LITEON®
OPTOELECTRONICS

Photocoupler
Product Data Sheet
LTV-M701 series

Spec No. :DS70-2013-0021
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LITE-ON DCC

RELEASE

BNS-OD-FC001/A4

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Photocoupler
LTV-M701 series

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

1. 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 Vcc and Vo terminals may be tied together to achieve conventional photo darlington operation. A base access terminal allows a gain bandwidth adjustment to be made.

1.1 Features

- High current transfer ratio – 2000% typical.
- Low input current requirements – 0.5mA
- High output current – 60mA
- Performance guaranteed guarantee – 0~70˚C.
- Instantaneous common mode rejection 10KV/μsec
- TTL compatible low output voltage– 0.1V V_{OL} typical
- Safety approval

  UL/ cUL 1577, Cert. No.E113898.

  3750s/1 min

  VDE DIN EN60747-5-5, Cert. No. 40015248

  V_{IORM} = 560 V_{peak}

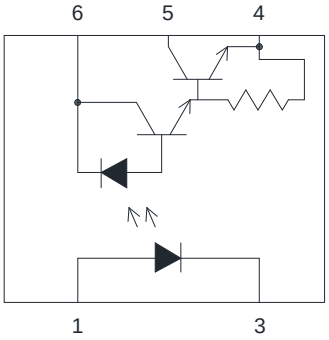
1.2 Applications

- Low input current line receiver
- Telephone ring detector
- EIA-RS-232C line receiver
- Current loop receiver
- Ground isolate most logic families:

  TTL/TTL, CMOS/TTL, CMOS/CMOS, LSTTL/TTL, CMOS/LSTTL
- AC line voltage status indicator: low input power dissipation

1.3 Functional Diagram

Pin No. and Internal connection diagram



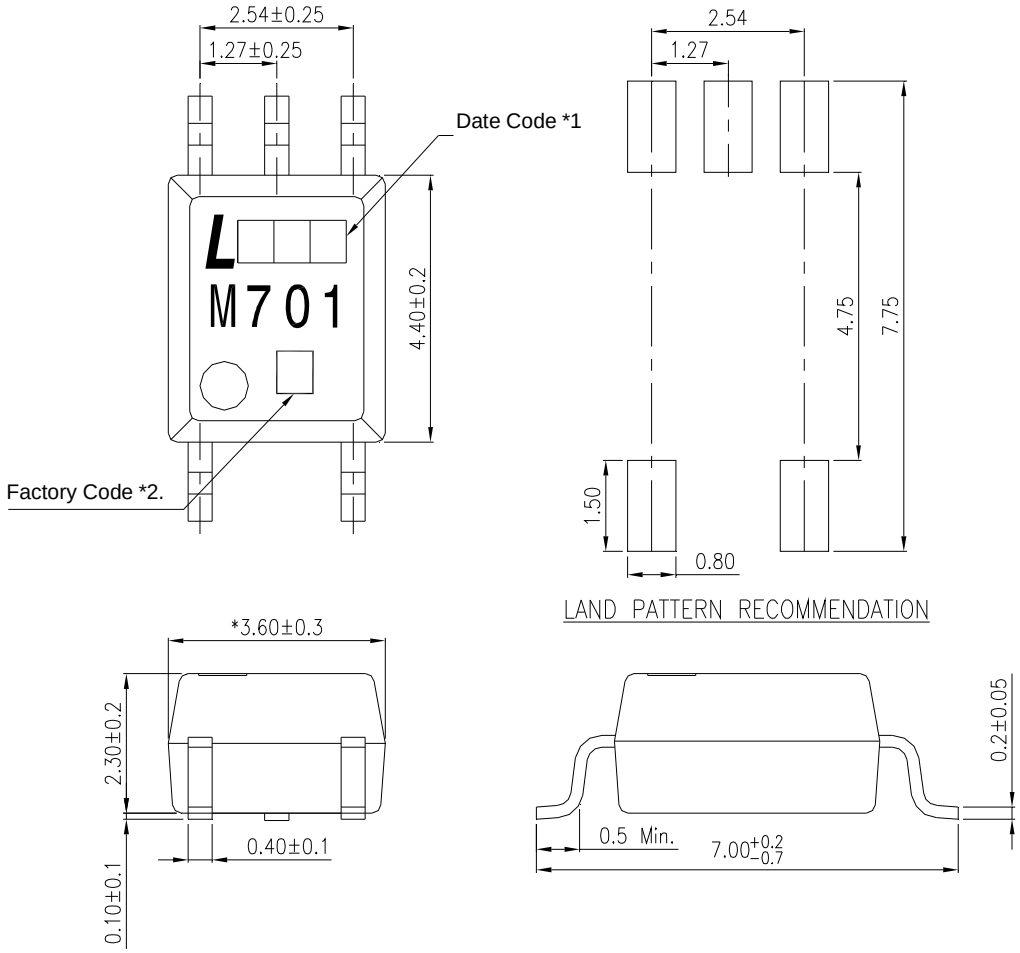
1. Anode
3. Cathode
4. GND
5. Vo (Output)
6. Vcc

Truth Table (Positive Logic)

LED	OUT
ON	L
OFF	H

A 0.1μF bypass Capacitor must be connected between Pin8 and Pin5

2. PACKAGE DIMENSIONS



NOTE :

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

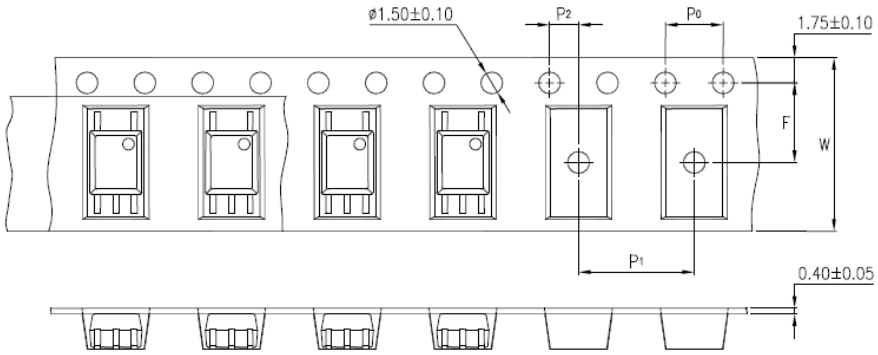
2. Factory identification mark (W :China-CZ).

Dimensions are all in Millimeters.

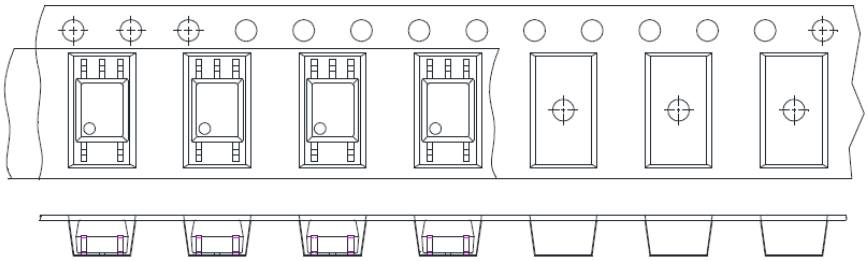
Mold flash on each side is 0.15mm maximum

3. TAPING DIMENSIONS

3.1 LTV-M701



3.2 LTV-M701-TP



Description	Symbol	Dimension in mm (inch)
Tape wide	W	12 ± 0.3 (.472)
Pitch of sprocket holes	P_0	4 ± 0.1 (.157)
Distance of compartment	F	5.5 ± 0.1 (.217)
	P_2	2 ± 0.1 (.079)
Distance of compartment to compartment	P_1	8 ± 0.1 (.315)

3.3 Quantities Per Reel

Package Type	LTV-M701 series
Quantities (pcs)	3000

4. RATING AND CHARACTERISTICS

4.1 Absolute Maximum Ratings at Ta=25℃ *1

	Parameter	Symbol	Rating	Unit	Note
Input	Average Forward Input Current	$I_{F(AVG)}$	20	mA	
	Peak Input Current (50% duty cycle, 1 ms pulse width)	I_F	1.0	A	
	Reverse Input Voltage	V_R	5	V	
	Power Dissipation	P_I	35	mW	
Output	Output Collector Current	I_O	60	mA	
	Output Collector Power Dissipation	P_o	100	mW	
	Isolation Voltage	V_{iso}	3750	V_{rms}	
	Supply Voltage	V_{CC}	-0.5~18	V	
	Operating Temperature	T_{opr}	-40 ~ +85	℃	
	Storage Temperature	T_{stg}	-55 ~ +125	℃	
	Lead Solder Temperature	T_{sol}	260	℃	2

*Ambient temperature = 25℃, unless otherwise speci fied. 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.

4.2 Electrical Characteristics at T_A=25℃

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Condition	Fig.	Note
Input								
Input Forward Voltage	V_F	—	1.30	1.75	V	I_F=1.6mA, T_A=25℃	4	
Input Forward Voltage Temperature Coefficient	$\Delta V_F/\Delta Ta$	—	-1.8	—	mV/℃	I_F=1.6mA		
Input Reverse Voltage	BV_R	5.0	—	—	V	I_R = 10μA		
Input Capacitance	C_{IN}	—	60	—	pF	V_F=0; f=1MHz		
Detector								
Current transfer ratio	CTR	400	1800	3500	%	I_F=0.5mA;Vcc=4.5V; T_A=25℃ ;Vo=0.4V	2	3
		500	1600	2600		I_F=1.6mA;Vcc=4.5V; T_A=25℃ ;Vo=0.4V		
Logic low output voltage output voltage	V_{OL}	—	0.1	0.4	V	I_F=1.6mA;Vcc=4.5V; I_o=8mA		
						I_F=5mA;Vcc=4.5V; I_o=15mA		
			0.2			I_F=12mA;Vcc=4.5V; I_o=24mA		
Logic high output current	I_{OH}	—	0.3	100	μA	I_F=0mA, Vo=Vcc=18V T_A=25℃		
Logic low supply current	I_{CCL}	—	0.7	1.5	mA	I_F=1.6mA,V_o=open, Vcc=18V		1
Logic high supply current	I_{CCH}	—	0.07	10	μA	I_F=0mA,V_o=open, Vcc=18V		1

* Over recommended temperature (T_A = 0℃ to 70℃) unless otherwise specified.
* All typicals at T_A = 25°C

5. SWITCHING SPECIFICATION

T_A=0~70℃, Vcc=5V, unless otherwise specified.

Parameter	Test Condition		Symbol	Min	Typ	Max	Units	Fig.	Note
Propagation Delay Time to Low Output Level	T_A = 25°C	I_F = 0.5mA; R_L = 4.7KΩ	t_{PHL}		5	75	μs	5,6	
						100			
	T_A = 25°C	I_F = 12mA; R_L = 270Ω			0.2	2			
						3			
	T_A = 25°C	I_F = 1.6mA; R_L = 2.2KΩ			0.7	20			
						25			
Propagation Delay Time to High Output Level	T_A = 25°C	I_F = 0.5mA; R_L = 4.7KΩ	t_{PLH}		2	60		5,6	
						90			
	T_A = 25°C	I_F = 12mA; R_L = 270Ω			7	10			
						15			
	T_A = 25°C	I_F = 1.6mA; R_L = 2.2KΩ			4	35			
						50			
Logic High Common Mode Transient Immunity	I_F = 0mA; $\|V_{CM}\|$ = 10V_{p-p} R_L = 2.2KΩ		$\|CM_H\|$	1	10	-	KV/μs	7	4
Logic Low Common Mode Transient Immunity	I_F = 1.6mA;$\|V_{CM}\|$ =10V_{p-p} R_L=2.2KΩ		$\|CM_L\|$	1	10			7	4

* Over recommended temperature (T_A = 0℃ to 70℃), V_{CC} = 5V, unless otherwise specified.
* All typicals at T_A = 25°C

6. ISOLATION CHARACTERISTIC

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Condition	Note
Input-Output Insulation Leakage Current	I_{I-O}	—	—	1.0	μA	45% RH, V_{I-O} = 3KV DC, T_A = 25℃	6
Withstand Insulation Test Voltage	V_{ISO}	3750	—	—	V_{RMS}	RH ≤ 50%, t = 1min, T_A = 25℃	5,6
Input-Output Resistance	R_{I-O}	—	10^{12}	—	Ω	RH ≤ 45%, V_{I-O} = 500V DC	6

*All Typical at T_A=25℃

Note

1. A 0.1μF or bigger bypass capacitor for V_{CC} is needed as shown in Fig.1
2. 260℃ for 10 seconds. Refer to Lead Free Reflow Profile.
3. Current Transfer Ratio (CTR) is defined as the ration of output collector current, Io, to the forward LED input current, I_F, times 100%.
4. Common mode transient immunity in a Logic High level is the maximum tolerable (positive) dV_{CM}/dt on the leading edge of the common mode pulse signal, V_{CM}, to assure that the output will remain in a Logic High state (i.e., V_O > 2.0 V). Common mode transient immunity in a Logic Low level is the maximum tolerable (negative) dV_{CM}/dt on the trailing edge of the common mode pulse signal, V_{CM}, to assure that the output will remain in a Logic Low state (i.e., V_O < 0.8 V)
5. In accordance with UL1577, each optocoupler is proof tested by applying an insulation test voltage 4500Vrms for one second (leakage current less than 10 uA). This test is performed before the 100% production test for partial discharge.
6. Device considered a two terminal device. Pins 1 and 3 shorted together and Pins 4, 5 and 6 shorted together.

7. CHARACTERISTICS CURVES

Figure 1: DC Transfer Characteristics

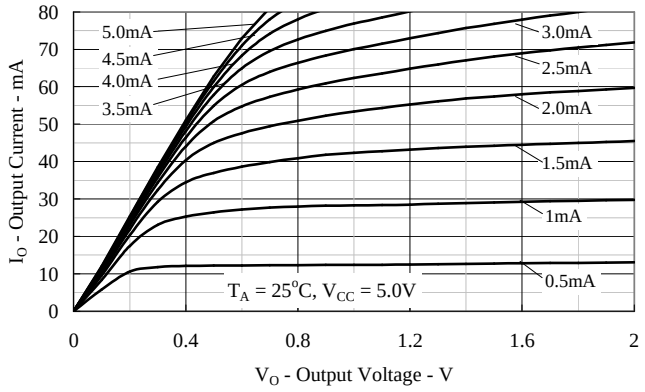


Figure 2: Current Transfer Ratio vs. Forward Current.

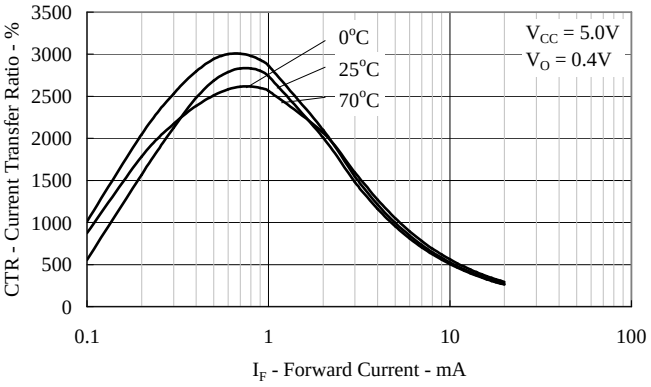


Figure 3: Output Current vs. Forward Current.

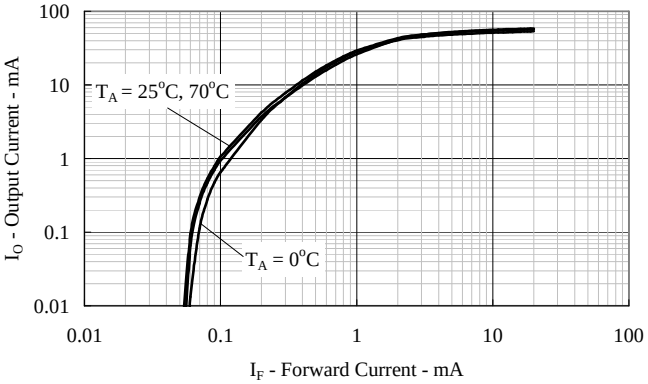


Figure 4: Input Diode Forward Current vs. Forward Voltage

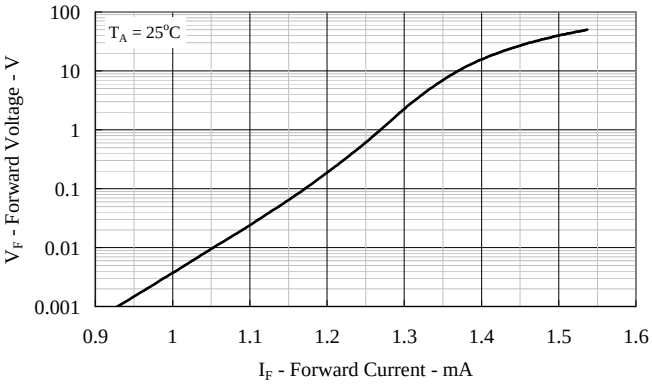
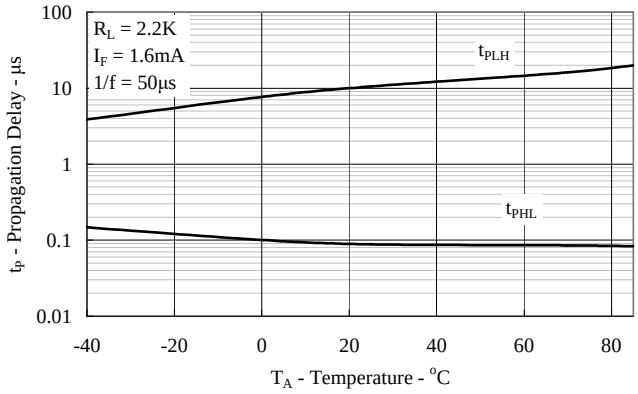


Figure 5: Propagation delay vs. Temperature



8. Switching Time Test Circuit

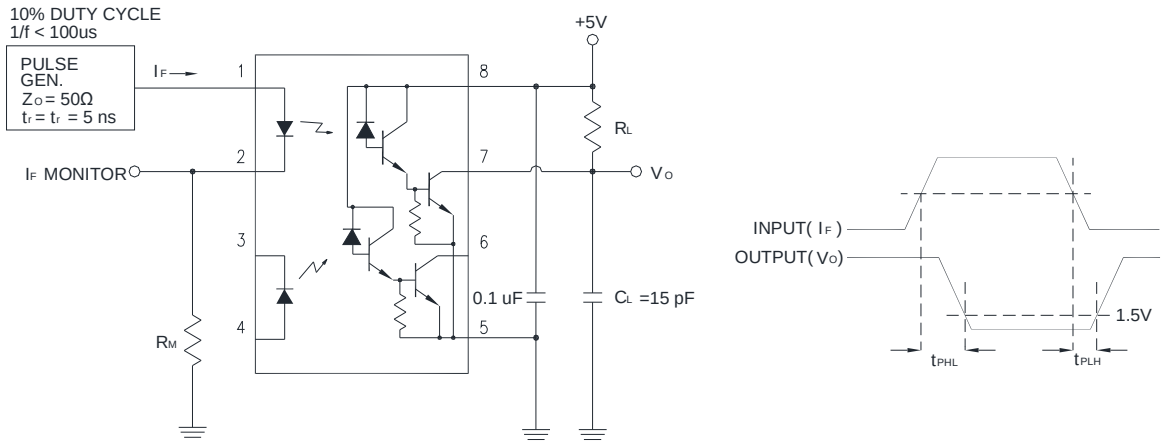


Figure 6: Single Channel Test Circuit for t_{PHL} and t_{PLH}

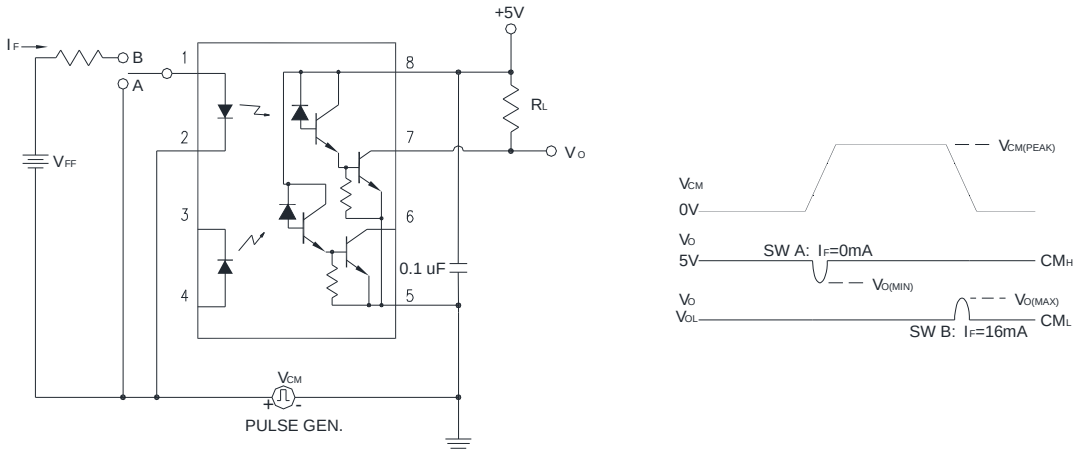


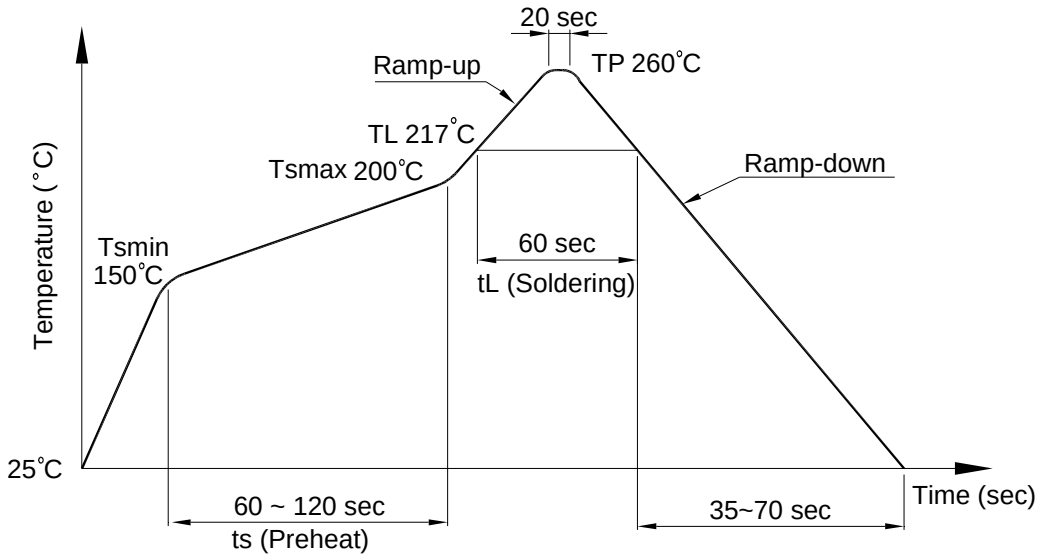
Figure 7: Single Channel Test Circuit for Common Mode Transient Immunity

9. TEMPERATURE PROFILE OF SOLDERING

9.1 IR Reflow soldering (JEDEC-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 Min (T_{Smin})	150˚C
- Temperature Max (T_{Smax})	200˚C
- Time (min to max) (ts)	90±30 sec
Soldering zone	
- Temperature (T_L)	217˚C
- Time (t_L)	60 sec
Peak Temperature (T_P)	260˚C
Ramp-up rate	3˚C / sec max.
Ramp-down rate	3~6˚C / sec



9.2 Wave soldering (JEDEC22A111 compliant)

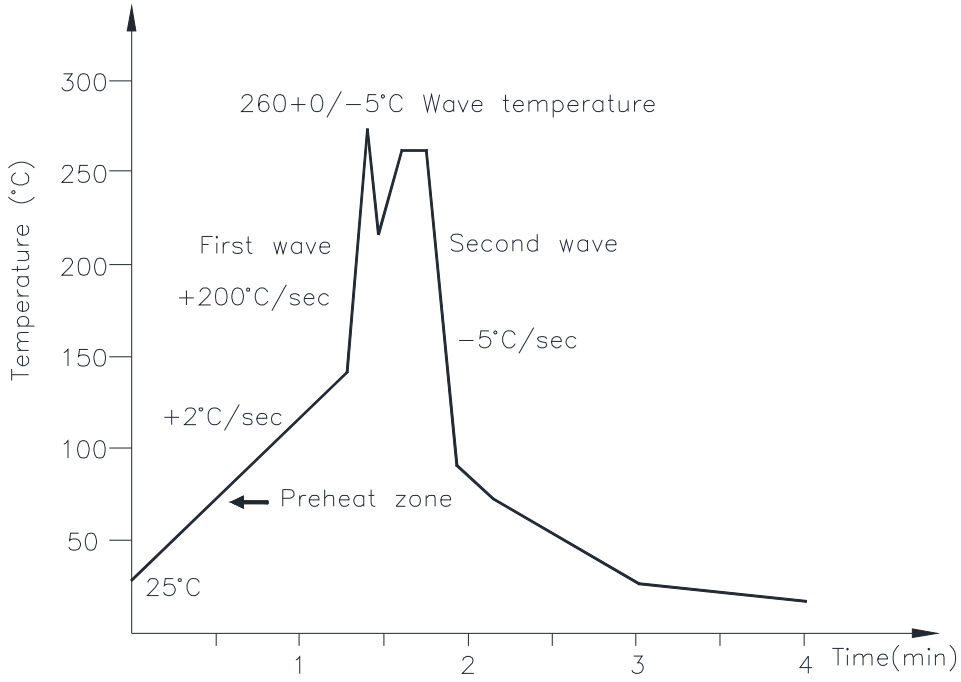
One time soldering is recommended within the condition of temperature.

Temperature: 260+0/-5˚C

Time: 10 sec.

Preheat temperature:25 to 140˚C

Preheat time: 30 to 80 sec.



9.3 Hand soldering by soldering iron

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

Temperature: 380+0/-5˚C

Time: 3 sec max.

10. NAMING RULE

Part Number Options
LTV-M701-TP
LTV-M701
LTVM701TP-V
LTVM701-V

Definition of Suffix	Remark
"M701"	LiteOn model name
" no suffix "	Pin 1 location at upper right of the tape
"TP"	Pin 1 location at lower left of the tape
"V"	VDE approved option

11. NOTES

LiteOn is continually improving the quality, reliability, function or design and LiteOn reserves the right to make changes without further notices.

The products shown in this publication are designed for the general use in electronic applications such as office automation equipment, communications devices, audio/visual equipment, electrical application and instrumentation.

For equipment/devices where high reliability or safety is required, such as space applications, nuclear power control equipment, medical equipment, etc, please contact our sales representatives.

When requiring a device for any ”specific” application, please contact our sales in advice.

If there are any questions about the contents of this publication, please contact us at your convenience.

The contents described herein are subject to change without prior notice.

Immerge unit’s body in solder paste is not recommended.