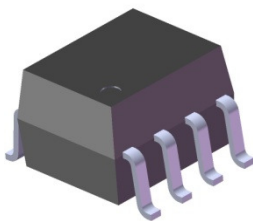


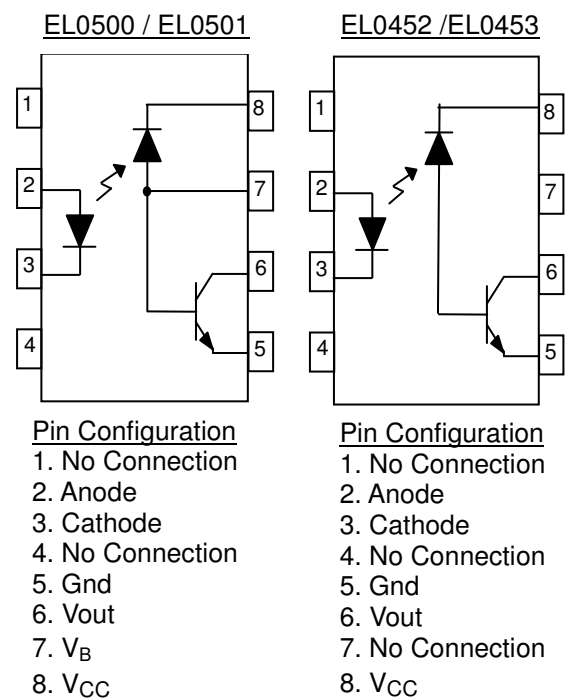
8 PIN SOP HIGH SPEED 1Mbit/s TRANSISTOR PHOTOCOUPLER EL045X EL050X series



Features

- High speed 1Mbit/s
- 15kV/μs minimum common mode transient immunity at VCM= 1500V (HCPL0453)
- High isolation voltage between input and output (Viso=3750 Vrms)
- Guaranteed performance from 0°C to 70 °C
- Wide operating temperature range of -55°C to 100°C
- Pb free and RoHS and Halogen free compliant
- cUL approved (No. E214129)
- VDE approved (No. 40028116)
- SEMKO approved
- NEMKO approved
- DEMKO approved
- FIMKO approved Description

Schematic



The EL0500, EL0501, EL0452 and EL0453 devices each consist of an infrared emitting diode, optically coupled to a high speed photo detector transistor. A separate connection for the photodiode bias and output-transistor collector increase the speed by several orders of magnitude over conventional phototransistor couplers by reducing the base-collector capacitance of the input transistor. The devices are packaged in an 8-pin small outline package which conforms to the standard SO-8 footprint.

Applications

- Line receivers
- Telecommunication equipments
- Power transistor isolation in motor drives
- Replacement for low speed phototransistor photo couplers
- Feedback loop in switch-mode power supplies
- Home appliances
- High speed logic ground isolation

Absolute Maximum Ratings (Ta=25°C)

Parameter		Symbol	Rating	Unit
Input	Forward current	I_F	25	mA
	Peak forward current (50% duty, 1ms P.W)	I_{FP}	50	mA
	Peak transient current ($\leq 1\mu s$ P.W, 300pps)	I_{Ftrans}	1	A
	Reverse voltage	V_R	5	V
	Power dissipation	P_{IN}	45	mW
	Power dissipation	P_O	100	mW
Output	Emitter-Base reverse voltage	EL0500 EL0501 V_{EBR}	5	V
	Base current	EL0500 EL0501 I_B	5	mA
	Average Output current	$I_{O(AVG)}$	8	mA
	Peak Output current	$I_{O(PK)}$	16	mA
	Output voltage	V_O	-0.5 to 20	V
	Supply voltage	V_{CC}	-0.5 to 30	V
	Isolation voltage ^{*1}	V_{ISO}	3750	V rms
	Operating temperature	T_{OPR}	-55 ~ +100	°C
	Storage temperature	T_{STG}	-55 ~ +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, 4 are shorted together, and pins 5, 6, 7, 8 are shorted together.

*2 For 10 seconds.

Electrical Characteristics (T_A=0 to 70 °C unless specified otherwise)

Input

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Forward Voltage	V _F	-	1.45	1.8	V	I _F =16mA
Reverse Voltage	V _R	5.0	-	-	V	I _R = 10μA
Temperature coefficient of forward voltage	ΔV _F /ΔT _A	-	-1.9	-	mV/°C	I _F =16mA

Output

Parameter	Symbol	Min	Typ.	Max.	Unit	Condition
Logic High Output Current	I _{OH}	-	0.001	0.5	μA	I _F =0mA, V _O =V _{CC} =5.5V, T _A =25 °C
		-	0.01	1		I _F =0mA, V _O =V _{CC} =15V, T _A =25 °C
		-	-	50		I _F =0mA, V _O =V _{CC} =15V
Logic Low Supply Current	I _{CCL}	-	140	200	μA	I _F =16mA, V _O =Open, V _{CC} =15V
Logic High Supply Current	I _{CCH}	-	0.01	1	μA	I _F =0mA, V _O =Open, V _{CC} =15V, T _A =25 °C
		-	-	2		I _F =0mA, V _O =Open, V _{CC} =15V

Transfer Characteristics (T_A=0 to 70 °C unless specified otherwise)

Parameter	Symbol	Min	Typ.	Max.	Unit	Condition	
Current Transfer Ratio	CTR	EL0500	7	-	50	%	I _F = 16mA, V _O = 0.4V, V _{CC} =4.5V, T _A =25 °C
		EL0501	19	-	50		
		EL0452					
		EL0453	5	-	-		I _F = 16mA, V _O = 0.5V, V _{CC} =4.5V
		EL0500	15	-	-		
		EL0501					
Logic Low Output Voltage	V _{OL}	EL0500	-	0.18	0.4	V	I _F = 16mA, I _O = 1.1mA, V _{CC} =4.5V, T _A =25 °C
		EL0501	-	0.18	0.4		I _F = 16mA, I _O = 3mA, V _{CC} =4.5V, T _A =25 °C
		EL0452					
		EL0453	-	-	0.5		I _F = 16mA, I _O = 0.8mA, V _{CC} =4.5V
		EL0500	-	-	0.5		
		EL0501					
EL0452	-	-	0.5	I _F = 16mA, I _O = 2.4mA, V _{CC} =4.5V			
EL0453							

Switching Characteristics ($T_A=0$ to 70°C unless specified otherwise, $I_F=16\text{mA}$, $V_{CC}=5\text{V}$)

Parameter	Symbol	Min	Typ.	Max.	Unit	Condition
Propagation Delay Time to Logic Low (Fig.8)	EL0500	-	-	1.5	μs	$R_L=4.1\text{K}\Omega$, $T_A=25^\circ\text{C}$
		-	-	2.0		$R_L=4.1\text{K}\Omega$
	EL0501 EL0452 EL0453	-	-	0.8		$R_L=1.9\text{K}\Omega$, $T_A=25^\circ\text{C}$
		-	-	1.0		$R_L=1.9\text{K}\Omega$
Propagation Delay Time to Logic High (Fig.8)	EL0500	-	-	1.5	μs	$R_L=4.1\text{K}\Omega$, $T_A=25^\circ\text{C}$
		-	-	2.0		$R_L=4.1\text{K}\Omega$
	EL0501 EL0452 EL0453	-	-	0.8		$R_L=1.9\text{K}\Omega$, $T_A=25^\circ\text{C}$
		-	-	1.0		$R_L=1.9\text{K}\Omega$
Common Mode Transient Immunity at Logic High (Fig.9) ^{*3}	EL0500	-	1,000	-	$\text{V}/\mu\text{s}$	$I_F = 0\text{mA}$, $V_{CM}=10\text{Vp-p}$, $R_L=4.1\text{K}\Omega$, $T_A = 25^\circ\text{C}$
	EL0452 EL0501	-	1,000	-		$I_F = 0\text{mA}$, $V_{CM}=10\text{Vp-p}$, $R_L=1.9\text{K}\Omega$, $T_A = 25^\circ\text{C}$
	EL0453	15000	-	-		$I_F = 0\text{mA}$, $V_{CM}=1500\text{Vp-p}$, $R_L=1.9\text{K}\Omega$, $T_A = 25^\circ\text{C}$
Common Mode Transient Immunity at Logic Low (Fig.9) ^{*3}	EL0500	-	1,000	-	$\text{V}/\mu\text{s}$	$I_F = 16\text{mA}$, $V_{CM}=10\text{Vp-p}$, $R_L=4.1\text{K}\Omega$, $T_A = 25^\circ\text{C}$
	EL0452 EL0501	-	1,000	-		$I_F = 16\text{mA}$, $V_{CM}=10\text{Vp-p}$, $R_L=1.9\text{K}\Omega$, $T_A = 25^\circ\text{C}$
	EL0453	15000	-	-		$I_F = 16\text{mA}$, $V_{CM}=1500\text{Vp-p}$, $R_L=1.9\text{K}\Omega$, $T_A = 25^\circ\text{C}$

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

Typical Electro-Optical Characteristics Curves

Figure 5. Logic High Output Current vs Ambient Temperature

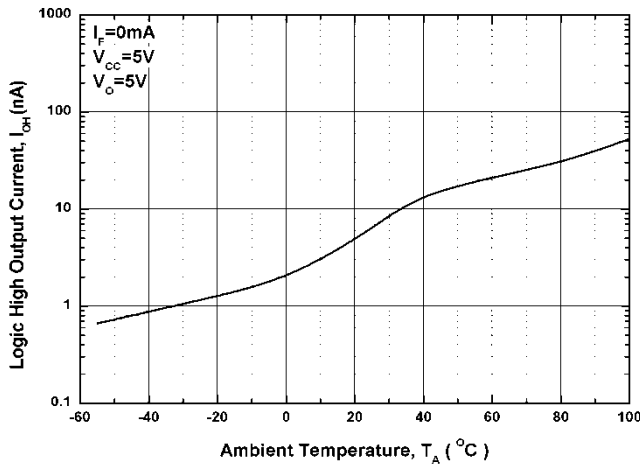


Figure 1. Forward Current vs Forward Voltage

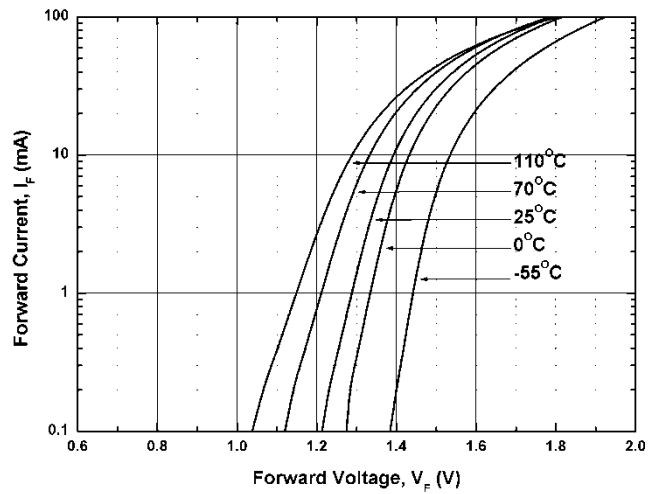


Figure 2. Current Transfer Ratio vs Forward Current

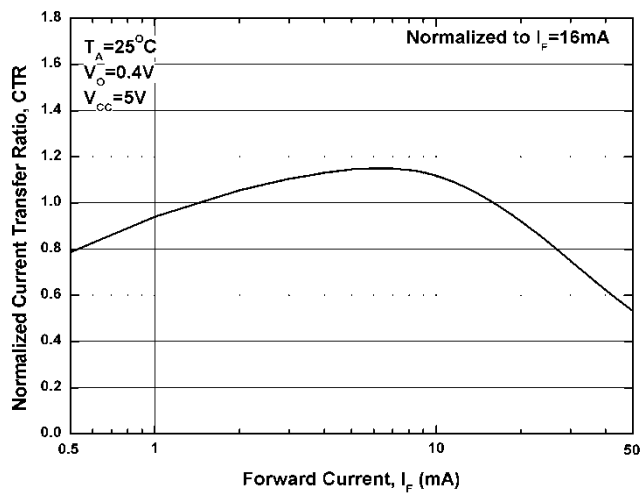


Figure 3. Current Transfer Ratio vs Ambient Temperature

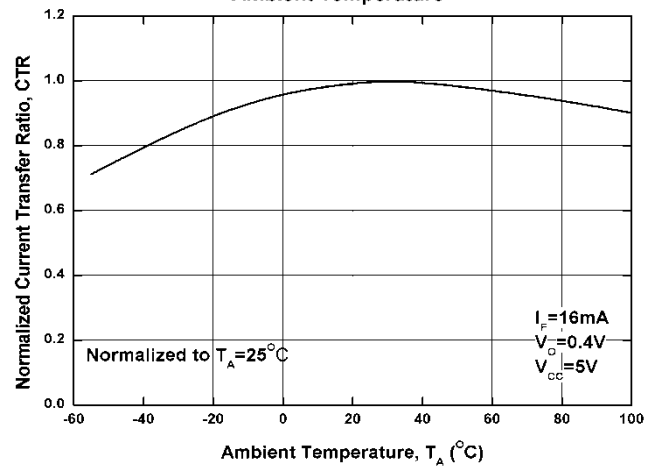


Figure 4. Output Current vs Output Voltage

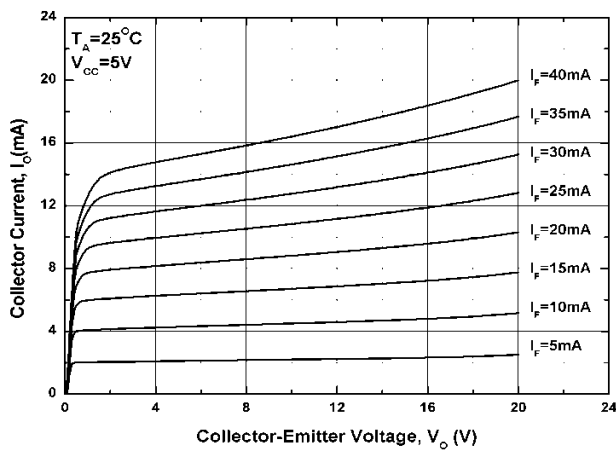


Figure 6. Propagation Delay vs. Load Resistance

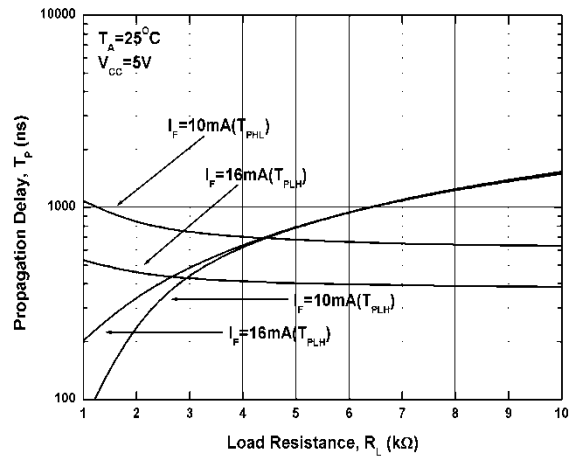


Figure 7. Propagation Delay vs. Temperature

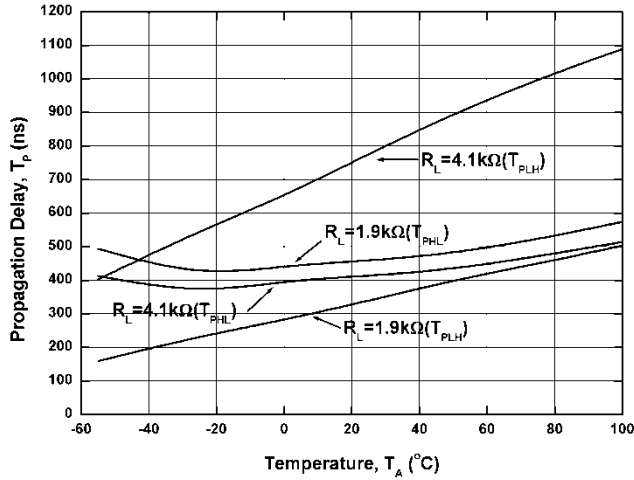


Figure 8 Switching Time Test Circuit & Waveform

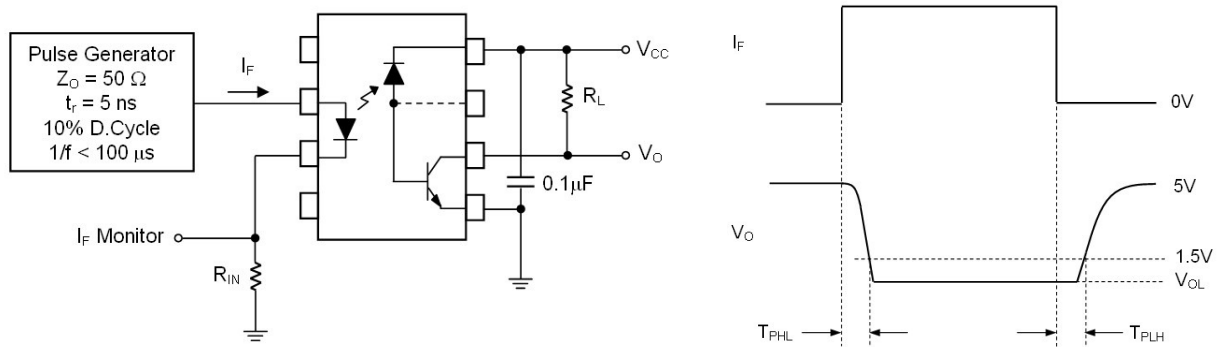
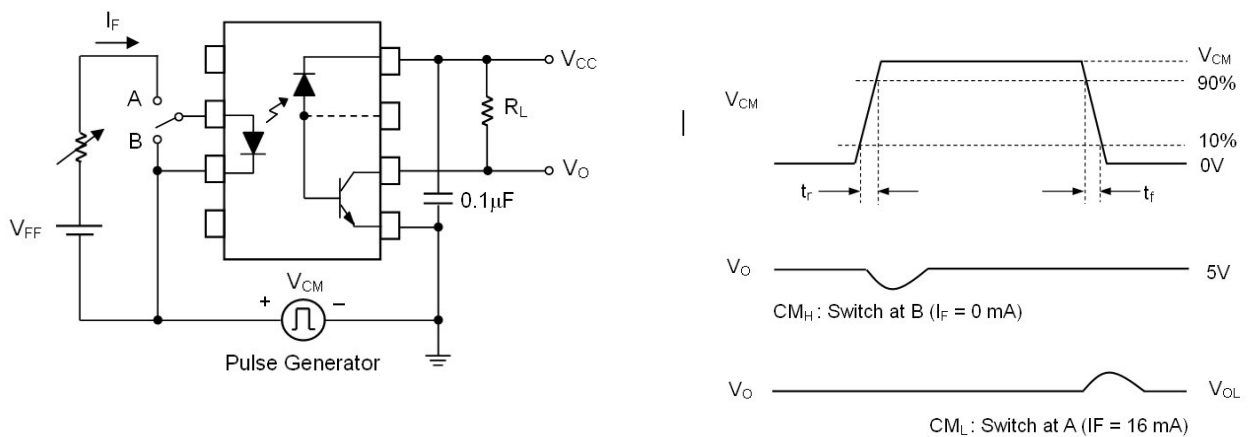


Figure 9 Transient Immunity Test Circuit & Waveform



Note:

*3 Common mode transient immunity in logic high level is the maximum tolerable (positive) dV_{cm}/dt on the leading edge of the common mode pulse signal VCM, to assure that the output will remain in a logic high state (i.e., $V_O > 2.0V$).

Common mode transient immunity in logic low level is the maximum tolerable (negative) dV_{cm}/dt on the trailing edge of the common mode pulse signal, VCM, to assure that the output will remain in a logic low state (i.e., $V_O < 0.8V$).

Order Information

Part Number

EL050X(Z)-V

Or

EL045X(Z)-V

Note

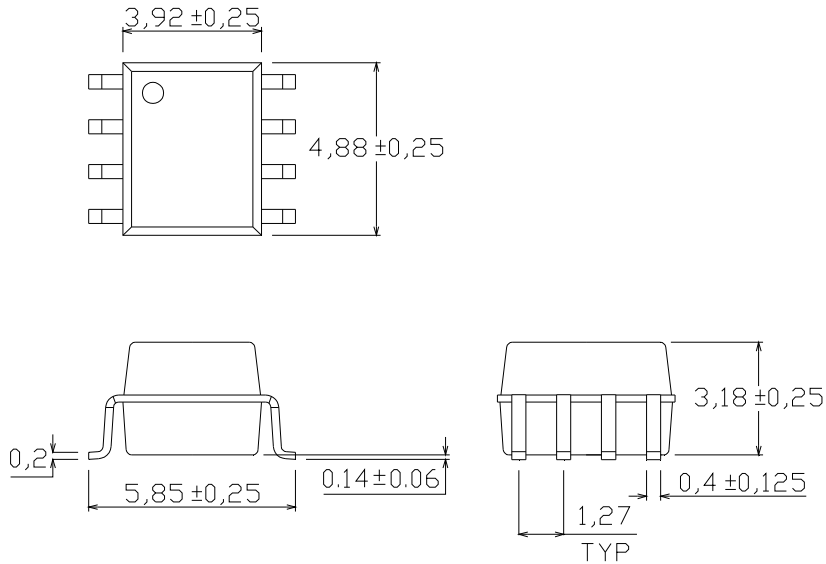
X = Part No. (X = 0 or 1) for EL050x; (x=2 or 3) for EL045x

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

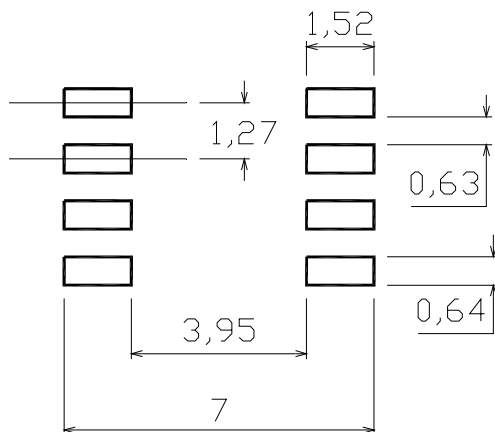
V = VDE (optional)

Option	Description	Packing quantity
None	Standard	100 units per tube
-V	Standard + VDE	100 units per tube
(TA)	TA tape & reel option	2000 units per reel
(TB)	TB tape & reel option	2000 units per reel
(TA)-V	TA tape & reel option + VDE	2000 units per reel
(TB)-V	TB tape & reel option + VDE	2000 units per reel

Package Drawing
(Dimensions in mm)



Recommended pad layout for surface mount leadform



Device Marking

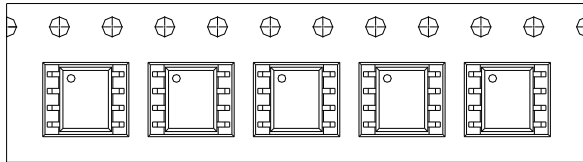


Notes

EL	denotes EVERLIGHT
0501	denotes Device Number
Y	denotes 1 digit Year code
WW	denotes 2 digit Week code
V	denotes VDE (optional)

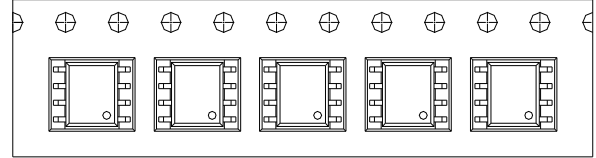
Tape & Reel Packing Specifications

Option TA



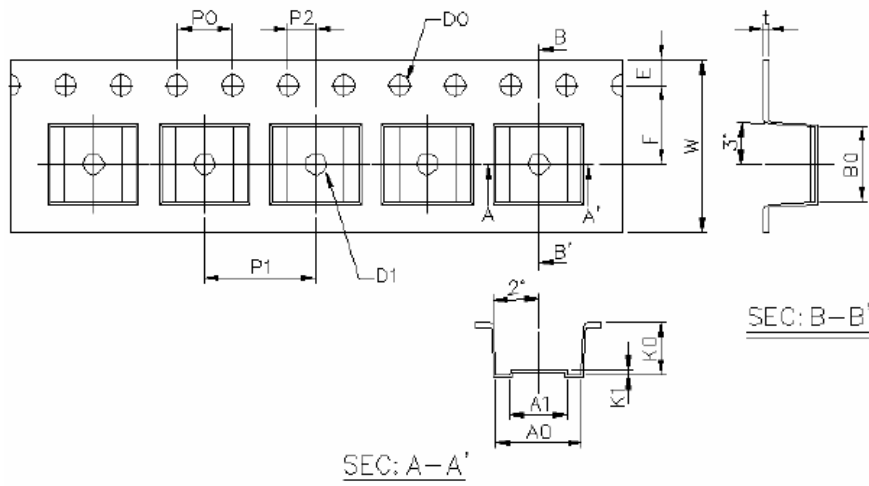
Direction of feed from reel

Option TB



Direction of feed from reel

Tape dimensions

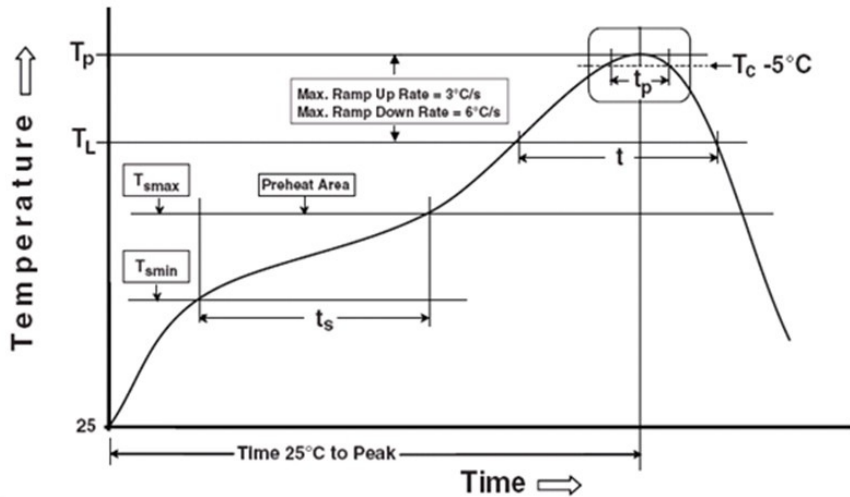


Dimension No.	A0	A1	B0	D0	D1	E	F
Dimension(mm)	6.2±0.1	4.1±0.1	5.28±0.1	1.5±0.1	1.5±0.3	1.75±0.1	5.5±0.1
Dimension No.	Po	P1	P2	t	W	K0	K1
Dimension(mm)	4.0±0.1	8.0±0.1	2.0±0.1	0.4±0.1	12.0+0.3/ -0.1	3.7±0.1	0.3±0.1

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: $T_p - 5 °C$	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

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