



ORIENT

Photo coupler

Product Data Sheet

Name: OR-M501

Customer:

Date:

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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.
- (5). MSL Class I



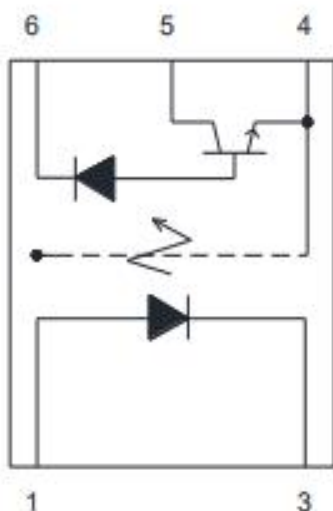
2. Instructions

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 _F	25	mA
	Reverse Input Voltage	V _R	5	V
	Power Dissipation	P _I	45	mW
Output	Output Collector Current	I _O	8	mA
	Output Collector Voltage	V _O	20	V
	Output Collector Power Dissipation	P _O	100	mW
Supply Voltage		V _{CC}	30	V
Insulation Voltage		V _{iso}	3750	V _{rms}
Working Temperature		T _{opr}	-55 ~ + 100	°C
Storage Temperature		T _{stg}	-55 ~ + 125	
*2 Soldering Temperature		T _{sol}	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	μA
High Level Supply Current	I_{CCL}	$I_F = 16\text{mA}$, $V_o = \text{open}$, ($V_{CC} = 15\text{V}$)	—	185	—	μA
Low Level Supply Current	I_{CCH}	$I_F = 0\text{mA}$, $V_o = \text{open}$, ($V_{CC} = 15\text{V}$)	—	0.002	1	μA

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/ μs
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/ μs

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, $t=5s,$ $V_{I-O} = 3kV\text{ DC}, T_A = 25\text{ }^\circ\text{C}$	—	—	1	μA
Withstand Insulation Test Voltage	V_{ISO}	$RH \leq 50\%, t = 1min, T_A = 25\text{ }^\circ\text{C}$	3750	—	—	V_{RMS}
Input-Output Resistance	R_{I-O}	$V_{I-O}=5000V\text{ DC}$	—	10^{12}	—	Ω

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



9. Order Information

Part Number

OR-M501-X-Y-Z

Note

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

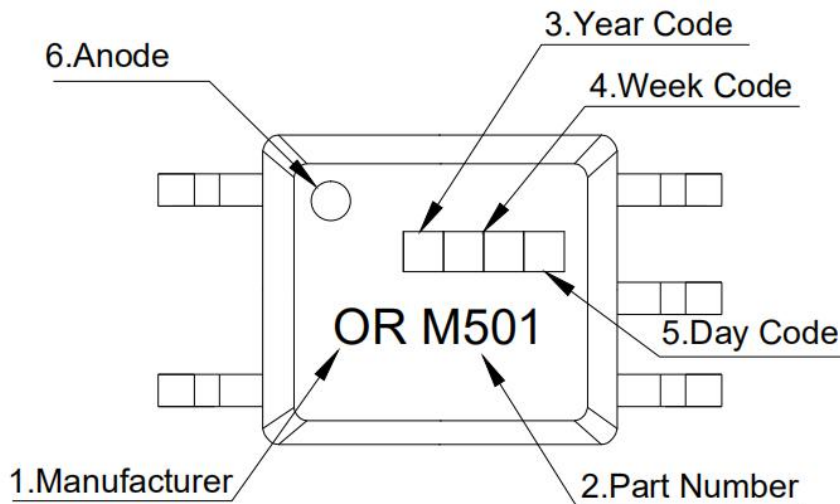
Y = 'V' code for VDE safety (This options is not necessary).

Z = 'G' code for Halogen free .

* 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:

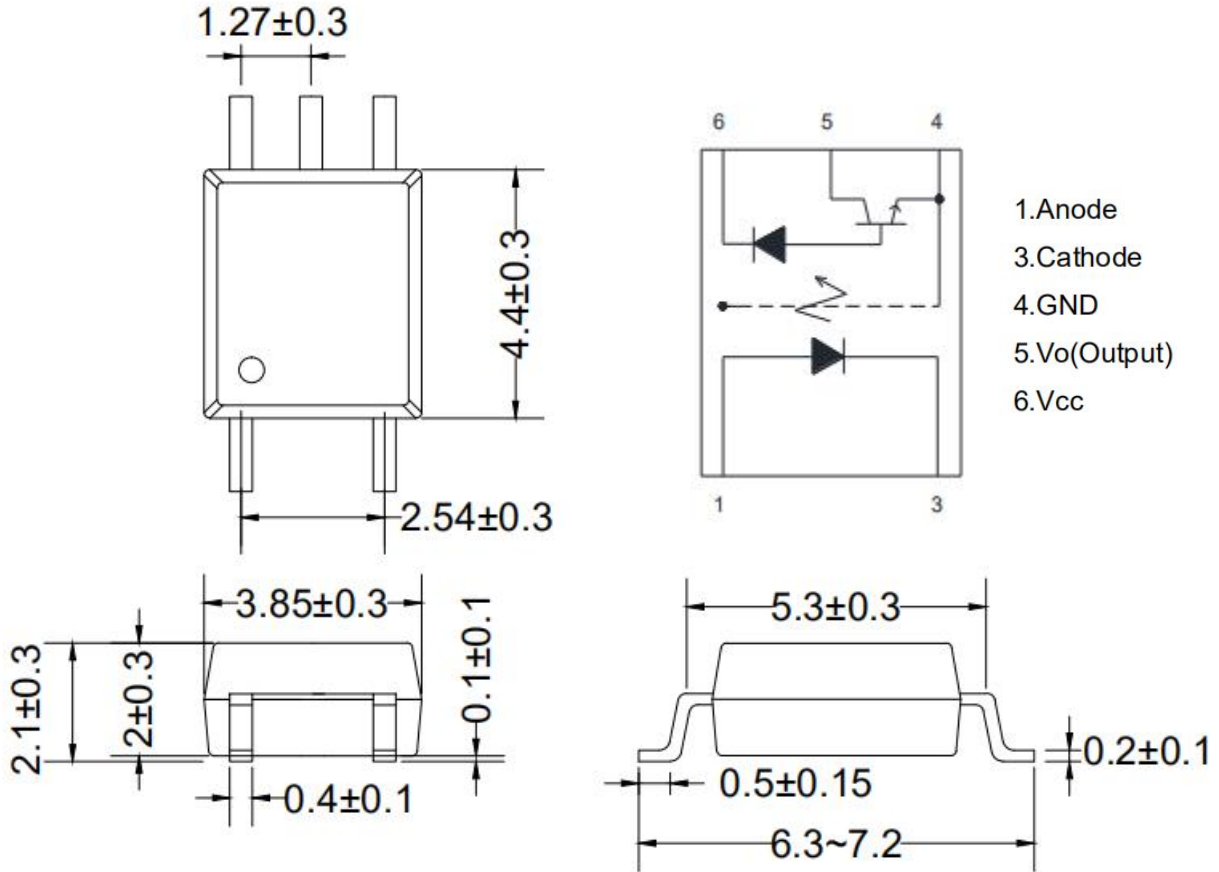
- (1) ORIENT
- (2) Part Number: 'M501'
- (3) Year Code: '9' means '2019'.
- (4) Week Code: '01' represents the first week, '02' represents the second week.
- (5) Day Code: 'A to F' means 'Monday to Sunday'
- (6) Anode.

* Halogen Free Mark can be selected.

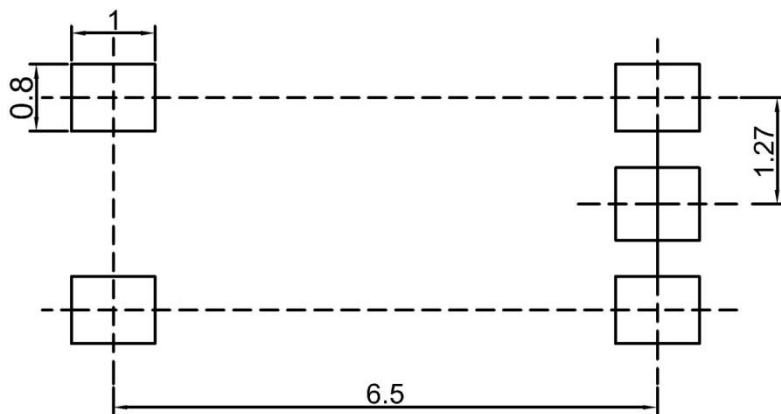
* VDE Mark can be selected.

11. Outer Dimension

(1) OR-M501



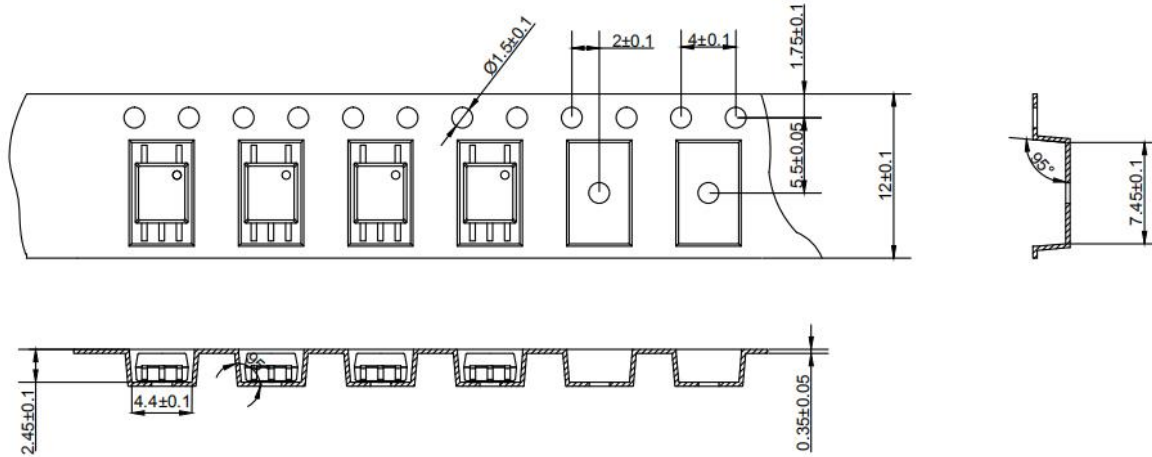
12. Recommended Foot Print Patterns (Mount Pad)



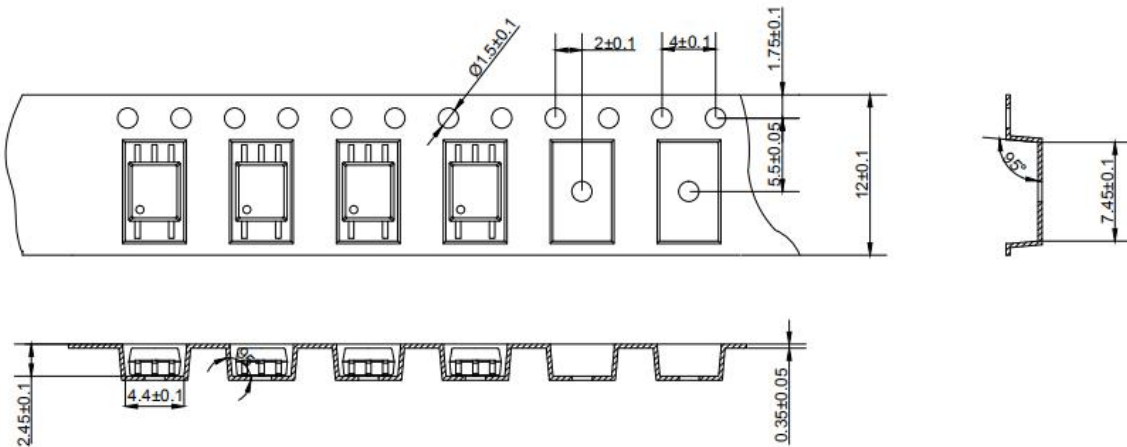
unit : mm

13. Taping Dimensions

(1) OR-M501-TP



(2) OR-M501-TP1



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

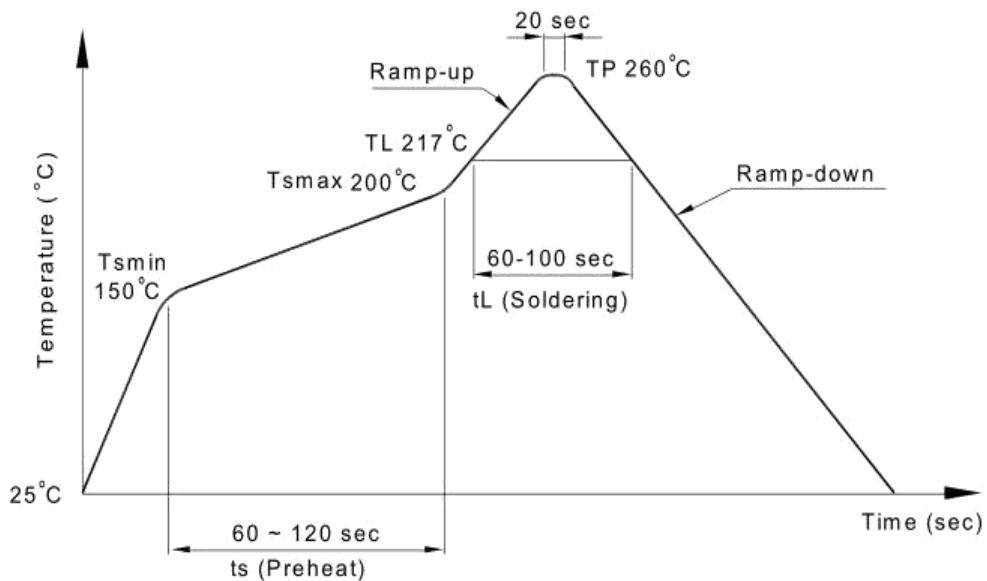
NO.	Item	Condition	Quantity	Cycle	Reference Standards
1	RSH, Resistance to Solder Heat	260±5°C,20s/cycle	22	3 cycles	JESC22A-106
2	SD, Solderability	260±5°C, 10s/cycle	22	1 cycle	JESD22-B102
3	TC, Temperature Cycle	H: 125°C 15min ∫ 5min L: -55°C 15min	77	300cycles	JESC22A-104
4	TS, Thermal Shock	H:100°C 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	1 cycle	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.

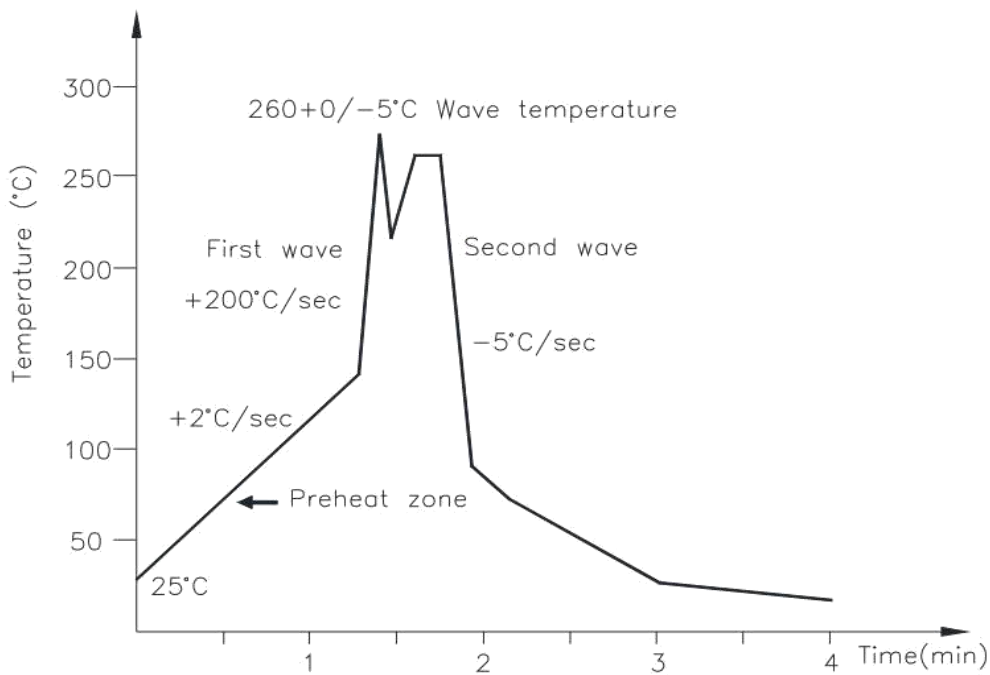
Profile item	Conditions
Preheat - Temperature Min (T Smin) - Temperature Max (T Smax) - Time (min to max) (ts)	150°C 200°C 90±30 sec
Soldering zone - Temperature (TL) - Time (t L)	217°C 60 sec
Peak Temperature	260°C
Peak Temperature time	20 sec
Ramp-up rate	3°C / sec max.
Ramp-down rate from peak temperature	3~6°C / sec
Reflow times	≤3



(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

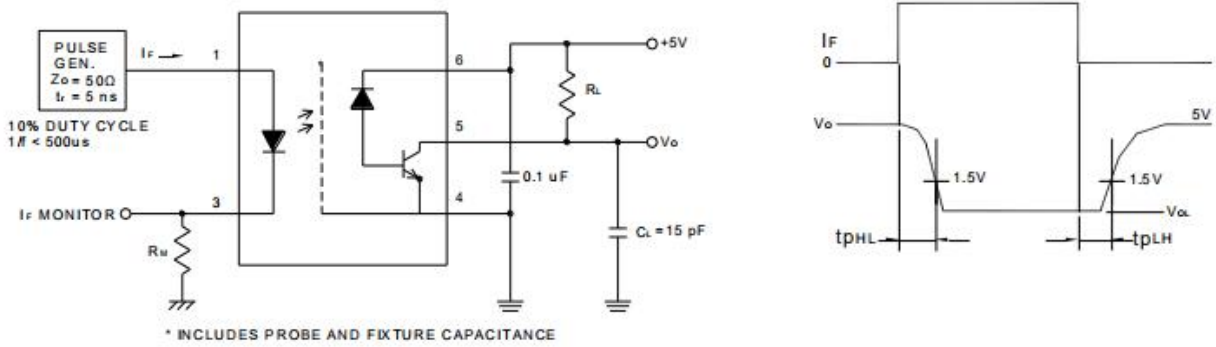


Figure 1: Test Circuit for t_{PHL} and t_{PLH}

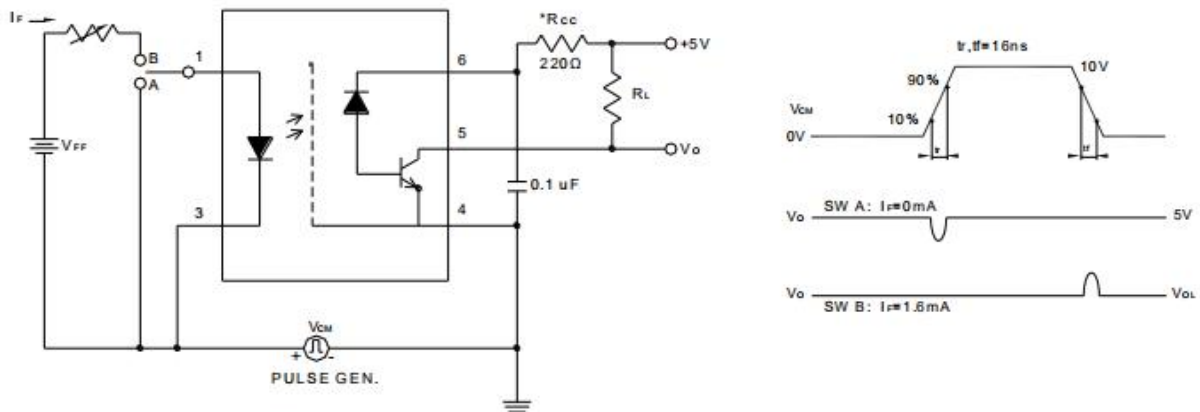


Figure 2: Single Channel Test Circuit for Common Mode Transient Immunity

18. Characteristics Curve

Figure 3: DC and pulsed transfer characteristics

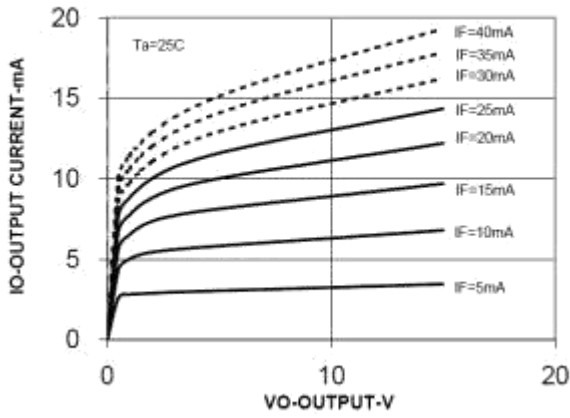


Figure 6: Current transfer ratio vs. input current

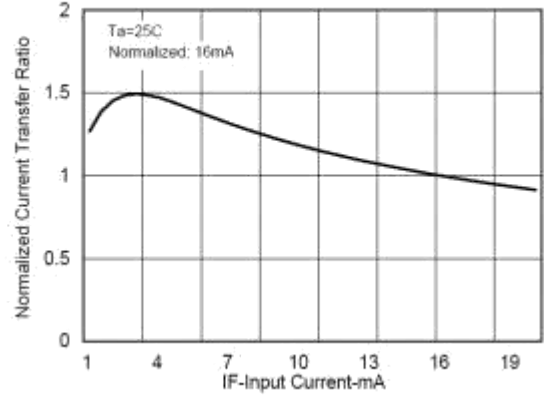


Figure 4: Input current vs. forward voltage

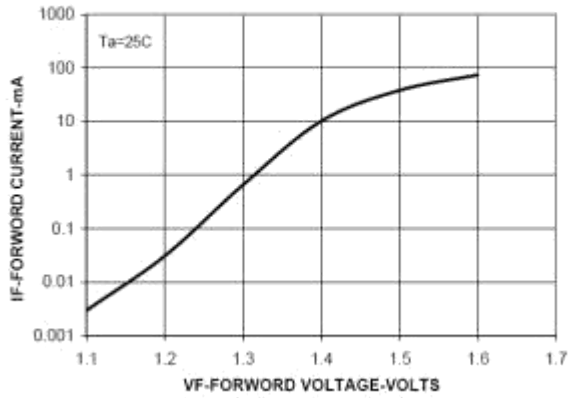


Figure 7: Current transfer ratio vs. temperature

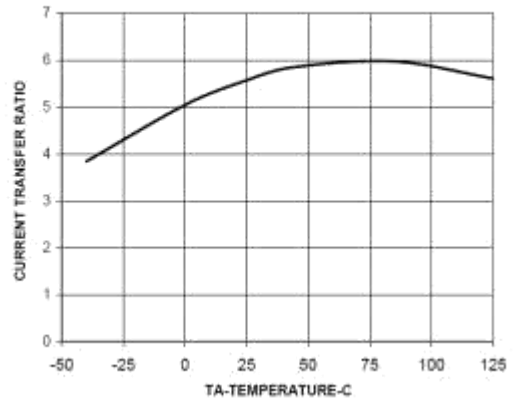


Figure 5: Logic high output current vs. temperature

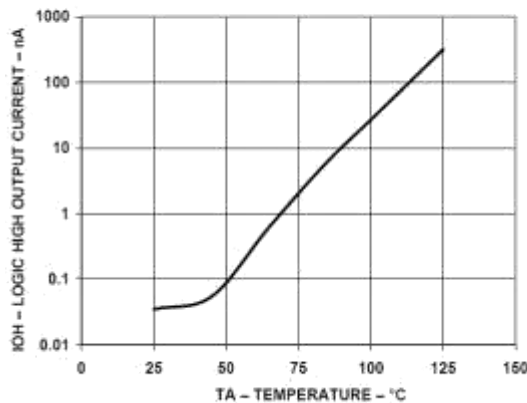


Figure 8: Small-signal current transfer ratio vs. quiescent current

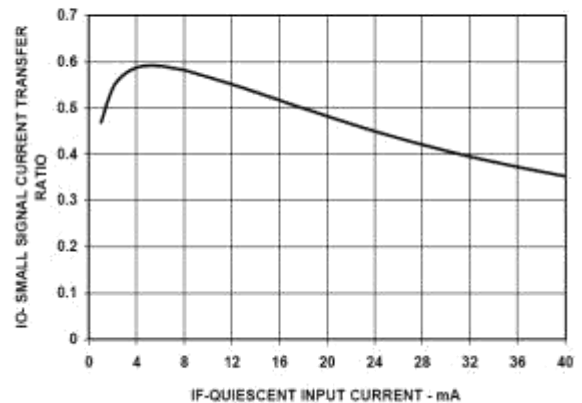


Figure 9: Propagation delay time vs. temperature

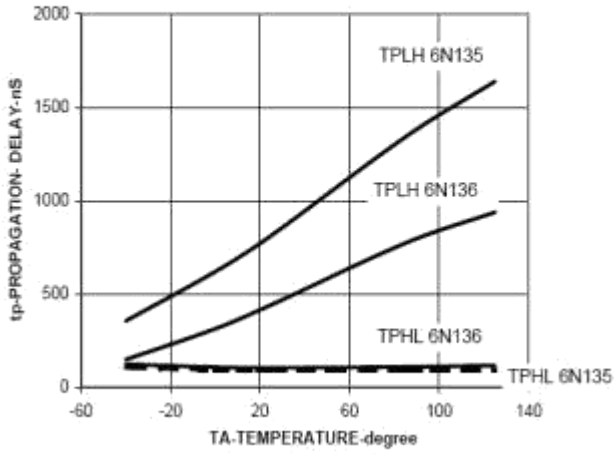
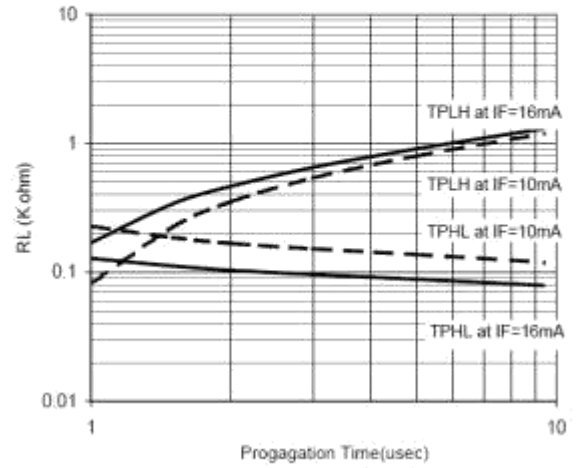


Figure 10: Propagation delay time vs. load resistance



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