ISOCOM® LTD

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COMPONENT	**ISSUE 8**
SPECIFICATION	**May 2013**

Component Specification For Ceramic Hermetically Sealed High Gain Optocouplers

M1077 IECQ

IECQ Product Certificate Number E1280/F

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FOREWORD

The IECQ Quality Assessment System for Electronic Components (IECQ) is composed of those member countries of the International Electrotechnical Commission (IEC) who wish to take part in a harmonized system for electronic components of assessed quality. IECQ is also known in some European member countries as IECQ-CECC.

The object of the System is to facilitate international trade by the harmonization of the specifications and quality assessment procedures for electronic components, and by the grant of an internationally recognised Mark, or Certificate of Conformity. The components produced or services provided under the system are thereby acceptable in all member countries without further testing.

This Component Specification is based upon the requirements of IECQ 03-3, Annex E (QC 001002-2 Amendment 1, Clause 5.4) and has been prepared by:

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AMENDMENT RECORD

Issue 1 – Changed Pages 4, 9 & 10 – Amendments 22/06/09
Issue 2 – Changed Pages 3, 4 & 5 – Amendments 05/07/10
Issue 3 – Changed Pages 3, 4, 5 & 6 – RoHS Compliant, Added CSM160/161/162-2 & Amendments 13/07/10
Issue 4 – Changed Pages 3,4,9 and 10 – Added CH390 23/08/10
Issue 5 – Changed Page 6 – Added 4/5 pin hybrid package 26/5/11
Issue 6 – Changed Page 9 – I_F changed to 2mA for I_{CCL} for CSM160/1 9/11/11
Issue 7 –Re-issued 30/5/13

REQUIREMENTS

The requirements for IECQ Component Specifications as detailed in IECQ 03-3, Annex E (QC 001002-2 Amendment 1, Clause 5.4) are satisfied by the following data sheet.

It should note that IECQ are not responsible for manufacturers declarations made in data sheets which fall outside the limits of approved detailed in IECQ certificates.
This Component Specification is intended for use with applicable IECQ Assessment Specifications. Eg: QC 88000-A0001

Ceramic Hermetically Sealed High Gain Optocouplers

- 6N140A
- CD750
- CD5731
- CH370
- CH390
- CS700
- CS5700
- CSM141/A
- CSM160/161/162-2
- CSM160/161/162-4
- CSM1700

Features

- Release to IECQ
- Hermetically Sealed
- High Density Packaging
- 1500V DC withstand Test Voltage
- Low Input Requirements: 0.5mA
- High Current Transfer Ratio: 1000% Typical
- RoHS Compliant

Applications

- Military, Space
- Medical instruments
- Mos, Cmos Applications
- Logic Interfacing
- Data Transmission
- Transportation

Description

Each channel contains a light emitting diode which is optically coupled to an integrated high gain photon detector. The high gain output stage features an open collector output providing both lower saturation voltage and higher signalling speed than a conventional Photo-Darlington optocoupler. The supply voltage can be operated as low as 2.0V without adversely affecting the parametric performance. The High Current Transfer Ratio of the optocouplers makes them ideal for low input current, min 0.5mA, applications.

The radiation immunity of the optocouplers compared to conventional photo transistor optocouplers is due to the shallow depth and small junctions offered by the IC process.

The optocoupler family is also available in various package styles including 6, 8 and 16 pin DIP through hole, 16 pin surface mount DIP flat pack and a 6 Pin leadless ceramic chip carrier. The devices can be purchased with lead bend and plating options.

ISOCOM optocouplers are offered on the basis of similarity of emitter and detector therefore the performance characterization is identical, subject to the limitations of the packages. The wafer die similarities apply to the optocouplers for high reliability screening and radiation testing.

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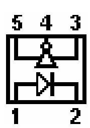
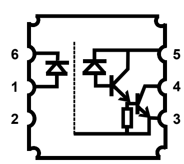
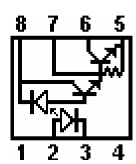
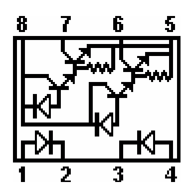
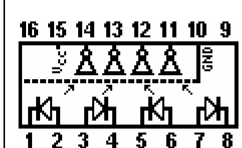
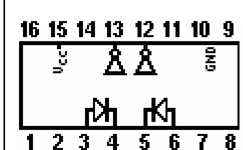
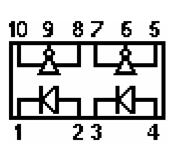
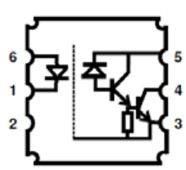
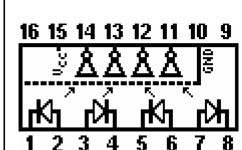
Selection Guide Package Styles and Configuration Options

Package	5 pin Hybrid	10 pin Hybrid	6 Pad LCC	8 pin DIP	8 pin DIP	16 pin DIP	16 pin Flat Pack
Lead Style							
Channels	1	2	1	1	2	4	2/4
Common Channel Wiring							

Isocom Part Numbers and Options

Commercial	CH370	CH390	CSM141A CSM1700	CS5700 CS700	CD750 CD5731	6N140A	CSM160/161/ 162
Defense Level	CH370/L2	CH390/L2	CSM141A/L2 CSM1700/L2	CS5700/L2 CS700/L2	CD750/L2 CD5731/L2	6N140A/L2	CSM160/161/ 162/L2
Space Level	CH370/L2S	CH390/L2S	CSM141A/L2S CSM1700/L2S	CS5700/L2S CS700/L2S	CD750/L2S CD5731/L2S	6N140A/L2S	CSM160/161/ 162/L2S
Standard Gold Plate Finish			Gold Plate	Gold Plate	Gold Plate	Gold Plate	Gold Plate
Solder Dipped			Option 20	Option 20	Option 20	Option 20	Option 20
Butt Cut/Gold Plate				Option 10	Option 10	Option 10	
Gull Wing/Soldered				Option 30	Option 30	Option 30	
Crew Cut/Gold Plate				Option 60	Option 60	Option 60	

Functional Diagrams

CH370	CSM141A	CS5700 CS700	CD750 CD5731	6N140A	CSM160/161 /162-2
5 pin Hybrid	6 Pad LCC	8 pin DIP	8 pin DIP	16 pin DIP	16 pin Flat Pack
1 Channel	1 Channel	1 Channel	2 Channel	4 Channel	2 Channel
					
CH390	**CSM1700**				**CSM160/161 /162-4**
10 pin Hybrid	6 Pad LCC				16 pin Flat Pack
2 Channel	1 Channel				4 Channel
					

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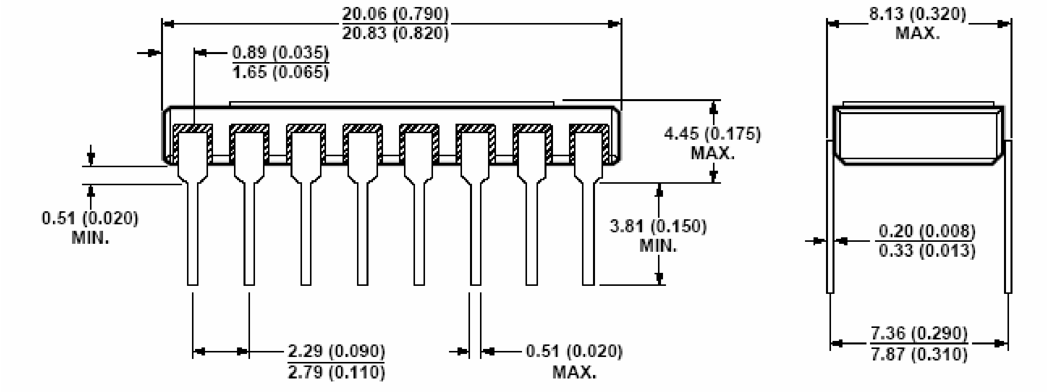
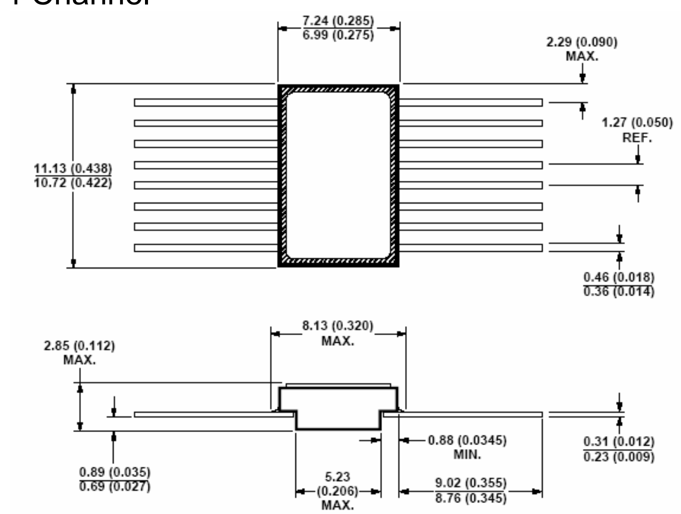
Outline Drawings

16 pin DIP, 4 Channel

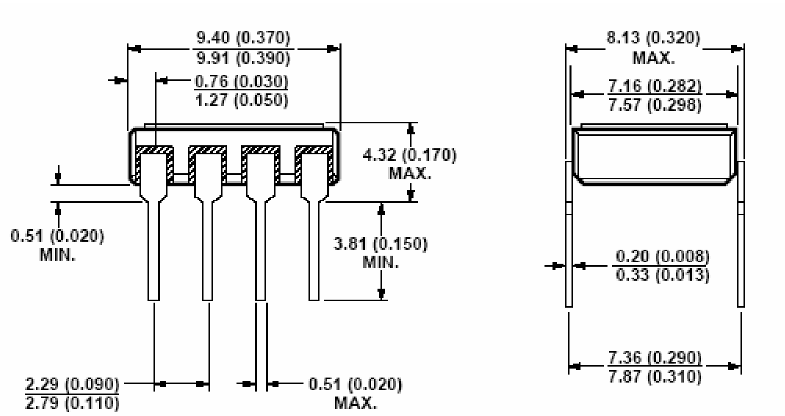


16 pin Flat Pack, 2 and 4 Channel



NOTE: DIMENSIONS IN MILLIMETERS

8 pin DIP 1 and 2 Channel



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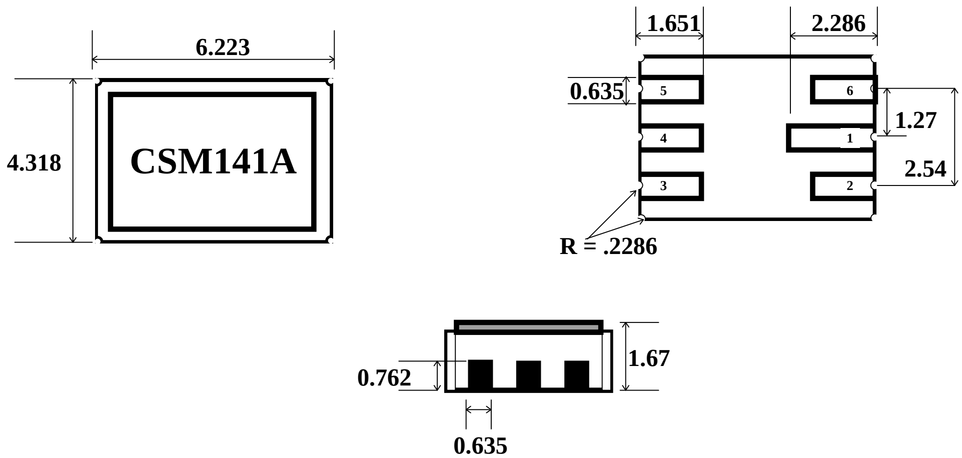
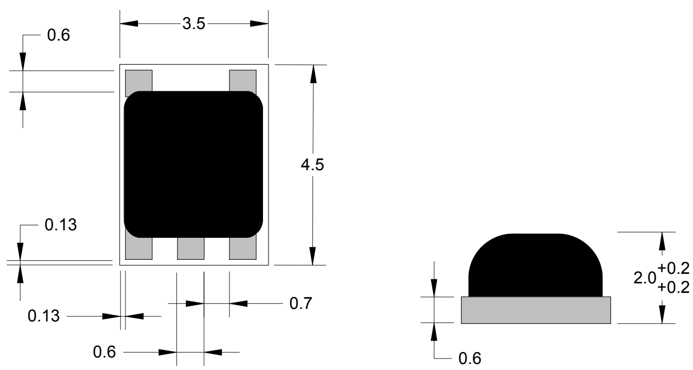
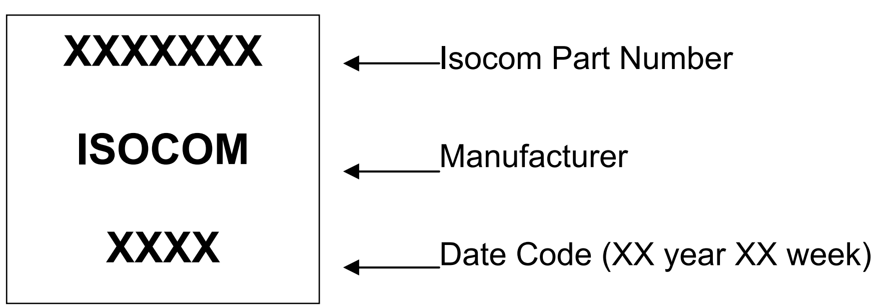
6 Terminal LCC Surface Mount, 1 Channel



4/5 Terminal Hybrid, 1 Channel



Device Marking



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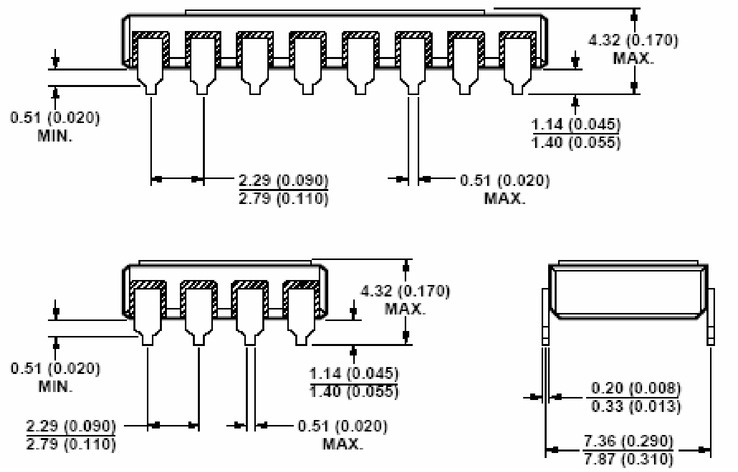
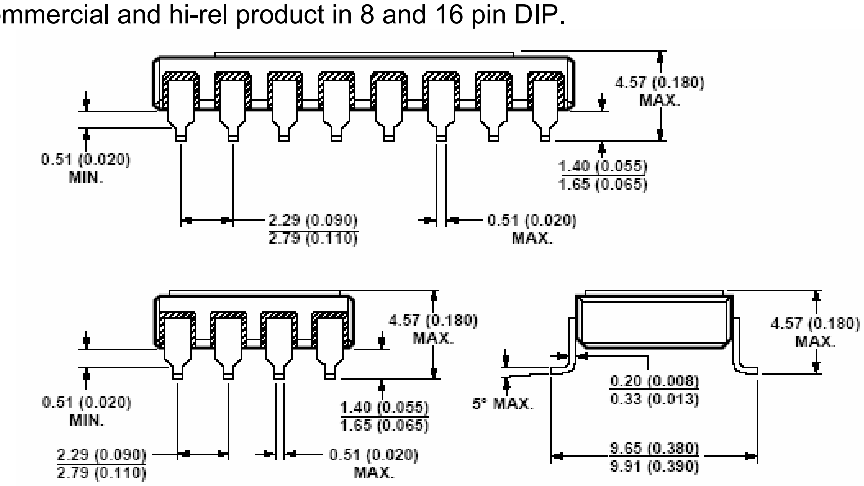
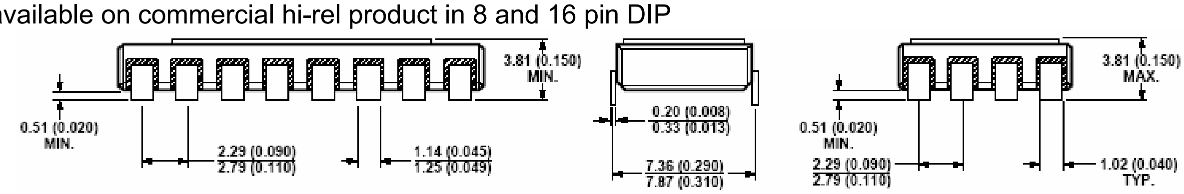
Hermetic Optocoupler Options

<table>
<tr><td>Option</td><td>Description</td></tr>
<tr><td>10</td><td>Surface mountable hermetic optocoupler with leads trimmed for butt joint assembly. This option is available on commercial hi-rel product in 8 and 16 pin DIP

</td></tr>
<tr><td>20</td><td></td></tr>
<tr><td>30</td><td>Surface mountable hermetic optocoupler with leads cut and bent for gull wing assembly. This option is available on commercial and hi-rel product in 8 and 16 pin DIP.

</td></tr>
<tr><td>60</td><td>Surface mountable hermetic optocoupler with leads trimmed for butt joint assembly. This option is available on commercial hi-rel product in 8 and 16 pin DIP

</td></tr>
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Absolute Maximum Ratings

Storage Temperature	-65°C to +150°C
Operating Temperature	-55°C to +125°C
Lead Soldering Temperature	260C for 10S, 1.6mm below seating plane where appropriate

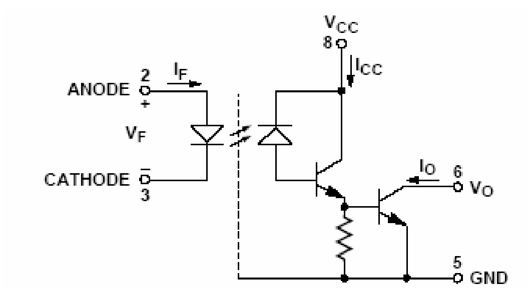
Input Diode

Peak Forward Current	20mA	≤ 1 mS duration, 500pps
Average Forward Current	10mA	(See note 3)
Reverse Voltage	5V	
Power Dissipation	35mW	

Output Detector

Supply Voltage	-0.5 to 20V	V_{CC} (See note 1)
Current	40mA	I_O
Collector Power Dissipation	50mW	(See note 2)
Voltage	-0.5 to 20V	V_O (See note 1)

Single Channel Schematic



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Electrical Characteristics

T_A = -55°C to +125°C U.O.S.

All typical values at V_{CC} = 5V, T_A = 25°C (each channel where appropriate).

Parameter	Symbol	Test Conditions	Device	Min	Type	Max	Units
High Level Output Current (See notes 4 & 6)	I_{OH} I_{OHX}	I_F = 2µA, $V_O = V_{CC}$ = 5.5V		-	0.001	250	µA
Lower Level Output Voltage (See note 4)	V_{OL}	I_F = 0.5mA, I_{OL}= 1.5mA, V_{CC} = 4.5V		-	0.1	0.4	V
		I_F = 5mA, I_{OL}= 10mA, V_{CC} = 4.5V		-	0.15	0.4	
High Level Supply Current	I_{CCH}	V_{CC} = 18V, $I_{F1} = I_{F2} = I_{F3} = I_{F4}$ = 0		-	0.1	40	µA
		V_{CC} = 5.5, $I_{F1} = I_{F2} = I_{F3} = I_{F4}$ = 0	CSM160/1			60	
Low Level Supply Current (See note 4)	I_{CCL}	V_{CC} = 18V, $I_{F1} = I_{F2} = I_{F3} = I_{F4}$ = 1.6mA		-	1.4	4	mA
		V_{CC} = 5.5V, $I_{F1} = I_{F2} = I_{F3} = I_{F4}$ = 2mA	CSM160/1			8	
Input-Output Insulation Leakage Current (See notes 7 & 13)	I_{I-O}	RH = 45%, T_A = 25°C, t = 5S V_{IO} = 1500Vdc		-	-	1.0	µA
Input Forward Voltage (See note 4)	V_F	I_F = 1.6mA, T_A = 25°C		-	1.45	1.9	V
		I_F = 4.0mA	CSM160/1				
Input Reverse Breakdown Voltage (See note 4)	B_{VR}	I_R = 10µA, T_A = 25°C		5	-	-	V
Propagation Delay Time to Logic High Output (See note 4)	t_{PLH}	R_L = 4.7KΩ, V_{CC} = 5V, I_F = 0.5mA, T_A = 25°C	6N140 CS5700 CSM6730 CH370/390 CD750 CSM1700	-	8	60	µS
			CSM160/1			100	
		R_L = 680Ω, V_{CC} = 5V, I_F = 5mA, T_A = 25°C	6N140	-	8	20	
			CS5700 CSM6730			30	
			CH370/390 CD750 CSM1700			60	
Propagation Delay Time to Logic Low Output (See note 4)	tPHL	RL = 4.7KΩ, VCC = 5V, IF = 0.5mA, TA = 25°C	CH370/390 CD750 CSM1700	-	35	100	µS
			CSM160 CSM161 CS5700 CSM6730			100	
		RL = 680Ω, VCC = 5V, IF = 5mA, TA = 25°C	CH370/390 CD750 CSM1700	-	3	12	
			CS5700 CSM6730			10	
			CSM160/1			5	
Current Transfer Ratio (See notes 4 & 5)	CTR	IF = 0.5mA, VO = 0.4V, VCC = 4.5V		300	700	-	%
		IF = 1.6mA, VO = 0.4V, VCC = 4.5V		200	1000	-	
		IF = 5mA, VO = 0.4V, VCC = 4.5V		200	600	-	

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Electrical Characteristics (Continued)

Common Mode Transient Immunity at Logical High Output Level (See notes 4, 10 & 12)	CM_H	V_{CC} = 5V, T_A = 25°C, V_{CM} = 50V p-p R_L = 1.5KΩ, I_F = 0Ma		500	1000	-	V/µS
		R_L = 2.2KΩ, I_F = 0mA	CH370/390 CS700 CSM1700 CSM6730				
Common Mode Transient Immunity at Logical Low Output Level (See notes 4, 10 & 12)	CM_L	V_{CC} = 5V, T_A = 25°C, V_{CM} = 50V p-p R_L = 1.5KΩ, I_F = 1.6mA		500	-1000	-	V/µS
		R_L = 2.2KΩ, I_F = 1.6mA	CH370/390 CS700 CSM1700 CSM6730				

Typical Characteristics

T_A = 25°C

Parameter	Symbol	Test Conditions	Notes	Min	Type	Max	Units
Resistance	R_{IO}	V_{10} = 500Vdc	4 & 8	-	10^{12}	-	Ω
Capacitance	C_{IO}	f = 1MHz	4 & 8	-	1.5	-	pF
Input Capacitance	C_{IN}	f = 1MHz, V_F = 0	4	-	60	-	pF
Temperature Coefficient of Forward Voltage	$\frac{\Delta V_F}{\Delta T_A}$	I_F = 1.6mA	1	-	-1.8	-	mV/°C
Input-Input Insulation Leakage Current	I_{I-I}	45% Relative Humidity V_{II} = 500Vdc, t = 5S	9	-	0.6	-	nA
Resistance	R_{I-I}	V_{II} = 500Vdc	9	-	10^{12}	-	Ω
Capacitance	C_{I-I}	f = 1MHz	9	-	1	-	pF

Notes:

1. The ground pin should be the most negative voltage at the detector side. Keeping V_{CC} as low as possible, but greater than 2.0V, will provide lowest total I_{OH} over temperature.
2. Output power is collector output plus one fourth of total supply power. Derate at 1.66mW/°C above 110°C.
3. Derate I_F at 0.33mA/°C above 110°C.
4. Each channel.
5. Current Transfer Ratio is defined as the ratio of output collector current, I_O, to the forward LED input current, I_F, times 100%.
6. I_{OHX} is the leakage current resulting from channel to channel optical crosstalk. I_F = 2µA for channel under test. For all other channels, I_F = 10mA.
7. Input pins are shorted together, and output pins are shorted together.
8. Measured between the LED anode and cathode shorted together and pins at output shorted together.
9. Measured between adjacent input pairs shorted together.
10. CM_H is the maximum tolerable common mode transient to assure that the output will remain in a high logic state (i.e., V_O > 2.0V).
11. CM_L is the maximum tolerable common mode transient to assure that the output will remain in the logic low state (i.e., V_O< 0.8V).
12. In applications where dV/dt may exceed 50,000V/µS (such as a static discharge), a series resistor, R_{CC}, should be included to protect the detector IC's from destructively high surge currents. The recommended value is

$$R_{CC} = \frac{1V}{0.6 I_F(mA)} \text{ k}\Omega$$

13. This is a momentary withstand test, not an operating condition.

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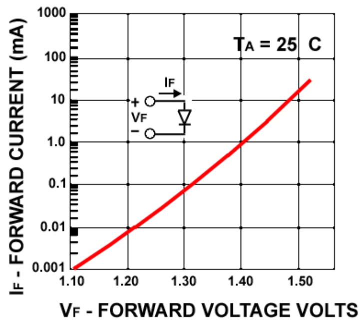
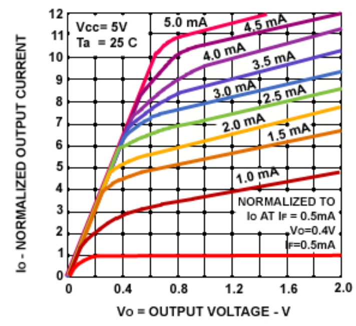
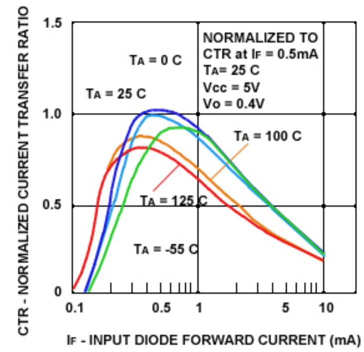
Electrical Characteristics



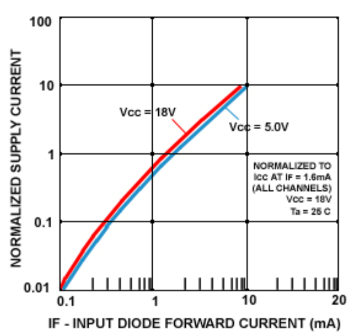
INPUT DIODE FORWARD CURRENT vs FORWARD VOLTAGE



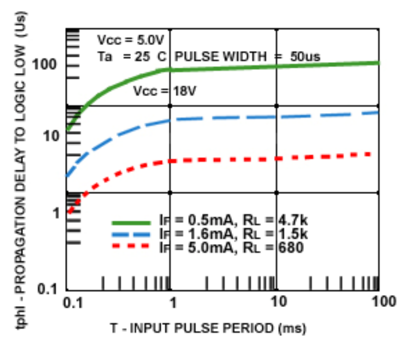
Normalized DC Transfer Characteristics



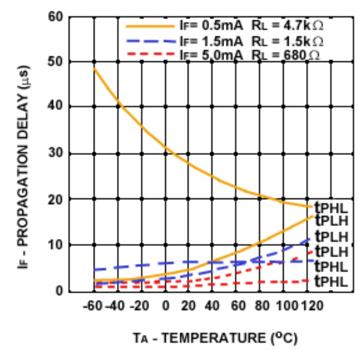
NORMALIZED CURRENT TRANSFER RATIO vs INPUT DIODE FORWARD CURRENT



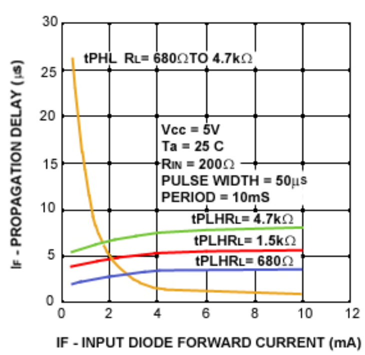
NORMALIZED SUPPLY CURRENT vs INPUT DIODE FORWARD CURRENT



PROPAGATION DELAY TO LOGIC LOW vs INPUT PULSE PERIOD



PROPAGATION DELAY vs TEMPERATURE



PROPAGATION DELAY vs INPUT DIODE FORWARD CURRENT

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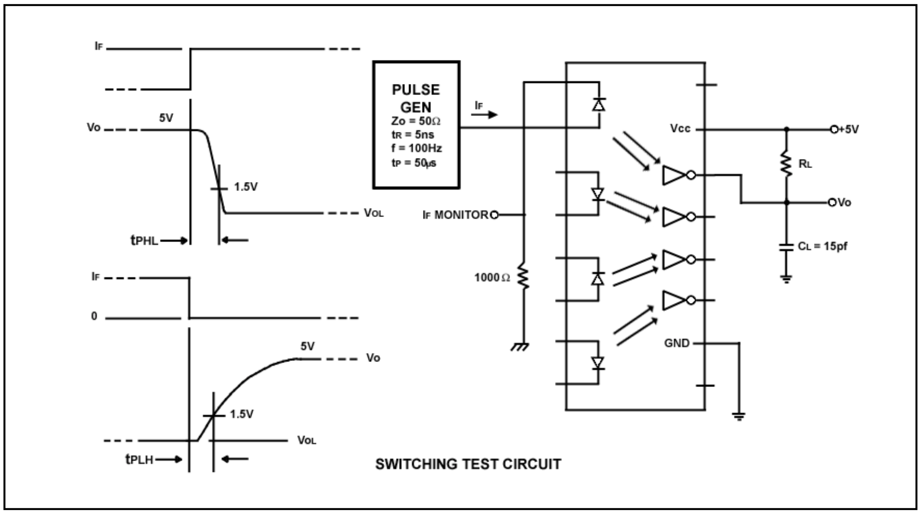
Switching Time Characteristics



SWITCHING TEST CIRCUIT

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