

#### **DESCRIPTION**

The IS314W Photocoupler is ideally suited for driving power IGBTs and MOSFETs used in inverters of motor control and of power supply system. It contains an AlGaAs LED optically coupled to an integrated circuit with a power output stage.

The device is in Stretched SO6 package.

#### **FEATURES**

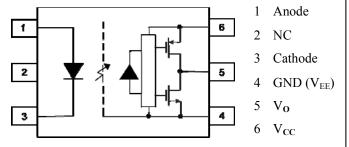
- 1.0A Maximum Peak Output Current
- 0.8A Minimum Peak Output Current
- Rail-to-Rail output voltage
- 20kV/μs Minimum Common Mode Rejection at V<sub>CM</sub> 1500V
- Maximum Propagation Delay 200ns
- Maximum Propagation Delay Difference 100ns
- Wide Operating Voltage Range V<sub>CC</sub> 10 to 30 V
- Maximum Supply Current I<sub>CC</sub> 3.0mA
- Under Voltage Lock Out (UVLO) Protection with Hysteresis
- Guaranteed Performance over Temperature Range - 40°C to +105°C
- MSL Level 1
- Lead Free and RoHS Compliant
- Safety Approvals Pending

#### **APPLICATIONS**

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

#### ORDER INFORMATION

Supplied in Tape & Reel



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

#### 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

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High Level Peak Output Current Exponential waveform. Pulse width ≤ 0.3 μs, f ≤ 15 kHz	1.0A
Low Level Peak Output Current Exponential waveform. Pulse width ≤ 0.3 µs, f ≤ 15 kHz	1.0A
Supply Voltage $(V_{CC} - V_{EE})$	35V
Output Voltage	$V_{\text{CC}}$
Power Dissipation	250mW

#### **Total Package**

Isolation Voltage	$5000V_{\text{RMS}}$
Total Power Dissipation	295mW
Operating Temperature	-40 to 105 °C
Storage Temperature	-55 to 125 °C
Lead Soldering Temperature (10s)	260°C

#### **ISOCOM COMPONENTS 2004 LTD**

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### **Truth Table**

LED	High Side	Low Side	Vo
OFF	OFF	ON	LOW
ON	ON	OFF	HIGH

## **Recommended Operating Conditions**

Parameter	Symbol	Min	Max	Unit
Operating Temperature	$T_{A}$	- 40	105	°C
Supply Voltage	$V_{CC} - V_{EE}$	10	30	V
Input Current (ON)	$I_{F(ON)}$	7	16	mA
Input Voltage (OFF)	$V_{F(OFF)}$	-3.0	0.8	V



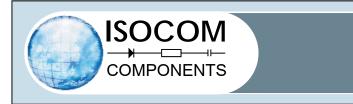
# **ELECTRICAL CHARACTERISTICS** (Typical Values at $V_{CC} - V_{EE} = 10V$ to 30V and $T_A = 25$ °C, Minimum and Maximum Values at Recommended Operating Conditions, unless otherwise specified)

### **INPUT**

Parameter	Symbol	Test Condition	Min	Тур.	Max	Unit
Forward Voltage	$V_{\mathrm{F}}$	$I_F = 10 \text{mA}$	1.2	1.37	1.8	V
Forward Voltage Temperature Coefficient	$\Delta V_{\rm F}/\Delta T$	$I_F = 10$ mA		-1.237		mV/°C
Reverse Voltage	$V_R$	$I_R = 10\mu A$	5			V
Input Threshold Current (Low to High)	$I_{FLH}$	$V_{O} > 5V, I_{O} = 0A$		1.9	5	mA
Input Threshold Voltage (High to Low)	$ m V_{FHL}$	$V_0 < 5V, I_0 = 0A$	0.8			V
Input Capacitance	$C_{IN}$	$V_F = 0V$ , $f = 1MHz$		33		pF

OUTDUT

Parameter	Symbol	Test Condition	Min	Тур.	Max	Unit
High Level Supply Current	I <sub>CCH</sub>	$I_F = 7 \text{ to } 16\text{mA}$ $V_O = \text{Open}$		1.9	3.0	mA
Low Level Supply Current	$I_{CCL}$	$V_F = -3 \text{ to } 0.8V$ $V_O = \text{Open}$		2.1	3.0	mA
High Level Output Current	$I_{OH}$	$V_O = V_{CC} - 1.5V$ Pulse Width = 50 $\mu$ s			- 0.3	A
		$V_{\rm O} = V_{\rm CC} - 3V$ Pulse Width = 10 $\mu$ s			- 0.8	
Low Level Output Current	$I_{OL}$	$V_{O} = V_{EE} + 1.5V$ Pulse Width = 50 $\mu$ s	0.3			A
		$V_{O} = V_{EE} + 3V$ Pulse Width = 10 $\mu$ s	0.8			
High Level Output Voltage	$V_{OH}$	$I_F = 10 \text{mA}, I_O = -100 \text{mA}$	V <sub>CC</sub> -0.6	V <sub>CC</sub> -0.35		V
Low Level Output Voltage	V <sub>OL</sub>	$I_F = 0mA, I_O = 100mA$		V <sub>EE</sub> +0.25	V <sub>EE</sub> +0.4	V
UVLO Threshold	V <sub>UVLO+</sub>	$V_{O} > 5V, I_{F} = 10mA$		7.8		V
	V <sub>UVLO-</sub>	$V_{O} < 5V, I_{F} = 10mA$		6.7		V
UVLO Hysteresis	UVLO <sub>HYS</sub>			1.1		V



# **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)

### **SWITCHING**

Parameter	Symbol	Test Condition	Min	Тур.	Max	Unit
Propagation Delay Time to High Output Level	$t_{\rm PLH}$	$I_F = 7 \text{ to } 16\text{mA},$ $V_{CC} = 15 \text{ to } 30\text{V},$ $V_{FF} = 0\text{V}$	50	120	200	ns
Propagation Delay Time to Low Output Level	$t_{\mathrm{PHL}}$	$Rg = 47\Omega,$ $Cg = 3nF,$	50	110	200	
Pulse Width Distortion  t <sub>PHL</sub> - t <sub>PLH</sub>   for any given device	PWD	f = 10kHz, Duty Cycle = 50%		20	70	
Propagation Delay Difference (t <sub>PHL</sub> - t <sub>PLH</sub> ) between any two Devices	PDD		-100		100	
Output Rise Time (10% to 90%)	t <sub>r</sub>			35		
Output Fall Time (90% to 10%)	$t_{ m f}$			35		
Common Mode Transient Immunity at High Output Level	$CM_H$	$I_F = 10 \text{ to } 16\text{mA},$ $V_{CC} = 30\text{V}$ $V_{CM} = 1500\text{V},$ $T_A = 25^{\circ}\text{C}$	20	25		kV/μs
Common Mode Transient Immunity at Low Output Level	$CM_L$	$V_F = 0V,$ $V_{CC} = 30V$ $V_{CM} = 1500V,$ $T_A = 25^{\circ}C$	20	25		kV/μs



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

#### **ISOLATION**

Parameter	Symbol	Test Condition	Min	Тур.	Max	Unit
Insulation Voltage	$V_{\rm ISO}$	RH $\leq 40\%$ to 60%, t = 1 min, T <sub>A</sub> = 25°C	5000			V
Input - Output Resistance	$R_{\text{I-O}}$	$V_{I-O} = 500 VDC$		10 <sup>12</sup>		Ω
Input - Output Capacitance	$C_{\text{I-O}}$	$f = 1MHz$ , $T_A = 25$ °C		0.92		pF

#### Note:

- 1. A 0.1uF or bigger bypass capacitor must be connected across pin 6 and pin 4.
- 2. PDD is the difference of t<sub>PHL</sub> and t<sub>PLH</sub> between any two IS314W devices under same test conditions.
- $CM_{H}$ , 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 ( $V_0 > 15V$ ). 3.
- CM<sub>L</sub>, Common Mode Transient Immunity in Low stage is the maximum tolerable negative dV<sub>CM</sub>/dt on the trailing edge of the common mode impulse signal,  $V_{CM}$ , to assure that the output will remain low ( $V_0 < 1V$ ).



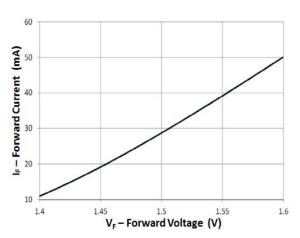


Fig 1 Forward Current vs Forward Voltage

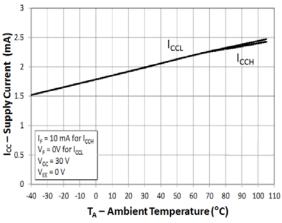


Fig 3 Supply Current vs Ambient Temperature

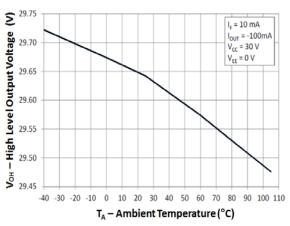


Fig 5 High Level Output Voltage vs Ambient Temperature

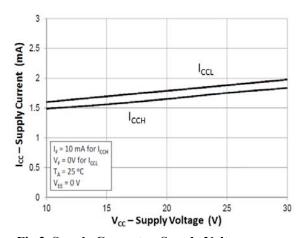


Fig 2 Supply Current vs Supply Voltage

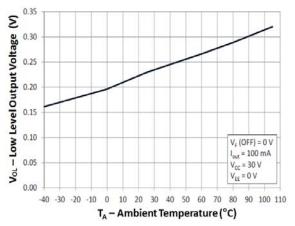


Fig 4 Low Level Output Voltage vs Ambient temperature

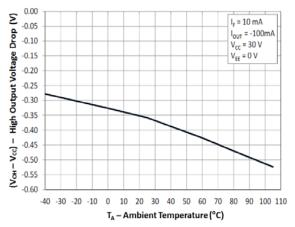


Fig 6 High Output Voltage Drop vs Ambient Temperature



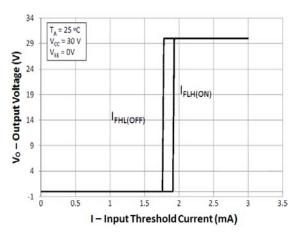


Fig 7 I<sub>FLH</sub> Hysteresis

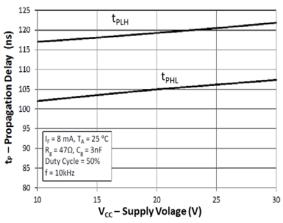


Fig 9 Propagation Delay vs Supply Voltage

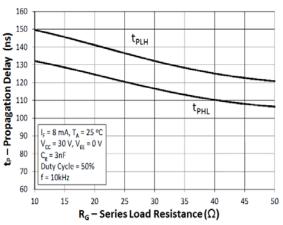


Fig 11 Propagation Delay vs Series Load Resistance

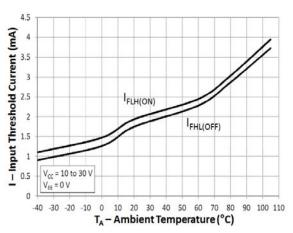


Fig 8 Input Threshold Current vs Ambient Temperature

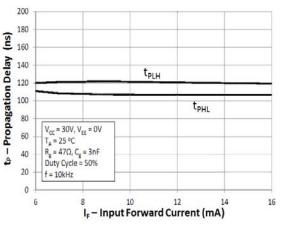


Fig 10 Propagation Delay vs Forward Current

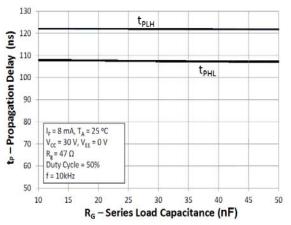


Fig 12 Propagation Delay vs Series Load Capacitance



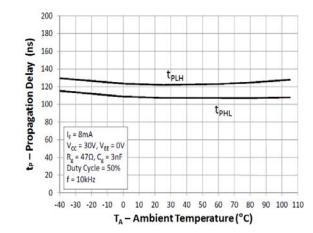
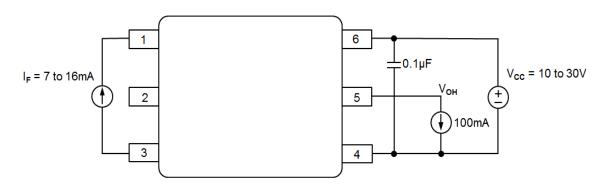
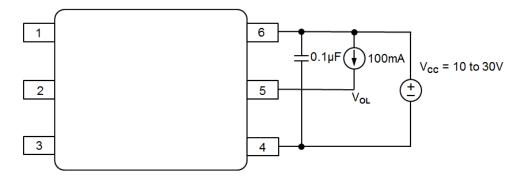


Fig 13 Propagation Delay vs Ambient Temperature

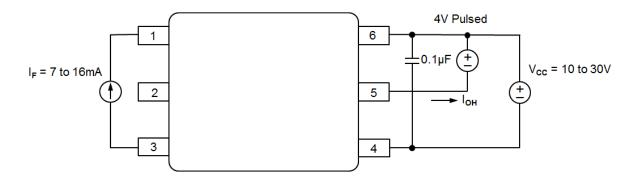


 $V_{OH}$  Test Circuit

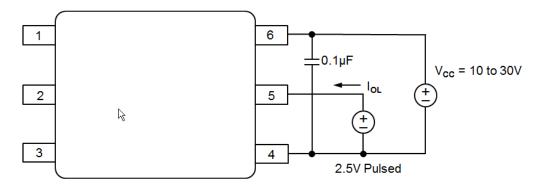


 $V_{OL} \ Test \ Circuit$ 

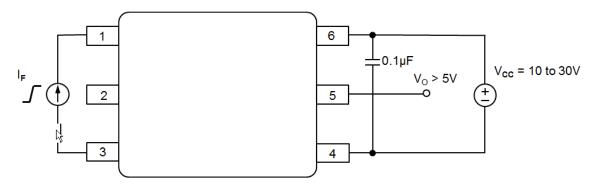




I<sub>OH</sub> Test Circuit

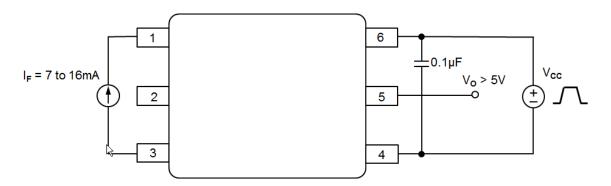


I<sub>OL</sub> Test Circuit

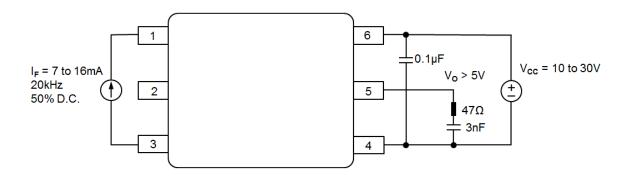


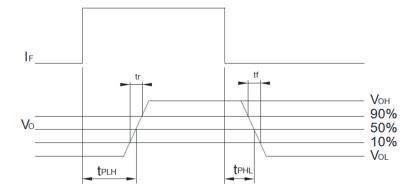
I<sub>FLH</sub> Test Circuit





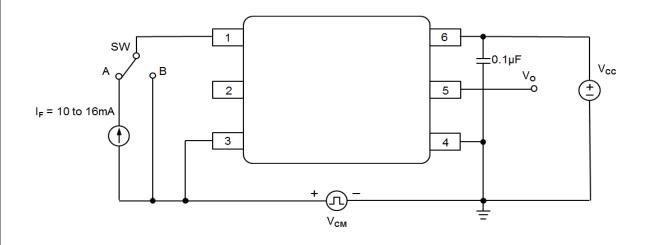
#### **UVLO Test Circuit**

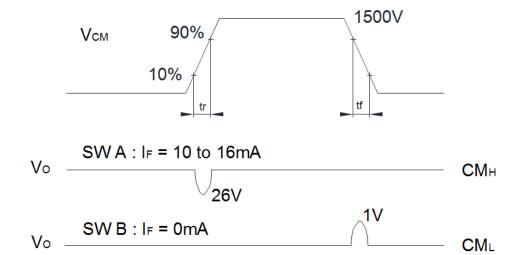




 $t_{r},\,t_{f},\,t_{PLH}$  and  $t_{PHL}$  Test Circuit and Waveform







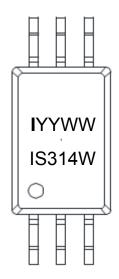
**CMR Test Circuit and Waveform** 



### **ORDER INFORMATION**

IS314W			
After PN	PN	Description	Packing quantity
None	IS314W	Stretched SO6	1000 pcs per reel

### **DEVICE MARKING**



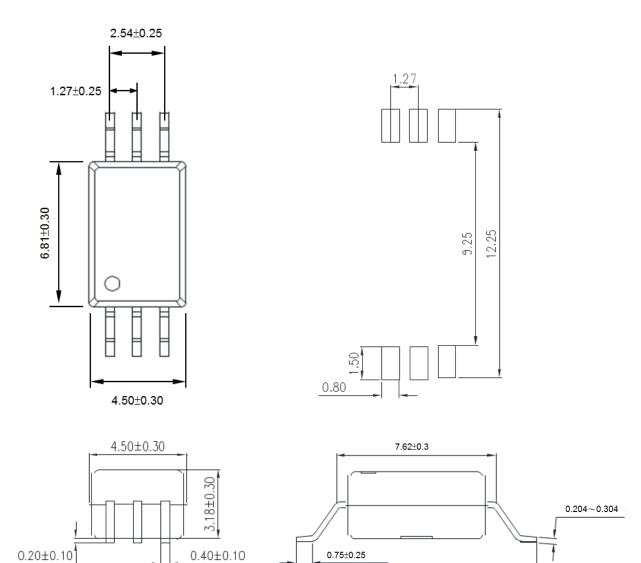
IS314W denotes Device Part Number

I denotes Isocom

YY denotes 2 digit Year code WW denotes 2 digit Week code



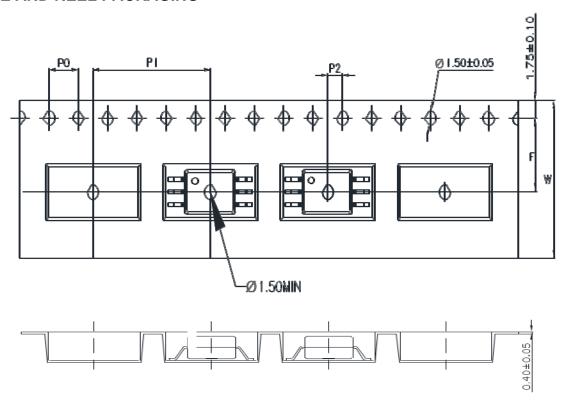
## PACKAGE DIMENSIONS and Recommended PCB Pad Layout in mm (inch)



11.50±0.30



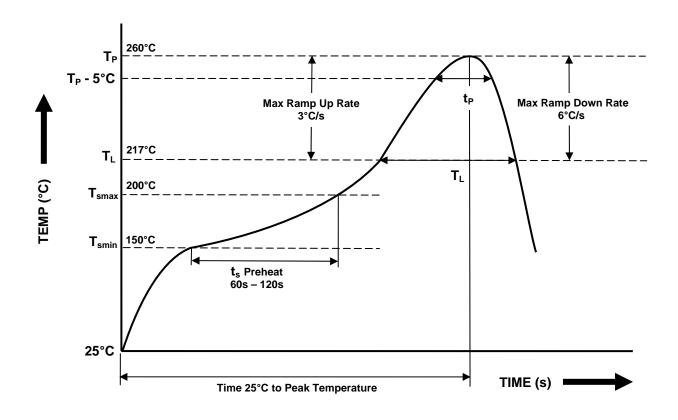
### **TAPE AND REEL PACKAGING**



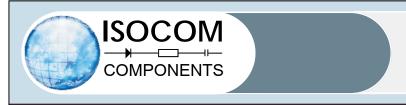
Description	Symbol	Dimension mm (inch)
Tape Width	W	16 ± 0.3 (0.63)
Pitch of Sprocket Holes	P <sub>0</sub>	4 ± 0.1 (0.16)
Distance of Compartment to Sprocket Holes	F	7.5 ± 0.1 (0.3)
Distance of Compartment to Sprocket Holes	P <sub>2</sub>	2 ± 0.1 (0.079)
Distance of Compartment to Compartment	P <sub>1</sub>	16 ± 0.1 (0.63)



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



Profile Details	Conditions
$ \begin{array}{l} \textbf{Preheat} \\ \textbf{- Min Temperature } (T_{SMIN}) \\ \textbf{- Max Temperature } (T_{SMAX}) \\ \textbf{- Time } T_{SMIN} \text{ to } T_{SMAX} \left(t_s\right) \end{array} $	150°C 200°C 60s - 120s
$\begin{tabular}{lll} \textbf{Soldering Zone} \\ - & \begin{tabular}{l} - & \begin{tabular}{l} \textbf{Peak Temperature} & \begin{tabular}{l} - & \begin{tabular}{l} \textbf{Iime at Peak Temperature} & \begin{tabular}{l} - & \begin{tabular}{l} \textbf{Iime at Peak Temperature} & \begin{tabular}{l} \textbf{Iime Temperature} & \begin{tabular}{l} \textbf{Iime Maintained} & \begin{tabular}{l} Iime Main$	260°C 10s max 217°C 30s max 60s - 100s 3°C/s max 6°C/s max
Average Ramp Up Rate (T <sub>smax</sub> to T <sub>P</sub> )	3°C/s max
Time 25°C to Peak Temperature	8 minutes max



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- 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.



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