

10Mbit/s High Speed Logic Gate Photo Coupler

Description

The SLM601 series combine an AlGaAs infrared emitting diode as the emitter which is optically coupled to a silicon high speed integrated photo-detector logic gate with a strobable output in a plastic SOP5 package.

With the robust coplanar double mold structure, SLM601 series provide the most stable isolation feature.

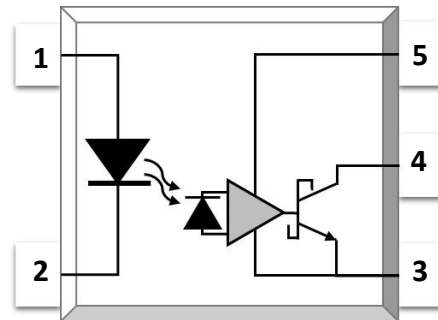
Features

- High isolation 3750 VRMS
- DC input with logic gate output
- Operating temperature range - 55 °C to 100 °C
- REACH compliance
- Halogen free
- MSL class 1
- Regulatory Approvals
 - UL - UL1577
 - VDE - EN60747-5-5(VDE0884-5)
 - CQC - GB4943.1, GB8898
 - cUL- CSA Component Acceptance Service Notice No. 5A

Applications

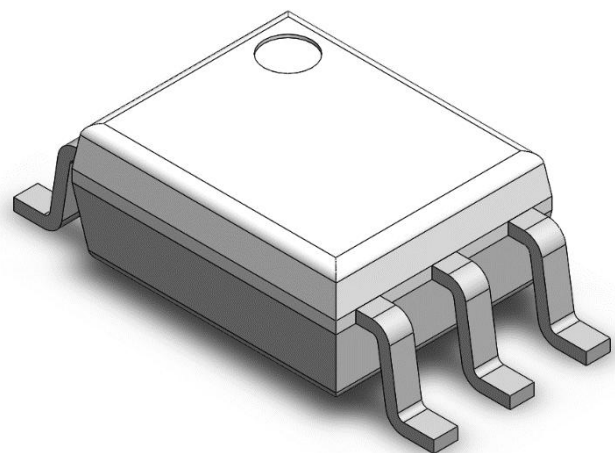
- Ground loop elimination
- LSTTL to TTL, LSTTL or CMOS
- Line receiver, data transmission
- Data multiplexing
- Switching power supply
- Pulse transformer replacement

SCHEMATIC



PIN DEFINITION

1.Anode	5.VCC
	4.VO
2.Cathode	3.GND



ABSOLUTE MAXIMUM RATINGS				
PARAMETER	SYMBOL	VALUE	UNIT	Note
INPUT				
Forward Current	I_F	25	mA	
Peak Forward Current	I_{FP}	50	mA	1
Peak Transient Current	$I_{F(trans)}$	1	A	2
Reverse Voltage	V_R	5	V	
Enable Voltage	V_E	VCC+0.5	V	
Input Power Dissipation	P_I	100	mW	
OUTPUT				
Supply Voltage	V_{CC}	7	V	
Output Voltage	V_O	7	V	
Output Current	I_O	50	mA	
Output Power Dissipation	P_O	85	mW	
COMMON				
Total Power Dissipation	P_{tot}	200	mW	
Isolation Voltage	V_{iso}	3750	Vrms	3
Operating Temperature	T_{opr}	-55~100	°C	
Storage Temperature	T_{stg}	-55~125	°C	
Soldering Temperature	T_{sol}	260	°C	4

Note 1. 50% duty, 1ms P.W

Note 2. $\leq 1\mu s$ P.W, 300pps

Note 3. AC For 1 Minute, R.H. = 40 ~ 60%

Note 4. For 10 seconds

RECOMMENDED OPERATION CONDITIONS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Operating Temperature	TA	-40	100	°C
Supply Voltage	VCC	2.7	3.6	V
	VCC	4.5	5.5	V
Low Level Input Current	IFL	0	250	μA
High Level Input Current	IFH	5	15	mA
Low Level Enable Voltage	VEL	0	0.8	V
High Level Enable Voltage	VEH	2	VCC	V
Output Pull-up Resistor	RL	330	4k	Ω
Fan Out (at RL=1kΩ per channel)	N	-	5	TTL Loads

ELECTRICAL OPTICAL CHARACTERISTICS at Ta=25°C

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION	NOTE
INPUT							
Forward Voltage	V _F	-	1.38	1.8	V	I _F =10mA	
Reverse Current	I _R	-	-	10	μA	V _R =5V	
Input Capacitance	C _{in}	-	13	-	pF	V=0, f=1MHz	
OUTPUT							
High Level Supply Current	I _{CCH}	-	6.3	10	mA	I _F =0mA, V _E =0.5V, V _{CC} =5.5V	
Low Level Supply Current	I _{CCL}	-	8.3	13	mA	I _F =10mA, V _{CC} =5.5V	
TRANSFER CHARACTERISTICS (Ta=-40 to 85°C)							
High Level Output Current	I _{OH}	-	0.73	100	μA	V _{CC} =5.5V, V _O =5.5V, I _F =250μA, V _E =2.0V	
Low Level Output Voltage	V _{OL}	-	0.28	0.6	V	V _{CC} =5.5V, I _F =5mA, V _E =2.0V, I _{CL} =13mA	
Input Threshold Current	I _{FT}	-	2.5	5	mA	V _{CC} =5.5V, V _O =0.6V, V _E =2.0V, I _{OL} =13mA	
Isolation Resistance	R _{iso}	10 ¹²	10 ¹⁴	-	Ω	DC500V, 40 ~ 60% R.H.	
Floating Capacitance	C _{IO}	-	1.0	-	pF	V=0, f=1MHz	

ELECTRICAL OPTICAL CHARACTERISTICS

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION	NOTE
SWITCHING CHARACTERISTICS (Ta=-40 to 85°C, V _{CC} =5V, I _F =7.5mA unless specified otherwise)							
Propagation Delay Time to Output Low Level	TPHL	-	35	75	ns	C _L =15pF, R _L =350Ω, Ta=25°C	Fig.23
Propagation Delay Time to Output High Level	TPLH	-	40	75	ns	C _L =15pF, R _L =350Ω, Ta=25°C	Fig.23
Pulse Width Distortion	TPHL-TPLH	-	5	35	ns	C _L =15pF, R _L =350Ω	Fig.23
Rise Time	tr	-	27	-	ns	C _L =15pF, R _L =350Ω	Fig.23
Fall Time	tf	-	7	-	ns	C _L =15pF, R _L =350Ω	Fig.23
Common Mode Transient Immunity at Logic High	CMH	10000	-	-	V/μs	I _F = 7.5mA , V _{OH} =2.0V, R _L =350Ω, Ta=25°C V _{CM} =400Vp-p	Fig.24
Common Mode Transient Immunity at Logic Low	CML	10000	-	-	V/μs	I _F = 0mA , V _{OH} =0.8V, R _L =350Ω, Ta=25°C V _{CM} =400Vp-p	Fig.24

ELECTRICAL OPTICAL CHARACTERISTICS at Ta=25°C							
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION	NOTE
INPUT							
Forward Voltage	V _F	-	1.38	1.8	V	I _F =10mA	
Reverse Current	I _R	-	-	10	μA	V _R =5V	
Input Capacitance	C _{in}	-	13	-	pF	V=0, f=1MHz	
OUTPUT							
High Level Supply Current	I _{CCH}	-	4.3	10	mA	I _F =0mA, V _E =0.5V, V _{CC} =3.3V	
Low Level Supply Current	I _{CCL}	-	6.4	13	mA	I _F =10mA, V _{CC} =3.3V	
TRANSFER CHARACTERISTICS (Ta=-40 to 85°C)							
High Level Output Current	I _{OH}	-	4.1	100	μA	V _{CC} =3.3V, V _O =3.3V, I _F =250μA, V _E =2.0V	
Low Level Output Voltage	V _{OL}	-	0.29	0.6	V	V _{CC} =3.3V, I _F =5mA, V _E =2.0V, I _{CL} =13mA	
Input Threshold Current	I _{FT}	-	2.2	5	mA	V _{CC} =3.3V, V _O =0.6V, V _E =2.0V, I _{OL} =13mA	
Isolation Resistance	R _{iso}	10 ¹²	10 ¹⁴	-	Ω	DC500V, 40 ~ 60% R.H.	
Floating Capacitance	C _{IO}	-	1.0	-	pF	V=0, f=1MHz	

ELECTRICAL OPTICAL CHARACTERISTICS

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION	NOTE
SWITCHING CHARACTERISTICS (Ta=-40 to 85°C, V _{CC} =3.3V, I _F =7.5mA unless specified otherwise)							
Propagation Delay Time to Output Low Level	TPHL	-	35	75	ns	C _L =15pF, R _L =350Ω, Ta=25°C	Fig.23
Propagation Delay Time to Output High Level	TPLH	-	47	75	ns	C _L =15pF, R _L =350Ω, Ta=25°C	Fig.23
Pulse Width Distortion	TPHL-TPLH	-	12	35	ns	C _L =15pF, R _L =350Ω	Fig.23
Rise Time	tr	-	30	-	ns	C _L =15pF, R _L =350Ω	Fig.23
Fall Time	tf	-	8.5	-	ns	C _L =15pF, R _L =350Ω	Fig.23
Common Mode Transient Immunity at Logic High	CMH	10000	-	-	V/μs	I _F = 7.5mA , V _{OH} =2.0V, R _L =350Ω, Ta=25°C V _{CM} =400Vp-p	Fig.24
Common Mode Transient Immunity at Logic Low	CML	10000	-	-	V/μs	I _F = 0mA , V _{OH} =0.8V, R _L =350Ω, Ta=25°C V _{CM} =400Vp-p	Fig.24

CHARACTERISTIC CURVES

Fig.1 Forward Current vs. Forward Voltage

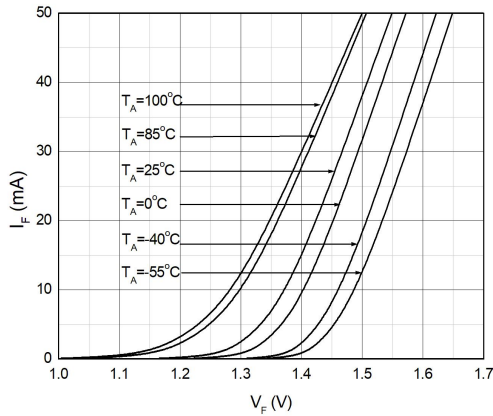


Fig.2 Forward Voltage vs. Ambient Temperature

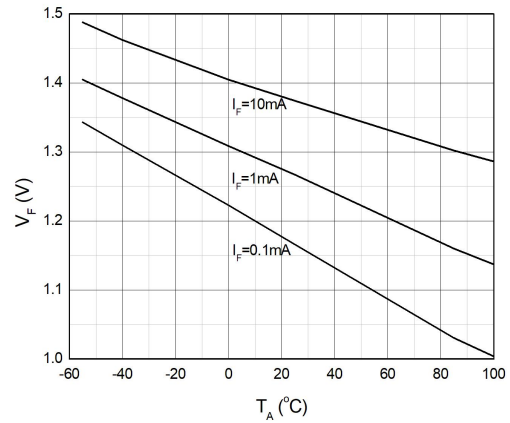


Fig.3 Input Threshold Current vs. Ambient Temperature

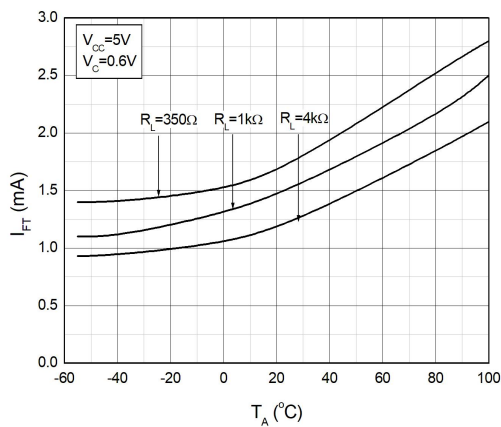


Fig.4 Input Threshold Current vs. Ambient Temperature

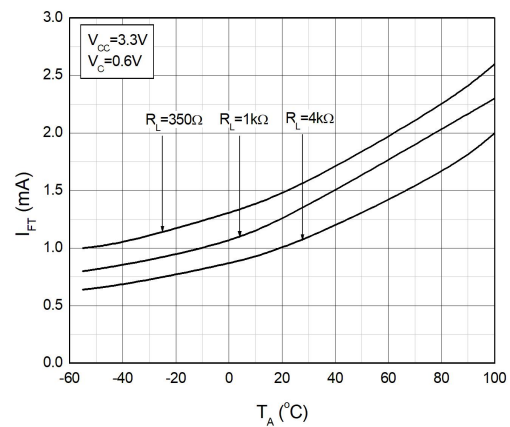


Fig.5 Low Level Output Current vs. Ambient Temperature

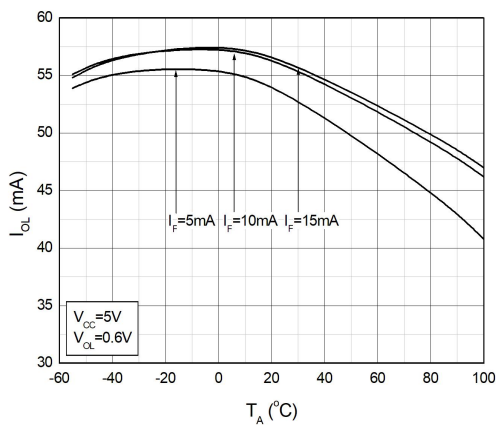
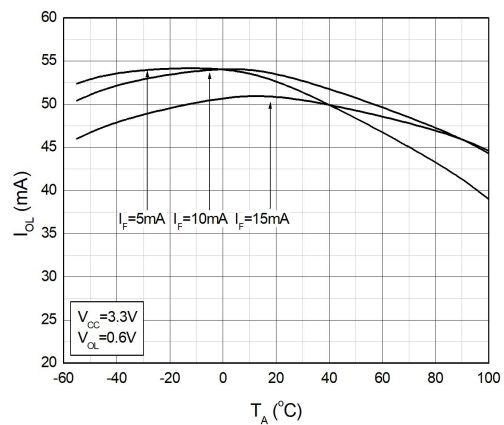


Fig.6 Low Level Output Current vs. Ambient Temperature



CHARACTERISTIC CURVES

Fig.7 Low Level Output Voltage vs. Ambient Temperature

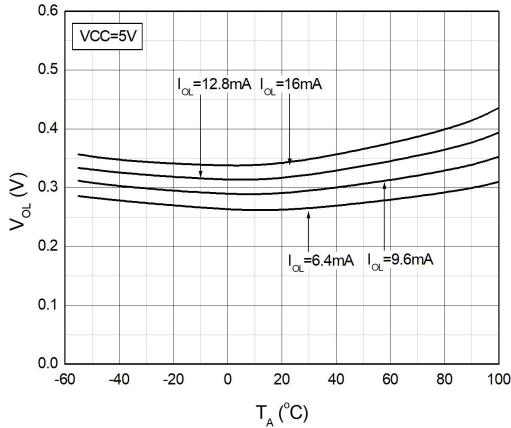


Fig.8 Low Level Output Voltage vs. Ambient Temperature

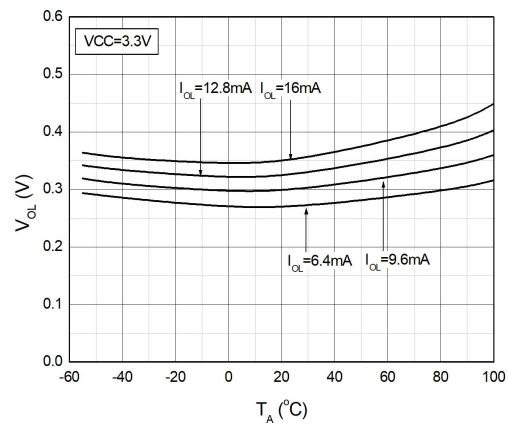


Fig.9 High Level Output Current vs. Ambient Temperature

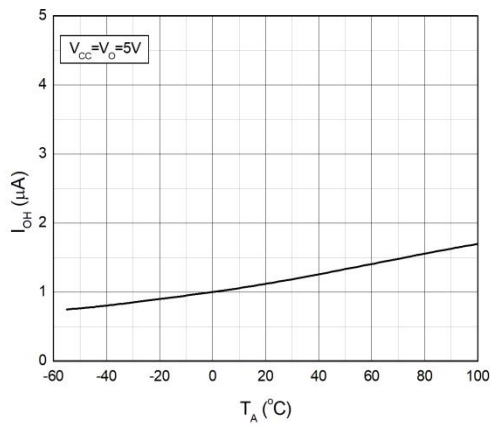


Fig.10 High Level Output Current vs. Ambient Temperature

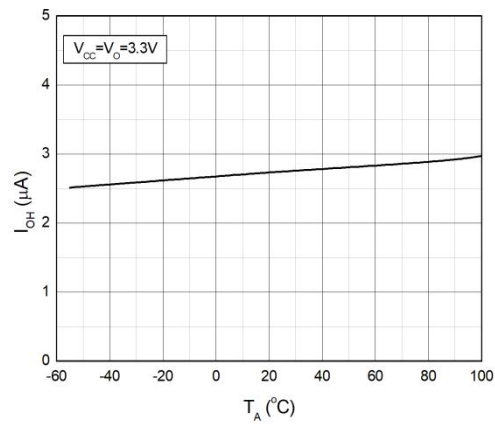


Fig.11 Output Voltage vs. Forward Current

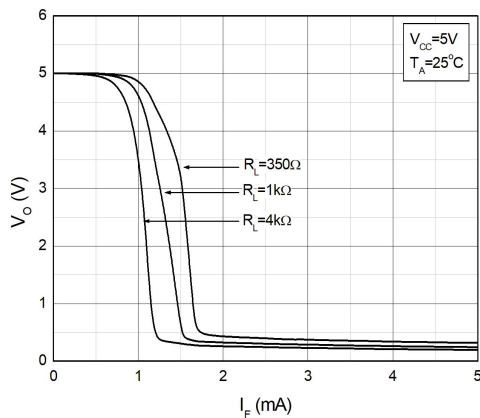
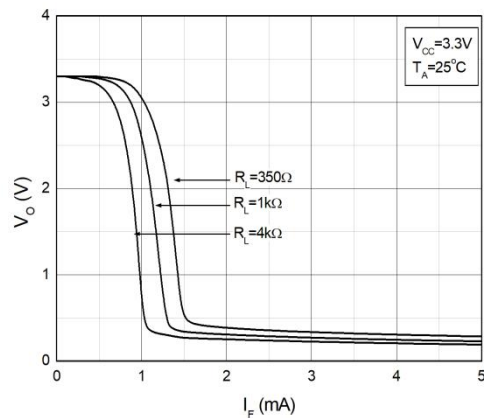


Fig.12 Output Voltage vs. Forward Current



CHARACTERISTIC CURVES

Fig.13 Propagation Delay vs. Forward Current

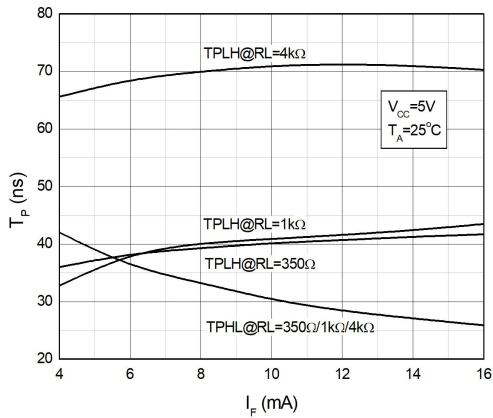


Fig.14 Propagation Delay vs. Forward Current

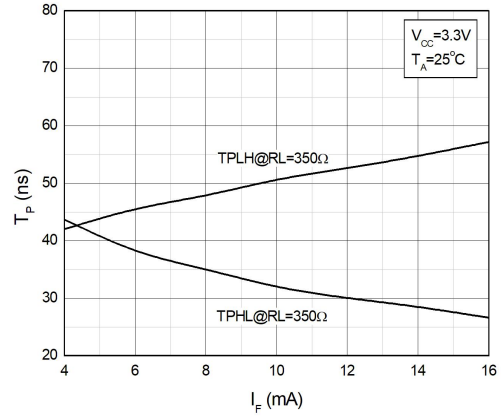


Fig.15 Rise and Fall Time vs. Ambient Temperature

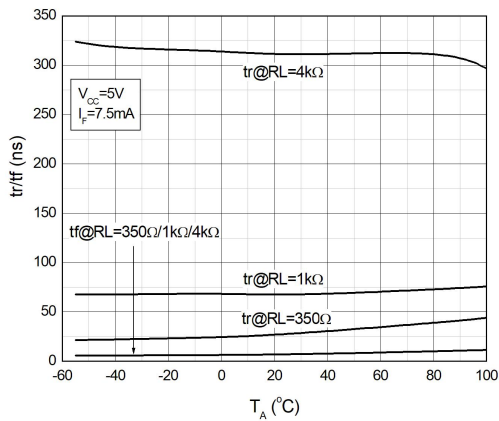


Fig.16 Rise and Fall Time vs. Ambient Temperature

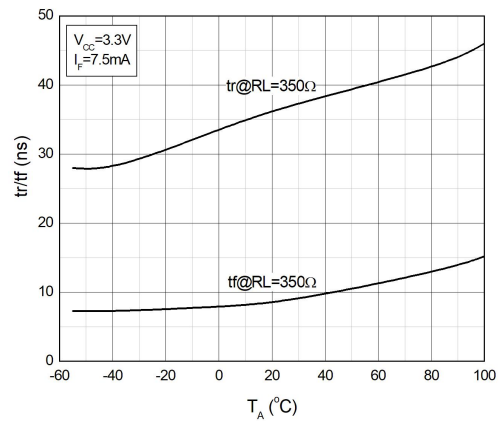


Fig.17 Propagation Delay vs. Ambient Temperature

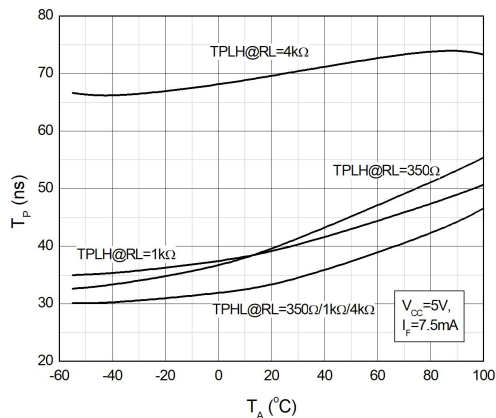
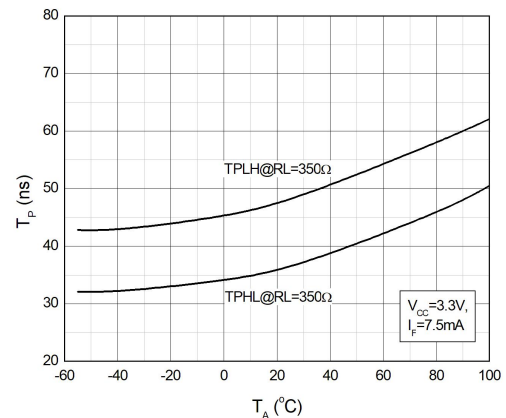


Fig.18 Propagation Delay vs. Ambient Temperature



CHARACTERISTIC CURVES

Fig.19 Pulse Width Distortion vs. Ambient Temperature

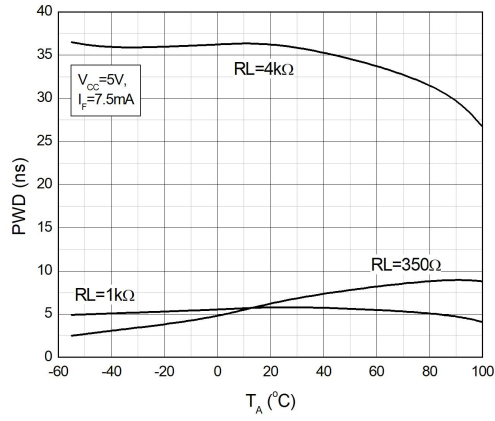
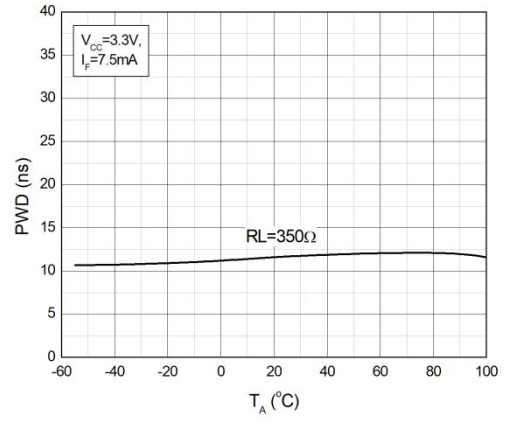


Fig.20 Pulse Width Distortion vs. Ambient Temperature



TEST CIRCUITS

Fig.23 Test Circuits for TPHL, TPLH, tr, tf

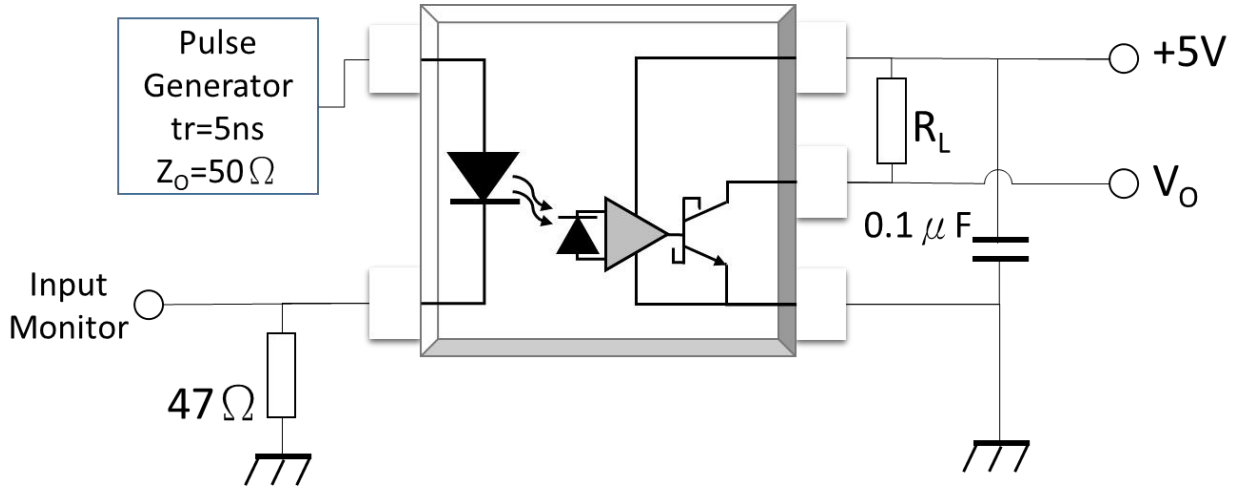
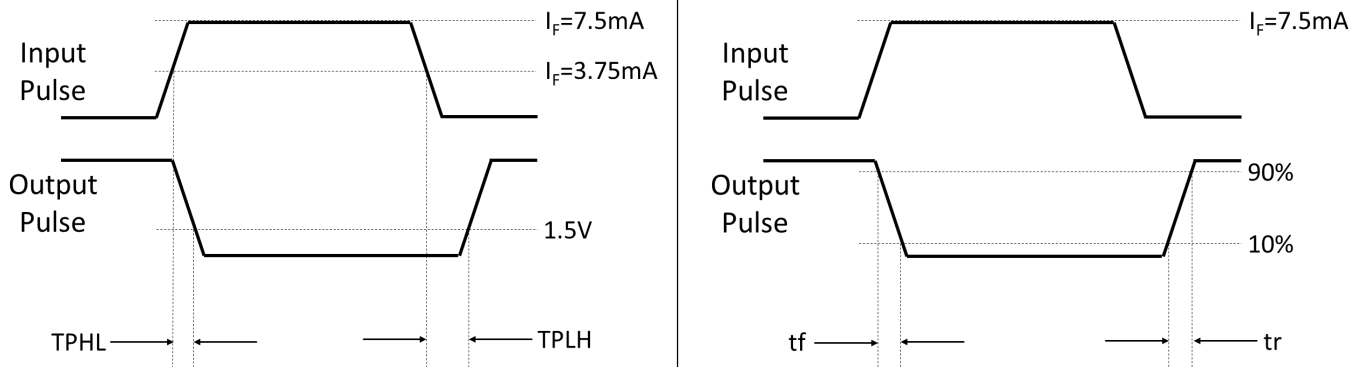


Fig.24 Waveforms of TPHL, TPLH, tr, tf



TEST CIRCUITS

Fig.24 Test Circuits for Common Mode Transient Immunity

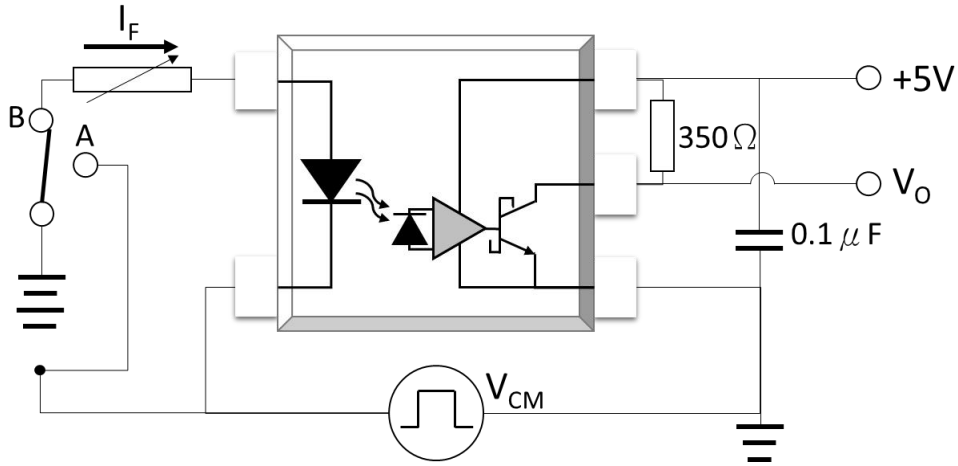
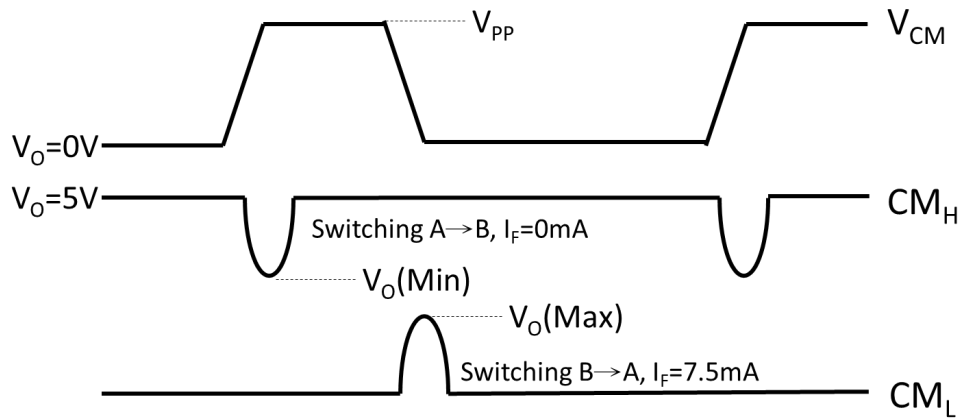
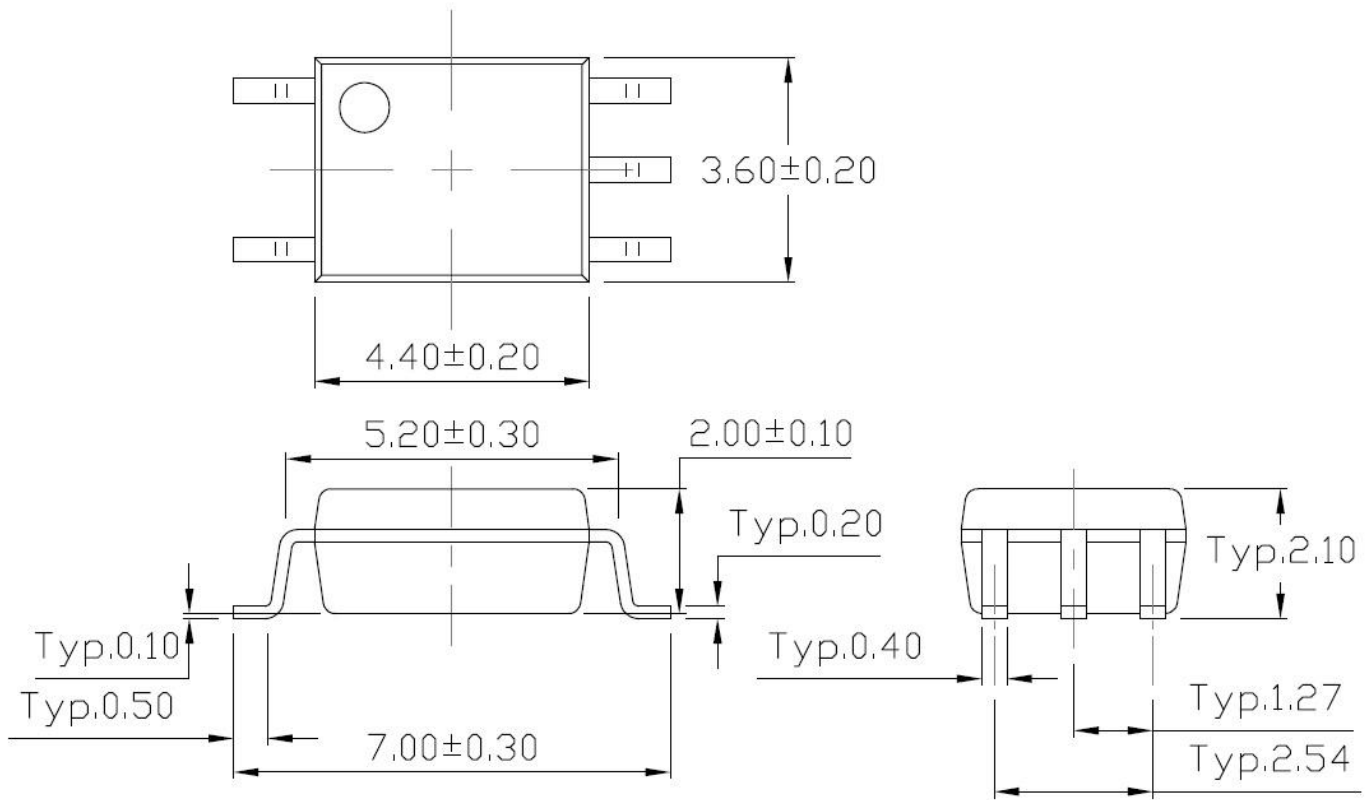


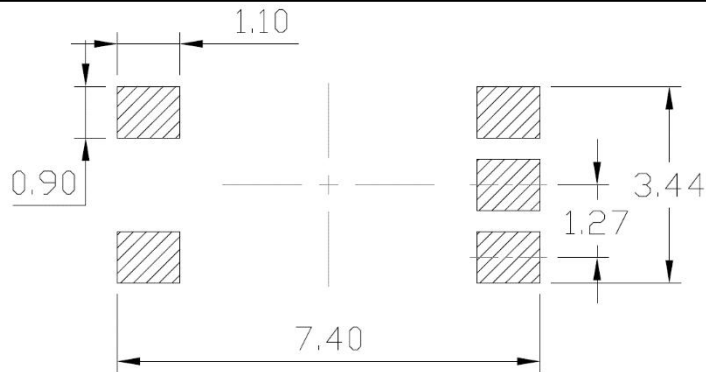
Fig.26 Waveforms of Common Mode Transient Immunity



PACKAGE DIMENSIONS (Dimensions in mm unless otherwise stated)

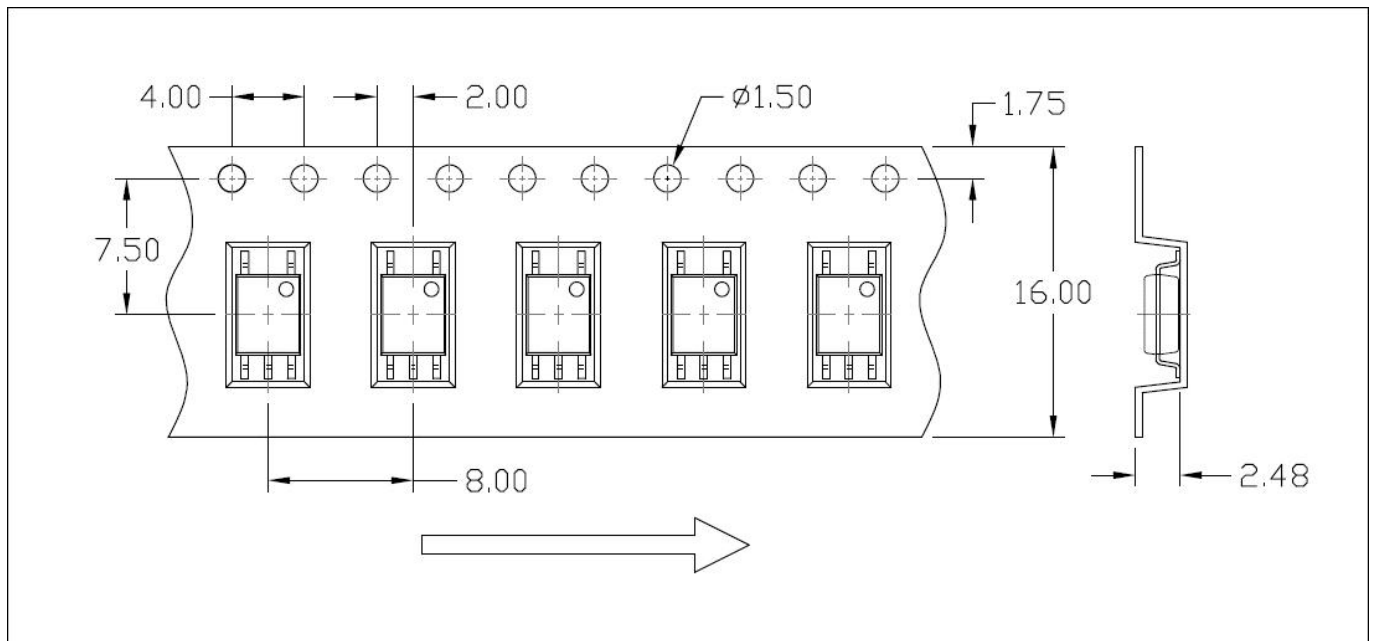


Recommended Solder Mask (Dimensions in mm unless otherwise stated)

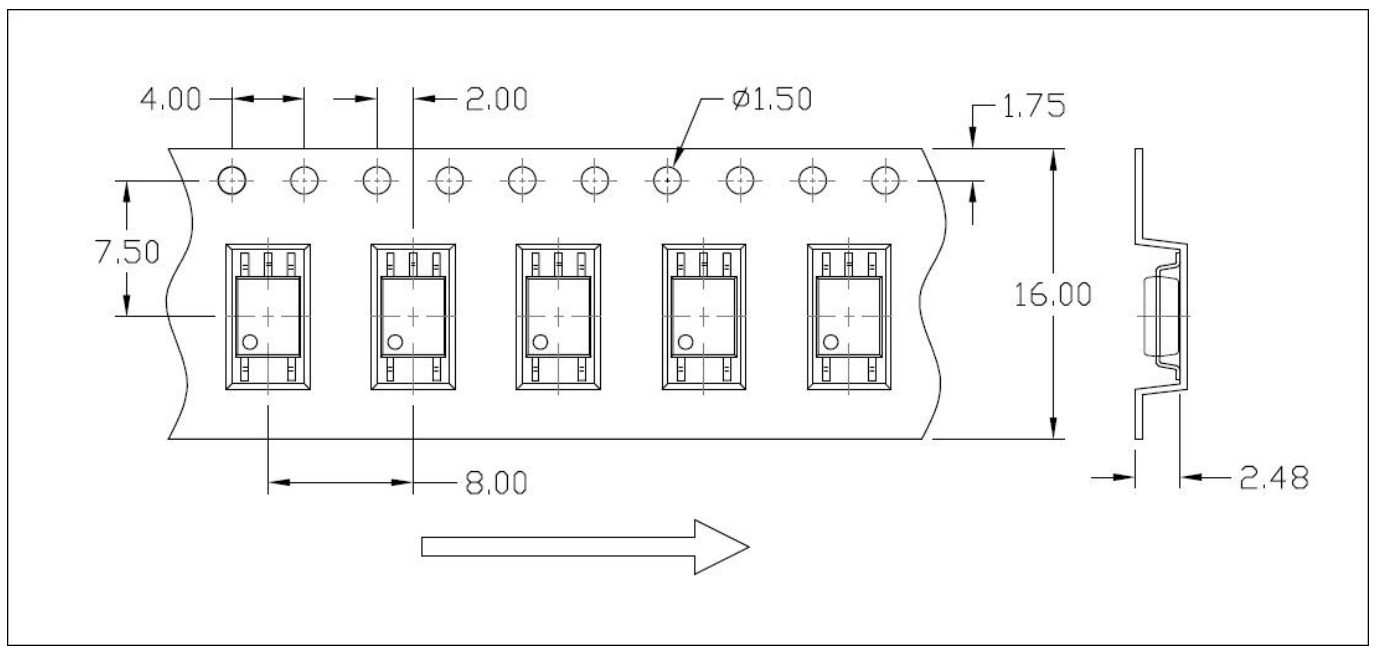


CARRIER TAPE SPECIFICATIONS (Dimensions in mm unless otherwise stated)

Option T1

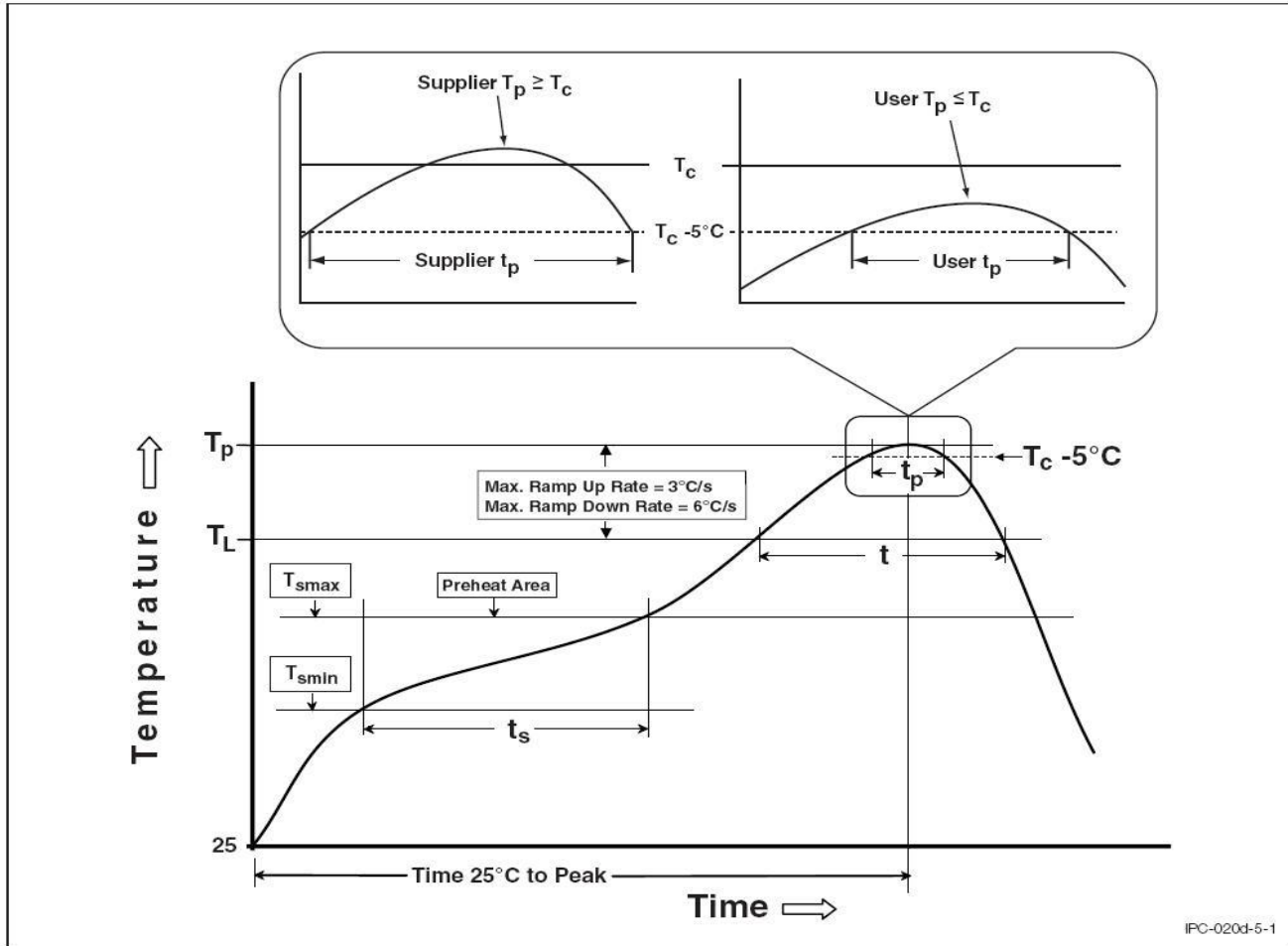


Option T2



REFLOW INFORMATION

REFLOW PROFILE



Profile Feature	Sn-Pb Assembly Profile	Pb-Free Assembly Profile
Temperature Min. (T _{smin})	100	150°C
Temperature Max. (T _{smax})	150	200°C
Time (t _s) from (T _{smin} to T _{smax})	60-120 seconds	60-120 seconds
Ramp-up Rate (t _L to t _P)	3°C/second max.	3°C/second max.
Liquidous Temperature (T _L)	183°C	217°C
Time (t _L) Maintained Above (T _L)	60 – 150 seconds	60 – 150 seconds
Peak Body Package Temperature	235°C +0°C / -5°C	260°C +0°C / -5°C
Time (t _P) within 5°C of 260°C	20 seconds	30 seconds
Ramp-down Rate (T _P to T _L)	6°C/second max	6°C/second max
Time 25°C to Peak Temperature	6 minutes max.	8 minutes max.