CQM60W Series
Application Note V10 septembre 2025

ISOLATED DC-DC CONVERTER
CQM60W SERIES
APPLICATION NOTE

Approved By:

Department	Approved By	Checked By	Written By
Research and Development Department	Jacky	Danny	Wade
Design Quality Department	Benny	JoJo	

Contents

1. Introduction 3
2. Pin Function Description 3
3. Connection for Standard Use 4
4. Test Set-Up 4
5. Recommend Layout, PCB Footprint and Soldering Information 5
6. Features and Functions 5
6.1 UVLO (Under Voltage Lock Out) 5
6.2 Over Current/Short Circuit Protection 6
6.3 Output Over Voltage Protection 6
6.4 Over Temperature Protection 6
6.5 Remote On/Off 7
6.6 Output Remote Sensing 7
6.7 Output Voltage Adjustment 8
7. Input / Output Considerations 10
7.1 Input Capacitance at the Power Module 10
7.2 Output Ripple and Noise 10
7.3 Output Capacitance 11
8. Series and Parallel Operation 11
8.1 Series Operation 11
8.2 Parallel Operation 11
8.3 Redundant Operation 12
9. Thermal Design 13
9.1 Operating Temperature Range 13
9.2 Convection Requirements for Cooling 13
9.3 Thermal Considerations 13
9.4 Power Derating 13
9.5 Quarter Brick Heat Sinks 14
10. Safety & EMC 15
10.1 Input Fusing and Safety Considerations 15
10.2 EMC Considerations 15

1. Introduction

The CQM60W series of medical dc-dc converters offers 60 watts of output power at single and dual output voltages of 5, 12, 15, 24, ±12, ±15VDC with industry standard quarter-brick. It has a wide (4:1) input voltage range of 9 to 36VDC (24VDC nominal), high efficiency up to 93.5% and very low no load power consumption, an ideal solution for energy critical systems.

Compliant with IEC/UL 60601-1 3rd for 2 x MOPP, EN/IEC 60601-1-2 , EN 55032, EN 55035. Isolation voltage 5000VAC, very low leakage current <4.5uA, design meets CF rated medical applications, allowing case operating temperature range of -40℃ to 105℃. An optional heat sink is available to extend the full power range of the unit.

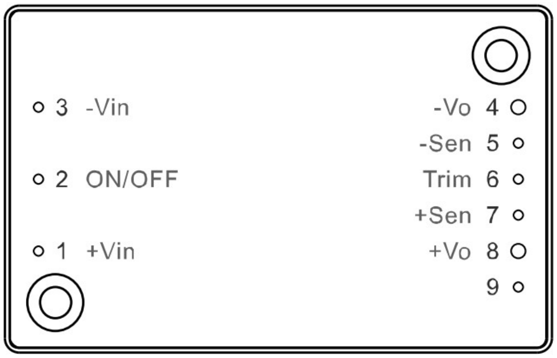
The standard control functions include remote **on/off** (positive or negative) and +20% to -10% (except for $5V_{out}$ +10% to -5%) adjustable output voltage.

Fully protected against input UVLO (under voltage lock out), output over-current, output over-voltage, over-temperature and continuous short circuit conditions.

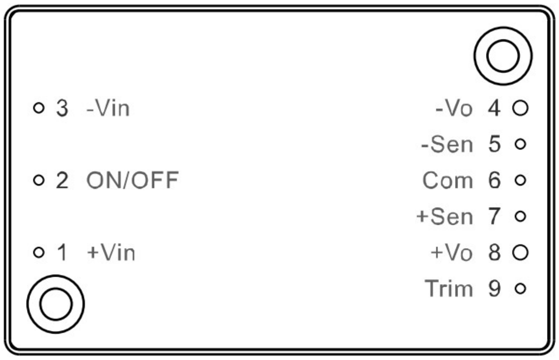
CQM60W series is designed primarily for medical applications, but is also suitable for distributed power architectures, telecommunications, battery operated equipment and industrial applications.

2. Pin Function Description

Single Output



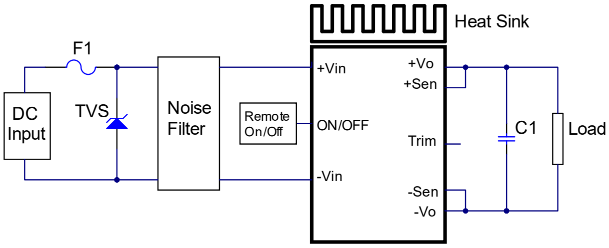
Dual Output

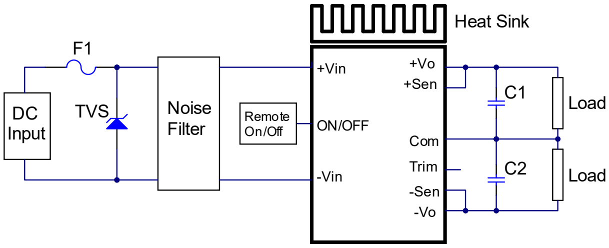


No	Label	Function	Description	Reference
1	+Vin	+V Input	Positive Supply Input	**Section 7.1**
2	ON/OFF	Remote On/Off	External Remote On/Off Control	**Section 6.5**
3	-Vin	-V Input	Negative Supply Input	**Section 7.1**
4	-Vo	-V Output	Negative Power Output	**Section 7.2/7.3**
5	-Sen	-Sense	Negative Output Remote Sense	**Section 6.6**
6	Trim	Trim	External Output Voltage Adjustment (Single Output)	**Section 6.7**
	Com	Common	Common Power Output (Dual Output)	**Section 7.2/7.3**
7	+Sen	+Sense	Positive Output Remote Sense	**Section 6.6**
8	+Vo	+V Output	Positive Power Output	**Section 7.2/7.3**
9	- -	NP	No Pin	- -
	Trim	Trim	External Output Voltage Adjustment (Dual Output)	**Section 6.7**

3. Connection for Standard Use

The connection for standard use is shown below. External output capacitors (C1, C2) are recommended to reduce output ripple and noise, 1uF ceramic capacitors for all models.





Symbol	Component	Reference
F1, TVS	Input fuse, TVS	**Section 10.1**
C1, C2	External capacitor on the output side	**Section 7.2/7.3**
Noise Filter	External input noise filter	**Section 10.2**
Remote On/Off	External remote **on/off** control	**Section 6.5**
Trim	External output voltage adjustment	**Section 6.7**
Heat Sink	External heat sink	**Section 9.2/9.3/9.4/9.5**
+Sense/-Sense	--	**Section 6.6**

4. Test Set-Up

The basic test set-up to measure parameters such as efficiency and load regulation is shown below. When testing the modules under any transient conditions please ensure that the transient response of the source is sufficient to power the equipment under test. We can calculate:

- Efficiency
- Load regulation and line regulation

The value of efficiency is defined as:

$$\eta = \frac{V_o \times I_o}{V_{in} \times I_{in}} \times 100\%$$

Where:

V_o is output voltage,

I_o is output current,

V_{in} is input voltage,

I_{in} is input current

The value of load regulation is defined as:

$$Load\ reg. = \frac{V_{FL} - V_{NL}}{V_{NL}} \times 100\%$$

Where:

V_{FL} is the output voltage at full load

V_{NL} is the output voltage at no load

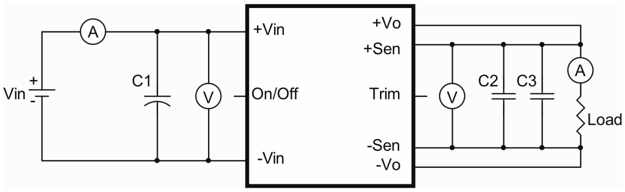
The value of line regulation is defined as:

$$Line\ reg. = \frac{V_{HL} - V_{LL}}{V_{LL}} \times 100\%$$

Where:

V_{HL} is the output voltage of maximum input voltage at full load

V_{LL} is the output voltage of minimum input voltage at full load

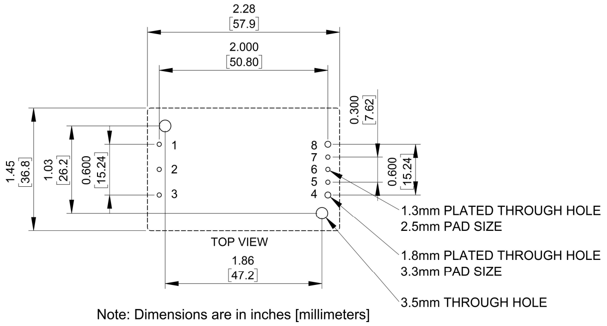


CQM60W Series Test Setup

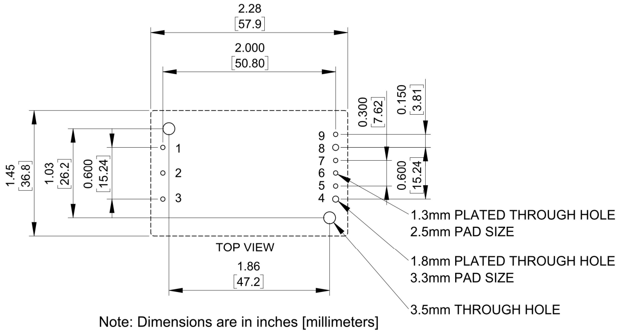
C1: None
C2: 1uF/1210 ceramic capacitor
C3: None

5. Recommend Layout, PCB Footprint and Soldering Information

The system designer or end user must ensure that metal and other components in the vicinity of the converter meet the spacing requirements for which the system is approved. Low resistance and inductance PCB layout traces are the norm and should be used where possible. Due consideration must also be given to proper low impedance tracks between power module, input and output grounds.



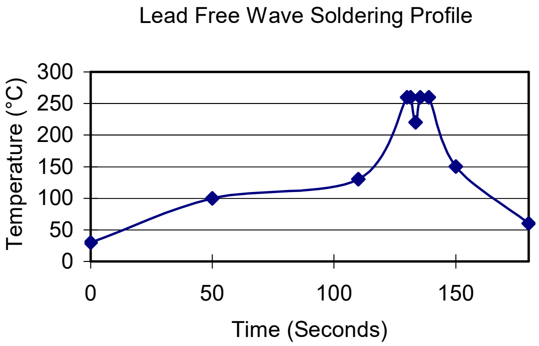
Single Output Module



Dual Output Module

Clean the soldered side of the module with a brush, prevent liquid from getting into the module. Do not clean by soaking the module into liquid. Do not allow solvent to come in contact with product labels or resin case as this may change the color of the resin case or cause deletion of the letters printed on the product label. After cleaning, dry the modules well.

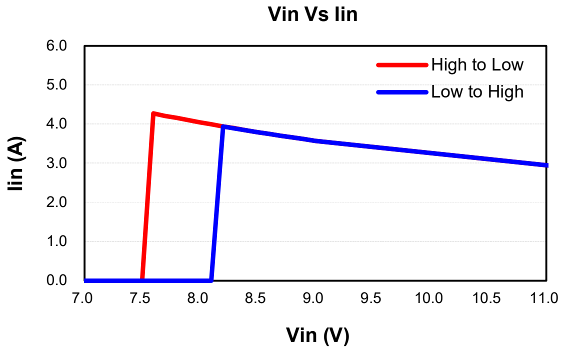
The suggested soldering iron is 420±10℃ for up to 4-10 seconds (less than 90W) used in double PCB and multilayer PCB, The other one is used in the single PCB is 385±10 ℃ for up to 2-6 seconds (less than 90W). Furthermore, the recommended soldering profile is shown below, and PCB layout is referring to **section 10.2.**



6. Features and Functions

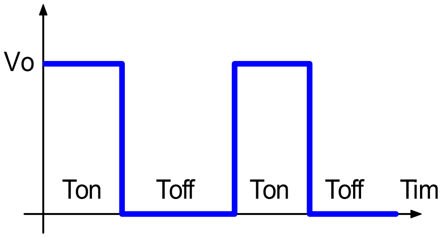
6.1 UVLO (Under Voltage Lock Out)

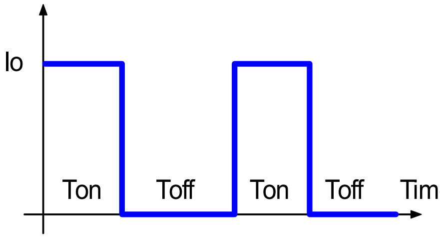
Input under voltage lockout is standard on the CQM60W series unit. The unit will shut down when the input voltage drops below a threshold, and the unit will operate when the input voltage goes above the upper threshold.



6.2 Over Current/Short Circuit Protection

All models have internal over current and continuous short circuit protection. The unit operates normally once the fault condition is removed. At the point of current limit inception, the converter will go into hiccup mode protection.





6.3 Output Over Voltage Protection

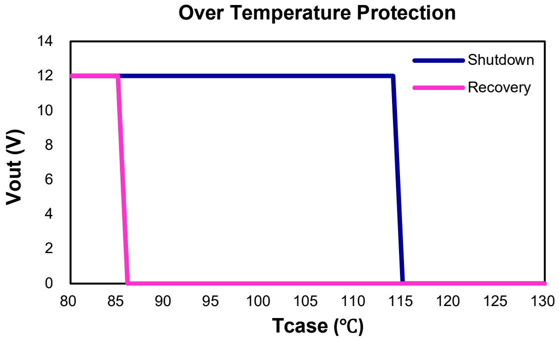
The output over voltage protection consists of circuitry that internally limits the output voltage. If more accurate output over voltage protection is required, then an external circuit can be used via the remote **on/off** pin.

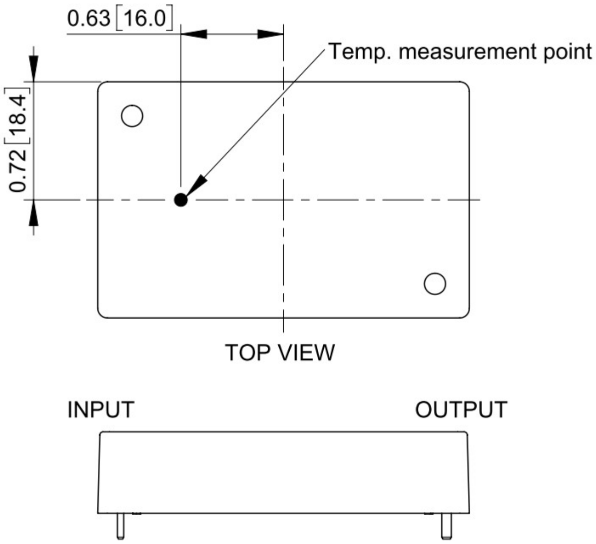
Note:

Please note that device inside the power supply might fail when voltage more than rate output voltage is applied to output pin. This could happen when the customer tests the over voltage protection of unit. OVP can be tested by using the **trim up** function. Consult us for more information.

6.4 Over Temperature Protection

These modules have an over temperature protection circuit to safeguard against thermal damage. Shutdown occurs with the maximum case reference temperature is exceeded. The module will restart when the case temperature falls below over temperature recovery threshold. Please measure case temperature of the center point of the case is offset by 16mm toward the input side.





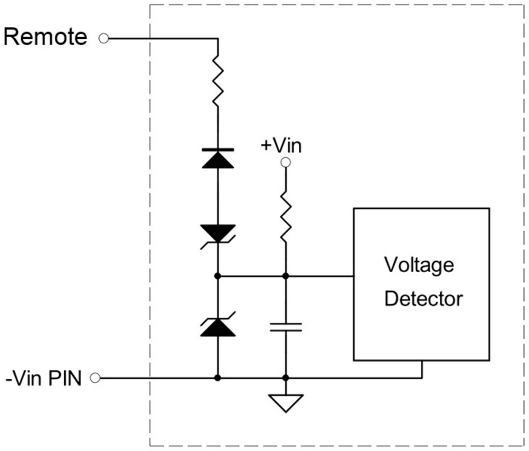
6.5 Remote On/Off

The CQM60W series allows the user to switch the module on and off electronically with the remote **on/off** feature. All models are available in “positive logic” and “negative logic” (optional) versions. The converter turns on if the remote **on/off** pin is high (>3.5Vdc to 75Vdc or open circuit). Setting the pin low (0 to <1.2Vdc) will turn the converter off. The signal level of the remote **on/off** input is defined with respect to ground. If not using the remote **on/off** pin, leave the pin open (converter will be on).

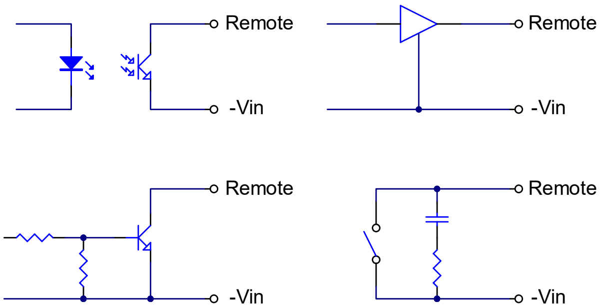
Models with part number suffix “N” are the “negative logic” remote **on/off** version. The unit turns off if the remote **on/off** pin is high (>3.5Vdc to 75Vdc or open circuit). The converter turns on if the **on/off** pin input is low (0 to <1.2Vdc). Note that the converter is off by default.

Logic State (Pin 2)	Negative Logic	Positive Logic
Logic Low	Module on	Module off
Logic High	Module off	Module on

The converter remote **on/off** circuit built-in on input side. The ground pin of input side remote **on/off** circuit is -V_{in} pin. Inside connection sees below.



Connection examples see below.



Remote On/Off Connection Example

6.6 Output Remote Sensing

The CQM60W series converter has the capability to remotely sense both lines of its output. This feature moves the effective output voltage regulation point from the output of the unit to the point of connection of the remote sense pins. This feature automatically adjusts the real output voltage of the CQM60W series in order to compensate for voltage drops in distribution and maintain a regulated voltage at the point of load. The remote-sense voltage range is:

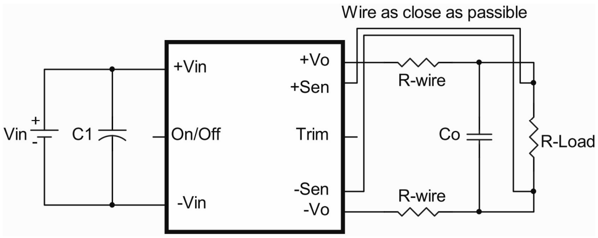
For 5Vout:

$[(+V_{out}) - (-V_{out})] – [(+Sense) – (-Sense)] \leqq 10\%$ of $V_{o\_nominal}$

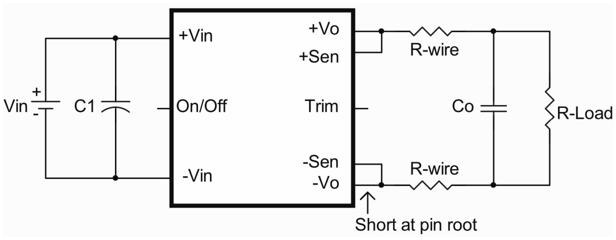
For Others:

$[(+V_{out}) - (-V_{out})] – [(+Sense) – (-Sense)] \leqq 20\%$ of $V_{o\_nominal}$

When remote sense is in use, the sense should be connected by twisted-pair wire or shield wire. If the sensing patterns short, heave current flows and the pattern may be damaged. Output voltage might become unstable because impedance of wiring and load condition when length of wire is exceeding 400mm. This is shown in the schematic below.



If the remote sense feature is not to be used, the sense pins should be connected locally. The +Sense pin should be connected to the +V_{out} pin at the module and the -Sense pin should be connected to the -V_{out} pin at the module. Wire between +Sense and +V_{out} and between -Sense and -V_{out} as short as possible. Loop wiring should be avoided. The converter might become unstable by noise coming from poor wiring. This is shown in the schematic below.

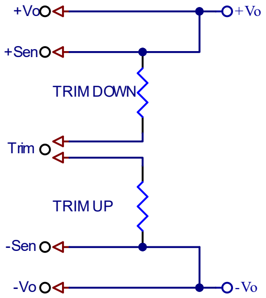


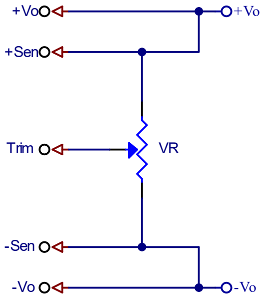
Note:

Although the output voltage can be varied (increased or decreased) by both remote sense and trim, the maximum variation for the output voltage is the larger of the two values not the sum of the values. The output power delivered by the module is defined as the voltage at the output terminals multiplied by the output current. Using remote sense and trim can cause the output voltage to increase and consequently increase the power output of the module if output current remains unchanged. Always ensure that the output power of the module remains at or below the maximum rated power. Also be aware that if $V_{o.set}$ is below nominal value, $P_{out.max.}$ will also decrease accordingly because $I_{o.max.}$ is an absolute limit. Thus, $P_{out.max.} = V_{o.set} \times I_{o.max.}$ is also an absolute limit.

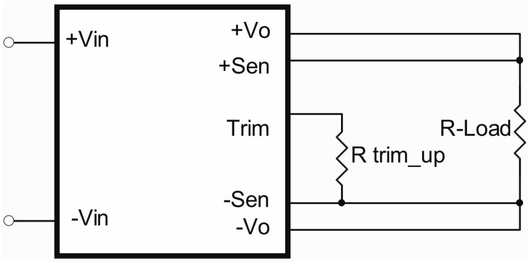
6.7 Output Voltage Adjustment

Output may be externally trimmed (+20% to -10%, except $5V_{out}$ is +10% to -5%) with a fixed resistor or an external trim pot as shown (optional). Model specific formulas for calculating trim resistors are available upon request as a separate document.

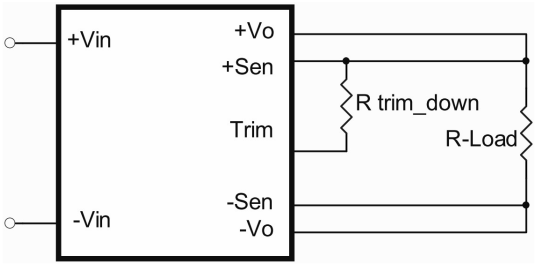




In order to trim the voltage up or down, one needs to connect the trim resistor either between the trim pin and -Sense for trim-up or between trim pin and +Sense for trim-down. The output voltage trim range is +20% to -10%, except $5V_{out}$, it is +10% to -5%. This is shown:



Trim-up Voltage Setup



Trim-down Voltage Setup

The CQM60W-24S05 value of R_{trim_up} defined as:

$$R_{trim\_up} = \frac{22.13 - 3.97 \times (V_o - V_{o,nom})}{7.012 \times (V_o - V_{o,nom})} - 1\ (K\Omega)$$

The CQM60W-24S12 value of R_{trim_up} defined as:

$$R_{trim\_up} = \frac{67.855}{2.4 \times (V_o - V_{o,nom})} - 3.9\ (K\Omega)$$

The CQM60W-24S15 value of R_{trim_up} defined as:

$$R_{trim\_up} = \frac{93.5}{2.4 \times (V_o - V_{o,nom})} - 3\ (K\Omega)$$

The CQM60W-24S24 value of R_{trim_up} defined as:

$$R_{trim\_up} = \frac{151.13}{2.32 \times (V_o - V_{o,nom})} - 3.9\ (K\Omega)$$

The CQM60W-24D12 value of R_{trim_up} defined as:

$$R_{trim\_up} = \frac{151.13}{4.64 \times (|V_o| - |V_{o,nom}|)} - 3.9\ (K\Omega)$$

The CQM60W-24D15 value of R_{trim_up} defined as:

$$R_{trim\_up} = \frac{149.175}{4.64 \times (|V_o| - |V_{o,nom}|)} - 3.9\ (K\Omega)$$

Where:

R_{trim_up} is the external resistor in KΩ
$V_{o,\ nom}$ is the nominal output voltage
V_o is the desired output voltage

For example, to trim-up the output voltage of ±12V module (CQM60W-24D12) by 20% to ±14.4V, R_{trim_up} is calculated as follows:

V_o=±14.4V, $V_{o,\ nom}$=±12V

$$R_{trim_{up}} = \frac{151.13}{4.64 \times (14.4 - 12)} - 3.9 = 9.671\ (K\Omega)$$

The typical value of R_{trim_up}

Trim up (%)	5V	12V	15V
	R_{trim_up} (KΩ)		
1%	61.55	231.71	256.72
2%	29.99	113.90	126.86
3%	19.47	74.64	83.57
4%	14.21	55.00	61.93
5%	11.06	43.22	48.94
6%	8.95	35.37	40.29
7%	7.45	29.76	34.10
8%	6.32	25.55	29.47
9%	5.45	22.28	25.86
10%	4.75	19.66	22.97
11%		17.52	20.61
12%		15.73	18.64
13%		14.22	16.98
14%		12.93	15.55
15%		11.81	14.31
16%		10.83	13.23
17%		9.96	12.28
18%		9.19	11.43
19%		8.50	10.67
20%		7.88	9.99

Trim up (%)	24V	±12V	±15V
	R_{trim_up} (KΩ)		
1%	267.53	267.53	210.43
2%	131.81	131.81	103.27
3%	86.58	86.58	67.54
4%	63.96	63.96	49.68
5%	50.39	50.39	38.97
6%	41.34	41.34	31.82
7%	34.88	34.88	26.72
8%	30.03	30.03	22.89
9%	26.26	26.26	19.91
10%	23.24	23.24	17.53
11%	20.78	20.78	15.58
12%	18.72	18.72	13.96
13%	16.98	16.98	12.59
14%	15.49	15.49	11.41
15%	14.20	14.20	10.39
16%	13.06	13.06	9.50
17%	12.07	12.07	8.71
18%	11.18	11.18	8.01
19%	10.39	10.39	7.38
20%	9.67	9.67	6.82

The CQM60W-24S05 value of R_{trim_down} defined as:

$$R_{trim_{down}} = \frac{41.996 - 16.792 \times (V_{o,nom} - V_o)}{7.012 \times (V_{o,nom} - V_o)} - 1\ (K\Omega)$$

The CQM60W-24S12 value of R_{trim_down} defined as:

$$R_{trim_{down}} = \frac{168.1}{2.4 \times (V_{o,nom} - V_o)} - 12.1\ (K\Omega)$$

The CQM60W-24S15 value of R_{trim_down} defined as:

$$R_{trim_{down}} = \frac{302.5}{2.4 \times (V_{o,nom} - V_o)} - 14\ (K\Omega)$$

The CQM60W-24S24 value of R_{trim_down} defined as:

$$R_{trim_{down}} = \frac{912.025}{2.32 \times (V_{o,nom} - V_o)} - 23\ (K\Omega)$$

The CQM60W-24D12 value of R_{trim_down} defined as:

$$R_{trim_{down}} = \frac{912.025}{4.64 \times (|V_{O,nom}| - |V_O|)} - 23\ (K\Omega)$$

The CQM60W-24D15 value of R_{trim_down} defined as:

$$R_{trim_{down}} = \frac{1625.625}{4.64 \times (|V_{O,nom}| - |V_O|)} - 29.4\ (K\Omega)$$

Where:

R_{trim_down} is the external resistor in KΩ
$V_{o,\ nom}$ is the nominal output voltage
V_o is the desired output voltage

For example: to trim-down the output voltage of 12V module (CQM60W-24S12) by 10% to 10.8V, R_{trim_down} is calculated as follows:

V_o=10.8V, $V_{o,\ nom}$=12V

$$R_{trim_{down}} = \frac{168.1}{2.4 \times (12 - 10.8)} - 12.1 = 46.27\ (K\Omega)$$

The typical value of R_{trim_down}

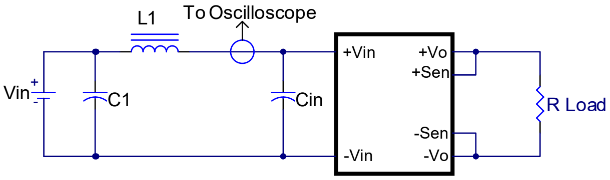
Trim down (%)	5V	12V	15V
	R_{trim_down} (KΩ)		
1%	116.39	571.58	826.28
2%	56.50	279.74	406.14
3%	36.53	182.46	266.09
4%	26.55	133.82	196.07
5%	20.56	104.64	154.06
6%		85.18	126.05
7%		71.28	106.04
8%		60.86	91.03
9%		52.75	79.36
10%		46.27	70.03

Trim down (%)	24V	±12V	±15V
	R_{trim_down} (KΩ)		
1%	1614.98	1614.98	2306.27
2%	795.99	795.99	1138.43
3%	522.99	522.99	749.16
4%	386.49	386.49	554.52
5%	304.60	304.60	437.73
6%	250.00	250.00	359.88
7%	211.00	211.00	304.27
8%	181.75	181.75	262.56
9%	159.00	159.00	230.12
10%	140.80	140.80	204.17

7. Input / Output Considerations

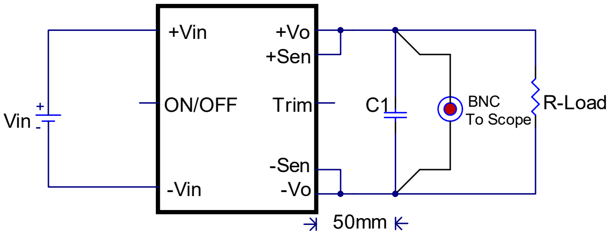
7.1 Input Capacitance at the Power Module

The converters must be connected to low AC source impedance. To avoid problems with loop stability source inductance should be low. Also, the input capacitors (Cin) should be placed close to the converter input pins to de-couple distribution inductance. However, the external input capacitors are chosen for suitable ripple handling capability. Low ESR capacitors are good choice. Circuit as shown as below represents typical measurement methods for reflected ripple current. C1 and L1 simulate a typical DC source impedance. The input reflected-ripple current is measured by current probe to oscilloscope with a simulated source Inductance (L1).

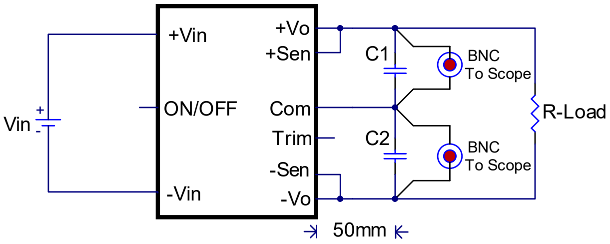


L1: 12uH
C1: None
Cin: 10uF/50V ceramic capacitor parallel 220uF/100V aluminum capacitor

7.2 Output Ripple and Noise



Single Output Ripple Noise



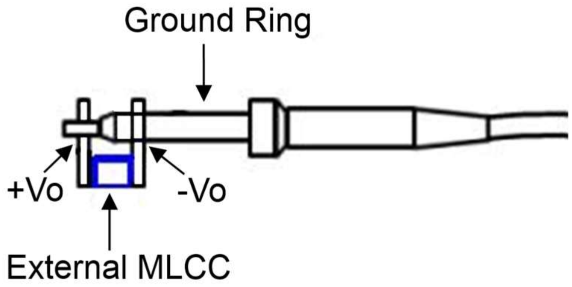
Dual Output Ripple Noise

C1, C2: 1uF/1210 ceramic capacitor

Output ripple and noise measured with 1uF ceramic capacitors across output. A 20 MHz bandwidth oscilloscope is normally used for the measurement.

The conventional ground clip on an oscilloscope probe should never be used in this kind of measurement. This clip, when placed in a field of radiated high frequency energy, acts as an antenna or inductive pickup loop, creating an extraneous voltage that is not part of the output noise of the converter.

Another method is shown in below, in case of coaxial-cable/BNC is not available. The noise pickup is eliminated by pressing scope probe ground ring directly against the -V$_{out}$ terminal while the tip contacts the +V$_{out}$ terminal. This makes the shortest possible connection across the output terminals.



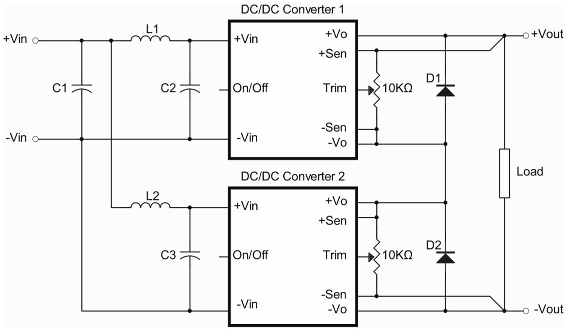
7.3 Output Capacitance

The CQM60W series converters provide unconditional stability with or without external capacitors. For good transient response, low ESR output capacitors should be located close to the point of load (<100mm). PCB design emphasizes low resistance and inductance tracks in consideration of high current applications. Output capacitors with their associated ESR values have an impact on loop stability and bandwidth. Cincon's converters are designed to work with load capacitance to see specifications.

8. Series and Parallel Operation

8.1 Series Operation

Series operation is possible by connecting the outputs two or more units. Connection is shown in below. The output current in series connection should be lower than the lowest rate current in each power module.



Simple Series Operation Connect Circuit

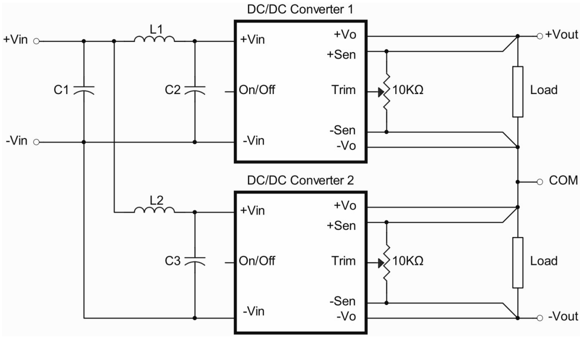
L1, L2: 1.0uH

C1, C2, C3: 470uF/100V ESR<0.04Ω

Note:

1. If the impedance of input line is high, C1, C2, C3 capacitance must be more than above. Use more than two recommended capacitor above in parallel when ambient temperature becomes lower than -20℃.
2. Recommend Schottky diode (D1, D2) be connected across the output of each series connected converter, so that if one converter shuts down for any reason, then the output stage won't be thermally overstressed. Without this external diode, the output stage of the shut-down converter could carry the load current provided by the other series converters, with its MOSFETs conducting through the body diodes. The MOSFETs could then be overstressed and fail. The external diode should be capable of handling the full load current for as long as the application is expected to run with any unit shut down.

Series for ±output operation is possible by connecting the outputs two units, as shown in the schematic below.



Simple ±Output Operation Connect Circuit

L1, L2: 1.0uH

C1, C2, C3: 470uF/100V ESR<0.04Ω

Note:

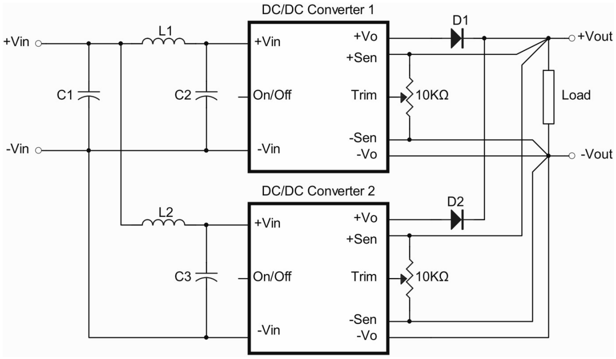
If the impedance of input line is high, C1, C2, C3 capacitance must be more than above. Use more than two recommended capacitor above in parallel when ambient temperature becomes lower than -20℃.

8.2 Parallel Operation

The CQM60W series parallel operation is not possible.

8.3 Redundant Operation

Parallel for redundancy operation is possible by connecting the units as shown in the schematic below. The current of each converter become unbalance by a slight difference of the output voltage. Make sure that the output voltage of units of equal value and the output current from each power supply does not exceed the rate current. Suggest use an external potentiometer to adjust output voltage from each power supply.



Simple Redundant Operation Connect Circuit

L1, L2: 1.0uH

C1, C2, C3: 470uF/100V ESR<0.04Ω

Note:

If the impedance of input line is high, C1, C2, C3 capacitance must be more than above. Use more than two recommended capacitor above in parallel when ambient temperature becomes lower than -20℃.

9. Thermal Design

9.1 Operating Temperature Range

The CQM60W series converters can be operated within a wide case temperature range of -40℃ to 105℃. Consideration must be given to the derating curves when ascertaining maximum power that can be drawn from the converter. The maximum power drawn from open quarter brick models is influenced by usual factors, such as:

- Input voltage range
- Output load current
- Forced air or natural convection
- Heat sink optional

9.2 Convection Requirements for Cooling

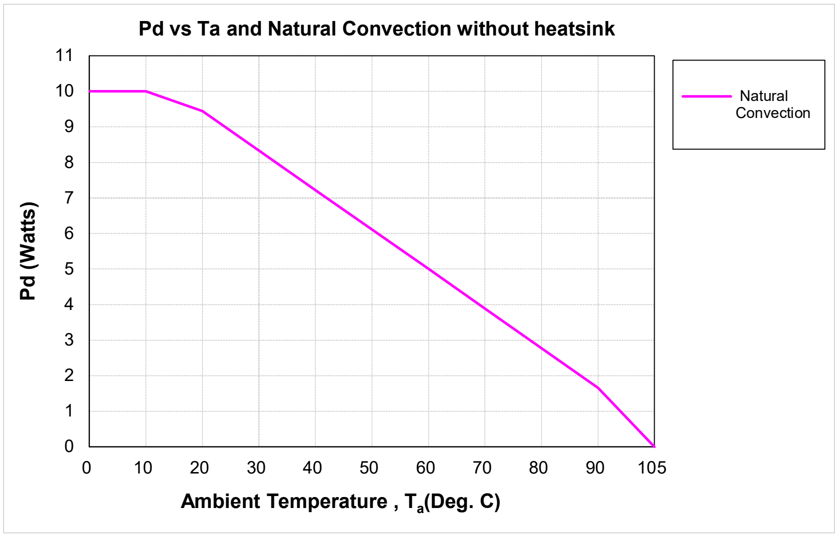
To predict the approximate cooling needed for the quarter brick module, refer to the power derating curves in **section 9.4**. These derating curves are approximations of the ambient temperatures and airflows required to keep the power module temperature below its maximum rating. Once the module is assembled in the actual system, the module's temperature should be monitored to ensure it does not exceed 105℃ at the top case, measured point refer **section 6.4** (thus verifying proper cooling).

9.3 Thermal Considerations

The power module operates in a variety of thermal environments; however, sufficient cooling should be provided to help ensure reliable operation of the unit. Heat is removed by conduction, convection, and radiation to the surrounding environment. The example is presented in **section 9.4**. The power output of the module should not be allowed to exceed rated power (V_{o_set} x $I_{o\_max.}$).

9.4 Power Derating

The operating case temperature range of CQM60W series is -40°C to +105°C. When operating the CQM60W series, proper derating or cooling is needed. The maximum case temperature under any operating condition should not exceed 105°C.
The following curve is the de-rating curve of CQM60W series without heat sink.



AIR FLOW RATE	TYPICAL R_{ca}
Natural Convection 20ft./min. (0.1m/s)	9.0 °C/W

Example:

What is the maximum ambient temperature for a CQM60W-24S12 operating at nominal line voltage, an output current of 5.0A, and natural convection?

Solution:

Given: V_{in}=24V_{dc}, V_o=12V_{dc}, I_o=5.0A

Determine power dissipation (P_d): $P_d=P_i-P_o=P_o(1-\eta)/\eta$, $P_d=12\times5\times(1-0.935)/0.935=4.17$Watts

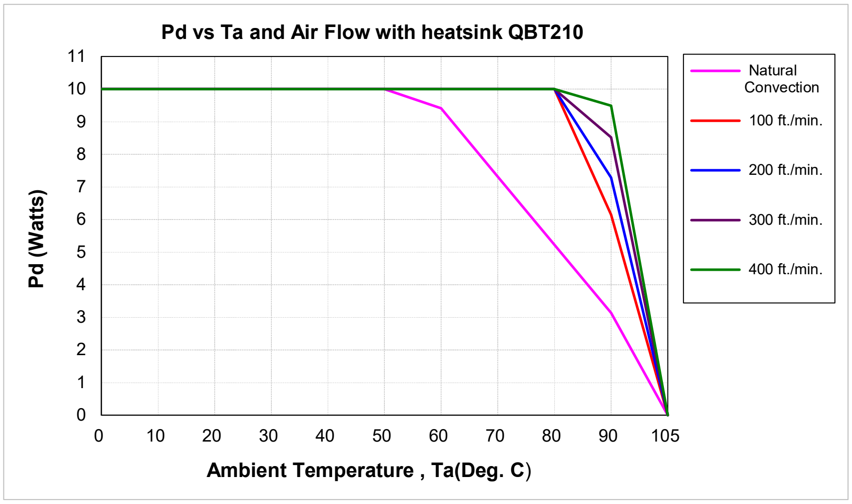
Determine Maximum temperature rise: $\Delta T=P_d\times R_{ca}=4.17\times9.0=37.53$°C

Determine Maximum ambient temperature: $T_a=T_{c\ max.}-\Delta T=105°C-37.53°C=67.47°C$

Where:

The R_{ca} is thermal resistance from case to ambient environment

T_a is ambient temperature and $T_{c\ max.}$ is maximum operating case temperature



AIR FLOW RATE	TYPICAL R_{ca}
Natural Convection 20ft./min. (0.1m/s)	4.78 °C/W
100 ft./min. (0.5m/s)	2.44 °C/W
200 ft./min. (1.0m/s)	2.06 °C/W
300 ft./min. (1.5m/s)	1.76 °C/W
400 ft./min. (2.0m/s)	1.58 °C/W

Example with heat sink QBT210 (M-C421):

What is the minimum airflow necessary for a CQM60W-24S05 operating at nominal line voltage, an output current of 12A, and a maximum ambient temperature of 75°C?

Solution:

Given: V_{in}=24V_{dc}, V_o=5V_{dc}, I_o=12A

Determine power dissipation (P_d): $P_d=P_i-P_o=P_o(1-\eta)/\eta$, $P_d=5\times12\times(1-0.89)/0.89=7.42$Watts

Determine airflow: Given: P_d=7.42W and T_a=75°C

Check above power derating curve: Minimum airflow=100ft./min

Verify:

Maximum temperature rise is $\Delta T= P_d\times R_{ca}=7.42\times2.44=18.105$°C

Maximum case temperature is $T_c=T_a+\Delta T=93.105°C <105°C$

Where:

The R_{ca} is thermal resistance from case to ambient environment

T_a is ambient temperature and T_c is case temperature

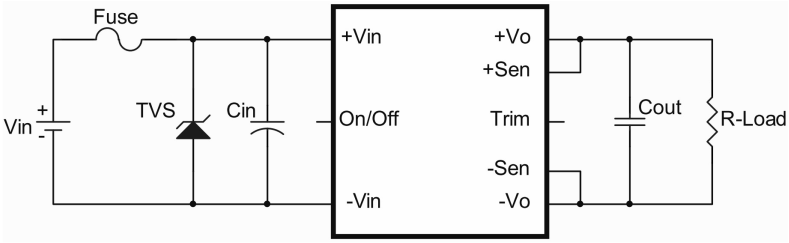
9.5 Quarter Brick Heat Sinks

Heat sinks assembly **refer to Datasheet-Thermal**

10. Safety & EMC

10.1 Input Fusing and Safety Considerations

The CQM60W series converters have no internal fuse. In order to achieve maximum safety and system protection, always use an input line fuse. We recommended a 12A time delay fuse for all models. It is recommended that the circuit have a transient voltage suppressor diode (TVS) across the input terminal to protect the unit against surge or spike voltage and input reverse voltage (as shown).



The external input capacitor (Cin) and transient voltage suppressor diode (TVS) are required if CQM60W series has to meet EN 61000-4-4, EN 61000-4-5.

The Cin recommended a 470uF/100V (Nippon Chemi-Con KY series) aluminum capacitor. And the TVS recommended a SMDJ40A transient voltage suppressor.

10.2 EMC Considerations

EMI Test standard: EN 60601-1-2, EN 55032, EN/IEC 61204-3, EN/IEC 61000-6-4, FCC Part 15B, ICES-003 Issue 7 Conducted & Radiated Emission

Test Condition: Input Voltage: 24V$_{dc}$, Output Load: Full Load

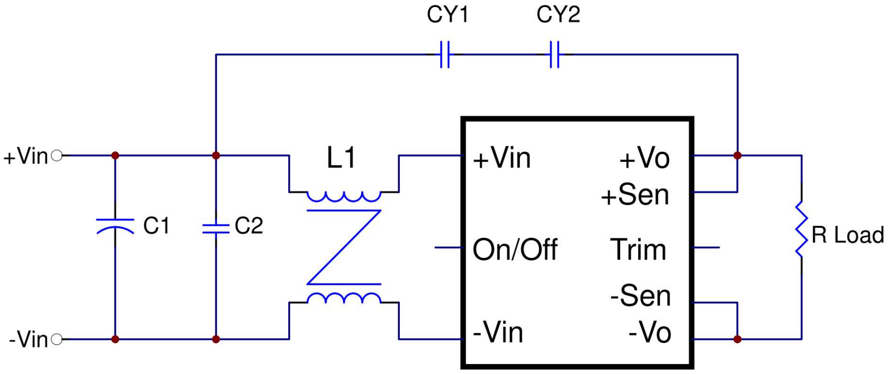


Figure1 Connection Circuit

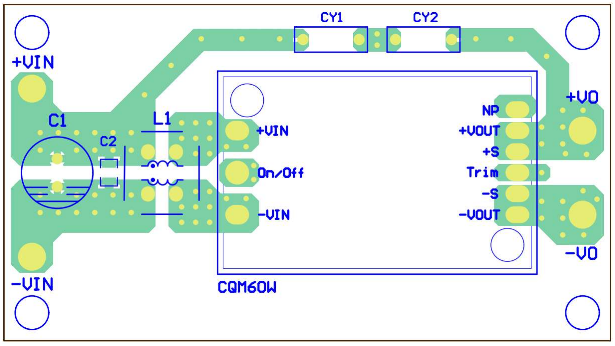


Figure2 Single Output PCB Top Layout

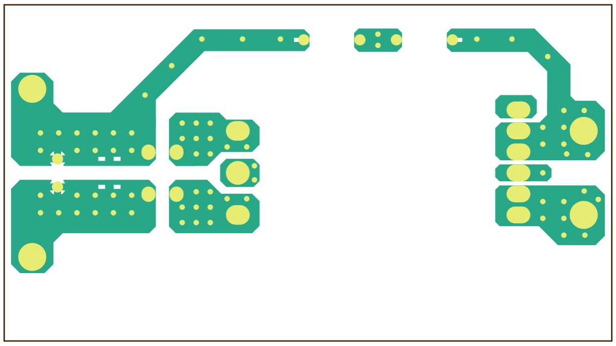


Figure3 Single Output PCB Bottom Layout

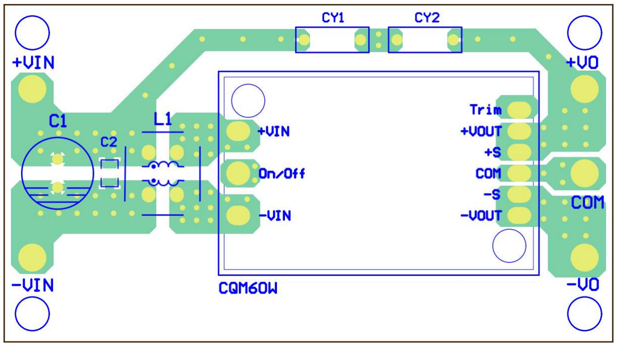


Figure4 Dual Output PCB Top Layout

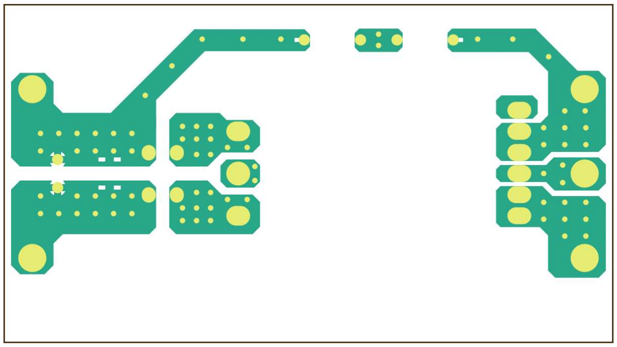


Figure5 Dual Output PCB Bottom Layout

Components Value:

C1	C2	CY1,CY2	L1
100uF/100V Aluminum Cap.	2.2uF/100V X7R 1210 Ceramic Cap.	100pF Y1 Cap.	0.175mH CMCK 74482210002 Wurth

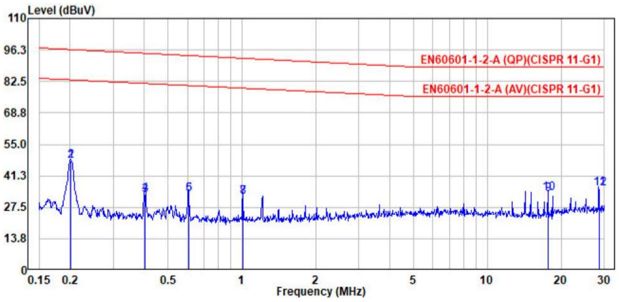
Note:

C1: 100uF/100V YXJ series aluminum capacitor or equivalent

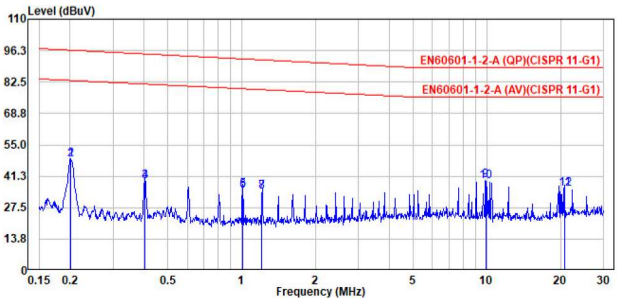
Conducted Emission (EN 60601-1-2)

CQM60W-24S05

Line

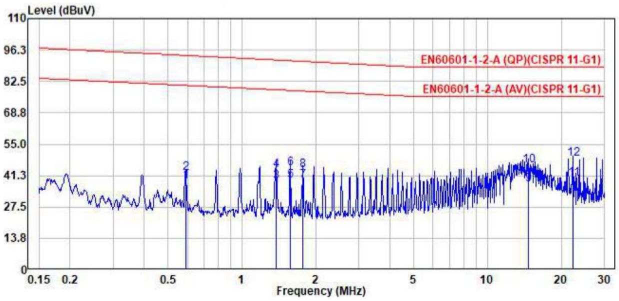


Neutral

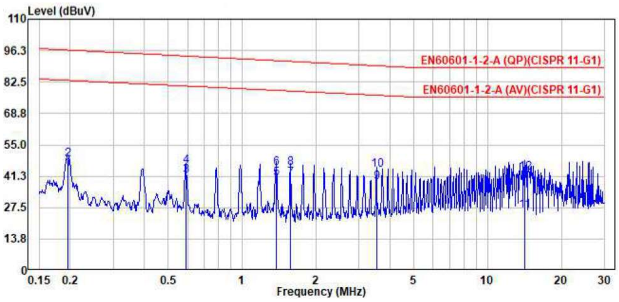


CQM60W-24S12

Line

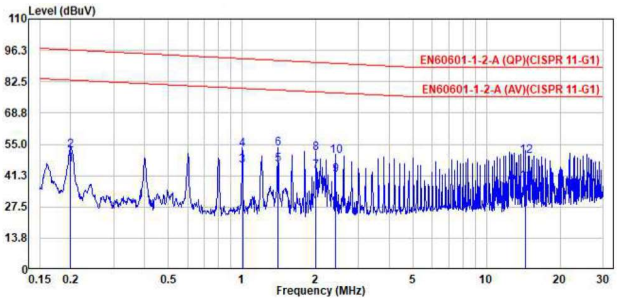


Neutral

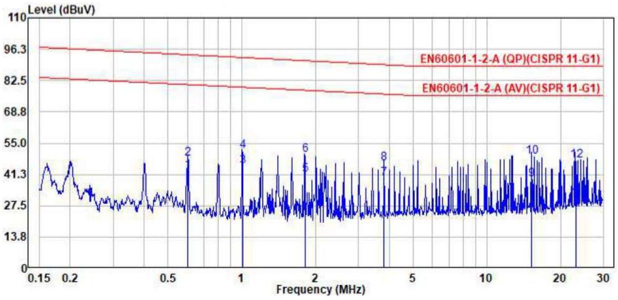


CQM60W-24S15

Line

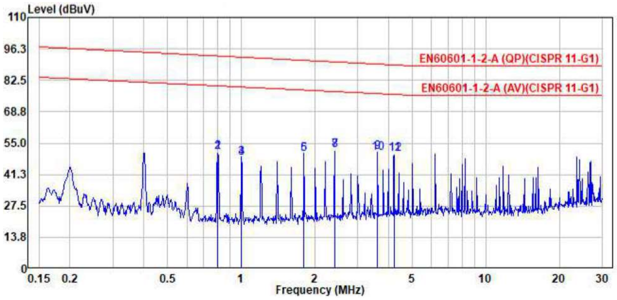


Neutral

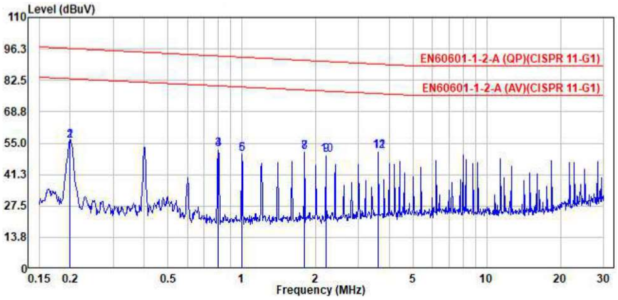


CQM60W-24S24

Line

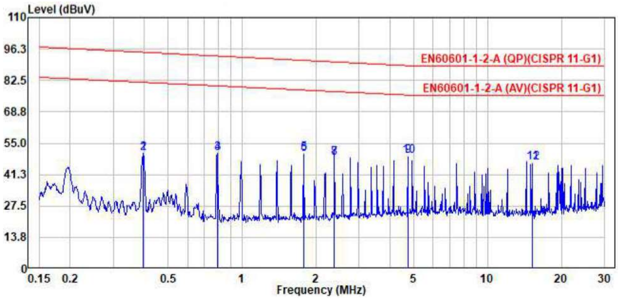


Neutral

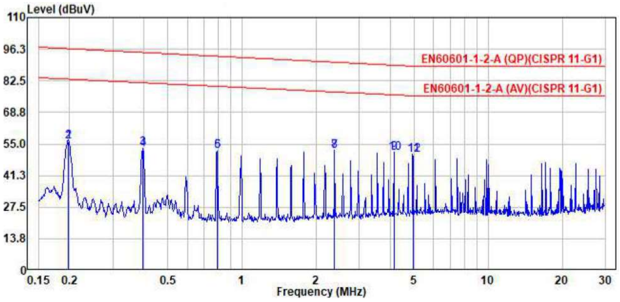


CQM60W-24D12

Line

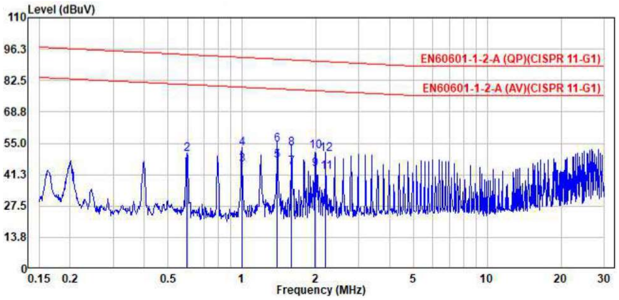


Neutral

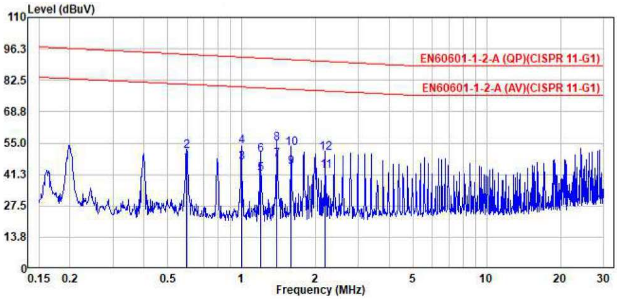


CQM60W-24D15

Line



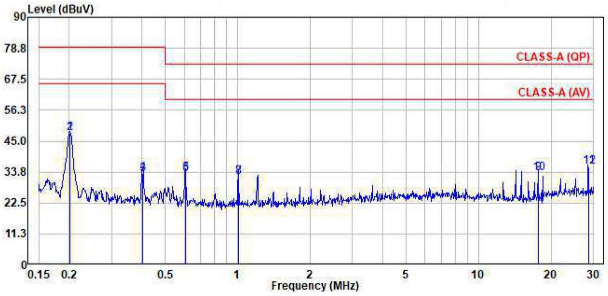
Neutral



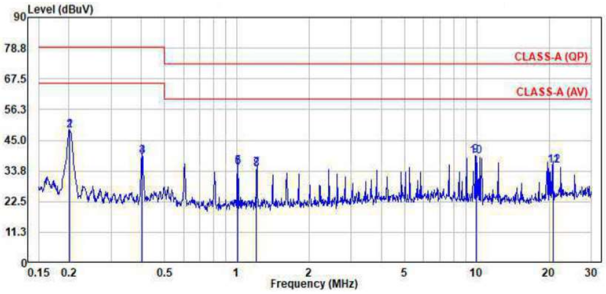
Conducted Emission (EN 55032)

CQM60W-24S05

Line

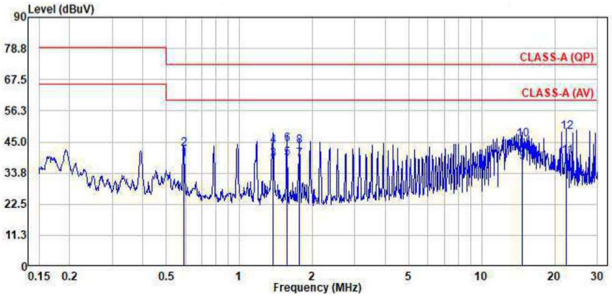


Neutral

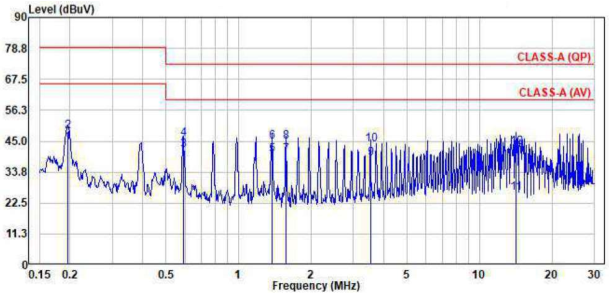


CQM60W-24S12

Line

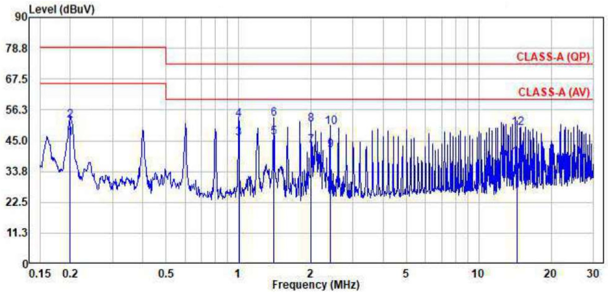


Neutral

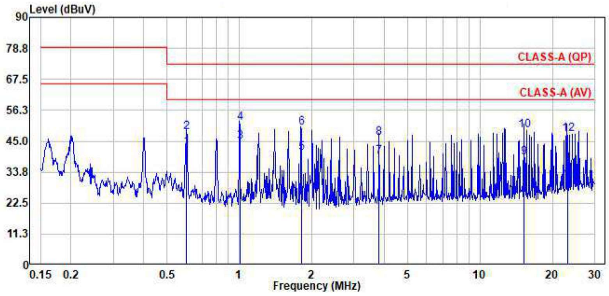


CQM60W-24S15

Line

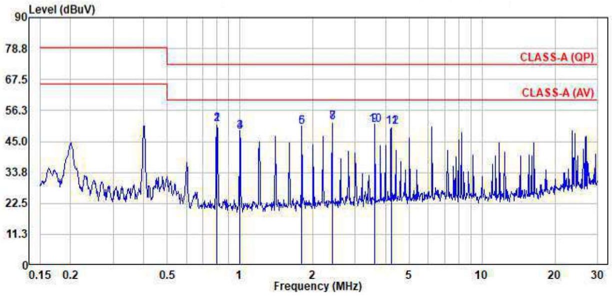


Neutral

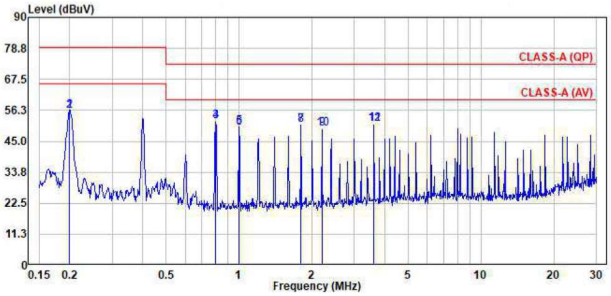


CQM60W-24S24

Line

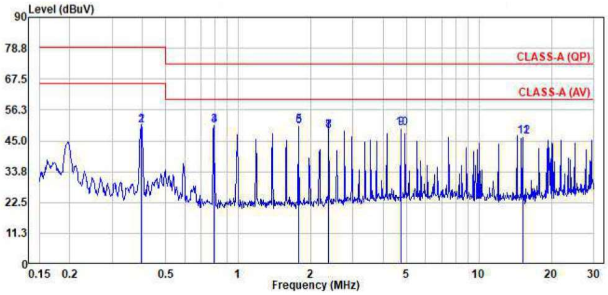


Neutral

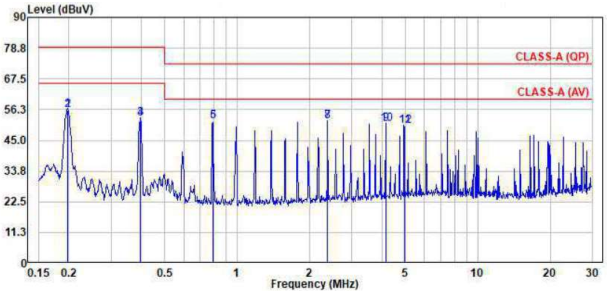


CQM60W-24D12

Line

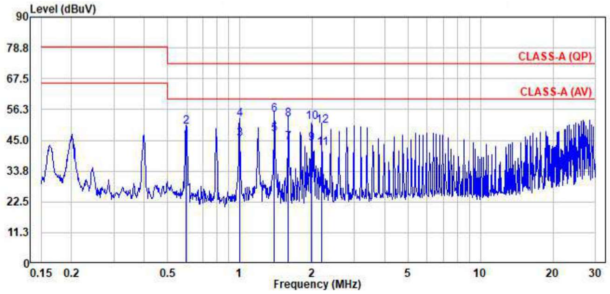


Neutral

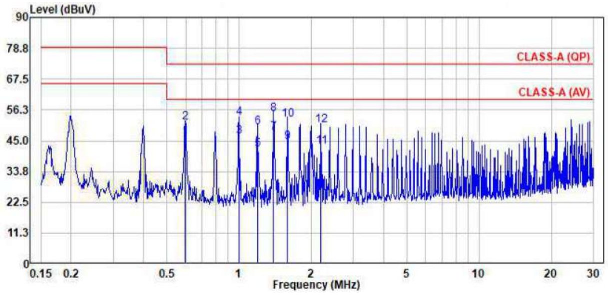


CQM60W-24D15

Line



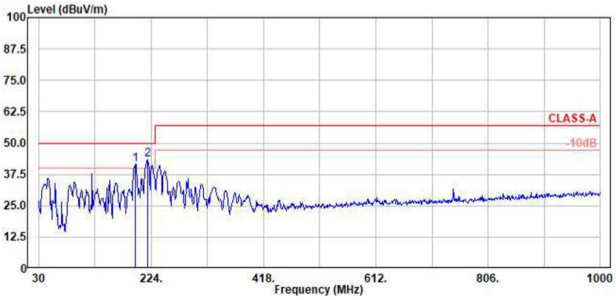
Neutral



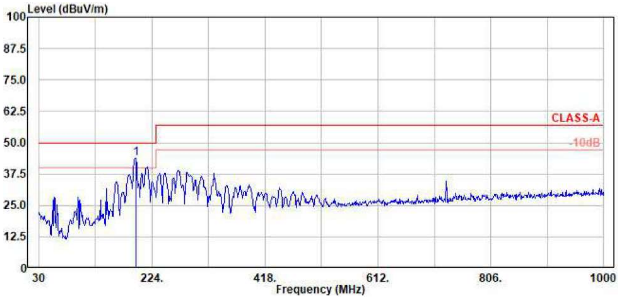
Radiated Emission (EN 60601-1-2/EN 55032)

CQM60W-24S05

Vertical

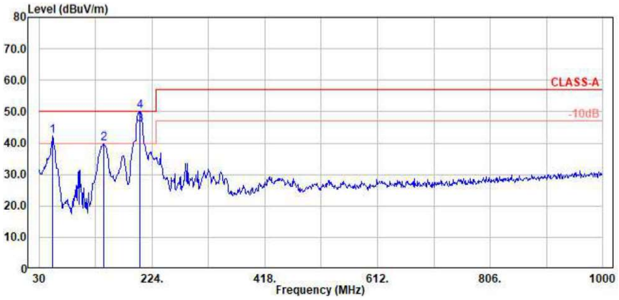


Horizontal

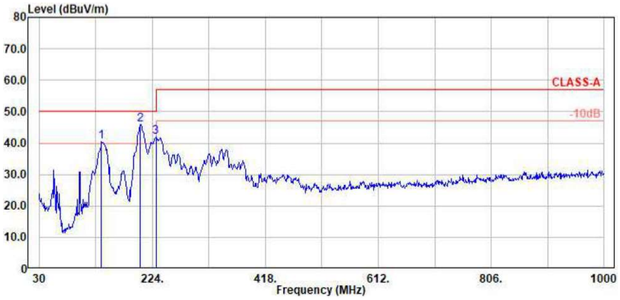


CQM60W-24S12

Vertical

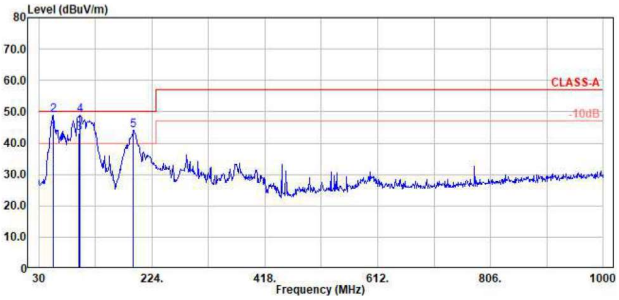


Horizontal

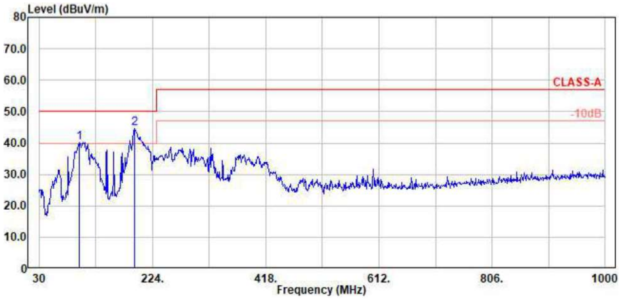


CQM60W-24S15

Vertical

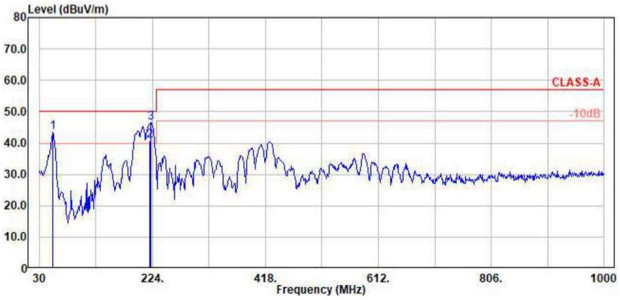


Horizontal

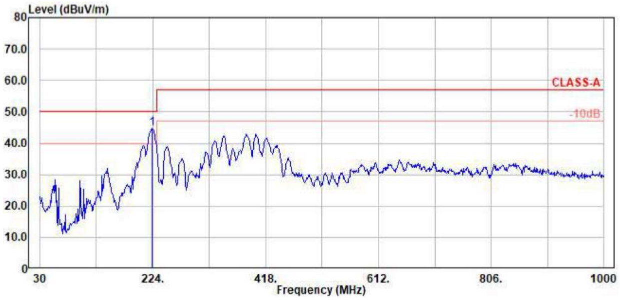


CQM60W-24S24

Vertical

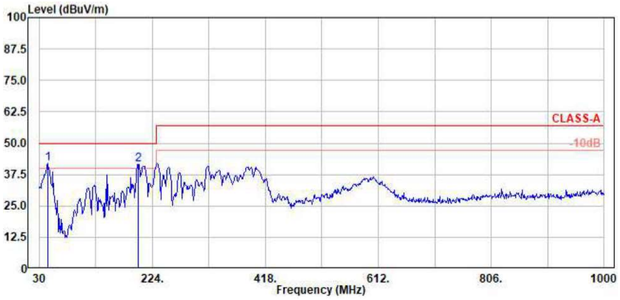


Horizontal

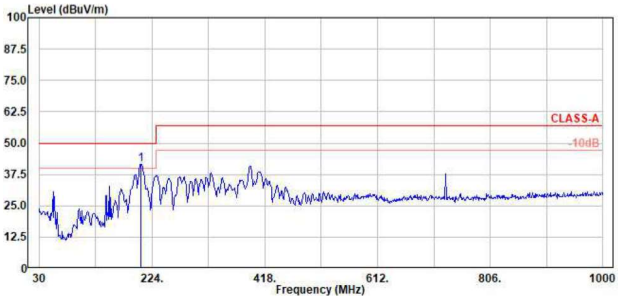


CQM60W-24D12

Vertical

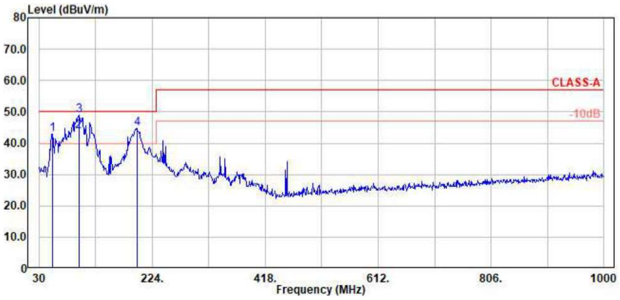


Horizontal

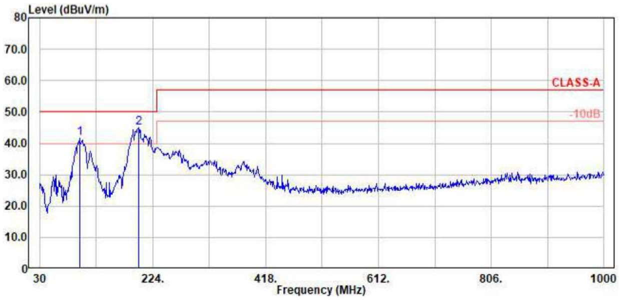


CQM60W-24D15

Vertical



Horizontal



CINCON ELECTRONICS CO., LTD.

Headquarters:

14F, No.306, Sec.4, Hsin Yi Rd.
Taipei, Taiwan
Tel: 886-2-27086210
Fax: 886-2-27029852
E-mail: sales@cincon.com.tw
Web Site: https://www.cincon.com

Factory:

No. 8-1, Fu Kung Rd.
Fu Hsing Industrial Park
Fu Hsing Hsiang,
ChangHua Hsien, Taiwan
Tel: 886-4-7690261
Fax: 886-4-7698031

Cincon North America:

1655Mesa Verde Ave. Ste 180
Ventura, CA93003
Tel: 805-639-3350
Fax: 805-639-4101
E-mail: info@cincon.com

22