ECLB60W SERIES
60 WATT 4:1 INPUT ISOLATED DC-DC CONVERTER

Features

- Efficiency Up to 92%
- Fixed Switching Frequency
- Regulated Outputs
- Remote On/Off
- Low No Load Power Consumption
- Fully protected (OTP/OCP/OVP/UVLO)
- 1500Vdc I/O Isolation
- Operating Case Temperature -40 to +105℃
- 2.05"x1.2"x0.4" Six-Sided Shield Metal Case Standard 2"X1" Pin Out Compatible
- Safety Meets IEC/EN/UL 62368-1
- Full Load Operation up to 60℃ with Heat Sink LBT127 (M-C655) Natural Convection
- -55℃ Operating Available (Suffix "-M2")



MODEL NUMBER	INPUT VOLTAGE	OUTPUT VOLTAGE	OUTPUT CURRENT		INPUT CURRENT		% EFF.		CAPACITORLOAD MAX.
			MIN.	MAX.	NO LOAD	FULL LOAD	(3)	(2)	
ECLB60W-24S33	9-36 VDC	3.3 VDC	0 mA	15 A	10 mA	2279 mA	90.5	90	15000uF
ECLB60W-24S05	9-36 VDC	5.0 VDC	0 mA	12 A	10 mA	2717 mA	92	92	12000uF
ECLB60W-24S12	9-36 VDC	12 VDC	0 mA	5 A	10 mA	2717 mA	92.5	91.5	5000μF
ECLB60W-24S15	9-36 VDC	15 VDC	0 mA	4 A	10 mA	2717 mA	92	91	4000μF
ECLB60W-24D12	9-36 VDC	±12 VDC	0 mA	±2.5 A	12 mA	2747 mA	91	91	2500uF
ECLB60W-24D15	9-36 VDC	±15 VDC	0 mA	±2.0 A	12 mA	2747 mA	92	91	2000uF
ECLB60W-48S33	18-75 VDC	3.3 VDC	0 mA	15 A	8 mA	1140 mA	90.5	90	15000uF
ECLB60W-48S05	18-75 VDC	5.0 VDC	0 mA	12 A	8 mA	1359 mA	92	92	12000uF
ECLB60W-48S12	18-75 VDC	12 VDC	0 mA	5 A	8 mA	1359 mA	92.5	92	5000μF
ECLB60W-48S15	18-75 VDC	15 VDC	0 mA	4 A	8 mA	1359 mA	92	91	4000μF
ECLB60W-48D12	18-75 VDC	±12 VDC	0 mA	±2.5 A	8 mA	1374 mA	91	91	2500uF
ECLB60W-48D15	18-75 VDC	±15 VDC	0 mA	±2.0 A	8 mA	1374 mA	92	91	2000uF

NOTE:

1. Nominal input voltage 24 or 48VDC.
2. Measured at nominal input voltage.
3. Measured at 12VDC for 24Vin, 24VDC for 48Vin.
4. -55℃ 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	Mounting Inserts	Operating Case Temp. Range
ECLB60W-	II	O	XX	L	-Y (Option)	-Z (Option)
ECLB60W	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	None : M2.5x0.45 Mounting Inserts -C : Clear Mounting Insert (2.65mm DIA.)	None : -40~105℃ -M2 : -55~105℃

Part Number Example:

ECLB60W-24S12N-M2: LB Case, 60W, 4:1 18-75Vdc Input, Single 12Vdc Output, Negative Logic, -55~105℃ Operating Case Temp. Range

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 Ambient Temperature	At the center part of case plate (with derating) Suffix “-M2” (with Derating)	All -M2	-40 -55		105 105	℃
Maximum Case Temperature		All			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		24Vin 48Vin	8 16.5	8.5 17	8.8 17.5	V_{dc}
Turn-Off Voltage Threshold		24Vin 48Vin	7.7 15.5	8 16	8.3 16.5	V_{dc}
Lockout Hysteresis Voltage		24Vin 48Vin		0.5 1		V_{dc}
Maximum Input Current	V_{in}=9V, Full load V_{in}=18V, Full load	24Vin 48Vin		7.5 3.8		A
No-Load Input Current	V_{in}=24, 48V, I_o=0A	See Model Number Table				mA
Input Filter	Pi 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}=24, 48V, Full load, T_c=25℃	All	-1.5		+1.5	%
Output Voltage Balance	V_{in}=24, 48V, Full load, T_c=25℃	Dual	-1.0		+1.0	%
Output Voltage Regulation						
Load Regulation	Full load to no load	All			±0.5	%
Line Regulation	V_{in}=High line to low line, full load	All			±0.2	%
Cross Regulation	Load cross variation 10%/100%	Dual			±5.0	%
Temperature Coefficient	T_c=-40℃ to 105℃	All			±0.02	%/℃
Output Voltage Ripple and Noise (5Hz to 20MHz bandwidth)						
Peak-to-Peak	Full load, 1uF ceramic capacitors	3.3Vo 5Vo Others			100 100 150	mV
Output Current Range	V_{in}= 9 to 36V, 18 to 75V	See Model Number Table				A
Over Current Protection	Hiccup mode. Auto recovery	All	110	130	170	%
Short Circuit Protection		All	Continuous, Auto Recovery			
External Load Capacitance	Full load (resistive)	See Model Number Table				uF
Output Voltage Trim Range	$P_o \leqq$ max. rated power, $I_o \leqq I_{o_max.}$	All	-10		+10	%

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Over Voltage Protection	Zener or TVS 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}=24V, 48V	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					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		15		ms
Turn-On Delay Time, From Input	$V_{in_min.}$ to 10%V_{o_set}, Power up	All		15		ms
Output Voltage Rise Time	10%V_{o_set} to 90%V_{o_set}	All		15		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 1 Minute; input to case 1 Minute; output to case	All			1500 1000 1000	V_{dc}
Isolation Resistance	Input to output	All	1000			MΩ
Isolation Capacitance	Input to output Input to case Output to case	All All All		1500 1000 1000		pF

FEATURE CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Switching Frequency	Pulse width modulation (PWM), fixed	Single Dual	210 270	245 300	265 330	KHz
On/Off Control, Positive Remote On/Off Logic, Refer to -Vin 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		75	V
On/Off Control, Negative Remote On/Off Logic, Refer to -Vin Pin						
Logic High (Module Off)	$V_{on/off}$ at $I_{on/off}$=0.0uA, Pin open=off	All	3.5		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		0.3	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
Over Temperature Shutdown	Temperature at the center part of case, non-latching	All		110		℃
Over Temperature Recovery				100		℃

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℃	3.3Vo		1116		K hours
		5Vo		872		
		12Vo		930		
		15Vo		1230		
		±12Vo		859		
		±15Vo		1063		
Weight		All		39		grams
Case Material	Aluminum, UL 94V-0					
Base Plate Material	FR4					
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	EN 45545-2 Compliant					
EMI	Meets EN 55032 Compliant (with External Filter)					Class A
ESD	Meets EN 61000-4-2	Level 3: Air ±8kV, Contact ±6kV				Perf. Criteria A
Radiated Immunity	Meets EN 61000-4-3	Level 3: 80~1000MHz, 20V/m				Perf. Criteria A
Fast Transient	Meets EN 61000-4-4	Level 3: On power input port, ±2kV, external input capacitor required				Perf. Criteria A
Surge	Meets EN 61000-4-5	Level 4: Line to earth, ±4kV, Line to line, ±2kV				Perf. Criteria A
Conducted Immunity	Meets EN 61000-4-6	Level 3: 0.15~80MHz, 10V				Perf. Criteria A
Application Note Link	ECLB60W Series App Notes					
Packaging Information Link	Packaging Information					

Immunity to Environmental Conditions

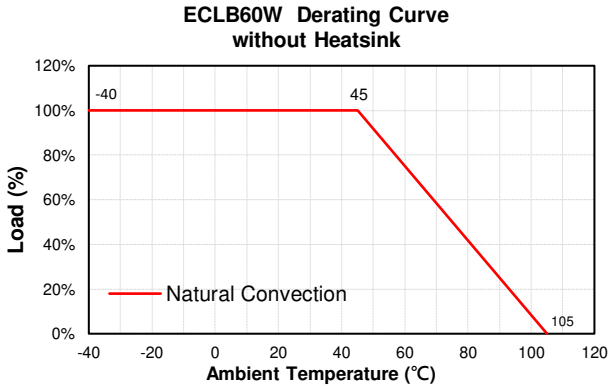
Phenomenon	Reference Clause	Reference Standard	Test Conditions	Result
Vibration Test	MIL-STD-810F Table 514.5C-VIII Figure 514.5C-6	MIL-STD-810F	Unit are Non-Operating Vibration Waveform: Random Vibration Frequency: 15 ~ 2000 Hz Vibration axis: X、Y、Z axis Duration: 1hr / axis	Pass
Shock Test	MIL-STD-810F 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

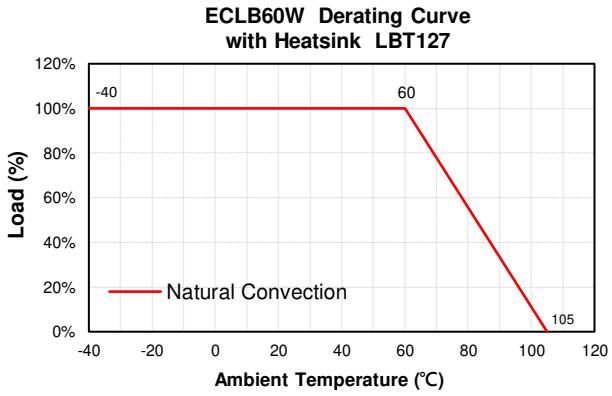
EN 45545-2 Fire & Smoke Test Conditions

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	EN 45545-2: 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

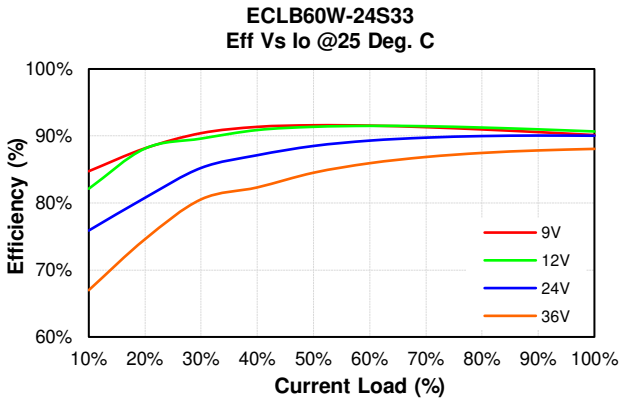
CHARACTERISTIC CURVE

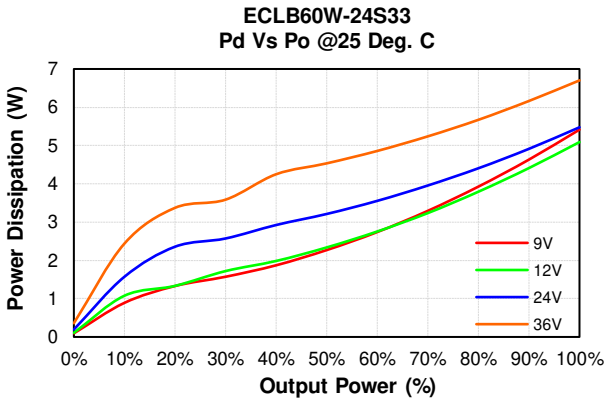
Power Derating Curve



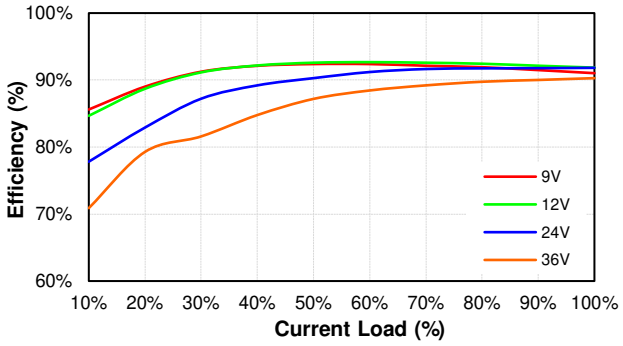


Performance Data

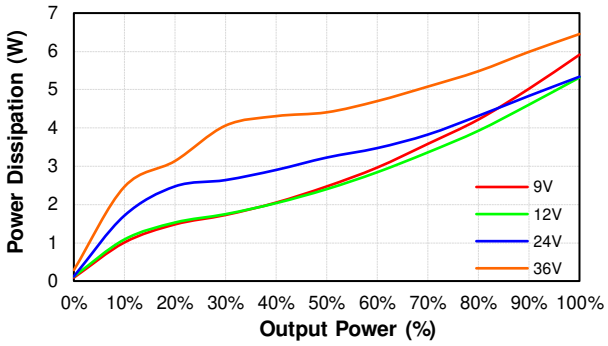




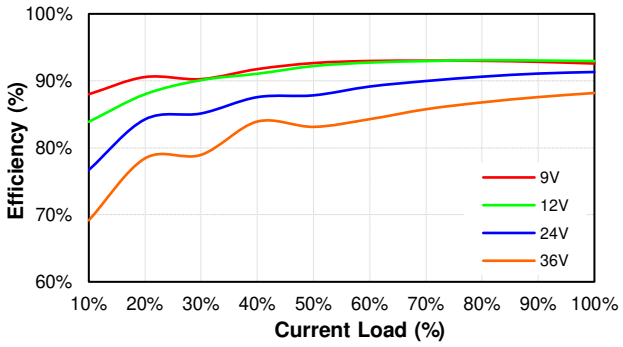
ECLB60W-24S05
Eff Vs Io @25 Deg. C



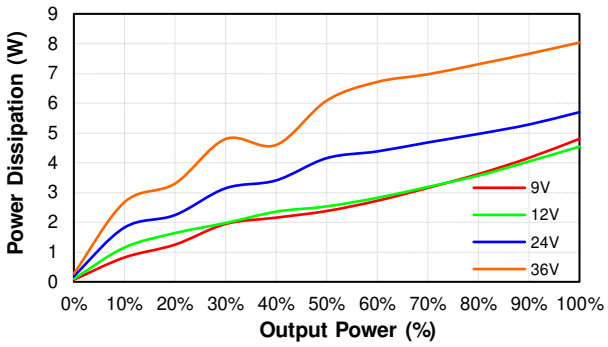
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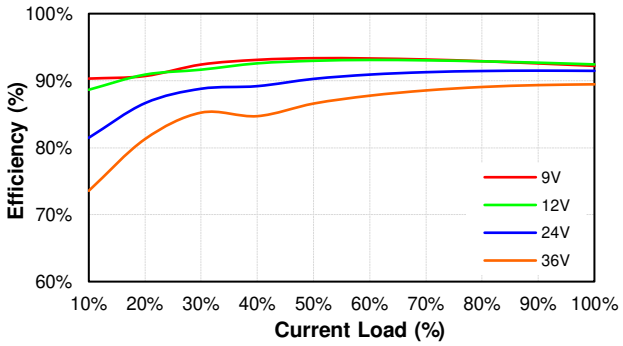
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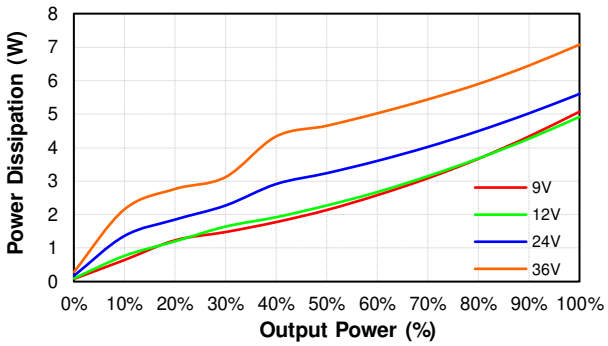
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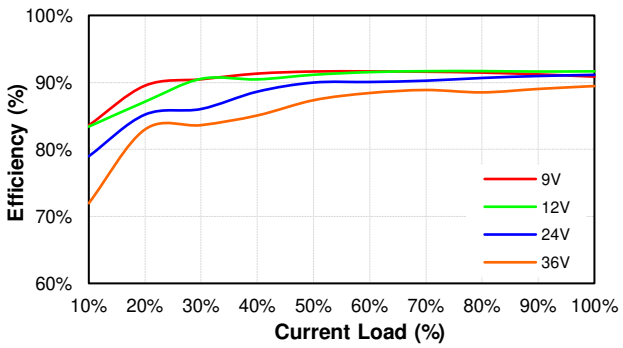
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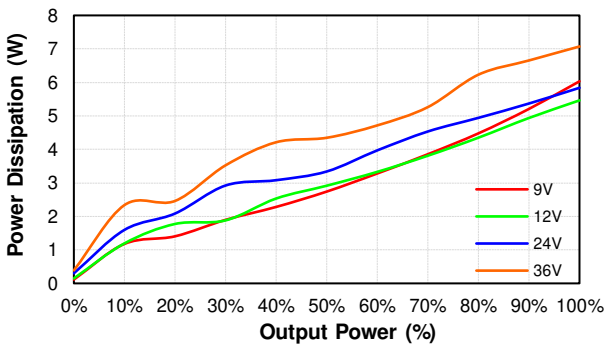
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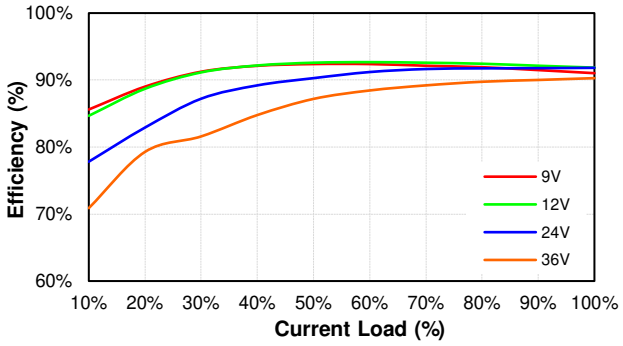
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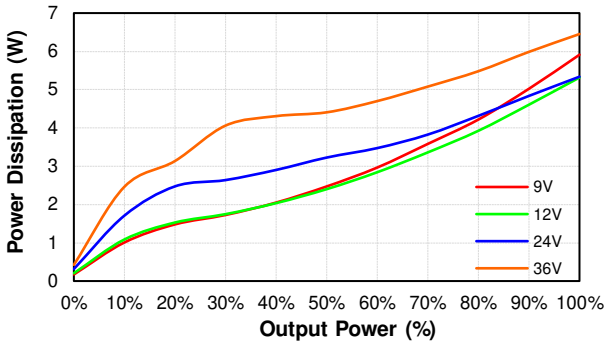
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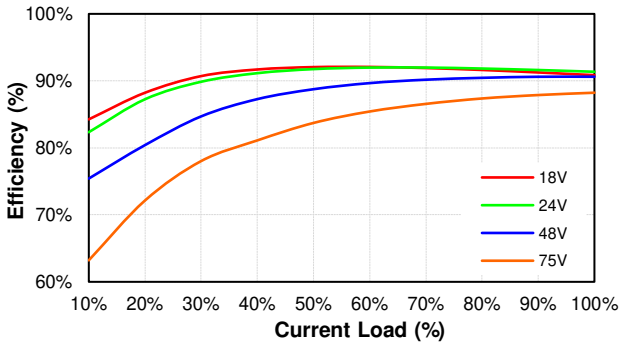
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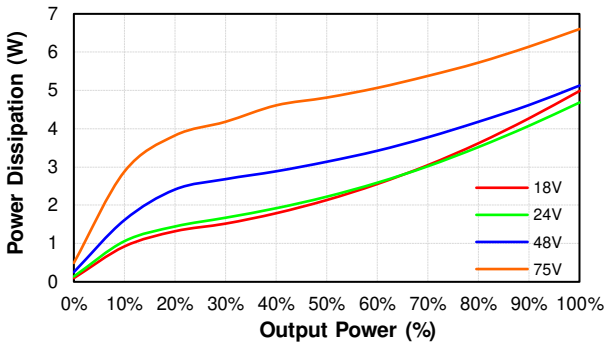
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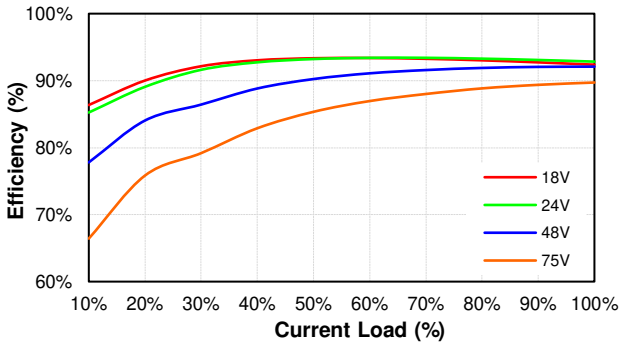
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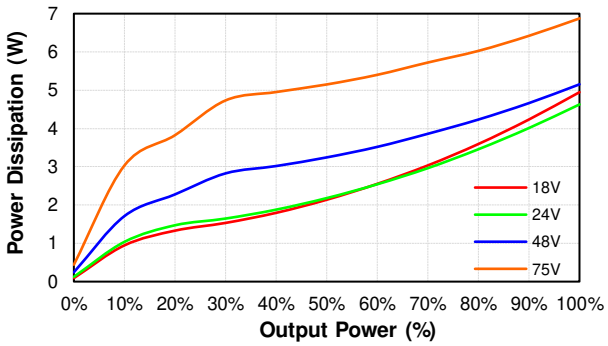
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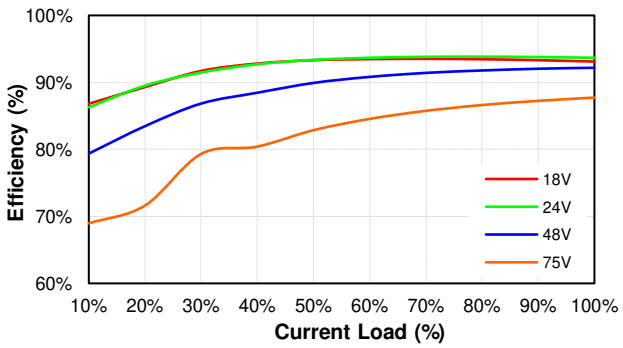
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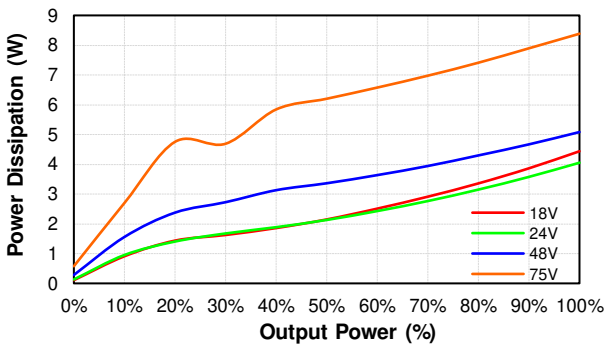
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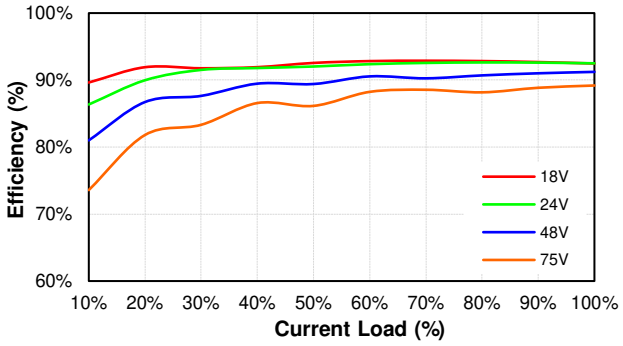
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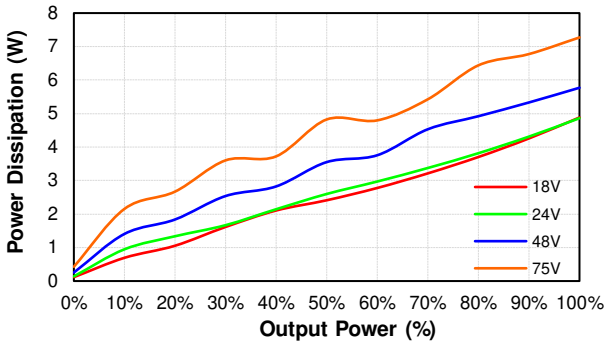
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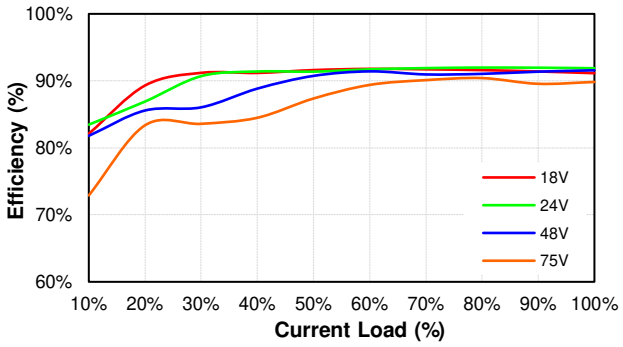
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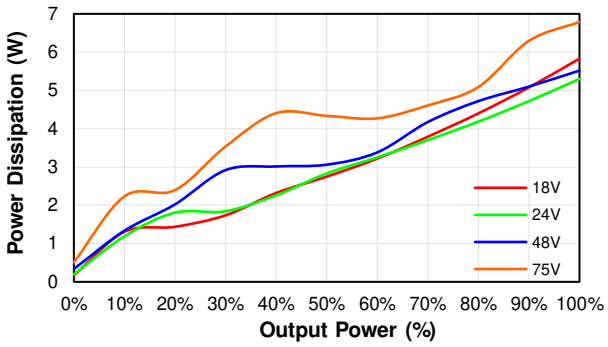
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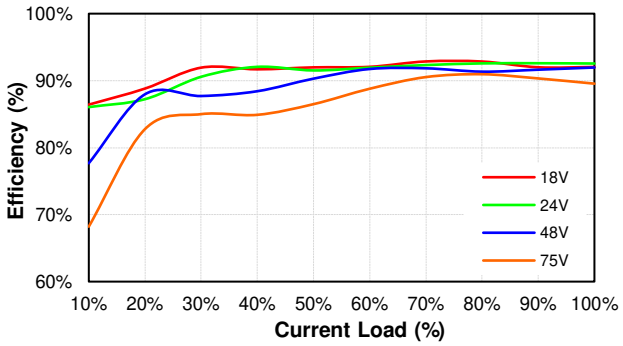
ECLB60W-48D12
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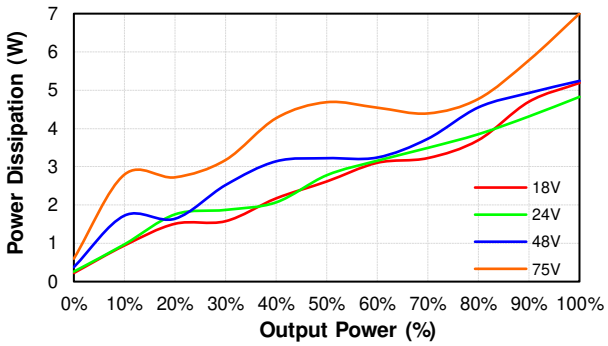
ECLB60W-48D12
Pd Vs Po @25 Deg. C



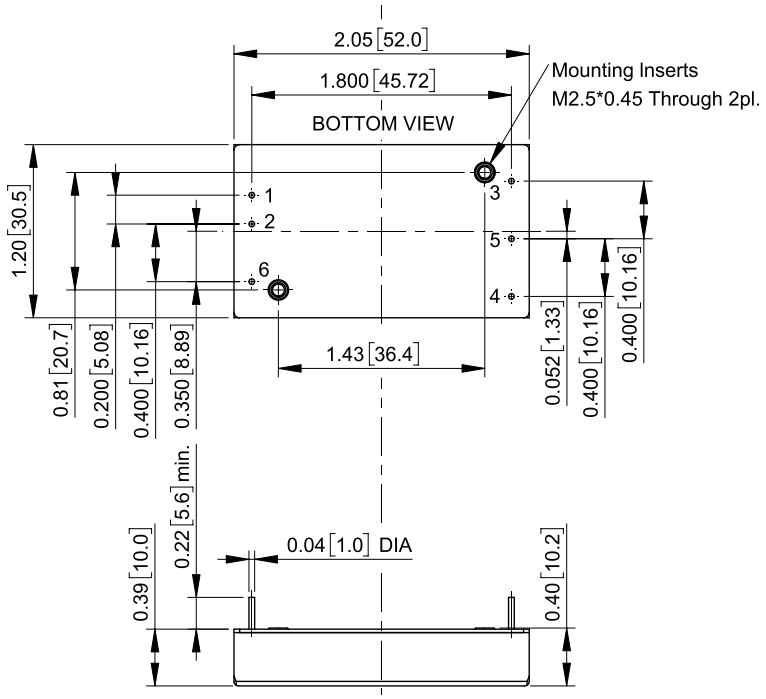
ECLB60W-48D15
Eff Vs Io @25 Deg. C



ECLB60W-48D15
Pd Vs Po @25 Deg. C



MECHANICAL SPECIFICATION



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

NOTE:Pin Size is 0.04±0.004 Inch[1.0±0.1 mm]DIA
All Dimensions in Inches[mm]
Tolerance Inches : X.XX=±0.02,X.XXX=±0.010
Millimeters : X.X=±0.5,X.XX=±0.25

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