



ICPLW137

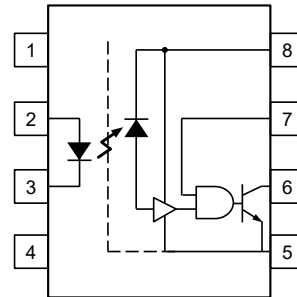


DESCRIPTION

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 0.1 μ F 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
- LVTTTL /LVCMOS Compatible
- Strobable Output
- Minimum Common Mode Transient Immunity 10kV/ μ s 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	μ A
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 ($R_L = 1k\Omega$)	N	—	5	TTL Loads

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ELECTRICAL CHARACTERISTICS ($T_A = -40$ to 105°C , $2.7\text{V} \leq V_{CC} \leq 3.6\text{V}$, $I_F = 7.5\text{mA}$ unless otherwise specified)

INPUT

Parameter	Symbol	Test Condition	Min	Typ.*	Max	Unit
Forward Voltage	V_F	$I_F = 10\text{mA}$		1.38	1.70	V
Forward Voltage Temperature Coefficient	$\Delta V_F/\Delta T$	$I_F = 10\text{mA}$		-1.5		mV/°C
Reverse Voltage	V_R	$I_R = 10\mu\text{A}$	5.0			V
Input Capacitance	C_{IN}	$V_F = 0\text{V}$, $f = 1\text{MHz}$		34		pF

OUTPUT

Parameter	Symbol	Test Condition	Min	Typ.*	Max	Unit
High Level Supply Current	I_{CCH}	$I_F = 0\text{mA}$, $V_{CC} = 3.3\text{V}$ $V_E = 0.5\text{V}$		3.3	5	mA
Low Level Supply Current	I_{CCL}	$I_F = 10\text{mA}$, $V_{CC} = 3.3\text{V}$ $V_E = 0.5\text{V}$		3.1	5	mA
High Level Enable Current	I_{EH}	$V_{CC} = 3.3\text{V}$, $V_E = 2.0\text{V}$		-0.19	-1.6	mA
Low Level Enable Current	I_{EL}	$V_{CC} = 3.3\text{V}$, $V_E = 0.5\text{V}$		-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}	$I_F = 250\mu\text{A}$, $V_{CC} = 3.3\text{V}$ $V_E = 2.0\text{V}$, $V_O = 3.3\text{V}$		1	10	μA
Low Level Output Voltage	V_{OL}	$I_F = 5\text{mA}$, $V_{CC} = 3.3\text{V}$ $V_E = 2.0\text{V}$, $I_{OL} = 13\text{mA}$		0.20	0.60	V
Input Threshold Current	I_{TH}	$V_{CC} = 3.3\text{V}$, $V_E = 2.0\text{V}$ $V_O = 0.6\text{V}$, $I_{OL} = 13\text{mA}$		2.5	5	mA

* Typical values at $T_A = 25^\circ\text{C}$, $V_{CC} = 3.3\text{V}$

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ELECTRICAL CHARACTERISTICS ($T_A = -40$ to 105°C , $2.7\text{V} \leq V_{CC} \leq 3.6\text{V}$, $I_F = 7.5\text{mA}$
unless otherwise specified)

SWITCHING

Parameter	Symbol	Test Condition	Min	Typ.*	Max	Unit
Propagation Delay Time to High Output Level	t_{PLH}	$R_L = 350\Omega$ $C_L = 15\text{pF}$	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}	$V_{EL} = 0\text{V}$ $V_{EH} = 3\text{V}$ $R_L = 350\Omega$ $C_L = 15\text{pF}$		15		
Enable Propagation Delay Time to Low Output Level	t_{EHL}			15		

* Typical values at $T_A = 25^\circ\text{C}$, $V_{CC} = 3.3\text{V}$

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ELECTRICAL CHARACTERISTICS ($T_A = -40$ to 105°C , $4.5\text{V} \leq V_{CC} \leq 5.5\text{V}$, $I_F = 7.5\text{mA}$ unless otherwise specified)

INPUT

Parameter	Symbol	Test Condition	Min	Typ.*	Max	Unit
Forward Voltage	V_F	$I_F = 10\text{mA}$		1.38	1.70	V
Forward Voltage Temperature Coefficient	$\Delta V_F/\Delta T$	$I_F = 10\text{mA}$		-1.5		mV/°C
Reverse Voltage	V_R	$I_R = 10\mu\text{A}$	5.0			V
Input Capacitance	C_{IN}	$V_F = 0\text{V}$, $f = 1\text{MHz}$		34		pF

OUTPUT

Parameter	Symbol	Test Condition	Min	Typ.*	Max	Unit
High Level Supply Current	I_{CCH}	$I_F = 0\text{mA}$, $V_{CC} = 5.5\text{V}$ $V_E = 0.5\text{V}$		3.7	5	mA
Low Level Supply Current	I_{CCL}	$I_F = 10\text{mA}$, $V_{CC} = 5.5\text{V}$ $V_E = 0.5\text{V}$		3.5	5	mA
High Level Enable Current	I_{EH}	$V_{CC} = 5.5\text{V}$, $V_E = 2.0\text{V}$		-0.6	-1.6	mA
Low Level Enable Current	I_{EL}	$V_{CC} = 5.5\text{V}$, $V_E = 0.5\text{V}$		-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}	$I_F = 250\mu\text{A}$, $V_{CC} = 5.5\text{V}$ $V_E = 2.0\text{V}$, $V_O = 5.5\text{V}$		1	10	μA
Low Level Output Voltage	V_{OL}	$I_F = 5\text{mA}$, $V_{CC} = 5.5\text{V}$ $I_{OL} = 13\text{mA}$		0.20	0.60	V
Input Threshold Current	I_{TH}	$V_{CC} = 5.5\text{V}$ $V_O = 0.6\text{V}$, $I_{OL} > 13\text{mA}$		2	5	mA

* Typical values at $T_A = 25^\circ\text{C}$, $V_{CC} = 5.0\text{V}$

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ELECTRICAL CHARACTERISTICS ($T_A = -40$ to 105°C , $4.5\text{V} \leq V_{CC} \leq 5.5\text{V}$, $I_F = 7.5\text{mA}$
unless otherwise specified)

SWITCHING

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

* Typical values at $T_A = 25^\circ\text{C}$, $V_{CC} = 5.0\text{V}$

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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	$I_F = 0\text{mA}$, $V_{CC} = 3.3\text{V}$ $R_L = 350\Omega$ $V_{CM} = 1000\text{Vp-p}$ $T_A = 25^\circ\text{C}$	10	15		kV/ μs
		$I_F = 0\text{mA}$, $V_{CC} = 5.0\text{V}$ $R_L = 350\Omega$ $V_{CM} = 1000\text{Vp-p}$ $T_A = 25^\circ\text{C}$	10	15		
Common Mode Transient Immunity at Logic Low	CM _L	$I_F = 10\text{mA}$, $V_{CC} = 3.3\text{V}$ $R_L = 350\Omega$ $V_{CM} = 1000\text{Vp-p}$ $T_A = 25^\circ\text{C}$	10	15		V/ μs
		$I_F = 10\text{mA}$, $V_{CC} = 5.0\text{V}$ $R_L = 350\Omega$ $V_{CM} = 1000\text{Vp-p}$ $T_A = 25^\circ\text{C}$	10	15		

ISOLATION

Parameter	Symbol	Test Condition	Min	Typ.*	Max	Unit
Isolation Voltage	V _{ISO}	$RH \leq 50\%$, $t = 1\text{min}$ $T_A = 25^\circ\text{C}$	5000			V _{RMS}
Leakage Current	I _{I-O}	$V_{I-O} = 3\text{kVDC}$ $RH = 45\%$, $t = 5\text{s}$ $T_A = 25^\circ\text{C}$			1.0	μA
Input-Output Resistance	R _{I-O}	$V_{I-O} = 500\text{VDC}$		10^{12}		Ω
Input-Output Capacitance	C _{I-O}	$f = 1\text{MHz}$ $T_A = 25^\circ\text{C}$		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 $T_A = 25^\circ\text{C}$



ELECTRICAL CHARACTERISTICS

Notes :

- V_{CC} supply must be bypassed by a $0.1\mu\text{F}$ 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., $V_O > 2.0\text{V}$).
- 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., $V_O < 0.8\text{V}$).

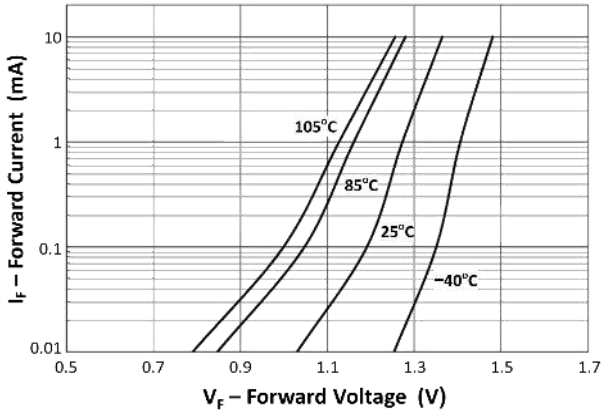


Fig 1 Forward Current vs Forward Voltage

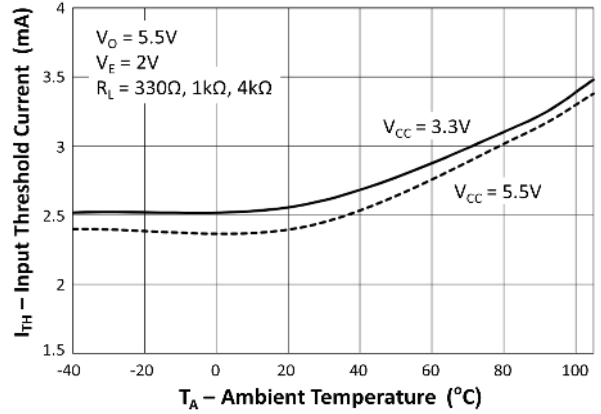


Fig 2 Input Threshold Current vs Ambient Temperature

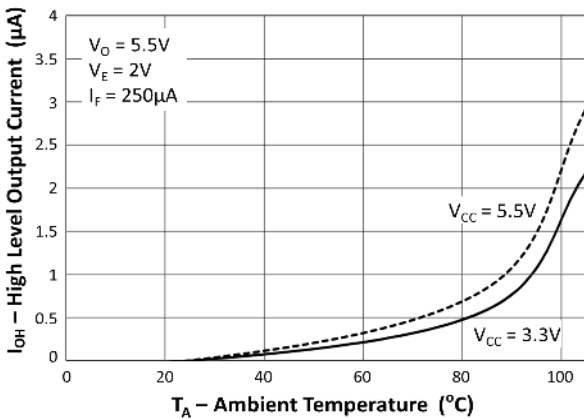


Fig 3 High Level Output Current vs Ambient Temperature

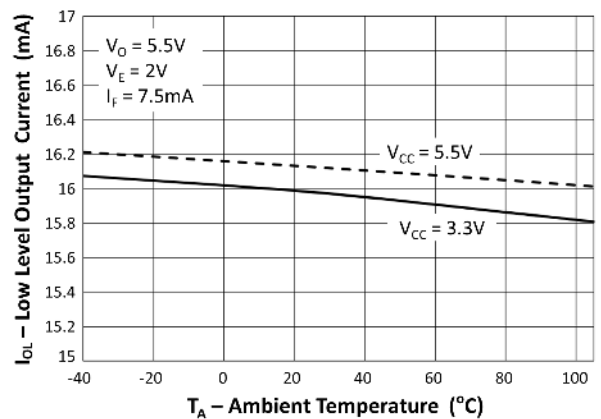


Fig 4 Low Level Output Current vs Ambient Temperature

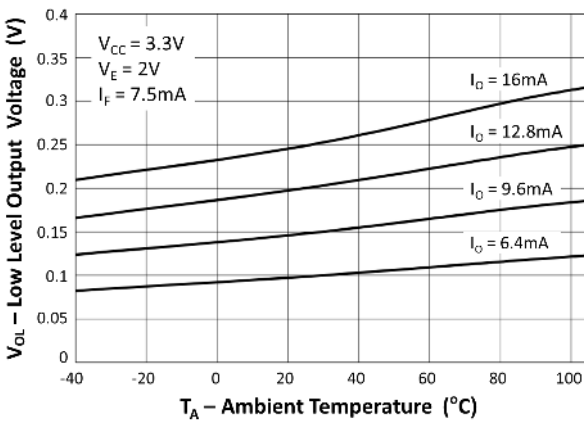


Fig 5 Low Level Output Voltage at VCC 3.3V vs Ambient Temperature

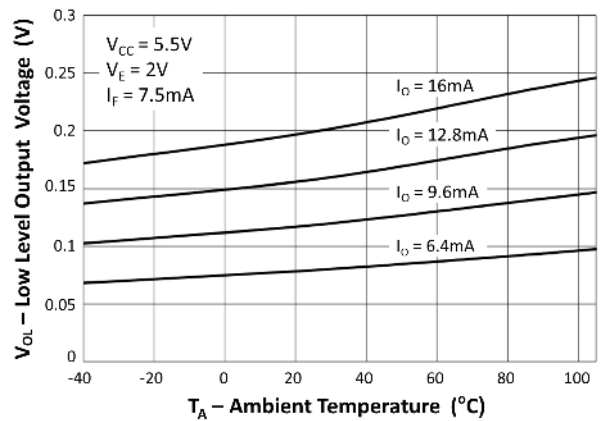


Fig 6 Low Level Output Voltage at VCC 5.5V vs Ambient Temperature

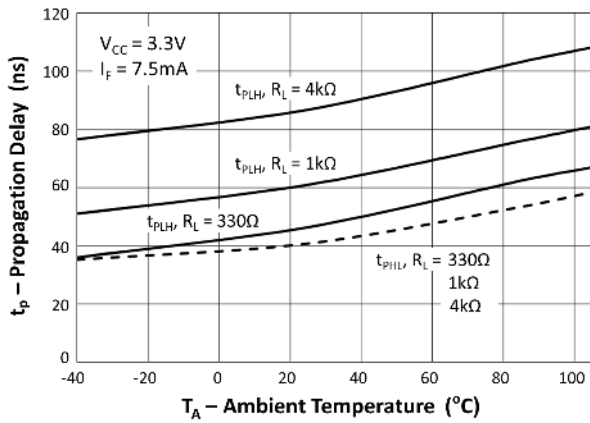


Fig 7 Propagation Delay at V_{CC} 3.3V vs Ambient Temperature

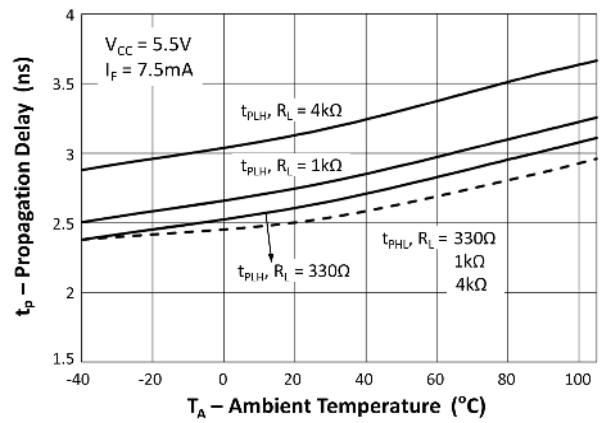


Fig 8 Propagation Delay at V_{CC} 5.5V vs Ambient Temperature

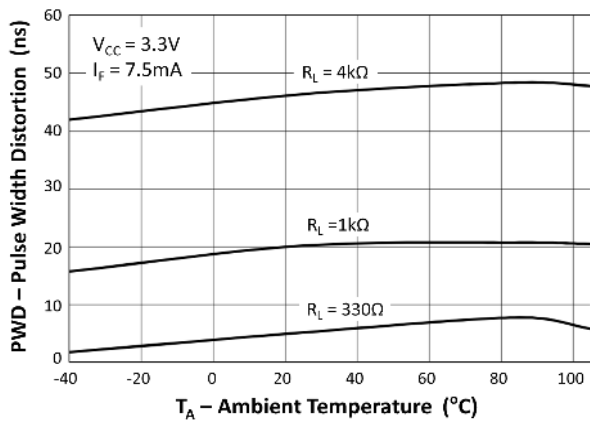


Fig 9 Pulse Width Distortion at V_{CC} 3.3V vs Ambient Temperature

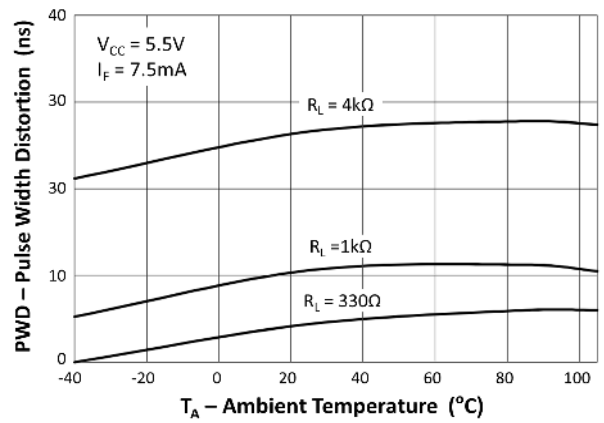
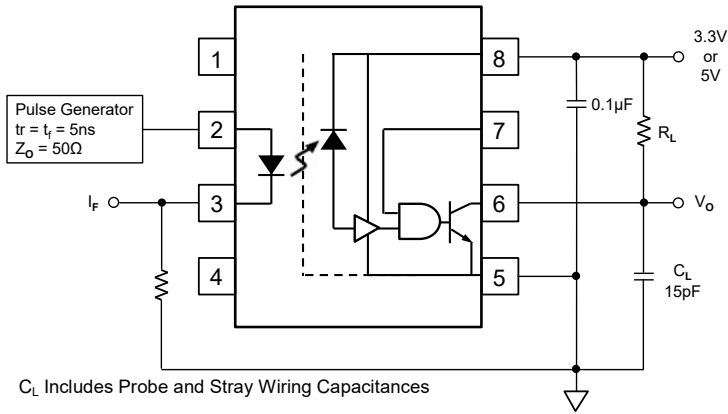
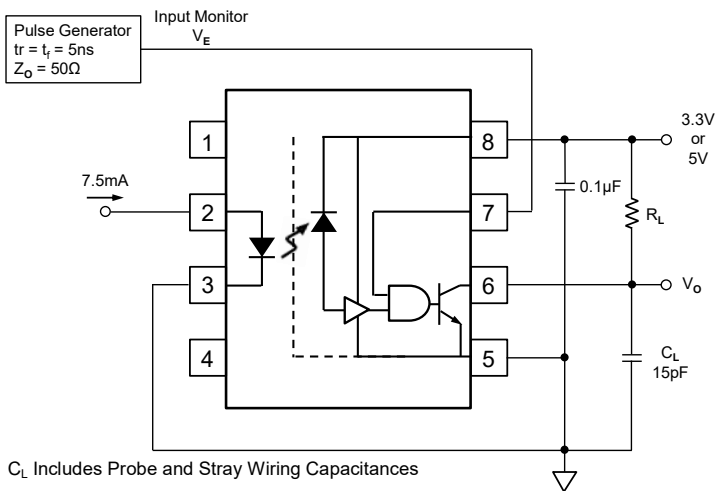
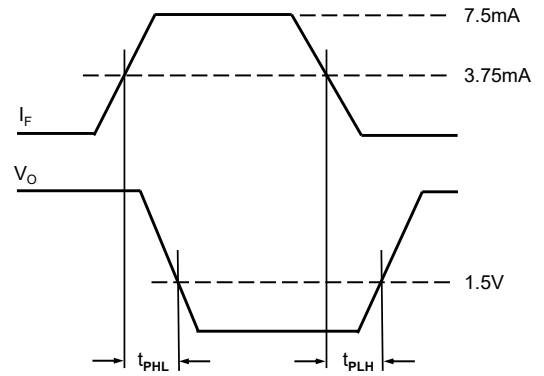


Fig 10 Pulse Width Distortion at V_{CC} 5.5V vs Ambient Temperature

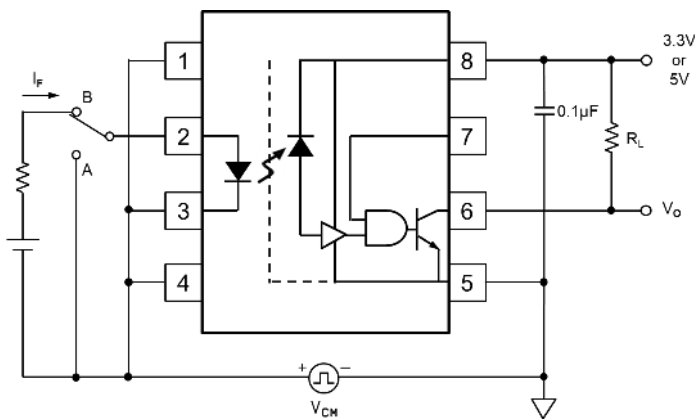
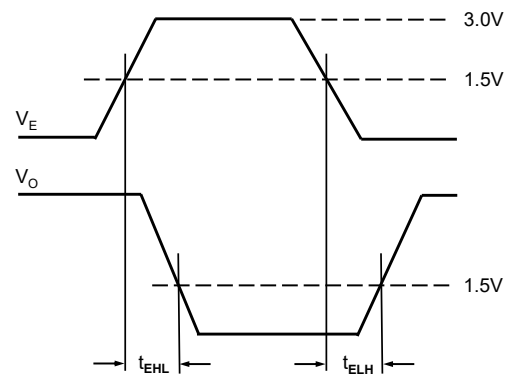
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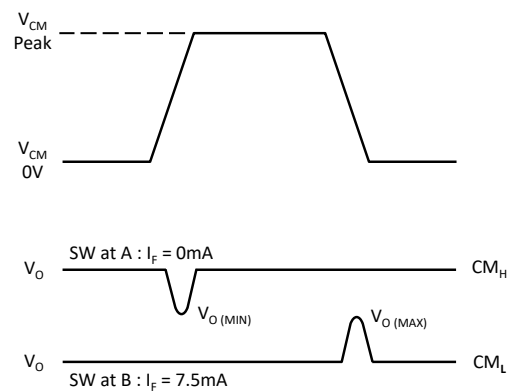
t_{PLH} and t_{PHL} Test Circuit



t_{ELH} and t_{EHL} Test Circuit



Common Mode Transient Immunity Test Circuit

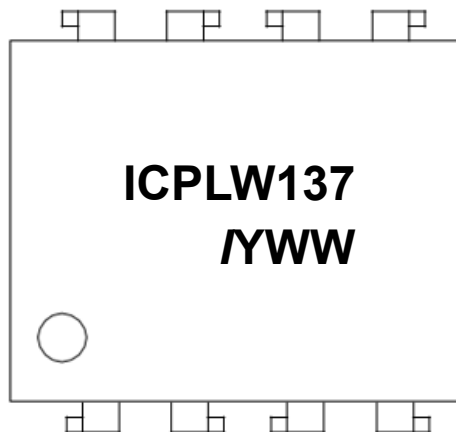


ICPLW137

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

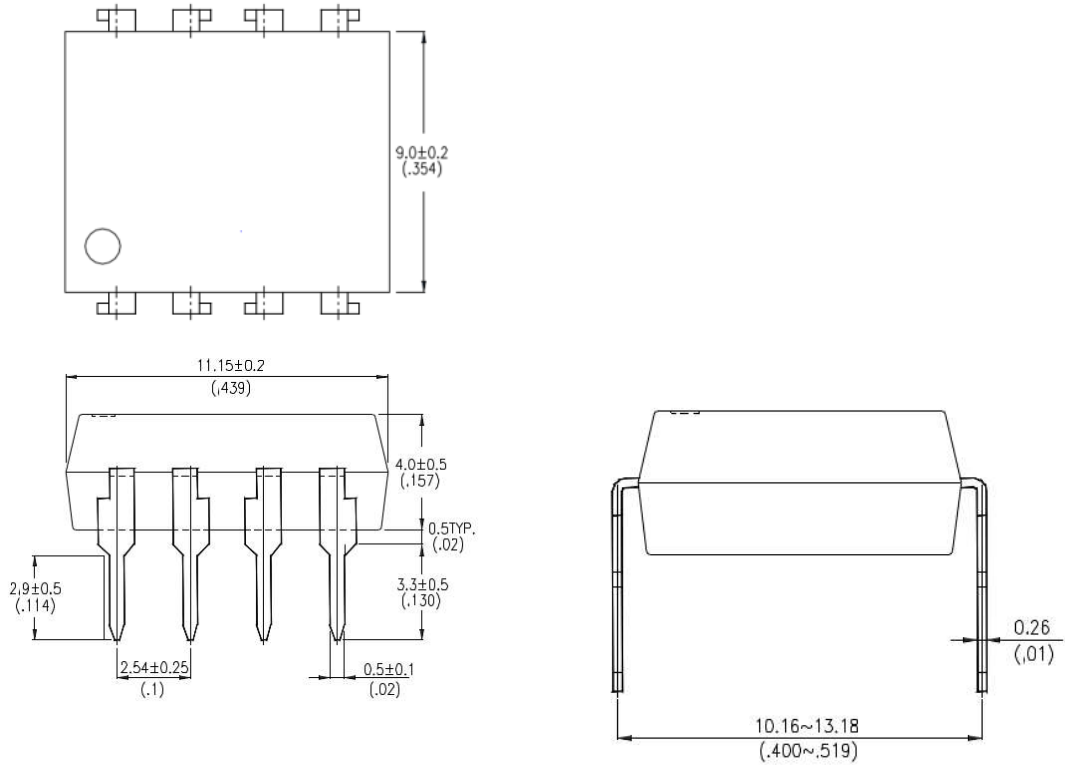


ICPLW137 denotes Device Part Number
 I denotes Isocom
 Y denotes Year code (A = 2010, B = 2011, etc.)
 WW denotes 2 digit Week Code

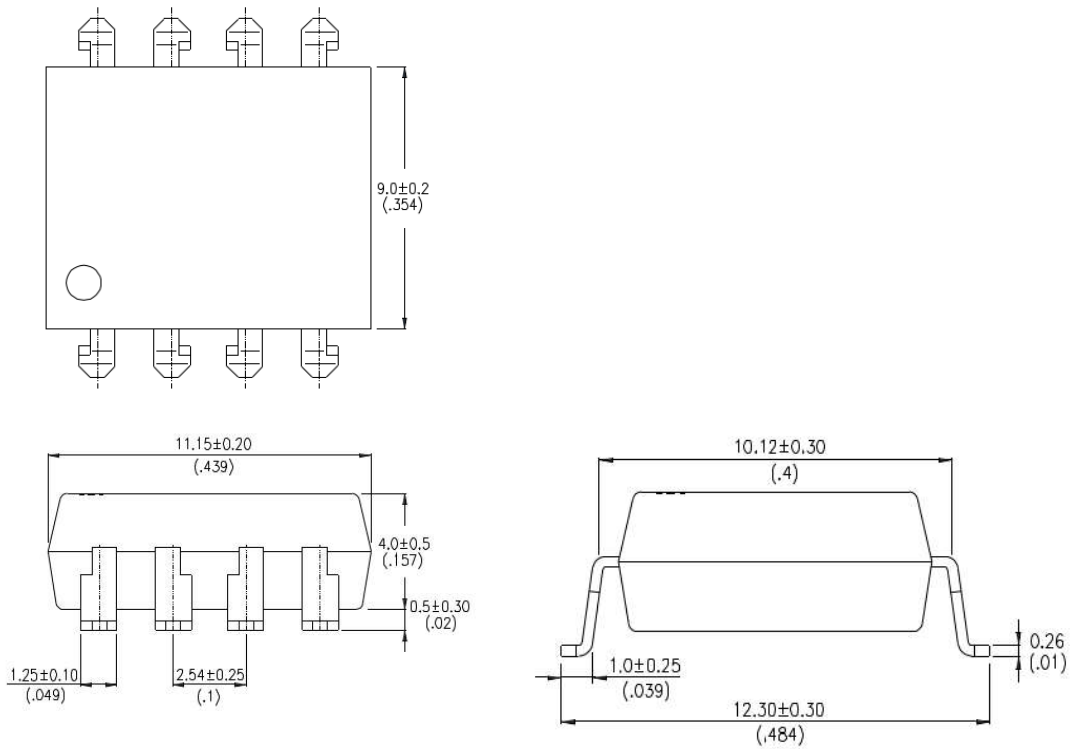
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PACKAGE DIMENSIONS (mm)

DIP

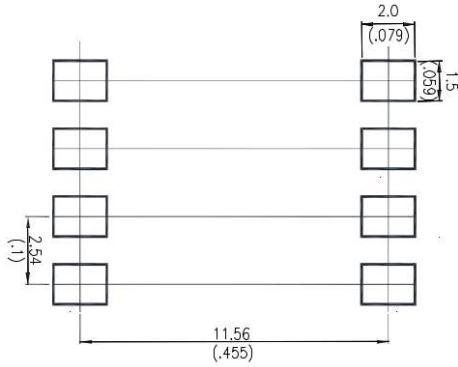


SMD

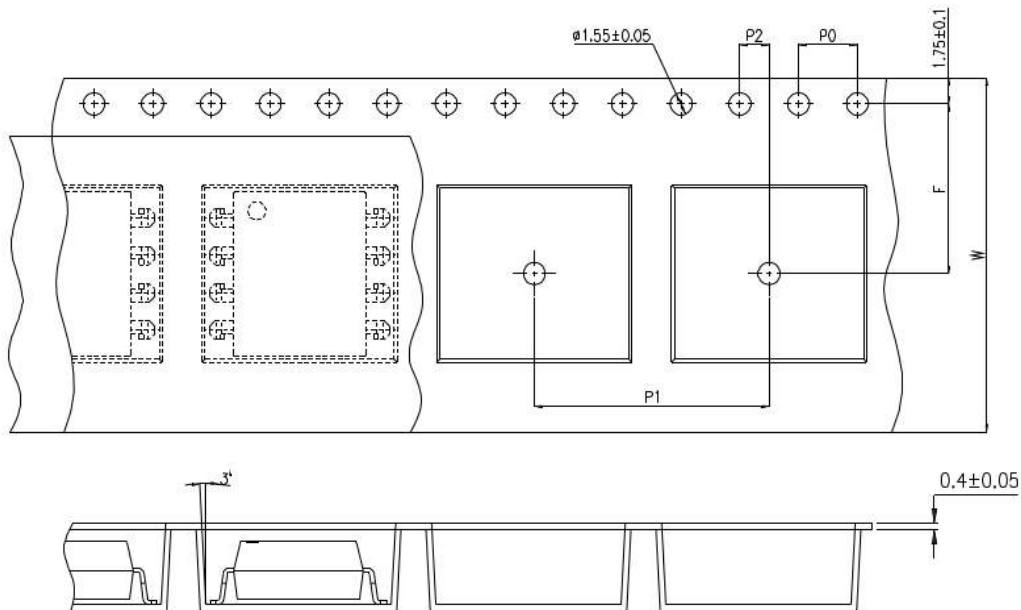


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RECOMMENDED PAD LAYOUT FOR SMD (mm)



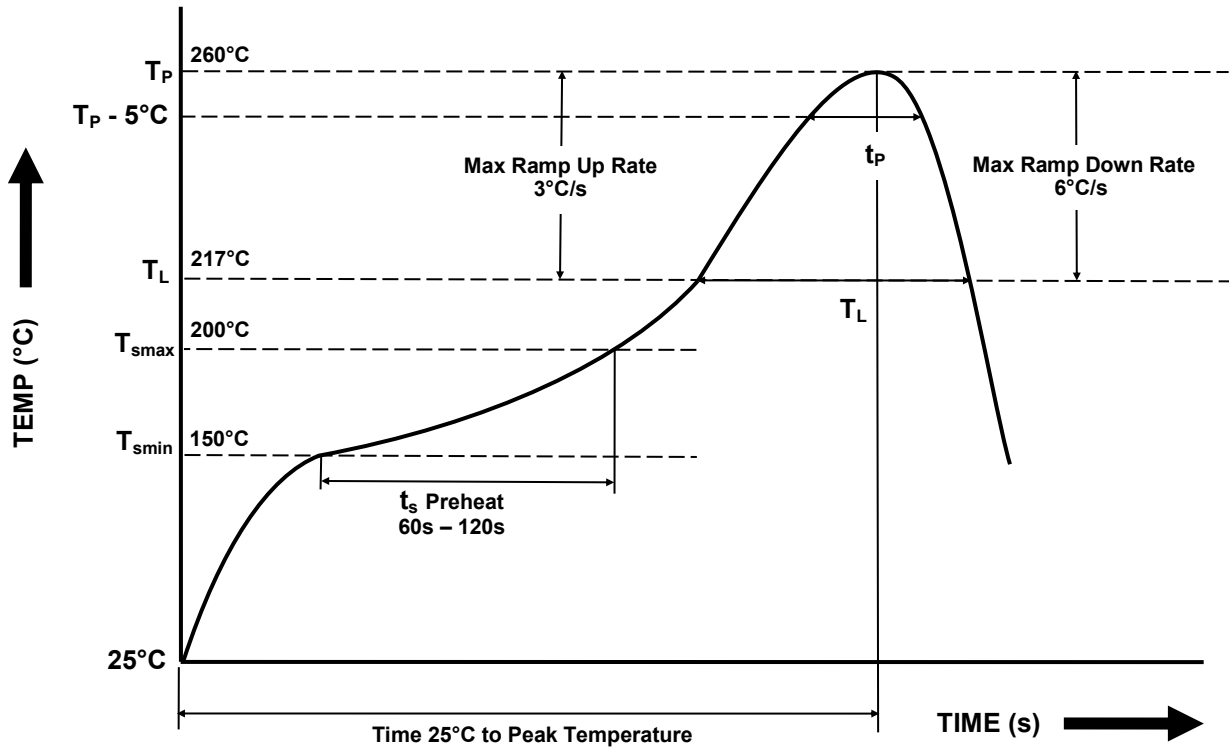
TAPE AND REEL PACKAGING



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 ($T_P - 5^\circ\text{C}$) - 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



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