EC4BU 10W Isolated DC-DC Converters

Application Note V10 January 2013

ISOLATED DC-DC Converter
EC4BU SERIES
APPLICATION NOTE

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Content

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1. Introduction

The EC4BU series offer 10 watts of output power in a 2.00x1.00x0.4 inches Copper packages. The EC4BU series has a 2:1 wide input voltage range of 4.7-9, 9-18, 18-36 and 36-75VDC and provides a precisely regulated output. This series has features such as high efficiency, 1500VDC of isolation and allows an ambient operating temperature range of –40℃ to 85℃ (de-rating above 71 ℃). The features include short circuit protection and remote on/off control. All models are very suitable for distributed power architectures, telecommunications, battery operated equipment and industrial applications.

2. DC-DC Converter Features

* 10W Isolated Output
* Efficiency to 87%
* 2:1 Input Range
* Regulated Outputs
* Fixed Switching Frequency
* Input under-voltage Protection
* Over Current Protection
* Remote ON/OFF
* Continuous Short Circuit Protection
* Conductive EMI Meets EN55022 Class A
* Without Tantalum Capacitors Inside
* CE Mark Meets 2004/108/EC
* Safety Meets UL60950-1, EN60950-1, and IEC60950-1

3. Electrical Block Diagram

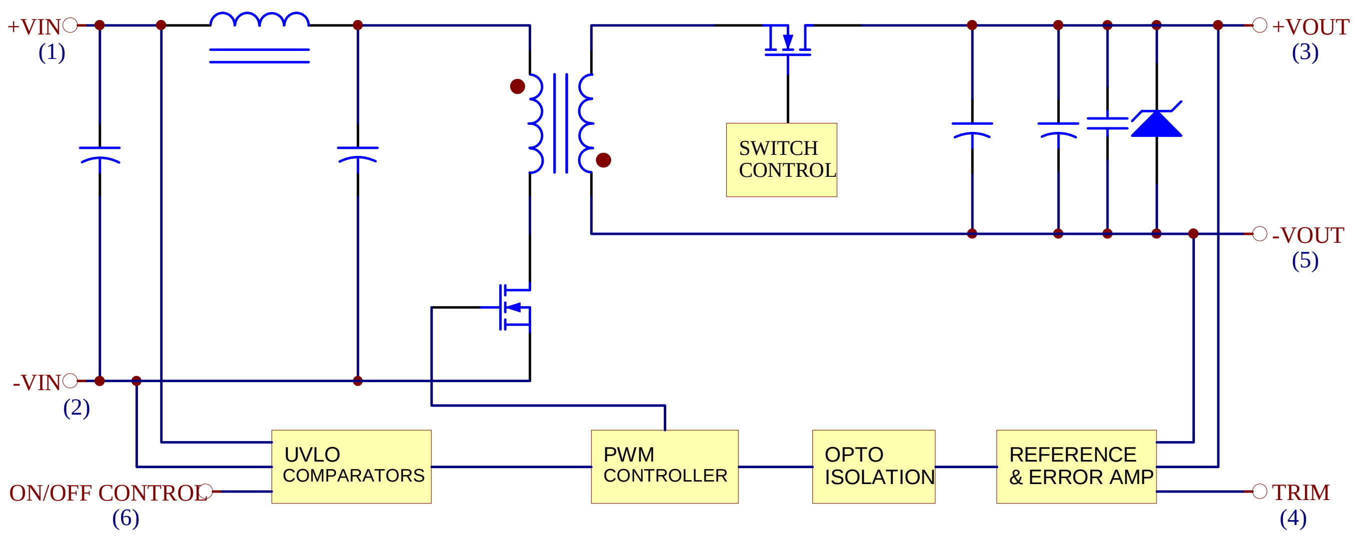


Figure 1 Electrical Block Diagram for Single Output Modules

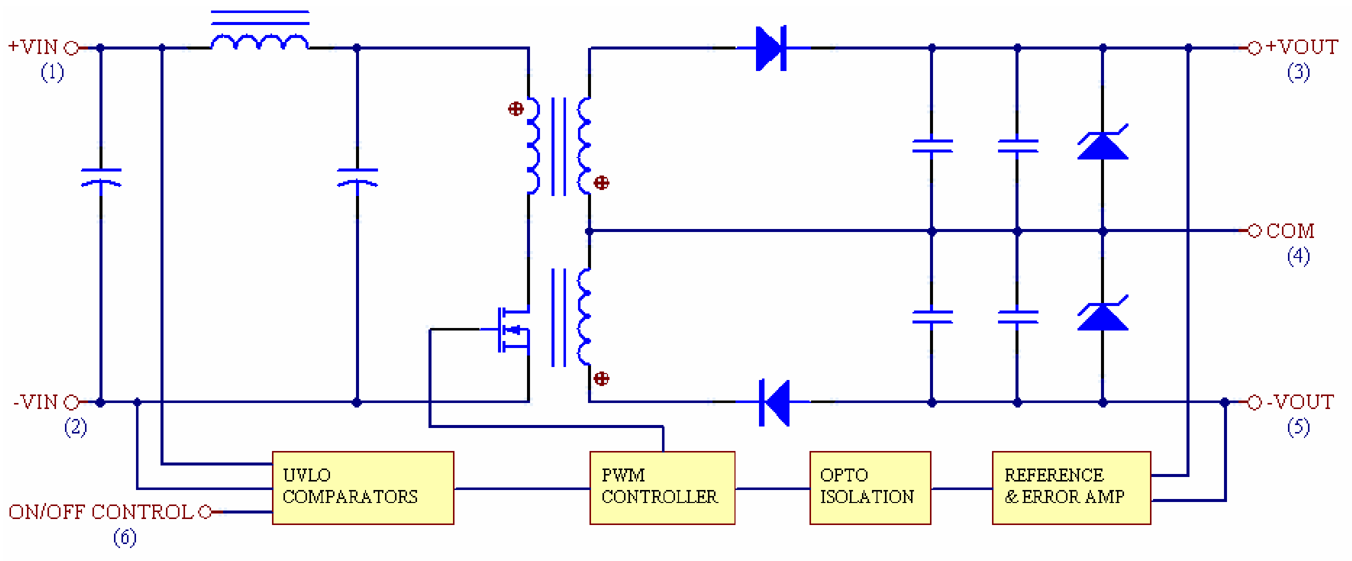


Figure 2 Electrical Block Diagram for Dual Output Modules

4. Technical Specifications

(All specifications are typical at nominal input, full load at 25℃ unless otherwise noted.)

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
ABSOLUTE MAXIMUM RATINGS						
Input Voltage						
Continuous		5Vin	4.7	5	9	Vdc
		12Vin	9	12	18	
		24Vin	18	24	36	
		48Vin	36	48	75	
Transient	100ms	5Vin			12	Vdc
		12Vin			25	
		24Vin			50	
		48Vin			100	
Operating Ambient Temperature	De-rating, Above 71℃	All	-40		+85	℃
Case Temperature		All			105	℃
Storage Temperature		All	-55		+125	℃
Input/Output Isolation Voltage	1 minute	All	1500			Vdc
INPUT CHARACTERISTICS						
Operating Input Voltage		5Vin	4.7	5	9	Vdc
		12Vin	9	12	18	
		24Vin	18	24	36	
		48Vin	36	48	75	
Turn-On Voltage Threshold		5Vin	4.2	4.4	4.6	Vdc
		12Vin	8.0	8.5	9.0	
		24Vin	16.5	17	17.5	
		48Vin	33.5	34	34.5	
Turn-Off Voltage Threshold		5Vin	4	4.2	4.4	Vdc
		12Vin	7.7	8	8.3	
		24Vin	15.5	16	16.7	
		48Vin	32.5	33	33.5	
Lockout Hysteresis Voltage		5Vin		0.3		
		12Vin		0.5		
		24Vin 48Vin		1		
Maximum Input Current	100% Load, Vin=4.7V for 05XXX	5Vin			2700	mA
	100% Load, Vin=9V for 12XXX	12Vin			1350	
	100% Load, Vin=18V for 24XXX	24Vin			675	
	100% Load, Vin=36V for 48XXX	48Vin			338	
No-Load Input Current	Vin=Nominal input	05S33		120		mA
		05S05		120		
		05S12		50		
		05S15		50		
		05D05		50		
		05D12		50		
		05D15		50		
		12S33		30		
		12S05		30		

		12S12		35		
		12S15		35		
		12D05		45		
		12D12		45		
		12D15		45		
		24S33		25		
		24S05		25		
		24S12		25		
		24S15		25		
		24D05		25		
		24D12		25		
		24D15		25		
		48S33		20		
		48S05		20		
		48S12		20		
		48S15		20		
		48D05		20		
		48D12		20		
		48D15		20		
Inrush Current (I^2t)		All			0.1	A^2s
Input Reflected-Ripple Current	P-P thru 12uH inductor, 5Hz to 20MHz	All			30	mA
OUTPUT CHARACTERISTIC						
Output Voltage Set Point	Vin=Nominal Vin , Io=Io.max, Tc=25℃	Vo=3.3V Vo=5.0V Vo=12V Vo=15V Vo=±5V Vo=±12V Vo=±15V	3.2505 4.925 11.82 14.77 4.925 11.82 14.77	3.3 5.0 12 15 5.0 12 15	3.3495 5.075 12.18 15.225 5.075 12.18 15.225	Vdc
Output Voltage Regulation						
Load Regulation	Io=Io.min to Io.max	Single			±0.2	%
		Dual			±1.0	
Line Regulation	Vin=low line to high line	Single			±0.2	%
		Dual			±0.5	
Temperature Coefficient	TC=-40℃ to 85℃				±0.03	%/℃
Output Voltage Ripple and Noise	20MHz bandwidth					
Peak-to-Peak	Full Load	All			100	mV
Operating Output Current Range		Vo=3.3V			2.5	A
		Vo=5.0V			2	
		Vo=12V			0.833	
		Vo=15V			0.666	
		Vo=±5V			±1	
		Vo=±12V			±0.416	
		Vo=±15V			±0.333	
Output DC Current-Limit Inception	Output Voltage =90% $Vo_{nominal}$		110	130	140	%
Maximum Output Capacitance	Full load, Resistance	Vo=3.3V			2470	uF
		Vo=5.0V			2000	
		Vo=12V			940	

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
		Vo=15V			690	
		Vo=±5V			1000	
		Vo=±12V			440	
		Vo=±15V			330	
DYNAMIC CHARACTERISTICS						
PARAMETER	**NOTES and CONDITIONS**	Device	Min.	Typical	Max.	Units
Output Voltage Current Transient	0.1A/us					
Step Change in Output Current	50% to 75% and 75% to 100% of Io.max				±4	%
Setting Time (within 1% $Vo_{nominal}$)	di/dt=0.1A/us				500	us
Turn-On Delay and Rise Time						
Turn-On Delay Time, From On/Off Control	Von/off to 10%Vo,set	All		10		ms
Turn-On Delay Time, From Input	Vin,min. to 10%Vo,set	All		10		ms
Output Voltage Rise Time	10%Vo,set to 90%Vo,set	All		5		ms
EFFICIENCY						
100% Load		05S33		87		%
		05S05		87		
		05S12		87		
		05S15		87		
		05D05		85		
		05D12		87		
		05D15		87		
		12S33		82		
		12S05		85		
		12S12		87		
		12S15		87		
		12D05		85		
		12D12		87		
		12D15		87		
		24S33		82		
		24S05		85		
		24S12		87		
		24S15		87		
		24D05		85		
		24D12		87		
		24D15		87		
		48S33		81		
		48S05		85		
		48S12		87		
		48S15		87		
		48D05		85		
		48D12		87		
		48D15		87		
ISOLATION CHARACTERISTICS						
Input to Output	1 minutes		1500			Vdc
Isolation Resistance		All			1000	MΩ
Isolation Capacitance		All		1000		pF
FEATURE CHARACTERISTICS						
Switching Frequency				350		KHz
ON/OFF Control , Positive Remote On/Off logic						
Logic Low (Module Off)	Von/off at Ion/off=1.0mA				1.2	V
Logic High (Module On)	Von/off at Ion/off=0.1uA		5.5 or		75	V

			open circuit			
ON/OFF Control, Negative Remote On/Off logic				N/A		
Logic High (Module On)	Von/off at Ion/off=1.0mA			N/A		V
Logic Low (Module Off)	Von/off at Ion/off=0.0uA			N/A		V
ON/OFF Current (for both remote on/off logic)	Ion/off at Von/off=0.0V				1	mA
Leakage Current (for both remote on/off logic)	Logic High, Von/off=15V				30	uA
Off Converter Input Current	Shutdown input idle current	5Vin 24Vin 48Vin		5	10	mA
		12Vin		10	15	
Output Voltage Trim Range	Pout=max rated power		-10		+10	%
Output Over Voltage Protection		Vo=3.3V		3.9		V
		Vo=5.0V		6.2		
		Vo=12V		15		
		Vo=15V		18		
		Vo=±5V		±6.2		
		Vo=±12V		±15		
		Vo=±15V		±18		
Over-Temperature Shutdown				N/A		℃
GENERAL SPECIFICATIONS						
MTBF	Io=100%of Io.max;Ta=25℃ per MIL-HDBK-217F			1.2		M hours
Weight				35		grams

5. Main Features and Functions

5.1 Operating Temperature Range

The EC4BU series converters can be operated by a wide ambient temperature range from -40℃ to 85℃(de-rating above 85℃) The standard model has a Copper case and case temperature can not over 105℃ at normal operating.

5.2 Over Current Protection

All different voltage models have full continuous short-circuit protection. To provide protection in a fault condition, the unit is equipped with internal over-current protection. The unit operates normally once the fault condition is removed. At the point of current-limit inception, the converter will go into over current protection.

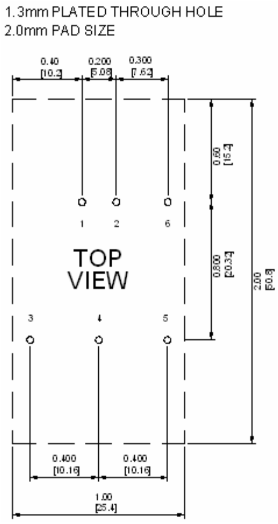
5.3 Remote ON/OFF

The EC4BU series allows the user to switch the module on and off electronically with the remote on/off feature. All models are available in "positive logic" versions. The converter turns on if the remote ON/OFF pin is high (>5.5Vdc to 75Vdc or open circuit). Setting the pin low (<1.2Vdc) will turn the converter off. The signal level of the remote on/off input is defined with respect to ground. If not using the remote on/off pin, leave the pin open (converter will be on).

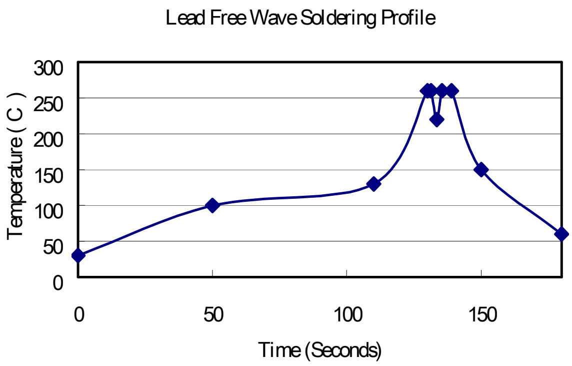
6. Applications

6.1 Recommended Layout PCB Footprints and Soldering Information

The system designer or the end user must ensure that other components and metal in the vicinity of the converter meet the spacing requirements to which the system is approved. Low resistance and low inductance PCB layout traces are the norm and should be used where possible. Due consideration must also be given to proper low impedance tracks between power module, input and output grounds. The recommended footprints and soldering profiles are shown as Figure 3.



Note: Dimensions are in inches (millimeters)



Note：

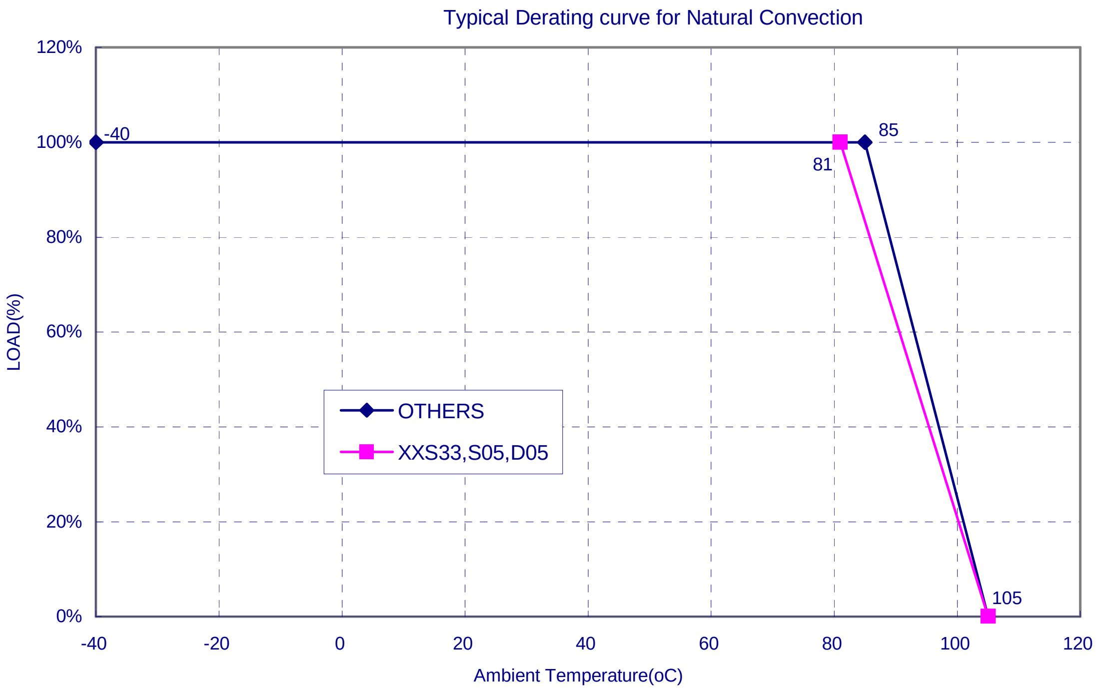
1. Soldering Materials: Sn/Cu/Ni
2. Ramp up rate during preheat: 1.4 ℃/Sec (From 50℃ to 100℃)
3. Soaking temperature: 0.5 ℃/Sec (From 100℃ to 130℃), 60±20 seconds
4. Peak temperature: 260℃, above 250℃ 3~6 Seconds
5. Ramp up rate during cooling: -10.0 ℃/Sec (From 260℃ to 150℃)

Figure3 Recommended PCB Layout Footprints and Wave Soldering Profiles for SB packages

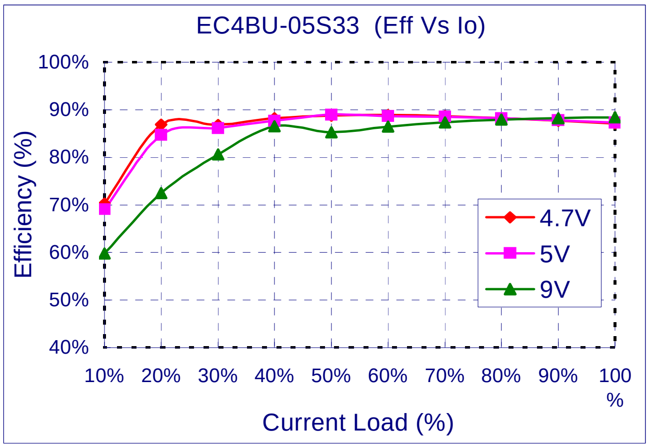
6.2 Power De-Rating Curves for EC4BU Series

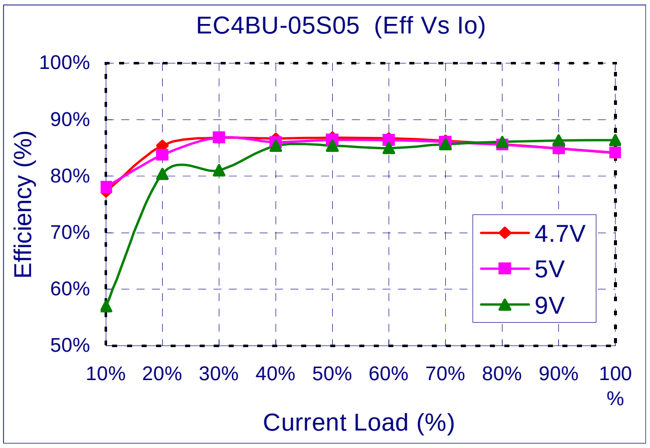
Operating Ambient temperature Range: -40℃ ~ 85℃ without de-rating.

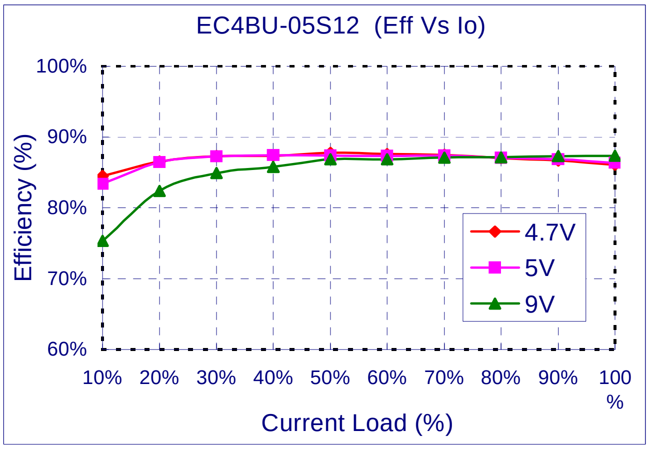
Maximum case temperature under any operating condition should not exceed 105℃.

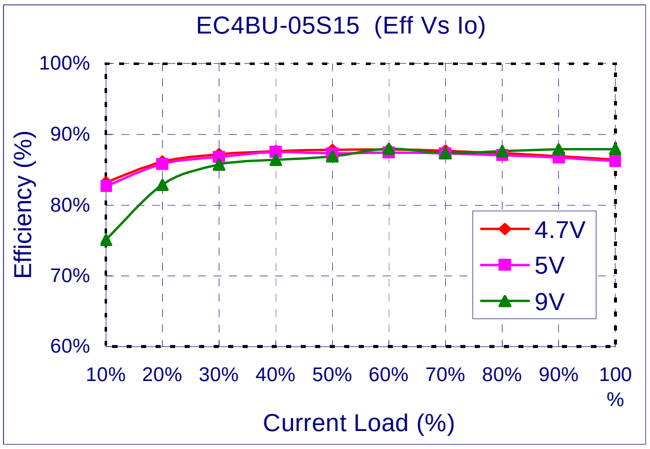


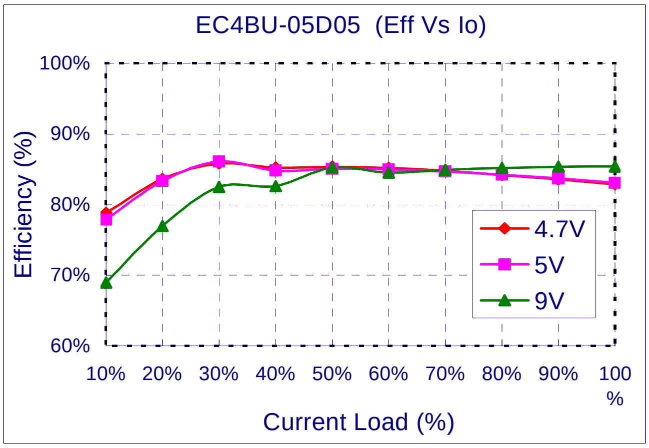
6.3 Efficiency vs. Load Curves

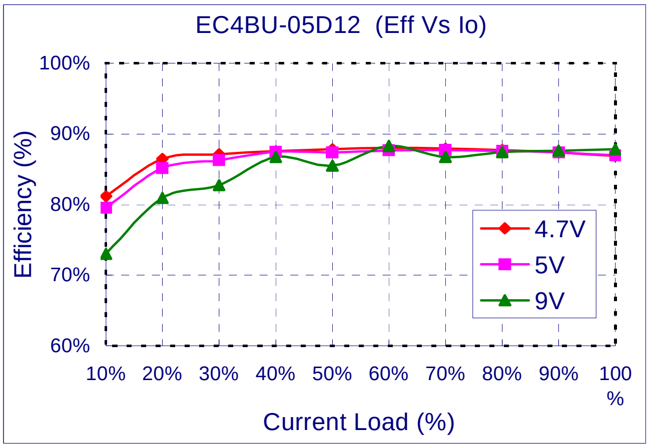


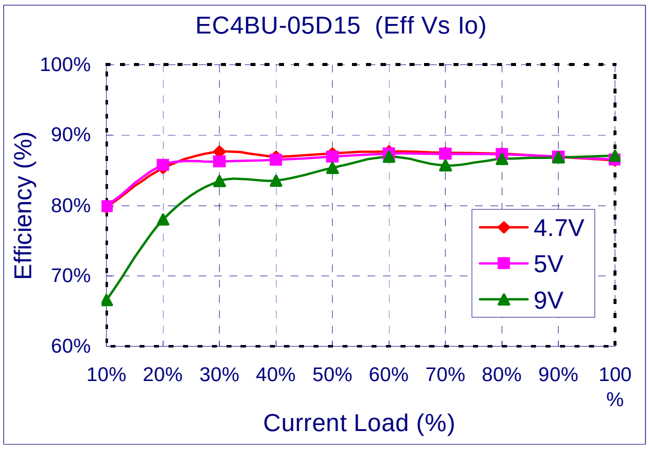




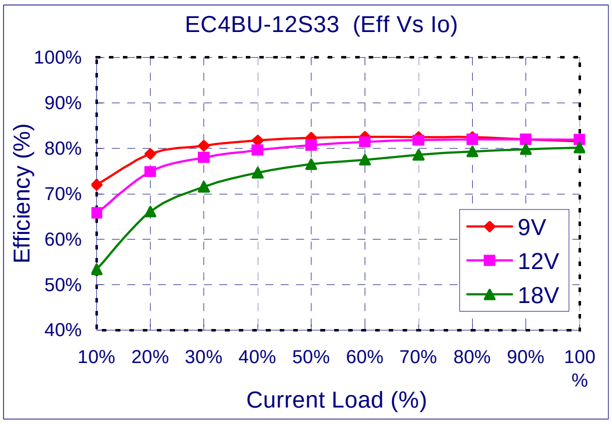




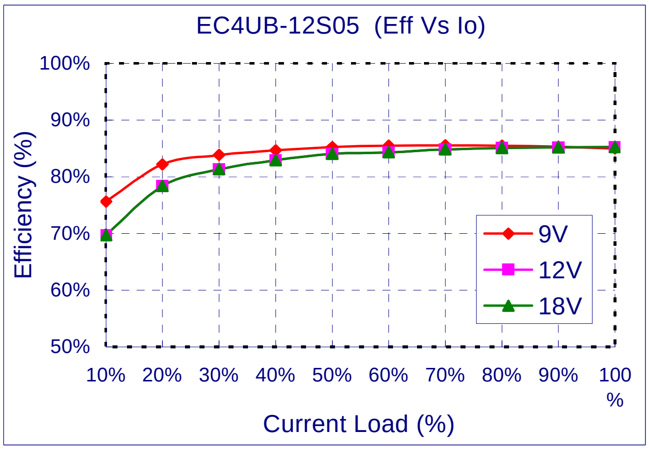




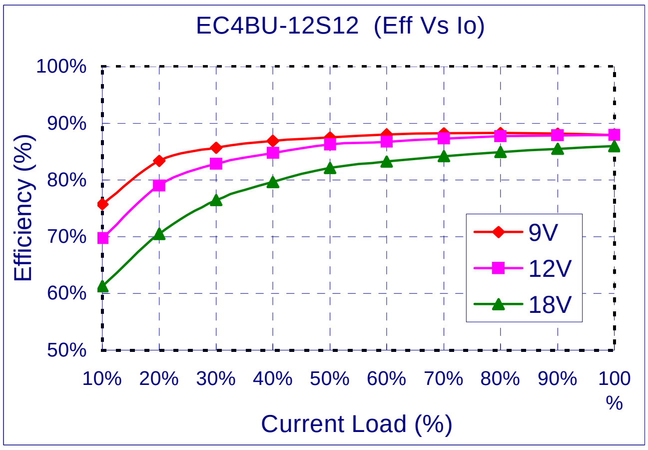
EC4BU-05D15 (Eff Vs Io)
Efficiency (%)
100%
90%
80%
70%
60%
10% 20% 30% 40% 50% 60% 70% 80% 90% 100 %
Current Load (%)
4.7V
5V
9V



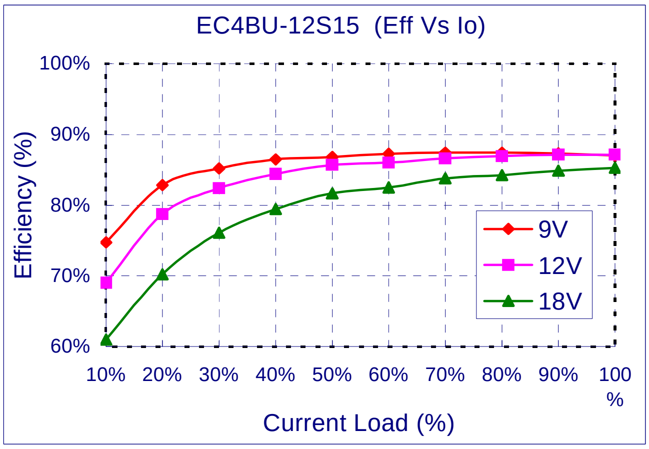
EC4BU-12S33 (Eff Vs Io)
Efficiency (%)
100%
90%
80%
70%
60%
50%
40%
10% 20% 30% 40% 50% 60% 70% 80% 90% 100 %
Current Load (%)
9V
12V
18V



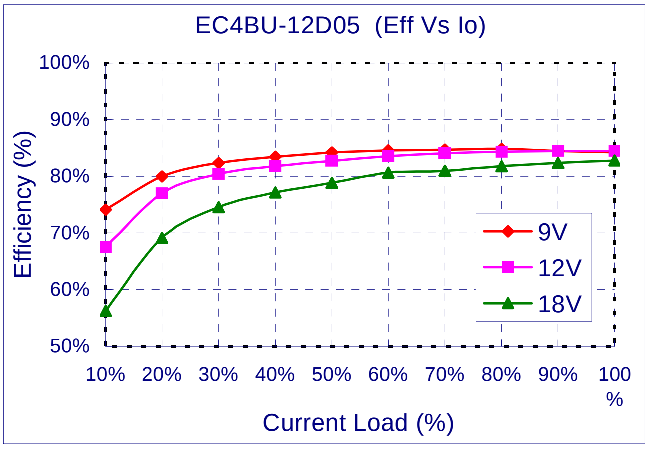
EC4UB-12S05 (Eff Vs Io)
Efficiency (%)
100%
90%
80%
70%
60%
50%
10% 20% 30% 40% 50% 60% 70% 80% 90% 100 %
Current Load (%)
9V
12V
18V



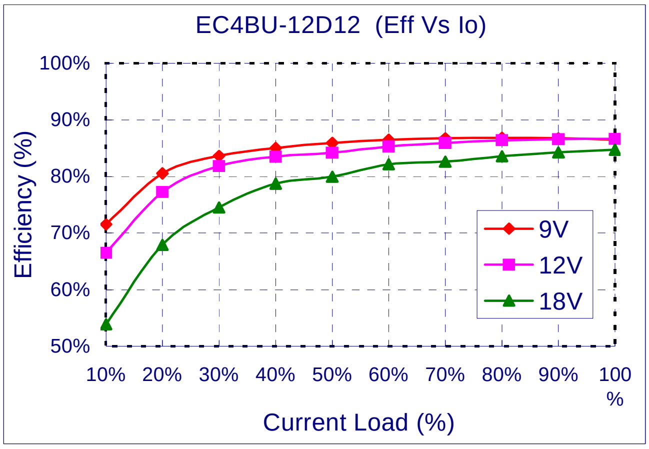
EC4BU-12S12 (Eff Vs Io)
Efficiency (%)
100%
90%
80%
70%
60%
50%
10% 20% 30% 40% 50% 60% 70% 80% 90% 100 %
Current Load (%)
9V
12V
18V



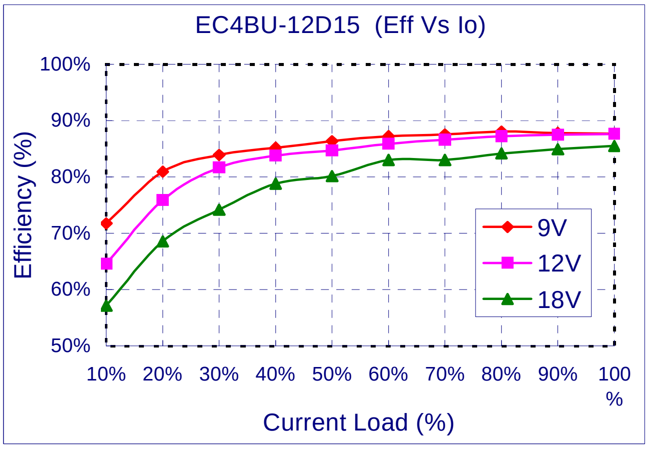
EC4BU-12S15 (Eff Vs Io)
Efficiency (%)
100%
90%
80%
70%
60%
10% 20% 30% 40% 50% 60% 70% 80% 90% 100 %
Current Load (%)
9V
12V
18V



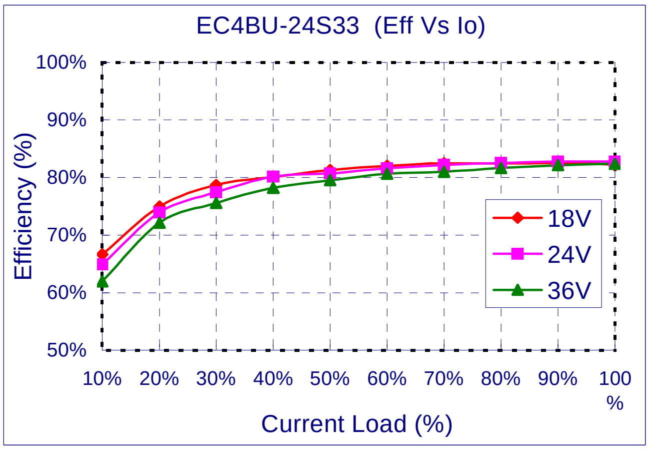
EC4BU-12D05 (Eff Vs Io)
Efficiency (%)
100%
90%
80%
70%
60%
50%
10% 20% 30% 40% 50% 60% 70% 80% 90% 100 %
Current Load (%)
9V
12V
18V



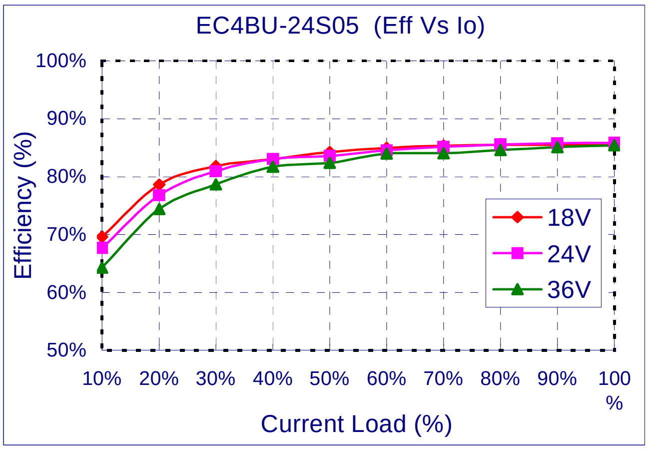
EC4BU-12D12 (Eff Vs Io)
Efficiency (%)
100%
90%
80%
70%
60%
50%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100
%
Current Load (%)
9V
12V
18V



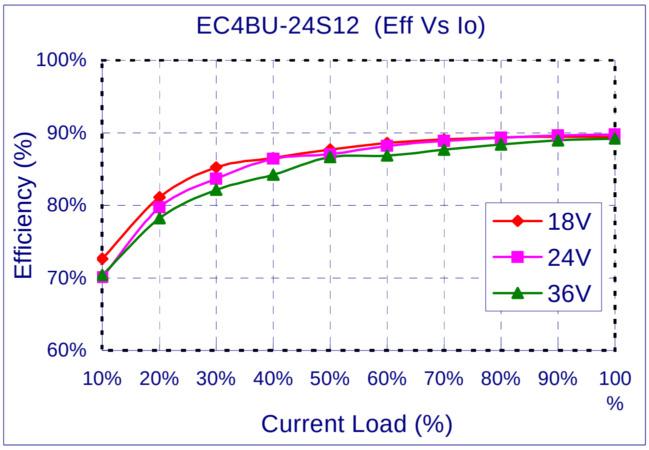
EC4BU-12D15 (Eff Vs Io)
Efficiency (%)
100%
90%
80%
70%
60%
50%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100
%
Current Load (%)
9V
12V
18V



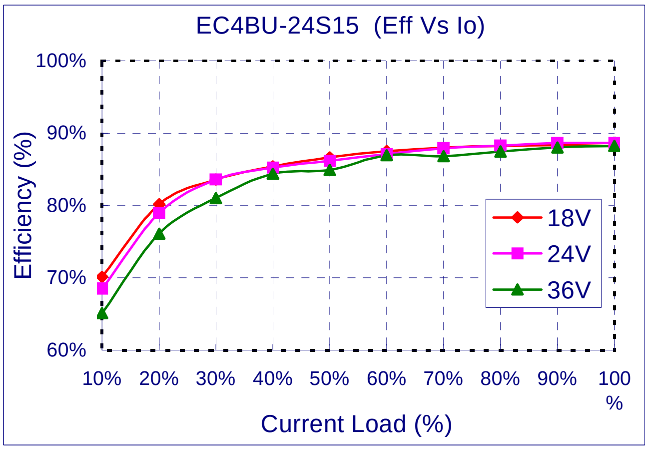
EC4BU-24S33 (Eff Vs Io)
Efficiency (%)
100%
90%
80%
70%
60%
50%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100
%
Current Load (%)
18V
24V
36V



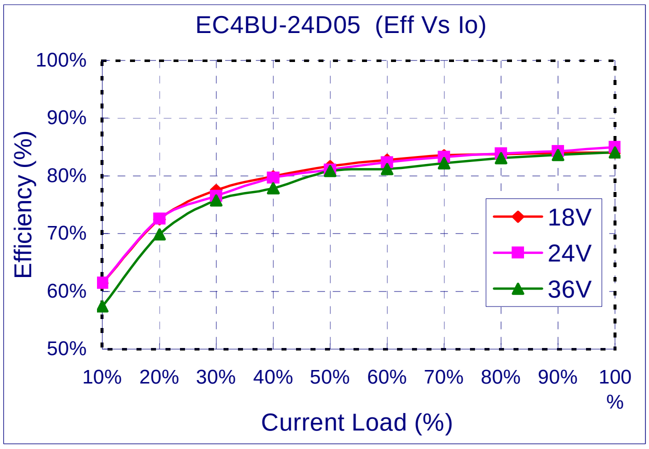
EC4BU-24S05 (Eff Vs Io)
Efficiency (%)
100%
90%
80%
70%
60%
50%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100
%
Current Load (%)
18V
24V
36V



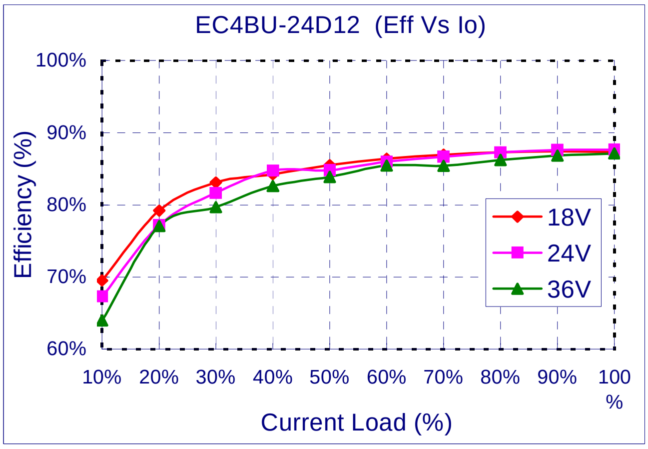
EC4BU-24S12 (Eff Vs Io)
Efficiency (%)
100%
90%
80%
70%
60%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100
%
Current Load (%)
18V
24V
36V



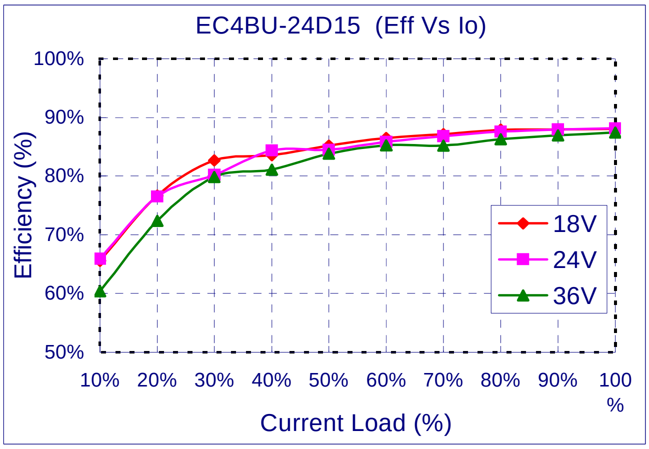
EC4BU-24S15 (Eff Vs Io)
Efficiency (%)
100%
90%
80%
70%
60%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100
%
Current Load (%)
18V
24V
36V



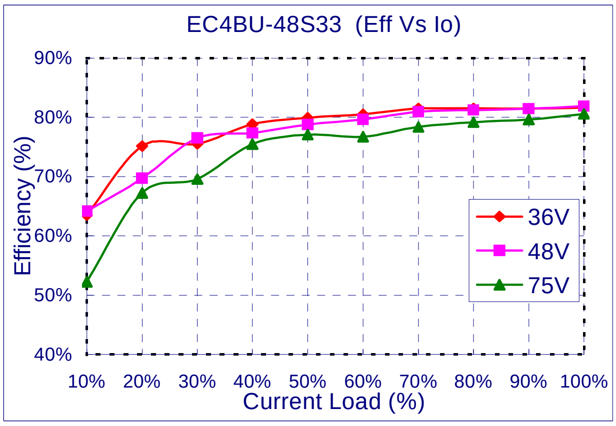
EC4BU-24D05 (Eff Vs Io)
Efficiency (%)
100%
90%
80%
70%
60%
50%
10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
Current Load (%)
18V
24V
36V



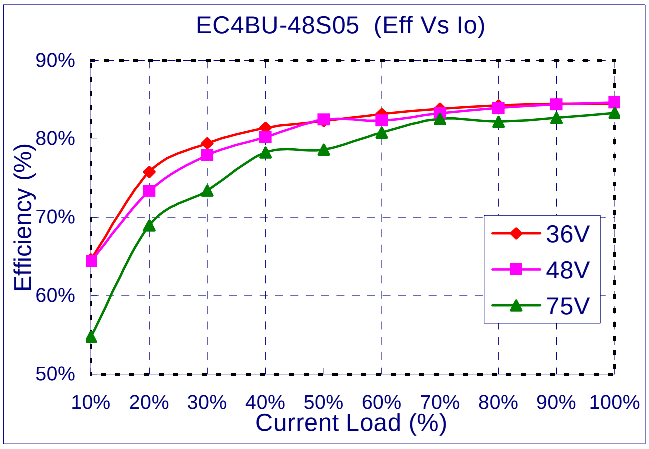
EC4BU-24D12 (Eff Vs Io)
Efficiency (%)
100%
90%
80%
70%
60%
10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
Current Load (%)
18V
24V
36V



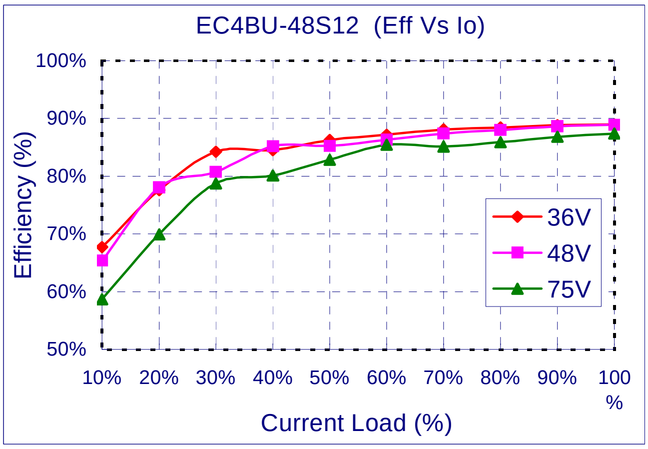
EC4BU-24D15 (Eff Vs Io)
Efficiency (%)
100%
90%
80%
70%
60%
50%
10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
Current Load (%)
18V
24V
36V



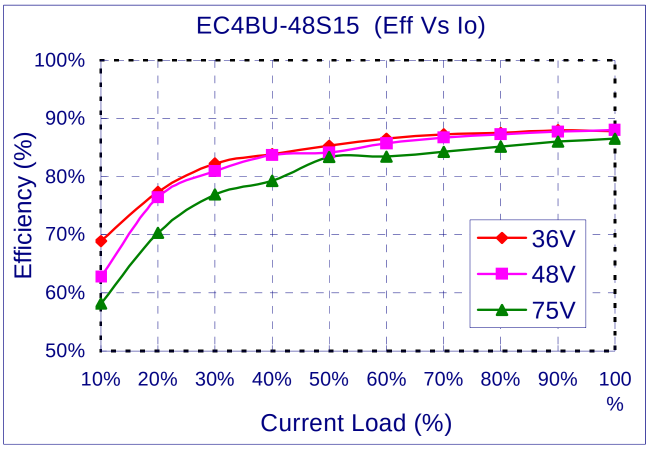
EC4BU-48S33 (Eff Vs Io)
Efficiency (%)
90%
80%
70%
60%
50%
40%
10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
Current Load (%)
36V
48V
75V

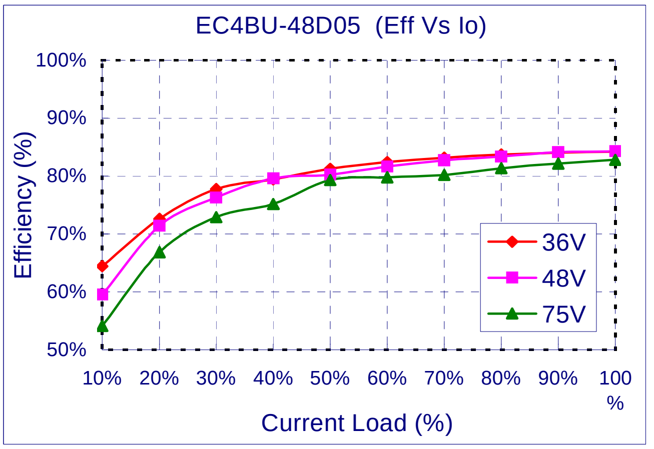


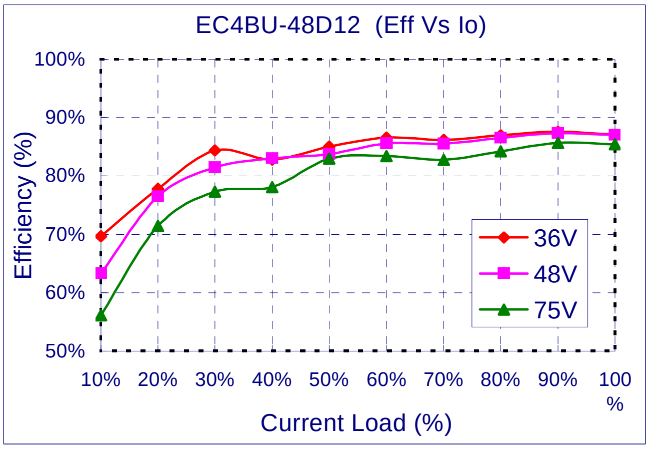
EC4BU-48S05 (Eff Vs Io)
Efficiency (%)
90%
80%
70%
60%
50%
10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
Current Load (%)
36V
48V
75V

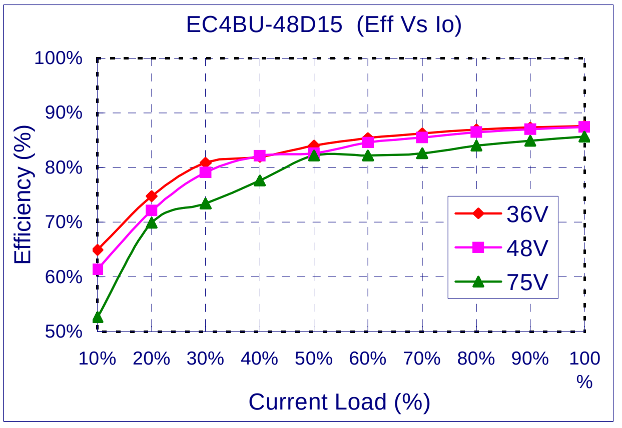


EC4BU-48S12 (Eff Vs Io)
Efficiency (%)
100%
90%
80%
70%
60%
50%
10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
Current Load (%)
36V
48V
75V


EC4BU-48S15 (Eff Vs Io)
Efficiency (%)
Current Load (%)
36V
48V
75V

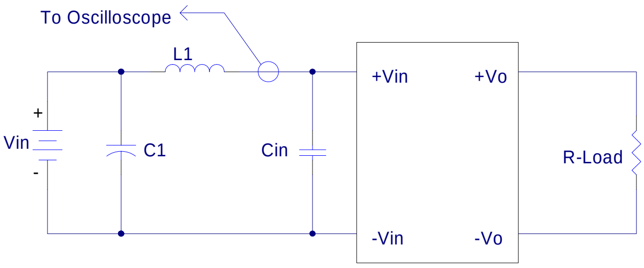

EC4BU-48D05 (Eff Vs Io)
Efficiency (%)
Current Load (%)
36V
48V
75V


EC4BU-48D12 (Eff Vs Io)
Efficiency (%)
Current Load (%)
36V
48V
75V


EC4BU-48D15 (Eff Vs Io)
Efficiency (%)
Current Load (%)
36V
48V
75V

6.4 Input Capacitance at the Power Module

The converters must be connected to low AC source impedance. To avoid problems with loop stability source inductance should be low. Also, the input capacitors (Cin) should be placed close to the converter input pins to de-couple distribution inductance. However, the external input capacitors are chosen for suitable ripple handling capability. Low ESR capacitors are good choice. Circuit as shown in Figure 4 represents typical measurement methods for reflected ripple current. C1 and L1 simulate a typical DC source impedance. The input reflected-ripple current is measured by current probe to oscilloscope with a simulated source Inductance (L1).



L1: 10uH
C1: None
Cin: 22uF ESR<0.66ohm @100KHz

Figure4 Input Reflected-Ripple Test Setup

6.5 Test Set-Up

The basic test set-up to measure parameters such as efficiency and load regulation is shown in Figure 5. When testing the modules under any transient conditions please ensure that the transient response of the source is sufficient to power the equipment under test. We can calculate the

- Efficiency
- Load regulation and line regulation.

The value of efficiency is defined as:

$$\eta = \frac{Vo \times Io}{Vin \times Iin} \times 100\%$$

Where

Vo is output voltage,
Io is output current,
Vin is input voltage,
Iin is input current.

The value of load regulation is defined as:

$$Load.reg = \frac{V_{FL} - V_{NL}}{V_{NL}} \times 100\%$$

Where

V_{FL} is the output voltage at full load
V_{NL} is the output voltage at 10% load

The value of line regulation is defined as:

$$Line.reg = \frac{V_{HL} - V_{LL}}{V_{LL}} \times 100\%$$

Where: V_{HL} is the output voltage of maximum input voltage at full load. V_{LL} is the output voltage of minimum input voltage at full load.

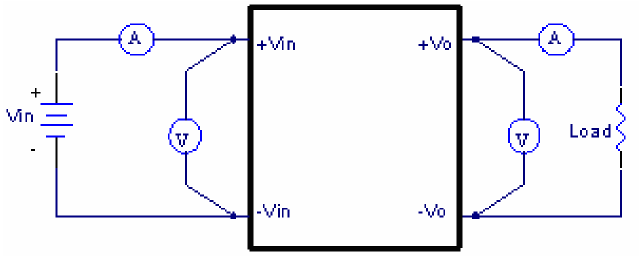


Figure5 EC4BU Series Test Setup

6.6 Output Voltage Adjustment

In order to trim the voltage up or down one needs to connect the trim resistor either between the trim pin and -Vo for trim-up and between trim pin and +Vo for trim-down. The output voltage trim range is ±10%. This is shown in Figures 1 and 2:

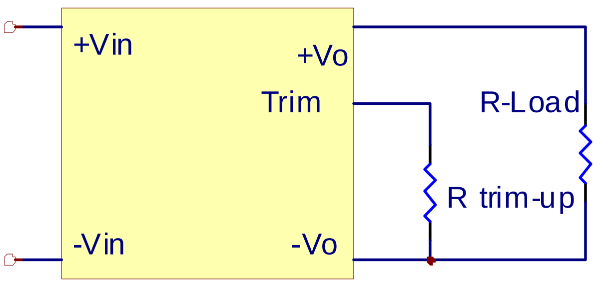


Figure 1. Trim-up Voltage Setup

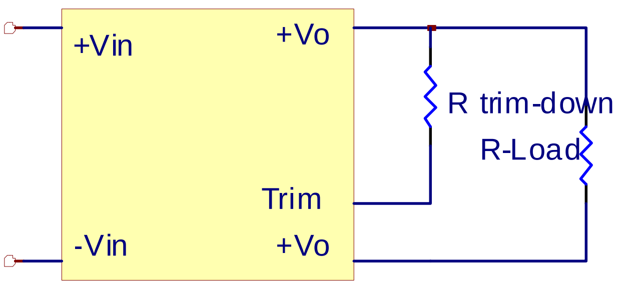


Figure 2. Trim-down Voltage Setup

1. The value of Rtrim-up defined as:

$$R_{trim-up} = \left(\frac{Vr \times R1 \times (R2 + R3)}{(Vo - V_{o,\,nom}) \times R2}\right) - Rt \quad (K\Omega)$$

Where: R trim-up is the external resistor in Kohm.
Vo,nom is the nominal output voltage.
Vo is the desired output voltage.
R1, Rt, R2, R3 and Vr are internal to the unit and are defined in Table 1.

Model Number	Output Voltage(V)	R1 (Kohm)	R2 (Kohm)	R3 (Kohm)	Rt (Kohm)	Vr
EC4BU-05S33 EC4BU-12S33 EC4BU-24S33 EC4BU-48S33	3.3	2.70	1.8	0.27	9.1	1.25
EC4BU-05S05 EC4BU-12S05 EC4BU-24S05 EC4BU-48S05	5.0	2.32	2.32	0	8.2	2.5
EC4BU-05S12 EC4BU-12S12 EC4BU-24S12 EC4BU-48S12	12.0	6.8	2.4	2.32	22	2.5
EC4BU-05S15	15.0	8.06	2.38	3.9	22	2.5
EC4BU-12S15 EC4BU-24S15 EC4BU-48S15	15.0	8.06	2.4	3.9	27	2.5

Table 1 – Trim up and Trim down Resistor Values

For example, to trim-up the output voltage of 5.0V module (EC4BU12S05) by 10% to 5.5V, R trim-up is calculated as follows:

Vo – Vo, nom = 5.5 – 5.0 = 0.5V
R1 = 2.32 Kohm
R2 = 2.32 Kohm
R3 = 0 Kohm
Rt = 8.2 Kohm, Vr= 2.5

$$R_{trim-up} = \left(\frac{2.5\times 2.32\times(2.32+0)}{0.5\times 2.32}\right) - 8.2 = 3.06(K\Omega)$$

The value of R trim-down defined as:

$$R_{trim-down} = R1\times\left(\frac{Vr\times R1}{(V_{o,nom}-Vo)\times R2} - 1\right) - Rt \quad (K\Omega)$$

Where: R trim-down is the external resistor in Kohm.
Vo, nom is the nominal output voltage.
Vo is the desired output voltage.
R1, Rt, R2, R3 and Vr are internal to the unit and are defined in Table 1

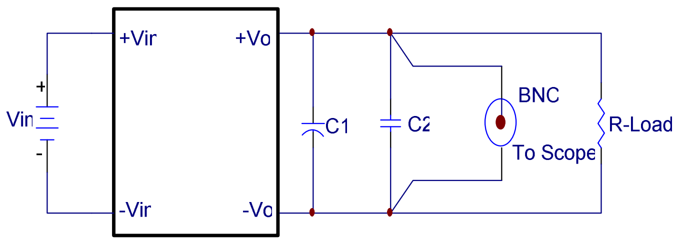
For example, to trim-down the output voltage of 5.0V module (EC4BU12S05) by 10% to 4.5V, R trim-down is calculated as follows:

Vo,nom – Vo = 5.0 – 4.5 = 0.5V
R1 = 2.32 Kohm
R2 = 2.32 Kohm
R3 = 0 Kohm
Rt = 8.2 Kohm, Vr= 2.5

$$R_{trim-down} = 2.32\times\left(\frac{(2.5\times 2.32)}{0.5\times 2.32} - 1\right) - 8.2 = 1.08 \quad (K\Omega)$$

6.7 Output Ripple and Noise Measurement

The test set-up for noise and ripple measurements is shown in Figure6. A coaxial cable was used to prevent impedance mismatch reflections disturbing the noise readings at higher frequencies. Measurements are taken with output appropriately loaded and all ripple/noise specifications are from D.C. to 20MHz Band Width.



Note: C1: NC
C2: 0.1uF Ceramic capacitor

Figure 6 Output Voltage Ripple and Noise Measurement Set-Up

6.8 Output Capacitance

The EC4BU series converters provide unconditional stability with or without external capacitors. For good transient response low ESR output capacitors should be located close to the point of load. These series converters are designed to work with load capacitance to see technical specifications.

7. Safety & EMC

7.1 Input Fusing and Safety Considerations.

The EC4BU series converters have not an internal fuse. However, to achieve maximum safety and system protection, always use an input line fuse. We recommended a time delay fuse, 5A for 5Vin, 4A for 12Vin models, 2A for 24Vin models, 1A 48Vin modules. Figure 7 circuit is recommended by a Transient Voltage Suppressor diode across the input terminal to protect the unit against surge or spike voltage and input reverse voltage.

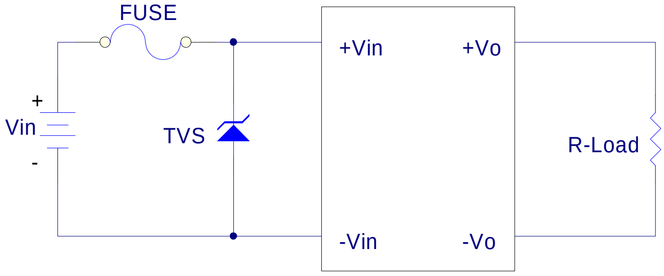


Figure7 Input Protection

7.2 EMC Considerations

EMI Test standard: EN55022 Class A and Class B Conducted Emission
Test Condition: Input Voltage: Nominal, Output Load: Full Load

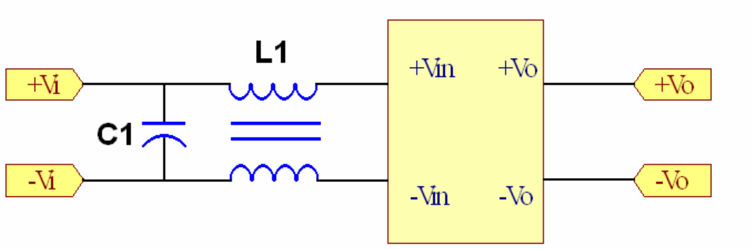
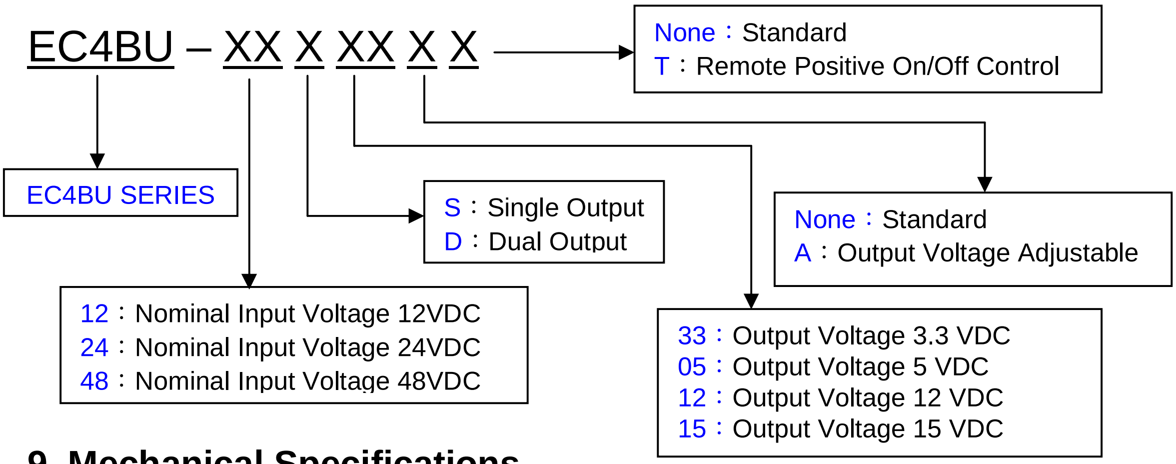


Figure 8 Connection circuit for conducted EMI testing

	EN55022 Class A		EN55022 Class B	
Model No.	C1	L1	C1	L1
EC4BU-05S33	NC	Short	TBD	TBD
EC4BU-05S05	NC	Short	TBD	TBD
EC4BU-05S12	NC	Short	TBD	TBD
EC4BU-05S15	NC	Short	TBD	TBD
EC4BU-05D05	NC	Short	TBD	TBD
EC4BU-05D12	NC	Short	TBD	TBD
EC4BU-05D15	NC	Short	TBD	TBD
EC4BU-12S33	NC	Short	1uF /100V 1812	3.9uH
EC4BU-12S05	NC	Short	1uF /100V 1812	3.9uH
EC4BU-12S12	NC	Short	1uF /100V 1812	3.9uH
EC4BU-12S15	NC	Short	1uF /100V 1812	3.9uH
EC4BU-12D05	NC	Short	1uF /100V 1812	3.9uH
EC4BU-12D12	NC	Short	1uF /100V 1812	3.9uH
EC4BU-12D15	NC	Short	1uF /100V 1812	3.9uH
EC4BU-24S33	NC	Short	1uF /100V 1812	3.9uH
EC4BU-24S05	NC	Short	1uF /100V 1812	3.9uH
EC4BU-24S12	NC	Short	1uF /100V 1812	3.9uH
EC4BU-24S15	NC	Short	1uF /100V 1812	3.9uH
EC4BU-24D05	NC	Short	1uF /100V 1812	3.9uH
EC4BU-24D12	NC	Short	1uF /100V 1812	3.9uH
EC4BU-24D15	NC	Short	1uF /100V 1812	3.9uH
EC4BU-48S33	NC	Short	1uF /100V 1812	3.9uH
EC4BU-48S05	NC	Short	1uF /100V 1812	3.9uH
EC4BU-48S12	NC	Short	1uF /100V 1812	3.9uH
EC4BU-48S15	NC	Short	1uF /100V 1812	3.9uH
EC4BU-48D05	NC	Short	1uF /100V 1812	3.9uH
EC4BU-48D12	NC	Short	1uF /100V 1812	3.9uH
EC4BU48D15	NC	Short	1uF /100V 1812	3.9uH

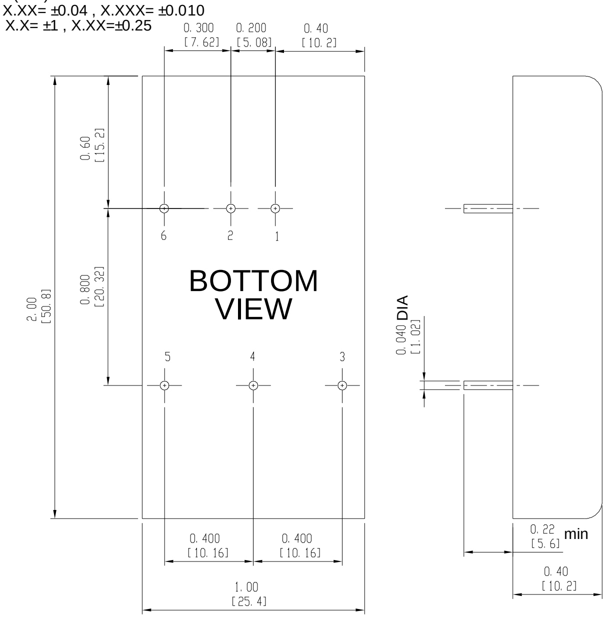
Note: All of capacitors are ceramic capacitors.

8. Part Number



9. Mechanical Specifications

All Dimensions In Inches (mm)
Tolerances Inches: X.XX= ±0.04 , X.XXX= ±0.010
Millimeters: X.X= ±1 , X.XX=±0.25



PIN CONNECTION	
Pin	Function
1.	+Input
2.	-Input
3.	+Output
4.	Common/NP/Trim(Option)
5.	-V Output
6.	NP/Remote(Option)

*NP-NO PIN ON SINGLE OUTPUT

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