



TAOS Inc.

is now

ams AG

The technical content of this TAOS datasheet is still valid.

Contact information:

Headquarters:

ams AG

Tobelbaderstrasse 30

8141 Unterpremstaetten, Austria

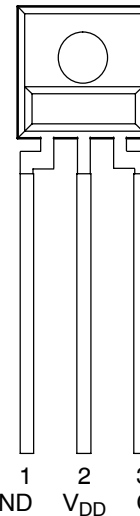
Tel: +43 (0) 3136 500 0

e-Mail: ams_sales@ams.com

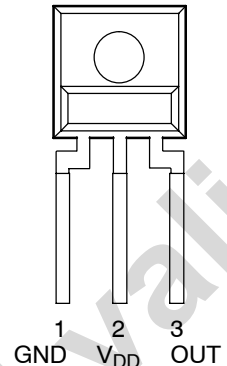
Please visit our website at www.ams.com

- Monolithic Silicon IC Containing Photodiode, Operational Amplifier, and Feedback Components
- Converts Light Intensity to a Voltage
- Irradiance Responsivity, Typically 9 mV/($\mu\text{W}/\text{cm}^2$) at $\lambda_p = 635 \text{ nm}$
- Compact 3-Lead Clear Plastic Package
- Single Voltage Supply Operation
- Low Dark (Offset) Voltage....10 mV Max
- Low Supply Current.....1.1 mA Typical
- Wide Supply-Voltage Range.... 2.7 V to 5.5 V
- Replacement for TSL254
- RoHS Compliant (–LF Package Only)

PACKAGE S
SIDELOOKER
(FRONT VIEW)



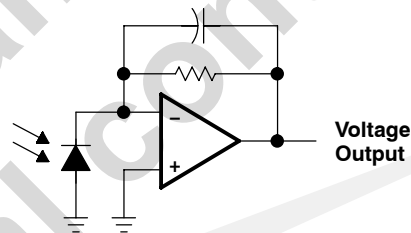
PACKAGE SM
SURFACE MOUNT
SIDELOOKER
(FRONT VIEW)



Description

The TSL254R is a light-to-voltage optical sensor combining a photodiode and a transimpedance amplifier (feedback resistor = 1 M Ω) on a single monolithic IC. Output voltage is directly proportional to the light intensity (irradiance) on the photodiode. The device has improved amplifier offset-voltage stability and low power consumption and is supplied in a 3-lead clear plastic sidelooker package with an integral lens. When supplied in the lead (Pb) free package, the device is RoHS compliant.

Functional Block Diagram



Available Options

DEVICE	T _A	PACKAGE - LEADS	PACKAGE DESIGNATOR	ORDERING NUMBER
TSL254R	0°C to 70°C	3-lead Sidelooker	S	TSL254R
TSL254R	0°C to 70°C	3-lead Sidelooker — Lead (Pb) Free	S	TSL254R-LF
TSL254R	0°C to 70°C	3-lead Surface-Mount Sidelooker — Lead (Pb) Free	SM	TSL254RSM-LF

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

TSL254R LIGHT-TO-VOLTAGE OPTICAL SENSOR

TAOS071C – SEPTEMBER 2007

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	± 10 mA
Duration of short-circuit current at (or below) 25°C (see Note 2)	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 (S Package)	260°C
Reflow solder, in accordance with J-STD-020C or J-STD-020D (SM Package)	260°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.

- NOTES: 1. All voltages are with respect to GND.
2. Output may be shorted to supply.

Recommended Operating Conditions

	MIN	NOM	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, $T_A = 25^\circ\text{C}$, $\lambda_p = 635$ nm, $R_L = 10$ k Ω (unless otherwise noted) (see Notes 3, 4, and 5)

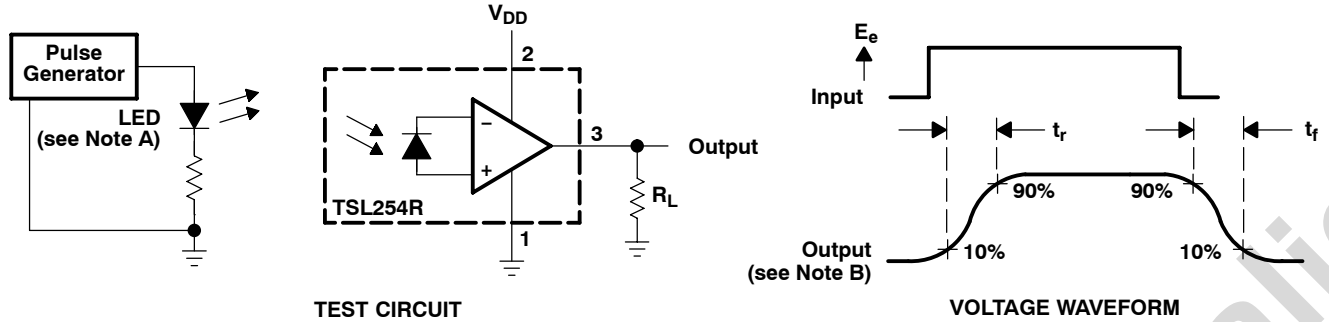
PARAMETER	TEST CONDITIONS	TSL254R			UNIT
		MIN	TYP	MAX	
V_D Dark voltage	$E_e = 0$	0	5	10	mV
V_{OM} Maximum output voltage	$V_{DD} = 4.5$ V	3.0	3.3		V
V_O Output voltage	$E_e = 222 \mu\text{W}/\text{cm}^2$	1.5	2	2.5	V
α_{V_O} Temperature coefficient of output voltage (V_O)	$V_O = 2$ V @ 25°C, $T_A = 0^\circ\text{C}$ to 70°C (see Note 6)	2			mV/°C
		0.1			%/°C
R_e Irradiance responsivity	See Notes 5 and 7	9			mV/($\mu\text{W}/\text{cm}^2$)
I_{DD} Supply current	$E_e = 222 \mu\text{W}/\text{cm}^2$	1.1	1.7		mA

- NOTES: 3. Measurements are made with $R_L = 10$ k Ω between output and ground.
4. Optical measurements are made using small-angle incident radiation from an LED optical source.
5. The input irradiance E_e is supplied by an AlInGaP LED with peak wavelength $\lambda_p = 635$ nm
6. The temperature coefficient of output voltage measurement is made by adjusting irradiance such that V_O is approximately 2 V at 25°C and then with irradiance held constant, measuring V_O while varying the temperature between 0°C and 70°C.
7. Irradiance responsivity is characterized over the range $V_O = 0.05$ to 2.9 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 $E_e = 0$.

Dynamic Characteristics at $V_{DD} = 5$ V, $T_A = 25^\circ\text{C}$, $\lambda_p = 635$ nm, $R_L = 10$ k Ω (see Figure 1)

PARAMETER	TEST CONDITIONS	TSL254R			UNIT
		MIN	TYP	MAX	
t_r Output pulse rise time	$V_{O(\text{peak})} = 2$ V	2.5			μs
t_f Output pulse fall time	$V_{O(\text{peak})} = 2$ V	2.5			μs
V_n Output noise voltage	$E_e = 0$, $V_O = V_D$ $f = 1$ kHz	1			$\mu\text{V}/\sqrt{\text{Hz}}$
	$E_e = 0$, $V_O = V_D$ $f = 10$ kHz	1			
	$V_O = 2$ V $f = 1$ kHz	1.5			
	$V_O = 2$ V $f = 10$ kHz	1.5			

PARAMETER MEASUREMENT INFORMATION



- NOTES: A. The input irradiance is supplied by a pulsed AlInGaP light-emitting diode with the following characteristics: $\lambda_p = 635 \text{ nm}$, $t_r < 1 \mu\text{s}$, $t_f < 1 \mu\text{s}$.
- 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

TSL254R LIGHT-TO-VOLTAGE OPTICAL SENSOR

TAOS071C – SEPTEMBER 2007

TYPICAL CHARACTERISTICS

**OUTPUT VOLTAGE
vs
IRRADIANCE**

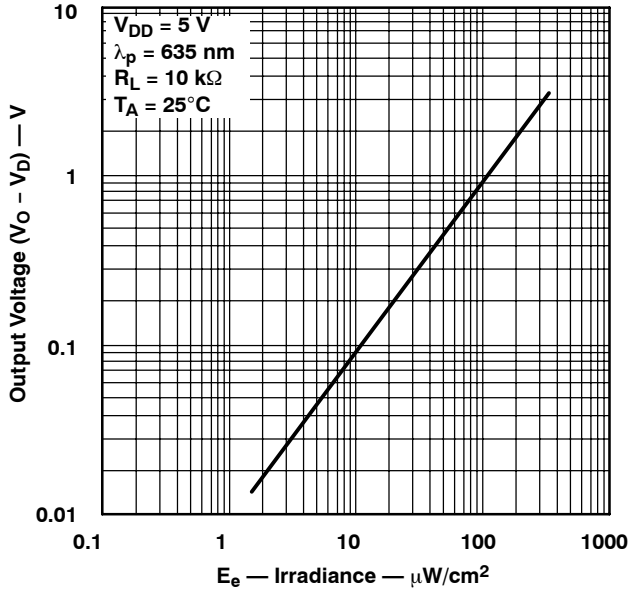


Figure 2

PHOTODIODE SPECTRAL RESPONSIVITY

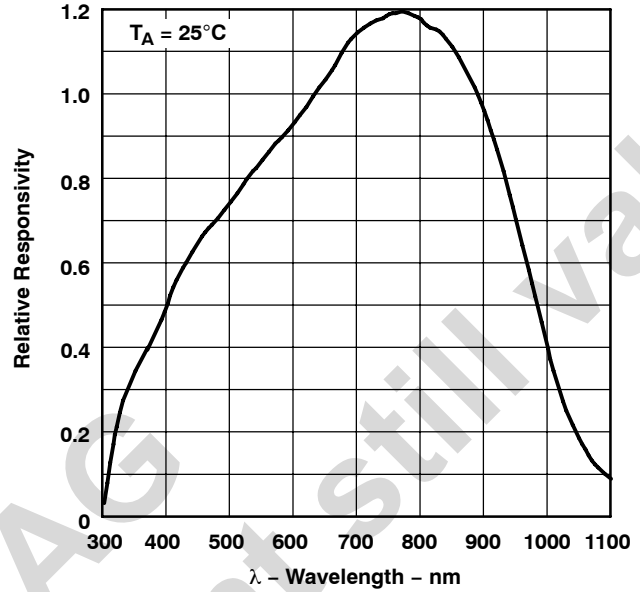


Figure 3

**MAXIMUM OUTPUT VOLTAGE
vs
SUPPLY VOLTAGE**

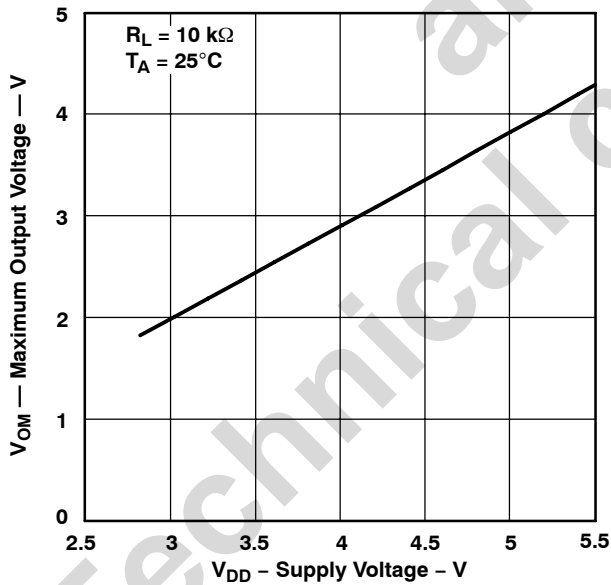


Figure 4

**SUPPLY CURRENT
vs
OUTPUT VOLTAGE**

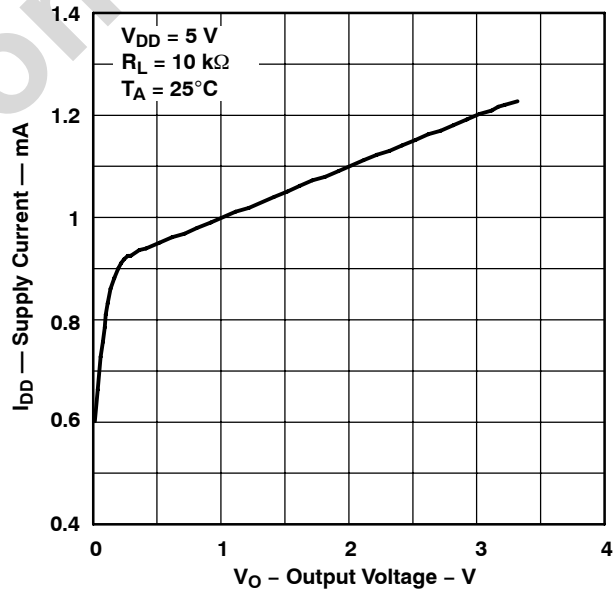


Figure 5



TYPICAL CHARACTERISTICS

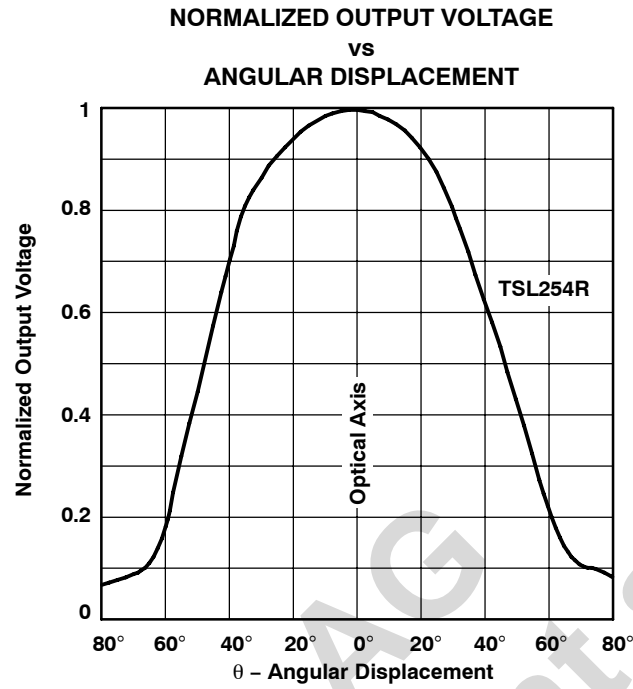


Figure 6

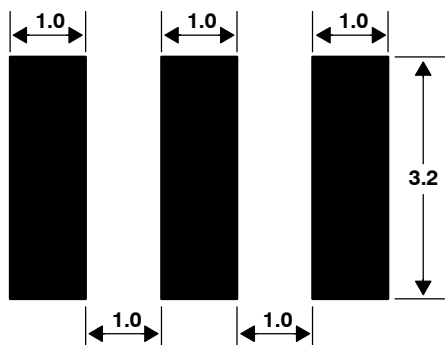
TSL254R LIGHT-TO-VOLTAGE OPTICAL SENSOR

TAOS071C – SEPTEMBER 2007

APPLICATION INFORMATION

PCB Pad Layout

Suggested PCB pad layout guidelines for the SM surface mount package are shown in Figure 7.



- NOTES: A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.

Figure 7. Suggested SM Package PCB Layout

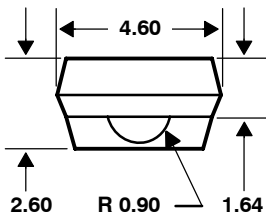
MECHANICAL INFORMATION

The device is supplied in a clear plastic three-lead package (S). The integrated photodiode active area is typically 1,0 mm² (0.0016 in²).

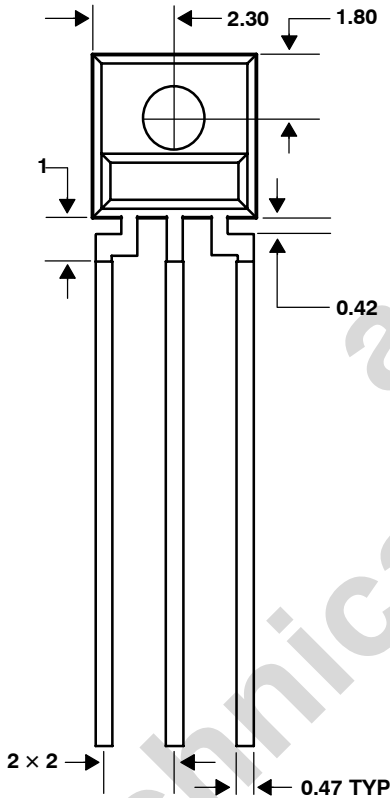
PACKAGE S

PLASTIC SINGLE-IN-LINE SIDE-LOOKER PACKAGE

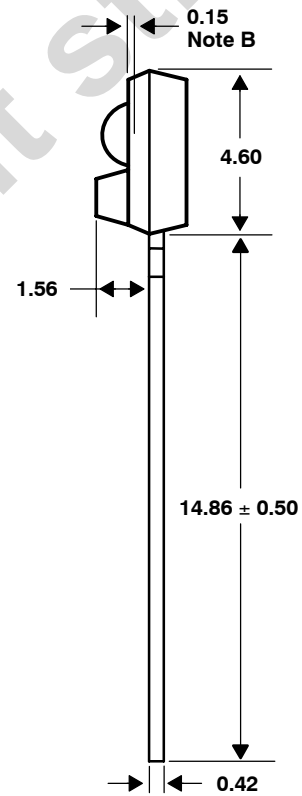
TOP VIEW



FRONT VIEW



SIDE VIEW



Lead Free Available

- NOTES: A. All linear dimensions are in millimeters; tolerance is ± 0.25 mm unless otherwise stated.
 B. Dimension is to center of lens arc, which is located below the package face.
 C. The integrated photodiode active area is typically located in the center of the lens and 0.97 mm below the top of the lens surface.
 D. Index of refraction of clear plastic is 1.55.
 E. Lead finish for TSL254R solder dipped, 63% Sn/37% Pb. Lead finish for TSL254R-LF: solder dipped, 100% Sn.
 F. This drawing is subject to change without notice.

Figure 8. Package S — Single-In-Line Side-Looker Package Configuration

TSL254R LIGHT-TO-VOLTAGE OPTICAL SENSOR

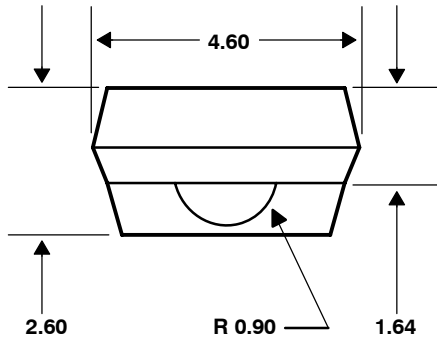
TAOS071C – SEPTEMBER 2007

MECHANICAL DATA

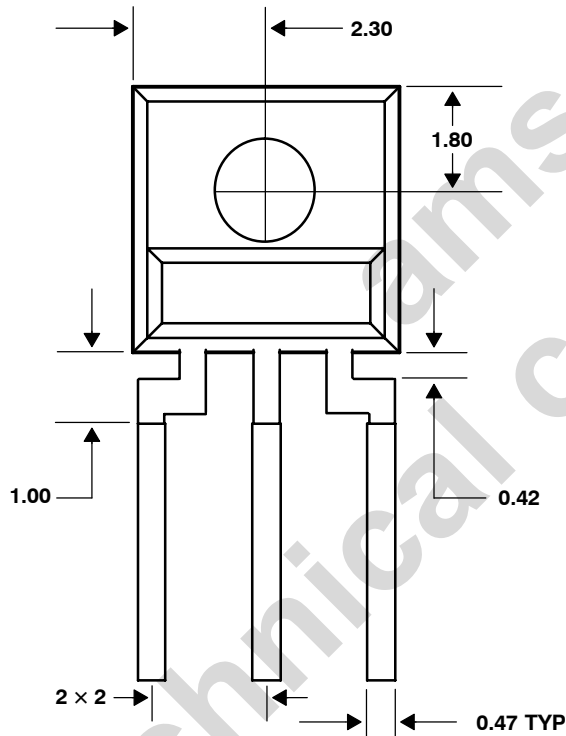
PACKAGE SM

PLASTIC SURFACE MOUNT SIDE-LOOKER PACKAGE

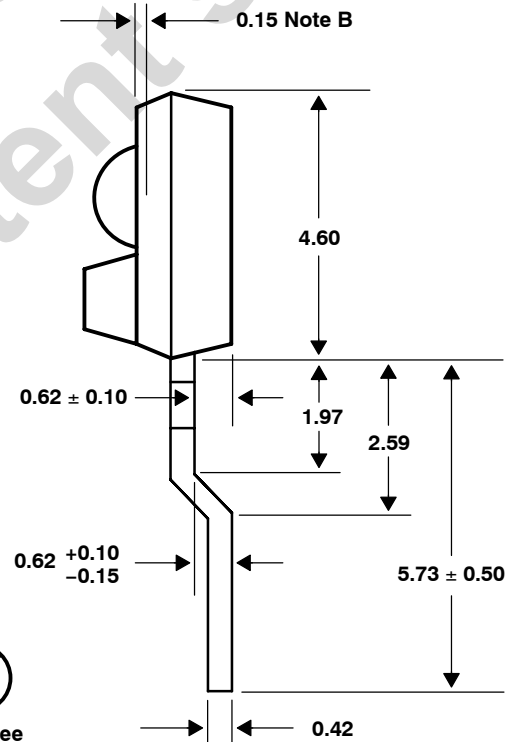
TOP VIEW



FRONT VIEW



SIDE VIEW



- NOTES: A. All linear dimensions are in millimeters; tolerance is ± 0.25 mm unless otherwise stated.
 B. Dimension is to center of lens arc, which is located below the package face.
 C. The integrated photodiode active area is typically located in the center of the lens and 0.97 mm below the top of the lens surface.
 D. Index of refraction of clear plastic is 1.55.
 E. Lead finish for TSL254RSM-LF: solder dipped, 100% Sn.
 F. This drawing is subject to change without notice.

Figure 9. Package SM — Surface Mount Side-Looker Package Configuration

PRODUCTION DATA — information in this document is current at publication date. Products conform to specifications in accordance with the terms of Texas Advanced Optoelectronic Solutions, Inc. standard warranty. Production processing does not necessarily include testing of all parameters.

LEAD-FREE (Pb-FREE) and GREEN STATEMENT

Pb-Free (RoHS) TAOS' terms *Lead-Free* or *Pb-Free* mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TAOS Pb-Free products are suitable for use in specified lead-free processes.

Green (RoHS & no Sb/Br) TAOS defines *Green* to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material).

Important Information and Disclaimer The information provided in this statement represents TAOS' knowledge and belief as of the date that it is provided. TAOS bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TAOS has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TAOS and TAOS suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

NOTICE

Texas Advanced Optoelectronic Solutions, Inc. (TAOS) reserves the right to make changes to the products contained in this document to improve performance or for any other purpose, or to discontinue them without notice. Customers are advised to contact TAOS to obtain the latest product information before placing orders or designing TAOS products into systems.

TAOS assumes no responsibility for the use of any products or circuits described in this document or customer product design, conveys no license, either expressed or implied, under any patent or other right, and makes no representation that the circuits are free of patent infringement. TAOS further makes no claim as to the suitability of its products for any particular purpose, nor does TAOS assume any liability arising out of the use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages.

TEXAS ADVANCED OPTOELECTRONIC SOLUTIONS, INC. PRODUCTS ARE NOT DESIGNED OR INTENDED FOR USE IN CRITICAL APPLICATIONS IN WHICH THE FAILURE OR MALFUNCTION OF THE TAOS PRODUCT MAY RESULT IN PERSONAL INJURY OR DEATH. USE OF TAOS PRODUCTS IN LIFE SUPPORT SYSTEMS IS EXPRESSLY UNAUTHORIZED AND ANY SUCH USE BY A CUSTOMER IS COMPLETELY AT THE CUSTOMER'S RISK.

LUMENOLOGY, TAOS, the TAOS logo, and Texas Advanced Optoelectronic Solutions are registered trademarks of Texas Advanced Optoelectronic Solutions Incorporated.

TSL254R
LIGHT-TO-VOLTAGE OPTICAL SENSOR

TAOS071C – SEPTEMBER 2007

ams AG
Technical content still valid