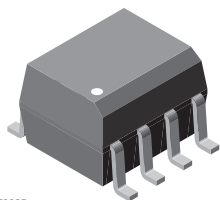
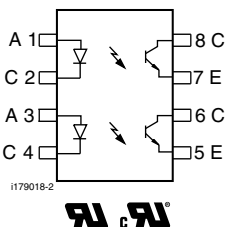




## Optocoupler, Phototransistor Output, Dual Channel, SOIC-8 Package



i179025



### DESCRIPTION

The ILD205T, ILD206T, ILD207T, ILD211T, and ILD213T are optically coupled pairs with a gallium arsenide infrared LED and a 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 ILD205T, ILD206T, ILD207T, ILD211T, and ILD213T come in a standard SOIC-8 small outline package for surface mounting which makes it ideally suited for high density applications with limited space. In addition to eliminating through-holes requirements, this package conforms to standards for surface mounted devices.

A specified minimum and maximum CTR allows a narrow tolerance in the electrical design of the adjacent circuits. The high  $BV_{CEO}$  of 70 V gives a higher safety margin compared to the industry standard of 30 V.

### FEATURES

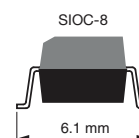
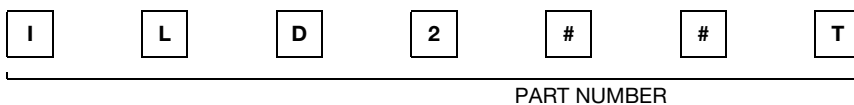
- Two channel coupler
- SOIC-8 surface mountable package
- Standard lead spacing of 0.05"
- Available only on tape and reel option (conforms to EIA standard 481-2)
- Isolation test voltage, 4000  $V_{RMS}$
- Compatible with dual wave, vapor phase and IR reflow soldering
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)

RoHS  
COMPLIANT

### AGENCY APPROVALS

- UL1577, file no. E52744 system code Y
- cUL - file no. E52744, equivalent to CSA bulletin 5A

### ORDERING INFORMATION



| AGENCY CERTIFIED/PACKAGE | CTR (%)  |           |            |         |         |
|--------------------------|----------|-----------|------------|---------|---------|
|                          | 10 mA    |           |            |         |         |
| UL, cUL                  | 40 to 80 | 63 to 125 | 100 to 200 | ≥ 20    | ≥ 100   |
| SOIC-8                   | ILD205T  | ILD206T   | ILD207T    | ILD211T | ILD213T |



| ABSOLUTE MAXIMUM RATINGS ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |                           |            |             |                    |
|-------------------------------------------------------------------------------------------------|---------------------------|------------|-------------|--------------------|
| PARAMETER                                                                                       | TEST CONDITION            | SYMBOL     | VALUE       | UNIT               |
| <b>INPUT</b>                                                                                    |                           |            |             |                    |
| Peak reverse voltage                                                                            |                           | $V_R$      | 6           | V                  |
| Peak pulsed current                                                                             | 1 $\mu\text{s}$ , 300 pps |            | 1           | A                  |
| Continuous forward current per channel                                                          |                           | $I_F$      | 30          | mA                 |
| Power dissipation                                                                               |                           | $P_{diss}$ | 50          | mW                 |
| <b>OUTPUT</b>                                                                                   |                           |            |             |                    |
| Collector emitter breakdown voltage                                                             |                           | $BV_{CEO}$ | 70          | V                  |
| Emitter collector breakdown voltage                                                             |                           | $BV_{ECO}$ | 7           | V                  |
| Power dissipation per channel                                                                   |                           | $P_{diss}$ | 125         | mW                 |
| <b>COUPLER</b>                                                                                  |                           |            |             |                    |
| Total package dissipation ambient<br>(2 LEDs and 2 detectors, 2 channels)                       |                           | $P_{tot}$  | 350         | mW                 |
| Storage temperature                                                                             |                           | $T_{stg}$  | -55 to +150 | $^{\circ}\text{C}$ |
| Operating temperature                                                                           |                           | $T_{amb}$  | -55 to +100 | $^{\circ}\text{C}$ |
| Soldering time from 260 $^{\circ}\text{C}$ <sup>(1)</sup>                                       |                           | $T_{sld}$  | 10          | s                  |

**Notes**

- 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.
- <sup>(1)</sup> Refer to reflow profile for soldering conditions for surface mounted devices.

| ELECTRICAL CHARACTERISTICS ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |                                              |             |      |      |      |               |
|---------------------------------------------------------------------------------------------------|----------------------------------------------|-------------|------|------|------|---------------|
| PARAMETER                                                                                         | TEST CONDITION                               | SYMBOL      | MIN. | TYP. | MAX. | UNIT          |
| <b>INPUT</b>                                                                                      |                                              |             |      |      |      |               |
| Forward voltage                                                                                   | $I_F = 10\text{ mA}$                         | $V_F$       | -    | 1.2  | 1.55 | V             |
| Reverse current                                                                                   | $V_R = 6\text{ V}$                           | $I_R$       | -    | 0.1  | 100  | $\mu\text{A}$ |
| Capacitance                                                                                       | $V_R = 0\text{ V}$                           | $C_O$       | -    | 25   | -    | pF            |
| <b>OUTPUT</b>                                                                                     |                                              |             |      |      |      |               |
| Collector emitter breakdown voltage                                                               | $I_C = 10\text{ }\mu\text{A}$                | $BV_{CEO}$  | 70   | -    | -    | V             |
| Emitter collector breakdown voltage                                                               | $I_E = 10\text{ }\mu\text{A}$                | $BV_{ECO}$  | 7    | -    | -    | V             |
| Collector emitter leakage current                                                                 | $V_{CE} = 10\text{ V}$ , $I_F = 0\text{ A}$  | $I_{CEO}$   | -    | 5    | 50   | nA            |
| Collector emitter capacitance                                                                     | $V_{CE} = 0\text{ V}$                        | $C_{CE}$    | -    | 10   | -    | pF            |
| <b>COUPLER</b>                                                                                    |                                              |             |      |      |      |               |
| Collector emitter saturation voltage                                                              | $I_F = 10\text{ mA}$ , $I_C = 2.5\text{ mA}$ | $V_{CEsat}$ | -    | -    | 0.4  | V             |
| Capacitance (input to output)                                                                     |                                              | $C_{IO}$    | -    | 0.5  | -    | pF            |

**Note**

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

| CURRENT TRANSFER RATIO ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |                                              |         |            |      |      |      |      |
|-----------------------------------------------------------------------------------------------|----------------------------------------------|---------|------------|------|------|------|------|
| PARAMETER                                                                                     | TEST CONDITION                               | PART    | SYMBOL     | MIN. | TYP. | MAX. | UNIT |
| $I_C/I_F$                                                                                     | $V_{CE} = 5\text{ V}$ , $I_F = 10\text{ mA}$ | ILD205T | $CTR_{DC}$ | 40   | -    | 80   | %    |
|                                                                                               |                                              | ILD206T | $CTR_{DC}$ | 63   | -    | 125  | %    |
|                                                                                               |                                              | ILD207T | $CTR_{DC}$ | 100  | -    | 200  | %    |
|                                                                                               |                                              | ILD211T | $CTR_{DC}$ | 20   | -    | -    | %    |
|                                                                                               |                                              | ILD213T | $CTR_{DC}$ | 100  | -    | -    | %    |
|                                                                                               | $V_{CE} = 5\text{ V}$ , $I_F = 1\text{ mA}$  | ILD205T | $CTR_{DC}$ | 13   | 30   | -    | %    |
|                                                                                               |                                              | ILD206T | $CTR_{DC}$ | 22   | 45   | -    | %    |
|                                                                                               |                                              | ILD207T | $CTR_{DC}$ | 34   | 70   | -    | %    |

| <b>SWITCHING CHARACTERISTICS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |                                                                                       |           |      |      |      |               |
|---------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|-----------|------|------|------|---------------|
| PARAMETER                                                                                               | TEST CONDITION                                                                        | SYMBOL    | MIN. | TYP. | MAX. | UNIT          |
| Delay time                                                                                              | $V_S = 5\text{ V}$ , $I_C = 2\text{ mA}$ , $R_L = 100\text{ }\Omega$ , (see figure 1) | $t_d$     | -    | 3    | -    | $\mu\text{s}$ |
| Rise time                                                                                               | $V_S = 5\text{ V}$ , $I_C = 2\text{ mA}$ , $R_L = 100\text{ }\Omega$ , (see figure 1) | $t_r$     | -    | 3    | -    | $\mu\text{s}$ |
| Fall time                                                                                               | $V_S = 5\text{ V}$ , $I_C = 2\text{ mA}$ , $R_L = 100\text{ }\Omega$ , (see figure 1) | $t_f$     | -    | 4.7  | -    | $\mu\text{s}$ |
| Storage time                                                                                            | $V_S = 5\text{ V}$ , $I_C = 2\text{ mA}$ , $R_L = 100\text{ }\Omega$ , (see figure 1) | $t_s$     | -    | 0.3  | -    | $\mu\text{s}$ |
| Turn-on time                                                                                            | $V_S = 5\text{ V}$ , $I_C = 2\text{ mA}$ , $R_L = 100\text{ }\Omega$ , (see figure 1) | $t_{on}$  | -    | 6    | -    | $\mu\text{s}$ |
| Turn-off time                                                                                           | $V_S = 5\text{ V}$ , $I_C = 2\text{ mA}$ , $R_L = 100\text{ }\Omega$ , (see figure 1) | $t_{off}$ | -    | 5    | -    | $\mu\text{s}$ |
| Turn-on time                                                                                            | $V_S = 5\text{ V}$ , $I_F = 10\text{ mA}$ , $R_L = 1\text{ k}\Omega$ , (see figure 2) | $t_{on}$  | -    | 3    | -    | $\mu\text{s}$ |
| Turn-off time                                                                                           | $V_S = 5\text{ V}$ , $I_F = 10\text{ mA}$ , $R_L = 1\text{ k}\Omega$ , (see figure 2) | $t_{off}$ | -    | 10   | -    | $\mu\text{s}$ |

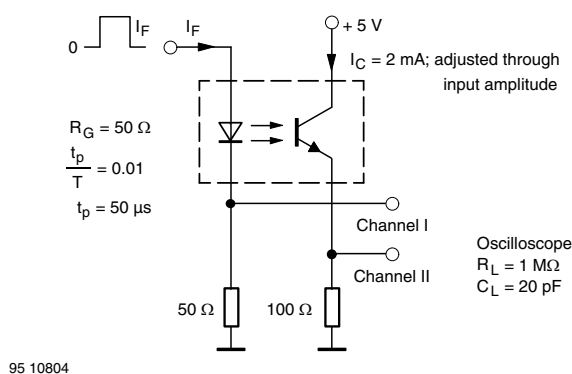


Fig. 1 - Test Circuit, Non-Saturated Operation

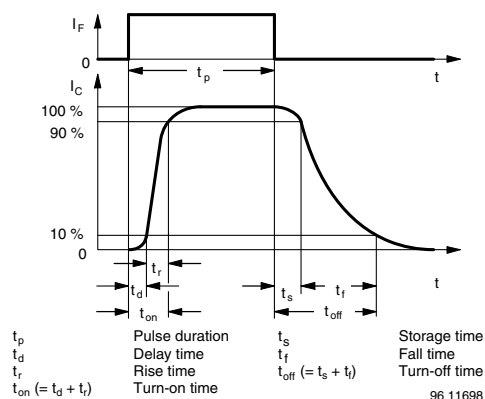


Fig. 3 - Switching Times

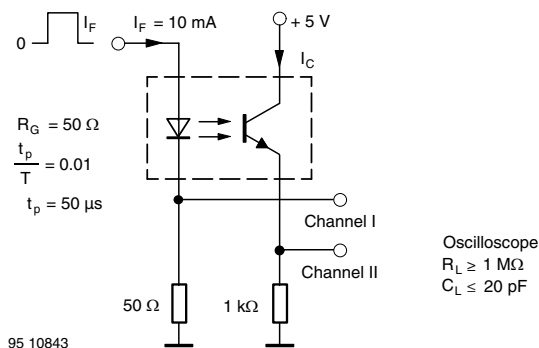


Fig. 2 - Test Circuit, Saturated Operation

**SAFETY AND INSULATION RATINGS**

| PARAMETER                                 | TEST CONDITION                                                    | SYMBOL     | VALUE          | UNIT               |
|-------------------------------------------|-------------------------------------------------------------------|------------|----------------|--------------------|
| Climatic classification                   | According to IEC 68 part 1                                        |            | 55/100/21      |                    |
| Comparative tracking index                |                                                                   | CTI        | 175            |                    |
| Tested withstanding isolation voltage     | According to UL1577, $t = 1$ s                                    | $V_{ISO}$  | 4000           | $V_{RMS}$          |
| Maximum transient isolation voltage       | According to DIN EN 60747-5-5                                     | $V_{IOTM}$ | 6000           | $V_{peak}$         |
| Maximum repetitive peak isolation voltage | According to DIN EN 60747-5-5                                     | $V_{IORM}$ | 560            | $V_{peak}$         |
| Isolation resistance                      | $T_{amb} = 25\text{ }^{\circ}\text{C}$ , $V_{IO} = 500\text{ V}$  | $R_{IO}$   | $\geq 10^{12}$ | $\Omega$           |
|                                           | $T_{amb} = 100\text{ }^{\circ}\text{C}$ , $V_{IO} = 500\text{ V}$ | $R_{IO}$   | $\geq 10^{11}$ | $\Omega$           |
| Output safety power                       |                                                                   | $P_{SO}$   | 350            | mW                 |
| Input safety current                      |                                                                   | $I_{SI}$   | 150            | mA                 |
| Input safety temperature                  |                                                                   | $T_S$      | 165            | $^{\circ}\text{C}$ |
| Creepage distance                         | DIP-6, option 6                                                   |            | 4              | mm                 |
| Clearance distance                        | DIP-6, option 6                                                   |            | 4              | mm                 |
| Insulation thickness                      |                                                                   |            | 0.2            | mm                 |

**Note**

- As per IEC 60747-5-5, § 7.4.3.8.2, this optocoupler is suitable for “safe electrical insulation” only within the safety ratings. Compliance with the safety ratings shall be ensured by means of protective circuits.

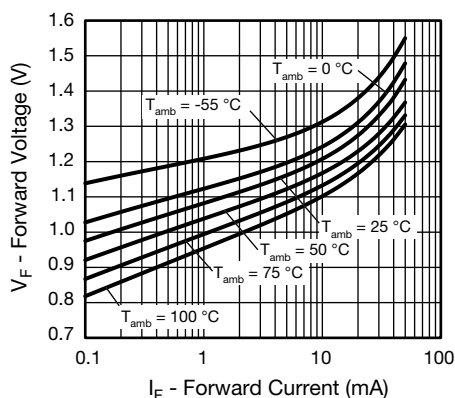
**TYPICAL CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)

Fig. 4 - Forward Voltage vs. Forward Current

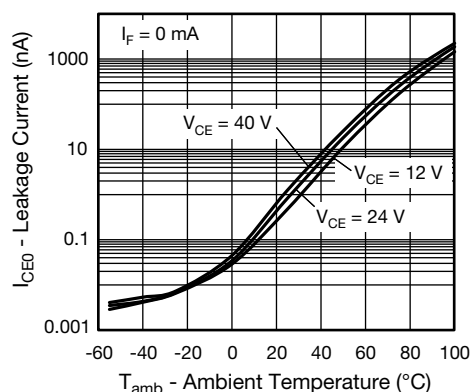


Fig. 6 - Leakage Current vs. Ambient Temperature

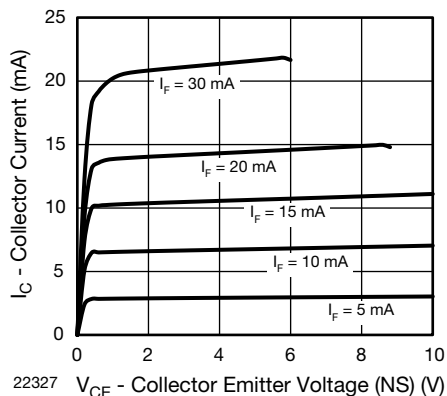


Fig. 5 - Collector Current vs. Collector Emitter Voltage (non-saturated)

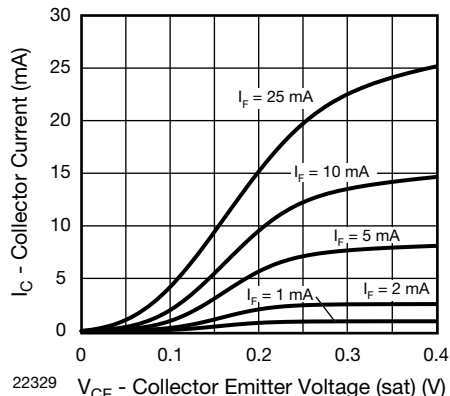


Fig. 7 - Collector Current vs. Collector Emitter Voltage (saturated)

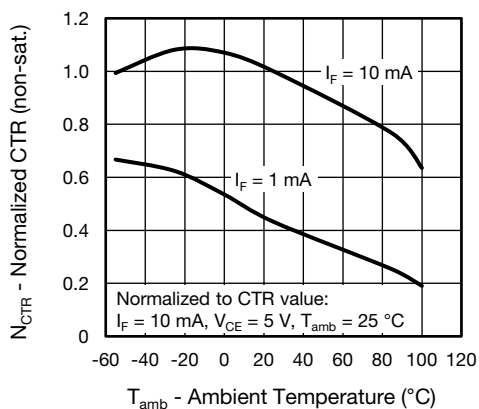


Fig. 8 - Normalized CTR (saturated) vs. Ambient Temperature

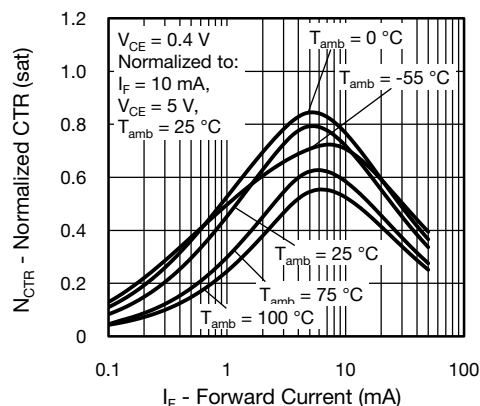


Fig. 11 - Normalized CTR (saturated) vs. Forward Current

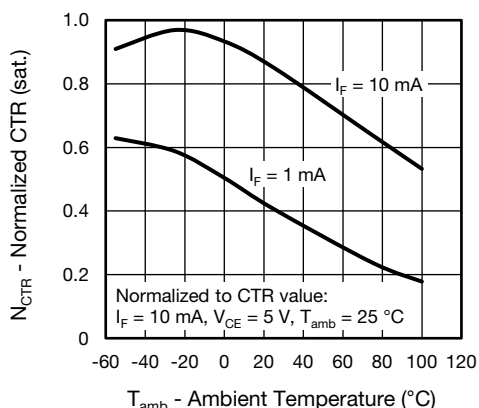


Fig. 9 - Normalized CTR (non-saturated) vs. Ambient Temperature

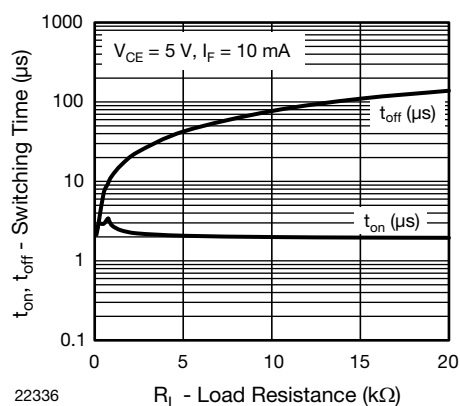


Fig. 12 - Switching Time vs. Load Resistance

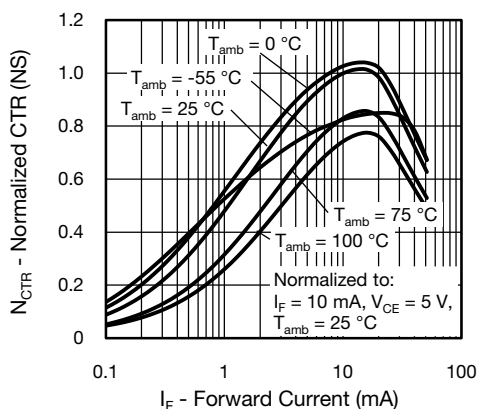


Fig. 10 - Normalized CTR (non-saturated) vs. Forward Current

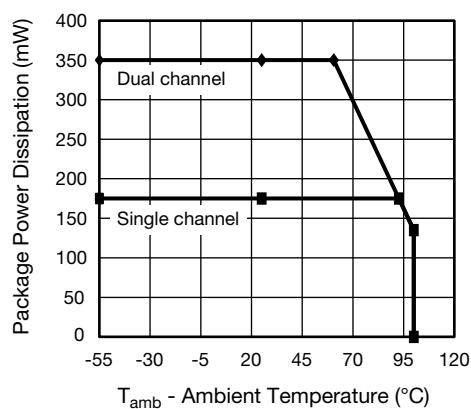
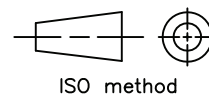
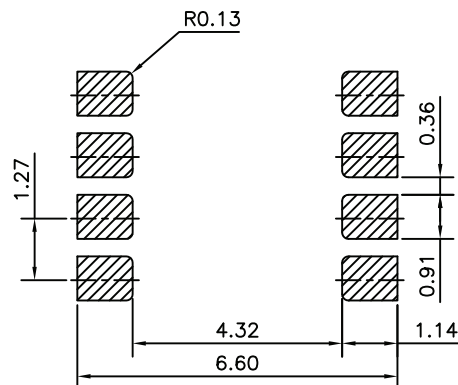
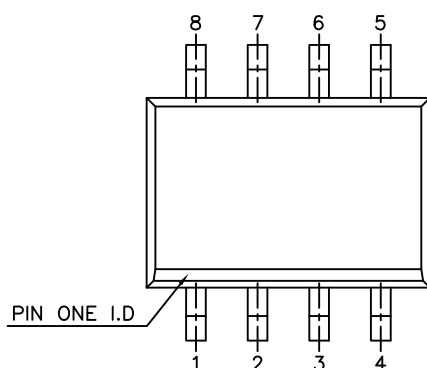
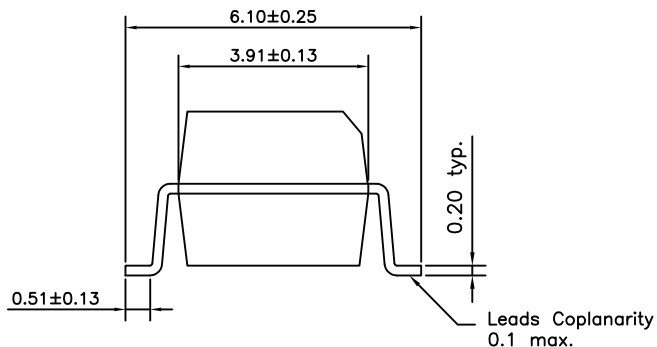
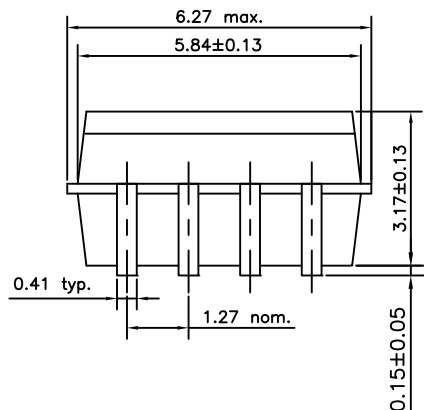


Fig. 13 - Power Dissipation vs. Ambient Temperature

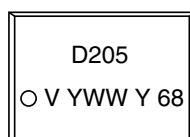


## PACKAGE DIMENSIONS (in millimeters)



ISO method

## PACKAGE MARKING (example)



### Note

- Tape and reel suffix (T) is not part of the package marking.

## TAPE AND REEL PACKAGING FOR DUAL CHANNELS <sup>(1)</sup> (in millimeters)

Selected dual SOIC8 optocouplers are available in tape and reel format. To order surface mount ILD2XX optocoupler on tape and reel, add a suffix "T" after the part number, i.e., ILD207T.

The tape is 16 mm and is wound on a 33 cm reel. There are 2000 parts per reel. Taped and reeled dual SOIC8 optocouplers conform to EIA-481-2 and IEC 60286-3.

### Note

(1) Select dual channel devices are available in the shorter SOIC-8 package and will be taped according to the single channel taping specification

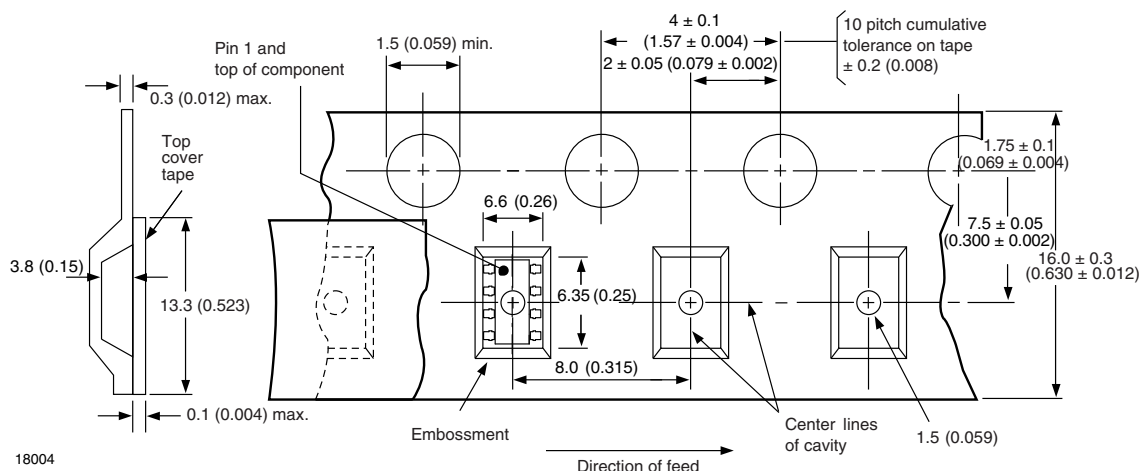
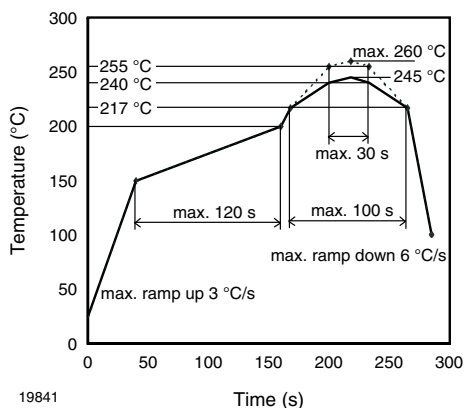


Fig. 14

## SOLDER PROFILE



19841

Fig. 15 - Lead (Pb)-free Reflow Solder Profile according to J-STD-020

## HANDLING AND STORAGE CONDITIONS

ESD level: HBM class 2

Floor life: unlimited

Conditions:  $T_{amb} < 30\text{ °C}$ ,  $RH < 85\%$

Moisture sensitivity level 1, according to J-STD-020



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