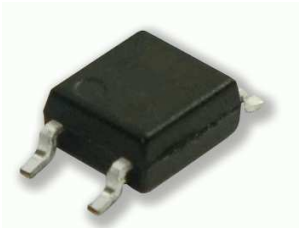
LTV-M501

Small Outline, 5 Lead, High Speed Optocouplers

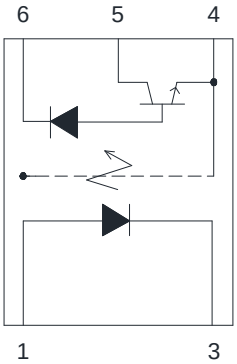


Description

The LTV-M501 consists of a high efficient AlGaAs Light Emitting Diode and a high speed optical detector. This design provides excellent AC and DC isolation between the input and output sides of the Optocoupler. Connection for the bias of the photodiode improves the speed that of a conventional phototransistor coupler by reducing the base-collector capacitances. The internal shield ensures high common mode transient immunity. A guaranteed common mode transient immunity is up to 15KV/μs (Min.)

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 Pin4 and Pin6 (note. 1)

Features

- Surface mountable
- High speed – 1MBd typical
- Compatible with infrared vapor phase reflow and wave soldering process
- Very high common mode transient immunity: 15K V/μs at V_{CM} = 1500 V guaranteed
- TTL compatible
- Open collector output
- Lead free option
- Worldwide Safety approval :

  UL/ cUL 1577, Cert. No.E113898.

  3750 Vrms/1 min

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

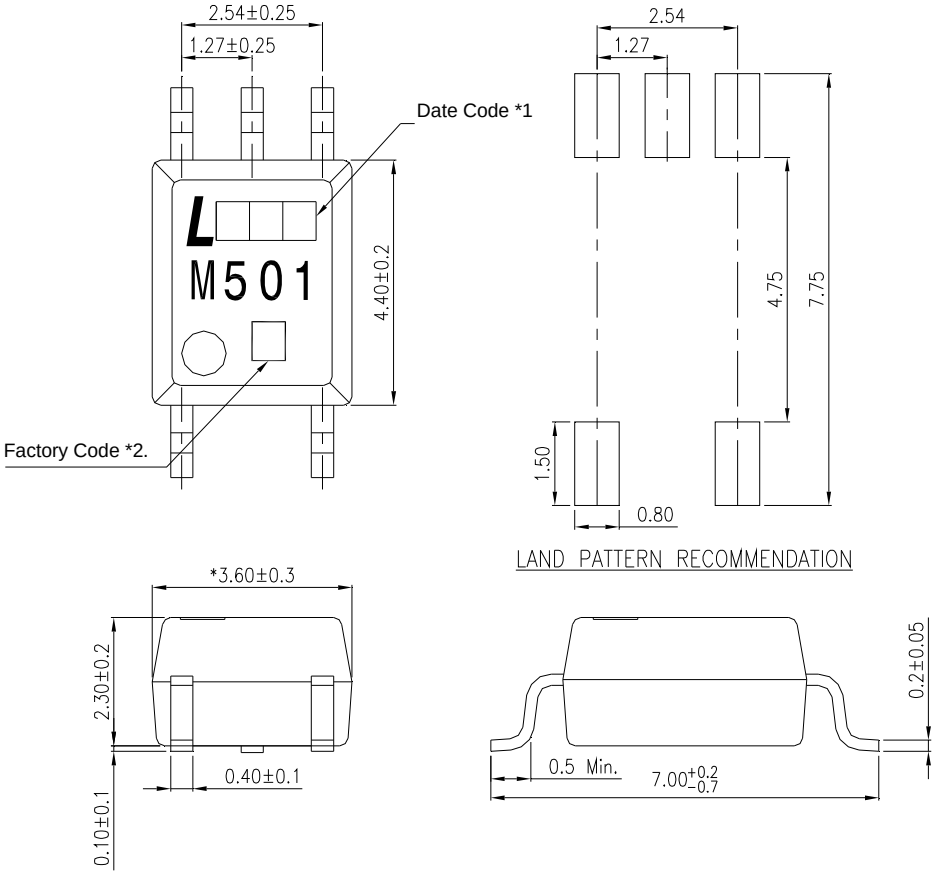
  V_{IORM} = 560 V_{peak}

Application

- Line receivers: High common mode transient immunity (>1000 V/μs) and low input-output capacitance (0.6 pF).
- High speed logic ground isolation: TTL/TTL, TTL/LTTL, TTL/CMOS, TTL/LSTTL
- Replace slow phototransistor optocouplers
- Replace pulse transformers: save board space and weight
- Analog signal ground isolation: Integrated photon detector provides improved linearity over phototransistor type

Package Dimensions

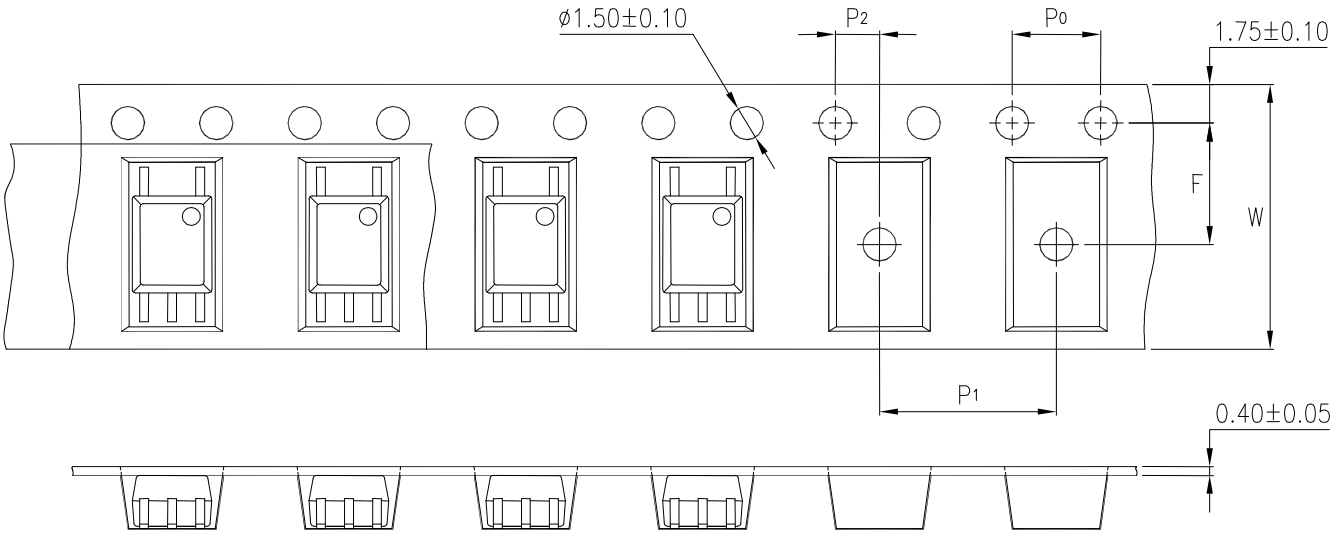
5-pin SOP Package (LTV-M501)



*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-M501



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

Quantitv Per Reel

Package Type	LTV-M501
Quantities(pcs)	3000

Absolute Maximum Ratings*1

Parameter	Symbol	Min	Max	Units	Note
Storage Temperature	T_{ST}	-55	125	°C	
Operating Temperature	T_A	-55	100	°C	
Isolation Voltage	V_{ISO}	3750		V_{RMS}	
Supply Voltage	V_{CC}	-0.5	30	V	
Lead Solder Temperature * 2			260	°C	2
Input					
Average Forward Input Current	I_F		25	mA	
Peak Input Current (50% duty cycle, 1 ms pulse width)	I_F		50	mA	
Peak Transient Input Current (1 µs pulse width, 300 pps)	I_F		1.0	A	
Reverse Input Voltage	V_R		5	V	
Input Power Dissipation	P_I		45	mW	
Output					
Output Collector Current	I_O		8	mA	
Peak Output Current	I_O		16	mA	
Output Collector Voltage	V_O	-0.5	20	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 =16mA, T_A=25 °C	V_F	1.2	1.4	1.8	V
Input Reverse Voltage	I_R = 10μA	BV_R	5			V
Detector						
Current transfer ratio	I_F = 16mA; V_{CC} = 4.5V; T_A = 25 °C; V_O = 0.4V	CTR	20	36		%
	I_F = 16mA; V_{CC} = 4.5V; T_A = 25 °C; V_O = 0.5V		15	38		
Logic low output voltage output voltage	I_F = 16mA;V_{CC} = 4.5V; I_o = 3.0mA; T_A = 25 °C	V_{OL}		0.2	0.4	V
	I_F = 16mA;V_{CC} = 4.5V; I_o = 2.4mA; T_A = 25 °C				0.5	
Logic high output current	I_F = 0mA, V_O = V_{CC} = 5.5V, T_A = 25 °C	I_{OH}		0.002	0.5	μA
	I_F = 0mA, V_O = V_{CC} = 15V T_A = 25 °C			0.005	1	
	T_A = 0 ~ 70°C				50	
Logic low supply current	I_F = 16mA, V_o = open (V_{CC}=15V)	I_{CCL}		185		
Logic high supply current	I_F = 0mA, V_o = open ; T_A = 25 °C (V_{CC} = 15V)	I_{CCH}		0.002	1	

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

Switching Specifications

Parameter	Test Condition		Symbol	Min	Typ	Max	Units
Propagation Delay Time to Low Output Level	T_A = 25°C	R_L=1.9KΩ	t_{PHL}		190	800	ns
	0 ~ 100°C					800	
Propagation Delay Time to High Output Level	T_A = 25°C		t_{PLH}		150	800	
	0 ~ 100°C					800	
Logic High Common Mode Transient Immunity	I_F = 0mA;V_{CM} = 1500Vp-p; C_L = 15 pF; T_A=25 °C, R_L=1.9KΩ		$\|CM_H\|$	15	25		KV/μs
Logic Low Common Mode Transient Immunity	I_F = 16mA;V_{CM} = 1500Vp-p C_L = 15 pF; T_A = 25 °C, R_L = 1.9KΩ		$\|CM_L\|$	15	25		KV/μs

Over recommended temperature (T_A = 0°C to 70°C) V_{CC} = 5 V, I_F = 16mA unless otherwise specified.
*All Typical at T_A =25° 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°C	I_{I-O}			1.0	μA
Withstand Insulation Test Voltage	RH ≤ 50%, t = 1min, T_A = 25°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 °C

Characteristics Curves

Figure 1: DC and Pulsed Transfer Characteristics.

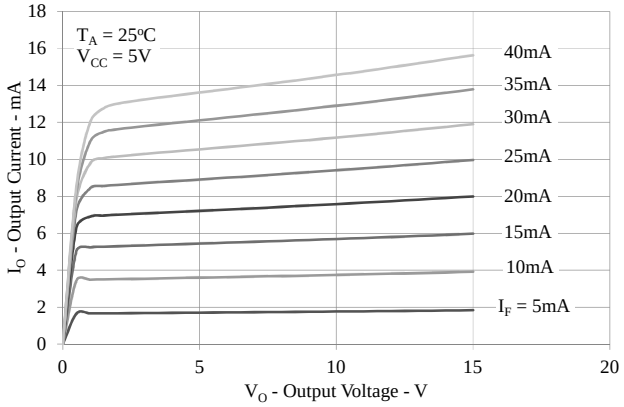


Figure 2: Input Current vs. Forward Voltage.

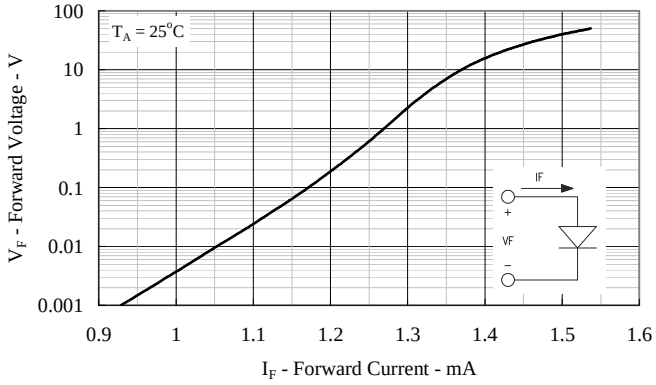


Figure 3: Propagation Delay vs. Load Resistance.

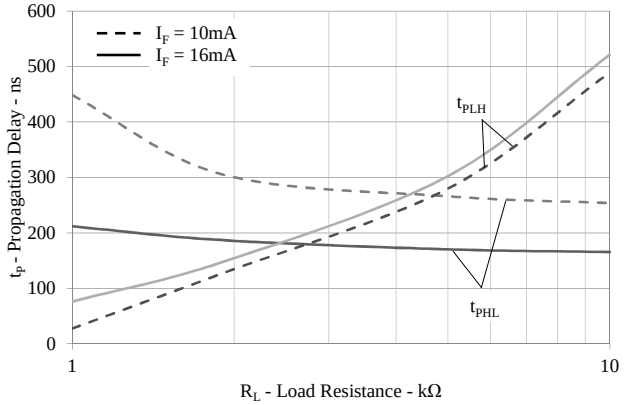


Figure 4: Current Transfer Ratio vs. Input Current.

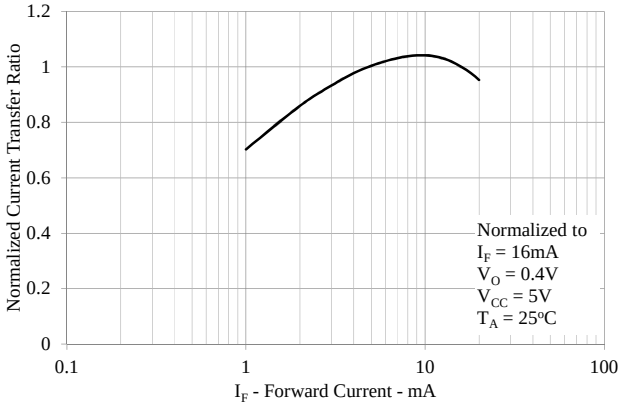


Figure 5: Current Transfer Ratio vs. Temperature.

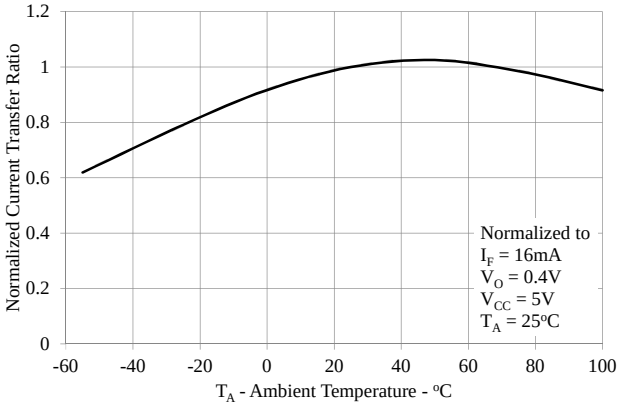
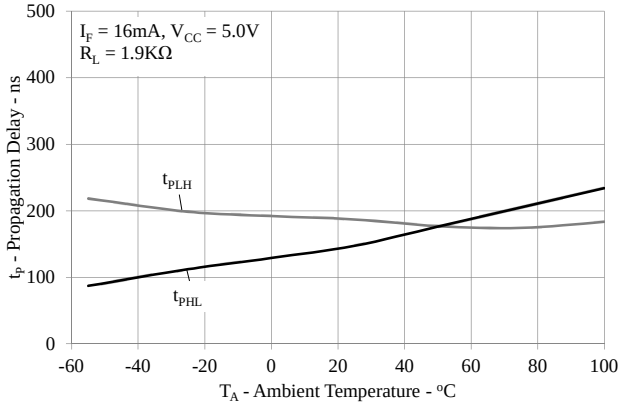


Figure 6: Propagation Delay Time vs.Temperature.



Characteristics Curves

Figure 7: Logic High Output Current vs. Temperature.

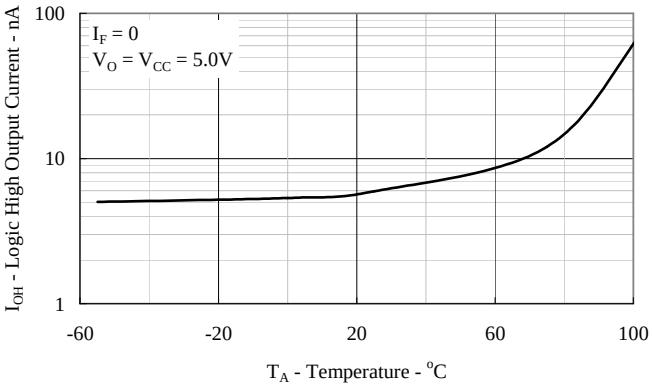


Figure 8: Frequency Response.

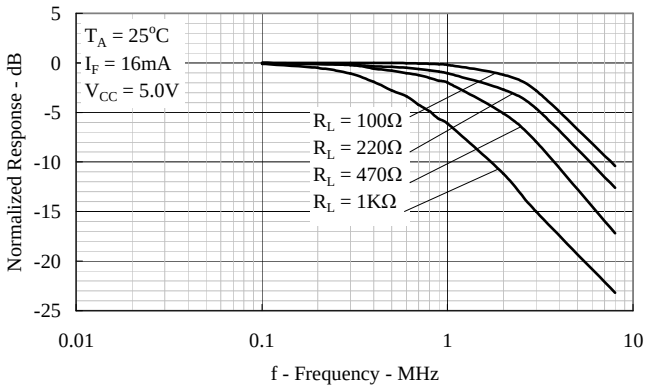


Figure 9: Switching Test Circuit.

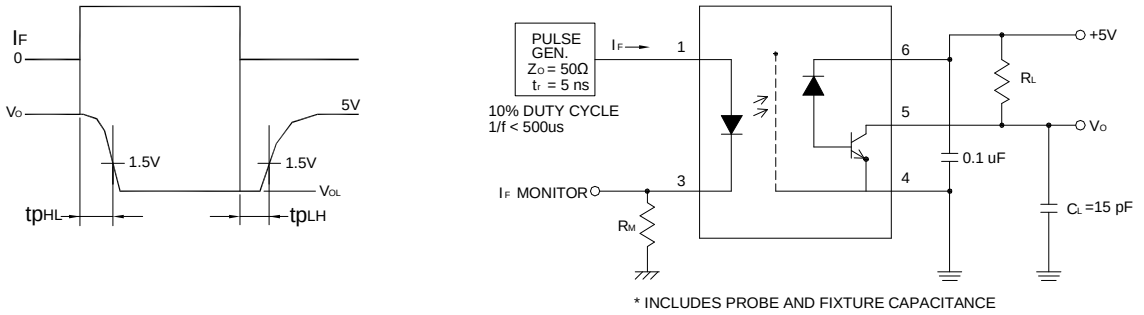
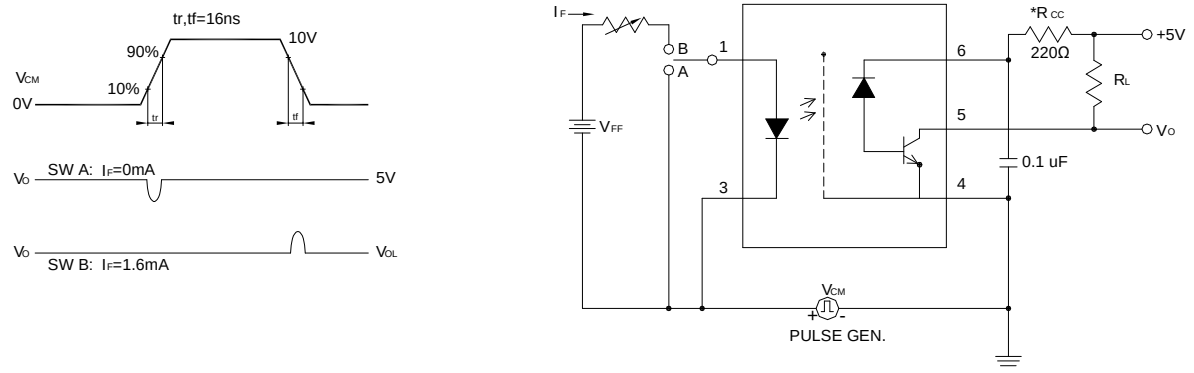


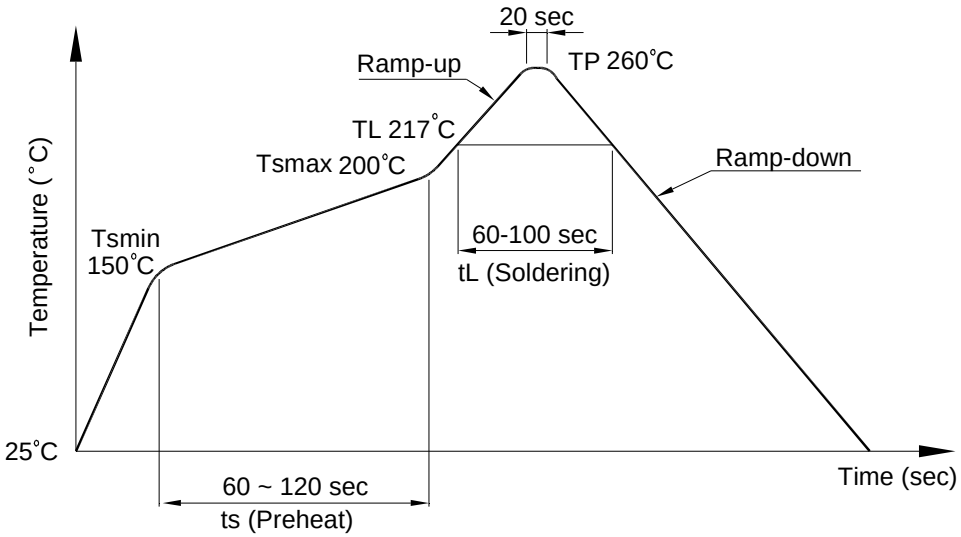
Figure 10: Test Circuit for Transient Immunity and Typical Waveforms.



Temperature Profile Of Soldering Reflow

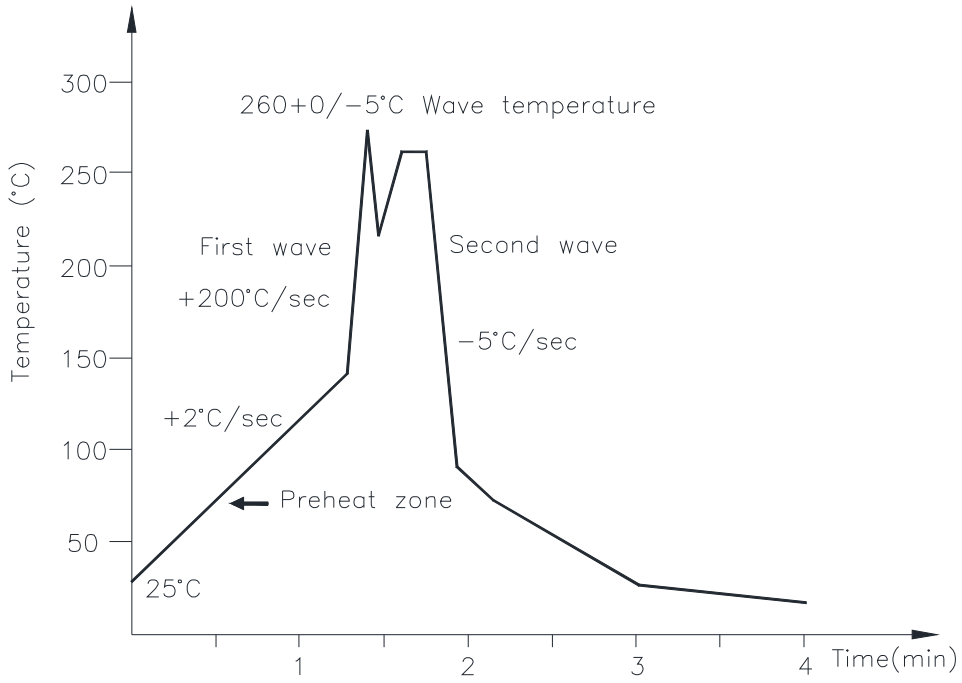
(1) IR Reflow soldering (JEDEC-STD-020C compliant)
One time soldering reflow is recommended within the condition of temperature and time profile shown below.

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+0/-5˚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+0/-5˚C
Time: 3 sec max.

Notes:

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

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 instrumentation and application. 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.

1. A 0.1μF 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 Io , to the forward LED input current IF, times 100.
3. The 1.9KΩ load represents 1TTL unit load of 1.6mA and the 5.6KΩ pull-up resistor.
4. The 4.1KΩ load represents 1LSTTL unit load of 0.36mA and the 6.1KΩ pull-up resistor.