



### FEATURES

- Wide input voltage range, 18~60V
- 200W Output @ 18V~27V Vin range
- 300W Output @ 27~60V Vin range
- Full Load Efficiency up to 88.3% @48Vin
- Intergrated fuse holder (option)
- Parallel Connection of multiple units
- Box type package with metal base plate
- Package Dimension:  
190.0x76.0x44.0mm (7.48"x2.99"x1.73")
- 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 for selective model
- RoHs Compliant
- ISO 9001, ISO 14001 certified manufacturing facility
- UL60950
- CE Mark
- EMC compatible: EN12895, CISPR11 ClassA
- Electrical transient conduction: ISO7637-2

The B40SR12424, 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 B40SR12424 offers input UVLO, output over current limit, short circuit, output over voltage, over temperature, and input reverse polarity protections, It has an option for intergrated fuse holder and enable on/off function. 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 B40SR12424 meet IP67 protection (refer to "water protection level" specification).

### 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		85	110	mA
	Vin=48V		40	70	mA
Off converter input current	Vin=48V, enable off (C version)		8	15	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	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, peak to peak, 20MHz bandwidth		100	160	mV
	RMS		35	50	mV
	Vin=24V, Io=16A peak to peak, 20MHz bandwidth		60	90	mV
	RMS, Vin=24V, Io=16A		20	30	mV
Output Current Limit	Vin=24V	16.5	18.5	20.5	A
	Vin=36V, 48V	25	28	31	A
Current share accuracy	Vin=36V, 48V, 24A for each module		6	10	%
Start-up time(start _up time by Vin)	Vin=48V,full load		750	900	mS
Start-up time(start _up time by Enable)	Vin=48V,full load (for C)		250	350	mS
Rise time			30	50	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		100	150	mV
	Vin=36V,48V, 12A to 18A load dynamic, 0.1A/us slew rate		100	150	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		0.7		Mhours
Weight			900		g

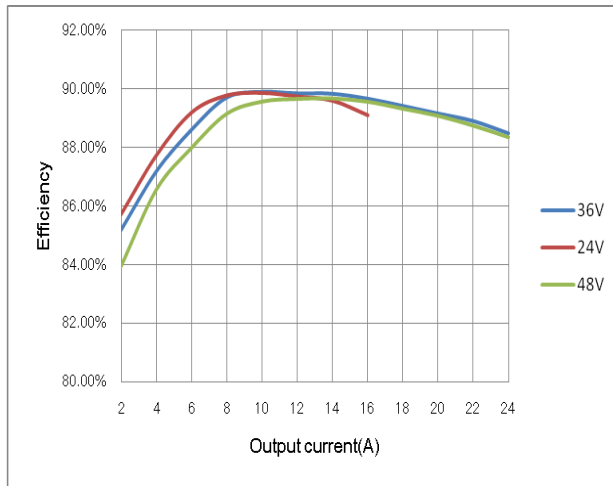
## Environmental Specifications

Parameter	Conditions	Min.	Max.	Unit
Storage Temperature Range		-40	+125	°C
Operating Temperature Range	Ambient Temperature	-40	+75	°C
Over Temperature Protection	NTC Temperature		118	°C
Humidity (non condensing)			95	% rel. H
Water Protection Level	For model P/N with suffix B	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		

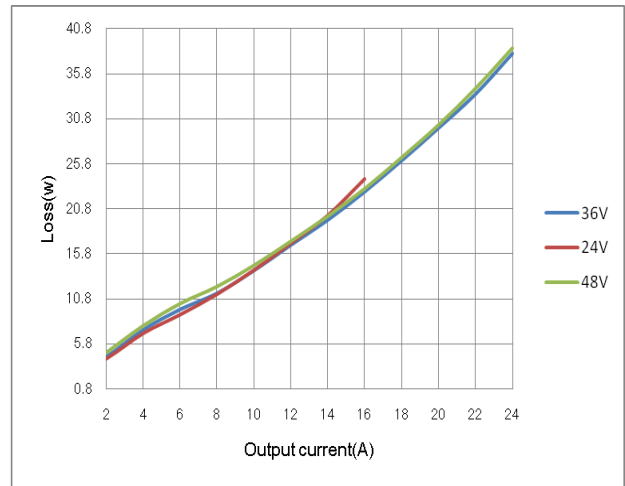
## Notes

- Specifications typical at  $T_a=+25^{\circ}\text{C}$ , nominal input voltage and rated full load output current unless otherwise noted.
- Specifications are subject to change without notice.

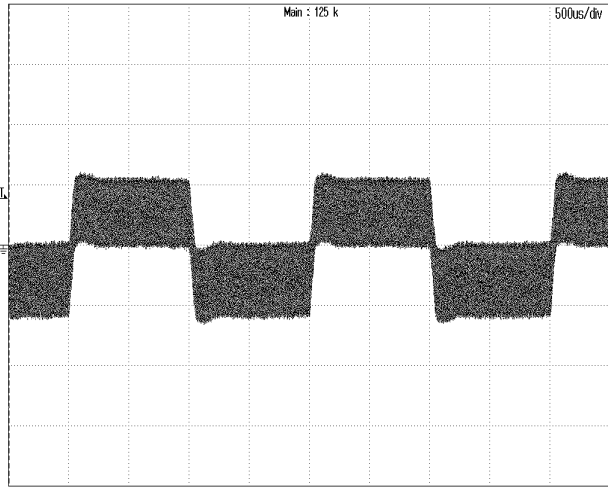
## ELECTRICAL CURVES



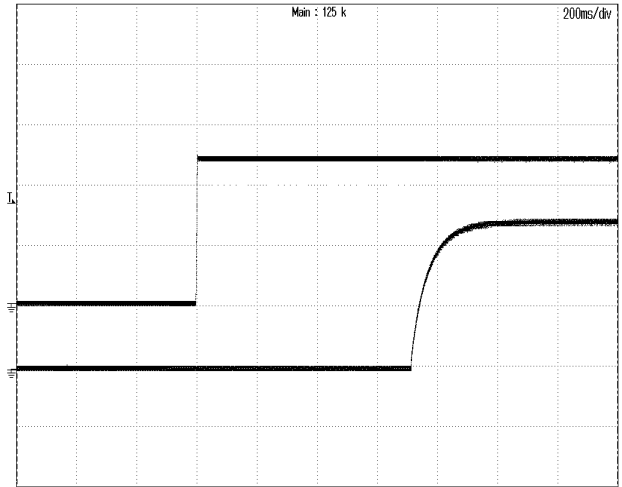
**Figure 1: Efficiency vs. Output current**  
@  $V_{in}=24V, 36V, 48V$



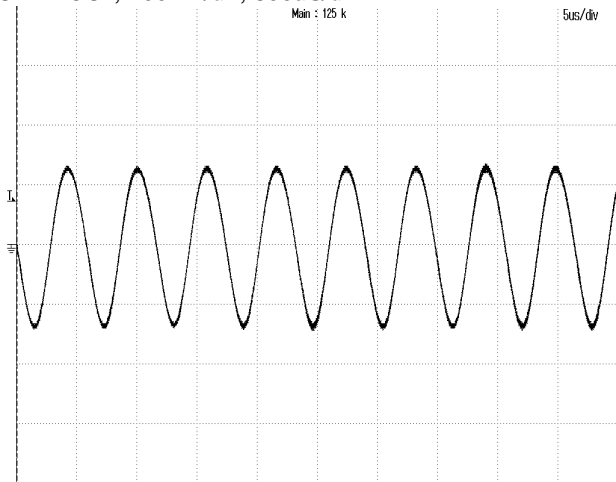
**Figure 2: Loss vs. Output current**  
@  $V_{in}=24V, 36V, 48V$



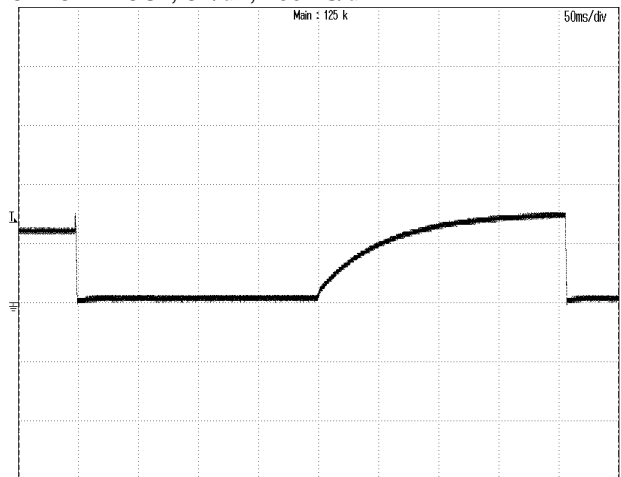
**Figure 3:** Dynamic response to load step 12A~18A with 0.1A/µS slew rate at 48Vin  
CH1: VOUT, 100mV/div, 500µS/div



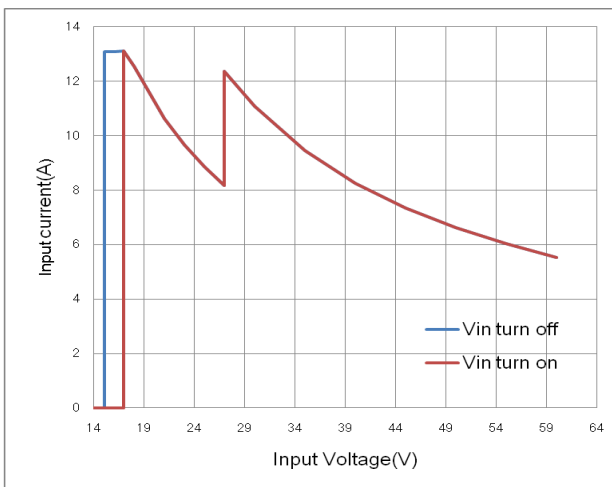
**Figure 4:** Vout start up with Vin on at 48Vin, 24A lout,  
TOP: VIN, 20V/div, 200mS/div  
BOTTOM: VOUT, 5V/div, 200mS/div



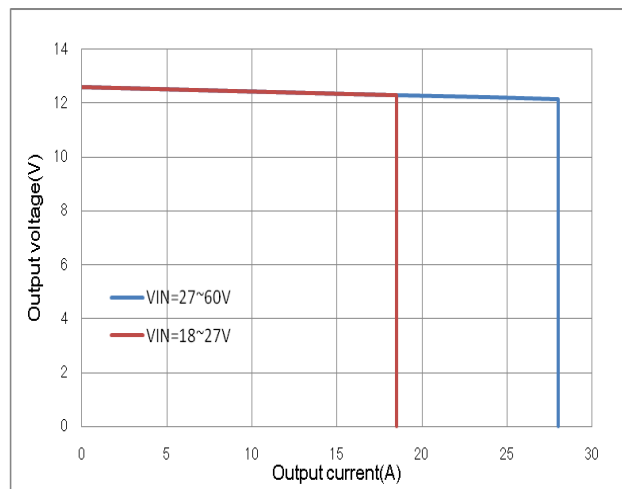
**Figure 5:** Output ripple & noise at 48Vin, 24A lout  
CH1: VOUT, 50mV/div, 5µS/div



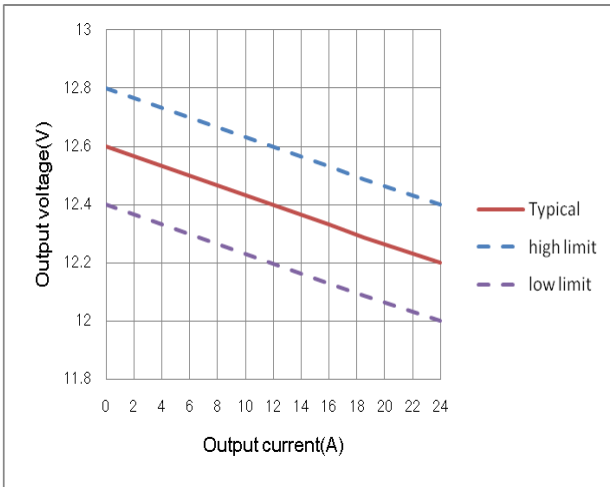
**Figure 6:** Output over voltage protection at 48Vin, 24A lout  
CH1: VOUT, 10V/div, 50mS/div



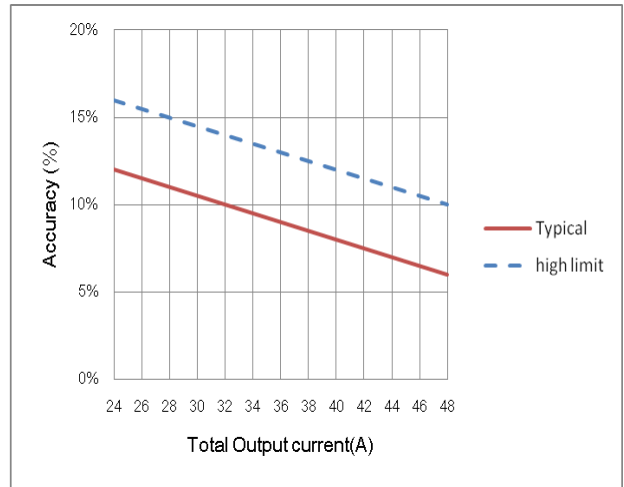
**Figure 7:** Input current vs. Input voltage  
@ Vin=18V~27V, 200W;  
Vin=27V~60V, 300W



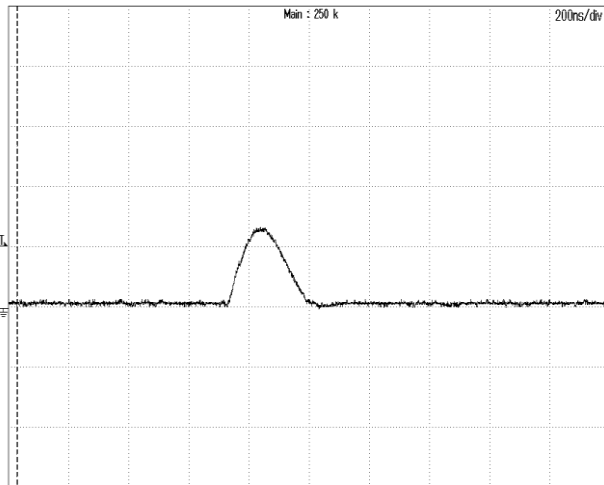
**Figure 8:** Output voltage vs. Output current  
OCL Performance



**Figure 9:** Output voltage vs. Output current @Vin=48V. Droop function.



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



**Figure 11:** Inrush current @ Vin=48V  
 CH1:lin, 2A/div, 200nS/div  
 Max current 2.7A, I2t=1.24E-7 A²S

**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 figure8 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**

B40SR12424C has Enable control 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.



*Figure 12: suggested Enable connection*

**Input Reverse Voltage Protection**

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

## DESIGN CONSIDERATIONS

### 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.

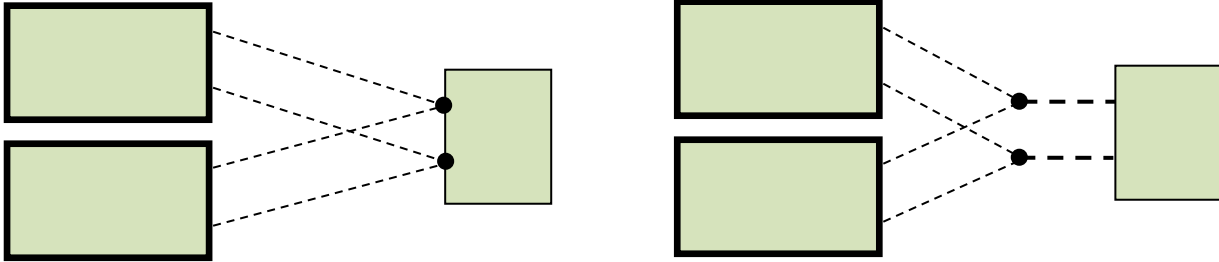


Figure 13: suggested parallel connections

### 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:**  $V_{in}=48V$ ,  $I_o=24A$ , 10m measure distance

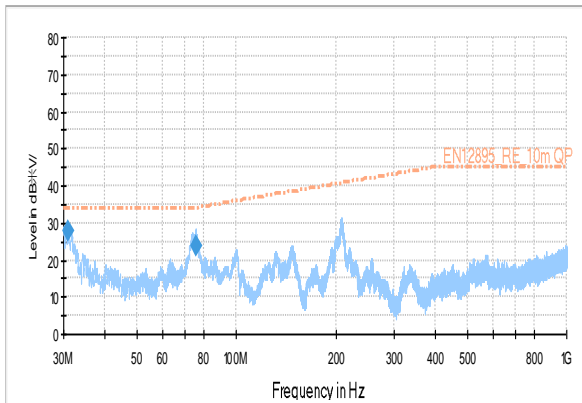


Figure 14: test result (Vertical)

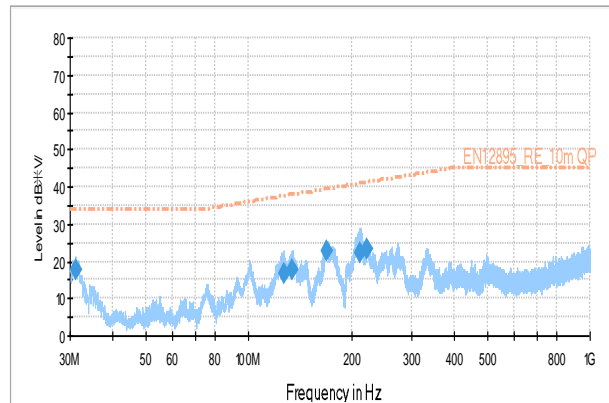


Figure 15: test result (Horizontal)

### Fuse replacement

For the versions with 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 thermal curve (Figure17~19) is based on a 250x300x5mm AL table, shown as below figure.

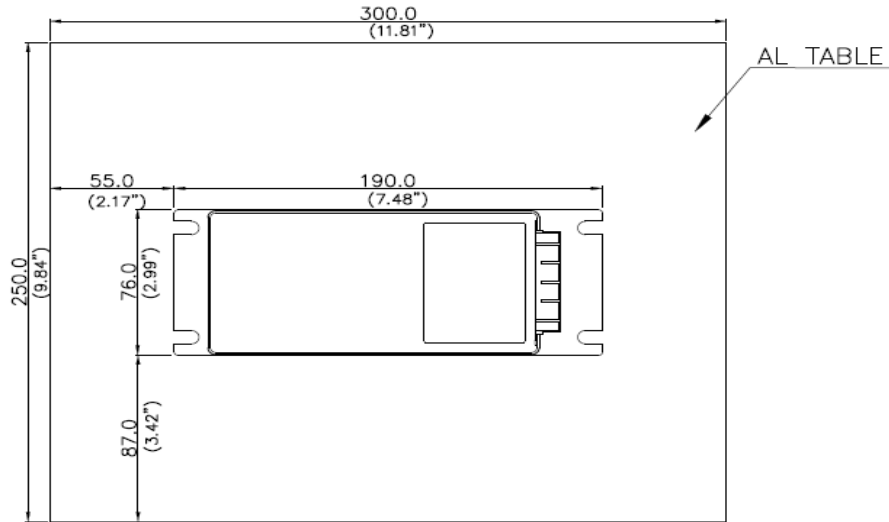


Figure 16: Thermal consideration

## THERMAL CURVE

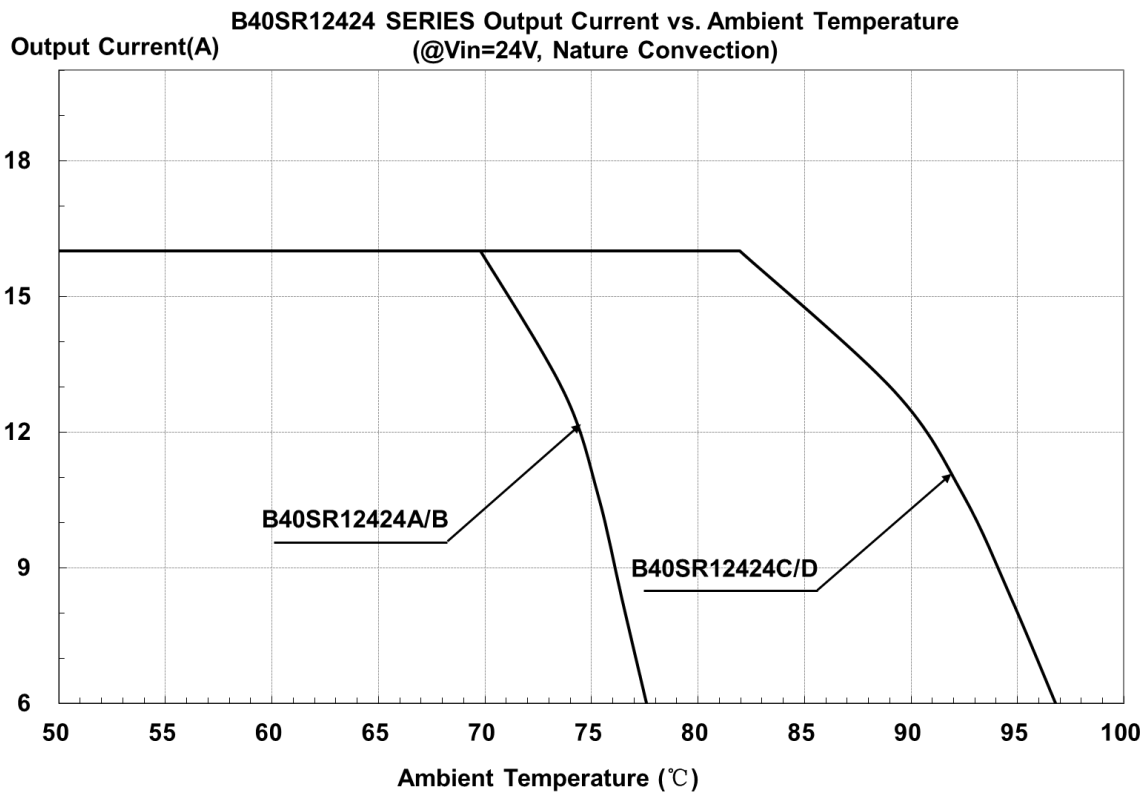


Figure 17: Output Current vs. Ambient temperature @Vin=24V



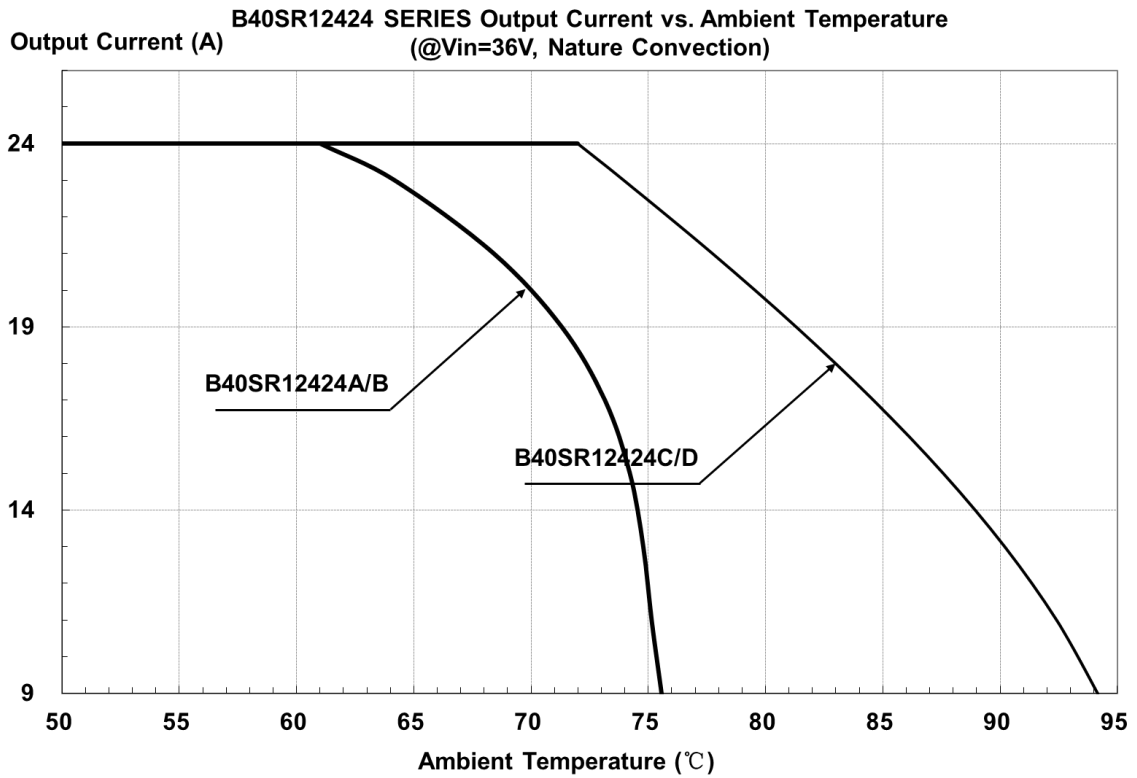


Figure 18: Output Current vs. Ambient temperature @ Vin=36V

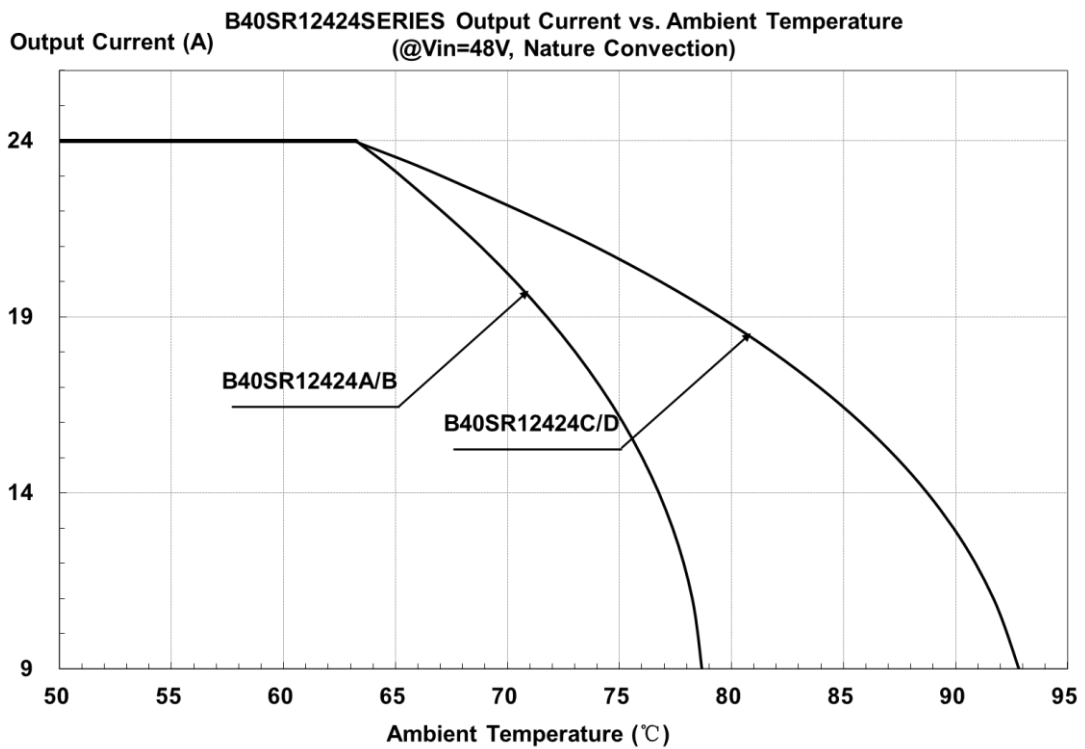


Figure 19: Output Current vs. Ambient temperature @ Vin=48V

## 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 (Figure21~23 base on different input voltage).

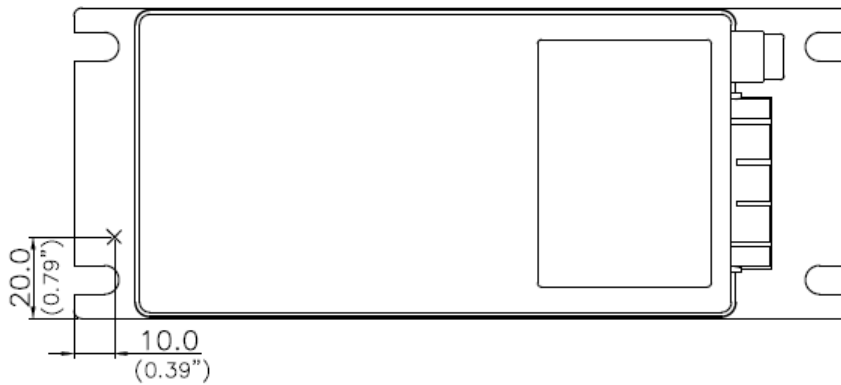


Figure 20: Thermal consideration

## THERMAL CURVE

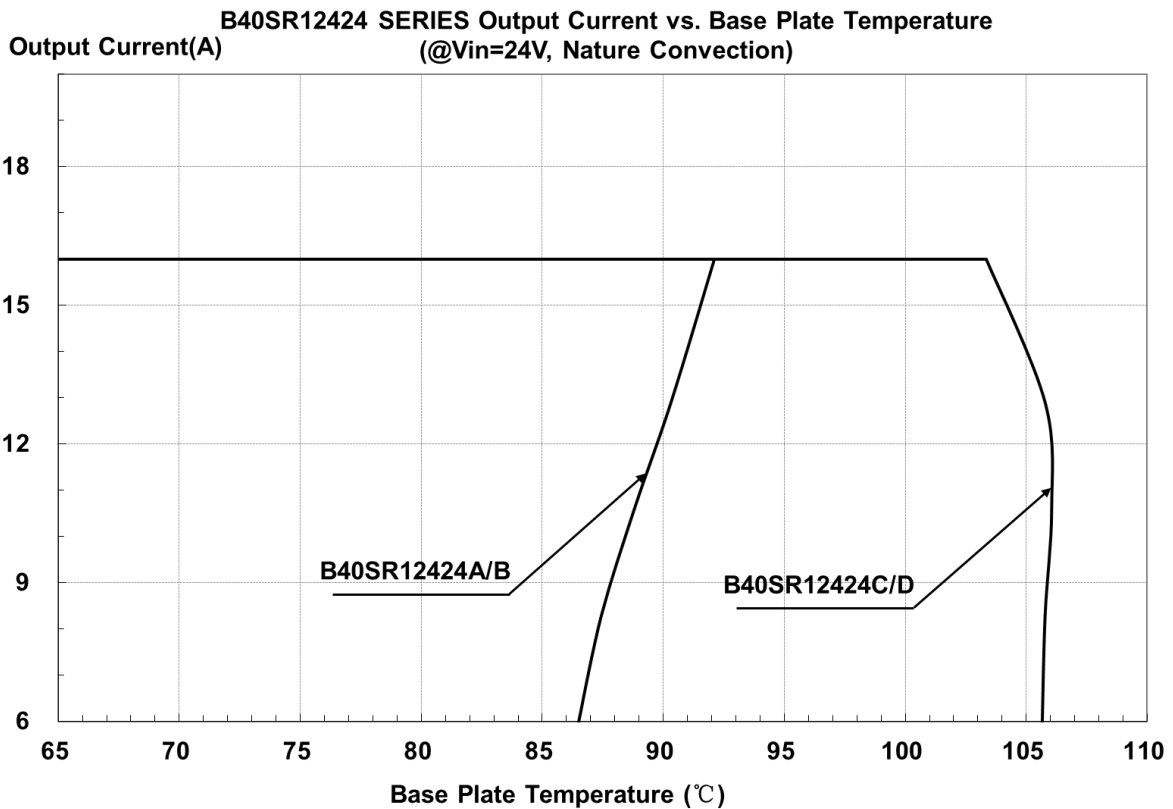


Figure 21: Output Current vs. Base Plate temperature @Vin=24V

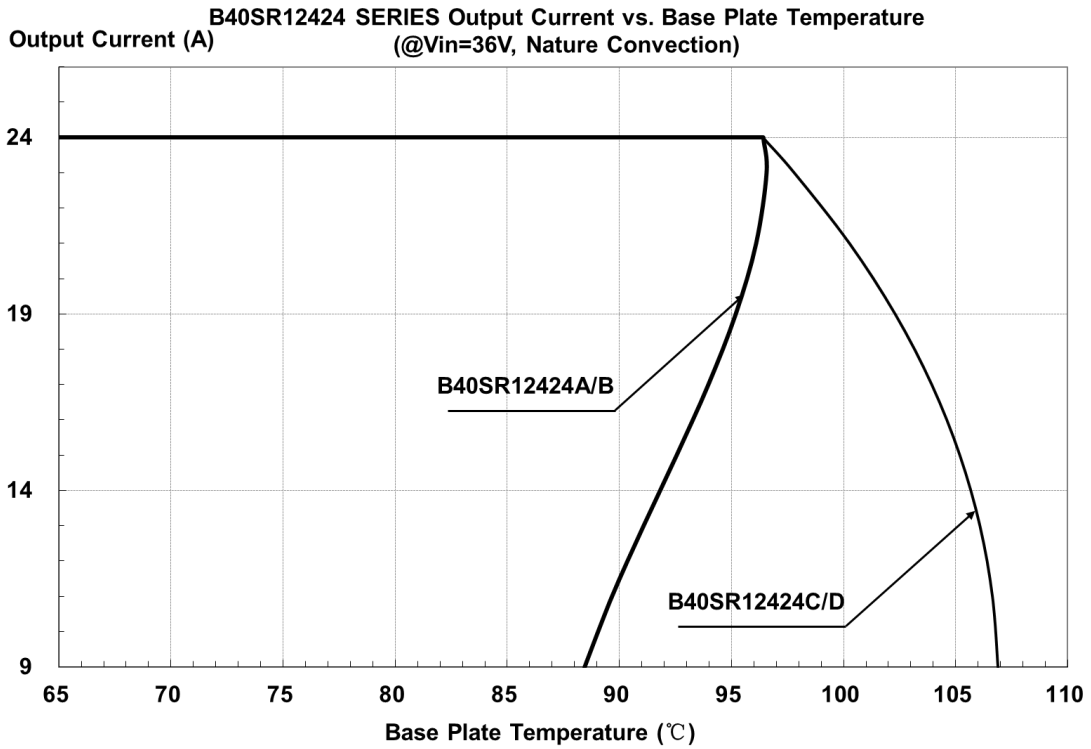


Figure 22: Output Current vs. Base Table temperature @ Vin=36V

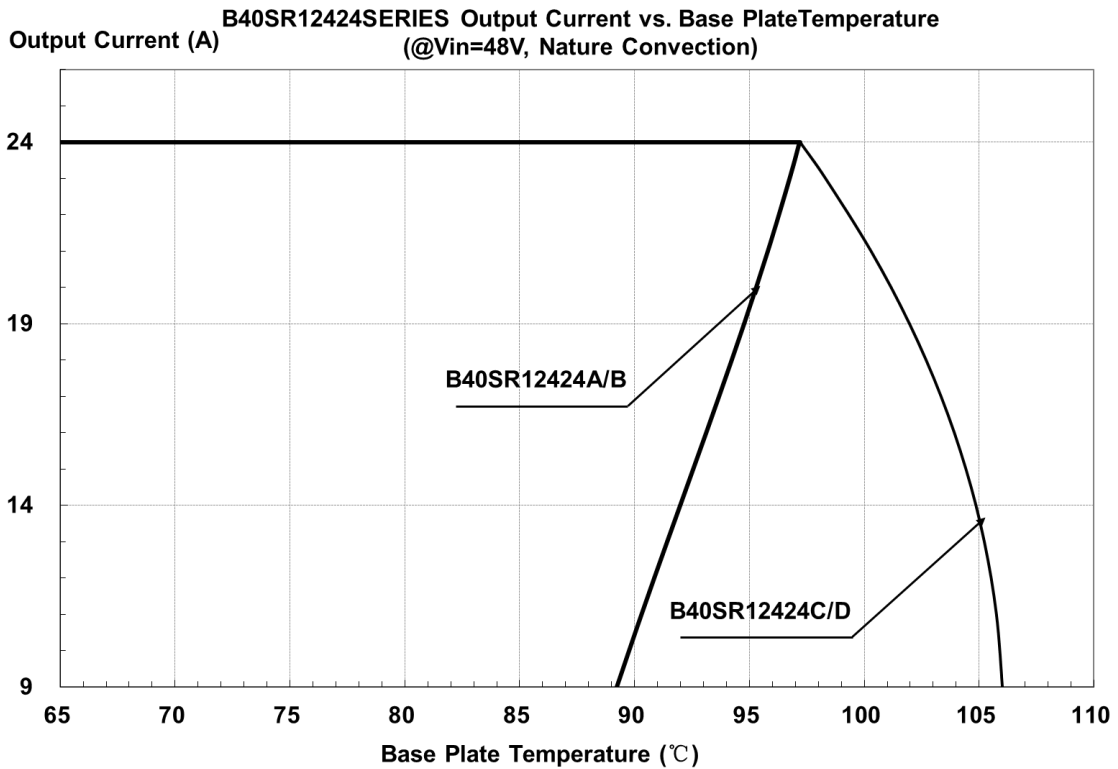
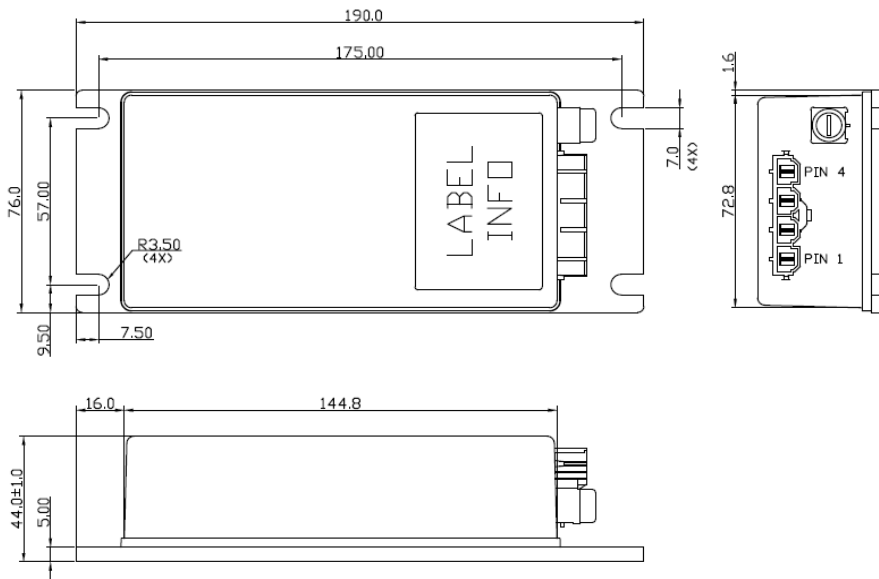


Figure 23: Output Current vs. Base Table temperature @ Vin=48V

## Mechanical Drawing

### Mechanical Dimensions

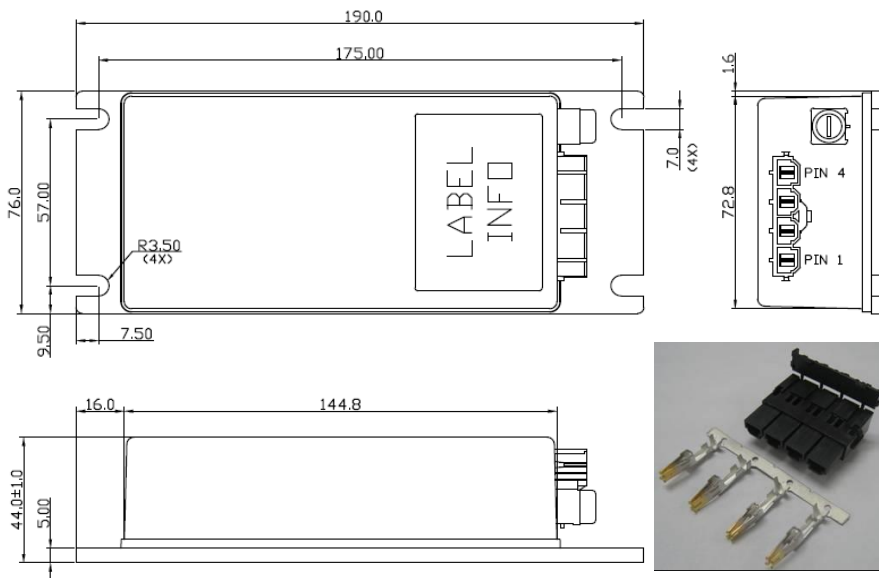


B40SR12424A

### Pin Connections

Pin	Function Description
1	OUTPUT -
2	OUTPUT +
3	INPUT -
4	INPUT +

- All dimensions in mm (inches)
- Tolerance: X.X±0.5 (X.XX±0.02)  
X.XX±0.25 (X.XXX±0.010)
- Connector:  
MOLEX MINI-FIT Sr™ Header  
(MOLEX P/N :42819-4213)



B40SR12424AC

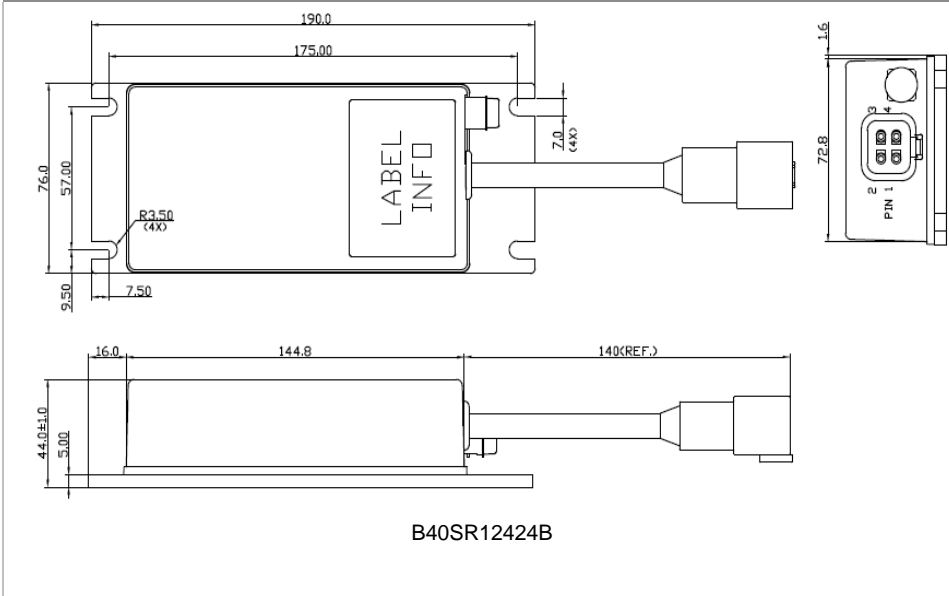
Pin	Function Description
1	OUTPUT -
2	OUTPUT +
3	INPUT -
4	INPUT +

- All dimensions in mm (inches)
- Tolerance: X.X±0.5 (X.XX±0.02)  
X.XX±0.25 (X.XXX±0.010)
- Connector:  
MOLEX MINI-FIT Sr™ Header  
(MOLEX P/N :42819-4213)
- Connector kit :  
Housing: 42816-0412  
Terminal: 42815-0042

## Mechanical Drawing

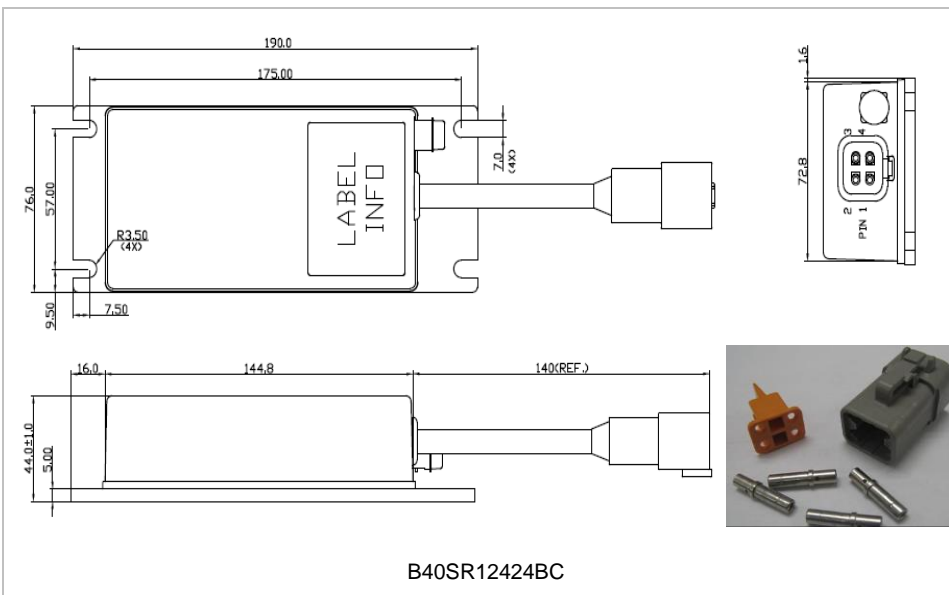
### Mechanical Dimensions

### Pin Connections



Pin	Function Description
1	OUTPUT -
2	OUTPUT +
3	INPUT -
4	INPUT +

- All dimensions in mm (inches)
- Tolerance: X.X±0.5 (X.XX±0.02)  
X.XX±0.25 (X.XXX±0.010)
- Connector:  
Deutsch DTP Receptacles  
(DEUTSCH P/N :DTP04-4P)

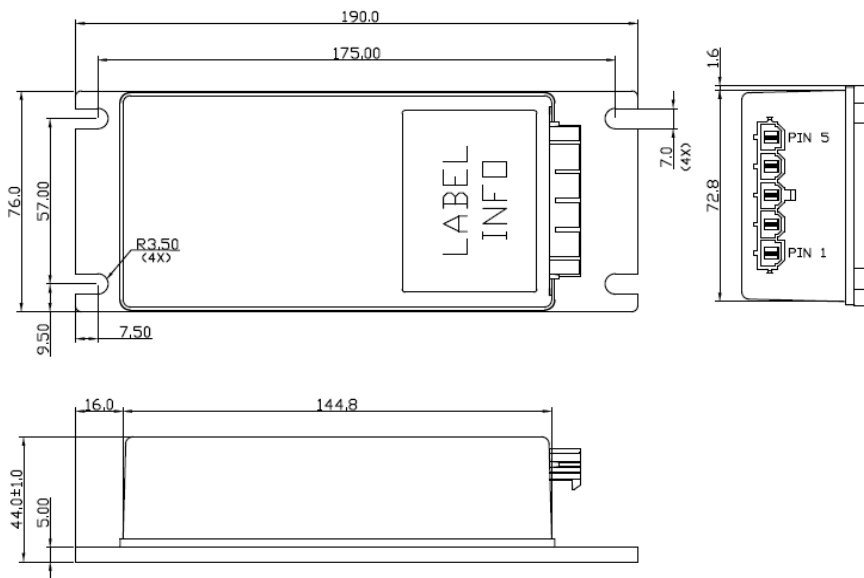


Pin	Function Description
1	OUTPUT -
2	OUTPUT +
3	INPUT -
4	INPUT +

- All dimensions in mm (inches)
- Tolerance: X.X±0.5 (X.XX±0.02)  
X.XX±0.25 (X.XXX±0.010)
- Connector:  
Deutsch DTP Receptacles  
(DEUTSCH P/N :DTP04-4P)
- Connector kit :  
Housing: DTP06-4S  
Wedge lock: WP-4S  
Terminal: 0462-203-12141

## Mechanical Drawing

### Mechanical Dimensions

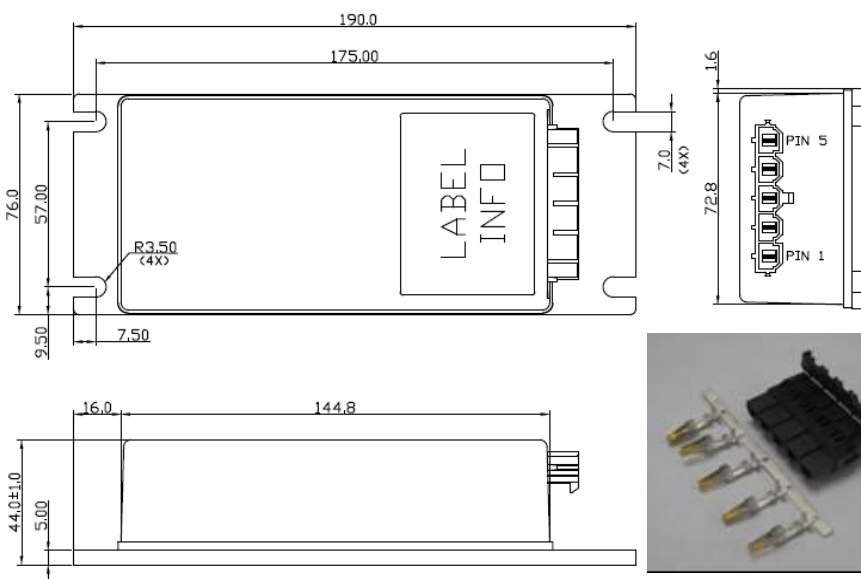


B40SR12424C

### Pin Connections

Pin	Function Description
1	OUTPUT -
2	OUTPUT +
3	INPUT -
4	INPUT +
5	ENABLE

- All dimensions in mm (inches)
- Tolerance: X.X±0.5 (X.XX±0.02)  
X.XX±0.25 ( X.XXX±0.010)
- Connector:  
MOLEX MINI-FIT Sr™ Header  
(MOLEX P/N :42819-5213)



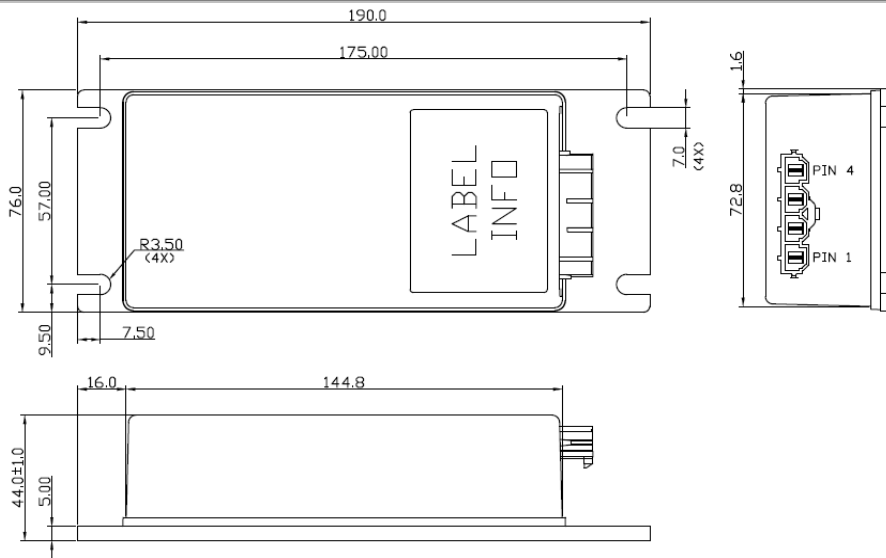
B40SR12424CC

Pin	Function Description
1	OUTPUT -
2	OUTPUT +
3	INPUT -
4	INPUT +
5	ENABLE

- All dimensions in mm (inches)
- Tolerance: X.X±0.5 (X.XX±0.02)  
X.XX±0.25 ( X.XXX±0.010)
- Connector:  
MOLEX MINI-FIT Sr™ Header  
(MOLEX P/N :42819-5213)
- Connector kit :  
Housing: 42816-0512  
Terminal: 42815-0042

## Mechanical Drawing

### Mechanical Dimensions

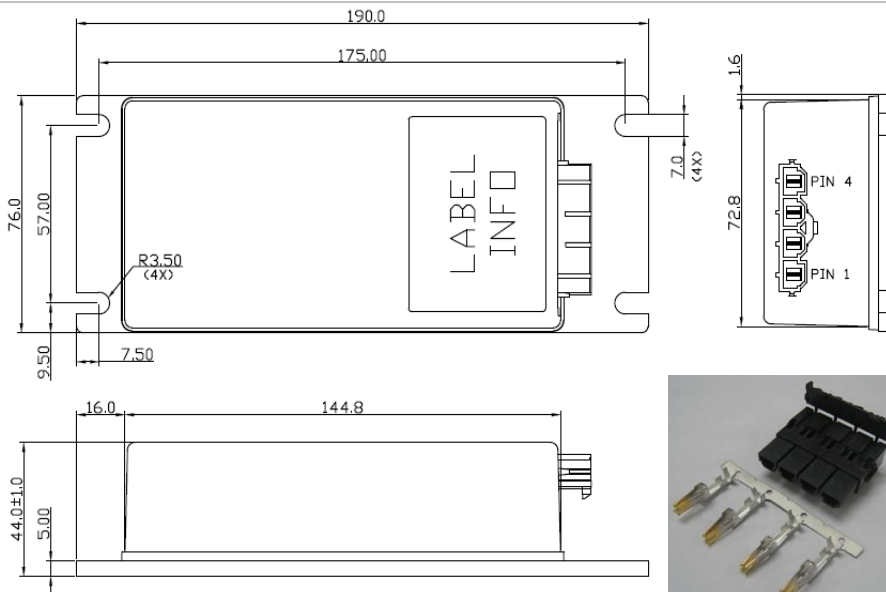


B40SR12424D

### Pin Connections

Pin	Function Description
1	OUTPUT -
2	OUTPUT +
3	INPUT -
4	INPUT +

- All dimensions in mm (inches)
- Tolerance: X.X±0.5 (X.XX±0.02)  
X.XX±0.25 (X.XXX±0.010)
- Connector:  
MOLEX MINI-FIT Sr™ Header  
(MOLEX P/N :42819-4213)



B40SR12424DC

Pin	Function Description
1	OUTPUT -
2	OUTPUT +
3	INPUT -
4	INPUT +

- All dimensions in mm (inches)
- Tolerance: X.X±0.5 (X.XX±0.02)  
X.XX±0.25 (X.XXX±0.010)
- Connector:  
MOLEX MINI-FIT Sr™ Header  
(MOLEX P/N :42819-4213)
- Connector kit :  
Housing: 42816-0412  
Terminal: 42815-0042



## 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	1xhousing+ 4 terminals
						C	NO	YES	NO	1xhousing+ 5 terminals
						D	NO	NO	NO	1xhousing+ 4 terminals

## 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%

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ext 6220~6226  
Fax: +886 3 4513485

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