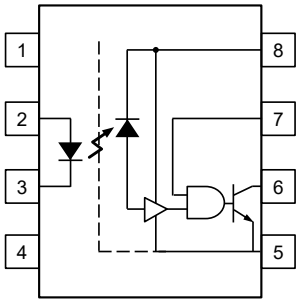
ICPLW137

DESCRIPTION

The ICPLW137 consists of an high efficient AlGaAs light emitting diode optically coupled to a high speed integrated photo detector. Output of the photo detector features an open collector Schottky clamped transistor. The enable function allows the output to be strobable.

An internal shield provides a guaranteed common mode transient immunity up to 10 KV/us at 3.3V/5V operation voltage.

This device belongs to Isocom wide body package range optocouplers.



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

A 0.1µF bypass Capacitor must be connected between Pins 8 and 5.

FEATURES

- High Speed 10Mbit/s
- 3.3V / 5V Dual Operation Voltages
- Wide Body Package
- Guaranteed Performance from −40°C to 105°C
- LVTTL /LVCMOS Compatible
- Strobable Output
- Minimum Common Mode Transient Immunity 10kV/µs at V_{CM} 1000V
- High AC Isolation Voltage 5000V_{RMS}
- Pb Free and RoHS Compliant
- UL Approval E91231

APPLICATIONS

- Line Receivers, Data Communication
- LSTTL to TTL, LSTTL or 5V CMOS
- Data Multiplexing
- Pulse Transformer Replacement
- Switch Mode Power Supplies
- Ground Loop Elimination
- Computer Peripheral Interface

ORDER INFORMATION

- Add SM after PN for Surface Mount
- Add SMT&R after PN for Surface Mount Tape & Reel

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	
Forward Current	20mA
Reverse Voltage	5V
Power dissipation	40mW
Junction Temperature	125°C
Output	
Output Current	50mA
Output Voltage	7.0V
Supply Voltage	7.0V
Enable Input Voltage	V_{CC}+0.5V
Enable Input Current	5mA
Power Dissipation	85mW
Total Package	
Isolation Voltage	5000V_{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 (Positive Logic)

Input	Enable	Output
H	H	L
L	H	H
H	L	H
L	L	H
H	NC	L
L	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}	2.0	V_{CC}	V
Enable Voltage, Low Level	V_{EL}	0	0.8	V
Output Pull-up Resistor	R_L	330	4k	Ω
Fan Out (R_L = 1kΩ)	N	—	5	TTL Loads

ELECTRICAL CHARACTERISTICS (T_A = −40 to 105°C, 2.7V ≤ V_{CC} ≤ 3.6V, I_F = 7.5mA unless otherwise specified)

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
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 = 2.0V		−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}		2.0			V
Low Level Enable Voltage	V_{EL}				0.8	V

COUPLED

Parameter	Symbol	Test Condition	Min	Typ.*	Max	Unit
High Level Output Current	I_{OH}	I_F = 250µA, V_{CC} = 3.3V V_E = 2.0V, V_O = 3.3V		1	10	µA
Low Level Output Voltage	V_{OL}	I_F = 5mA, V_{CC} = 3.3V V_E = 2.0V, I_{OL} = 13mA		0.20	0.60	V
Input Threshold Current	I_{TH}	V_{CC} = 3.3V, V_E = 2.0V V_O = 0.6V, I_{OL} = 13mA		2.5	5	mA

* Typical values at T_A = 25°C, V_{CC} = 3.3V

ELECTRICAL CHARACTERISTICS (T_A = −40 to 105°C, 2.7V ≤ V_{CC} ≤ 3.6V, I_F = 7.5mA unless otherwise specified)

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	$\|t_{PLH} - t_{PHL}\|$			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		
Enable Propagation Delay Time to High Output Level	t_{ELH}	V_{EL} = 0V V_{EH} = 3V R_L = 350Ω C_L = 15pF		15		
Enable Propagation Delay Time to Low Output Level	t_{EHL}			15		

* Typical values at T_A = 25°C, V_{CC} = 3.3V

ELECTRICAL CHARACTERISTICS (T_A = −40 to 105°C, 4.5V ≤ V_{CC} ≤ 5.5V, I_F = 7.5mA unless otherwise specified)

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
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 = 2.0V		−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}		2.0			V
Low Level Enable Voltage	V_{EL}				0.8	V

COUPLED

Parameter	Symbol	Test Condition	Min	Typ.*	Max	Unit
High Level Output Current	I_{OH}	I_F = 250µA, V_{CC} = 5.5V V_E = 2.0V, V_O = 5.5V		1	10	µA
Low Level Output Voltage	V_{OL}	I_F = 5mA, V_{CC} = 5.5V I_{OL} = 13mA		0.20	0.60	V
Input Threshold Current	I_{TH}	V_{CC} = 5.5V V_O = 0.6V, I_{OL} > 13mA		2	5	mA

* Typical values at T_A = 25°C, V_{CC} = 5.0V

ELECTRICAL CHARACTERISTICS (T_A = −40 to 105°C, 4.5V ≤ V_{CC} ≤ 5.5V, I_F = 7.5mA unless otherwise specified)

SWITCHING

Parameter	Symbol	Test Condition	Min	Typ.*	Max	Unit
Propagation Delay Time to High Output Level	t_{PLH}	R_L = 350Ω, C_L = 15pF			100	ns
		R_L = 350Ω, C_L = 15pF T_A = 25°C	25	50	90	
Propagation Delay Time to Low Output Level	t_{PHL}	R_L = 350Ω, C_L = 15pF			100	
		R_L = 350Ω, C_L = 15pF T_A = 25°C	25	40	90	
Pulse Width Distortion	$\|t_{PLH} - t_{PHL}\|$	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		
Enable Propagation Delay Time to High Output Level	t_{ELH}	V_{EL} = 0V V_{EH} = 3V R_L = 350Ω C_L = 15pF		15		
Enable Propagation Delay Time to Low Output Level	t_{EHL}			15		

* Typical values at T_A = 25°C, V_{CC} = 5.0V

ELECTRICAL CHARACTERISTICS (T_A = −40 to 105°C unless otherwise specified)

SWITCHING

Parameter	Symbol	Test Condition	Min	Typ.*	Max	Unit
Common Mode Transient Immunity at Logic High	CM_H	I_F = 0mA, V_{CC} = 3.3V R_L = 350Ω V_{CM} = 1000Vp-p T_A = 25°C	10	15		kV/µs
		I_F = 0mA, V_{CC} = 5.0V R_L = 350Ω V_{CM} = 1000Vp-p T_A = 25°C	10	15		
Common Mode Transient Immunity at Logic Low	CM_L	I_F = 10mA, V_{CC} = 3.3V R_L = 350Ω V_{CM} = 1000Vp-p T_A = 25°C	10	15		V/µs
		I_F = 10mA, V_{CC} = 5.0V R_L = 350Ω V_{CM} = 1000Vp-p T_A = 25°C	10	15		

ISOLATION

Parameter	Symbol	Test Condition	Min	Typ.*	Max	Unit
Isolation Voltage	V_{ISO}	RH ≤ 50%, t = 1min T_A = 25°C	5000			V_{RMS}
Leakage Current	I_{I-O}	V_{I-O} = 3kVDC RH = 45%, t = 5s T_A = 25°C			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 to 4 are shorted together and pins 5 to 8 are shorted together.

* Typical values at T_A = 25°C

ELECTRICAL CHARACTERISTICS

Notes :

- V_{CC} supply must be bypassed by a 0.1µF capacitor or larger.
- Peaking 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 3.75mA level on the HIGH to LOW transition of the input current pulse to the 1.5V level on the LOW to HIGH transition of the output voltage pulse.
- t_{PHL} is measured from the 3.75mA level on the LOW to HIGH transition of the input current pulse to the 1.5 V level on the HIGH to LOW transition of the output voltage pulse.
- t_{ELH} is measured from the 1.5V level on the HIGH to LOW transition of the input Enable voltage pulse to the 1.5V level on the LOW to HIGH transition of the output voltage pulse.
- t_{EHL} is measured from the 1.5V level on the LOW to HIGH transition of the input Enable voltage pulse to the 1.5V level on the HIGH to LOW transition of the output voltage pulse.
- CM_H is the maximum tolerable rate of rise of the Common Mode voltage to ensure the output will remain in the HIGH state (i.e., $V_O > 2.0V$).
- CM_L is the maximum tolerable rate of rise of the Common Mode voltage to ensure the output will remain in the LOW state (i.e., $V_O < 0.8V$).

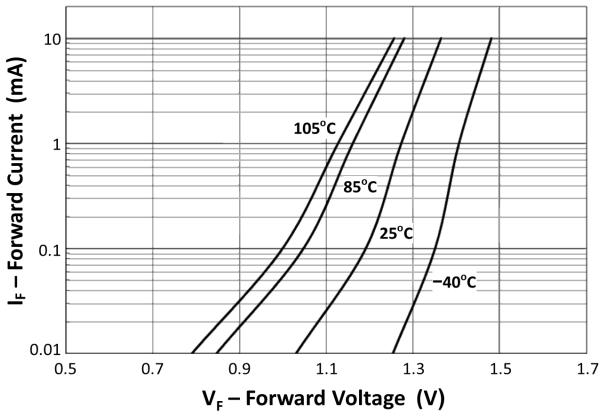


Fig 1 Forward Current vs Forward Voltage

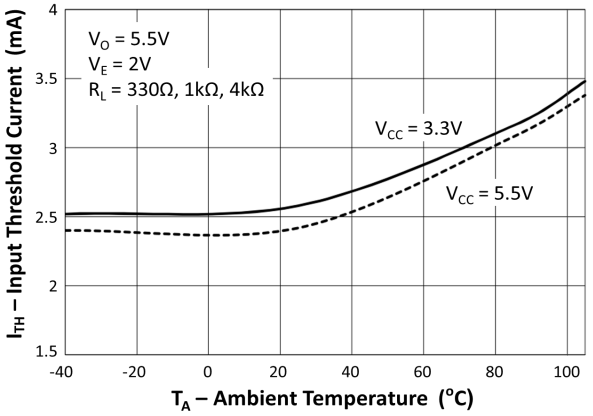


Fig 2 Input Threshold Current vs Ambient Temperature

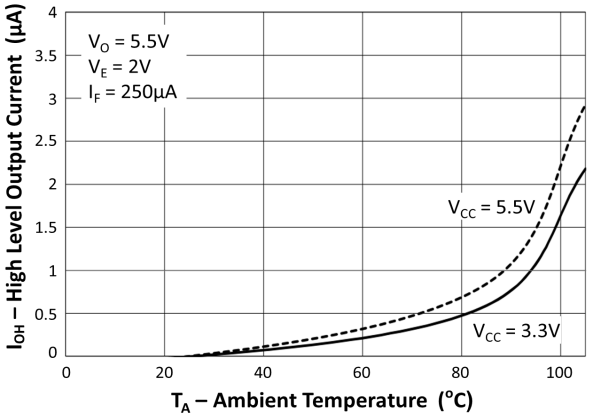


Fig 3 High Level Output Current vs Ambient Temperature

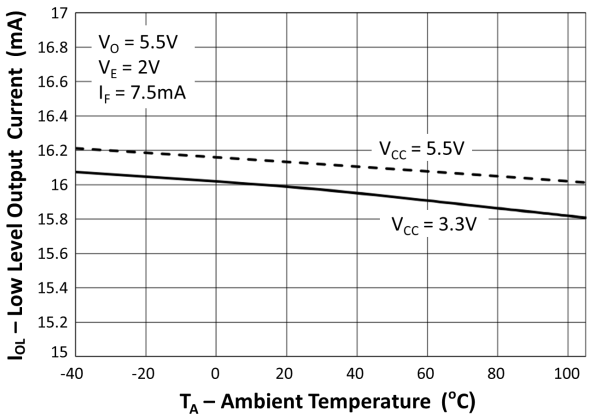


Fig 4 Low Level Output Current vs Ambient Temperature

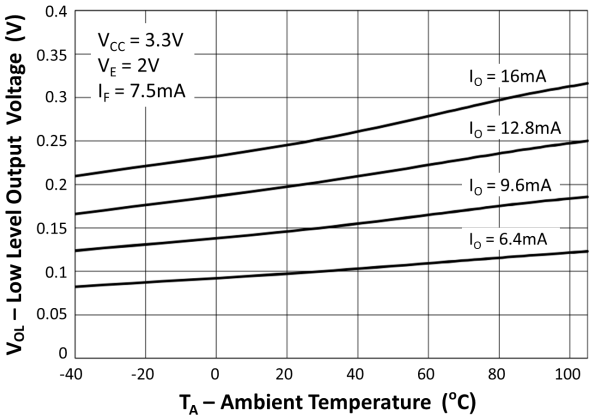


Fig 5 Low Level Output Voltage at V_{CC} 3.3V vs Ambient Temperature

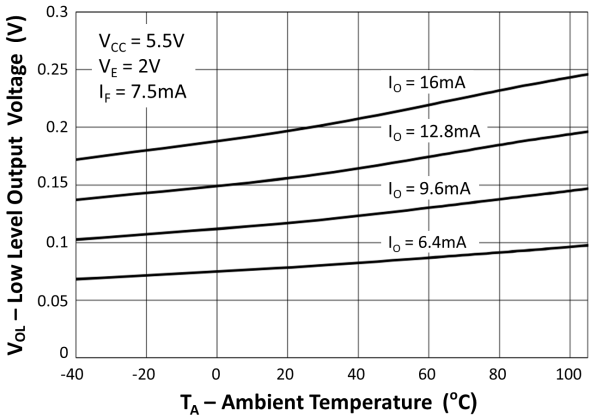


Fig 6 Low Level Output Voltage at V_{CC} 5.5V vs Ambient Temperature

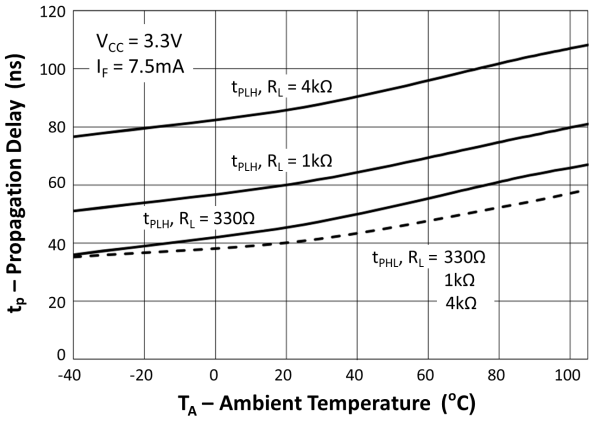


Fig 7 Propagation Delay at V_{CC} 3.3V vs Ambient Temperature

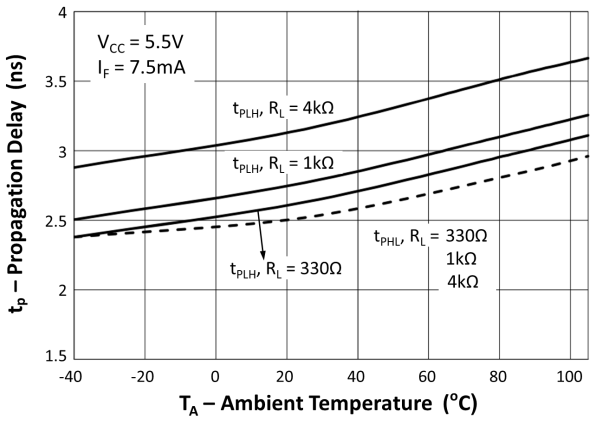


Fig 8 Propagation Delay at V_{CC} 5.5V vs Ambient Temperature

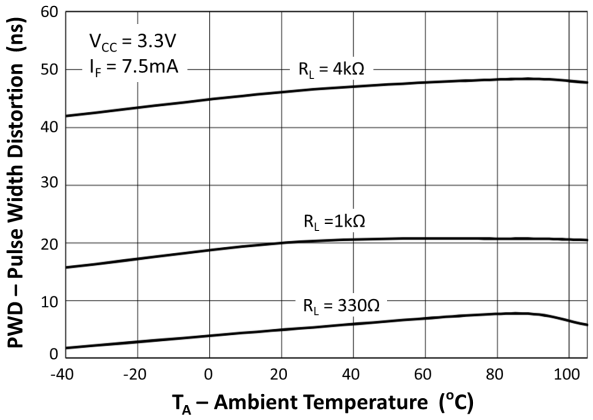


Fig 9 Pulse Width Distortion at V_{CC} 3.3V vs Ambient Temperature

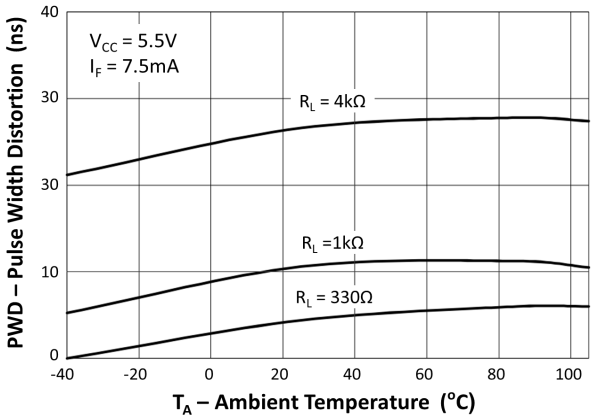
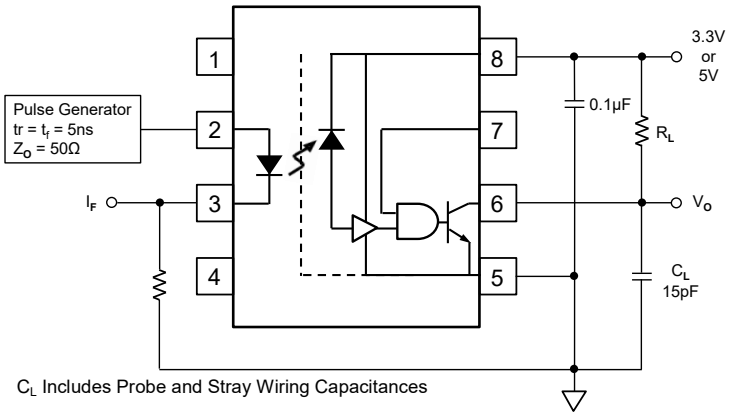
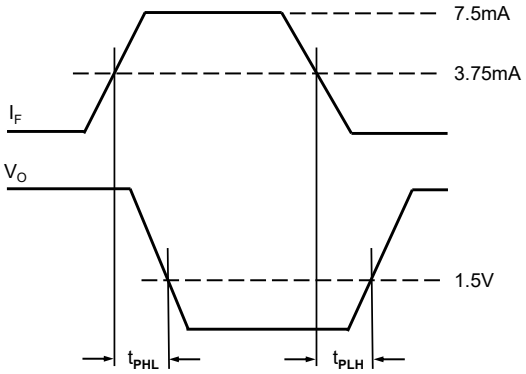
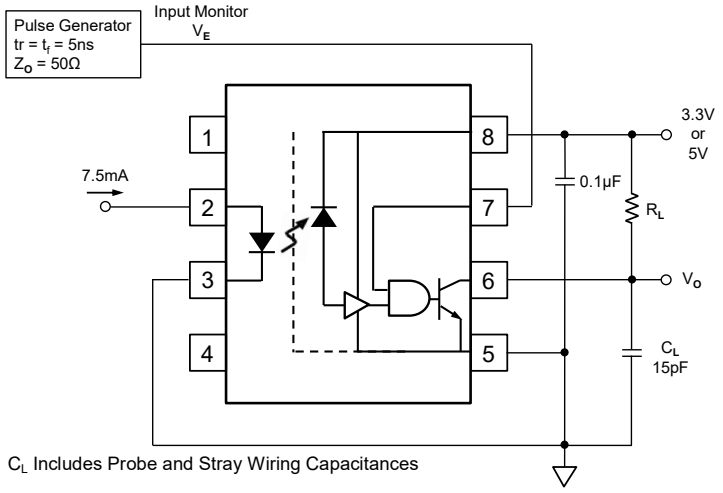


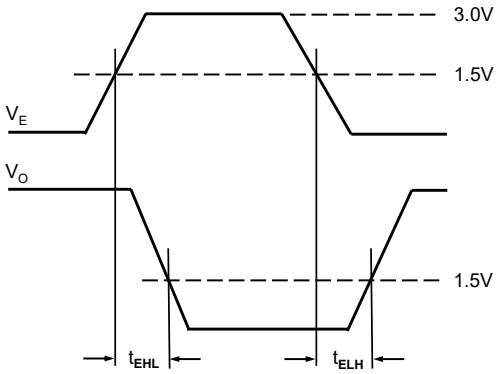
Fig 10 Pulse Width Distortion at V_{CC} 5.5V vs Ambient Temperature



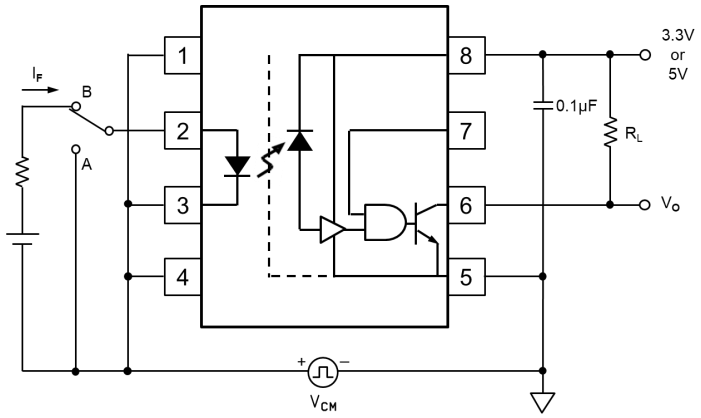


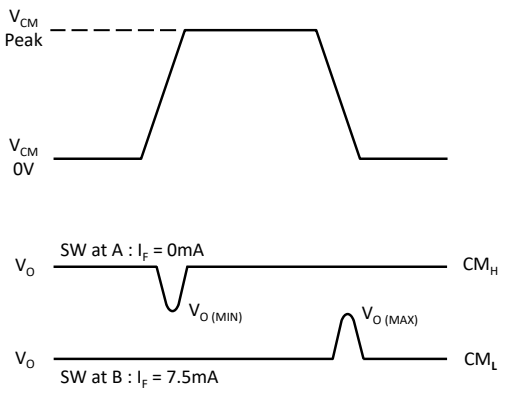
t_{PLH} and t_{PHL} Test Circuit





t_{ELH} and t_{EHL} Test Circuit



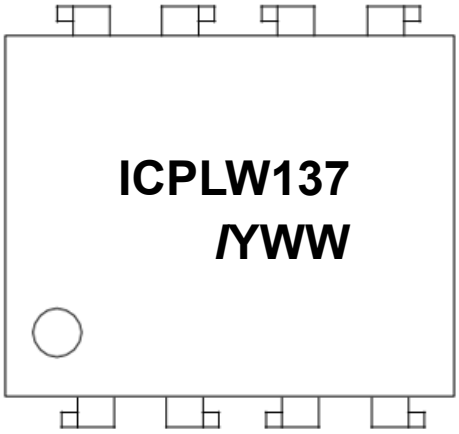


Common Mode Transient Immunity Test Circuit

ORDER INFORMATION

ICPLW137			
After PN	**PN**	**Description**	**Packing quantity**
None	ICPLW137	Wide Body DIP8	40 pcs per tube
SM	ICPLW137SM	Surface Mount	40 pcs per tube
SMT&R	ICPLW137SMT&R	Surface Mount Tape & Reel	750 pcs per reel

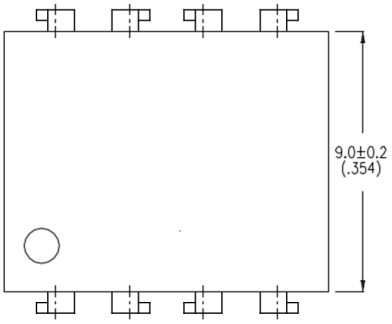
DEVICE MARKING

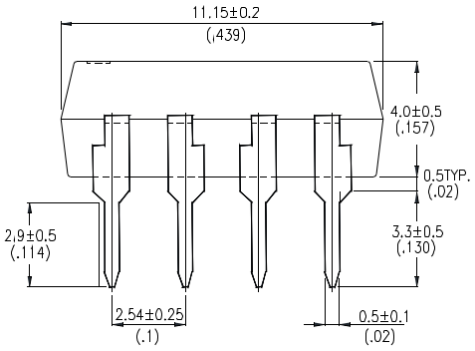


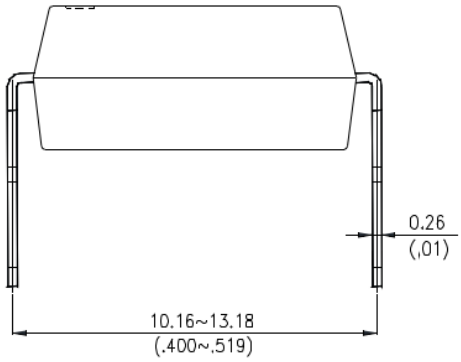
ICPLW137	denotes Device Part Number
I	denotes Isocom
Y	denotes Year code (A = 2010, B = 2011, etc.)
WW	denotes 2 digit Week Code

PACKAGE DIMENSIONS (mm)

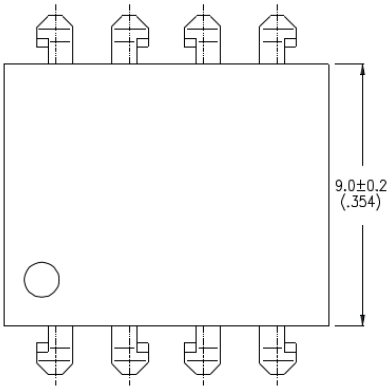
DIP

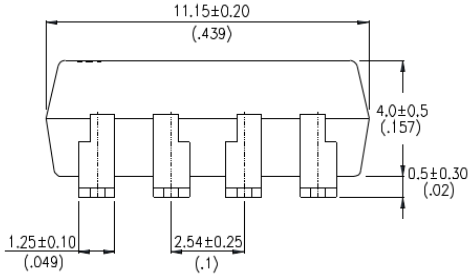


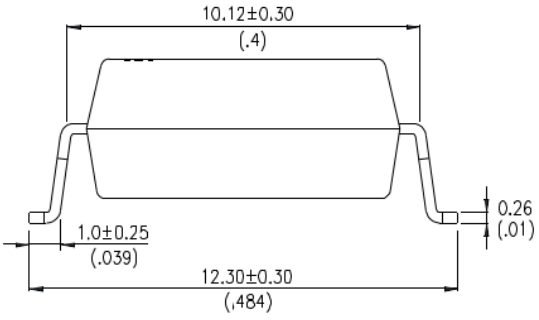




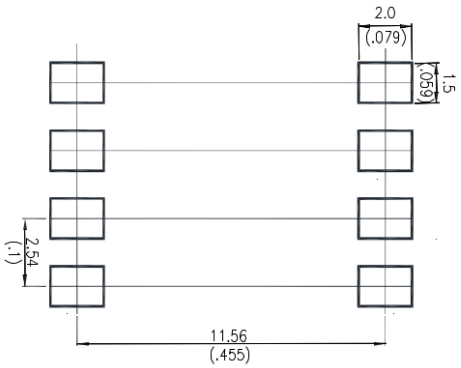
SMD



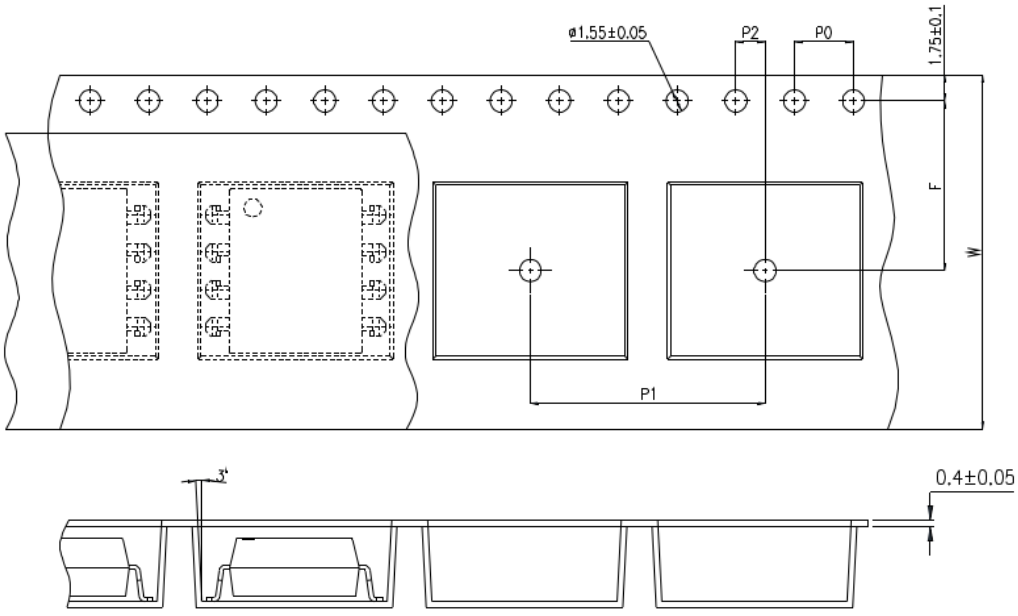




RECOMMENDED PAD LAYOUT FOR SMD (mm)

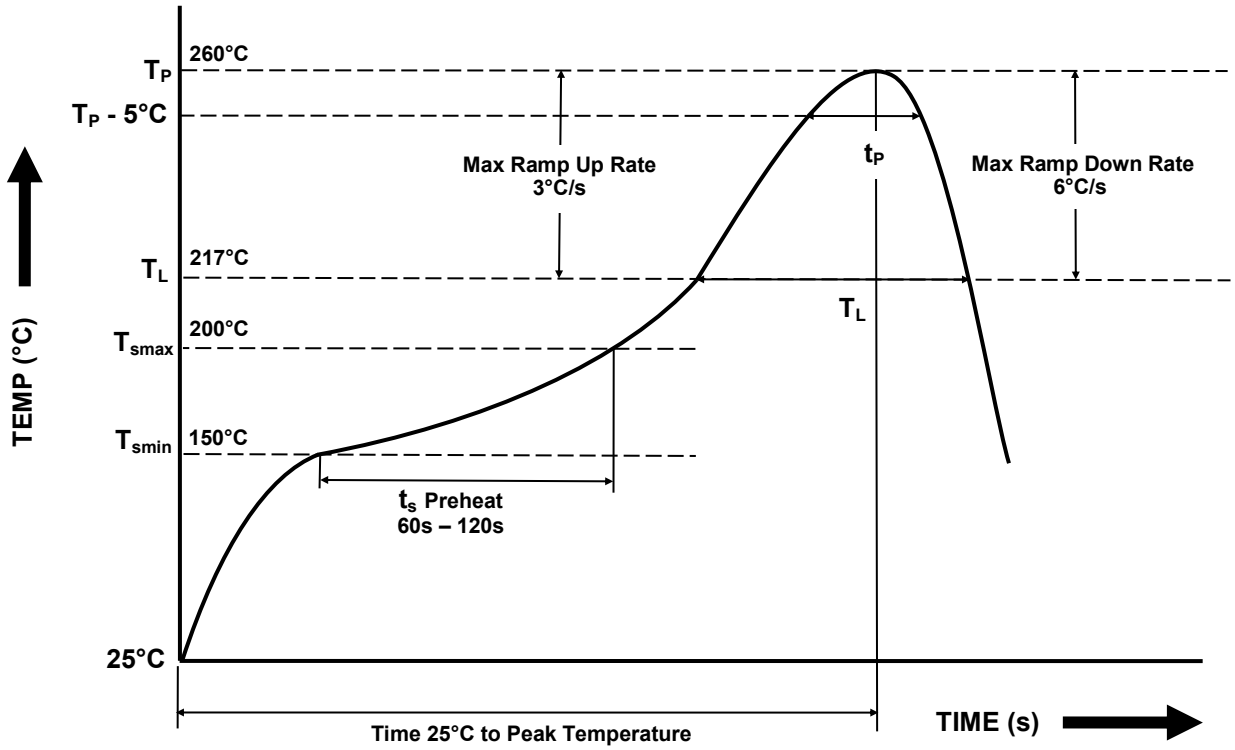


TAPE AND REEL PACKAGING



Description	Symbol	Dimension mm (inch)
Tape Width	W	24 ± 0.3 (0.945)
Pitch of Sprocket Holes	P_0	4 ± 0.1 (0.157)
Distance of Compartment to Sprocket Holes	F	11.5 ± 0.1 (0.453)
	P_2	2 ± 0.1 (0.079)
Distance of Compartment to Compartment	P_1	16 ± 0.1 (0.630)

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

DISCLAIMER

Isocom Components is continually working to improve the quality and reliability of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing Isocom Components products, to comply with the standards of safety in making a safe design for the entire system, and to avoid situations in which a malfunction or failure of such Isocom Components products could cause loss of human life, bodily injury or damage to property.

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.

The products described in this document are subject to the foreign exchange and foreign trade laws.

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