

**PART NUMBER**

**CS201**

**COMPONENT**

**ISSUE 1**

**SPECIFICATION**

**August 2013**

**Component Specification  
For Ceramic Hermetically Sealed, Radiation Hard  
Transistor Optocoupler**



**M1077 IECQ**

**BS9000**



**1077/M**



Further copies of this document may be obtained from:

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## Ceramic Hermetically Sealed, Radiation Hard Transistor Optocoupler

- CS201
- CS201/L2
- CS201/L2S

### Features

- Released to European Standard and complies to Mil Std
- Hermetically Sealed
- High Isolation 1500Vdc
- 6 Pin Dual In Line Package
- Low Input Requirements
- High Current Transfer Ratio
- Total Ionizing Dose Tested to 150KRad(si)
- Displacement Damage Tested to 1 MEV x10<sup>12</sup>

### Applications

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

### Description

These devices are single, hermetically sealed optically coupled isolators. Each channel is composed of a Gallium Arsenide infra-red emitting diode and a silicon phototransistor. The CS200 series is being used in environments encountered by space applications. It is manufactured to JANS standard in conjunction with MIL-PRF-19500 procedures (please see next page for all other applicable specifications). Package styles for this device include 6 Pin DIL Package with surface mount, solder dip option available.

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.

### **Amendment Record**

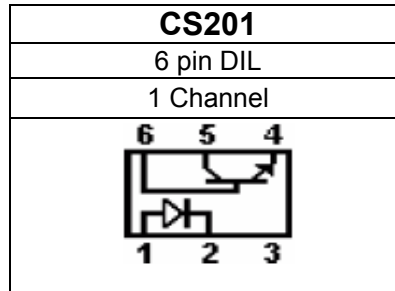
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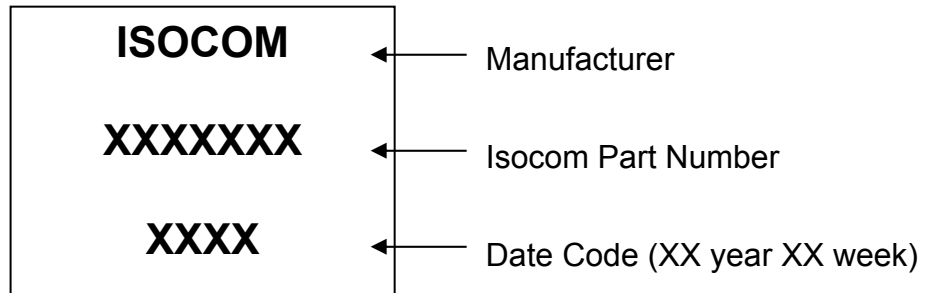
## Selection Guide Package Styles and Configuration Options

Package	6 pin DIL
Lead Style	
Channels	1
Common Channel Wiring	
<b>Isocom Part Number and Options</b>	
Commercial	CS201
Defense Screen Level	CS201/L2
Space Screen Level	CS201/L2S
Standard Gold Plate Finish	Gold Plate
Butt Joint	Option 10
Solder Dipped	Option 20
Gull Wing	Option 30
Butt Joint	Option 60

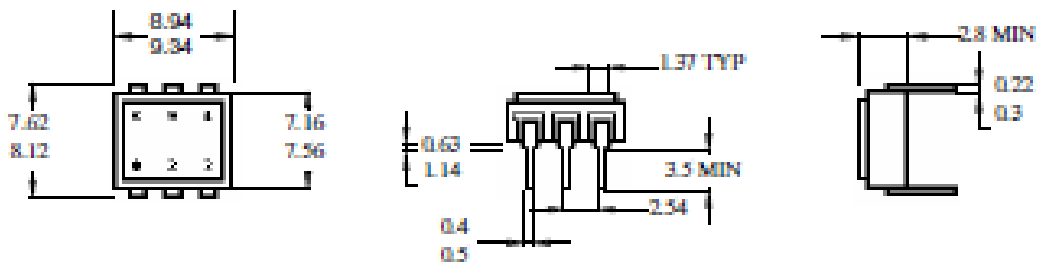
### Functional Diagrams



### Device Marking



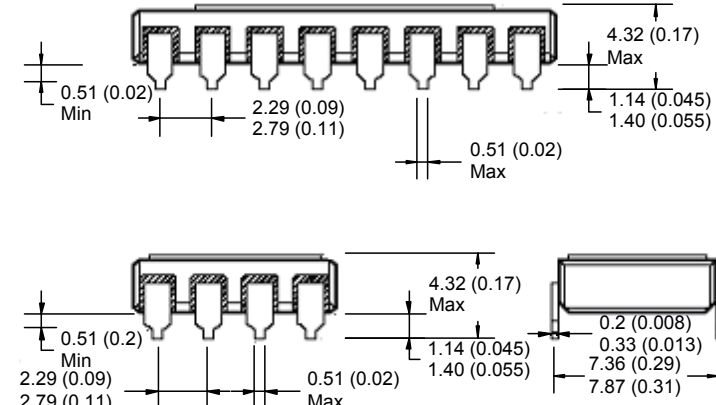
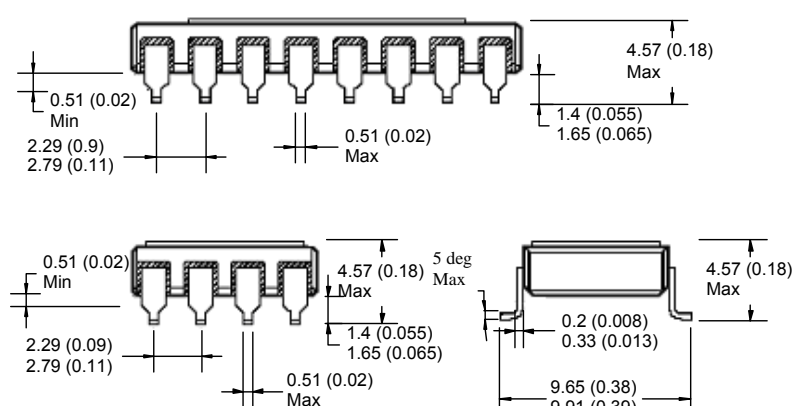
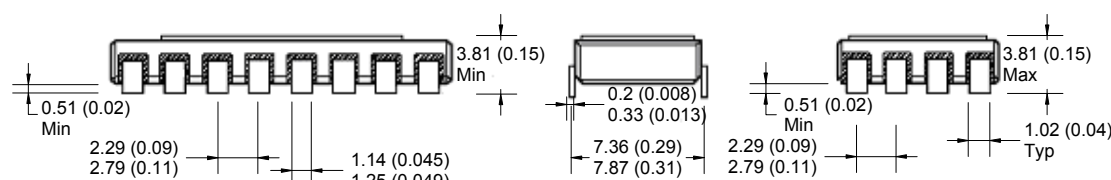
### Outline Drawings



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## Hermetic Optocoupler Options

Option	Description
10	<p>Surface mountable hermetic optocoupler with leads trimmed for butt joint assembly. This option is available on commercial hi-rel product in 6, 8 and 16 pin DIP</p> 
20	
30	<p>Surface mountable hermetic optocoupler with leads cut and bent for gull wing assembly. This option is available on commercial and hi-rel product in 6, 8 and 16 pin DIP.</p> 
60	<p>Surface mountable hermetic optocoupler with leads trimmed for butt joint assembly. This option is available on commercial hi-rel product in 6, 8 and 16 pin DIP</p> 

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## Absolute Maximum Ratings

T<sub>A</sub> = 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	↑1500VDC

### **Input Diode**

Average Forward Current	50mA	
Reverse Voltage	7V	
Peak forward Current	1.5A	≤1μS,
Power Dissipation	100mW	Derate linearly 1.6mW/°C above 100°C

### **Output Transistor**

Collector-Emitter Voltage	70V	
Emitter-Collector Voltage	7V	
Collector-Base Voltage	70V	≤ 10μS
Collector Current	100mA	t= 1mS
Power Dissipation	150mW	Derate linearly above 100°C at 1.4W/°C

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## Electrical Characteristics

T<sub>A</sub> = 25°C U.O.S.

### Input Diode Electrical Characteristics

Parameter	Symbol	Test Conditions	Min	Type	Max	Units
Forward Voltage	V <sub>F</sub>	I <sub>F</sub> = 10mA	0.7	1.18	1.8	V
		I <sub>F</sub> = 10mA -55°C	0.7	1.29	1.8	V
		I <sub>F</sub> = 10mA +125°C	0.7	1.10	1.8	V
Reverse Breakdown Voltage	V <sub>R</sub>	I <sub>R</sub> = 0.1mA	5	-	-	V
Reverse Current	I <sub>R</sub>	V <sub>R</sub> = 3.0V	-	-	100	μA

### Output Detector Electrical Characteristics

Collector-Emitter Breakdown Voltage	V <sub>(BR)CEO</sub>	I <sub>C</sub> = 1mA	70	-	-	V
Collector-Base Breakdown Voltage	V <sub>(BR)CBO</sub>	I <sub>B</sub> = 100μA	70	-	-	V
Emitter-Collector Breakdown Voltage	V <sub>(BR)ECO</sub>	I <sub>E</sub> = 0.1mA	7	-	-	V
Emitter-Base Breakdown Voltage	V <sub>(BR)EBO</sub>	I <sub>B</sub> = 0.1mA	5	-	-	V
Collector-Emitter Leakage Current	I <sub>CEO</sub>	V <sub>CE</sub> = 20v, I <sub>F</sub> = 0	-	6	100	μA
		V <sub>CE</sub> = 20v I <sub>F</sub> = 0, -55°C	-	-	100	μA
		V <sub>CE</sub> = 20v, I <sub>F</sub> = 0, +125°C	-	8	100	μA

### Coupled Electrical Characteristics

DC Current Transfer Ratio	I <sub>C</sub> /I <sub>F</sub>	I <sub>F</sub> = 10.0mA, V <sub>CE</sub> = 5V (Note 1)	100	-	-	%
Collector-Emitter Saturation Voltage	V <sub>CE</sub> (Sat)	I <sub>C</sub> = 2.5mA I <sub>F</sub> = 10.0mA	-	-	0.3	V
Isolation Voltage	V <sub>in-out</sub>	T = 5s (Note 2)	1500	-	-	VDC
Input to Output Resistance	R <sub>in-out</sub>	V <sub>IO</sub> = 500V (Note 2)	-	10 <sup>11</sup>	-	Ω
Rise Time	t <sub>r</sub>	R <sub>L</sub> = 100Ohms	-	5	-	μS
Fall Time	t <sub>f</sub>	R <sub>L</sub> = 100Ohms	-	5	-	μS
Turn on Time	t <sub>on</sub>	R <sub>L</sub> = 100KOhms V <sub>CC</sub> = 5V I <sub>F</sub> = 5.0mA	-	9.0	-	μS
Turn off Time	t <sub>off</sub>	R <sub>L</sub> = 100KOhms V <sub>CC</sub> = 5V I <sub>F</sub> = 5.0mA	-	25	-	μS

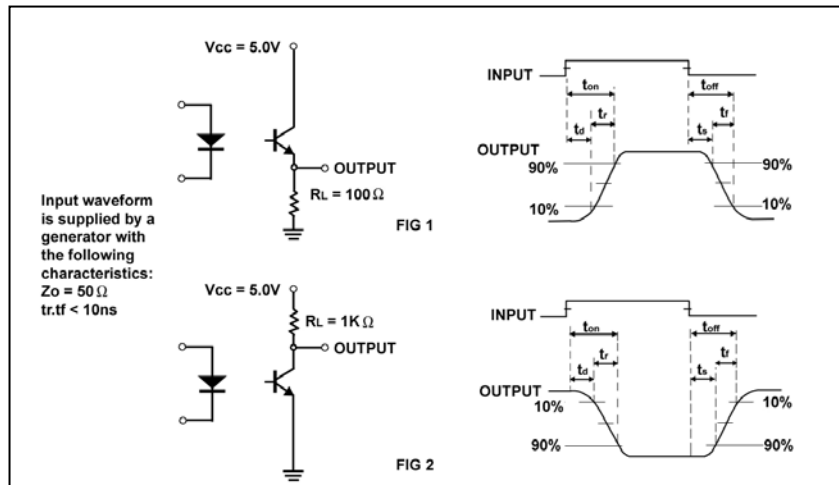
Notes:

- 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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## Switching Time



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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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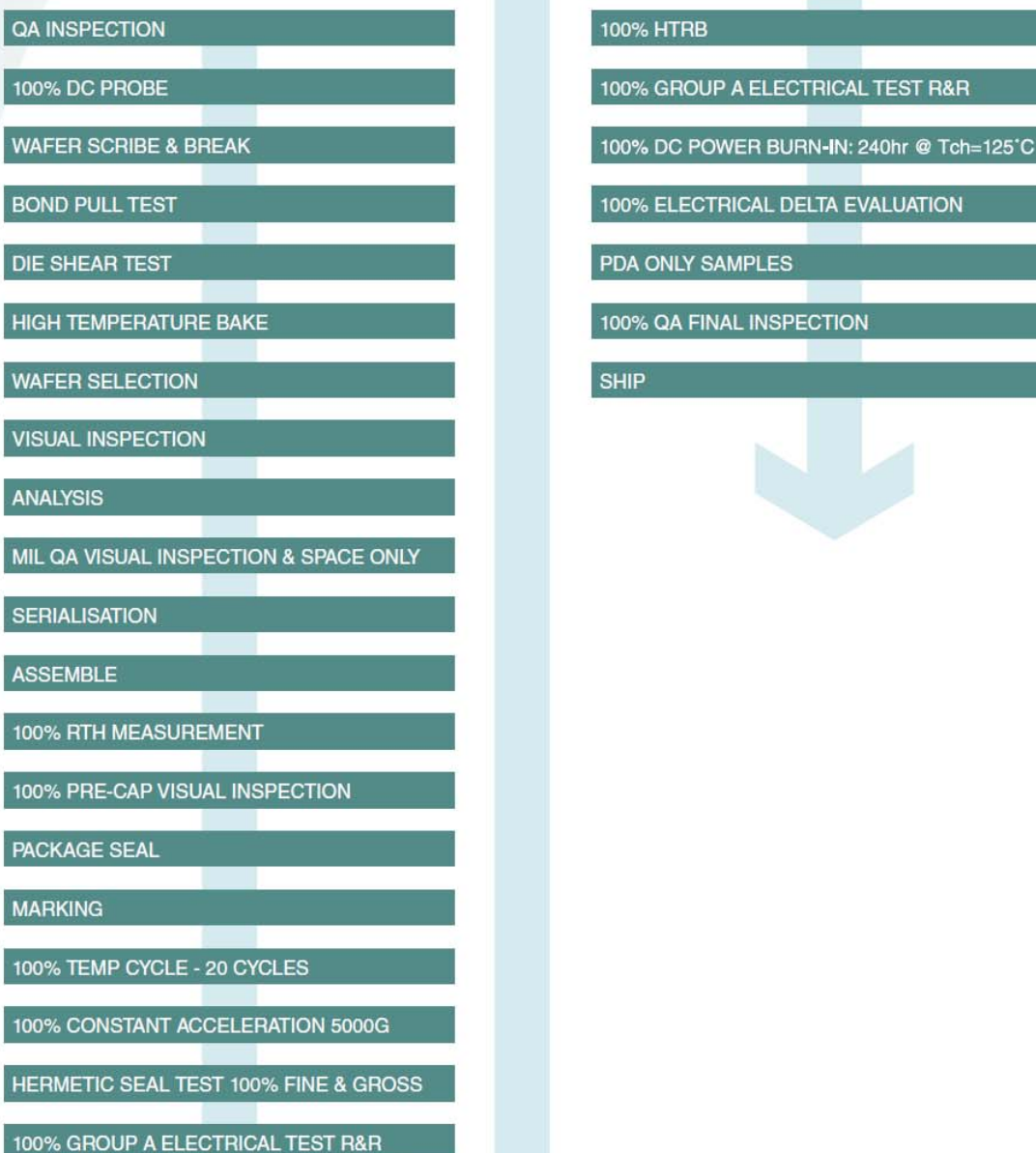
## 100% SCREENING to MIL-STD 750

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
<ul style="list-style-type: none"> <li><i>Military Grade</i></li> <li><i>Space Grade</i></li> </ul>	25 cycles 50 cycles	25 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
<ul style="list-style-type: none"> <li><i>Fine Leak</i></li> <li><i>Gross Leak</i></li> </ul>	Condition A1 Condition C	Condition G or H 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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