

เอกสารอ้างอิง

1. Smith, E. v.P., and Jacobs, K. C., Introductory Astronomy and Astrophysics, pp. 215-217, pp. 223-245, pp. 297-306, Saunder College Publishing, Pheladelphia, 1973.
2. Allen, C. W., Astrophysical Quantities, pp. 35-40, pp. 161-180, pp. 196-214, pp. 256, The Athlone Press, University of London, London, 3rd ed., 1976.
3. A Dictionary of Astronomy (Illingworth, V.), pp. 229, Pan Book ltd, London, 1981.
4. ระเบียบ ภาวิไล, ดาราศาสตร์และอวกาศ, หน้า 294-341, บริษัท ดิกนิตสยาม จำกัด, กรุงเทพมหานคร, พ.ศ.2523.
5. Aller, L. H., Astrophysics:The Atmospheres of Sun and Star, pp. 109-112, pp. 174-175, The Ronald Press Co., 2nd ed., 1963.
6. Minnaert, M., Mulders, G. F. W., and Houtgast, J., Photometric Atlas of the Solar Spectrum, Kampert & Kelm, Amsterdam, 1940.
7. Sawyer, R. A., Experimental Spectroscopy, pp. 50-57, pp. 127-132, pp. 192-214, pp. 254-287, Prentice-Hall, New Jersey, 2nd. ed., 1956
8. Kodak Films in Rolls, Eastman Kodak Co., Rochester, New York, 2nd. ed., 1965.
9. Kodak TMAX Professional Films, Eastman Kodak Co., Rochester, New York, 1988.

10. Jenkins, F. A., and White, H. E., Fundamentals of Optics, pp. 134-139, pp. 355-376, McGraw-Hill Book Co., Singapore, 4th. ed., 1981.
11. Gray, D. F., The Observation and Analysis of Stellar Photosphere, pp. 68-69, John Wiley & Sons Inc., New York, 1976.
12. Reitz, J. R., and Milford, F. J., Foundations of Electromagnetic Theory, pp. 327-332, Addison-Wesley Publishing Co., Reading, Massachusetts, 2nd. ed., 1967
13. Mihalas, D., Stellar Atmospheres, pp. 68, W. H. Freeman and Company, San Francisco, 1970.
14. Novotny, E., Introduction to Stellar Atmospheres and Interiors, pp. 112-119, Oxford University Press Inc., New York, 1973.
15. Optoelectronics Data Book 1983-84, Texas Instruments Inc., Texas, 1983.

ภาคผนวก

ข้อมูลของ โฟโตทรานซิสเตอร์ TIL 81 [15]

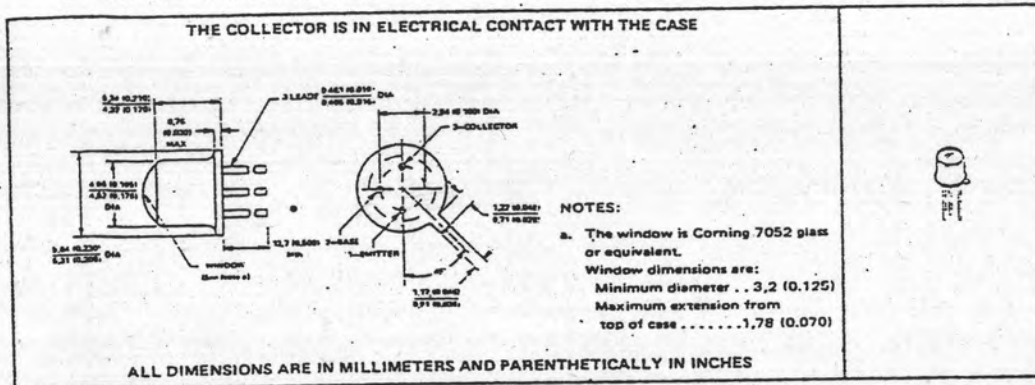
TYPE TIL81
N-P-N PLANAR SILICON PHOTOTRANSISTOR

D1215, MARCH 1972—REVISED DECEMBER 1982

- Recommended for Application in Character Recognition, Tape and Card Readers, Velocity Indicators, and Encoders
- Spectrally and Mechanically Compatible with TIL31B IR Emitter
- Glass-to-Metal-Seal Header
- Base Contact Externally Available
- Saturation Level Directly Compatible with Most TTL/DTL
- TIL81HR2* Includes High-Reliability Processing and Lot Acceptance (See Page 5-13 for Summary of Processing)

mechanical data

The device is in a hermetically sealed package with glass window. The outline of the TIL81 is similar to TO-18 except for the window. All TO-18 registration notes also apply to this outline



PHOTODETECTORS 5

absolute maximum ratings at 25°C free-air temperature (unless otherwise noted)

Collector-Base Voltage	50 V
Collector-Emitter Voltage	30 V
Emitter-Base Voltage	7 V
Emitter-Collector Voltage	7 V
Continuous Collector Current	50 mA
Continuous Device Dissipation at (or below) 25°C Free-Air Temperature (See Note 1)	250 mW
Operating Free-Air Temperature Range	-65°C to 125°C
Storage Temperature Range	-65°C to 150°C
Lead Temperature 1.6 mm (1/16 inch) from Case for 10 Seconds	240°C

NOTE 1: Derate linearly to 125°C free-air temperature at the rate of 2.5 mW/°C.

*All electrical and mechanical specifications for the TIL81 also apply for the TIL81HR2.

TYPE TIL81
N-P-N PLANAR SILICON PHOTOTRANSISTOR

electrical characteristics at 25°C free-air temperature (unless otherwise noted)

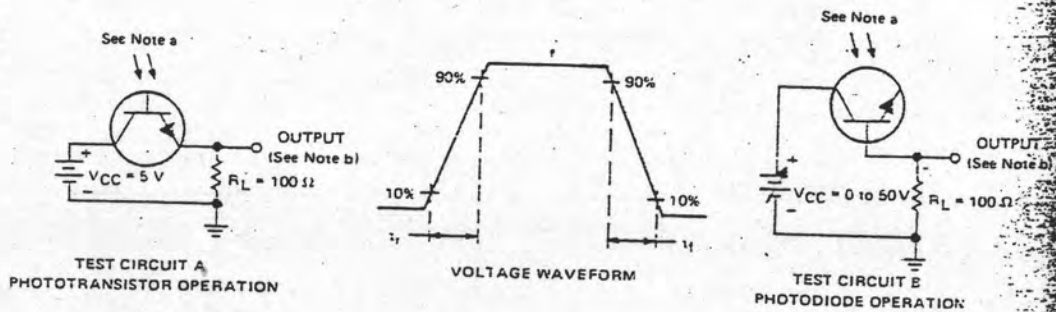
PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
V(BR)CBO	Collector-Base Breakdown Voltage	$I_C = 100 \mu A, I_E = 0, E_e = 0$	50			V
V(BR)CEO	Collector-Emitter Breakdown Voltage	$I_C = 100 \mu A, I_B = 0, E_e = 0$	30			V
V(BR)EBO	Emitter-Base Breakdown Voltage	$I_E = 100 \mu A, I_C = 0, E_e = 0$	7			V
V(BR)ECO	Emitter-Collector Breakdown Voltage	$I_E = 100 \mu A, I_B = 0, E_e = 0$	7			V
I _D	Dark Current	Phototransistor Operation			0.1	μA
		Photodiode Operation	$V_{CE} = 10 V, I_B = 0, E_e = 0, T_F = 100^\circ C$	20		μA
I _L	Light Current	Phototransistor Operation	$V_{CE} = 5 V, I_B = 0, E_e = 5 mW/cm^2$	5	22	mA
		Photodiode Operation	$V_{CB} = 0 \text{ to } 50 V, I_E = 0, E_e = 20 mW/cm^2$		170	μA
h _{FE}	Static Forward Current Transfer Ratio	$V_{CE} = 5 V, I_C = 1 mA, E_e = 0$		200		
V _{CE(sat)}	Collector-Emitter Saturation Voltage	$I_C = 2 mA, I_B = 0, E_e = 20 mW/cm^2$	0.2			V

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

switching characteristics at 25°C free-air temperature

PARAMETER		TEST CONDITIONS	TYPICAL	UNIT
t _r	Rise Time	Phototransistor Operation $V_{CC} = 5 V, I_L = 800 \mu A, R_L = 100 \Omega$ See Test Circuit A of Figure 1	8	μs
t _f	Fall Time		6	
t _r	Rise Time	Photodiode Operation $V_{CC} = 0 \text{ to } 50 V, I_L = 60 \mu A, R_L = 100 \Omega$ See Test Circuit B of Figure 1	350	ns
t _f	Fall Time		50	

PARAMETER MEASUREMENT INFORMATION



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

FIGURE 1

5 PHOTODETECTORS

TYPE TIL81 N-P-N PLANAR SILICON PHOTOTRANSISTOR

TYPICAL CHARACTERISTICS

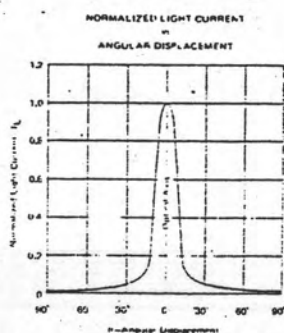


FIGURE 2

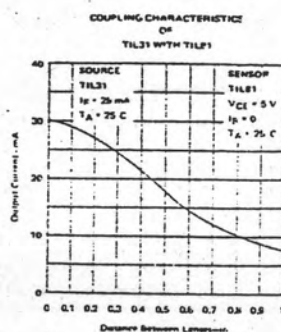


FIGURE 3

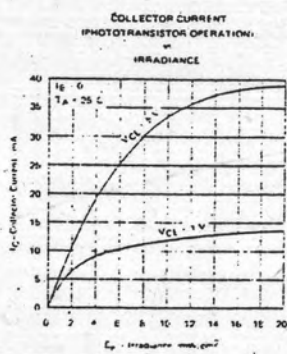


FIGURE 4

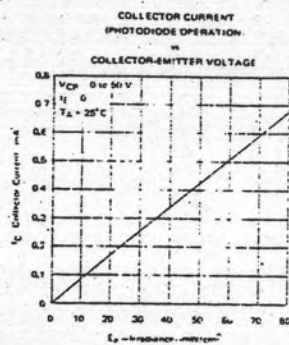


FIGURE 5

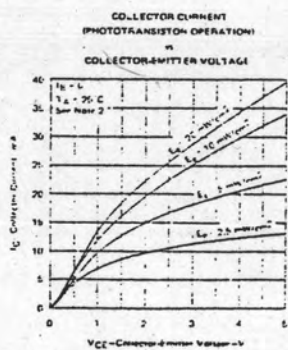


FIGURE 6

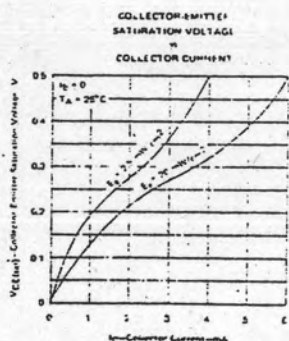


FIGURE 7

NOTE 2: Irradiance (E_0) is the radiant power per unit area incident upon a surface. For these measurements the source is an unfiltered tungsten

5
PHOTODETECTORS

**TYPE TIL81
N-P-N PLANAR SILICON PHOTOTRANSISTOR**

TYPICAL CHARACTERISTICS

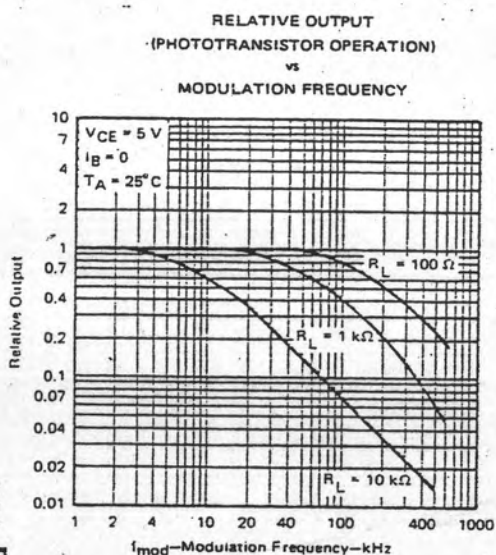


FIGURE 8

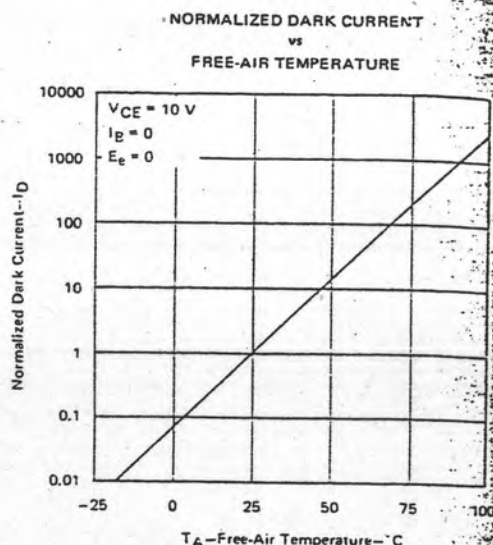


FIGURE 9

PHOTODETECTORS

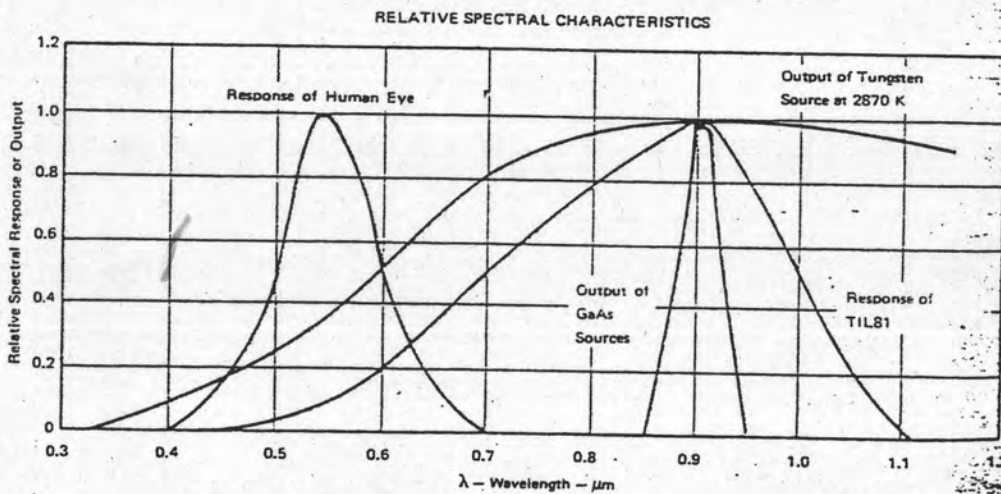


FIGURE 10

ภาคผนวก ข

ผลการทดลองเทียบมาตรฐานมาตรฐานความทึบแสง

บันไดทอนแสง ชั้นที่	$\log_{10} [(R_o - R_D) / (R - R_D)]$				
	1	2	3	4	5
1	0.104	0.028	0.161	0.132	0.134
2	0.297	0.361	0.316	0.288	0.312
3	0.528	0.573	0.541	0.541	0.524
4	0.763	0.781	0.804	0.755	0.740
5	0.978	1.01	0.995	0.970	1.10
6	1.18	1.2	1.18	1.18	1.17
7	1.4	1.4	1.4	1.4	1.4
8	1.6	1.6	1.6	1.6	1.6
9	1.8	1.8	1.8	1.8	1.8
10	2.0	2.0	2.0	2.0	2.0
11	2.2	2.3	2.2	2.2	2.2
12	2.4	2.4	2.5	2.4	2.4
13	2.7	2.6	2.6	2.6	2.6
14	2.9	2.8	2.8	2.8	2.8

บันไดทอนแสง ชั้นที่	$\log_{10} [(R_o - R_D) / (R - R_D)]$				
	6	7	8	9	10
1	0.121	0.106	0.036	0.123	0.101
2	0.328	0.323	0.269	0.304	0.322
3	0.552	0.542	0.466	0.548	0.536
4	0.763	0.749	0.680	0.741	0.789
5	0.995	0.973	0.884	0.977	0.977
6	1.2	1.18	1.1	1.2	1.17
7	1.4	1.4	1.3	1.4	1.4
8	1.6	1.6	1.5	1.6	1.6
9	1.8	1.8	1.7	1.8	1.8
10	2.0	2.0	1.9	2.0	2.0
11	2.2	2.2	2.1	2.2	2.2
12	2.4	2.4	2.3	2.4	2.4
13	2.6	2.6	2.5	2.6	2.6
14	2.8	2.9	2.8	2.8	2.8

ภาคผนวก ค

ข้อมูลของการเทียบมาตรฐานมาตรฐานความทึบแสง

บันไดทอนแสง ชั้นที่	ความทึบแสง	$\log_{10} [(R_o - R_D) / (R - R_D)]$ ครึ่งที่					
		1	2	3	4	5	6
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	0.07	0.12	0.15	0.12	0.13	0.15	0.13
2	0.18	0.33	0.35	0.35	0.33	0.34	0.34
3	0.30	0.57	0.61	0.59	0.58	0.58	0.59
4	0.42	0.82	0.82	0.82	0.82	0.79	0.81
5	0.54	1.04	1.05	1.03	1.04	1.09	1.04
6	0.66	1.25	1.26	1.25	1.25	1.30	1.26
7	0.78	1.5	1.5	1.5	1.5	1.5	1.5

ชั้นที่	ความทึบแสง	$\log_{10} [(R_o - R_u) / (R - R_u)]$ ชั้นที่					
		1	2	3	4	5	6
8	0.90	1.7	1.7	1.7	1.7	1.8	1.7
9	1.01	1.9	1.9	1.9	1.9	1.9	1.9
10	1.14	2.1	2.1	2.2	2.1	2.2	2.1
11	1.26	2.3	2.4	2.4	2.4	2.4	2.4
12	1.38	2.6	2.6	2.6	2.6	2.6	2.6
13	1.50	2.8	2.8	2.8	2.8	2.8	3.0
14	1.63	3.1	3.1	3.1	3.1	3.1	3.1



138 ✓

ประวัติผู้เขียน

นายสนั่น วิจารณ์วรรณลักษณ์ เกิดเมื่อวันที่ 9 พฤศจิกายน พ.ศ. 2507
ณ กรุงเทพมหานคร สำเร็จการศึกษาปริญญาวิทยาศาสตรบัณฑิต (เกียรตินิยมอันดับสอง)
จากจุฬาลงกรณ์มหาวิทยาลัย ในปี พ.ศ. 2529 เข้าศึกษาต่อในบัณฑิตวิทยาลัย
จุฬาลงกรณ์มหาวิทยาลัย ในปีพ.ศ. 2529 ได้รับทุนผู้ช่วยวิจัย จากคณะวิทยาศาสตร์
ระหว่างปี พ.ศ. 2529-2530