ISOCOM® LTD

PART NUMBER **CSM100/101/L2S**

COMPONENT **ISSUE 2**

SPECIFICATION **June 2014**

Component Specification
For Ceramic Hermetically Sealed, Radiation Hard Transistor Optocouplers

M1077 IECQ **1077/M**

Further copies of this document may be obtained from:

ISOCOM LIMITED
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ISOCOM® LTD

Ceramic Hermetically Sealed, Radiation Hard Transistor Optocouplers

- **CSM100/101**
- **CSM100/101/L2**
- **CSM100/101/L2S**

Features

- Released to European Standard and Complies to Mil Std
- Total Ionizing Dose Tested to 150KRad(si)
- Displacement Damage to 1 MEV x 10^{12}
- High Isolation Voltage 1000vdc
- 4 Pin LCC Package
- Low Input Requirements
- High Current Transfer Ratio
- High Speed Switching
- Hermetically Sealed

Applications

- Space Radiation Equipment
- Military, high reliability system
- Medical instruments
- Logic Interfacing
- Mos, Cmos Applications
- Data Transmission
- Power Supply
- Modems

Description

These devices are single, hermetically sealed optically coupled isolators. Each channel is composed of a infra-red emitting diode and a silicon phototransistor. The CSM100 series is being used in environments encounted by space applications. It is manufactured to meet the JANS standard in conjunction with MIL-PRF-19500 procedures (please see next page for all other applicable specifications). Package styles for this device include 4 Pin LCC Package with surface mount, solder dip option available.
Therefore 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.

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Standards

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

Military Compliance Specifications

MIL-PRF-19500 – General Specification for Discrete Semiconductor Devices
IECQ – M1077

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
ISO 9001:2008 – Manufacturing of Optocouplers and Optoelectronic components.

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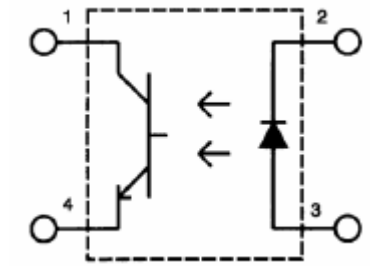
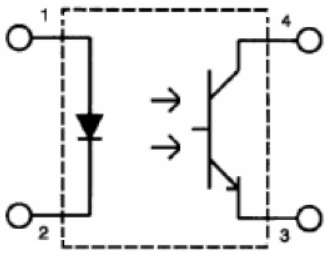
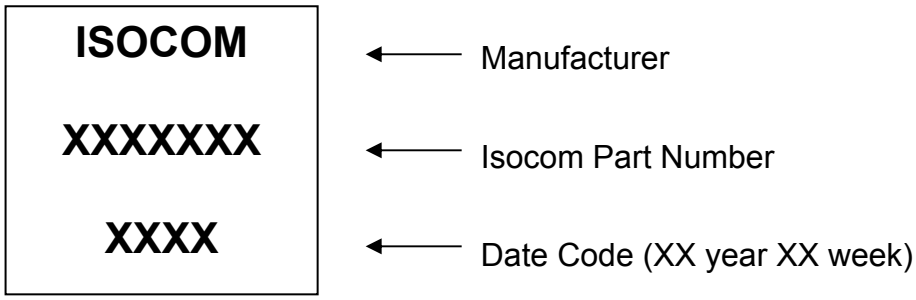
Selection Guide Package Styles and Configuration Options

Package	4 pin LCC
Lead Style	
Channels	1
Common Channel Wiring	
Isocom Part Number and Options	
Commercial	CSM100/101
Defense Screen Level	CSM100/101/L2
Space Screen Level	CSM100/101/L2S
Standard Gold Plate Finish	Gold Plate
Solder Dipped	Option 20

Functional Diagrams

CSM100	CSM101
4 pin LCC	4 pin LCC
1 Channel	1 Channel
	

Device Marking



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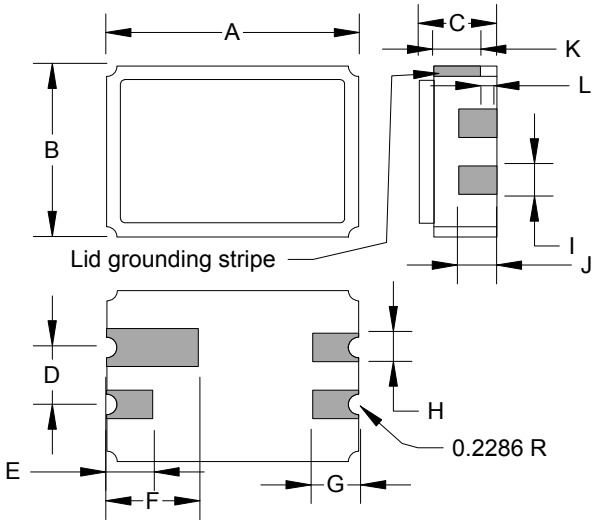
Outline Drawings



	Inches		Millimetres	
SYMBOL	MIN.	MAX.	MIN.	MAX.
A	0.215	0.225	5.46	5.71
B	0.145	0.155	3.68	3.94
C	0.061	0.075	1.55	1.91
D	0.045	0.055	1.14	1.40
E	0.032	0.048	0.81	1.22
F	0.072	0.088	1.83	2.24
G	0.032	0.048	0.81	1.22
H	0.022	0.028	0.56	0.71
I	0.010	0.024	0.25	0.61
J	0.029	0.044	0.74	1.12
K	0.036	0.044	0.91	1.12
L	0.011	0.019	0.28	0.48

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Absolute Maximum Ratings

T_A = 25°C U.O.S.

Storage Temperature	-65°C to +150°C
Operating Temperature	-55°C to +125°C
Lead Soldering Temperature	260°C 1.6mm from case for 10S
Input-to-Output Isolation Voltage	⇧1000VDC

Input Diode

Forward DC Current	40mA	DC at (or below) +65°C Derates linearly to +125°C free air temperature at the rate of 0.67mA/°C.
Reverse DC Voltage	2V	
Peak forward Current	1.0mA	$P_W \leq 1\mu S$, PRR<300pps ≤ 10µS ms
Power Dissipation	60mW	Derates linearly above 65°C at 1.0W/°C

Output Transistor

Collector-Emitter Voltage	40V	BV_{CEO}
Emitter-Collector Voltage	5V	BV_{ECO}
Collector Current	50mA	
Power Dissipation	300mW	Derates linearly above 25°C at 3.0W/°C

Coupled Device

Input to Output Isolation Voltage	1000V	
Power Dissipation	360mW	
SolderingTemperature,Soldering Iron	260,5	°C,s This part shall not be re-soldered until 3 minutes have elapsed.
SolderingTemperature,Vapour Phase	220,40	°C,s This part shall not be re-soldered until 3 minutes have elapsed.
ESD Classification	Class 2	Class 2 with minimum critical path voltage of 4,000 to 15,999V. MIL-STD-883

Recommended Operating Conditions

Characteristics	Symbol	Maximum Range	Unit	Comments
Supply Voltage	V_{CE}	5.0 to 20	V	
Operating Temperature	T_{OP}	-55 to 125	^{O}C	

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Electrical Characteristics

Input Diode Electrical Characteristics T_A = 25°C U.O.S.

Parameter	Symbol	Test Conditions	Min	Type	Max	Units
Forward Voltage	V_F	I_F = 10mA	1.3	-	1.6	V
		I_F = 10mA -55°C	1.3	-	1.8	V
		I_F = 10mA +125°C	1.1	-	1.6	V
Reverse Current	I_R	V_R = 2.0V	-	-	100	µA

Output Detector Electrical Characteristics

Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	I_C = 1mA	70	100	-	V
Emitter-Collector Breakdown Voltage	$V_{(BR)ECO}$	I_E = 0.1mA	7	9	-	V
Collector–Emitter Leakage Current	I_{CEO}	V_{CE} = 20v, I_F = 0	-	7	100	µA
		V_{CE} = 20v I_F = 0, -55°C	-	-	100	µA
		V_{CE} = 20v, I_F = 0, +125°C	-	10	150	µA

Coupled Electrical Characteristics

DC Current Transfer Ratio	I_C/I_F	I_F = 1.0mA, V_{CE} = 1V	200	-	-	%
		I_F = 3.0mA, V_{CE} = 1V	200	-	-	%
		I_F = 15.0mA, V_{CE} = 1V	100	-	-	%
		I_F = 10.0mA, V_{CE} = 5V (Note 1)	350	-	-	%
		I_F = 15.0mA, V_{CE} = 5V (Note 1)	100	-	-	%
		I_F = 1.0mA, V_{CE} = 15V	300			%
Collector-Emitter Saturation Voltage	V_{CE} (Sat)	I_C =10.0mA I_F = 20mA	-	-	0.22	V
Isolation Voltage	V_{in-out}	T = 5s (Note 2)	1000	-	-	V_{dc}
Input to Output Resistance	R_{in-out}	V_{IO} = 500V (Note 2)	-	10^5		Ω
Rise Time	tr	R_L = 100Ohms V_{cc} = 10V I_F = 10mA	-	-	20.0	µS
Fall Time	tf	R_L = 100Ohms V_{cc} = 10V I_F = 10mA	-	-	20.0	µS
Propagation Delay H-L	t_{PHL}	R_L = 100Ohms V_{cc} = 10V I_F = 10mA	-	-	5.0	µS
Propagation Delay L-H	t_{PLH}	R_L = 100Ohms V_{cc} = 10V I_F = 10mA	-	-	5.0	µS
DC Current Transfer Ratio	I_C	I_F = 1.0mA, V_{CE} = 1V, T_A = 125°C	200	-	-	%
		I_F = 1.0mA, V_{CE} = 1V, T_A = -55°C	200	-	-	%
		I_F = 3.0mA, V_{CE} = 1V, T_A = 125°C	100	-	-	%
		I_F = 3.0mA, V_{CE} = 1V, T_A = -55°C	100	-	-	%
		I_F = 15.0mA, V_{CE} = 1V, T_A = 125°C	66	-	-	%
		I_F = 15.0mA, V_{CE} = 1V, T_A = -55°C	66	-	-	%
		I_F = 10.0mA, V_{CE} = 5V; T_A =125°C	160	-	-	%
		I_F = 10.0mA, V_{CE} = 5V, T_A = -55°C	160	-	-	%
	(note 2)	I_F = 15.0mA, V_{CE} = 5V, T_A = 125°C	40	-	-	%
	(note 2)	I_F = 15.0mA, V_{CE} = 5V, T_A = -55°C	40	-	-	%
		I_F = 1.0mA, V_{CE} = 15V, T_A = 125°C	250	-	-	%
		I_F = 1.0mA, V_{CE} = 15V, T_A = -55°C	250	-	-	%

Notes:
1) Sample and hold pulse shall not be longer than 0.1 seconds. Duty cycle shall be 10.
2) Measurements with inputs shorted together and outputs shorted together.

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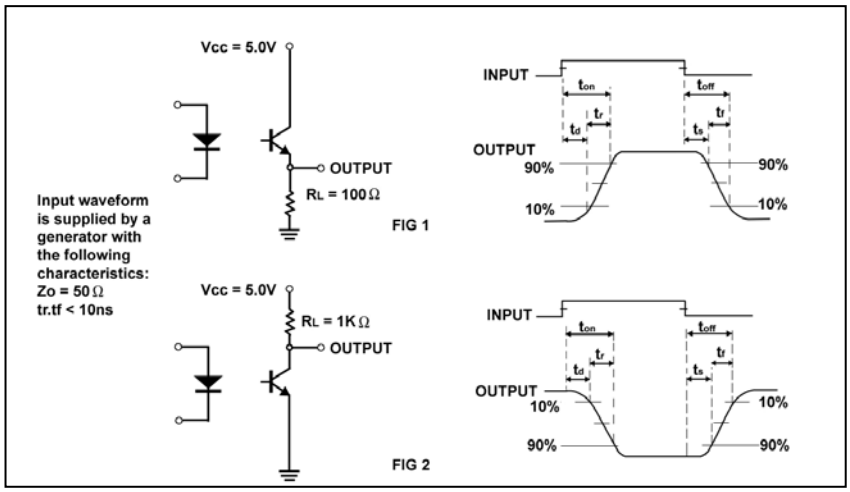
Electrical Measurements During and on Completion of Radiation Testing

Parameter	Symbol	Test Conditions	Min	Max	Units
Input Diode Forward Voltage	V_F	I_F = 10mA	1.3	1.8	V
Input Diode Reverse Current	I_R	V_R = 2.0V	-	100	µA
Photo Transistor Collector-Emitter Dark Current	I_{CEO}	V_{CE} = 20v, I_F = 0	-	100	µA
Coupled Current Transfer Ratio	I_C	I_F = 1.0mA, V_{CE} = 1V	200	-	%
		I_F = 3.0mA, V_{CE} = 1V	100	-	%
		I_F = 15.0mA, V_{CE} = 1V	100	-	%
		I_F = 10.0mA, V_{CE} = 5V (note 1)	250	-	%
		I_F = 15.0mA, V_{CE} = 5V (note 1)	100	-	%
		I_F = 1.0mA, V_{CE} = 15V	250	-	%
Collector-Emitter Saturation Voltage	V_{CE} (Sat)	I_C =10.0mA I_F = 20mA	-	0.22	V

NOTE 1 = Sample and hold pulse shall be not longer than 0.1 seconds. Duty cycle shall be 10

Switching Time



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GROUP TESTING TO MIL-STD 750

GROUP	TEST	MIL-STD-750	READ AND 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, 100 cycles, -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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100% SCREENING TO MIL-STD 750

TEST	MIL-STD-750	READ AND 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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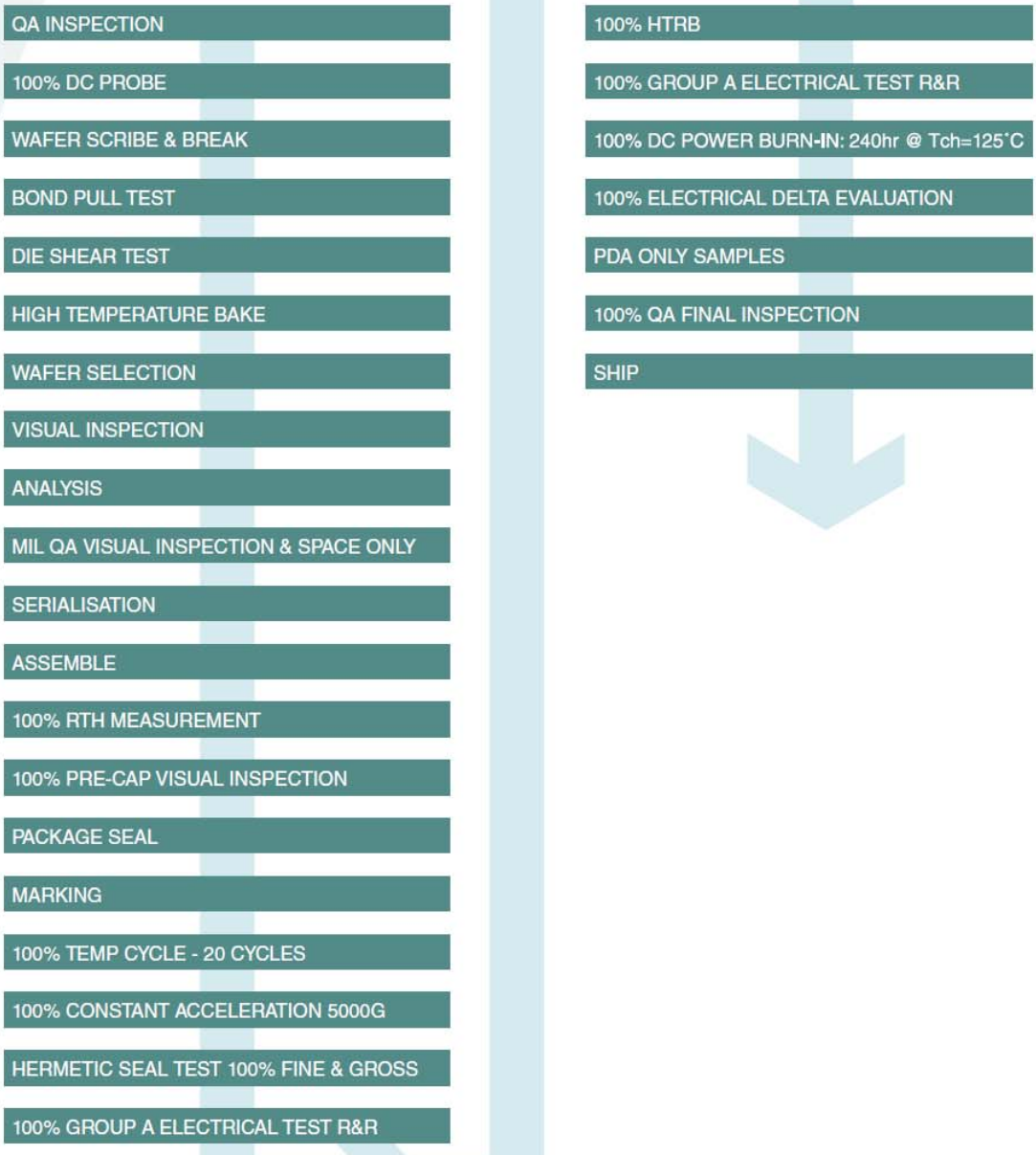
Space Qualification

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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