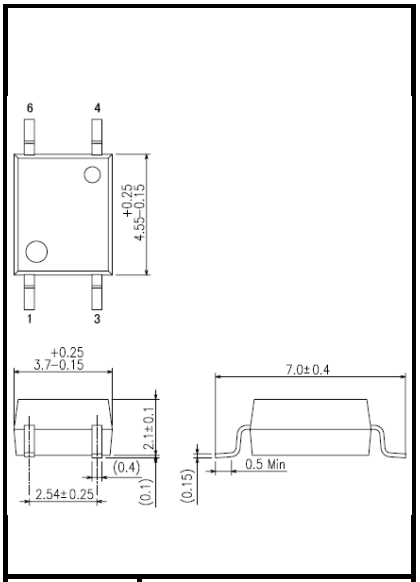
TOSHIBA Photocoupler InGaAs Infrared LED & Photo−Transistor

# TLP182

Telephone Use Equipment
Programmable Controllers
AC / DC−Input Module
Telecommunication

Unit: mm



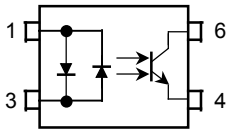

| | |
|---|---|
| JEDEC | - |
| JEITA | - |
| TOSHIBA | 11-4M1S |

Weight: 0.08 g (typ.)

TLP182 consist of photo transistor, optically coupled to two InGaAs infrared emitting diode connected inverse parallel, and can operate directly by low AC input current.
TLP182 are guaranteed wide operating temperature (Ta = -55 to 125 °C) and high isolation voltage (3750Vrms), it's suitable for switching power supplies and hybrid ICs.

- Collector-emitter voltage : 80V (min)
- Current transfer ratio : 50% (min)
  Rank GB : 100% (min)
- Isolation voltage : 3750 Vrms (min)
- Operation Temperature :-55 to 125 °C
- UL recognized : UL1577, File No. E67349
- cUL approved : CSA Component Acceptance Service No.5A, File No. E67349
- Option (V4)
  VDE approved : DIN EN 60747-5-5, approved No. 40009347
  **(Note) When an EN 60747-5-5 approved type is needed, please designate the "Option(V4)"**
- Construction mechanical rating
  Creepage distance : 5.0 mm(min)
  Clearance : 5.0 mm(min)
  Insulation thickness : 0.4 mm(min)

## Pin Configuration




1: Anode, Cathode
3: Cathode, Anode
4: Emitter
6: Collector

## Current Transfer Ratio (Unless otherwise specified, Ta = 25°C)

| Rank (Note 1) | Test condition | Current Transfer Ratio $I_C / I_F$ | | Marking of classification | Unit |
|---|---|---|---|---|---|
| | | Min | Max | | |
| Blank | $I_F$ = ±5 mA, $V_{CE}$ = 5 V | 50 | 600 | Blank, YE, GR, GB, BL | % |
| | $I_F$ = ±0.5 mA, $V_{CE}$ = 5 V | | | | |
| Y | $I_F$ = ±5 mA, $V_{CE}$ = 5 V | 50 | 150 | YE | |
| | $I_F$ = ±0.5 mA, $V_{CE}$ = 5 V | | | | |
| GR | $I_F$ = ±5 mA, $V_{CE}$ = 5 V | 100 | 300 | GR | |
| | $I_F$ = ±0.5 mA, $V_{CE}$ = 5 V | | | | |
| GB | $I_F$ = ±5 mA, $V_{CE}$ = 5 V | 100 | 600 | GB | |
| | $I_F$ = ±0.5 mA, $V_{CE}$ = 5 V | | | | |
| BL | $I_F$ = ±5 mA, $V_{CE}$ = 5 V | 200 | 600 | BL | |
| | $I_F$ = ±0.5 mA, $V_{CE}$ = 5 V | | | | |

Note1: Specify both the part number and a rank in this format when ordering

(e.g.) rank GB: TLP182 (GB,E

For safety standard certification, however, specify the part number alone.

(e.g.)TLP182 (GB,E: TLP182

## Absolute Maximum Ratings (Note) (Unless otherwise specified, Ta = 25°C)

| Characteristic | | Symbol | Note | Rating | Unit |
|---|---|---|---|---|---|
| LED | R.M.S. forward current | $I_{F(RMS)}$ | | ±50 | mA |
| | Input forward current derating (Ta≥90°C) | $\Delta I_F$ / $\Delta$Ta | | -1.5 | mA / °C |
| | Input forward current (pulsed) | $I_{FP}$ | (Note 2) | ±1 | A |
| | Junction temperature | $T_j$ | | 125 | °C |
| Detector | Collector−emitter voltage | $V_{CEO}$ | | 80 | V |
| | Emitter−collector voltage | $V_{ECO}$ | | 7 | V |
| | Collector current | $I_C$ | | 50 | mA |
| | Collector power dissipation | $P_C$ | | 150 | mW |
| | Power dissipation derating (Ta ≥ 25°C) | $\Delta P_C$ / $\Delta$Ta | | -1.5 | mW / °C |
| | Junction temperature | $T_j$ | | 125 | °C |
| Operating temperature range | | $T_{opr}$ | | −55 to 125 | °C |
| Storage temperature range | | $T_{stg}$ | | −55 to 125 | °C |
| Lead soldering temperature | | $T_{sol}$ | | 260(10s) | °C |
| Total package power dissipation | | $P_T$ | | 200 | mW |
| Total package power dissipation derating (Ta ≥ 25°C) | | $\Delta P_T$ / $\Delta$Ta | | -2.0 | mW / °C |
| Isolation voltage | | $BV_S$ | (Note 3) | 3750 | Vrms |

Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings.
Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook (“Handling Precautions”/“Derating Concept and Methods”) and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

Note 2: Pulse width ≤ 100 μs, frequency 100 Hz

Note 3: AC, 1min., R.H.≤ 60%, Device considered a two terminal device: LED side pins shorted together and detector side pins shorted together.

## Electrical Characteristics (Unless otherwise specified, Ta = 25°C)

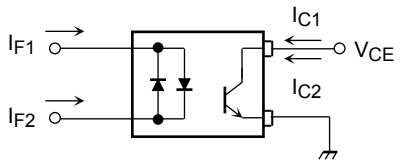
| | Characteristic | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|---|
| LED | Input forward voltage | $V_F$ | $I_F$ = ±10 mA | 1.1 | 1.25 | 1.4 | V |
| | Input capacitance | $C_T$ | V = 0 V, f = 1 MHz | - | 60 | - | pF |
| Detector | Collector−emitter breakdown voltage | $V_{(BR)\ CEO}$ | $I_C$ = 0.5 mA | 80 | - | - | V |
| | Emitter−collector breakdown voltage | $V_{(BR)\ ECO}$ | $I_E$ = 0.1 mA | 7 | - | - | V |
| | Collector dark current | $I_{DARK}$ | $V_{CE}$ = 48 V | - | 0.01 | 0.08 | μA |
| | | | $V_{CE}$ = 48 V, Ta = 85°C | - | 2 | 50 | μA |
| | Collector-emitter capacitance | $C_{CE}$ | V = 0 V, f = 1 MHz | - | 10 | - | pF |

## Coupled Electrical Characteristics (Unless otherwise specified, Ta = 25°C)

| Characteristic | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|
| Current transfer ratio | $I_C$ / $I_F$ | $I_F$ = ±5 mA, $V_{CE}$ = 5 V | 50 | - | 600 | % |
| | | Rank GB | 100 | - | 600 | |
| | | $I_F$ = ±0.5 mA, $V_{CE}$ = 5 V | 50 | - | 600 | |
| | | Rank GB | 100 | - | 600 | |
| Saturated CTR | $I_C$ / $I_{F\ (sat)}$ | $I_F$ = ±1 mA, $V_{CE}$ = 0.4 V | - | 60 | - | % |
| | | Rank GB | 50 | - | - | |
| Collector−emitter saturation voltage | $V_{CE\ (sat)}$ | $I_C$ = 2.4 mA, $I_F$ = ±8 mA | - | - | 0.3 | V |
| | | $I_C$ = 0.2 mA, $I_F$ = ±1 mA | - | 0.2 | - | |
| | | Rank GB | - | - | 0.3 | |
| Off−state collector current | $I_{C(off)}$ | $V_F$ = ± 0.7 V, $V_{CE}$ = 48 V | - | 1 | 10 | μA |
| Collector current ratio | $I_{C\ (ratio)}$ | $I_C$ ($I_F$ = -5 mA) / $I_C$ ($I_F$ = 5 mA) (Fig 1) | 0.33 | - | 3 | — |

Fig. 1: Collector current ratio test circuit

$$I_{C(ratio)} = \frac{I_{C2}(I_F = I_{F2}, V_{CE} = 5V)}{I_{C1}(I_F = I_{F1}, V_{CE} = 5V)}$$



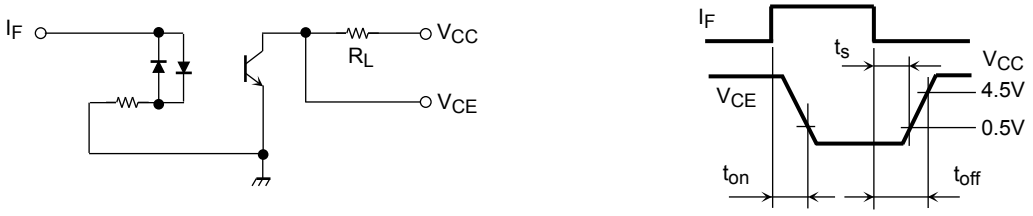
## Isolation Characteristics ( Unless otherwise specified, Ta = 25°C)

| Characteristic | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|
| Total capacitance (input to output) | $C_S$ | $V_S$ = 0 V, f = 1 MHz | - | 0.8 | - | pF |
| Isolation resistance | $R_S$ | $V_S$ = 500 V, R.H. ≤ 60% | $1\times10^{10}$ | $10^{14}$ | - | Ω |
| Isolation voltage | $BV_S$ | AC, 1 minute | 3750 | - | - | $V_{rms}$ |
| | | AC, 1 second, in oil | - | 10000 | - | |
| | | DC, 1 minute, in oil | - | 10000 | - | $V_{dc}$ |

## Switching Characteristics ( Unless otherwise specified, Ta = 25°C)

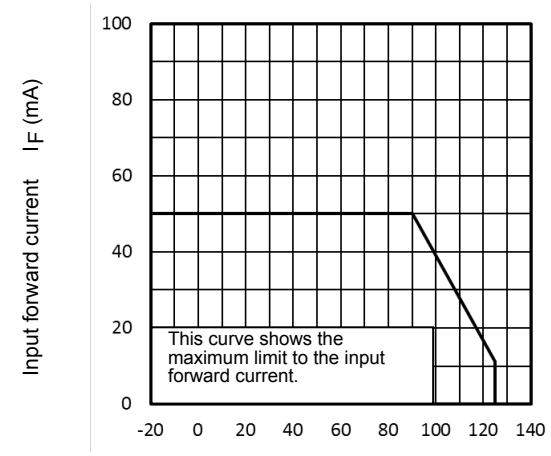
| Characteristic | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|
| Rise time | $t_r$ | $V_{CC}$ = 10 V, $I_C$ = 2 mA<br>$R_L$ = 100 Ω | — | 2 | — | μs |
| Fall time | $t_f$ | | — | 3 | — | |
| Turn−on time | $t_{on}$ | | — | 3 | — | |
| Turn−off time | $t_{off}$ | | — | 3 | — | |
| Turn−on time | ton | $R_L$ = 1.9 kΩ (Fig.2)<br>$V_{CC}$ = 5 V, $I_F$ = ±16 mA | — | 0.4 | — | |
| Storage time | ts | | — | 20 | — | |
| Turn−off time | toff | | — | 35 | — | |
| Turn−on time | $t_{on}$ | $R_L$ = 4.7 kΩ (Fig.2)<br>$V_{CC}$ = 5 V, $I_F$ = ±1.6 mA | — | 4 | — | μs |
| Storage time | $t_s$ | | — | 7 | — | |
| Turn−off time | $t_{off}$ | | — | 30 | — | |

Fig. 2: Switching time test circuit

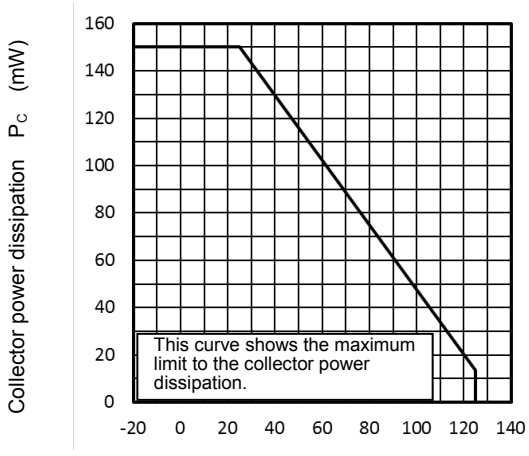


## Characteristics Curves (Note)

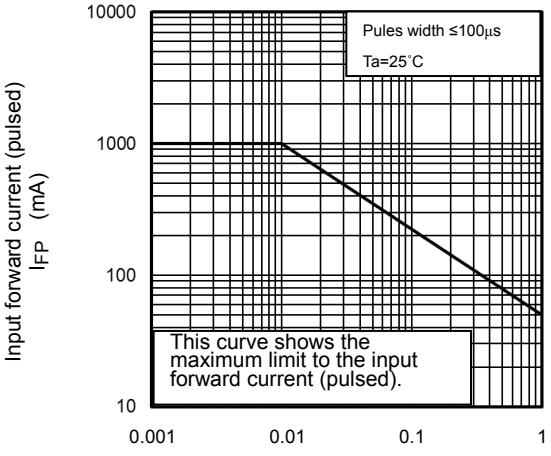
$I_F$ - Ta



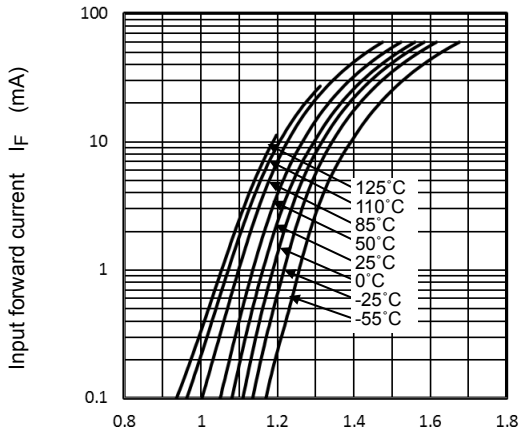

$P_C$ - Ta



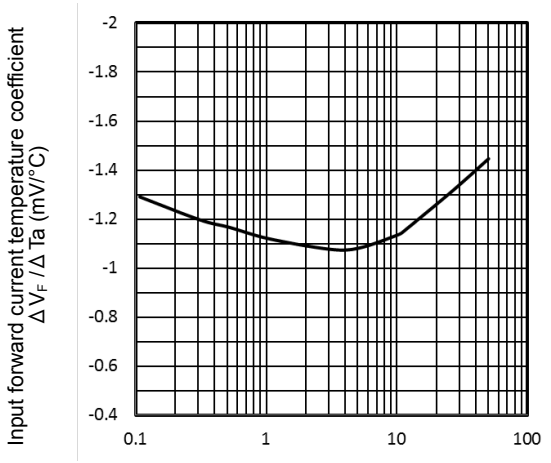

$I_{FP}$ - $D_R$



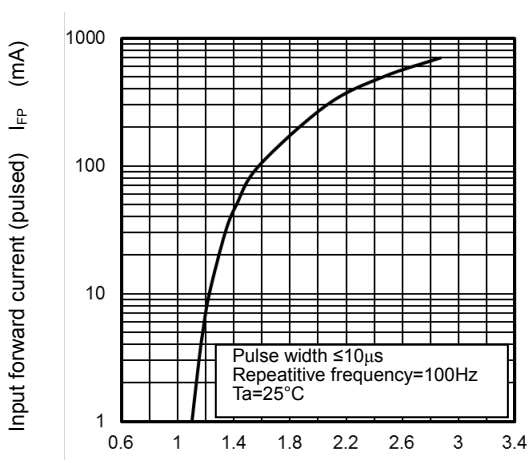

$I_F$ - $V_F$




$\Delta V_F / \Delta Ta$ - $I_F$

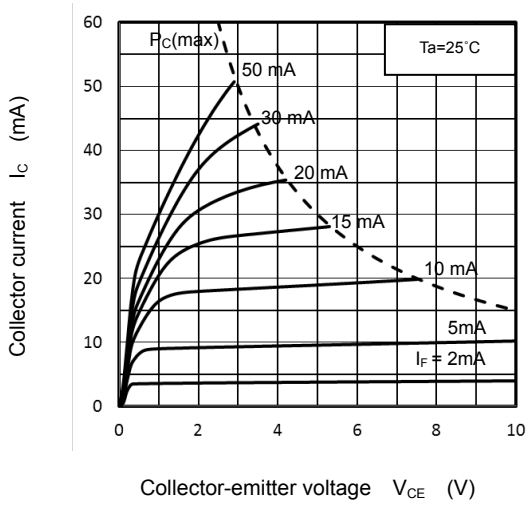



$I_{FP}$ – $V_{FP}$

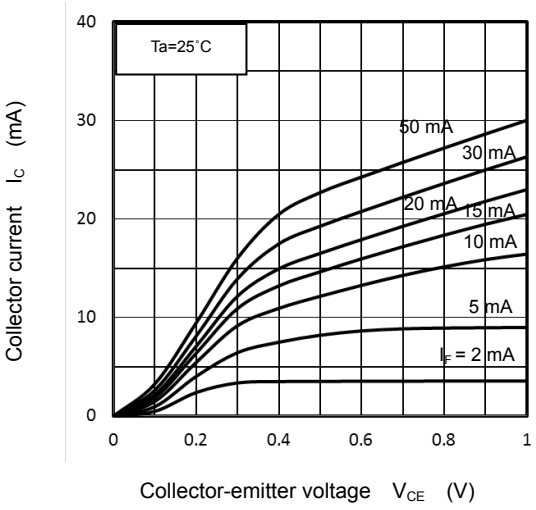



Note: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.

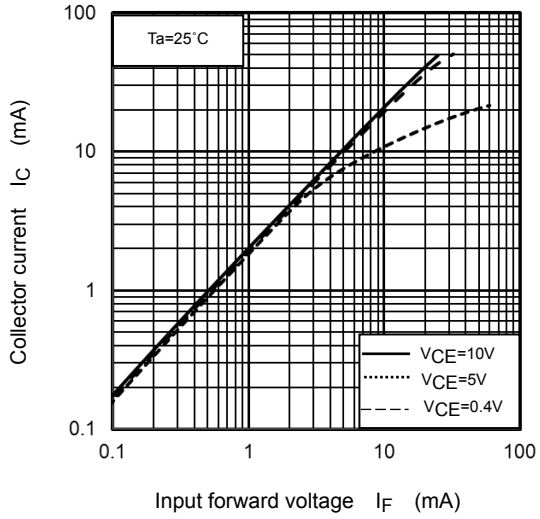
$I_C$ - $V_{CE}$



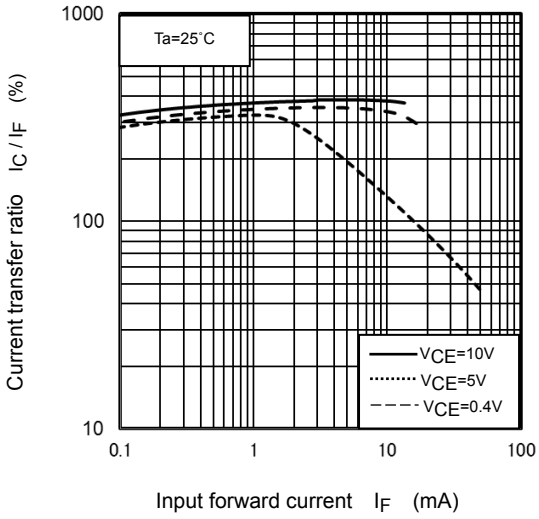

$I_C$ - $V_{CE}$



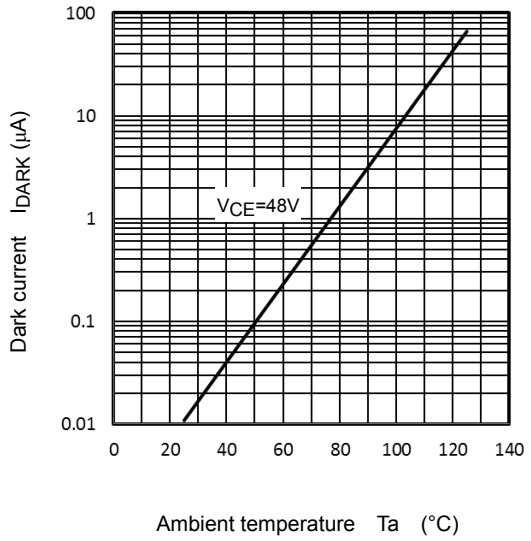

$I_C$ - $I_F$



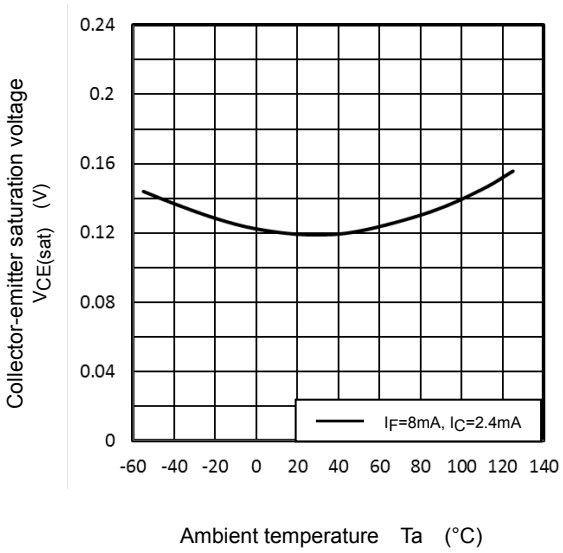

$I_C$ / $I_F$ - $I_F$




$I_{DARK}$ - Ta




$V_{CE(sat)}$ - Ta

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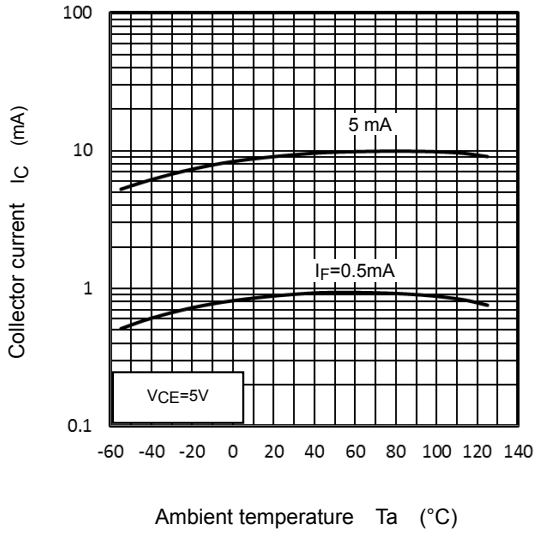
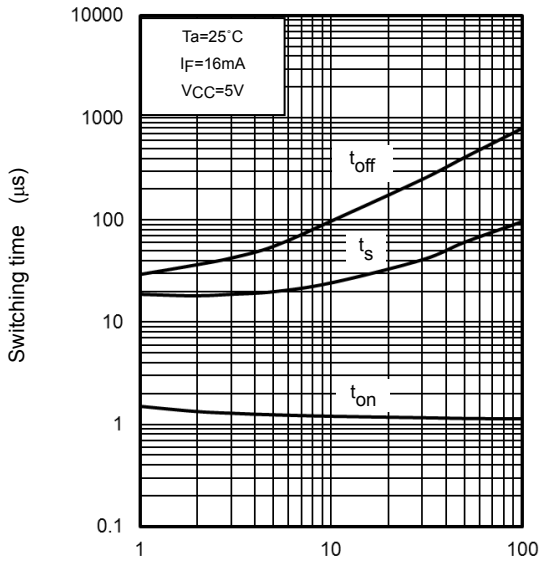
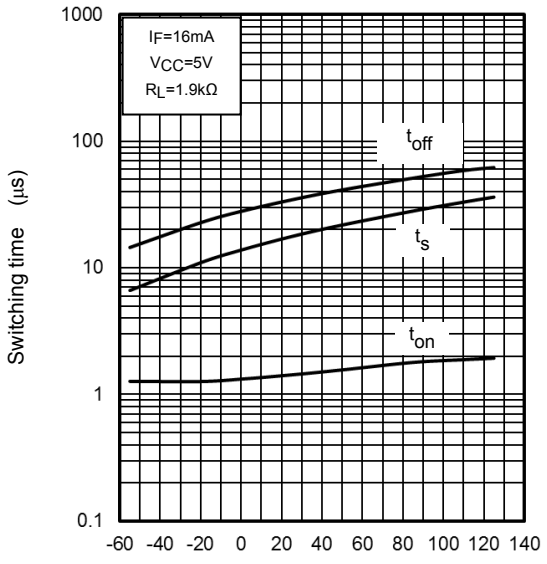
$I_C$ - Ta




Switching time - $R_L$




Switching time - Ta

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# Soldering and Storage

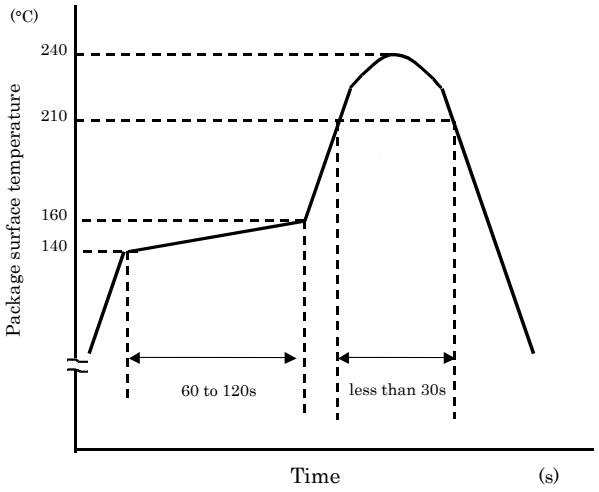
## 1. Soldering

1.1 Soldering

When using a soldering iron or medium infrared ray/hot air reflow, avoid a rise in device temperature as much as possible by observing the following conditions.

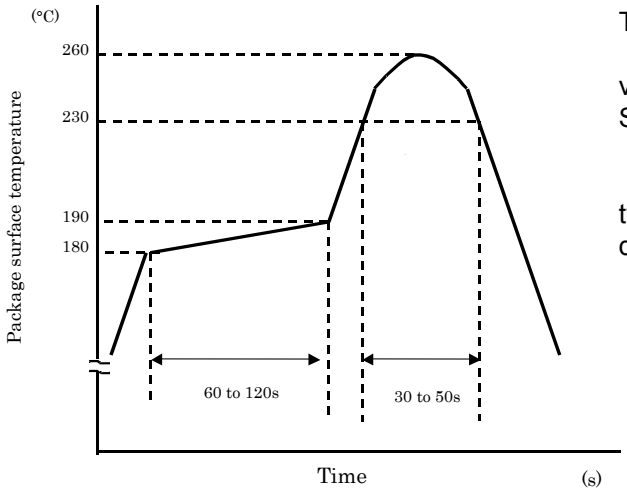
1) Using solder reflow

·Temperature profile example of lead (Pb) solder




This profile is based on the device's maximum heat resistance guaranteed value.
Set the preheat temperature/heating temperature to the optimum temperature corresponding to the solder paste type used by the customer within the described profile.

·Temperature profile example of using lead (Pb)-free solder




This profile is based on the device's maximum heat resistance guaranteed value.
Set the preheat temperature/heating temperature to the optimum temperature corresponding to the solder paste type used by the customer within the described profile.

Reflow soldering must be performed once or twice.

The mounting should be completed with the interval from the first to the last mountings being 2 weeks.

2) Using solder flow (for lead (Pb) solder, or lead (Pb)-free solder)

·Please preheat it at 150°C between 60 and 120 seconds.

·Complete soldering within 10 seconds below 260°C.

·Flow soldering must be performed once.

3) Using a soldering iron

Complete soldering within 10 seconds below 260°C, or within 3 seconds at 350°C. Each pin may be heated at most once.

**2. Storage**

1) Avoid storage locations where devices may be exposed to moisture or direct sunlight.
2) Follow the precautions printed on the packing label of the device for transportation and storage.
3) Keep the storage location temperature and humidity within a range of 5°C to 35°C and 45% to 75%, respectively.
4) Do not store the products in locations with poisonous gases (especially corrosive gases) or in dusty conditions.
5) Store the products in locations with minimal temperature fluctuations. Rapid temperature changes during storage can cause condensation, resulting in lead oxidation or corrosion, which will deteriorate the solderability of the leads.
6) When restoring devices after removal from their packing, use anti-static containers.
7) Do not allow loads to be applied directly to devices while they are in storage.
8) If devices have been stored for more than two years under normal storage conditions, it is recommended that you check the leads for ease of soldering prior to use.

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