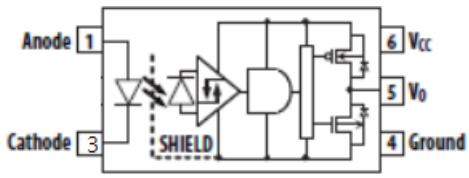
KPC484 Series

5PIN IPM DRIVE PHOTOCOUPLER

Description

The KPC484 series photo coupler contains a 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 drive Intelligent Power Module or gate drive. Minimized propagation delay difference between devices makes these photo couplers excellent solutions for improving inverter efficiency through reduced switching dead time.

Schematic



1. Anode
3. Cathode
4. GND
5. Vo (Voltage Output)
6. Vcc

Features

1. Positive output type (totem pole output)
2. Truth Table Guaranteed: VCC from 4.5V to 30V
3. Performance Specified for Common IPM Applications Over Industrial Temperature Range.
4. Short Maximum Propagation Delays
5. Minimized Pulse Width Distortion (PWD)
6. Very High Common Mode Rejection (CMR)
7. Hysteresis
8. Safety Approvals:
   CQC GB4943.1-2022

Applications

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

Truth Table

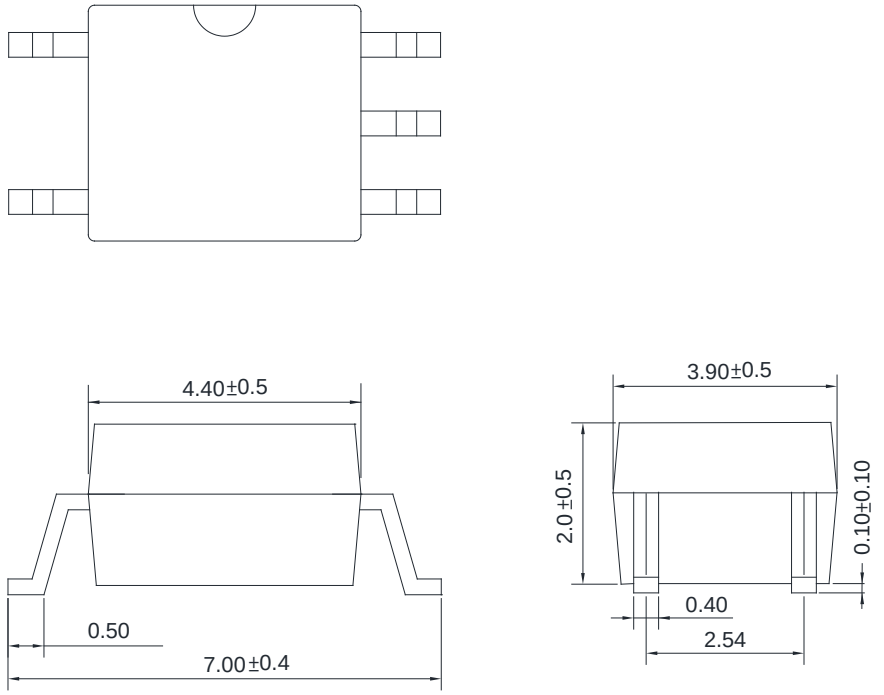
LED	OUT
ON	H
OFF	L

Note: A 0.1μF bypass capacitor must be connected between Pin 4 and 6.

.

Outside Dimension

Unit : mm



TOLERANCE: ±0.2mm

Device Marking

Notes:

cosmo
484
YWW

Y: Year code / WW: Week code

● Absolute Maximum Ratings

(Ta = 25°C)

Parameter			Symbol	Rating	Unit
Input	Forward current		I_F	20	mA
	Peak transient forward current	(Note 1)	I_{FPT}	1	A
	Reverse voltage		V_R	5	V
Output	Output current		I_O	50	mA
	Output voltage		V_O	35	V
	Supply Voltage		Vcc	35	V
Junction temperature			T_j	125	°C
Storage Temperature			T_{stg}	-55~125	°C
Operating Temperature			T_{opr}	-40~110	°C
Total Package Power Dissipation			P_T	145	mW
Lead soldering temperature(10s)		(Note 2)	T_{sol}	260	°C
Isolation voltage (AC,1min.,R.H≦60%)		(Note 3)	BVs	3750	Vrms
Input-Output Resistance (V_{I-O} = 500V DC)		(Note 3)	R_{I-O}	10^{12}	Ω

Note 1: Pulse width Pw ≦ 1 μs,300pps.
Note 2: It is 2 mm or more from a lead root.
Note 3: Device is considered as a two terminal device: Pin1 and 3 shorted together, and pins 4,5 and 6 shorted together.

● Recommend Operation Conditions

Parameter	Symbol	Min.	Max.	Unit
Operating Temperature	T_A	-40	110	°C
Supply Voltage[1]	V_{CC}	4.5	30	V
Input Current (ON)[2]	$I_{F(ON)}$	4	7	mA
Input Voltage (OFF)	$V_{F(OFF)}$	0	0.8	V

Note 1: Detector requires a VCC of 4.5 V or higher for stable operation as output might be unstable if VCC is lower than 4.5 V. Be sure to check the power ON/OFF operation other than the supply current.
Note 2: The initial switching threshold is 1.6 mA or less. It is recommended that 2.2 mA be used to permit at least a 20% LED degradation guard band.

Electrical Characteristics

Specified over recommended temperature (TA = -40°C to +110°C, 4.5V ≤ VCC ≤ 30V), IF(ON) = 4mA to 7mA, VF(OFF) = 0V to 0.8V, unless otherwise specified. All typical at TA = 25°C.

Parameter		Symbol	Test Condition	Min.	Typ.	Max.	Unit
Input Forward Voltage		V_F	I_F=10mA	1.2	1.35	1.7	V
Input Forward Voltage Temperature Coefficient		$\triangle V_F / \Delta T$	I_F=10mA	-	-	-	mV/°C
Input Reverse Voltage		BV_R	I_R = 10μA	5	-	-	V
Input Threshold Current (Low to High)		I_{FLH}		-	1.5	2.5	mA
Input Threshold Voltage (High to Low)		V_{FHL}		0.8	-	-	V
Input Capacitance		C_{IN}	f = 1 MHz, V_F = 0 V	-	60	-	pF
Supply Current	High Level	I_{CCH}	VCC = 5 V, IF = 7mA, IO = 0 mA	-	0.85	3	mA
			VCC = 30 V, IF = 7mA, IO = 0 mA		1.20	3	
	Low Level	I_{CCL}	VCC = 5V, VF =0V , IO = 0 mA	-	0.85	3	
			VCC = 20 V, VF =0V, IO = 0 mA		1.10	3	
Output current	High level	I_{OH}	VCC = 5.5V, IF=7mA, VO = GND	-	-	-180	mA
	Low level	I_{OL}	VO =VCC = 5.5V, VF =0V	200	-	-	
Output voltage	High level	V_{OH}	VCC=5.5V, IF=7m A, IOL = -6.5mA	VCC -0.5	VCC -0.04	-	V
	Low level	V_{OL}	IOL = 6.5mA	-	-	0.5	

Note 1: Duration of output short circuit time should not exceed 10 μs.
Note 2: Input capacitance is measured between pin 1 and pin 3.

● Switching Characteristics

Over recommended operating conditions TA = -40° C to 105° C, VCC = +4.5 V to 30 V, IF(ON) = 4 mA to 7 mA, VF(OFF) = 0 V to 0.8 V, unless otherwise specified. All typical at TA = 25°C.

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Propagation Delay Time to Output Low Level	t_{PHL}	f = 100kHz, Duty Cycle = 50% I_F = 4mA,	-	140	220	ns
Propagation Delay Time to Output High Level	t_{PLH}		-	70	220	
Pulse Width Distortion	PWD		-	80	120	
Propagation Delay Difference Between Any Two Parts	PDD (t_{PHL} - t_{PLH})		-200	-	+200	
Rise Time	t_r		-	30	-	
Fall Time	t_f		-	25	-	
Common mode transient immunity at high level output	$\|C_{MH}\|$	I_F=4.0 mA V_{CC}= 5V, T_A= 25 ˚C, V_{CM}= 1.0KV	20	—	—	KV / μs
Common mode transient immunity at low level output	$\|C_{ML}\|$	I_F=0mA V_{CC}= 5V, T_A= 25 ˚C, V_{CM}= 1.0KV	20	—	—	KV / μs

Note 1: The tPLH 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. The tPHL 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.

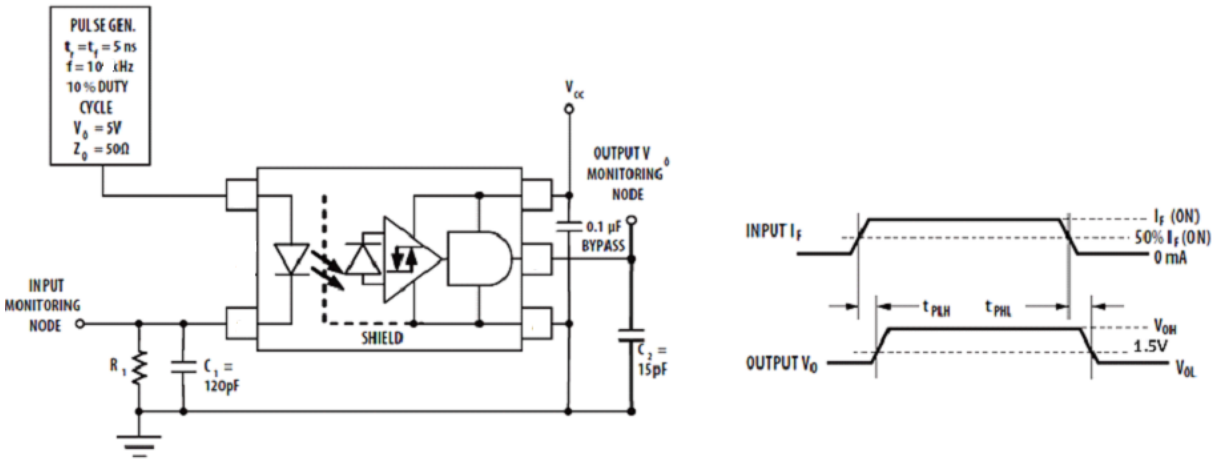
Note 2: Pulse Width Distortion (PWD) is defined as |tPHL - tPLH | for any given device.

Note 3: The difference of tPLH and tPHL between any two devices under the same test condition.

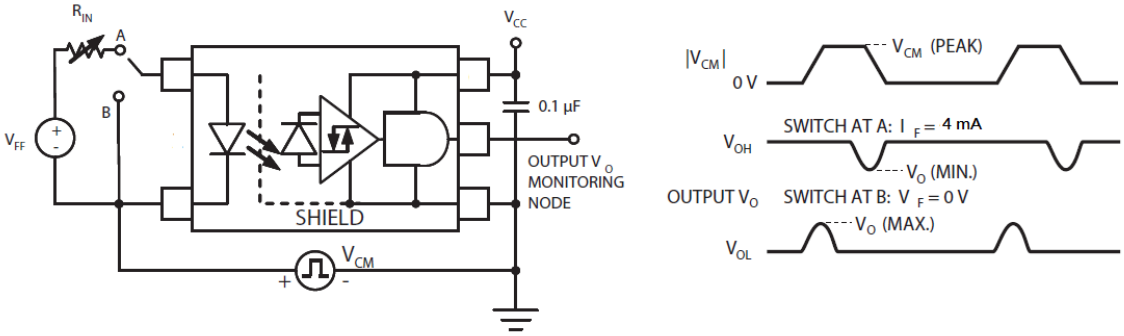
Note 4: CMH is the maximum slew rate of the common mode voltage that can be sustained with the output voltage in the logic high state, VO > 2.0 V. CML is the maximum slew rate of the common mode voltage that can be sustained with the output voltage in the logic low state, VO < 0.8 V. Note: Equal value split resistors (Rin/2) must be used at both ends of the LED.

- **Test Circuit**

Propagation delay time tPLH、tPHL、and rise time tr, fall time tf

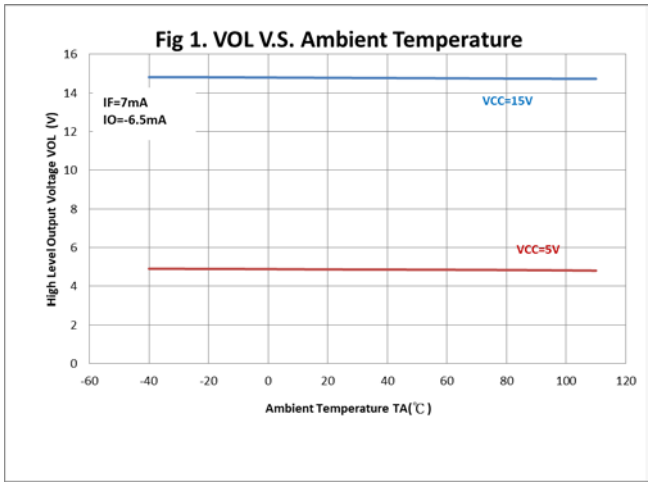


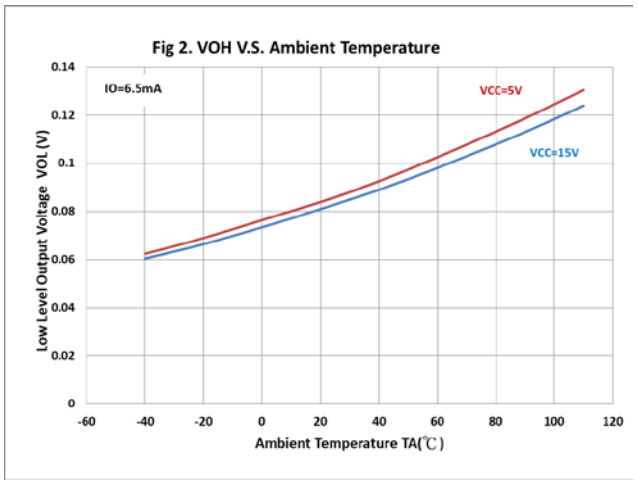
Common Mode Transient Immunity Test Circuit and Typical Waveforms

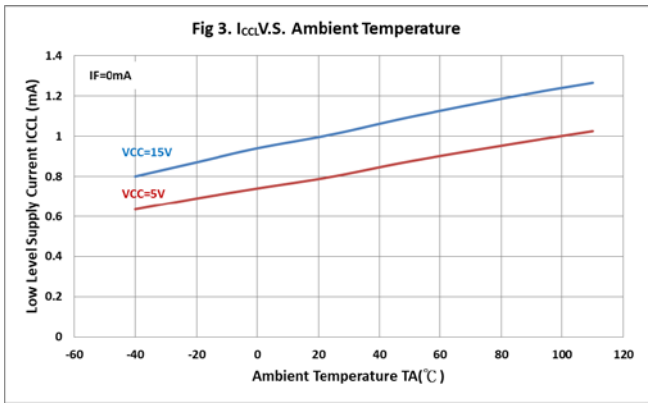


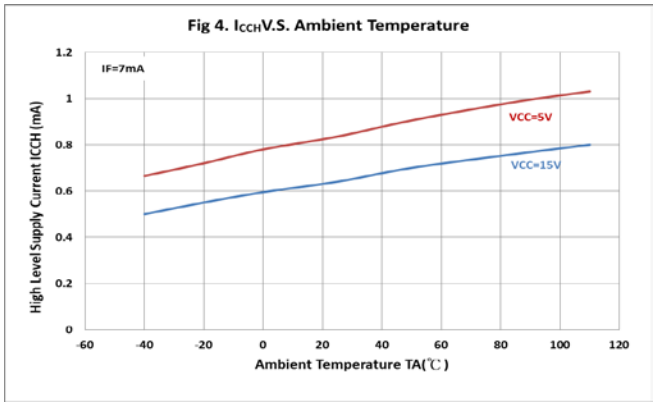
*C_{ML}(C_{MH}) is the maximum rate of rise (fall) of the common mode voltage that can be sustained with the output voltage in the low (high) state.

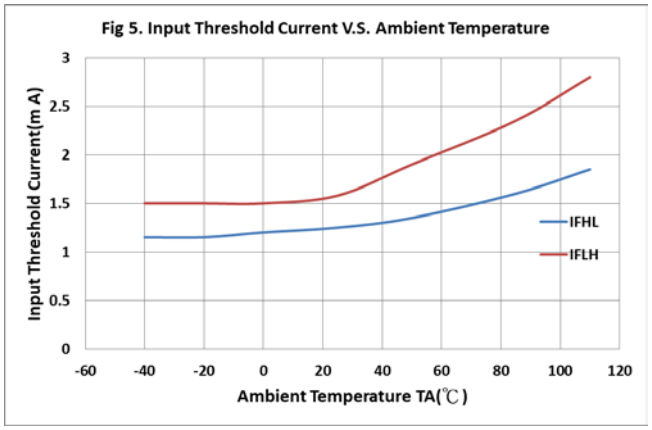
Characteristics curves

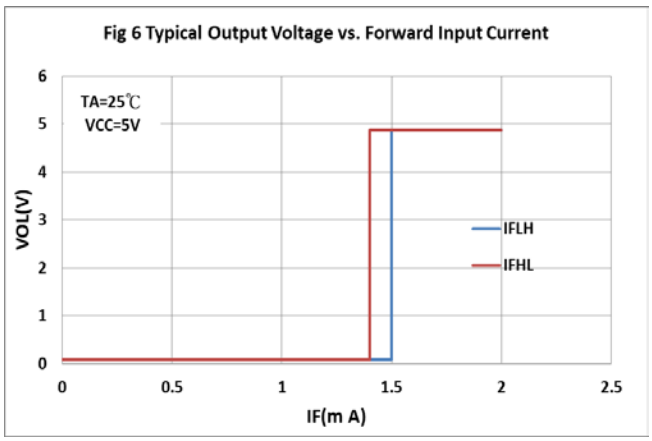












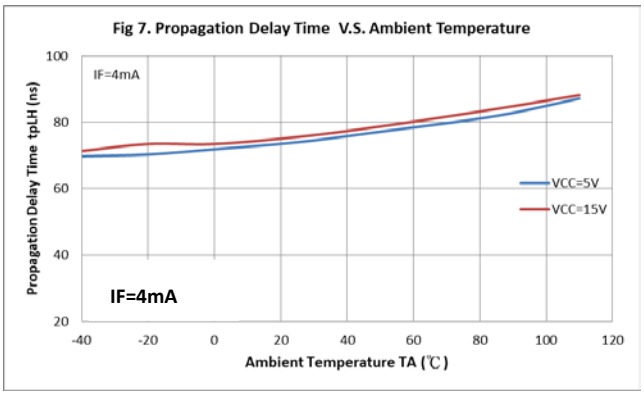


Fig 7. Propagation Delay Time V.S. Ambient Temperature
IF=4mA
Propagation Delay Time tpLH (ns)
100
80
60
40
20
VCC=5V
VCC=15V
IF=4mA
-40
-20
0
20
40
60
80
100
120
Ambient Temperature TA (℃)

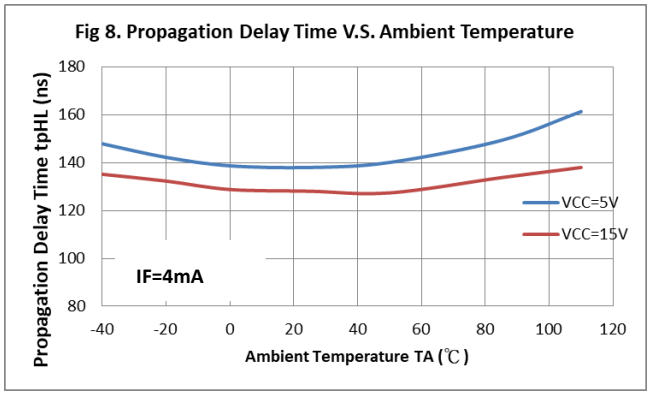


Fig 8. Propagation Delay Time V.S. Ambient Temperature
Propagation Delay Time tpHL (ns)
180
160
140
120
100
80
VCC=5V
VCC=15V
IF=4mA
-40
-20
0
20
40
60
80
100
120
Ambient Temperature TA (℃)

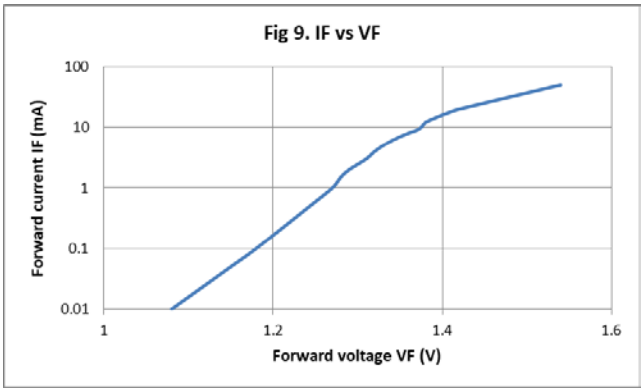


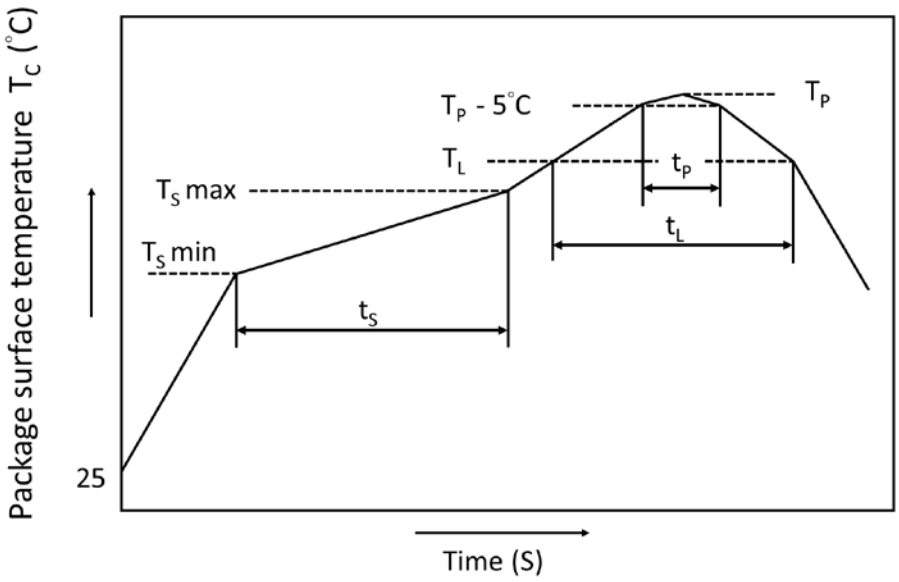
Fig 9. IF vs VF
Forward current IF (mA)
100
10
1
0.1
0.01
1
1.2
1.4
1.6
Forward voltage VF (V)

● Recommended Soldering Conditions

IR Reflow soldering

One time soldering reflow is recommended within the condition of temperature and time profile shown below. Do not solder more than three times.

Recommended Temperature Profile of Infrared Reflow



	Symbol	Min	Max	Unit
Preheat temperature	T_S	150	200	°C
Preheat time	t_S	60	120	s
Ramp-up rate (T_L to T_P)			3	°C/s
Liquidus temperature	T_L	217		°C
Time above T_L	t_L	60	100	s
Peak Temperature	T_P		260	°C
Time during which T_C is between (T_P - 5) and T_P	t_P		20	s
Ramp-down rate			6	°C/s

- **Numbering System**

KPC484 (Y)

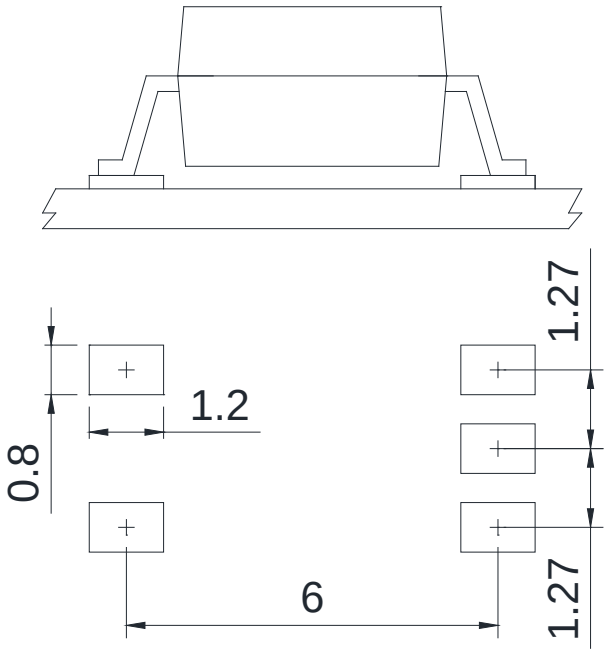
Notes:

KPC484 = Part No.

Y = Tape and reel option (TLD or TRU)

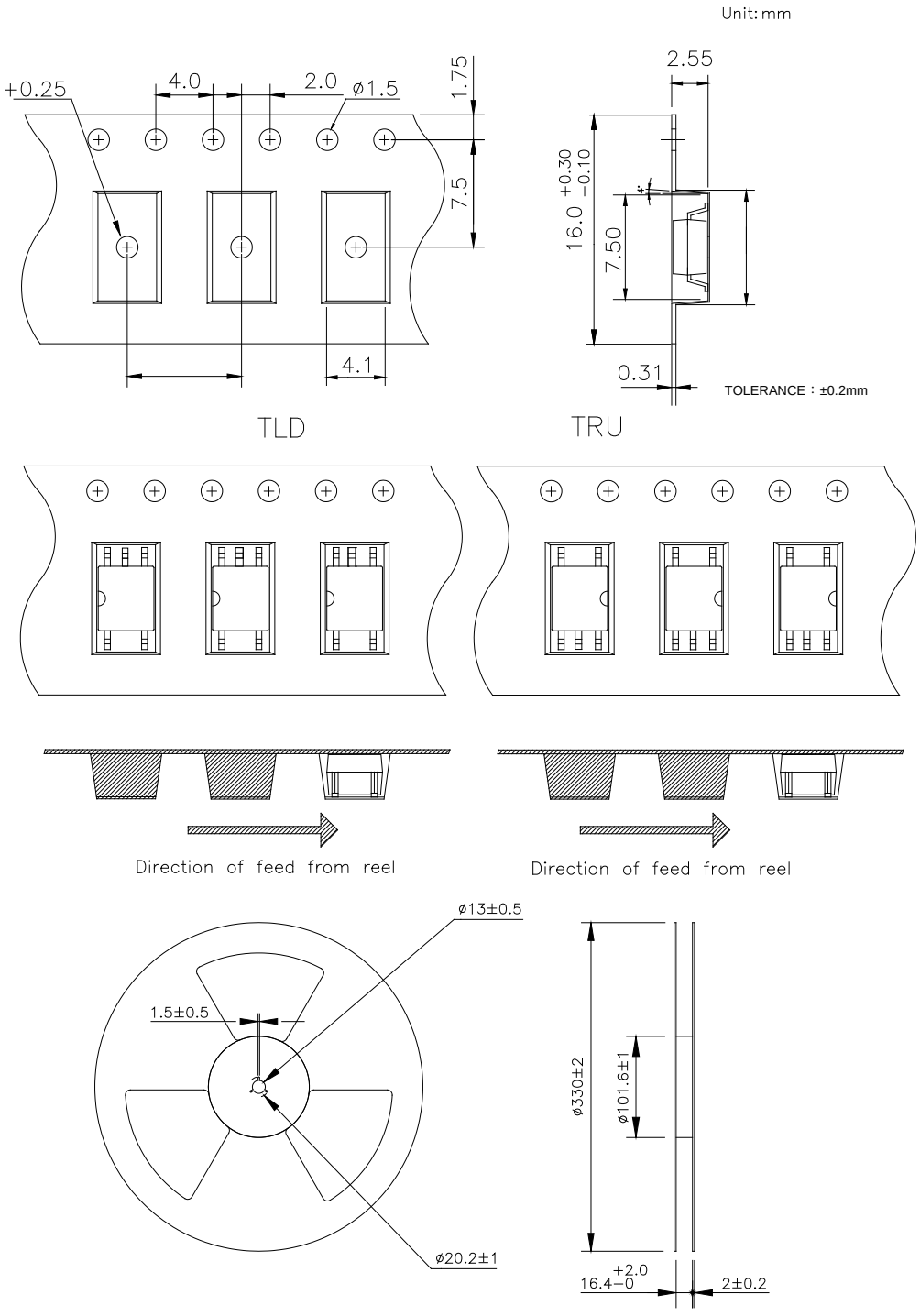
Option	Description	Packing quantity
(TLD)	surface mount type package + TL tape & reel option	3000 units per reel
(TRU)	surface mount type package + TR tape & reel option	3000 units per reel

- **Recommended Pad Layout for Surface Mount Lead Form**



Unit : mm

● SOP Carrier Tape & Reel



Unit :mm

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