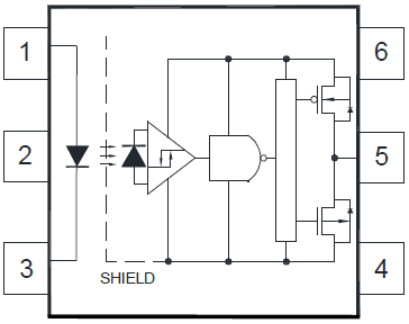
IS480P

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.



1 Anode
2 NC
3 Cathode
4 GND
5 V_O
6 V_{CC}

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

FEATURES

- Totem Pole Output
- Wide Operating Voltage Range
  V_{CC} 4.5V to 30V
- Wide 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
- Minimum Common Mode Rejection
  20kV/µs at V_{CM} 1500V
- Lead Free
- UL File E91231

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

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

Output

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

Total Package

Isolation Voltage	5000V_{RMS}
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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Truth Table

LED	V_O
ON	HIGH
OFF	LOW

Recommended Operating Conditions

Parameter	Symbol	Min	Max	Unit
Operating Temperature	T_A	- 40	105	°C
Supply Voltage	V_{CC}	4.5	30	V
Input Current (ON)	$I_{F(ON)}$	1.6	5	mA
Input Voltage (OFF)	$V_{F(OFF)}$		0.8	V

Note :

1. Photo Detector requires a V_{CC} of 4.5 V or higher for stable operation as output might be unstable if V_{CC} 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.

ELECTRICAL CHARACTERISTICS

(Over Recommended Operating Conditions unless otherwise specified : V_{CC} = 4.5V to 30V, $I_{F(ON)}$ = 1.6mA to 5mA, $V_{F(OFF)}$ = 0V to 0.8V, T_A = -40°C to 105°C. Typical Values at T_A = 25°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/°C
Reverse Voltage	V_R	I_R = 10µA	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 < 500µs			-160	mA
		V_{CC} = 20V, I_F = 5mA, V_O = GND, Duration < 500µs			-200	
Low Level Short Circuit Output Current	I_{OSL}	V_O = V_{CC} = 5.5V, V_F = 0V, Duration < 500µs	160			mA
		V_O = V_{CC} = 20V, V_F = 0V, Duration < 500µs	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

ELECTRICAL CHARACTERISTICS

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

SWITCHING

Parameter	Symbol	Test Condition	Min	Typ.	Max	Unit
Propagation Delay Time to High Output Level	t_{PLH}	V_F = 0V → $I_{F(ON)}$ = 1.6mA C_L = 100pF		130	200	ns
Propagation Delay Time to Low Output Level	t_{PHL}	$I_{F(ON)}$ = 1.6mA → V_F = 0V C_L = 100pF		120	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°C	20			kV/µs
Common Mode Transient Immunity at Low Output Level	CM_L	V_F = 0V V_{CC} = 5V V_{CM} = 1500V T_A = 25°C	20			kV/µs

Note :

1. A 0.1uF 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.

ELECTRICAL CHARACTERISTICS (Over Recommended Operating Conditions unless otherwise specified : T_A = -40°C to 105°C. Typical Values at T_A = 25°C)

ISOLATION

Parameter	Symbol	Test Condition	Min	Typ.	Max	Unit
Isolation Voltage	V_{ISO}	RH ≤ 50%, t = 1 min, T_A = 25°C	5000			V_{RMS}
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		1.0		pF

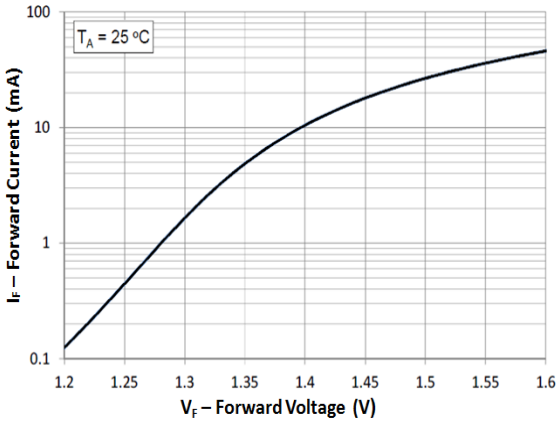


Fig 1 Forward Current vs Forward Voltage

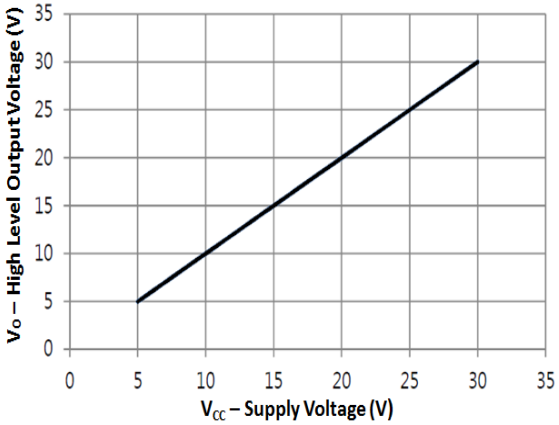


Fig 2 High Level Output Voltage vs Supply Voltage

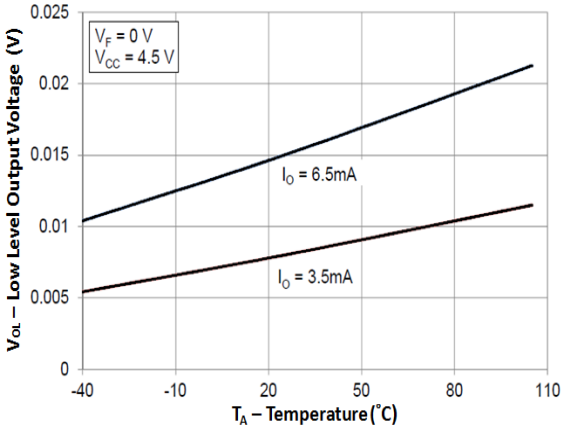


Fig 3 Low Level Output Voltage vs Ambient Temperature

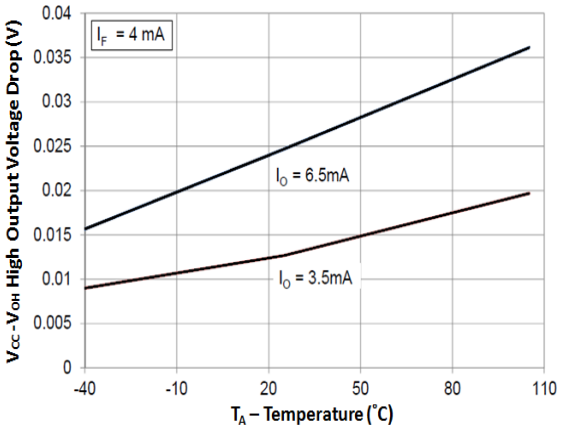


Fig 4 High Level Output Voltage Drop vs Ambient temperature

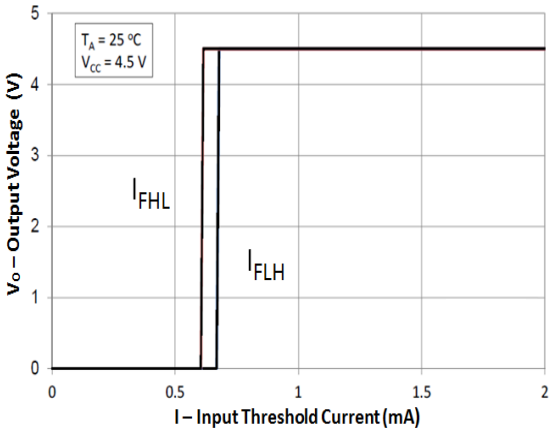


Fig 5 Hysteresis - Output Voltage vs Input Threshold Current

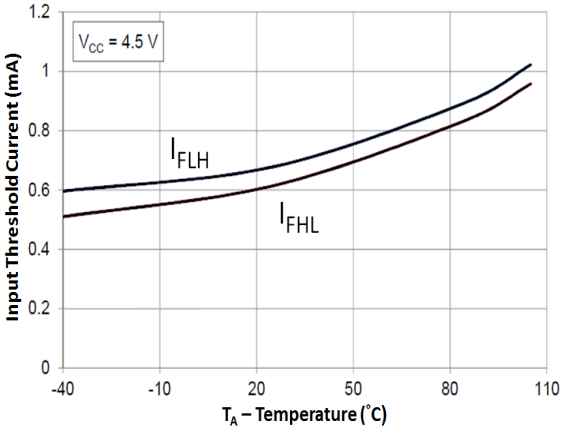


Fig 6 Input Threshold Current vs Ambient Temperature

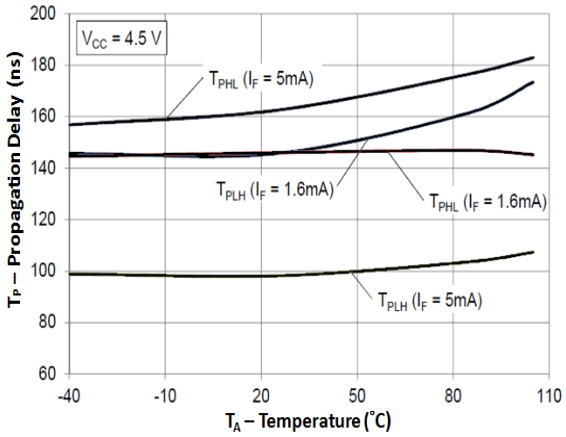


Fig 7 Propagation Delay vs Ambient Temperature at V_{CC} 4.5V

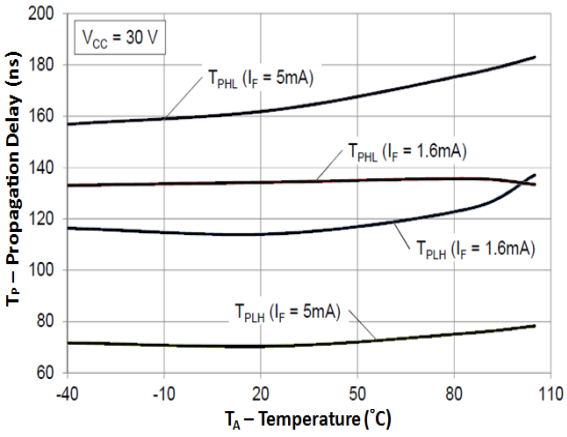


Fig 8 Propagation Delay vs Ambient Temperature at V_{CC} 30V

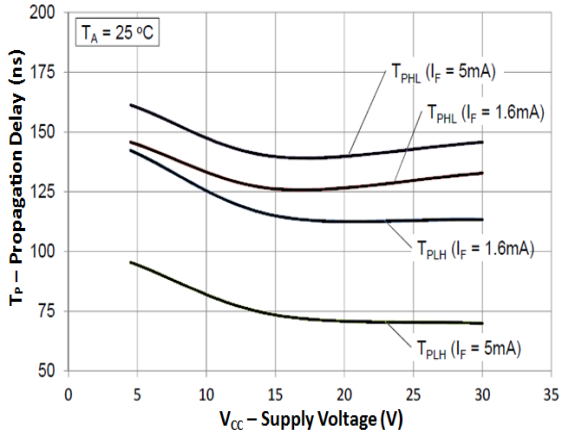
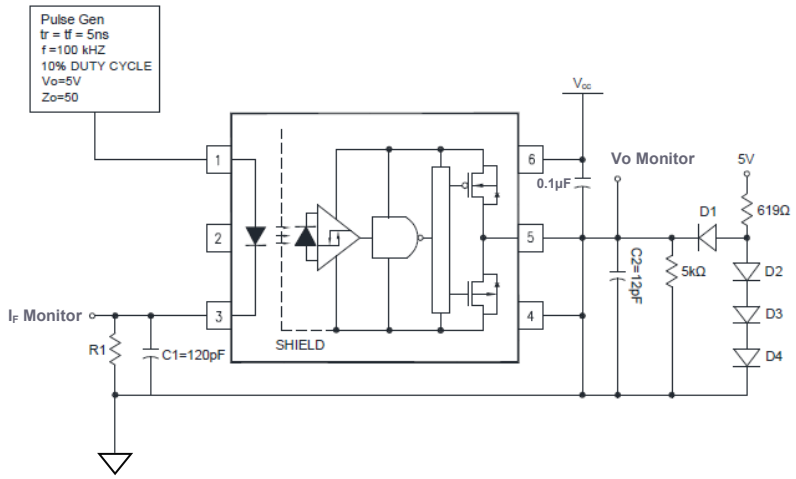
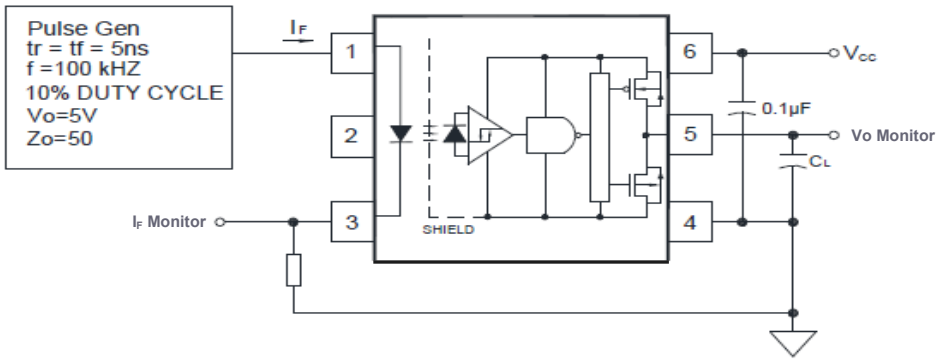
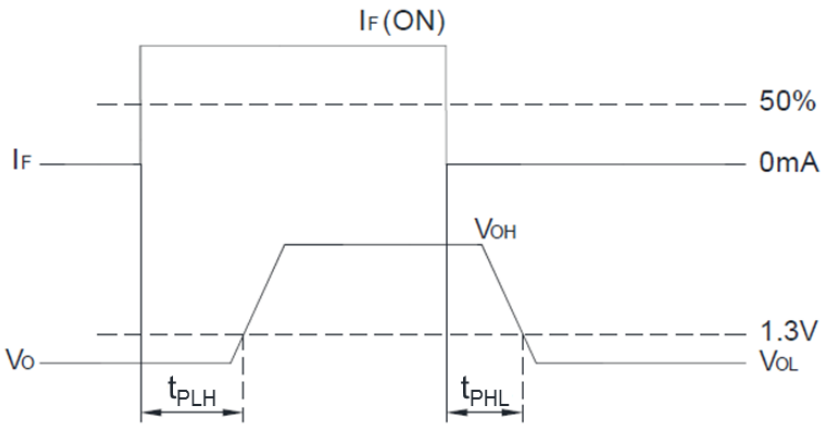


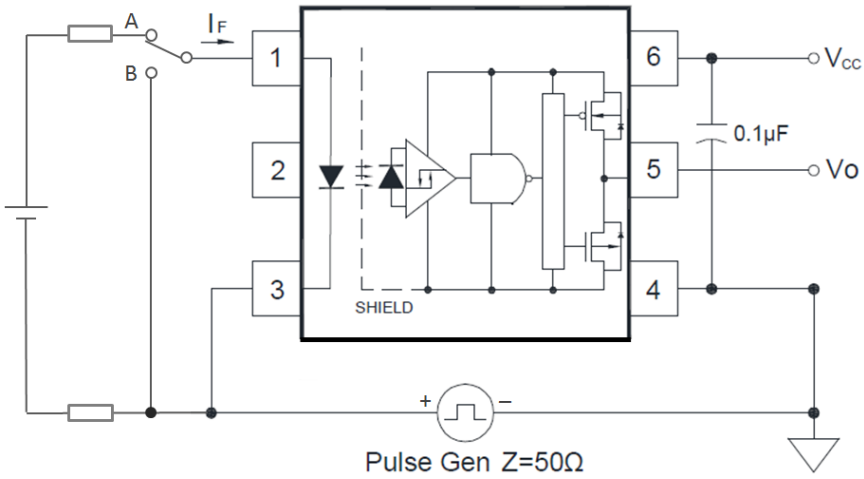
Fig 9 Propagation Delay vs Supply Voltage



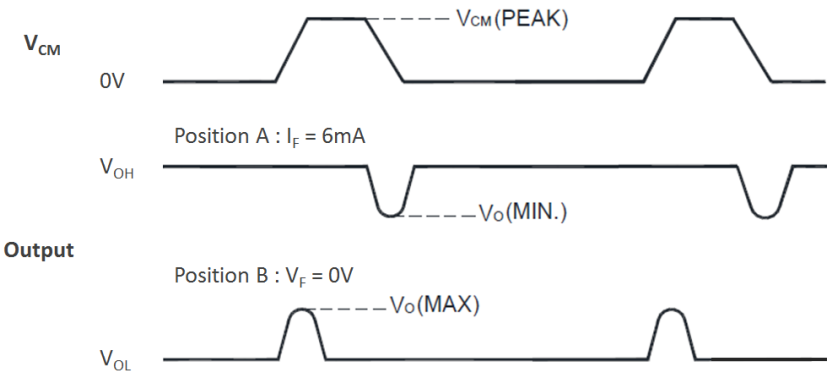




t_r, t_f, t_{PLH} and t_{PHL} Test Circuit and Waveform



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



CMR Test Circuit and Waveform

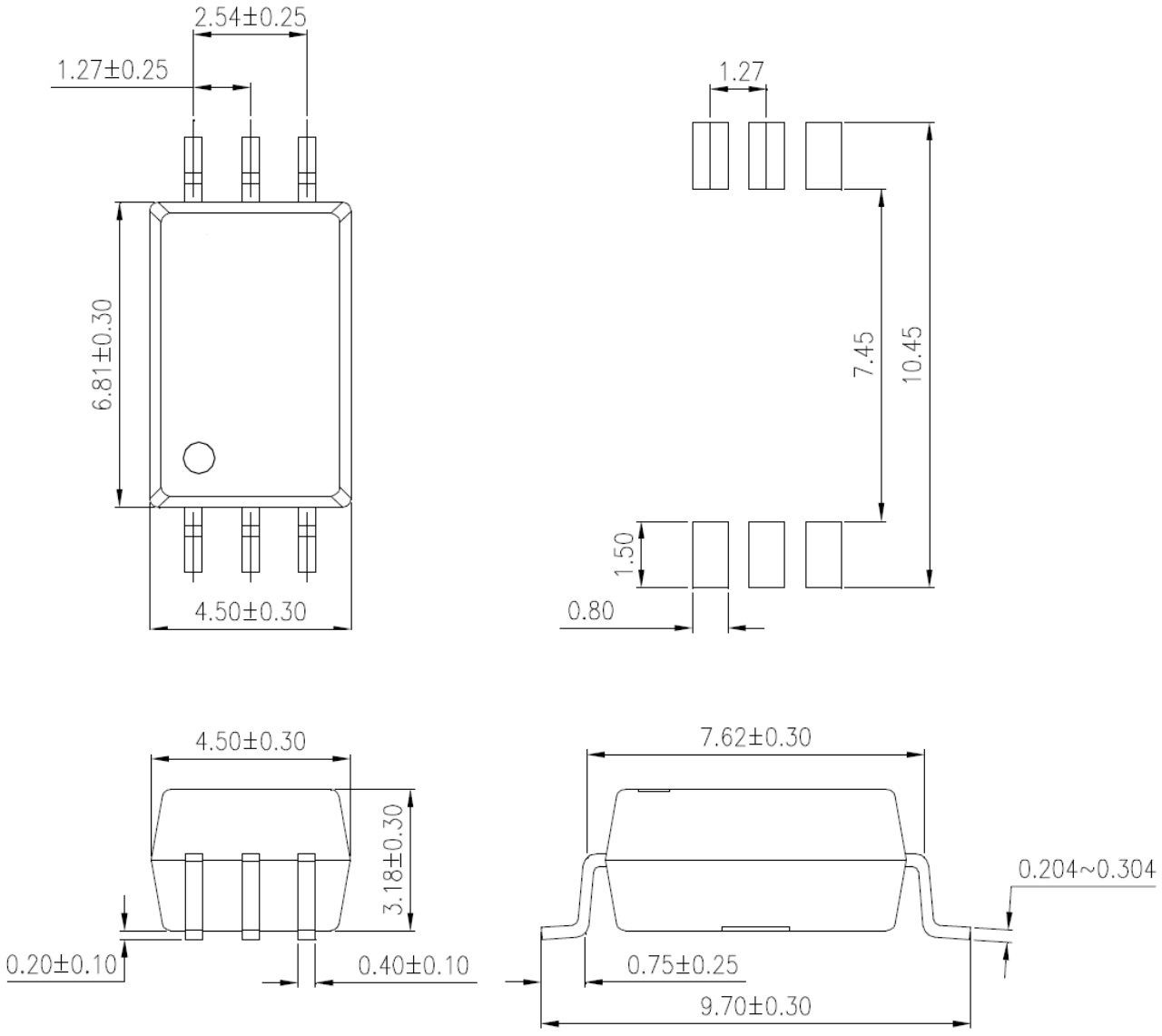
ORDER INFORMATION

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

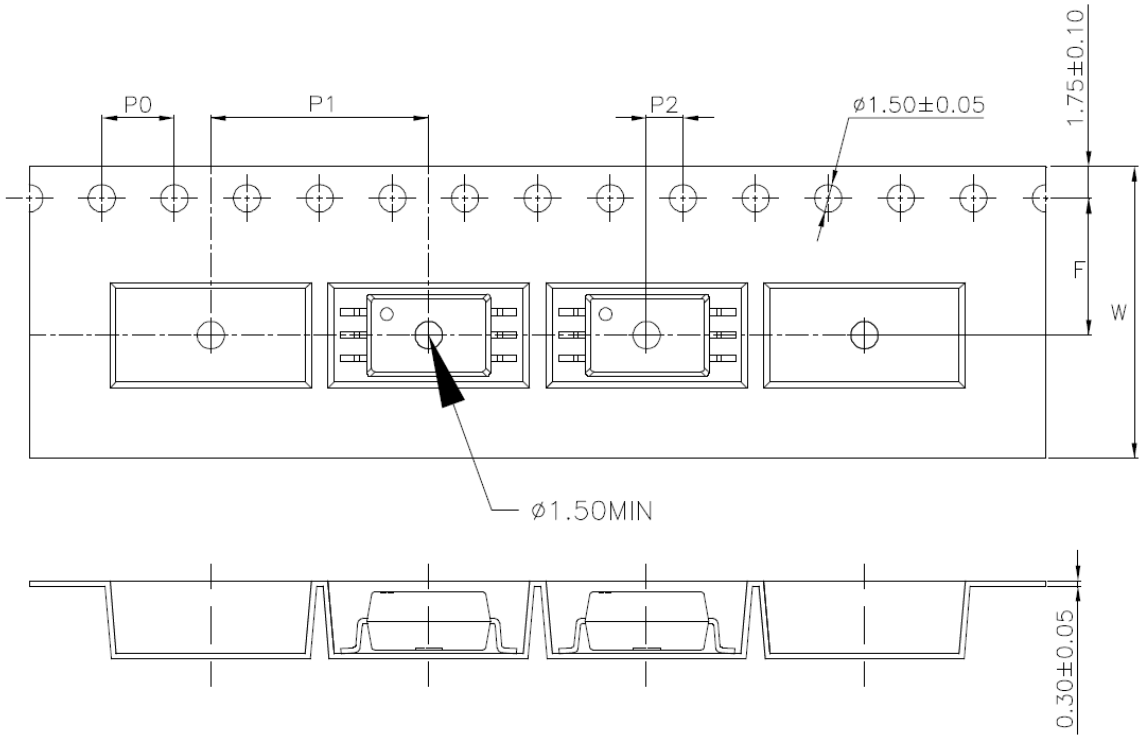
DEVICE MARKING

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

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

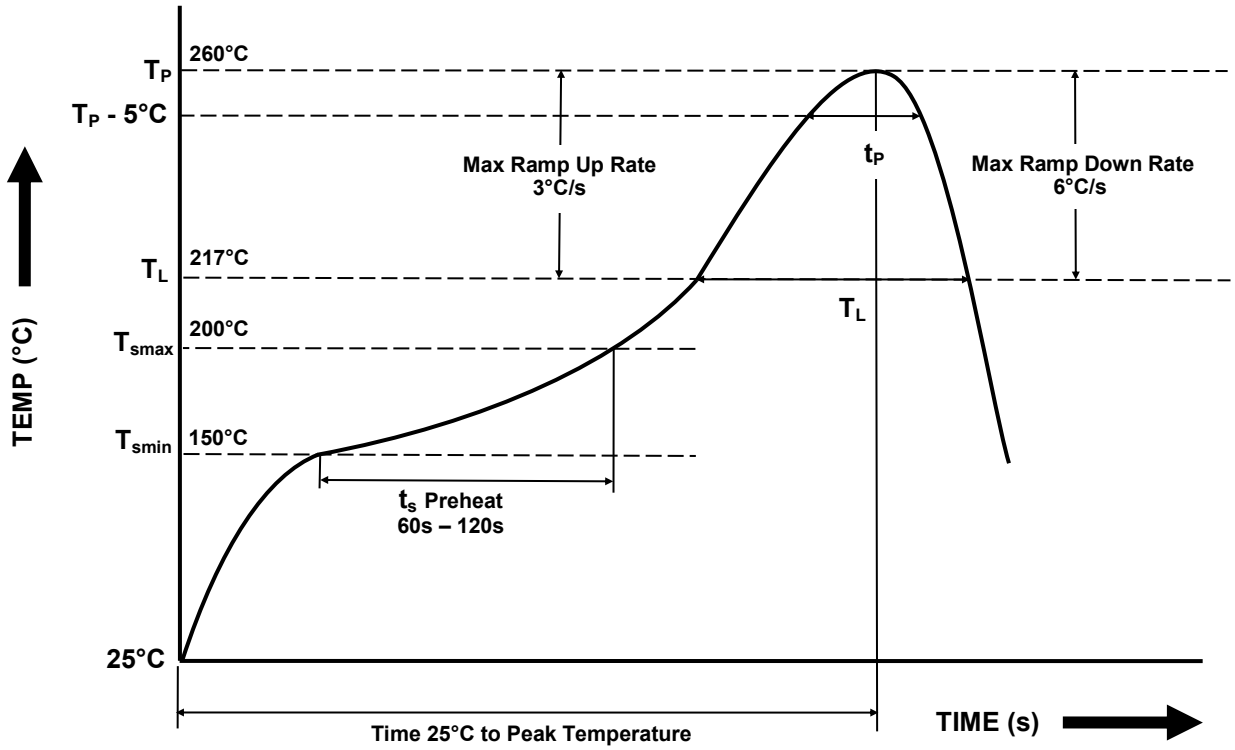


TAPE AND REEL PACKAGING



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)



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

ISOCOM COMPONENTS

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