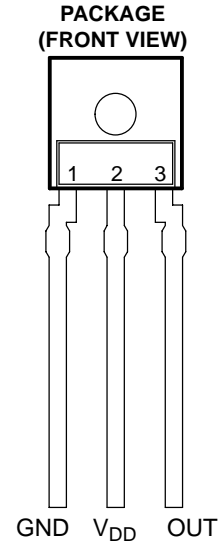


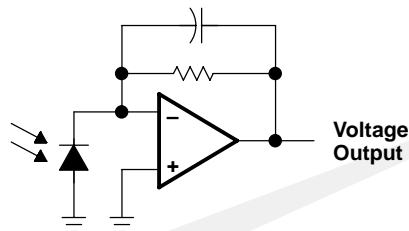
- Integral Visible Light Cutoff Filter
- Converts IR Light Intensity to Output Voltage
- Monolithic Silicon IC Containing Photodiode, Operational Amplifier, and Feedback Components
- High Sensitivity
- Single Voltage Supply Operation (2.7 V to 5.5 V)
- Low Noise (200  $\mu$ Vrms Typ to 1 kHz)
- Rail-to-Rail Output
- High Power-Supply Rejection (35 dB at 1 kHz)
- Compact 3-Leaded Plastic Package



## Description

The TSL267 is a high-sensitivity low-noise infrared light-to-voltage optical converter that combines a photodiode and a transimpedance amplifier on a single monolithic CMOS integrated circuit. Output voltage is directly proportional to IR light intensity (irradiance) on the photodiode. The TSL267 has a transimpedance gain of 320 M $\Omega$ . The device has improved offset voltage stability and low power consumption and is supplied in a 3-lead visible-light-blocking plastic sidelooker package with an integral lens.

## Functional Block Diagram



## Terminal Functions

TERMINAL NAME	NO.	DESCRIPTION
GND	1	Ground (substrate). All voltages are referenced to GND.
OUT	3	Output voltage
V <sub>DD</sub>	2	Supply voltage

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## Absolute Maximum Ratings over operating free-air temperature range (unless otherwise noted)†

Supply voltage, $V_{DD}$ (see Note 1)	6 V
Output current, $I_O$	$\pm 10$ mA
Duration of short-circuit current at (or below) 25°C	5 s
Operating free-air temperature range, $T_A$	-25°C to 85°C
Storage temperature range, $T_{stg}$	-25°C to 85°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds	240°C

† Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

NOTE 1: All voltages are with respect to GND.

## Recommended Operating Conditions

	MIN	MAX	UNIT
Supply voltage, $V_{DD}$	2.7	5.5	V
Operating free-air temperature, $T_A$	0	70	°C

## Electrical Characteristics at $V_{DD} = 5$ V, $T_A = 25^\circ\text{C}$ , $\lambda_p = 940$ nm, $R_L = 10$ k $\Omega$ (unless otherwise noted) (see Notes 2, 3, and 4)

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
$V_D$ Dark voltage	$E_e = 0$	0		15	mV
$V_{OM}$ Maximum output voltage swing	$V_{DD} = 4.5$ V, No Load		4.49		V
	$V_{DD} = 4.5$ V, $R_L = 10$ k $\Omega$	4	4.2		
$V_O$ Output voltage	$E_e = 4.4$ $\mu\text{W}/\text{cm}^2$	1.2	2	2.8	V
$\alpha_{VD}$ Temperature coefficient of dark voltage ( $V_D$ )	$T_A = 0^\circ\text{C}$ to $70^\circ\text{C}$		-15		$\mu\text{V}/^\circ\text{C}$
$N_e$ Irradiance responsivity	See Note 5		0.45		$\text{V}/(\mu\text{W}/\text{cm}^2)$
PSRR Power supply rejection ratio	$f_{ac} = 100$ Hz, see Note 6		55		dB
	$f_{ac} = 1$ kHz, see Note 6		35		
$I_{DD}$ Supply current	$E_e = 4.4$ $\mu\text{W}/\text{cm}^2$		1.9	4	mA

NOTES: 2. Measured with  $R_L = 10$  k $\Omega$  between output and ground.

3. Optical measurements are made using small-angle incident radiation from a light-emitting diode (LED) optical source.

4. The input irradiance is supplied by a GaAs light-emitting diode with the following characteristics: peak wavelength  $\lambda_p = 940$  nm.

5. Irradiance responsivity is characterized over the range  $V_O = 0.1$  V to 4.5 V. The best-fit straight line of Output Voltage  $V_O$  versus Irradiance  $E_e$  over this range will typically have a positive extrapolated  $V_O$  value for  $E_e = 0$ .

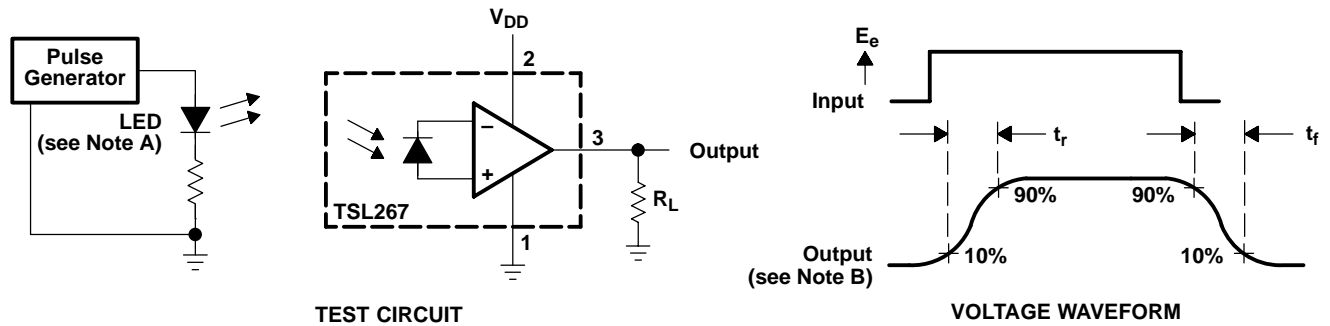
6. Power supply rejection ratio PSRR is defined as  $20 \log (\Delta V_{DD}(f)/\Delta V_O(f))$  with  $V_{DD}(f = 0) = 5$  V and  $V_O(f = 0) = 2$  V.

**Switching Characteristics at  $V_{DD} = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$ ,  $\lambda_p = 940\text{ nm}$ ,  $R_L = 10\text{ k}\Omega$  (unless otherwise noted)**

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
$t_r$ Output pulse rise time, 10% to 90% of final value	See Note 7 and Figure 1		160	250	$\mu\text{s}$
$t_f$ Output pulse fall time, 10% to 90% of final value	See Note 7 and Figure 1		150	250	$\mu\text{s}$
$t_s$ Output settling time to 1% of final value	See Note 7 and Figure 1		330		$\mu\text{s}$
Integrated noise voltage	$f = \text{dc to } 1\text{ kHz}$ $E_e = 0$		200		$\mu\text{Vrms}$
$V_n$ Output noise voltage, rms	$f = 10\text{ Hz}$ $E_e = 0$		6		$\mu\text{V}/\sqrt{\text{Hz}}$ rms
	$f = 100\text{ Hz}$ $E_e = 0$		6		
	$f = 1\text{ kHz}$ $E_e = 0$		7		

NOTE 7: Switching characteristics apply over the range  $V_O = 0.1\text{ V}$  to  $4.5\text{ V}$ .

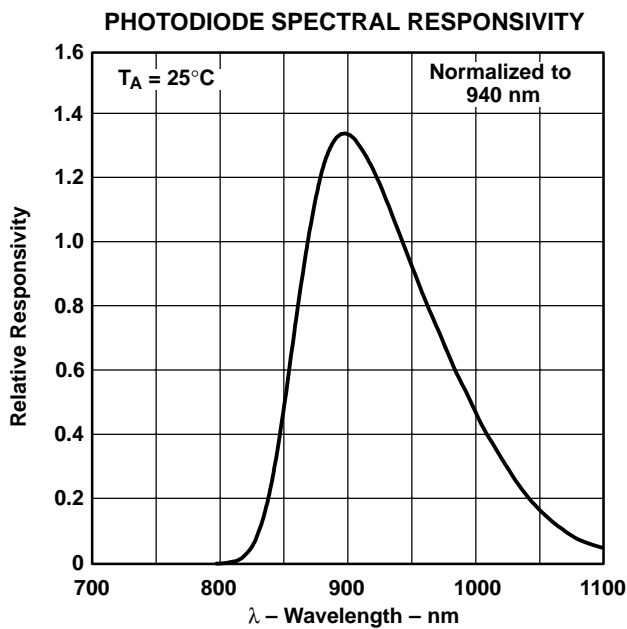
**PARAMETER MEASUREMENT INFORMATION**



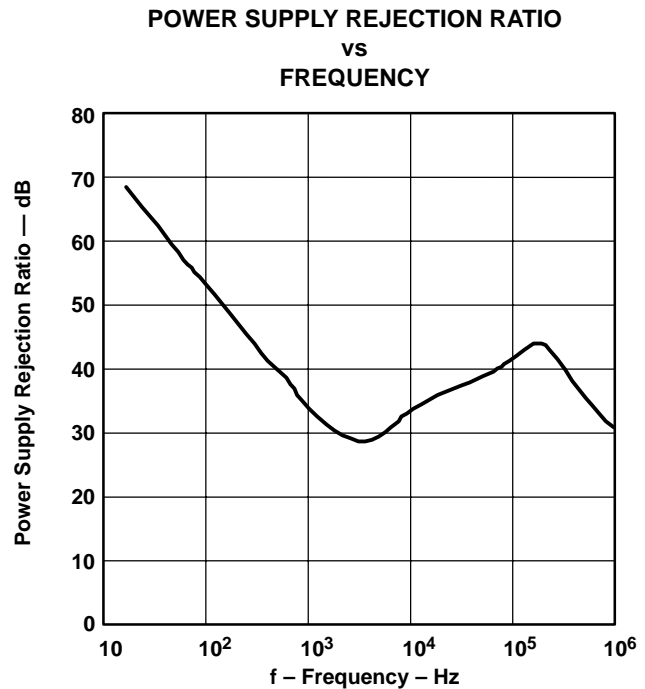
- NOTES: A. The input irradiance is supplied by a pulsed GaAs light-emitting diode with peak wavelength:  $\lambda_p = 940\text{ nm}$ ,  $t_r < 1\text{ }\mu\text{s}$ ,  $t_f < 1\text{ }\mu\text{s}$ .  
 B. The output waveform is monitored on an oscilloscope with the following characteristics:  $t_r < 100\text{ ns}$ ,  $Z_i \geq 1\text{ M}\Omega$ ,  $C_i \leq 20\text{ pF}$ .

**Figure 1. Switching Times**

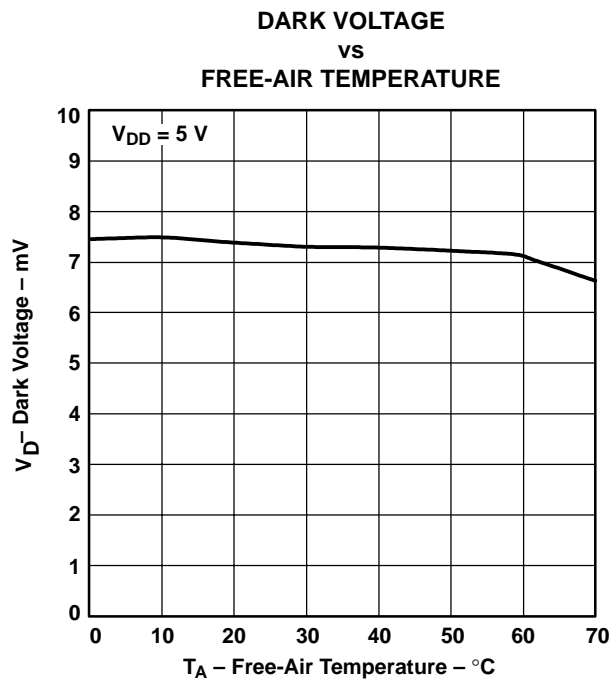
**TYPICAL CHARACTERISTICS**



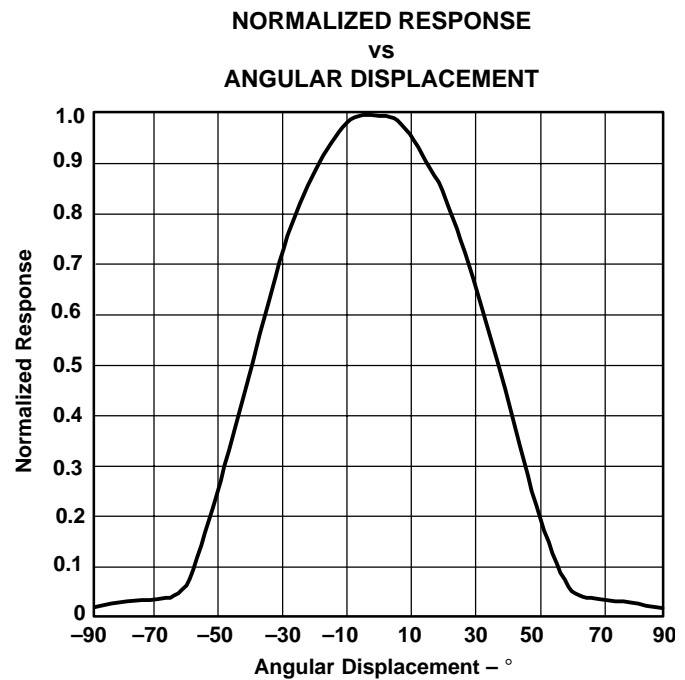
**Figure 2**



**Figure 3**



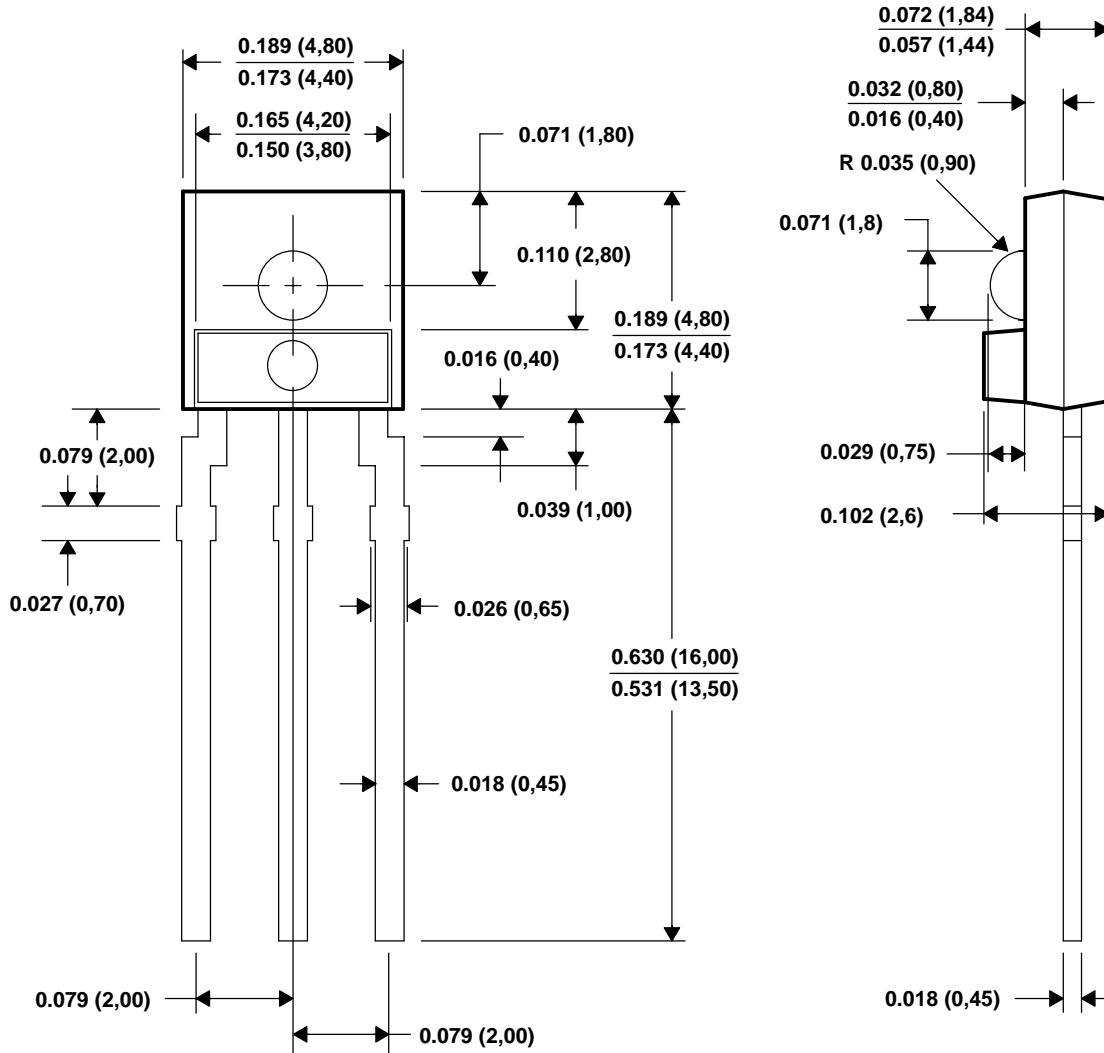
**Figure 4**



**Figure 5**

**MECHANICAL DATA**

The TSL267 is implemented in a visible-light-blocking 3-leaded package with a molded focusing lens.



**Figure 6. Package Configuration**

- NOTES: A. All linear dimensions are in inches (millimeters).  
 B. This drawing is subject to change without notice.  
 C. All dimensions apply before solder dip.

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