

HNTA0510S High Reliability Point of Load DC to DC Converter

1 Features of high reliability point of load DC-DC converter

- High reliability
- Low voltage input: 4.5V~5.5V, Typical 5V
- High conversion efficiency
- Output Power P_O : 33W
- Operating temperature T_c : $-55^{\circ}\text{C} \sim +125^{\circ}\text{C}$
- Low start-up current
- No output overshoot
- Inhibit function
- Output over current and short circuit protection
- Maximum power density: $108\text{W}/\text{in}^3$
- Hermetically sealed metal case



尺寸: $27 \times 27 \times 6.86\text{mm}^3$

重量: 17.5g

HNTA0510S

2 Scope of application of high reliability point of load DC-DC converter

High-reliability electronic system for ground ,vehicle ,radar , aviation and aerospace, etc.

3 Description of high reliability point of load DC-DC converter

The HNTA0510S is a high reliable, output voltage adjustable non-isolated High reliability point of load DC to DC converter with BUCK circuit topology and pulse width modulation principle. The output sampling voltage is directly feedbacked to modulate the pulse width to achieve closed-loop control to meet the stability of the voltage output requirements. By changing the external resistance method to achieve the output voltage 0.8V-3.3V adjustable. The series of products are made by thick-film hybrid integrated production process, metal sealed package. The design and manufacturing process of HNTA0510S Series converters are in compliance with MIL-PRF-38534.

4 Technical Specifications of high reliability point of load D C-DC converter

Table 2 Rated conditions and recommended operating conditions

Absolute Max. Rating	
Input voltage: 4.5V~5.5V Input voltage (Transient,1s) : 5.8V Output Power: 35 W Storage temperature: -65°C~150°C	Mechanical Shock: 1500g Lead temperature: 300°C (10s) Weight: 17.5 g

Table 3 Electrical characteristics

Items	Sym	Conditions (Unless other wise, $V_i=5V, -55^{\circ}C \leq T_c \leq 125^{\circ}C$)	A Group	Limited		Unit
				Min	Max	
Output voltage	V_o	$V_i=5V, I_o=10A$	1,2,3	0.780	0.820	V
		$V_i=5V, I_o=10A$		2.437	2.563	
		$V_i=4.5V \sim 5.5V, I_o=10A$		3.217	3.383	
Output current	I_o	$V_i=4.5V \sim 5.5V$	1,2,3	-	10	A
Output ripple voltage (Peak-peak)	V_R	$V_o=3.3V, I_o=10A, B_W=6MHz$	1,2,3	-	80	mV
Current regulation	S_i	$V_o=3.3V, I_o=0 \rightarrow 10A$	1,2,3	-	60	mV
Input current	I_i	Null, Inhibit connect Input G	1,2,3	-	3	mA
		Null, Inhibit open	1,2,3	-	80	
efficiency	η	$V_o=3.3V, I_o=10A$	1,2,3	91	-	%
Insulation resistance	R_i	$T_A=25^{\circ}C$, impose 500V DC voltage between case and any pin (Expect pin 9)	1	100	-	MΩ
Short circuit power consumption	P_D	Output short	1,2,3	-	3	W
Capacitive load ^{ab}	C_L	$T_A=25^{\circ}C, V_o=3.3V, I_o=10A$	4	-	5000	μF
switching frequency ^b	f_s	$V_o=3.3V, I_o=10A$	4,5,6	240	350	kHz
Start-up Overshoot (peak)	V_{TO}	Output voltage $V_i: 0 \rightarrow 5V, V_o=3.3V, I_o=10A$	4,5,6	-	40	mV
Start-up Delay	t_{TR}	Output voltage $V_i: 0 \rightarrow 5V, V_o=3.3V, I_o=10A$	4,5,6	-	8	ms

Notes:

- a Capacitive load may be any value from 0 to the maximum limit with on influence to DC performance.
- b This parameter shall be guaranteed by design and tested only when there is qualification test and design or process change.
- c Load step transition time shall be more than 10 μ s, connect 100 μ F capacitor between positive input and ground.
- d Recovery time means the time that step start-up until the output voltage comes back to the $\pm 1\%$ of the typical value.

5 Circuit block diagram of high reliability point of load DC-DC converter

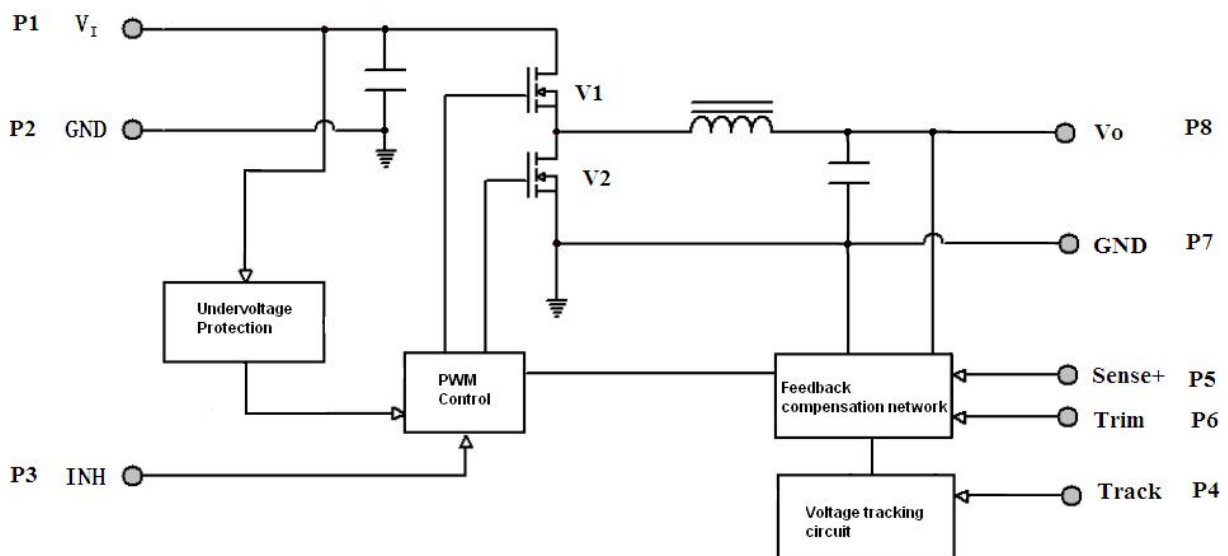


Fig 2 HNTA0510S circuit block diagram

6 Typical Characteristic Curve of high reliability point of load DC-DC converter (Testing condition as per $T_C=25^\circ\text{C}$, $V_{IN}=5V\pm 0.15V$, unless otherwise specified)

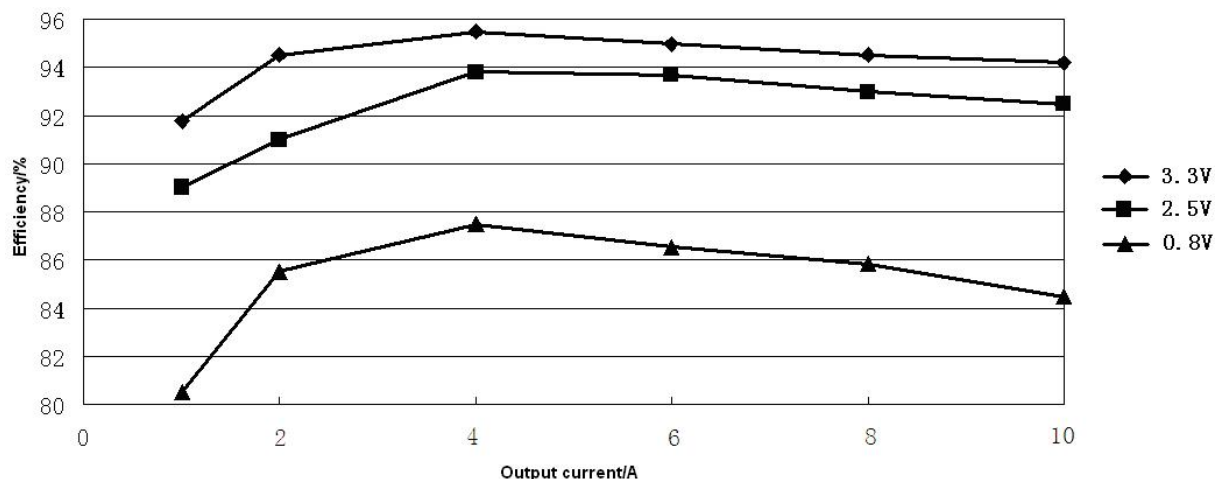


Fig 3 HNTA0510S Efficiency

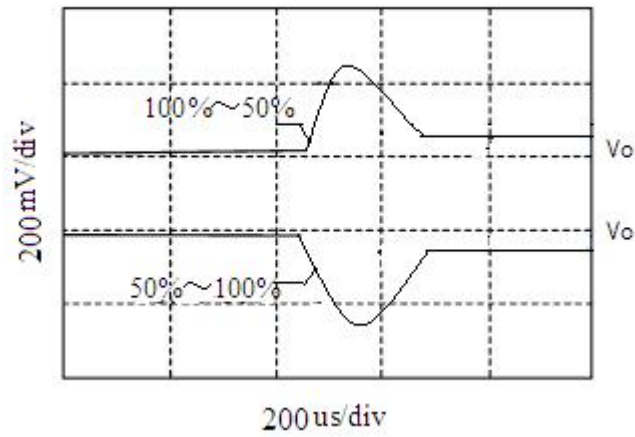


Fig 4 HNTA0510S Load

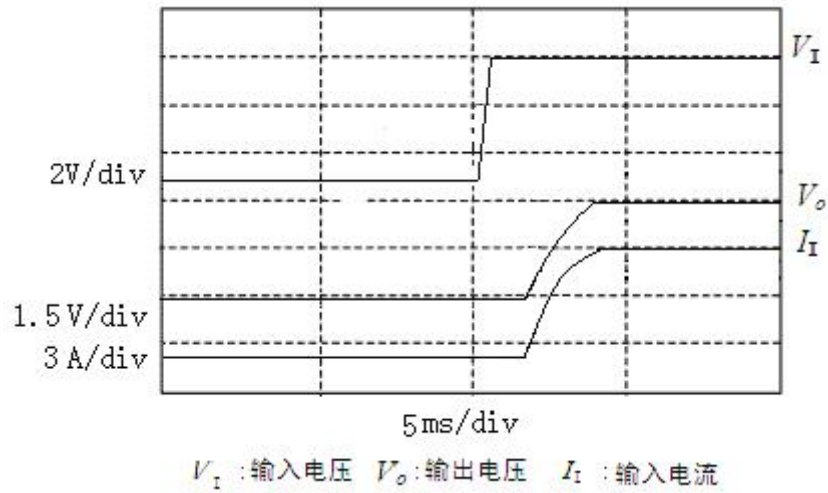


Fig 5 HNTA0510S Overshoot/Start-up Delay

7 MTBF Curve of high reliability point of load DC-DC converter

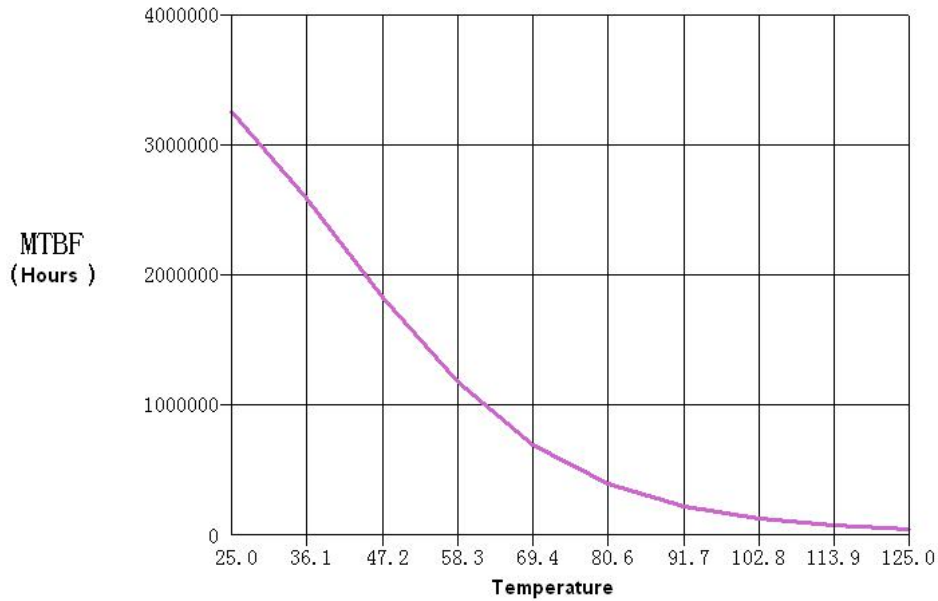


Fig 6 MTBF Temperature Curve (HNTA0510S)

8 Pin Designations of high reliability point of load DC-DC converter

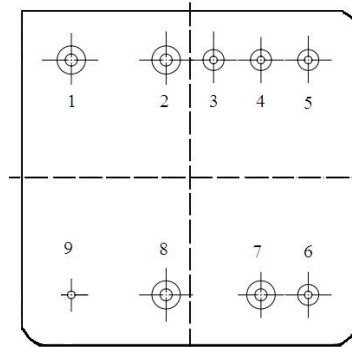
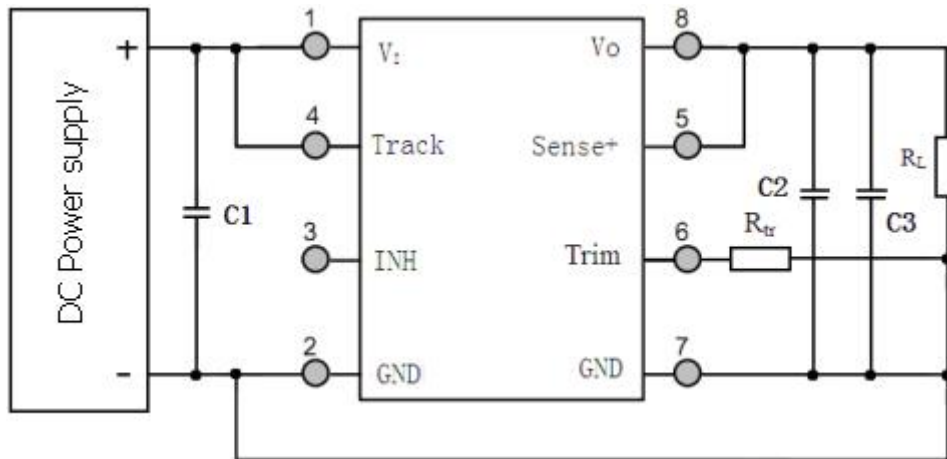


Figure 7 Bottom View

Table 4 Pin Designation

Pin	Symbol	Designation	Pin	Symbol	Designation
1	V_i	Positive input	6	Trim	Output Trimming
2	GND	Common GND	7	GND	Common GND
3	INH	Inhibit	8	V_o	Positive output
4	Track	Track	9	GND_c	Case GND
5	Sense+	Output positive terminal			

9 Typical Connection Diagram of high reliability point of load DC-DC converter



C1=100μF; C2=10μF; C3=0.1μF C1、C2、C3 are chip capacitors

Fig 8 Connection Diagram

In fig 8, By adjusting the external resistor R_{tr} , can achieve different output voltage, R_{tr} and V_o relationship is shown as follow:

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

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

V_o (V)	$R_{tr}(k\Omega)$ <i>Reference</i>
3.3	3.3
2.6	6.55
2.5	7.25
0.8	None

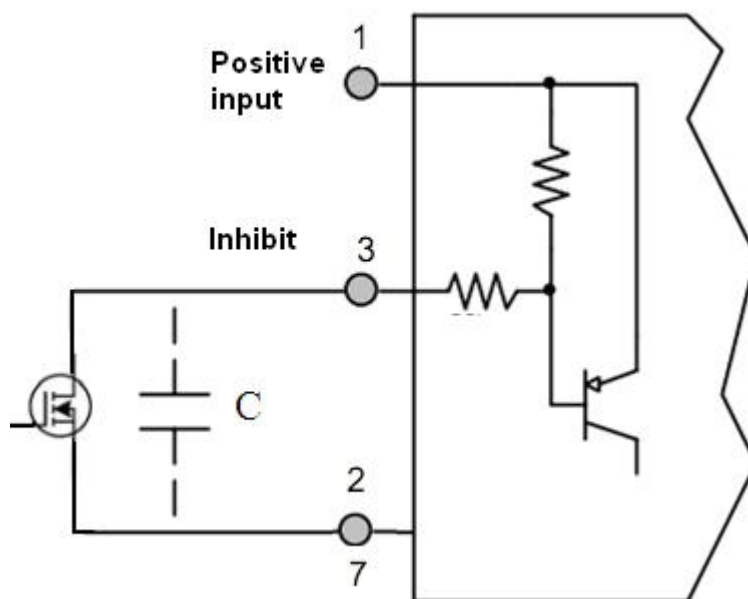


Fig 9 Inhibit Driver Circuit Diagram

The start-up delay (roughly 10ms when C=0.01uF) can be elonged by adjusting the external capacitor.

10 Package Specifications of high reliability point of load DC-DC converter

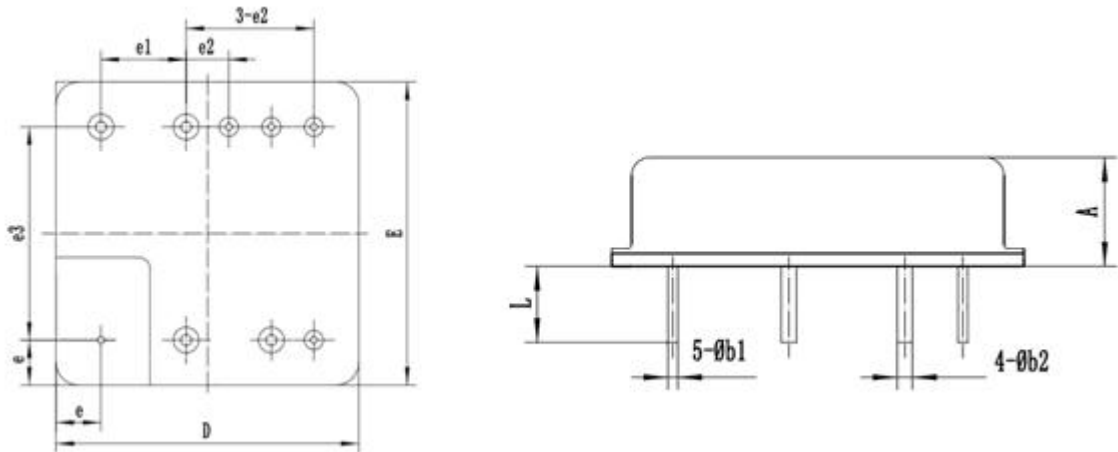


Fig 10 Bottom View and Side View

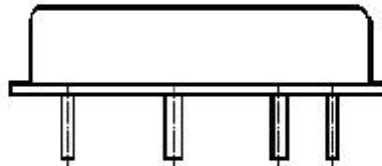
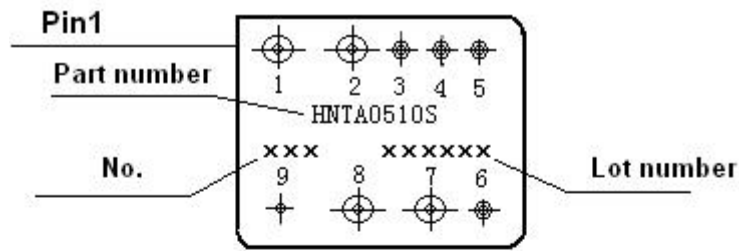
Table 5 Package Outline

Symbols	Unit/mm		
	Minimum	Nominal	Maximum
A	-	-	7.20
$\phi b1$	0.51	-	0.77
$\phi b2$	0.87	-	1.13
D	-	-	27.57
E	-	-	27.57
e^a	3.71	4.01	4.31
$e1^a$	7.32	7.62	7.92
$e2^a$	3.51	3.81	4.11
$e3^a$	18.55	19.05	19.55
L	4.05	-	-

Table 6 Case Materials

Case Model	Header	Header Plating	Cover	Cover Plating	Pin	Pin Plating	Sealing	Notes
PP2727-09 B	Cold Rolled Steel	Au	Steel (SPCC-S D)	Ni	Copper -core Compound	Au	Compression	

11 Ordering Information of high reliability point of load DC-DC converter



(主视图)

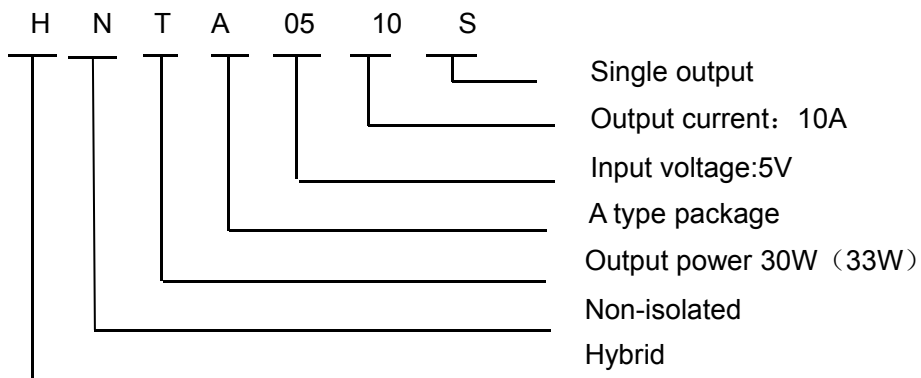
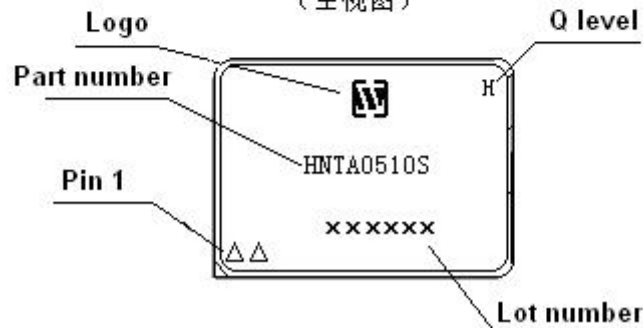


Fig 11 Part Numbering Key

Application Notes of high reliability 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.