



# ORIENT

## Photo coupler

### Product Data Sheet

Name: OR-M501

Customer:

Date:

**SHENZHEN ORIENT COMPONENTS CO., LTD**

### 1. Features

- (1). High speed - 1MBd model.
- (2). Adapted to the dual-in-line, lead spacing width, surface installation.
- (3). Store output.
- (4). UL, VDE approval.



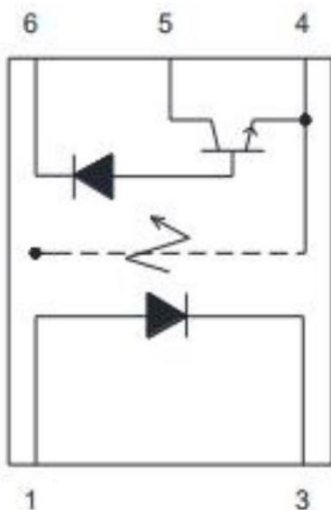
### 2. Instructions

M501 consists of highly efficient AlGaAs light-emitting diodes and high-speed optical detectors. The design provides good ac and dc isolation at the input and output ends of the photoelectric coupler. Connections related to photodiode biasing can improve the speed of conventional phototransistor couplers by reducing the capacitance of the matrix collector. Internal shielding ensures high transient immunity in general mode. Ensure the common-mode transient immunity to 1 kv/μsec.

### 3. Application Range

- line receiver isolation
- switching power supply
- motor control system

### 4. Functional Diagram



- 1. Anode
- 3. Cathode
- 4. GND
- 5. Vo(Output)
- 6. Vcc

Truth table

Input (LED)	Output
ON	L
OFF	H

**5. Absolute Maximum Ratings (Ta=25°C) \*1**

Parameter		Symbol	Rated Value	Unit
Input	Average Forward Input Current	I <sub>F</sub>	25	mA
	Reverse Input Voltage	V <sub>R</sub>	5	V
	Power Dissipation	P <sub>I</sub>	45	mW
Output	Output Collector Current	I <sub>O</sub>	8	mA
	Output Collector Voltage	V <sub>O</sub>	20	V
	Output Collector Power Dissipation	P <sub>O</sub>	100	mW
Supply Voltage		V <sub>CC</sub>	30	V
Insulation Voltage		V <sub>iso</sub>	3750	V <sub>rms</sub>
Working Temperature		T <sub>opr</sub>	-55 ~ + 100	°C
Storage Temperature		T <sub>stg</sub>	-55 ~ + 125	
*2 Soldering Temperature		T <sub>sol</sub>	260	

\*1. Room temperature = 25 °C. Exceeding the maximum absolute rating can permanently damage the device. Working long hours at the maximum absolute rating can affect reliability.

\*2. soldering time is 10 seconds.

**6. Electrical optical characteristics at TA=25°C**

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Forward voltage	$V_F$	$I_F = 16\text{mA}$	1.2	1.4	1.8	V
Reverse voltage	$BV_R$	$I_R = 10\mu\text{A}$	5	—	—	V
Current transfer ratio	CTR	$I_F = 16\text{mA}$ , $V_o = 0.4\text{V}$ , $V_{CC} = 4.5\text{V}$	20	36	—	%
Low Level Output Voltage	$V_{OL}$	$V_{CC} = 4.5\text{V}$ , $I_F = 16\text{mA}$ , $I_o = 3.0\text{mA}$	—	0.2	0.4	V
High Level Output Current	$I_{OH}$	$V_{CC} = 15\text{V}$ , $V_o = 15\text{V}$ , $I_F = 0\text{mA}$ $I_F = 0\text{mA}$	—	0.005	1	$\mu\text{A}$
High Level Supply Current	$I_{CCL}$	$I_F = 16\text{mA}$ , $V_o = \text{open}$ , ( $V_{CC} = 15\text{V}$ )	—	185	—	$\mu\text{A}$
Low Level Supply Current	$I_{CCH}$	$I_F = 0\text{mA}$ , $V_o = \text{open}$ , ( $V_{CC} = 15\text{V}$ )	—	0.002	1	$\mu\text{A}$

## 7. Switching Characteristics at TA=25°C

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Propagation delay time to output Low level	$t_{PHL}$	$R_L=1.9k\Omega$ $I_F=16mA$	—	0.19	0.8	us
Propagation delay time to output High level	$t_{PLH}$	$R_L=1.9k\Omega$ $I_F=16mA$	—	0.15	0.8	us
Logic High Common Mode Transient Immunity	$ CM_H $	$C_L=15pF$ $V_{CM}=1500Vp-p,$ $R_L=1.9k\Omega,$ $I_F=0mA$	15	25	—	kV/ $\mu s$
Logic Low Common Mode Transient Immunity)	$ CM_L $	$V_{CM}=1500Vp-p, C_L=15pF$ $R_L=1.9k\Omega,$ $I_F=16mA$	15	25	—	kV/ $\mu s$

Recommended temperature range ( $T_A = 0\text{ }^\circ\text{C} \text{ -- } 70\text{ }^\circ\text{C}$ ), unless otherwise specified power supply for 5 v.

Typical values of  $T_A = 25\text{ }^\circ\text{C}$ .

## 8. Isolation characteristics at TA=25°C

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Input-Output Insulation Leakage Current	$I_{I-O}$	45% RH, $t=5s,$ $V_{I-O} = 3kV\text{ DC}, T_A = 25^\circ\text{C}$	—	—	1	$\mu A$
Withstand Insulation Test Voltage	$V_{ISO}$	$RH \leq 50\%, t = 1min, T_A = 25^\circ\text{C}$	3750	—	—	$V_{RMS}$
Input-Output Resistance	$R_{I-O}$	$V_{I-O} = 5000V\text{ DC}$	—	$10^{12}$	—	$\Omega$

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



## 9. Order Information

Part Number

# OR-M501-Z

### Note

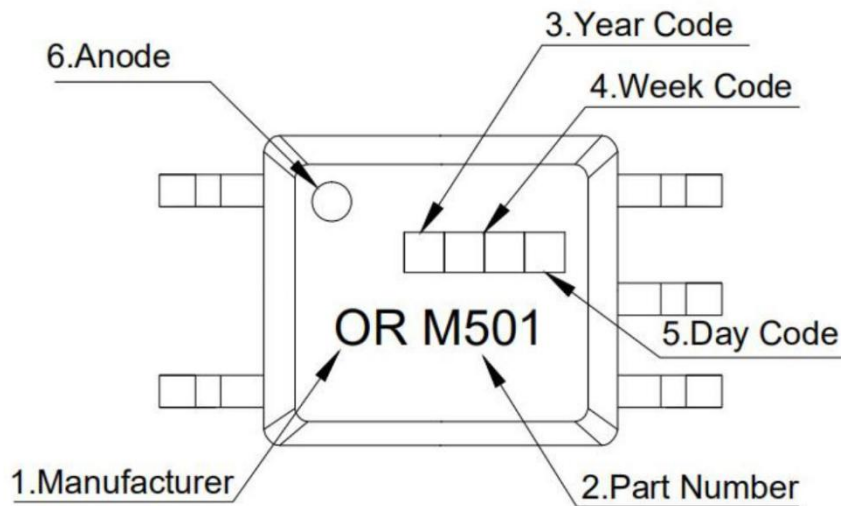
Z = Tape and reel option (TP or TP1).

\* Halogen Free can be selected.

\* VDE Code can be selected.

Option	Description	Packing quantity
TP	Surface mount lead form (low profile) + TP tape & reel option	3000 units per reel
TP1	Surface mount lead form (low profile) + TP1 tape & reel option	3000 units per reel

## 10. Naming Rule



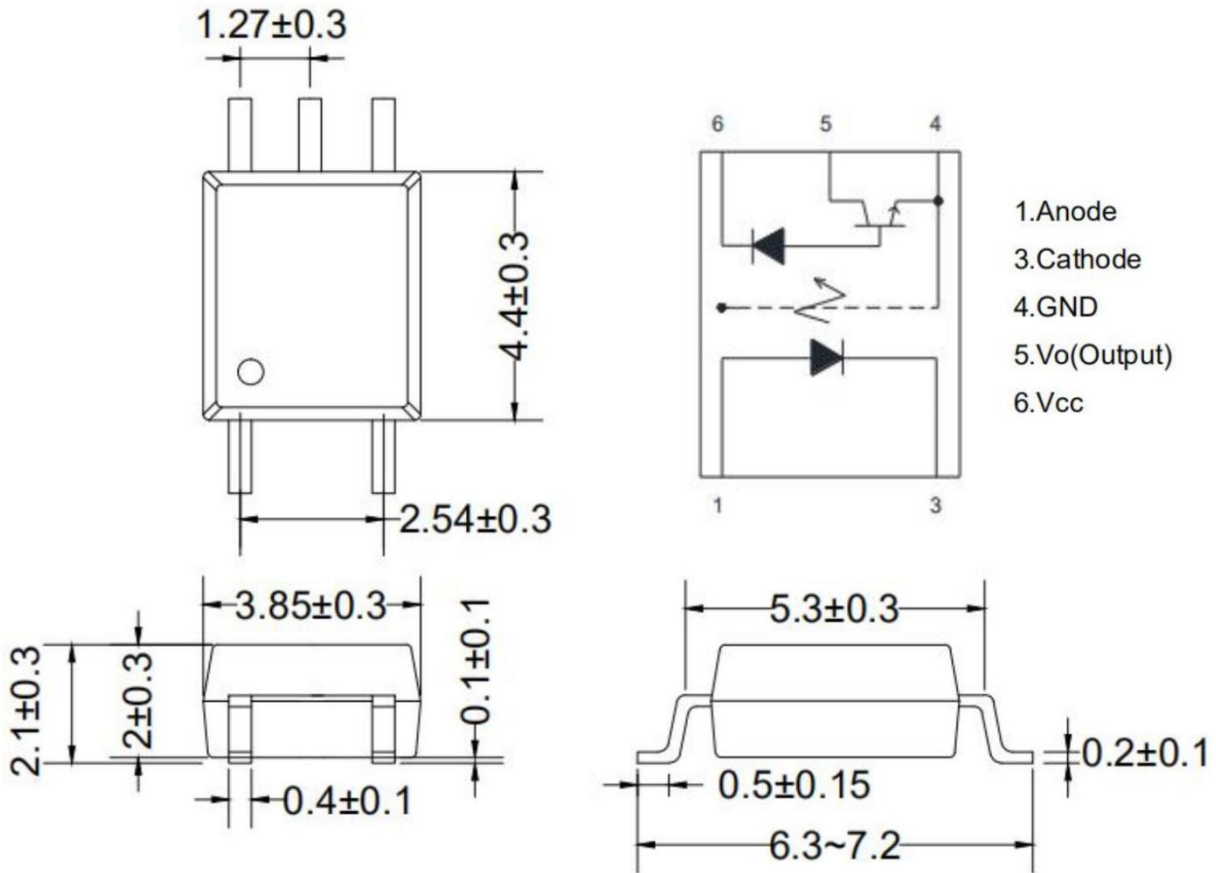
### NOTE :

- (1) ORIENT
- (2) Part Number: 'M501'
- (3) Year Code: '9' means '2019'.
- (4) Week Code: '01' represents the first week, '02' represents the second week.
- (5) Day Code: 'A to F' means 'Monday to Sunday'
- (6) Anode.

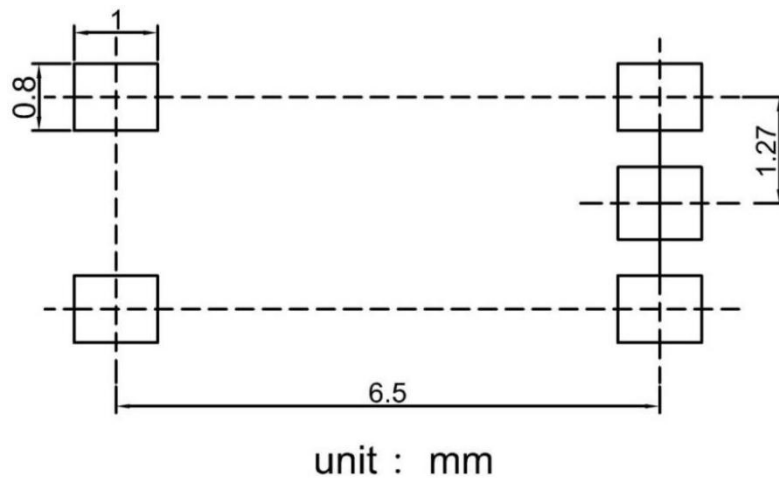
- \* If the photo coupler is Free from Halogen, there will be a ' G ' mark in the upper left corner.
- \* VDE Code can be selected.

### 11. Outer Dimension

(1) OR-M501



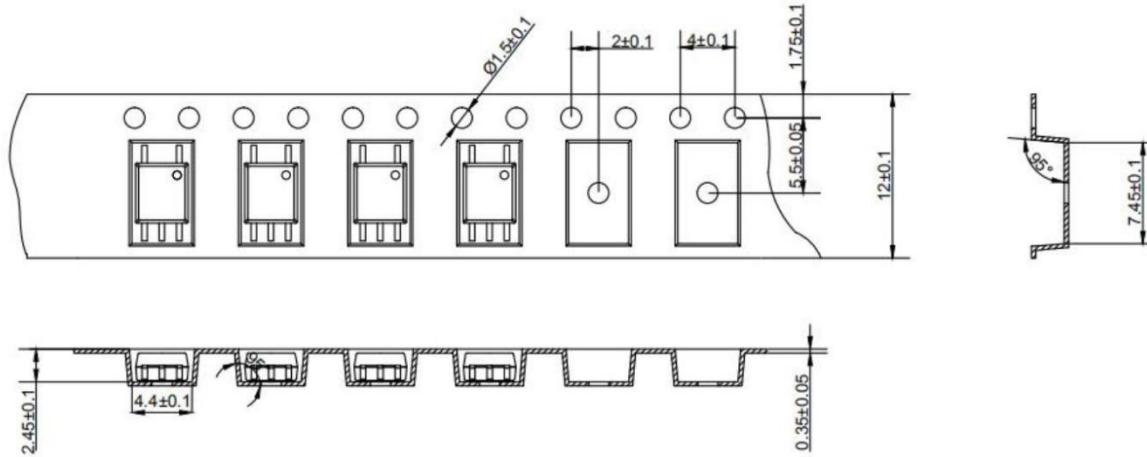
### 12. Recommended Foot Print Patterns (Mount Pad)



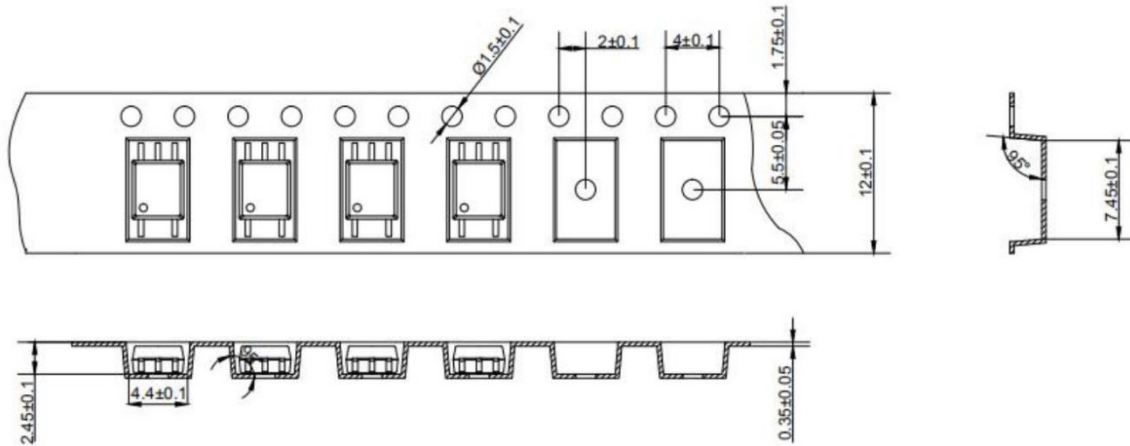


### 13. Taping Dimensions

#### (1) OR-M501-TP



#### (2) OR-M501-TP1



Description	Symbol	Dimension in mm(inch)
Tape wide	W	$12 \pm 0.3$ (0.472)
Pitch of sprocket holes	P0	$4 \pm 0.1$ (0.157)
Distance of compartment	F	$5.5 \pm 0.1$ (0.217)
	P2	$2 \pm 0.1$ (0.079)
Distance of compartment to compartment	P1	$8 \pm 0.1$ (0.315)

Encapsulation type	TP/TP1
amount (pcs)	3000

## 14. Package Dimension

### (1) package dimension

Packing Information

Packing Information	
Packing type	Reel type
Tape Width	12mm
Qty per Reel	3,000
Small box (inner) Dimension	345*345*45mm
Max qty per small box	6,000
Large box (Outer) Dimension	480x360x360mm
Max qty per large box	60,000

### (2) Packing Label Sample



1. MTL NO:Contents with "Order Information" in the specification.
2. LOT NO:The production cycle of the product.
3. BATCH:The CTR RANK of the product.
4. Quantity:Product packaging quantity.
5. Product Data: The data when product be made.

## 15. Reliability Test

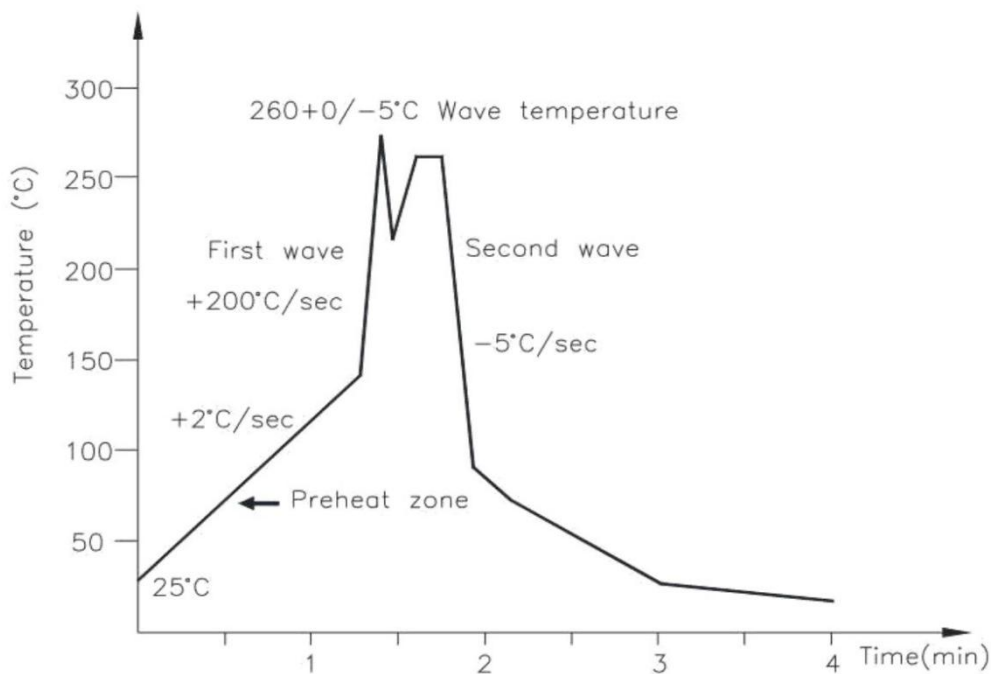
NO.	Item	Condition	Quantity	Cycle	Reference Standards
1	RSH, Resistance to Solder Heat	260±5°C, 10s/cycle	22	3cycles	JESC22A-106
2	SD, Solderability	260±5°C, 2-3s/cycle	22	1cycle	JESD22-B102
3	TC, Temperature Cycle	H: 125°C 15min ∫ 5min L: -55°C 15min	77	300cycles	JESC22A-104
4	TS, Thermal Shock	H:100°C 5min ∫ 15s L:-10°C 5min	77	300cycles	JESC22A-106
5	LTSL, Low Temperature Storage	T:-55°C	77	1000h	JESD22-A119
6	HTSL, High Temperature Storage	T:125°C	77	1000h	JESC22A-103
7	THB, High Temperature High Humidity	T:85°C RH: 85%	77	1000h	JESC22A-101
8	HTOL DC Operating Life	T: 110°C IF=10mA VCC=5V	77	1000h	MIL-STD-750 Method 1037
9	ESD-HBM Human Body Model ESD	Ta=25° C, Reference JESD22-A114	6	1cycle	JESD22-A114

## 16. Temperature Profile Of Soldering

(1) IR Reflow soldering (JEDEC-STD-020C compliant)

Note: one solder backflow is recommended under the conditions described below in the temperature and time profile. Do not weld more than three times.

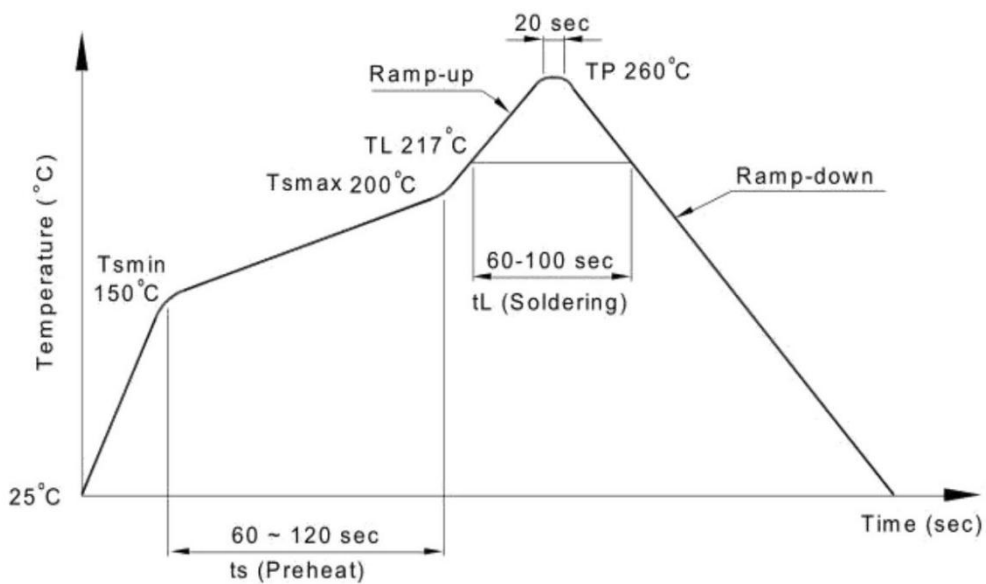
Configuration items	conditions
<b>Preheat</b> - The lowest temperature (TSmin) - The highest temperature (TSmax) - Time (min to Max (TS))	150°C  200°C  90±30 sec
<b>Soldering zone</b> - Temperature (TL) - Time (tL)	217°C 60~100 sec
Peak Temperature	260°C
Ramp-up rate	3°C / sec max.
Drop rate (3°C / sec max.)	3~6°C / sec



(2) Wave soldering (JEDEC22A111 compliant)

One-time welding is recommended under the temperature condition.

Temperature	260+0/-5°C
Time	10 sec
Preheat temperature	5 to 140°C
Preheat time	30 to 80 sec



(3) Hand soldering by soldering iron

Single lead welding is allowed in each process and one-time welding is recommended.

Temperature	380+0/-5°C
Time	3 sec max

### 17. Switching Time Test Circuit

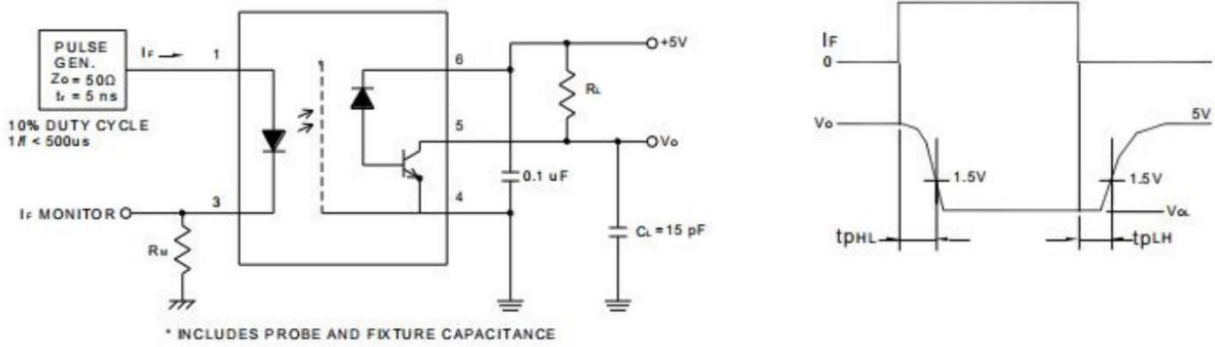


Figure 1: Test Circuit for  $t_{PHL}$  and  $t_{PLH}$

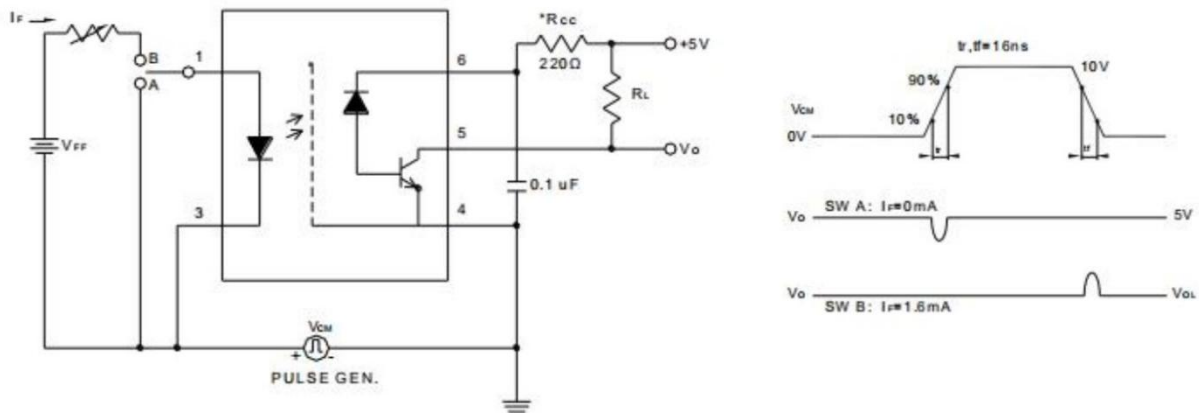


Figure 2: Single Channel Test Circuit for Common Mode Transient Immunity

### 18.Characteristics Curve

Figure 3: DC and pulsed transfer characteristics

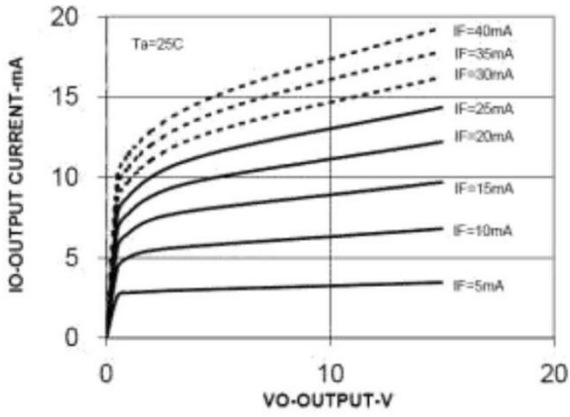


Figure 6: Current transfer ratio vs. input current

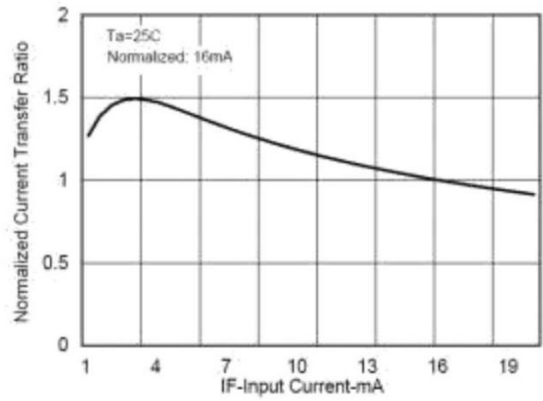


Figure 4: Input current vs. forward voltage

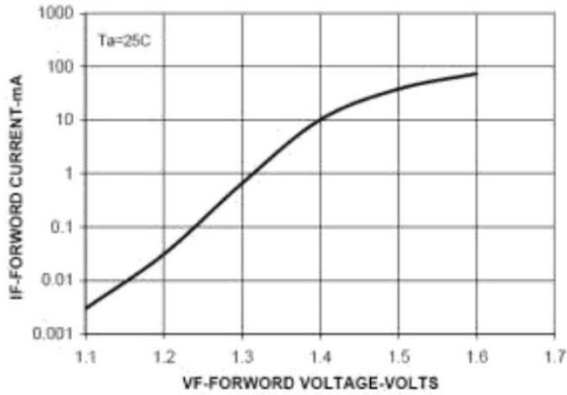


Figure 7: Current transfer ratio vs. temperature

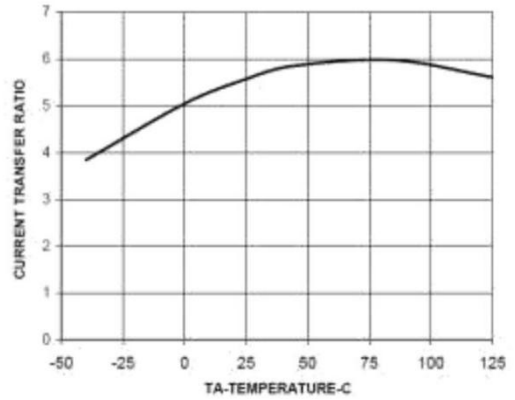


Figure 5: Logic high output current vs. temperature

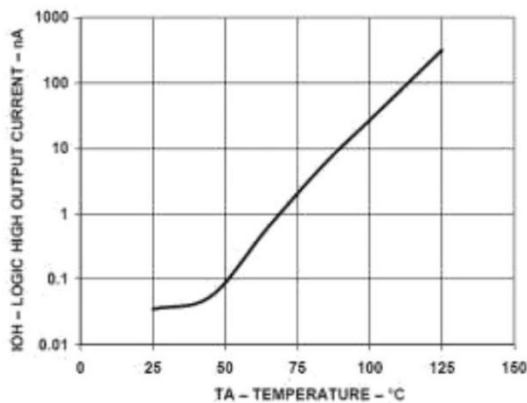


Figure 8: Small-signal current transfer ratio vs. quiescent current

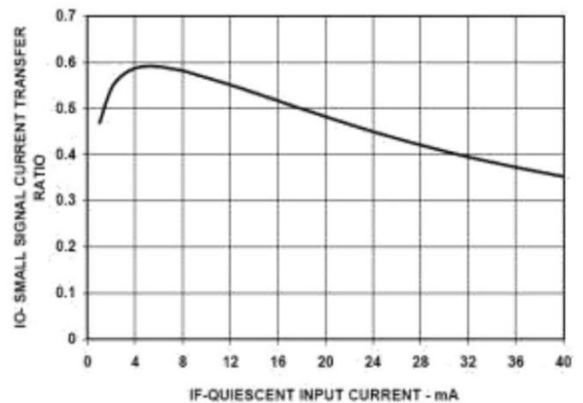


Figure 9: Propagation delay time vs. temperature

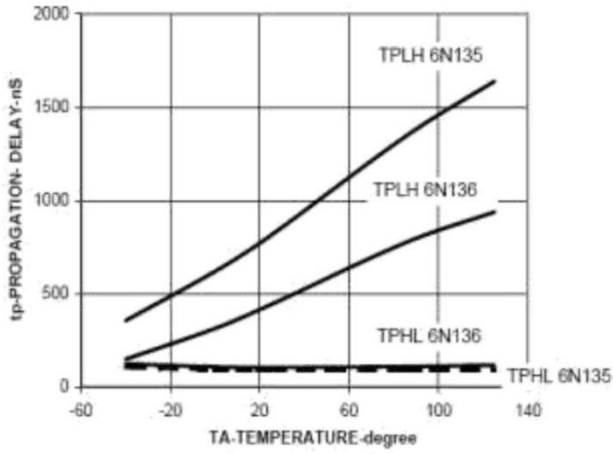


Figure 10: Propagation delay time vs. load resistance

