1. Product features

- Peak breakdown voltage
  KL302X: 400V
- High isolation voltage between inputs and output (Viso=5000 V rms)
- Compact dual-in-line package
- Compliance with EU REACH
- Pb free and RoHS compliant
- Safety approval
  CQC approved (No. CQC23001407999)
  UL approved (No. UL-CA-2340753-0)

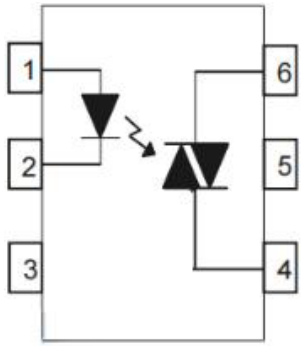
2. Product Descripion

- The KL302X of device consists of a GaAs infrared emitting diode optically coupled to a monolithic silicon random phase photo Triac
- It is designed for interfacing between electronic controls and power triacs to control resistive and inductive loads for 115 to 240 VAC operations.

3. Product Applications

- Solenoid/valve controls, Temperature controls, Motor controls
- Static AC power switch
- Interfacing microprocessors to 115 to 240Vac peripherals
- Incandescent lamp dimmers, Lamp ballasts

4. Functional Diagram



Pin Configuration
1. Anode
2. Cathode
3. No Connection
4. Terminal
5. Substrate (do not connect)
6. Terminal

5. Electrical-Optical characteristics

- Absolute Maximum Ratings(Ta=25℃)

Parameter		Symbol	Rated Value	Unit
Input	Forward current	I_F	60	mA
	Reverse voltage	V_R	6	V
	Power dissipation	P_D	100	mW
	Derating factor (above Ta = 85°C)		3.8	mW /°C
Output	Off-state Output Terminal Voltage	V_{DRM}	400	V
	Peak Repetitive Surge Current (pw=1ms,120pps)	I_{TSM}	1	A
	On-State RMS Current	$I_{T(RMS)}$	100	mA
	Output Power dissipation	Pc	300	mW
	Derating factor (above Ta = 85°C)		7.4	mW/℃
Total Consume Power		P_{TOT}	330	mW
Isolation Voltage (1*)		V_{iso}	5000	Vrms
Operating temperature		T_{OPR}	-55 to +100	℃
Storage temperature		T_{STG}	-55 to +125	℃
Soldering temperature (2*)		T_{SOL}	260	℃

(Notes):

1* AC for 1 minute, R.H.= 40 ~ 60% R.H. In this test, pins 1, 2&3 are shorted together, and pins 4, 5 & 6 are shorted together.

2* Soldering time is 10 seconds

6. Electrical Characteristics(Ta=25℃ unless specified otherwise)

Parameter		Symbol	Min.	Typ.	Max.	Unit	Condition
In put	Forward voltage	V_F	-	1.18	1.5	V	I_F=10mA
	Reverse current	I_R	-	-	10	μA	V_R=6V
Out put	Peak Blocking Current	I_{DRM}	-	-	100	nA	V_{DRM} = Rated V_{DRM} I_F = 0 mA 2*
	Peak On-state Voltage	V_{TM}	-	-	3	V	TM=100 mA peak, I_F=Rated I_{FT}
	Critical Rate of Rise off-state Voltage	dv/dt	-	100	-	V/μs	V_{PEAK} =Rated V_{DRM}, I_F=0mA 3*

- (Notes):

1*. Typical values at Ta = 25°C

2*. Test voltage must be applied within dv/dt rating

3*. This is static dv/dt,Commutating dv/dt is a function of the load-driving thyristor(s) only

- Transfer Characteristics (Ta=25℃ unless specified otherwise)

Parameter		Symbol	Min.	Typ.	Max.	Unit	Condition
LED Trigger Current	KL3020	I_{FT}	-	-	30	mA	Main terminal Voltage=3V 4*
	KL3021	I_{FT}	-	-	15		
	KL3022	I_{FT}	-	-	10		
	KL3023	I_{FT}	-	-	5		
Holding Current		I_H	-	250	-	uA	

(Notes):

4*. All devices are guaranteed to trigger at an IF value less than or equal to max IFT. Therefore, Recommended operating IF lies between max IFT (30 mA for KL3020, 15 mA for KL3021, 10 mA for KL3022, 5 mA for KL3023) and absolute maximum IF (60 mA).

7. Reliability Test

NO.	Test Items	Reference	Test conditions	Test process	Qty.(pcs)	LTPD
1	TC	JESD22-A104C	H:125±5℃ 15min ∫5min L:-55±5℃ 15min	300cycle	45	0/45
2	HTOL	JESD22-A108C	HTOL@110°±5C IF=15mA Ic=AC 20mA	168、500、1000hrs	45	0/45
3	HTRB	JESD22-A108C	HTRB@100±5℃ Vce=480V	168、500、1000hrs	45	0/45
4	H3TRB	JESD22-A101-B	H3TRB@ 85+5/-2℃、85±5%RH Vce=100V	168、500、1000hrs	45	0/45
5	Autoclave	JESD22-A102-C	Ta=121±5℃, 100±5%RH, 2atm	96hrs	45	0/45
6	HTS	JESD22-A103C	HTS@125±5℃	168、500、1000hrs	45	0/45
7	LTS	JESD22-A119	LTS@-55±5℃	168、500、1000hrs	45	0/45
8	RSH	JESD22-B106C	RSH@260±5℃	10sec*3times	45	0/45
9	SD	JESD22-B102D	Pb-free@ 245±5℃	3sec*1times	22	0/22
Remarks	All the tests should be performed according to customers' actual requirements, while difference of test standard or special requirements exist. Otherwise, all the tests are performed according to the standard listed above. Different current is applied to the tests of different product models					

8. Characteristic Curves

图1. 正向电流与正向电压的关系
Forward Current VS Forward Voltage

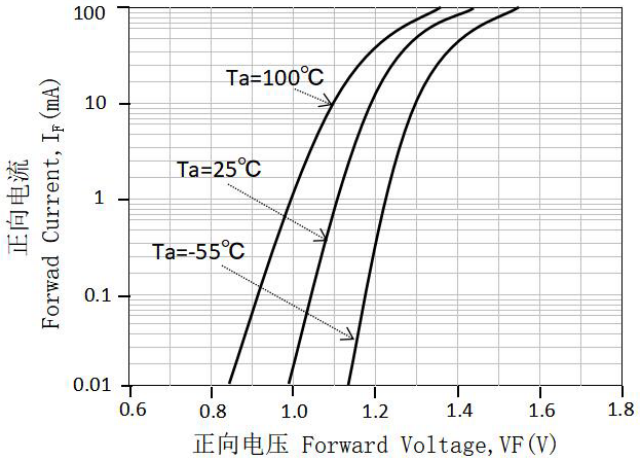


图2. 导通特性
On-State Characteristics

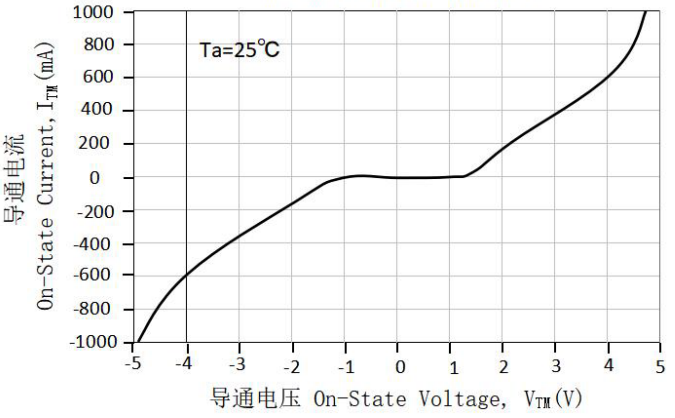


图3. 保持电流 vs 环境温度的关系
Holding Current vs Ambient Temperature

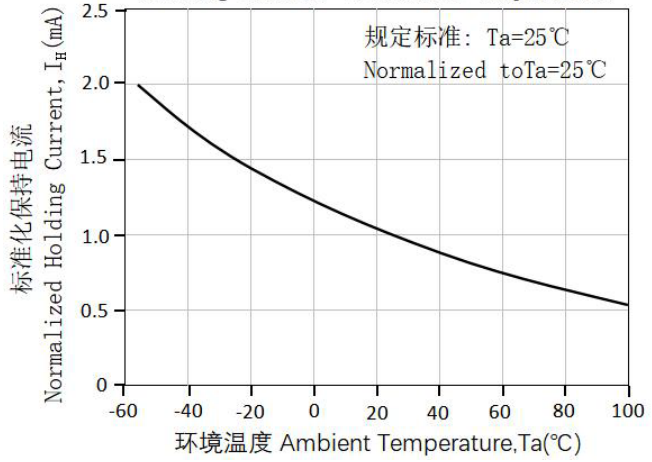


图4. 触发所需的LED电流 vs LED脉冲宽度的关系
LED Current Required to Trigger vs LED Pulse Widt

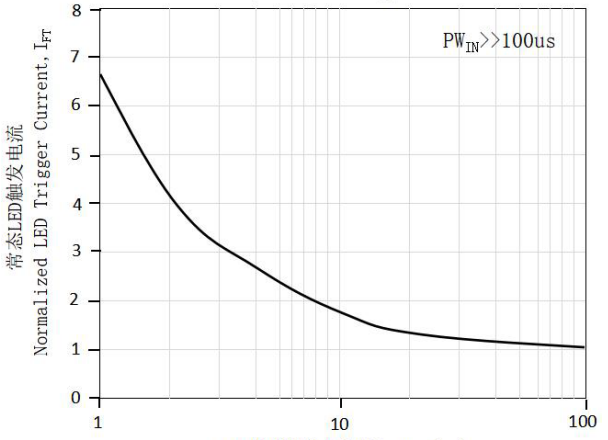


图5. 漏电流 vs 环境温度的关系
Leakage Current VS Ambient Temperature

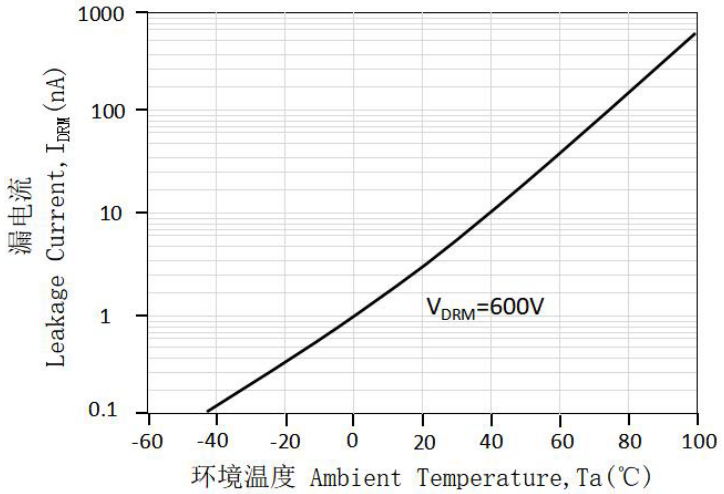
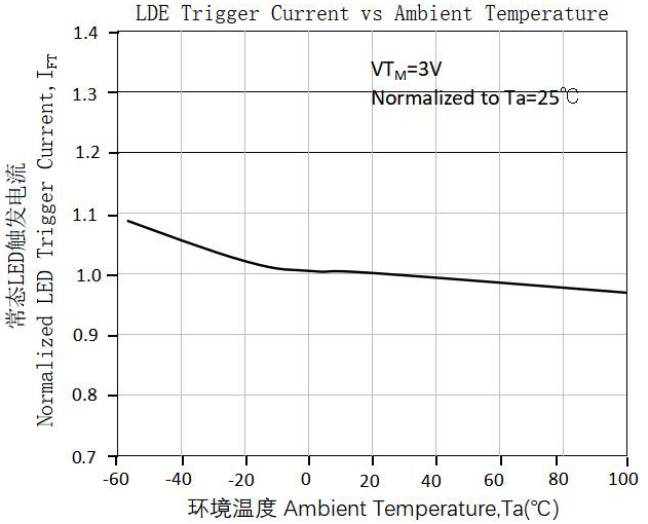


图6. LED触发电流 vs 环境温度的关系
LDE Trigger Current vs Ambient Temperature



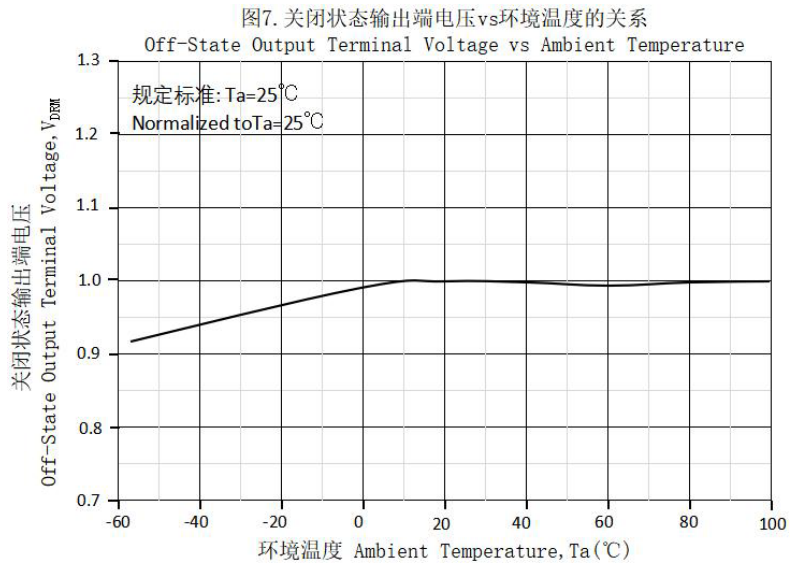
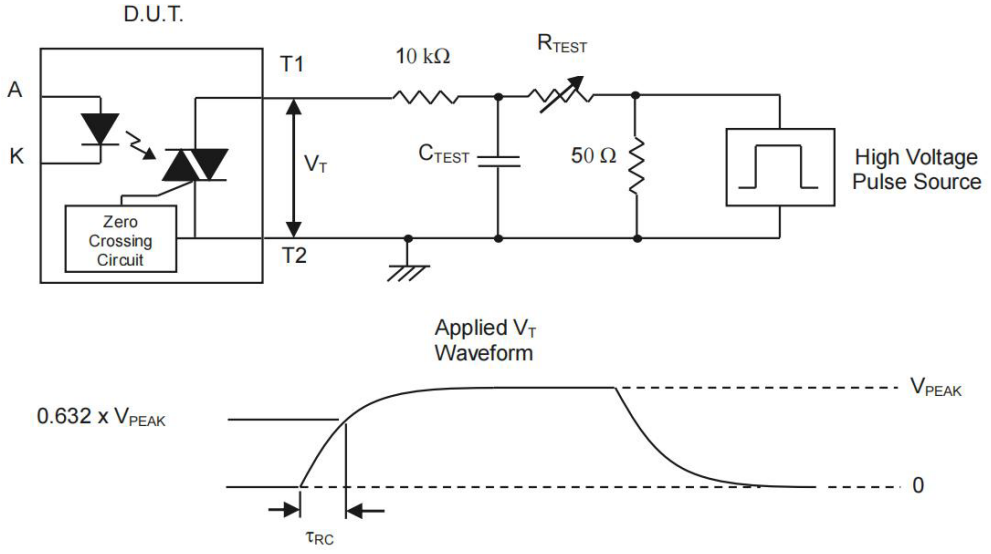


图8. Static dv/dt Test Circuit & Waveform



Measurement Method

The high voltage pulse is set to the required VPEAK value and applied to the D.U.T. output side through the RC circuit above. LED current is not applied. The waveform VT is monitored using a x100 scope probe. By varying RTEST, the dv/dt (slope) is increased, until the D.U.T. is observed to trigger (waveform collapses). The dv/dt is then decreased until the D.U.T. stops triggering. At this point, τ_{RC} is recorded and the dv/dt calculated. $dv/dt=0.632*V_{PEAK}/\tau_{RC}$

For example, V_{PEAK} = 400V for KL302X series. The dv/dt value is calculated as follows:

$dv/dt= 0.632*400/\tau_{RC}$

9. Order Information

- Part Number

KL302XY(Z)-V

(PN:KL302XY-Z-V)

(Notes):

X = Part No. (0, 1 ,2 or 3)

Y = Lead form option (S, S1, M or none)

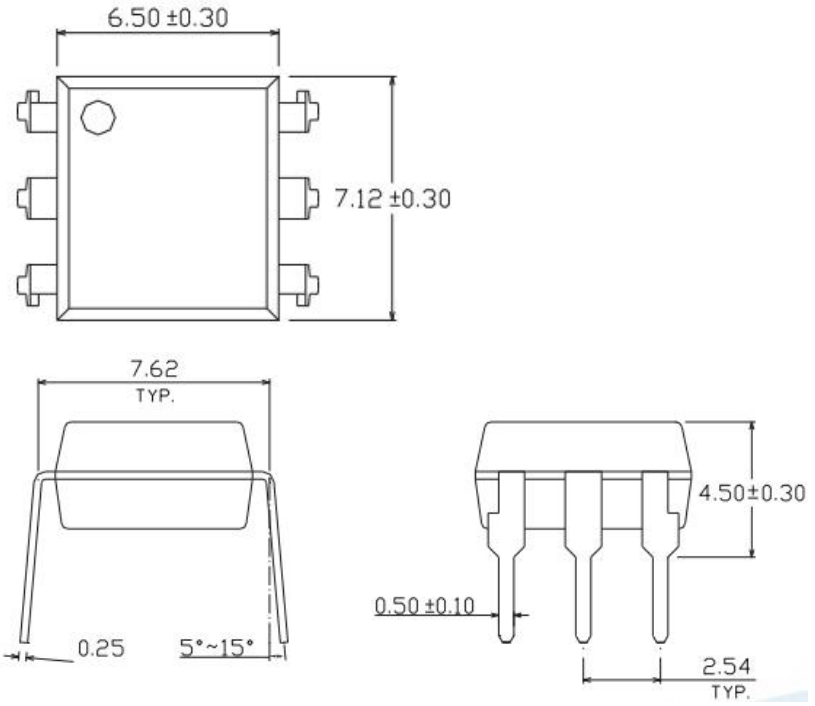
Z = Tape and reel option (TA, TB or none)

V = VDE (Only add "V" to laser characters specified by the customer)

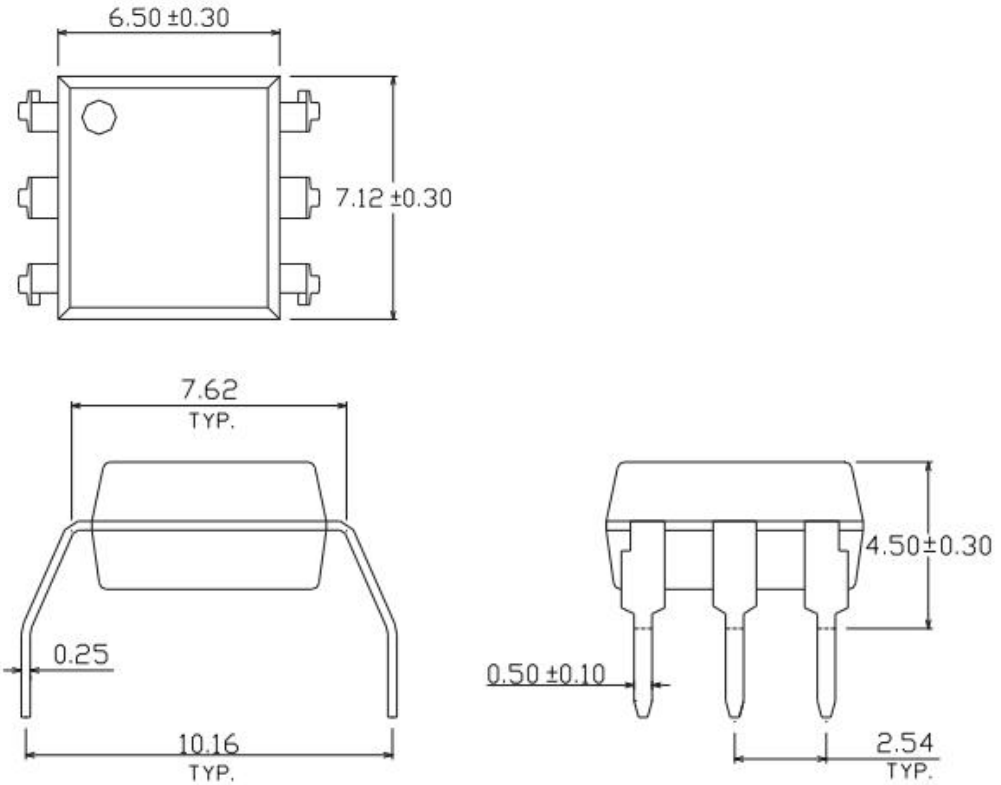
Option	Description	Packing quantity
None	Standard DIP-6	65 units per tube
M	Wide lead bend (0.4 inch spacing)	65 units per tube
S (TA)	Surface mount lead form + TA tape & reel option	1000 units per tube
S (TB)	Surface mount lead form + TB tape & reel option	1000 units per tube
S1 (TA)	Surface mount lead form (low profile) + TA tape & reel option	1000 units per reel
S1 (TB)	Surface mount lead form (low profile) + TB tape & reel option	1000 units per reel

10. Package Drawing(Unit:mm)

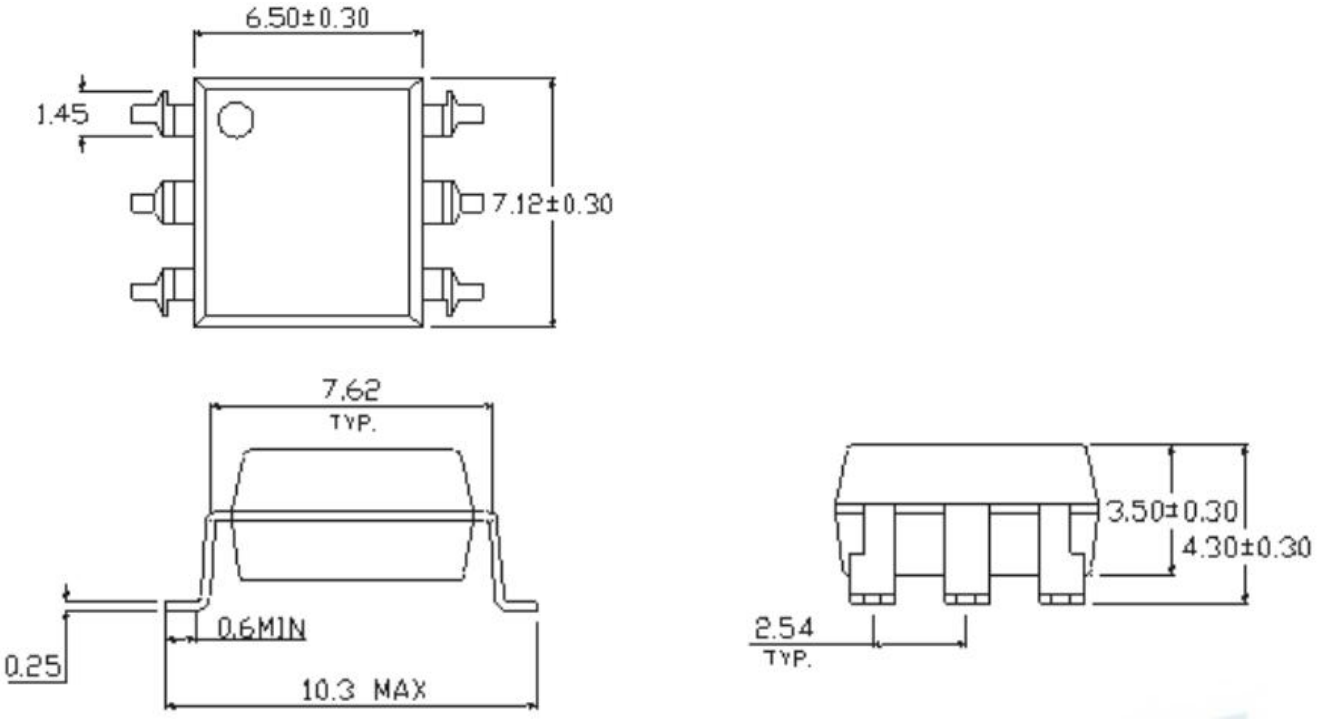
- Standard DIP Type



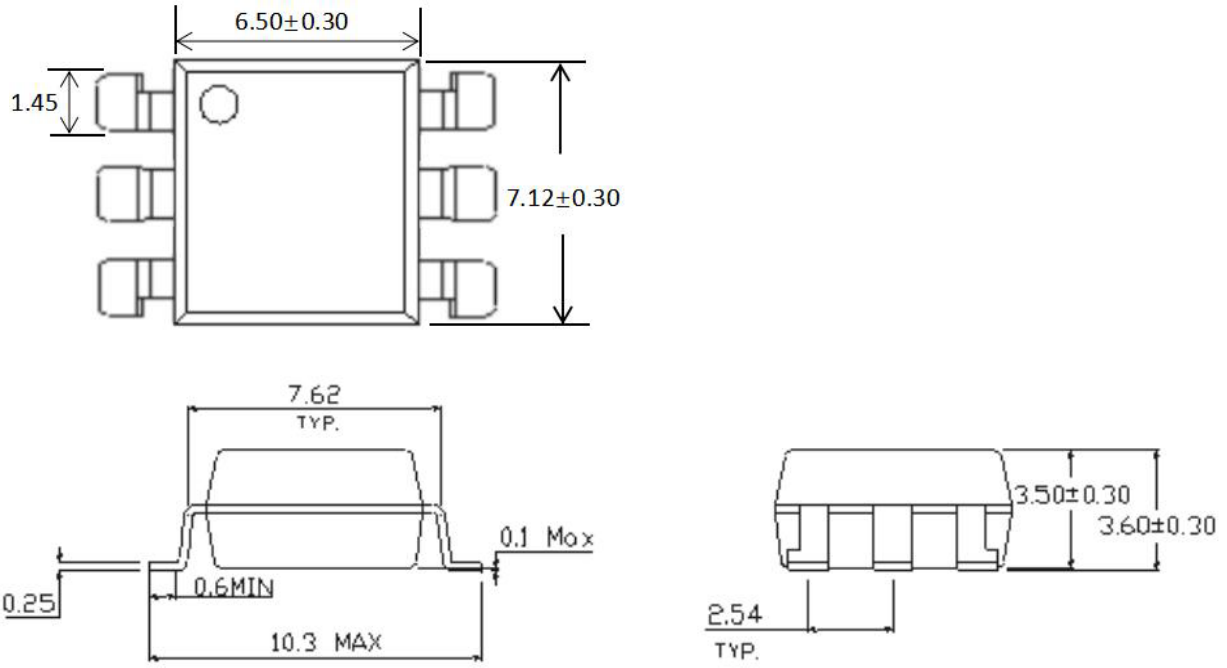
- Option M Type



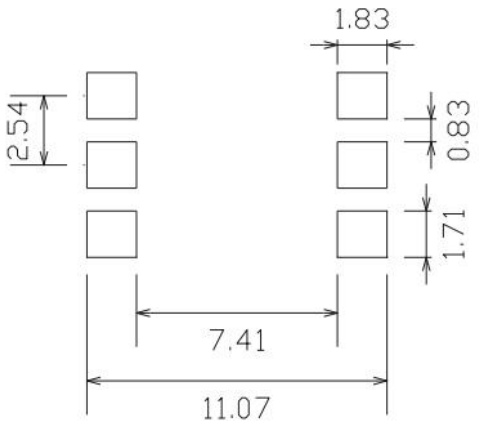
- Option S Type



- Option S1 Type



- Surface patch type PIN foot pad layout

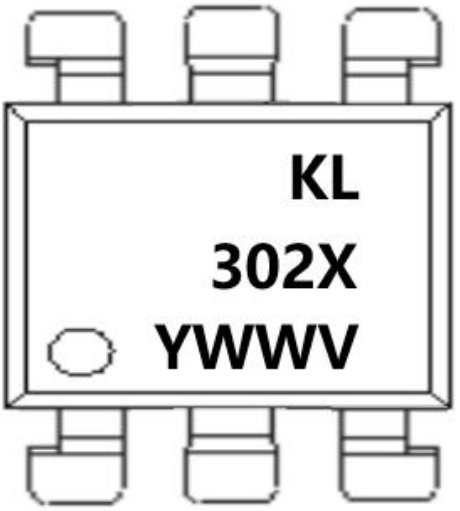


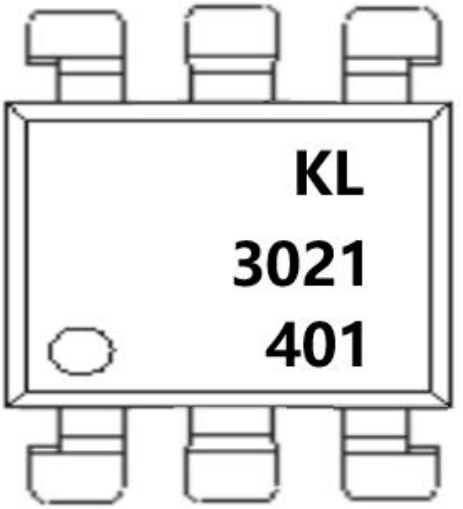
Notes

a. Suggested pad dimension is just for reference only

b. Please modify the pad dimension based on individual need

11. Device marking





(Template reference)

(Notes):

KL = Denotes KingLight

302X = Denotes Device Part Number
Part No. (0, 1, 2 or 3)

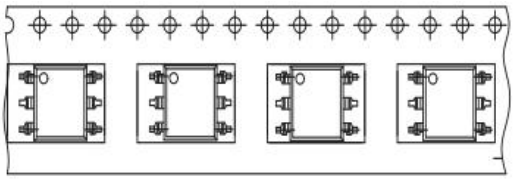
Y = Denotes 1 digit Year code

WW = Denotes 2 digit Week code

V = VDE (Only add "V" to laser characters specified by the customer)

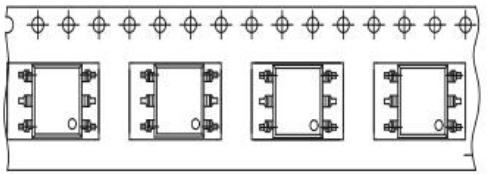
12. Tape & Reel Packing Specifications

• Option TA



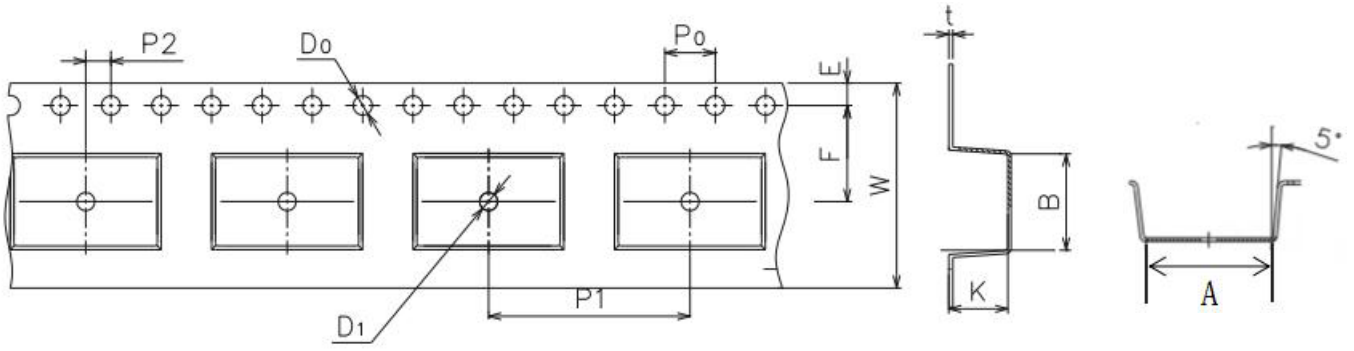
Direction of feed from reel

• Option TB



Direction of feed from reel

Material belt size

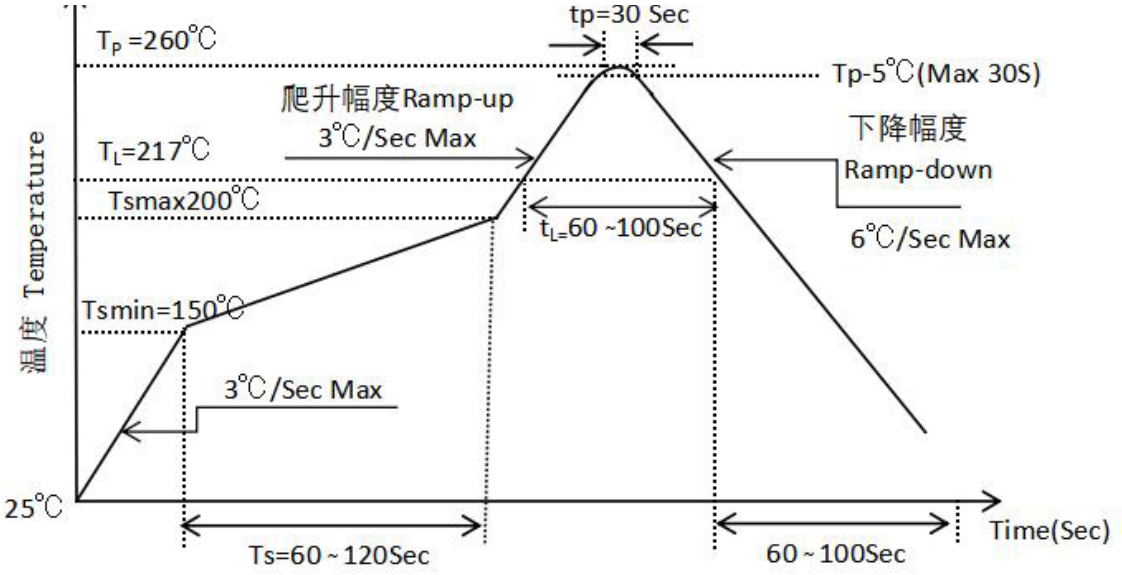


Dimension No.	A	B	D0	D1	E	F
Dimension(mm)	10.8±0.1	7.5±0.1	1.5±0.1	1.5±0.1	1.75±0.1	7.5±0.1
Dimension No.	P0	P1	P2	t	W	K
Dimension(mm)	4.0±0.15	16.0±0.1	2.0±0.1	0.35±0.03	16.0±0.2	4.5±0.1

13. Temperature Profile Of Soldering

- **Reflow soldering**

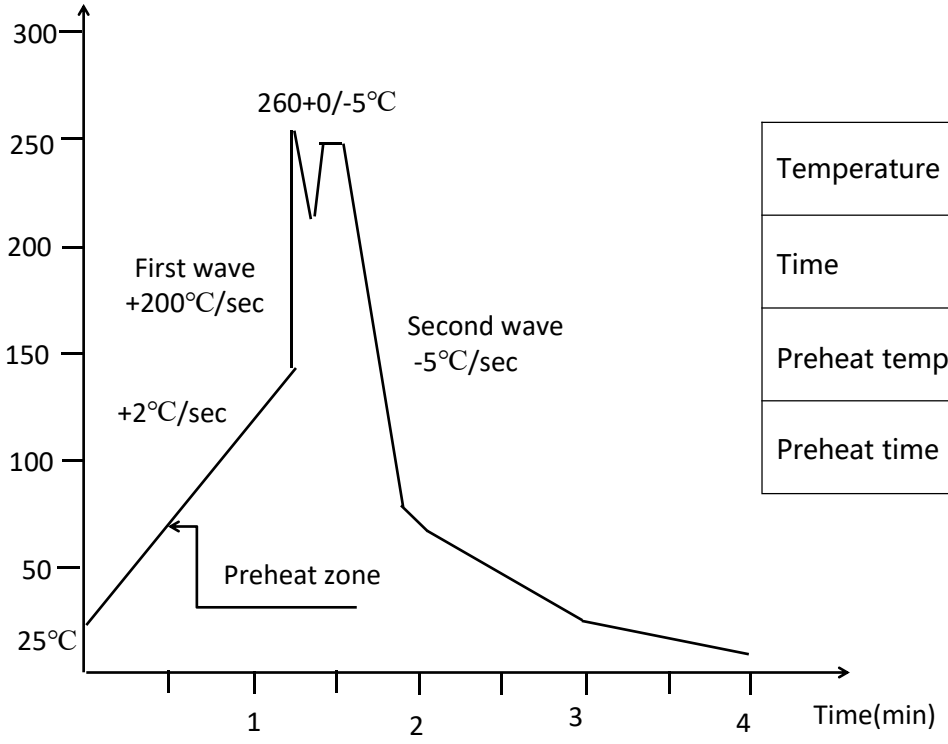
  One time soldering reflow is recommended within the condition of temperature and time profile shown below. Do not solder more than three times.



Item	Symbol	Min.	Max.	Unit
Preheat Temperature	T_s	150	200	℃
Preheat Time	ts	60	120	s
Ramp-Up Rate (T_L to T_P)	-	-	3	℃/s
Liquidus Temperature	T_L	217		℃
Time above Liquidus Temperature T_L	t_L	60	100	s
Peak Temperature	T_P	-	260	℃
Time During Which T_c Is Between (T_P-5) and T_P	t_p	-	30	s
Ramp-down Rate(T_P to T_L)	-	-	6	℃/s

- **Wave Soldering**

One time soldering is recommended within the condition of temperature



Temperature	260℃+0/-5℃
Time	10S
Preheat temperature	25 to 140℃
Preheat time	30 to 80 S