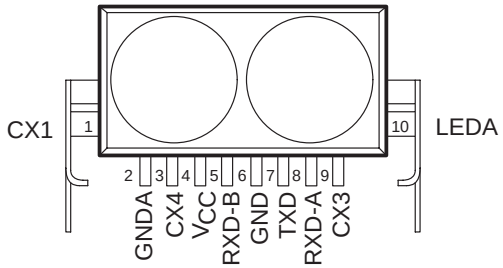
SOES034A – SEPTEMBER 1997 – REVISED OCTOBER 1997

- **Fully Compliant with IrDA 1.1 (4 MBPS)**
- **Compatible with ASK, HP-SIR and TV Remote**
- **No Programming Required to Switch Speeds**
- **Backward Compatible to Slower IrDA Speeds**
- **Excellent Noise Immunity**
- **Fully Supportable by all Interface Chips**
- **Designed to Compensate for Light Loss Caused by Cosmetic Windows**

SRA PACKAGE
(TOP VIEW)



description

The TSLM1100 is an infrared transceiver that provides the interface between logic and IR signals for through-air, serial, half-duplex IR data links. The TSLM1100 is compliant with the Infrared Data Association (IrDA) 1.1 physical-layer specification. Additionally, the TSLM1100 is compatible with ASK, HP-SIR and TV Remote standards.

The TSLM1100 is a hybrid device that includes a high-speed AlGaAs 870-nm LED, a silicon intrinsic PN junction (PIN) diode, and a LinCMOS transceiver integrated circuit. This IC has the LED driver and a receiver that provides two output signals: RXD-A for data rates from 2.4 kb/s to 115.2 kb/s and RXD-B for data rates of 576 kb/s to 4.0 Mb/s.

The device is encapsulated in a visible-light-rejecting plastic package that has integral lenses for the LED and the PIN diode. The receiver lens increases the effective area of the PIN diode to increase sensitivity. The LED lens is designed to provide a beam angle of ±30°. The receiver outputs pulse low when an IR signal is detected. The power supply for both PIN diode and LED should be filtered to minimize noise from external sources.

This transceiver is well suited for a wide variety of IR interface applications including: PC notebooks, PDAs, pagers, printers, cameras, LANs, telephones and industrial handheld devices.

FUNCTION TABLE

INPUTS		OUTPUTS		
TXD	E_e	$I_{e(LED)}$	RXD-A	RXD-B
V_{IH}	X	High	NV	NV
V_{IL}	$E_{I(IH)}$†	Low	Low	NV
V_{IL}	$E_{I(IH)}$‡	Low	NV	Low
V_{IL}	$E_{I(IL)}$	Low	High	High

X – don't care, NV – not valid
† Data rates up to 115.2 kb/s
‡ Data rates > 115.2 kb/s

Terminal Functions

PIN NAME	PIN NO.	DESCRIPTION
CX1	1	Photodiode bypass capacitor
GNDA	2	Analog ground
CX4	3	Averaging capacitor
V_{CC}	4	Supply voltage
RXD-B	5	Receiver data output – Channel B
GND	6	Ground
TXD	7	Transmitter data input
RXD-A	8	Receiver data output – Channel A
CX3	9	Threshold capacitor
LEDA	10	LED anode

absolute maximum ratings over operating free-air temperature (unless otherwise noted)†

Supply voltage, V_{CC} . . . . . 7 V
LED anode voltage range, $V_{I(LEDA)}$ . . . . . –0.5 V to 7 V
Receiver data output voltage range: $V_{O(RXD-A)}$ . . . . . –0.5 V to V_{CC} + 0.5 V
$V_{O(RXD-B)}$ . . . . . –0.5 V to V_{CC} + 0.5 V
Average LED current, $I_{I(LED)(avg)}$: Direct current . . . . . 100 mA
Pulsed, ≤ 90-µs pulse width, ≤ 25% duty cycle . . . . . 165 mA
Peak LED current, $I_{I(LED)(PK)}$: ≤ 90-µs pulse width, ≤ 25% duty cycle . . . . . 660 mA
≤ 2-µs pulse width, ≤ 10% duty cycle . . . . . 1 A
Transmitter data input current range, $I_{I(TXD)}$ . . . . . –12 mA to 12 mA
Storage temperature range, T_{stg} . . . . . –20°C to 85°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.

recommended operating conditions

	CONDITIONS	MIN	MAX	UNITS
Supply voltage, V_{CC}		4.75	5.25	V
Logic high transmitter input voltage, V_{IH}		4.25	5.25	V
Logic low transmitter input voltage, V_{IL}		0.0	0.3	V
Logic high receiver input irradiance, $E_{e(IH)}$	For in-band signals ≤ 116 kb/s	0.0036	500	mW/cm^2
	For in-band signals ≥ 576 kb/s	0.0090	500	mW/cm^2
Logic low receiver input irradiance, $E_{e(IL)}$	For in-band signals		0.3	µW/cm^2
LED (logic high) Current pulse amplitude, $I_{I(LEDA)}$		400	660	mA
Receiver setup time	For full sensitivity after transmitting		1.0	ms
Receiver signal rate, RXD-A		2.4	116	kb/s
Receiver signal rate, RXD-B		0.576	4	Mb/s
Ambient light	See IrDA serial infrared physical link specification, 1.1e Appendix A for Ambient levels and Appendix B			
Operating temperature, T_A	Case to ambient thermal resistance ≤ 50°C/W	0	70	°C

electrical characteristics at V_{CC} = 5 V, T_A = 25°C (unless otherwise noted); test conditions represent worst-case values for the parameters under test

PARAMETER			TEST CONDITIONS	MIN	TYP	MAX	UNIT
V_{OL}	Low-level output voltage, receiver data	RXD-A	I_O = 1 mA, for in-band $E_e \geq 3.6$ μW/cm^2, $\phi^{1/2} \leq 15°$			0.5	V
		RXD-B	I_O = 1 mA, for in-band $E_e \geq 9$ μW/cm^2, $\phi^{1/2} \leq 15°$			0.5	
V_{OH}	High-level output voltage, receiver data	RXD-A	I_O = –20 μA, for in-band $E_e \leq 0.3$ μW/cm^2	V_{CC} –0.6			V
		RXD-B	I_O = –20 μA, for in-band $E_e \leq 0.3$ μW/cm^2	V_{CC} –1.2			
I_{IL}	Low-level input current, transmitter data	$I_{IL(TXD)}$	GND ≤ $V_{IL(TXD)}$ ≤ 0.3 V	–2		2	μA
I_{IH}	High-level input current, transmitter data	$I_{IH(TXD)}$	$V_{IH(TXD)}$ = 4.25 V		40	250	μA
v_T	On-state voltage LED anode	$v_{T(LEDA)}$	$I_{I(LED)}$ = 400 mA at 25°C $V_{IH(TXD)}$ = 4.25 V			2.78	V
$I_{D(lkg)}$	OFF-state leakage current, LED anode	$I_{D(lkg)(LEDA)}$	$V_{I(LEDA)}$ = V_{CC} = 5.25 V $V_{IL(TXD)}$ = 0.3 V			250	μA
I_{CC1}	Supply current, idle state		V_{CC} = 5.25 V $V_{I(TXD)}$ = V_{IL}, E_e = 0		3	5.1	mA
I_{CC2}	Supply current, active receiver		V_{CC} = 5.25 V $V_{I(TXD)}$ = V_{IL}, $E_e \leq 500$ nW/cm^2		4	18	mA

optical specifications

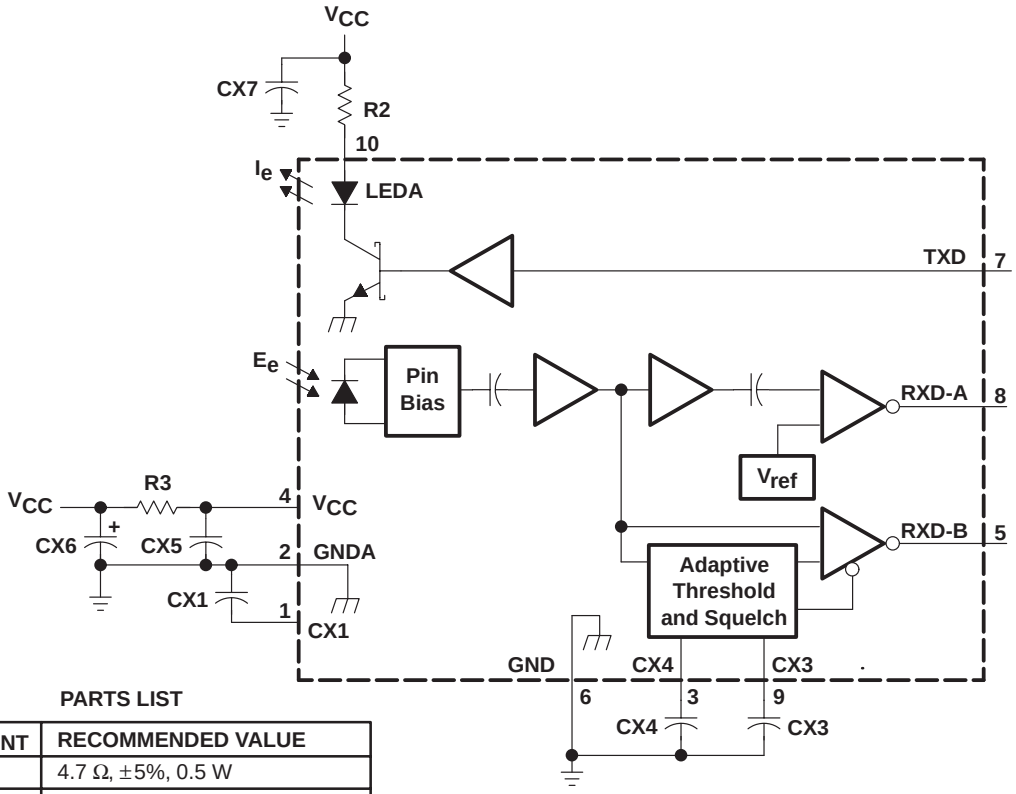
PARAMETER		CONDITIONS	MIN	TYP	MAX	UNIT
$2\phi^{1/2}$	Receiver viewing angle		±15			°
	Effective detector area			0.2		cm^2
I_e	Transmitter radiant intensity, logic high	$V_{IH(TXD)}$ = 4.25 V $I_{I(LED)}$ = 450 mA, $\Phi^{1/2} \leq 15°$, T_A = 25°C	100	177		mW/sr
		$V_{IH(TXD)}$ = 4.25 V $I_{I(LED)}$ = 450 mA, $\Phi^{1/2} \leq 15°$, 0°C ≤ T_A ≤ 70°C	80	177		mW/sr
λ_p	Transmitter peak-emission wavelength			875		nm
$\Delta\lambda^{1/2}$	Transmitter spectral-line half-width			35		nm
$2\Phi^{1/2}$	Transmitter viewing angle		±15		±30	°
	Receiver peak-emission sensitivity wave length			880		nm

switching characteristics

PARAMETER			TEST CONDITIONS	MIN	TYP	MAX	UNIT
$I_{e(PW)}$	Transmitter radiant intensity pulse width		$I_{e(PW)(TXD)}$ = 1.6 µs at 115.2k pulses/s	1.5	1.6	1.8	µs
			$I_{e(PW)(TXD)}$ = 125 ns at 2M pulses/s	115	125	135	ns
I_e	Transmitter radiant intensity	Rise time	$I_{e(PW)(TXD)}$ = 125 ns at 2M pulses/s			40	ns
		Fall time					
PW	Pulse width	RXD-A	$\Phi^{1/2}$ =≤ 15°	1		7.5	µs
		RXD-B		75		185	ns
PW	Pulse width, RXD-B (ASK)		500 kHz, 50% duty cycle carrier ASK	0.7	1	1.3	µs
t_L	Receiver latency time	RXD-A			0.5		ms
		RXD-B					

APPLICATION INFORMATION

schematic



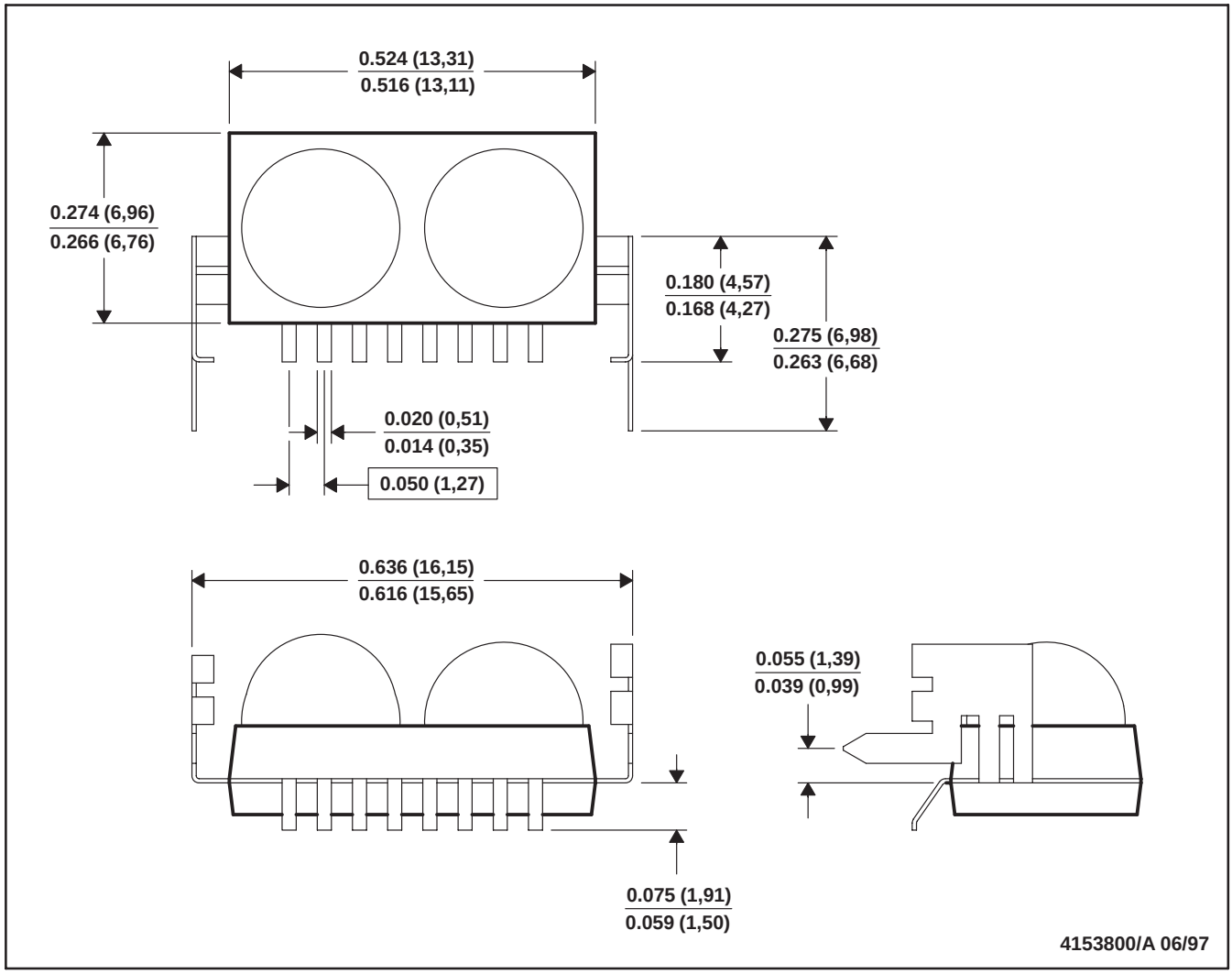
PARTS LIST

COMPONENT	RECOMMENDED VALUE
R2	4.7 Ω, ±5%, 0.5 W
R3	10 Ω, ±5%, 0.125 W
CX1†	0.47 µF, ±10%, X7R Ceramic
CX3	4700 pF, ±10%, X7R Ceramic
CX4	0.010 µF, ±10%, X7R Ceramic
CX5†	0.47 µF, ±20%, X7R Ceramic
CX6	6.8 µF, Tantalum
CX7	0.47 µF, ±20%, X7R Ceramic

† CX1 and CX5 must be placed within 0.7 cm of the TSLM1100 to obtain optimum noise immunity.

MECHANICAL DATA

SRA (R-PSIP-T8) **PLASTIC SMALL-OUTLINE PACKAGE**



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

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)
TSLM1100	OBSOLETE	OPTO	SRA	10		TBD	Call TI	Call TI

(1) The marketing status values are defined as follows:
ACTIVE: Product device recommended for new designs.
LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.
NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.
PREVIEW: Device has been announced but is not in production. Samples may or may not be available.
OBSOLETE: TI has discontinued the production of the device.

(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS) or Green (RoHS & no Sb/Br) - please check http://www.ti.com/productcontent for the latest availability information and additional product content details.
TBD: The Pb-Free/Green conversion plan has not been defined.
Pb-Free (RoHS): TI's 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, TI Pb-Free products are suitable for use in specified lead-free processes.
Green (RoHS & no Sb/Br): TI 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)

(3) MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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