

# TLP633, 634

(TLP633)

- OFFICE MACHINE.
- HOUSEHOLD USE EQUIPMENT.
- SOLID STATE RELAY.
- SWITCHING POWER SUPPLY.

The TOSHIBA TLP633 and TLP634 consists of a photo-transistor optically coupled to a gallium arsenide infrared emitting diode in a six lead plastic DIP package. TLP634 is no-base internal connection for high-EMI environments.

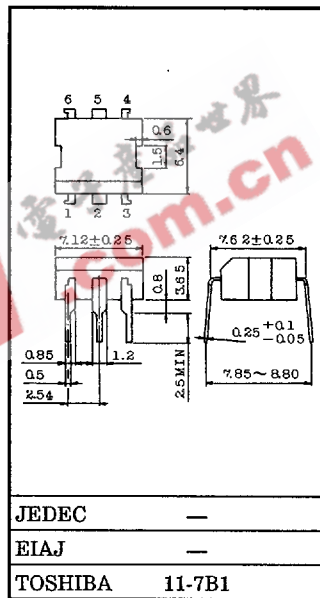
- Collector-emitter Voltage : 55V (Min.)
- Current Transfer Ratio : 50% (Min.)  
Rank GB : 100% (Min.)
- UL Recognized : UL1577, File No. E67349
- BSI Approved : BS415:1990, BS7002:1989 (EN60950)  
Certificate No. 7123, 7437
- SEMKO Approved : SS4330784,  
Certificate No. 8937148 (TLP633)  
9019123 (TLP634)
- Isolation Voltage : 4000V<sub>rms</sub> (Min.)
- Option (D4) type  
VDE Approved : DIN VDE0884/08.87,  
Certificate No. 68367

Maximum Operating Insulation Voltage : 630Vpk  
Highest Permissible Over Voltage : 6000vpk

(Note) When a VDE0884 approved type is needed,  
Please designate the "option (D4)"

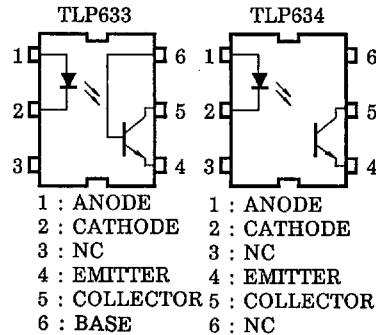
- |                        | 7.62mm pitch<br>standard type | 10.16mm pitch<br>(LF2) type |
|------------------------|-------------------------------|-----------------------------|
| • Creepage Distance    | : 7.0mm (Min)                 | 8.0mm (Min)                 |
| Clearance              | : 7.0mm (Min)                 | 8.0mm (Min)                 |
| Internal Creepage Path | : 4.0mm (Min)                 | 4.0mm (Min)                 |
| Insulation Thickness   | : 0.5mm (Min)                 | 0.5mm (Min)                 |

Unit in mm



Weight : 0.37g

PIN CONFIGURATIONS (TOP VIEW)



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## Current Transfer Ratio

| TYPE   | CLASSIFICATION<br>*1 | CURRENT TRANSFER RATIO (%)<br>( $I_C/I_F$ )              |      | MARKING OF CLASSIFICATION   |
|--------|----------------------|--|------|---|
|        |                      | $I_F=5\text{mA}, V_{CE}=5\text{V}, T_a=25^\circ\text{C}$ |      |   |
|        |                      | MIN.   | MAX. |   |
| TLP633 | (None)               | 50   | 600  | BLANK, Y, Y <sup>■</sup> , G, G <sup>■</sup> , B, B <sup>■</sup> , GB |
|        | Rank GR              | 100  | 300  | Y, Y <sup>■</sup> , G, G <sup>■</sup>                                 |
| TLP634 | (None)               | 200  | 600  | B, B <sup>■</sup>   |
|        | Rank GB              | 100  | 600  | G, G <sup>■</sup> , B, B <sup>■</sup> , GB                            |

\*1 : Ex. Rank GB : TLP633 (GB)

Note : Application type name for certification test, please use standard product type name, i. e.

TLP633 (GB) : TLP633

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

| CHARACTERISTIC   |  | SYMBOL                        | RATING                | UNIT                  |
|--|--|-------------------------------|-----------------------|-----------------------|
| LED  | Forward Current  | $I_F$                         | 60                    | mA                    |
|  | Forward Current Derating ( $T_a \geq 39^\circ\text{C}$ )   | $\Delta I_F / ^\circ\text{C}$ | -0.7                  | mA / $^\circ\text{C}$ |
|  | Peak Forward Current (100 $\mu\text{s}$ pulse, 100pps)     | $I_{FP}$                      | 1                     | A                     |
|  | Reverse Voltage  | $V_R$                         | 5                     | V                     |
|  | Junction Temperature                                       | $T_j$                         | 125                   | $^\circ\text{C}$      |
| DETECTOR   | Collector-Emitter Voltage                                  | $V_{CEO}$                     | 55                    | V                     |
|  | Collector-Base Voltage (TLP633)                            | $V_{CBO}$                     | 80                    | V                     |
|  | Emitter-Collector Voltage                                  | $V_{ECO}$                     | 7                     | V                     |
|  | Emitter-Base Voltage (TLP633)                              | $V_{EBO}$                     | 7                     | V                     |
|  | Collector Current  | $I_C$                         | 50                    | mA                    |
|  | Power Dissipation  | $P_C$                         | 150                   | mW                    |
|  | Power Dissipation Derating ( $T_a \geq 25^\circ\text{C}$ ) | $\Delta P_C / ^\circ\text{C}$ | -1.5                  | mW / $^\circ\text{C}$ |
|  | Junction Temperature                                       | $T_j$                         | 125                   | $^\circ\text{C}$      |
|  | Storage Temperature Range                                  | $T_{stg}$                     | -55~150               | $^\circ\text{C}$      |
|  | Operating Temperature Range                                | $T_{opr}$                     | -55~100               | $^\circ\text{C}$      |
| Lead Soldering Temperature (10 s)  | $T_{sol}$  | 260                           | $^\circ\text{C}$      |                       |
| Total Package Power Dissipation  | $P_T$  | 250                           | mW                    |                       |
| Total Package Power Dissipation Derating ( $T_a \geq 25^\circ\text{C}$ ) | $\Delta P_T / ^\circ\text{C}$                              | -2.5                          | mW / $^\circ\text{C}$ |                       |
| Isolation Voltage (AC, 1min., RH $\leq$ 60%) (Note 1)                    | $BV_S$   | 4000                          | Vrms                  |                       |

Note 1 : Device considered a two-terminal device : Pins 1, 2 and 3 shorted together and pins 4, 5 and 6 shorted together.

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## INDIVIDUAL ELECTRICAL CHARACTERISTICS (Ta = 25°C)

| CHARACTERISTIC |   | SYMBOL        | TEST CONDITION  | MIN. | TYP. | MAX. | UNIT          |
|----------------|---|---------------|---|------|------|------|---------------|
| LED            | Forward Voltage                           | $V_F$         | $I_F = 10\text{mA}$   | 1.0  | 1.15 | 1.3  | V             |
|                | Reverse Current                           | $I_R$         | $V_R = 5\text{V}$   | —    | —    | 10   | $\mu\text{A}$ |
|                | Capacitance                               | $C_T$         | $V = 0, f = 1\text{MHz}$  | —    | 30   | —    | pF            |
| DETECTOR       | Collector-Emitter Breakdown Voltage       | $V_{(BR)CEO}$ | $I_C = 0.5\text{mA}$  | 55   | —    | —    | V             |
|                | Emitter-Collector Breakdown Voltage       | $V_{(BR)ECO}$ | $I_E = 0.1\text{mA}$  | 7    | —    | —    | V             |
|                | Collector-Base Breakdown Voltage (TLP633) | $V_{(BR)CBO}$ | $I_C = 0.1\text{mA}$  | 80   | —    | —    | V             |
|                | Emitter-Base Breakdown Voltage (TLP633)   | $V_{(BR)EBO}$ | $I_E = 0.1\text{mA}$  | 7    | —    | —    | V             |
|                | Collector Dark Current                    | $I_{CEO}$     | $V_{CE} = 24\text{V}$   | —    | 10   | 100  | nA            |
|                | Collector Dark Current                    | $I_{CER}$     | $V_{CE} = 24\text{V}, T_a = 85^\circ\text{C}$                               | —    | 2    | 50   | $\mu\text{A}$ |
|                | Collector Dark Current (TLP633)           | $I_{CER}$     | $V_{CE} = 24\text{V}, T_a = 85^\circ\text{C}$<br>$R_{BE} = 1\text{M}\Omega$ | —    | 0.5  | 10   | $\mu\text{A}$ |
|                | Collector Dark Current (TLP633)           | $I_{CBO}$     | $V_{CB} = 10\text{V}$   | —    | 0.1  | —    | nA            |
|                | DC Forward Current Gain (TLP633)          | $h_{FE}$      | $V_{CE} = 5\text{V}, I_C = 0.5\text{mA}$                                    | —    | 400  | —    | —             |
|                | Capacitance Collector to Emitter          | $C_{CE}$      | $V = 0, f = 1\text{MHz}$  | —    | 10   | —    | pF            |



## COUPLED ELECTRICAL CHARACTERISTICS (Ta = 25°C)

| CHARACTERISTIC                       | SYMBOL             | TEST CONDITION                                      | MIN. | TYP. | MAX. | UNIT          |
|--------------------------------------|--------------------|---|------|------|------|---------------|
| Current Transfer Ratio               | $I_C / I_F$        | $I_F = 5\text{mA}, V_{CE} = 5\text{V}$<br>Rank GB   | 50   | —    | 600  | %             |
|                                      |                    |   | 100  | —    | 600  |               |
| Saturated CTR                        | $I_C / I_{F(sat)}$ | $I_F = 1\text{mA}, V_{CE} = 0.4\text{V}$<br>Rank GB | —    | 60   | —    | %             |
|                                      |                    |   | 30   | —    | —    |               |
| Base Photo-Current                   | $I_{PB}$           | $I_F = 5\text{mA}, V_{CB} = 5\text{V}$              | —    | 10   | —    | $\mu\text{A}$ |
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$      | $I_C = 2.4\text{mA}, I_F = 8\text{mA}$<br>Rank GB   | —    | —    | 0.4  | V             |
|                                      |                    |   | —    | 0.2  | —    |               |
|                                      |                    |   | —    | —    | 0.4  |               |

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## ISOLATION CHARACTERISTICS (Ta = 25°C)

| CHARACTERISTIC                | SYMBOL | TEST CONDITION      | MIN.               | TYP.             | MAX. | UNIT |
|-------------------------------|--------|---------------------|--------------------|------------------|------|------|
| Capacitance (Input to Output) | CS     | VS=0, f=1MHz        | —                  | 0.8              | —    | pF   |
| Isolation Resistance          | RS     | VS=500V             | 5×10 <sup>10</sup> | 10 <sup>14</sup> | —    | Ω    |
| Isolation Voltage             | BVS    | AC, 1minute         | 4000               | —                | —    | Vrms |
|                               |        | AC, 1second, in oil | —                  | 10000            | —    | Vrms |
|                               |        | DC, 1minute, in oil | —                  | 10000            | —    | Vdc  |

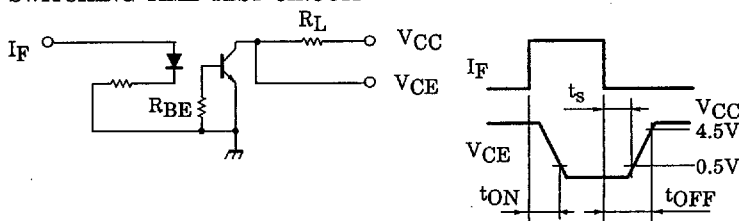
## SWITCHING CHARACTERISTICS (Ta = 25°C)

| CHARACTERISTIC | SYMBOL | TEST CONDITION  | MIN. | TYP. | MAX. | UNIT |
|----------------|--------|---|------|------|------|------|
| Rise Time      | tr     | VCC=10V<br>IC=2mA<br>RL=100Ω                              | —    | 2    | —    | μs   |
| Fall Time      | tf     |   | —    | 3    | —    |      |
| Turn-on Time   | tON    |   | —    | 3    | 10   |      |
| Turn-off Time  | tOFF   |   | —    | 3    | 10   |      |
| Turn-on Time   | tON    | RL=1.9kΩ (Fig.1)<br>RBE=OPEN<br>VCC=5V, IF=16mA           | —    | 3    | —    | μs   |
| Storage Time   | ts     |   | —    | 40   | —    |      |
| Turn-off Time  | tOFF   |   | —    | 90   | —    |      |
| Turn-on Time   | tON    | RL=1.9kΩ (Fig.1)<br>RBE=220kΩ (TLP633)<br>VCC=5V, IF=16mA | —    | 3    | —    | μs   |
| Storage Time   | ts     |   | —    | 30   | —    |      |
| Turn-off Time  | tOFF   |   | —    | 60   | —    |      |

## RECOMMENDED OPERATING CONDITIONS

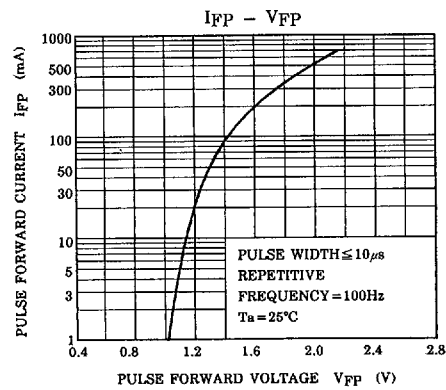
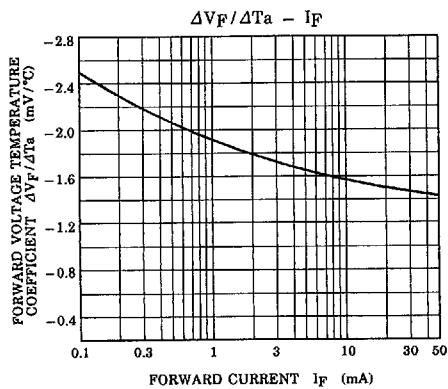
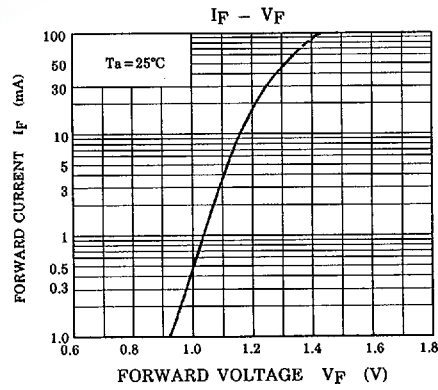
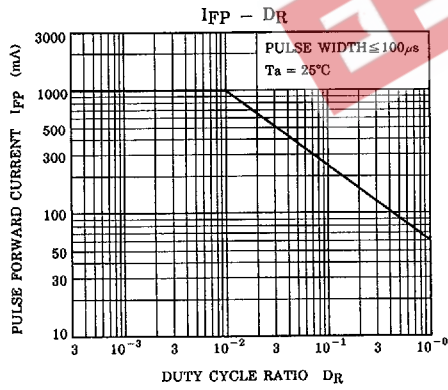
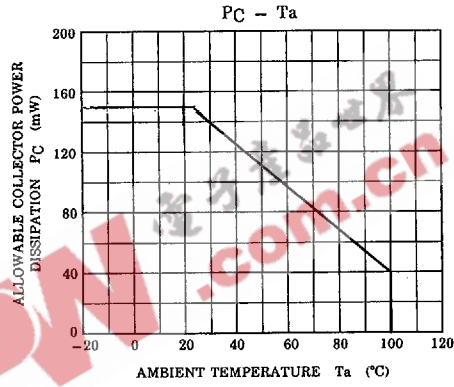
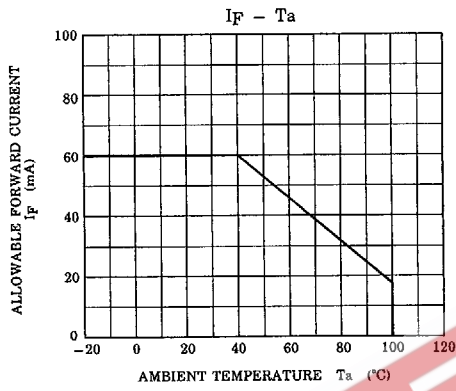
| CHARACTERISTIC        | SYMBOL | MIN. | TYP. | MAX. | UNIT |
|-----------------------|--------|------|------|------|------|
| Supply Voltage        | VCC    | —    | 5    | 24   | V    |
| Forward Current       | IF     | —    | 16   | 25   | mA   |
| Collector Current     | IC     | —    | 1    | 10   | mA   |
| Operating Temperature | Topr   | -25  | —    | 85   | °C   |

Fig. 1 SWITCHING TIME TEST CIRCUIT



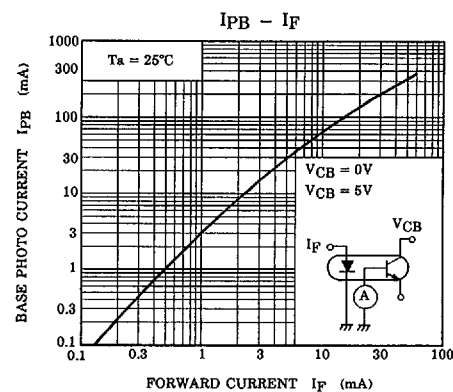
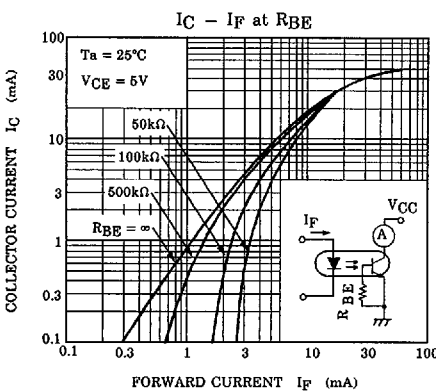
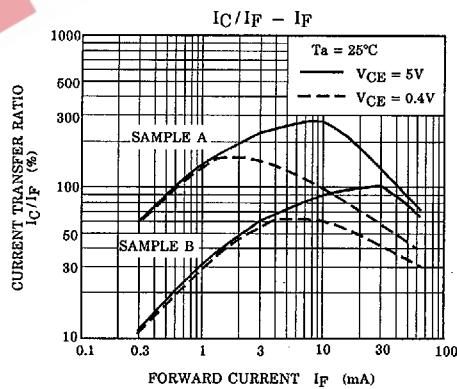
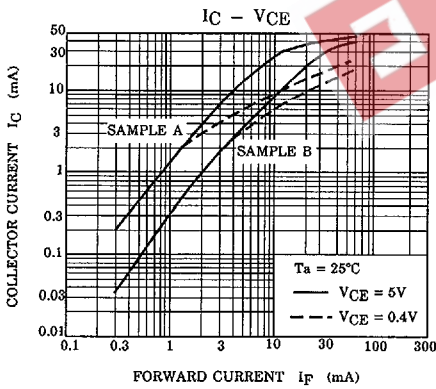
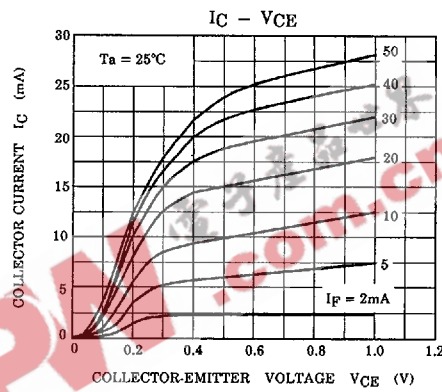
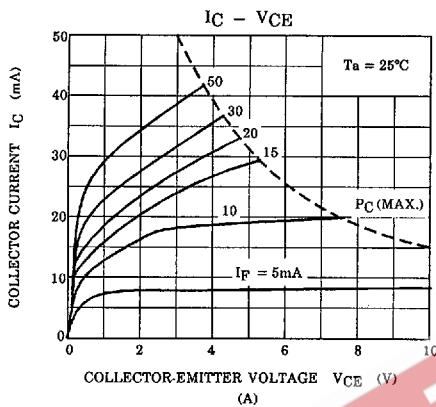
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