Size: 2in x 1in x 0.40~0.43in
(50.8mm x 25.4mm x 10.2~11mm)

FEATURES

- RoHS & REACH Compliant
- 40 Watts Output Power
- 4:1 Ultra Wide Input Voltage Ranges
- Single & Dual Outputs
- Remote ON/OFF Control
- 1500VDC I/O Isolation
- High Efficiency up to 91%
- Under Voltage Lockout (UVLO)
- 2.0” x 1.0” x 0.4” Package Size
- Trimmable Output Voltage
- Shielded Metal Case with Isolated Base-plate
- High Power Density
- Over Load, Short Circuit, Over Voltage, and Over Temperature Protection
- UL/cUL/IEC/EN 60950-1 Safety Approvals
- Heatsink (Optional)

DESCRIPTION

The DHW40 series is the latest generation of high performance DC/DC converters setting a new standard concerning power density. These converters offer 40 Watts of continuous output power in a 2.0” x 1.0” x 0.4” encapsulated, shielded metal package. The DHW40 series has single and dual output models with 4:1 ultra wide input voltage ranges of 9-36VDC and 18-75VDC. Advanced circuit topology provides a very high efficiency up to 91% and an operating temperature range of -40°C to +80°C. Further features include remote on/off, trimmable output voltage, under-voltage lockout as well as over load, over voltage, short circuit, and over-temperature protection. These converters are RoHS compliant and are ideal for use in battery operated equipment, instrumentation, distributed power architectures in communication and industrial electronics and many other space critical applications.

MODEL SELECTION TABLE

Single Output Models

Model Number[1]	Input Voltage Range	Output Voltage	Output Current		Input Current		Output Power	Maximum Capacitive Load	Efficiency	Over Voltage Protection	Reflected Ripple Current
			Min Load	Max Load	No Load	Max Load					
DHW24S3.3-26	24VDC (9~36VDC)	3.3VDC	0mA	8A	90mA	1.24A	26.4W	21000µF	89%	3.9VDC	30mA Typ.
DHW24S5-40		5VDC	0mA	8A	90mA	1.85A	40W	13600µF	90%	6.2VDC	
DHW24S12-40		12VDC	0mA	3.33A	95mA	1.87A	40W	2400µF	89%	15VDC	
DHW24S15-40		15VDC	0mA	2.67A	105mA	1.87A	40W	1500µF	89%	18VDC	
DHW24S24-40		24VDC	0mA	1.67A	115mA	1.835A	40W	600µF	91%	30VDC	
DHW48S3.3-26	48VDC (18~75VDC)	3.3VDC	0mA	8A	55mA	620mA	26.4W	21000µF	89%	3.9VDC	20mA Typ.
DHW48S5-40		5VDC	0mA	8A	55mA	930mA	40W	13600µF	90%	6.2VDC	
DHW48S12-40		12VDC	0mA	3.33A	60mA	930mA	40W	2400µF	90%	15VDC	
DHW48S15-40		15VDC	0mA	2.67A	65mA	930mA	40W	1500µF	90%	18VDC	
DHW48S24-40		24VDC	0mA	1.67A	75mA	918mA	40W	600µF	91%	30VDC	

MODEL SELECTION TABLE

Dual Output Models

Model Number	Input Voltage Range	Output Voltage	Output Current		Input Current		Output Power	Maximum Capacitive Load	Efficiency	Over Voltage Protection	Reflected Ripple Current
			Min Load	Max Load	No Load	Max Load					
DHW24D12-40	24VDC (9~36VDC)	±12 VDC	±145mA	±1.67A	65mA	1.89A	40W	1200µF*	88%	±15 VDC	30mA Typ.
DHW24D15-40		±15 VDC	±110mA	±1.33A	65mA	1.89A	40W	750µF*	88%	±18 VDC	
DHW48D12-40	48VDC (18~75VDC)	±12 VDC	±145mA	±1.67A	45mA	950mA	40W	1200µF*	88%	±15 VDC	20mA Typ.
DHW48D15-40		±15 VDC	±110mA	±1.33A	45mA	950mA	40W	750µF*	88%	±18 VDC	

* for each output

SPECIFICATIONS

All specifications are based on 25°C, Nominal Input Voltage, Resistive Load and Rated Output Current unless otherwise noted.
We reserve the right to change specifications based on technological advances.

SPECIFICATION	TEST CONDITIONS		Min	Typ	Max	Unit
INPUT SPECIFICATIONS						
Input Voltage Range	24VDC Nominal Input Models		9	24	36	VDC
	48VDC Nominal Input Models		18	48	75	
Input Surge Voltage (100ms Max.)	24VDC Nominal Input Models		-0.7		50	VDC
	48VDC Nominal Input Models		-0.7		100	
Start-Up Threshold Voltage	24VDC Nominal Input Models				9	VDC
	48VDC Nominal Input Models				18	
Under Voltage Lockout	24VDC Nominal Input Models			8.3		VDC
	48VDC Nominal Input Models			16.5		
Input Filter	All models		Internal LC Type			
OUTPUT SPECIFICATIONS						
Output Voltage			See Table			
Voltage Accuracy					±1.0	%Vnom
Line Regulation	Vin=Min. to Max. @Full Load				±0.5	%
Load Regulation	Min. Load to Full Load	Single Outputs			±0.5	%
		Dual Outputs			±1.0	
Voltage Balance	Dual Outputs, Balanced Loads				±2.0	%
Load Cross Regulation	Dual Outputs, Asymmetrical Load 25%/100% Full Load				±5.0	%
Trim Up/Down Range	% of Nominal Output Voltage	24V Models	-10		+20	%
		Other Models			±10	
Output Power			See Table			
Output Current			See Table			
Minimum Load	Single Output Models		No Minimum Load Requirement			
	Dual Output Models		See Table			
Maximum Capacitive Load			See Table			
Ripple & Noise (20MHz bandwidth)[2]	0-20MHz Bandwidth	3.3V & 5V			100	mVp-p
		12V, 15V, & 24V Models			150	
		Dual Output Models			150	
Transient Recovery Time[3]	25% Load Step Change			250		µsec
Transient Response Deviation	25% Load Step Change			±3	±5	%
Start-Up Time (Power On)	Nominal Vin and Constant Resistive Load				30	ms
Temperature Coefficient					±0.02	%/ºC
REMOTE ON/OFF CONTROL						
Converter On			3.5~12V or Open Circuit			
Converter Off			0V~1.2V or Short Circuit			
Control Input Current	On, Vctrl=5.0V			0.5		mA
	Off, Vctrl=0V			-0.5		
Control Common			Referenced to Negative Input			
Remote OFF Input Current	Nominal Vin			2.5		mA
PROTECTION						
Short Circuit Protection	24V Output Model		0.3Hz Typ. Automatic Recovery			
	Others		Hiccup Mode 1.5Hz Typ.			
Over Load Protection	Hiccup		Circuit Limitation at 150% typ. of Iout max.			
Over Voltage Protection			See Table			
Over Temperature Protection	Shutdown Temperature				+110	ºC
GENERAL SPECIFICATIONS						
Efficiency			See Table			
Switching Frequency	24V Models			285		KHz
	Other Models			320		
Isolation Voltage	60 Seconds		1500			VDC
	1 Second		1800			
Isolation Resistance	500VDC		1000			MΩ
Isolation Capacitance	100KHz, 1V				1500	
PHYSICAL SPECIFICATIONS						
Weight			1.06oz (30g)			
Dimensions (L x W x H)	24V Models		2in x 1in x 0.43in (50.8mm x 25.4mm x 11mm)			
	Others		2in x 1in x 0.40in (50.8mm x 25.4mm x 10.2mm)			
Case Material			Aluminum Alloy, Black Anodized Coating			
Base Material			FR4 PCB (Flammability to UL 94V-0 Rated)			
Pin Material			Copper Alloy w/ Gold Plate Over Nickel Subplate			
RFI			Six-Sided Shielded, Metal Case			

SPECIFICATIONS

All specifications are based on 25°C, Nominal Input Voltage, and Maximum Output Current unless otherwise noted.
We reserve the right to change specifications based on technological advances.

SPECIFICATION	TEST CONDITIONS		Min	Typ	Max	Unit
ENVIRONMENTAL SPECIFICATIONS						
Operating Ambient Temperature (Without Heatsink)	Natural Convection, Nomina Vin, Load 100% Inom	DHW24S3.3-26, DHW48S3.3-26	-40		66	ºC
		DHW24S05-40, DHW48S05-40, DHW48S12-40, DHW48S15-40	-40		51	
		DHW24S12-40, DHW24S15-40	-40		45	
		DHW24S24-40, DHW48S24-40	-40		57	
		DHW24D12-40, DHW24D15-40, DHW48D12-40, DHW48D15-40	-40		40	
Operating Ambient Temperature (With Heatsink)	Natural Convection, Nomina Vin, Load 100% Inom	DHW24S3.3-26, DHW48S3.3-26	-40		73	ºC
		DHW24S05-40, DHW48S05-40, DHW48S12-40, DHW48S15-40	-40		61	
		DHW24S12-40, DHW24S15-40	-40		57	
		DHW24S24-40, DHW48S24-40	-40		66	
		DHW24D12-40, DHW24D15-40, DHW48D12-40, DHW48D15-40	-40		52	
Storage Temperature			-50		+125	ºC
Thermal Impedance (Without Heatsink)	Natural Convection		12.0			ºC/W
	100LFM		9.0			
	200LFM		8.0			
	400LFM		6.0			
Thermal Impedance (With Heatsink)	Natural Convection		10.0			ºC/W
	100LFM		5.4			
	200LFM		4.5			
	400LFM		3.0			
Relative Humidity	Non-Condensing				95	%RH
Case Temperature					+105	ºC
Cooling[4]			Natural Convection.			
Lead Temperature	1.5mm from case for 10Sec				260	ºC
MTBF	MIL-HDBK-217F @25ºC, Ground Benign			328,000		Hours
SAFETY CHARACTERISTICS						
Safety Approvals	UL/cUL 60950-1 Recognition (CSA Certificate) IEC/EN 60950-1 (CB-Report)					
EMI	Conduction	EN55032, FCC Part 15				Class A
EMS	EN55024					
	ESD	EN61000-4-2 Air±8kV, Contact ±6kV				A
	Radiated Immunity	EN61000-4-3 10V/m				A
	Fast Transient	EN61000-4-4 ±2kV[5]				A
	Surge	EN61000-4-5 ±1kV[5]				A
	Conducted Immunity	EN61000-4-6 10Vrms				A
	PFMF	EN61000-4-8 3A/m				A

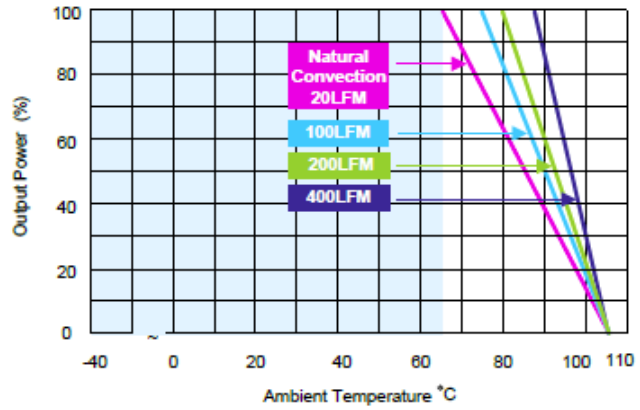
NOTES

1. Heatsink is available for models. Add “HS1” to model name for 24V model heatsink, or “HS” for other models.
2. Ripple & Noise measurement with a 1µF M/C and a 10µF T/C.
3. Transient recovery time is measured to within 1% error band for a step change in output load of 75% to 100%
4. Natural convection is about 20LFM but is not equal to still air (0 LFM).
5. To meet EN61000-4-4 & EN61000-4-5 an external capacitor across the input pins is required. Suggested capacitor: 330µF/100V.
6. It is recommended to protect the converter by a slow blow fuse in the input supply line.
7. Other input and output voltages may be available, please contact factory.
8. Do not exceed maximum power specification when adjusting output voltage.

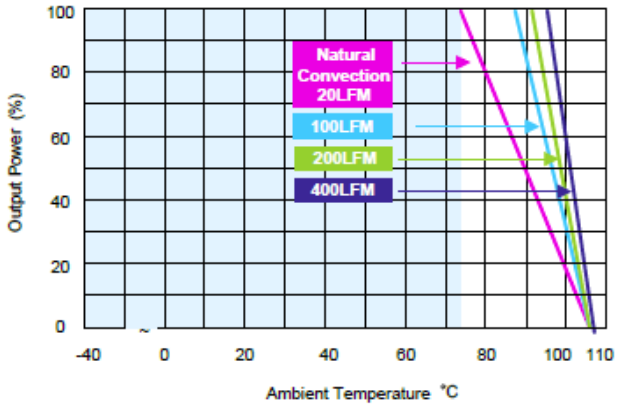
**Due to advances in technology, specifications subject to change without notice.*

DERATING CURVES

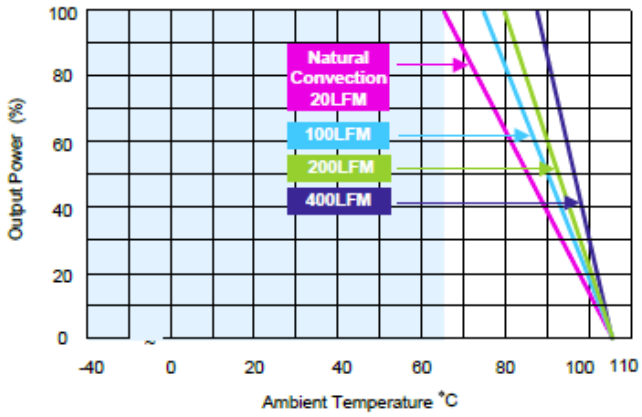
DHW24S3.3-26 & DHW48S3.3-26
Derating Curve without Heatsink



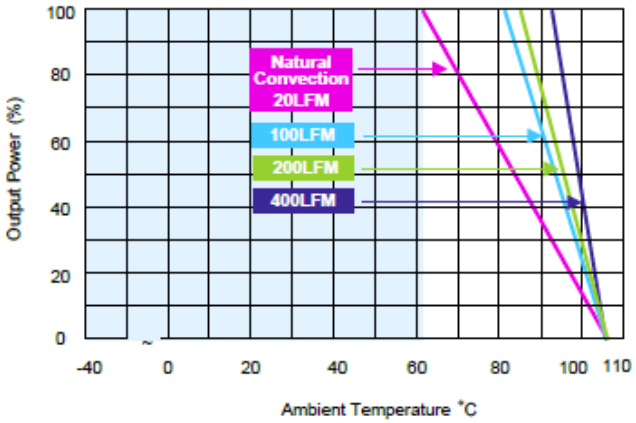
DHW24S3.3-26 & DHW48S3.3-26
Derating Curve with Heatsink



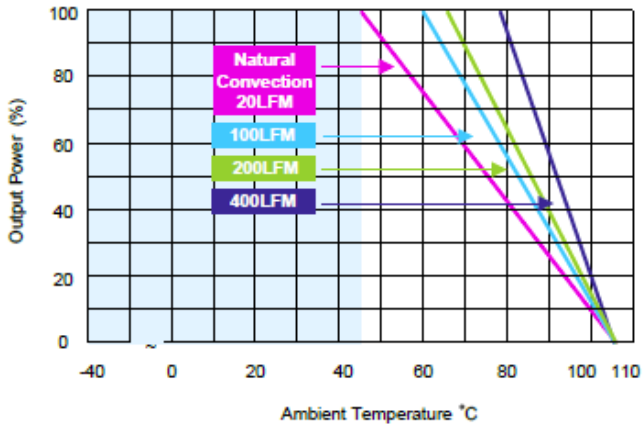
DHW24S05-40, DHW48S05-40, DHW48S12-40, DHW48S15-40
Derating Curve without Heatsink



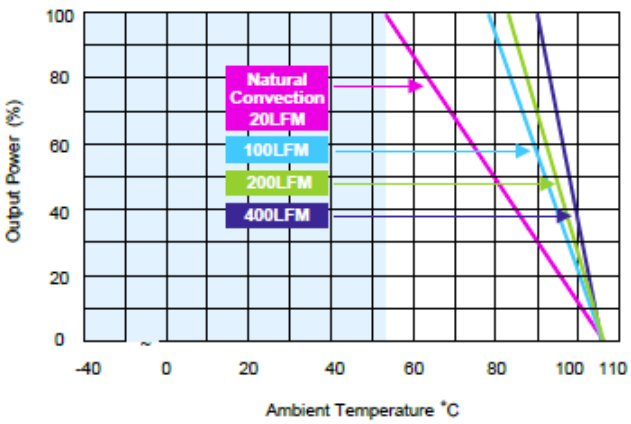
DHW24S05-40, DHW48S05-40, DHW48S12-40, DHW48S15-40
Derating Curve with Heatsink



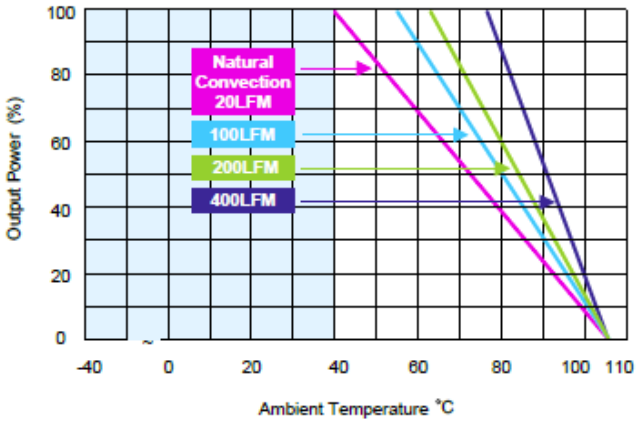
DHW24S12-40 & DHW24S15
Derating Curve without Heatsink



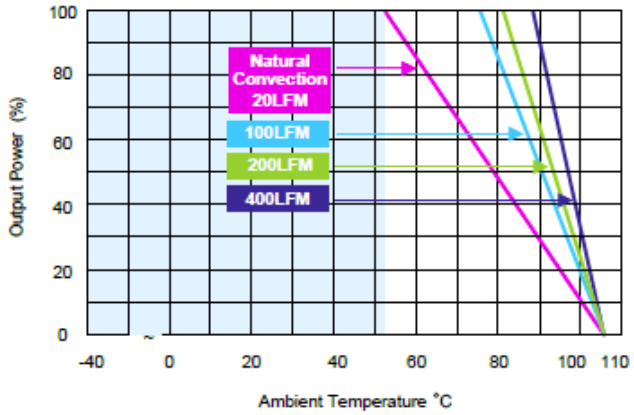
DHW24S12-40 & DHW24S15
Derating Curve with Heatsink



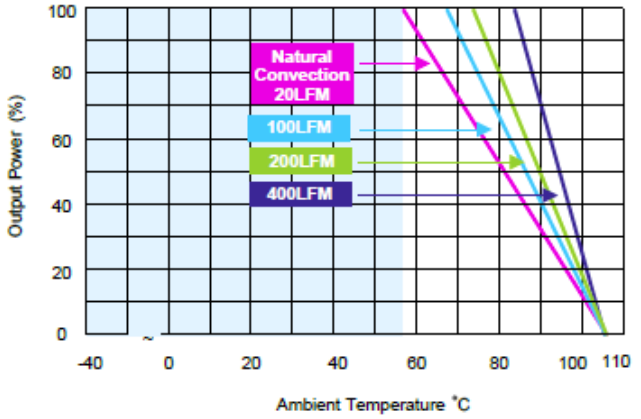
DHW24D12-40, DHW24D15-40, DHW48D12-40, DHW48D15-40 Derating Curve without Heatsink



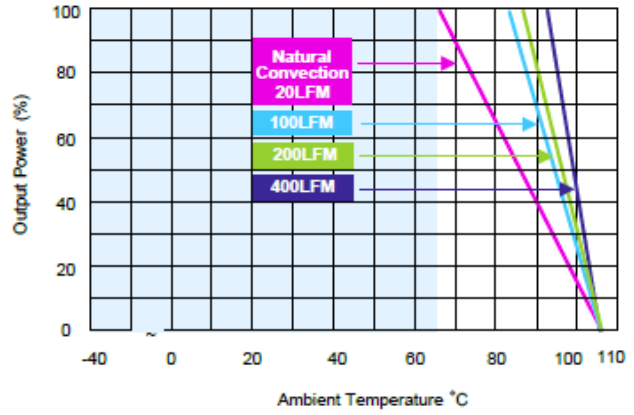
DHW24D12-40, DHW24D15-40, DHW48D12-40, DHW48D15-40 Derating Curve with Heatsink



DHW24S24-40, DHW48S24-40 Derating Curve without Heatsink



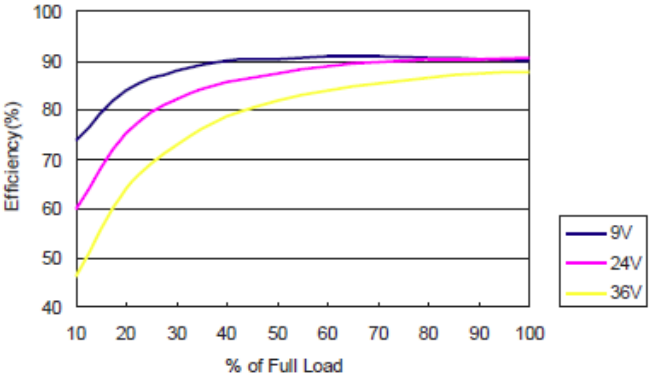
DHW24S24-40, DHW48S24-40 Derating Curve with Heatsink



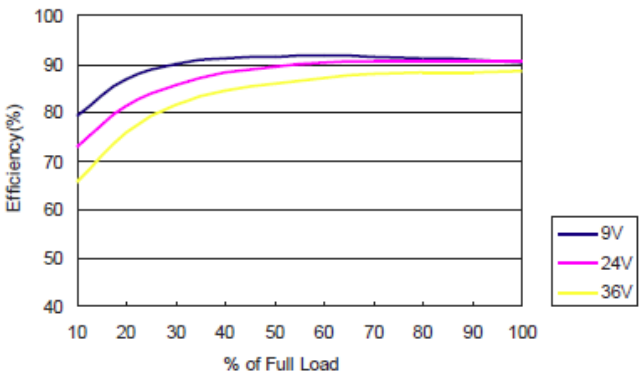
EFFICIENCY GRAPHS

24VDC Nominal Input Voltage, 25ºC

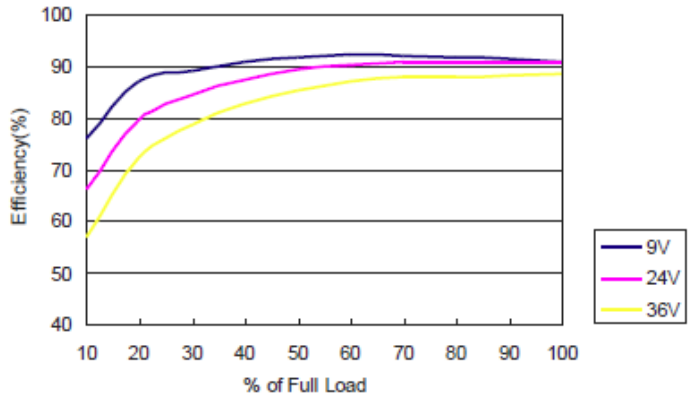
DHW24S03.3-26 Efficiency vs. Load Current



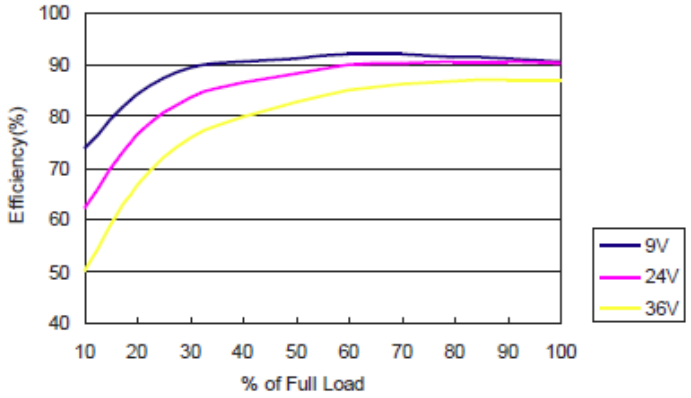
DHW24S05-40 Efficiency vs. Load Current



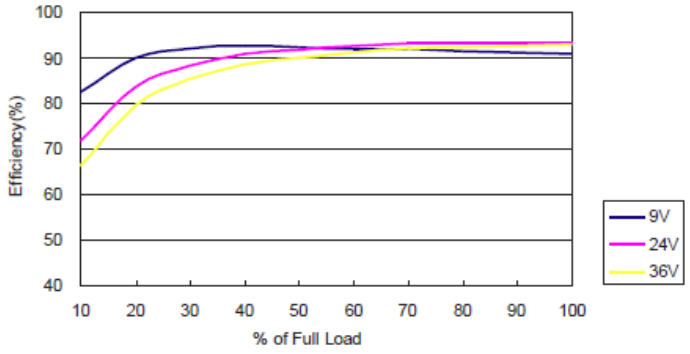
DHW24S12-40 Efficiency vs. Load Current



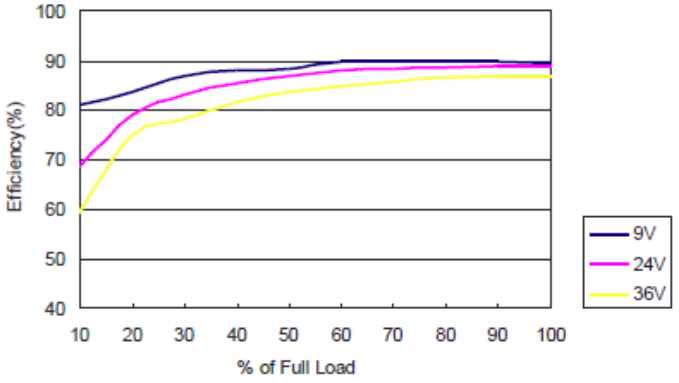
DHW24S15-40 Efficiency vs. Load Current



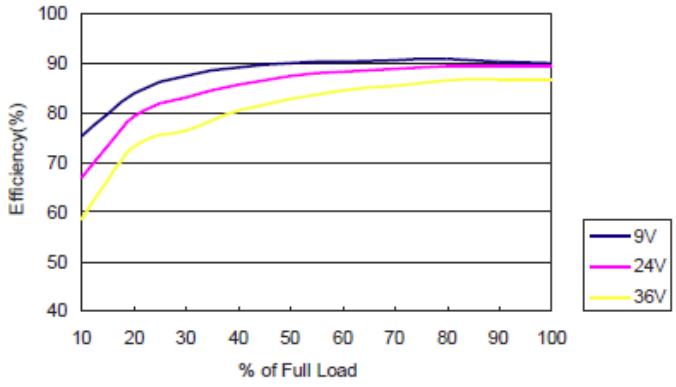
DHW24S24-40 Efficiency vs. Load Current



DHW24D12-40 Efficiency vs. Load Current



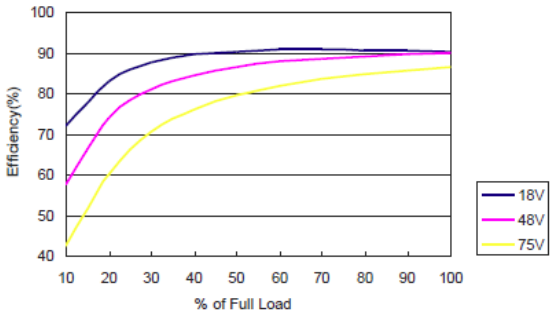
DHW24D15-40 Efficiency vs. Load Current



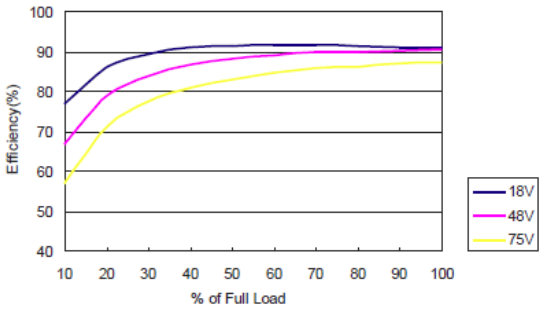
EFFICIENCY GRAPHS

48VDC Nominal Input Voltage, 25ºC

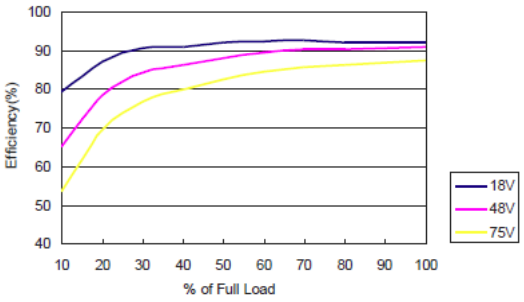
DHW48S03.3-26 Efficiency vs. Load Current



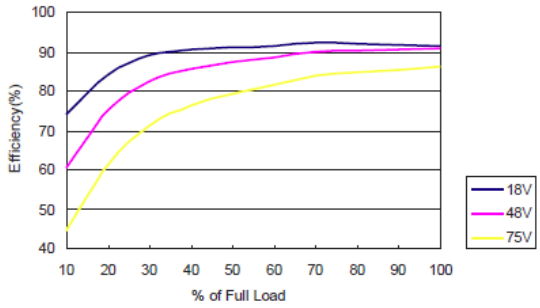
DHW48S05-40 Efficiency vs. Load Current



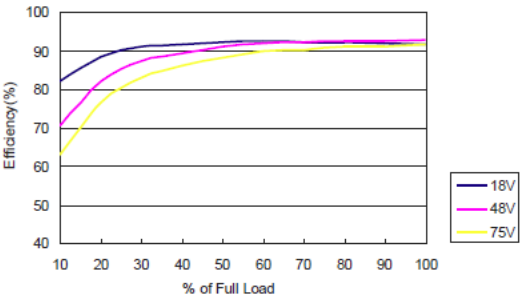
DHW48S12-40 Efficiency vs. Load Current



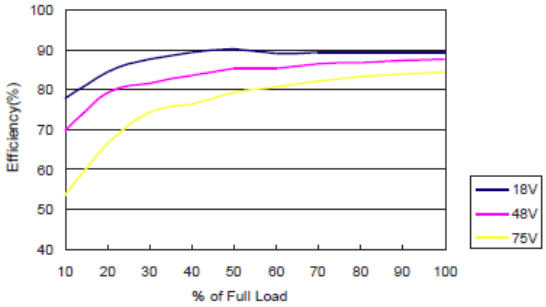
DHW48S15-40 Efficiency vs. Load Current



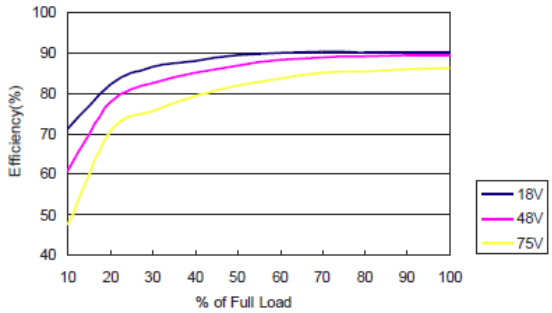
DHW24S48-40 Efficiency vs. Load Current



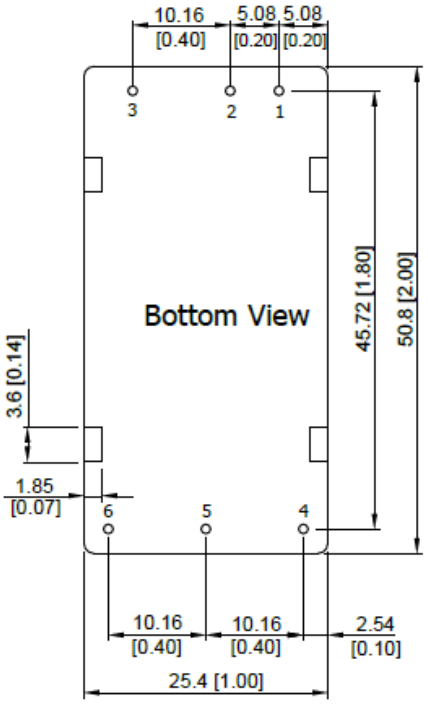
DHW48D12-40 Efficiency vs. Load Current

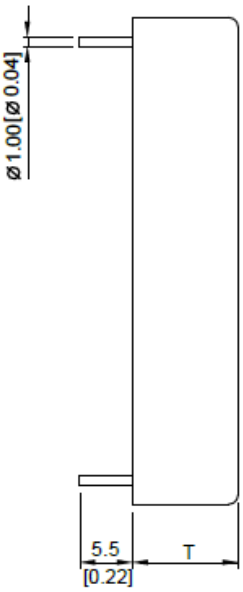


DHW48D15-40 Efficiency vs. Load Current



MECHANICAL DRAWINGS





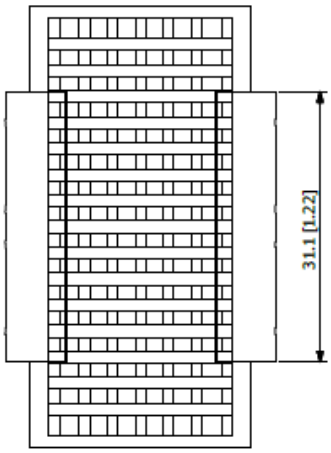
Pin Connections

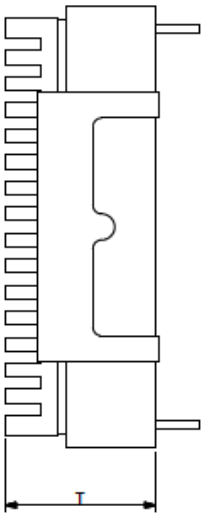
Pin	Single Output	Dual Output
1	+Vin	+Vin
2	-Vin	-Vin
3	Remote On/Off	Remote On/Off
4	+Vout	+Vout
5	-Vout	Common
6	Trim	-Vout

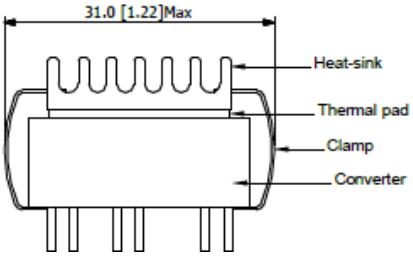
T: 11mm (0.43in) for 24V Output Models
T: (10.2mm (0.40in) for Other Output Models

Notes:
All dimensions in mm (inches)
Tolerance: X.X±0.25 (X.XX±0.01)
X.XX±0.13 (X.XXX±0.005)
Pin Diameter Ø 1.0±0.05 (0.04±0.002)

Heatsink Option (-HS or -HS1 Suffix)







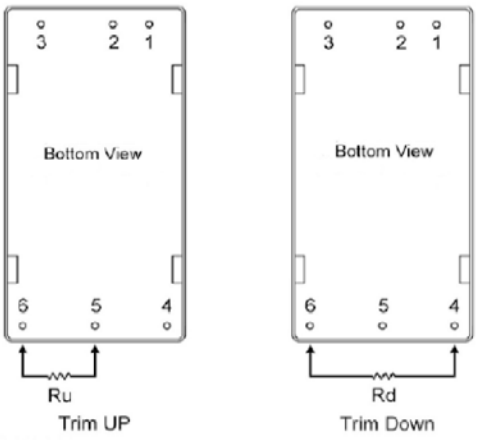
Physical Characteristics
Heatsink Material: Aluminum
Finish: Black Anodized Coating

T: 18.0mm (0.71in) for 24V Output Models
T: 17.2mm (0.68in) for Other Output Models

The advantages of adding heatsink are:
1. Improve heat dissipation and increase stability and reliability of the DC/DC converters at high operating temperatures.
2. To increase operating temperature of the DC/DC converter, see derating curve.

EXTERNAL OUTPUT TRIMMING

Output can be externally trimmed using the method shown below:



3.3VDC Models

Trim Down	1	2	3	4	5	6	7	8	9	10	%
Vout=	Vox0.99	Vox0.98	Vox0.97	Vox0.96	Vox0.95	Vox0.94	Vox0.93	Vox0.92	Vox0.91	Vox0.90	Volts
Rd=	72.61	32.55	19.20	12.52	8.51	5.84	3.94	2.51	1.39	0.50	KOhms
Trim Up	1	2	3	4	5	6	7	8	9	10	%
Vout=	Vox1.01	Vox1.02	Vox1.03	Vox1.04	Vox1.05	Vox1.06	Vox1.07	Vox1.08	Vox1.09	Vox1.10	Volts
Ru=	60.84	27.40	16.25	10.68	7.34	5.11	3.51	2.32	1.39	0.65	KOhms

5VDC Models

Trim Down	1	2	3	4	5	6	7	8	9	10	%
Vout=	Vox0.99	Vox0.98	Vox0.97	Vox0.96	Vox0.95	Vox0.94	Vox0.93	Vox0.92	Vox0.91	Vox0.90	Volts
Rd=	138.88	62.41	36.92	24.18	16.53	11.44	7.79	5.06	2.94	1.24	KOhms
Trim Up	1	2	3	4	5	6	7	8	9	10	%
Vout=	Vox1.01	Vox1.02	Vox1.03	Vox1.04	Vox1.05	Vox1.06	Vox1.07	Vox1.08	Vox1.09	Vox1.10	Volts
Ru=	106.87	47.76	28.06	18.21	12.30	8.36	5.55	3.44	1.79	0.48	KOhms

12VDC Models

Trim Down	1	2	3	4	5	6	7	8	9	10	%
Vout=	Vox0.99	Vox0.98	Vox0.97	Vox0.96	Vox0.95	Vox0.94	Vox0.93	Vox0.92	Vox0.91	Vox0.90	Volts
Rd=	413.55	184.55	108.22	70.05	47.15	31.88	20.98	12.80	6.44	1.35	KOhms
Trim Down	1	2	3	4	5	6	7	8	9	10	%
Vout=	Vox1.01	Vox1.02	Vox1.03	Vox1.04	Vox1.05	Vox1.06	Vox1.07	Vox1.08	Vox1.09	Vox1.10	Volts
Rd=	351.00	157.50	93.00	60.75	14.40	28.50	19.29	12.37	7.00	2.70	KOhms

15VDC Models

Trim Down	1	2	3	4	5	6	7	8	9	10	%
Vout=	Vox0.99	Vox0.98	Vox0.97	Vox0.96	Vox0.95	Vox0.94	Vox0.93	Vox0.92	Vox0.91	Vox0.90	Volts
Rd=	530.73	238.61	141.24	92.56	63.35	43.87	29.96	19.53	11.41	4.92	KOhms
Trim Down	1	2	3	4	5	6	7	8	9	10	%
Vout=	Vox1.01	Vox1.02	Vox1.03	Vox1.04	Vox1.05	Vox1.06	Vox1.07	Vox1.08	Vox1.09	Vox1.10	Volts
Rd=	422.77	189.89	112.26	73.44	50.15	34.63	23.54	15.22	8.75	3.58	KOhms

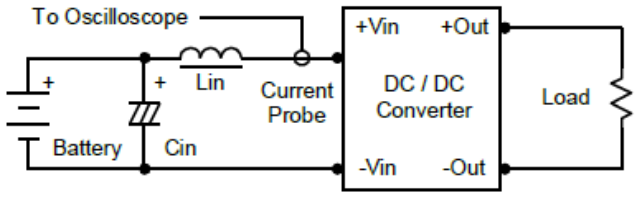
24VDC Models

Trim Down	1	2	3	4	5	6	7	8	9	10	%
Vout=	Vox0.99	Vox0.98	Vox0.97	Vox0.96	Vox0.95	Vox0.94	Vox0.93	Vox0.92	Vox0.91	Vox0.90	Volts
Rd=	333.39	148.80	87.26	56.50	38.04	25.73	16.94	10.35	5.22	1.12	KOhms
Trim Down	2	4	6	8	10	12	14	16	18	20	%
Vout=	Vox1.02	Vox1.04	Vox1.06	Vox1.08	Vox1.1	Vix1.12	Vox1.14	Vox1.16	Vox1.18	Vox1.2	Volts
Rd=	243.70	108.50	63.43	40.90	27.38	18.37	11.93	7.10	3.34	0.34	KOhms

TEST SETUP

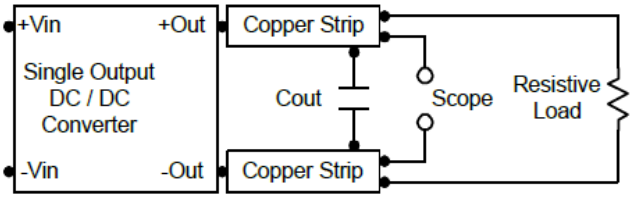
Input Reflected-Ripple Current Test Setup

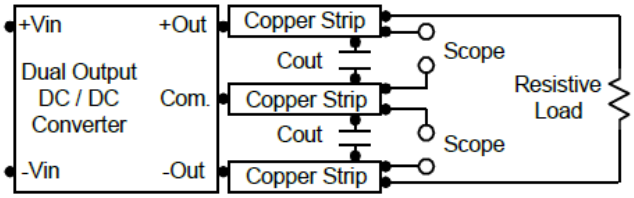
Input reflected ripple-current is measured with an inductor Lin (4.7µH) and Cin (220µF, ESR < 1.0Ω at 100KHz) to simulate source impedance. Capacitor Cin, offsets possible battery impedance. Current ripple is measured at the input terminals of the module, measurement bandwidth is 0-500KHz.



Peak-to-Peak Output Noise Measurement Test

Use a 1µF ceramic capacitor and a 10µF tantalum capacitor. Scope measurement should be made by using a BNC socket, measurement bandwidth is 0-20MHz. Position the load between 50mm and 75mm from the DC/DC converter.





TECHNICAL NOTES

Remote On/Off

Positive logic remote on/off turns the module on during a logic high voltage on the remote on/off pin, and off during a logic low. To turn the power module on and off, the user must supply a switch to control the voltage between the on/off terminal and the –Vin terminal. The switch can be an open collector or equivalent. A logic low is 0V to 1.2V. A logic high is 4.7V to 12V. The maximum sink current at the on/off terminal (Pin 3) during a logic low is -100µA. The maximum allowable leakage current of a switch connected to the on/off terminal (Pin 3) at logic high (2.5V to 100V) is 5µA.

Over Load Protection

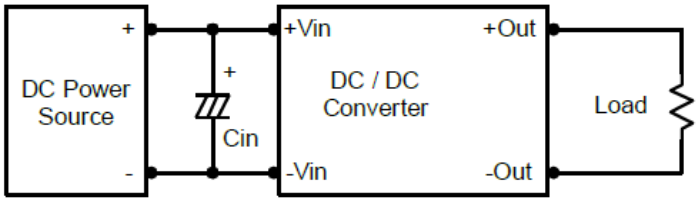
To provide hiccup mode protection in a fault (output over load) condition, the unit is equipped with internal current limiting circuitry and can endure overload for an unlimited duration.

Over Voltage Protection

The output over voltage clamp consists of control circuitry, which is independent of the primary regulation loop that monitors the voltage on the output terminals. The control loop of the clamp has a higher voltage set point than the primary loop. This provides a redundant voltage control that reduces the risk of output overvoltage. The OVP level can be found in data sheet.

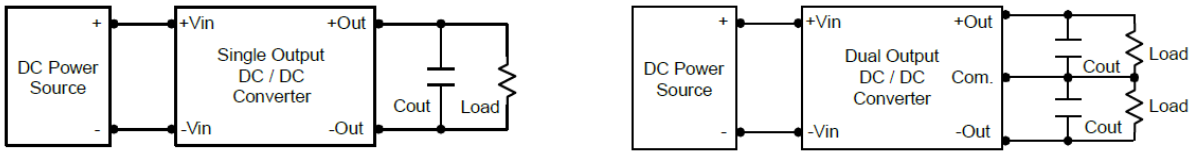
Input Source Impedance

The power module should be connected to a low ac-impedance input source. Highly inductive source impedances can affect the stability of the power module. In applications where power is supplied over long lines and output loading is high, it may be necessary to use a capacitor at the input to ensure startup. Capacitor mounted close to the power module helps ensure stability of the unit, it is recommended to use a good quality low Equivalent Series Resistance (ESR<1.0Ω at 100KHz) capacitor of a 10µF for the 24V and 48V devices.



Output Ripple Reduction

A good quality low ESR capacitor placed as close as practicable across the load will give the best ripple and noise performance. To reduce output ripple, it is recommended to use 4.7µF capacitors at the output.

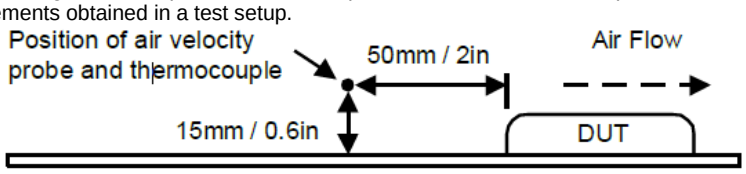


Maximum Capacitive Load

The DHW40 series has limitation of maximum connected capacitance at the output. The power module may be operated in current limiting mode during start-up, affecting the ramp-up and the startup time. The maximum capacitance can be found in data sheet.

Thermal Considerations

Many conditions affect the thermal performance of the power module, such as orientation, airflow over the module, and board spacing. To avoid exceeding the maximum temperature rating of the components inside the power module, the case temperature must be kept below 105ºC. The derating curves are determined from measurements obtained in a test setup.



MODEL NUMBER SETUP

DHW	24	S	15	-	40	-	HS
Series Name	Input Power	Output Quantity	Output Voltage		Ouptut Power		Heatsink Option
	24: 9~36VDC **48:** 18~75VDC	**S:** Single	**3.3:** 3.3VDC **5:** 5VDC **12:** 12VDC **15:** 15VDC **24:** 24VDC		**26:** 26.4 Watts **40:** 40 Watts		**HS:** Standard Heatsink **HS1:** Heatsink for 24V Models
		D: Dual	**12:** ±12VDC **15:** ±15VDC				

COMPANY INFORMATION

Wall Industries, Inc. has created custom and modified units for over 50 years. Our in-house research and development engineers will provide a solution that exceeds your performance requirements on-time and on budget. Our ISO9001-2008 certification is just one example of our commitment to producing a high quality, well-documented product for our customers.

Our past projects demonstrate our commitment to you, our customer. Wall Industries, Inc. has a reputation for working closely with its customers to ensure each solution meets or exceeds form, fit and function requirements. We will continue to provide ongoing support for your project above and beyond the design and production phases. Give us a call today to discuss your future projects.

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