LTV-M601

High Speed 10MBit/s TTL Compatible Optocouplers

Lead Free RoHS COMPLIANT

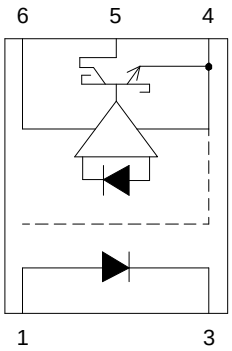
Description

The LTV-M601 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. The output of the optical detector features an open collector Schottky clamped transistor. The enable function allows the optical detector to be strobed. The internal shield ensures high common mode transient immunity. A guaranteed common mode transient immunity is up to 15,000V/μs.

The Optocoupler operational parameters are guaranteed over the temperature range from -40°C ~ +85°C.

Functional Diagram

Pin No. and Internal connection diagram

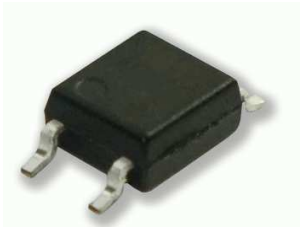


1. Anode
3. Cathode
4. GND
5. Vo (Output)
6. Vcc

Truth Table (Positive Logic)

LED	OUT
ON	L
OFF	H

A 0.1μF bypass Capacitor must be connected between Pin4 and Pin6



Features

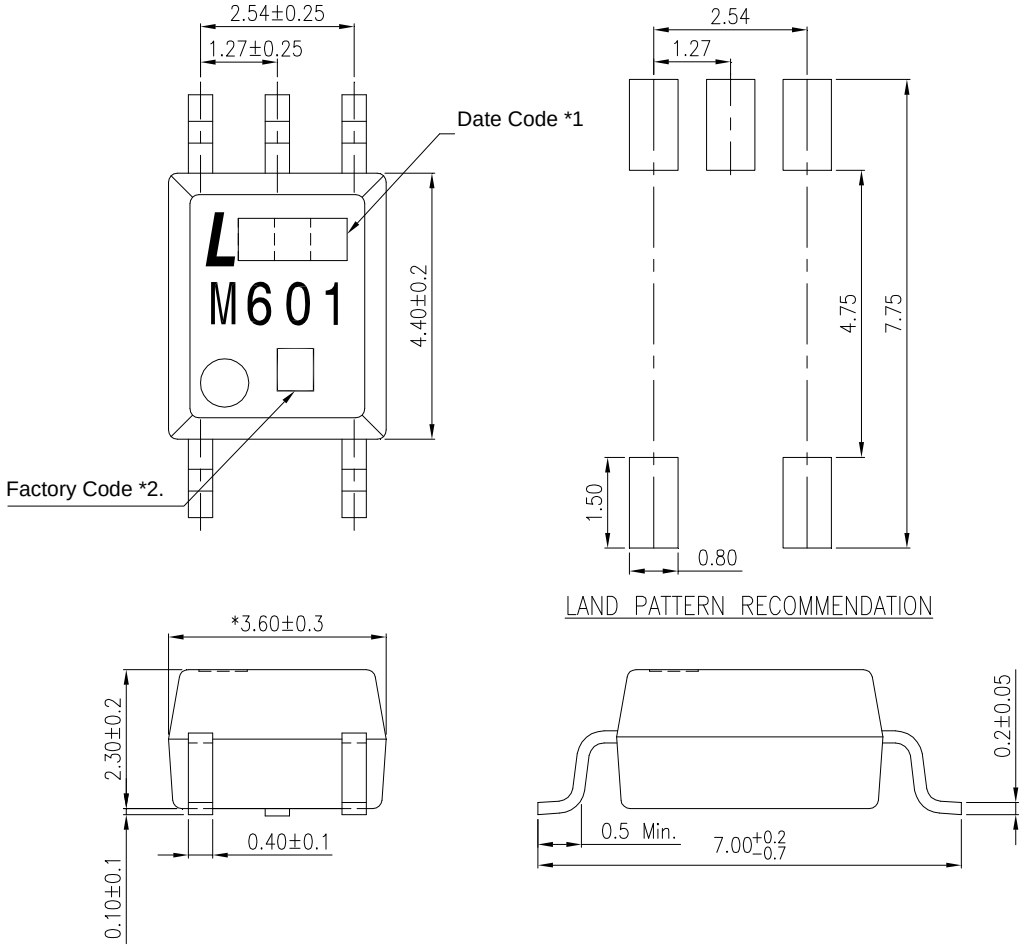
- SOP5 package
- High speed – 10MBd typical
- Guaranteed AC and DC performance over temperature -40°C ~ +85°C.
- Internal Shield for High Common Mode Rejection (CMR)
  LTV-M601: 10KV/us at V_{CM} = 1000V
- LSTTL/TTL Compatible.
- Strobable output.
- Safety approval
  UL/ cUL 1577, Cert. No.E113898.
  3750 Vrms/1 min
  VDE DIN EN60747-5-5, Cert. No. 138213
  V_{IORM} = 567 V_{peak}

Application

- Isolation in line receivers
- Ground loop elimination
- Feedback Element in Switching Mode Power Supplier
- High Speed Logic Ground Isolation – TTL/TTL, TTL/CMOS, TTL/LSTTL
- Pulse transformer replacement
- Power transistor isolation in motor drives
- Interface between Microprocessor system, computer and their peripheral

Package Dimensions

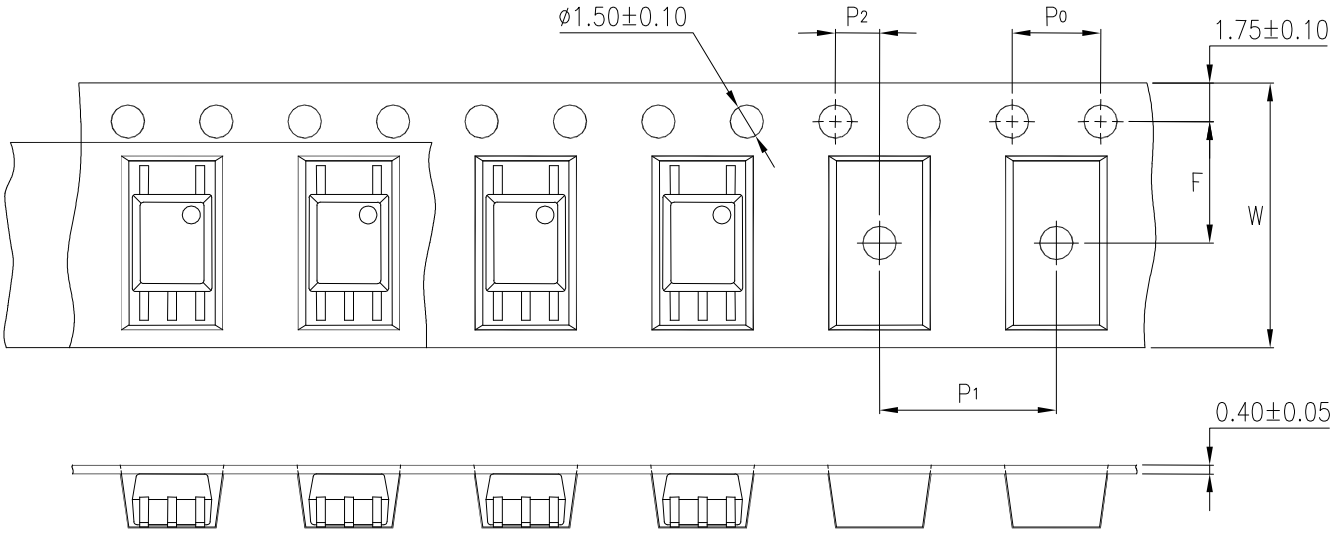
5-pin SOP Package (LTV-M601)



*1. The first digit is year date code, second and third digit is work week
*2. Factory identification mark (W :China-CZ)
Dimensions are in Millimeters and (Inches).

Taping Dimensions

LTV-M601



Description	Symbol	Dimensions in millimeters (inches)
Tape wide	W	12 ± 0.3 (.63)
Pitch of sprocket holes	P0	4 ± 0.1 (.15)
Distance of compartment	F P2	5.5 ± 0.1 (.295) 2 ± 0.1 (.079)
Distance of compartment to compartment	P1	8 ± 0.1 (.472)

Quantity Per Reel

Package Type	LTV-M601
Quantities(pcs)	3000

Absolute Maximum Ratings*1

Parameter	Symbol	Min	Max	Units	Note
Storage Temperature	T_{ST}	-40	125	°C	
Operating Temperature	T_A	-40	85	°C	
Isolation Voltage	V_{ISO}	3750		V_{RMS}	
Supply Voltage	V_{CC}		7	V	
Lead Solder Temperature * 2			260	°C	2
Input					
Average Forward Input Current	I_F		50	mA	
Reverse Input Voltage	V_R		5	V	
Input Power Dissipation	P_I		40	mW	
Output					
Output Collector Current	I_O		50	mA	
Output Collector Voltage	V_O		7	V	
Output Collector Power Dissipation	P_O		85	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 = 10mA	V_F		1.38	1.80	V
Input Forward Voltage Temperature Coefficient	I_F = 10mA	$\Delta V_F / \Delta T$		-1.6		mV/^{O}C
Input Reverse Voltage	I_R = 10μA	BV_R	5			V
Input Threshold Current	V_{CC} = 5.5V, V_O=0.6V I_{OL} (sinking) = 13mA	I_{TH}		1.8(1)	3	mA
Input Capacitance	f = 1MHz, V_F = 0V	C_{IN}		34		pF
Detector						
High Level Supply Current	V_{CC} = 5.5V, I_F = 0mA	I_{CCH}		6	10	mA
Low Level Supply Current	V_{CC} = 5.5V, I_F = 10mA	I_{CCL}		8	13	mA
High Level Output Current	V_{CC} = 5.5V, V_O = 5.5V, I_F = 250μA	I_{OH}		2	100	μA
Low Level Output Voltage	V_{CC} = 5.5V, I_F = 5mA, I_{OL} (sinking) = 13mA	V_{OL}		0.4	0.60	V

Specified over recommended temperature (T_A = -40^{o}C to +85^{o}C) unless otherwise specified. Typical values applies to V_{CC} = 5V, T_A = 25^{o}C. See note 1.

Switching Specifications

Parameter	Test Condition	Symbol	Min	Typ	Max	Units
Propagation Delay Time to Low Output Level	T_A=25°C (R_L=350Ω, C_L = 15pF)	t_{PHL}		30	75	ns
Propagation Delay Time to High Output Level		t_{PLH}		40	75	
Pulse Width Distortion		$\|t_{PLH} - t_{PHL}\|$		10	35	
Propagation Delay Skew		t_{PSK}			40	
Output Rise Time (10 to 90%)		t_r		21		
Output Fall Time (90 to 10%)		t_f		7		
Common Mode Transient Immunity at High Output Level	V_{CM} = 1000V, R_L = 350Ω, IF = 0mA T_A = 25°C	|CMH|	10			KV/μs
Common Mode Transient Immunity at Low Output Level	V_{CM} = 1000V, R_L = 350Ω, IF=10.0mA T_A = 25°C	|CML|	10			

Specified over recommended temperature (T_A = -40°C to +85°C), V_{CC} = 5V, I_F = 7.5mA unless otherwise specified. Typical values applies to V_{CC} = 5V, 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
Input-Output Resistance	V_{I-O} = 500V DC	R_{I-O}		10^{12}		Ω
Input-Output Capacitance	f = 1MHz, T_A = 25°C	C_{I-O}		1.0		pF

*All Typical at T_A =25 °C

Notes

1. A 0.1μF or bigger bypass capacitor for V_{CC} is needed as shown in Fig.1
2. Peaking driving circuit may be used to speed up the LED. The peak drive current of LED may go up to 50mA and maximum pulse width 50ns, as long as average current doesn't exceed 20mA.
3. t_{PLH} (propagation delay) is measured from the 3.75 mA point on the falling edge of the input pulse to the 1.5 V point on the rising edge of the output pulse.
4. t_{PHL} (propagation delay) is measured from the 3.75 mA point on the rising edge of the input pulse to the 1.5 V point on the falling edge of the output pulse.
5. The t_{ELH} enable propagation delay is measured from the 1.5 V point on the falling edge of the enable input pulse to the 1.5 V point on the rising edge of the output pulse.
6. The t_{EHL} enable propagation delay is measured from the 1.5 V point on the rising edge of the enable input pulse to the 1.5 V point on the falling edge of the output pulse.
7. CM_H is the maximum tolerable rate of rise of the common mode voltage to assure that the output will remain in a high logic state (i.e., VO > 2.0 V).
8. CM_L is the maximum tolerable rate of fall of the common mode voltage to assure that the output will remain in a low logic state (i.e., VO < 0.8 V).
9. No external pull up is required for a high logic state on the enable input. If the enable pin is not used, tying it to V_{CC}.
10. Device is considered a two-terminal device: pins 1, 2, 3, and 4 shorted together, and pins 5, 6, 7, and 8 shorted together.
11. In accordance with UL1577, each optocoupler is proof tested by applying an insulation test voltage 3000 V rms for one second (leakage current less than 5 uA). This test is performed before the 100% production test for partial discharge

Switching Time Test Circuit

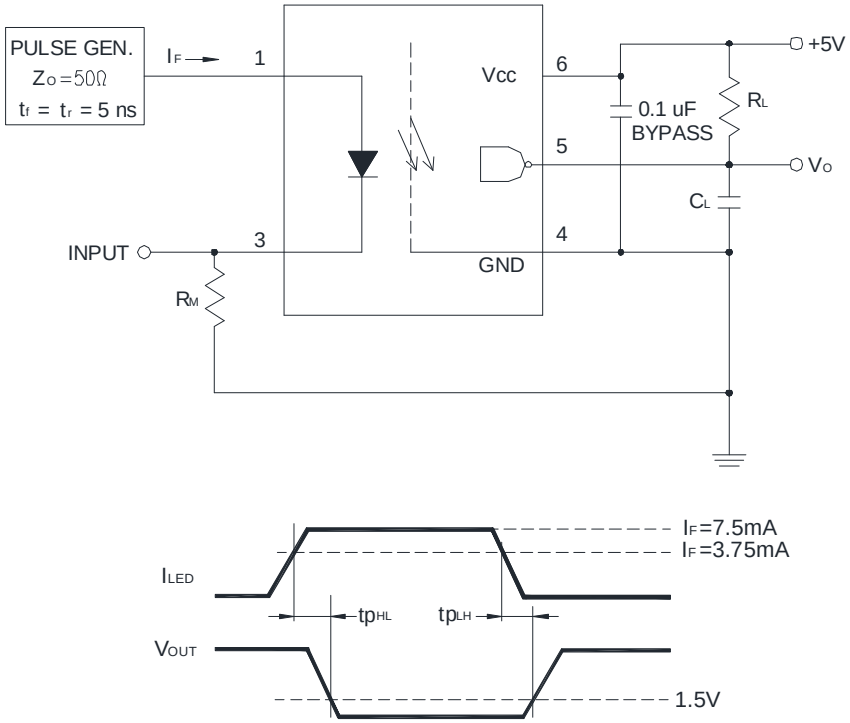


Figure 1: Single Channel Test Circuit for t_{PHL} and t_{PLH}

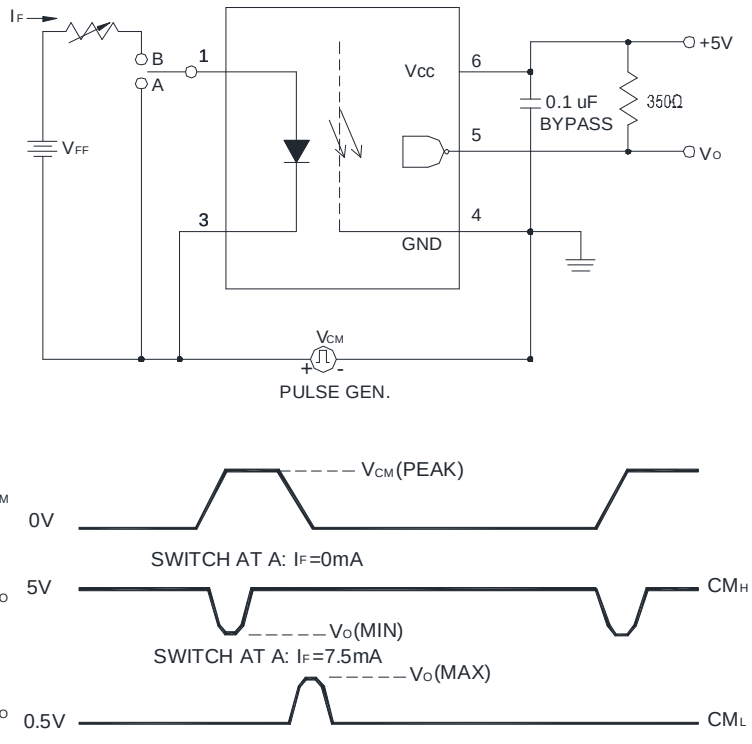


Figure 2: Single Channel Test Circuit for Common Mode Transient Immunity

Typical Performance Curves

Figure 3: Typical Input Diode Forward Characteristics

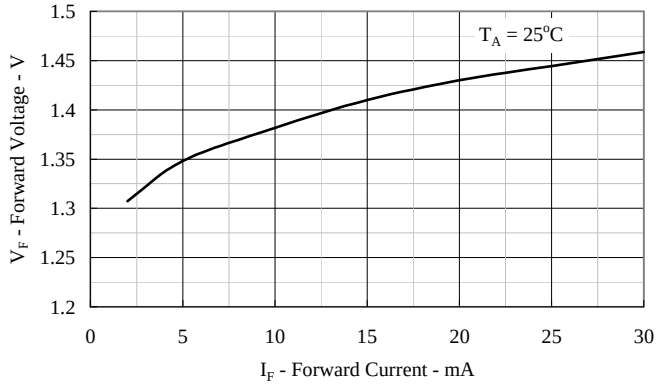


Figure 4: Typical Input Diode Forward Voltage vs. Ambient Temperature

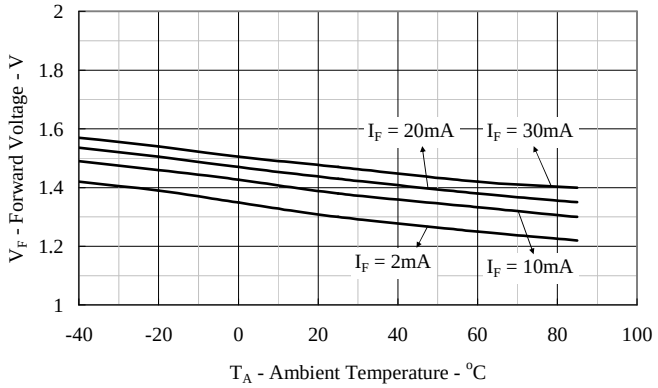


Figure 5: Typical Input Diode Threshold Current vs. Ambient Temperature

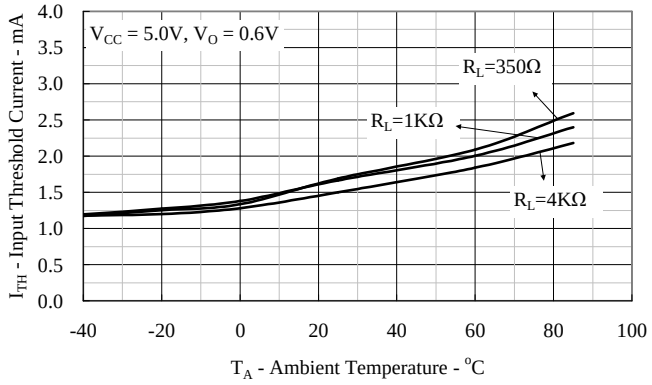


Figure 6: Typical Output Voltage vs. Input Forward Current

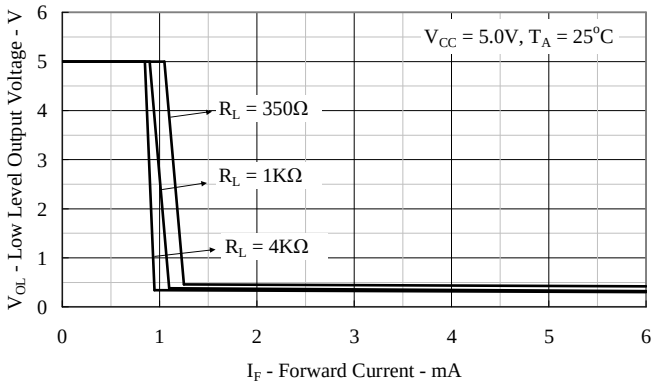


Figure 7: Typical Low Level Output Voltage vs. Ambient Temperature

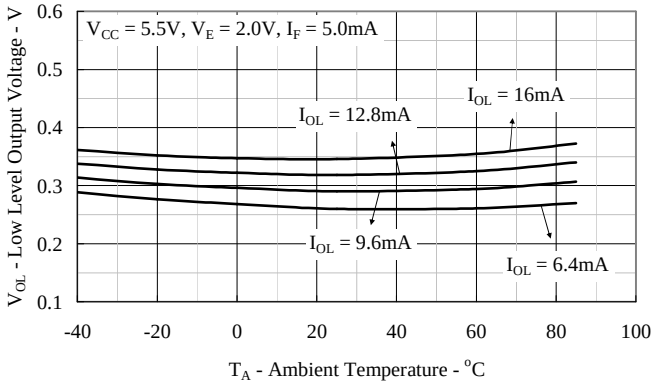
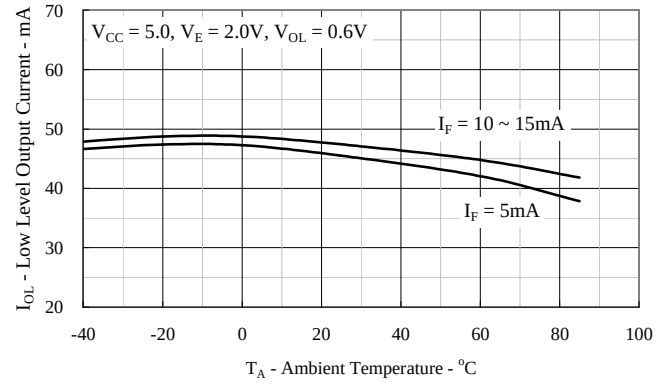


Figure 8: Typical Low Level Output Current vs. Ambient Temperature



Typical Performance Curves

Figure 9: Typical Enable Propagation Delay vs. Ambient Temperature

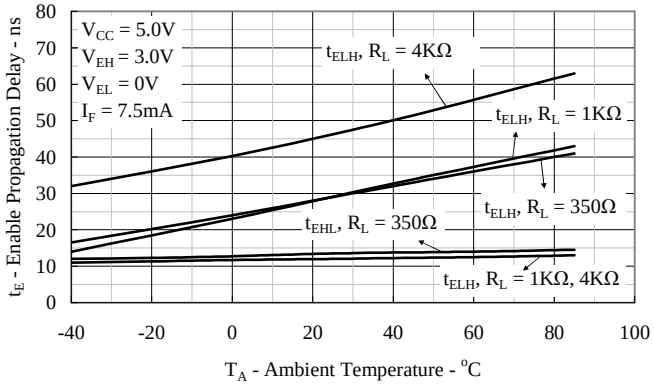


Figure 10: Typical Rise and Fall Time vs. Ambient Temperature

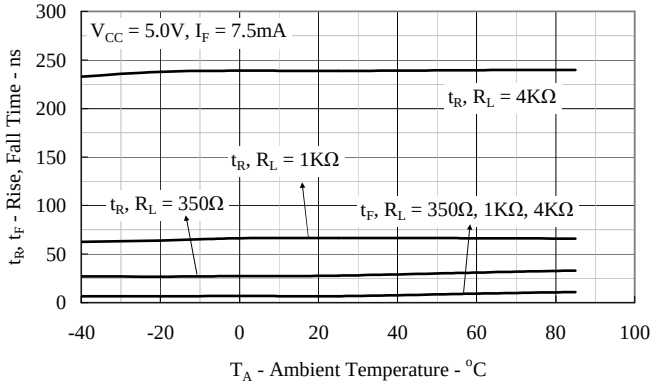


Figure 11: Typical Propagation Delay vs. Ambient

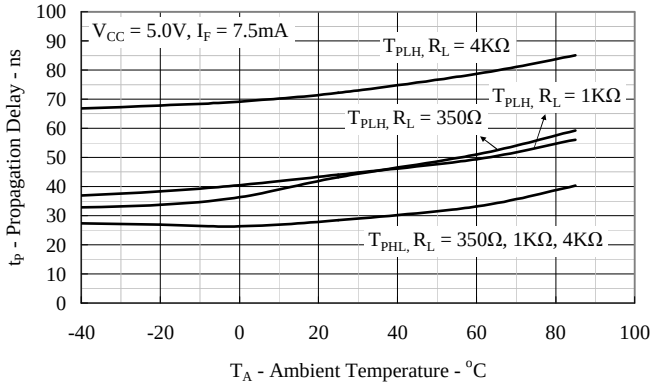


Figure 12: Typical Propagation Delay vs. Input Forward Current

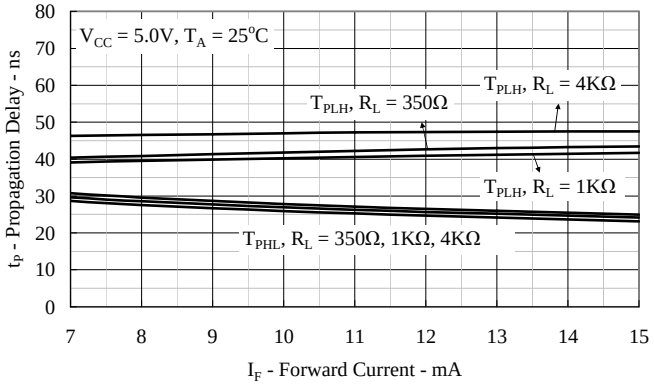


Figure 13: Typical Pulse Width Distortion vs. Input Forward Current

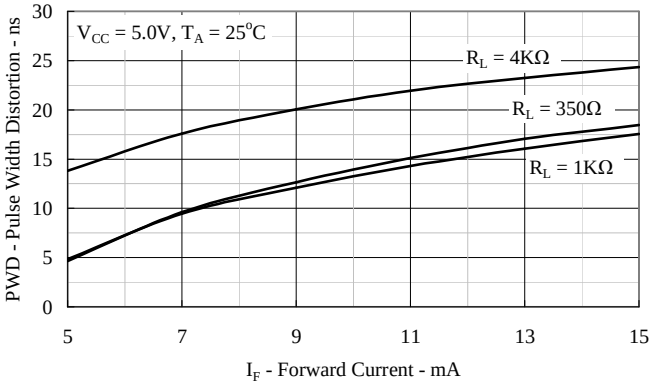
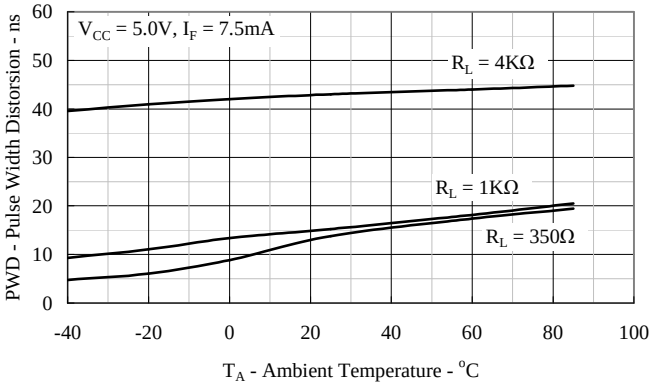


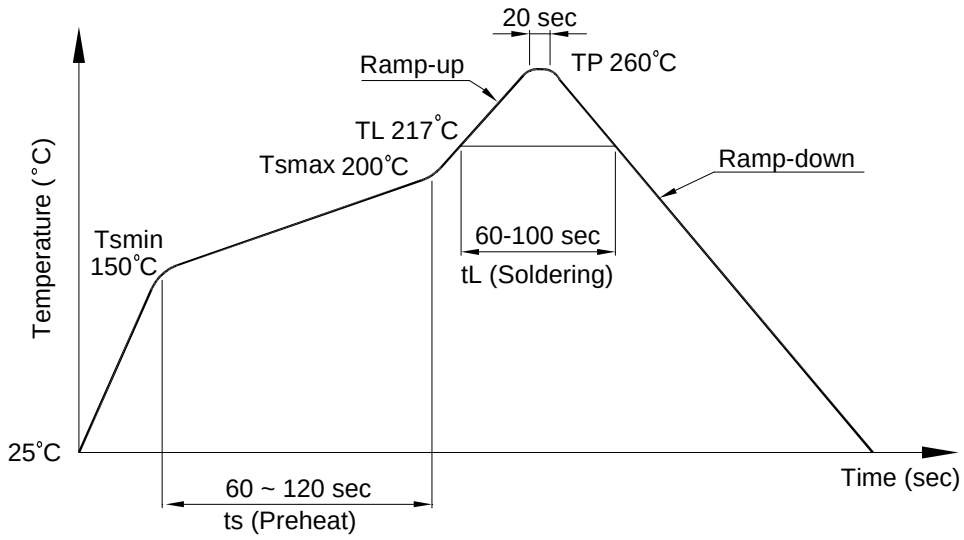
Figure 14: Typical Pulse Width Distortion vs. Ambient Temperature



Temperature Profile Of Soldering Reflow

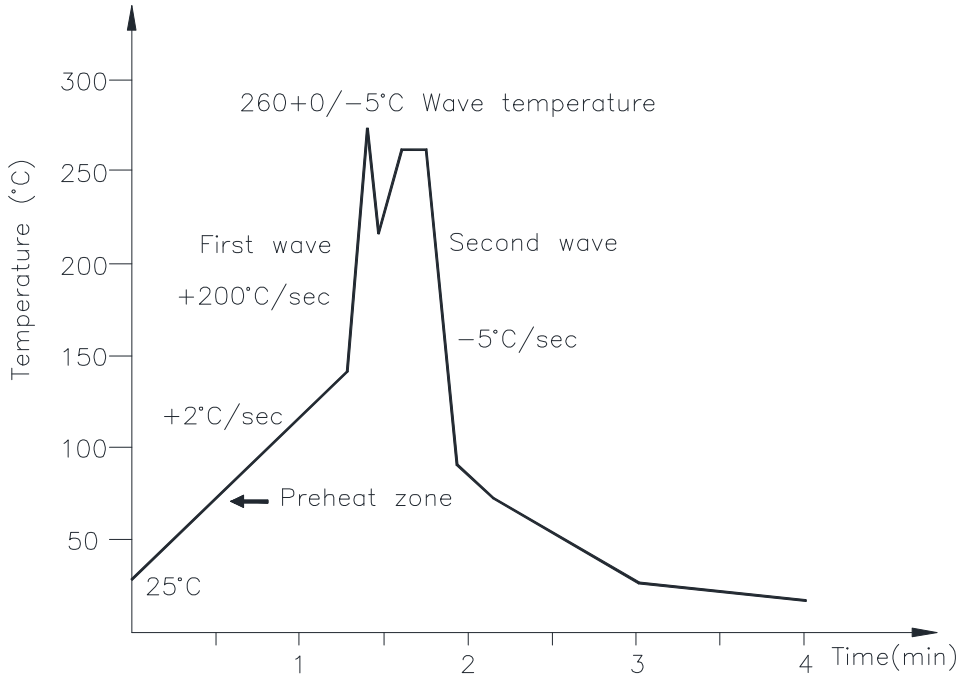
(1) IR Reflow soldering (JEDEC-STD-020C compliant)
One time soldering reflow is recommended within the condition of temperature and time profile shown below.

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.

Note:

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