SOOS010 D2969, NOVEMBER 1986

- 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 HCPL2630
- UL Recognized . . . File Number E65085

description

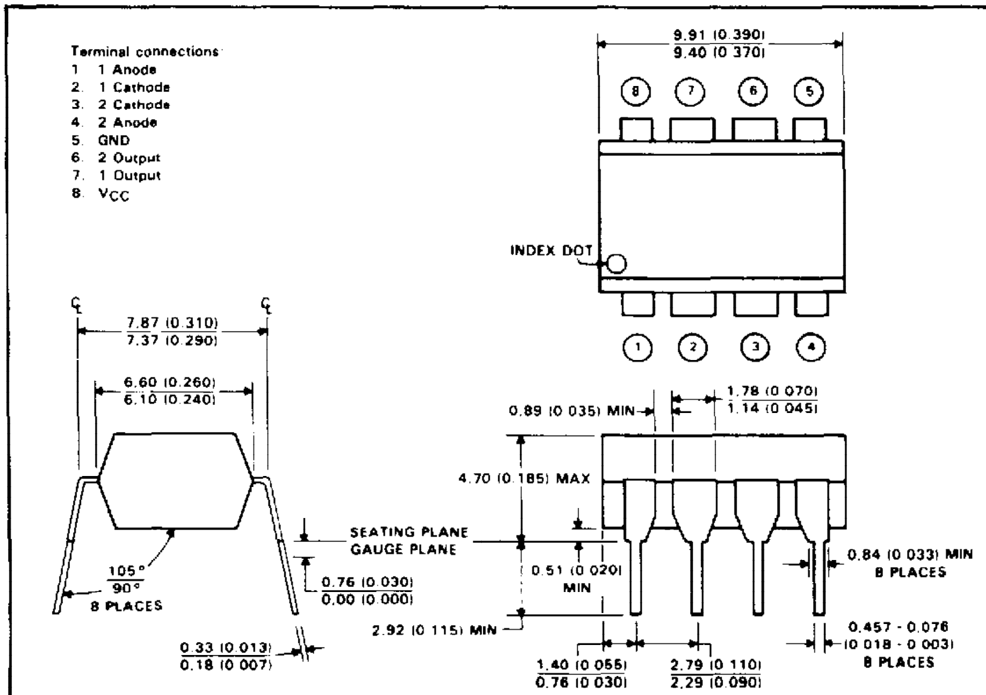
The HCPL2630 is a dual optocoupler designed for use in high-speed digital interfacing applications that require high-voltage isolation between the input and output. Applications include line receivers, microprocessors or computer interface, and other control systems.

Each channel of the HCPL2630 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 milliamperes will switch the output transistor low, providing an on-state drive current of 13 milliamperes (eight 1.6-milliampere TTL loads).

The device is mounted in a standard 8-pin dual-in-line plastic package.

The HCPL2630 is characterized for operation over the temperature range of 0°C to 70°C.

mechanical data



ALL LINEAR DIMENSIONS ARE IN MILLIMETERS AND PARENTHETICALLY IN INCHES

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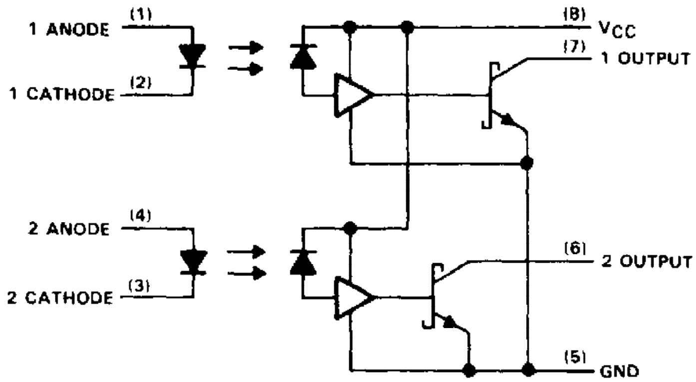
logic diagram (positive logic)



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

Supply voltage, V_{CC}	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
V_{CC}	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	μA
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).

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

PARAMETER		TEST CONDITIONS	MIN	TYP†	MAX	UNIT
V_F	Input forward voltage	I_F = 10 mA, T_A = 25°C		1.6	1.75	V
αV_F	Temperature coefficient of forward voltage	I_F = 10 mA		−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	36	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.

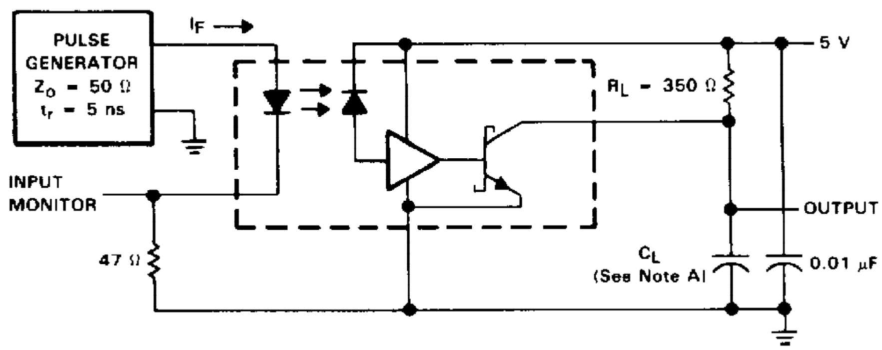
NOTES 1. These parameters are measured between pins 1, 2, 3, and 4 shorted together and pins 5, 6, 7, and 8 shorted together.
2. These parameters are measured between pins 1 and 2 shorted together and pins 3 and 4 shorted together.

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

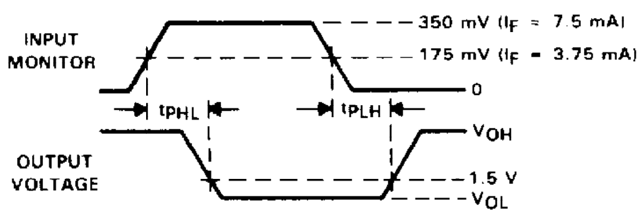
PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH}	Propagation delay time, low-to-high-level output, from LED input	I_F = 7.5 mA, R_L = 350 Ω, C_L = 15 pF, See Figure 1		42	75	ns
t_{PHL}	Propagation delay time, high-to-low level output, from LED input	I_F = 7.5 mA, R_L = 350 Ω, C_L = 15 pF, See Figure 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
$\frac{dV_{CM}}{dt}$ (H)	Common-mode input transient immunity, high-level output	ΔV_{CM} = 10 V, I_F = 0, R_L = 350 Ω, See Note 3 and Figure 2		50		V/µs
$\frac{dV_{CM}}{dt}$ (L)	Common-mode input transient immunity, low-level output	ΔV_{CM} = −10 V, I_F = 5 mA, R_L = 350 Ω, See Note 3 and Figure 2		−150		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.

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

PARAMETER MEASUREMENT INFORMATION (EACH CHANNEL)

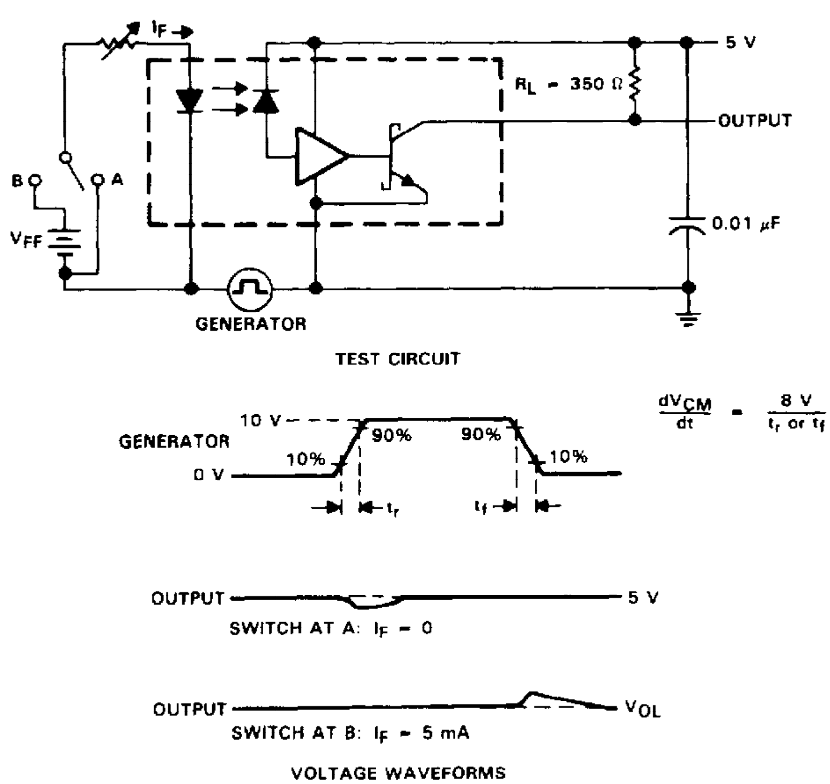


FIGURE 2. TRANSIENT IMMUNITY TEST CIRCUIT AND WAVEFORMS

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.

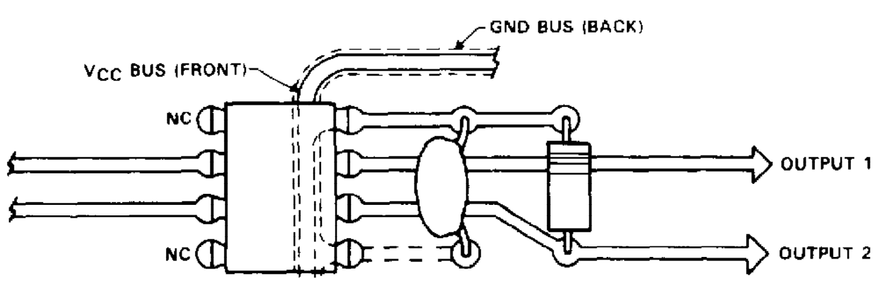


FIGURE 3. RECOMMENDED PRINTED CIRCUIT BOARD LAYOUT

TYPICAL CHARACTERISTICS

INPUT DIODE FORWARD CURRENT
vs
FORWARD VOLTAGE

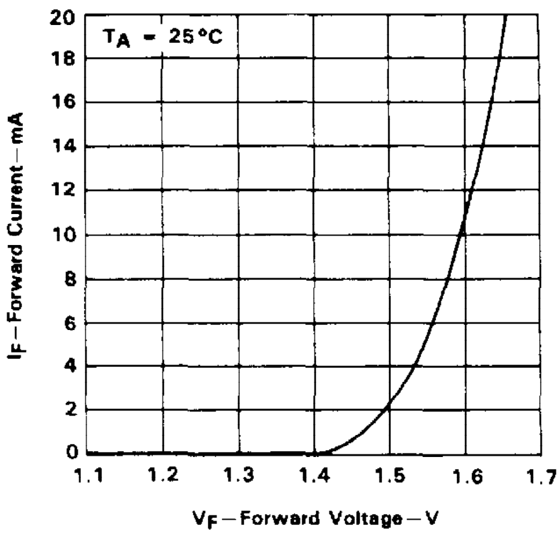


FIGURE 4

LOW-LEVEL OUTPUT VOLTAGE
vs
FREE—AIR TEMPERATURE

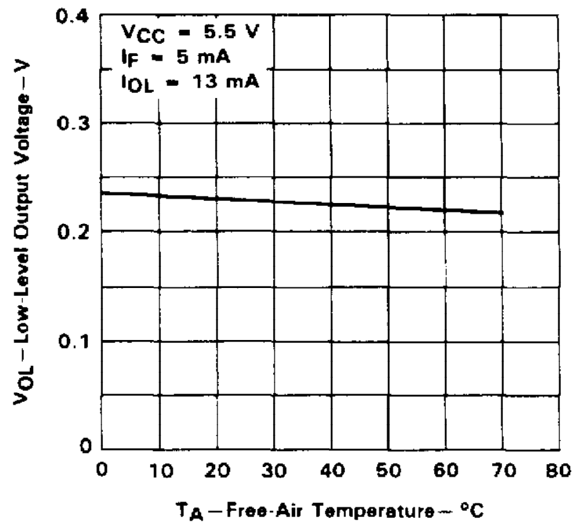


FIGURE 5

HIGH-LEVEL OUTPUT CURRENT
vs
FREE-AIR TEMPERATURE

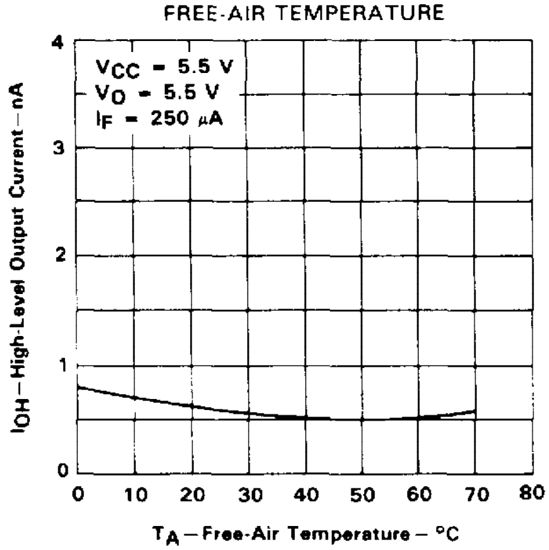


FIGURE 6

TYPICAL CHARACTERISTICS

PROPAGATION DELAY TIME FROM LED INPUT
vs
PULSE FORWARD CURRENT

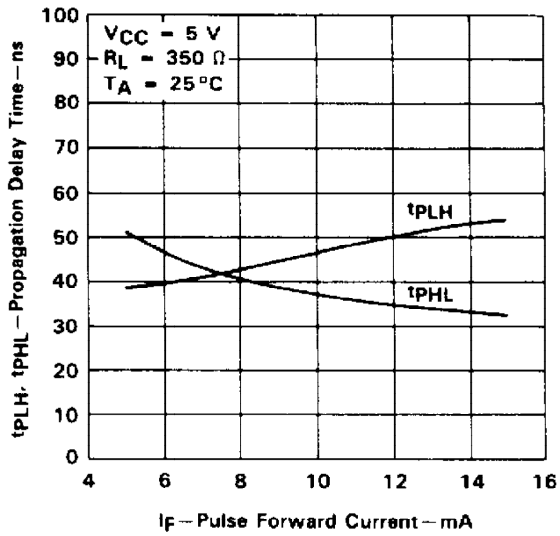


FIGURE 7

PROPAGATION DELAY TIME FROM LED INPUT
vs
LOAD RESISTANCE

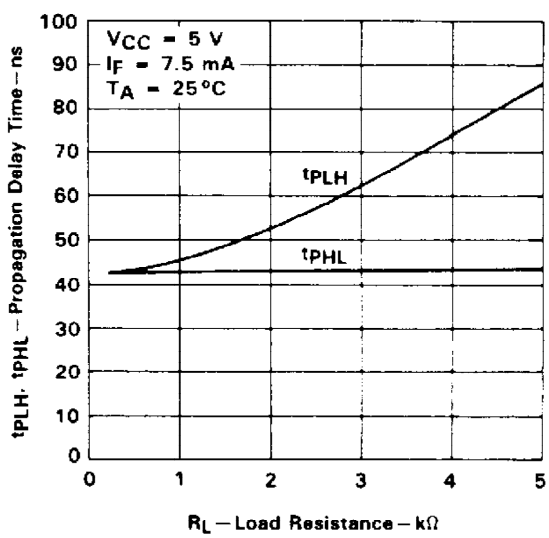


FIGURE 8

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