-Q5-3R3			79.2		%
VPS6-Q5-5			83.9		%
VPS6-Q5-12			86.7		%
VPS6-Q5-15			85.6		%
Dynamic load response (Load change from $I_o = 50\%$ to $100\%$ , $100\%$ to $50\%$ of $I_{o,max}$ , Slew rate=0.1A/ $\mu$ s , 1 $\mu$ F ceramic cap + 15 $\mu$ 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					$\mu$ F

**Isolation Specifications**

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

**VPS6-Q5 Series : Isolated DC/DC Converters**  
**4.5 - 18V Input Voltage Range, Maximum Power : 6W**Data 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					
MTBF		5.6 x 10 <sup>5</sup>			hrs
Dimensions		22.6 x 6 x 22 (L x W x 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

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Data Sheet  
 May. 31, 2022

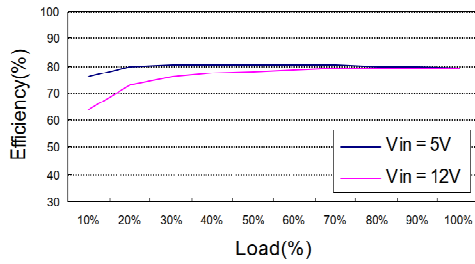
**Characteristic Curves**

**Efficiency**

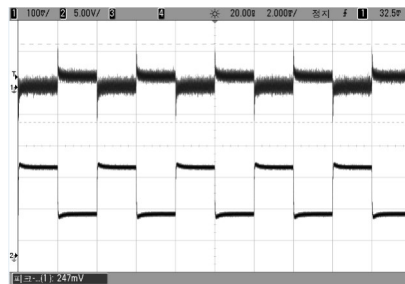
**Output Load Transient Response**

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

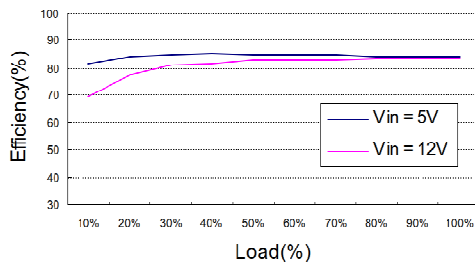
VPS6-Q5-3R3



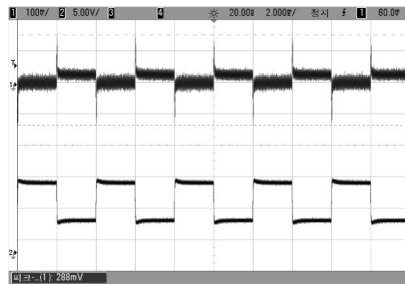
VPS6-Q5-3R3



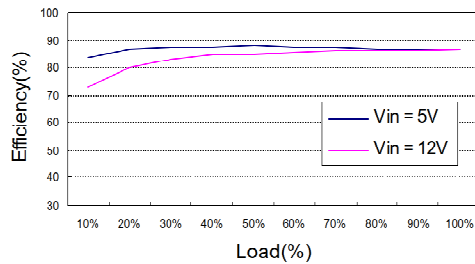
VPS6-Q5-5



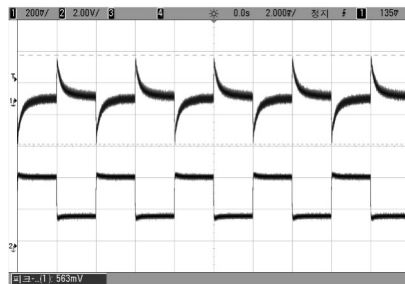
VPS6-Q5-5



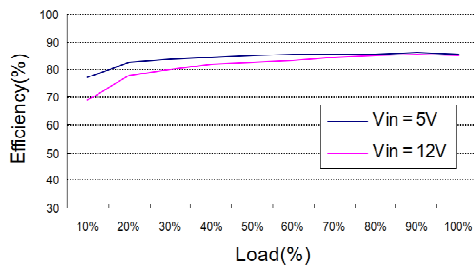
VPS6-Q5-12



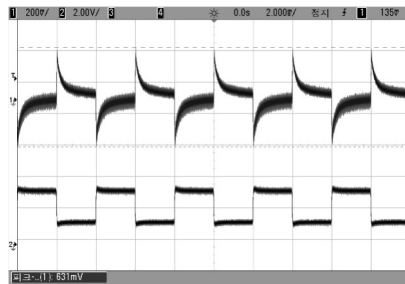
VPS6-Q5-12



VPS6-Q5-15



VPS6-Q5-15



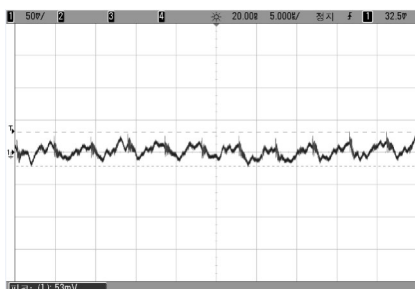
**VPS6-Q5 Series : Isolated DC/DC Converters**  
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Data Sheet  
 May. 31, 2022

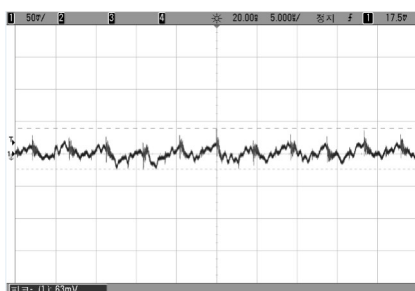
**Output Ripple/Noise**

**Start-up from Vin**

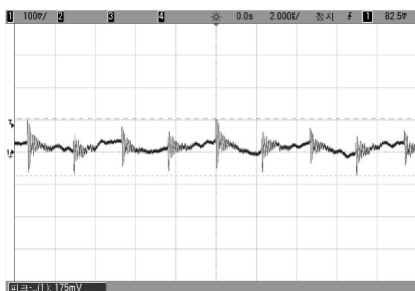
VPS6-Q5-3R3



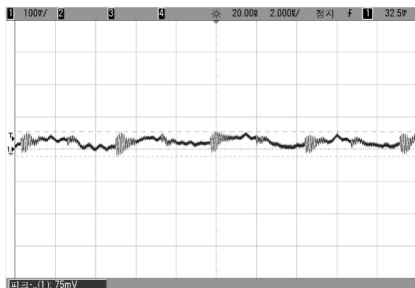
VPS6-Q5-5



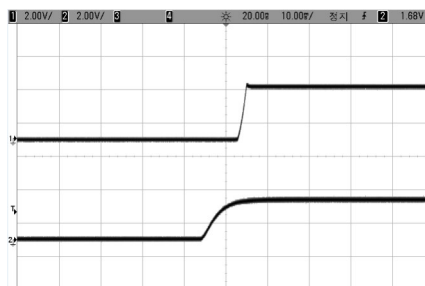
VPS6-Q5-12



VPS6-Q5-15



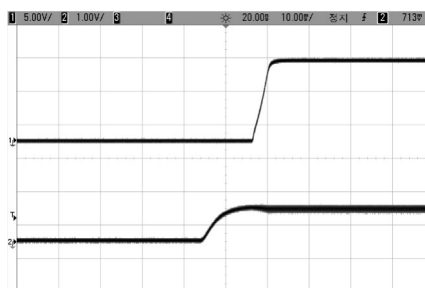
VPS6-Q5-3R3



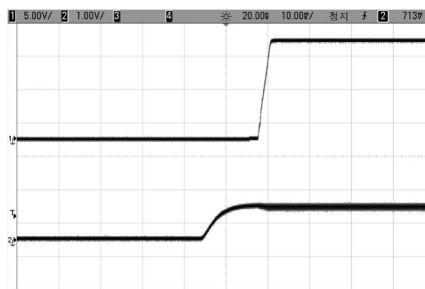
VPS6-Q5-5



VPS6-Q5-12



VPS6-Q5-15



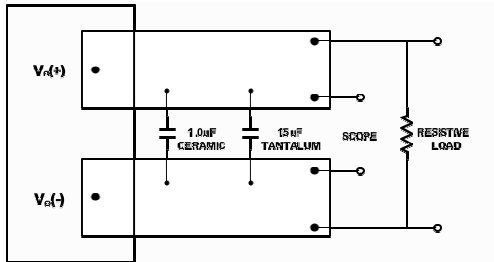
**VPS6-Q5 Series : Isolated DC/DC Converters**  
**4.5 - 18V Input Voltage Range, Maximum Power : 6W**

Data Sheet  
 May. 31, 2022

**TEST Configurations**

**Output ripple & noise Test**

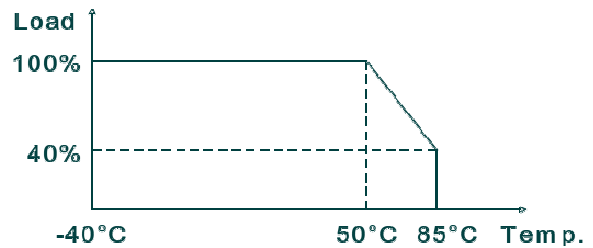
The probe ground should be less than 1/2 inch and oscilloscope is set up 20MHz bandwidth to measure exact data.



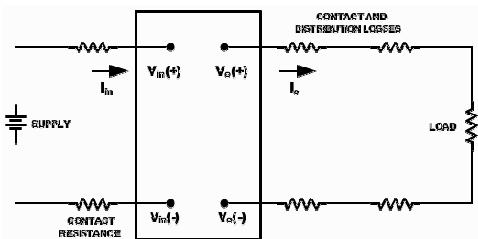
**Thermal Considerations**

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.



**Output Voltage and Efficiency Test**



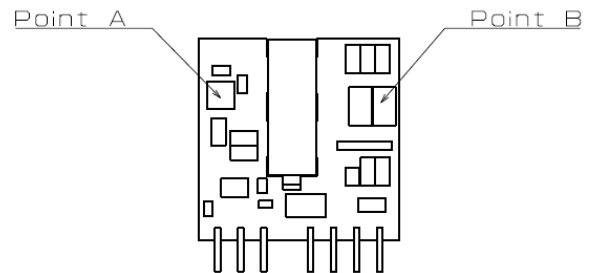
\*All measurements are taken at the module terminals when socketing, place Kelvin connections at module terminals to Avoid measurement errors due to socket contact resistance.

**Efficiency**

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

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.



**VPS6-Q5 Series : Isolated DC/DC Converters**  
**4.5 - 18V Input Voltage Range, Maximum Power : 6W**Data Sheet  
May. 31, 2022

## 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%



**VPS6-Q5 Series : Isolated DC/DC Converters**  
**4.5 - 18V Input Voltage Range, Maximum Power : 6W**

Data Sheet  
 May. 31, 2022

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 of 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)**

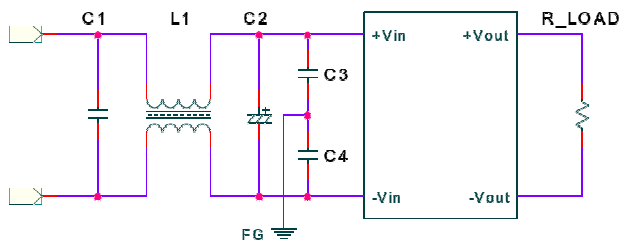
VPS series has not built in over temperature protection circuit. So, you need to set up a circuit externally which can protect the output over voltage if necessary

**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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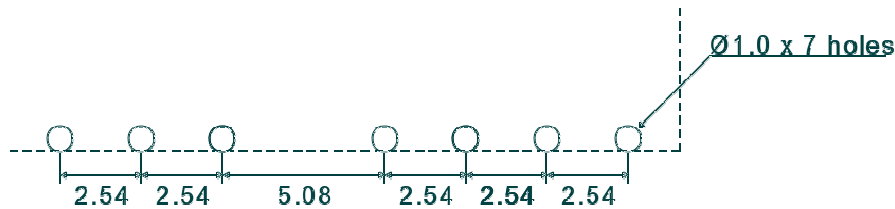
**VPS6-Q5 Series : Isolated DC/DC Converters**  
**4.5 - 18V Input Voltage Range, Maximum Power : 6W**

Data Sheet  
 May. 31, 2022

VPS6-Q5-5				
VPS6-Q12-5				
VPS6-Q24-5				

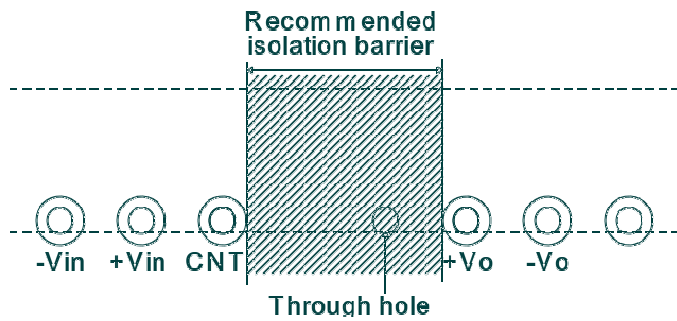
(To be continued)

**Recommended Footprint Details (SIP8)**



(\* All dimensions in mm )

**Recommended Layout (SIP8)**

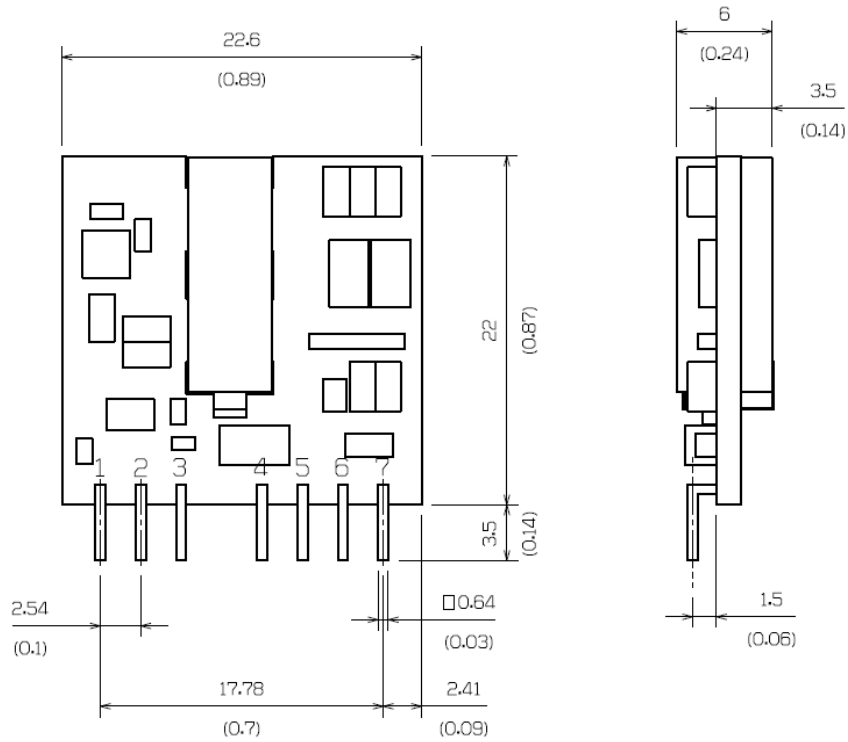


(\* 2.2nF/3000Vdc capacitor can be connected between -Vin to -Vo for the more small noise. )

**Mechanical Specification**

**VPS6-Q5 Series : Isolated DC/DC Converters**  
**4.5 - 18V Input Voltage Range, Maximum Power : 6W**

Data Sheet  
 May. 31, 2022



**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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**VPS6-Q5 Series : Isolated DC/DC Converters**  
**4.5 - 18V Input Voltage Range, Maximum Power : 6W**

 Data Sheet  
 May. 31, 2022

		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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#### HEAD OFFICE & FACTORY

#1402, 14F/L 6th Daeryung TechnoTown 493-6,  
 Gasan-Dong, Kumchon-Gu, Seoul, 153-774,  
 Korea

TEL: +82 2 855 4955 | FAX: +82 2 855 4954

#### GENERAL SALES INQUIRIES

Please feel free to  
 contact : sales@powerplaza.co.kr

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