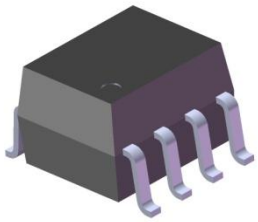
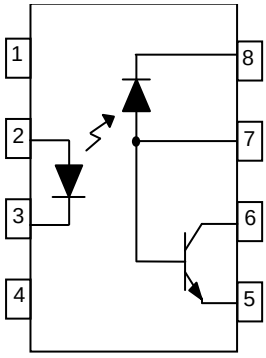
DATASHEET

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

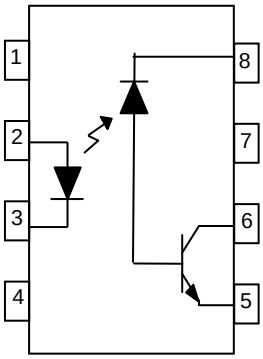


Schematic

EL0500 / EL0501



EL0452 /EL0453



Pin Configuration
1. No Connection
2. Anode
3. Cathode
4. No Connection
5. Gnd
6. Vout
7. V_B
8. V_{CC}

Pin Configuration
1. No Connection
2. Anode
3. Cathode
4. No Connection
5. Gnd
6. Vout
7. No Connection
8. V_{CC}

Features

- Compliance Halogen Free (Br <900 ppm ,Cl <900 ppm , Br+Cl < 1500 ppm)
- High speed 1Mbit/s
- 15kV/μs minimum commone mode transient immunity at VCM= 1500V (EL0453)
- 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
- Compliance with EU REACH
- Pb free and RoHS compliant
- UL and cUL approved(No. E214129)
- VDE approved (No. 40028116)
- SEMKO approved
- NEMKO approved
- DEMKO approved
- FIMKO approved Description

Description

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

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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 (≤1μs P.W,300pps)		I_{Ftrans}	1	A
	Reverse voltage		V_R	5	V
	Power dissipation		P_{IN}	45	mW
Output	Power dissipation		P_O	100	mW
	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.

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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	$\Delta V_F/\Delta T_A$	-	-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	EL0500	CTR	7	-	50	%	I_F = 16mA ,V_O = 0.4V, V_{CC}=4.5V, T_A=25°C
	EL0501 EL0452 EL0453		19	-	50		
	EL0500		5	-	-		I_F = 16mA ,V_O = 0.5V, V_{CC}=4.5V
	EL0501 EL0452 EL0453		15	-	-		
Logic Low Output Voltage	EL0500	V_{OL}	-	0.18	0.4	V	I_F = 16mA ,I_O = 1.1mA, V_{CC}=4.5V, T_A=25°C
	EL0501 EL0452 EL0453		-	0.18	0.4		I_F = 16mA ,I_O = 3mA, V_{CC}=4.5V, T_A=25°C
	EL0500		-	-	0.5		I_F = 16mA ,I_O =0.8mA, V_{CC}=4.5V
	EL0501 EL0452 EL0453		-	-	0.5		I_F= 16mA ,I_O=2.4mA, V_{CC}=4.5V

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Switching Characteristics (T_A=0 to 70°C unless specified otherwise, I_F=16mA, Vcc=5V)

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

* Typical values at T_a = 25°C

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Typical Electro-Optical Characteristics Curves

Figure 5. Logic High Output Current vs Ambient Temperature

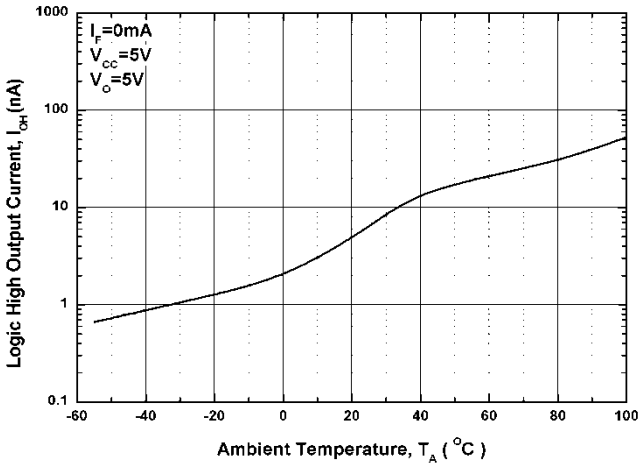

Figure 1. Forward Current vs Forward Voltage

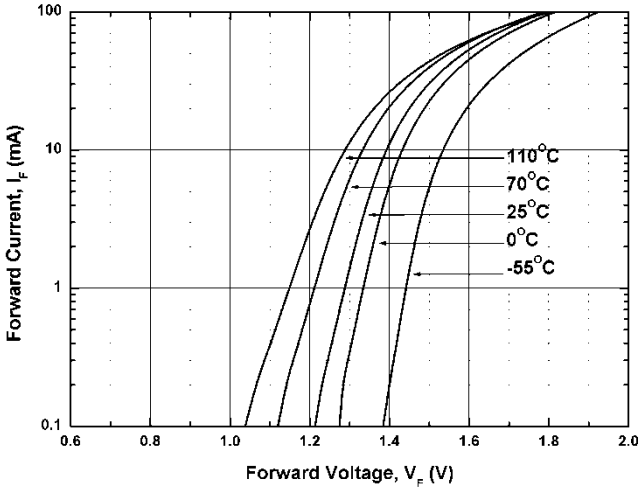

Figure 2. Current Transfer Ratio vs Forward Current

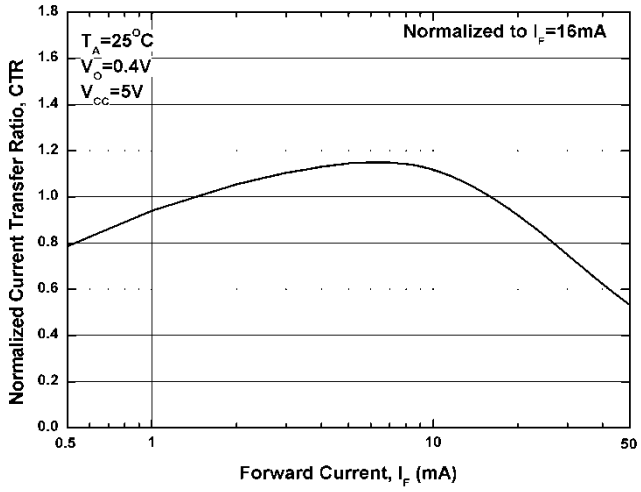

Figure 3. Current Transfer Ratio vs Ambient Temperature

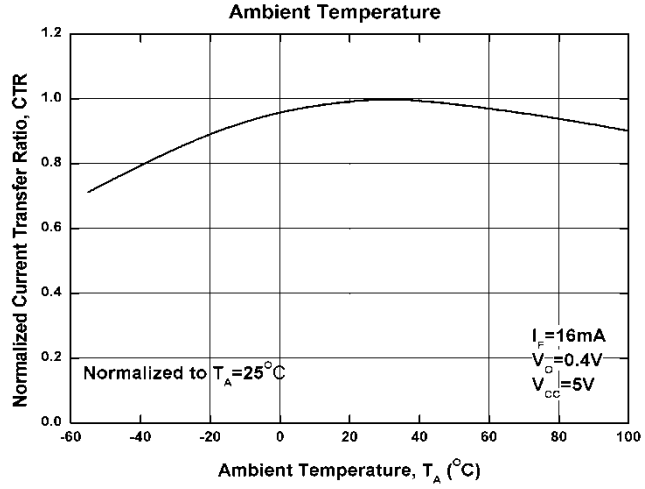

Figure 4. Output Current vs Output Voltage

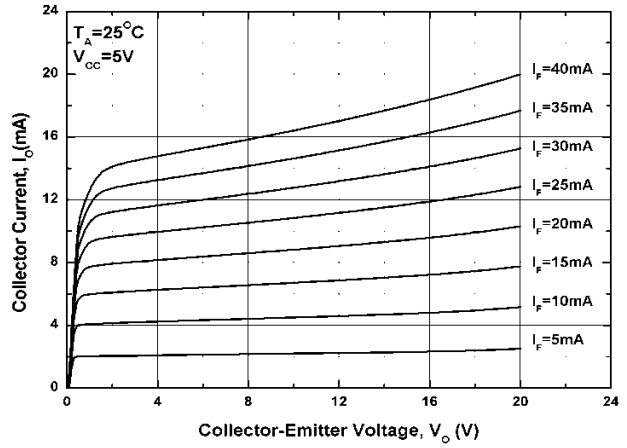

Figure 6. Propagation Delay vs. Load Resistance

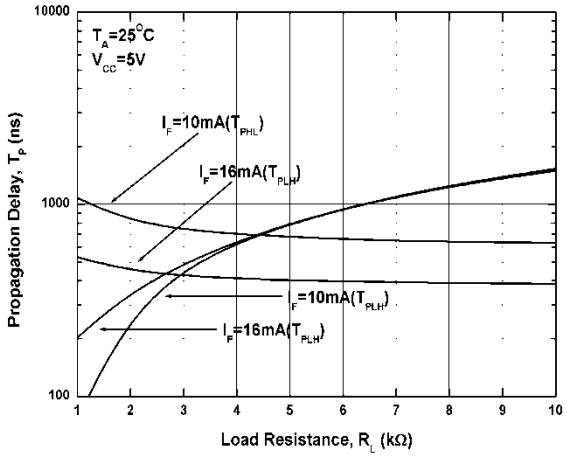

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Figure 7. Propagation Delay vs. Temperature

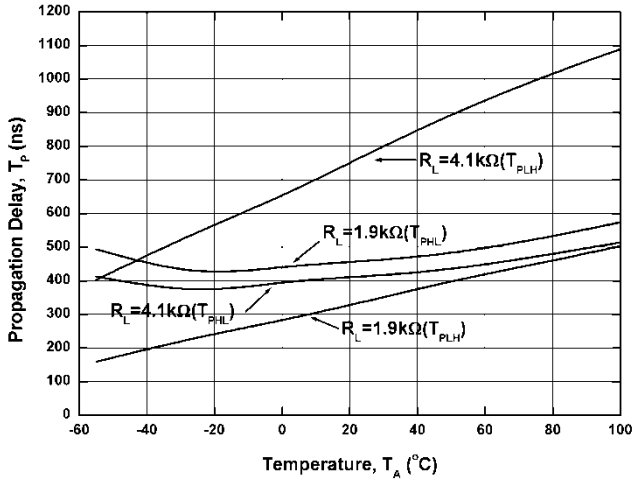


Figure 8 Switching Time Test Circuit & Waveform

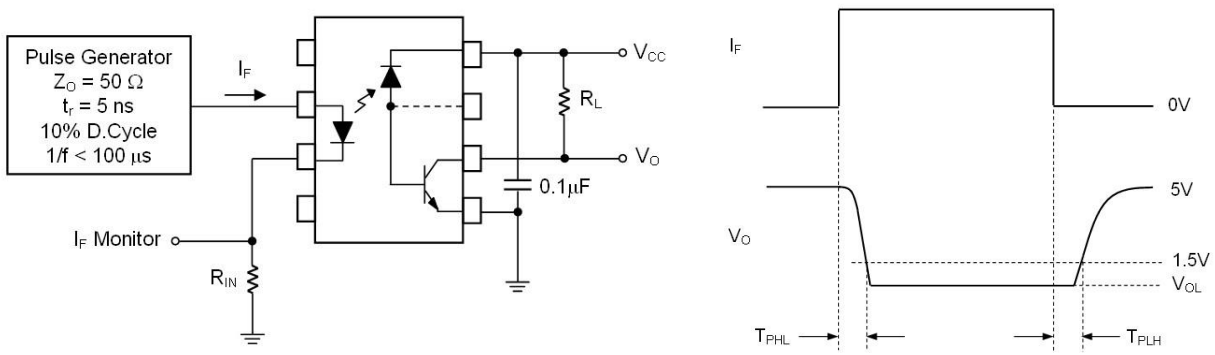
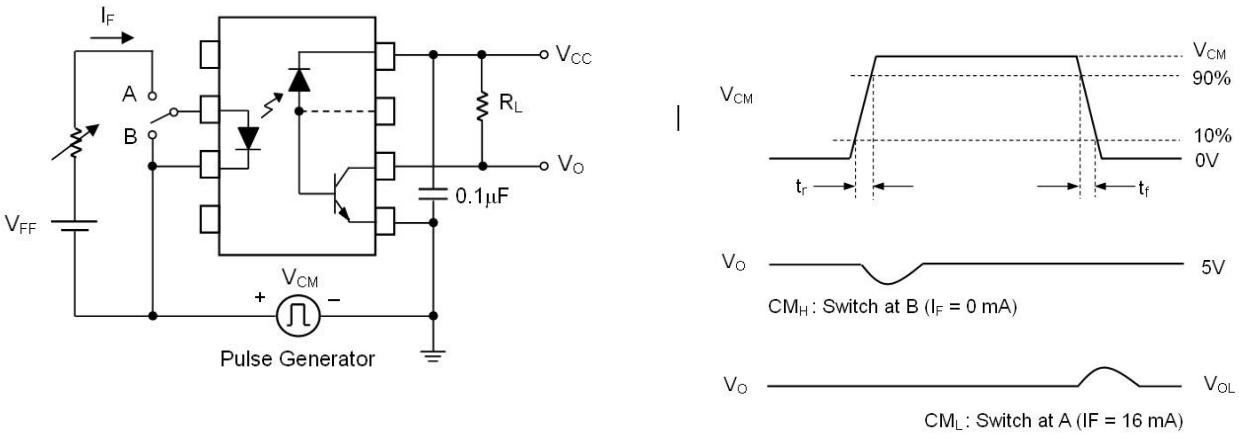


Figure 9 Transient Immunity Test Circuit & Waveform



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Note:

*3 Common mode transient immunity in logic high level is the maximum tolerable (positive) dVcm/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., VO > 2.0V).
Common mode transient immunity in logic low level is the maximum tolerable (negative) dVcm/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., VO < 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

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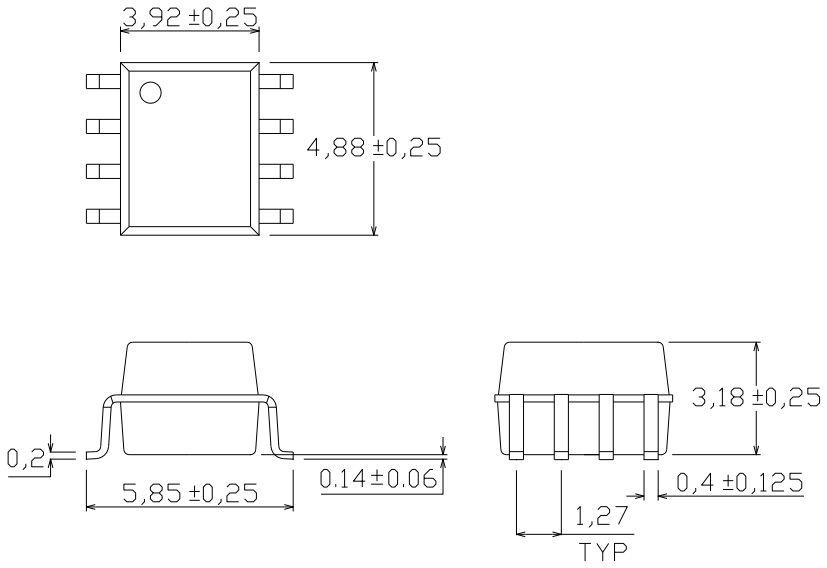
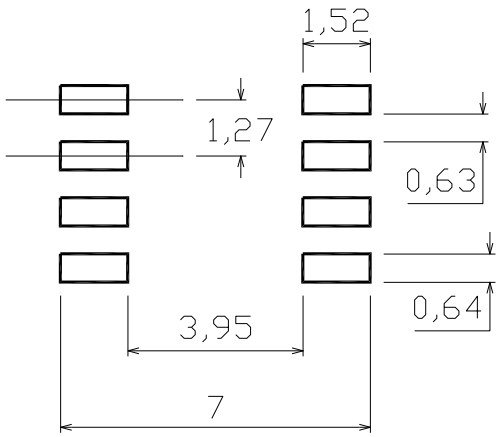
Package Drawing
(Dimensions in mm)



Recommended pad layout for surface mount leadform



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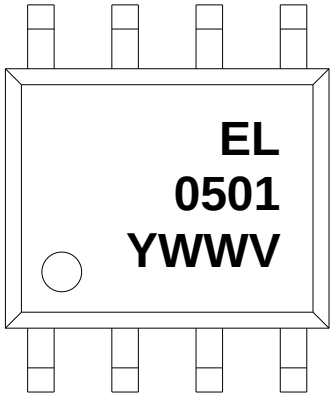
Device Marking



Notes

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

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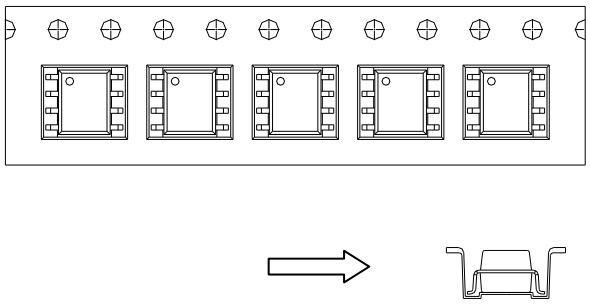
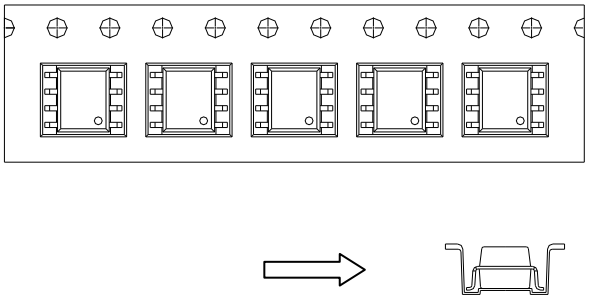
Tape & Reel Packing Specifications

Option TA



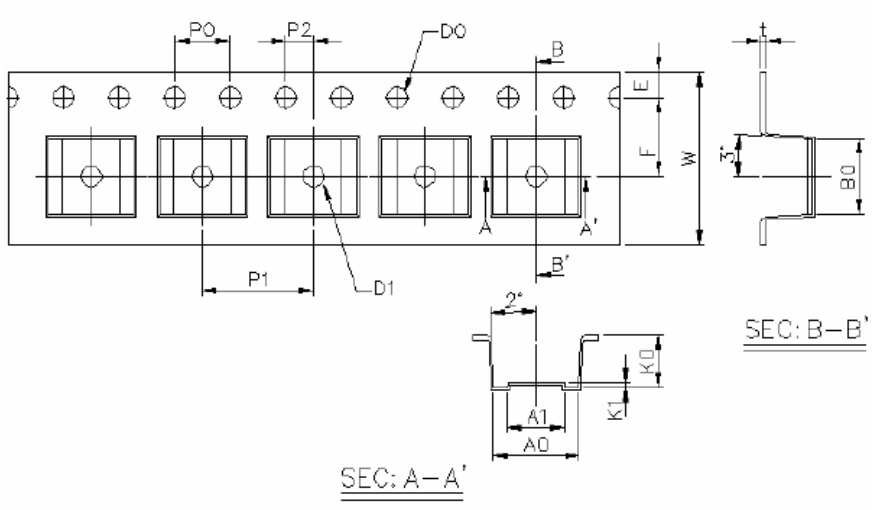
Direction of feed from reel

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

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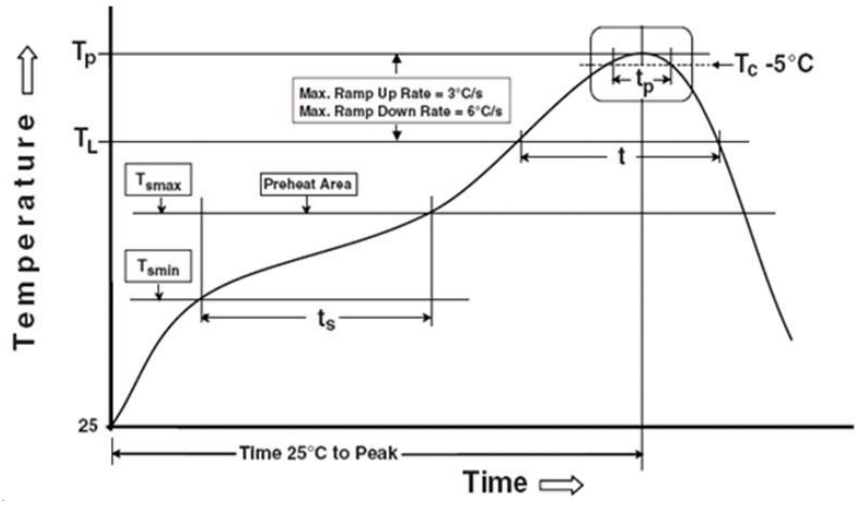
Precautions for Use

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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