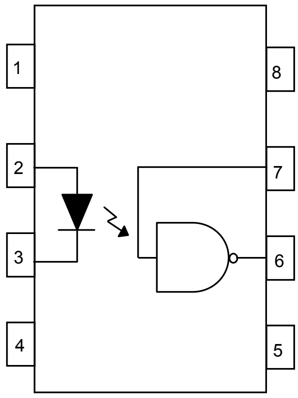
# ICPLW137, ICPLW2601, ICPLW2611

## DESCRIPTION

The ICPLW137, ICPLW2601 and ICPLW2611 devices each consist of an infrared emitting diode, optically coupled to a high speed integrated photo detector logic gate with a strobable output.

These devices belong to Isocom wide body package range optocouplers.




1. No Connection
2. Anode
3. Cathode
4. No Connection
5. Gnd
6. Vout
7. $V_E$
8. $V_{CC}$

A 0.1μF bypass capacitor must be connected between pins 8 and 5.

## FEATURES

- High Speed 10Mbit/s
- Wide Body Package
- 10kV/μs min. Common Mode Transient Immunity (ICPLW2611)
- High AC Isolation Voltage 5000$V_{RMS}$
- Guaranteed Performance from -40°C to +85°C
- Strobable Logic Gate Output
- Pb Free and RoHS Compliant
- Safety Approvals Pending

## 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)

**Input Diode**

| | |
|---|---|
| Forward Current | 50mA |
| Reverse Voltage | 5V |
| Power dissipation | 100mW |

**Output**

| | |
|---|---|
| Output Current | 50mA |
| Output Voltage | 7.0V |
| Supply Voltage | 7.0V |
| Enable Input Voltage (maximum 500mV above $V_{CC}$) | 5.5V |
| Power Dissipation | 85mW |

**Total Package**

| | |
|---|---|
| Isolation Voltage (R.H. 40 - 60%, 1 min, Pins 1, 2, 3 & 4 shorted together, Pins 5, 6, 7 & 8 shorted together) | 5000$V_{RMS}$ |
| Operating Temperature | -40 to +85 °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 |

## ELECTRICAL CHARACTERISTICS ($T_A$ = -40°C to +85°C unless otherwise specified)

### INPUT

| Parameter | Symbol | Test Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Forward Voltage | $V_F$ | $I_F$ = 10mA | | 1.4 | 1.8 | V |
| Reverse Voltage | $V_R$ | $I_R$ = 100µA, $T_A$ = 25°C | 5.0 | | | V |
| Temperature Coefficient of Forward Voltage | $\Delta V_F/\Delta T_A$ | $I_F$ = 10mA | | -1.9 | | mV/°C |
| Input Capacitance | $C_{IN}$ | $V_F$ = 0V, f = 1MHz | | 70 | | pF |

### OUTPUT

| Parameter | Symbol | Test Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| High Level Supply Current | $I_{CCH}$ | $I_F$ = 0mA, $V_E$ = 0.5V, $V_{CC}$ = 5.5V | | 6.5 | 10 | mA |
| Low Level Supply Current | $I_{CCL}$ | $I_F$ = 10mA, $V_E$ = 0.5V, $V_{CC}$ = 5.5V | | 8 | 13 | mA |
| High Level Enable Current | $I_{EH}$ | $V_E$ = 2.0V, $V_{CC}$ = 5.5V | | -0.6 | -1.6 | mA |
| Low Level Enable Current | $I_{EL}$ | $V_E$ = 0.5V, $V_{CC}$ = 5.5V | | -0.8 | -1.6 | mA |
| High Level Enable Voltage | $V_{EH}$ | $I_F$ = 10mA, $V_{CC}$ = 5.5V | 2.0 | | | V |
| Low Level Enable Voltage | $V_{EL}$ | $I_F$ = 10mA, $V_{CC}$ = 5.5V | | | 0.8 | V |

## ELECTRICAL CHARACTERISTICS ($T_A$ = -40°C to +85°C unless otherwise specified)

### COUPLED

| Parameter | Symbol | Test Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| High Level Output Current | $I_{OH}$ | $V_{CC}$ = 5.5V, $V_E$ = 2.0V, $V_O$ = 5.5V, $I_F$ = 250µA | | 2.1 | 100 | µA |
| Low Level Output Voltage | $V_{OL}$ | $V_{CC}$ = 5.5V, $V_E$ = 2.0V, $I_F$ = 5mA, $I_{OL}$ = 13mA | | 0.35 | 0.6 | V |
| Input Threshold Current | $I_{FT}$ | $V_{CC}$ = 5.5V, $V_E$ = 2.0V, $V_O$ = 0.6V, $I_{OL}$ = 13mA | | 3.0 | 5 | mA |

## Switching Characteristics ($T_A$ = -40°C to +85°C, $V_{CC}$ = 5V, $I_F$ = 7.5mA unless otherwise specified)

| Parameter | Symbol | Test Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Propagation Delay Time to Output High Level | $t_{PLH}$ | $C_L$ = 15pF, $R_L$ = 350Ω, $T_A$ = 25°C | | 35 | 100 | ns |
| Propagation Delay Time to Output Low level | $t_{PHL}$ | $C_L$ = 15pF, $R_L$ = 350Ω, $T_A$ = 25°C | | 40 | 100 | ns |
| Pulse Width Distortion | $\|t_{PHL}-t_{PLH}\|$ | $C_L$ = 15pF, $R_L$ = 350Ω | | 5 | 40 | ns |
| Output Rise Time | $t_r$ | $C_L$ = 15pF, $R_L$ = 350Ω | | 40 | | ns |
| Output Fall Time | $t_f$ | $C_L$ = 15pF, $R_L$ = 350Ω | | 10 | | ns |
| Enable Propagation Delay Time to Output High Level | $t_{ELH}$ | $I_F$ = 7.5mA, $V_{EH}$ = 3.5V, $C_L$ = 15pF, $R_L$ = 350Ω | | 15 | | ns |
| Enable Propagation Delay Time to Output Low Level | $t_{EHL}$ | $I_F$ = 7.5mA, $V_{EH}$ = 3.5V, $C_L$ = 15pF, $R_L$ = 350Ω | | 15 | | ns |

## ELECTRICAL CHARACTERISTICS ($T_A$ = -40°C to +85°C unless otherwise specified)

### Switching Characteristics ($T_A$ = -40°C to +85°C, $V_{CC}$ = 5V, $I_F$ = 7.5mA unless otherwise specified)

| Parameter | Symbol | Test Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Common Mode Transient Immunity at Logic High | $CM_H$ | ICPLW137 (Fig 14)<br>$I_F$ = 0mA, $V_{OH}$ (Min) = 2V,<br>$R_L$ = 350Ω, $V_{CM}$ = 10Vp-p,<br>$T_A$ = 25°C | | 5000 | | V/µs |
| | | ICPLW2601 (Fig 14)<br>$I_F$ = 0mA, $V_{OH}$ (Min) = 2V,<br>$R_L$ = 350Ω, $V_{CM}$ = 50Vp-p,<br>$T_A$ = 25°C | 5000 | | | |
| | | ICPLW2611 (Fig 14)<br>$I_F$ = 0mA, $V_{OH}$ (Min) = 2V,<br>$R_L$ = 350Ω, $V_{CM}$ = 400Vp-p,<br>$T_A$ = 25°C | 10000 | | | |
| | | ICPLW2611 (Fig 15)<br>$I_F$ = 0mA, $V_{OH}$ (Min) = 2V,<br>$R_L$ = 350Ω, $V_{CM}$ = 400Vp-p,<br>$T_A$ = 25°C | 20000 | | | |
| Common Mode Transient Immunity at Logic Low | $CM_L$ | ICPLW137 (Fig 14)<br>$I_F$ = 7.5mA, $V_{OL}$ (Max) = 0.8V,<br>$R_L$ = 350Ω, $V_{CM}$ = 10Vp-p,<br>$T_A$ = 25°C | | 5000 | | V/µs |
| | | ICPLW2601 (Fig 14)<br>$I_F$ = 7.5mA, $V_{OL}$ (Max) = 0.8V,<br>$R_L$ = 350Ω, $V_{CM}$ = 50Vp-p,<br>$T_A$ = 25°C | 5000 | | | |
| | | ICPLW2611 (Fig 14)<br>$I_F$ = 7.5mA, $V_{OL}$ (Max) = 0.8V,<br>$R_L$ = 350Ω, $V_{CM}$ = 400Vp-p,<br>$T_A$ = 25°C | 10000 | | | |
| | | ICPLW2611 (Fig 15)<br>$I_F$ = 7.5mA, $V_{OL}$ (Max) = 0.8V,<br>$R_L$ = 350Ω, $V_{CM}$ = 400Vp-p,<br>$T_A$ = 25°C | 20000 | | | |

# ICPLW137, ICPLW2601, ICPLW2611

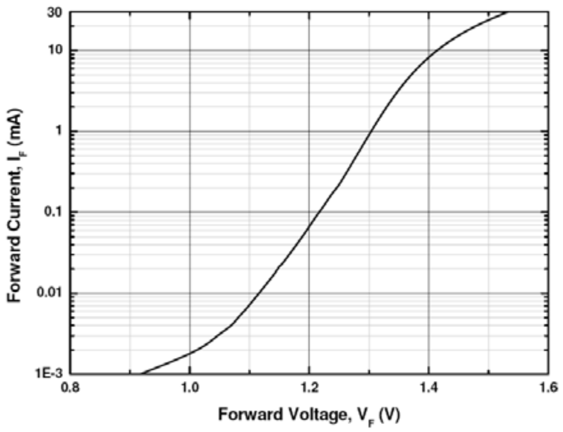



**Fig 1 Forward Current vs Forward Voltage**

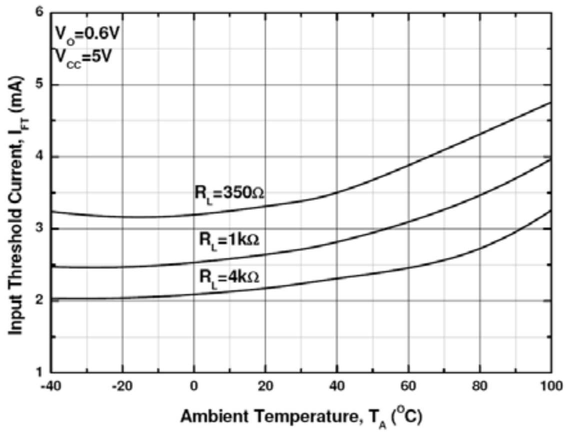



**Fig 2 Input Threshold Current vs $T_A$**

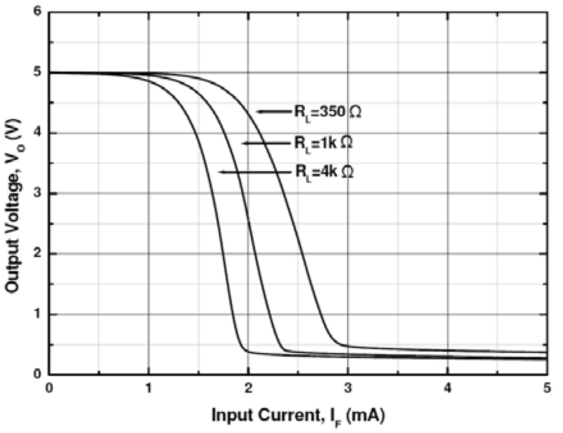



**Fig 3 Input Current vs Output Voltage**

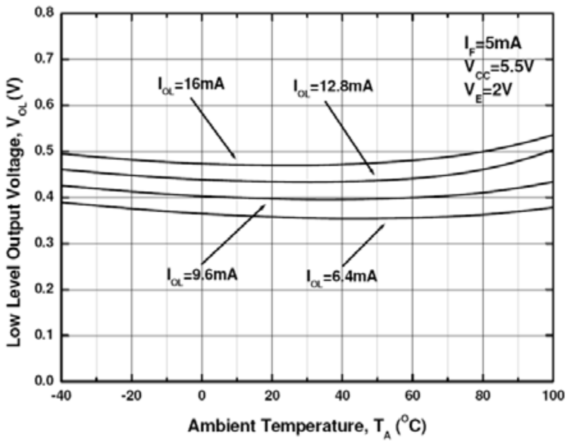



**Fig 4 Low Level Output Voltage vs $T_A$**

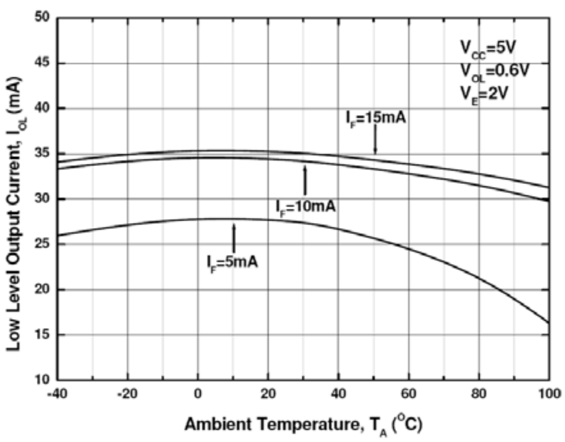



**Fig 5 Low Level Output Current vs $T_A$**

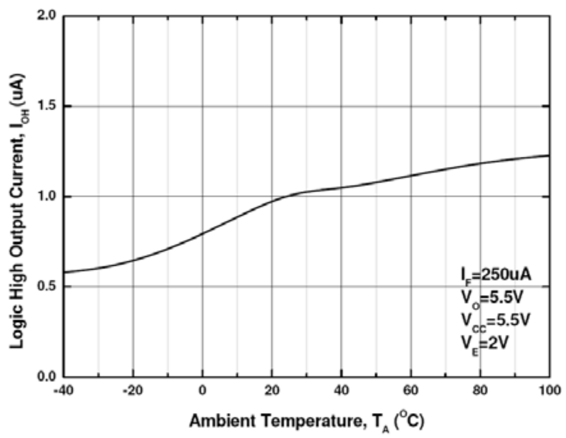



**Fig 6 High Level Output Current vs $T_A$**

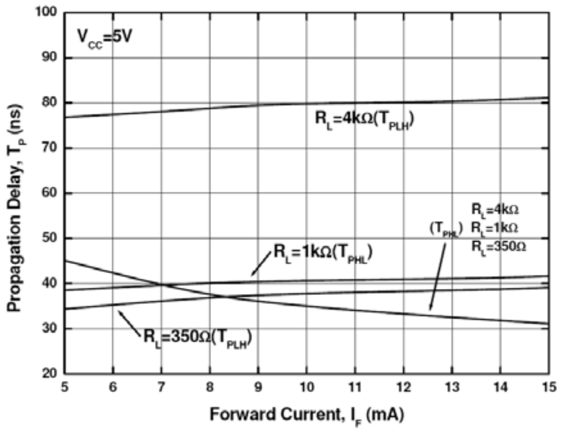



Fig 7 Propagation Delay Time vs Forward Current

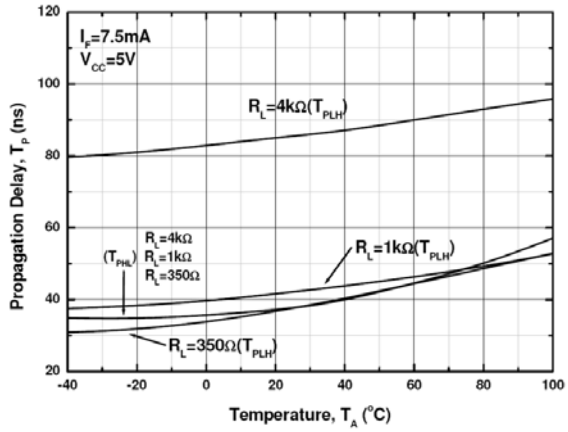



Fig 8 Propagation Delay Time vs $T_A$

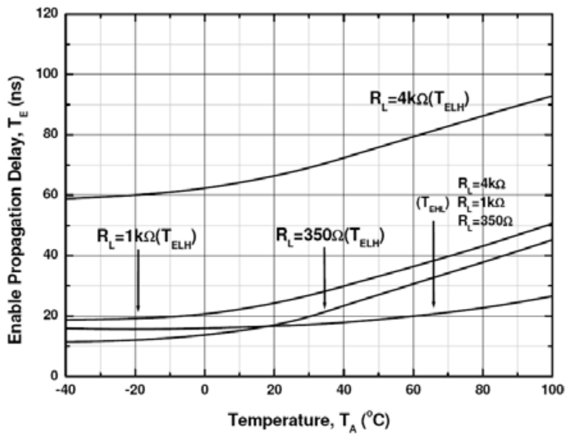



Fig 9 Enable Propagation Delay Time vs $T_A$

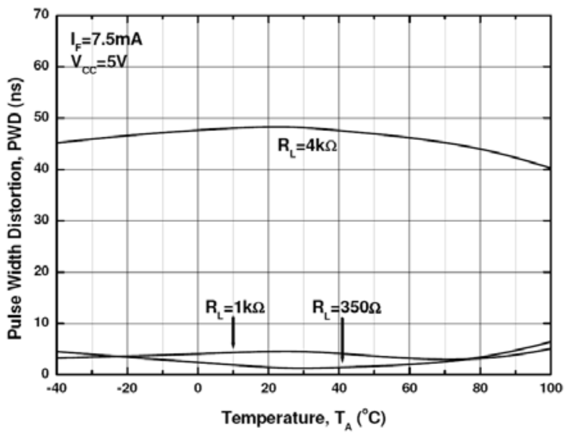



Fig 10 Pulse Width Distortion vs $T_A$

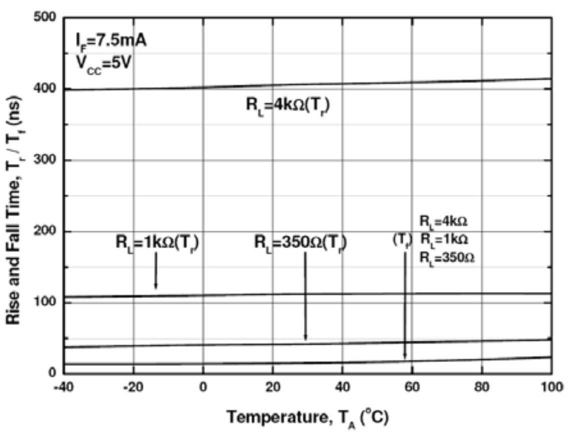
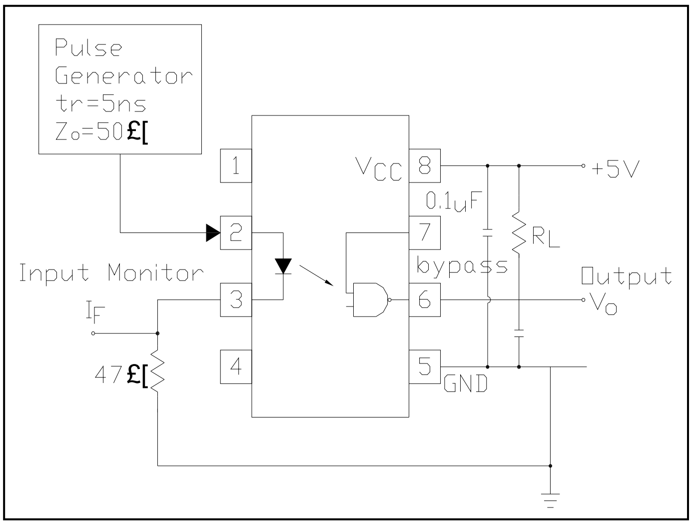
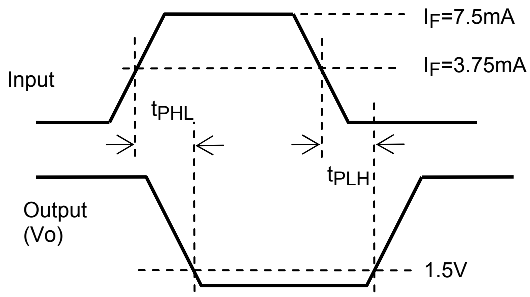



Fig 11 Rise Time / Fall Time vs $T_A$



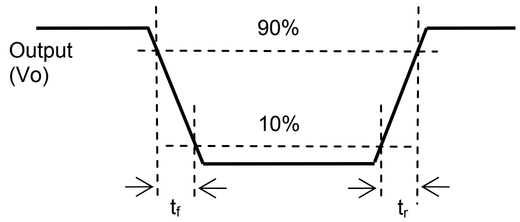
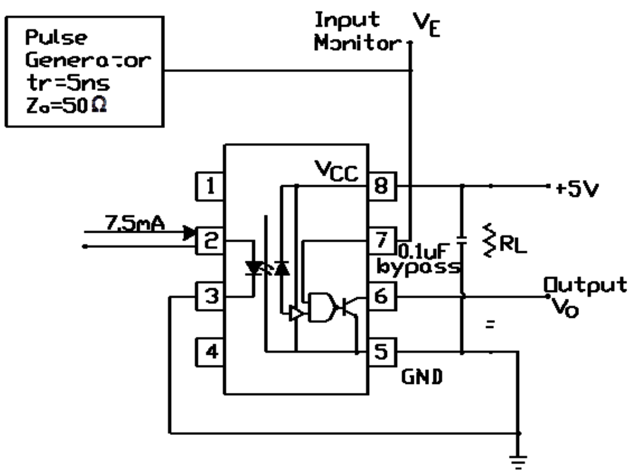




Fig 12 $t_{PHL}$, $t_{PLH}$, $t_r$ and $t_f$ Test Circuit



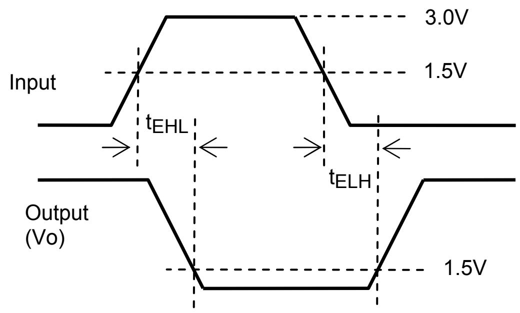




Fig 13 $t_{EHL}$ and $t_{ELH}$ Test Circuit

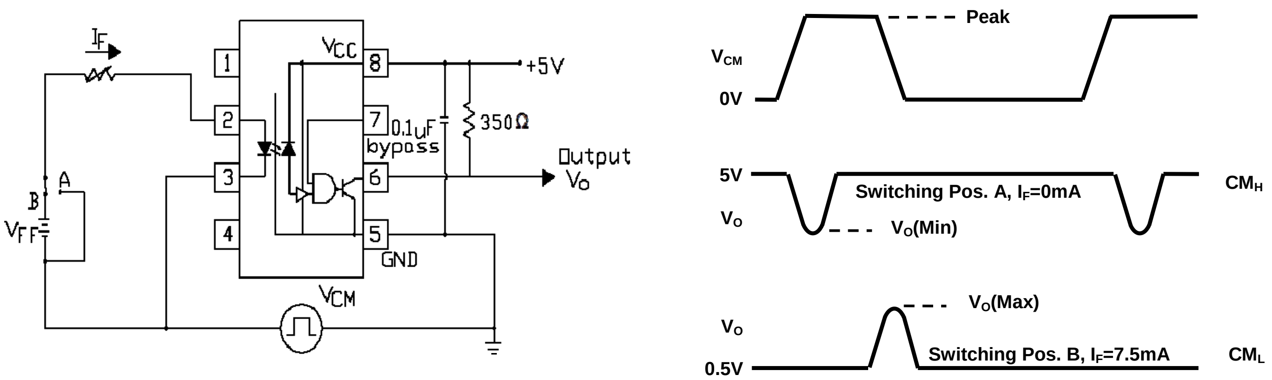



**Fig 14 Common Mode Transient Immunity Test Circuit**

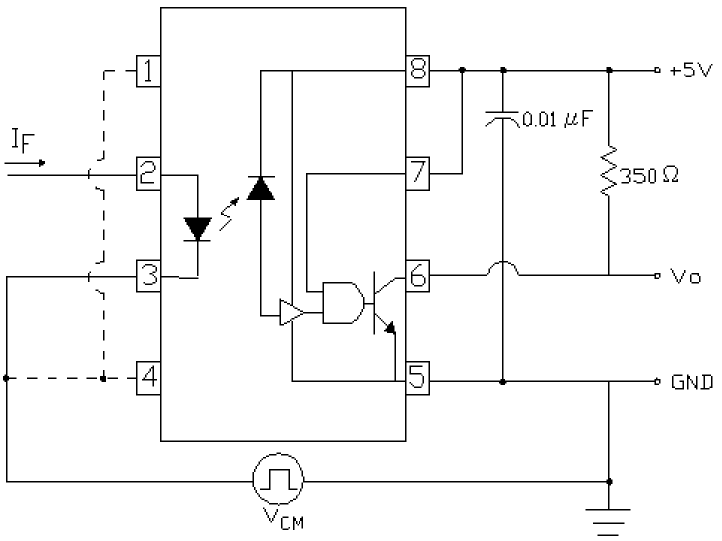



**Fig 15 Recommended Drive Circuit for ICPLW2611 for High Common Mode Transient Immunity**

$CM_H$ : Common mode transient immunity in logic high level is the maximum tolerable (positive) $dV_{CM}/dt$ on the leading edge of the common mode pulse signal $V_{CM}$, to assure that the output will remain in a logic high state (i.e., $V_O >$ 2.0V).

$CM_L$ : Common mode transient immunity in logic low level is the maximum tolerable (negative) $dV_{CM}/dt$ on the trailing edge of the common mode pulse signal, $V_{CM}$, to assure that the output will remain in a logic low state (i.e., $V_O <$ 0.8V).

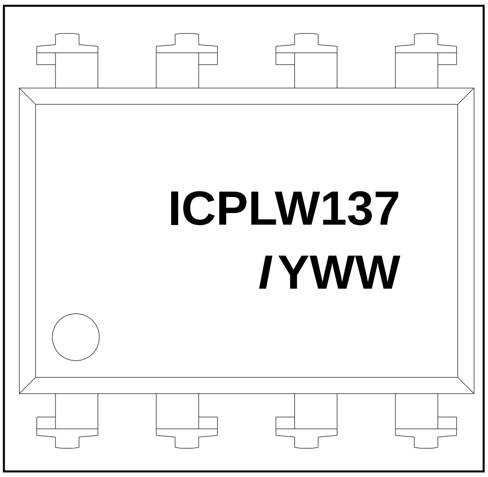
**NOTES :**

- The $V_{CC}$ 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.
- Enable Input – No pull up resistor required as the device has an internal pull up resistor.
- $t_{PLH}$ is measured from the 3.75mA level on the HIGH to LOW transition of the input current pulse to the 1.5 V 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.
- $t_r$ Rise time is measured from the 10% to the 90% levels on the LOW to HIGH transition of the output pulse.
- $t_f$ Fall time is measured from the 90% to the 10% levels on the HIGH to LOW transition of the output 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.
- $CM_H$– 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).
- $CM_L$– 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).

## ORDER INFORMATION

| ICPLW137, ICPLW2601, ICPLW2611 | | | |
|---|---|---|---|
| **After PN** | **PN** | **Description** | **Packing quantity** |
| None | ICPLW137, ICPLW2601, ICPLW2611 | Standard DIP | 40 pcs per tube |
| SM | ICPLW137SMT&R, ICPLW2601SMT&R, ICPLW2611SMT&R | Surface Mount Tape and Reel | 500 pcs per reel |

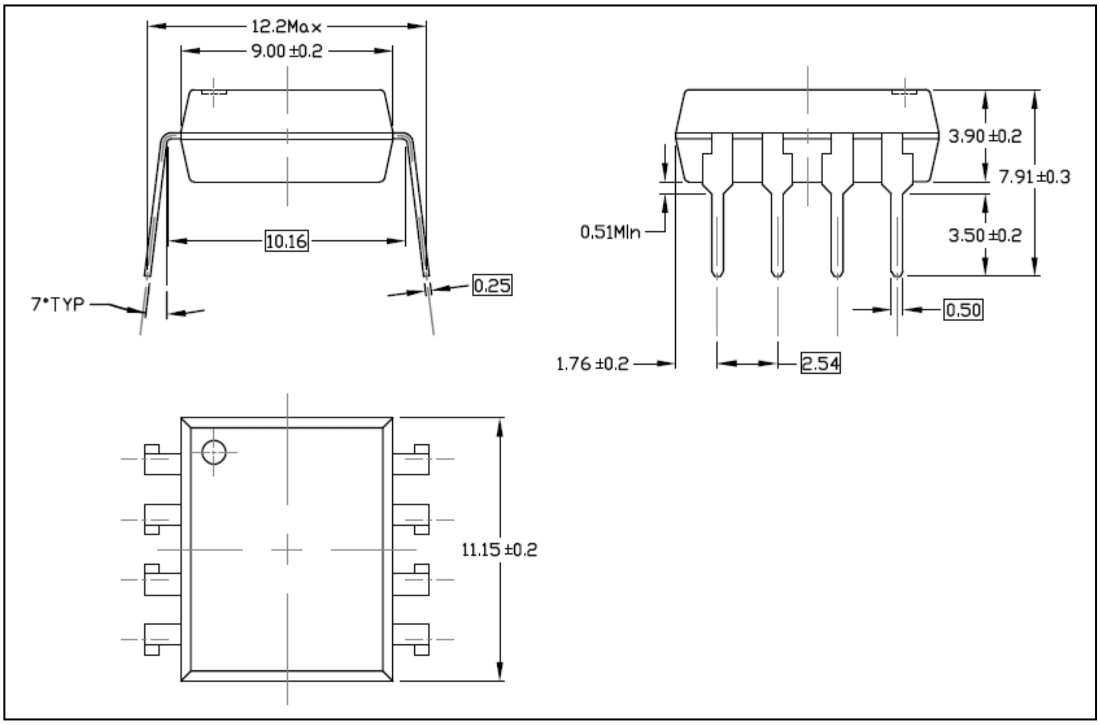
## DEVICE MARKING



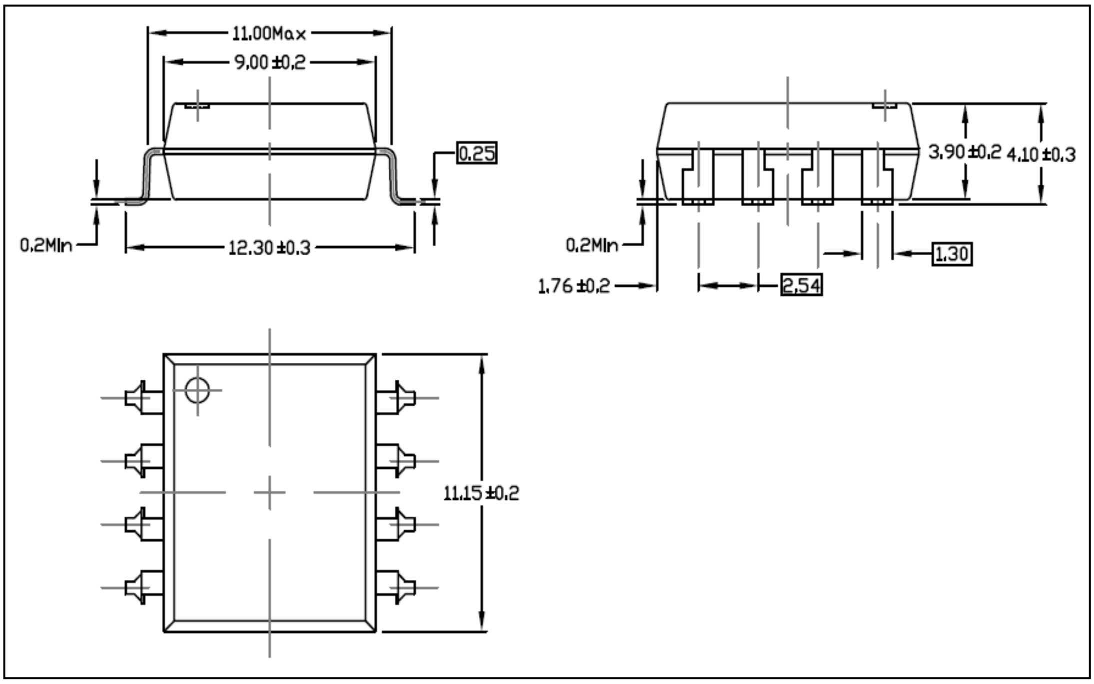

ICPLW137 denotes Device Part Number (ICPLW137 is used as example)
Y denotes 1 digit Year code
WW denotes 2 digit Week code
***I*** denotes Isocom

## PACKAGE DIMENSIONS (mm)

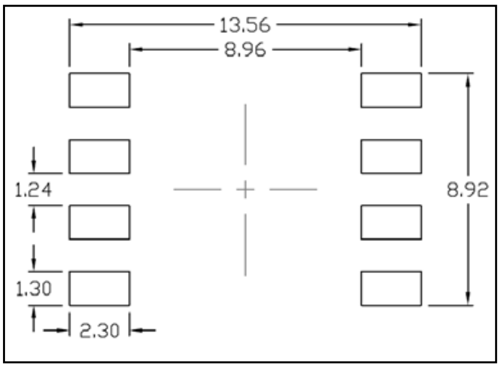
**DIP**



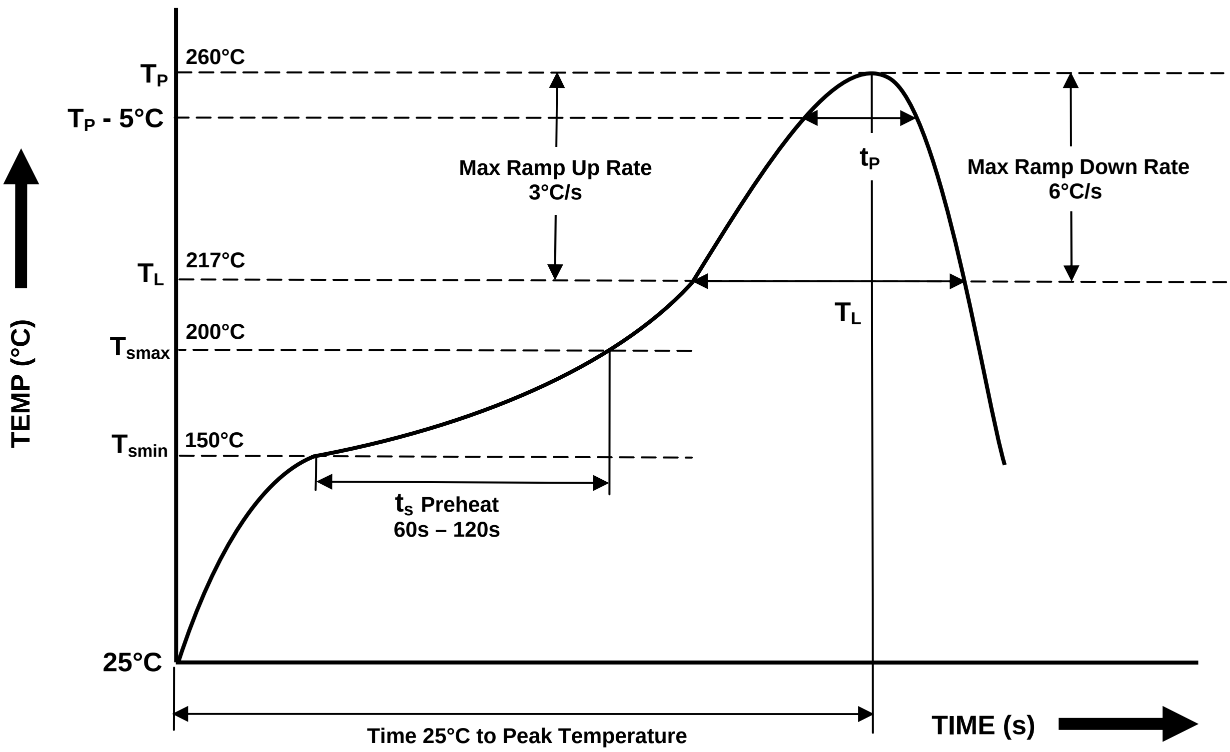

**SMD**



**RECOMMENDED PAD LAYOUT FOR SMD (mm)**

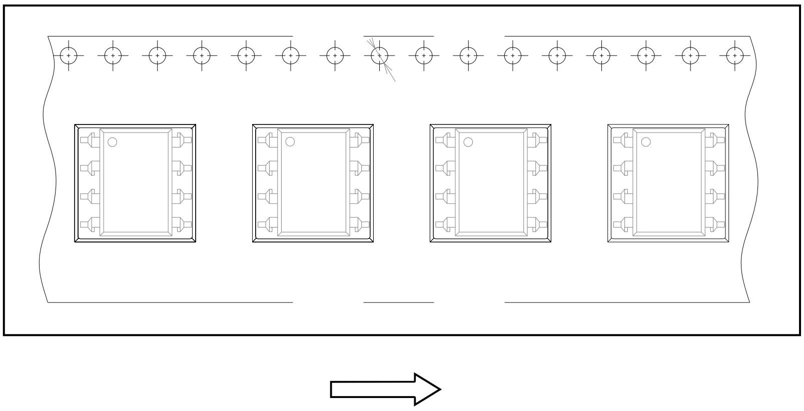


## IR REFLOW SOLDERING TEMPERATURE PROFILE
## (One Time Reflow Soldering is Recommended)

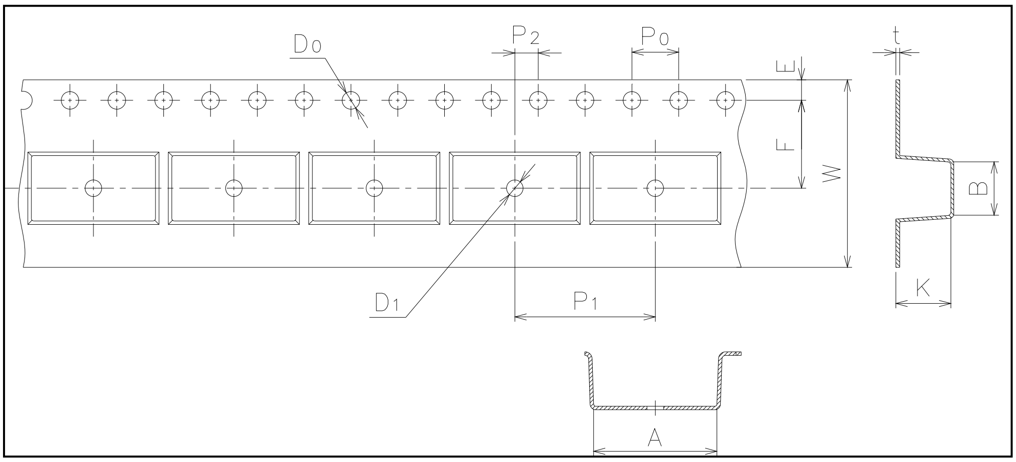



| Profile Details | Conditions |
|---|---|
| **Preheat**<br>- Min Temperature ($T_{SMIN}$)<br>- Max Temperature ($T_{SMAX}$)<br>- Time $T_{SMIN}$ to $T_{SMAX}$ ($t_s$) | <br>150°C<br>200°C<br>60s - 120s |
| **Soldering Zone**<br>- Peak Temperature ($T_P$)<br>- Liquidous Temperature ($T_L$)<br>- Time within 5°C of Actual Peak Temperature ($T_P$ – 5°C)<br>- Time maintained above $T_L$ ($t_L$)<br>- Ramp Up Rate ($T_L$ to $T_P$)<br>- Ramp Down Rate ($T_P$ to $T_L$) | <br>260°C<br>217°C<br>30s<br>60s - 100s<br>3°C/s max<br>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 |

## TAPE AND REEL PACKAGING



Direction of feed from reel




| Dimension No. | A | B | Do | D1 | E | F |
|---|---|---|---|---|---|---|
| Dimension( mm) | 12.7±0.1 | 11.45±0.1 | 1.5±0.1 | 1.5±0.1 | 1.75±0.1 | 11.5±0.1 |
| Dimension No. | Po | P1 | P2 | t | W | K |
| Dimension (mm) | 4.0±0.1 | 16.0±0.1 | 2.0±0.1 | 0.4±0.05 | 24.00±0.3 | 4.6±0.1 |

**NOTES :**

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- 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.

- For equipment/application where high reliability or safety is required, such as space applications, nuclear power control equipment, medical equipment, etc., please contact our sales representatives.

- When requiring a device for any ”specific” application, please contact our sales for advice.

- The contents described herein are subject to change without prior notice.

- Do not immerse device body in solder paste.

## ICPLW137, ICPLW2601, ICPLW2611

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