



Dual Channel Line Receiver Hermetically Sealed Optocoupler

Technical Data

HCPL-1930
HCPL-1931
HCPL-193K
5962-89572

Features

- Dual Marked with Device Part Number and DSCC Standard Microcircuit Drawing
- Manufactured and Tested on a MIL-PRF-38534 Certified Line
- QML-38534, Class H and Class K
- Hermetically Sealed 16-pin Dual In-Line Package
- Performance Guaranteed Over -55°C to +125°C
- High Speed – 10 Mb/s
- Accepts a Broad Range of Drive Conditions
- Adaptive Line Termination Included
- Internal Shield Provides Excellent Common Mode Rejection
- External Base Lead Allows "LED Peaking" and LED Current Adjustment
- 1500 Vdc Withstand Test Voltage
- High Radiation Immunity
- HCPL-2602 Function Compatibility
- Reliability Data Available

Applications

- Military and Space
- High Reliability Systems
- Isolated Line Receiver
- Simplex/Multiplex Data Transmission
- Computer-Peripheral Interface
- Microprocessor System Interface
- Harsh Environmental Environments
- Digital Isolation for A/D, D/A Conversion
- Current Sensing
- Instrument Input/Output Isolation
- Ground Loop Elimination
- Pulse Transformer Replacement

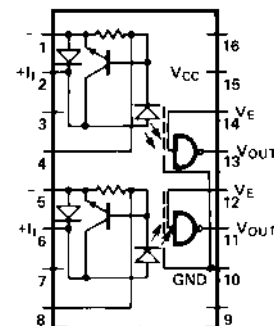
Description

The HCPL-193X devices are dual channel, hermetically sealed, high CMR, line receiver optocouplers. The products are capable of operation and storage over the full military temperature range and can be purchased as either a standard product or with full MIL-PRF-38534 Class Level H or K testing, or from the DSCC Standard Microcircuit Drawing (SMD) 5962-89572. This is a sixteen pin DIP which may be purchased with a variety of lead bend and plating options. See selection guide table for details. Standard Microcircuit Drawing (SMD) parts are available for each lead style.

Truth Table

(POSITIVE LOGIC)		
INPUT	ENABLE	OUTPUT
ON	H	L
OFF	H	H
ON	L	H
OFF	L	H

Functional Diagram



The connection of a 0.1 μ F bypass capacitor between pins 15 and 10 is recommended.

CAUTION: It is advised that normal static precautions be taken in handling and assembly of this component to prevent damage and/or degradation which may be induced by ESD.

All devices are manufactured and tested on a MIL-PRF-38534 certified line and are included in the DSCC Qualified Manufacturers List QML-38534 for Hybrid Microcircuits.

Each unit contains two independent channels, consisting of a GaAsP light emitting diode, an input current regulator, and an integrated high gain photon detector. The input regulator serves as a line termination for line receiver applications. It

clamps the line voltage and regulates the LED current so line reflections do not interfere with circuit performance. The regulator allows a typical LED current of 12.5 mA before it starts to shunt excess current. The output of the detector IC is an open collector Schottky clamped transistor. An enable input gates the detector. The internal detector shield provides a guaranteed common mode transient immunity specification of +1000 V/ μ sec.

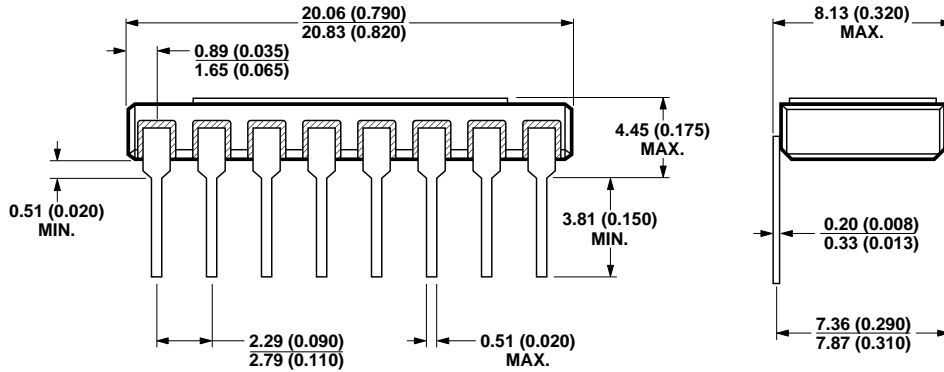
DC specifications are compatible with TTL logic and are guaranteed from -55°C to +125°C allowing trouble-free interfacing with digital logic circuits. An input current of 10 mA will sink a six gate fan-out (TTL) at the output with a typical propagation delay from input to output of only 45 nsec.

Selection Guide—Package Styles and Lead Configuration Options

Agilent Part # and Options	
Commercial	HCPL-1930
MIL-PRF-38534 Class H	HCPL-1931
MIL-PRF-38534 Class K	HCPL-193K
Standard Lead Finish	Gold
Solder Dipped	Option #200
Butt Joint/Gold Plate	Option #100
Gull Wing/Soldered	Option #300
Crew Cut/Gold Plate	Option #600
Class H SMD Part #	
Prescript for all below	5962-
Either Gold or Soldered	8957201EX
Gold Plate	8957201EC
Solder Dipped	8957201EA
Butt Joint/Gold Plate	8957201YC
Butt Joint/Soldered	8957201YA
Gull Wing/Soldered	8957201XA
Crew Cut/Gold Plate	Available
Crew Cut/Soldered	Available
Class K SMD Part #	
Prescript for all below	5962-
Either Gold or Soldered	8957202KEX
Gold Plate	8957202KEC
Solder Dipped	8957202KEA
Butt Joint/Gold Plate	8957202KYC
Butt Joint/Soldered	8957202KYA
Gull Wing/Soldered	8957202KXA

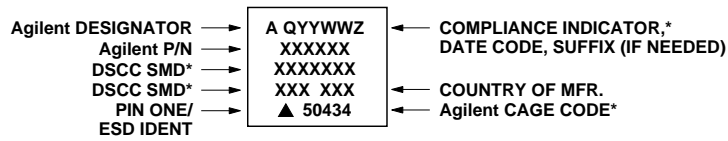
Outline Drawings

16 Pin DIP Through Hole, 2 Channels



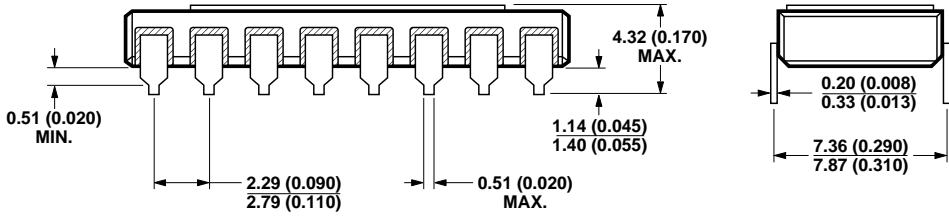
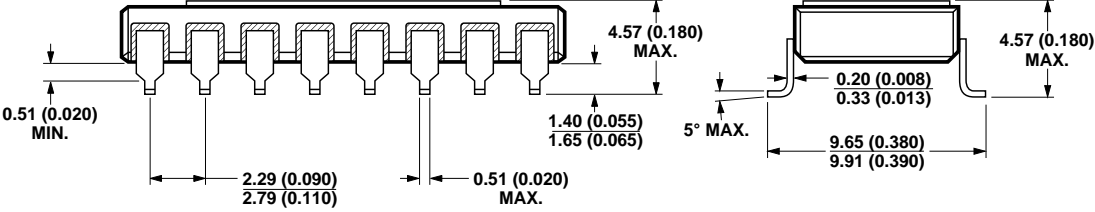
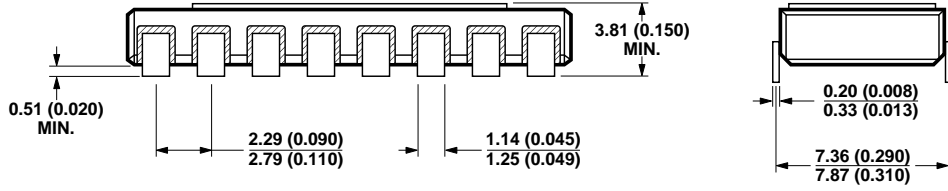
NOTE: DIMENSIONS IN MILLIMETERS (INCHES).

Device Marking



* QUALIFIED PARTS ONLY

Hermetic Optocoupler Options

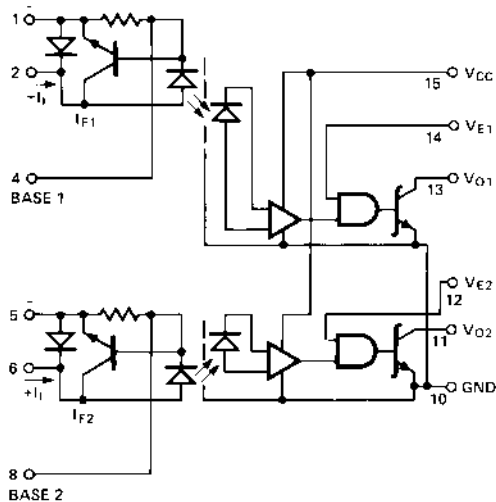
Option	Description
100	<p>Surface mountable hermetic optocoupler with leads trimmed for butt joint assembly. This option is available on commercial and hi-rel product.</p> 
200	<p>Lead finish is solder dipped rather than gold plated. This option is available on commercial and hi-rel product. DSCC Drawing part numbers contain provisions for lead finish.</p>
300	<p>Surface mountable hermetic optocoupler with leads cut and bent for gull wing assembly. This option is available on commercial and hi-rel product. This option has solder dipped leads.</p> 
600	<p>Surface mountable hermetic optocoupler with leads trimmed for butt joint assembly. This option is available on commercial and hi-rel product. Contact factory for the availability of this option on DSCC part types.</p> 

Note: Dimensions in millimeters (inches).

Absolute Maximum Ratings

Storage Temperature	-65°C to +150°C
Operating Temperature	-55°C to +125°C
Lead Solder Temperature	260°C for 10 s
	1.6 mm below seating plane
Forward Input Current – I_I (each channel)	60 mA ²
Reverse Input Current	60 mA
Supply Voltage – V_{CC}	7 V (1 Minute Maximum)
Enable Input Voltage – V_E (each channel)	5.5 V
	Not to exceed V_{CC} by more than 500 mV
Output Collector Current – I_O (each channel)	25 mA
Output Collector Power Dissipation (each channel)	40 mW
Output Collector Voltage – V_O (each channel)	7 V
Total Package Power Dissipation	564 mW
Input Power Dissipation (each channel)	168 mW

Schematic



A 0.1 μ F BYPASS CAPACITOR
MUST BE CONNECTED BETWEEN
PINS 10 AND 15 (SEE NOTE 1).

ESD Classification

(MIL-STD-883, Method 3015) (Δ), Class 1

Recommended Operating Conditions

Parameter	Symbol	Min.	Max.	Units
Input Current, Low Level	I_{IL}	0	250	μ A
Input Current, High Level*	I_{IH}	12.5	60	mA
Supply Voltage, Output	V_{CC}	4.5	5.5	V
High Level Enable Voltage	V_{EH}	2.0	V_{CC}	V
Low Level Enable Voltage	V_{EL}	0	0.8	V
Fan Out (@ $R_L = 4 \text{ k}\Omega$)	N		5	TTL Loads
Operating Temperature	T_A	-55	125	$^{\circ}$ C

*12.5 mA condition permits at least 20% guardband for optical coupling variation. Initial switching threshold is 10 mA or less.

Electrical Specifications $T_A = -55^{\circ}\text{C}$ to 125°C unless otherwise stated. See note 15.

Parameter	Symbol	Test Conditions	Group A Sub-groups	Limits			Units	Fig.	Note
				Min.	Typ.*	Max.			
High Level Output Current	I_{OH}	$V_{CC} = 5.5\text{ V}$, $V_O = 5.5\text{ V}$ $I_I = 250\ \mu\text{A}$, $V_E = 2.0\text{ V}$	1, 2, 3		20	250	μA	3	3
Low Level Output Voltage	V_{OL}	$V_{CC} = 5.5\text{ V}$; $I_I = 10\text{ mA}$ $V_E = 2.0\text{ V}$, I_{OL} (Sinking) = 10 mA	1, 2, 3		0.3	0.6	V	1	3
Input Voltage	V_I	$I_I = 10\text{ mA}$	1, 2, 3		2.2	2.6	V	2	3
		$I_I = 60\text{ mA}$			2.35	2.75			
Input Reverse Voltage	V_R	$I_R = 10\text{ mA}$	1, 2, 3		0.8	1.10	V		3
Low Level Enable Current	I_{EL}	$V_{CC} = 5.5\text{ V}$, $V_E = 0.5\text{ V}$	1, 2, 3		-1.45	-2.0	mA		3
High Level Enable Voltage	V_{EH}		1, 2, 3	2.0			V		3, 12
Low Level Enable Voltage	V_{EL}		1, 2, 3			0.8	V		3
High Level Supply Current	I_{CCH}	$V_{CC} = 5.5\text{ V}$; $I_I = 0$, $V_E = 0.5\text{ V}$ both channels	1, 2, 3		21	28	mA		
Low Level Supply Current	I_{CCL}	$V_{CC} = 5.5\text{ V}$; $I_I = 60\text{ mA}$, $V_E = 0.5\text{ V}$ both channels	1, 2, 3		27	36	mA		
Input-Output Insulation Leakage Current	$I_{I,O}$	Relative Humidity = 45% $t = 5\text{ s}$, $V_{I,O} = 1500\text{ Vdc}$	1			1	μA		4
Propagation Delay Time to High Output Level	t_{PLH}	$R_L = 510\ \Omega$; $C_L = 50\text{ pF}$, $I_I = 13\text{ mA}$, $V_{CC} = 5.0\text{ V}$	9		55	100	ns	4, 5	3, 5
			10, 11			140			
Propagation Delay Time to Low Output Level	t_{PHL}	$R_L = 510\ \Omega$; $C_L = 50\text{ pF}$, $I_I = 13\text{ mA}$, $V_{CC} = 5.0\text{ V}$	9		60	100	ns	4, 5	3, 6
			10, 11			120			
Common Mode Transient Immunity at High Output Level	$ CM_H $	$V_{CM} = 50\text{ V (peak)}$, V_O (min.) = 2 V , $R_L = 510\ \Omega$; $I_I = 0\text{ mA}$, $V_{CC} = 5.0\text{ V}$	9, 10, 11	1000	10,000		V/ μs	8, 9	3, 9, 14
Common Mode Transient Immunity at Low Output Level	$ CM_L $	$V_{CM} = 50\text{ V (peak)}$, V_O (max.) = 0.8 V , $R_L = 510\ \Omega$; $I_I = 10\text{ mA}$, $V_{CC} = 5.0\text{ V}$	9, 10, 11	1000	10,000		V/ μs	8, 9	3, 10, 14

*All typical values are at $V_{CC} = 5\text{ V}$, $T_A = 25^{\circ}\text{C}$.

Typical Specifications $T_A = 25^\circ\text{C}$, $V_{CC} = 5\text{ V}$

Parameter	Symbol	Typ.	Units	Test Conditions	Fig.	Note
Resistance (Input-Output)	R_{LO}	10^{12}	Ω	$V_{LO} = 500\text{ V dc}$		3, 13
Capacitance (Input-Output)	C_{LO}	1.7	pF	$f = 1\text{ MHz}$		3, 13
Input-Input Insulation Leakage Current	I_{LI}	0.5	nA	45% Relative Humidity, $V_{LI} = 500\text{ Vdc}$, $t = 5\text{ s}$		11
Resistance (Input-Input)	R_{LI}	10^{12}	Ω	$V_{LI} = 500\text{ Vdc}$		11
Capacitance (Input-Input)	C_{LI}	0.55	pF	$f = 1\text{ MHz}$		11
Propagation Delay Time of Enable from V_{EH} to V_{EL}	t_{ELH}	35	ns	$R_L = 510\ \Omega$, $C_L = 15\text{ pF}$, $I_I = 13\text{ mA}$, $V_{EH} = 3\text{ V}$, $V_{EL} = 0\text{ V}$	6, 7	3, 7
Propagation Delay Time of Enable from V_{EL} to V_{EH}	t_{EHL}	35	ns		6, 7	3, 8
Output Rise Time (10-90%)	t_r	30	ns	$R_L = 510\ \Omega$, $C_L = 15\text{ pF}$, $I_I = 13\text{ mA}$		3
Output Fall Time (90-10%)	t_f	24	ns			3
Input Capacitance	C_i	60	pF	$f = 1\text{ MHz}$, $V_i = 0$, PINS 1 to 2 or 5 to 6		3

Notes:

1. Bypassing of the power supply line is required, with a $0.1\ \mu\text{F}$ ceramic disc capacitor adjacent to each isolator. The power supply bus for the isolators should be separate from the bus for any active loads, otherwise additional bypass capacitance may be needed to suppress regenerative feedback via the power supply.
2. Derate linearly at $1.2\text{ mA}/^\circ\text{C}$ above $T_A = 100^\circ\text{C}$.
3. Each channel.
4. Device considered a two terminal device: pins 1 through 8 are shorted together, and pins 9 through 16 are shorted together.
5. The t_{PLH} propagation delay is measured from the 6.5 mA point on the trailing edge of the input pulse to the 1.5 V point on the trailing edge of the output pulse.
6. The t_{PHL} propagation delay is measured from the 6.5 mA point on the leading edge of the input pulse to the 1.5 V point on the leading edge of the output pulse.
7. The t_{ELH} enable propagation delay is measured from the 1.5 V point on the trailing edge of the enable input pulse to the 1.5 V point on the trailing edge of the output pulse.
8. The t_{EHL} enable propagation delay is measured from the 1.5 V point on the leading edge of the enable input pulse to the 1.5 V point on the leading edge of the output pulse.
9. CM_H is the maximum tolerable rate of rise of the common mode voltage to assure that the output will remain in a high logic state, i.e. $V_{OUT} > 2.0\text{ V}$.
10. CM_L is the maximum tolerable rate of fall of the common mode voltage to assure that the output will remain in a low logic state, i.e. $V_{OUT} < 0.8\text{ V}$.
11. Measured between adjacent input leads shorted together, i.e. between 1, 2 and 4 shorted together and pins 5, 6 and 8 shorted together.
12. No external pull up is required for a high logic state on the enable input.
13. Measured between pins 1 and 2 or 5 and 6 shorted together, and pins 10 through 15 shorted together.
14. Parameters shall be tested as part of device initial characterization and after process changes. Parameters shall be guaranteed to the limits specified for all lots not specifically tested.
15. Standard parts receive 100% testing at 25°C (Subgroups 1 and 9). Hi-Rel and SMD parts receive 100% testing at 25 , 125 , and -55°C (Subgroups 1 and 9, 2 and 10, 3 and 11, respectively).

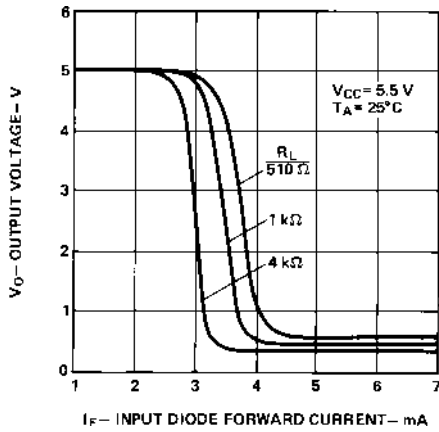


Figure 1. Input-Output Characteristics.

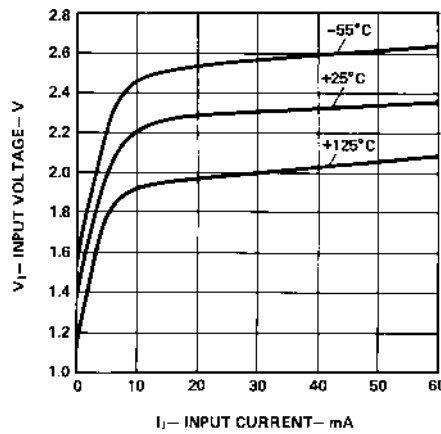


Figure 2. Input Characteristics.

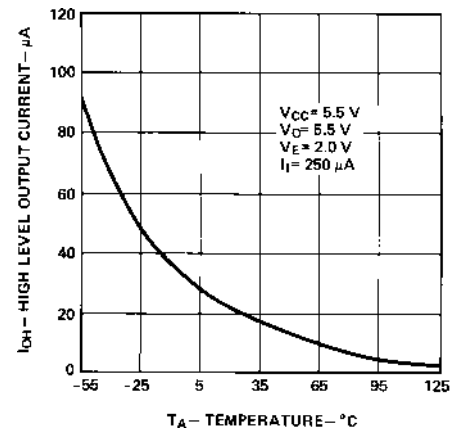


Figure 3. High Level Output Current vs. Temperature.

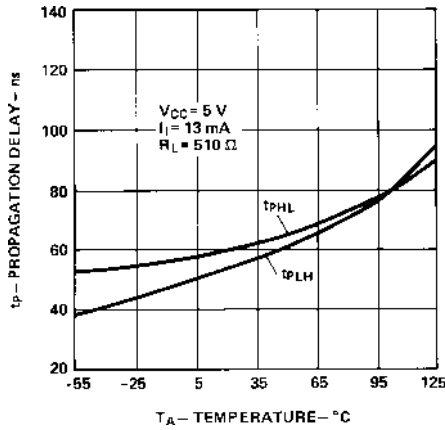


Figure 4. Propagation Delay vs. Temperature.

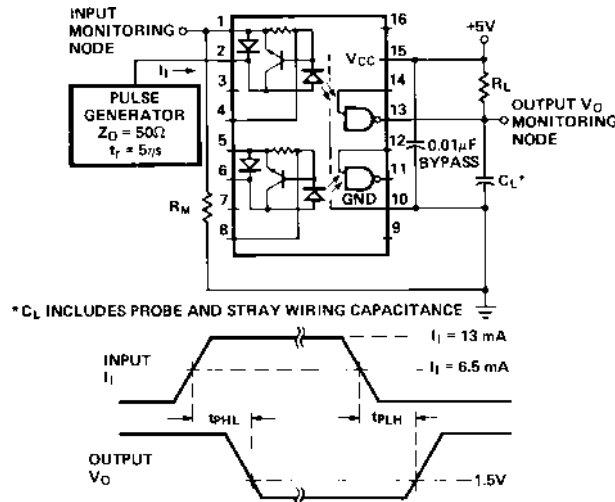


Figure 5. Test Circuit for t_{pHL} and t_{pLH} .

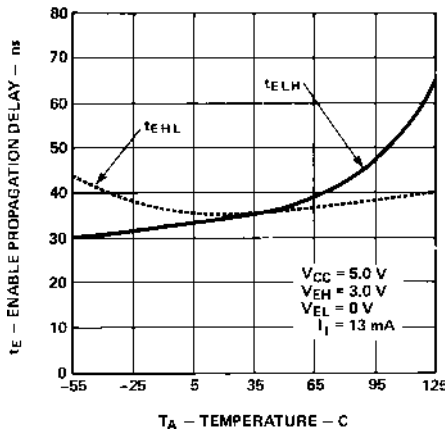


Figure 6. Enable Propagation Delay vs. Temperature.

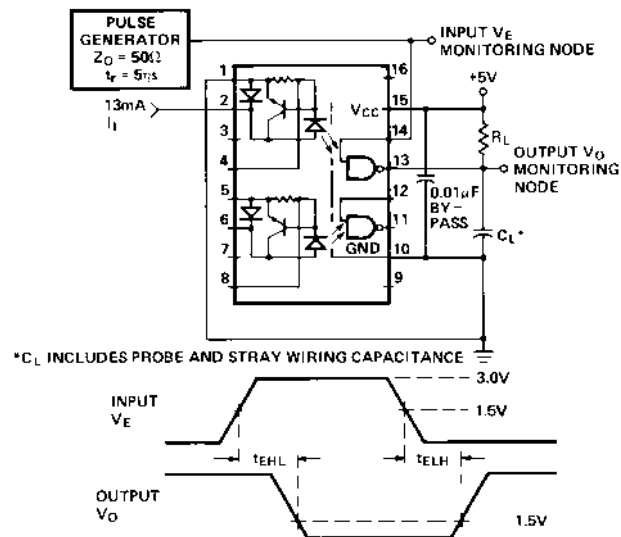


Figure 7. Test Circuit for t_{EHL} and t_{ELH} .

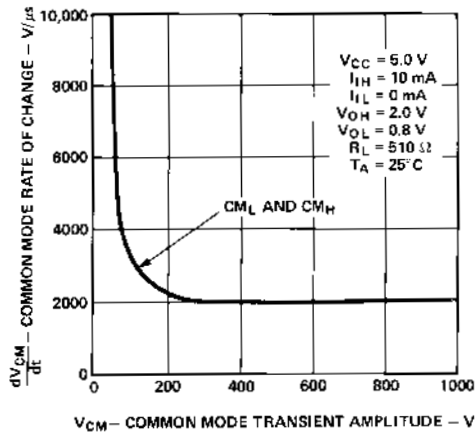


Figure 8. Typical Common Mode Transient Immunity.

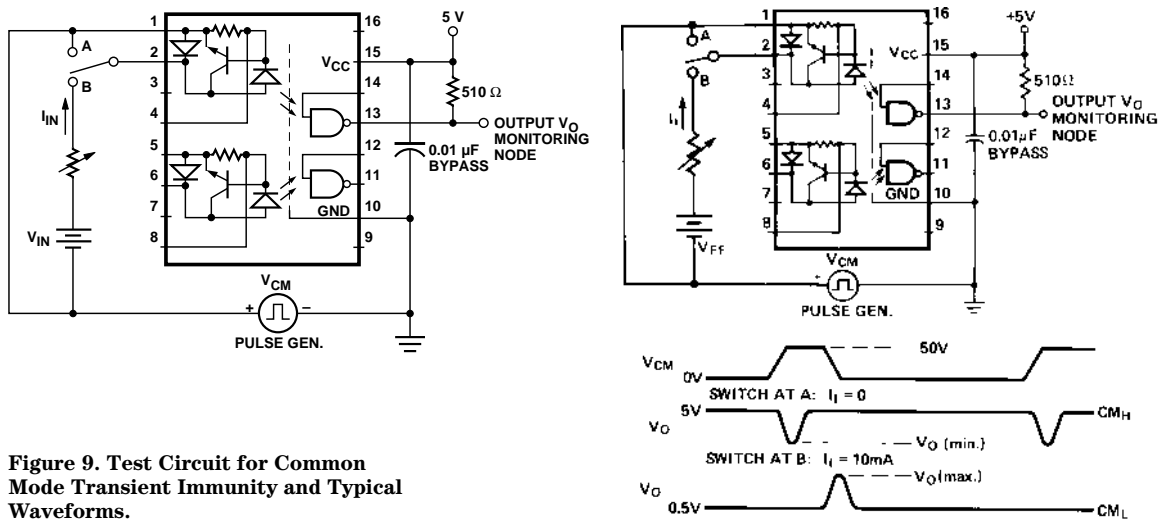


Figure 9. Test Circuit for Common Mode Transient Immunity and Typical Waveforms.

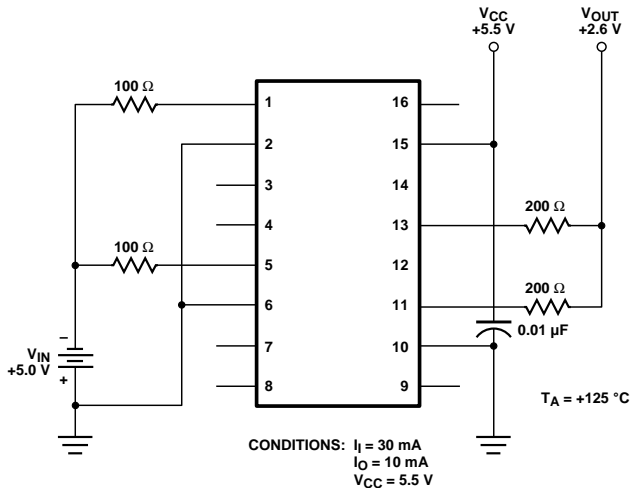


Figure 10. Burn In Circuit.

Application Circuits*

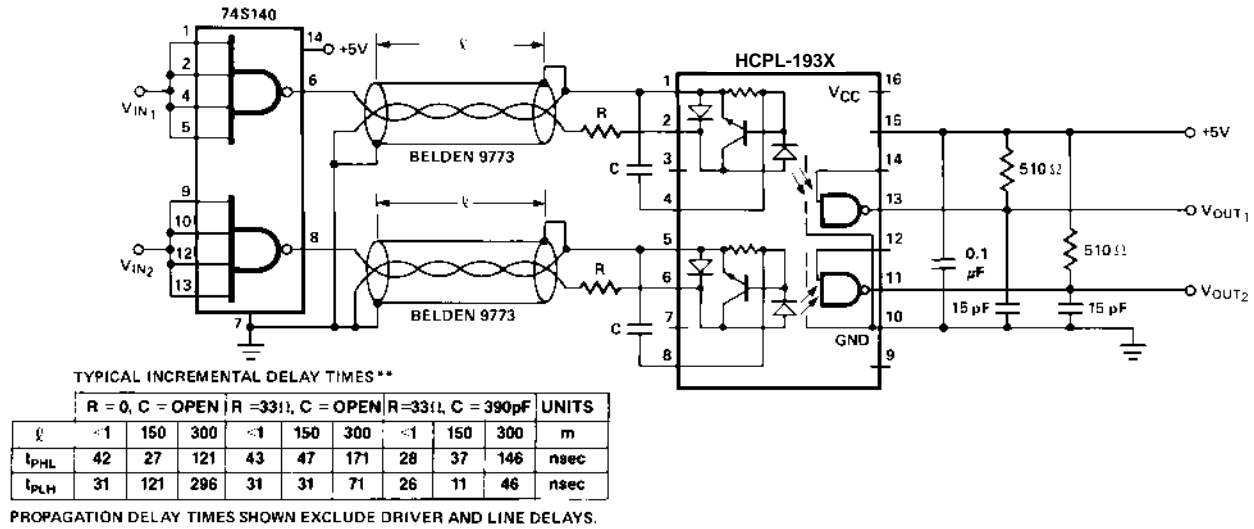


Figure A₁. Polarity Non-Reversing.

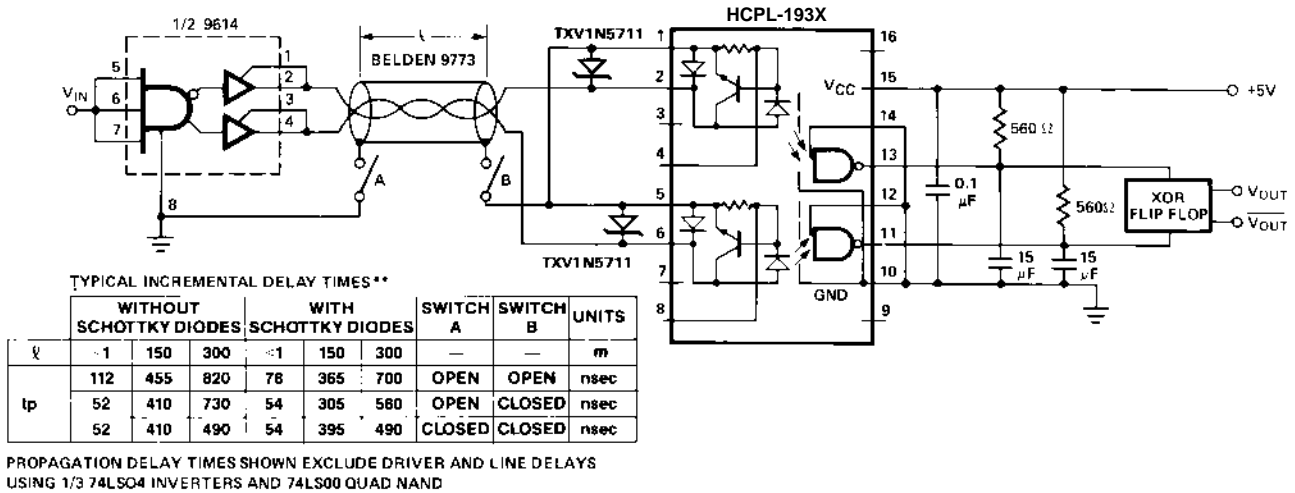
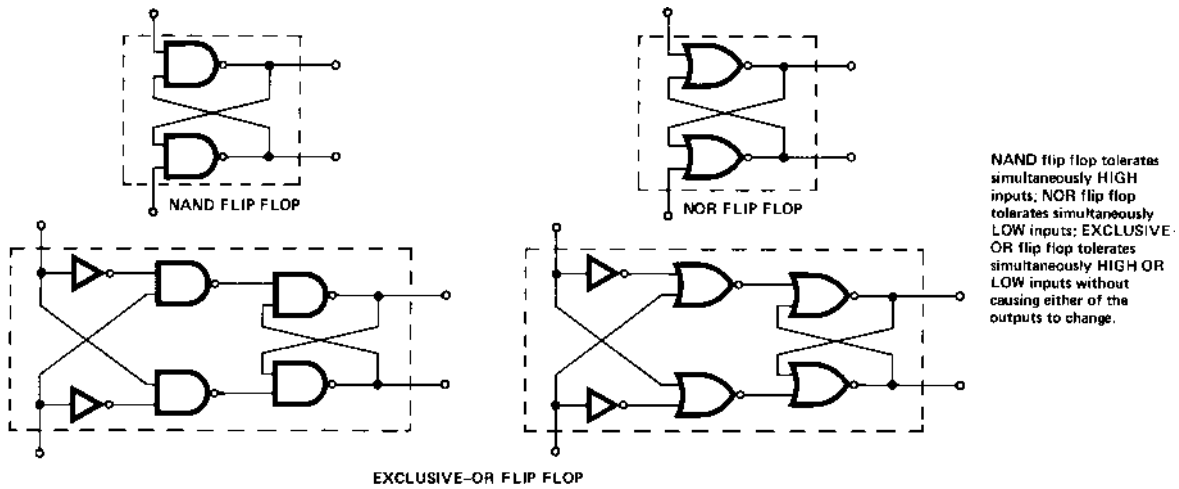


Figure A₂. Polarity Reversing, Split Phase.



*FOR A DESCRIPTION OF THESE CIRCUITS SEE HCPL-2602 DATA SHEET.

Figure A₃. Flop-Flop Configurations.

MIL-PRF-38534 Class H, Class K, and DSCC SMD Test Program

Agilent Technologies' Hi-Rel Optocouplers are in compliance with MIL-PRF-38534 Class H and K. Class H and Class K devices are also in compliance with DSCC drawing 5962-89572.

Testing consists of 100% screening and quality conformance inspection to MIL-PRF-38534.



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Obsoletes 5967-5809E

5968-9401E (4/00)

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微波光电部专业代理经销高频、微波、光纤、光电元器件、组件、部件、模块、整机；电磁兼容元器件、材料、设备；微波 CAD、EDA 软件、开发测试仿真工具；微波、光纤仪器仪表。欢迎国外高科技微波、光纤厂商将优秀产品介绍到中国、共同开拓市场。长期大量现货专业批发高频、微波、卫星、光纤、电视、CATV 器件：晶振、VCO、连接器、PIN 开关、变容二极管、开关二极管、低噪晶体管、功率电阻及电容、放大器、功率管、MMIC、混频器、耦合器、功分器、振荡器、合成器、衰减器、滤波器、隔离器、环行器、移相器、调制解调器；光电子器件和组件：红外发射管、红外接收管、光电开关、光敏管、发光二极管和发光二极管组件、半导体激光二极管和激光器组件、光电探测器和光接收组件、光发射接收模块、光纤激光器和光放大器、光调制器、光开关、DWDM 用光发射和接收器件、用户接入系统光收发器件与模块、光纤连接器、光纤跳线/尾纤、光衰减器、光纤适配器、光隔离器、光耦合器、光环行器、光复用器/转换器；无线收发芯片和模组、蓝牙芯片和模组。

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