

VHD-3.5W Series

3.5W Regulated Single Output

Features

- 5KVAC Highest Reinforced Isolation
- Minimum internal creepage and clearance distance > 8mm
- Industry standard DIP24 package
- Excellent efficiency up to 85%
- ±20% input voltage range
- 3.5W regulated output
- Short circuit protection
- Operating temperature range -40°C to 85°C



The VHD series is a family of cost effective 3.5W single output DC-DC converters. These converters combine miniature package in a 24-pin DIL compatible case with high performance features such as 5000 VAC input/output isolation voltage, continuous short circuit protection with automatic restart and tightline / load regulation. Devices are encapsulated using flame retardant resin. Input voltages of 5, 12, with output voltage of 3.3, 5, 12, and 15 Vdc. High performance features include high efficiency operation up to 85% and output voltage accuracy of ±2% maximum. Standard features include an input range of ±20% tolerance and low output noise and ripple.

All specifications typical at Ta=25°C, nominal input voltage and full load unless otherwise specified

OUTPUT SPECIFICATIONS			GENERAL SPECIFICATIONS	
Output Voltage Accuracy		±2%	Efficiency (Full-Load)	See table, min.
Output Current (Full Load)		See table, max.	I/O Isolation Voltage (3 sec.)	5000Vac
Line Regulation		±0.2%, max.	I/O Isolation Capacitance	50 pF, max.
Load Regulation (Io=10% to 100%)		±0.5%, max.	I/O Isolation Resistance	1000 MΩ, min.
Output Ripple & Noise (20 MHz bandwidth) (1)		See table, max.	Switching Frequency	570KHz, typ.
	(Io=3% to 100%)		Humidity	95% rel H
Short Circuit Protection		Continuous (Automatic Recovery)	Reliability Calculated MTBF (MIL-HDBK-217 F)	>1.0 Mhrs
Temperature Coefficient		±0.02%/°C	Safety Standard : (designed to meet)	IEC/EN 60950-1
Capacitive Load (2)		See table, max.	Reinforced Isolation	
Transient Recovery Time (3)		250us, typ.	PCB Creepage & Clearance Distance	8 mm, min.
Transient Response Deviation (3)		±3%, max.		
INPUT SPECIFICATIONS			PHYSICAL SPECIFICATIONS	
Input Voltage Range		±20%	Case Material	Non-conductive Black Plastic (UL94V-0 rated)
Start up Time (Nominal Vin and constant resistive Load)		70mS, typ.	Base Material	Non-conductive Black Plastic (UL94V-0 rated)
Input Current (No-Load)		See table, max.	Pin Material	Ø0.5mm Brass Solder-coated
Input Current (Full-Load)		See table, typ.	Potting Material	Epoxy (UL94V-0 rated)
Input Filter		Capacitors	Weight	12.5g
Input Reflected Ripple Current (4)		35mA _{p-p} , typ.	Dimensions	DIP24 : 1.25"x0.8"x0.4"
EMC CHARACTERISTICS			ABSOLUTE MAXIMUM RATINGS (7)	
Radiated Emissions (5)	EN55022	CLASS A	These are stress ratings. Exposure of devices to any of these conditions may adversely affect long-term reliability.	
Conducted Emissions (5)	EN55022	CLASS A	Input Surge Voltage (100mS)	
ESD	IEC 61000-4-2	Perf. Criteria A	5 Models	0~7 Vdc
RS	IEC 61000-4-3	Perf. Criteria A	12 Models	0~15 Vdc
EFT (6)	IEC 61000-4-4	Perf. Criteria A	Soldering Temperature	260°C, max.
Surge (6)	IEC 61000-4-5	Perf. Criteria A	(1.5mm from case 10 sec. max.)	
CS	IEC 61000-4-6	Perf. Criteria A	ENVIRONMENT SPECIFICATIONS	
PFMF	IEC 61000-4-8	Perf. Criteria A	Operating Ambient Temperature	-40°C ~ +85°C (See Derating Curve)
			Maximum Case Temperature	100°C
			Storage Temperature	-55°C ~ +125°C
			Cooling	Nature Convection

NOTE

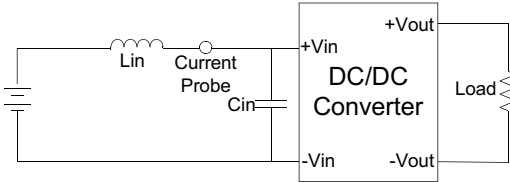
1. Ripple/Noise measured with a 1uF ceramic capacitor.
2. Tested by minimal Vin and constant resistive load.
3. Tested by normal Vin and 25% load step change (75%-50%-25% of Io).
4. Measured Input reflected ripple current with a simulated source inductance of 12uH.
5. Input filter components (C1, C2, C3, L1) are used to help meet conducted and radiated emissions requirement for the module, which application refer to the EMI Filter of design & feature configuration. These components should be mounted as close as possible to the module; and all leads should be minimized to decrease radiated noise.
6. An external filter capacitor is required if the module has to meet IEC 61000-4-4 and IEC 61000-4-5. The filter capacitor Motien suggest: Nippon - chemi - con KY series, 470uF/25V.
7. Exceeding the absolute ratings of the unit could cause damage. It is not allowed for continuous operating.

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TEST CONFIGURATIONS

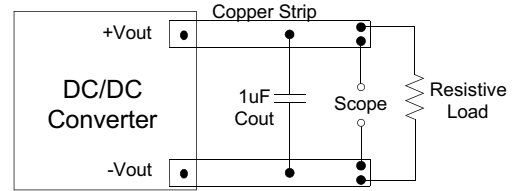
Input Reflected Ripple Current Test Step

Input reflected ripple current is measured through a source inductor L_{in} (12 μ H) and a source capacitor C_{in} (47 μ F, ESR<1.0 Ω at 100KHz) at nominal input and full load.



Output Ripple & Noise Measurement Test

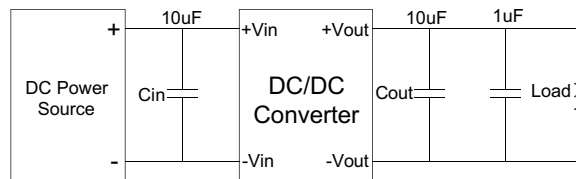
Use a capacitor C_{out} (1.0 μ F) measurement. The Scope measurement bandwidth is 0-20MHz.



DESIGN & FEATURE CONFIGURATIONS

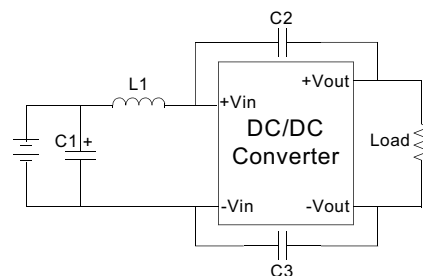
Output Ripple & Noise Reduction

To reduce ripple and noise, it is recommended to use a 1 μ F ceramic disk capacitor and a 10 μ F electrolytic capacitor to at the output.



EMI Filter

Input filter components (C_1, C_2, C_3, L_1) are used to help meet conducted emissions requirement for the module. These components should be mounted as close as possible to the module; and all leads should be minimized to decrease radiated noise.

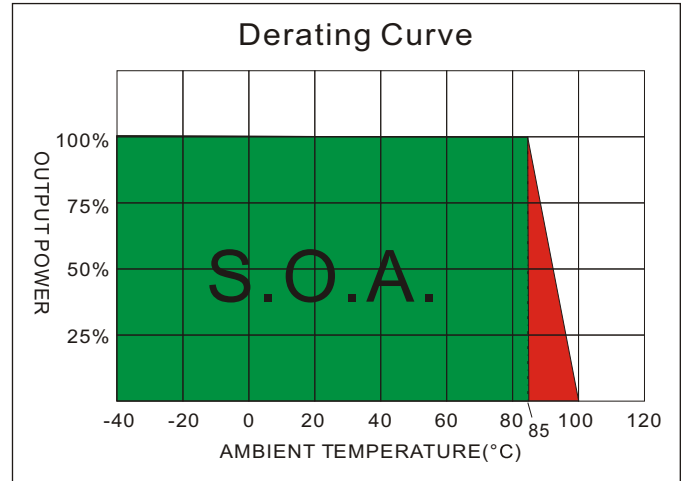
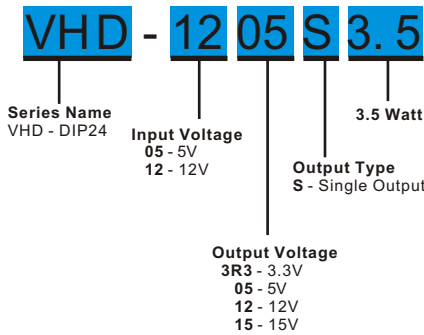


C1	L1	C2 & C3
47 μ F, 25V	12 μ H	150PF/250VAC

C_2 & C_3 : Y5P Safety Standard Recognized Ceramic Capacitors
foot distance 10mm

VHD - 3.5W Regulated Single output

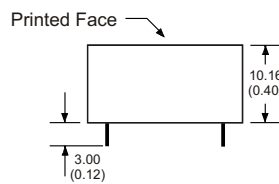
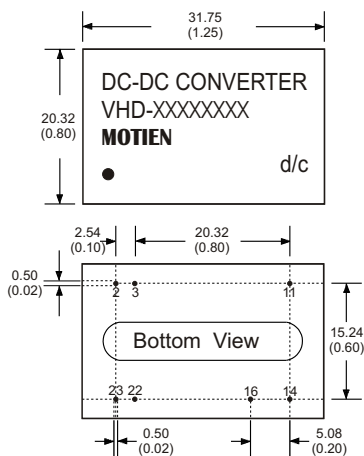
PARTNUMBER STRUCTURE



MODEL SELECTION GUIDE

MODEL NUMBER	INPUT Voltage Range (Vdc)	INPUT Current		OUTPUT Voltage (Vdc)	OUTPUT Current Full load (mA)	OUTPUT Ripple & noise (mV)	EFFICIENCY @FL(%)	Capacitor Load(µF)
		No-Load (mA)	Full Load (mA)					
VHD-053 R3S3.5	5	70	633	3.3	700	75	73	470
VHD-05 05S3.5	5	85	909	5	700	75	77	470
VHD-05 12S3.5	5	95	884	12	291	85	79	220
VHD-05 15S3.5	5	115	896	15	233	75	78	220
VHD-123 R3S3.5	12	30	257	3.3	700	75	75	470
VHD-12 05S3.5	12	35	369	5	700	75	79	470
VHD-12 12S3.5	12	50	364	12	291	85	80	220
VHD-12 15S3.5	12	60	364	15	233	75	80	220

MECHANICAL SPECIFICATIONS



24 Pin DIL Package
Non-Conductive Plastic

Notes: All dimensions are typical in millimeters (inches).
 1. Pin diameter: 0.5±0.05 (0.02±0.002)
 2. Pin pitch and length tolerance: ±0.35 (±0.014)
 3. Case Tolerance: ±0.5 (±0.02)

PIN CONNECTIONS	
PIN NUMBER	DESCRIPTION
2	-V Input
3	-V Input
11	N.C.
14	+V Output
16	-V Output
22	+V Input
23	+V Input

DRAWING: *Jacob*

APPROVED: *Nemo*