

Vishay Semiconductors ILD205T Optocoupler, Phototransistor Output Dual Channel User Manual

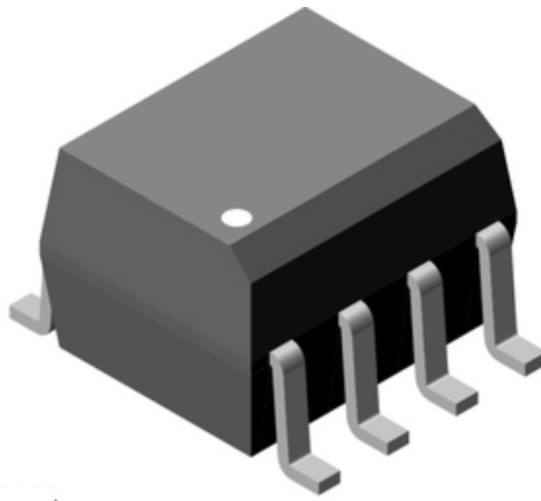
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ILD205T Optocoupler, Phototransistor Output Dual Channel



Product Information:

- Product Name: ILD205T, ILD206T, ILD207T, ILD211T, ILD213T
- Manufacturer: Vishay Semiconductors
- Product Type: Optocoupler
- Output Type: Phototransistor
- Package Type: SOIC-8
- High BVCEO (Collector Emitter Breakdown Voltage): 70V
- Minimum and Maximum CTR (Current Transfer Ratio) for narrow tolerance in electrical design
- Wide range of agency certifications and approvals
- Ordering Information available at www.vishay.com/doc?99912

Product Usage Instructions

To use the ILD205T, ILD206T, ILD207T, ILD211T, or ILD213T optocoupler, follow these steps:

1. Ensure that the adjacent circuits in your electrical design require a narrow tolerance in CTR. The ILD205T, ILD206T, ILD207T, ILD211T, and ILD213T provide a specified minimum and maximum CTR to meet this requirement.
2. Check the BVCEO (Collector Emitter Breakdown Voltage) of your application. The optocouplers have a high BVCEO of 70V, providing a higher safety margin compared to the industry standard of 30V.
3. Verify the package type required for your application. The ILD205T, ILD206T, ILD207T, ILD211T, and ILD213T come in a SOIC-8 package.
4. If necessary, refer to the ordering information available at www.vishay.com/doc?99912 to select the appropriate part number and package type.
5. Follow the recommended soldering conditions for surface mounted devices, as specified in the reflow profile.
6. Connect the input terminals of the optocoupler to the appropriate circuit in your application, ensuring that the forward voltage (VF) does not exceed 1.55V and the reverse current (IR) is within the specified range.
7. Connect the output terminals of the optocoupler to the desired circuit, considering the collector emitter breakdown voltage (BVCEO) and emitter collector breakdown voltage (BVECO) limits.
8. Take into account the power dissipation limits for both input and output channels, as well as the total package dissipation ambient for the complete optocoupler.

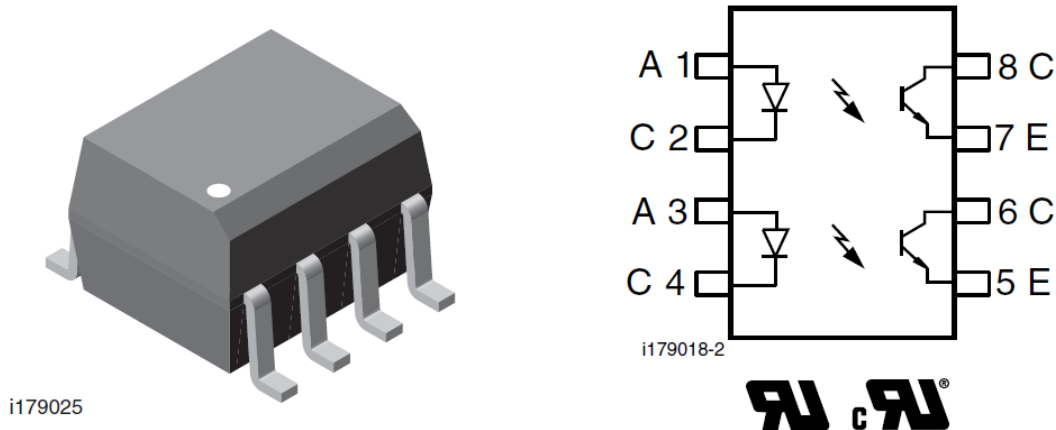
9. If required, measure and adjust the delay time, rise time, fall time, storage time, turn-on time, and turn-off time of the optocoupler using the specified test conditions.

For any technical questions or further assistance, contact optocoupleranswers@vishay.com.

Please note that this document is subject to change without notice.

Refer to www.vishay.com/doc?91000 for specific disclaimers related to the product and document.

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



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 BVCEO 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

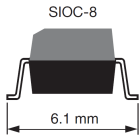


RoHS
COMPLIANT

- Standard lead spacing of 0.05"
- Available only on tape and reel option (conforms to EIA standard 481-2)
- Isolation test voltage, 4000 VRMS
- Compatible with dual wave, vapor phase and IR reflow soldering
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

AGENCY APPROVALS

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

ORDERING INFORMATION					
I L	D 2	# PART NUMBER	# T		
AGENCY CERTIFIED/PACKAGE	CTR (%)				
	10 mA				
UL, cUL	40 to 80	63 to 125	100 to 200	³ 20	³ 100
SOIC-8	ILD205T	ILD206T	ILD207T	ILD211T	ILD213T

ABSOLUTE MAXIMUM RATINGS ($T_{\text{amb}} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
INPUT				
Peak reverse voltage		V_R	6	V
Peak pulsed current	1 μs , 300 pps		1	A
Continuous forward current per channel		I_F	30	mA
Power dissipation		P_{diss}	50	mW
OUTPUT				
Collector emitter breakdown voltage		BV_{CEO}	70	V
Emitter collector breakdown voltage		BV_{ECO}	7	V
Power dissipation per channel		P_{diss}	125	mW
COUPLER				
Total package dissipation ambient (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 $^{\circ}\text{C}$ (1)		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.

(1) Refer to reflow profile for soldering conditions for surface mounted devices.

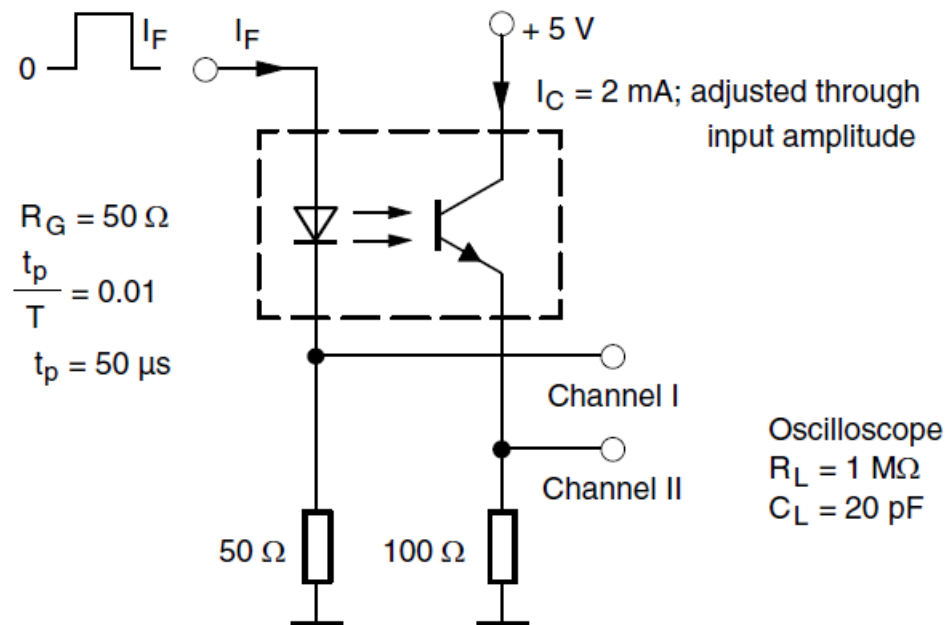
ELECTRICAL CHARACTERISTICS ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
INPUT						
Forward voltage	$I_F = 10\text{ mA}$	V_F	–	1.2	1.55	V
Reverse current	$V_R = 6\text{ V}$	I_R	–	0.1	100	μA
Capacitance	$V_R = 0\text{ V}$	C_O	–	25	–	pF
OUTPUT						
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
COUPLER						
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.

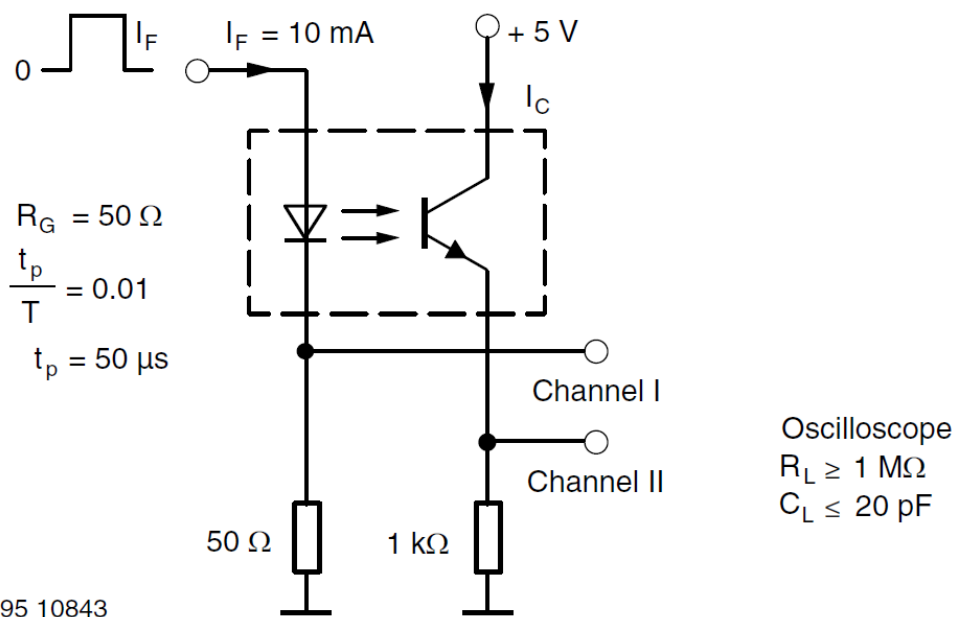
CURRENT TRANSFER RATIO ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
I_C/I_F	$V_{CE} = 5\text{ V}$, $I_F = 10\text{ mA}$	ILD205T	CTR_{DC}	40	–	80	%
		ILD206T	CTR_{DC}	63	–	125	%
		ILD207T	CTR_{DC}	100	–	200	%
		ILD211T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

SWITCHING CHARACTERISTICS ($T_{amb} = 25\text{ }^{\circ}\text{C}$, 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	–	μs
Rise time	$V_S = 5\text{ V}$, $I_C = 2\text{ mA}$, $R_L = 100\text{ }\Omega$, (see figure 1)	t_r	–	3	–	μs
Fall time	$V_S = 5\text{ V}$, $I_C = 2\text{ mA}$, $R_L = 100\text{ }\Omega$, (see figure 1)	t_f	–	4.7	–	μs
Storage time	$V_S = 5\text{ V}$, $I_C = 2\text{ mA}$, $R_L = 100\text{ }\Omega$, (see figure 1)	t_s	–	0.3	–	μs
Turn-on time	$V_S = 5\text{ V}$, $I_C = 2\text{ mA}$, $R_L = 100\text{ }\Omega$, (see figure 1)	t_{on}	–	6	–	μs
Turn-off time	$V_S = 5\text{ V}$, $I_C = 2\text{ mA}$, $R_L = 100\text{ }\Omega$, (see figure 1)	t_{off}	–	5	–	μs
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	–	μs
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	–	μs



95 10804

Fig. 1 - Test Circuit, Non-Saturated Operation



95 10843

Fig. 2 - Test Circuit, Saturated Operation

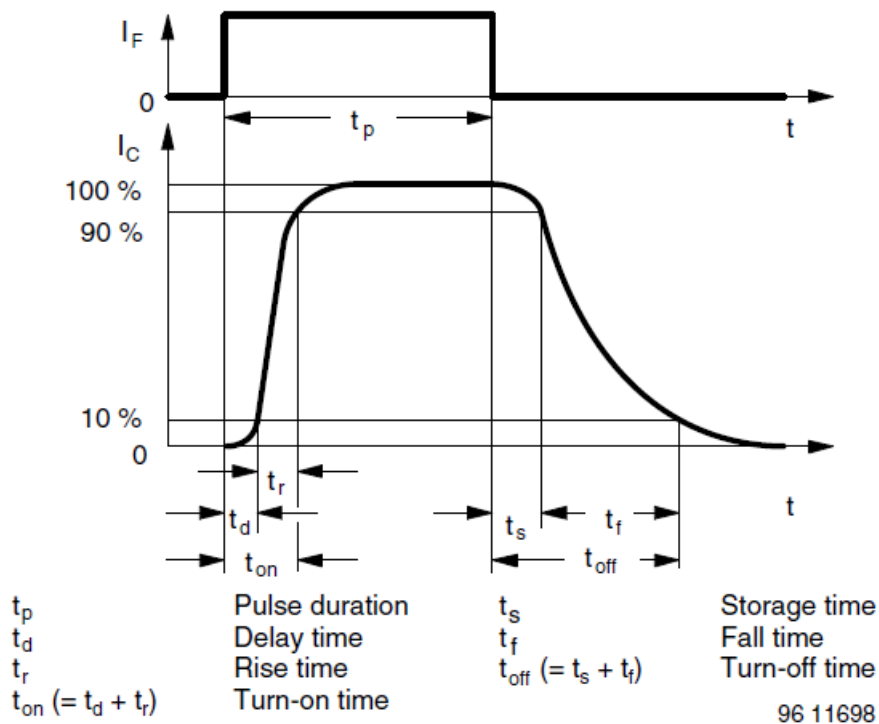


Fig. 3 - Switching Times

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, $t = 1 \text{ s}$	VISO	4000	VRMS
Maximum transient isolation voltage	According to DIN EN 60747-5-5	VIOTM	6000	Vpeak
Maximum repetitive peak isolation voltage	According to DIN EN 60747-5-5	VIORM	560	Vpeak
Isolation resistance	$T_{amb} = 25 \text{ }^{\circ}\text{C}$, $V_{IO} = 500 \text{ V}$	RIO	$\geq 10^{12}$	W
	$T_{amb} = 100 \text{ }^{\circ}\text{C}$, $V_{IO} = 500 \text{ V}$	RIO	$\geq 10^{11}$	W
Output safety power		PSO	350	mW
Input safety current		ISI	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)

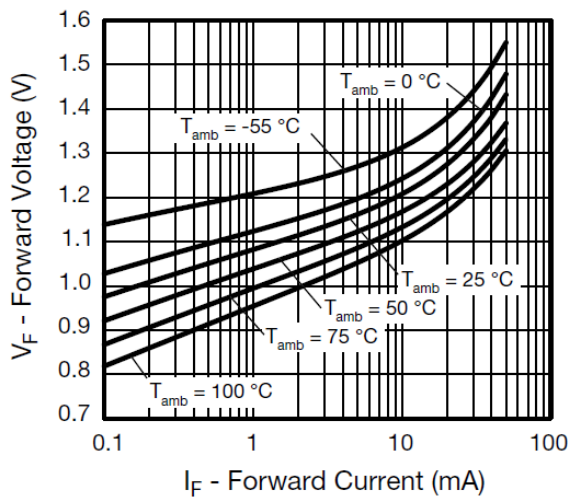


Fig. 4 - Forward Voltage vs. Forward Current

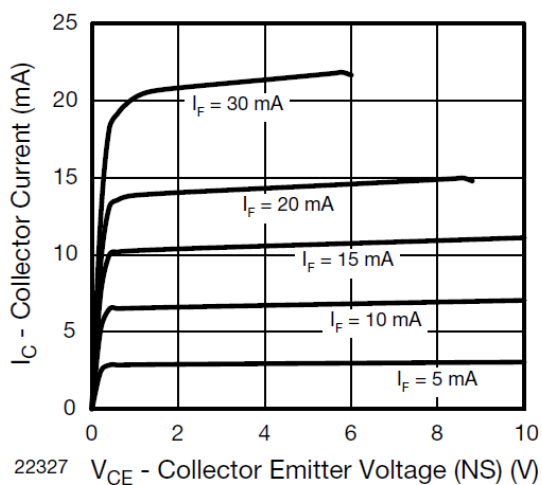


Fig. 5 - Collector Current vs. Collector Emitter Voltage (non-saturated)

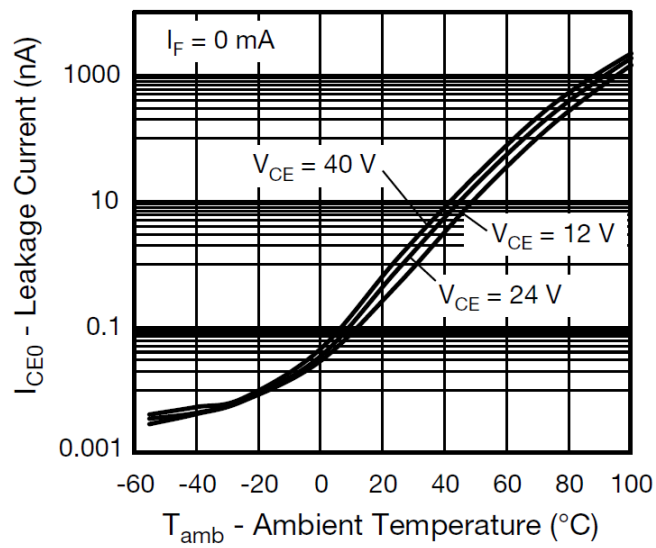


Fig. 6 - Leakage Current vs. Ambient Temperature

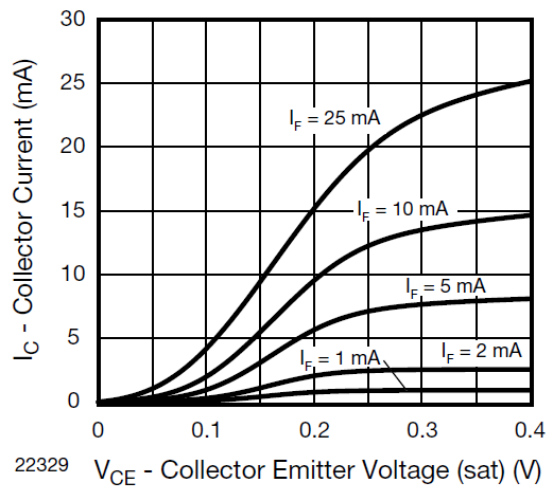


Fig. 7 - Collector Current vs. Collector Emitter Voltage (saturated)

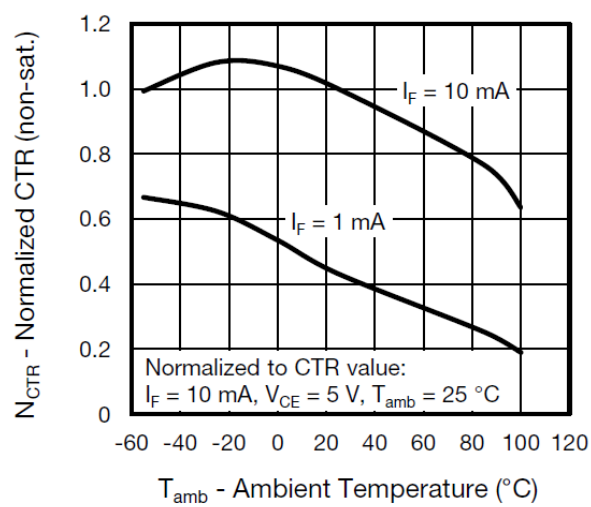


Fig. 8 - Normalized CTR (saturated) vs. Ambient Temperature

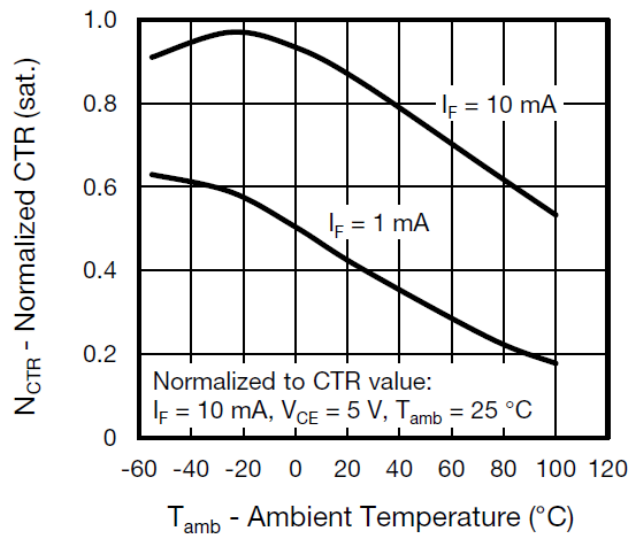


Fig. 9 - Normalized CTR (non-saturated) vs. Ambient Temperature

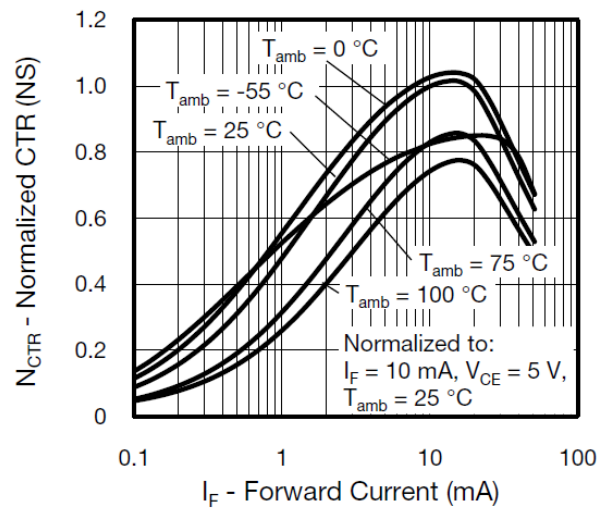


Fig. 10 - Normalized CTR (non-saturated) vs. Forward Current

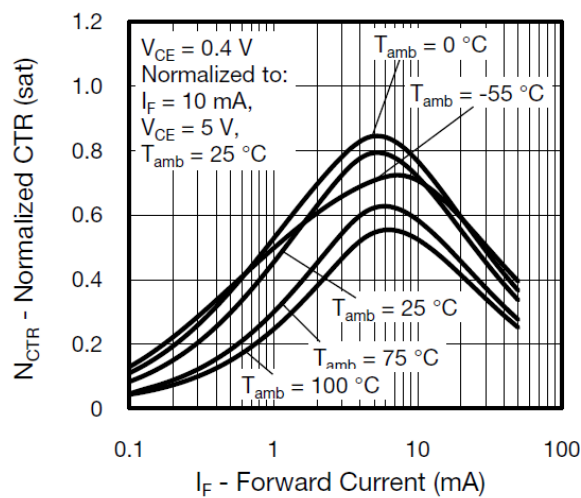


Fig. 11 - Normalized CTR (saturated) vs. Forward Current

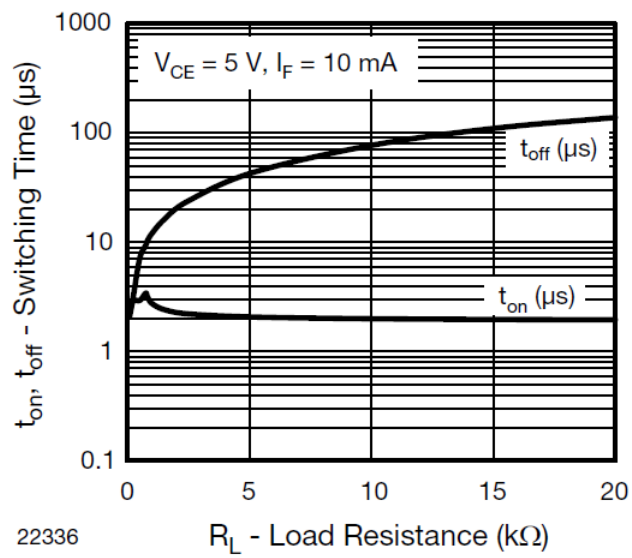


Fig. 12 - Switching Time vs. Load Resistance

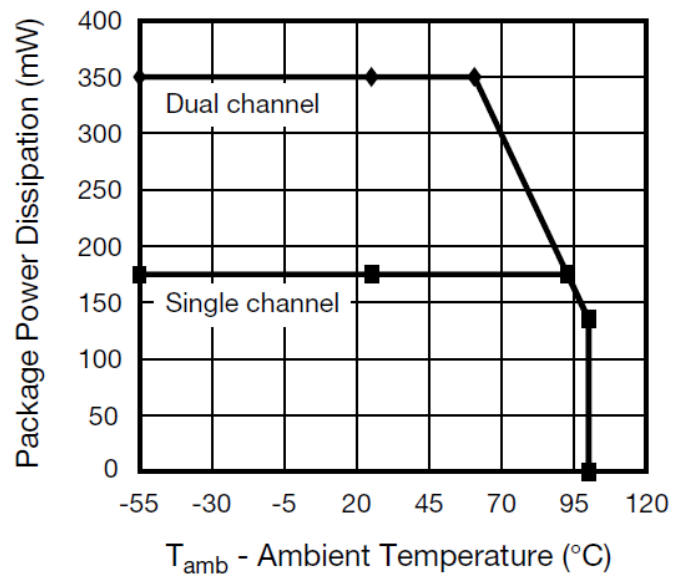
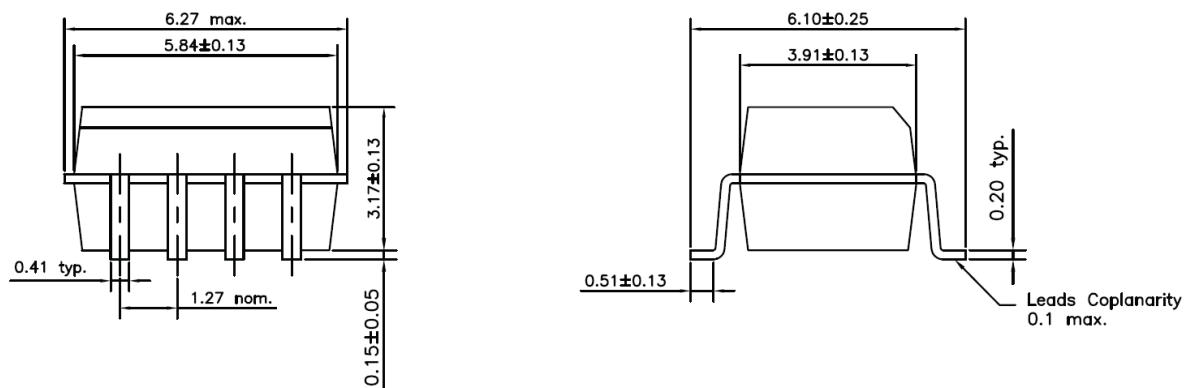
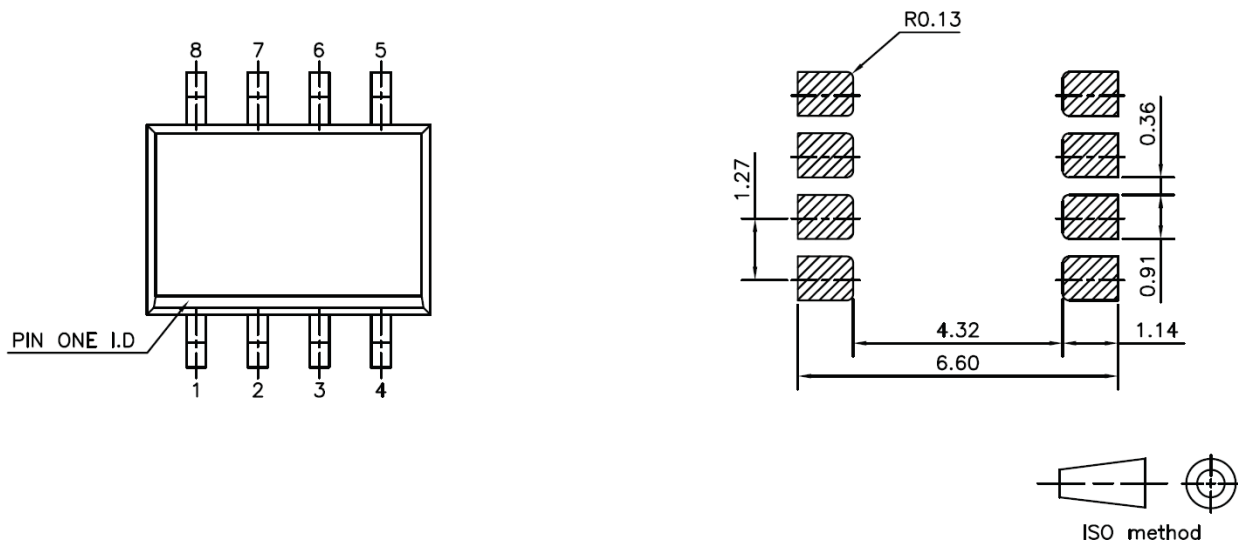


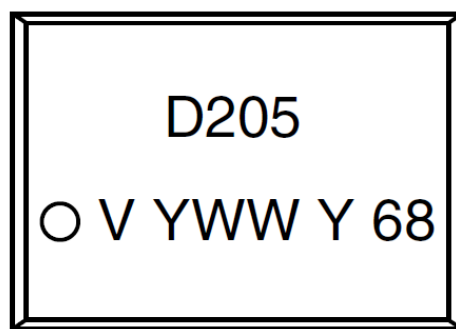
Fig. 13 - Power Dissipation vs. Ambient Temperature

PACKAGE DIMENSIONS (in millimeters)





PACKAGE MARKING (example)



Note

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

TAPE AND REEL PACKAGING FOR DUAL CHANNELS (1) (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

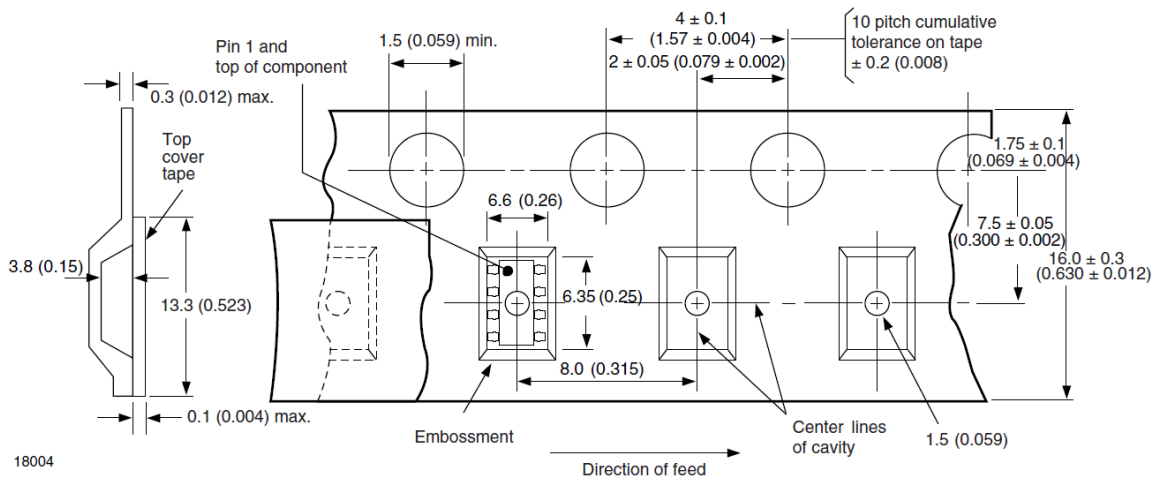


Fig. 14

SOLDER PROFILE

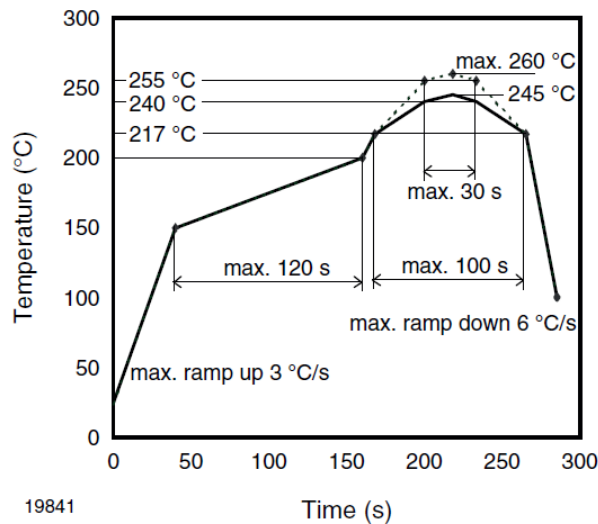


Fig. 15 - Lead (Pb)-free Reflow Solder Profile according to J-STD-020

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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References

- [Vishay Intertechnology: Passives & Discrete Semiconductors](#)
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