



# CQB50W12 SERIES 30-50 WATT 12:1 INPUT ISOLATED DC-DC CONVERTER

## Features

- Efficiency Up to 89%
- Fixed Switching Frequency
- Regulated Outputs
- Remote On/Off
- Low No Load Power Consumption
- Fully protected (OTP/OCP/OVP/UVLO)
- 3000Vdc I/O Isolation
- Operating Case Temperature -40 to +100°C
- Quarter Brick Size Meet Industrial Standard 2.28"x1.45"x0.5"
- CB Test Certificate IEC60950-1
- UL60950-1 2<sup>nd</sup> (Basic Insulation) Approval
- EN50155 Compliant with External Circuits
- Shock & Vibration EN50155 (EN61373) Compliant
- Fire & Smoke EN45545-2 Compliant
- 5000m Operating Altitude
- Safety Meets IEC/EN/UL 62368-1



MODEL NUMBER	INPUT VOLTAGE	OUTPUT VOLTAGE	OUTPUT CURRENT		INPUT CURRENT		% EFF.		CAPACITOR LOAD MAX.
			MIN.	MAX.	NO LOAD	FULL LOAD	(1)	(2)	
CQB50W12-72S05	14-160 VDC	5 VDC	0 mA	6.0 A	5 mA	530 mA	83	81	10000uF
CQB50W12-72S12	14-160 VDC	12 VDC	0 mA	4.2 A	5 mA	810 mA	87	86	6800uF
CQB50W12-72S24	14-160 VDC	24 VDC	0 mA	2.1 A	5 mA	810 mA	89	87	3300µF
CQB50W12-72S48	14-160 VDC	48 VDC	0 mA	1.05 A	8 mA	810 mA	88	85	680µF

**NOTE:**

1. Nominal Input Voltage 72 VDC
2. Measured at 110Vin
3. An External Input Capacitor 68uF for All Models are Recommended to Reduce Input Ripple Voltage
4. To meet EN50155 and RIA12 refer to application note.

## PART NUMBER

Series	Nominal Input Voltage	Number of Outputs	Nominal Output Voltage	Remote On/Off Logic	Mounting Inserts
CQB50W12-	II	O	XX	L	-Y (Option)
CQB50W12	72: 72 VDC	S: Single	5: 5VDC 12: 12VDC 24: 24VDC 48: 48VDC	None: Positive N: Negative	None: M3x0.5 Mounting Inserts -C: Clear Mounting Insert (3.2mm DIA.)

**Part Number Example:**

**CQB50W12-72S12N-C:** Quarter Brick, 50W, 12:1 14-160Vdc Input, Single 12Vdc Output, Negative Logic, Clear Mounting Insert



# CQB50W12 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	All	-0.3		160	V <sub>dc</sub>
Input Surge Voltage	100ms max.	All			200	V <sub>dc</sub>
Operating Case Temperature	At the Center Part of Base Plate	All	-40		100	°C
Storage Temperature		All	-55		125	°C

### INPUT CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Operating Input Voltage		All	14	72	160	V <sub>dc</sub>
Input Under Voltage Lockout						
Turn-On Voltage Threshold		All	14.2	14.6	15	V <sub>dc</sub>
Turn-Off Voltage Threshold		All	11.6	12	12.4	V <sub>dc</sub>
Lockout Hysteresis Voltage		All		2.6		V <sub>dc</sub>
Maximum Input Current	V <sub>in</sub> =14V, Full Load.	All		4.6		A
No-Load Input Current	V <sub>in</sub> =72V, I <sub>o</sub> =0A	See Model Number Table				mA
Input Filter	Pi filter.	All				
Inrush Current (I <sup>2</sup> t)	As per ETS300 132-2.	All			0.1	A <sup>2</sup> 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 <sub>in</sub> =72V, Full Load, T <sub>c</sub> =25°C	All	-1.0		+1.0	%
Output Voltage Regulation						
Load Regulation	Full Load to No Load	All			±0.2	%
Line Regulation	V <sub>in</sub> =High Line to Low Line, Full Load	All			±0.2	%
Temperature Coefficient	T <sub>c</sub> =-40°C to 100°C	All			±0.02	%/°C
Output Voltage Ripple and Noise (5Hz to 20MHz bandwidth)						
Peak-to-Peak	Full load, 22uF aluminum solid capacitor and 1uF ceramic capacitors	All			100	mV
RMS.		All			40	mV
Output Current Range	V <sub>in</sub> = 14 to 160V	See Model Number Table				A
Over Current Protection	Hiccup Mode. Auto Recovery.	All	110	180	220	%
Short Circuit Protection		All	Continuous, Auto Recovery.			
External Load Capacitance	Full load (resistive)	See Model Number Table				uF
Output Voltage Trim Range	P <sub>o</sub> ≤ max rated power, I <sub>o</sub> ≤ I <sub>o,max</sub>	All	-20		+10	%
Output Voltage Remote Sense Range	P <sub>o</sub> ≤ max rated power, I <sub>o</sub> ≤ I <sub>o,max</sub> % of nominal V <sub>o</sub>	All			+10	%
Over Voltage Protection	Limited Voltage, % of Nominal V <sub>o</sub>	All	115	125	140	%

### EFFICIENCY

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
100% Load	V <sub>in</sub> =72V, 110V	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 <sub>o,max</sub> step load change d <sub>i</sub> /d <sub>t</sub> =0.1A/us (within 1% V <sub>out</sub> nominal)	All			±5	%
Recovery Time		All			250	us
Turn-On Delay and Rise Time	Full load (Constant resistive load)					



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PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
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		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			3000	$V_{dc}$
	1 minute; Input to Case (Base Plate),	All			2500	$V_{dc}$
	1 minute; Output to Case (Base Plate)	All			500	$V_{ac}$
Isolation Resistance	Input to Output	All	200			M $\Omega$
Isolation Capacitance	Input to Output	All		1000		pF
	Input to Case (Base Plate)	All		1500		
	Output to Case (Base Plate)	All		10000		

## FEATURE CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Switching Frequency	Pulse wide modulation (PWM), Fixed	All	215	240	265	KHz
On/Off Control, Positive Remote On/Off logic, Refer to -Vin pin.						
Logic Low (Module Off)	$V_{on/off}$ at $I_{on/off}=1.0mA$	All	0		1.2	V
Logic High (Module On)	$V_{on/off}$ at $I_{on/off}=0.0uA$ , Pin open=On	All	3.5		160	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	4.0		160	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		0.4	1	mA
Leakage Current (for both remote on/off logic)	Logic High, $V_{on/off}=15V$	All			30	$\mu A$
Off Converter Input Current	Shutdown input idle current	All		3	5	mA
Over Temperature Shutdown	Temperature at the Center Part of Base Plate, Non-Latching	All		110		$^{\circ}C$
Over Temperature Recovery		All		100		$^{\circ}C$

## 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 $^{\circ}C$	72S05		810		K hours
		72S12		736		
		72S24		795		
		72S48		791		
Weight		All		61.5		grams
Case Material	Plastic, DAP, UL 94V-0					
Base plate Material	Aluminum					
Potting Material	UL 94V-0					
Pin Material	Base: Copper Plating: Nickel with Matte Tin					
Shock/Vibration	MIL-STD-810F/EN61373 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 & EN50155 Compliant (with external filter)					Class A
ESD	EN61000-4-2	Level 3: Air $\pm 8kV$ , Contact $\pm 6kV$				Perf. Criteria A
Radiated immunity	EN61000-4-3	Level 3: 80~1000MHz, 20V/m				Perf. Criteria A
Fast Transient	EN61000-4-4	Level 3: On power input port, $\pm 2kV$ , external input capacitor required				Perf. Criteria A
Surge	EN61000-4-5	Level 4: Line to earth, $\pm 4kV$ , Line to line, $\pm 2kV$				Perf. Criteria A



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Conducted immunity	EN61000-4-6	Level 3: 0.15~80MHz, 10V	Perf. Criteria A
Interruptions of Voltage Supply	EN50155	Class S3: 20ms interruptions	Perf. Criteria A
Supply Change Over	EN50155	Class C2: During a supply break of 30 ms,	Perf. Criteria A
Application Note Link			<a href="#">CQB50W12 Series App Notes</a>
Packaging Information Link			<a href="#">Packaging Information</a>

## Immunity to Environmental Conditions.

Phenomenon	EN50155; 2017 Reference Clause(s)	Reference Standard	Test Conditions	Result
Low Temperature Start-up test	13.4.4	EN 60068-2-1	Class OT4 Temperature: -40°C Duration: 2 hrs	Pass
Dry Heat Test	13.4.5	EN 60068-2-2	Class OT4 & ST2 Temperature: 70°C Duration: 6 hrs Extended temperature: 85°C Extended Duration: 10min	Pass
Low Temperature Storage Test	13.4.6	EN 60068-2-1	Temperature: -40°C Duration: 16 hrs	Pass
Cyclic Damp Heat Test	13.4.7	EN 60068-2-30	Temperature: 25°C - 55°C Humidity: 90 ~ 96% RH Duration: 48 hrs	Pass
Random Vibration Test	13.4.11	EN 61373	Temperature: 26°C +/- 3°C Humidity: 70% +/-5% RH Frequency range: 5 ~ 150 Hz Vertical: 1.01 $m/s^2$ Transverse: 0.450 $m/s^2$ Longitudinal: 0.700 $m/s^2$ Duration: 10 min / axis	Pass
Simulated Long Life Test at Increased Random Vibration Levels	13.4.11	EN 61373	Temperature: 26°C +/-3°C Humidity: 70% +/-5% RH Frequency range: 5 ~ 150 Hz Vertical: 5.72 $m/s^2$ Transverse: 2.55 $m/s^2$ Longitudinal: 3.96 $m/s^2$ Duration: 5 hrs / axis	Pass
Shock Test	13.4.11	EN 61373	Temperature: 26°C +/-3°C Humidity: 70% +/-5% RH Frequency range: 5 ~ 150 Hz +/-Vertical: 30 $m/s^2$ +/-Transverse: 30 $m/s^2$ +/-Longitudinal: 50 $m/s^2$ Duration: 30ms x18 (Each axis 3 shocks)	Pass



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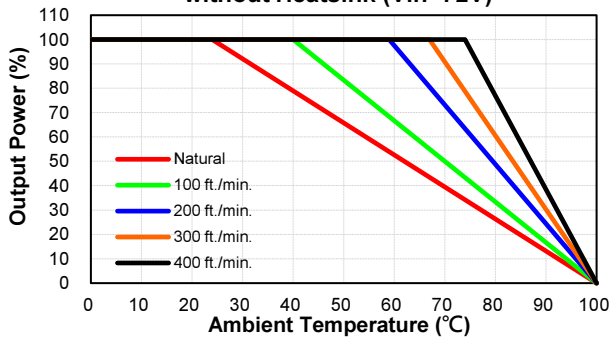
## EN45545-2 Fire & Smoke Test Conditions.

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
	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

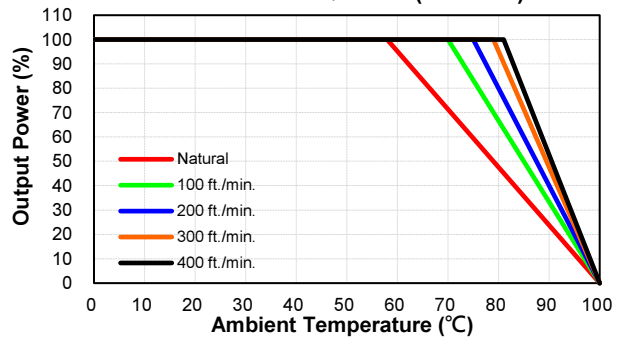
## CHARACTERISTIC CURVE

### Power Derating Curve

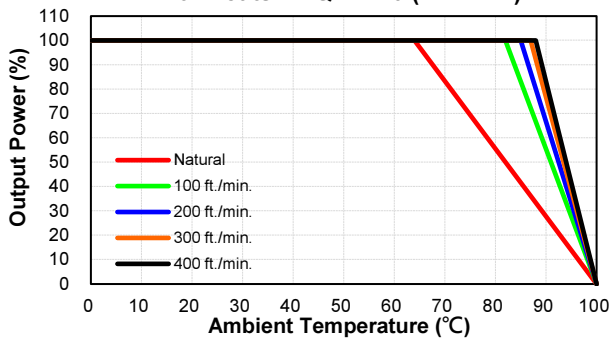
**CQB50W12-72S Derating Curve without Heatsink (Vin=72V)**



**CQB50W12-72S Derating Curve with Heatsink QBL127 (Vin=72V)**



**CQB50W12-72S Derating Curve with Heatsink QBT210 (Vin=72V)**

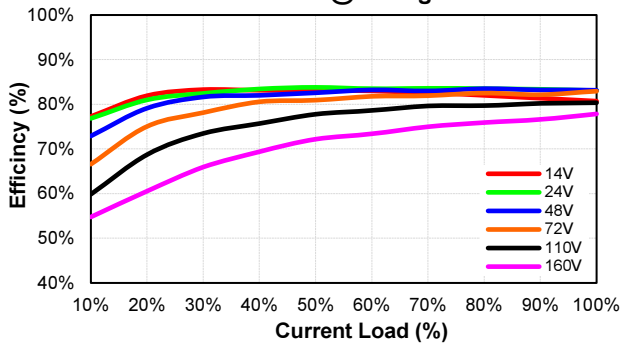




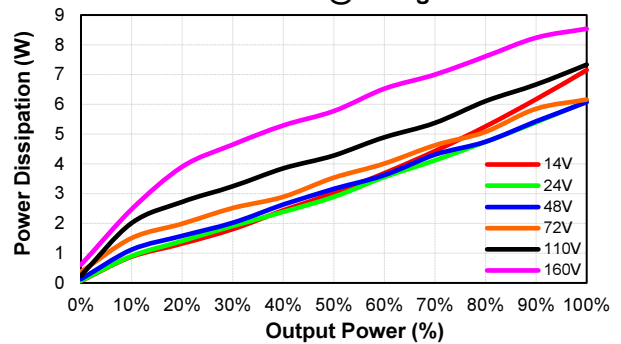
# CQB50W12 Series

## Performance Data

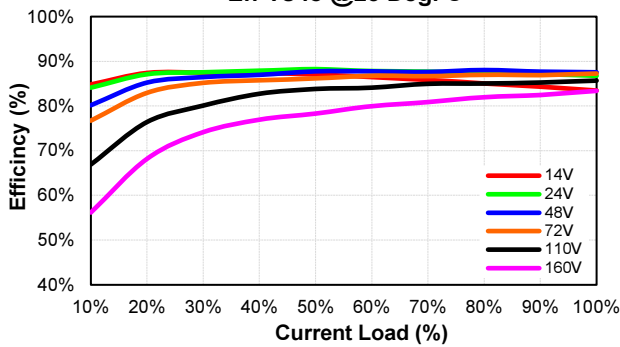
**CQB50W12-72S05**  
Eff Vs Io @25 Deg. C



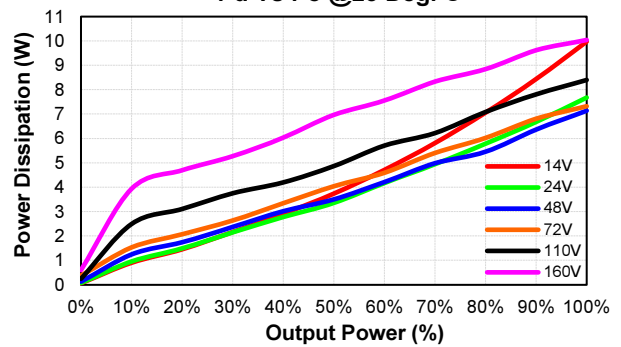
**CQB50W12-72S05**  
Pd Vs Po @25 Deg. C



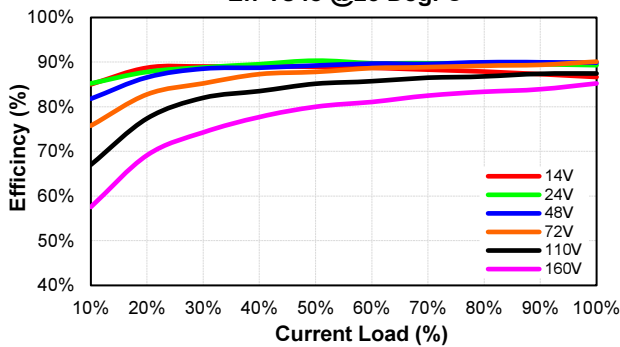
**CQB50W12-72S12**  
Eff Vs Io @25 Deg. C



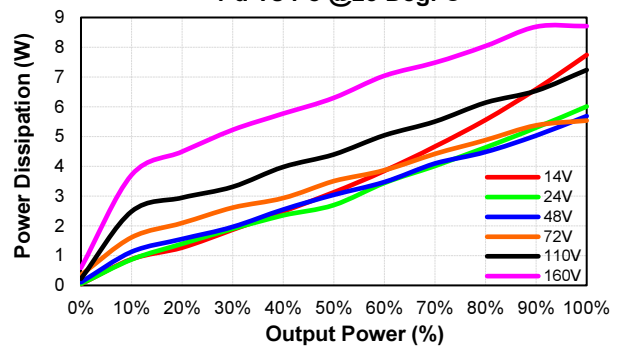
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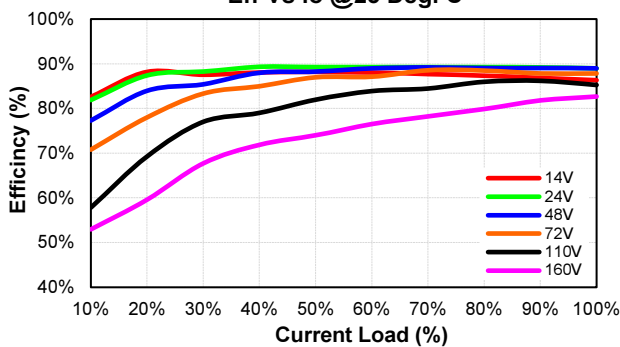
**CQB50W12-72S24**  
Eff Vs Io @25 Deg. C



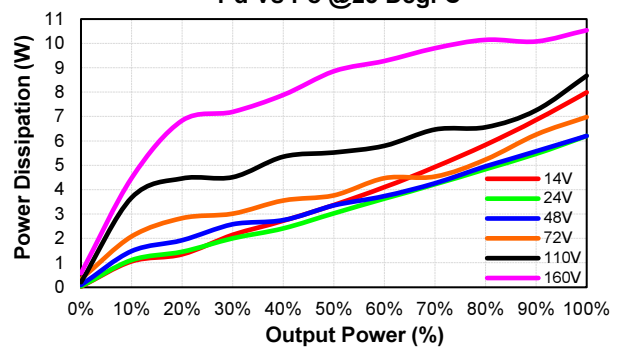
**CQB50W12-72S24**  
Pd Vs Po @25 Deg. C



**CQB50W12-72S48**  
Eff Vs Io @25 Deg. C



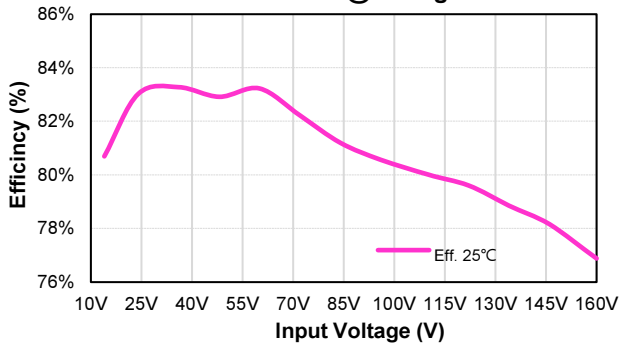
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Pd Vs Po @25 Deg. C



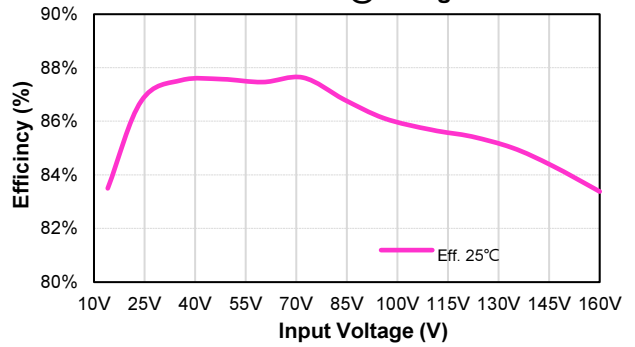


# CQB50W12 Series

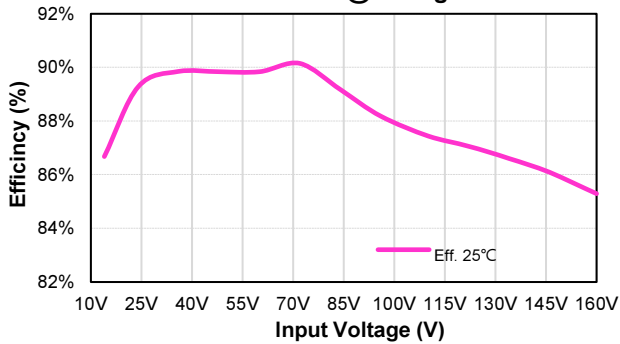
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Eff Vs Vin @25 Deg. C



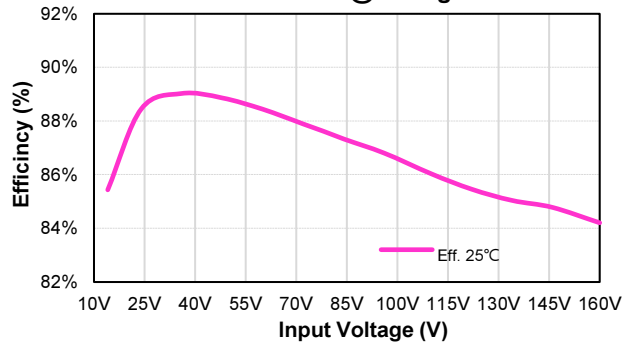
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Eff Vs Vin @25 Deg. C



**CQB50W12-72S24**  
Eff Vs Vin @25 Deg. C



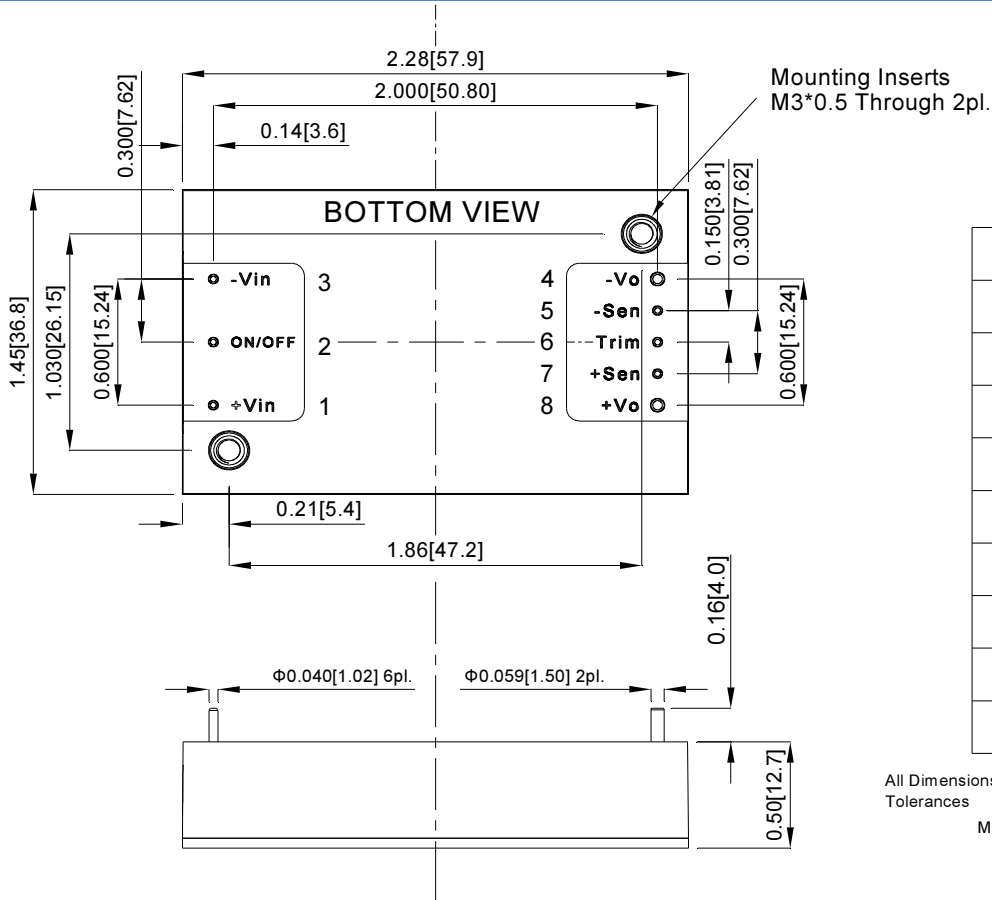
**CQB50W12-72S48**  
Eff Vs Vin @25 Deg. C





# CQB50W12 Series

## MECHANICAL SPECIFICATION



PIN CONNECTION	
PIN	Function
1	+V Input
2	On/Off
3	-V Input
4	-V Output
5	-Sense
6	Trim
7	+Sense
8	+V Output

All Dimensions In Inches(mm)  
 Tolerances Inches: X.XX= ±0.02 , X.XXX= ±0.010  
 Millimeters: X.X= ±0.5 , X.XX=±0.25

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