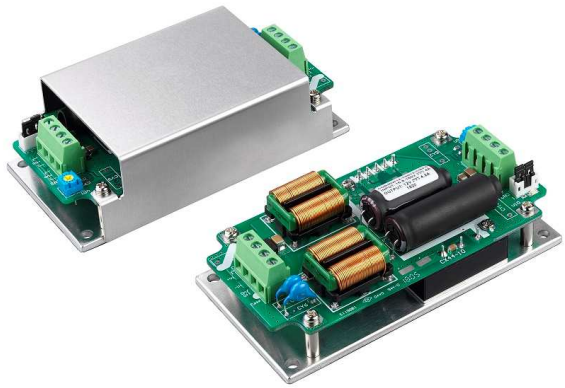
CQB50W12-CMFC(D) SERIES
30-50 WATT 12:1 INPUT ISOLATED DC-DC CONVERTERS

Features

- Efficiency Up to 89%
- Fixed Switching Frequency
- Regulated Outputs
- Remote On/Off
- Low No Load Power Consumption
- Fully protected (OTP/OCP/OVP/UVLO)
- 3000Vdc I/O Isolation
- Operating Case Temperature -40 to +100℃
- UL60950-1 2nd (Basic Insulation) Approval for DC Modules
- EN50155 for EMC, Environmental and Characteristic
- Shock & Vibration EN50155 (EN61373) Compliant
- Fire & Smoke EN45545-2 Compliant
- Safety Meets IEC/EN/UL 60950-1
- Build-In EMI Filter
- Chassis Mount, Baseplate Cooled



CE Railway System

MODEL NUMBER	INPUT VOLTAGE	OUTPUT VOLTAGE	OUTPUT CURRENT		INPUT CURRENT		% EFF.	CAPACITOR LOAD MAX.
			MIN.	MAX.	NO LOAD	FULL LOAD		
CQB50W12-72S05□-CMFC CQB50W12-72S05□-CMFD	14-160 VDC	5 VDC	0 mA	6.0 A	8 mA	530 mA	83	10000uF
CQB50W12-72S12□-CMFC CQB50W12-72S12□-CMFD	14-160 VDC	12 VDC	0 mA	4.2 A	8 mA	810 mA	87	6800uF
CQB50W12-72S24□-CMFC CQB50W12-72S24□-CMFD	14-160 VDC	24 VDC	0 mA	2.1 A	8 mA	810 mA	89	3300μF
CQB50W12-72S48□-CMFC 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^2).

PART NUMBER

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

Part Number Example:

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

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_{dc}
Input Surge Voltage	100ms max.	All			200	V_{dc}
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_{dc}
Input Under Voltage Lockout						
Turn-On Voltage Threshold	Full load	All	14.2	14.6	15	V_{dc}
Turn-Off Voltage Threshold	Full load	All	11.6	12.6	13	V_{dc}
Lockout Hysteresis Voltage	Full load	All		2.0		V_{dc}
Maximum Input Current	V_{in}=16.8V, Full load	72S05 Other		2.3 4		A
No-Load Input Current	V_{in}=72V, Io=0A	See Model Number Table				mA

OUTPUT CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Voltage Set Point Accuracy	V_{in}=72V, Full Load, Tc=25°C	All	-1.0		+1.0	%
Output Voltage Regulation						
Load Regulation	Full load to no load	All			±0.2	%
Line Regulation	V_{in}=High line to low line, full load	All			±0.2	%
Temperature Coefficient	Tc=-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_{in}= 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	Po≦max rated power, $I_o \leqq I_{o_max}$	All	-20		+10	%
Output Voltage Remote Sense Range	Po≦max rated power, $I_o \leqq I_{o_max}$ % of nominal Vo	All			+10	%
Over Voltage Protection	Limited voltage, % of nominal Vo	All	115	125	140	%

EFFICIENCY

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
100% Load	Vin=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_{o_max} step load change d_i/d_t=0.1A/us (within 1% Vout nominal)	All			±5	%
Recovery Time					250	us

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 (100% factory Hi-Pot tested @2sec.)	1 minute; Input to output 1 minute; Input to case (base plate) 1 minute; Output to case (base plate)	All			3000 2500 500	V_{dc} V_{ac}
Isolation Resistance	Input to output	All	200			MΩ
Isolation Capacitance	Input to output Input to case (base plate) Output to case (base plate)	All		3000 5000 10000		pF

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		3.5		160	
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		0		1.2	
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		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_o=100% of I_{o_max}; MIL-HDBK - 217F_Notice 1, GB, 25°C	72S05 36S12 36S24 36S48		506 484 515 513		K hours
Weight		-CMFC -CMFD		215 250		grams
Base plate Material	Aluminum					
Potting Material	UL 94V-0 (DC Module)					
Shock/Vibration	EN50155 (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	EN55032 & EN50155 Compliant (with external output filter)					Class A
ESD	EN61000-4-2 Level 3: Air ±8kV, Contact ±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, ±2kV					Perf. Criteria A
Surge	EN61000-4-5 Level 4: Line to earth, ±4kV, Line to line, ±2kV					Perf. Criteria A

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 30ms	Perf. Criteria A
Application Note Link			CQB50W12-72S CMFC(D) Series App Notes
Packaging Information Link			Packaging Information

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℃ Duration: 2 hrs	Pass
Dry Heat Test	13.4.5	EN 60068-2-2	Class OT4 & ST2 Temperature: 70℃ Duration: 6 hrs Extended temperature: 85℃ Extended Duration: 10min	Pass
Low Temperature Storage Test	13.4.6	EN 60068-2-1	Temperature: -40℃ Duration: 16 hrs	Pass
Cyclic Damp Heat Test	13.4.7	EN 60068-2-30	Temperature: 25℃ - 55℃ Humidity: 90 ~ 96% RH Duration: 48 hrs	Pass
Random Vibration Test	13.4.11	EN 61373	Temperature: 26℃ +/- 3℃ Humidity: 50% +/-25% 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℃ +/-3℃ 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℃ +/-3℃ 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

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

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 30ms	Perf. Criteria A
Application Note Link			CQB50W12-72S CMFC(D) Series App Notes
Packaging Information Link			Packaging Information

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℃ Duration: 2 hrs	Pass
Dry Heat Test	13.4.5	EN 60068-2-2	Class OT4 & ST2 Temperature: 70℃ Duration: 6 hrs Extended temperature: 85℃ Extended Duration: 10min	Pass
Low Temperature Storage Test	13.4.6	EN 60068-2-1	Temperature: -40℃ Duration: 16 hrs	Pass
Cyclic Damp Heat Test	13.4.7	EN 60068-2-30	Temperature: 25℃ - 55℃ Humidity: 90 ~ 96% RH Duration: 48 hrs	Pass
Random Vibration Test	13.4.11	EN 61373	Temperature: 26℃ +/- 3℃ Humidity: 50% +/-25% 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℃ +/-3℃ 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℃ +/-3℃ 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

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

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 30ms	Perf. Criteria A
Application Note Link			CQB50W12-72S CMFC(D) Series App Notes
Packaging Information Link			Packaging Information

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℃ Duration: 2 hrs	Pass
Dry Heat Test	13.4.5	EN 60068-2-2	Class OT4 & ST2 Temperature: 70℃ Duration: 6 hrs Extended temperature: 85℃ Extended Duration: 10min	Pass
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Cyclic Damp Heat Test	13.4.7	EN 60068-2-30	Temperature: 25℃ - 55℃ Humidity: 90 ~ 96% RH Duration: 48 hrs	Pass
Random Vibration Test	13.4.11	EN 61373	Temperature: 26℃ +/- 3℃ Humidity: 50% +/-25% 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℃ +/-3℃ 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℃ +/-3℃ 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

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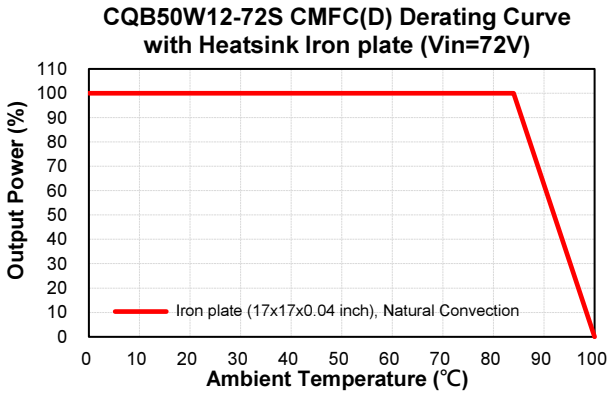
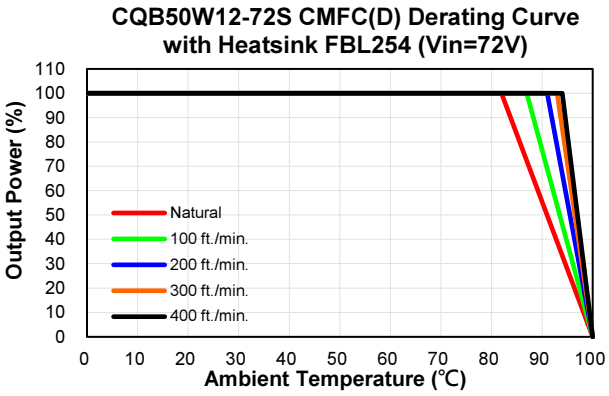
	Smoke Toxicity Test	EN 45545-2: 2013 NF X70-100: 2006	HL1, HL2, HL3
R24	Oxygen Index Test	EN45545-2: 2013 EN ISO 4589-2	HL1, HL2, HL3
R25	Glow - Wire Test	EN 45545-2:2013 EN 60695-2-11:2001	HL1, HL2, HL3
R26	Vertical Flame Test	EN 45545-2: 2013 EN 60695-11-10: 2013	HL1, HL2, HL3

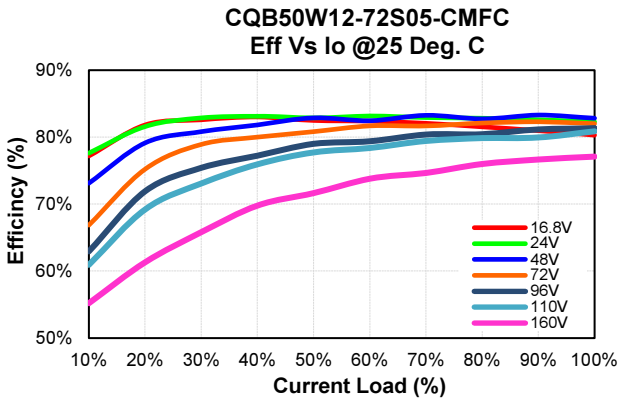
CHARACTERISTIC CURVE

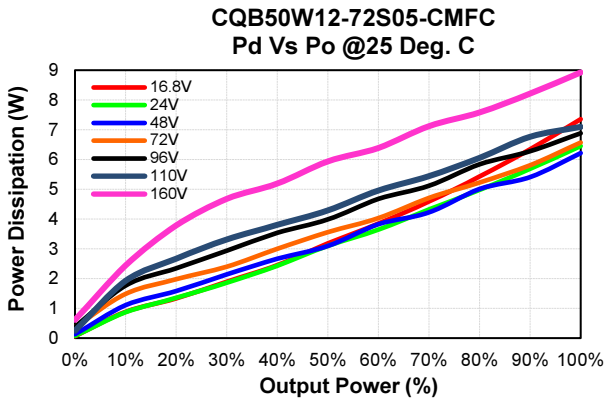
Power Derating Curve

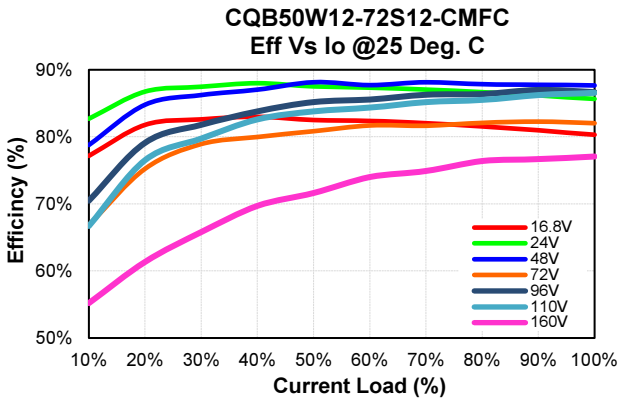


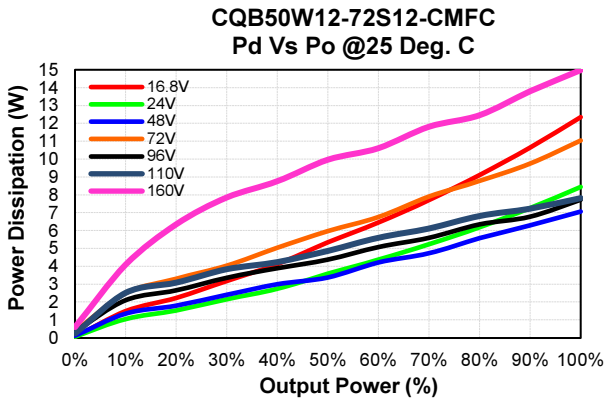


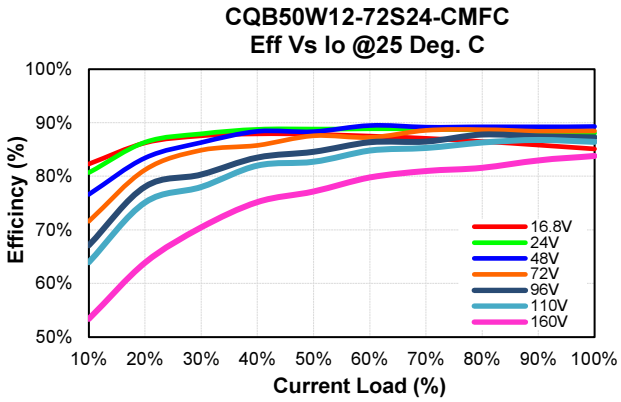
Performance Data

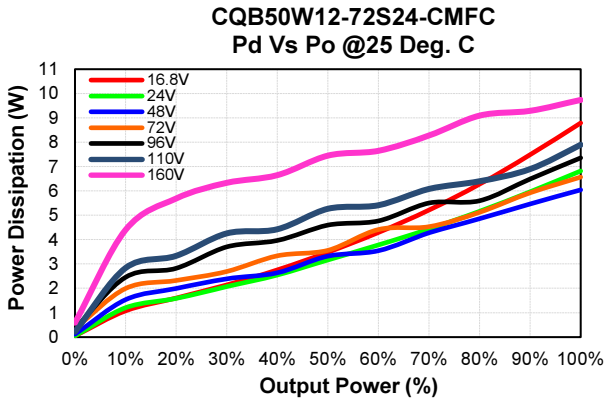


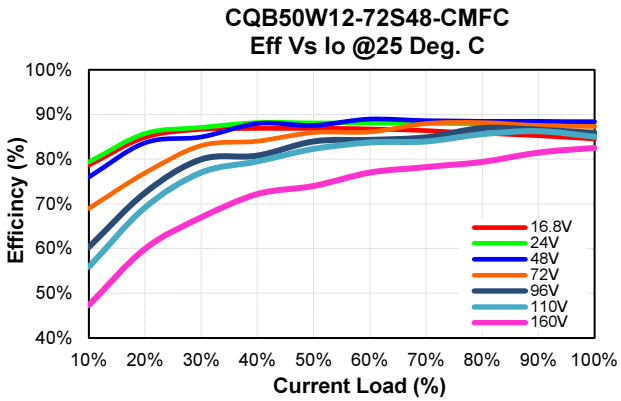


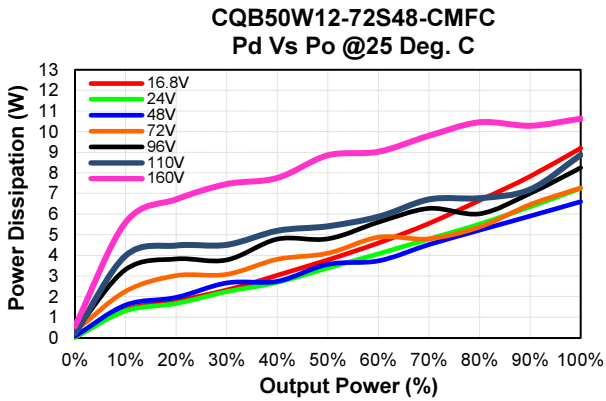





CQB50W12-72S24-CMFC
Eff Vs Io @25 Deg. C
Efficincy (%)
100%
90%
80%
70%
60%
50%
10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
Current Load (%)
16.8V
24V
48V
72V
96V
110V
160V

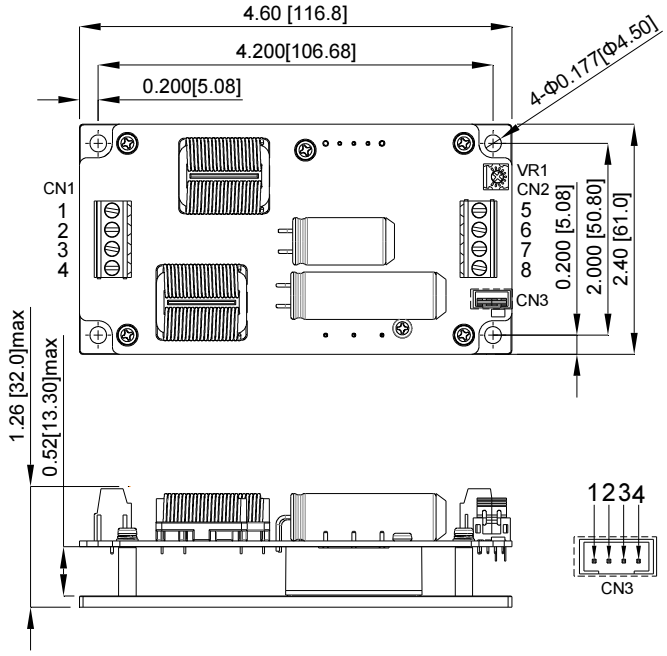

CQB50W12-72S24-CMFC
Pd Vs Po @25 Deg. C
Power Dissipation (W)
11
10
9
8
7
6
5
4
3
2
1
0
0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
Output Power (%)
16.8V
24V
48V
72V
96V
110V
160V


CQB50W12-72S48-CMFC
Eff Vs Io @25 Deg. C
Efficincy (%)
100%
90%
80%
70%
60%
50%
40%
10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
Current Load (%)
16.8V
24V
48V
72V
96V
110V
160V


CQB50W12-72S48-CMFC
Pd Vs Po @25 Deg. C
Power Dissipation (W)
13
12
11
10
9
8
7
6
5
4
3
2
1
0
0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
Output Power (%)
16.8V
24V
48V
72V
96V
110V
160V

MECHANICAL SPECIFICATION

CMFC



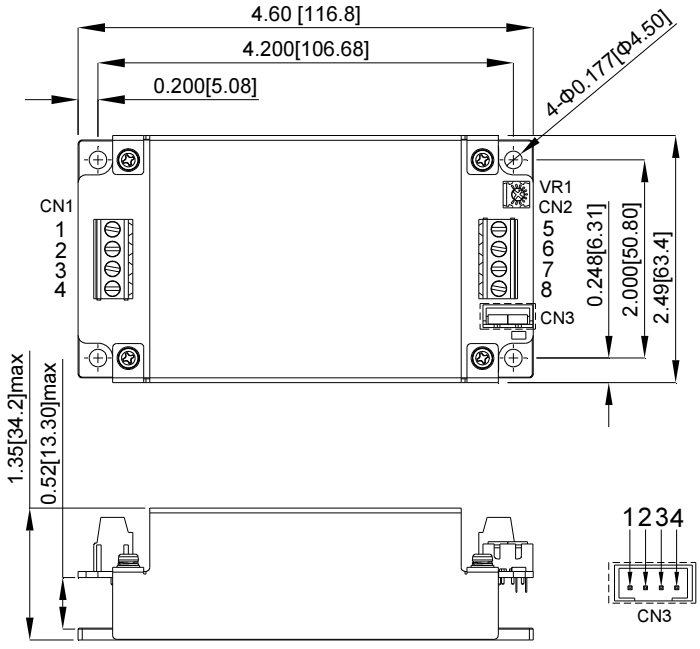
CN1&CN2
PIN CONNECTION

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

CMFD with Cover



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

All Dimensions in Inches(mm)
Tolerance Inches: x.xx=±0.02, X.XXX=±0.010
Millimeters: x.x=±0.5, XXX=±0.25

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