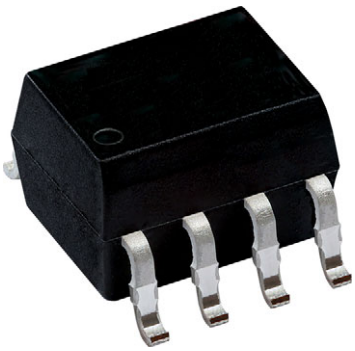
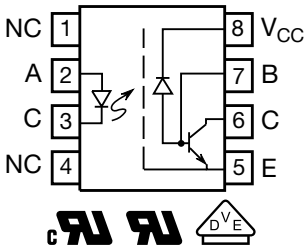
High Speed Optocoupler, 1 MBd, Transistor Output





LINKS TO ADDITIONAL RESOURCES

Related Documents

DESCRIPTION

The SFH6316 is a 1 MBd high speed optocoupler, consisting of a GaAlAs infrared emitting diode, optically coupled with an integrated photo detector and a high speed transistor. The photo detector is junction isolated from the transistor to reduce miller capacitance effects. The open collector output function allows circuit designers to adjust the load conditions when interfacing with different logic systems such as TTL, CMOS, etc.

Because the SFH6316 has a faraday shield on the detector chip, it can also reject and minimize high input to output common mode transient voltages.

FEATURES

- 1 MBd high speed
- Enhanced CTI of 275
- Guaranteed AC and DC performance
- Open collector output
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free

e3

RoHS COMPLIANT

APPLICATIONS

- Microprocessor system interface
- Ground loop elimination
- Galvanic noise isolation
- Serial bus systems
- Signal level translation

AGENCY APPROVALS

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

ORDERING INFORMATION

S	F	H	6	3	1	6	T

PART NUMBER

AGENCY CERTIFIED / PACKAGE	
UL, cUL	
SOIC-8	SFH6316T
UL, cUL, VDE	
SOIC-8	SFH6316-X001T

ABSOLUTE MAXIMUM RATINGS (T_{amb} = 25 °C, unless otherwise specified)

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
INPUT				
Reverse voltage		V_R	5	V
Average forward input current		I_F	25	mA
Power dissipation	$T_{amb} \leq 70$ °C	P_{diss}	45	mW
OUTPUT				
Supply voltage		V_S	30	V
Output voltage		V_O	20	V
Output current		I_O	8	mA
Power dissipation	$T_{amb} \leq 70$ °C	P_{diss}	100	mW
COUPLER				
Storage temperature range		T_{stg}	-55 to +150	°C
Ambient temperature range		T_{amb}	-55 to +100	°C
Junction temperature		T_j	125	°C
Soldering temperature	Max. 10 s, dip soldering distance to seating plane ≥ 1.5 mm		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.

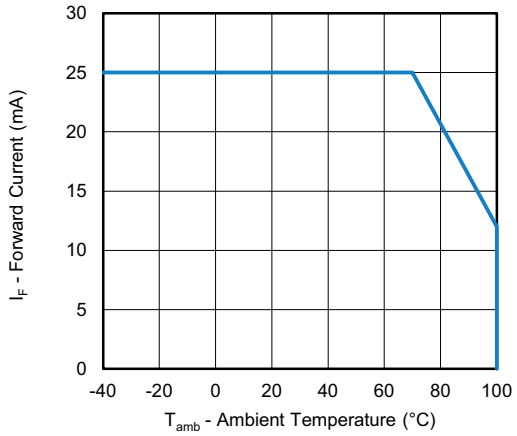


Fig. 1 - Forward Current vs. Ambient Temperature

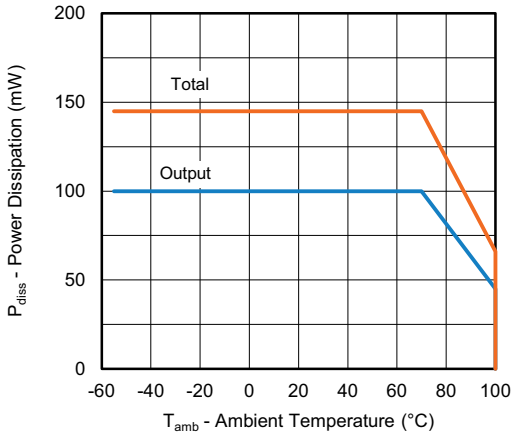


Fig. 2 - Power Dissipation vs. Ambient Temperature

ELECTRICAL CHARACTERISTICS (T_{amb} = 0 °C to 70 °C; typical values are at T_{amb} = 25 °C)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
INPUT						
Forward voltage	I_F = 16 mA, T_{amb} = 25 °C	V_F	-	1.49	1.8	V
Reverse current	V_R = 5 V	I_R	-	-	10	µA
Capacitance	f = 1 MHz, V_F = 0 V	C_{IN}	-	6	-	pF
OUTPUT						
Logic low supply current	I_F = 16 mA, V_O = open, V_{CC} = 15 V	I_{CCL}	-	170	-	µA
Logic high supply current	I_F = 0 mA, V_O = open, V_{CC} = 15 V, T_{amb} = 25 °C	I_{CCH}	-	0.002	1	µA
Logic low output voltage	I_F = 16 mA, I_O = 2.4 mA, V_{CC} = 4.5 V, T_{amb} = 25 °C	V_{OL}	-	0.15	0.4	V
Logic high output current	I_F = 0 mA, V_O = V_{CC} = 5.5 V, T_{amb} = 25 °C	I_{OH}	-	0.002	0.5	µA
	I_F = 0 mA, V_O = V_{CC} = 15 V, T_{amb} = 25 °C	I_{OH}	-	0.005	1	µA
	I_F = 0 mA, V_O = V_{CC} = 15 V	I_{OH}	-	-	50	µA
COUPLER						
Capacitance (input to output)	f = 1 MHz	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.

CURRENT TRANSFER RATIO (T_{amb} = 0 °C to 70 °C; typical values are at T_{amb} = 25 °C)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Current transfer ratio	I_F = 16 mA, V_{CC} = 4.5 V, V_O = 0.4 V, T_{amb} = 25 °C	CTR	19	32	50	%
	I_F = 16 mA, V_{CC} = 4.5 V, V_O = 0.5 V	CTR	15	33	50	%

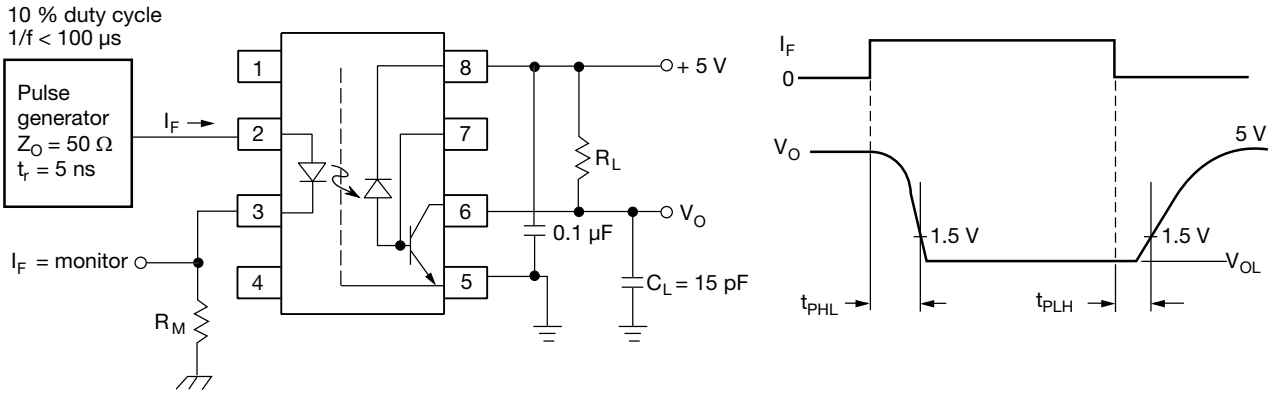


Fig. 3 - Test Circuit for Switching Times

SWITCHING CHARACTERISTICS (T_{amb} = 0 °C to 70 °C, V_{CC} = 5 V, I_F = 16 mA; typical values are at T_{amb} = 25 °C)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Propagation delay time to logic low at output (see Fig. 1)	R_L = 1.9 kΩ, T_{amb} = 25 °C	t_{PHL}	-	0.2	0.8	µs
Propagation delay time to logic high at output (see Fig. 1)	R_L = 1.9 kΩ, T_{amb} = 25 °C	t_{PLH}	-	0.3	0.8	µs

Note

- The 1.9 kΩ load represents 1 TTL unit load of 1.6 mA and the 5.6 kΩ pull-up resistor.

COMMON MODE TRANSIENT IMMUNITY (T_{amb} = 25 °C)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Common mode transient immunity at logic high level output (see Fig. 2)	I_F = 0 mA, R_L = 1.9 kΩ, C_L = 15 pF, V_{CM} = 1500 V_{PP}	$\|CM_H\|$	1000	-	-	V/µs
Common mode transient immunity at logic low level output (see Fig. 2)	I_F = 16 mA, R_L = 1.9 kΩ, C_L = 15 pF, V_{CM} = 1500 V_{PP}	$\|CM_L\|$	1000	-	-	V/µs

Note

- The 1.9 kΩ load represents 1 TTL unit load of 1.6 mA and the 5.6 kΩ pull-up resistor.

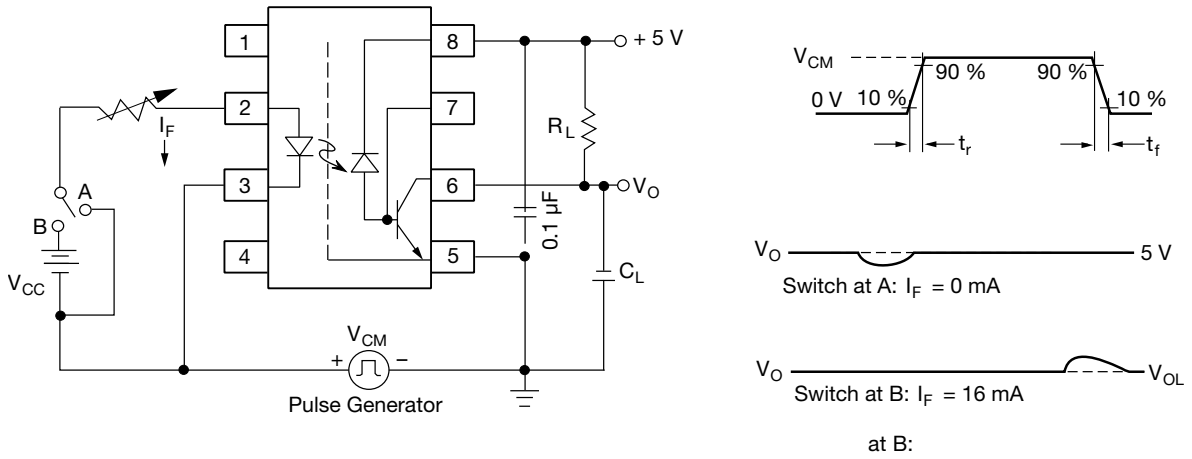


Fig. 4 - Test Circuit for Transient Immunity and Typical Waveforms

SAFETY AND INSULATION RATINGS (T_{amb} = 25 °C, unless otherwise specified)				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
Climatic classification	According to IEC 68 part 1		55 / 100 / 21	
Pollution degree	According to DIN VDE 0109		2	
Comparative tracking index	Insulation group IIIa	CTI	275	
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}	560	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}	100	mW
Input safety current		I_{SI}	25	mA
Safety temperature		T_S	150	°C
Creepage distance			≥ 5	mm
Clearance distance			≥ 5	mm
Insulation thickness		DTI	≥ 0.4	mm

Note

- As per IEC 60747-5-5, §7.4.3.8.1, 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)

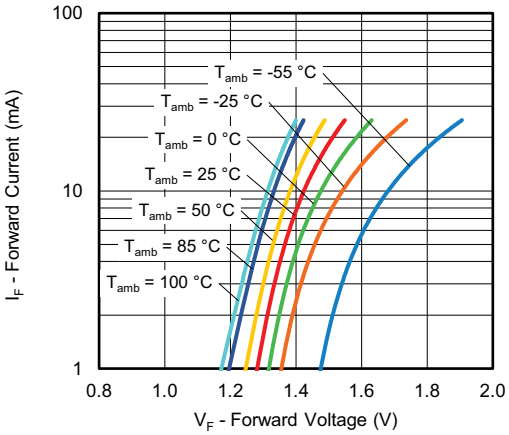


Fig. 5 - Forward Current vs. Forward Voltage

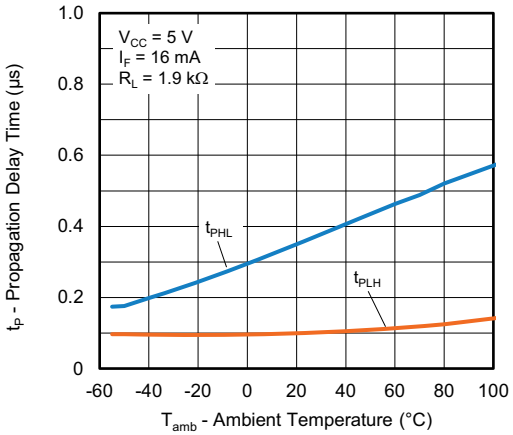


Fig. 8 - Propagation Delay Time vs. Ambient Temperature

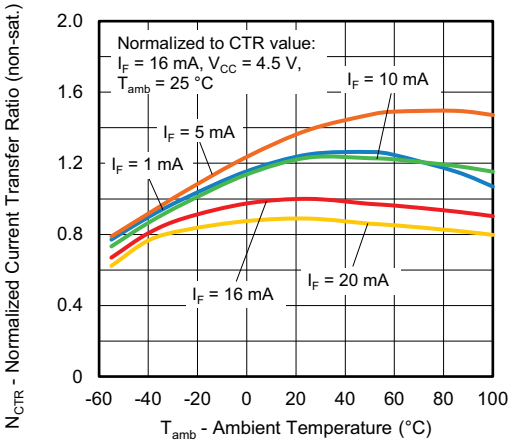


Fig. 6 - Normalized Current Transfer Ratio (non-saturated) vs. Ambient Temperature

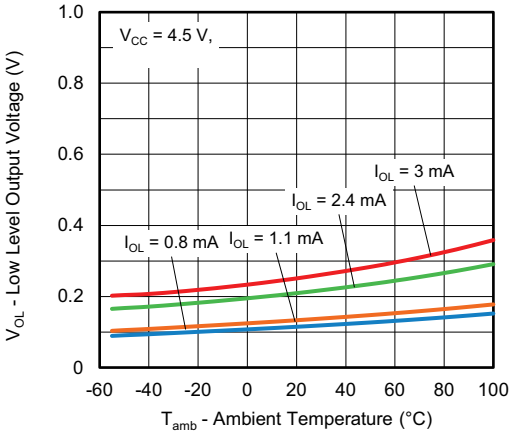


Fig. 9 - Low Level Output Voltage vs. Ambient Temperature

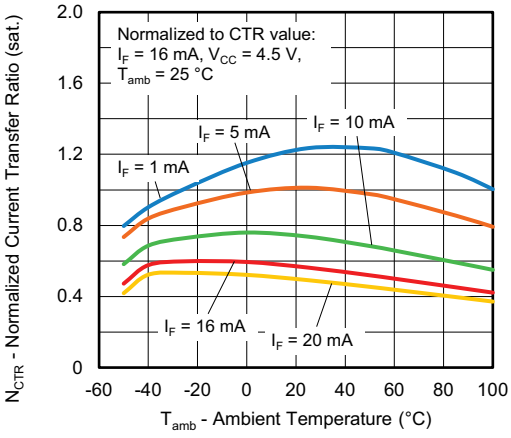


Fig. 7 - Normalized Current Transfer Ratio (saturated) vs. Ambient Temperature

PACKAGE DIMENSIONS (in millimeters)

SOIC-8

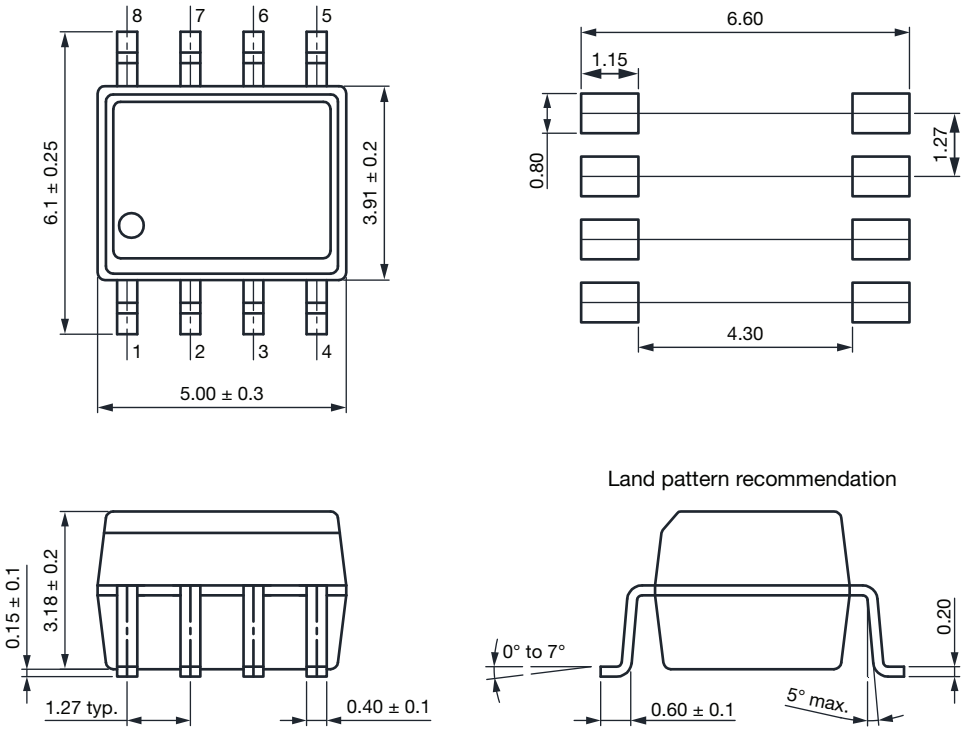


Fig. 10

PACKAGE MARKING

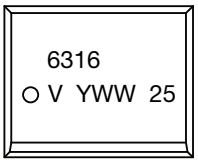


Fig. 11 - Example of SFH6316T

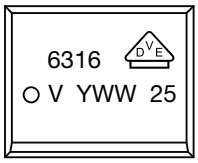


Fig. 12 - Example of SFH6316-X001T

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

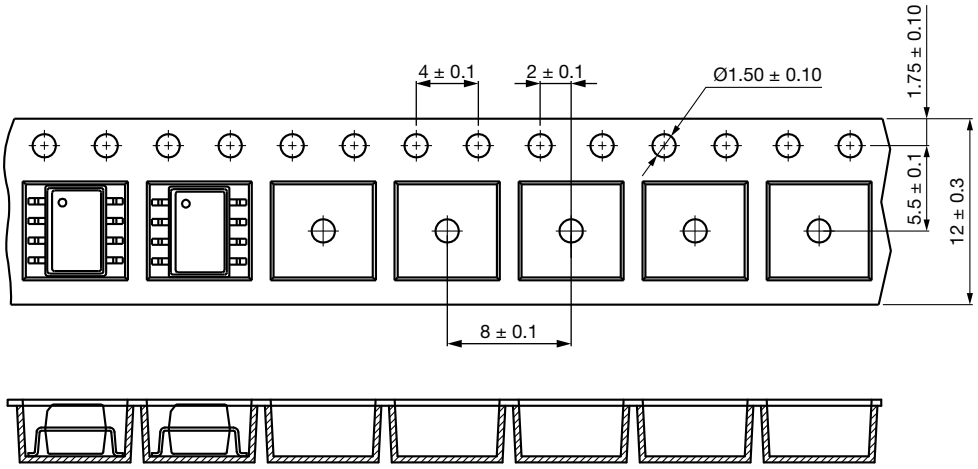


Fig. 13 - Tape and Reel Packaging (2000 pieces on reel)

Reel

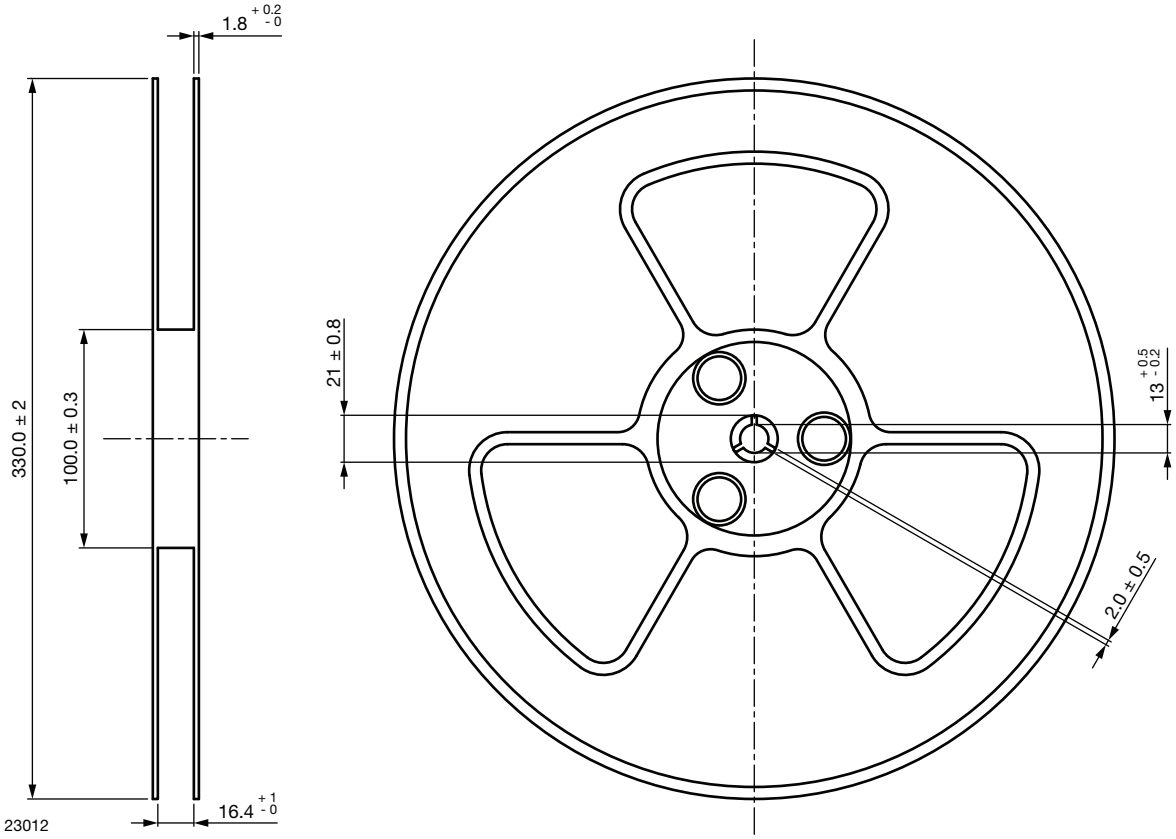


Fig. 14 - Tape and Reel Shipping Medium

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

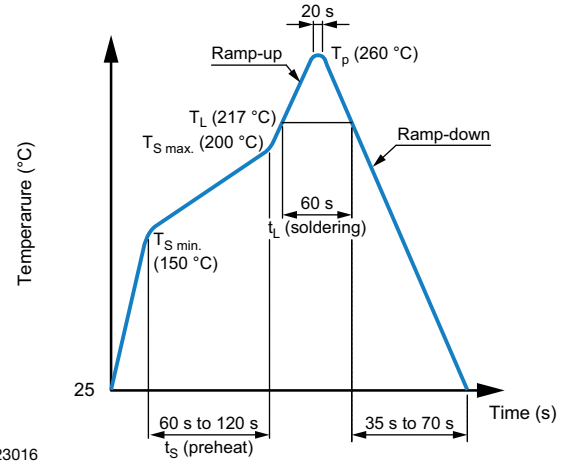


Fig. 15

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

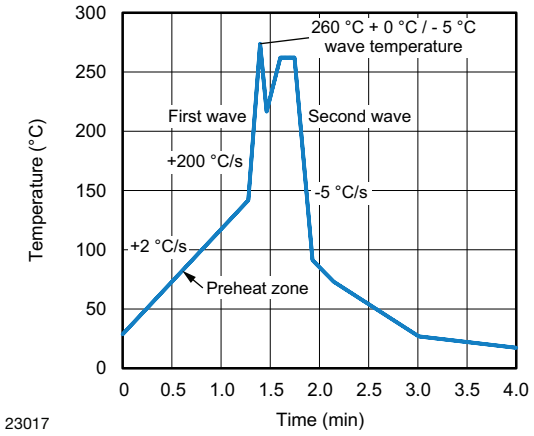


Fig. 16

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 1C

Floor life: unlimited

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

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

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