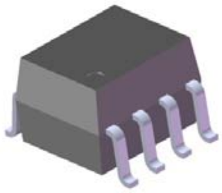
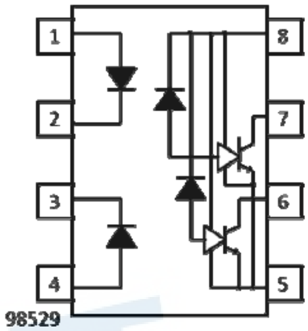
EVERLIGHT

DATASHEET

8 PIN SOP DUAL CHANNEL HIGH SPEED 10MBit/s LOGIC GATE PHOTOCOUPLER EL063X Series



Schematic



Features

- Compliance Halogen Free .
  (Br< 900 ppm ,Cl< 900 ppm , Br+Cl< 1500 ppm)
- High speed 10Mbit/s
- 10kV/μs min. common mode transient immunity (EL0631)
- 3.3V/5 V Dual supply voltage
- Logic gate output
- High isolation voltage between input and output (Viso=3750 V rms)
- Compliance with EU REACH
- Pb free and RoHS compliant
- UL and cUL approved
- VDE approved
- SEMKO approved
- NEMKO approved
- DEMKO approved
- FIMKO approved

Pin Configuration

1. Anode
2. Cathode
3. Cathode
4. Anode
5. Gnd
6. $V_{out\ 2}$
7. $V_{out\ 1}$
8. V_{CC}

Description

The EL0630 and EL0631 are dual channel devices each consists of an infrared emitting diode optically coupled to a high speed integrated photo detector logic gate with a strobable output. The devices are packaged in an 8-pin small outline package which conforms to the standard SO8 footprint.

Applications

- Ground loop elimination
- LSTTL to TTL, LSTTL or CMOS
- Line receiver, data transmission
- Data multiplexing
- Switching power supplies
- Pulse transformer replacement
- Computer peripheral interface

Truth Table

Input	Output
H	L
L	H

Absolute Maximum Ratings (Ta=25°C)*1

Parameter		Symbol	Rating	Unit
Input	Forward Current	I_F	20	mA
	Reverse Voltage	V_R	5	V
	Power Dissipation	P_D	40	mW
Output	Power Dissipation	P_C	60	mW
	Output Current	I_O	50	mA
	Output Voltage	V_O	7.0	V
	Supply Voltage	V_{CC}	7.0	V
Output Power Dissipation		P_O	100	mW
Isolation Voltage*2		V_{ISO}	3750	V rms
Operating Temperature		T_{OPR}	-40 ~ +85	°C
Storage Temperature		T_{STG}	-55 ~ +125	°C
Soldering Temperature*3		T_{SOL}	260	°C

Notes:
*1 Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of this document. Exposure to absolute maximum ratings for extended periods of the time can adversely affect reliability. The absolute maximum ratings are stress only T_A=25°C unless otherwise specified. Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum rating.
*2 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.
*3 For 10 seconds

Recommended Operating Conditions*4

Characteristics	Symbol	Min	Max	Unit
Input Current, High Level*5	I_{FH}	7	15	mA
Supply Voltage	V_{CC}	2.7	3.6	V
		4.5	5.5	
Operating Temperature	T_{opr}	-20	60	°C

Notes:
*4 The recommended operating conditions are given as a design guide necessary to obtain the intended performance of the device. Each parameter is an independent value. When creating a system design using this device, the electrical characteristics specified in this datasheet should also be considered. The V_{CC} supply must be bypassed by a 0.1μF capacitor or larger. This can be either a ceramic or solid tantalum capacitor with good high frequency characteristic and should be connected as close as possible to the package V_{CC} and GND pins.
*5 The initial switching threshold is 5 mA or less. It is recommended that 7 mA to 10 mA be used for best performance and to permit at least a 20% LED degradation guardband.

Electrical Characteristics

Input

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Forward Voltage	V_F	-	1.4	1.8	V	I_F =10mA
Reverse Voltage	V_R	5.0	-	-	V	I_R =10μA
Input Capacitance	C_{IN}	-	60	-	pF	V_F =0, f=1MHz

Note: Reverse Voltage(V_R) Condition is applied to I_R test only. The device is not designed for reverse operation.

Output

Parameter	Symbol	Min	Typ.	Max.	Unit	Condition
High level Supply Current	I_{CCH}	-	13	18	mA	I_F =0mA, V_{CC} =5.5V
Low level Supply Current	I_{CCL}	-	15	21	mA	I_F =10mA, V_{CC} =5.5V

Transfer Characteristics

Parameter	Symbol	Min	Typ.	Max.	Unit	Condition
High Level Output Current	I_{OH}	-	-	100	μA	V_{CC}=5.5V, V_O =5.5V, I_F =250μA
Low Level Output Current	V_{OL}	-	-	0.6	V	V_{CC} =5.5V, I_F =5mA, I_{OL} =13mA
Input Threshold Current	I_{FT}	-	-	5	mA	V_{CC} =5.5V, V_O =0.6V, I_{OL} =13mA

Notes:
*a Over recommended operating conditions (T_A = -40°C to +85°C, 4.5V ≤ V_{CC} ≤ 5.5V) unless otherwise specified.
*b All Typical at V_{CC} = 5.5V, T_A =25°C.

Switching Characteristics

Parameter		Symbol	Min	Typ.	Max.	Unit	Condition
Propagation delay time to output High level*7		t_{PHL}	-	-	100	ns	V_{CC}=5.5V, I_F=7.5mA C_L=15pF, R_L=350Ω T_A=25°C
Propagation delay time to output Low level*8		t_{PLH}	-	-	100	ns	
Pulse width distortion		$\lvert t_{PHL} - t_{PLH} \rvert$	-	15	-	ns	
Output rise time*9		t_r	-	40	-	ns	
Output fall time*10		t_f	-	10	-	ns	
Common Mode Transient Immunity at Logic High*11	EL0630	$\lvert CM_H \rvert$	5000	-	-	V/μs	I_F=0mA, $V_{OH(MIN)}$=2.0V, V_{CC}=5V R_L=350Ω, T_A=25°C $\lvert V_{CM} \rvert$=1KV
	EL0631		10000				I_F = 0mA, $V_{OH(MIN)}$=2.0V, V_{CC}=5V R_L=350Ω, T_A=25°C $\lvert V_{CM} \rvert$=1KV
Common Mode Transient Immunity at Logic Low*12	EL0630	$\lvert CM_L \rvert$	5000	-	-	V/μs	I_F=7.5mA, $V_{OL(MAX)}$=0.8V, V_{CC}=5V R_L=350Ω, T_A=25°C $\lvert V_{CM} \rvert$=1KV
	EL0631		10000				I_F=7.5mA, $V_{OL(MAX)}$=0.8V, V_{CC}=5V R_L=350Ω, T_A=25°C $\lvert V_{CM} \rvert$=1KV

Notes:
*a Over recommended operating conditions (T_A= -40°C to +85°C, 4.5V ≤ V_{CC} ≤ 5.5V, I_F=7.5mA) unless otherwise specified.
*b All Typical at V_{CC} = 5.5V, T_A=25°C.

Electrical Characteristics

Input

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Forward Voltage	V_F	-	1.4	1.8	V	I_F =10mA
Reverse Voltage	V_R	5.0	-	-	V	I_R =10μA
Input Capacitance	C_{IN}	-	60	-	pF	V_F =0, f=1MHz

Note: Reverse Voltage(V_R) Condition is applied to I_R test only. The device is not designed for reverse operation.

Output

Parameter	Symbol	Min	Typ.	Max.	Unit	Condition
High Level Supply Current	I_{CCH}	-	8	18	mA	I_F =0mA, V_{CC} =3.3V
Low Level Supply Current	I_{CCL}	-	10	21	mA	I_F =10mA, V_{CC} =3.3V

Transfer Characteristics

Parameter	Symbol	Min	Typ.	Max.	Unit	Condition
High Level Output Current	I_{OH}	-	-	200	μA	V_{CC}=3.3V, V_O =3.3V I_F =250μA
Low Level Output Current	V_{OL}	-	-	0.6	V	V_{CC} =3.3V, I_F =5mA, I_{OL} =13mA
Input Threshold Current	I_{FT}	-	-	6	mA	V_{CC} =3.3V, V_O =0.6V, I_{OL} =13mA

Notes:
*a Over recommended operating conditions (T_A = -40°C to +85°C, 2.7V ≤ V_{CC} ≤ 3.6V) unless otherwise specified.
*b All Typical at V_{CC} = 3.3V, T_A =25°C.

Switching Characteristics

Parameter		Symbol	Min	Typ.	Max.	Unit	Condition
Propagation delay time to output High level*7		t_{PHL}	-	-	120	ns	V_{CC}=3.3V, I_F=7.5mA C_L =15pF, R_L=350Ω T_A =25°C
Propagation delay time to output Low level*8		t_{PLH}	-	-	120	ns	
Pulse width distortion		$\|t_{PHL} - t_{PLH}\|$	-	30	-	ns	
Output rise time*9		t_r	-	65	-	ns	
Output fall time*10		t_f	-	15	-	ns	
Common Mode Transient Immunity at Logic High*11	EL0630	$\|CM_H\|$	5000	-	-	V/µs	I_F =0mA, $V_{OH(MIN)}$ =2.0V, V_{CC}=3.3V R_L =350Ω, T_A =25°C $\|V_{CM}\|$ =1KV
	EL0631		10000				I_F = 0mA, $V_{OH(MIN)}$=2.0V, V_{CC}=3.3V R_L=350Ω, T_A=25°C $\|V_{CM}\|$=1KV
Common Mode Transient Immunity at Logic Low*12	EL0630	$\|CM_L\|$	5000	-	-	V/µs	I_F =7.5mA,$V_{OL(MAX)}$ =0.8V, V_{CC}=3.3V R_L =350Ω, T_A =25°C $\|V_{CM}\|$ =1KV
	EL0631		10000				I_F =7.5mA,$V_{OL(MAX)}$ =0.8V, V_{CC}=3.3V R_L =350Ω, T_A =25°C $\|V_{CM}\|$ =1KV

Notes:
*a Over recommended operating conditions (T_A = -40°C to +85°C, 2.7V ≤ V_{CC} ≤ 3.6V, I_F=7.5mA) unless otherwise specified.
*b All Typical at V_{CC} = 3.3V, T_A =25°C.

Typical Electro-Optical Characteristics Curves

Figure 1. Low Level Output Voltage vs. Ambient Temperature

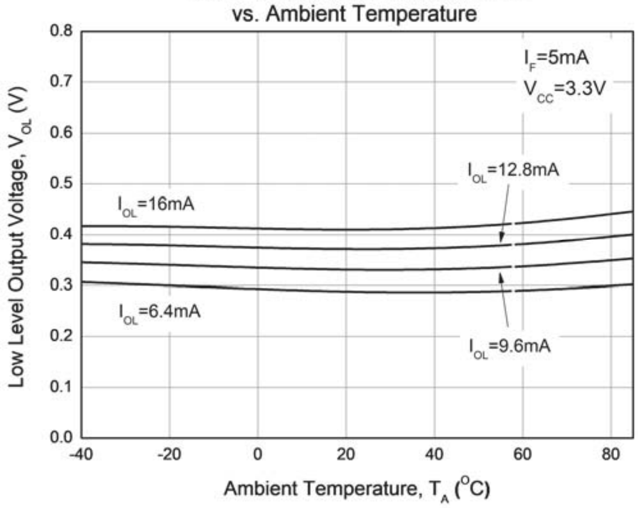


Figure 2. Low Level Output Voltage vs. Ambient Temperature

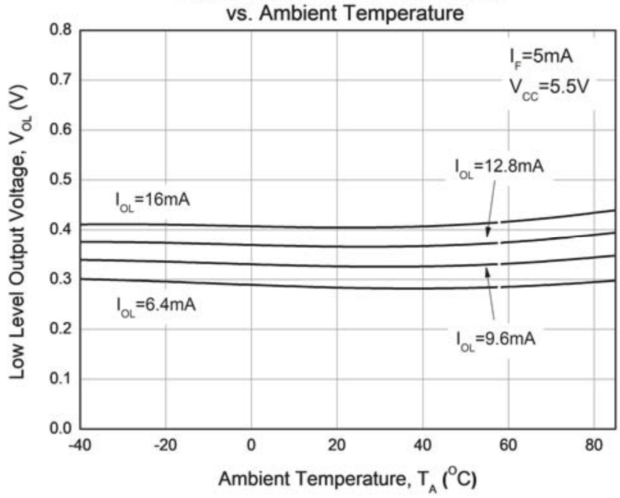


Figure 3. Low Level Output Current vs Ambient Temperature

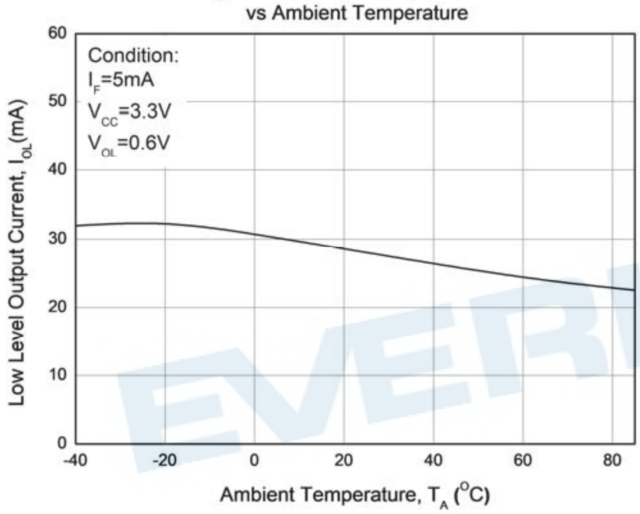


Figure 4. Low Level Output Current vs Ambient Temperature

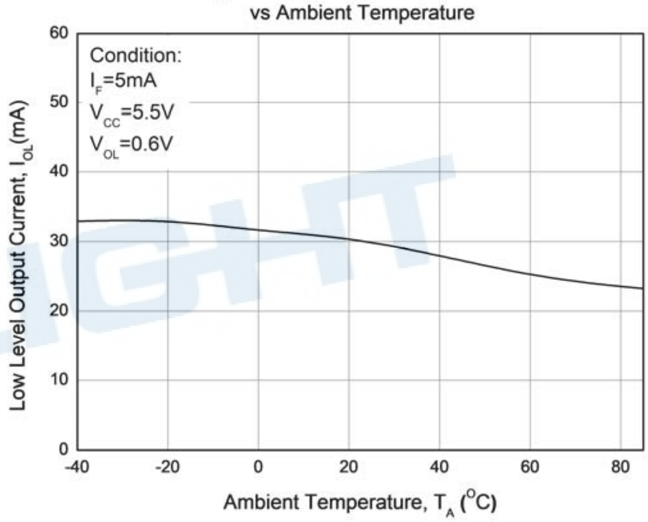


Figure 5. High Level Output Current vs Ambient Temperature

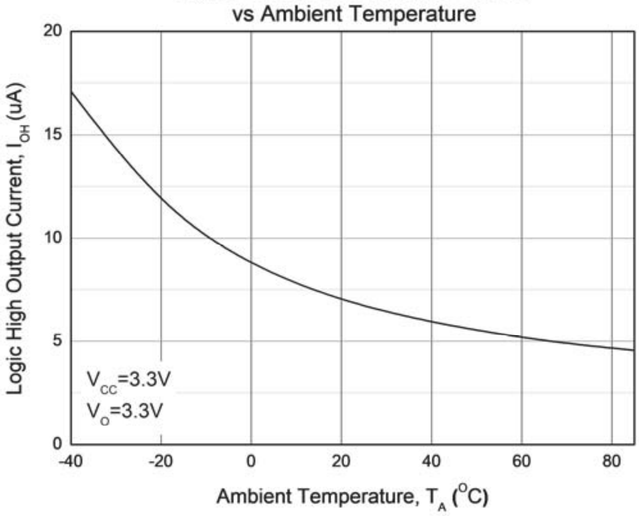


Figure 6. High Level Output Current vs Ambient Temperature

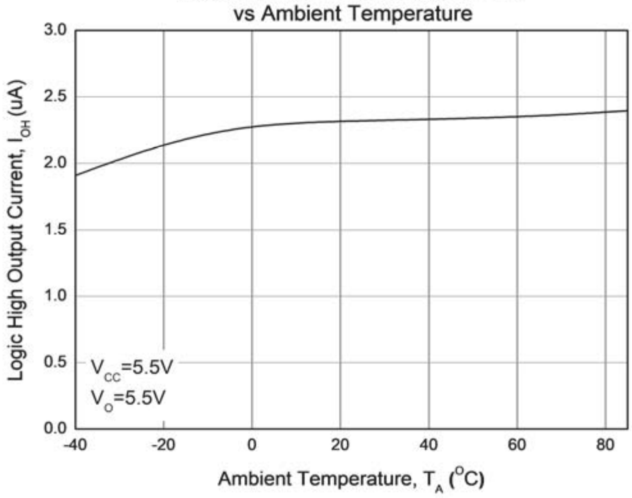


Figure 7. Input Threshold Current vs Ambient Temperature

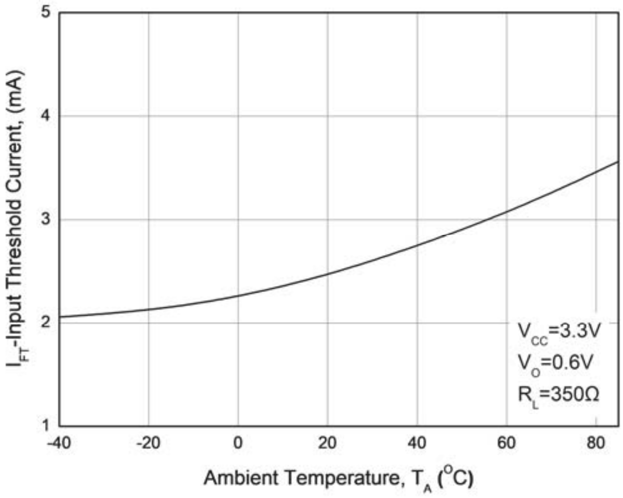


Figure 8. Input Threshold Current vs Ambient Temperature

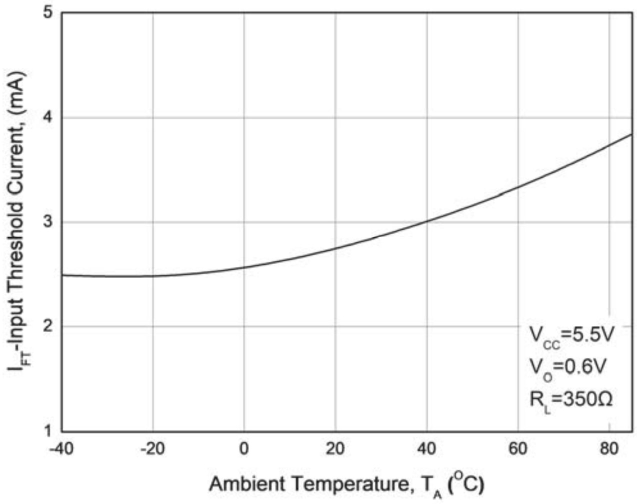


Figure 9. Switching Time vs. Ambient Temperature

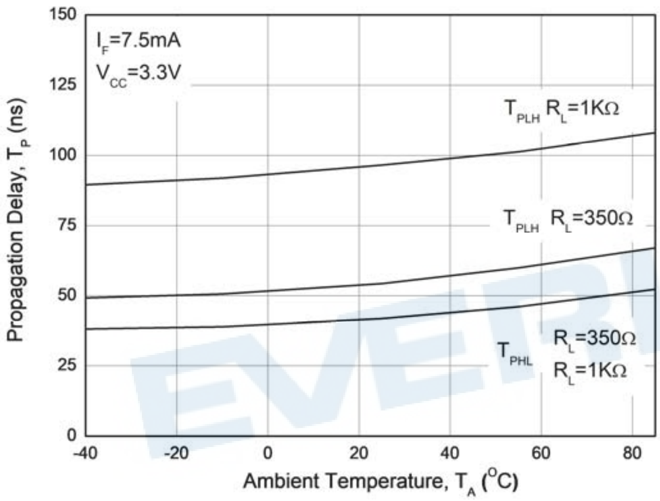


Figure 10. Switching Time vs. Ambient Temperature

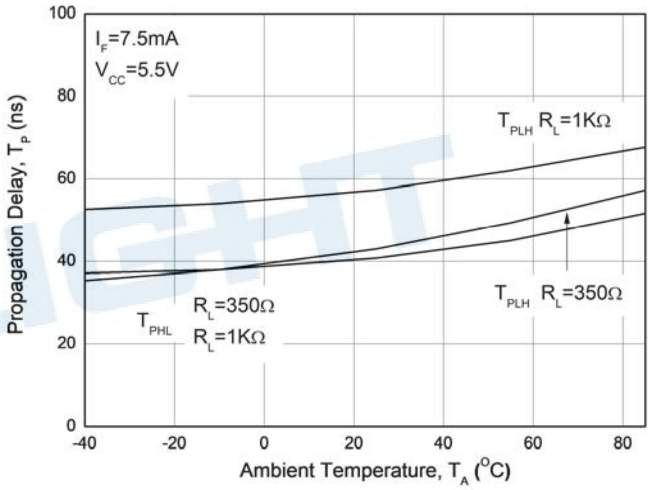


Figure 11. Pulse Width Distortion vs. Temperature

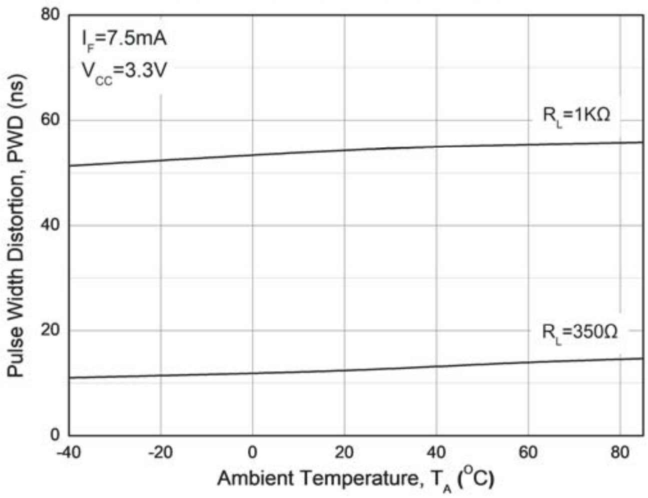


Figure 12. Pulse Width Distortion vs. Temperature

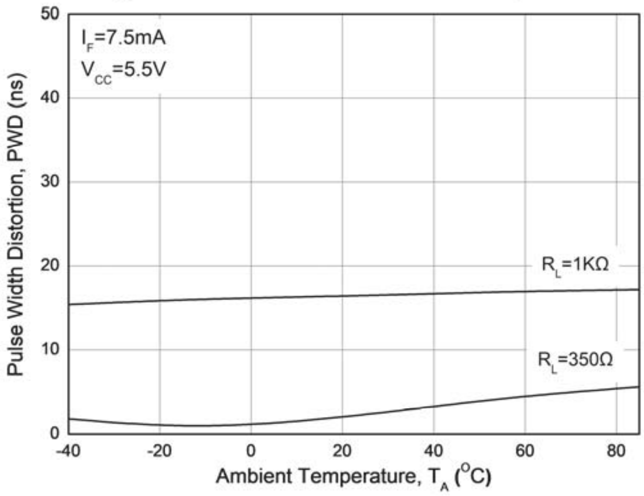


Figure 13. Forward Voltage vsForward Current

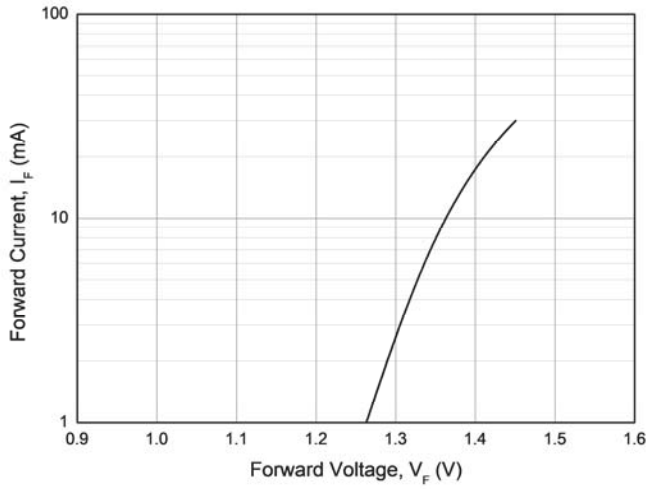
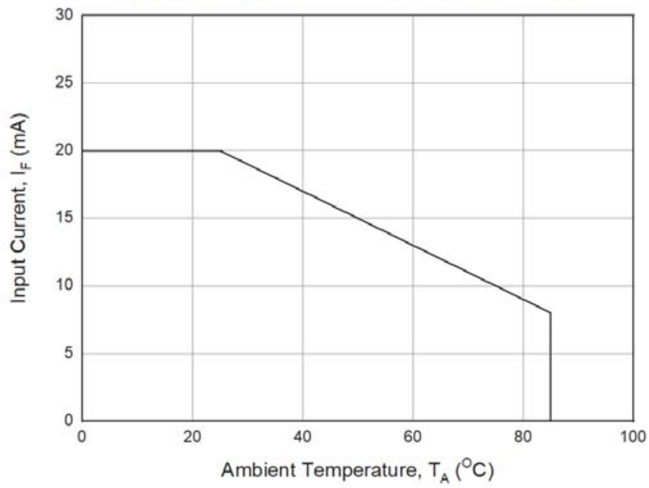


Figure14. Input Current vs Ambient Temperature



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

Fig. 15 Test circuit and waveforms for t_{PHL}, t_{PLH}, t_r, and t_f

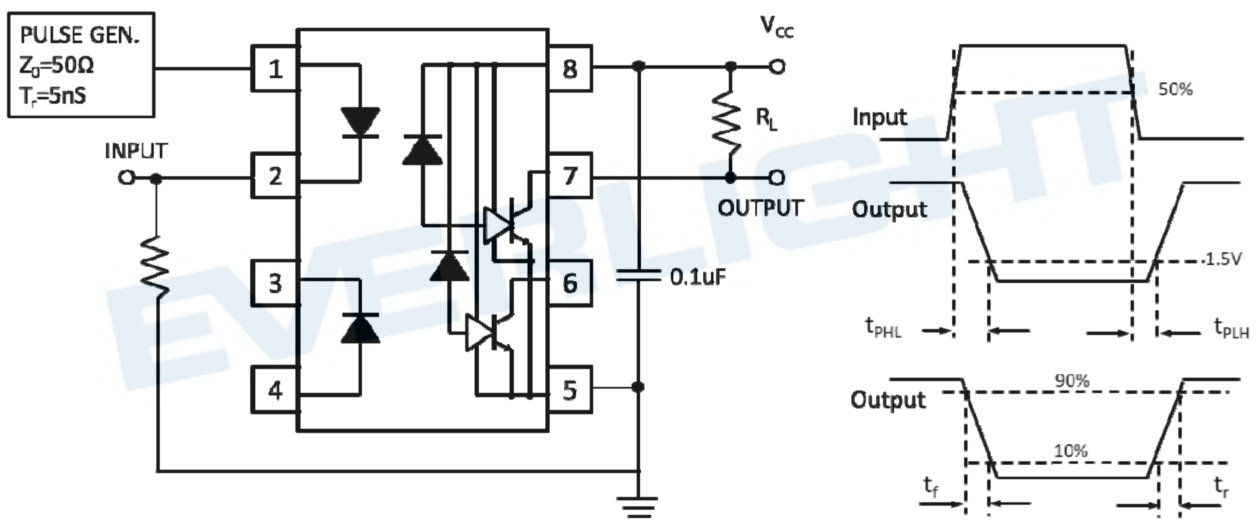
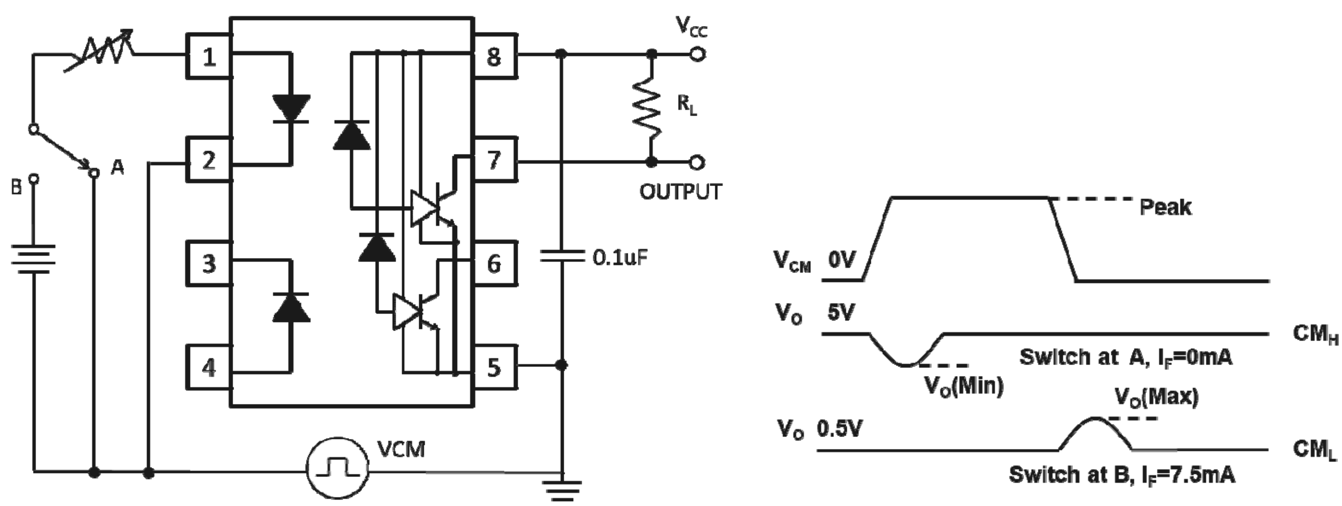


Fig. 16 Test circuit Common mode Transient Immunity



Notes:

*6 The V_{CC} supply must be bypassed by a 0.1μF capacitor or larger. This can be either a ceramic or solid tantalum capacitor with good high frequency characteristic and should be connected as close as possible to the package V_{CC} and GND pins

*7 t_{PHL} – Propagation delay is measured from the 3.75mA level on the LOW to HIGH transition of the input current pulse to the 1.5 V level on the HIGH to LOW transition of the output voltage pulse.

*8 t_{PLH} – Propagation delay is measured from the 3.75mA level on the HIGH to LOW transition of the input current pulse to the 1.5 V level on the LOW to HIGH transition of the output voltage pulse.

*9 t_r – Rise time is measured from the 10% to the 90% levels on the LOW to HIGH transition of the output pulse.

*10 t_f – Fall time is measured from the 90% to the 10% levels on the HIGH to LOW transition of the output pulse.

*11 CM_H – The maximum tolerable rate of rise of the common mode voltage to ensure the output will remain in the HIGH state (i.e., V_{OUT} > 2.0V).

*12 CM_L – The maximum tolerable rate of rise of the common mode voltage to ensure the output will remain in the LOW output state (i.e., V_{OUT} < 0.8V).

Order Information

Part Number

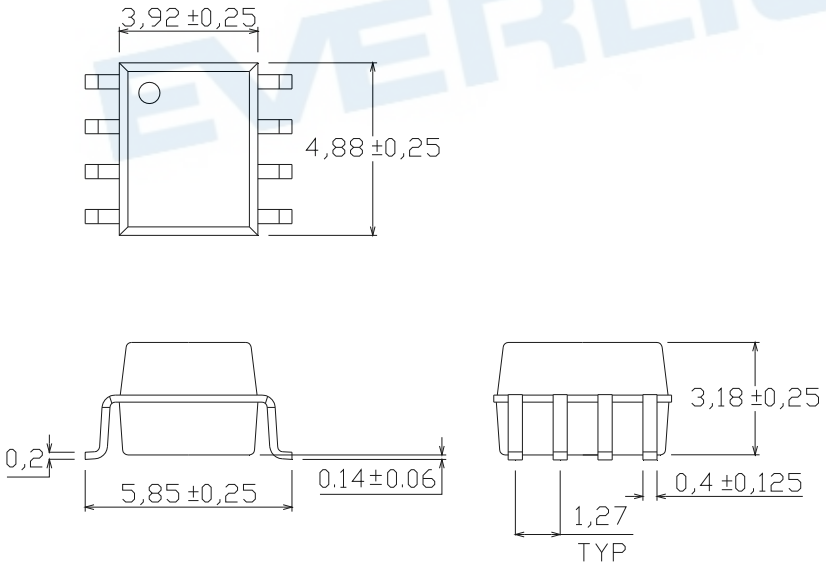
EL063X(Z) -V

Note

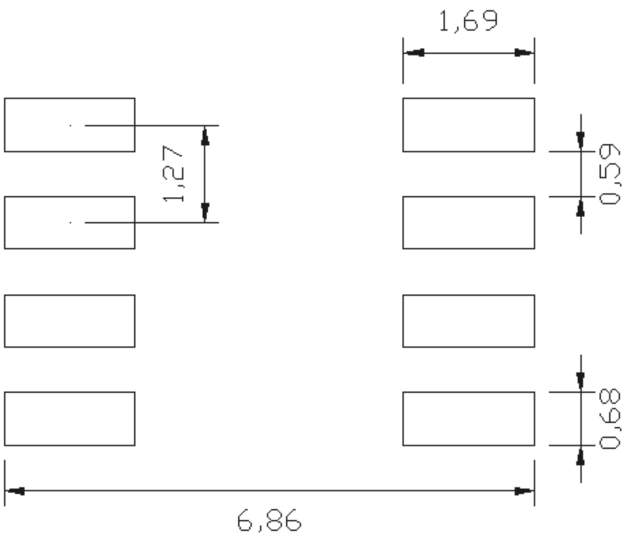
X = Part no. (X = 0 or 1)
Z = Tape and reel option (TA, TB).
V = VDE (optional)

Option	Description	Packing quantity
(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 Dimension
(Dimensions in mm)

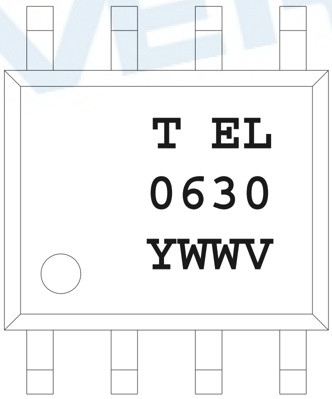


Recommended pad layout for surface mount leadform



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

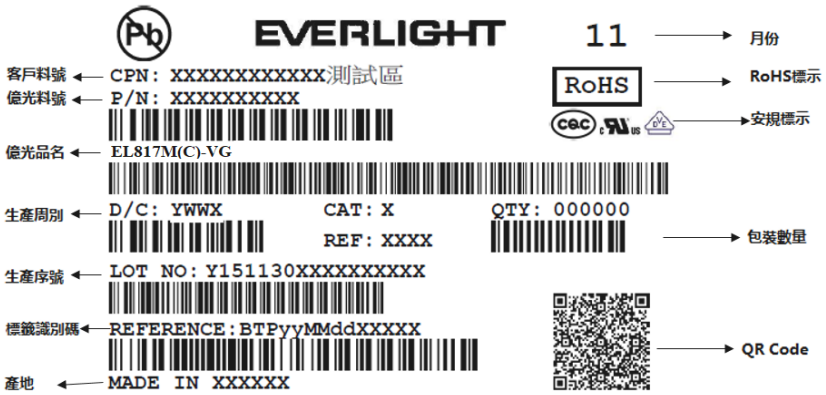
Device Marking



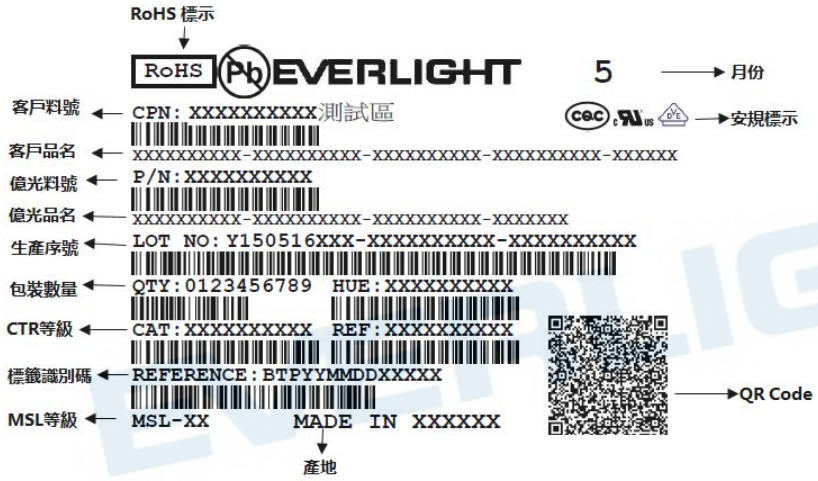
Notes

T	denotes Factory No code : made in China T : made in Taiwan
EL	denotes EVERLIGHT
0630	denotes Device Number
Y	denotes 1 digit Year code
WW	denotes 2 digit Week code
V	denotes VDE (optional)

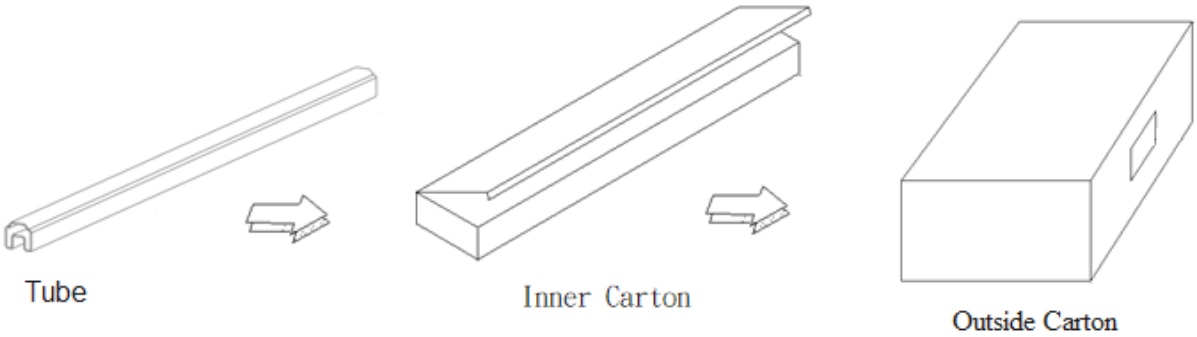
Label form



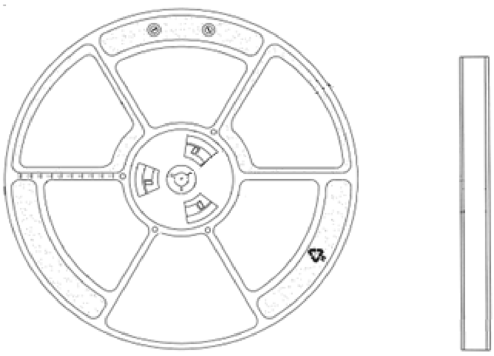
or



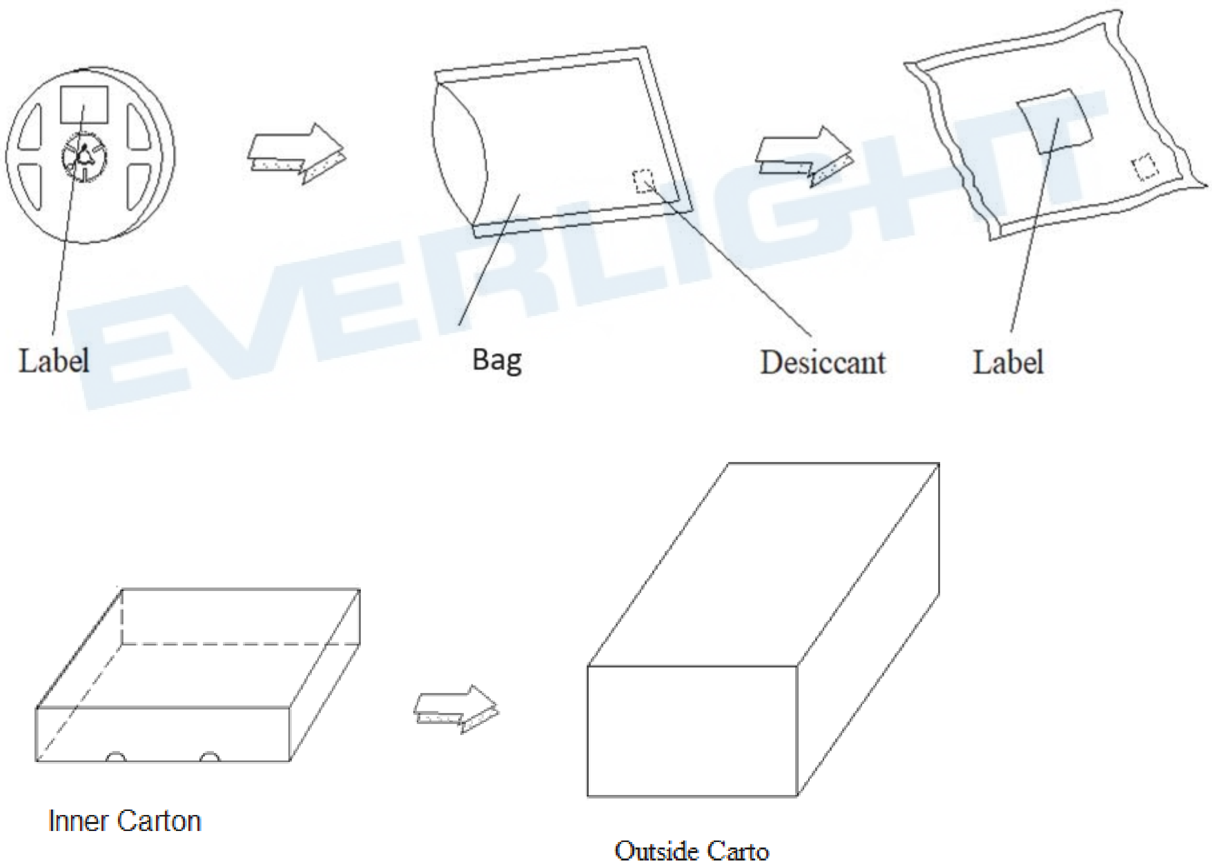
TUBE



Reel

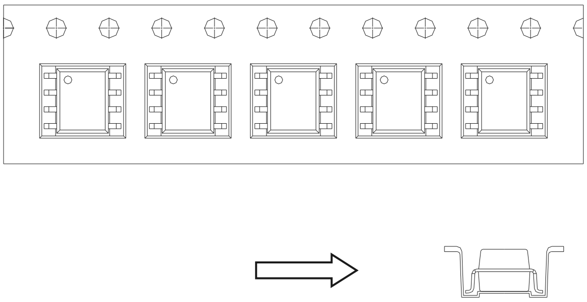


Moisture Resistant Packaging



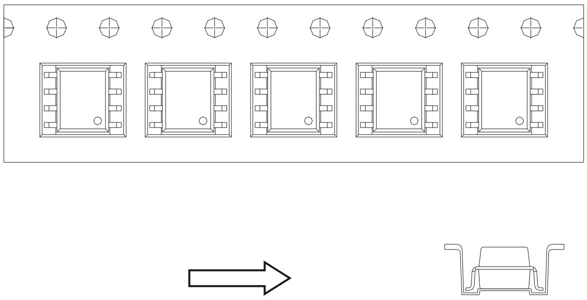
Tape & Reel Packing Specifications

Option TA



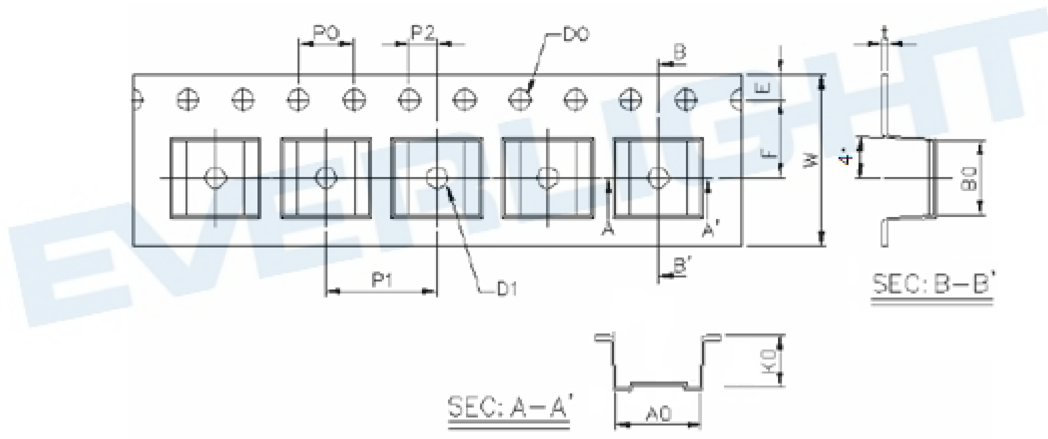
Direction of feed from reel

Option TB



Direction of feed from reel

Tape dimensions

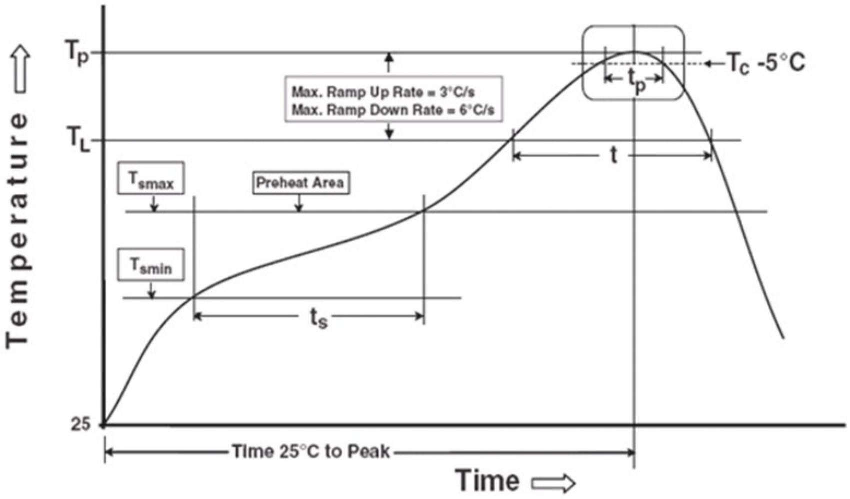


Dimension No.	A0	B0	D0	D1	E	F
Dimension(mm)	6.2±0.1	5.26±0.1	1.5±0.1	1.5±0.3	1.75±0.1	5.5±0.1
Dimension No.	Po	P1	P2	t	W	K0
Dimension(mm)	4.0±0.1	8.0±0.1	2.0±0.1	0.25±0.1	12.0+0.3/ -0.1	3.75±0.1

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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EN-60747-5-5 Insulation Related Characteristics

Description	Symbol	Rating	Unit
Climatic Classification	-	55/100/21	-
Pollution Degree	-	2	-
Maximum Working Insulation Voltage	V_{IORM}	566	V_{peak}
Input to Output Test Voltage, Method A $V_{IORM} \times 1.6 = V_{PR}$, Type and Sample Test, t_m = 10s, Partial Discharge < 5 pC	V_{PR}	905.6	V_{peak}
Input to Output Test Voltage, Method B $V_{IORM} \times 1.875 = V_{PR}$, 100% Production Test with tm = 1s, Partial Discharge < 5 pC	V_{PR}	1061	V_{peak}
Highest Allowable Overvoltage (Transient Overvoltage, t_{ini} = 60s)	V_{IOTM}	4500	V_{peak}
Safety Limiting Values (max. allowable ratings in case of fault, also refer to thermal derating curve)			
Temperature	T_S	150	°C
Input Current	$I_{S,INPUT}$	130	mA
Output Power	$P_{S,OUTPUT}$	256	mW
Insulation Resistance at T_S, V_{IO} = 500 V	R_S	10^9	Ω

Precautions for General Storage

1. Avoid storage locations where devices may be exposed to moisture or direct sunlight.
2. Follow the precautions printed on the packing label of the device for transportation and storage.
3. Keep the storage location temperature and humidity within a range of 5°C to 35°C and 20 % to 60 %, respectively.
4. Do not store the products in locations with poisonous gases (especially corrosive gases) or in dusty conditions.
5. 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.
6. When restoring devices after removal from their packing, use anti-static containers.
7. Do not allow loads to be applied directly to devices while they are in storage.
8. 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.

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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