

# PIN RADIATION DETECTORS

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UM9441

## Features

- High Photocurrent Sensitivity
- High Reliability Construction
- Fast Rise Time
- Wide Dynamic Range
- Hardness to Neutron Bombardment
- Low Operating Voltage

## Description

Silicon PIN devices are effective detectors of nuclear and electromagnetic radiation. This includes gamma radiation, electrons and X-rays. The detectors can be used across the temperature range of  $-55^{\circ}\text{C}$  to  $+175^{\circ}\text{C}$  instead of being restricted to use at low temperatures.

The absorbed radiation produces electron-hole pairs in the space charge region. These charges are swept out by the applied field and result in a current flow proportional to the rate of absorbed radiation.

The Microsemi UM9441 series utilizes high resistivity material and is designed to have a uniform area mesa structure to define the active volume. The current sensitivity of

these devices is proportional only to the I-region volume and is independent of temperature so long as applied voltage exceeds the saturation voltage. This structure also minimizes the effects of permanent damage caused by neutrons and other high energy radiation. Experiments on devices of the UM9441 design show no degradation in gamma sensitivity resulting from a total dose of  $10^{14}$  neutrons/cm<sup>2</sup> of 1 MeV equivalent.

## Package

The UM9441 is an axially leaded device constructed by metallurgically bonding the PIN chip in between two molybdenum refractory pins that are typically 0.125 inches in diameter and 0.050 inches long. Hyper-pure glass is then fused over this bond to form a voidless seal. Leads are then brazed to ends of molybdenum pins. This results in a high-reliability package using materials so well thermally matched that the UM9441 can withstand temperature shock or cycling from  $-196^{\circ}\text{C}$  to  $+300^{\circ}\text{C}$ .

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## ABSOLUTE MAXIMUM RATINGS

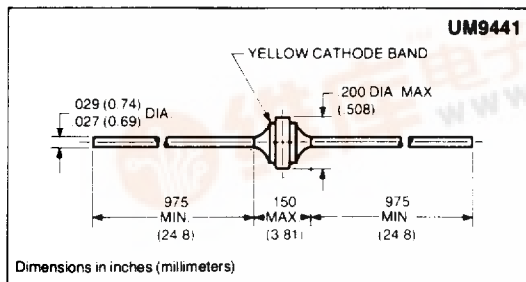
Reverse Voltage . . . . . 100V

Photocurrent . . . . . 3Adc, 3A<sup>2</sup>s pulsed

Storage Temperature . . .  $-55^{\circ}\text{C}$  to  $+200^{\circ}\text{C}$

Operating Temperature .  $-55^{\circ}\text{C}$  to  $+175^{\circ}\text{C}$

## MECHANICAL SPECIFICATIONS

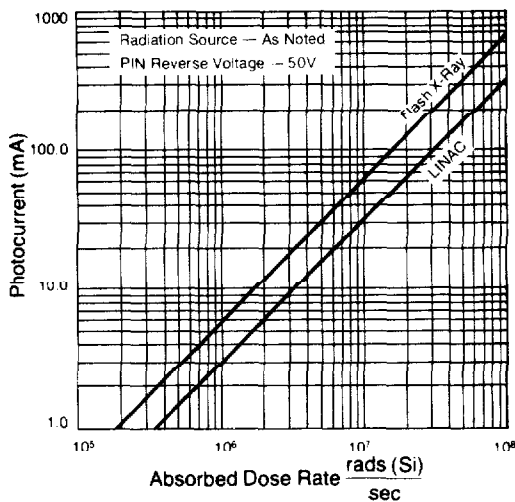
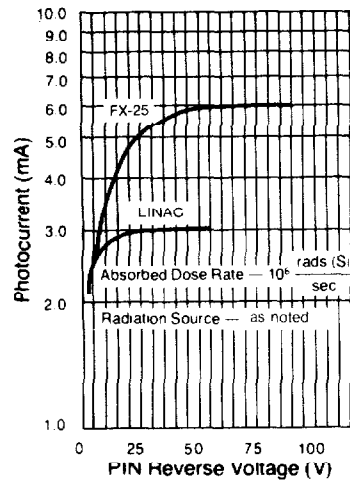


**Microsemi Corp.**  
**Watertown**  
The diode experts

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**Electrical Specifications (at 25°C)**

Test	Min	Typ	Max.	Units	Test Conditions
Photocurrent	4.0	6.0		mA	$V_R = 50V$ $10^6 \frac{\text{rads (Si)}}{\text{sec}}$ 2.5 MeV Flash X-Ray Ion Physics Corp. FX-25
Capacitance			10	pF	$F = 1 \text{ MHz}, V = 50V$
Reverse Current			1.0	$\mu A$	$V_R = 50V$
Minority Carrier Lifetime	2.0			$\mu S$	$I_f = 10mA$

**TYPICAL PHOTOCURRENT SENSITIVITY****TYPICAL VOLTAGE SENSITIVITY****RELIABILITY**

The UM9441 is consistent with Microsemi's reputation as a manufacturer of high reliability semiconductors. Microsemi is equipped to perform JAN type testing, base-lining and documental conformance to a wide range of reliability testing. This commitment to reliability has enabled Microsemi to be a qualified supplier of semiconductor devices to many high-reliability programs such as:

APOLLO	MINUTEMAN
DRAGON	SPRINT
HAWK	TRIDENT
MARINER	VIKING