



# TIED69 Avalanche Photodiode

## DESCRIPTION

The TIED69 is a high-speed, high-resistivity photodiode. It is designed to operate in the reverse-voltage avalanche region just below the breakdown voltage. This results in a photocurrent signal gain of a magnitude dependent on the reverse voltage. The signal gain ahead of the input noise of typical amplifiers provides for enhancement of the signal-to-noise ratio in most optical receiver systems. The TIED69 is similar to TIED56 and TIED59 except that it has a larger active area.

## FEATURES

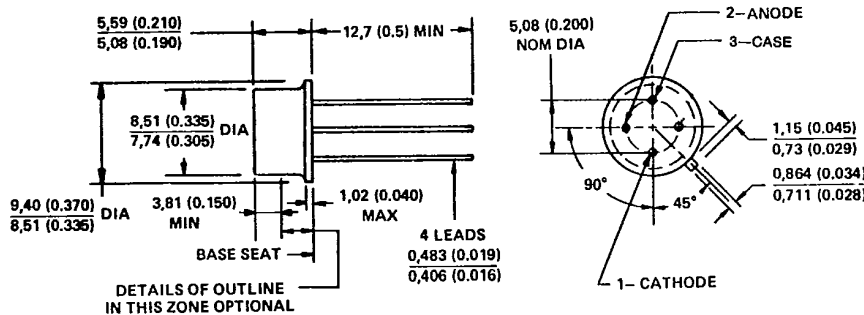
- Useful from Audio to Microwave Frequencies
- Typical Photocurrent Gain > 600
- Active Area of  $1.8 \times 10^{-2} \text{ cm}^2$  (Diameter = 60 Mils)
- Typical System Noise Equivalent Power of  $10^{-13} \text{ W}/\sqrt{\text{Hz}}$  at 30 MHz Bandwidth with TIEF151 Amplifier

## MECHANICAL DATA

The device is in a hermetically sealed welded case similar to, but slightly shorter than JEDEC TO-39. The window is borosilicate glass. Its nominal dimensions are: diameters, 6,6 mm (0.260 inch); thickness, 1,5 mm (0.060 inch); and distance from front surface of the window to the active area, 1,9 mm (0.075 inch).

## PACKAGE CONFIGURATION

The Active Elements are Electrically Isolated from the Case



All Linear Dimensions are in Millimeters and Parenthetically in Inches

## ABSOLUTE MAXIMUM RATINGS

Continuous Power Dissipation at (or below) 25°C Case Temperature (See Note 1).....	100 mW
Storage Temperature Range.....	-65°C to 150°C
Lead Temperature 1,6 mm (1/16 inch) from Case for 10 Seconds.....	230°C

NOTE 1: Derate linearly to 125°C case temperature at the rate of 1 mW/°C.



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## ELECTRO-OPTICAL CHARACTERISTICS (T<sub>C</sub> = 25°C)

PARAMETER	TEST CONDITIONS‡	MIN	TYP	MAX	UNIT
Breakdown Voltage, V <sub>(BR)</sub>	I <sub>R</sub> = 100 μA, E <sub>e</sub> = 0	155	170	185	V
Dark Current†	Bulk	M = 100, E <sub>e</sub> = 0	140	700	pA
	Surface	M = 100, E <sub>e</sub> = 0	3.5	40	nA
Temperature Coefficient of Breakdown Voltage, αV <sub>(BR)</sub>	I <sub>R</sub> = 100 μA, E <sub>e</sub> = 0, See Note 2		200		mV/°C
Photocurrent Gain at Avalanche Noise Threshold, M <sub>T</sub>	λ = 900 nm See Note 3	200	>600		
Total Capacitance, C <sub>T</sub>	V <sub>R</sub> = 100 V, f = 1 MHz		30	45	pF
Series Resistance	f = 0.9 GHz		5		Ω
Radiant Responsivity, R <sub>e</sub>	λ = 900 nm, M = 100, f <sub>mod</sub> = 15 MHz, Φ <sub>e</sub> ≤ 0.1 mW		20		A/W
	λ = 900 nm, M = 1, f <sub>mod</sub> = 10 MHz, Φ <sub>e</sub> ≤ 0.1 mW	0.15			

† Dark current is the sum of surface current and gain M times the bulk current.

‡ E<sub>e</sub> is the incident radiant power per unit area.

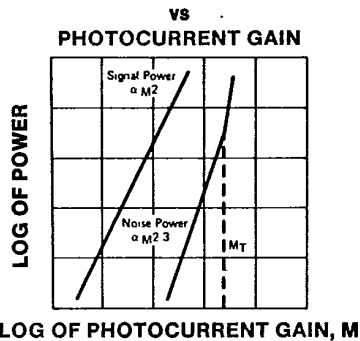
NOTES: 2. Temperature coefficient is determined by the formula:

$$\alpha V_{(BR)} = \frac{V_{(BR)} @ 125^{\circ}\text{C} - V_{(BR)} @ -55^{\circ}\text{C}}{125^{\circ}\text{C} - (-55^{\circ}\text{C})}$$

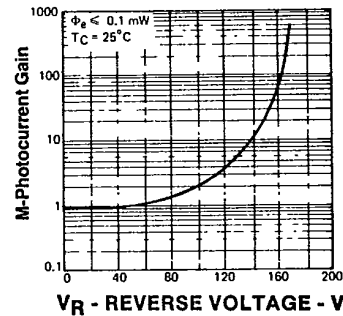
3. Gain M<sub>T</sub> is measured at the reverse voltage at which the noise deviates from the theoretical linear characteristic. Radiant flux is as required to give a photocurrent of 0.1 nA rms at V<sub>R</sub> = 40 V.

## TYPICAL CHARACTERISTICS

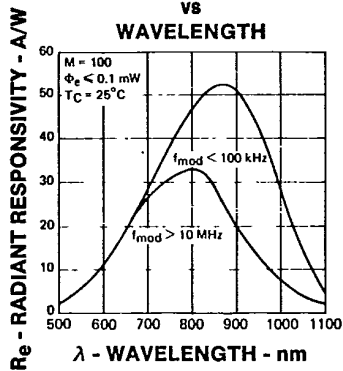
SIGNAL POWER AND NOISE POWER



PHOTOCURRENT GAIN  
VS  
REVERSE VOLTAGE



RADIANT RESPONSIVITY  
VS  
WAVELENGTH



TOTAL CAPACITANCE  
VS  
REVERSE VOLTAGE

