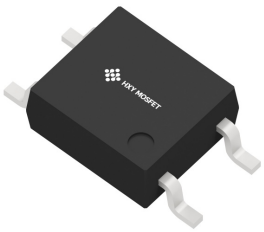
Description

HEL1019 photocoupler consist of an infrared light-emitting diode and a phototransistor. The devices can realize electrical isolation and signal transmission between different circuits, the products are widely used in power supply equipment, such as mobile phone charger, home appliance product power supply device, etc.

Features

- Current transfer ratio (CTR:200%-400%@I_F=5mA, V_{CE}=5V)
- High isolation voltage between input and output(V_{ISO}=5,000Vrms)
- Creepage distance > 8mm
- Operating temperature up to +110°C
- Collector-Emitter voltage BV_{CEO}≥80V
- The products comply with RoHS, REACH and HF；

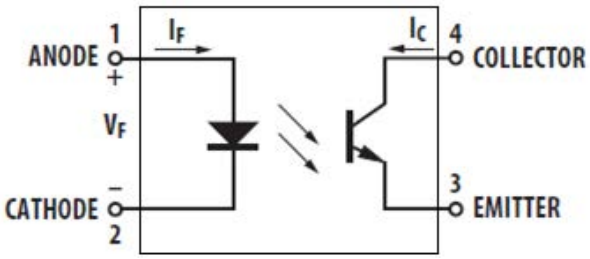
Pin Configuration



PIN 1

SOP-4

Schematic



1. Anode
2. Cathode
3. Emitter
4. Collector

Electrical Characteristics

Absolute Maximum Ratings (Temperature=25°C)

Parameter		Symbol	Rating	Unit
Input	Forward Current	I_F	50	mA
	Reverse Voltage	V_R	6	V
	Power Dissipation	P_D	90	mW
Output	Collector Emitter voltage	V_{CEO}	80	V
	Emitter Collector voltage	V_{ECO}	6	
	Collector current	I_C	50	mA
	Power Dissipation	P_C	180	mW
Total Power Dissipation		P_{tot}	270	mW
*1 Isolation Voltage		V_{iso}	5,000	Vrms
Operating Temperature		T_{opr}	-0 to + 70	°C
Storage Temperature		T_{stg}	-55 to + 125	
*2 Soldering Temperature		T_{sol}	260	

Note:

*1.AC For 1 Minute, R.H. = 40 ~ 60%;

Isolation voltage shall be measured using the following method:

(1)Short between anode and cathode on the primary side and between collector and emitter onthe secondary side;

(2)The isolation voltage tester with zero-cross circuit shall be used;

(3)The waveform of applied voltage shall be a sine wave.

*2. Soldering time is 10 seconds

Electrical Characteristics (Temperature=25°C)

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit
Input	Forward Voltage	V_F	I_F=50mA	---	1.35	1.6	V
	Reverse Current	I_R	V_R=4V	---	---	10	μA
	Terminal Capacitance	C_t	V=0, f=1MHz	---	30	250	pF
Output	Collector dark current	I_{CEO}	V_{CE}=20V, I_F=0	---	---	100	nA
	Collector-Emitter breakdown voltage	BV_{CEO}	I_C=0.1mA I_F=0	80	---	---	V
	Emitter-Collector breakdown voltage	BV_{ECO}	I_E=0.1mA I_F=0	6	---	---	V
Transfer characteristic	Collector Current	Ic	I_F=5mA V_{CE}=5V	2.5	---	30	mA
	*1 Current Transfer Ratio	CTR		50	---	600	%
	Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	I_F=20mA I_C= 1mA	---	0.1	0.2	V
	Isolation resistance	R_{iso}	DC500V 40~60%R.H.	5×10^{10}	---	---	Ω
	Floating Capacitance	C_f	V=0, f=1MHz	---	0.6	1	pF
	Cut-off Frequency	f_c	V_{CE}=5V, I_C=2mA R_L=100Ω, -3dB	---	80	---	kHz
	Rise time	t_r	V_{CE}=2V, I_C=2mA R_L=100Ω	---	4	18	μs
	Fall time	t_f		---	3	18	μs

Note:

*1 Current Transfer Ratio = I_C / I_F ×100%, Tolerance:±3%.

Rank Table of Current Transfer Ratio(Temperature=25°C)

CTR Rank	Min (%)	Max (%)	C ondition
HEL1019	200	400	I_F=5mA，V_{CE}=5V

Characteristics Curves

Figure1. Forward Current vs. Forward Voltage

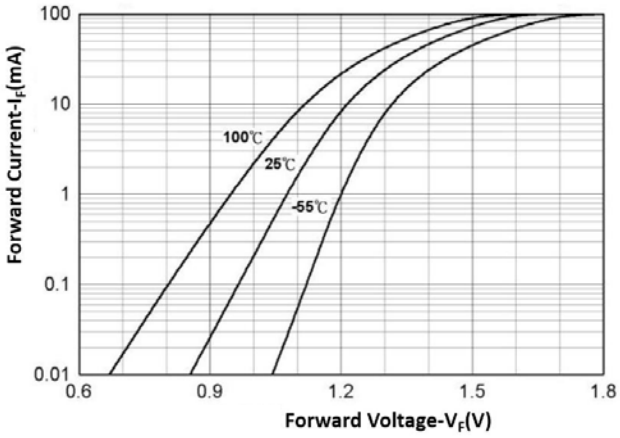


Figure2. Collector Dark Current vs. Ambient Temperature

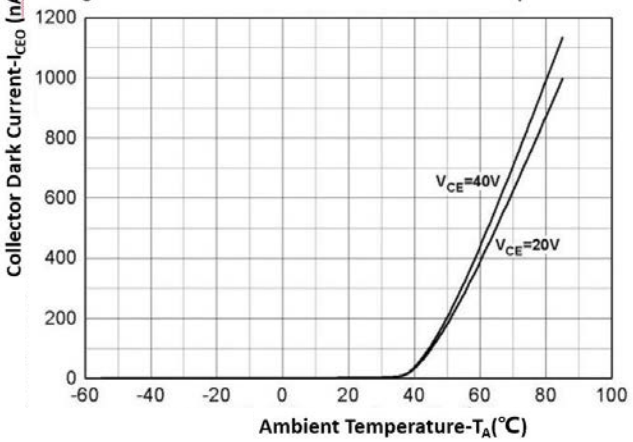


Figure3. Collector Current vs. Collector Emitter Voltage

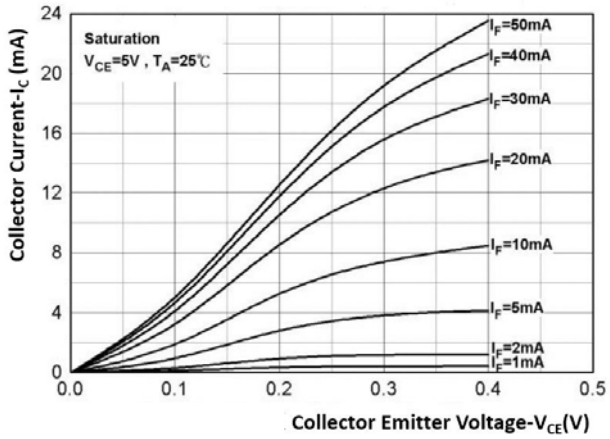


Figure4. Collector Current vs. Collector Emitter Voltage

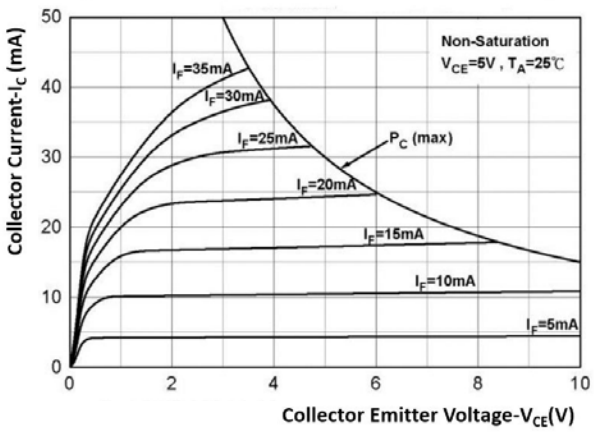


Figure5. Normalized Collector Current vs. Forward Current

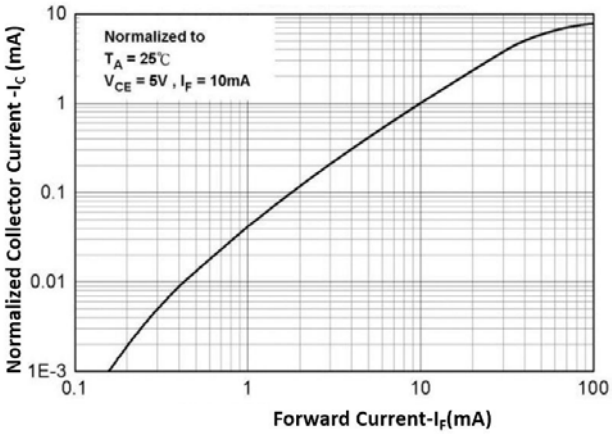


Figure6. Normalized Current Transfer Ratio vs. Forward Current

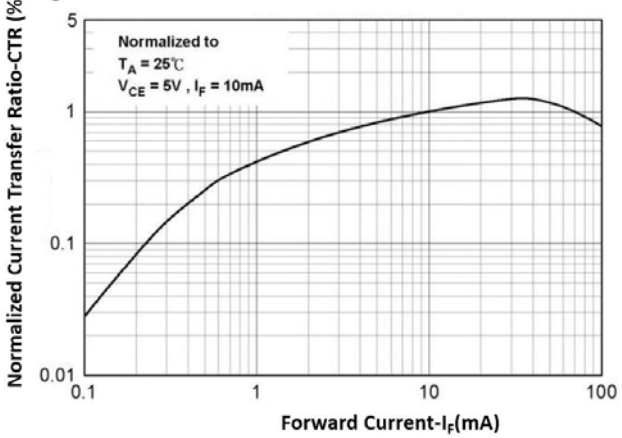


Figure7. Normalized Current Transfer Ratio vs. Ambient Temperature

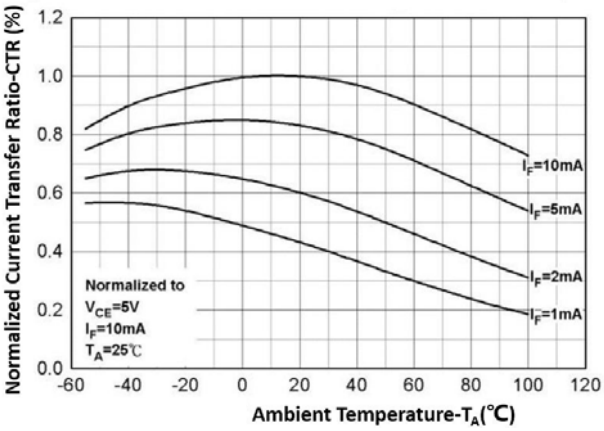


Figure8. Normalized Current Transfer Ratio vs. Ambient Temperature

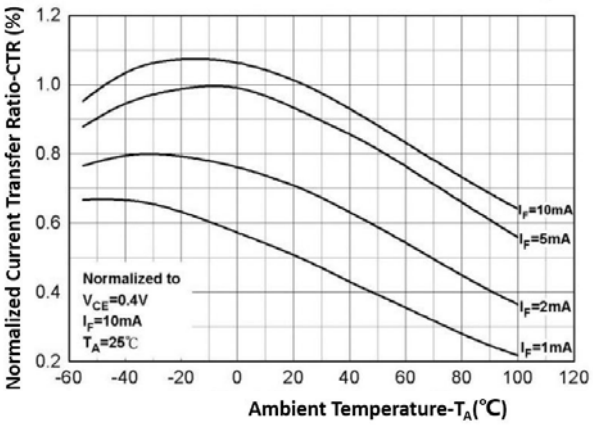


Figure9. Turn on/off Time vs. Collector Current

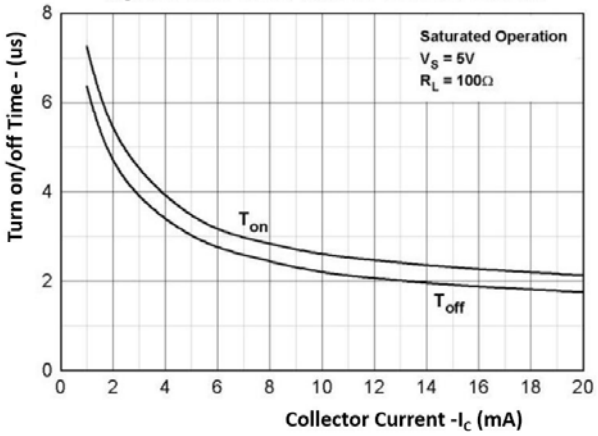


Figure10. Turn on/off Time vs. Forward Current

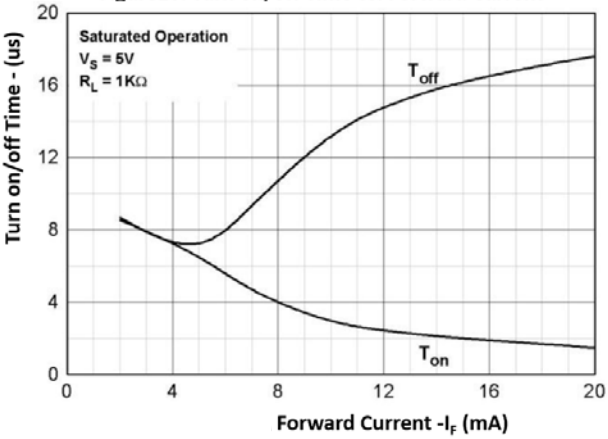
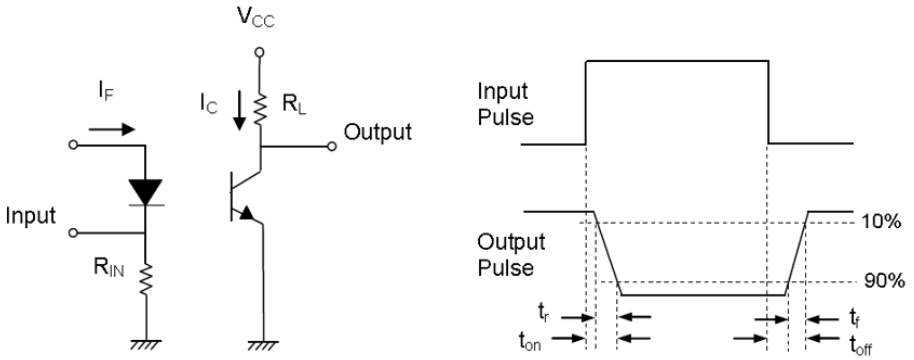


Figure11. Switching Time Test Circuit & Waveforms



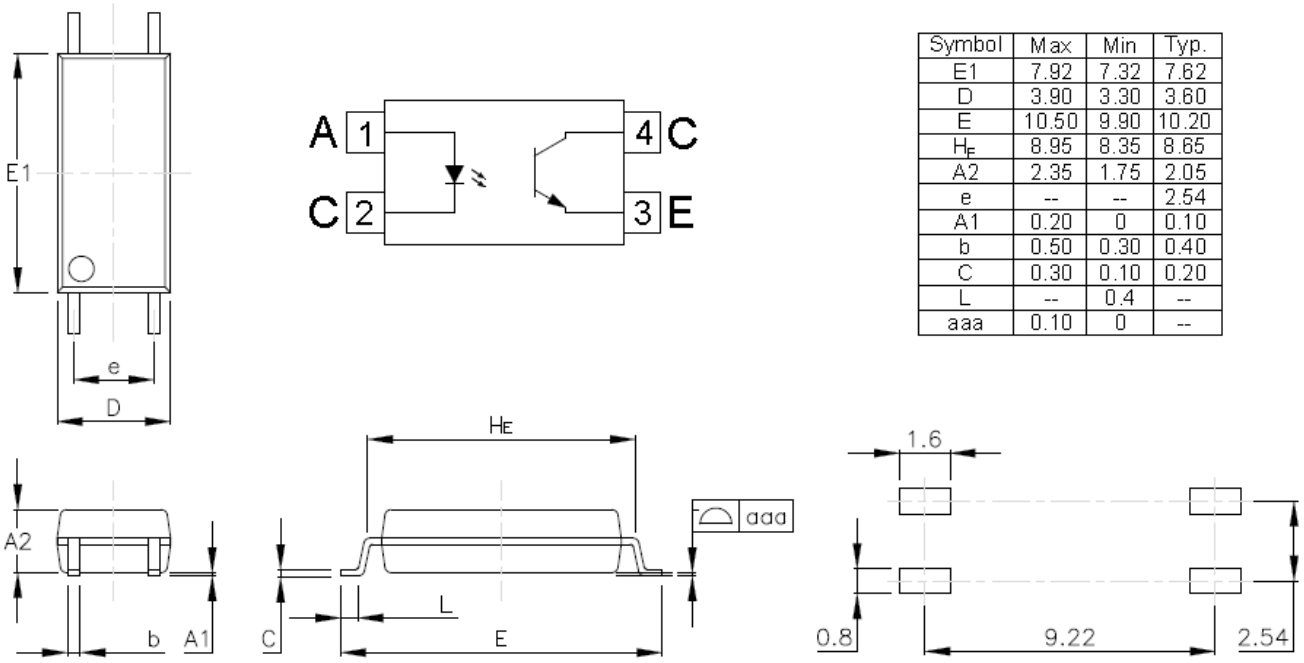
Reliability Test Items And Conditions

Test Items	Reference	Test Conditions	Time	Quantity	Criterion
Solderability	JESD22-B102	Tsol=(245±)5°C，t=5s;	1 times	22	0/22
Resistance to Soldering Heat	JESD22-A106	Tsol=(260±5)°C，t=10s	3 times	22	0/22
ESD-HBM	JESD22-A114	Ta=25°C，HBM （2000V）	P&N 3 times	10	0/10
High Temperature Storage	JESD22-A103	Ta=125°C	1000h	22	0/22
Low Temperature Storage	JESD22-A119	Ta= -55°C	1000h	22	0/22
Thermal Shock	JESD22-A104	-55°C(15min)←→125°C(15min)	300 cycles	22	0/22
Lifespan Test	JESD22-A108	Ta=25℃，I_F=50mA，Vcc=5V	1000h	22	0/22
DC Operating Life	JESD22-A108	Ta=110℃，I_F=20mA，Vcc=5V	1000h	76	0/76
High Temperature High Humidity bias Voltage	JESD22-A101	Ta =85°C，RH=85% IF=0mA，V_{CE}=64V	1000h	22	0/22
High Temperature bias Voltage	JESD22-A108	Ta =110℃，I_F=0mA，V_{CE}=80V	1000h	22	0/22
High pressure steam test	JESD22-A102	P=15PSIG，121°C，100%RH	96h	22	0/22

Criteria For Judging Damage

Test Items	Symbol	Test Conditions	Criteria For Judging Damage
Forward Voltage	V_F (V)	I_F=20mA	Initial Data±20%
Reverse Current	I_R(uA)	V_R=4V	I_R≤10μA
Current Transfer Ratio	CTR(%)	I_F=5mA, V_{CE}=5V	Initial Data±20%
Collector-Emitter Saturation Voltage	V_{CE}(sat)	I_F =20mA, IC=1mA	V_{CE}(sat) ≤0.2V
Collector-Emitter breakdown voltage	BV_{CEO} (V)	I_C=0.1mA, I_F=0mA	BV_{CEO}≥80V& Initial Data±20%
Collector Current	I_{CEO}(nA)	V_{CE}=20V, I_F=0	I_{CEO}≤0.1μA

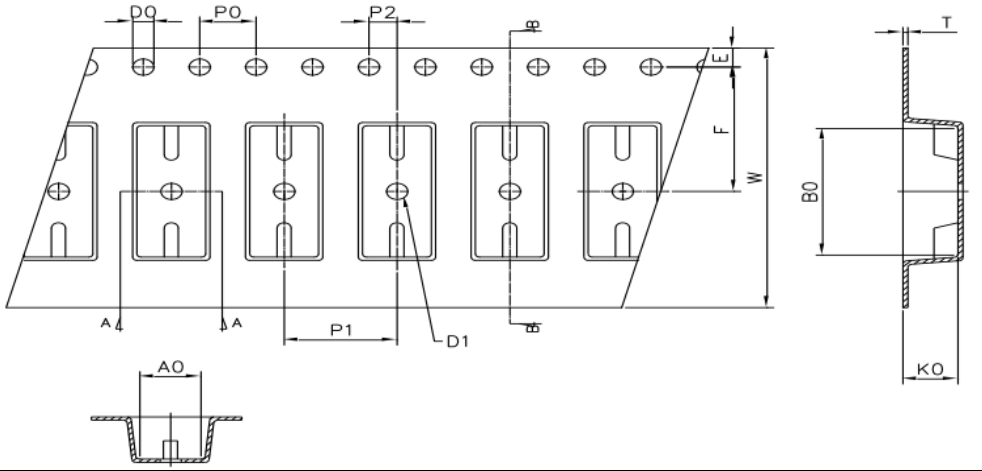
Packaging Dimension (Unit : mm)



Symbol	Max	Min	Typ.
E1	7.92	7.32	7.62
D	3.90	3.30	3.60
E	10.50	9.90	10.20
H_E	8.95	8.35	8.65
A2	2.35	1.75	2.05
e	--	--	2.54
A1	0.20	0	0.10
b	0.50	0.30	0.40
C	0.30	0.10	0.20
L	--	0.4	--
aaa	0.10	0	--

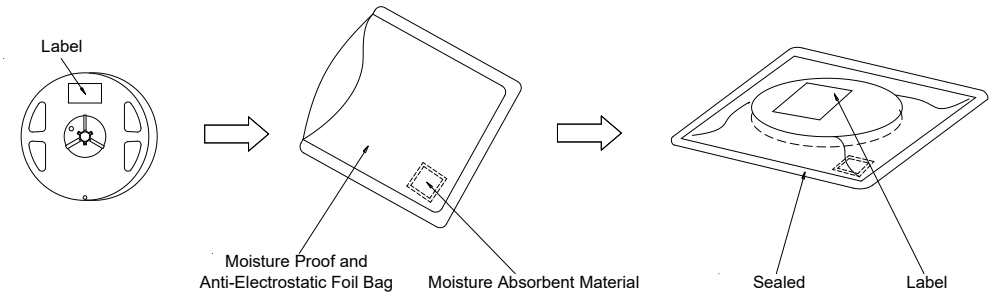
Packaging

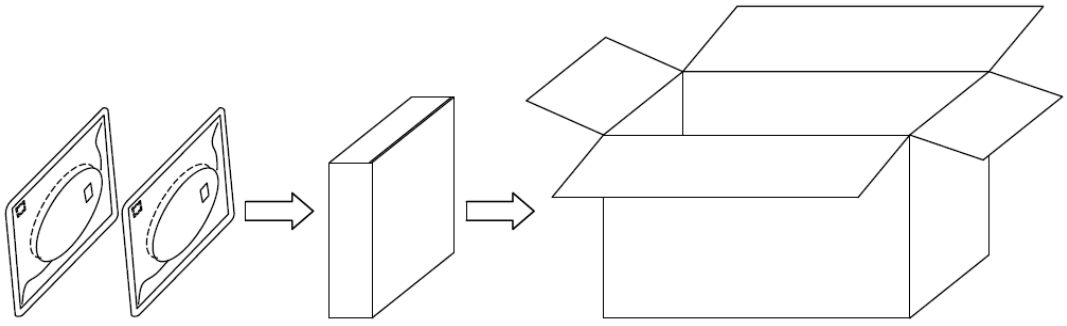
Standard Packing：3000pcs/Reel



Dimension No.	Ao +0.10 -0.10	Bo +0.10 -0.10	Do +0.10 -0.00	D1 +0.10 -0.00	Po +0.10 -0.10	P1 +0.10 -0.10	P2 +0.10 -0.10	E +0.10 -0.10	F +0.10 -0.10	T +0.05 -0.05	W +0.30 -0.10	Ko +0.10 -0.10
Dimension (mm)	5.10	10.50	1.50	1.50	4.00	8.00	2.00	1.75	7.50	0.40	16.00	4.20

Moisture Proof and Anti-Electrostatic Foil Bag





Each inner box contains 2 packing bag，6000pcs product per box； Each outer box contains 10 inner boxes，60000pcs product per box；

Precautions for Use

Hand soldering Condition

Hand soldering by soldering iron, One time soldering is recommended:

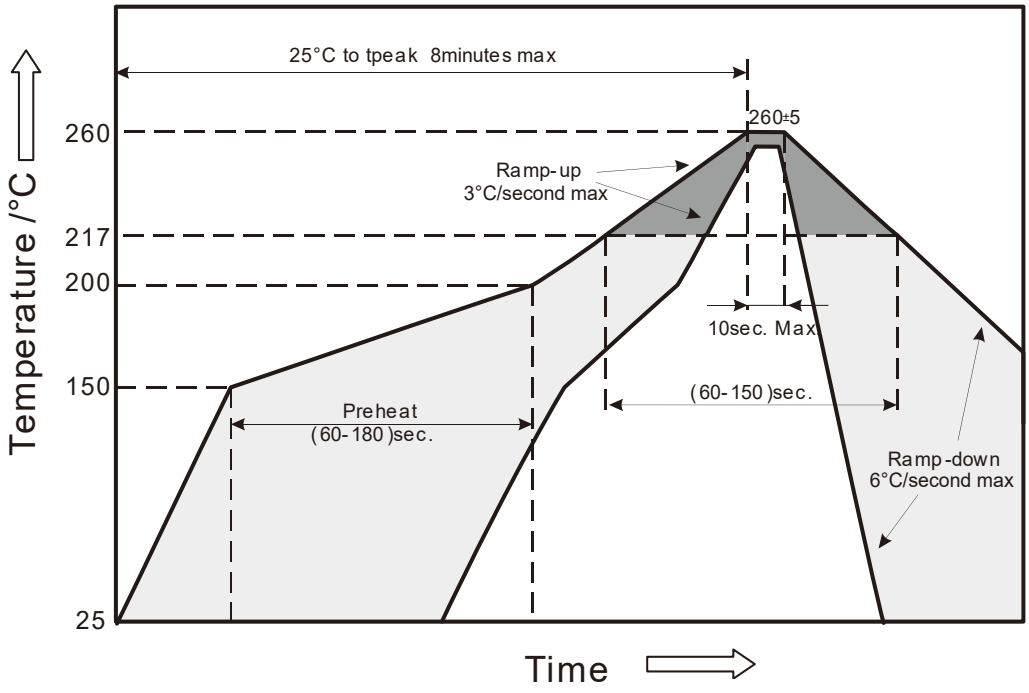
Temperature: 380

+5/-5°C Time: 3 sec max

Reflow Soldering

Stress on the product should be avoided during heating in soldering process.

After soldering, do not deal with the product before its temperature drop down to room temperature.



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