

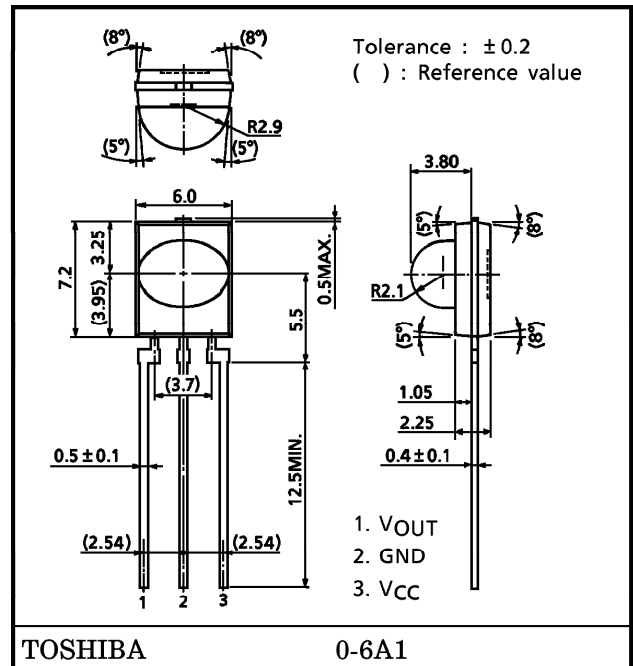
TOSHIBA PHOTO-IC Si MONOLITHIC PHOTO-IC

# TPS830

HIGH-SPEED OPTICAL REMOTE CONTROLLERS  
 CORDLESS CONTROLLERS FOR VIDEOGAMES  
 ELECTRONIC ORGANIZERS AND OTHER NEW  
 PORTABLE INFORMATION DEVICES  
 IR DATA COMMUNICATIONS

- Photodiode, I-V converter, band-pass filter and AGC amplifier all incorporated in a single chip
- Carrier frequency :  $f_0 = 455 \text{ kHz}$  (typ.)
- Supply voltage :  $V_{CC} = 5 \text{ V}$
- Visible light cut-off frequency :  $\lambda > 700 \text{ nm}$
- TLN105B and TLN231 available as infrared LEDs for remote controllers

Unit : mm



Weight : 0.3 g (typ.)

MAXIMUM RATINGS ( $T_a = 25^\circ\text{C}$ )

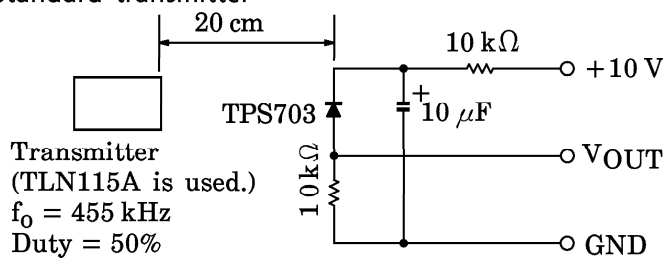
CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage	$V_{CC}$	7	V
Output Current	$I_O$	$\pm 10$	$\mu\text{A}$
Operating Temperature Range	$T_{opr}$	$-20 \sim 60$	$^\circ\text{C}$
Storage Temperature Range	$T_{stg}$	$-30 \sim 100$	$^\circ\text{C}$
Soldering Temperature Range (5 s)	$T_{sol}$	260	$^\circ\text{C}$

OPTICAL AND ELECTRICAL CHARACTERISTICS ( $V_{CC} = 5\text{ V}$ ,  $T_a = 25^\circ\text{C}$ ,  $C = 1000\text{ pF}$  : Note 1)

CHARACTERISTIC	SYMBOL	TEST CONDITION	Min	Typ.	Max	UNIT
Supply Voltage	$V_{CC}$	—	3	5	7	V
Supply Current	$I_{CC}$	$E=0$	—	1.2	3.0	mA
Electromagnetic Sensitivity	$E_S$	(Note 5)	—	250	—	$V_{p-p}/\text{m}$
Transmission Range	$L$ (Note 3)	The burst wave shown in Note 4 is transmitted by a standard transmitter (Note 2).	3	6	—	m
High-Level Output Voltage	$V_{OH}$		4.0	—	—	V
Low-Level Output Voltage	$V_{OL}$		—	—	0.5	V
ON Pulse Width	$T_{ON}$	External light intensity $< 500\text{ lx}$ Output current $< 10\text{ }\mu\text{A}$	16	25	40	$\mu\text{s}$
OFF Pulse Width	$T_{OFF}$		—	63	—	$\mu\text{s}$
Carrier Frequency	$f_o$	—	—	455	—	kHz
Peak Sensitivity Wavelength	$\lambda_P$	—	—	900	—	nm
Radiation Angle	$\theta_H$	Horizontal angle, $L/2$ (Note 6)	$\pm 55$	$\pm 63$	—	$^\circ$
	$\theta_V$	Vertical angle, $L/2$ (Note 6)	$\pm 25$	$\pm 30$	—	$^\circ$

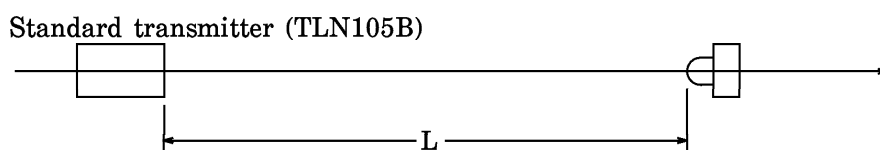
(Note 1) : Measurements for the TPS830 are based on a standard circuit which includes a 1000-pF capacitor between  $V_O$  and GND to prevent oscillation.

(Note 2) : Standard transmitter



In the figure above, the transmitter output  $V_{OUT}$  is 80 mVpp. The TPS703 in this application has a short-circuit current of  $I_{SC} = 1.24\text{ }\mu\text{A}$  when measured at  $E = 0.1\text{ mW}/\text{cm}^2$ . ( $E$  is the radiant incidence when a CIE standard light source A is used.)

(Note 3) : Transmission range  $L$



$L$  is the maximum distance at which burst waves can be received from the transmitter unit, and at which data can be processed by the receiver unit.

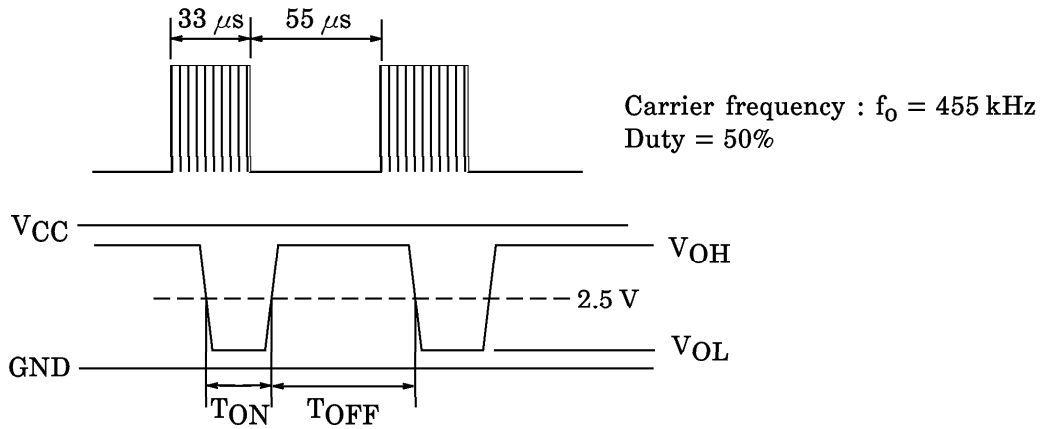
Note that when signals other than the recommended burst wave are transmitted, the transmission range may be reduced or a malfunction may occur.

(\*) The TLN105B is used as the standard LED transmitter.

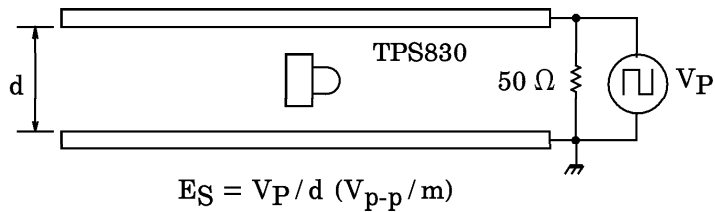
If the TLN231 is used instead, the transmission range is 1.2 times that of the TLN105B.

Example : 6 m (with TLN105B)  $\Rightarrow$  10.1 m (with TLN231)

(Note 4) : Burst wave



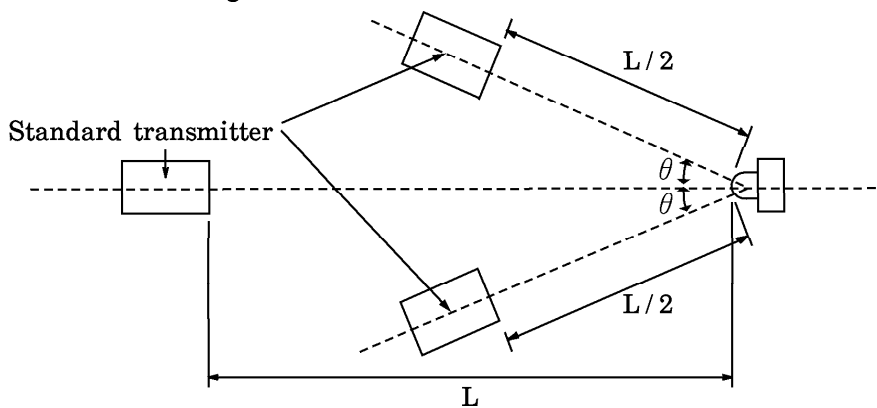
(Note 5) : Electromagnetic sensitivity



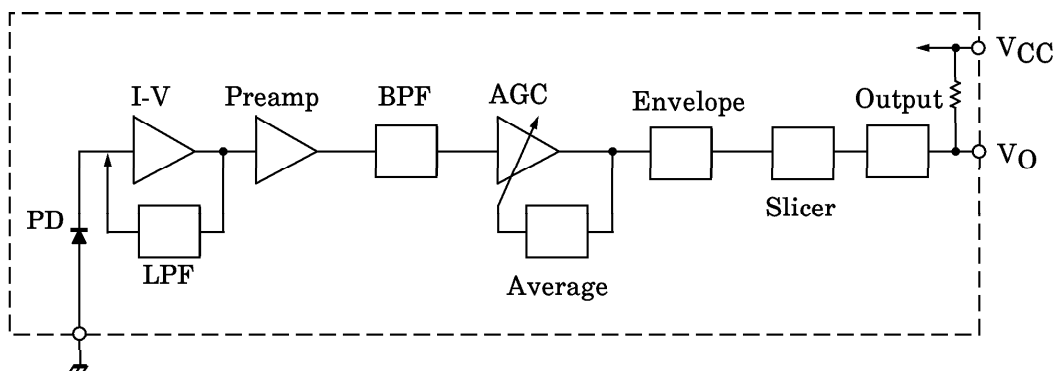
Mount the device between two parallel boards separated by a distance of  $d$ . Apply voltages modulated using frequencies ranging from 10 kHz to 50 MHz across the boards and read off the voltage at which noise is generated in the output from the device.

(\*) Usage in strong electromagnetic fields may affect the device. Please evaluate product in this type of environment before releasing them for actual use.

(Note 6) : Radiation angle



Circuit Block Diagram



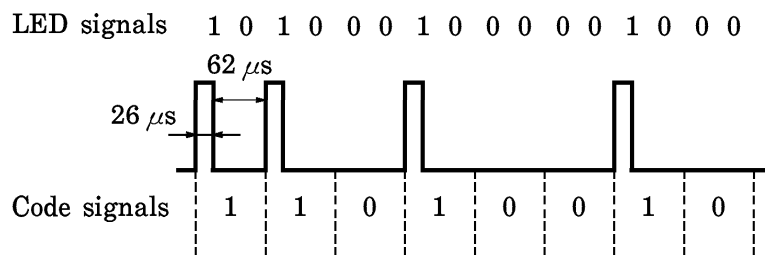
Bit pattern designing example (reference)

- Example of code signal = 11010010

Sequence of LED signals = 1 must be avoided. If LED signals of 1 sequence, TPS830 may not receive LED signals properly. After an LED signal of 1, 0 must be sent (55  $\mu$ s or longer interval necessary). Please take this into account when designing a bit pattern. The following shows the bit pattern t example that is converted at first code signals to LED signals as shown on the right diagram.

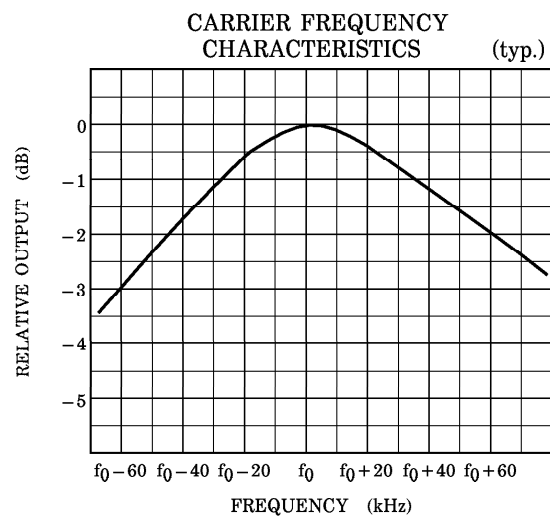
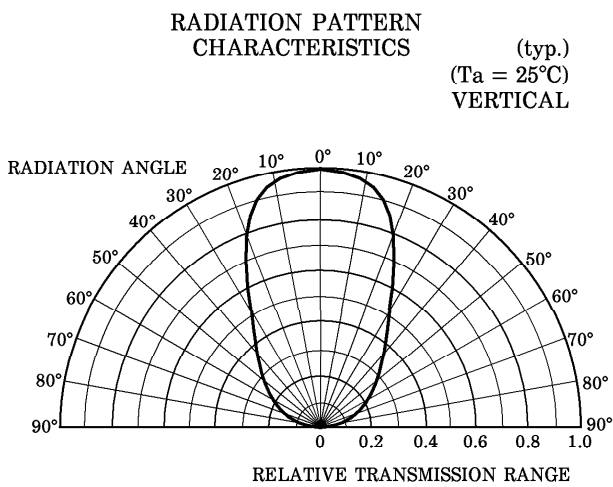
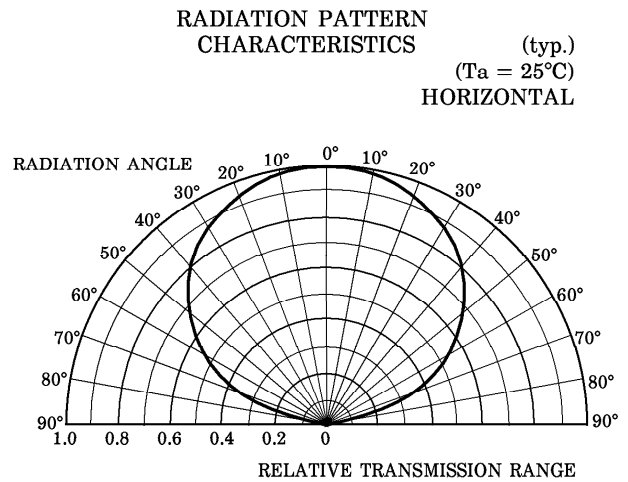
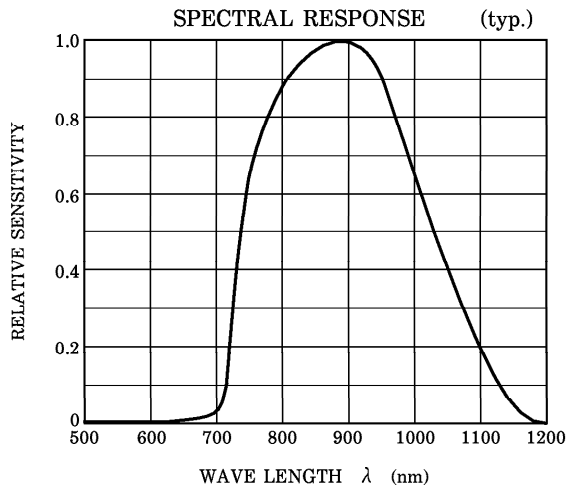
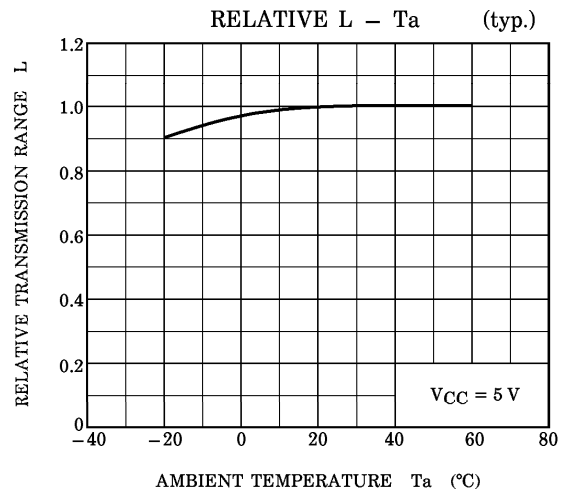
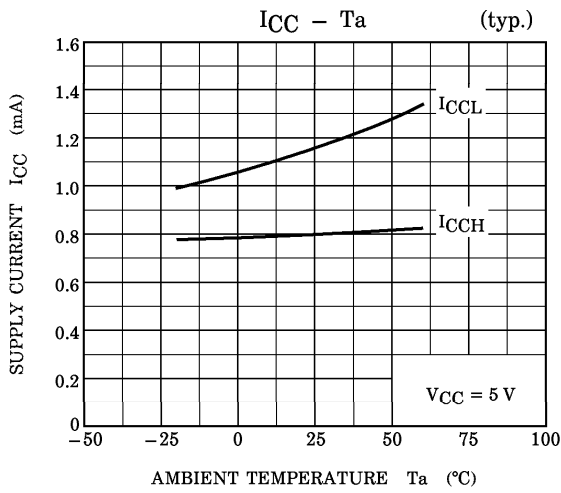
< Conversion example >		
Code signal	→	LED signal
0	→	00
1	→	10

<Pattern example>



PRECAUTIONS

1. To stabilize the power line, insert a bypass capacitor of up to 0.01  $\mu$ F between  $V_{CC}$  and GND, close to the device.
2. At power-on the internal circuit takes about 100  $\mu$ s to stabilize. During this period the output signal is unstable and may change.
3. To avoid unnecessary oscillation, insert a bypass capacitor of 1000 pF between  $V_{CC}$  and GND.
4. When using the device, please take the device's characteristics, the operating environment and the characteristics of pairing LED device into considerations.
5. Soldering temperature :  $\leq 260^{\circ}C$ , Soldering time :  $\leq 5$  s (Soldering must be performed under the 2 mm from the body of the device.)
6. When forming the leads, bend each lead under the 2 mm from the body of the device. Soldering must be performed after the leads have been formed.



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