芯伯乐®
XINBOLE

# Product Specification

## XEL357x

4-Pin SOP Phototransistor Optocouplers

WEB | www.xinboleic.com

## Descriptions

The XEL357x series contains an infrared emitting diode, optically coupled to a phototransistor detector. The devices in a 4-pin small outline SOP package.

## Features

- DC Input Response
- Current Transfer Ratio in Selected Groups
  - XEL357: 50–600%
  - XEL357A: 80–160%
  - XEL357B: 130–260%
  - XEL357C: 200–400%
  - XEL357D: 300–600%
- Minimum $BV_{CEO}$ of 70 V Guaranteed
- High isolation voltage between input and output (Viso=3750V rms )
- This Device is Pb−Free
- Adopting SOP-4 package

SOP−4

## Applications

- Power Supply Regulators
- Digital Logic Inputs
- Microprocessor Inputs

## Ordering Information

| Product Model | Package Type | Marking | Packing | Packing Qty | CTR Value* |
|---|---|---|---|---|---|
| XEL357-TAG | SOP-4-2.54mm | 357 | Tape | 3000Pcs/Reel | 50-600% |
| XEL357A-TAG | SOP-4-2.54mm | 357A | Tape | 3000Pcs/Reel | 80-160% |
| XEL357B-TAG | SOP-4-2.54mm | 357B | Tape | 3000Pcs/Reel | 130-260% |
| XEL357C-TAG | SOP-4-2.54mm | 357C | Tape | 3000Pcs/Reel | 200-400% |
| XEL357D-TAG | SOP-4-2.54mm | 357D | Tape | 3000Pcs/Reel | 300-600% |

*Notes:$I_F$=5mA,$V_{CE}$=5V,$T_A$=25°C

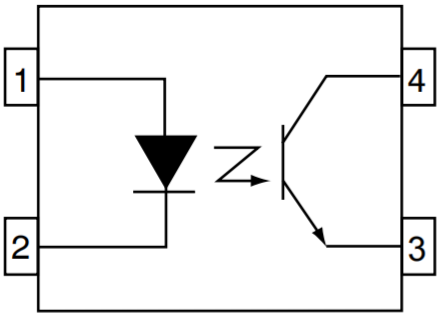
## Product Model

# XEL357X-YG

Note

X = CTR Rank(A, B, C, D or none)
Y = Tape and reel option (TA, TB or none)
G = Halogen free

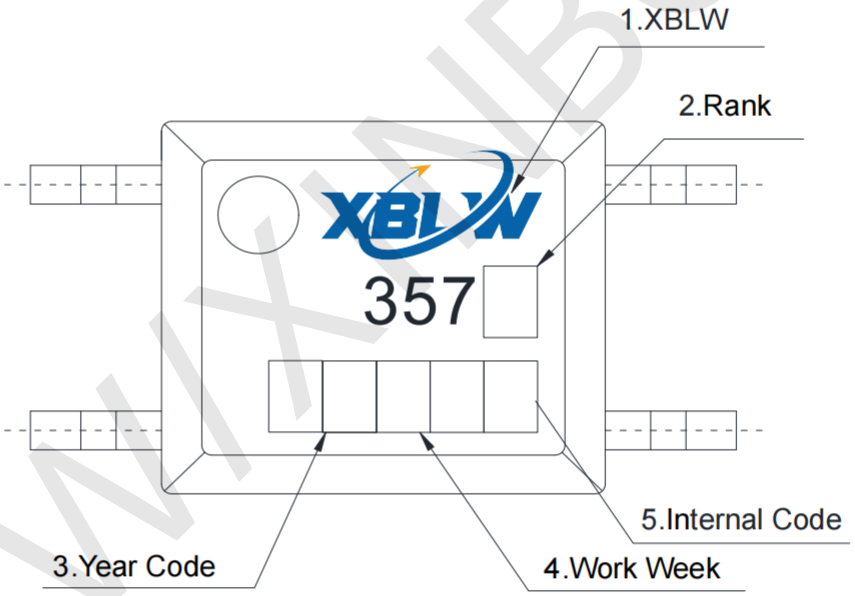
## Block Diagram




## Pin Configurations

1. Anode
2. Cathode
3. Emitter
4. Collector

## Naming Rule




1.XBLW LOGO
2.CTR Rank
3.Year Code, Example : 2023=23
4.Work Week Ranging from '01' to '53'
5.Internal Code

## ABSOLUTE MAXIMUM RATINGS $T_A$ = 25°C unless otherwise specified.

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| **TOTAL DEVICE** | | | |
| $T_{STG}$ | Storage Temperature | −55 to +150 | ℃ |
| $T_{OPR}$ | Operating Temperature | −55 to +110 | |
| $T_J$ | Junction Temperature | −55 to +125 | |
| $T_{SOL}$ | Lead Solder Temperature | 260 for 10 s | |
| $\theta_{JC}$ | Junction−to−Case Thermal Resistance | 210 | ℃/W |
| $P_{TOT}$ | Total Device Power Dissipation | 200 | mW |

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| **EMITTER** | | | |
| $I_F$ | Continuous Forward Current | 50 | mA |
| $V_R$ | Reverse Voltage | 6 | V |
| $P_D$ | Power Dissipation | 70 | mW |
| | Derate Above 100 ℃ | 1.7 | mW/℃ |
| **DETECTOR** | | | |
| $V_{CEO}$ | Collector−Emitter Voltage | 70 | V |
| $V_{ECO}$ | Emitter−Collector Voltage | 6 | |
| $I_C$ | Continuous Collector Current | 50 | mA |
| $P_C$ | Collector Power Dissipation | 150 | mW |
| | Derate Above 90 ℃ | 2.9 | mW/℃ |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

## ELECTRICAL CHARACTERISTICS $T_A$ = 25°C unless otherwise specified.

### INDIVIDUAL COMPONENT CHARACTERISTICS

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Emmiter** | | | | | | |
| $V_F$ | Forward Voltage | $I_F$ = 20 mA | – | 1.2 | 1.4 | V |
| $I_R$ | Reverse Current | $V_R$ = 4.0 V | | | 10 | μA |
| $C_t$ | Terminal Capacitance | V = 0, f = 1 kHz | | 30 | 250 | pF |
| **Detector** | | | | | | |
| $I_{CEO}$ | Collector Dark Current | $V_{CE}$ = 20 V, IF = 0 | – | | 100 | nA |
| $BV_{CEO}$ | Collector−Emitter Breakdown Voltage | $I_C$ = 0.1 mA, $I_F$ = 0 | 70 | – | | V |
| $BV_{ECO}$ | Emitter−Collector Breakdown Voltage | $I_E$ = 10 μA, $I_F$ = 0 | 6 | – | – | |

## DC TRANSFER CHARACTERISTICS

| Symbol | Parameter | Device | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| CTR | Current Transfer Ratio (Note 1 ) | XEL357 | $I_F$ = 5 mA, $V_{CE}$ = 5 V | 50 | – | 600 | % |
| | | XEL357A | | 80 | | 160 | |
| | | XEL357B | | 130 | – | 260 | |
| | | XEL357C | | 200 | – | 400 | |
| | | XEL357D | | 300 | | 600 | |
| $V_{CE(SAT)}$ | Collector–Emitter Saturation Voltage | XEL357 Series | $I_F$ = 20 mA, $I_C$ = 1 mA | – | 0.1 | 0.2 | V |

## ELECTRICAL CHARACTERISTICS TA = 25°C unless otherwise specified. (continued)

### AC TRANSFER CHARACTERISTICS

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $f_C$ | Cut–Off Frequency | $V_{CE}$ = 5 V, $I_C$ = 2 mA, $R_L$ = 100 Ω, –3 dB | 15 | 80 | – | kHz |
| $t_r$ | Response Time (Rise) | $V_{CE}$ = 2 V, $I_C$ = 2 mA, $R_L$ = 100 Ω (Note 2) | – | 4 | 18 | μs |
| $t_f$ | Response Time (Fall) | | – | 3 | 18 | |

### ISOLATION CHARACTERISTICS

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $V_{ISO}$ | Input–Output Isolation Voltage (Note 3 ) | f = 60 Hz, t = 1 min, $I_{I-O}$ ≤ 2 μA | 5000 | | | $VAC_{RMS}$ |
| $R_{ISO}$ | Isolation Resistance | $V_{I-O}$ = 500 $V_{DC}$ | $5x10^{10}$ | $1x10^{11}$ | – | Ω |
| $C_{ISO}$ | Isolation Capacitance | $V_{I-O}$ = 0, f = 1 MHz | – | 0.6 | 1.0 | pf |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

1. Current Transfer Ratio (CTR) = IC / $I_F$ x 100%
2. For test circuit setup and waveforms, refer to page 6 to 8 .
3. For this test, Pins 1 and 2 are common, and Pins 3 and 4 are common.

## TYPICAL ELECTRICAL/OPTICAL CHARACTERISTICS CURVES

TA = 25 ℃ unless otherwise specified.

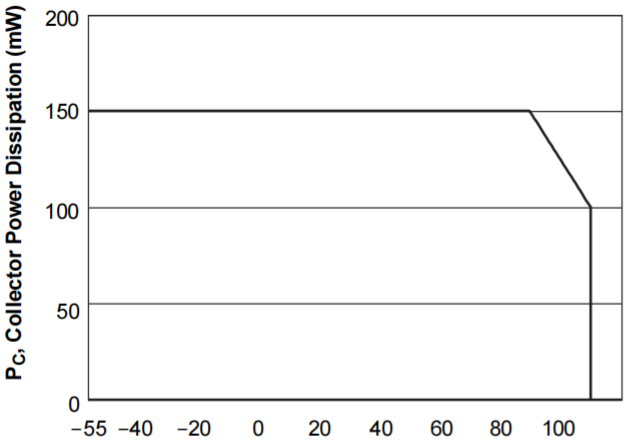



Figure 1 . Collector Power Dissipation vs. Ambient Temperature

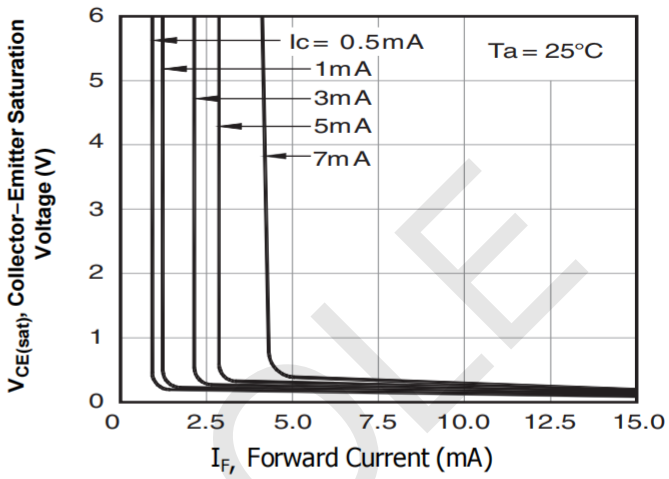



Figure 2 . Collector−Emitter Saturation Voltage vs.

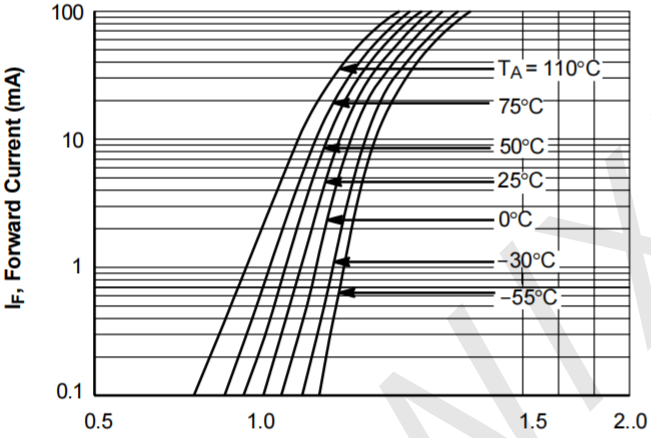



Figure 3 . Forward Current vs. Forward Voltage

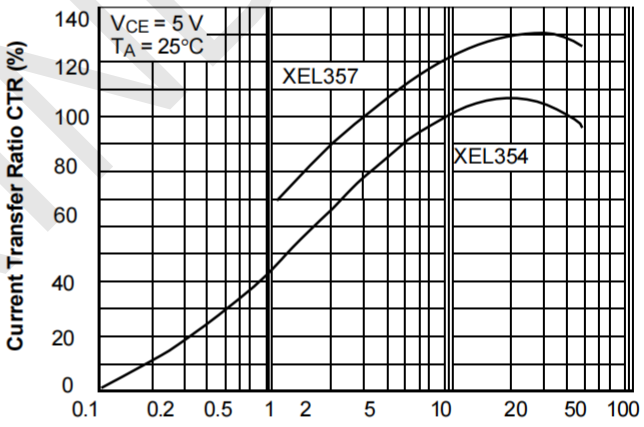



Figure 4 . Current Transfer Ratio vs. Forward Current

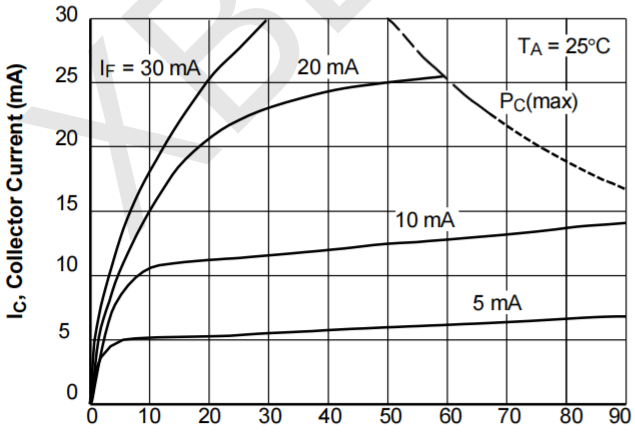



Figure 5 . Collector Current vs.Collector-Emitor Voltage

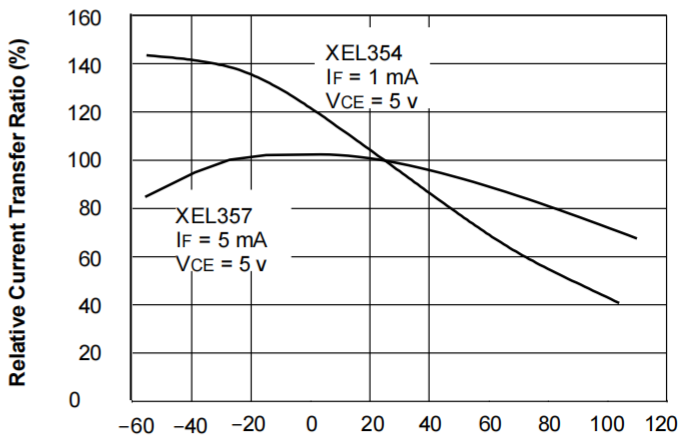
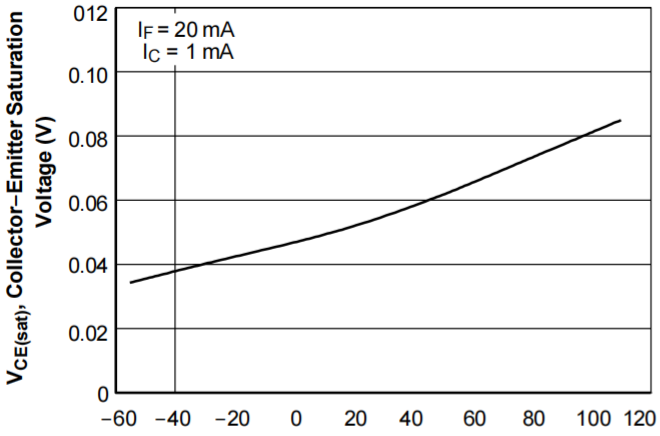
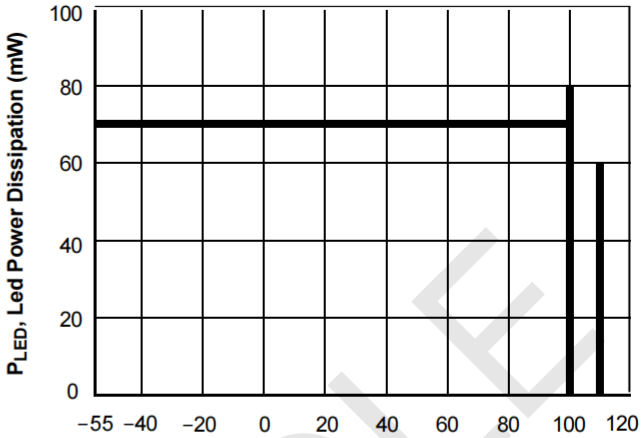



Figure 6. Relative Current Transfer Ratio vs.Ambient Temperature



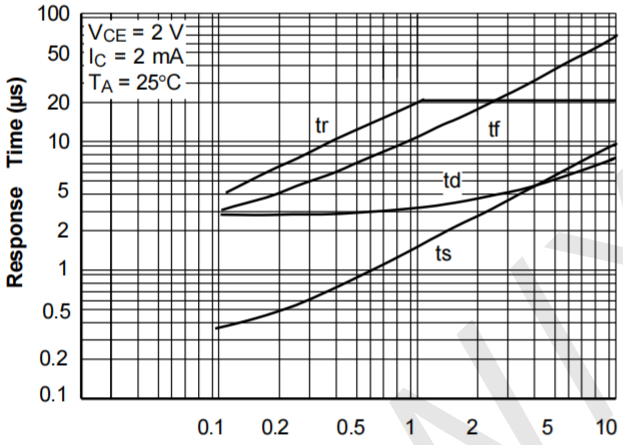

$T_A$, Ambient Temperature (°C

Figure 7 . Collector−Emitter Saturation Voltage vs. Ambient Temperature



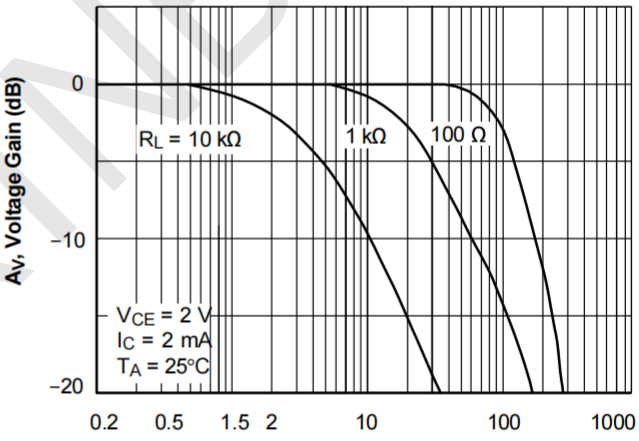

$T_A$, Ambient Temperature (°C)

Figure 8 . Led Power Dissipation vs. Ambient Temperature



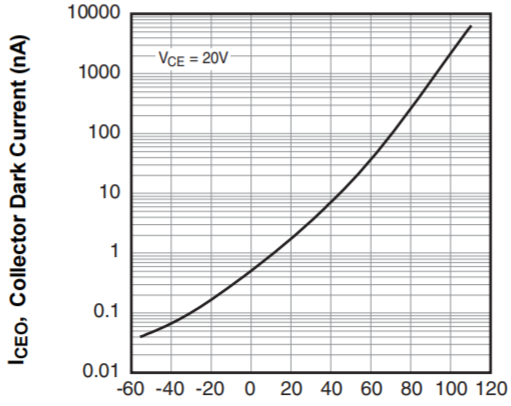

$R_L$, Load Resistance (kΩ)

Figure 9 . Response Time vs. Load Resistance




f, Frequency (kHz)

Figure 10. Frequency Response




TA, Ambient Temperature (°C)

Figure 11. Collector Dark Current vs.Ambient Temperature

**REFLOW PROFILE**

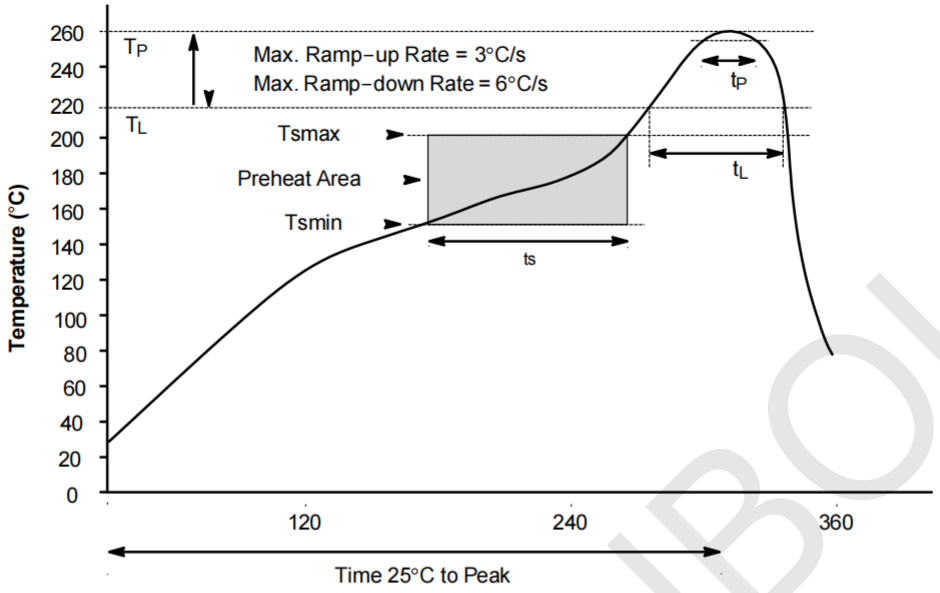


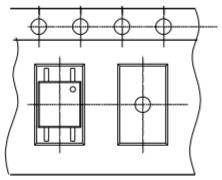

Figure 12.
Reflow Profile

**REFLOW PROFILE**

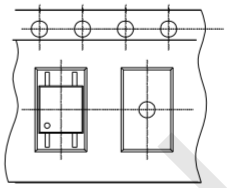
| Profile Feature | Pb−Free Assembly Profile |
|---|---|
| Temperature Min. (Tsmin) | 150 °C |
| Temperature Max. (Tsmax) | 200 °C |
| Time (tS) from (Tsmin toTsmax) | 60−120 s |
| Ramp−up Rate ($t_L$ to tP) | 3 °C /s max. |
| Liquidous Temperature ($T_L$) | 217 °C |
| Time ($t_L$) Maintained Above ($T_L$) | 60−150 s |
| Peak Body Package Temperature | 260 °C +0 °C / −5 °C |
| Time ($t_P$) within 5 °C of 260 °C | 30 s |
| Ramp−down Rate ($T_P$ to $T_L$) | 6 °C/s max. |
| Time 25°C to Peak Temperature | 8 min max. |

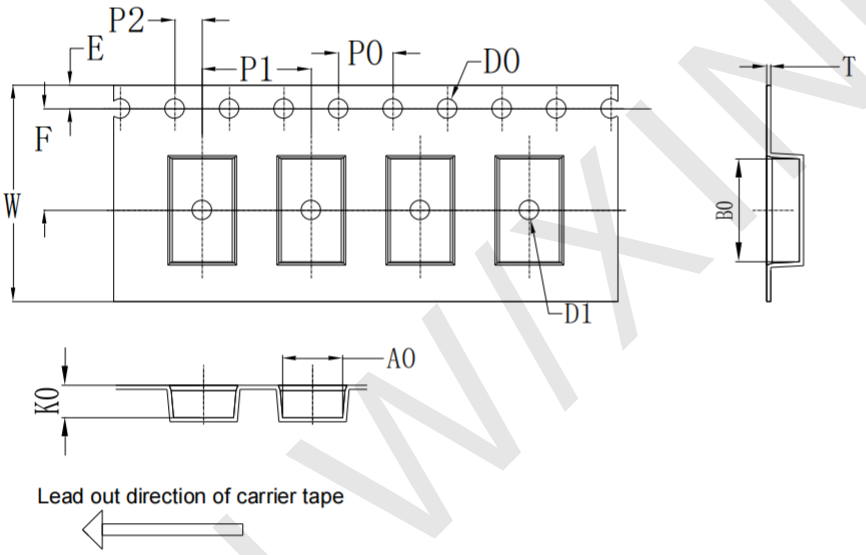
## Tape & Reel Packing Specifications

**Option TA**



**Option TB**



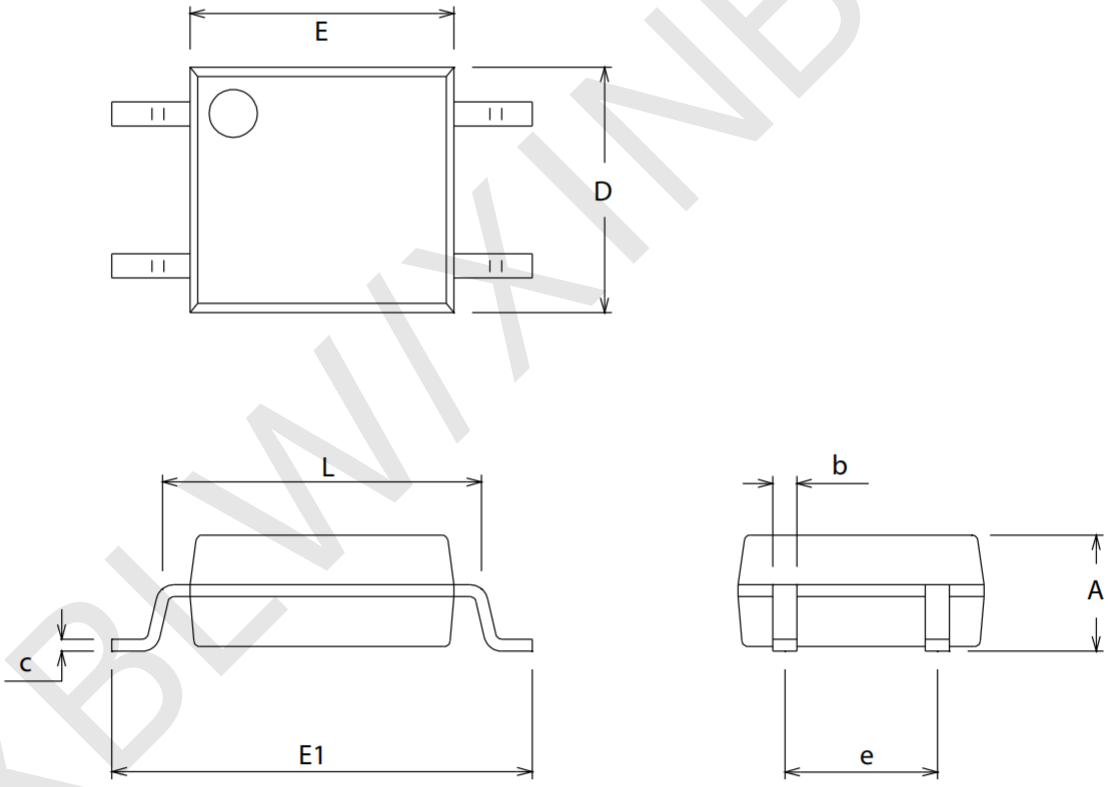



| ITEM | DIM(mm) |
|---|---|
| W | 16±0.20 |
| $A_0$ | 4.4±0.10 |
| $B_0$ | 7.60±010 |
| $K_0$ | 2.40±0.10 |
| P1 | 8.00±0.10 |
| F | 7.50±0.10 |
| E | 1.75±0.10 |
| $D_0/D_1$ | 1.50+0.10 |
| $P_0$ | 4.00±0.10 |
| $P_2$ | 2.00±0.10 |
| T | 0.30±0.03 |

## Package Dimension

- SOP-4-2.54mm

| SIZE / SYMBOL | Dimensions In Millimeters DIM(mm) | SIZE / SYMBOL | Dimensions In Inches DIM(in) |
|---|---|---|---|
| A | MAX2.0 | A | 0.0787 |
| L | 5.2±0.2 | L | 0.205±0.00787 |
| e | 2.54±0.02 | e | 0.1±0.000787 |
| b | 0.4±0.1 | b | 0.0157±0.00394 |
| c | 0.2 | c | 0.0078 |
| D | 4.0±0.2 | D | 0.0157±0.00787 |
| E | 4.4±0.05 | E | 0.173±0.00197 |
| E1 | 7.0±0.3 | E1 | 0.276±0.0118 |



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