

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 : $-55^{\circ}\text{C} \sim +125^{\circ}\text{C}$
- Small Starting current
- No output overshoot
- Inhibit Function
- Inhibit function and indefinite short circuit protection
- maximum power density: 80W/in³
- 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 output 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

Table2 Rated conditions and recommended operating conditions

| Absolute Max. Rated value | |
|---|--|
| Input voltage: 3V~5.5V | Mechanical Shock: 1500g |
| Input voltage (Transient,1s) : 6V | Lead resistance welding temperature : 300 °C (15s) |
| Output Power: 18.2W | Weight: 13.5g |
| Storage temperature: $-65^{\circ}\text{C} \sim 150^{\circ}\text{C}$ | |

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| | |
|--|--|
| | |
|--|--|

Table 3 Electric characteristics

| Parameter | Conditions (Unless otherwise specified, $-55^{\circ}\text{C} \leq T_c \leq 125^{\circ}\text{C}$, $V_{IN}=5V \pm 0.15V$) | HND05S3R3 | | Unit |
|---------------------------|---|----------------|-----|------------|
| | | Q/HW21914-2012 | | |
| | | Min | Max | |
| Output voltage | $V_{IN}=3V \sim 5.5V, I_o=5A$ | 0.8 | 2.5 | V |
| | $V_{IN}=4V \sim 5.5V, I_o=5A$ | 2.5 | 3.3 | |
| Output current | $V_{IN}=3V \sim 5.5V$ | - | 5 | A |
| Output Ripple Voltage/mV | $T_A=25^{\circ}\text{C}$ $I_o=5A, V_o=3.3V$ $BW=10\text{kHz} \sim 2\text{MHz}$ | - | 35 | mV |
| Load Regulation/mV | $I_o=0 \rightarrow 5A, V_o=3.3V$ | - | 40 | mV |
| Efficiency/% | $V_o=3.3V, I_o=4A$ | 93 | - | % |
| Isolation/M Ω | Input to output or any pin to case(except pin 3)at 500V, $T_c=25^{\circ}\text{C}$ | 100 | - | M Ω |
| Inhibit voltage | $T_A=25^{\circ}\text{C}, V_o=3.3V, I_o=5A$ | 0 | 0.8 | V |
| Start-up Delay (ms) | $V_{IN}: 0 \rightarrow 5V, V_o=3.3V$ | - | 10 | ms |
| Start-up Overshoot(mV pK) | $V_{IN}: 0 \rightarrow 5V, V_o=3.3V$ | - | 200 | mV |

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

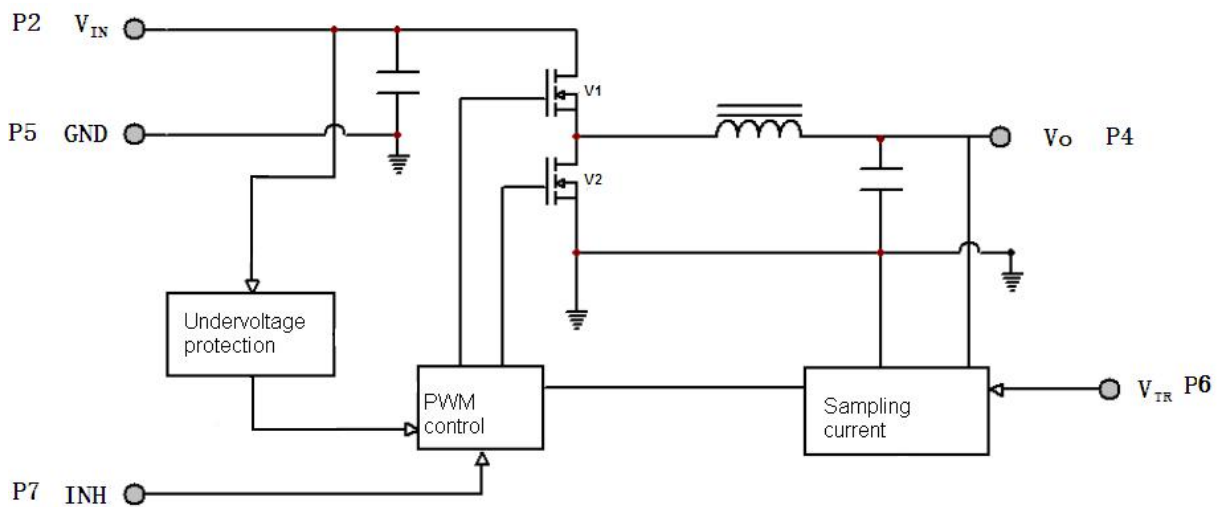


Figure 1 HND05S3R3 Series circuit block diagram

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

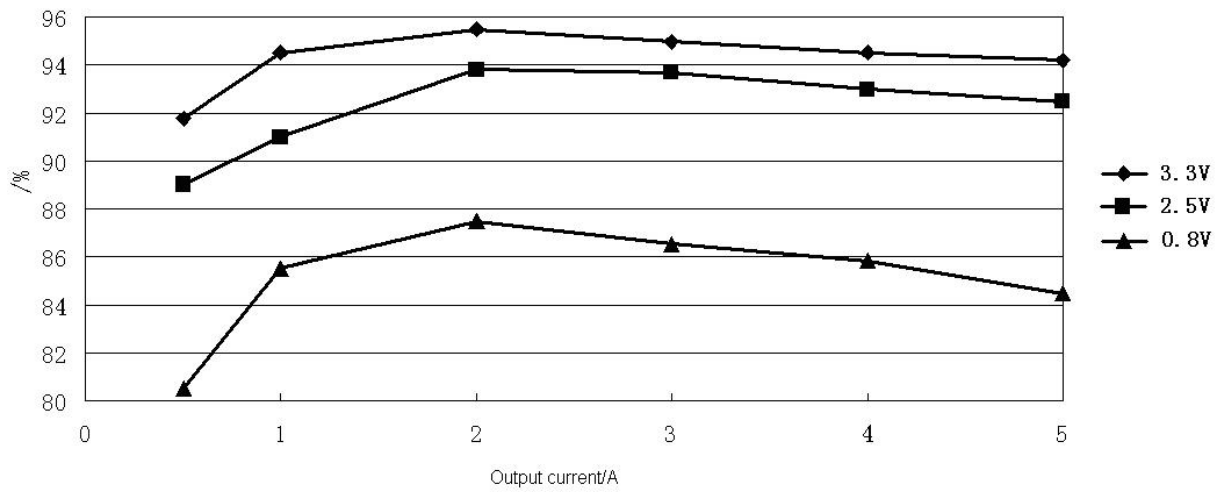


Figure 2 HND05S3R3 Efficiency

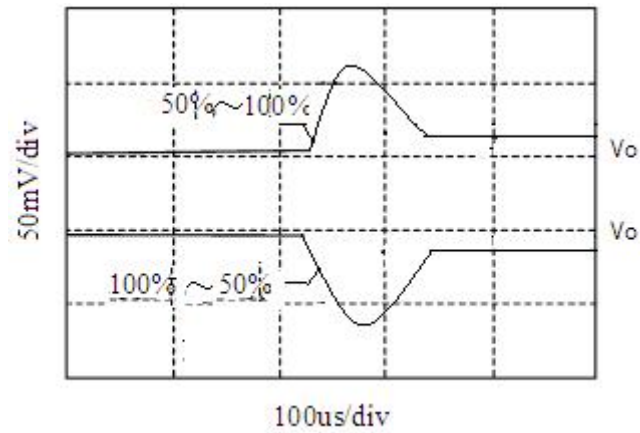


Figure 3 HND05S3R3 Load step curve

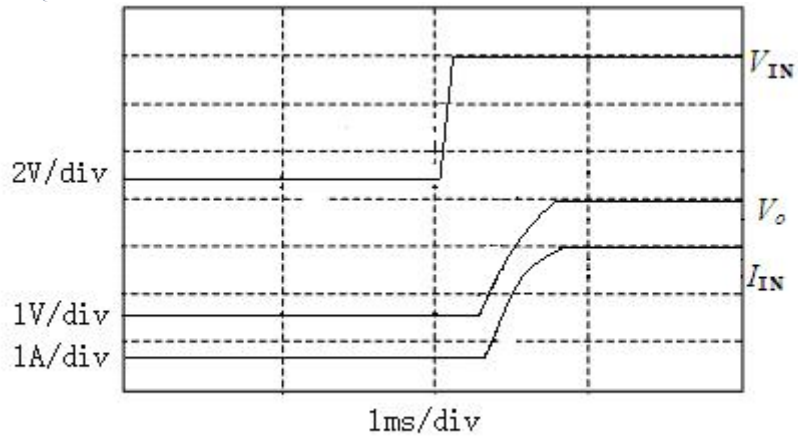


Figure 4 HND05S3R3 Start-up Overshoot/Start-up Delay

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

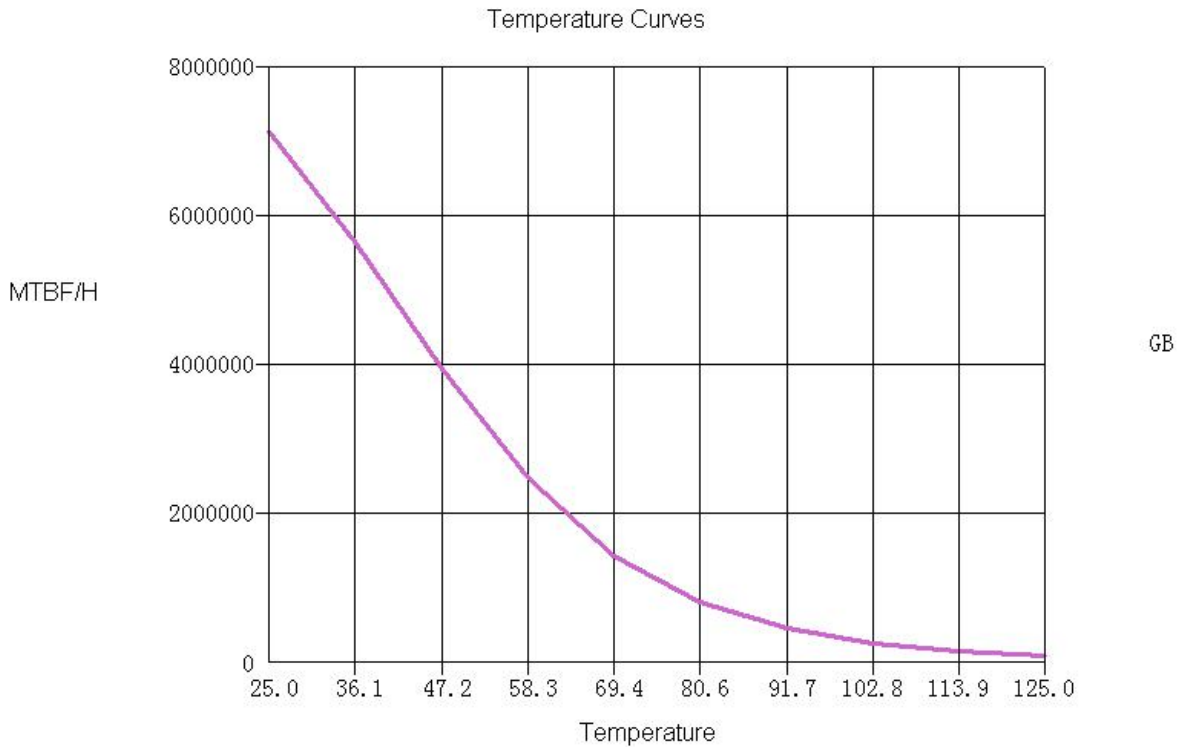


Figure 5 MTBF temperature curves (HND05S3R3)

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

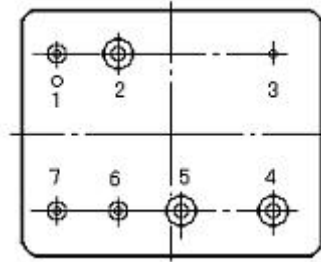


Figure 6 Pin out Bottom View

Table 4 Pin Designation

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

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

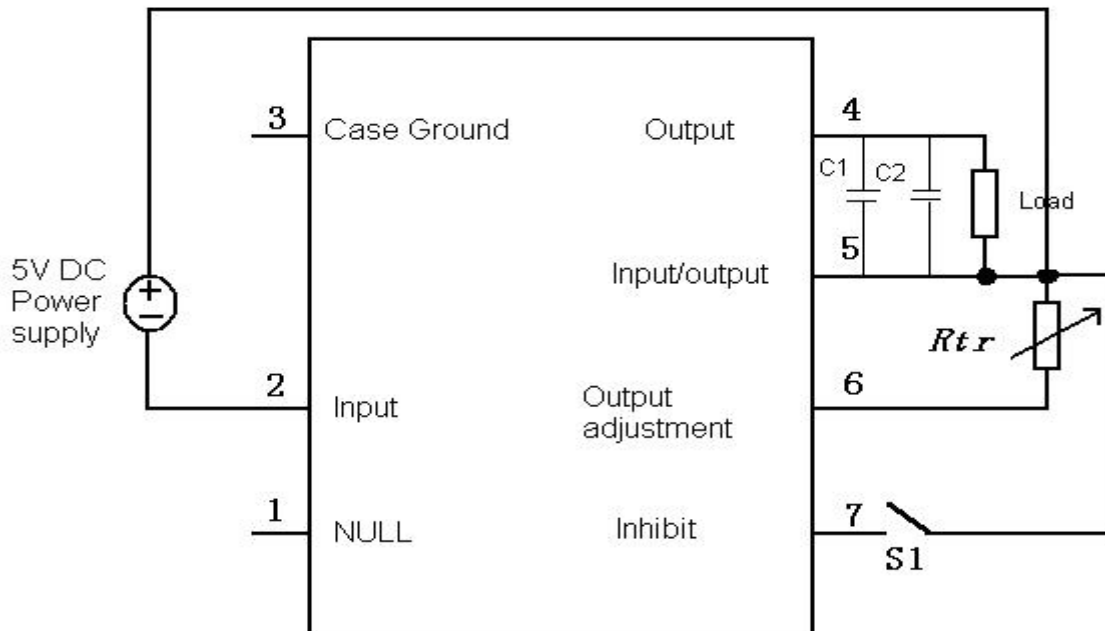


Figure 7 Products Using Connection Diagram

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

$$V_o = \frac{168R_{tr} + 5.267 \times 10^6}{210R_{tr} + 1.071 \times 10^6}$$

$$R_{tr} = \frac{5.267 \times 10^6 - 1.071 \times 10^6 \times V_o}{210 \times V_o - 168}$$

| V_o (V) | $R_{tr}(k\Omega)$ reference value |
|-----------|-----------------------------------|
| 3.3 | 3.3 |
| 2.6 | 6.55 |
| 2.5 | 7.25 |
| 0.8 | - |

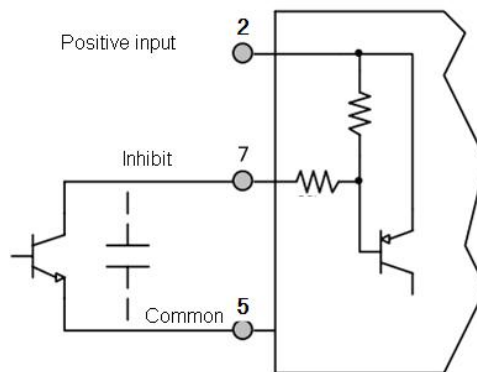


Figure 8 Inhibit Diver Diagram

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)

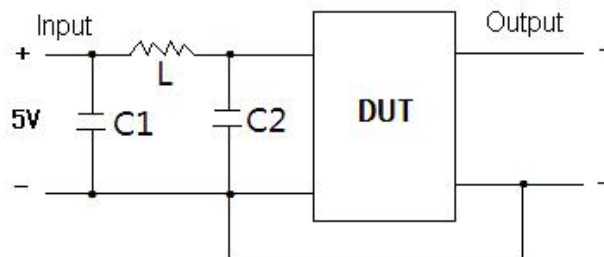


Figure 9 Recommended connection inputs

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)

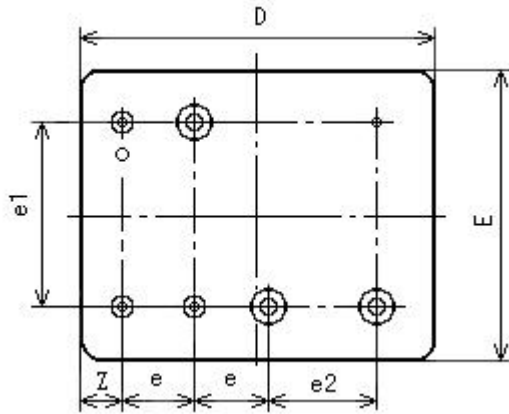


Figure 10 Bottom View

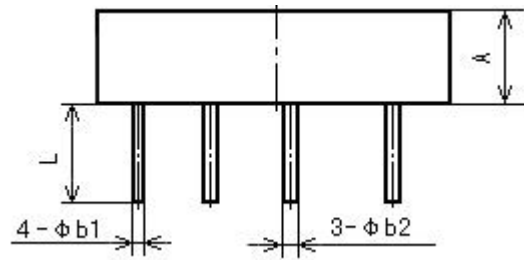


Figure 11 Side View

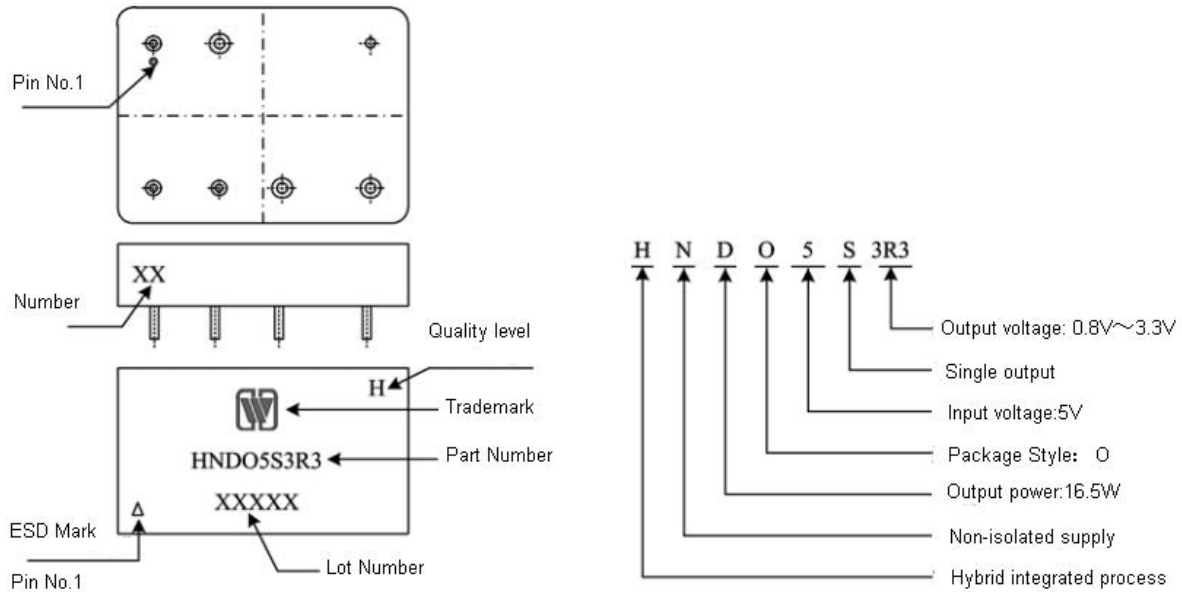
Table 5 Package Outline

| Dimension Symbols | Unit/mm | | |
|-----------------------|---------|---------|---------|
| | Minimum | Nominal | Maximum |
| <i>A</i> | - | 6.86 | 7.36 |
| $\Phi b1$ | 0.32 | 0.45 | 0.58 |
| $\Phi b2$ | 0.87 | 1 | 1.13 |
| <i>D</i> | - | 25 | 25.14 |
| <i>E</i> | - | 20 | 20.66 |
| <i>e^a</i> | - | 5.08 | - |
| <i>e1^a</i> | - | 12.70 | - |
| <i>e2^a</i> | - | 7.62 | - |
| <i>Z</i> | 2.62 | 2.92 | 3.22 |
| <i>L</i> | 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.