



Features

- 7pin SIP Package with Industry-Standard Footprint
- Input / Output Isolation Voltage: 1.5kVDC
- High Efficiency
- Lead Free Design, RoHS Compliant
- Operating temperature: -40°C to +85°C
- Meet Safety Standard / Approval: IEC / EN60950-1



Applications

These converters are well suitable for battery operated equipment, measurement equipment, telecom, wireless network, Industry control system, everywhere where isolated, tightly regulated voltages and compact size are required.

Technical Specification All specifications are typical at nominal input, full load and 25°C unless otherwise stated.

Model Number	Input Voltage Range(V)	Output Voltage (V)	Output Current (mA) ⁽¹⁾		Input Current (mA) Typ.		Eff. (%) ⁽²⁾ Typ.	Capacitive Load, max. ⁽³⁾ (uF)
			Full Load	No Load	No Load	Full Load		
DHA1-03S0	3.14-3.47 Nominal:3.3	3.3	300	35	455	66	68	
DHA1-03S1		5	200					446
DHA1-05S0	4.75-5.25 Nominal:5	3.3	300	25	291	68	68	
DHA1-05S1		5	200		286	70	47	
DHA1-05SA		9	110		275	72	33	
DHA1-05S2		12	83		269	74	22	
DHA1-05S3		15	67		269	74	22	
DHA1-05S5		24	42		296	68	10	
DHA1-09S0		4.75-5.25 Nominal:9	3.3		300	20	163	68
DHA1-09S1	5		200	158	70		47	
DHA1-09S2	12		83	154	72		22	
DHA1-09S3	15		67	150	74		22	
DHA1-09S5	24		42	150	74		10	
DHA1-12S0	11.4-12.6 Nominal:12	3.3	300	15	121	68	68	
DHA1-12S1		5	200		119	70	47	
DHA1-12SA		9	110		115	72	33	
DHA1-12S2		12	83		112	74	22	
DHA1-12S3		15	67		112	74	22	
DHA1-12S5		24	42		120	70	10	
DHA1-15S0	14.3-15.8 Nominal:15	3.3	300	12	97	68	68	
DHA1-15S1		5	200		95	70	47	
DHA1-15SA		9	110		92	72	33	
DHA1-15S2		12	83		90	74	22	
DHA1-15S3		15	67		90	74	22	
DHA1-15S5		24	42		96	70	10	
DHA1-24S0	22.8-25.2 Nominal:24	3.3	300	7	59	70	68	
DHA1-24S1		5	200		58	72	47	



DHA1-24SA		9	110		56	74	33
DHA1-24S2		12	83		55	76	22
DHA1-24S3		15	67		55	76	22
DHA1-24S5		24	42		60	70	10

Input Specifications

	3.3V nominal input	3.14-3.47V
	5V nominal input	4.75-5.25V
	12V nominal input	11.4-12.6V
	15V nominal input	14.3-15.8V
	24V nominal input	22.8-25.2V

Input filter Capacitor

Hot Plug **Unavailable**

Environmental Specifications

Operating ambient temperature	-40°C to +85°C
Maximum case temperature	+105°C
Storage temperature range	-55°C to +125°C
Relative humidity	95%RH Max.

Output Specifications

Output power	1 Watts Max.	
Voltage accuracy	Nominal Vin and full load	
	3.3Vdc	3.135-3.399V
	5Vdc	4.75-5.15V
	9Vdc	8.73-9.18V
	12Vdc	11.64-12.24V
	15Vdc	14.55-15.30V
	24Vdc	23.52-24.36V
Voltage balance	Output	±1% max.
Minimum load	0A	
Line regulation	For Vin charge of -5% +5%	±0.25% Max.
Load Regulation	10%~100% load	±1% Max.
Ripple and Noise (20MHz Bandwidth)	60mVp-p Max.	
Maximum capacitive load	See table	
Output short circuit protection	Automatic recovery	Continuous
Temperature coefficient	±0.03%/°C Typ.	

General Specifications

Efficiency	Nominal input and full load	See table
Isolation voltage	Input to output	1500VDC (60 second)
Isolation resistance	500VDC	1000MΩ Min.
Isolation capacitance	30pF Typ.	
Switching frequency	300kHz Max.	
Reliability, calculated MTBF	2×10 ⁶ Hrs	

Physical Specifications

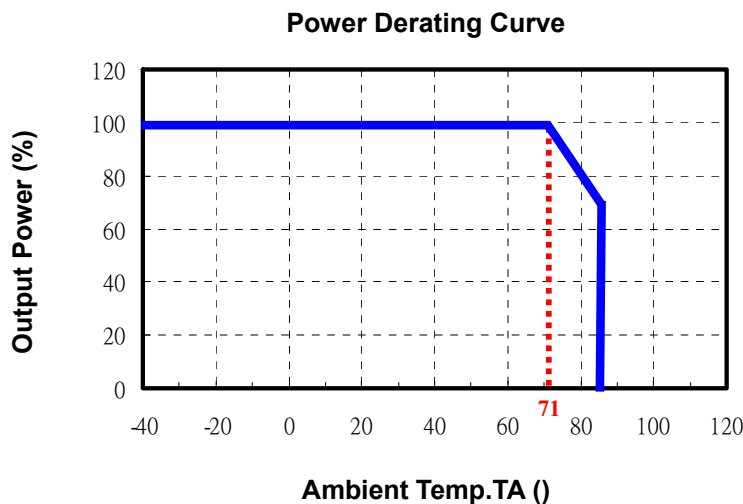


Case material	Plastic (UL94 V-0)
Potting material	Epoxy (UL94 V-0)
Dimensions	19.6×10.1×6.0 mm
Weight	2g Typ.

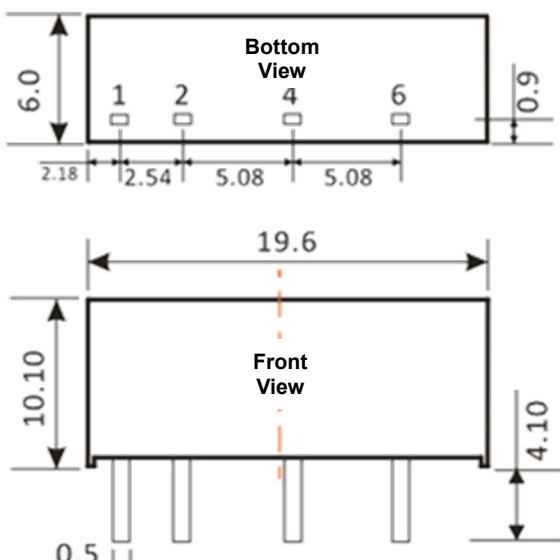
Note

1. Io below this value will not damage these converters, however, they may not meet all listed specifications.
2. Typical value, tested at nominal input and full load.
3. For each output.
4. Specifications subject to change without notice.
5. In case of long input lines or hot plug-in requirements, we recommended to use an external low ESR capacitor (22uF) near to the converter's input pins.

Power Derating Curve



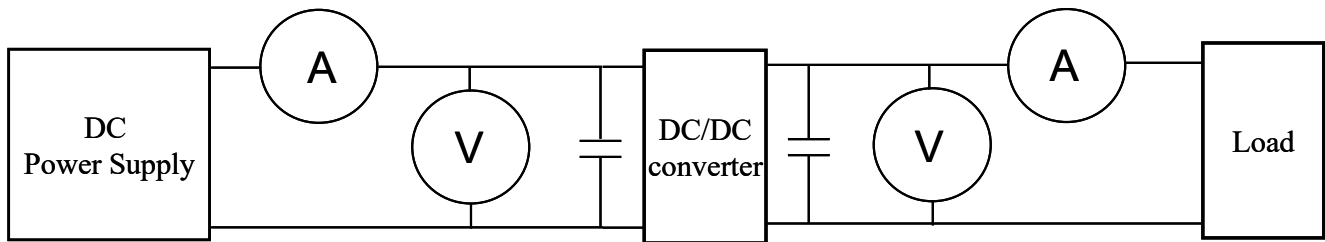
Mechanical Dimensions



Pin Assignment	
Pin	Single
1	+Vin
2	-Vin
4	-Vout
6	+Vout

Test Configurations

All specifications are typical at nominal input, full load and 25°C unless otherwise stated.



- ⊙DC Power Supply: It offers a wide voltage and current range precisely.
- ⊙Current meter (A): Accuracy → 200μA ~ 200mA 4 ranges ±(0.2% rdg + 2 digits)
2000mA ~ 20A 2 ranges ±(0.3% rdg + 2 digits).
- ⊙Voltage meter (V): Accuracy → ±(0.03% rdg + 4 digits).
- ⊙Load: At full load.
- ⊙Wires: The resistance of the wires must be small.

1. Input voltage range: Narrow input voltage range (±10%) · wide input voltage range (2:1 and 4:1) °

EX: Narrow input voltage range (±10%)

- 5V nominal input → 4.5~5.5V
- 12V nominal input → 10.10~13.2V
- 24V nominal input → 21.6~26.4V

Wide input voltage range 2:1

- 5V nominal input → 4.5~9V
- 12V nominal input → 9~18V
- 24V nominal input → 18~36V
- 48V nominal input → 36~75V

Wide input voltage range 4:1 (W)

- 24V nominal input → 9~36V
- 48V nominal input → 18~75V

2. Input power :

$$P_{in} = V_{in} \times I_{in}$$

V_{in} : Input voltage

I_{in} : Input current

3. Output power :

$$P_{out} = V_{out} \times I_{out}$$

V_{out} : Output voltage

I_{out} : Output current

4. Efficiency :

$$\text{Efficiency} = \frac{P_{out}}{P_{in}} \times 100\%$$

P_{out} : Output power

P_{in} : Input power



5. Voltage accuracy:

$$\frac{|V_{out}-V_{out(nominal)}|}{V_{out}} \times 100\%$$

Vout : Output voltage

Vout(nominal) : Nominal output voltage

6. Line regulation:

Narrow input voltage range (±10%) and unregulated output voltage series.

$$\text{Line regulation} = \frac{\Delta V_{out}}{\Delta V_{in}}$$

$$\Delta V_{out} = \frac{V_{out(+10\%)} - V_{out(-10\%)}}{V_{out}} \times 100\%$$

Vout(+10%) : Output voltage at Vin = 1.1xVin(nominal)&full load

Vout(-10%) : Output voltage at Vin = 0.9xVin(nominal)&full load

Vout : Output voltage at Vin = Vin(nominal)&full load

$$\Delta V_{in} = \frac{V_{in(+10\%)} - V_{in(-10\%)}}{V_{in(nominal)}} \times 100\%$$

Vin(+10%) : Input voltage = 1.1xVin(nominal)

Vin(-10%) : Input voltage = 0.9xVin(nominal)

Vin(nominal) : Nominal Input voltage

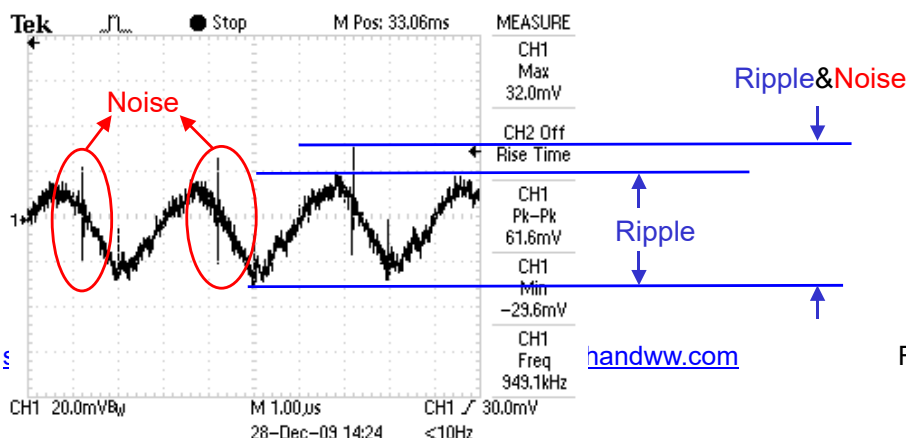
7. Load regulation :

$$\frac{|V_{out(FL)} - V_{out(NL)}|}{V_{out(FL)}} \times 100\%$$

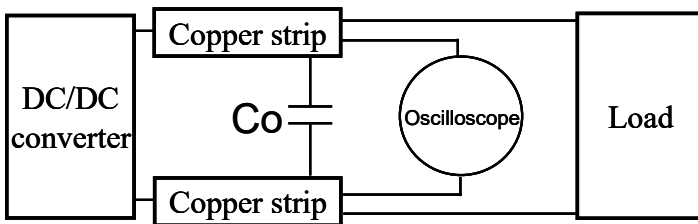
Vout(FL): Output voltage at full load

Vout(NL): Output voltage at 25% full load or 10% full load

8. Ripple and Noise: as shown below. The bandwidth is 0-20MHz.

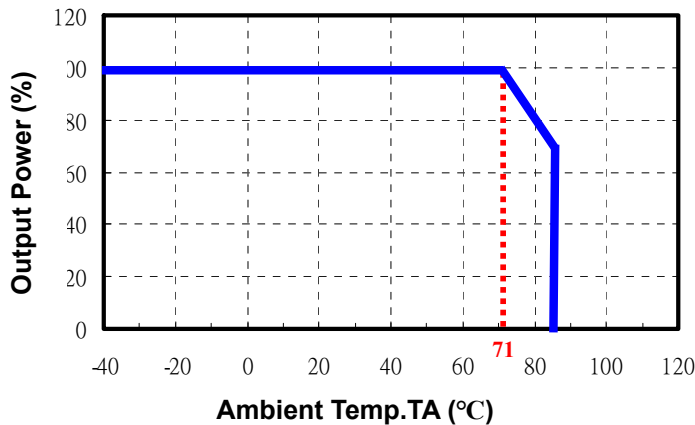


Output Ripple&Noise measurement test circuit: as shown below.



Co: usually 0.47uF.

9. **Temperature derating curve:** The DC-DC converter will operate over a wider temperature range if less power is drawn from the output and the device is already running. The temperature derating curve shows the operating power-temperature range. As shown below.



10. **Switching frequency:** The nominal operating frequency of the DC-DC converters.
11. **Input to output isolation:** The dielectric breakdown strength test between input and output circuits. This is the isolation voltage the device is capable of withstanding for a specified time, usually 1 second or 1 minute.
12. **Input source impedance:** The power module should be connected to 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 commended to use a good quality low Equivalent Series Resistance (ESR < 0.1Ω at 100KHz) capacitor of a 22uF for the power module.

