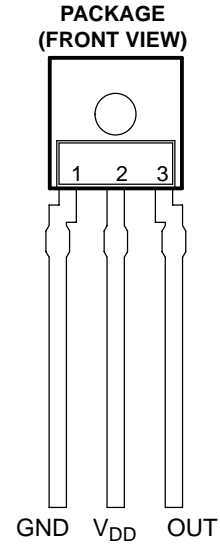


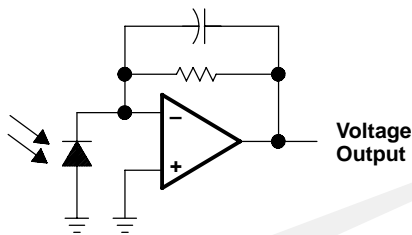
- High Sensitivity
- Low Noise (500 μ Vrms Typ)
- Rail-to-Rail Output
- High Power-Supply Rejection (>35 dB)
- Single Voltage Supply Operation
- Monolithic Silicon IC Containing Photodiode, Operational Amplifier, and Feedback Components
- Converts Light Intensity to Output Voltage
- Compact 3-Leaded Plastic Package
- Wide Supply-Voltage Range



Description

The TSL256 is a high-sensitivity low-noise light-to-voltage optical converter that combines a photodiode and a transimpedance amplifier on a single monolithic CMOS integrated circuit. The output voltage is directly proportional to light intensity (irradiance) on the photodiode. The TSL256 has a transimpedance gain of 320 M Ω . The device has improved offset voltage stability and low power consumption and is supplied in a 3-lead clear plastic sidelooper 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 _{DD}	2	Supply voltage

TSL256 HIGH-SENSITIVITY LIGHT-TO-VOLTAGE CONVERTER

TAOS014 – JANUARY 2000

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

Supply voltage, V_{DD} (see Note 1)	7 V
Output current, I_O	± 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}	4.5	5.5	V
Operating free-air temperature, T_A	0	70	°C

Electrical Characteristics at $V_{DD} = 5$ V, $T_A = 25^\circ\text{C}$, $\lambda_p = 470$ nm, $R_L = 10$ k Ω (unless otherwise noted) (see Notes 2 and 3)

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
V_D Dark voltage	$E_e = 0$			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 Ω	4	4.2		
V_O Output voltage	$E_e = 1.7\mu\text{W}/\text{cm}^2$	1.6	2	2.4	V
α_{VD} Temperature coefficient of dark voltage (V_D)	$T_A = 0^\circ\text{C}$ to 70°C		-15		$\mu\text{V}/^\circ\text{C}$
N_e Irradiance responsivity	See Note 2		1.17		$\text{V}/(\mu\text{W}/\text{cm}^2)$
Power supply rejection	$f_{ac} = 100$ Hz		55		dB
	$f_{ac} = 1$ kHz		35		dB
I_{DD} Supply current			2.5	4.5	mA

NOTE 2: Irradiance responsivity is characterized over the range $V_O = 0.1$ V to 4.5 V.

Switching Characteristics at $V_{DD} = 5$ V, $T_A = 25^\circ\text{C}$, $\lambda_p = 470$ nm, $R_L = 10$ k Ω (unless otherwise noted)

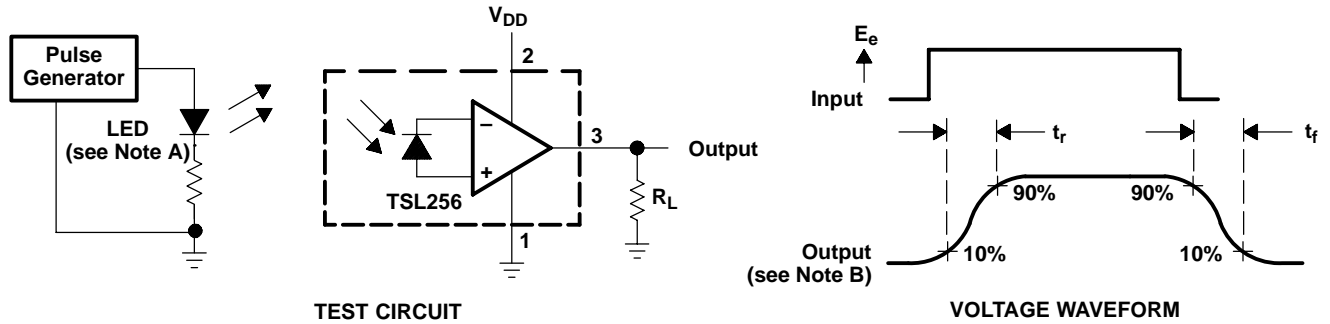
PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_r Output pulse rise time, 10% to 90% of final value	See Notes 3, 4, and 5		160	250	μs
t_f Output pulse fall time, 10% to 90% of final value	See Notes 3, 4, and 5		150	250	μs
t_s Output settling time to 1% of final value			330		μs
Integrated noise voltage	$f = \text{dc}$ to 1 kHz		500		μV_{rms}
V_n Output noise voltage, rms	$f = 10$ Hz		4.7		$\mu\text{V}/\sqrt{\text{Hz}}$ rms
	$f = 100$ Hz		5.4		
	$f = 1$ kHz		7.2		

NOTES: 3. Measured with $R_L = 10$ k Ω between output and ground.

4. The output waveform is monitored on an oscilloscope with $Z_i = 1$ M Ω , $C_i < 20$ pF.

5. Switching characteristics apply over the range $V_O = 0.1$ V to 4.5 V.

PARAMETER MEASUREMENT INFORMATION



NOTES: A. The input irradiance is supplied by a pulsed InGaN light-emitting diode with the following characteristics: $\lambda_p = 470 \text{ nm}$, $t_r < 1 \mu\text{s}$, $t_f < 1 \mu\text{s}$.
 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

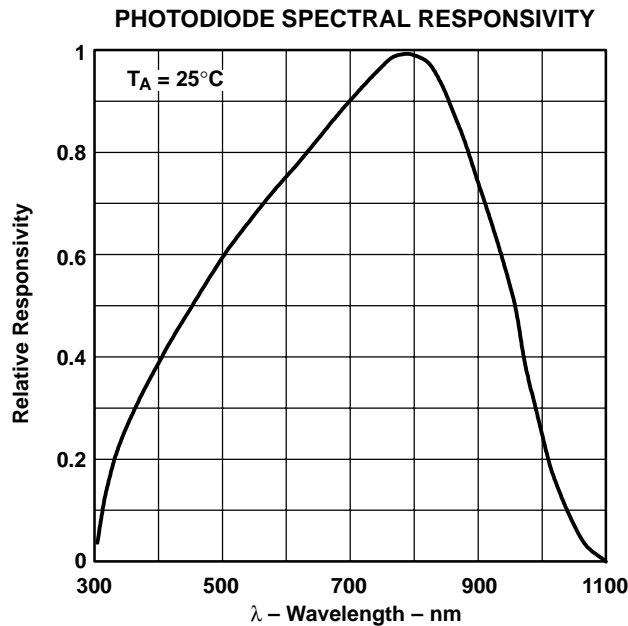


Figure 2

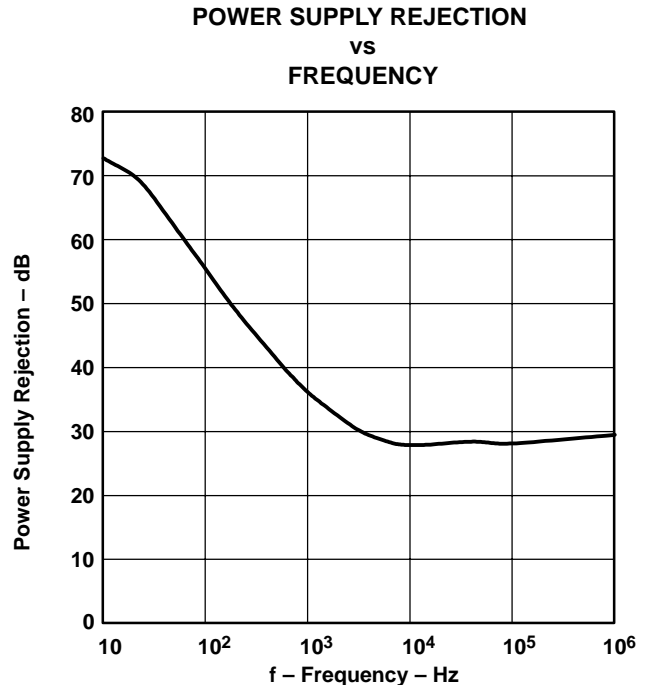


Figure 3

TYPICAL CHARACTERISTICS

**DARK VOLTAGE
 vs
 FREE-AIR TEMPERATURE**

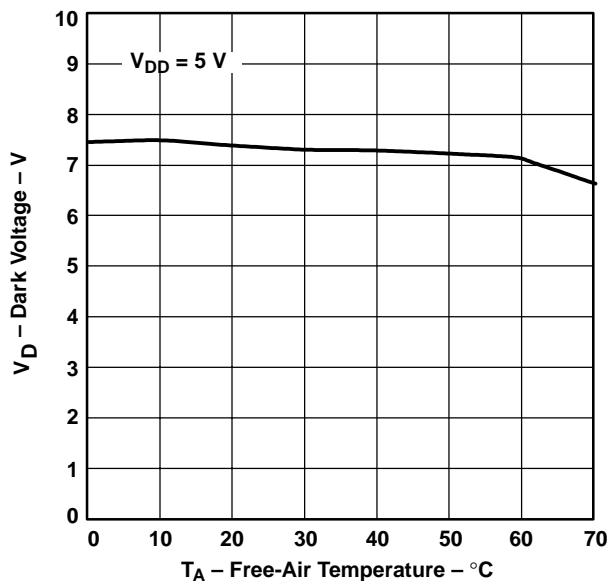


Figure 4

**INTEGRATED NOISE VOLTAGE
 vs
 MEASUREMENT BANDWIDTH FREQUENCY**

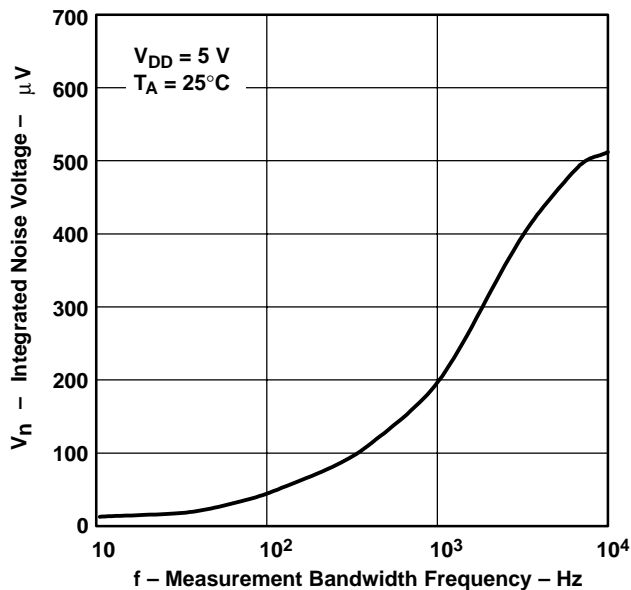


Figure 5

**NORMALIZED RESPONSE
 vs
 ANGULAR DISPLACEMENT**

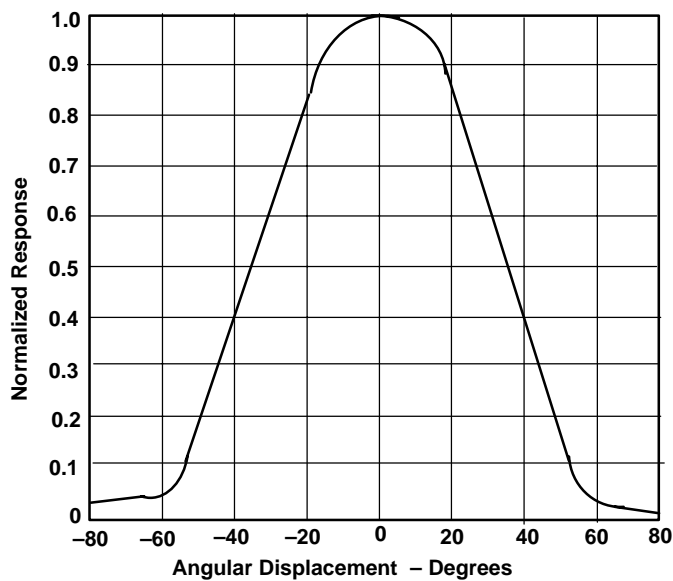


Figure 6

MECHANICAL DATA

The TSL256 is supplied in a clear 3-leaded package with a large molded focusing lens.

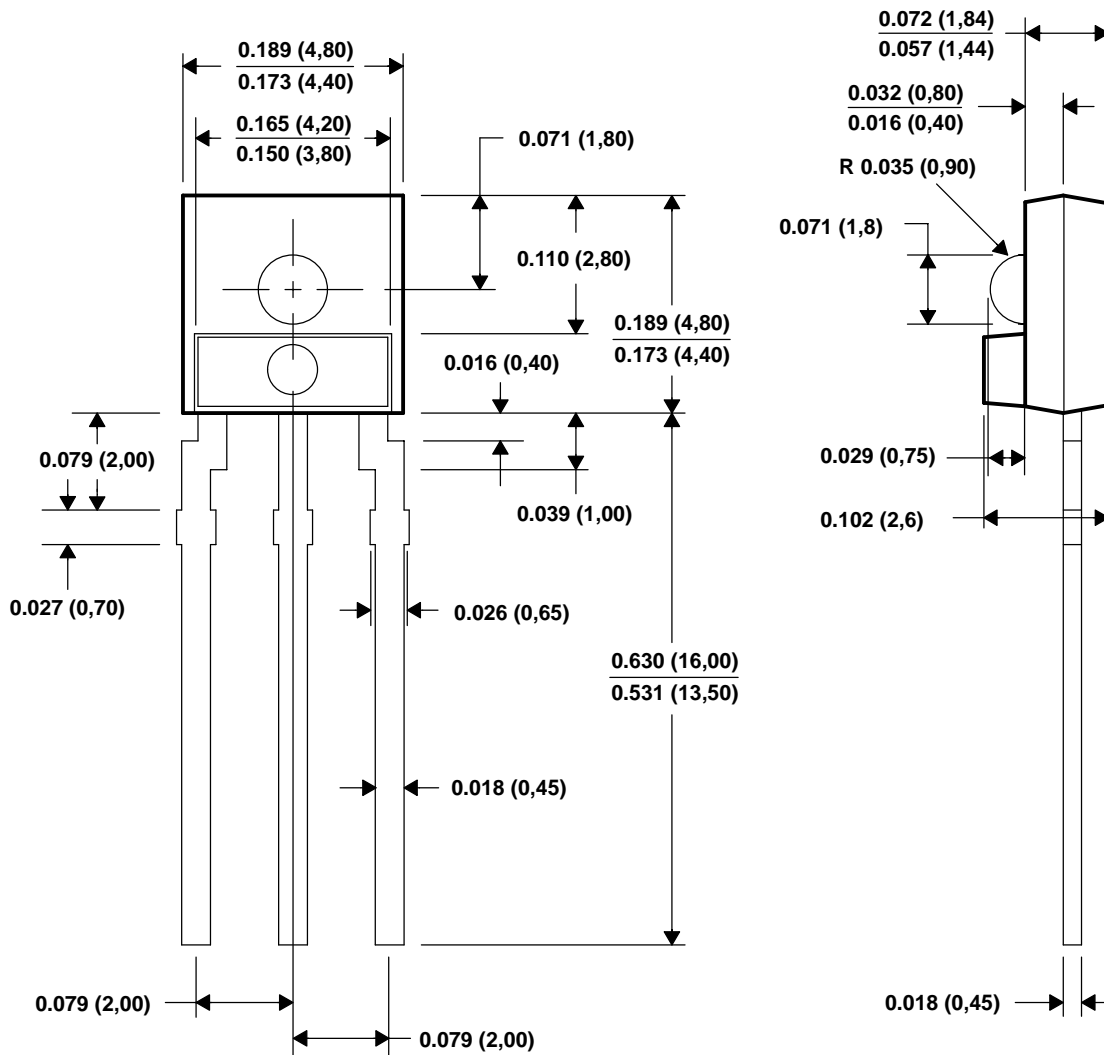


Figure 7. Package Configuration

- 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.
 - D. Package body is a clear nonfilled optically transparent material
 - E. Index of refraction of clear plastic is 1.55.

TSL256 HIGH-SENSITIVITY LIGHT-TO-VOLTAGE CONVERTER

TAOS014 – JANUARY 2000

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