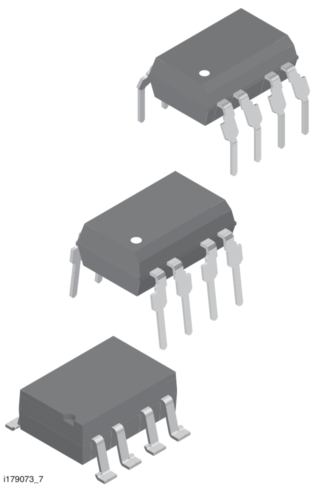
# Optocoupler, Phototransistor Output, Dual Channel



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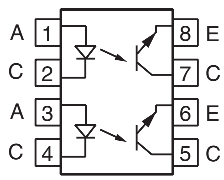



## FEATURES

- Dual version of SFH610 series
- Isolation test voltage, 5300 $V_{RMS}$
- $V_{CEsat}$ 0.25 (≤ 0.4) V at $I_F$ = 10 mA, $I_C$ = 2.5 mA
- $V_{CEO}$ = 70 V
- Compliant to RoHS Directive 2002/95/EC and in accordance to WEEE 2002/96/EC

Pb-free
e3
RoHS COMPLIANT

## AGENCY APPROVALS

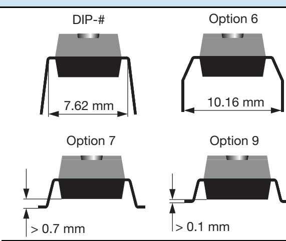
- UL1577, file no. E52744 system code H or J, double protection
- DIN EN 60747-5-5 (VDE 0884)/DIN EN 60747-5-5 pending
- CSA 93751
- BSI IEC 60950; IEC 60065

## DESCRIPTION

The ILD610 series is a dual channel optocoupler series for high density applications. Each channel consists of an optically coupled pair with a gallium arsenide infrared LED and silicon NPN phototransistor. Signal information, including a DC level, can be transmitted by the device while maintaining a high degree of electrical isolation between input and output. The ILD610 series is the dual version of SFH610 series and uses a repetitive pin-out configuration instead of the more common alternating pin-out used in most dual couplers.

## ORDERING INFORMATION

| I | L | D | 6 | 1 | 0 | - | # | X | 0 | 0 | # | T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PART NUMBER | | | | | | | CTR BIN | PACKAGE OPTION | | | | TAPE AND REEL |




| AGENCY CERTIFIED/PACKAGE | CTR (%) | | | |
|---|---|---|---|---|
| **UL, CSA, BSI** | **40 to 80** | **63 to 125** | **100 to 200** | **160 to 320** |
| DIP-8 | ILD610-1 | - | ILD610-3 | - |
| DIP-8, 400 mil, option 6 | - | - | ILD610-3X006 | - |
| SMD-8, option 7 | - | ILD610-2X007T | - | - |
| SMD-8, option 9 | - | - | ILD610-3X009 | ILD610-4X009 |

**Note**

- Additional options may be possible, please contact sales office.

| **ABSOLUTE MAXIMUM RATINGS** ($T_{amb}$ = 25 °C, unless otherwise specified) | | | | |
|---|---|---|---|---|
| **PARAMETER** | **TEST CONDITION** | **SYMBOL** | **VALUE** | **UNIT** |
| **INPUT** | | | | |
| Reverse voltage | | $V_R$ | 6.0 | V |
| Surge forward current | t ≤ 1.0 ms | $I_{FSM}$ | 1.5 | A |
| Power dissipation | | $P_{diss}$ | 100 | mW |
| Derate linearly from 25 °C | | | 1.3 | mW/°C |
| Forward continuous current | | $I_F$ | 60 | mA |
| **OUTPUT** | | | | |
| Collector emitter voltage | | $V_{CE}$ | 70 | V |
| Collector current | | $I_C$ | 50 | mA |
| | t ≤ 1.0 ms | $I_C$ | 100 | mA |
| Power dissipation | | $P_{diss}$ | 150 | mW |
| Derate linearly from 25 °C | | | 2.0 | mW/°C |
| **COUPLER** | | | | |
| Isolation test voltage | t = 1.0 s | $V_{ISO}$ | 5300 | $V_{RMS}$ |
| Isolation resistance | $V_{IO}$ = 500 V, $T_{amb}$ = 25 °C | $R_{IO}$ | ≥ $10^{12}$ | Ω |
| | $V_{IO}$ = 500 V, $T_{amb}$ = 100 °C | $R_{IO}$ | ≥ $10^{11}$ | Ω |
| Storage temperature | | $T_{stg}$ | - 55 to + 150 | °C |
| Operating temperature | | $T_{amb}$ | - 55 to + 100 | °C |
| Junction temperature | | $T_j$ | 100 | °C |
| Lead soldering time at 260 °C | | | 10 | s |

**Note**

- Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of this document. Exposure to absolute maximum ratings for extended periods of the time can adversely affect reliability.

| **ELECTRICAL CHARACTERISTICS** ($T_{amb}$ = 25 °C, unless otherwise specified) | | | | | | | |
|---|---|---|---|---|---|---|---|
| **PARAMETER** | **TEST CONDITION** | **PART** | **SYMBOL** | **MIN.** | **TYP.** | **MAX.** | **UNIT** |
| **INPUT** | | | | | | | |
| Forward voltage | $I_F$ = 60 mA | | $V_F$ | | 1.25 | 1.65 | V |
| Reverse current | $V_R$ = 6.0 V | | $I_R$ | | 0.01 | 10 | µA |
| Capacitance | $V_R$ = 0 V, f = 1.0 MHz | | $C_O$ | | 25 | | pF |
| **OUTPUT** | | | | | | | |
| Collector emitter breakdown voltage | $I_C$ = 10 mA, $I_E$ = 10 µA | | $BV_{CEO}$ | 70 | 90 | | V |
| | | | $BV_{CEO}$ | 6.0 | 7.0 | | V |
| Collector emitter dark current | $V_{CE}$ = 10 V | | $I_{CEO}$ | | 2.0 | 50 | nA |
| Collector emitter capacitance | $V_{CE}$ = 5.0 V, f = 1.0 MHz | | $C_{CE}$ | | 7.0 | | pF |
| Collector emitter leakage current | $V_{CE}$ = 10 V | ILD610-1 | $I_{CEO}$ | | 2.0 | 50 | nA |
| | | ILD610-2 | $I_{CEO}$ | | 2.0 | 50 | nA |
| | | ILD610-3 | $I_{CEO}$ | | 5.0 | 100 | nA |
| | | ILD610-4 | $I_{CEO}$ | | 5.0 | 100 | nA |
| **COUPLER** | | | | | | | |
| Collector emitter saturation voltage | $I_F$ = 10 mA, $I_C$ = 2.5 mA | | $V_{CEsat}$ | | 0.25 | 0.40 | V |
| Coupling capacitance | | | $C_C$ | | 0.35 | | pF |

**Note**

- Minimum and maximum values are testing requirements. Typical values are characteristics of the device and are the result of engineering evaluation. Typical values are for information only and are not part of the testing requirements.

| **CURRENT TRANSFER RATIO** ($T_{amb}$ = 25 °C, unless otherwise specified) | | | | | | | |
|---|---|---|---|---|---|---|---|
| **PARAMETER** | **TEST CONDITION** | **PART** | **SYMBOL** | **MIN.** | **TYP.** | **MAX.** | **UNIT** |
| CTR [(1)] | $I_F$ = 10 mA, $V_{CE}$ = 5.0 V | ILD610-1 | CTR | 40 | | 80 | % |
| | | ILD610-2 | CTR | 63 | | 125 | % |
| | | ILD610-3 | CTR | 100 | | 200 | % |
| | | ILD610-4 | CTR | 160 | | 320 | % |
| | $I_F$ = 1.0 mA, $V_{CE}$ = 5.0 V | ILD610-1 | CTR | 13 | | | % |
| | | ILD610-2 | CTR | 22 | | | % |
| | | ILD610-3 | CTR | 34 | | | % |
| | | ILD610-4 | CTR | 56 | | | % |

**Note**

[(1)] CTR will match within a ratio of 1.7:1

| **SWITCHING CHARACTERISTICS** ($T_{amb}$ = 25 °C, unless otherwise specified) | | | | | | | |
|---|---|---|---|---|---|---|---|
| **PARAMETER** | **TEST CONDITION** | **PART** | **SYMBOL** | **MIN.** | **TYP.** | **MAX.** | **UNIT** |
| **NON-SATURATED** | | | | | | | |
| Rise time | $V_{CC}$ = 5.0 V, $R_L$ = 75 Ω, $I_F$ = 10 mA | ILD610-1 | $t_r$ | | 2.0 | | μs |
| | | ILD610-2 | | | 2.5 | | |
| | | ILD610-3 | | | 2.9 | | |
| | | ILD610-4 | | | 3.3 | | |
| Fall time | $V_{CC}$ = 5.0 V, $R_L$ = 75 Ω, $I_F$ = 10 mA | ILD610-1 | $t_f$ | | 2.0 | | μs |
| | | ILD610-2 | | | 2.6 | | |
| | | ILD610-3 | | | 3.1 | | |
| | | ILD610-4 | | | 3.5 | | |
| Turn-on time | $V_{CC}$ = 5.0 V, $R_L$ = 75 Ω, $I_F$ = 10 mA | ILD610-1 | $t_{on}$ | | 3.0 | | μs |
| | | ILD610-2 | | | 3.2 | | |
| | | ILD610-3 | | | 3.6 | | |
| | | ILD610-4 | | | 4.1 | | |
| Turn-off time | $V_{CC}$ = 5.0 V, $R_L$ = 75 Ω, $I_F$ = 10 mA | ILD610-1 | $t_{off}$ | | 2.9 | | μs |
| | | ILD610-2 | | | 3.4 | | |
| | | ILD610-3 | | | 3.7 | | |
| | | ILD610-4 | | | 4.1 | | |
| **SATURATED** | | | | | | | |
| Rise time | $V_{CC}$ = 5.0 V, $R_L$ = 1.0 kΩ, $I_F$ = 20 mA | ILD610-1 | $t_r$ | | 2.0 | | μs |
| | $V_{CC}$ = 5.0 V, $R_L$ = 1.0 kΩ, $I_F$ = 10 mA | ILD610-2 | | | 2.8 | | |
| | $V_{CC}$ = 5.0 V, $R_L$ = 1.0 kΩ, $I_F$ = 10 mA | ILD610-3 | | | 2.8 | | |
| | $V_{CC}$ = 5.0 V, $R_L$ = 1.0 kΩ, $I_F$ = 5 mA | ILD610-4 | | | 4.6 | | |
| Fall time | $V_{CC}$ = 5.0 V, $R_L$ = 1.0 kΩ, $I_F$ = 20 mA | ILD610-1 | $t_f$ | | 11 | | μs |
| | $V_{CC}$ = 5.0 V, $R_L$ = 1.0 kΩ, $I_F$ = 10 mA | ILD610-2 | | | 14 | | |
| | $V_{CC}$ = 5.0 V, $R_L$ = 1.0 kΩ, $I_F$ = 10 mA | ILD610-3 | | | 14 | | |
| | $V_{CC}$ = 5.0 V, $R_L$ = 1.0 kΩ, $I_F$ = 5 mA | ILD610-4 | | | 15 | | |
| Turn-on time | $V_{CC}$ = 5.0 V, $R_L$ = 1.0 kΩ, $I_F$ = 20 mA | ILD610-1 | $t_{on}$ | | 3.0 | | μs |
| | $V_{CC}$ = 5.0 V, $R_L$ = 1.0 kΩ, $I_F$ = 10 mA | ILD610-2 | | | 4.3 | | |
| | $V_{CC}$ = 5.0 V, $R_L$ = 1.0 kΩ, $I_F$ = 10 mA | ILD610-3 | | | 4.3 | | |
| | $V_{CC}$ = 5.0 V, $R_L$ = 1.0 kΩ, $I_F$ = 5 mA | ILD610-4 | | | 6.0 | | |
| Turn-off time | $V_{CC}$ = 5.0 V, $R_L$ = 1.0 kΩ, $I_F$ = 20 mA | ILD610-1 | $t_{off}$ | | 18 | | μs |
| | $V_{CC}$ = 5.0 V, $R_L$ = 1.0 kΩ, $I_F$ = 10 mA | ILD610-2 | | | 25 | | |
| | $V_{CC}$ = 5.0 V, $R_L$ = 1.0 kΩ, $I_F$ = 10 mA | ILD610-3 | | | 25 | | |
| | $V_{CC}$ = 5.0 V, $R_L$ = 1.0 kΩ, $I_F$ = 5 mA | ILD610-4 | | | 25 | | |

## TYPICAL CHARACTERISTICS ($T_{amb}$ = 25 °C, unless otherwise specified)

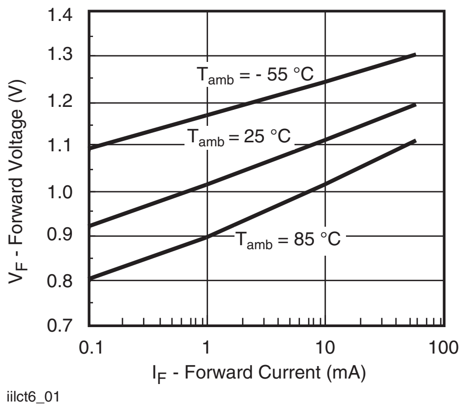



Fig. 1 - Forward Voltage vs. Forward Current

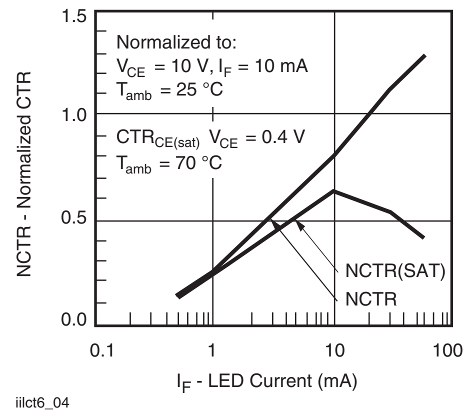



Fig. 4 - Normalized Non-Saturated and Saturated CTR vs. LED Current

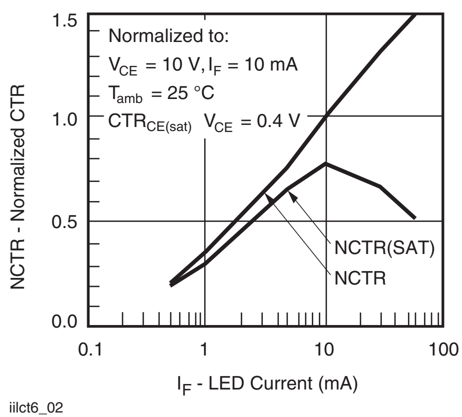



Fig. 2 - Normalized Non-Saturated and Saturated CTR vs. LED Current

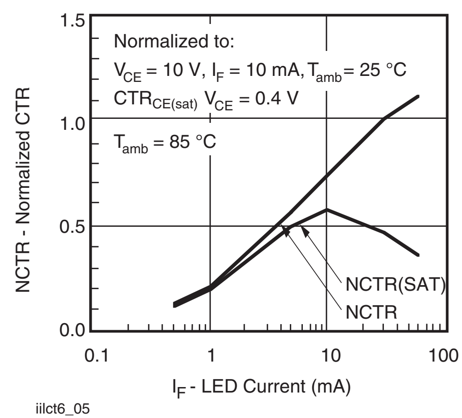



Fig. 5 - Normalized Non-Saturated and Saturated CTR vs. LED Current

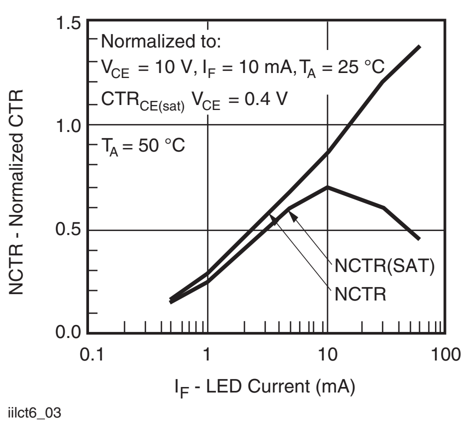



Fig. 3 - Normalized Non-Saturated and Saturated CTR vs. LED Current

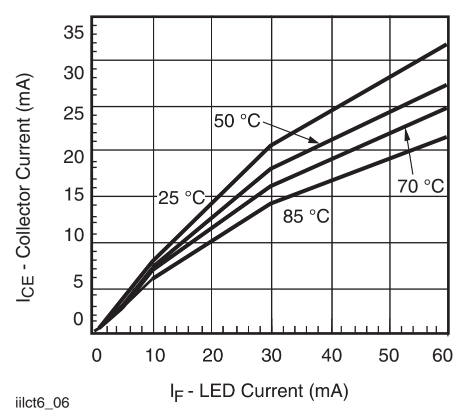



Fig. 6 - Collector Emitter Current vs. Temperature and LED Current

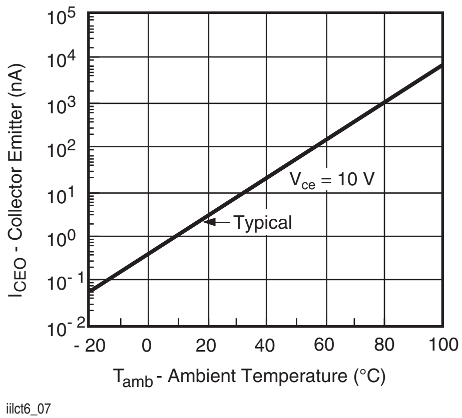



Fig. 7 - Collector Emitter Leakage Current vs.Temperature

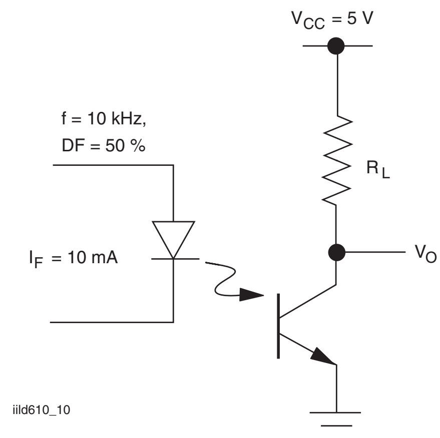



Fig. 10 - Non-Saturated Switching Schematic

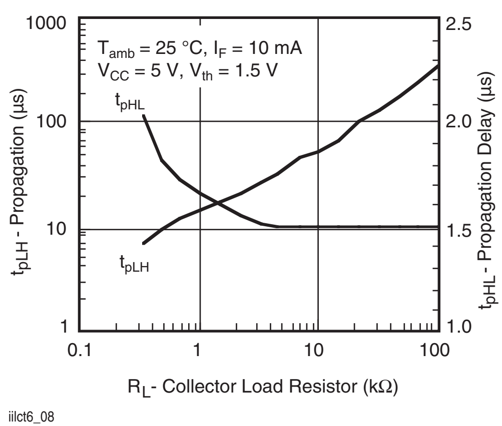



Fig. 8 - Propagation Delay vs. Collector Load Resistor

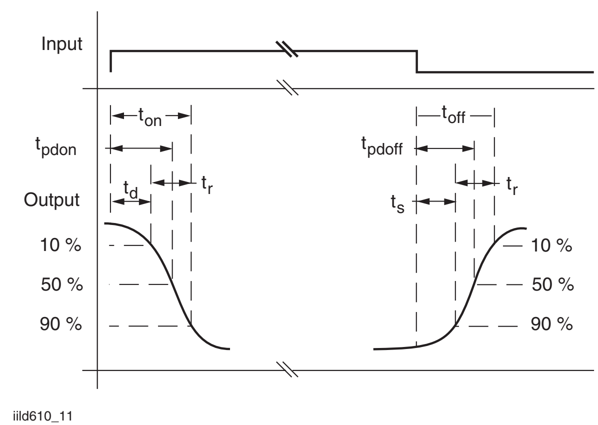



Fig. 11 - Saturated Switching Time Test Waveform

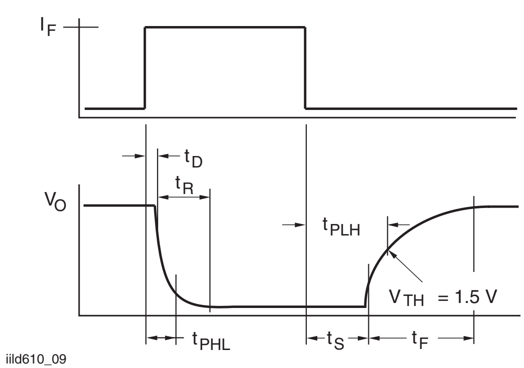
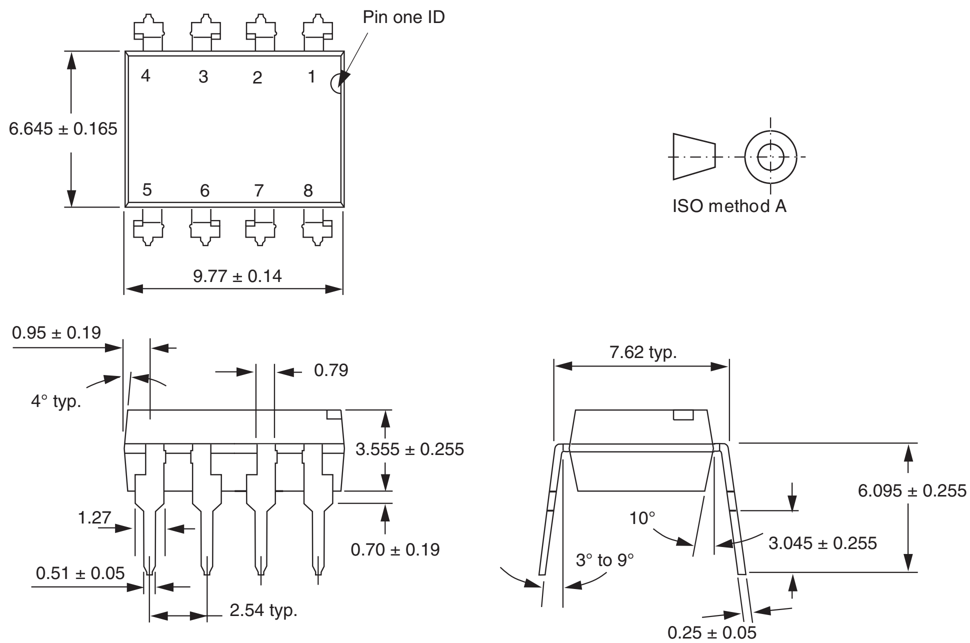



Fig. 9 - Switching Timing

## **PACKAGE DIMENSIONS** in millimeters

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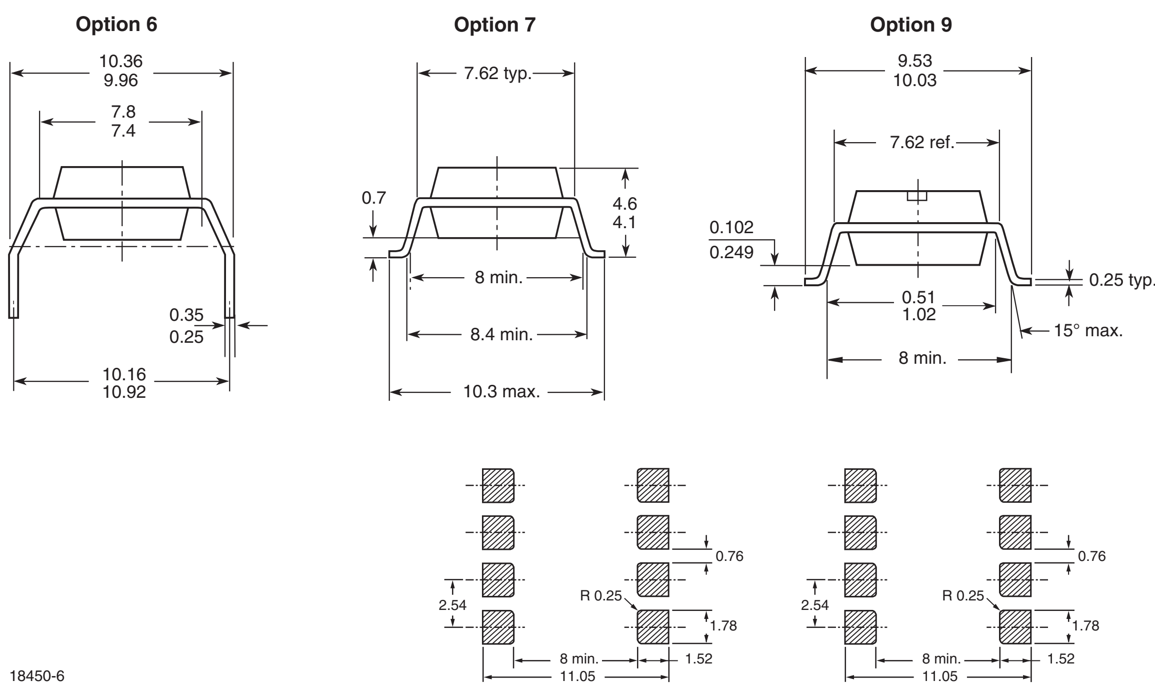


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## **PACKAGE MARKING**


**Notes**

- Only option 1 and 7 reflected in the package marking
- Tape and reel suffix (T) is not part of the package marking

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