

TOSHIBA PHOTO-IC Si MONOLITHIC PHOTO-IC

## TPS831

HIGH-SPEED OPTICAL REMOTE CONTROLLERS

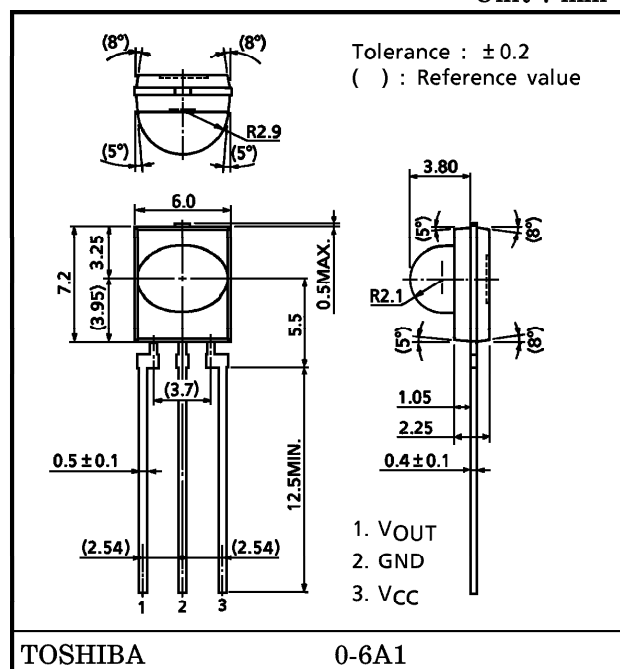
CORDLESS CONTROLLERS FOR VIDEOGAMES

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 :  $800 \text{ nm}$
- TLN105B and TLN115A available as infrared LEDs for remote controllers

Unit : mm



Weight : 0.3 g (typ.)

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

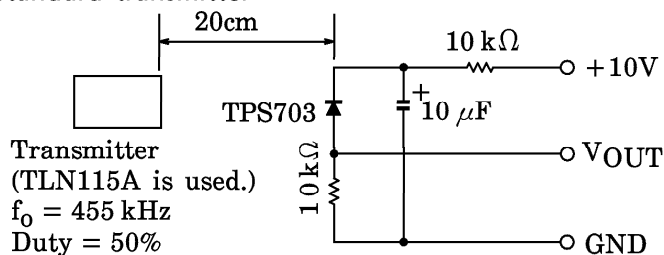
| CHARACTERISTIC                   | SYMBOL    | RATING         | UNIT             |
|----------------------------------|-----------|----------------|------------------|
| Supply Voltage                   | $V_{CC}$  | 7              | V                |
| Operating Temperature Range      | $T_{opr}$ | $-20 \sim 60$  | $^\circ\text{C}$ |
| Storage Temperature Range        | $T_{stg}$ | $-30 \sim 100$ | $^\circ\text{C}$ |
| Soldering Temperature Range (5s) | $T_{sol}$ | 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      | —   | $V_{p-p}/m$   |
| Transmission Range          | $L$ (Note 3) | The burst wave shown in Note 4 is transmitted by a standard transmitter (Note 2).      | 3        | 5        | —   | 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 $< 500\text{ lx}$<br>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           |
| Radiation Angle             | $\theta_H$   | Horizontal angle, $L/2$ (Note 6)                                                       | $\pm 55$ | $\pm 63$ | —   | $^\circ$      |
|                             | $\theta_V$   | Vertical angle, $L/2$ (Note 6)                                                         | $\pm 25$ | $\pm 30$ | —   | $^\circ$      |

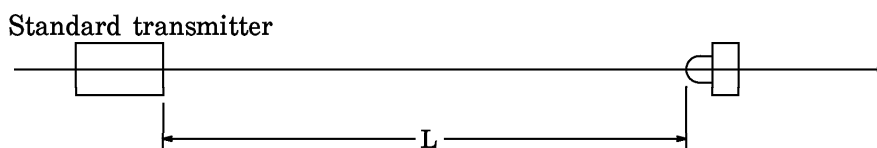
(Note 1) : Measurements for the TPS831 are based on a standard circuit which includes a 1000-pF capacitor between  $V_O$  and GND to prevent oscillation.

(Note 2) : Standard transmitter

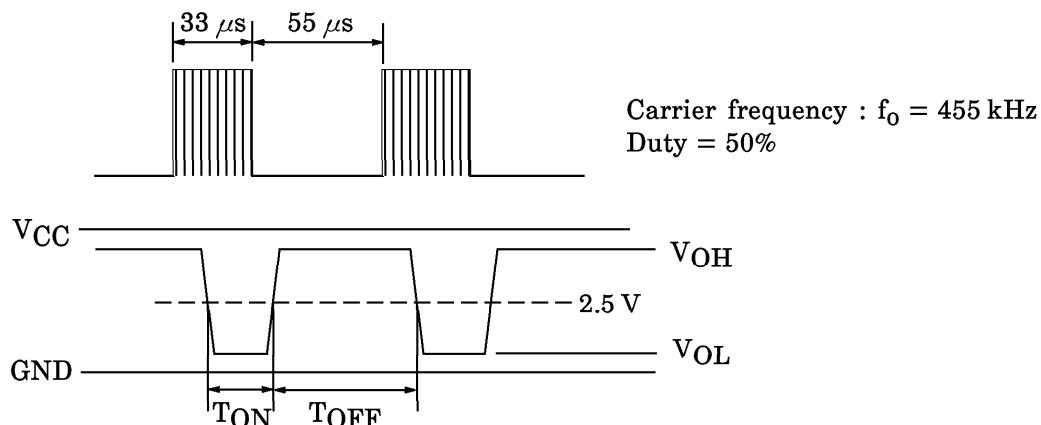


In the figure above, the transmitter output  $V_{OUT}$  is 80 mVpp.  
The TPS703 in this application has a short-circuit current of  $I_{SC} = 1.24\text{ }\mu\text{A}$  when measured at  $E = 0.1\text{ mW}/\text{cm}^2$ . ( $E$  is the radiant incidence when a CIE standard light source A is used.)

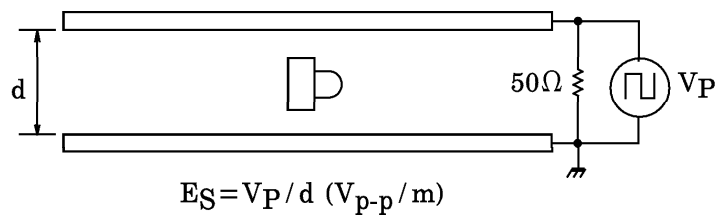
(Note 3) : Transmission range  $L$



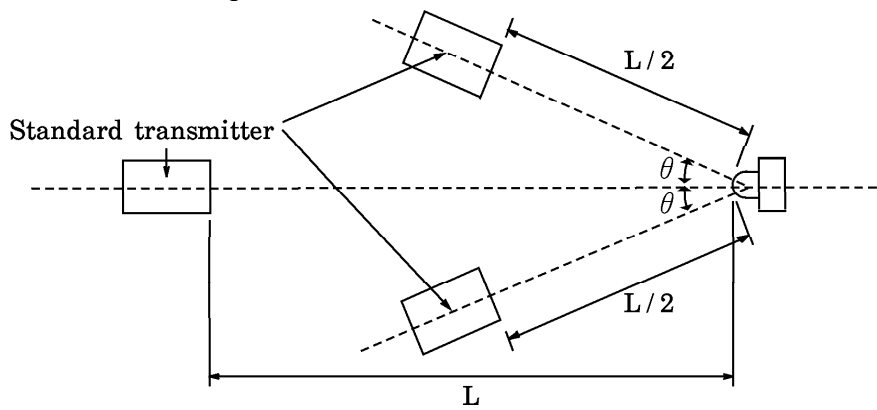
(Note 4) Burst wave



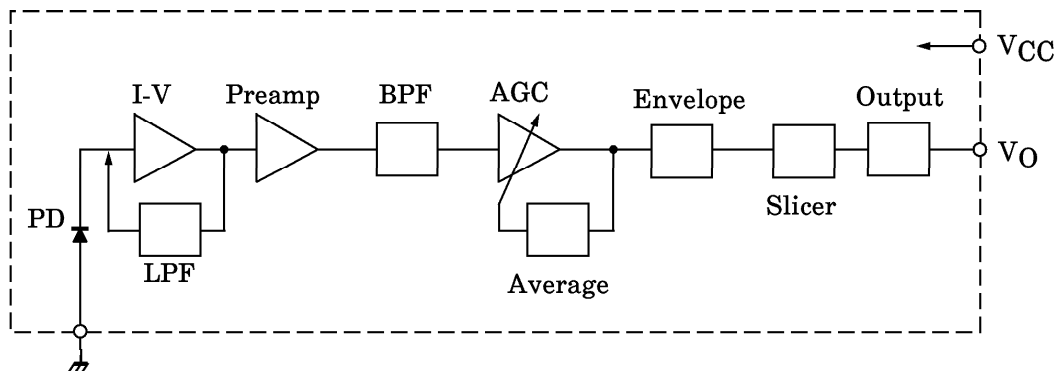
(Note 5) : Electromagnetic sensitivity



(Note 6) : Radiation angle



Circuit block diagram



### Bit pattern designing example (reference)

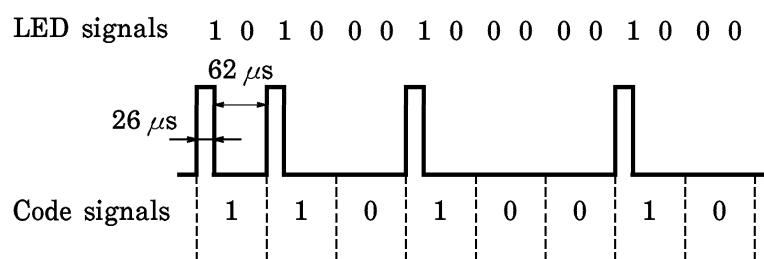
- Example of code signal = 11010010

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 example that is converted at first code signals to LED signals as shown on the right diagram.

#### <Conversion example>

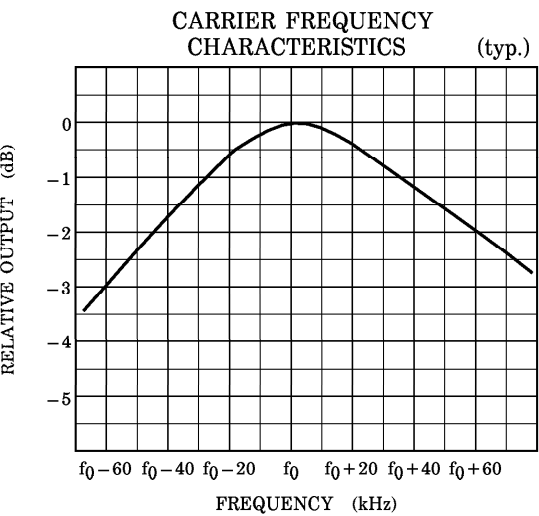
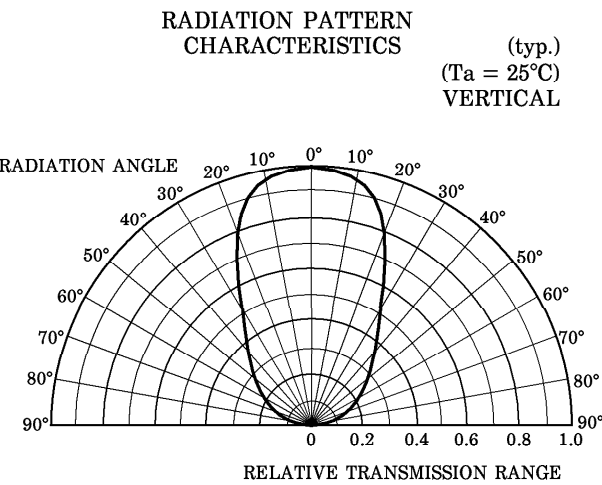
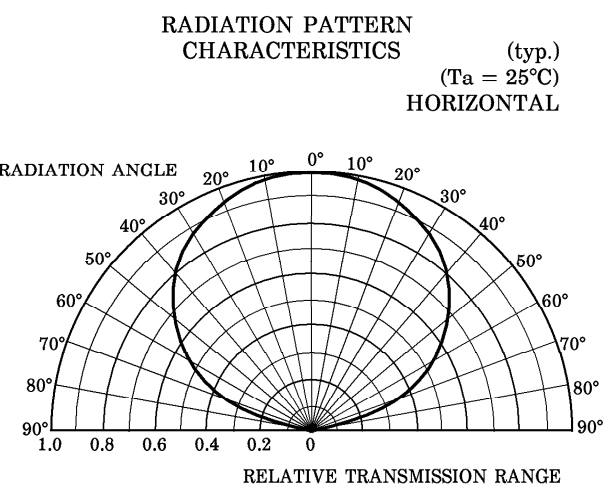
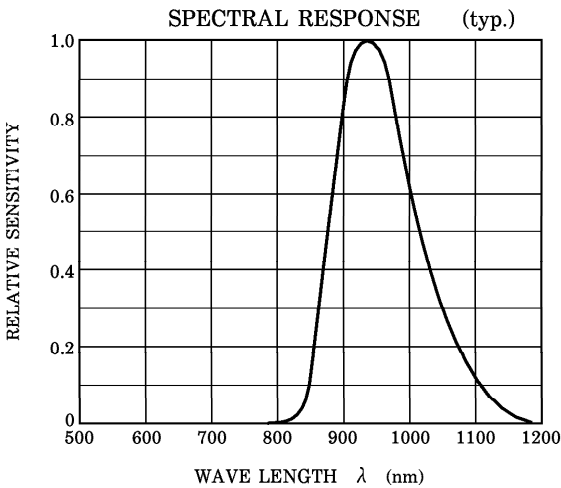
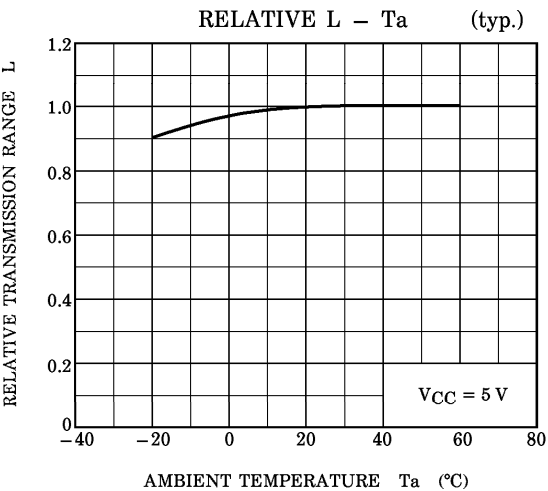
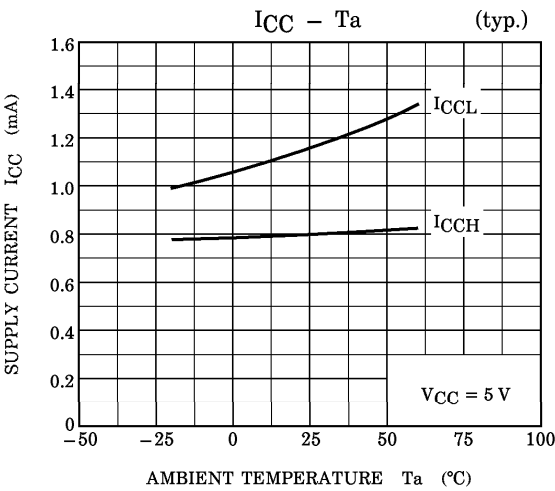
| Code signal | LED signal |
|-------------|------------|
| 0           | → 00       |
| 1           | → 10       |

#### <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 :  $\leq 260^{\circ}\text{C}$ , 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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