

### 4 PIN SOP ZERO-CROSS TRIAC PHOTOCOUPLER ELM304X, ELM306X, ELM308X Series



#### Features:

- Peak breakdown voltage
  - 400V: ELM304X
  - 600V: ELM306X
  - 800V: ELM308X
- High isolation voltage between input and output (Viso=3750 V rms)
- Zero voltage crossing
- Pb free and RoHS compliant.
- UL approved (No. E214129)
- VDE approved (No.132249)
- SEMKO approved
- NEMKO approved
- DEMKO approved
- FIMKO approved

#### Description

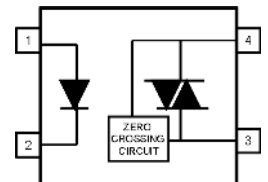
The ELM304X, ELM306X and ELM308X devices consist of a GaAs infrared emitting diode optically coupled to a monolithic silicon detector performing the function of a zero voltage crossing bilateral triac driver.

They are designed for use with a discrete power triac in the interface of logic systems to equipment powered from 110 to 240 VAC lines, such as solid-state relays, industrial controls, motors, solenoids and consumer appliances, etc.

#### Applications

- Solenoid/valve controls
- Light controls
- Static power switch
- AC motor drivers
- E.M. contactors
- Temperature controls
- AC Motor starters
- Solid state relays

Schematic



Pin Configuration

1. Anode
2. Cathode
3. Terminal
4. Terminal

**Absolute Maximum Ratings (Ta=25°C)**

Parameter		Symbol	Rating	Unit
Input	Forward current	$I_F$	60	mA
	Peak forward current (1us pulse, 300pps)	$I_{F(PK)}$	1	A
	Reverse voltage	$V_R$	6	V
	Power Dissipation	$P_D$	100	mW
Output			ELM304X	400
	Off-state Output Terminal Voltage	$V_{DRM}$	ELM306X	600
			ELM308X	800
	On state RMS current	$I_{T(RMS)}$	70	mA(RMS)
Power dissipation	$P_C$	300	mW	
Isolation voltage <sup>*1</sup>		$V_{ISO}$	3750	Vrms
Operating temperature		$T_{OPR}$	-40~+110	°C
Storage temperature		$T_{STG}$	-55~+150	°C
Soldering Temperature <sup>*2</sup>		$T_{SOL}$	260	°C

Notes:

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

\*2 For 10 seconds

**Electro-Optical Characteristics (Ta=25°C unless specified otherwise)**

**Input**

Parameter	Symbol	Min.	Typ.*	Max.	Unit	Condition
Forward Voltage	$V_F$	-	-	1.5	V	$I_F = 30\text{mA}$
Reverse Leakage current	$I_R$	-	-	10	$\mu\text{A}$	$V_R = 6\text{V}$

**Output**

Parameter	Symbol	Min.	Typ.*	Max.	Unit	Condition
Peak Blocking Current	$I_{\text{DRM1}}$	-	-	100	nA	$V_{\text{DRM}} = \text{Rated } V_{\text{DRM}}$ $I_F = 0\text{mA}$
Peak On-state Voltage	$V_{\text{TM}}$	-	-	3	V	$I_{\text{TM}} = 100\text{mA peak}$
Critical Rate of Rise off-state Voltage	$dv/dt$	1000	-	-	V/ $\mu\text{s}$	
Inhibit Voltage (MT1-MT2 voltage above which device will not trigger)	$V_{\text{INH}}$	-	-	20	V	$I_F = \text{Rated } I_{\text{FT}}$
Leakage in Inhibited State	$I_{\text{DRM2}}$	-	-	1000	$\mu\text{A}$	$I_F = \text{Rated } I_{\text{FT}}$ , $V_{\text{DRM}} = \text{Rated } V_{\text{DRM}}$ , off state

**Transfer Characteristics**

Parameter	Symbol	Min.	Typ.*	Max.	Unit	Condition	
LED Trigger Current	$I_{\text{FT}}$	3042	-	-	10	mA	Main terminal Voltage=3V
		3062	-	-	10		
		3082	-	-	10		
		3043	-	-	5		
		3063	-	-	5		
		3083	-	-	5		
Holding Current	$I_H$	3044	-	-	3	$\mu\text{A}$	
		3064	-	-	3		
		3084	-	-	3		
			-	280	-		

\* Typical values at  $T_a = 25^\circ\text{C}$

Typical Electro-Optical Characteristics Curves

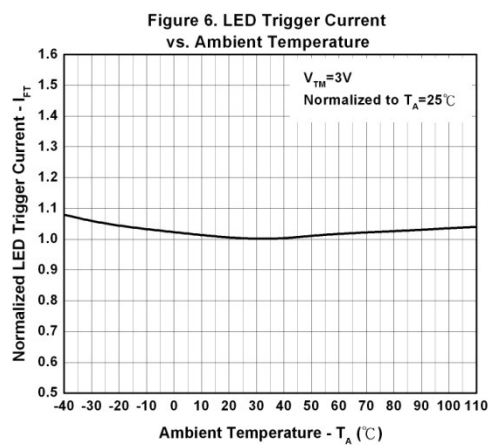
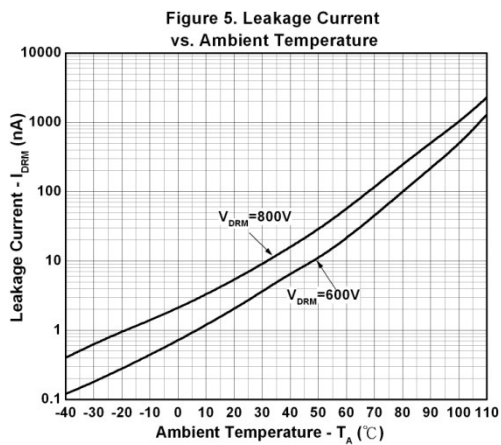
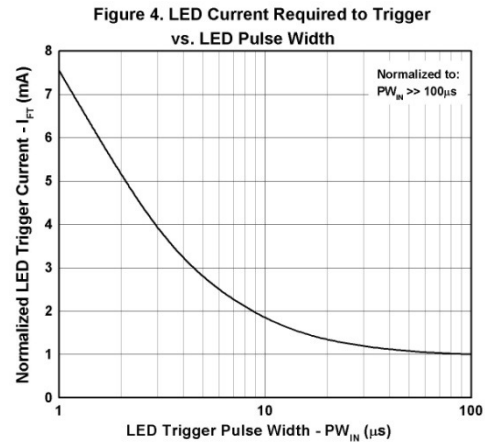
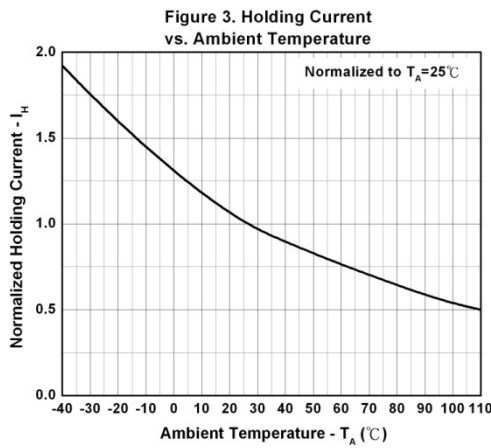
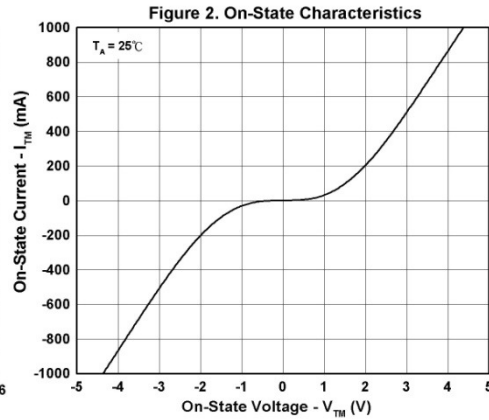
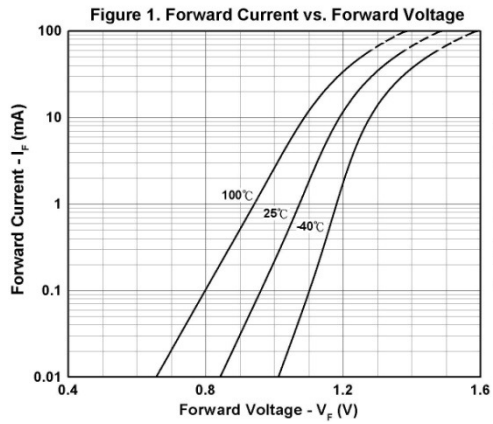


Figure 7. Off-State Output Terminal Voltage vs. Ambient Temperature

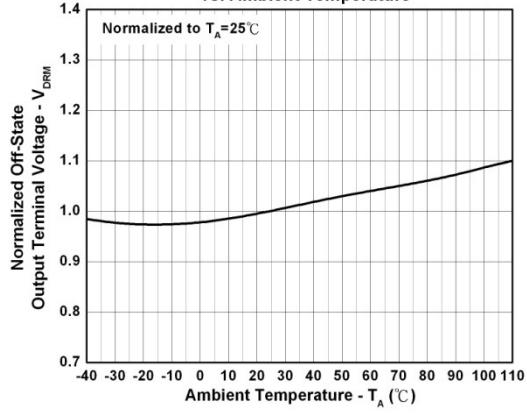


Figure 8. Leakage in Inhibit State vs. Ambient Temperature

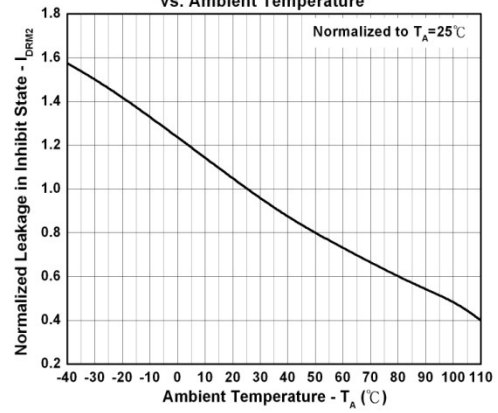


Figure 9. Inhibit Voltage vs. Ambient Temperature

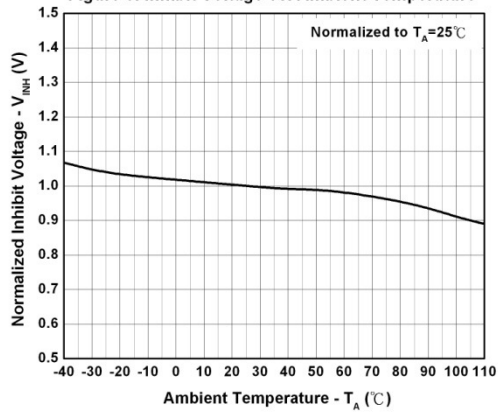
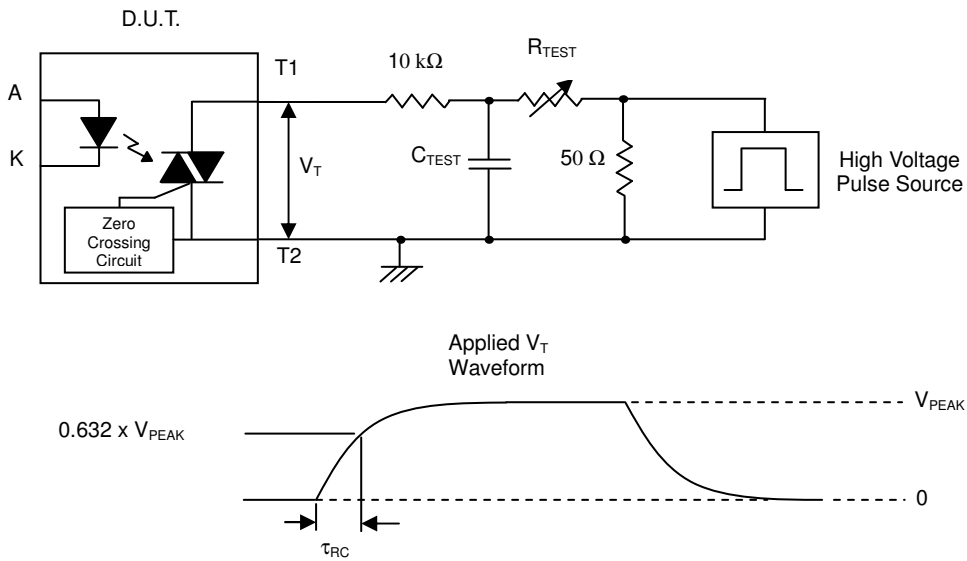


Figure 10. Static dv/dt Test Circuit & Waveform



### 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,  $\tau_{RC}$  is recorded and the  $dv/dt$  calculated.

$$dv/dt = \frac{0.632 \times V_{PEAK}}{\tau_{RC}}$$

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For example,  $V_{PEAK} = 600V$  for EL306X series. The  $dv/dt$  value is calculated as follows:

$$dv/dt = \frac{0.63 \times 600}{\tau_{RC}} = \frac{378}{\tau_{RC}}$$

## Order Information

### Part Number

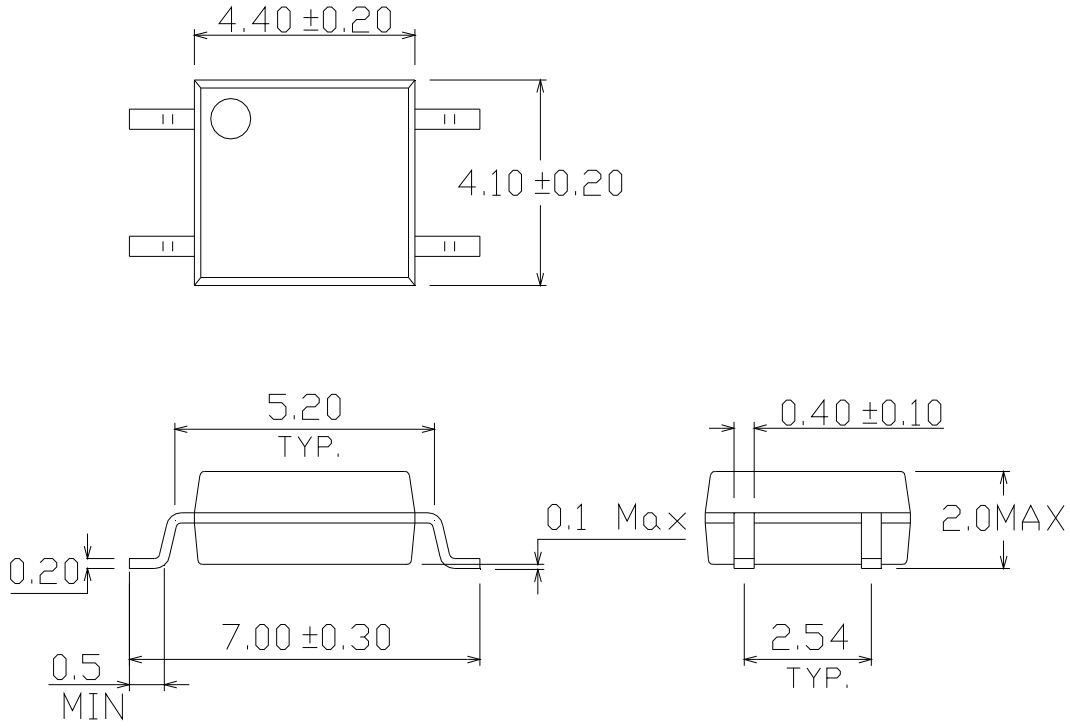
**ELM304X(Z)-V**  
or **ELM306X(Z)-V**  
or **ELM308X(Z)-V**

### Note

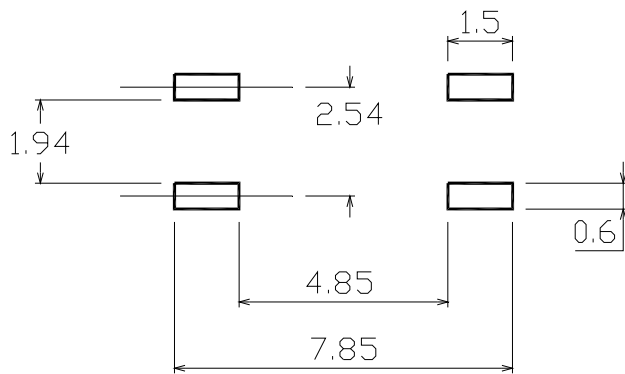
X = Part No. (2 for  $I_{FT}=10mA$ , 3 for  $I_{FT}=5mA$ , 4 for  $I_{FT}=3mA$ )  
Z = Tape and reel option (TA, TB or none).  
V = VDE safety approved optional

Option	Description	Packing quantity
None	Standard	100 units per tube
None	Standard + VDE safety optional	100 units per tube
(TA)	TA tape & reel option	3000 units per reel
(TB)	TB tape & reel option	3000 units per reel
(TA)-V	TA tape & reel option + VDE safety optional	3000 units per reel
(TB)-V	TB tape & reel option + VDE safety optional	3000 units per reel

**Package Dimension (Dimensions in mm)**



**Recommended pad layout for surface mount leadform**





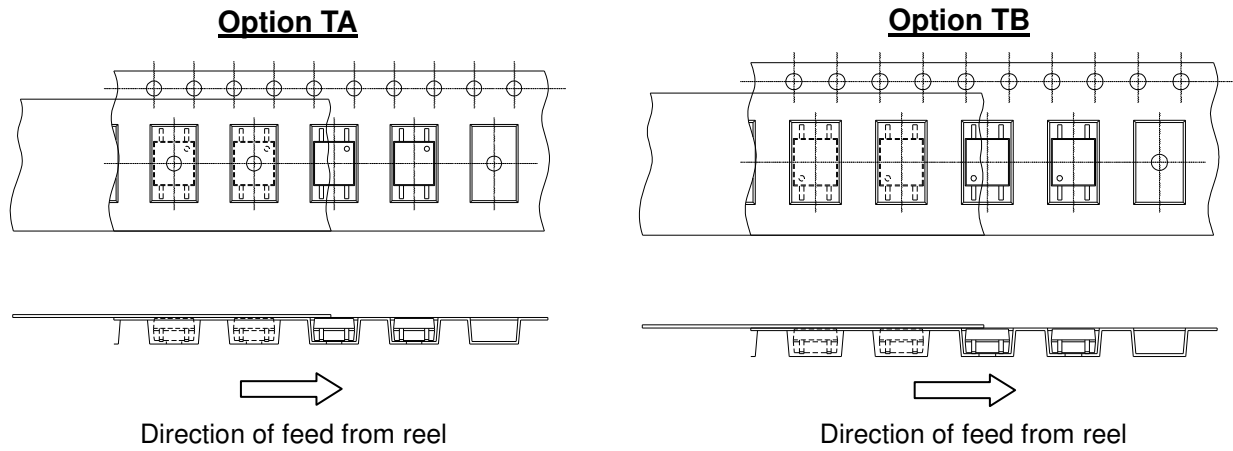
## Device Marking



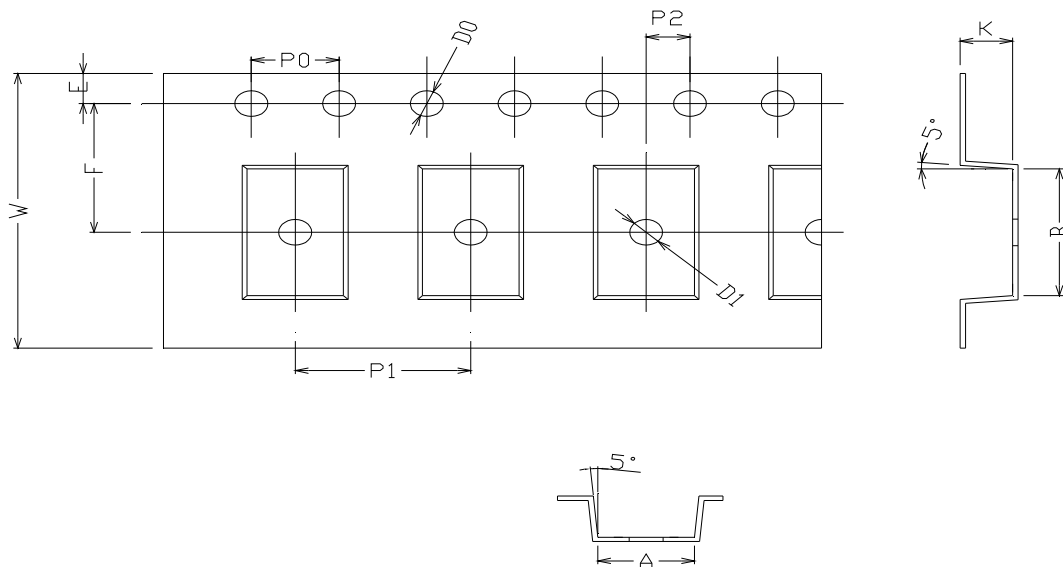
## Notes

EL	denotes Everlight
M3063	denotes Device Number
Y	denotes 1 digit Year code
WW	denotes 2 digit Week code
V	denotes VDE safety option (optional)

**Tape & Reel Packing Specifications**



**Tape dimensions**



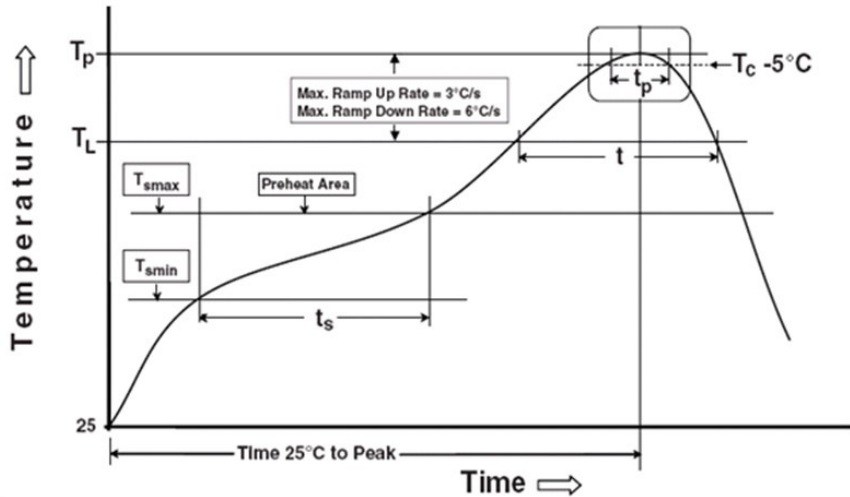
Dimension No.	A	B	Do	D1	E	F
Dimension (mm)	4.4 ± 0.1	7.4 ± 0.1	1.5 + 0.1/-0	1.5 ± 0.1	1.75 ± 0.1	7.5 ± 0.1

Dimension No.	Po	P1	P2	t	W	K
Dimension (mm)	4.0 ± 0.15	8.0 ± 0.1	2.0 ± 0.1	0.25 ± 0.03	16.0 ± 0.2	2.4 ± 0.1

## Precautions for Use

### 1. Soldering Condition

#### 1.1 (A) Maximum Body Case Temperature Profile for evaluation of Reflow Profile



Note:

Reference: IPC/JEDEC J-STD-020D

#### Preheat

Temperature min ( $T_{smin}$ )	150 °C
Temperature max ( $T_{smax}$ )	200 °C
Time ( $T_{smin}$ to $T_{smax}$ ) ( $t_s$ )	60-120 seconds
Average ramp-up rate ( $T_{smax}$ to $T_p$ )	3 °C/second max

#### Other

Liquidus Temperature ( $T_L$ )	217 °C
Time above Liquidus Temperature ( $t_L$ )	60-100 sec
Peak Temperature ( $T_p$ )	260 °C
Time within 5 °C of Actual Peak Temperature: $T_p - 5^\circ\text{C}$	30 s
Ramp- Down Rate from Peak Temperature	6 °C /second max.
Time 25 °C to peak temperature	8 minutes max.
Reflow times	3 times

## **DISCLAIMER**

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