

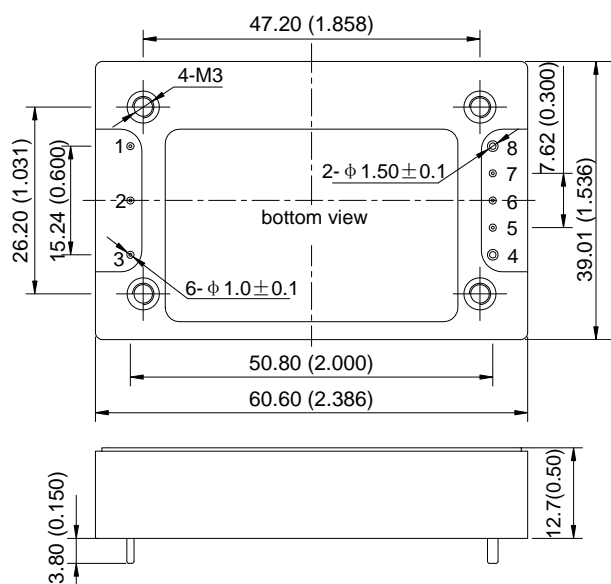
### NTP2415QN26W Non-Isolated DC-DC Converters

Input 9V~36V, Output 26V/11.5A, Industry Standard Quarter Brick

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#### Outline Diagram



Notes: all dimensions in mm(inches)

Tolerances: X.X±0.5 (X.XX±0.02)

X.XX±0.25 (X.XXX±0.010)

Case material: Black flame retardant Plastic;

Pins: Copper alloy with gold plating;

Aluminum baseplate can be connected to Protective Earth by M3 screw.



#### Features

- ◆ Quarter Brick: 60.6mm×39.01mm×12.7mm
- ◆ Wide Input Voltage (9.0Vdc~36.0Vdc)
- ◆ Input Under Voltage Threshold (8.1Vdc~8.9Vdc)
- ◆ Input Under Voltage Resume Point (9.0Vdc~10.0Vdc)
- ◆ Negative Logic Control (0V to 1V turn on or CNT floating)
- ◆ Output Voltage Adjust Range: ±10% of the rated output voltage
- ◆ High Efficiency up to 96% typ.
- ◆ Output Over Current Protection, Output Short-circuit Protection, automatic recovery
- ◆ Over Temperature Protection(OTP)
- ◆ Operating Ambient Temperature -40℃ to +70℃
- ◆ Maximum Load Current:11.5A
- ◆ Applications: Telecom & Datacom ,Industry, and Rail transit & Railway application

Pin	Symbol	Function
1	-Vin	Negative Input
2	CNT	Remote Control, turn on/off the converter without cutting off the power supply
3	+Vin	Positive Input
4	+Vo	Positive Output
5	+S	Positive Remote Sense, connected to +Vo pin when not in use
6	TRIM	Output Voltage Trim, voltage be trimmed up or down by applying external resistor connected to +S or -S output
7	-S	Negative Remote Sense, connected to -Vo pin when not used
8	-Vo	Negative Output

**NTP2415QN26W Non-Isolated DC-DC Converters**

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**Specification**

Unless otherwise specified, all tests are at room temperature and standard atmosphere, pure resistive load and basic connection.

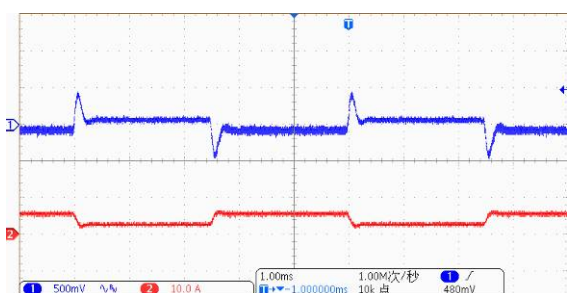
Input		Symbol	Min	Typ	Max	Unit	Conditions
Input Voltage		$V_{in}$	9	24	36	V	10V strat-up
Maximum Input Current		$I_{in,max}$	—	—	17.5	A	$V_{in}=18V$ , $I_o=11.5A$
Under Voltage Threshold		$V_{UVLO}$	8.1	—	8.9	V	—
Under Voltage Resume Point		$V_{UVR}$	9.0	—	10.0	V	—
Input Over Voltage Reference Point		$V_{ovlo}$	44	—	50	V	—
Negative Logic Control	On	—	0	—	1	V	Refer to $-V_{in}$ ; Turn on when CNT floating
	Current	—	—	—	1	mA	CNT source current when turn on
	Off	—	2.0	—	10.0	V	Refer to $-V_{in}$
	Current	—	—	—	1	mA	CNT sink current when turn off

Output		Symbol	Min	Typ	Max	Unit	Conditions
Output Voltage		$V_o$	25.48	26.00	26.52	V	—
Output Current		$I_{o,nom}$	0	—	11.5	A	Meet Characteristic Curve “Input Voltage Vs Output Load Current”
Line Regulation		$S_V$	—	—	$\pm 1$	% $V_o$	$V_{in}$ : 9V~36V
Load Regulation		$S_I$	—	—	$\pm 2$	% $V_o$	$V_{in,nom}$ , $I_o=0\sim 11.5A$
Output Voltage Adjust Range		$V_{trim}$	23.4	—	28.6	V	Trim up: $P_o \leq 300W$ Trim down: $I_o \leq 11.5A$
Output Overshoot		—	0	—	$\pm 10$	% $V_o$	$V_{in,nom}$ , pure resistive load
Remote Sense Compensation Range		$V_{sense}$	—	—	0.5	V	+S and -S twisted Pair, length is less than 20cm
Output Over Current Protection Range		$I_{o,lim}$	12.65	—	17.25	A	$V_{in,nom}$
Peak to Peak Ripple and Noise		$\Delta V_{pp}$	—	—	150	mV	20MHz bandwidth, Output equipped 10 $\mu$ F tantalum capacitor and 1 $\mu$ F ceramic capacitor
Output Short-circuit Protection		Hiccup mode,automatic recovery					
Rise Time		$T_{rise}$	—	30	—	ms	$I_{o,nom}$ , pure resistive load
Start-up Delay Time		$T_{delay}$	—	5	—	ms	$I_{o,nom}$ , pure resistive load
Capacitive Load		$C_o$	0	—	2200	$\mu$ F	pure resistive load
Load Transient	Recovery Time	$t_{tr}$	—	—	400	$\mu$ s	25%~50%~25% $I_{o,nom}$ or 50%~75%~50% $I_{o,nom}$ ,
	Voltage Deviation	$\Delta V_{tr}$	—	—	$\pm 4$	% $V_o$	0.1A/ $\mu$ s; 50%~100%~50 $I_{o,nom}$ , 2.5A/ $\mu$ s

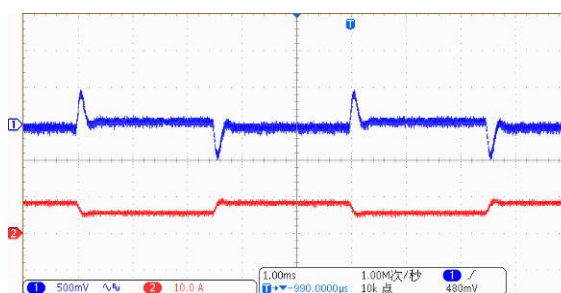
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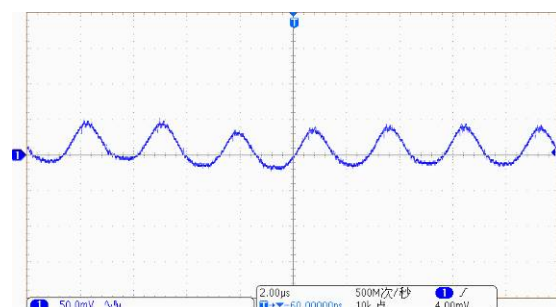
General	Symbol	Min	Typ	Max	Unit	Conditions
Efficiency	$\eta$	—	96	—	%	$V_{in}=24V$ , $I_o=11.5A$
Switching Frequency	$f_s$	—	350	—	kHz	—
MTBF	—	—	$2 \times 10^6$	—	h	BELLCORE TR-332
Operating Ambient Temperature	—	-40	—	70	°C	—
Operating Baseplate Temperature	—	-40	—	100	°C	—
Storage Temperature	—	-55	—	+125	°C	—
Thermal resistance	$R_{\theta CA}$	—	10	—	°C/W	—
Relative Humidity	—	10	—	95	%	No Condensing
Temperature Coefficient	$S_T$	—	—	$\pm 0.02$	%/°C	—
Over Temperature Protection Reference Point	$T_{ref}$	100	110	125	°C	Baseplate Temperature
Hand Soldering	Maximum soldering Temperature < 425°C, and duration < 5s					
Wave Soldering	Maximum soldering Temperature < 255°C, and duration < 10s					
Vibration and Shock	Meets EN50155					
Weight	—	—	70	—	g	—

**Characteristic Curves**
**Load Transient Response**


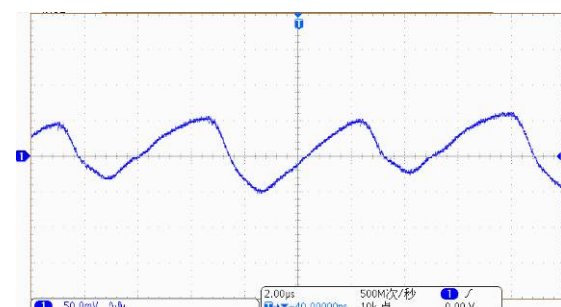
Load change: 25%~50%  
 ~25%  $I_{O,nom}$ , 2.5A/ $\mu$ s  
 $V_{in}=24Vdc$   
 Trace1: 0.5V/div  
 Trace2: 10A/div  
 Time scale: 1ms/div

**Load Transient Response**


Load change: 50%~75%  
 ~50%  $I_{O,nom}$ , 2.5A/ $\mu$ s  
 $V_{in}=24Vdc$   
 Trace1: 0.5V/div  
 Trace2: 10A/div  
 Time scale: 1ms/div

**Output Ripple and noise**


$V_{in}=18Vdc$ ,  $I_o=11.5A$

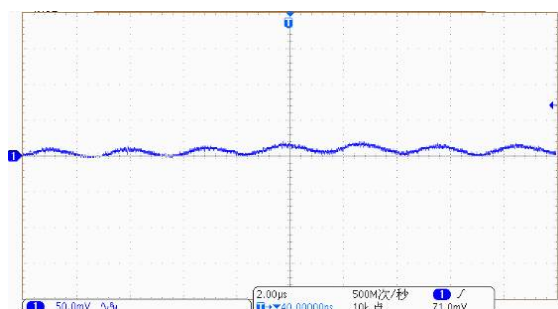
**Output Ripple and noise**


$V_{in}=24Vdc$ ,  $I_o=11.5A$

### NTP2415QN26W Non-Isolated DC-DC Converters

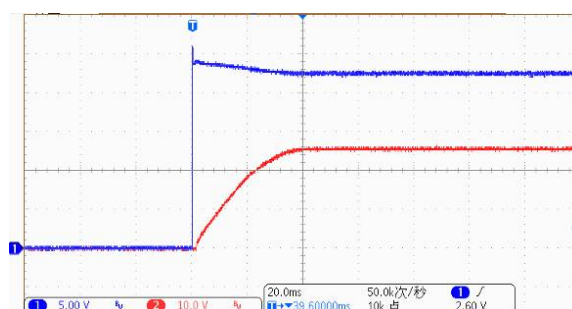
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Output Ripple and noise



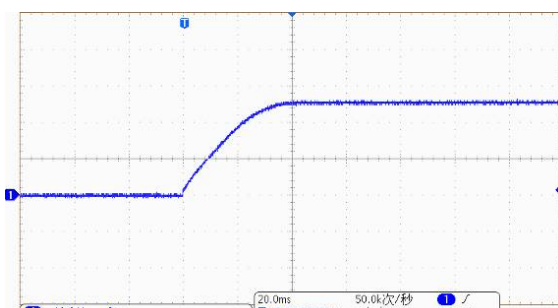
$V_{in}=36Vdc, I_o=11.5A$

Start-up Delay Time



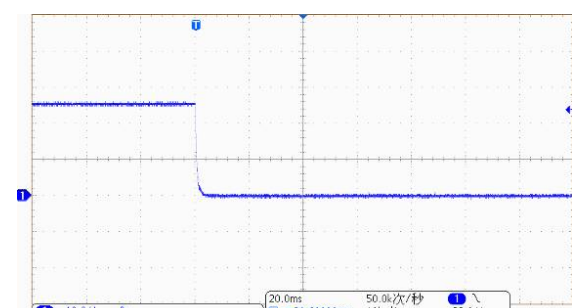
$V_{in}=24Vdc, I_o=11.5A$

Rise Time



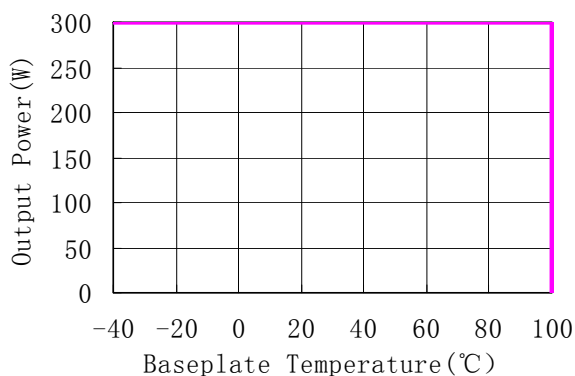
$V_{in}=24Vdc, I_o=11.5A$

Turn-off

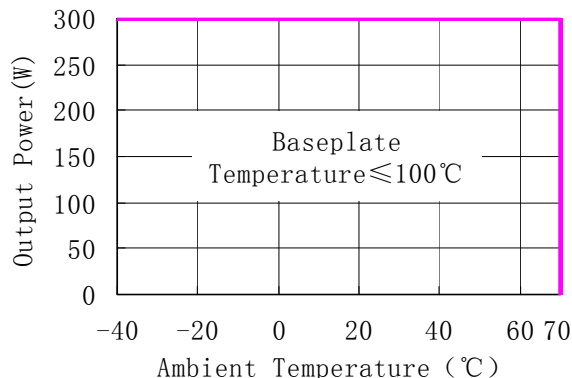


$V_{in}=24Vdc, I_o=11.5A$

Derating Curve 1



Derating Curve 2

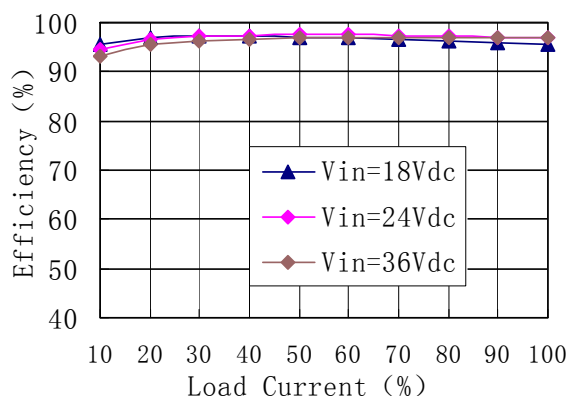


Note: during the converters' installation, attention should be paid to the flow direction of the hot air to ensure the smooth exchange of the heat with the environment. As long as the baseplate temperature does not exceed 100°C, the converters can work normally within the required ambient temperature range. For the specified ambient temperature, users can increase airflow and change the size of heatsink to improve the heat dissipating for the module with baseplate.

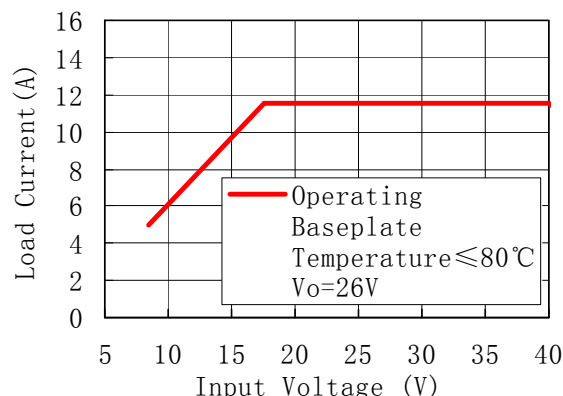
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Efficiency vs Load Current

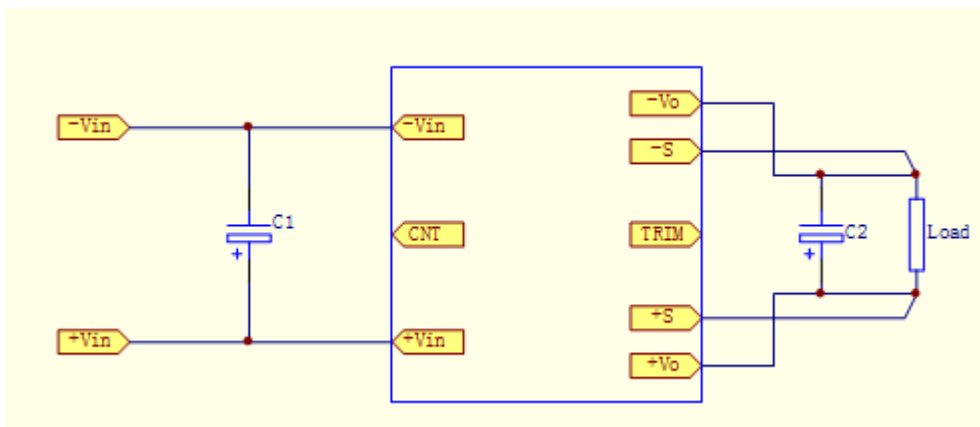


Input Voltage Vs Output Load Current



## Design Considerations

### Basic Connection

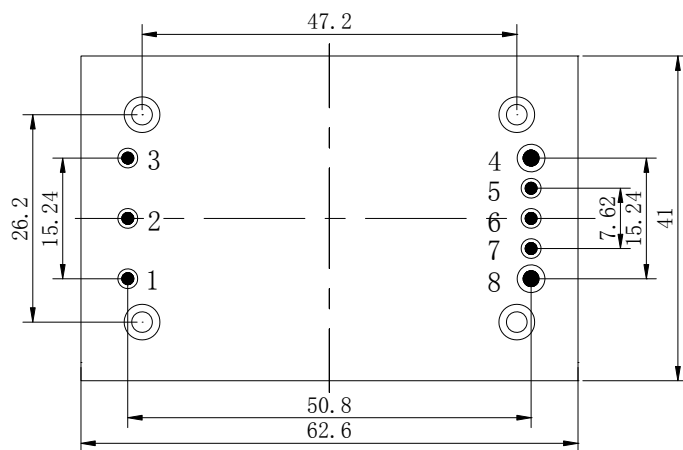


Notes: The basic connection indicates the basic requirements that the power module can provide rated output voltage and rated power only, Please refer the instruction followed for further information.

### Parameter description:

No.	Model	No.	Model
C1	100μF/50V aluminum electrolytic capacitor	C2	220μF/50V aluminum electrolytic capacitor

### Recommended Layout



NO.	Recommendation & Notes
Pad Design	4 and 8 Pad holes is 1.9 mm, pad diameter including holes is 3.5mm in the X direction, 2.3mm in the Y direction; the rest is 1.5mm, pad diameter including hole is 2.5 mm in the X direction, 2.1mm in the Y direction.
Electrical	The Vin(-) and Vo(-) planes should be placed under of the converter separately. Avoid routing sensitive signal or high disturbance AC signal under the converter

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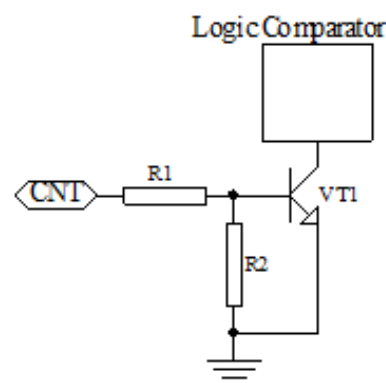
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## **Input Voltage Range**

The input voltage range of the DC/DC converter is 9V~36V. The input impedance of the converter looks like a negative resistor, which can interact with the reactance of the power bus (including any filter elements that have been added to the input of the converter), causes an unstable condition.

## **Remote Control**

Remote control can be offered by setting right control voltage level to CNT pin. NTP2415QN26W is provided with negative logic remote control. The circuit diagram is shown as “Internal Circuit Diagram”. When the level is less than 1V or the pin is left floating, the converter will turn on, When the level is higher than 2V, the converter will turn off.

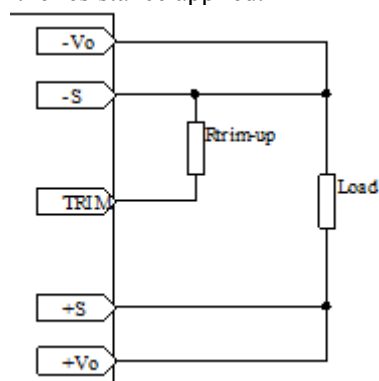


Internal Circuit Diagram

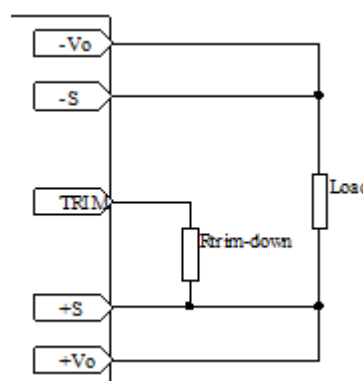
## **Output Voltage Adjust**

The converters have an Output Voltage adjust pin (Trim). This pin can be used to adjust the output voltage above or below Output voltage initial setting. The maximum value of the trimmed up is 10%, even +S and -S pins are used to compensate the voltage simultaneously, the sum of the trimmed up and the compensation should not be more than 10%, or the characteristics will not be assured in compliant with the specification, even the over voltage protection may be triggered. The output power can not exceed 300W at increased output voltages, and the output current can not exceed 11.5A.

External circuit is connected as the figure shown, the resistance is calculated as the formula below, please note that the formula will be invalid when  $R_{Trim-up}$ 、 $R_{Trim-down}$  are used simultaneously, users adjust the value based on the resistance applied.



Connection of Trimming Up



Connection for Trimming Down

$$\text{Resistance for trimming up : } R_{trim-up} = \left( \frac{28}{2(V_o + \Delta V) - 50.72} \right) K\Omega$$

$$\text{Resistance for trimming down: } R_{trim-down} = \left( \frac{624.64 - 146.8(V_o - \Delta V)}{2(V_o - \Delta V) - 52.32} \right) K\Omega$$

$R_{Trim-up}$ 、 $R_{Trim-down}$  :Resistance for trimming up or down, Unit:kΩ;

$\Delta V$ : Change rate, divide output voltage by rated output voltage;

For example: trimmed down voltage to 22V, then  $\Delta V = 26 - 22 = 4V$ ;

$$R_{trim-down} = \left( \frac{624.64 - 146.8(V_o - \Delta V)}{2(V_o - \Delta V) - 52.32} \right) = 313K\Omega$$



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**External Capacitance**

Unless special purpose (i.e. prolonging hold-up time, input impedance matching), the recommended input filter's capacitance ranges 100 $\mu$ F to 470 $\mu$ F, which not only offers a stable system, and reduces the cost, but also lessens the inrush current when the power supplies.

When larger capacitance is required, a circuit of suppressing the inrush current is recommended when the regulator start-up and a discharge circuit is recommended when the output dropped, ensuring the reliability and safety of other equipments in the system.

**Over Temperature Protection**

The over temperature protection feature is used to protect the converter, and the sensor locates in the baseplate. If the temperature of the baseplate exceeds the threshold of 110°C, the converter will shut down. The converter will stop until safe operating temperature is restored. Hysteresis temperature between OTP trig point and restart is approx 10°C. Time between OTP and restart is dependent on cooling of the regulator, and radiation to the surrounding environment. If the surrounding environment does not change, restart will work cycle by cycle.

**Remote Sense**

The remote sense can be used to compensate for the voltage drop between the output pins of the converter and the load input pins by +S、-S pins. The +S and -S pins should be connected to the input pins of the load respectively. The remote sense circuit will compensate for maximum 0.5 voltage drop between the sense voltage and the voltage at the output pins.

The anti-interference design should be considered when the +S、-S pins are connected to the pins to be compensated. The +S、-S traces should be located close to a ground trace or ground plane, and the area they surrounded should be minimized (just for electrical isolation); If cable connection presents, twisted pair wires should be used, EMI core are equipped with the twisted pair wires to reduce common mode noise when necessary, the sense leads should not be longer than 200mm, or the system characteristics may not be assured.

The sense leads only can carry very little current, and are not used for converter power output. Care should be taken in operation to avoid damaging the converter.

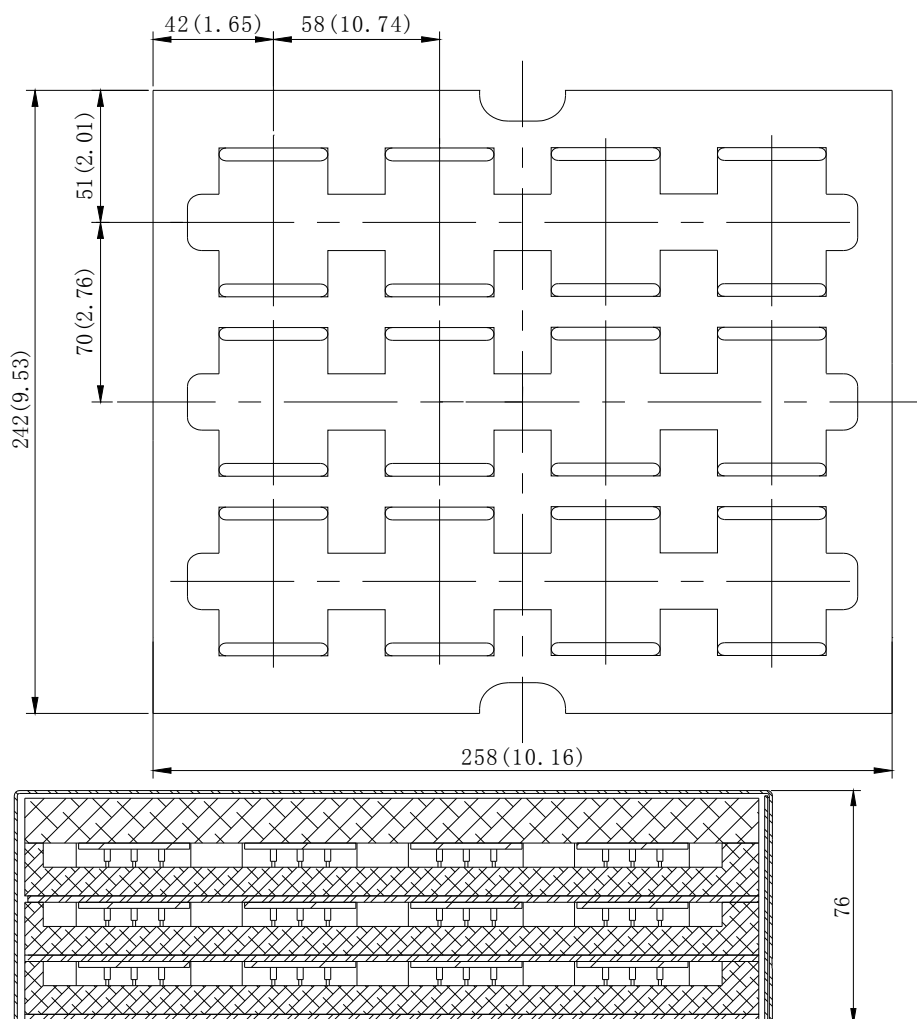
**Thermal Consideration**

The converters operate in a variety of thermal environments, however, sufficient cooling should be provided to ensure reliable operation of the unit. Heat is removed by conduction, convection and radiation to the surrounding environment. During the converters' installation, attention should be paid to the flow direction of the hot air to ensure the smooth exchange of the heat with the environment. As long as the baseplate temperature does not exceed the over temperature protection reference point, the converters can work normally.

For the specified ambient temperature, users can increase airflow and change the size of heatsink to improve the heat dissipating for the module with baseplate, the derating curves should be referred or external heat dissipation measures.

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**Delivery Package Information**

Package material is multiple wall corrugated, internal material is anti-static foam, it's surface resistance is from  $10^5 \Omega$  to  $10^{12} \Omega$ . Tray capacity:  $3 \times 12 = 36$  PCS/box, Tray weight: 2.72kg, Carton capacity:  $4 \times 36 = 144$  PCS, Carton weight: 11.5kg

**Quality Statement**

The converters are manufactured in accordance with ISO 9001 system requirements and are monitored 100% by auto-testing system, 100% burn in.

The warranty for the converters is 5-year.

**Contact Information**

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