

HCPL2631 DUAL-CHANNEL OPTOCOUPLER/OPTOISOLATOR

SOOS017 D3114, APRIL 1988

- Gallium Arsenide Phosphide LED Optically Coupled to an Integrated Circuit Detector
- Compatible with TTL and LSTTL Inputs
- Low Input Current Required for On-State Output . . . 5 mA Max
- High-Voltage Electrical Insulation . . . 3000 V DC Min
- High-Speed Switching . . . 75 ns Max
- Directly Interchangeable with Hewlett Packard HCPL2631
- UL Recognized . . . File Number E65085
- Internal Shield for High Common-Mode Rejection

description

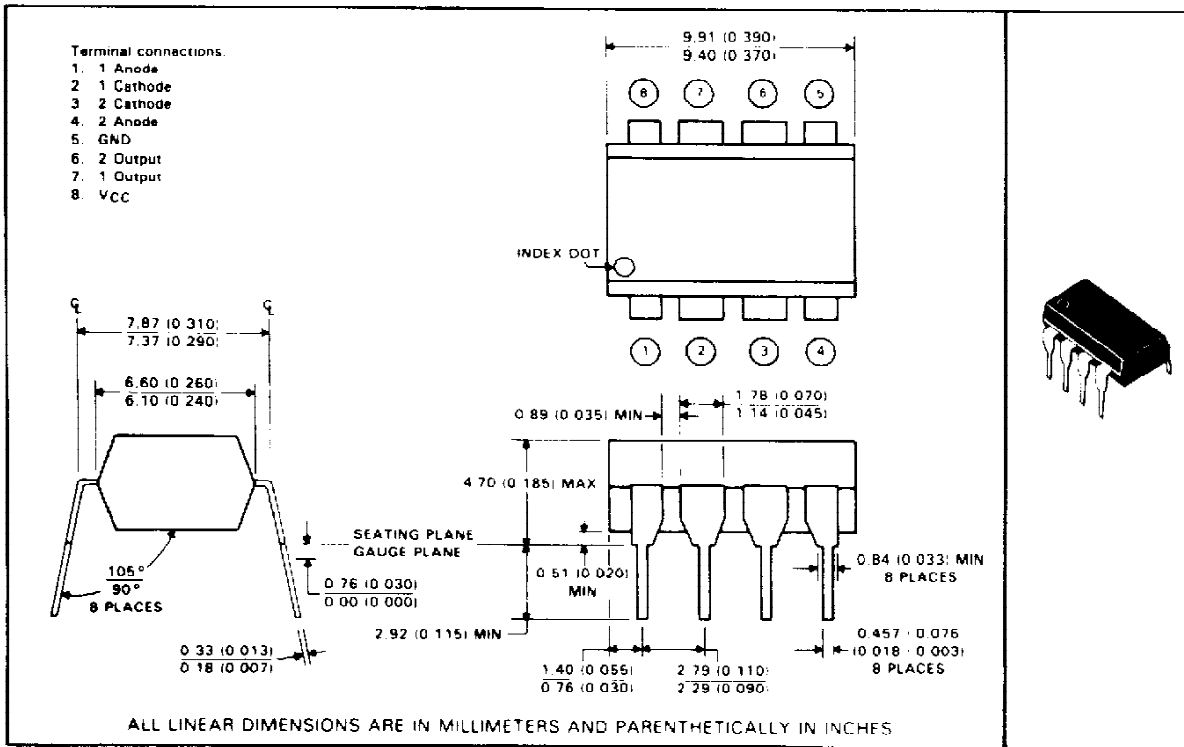
The HCPL2631 is a dual optocoupler designed for use in high-speed digital interfacing applications that require high-voltage isolation between the input and output. Applications include line receivers, microprocessors or computer interface, and other control systems.

Each channel of the HCPL2631 optocoupler consists of a GaAsP light-emitting diode and an integrated light detector composed of a photodiode, a high-gain amplifier, and a Schottky-clamped open-collector output transistor. An input diode forward current of 5 mA will switch the output transistor low, providing an on-state drive current of 13 mA (eight 1.6-mA TTL loads).

The device is mounted in a standard 8-pin dual-in-line plastic package. The internal shield provides a guaranteed common-mode transient immunity of 1000 V/μs minimum.

The HCPL2631 is characterized for operation over the temperature range of 0°C to 70°C.

mechanical data



PRODUCTION DATA documents contain information current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

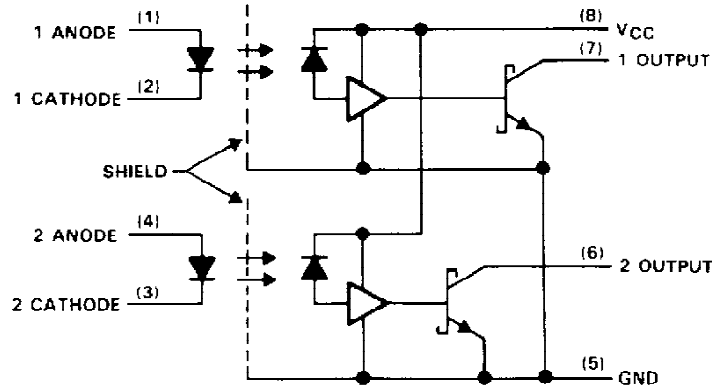
**TEXAS
INSTRUMENTS**

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HCPL2631 DUAL-CHANNEL OPTOCOUPLER/OPTOISOLATOR

logic diagram (positive logic)



absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Supply voltage, VCC	7 V
Reverse input voltage	5 V
Output voltage	7 V
Peak forward input current, each channel (≤ 1 ms duration)	30 mA
Average forward input current, each channel	15 mA
Output current, each channel	16 mA
Output power dissipation	85 mW
Storage temperature range	-55°C to 125°C
Operating free-air temperature range	0°C to 70°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds	260°C

recommended operating conditions

	MIN	NOM	MAX	UNIT	
VCC	Output supply voltage (see Note 1)	4.5	5	5.5	V
$I_{F(on)}$	Input forward current to turn output on	6.3	15	mA	
$I_{F(off)}$	Input forward current to turn output off	0	250	μ A	
I_{OL}	Low-level (on-state) output current		13	mA	
T_A	Operating free-air temperature	0	70	°C	

NOTE 1: All voltage values are with respect to GND (pin 5).

HCPL2631 DUAL-CHANNEL OPTOCOUPLER/OPTOISOLATOR

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS	MIN	TYP [†]	MAX	UNIT
V _F	Input forward voltage		1.6	1.75	V
α _{VF}	Temperature coefficient of forward voltage		-1.8		mV/°C
V _{BR}	Input reverse breakdown voltage	I _R = 10 μA, T _A = 25°C	5		V
V _{OL}	Low-level output voltage	V _{CC} = 5.5 V, I _F = 5 mA, I _{OL} = 13 mA	0.23	0.6	V
I _{OH}	High-level output current	V _{CC} = 5.5 V, V _O = 5.5 V, I _F = 250 μA		250	μA
I _{CCH}	Supply current, high-level output	V _{CC} = 5.5 V, I _F = 0	20	30	mA
I _{CCL}	Supply current, low-level output	V _{CC} = 5.5 V, I _F = 10 mA	26	38	mA
I _{II}	Input-input insulation leakage current	V _{II} = 500 V, t = 5 s, T _A = 25°C, RH = 45%, See Note 2	0.005		μA
I _{IO}	Input-output insulation leakage current	V _{IO} = 3000 V, t = 5 s, T _A = 25°C, RH = 45%, See Note 1		1	μA
r _{II}	Input-input resistance	V _{II} = 500 V, T _A = 25°C, See Note 2	10 ¹¹		Ω
r _{IO}	Input-output resistance	V _{IO} = 500 V, T _A = 25°C, See Note 1	10 ¹²		Ω
C _I	Input capacitance	V _F = 0, f = 1 MHz	60		pF
C _{II}	Input-input capacitance	V _F = 0, f = 1 MHz	0.25		pF
C _{IO}	Input-output capacitance	f = 1 MHz, T _A = 25°C, See Note 1	0.6		pF

[†]All typical values are at V_{CC} = 5 V, T_A = 25°C.

NOTES: 1. These parameters are measured between pins 1, 2, 3, and 4 shorted together and pins 5, 6, 7, and 8 shorted together.
2. These parameters are measured between pins 1 and 2 shorted together and pins 3 and 4 shorted together.

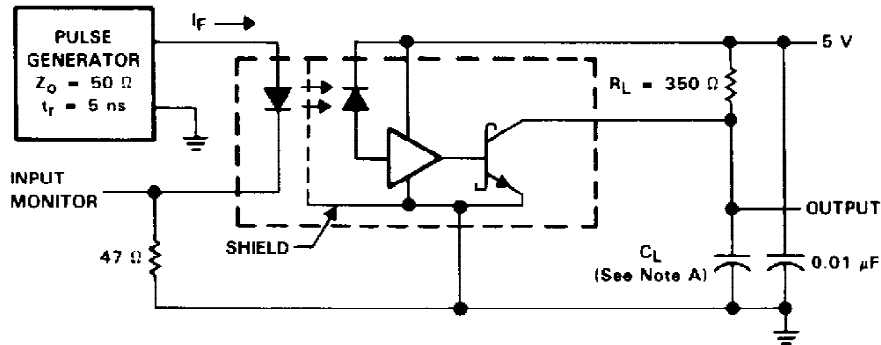
switching characteristics at V_{CC} = 5 V, T_A = 25°C

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t _{PLH}	Propagation delay time, low-to-high-level output, from LED input	I _F = 7.5 mA, R _L = 350 Ω, C _L = 15 pF, See Figure 1	42	75	ns
t _{PHL}	Propagation delay time, high-to-low level output, from LED input	I _F = 7.5 mA, R _L = 350 Ω, C _L = 15 pF, See Figure 1	42	75	ns
t _r	Rise time	I _F = 7.5 mA, R _L = 350 Ω, C _L = 15 pF	20		ns
t _f	Fall time	I _F = 7.5 mA, R _L = 350 Ω, C _L = 15 pF	30		ns
$\frac{dV_{LM}}{dt}$ (H)	Common-mode input transient immunity, high-level output	ΔV _{CM} = 50 V, I _F = 0, R _L = 350 Ω, See Note 3 and Figure 2	1000	10 000	V/μs
$\frac{dV_{CM}}{dt}$ (L)	Common-mode input transient immunity, low-level output	ΔV _{CM} = -50 V, I _F = 5 mA, R _L = 350 Ω, See Note 3 and Figure 2	-1000	-10 000	V/μs

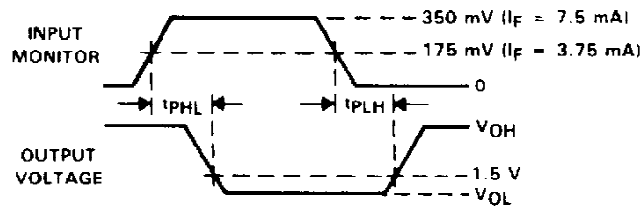
NOTE 3: Common-mode input transient immunity, high-level output, is the maximum rate of rise of the common-mode input voltage that does not cause the output voltage to drop below 2 V. Common-mode input transient immunity, low-level output, is the maximum rate of fall of the common-mode input voltage that does not cause the output voltage to rise above 0.8 V.

**HCPL2631
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**PARAMETER MEASUREMENT INFORMATION
(EACH CHANNEL)**



TEST CIRCUIT



WAVEFORMS

NOTE A: C_L is approximately 15 pF , which includes probe and stray wiring capacitances

FIGURE 1. t_{PLH} AND t_{PHL} FROM LED INPUT TEST CIRCUIT AND WAVEFORMS

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PARAMETER MEASUREMENT INFORMATION
(EACH CHANNEL)

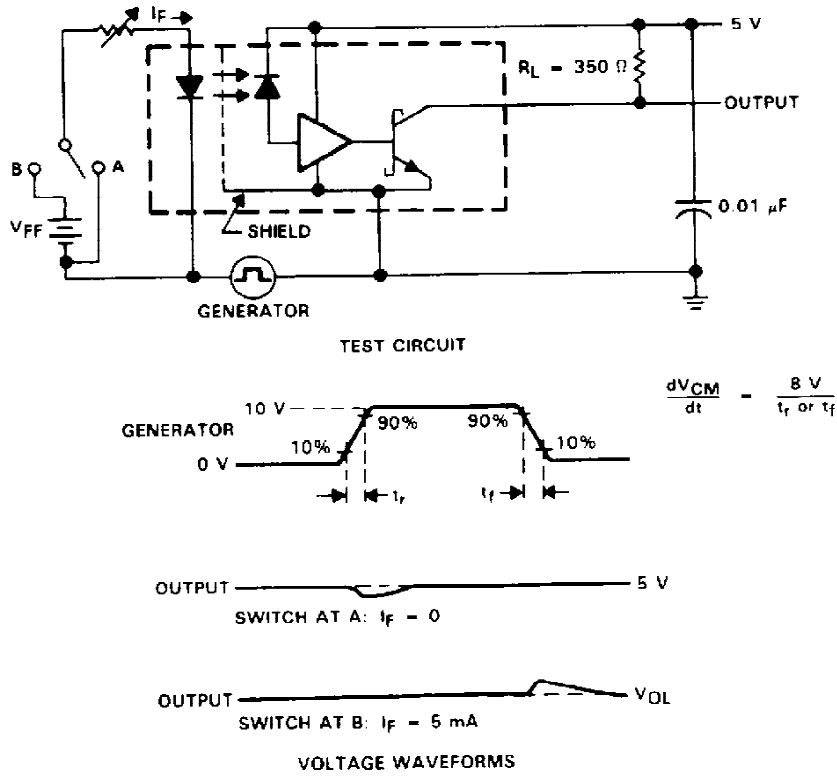


FIGURE 2. TRANSIENT IMMUNITY TEST CIRCUIT AND WAVEFORMS

TYPICAL APPLICATION INFORMATION

A ceramic capacitor (0.01 μF to 0.1 μF) should be connected between pins 8 and 5 to stabilize the high-gain amplifier. The total lead length between the capacitor and the optocoupler should not exceed 20 mm (0.8 inches). Failure to provide a bypass capacitor may result in impaired switching characteristics.

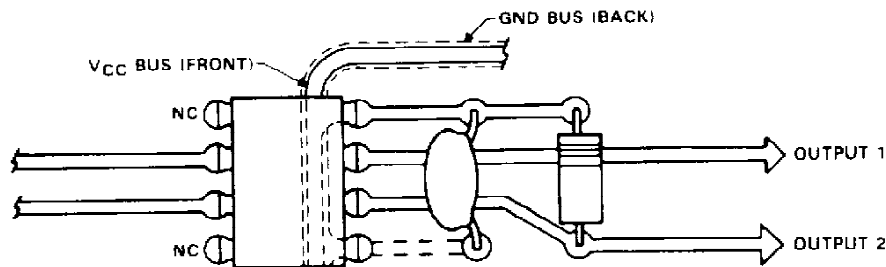


FIGURE 3. RECOMMENDED PRINTED CIRCUIT BOARD LAYOUT

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TYPICAL CHARACTERISTICS

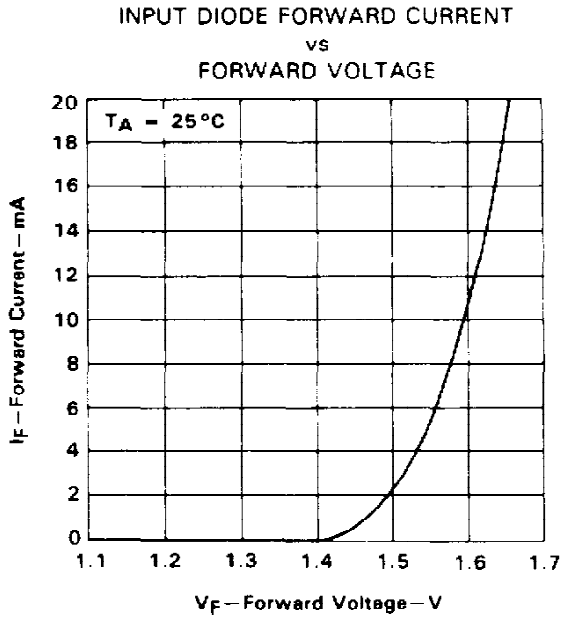


FIGURE 4

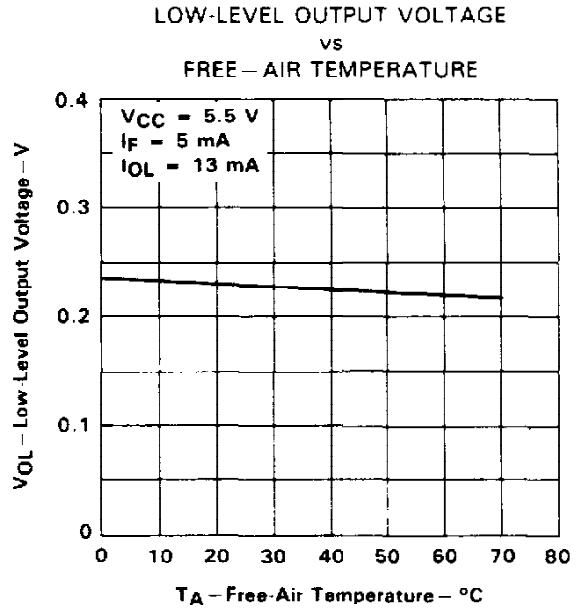


FIGURE 5

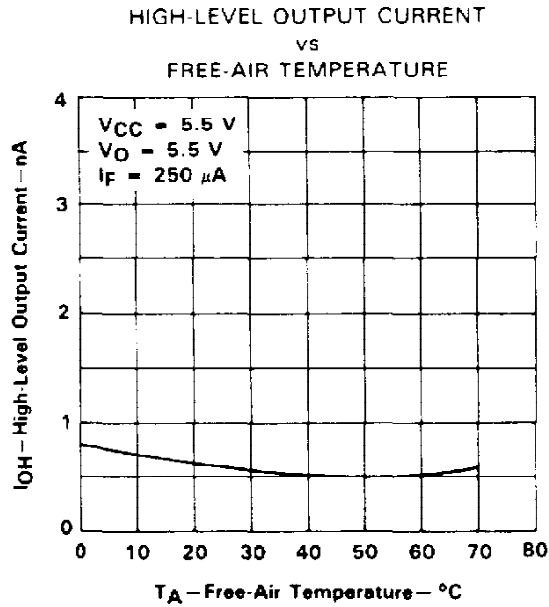


FIGURE 6

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DUAL-CHANNEL OPTOCOUPLER/OPTOISOLATOR

TYPICAL CHARACTERISTICS

PROPAGATION DELAY TIME FROM LED INPUT
VS
PULSE FORWARD CURRENT

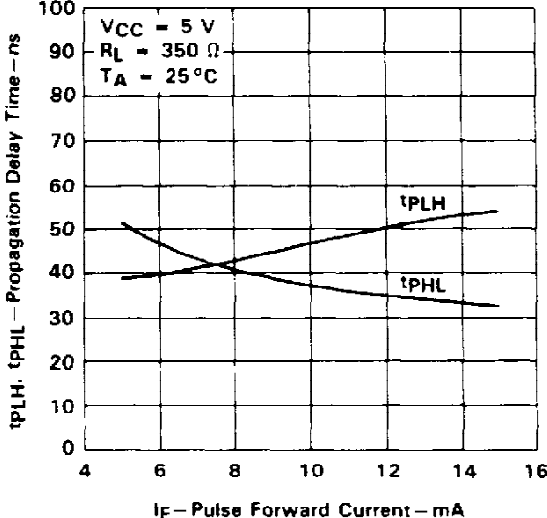


FIGURE 7

PROPAGATION DELAY TIME FROM LED INPUT
VS
LOAD RESISTANCE

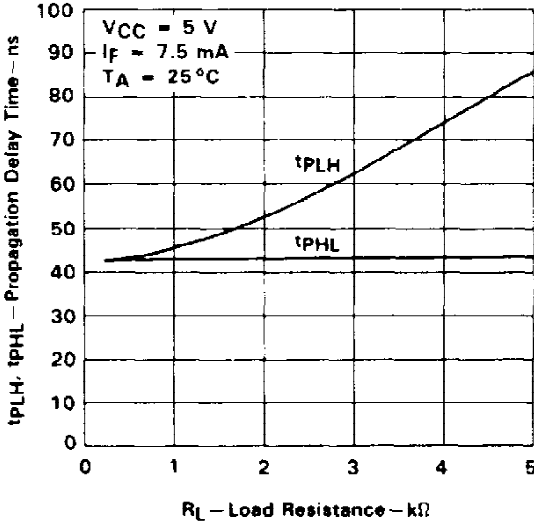


FIGURE 8

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