

DATA SHEET

4N47/48/49: Photo-Transistor Hermetic Optocouplers

Features

- Current Transfer Ratio (CTR) guaranteed over $-55\text{ }^{\circ}\text{C}$ to $+100\text{ }^{\circ}\text{C}$ ambient temperature range
- 1000 V electrical isolation
- Standard TO-5 hermetic package
- High CTR at low input current
- Base lead available for transistor biasing
- Offers 100% high-reliability screenings

Description

The 4N47/48/49 is designed especially for high-reliability applications that require optical isolation with high CTR and low saturation V_{CE} . Each optocoupler consists of an LED and N-P-N silicon photo-transistor, mounted and coupled in a miniature custom ceramic substrate inside a hermetic TO-5 package. The low input current makes the 4N47/48/49 compatible for direct CMO to Low-Power Schottky Transistor-Transistor Logic (LSTTL)/Transistor-to-Transistor Logic (TTL) interfaces. All electrical parameters are identical to the JEDEC registered 4N47, 4N48, and 4N49.

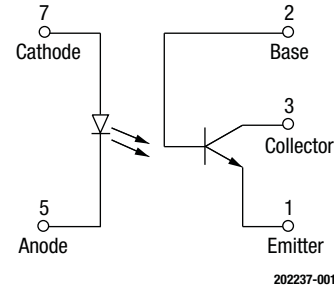


Figure 1. 4N47/48/49 Block Diagram

Figure 1 shows the 4N47/48/49 functional block diagram. Table 1 provides the 4N47/48/49 absolute maximum ratings. Table 2 provides the 4N47/48/49 electrical specifications.

Figures 2 through 4 illustrate the 4N47/48/49 typical performance characteristics. Figure 5 shows the 4N47/48/49 switching test circuit. Figure 6 provides the 4N47/48/49 package dimensions.

Table 1. 4N47/48/49 Absolute Maximum Ratings

Parameter	Symbol	Minimum	Maximum	Units
<i>Coupled</i>				
Input to output isolation voltage ¹	V _{DC}	-1000	+1000	V
Storage temperature range	T _{STG}	-55	+150	°C
Lead temperature 1.6 mm from the case for 10 seconds			+240	°C
<i>Input Diode</i>				
Average input current	I _{DD}		40	mA
Peak forward current (≤1 ms duration)	I _F		1	A
Reverse voltage	V _R		2	V
<i>Output Detector</i>				
Collector to emitter voltage	V _{CE}		35	V
Emitter to base voltage	V _{EB}		4	V
Collector to base voltage	V _{CB}		35	V
Continuous collector current			50	mA
Power dissipation	P _D		300	mW

¹ Measured between pins 5, 6, and 7 shorted together, and pins 1, 2 and 3 shorted together. T_A = 25 °C and duration = 1 second.

CAUTION: Although this device is designed to be as robust as possible, electrostatic discharge (ESD) can damage this device. This device must be protected at all times from ESD. Static charges may easily produce potentials of several kilovolts on the human body or equipment, which can discharge without detection. Industry-standard ESD precautions should be used at all times.

Table 2. 4N47/48/49 Electrical Specifications ¹
(TA = 25 °C, Unless Otherwise Noted)

Parameter	Symbol	Test Condition	4N47			4N48			4N49			Units
			Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	
On-state collector current	I _{CC(ON)}	I _F = 1 mA, V _{CE} = 5 V	.05			1.0		5.0	2.0		10	mA
		I _F = 2 mA, V _{CE} = 5 V, T _A = -55 °C	.07			1.4			2.8			mA
		I _F = 2 mA, V _{CE} = 5 V, T _A = +100 °C	.05			1.0			2.0			mA
On-state collector base current	I _{CCB(ON)}	I _F = 10 mA, V _{CB} = 5 V	30			30		30				µA
Saturation voltage	V _{CE_SAT}	I _F = 2 mA, I _{CC} = 0.5 mA			0.3							V
		I _F = 2 mA, I _{CC} = 1.0 mA						0.3				V
		I _F = 2 mA, I _{CC} = 2.0 mA								0.3		V
Breakdown voltage	BV _{CEO}	I _{CE} = 1 mA	40			40			40			V
		I _{CB} = 100 µA	45			45			45			V
		I _{EB} = 100 µA	7			7			7			V
Off-state:	I _{CE(OFF)}	V _{CE} = 20 V			100			100			100	nA
		V _{CE} = 20 V, T _A = 100 °C			100			100			100	µA
		V _{CB} = 20 V			100			100			100	nA
Input forward voltage	V _F	I _F = 10 mA, T _A = -55 °C	1.0		1.7	1.0		1.7	1.0		1.7	V
		I _F = 10 mA	0.8		1.5	0.8		1.5	0.8		1.5	V
		I _F = 10 mA, T _A = +100 °C	0.7		1.3	0.7		1.3	0.7		1.3	V
Input reverse current	I _R	V _R = 2 V			100			100			100	µA
Input to output resistance ²	R _{L0}	V _{L0} = ± 1000 V _{DC}	10 ¹¹			10 ¹¹			10 ¹¹			Ω
Input to output capacitance ²	C _{L0}	V _{L0} = 0 V, f = 1 MHz			5			5			5	pF
Rise time	t _R	V _{CC} = 10 V, R _L = 100 Ω		10	20		10	20		15	25	µs
Fall time	t _F	I _F = 5 mA		10	20		10	20		15	25	µs

¹ Exposure to maximum rating conditions for extended periods may reduce device reliability. There is no damage to the device with only one parameter set at the limit and all other parameters set at or below their nominal value. Exceeding any of the limits listed in the above table may result in permanent damage to the device.

² Measured between pins 1, 2, 3, and 4 shorted together, and pins 5, 6, 7, and 8 shorted together. TA = 25 °C and duration = 1 second.

Typical Performance Characteristics

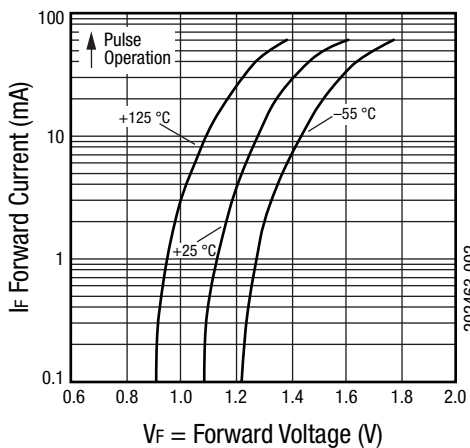


Figure 2. Forward Current vs Diode Forward Voltage

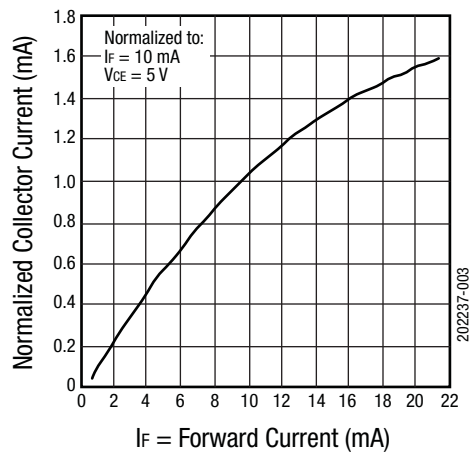


Figure 3. Normalized Collector Current vs Forward Current

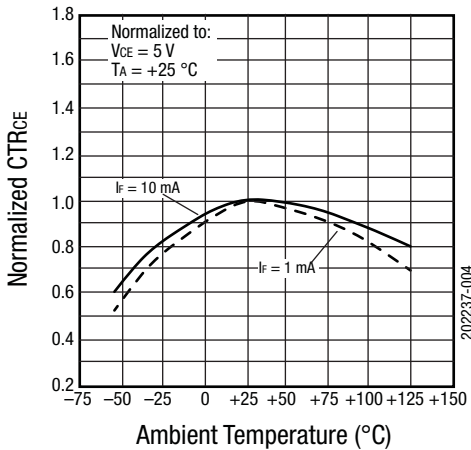


Figure 4. Normalized CTRCE vs Temperature

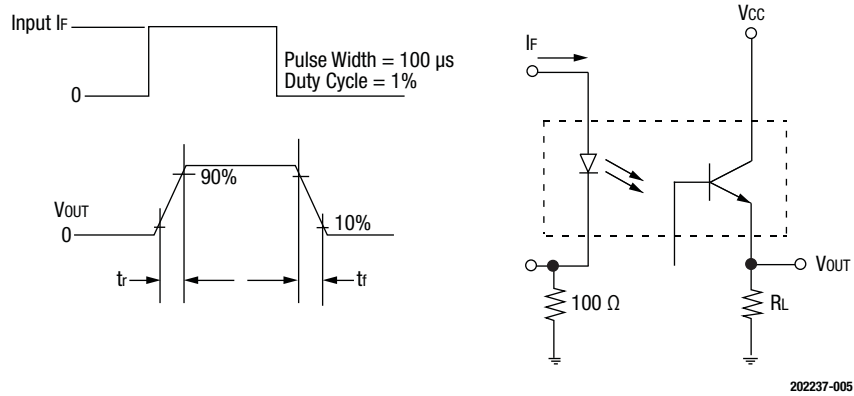


Figure 5. 4N47/48/49 Switching Test Circuit

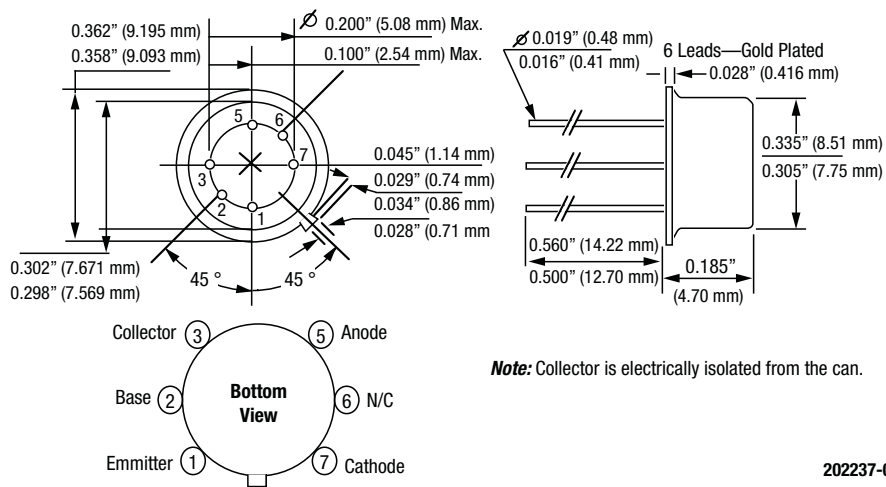


Figure 6. 4N47/48/49 Package Dimensions

Ordering Information

Model Name	Manufacturing Part Number
4N47/48/49: Photo-Transistor Hermetic Optocouplers	4N47/48/49

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