

4N25, 4N26, 4N27, 4N28 OPTOCOUPLERS

SOOS035 D2493 SEPTEMBER 1978 - REVISED MARCH 1983

COMPATIBLE WITH STANDARD TTL INTEGRATED CIRCUITS

- Gallium Arsenide Diode Infrared Source Optically Coupled to a Silicon N-P-N Phototransistor
- High Direct-Current Transfer Ratio
- High-Voltage Electrical Isolation . . . 2.5-kV, 1.5-kV, or 0.5-kV Rating
- Plastic Dual-In-Line Package
- High-Speed Switching . . . $t_r = 2 \mu s$, $t_f = 2 \mu s$ Typical

mechanical data

The package consists of a gallium arsenide infrared-emitting diode and an n-p-n silicon phototransistor mounted on a 6-lead frame encapsulated within an electrically nonconductive plastic compound. The case will withstand soldering temperature with no deformation and device performance characteristics remain stable when operated in high-humidity conditions. Unit weight is approximately 0.52 grams.

NOTES:

- Leads are within 0,127 (0.005) radius of true position (T.P.) with maximum material condition and unit installed.
- Pin 1 identified by index dot.
- Terminal connections:

1 Anode	}	Infrared-emitting diode
2 Cathode		
3 No internal connection		
4 Emitter	}	Phototransistor
5 Collector		
6 Base		

FALLS WITHIN JEDEC MO-001AM DIMENSIONS
ALL LINEAR DIMENSIONS ARE IN MILLIMETERS AND PARENTHEMICALLY IN INCHES

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

*Peak Input-to-Output Voltage:	4N25	±2.5 kV
	4N26, 4N27	±1.5 kV
	4N28	±0.5 kV
*Collector-Base Voltage		70 V
*Collector-Emitter Voltage (See Note 1)		30 V
*Emitter-Collector Voltage		7 V
*Emitter-Base Voltage		7 V
*Input-Diode Reverse Voltage		3 V
*Input-Diode Continuous Forward Current at (or below) 25°C Free-Air Temperature (See Note 2)		80 mA
*Input-Diode Peak Forward Current ($t_W = 300 \mu s$, duty cycle = 2%)		3 A
*Continuous Power Dissipation at (or below) 25°C Free-Air Temperature:		
Infrared-Emitting Diode (See Note 3)		150 mW
Phototransistor (See Note 3)		150 mW
Total, Infrared-Emitting Diode plus Phototransistor (See Note 4)		250 mW
*Storage Temperature Range		-55°C to 150°C
*Lead Temperature 1,6 mm (1/16 inch) from Case for 10 Seconds		260°C

*JEDEC registered data. This data sheet contains all applicable JEDEC-registered data in effect at the time of publication.

- NOTES:
- This value applies when the base-emitter diode is open-circuited.
 - Derate linearly to 100°C free-air temperature at the rate of 1.33 mA/°C.
 - Derate linearly to 100°C free-air temperature at the rate of 2 mW/°C.
 - Derate linearly to 100°C free-air temperature at the rate of 3.33 mW/°C.

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TEXAS
INSTRUMENTS

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

PARAMETER	TEST CONDITIONS	4N25, 4N26			4N27, 4N28			UNIT
		MIN	TYP	MAX	MIN	TYP	MAX	
*V _{(BR)CBO} Collector-Base Breakdown Voltage	I _C = 100 μA, I _E = 0, I _F = 0	70			70			V
*V _{(BR)CEO} Collector-Emitter Breakdown Voltage	I _C = 1 mA, I _B = 0, I _F = 0	30			30			V
*V _{(BR)ECO} Emitter-Collector Breakdown Voltage	I _E = 100 μA, I _B = 0, I _F = 0	7			7			V
*I _R Input Diode Static Reverse Current	V _R = 3 V	100			100			μA
*I _{C(on)} On-State Collector Current (Phototransistor Operation)	V _{CE} = 10 V, I _B = 0, I _F = 10 mA	2	5		1	3		mA
I _{C(on)} On-State Collector Current (Photodiode Operation)	V _{CB} = 10 V, I _E = 0, I _F = 10 mA	20			20			μA
*I _{C(off)} Off-State Collector Current (Phototransistor Operation)	V _{CE} = 10 V, I _B = 0, I _F = 0	1 50			1 50			nA
*I _{C(off)} Off-State Collector current (Photodiode Operation)	V _{CB} = 10 V, I _E = 0, I _F = 0	0.1 20			0.1 20			nA
*V _F Input Diode Static Forward Voltage	I _F = 10 mA	1.25 1.5			1.25 1.5			V
*V _{CE(sat)} Collector-Emitter Saturation Voltage	I _C = 2 mA, I _B = 0, I _F = 50 mA	0.25 0.5			0.25 0.5			V
r _{IO} Input-to-Output Internal resistance	V _{in-out} = ± 2.5 kV for 4N25, ± 1.5 kV for 4N26, 4N27, ± 0.5 kV for 4N28, See Note 5	10 ¹¹ 10 ¹²			10 ¹¹ 10 ¹²			Ω
C _{IO} Input-to-Output Capacitance	V _{in-out} = 0, f = 1 MHz, See Note 5	1			1			pF

*JEDEC registered data

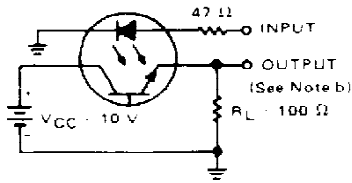
NOTE 5: These parameters are measured between both input diode leads shorted together and all the phototransistor leads shorted together

switching characteristics at 25°C free-air temperature

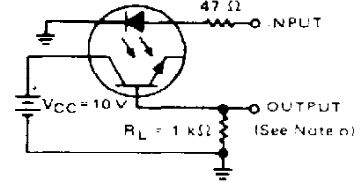
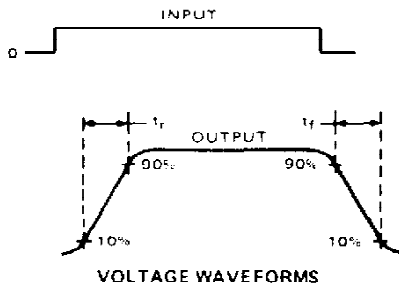
PARAMETER		TEST CONDITIONS	TYP	UNIT
t _r	Rise Time	V _{CC} = 10 V, I _B = 0, I _{C(on)} = 2 mA, R _L = 100 Ω, See Test Circuit A of Figure 1	2	μs
t _f	Fall Time			
t _r	Rise Time	V _{CC} = 10 V, I _E = 0, I _{C(on)} = 20 μA, R _L = 1 kΩ, See Test Circuit B of Figure 1	1	μs
t _f	Fall Time			

PARAMETER MEASUREMENT INFORMATION

Adjust amplitude of input pulse for:
I_{C(on)} = 2 mA (Test Circuit A) or
I_{C(on)} = 20 μA (Test Circuit B)



TEST CIRCUIT A
PHOTOTRANSISTOR OPERATION



TEST CIRCUIT B
PHOTODIODE OPERATION

- NOTES a. The input waveform is supplied by a generator with the following characteristics: Z_{out} = 50 Ω, t_r < 15 ns, duty cycle ≈ 1%, t_w = 100 μs.
b. The output waveform is monitored on an oscilloscope with the following characteristics: t_r < 12 ns, R_{in} ≥ 1 MΩ, C_{in} ≤ 20 pF.

FIGURE 1 – SWITCHING TIMES

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