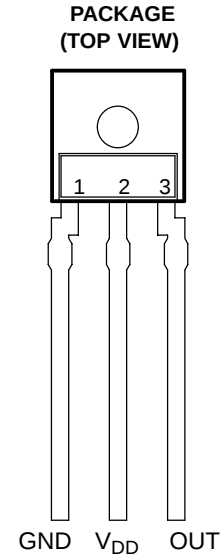


- High Sensitivity
- Rail-to-Rail Output
- Single Voltage Supply Operation
- Monolithic Silicon IC Containing Photodiode, Operational Amplifier, and Feedback Components
- Converts NIR Light Intensity to Output Voltage
- Compact 3-Leaded Infrared-Transmissive Plastic Package
- Wide Supply-Voltage Range
- Low Supply Current

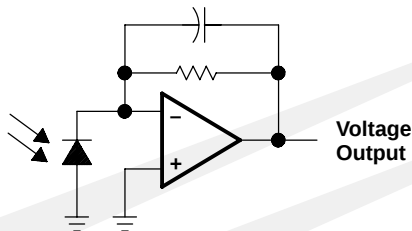


Description

The TSL265 is a high-sensitivity 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 near infrared (NIR) light intensity (irradiance) on the photodiode. The TSL265 has a transimpedance gain of 3.2 GΩ. Bandwidth and signal-to-noise ratio are optimized by means of a patented design that minimizes the effects of photodiode capacitance. It uses design techniques that provide improved offset voltage stability and low power consumption, and is supplied in a 3-lead visible-light-blocking sidelooker package with an integral lens.

The TSL265 is intended for NIR light-sensing applications requiring ultrahigh sensitivity where a linear voltage output is desired.

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

TSL265

HIGH-SENSITIVITY NEAR-INFRARED LIGHT-TO-VOLTAGE CONVERTER

TAOS016 – SEPTEMBER 1999

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}	2.7	6	V
Operating free-air temperature, T_A	0	70	°C

Electrical Characteristics at $V_{DD} = 5$ V, $T_A = 25^\circ\text{C}$, $\lambda_p = 880$ 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	$E_e = 0$			100	mV
V_{OM} Maximum output voltage swing	$V_{DD} = 4.5$ V, $R_L = 0$,		4.49		V
	$V_{DD} = 4.5$ V, $R_L = 10$ k Ω	4	4.2		
V_O Output voltage	$E_e = 156$ mW/cm ²	1.6	2	2.4	V
α_{V_O} Temperature coefficient of output voltage (V_O)	$T_A = 0^\circ\text{C}$ to 70°C , See Note 2		TBD		%/°C
N_e Irradiance responsivity			12.8		V/($\mu\text{W}/\text{cm}^2$)
Power supply rejection	$f_{ac} = 100$ Hz, 1.3 V _{O(pp)}		32		dB
	$f_{ac} = 1$ kHz, 1.3 V _{O(pp)}		19		
I_{DD} Supply current		2.5		4.5	mA

NOTES: 2. The input irradiance E_e is supplied by a GaAlAs infrared-emitting diode with $\lambda_p = 880$ nm.

3. Irradiance responsivity is characterized over the range $V_O = 0.1$ V to 4.5 V.

Switching Characteristics at $V_{DD} = 5$ V, $T_A = 25^\circ\text{C}$, $\lambda_p = 880$ nm, $R_L = 10$ k Ω (unless otherwise noted) (see Note 3)

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_r Output pulse rise time	See Notes 4 and 5		166	250	μs
t_f Output pulse fall time	See Notes 4 and 5		163	250	μs
t_s Output settling time			322		μs
Integrated noise voltage	$f = \text{dc}$ to 1 kHz		3.5		mV RMS
V_n Output noise voltage, rms	$f = 10$ Hz, See Note 6		92		$\mu\text{V}/\sqrt{\text{Hz}}$ RMS
	$f = 100$ Hz		86		
	$f = 1$ Hz		104		

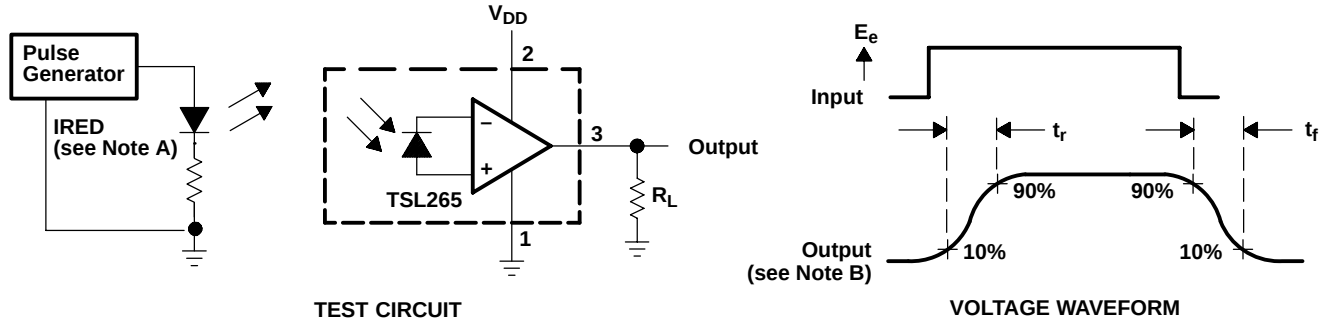
NOTES: 3. Irradiance responsivity is characterized over the range $V_O = 0.1$ V to 4.5 V.

4. Measured with $R_L = 10$ k Ω between output and ground.

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

6. Measured with external 1-kHz RC filter (10 k Ω /15.9 nF)

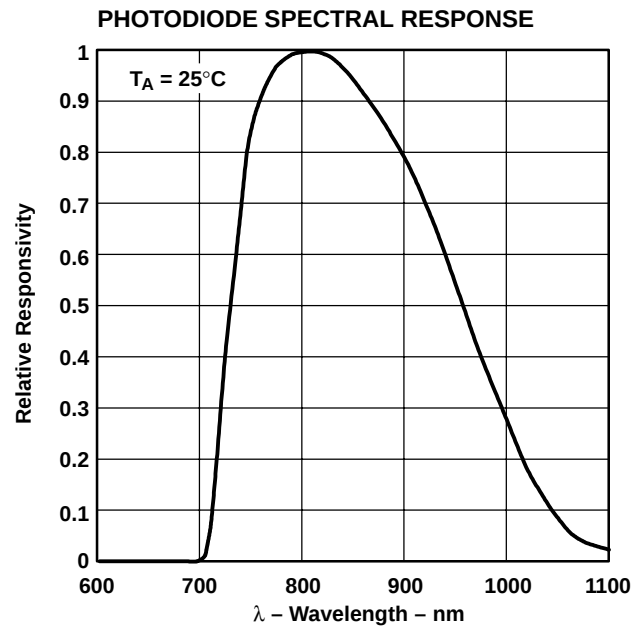
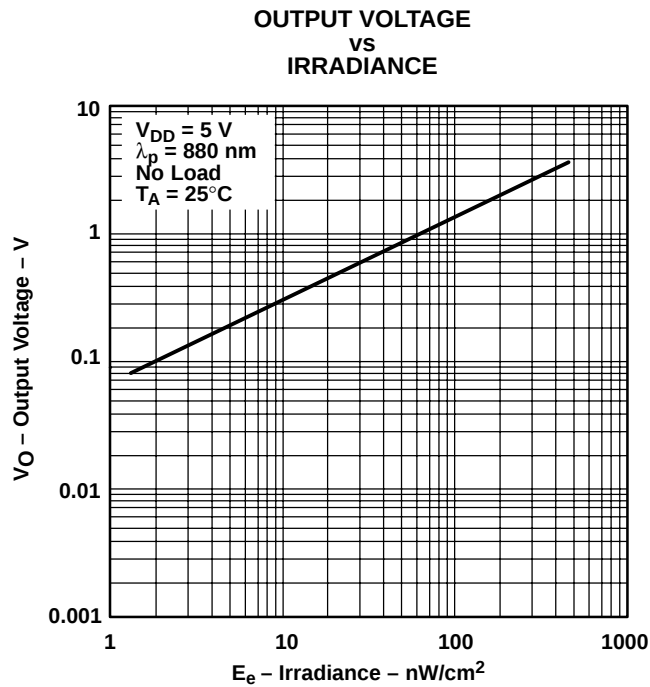
PARAMETER MEASUREMENT INFORMATION



- NOTES: A. The input irradiance is supplied by a pulsed GaAlAs infrared-emitting diode with the following characteristics: $\lambda_p = 880 \text{ nm}$, $t_r < 1 \mu\text{s}$, $t_f < 1 \mu\text{s}$.
- B. The output waveform is monitored on an oscilloscope with the following characteristics: $t_r < 100 \text{ ns}$, $Z_i \geq 1 \text{ MHz}$, $C_i \leq 20 \text{ pF}$.

Figure 1. Switching Times

TYPICAL CHARACTERISTICS



TYPICAL CHARACTERISTICS

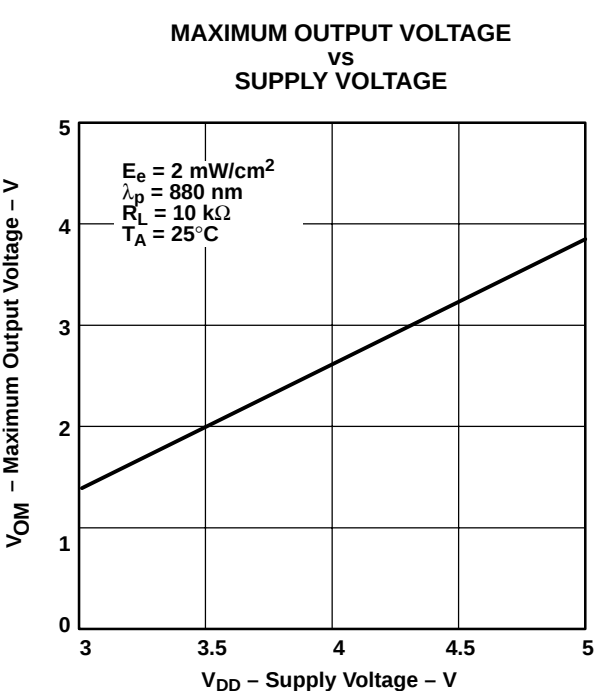


Figure 4

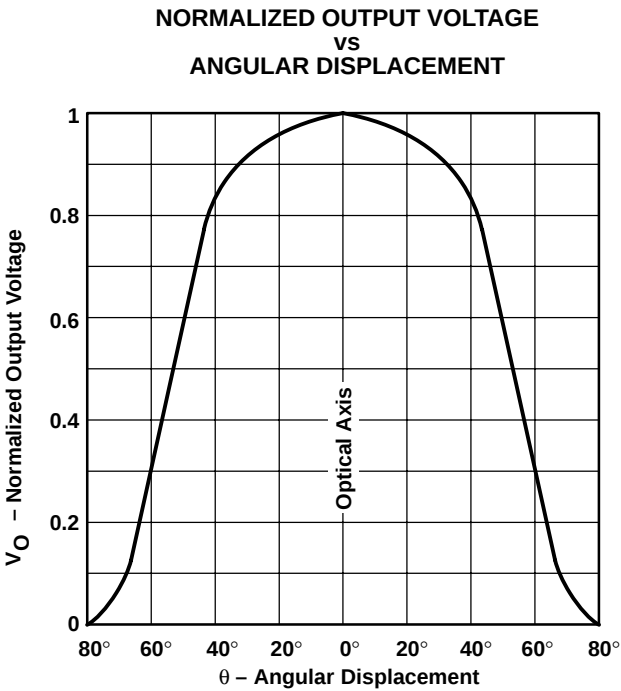


Figure 5

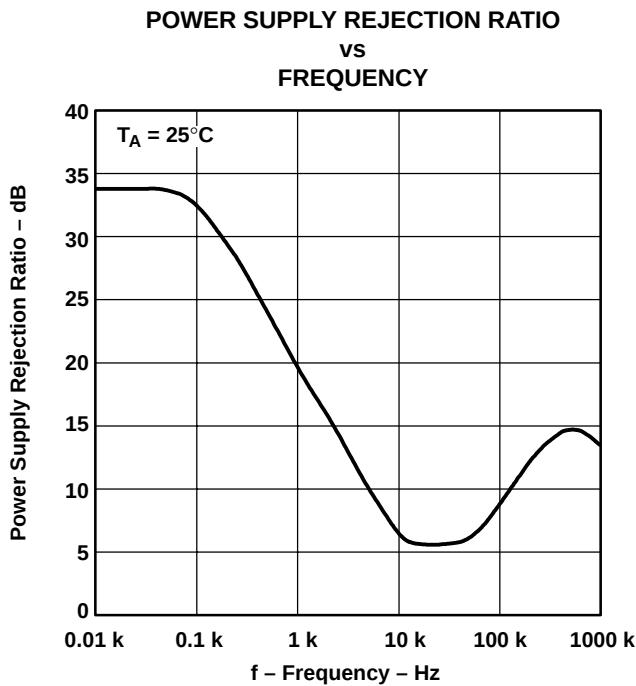


Figure 6

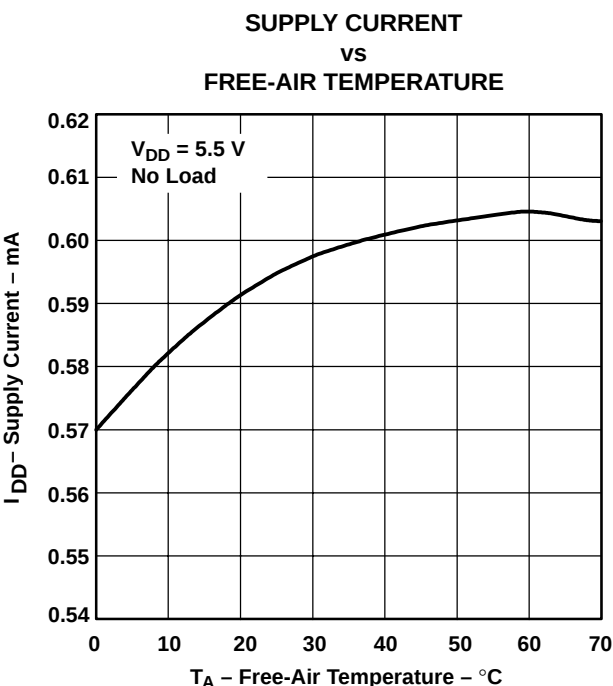
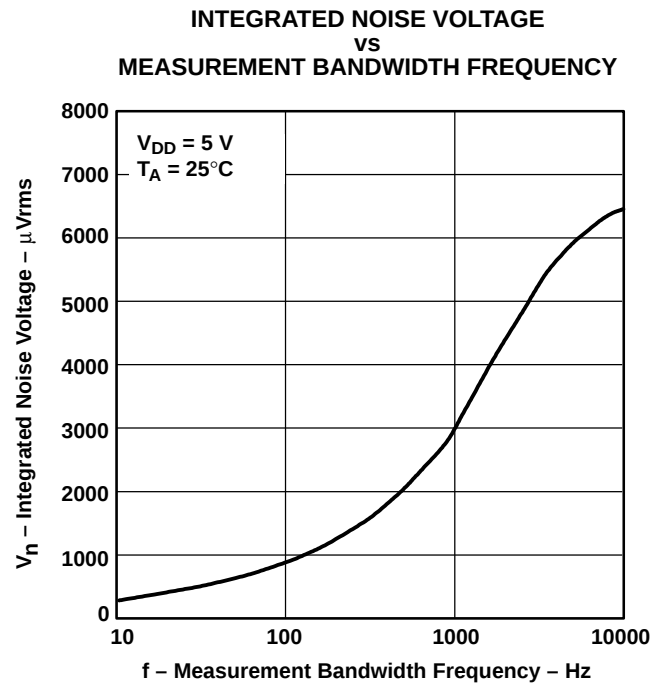
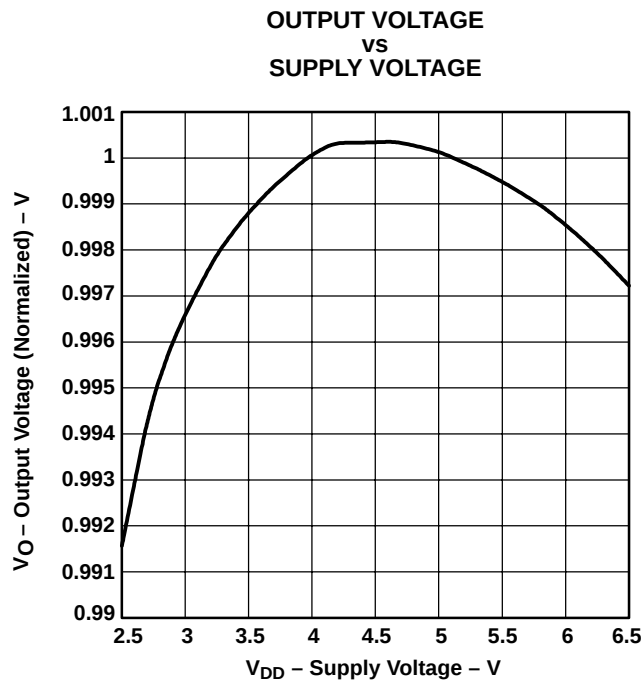
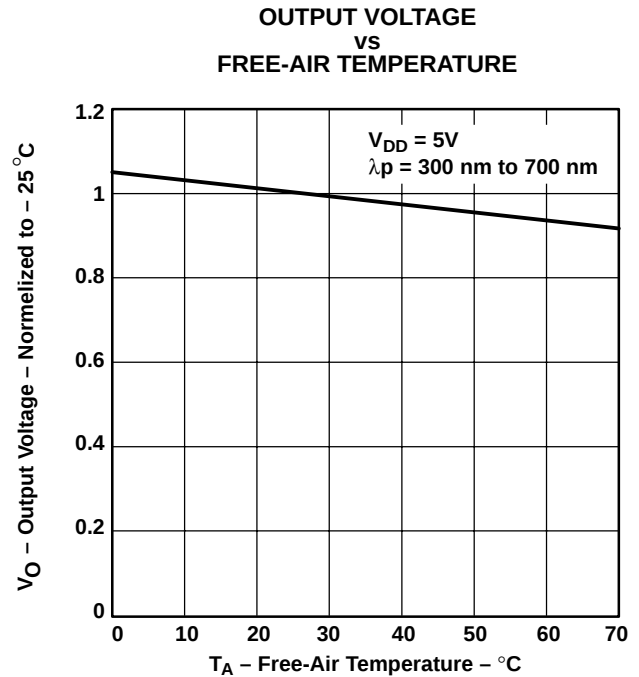
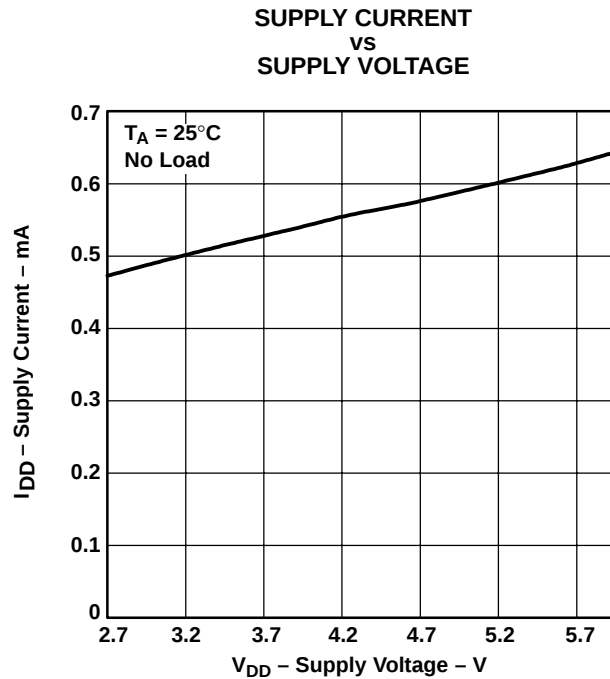


Figure 7

TYPICAL CHARACTERISTICS



TSL265 HIGH-SENSITIVITY NEAR-INFRARED LIGHT-TO-VOLTAGE CONVERTER

TAOS016 – SEPTEMBER 1999

MECHANICAL DATA

The TSL265 is implemented in a clear 3-leaded package with a large molded focusing lens.

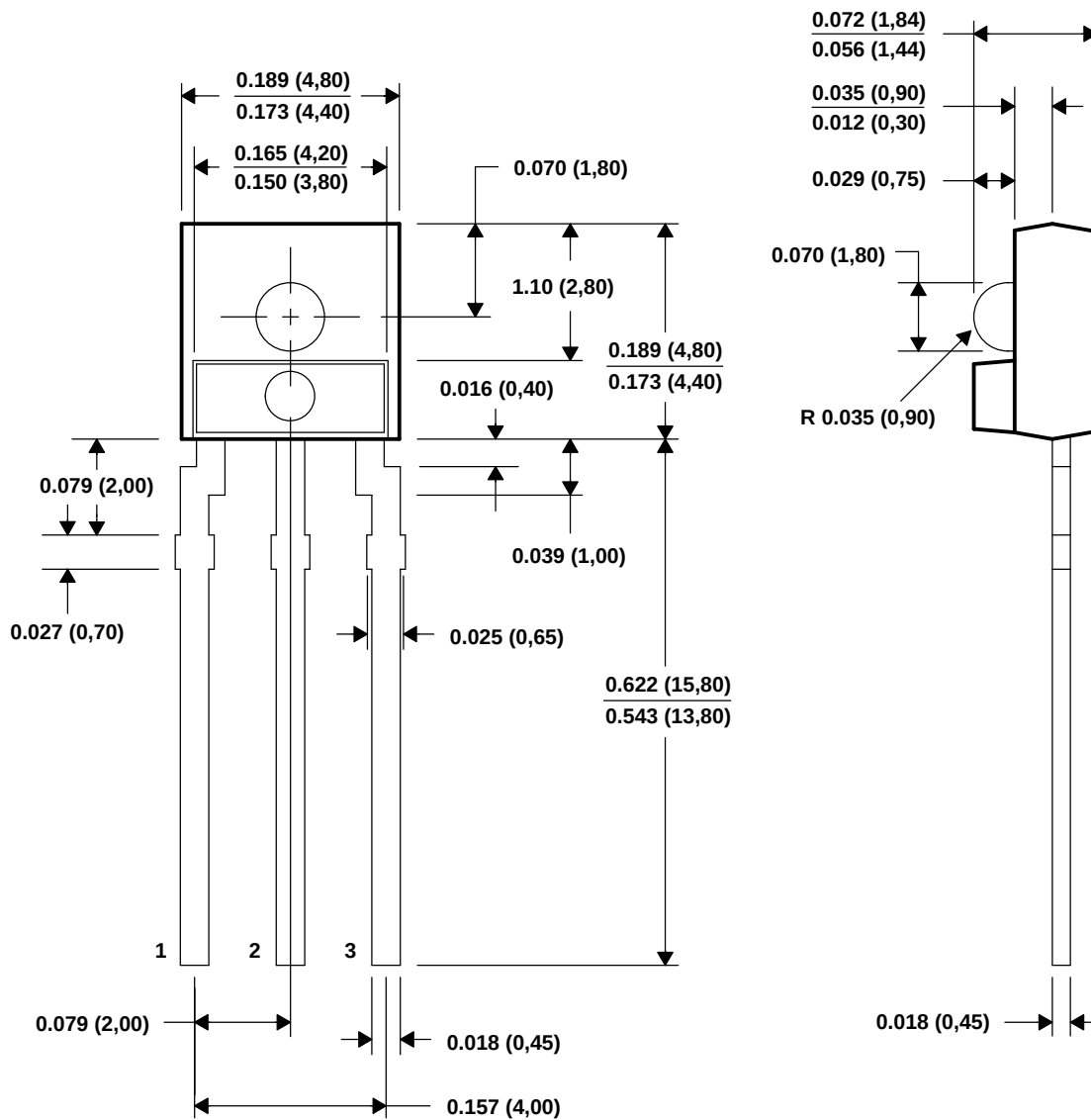


Figure 12. Package Configuration

- 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.

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