

RANDOM-PHASE TRIAC DRIVER PHOTOCOUPLER

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)

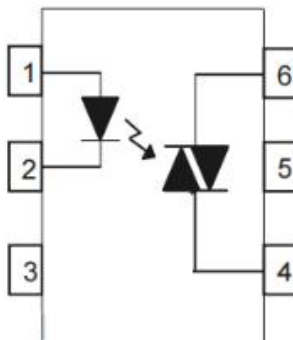
2. Product Description

- 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°C)

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	P_C	300	mW
	Derating factor (above Ta = 85°C)		7.4	mW/°C
Total Consume Power		P_{TOT}	330	mW
Isolation Voltage (1*)		V_{iso}	5000	Vrms
Operating temperature		T_{OPR}	-55 to +100	°C
Storage temperature		T_{STG}	-55 to +125	°C
Soldering temperature (2*)		T_{SOL}	260	°C

(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°C unless specified otherwise)

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

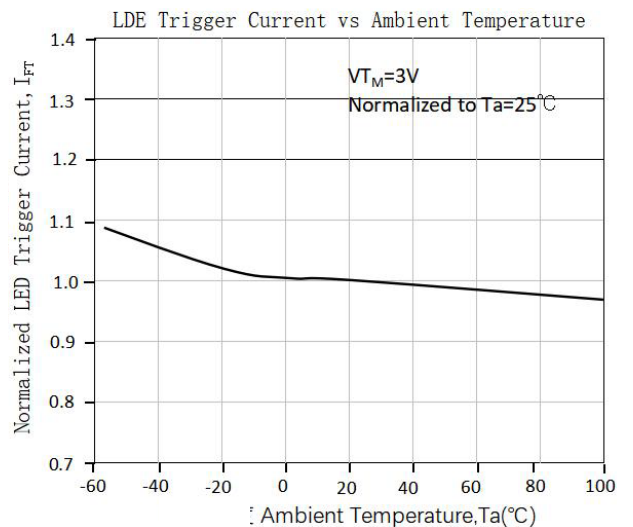
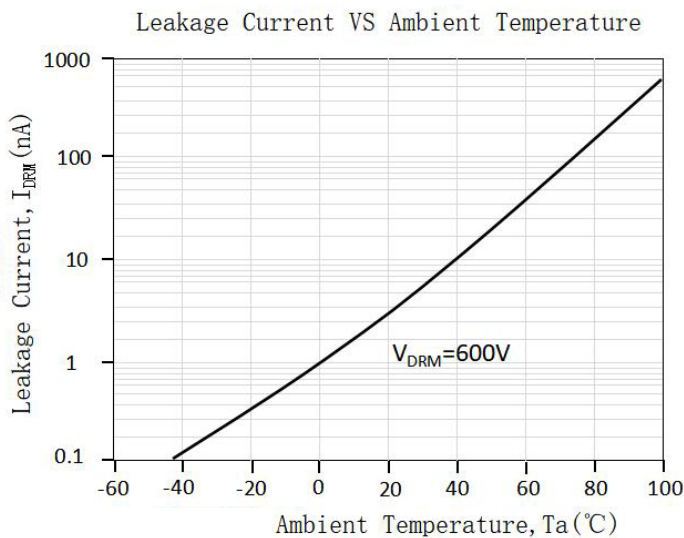
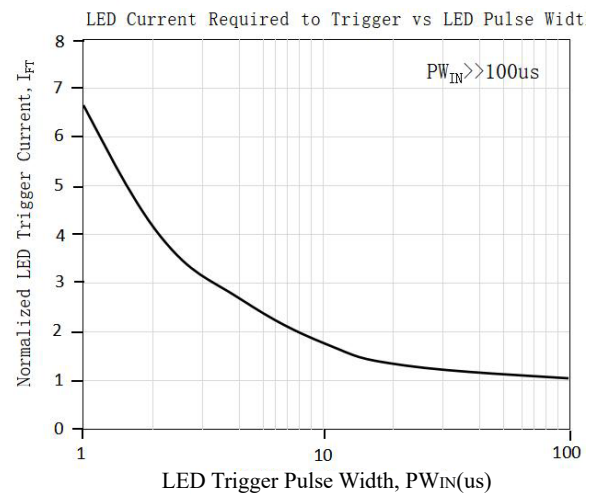
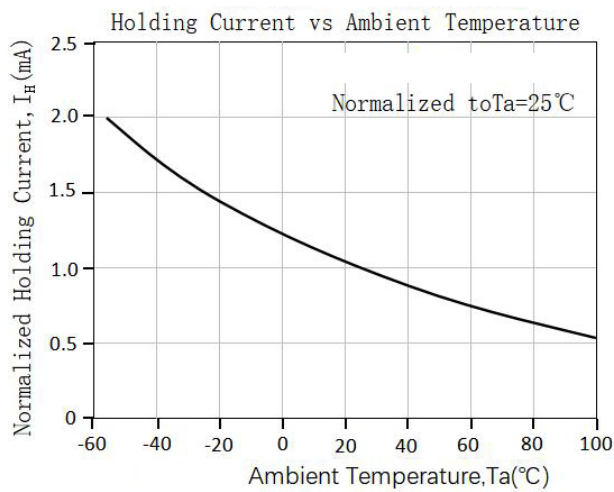
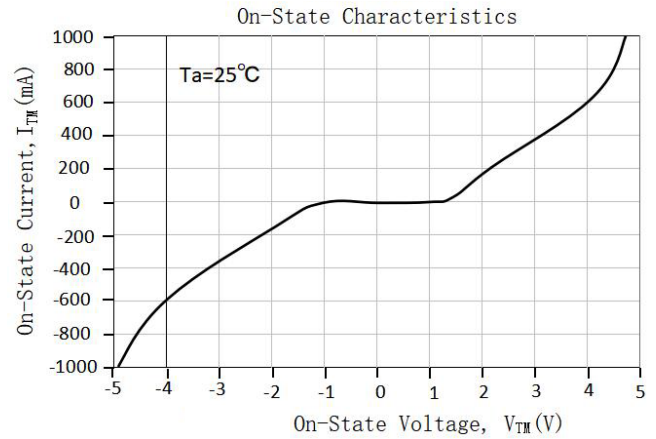
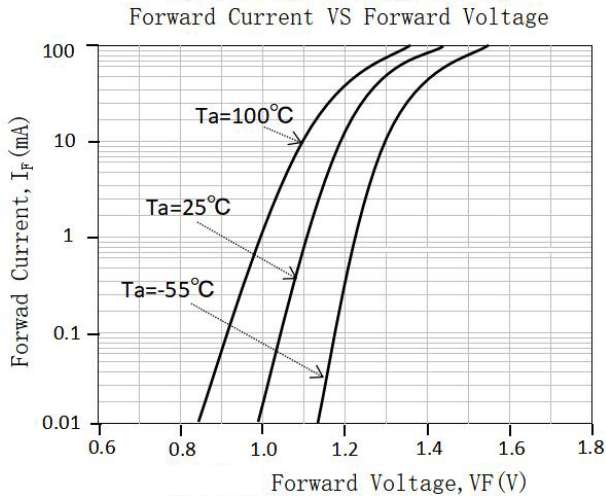
(Notes):

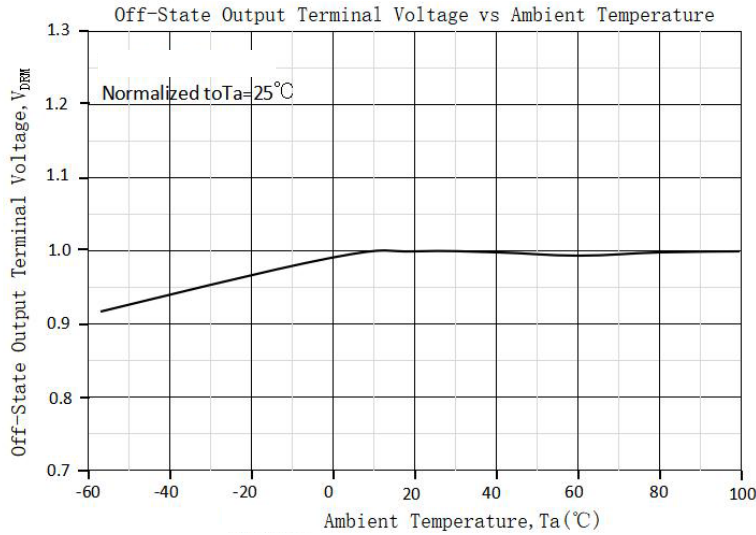
4*. All devices are guaranteed to trigger at an IF value less than or equal to max IFT. Therefore, Recommended operating IF lies between max IFT (30 mA for KL3020, 15 mA for KL3021, 10 mA for KL3022, 5 mA for KL3023) and absolute maximum IF (60 mA).

7. Reliability Test

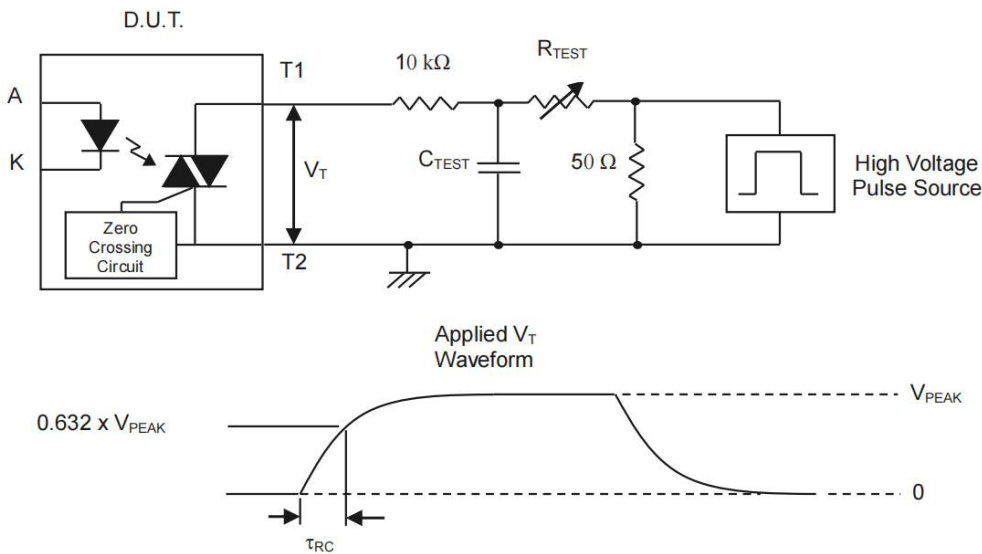
NO.	Test Items	Reference	Test conditions	Test process	Qty.(pcs)	LTPD
1	TC	JESD22-A104C	H:125±5°C 15min f5min L:-55±5°C 15min	300cycle	45	0/45
2	HTOL	JESD22-A108C	HTOL@110°±5C IF=15mA Ic=AC 20mA	168、500、 1000hrs	45	0/45
3	HTRB	JESD22-A108C	HTRB@100±5°C Vce=480V	168、500、 1000hrs	45	0/45
4	H3TRB	JESD22-A101-B	H3TRB@ 85+5/- 2°C、85±5%RH Vce=100V	168、500、 1000hrs	45	0/45
5	Autoclave	JESD22-A102-C	Ta=121±5°C, 100±5%RH, 2atm	96hrs	45	0/45
6	HTS	JESD22-A103C	HTS@125±5°C	168、500、 1000hrs	45	0/45
7	LTS	JESD22-A119	LTS@-55±5°C	168、500、 1000hrs	45	0/45
8	RSH	JESD22-B106C	RSH@260±5°C	10sec*3times	45	0/45
9	SD	JESD22-B102D	Pb-free@ 245±5°C	3sec*1times	22	0/22
Rem arks	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





Static dv/dt Test Circuit & Waveform



Measurement Method

The high voltage pulse is set to the required V_{PEAK} value and applied to the D.U.T. output side through the RC circuit above. LED current is not applied. The waveform V_T is monitored using a x100 scope probe. By varying R_{TEST} , 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. $dv/dt = 0.632 \cdot V_{PEAK} / \tau_{RC}$

For example, $V_{PEAK} = 400V$ for KL302X series. The dv/dt value is calculated as follows: $dv/dt = 0.632 \cdot 400 / \tau_{RC}$

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)

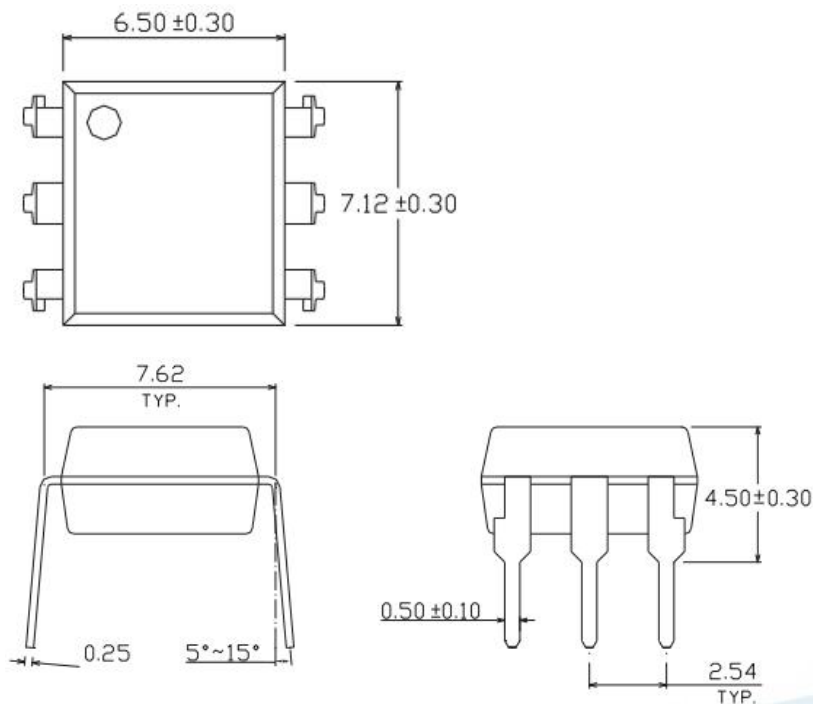
Z = Tape and reel option (TA, TB or none)

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

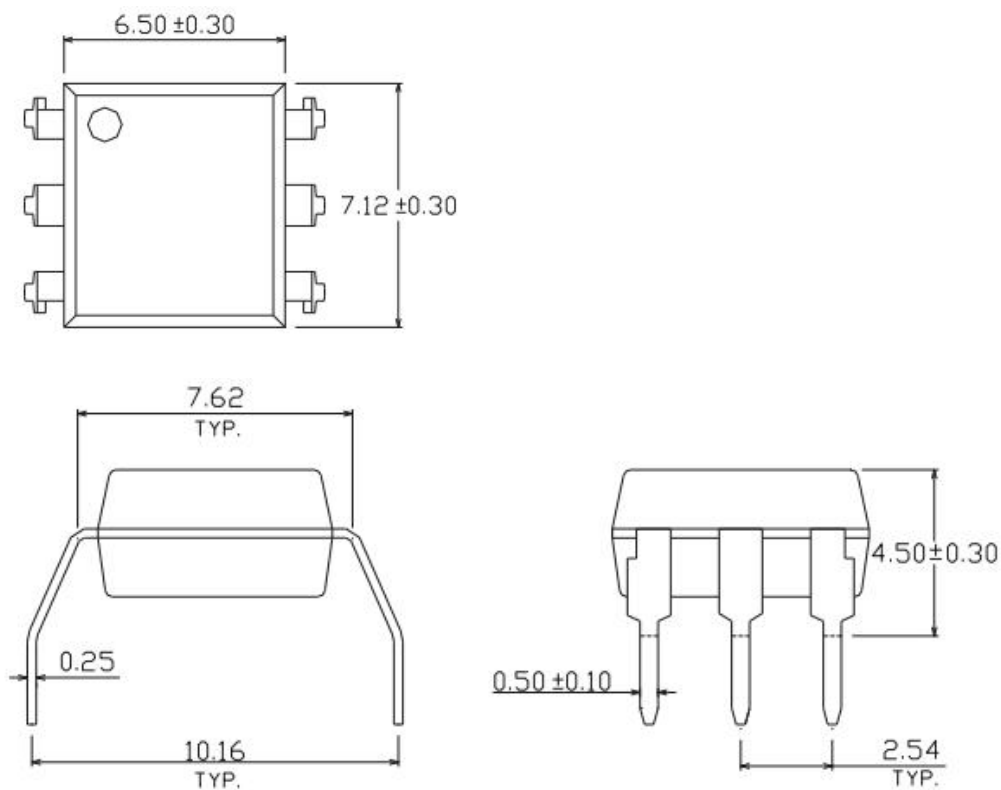
Option	Description	Packing quantity
None	Standard DIP-6	65 units per tube
M	Wide lead bend (0.4 inch spacing)	65 units per tube
S (TA)	Surface mount lead form + TA tape & reel option	1000 units per tube
S (TB)	Surface mount lead form + TB tape & reel option	1000 units per tube
S1 (TA)	Surface mount lead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

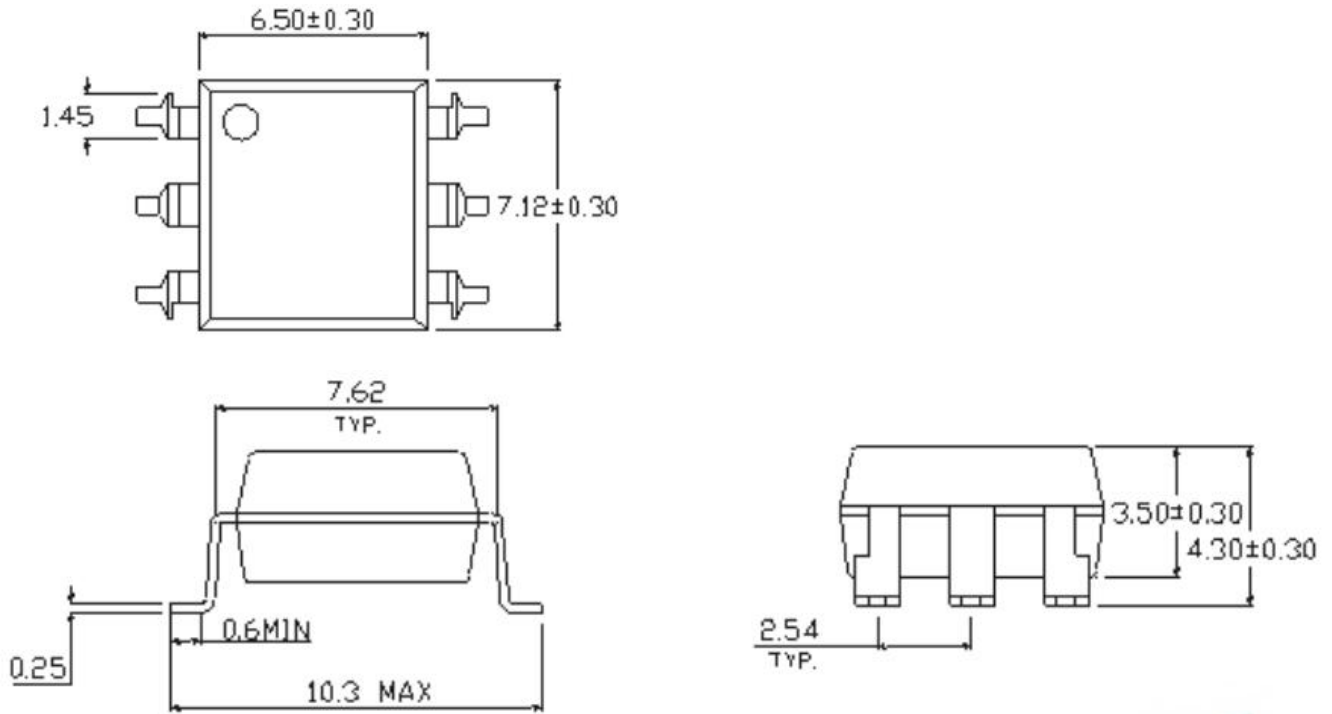
- Standard DIP Type



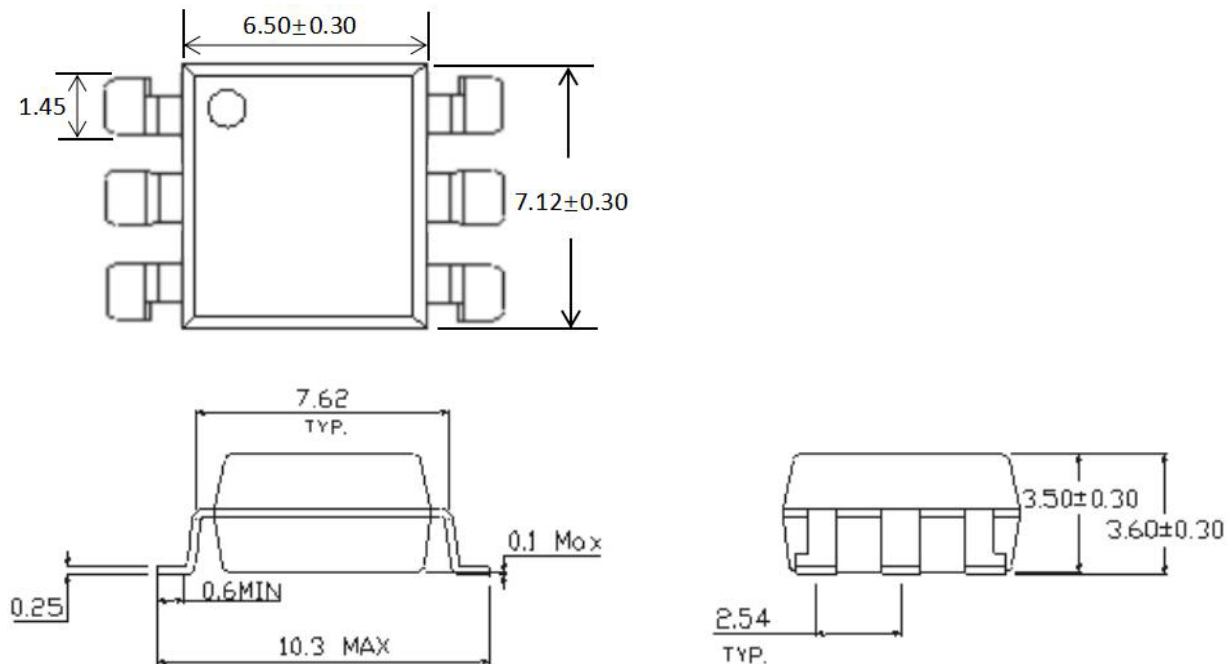
- Option M Type



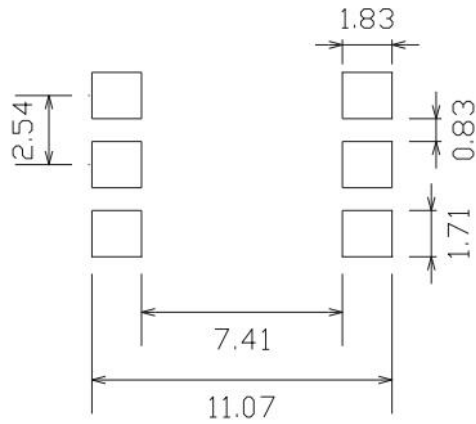
- Option S Type



- Option S1 Type

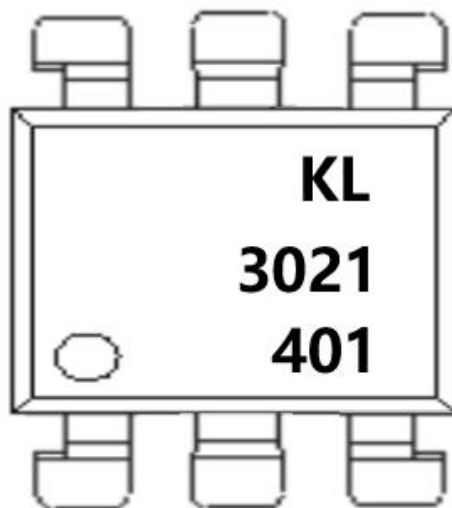
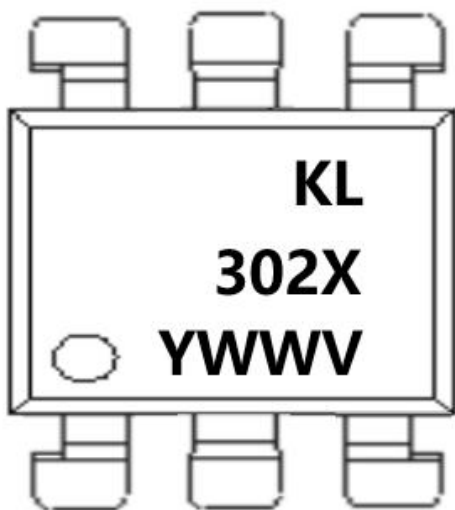


- Surface patch type PIN foot pad layout

**Notes**

- Suggested pad dimension is just for reference only
- Please modify the pad dimension based on individual need

11. Device marking



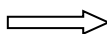
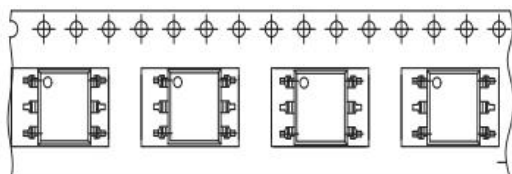
(Template reference)

(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)

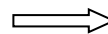
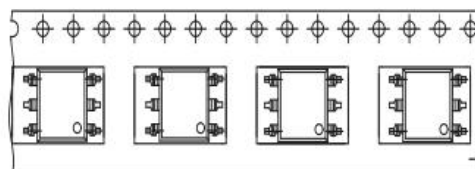
12. Tape & Reel Packing Specifications

- Option TA



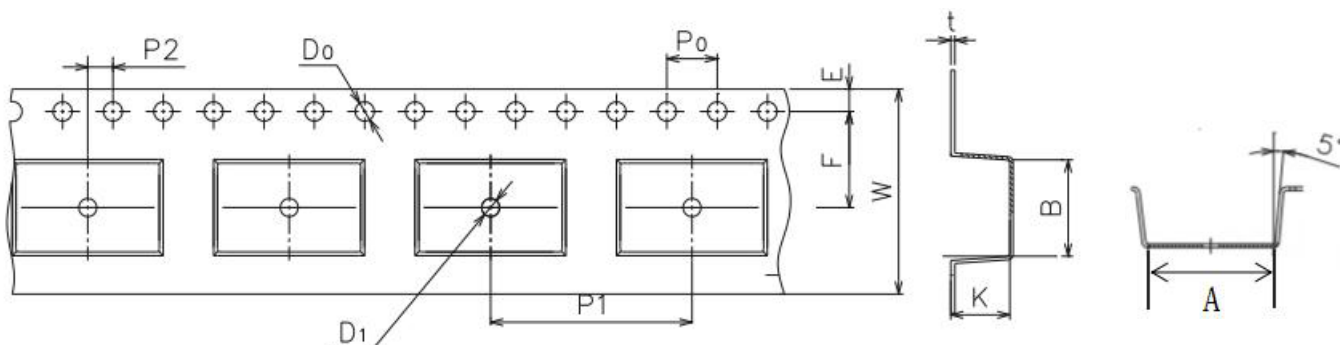
Direction of feed from reel

- Option TB



Direction of feed from reel

Material belt size

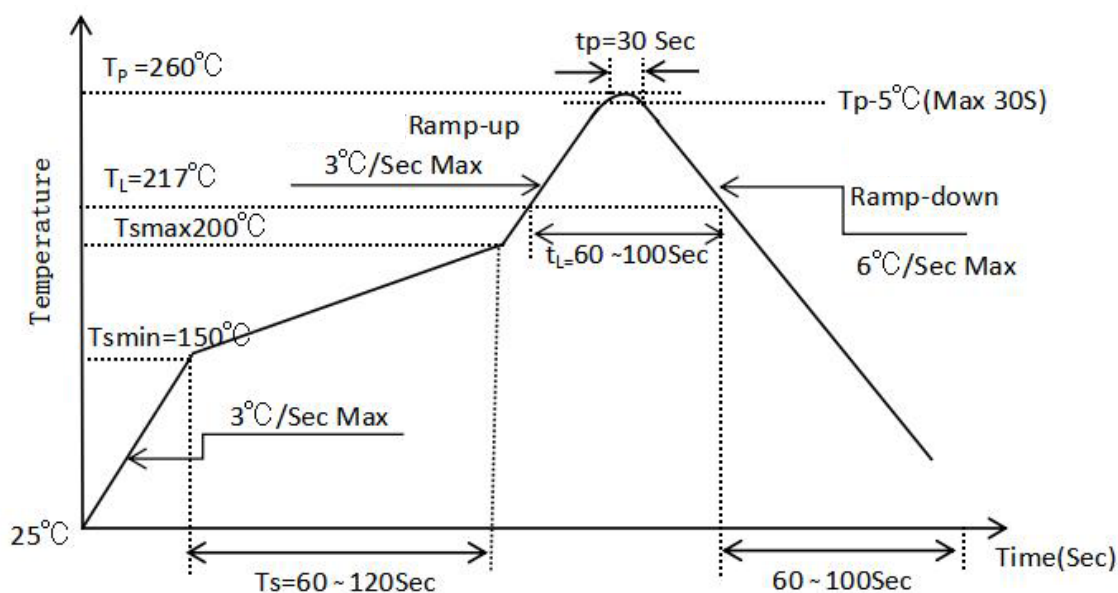


Dimension No.	A	B	D0	D1	E	F
Dimension(mm)	10.8±0.1	7.5±0.1	1.5±0.1	1.5±0.1	1.75±0.1	7.5±0.1
Dimension No.	P0	P1	P2	t	W	K
Dimension(mm)	4.0±0.15	16.0±0.1	2.0±0.1	0.35±0.03	16.0±0.2	4.5±0.1

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	°C
Preheat Time	t _s	60	120	s
Ramp-Up Rate (T _L to T _P)	-	-	3	°C/s
Liquidus Temperature	T _L	217		°C
Time above Liquidus Temperature T _L	t _L	60	100	s
Peak Temperature	T _P	-	260	°C
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	°C/s

• Wave Soldering

One time soldering is recommended within the condition of temperature

