ICPL0611

DESCRIPTION

The ICPL0611 consists of an AlGaAs infrared emitting diode optically coupled to a high speed integrated photo detector with a strobable open collector Schottky clamped transistor output.

This device belongs to isocom Compact Range of Optocouplers.

FEATURES

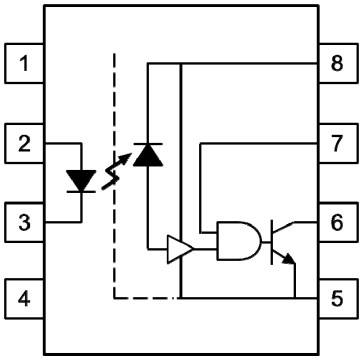
- Half Pitch 1.27mm
- High Speed 10Mbit/s typical
- Operating Voltage 3.3V / 5V
- LVTTL / LVCMOS Compatible
- Strobable Output
- Common Mode Transient Immunity 10kV/µs min at V_{CM} 1000V
- Guaranteed performance over - 40°C to +105°C
- High AC Isolation voltage 3750V_{RMS}
- Lead Free and RoHS Compliant
- Safety Approvals Pending

APPLICATIONS

- Line Receivers, Data Communication
- Data Multiplexing
- Pulse Transformer Replacement
- Switch Mode Power Supplies
- Ground Loop Elimination
- Computer Peripheral Interface

ORDER INFORMATION

- Available in Tape and Reel with 2000 pieces per reel



1	NC
2	Anode
3	Cathode
4	NC
5	GND
6	V_O
7	V_E
8	V_{CC}

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

Stresses exceeding the absolute maximum ratings can cause permanent damage to the device.
Exposure to absolute maximum ratings for long periods of time can adversely affect reliability.

Input

Average Current	20mA
Peak Forward Current (50ns max)	50mA
Reverse Voltage	5V
Enable Input Voltage	V_{CC}+0.5V
Enable Input Current	5mA
Power Dissipation	40mW

Output

Collector Current	50mA
Collector Voltage	7V
Supply Voltage	7V
Power Dissipation	85mW

Total Package

Isolation Voltage	3750V_{RMS}
Operating Temperature	-40 to 105 °C
Storage Temperature	-55 to 125 °C
Lead Soldering Temperature (10s)	260°C

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Truth Table

Input LED	Enable	Output
ON	H	L
OFF	H	H
ON	L	H
OFF	L	H
ON	NC	L
OFF	NC	H

Recommended Operating Conditions

Parameter	Symbol	Min	Max	Unit
Operating Temperature	T_A	- 40	105	°C
Supply Voltage	V_{CC}	2.7	3.6	V
		4.5	5.5	
Input Current, High Level	I_{FH}	5	15	mA
Input Current, Low Level	I_{FL}	0	250	µA
Enable Voltage, High Level	V_{EH}	2	V_{CC}	V
Enable Voltage, Low Level	V_{EL}	0	0.8	V
Output Pull-up Resistance	R_L	330	4k	Ω
Fan Out (R_L = 1kΩ)	N	–	5	TTL Loads

ELECTRICAL CHARACTERISTICS

$2.7V \le V_{CC} \le 3.6V$, $I_F = 7.5mA$, $T_A = -40°C$ to $105°C$ unless otherwise specified specified.
Typical Values at $T_A = 25°C$, $V_{CC} = 3.3V$.

INPUT

Parameter	Symbol	Test Condition	Min	Typ.	Max	Unit
Forward Voltage	V_F	I_F = 10mA		1.38	1.70	V
Forward Voltage Temperature Coefficient	$\Delta V_F/\Delta T$	I_F = 10mA		−1.5		mV/°C
Reverse Voltage	V_R	I_R = 10µA	5.0			V
Threshold Current	I_{TH}	V_{CC} = 3.3V, V_E = 2V, V_O = 0.6V, I_{OL} (sinking) = 13mA		2	5	mA
Input Capacitance	C_{IN}	V_F = 0V, f = 1MHz		34		pF

OUTPUT

Parameter	Symbol	Test Condition	Min	Typ.	Max	Unit
High Level Supply Current	I_{CCH}	I_F = 0mA, V_{CC} = 3.3V, V_E = 0.5V		3.3	5	mA
Low Level Supply Current	I_{CCL}	I_F = 10mA, V_{CC} = 3.3V, V_E = 0.5V		3.1	5	mA
High Level Enable Current	I_{EH}	V_{CC} = 3.3V, V_E = 2V		-0.19	-1.6	mA
Low Level Enable Current	I_{EL}	V_{CC} = 3.3V, V_E = 0.5V		-0.41	-1.6	mA
High Level Enable Voltage	V_{EH}		2			V
Low Level Enable Voltage	V_{EL}				0.8	V
High Level Output Current	I_{OH}	I_F = 250µA, V_{CC} = 3.3V, V_E = 2V, V_O = 3.3V		1	10	µA
Low Level Output Voltage	V_{OL}	I_F = 5mA, V_{CC} = 3.3V, V_E =2V I_{OL} (sinking) = 13mA		0.2	0.6	V

ELECTRICAL CHARACTERISTICS

2.7V ≤ V_{CC} ≤ 3.6V, I_F = 7.5mA, T_A = -40°C to 105°C unless otherwise specified specified.
Typical Values at T_A = 25°C, V_{CC} = 3.3V.

SWITCHING

Parameter	Symbol	Test Condition	Min	Typ.	Max	Unit
Propagation Delay Time to High Output Level	t_{PLH}	R_L = 350Ω, C_L = 15pF	25	50	90	ns
Propagation Delay Time to Low Output Level	t_{PHL}		25	40	90	
Pulse Width Distortion	$\|t_{PHL} - t_{PLH}\|$			10		
Propagation Delay Skew	t_{PSK}				40	
Output Rise Time (10% to 90%)	t_r			23		
Output Fall Time (90% to 10%)	t_f			10		
Propagation Delay Time Enable V_{EH} to V_{EL}	t_{ELH}	R_L = 350Ω, C_L = 15pF, V_{EH} = 3V, V_{EL} = 0V		15		
Propagation Delay Time Enable V_{EL} to V_{EH}	t_{EHL}	R_L = 350Ω, C_L = 15pF, V_{EH} = 3V, V_{EL} = 0V		15		
Common Mode Transient Immunity at Logic High	CM_H	V_{CC} = 3.3V, I_F = 0mA, R_L = 350Ω, V_{CM} = 1000Vp-p, T_A = 25°C	10	15		kV/µs
Common Mode Transient Immunity at Logic Low	CM_L	V_{CC} = 3.3V, I_F = 10mA, R_L = 350Ω, V_{CM} = 1000Vp-p, T_A = 25°C	10	15		

ELECTRICAL CHARACTERISTICS

4.5V ≤ V_{CC} ≤ 5.5V, I_F = 7.5mA, T_A = -40°C to 105°C unless otherwise specified specified.
Typical Values at T_A = 25°C, V_{CC} = 5.0V.

INPUT

Parameter	Symbol	Test Condition	Min	Typ.	Max	Unit
Forward Voltage	V_F	I_F = 10mA		1.38	1.70	V
Forward Voltage Temperature Coefficient	$\Delta V_F/\Delta T$	I_F = 10mA		−1.5		mV/°C
Reverse Voltage	V_R	I_R = 10µA	5.0			V
Threshold Current	I_{TH}	V_{CC} = 5.5V, V_E = 2V, V_O = 0.6V, I_{OL} (sinking) = 13mA		2	5	mA
Input Capacitance	C_{IN}	V_F = 0V, f = 1MHz		34		pF

OUTPUT

Parameter	Symbol	Test Condition	Min	Typ.	Max	Unit
High Level Supply Current	I_{CCH}	I_F = 0mA, V_{CC} = 5.5V, V_E = 0.5V		3.7	5	mA
Low Level Supply Current	I_{CCL}	I_F = 10mA, V_{CC} = 5.5V, V_E = 0.5V		3.5	5	mA
High Level Enable Current	I_{EH}	V_{CC} = 5.5V, V_E = 2V		-0.6	-1.6	mA
Low Level Enable Current	I_{EL}	V_{CC} = 5.5V, V_E = 0.5V		-0.9	-1.6	mA
High Level Enable Voltage	V_{EH}		2			V
Low Level Enable Voltage	V_{EL}				0.8	V
High Level Output Current	I_{OH}	I_F = 250µA, V_{CC} = 5.5V, V_E = 2V, V_O = 5.5V		1	10	µA
Low Level Output Voltage	V_{OL}	I_F = 5mA, V_{CC} = 5.5V, I_{OL} (sinking) = 13mA		0.2	0.6	V

ELECTRICAL CHARACTERISTICS

4.5V ≤ V_{CC} ≤ 5.5V, I_F = 7.5mA, T_A = -40°C to 105°C unless otherwise specified specified.
Typical Values at T_A = 25°C, V_{CC} = 5.0V.

SWITCHING

Parameter	Symbol	Test Condition	Min	Typ.	Max	Unit
Propagation Delay Time to High Output Level	t_{PLH}	R_L = 350Ω, C_L = 15pF, T_A = 25°C	25	50	90	ns
		R_L = 350Ω, C_L = 15pF			100	
Propagation Delay Time to Low Output Level	t_{PHL}	R_L = 350Ω, C_L = 15pF, T_A = 25°C	25	40	90	
		R_L = 350Ω, C_L = 15pF			100	
Pulse Width Distortion	$\lvert t_{PHL} - t_{PLH} \rvert$	R_L = 350Ω, C_L = 15pF		10		
Propagation Delay Skew	t_{PSK}				40	
Output Rise Time (10% to 90%)	t_r			23		
Output Fall Time (90% to 10%)	t_f			10		
Propagation Delay Time Enable V_{EH} to V_{EL}	t_{ELH}	R_L = 350Ω, C_L = 15pF, V_{EH} = 3V, V_{EL} = 0V		15		
Propagation Delay Time Enable V_{EL} to V_{EH}	t_{EHL}	R_L = 350Ω, C_L = 15pF, V_{EH} = 3V, V_{EL} = 0V		15		
Common Mode Transient Immunity at Logic High	CM_H	V_{CC} = 5V, I_F = 0mA, R_L = 350Ω, V_{CM} = 1000Vp-p, T_A = 25°C	10	15		kV/µs
Common Mode Transient Immunity at Logic Low	CM_L	V_{CC} = 5V, I_F = 10mA, R_L = 350Ω, V_{CM} = 1000Vp-p, T_A = 25°C	10	15		

ELECTRICAL CHARACTERISTICS

T_A = -40°C to 105°C unless otherwise specified specified.
Typical Values at T_A = 25°C.

ISOLATION

Parameter	Symbol	Test Condition	Min	Typ.*	Max	Unit
Isolation Voltage	V_{ISO}	RH ≤ 50%, T_A = 25°C, t = 1 min	3750			V_{RMS}
Leakage Current	I_{I-O}	RH = 45%, T_A = 25°C V_{I-O} = 3kVDC, t = 5s			1.0	µA
Input-Output Resistance	R_{I-O}	V_{I-O} = 500VDC		10^{12}		Ω
Input-Output Capacitance	C_{I-O}	f = 1MHz, T_A = 25°C		1.0		pF

Device is considered a two terminal device : pins 1, 2, 3, 4 shorted together and pins 5, 6, 7, 8 shorted together.

NOTES

- V_{CC} supply must be bypassed by a 0.1µF capacitor or larger with good high frequency characteristic and should be connected as close as possible to the package V_{CC} and GND pins.

- Peak drive circuit may be used to speed up the LED. Peak driving current may go up to 50mA with maximum pulse width 50ns, provided average current does not exceed 20mA.

- t_{PLH} is measured from the 3.75 mA point on the falling edge of the input pulse to the 1.5 V point on the rising edge of the output pulse.

- t_{PHL} is measured from the 3.75 mA point on the rising edge of the input pulse to the 1.5 V point on the falling edge of the output pulse.

- t_{ELH} is measured from the 1.5V point on the falling edge of the Enable input pulse to the 1.5 V point on the rising edge of the output pulse.

- t_{EHL} is measured from the 1.5V point on the rising edge of the Enable input pulse to the 1.5 V point on the falling edge of the output pulse.

- CM_H is the maximum tolerable rate of rise of the common mode voltage to assure that the output will remain in a high logic state (i.e., V_O > 2.0 V).

- CM_L is the maximum tolerable rate of fall of the common mode voltage to assure that the output will remain in a low logic state (i.e., V_O < 0.8 V).

- No external pull up is required for a logic high state on the Enable input. If V_E pin is not used, tying V_E to V_{CC} will result in improved CMR performance.

- t_{PSK} is equal to the worst case difference in t_{PHL} and / or t_{PLH} that will be seen between devices at any given temperature and specific test conditions

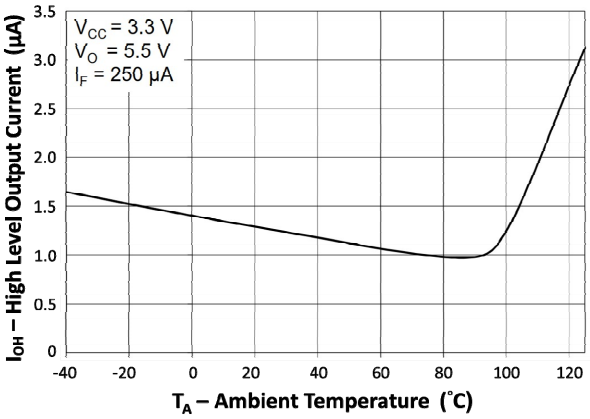


Fig 1 Typical High Level Output Current vs Ambient Temperature at V_{CC} 3.3V

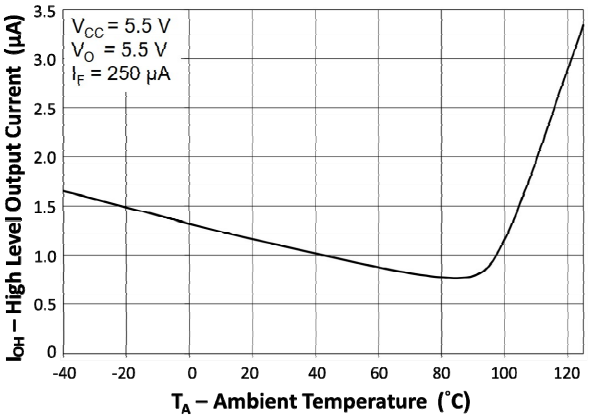


Fig 2 Typical High Level Output Current vs Ambient Temperature at V_{CC} 5.5V

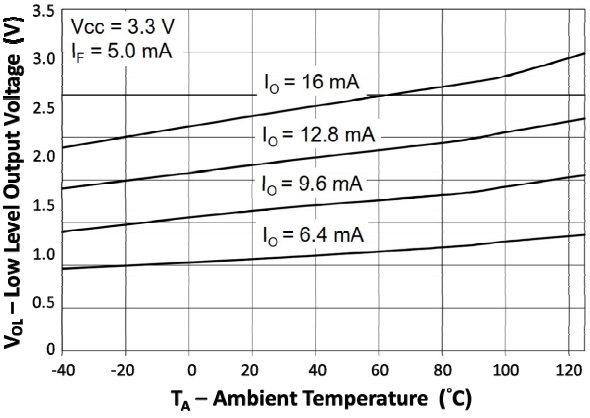


Fig 3 Typical Low Level Output Voltage vs Ambient Temperature at V_{CC} 3.3V

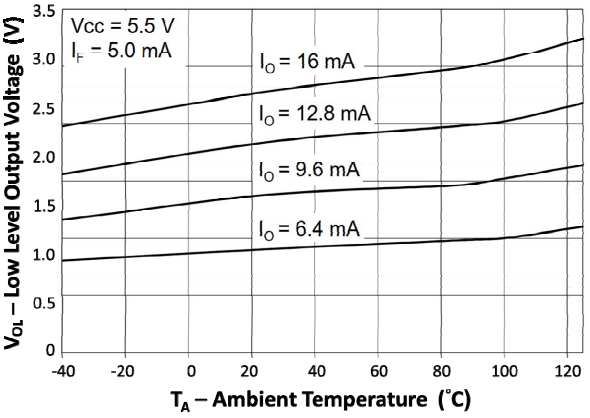


Fig 4 Typical Low Level Output Voltage vs Ambient Temperature at V_{CC} 5.5V

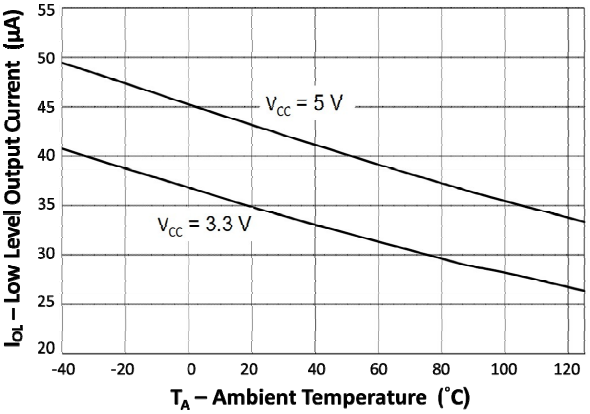


Fig 5 Typical Low Level Output Current vs Ambient Temperature

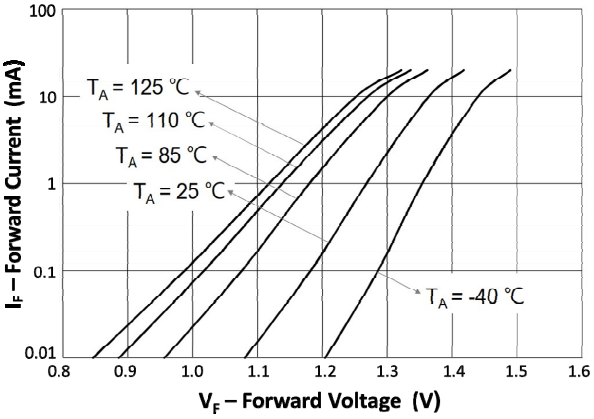


Fig 6 Forward Current vs Forward Voltage

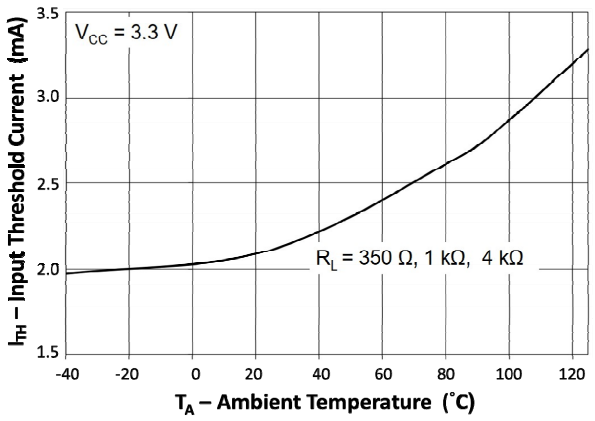


Fig 7 Typical Input Diode Threshold Current vs Ambient Temperature at V_{CC} 3.3V

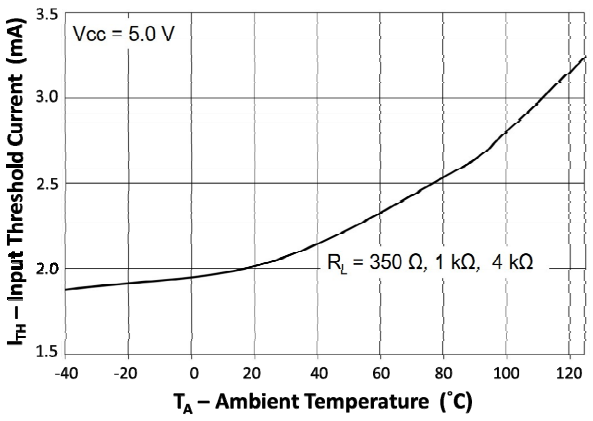


Fig 8 Typical Input Diode Threshold Current vs Ambient Temperature at V_{CC} 5.0V

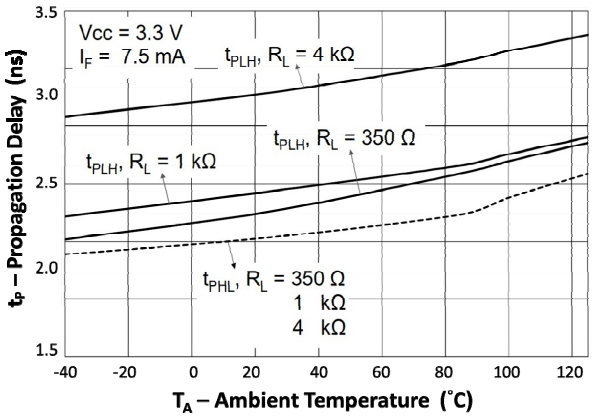


Fig 9 Typical Propagation Delay vs Ambient Temperature at V_{CC} 3.3V

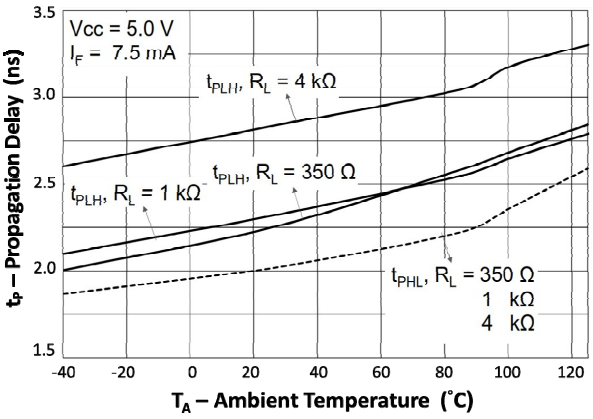


Fig 10 Typical Propagation Delay vs Ambient Temperature at V_{CC} 5.5V

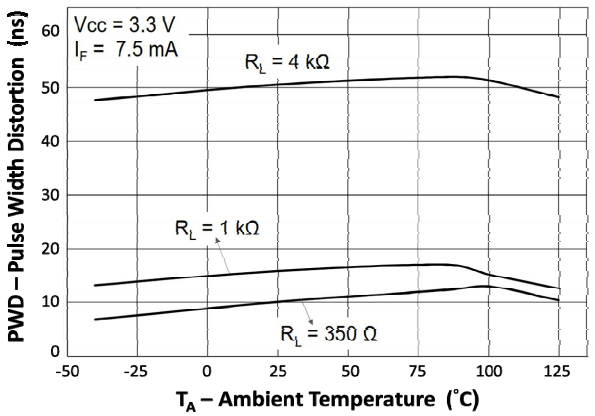


Fig 11 Typical Pulse Width Distortion vs Ambient Temperature at V_{CC} 3.3V

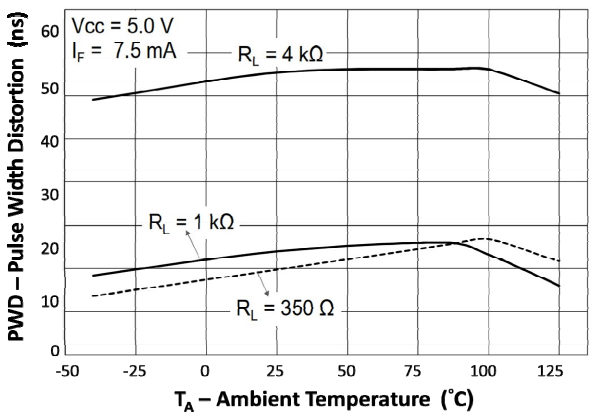
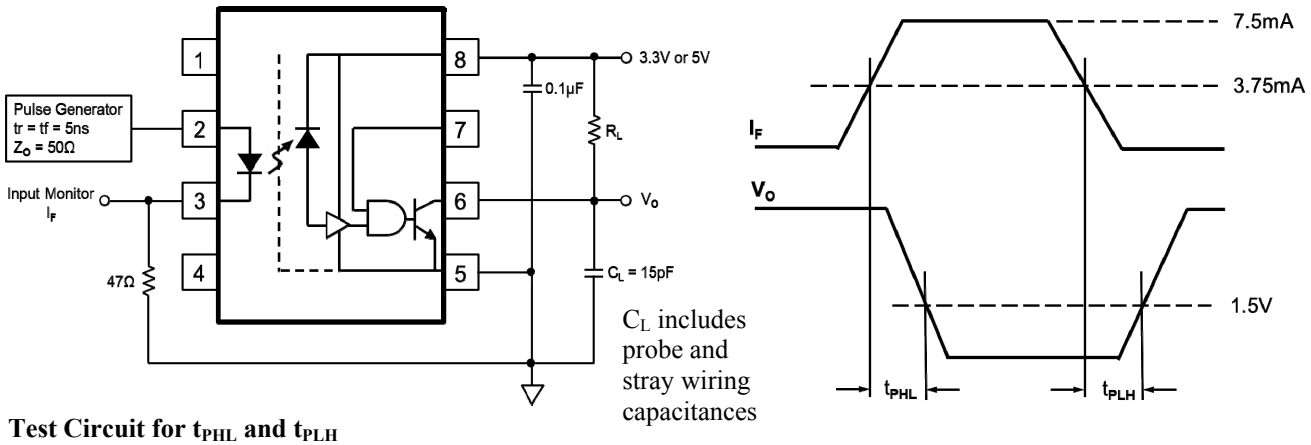
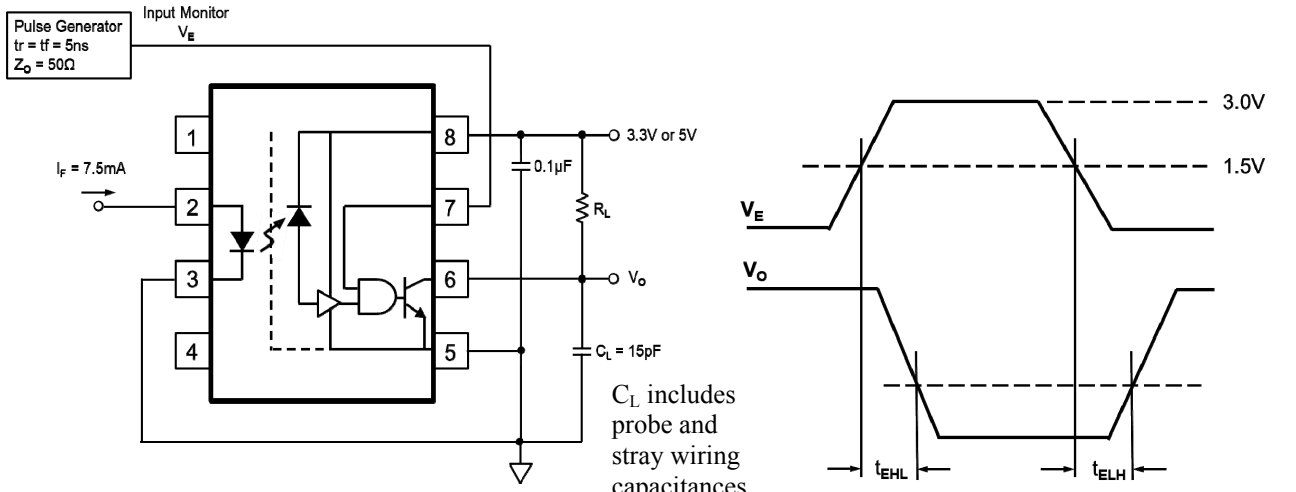


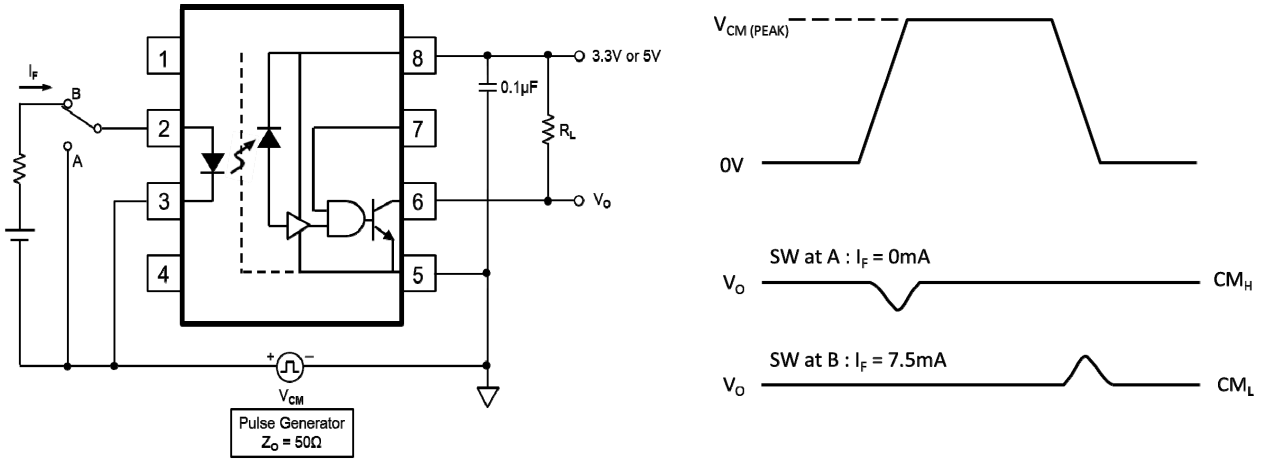
Fig 12 Typical Pulse Width Distortion vs Ambient Temperature at V_{CC} 5.0V



Test Circuit for t_{PHL} and t_{PLH}



Test Circuit for t_{EHL} and t_{ELH}

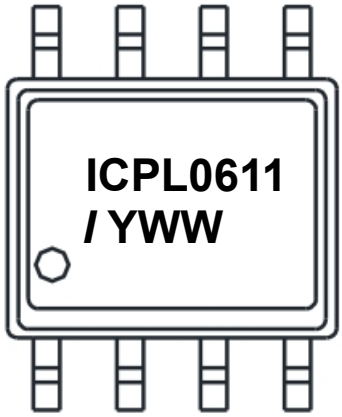


Test Circuit for Common Mode Transient Immunity

ORDER INFORMATION

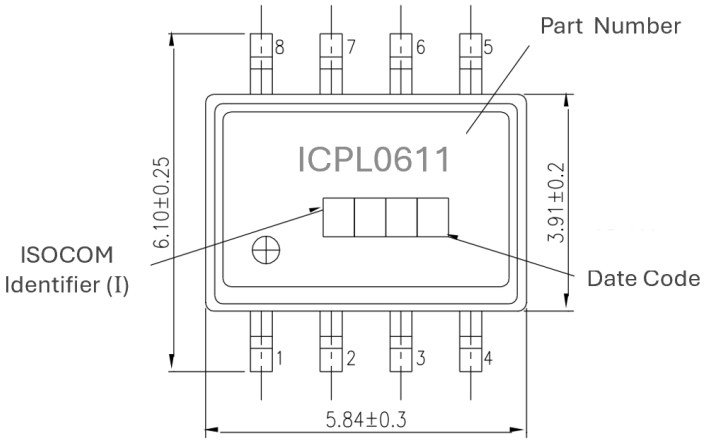
ICPL0611			
After PN	**PN**	**Description**	**Packing quantity**
None	ICPL0611	Surface Mount Tape and Reel	2000 pcs per reel

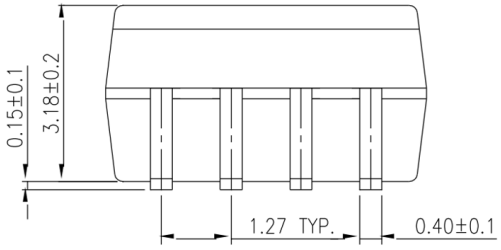
DEVICE MARKING

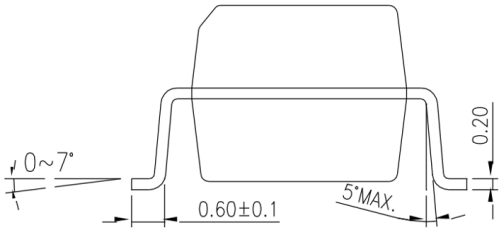


ICPL0611	denotes Device Part Number
/	denotes Isocom
Y	denotes 1 digit Year code (A = 2010, B = 2011, etc.)
WW	denotes 2 digit Week code

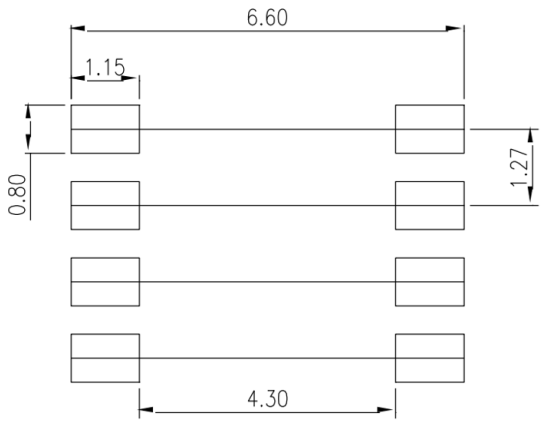
PACKAGE DIMENSIONS in mm



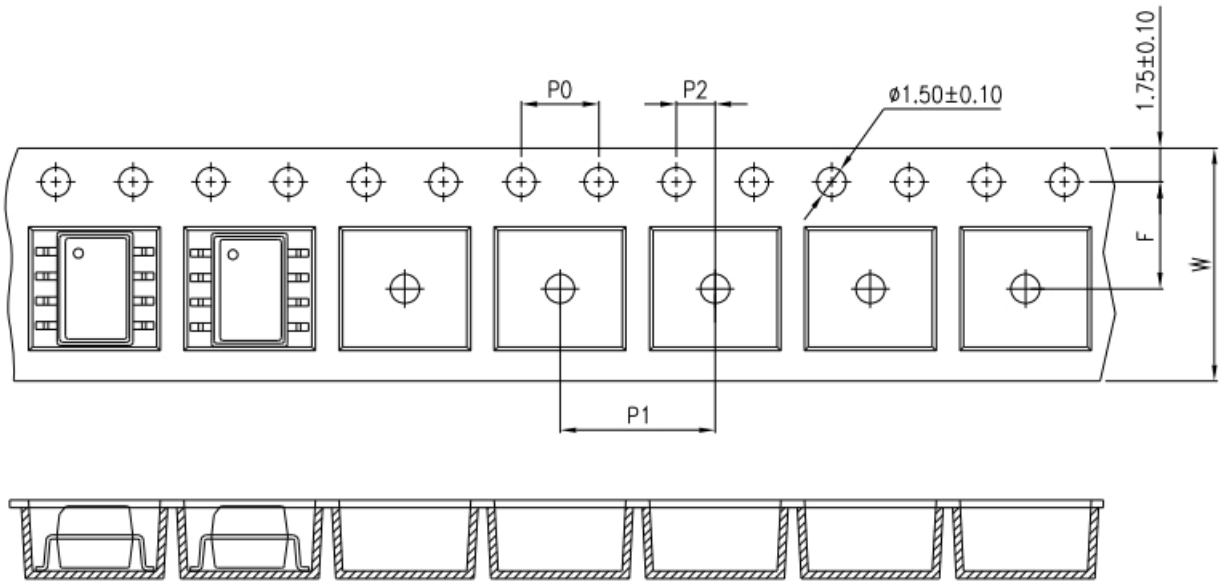




RECOMMENDED PAD LAYPUT FOR SMD (mm)

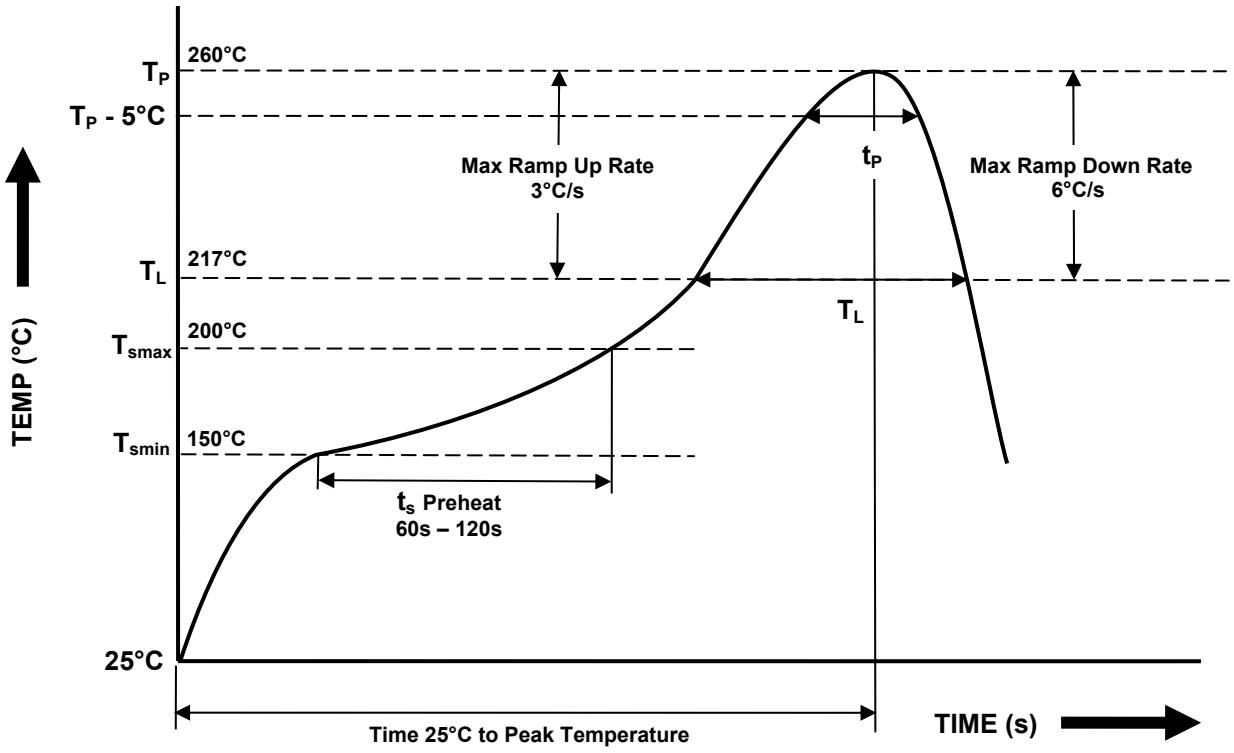


TAPE AND REEL PACKAGING



Description	Symbol	Dimension mm (inch)
Tape Width	W	12 ± 0.3 (0.47)
Pitch of Sprocket Holes	P_0	4 ± 0.1 (0.15)
Distance of Compartment to Sprocket Holes	F	5.5 ± 0.1 (0.217)
	P_2	2 ± 0.1 (0.079)
Distance of Compartment to Compartment	P_1	8 ± 0.1 (0.315)

IR REFLOW SOLDERING TEMPERATURE PROFILE
One Time Reflow Soldering is Recommended.
Do not immerse device body in solder paste.



Profile Details	Conditions
Preheat - Min Temperature (T_{SMIN}) - Max Temperature (T_{SMAX}) - Time T_{SMIN} to T_{SMAX} (t_s)	 150°C 200°C 60s - 120s
Soldering Zone - Peak Temperature (T_P) - Time at Peak Temperature - Liquidous Temperature (T_L) - Time within 5°C of Actual Peak Temperature (T_P – 5°C) - Time maintained above T_L (t_L) - Ramp Up Rate (T_L to T_P) - Ramp Down Rate (T_P to T_L)	 260°C 10s max 217°C 30s max 60s - 100s 3°C/s max 6°C/s max
Average Ramp Up Rate (T_{smax} to T_P)	3°C/s max
Time 25°C to Peak Temperature	8 minutes max

ISOCOM COMPONENTS

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In developing your designs, please ensure that Isocom Components products are used within specified operating ranges as set forth in the most recent Isocom Components products specifications.

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Gallium arsenide (GaAs) is a substance used in the products described in this document. GaAs dust and fumes are toxic. Do not break, cut or pulverize the product, or use chemicals to dissolve them. When disposing of the products, follow the appropriate regulations. Do not dispose of the products with other industrial waste or with domestic garbage.

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