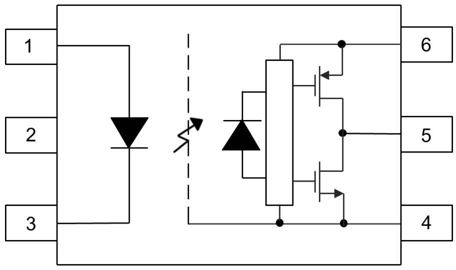
# ISOCOM COMPONENTS

## IS314P

## DESCRIPTION

The IS314P Photocoupler is ideally suited for driving power IGBTs and MOSFETs used in inverters of motor control and in power supply system. It contains an AlGaAs LED optically coupled to an integrated circuit with a power output stage.

The device is supplied in Stretched SO6 package.




1 Anode
2 NC
3 Cathode
4 GND ($V_{EE}$)
5 $V_O$
6 $V_{CC}$

**A 0.1µF bypass Capacitor must be connected between Pins 6 and 4.**

## FEATURES

- 1.5A Maximum Peak Output Current
- Rail-to-Rail Output Voltage
- Maximum Propagation Delay 150ns
- Maximum Propagation Delay Difference 80ns
- Under Voltage Lock Out (UVLO) Protection with Hysteresis
- Minimum Common Mode Rejection 35kV/µs at $V_{CM}$ 1500V
- Wide Operating Voltage Range $V_{CC}$ 10 to 30 V
- Guaranteed Performance over Temperature Range −40°C to +125°C
- MSL Level 1
- RoHS Compliant
- UL E91231 Model "IS314"

## APPLICATIONS

- IGBT/MOSFET Gate Drive
- UPS
- Industrial Inverters
- Switching Power Supplies
- AC and Brushless DC Motor Drives

## ORDER INFORMATION

- Supplied in 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 | 25mA |
| Forward Peak Current (Pulse Width ≤ 1µs, 300pps) | 1.0A |
| Reverse Voltage | 5V |
| Forward Current Rise / Fall Time | 500ns |
| Power dissipation | 45mW |
| **Output** | |
| High Level Peak Output Current Exponential waveform. Pulse width ≤ 0.3 µs, f ≤ 15 kHz | 1.5A |
| Low Level Peak Output Current Exponential waveform. Pulse width ≤ 0.3 µs, f ≤ 15 kHz | 1.5A |
| Total Supply Voltage ($V_{CC} - V_{EE}$) | 35V |
| Output Voltage | $V_{CC}$ |
| Power Dissipation | 600mW |
| Junction Temperture | 125°C |
| **Total Package** | |
| Isolation Voltage | $5000V_{RMS}$ |
| Total Power Dissipation | 645mW |
| Operating Temperature | −40 to 125°C |
| Storage Temperature | −55 to 125°C |
| Lead Soldering Temperature (10s) | 260°C |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## Truth Table

| LED | High side | Low Side | $V_O$ |
|---|---|---|---|
| OFF | OFF | ON | LOW |
| ON | ON | OFF | HIGH |

## Recommended Operating Conditions

| Parameter | Symbol | Min | Max | Unit |
|---|---|---|---|---|
| Operating Temperature | $T_A$ | −40 | 125 | °C |
| Supply Voltage | $V_{CC}$ | 10 | 30 | V |
| Input Current (ON) | $I_{F(ON)}$ | 7 | 12 | mA |
| Input Voltage (OFF) | $V_{F(OFF)}$ | −3.0 | 0.8 | V |

## ELECTRICAL CHARACTERISTICS (Typical Values at $V_{CC} - V_{EE}$ = 30V and $T_A$ = 25°C, Minimum and Maximum Values at Recommended Operating Conditions, unless otherwise specified)

### INPUT

| Parameter | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|
| Forward Voltage | $V_F$ | $I_F$ = 10mA | 1.2 | 1.37 | 1.8 | V |
| Forward Voltage Temperature Coefficient | $\Delta V_F/\Delta T$ | $I_F$ = 10mA | | −2.0 | | mV/°C |
| Reverse Voltage | $BV_R$ | $I_R$ = 10µA | 5 | | | V |
| Input Threshold Current (Low to High) | $I_{FLH}$ | $V_{CC}$ = 30V<br>$V_O$ > 5V | | 2.5 | 5 | mA |
| Input Threshold Voltage (High to Low) | $V_{FHL}$ | $V_{CC}$ = 30V<br>$V_O$ < 5V | 0.8 | | | V |
| Input Capacitance | $C_{IN}$ | $V_F$ = 0V, f = 1MHz | | 33 | | pF |

### OUTPUT

| Parameter | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|
| High Level Supply Current | $I_{CCH}$ | $I_F$ = 10mA, $V_{CC}$ = 30V<br>$V_O$ = Open | | 1.7 | 3 | mA |
| Low Level Supply Current | $I_{CCL}$ | $I_F$ = 0mA, $V_{CC}$ = 30V<br>$V_O$ = Open | | 2.0 | 3 | mA |
| High Level Output Current | $I_{OH}$ | $V_O = V_{CC} - 2V$<br>Maximum Pulse Width = 50µs | | | −0.4 | A |
| | | $V_O = V_{CC} - 6V$<br>Maximum Pulse Width = 10µs | | | −1.5 | A |
| Low Level Output Current | $I_{OL}$ | $V_O = V_{EE} + 2V$<br>Maximum Pulse Width = 50µs | 0.4 | | | A |
| | | $V_O = V_{EE} + 6V$<br>Maximum Pulse Width = 10µs | 1.5 | | | A |
| High Level Output Voltage | $V_{OH}$ | $I_F$ = 10mA, $I_O$ = −100mA | $V_{CC} - 0.6$ | $V_{CC} - 0.3$ | | V |
| Low Level Output Voltage | $V_{OL}$ | $I_F$ = 0mA, $I_O$ = 100mA | | $V_{EE} + 0.25$ | $V_{EE} + 0.4$ | V |
| UVLO Threshold | $V_{UVLO+}$ | $V_O$ > 5V, $I_F$ = 10mA | 6.9 | 7.8 | 8.7 | V |
| | $V_{UVLO-}$ | $V_O$ < 5V, $I_F$ = 10mA | 5.9 | 6.7 | 7.5 | V |
| UVLO Hysteresis | $UVLO_{HYS}$ | | | 1.1 | | V |

## ELECTRICAL CHARACTERISTICS (Typical Values at $V_{CC} - V_{EE}$ = 30V and $T_A$ = 25°C, Minimum and Maximum Values at Recommended Operating Conditions, unless otherwise specified)

### SWITCHING

| Parameter | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|
| Propagation Delay Time to High Output Level | $t_{PLH}$ | $I_F$ = 7 to 12mA<br>$V_{CC}$ = 15 to 30V<br>$V_{EE}$ = 0V<br>Rg = 47Ω<br>Cg = 3nF<br>f = 10kHz<br>Duty Cycle = 50% | 50 | 70 | 150 | ns |
| Propagation Delay Time to Low Output Level | $t_{PHL}$ | | 50 | 85 | 150 | |
| Pulse Width Distortion $\|t_{PHL} - t_{PLH}\|$ for any given Device | PWD | | | 15 | 70 | |
| Propagation Delay Difference between any two Devices | PDD | | −80 | | 80 | |
| Output Rise Time (10% to 90%) | $t_r$ | | | 35 | | |
| Output Fall Time (90% to 10%) | $t_f$ | | | 35 | | |
| Common Mode Transient Immunity at High Output Level | $\|CM_H\|$ | $I_F$ = 10 to 16mA,<br>$V_{CC}$ = 30V<br>$V_{CM}$ = 1500V<br>$T_A$ = 25°C | 35 | 50 | | kV/μs |
| Common Mode Transient Immunity at Low Output Level | $\|CM_L\|$ | $V_F$ = 0V<br>$V_{CC}$ = 30V<br>$V_{CM}$ = 1500V<br>$T_A$ = 25°C | 35 | 50 | | kV/μs |

**Notes :**

1. A 0.1uF bypass capacitor must be connected across pin 6 and pin 4.
2. PDD is the difference between $t_{PHL}$ and $t_{PLH}$ between any two devices under same test conditions.
3. $CM_H$, Common Mode Transient Immunity in High stage is the maximum tolerable positive $dV_{CM}/dt$ on the leading edge of the common mode impulse signal, $V_{CM}$, to assure that the output will remain high ($V_O$ > 15V).
4. $CM_L$, Common Mode Transient Immunity in Low stage is the maximum tolerable negative $dV_{CM}/dt$ on the trailing edge of the common mode impulse signal, $V_{CM}$, to assure that the output will remain low ($V_O$ < 1V).

## ELECTRICAL CHARACTERISTICS (Typical Values at $V_{CC} - V_{EE}$ = 10V to 30V and $T_A$ = 25°C, Minimum and Maximum Values at Recommended Operating Conditions, unless otherwise specified)

## ISOLATION (Typical Values at $T_A$ = 25°C)

| Parameter | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|
| Isolation Voltage | $V_{ISO}$ | RH ≤ 40% to 60%, t = 1 min, $T_A$ = 25°C | 5000 | | | V |
| 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 | | 0.92 | | pF |

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

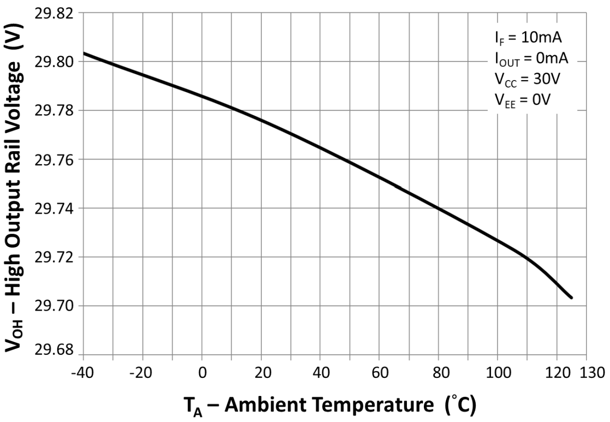



**Fig 1 High Output Rail Voltage vs Ambient Temperature**

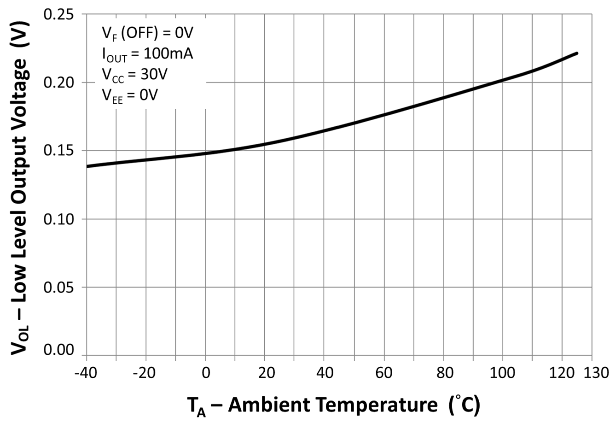



**Fig 2 Low Level Output Voltage vs Ambient Temperature**

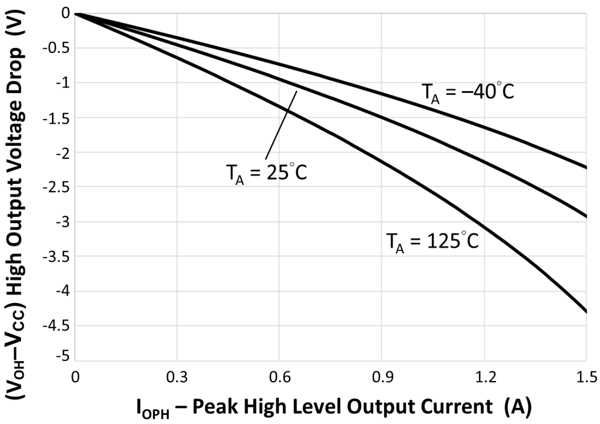



**Fig 3 High Output Voltage Drop vs Peak High Level Output Current**

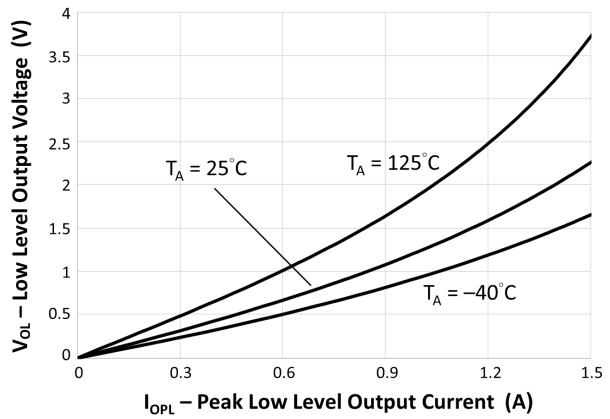



**Fig 4 Low Level Output Voltage vs Peak Low Level Output Current**

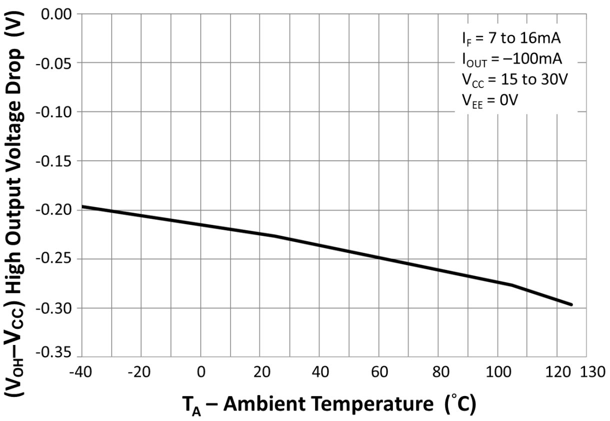



**Fig 5 High Level Output Voltage Drop vs Ambient Temperature**

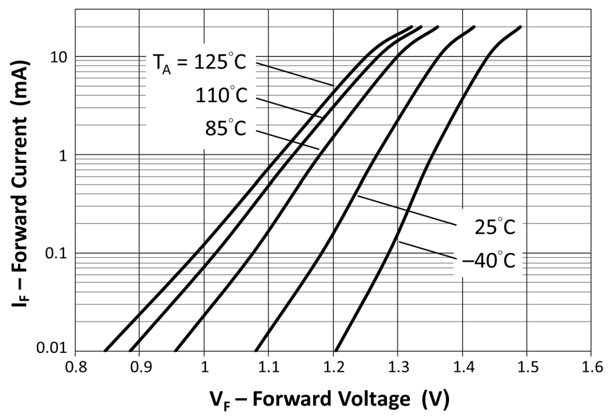



**Fig 6 Forward Current vs Forward Voltage**

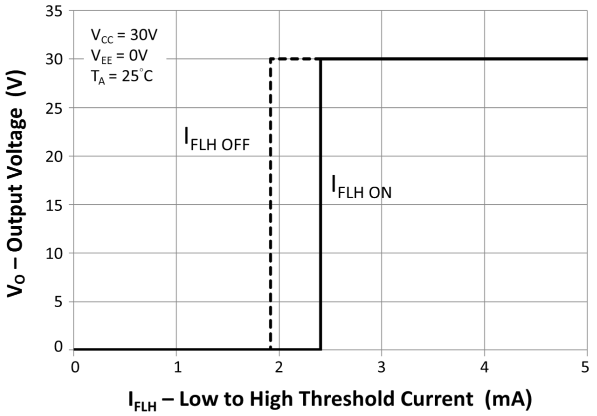



Fig 7 $I_{FLH}$ Hysteresis

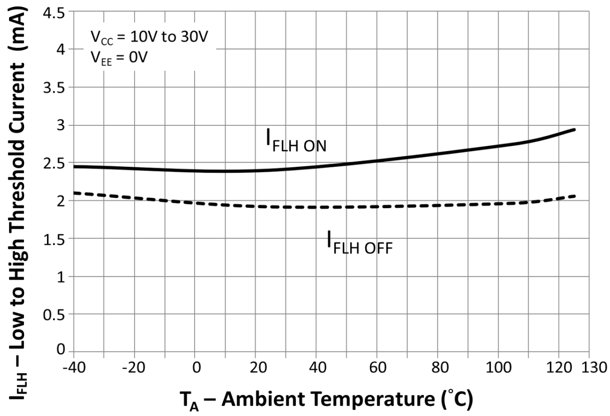



Fig 8 $I_{FLH}$ vs Ambient Temperature

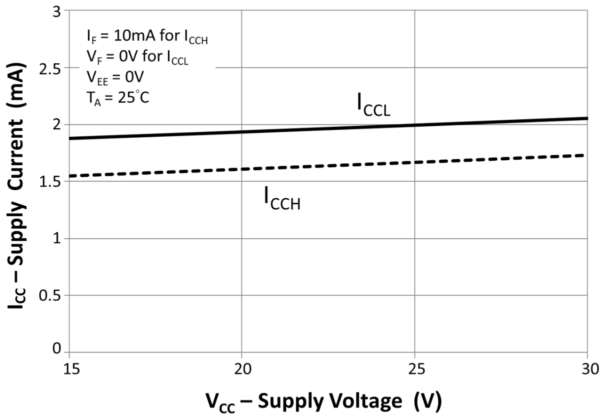



Fig 9 Supply Current vs Supply Voltage

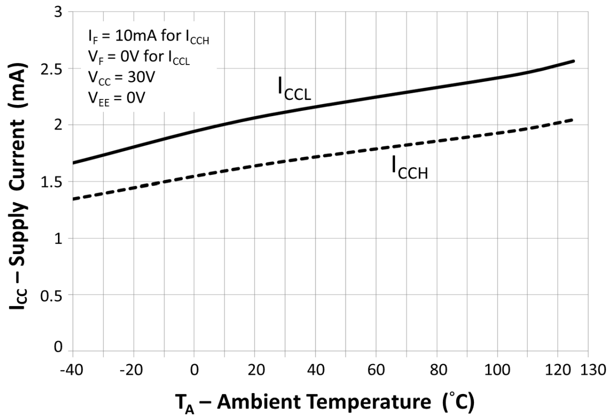



Fig 10 Supply Current vs Ambient Temperature

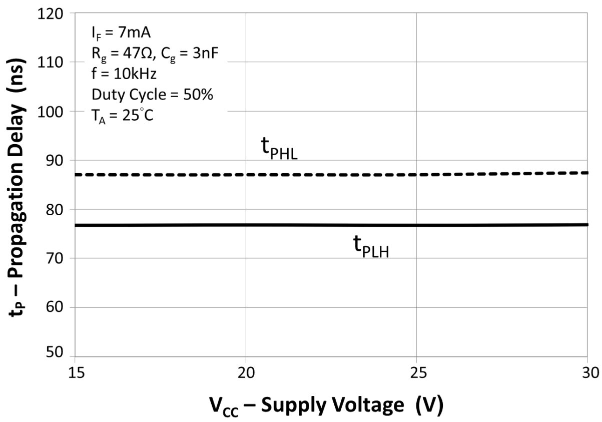



Fig 11 Propagation Delay vs Supply Voltage

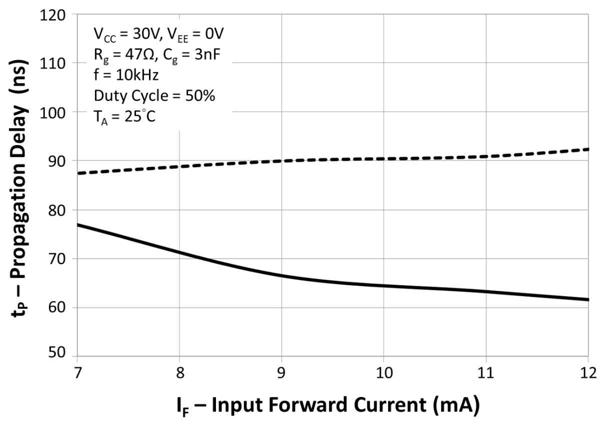



Fig 12 Propagation Delay vs Forward Current

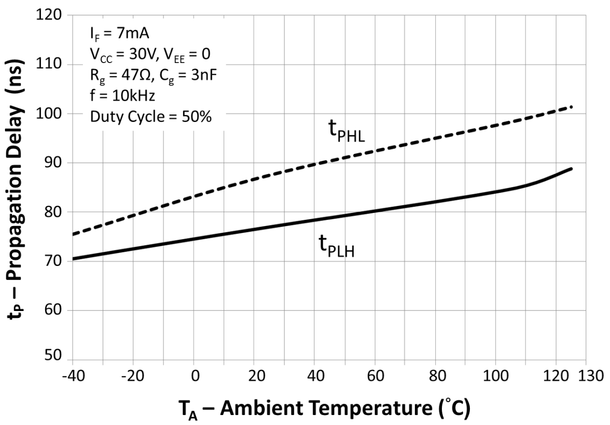
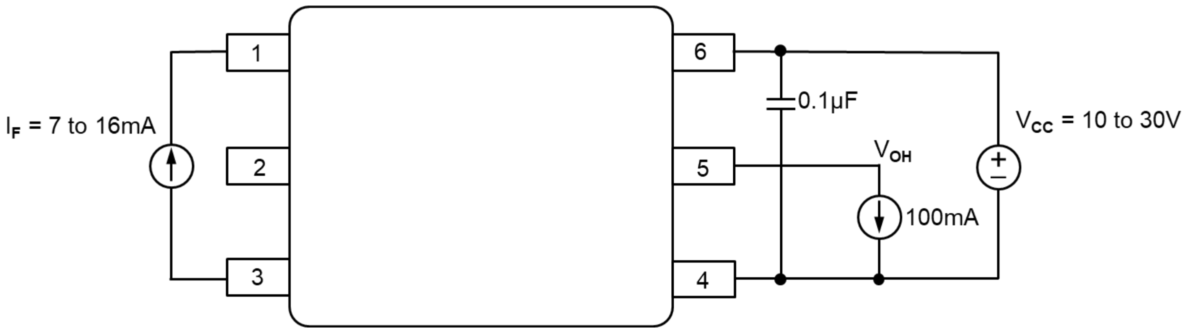
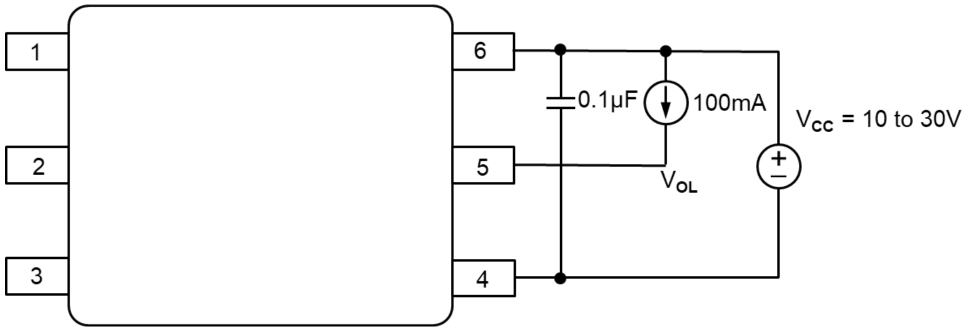


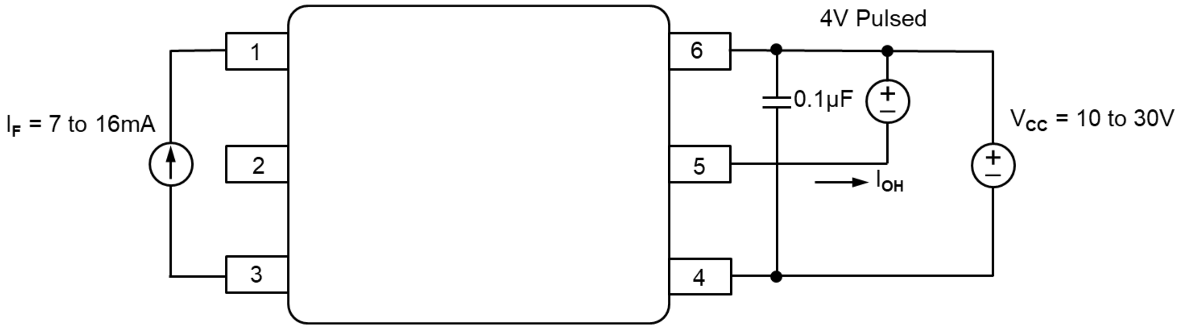

**Fig 13 Propagation Delay vs Ambient Temperature**



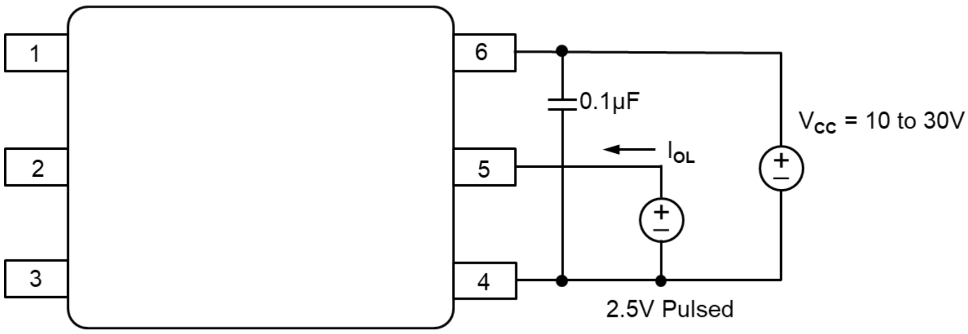

**$V_{OH}$ Test Circuit**



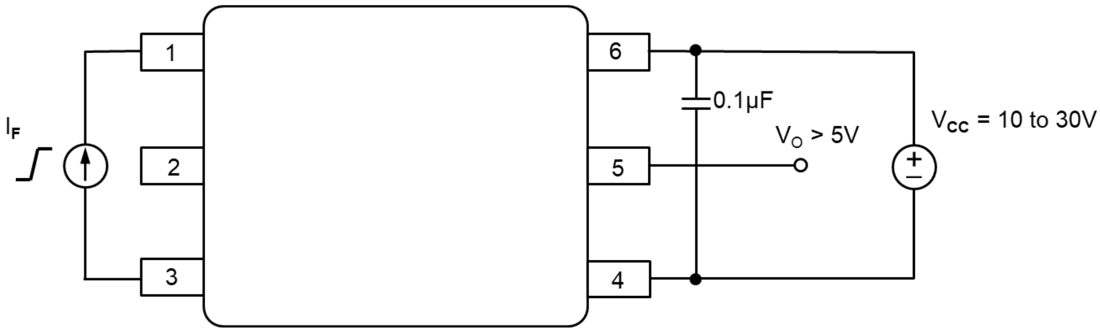

**$V_{OL}$ Test Circuit**



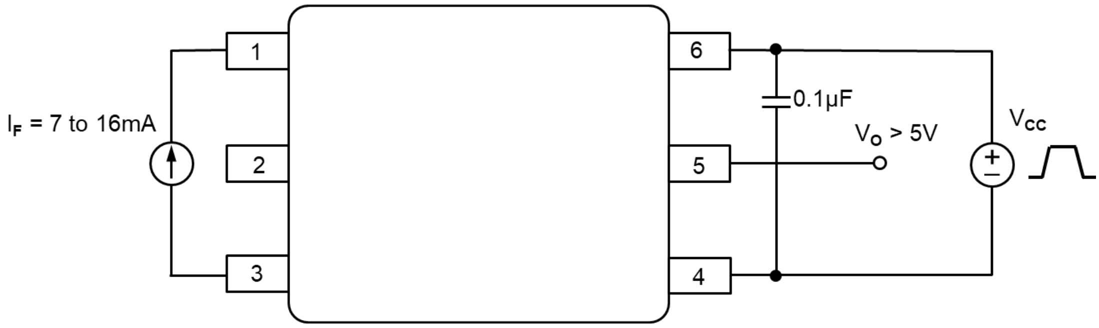

**$I_{OH}$ Test Circuit**



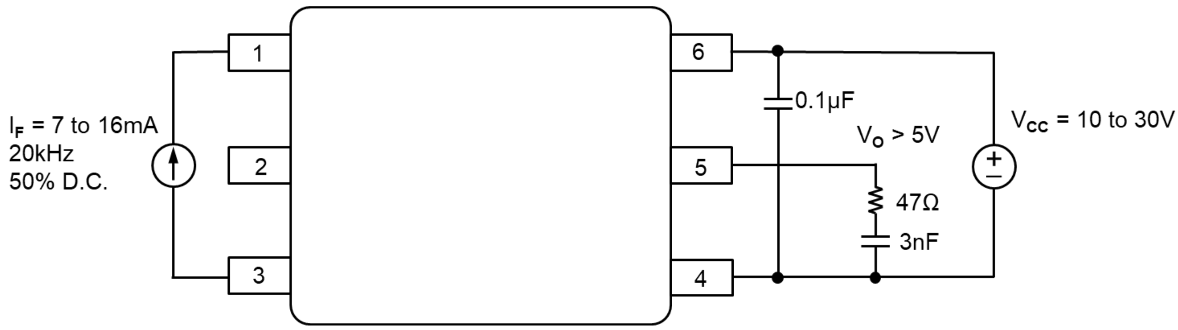

**$I_{OL}$ Test Circuit**

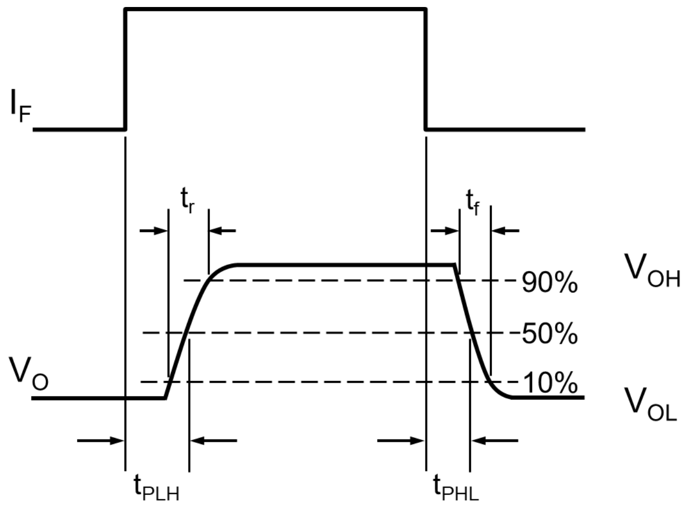



**$I_{FLH}$ Test Circuit**

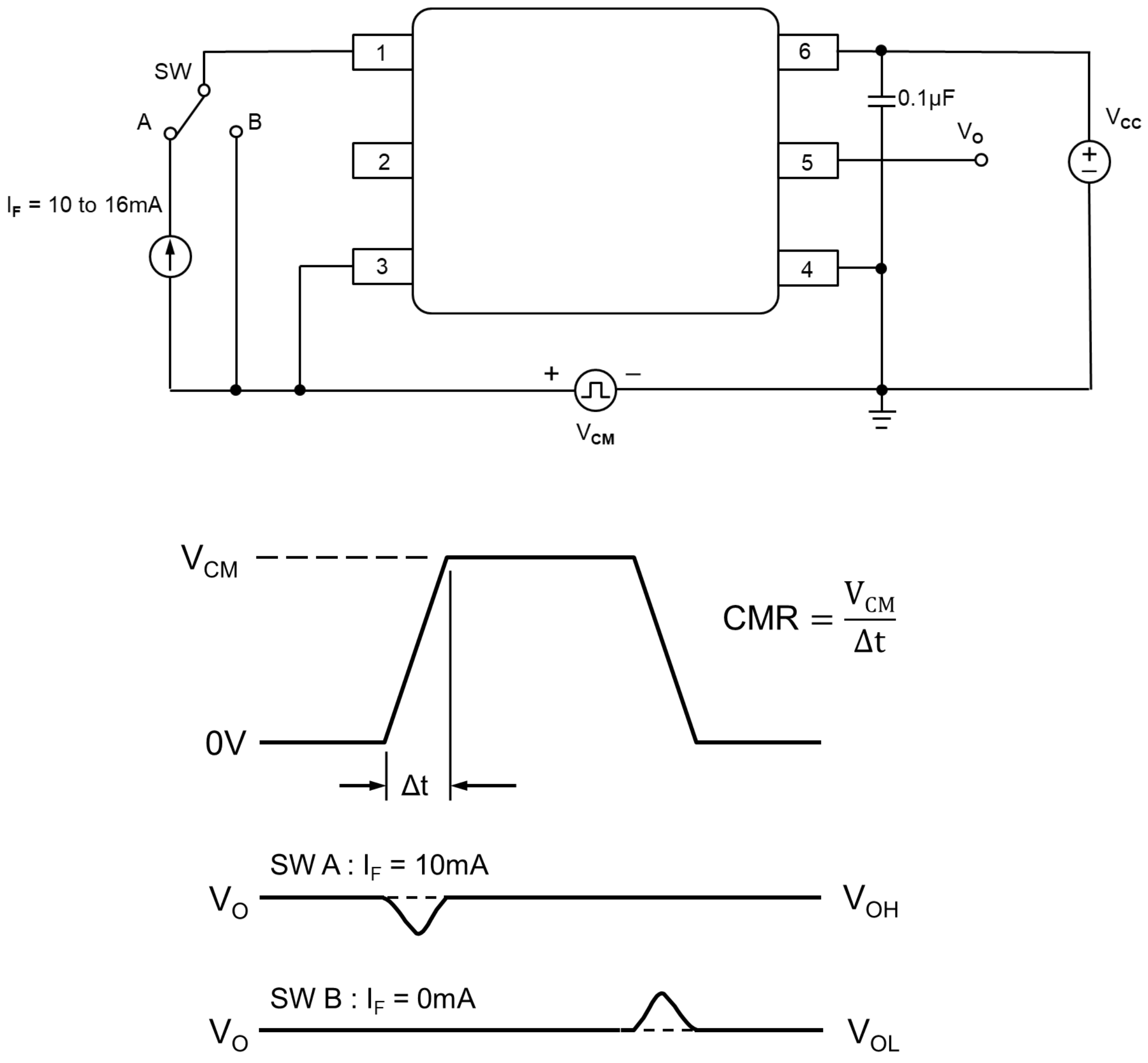



**UVLO Test Circuit**




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




**CMR Test Circuit and Waveform**

# IS314P

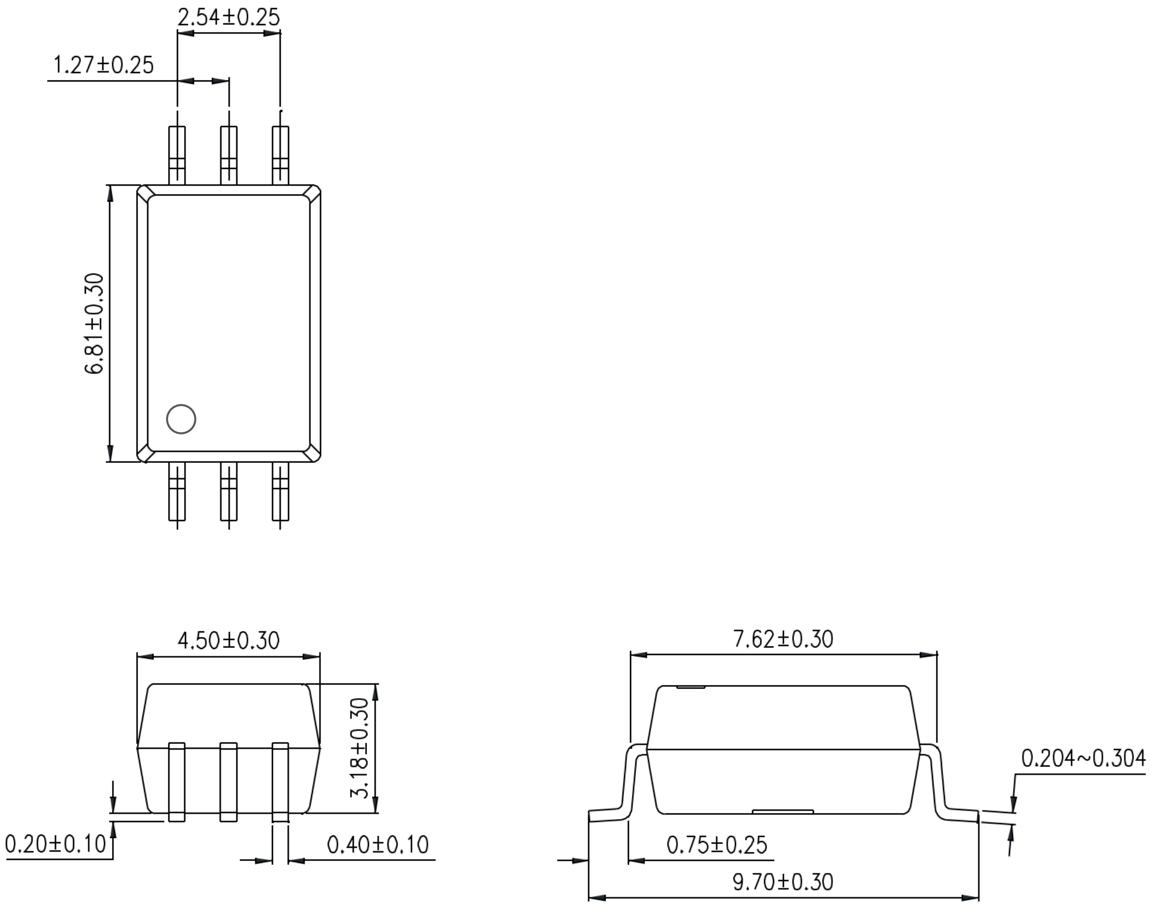
## ORDER INFORMATION

| IS341P | | | |
|---|---|---|---|
| **After PN** | **PN** | **Description** | **Packing quantity** |
| None | IS314P | Stretched SO6 | 1000 pcs per reel |

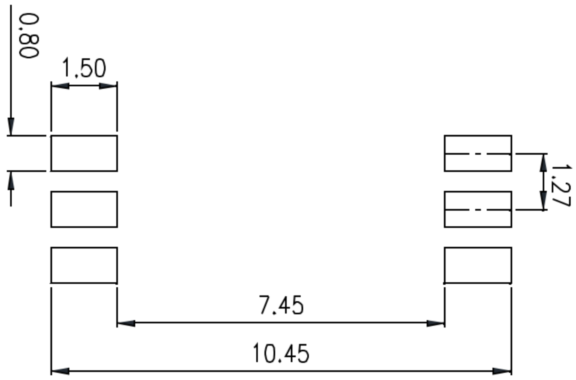
## DEVICE MARKING


| | |
|---|---|
| IS314 | Device Part Number |
| **I** | Isocom |
| YY | 2 digit Year code |
| WW | 2 digit Week code |

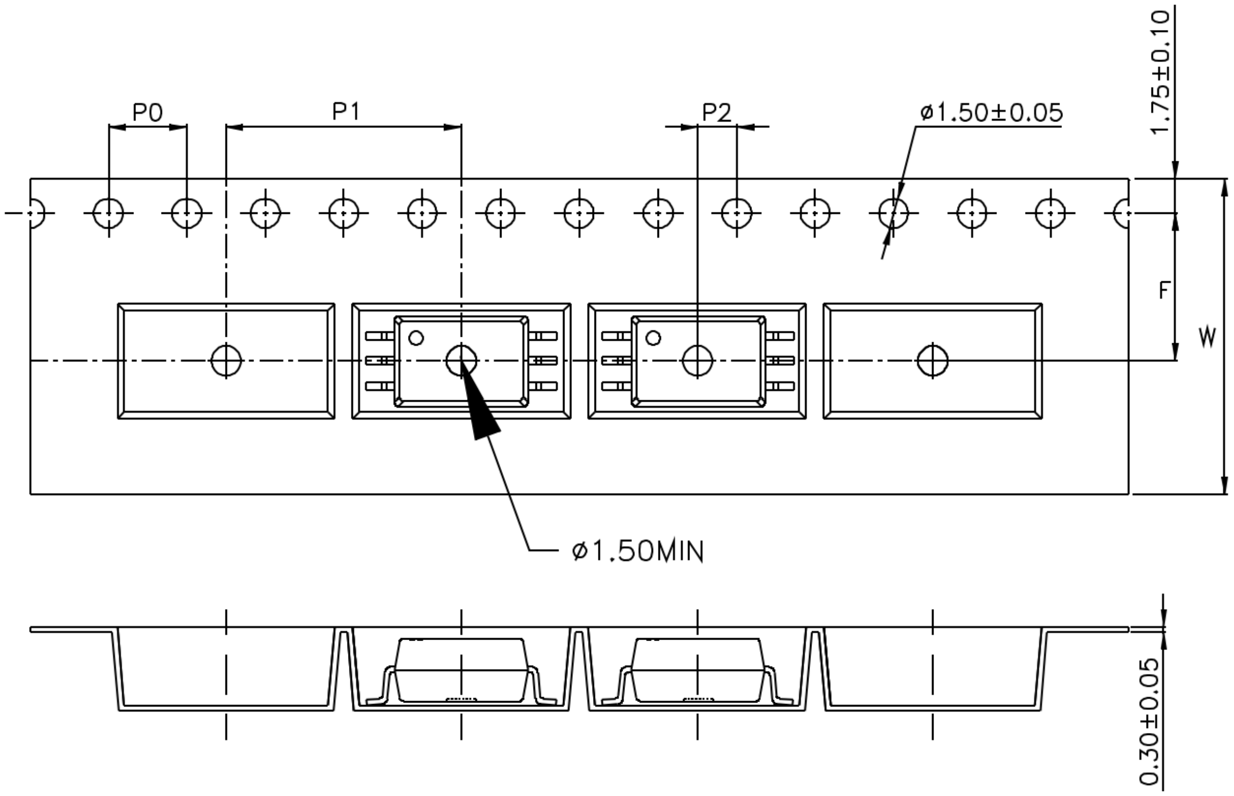
## PACKAGE DIMENSIONS (mm)




## RECOMMENDED PAD LAYOUT (mm)

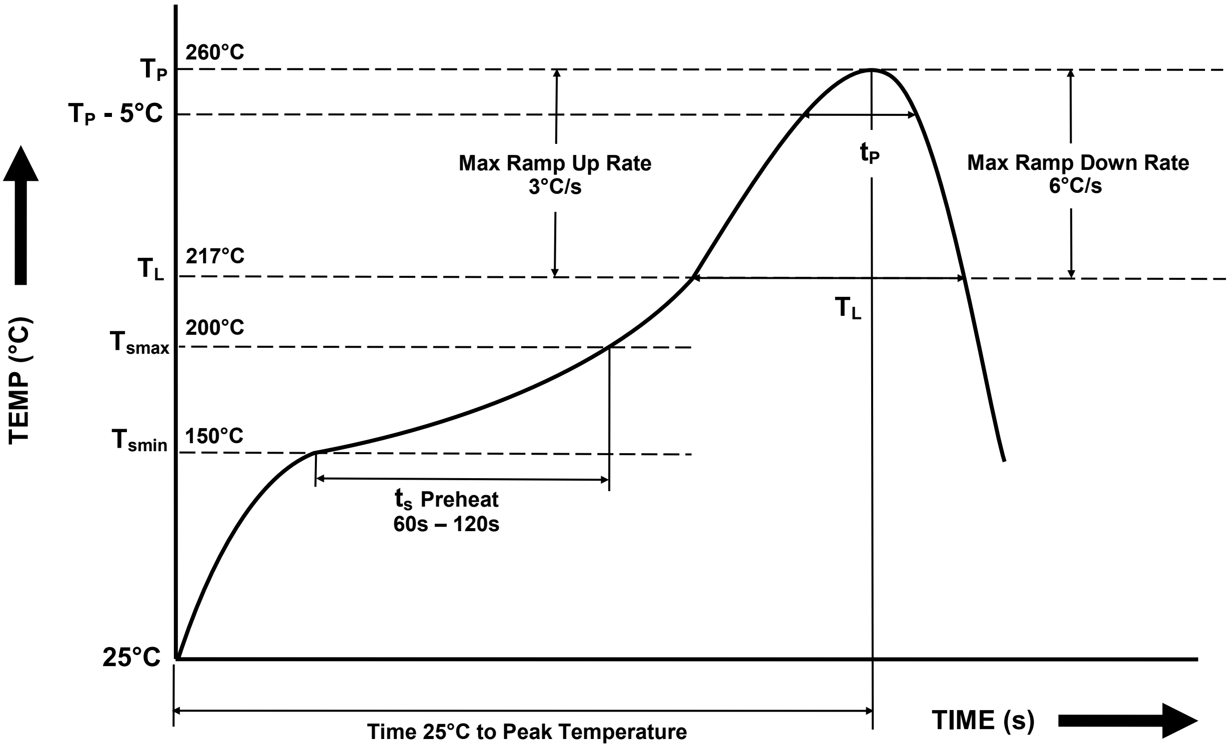


## TAPE AND REEL PACKAGING




| **Description** | **Symbol** | **Dimension mm (inch)** |
|---|---|---|
| Tape Width | W | 16 ± 0.3 (0.63) |
| Pitch of Sprocket Holes | $P_0$ | 4 ± 0.1 (0.16) |
| Distance of Compartment to Sprocket Holes | F | 7.5 ± 0.1 (0.3) |
| | $P_2$ | 2 ± 0.1 (0.079) |
| Distance of Compartment to Compartment | $P_1$ | 12 ± 0.1 (0.47) |

**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 |

ISOCOM COMPONENTS

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