

66168

PROTON RADIATION TOLERANT OPTOCOUPLER
(Pin-for-Pin Replacement for 4N49)

Mii

**OPTOELECTRONIC PRODUCTS
DIVISION**

Rev. A 4/25/00

Features:

- High Reliability
- Base lead provided for conventional transistor biasing
- Rugged package
- Stability over wide temperature
- +1000V electrical isolation

Applications:

- Eliminate ground loops
- Level shifting
- Line receiver
- Switching power supplies
- Motor control

DESCRIPTION

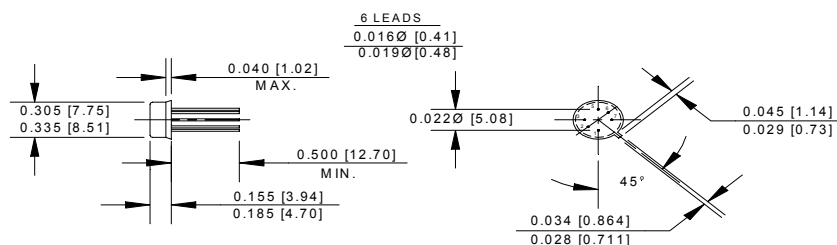
The **66168** is a modified 4N49 (LED) designed to be more tolerant to proton radiation. The 66168 optocoupler is packaged in a hermetically sealed TO-5. This device can be supplied to customer specifications as well as tested in accordance with MIL-PRF-19500/548 (4N49) to JAN, JANTX, JANTXV and JANS levels.

ABSOLUTE MAXIMUM RATINGS

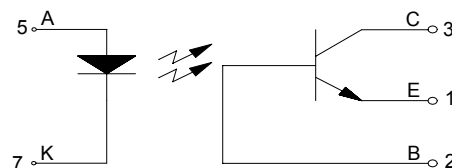
Input to Output Voltage	±1kV
Emitter-Base Voltage	7V
Collector-Emitter Voltage (Value applies to emitter-base open-circuited & the input-diode equal to zero)	40V
Collector-Base Voltage	45V
Reverse Input Voltage	2V
Input Diode Continuous Forward Current at (or below) 65°C Free-Air Temperature (see note 1)	40mA
Peak Forward Input Current (Value applies for $t_w \leq 1\mu s$, PRR < 300 pps)	1A
Continuous Collector Current	50mA
Continuous Transistor Power Dissipation at (or below) 25°C Free-Air Temperature (see Note 2)	300mW
Storage Temperature	-65°C to +125°C
Operating Free-Air Temperature Range	-55°C to +100°C
Lead Solder Temperature (10 seconds max.)	240°C

Notes:

1. Derate linearly to 125°C free-air temperature at the rate of 0.67 mW/°C above 65°C.
2. Derate linearly to 125°C free-air temperature at the rate of 3 mW/°C.

Package Dimensions**Schematic Diagram**

NOTE: ALL LINEAR DIMENSIONS ARE IN INCHES (MILLIMETERS)



Rev. A 4/25/00

ELECTRICAL CHARACTERISTICS $T_A = 25^\circ\text{C}$ unless otherwise specified.

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS	TEST CONDITIONS	NOTE
Input Diode Static Reverse Current	I_R			100	μA	$V_R = 2\text{V}$	
Input Diode Static Forward Voltage -55°C	V_F	1.0		2.4	V	$I_F = 10\text{mA}$	
Input Diode Static Forward Voltage $+25^\circ\text{C}$	V_F	0.8	1.7	2.0	V	$I_F = 10\text{mA}$	
Input Diode Static Forward Voltage $+100^\circ\text{C}$	V_F	0.7		1.8	V	$I_F = 10\text{mA}$	

OUTPUT TRANSISTOR $T_A = 25^\circ\text{C}$ unless otherwise specified.

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS	TEST CONDITIONS	NOTE
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	45			V	$I_C = 100\mu\text{A}$, $I_B = 0$, $I_F = 0$	
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	40			V	$I_C = 1\text{mA}$, $I_B = 0$, $I_F = 0$	
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	7			V	$I_C = 0\text{mA}$, $I_E = 100\mu\text{A}$, $I_F = 0$	
Off-State Collector Current $+100^\circ\text{C}$	$I_{C(OFF)}$			100	nA	$V_{CE} = 20\text{V}$, $I_F = 0\text{mA}$, $I_B = 0$	
	$I_{C(OFF)}$			100	μA	$V_{CE} = 20\text{V}$, $I_F = 0\text{mA}$, $I_B = 0$	

COUPLED CHARACTERISTICS $T_A = 25^\circ\text{C}$ unless otherwise specified.

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS	TEST CONDITIONS	NOTE
On State Collector Current	$I_{C(ON)}$	2.0			mA	$V_{CE} = 5\text{V}$, $I_F = 1\text{mA}$	
On State Collector Current $+100^\circ\text{C}$	$I_{C(ON)}$	0.5			mA	$V_{CE} = 0.4\text{V}$, $I_F = 2\text{mA}$	2
On State Collector Current -55°C	$I_{C(ON)}$	0.7			mA	$V_{CE} = 5\text{V}$, $I_F = 2\text{mA}$	
Collector-Emitter Saturation Voltage	$V_{CE(SAT)}$			0.3	V	$I_F = 2\text{mA}$, $I_C = 2\text{mA}$, $I_B = 0$	
Input to Output Internal Resistance	R_{IO}	10^{11}			Ω	$V_{IN-OUT} = 500\text{V}$	1
Input to Output Capacitance	C_{IO}		2.5	5	pF	$f = 1\text{MHz}$, $V_{IN-OUT} = 1\text{kV}$	1
Rise Time-Phototransistor Operation	t_r		10	25	μs	$V_{CC} = 10\text{V}$, $I_F = 5\text{mA}$, $R_L = 100\Omega$, $I_B = 0$	
Fall Time-Phototransistor Operation	t_f		10	25	μs	$V_{CC} = 10\text{V}$, $I_F = 5\text{mA}$, $R_L = 100\Omega$, $I_B = 0$	
Rise Time-Photodiode Operation	t_r		0.85	3	μs	$V_{CC} = 10\text{V}$, $I_F = 5\text{mA}$, $R_L = 100\Omega$, $I_E = 0$	
Fall Time-Photodiode Operation	t_f		0.85	3	μs	$V_{CC} = 10\text{V}$, $I_F = 5\text{mA}$, $R_L = 100\Omega$, $I_E = 0$	

NOTES:

- These parameters are measured between all phototransistor leads shorted together and with both input diode leads shorted together.
- This parameter must be measured using pulse techniques ($t_w = 100\mu\text{s}$ duty cycle $\leq 1\%$).

RECOMMENDED OPERATING CONDITIONS:

PARAMETER	SYMBOL	MIN	MAX	UNITS
Input Current, Low Level	I_{FL}	0	90	μA
Input Current, High Level	I_{FH}	2	10	mA
Supply Voltage	V_{CE}	5	10	V
Operating Temperature	T_A	-55	100	$^\circ\text{C}$

SELECTION GUIDE

PART NUMBER	PART DESCRIPTION
66168-001	Single Channel Commercial Proton Radiation Tolerant (4N49) Optocoupler (0° to 70°C)
66168-101	Single Channel Proton Radiation Tolerant (4N49) Screened to JAN level
66168-103	Single Channel Proton Radiation Tolerant (4N49) Screened to JANTX level
66168-105	Single Channel Proton Radiation Tolerant (4N49) Screened to JANTXV level
66168-300	Single Channel Proton Radiation Tolerant (4N49) Screened to JANS level