



# CQB50W12 CMFC(D) SERIES

## 30-50 WATT 12:1 INPUT

## ISOLATED DC-DC CONVERTERS

### Features

- Efficiency Up to 89%
- Fixed Switching Frequency
- Regulated Outputs
- Remote On/Off
- Low No Load Power Consumption
- Fully Protected (OTP/OCV/OVP/UVLO)
- 3000Vdc I/O Isolation
- Operating Case Temperature -40 to +100°C
- UL 60950-1 2<sup>nd</sup> (Basic Insulation) Approval for DC Modules
- EN 50155 for EMC, Environmental and Characteristic
- Shock & Vibration EN 50155 (EN 61373) Compliant
- Fire & Smoke EN 45545-2 Compliant
- Safety Meets IEC/EN/UL 62368-1
- Build-In EMI Filter
- Chassis Mount, Baseplate Cooled



| MODEL NUMBER                                 | INPUT VOLTAGE | OUTPUT VOLTAGE | OUTPUT CURRENT |        | INPUT CURRENT |           | % EFF. | CAPACITOR LOAD MAX. |
|----------------------------------------------|---------------|----------------|----------------|--------|---------------|-----------|--------|---------------------|
|                                              |               |                | MIN.           | MAX.   | NO LOAD       | FULL LOAD |        |                     |
| CQB50W12-72S05□-CMFC<br>CQB50W12-72S05□-CMFD | 14-160 VDC    | 5 VDC          | 0 mA           | 6.0 A  | 8 mA          | 530 mA    | 83     | 10000uF             |
| CQB50W12-72S12□-CMFC<br>CQB50W12-72S12□-CMFD | 14-160 VDC    | 12 VDC         | 0 mA           | 4.2 A  | 8 mA          | 810 mA    | 87     | 6800uF              |
| CQB50W12-72S24□-CMFC<br>CQB50W12-72S24□-CMFD | 14-160 VDC    | 24 VDC         | 0 mA           | 2.1 A  | 8 mA          | 810 mA    | 89     | 3300μF              |
| CQB50W12-72S48□-CMFC<br>CQB50W12-72S48□-CMFD | 14-160 VDC    | 48 VDC         | 0 mA           | 1.05 A | 12 mA         | 810 mA    | 88     | 680μF               |

#### NOTE:

1. Nominal input voltage 72 VDC, input voltage range: 14-16.8 VDC (t ≤ 60 sec.).
2. □ = N or none
3. VR1 is used for output voltage adjustment.
4. Refer to application note for thermal resistance and derating information.
5. TVS is included for input surge voltage protection.
6. Recommend an external fuse for input reverse polarity protection (shunt diode is included inside).
7. Output connector CN3 wafer with TAIWAN KING pin terminal P110I series and mate with JST housing PH series or equivalent.
8. CN1 & CN2 connection: DINKLE EK500V-04P series or equivalent, suitable electric wire: 24~12AWG (IEC 0.5~2.5mm<sup>2</sup>).

### PART NUMBER

| Series    | Nominal Input Voltage | Number of Outputs | Nominal Output Voltage                              | Remote On/Off Logic             | Chassis Mount Type                  |                                  | Heatsink                                                 |
|-----------|-----------------------|-------------------|-----------------------------------------------------|---------------------------------|-------------------------------------|----------------------------------|----------------------------------------------------------|
| CQB50W12- | II                    | O                 | XX                                                  | L                               | -YYY                                | Z                                | +WW                                                      |
| CQB50W12  | 72 : 72 VDC           | S : Single        | 05 : 5VDC<br>12 : 12VDC<br>24 : 24VDC<br>48 : 48VDC | None : Positive<br>N : Negative | CMF : Chassis Mount Built in Filter | C : Open Frame<br>D : With Cover | None : Blank<br>HS : Heatsink<br>HD : Heatsink+ Din Rail |

Part Number Example:

**CQB50W12-72S12N-CMFC:** Chassis Mount, 50W, 12:1 14-160Vdc Input, Single 12Vdc Output, Negative Logic, Open Frame



# CQB50W12 CMFC(D) 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    | -40  |      | 105  | °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   | Full load                                | All                    | 14.2 | 14.6     | 15   | V <sub>dc</sub> |
| Turn-Off Voltage Threshold  | Full load                                | All                    | 11.6 | 12.6     | 13   | V <sub>dc</sub> |
| Lockout Hysteresis Voltage  | Full load                                | All                    |      | 2.0      |      | V <sub>dc</sub> |
| Maximum Input Current       | V <sub>in</sub> =16.8V, Full load        | 72S05<br>Other         |      | 2.3<br>4 |      | A               |
| No-Load Input Current       | V <sub>in</sub> =72V, I <sub>o</sub> =0A | See Model Number Table |      |          |      | 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, 1uF ceramic capacitors                                                                     | All                    | 100                       |      |       | mV    |
| RMS.                                                     |                                                                                                       |                        | 40                        |      |       |       |
| 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/I <sub>o</sub> =0.1A/us | All    |      |      | ±5   | %     |
| Recovery Time                    | (within 1% V <sub>out</sub> nominal)                                              |        |      |      | 250  | us    |



# CQB50W12 CMFC(D) Series

| PARAMETER                               | NOTES and CONDITIONS                          | Device | Min. | Typ. | Max. | Units |
|-----------------------------------------|-----------------------------------------------|--------|------|------|------|-------|
| 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    |      | 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)  |        |      |       | 2500 |            |
|                                                          | 1 Minute; output to case (base plate) |        |      |       | 500  | $V_{ac}$   |
| Isolation Resistance                                     | Input to output                       | All    | 200  |       |      | M $\Omega$ |
| Isolation Capacitance                                    | Input to output                       | All    |      | 3000  |      | pF         |
|                                                          | Input to case (base plate)            |        |      | 5000  |      |            |
|                                                          | Output to case (base plate)           |        |      | 10000 |      |            |

## FEATURE CHARACTERISTICS

| PARAMETER                                                       | NOTES and CONDITIONS                                            | Device | Min. | Typ. | Max. | Units |
|-----------------------------------------------------------------|-----------------------------------------------------------------|--------|------|------|------|-------|
| Switching Frequency                                             | Pulse width 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 <sub>on/off</sub> at I <sub>on/off</sub> =1.0mA               | All    | 0    |      | 1.2  | V     |
| Logic High (Module On)                                          | V <sub>on/off</sub> at I <sub>on/off</sub> =0.0uA, Pin open=on  |        | 3.5  |      | 160  |       |
| On/Off Control, Negative Remote On/Off Logic, Refer to -Vin Pin |                                                                 |        |      |      |      |       |
| Logic High (Module Off)                                         | V <sub>on/off</sub> at I <sub>on/off</sub> =0.0uA, Pin open=off | All    | 4.0  |      | 160  | V     |
| Logic Low (Module On)                                           | V <sub>on/off</sub> at I <sub>on/off</sub> =1.0mA               |        | 0    |      | 1.2  |       |
| On/Off Current (for Both Remote On/Off Logic)                   | I <sub>on/off</sub> at V <sub>on/off</sub> =0V                  | All    |      | 0.3  | 1    | mA    |
| Leakage Current (for Both Remote On/Off Logic)                  | Logic high, V <sub>on/off</sub> =15V                            | All    |      |      | 30   | uA    |
| 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  |      | °C    |
| Over Temperature Recovery                                       |                                                                 |        |      | 100  |      |       |

## GENERAL SPECIFICATIONS

| PARAMETER           | NOTES and CONDITIONS                                                                | Device   | Min. | Typ. | Max. | Units            |
|---------------------|-------------------------------------------------------------------------------------|----------|------|------|------|------------------|
| MTBF                | I <sub>o</sub> =100% of I <sub>o_max.</sub> ;<br>MIL-HDBK - 217F_Notice 1, GB, 25°C | 72S05    |      | 506  |      | K<br>hours       |
|                     |                                                                                     | 36S12    |      | 484  |      |                  |
|                     |                                                                                     | 36S24    |      | 515  |      |                  |
|                     |                                                                                     | 36S48    |      | 513  |      |                  |
| Weight              |                                                                                     | -CMFC    |      | 215  |      | grams            |
|                     |                                                                                     | -CMFD    |      | 250  |      |                  |
|                     |                                                                                     | -CMFD+HS |      | 470  |      |                  |
|                     |                                                                                     | -CMFD+HD |      | 490  |      |                  |
| Base Plate Material | Aluminum                                                                            |          |      |      |      |                  |
| Potting Material    | UL 94V-0 (DC Module)                                                                |          |      |      |      |                  |
| Shock/Vibration     | EN 50155 (EN 61373) Compliant (Except -HD)                                          |          |      |      |      |                  |
| 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                 | EN 55032 & EN 50155 (with external output filter) Compliant                         |          |      |      |      | Class A          |
| ESD                 | EN 61000-4-2      Level 3: Air ±8kV, Contact ±6kV                                   |          |      |      |      | Perf. Criteria A |
| Radiated Immunity   | EN 61000-4-3      Level 3: 80~1000MHz, 20V/m                                        |          |      |      |      | Perf. Criteria A |



# CQB50W12 CMFC(D) Series

## GENERAL SPECIFICATIONS

|                                 |              |                                                                           |                                                       |
|---------------------------------|--------------|---------------------------------------------------------------------------|-------------------------------------------------------|
| Fast Transient                  | EN 61000-4-4 | Level 3: On power input port, $\pm 2\text{kV}$                            | Perf. Criteria A                                      |
| Surge                           | EN 61000-4-5 | Level 4: Line to earth, $\pm 4\text{kV}$ , Line to line, $\pm 2\text{kV}$ | Perf. Criteria A                                      |
| Conducted Immunity              | EN 61000-4-6 | Level 3: 0.15~80MHz, 10V                                                  | Perf. Criteria A                                      |
| Interruptions of Voltage Supply | EN 50155     | Class S3: 20ms interruptions                                              | Perf. Criteria A                                      |
| Supply Change Over              | EN 50155     | Class C2: During a supply break of 30ms                                   | Perf. Criteria A                                      |
| Application Note Link           |              |                                                                           | <a href="#">CQB50W12-72S CMFC(D) Series App Notes</a> |
| Packaging Information Link      |              |                                                                           | <a href="#">Packaging Information</a>                 |

## Immunity to Environmental Conditions.

| Phenomenon                                                    | EN 50155; 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: $-40^{\circ}\text{C}$<br>Duration: 2 hrs                                                                                                                                                                                                                      | Pass   |
| Dry Heat Test                                                 | 13.4.5                             | EN 60068-2-2       | Class OT4 & ST2<br>Temperature: $70^{\circ}\text{C}$<br>Duration: 6 hrs<br>Extended temperature: $85^{\circ}\text{C}$<br>Extended Duration: 10min                                                                                                                                       | Pass   |
| Low Temperature Storage Test                                  | 13.4.6                             | EN 60068-2-1       | Temperature: $-40^{\circ}\text{C}$<br>Duration: 16 hrs                                                                                                                                                                                                                                  | Pass   |
| Cyclic Damp Heat Test                                         | 13.4.7                             | EN 60068-2-30      | Temperature: $25^{\circ}\text{C}$ - $55^{\circ}\text{C}$<br>Humidity: 90 ~ 96% RH<br>Duration: 48 hrs                                                                                                                                                                                   | Pass   |
| Random Vibration Test                                         | 13.4.11                            | EN 61373           | Temperature: $26^{\circ}\text{C} \pm 3^{\circ}\text{C}$<br>Humidity: 50% $\pm 25\%$ RH<br>Frequency range: 5 ~ 150 Hz<br>Vertical: $1.01 \text{ m/s}^2$<br>Transverse: $0.450 \text{ m/s}^2$<br>Longitudinal: $0.700 \text{ m/s}^2$<br>Duration: 10 min / axis                          | Pass   |
| Simulated Long Life Test at Increased Random Vibration Levels | 13.4.11                            | EN 61373           | Temperature: $26^{\circ}\text{C} \pm 3^{\circ}\text{C}$<br>Humidity: 70% $\pm 5\%$ RH<br>Frequency range: 5 ~ 150 Hz<br>Vertical: $5.72 \text{ m/s}^2$<br>Transverse: $2.55 \text{ m/s}^2$<br>Longitudinal: $3.96 \text{ m/s}^2$<br>Duration: 5 hrs / axis                              | Pass   |
| Shock Test                                                    | 13.4.11                            | EN 61373           | Temperature: $26^{\circ}\text{C} \pm 3^{\circ}\text{C}$<br>Humidity: 70% $\pm 5\%$ RH<br>Frequency range: 5 ~ 150 Hz<br>$\pm$ Vertical: $30 \text{ m/s}^2$<br>$\pm$ Transverse: $30 \text{ m/s}^2$<br>$\pm$ Longitudinal: $50 \text{ m/s}^2$<br>Duration: 30ms x18 (Each axis 3 shocks) | Pass   |



# CQB50W12 CMFC(D) Series

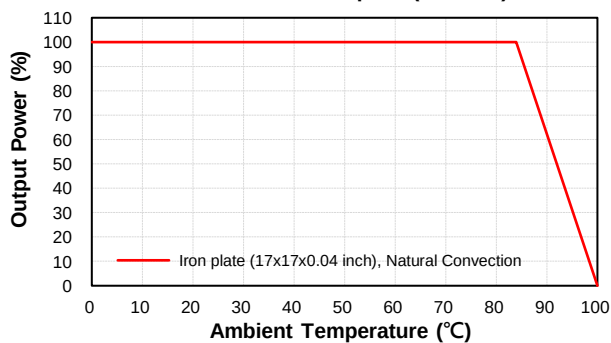
## EN 45545-2 Fire & Smoke Test Conditions.

| Item |                     | Standard                                              | Hazard Level  |
|------|---------------------|-------------------------------------------------------|---------------|
| R22  | Oxygen Index Test   | EN 45545-2: 2013+A1:2015<br>EN ISO 4589-2: 2017       | HL1, HL2, HL3 |
|      | Smoke Density Test  | EN 45545-2: 2013+A1:2015<br>EN ISO 5659-2: 2017       | HL1, HL2, HL3 |
|      | Smoke Toxicity Test | EN 45545-2: 2013+A1:2015<br>NF X70-100-1 and -2: 2006 | HL1, HL2, HL3 |
| R23  | Oxygen Index Test   | EN 45545-2: 2013+A1:2015<br>EN ISO 4589-2: 2017       | HL1, HL2, HL3 |
|      | Smoke Density Test  | EN 45545-2: 2013+A1:2015<br>EN ISO 5659-2: 2013       | HL1, HL2, HL3 |
|      | Smoke Toxicity Test | EN 45545-2: 2013+A1:2015<br>NF X70-100-1 and -2: 2006 | HL1, HL2, HL3 |
| R24  | Oxygen Index Test   | EN 45545-2: 2013<br>EN ISO 4589-2                     | HL1, HL2, HL3 |
| R25  | Glow - Wire Test    | EN 45545-2+A1:2016<br>EN 60695-2-11:2014              | HL1, HL2, HL3 |
| R26  | Vertical Flame Test | EN 45545-2: 2013<br>EN 60695-11-10: 2013              | HL1, HL2, HL3 |

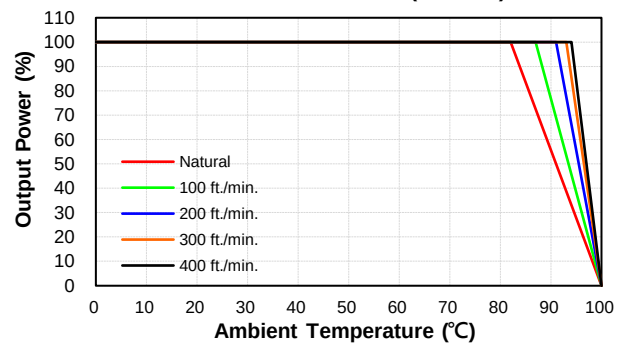
## CHARACTERISTIC CURVE

### Power Derating Curve

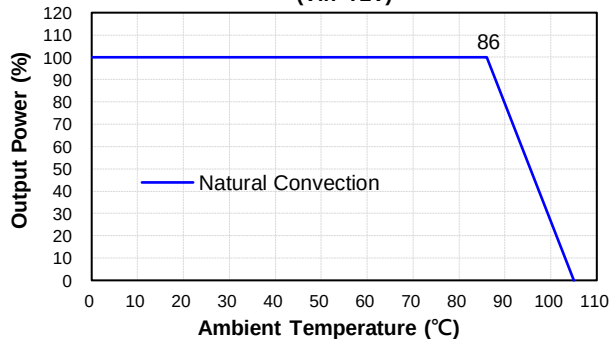
CQB50W12-72S CMFC(D) Derating Curve  
with Heatsink Iron plate (Vin=72V)



CQB50W12-72S CMFC(D) Derating Curve  
with Heatsink FBL254 (Vin=72V)



CQB50W12-72S-CMFD+HS(HD) Derating Curve  
(Vin=72V)

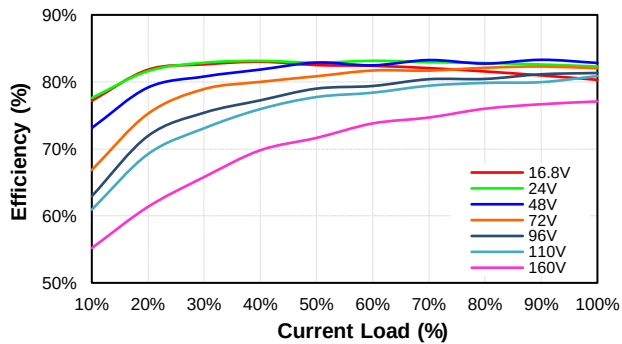




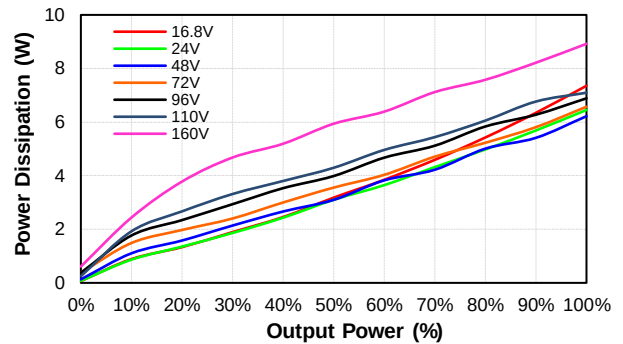
# CQB50W12 CMFC(D) Series

## Performance Data

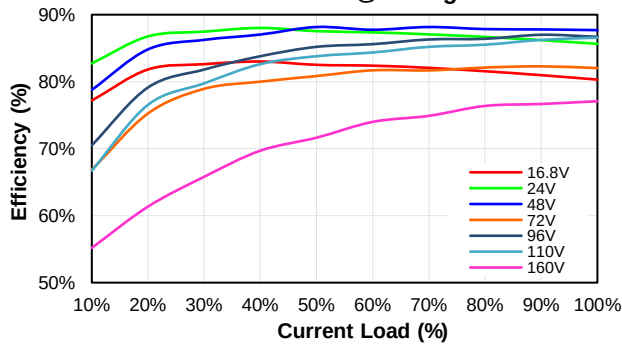
CQB50W12-72S05-CMFC  
Eff Vs Io @25 Deg. C



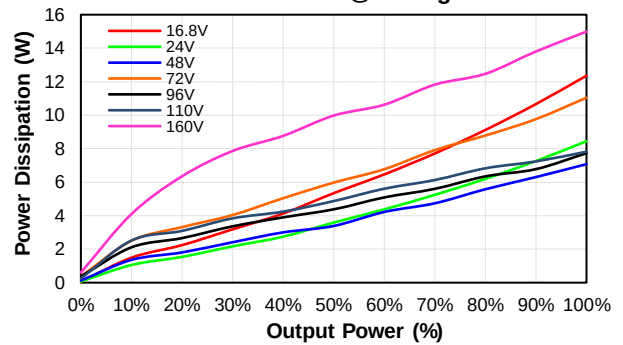
CQB50W12-72S05-CMFC  
Pd Vs Po @25 Deg. C



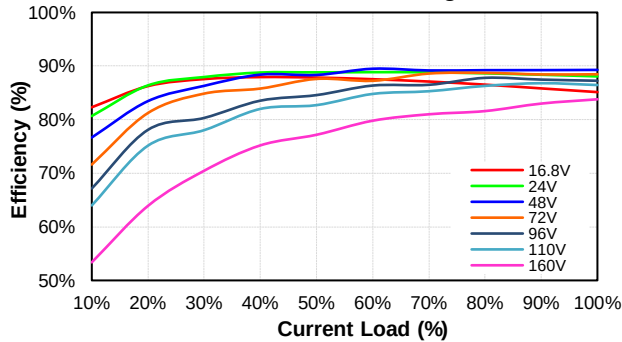
CQB50W12-72S12-CMFC  
Eff Vs Io @25 Deg. C



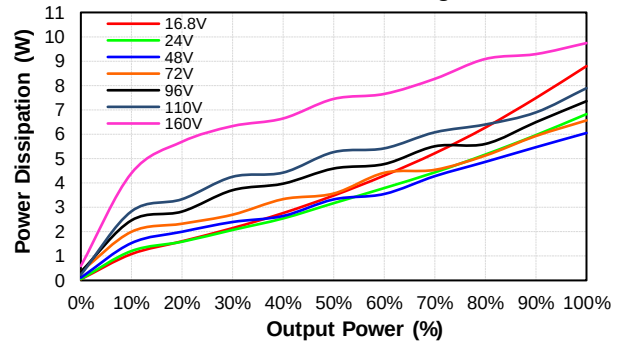
CQB50W12-72S12-CMFC  
Pd Vs Po @25 Deg. C



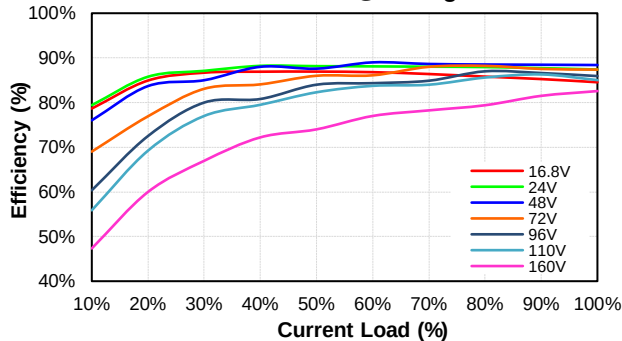
CQB50W12-72S24-CMFC  
Eff Vs Io @25 Deg. C



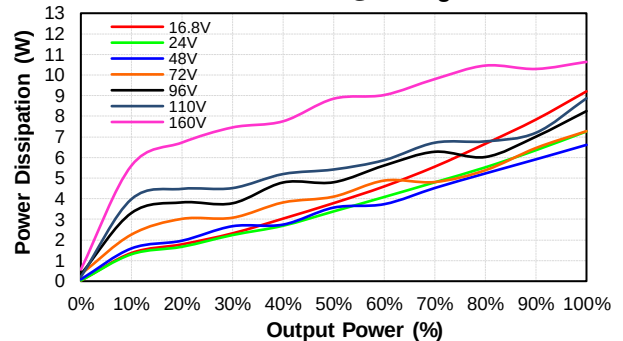
CQB50W12-72S24-CMFC  
Pd Vs Po @25 Deg. C



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



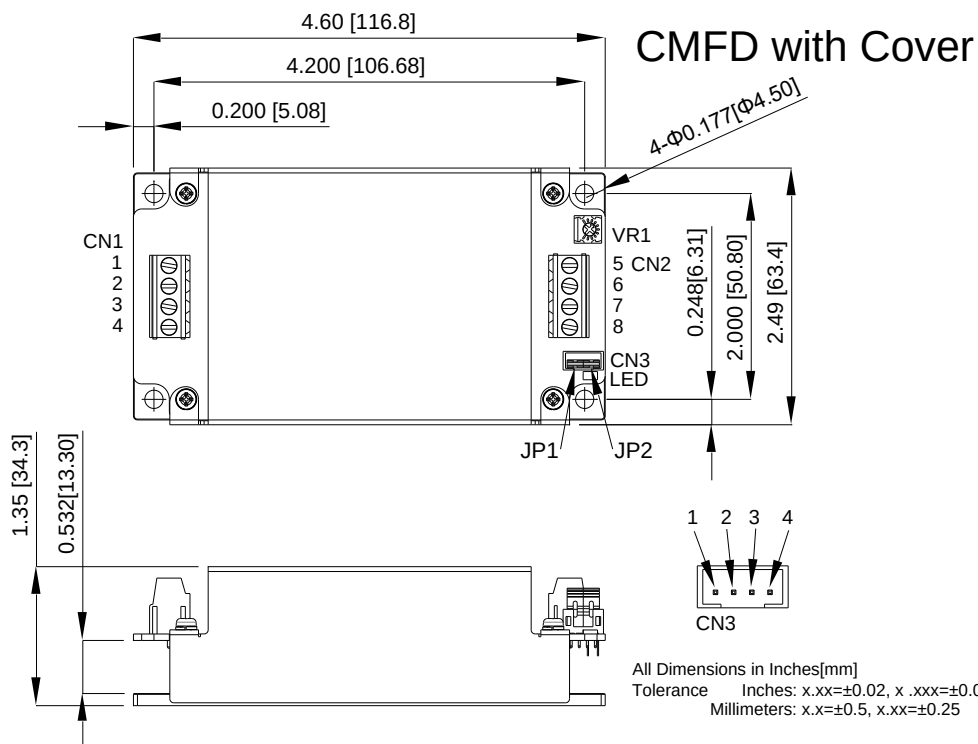
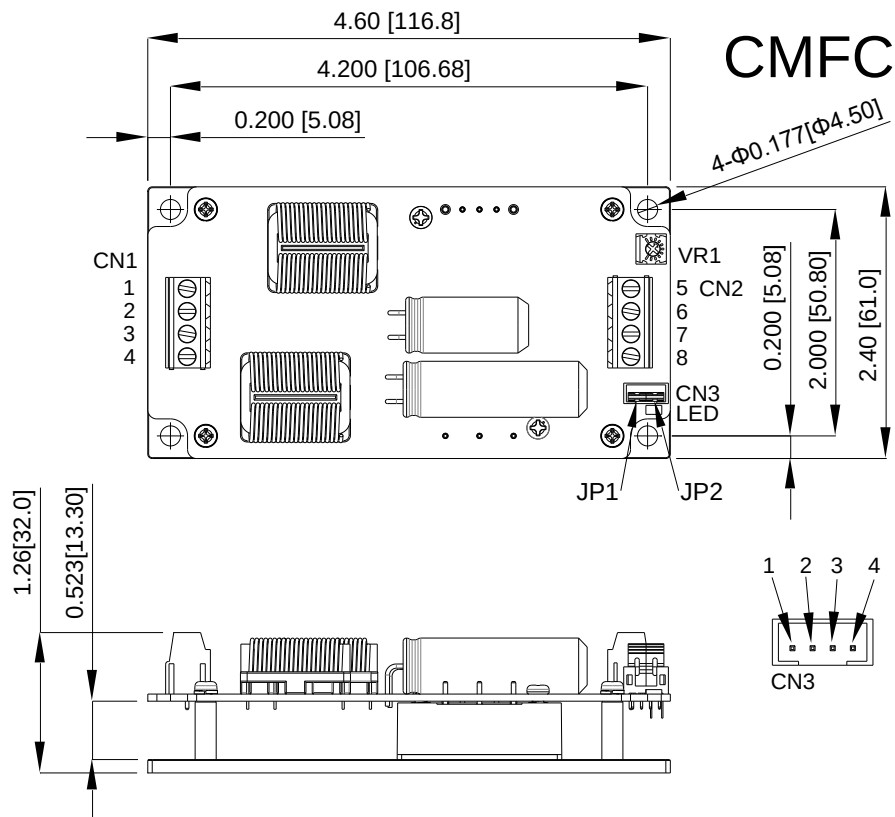
CQB50W12-72S48-CMFC  
Pd Vs Po @25 Deg. C





# CQB50W12 CMFC(D) Series

## MECHANICAL SPECIFICATION



CN1 & CN2  
PIN CONNECTION

| PIN | Function  |
|-----|-----------|
| 1   | +V Input  |
| 2   | -V Input  |
| 3   | Remote    |
| 4   | Case      |
| 5   | +V Output |
| 6   | +V Output |
| 7   | -V Output |
| 8   | -V Output |

CN3  
PIN CONNECTION

| PIN | Function  |
|-----|-----------|
| 1   | -V Output |
| 2   | -Sense    |
| 3   | +Sense    |
| 4   | +V Output |

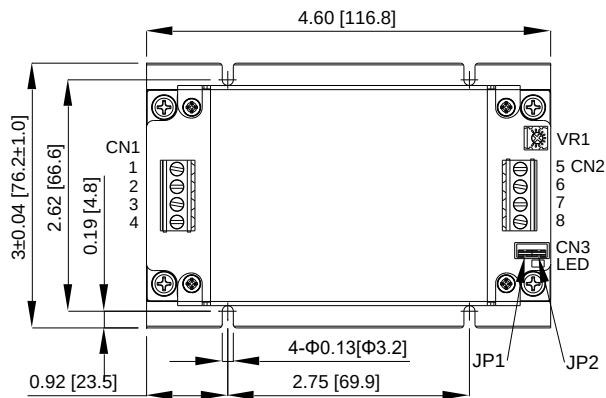
\*JP1: Short PIN1 & PIN2  
\*JP2: Short PIN3 & PIN4



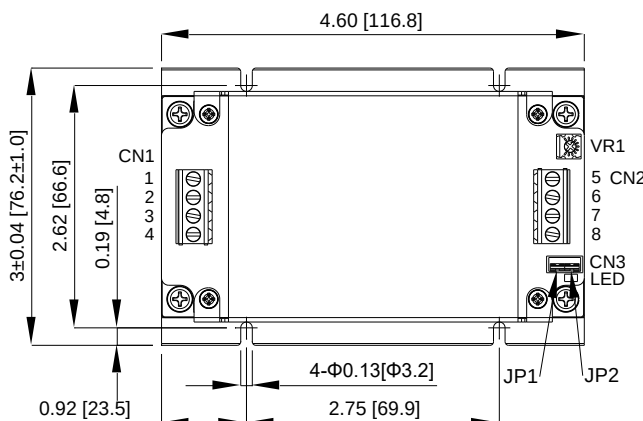
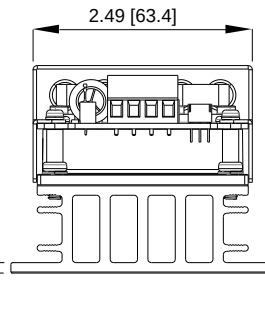
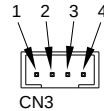


# CQB50W12 CMFC(D) Series

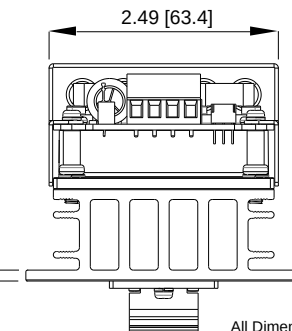
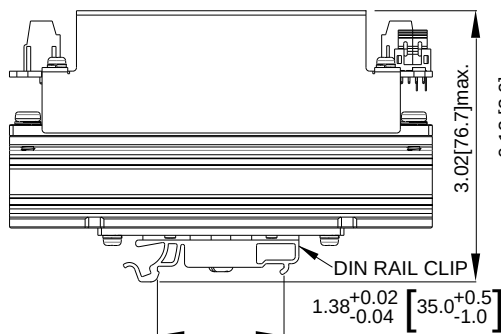
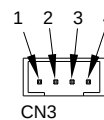
## MECHANICAL SPECIFICATION



### CMFD+HS



### CMFD+HD



#### CN1 & CN2 PIN CONNECTION

| PIN | Function  |
|-----|-----------|
| 1   | +V Input  |
| 2   | -V Input  |
| 3   | Remote    |
| 4   | Case      |
| 5   | +V Output |
| 6   | +V Output |
| 7   | -V Output |
| 8   | -V Output |

#### CN3 PIN CONNECTION

| PIN | Function  |
|-----|-----------|
| 1   | -V Output |
| 2   | -Sense    |
| 3   | +Sense    |
| 4   | +V Output |

\*JP1: Short PIN1 & PIN2  
\*JP2: Short PIN3 & PIN4

All Dimensions in Inches[mm]  
Tolerance Inches: x.xx=±0.02, x.xxx=±0.010  
Millimeters: x.x=±0.5, x.xx=±0.25