LITEON®
OPTOELECTRONICS

Photocoupler

Product Data Sheet

LTV-0501

Spec No.: DS70-2013-0017

Effective Date: 06/07/2016

Revision: B

LITE-ON DCC

RELEASE

BNS-OD-FC001/A4

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Photocoupler
LTV-0501 series

1. DESCRIPTION

The LTV-0501 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 1KV/μsec.

1.1 Features

- SO8 package
- High speed – 1MBd typical
- TTL compatiable
- Open collector output
- Storable output.
- Safety approval

  UL/ cUL 1577, Cert. No.E113898.

  3750 Vrms/1 min

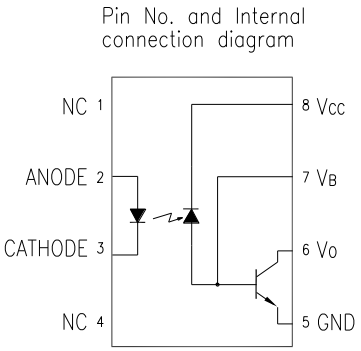
  VDE DIN EN60747-5-5, Cert. No. 40015248

  V_{IORM} = 560 V_{peak}

1.2 Applications

- High Voltage Isolation
- Isolation in line receivers
- Feedback element in switching mode power supplier
- Power transistor isolation in motor drives
- Interface between Microprocessor system, computer and their periphe
- Replace pulse transformers.
- Replace slower optocoupler isolators.
- Analog signal ground isolation

1.3 Functional Diagram

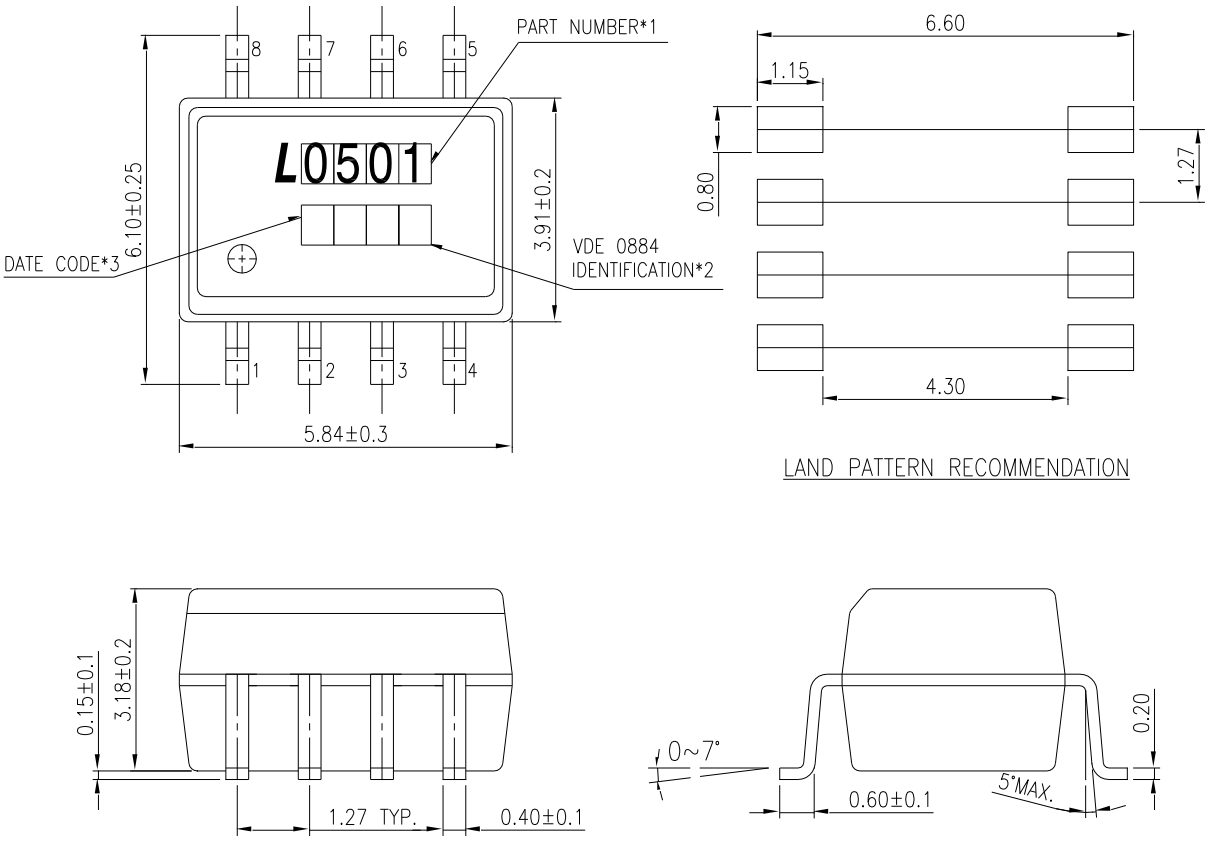


Truth Table (Positive Logic)

LED	OUT
ON	L
OFF	H

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

2. PACKAGE DIMENSIONS



Part No : LTV-0501

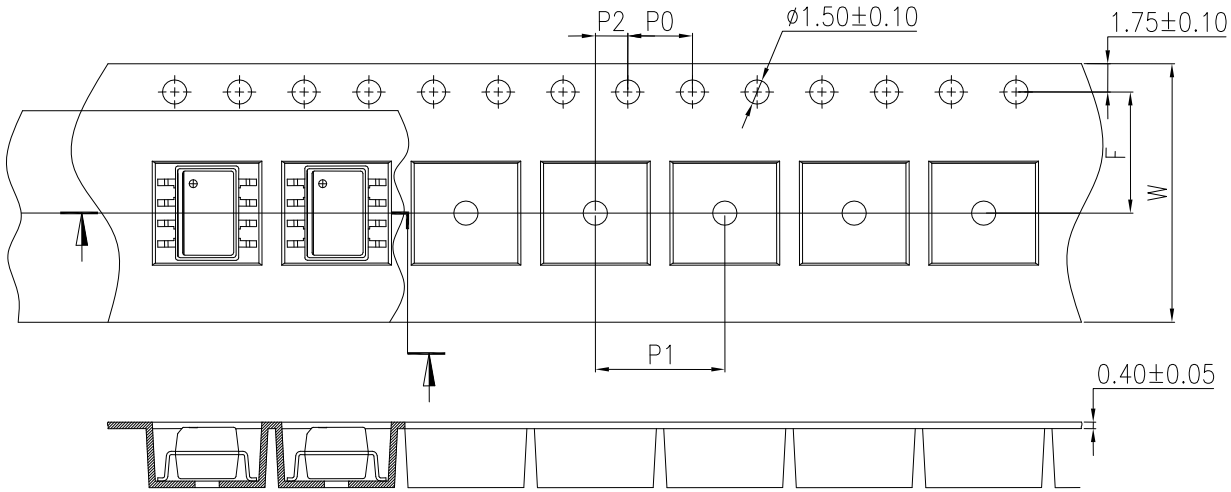
Notes :

1. Date code
2. "V" to represent VDE0884
3. 1st digit year code, 2nd and 3rd digit work week code

Dimensions are all in Millimeters.

3. TAPING DIMENSIONS

3.1 LTV-0501



Description	Symbol	Dimension in mm (inch)
Tape wide	W	16±0.3 (0.63)
Pitch of sprocket holes	P_0	4±0.1 (0.157)
Distance of compartment	F	7.5±0.1 (0.295)
	P_2	2±0.1 (0.079)
Distance of compartment to compartment	P_1	12±0.1 (0.472)

3.2 Quantities Per Reel

Package Type	LTV-0501
Quantities (pcs)	2000

4. RATING AND CHARACTERISTICS

4.1 Absolute Maximum Ratings at T_A=25°C *

	Parameter	Symbol	Rating	Unit	Note
Input	Average Forward Input Current	I_F	25	mA	
	Reverse Input Voltage	V_R	5	V	
	Power Dissipation	P_I	45	mW	
Output	Output Collector Current	I_O	8	mA	
	Output Collector Voltage	V_O	20	V	
	Output Collector Power Dissipation	P_o	100	mW	
	Isolation Voltage	V_{iso}	3750	V_{rms}	
	Supply Voltage	V_{CC}	30	V	
	Operating Temperature	T_{opr}	-55 ~ +100	°C	
	Storage Temperature	T_{stg}	-55 ~ +125	°C	
	Lead Solder Temperature **	T_{sol}	260	°C	

* 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.

** 260°C for 10 seconds. Refer to Lead Free Reflow Profile.

4.2 ELECTRICAL OPTICAL CHARACTERISTICS

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Condition	Note
Input Forward Voltage	V_F	—	—	1.80	V	I_F= 16mA, T_A=25 °C	
Input Reverse Voltage	BV_R	5.0	—	—	V	I_R = 10μA	
Low Level Supply Current	I_{CCL}	—	170	—	uA	I_F=16mA, V_o=open (Vcc=15V)	1
High Level Supply Current	I_{CCH}	—	0.002	1		I_F=0mA, V_o=open ; T_A=25 °C (Vcc=15V)	1
Current transfer ratio	CTR	19	32	—	%	I_F=16mA;Vcc=4.5V; T_A=25 °C;Vo=0.4V	2
		15	33	—		I_F=16mA;Vcc=4.5V; T_A=25 °C;Vo=0.5V	
High Level Output Current	I_{OH}	—	0.002	0.5	μA	I_F=0mA, Vo=Vcc=5.5V T_A=25 °C	
		—	0.005	1		I_F=0mA, Vo=Vcc=15V T_A=25 °C	
		—	—	50		VO = VCC = 15 V	
Low Level Output Voltage	V_{OL}	—	0.1	0.5	V	I_F=16mA;Vcc=4.5V; I_o=2.4mA; T_A=25 °C	

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

5. SWITCHING SPECIFICATION

T_A=0~70 °C, V_{CC}=5V, unless otherwise specified.

Parameter	Test Condition	Sym.	Min.	Typ.	Max.	Units	Fig.	Note
Propagation Delay Time to Low Output Level	T_A=25°C (R_L=1.9KΩ, I_F=16mA)	t_{PHL}	—	0.2	0.8	μs	1	3, 4
Propagation Delay Time to High Output Level		t_{PLH}	—	0.2	0.8		1	3, 4
Logic High Common Mode Transient Immunity	I_F=0mA;V_{CM}=1500Vp-p; C_L = 15 pF; T_A=25C, R_L=1.9KΩ	$\|CM_H\|$	15	25	—	KV/μs	2	3, 4
Logic Low Common Mode Transient Immunity	I_F=16mA;V_{CM}=1500Vp-p C_L = 15 pF; T_A=25C, R_L=1.9KΩ	$\|CM_L\|$	15	25	—		2	3, 4

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, t = 5s, V_{I-O} = 3kV DC, T_A =25°C	5
Withstand Insulation Test Voltage	V_{ISO}	3750	—	—	V_{RMS}	RH ≤ 50%, t = 1min, T_A = 25°C	5, 6
Input-Output Resistance	R_{I-O}	—	10^{12}	—	Ω	V_{I-O} = 500V DC	5

Typical values applies to T_A = 25°C

7. SWITCHING TIME TEST CIRCUIT

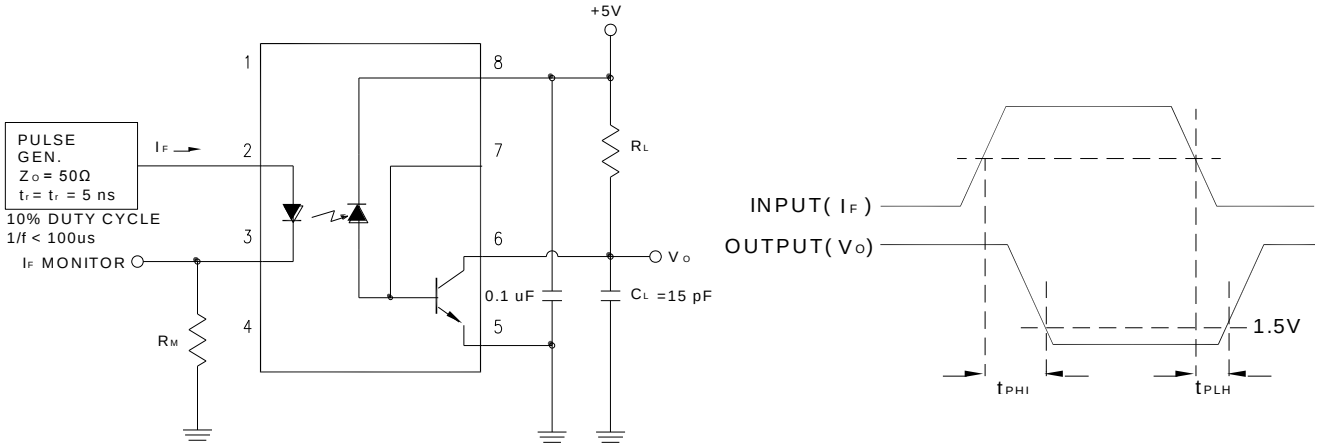


Figure 1: Single Channel Test Circuit for t_{PHL} and t_{PLH}

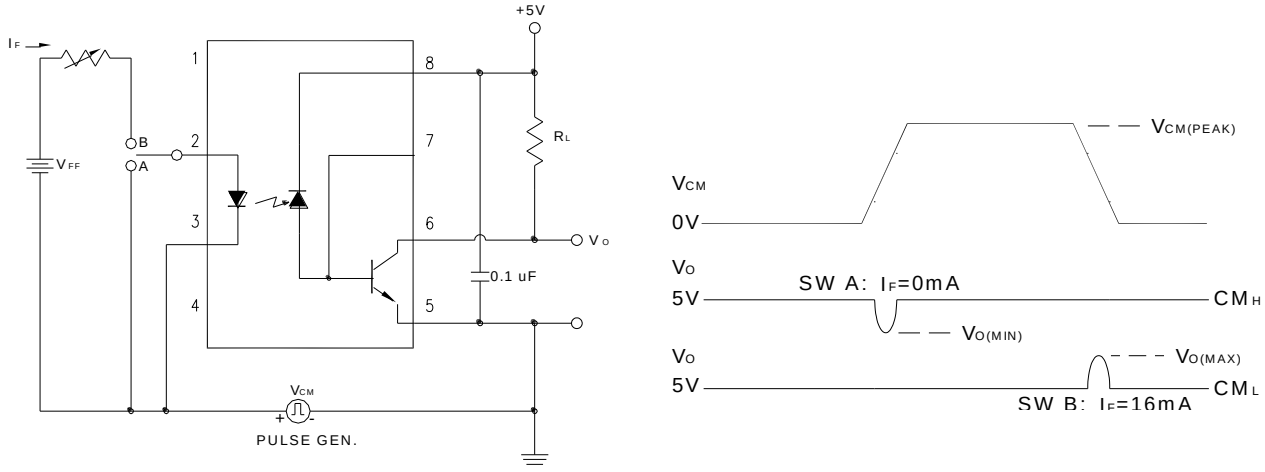


Figure 2: Single Channel Test Circuit for Common Mode Transient Immunity

8. CHARACTERISTICS CURVES

Figure 3: DC and Pulsed Transfer Characteristics.

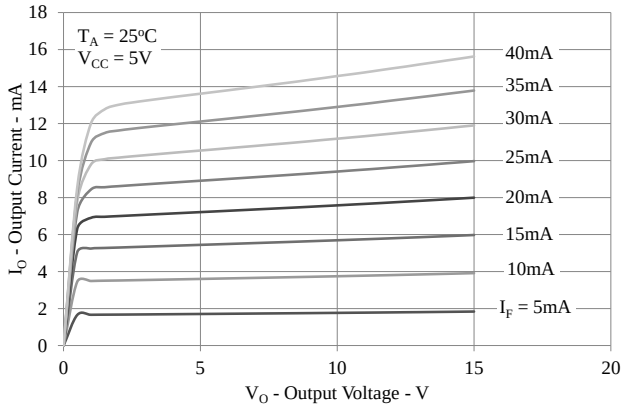


Figure 4: Current Transfer Ratio vs. Input Current.

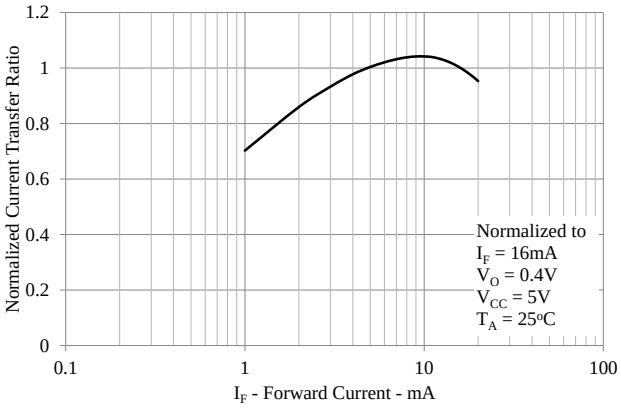


Figure 5: Input Current vs. Forward Voltage.

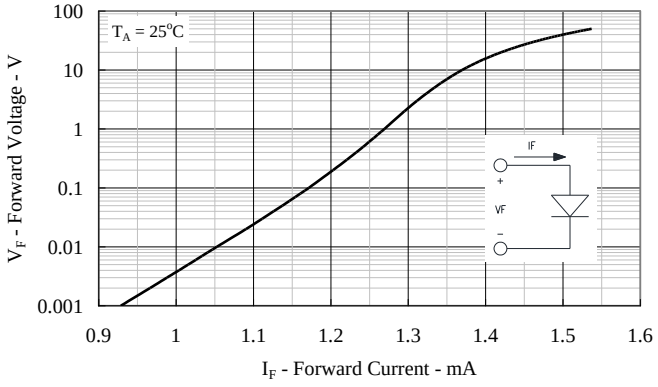


Figure 6: Current Transfer Ratio vs. Temperature.

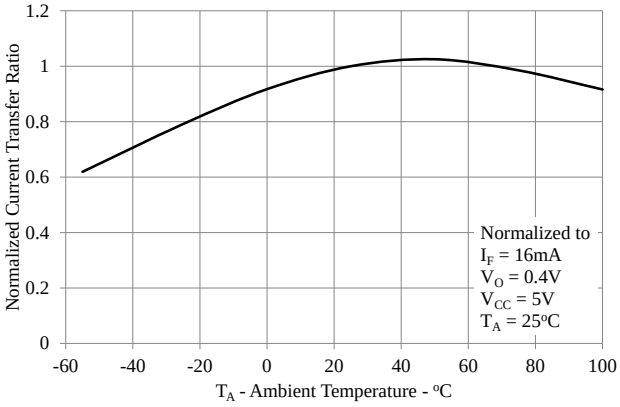


Figure 7: Propagation Delay vs. Load Resistance.

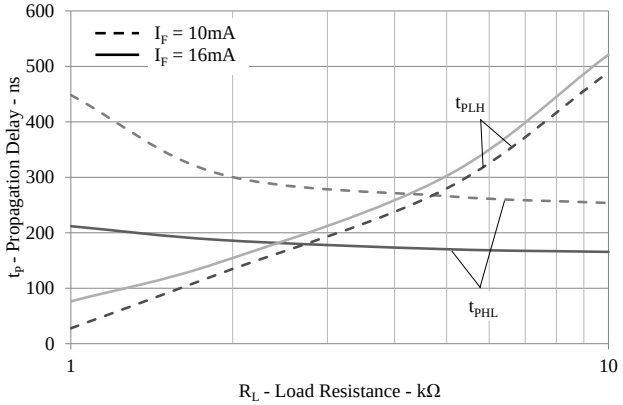


Figure 8: Propagation Delay Time vs.Temperature.

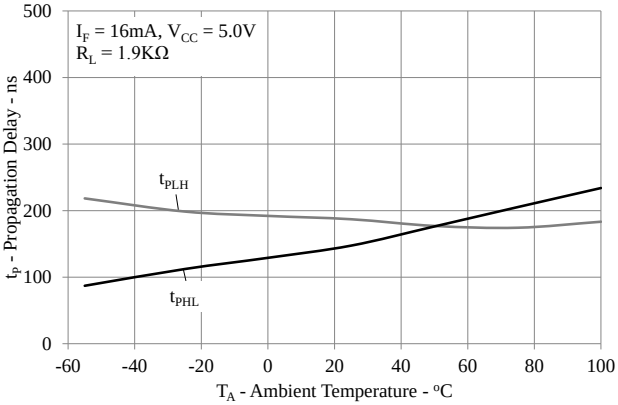


Figure 9: Logic High Output Current vs. Temperature.

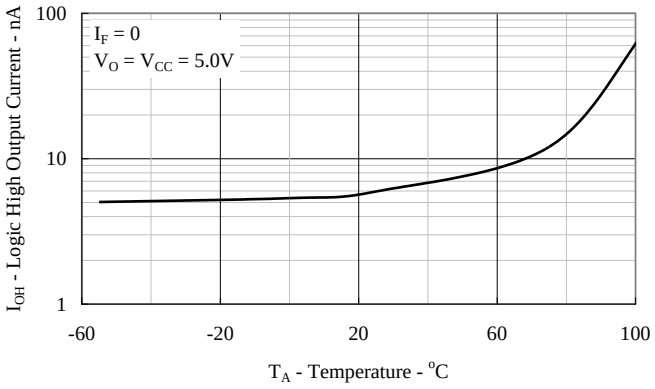
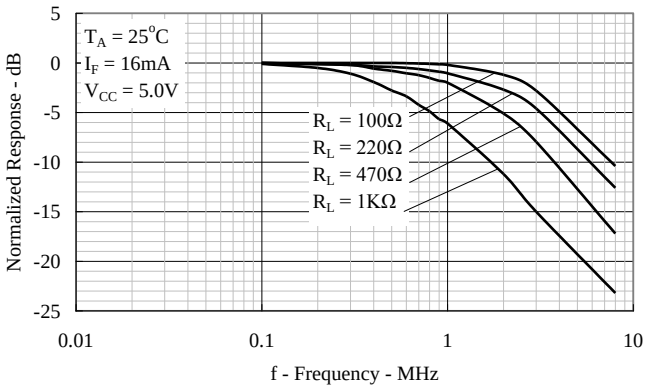


Figure 10: Frequency Response.

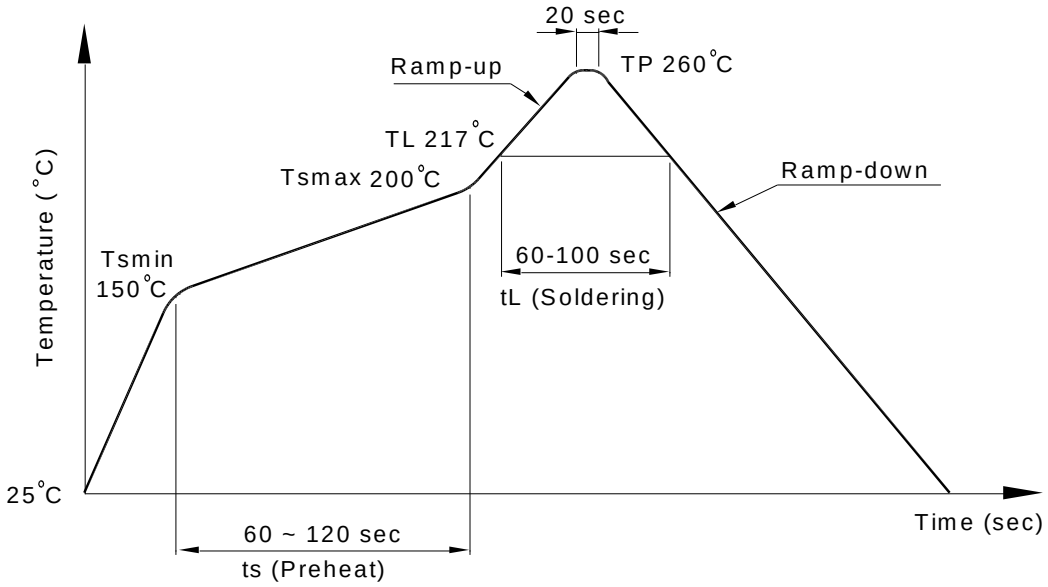


9. TEMPERATURE PROFILE OF SOLDERING

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



9.2 Wave soldering (JEDEC22A111 compliant)

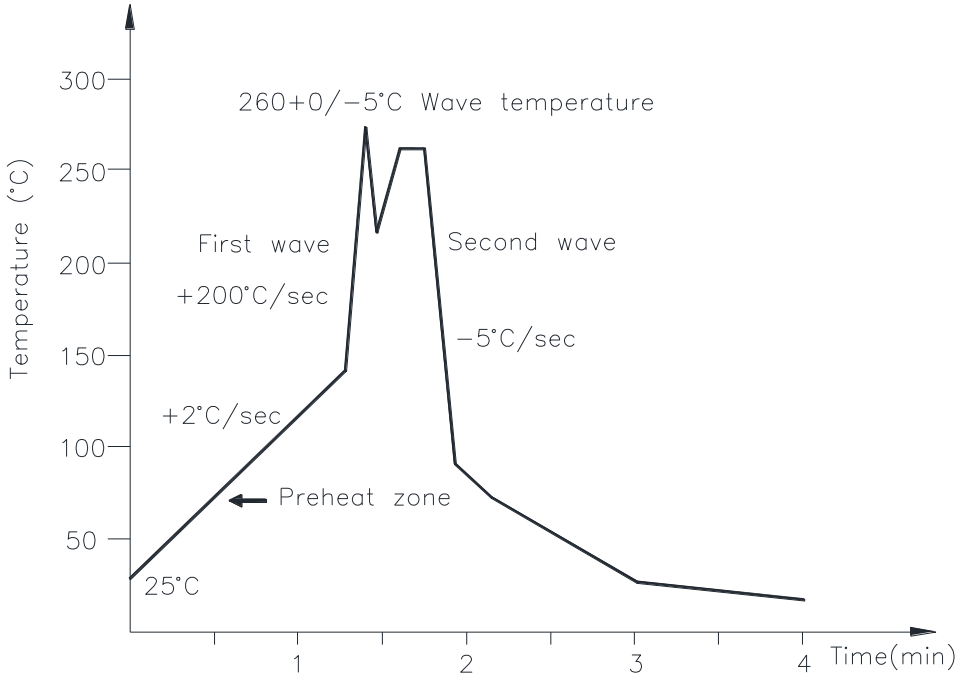
One time soldering is recommended within the condition of temperature.

Temperature: 260+0/-5˚C

Time: 10 sec.

Preheat temperature:25 to 140˚C

Preheat time: 30 to 80 sec.



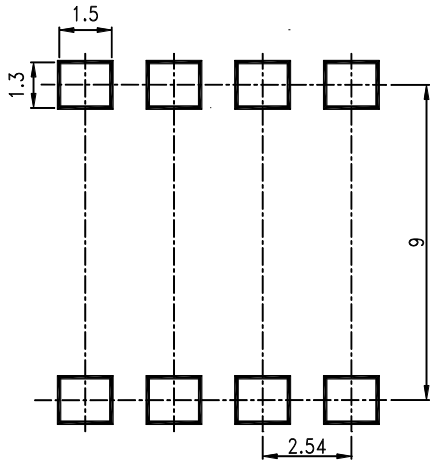
9.3 Hand soldering by soldering iron

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

Temperature: 380+0/-5˚C

Time: 3 sec max.

10. RECOMMENDED FOOT PRINT PATTERNS (MOUNT PAD)



Note :

Dimensions in millimeters.

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.

1. Use of a 0.1 μf bypass capacitor connected between pins 5 and 8 is recommended.
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.
5. Device considered a two-terminal device: Pins 1, 2, 3, and 4 shorted together and Pins 5, 6, 7, and 8 shorted together.
6. In accordance with UL1577, each optocoupler is proof tested by applying an insulation test voltage 3937.5Vrms for one second (leakage current less than 10 μA). This test is performed before the 100% production test for partial discharge