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HCPL2630
DUAL-CHANNEL OPTOCOUPLER/OPTOISOLATOR

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.

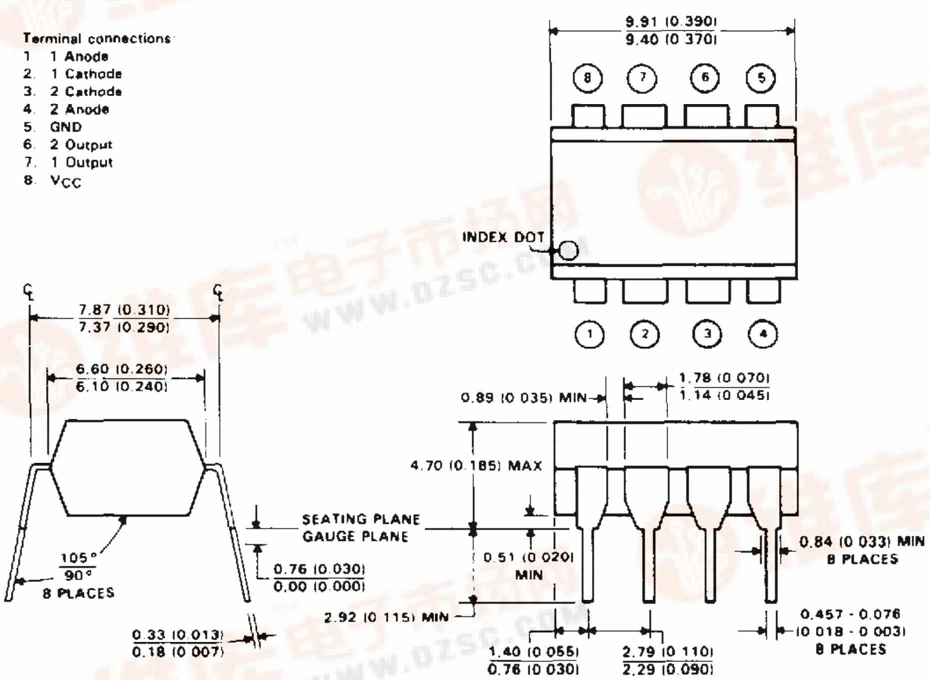
Each channel of the HCPL2630 optocoupler consists of a GaAsP light-emitting diode and an integrated light detector composed of a photodiode, a high-gain amplifier, and a Schottky-clamped open-collector output transistor. An input diode forward current of 5 milliamperes will switch the output transistor 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

Terminal connections:
1. 1 Anode
2. 1 Cathode
3. 2 Cathode
4. 2 Anode
5. GND
6. 2 Output
7. 1 Output
8. V_{CC}



ALL LINEAR DIMENSIONS ARE IN MILLIMETERS AND PARENTHETICALLY IN INCHES

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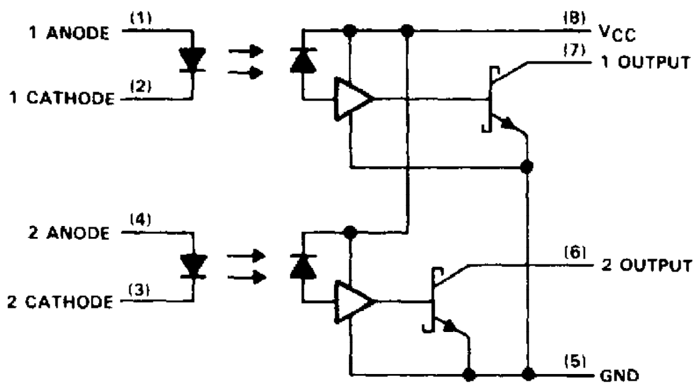
logic diagram (positive logic)



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 ($\leq$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	$I_R = 10\ \mu A$,	$T_A = 25°C$	5			V
V_{OL}	Low-level output voltage	$V_{CC} = 5.5$ V, $I_{OL} = 13$ mA	$I_F = 5$ mA,		0.23	0.6	V
I_{OH}	High-level output current	$V_{CC} = 5.5$ V, $I_F = 250\ \mu A$	$V_O = 5.5$ V,			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, $T_A = 25°C$ See Note 2	t = 5 s, RH = 45%,		0.005		μA
I_{IO}	Input-output insulation leakage current	$V_{IO} = 3000$ V, $T_A = 25°C$, See Note 1	t = 5 s, RH = 45%,			1	μA
r_{II}	Input-input resistance	$V_{II} = 500$ V, See Note 2	$T_A = 25°C$,		10^{11}		Ω
r_{IO}	Input-output resistance	$V_{IO} = 500$ V, See Note 1	$T_A = 25°C$,		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, See Note 1	$T_A = 25°C$.		0.6		pF

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

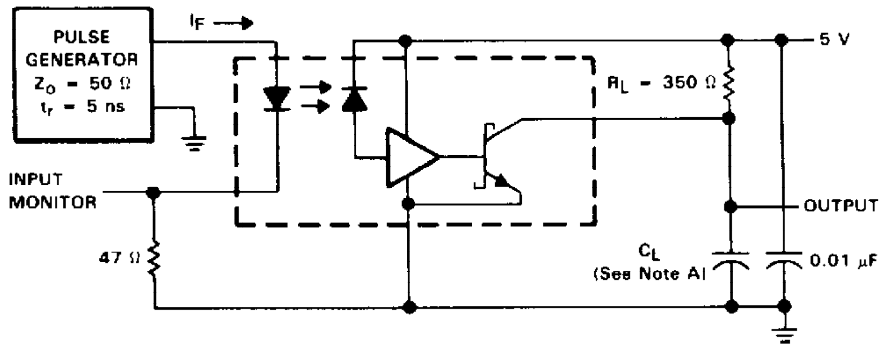
NOTES 1. These parameters are measured between pins 1, 2, 3, and 4 shorted together and pins 5, 6, 7, and 8 shorted together.
2. These parameters are measured between pins 1 and 2 shorted together and pins 3 and 4 shorted together.

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

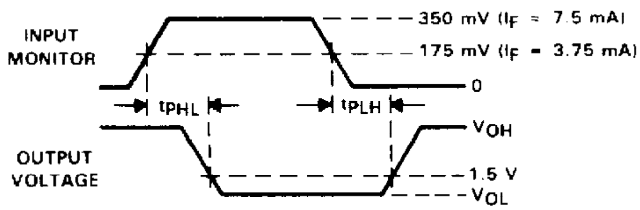
PARAMETER		TEST CONDITIONS		MIN	TYP	MAX	UNIT
t_{PLH}	Propagation delay time, low-to-high-level output, from LED input	$I_F = 7.5$ mA, $C_L = 15$ pF,	$R_L = 350\ \Omega$, See Figure 1		42	75	ns
t_{PHL}	Propagation delay time, high-to-low level output, from LED input	$I_F = 7.5$ mA, $C_L = 15$ pF,	$R_L = 350\ \Omega$, See Figure 1		42	75	ns
t_r	Rise time	$I_F = 7.5$ mA, $C_L = 15$ pF	$R_L = 350\ \Omega$,		20		ns
t_f	Fall time	$I_F = 7.5$ mA, $C_L = 15$ pF	$R_L = 350\ \Omega$,		30		ns
$\frac{dV_{CM}}{dt}$ (H)	Common-mode input transient immunity, high-level output	$\Delta V_{CM} = 10$ V, $R_L = 350\ \Omega$, See Note 3 and Figure 2	$I_F = 0$,		50		V/μs
$\frac{dV_{CM}}{dt}$ (L)	Common-mode input transient immunity, low-level output	$\Delta V_{CM} = -10$ V, $I_F = 5$ mA, $R_L = 350\ \Omega$, 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

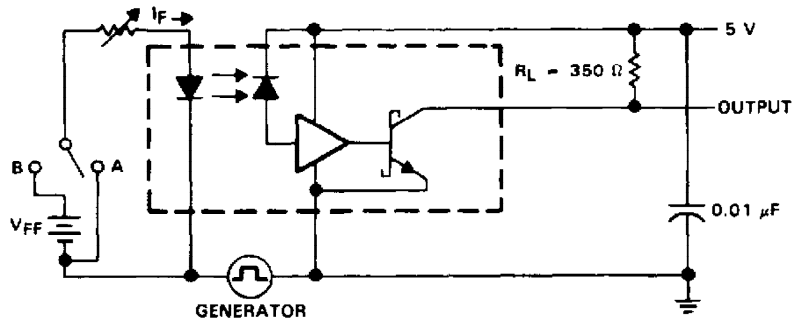


WAVEFORMS

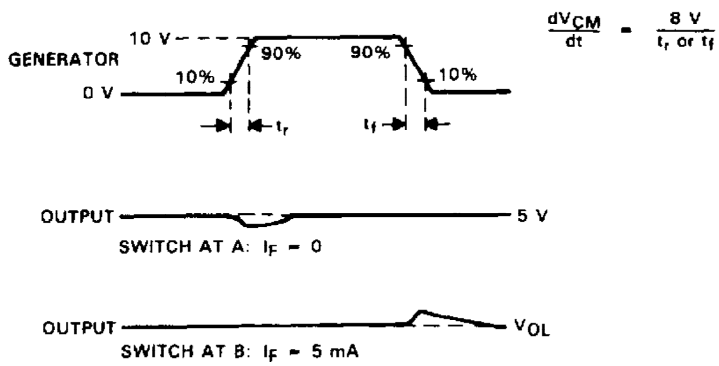
NOTE A: C_L is approximately 15 pF, which includes probe and stray wiring capacitances.

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

PARAMETER MEASUREMENT INFORMATION (EACH CHANNEL)



TEST CIRCUIT



VOLTAGE WAVEFORMS

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.

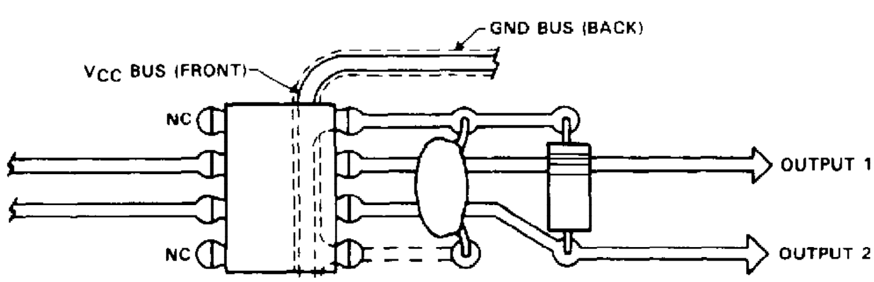


FIGURE 3. RECOMMENDED PRINTED CIRCUIT BOARD LAYOUT

TYPICAL CHARACTERISTICS

INPUT DIODE FORWARD CURRENT
vs
FORWARD VOLTAGE

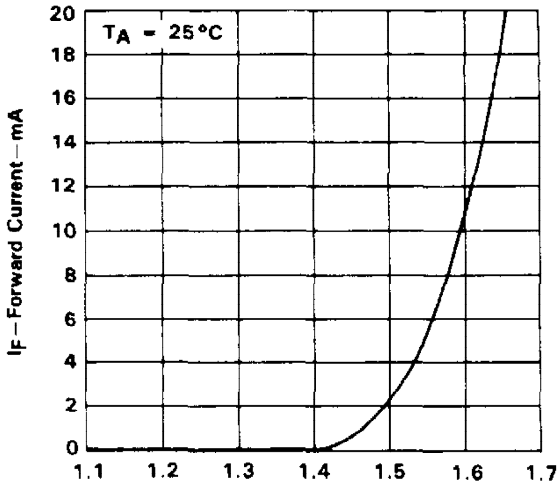


FIGURE 4

LOW-LEVEL OUTPUT VOLTAGE
vs
FREE–AIR TEMPERATURE

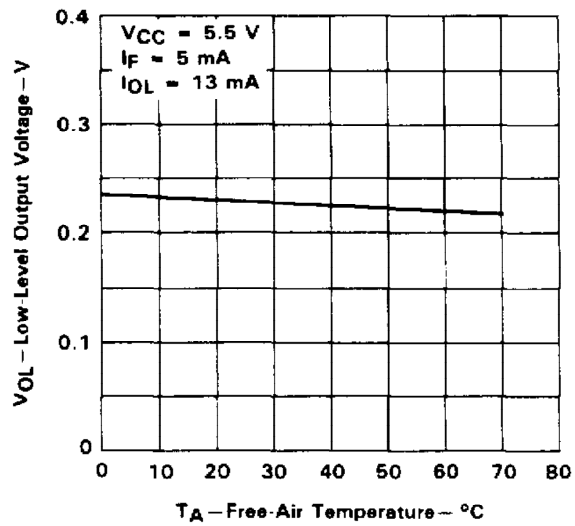


FIGURE 5

HIGH-LEVEL OUTPUT CURRENT
vs
FREE-AIR TEMPERATURE

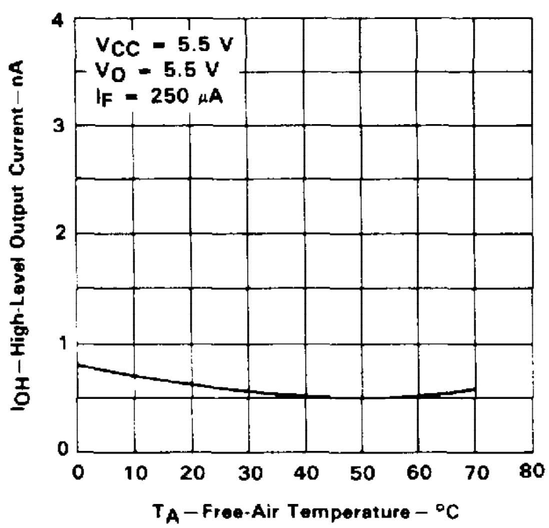


FIGURE 6

TYPICAL CHARACTERISTICS

PROPAGATION DELAY TIME FROM LED INPUT
vs
PULSE FORWARD CURRENT

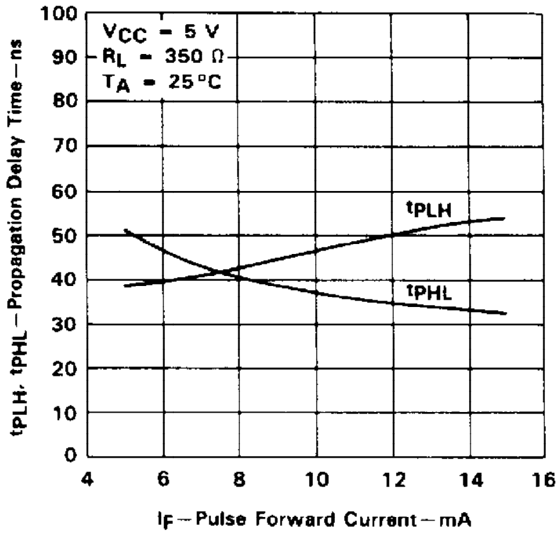


FIGURE 7

PROPAGATION DELAY TIME FROM LED INPUT
vs
LOAD RESISTANCE

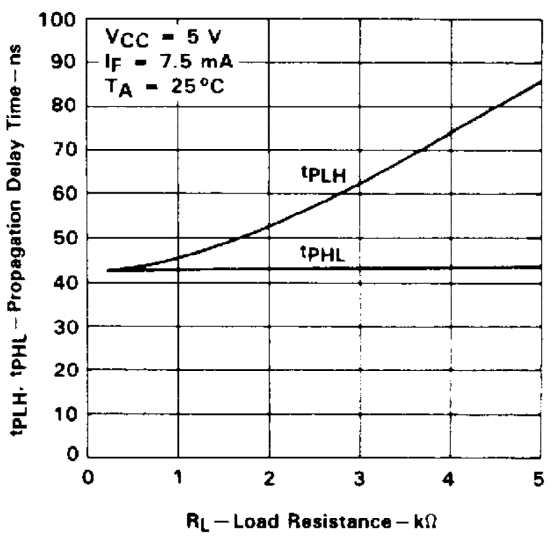


FIGURE 8

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