

## Photocoupler LTV-2630 series

### 1. DESCRIPTION

The LTV-2630 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. A guaranteed common mode transient immunity is up to 10kV/μs at 3.3V. The Optocoupler operational parameters are guaranteed over the temperature range from -40°C ~ +85°C.

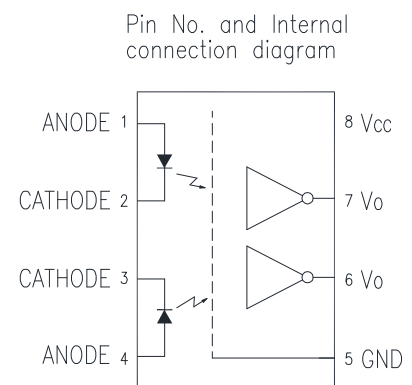
#### 1.1 Features

- 3.3V / 5V Dual Supply Voltages
- Low power consumption
- High speed – 10MBd typical
- 10kV/μs minimum Common Mode Rejection (CMR) at  $V_{CM} = 1000V$
- Guaranteed AC and DC performance over temperature -40°C ~ +85°C.
- LVTTTL/LVCMOS Compatible.
- Available in Dual-in-line, Wide lead spacing, Surface mounting package.
- Safety approval pending

#### 1.2 Applications

- Isolation in line receivers
- Digital isolation for A/D, D/A conversion
- Ground loop elimination
- Feedback Element in Switching Mode Power Supplier
- Pulse transformer replacement
- Power transistor isolation in motor drives
- Interface between Microprocessor system, computer and their peripheral

#### 1.3 Functional Diagram



Truth Table (Positive Logic)

LED	OUT
ON	L
OFF	H

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

### 2. TYPE

Part number	Lead Frame		Suffix option					Quantity
	Type	Clearance distance	Tape & Reel	Pin 1 location	IEC/EN/DIN EN60747-5-5	Halogen free option	Customer Code	
LTV-2630	Through hole	Typ. 7 mm	-TA	lower right of the tape	-V*	-G	—	1000 per reel 65 per tube
LTV-2630M	Wide lead	Typ. 8 mm						
LTV-2630S	Surface mount	Typ. 8 mm	-TA1	upper left of the tape				
LTV-2630S2	Surface mount 2	Min. 8 mm						

Example 1 : LTV-2630S-TA1-G

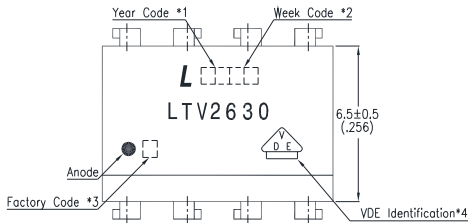
Example 2 : LTV2630STA1-V-G

\* Naming rule of VDE option : All "-" before -V be removed.

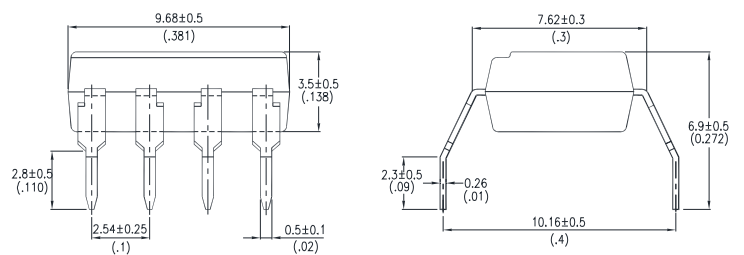
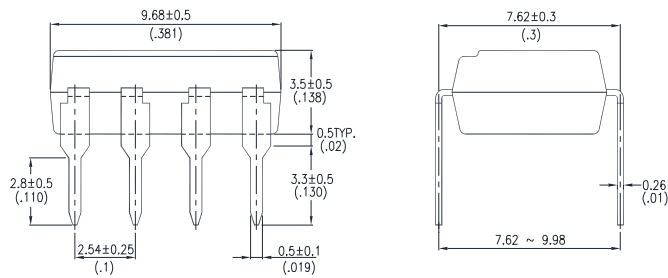
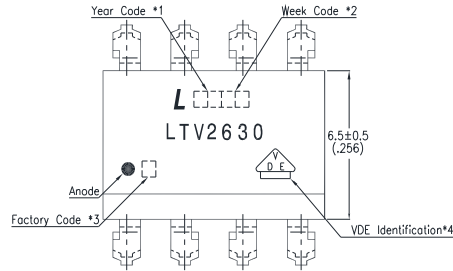
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### 3. PACKAGE DIMENSIONS

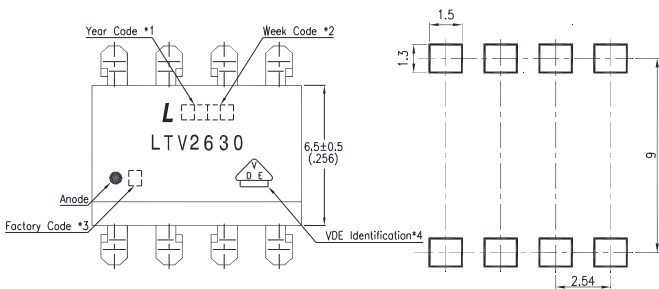
#### 3.1 LTV-2630



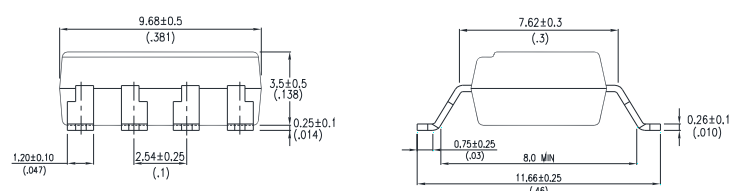
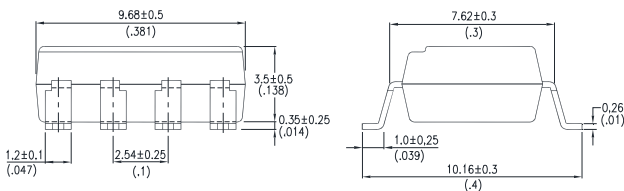
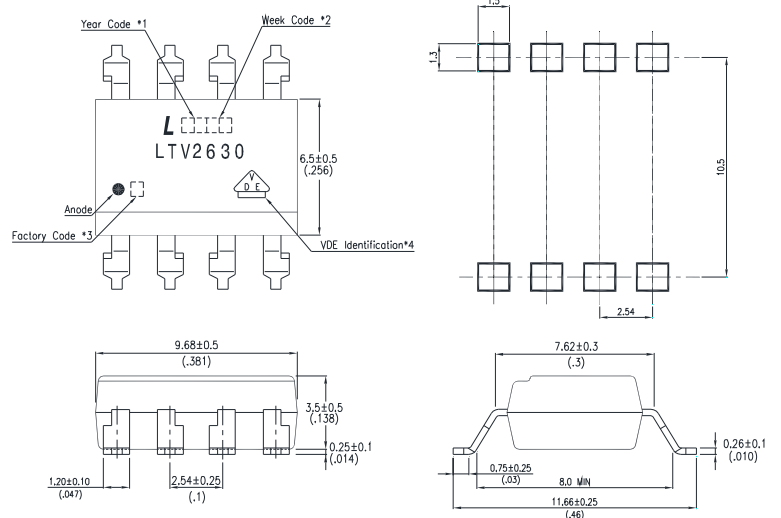
#### 3.2 LTV-2630M



#### 3.3 LTV-2630S



#### 3.4 LTV-2630S2



#### Notes :

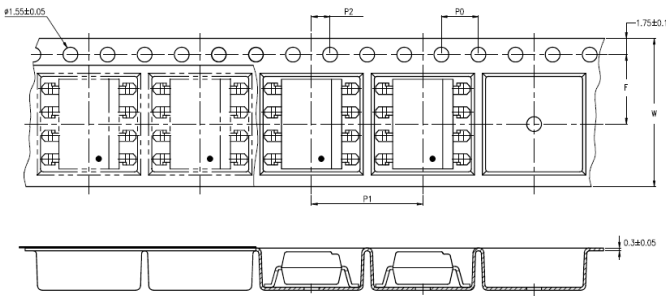
1. 2-digit year code, example : 2017 = 17
2. 2-digit work week ranging from '01' to '52'
3. Factory identification mark shall be marked (W: China-CZ, Y: Thailand)
4. VDE identification mark (option).

Dimensions in millimeters (inches).

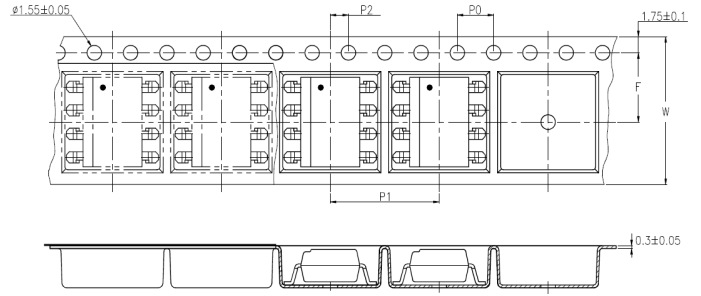
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### 4. TAPING DIMENSIONS

#### 4.1 LTV-2630S-TA

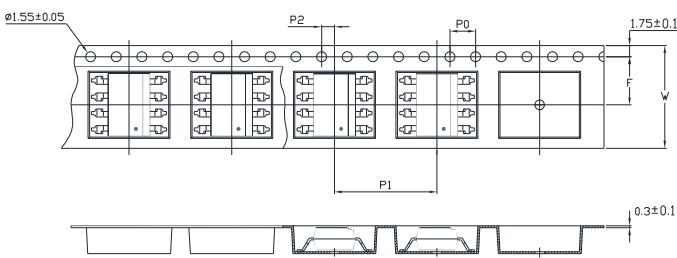


#### 4.2 LTV-2630S-TA1

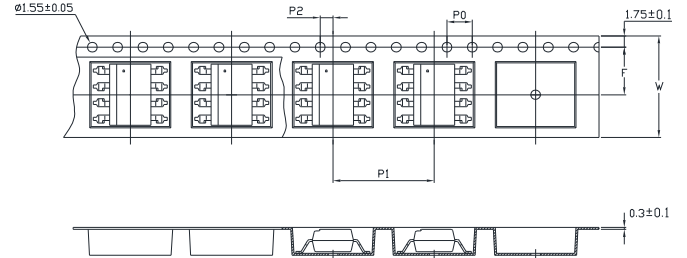


Description	Symbol	Dimension in mm (inch)
Tape wide	W	16±0.3 (0.63)
Pitch of sprocket holes	P <sub>0</sub>	4±0.1 (0.15)
Distance of compartment	F	7.5±0.1 (0.295)
	P <sub>2</sub>	2±0.1 (0.079)
Distance of compartment to compartment	P <sub>1</sub>	12±0.1 (0.472)

#### 4.3 : LTV-2630S2-TA



#### 4.4 : LTV-2630S2-TA1



Description	Symbol	Dimension in mm (inch)
Tape wide	W	16±0.3 (0.63)
Pitch of sprocket holes	P <sub>0</sub>	4±0.1 (0.15)
Distance of compartment	F	7.5±0.1 (0.295)
	P <sub>2</sub>	2±0.1 (0.079)
Distance of compartment to compartment	P <sub>1</sub>	12±0.1 (0.472)

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### 5. RATING AND CHARACTERISTICS

#### 5.1 Absolute Maximum Ratings at Ta=25°C

	Parameter	Symbol	Rating	Unit	Note
Input	Average Forward Input Current	$I_F$	20	mA	2
	Reverse Input Voltage	$V_R$	5	V	
	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	
	Isolation Voltage	$V_{iso}$	5000	$V_{rms}$	
	Supply Voltage	$V_{CC}$	7	V	
	Operating Temperature	$T_{opr}$	-40 ~ +85	°C	
	Storage Temperature	$T_{stg}$	-55 ~ +125	°C	
	Lead Solder Temperature *2	$T_{sol}$	260	°C	

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.

#### 5.2 Recommended Operating Conditions

Parameter	Symbol	Min.	Max.	Unit
Operating Temperature	$T_A$	-40	85	°C
Supply Voltage	$V_{CC}$	2.7	3.6	V
		4.5	5.5	
Low Level Input Current	$I_{FL}$	0	250	μA
High Level Input Current	$I_{FH}$	5	15	mA
Output Pull-up Resistor	$R_L$	330	4k	Ω
Fan Out (at $R_L=1k\Omega$ per channel)	N	—	5	TTL Loads

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### 5.3 ELECTRICAL OPTICAL CHARACTERISTIC

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Condition	Fig.	Note
<b>Input</b>								
Input Forward Voltage	$V_F$	—	1.38	1.80	V	$I_F=10\text{mA}$ , $T_A=25^\circ\text{C}$	7	
Input Forward Voltage Temperature Coefficient	$\Delta V_F/\Delta T$	—	-1.6	—	mV/ $^\circ\text{C}$	$I_F=10\text{mA}$		
Input Reverse Voltage	$BV_R$	5.0	—	—	V	$I_R = 10\mu\text{A}$		
Input Threshold Current	$I_{TH}$	—	2	5	mA	$V_{CC} = 3.3\text{V}$ , $V_O = 0.6\text{V}$ $I_{OL} (\text{sinking}) = 13\text{mA}$	4	
Input Capacitance	$C_{IN}$	—	34	—	pF	$V_F=0$ ; $f=1\text{MHz}$		
<b>Detector</b>								
Logic low output voltage	$V_{OL}$	—	0.3	0.6	V	$V_{CC} = 3.3\text{V}$ , $I_F = 5\text{mA}$ , $I_{OL} (\text{sinking}) = 13\text{mA}$	5	
Logic high output current	$I_{OH}$	—	5	100	$\mu\text{A}$	$V_{CC} = 3.3\text{V}$ , $V_O = 3.3\text{V}$ , $I_F = 250\mu\text{A}$	3	
Logic low supply current	$I_{CCL}$	—	—	15	mA	$V_{CC} = 3.3\text{V}$ , $I_F = 10\text{mA}$		1
Logic high supply current	$I_{CCH}$	—	—	10	mA	$V_{CC} = 3.3\text{V}$ , $I_F = 0\text{mA}$		1

Specified over recommended temperature ( $T_A = -40^\circ\text{C}$  to  $+85^\circ\text{C}$ ,  $2.7\text{V} \leq V_{CC} \leq 3.6\text{V}$ ),  $I_F = 7.5\text{mA}$  unless otherwise specified. All typicals at  $T_A = 25^\circ\text{C}$ ,  $V_{CC} = 3.3\text{V}$ .

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Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Condition	Fig.	Note
<b>Input</b>								
Input Forward Voltage	$V_F$	—	1.38	1.80	V	$I_F=10\text{mA}$ , $T_A=25^\circ\text{C}$	7	
Input Forward Voltage Temperature Coefficient	$\Delta V_F/\Delta T$	—	-1.6	—	mV/°C	$I_F=10\text{mA}$		
Input Reverse Voltage	$BV_R$	5.0	—	—	V	$I_R = 10\mu\text{A}$		
Input Threshold Current	$I_{TH}$	—	2	5	mA	$V_{CC} = 5.5\text{V}$ , $V_O=0.6\text{V}$ $I_{OL} \geq 13\text{mA}$	4	
Input Capacitance	$C_{IN}$	—	34	—	pF	$V_F=0$ ; $f=1\text{MHz}$		
<b>Detector</b>								
Logic low output voltage	$V_{OL}$	—	0.4	0.6	V	$V_{CC} = 5.5\text{V}$ , $I_F = 5\text{mA}$ , $I_{OL} (\text{sinking}) = 13\text{mA}$	5	
Logic high output current	$I_{OH}$	—	—	100	$\mu\text{A}$	$V_{CC} = 5.5\text{V}$ , $V_O = 5.5\text{V}$ , $I_F = 250\mu\text{A}$	3	
Logic low supply current	$I_{CCL}$	—	—	21	mA	$V_{CC} = 5.5\text{V}$ , $I_F = 10\text{mA}$		1
Logic high supply current	$I_{CCH}$	—	—	15	mA	$V_{CC} = 5.5\text{V}$ , $I_F = 0\text{mA}$		1

Specified over recommended temperature ( $T_A = -40^\circ\text{C}$  to  $+85^\circ\text{C}$ ,  $4.5\text{V} \leq V_{CC} \leq 5.5\text{V}$ ),  $I_F = 7.5\text{mA}$  unless otherwise specified. All typicals at  $T_A = 25^\circ\text{C}$ ,  $V_{CC} = 5.0\text{V}$ .

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### 6. SWITCHING SPECIFICATION

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Condition	Note
Propagation Delay Time to High Output Level	$t_{PLH}$	20	48	100	ns	$R_L = 350\Omega, C_L = 15pF$	3
Propagation Delay Time to Low Output Level	$t_{PHL}$	25	50	100	ns		4
Pulse Width Distortion	$ t_{PLH} - t_{PHL} $	—	3.5	35	ns		—
Propagation Delay Skew	$t_{PSK}$	—	—	40			—
Output Rise Time (10 to 90%)	$t_r$	—	24	—	ns		—
Output Fall Time (90 to 10%)	$t_f$	—	10	—	ns		—

Specified over recommended temperature ( $T_A = -40^\circ\text{C}$  to  $+85^\circ\text{C}$ ,  $2.7\text{V} \leq V_{CC} \leq 3.6\text{V}$ ),  $I_F = 7.5\text{mA}$  unless otherwise specified.

All typicals at  $T_A = 25^\circ\text{C}$ ,  $V_{CC} = 3.3\text{V}$ .

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Condition	Note
Propagation Delay Time to High Output Level	$t_{PLH}$	25	48	75	ns	$TA = 25^\circ\text{C}$ $R_L = 350\Omega,$ $C_L = 15pF$	3
		—	—	100			
Propagation Delay Time to Low Output Level	$t_{PHL}$	25	32	75	ns	$TA = 25^\circ\text{C}$ $R_L = 350\Omega,$ $C_L = 15pF$	4
		—	—	100			
Pulse Width Distortion	$ t_{PLH} - t_{PHL} $	—	8	—	ns	$R_L = 350\Omega, C_L = 15pF$	—
Propagation Delay Skew	$t_{PSK}$	—	—	40			—
Output Rise Time (10 to 90%)	$t_r$	—	22	—	ns		—
Output Fall Time (90 to 10%)	$t_f$	—	6.9	—	ns		—

Specified over recommended temperature ( $T_A = -40^\circ\text{C}$  to  $+85^\circ\text{C}$ ,  $4.5\text{V} \leq V_{CC} \leq 5.5\text{V}$ ),  $I_F = 7.5\text{mA}$  unless otherwise specified. All typicals at  $T_A = 25^\circ\text{C}$ ,  $V_{CC} = 5.0\text{V}$ .

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Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Condition	Note
Logic High Common Mode Transient Immunity	CM <sub>H</sub>	5	10	—	kV/μs	V <sub>CC</sub> = 3.3V V <sub>CM</sub> = 1000V R <sub>L</sub> = 350Ω I <sub>F</sub> = 0mA T <sub>A</sub> = 25°C	7
		5	10	—		V <sub>CC</sub> = 5V V <sub>CM</sub> = 1000V R <sub>L</sub> = 350Ω I <sub>F</sub> = 0mA T <sub>A</sub> = 25°C	
Logic Low Common Mode Transient Immunity	CM <sub>L</sub>	5	10	—	kV/μs	V <sub>CC</sub> = 3.3V V <sub>CM</sub> = 1000V R <sub>L</sub> = 350Ω I <sub>F</sub> = 10.0mA T <sub>A</sub> = 25°C	8
		5	10	—		V <sub>CC</sub> = 5V V <sub>CM</sub> = 1000V R <sub>L</sub> = 350Ω I <sub>F</sub> = 10.0mA T <sub>A</sub> = 25°C	



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### 7. ISOLATION CHARACTERISTIC

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Condition	Note
Input-Output Insulation Leakage Current	$I_{I-O}$	—	—	1.0	$\mu\text{A}$	45% RH, $t = 5\text{s}$ , $V_{I-O} = 3\text{kV DC}$ , $T_A = 25^\circ\text{C}$	9
Withstand Insulation Test Voltage	$V_{ISO}$	5000	—	—	$V_{RMS}$	$RH \leq 50\%$ , $t = 1\text{min}$ , $T_A = 25^\circ\text{C}$	9, 10
Input-Output Resistance	$R_{I-O}$	—	$10^{12}$	—	$\Omega$	$V_{I-O} = 500\text{V DC}$	9,
Input-Output Capacitance	$C_{I-O}$	—	1.0	—	p	$f = 1\text{MHz}$ , $T_A = 25^\circ\text{C}$	9,

Specified over recommended temperature ( $T_A = -40^\circ\text{C}$  to  $+85^\circ\text{C}$ ) unless otherwise specified. Typical values applies to  $T_A = 25^\circ\text{C}$

### Notes

1. A 0.1 $\mu\text{F}$  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.  $CM_H$  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.,  $V_O > 2.0\text{ V}$ ).
6.  $CM_L$  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.,  $V_O < 0.8\text{ V}$ ).
7. Device is considered a two-terminal device: pins 1, 2, 3 and 4 shorted together, and pins 5, 6, 7 and 8 shorted together.
8. In accordance with UL1577, each optocoupler is proof tested by applying an insulation test voltage 5250Vrms for one second (leakage current less than 10  $\mu\text{A}$ ). This test is performed before the 100% production test for partial discharge

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### 8. TEST CIRCUITS

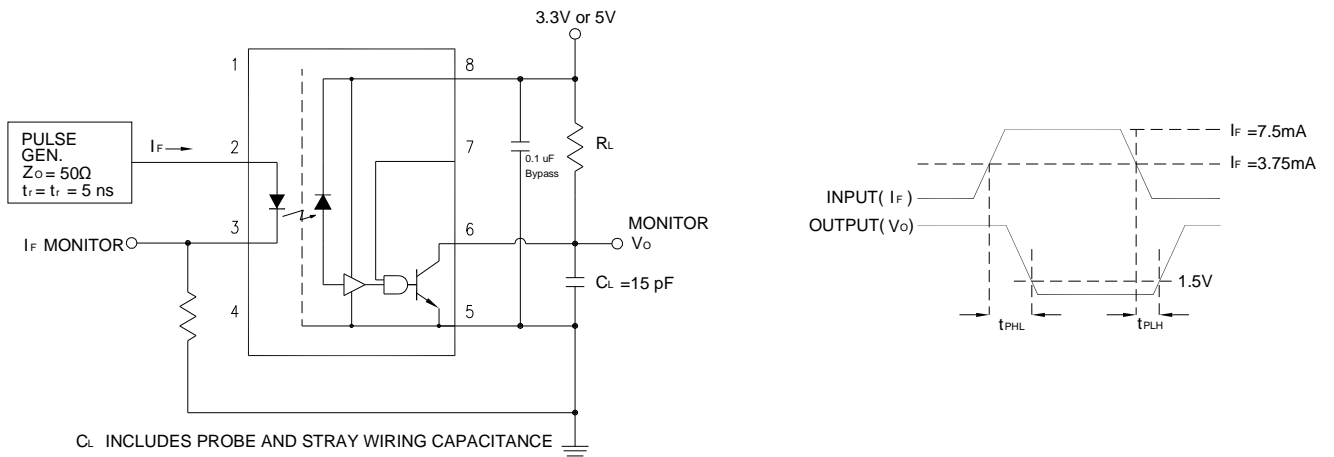


Figure 1: Test Circuit for  $t_{PHL}$  and  $t_{PLH}$

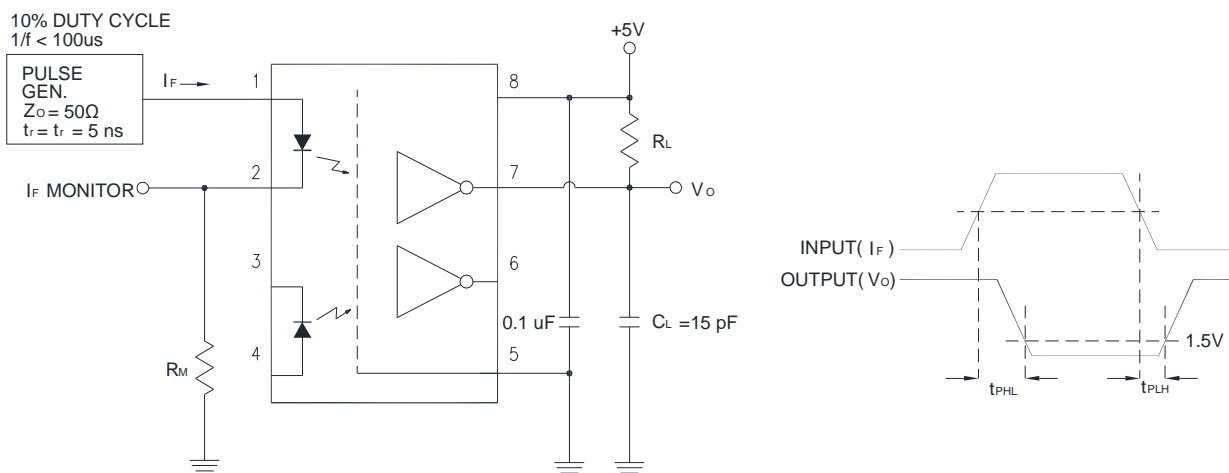
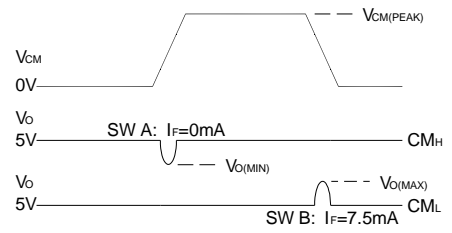
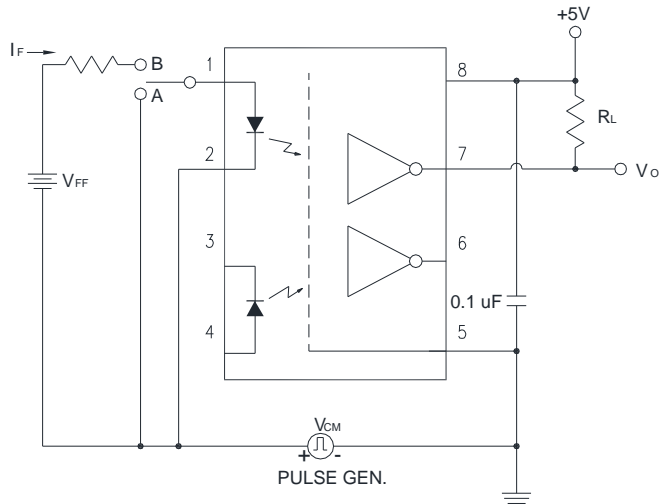


Figure 2: Single Channel Test Circuit for Common Mode Transient Immunity

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**Figure 3: Single Channel Test Circuit for Common Mode Transient Immunity**

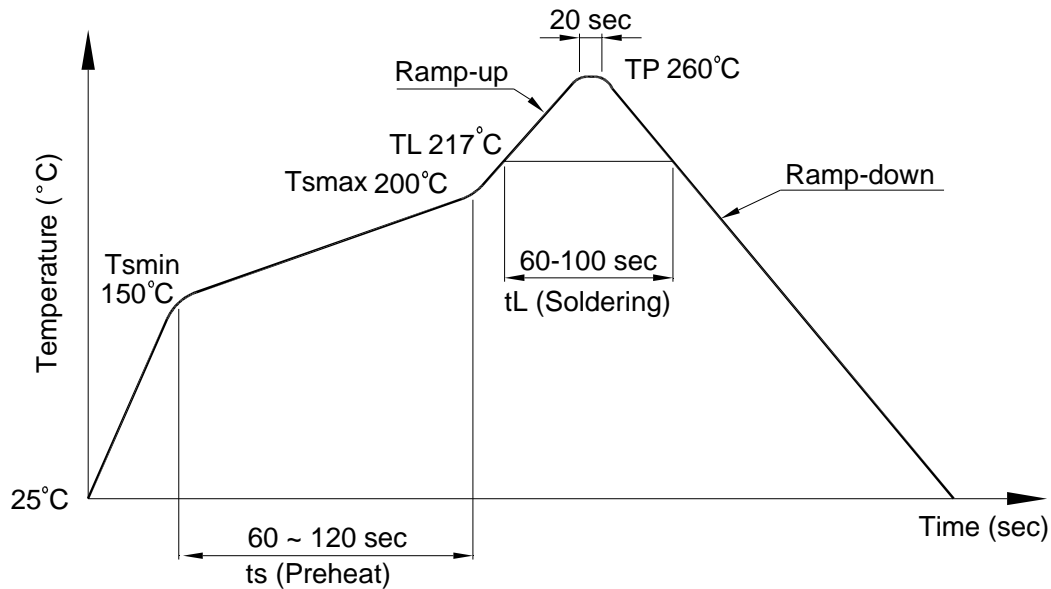
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## 9. TEMPERATURE PROFILE OF SOLDERING

### 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 ~ 100 sec
Peak Temperature ( $T_P$ )	260°C
Ramp-up rate	3°C / sec max.
Ramp-down rate	3~6°C / sec



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### 9.2 Wave soldering (JEDEC22A111 compliant)

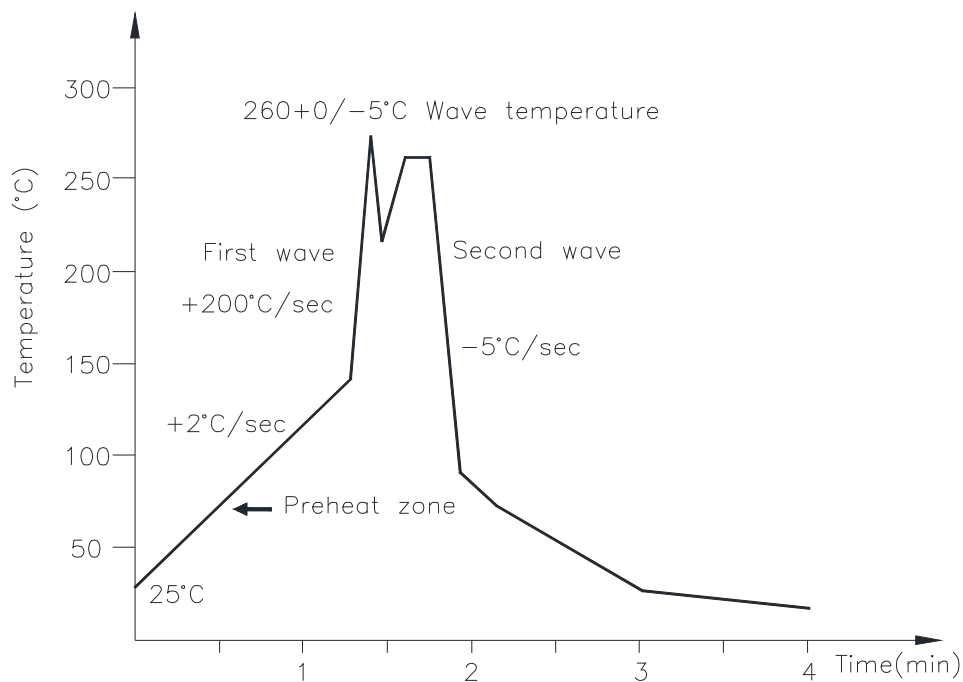
One time soldering is recommended within the condition of temperature.

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

Time: 10 sec.

Preheat temperature: 25 to  $140^{\circ}\text{C}$

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

Time: 3 sec max.

## 10. 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.