



TLP2309

1. Applications

2. General

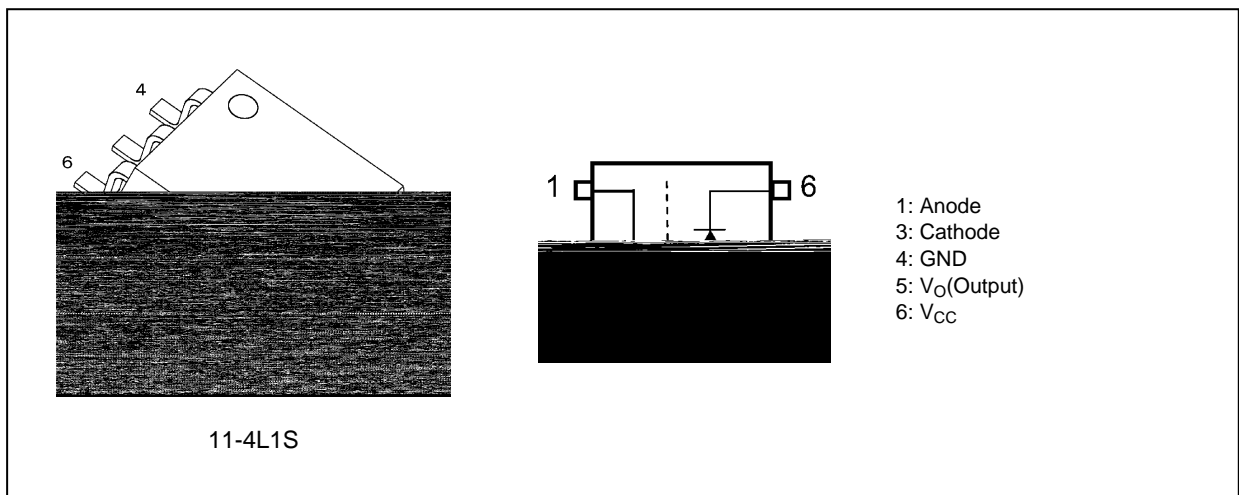
\geq °C \geq

3. Features

°C

μ

4. Packaging and Pin Configuration





5. Internal Circuit

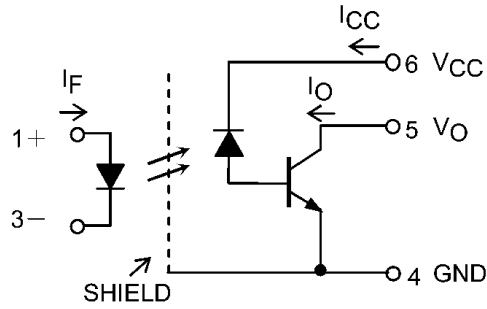


Fig. 5.1 Internal Circuit

6. Principle of Operation

6.1. Truth Table

| Input | LED | Output |
|-------|-----|--------|
| H | ON | L |
| L | OFF | H |

6.2. Mechanical Parameters

| Characteristics | Min | Unit |
|------------------------------|-----|------|
| Creepage distances | 5.0 | mm |
| Clearance distances | 5.0 | |
| Internal isolation thickness | 0.4 | |

**7. Absolute Maximum Ratings (Note) (Unless otherwise specified, $T_a = 25^\circ\text{C}$)**

| Characteristics | | Symbol |
|-----------------|---|-----------------------------|
| LED | Input forward current | I_F |
| | Input forward current derating ($T_a \geq 100^\circ\text{C}$) | $\Delta I_F / \Delta T_a$ |
| | Input forward current (pulsed) | I_{FP} |
| | Input forward current derating (pulsed) ($T_a \geq 100^\circ\text{C}$) | ΔI_{FP} |
| | Peak transient input forward current | |
| | Peak transient input forward current derating ($T_a \geq 85^\circ\text{C}$) | |
| | Input power dissipation | |
| | Input power dissipation derating ($T_a \geq 100^\circ\text{C}$) | |
| | Input reverse voltage | |
| Detector | Output current | |
| | Peak output current | |
| | Supply voltage | |
| | Output voltage | |
| | Output power dissipation | |
| | Output power dissipation derating ($T_a \geq 100^\circ\text{C}$) | |
| Common | Operating temperature | |
| | Storage temperature | |
| | Lead soldering temperature (10 s) | |
| | Isolation voltage | AC, 1 min, R.H. $\leq 60\%$ |

9. Electrical Characteristics (Note) (Unless otherwise specified, $T_a = 25^\circ\text{C}$)

| Characteristics | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|-------------------------|--|------|------|-----|---------------|
| Input forward voltage | V_F | $I_F = 10 \text{ mA}$ | 1.45 | 1.55 | 1.7 | V |
| Input forward voltage temperature coefficient | $\Delta V_F/\Delta T_a$ | $I_F = 10 \text{ mA}$, $T_a = -40^\circ\text{C}$ to 110°C | — | -2.0 | — | mV/°C |
| Input reverse current | I_R | $V_R = 5 \text{ V}$ | — | — | 10 | μA |
| Input capacitance | C_t | $V = 0 \text{ V}$, $f = 1 \text{ MHz}$ | — | 60 | — | pF |
| High-level output current | I_{OH} | $I_F = 0 \text{ mA}$, $V_O = 5.5 \text{ V}$, $V_{CC} = 5.5 \text{ V}$ | — | 3 | 500 | μA |
| | | $I_F = 0 \text{ mA}$, $V_O = 20 \text{ V}$, $V_{CC} = 30 \text{ V}$ | — | — | 5 | |
| | | $I_F = 0 \text{ mA}$, $V_O = 20 \text{ V}$, $V_{CC} = 30 \text{ V}$, $T_a = 110^\circ\text{C}$ | — | — | 50 | |
| High-level supply current | I_{CCH} | $I_F = 0 \text{ mA}$, $V_{CC} = 30 \text{ V}$ | — | 0.01 | 1 | |
| Current transfer ratio | I_O/I_F | $I_F = 10 \text{ mA}$, $V_O = 0.4 \text{ V}$, $V_{CC} = 3.3 \text{ V}$ | 15 | — | — | % |
| | | $I_F = 16 \text{ mA}$, $V_O = 0.4 \text{ V}$, $V_{CC} = 4.5 \text{ V}$ | 15 | — | — | |
| Low-level output voltage | V_{OL} | $I_F = 16 \text{ mA}$, $V_{CC} = 4.5 \text{ V}$, $I_O = 2.4 \text{ mA}$ | — | — | 0.4 | V |

Note: All typical values are at $T_a = 25^\circ\text{C}$.

10. Isolation Characteristics (Unless otherwise specified, $T_a = 25^\circ\text{C}$)

| Characteristics | Symbol | Note | Test Conditions | Min | Typ. | Max | Unit |
|-------------------------------------|--------|----------|---|--------------------|-----------|-----|----------|
| Total capacitance (input to output) | C_S | (Note 1) | $V_S = 0 \text{ V}$, $f = 1 \text{ MHz}$ | — | 0.8 | — | pF |
| Isolation resistance | R_S | (Note 1) | $V_S = 500 \text{ V}$, R.H. $\leq 60\%$ | 1×10^{12} | 10^{14} | — | Ω |
| Isolation voltage | BV_S | | AC, 1 min | 3750 | — | — | Vrms |
| | | | AC, 1 s in oil | — | 10000 | — | |
| | | | DC, 1 min in oil | — | 10000 | — | Vdc |

12. Test Circuits and Characteristics Curves

12.1. Test Circuits

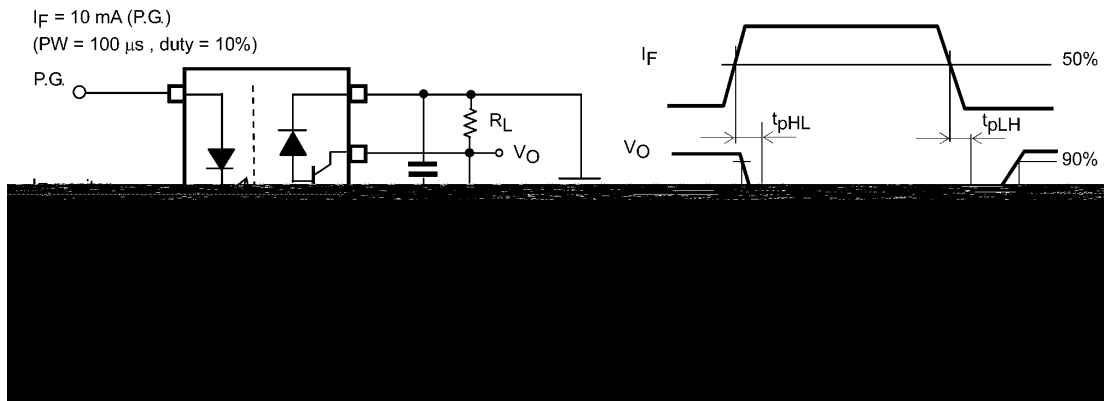


Fig. 12.1.1 Switching Time Test Circuit

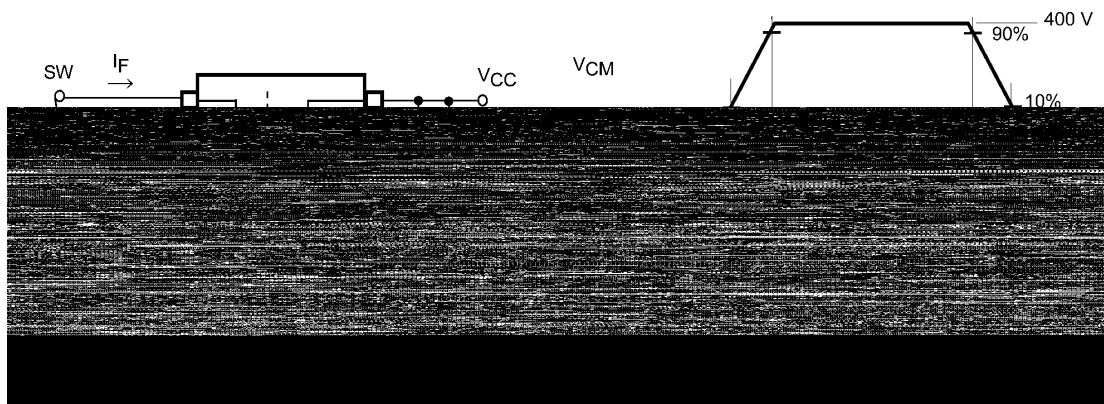


Fig. 12.1.2 Common-Mode Transient Immunity



12.2. Characteristics Curves (Note)

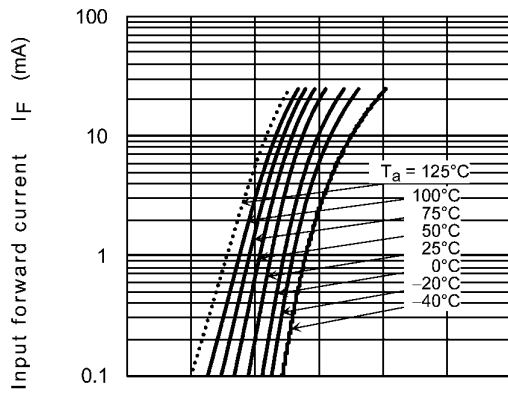


Fig. 12.2.1 I

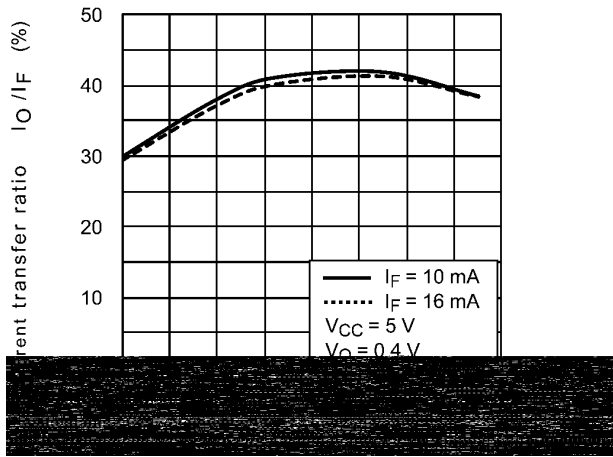


Fig. 12.2.7 $I_O/I_F - T_a$

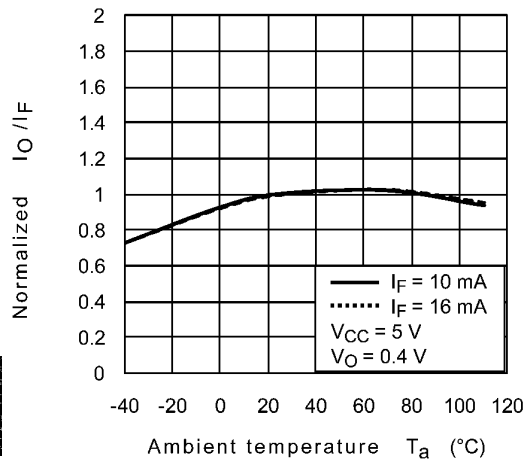


Fig. 12.2.8 $I_O/I_F - T_a$

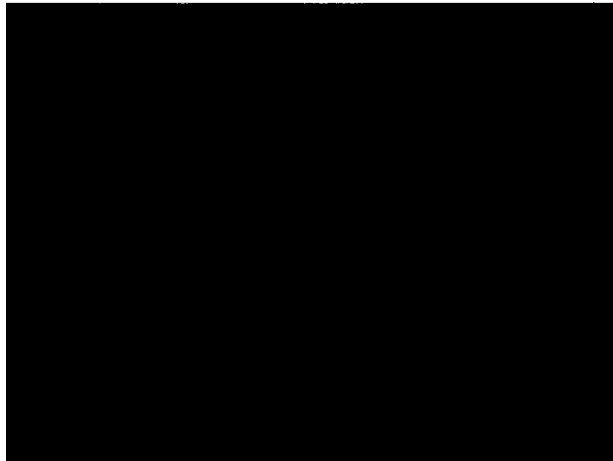


Fig. 12.2.9 $I_O/I_F - T_a$

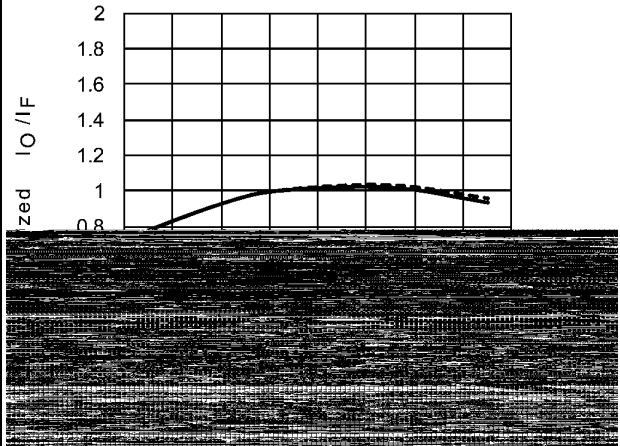


Fig. 12.2.10 $I_O/I_F - T_a$

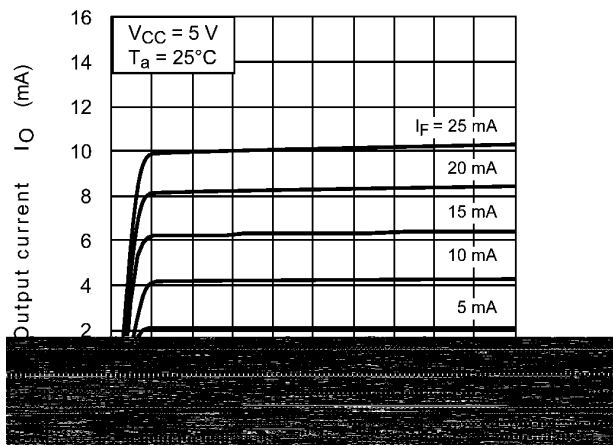


Fig. 12.2.11 $I_O - V_O$

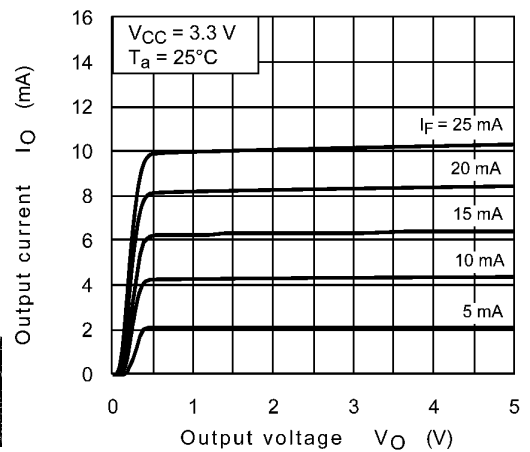


Fig. 12.2.12 $I_O - V_O$



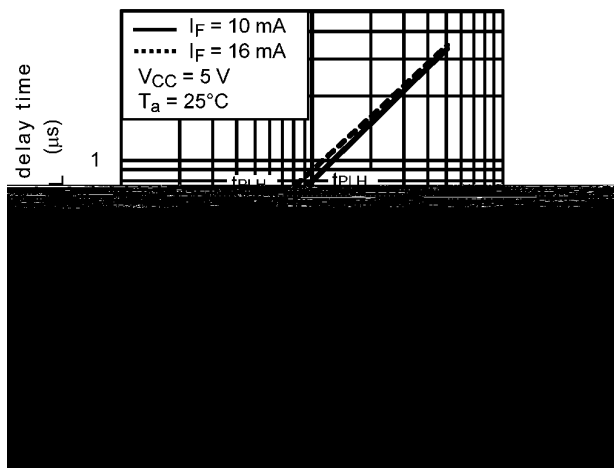


Fig. 12.2.19 t_{PLH} , t_{PHL} - R_L

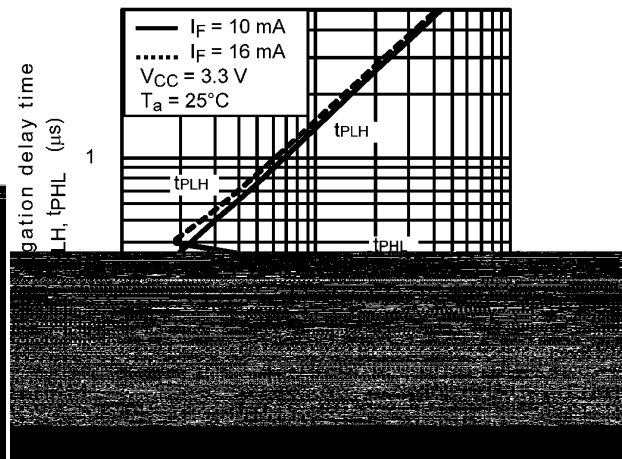


Fig. 12.2.20 t_{PLH} , t_{PHL} - R_L

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



13. Soldering and Storage

13.1. Precautions for Soldering

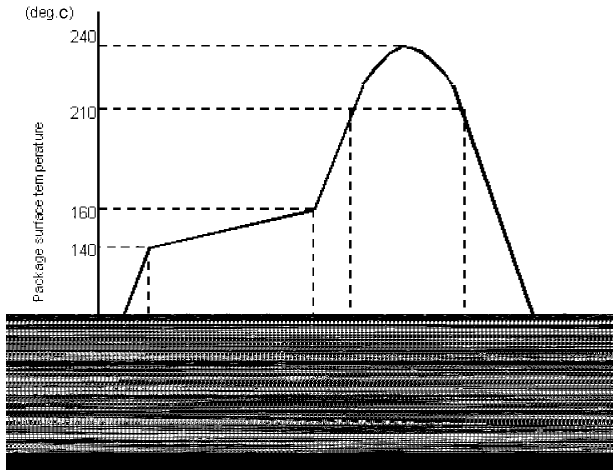


Fig. 13.1.1 An example of a temperature profile when Sn-Pb eutectic solder is used

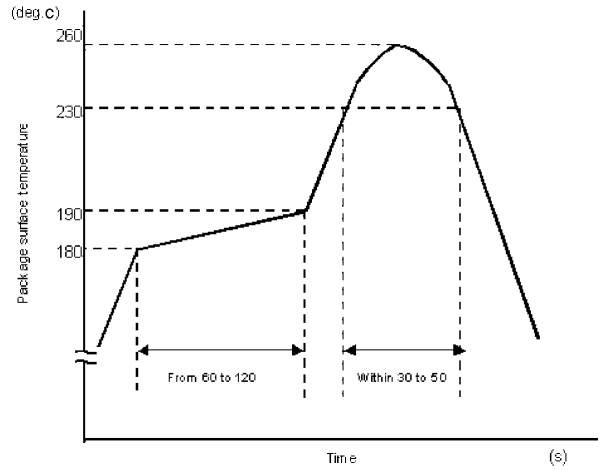


Fig. 13.1.2 An example of a temperature profile when lead(Pb)-free solder is used

°C
°C

°C

°C

13.2. Precautions for General Storage

°C °C



14. Land Pattern Dimensions for Reference Only

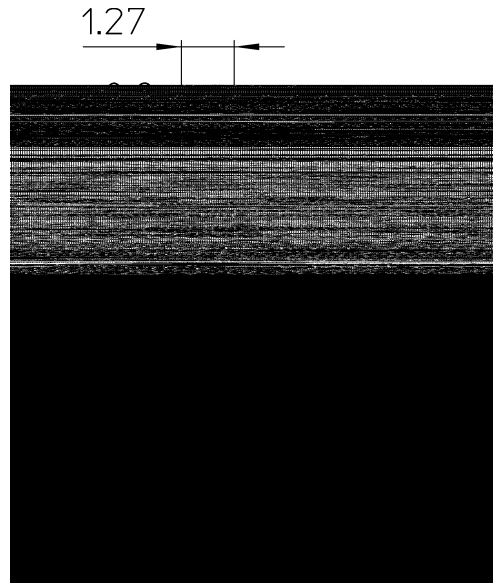


Fig. 14.1 Land Pattern Dimensions for Reference Only (unit: mm)

15. Marking

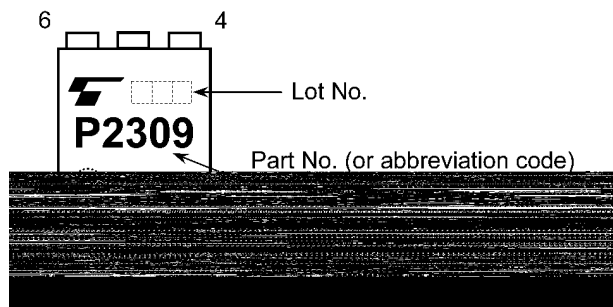
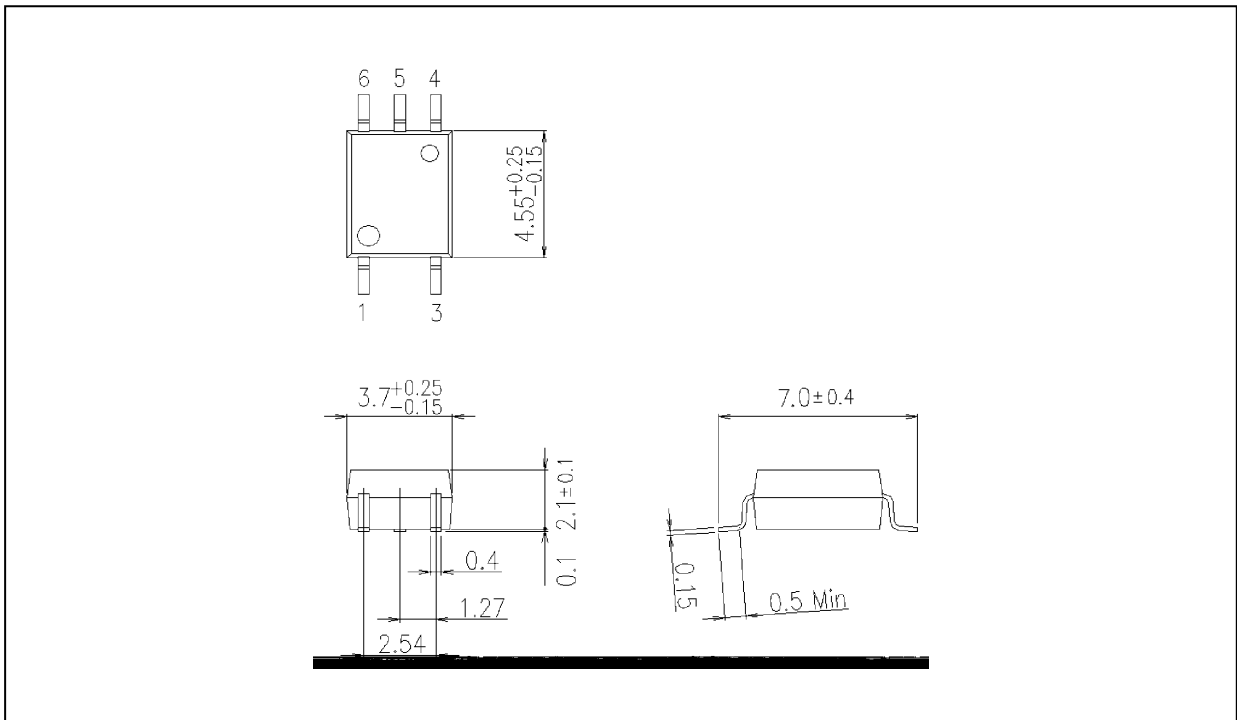


Fig. 15.1 Marking



Package Dimensions

Unit: mm



Weight: 0.08 g (typ.)

| Package Name(s) |
|------------------|
| TOSHIBA: 11-4L1S |



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