Hybrid Non-isolated Point of load DC DC converter（HNDO5S Series）

1 Features of non-isolated point of load DC DC converter

- High reliability
- Low input voltage：3V～5.5V，Nominal DC input voltage 5V
- High conversion efficiency
- Output power P_O：16.5W
- Operating temperature range T_c：-55℃～+125℃
- Small Starting current
- No output overshoot
- Inhabit Function
- Inhibit function and indefinite short circuit protection
- maximum power density：80W/in^3
- Hermetically sealed metal cases

Size:25×20×6.86mm

Weight：13g

Table1 Product models

HNDO5S3R3

2 Scope of application of non-isolated point of load DC DC converter

High-reliability electronic system for aviation and aerospace,etc

3 Description of non-isolated point of load DC DC converter

This product is a high-reliability, output voltage adjustable non-isolated Point of load DC D C converter. Products using buck circuit topology,and the pulse width modulation principle,the o utput voltage is directly sampled feedback pulse width modulation controller,closed loop control,t o meet the requirements of a stable voltage output.By changing the external resistor to achiev e the output voltage 0.8V~3.3V adjustable.The series of products using thick-film hybrid integrat ed production process,metal sealed enclosure package. he design and manufacturing process o f HNDO5S Series converters are in compliance with MIL-PRF-38534.

4 Electrical performance of non-isolated point of load DC DC converter

Tabel2 Rated conditions and recommended operating conditions

Absolute Max. Rated value	
Input voltage：3V～5.5V Input voltage（Transient,1s）：6V Output Power：18.2W Storage temperature：-65℃～150℃	Mechanical Shock：1500g Lead resistance welding temperature：300 ℃（15s） Weight：13.5g

Table 3 Electric characteristics

Parameter	Conditions (Unless otherwise specified, -55℃ ≤T_c≤125℃, V_{IN}=5V±0.15V)	HND05S3R3 Q/HW21914-2012		Unit
		Min	Max	
Output voltage	V_{IN}=3V～5.5V, I_0=5A	0.8	2.5	V
	V_{IN}=4V～5.5V, I_0=5A	2.5	3.3	
Output current	V_{IN}=3V～5.5V	-	5	A
Output Ripple Voltage/mV	T_A=25℃ I_0=5A, Vo=3.3V BW =10kHz～2MHz	-	35	mV
Load Regulation/mV	I_0=0→5A, Vo=3.3V	-	40	mV
Efficiency/%	V_o=3.3V, I_o=4A	93	-	%
Isolation/MΩ	Input to output or any pin to case(except pin 3)at 500V, T_c=25℃	100	-	MΩ
Inhibit voltage	T_A=25℃, Vo=3.3V, I_0=5A	0	0.8	V
Start-up Delay (ms)	V_{IN}: 0→5V, Vo=3.3V	-	10	ms
Start-up Overshoot(mV pK)	V_{IN}: 0→5V, Vo=3.3V	-	200	mV

5 Circuit block diagram of non-isolated point of load DC DC converter

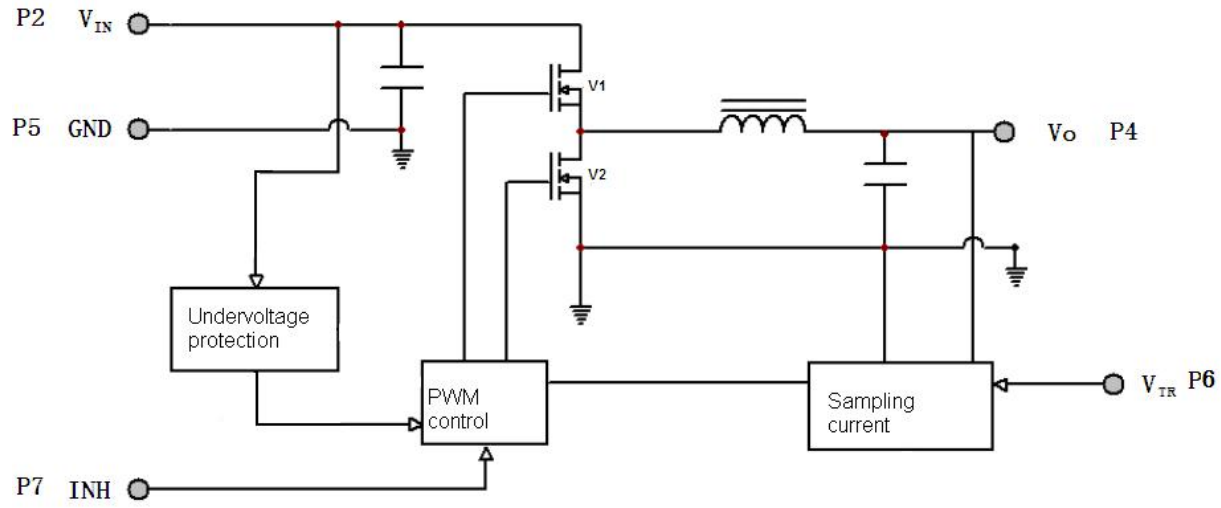


Figure 1 HND05S3R3 Series circuit block diagram

6 Typical Performance Curves of non-isolated point of load DC DC converter

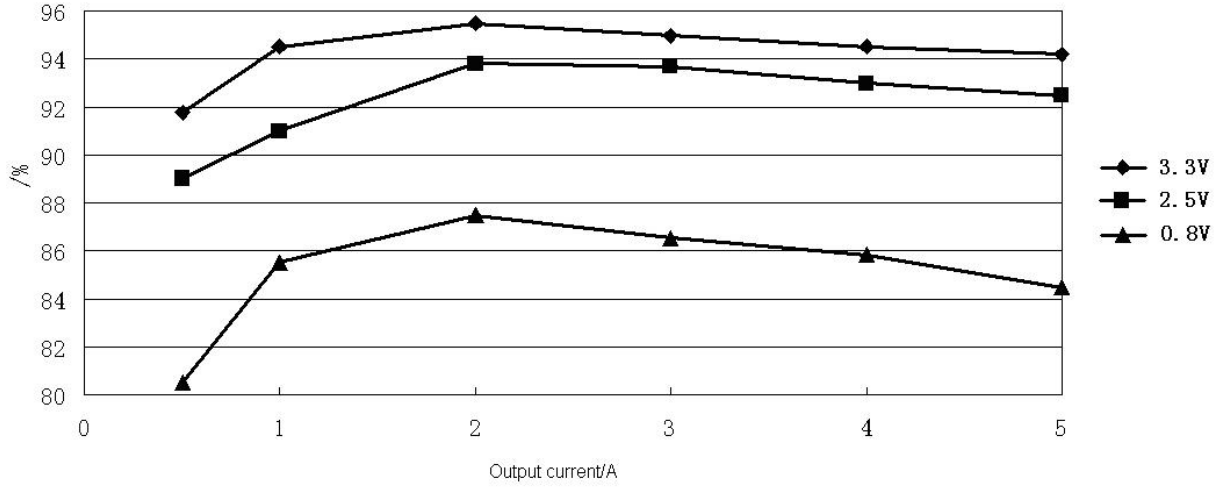


Figure 2 HND05S3R3 Efficiency

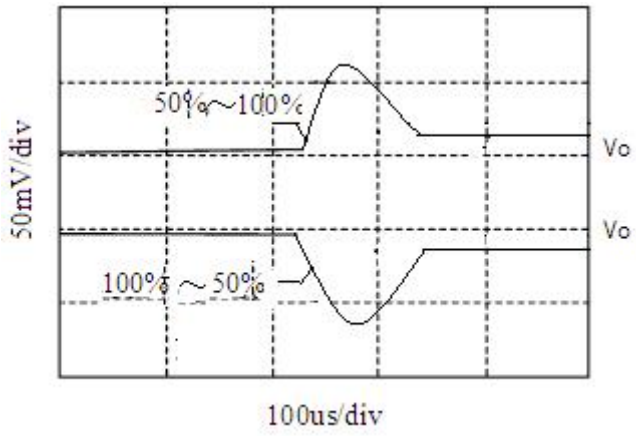


Figure 3 HND05S3R3 Load step curve

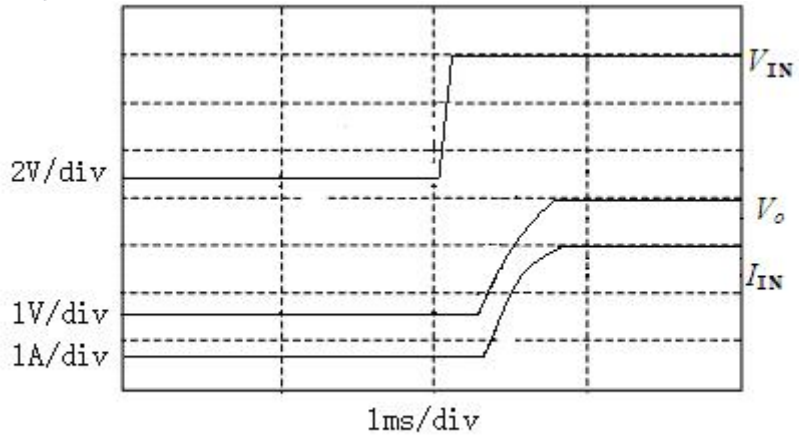


Figure 4 HND05S3R3 Start-up Overshoot/Start-up Delay

7 MTBF Curves of non-isolated point of load DC DC converter

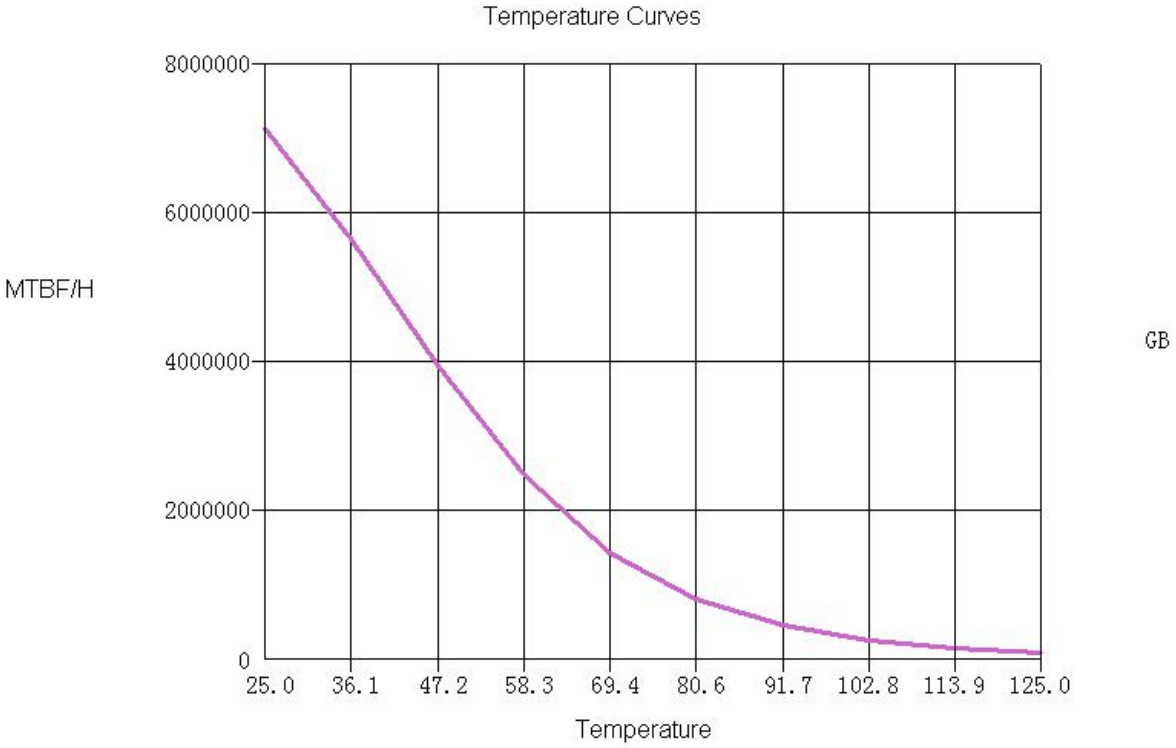


Figure 5 MTBF temperature curves (HND05S3R3)

8 Pin Designation of non-isolated point of load DC DC converter

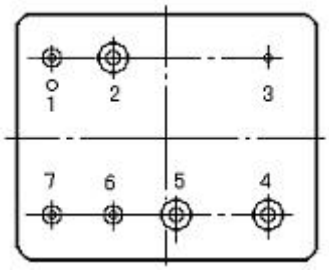


Figure 6 Pin out Bottom View

Table 4 Pin Designation

Pin	Symbol	Designation
1	NC	NULL
2	V_{IN}	Input
3	GND_C	Case Ground
4	V_0	Output
5	GND	Input/output common
6	V_{TR}	Output trimment
7	INH	Inhibit

9 Typical Connection Diagram of non-isolated point of load DC DC converter

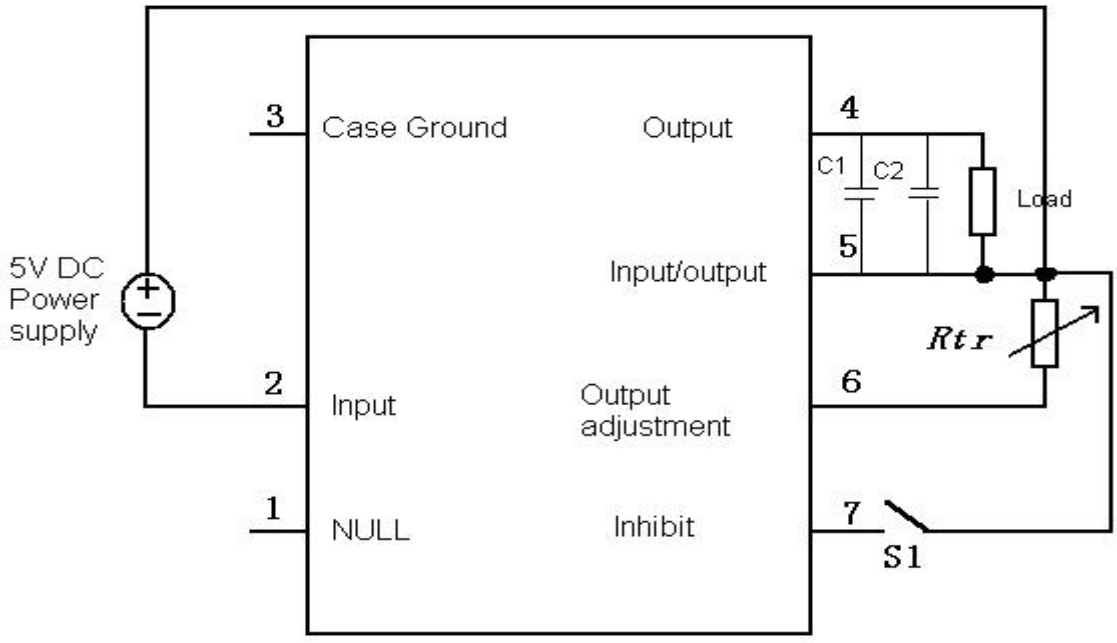


Figure 7 Products Using Connection Diagram

In figure 7, by adjusting the external resistor R_{tr}, the output voltage can be realized in different. Correspondence between R_{tr} and V_0 are as follows:

$$V_o = \frac{168R_{tr} + 5.267\times10^6}{210R_{tr} + 1.071\times10^6}$$

$$R_{tr} = \frac{5.267\times10^6 - 1.071\times10^6 \times V_o}{210\times V_o - 168}$$

V_o（V）	R_{tr}(kΩ) reference value
3.3	3.3
2.6	6.55
2.5	7.25
0.8	-

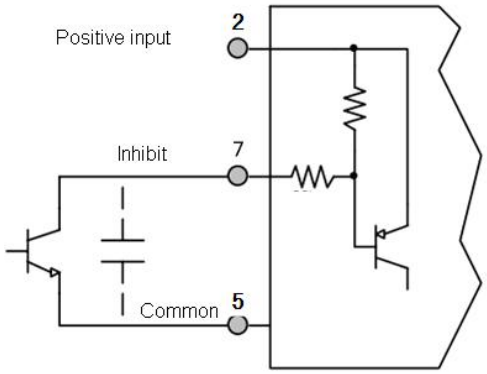


Figure 8 Inhibit Diver Diagram

In figure 8，By adjusting the external capacitor circuit start-up delay time may be extended (C=0.1uF,prolonged delay of about 3ms,there are differences depending on the output)

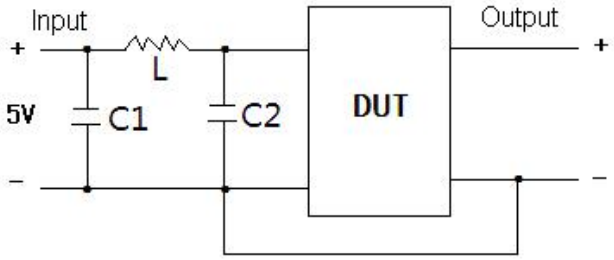


Figure 9 Recommended connection inputs

In figure 9,Adjusting the capacitance inductance parameter input ripple voltage，

（ When L=4.7uH，C1=100uF ,C2=47 uF，Input ripple voltage is 100mV，there are differences depending on the output）

10 Package Specifications of non-isolated point of load DC DC converter (Unit:mm)

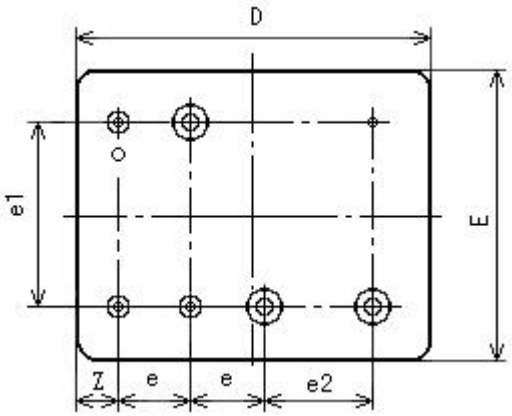


Figure 10 Bottom View

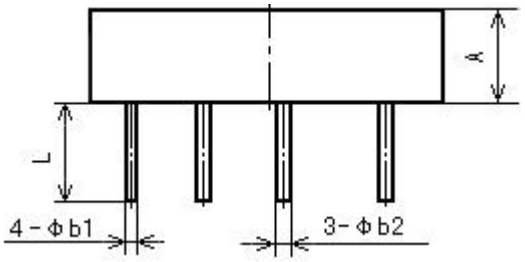


Figure 11 Side View

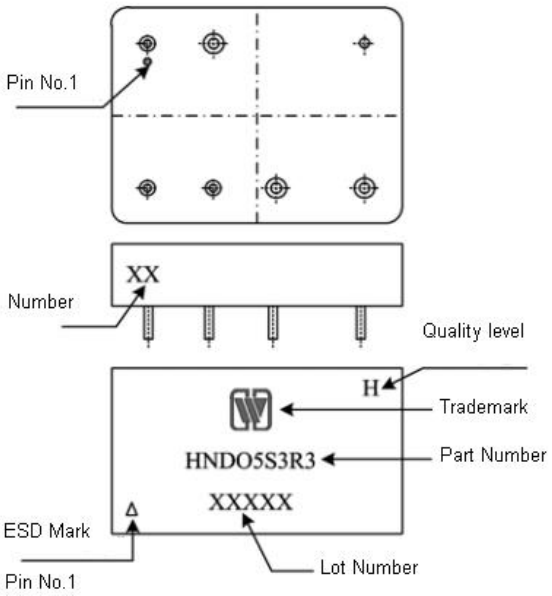
Table 5 Package Outline

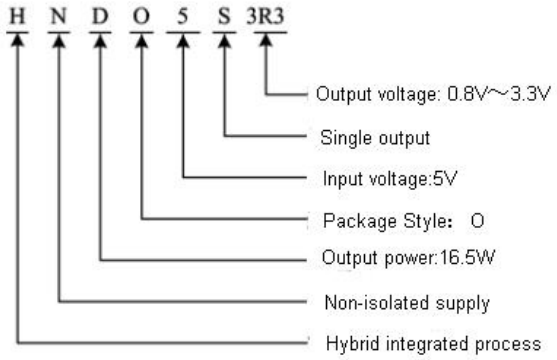
Dimension Symbols	Unit/mm		
	Minimum	Nominal	Maximum
A	–	6.86	7.36
Φb1	0.32	0.45	0.58
Φb2	0.87	1	1.13
D	–	25	25.14
E	–	20	20.66
e[a]	–	5.08	–
e1[a]	–	12.70	–
e2[a]	–	7.62	–
Z	2.62	2.92	3.22
L	5.40	*6.4*	–

Table 6 Case Materials

Case Model	Header	Header Plating	Cover	Cover Plating	Pin	Pin Plating	Sealing Style	Notes
UPP2520-07	Cold Rolled Steel (10#)	Ni	Kovar (4J42)	Ni	Copper Compound	Au	Compression Seal	

11 Ordering Information of non-isolated point of load DC DC converter





Application Notes **of non-isolated point of load DC DC converter**:

☆ Both positive and negative terminals for power supply shall be correctly connected when power is applied so as to avoid permanent damage to the device.

☆ Testing position shall be the root of the pin of the device when the electrical characteristic is measured.

☆ The baseplate of the device shall be closely attached to the circuit board during device mounting so as to avoid the damage on pins. The shockproof actions shall be adopted when necessary.

☆ Pins shall not be bended to avoid the glass insulator cracking and case leaking.

☆ Pins at inhibit terminal shall be hung in the air during no operation.

☆ When ordering this device，the detail electrical specification shall be based on relevant standards. While data offered in this document shall be for reference only.