



EC5SBW SERIES 30 WATT 4:1 INPUT ISOLATED DC-DC CONVERTER

Features

- Efficiency up to 90%
- Fixed Switching Frequency
- Regulated Outputs
- Remote On/Off
- Low No Load Power Consumption
- Fully Protected (OTP/OCP/OVP/UVLO)
- 1500Vdc I/O Isolation
- No Tantalum Capacitor Inside
- Five-Sided Shielded Metal Case
- Meets Industrial Standard 1"x1"x0.4"
- UL62368-1 Approval
- CB Test Certificate IEC62368-1
- 5000m Operating Altitude
- -55°C Operating Available (Suffix "-M2")



MODEL NUMBER	INPUT VOLTAGE	OUTPUT VOLTAGE	OUTPUT CURRENT		INPUT CURRENT		% EFF.		CAPACITOR LOAD MAX.
			MIN.	MAX.	NO LOAD	FULL LOAD	(2)	(1)	
EC5SBW-24S33	9-36 VDC	3.3 VDC	0 mA	7500 mA	10 mA	1172 mA	88	88	7500uF
EC5SBW-24S05	9-36 VDC	5 VDC	0 mA	6000 mA	10 mA	1389 mA	89	90	6000uF
EC5SBW-24S12	9-36 VDC	12 VDC	0 mA	2500 mA	10 mA	1404 mA	89	89	2500uF
EC5SBW-24S15	9-36 VDC	15 VDC	0 mA	2000 mA	10 mA	1404 mA	89	89	2000uF
EC5SBW-24D12	9-36 VDC	±12 VDC	0 mA	±1250 mA	10 mA	1404 mA	88	88	1250uF
EC5SBW-24D15	9-36 VDC	±15 VDC	0 mA	±1000 mA	10 mA	1404 mA	88	88	1000uF
EC5SBW-48S33	18-75 VDC	3.3 VDC	0 mA	7500 mA	8 mA	586 mA	88	88	7500uF
EC5SBW-48S05	18-75 VDC	5 VDC	0 mA	6000 mA	8 mA	694 mA	90	90	6000uF
EC5SBW-48S12	18-75 VDC	12 VDC	0 mA	2500 mA	8 mA	694 mA	90	89	2500uF
EC5SBW-48S15	18-75 VDC	15 VDC	0 mA	2000 mA	8 mA	702 mA	90	89	2000uF
EC5SBW-48D12	18-75 VDC	±12 VDC	0 mA	±1250 mA	8 mA	710 mA	89	88	1250uF
EC5SBW-48D15	18-75 VDC	±15 VDC	0 mA	±1000 mA	8 mA	702 mA	89	89	1000uF

NOTE:

1. Nominal Input Voltage 24 or 48 VDC.
2. Measured at 12VDC for 24Vin, 24VDC for 48Vin.
3. -55°C Start-up Screen per MIL-STD105E S1 Sampling Procedure for "-M2" Version.

PART NUMBER

Series	Nominal Input Voltage	Number of Outputs	Nominal Output Voltage	Remote On/Off Logic	Operating Case Temp. Range
EC5SBW-	II	O	XX	L	-Z (Option)
EC5SBW	24 : 24 VDC 48 : 48 VDC	S : Single	33 : 3.3VDC 05 : 5.0VDC 12 : 12VDC 15 : 15VDC	None : Positive	None : -40~105°C
		D : Dual	12 : ±12VDC 15 : ±15VDC	N : Negative	-M2 : -55~105°C

Part Number Example:

EC5SBW-24S12N-M2: 1.0"x1.0", 30W, 4:1 9-36Vdc Input, Single 12Vdc Output, Negative Logic, -55~105°C Operating Case Temp. Range



EC5SBW Series

TECHNICAL SPECIFICATIONS

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

ABSOLUTE MAXIMUM RATINGS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Input Voltage	Continuous	24Vin	-0.3		36	V _{dc}
		48Vin	-0.3		75	
Input Surge Voltage	100ms max.	24Vin			50	V _{dc}
		48Vin			100	
Operating Case Temperature	At the center part of case (with Derating)	All	-40		105	°C
	Suffix "-M2" (with Derating)	-M2	-55		105	
Storage Temperature		All	-55		125	°C

INPUT CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Operating Input Voltage		24Vin	9	24	36	V _{dc}
		48Vin	18	48	75	
Input Under Voltage Lockout						
Turn-On Voltage Threshold	100% Load	24Vin	8	8.5	8.8	V _{dc}
		48Vin	16.5	17	17.5	
Turn-Off Voltage Threshold	100% Load	24Vin	7.7	8	8.3	V _{dc}
		48Vin	15.5	16	16.5	
Lockout Hysteresis Voltage	100% Load	24Vin	0.5			V _{dc}
		48Vin	1			
Maximum Input Current	V _{in} =9V, Full load	24Vin	3900			mA
	V _{in} =18V, Full load	48Vin	1950			
No-Load Input Current	V _{in} =Nominal, I _o =0A	See Model Number Table				mA
Input Filter	Pi filter	All				
Inrush Current (I ² t)	As per ETS300 132-2	All	0.1			A ² s
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°C	All	-1.5		+1.5	%
Output Voltage Balance	V _{in} =Nominal, full load, T _c =25°C	Dual	-1.5		+1.5	%
Output Voltage Regulation						
Load Regulation	Full load to no load	Single			±0.2	%
		Dual			±1.0	
Line Regulation	V _{in} =High line to low line, full load	Single			±0.2	%
		Dual			±0.5	
Cross Regulation	Load cross variation 10%/100%	Dual			±5	%
Temperature Coefficient	T _c =-40°C to 85°C	All			±0.03	%/°C
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			75	mV
		Others			100	
Output Current Range	V _{in} =Nominal,	See Model Number Table				A
Over Current Protection	Hiccup mode. Auto recovery	All	110	140	170	%
Short Circuit Protection		All	Continuous, Auto Recovery			
External Load Capacitance	Full load (resistive)	See Model Number Table				uF



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

EFFICIENCY

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
100% Load	V _{in} =Nominal, full load, T _c =25°C	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	-M2 Others	0 0		1.0 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	-M2 Others	0 0		1.0 1.2	V
On/Off Current (for both remote on/off logic)	I _{on/off} at V _{on/off} =0V	All		0.4	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
Over Temperature Shutdown	Temperature at the center part of case, non-latching	All		110		°C
Over Temperature Recovery		All		100		°C



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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°C	24S33		903		K hours
		24S05		799		
		24S12		1090		
		24S15		1125		
		24D12		1149		
		24D15		1221		
		48S33		925		
		48S05		813		
		48S12		1114		
		48S15		1215		
		48D12		1156		
		48D15		1244		
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					
Fire & Smoke	EN45545-2 Compliant					
EMI	Meets EN55032, Conducted with external input filter				Class A	
ESD	IEC61000-4-2 Level 3: Air ±8kV, Level 2: Contact ±4kV				Perf. Criteria A	
Radiated immunity	EN61000-4-3 Level 2: 80~1000MHz, 3V/m				Perf. Criteria A	
Fast Transient	EN61000-4-4 Level 1: On power input port, ±0.5kV, external input TVS required				Perf. Criteria A	
Surge	EN61000-4-5 Level 1: Line to line, ±0.5kV				Perf. Criteria A	
Conducted immunity	EN61000-4-6 Level 2: 0.15~80MHz, 3V				Perf. Criteria A	
Application Note Link			EC5SBW 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°C to 105°C 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°C to 30°C Humidity: 95%RH Duration: 240 hrs	Pass



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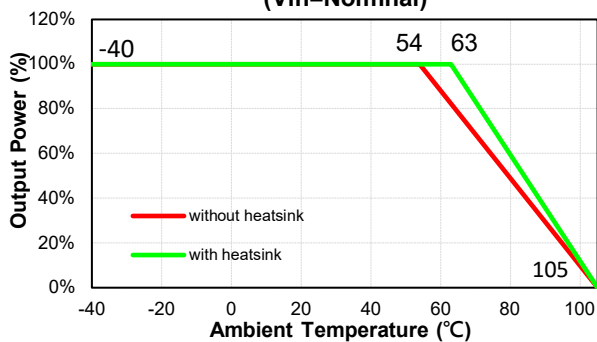
EN45545-2 Fire & Smoke Test Conditions

Item		Standard	Hazard Level
R22	Oxygen Index Test	EN 45545-2: 2013 EN ISO 4589-2: 2006	HL1, HL2, HL3
	Smoke Density Test	EN 45545-2: 2013 EN ISO 5659-2: 2013	HL1, HL2, HL3
	Smoke Toxicity Test	EN 45545-2: 2013 NF X70-100: 2006	HL1, HL2, HL3
R23	Oxygen Index Test	EN 45545-2: 2013 EN ISO 4589-2: 2006	HL1, HL2, HL3
	Smoke Density Test	EN 45545-2: 2013 EN ISO 5659-2: 2013	HL1, HL2, HL3
	Smoke Toxicity Test	EN 45545-2: 2013 NF X70-100: 2006	HL1, HL2, HL3
R24	Oxygen Index Test	EN45545-2: 2013 EN ISO 4589-2	HL1, HL2, HL3
R25	Glow - Wire Test	EN 45545-2:2013 EN 60695-2-11:2001	HL1, HL2, HL3
R26	Vertical Flame Test	EN 45545-2: 2013 EN 60695-11-10: 2013	HL1, HL2, HL3

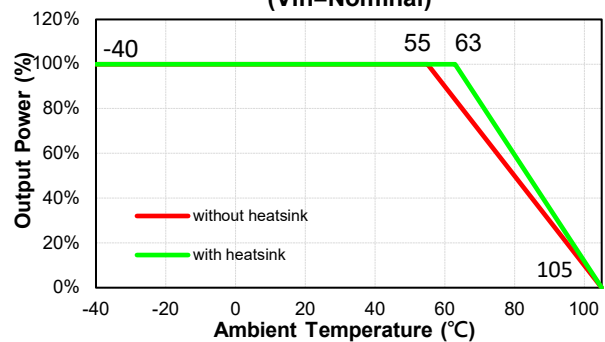
CHARACTERISTIC CURVE

Power Derating Curve

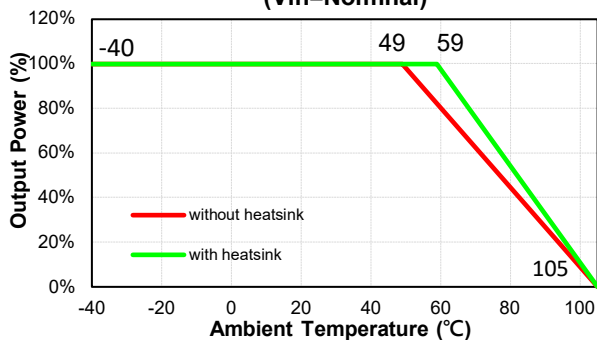
EC5SBW-XXS33 Derating Curve
(Vin=Nominal)



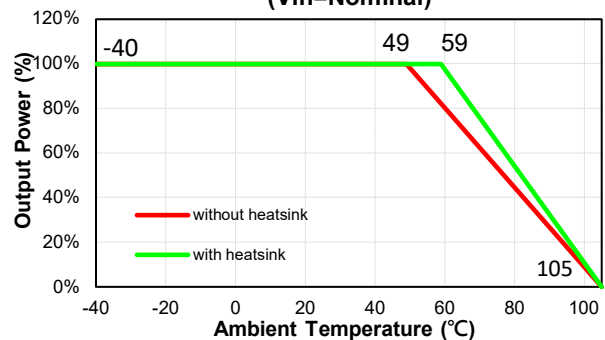
EC5SBW-XXS05 Derating Curve
(Vin=Nominal)



EC5SBW-XXS12 Derating Curve
(Vin=Nominal)



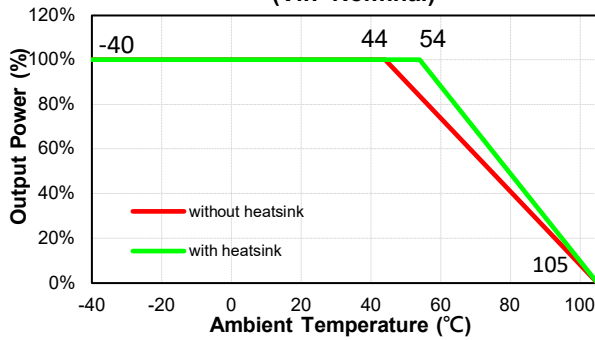
EC5SBW-XXS15 Derating Curve
(Vin=Nominal)



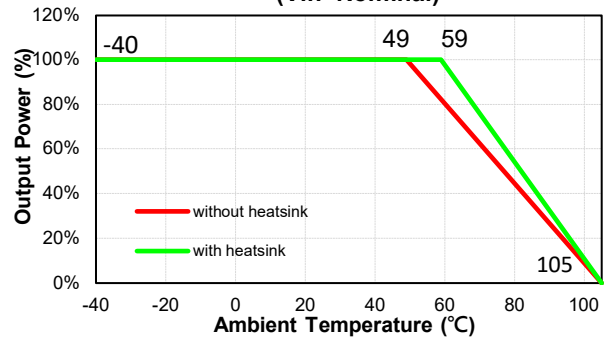


EC5SBW Series

**EC5SBW-24D12, 24D15 Derating Curve
(Vin=Nominal)**

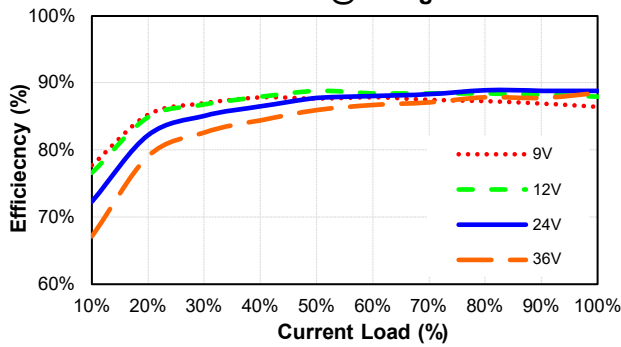


**EC5SBW-48D12, 48D15 Derating Curve
(Vin=Nominal)**

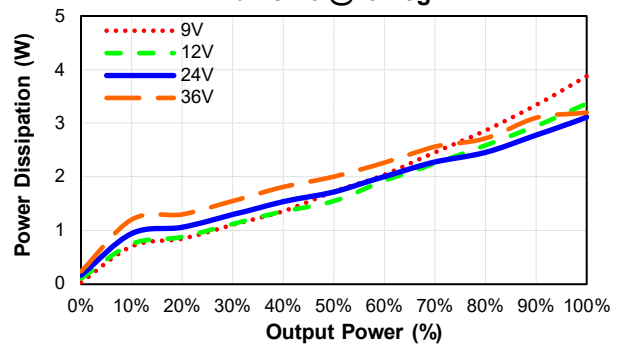


Performance Data

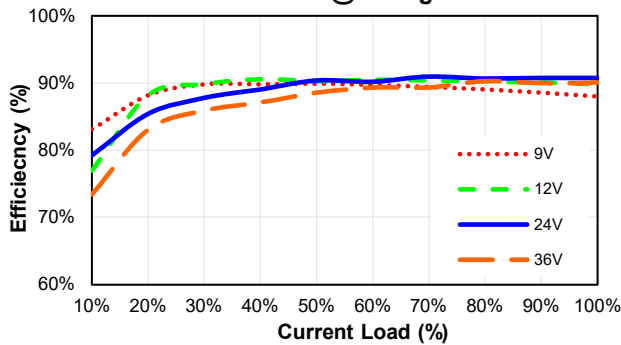
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Eff Vs Io @25 Deg. C**



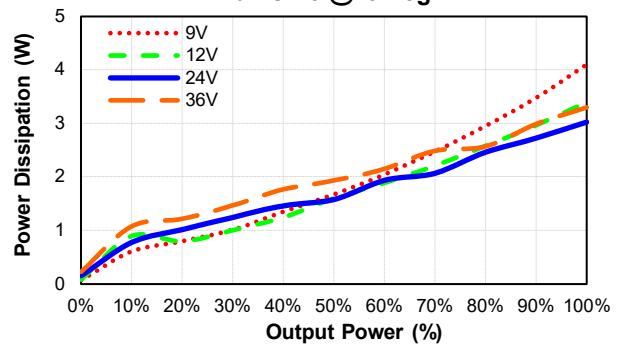
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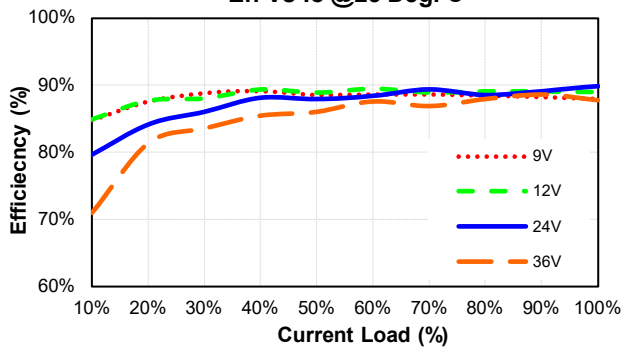
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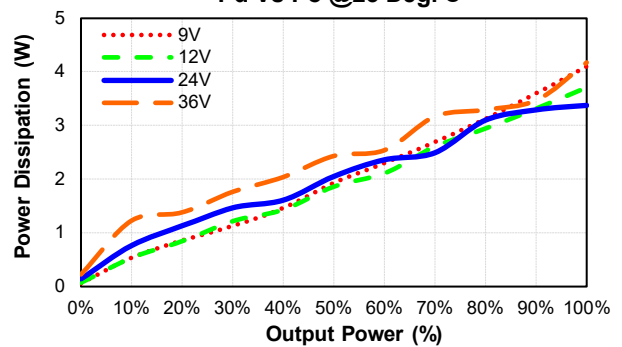
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**EC5SBW-24S12
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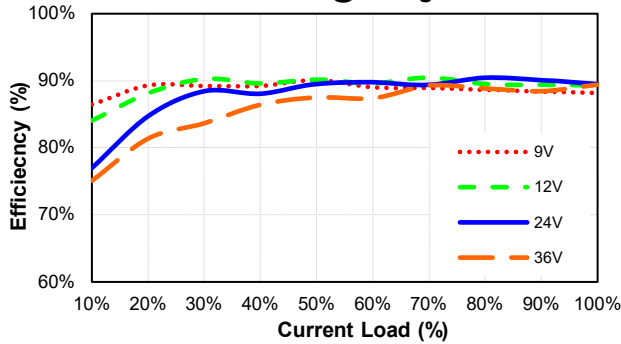
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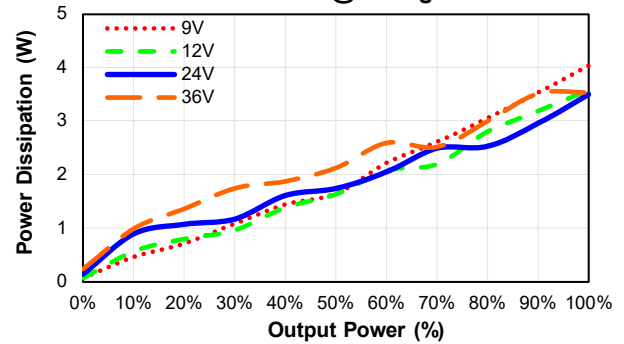


EC5SBW Series

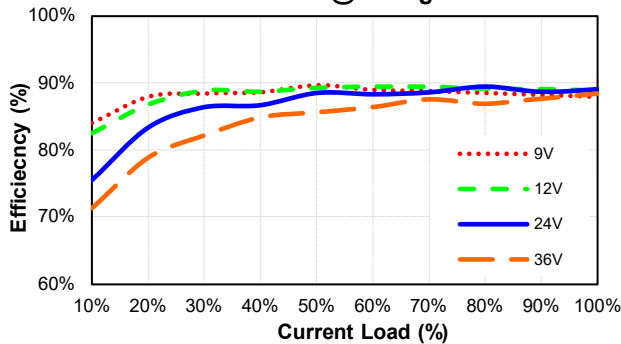
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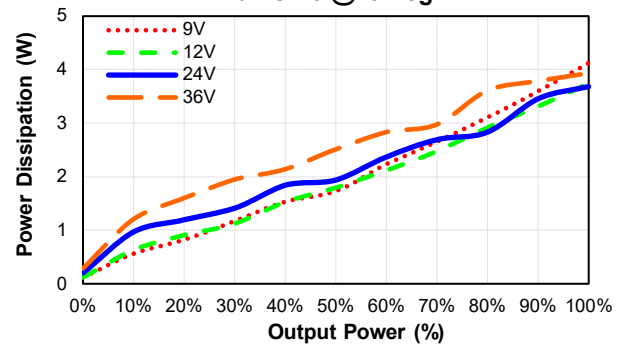
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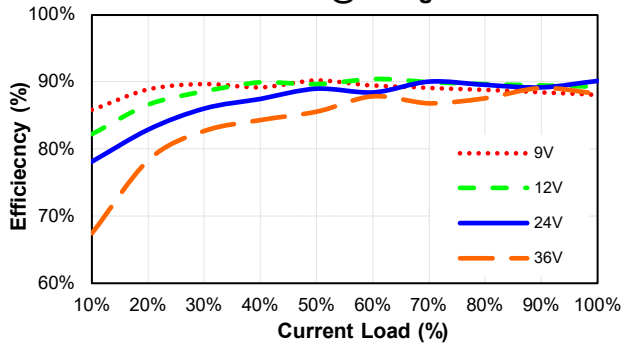
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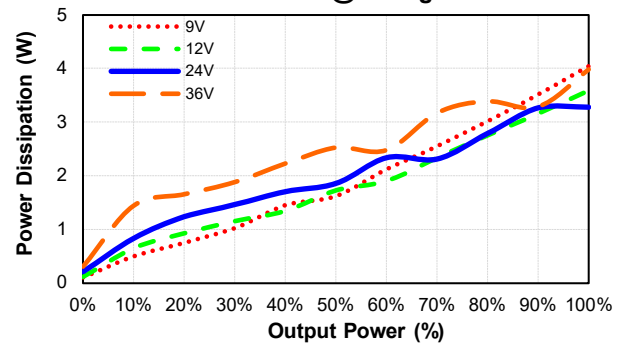
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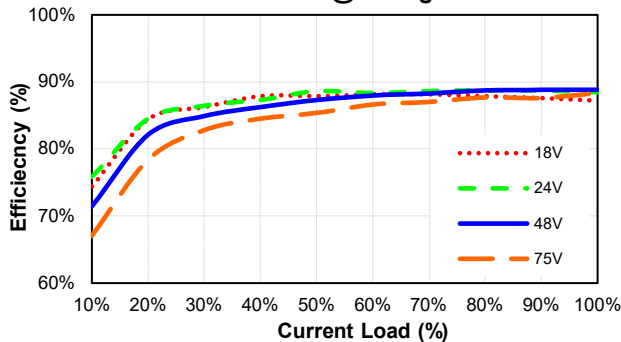
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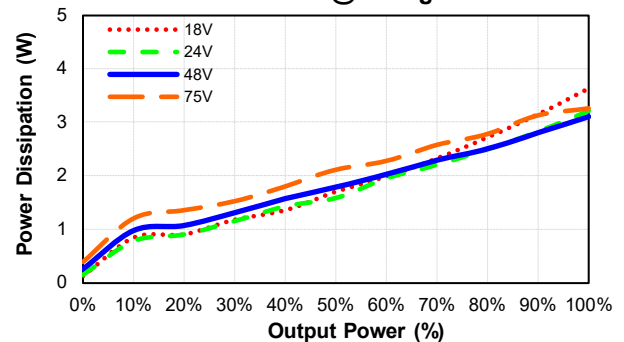
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EC5SBW-48S33
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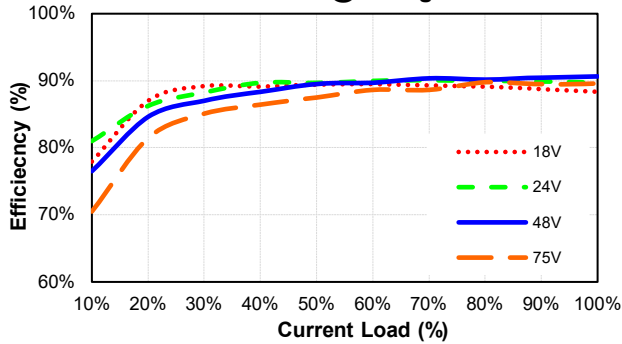
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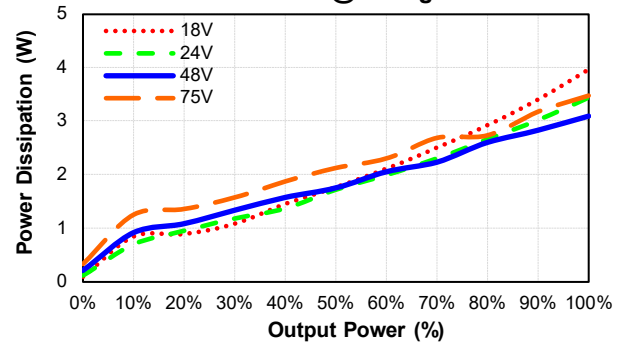


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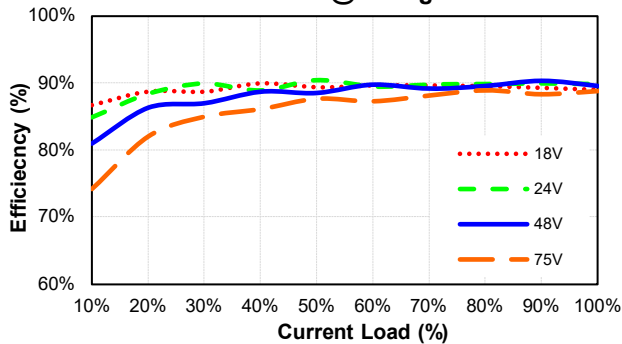
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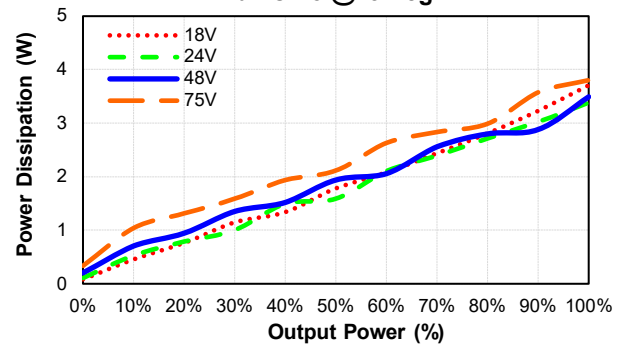
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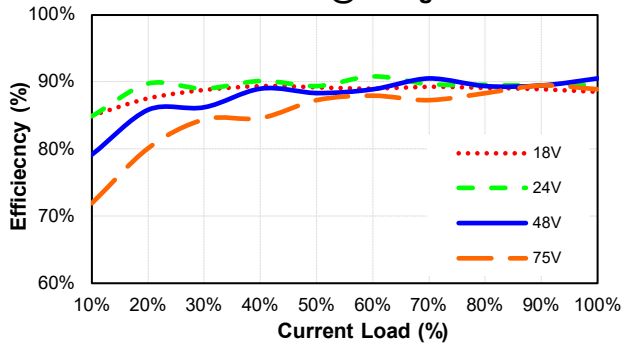
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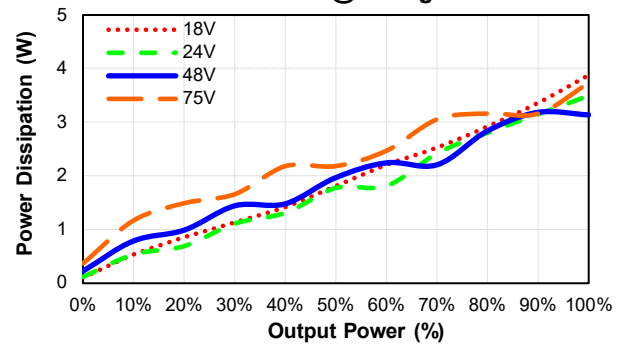
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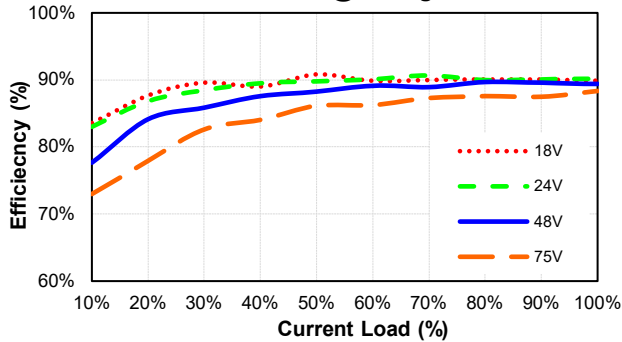
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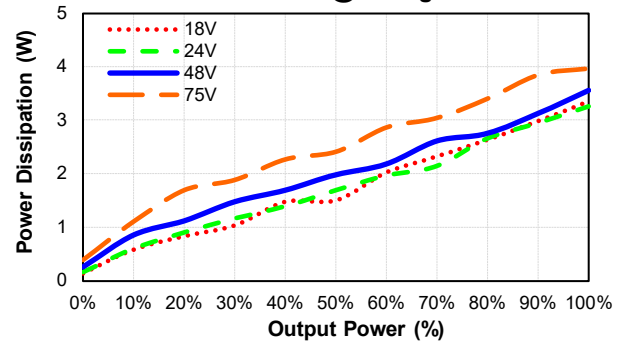
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EC5SBW-48D12
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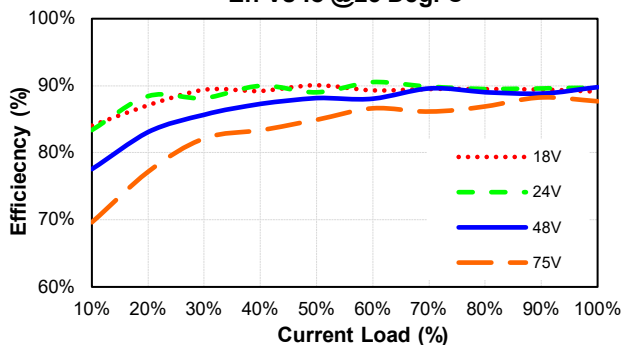
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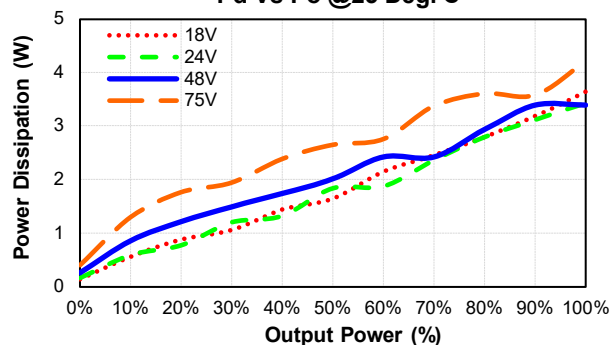


EC5SBW Series

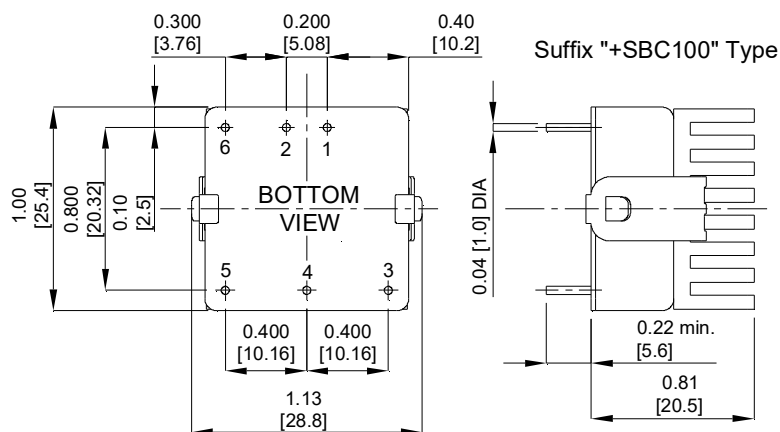
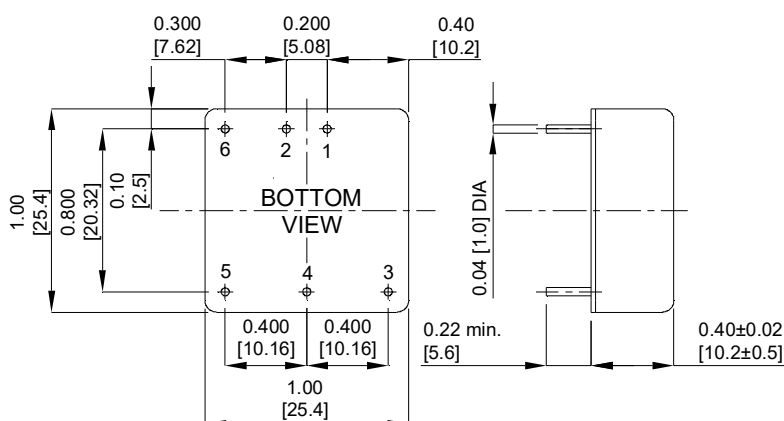
EC5SBW-48D15
Eff Vs Io @25 Deg. C



EC5SBW-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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