

HS100-24-24 : High efficient DC/DC converter

Features

- Industry standard Half-Brick size
- Six-side shielding
- High efficiency
- Wide operating temperature range with derating (-40°C to +85°C)
- Precision thermal protection(Accuracy $\pm 3^{\circ}\text{C}$)
- Over current protection
- Under voltage lockout (UVLO)
- Output over voltage protection
- Remote on/off control
- Output voltage variation (TRM)
- Positive/Negative remote sense
- RoHS directive

Applications

- Telecommunication/Network equipment
- High current microprocessors and ICs
- Instrumentation / Equipments

- Distributed Power Systems



Description

HS100-24-24 is isolated dc/dc converter that is designed to be high efficient, precision thermal protection.

Features include high isolation, output over-voltage protection, over current limiting, short-circuit protection, thermal shutdown, remote on/off control, output trim and (\pm)output sense functions.

Absolute Maximum Ratings

Parameter	Min.	Typ.	Max.	Unit	Notes
Input voltage continuous	18	-	36	Vdc	
Operating ambient temperature	-40	-	85	°C	
Storage temperature	-40	-	105	°C	
I/O isolation voltage	-	1500	-	VDC	

Stresses in excess of the absolute maximum ratings can cause permanent damage to the device.

Electrical Specifications

Ta=25°C, Airflow rate=400LFM, Vin=24Vdc unless otherwise noted.

Input Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit
Operating voltage range		18	24	36	Vdc
Input under voltage lockout		16.2	-	17.9	Vdc
Disabled input current (Remote on/off control)		-	6.2	-	mA
Maximum Input current(At minimum input voltage and maximum output power) HS100-24-24	I _{in}	-	6.2	-	A
No load input current HS100-24-24		-	27	-	mA
Input reflected ripple current (Maximum output power) HS100-24-24		-	200	-	mA

Output Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit
Output voltage tolerance	V_o	-	-	2	%
Output regulation;					
- Line regulation		-	± 0.2	± 0.5	%
- Load regulation		-	± 0.2	± 0.5	%
Output current	I_o				
HS100-24-24		0	-	4.2	A
Output current limit(Automatic recovery)		105	-	-	%
Output ripple and noise, ($V_{in} = 24V$, $I_o = \text{Max. output current}$, $1\mu F$ ceramic + $15\mu F$ tantalum, Bandwidth : 20MHz)					
HS100-24-24		-	-	240	mV
Efficiency ($V_{in} = 24V$, 100% Load)					
HS100-24-24		-	89.6	-	%
Dynamic load response ($1\mu F$ ceramic + $15\mu F$ tantalum, 50% to 75 %, 75% to 50%, Slew rate = $0.1A/\mu s$, See fig.30)					
HS100-24-24		-	± 300	-	mV
Recovery time(with in 1% Nominal V_o)					
HS100-24-24		-	100	-	μs
Start-up time					
		-	23	-	ms
Turn-on overshoot					
		-	0	-	%
Maximum output capacitance					
HS150-24-24		-	470	-	μF

Isolation Specifications

Parameter	Symbol	Min.	Typ.	Max.	Unit
I/O isolation voltage					
- Input-output:		-	1500	-	Vdc
- Input-case:		-	1000	-	Vdc
- Output-case:		-	1000	-	Vdc
I/O isolation resistance	RISO	-	100	-	MΩ
Isolation capacitance	CISO	-	4.7	-	nF

General Specifications

Parameter	Symbol	Min	Typ	Max	Unit
Switching Frequency		320	350	380	KHz
Remote ON/OFF (Positive Logic)					
On = open		2.5	-	7	Vdc
Off = short to Vin-		0	-	0.8	Vdc
Output voltage trim range		-	-	±10	%
Output voltage remote sense range		-	-	10	%
Over-temperature shutdown		-	98	-	°C
Over-temperature accuracy		-	±3	-	°C
Over temperature restart hysteresis		-	-	11	°C
MTBF(Io=80%, Ta=25°C, Air flow=400LFM)		179200			hrs
Dimensions(W.H.L.)		58.4 x 61 x 12.7 (2.28 x 2.4 x 0.5)			Mm (inches)
Weight		-	180	-	g

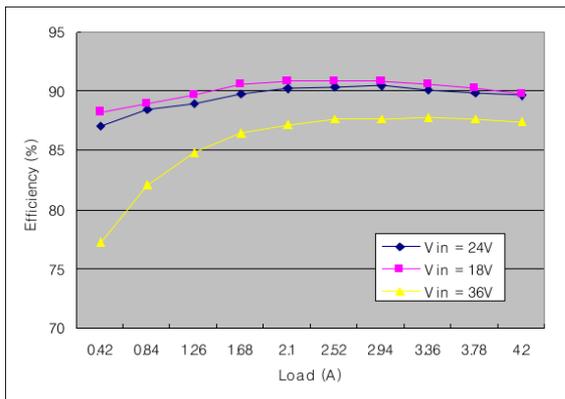
Environmental

Parameter	Symbol	Min.	Typ.	Max.	Unit
Operating Temperature		-40	-	85	°C
Storage Temperature		-40	-	105	°C

Characteristic Curves

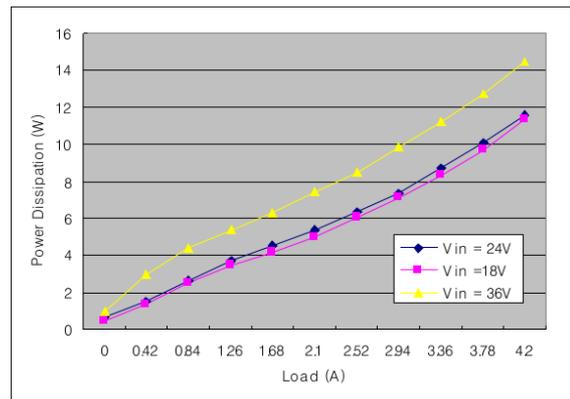
The following [Fig.1~6] provide typical characteristics for HS100-24-24 (24V, 4.2A).

Efficiency



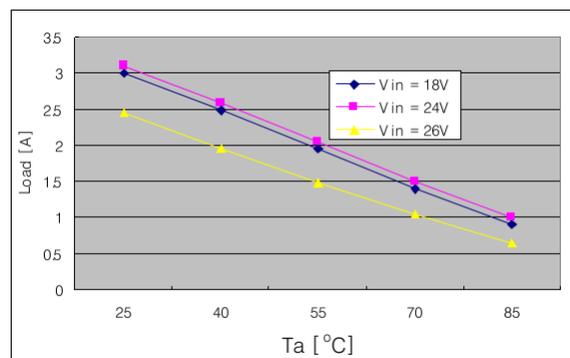
[Fig.1] Efficiency for 18V, 24V and 36V input Voltage at 25°C, 400LFM.

Power Dissipation



[Fig.2] Power dissipation for 18V, 24V and 36V input voltage at 25°C, 400LFM.

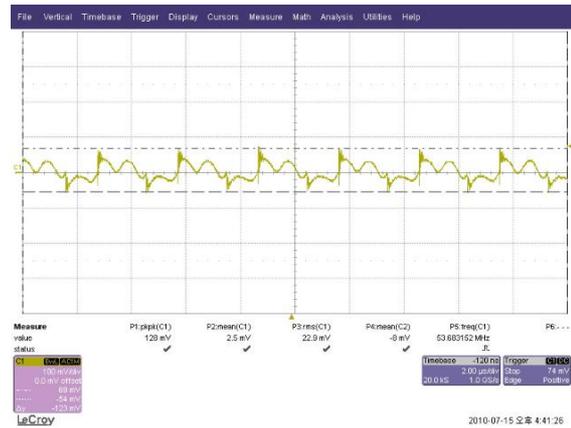
Thermal Derating



[Fig.3] Thermal derating for 18V, 24V, and 36V

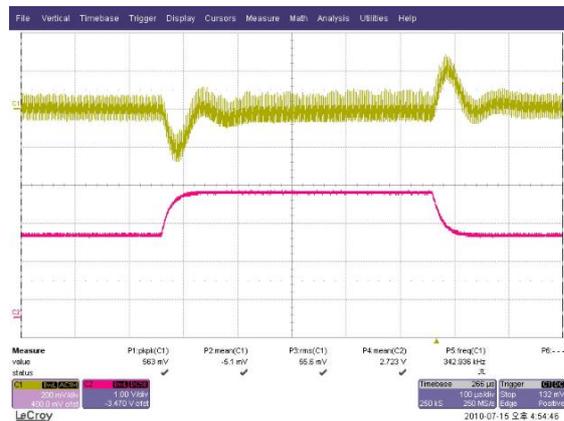
[Fig.3] Load step: 50%-75%-50% of I_o , $di/dt=0.1A/us$ (CH1: 200mV, CH2: 1A/div, 100us/div)

Output Ripple/Noise



[Fig.4] Output voltage ripple & noise(100mV/div
Bandwidth : 20MHz)

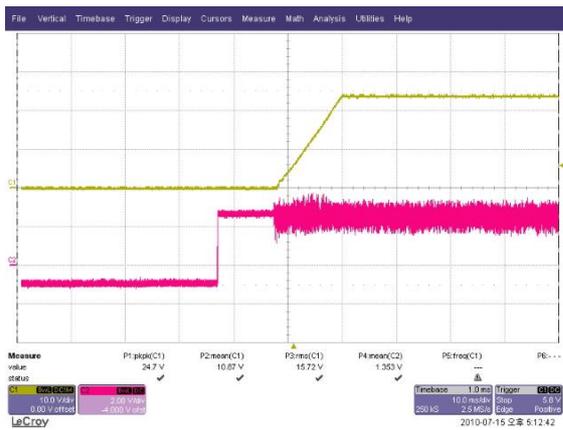
Output Load Transient Response



Input Reflected Ripple Current



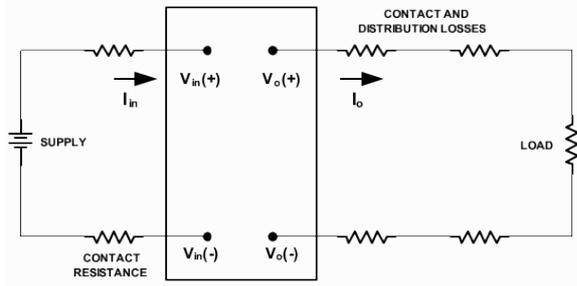
[Fig.5] Input reflect ripple current (100mA/div)
Start-up from On/off input



[Fig.6] Ch2: Vo, Ch3: On/off input(10ms/div)

TEST Configurations

Output Voltage and Efficiency



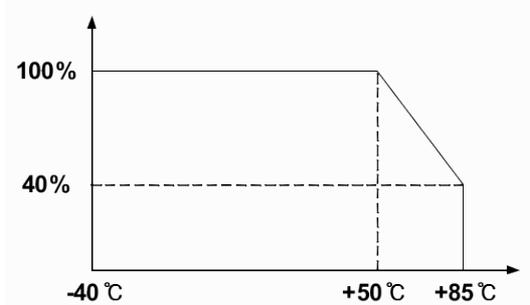
[Fig.7]

*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

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

Thermal Considerations



[Fig.8]

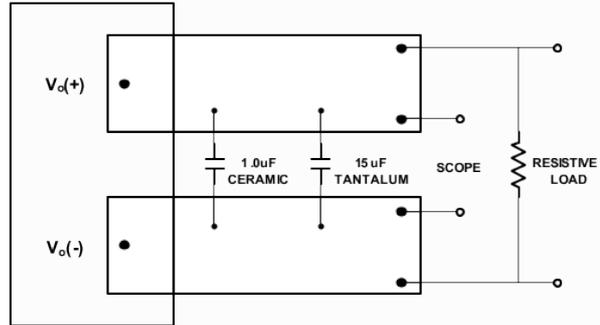
This products has wide operating temperature range from -40°C to +85°C.

However, it should be required a 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 load transient response /

ripple&noise Test

Output load transient response and ripple&noise are measured in figure 13. And the probe ground should be less than 1/2 inch to measure exact data.



[Fig.9]

General Functions

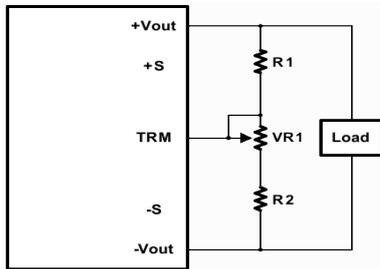
Remote On/Off Control (CNT)

By using CNT pin you can control the output without turning the input power on or off. This unit is positive-polarity device. Positive-polarity device is enabled when pin is left open or is pulled up to high. And positive-polarity device is disabled when pin2 is pulled down to low with respect to -Vin.

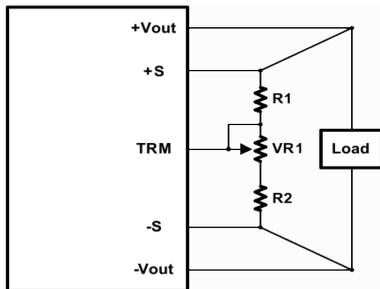
Output voltage variation (Trim)

Output Voltage adjusted by using trim pin within ±10% of output voltage.

Resistors should be located close to the converters. If the trim function is not used, leave the trim pin open. And If ±sense are used, change from figure15 to figure16.



[Fig.10]

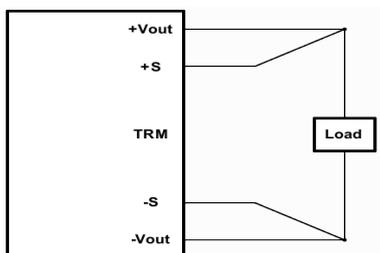


[Fig.11]

Output Voltage	VR	R1	R2
3.3V	500Ω	1kΩ	560Ω
5V	1kΩ	1kΩ	680Ω
12V	1kΩ	3.9kΩ	680Ω

Remote Sense

The sense inputs correct for output voltage drops along the conductors that connect the converter's output pins to the load. This output voltage drop should not be allowed to exceed 0.5V. Consider using heavier wire if this drop is excessive.



[Fig.12]

Over Voltage Protection(OVP)

If the output voltage rises to a fault condition, which could be damaging to the load circuitry, the sensing circuitry will power down the PWM controller causing the output voltage to decrease.

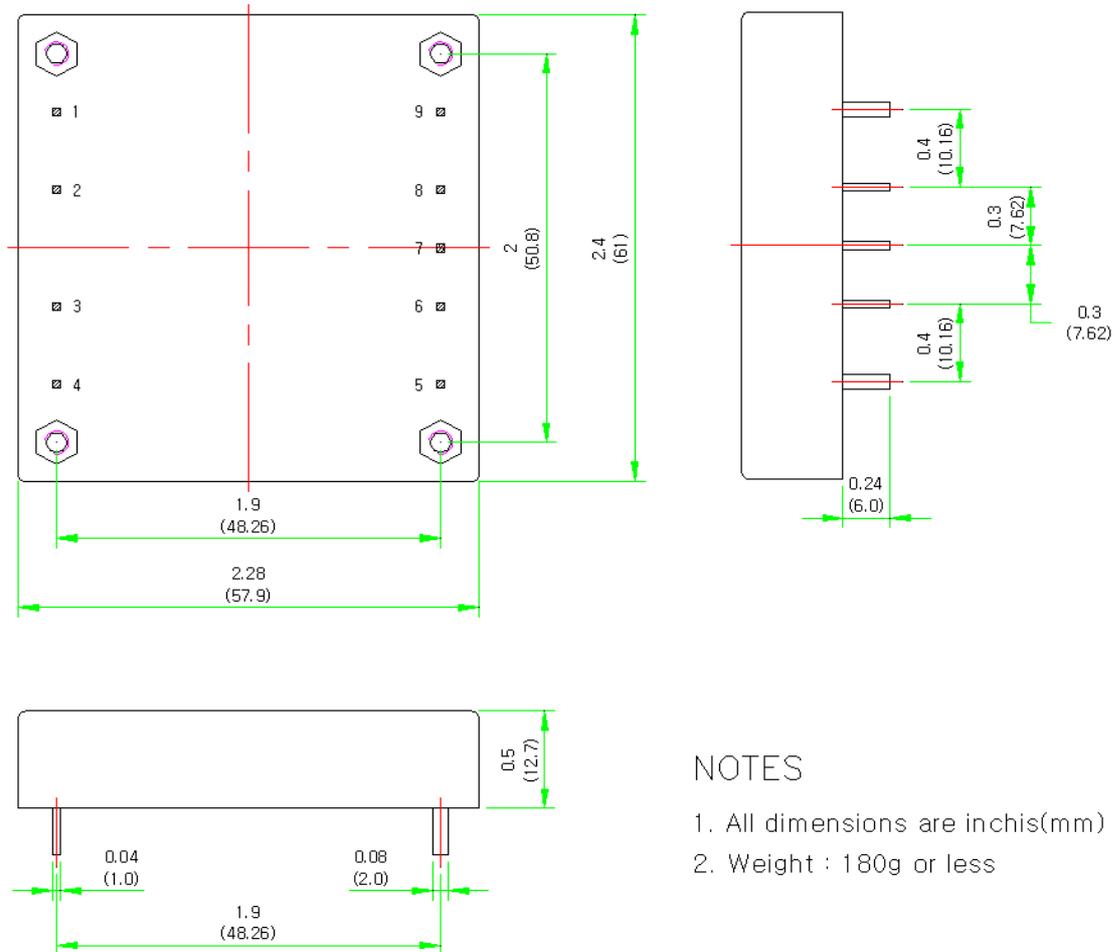
Over current Protection(OCP)

This products built in over current protection circuit which operates when the output current is over 105% of rating and automatically recovers when over current condition is removed.

Over Temperature Shutdown(OTP)

This converters are equipped with precision thermal-shutdown circuitry. If the internal temperature of the converter rises up to the designed operating temperature, a precision temperature sensor will power down the unit. When the internal temperature decreases below the threshold of the temperature sensor, the unit will self start.

Mechanical Specification



NOTES

1. All dimensions are inches(mm)
2. Weight : 180g or less

Pin Assignments

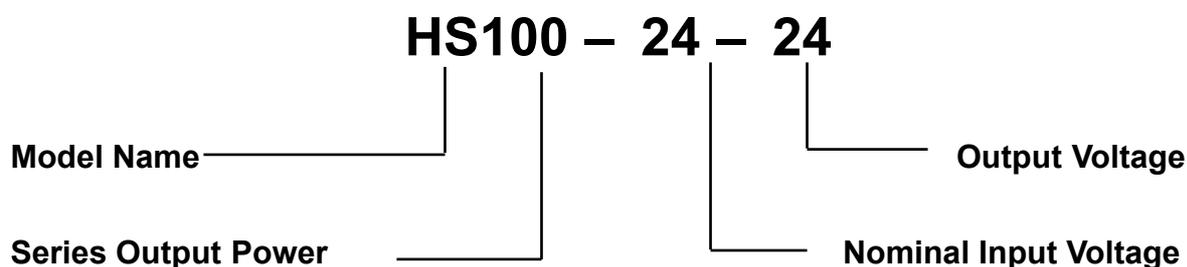
PIN NO	NAME	FUNCTION
1	+Vin	Positive Input voltage
2	CNT	Remote ON/OFF
3	Case	Case
4	-Vin	Negative input voltage
5	-Vout	Negative output voltage
6	-Sense	Negative remote sense

7	Trim	Output voltage variation
8	+Sense	Positive remote sense
9	+Vout	Positive output voltage

Ordering Information

Input	Output	Maximum Power	Ripple & Noise Max.	Efficiency Typ.	Model Number
18~36V	24V@4.2A	100.8W	240mVp-p	89.6%	HS100-24-24

Part Number Structure



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