

Features

- High isolation 3750 VRMS
- DC input with logic gate output
- Operating temperature range - 40 °C to 100 °C
- REACH compliance
- Halogen free
- MSL class 1
- Regulatory Approvals
 - UL - UL1577 (Pending Approved)
 - VDE - EN60747-5-5(VDE0884-5)
 - CQC – GB4943.1

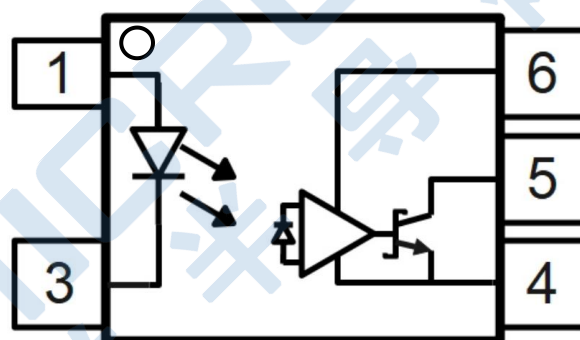
Applications

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

Description

The ICPL-M601 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, ICPL-M601series provide the most stable isolation feature.



Truth Table

LED	OUT
ON	L
OFF	H



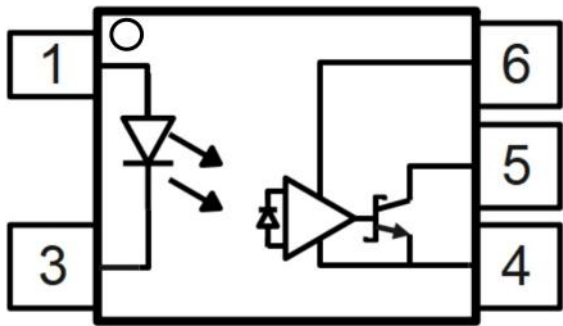
ORDERING INFORMATION

Outline	Part Number	Package	Marking	Packing	Packing Size	Quantity
	ICPL-M601-510E	SOP5	ICPL M601 /YYWW A	Reel	13 "	3000

CONTENTS

Pin Configuration And Functions.	3
Absolute Maximum Ratings.	3
Recommended Operation Conditions.	4
Switching Characteristics.	4
Electrical Optical Characteristics.	5
Characteristic Curves.	6
Test Circuits.	10
Package Dimensions.	12
Recommended Solder Mask.	12
Carrier Tape Specifications.	13
Ordering And Marking Information.	14
Reflow Information.	15
Temperature Profile Of Soldering.	16
Disclaimer.	17

PIN CONFIGURATION AND FUNCTIONS

	Pin	Name
	1	Anode
	3	Cathode
	4	GND
	5	V_o
	6	V_{cc}

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	$V_{CC}+0.5$	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	V _{rms}	3
Operating Temperature	T_{opr}	-40~100	°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	T_a	-40	100	°C
Supply Voltage	V_{CC}	2.7	3.6	V
	V_{CC}	4.5	5.5	V
Low Level Input Current	I_{FL}	0	250	μA
High Level Input Current	I_{FH}	5	15	mA
Low Level Enable Voltage	V_{EL}	0	0.8	V
High Level Enable Voltage	V_{EH}	2	V_{CC}	V
Output Pull-up Resistor	R_L	330	4k	Ω
Fan Out (at $R_L=1k\Omega$ per channel)	N	-	5	TTL Loads

SWITCHING CHARACTERISTICS

($T_a=-40$ to $85^\circ C$, $V_{CC}=5V$, $I_F=7.5mA$ unless specified otherwise)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Condition	Note
Propagation Delay Time to Output Low Level	t_{PHL}	-	35	75	ns	$C_L=15pF$, $R_L=350\Omega$, $T_a=25^\circ C$	Fig.23
Propagation Delay Time to Output High Level	t_{PLH}	-	40	75	ns	$C_L=15pF$, $R_L=350\Omega$, $T_a=25^\circ C$	Fig.23
Pulse Width Distortion	$ t_{PHL}-t_{PLH} $	-	5	35	ns	$C_L=15pF$, $R_L=350\Omega$	Fig.23
Rise Time	t_r	-	27	-	ns	$C_L=15pF$, $R_L=350\Omega$	Fig.23
Fall Time	t_f	-	7	-	ns	$C_L=15pF$, $R_L=350\Omega$	Fig.23
Common Mode Transient Immunity at Logic High	CM_H	10000	-	-	V/ μs	$I_F = 7.5mA$, $V_{OH}=2.0V$, $R_L=350\Omega$, $T_a=25^\circ C$ $V_{CM}=400Vp-p$	Fig.24
Common Mode Transient Immunity at Logic Low	CM_L	10000	-	-	V/ μs	$I_F = 0mA$, $V_{OH}=0.8V$, $R_L=350\Omega$, $T_a=25^\circ C$ $V_{CM}=400Vp-p$	Fig.24

ELECTRICAL OPTICAL CHARACTERISTICS(T_a=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 (T _a =-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	

CHARACTERISTIC CURVES

Fig.1 Forward Current vs. Forward Voltage

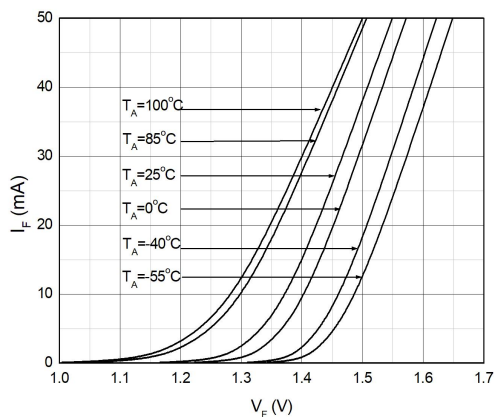


Fig.2 Forward Voltage vs. Ambient Temperature

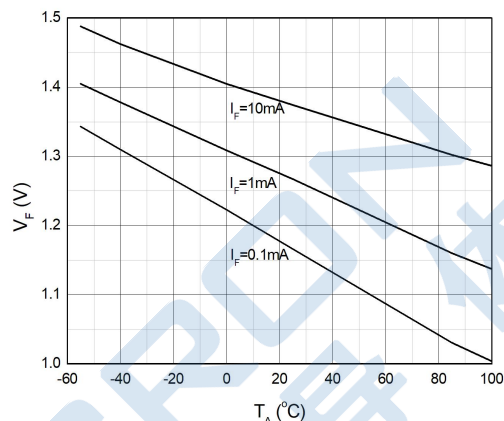


Fig.3 Input Threshold Current vs. Ambient Temperature

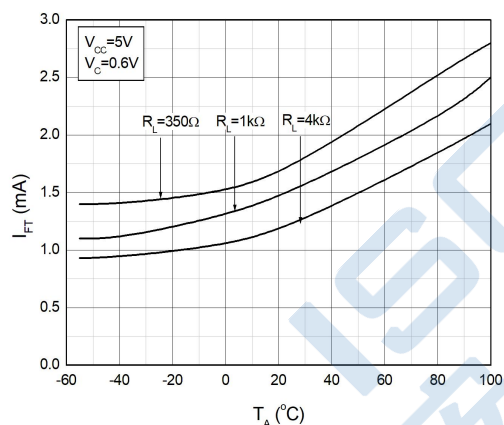


Fig.4 Input Threshold Current vs. Ambient Temperature

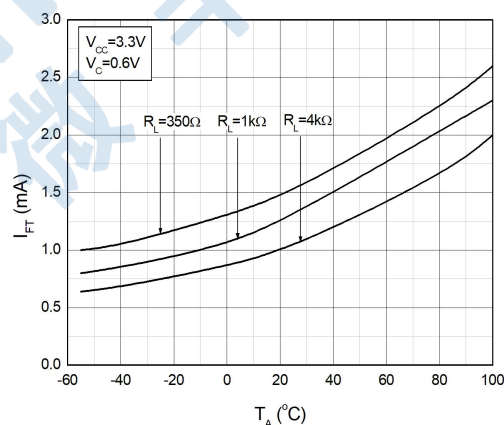


Fig.5 Low Level Output Current vs. Ambient Temperature

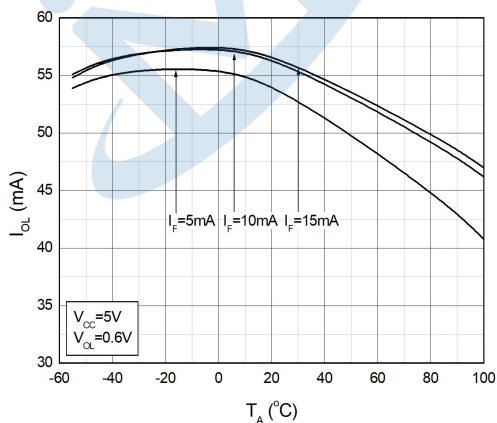


Fig.6 Low Level Output Current vs. Ambient Temperature

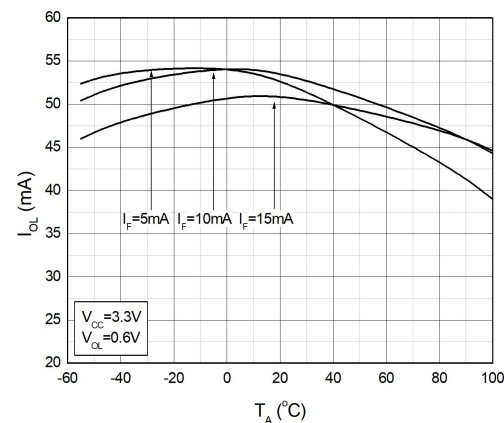


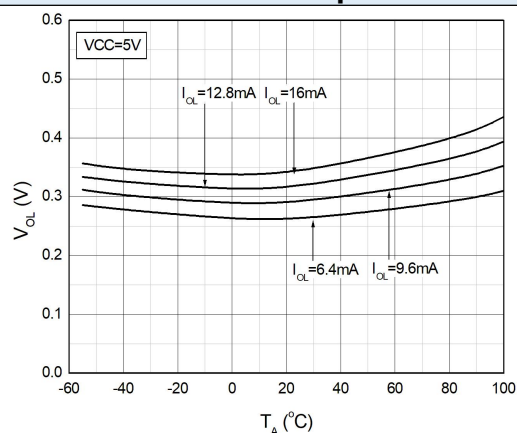
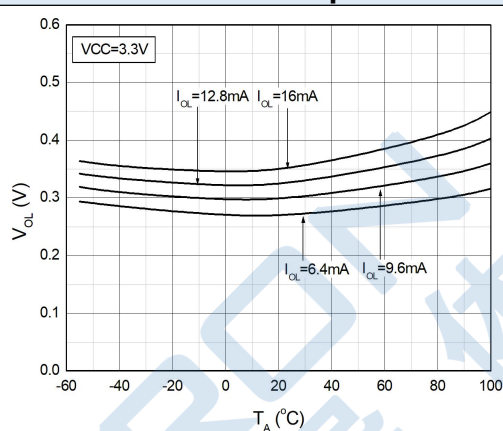
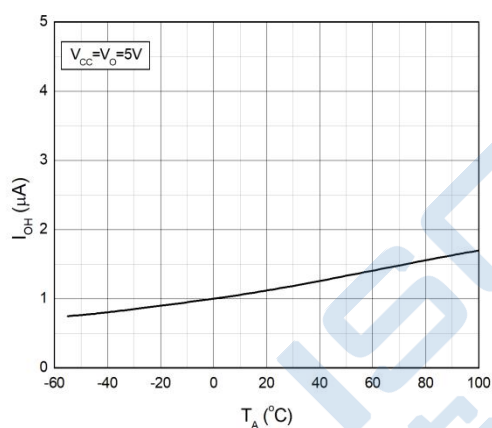
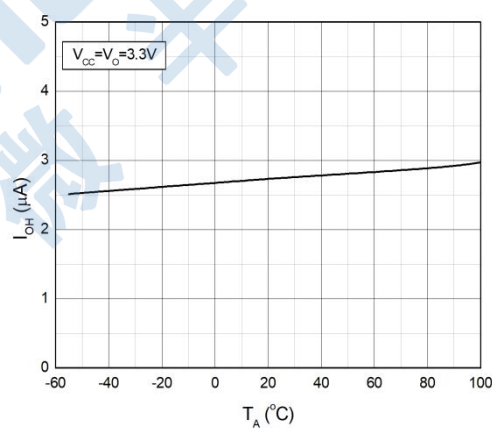
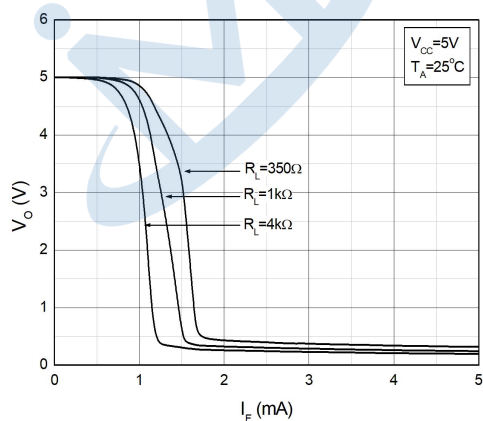
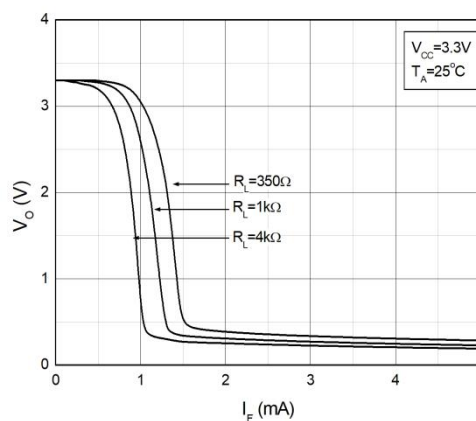
Fig.7 Low Level Output Voltage vs. Ambient Temperature

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


Fig.13 Propagation Delay vs. Forward Current

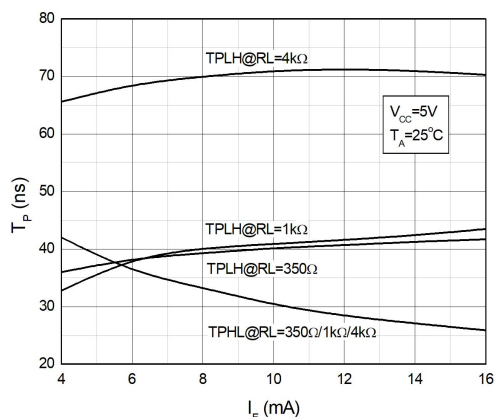


Fig.14 Propagation Delay vs. Forward Current

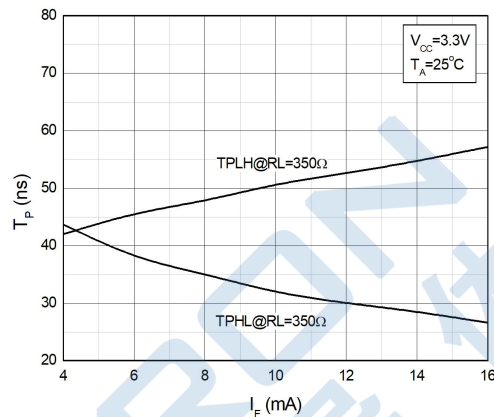


Fig.15 Rise and Fall Time vs. Ambient Temperature

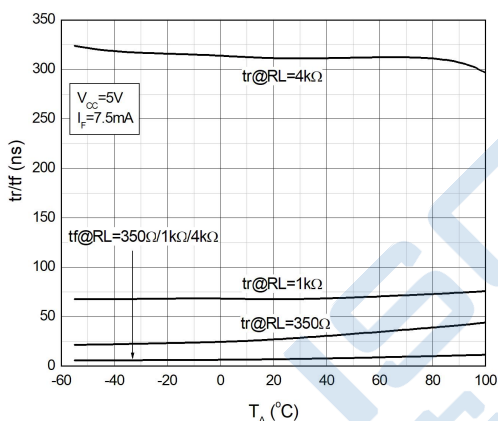


Fig.16 Rise and Fall Time vs. Ambient Temperature

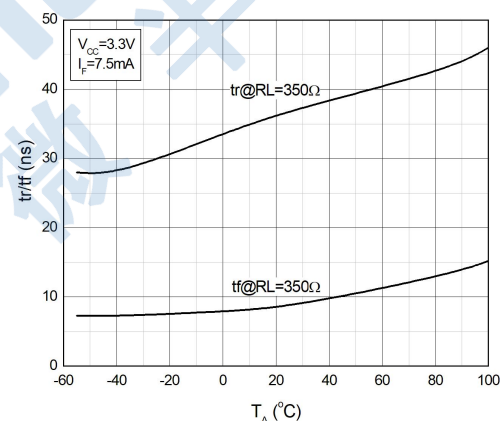


Fig.17 Propagation Delay vs. Ambient Temperature

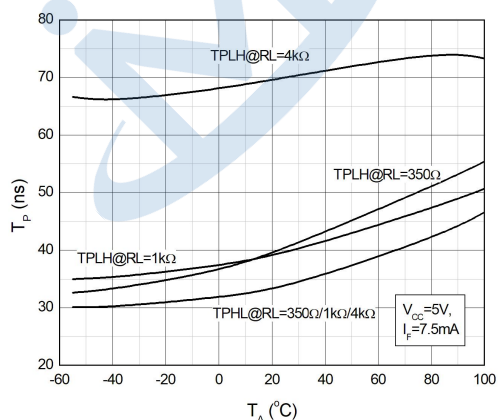


Fig.18 Propagation Delay vs. Ambient Temperature

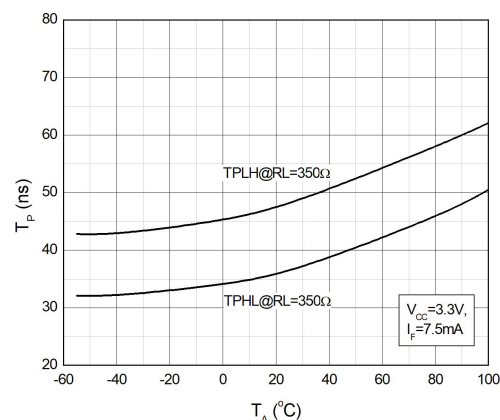


Fig.19 Pulse Width Distortion vs. Ambient Temperature

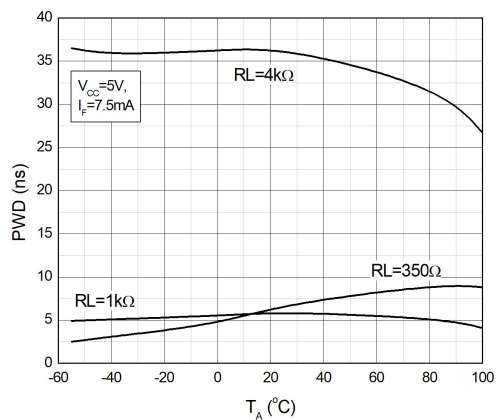
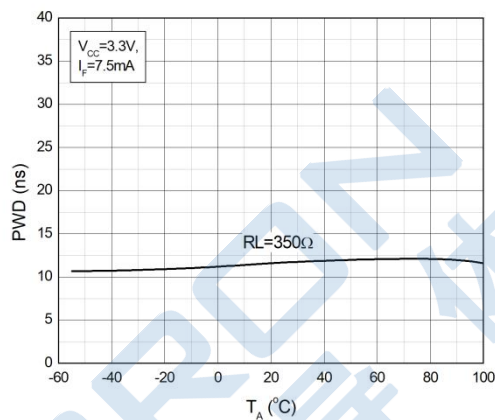


Fig.20 Pulse Width Distortion vs. Ambient Temperature



TEST CIRCUITS

Fig.23 Test Circuits for t_{PHL} , t_{PLH} , t_r , t_f

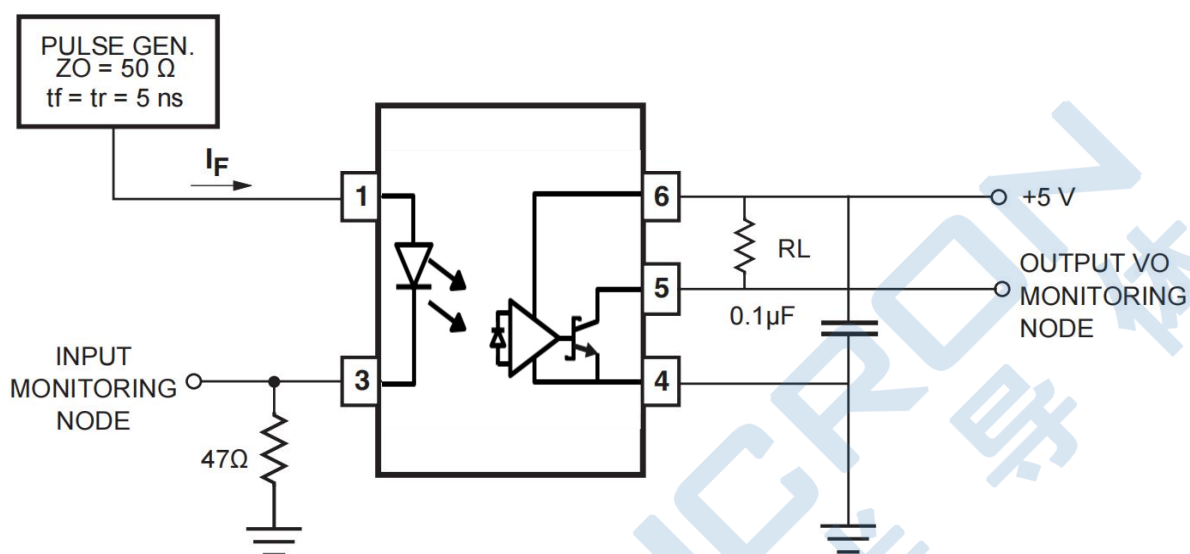
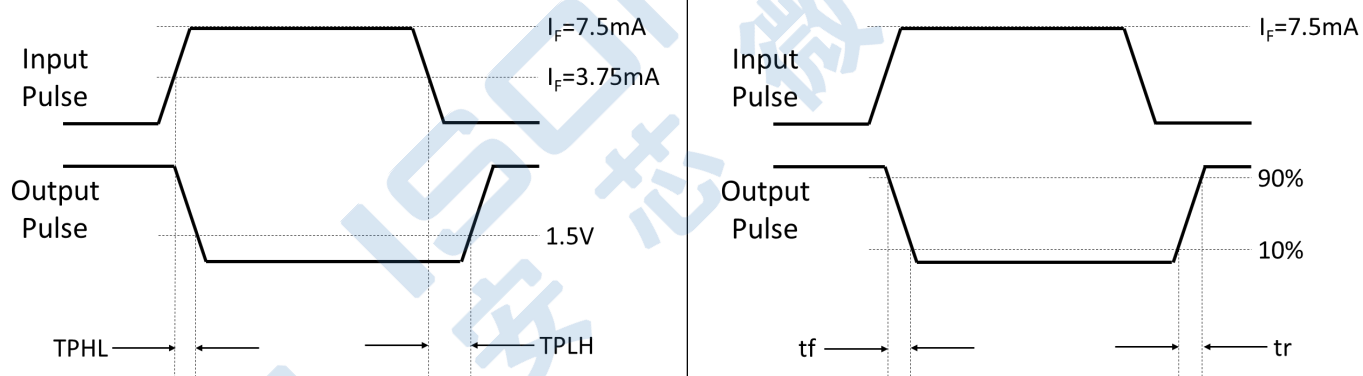


Fig.24 Waveforms of t_{PHL} , t_{PLH} , t_r , t_f



TEST CIRCUITS

Fig.25 Test Circuits for Common Mode Transient Immunity

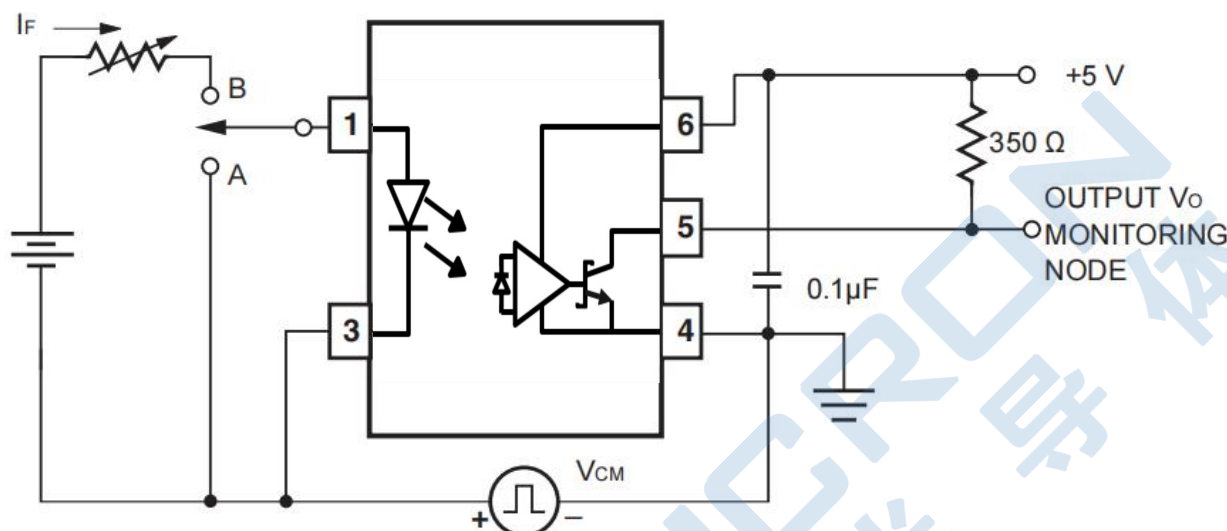
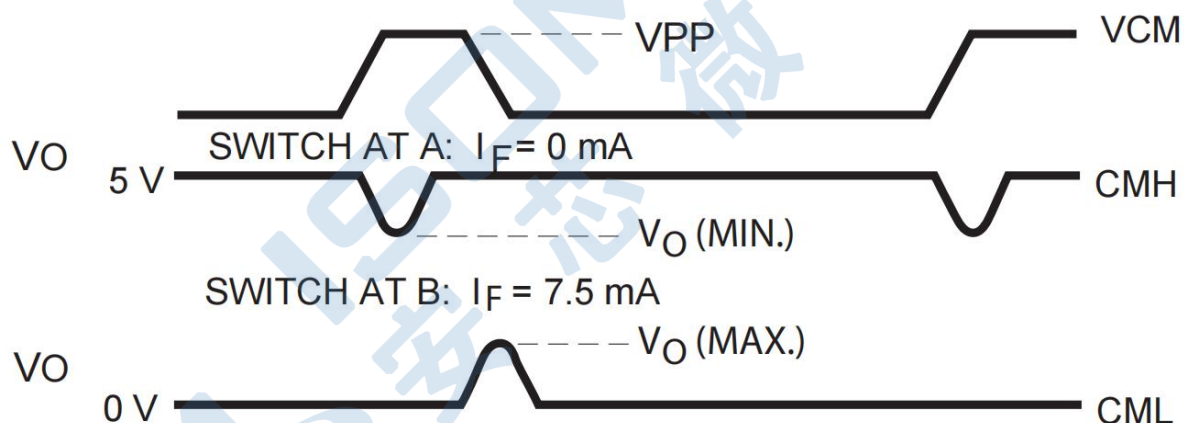
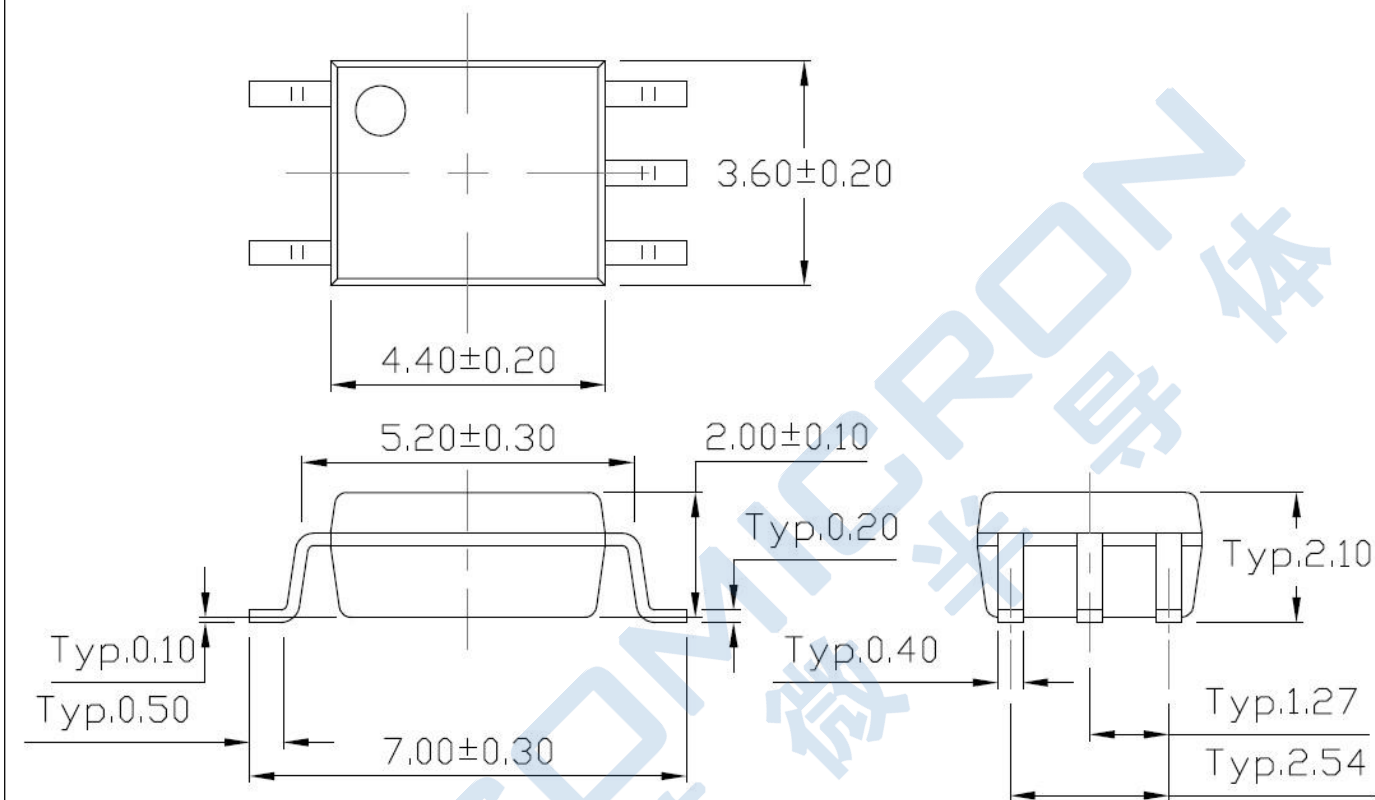


Fig.26 Waveforms of Common Mode Transient Immunity

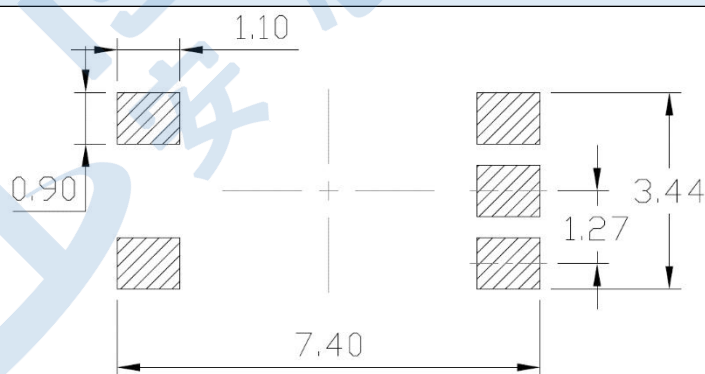


PACKAGE DIMENSIONS

Surface Mount (Low Profile) - (SOP5)



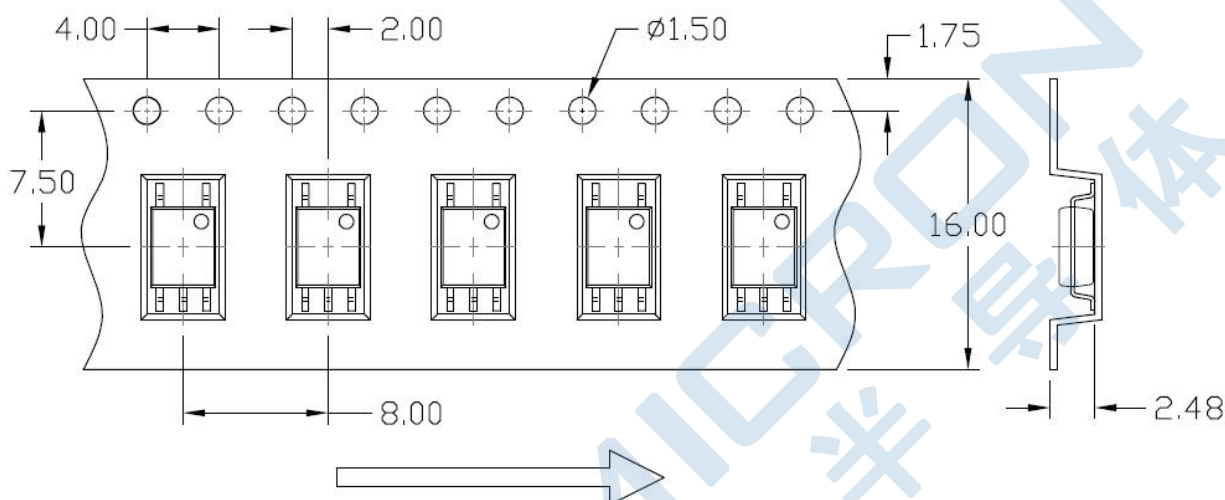
Recommended Solder Mask



- Dimensions in mm unless otherwise stated

CARRIER TAPE SPECIFICATIONS

Option SOP5



- Dimensions in mm unless otherwise stated

ORDERING AND MARKING INFORMATION

Marking Information



ICPL : Company Abbr.
 M601 : Part Number
 / : ISOMICRON
 YY : Fiscal Year
 WW : Work Week
 A : Manufacturing Code

Order Code

ICPL – M601 - 5 1 0 E

Company Abbr. ←

Part Number ←

Lead Forming
5: SM-SL ←

Halogen Free

E: Halogen-free, Lead-free
Z: Halogen, Lead-free

None

Performance

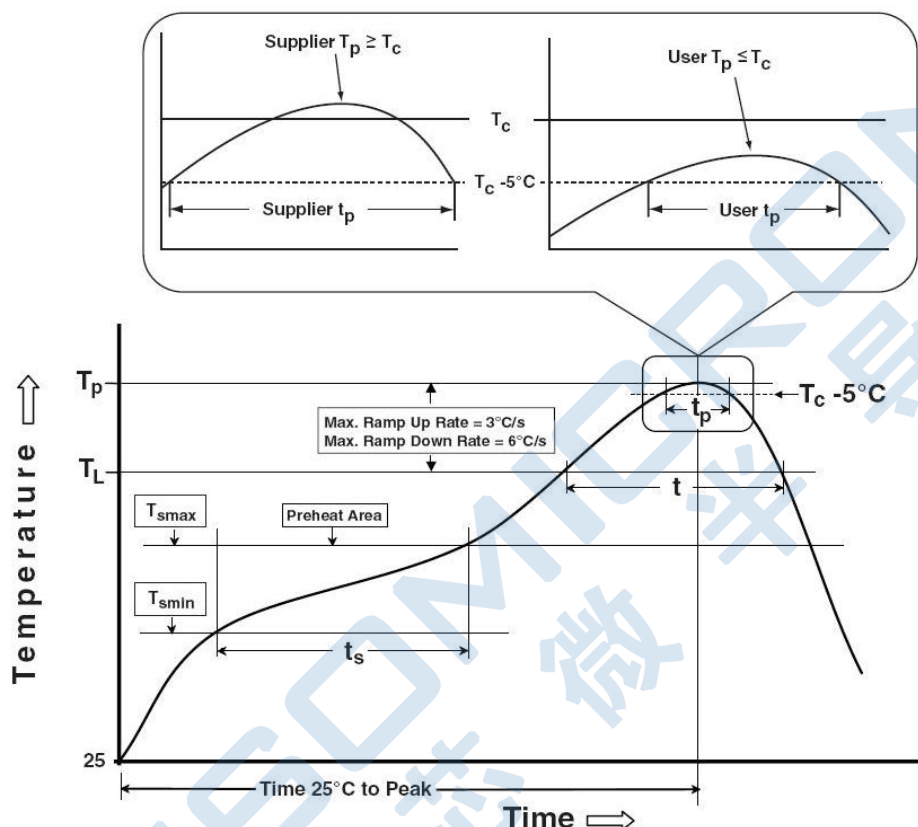
0: Normal
1: Enhanced
2: Industrial level
3: Auto level
4: Military level

Packing Quantity

Option	Quantity	Quantity – Inner box	Quantity – Outer box
SM-SL	3000 Units/Reel	2 Reels/Inner box	5 Inner box/Outer box = 30k Units

REFLOW INFORMATION

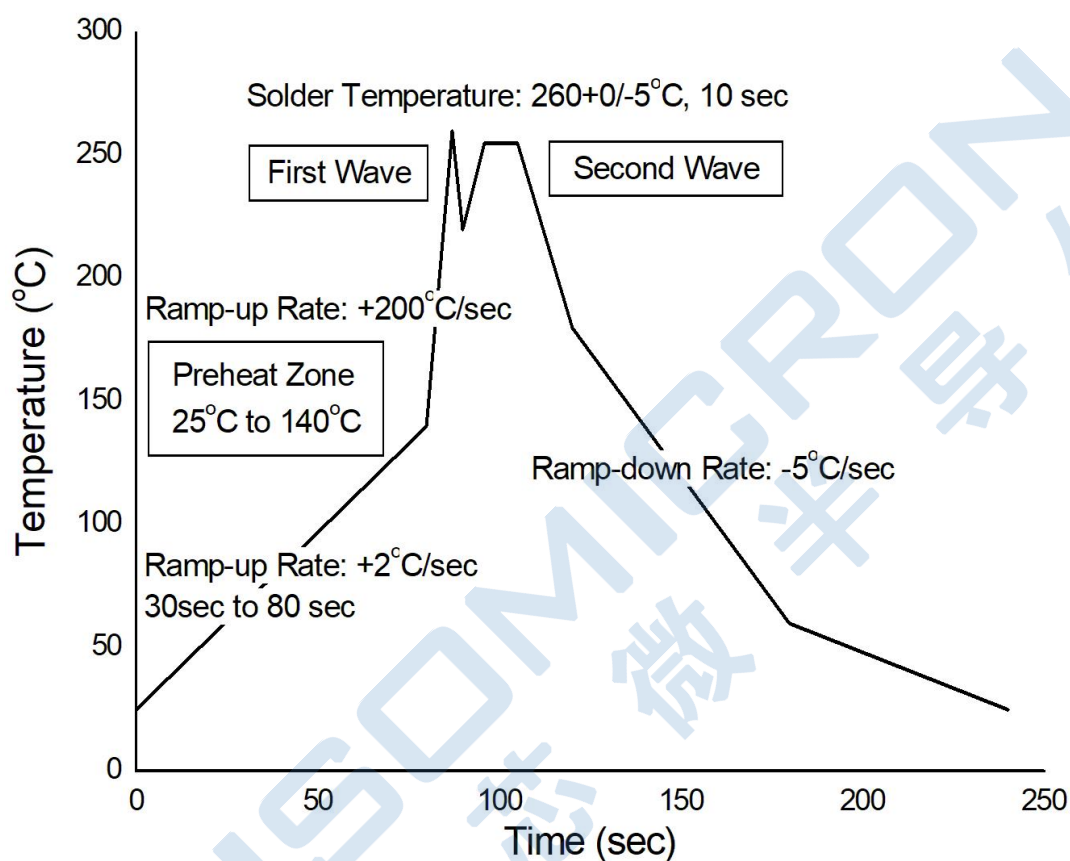
Reflow Profile



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.

TEMPERATURE PROFILE OF SOLDERING

Wave Soldering (JESD22-A111 Compliant)



Hand Soldering By Soldering Iron

Soldering Temperature	380+0/-5°C
Soldering Time	3 sec max.

- One time soldering is recommended for all soldering method.
- Do not solder more than three times for IR reflow soldering.

DISCLAIMER

- ISOMICRON is continually improving the quality, reliability, function and design. ISOMICRON reserves the right to make changes without further notices.
- The characteristic curves shown in this datasheet are representing typical performance which are not guaranteed.
- ISOMICRON makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, ISOMICRON disclaims (a) any and all liability arising out of the application or use of any product, (b) any and all liability, including without limitation special, consequential or incidental damages, and (c) any and all implied warranties, including warranties of fitness for particular
- The products shown in this publication are designed for the general use in electronic applications such as office automation, equipment, communications devices, audio/visual equipment, electrical application and instrumentation purpose, non-infringement and merchantability.
- This product is not intended to be used for military, aircraft, automotive, medical, life sustaining or lifesaving applications or any other application which can result in human injury or death.
- Please contact ISOMICRON sales agent for special application request.
- Immerge unit's body in solder paste is not recommended.
- Parameters provided in datasheets may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated in each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify ISOMICRON's terms and conditions of purchase, including but not limited to the warranty expressed therein.
- Discoloration might be occurred on the package surface after soldering, reflow or long-time use. It neither impacts the performance nor reliability.