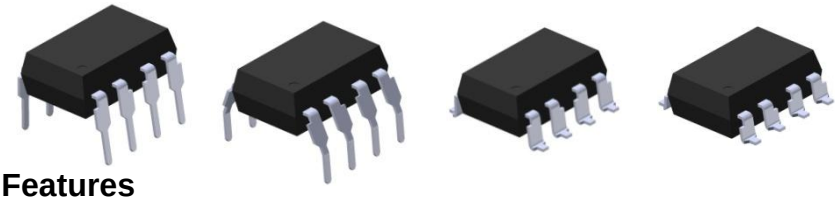
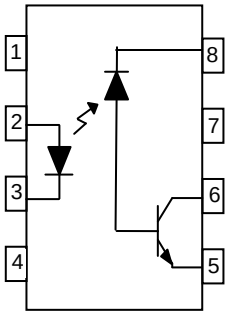
DATASHEET

HIGH CMR HIGH SPEED 1Mbit/s TRANSISTOR PHOTOCOUPLER EL4504



Schematic



Pin Configuration

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

Features

- Application for IPM and TTL
- High isolation voltage between input and output (Viso=5000 Vrms)
- High CMR at V_{CM}=1500V
- Open collector output
- Guaranteed performance from 0°C to 70°C
- Wide operating temperature range of -55°C to 100°C
- Pb free and RoHS compliant.
- UL and cUL approved(No. E214129)
- VDE approved (No. 132249)
- SEMKO approved
- NEMKO approved
- DEMKO approved
- FIMKO approved

Description

The EL4504 devices 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 DIP package and available in wide-lead spacing and SMD option.

Applications

- Inverter circuits and IPM interface
- Line receivers
- High speed logic ground isolation
- Analog signal ground isolation
- Replaces pulse transformers

Absolute Maximum Ratings (T_A=25℃)

	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	35	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}	5000	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	-	1.4	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	Conditions
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_{F1}=I_{F2}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

* Typical values at T_A = 25°C

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

Parameter	Symbol	Min.	Typ.*	Max.	Unit	Conditions
Current Transfer Ratio	CTR	25	-	60	%	I_F = 16mA ,V_O = 0.4V, V_{CC}=4.5V, T_A=25°C
		21	35			I_F = 16mA ,V_O = 0.5V, V_{CC}=4.5V
		26	-	65		I_F = 12mA ,V_O = 0.4V, V_{CC}=4.5V, T_A=25°C
		22	39	-		I_F = 12mA ,V_O = 0.5V, V_{CC}=4.5V
Logic Low Output Voltage	V_{OL}	-	0.25	0.4	V	I_F = 16mA ,I_O = 4.0mA, V_{CC}=4.5V, T_A=25°C
		-		0.5		I_F = 16mA ,I_O = 3.3mA, V_{CC}=4.5V

* Typical values at T_A = 25°C

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

Parameter	Symbol	Min.	Typ.*	Max.	Unit	Conditions
Propagation Delay Time to Logic Low (Fig.8)	t_{PHL}	-	0.25	0.4	µs	Pulse f=20KHz, Duty cycle = 10%, I_F = 16mA , V_{CC}=5V, R_L=1.9KΩ, V_{THHL}=1.5V, T_A =25°C
		-	0.6	0.8		Pulse f=10kHz, Duty cycle = 50%, I_F = 12mA , V_{CC}=15V, R_L=20kΩ, V_{THHL}=1.5V, T_A =25°C
		-		0.4		Pulse f=20kHz, Duty cycle = 10%, I_F = 16mA , V_{CC}=5V, R_L=1.9kΩ, V_{THHL}=1.5V
		-		1.0		Pulse f=10kHz, Duty cycle = 50%, I_F = 12mA , V_{CC}=15V, R_L=20kΩ, V_{THHL}=1.5V
Propagation Delay Time to Logic High (Fig.8)	t_{PLH}	-	0.25	0.4	µs	Pulse f=20kHz, Duty cycle = 10%, I_F = 16mA , V_{CC}=5V, R_L=1.9kΩ, V_{THLH}=1.5V, T_A =25°C
		-	1.0	1.2		Pulse f=10kHz, Duty cycle = 50%, I_F = 12mA , V_{CC}=15V, R_L=20kΩ, V_{THLH}=1.5V, T_A =25°C
		-	-	0.7		Pulse f=20kHz, Duty cycle = 10%, I_F = 16mA , V_{CC}=5V, R_L=1.9kΩ, V_{THLH}=2V
		-	-	1.4		Pulse f=10kHz, Duty cycle = 50%, I_F = 12mA , V_{CC}=15V, R_L=20kΩ, V_{THLH}=2V
Propagation Delay Difference Between Any 2 Parts	t_{PLH}-t_{PHL}	-0.4	0.4	0.9	V/µs	Pulse f=10kHz, Duty cycle = 50%, I_F = 12mA , V_{CC}=15V, R_L=20kΩ, V_{THHL}=1.5V, V_{THLH}=2V, T_A =25°C
		-0.7	-	1.3		Pulse f=10kHz, Duty cycle = 50%, I_F = 12mA , V_{CC}=15V, R_L=20kΩ, V_{THLH}=1.5V, V_{THLH}=2V
Common Mode Transient Immunity at Logic Low (Fig.9)*3	CM_L	1,000	10,000	-	V/µs	I_F = 16mA , V_{CM}=10Vp-p, R_L=4.1KΩ, T_A =25°C
		1,000	10,000	-		I_F = 16mA , V_{CM}=1000Vp-p, R_L=1.9KΩ, T_A=25°C

Common Mode Transient Immunity at Logic Low (Fig.9)*3	CM_H	15,000	-	-	V/μs	I_F = 0mA , V_{CC}=5V,V_{CM}=1500Vp-p, R_L=1.9KΩ, T_A =25°C
		15,000	-	-		I_F = 0mA , V_{CC}=15V,V_{CM}=1500Vp-p, R_L=20KΩ, T_A =25°C
Common Mode Transient Immunity at Logic Low (Fig.9)*3	CM_L	15,000	-	-	V/μs	I_F = 16mA , V_{CC}=5V,V_{CM}=1500Vp-p, R_L=1.9KΩ, T_A =25°C
		15,000	-	-		I_F = 12mA , V_{CC}=15V,V_{CM}=1500Vp-p, R_L=20KΩ, T_A=25°C
		15,000	-	-		I_F = 16mA , V_{CC}=15V,V_{CM}=1500Vp-p, R_L=20KΩ, T_A =25°C

* Typical values at T_A = 25°C

Typical Electro-Optical Characteristics Curves

Fig.1 Forward Current vs. Forward Voltage

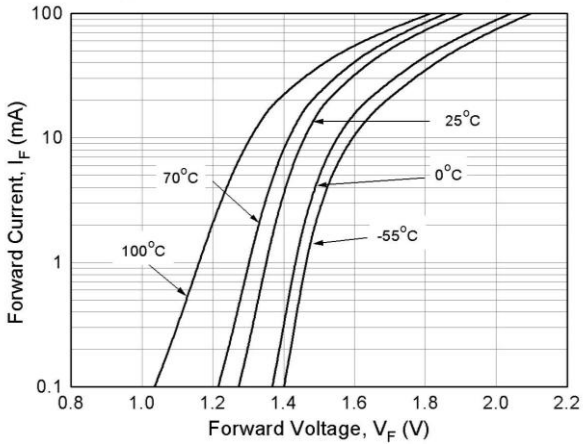


Figure 2.Normalized Current Transfer Ratio vs. Forward Current

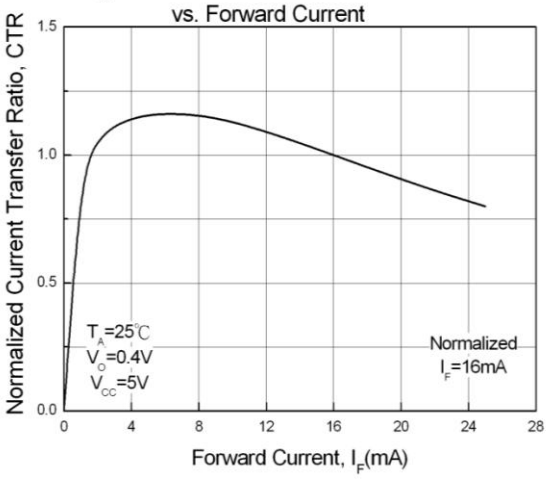


Figure 3. Normalized Current Transfer Ratio vs. Ambient Temperature

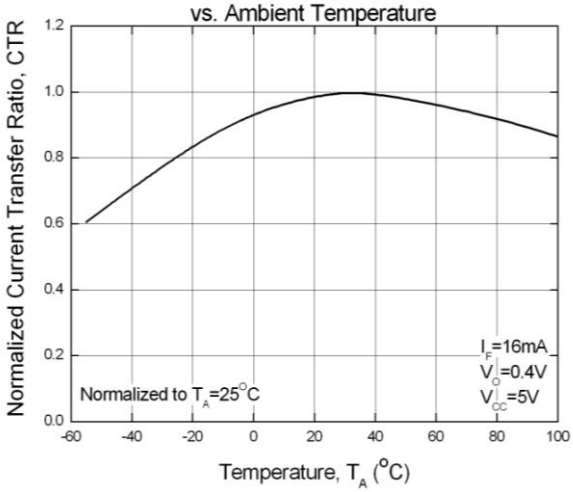


Figure 4.Output Current vs Output Voltage

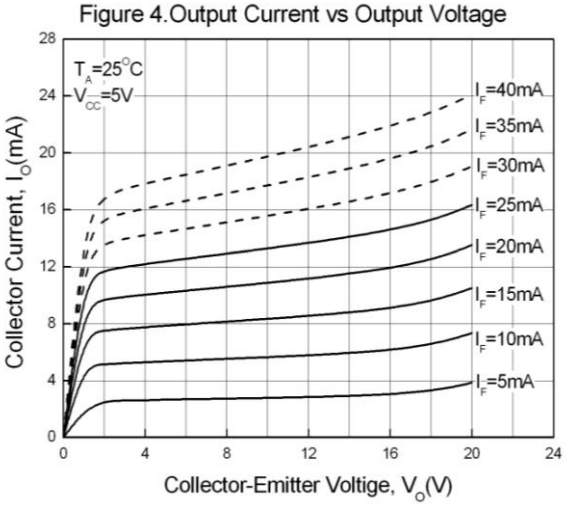


Figure 5. Logic High Output Current vs Ambient Temperature

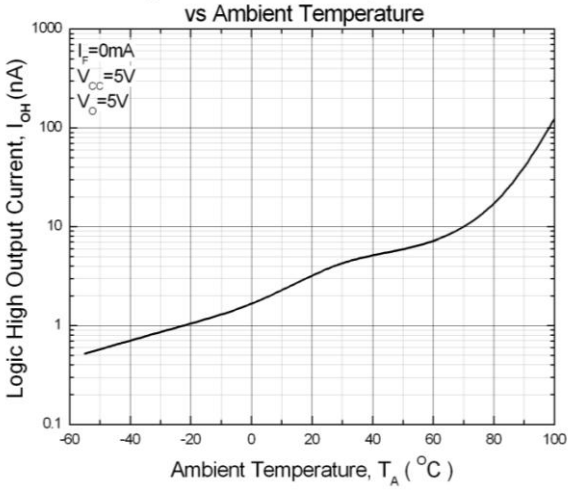


Figure 6. Propagation Delay vs. Temperature

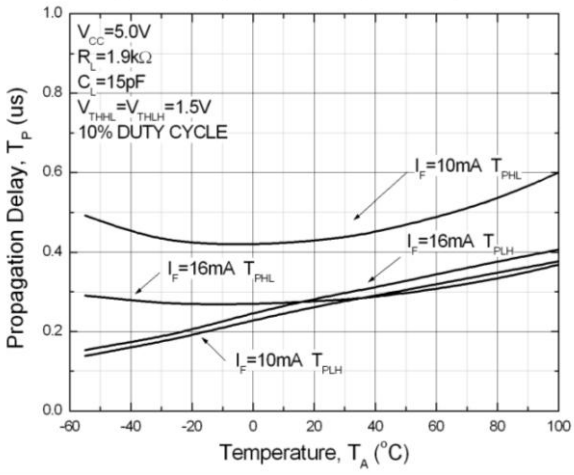


Figure 7. Propagation Delay vs. Load Resistance

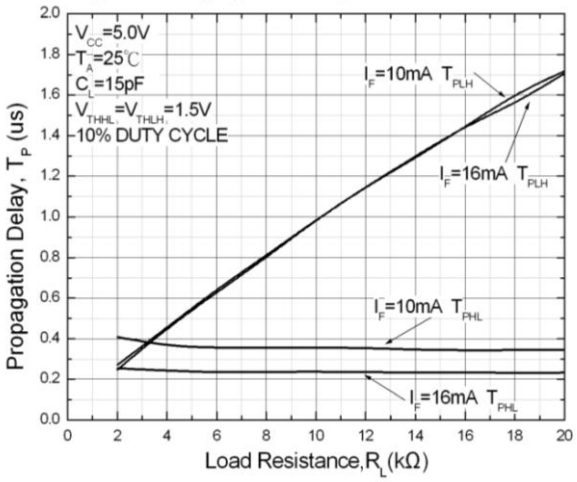


Figure 8. Propagation Delay vs. Load Resistance

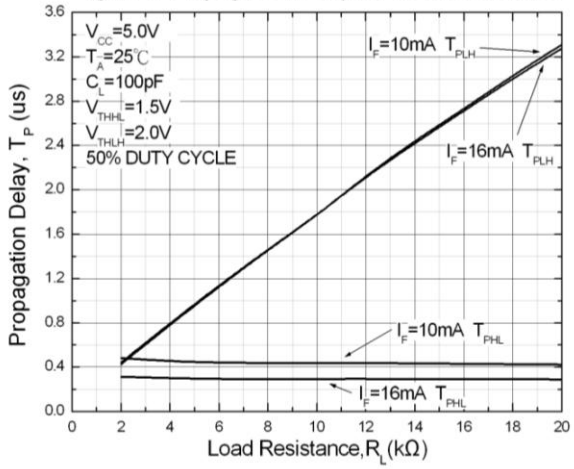


Figure 9. Propagation Delay vs. Temperature

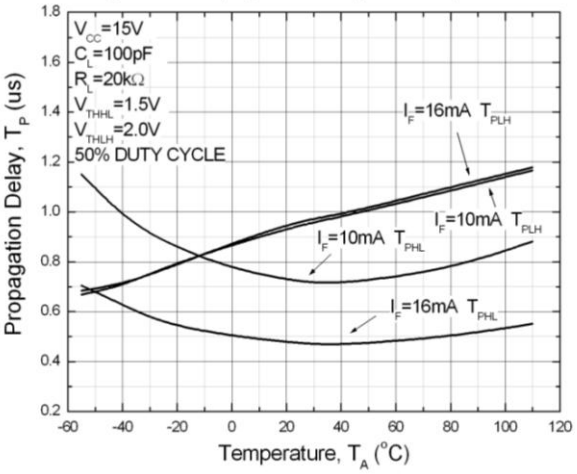


Figure 10. Propagation Delay vs. Load Resistance

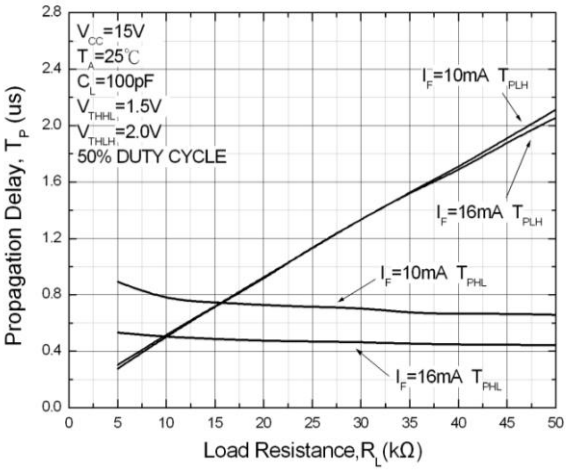


Figure 11. Propagation Delay vs. Load Capacitance

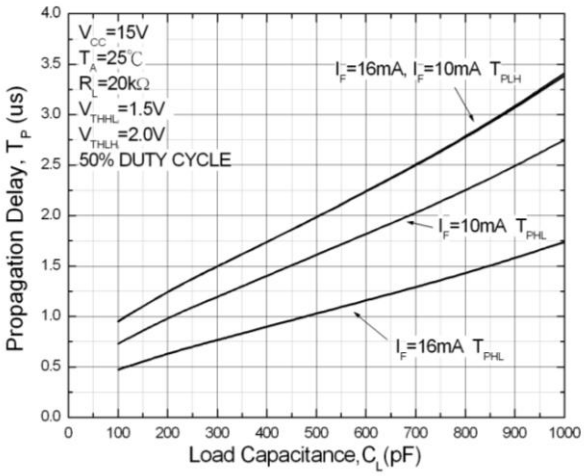


Figure 12 Switching Time Test Circuit & Waveform

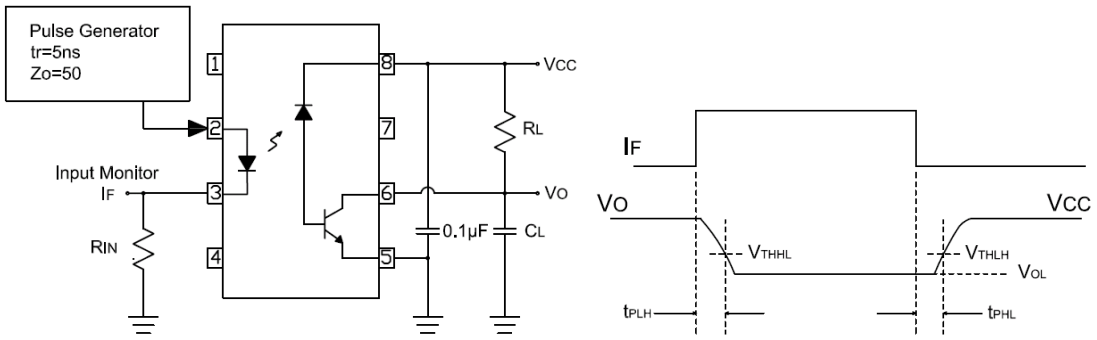
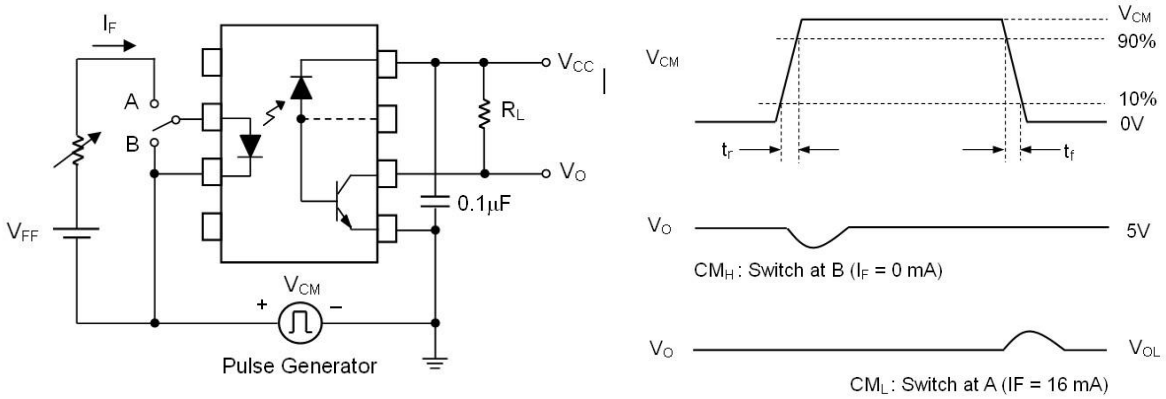


Figure 13 Transient Immunity Test Circuit & Waveform



*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., V_O > 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., V_O < 0.8V).

Order Information

Part Number

EL4504Y(Z)-V

Note

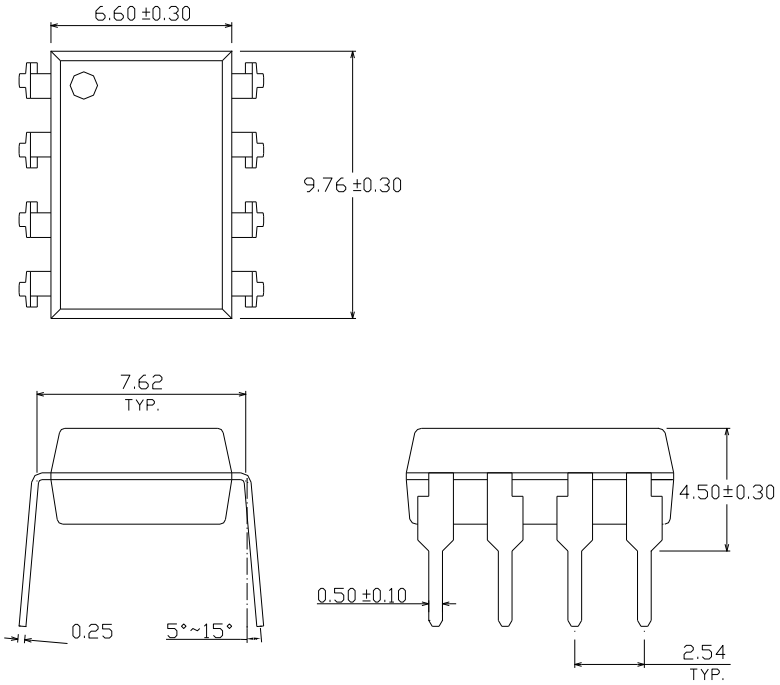
X = Part no. (0 or 1)
Y = Lead form option (S, S1, M or none)
Z = Tape and reel option (TA, TB or none)
V = VDE (optional)

Option	Description	Packing quantity
None	Standard DIP-8 for EL4504	45 units per tube
M	Wide lead bend (0.4 inch spacing)	45 units per tube
S (TA)	Surface mount lead form + TA tape & reel option	1000 units per reel
S1 (TA)	Surface mount lead form (low profile) + TA tape & reel option	1000 units per reel

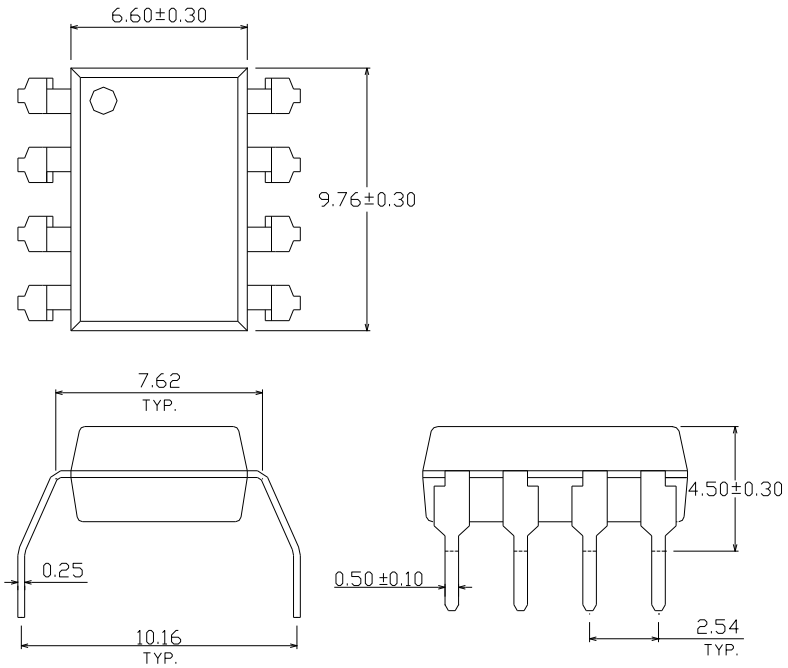
Package Dimension

(Dimensions in mm)

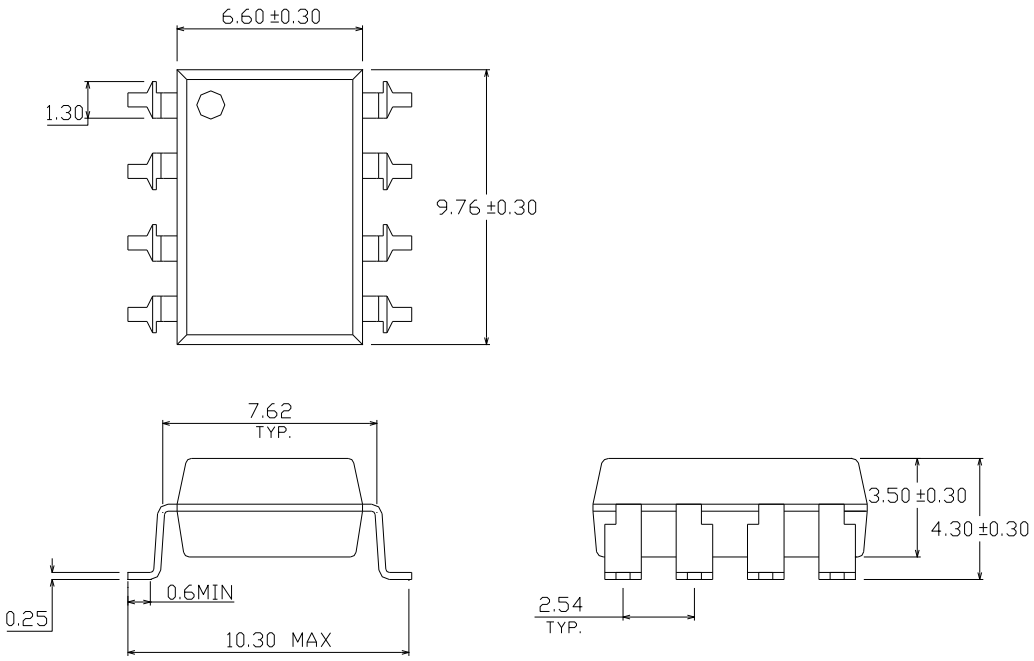
Standard DIP Type



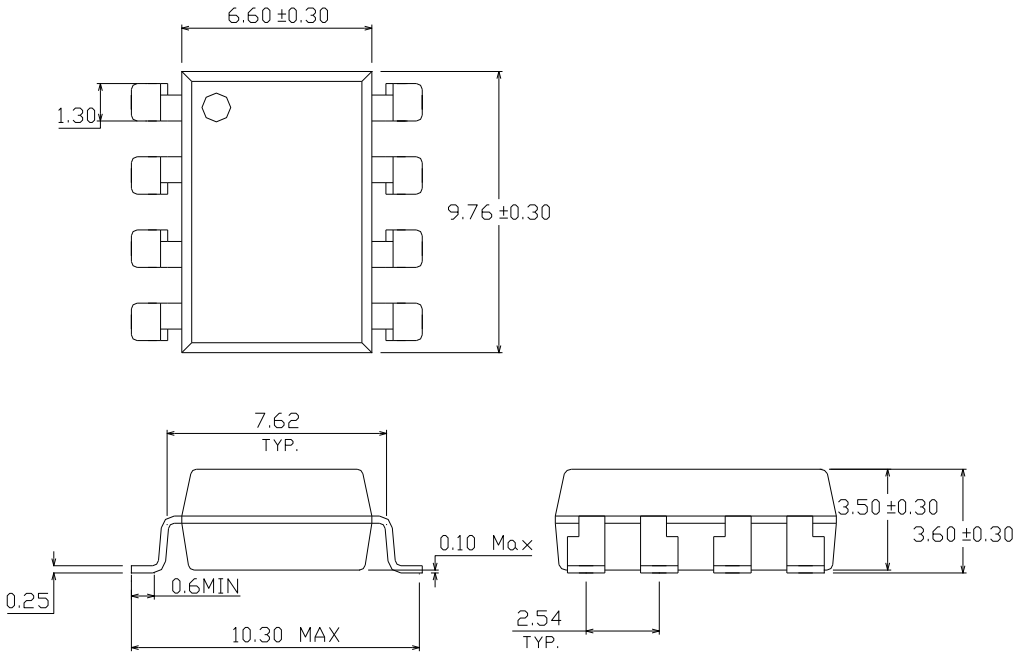
Option M Type



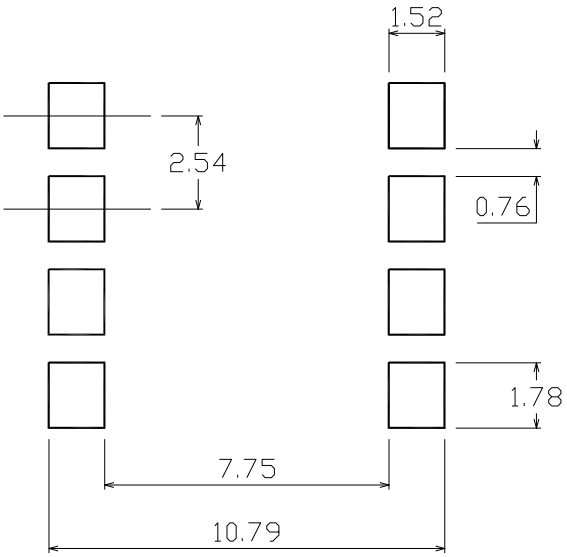
Option S Type



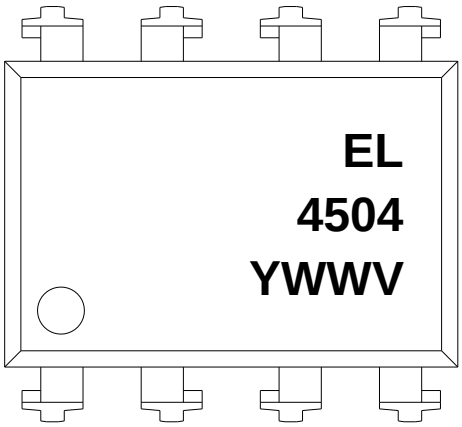
Option S1 Type



Recommended pad layout for surface mount leadform



Device Marking

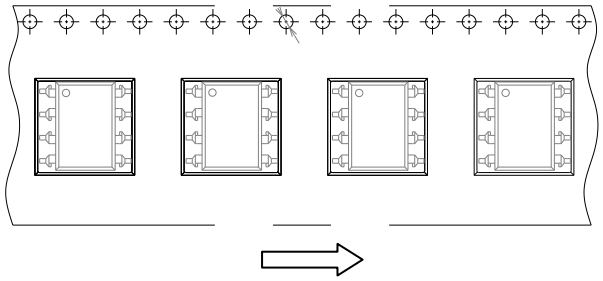


Notes

EL	denotes EVERLIGHT
4504	denotes Device Number
Y	denotes 1 digit Year code
WW	denotes 2 digit Week code
V	denotes VDE (optional)

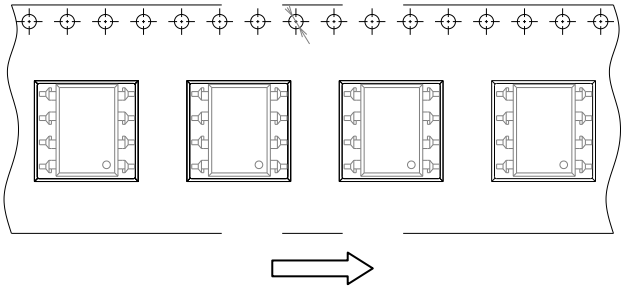
Tape & Reel Packing Specifications

Option TA



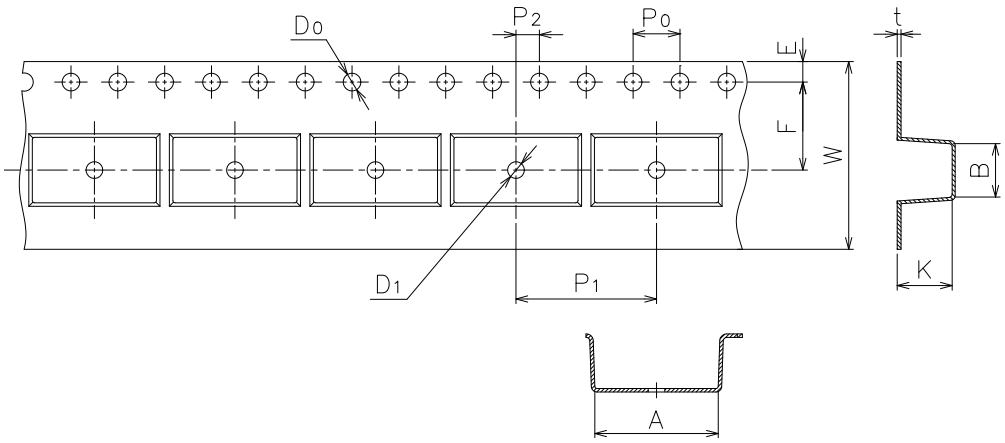
Direction of feed from reel

Option TB



Direction of feed from reel

Tape dimension

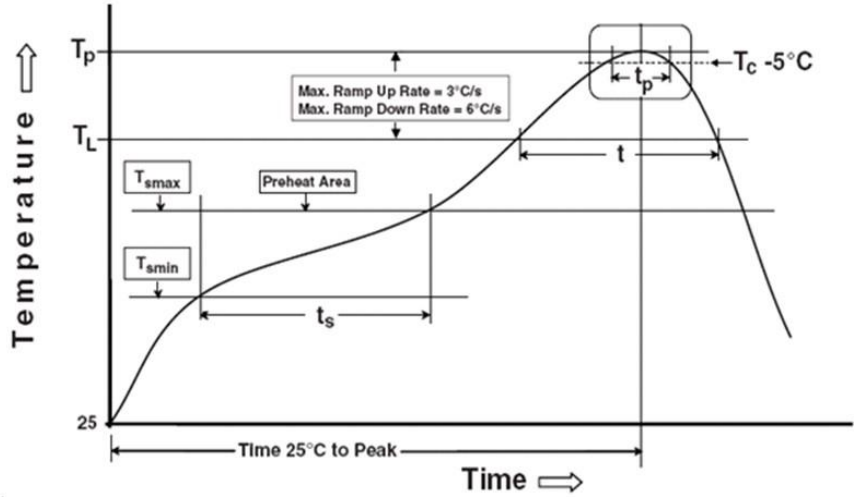


Dimension No.	A	B	Do	D1	E	F
Dimension(mm)	10.4±0.1	10.0±0.1	1.5±0.1	1.5±0.1	1.75±0.1	7.5±0.1
Dimension No.	Po	P1	P2	t	W	K
Dimension(mm)	4.0±0.1	12.0±0.1	2.0±0.1	0.4±0.1	16.0+0.3/-0.1	4.5±0.1

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

DISCLAIMER

1. Above specification may be changed without notice. EVERLIGHT will reserve authority on material change for above specification.
2. When using this product, please observe the absolute maximum ratings and the instructions for using 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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