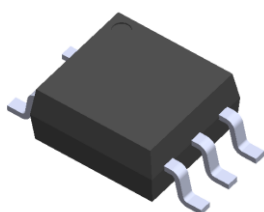
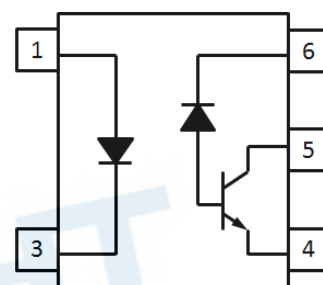


5 PIN SOP HIGH SPEED 1Mbit/s TRANSISTOR PHOTOCOUPLER ELM45X Series



Schematic



Pin Configuration

- 1. Anode
- 3. Cathode
- 4. Gnd
- 5. V_{out}
- 6. Vcc

Features

- Compliance Halogen Free .
(Br <900 ppm ,Cl <900 ppm , Br+Cl < 1500 ppm)
- Pb free and RoHS compliant
- Compliance with EU REACH
- High isolation voltage between input and output (Viso=3750 Vrms)
- High speed 1Mbit/s
- High CMR 15KV/us at $V_{CM}=1500V$ (ELM453)
- Wide operating temperature range of -40°C to 85°C
- UL and cUL approved
- VDE approved
- SEMKO approved
- NEMKO approved
- DEMKO approved
- FIMKO approved
- CQC approved

Description

The ELM452 and ELM453 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 industry standard 5pin SOP packages and are suitable for surface mounting.

Applications

- Line receivers
- Field bus communication and control.
- Power transistor isolation in motor drives
- Replacement for low speed phototransistor photo couplers
- High speed logic ground isolation
- Analog signal ground isolation

Absolute Maximum Ratings (Ta=25°C unless otherwise noted)

	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)	$I_{F(trans)}$	1	A
	Reverse Voltage	V_R	5	V
	Power Dissipation	P_{IN}	45	mW
Output	Power Dissipation	P_O	100	mW
	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}	-40 ~ +85	°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 & 3 are shorted together, and pins 4, 5 & 6 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	$I_F = 16\text{mA}$
Reverse Voltage	V_R	5.0	-	-	V	$I_R = 10\mu\text{A}$

Note: Reverse Voltage(VR) Condition is applied to IR test only The device is not designed for reverse operation

Output

Parameter	Symbol	Min	Typ.	Max.	Unit	Condition
Logic High Output Current	I_{OH}	-	0.001	0.5	μA	$I_F=0\text{mA}$, $V_O=V_{CC}=5.5\text{V}$, $T_A=25^{\circ}\text{C}$
		-	0.001	1		$I_F=0\text{mA}$, $V_O=V_{CC}=15\text{V}$, $T_A=25^{\circ}\text{C}$
		-	-	50		$I_F=0\text{mA}$, $V_O=V_{CC}=15\text{V}$
Logic Low Supply Current	I_{CCL}	-	200	-	μA	$I_F=16\text{mA}$, $V_O=\text{Open}$, $V_{CC}=15\text{V}$
Logic High Supply Current	I_{CCH}	-	0.05	1	μA	$I_F=0\text{mA}$, $V_O=\text{Open}$, $V_{CC}=15\text{V}$, $T_A=25^{\circ}\text{C}$
		-	-	2		$I_F=0\text{mA}$, $V_O=\text{Open}$, $V_{CC}=15\text{V}$

Transfer Characteristics

Parameter	Symbol	Min	Typ.	Max.	Unit	Condition
Current Transfer Ratio	CTR	20	-	50	%	$I_F = 16\text{mA}$, $V_O = 0.4\text{V}$, $V_{CC}=4.5\text{V}$, $T_A=25^{\circ}\text{C}$
		15	-	-		$I_F = 16\text{mA}$, $V_O = 0.5\text{V}$, $V_{CC}=4.5\text{V}$
Logic Low Output Voltage	V_{OL}	-	-	0.4	V	$I_F = 16\text{mA}$, $I_O = 3\text{mA}$, $V_{CC}=4.5\text{V}$, $T_A=25^{\circ}\text{C}$
		-	-	0.5		$I_F = 16\text{mA}$, $I_O = 2.4\text{mA}$, $V_{CC}=4.5\text{V}$

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

Parameter	Symbol	Min	Typ.	Max.	Unit	Condition
Propagation Delay Time to Logic Low	T_{PHL}	-	0.4	0.8	μs	$I_F=16\text{mA}$, $R_L=1.9\text{K}\Omega$, $T_A=25^\circ\text{C}$
		-	-	1.0		$I_F=16\text{mA}$, $R_L=1.9\text{K}\Omega$
Propagation Delay Time to Logic High	T_{PLH}	-	0.35	0.8	μs	$I_F=16\text{mA}$, $R_L=1.9\text{K}\Omega$, $T_A=25^\circ\text{C}$
		-	-	1.0		$I_F=16\text{mA}$, $R_L=1.9\text{K}\Omega$
Common Mode Transient Immunity at Logic High ^(*)	ELM452	5,000	-	-	$\text{V}/\mu\text{s}$	$I_F=0\text{mA}$, $V_{CM}=10\text{Vp-p}$, $R_L=1.9\text{K}\Omega$, $T_A=25^\circ\text{C}$
	ELM453	15,000	-	-		$I_F=0\text{mA}$, $V_{CM}=1500\text{Vp-p}$, $R_L=1.9\text{K}\Omega$, $T_A=25^\circ\text{C}$
Common Mode Transient Immunity at Logic Low ^(*)	ELM452	5,000	-	-	$\text{V}/\mu\text{s}$	$I_F=16\text{mA}$, $V_{CM}=10\text{Vp-p}$, $R_L=1.9\text{K}\Omega$, $T_A=25^\circ\text{C}$
	ELM453	15,000	-	-		$I_F=16\text{mA}$, $V_{CM}=1500\text{Vp-p}$, $R_L=1.9\text{K}\Omega$, $T_A=25^\circ\text{C}$

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

Typical Electro-Optical Characteristics Curves

Figure 1. Forward Current vs Forward Voltage

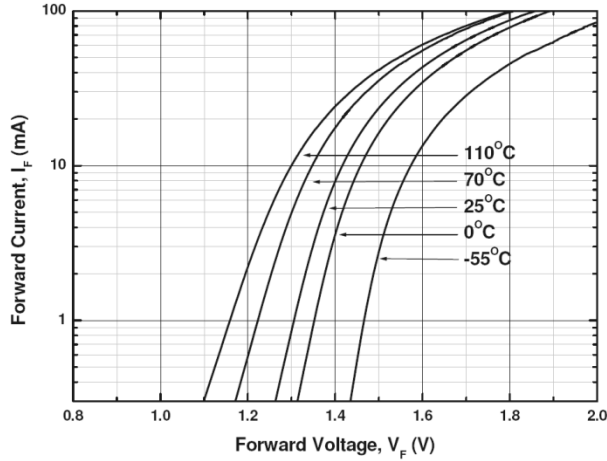


Figure 2. Current Transfer Ratio vs Forward Current

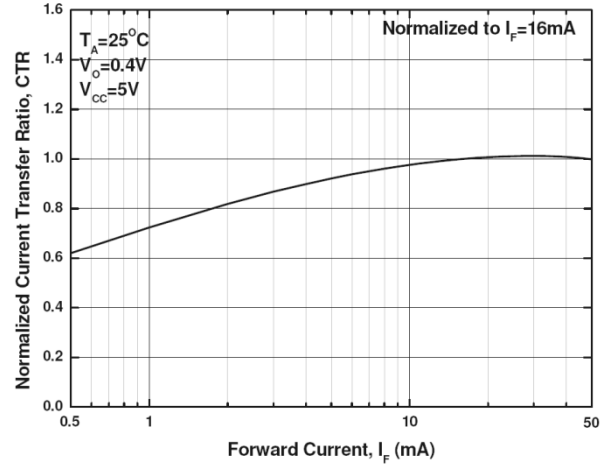


Figure 3. Current Transfer Ratio vs Ambient Temperature

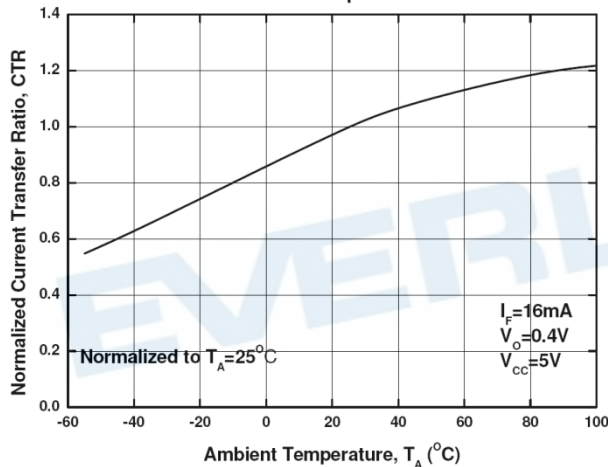


Figure 4. Output Current vs Output Voltage

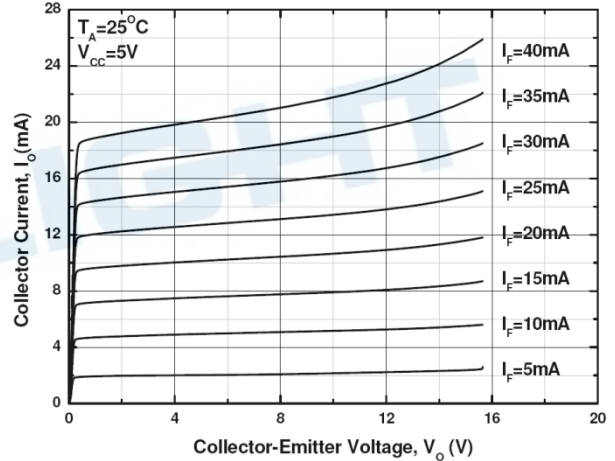


Figure 5. Logic High Output Current vs Ambient Temperature

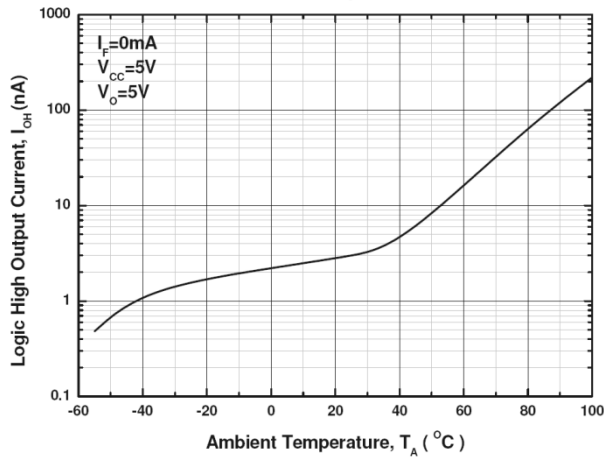


Figure 6. Propagation Delay vs. Load Resistance

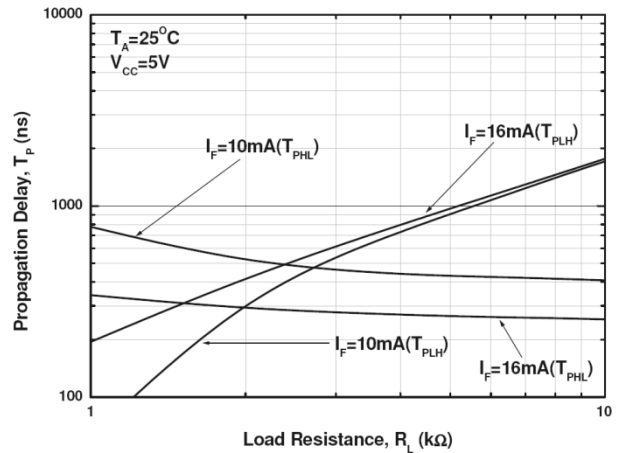


Figure 7. Propagation Delay vs. Temperature

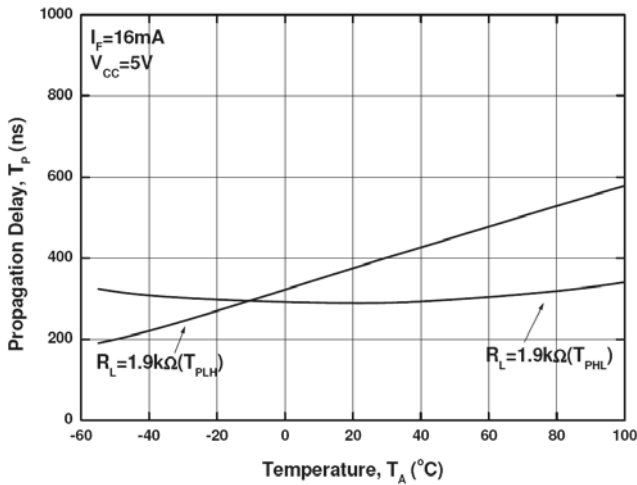
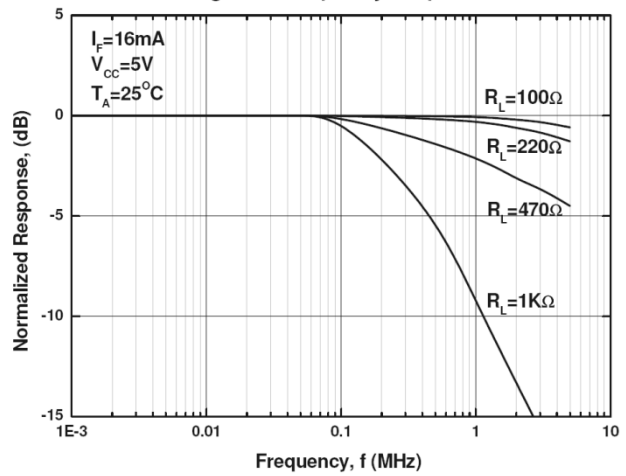


Figure 8. Frequency Response



Note: The graphs shown in this datasheet are representing typical data only and do not show guaranteed values

Figure 9 Switching Time Test Circuit & Waveform

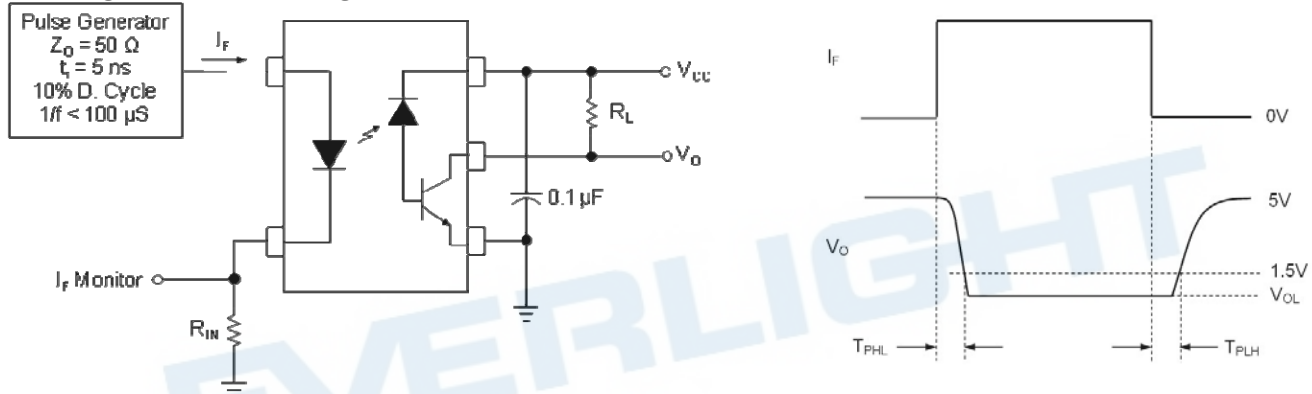
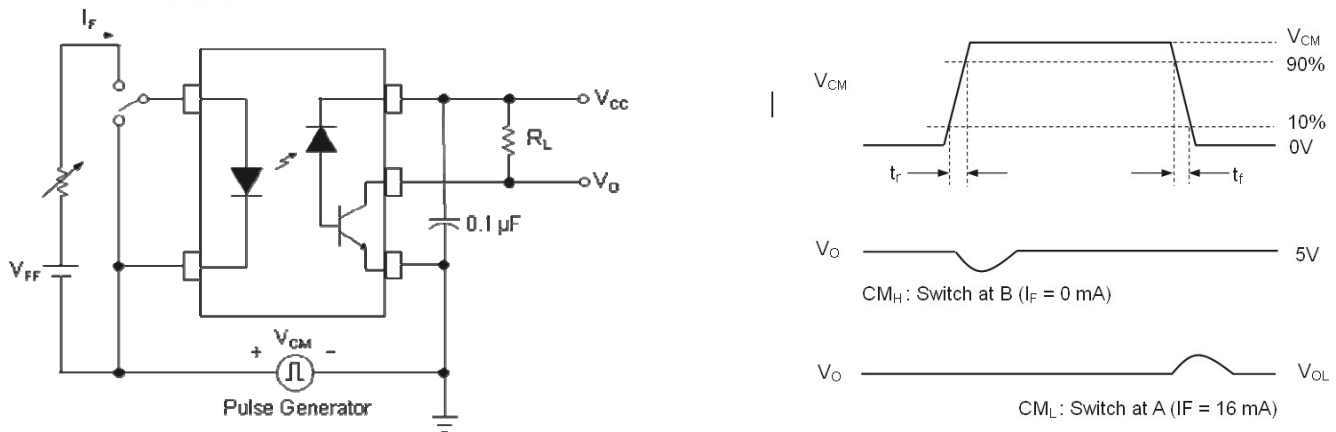


Figure 10 Transient Immunity Test Circuit & Waveform



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 V_{CM} , 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, V_{CM} , to assure that the output will remain in a logic low state (i.e., $V_O < 0.8V$).

Order Information

Part Number

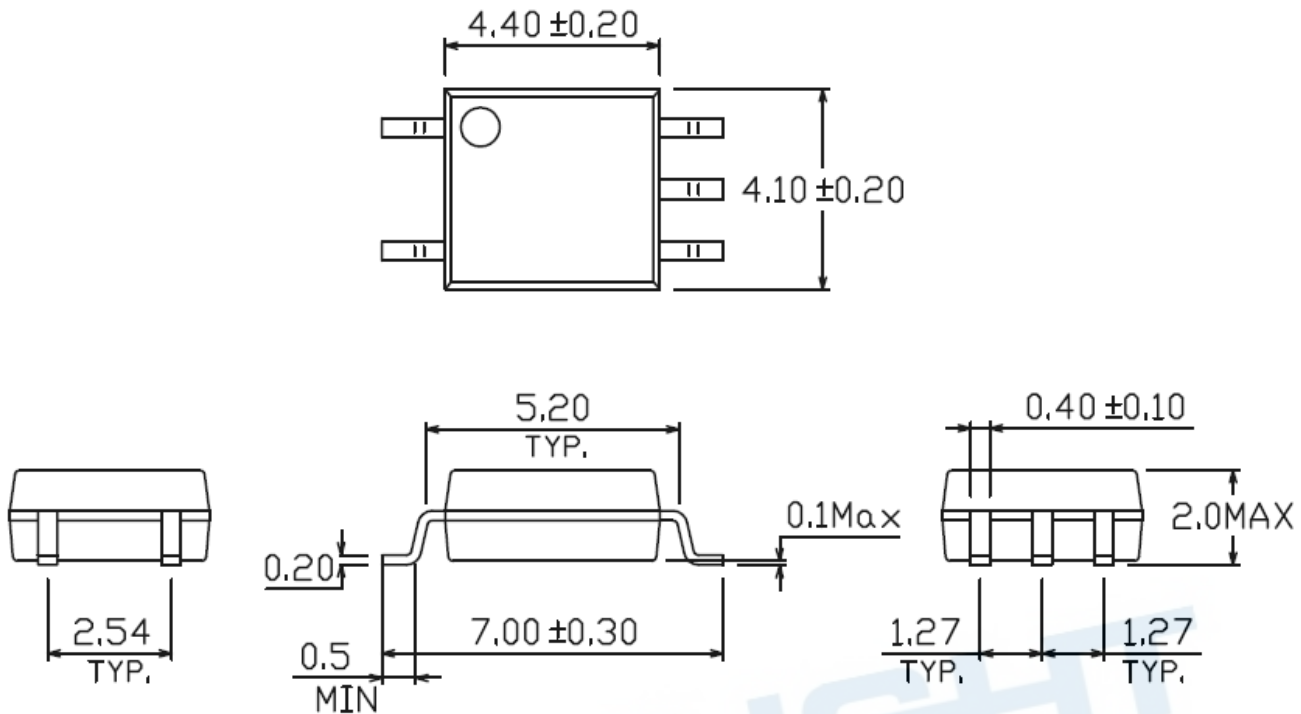
ELM45X(Z)-V

Note

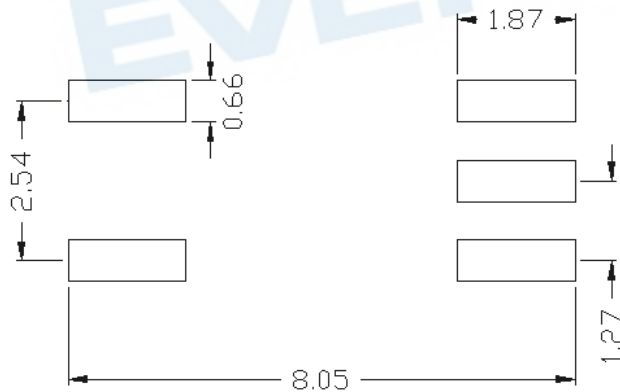
X = Part no. (X = 2 or 3)
Z = Tape and reel option (TA, TB).
V = VDE (optional)

Option	Description	Packing quantity
None	Standard	100 units per tube
-V	Standard + VDE	100 units per tube
(TA)	TA tape & reel option	3500 units per reel
(TB)	TB tape & reel option	3500 units per reel
(TA)-V	TA tape & reel option + VDE	3500 units per reel
(TB)-V	TB tape & reel option + VDE	3500 units per reel

Package Dimension (Dimensions in mm)



Recommended pad layout for surface mount leadform



Notes.
Suggested pad dimension is just for reference only.
Please modify the pad dimension based on individual need.

Device Marking



Notes

EL	denotes EVERLIGHT
M453	denotes Device Number
Y	denotes 1 digit Year code
WW	denotes 2 digit Week code
V	denotes VDE (optional)

EVERLIGHT

Label form

Pb **EVERLIGHT** **11** → 月份

客戶料號 ← CPN: XXXXXXXXXXXX 測試區

億光料號 ← P/N: XXXXXXXXXXXX

億光品名 ← EL817M(C)-VG

生產周別 ← D/C: YWWX CAT: X QTY: 000000

生產序號 ← LOT NO: Y151130XXXXXXXXXX

標籤識別碼 ← REFERENCE: BTPyyMMddXXXXX

產地 ← MADE IN XXXXXX

RoHS 標示

CCC, RoHS, VDE 安規標示

QR Code

包裝數量

or

RoHS 標示

RoHS **Pb** **EVERLIGHT** **5** → 月份

客戶料號 ← CPN: XXXXXXXXXXXX 測試區

客戶品名 ← XXXXXXXXXXXX-XXXXXXXXXX-XXXXXXXXXX-XXXXXXXXXX-XXXXXX

億光料號 ← P/N: XXXXXXXXXXXX

億光品名 ← XXXXXXXXXXXX-XXXXXXXXXX-XXXXXXXXXX-XXXXXX

生產序號 ← LOT NO: Y150516XXX-XXXXXXXXXX-XXXXXXXXXX

包裝數量 ← QTY: 0123456789 HUE: XXXXXXXXXXXX

CTR等級 ← CAT: XXXXXXXXXXXX REF: XXXXXXXXXXXX

標籤識別碼 ← REFERENCE: BTPYYMMDDXXXXX

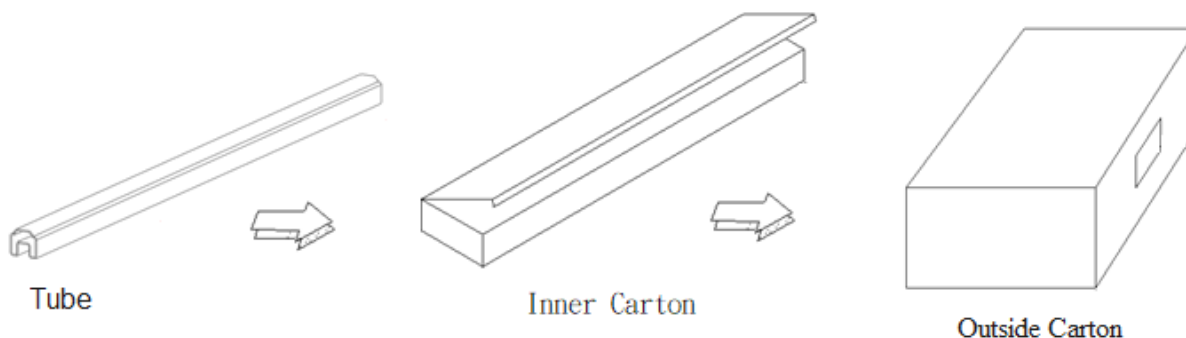
MSL等級 ← MSL-XX

產地

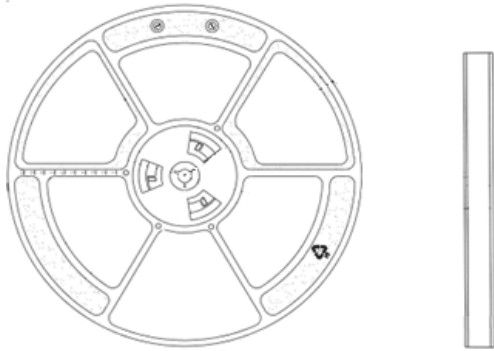
CCC, RoHS, VDE 安規標示

QR Code

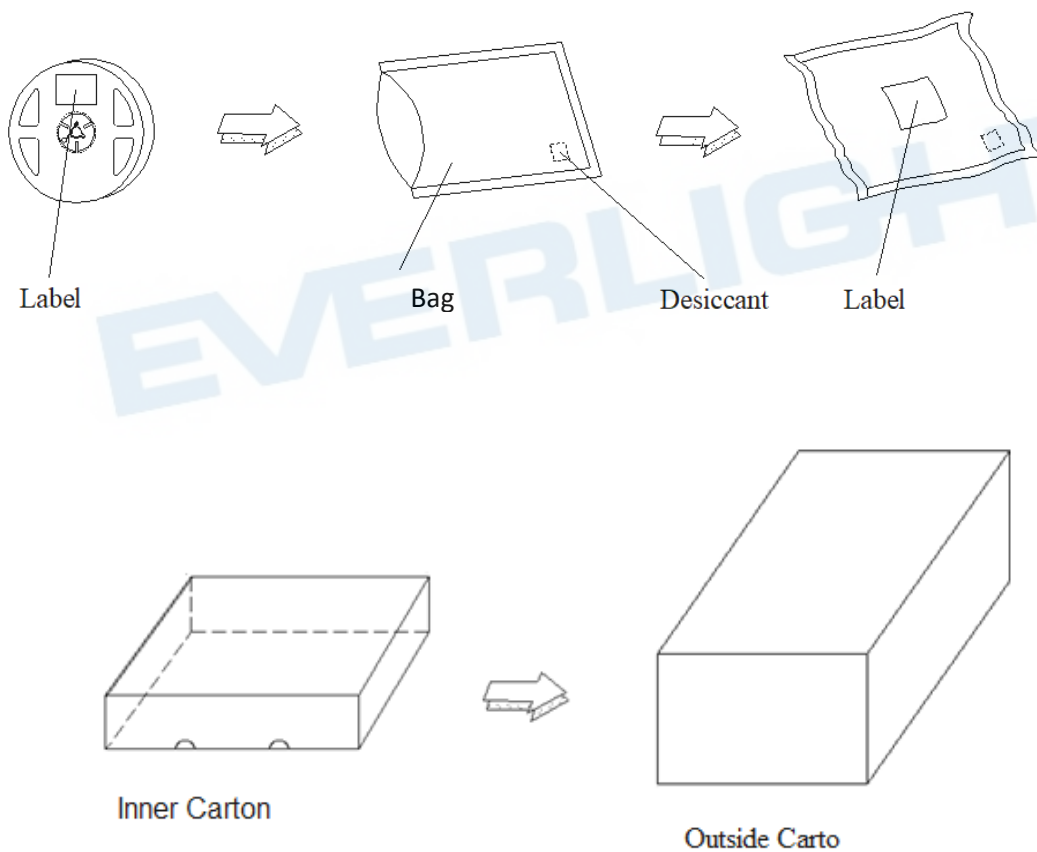
TUBE Dimension



Reel Dimension

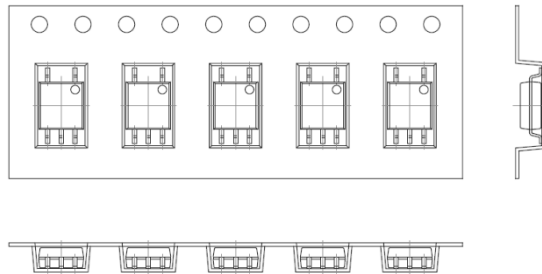


Moisture Resistant Packaging



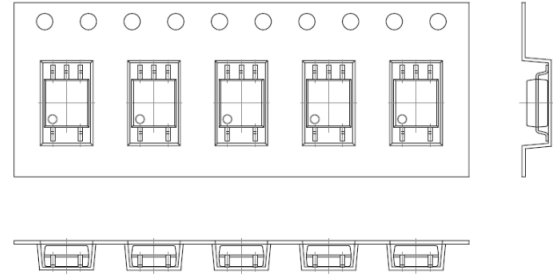
Tape & Reel Packing Specifications

Option TA



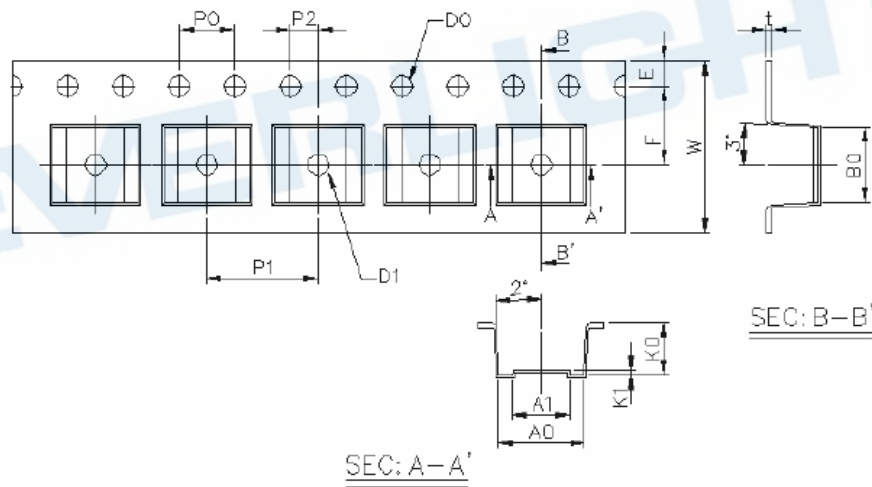
Direction of feed from reel

Option TB



Direction of feed from reel

Tape dimensions

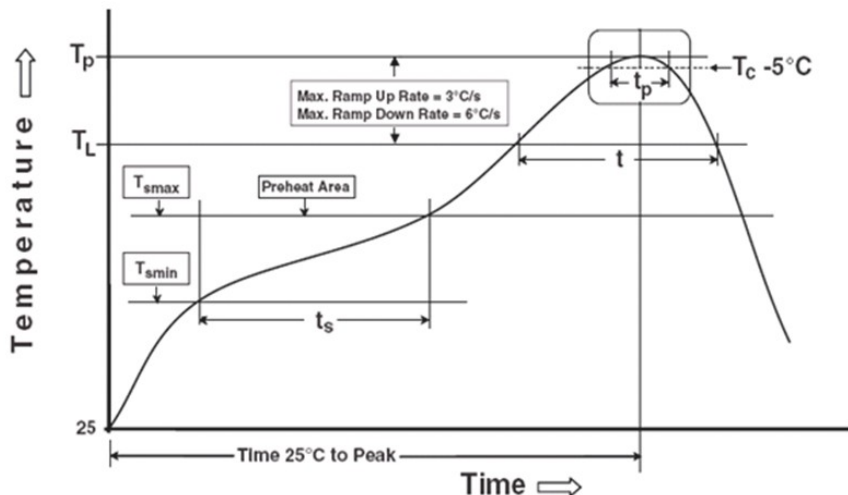


Dimension No.	A	B	D0	D1	E	F
Dimension(mm)	4.4±0.1	7.6±0.1	1.5±0.1	1.5±0.1	1.75±0.1	7.5±0.1
Dimension No.	Po	P1	P2	t	W	K
Dimension(mm)	4.0±0.15	8.0±0.1	2.0±0.1	0.3±0.05	16.0±0.2	2.4±0.1

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

Precautions for General Storage

- Avoid storage locations where devices may be exposed to moisture or direct sunlight.
- Follow the precautions printed on the packing label of the device for transportation and storage.
- Keep the storage location temperature and humidity within a range of 5°C to 35°C and 20 % to 60 %, respectively.
- Do not store the products in locations with poisonous gases (especially corrosive gases) or in dusty conditions.
- Store the products in locations with minimal temperature fluctuations. Rapid temperature changes during storage can cause condensation, resulting in lead oxidation or corrosion, which will deteriorate the solderability of the leads.
- When restoring devices after removal from their packing, use anti-static containers.
- Do not allow loads to be applied directly to devices while they are in storage.
- If devices have been stored for more than two years under normal storage conditions, it is recommended that you check the leads for ease of soldering prior to use.

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DISCLAIMER

1. Above specification may be changed without notice. EVERLIGHT will reserve authority on material change for above specification.
2. The graphs shown in this datasheet are representing typical data only and do not show guaranteed values.
3. When using this product, please observe the absolute maximum ratings and the instructions for use outlined in these specification sheets. EVERLIGHT assumes no responsibility for any damage resulting from use of the product which does not comply with the absolute maximum ratings and the instructions included in these specification sheets.
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