

(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.

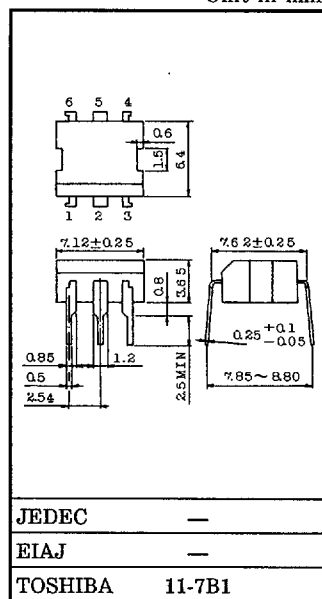
- Collector-emitter Voltage : 55V (Min.)
- Current Transfer Ratio : 50% (Min.)
- Rank GB : 100% (Min.)
- UL Recognized : UL1577, File No. E67349
- BSI Approved : BS415 : 1990, BS7002 : 1989  
(EN60950)  
Certificate No. 7123, 7437
- SEMKO Approved : SS4330784,  
Certificate No. 8937148 (TLP633)  
9019123 (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)"

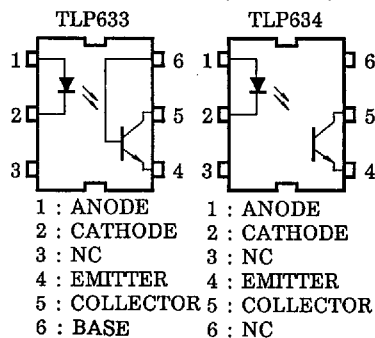
- |                        | 7.62mm pitch<br>standard type | 10.16mm pitch<br>(LF2) type |
|------------------------|-------------------------------|-----------------------------|
| • Creepage Distance    | : 7.0mm (Min)                 | 8.0mm (Min)                 |
| Clearance              | : 7.0mm (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   | CLASSI-<br>FICATION<br><br>※1 | CURRENT TRANSFER<br>RATIO (%)<br>(I <sub>C</sub> / I <sub>F</sub> ) |      | MARKING OF CLASSIFICATION                                             |
|--------|-------------------------------|---------------------------------------------------------------------|------|-----------------------------------------------------------------------|
|        |                               | I <sub>F</sub> = 5mA, V <sub>CE</sub> = 5V, T <sub>a</sub> = 25°C   |      |                                                                       |
|        |                               | MIN.                                                                | MAX. |                                                                       |
| TLP633 | (None)                        | 50                                                                  | 600  | BLANK, Y, Y <sup>■</sup> , G, G <sup>■</sup> , B, B <sup>■</sup> , GB |
|        |                               | 50                                                                  | 150  | Y, Y <sup>■</sup>                                                     |
| TLP634 | Rank GR                       | 100                                                                 | 300  | G, G <sup>■</sup>                                                     |
|        |                               | 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)                    |                                                            | $BVS$                         | 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            |
|                |                                           |               | $V_{CE} = 24\text{V}, T_a = 85^\circ\text{C}$                               | —    | 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                        | $I_C / I_F(\text{sat})$ | $I_F = 1\text{mA}, V_{CE} = 0.4\text{V}$<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 | $V_{CE}(\text{sat})$    | $I_C = 2.4\text{mA}, I_F = 8\text{mA}$              | —    | —    | 0.4  | V             |
|                                      |                         | $I_C = 0.2\text{mA}, I_F = 1\text{mA}$              | —    | 0.2  | —    |               |
|                                      |                         | Rank GB                                             | —    | —    | 0.4  |               |

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## ISOLATION CHARACTERISTICS (Ta = 25°C)

| CHARACTERISTIC                | SYMBOL          | TEST CONDITION            | MIN.               | TYP.             | MAX. | UNIT             |
|-------------------------------|-----------------|---------------------------|--------------------|------------------|------|------------------|
| Capacitance (Input to Output) | C <sub>S</sub>  | V <sub>S</sub> =0, f=1MHz | —                  | 0.8              | —    | pF               |
| Isolation Resistance          | R <sub>S</sub>  | V <sub>S</sub> =500V      | 5×10 <sup>10</sup> | 10 <sup>14</sup> | —    | Ω                |
| Isolation Voltage             | BV <sub>S</sub> | AC, 1minute               | 4000               | —                | —    | V <sub>rms</sub> |
|                               |                 | AC, 1second, in oil       | —                  | 10000            | —    |                  |
|                               |                 | DC, 1minute, in oil       | —                  | 10000            | —    | V <sub>dc</sub>  |

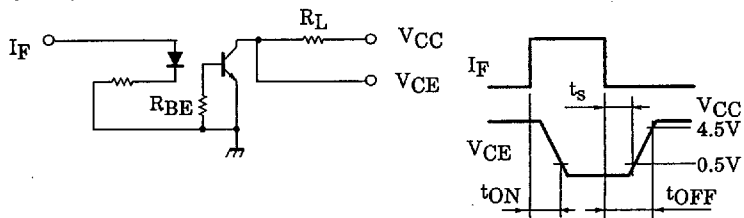
## SWITCHING CHARACTERISTICS (Ta = 25°C)

| CHARACTERISTIC | SYMBOL           | TEST CONDITION                                                                                                | MIN. | TYP. | MAX. | UNIT |
|----------------|------------------|---------------------------------------------------------------------------------------------------------------|------|------|------|------|
| Rise Time      | t <sub>r</sub>   | V <sub>CC</sub> =10V<br>I <sub>C</sub> =2mA<br>R <sub>L</sub> =100Ω                                           | —    | 2    | —    | μs   |
| Fall Time      | t <sub>f</sub>   |                                                                                                               | —    | 3    | —    |      |
| Turn-on Time   | t <sub>ON</sub>  |                                                                                                               | —    | 3    | 10   |      |
| Turn-off Time  | t <sub>OFF</sub> |                                                                                                               | —    | 3    | 10   |      |
| Turn-on Time   | t <sub>ON</sub>  | R <sub>L</sub> =1.9kΩ (Fig.1)<br>R <sub>BE</sub> =OPEN<br>V <sub>CC</sub> =5V, I <sub>F</sub> =16mA           | —    | 3    | —    | μs   |
| Storage Time   | t <sub>s</sub>   |                                                                                                               | —    | 40   | —    |      |
| Turn-off Time  | t <sub>OFF</sub> |                                                                                                               | —    | 90   | —    |      |
| Turn-on Time   | t <sub>ON</sub>  | R <sub>L</sub> =1.9kΩ (Fig.1)<br>R <sub>BE</sub> =220kΩ (TLP633)<br>V <sub>CC</sub> =5V, I <sub>F</sub> =16mA | —    | 3    | —    | μs   |
| Storage Time   | t <sub>s</sub>   |                                                                                                               | —    | 30   | —    |      |
| Turn-off Time  | t <sub>OFF</sub> |                                                                                                               | —    | 60   | —    |      |

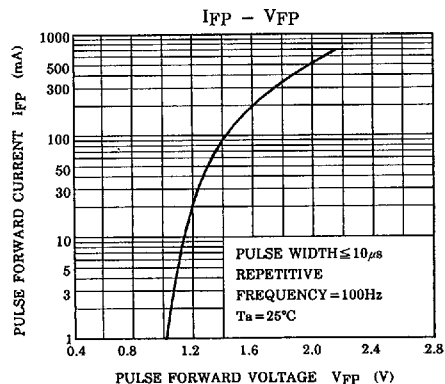
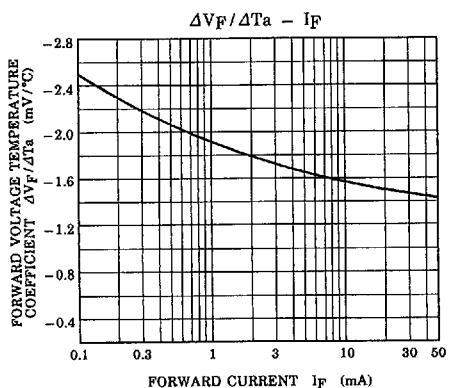
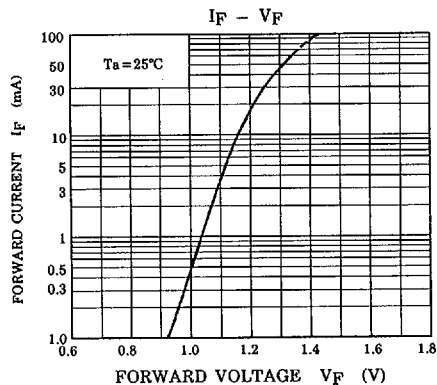
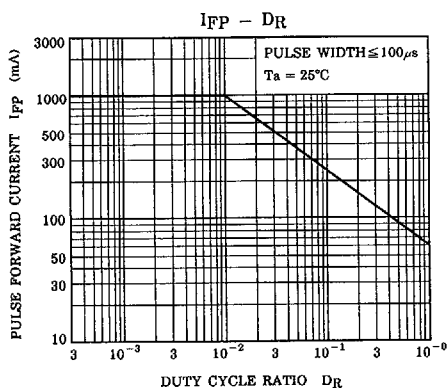
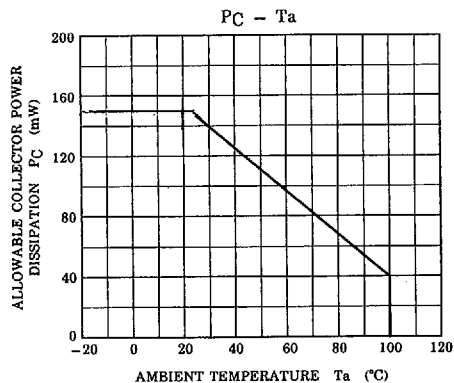
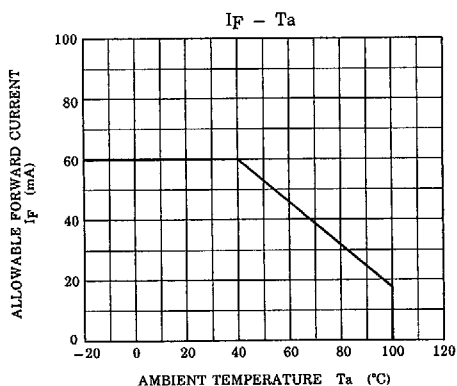
## RECOMMENDED OPERATING CONDITIONS

| CHARACTERISTIC        | SYMBOL           | MIN. | TYP. | MAX. | UNIT |
|-----------------------|------------------|------|------|------|------|
| Supply Voltage        | V <sub>CC</sub>  | —    | 5    | 24   | V    |
| Forward Current       | I <sub>F</sub>   | —    | 16   | 25   | mA   |
| Collector Current     | I <sub>C</sub>   | —    | 1    | 10   | mA   |
| Operating Temperature | T <sub>opr</sub> | -25  | —    | 85   | °C   |

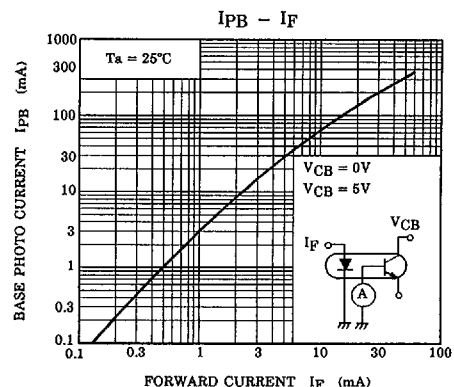
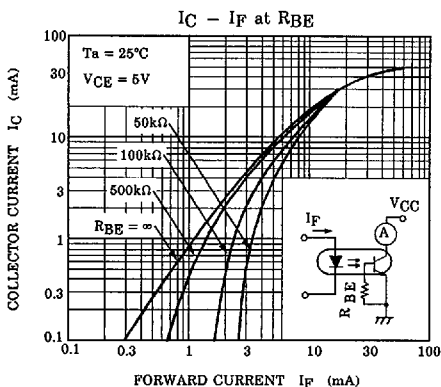
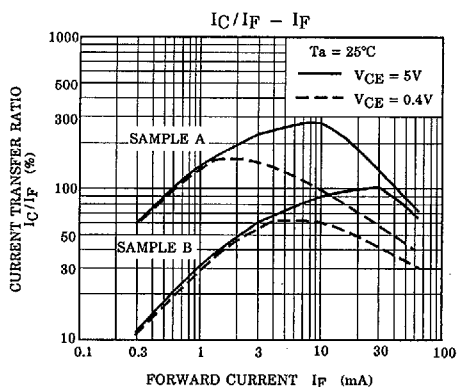
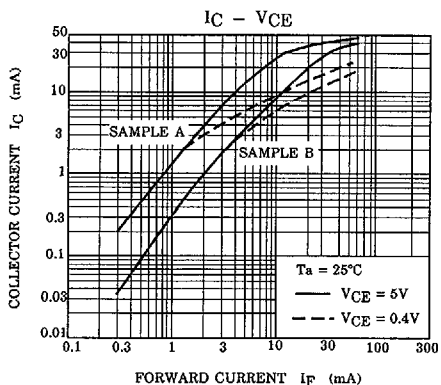
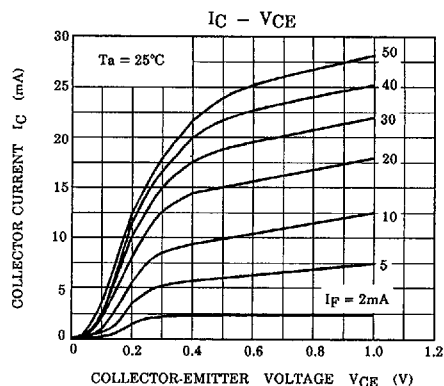
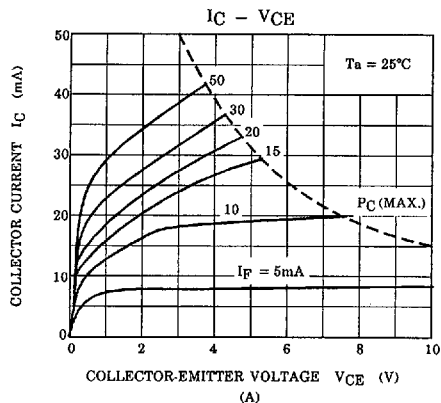
Fig. 1 SWITCHING TIME TEST CIRCUIT



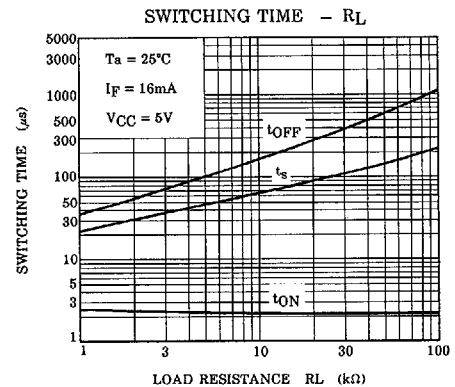
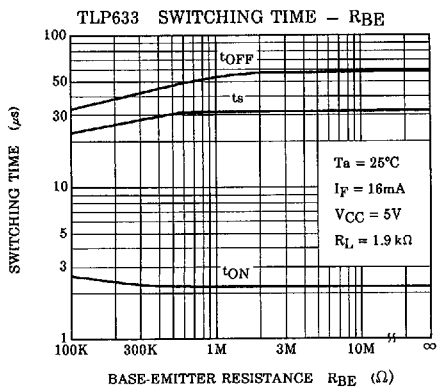
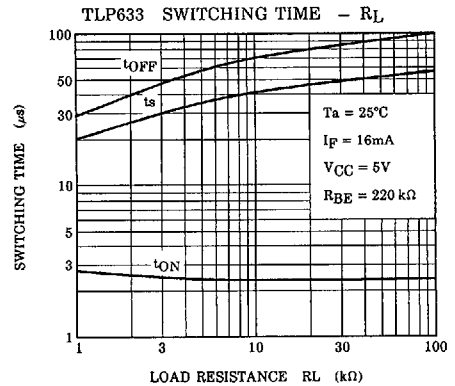
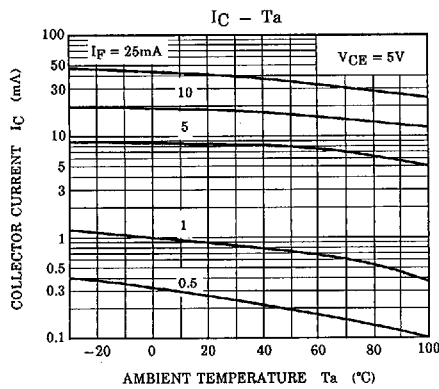
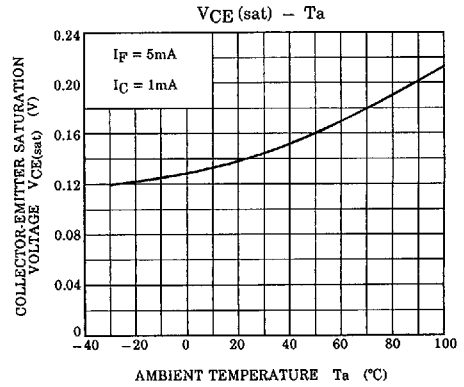
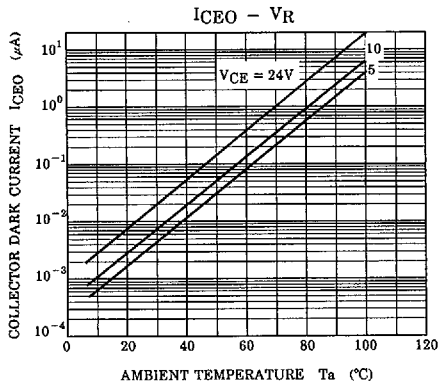
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