



# Photocouplers

## LTV-0701

### Data Sheet

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Lite-on Technology Corp.  
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<http://www.liteon.com/opto>



## Photocouplers LTV-0701

### 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  $V_{cc}$  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.

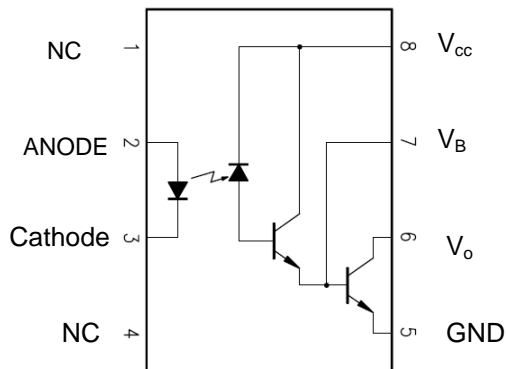
#### 1.1 Features

- SO8 package
- 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/ $\mu$ sec
- TTL compatible output – 0.1V  $V_{OL}$  typical

#### 1.2 Applications

- Digital logic ground isolation
- Low input current line receiver
- Telephone ring detector
- EIA-RS-232C line receiver
- Current loop receiver
- High common mode noise line receiver

#### 1.3 Functional Diagram



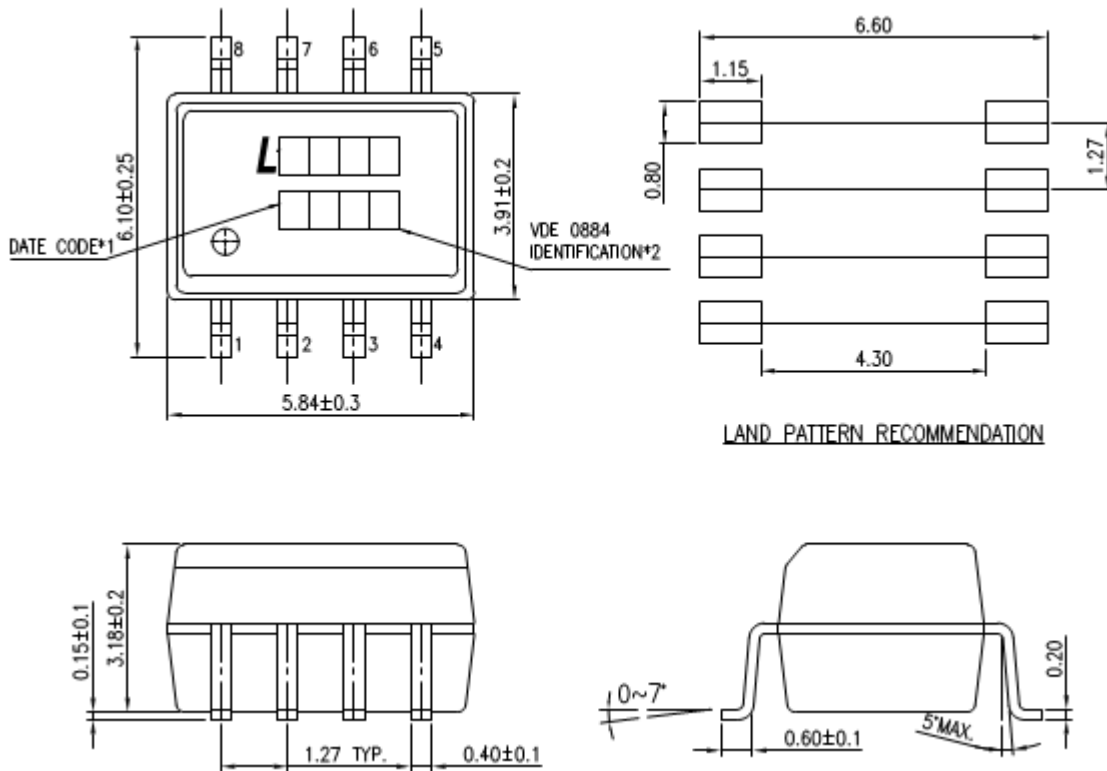
Truth Table (Positive Logic)

LED	OUT
ON	L
OFF	H

A 0.1 $\mu$ F bypass Capacitor must be connected between Pin8 and Pin5

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**2. PACKAGE DIMENSIONS**



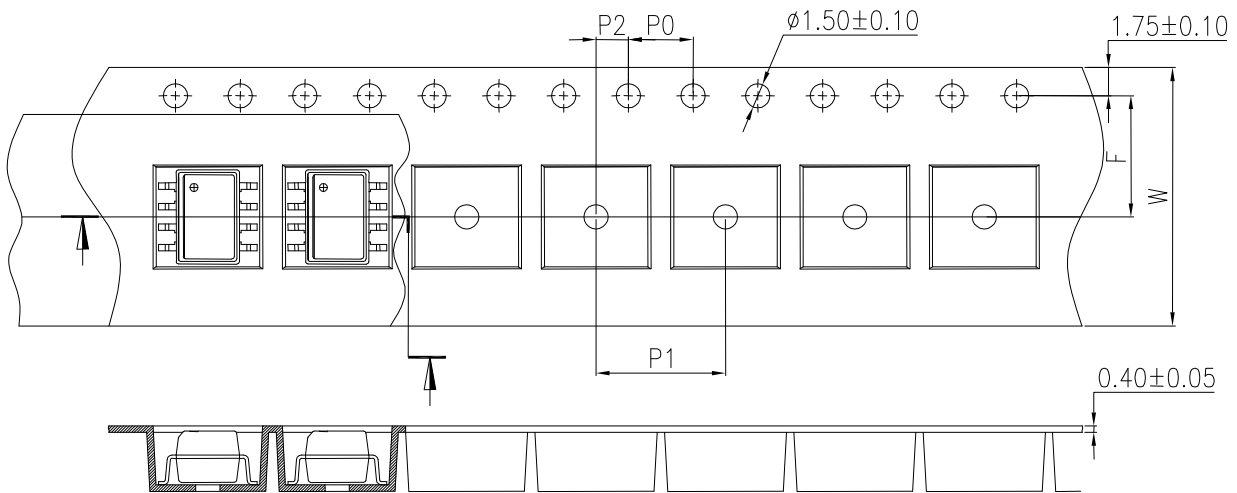
Part No : LTV-0701

**Notes :**

1. Date code
2. "V" to represent VDE0884
3. Date code
4. Dimensions are all in Millimeters.

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### 3. TAPING DIMENSIONS



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>	8±0.1 (0.47)

### Quantities Per Reel

Package Type	LTV-0701
Quantities (pcs)	2000

### 4. RATING AND CHARACTERISTICS

#### 4.1 Absolute Maximum Ratings at Ta=25°C \*1

	Parameter	Symbol	Rating	Unit
Input	Average Forward Input Current	$I_F$	20	mA
	Reverse Input Voltage	$V_R$	5	V
	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
	Isolation Voltage	$V_{iso}$	3750	$V_{rms}$
	Supply Voltage	$V_{CC}$	-0.5~7	V
	Operating Temperature	$T_{opr}$	-55 ~ +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.

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### 4.2 ELECTRICAL OPTICAL CHARACTERISTICS at Ta=25°C

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Condition
<b>Input</b>						
Input Forward Voltage	$V_F$	—	—	1.8	V	$I_F=16\text{mA}$ , $T_A=25^\circ\text{C}$
Input Forward Voltage Temperature Coefficient	$\Delta V_F/\Delta T_A$	—	-1.8	—	mV/°C	$I_F=1.6\text{mA}$
Input Reverse Voltage	$BV_R$	5.0	—	—	V	$I_R = 10\mu\text{A}$
Input Capacitance	$C_{IN}$	—	60	—	pF	$V_F=0$ ; $f=1\text{MHz}$
<b>Detector</b>						
Current transfer ratio	CTR	400	1800	5000	%	$I_F=0.5\text{mA}$ ; $V_{CC}=4.5\text{V}$ ; $T_A=25^\circ\text{C}$ ; $V_o=0.4\text{V}$
		500	2000	2600		$I_F=1.6\text{mA}$ ; $V_{CC}=4.5\text{V}$ ; $T_A=25^\circ\text{C}$ ; $V_o=0.5\text{V}$
Logic low output voltage output voltage	$V_{OL}$	—	0.06	0.1	V	$I_F=0.5\text{mA}$ ; $V_{CC}=4.5\text{V}$ ; $I_o=2\text{mA}$
		—	0.1	0.4		$I_F=1.6\text{mA}$ ; $V_{CC}=4.5\text{V}$ ; $I_o=8\text{mA}$
		—	0.2	0.4		$I_F=5\text{mA}$ ; $V_{CC}=4.5\text{V}$ ; $I_o=15\text{mA}$
		—	0.2	0.4		$I_F=12\text{mA}$ ; $V_{CC}=4.5\text{V}$ ; $I_o=24\text{mA}$
Logic high output current	$I_{OH}$	—	0.3	100	$\mu\text{A}$	$I_F=0\text{mA}$ , $V_o=V_{CC}=18\text{V}$ $T_A=25^\circ\text{C}$
Logic low supply current	$I_{ccL}$	—	0.7	1.5	mA	$I_F=1.6\text{mA}$ , $V_o=\text{open}$ ( $V_{CC}=18\text{V}$ )
Logic high supply current	$I_{ccH}$	—	0.07	10	mA	$I_F=0\text{mA}$ , $V_o=\text{open}$ , $T_A=25^\circ\text{C}$ ( $V_{CC}=18\text{V}$ )

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

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### 5. SWITCHING SPECIFICATION

$T_A=0\sim 70^{\circ}\text{C}$ ,  $V_{CC}=5\text{V}$ , unless otherwise specified.

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Propagation Delay Time to Low Output Level	$t_{PHL}$	—	—	25	$\mu\text{s}$	$I_F=0.5\text{mA}$ ; $R_L=4.7\text{K}\Omega$
		—	—	3		$I_F=12\text{mA}$ ; $R_L=270\Omega$
Propagation Delay Time to High Output Level	$t_{PLH}$	—	—	60	$\mu\text{s}$	$I_F=0.5\text{mA}$ ; $R_L=4.7\text{K}\Omega$
		—	—	20		$I_F=12\text{mA}$ ; $R_L=270\Omega$
Logic High Common Mode Transient Immunity	$ CM_H $	1	10	—	$\text{KV}/\mu\text{s}$	$I_F=0\text{mA}$ ; $ V_{CM} =10\text{V}_{p-p}$ $R_L=2.2\text{K}\Omega$
Logic Low Common Mode Transient Immunity	$ CM_L $	1	10	—	$\text{KV}/\mu\text{s}$	$I_F=1.6\text{mA}$ ; $ V_{CM} =10\text{V}_{p-p}$ $R_L=2.2\text{K}\Omega$

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

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### 6. ISOLATION CHARACTERISTIC

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

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

#### Notes

- AC For 1 Minute, R.H. = 40 ~ 60%. Isolation voltage shall be measured using the following method.
  - Short between anode and cathode on the primary side and between collector and emitter on the secondary side.
  - The isolation voltage tester with zero-cross circuit shall be used.
  - The waveform of applied voltage shall be a sine wave.
- For 10 Seconds
- Current Transfer Ratio (CTR) is defined as the ration of output collector current,  $I_o$ , to the forward LED input current,  $I_F$ , times 100%.
- Pin 7 open.
- Instantaneous common mode rejection voltage "output (1)" represents a common mode voltage variation that can hold the output above (1) level ( $V_o > 2.0\text{V}$ ). Instantaneous common mode rejection voltage "output (0)" represents a common mode voltage variation that can hold the output above (0) level ( $V_o < 0.8\text{V}$ ).
- Device considered a two terminal device. Pins 1, 2, 3 and 4 shorted together and Pins 5, 6, 7 and 8 shorted together.



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## 7. CHARACTERISTICS CURVES

Figure 1: DC and pulsed transfer characteristics

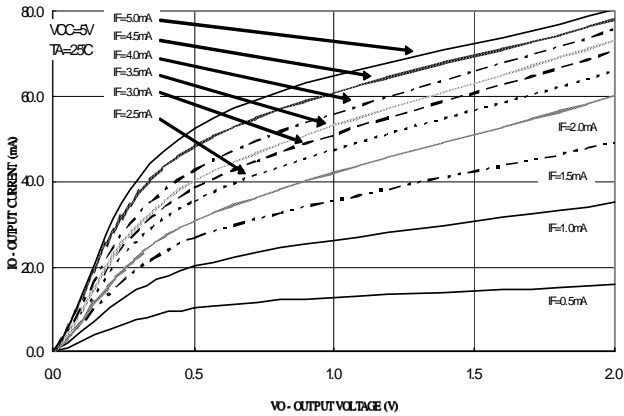


Figure 2: Input current vs. forward voltage

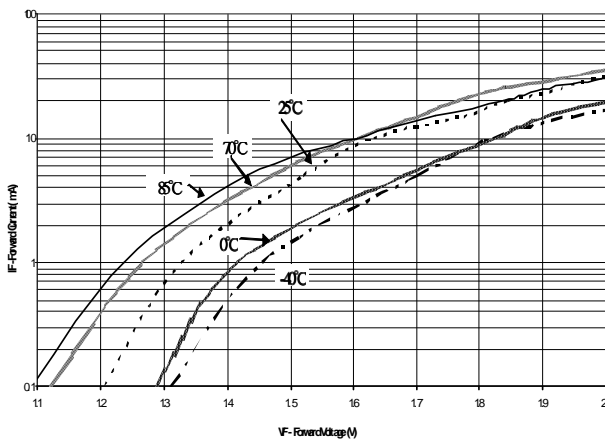


Figure 3: Logic high output current vs. temperature

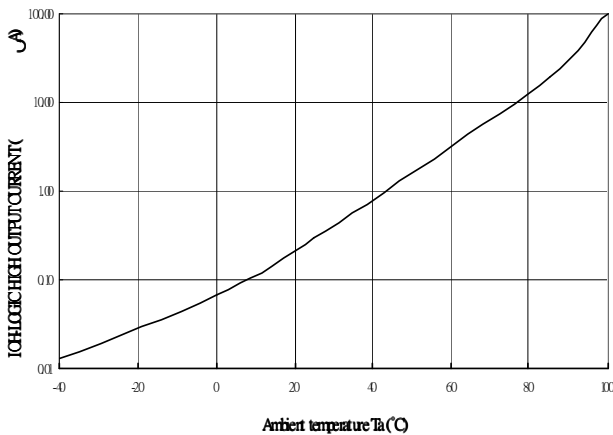


Figure 4: Current transfer ratio vs. input current

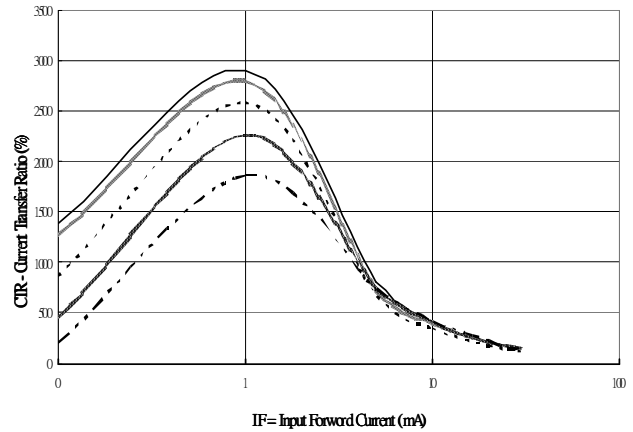


Figure 5: Current transfer ratio vs. temperature

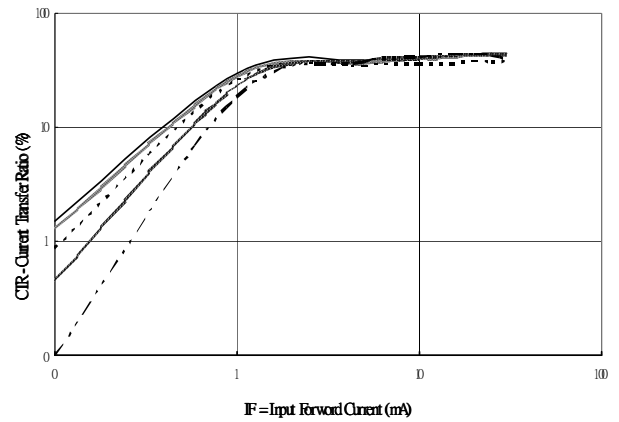
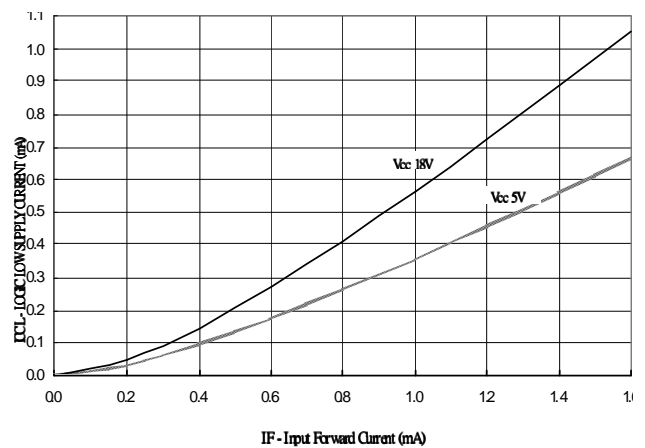


Figure 6: Logic low supply current vs. input forward current



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Figure 7: Propagation delay time vs. temperature

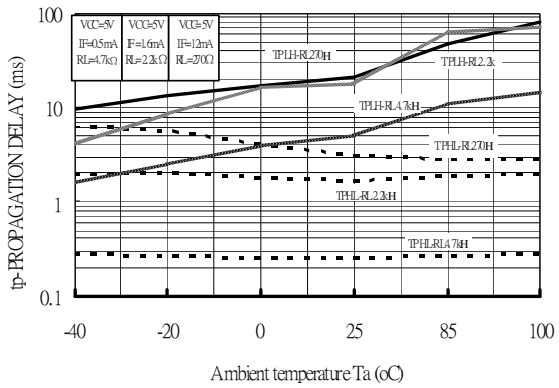
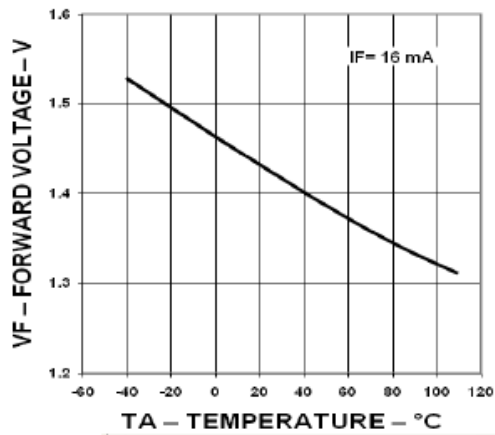


Figure 8: Forward voltage vs. temperature



8. Switching Time Test Circuit

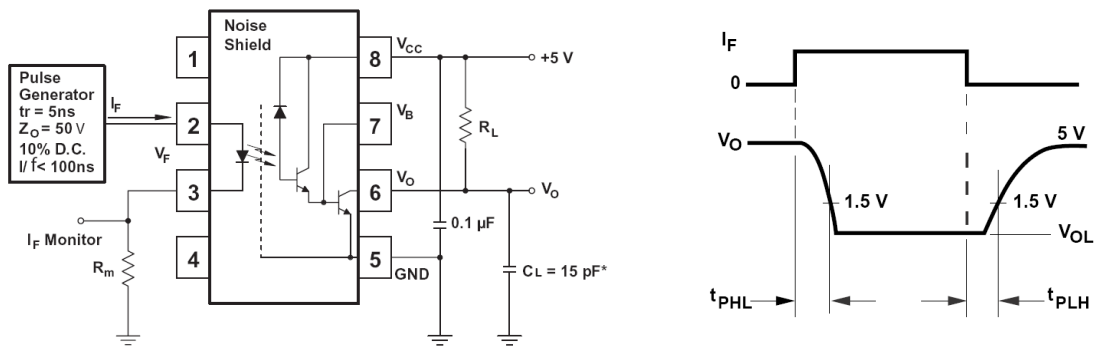


Figure 1: Single Channel Test Circuit for  $t_{PHL}$  and  $t_{PLH}$

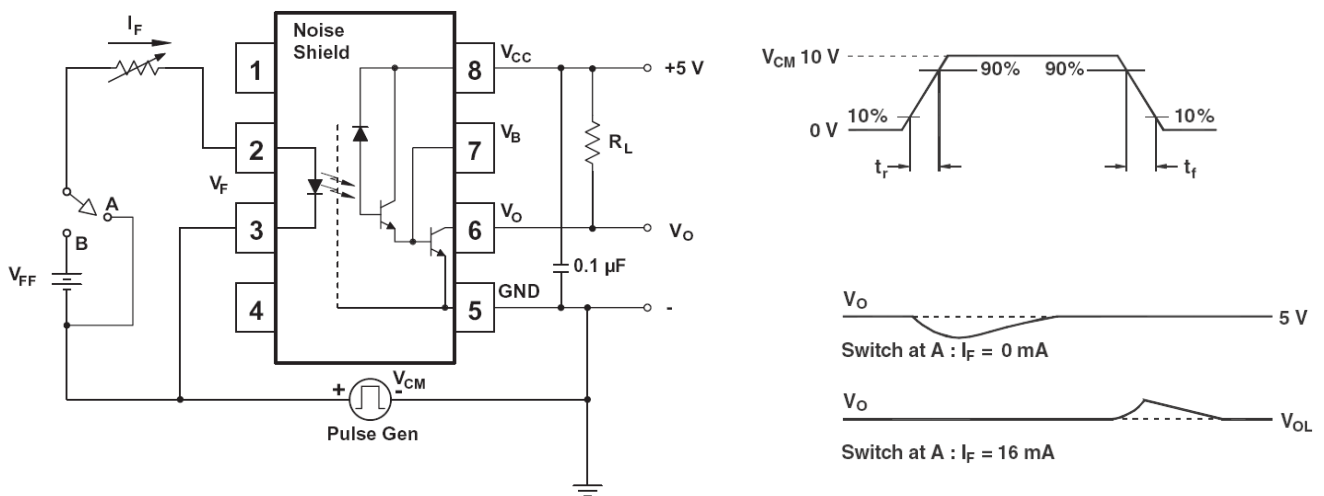


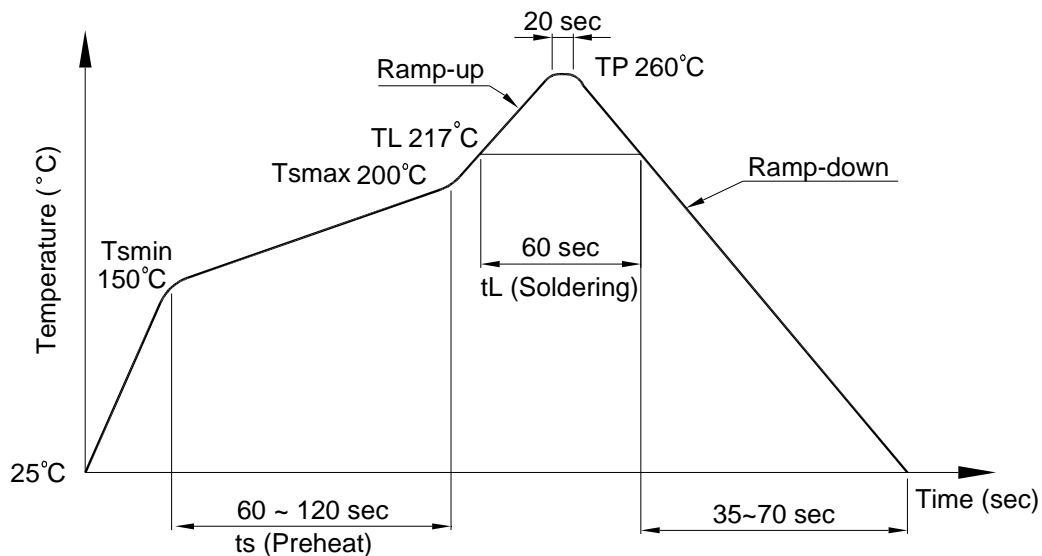
Figure 2: Single Channel Test Circuit for Common Mode Transient Immunity

## 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



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### 9.2 Wave soldering (JEDEC22A111 compliant)

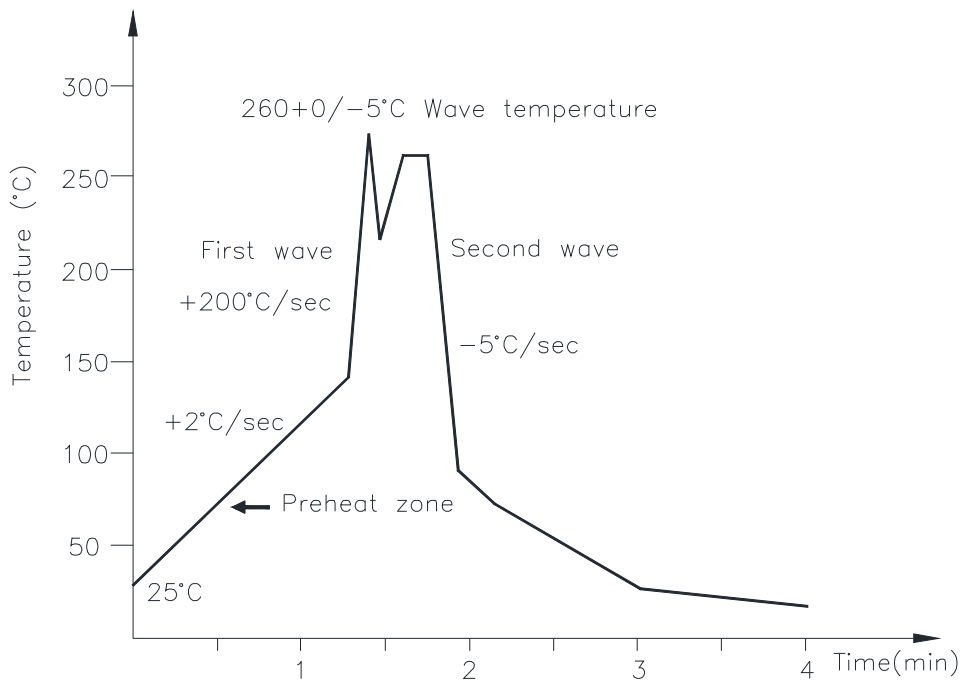
One time soldering is recommended within the condition of temperature.

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:

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.