



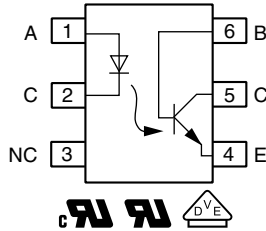
**THE DATASHEET OF  
H11D1-X009**



## Optocoupler, Phototransistor Output, With Base Connection, High $BV_{CEO}$ Voltage



23109



### DESIGN SUPPORT TOOLS AVAILABLE



### DESCRIPTION

The H11Dx 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.

### FEATURES

- Very high collector emitter breakdown voltage  $BV_{CEO} = 300\text{ V}$
- Isolation test voltage:  $5000\text{ V}_{RMS}$
- Low coupling capacitance
- High common mode transient immunity
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



### AGENCY APPROVALS

- [UL1577](#)
- [cUL1577](#)
- [DIN EN 60747-5-5 \(VDE 0884-5\) available with option 1](#)

### APPLICATIONS

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

ORDERING INFORMATION				
<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 2px 5px;">H</div> <div style="border: 1px solid black; padding: 2px 5px;">1</div> <div style="border: 1px solid black; padding: 2px 5px;">1</div> <div style="border: 1px solid black; padding: 2px 5px;">D</div> <div style="border: 1px solid black; padding: 2px 5px;">#</div> <div style="border: 1px solid black; padding: 2px 5px;">-</div> <div style="border: 1px solid black; padding: 2px 5px;">X</div> <div style="border: 1px solid black; padding: 2px 5px;">0</div> <div style="border: 1px solid black; padding: 2px 5px;">#</div> <div style="border: 1px solid black; padding: 2px 5px;">#</div> <div style="border: 1px solid black; padding: 2px 5px;">#</div> </div>	PART NUMBER		PACKAGE OPTION	TAPE AND REEL
AGENCY CERTIFIED/PACKAGE	CTR (%)			
<b>UL, cUL</b>	<b>&gt; 20</b>			
DIP-6	H11D1	H11D2	H11D3	
SMD-6, option 7	H11D1-X007T <sup>(1)</sup>	H11D2-X007	-	
SMD-6, option 9	H11D1-X009T <sup>(1)</sup>	-	-	
<b>UL, cUL, VDE</b>	<b>&gt; 20</b>			
SMD-6, option 7	H11D1-X017T	-	-	

### Notes

- Additional options may be possible, please contact sales office
- <sup>(1)</sup> Also available in tubes; do not put T on the end



ABSOLUTE MAXIMUM RATINGS (T <sub>amb</sub> = 25 °C, unless otherwise specified)					
PARAMETER	TEST CONDITION	PART	SYMBOL	VALUE	UNIT
<b>INPUT</b>					
Reverse voltage			V <sub>R</sub>	6	V
Forward current			I <sub>F</sub>	60	mA
Power dissipation			P <sub>diss</sub>	100	mW
<b>OUTPUT</b>					
Collector emitter voltage		H11D1	V <sub>CEO</sub>	300	V
		H11D2	V <sub>CEO</sub>	300	V
		H11D3	V <sub>CEO</sub>	200	V
Collector base voltage		H11D1	V <sub>CB0</sub>	300	V
		H11D2	V <sub>CB0</sub>	300	V
		H11D3	V <sub>CB0</sub>	200	V
Emitter base voltage			V <sub>EBO</sub>	7	V
Collector current			I <sub>C</sub>	50	mA
Power dissipation			P <sub>diss</sub>	150	mW
<b>COUPLER</b>					
Storage temperature range			T <sub>stg</sub>	-55 to +125	°C
Operating temperature range			T <sub>amb</sub>	-55 to +100	°C
Soldering temperature	t = 10 s	T <sub>sld</sub>	T <sub>sld</sub>	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

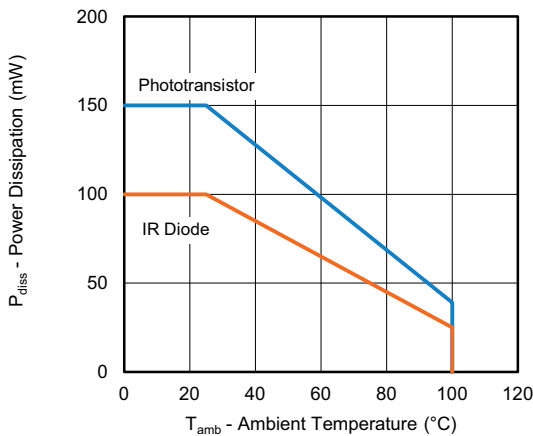


Fig. 1 - Power Dissipation vs. Ambient Temperature

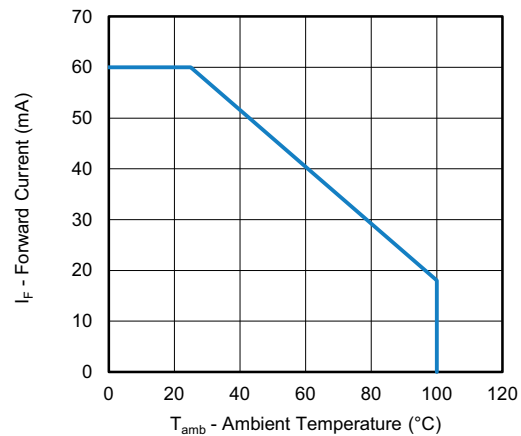


Fig. 2 - Maximum Forward Current vs. Ambient Temperature

ELECTRICAL CHARACTERISTICS (T <sub>amb</sub> = 25 °C, unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
<b>INPUT</b>						
Forward voltage	I <sub>F</sub> = 10 mA	V <sub>F</sub>	-	1.2	1.5	V
Reverse voltage	I <sub>R</sub> = 10 μA	V <sub>R</sub>	6	-	-	V
Reverse current	V <sub>R</sub> = 6 V	I <sub>R</sub>	-	0.01	10	μA
Capacitance	V <sub>R</sub> = 0 V, f = 1 kHz	C <sub>I</sub>	-	30	-	pF
<b>OUTPUT</b>						
Collector emitter breakdown voltage	I <sub>CE</sub> = 1 mA, R <sub>BE</sub> = 1 MΩ	BV <sub>CEO</sub>	300	-	-	V
Emitter base breakdown voltage	I <sub>EB</sub> = 10 μA	BV <sub>EBO</sub>	7	-	-	V

<b>ELECTRICAL CHARACTERISTICS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
<b>COUPLER</b>						
Coupling capacitance	$V = 0\text{ V}$ , $f = 1\text{ MHz}$	$C_{IO}$	-	0.6	-	pF
Collector emitter, saturation voltage	$I_F = 10\text{ mA}$ , $I_C = 0.5\text{ mA}$ , $R_{BE} = 1\text{ M}\Omega$	$V_{CEsat}$	-	0.25	0.4	V
Collector emitter leakage current	$V_{CE} = 200\text{ V}$ , $R_{BE} = 1\text{ M}\Omega$	$I_{CEO}$	-	-	100	nA

**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

<b>CURRENT TRANSFER RATIO</b>						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
$I_C/I_F$	$I_F = 10\text{ mA}$ , $V_{CE} = 10\text{ V}$	CTR	20	-	-	%

<b>SWITCHING CHARACTERISTICS</b>						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Turn-on time	$I_C = 2\text{ mA}$ , $R_L = 100\text{ }\Omega$ , $V_{CC} = 5\text{ V}$	$t_{on}$	-	4	-	$\mu\text{s}$
Turn-off time	$I_C = 2\text{ mA}$ , $R_L = 100\text{ }\Omega$ , $V_{CC} = 5\text{ V}$	$t_{off}$	-	5	-	$\mu\text{s}$

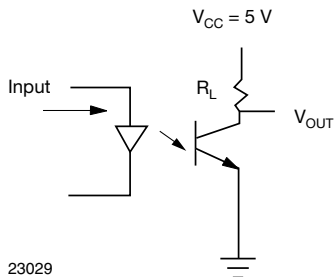


Fig. 3 - Test Circuit for Switching Characteristics

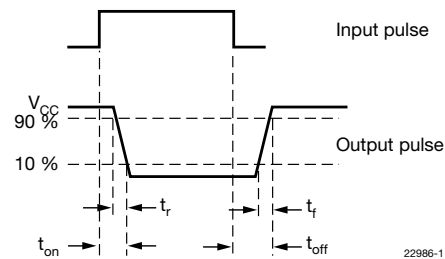


Fig. 4 - Parameter and Limit Definition

<b>SAFETY AND INSULATION RATINGS</b>				
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, $t = 1\text{ min}$	$V_{ISO}$	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	$V_{IO} = 500\text{ V}$ , $T_{amb} = 25\text{ }^{\circ}\text{C}$	$R_{IO}$	$\geq 10^{12}$	$\Omega$
	$V_{IO} = 500\text{ V}$ , $T_{amb} = 100\text{ }^{\circ}\text{C}$	$R_{IO}$	$\geq 10^{11}$	$\Omega$
Output safety power		$P_{SO}$	700	mW
Input safety current		$I_{SI}$	400	mA
Input safety temperature		$T_S$	175	$^{\circ}\text{C}$
Creepage distance	DIP-6, SMD-6		$\geq 7$	mm
Clearance distance			$\geq 7$	mm
Insulation thickness		DTI	$\geq 0.4$	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** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)

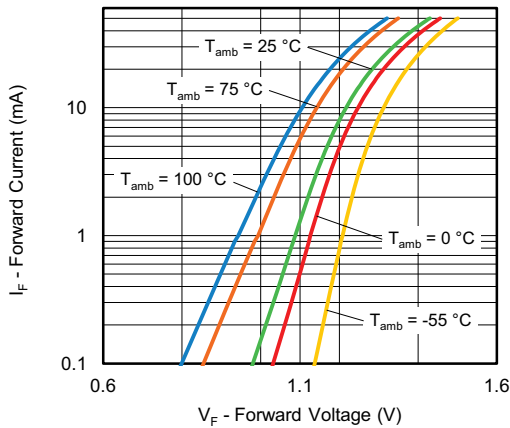


Fig. 5 - Forward Current vs. Forward Voltage

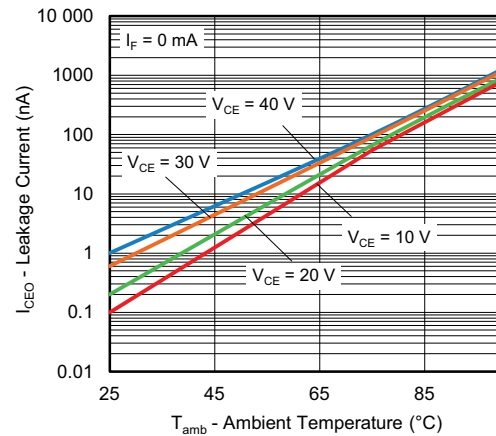


Fig. 8 - Leakage Current vs. Ambient Temperature

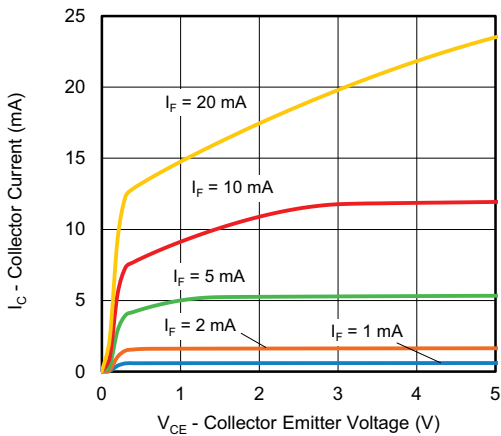


Fig. 6 - Collector Current vs. Collector Emitter Voltage (non-saturated)

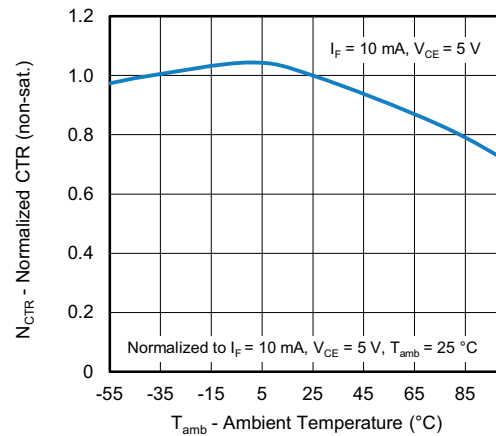


Fig. 9 - Normalized CTR vs. Ambient Temperature (non-saturated)

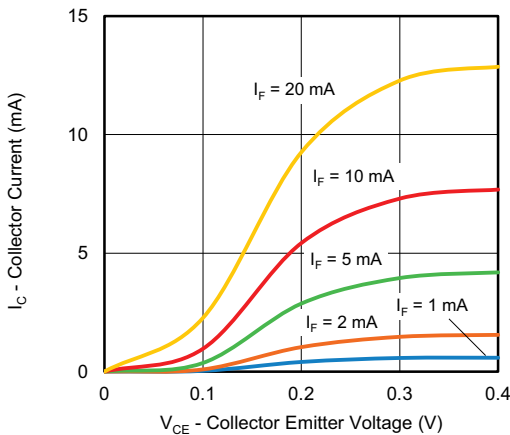


Fig. 7 - Collector Current vs. Collector Emitter Voltage (saturated)

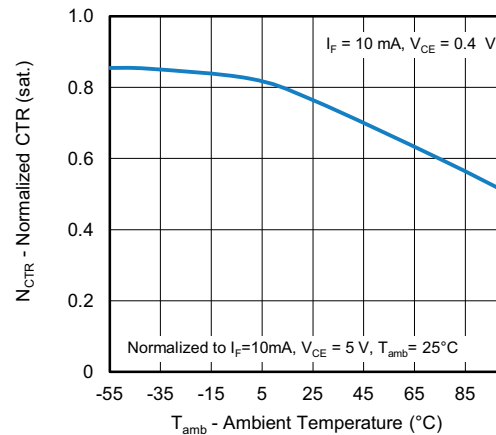


Fig. 10 - Normalized CTR vs. Ambient Temperature (saturated)

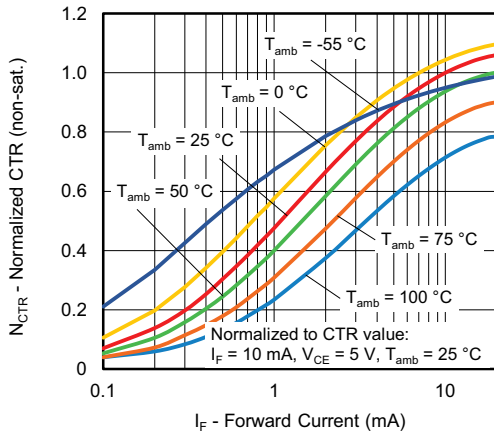


Fig. 11 - Normalized CTR (non-saturated) vs. Forward Current

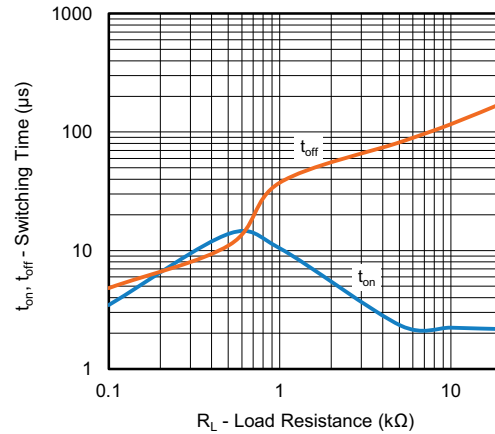


Fig. 13 - Switching Time vs. Load Resistance

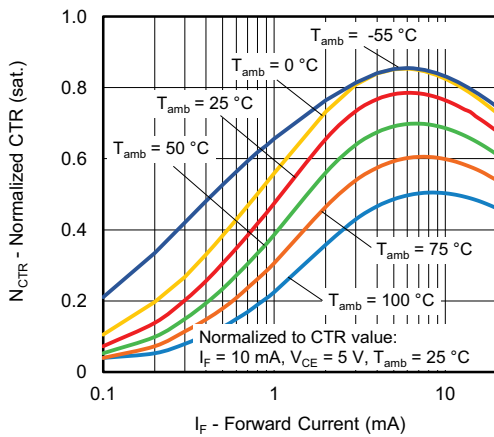


Fig. 12 - Normalized CTR (saturated) vs. Forward Current

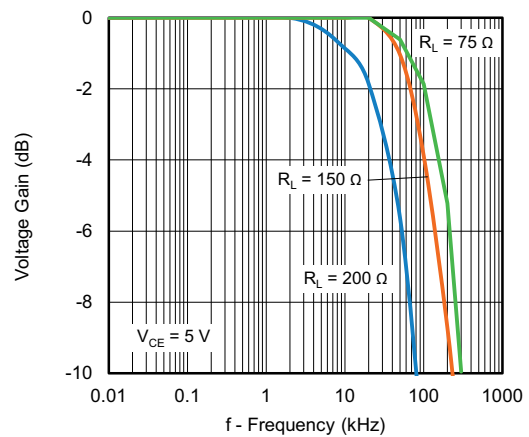
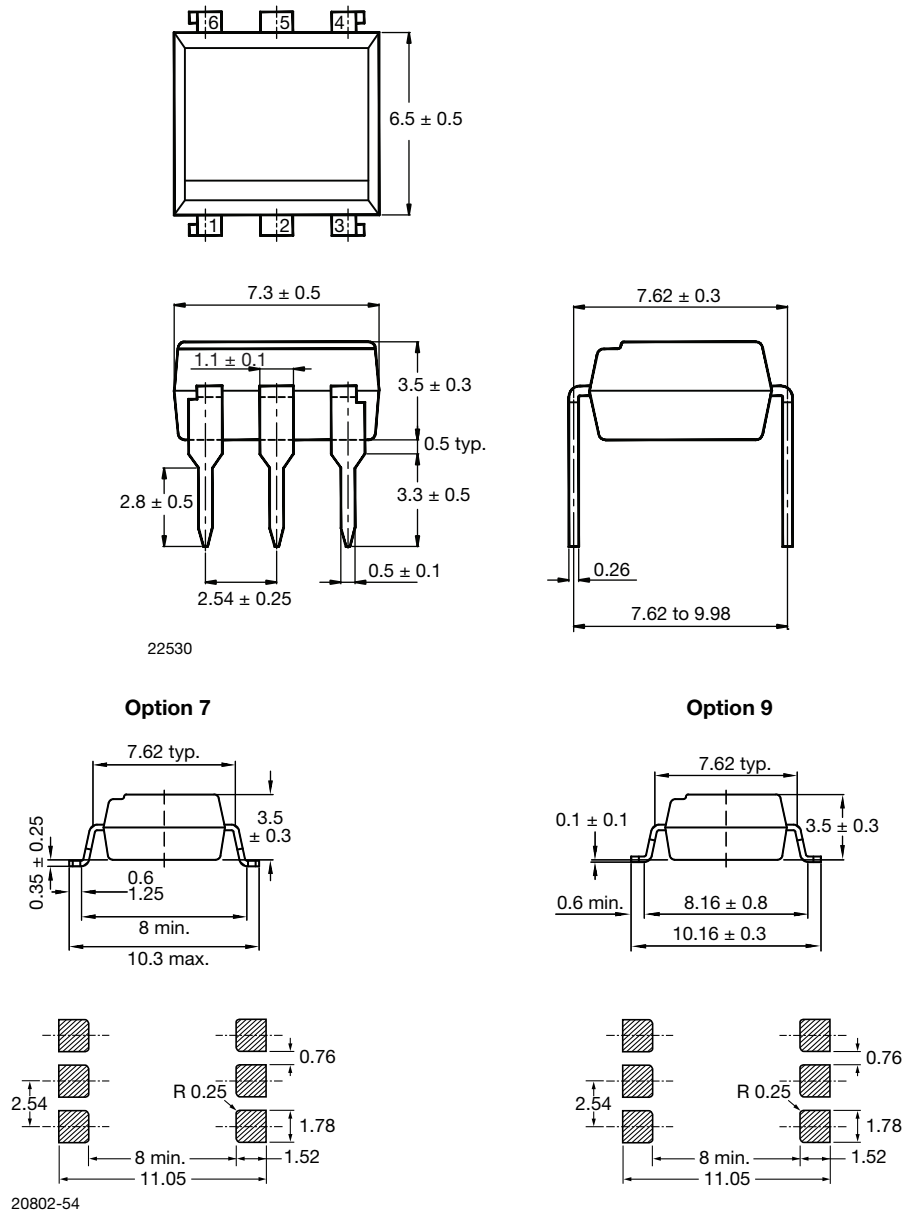


Fig. 14 - Voltage Gain vs. Frequency



## PACKAGE DIMENSIONS in millimeters

### 6 Pin Package



## PACKAGE MARKING

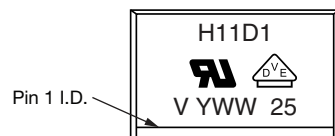


Fig. 15 - Example of H11D1

### 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



## PACKAGING INFORMATION (in millimeters)

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

### DIP-6

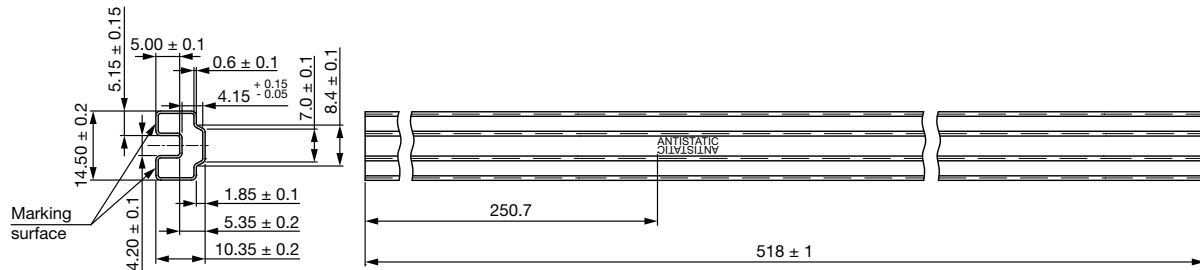


Fig. 16 - DIP-6

### SMD-6

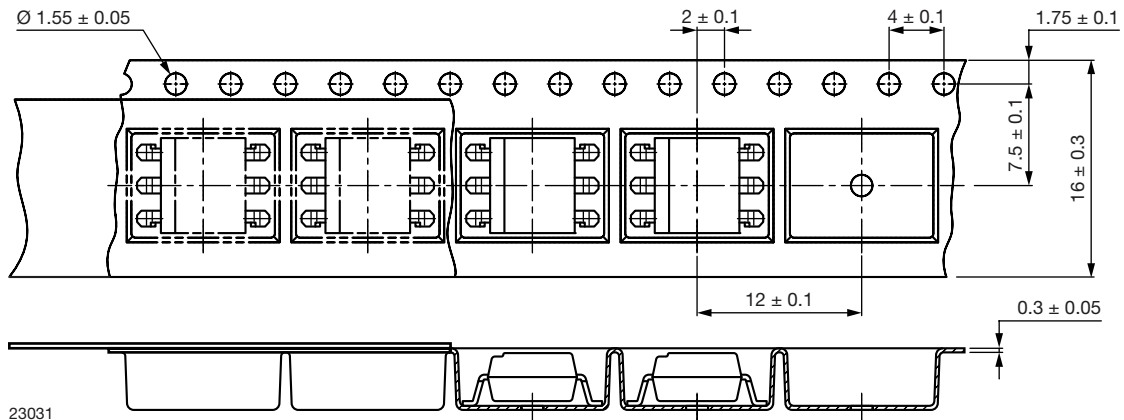


Fig. 17 - SMD-6

**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 ( $T_{S \text{ min.}}$ )	150 °C
- Temperature maximum ( $T_{S \text{ max.}}$ )	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

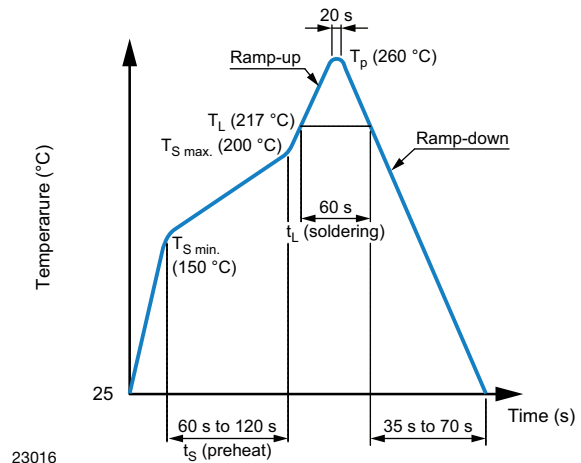


Fig. 19



### 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

### 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.



23017

Fig. 20



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