PART NUMBER **CQMR310**

COMPONENT SPECIFICATION **ISSUE 3 (April 2022)**

Component Specification for Quad Channel Optically Coupled Solid State Relay

Features	APPLICATIONS
▪ Released to European Standard and complies to MIL-STD ▪ Withstand test voltage up to 1,500Vdc ▪ Output Withstand Voltage 100V ▪ Continuous Output Current of 0.8A ▪ 3A Output Surge ▪ High Level of Transient Immunity ▪ Optically Coupled between Input and Output ▪ Hermetically Sealed	▪ Space Equipment and Systems ▪ Military and High Reliability Systems ▪ Aircraft Controls ▪ Standard 28 VDC and 48 VDC Load Driver ▪ Electromechanical and Solid State Relay Replacement

DESCRIPTION

The CQMR310 has four power MOSFET optocouplers packaged into a single 32-pin Flatpack package, and is suited for applications where four independent switches are required. This popular hermetic ceramic package combined with 1,500Vdc isolation between input and output, and between four isolated relays, makes this device ideal for solid state relay applications.

The CQMR310 is available over the full military temperature range, with quality and screening levels ranging from Commercial and Industrial, to Defence and Space. Gold plated leads are standard. However, other lead finishes per MIL-PRF-38534 are also available.

Functionally, each relay is actuated by an input current that can be driven from a standard TTL device. The input current bodes a light emitting diode that is optically coupled to an integrated photovoltaic diode array. The photovoltaic diode array energises control circuitry that operates the output MOSFET.

Absolute maximum ratings, recommended operating conditions, electrical specifications and performance characteristics are identical for all units. Any exceptions, due to packaging variations and limitations, are as noted in the datasheet.

GB15/92780 0005

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STANDARDS

The following specifications have been complied with in the manufacturing of this product:

Aerospace Compliance Standards

AS9100D / ISO 9001:2015 – Design & Manufacture of Electronic and Optoelectronic Components *(Ref GB15/92780)*
IECQ Approved Process Manufacturer *(Ref M1077)*
IECQ Qualification *(Ref E1280/F)*

Military Compliance Specifications

MIL-PRF-19500 – General Specification for Discrete Semiconductor Devices

Military Compliance Standards

MIL-STD-202 – Test Method Standard Electronic and Electrical Component Parts
MIL-STD-883 – Test Method Standard Microcircuits
MIL-STD-750 – Test Methods for Semiconductor Devices

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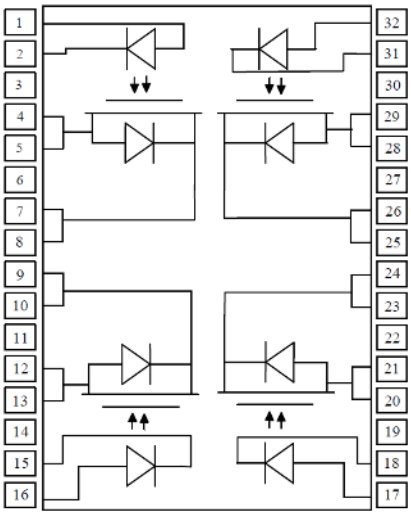
SELECTION GUIDE PACKAGE STYLES AND CONFIGURATION OPTIONS

ISOCOM Part Number and Options	
Package	32-pin Flatpack
Lead Style	–
Channels	4
Common Channel Wiring	–
Commercial	CQMR310
Defense Screen Level	CQMR310/L2
Space Screen Level	CQMR310/L2S
Standard Finish	Gold Plating
Solder Dipped	Option #20

FUNCTIONAL DIAGRAMS

CQMR310

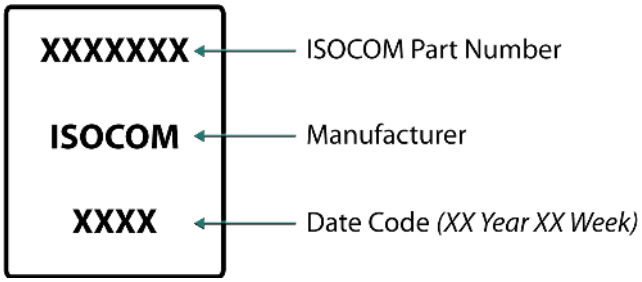
32-pin Flatpack



TRUTH TABLE

INPUT	OUTPUT
CLOSED	CLOSED
OPEN	OPEN

MARKING



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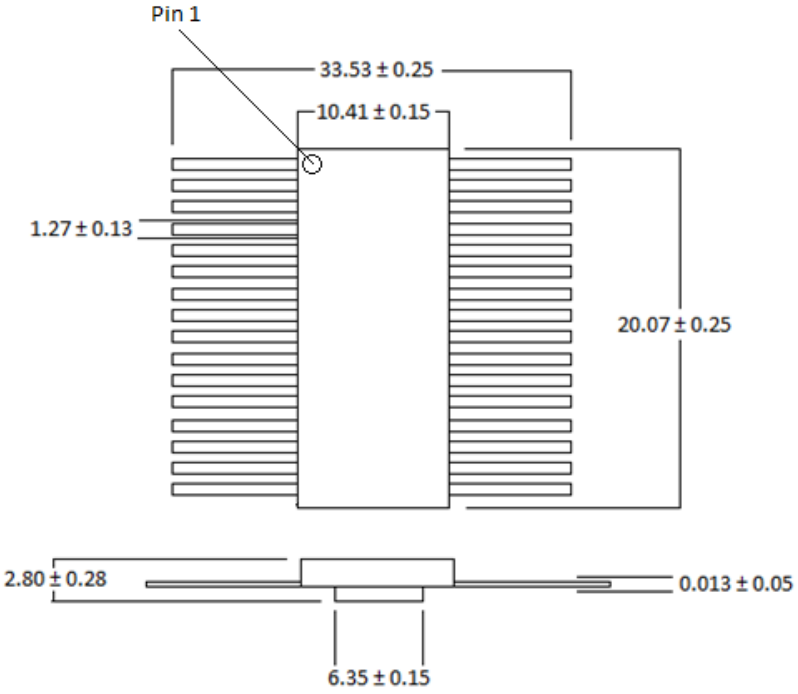
PACKAGE DIMENSIONS



PIN CONFIGURATION

Pin Number	Symbol	Pin Number	Symbol
1	Anode 1	**17**	Anode 3
2	Cathode 1	**18**	Cathode 3
3	No Connection	**19**	No Connection
4	Source 1	**20**	Source 3
5	Source 1	**21**	Source 3
6	No Connection	**22**	No Connection
7	Drain 1	**23**	Drain 3
8	Drain 1	**24**	Drain 3
9	Drain 4	**25**	Drain 2
10	Drain 4	**26**	Drain 2
11	No Connection	**27**	No Connection
12	Source 4	**28**	Source 2
13	Source 4	**29**	Source 2
14	No Connection	**30**	No Connection
15	Cathode 4	**31**	Cathode 2
16	Anode 4	**32**	Anode 2

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ABSOLUTE MAXIMUM RATINGS

T_A = 25°C U.O.S.

Storage Temperature	-65°C to +150°C
Operating Ambient Temperature	-55°C to +125°C
Junction Temperature	+150°C
Lead Solder Temperature	260°C 1.6mm from case for 10 seconds
Average Input Current	20mA
Peak Repetitive Input Current	40mA (pulse width < 100ms; duty cycle < 50%)
	100mA (pulse width < 0.2ms; duty cycle < 0.1%)
Continuous Output Current per relay	0.8A
Single Shot Output Current per relay	3.0A (pulse width < 10ms)
Output Voltage	100V_{DC}

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Min	Max	Units
Input Current (ON)	$I_{F(ON)}$	10	20	mA
Input Voltage (OFF)	$V_{F(OFF)}$	0	0.6	V_{DC}
Operating Temperature	T_A	-55	+125	°C

ELECTRICAL CHARACTERISTICS (per relay)

T_A=-55°C - +125°C U.O.S.

Parameter	Symbol	Conditions	Min	Max	Unit
Output Withstand Voltage	$V_{O(OFF)}$	$V_{O(OFF)}$ = 0.6V, I_O = 10µA	100	-	V
Output On-Resistance ②	$R_{DS(ON)}$	$I_{F(ON)}$ = 10mA, I_O = 800mA, pulse duration ≤30ms, duty cycles < 10%	-	1.2	Ω
Output Leakage Current	$I_{O(OFF)}$	$V_{F(OFF)}$=0.6V, V_O=90V	-	10	µA
Input Forward Voltage	$V_{F(OFF)}$	I_{FON}=10mA	1.0	1.7	V
Input Reverse Breakdown Voltage	V_R	I_R=10µA	5.0	-	V
Input-Output Isolation Current ③	I_{I-O}	V_{I-O}=1,000V_{dc}, t=5s, R_H ≤ 45%. T_A=25°C	-	1.0	µA
Channel-Channel Isolation Current ③	I_{ISO}	V_{ISO}=1,000V_{dc}, t=5s, R_H ≤ 45%. T_A=25°C	-	1.0	µA
Turn-On Time ②	t_{ON}	I_{FON} = 10mA, I_O = 800mA, pulse duration ≤ 30 ms, duty cycles < 10%	-	6.0	ms
Turn-Off Time ②	t_{OFF}	$I_{F(ON)}$ = 10mA, IO = 800mA, pulse duration ≤ 30 ms, duty cycles < 10%	-	2.0	ms

Notes

1. Maximum average current rating where the case temperature (T_C) is maintained below 120°C.
2. During the pulsed $R_{DS(ON)}$ measurement (I_O duration < 30ms), ambient (T_A) and case temperature (T_C) are equal.
3. This is a momentary withstand test, not a continuous operating condition.
4. Typical junction to case thermal resistance (ΘJC) for the device is 15°C/W, where the case temperature (T_C) is measured at the centre of the package bottom.

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100% SCREENING to MIL-STD-750

TEST	MIL-STD-750	READ & RECORD
Internal Visual	2072	
Sealing		
Fine Leak	1071, Condition H1	
Gross Leak	1071, Condition C	
Temp Cycling	1051, Condition B-55/+125°C, 20 Cycles	
Const. Acceler	2006, 5000G, Y1 only	
PIND	2052, Condition A	
Radiography	2076	
Initial Electrical	125°C, -55°C, 25°C	R & R
HTRB	1039	
Interim Electrical	25°C only	R & R
Burn-In	1039	
Final Electrical	125°C, -55°C, 25°C	R & R
PDA	Max. 5%, pre/post B1 electrical and delta at RT only	Calculate & R
Fine Leak	1071, Condition H1	
Gross Leak	1071, Condition C	
Solder Dip		
Fine Leak	1071, Condition H1	
Gross Leak	1071, Condition C	

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GROUP TESTING to MIL-STD-750

GROUP	TEST	MIL-STD-750	READ & RECORD
Group A			
SG1	Visual inspection & mechanical dimensions	Method 2071	
SG2	DC static test at 25°C		yes
SG3	DC static test at 125°C and -55°C		yes
SG4	Dynamic test at 25°C		yes
Group B			
SG 1	Physical dimensions	Method 2066	
SG 2	Solderability	Method 2026	
	Resistance to solvents	Method 1022	
SG 3	Thermal Shock	Method 1056 Cond. B, 25 cycles	
	Temperature cycling	Method 1051, -55/+125°C	
	Hermetic seal fine and gross leak	Method 1071, Cond. H (fine), Cond. C (gross)	
	Electrical measurement	pre and post	yes
	Decap internal visual inspection	2075	
	Bond strength	Method 2037, Cond. D	yes
	Die shear	Method 2017	yes
SG 4	Intermittent operation life	Method 1037, 1042, Cond D, Tab.5-5	
	Hermetic seal fine and gross leak	Method 1071, Cond. H (fine), Cond. C (gross)	
	Electrical measurement	pre and post	yes
	Bond strength	Method 2037, Cond. D	yes
SG 5	Acc. steady-state operation life	Method 1027	
	Electrical measurement	pre and post	yes
	Bond strength	Method 2037, Cond. D	yes
Group C			
SG 2	Thermal Shock	Method 1056, Cond. B, 25 shocks	
	Temperature cycling	Method 1051, Cond. C, -55/+125°C , 25 cycles (total 45 cycles including screening)	
	Hermetic seal fine and gross leak	Method 1071, Cond. H (fine), Cond. C (gross)	
	Moisture resistance	Method 1021	
	Electrical measurement	pre and post	yes
SG 3	Mechanical shock	Method 2016, non-operating, 1500 G, 0.5 ms, 5 blows in each orientation (X1,Y1,Z1)	
	Vibration	Method 2056	
	Constant acceleration	Method 2006, at a peak level of 5000 G	
	Electrical measurement	pre and post	yes
SG 6	Steady state operating life Not required as B5 is available on same lot		

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Space Qualification

PROCESS FLOW CHART FOR PACKAGED DEVICES

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Space Qualification

PROCESS FLOW CHART FOR PACKAGED DEVICES

Group B Testing	*MIL-STD-883	*MIL-STD-750
Physical Dimensions	Method 2016	Method 2066
Solderability	Method 2003	Method 2023
Resistance to Solvents	Method 2015	Method 1022
Temperature Cycling	Method 1010	Method 1051
• *Military Grade*	25 cycles	25 cycles
• *Space Grade*	50 cycles	50 cycles
Steady State Life (Tch 175°C / 340hr minimum)	Method 1005	Method 1027
DPA	*MIL-STD-1580A	*MIL-STD-1580A
	*Unless otherwise indicated	*Unless otherwise indicated

Environmental & Mechanical Testing Specifications		
	***MIL-STD-883**	***MIL-STD-750**
Hermetic Seal Test	Method 1014	Method 1071
• *Fine Leak*	Condition A1	Condition G or H
• *Gross Leak*	Condition C	Method 1051
Temperature Cycle *(Standard Military Level)*	Method 1010, Condition C	Method 1051, Condition C
Temperature Cycle *(Standard Space Level)*	Method 1010, Condition C	Method 1051, Condition C
Constant Acceleration	Method 2001	Method 2006
PIND Test	Method 2020	Method 2052, Condition A
RTH Measurement	Method 1012	
HTRB *(High Temperature Reverse Bias)*	Method 1015, Condition A	Method 1042, Condition B
DPA	*MIL-STD-1580A	*MIL-STD-1580A
	*Unless otherwise indicated	*Unless otherwise indicated

Inspection Table		
COMMERCIAL	**MILITARY**	**HI-REL / SPACE**
AQL Sampling Plan	MIL-STD-883, Method 2010, Class Level B	MIL-STD-883, Method 2010, Class Level S
Isocom Internal Specifications	MIL-STD-750, Method 2070, 2071,2072	MIL-STD-750, Method 2070, 2071,2072

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