



# 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<br>12: 12VDC<br>24: 24VDC<br>48: 48VDC | None: Positive<br>N: Negative | None: M3x0.5 Mounting Inserts<br>-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><br>% 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<br>d <sub>i</sub> /d <sub>t</sub> =0.1A/us<br>(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<br>(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 $I_{o\_max}$ ;<br>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<br>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<br>Temperature: -40°C<br>Duration: 2 hrs  | Pass   |
| Dry Heat Test   | 13.4.5                            | EN 60068-2-2       | Class OT4 & ST2<br>Temperature: 70°C<br>Duration: 6 hrs<br>Extended temperature: 85°C<br>Extended Duration: 10min   | Pass   |
| Low Temperature Storage Test                                  | 13.4.6                            | EN 60068-2-1       | Temperature: -40°C<br>Duration: 16 hrs  | Pass   |
| Cyclic Damp Heat Test   | 13.4.7                            | EN 60068-2-30      | Temperature: 25°C - 55°C<br>Humidity: 90 ~ 96% RH<br>Duration: 48 hrs   | Pass   |
| Random Vibration Test   | 13.4.11                           | EN 61373           | Temperature: 26°C +/- 3°C<br>Humidity: 70% +/-5% RH<br>Frequency range: 5 ~ 150 Hz<br>Vertical: 1.01 $m/s^2$<br>Transverse: 0.450 $m/s^2$<br>Longitudinal: 0.700 $m/s^2$<br>Duration: 10 min / axis                 | Pass   |
| Simulated Long Life Test at Increased Random Vibration Levels | 13.4.11                           | EN 61373           | Temperature: 26°C +/-3°C<br>Humidity: 70% +/-5% RH<br>Frequency range: 5 ~ 150 Hz<br>Vertical: 5.72 $m/s^2$<br>Transverse: 2.55 $m/s^2$<br>Longitudinal: 3.96 $m/s^2$<br>Duration: 5 hrs / axis                     | Pass   |
| Shock Test  | 13.4.11                           | EN 61373           | Temperature: 26°C +/-3°C<br>Humidity: 70% +/-5% RH<br>Frequency range: 5 ~ 150 Hz<br>+/-Vertical: 30 $m/s^2$<br>+/-Transverse: 30 $m/s^2$<br>+/-Longitudinal: 50 $m/s^2$<br>Duration: 30ms x18 (Each axis 3 shocks) | Pass   |



# CQB50W12 Series

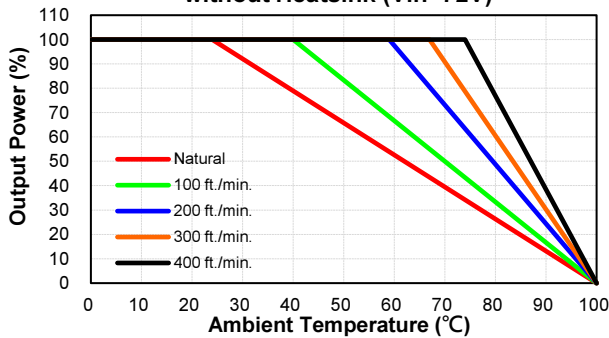
## EN45545-2 Fire & Smoke Test Conditions.

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

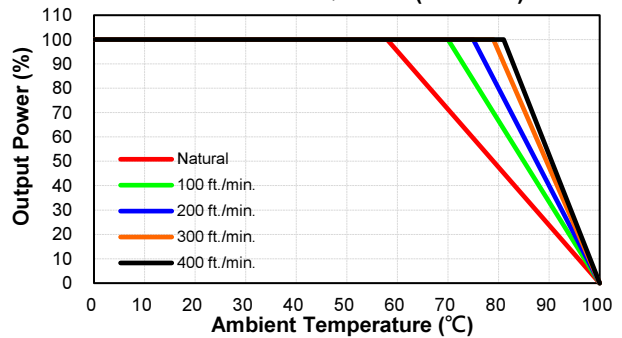
## CHARACTERISTIC CURVE

### Power Derating Curve

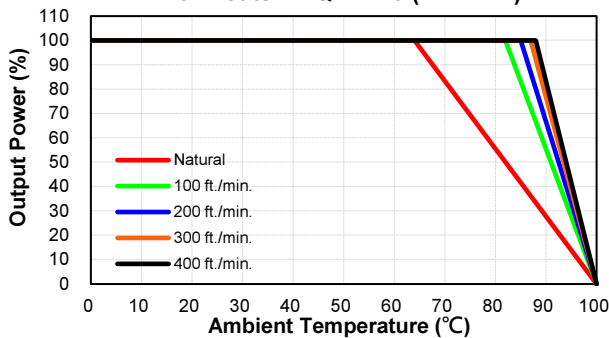
**CQB50W12-72S Derating Curve without Heatsink (Vin=72V)**



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



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

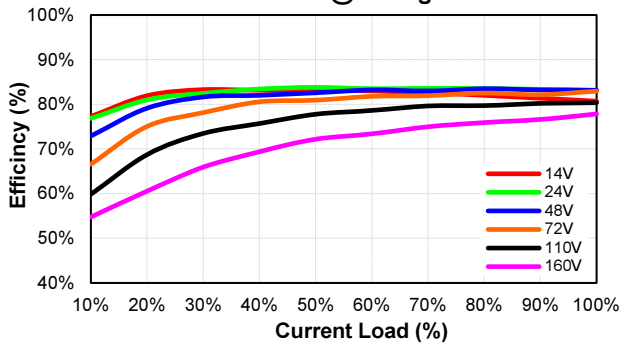




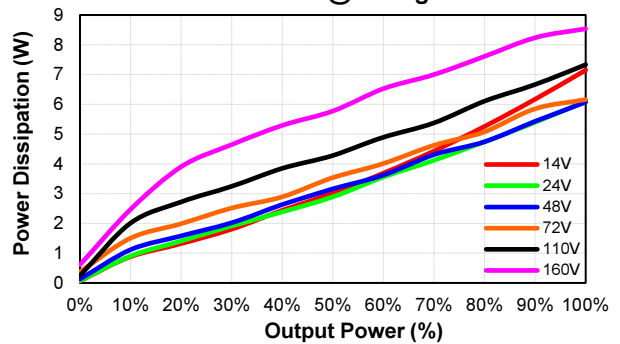
# CQB50W12 Series

## Performance Data

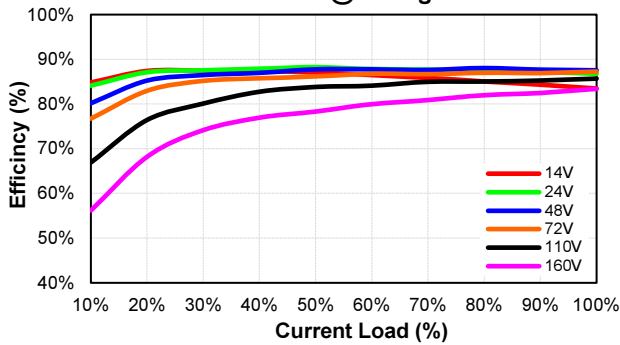
**CQB50W12-72S05**  
Eff Vs Io @25 Deg. C



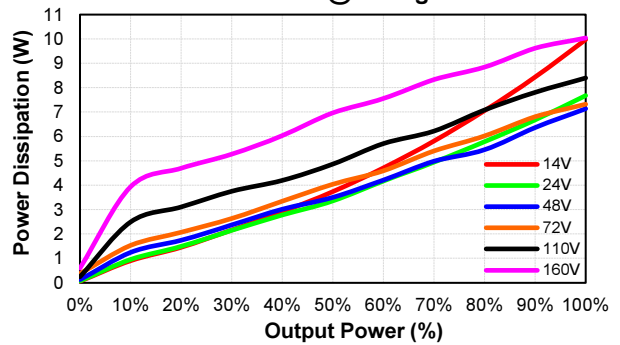
**CQB50W12-72S05**  
Pd Vs Po @25 Deg. C



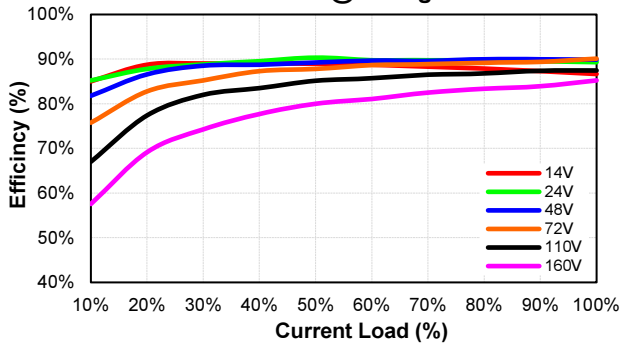
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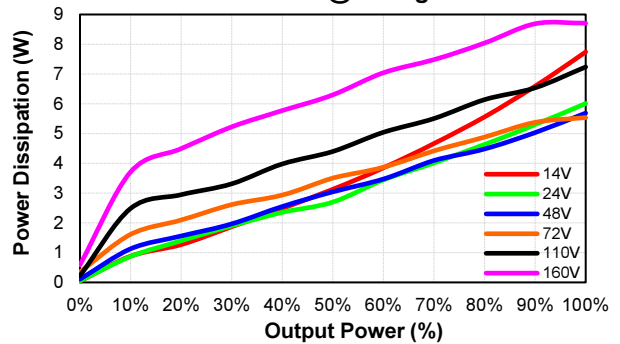
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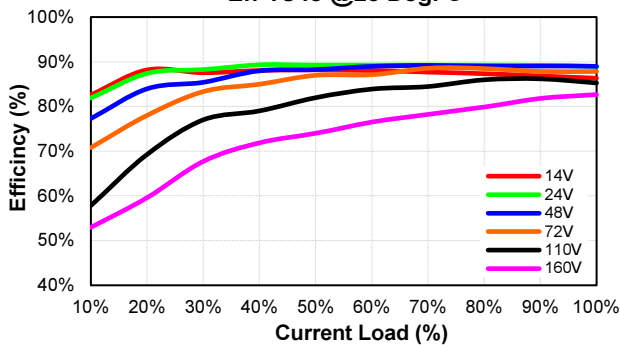
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Eff Vs Io @25 Deg. C



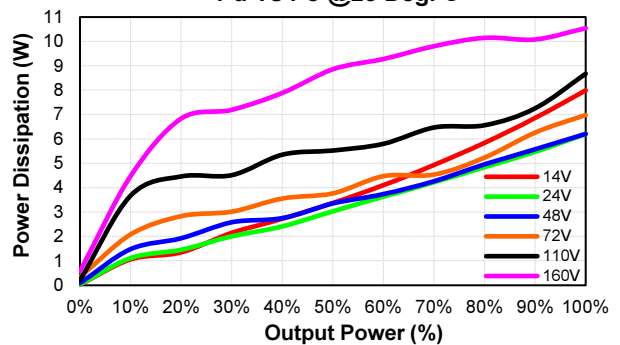
**CQB50W12-72S24**  
Pd Vs Po @25 Deg. C



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



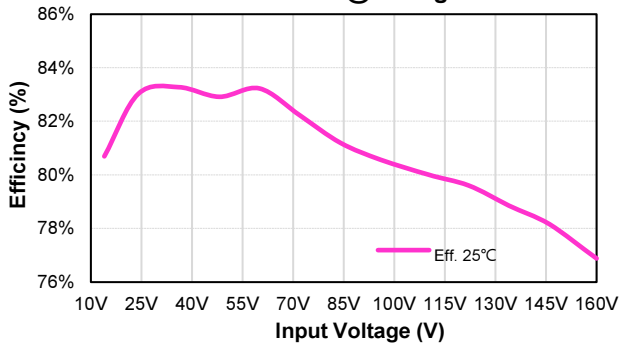
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Pd Vs Po @25 Deg. C



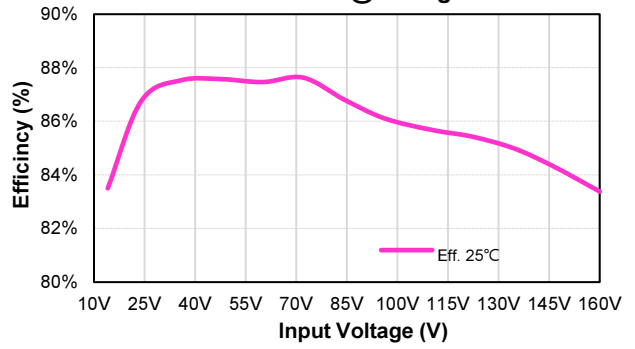


# CQB50W12 Series

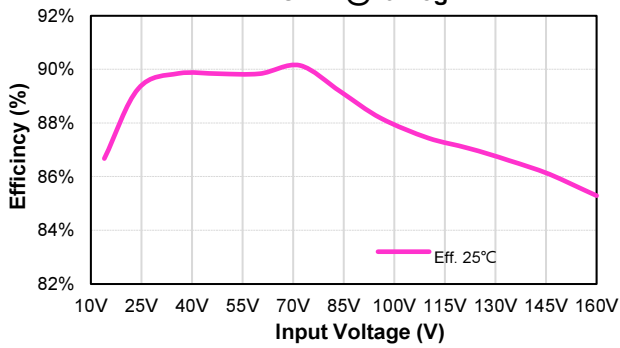
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Eff Vs Vin @25 Deg. C



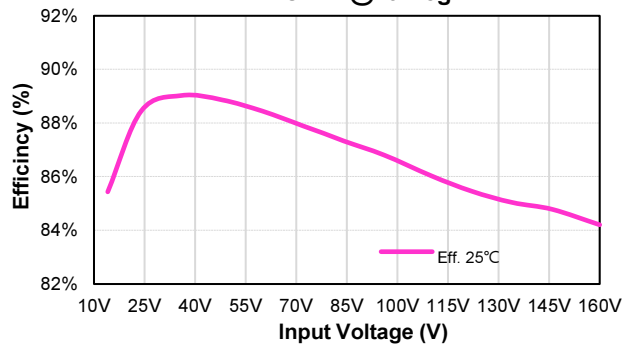
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Eff Vs Vin @25 Deg. C



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



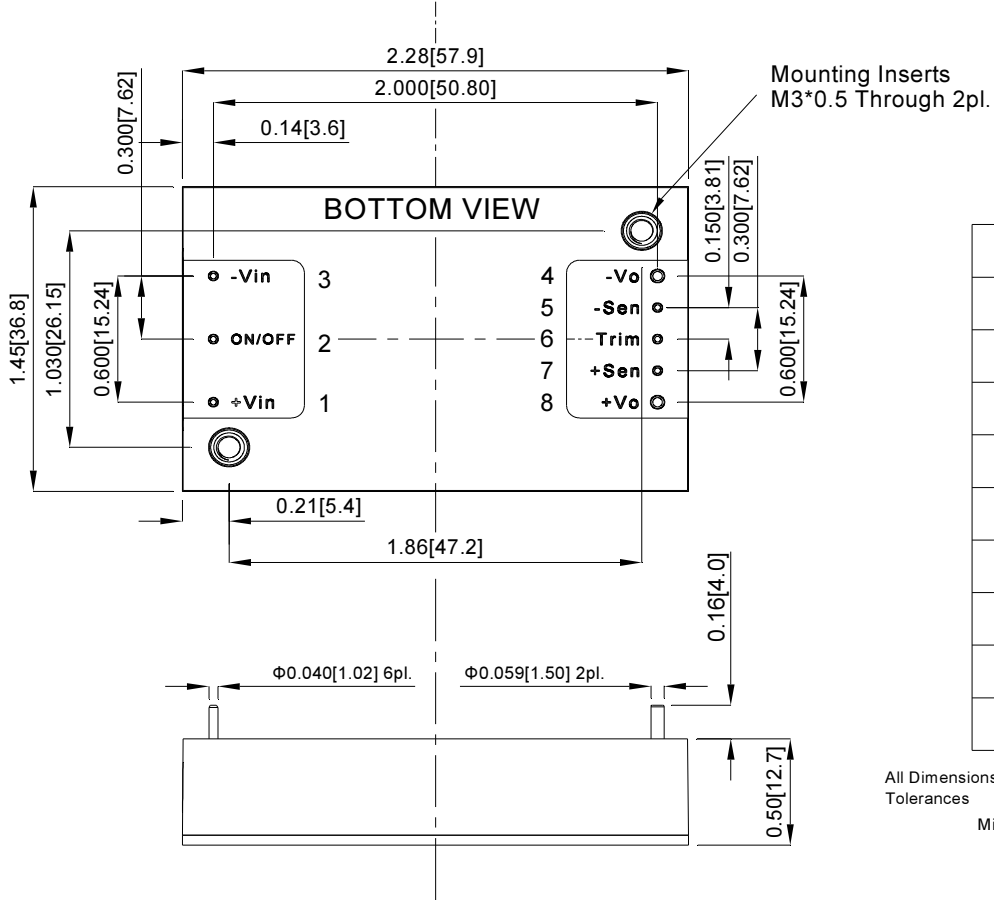
**CQB50W12-72S48**  
Eff Vs Vin @25 Deg. C





# 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=  $\pm 0.02$  , X.XXX=  $\pm 0.010$   
 Millimeters: X.X=  $\pm 0.5$  , X.XX=  $\pm 0.25$