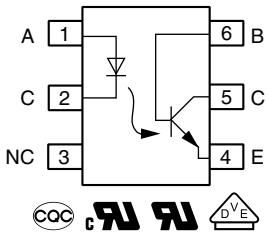
Optocoupler, Phototransistor Output, With Base Connection





23030

FEATURES

- Isolation test voltage, 5000 V_{RMS}
- Low coupling capacitance
- High common mode transient immunity
- Storage temperature, -55 ° to +150 °C
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free

e3

RoHS COMPLIANT

HALOGEN FREE

GREEN (5-2008)

APPLICATIONS

- Telecom
- Industrial controls
- Battery powered equipment
- Office machines
- Programmable controllers

AGENCY APPROVALS

- UL
- cUL
- DIN EN 60747-5-5 (VDE 0884-5) available with option 1
- CQC

DESIGN SUPPORT TOOLS AVAILABLE

3D Models | Design Tools | Related Documents

DESCRIPTION

The SFH601 has a GaAs infrared emitting diode emitter, which is optically coupled to a silicon planar phototransistor detector, and is incorporated in a plastic DIP-6 package.

It features a high current transfer ratio, low coupling capacitance, and high isolation voltage.

The coupling device is designed for signal transmission between two electrically separated circuits.

ORDERING INFORMATION

S	F	H	6	0	1	-	#	X	0	#	#	#
PART NUMBER							CTR BIN	PACKAGE OPTION				TAPE AND REEL

AGENCY CERTIFIED/PACKAGE	CTR (%)			
UL, cUL, CQC	**40 to 80**	**63 to 125**	**100 to 200**	**160 to 320**
DIP-6	SFH601-1	SFH601-2	SFH601-3	-
SMD-6, option 7			SFH601-3X007T	SFH601-4X007T
SMD-6, option 9	-	-	SFH601-3X009	-
VDE, UL, cUL, CQC	**40 to 80**	**63 to 125**	**100 to 200**	**160 to 320**
DIP-6, 400 mil, option 6	-	SFH601-2X016	SFH601-3X016	-
SMD-6, option 7	-	-	SFH601-3X017T	-

Note

- Additional options may be possible, please contact sales office

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ABSOLUTE MAXIMUM RATINGS (T_{amb} = 25 °C, unless otherwise specified)				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
INPUT				
Reverse voltage		V_R	6	V
Forward current		I_F	60	mA
Total power dissipation		P_{diss}	100	mW
OUTPUT				
Collector emitter voltage		V_{CEO}	100	V
Emitter base voltage		V_{EBO}	7	V
Collector current		I_C	50	mA
Power dissipation		P_{diss}	150	mW
COUPLER				
Storage temperature range		T_{stg}	-55 to +150	°C
Ambient temperature range		T_{amb}	-55 to +100	°C
Soldering temperature	t = 10 s	T_{sld}	260	°C

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

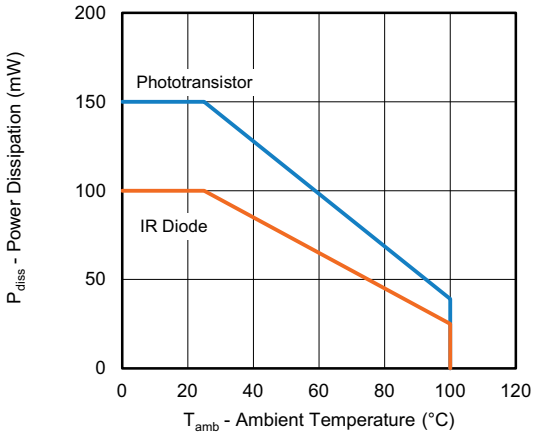


Fig. 1 - Power Dissipation vs. Ambient Temperature

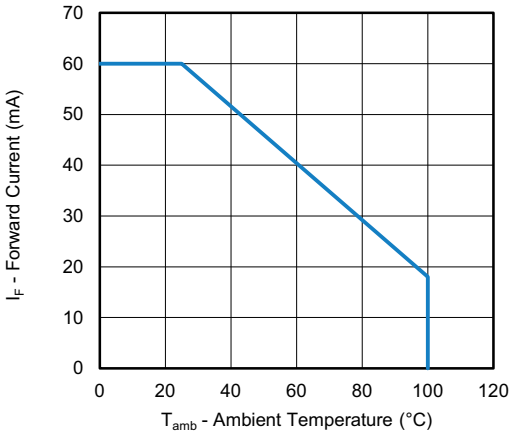


Fig. 2 - Maximum Forward Current vs. Ambient Temperature

ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
INPUT						
Forward voltage	I_F = 60 mA	V_F	-	1.45	1.65	V
Breakdown voltage	I_R = 10 µA	V_{BR}	6	-	-	V
Reverse current	V_R = 6 V	I_R	-	0.01	10	µA
Capacitance	V_F = 0 V, f = 1 kHz	C_I	-	-	100	pF
OUTPUT						
Collector emitter leakage current	V_{CE} =10 V	I_{CEO}	-	2	50	nA
COUPLER						
Collector emitter saturation voltage	I_F = 10 mA, I_C = 2.5 mA	V_{CEsat}	-	0.125	0.4	V
Coupling capacitance	V_{I-O} = 0, f = 1 MHz	C_{IO}	-	0.6	-	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

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CURRENT TRANSFER RATIO							
PARAMETER	**TEST CONDITION**	**PART**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
I_C/I_F	I_F = 10 mA, V_{CE} = 5 V	SFH601-1	CTR	40	-	80	%
		SFH601-2	CTR	63	-	125	%
		SFH601-3	CTR	100	-	200	%
		SFH601-4	CTR	160	-	320	%

SWITCHING CHARACTERISTICS						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Turn-on time	V_{CC} = 5 V, I_C = 2 mA, R_L = 100 Ω	t_{on}	-	3	-	µs
Turn-off time	V_{CC} = 5 V, I_C = 2 mA, R_L = 100 Ω	t_{off}	-	3	-	µs

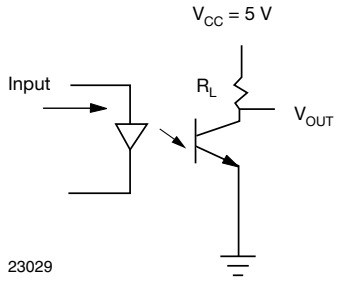


Fig. 3 - Test Circuit for Switching Characteristics

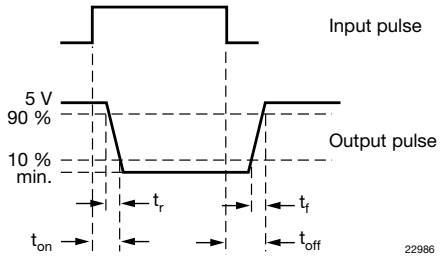


Fig. 4 - Parameter and Limit Definition

SAFETY AND INSULATION RATINGS				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
Climatic classification	According to IEC 68 part 1		55 / 115 / 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}	5000	V_{RMS}
Maximum transient isolation voltage	According to DIN EN 60747-5-5	V_{IOTM}	8000	V_{peak}
Maximum repetitive peak isolation voltage	According to DIN EN 60747-5-5	V_{IORM}	890	V_{peak}
Isolation resistance	T_{amb} = 25 °C, V_{IO} = 500 V	R_{IO}	≥ 10^{12}	Ω
	T_{amb} = 100 °C, V_{IO} = 500 V	R_{IO}	≥ 10^{11}	Ω
Output safety power		P_{SO}	700	mW
Input safety current		I_{SI}	400	mA
Input safety temperature		T_{SI}	175	°C
Creepage distance	DIP-6, SMD-6		≥ 7	mm
Clearance distance			≥ 7	mm
Creepage distance	DIP-6, 400 mil		≥ 8	mm
Clearance distance			≥ 8	mm
Insulation thickness		DTI	≥ 0.4	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

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

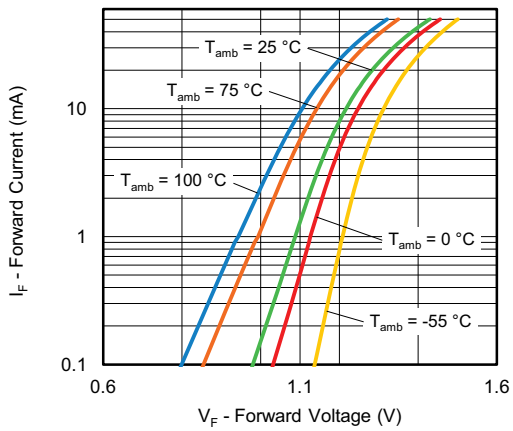


Fig. 5 - Forward Current vs. Forward Voltage

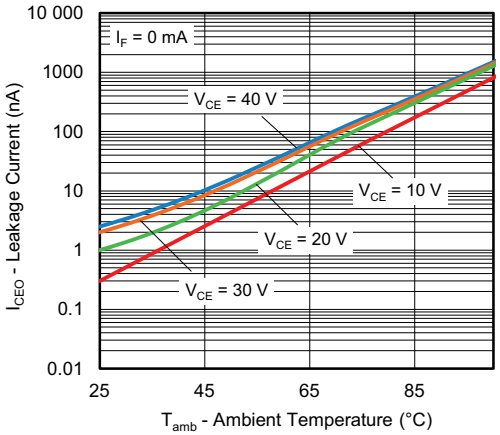


Fig. 8 - Leakage Current vs. Ambient Temperature

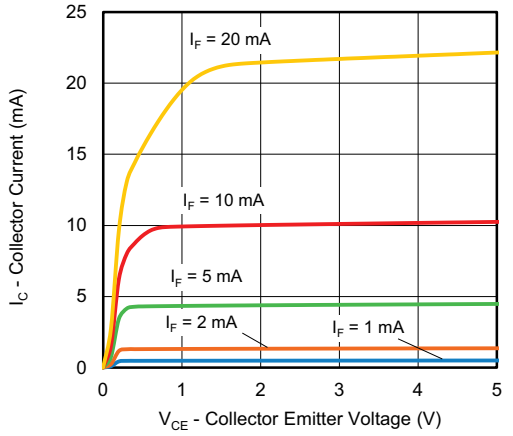


Fig. 6 - Collector Current vs. Collector Emitter Voltage (non-saturated)

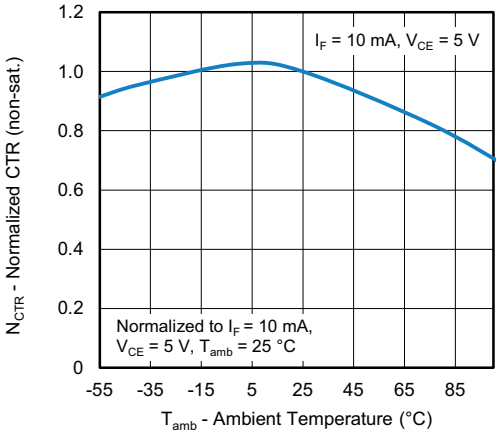


Fig. 9 - Normalized CTR vs. Ambient Temperature (non-saturated)

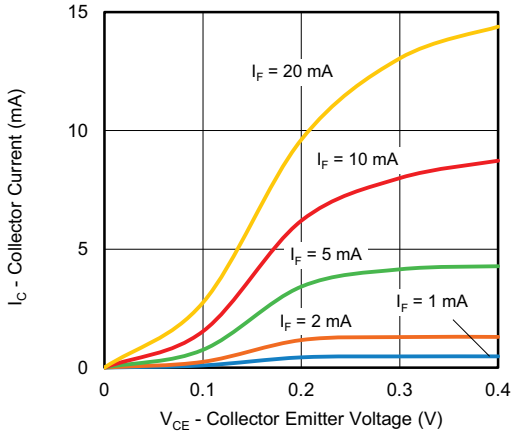


Fig. 7 - Collector Current vs. Collector Emitter Voltage (saturated)

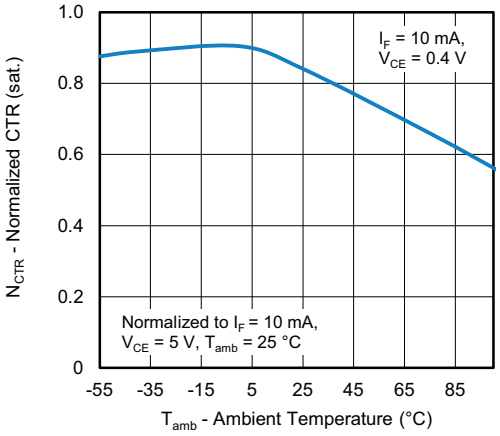


Fig. 10 - Normalized CTR vs. Ambient Temperature (saturated)

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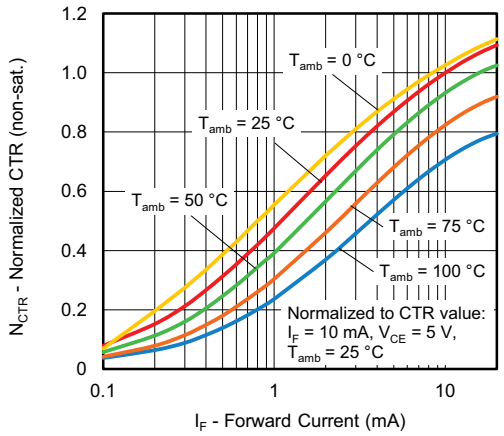


Fig. 11 - Normalized CTR vs. Forward Current (non-saturated)

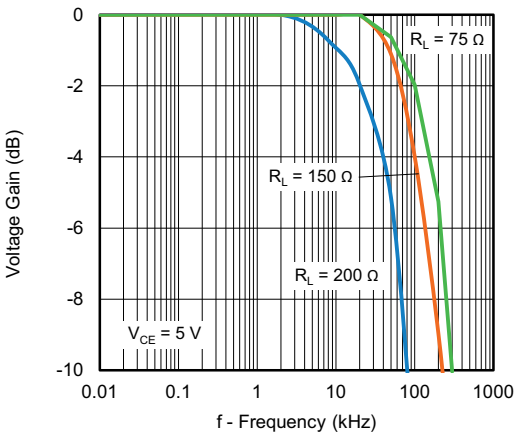


Fig. 13 - Voltage Gain vs. Frequency

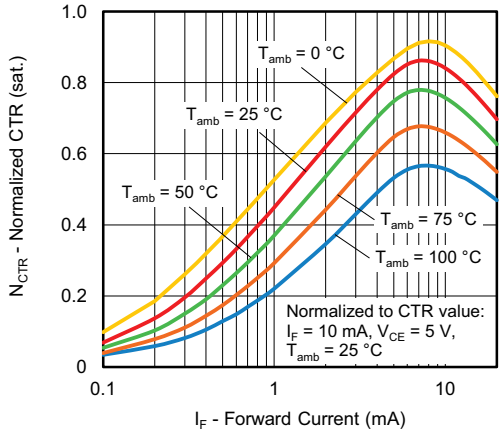


Fig. 12 - Normalized CTR vs. Forward Current (saturated)

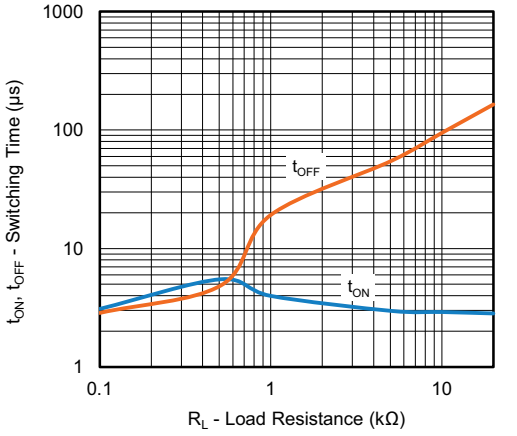
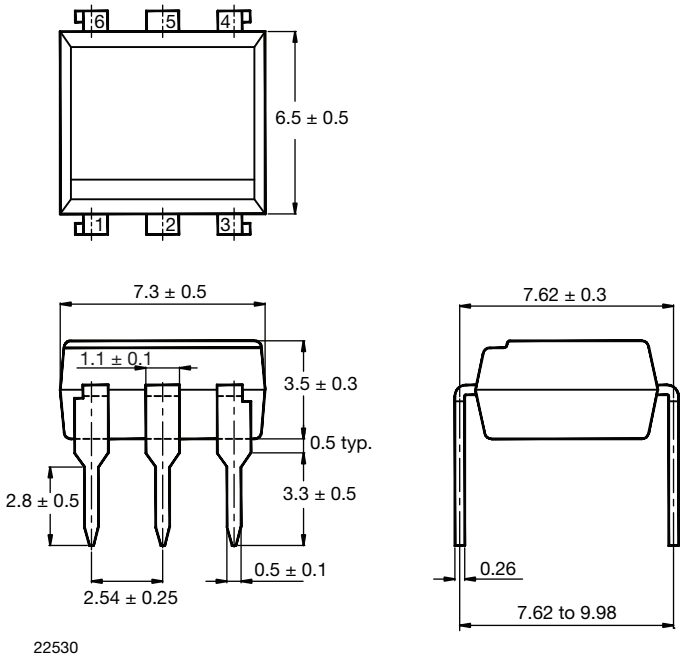


Fig. 14 - Switching Time vs. Load Resistance

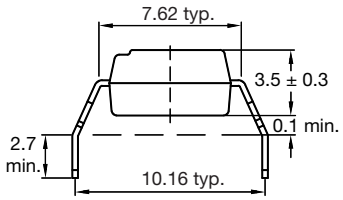
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PACKAGE DIMENSIONS in millimeters

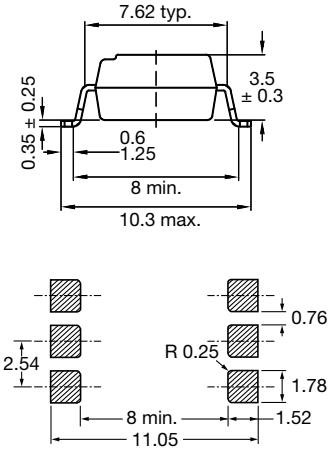
6 Pin Package



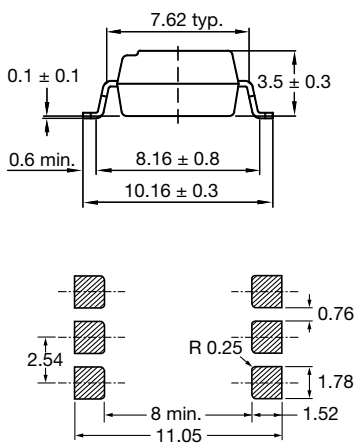
Option 6



Option 7



Option 9



20802-52

PACKAGE MARKING

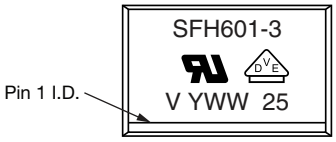


Fig. 15 - Example of SFH601

Notes

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

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PACKAGING INFORMATION (in millimeters)

DEVICES PER TUBE			
TYPE	**UNITS/TUBE**	**TUBES/BOX**	**UNITS/BOX**
DIP-6	50	40	2000
DIP-6, option 6	50	40	2000
SMD-6, option 9	50	40	2000

DIP-6

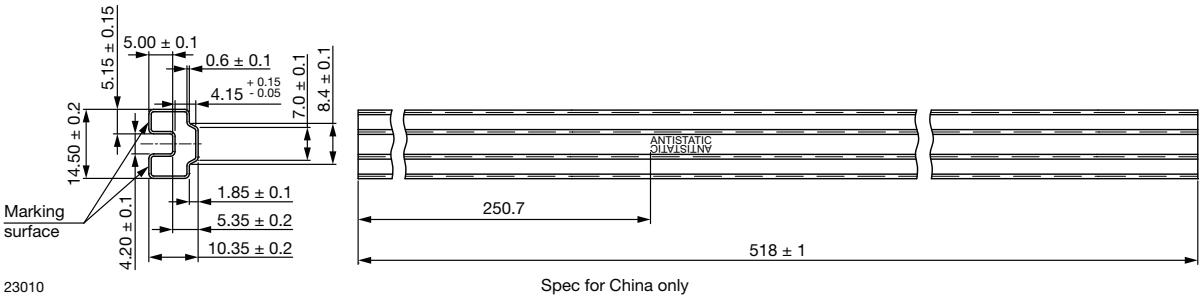


Fig. 16 - DIP-6

SMD-6

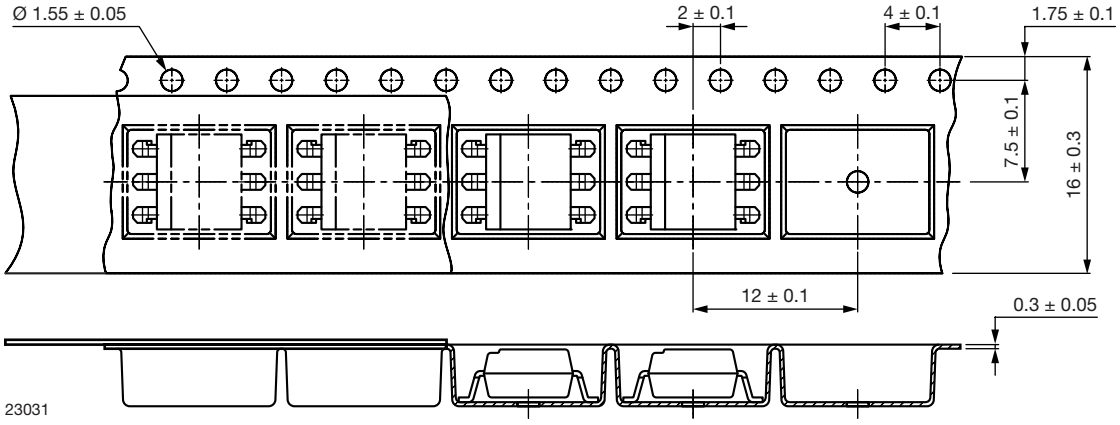


Fig. 17 - SMD-6

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Reel

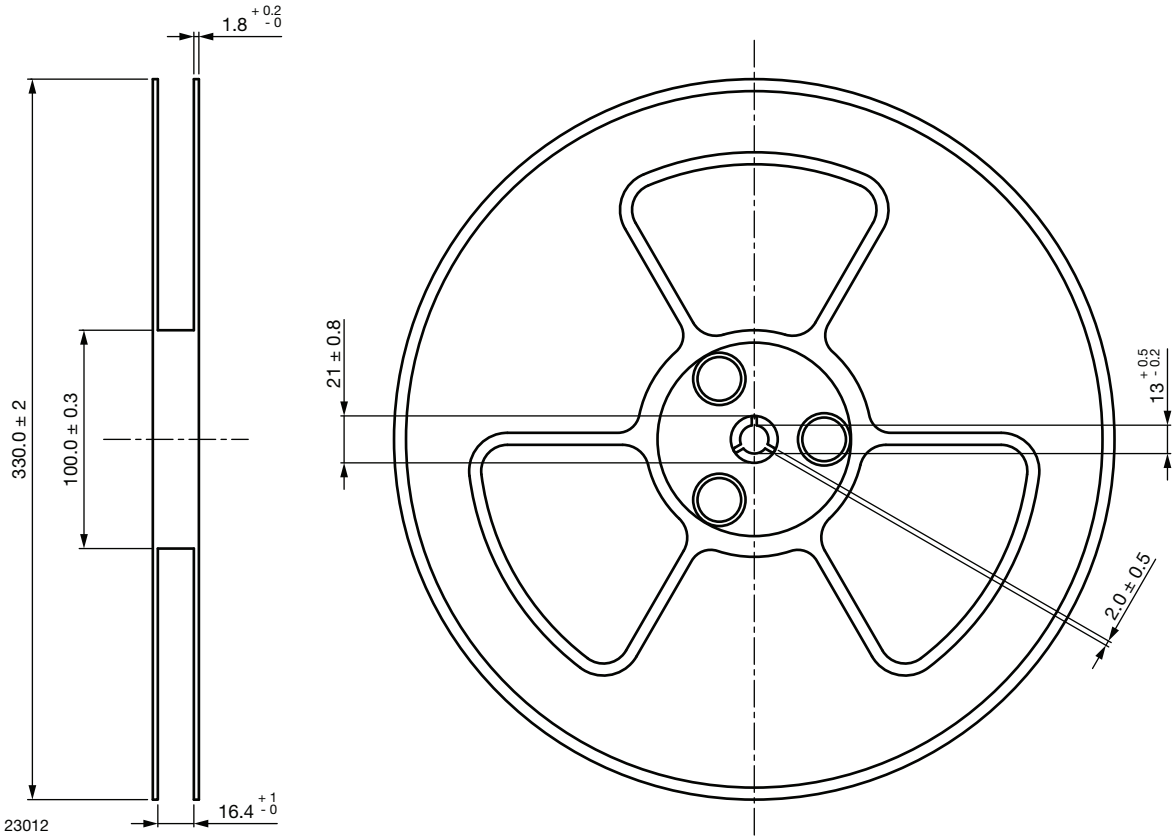


Fig. 18 - Tape and Reel Shipping Medium

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

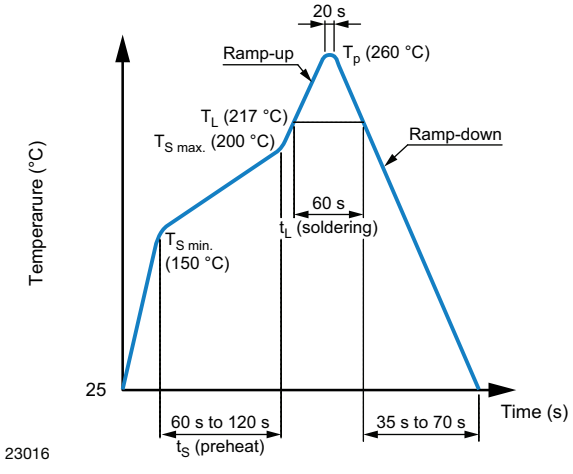


Fig. 19

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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

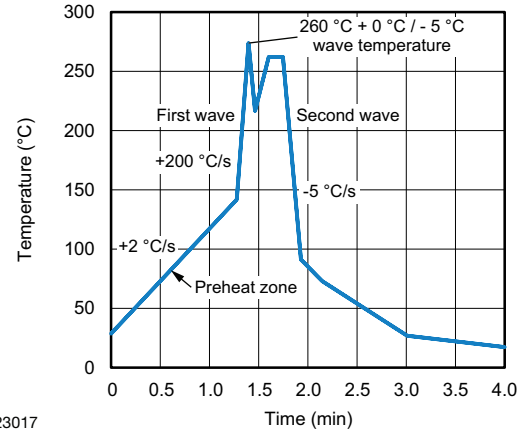


Fig. 20

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.

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