TDL501 Series

LSOP6, 1Mbit/s High Speed Transistor Photo Coupler

Description

The TDL501 series combine an AlGaAs infrared emitting diode as the emitter which is optically coupled to a silicon high speed photo transistor in a plastic LSOP6 package.

With the robust coplanar double mold structure, TDL501 series provide the most stable isolation feature.

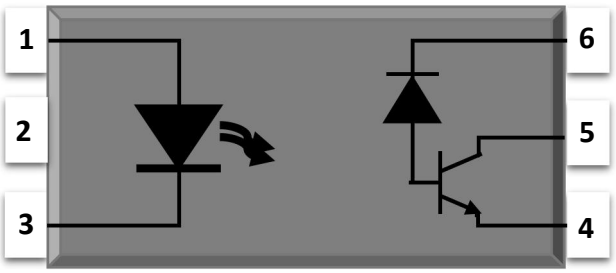
Features

- High isolation 5000 VRMS
- DC input with high speed transistor
- Operating temperature range - 40 °C to 100 °C
- REACH compliance
- Halogen free
- MSL class 1
- Regulatory Approvals
  - UL - UL1577
  - VDE - EN60747-5-5(VDE0884-5)
  - CQC - GB4943.1, GB8898
  - cUL- CSA Component Acceptance Service Notice No. 5A

Applications

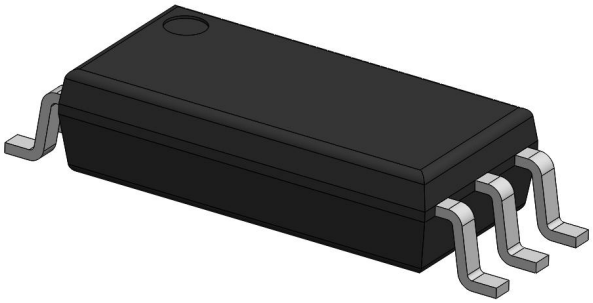
- Line receivers
- Telecommunication equipment
- Out interface to CMOS-LSTTL-TTL
- Wide bandwidth analog coupling
- Pulse transformer replacement
- Computer-peripheral interface

SCHEMATIC



PIN DEFINITION

1. Anode	6.VCC
2. No Connection	5.VO
3. Cathode	4.GND



ABSOLUTE MAXIMUM RATINGS				
PARAMETER	SYMBOL	VALUE	UNIT	Note
INPUT				
Forward Current	I_F	25	mA	
Peak Forward Current	I_{FP}	50	mA	1
Peak Transient Current	$I_{F(trans)}$	1	A	2
Reverse Voltage	V_R	5	V	
Input Power Dissipation	P_I	100	mW	
OUTPUT				
Supply Voltage	V_{CC}	-0.5~30	V	
Output Voltage	V_O	-0.5~20	V	
Output Current	I_O	8	mA	
Peak Output Current	I_O	16	mA	
Output Power Dissipation	P_O	100	mW	
COMMON				
Total Power Dissipation	Ptot	200	mW	
Isolation Voltage	Viso	500	Vrms	3
Operating Temperature	Topr	-40~100	°C	
Storage Temperature	Tstg	-55~125	°C	
Soldering Temperature	Tsol	260	°C	4

Note 1. 50% duty, 1ms P.W

Note 2. ≤1μs P.W,300pps

Note 3. AC For 1 Minute, R.H. = 40 ~ 60%

Note 4. For 10 seconds

ELECTRICAL OPTICAL CHARACTERISTICS at Ta=25°C							
PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	TEST CONDITION	NOTE
INPUT							
Forward Voltage	V_F	-	1.35	1.8	V	I_F=16mA	
Reverse Current	I_R	-	-	10	μA	V_R=5V	
Input Capacitance	Cin	-	60	-	pF	V=0, f=1MHz	
OUTPUT							
High Level Supply Current	I_{CCH}	-	0.08	1	μA	I_F=0mA, V_O=Open, V_{CC}=30V, Ta=25°C	
Low Level Supply Current	I_{CCL}	-	600	-	μA	I_F=16mA, V_O=Open, V_{CC}=30V	
Logic High Output Current	I_{OH}	-	0.001	0.5	μA	I_F=0mA, V_O=V_{CC}=5.5V, Ta=25°C	
		-	0.01	1	μA	I_F=0mA, V_O=V_{CC}=15V, Ta=25°C	
		-	-	50	μA	I_F=0mA, V_O=V_{CC}=15V	
TRANSFER CHARACTERISTICS(at Ta=0 to 70°C , unless specified otherwise)							
Current Transfer Ratio	CTR	20	60	100	%	I_F = 16mA ,V_O = 0.4V, V_{CC}=4.5V, Ta=25°C	
		15	-	-		I_F = 16mA ,V_O = 0.5V, V_{CC}=4.5V	
Logic Low Output Voltage	V_{OL}	-	0.08	0.4	V	I_F = 16mA ,I_O = 3mA, V_{CC}=4.5V, Ta=25°C	
		-	-	0.5		I_F = 16mA ,I_O = 2.4mA, V_{CC}=4.5V	
Isolation Resistance	Riso	10^12	10^14	-	Ω	DC500V, 40 ~ 60% R.H.	
Floating Capacitance	C_{IO}	-	0.3	-	pF	V=0, f=1MHz	

ELECTRICAL OPTICAL CHARACTERISTICS							
PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	TEST CONDITION	NOTE
SWITCHING CHARACTERISTICS(at Ta=0 to 70°C, I_F=16mA ,V_{CC}=5V, unless specified otherwise)							
Propagation Delay Time to Logic Low	TPHL	-	0.4	0.8	μs	R_L=1.9kΩ,T_A=25°C	Fig.13
		-	-	1.0		R_L=1.9kΩ	
Propagation Delay Time to Logic High	TPLH	-	0.35	0.8	μs	R_L=1.9kΩ,T_A=25°C	Fig.13
		-	-	1.0		R_L=1.9kΩ	
Common Mode Transient Immunity at Logic High	CM_H	15	-	-	kV/μs	I_F = 0mA , V_{CM}=1500Vpp, RL=1.9kΩ, T_A =25°C	Fig.15
Common Mode Transient Immunity at Logic Low	CM_L	15	-	-	kV/μs	I_F = 16mA , VCM=1500Vpp, R_L=1.9kΩ, T_A =25°C	Fig.15

CHARACTERISTIC CURVES

Fig.1 Forward Current vs. Forward Voltage

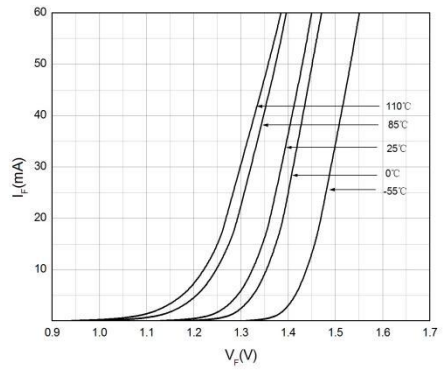


Fig.2 Forward Voltage vs. Ambient Temperature

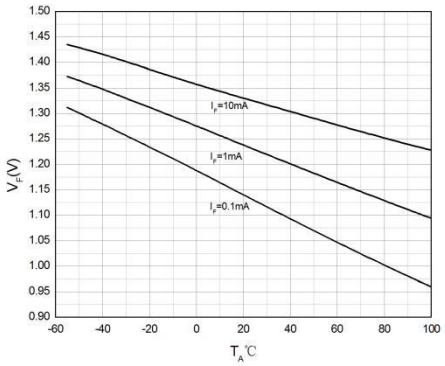


Fig.3 Normalized CTR vs. Forward Current

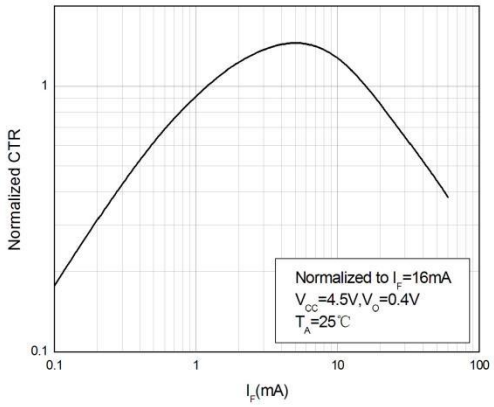


Fig.4 Normalized CTR vs. Ambient Temperature

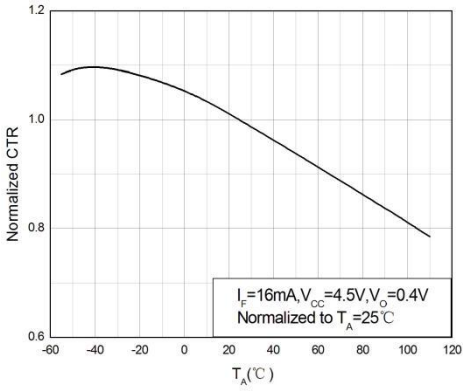


Fig.5 Output Current vs. Output Voltage

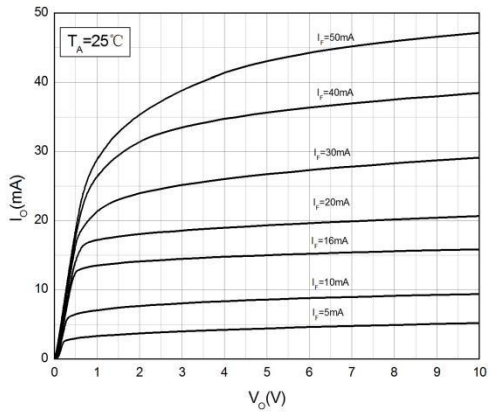
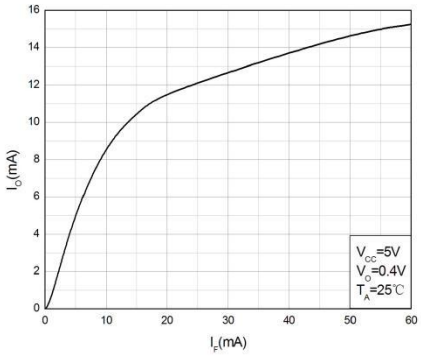


Fig.6 Output Current vs. Forward Current



CHARACTERISTIC CURVES

Fig.7 Logic High Output Current vs. Ambient Temperature

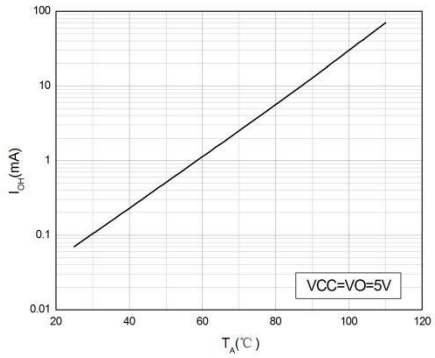


Fig.8 Propagation Delay vs. Load Resistance

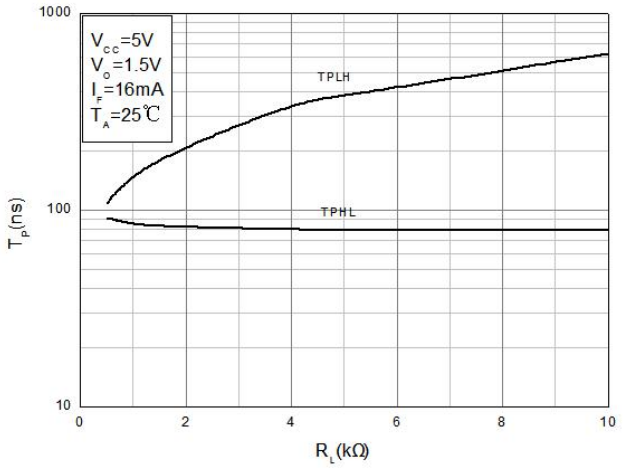


Fig.9 Switching Time vs. Load Resistance

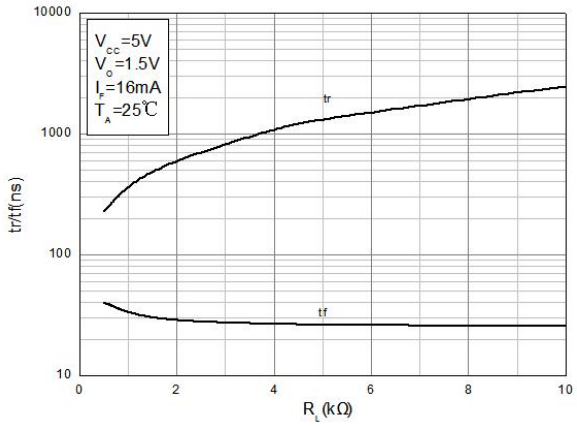


Fig.10 Propagation Delay vs. Ambient Temperature

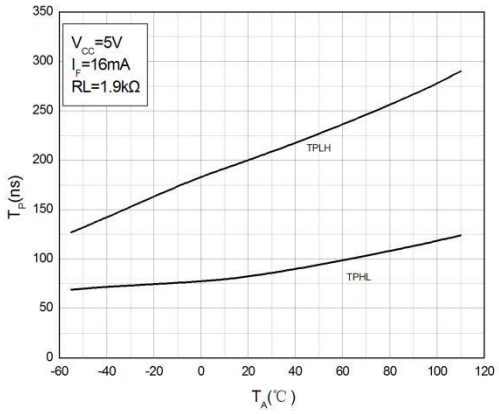
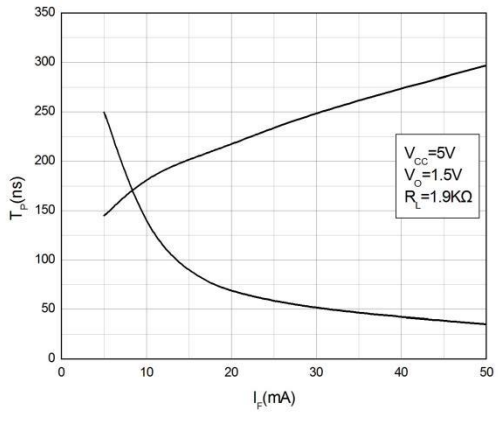


Fig.11 Propagation Delay vs. Forward Current



TEST CIRCUITS

Fig.13 Test Circuits for TPHL, TPLH, tr, tf

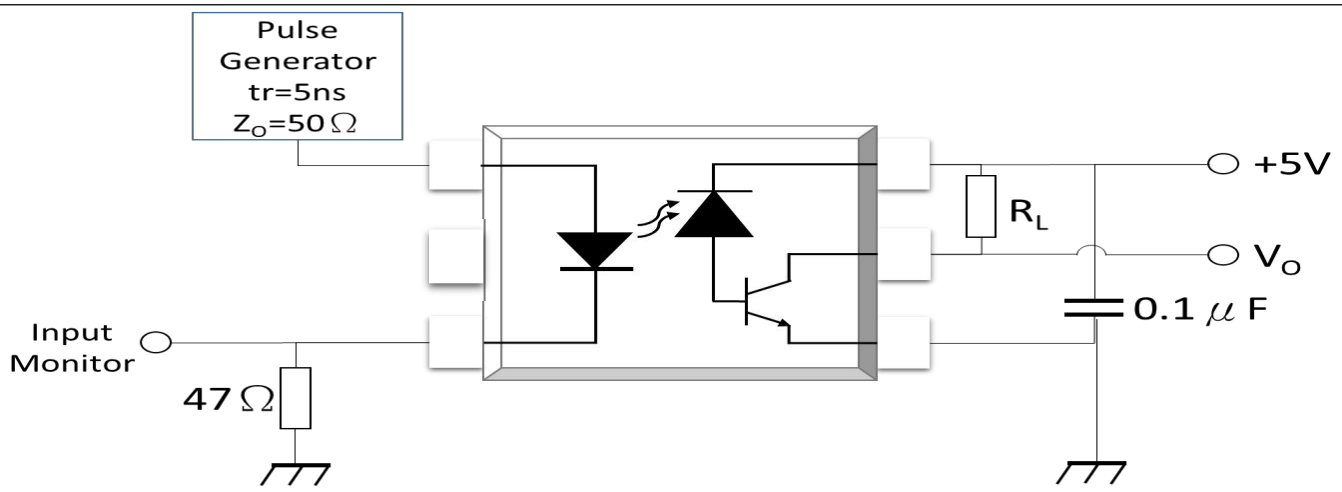
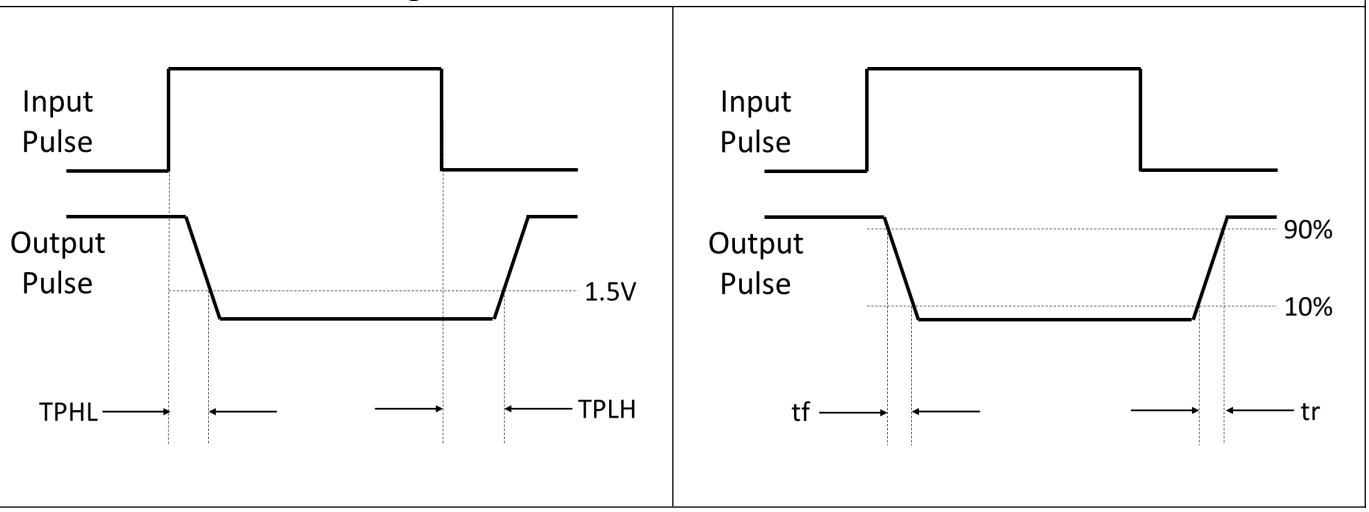


Fig.14 Waveforms of TPHL, TPLH, tr, tf



TEST CIRCUITS

Fig.15 Test Circuits for Common Mode Transient Immunity

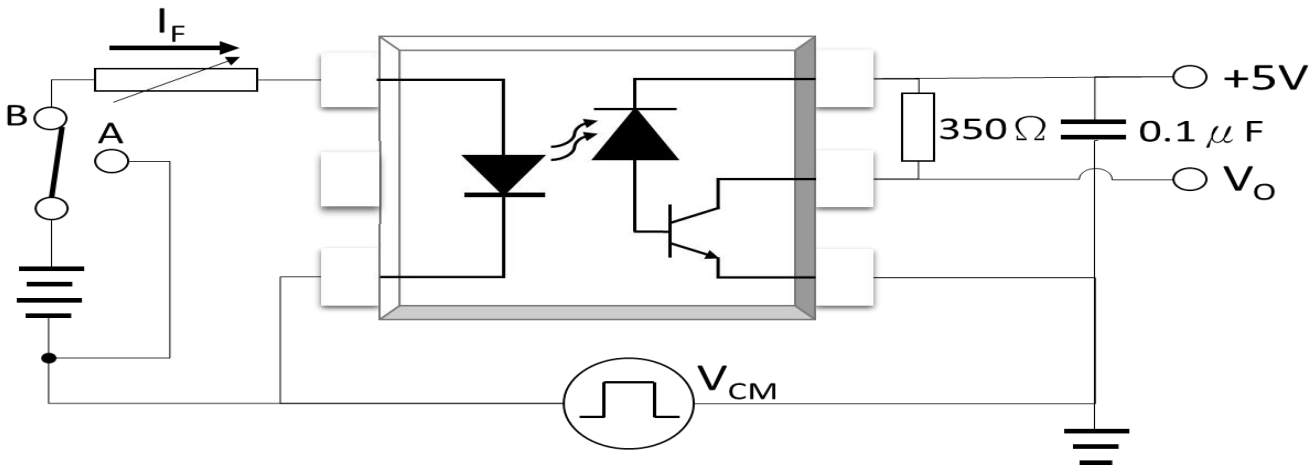
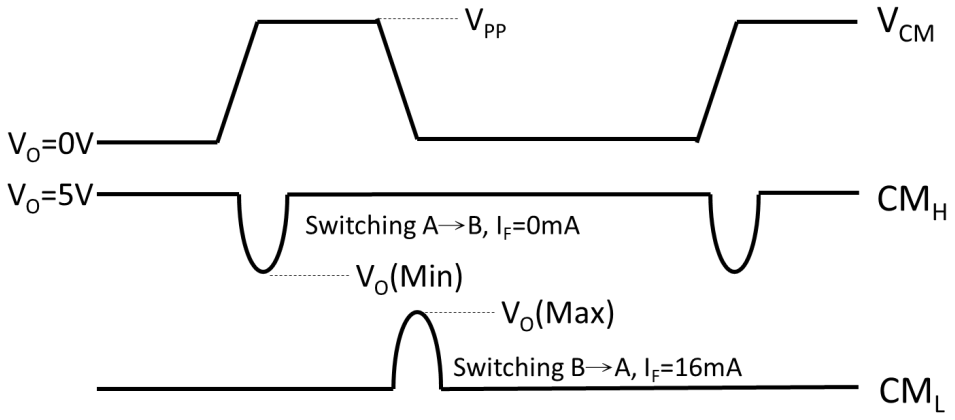
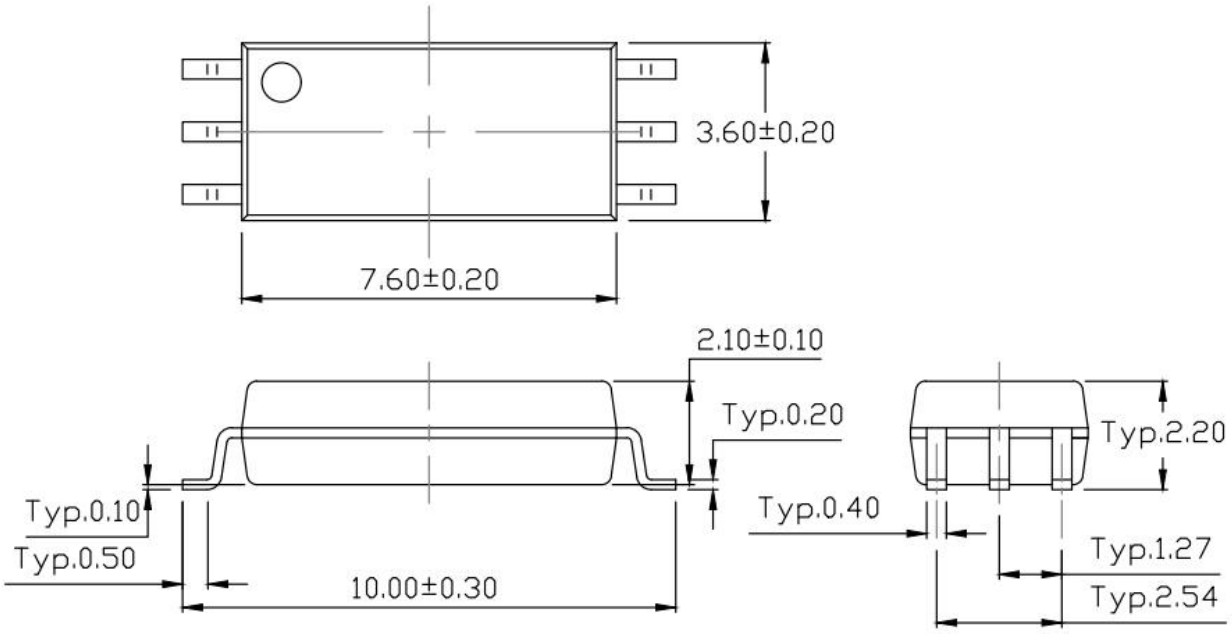


Fig.16 Wave forms of Common Mode Transient Immunity

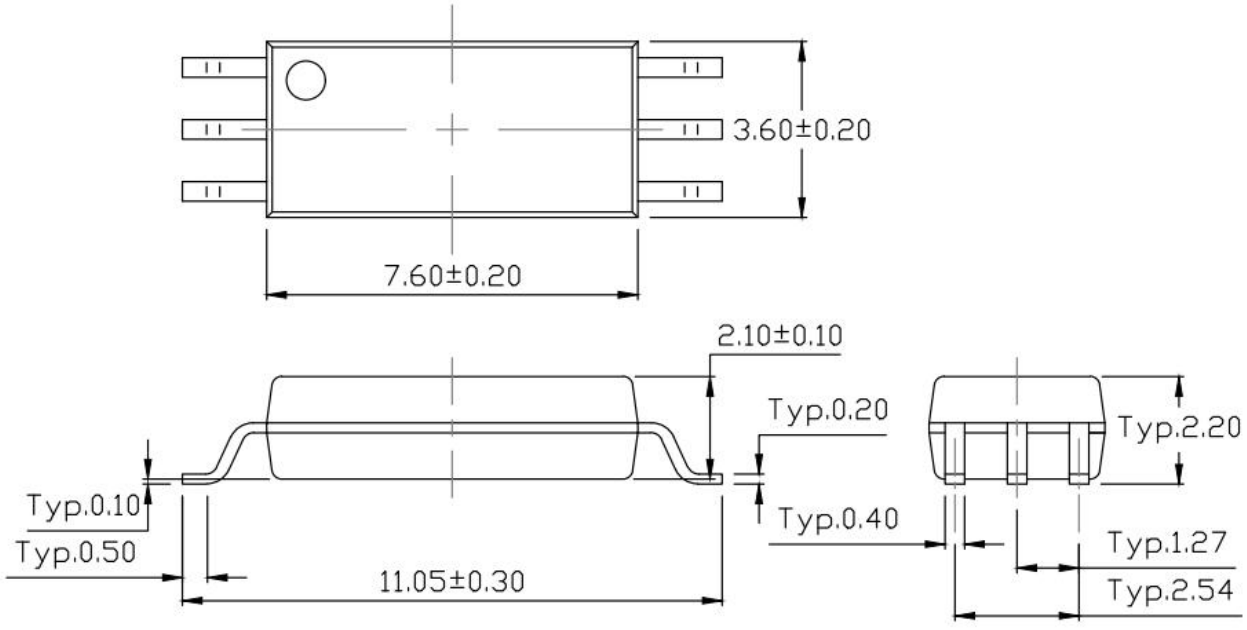


PACKAGE DIMENSIONS (Dimensions in mm unless otherwise stated)

Standard P Type

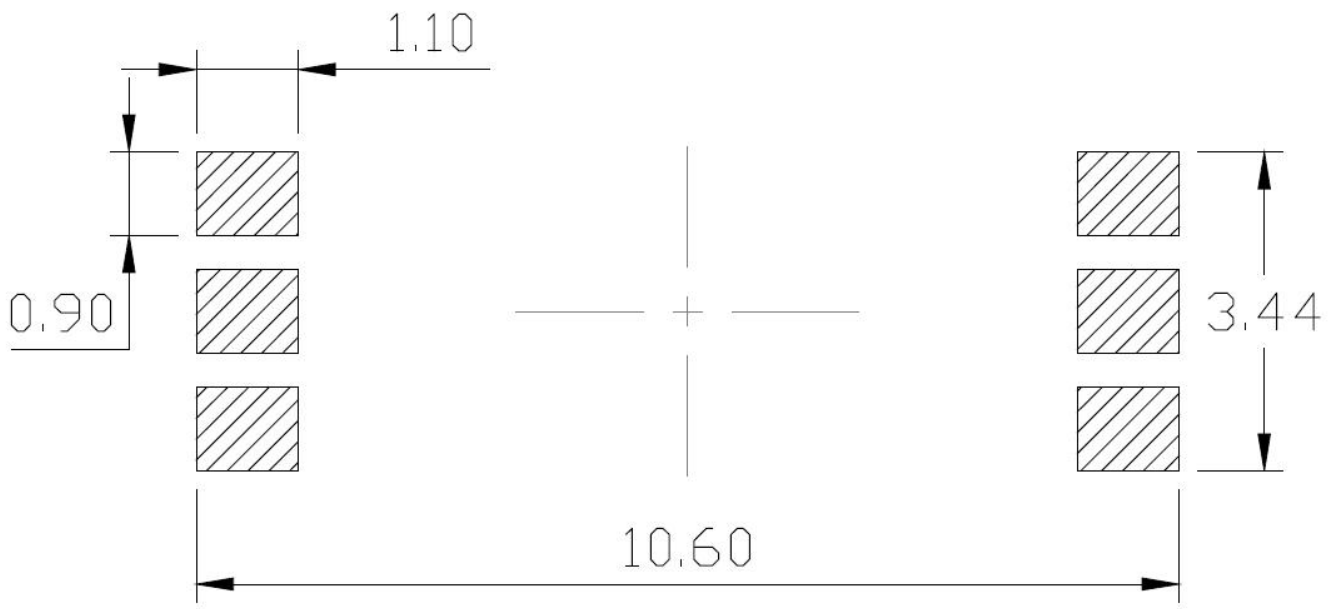


Standard W Type

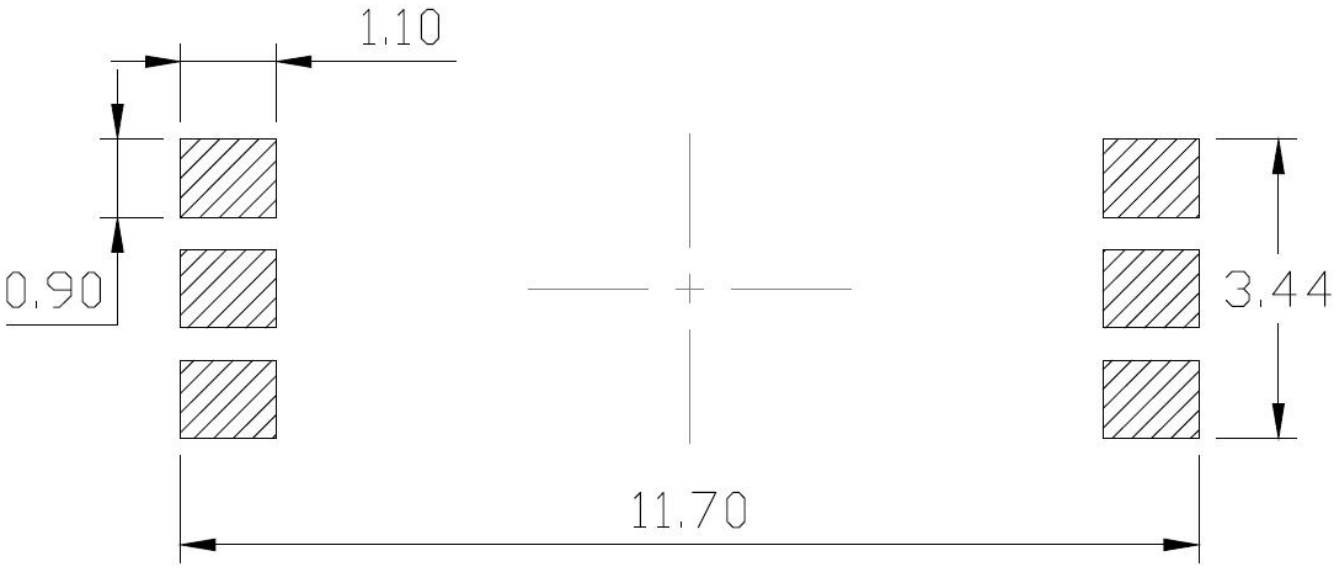


Recommended Solder Mask (Dimensions in mm unless otherwise stated)

Surface Mount Lead Forming & Surface Mount (Low Profile) Lead Forming

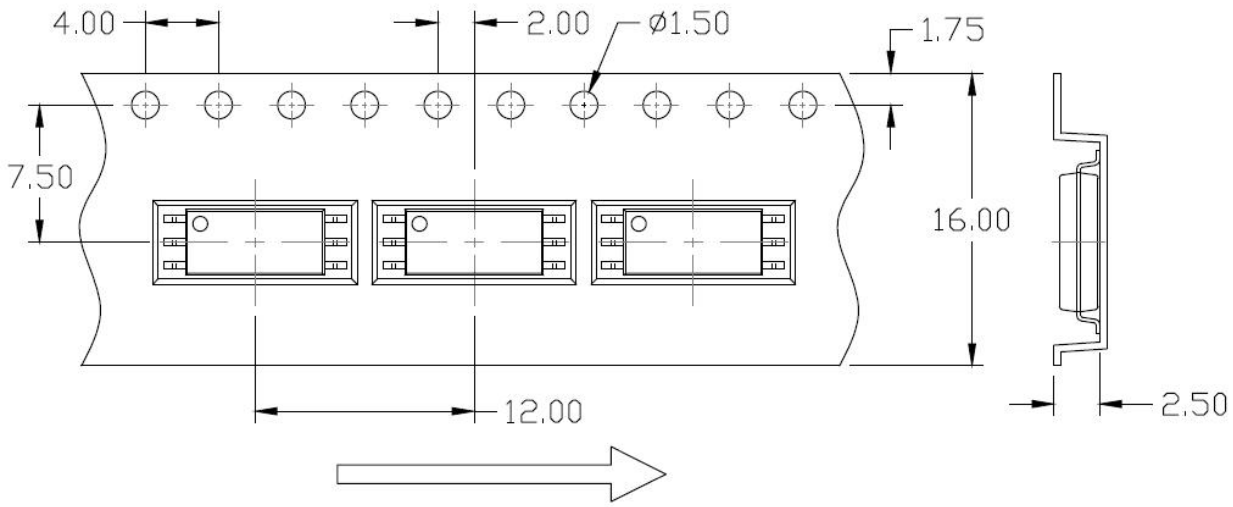


Surface Mount (Gullwing) Lead Forming

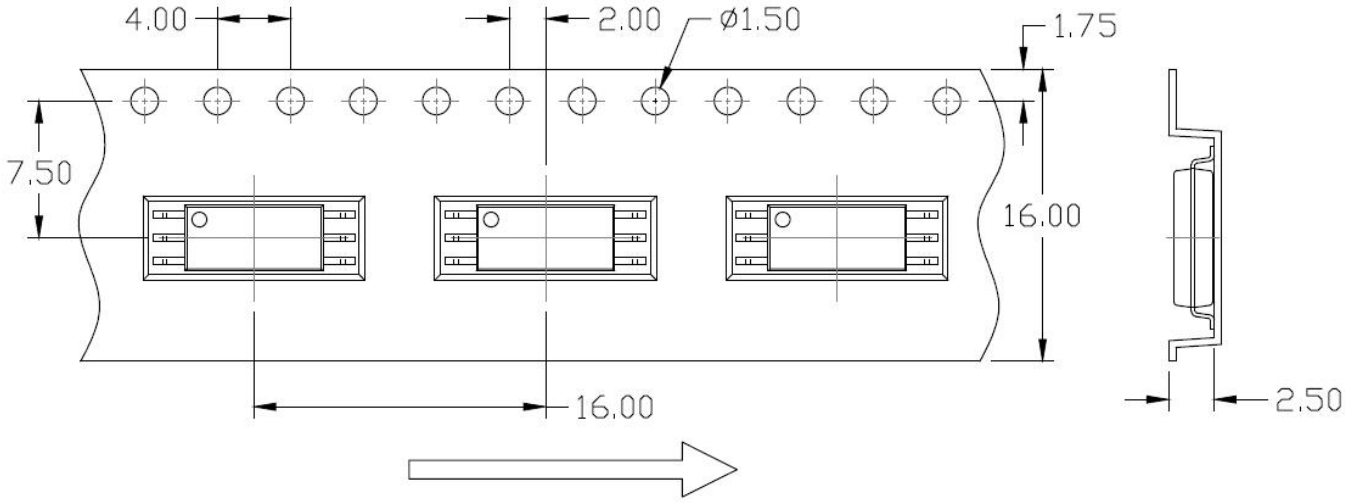


CARRIER TAPE SPECIFICATIONS (Dimensions in mm unless otherwise stated)

Standard P Type

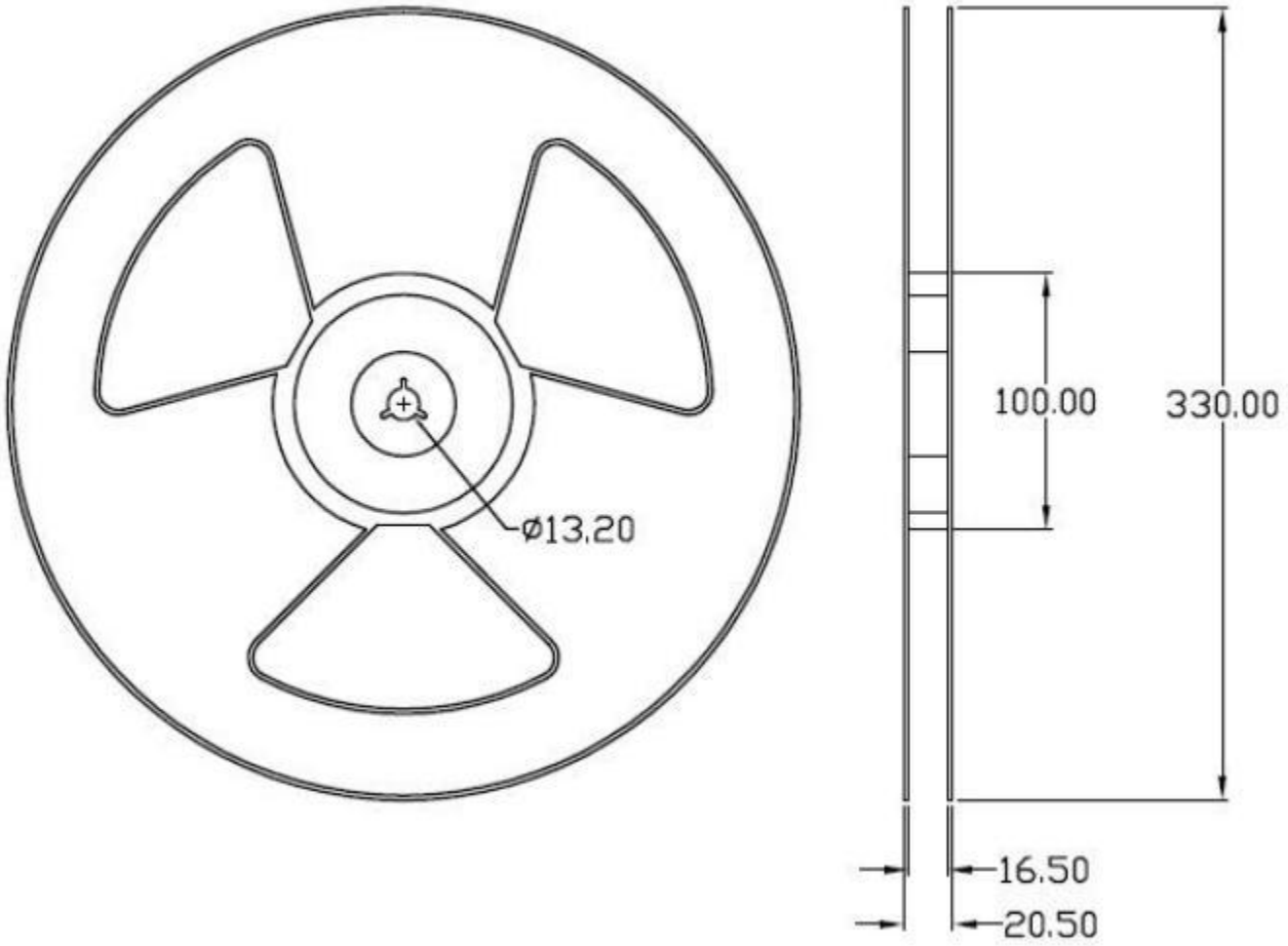


Standard W Type



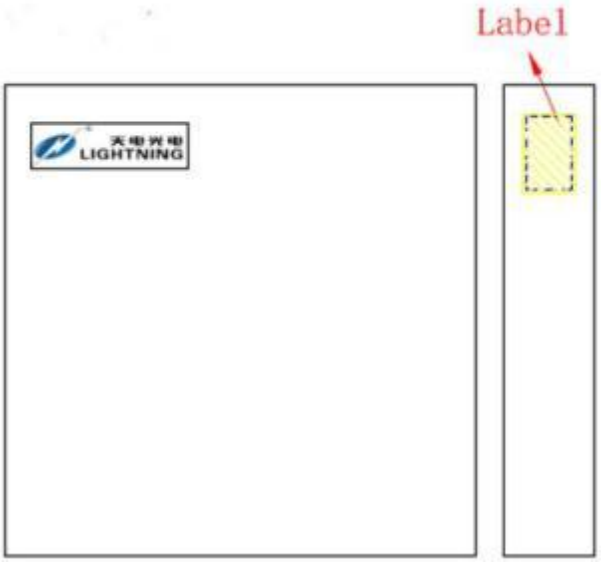
REEL SPECIFICATIONS (Dimensions in mm unless otherwise stated)

Option



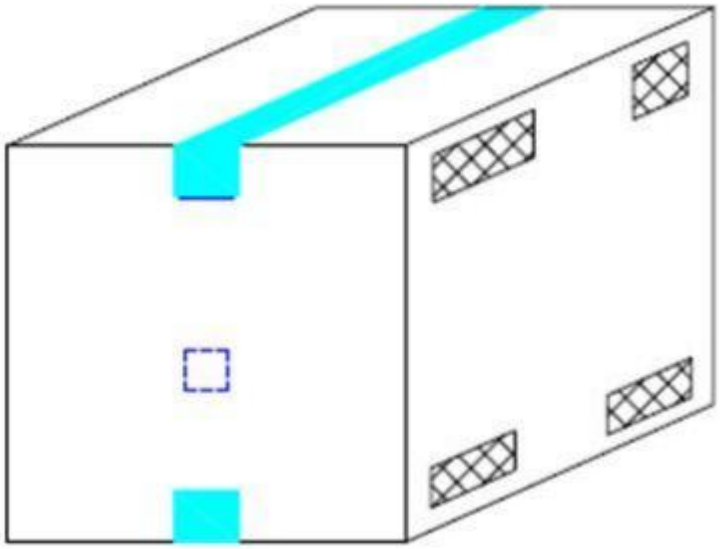
BOX SPECIFICATIONS (Reel Type)

Inner Box



- L x W x H = 36cm x 36cm x 6.9cm

Outer Box



- L x W x H = 45cm x 3

ORDERING AND MARKING INFORMATION

MARKING INFORMATION

TD : Company Abbr.
501 : Part Number
V : VDE Option
Y : Fiscal Year
A : Manufacturing Code
WW : Work Week

ORDERING INFORMATION

TDL501(Y)(Z)-GV

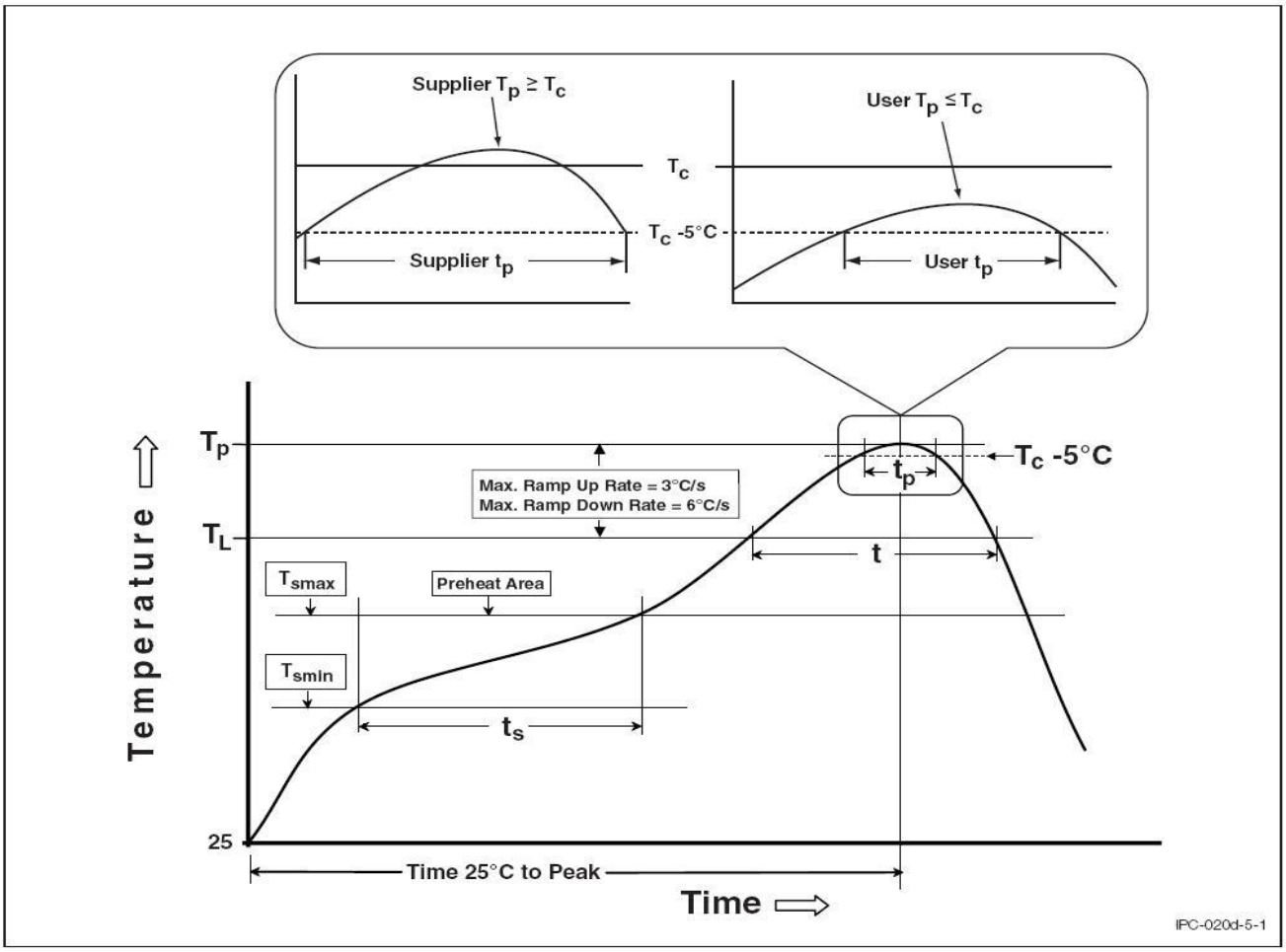
TD – Company Abbr
L – LSOP6
501 – Part Number
Y – Lead Form Option (P/W)
Z – Tape and Reel Option (T3)
G – Material Option
(G: Green, None: Non-Green)
V – VDE Option (V or None)

PACKING QUANTITY

Option	Quantity	Quantity – Inner box	Quantity – Outer box
T3	1500 Units/Reel	3 Reels/Inner box	5 Inner box/Outer box = 22.5k Units

REFLOW INFORMATION

REFLOW PROFILE



Profile Feature	Sn-Pb Assembly Profile	Pb-Free Assembly Profile
Temperature Min. (Tsmin)	100	150°C
Temperature Max. (Tsmax)	150	200°C
Time (ts) from (Tsmin to Tsmax)	60-120 seconds	60-120 seconds
Ramp-up Rate (tL to tP)	3°C/second max.	3°C/second max.
Liquidous Temperature (TL)	183°C	217°C
Time (tL) Maintained Above (TL)	60 – 150 seconds	60 – 150 seconds
Peak Body Package Temperature	235°C +0°C / -5°C	260°C +0°C / -5°C
Time (tP) within 5°C of 260°C	20 seconds	30 seconds
Ramp-down Rate (TP to TL)	6°C/second max	6°C/second max
Time 25°C to Peak Temperature	6 minutes max.	8 minutes max.

DISCLAIMER

- LIGHTNING is continually improving the quality, reliability, function and design. LIGHTNING reserves the right to make changes without further notices.
- The characteristic curves shown in this datasheet are representing typical performance which are not guaranteed.
- LIGHTNING makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, LIGHTNING disclaims (a) any and all liability arising out of the application or use of any product, (b) any and all liability, including without limitation special, consequential or incidental damages, and (c) any and all implied warranties, including warranties of fitness for particular
- 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 purpose, non-infringement and merchantability.
- This product is not intended to be used for military, aircraft, automotive, medical, life sustaining or lifesaving applications or any other application which can result in human injury or death.
- Please contact LIGHTNING sales agent for special application request.
- Immerge unit's body in solder paste is not recommended.
- Parameters provided in datasheets may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated in each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify LIGHTNING's terms and conditions of purchase, including but not limited to the warranty expressed therein.
- Discoloration might be occurred on the package surface after soldering, reflow or long-time use. It neither impacts the performance nor reliability.