



# THE DATASHEET OF IS480P





## IS480P

### DESCRIPTION

The IS480P High Speed Photocoupler contains a AlGaAs LED and Photo detector with built-in Schmitt Trigger to provide logic-compatible waveforms, eliminating the need for additional wave shaping.

The totem pole output eliminates the need for a pull up resistor and allows for direct Intelligent Power Module Drive or Gate Drive. Minimized Propagation Delay difference between devices makes this photocoupler excellent solutions for improving inverter efficiency through reduced switching dead time.

The device is in Stretched SO6 package.

### FEATURES

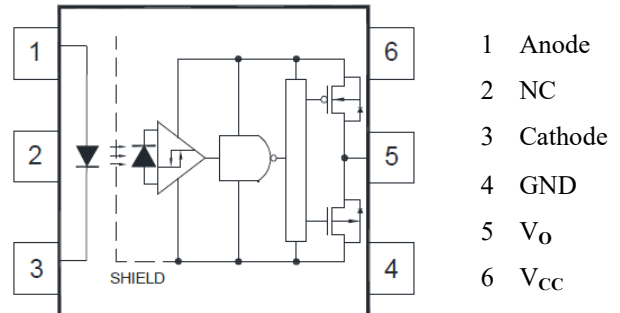
- Totem Pole Output
- Wide Operating Voltage Range  
 $V_{CC}$  4.5V to 30V
- Operating Temperature Range  
- 40°C to +105°C
- Performance specified for Common IPM Applications over Industrial Temperature range.
- Maximum Propagation Delays  
 $t_{PLH} / t_{PHL} : 200ns / 220ns$
- Propagation Delay Difference  
Min / Max : -210ns / 210ns
- Maximum Pulse Width Distortion  
PWD : 120ns
- Hysteresis
- 20kV/ $\mu s$  Minimum Common Mode Rejection at  $V_{CM}$  1500V
- Lead Free and RoHS Compliant
- Safety Approvals Pending

### APPLICATIONS

- Isolated IGBT/MOSFET Gate Drive
- IPM Interface Isolation
- Industrial Inverters
- AC Brushless and DC Motor Drives
- Digital Isolation

### ORDER INFORMATION

- Supply in Tape & Reel



A 0.1 $\mu F$  bypass Capacitor must be connected between Pins 6 and 4.

### ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ C$ )

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	10mA
Forward Peak Current (Pulse Width < 1 $\mu s$ , 300pps)	1.0A
Reverse Voltage	5V

#### Output

Output Current	50mA
Output Voltage	-0.5V to 35V
Supply Voltage	35V

#### Total Package

Isolation Voltage	5000V <sub>RMS</sub>
Total Power Dissipation	145mW
Operating Temperature	-40 to 105 °C
Storage Temperature	-55 to 125 °C
Lead Soldering Temperature (10s)	260°C

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## IS480P

### Truth Table

LED	V <sub>o</sub>
ON	HIGH
OFF	LOW

### Recommended Operating Conditions

Parameter	Symbol	Min	Max	Unit
Operating Temperature	T <sub>A</sub>	- 40	105	°C
Supply Voltage	V <sub>CC</sub>	4.5	30	V
Input Current (ON)	I <sub>F(ON)</sub>	1.6	5	mA
Input Voltage (OFF)	V <sub>F(OFF)</sub>		0.8	V

**Note :**

- 1: Photo Detector requires a V<sub>CC</sub> of 4.5 V or higher for stable operation as output might be unstable if V<sub>CC</sub> is lower than 4.5 V.
- 2: The initial switching threshold is 1.6 mA or less. It is recommended that 2.2 mA be used to permit a guard band.



## IS480P

**ELECTRICAL CHARACTERISTICS** (Over Recommended Operating Conditions,  
 $V_{CC} = 4.5V$  to  $30V$ ,  $I_{F(ON)} = 1.6mA$  to  $5mA$ ,  $V_{F(OFF)} = 0V$  to  $0.8V$ ,  
 $T_A = -40^{\circ}C$  to  $105^{\circ}C$ , unless otherwise specified.  
 Typical Values at  $T_A = 25^{\circ}C$ )

### INPUT

Parameter	Symbol	Test Condition	Min	Typ.	Max	Unit
Forward Voltage	$V_F$	$I_F = 5mA$	1.2	1.33	1.6	V
Forward Voltage Temperature Coefficient	$\Delta V_F / \Delta T$	$I_F = 5mA$		-1.237		mV/ $^{\circ}C$
Reverse Voltage	$V_R$	$I_R = 10\mu A$	5			V
Input Threshold Current (Low to High)	$I_{FLH}$			0.7	1.5	mA
Input Threshold Voltage (High to Low)	$V_{FHL}$		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	$I_{CCH}$	$V_{CC} = 5.5V$ , $I_F = 5mA$ $I_O = 0mA$			3.0	mA
		$V_{CC} = 30V$ , $I_F = 5mA$ $I_O = 0mA$		1.9	3.0	
Low Level Supply Current	$I_{CCL}$	$V_{CC} = 5.5V$ , $V_F = 0V$ $I_O = 0mA$			3.0	mA
		$V_{CC} = 30V$ , $V_F = 0V$ $I_O = 0mA$		2.0	3.0	
High Level Short Circuit Output Current	$I_{OSH}$	$V_{CC} = 5.5V$ , $I_F = 5mA$ , $V_O = GND$ Duration $< 500\mu s$			-160	mA
		$V_{CC} = 20V$ , $I_F = 5mA$ , $V_O = GND$ Duration $< 500\mu s$			-200	
Low Level Short Circuit Output Current	$I_{OSL}$	$V_O = V_{CC} = 5.5V$ , $V_F = 0V$ Duration $< 500\mu s$	160			mA
		$V_O = V_{CC} = 20V$ , $V_F = 0V$ Duration $< 500\mu s$	200			
High Level Output Voltage	$V_{OH}$	$I_{OH} = -6.5mA$	$V_{CC} - 0.5$	$V_{CC} - 0.025$		V
Low Level Output Voltage	$V_{OL}$	$I_{OL} = 6.5mA$		0.015	0.5	V



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**ELECTRICAL CHARACTERISTICS** (Over Recommended Operating Conditions,  
 $V_{CC} = 4.5V$  to  $30V$ ,  $I_{F(ON)} = 1.6mA$  to  $5mA$ ,  $V_{F(OFF)} = 0V$  to  $0.8V$ ,  
 $T_A = -40^{\circ}C$  to  $105^{\circ}C$ , unless otherwise specified.  
 Typical Values at  $T_A = 25^{\circ}C$ )

### SWITCHING

Parameter	Symbol	Test Condition	Min	Typ.	Max	Unit
Propagation Delay Time to High Output Level	$t_{PLH}$	$V_F = 0V \rightarrow I_{F(ON)} = 1.6mA$ $C_L = 100pF$		120	200	ns
Propagation Delay Time to Low Output Level	$t_{PHL}$	$I_{F(ON)} = 1.6mA \rightarrow V_F = 0V$ $C_L = 100pF$		130	220	
Pulse Width Distortion $ t_{PHL} - t_{PLH} $ for any given device	PWD	$C_L = 100pF$			120	
Propagation Delay Difference ( $t_{PHL} - t_{PLH}$ ) between any two devices	PDD	$C_L = 100pF$	-210		210	
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	$CM_H$	$I_F = 6.0mA$ $V_{CC} = 5V$ $V_{CM} = 1500V$ $T_A = 25^{\circ}C$	20			kV/ $\mu s$
Common Mode Transient Immunity at Low Output Level	$CM_L$	$V_F = 0V$ $V_{CC} = 5V$ $V_{CM} = 1500V$ $T_A = 25^{\circ}C$	20			kV/ $\mu s$

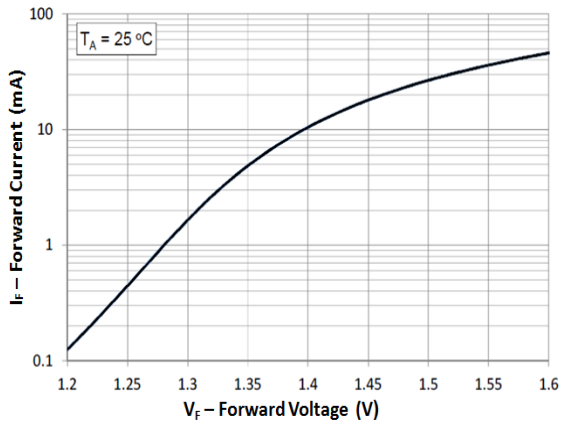
**Note :**

1. A 0.1 $\mu F$  or bigger bypass capacitor must be connected across pin 6 and pin 4.
2.  $t_{PLH}$  propagation delay is measured from the 50% point on the leading edge of the input pulse to the 1.3 V point on the leading edge of the output pulse.  
 $t_{PHL}$  propagation delay is measured from the 50% point on the trailing edge of the input pulse to the 1.3 V point on the trailing edge of the output pulse.
3. PDD is the difference of  $t_{PHL}$  and  $t_{PLH}$  between any two devices under same test conditions.
4.  $CM_H$ , Common Mode Transient Immunity in High stage is the maximum tolerable slew rate of the common mode impulse signal,  $V_{CM}$ , to assure that the output will remain high ( $V_O > 2V$ ). Equal value split resistors must be used at both ends of the LED.
5.  $CM_L$ , Common Mode Transient Immunity in Low stage is the maximum tolerable slew rate of the common mode impulse signal,  $V_{CM}$ , to assure that the output will remain low ( $V_O < 0.8V$ ). Equal value split resistors must be used at both ends of the LED.

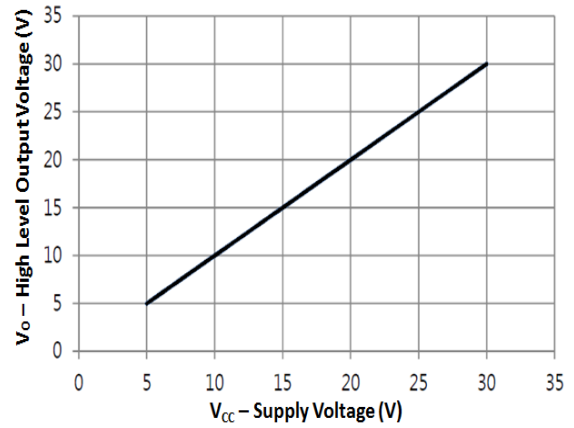




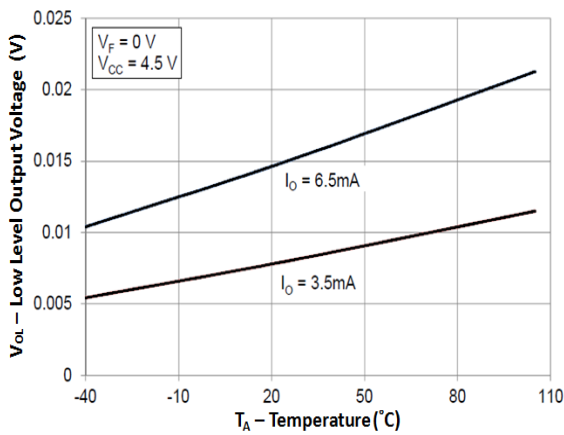
## IS480P



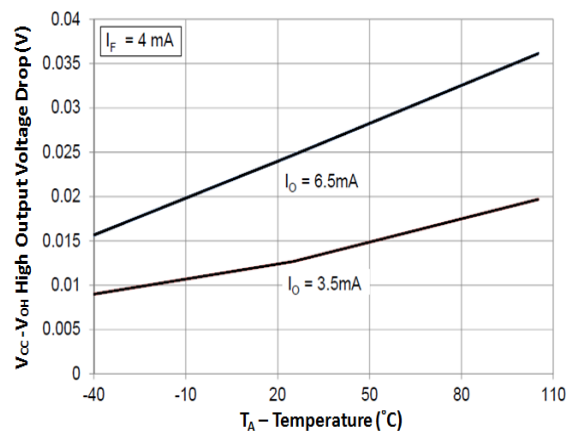
**Fig 1 Forward Current vs Forward Voltage**



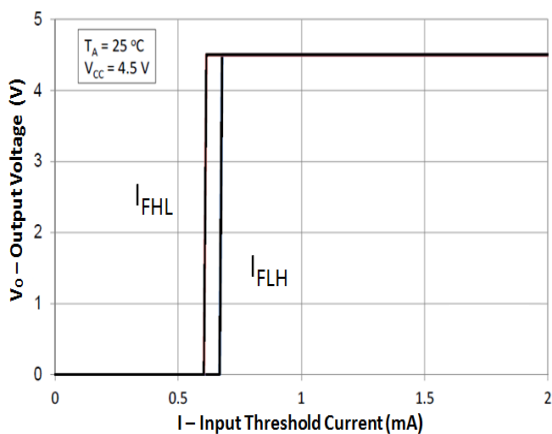
**Fig 2 High Level Output Voltage vs Supply Voltage**



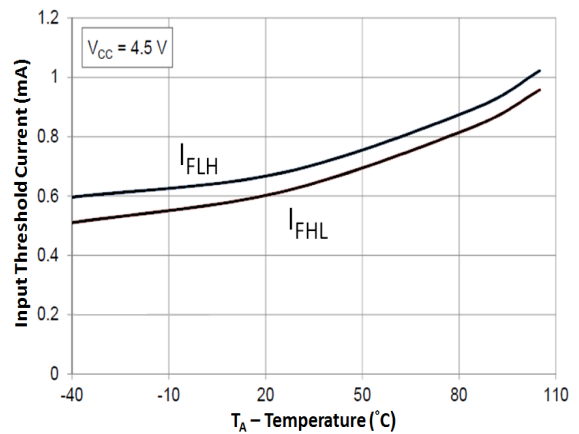
**Fig 3 Low Level Output Voltage vs Ambient Temperature**



**Fig 4 High Level Output Voltage Drop vs Ambient temperature**



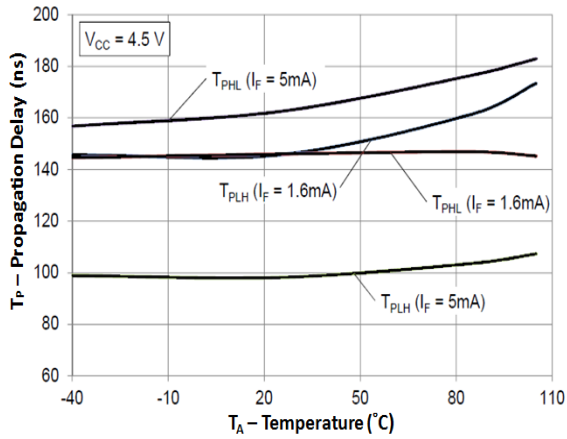
**Fig 5 Hysteresis - Output Voltage vs Input Threshold Current**



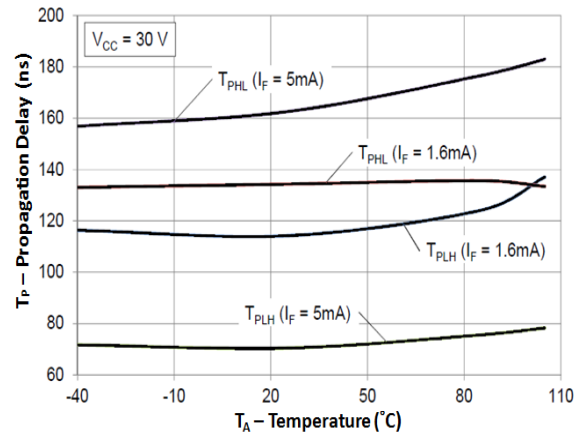
**Fig 6 Input Threshold Current vs Ambient Temperature**



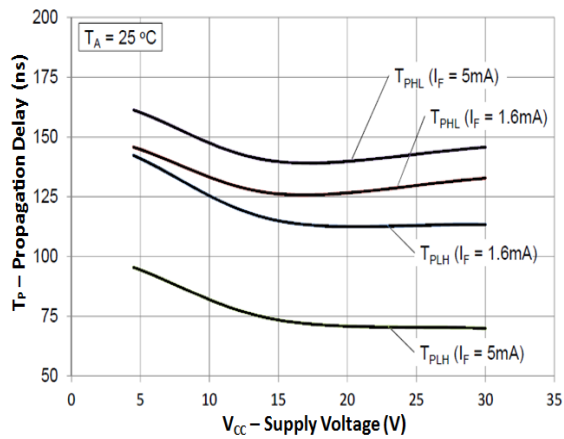
## IS480P



**Fig 7 Propagation Delay vs Ambient Temperature at  $V_{CC}$  4.5V**



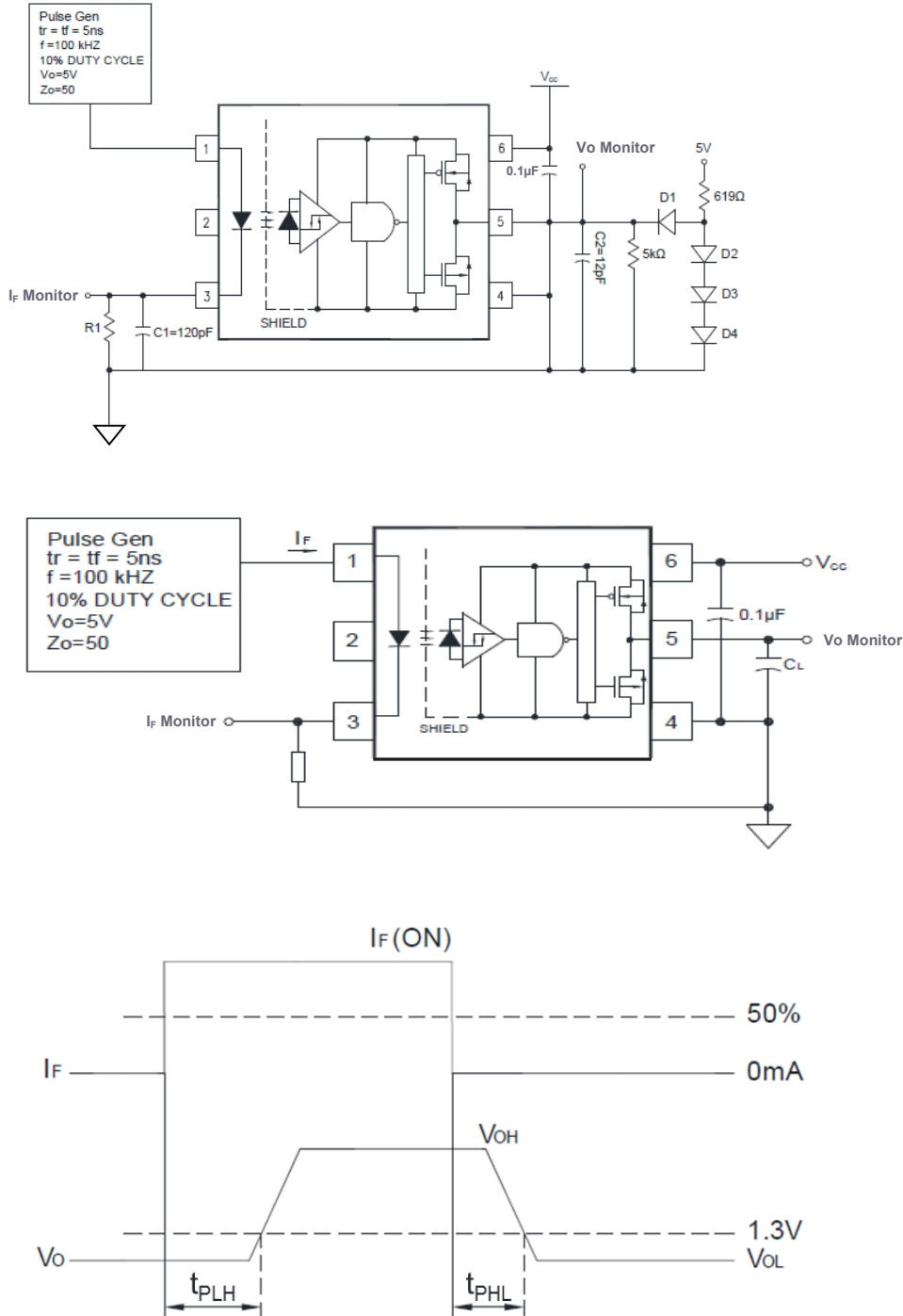
**Fig 8 Propagation Delay vs Ambient Temperature at  $V_{CC}$  30V**



**Fig 9 Propagation Delay vs Supply Voltage**



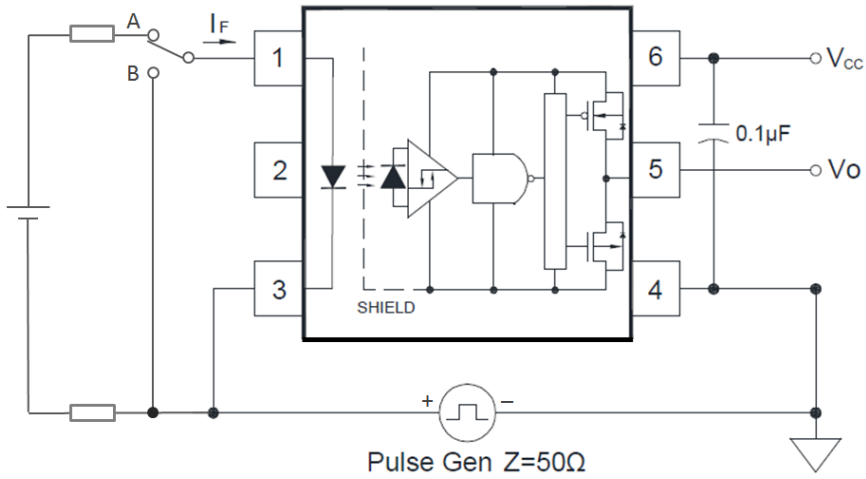
## IS480P



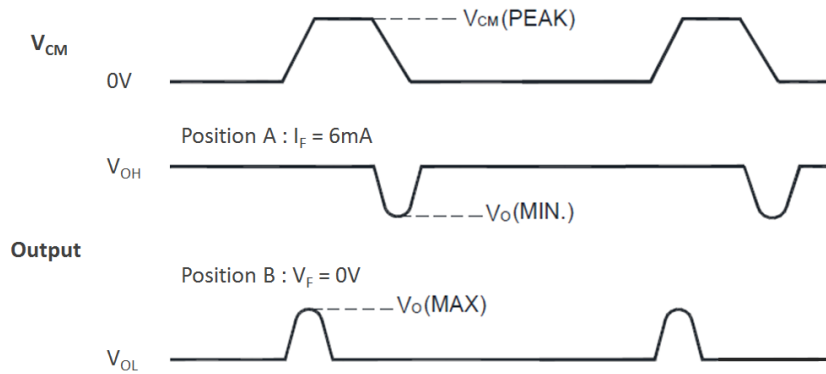
**$t_r$ ,  $t_b$ ,  $t_{PLH}$  and  $t_{PHL}$  Test Circuit and Waveform**



## IS480P



**Equal value split resistors must be used at both ends of the LED.**



**CMR Test Circuit and Waveform**



**ISOCOM**  
COMPONENTS

## IS480P

### ORDER INFORMATION

IS480P			
After PN	PN	Description	Packing quantity
None	IS480P	Stretched SO6	1000 pcs per reel

### DEVICE MARKING

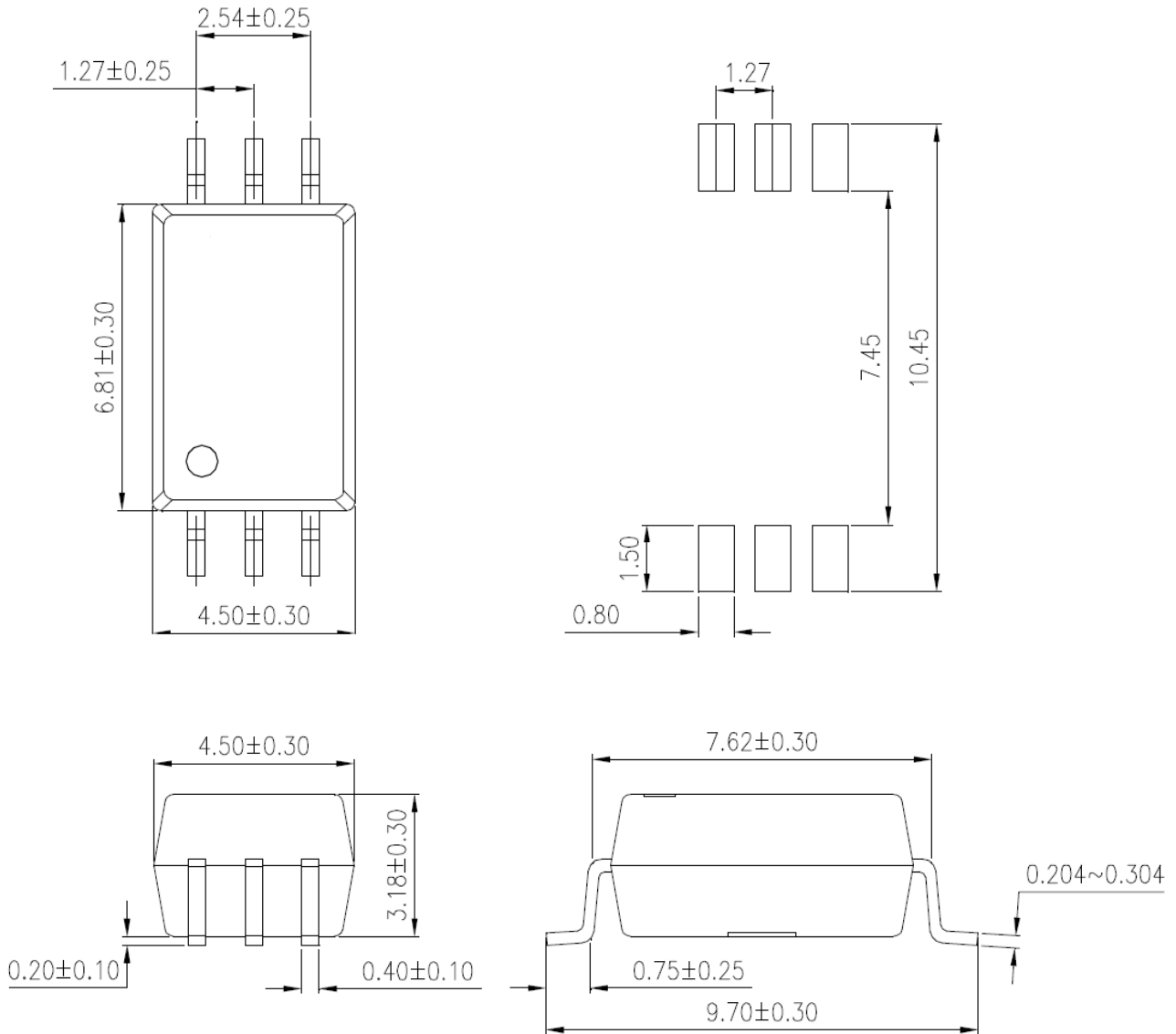


480P            denotes Device Part Number  
YY             denotes 2 digit Year code  
WW             denotes 2 digit Week code



## IS480P

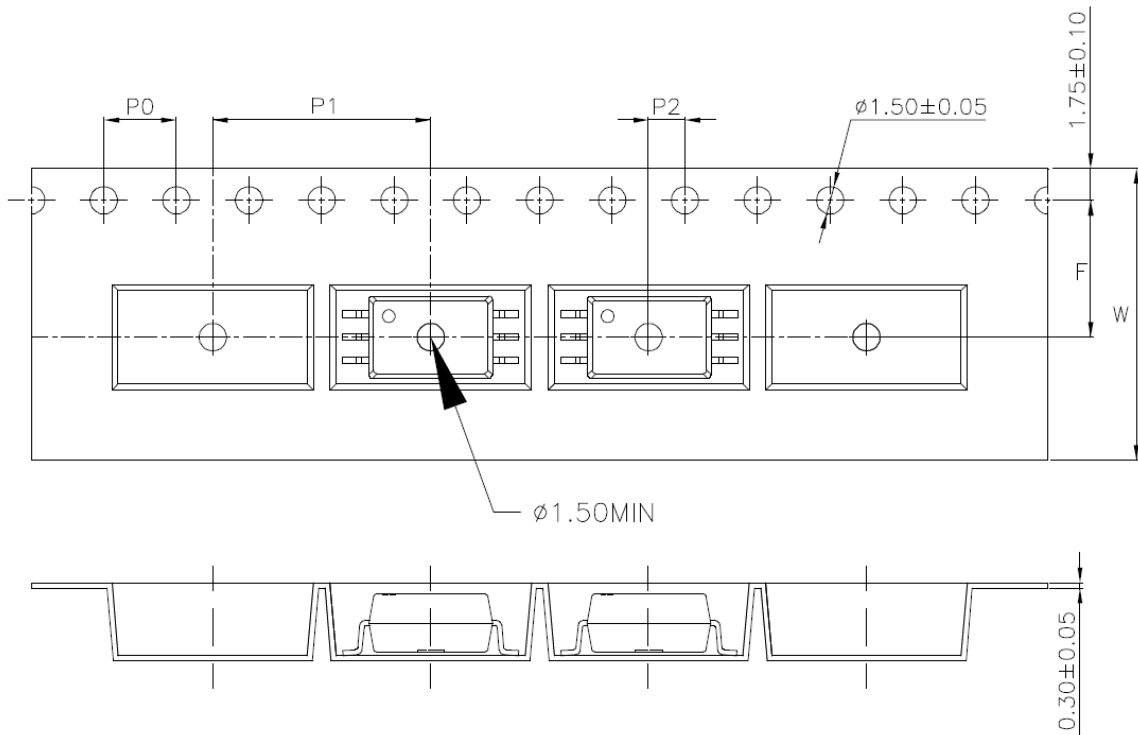
### PACKAGE DIMENSIONS and Recommended PCB Pad Layout in mm (inch)





## IS480P

### TAPE AND REEL PACKAGING

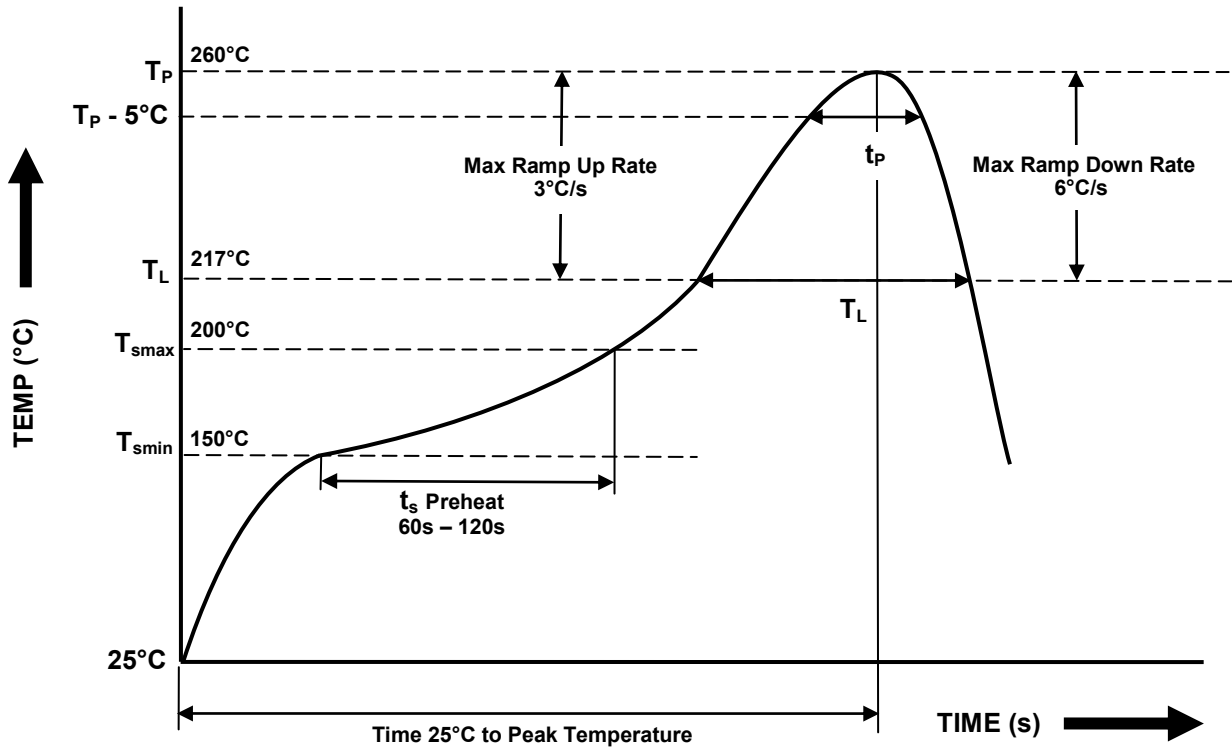


Description	Symbol	Dimension mm (inch)
Tape Width	W	16 ± 0.3 (0.63)
Pitch of Sprocket Holes	P <sub>0</sub>	4 ± 0.1 (0.16)
Distance of Compartment to Sprocket Holes	F	7.5 ± 0.1 (0.3)
	P <sub>2</sub>	2 ± 0.1 (0.079)
Distance of Compartment to Compartment	P <sub>1</sub>	12 ± 0.1 (0.47)



**IS480P**

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





Profile Details	Conditions
<b>Preheat</b> - Min Temperature ( $T_{SMIN}$ ) - Max Temperature ( $T_{SMAX}$ ) - Time $T_{SMIN}$ to $T_{SMAX}$ ( $t_s$ )	150°C 200°C 60s - 120s
<b>Soldering Zone</b> - Peak Temperature ( $T_P$ ) - Time at Peak Temperature - Liquidous Temperature ( $T_L$ ) - Time within 5°C of Actual Peak Temperature ( $T_P - 5^\circ C$ ) - 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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