# ICPLW2601, ICPLW2611

## DESCRIPTION

The ICPLW2601 and ICPLW2611 devices each consists 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.

## FEATURES

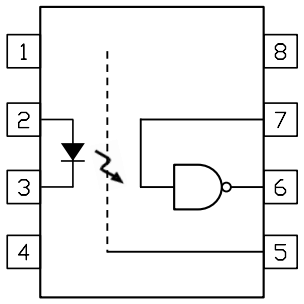
- High Speed 10Mbit/s
- Wide Body Package
- Guaranteed Performance from −40°C to 85°C
- Strobable Logic Gate Output
- Minimum Common Mode Transient Immunity 10kV/µs at $V_{CM}$ 1000V (ICPLW2611)
- High AC Isolation Voltage 5000$V_{RMS}$
- Pb Free and RoHS Compliant
- Safety Approvals Pending

## 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




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.**

## 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 | 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 | 5000$V_{RMS}$ |
| Operating Temperature | −40 to 85°C |
| Junction Temperature | 125°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 |



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## ELECTRICAL CHARACTERISTICS ($T_A$ = −40 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 |
| Forward Voltage Temperature Coefficient | $\Delta V_F/\Delta T$ | $I_F$ = 10mA | | −1.9 | | mV/°C |
| Reverse Voltage | $V_R$ | $I_R$ = 100µA, $T_A$ = 25°C | 5.0 | | | V |
| Input Capacitance | $C_{IN}$ | $V_F$ = 0V, f = 1MHz | | 70 | | pF |

### OUTPUT

| Parameter | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|
| Low Level Supply Current | $I_{CCH}$ | $I_F$ = 0mA, $V_{CC}$ = 5.5V<br>$V_E$ = 0.5V | | 6.5 | 10 | mA |
| Low Level Supply Current | $I_{CCL}$ | $I_F$ = 10mA, $V_{CC}$ = 5.5V<br>$V_E$ = 0.5V | | 8 | 13 | 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 | | −0.8 | −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 |

### COUPLED

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



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## ELECTRICAL CHARACTERISTICS ($T_A$ = −40 to 85°C, $V_{CC}$ = 5V, $I_F$ = 7.5mA unless otherwise specified)

### SWITCHING

| Parameter | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|
| Propagation Delay Time to High Output Level | $t_{PHL}$ | $R_L$ = 350Ω<br>$C_L$ = 15pF<br>$T_A$ = 25°C | | 35 | 100 | ns |
| Propagation Delay Time to Low Output Level | $t_{PLH}$ | | | 40 | 100 | |
| Pulse Width Distortion | $\|t_{PHL} - t_{PLH}\|$ | $R_L$ = 350Ω<br>$C_L$ = 15pF | | 5 | 40 | |
| Output Rise Time (10% to 90%) | $t_r$ | | | 40 | | |
| Output Fall Time (90% to 10%) | $t_f$ | | | 10 | | |
| Enable Propagation Delay Time to High Output Level | $t_{ELH}$ | $V_{EH}$ = 3.0V<br>$R_L$ = 350Ω<br>$C_L$ = 15pF | | 15 | | |
| Enable Propagation Delay Time to Low Output Level | $t_{EHL}$ | | | 15 | | |



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## ELECTRICAL CHARACTERISTICS ($T_A$ = −40 to 85°C, $V_{CC}$ = 5V, $I_F$ = 7.5mA unless otherwise specified)

### SWITCHING

| Parameter | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|
| Common Mode Transient Immunity at Logic High | $CM_H$ | ICPLW2601<br>$I_F$ = 0mA, $V_{OH}$ = 2.0V<br>$R_L$ = 350Ω<br>$V_{CM}$ = 50Vp-p<br>$T_A$ = 25°C | 5 | | | kV/µs |
| | | ICPLW2611<br>$I_F$ = 0mA, $V_{OH}$ = 2.0V<br>$R_L$ = 350Ω<br>$V_{CM}$ = 400Vp-p<br>$T_A$ = 25°C | 10 | | | |
| | | ICPLW2611<br>$I_F$ = 0mA, $V_{OH}$ = 2.0V<br>$V_E$ = $V_{CC}$<br>$R_L$ = 350Ω<br>$V_{CM}$ = 400Vp-p<br>$T_A$ = 25°C | 20 | | | |
| Common Mode Transient Immunity at Logic Low | $CM_L$ | ICPLW2601<br>$I_F$ = 7.5mA, $V_{OL}$ = 0.8V<br>$R_L$ = 350Ω<br>$V_{CM}$ = 50Vp-p<br>$T_A$ = 25°C | 5 | | | kV/µs |
| | | ICPLW2611<br>$I_F$ = 7.5mA, $V_{OL}$ = 0.8V<br>$R_L$ = 350Ω<br>$V_{CM}$ = 400Vp-p<br>$T_A$ = 25°C | 10 | | | |
| | | ICPLW2611<br>$I_F$ = 7.5mA, $V_{OL}$ = 0.8V<br>$V_E$ = $V_{CC}$<br>$R_L$ = 350Ω<br>$V_{CM}$ = 400Vp-p<br>$T_A$ = 25°C | 20 | | | |

### ISOLATION

| Parameter | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|
| Isolation Voltage | $V_{ISO}$ | RH = 40−60%, t = 1min<br>$T_A$ = 25°C | 5000 | | | $V_{RMS}$ |

Device is considered a two terminal device : pins 1 to 4 are shorted together and pins 5 to 8 are shorted together.



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## ELECTRICAL CHARACTERISTICS

**Notes :**

- $V_{CC}$ supply must be bypassed by a 0.1µF capacitor or larger with good frequency characteristics and should be connected as close as possible to the package $V_{CC}$ and GND pins.
- Enable Input : No pull up resistor reqired as the device has an internal pull up resistor.
- $t_{PLH}$ : 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.
- $t_{PHL}$ : 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.
- $t_r$ : measured from the 10% to 90% level on the LOW to HIGH transition of the output voltage pulse.
- $t_f$ : measured from the 90% to 10% level on the HIGH to LOW transition of the output voltage pulse.
- $t_{ELH}$ : 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.
- $t_{EHL}$ : 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., $V_O < 0.8V$).



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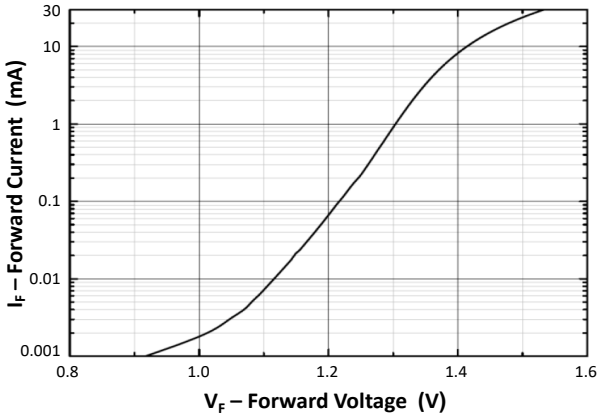



Fig 1 Forward Current vs Forward Voltage

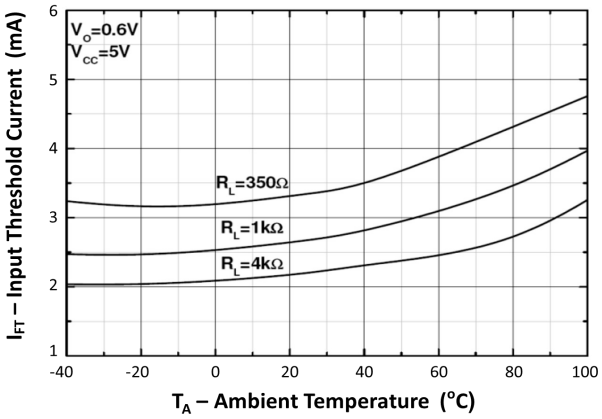



Fig 2 Input Threshold Current vs Ambient Temperature

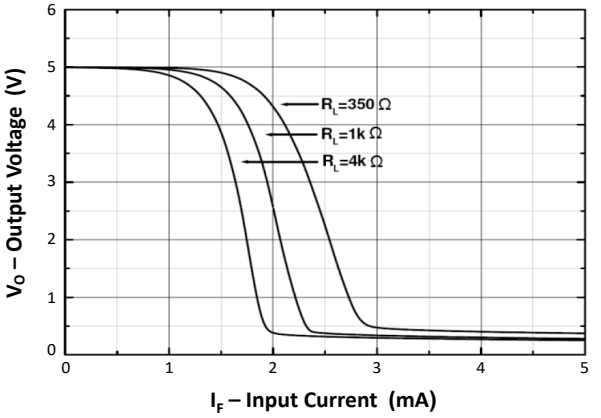



Fig 3 Output Voltage vs Input Current

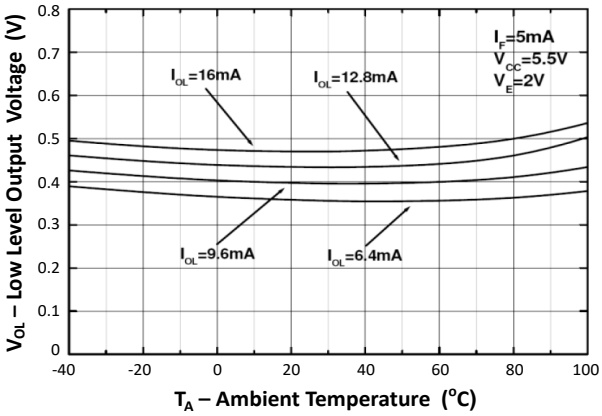



Fig 4 Low Level Output Voltage vs Ambient Temperature

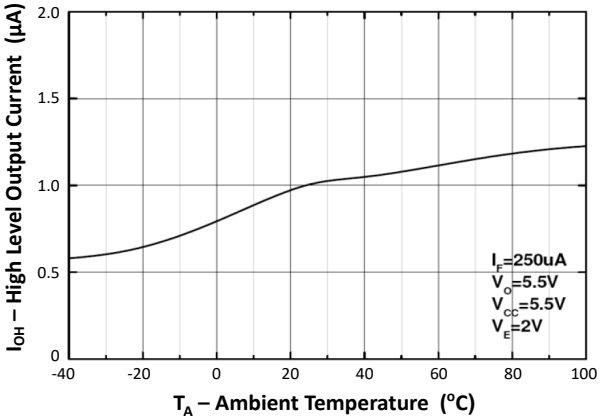



Fig 5 High Level Output Current vs Ambient Temperature

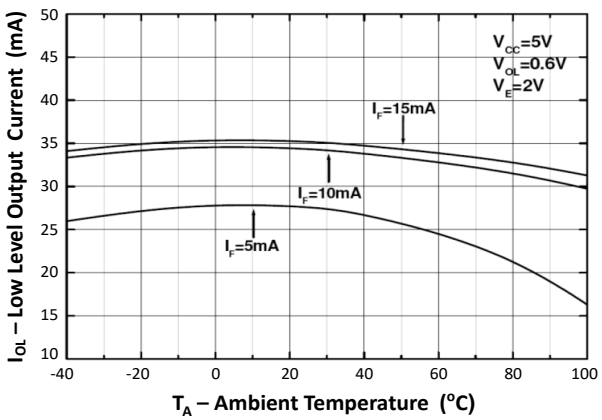



Fig 6 Low Level Output Current vs Ambient Temperature



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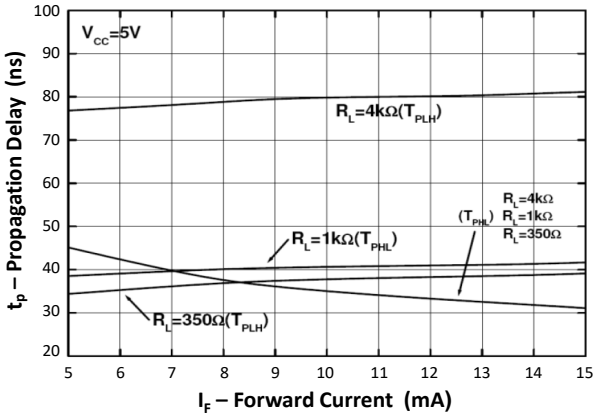



Fig 7 Propagation Delay vs Forward Current

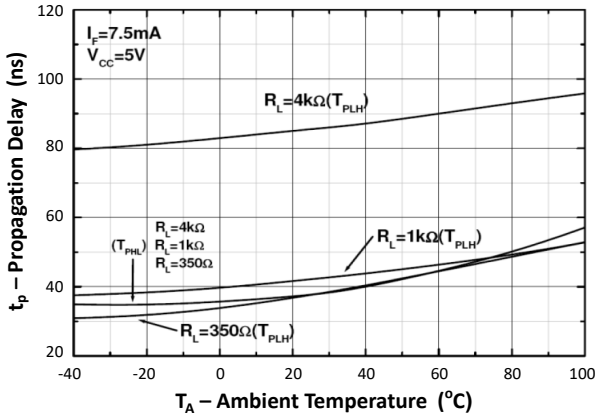



Fig 8 Propagation Delay vs Ambient Temperature

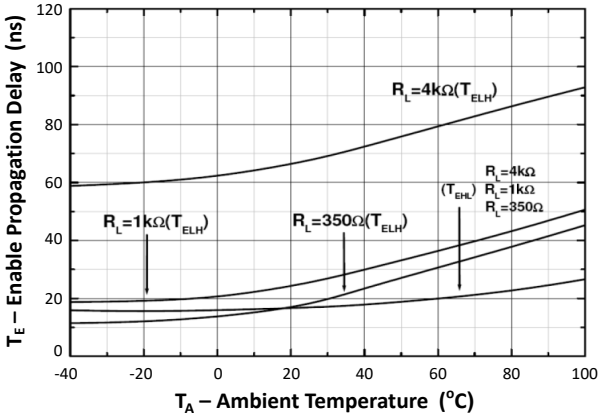



Fig 9 Enable Propagation Delay vs Ambient Temperature

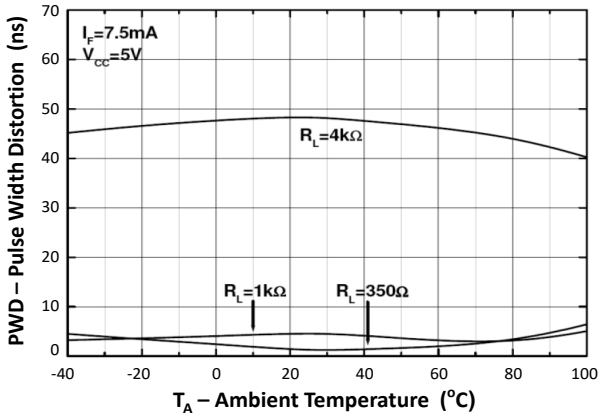



Fig 10 Pulse Width Distortion vs Ambient Temperature

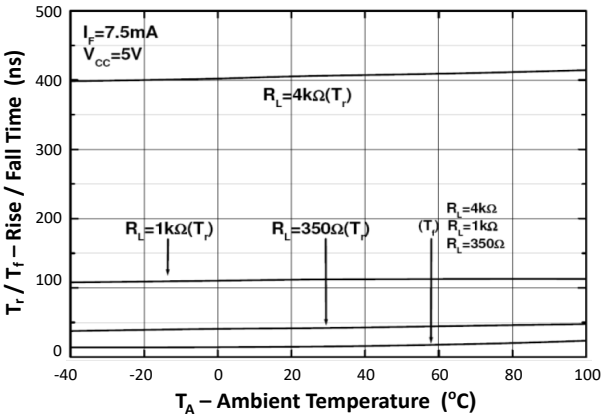
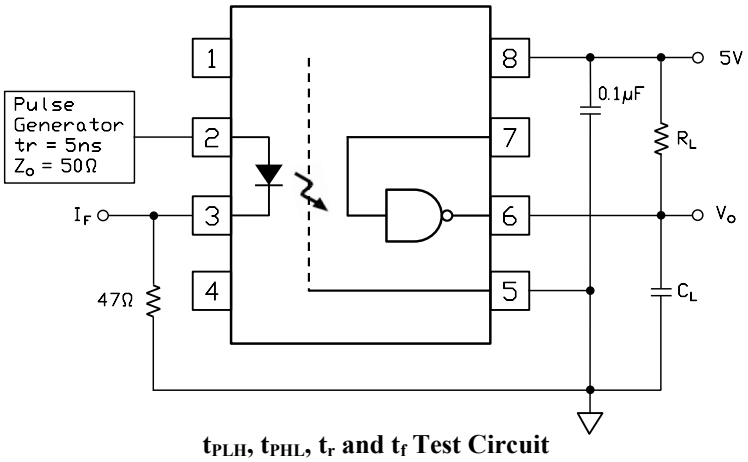
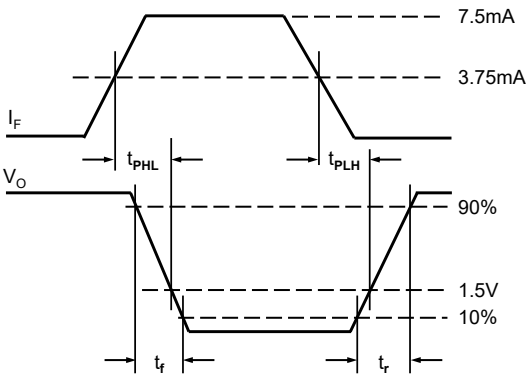



Fig 11 Rise Time / Fall Time vs Ambient Temperature

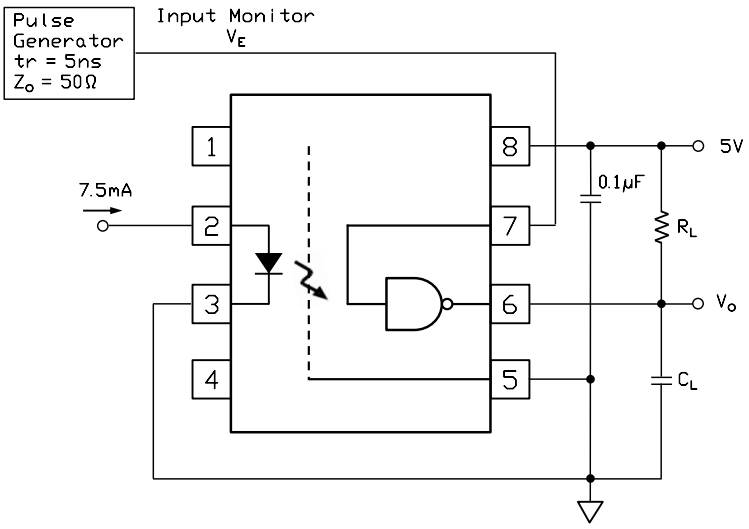


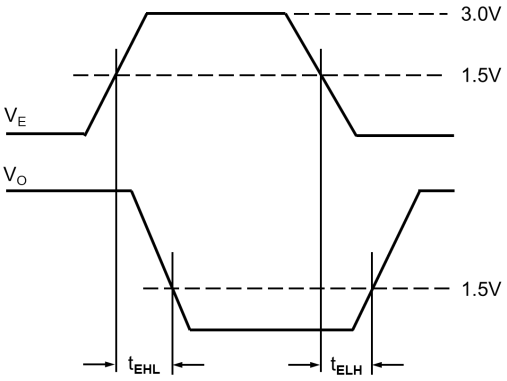
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**$t_{PLH}$, $t_{PHL}$, $t_r$ and $t_f$ Test Circuit**

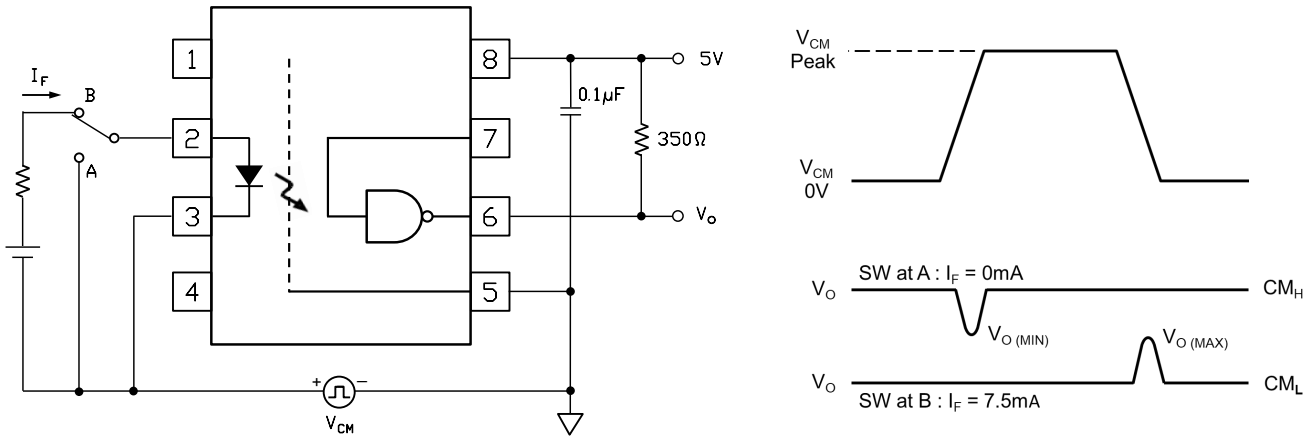


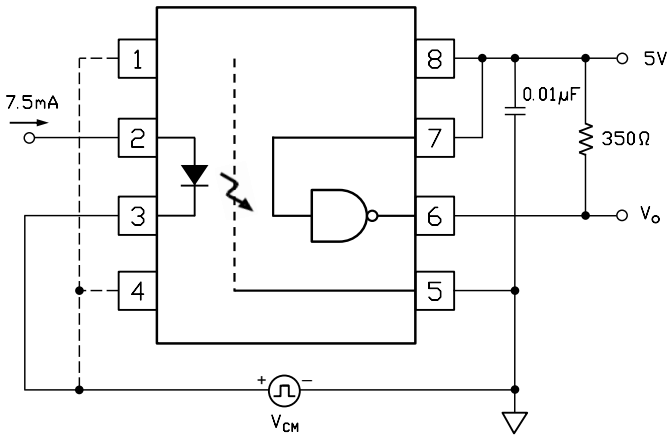

**$t_{ELH}$ and $t_{EHL}$ Test Circuit**



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**Common Mode Transient Immunity Test Circuit**




**ICPLW2611 : Recommended Drive Circuit for High Common Mode Transient Immunity**

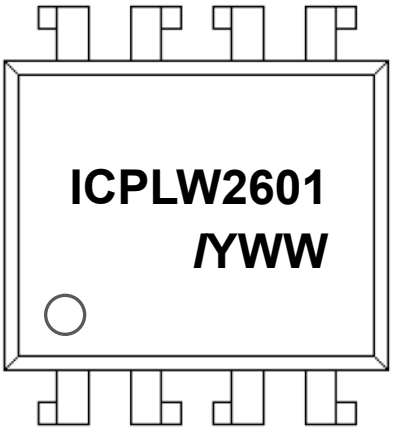


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## ORDER INFORMATION

| ICPLW2601, ICPLW2611 | | | |
|---|---|---|---|
| **After PN** | **PN** | **Description** | **Packing quantity** |
| None | ICPLW2601, ICPLW2611 | Wide Body DIP8 | 40 pcs per tube |
| SM | ICPLW2601SM, ICPLW2611SM | Surface Mount | 40 pcs per tube |
| SMT&R | ICPLW2601SMT&R<br>ICPLW2611SMT&R | Surface Mount Tape & Reel | 500 pcs per reel |

## DEVICE MARKING
**Example : ICPLW2601**



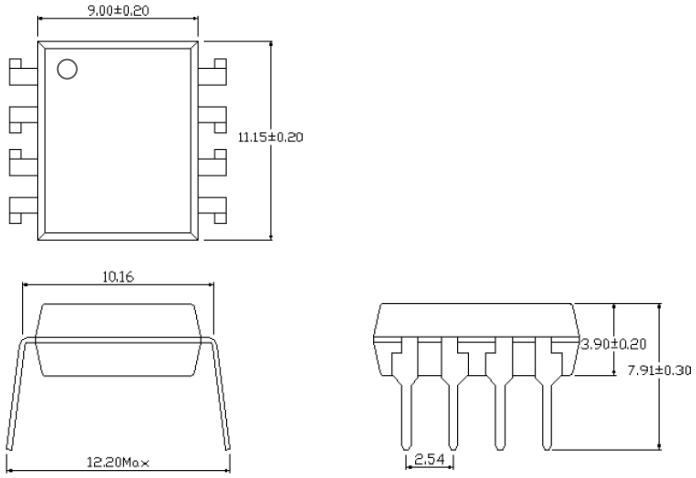

| | |
|---|---|
| ICPLW2601 | denotes Device Part Number |
| ***I*** | denotes Isocom |
| Y | denotes Year code |
| WW | denotes 2 digit Week Code |



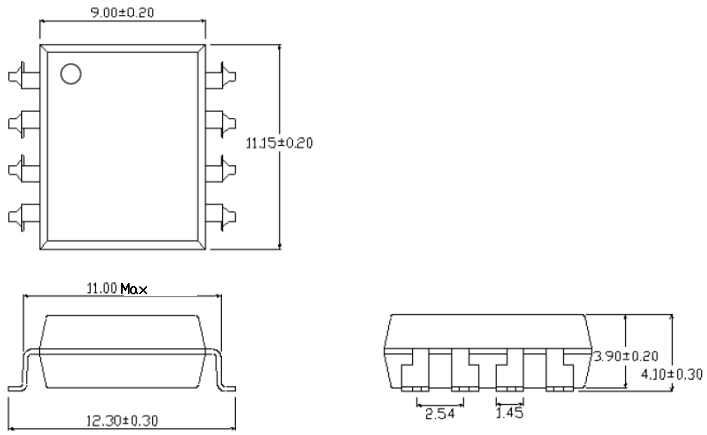
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## PACKAGE DIMENSIONS (mm)

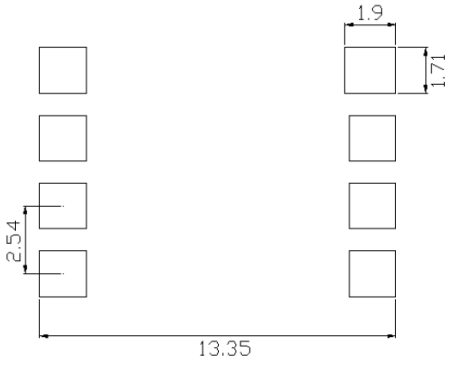
### DIP




### SMD



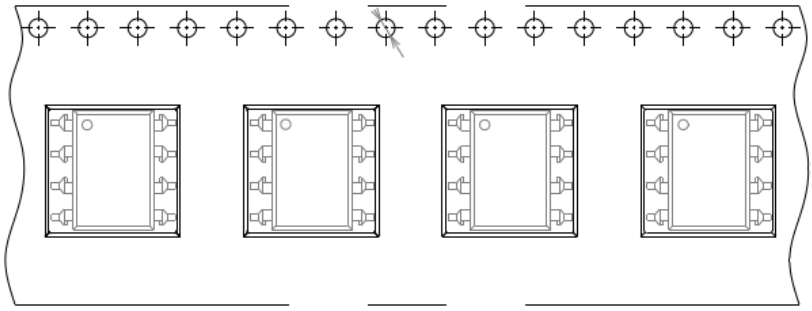

## RECOMMENDED PAD LAYOUT FOR SMD (mm)



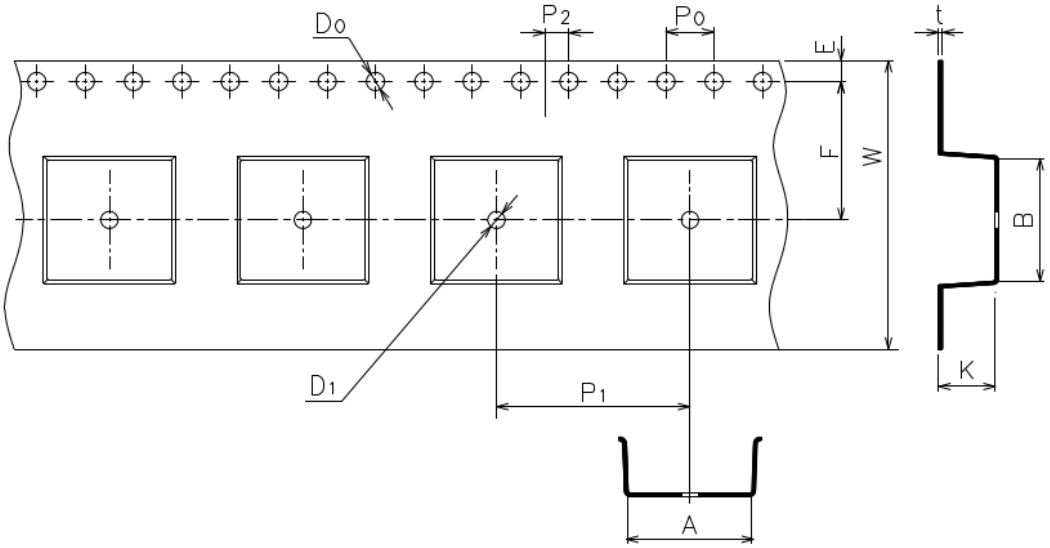



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## TAPE AND REEL PACKAGING



Direction of feed from reel

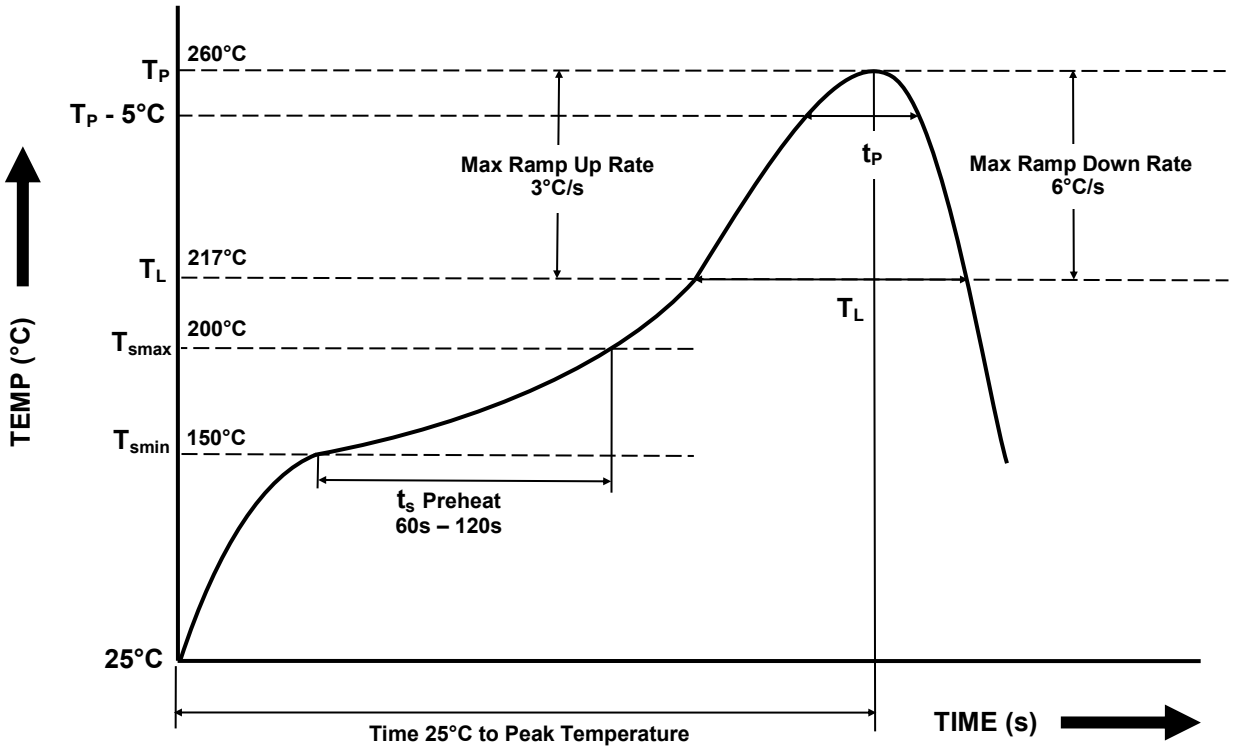



| Dimension | A | B | $D_0$ | $D_1$ | E | F |
|---|---|---|---|---|---|---|
| mm | 12.7±0.1 | 11.45±0.1 | 1.5±0.1 | 1.5±0.1 | 1.75±0.1 | 11.5±0.1 |
| Dimension | $P_0$ | $P_1$ | $P_2$ | t | W | K |
| mm | 4.0±0.1 | 16.0±0.1 | 2.0±0.1 | 0.4±0.05 | 24.00±0.3 | 4.6±0.1 |



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




| 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>- Time at Peak Temperature<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>10s max<br>217°C<br>30s max<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 |



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