EC4SBW SERIES
20 WATT 4:1 INPUT
ISOLATED DC-DC CONVERTER

Features

- Efficiency up to 90.5%
- Fixed Switching Frequency
- Regulated Outputs
- Remote On/Off
- Low No Load Power Consumption
- Fully Protected (OCP/OVP/UVLO)
- 1500V_{dc} I/O Isolation
- No Tantalum Capacitor Inside
- Five-Sided Shielded Metal Case
- Meets Industrial Standard 1”x1”x0.4”
- UL 62368-1 Approval
- CB Test Certificate IEC 62368-1
- 5000m Operating Altitude

E176177

MODEL NUMBER	INPUT VOLTAGE	OUTPUT VOLTAGE	OUTPUT CURRENT		INPUT CURRENT		% EFF.		CAPACITOR LOAD MAX.
			MIN.	MAX.	NO LOAD	FULL LOAD	(2)	(1)	
EC4SBW-24S33	9-36 VDC	3.3 VDC	0 mA	4500 mA	10 mA	699 mA	88	88.5	5000uF
EC4SBW-24S05	9-36 VDC	5 VDC	0 mA	4000 mA	10 mA	920 mA	90	90.5	4000uF
EC4SBW-24S12	9-36 VDC	12 VDC	0 mA	1670 mA	10 mA	938 mA	89	89	1650uF
EC4SBW-24S15	9-36 VDC	15 VDC	0 mA	1330 mA	10 mA	933 mA	89	89	1300uF
EC4SBW-24D12	9-36 VDC	±12 VDC	0 mA	±830 mA	10 mA	938 mA	88.5	88.5	800uF
EC4SBW-24D15	9-36 VDC	±15 VDC	0 mA	±660 mA	10 mA	926 mA	89	89	650uF
EC4SBW-48S33	18-75 VDC	3.3 VDC	0 mA	4500 mA	8 mA	349 mA	89	88.5	5000uF
EC4SBW-48S05	18-75 VDC	5 VDC	0 mA	4000 mA	8 mA	460 mA	90.5	90.5	4000uF
EC4SBW-48S12	18-75 VDC	12 VDC	0 mA	1670 mA	8 mA	466 mA	89.5	89.5	1650uF
EC4SBW-48S15	18-75 VDC	15 VDC	0 mA	1330 mA	8 mA	467 mA	89	89	1300uF
EC4SBW-48D12	18-75 VDC	±12 VDC	0 mA	±830 mA	8 mA	469 mA	89.5	88.5	800uF
EC4SBW-48D15	18-75 VDC	±15 VDC	0 mA	±660 mA	8 mA	466 mA	89.5	88.5	650uF

NOTE:

1. Nominal input voltage 24 or 48 VDC.
2. Measured at 12VDC for 24V_{in}, 24VDC for 48V_{in}.

PART NUMBER

Series	Nominal Input Voltage	Number of Outputs	Nominal Output Voltage	Remote On/Off Logic
EC4SBW-	II	O	XX	L
EC4SBW	24 : 24 VDC 48 : 48 VDC	S : Single D : Dual	33 : 3.3VDC 05 : 5.0VDC 12 : 12VDC 15 : 15VDC 12 : ±12VDC 15 : ±15VDC	None : Positive N : Negative

Part Number Example:

EC4SBW-24S12N: 1.0”x1.0”, 20W, 4:1 9-36V_{dc} Input, Single 12V_{dc} Output, Negative Logic

TECHNICAL SPECIFICATIONS

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

ABSOLUTE MAXIMUM RATINGS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Input Voltage	Continuous	24Vin 48Vin	-0.3 -0.3		36 75	V_{dc}
Input Surge Voltage	100ms max.	24Vin 48Vin			50 100	V_{dc}
Operating Case Temperature	At the center part of case (with Derating)	All	-40		105	℃
Storage Temperature		All	-55		125	℃

INPUT CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Operating Input Voltage		24Vin 48Vin	9 18	24 48	36 75	V_{dc}
Input Under Voltage Lockout						
Turn-On Voltage Threshold	100% Load	24Vin 48Vin	8 16.5	8.5 17	8.8 17.5	V_{dc}
Turn-Off Voltage Threshold	100% Load	24Vin 48Vin	7.7 15.5	8 16	8.3 16.5	V_{dc}
Lockout Hysteresis Voltage	100% Load	24Vin 48Vin		0.5 1		V_{dc}
Maximum Input Current	V_{in}=9V, Full load V_{in}=18V, Full load	24Vin 48Vin			2600 1300	mA
No-Load Input Current	V_{in}=Nominal, I_o=0A	See Model Number Table				mA
Input Filter	P_i filter	All				
Inrush Current (I^2t)	As per ETS300 132-2	All			0.1	A^2s
Input Reflected Ripple Current	P-P thru 12uH inductor, 5Hz to 20MHz	All		30		mA

OUTPUT CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Voltage Set Point Accuracy	V_{in}=Nominal, full load, T_c=25℃	All	-1.5		+1.5	%
Output Voltage Balance	V_{in}=Nominal, full load, T_c=25℃	Dual	-1.5		+1.5	%
Output Voltage Regulation						
Load Regulation	Full load to no load	Single Dual			±0.2 ±1.0	%
Line Regulation	V_{in}=High line to low line, full load	Single Dual			±0.2 ±0.5	%
Cross Regulation	Load cross variation 10%/100%	Dual			±5	%
Temperature Coefficient	T_c=-40℃ to 85℃	All			±0.03	%/℃
Output Voltage Ripple and Noise (5Hz to 20MHz bandwidth)						
Peak-to-Peak	Full Load, 20MHz bandwidth 10uF tantalum and 1uF ceramic capacitor	3.3 & 5Vo Others			75 100	mV
Output Current Range	V_{in}=Nominal	See Model Number Table				A
Over Current Protection	Hiccup mode. Auto recovery	24S33 24S05	110	170	200	%
		Others	110	140	170	
Short Circuit Protection		All	Continuous, Auto Recovery			
External Load Capacitance	Full load (resistive)	See Model Number Table				uF

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Over Voltage Protection	Zener clamp	3.3Vo 5Vo 12Vo 15Vo ±12Vo ±15Vo		3.9 6.2 15 18 ±15 ±18		V_{dc}

EFFICIENCY

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
100% Load	V_{in}=Nominal, full load, T_c=25℃	See Model Number Table				%

DYNAMIC CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Output Voltage Current Transient						
Error Band	75% to 100% of I_{o_max} step load change d_i/d_t=0.1A/us (within 1% V_{out} nominal)	All			±5	%
Recovery Time		All			250	us
Turn-On Delay and Rise Time	Full load (Constant resistive load)					
Turn-On Delay Time, From On/Off Control	$V_{on/off}$ to 10%V_{o_set}, Remote on	All		10		ms
Turn-On Delay Time, From Input	V_{in_min} to 10%V_{o_set}, Power up	All		10		ms
Output Voltage Rise Time	10%V_{o_set} to 90%V_{o_set}	All		10		ms

ISOLATION CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Isolation Voltage (100% factory Hi-Pot tested @2sec.)	1 Minute; input to output	All			900 1500	V_{ac} V_{dc}
Isolation Resistance	Input to output	All	1000			MΩ
Isolation Capacitance	Input to output (10KHz, 0.25V)	All		1500		pF

FEATURE CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Switching Frequency	Pulse width modulation (PWM), fixed	Vo=3.3&5V Others	240 300	270 330	300 360	KHz
On/Off Control, Positive Remote On/Off Logic, Refer to –V_{in} Pin						
Logic Low (Module Off)	$V_{on/off}$ at $I_{on/off}$=1.0mA	All	0		1.2	V
Logic High (Module On)	$V_{on/off}$ at $I_{on/off}$=0.0uA, Pin open=on	All	3.5 or Open Circuit		75	V
On/Off Control, Negative Remote On/Off Logic, Refer to –V_{in} Pin						
Logic High (Module Off)	$V_{on/off}$ at $I_{on/off}$=0.0uA, Pin open=off	All	3.5 or Open Circuit		75	V
Logic Low (Module On)	$V_{on/off}$ at $I_{on/off}$=1.0mA	All	0		1.2	V
On/Off Current (for both remote on/off logic)	$I_{on/off}$ at $V_{on/off}$=0V	All		0.3	1	mA
Leakage Current (for both remote on/off logic)	Logic high, $V_{on/off}$=15V	All			30	uA
Off Converter Input Current	Shutdown input idle current	All		4	10	mA

GENERAL SPECIFICATIONS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
MTBF	I_o=100% of I_{o_max}; MIL-HDBK - 217F_Notice 1, GB, 25℃	Vo=3.3V Vo=5.0V Others		925 1290		K hours
Weight		All		18		grams
Case Material	Black coated copper					
Base Plate Material	Plastic, DAP					
Potting Material	UL 94V-0					
Pin Material	Base: Copper Plating: Matte Tin					
Shock/Vibration	MIL-STD-810F Compliant					
Humidity	95% RH max. Non condensing					
Altitude	5000m Operating altitude, 12000m Transport altitude					
Thermal Shock	MIL-STD-810F					

EMC SPECIFICATIONS (External components required, please refer to application note.)

EMI	Meets EN 55032, Conducted with external input filter	Class A / B
ESD	IEC 61000-4-2 Level 3: Air ±8KV, Level 2: Contact ±4KV	Perf. Criteria A
Radiated Immunity	EN 61000-4-3 Level 2: 80~1000MHz, 3V/m	Perf. Criteria A
Fast Transient	EN 61000-4-4 Level 1: On power input port, ±0.5KV, external input TVS required	Perf. Criteria A
Surge	EN 61000-4-5 Level 1: Line to line, ±0.5KV, external input TVS required	Perf. Criteria A
Conducted Immunity	EN 61000-4-6 Level 2: 0.15~80MHz, 3V	Perf. Criteria A
Application Note Link		EC4SBW Series App Notes
Packaging Information Link		Packaging Information

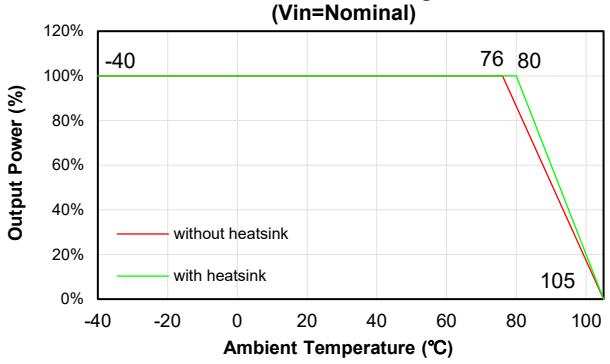
Immunity to Environmental Conditions

Phenomenon	Reference Clause	Reference Standard	Test Conditions	Result
Vibration Test	MIL-STD-810F Table 514.5C-VIII Figure 514.5C-6	MIL-STD-810F	Unit are Non-Operating Vibration Waveform: Random Vibration Frequency: 15 ~ 2000 Hz Vibration axis: X、Y、Z axis Duration: 1hr / axis	Pass
Shock Test	MIL-STD-810F 516.5 Table 516.5-I	MIL-STD-810F	Wave form: Sawtooth Wave Test Category: Crash Hazard Test for Ground Equipment Duration: 10 ms Peak Acceleration: 75 G Cross-Over Frequency：80 Hz No. of Shock: Each axis 3 times Shock Direction: ±X , ±Y, ±Z axis	Pass
Thermal Shock Cycling Test	MIL-STD-810F 503.4 Figure 503.4-1	MIL-STD-810F	Temperature: -55℃ to 105℃ Humidity: 95%RH Duration: 8hrs/ 3 times cycling& 4hrs dwell time	Pass
Thermal Humidity Cycling Test	MIL-STD-810F Notice 3 Method 507.4	MIL-STD-810F	Temperature: 60℃ to 30℃ Humidity: 95%RH Duration: 240 hrs	Pass

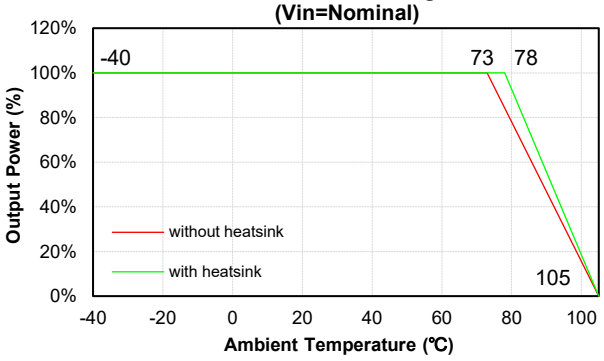
CHARACTERISTIC CURVE

Power Derating Curve

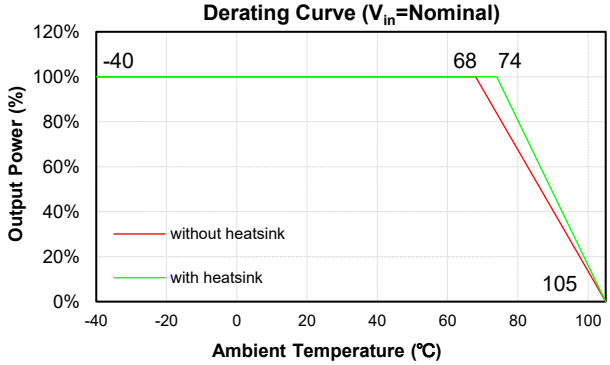
EC4SBW-XXS33 Derating Curve
(Vin=Nominal)



EC4SBW-XXS05 Derating Curve
(Vin=Nominal)



EC4SBW-24S12, EC4SBW-XXS15, EC4SBW-24D15
Derating Curve (V_{in}=Nominal)



EC4SBW-XXD12, EC4SBW-48D15
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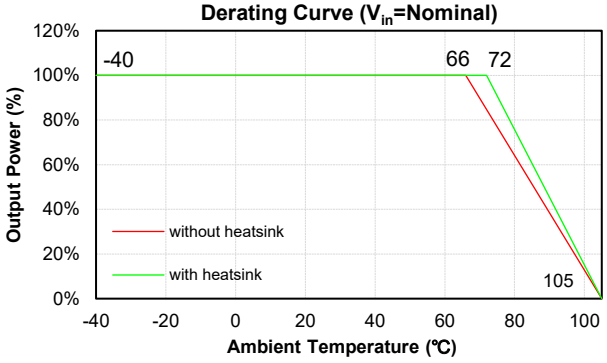
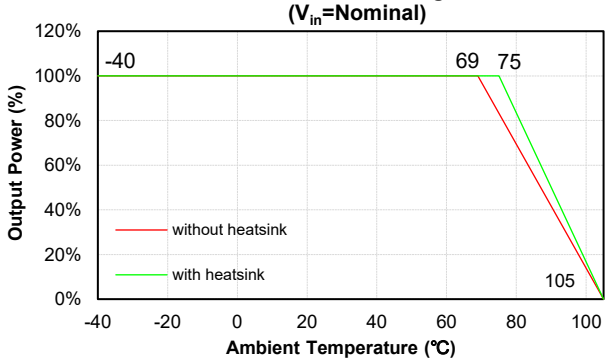
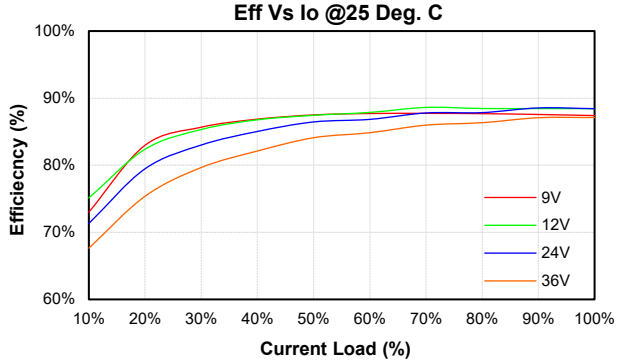


EC4SBW-48S12 Derating Curve
(V_{in}=Nominal)



Performance Data

EC4SBW-24S33
Eff Vs Io @25 Deg. C



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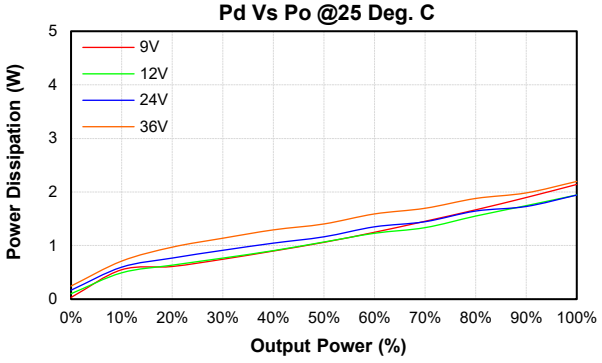
Pd Vs Po @25 Deg. C



EC4SBW-24S05
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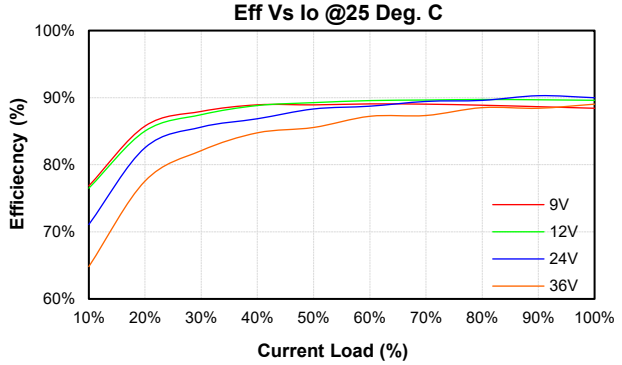

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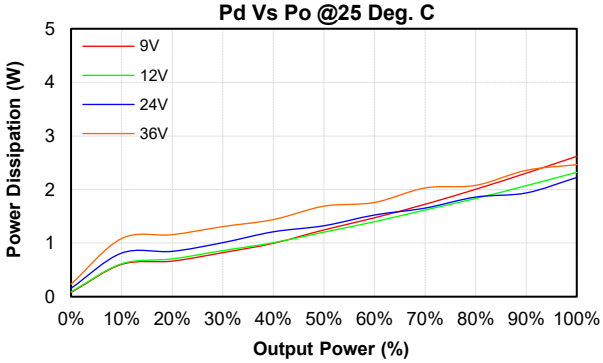

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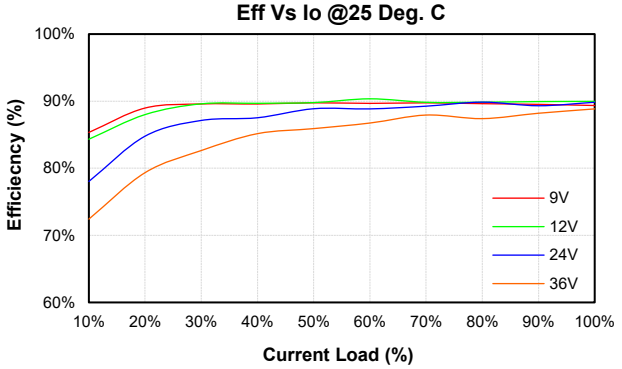

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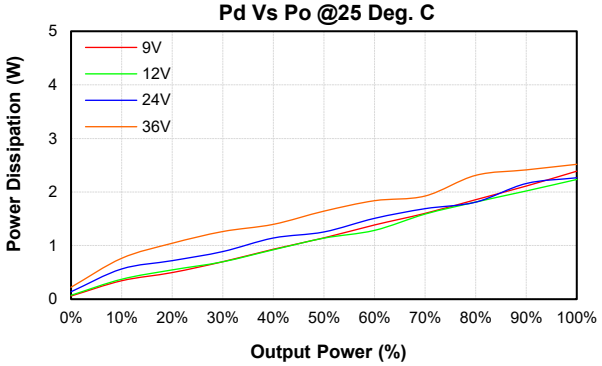

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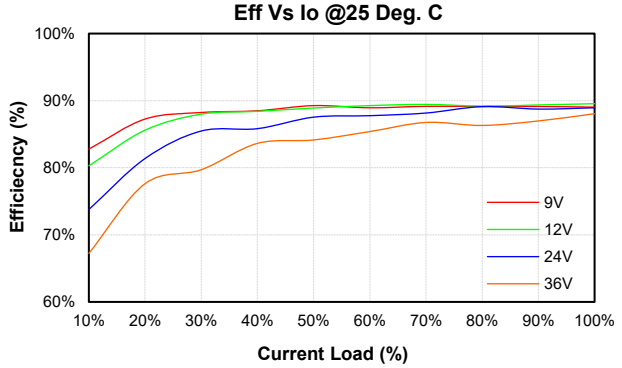

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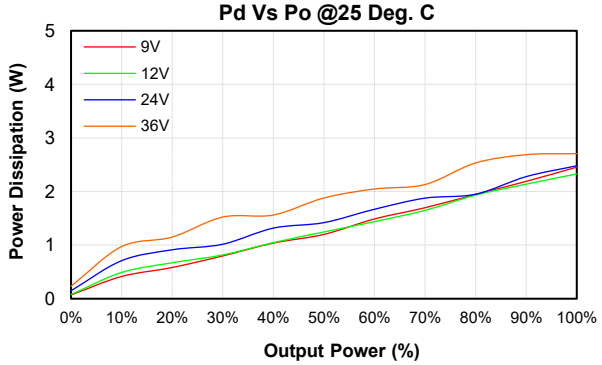

EC4SBW-24D12
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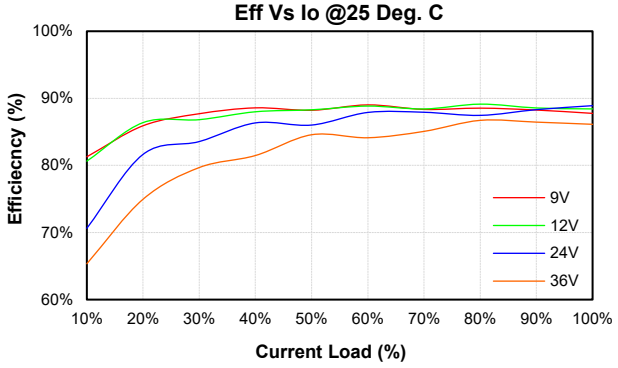

EC45SBW-24D12
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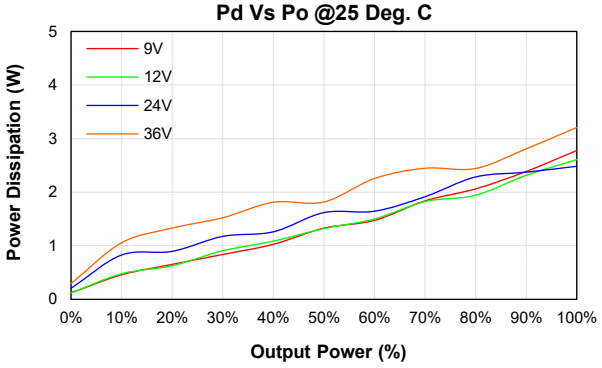

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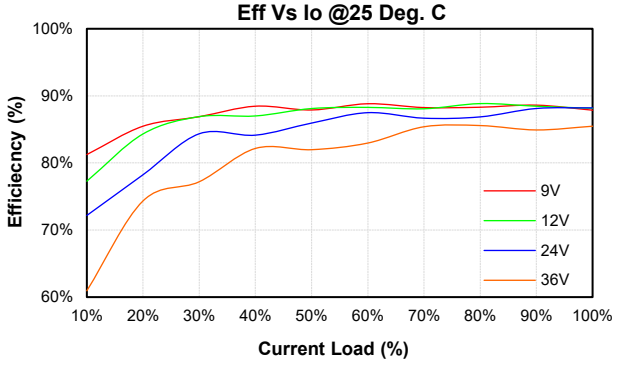

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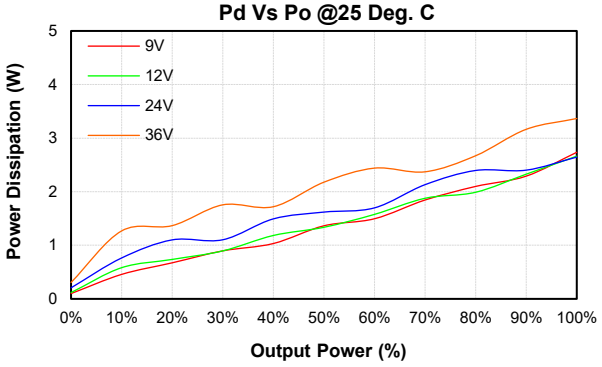

EC4SBW-48S33
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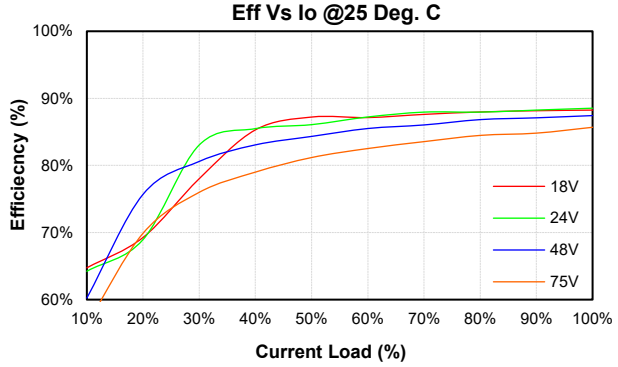

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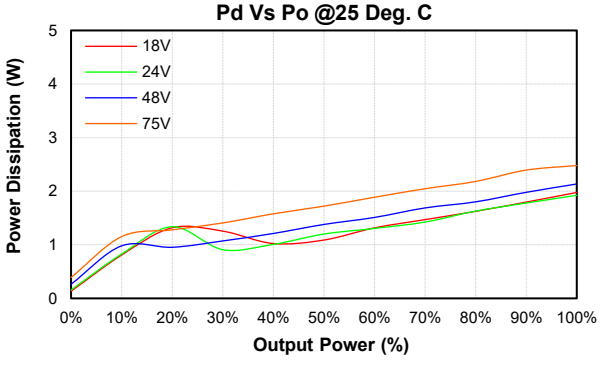

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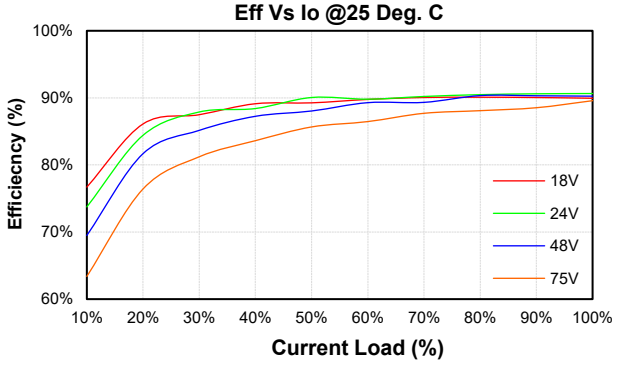

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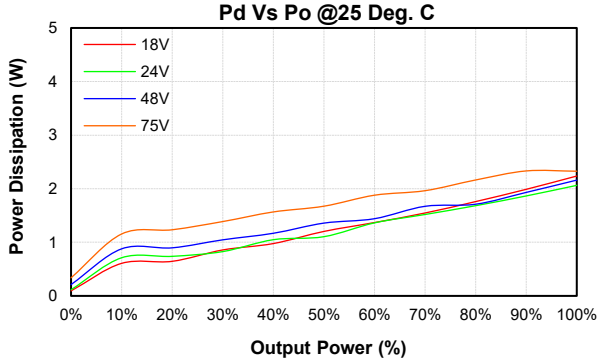

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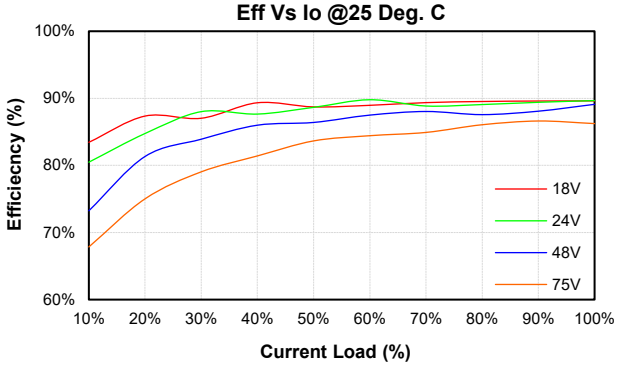

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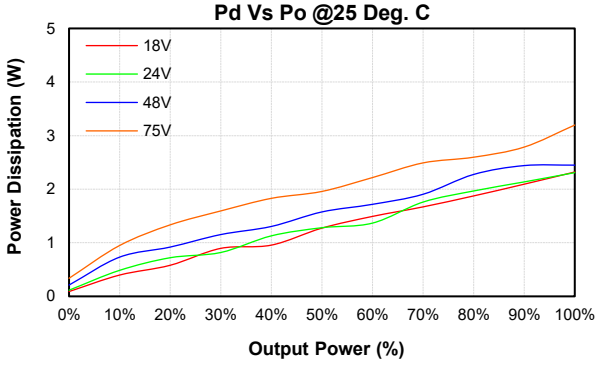

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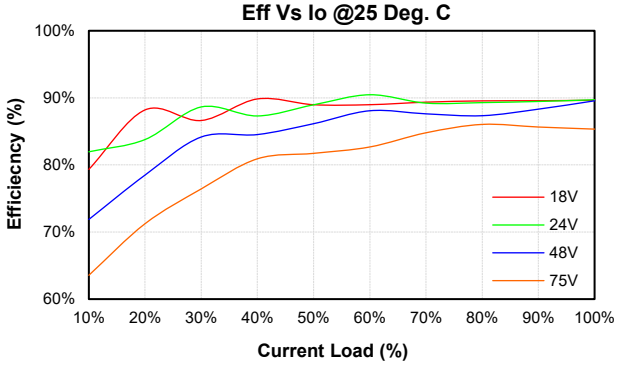

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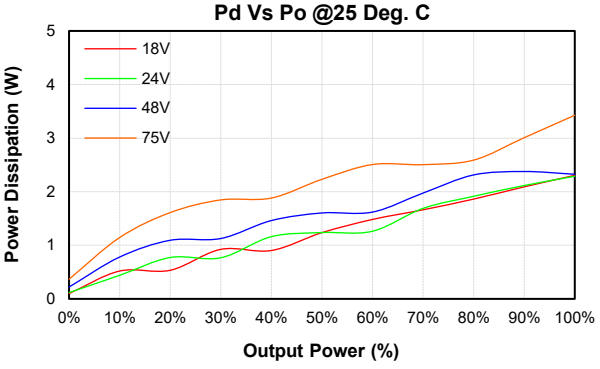

EC4SBW-48D12
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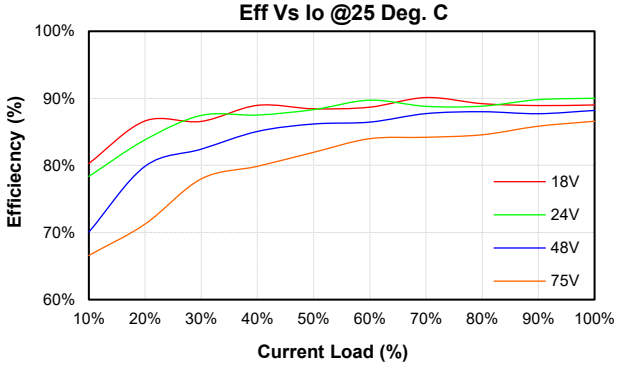

EC4SBW-48D12
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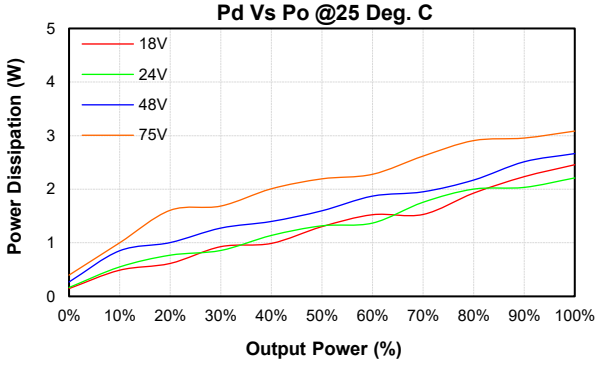

EC4SBW-48D15
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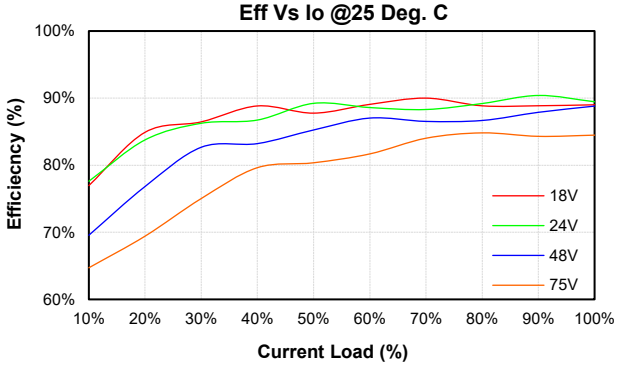
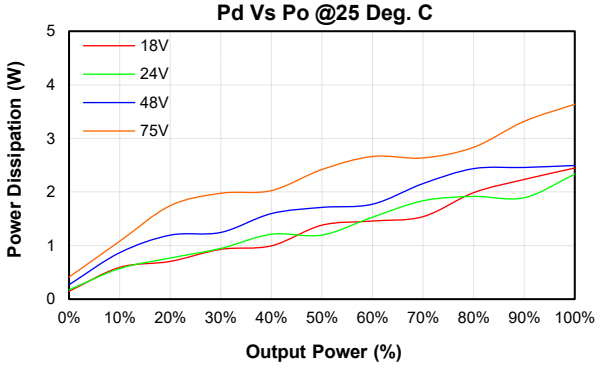
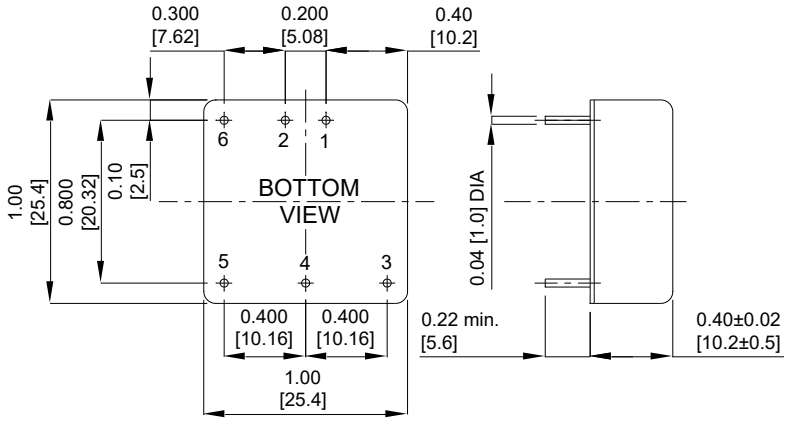
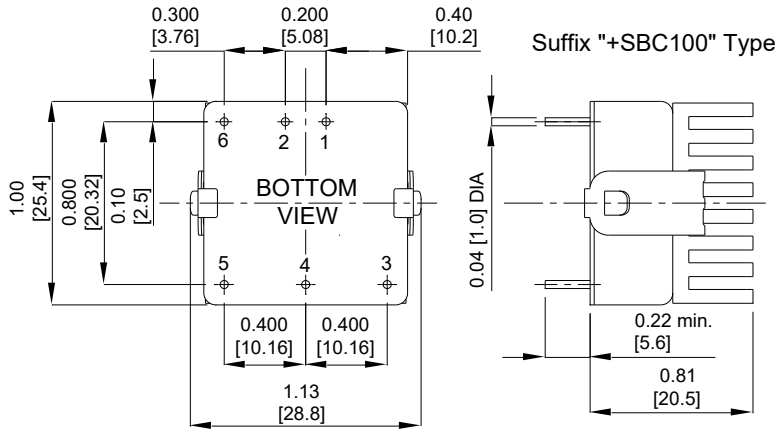


EC4SBW-48D15
Pd Vs Po @25 Deg. C



MECHANICAL SPECIFICATION





NOTE:Pin Size is 0.04±0.004 Inch [1.0±0.1 mm]DIA
All Dimensions In Inches [mm]
Tolerances Inches: X.XX= ±0.04 , X.XXX= ±0.010
Millimeters: X.X= ±1.0 , X.XX=±0.25

PIN CONNECTION		
PIN	Single	Dual
1	+Input	+Input
2	-Input	-Input
3	+V Output	+V Output
4	Trim	Common
5	-V Output	-V Output
6	Remote	Remote

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