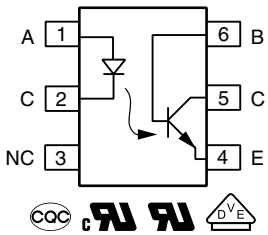
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Optocoupler, Phototransistor Output, With Base Connection, 300 V BV_{CEO}





23109

FEATURES

- Phototransistor optocoupler in a 6 pin DIP package with base connection
- Very high collector emitter breakdown voltage, BV_{CEO} = 300 V
- Isolation rated voltage: 5000 V_{RMS}
- Low coupling capacitance
- High common m;ode transient immunity
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free
e3
RoHS COMPLIANT
HALOGEN FREE
GREEN (5-2008)

LINKS TO ADDITIONAL RESOURCES

3D Models | Design Tools | Related Documents | SPICE Models | Footprints | Schematics

APPLICATIONS

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

DESCRIPTION

The SFH640 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.

AGENCY APPROVALS

- UL
- cUL
- DIN EN 60747-5-5 (VDE 0884-5) available with option 1
- CQC GB4943.1-2011
- CQC GB8898-2011

ORDERING INFORMATION

S	F	H	6	4	0	-	#	X	0	#	#	T
PART NUMBER							CTR BIN	PACKAGE OPTION				TAPE AND REEL

AGENCY CERTIFIED / PACKAGE	CTR (%) 10 mA	
UL, cUL	**63 to 125**	**100 to 200**
DIP-6	SFH640-2	SFH640-3
SMD-6, option 7	SFH640-2X007	SFH640-3X007T (1)
VDE, UL, cUL	**63 to 125**	**100 to 200**
SMD-6, option 9	-	SFH640-3X019T

Notes

- Additional options may be possible, please contact sales office

(1) Also available in tubes, do not put T on the end

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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
Power dissipation		P_{diss}	100	mW
OUTPUT				
Power dissipation		P_{diss}	150	mW
Collector emitter voltage		V_{CEO}	300	V
Collector base voltage		V_{CBO}	300	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
Operating temperature range		T_{amb}	-55 to +115	°C
Soldering temperature	t = 10 s	T_{sld}	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

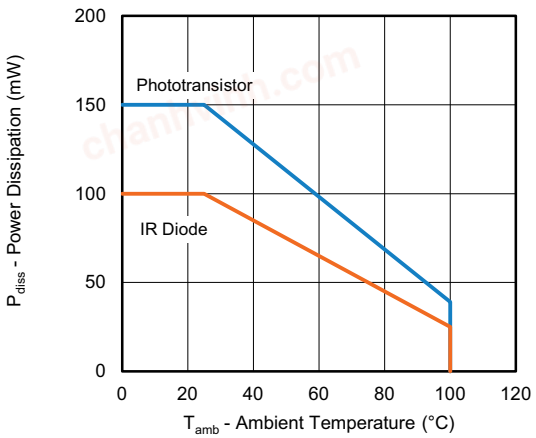


Fig. 1 - Power Dissipation vs. Ambient Temperature

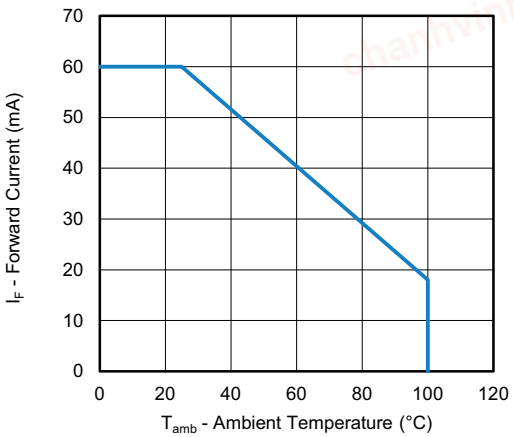


Fig. 2 - Maximum Forward Current vs. Ambient Temperature

ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
INPUT						
Forward voltage	I_F = 10 mA	V_F	-	1.2	1.5	V
Reverse voltage	I_R = 10 µA	V_R	6	-	-	V
Reverse current	V_R = 6 V	I_R	-	0.01	10	µA
Capacitance	V_F = 0 V, f = 1 kHz	C_I	-	30	-	pF
OUTPUT						
Collector emitter breakdown voltage	I_{CE} = 1 mA, R_{BE} = 1 MΩ	BV_{CEO}	300	-	-	V
Voltage emitter base	I_{EB} = 10 µA	BV_{BEO}	7	-	-	V

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ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
COUPLER						
Coupling capacitance	V = 0 V, f = 1 MHz	C_{IO}	-	0.6	-	pF
Collector emitter saturation voltage	I_F = 10 mA, I_C = 3.2 mA	V_{CEsat}	-	0.25	0.4	V
Collector emitter leakage current	V_{CE} = 200 V, R_{BE} = 1 MΩ	I_{CEO}	-	1	100	nA

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**
I_C/I_F	I_F = 10 mA, V_{CE} = 10 V	SFH640-2	CTR	63	-	125	%
	I_F = 1 mA, V_{CE} = 10 V	SFH640-2	CTR	22	45	-	%
	I_F = 10 mA, V_{CE} = 10 V	SFH640-3	CTR	100	-	200	%
	I_F = 1 mA, V_{CE} = 10 V	SFH640-3	CTR	34	70	-	%

SWITCHING CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Turn-on time	I_C = 2 mA, R_L = 100 Ω, V_{CC} = 5 V	t_{on}	-	4	-	µs
Turn-off time	I_C = 2 mA, R_L = 100 Ω, V_{CC} = 5 V	t_{off}	-	5	-	µs

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	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
Output safety power		P_{SO}	700	mW
Input safety current		I_{SI}	400	mA
Input safety temperature		T_S	175	°C
Creepage distance	DIP-6, SMD-6		≥ 7	mm
Clearance distance			≥ 7	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

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

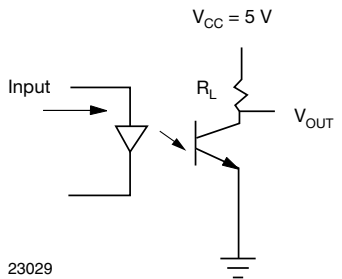


Fig. 3 - Test Circuit for Switching Characteristics

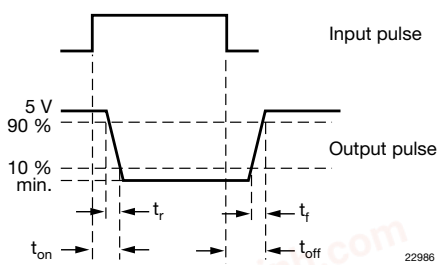


Fig. 4 - Parameter and Limit Definition

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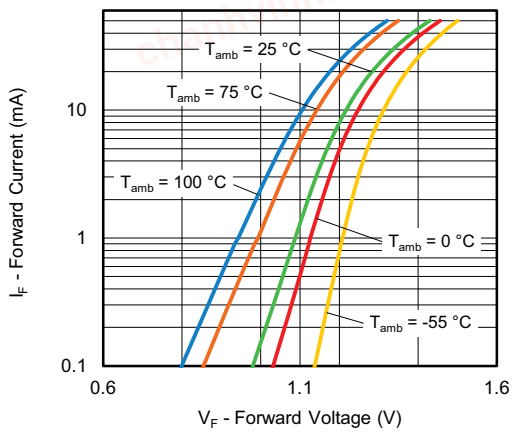


Fig. 5 - Forward Current vs. Forward Voltage

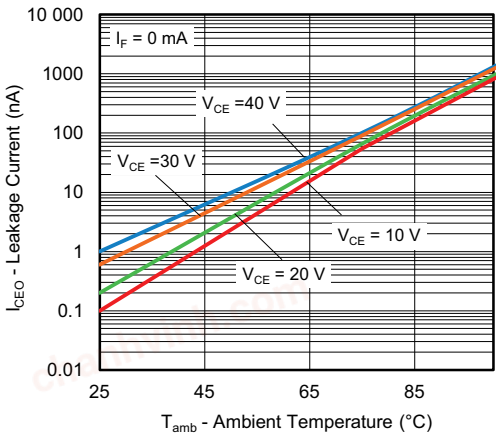


Fig. 8 - Leakage Current vs. Ambient Temperature

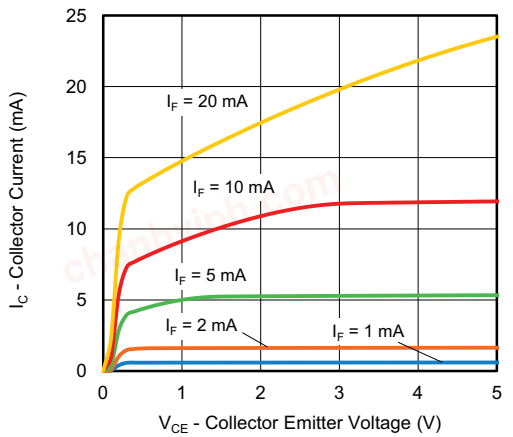


Fig. 6 - Collector Current vs. Collector Emitter Voltage (non-saturated)

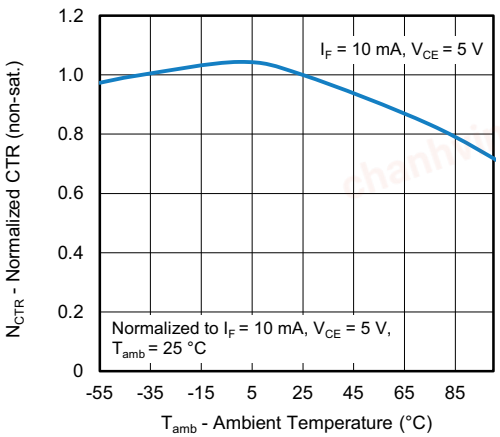


Fig. 9 - Normalized CTR vs. Ambient Temperature (non-saturated)

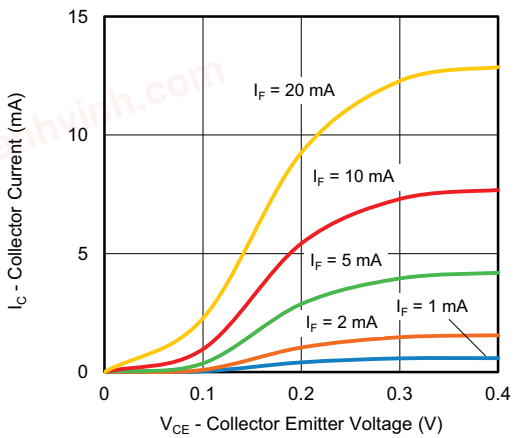


Fig. 7 - Collector Current vs. Collector Emitter Voltage (saturated)

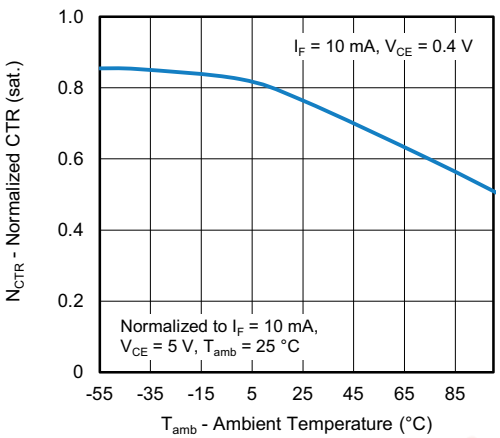


Fig. 10 - Normalized CTR vs. Ambient Temperature (saturated)

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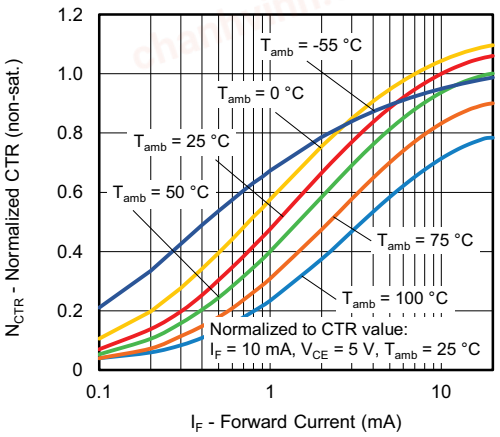


Fig. 11 - Normalized CTR (non-saturated) vs. Forward Current

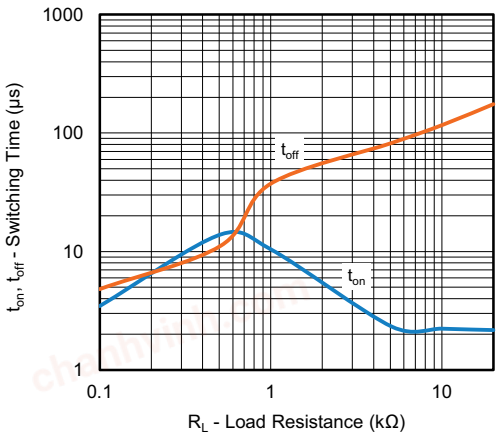


Fig. 13 - Switching Time vs. Load Resistance

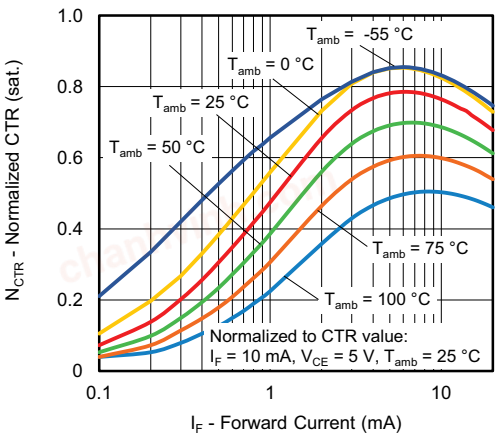


Fig. 12 - Normalized CTR (saturated) vs. Forward Current

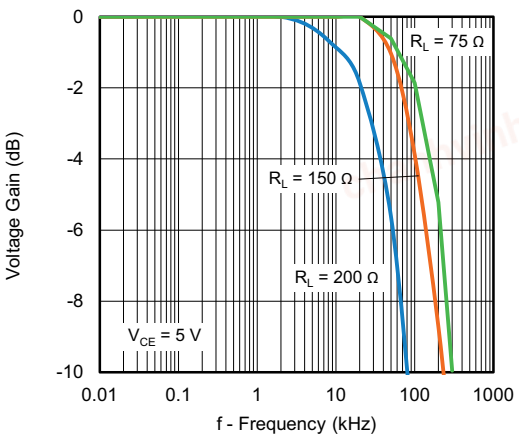


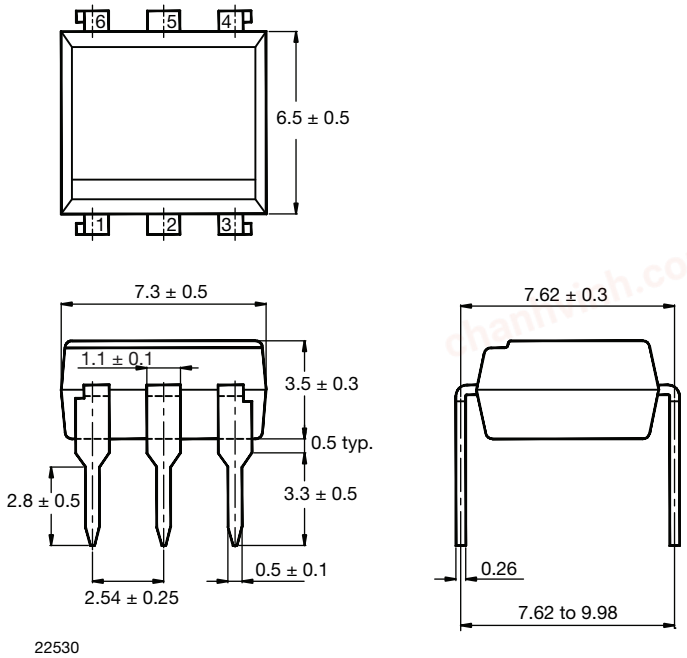
Fig. 14 - Voltage Gain vs. Frequency

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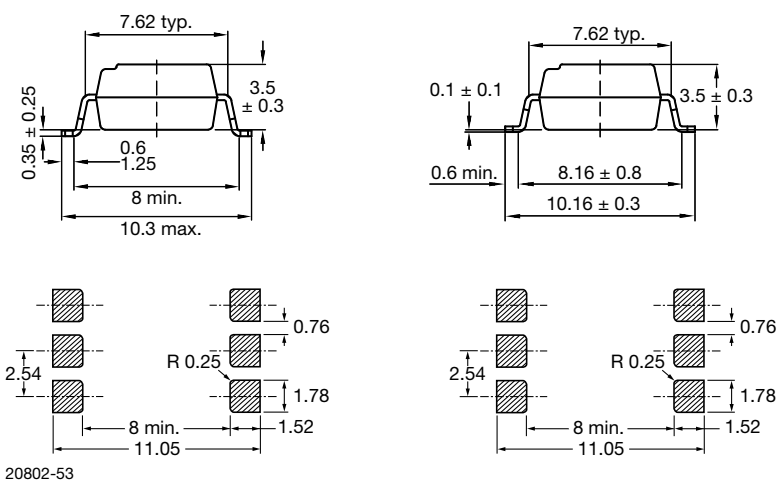
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PACKAGE DIMENSIONS in millimeters

6 Pin Package



Option 7 **Option 9**



PACKAGE MARKING

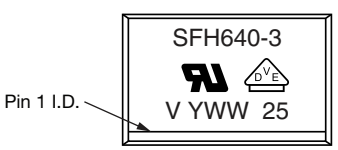


Fig. 15 - Example of SFH640

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

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

DIP-6

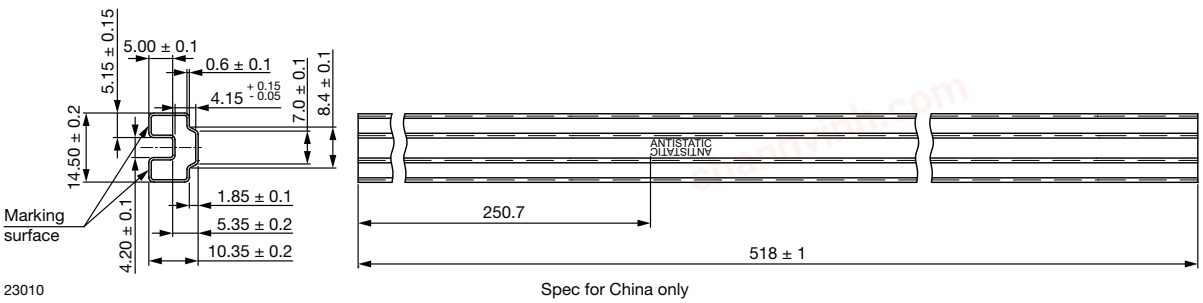


Fig. 16 - DIP-6

SMD-6

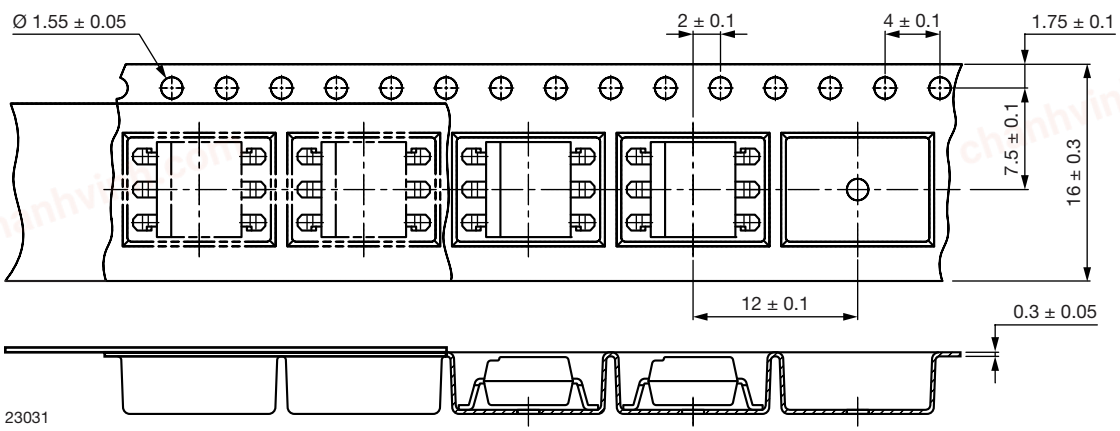


Fig. 17 - SMD-6

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Reel

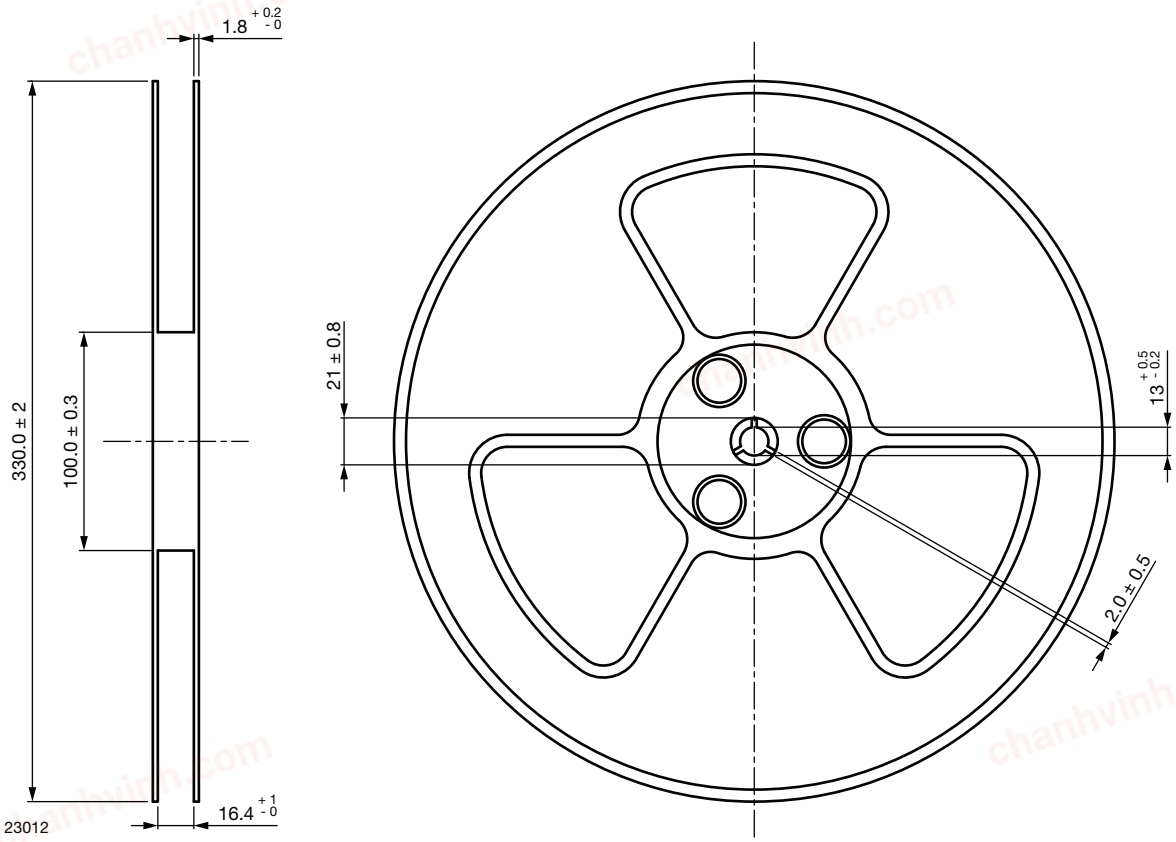


Fig. 18 - Tape and Reel Shipping Medium

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

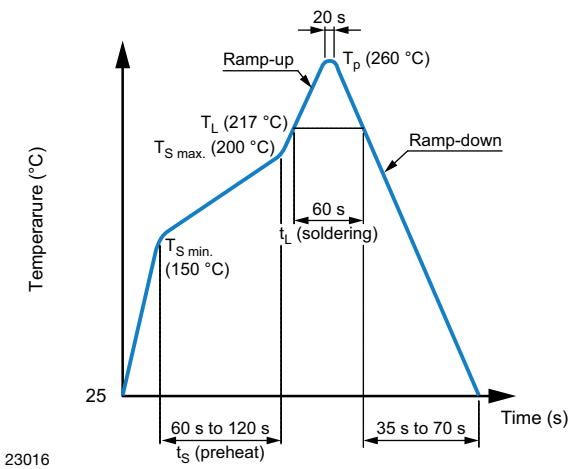


Fig. 19

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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

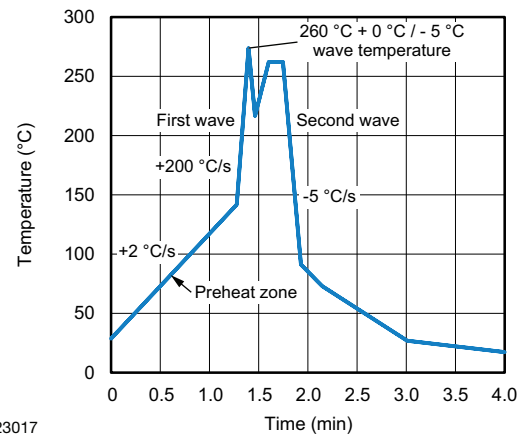


Fig. 20

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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