

### FEATURES

- ◆ Wide input voltage range, 18~60V
- ◆ 200W Output @ 18V~27V Vin range
- ◆ 300W Output @ 27~60V Vin range (Including 27V)
- ◆ Full Load Efficiency up to 88.3% @48Vin
- ◆ Intergrated fuse holder
- ◆ Parallel Connection of multiple units
- ◆ Box type package with metal base plate
- ◆ Package Dimension:  
190.0x76.0x43.5mm (7.48"x2.99"x1.71")
- ◆ Operating Temperature Range - 40°C to +75°C
- ◆ Input Reverse Polarity Protection
- ◆ Minimized Inrush current
- ◆ Input UVLO, Output OCL, Short circuit protection, OVP, OTP
- ◆ Enable on/off (option)
- ◆ 2250VDC Isolation
- ◆ IP67 Protection
- ◆ RoHs Compliant
- ◆ ISO 9001, ISO 14001 certified manufacturing facility
- ◆ UL60950
- ◆ CE Mark
- ◆ EMC compatible: EN12895
- ◆ Electrical transient conduction: ISO7637-2



The B40SR12424A, a wide input voltage range of 18~60V, and single isolated output converter, is the latest product offering from a world leader in power systems technology and manufacturing — Delta Electronics, Inc. Such box type DCDC converter can provide 300W (200W at Vin < 27V), 12.4V regulated DC output voltage with full load efficiency up to 88.3% @48Vin; The B40SR12424A offers input UVLO, output over current limit, short circuit, output over voltage, over temperature, and input reverse polarity protections, It has an intergrated fuse holder. It also has parallel function; and allows a wide operating temperature range of -40°C to +75°C. With creative design technology and optimization of component placement, this converter possess outstanding electrical and thermal performance, as well as high reliability under extrmely harsh operating conditions. The B40SR12424A meets IP67 protection (not include the connector and fuseholder).

### Input Characteristics

| Item  | Condition                    | Min.                      | Typ. | Max. | Unit |
|---|------------------------------|---------------------------|------|------|------|
| Continuous Input Voltage                                |                              | 18                        | 48   | 60   | VDC  |
| Max Input voltage                                       | 10 minutes, normal operating |                           |      | 80   | VDC  |
| Input Under-Voltage Lockout, Turn-On Voltage Threshold  |                              | 16                        | 17   | 18   | VDC  |
| Input Under-Voltage Lockout, Turn-Off Voltage Threshold |                              | 14                        | 15   | 16   | VDC  |
| Lockout Hysteresis Voltage                              |                              | 1                         | 2    | 3    | VDC  |
| Maximum Input Current                                   | Vin=18V, 100% Load           |                           | 12.6 | 13.1 | A    |
| No-Load Input Current                                   | Vin=24V                      |                           | 100  | 150  | mA   |
|   | Vin=36V                      |                           | 55   | 80   | mA   |
|   | Vin=48V                      |                           | 40   | 70   | mA   |
| Reflected input ripple current                          | Vin=48V, Vpp                 |                           |      | 0.2  | A    |
| Max Reverse Polarity Input Voltage                      |                              |                           |      | 60   | VDC  |
| Max Inrush current                                      |                              |                           |      | 10   | A    |
| Internal Input Fuse                                     | Ø6.35mm*31.75mm              | 250V/30A Fast-acting fuse |      |      |      |



## Output Characteristics

| Item   | Conditions  | Min.  | Typ.  | Max.  | Unit |
|--|---|-------|-------|-------|------|
| Operating Output Current Range                                       | Vin=18V~27V   | 0     |       | 16    | A    |
|  | Vin=27V~60V(include 27V)                                | 0     |       | 24    | A    |
| Output Voltage Set Point   | Vin=24V,36V,48V, Io=0                                   | 12.4  | 12.6  | 12.8  | V    |
|  | Vin=24V, Io=16A   | 12.13 | 12.33 | 12.53 | V    |
|  | Vin=36V,48V, Io=24A                                     | 12.0  | 12.2  | 12.4  | V    |
| Output Voltage Ripple and Noise,                                     | Vin=36V, 48V, Io=24A, peak to peak, 20MHz bandwidth     |       | 150   | 250   | mV   |
|  | RMS   |       | 35    | 60    | mV   |
|  | Vin=24V, Io=16A, peak to peak, 20MHz bandwidth          |       | 100   | 150   | mV   |
|  | RMS   |       | 30    | 50    | mV   |
| Output Current Limit   | Vin=24V   | 16.5  | 18.5  | 20.5  | A    |
|  | Vin=36V, 48V  | 25    | 28    | 31    | A    |
| Short current  | Vin=48V, Auto restart, RMS value                        |       | 3     |       | A    |
| Current share accuracy   | Vin=36V, 48V, 24A for each module                       |       | 6     | 10    | %    |
| Start-up time  |   |       | 800   | 1200  | mS   |
| Rise time  |   |       | 130   | 200   | mS   |
| Output Voltage Protection  |   | 13    | 15    | 17    | V    |
| Output Voltage Current Transient, positive and negative voltage step | Vin=24V, 8A to 12A load dynamic, 0.1A/us slew rate      |       | 150   | 250   | mV   |
|  | Vin=36V,48V, 12A to 18A load dynamic, 0.1A/us slew rate |       | 150   | 250   | mV   |
| Maximum Output Capacitance   | ESR>10mohm  |       |       | 5000  | μF   |
| Output overshoot   |   |       |       | 3     | %    |
| Efficiency @ 100% Load(16A)  | Vin=24V   | 86.8  | 88.8  |       | %    |
| Efficiency @ 100% Load(24A)  | Vin=36V   | 86.5  | 88.5  |       | %    |
| Efficiency @ 100% Load(24A)  | Vin=48V   | 86.3  | 88.3  |       | %    |
| Efficiency @ 60% Load(9.6A)  | Vin=24V   | 87.6  | 89.6  |       | %    |
| Efficiency @ 60% Load(14.4A)   | Vin=36V   | 87.8  | 89.8  |       | %    |
| Efficiency @ 60% Load(14.4A)   | Vin=48V   | 87.3  | 89.3  |       | %    |

## General Characteristics

| Item                                   | Conditions                     | Min. | Typ. | Max. | Unit   |
|--|--------------------------------|------|------|------|--------|
| Isolation Voltage,                     | Input to Output, Input to Case |      | 2250 |      | VDC    |
|  | Output to Case                 |      | 550  |      | VDC    |
| Isolation Resistance, Input to Output  |                                | 10   |      |      | MΩ     |
| Isolation Capacitance, Input to Output |                                |      | 6000 |      | pF     |
| Switching Frequency                    |                                |      | 175  |      | KHz    |
| MTBF                                   | Ta=25°C, 80%load               |      | 2.8  |      | Mhours |
| Weight                                 |                                |      | 900  |      | g      |

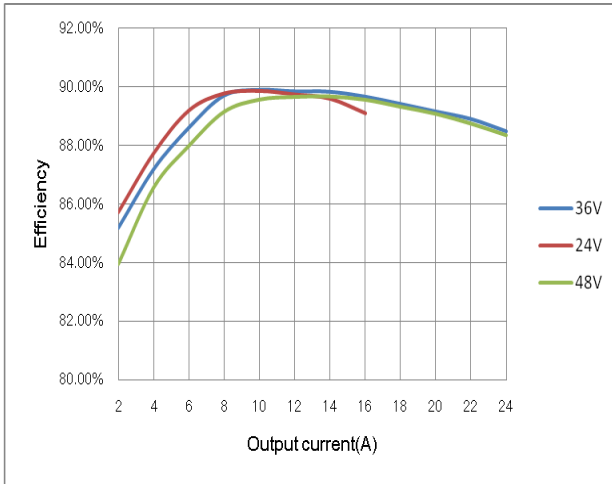
## Environmental Specifications

| Parameter                                | Conditions                         | Min.                                   | Typ.                   | Max. | Unit     |
|--|------------------------------------|--|------------------------|------|----------|
| Storage Temperature Range                |                                    | -40                                    |                        | +125 | °C       |
| Operating Temperature Range              | Ambient Temperature                | -40                                    |                        | +75  | °C       |
| Maximum permitted meta plate temperature | Vin=48V, Io=24A, Refer to figure20 |  |                        | 98   | °C       |
| Over Temperature Protection              | NTC Temperature                    |  | 118                    |      | °C       |
| Humidity (non condensing)                |                                    |  |                        | 95   | % rel. H |
| Water Protection Level                   | Without connector&fuseholder       |  | IP67                   |      |          |
| Vibration                                | IEC 60068-2-6                      |  | 10G/15~200HZ/3 PLANES  |      |          |
| Shock                                    | IEC 60068-2-27                     |  | 50G 3 PLANES           |      |          |
| Emission                                 | EN12895                            |  | 30-1000MHz 34-45dBuV/m |      |          |
| Immunity                                 | EN12895, EN61000-4-3               | 10V/m /27-1000MHz AM; 10V/m /900MHz PM |                        |      |          |
| ESD                                      | EN12895, EN61000-4-2               | Direct: ±2KV ±4KV; Air: ±2KV ±4KV ±8KV |                        |      |          |

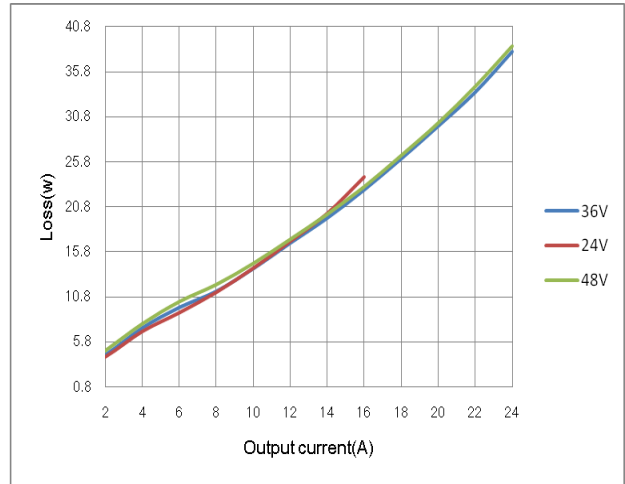
## Notes

- Specifications typical at Ta=+25°C, nominal input voltage and rated full load output current unless otherwise noted.
- Specifications are subject to change without notice.

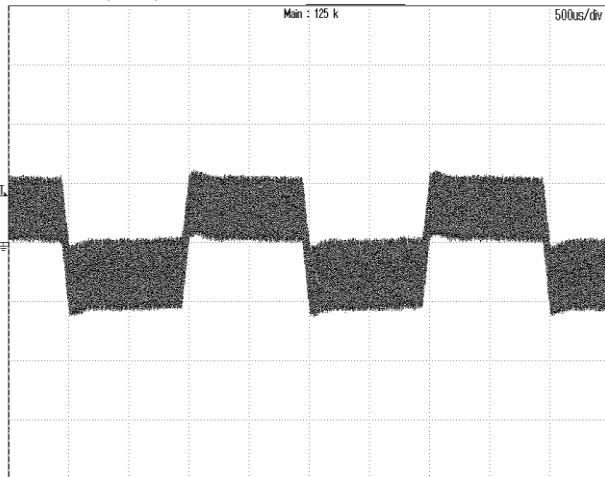
## ELECTRICAL CURVES



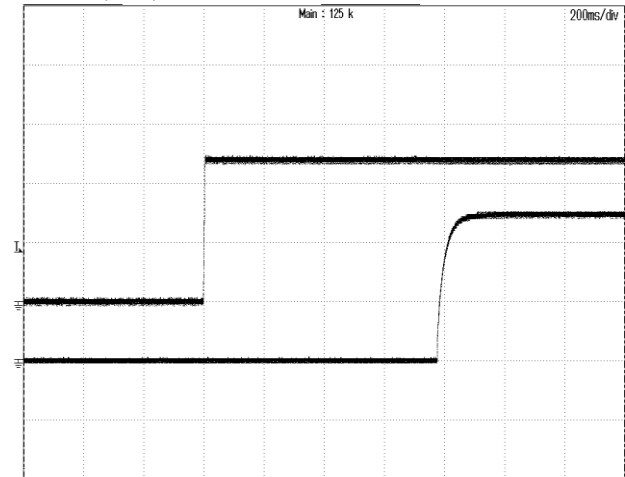
**Figure 1: Efficiency vs. Output current**  
@ Vin=24V,36V,48V



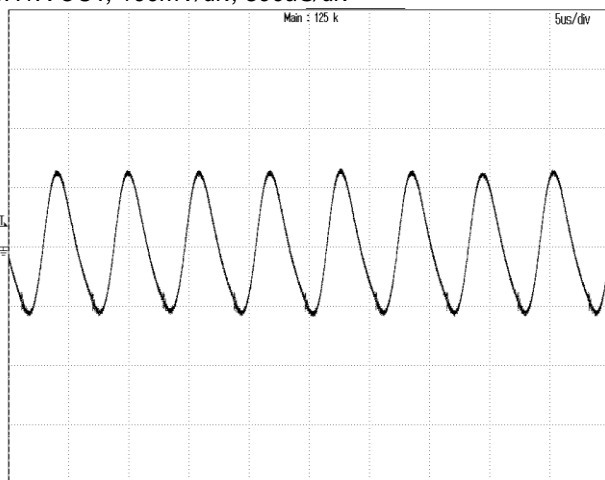
**Figure 2: Loss vs. Output current**  
@ Vin=24V,36V,48V



**Figure 3: Dynamic response to load step 12A~18A with 0.1A/uS slew rate at 48Vin**  
CH1:VOUT, 100mV/div, 500uS/div



**Figure 4: Vout start up with Vin on at 48Vin, 24A Iout,**  
TOP: VIN, 20V/div, 200mS/div  
BOTTOM: VOUT, 5V/div, 200mS/div

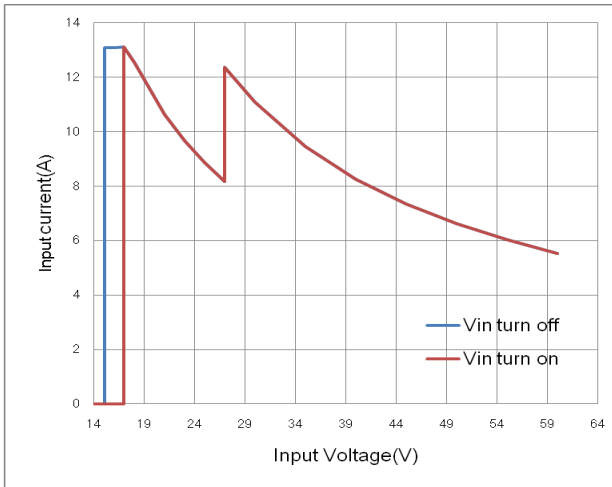


**Figure 5: Output ripple & noise at 48Vin, 24A Iout**  
CH1:VOUT, 50mV/div, 5uS/div

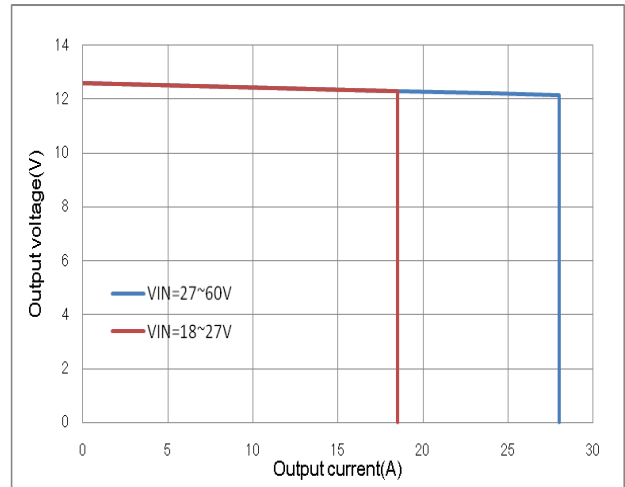


**Figure 6: Output over voltage protection at 48Vin, 24A Iout**  
CH1:VOUT, 10V/div, 50mS/div

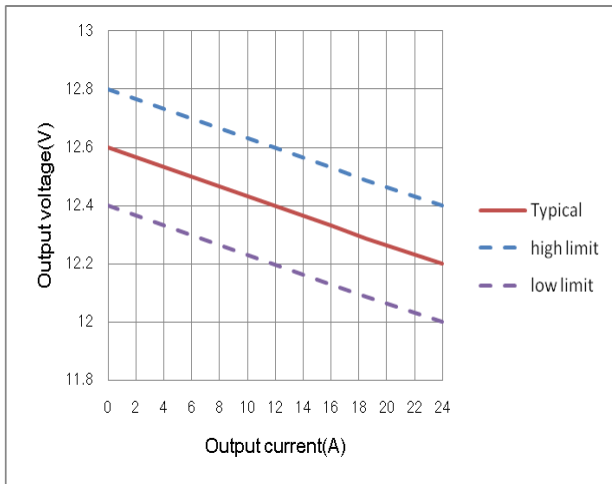
## ELECTRICAL CURVES (continuous)



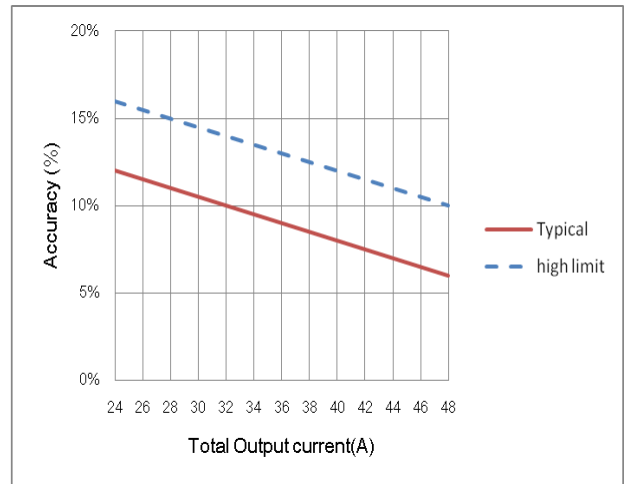
**Figure 7:** Input current vs. Input voltage  
@  $V_{in}=18V\sim 27V, 200W$ ;  $V_{in}=27V\sim 60V, 300W$



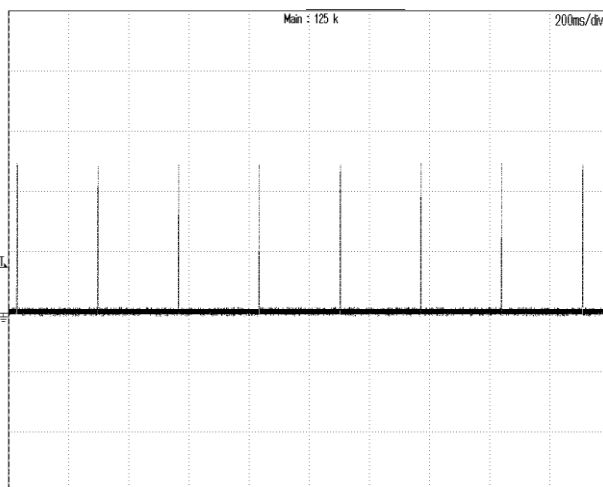
**Figure 8:** Output voltage vs. Output current  
OCL Performance



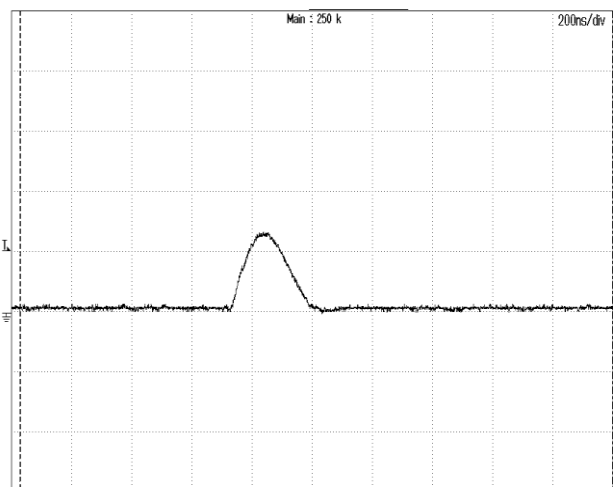
**Figure 9:** Output voltage vs. Output current  
@  $V_{in}=48V$ . Droop function.



**Figure 10:** Current share accuracy vs. Total output current  
2 in parallel.



**Figure 11:** Output short current @  $V_{in}=48V$   
CH1:io, 20A/div, 200ms/div



**Figure 12:** Inrush current @  $V_{in}=48V$   
CH1:lin, 2A/div, 200ns/div  
Max current 2.7A,  $I_2t=1.24E-7 A^2S$

## FEATURES DESCRIPTIONS

### Output Over-Current Limit and Short Protection

The modules include internal output over-current limit (OCL) and short circuit protection (SCP) circuits, the OCL set point is lower than that of the SCP; The response of SCP circuit is much fast than that of the OCL circuit. The slowly increase of the output current will let module enter OCL protection when the current exceeds the OCL set point, while the fast increase of the output current will let module enter SCP when the current exceeds the SCP set point.

When the modules enter OCL protection, the output voltage will decrease while the output current is kept constant, the output voltage will soft start to set point when the overload condition is removed.

The module will enter hiccup mode when it triggers the SCP set point. The module will try to restart after shutdown. If the overload condition still exists, the module will shut down again. This restart trial will continue until the overload condition is removed.

### Output Over-Voltage Protection

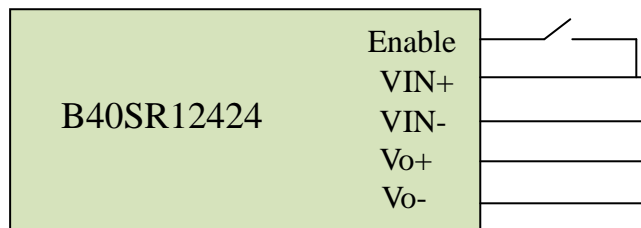
The power module includes an internal output over-voltage protection(OVP) circuit, which monitors the voltage on the output terminals. If this voltage exceeds the OVP set point, the module will shut down, and then restart after a fixed delay time (hiccup mode), please refer to figure6 for detail.

### Over-Temperature Protection

The over-temperature protection consists of circuitry that provides protection from thermal damage. If the temperature exceeds the preset temperature threshold the module will shut down, and all components will not exceed their absolute maximum temperature ratings. The module will restart after the temperature is within specification.

### Remote On/Off

B40SR12424A has an option for Enable control. An additional PIN need to added to achieve this function. This Enable PIN is designed on the primary side of converter, the converter will turn on when the Enable PIN connected to VIN+, and turn off when the Enable PIN connected to VIN- or floating. Delta can change the 4PIN connector to a 5PIN connector to achieve the enable function, please contact us if you need this function.



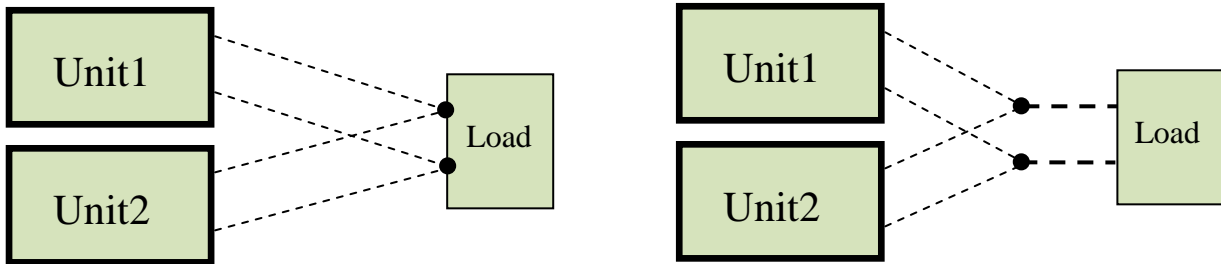
*Figure 13: suggested Enable connection*

### Input Reverse Voltage Protection

The input reverse voltage protection is provided by an diode on the input line, the standoff voltage for the reverse protection shall be no less than -60V.

**Parallel connection of multiple units**

Two units parallel operation is verified, please contact Delta if more than two units need to be paralleled. While paralleling multiple units, the impedance of the cables from unit to junction point of each unit should be within  $\pm 5\%$  of each other.

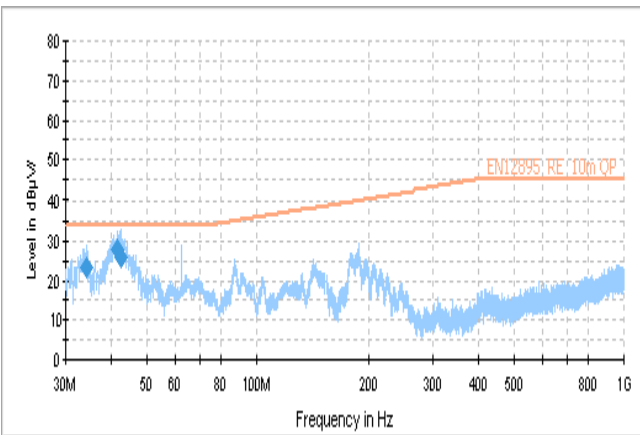


*Figure 14: suggested parallel connections*

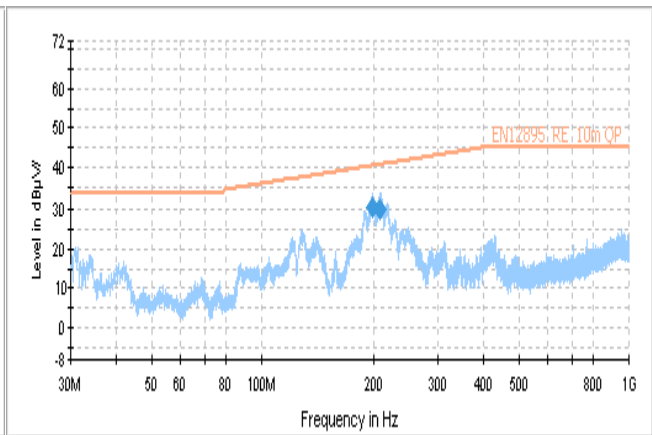
**EMC**

The converter has the internal EMI filters and meet the EMC standards EN12895 30-1000MHz 34-45dBuV/m. The test result is showed as below

**Conditions:** Vin=48V, Io=24A, 10m measure distance



*Figure 15: test result(Vertical)*



*Figure 16: test result(Horizontal)*

**Fuse replacement**

The module has the intergratted the fuse holder, when the fuse needs to be replaced, it can be taken down in an anticlockwise direction by slotted type screwdrivers .

Recommended fuse replacement P/N:

Littlefuse 0314030.MXP

## THERMAL CONSIDERATION

The following figure shows the location to monitor the temperature of base plate. Before customer decides to use this DCDC converter, a thermal evaluation need to be did to make sure the temperature of base plate is lower than that read from below thermal curves (Figure18~20 base on different input voltage).

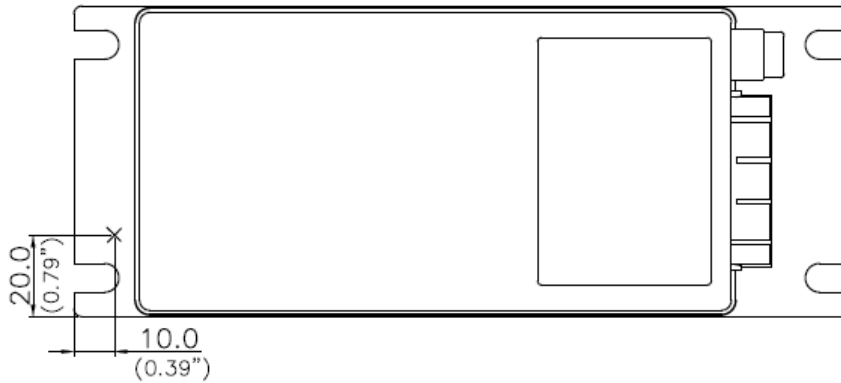


Figure 17: Thermal consideration

## THERMAL CURVE

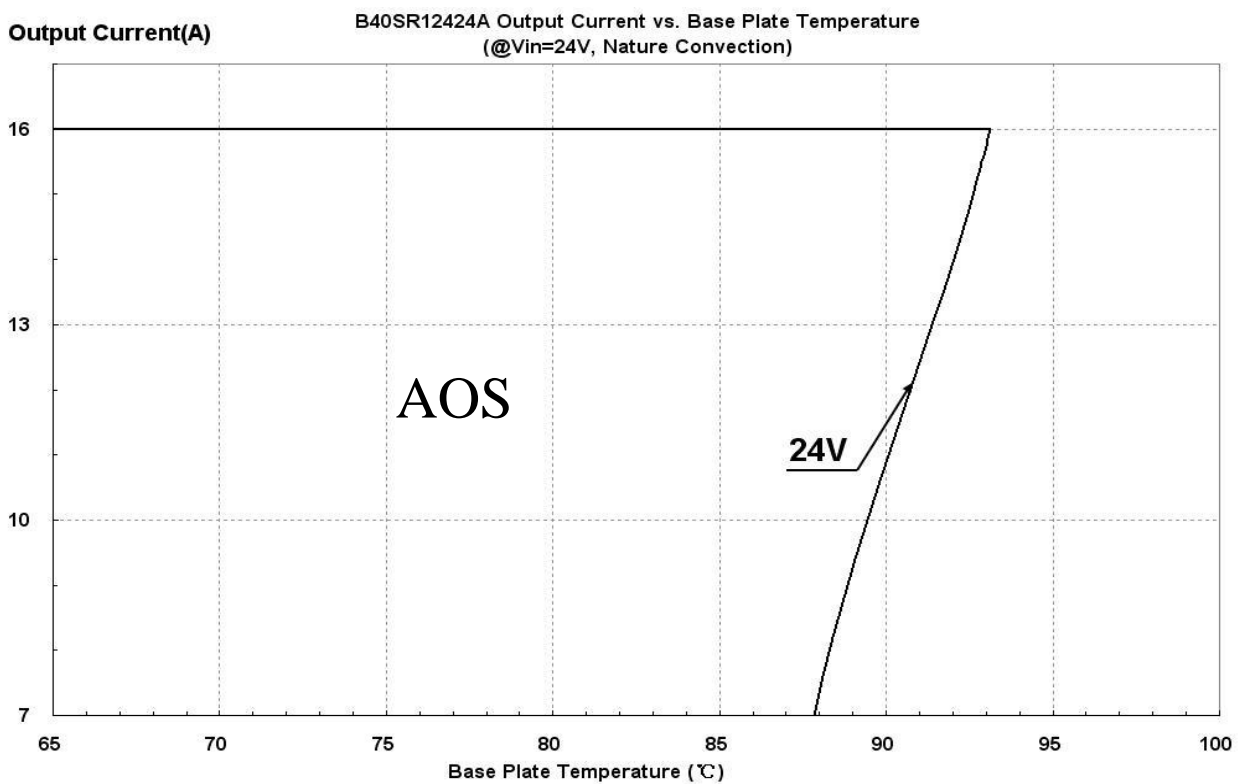


Figure 18: Output Current vs. Base Plate temperature

@Vin=24V

**THERMAL CURVES**

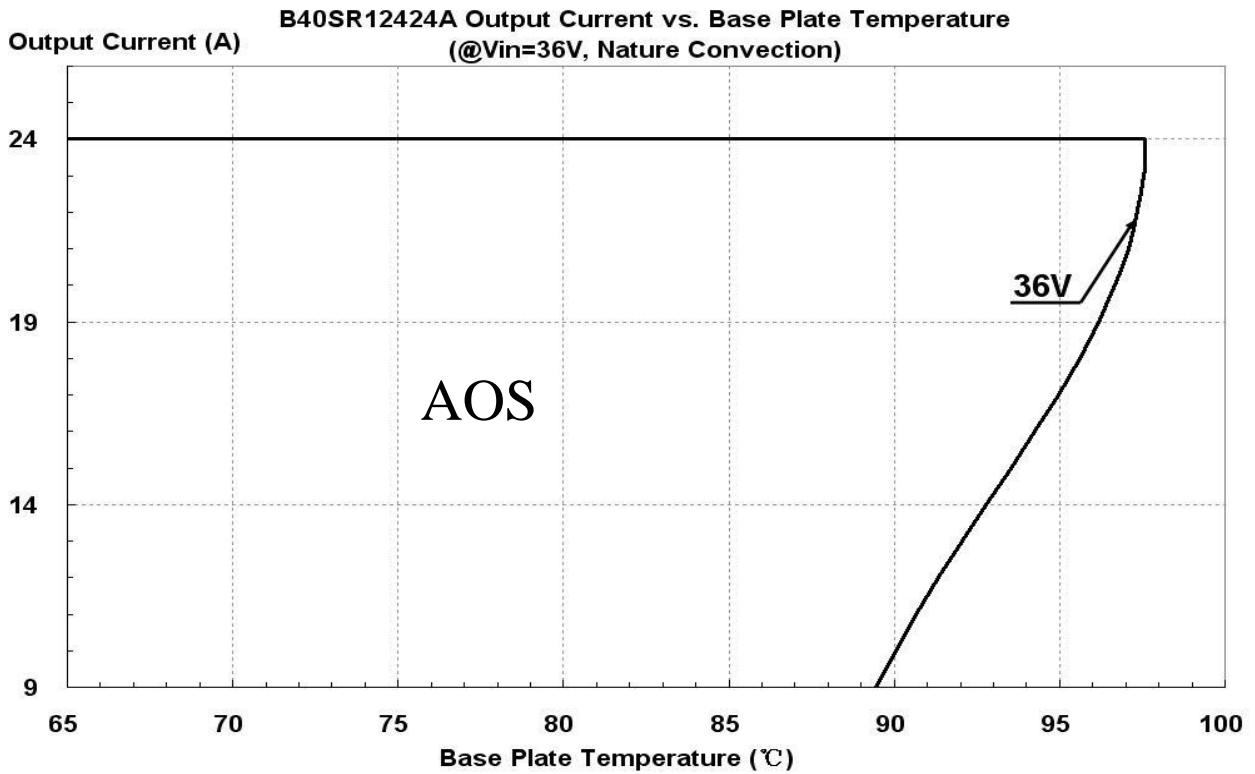


Figure 19: Output Current vs. Base Table temperature @ Vin=36V

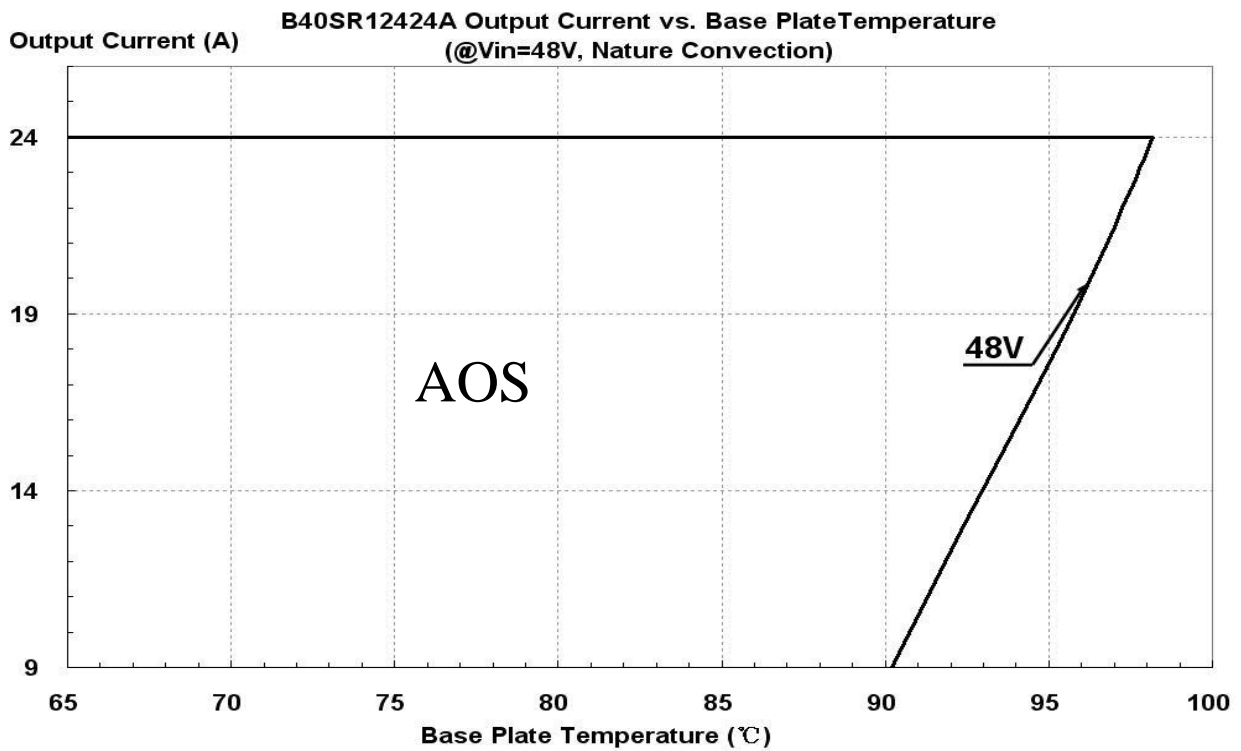
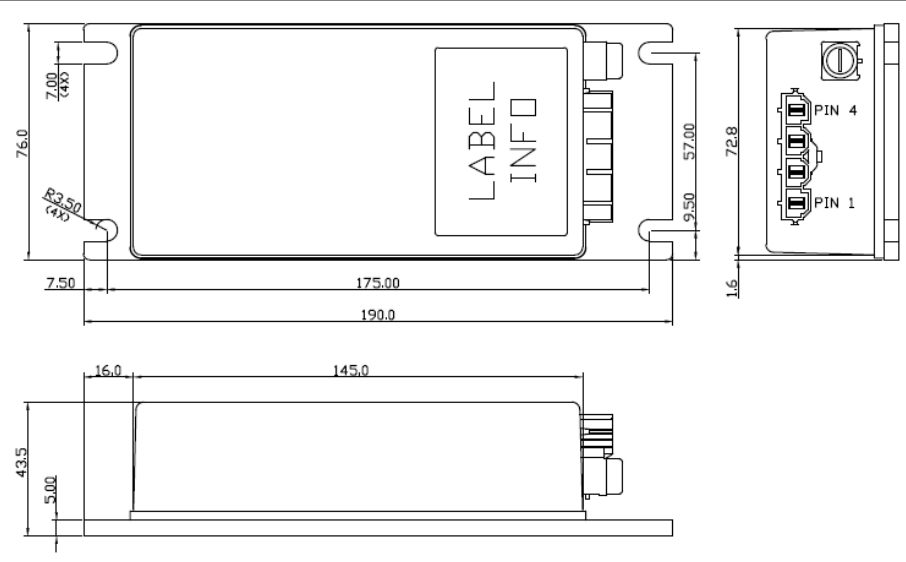


Figure 20: Output Current vs. Base Table temperature @ Vin=48V



## Mechanical Drawing

| Mechanical Dimensions  |                      | Pin Connections   |  |     |                      |   |          |   |          |   |         |   |         |
|--|----------------------|---|--|-----|----------------------|---|----------|---|----------|---|---------|---|---------|
|  |                      | <table border="1"> <thead> <tr> <th>Pin</th> <th>Function Description</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>OUTPUT -</td> </tr> <tr> <td>2</td> <td>OUTPUT +</td> </tr> <tr> <td>3</td> <td>INPUT -</td> </tr> <tr> <td>4</td> <td>INPUT +</td> </tr> </tbody> </table> |  | Pin | Function Description | 1 | OUTPUT - | 2 | OUTPUT + | 3 | INPUT - | 4 | INPUT + |
| Pin  | Function Description |   |  |     |                      |   |          |   |          |   |         |   |         |
| 1  | OUTPUT -             |   |  |     |                      |   |          |   |          |   |         |   |         |
| 2  | OUTPUT +             |   |  |     |                      |   |          |   |          |   |         |   |         |
| 3  | INPUT -              |   |  |     |                      |   |          |   |          |   |         |   |         |
| 4  | INPUT +              |   |  |     |                      |   |          |   |          |   |         |   |         |
|  |                      | <ul style="list-style-type: none"> <li>➤ All dimensions in mm (inches)</li> <li>➤ Tolerance: X.X±0.5 (X.XX±0.02)<br/>X.XX±0.25 ( X.XXX±0.010)</li> <li>➤ Connector:<br/>MOLEX MINI-FIT Sr™ Header<br/>(MOLEX P/N :42819-4213)</li> </ul>  |  |     |                      |   |          |   |          |   |         |   |         |

## Physical Outline

|               |  |
|---------------|--|
| Case Size     | : 190.0x76.0x43.5 mm (7.48"x2.99"x1.71") |
| Case Material | : Case: PC; Plate: AL6063                |



| Part Numbering System |               |                   |                |                |                |             |                           |            |                                |                        |
|-----------------------|---------------|-------------------|----------------|----------------|----------------|-------------|---------------------------|------------|--------------------------------|------------------------|
| B                     | 40            | S                 | R              | 124            | 24             | A           |                           |            |                                | C                      |
| Form Factor           | Input Voltage | Number of Outputs | Product Series | Output Voltage | Output Current | Option Code |                           |            |                                | Option Fitting         |
| B-Box                 | 40 – 18V~60V  | S – Single        | R – Regular    | 124 – 12.4V    | 24 – 24A       |             | With Built-in fuse holder | Enable pin | Sealed connector & fuse holder | Connector Kit          |
|                       |               |                   |                |                |                | A           | YES                       | NO         | NO                             | 1xhousing+ 4 terminals |
|                       |               |                   |                |                |                | B           | YES                       | NO         | YES                            |                        |
|                       |               |                   |                |                |                | C           | NO                        | YES        | NO                             |                        |
|                       |               |                   |                |                |                | D           | NO                        | NO         | NO                             |                        |

| Model List          |         |       |        |     |                      |  |
|---------------------|---------|-------|--------|-----|----------------------|--|
| Input Voltage Range | Input   |       | Output |     | EFF @48VIN 100% LOAD |  |
| B40SR12424(A\B\C\D) | 18V~60V | 13.1A | 12.4V  | 24A | 88.3%                |  |

**WARRANTY**

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