

**PART NUMBER**

**CH100 Series**

**COMPONENT**

**ISSUE 1**

**SPECIFICATION**

**May 2014**

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**Component Specification  
Transistor Optocouplers  
With Very Low Operating Temperatures**



**M1077 IECQ**



**1077/M**



Further copies of this document may be obtained from:

ISOCOM LIMITED  
WASHINGTON, UK  
NE38 0AH  
[www.isocom.uk.com](http://www.isocom.uk.com)

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For sales enquiries, or further information, please contact our sales office at:

Isocom Ltd, 48, Hutton Close, Crowther Industrial Estate, Washington, Tyne and Wear, NE38 0AH, UK  
Tel: +44 0191 4166 546 Fax: +44 0191 4155 055



## Transistor Optocouplers Very Low Operating Temperatures

- CH100/101/102/103
- CH100/101/102/103/L2
- CH100/101/102/103/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<sup>12</sup>
- Low Temperature Operation upto -150°C
- 4 Pad LCC Package
- Flexibility in Design for mounting styles
- High Current Transfer Ratio
- High Isolation Voltage upto 1000vdc
- Hermetically Sealed

### Applications

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

### Description

The CH100 has been designed and manufactured to meet the requirements of very low temperatures experienced in harsh environments encountered by space applications. These devices can be wire bonded within a hybrid application or mounted directly onto a PCB board offering the customer flexibility in their design.

They are single channel, hermetically sealed, Radiation Hard optically coupled isolators. Each channel is composed of an infra-red emitting diode and a silicon phototransistor. The CH100 series was 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 Pad LCC.

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## **Standards**

The following specifications have been complied with in the manufacturing of this product to JANS MIL-STD requirements:

### **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.

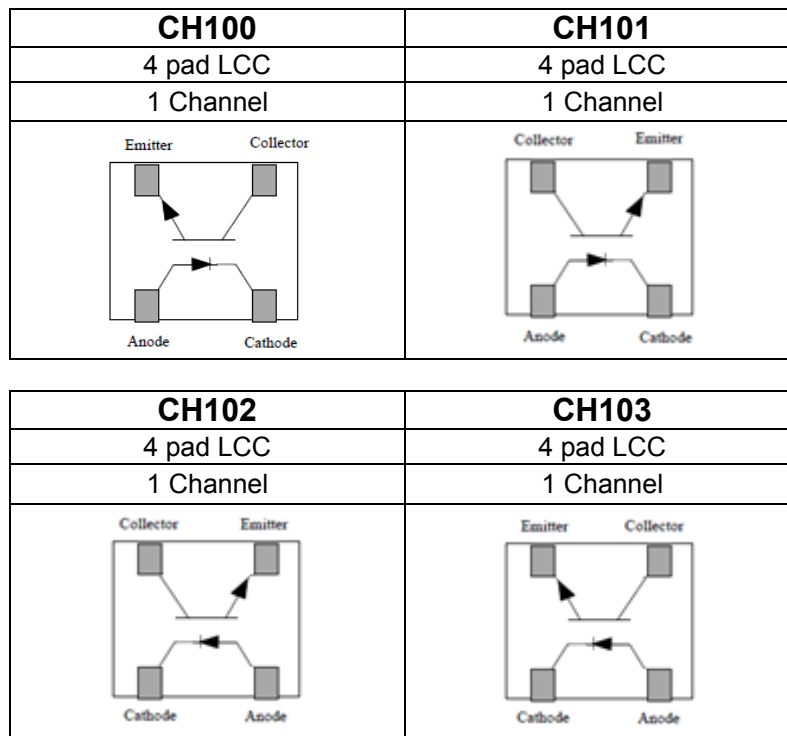
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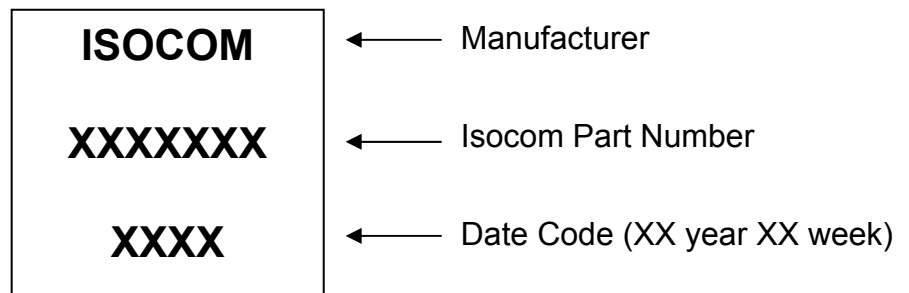
## Selection Guide Package Styles and Configuration Options

Package	4 pad LCC
Lead Style	
Channels	1
Common Channel Wiring	
<b>Isocom Part Number and Options</b>	
Commercial	CH100/101/102/103
Defense Screen Level	CH100/101/102/103/L2
Space Screen Level	CH100/101/102/103/L2S
Standard Gold Plate Finish	Gold Plate
Solder Dipped	Option 20

## Functional Diagrams



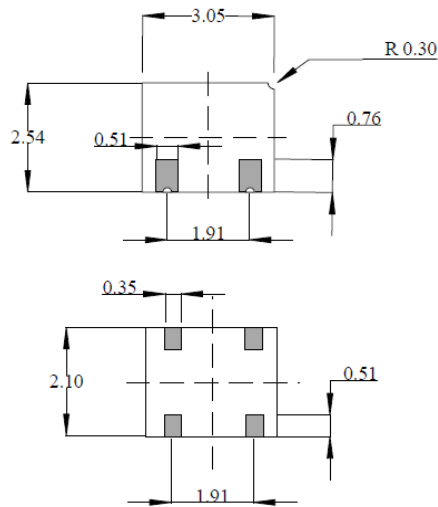
## Device Marking



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## Outline Drawings



## Absolute Maximum Ratings

$T_A = 25^\circ\text{C}$  U.O.S.

Storage Temperature	-65°C to +150°C
Operating Temperature	-150°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	$P_w \leq 1\mu\text{S}$ , $\text{PRR} < 300\text{pps} \leq 10\mu\text{S}$ ms
Power Dissipation	60mW	Derates linearly above 65°C at 1.0W/°C

### **Output Transistor**

Collector-Emitter Voltage	70V	$BV_{CEO}$
Emitter-Collector Voltage	7V	$BV_{ECO}$
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	
Soldering Temperature, Soldering Iron	260,5	°C,s This part shall not be re-soldered until 3 minutes have elapsed.
Soldering Temperature, 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

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## Electrical Characteristics

### Input Diode Electrical Characteristics $T_A = 25^\circ\text{C}$ U.O.S.

Parameter	Symbol	Test Conditions	Min	Type	Max	Units
Forward Voltage	$V_F$	$I_F = 10\text{mA}$	1.3	-	1.8	V
		$I_F = 10\text{mA}$ $-55^\circ\text{C}$	1.3	-	1.8	V
		$I_F = 10\text{mA}$ $+125^\circ\text{C}$	1.1	-	1.8	V
Reverse Current	$I_R$	$V_R = 2.0\text{V}$	-	-	100	$\mu\text{A}$

### Output Detector Electrical Characteristics

Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	$I_C = 1\text{mA}$	70	100	-	V
Emitter-Collector Breakdown Voltage	$V_{(BR)ECO}$	$I_E = 0.1\text{mA}$	7	9	-	V
Collector-Emitter Leakage Current	$I_{CEO}$	$V_{CE} = 20\text{V}$ , $I_F = 0$	-	7	100	$\mu\text{A}$
		$V_{CE} = 20\text{V}$ , $I_F = 0$ , $-55^\circ\text{C}$	-	-	100	$\mu\text{A}$
		$V_{CE} = 20\text{V}$ , $I_F = 0$ , $+125^\circ\text{C}$	-	10	150	$\mu\text{A}$

### Coupled Electrical Characteristics

DC Current Transfer Ratio	$I_C/I_F$	$I_F = 1.0\text{mA}$ , $V_{CE} = 5\text{V}$	100	-	-	%
		$I_F = 10.0\text{mA}$ , $V_{CE} = 5\text{V}$ (Note 1)	150	-	-	%
Collector-Emitter Saturation Voltage	$V_{CE}$ (Sat)	$I_C = 10.0\text{mA}$ $I_F = 20\text{mA}$	-	-	0.3	V
Isolation Voltage	$V_{in-out}$	$T = 5\text{s}$ (Note 2)	500	-	1000	$V_{dc}$
Input to Output Resistance	$R_{in-out}$	$V_{IO} = 500\text{V}$ (Note 2)	-	$10^5$	-	$\Omega$
Rise Time	$t_r$	$R_L = 100\text{Ohms}$ $V_{CC} = 10\text{V}$ $I_F = 10\text{mA}$	-	7	20.0	$\mu\text{S}$
Fall Time	$t_f$	$R_L = 100\text{Ohms}$ $V_{CC} = 10\text{V}$ $I_F = 10\text{mA}$	-	7	20.0	$\mu\text{S}$
Propagation Delay H-L	$t_{PHL}$	$R_L = 100\text{Ohms}$ $V_{CC} = 10\text{V}$ $I_F = 10\text{mA}$	-	-	5.0	$\mu\text{S}$
Propagation Delay L-H	$t_{PLH}$	$R_L = 100\text{Ohms}$ $V_{CC} = 10\text{V}$ $I_F = 10\text{mA}$	-	-	5.0	$\mu\text{S}$

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	$V_F$	$I_F = 10\text{mA}$	1.3	1.8	V
Input Diode Reverse Current	$I_R$	$V_R = 2.0\text{V}$	-	100	$\mu\text{A}$
Photo Transistor Collector-Emitter Dark Current	$I_{CEO}$	$V_{CE} = 20\text{v}, I_F = 0$	-	100	$\mu\text{A}$
Coupled Current Transfer Ratio	$I_C$	$I_F = 1.0\text{mA}, V_{CE} = 5\text{V}$	100	-	%
		$I_F = 10.0\text{mA}, V_{CE} = 5\text{V}$ (note 1)	150	-	%
Collector-Emitter Saturation Voltage	$V_{CE}$ (Sat)	$I_C = 10.0\text{mA}$ $I_F = 20\text{mA}$	-	0.3	V

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

NOTE 2 = Please note that if you require any parameters to be controlled to meet your design needs such as CTR,  $V_F$ ,  $I_{CEO}$ ,  $V_{CE(SAT)}$ , please contact Isocom Limited customer service team. We also offer a selection of screening procedures that will match your needs.

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## GROUP TESTING TO MIL-STD 750

GROUP	TEST	MIL-STD-750	READ AND RECORD
<b>Group A</b>			
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
<b>Group B</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)	
	<b>Electrical measurement</b>	pre and post	yes
	Decap internal visual inspection	2075	
	<b>Bond strength</b>	Method 2037, Cond. D	yes
	<b>Die shear</b>	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)	
	<b>Electrical measurement</b>	pre and post	yes
	<b>Bond strength</b>	Method 2037, Cond. D	yes
SG 5	Acc. steady-state operation life	Method 1027	
	<b>Electrical measurement</b>	pre and post	yes
	<b>Bond strength</b>	Method 2037, Cond. D	yes
<b>Group C</b>			
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	
	<b>Electrical measurement</b>	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	
	<b>Electrical measurement</b>	pre and post	yes
SG 6	Steady state operating life Not required as B5 is available on same lot		

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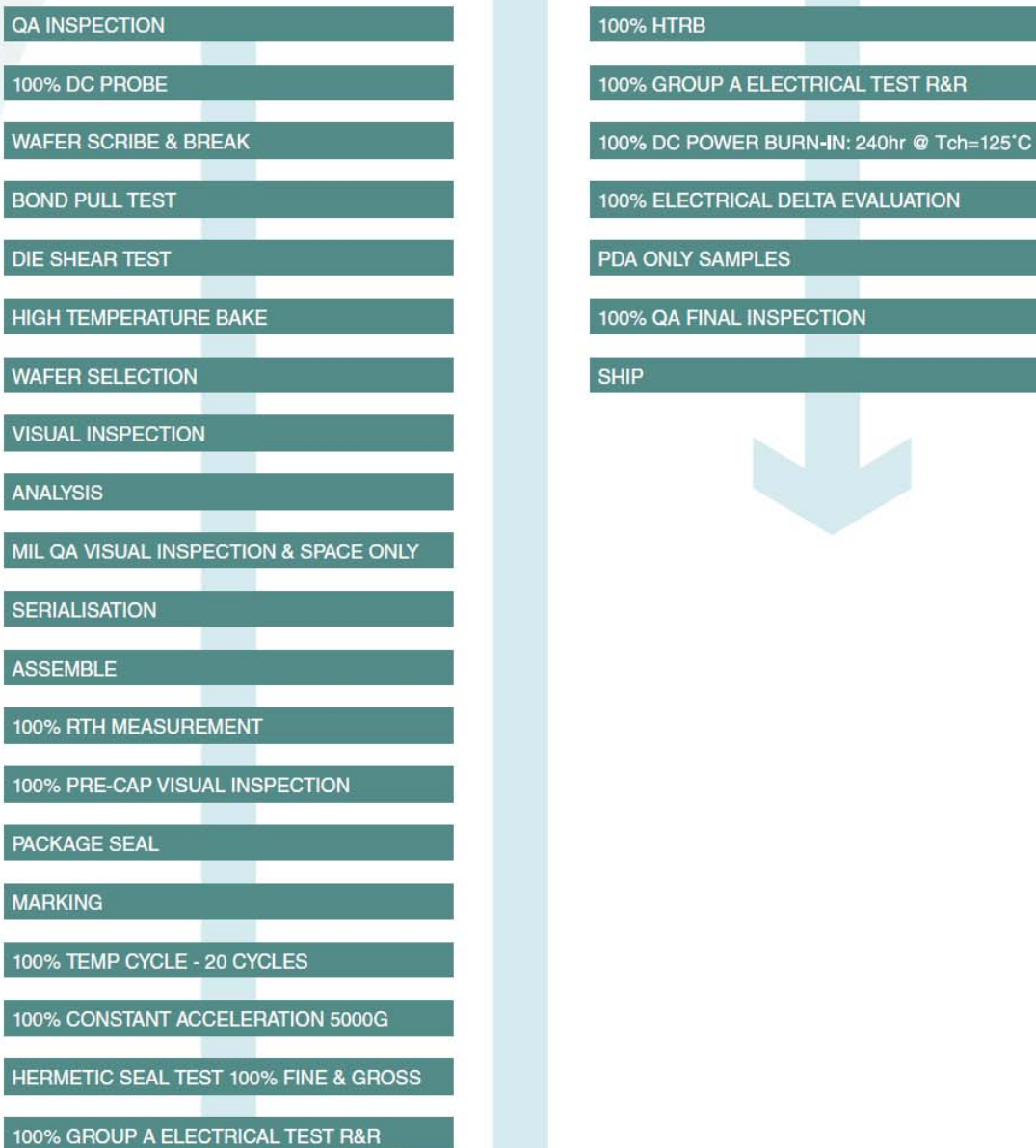
## 100% SCREENING TO MIL-STD 750

TEST	MIL-STD-750	READ AND RECORD?
Internal Visual	2072	
<b>Sealing</b>		
(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	
<b>Solder Dip</b>		
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
• <i>Military Grade</i>	25 cycles	25 cycles
• <i>Space Grade</i>	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
• <i>Fine Leak</i>	Condition A1	Condition G or H
• <i>Gross Leak</i>	Condition C	Method 1051
Temperature Cycle ( <i>Standard Military Level</i> )	Method 1010, Condition C	Method 1051, Condition C
Temperature Cycle ( <i>Standard Space Level</i> )	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 ( <i>High Temperature Reverse Bias</i> )	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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