

Product Specification

XBL354

4-Pin SOP Phototransistor Optocouplers

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Descriptions

The XBL354 series contains two infrared emitting diode, optically coupled to a phototransistor detector. The devices in a 4-pin small outline SOP package.

Features

- AC Input Response
- Current Transfer Ratio in Selected Groups
 - XBL354: 20–300%
 - XBL354A: 50–150%
 - XBL354B: 100–300%
- Minimum BV_{CEO} of 70 V Guaranteed
- High isolation voltage between input and output ($V_{iso}=3750$ V rms)
- This Device is Pb–Free
- Adopting SOP-4-2.54mm package



SOP–4

Applications

- AC Line Monitor
- Unknown Polarity DC Sensor
- Telephone Line Interface

Ordering Information

Product Model	Package Type	Marking	Packing	Packing Qty	CTR Value*
XBL354-TAG	SOP-4-2.54mm	354	Tape	3000Pcs/Reel	20-300%
XBL354A-TAG	SOP-4-2.54mm	354A	Tape	3000Pcs/Reel	50-150%
XBL354B-TAG	SOP-4-2.54mm	354B	Tape	3000Pcs/Reel	100-300%

*Notes: $I_F=1$ mA, $V_{CE}=5$ V, $T_A=25^{\circ}\text{C}$

Product Model

XBL354X-YG

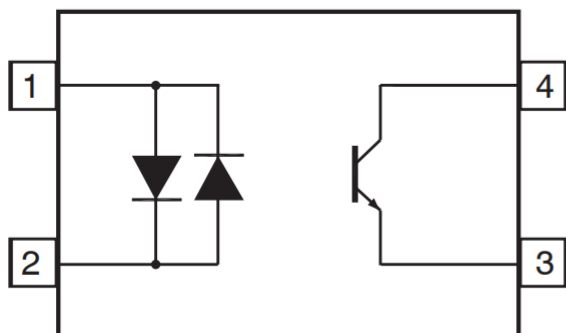
Note

X = CTR Rank(A, B or none)

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

G = Halogen free

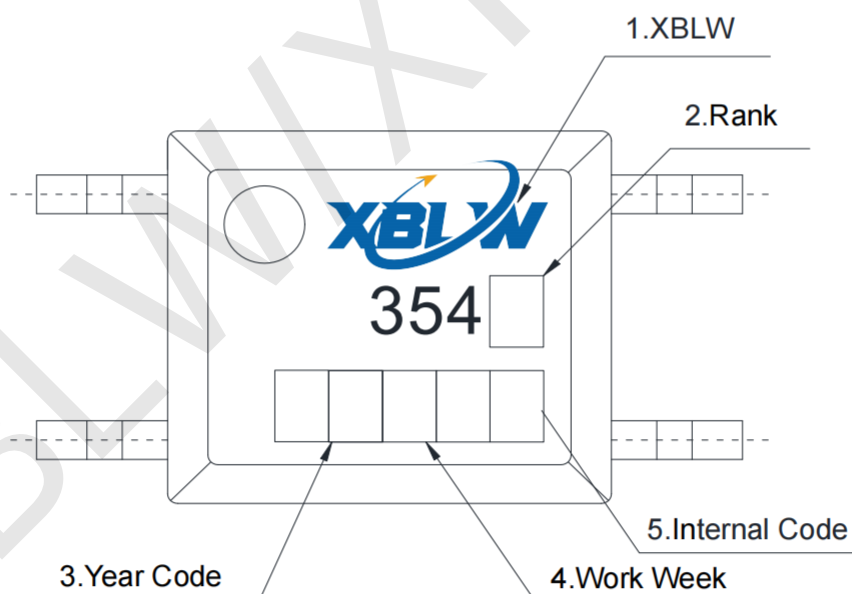
Block Diagram



Pin Configurations

1. Anode Cathode
2. Cathode Anode
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 $T_A = 25^{\circ}\text{C}$ unless otherwise specified.

Symbol	Parameter	Value	Unit
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TOTAL DEVICE

T_{STG}	Storage Temperature	-55 to +150	$^{\circ}\text{C}$
T_{OPR}	Operating Temperature	-55 to +105	
T_J	Junction Temperature	-55 to +125	
T_{SOL}	Lead Solder Temperature	260 for 10 s	
θ_{JC}	Junction-to-Case Thermal Resistance	210	$^{\circ}\text{C}/\text{W}$
P_{TOT}	Total Device Power Dissipation	200	mW

Symbol	Parameter	Value	Unit
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EMITTER

I_F	Continuous Forward Current	± 50	mA
V_R	Reverse Voltage	± 6	V
P_D	Power Dissipation	70	mW
	Derate Above 100°C	1.7	mW/ $^{\circ}\text{C}$

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°C	2.9	mW/ $^{\circ}\text{C}$

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 $T_A = 25^\circ\text{C}$ unless otherwise specified.

INDIVIDUAL COMPONENT CHARACTERISTICS

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
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Emitter

V_F	Forward Voltage	$I_F = \pm 20\text{ mA}$	–	1.2	1.4	V
I_R	Reverse Current	$V_R = 4.0\text{ V}$			10	μA
C_t	Terminal Capacitance	$V = 0, f = 1\text{ kHz}$		30	250	pF

Detector

I_{CEO}	Collector Dark Current	$V_{CE} = 20\text{ V}, I_F = 0$	–		100	nA
BV_{CEO}	Collector–Emitter Breakdown Voltage	$I_C = 0.1\text{ mA}, I_F = 0$	70	–		V
BV_{ECO}	Emitter–Collector Breakdown Voltage	$I_E = 10\text{ }\mu\text{A}, I_F = 0$	6	–	–	

DC TRANSFER CHARACTERISTICS

Symbol	Parameter	Device	Test Conditions	Min	Typ	Max	Unit
CTR	Current Transfer Ratio (Note 1)	XBL354	$I_F = \pm 1\text{ mA},$ $V_{CE} = 5\text{ V}$	20	–	300	%
		XBL354A		50	–	150	
		XBL354B		100	–	300	
$V_{CE(SAT)}$	Collector–Emitter Saturation Voltage	XBL354 series	$I_F = \pm 20\text{ mA},$ $I_C = 1\text{ mA}$	–	0.1	0.2	V

ELECTRICAL CHARACTERISTICS $T_A = 25^\circ\text{C}$ unless otherwise specified. (continued)

AC TRANSFER CHARACTERISTICS

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
f_c	Cut-Off Frequency	$V_{CE} = 5\text{ V}, I_C = 2\text{ mA},$ $R_L = 100\text{ }\Omega, -3\text{ dB}$	15	80	–	kHz
t_r	Response Time (Rise)	$V_{CE} = 2\text{ V}, I_C = 2\text{ mA},$ $R_L = 100\text{ }\Omega$ (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)	$f = 60\text{ Hz}, t = 1\text{ min},$ $I_{I-O} \leq 2\text{ }\mu\text{A}$	5000			V_{ACRMS}
R_{ISO}	Isolation Resistance	$V_{I-O} = 500\text{ V}_{DC}$	5×10^{10}	1×10^{11}	–	Ω
C_{ISO}	Isolation Capacitance	$V_{I-O} = 0, f = 1\text{ MHz}$	–	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) = $I_C / I_F \times 100\%$
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

$T_A = 25^\circ\text{C}$ unless otherwise specified.

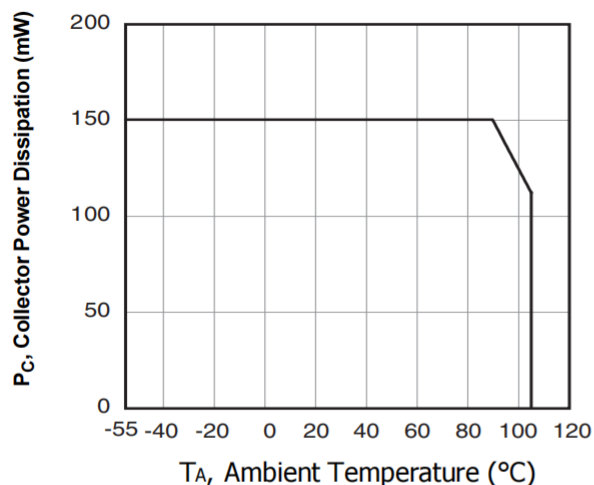


Figure 1. Collector Power Dissipation vs. Ambient Temperature

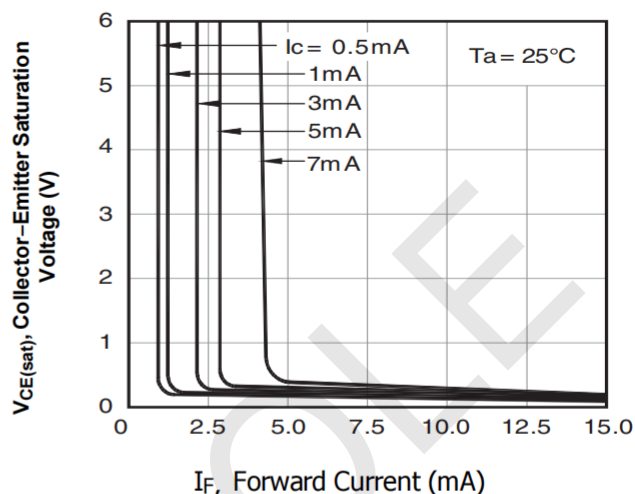


Figure 2. Collector-Emitter Saturation Voltage vs. Forward Current

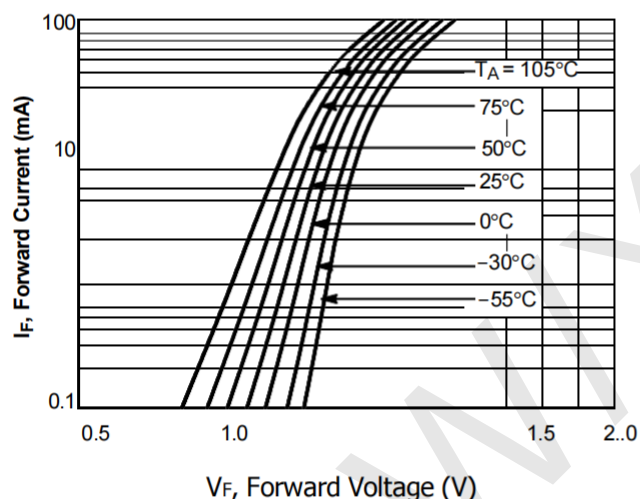


Figure 3. Forward Current vs. Forward Voltage

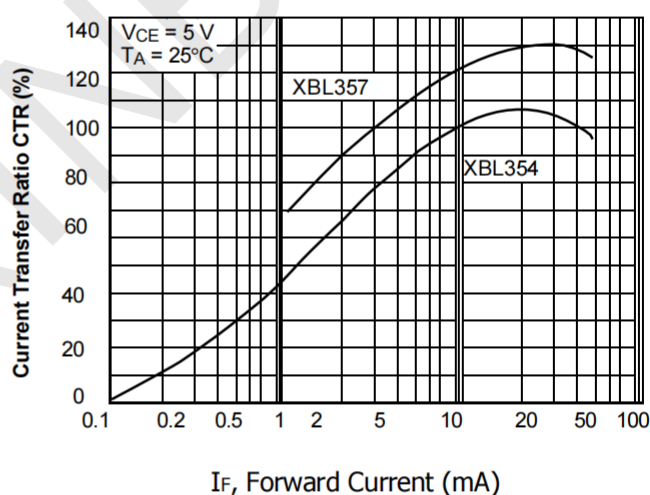


Figure 4. Current Transfer Ratio vs. Forward Current

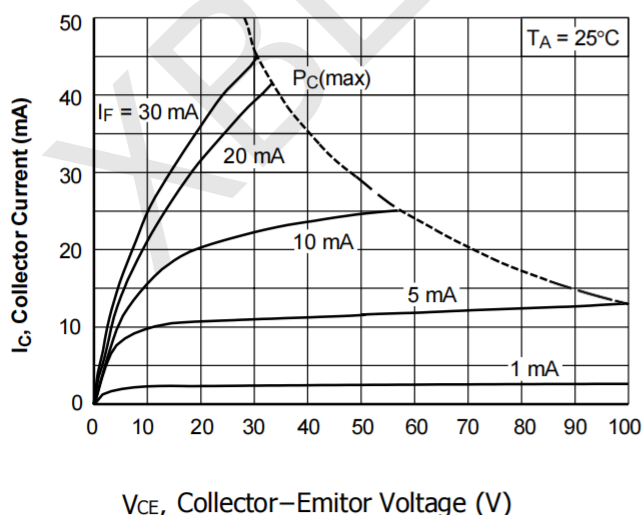


Figure 5. Collector Current vs. Collector-Emitter Voltage

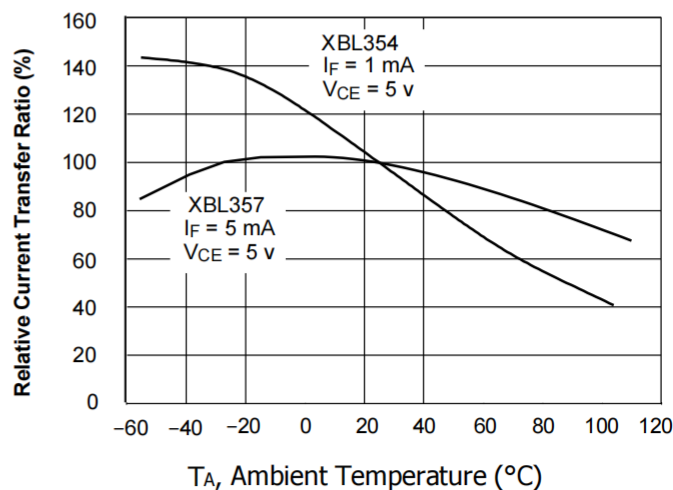
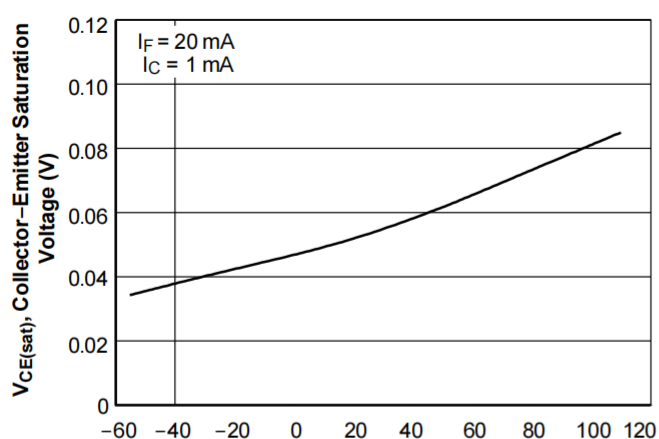
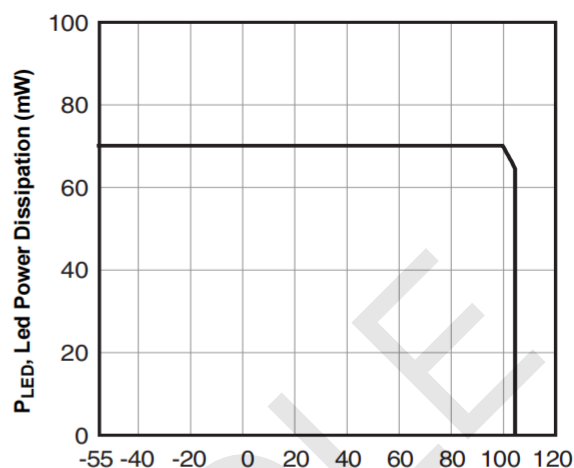


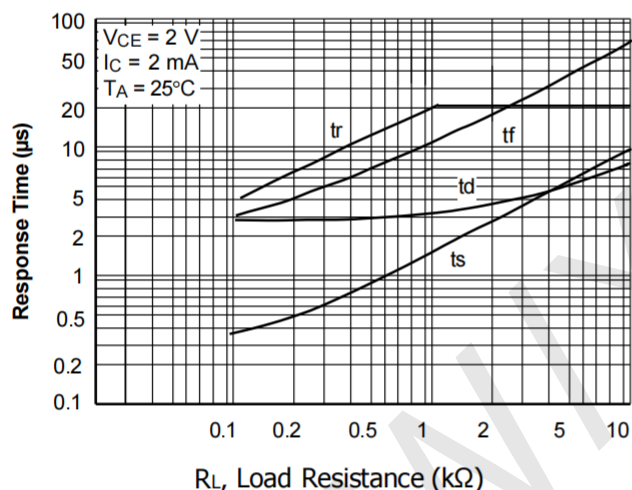
Figure 6. Relative Current Transfer Ratio vs. Ambient Temperature



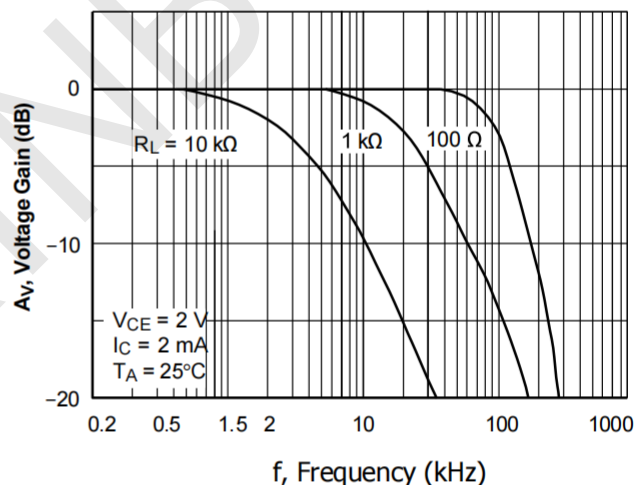
T_A , Ambient Temperature (°C)
Figure 7 . Collector-Emitter Saturation Voltage vs. Ambient Temperature



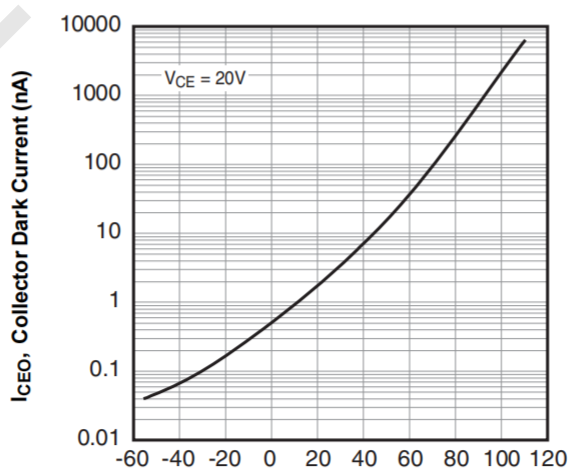
T_A , Ambient Temperature (°C)
Figure 8 . Led Power Dissipation vs. Ambient Temperature



R_L , Load Resistance (k Ω)
Figure 9 . Response Time vs. Load Resistance



f , Frequency (kHz)
Figure 10 . Frequency Response



T_A , Ambient Temperature (°C)
Figure 11. Collector Dark Current vs. Ambient Temperature

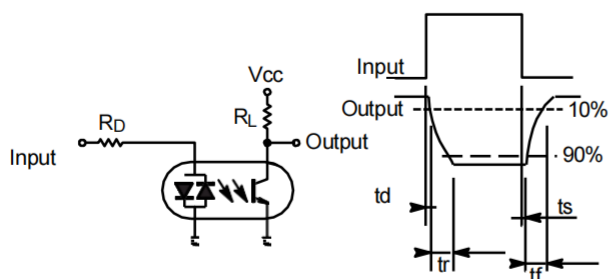


Figure 12. Test Circuit for Response Time

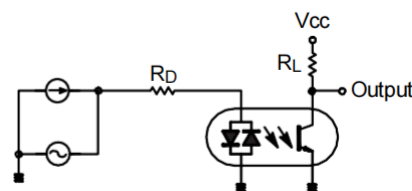


Figure 13. Test Circuit for Frequency Response

REFLOW PROFILE

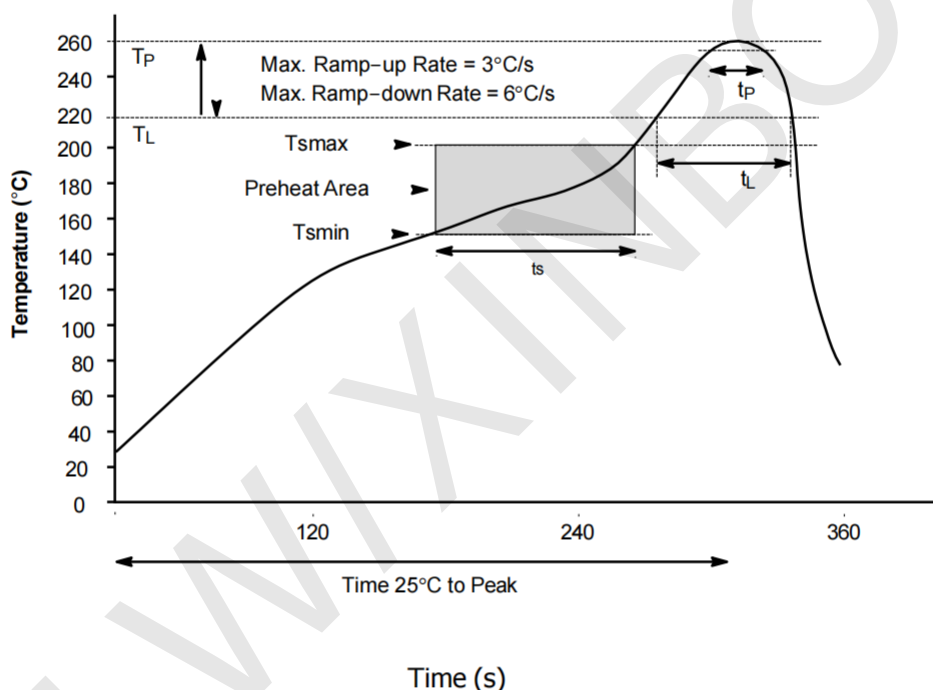


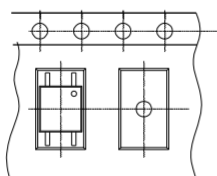
Figure 14. Reflow Profile

REFLOW PROFILE

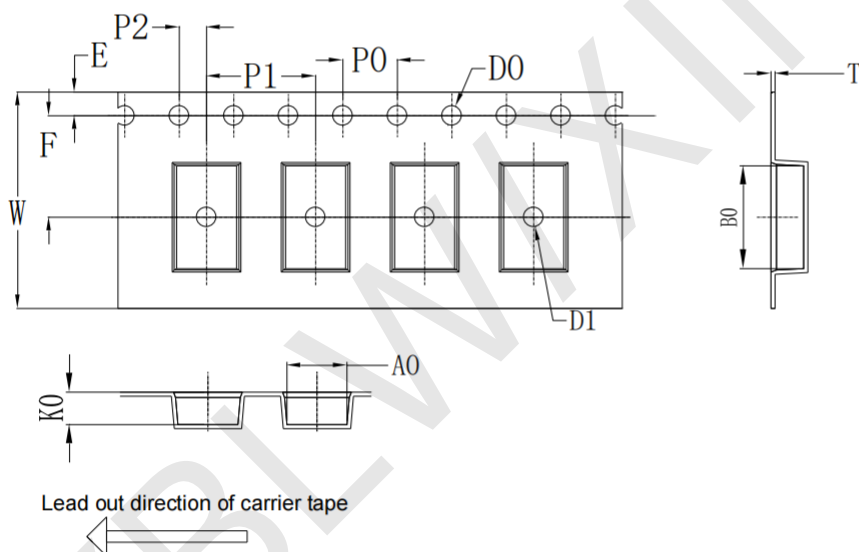
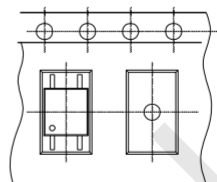
Profile Feature	Pb-Free Assembly Profile
Temperature Min. (T _{min})	150 °C
Temperature Max. (T _{max})	200 °C
Time (t _s) from (T _{min} to T _{max})	60–120 s
Ramp-up Rate (t _L to t _P)	3 °C /s max.
Liquidous Temperature (T _L)	217 °C
Time (t _L) Maintained Above (T _L)	60–150 s
Peak Body Package Temperature	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

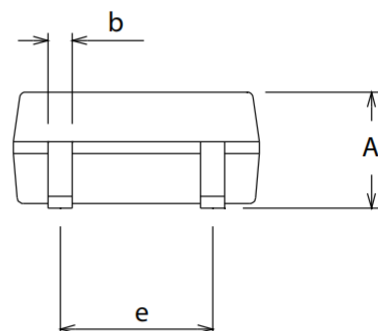
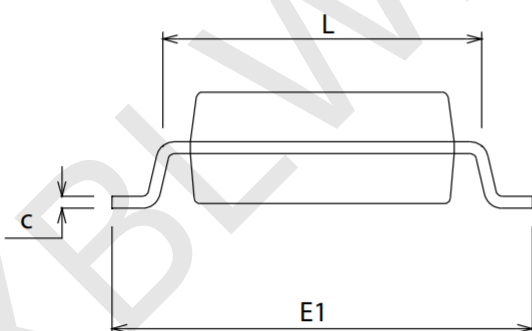
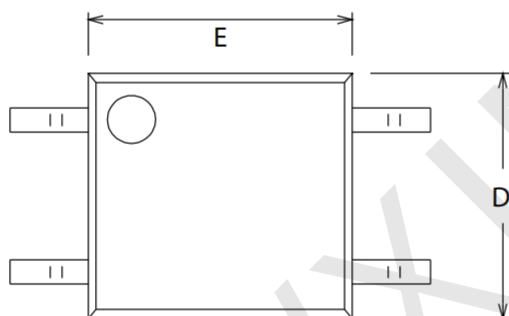


ITEM	DIM(mm)
W	16±0.20
A ₀	4.4±0.10
B ₀	7.60±0.10
K ₀	2.40±0.10
P ₁	8.00±0.10
F	7.50±0.10
E	1.75±0.10
D ₀ /D ₁	1.50±0.10
P ₀	4.00±0.10
P ₂	2.00±0.10
T	0.30±0.03

Package Dimension

- SOP-4-2.54mm

SIZE SYMBOL	Dimensions In Millimeters	SIZE SYMBOL	Dimensions In Inches
	DIM(mm)		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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