

**TIL601 THRU TIL604, LS600, LS602, LS611 THRU LS619
N-P-N PLANAR SILICON PHOTOTRANSISTORS**

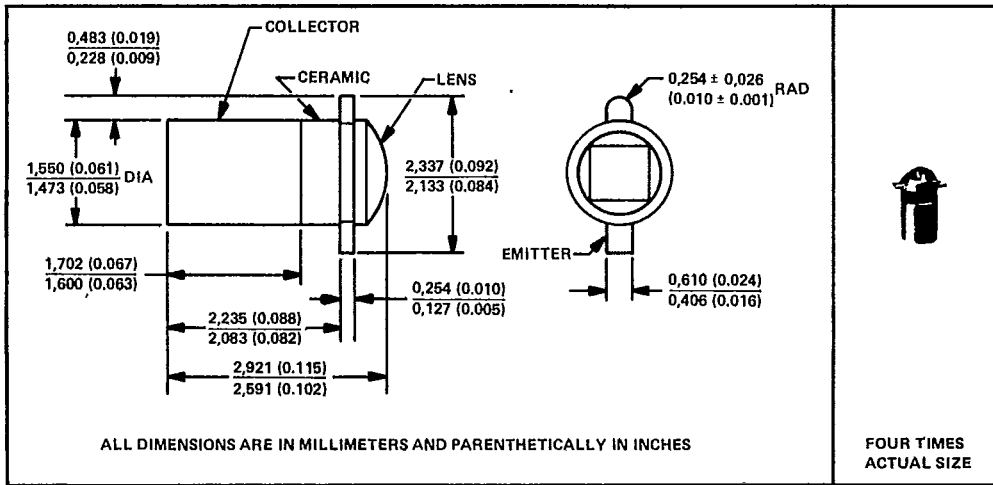
D1971, NOVEMBER 1974--REVISED SEPTEMBER 1989

DESIGNED FOR HIGH-DENSITY READ OUT

T-41-61

- Hermetically-Sealed Pill Package
- Recommended for Application in Character Recognition, Tape and Card Readers, Velocity Indicators, and Encoders
- Unique Package Design Allows for Assembly into Printed Circuit Boards
- Spectrally and Mechanically Compatible with TIL23 thru TIL25
- Saturation Level Directly Compatible with Most TTL
- TIL604HR2† Includes High-Reliability Processing and Lot Acceptance (See TIL604HR2 for Summary of Processing)

mechanical data



Infrared Emitters and Phototransistors



† All electrical and mechanical specifications for the TIL24 also apply for TIL24HR2.

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.



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absolute maximum ratings at 25 °C case temperature (unless otherwise noted)

Collector-emitter voltage	50 V
Emitter-collector voltage	7 V
Continuous device dissipation at (or below) 25 °C case temperature (see Note 1)	50 mW
Operating case temperature range	-65 °C to 125 °C
Storage temperature range	-65 °C to 150 °C
Soldering temperature (10 seconds)	240 °C

electrical characteristics at 25 °C case temperature (unless otherwise noted)

PARAMETER	TEST CONDITIONS	TYPE	MIN	TYP	MAX	UNIT
V _{(BR)CEO} Collector-emitter breakdown voltage	I _C = 100 μA, E _e = 0	All	50			V
V _{(BR)ECO} Emitter-collector breakdown voltage	I _E = 100 μA, E _e = 0	All	7			V
I _D Dark current	V _{CE} = 30 V, E _e = 0	All			25	nA
	V _{CE} = 30 V, E _e = 0, T _C = 100 °C	All		3		μA
I _L Light current	V _{CE} = 5 V, E _e = 20 mW/cm ² , See Note 2	TIL601	0.5		3	mA
		TIL602	2		5	
		TIL603	4		8	
		TIL604	7			
		LS600	0.8			
		LS602	0.5			
		LS611	0.5	1	2	
		LS612	1	2	3	
		LS613	2	3	4	
		LS614	3	4	5	
		LS615	4	5	6	
		LS616	5	6	7	
LS617	6	7	8			
LS618	7	8	9			
LS619	8	9				
V _{CE(sat)} Collector-emitter saturation voltage	I _C = 0.4 mA, E _e = 20 mW/cm ² , See Note 2	All		0.15		V

NOTES: 1. Derate linearly to 125 °C at the rate of 0.5 mW/°C.
2. Irradiance (E_e) is the radiant power per unit area incident upon a surface. For this measurement, the source is an unfiltered tungsten linear-filament lamp operating at a color temperature of 2870 K.

switching characteristics at 25 °C case temperature

PARAMETER	TEST CONDITIONS	TYP	UNIT
t _r Rise time	V _{CC} = 30 V, I _L = 800 μA,	8	μs
t _f Fall time	R _L = 1 kΩ, See Figure 1	6	

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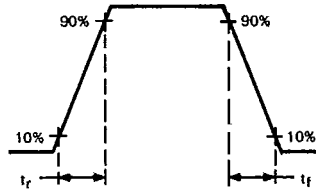
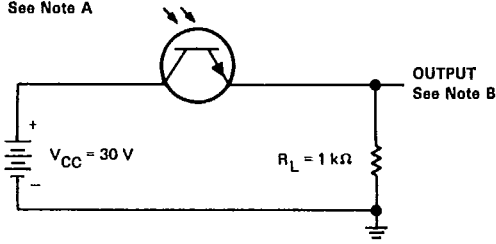


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PARAMETER MEASUREMENT INFORMATION

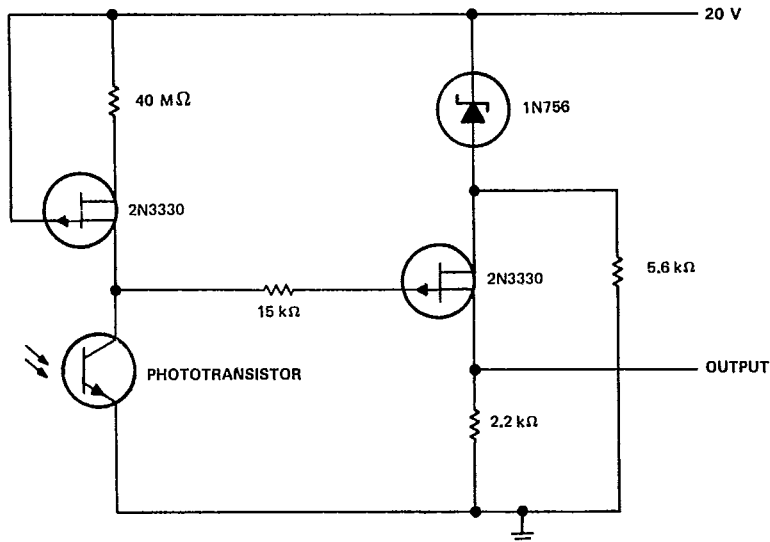
See Note A



NOTES: A. Input irradiance is supplied by a pulsed gallium arsenide infrared emitter with rise and fall times of less than 50 ns. Incident irradiance is adjusted for $I_L = 800 \mu A$.
B. Output waveform is monitored on an oscilloscope with the following characteristics: $t_r \leq 25 \text{ ns}$, $R_{in} \geq 1 \text{ M}\Omega$, $C_{in} \leq 20 \text{ pF}$.

FIGURE 1

TYPICAL APPLICATION DATA



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TYPICAL APPLICATION DATA

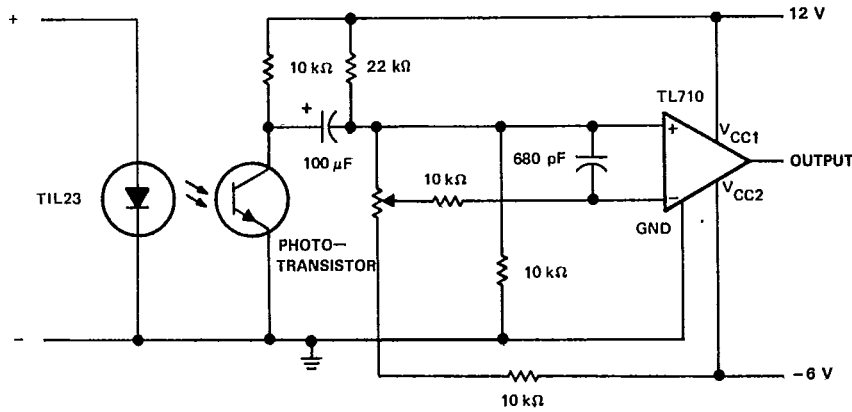


FIGURE 3. OPTICALLY COUPLED AMPLIFIER

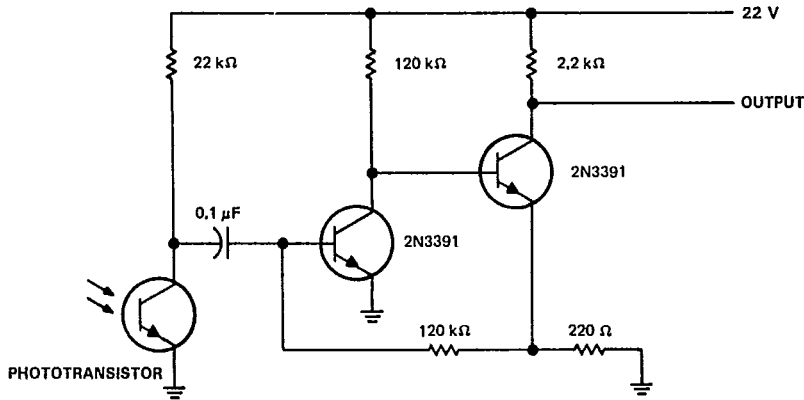


FIGURE 4. LIGHT PULSE DETECTOR

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TYPICAL CHARACTERISTICS

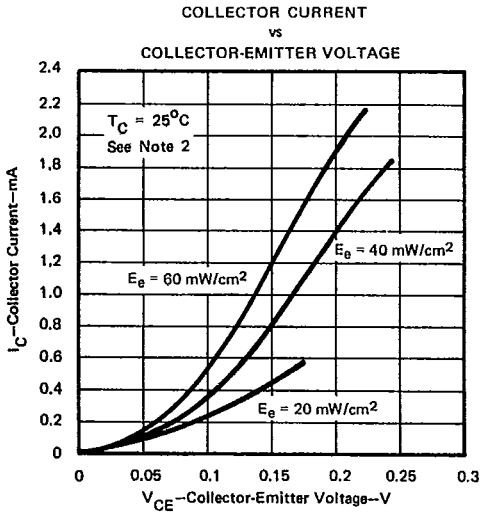


FIGURE 5

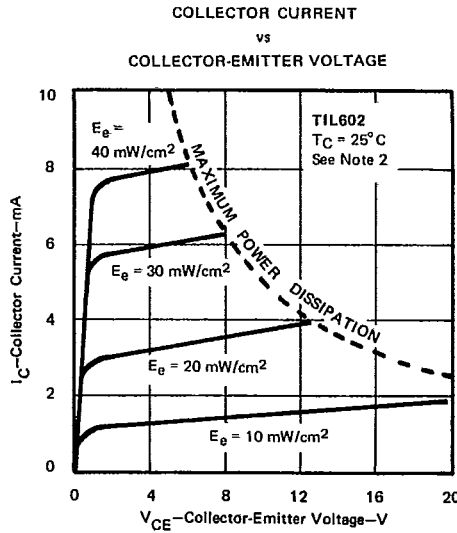


FIGURE 6

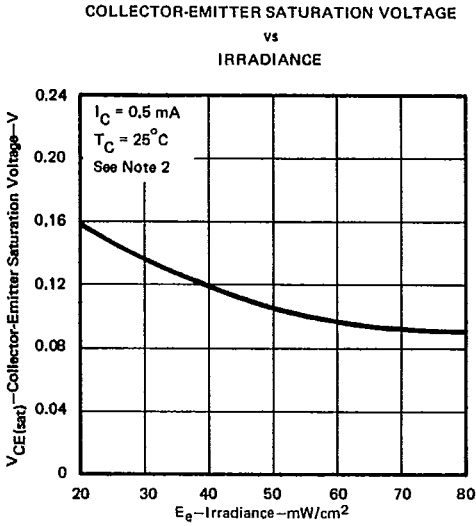


FIGURE 7

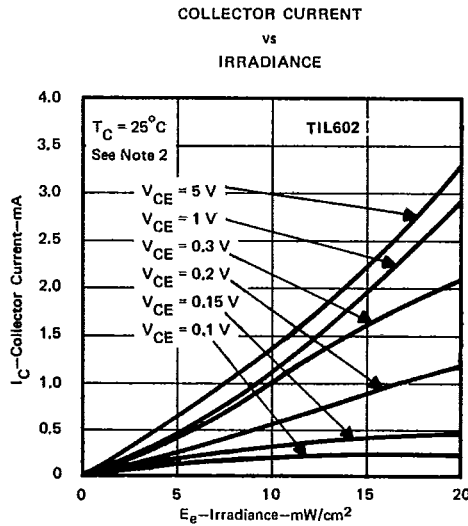


FIGURE 8

NOTE 2. Irradiance (E_e) is the radiant power unit area incident upon a surface. For this measurement, the source is an unfiltered tungsten linear-filament lamp operating at a color temperature of 2870 K.

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TYPICAL CHARACTERISTICS

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DARK CURRENT
vs
CASE TEMPERATURE

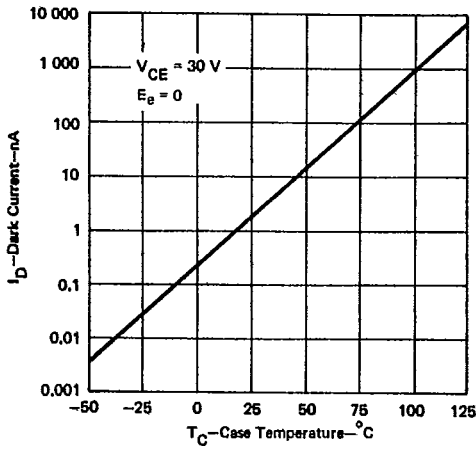


FIGURE 9

RELATIVE OUTPUT
vs
MODULATION FREQUENCY

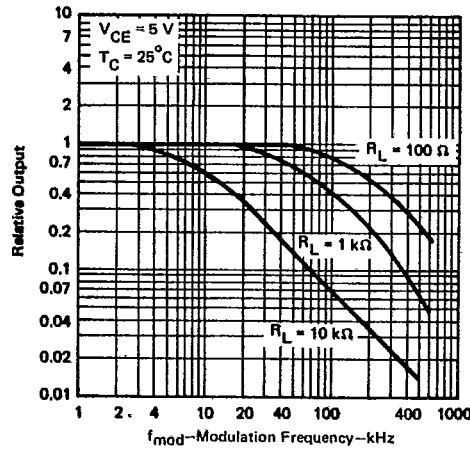


FIGURE 10

COUPLING CHARACTERISTICS
OF TIL23 OR TIL24 WITH TIL602

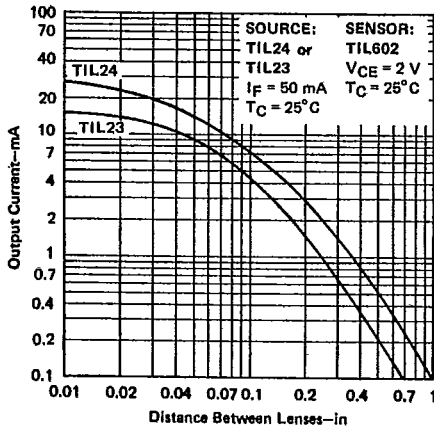


FIGURE 11

RELATIVE OUTPUT
vs
CASE TEMPERATURE OF SOURCE AND SENSOR

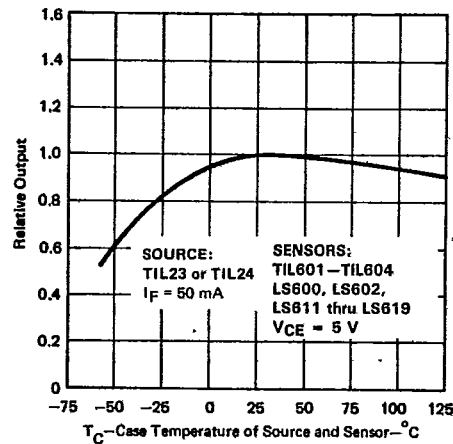


FIGURE 12

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TYPICAL CHARACTERISTICS

NORMALIZED LIGHT CURRENT
vs
ANGULAR DISPLACEMENT

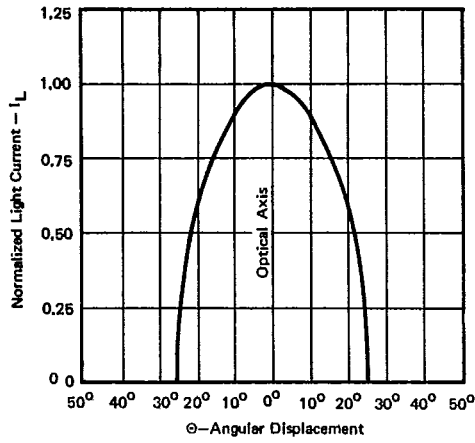


FIGURE 13

RELATIVE SPECTRAL CHARACTERISTICS

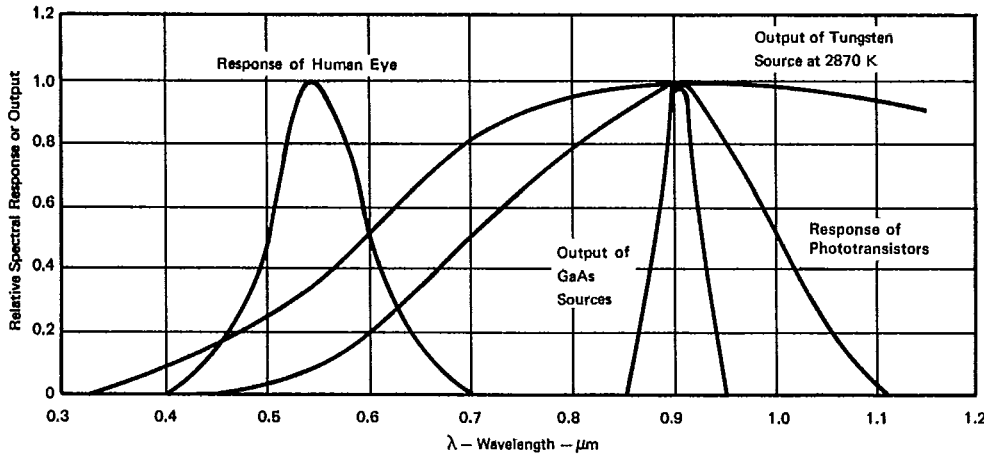


FIGURE 14

Infrared Emitters and Phototransistors

