

DC-DC converter up to 2,01 Watts

5
YEARS
WARRANTY

ROHS
COMPLIANT

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Medical



PV



Automation



Datacom



IPC



Industry



Measurement



Telecom



Automobile



Boat



Charger



Railway

c **UL** [®] **US** **CB** **CE**

2 X MOPP **5000** VAC Reinforced Insulation **2 : 1** Input Range **LOW** Leakage Current Operating Altitude **5000** meter **REMOTE ON OFF** **OVP** **SCP** **UVP**

PART NUMBER STRUCTURE

VPS02 -	48	S	05
Series Name	Input Voltage (VDC)	Output Quantity	Output Voltage (VDC)
VPS02: SMD type	05:4.5~12	S:Single	3P3:3.3
VPH02: DIP type	12:9~18		05:5
	24:18~36		09:9
	48:36~75		12:12
			15:15
			24:24
		D: Dual	12:±12
			15:±15

TECHNICAL SPECIFICATION All specifications are typical at nominal input, full load and 25°C unless otherwise noted

Model Number	Input Range	Output Voltage	Output Current @Full Load	Input Current @ No Load	Efficiency	Maximum Capacitor Load
	VDC	VDC	mA	mA	%	μF
VPS(H) 02-05S3P3	4.5 ~ 12	3.3	600	60	75	1000
VPS(H) 02-05S05	4.5 ~ 12	5	400	60	78	1000
VPS(H) 02-05S09	4.5 ~ 12	9	222	60	78	430
VPS(H) 02-05S12	4.5 ~ 12	12	167	70	82	220
VPS(H) 02-05S15	4.5 ~ 12	15	134	80	82	170
VPS(H) 02-05S24	4.5 ~ 12	24	83	80	82	100
VPS(H) 02-05D12	4.5 ~ 12	±12	±83	80	82	±170
VPS(H) 02-05D15	4.5 ~ 12	±15	±67	90	80	±100
VPS(H) 02-12S3P3	9 ~ 18	3.3	600	30	76	1000
VPS(H) 02-12S05	9 ~ 18	5	400	40	78	1000
VPS(H) 02-12S09	9 ~ 18	9	222	40	79	430
VPS(H) 02-12S12	9 ~ 18	12	167	40	82	220
VPS(H) 02-12S15	9 ~ 18	15	134	45	82	170
VPS(H) 02-12S24	9 ~ 18	24	83	45	81	100
VPS(H) 02-12D12	9 ~ 18	±12	±83	45	81	±170
VPS(H) 02-12D15	9 ~ 18	±15	±67	45	81	±100
VPS(H) 02-24S3P3	18 ~ 36	3.3	600	20	76	1000
VPS(H) 02-24S05	18 ~ 36	5	400	20	79	1000
VPS(H) 02-24S09	18 ~ 36	9	222	25	80	430
VPS(H) 02-24S12	18 ~ 36	12	167	25	81	220
VPS(H) 02-24S15	18 ~ 36	15	134	25	81	170
VPS(H) 02-24S24	18 ~ 36	24	83	25	81	100
VPS(H) 02-24D12	18 ~ 36	±12	±83	25	81	±170
VPS(H) 02-24D15	18 ~ 36	±15	±67	25	81	±100
VPS(H) 02-48S3P3	36 ~ 75	3.3	600	10	76	1000
VPS(H) 02-48S05	36 ~ 75	5	400	10	78	1000
VPS(H) 02-48S09	36 ~ 75	9	222	12	79	430
VPS(H) 02-48S12	36 ~ 75	12	167	12	80	220
VPS(H) 02-48S15	36 ~ 75	15	134	12	82	170
VPS(H) 02-48S24	36 ~ 75	24	83	12	81	100
VPS(H) 02-48D12	36 ~ 75	±12	±83	12	81	±170
VPS(H) 02-48D15	36 ~ 75	±15	±67	12	81	±100

INPUT SPECIFICATIONS

Parameter	Conditions	Min.	Typ.	Max.	Unit
Operating input voltage range	5Vin(nom)	4.5	5	12	VDC
	12Vin(nom)	9	12	18	
	24Vin(nom)	18	24	36	
	48Vin(nom)	36	48	75	
Start up voltage	5Vin(nom)			4.5	VDC
	12Vin(nom)			9	
	24Vin(nom)			18	
	48Vin(nom)			36	
Shutdown voltage	5Vin(nom)	2	3	4	VDC
	12Vin(nom)	6	7	8	
	24Vin(nom)	13	15	17	
	48Vin(nom)	29	32	35	
Start up time	Constant resistive load	Power up		10	ms
Input surge voltage	1 second, max.	Remote ON/OFF		20	VDC
		5Vin(nom)		15	
		12Vin(nom)		25	
		24Vin(nom)		50	
Input filter		48Vin(nom)		100	VDC
Remote ON/OFF	Referred to -Vin pin and Ctrl pin applied current	Capacitor type			mA
		DC-DC ON		Open or high impedance	
		DC-DC OFF		2.0	
		Remote off input current		3.0	
				2.5	mA



OUTPUT SPECIFICATIONS

Parameter	Conditions		Min.	Typ.	Max.	Unit
Voltage accuracy			-1.0		+1.0	%
Line regulation	Low Line to High Line at Full Load		-0.2		+0.2	%
Load regulation	No Load to Full Load	Single	-1.0		+1.0	%
		Dual	-1.0		+1.0	
	10% Load to 90% Load	Single	-0.5		+0.5	%
		Dual	-0.8		+0.8	
Cross regulation	Asymmetrical load 25%/100% FL	Dual	-5.0		+5.0	%
Ripple and noise	Measured by 20MHz bandwidth			50		mVp-p
Temperature coefficient			-0.02		+0.02	%/°C
Transient response recovery time	25% load step change			500		µs
Over voltage protection		3.3Vout	4.0		6.5	VDC
		5Vout	6.0		8.0	
		9Vout	10.0		14.0	
		12Vout	13.0		19.0	
		15Vout	16.0		22.0	
		24Vout	25.0		35.0	
Short circuit protection			Continuous, automatics recovery			

GENERAL SPECIFICATIONS

Parameter	Conditions	Min.	Typ.	Max.	Unit
Isolation voltage	1 minute Reinforced insulation for 250VAC working voltage	5000			VAC
Isolation resistance	500VDC	10			GΩ
Isolation capacitance			16	20	pF
Leakage current	240VAC, 60Hz			2	μA
Switching frequency		100			kHz
Clearance/Creepage		8			mm
Safety approvals	IEC/ EN/ ANSI/AAMI ES 60601-1 IEC/ EN/ UL 62368-1			UL:E360199 UL:E193009 CB:UL(Demko)	
Case material				Non-conductive black plastic	
Base material				Non-conductive black plastic	
Potting material				Silicone (UL94 V-0)	
Weight				7.0g (0.24oz)	
MTBF	MIL-HDBK-217F, Full load			6.809 x 10 ⁶ hrs	

ENVIRONMENTAL SPECIFICATIONS

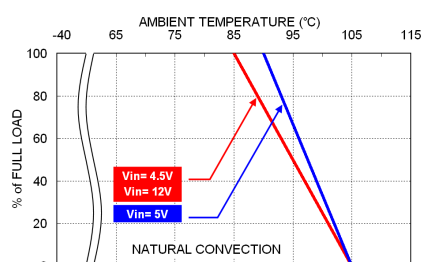
Parameter	Conditions	Min.	Typ.	Max.	Unit
Operating ambient temperature	With derating	-40		+105	°C
Maximum case temperature				105	°C
Storage temperature range		-55		+125	°C
Operating altitude				5000	m
Thermal shock				MIL-STD-810F	
Shock				MIL-STD-810F	
Vibration				MIL-STD-810F	
Relative humidity				5% to 95% RH	
Lead-free reflow solder process	Only for SMD type			IPC J-STD-020E	
Moisture sensitivity level(MSL)	Only for SMD type			IPC J-STD-033C Level 2	

EMC SPECIFICATIONS

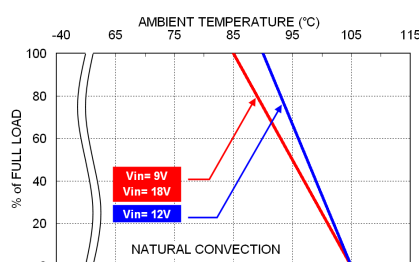
Parameter	Conditions	Level
EMI	EN55011, EN55032, EN60601-1-2 and FCC Part 18 / 15 With external components	Class A, Class B
EMS	EN55024 and EN60601-1-2	
ESD	EN61000-4-2 Air $\pm 15\text{kV}$ and Contact $\pm 8\text{kV}$	Perf. Criteria A
Radiated immunity	EN61000-4-3 10 V/m	Perf. Criteria A
Fast transient	EN61000-4-4 $\pm 2\text{kV}$	Perf. Criteria A
	VPS(H)02-05□□□ With an aluminum electrolytic capacitor (Nippon chemi-con KY series, 1000 μF /25V) and a TVS(SMAJ18A, 18V, 400Watt peak pulse power) in parallel.	
	VPS(H)02-12□□□ With an external input filter capacitor (Nippon chemi-con KY series, 470 μF /50V)	
	VPS(H)02-24□□□ With an external input filter capacitor (Nippon chemi-con KY series, 470 μF /50V)	
	VPS(H)02-48□□□ With an external input filter capacitor (Nippon chemi-con KY series, 220 μF /100V)	
Surge	EN61000-4-5 $\pm 1\text{kV}$	Perf. Criteria A
	VPS(H)02-05□□□ With an aluminum electrolytic capacitor (Nippon chemi-con KY series, 1000 μF /25V) and a TVS(SMAJ18A, 18V, 400Watt peak pulse power) in parallel.	
	VPS(H)02-12□□□ With an external input filter capacitor (Nippon chemi-con KY series, 470 μF /50V)	
	VPS(H)02-24□□□ With an external input filter capacitor (Nippon chemi-con KY series, 470 μF /50V)	
	VPS(H)02-48□□□ With an external input filter capacitor (Nippon chemi-con KY series, 220 μF /100V)	
Conducted immunity	EN61000-4-6 10 Vr.m.s	Perf. Criteria A
Power frequency magnetic field	EN61000-4-8 100A/m continuous; 1000A/m 1 second	Perf. Criteria A

CAUTION: This power module is not internally fused. An input line fuse must always be used.

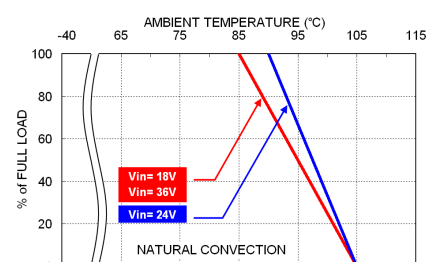
CHARACTERISTIC CURVE



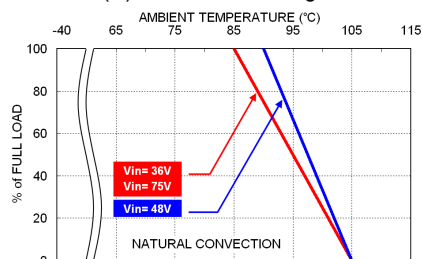
VPS(H)02-05□□□ Derating Curve



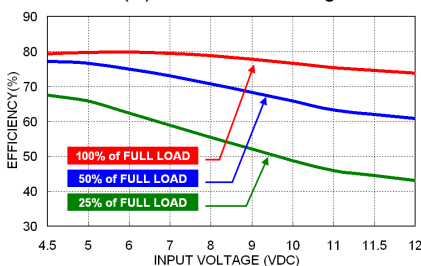
VPS(H)02-12□□□ Derating Curve



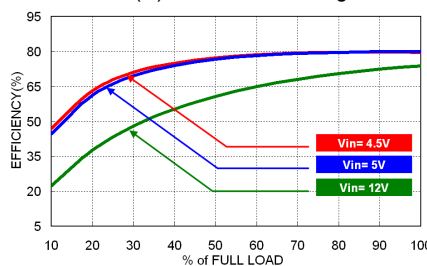
VPS(H)02-24□□□ Derating Curve



VPS(H)02-48□□□ Derating Curve



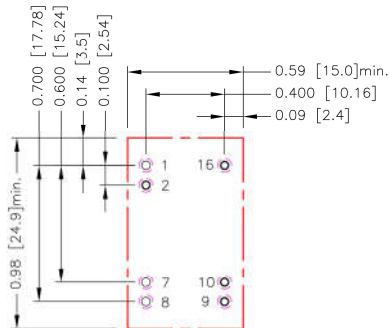
VPS(H)02-05S05 Efficiency vs. Input Voltage



VPS(H)02-05S05 Efficiency vs. Output Current

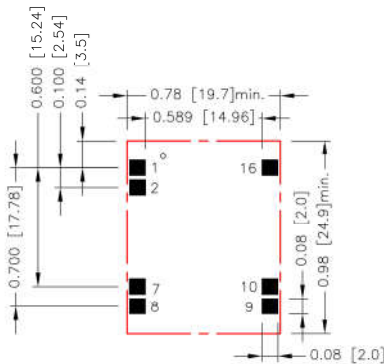
RECOMMENDED PAD LAYOUT

VPH02



All dimensions in inch[mm]
Pad size(lead free recommended)
Through hole 1.2.7.8.9.10.16: $\varnothing 0.035[0.90]$
Top view pad 1.2.7.8.9.10.16: $\varnothing 0.044[1.13]$
Bottom view pad 1.2.7.8.9.10.16: $\varnothing 0.071[1.80]$

VPS02



All dimensions in inch[mm]
Pad size(lead free recommended)
Top view pad: $0.080 \times 0.080[2.00 \times 2.00]$

- * There should be at least 8mm distance between primary and secondary circuit.
- ** For further information, please contact us.

THERMAL CONSIDERATIONS

The power module operates in a variety of thermal environments.

However, sufficient cooling should be provided to help ensure reliable operation of the unit.

Heat is removed by conduction, convection, and radiation to the surrounding Environment.

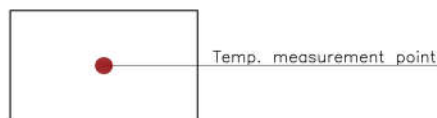
Proper cooling can be verified by measuring the point as the figure below.

The temperature at this location should not exceed "Maximum case temperature".

When Operating, adequate cooling must be provided to maintain the test point temperature at or below "Maximum case temperature".

You can limit this Temperature to a lower value for extremely high reliability.

- Thermal test condition with vertical direction by natural convection (20LFM).



TOP VIEW