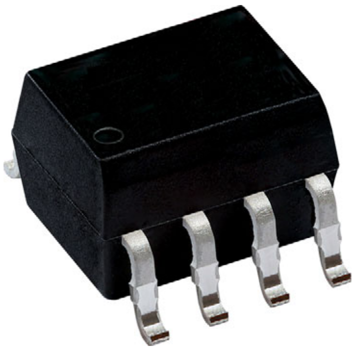
High Speed Optocoupler, 10 MBd

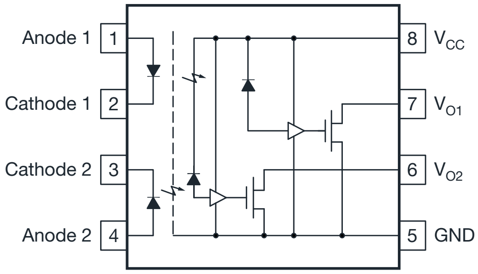


DESCRIPTION

The VO0630, VO0631, VO0661 are dual channel 10 MBd optocoupler utilizing a high efficient input LED coupled to a high speed integrated photo-detector logic gate. The detector features an open drain output. The internal shield provides a guaranteed common mode transient immunity of up to 15 kV/μs.

FEATURES

- CMTI of 15 kV/μs (min.)
- LVTTL/LVCMOS compatibility
- Low power consumption
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



APPLICATIONS

- Microprocessor system interface
- Ground loop elimination
- Digital bus systems isolation
- High speed A/D and D/A conversion
- Digital control power supply
- Level shifting

AGENCY APPROVALS

- UL1577
- cUL
- DIN EN 60747-5-5 (VDE 0884-5), available with option 1

LINKS TO ADDITIONAL RESOURCES

Design Tools
Related Documents
EDA / CAD
Models
Application Notes
Evaluation Boards

ORDERING INFORMATION

V	O	0	6	#	#	-	X	0	0	#	T
PART NUMBER							PACKAGE OPTION				TAPE AND REEL

AGENCY CERTIFIED / PACKAGE	CMR (kV/μs)		
UL, cul	**1**	**5**	**15**
SOIC-8	VO0630T	VO0631T	VO0661T
UL, cUL, VDE (option 1)	**1**	**5**	**15**
SOIC-8	-	VO0631-X001T	-

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				
Input forward current		I_F	15	mA
Peak transient input current	> 1 μs pulse width, 330 pps	$I_{F(tran)}$	1.0	A
Reverse input voltage		V_R	5	V
Input power dissipation		P_{diss}	40	mW
OUTPUT				
Supply voltage		V_{CC}	7	V
Output current		I_O	50	mA
Output voltage		V_O	7	V
Output power dissipation		P_{diss}	60	mW
COUPLER				
Storage temperature		T_{stg}	-55 to +125	°C
Operating temperature		T_{amb}	-40 to +100	°C
Solder reflow temperature (1)	5 s		260	°C

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 (SMD). Refer to wave profile for soldering conditions for through hole devices (DIP).

RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Operating temperature	T_{amb}	-40	+100	°C
Supply voltage	V_{CC}	4.5	5.5	V
Input current low level	I_{FL}	0	250	μA
Input current high level	I_{FH}	5	15	mA
Output pull up resistor	R_L	330	4000	Ω
Fanout (R_L = 1 kΩ)	N	-	5	TTL loads

TRUTH TABLE (positive logic)

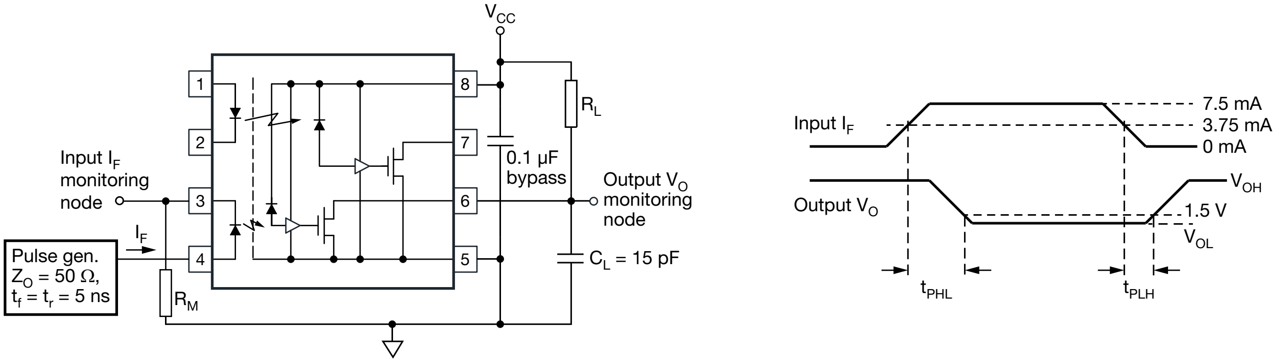
LED	OUTPUT
On	L
Off	H

ELECTRICAL CHARACTERSITCS (T_{amb} = -40 °C to +100 °C, 4.5 V ≤ V_{CC} ≤ 5.5 V, I_F = 7.5 mA, unless otherwise specified; typical values are at V_{CC} = 5.0 V, T_{amb} = 25 °C)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
INPUT						
Input forward voltage	I_F = 10 mA	V_F	-	1.38	1.70	V
Input forward voltage temperature coefficient	I_F = 10 mA	$\Delta V_F/\Delta T$	-	-1.5	-	mV/K
Input reverse voltage	I_R = 10 µA	BV_R	5	-	-	V
Input threshold current	V_O = 0.6 V, V_{CC} = 5.5 V, I_{OL} (sinking) = 13 mA	I_{TH}	-	2.1	5	mA
Input capacitance	f = 1 MHz, V_F = 0 V	C_I	-	34	-	pF
OUTPUT						
Low level supply current	I_F = 10 mA, V_{CC} = 5.5 V	I_{CCL}	-	7.2	10	mA
High level supply current	I_F = 0 mA, V_{CC} = 5.5 V	I_{CCH}	-	7.6	10	mA
Low level output voltage	V_{CC} = 5.5 V, I_F = 5 mA, I_{OL} (sinking) = 13 mA	V_{OL}	-	0.09	0.60	V
High level output current	V_{CC} = 5.5 V, V_O = 5.5 V, I_F = 250 µA	I_{OH}	-	1	10	µA
COUPLER						
Input to output capacitance	f = 1 MHz, T_{amb} = 25 °C	C_{IO}	-	1	-	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.

SWITCHING CHARACTERISTICS (T_{amb} = -40 °C to +100 °C, 4.5 V ≤ V_{CC} ≤ 5.5 V, I_F = 7.5 mA, unless otherwise specified; typical values are at V_{CC} = 5.0 V, T_{amb} = 25 °C)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Propagation delay time to high output level	R_L = 350 Ω, C_L = 15 pF, T_{amb} = 25 °C	t_{PLH}	25	50	90	ns
	R_L = 350 Ω, C_L = 15 pF	t_{PLH}	-	-	100	ns
Propagation delay time to low output level	R_L = 350 Ω, C_L = 15 pF, T_{amb} = 25 °C	t_{PHL}	25	40	75	ns
	R_L = 350 Ω, C_L = 15 pF	t_{PHL}	-	-	100	ns
Pulse width distortion	R_L = 350 Ω, C_L = 15 pF	$\lvert t_{PLH} - t_{PHL}\rvert$	-	10	-	ns
Propagation delay skew	R_L = 350 Ω, C_L = 15 pF	t_{PSK}	-	-	40	ns
Output rise time (10 % to 90 %)	R_L = 350 Ω, C_L = 15 pF	t_r	-	11	-	ns
Output fall time (90 % to 10 %)	R_L = 350 Ω, C_L = 15 pF	t_f	-	2.3	-	ns



The probe and Jig capacitances are included in C_L

Fig. 1 - Test Circuit for t_{PLH}, t_{PHL}, t_r, and t_f

COMMON MODE TRANSIENT IMMUNITY (T_{amb} = 25 °C, unless otherwise specified)							
PARAMETER	**TEST CONDITION**	**SYMBOL**	**PART NUMBER**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Logic high common mode transient immunity	V_{CC} = 5 V, $\|V_{CM}\|$ = 1000 V, I_F = 0 mA, V_O > 2.0 V, R_L = 350 Ω	$\|CM_H\|$	VO0630	1000	-	-	V/µs
			VO0631	5000	-	-	
			VO0661	15 000	-	-	
Logic low common mode transient immunity	V_{CC} = 5 V, $\|V_{CM}\|$ = 1000 V, I_F = 10 mA, V_O < 0.8 V, R_L = 350 Ω	$\|CM_H\|$	VO0630	1000	-	-	
			VO0631	5000	-	-	
			VO0661	15 000	-	-	

Notes

- No external pull up is required for a high logic state on the enable input. If the enable pin in not used, connect it to V_{CC}.

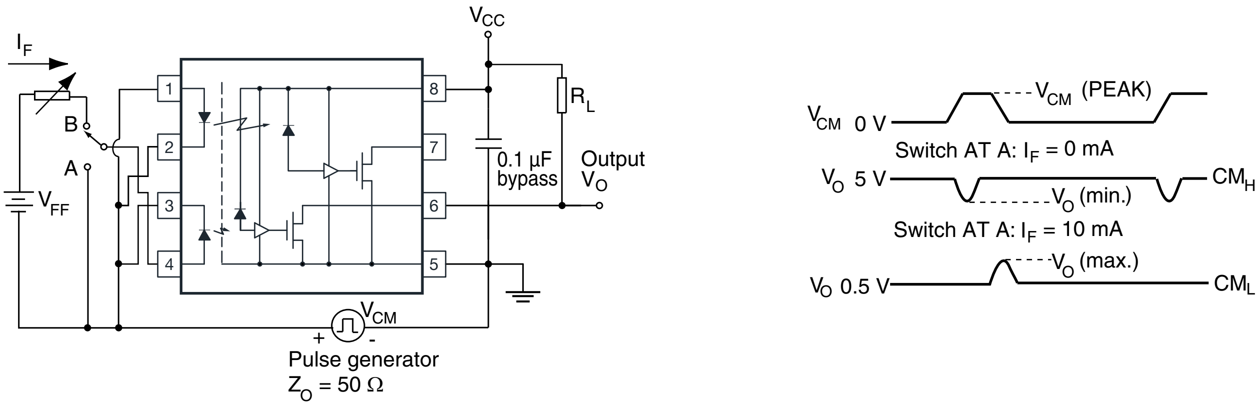


Fig. 2 - Test Circuit for Common Mode Transient Immunity

SAFETY AND INSULATION RATINGS				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
Climatic classification	According to IEC 68 part 1		40 / 100 / 21	
Pollution degree	According to DIN VDE 0109		2	
Comparative tracking index	Insulation group IIIa	CTI	175	
Maximum rated withstanding isolation voltage	According to UL1577, t = 1 min	V_{ISO}	3750	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}	567	V_{peak}
Isolation resistance	T_{amb} = 25 °C, V_{IO} = 500 V	R_{IO}	$\geq 10^{12}$	Ω
Maximum output power dissipation		P_{SO}	85	mW
Maximum input current		I_{SI}	50	mA
Maximum ambient temperature (derated)		T_S	175	°C
Creepage distance			≥ 5	mm
Clearance distance			≥ 5	mm
Insulation thickness		DTI	≥ 0.4	mm

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

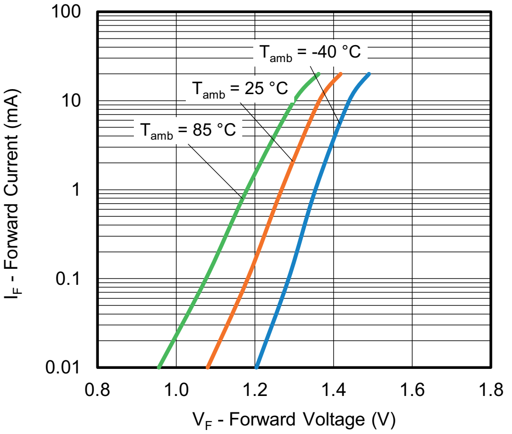


Fig. 3 - Forward Current vs. Forward Voltage

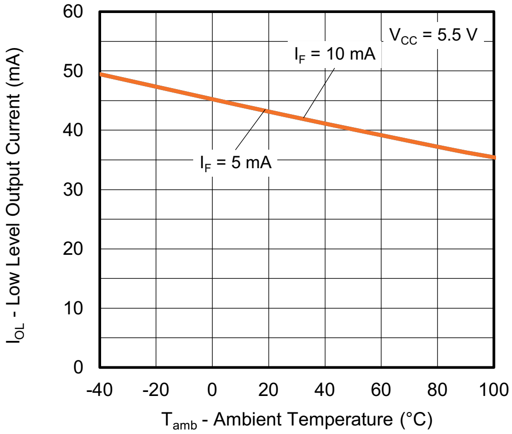


Fig. 6 - Low Level Output Current vs. Ambient Temperature

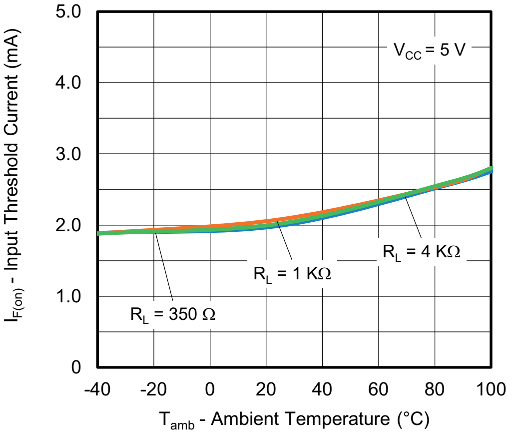


Fig. 4 - Input Threshold Current vs. Ambient Temperature

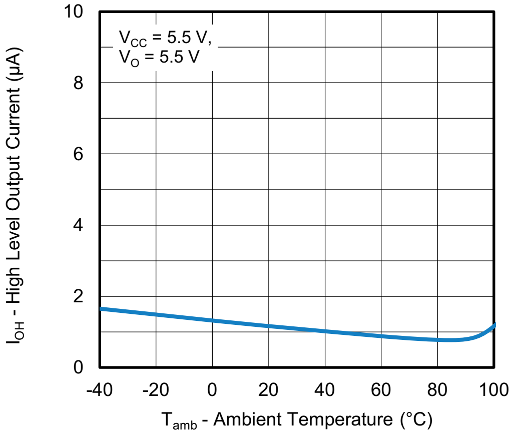


Fig. 7 - High Level Output Current vs. Ambient Temperature

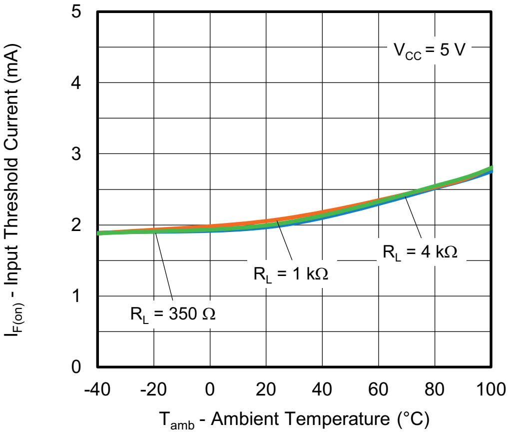


Fig. 5 - Low Level Output Voltage vs. Ambient Temperature

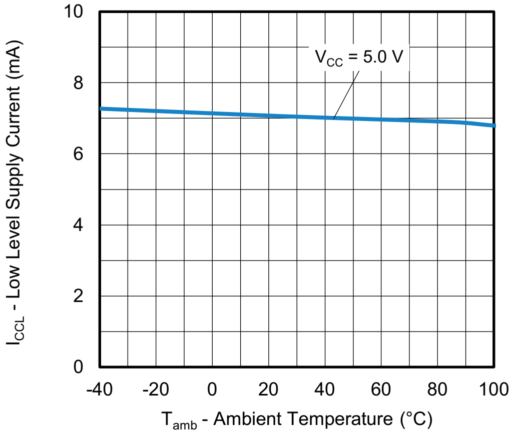


Fig. 8 - Low Level Supply Current vs. Ambient Temperature

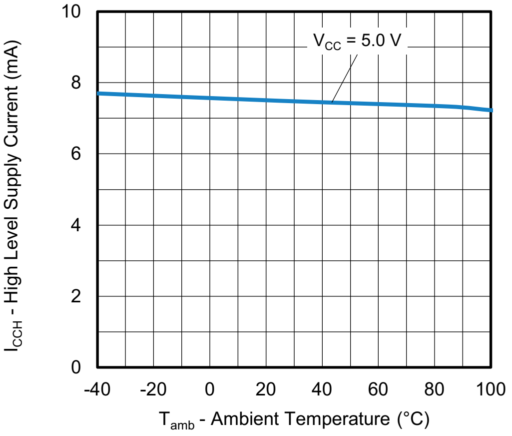


Fig. 9 - High Level Supply Current vs. Ambient Temperature

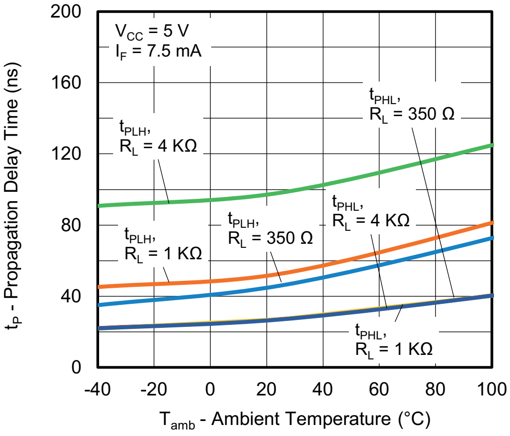


Fig. 11 - Propagation Delay Time vs. Ambient Temperature

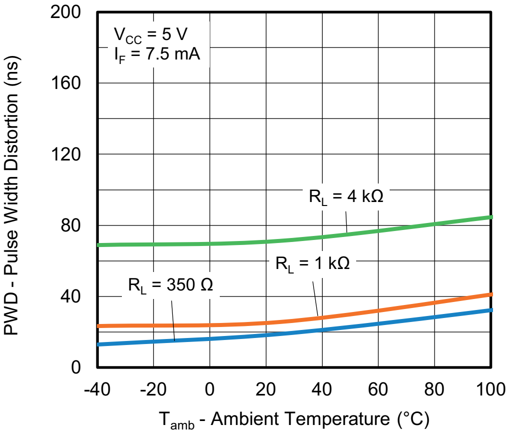


Fig. 10 - Pulse Width Distortion vs. Ambient Temperature

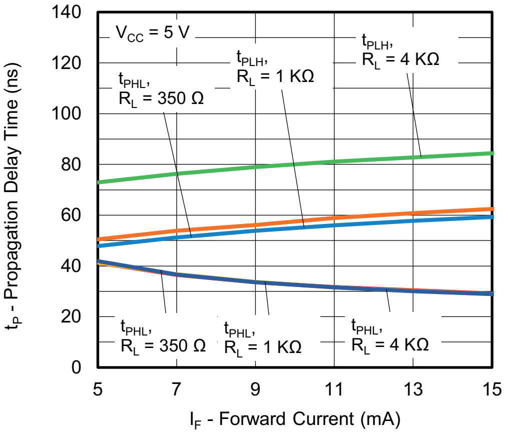


Fig. 12 - Propagation Delay Time vs. Forward Current

PACKAGE DIMENSIONS (in millimeters)

SOIC-8

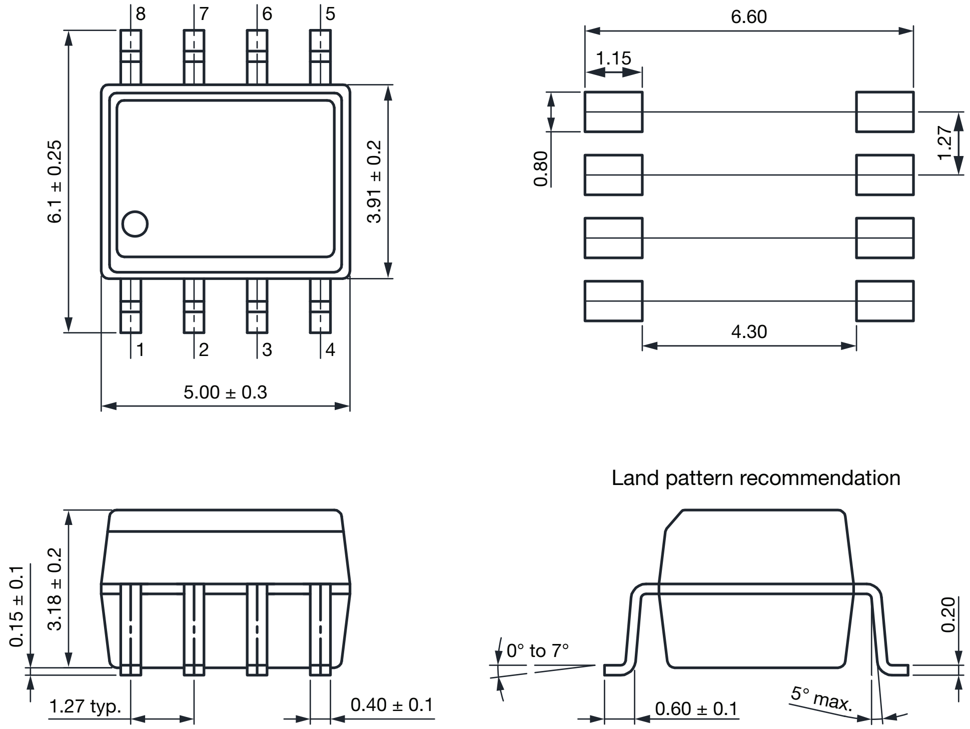


Fig. 13

PACKAGE MARKING

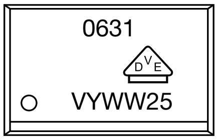


Fig. 14 - Example of VO0631-X001T

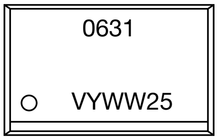


Fig. 15 - Example of VO0631T

Notes

- "YWW" is the date code marking (Y = year code, WW = week code)
- The VDE symbol is only marked on VDE option parts
- Tape and reel suffix (T) is not part of the package marking

PACKAGING INFORMATION (in millimeters)

SOIC-8 Tape

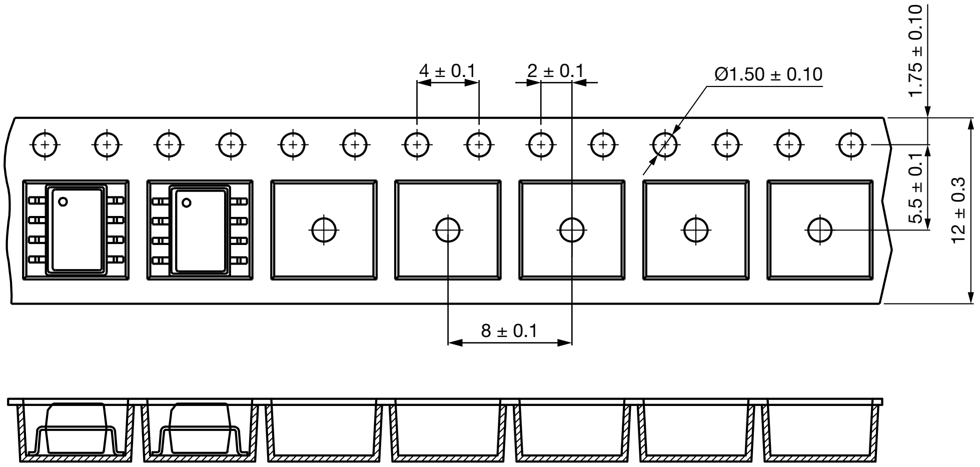


Fig. 16 - Tape and Reel Packaging (2000 pieces on reel)

Reel

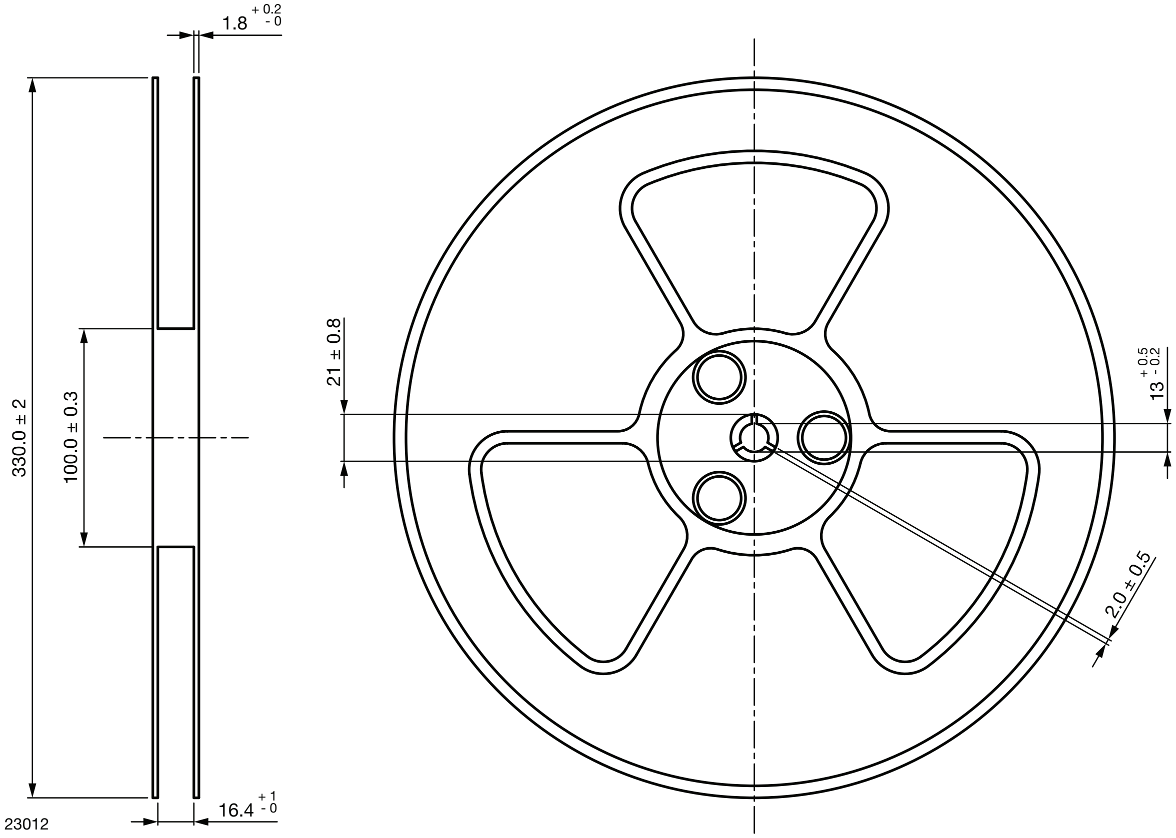


Fig. 17 - Tape and Reel Shipping Medium

SOLDER PROFILES

IR Reflow Soldering (JEDEC® J-STD-020C compliant)

One time soldering reflow is recommended within the condition of temperature and time profile shown below. Do not solder more than three times.

PROFILE ITEM	CONDITIONS
Preheat	
- Temperature minimum ($T_{S\ min.}$)	150 °C
- Temperature maximum ($T_{S\ max.}$)	200 °C
- Time (min. to max.) (t_S)	90 s ± 30 s
Soldering zone	
- Temperature (T_L)	217 °C
- Time (t_L)	60 s
Peak temperature (T_p)	260 °C
Ramp-up rate	3 °C/s max.
Ramp-down rate	3 °C/s to 6 °C/s

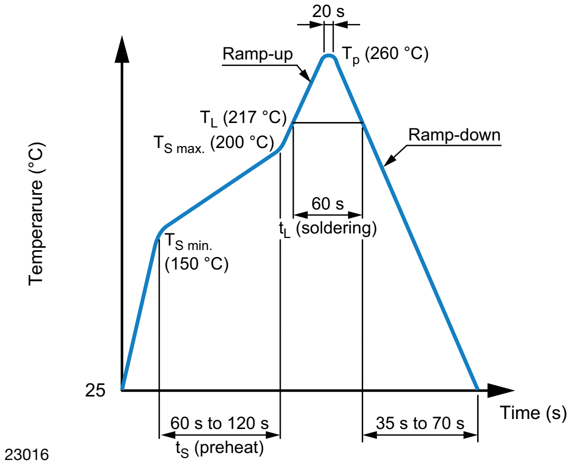


Fig. 18

Wave Soldering (JEDEC JESD22-A111 compliant)

One time soldering is recommended within the condition of temperature.

Temperature: 260 °C + 0 °C / - 5 °C

Time: 10 s

Preheat temperature: 25 °C to 140 °C

Preheat time: 30 s to 80 s

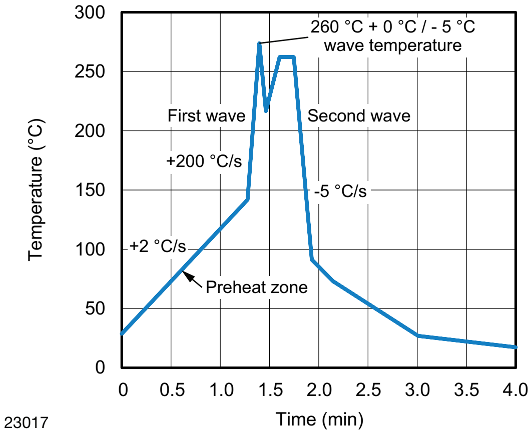


Fig. 19

Hand Soldering by Soldering Iron

Allow single lead soldering in every single process. One time soldering is recommended.

Temperature: 380 °C + 0 °C / - 5 °C

Time: 3 s max.

HANDLING AND STORAGE CONDITIONS

ESD level: HBM class 2

Floor life: unlimited

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

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

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