CQM60W SERIES
60 WATT 4:1 INPUT MEDICAL ISOLATED DC-DC CONVERTER

Features

- Efficiency up to 93.5%
- Fixed Switching Frequency
- Regulated Outputs
- Remote On/Off
- Low No Load Power Consumption
- Fully Protected (OTP/OCP/OVP/UVLO)
- 5000Vac I/O Isolation for 250Vac Working Voltage
- Operating Ambient Temperature -40 to +105℃
- EN 60601-1-2, EN 55032, EN 55035 Approval
- IEC/UL 60601-1 3rd 2 MOPP Approval
- Design Meets CF Rated Medical Applications
- 5000m Operating Altitude

MODEL NUMBER	INPUT VOLTAGE	OUTPUT VOLTAGE	OUTPUT CURRENT		INPUT CURRENT		% EFF.		CAPACITOR LOAD MAX.
			MIN.	MAX.	NO LOAD	FULL LOAD	(2)	(1)	
CQM60W-24S05	9-36 VDC	5 VDC	0 mA	12000 mA	15 mA	2809 mA	87.5	89	12000μF
CQM60W-24S12	9-36 VDC	12 VDC	0 mA	5000 mA	15 mA	2674 mA	92	93.5	5000μF
CQM60W-24S15	9-36 VDC	15 VDC	0 mA	4000 mA	15 mA	2674 mA	92	93.5	4000μF
CQM60W-24S24	9-36 VDC	24 VDC	0 mA	2500 mA	15 mA	2778 mA	89	90	2500μF
CQM60W-24D12	9-36 VDC	±12 VDC	0 mA	±2500 mA	15 mA	2778 mA	89	90	2500μF
CQM60W-24D15	9-36 VDC	±15 VDC	0 mA	±2000 mA	15 mA	2762 mA	89	90.5	2000μF

NOTE:

1. Nominal input voltage 24V_{dc}.
2. Measured at 12V_{in}.

PART NUMBER

Series	Nominal Input Voltage	Number of Outputs	Nominal Output Voltage	Remote On/Off Logic
CQM60W-	II	O	XX	L
CQM60W	24 : 24 VDC	S : Single D : Dual	05 : 5.0VDC 12 : 12VDC 15 : 15VDC 24 : 24VDC 12 : ±12VDC 15 : ±15VDC	None : Positive N : Negative

Part Number Example:

CQM60W-24S12N: Quarter Brick, 60W, 4:1 9-36V_{dc} Input, Single 12V_{dc} Output, Negative Logic

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CQM60W Series

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	All	-0.3		36	V_{dc}
Input Surge Voltage	100ms max.	All			50	V_{dc}
Operating Ambient Temperature	With derating	All	-40		105	℃
Maximum Case Temperature	See note for case temperature measurement point	All			105	℃
Storage Temperature		All	-55		125	℃

INPUT CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Operating Input Voltage		All	9	24	36	V_{dc}
Input Under Voltage Lockout						
Turn-On Voltage Threshold	Full load	All	7.8	8.3	8.8	V_{dc}
Turn-Off Voltage Threshold	Full load	All	7.1	7.6	8.1	V_{dc}
Lockout Hysteresis Voltage	Full load	All		0.7		V_{dc}
Maximum Input Current	V_{in}=9V, Full load	All		8.0		A
No-Load Input Current	V_{in}=24, 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, Full load, T_c=25℃	All	-1.0		+1.0	%
Output Voltage Balance	V_{in}=24, Full load, T_c=25℃	Dual	-1.0		+1.0	%
Output Voltage Regulation						
Load Regulation	Full load to no load	Single Dual			±0.2 ±1.0	%
Line Regulation	V_{in}=High line to low line, full load	All			±0.2	%
Cross Regulation	Load cross variation 25%/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.	5Vo Others			100 150	mV
Output Current Range	V_{in}= 9 to 36V	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, $I_o \leqq I_{o\_max.}$	5Vo Others	-5 -10		+10 +20	%
Output Voltage Remote Sense Range	$P_o \leqq$ max. rated power, $I_o \leqq I_{o\_max.}$ % of nominal V_o	5Vo Others			+10 +20	%
Over Voltage Protection	Limited voltage, % of nominal V_o	All	120	125	130	%

EFFICIENCY

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
100% Load	V_{in}=24V	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 di/dt=0.1A/us (within 1% V_{out} nominal)	All			±5	%
Recovery Time		All			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		5		ms
Turn-On Delay Time, From Input	$V_{in\_min.}$ to 10%V_{o_set}, Power up	All		5		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			5000	V_{ac}
Isolation Resistance	Input to output	All	10			GΩ
Isolation Capacitance	Input to output (100KHz, 0.25V)	All		40		pF
Leakage Current	Touch current	All			4.5	uA
Creepage Distance	Input to output	All	8			mm
Clearance Distance	Input to output	All	8			mm

FEATURE CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Switching Frequency	Pulse width modulation (PWM), Fixed	All	180	200	220	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		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	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	uA
Off Converter Input Current	Shutdown input idle current	All		1.5	3	mA
Over Temperature Shutdown	See Note for case temperature measurement point, non-latching	All		115		℃
Over Temperature Recovery				85		℃

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℃	24S05		1093		K hours
		24S12		1323		
		24S15		1529		
		24S24		1248		
		24D12		1044		
		24D15		1427		
Weight		All		67		grams
Case Material	Plastic, DAP, UL 94V-0					
Base Material	Plastic, DAP, UL 94V-0					
Potting Material	UL 94V-0					
Pin Material	Base: Copper plated steel wire Plating: Tin					
Safety	IEC 60601-1, ANSI/AAMI ES 60601-1					

CQM60W Series

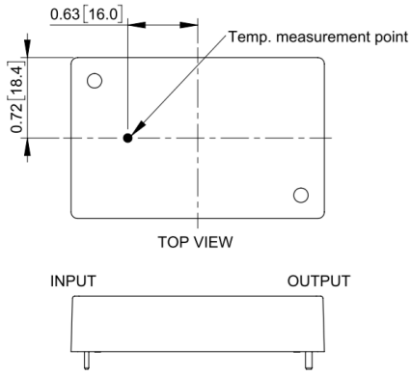
GENERAL SPECIFICATIONS

Shock/Vibration	MIL-STD-810F
Humidity	95% RH max. Non condensing
Altitude	5000m Operating altitude, 12000m Transport altitude
Thermal Shock	MIL-STD-810F

EMC SPECIFICATIONS (External components required, please refer to application note.)

EMI	EN 60601-1-2, EN 55032, EN/IEC 61204-3, FCC Part 15B, EN/IEC 61000-6-4, ICES-003 Issue 7, with external filter	Class A
EMS	EN 55035, EN/IEC 61204-3, EN/IEC 61000-6-1, EN/IEC 61000-6-2	
	EN 60601-1-2	Ed 4.1
ESD	EN 61000-4-2 Level 4: Air ±15kV, Contact ±8kV	Perf. Criteria A
Radiated Immunity	EN 61000-4-3 Level 3: 80MHz~2.7GHz: 10V/m	Perf. Criteria A
Fast Transient	EN 61000-4-4 Level 3: On power input port, ±2kV, with external circuit	Perf. Criteria A
Surge	EN 61000-4-5 Level 4: Line to line, ±2kV, with external circuit	Perf. Criteria A
Conducted Immunity	EN 61000-4-6 Level 2: 0.15~80MHz, 3V (EN 60601-1-2) Level 3: 0.15~80MHz, 10V (EN/IEC 61204-3)	Perf. Criteria A
Power Frequency Magnetic Field	EN 61000-4-8 Level 4: 50Hz & 60Hz 30A/m	Perf. Criteria A
Proximity Magnetic Fields	EN 61000-4-39 30kHz,8A/m ≧ 2sec, Continuous wave 134.2kHz,65A/m ≧ 2sec, Plus modulation 2.1kHz 13.56MHz,7.5A/m ≧ 2sec, Plus modulation 50kHz	Perf. Criteria A
Application Note Link		CQM60W Series App Notes
Packaging Information Link		Packaging Information

Note: The center point of the case is offset by 16mm toward the input side.



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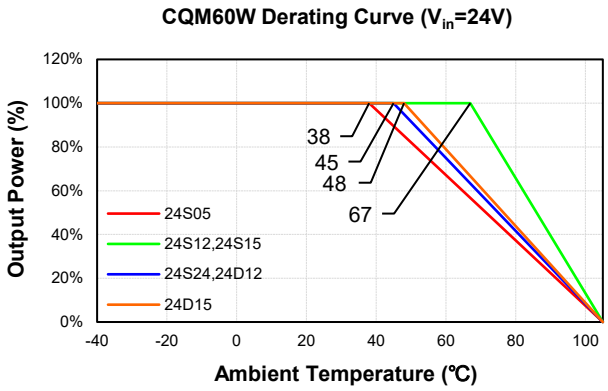
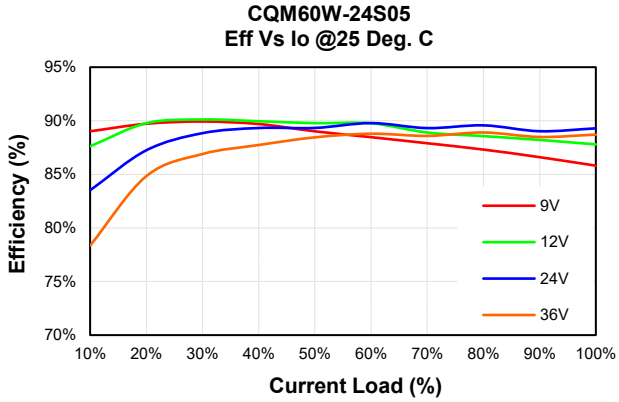
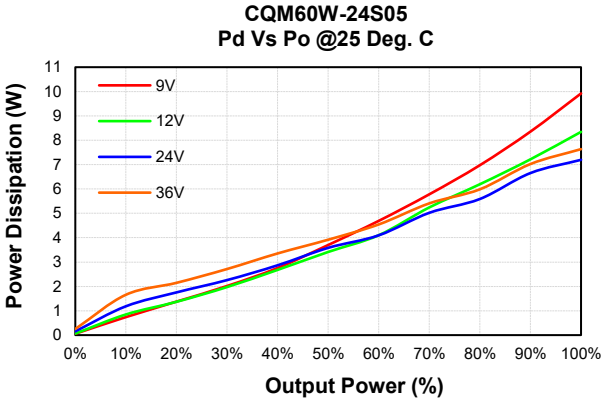
CHARACTERISTIC CURVE

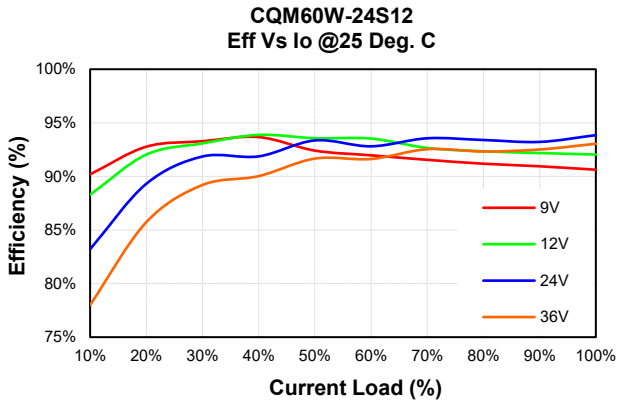
Power Derating Curve

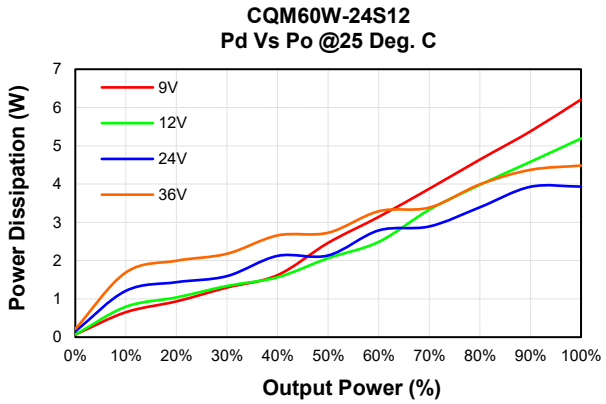


Performance Data









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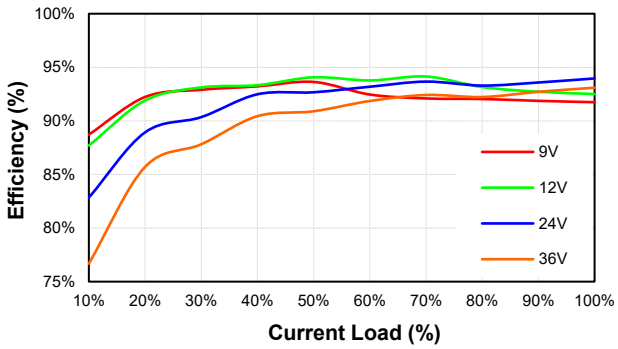
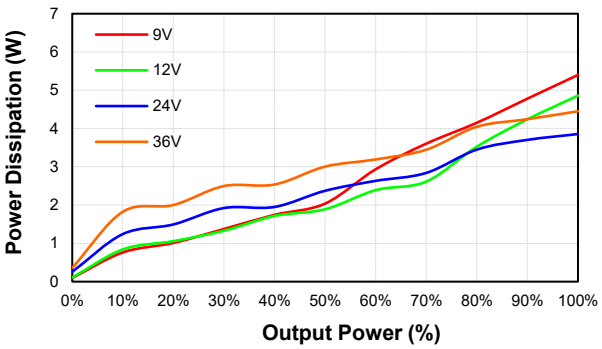
CQM60W Series

CQM60W-24S15
Eff Vs Io @25 Deg. C



CQM60W-24S15
Pd Vs Po @25 Deg. C



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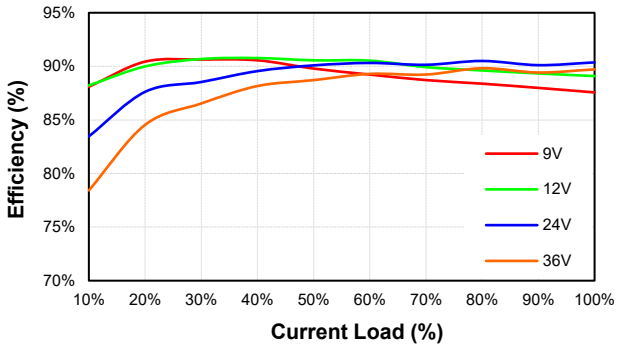

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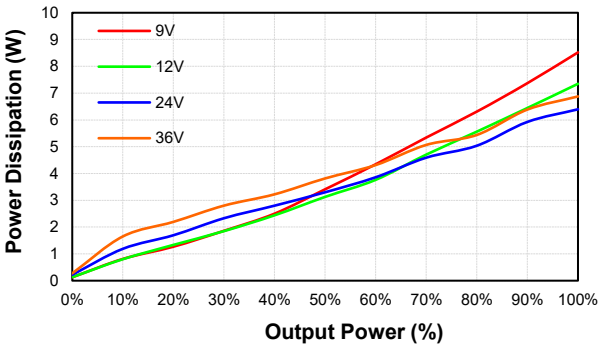
Pd Vs Po @25 Deg. C



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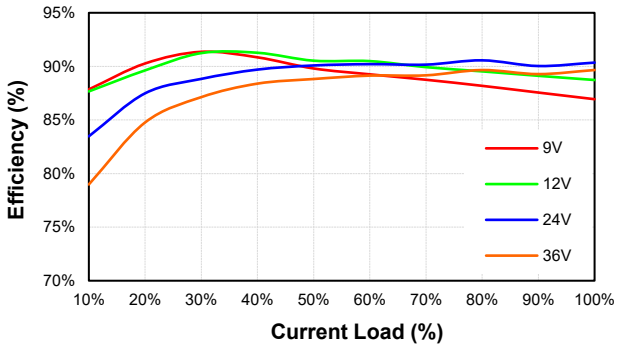

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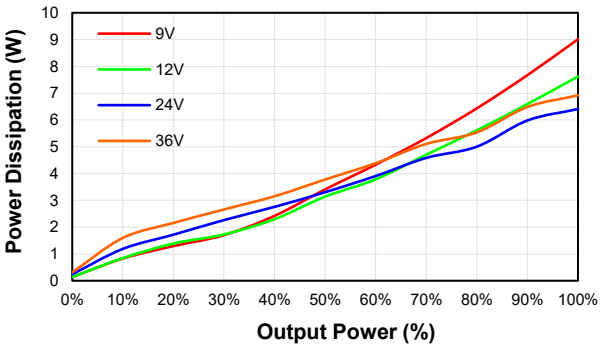

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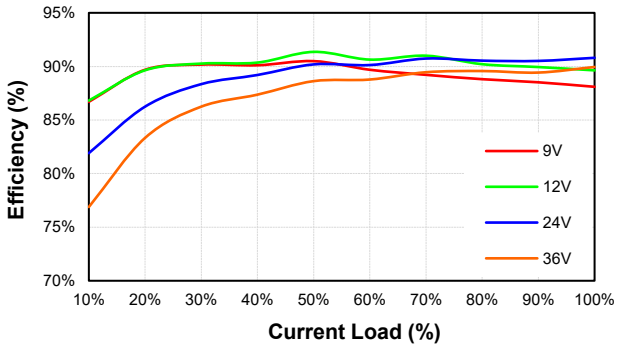
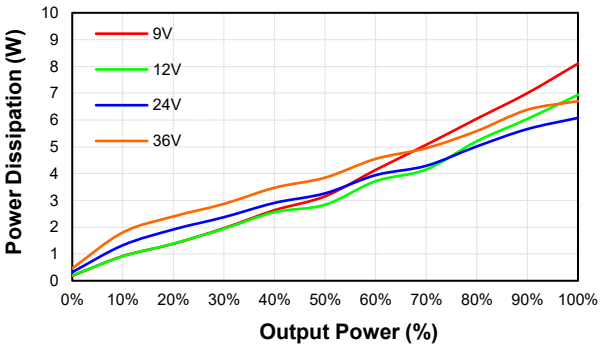


CQM60W-24D15
Pd Vs Po @25 Deg. C



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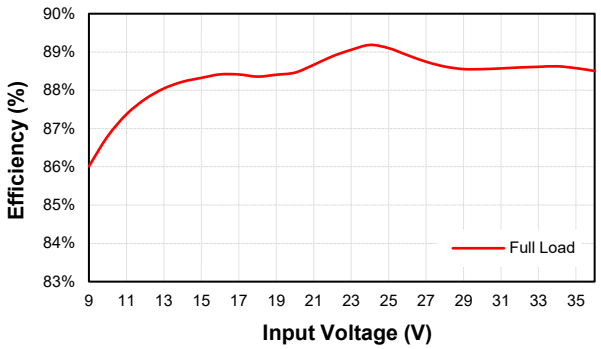
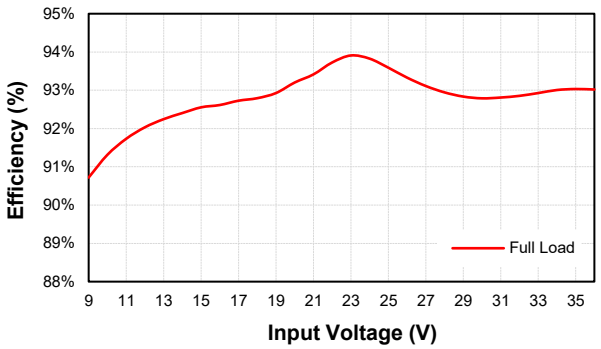
CQM60W Series

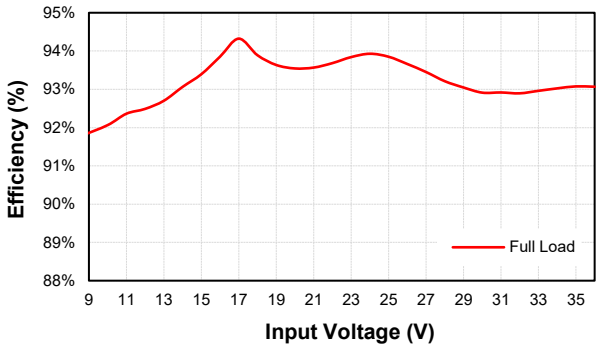
CQM60W-24S05
Eff Vs V_{in} @25 Deg. C



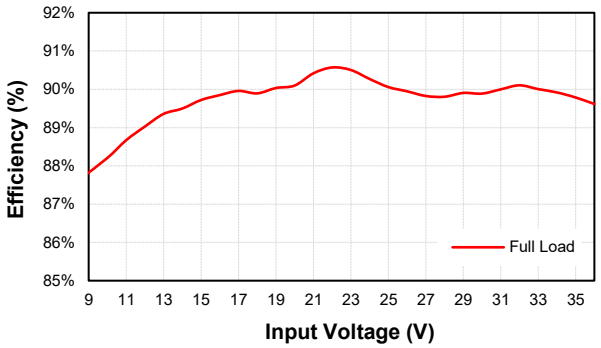
CQM60W-24S12
Eff Vs V_{in} @25 Deg. C



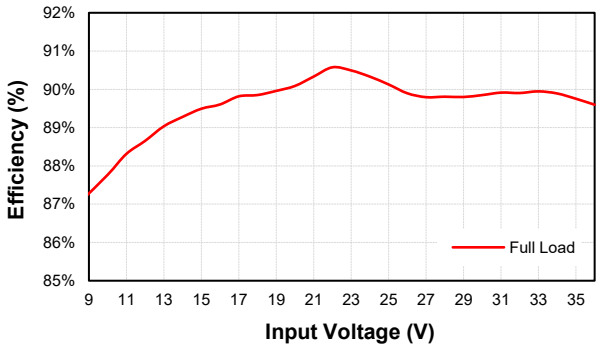
CQM60W-24S15
Eff Vs V_{in} @25 Deg. C



CQM60W-24S24
Eff Vs V_{in} @25 Deg. C



CQM60W-24D12
Eff VsV_{in} @25 Deg. C



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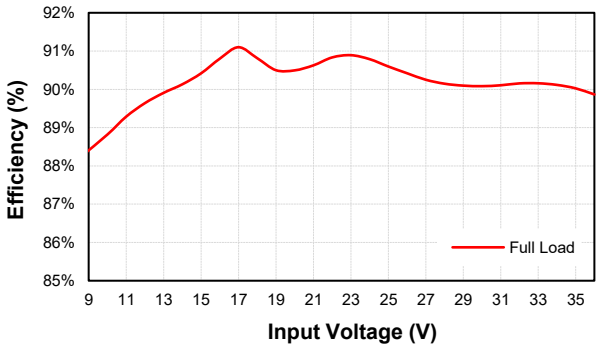
Eff Vs V_{in} @25 Deg. C



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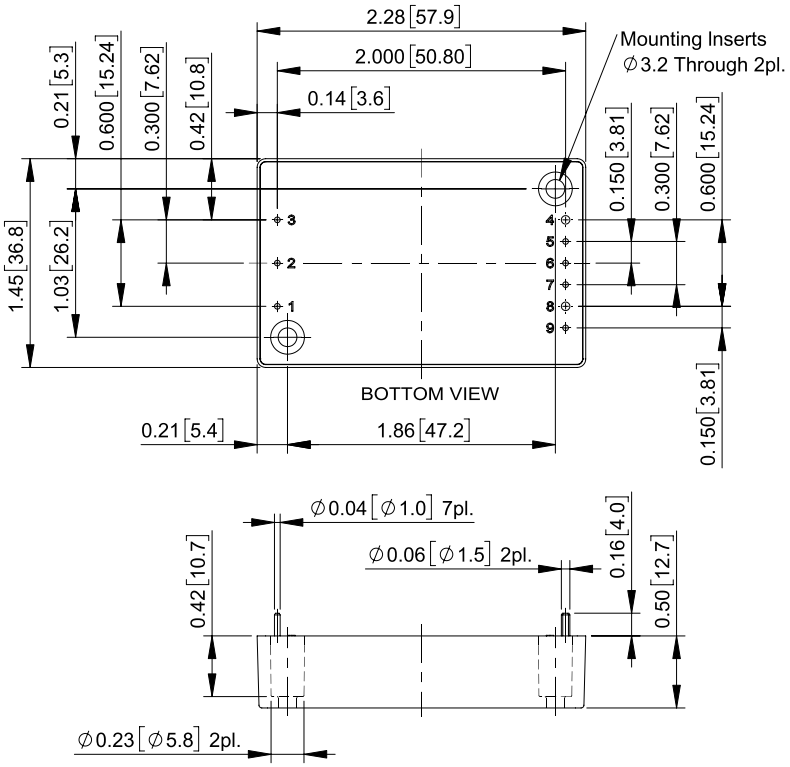
CQM60W Series

MECHANICAL SPECIFICATION



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

Pin Connection

Pin	Single Output	Dual Output
1	+V Input	+V Input
2	On/Off	On/Off
3	-V Input	-V Input
4	-V Output	-V Output
5	-Sense	-Sense
6	Trim	Common
7	+Sense	+Sense
8	+V Output	+V Output
9	NP	Trim

Note:Pin Size is ∅0.04±0.004 Inch [∅1.0±0.1 mm]
Pin Size is ∅0.06±0.004 Inch [∅1.5±0.1 mm]
NP-No Pin