

LTV-M701

Small Outline, 5 Lead Low Input Current, High Gain Optocouplers



Description

These high gain series couplers use a light emitter diode and an integrated high gain photo detector to provide extremely high current transfer ratio between input and output. Separate pins for the photodiode and output stage result in TTL compatible saturation voltage and high speed operation. Where desired the V_{CC} and V_O terminals may be tied together to achieve conventional photo Darlington operation. A base access terminal allows a gain bandwidth adjustment to be made.



Features

- High current transfer ratio – 2000% typical.
- Low input current requirements – 0.5mA
- High output current – 60mA
- CTR guarantee – 0~70°C
- Instantaneous common mode rejection 10KV/ μ sec
- TTL compatible output – 0.1V V_{OL} typical
- Safety approval

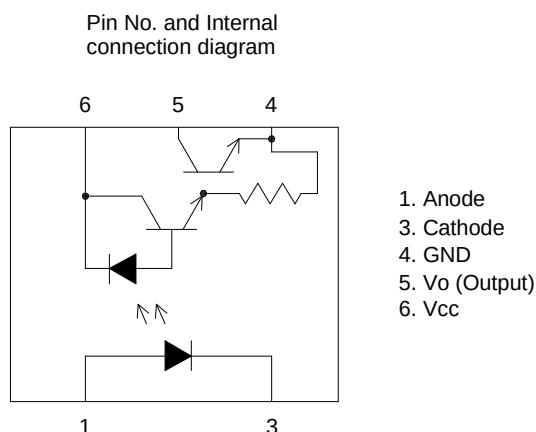
UL/ cUL 1577, Cert. No.E113898.

3750 Vrms/1 min

VDE DIN EN60747-5-5, Cert. No. 138213

$V_{IORM} = 567 V_{peak}$

Functional Diagram



Truth Table (Positive Logic)

LED	OUT
ON	L
OFF	H

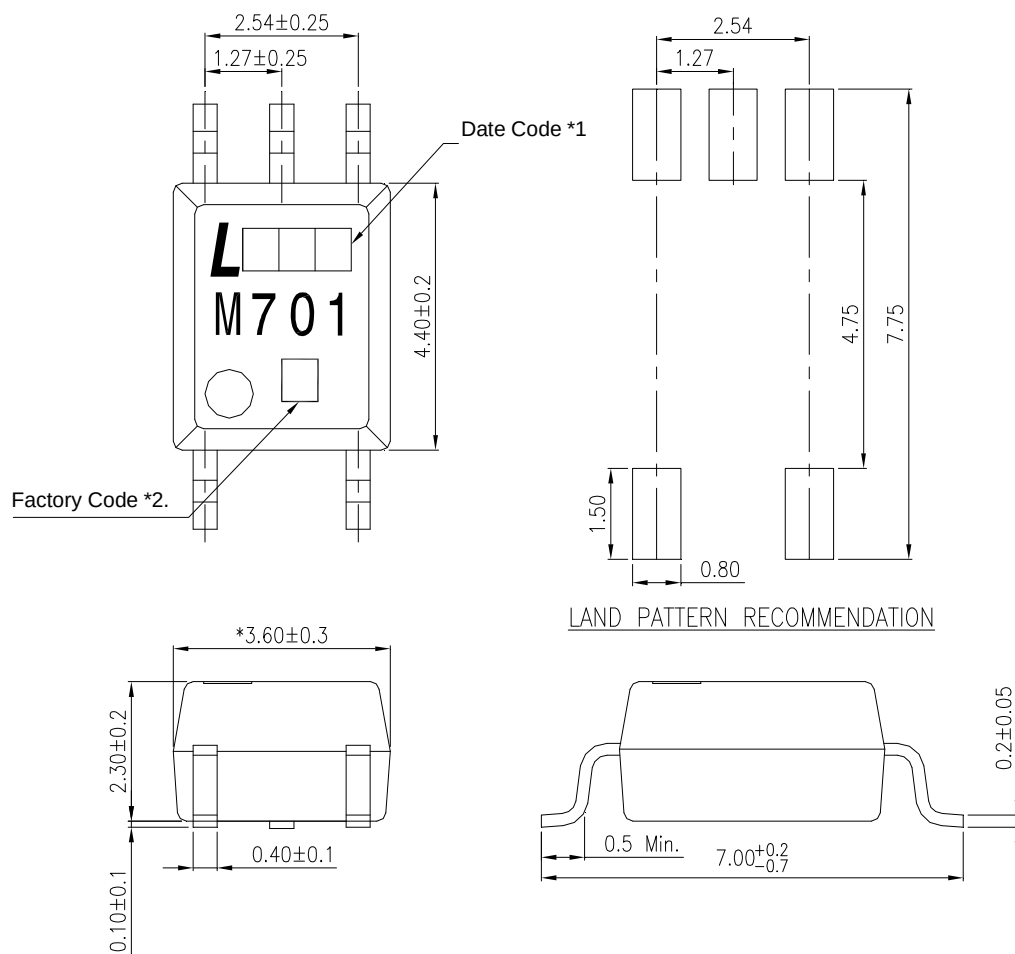
A 0.1 μ F bypass Capacitor must be connected between Pin4 and Pin6

Application

- Ground isolate most logic families: TTL/TTL, CMOS/TTL, CMOS/CMOS, LSTTL/TTL, CMOS/LSTTL
- Low input current line receiver
- Telephone ring detector
- EIA-RS-232C line receiver
- Current loop receiver
- ac line voltage status indicator: low input power dissipation

Package Dimensions

5-pin SOP Package (LTV-M701)



*1. Year date code and 2-digit work week.

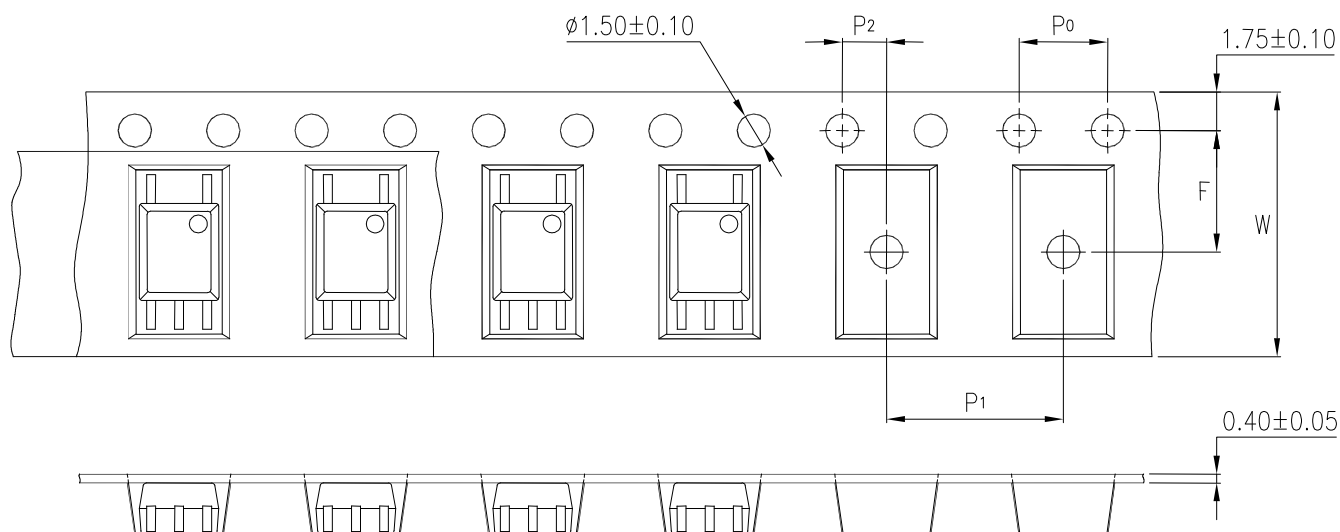
*2. Factory identification mark
(W :China-CZ)

Dimensions are in Millimeters and (Inches).

Mold flash on each side is 0.15mm maximum

Taping Dimensions

LTV-M701



Description	Symbol	Dimensions in millimeters (inches)
Tape wide	W	12 $\pm$ 0.3 (0.47)
Pitch of sprocket holes	P0	4 $\pm$ 0.1 (0.15)
Distance of compartment	F	5.5 $\pm$ 0.1 (0.217)
	P2	2 $\pm$ 0.1 (0.079)
Distance of compartment to compartment	P1	8 $\pm$ 0.1 (0.315)

Quantity Per Reel

Package Type	LTV-M701
Quantities(pcs)	3000

Absolute Maximum Ratings*1

Parameter	Symbol	Min	Max	Units	Note
Storage Temperature	T_{ST}	-55	125	°C	
Operating Temperature	T_A	-40	85	°C	
Isolation Voltage	V_{ISO}	3750		V_{RMS}	
Supply Voltage	V_{CC}	-0.5	18	V	
Lead Solder Temperature * 2			260	°C	2
Input					
Average Forward Input Current	I_F		20	mA	
Peak Input Current (50% duty cycle, 1 ms pulse width)	I_F		40	mA	
Peak Transient Input Current ($\leq 1 \mu s$ pulse width, 300 pps)	I_F		1.0	A	
Reverse Input Voltage	V_R		5	V	
Input Power Dissipation	P_I		35	mW	
Output					
Output Collector Current	I_O		60	mA	
Output Collector Voltage	V_O	-0.5	18	V	
Output Collector Power Dissipation	P_O		100	mW	

1. Ambient temperature = 25°C, unless otherwise specified. Stresses exceeding the absolute maximum ratings can cause permanent damage to the device. Exposure to absolute maximum ratings for long periods of time can adversely affect reliability.

2. 260°C for 10 seconds. Refer to Lead Free Reflow Profile.

Electrical Specifications

Parameters	Test Condition	Symbol	Min	Typ	Max	Units
Input						
Input Forward Voltage	$I_F = 1.6\text{mA}$, $T_A = 25^\circ\text{C}$	V_F		1.3	1.7	V
Input Reverse Voltage	$I_R = 10\mu\text{A}$	BV_R	5			V
Input Forward Voltage Temperature Coefficient	$I_F = 1.6\text{mA}$	$\Delta V_F / \Delta T_A$		-1.8		mV/ $^\circ\text{C}$
Input Capacitance	$V_F = 0$; $f = 1\text{MHz}$	C_{IN}		60		pF
Detector						
Current transfer ratio	$I_F = 0.5\text{mA}$; $V_O = 0.4\text{V}$; $V_{CC} = 4.5\text{V}$	CTR	400	1600	3500	%
	$I_F = 1.6\text{mA}$; $V_O = 0.4\text{V}$; $V_{CC} = 4.5\text{V}$		500	1900	2600	
Logic low output voltage output voltage	$I_F = 1.6\text{mA}$; $I_O = 8\text{mA}$; $V_{CC} = 4.5\text{V}$	V_{OL}		0.1	0.4	V
	$I_F = 5\text{mA}$; $I_O = 15\text{mA}$; $V_{CC} = 4.5\text{V}$					
	$I_F = 12\text{mA}$; $I_O = 24\text{mA}$; $V_{CC} = 4.5\text{V}$			0.2		
Logic high output current	$I_F = 0\text{mA}$, $V_O = V_{CC} = 18\text{V}$	I_{OH}		0.01	100	μA
Logic low supply current	$I_F = 1.6\text{mA}$, $V_O = \text{open}$ ($V_{CC} = 18\text{V}$)	I_{cCL}		0.4	1.5	mA
Logic high supply current	$I_F = 0\text{mA}$, $V_O = \text{open}$; ($V_{CC} = 18\text{V}$)	I_{cCH}		0.03	10	mA

Over recommended temperature ($T_A = 0^\circ\text{C}$ to 70°C) unless otherwise specified.

*All Typical at $T_A = 25^\circ\text{C}$

Switching Specifications

Parameter	Test Condition	Symbol	Min	Typ	Max	Units
Propagation Delay Time to Low Output Level	$T_A = 25^\circ\text{C}$	t_{PHL}		5	75	μs
	$I_F = 0.5\text{mA}; R_L = 4.7\text{K}\Omega$				100	
	$T_A = 25^\circ\text{C}$			0.2	2	
	$I_F = 12\text{mA}; R_L = 270\Omega$				3	
	$T_A = 25^\circ\text{C}$			0.7	20	
	$I_F = 1.6\text{mA}; R_L = 2.2\text{K}\Omega$				25	
Propagation Delay Time to High Output Level	$T_A = 25^\circ\text{C}$	t_{PLH}		2	60	
	$I_F = 0.5\text{mA}; R_L = 4.7\text{K}\Omega$				90	
	$T_A = 25^\circ\text{C}$			7	10	
	$I_F = 12\text{mA}; R_L = 270\Omega$				15	
	$T_A = 25^\circ\text{C}$			4	35	
	$I_F = 1.6\text{mA}; R_L = 2.2\text{K}\Omega$				50	
Logic High Common Mode Transient Immunity	$I_F = 0\text{mA}; V_{CM} = 10\text{V}_{p-p}$ $R_L = 2.2\text{K}\Omega$	$ CM_H $	1	10	-	$\text{KV}/\mu\text{s}$
Logic Low Common Mode Transient Immunity	$I_F = 1.6\text{mA}; V_{CM} = 10\text{V}_{p-p}$ $R_L = 2.2\text{K}\Omega$	$ CM_L $	1	10		

Over recommended temperature ($T_A = 0^\circ\text{C}$ to 70°C), $V_{CC} = 5\text{V}$, unless otherwise specified.
 *All Typical at $T_A = 25^\circ\text{C}$

Isolation Characteristics

Parameter	Test Condition	Symbol	Min	Typ	Max	Units
Input-Output Insulation Leakage Current	45% RH, $t = 5s$, $V_{I-O} = 3kV$ DC, $T_A = 25^{\circ}C$	I_{I-O}			1.0	μA
Withstand Insulation Test Voltage	$RH \leq 50\%$, $t = 1min$, $T_A = 25^{\circ}C$	V_{ISO}	3750			V_{RMS}
Input-Output Resistance	$V_{I-O} = 500V$ DC	R_{I-O}		10^{12}		Ω

*All Typical at $T_A = 25^{\circ}C$ **Notes**

1. A 0.1 μF or bigger bypass capacitor for V_{CC} is needed as shown in Fig.1
2. Current Transfer Ratio is defined as the ratio of output collector current I_O , to the forward LED input current I_F , times 100.
3. The 1.9K Ω load represents 1TTL unit load of 1.6mA and the 5.6K Ω pull-up resistor.
4. The 4.1K Ω load represents 1LSTTL unit load of 0.36mA and the 6.1K Ω pull-up resistor.

Typical Performance Curves

Figure 1: DC Transfer Characteristics

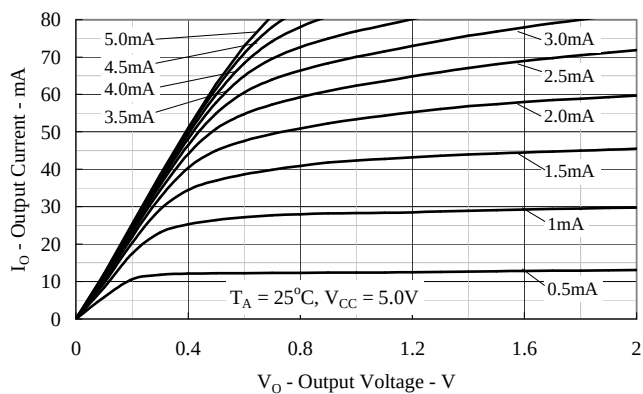


Figure 4: Input Diode Forward Current vs. Forward Voltage

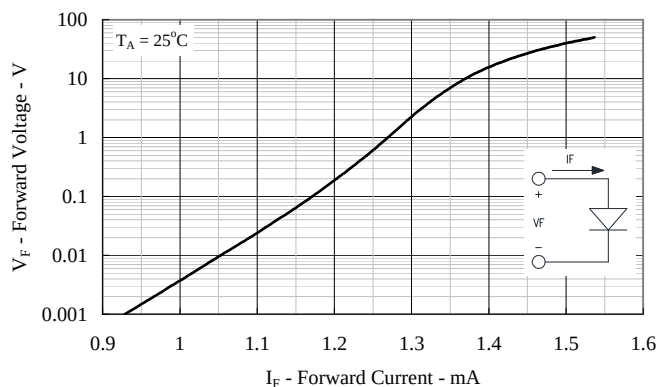


Figure 2: Current Transfer Ratio vs. Forward Current.

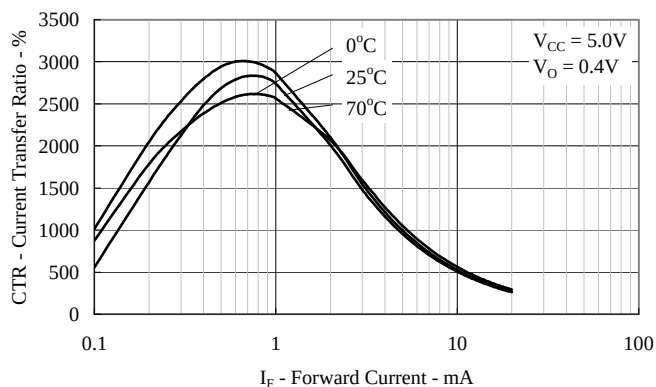


Figure 5: Propagation delay vs. Temperature

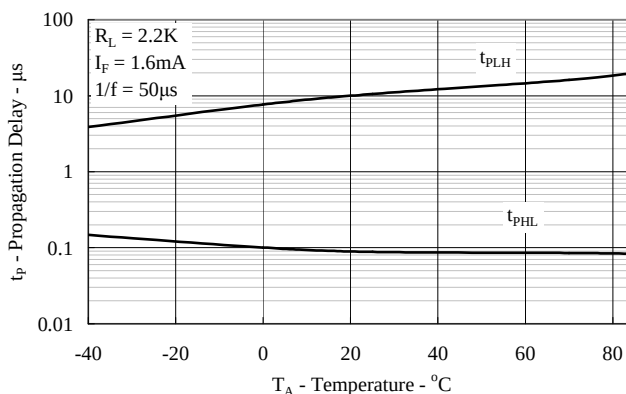


Figure 3: Output Current vs. Forward Current.

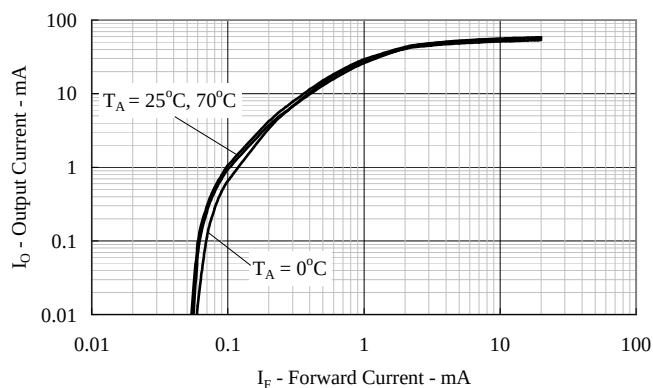


Figure 6: Switching Test Circuit

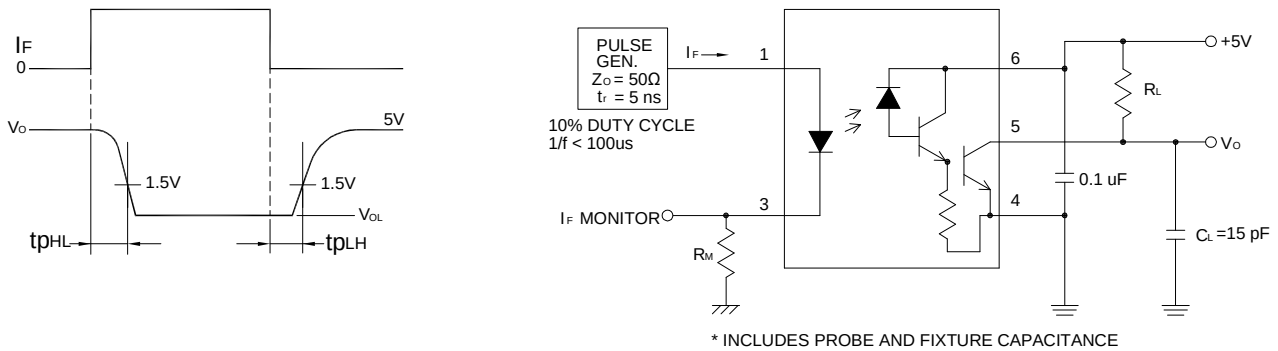
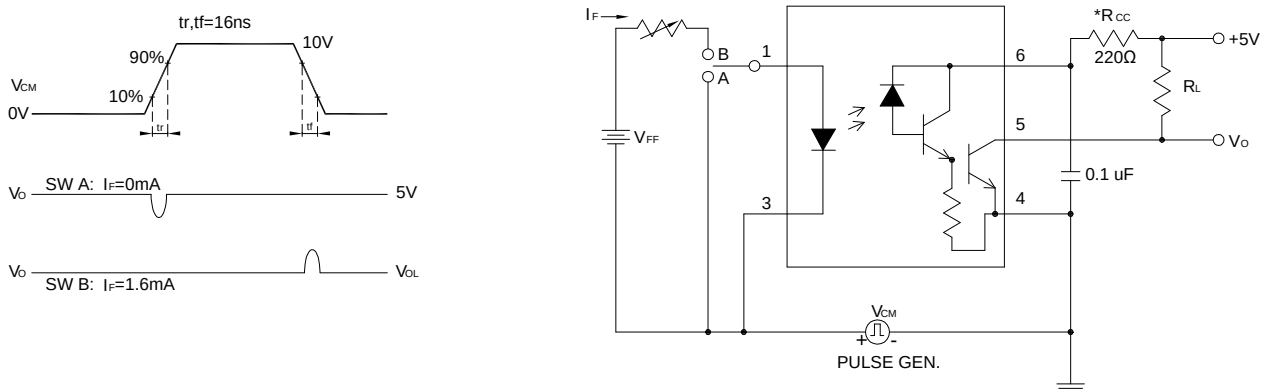


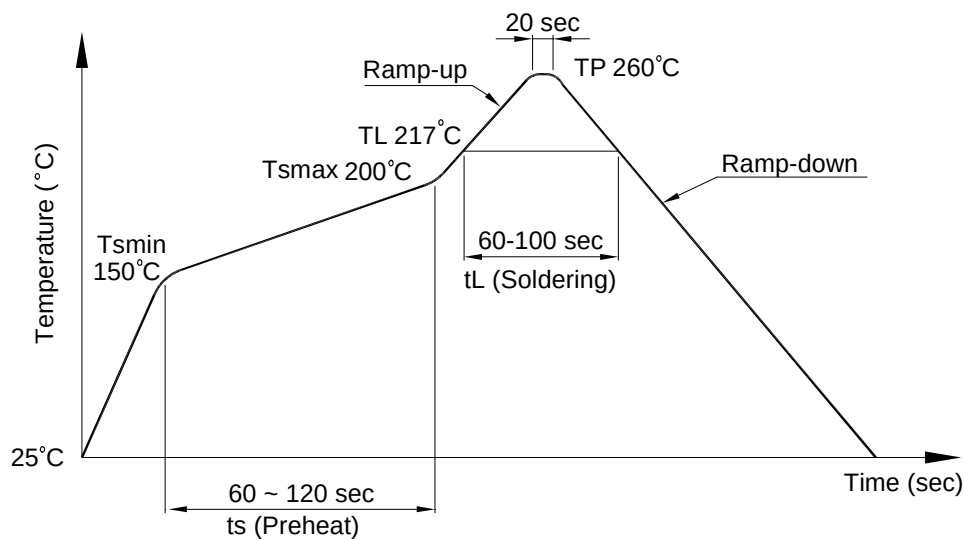
Figure 7: Test Circuit for Transient Immunity and Typical Waveforms



Temperature Profile Of Soldering Reflow**(1) IR Reflow soldering (JEDEC-STD-020C compliant)**

One time soldering reflow is recommended within the condition of temperature and time profile shown below.

Profile item	Conditions
Preheat - Temperature Min (T_{Smin}) - Temperature Max (T_{Smax}) - Time (min to max) (ts)	150°C 200°C 90±30 sec
Soldering zone - Temperature (T_L) - Time (t_L)	217°C 60 ~ 100sec
Peak Temperature (T_P)	260°C
Ramp-up rate	3°C / sec max.
Ramp-down rate	3~6°C / sec



Temperature Profile Of Soldering Reflow

(2) Wave soldering (JEDEC22A111 compliant)

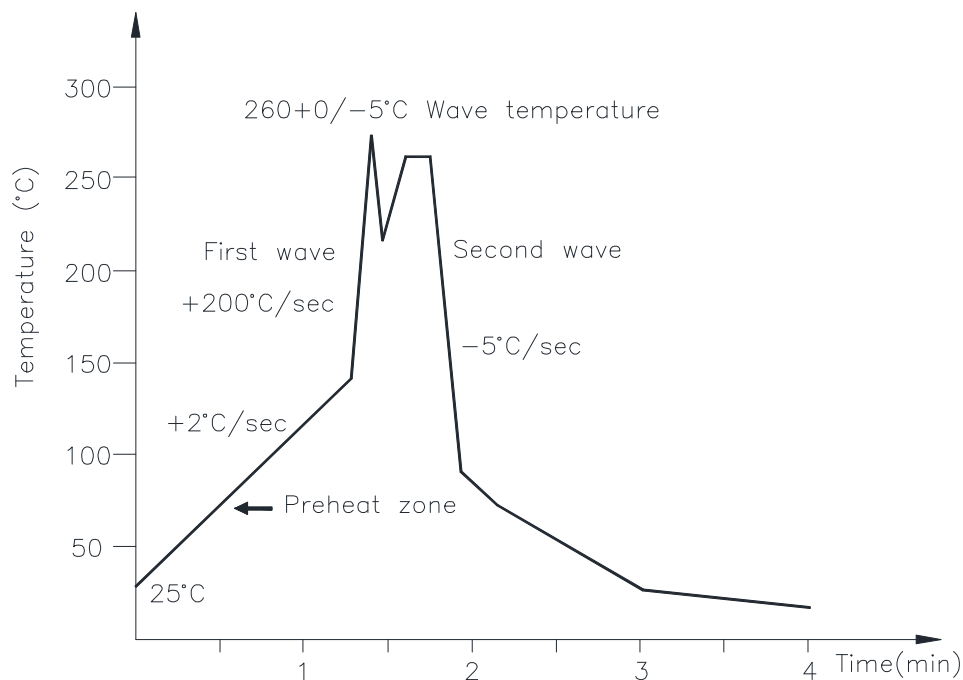
One time soldering is recommended within the condition of temperature.

Temperature: $260 \pm 0/-5^{\circ}\text{C}$

Time: 10 sec.

Preheat temperature: 25 to 140°C

Preheat time: 30 to 80 sec.



(3) Hand soldering by soldering iron

Allow single lead soldering in every single process. One time soldering is recommended.

Temperature: $380 \pm 0/-5^{\circ}\text{C}$

Time: 3 sec max.

Note:

Specifications of the products displayed herein are subject to change without notice.

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