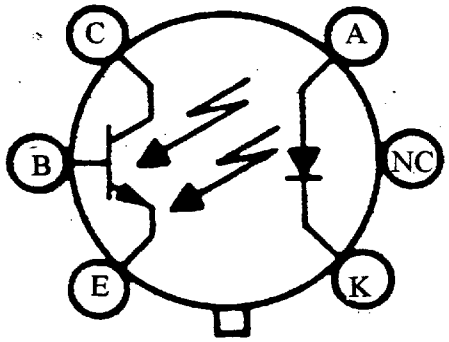
Radiation Hardened 4N49RP High Gain Optocoupler

For Space Applications



SEI's 4N49RP (RP for RAD-PAK®) high gain, high voltage optocoupler features a minimum 100 kilorad (Si) total dose tolerance. Using SEI's radiation hardened RAD-PAK® packaging technology, the 4N49RP is fully equivalent to commercially 4Nxx type devices. The 4N49RP is a very high gain radiation tolerant optocoupler consisting of a GaAlAs LED optically coupled to an N-P-N silicon phototransistor. The 4N49RP features a Current Transfer Ratio (CTR) of 150% typically and high voltage electrical isolation. Capable of surviving space environments with no significant CTR degradation, the 4N49RP is ideal for satellite, spacecraft, and space probe missions. SEI's RAD-PAK® advanced technology incorporates radiation shielding in the microcircuit package. It eliminates box shielding while providing lifetime in orbit. This device provides a total dose survivability of greater than 100 krad(Si). It is available in Class S packaging and screening.

SPACE ELECTRONICS INCORPORATED
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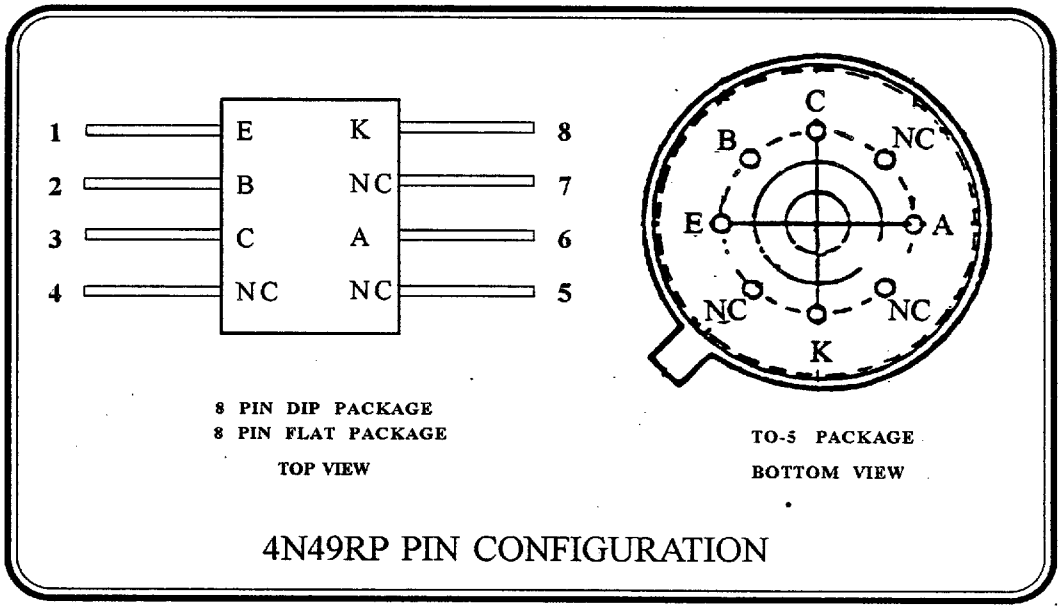

4N49RP PIN CONFIGURATION

Features:

- Pin Compatible with 4Nxx Type Devices
- RAD-PAK® Radiation Hardened
- Against Natural Space Radiation
- Total Dose Hardness >100 krad (Si)
- No Significant CTR Degradation
- Package:
  - RAD-PAK® TO-5 Package
  - 8 Pin Flat Package
  - 8 Pin DIP Package
- Very High Gain
- High Voltage Electrical Isolation
- Class S Screening per TM 5004
- QCI per TM5005

TQM
Total Quality Management

July 1996

For Further Information Contact:
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4N49RP ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN	MAX	UNIT
Input-to-Output Voltage		-1	+1	kV
Collector-Base Voltage			45	V
Collector-Emitter Voltage 1/			40	V
Emitter-Base Voltage			7	V
Input Diode Reverse Voltage			2	V
Input Diode Continuous Forward Current at (or below) 65°C Free-Air Temperature 2/			40	mA
Continuous Collector Current			50	mA
Peak Diode Current 3/			1	A
Continuous Transistor Power Dissipation at (or below) 25°C Free-Air Temperature 4/			300	mA
Operating and Storage Free-Air Temperature Range		-55	+125	°C

Note:

1/ This value applies with the emitter-base diode open-circuited and the input-diode current equal to zero.
2/ Derate linearly to 125°C free-air temperature at the rate of 0.67mA/°C.
3/ This value applies for $t_w \leq 1\mu sec$. PPR < 300pps.
4/ Derate linearly to 125°C free-air temperature at the rate of 3mW/°C

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4N49RP OPTICAL/ ELECTRICAL CHARACTERISTICS

(Temperature @ 25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITION	MIN	TYP	MAX	UNIT
Input Diode Static Reverse Current	I_R	$V_R = 2V$			100	μA
Input Diode Static Forward Voltage	V_F	$I_F = 10mA$, $T_A = -55°C$	1		1.7	V
		$I_F = 10mA$	0.8	1.4	1.5	
		$I_F = 10mA$, $T_A = 100°C$	0.7		1.3	
Input-to-Output Internal Resistance	R_{io}	$V_{in-out} = \pm 1kV$ 5/	10^{11}			Ω
Input-to-Output Capacitance	C_{io}	$f = 1MHz$ $V_{in-out} = 0$ 5/		2.5	5	pF
Collector-Emitter Saturation Voltage	$V_{CE(SAT)}$	$I_F = 2mA$, $I_C = 2mA$ $I_B = 0$			0.3	V
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	$I_C = 100μA$, $I_B = 0$ $I_F = 0$	45			V
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	$I_C = 1mA$, $I_B = 0$ $I_F = 0$	40			V
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	$I_C = 0$, $I_E = 100μA$ $I_F = 0$	7			V
On-State Collector Current	$I_{C(ON)}$	$V_{CE} = 5V$, $I_B = 0$, $I_F = 1mA$	2		10	mA
		$V_{CE} = 5V$, $I_B = 0$, $I_F = 2mA$, $T_A = -55°C$	2.8			
		$V_{CE} = 5V$, $I_B = 0$, $I_F = 2mA$, $T_A = 100°C$ 6/	2.0			
Off-State Collector Current	$I_{C(OFF)}$	$V_{CE} = 20V$, $I_B = 0$, $I_F = 0$			100	nA
		$V_{CE} = 20V$, $I_B = 0$, $I_F = 0$, $T_A = 100°C$			100	μA

Note:

5/ These parameters are measured between all phototransistor leads shorted together and with both input diode leads shorted together.

6/ This parameter must be measured using pulse techniques, tw = 100μs, duty cycle ≤ 1%.

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4N49RP SWITCHING CHARACTERISTICS

(Temperature @ 25°C free-air temperature, unless otherwise specified)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
Phototransistor Operation	tr Rise Time	V_{CC} = 10V, I_B = 0, $I_{C(ON)}$ = 5mA R_L = 100Ω		10	25	µsec
	t_f Fall Time			10	25	
Photodiode Operation	tr Rise Time	V_{CC} = 10V, I_E = 0, $I_{C(ON)}$ = 50µA R_L = 100Ω		850		nsec
	t_f Fall Time			850		

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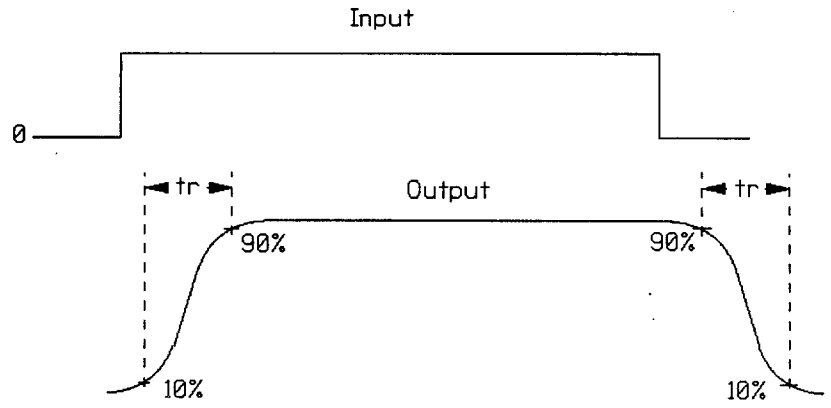

Figure 1. Voltage Waveforms

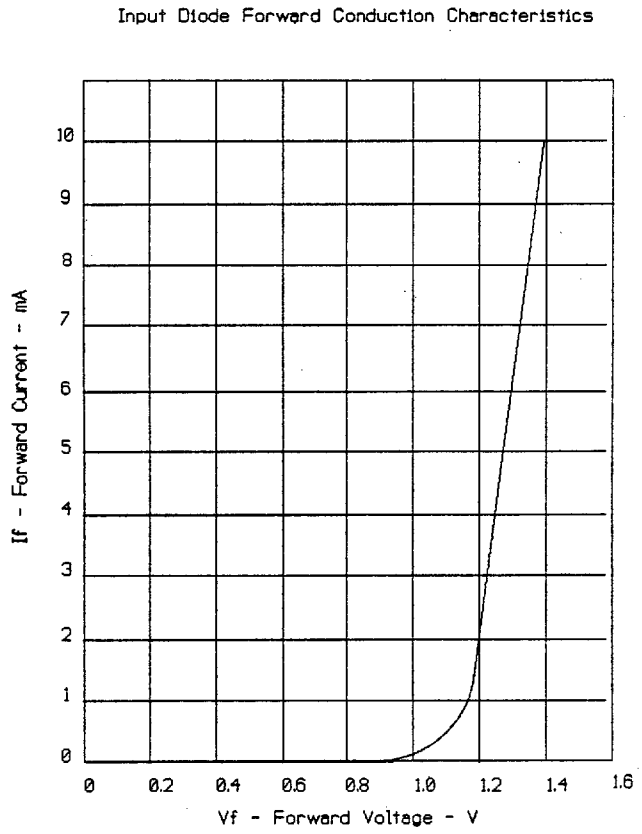

Figure 2. Typical Characteristics

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