

● Description

The KPC483 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.

● Features

1. Inverter 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

● Applications

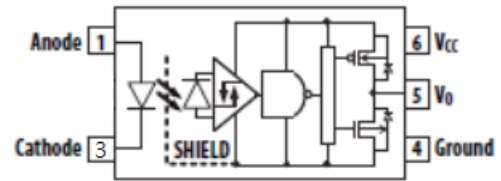
- IPM Interface Isolation
- Isolated IGBT/MOSFET Gate Drive
- AC and Brushless DC Motor Drives
- Industrial Inverters
- General Digital Isolation

● Truth Table

LED	OUT
ON	L
OFF	H

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

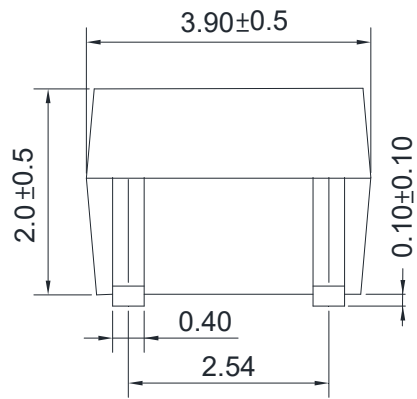
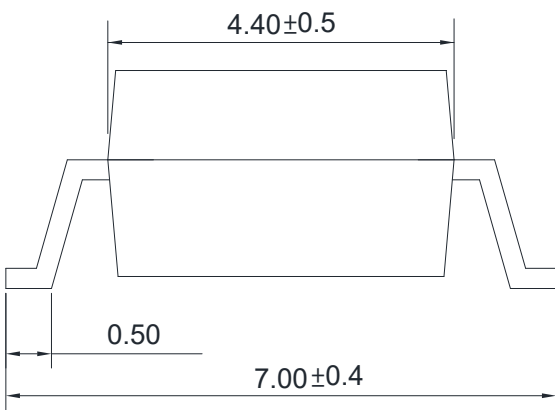
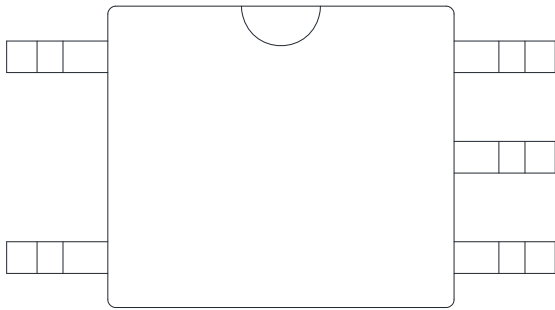
● Schematic



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

● **Outside Dimension**

Unit : mm



TOLERANCE: ±0.2mm

● **Device Marking**



Notes:

cosmo
483
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	V_{CC}	35	V
Junction temperature		T_j	125	°C
Storage Temperature		T_{stg}	-50~125	°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)		BV_s	3750	V _{rms}
Input-Output Resistance ($V_{I-O} = 500V$ DC) (Note 3)		R_{I-O}	10^{12}	Ω

Note 1: Pulse width $P_w \leq 1\mu s, 300pps$.

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)	$V_{F(OFF)}$	-	0.8	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 ($T_A = -40^{\circ}\text{C}$ to $+110^{\circ}\text{C}$, $+4.5\text{V} \leq V_{CC} \leq 30\text{V}$), $I_F(\text{ON}) = 1.6\text{mA}$ to 5mA , $V_F(\text{OFF}) = 0\text{V}$ to 0.8V , unless otherwise specified. All typicals at $T_A = 25^{\circ}\text{C}$.

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit	
Input Forward Voltage	V_F	$I_F = 10\text{mA}$	1.2	1.35	1.7	V	
Input Forward Voltage Temperature Coefficient	$\Delta V_F / \Delta T$	$I_F = 10\text{mA}$	-	-1.24	-	mV/ $^{\circ}\text{C}$	
Input Reverse Voltage	BV_R	$I_R = 10\mu\text{A}$	5	-	-	V	
Input Threshold Current (High to Low)	I_{FHL}	$V_{CC} = 5\text{V}$, $V_O < 0.5\text{V}$	-	1.5	2.5	mA	
Input Threshold Voltage (High to Low)	V_{FHL}	$V_{CC} = 30\text{V}$, $V_O > 5\text{V}$	0.8	-	-	V	
Input Capacitance	C_{IN}	$f = 1\text{MHz}$, $V_F = 0\text{V}$	-	60	-	pF	
Supply Current	High Level	I_{CCH}	$V_{CC} = 5.5\text{V}$, $I_F = 0\text{mA}$	-	1	3.0	mA
			$V_{CC} = 20\text{V}$, $V_F = 0\text{V}$		1.2	3.0	
	Low Level	I_{CCL}	$V_{CC} = 5.5\text{V}$, $I_F = 7\text{mA}$	-	1	3.0	
			$V_{CC} = 20\text{V}$, $I_F = 7\text{mA}$		1.2	3.0	
Output current	High level	I_{OH}	$V_{CC} = 5.5\text{V}$, $V_F = 0\text{V}$	-	-160	-165	mA
			$V_{CC} = 20\text{V}$, $V_F = 0\text{V}$	-	-	-125	
	Low level	I_{OL}	$V_O = V_{CC} = 5.5\text{V}$, $I_F = 10\text{mA}$, $V_O = 0\text{V}$	125	185	-	
			$V_O = V_{CC} = 20\text{V}$, $I_F = 7\text{mA}$, $V_O = 0\text{V}$	125	-	-	
Output voltage	High level	V_{OH}	$I_{OL} = -6.5\text{mA}$	$V_{CC} - 0.5$	$V_{CC} - 0.04$	-	V
	Low level	V_{OL}	$I_{OL} = 6.5\text{mA}$	-	-	0.5	

Note 1: Duration of output short circuit time should not exceed $10\mu\text{s}$.

Note 2: Input capacitance is measured between pin 1 and pin 3.

● Switching Characteristics

Over recommended operating conditions $T_A = -40^\circ\text{C}$ to 110°C , $V_{CC} = +4.5\text{V}$ to 30V , $I_F(\text{ON}) = 1.6\text{mA}$ to 5mA , $V_F(\text{OFF}) = 0\text{V}$ to 0.8V , unless otherwise specified. All typicals at $T_A = 25^\circ\text{C}$.

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Propagation Delay Time to Output Low Level	t_{PHL}	$f = 10\text{kHz}$, Duty Cycle = 50% $I_F = 4\text{mA}$, $V_{CC} = 30\text{V}$	-	110	220	ns
Propagation Delay Time to Output High Level	t_{PLH}		-	90	220	
Pulse Width Distortion	PWD		-	20	120	
Propagation Delay Difference Between Any Two Parts	PDD ($t_{\text{PHL}} - t_{\text{PLH}}$)		-200	-	+200	
Rise Time	t_r		-	6	-	
Fall Time	t_f		-	7	-	
Common mode transient immunity at high level output	$ C_{\text{MH}} $	$I_F = 4.0\text{mA}$ $V_{CC} = 5\text{V}$, $T_A = 25^\circ\text{C}$, $V_{\text{CM}} = 1.0\text{KV}$	20	-	-	KV / μs
Common mode transient immunity at low level output	$ C_{\text{ML}} $	$I_F = 0\text{mA}$ $V_{CC} = 5\text{V}$, $T_A = 25^\circ\text{C}$, $V_{\text{CM}} = 1.0\text{KV}$	20	-	-	KV / μs

Note 1: The t_{PLH} propagation delay is measured from the 50% point on the leading edge of the input pulse to the 1.5 V point on the leading edge of the output pulse. The t_{PHL} propagation delay is measured from the 50% point on the trailing edge of the input pulse to the 1.5 V point on the trailing edge of the output pulse.

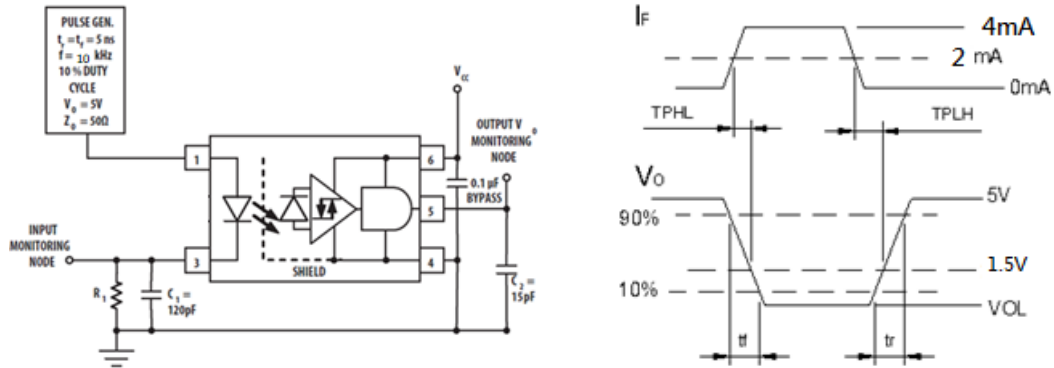
Note 2: Pulse Width Distortion (PWD) is defined as $|t_{\text{PHL}} - t_{\text{PLH}}|$ for any given device.

Note 3: The difference of t_{PLH} and t_{PHL} between any two devices under the same test condition.

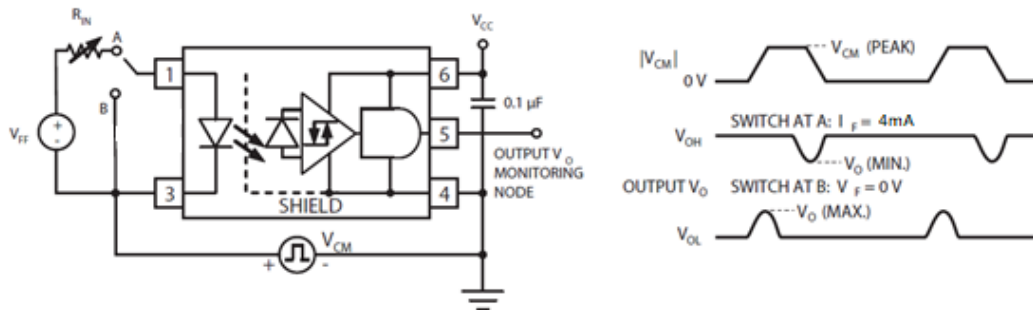
Note 4: CMH is the maximum slew rate of the common mode voltage that can be sustained with the output voltage in the logic high state, $V_O > 2.0\text{V}$. CML is the maximum slew rate of the common mode voltage that can be sustained with the output voltage in the logic low state, $V_O < 0.8\text{V}$.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

● **Test Circuit**

Propagation delay time t_{PLH} 、 t_{PHL} 、and rise time t_r , fall time t_f

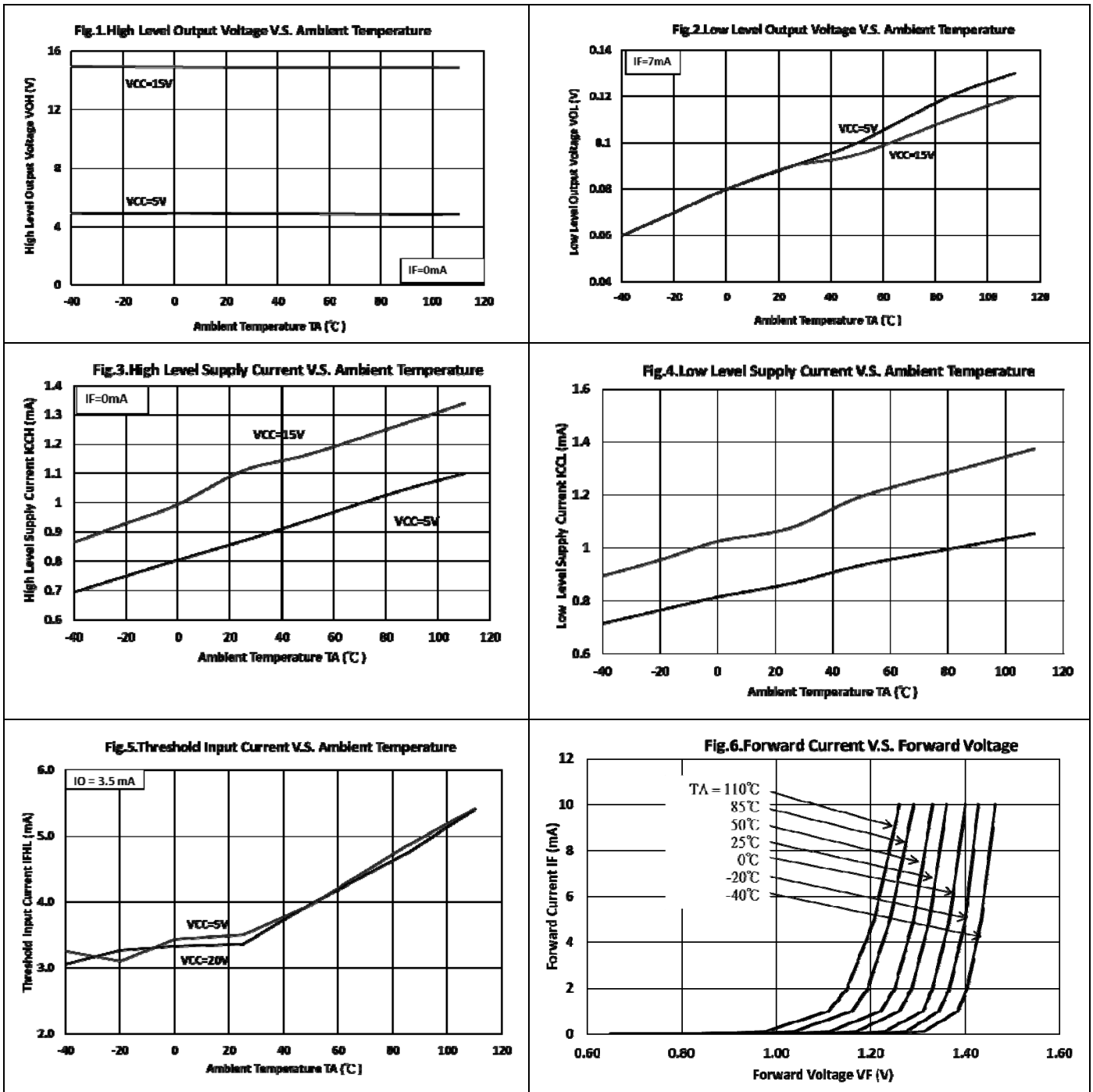


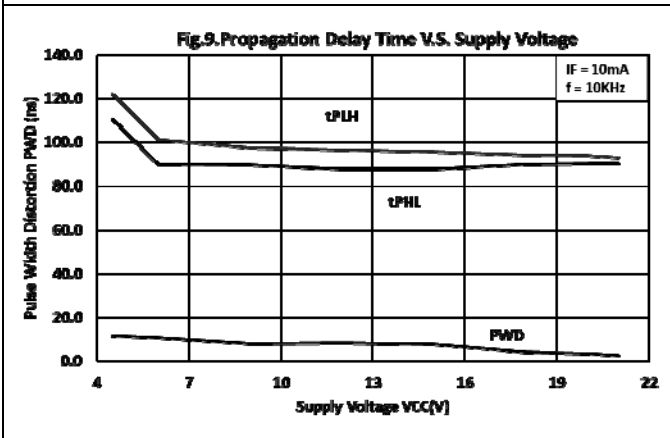
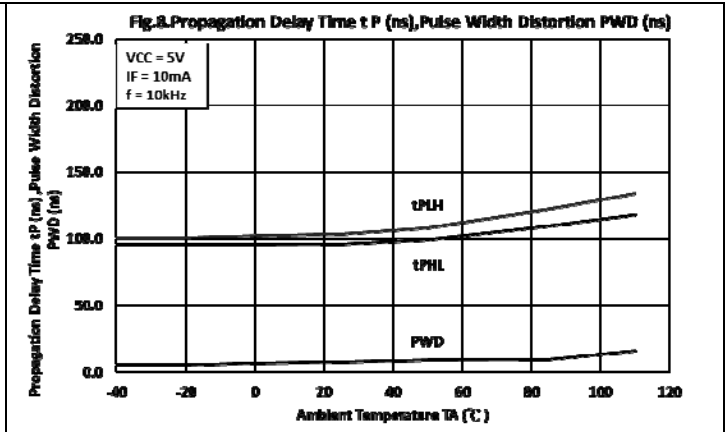
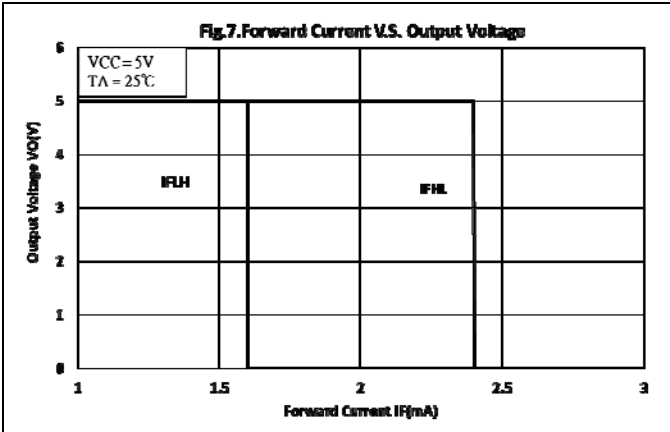
Common Mode Transient Immunity Test Circuit and Typical Waveforms



* $C_{ML}(C_{MH})$ 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



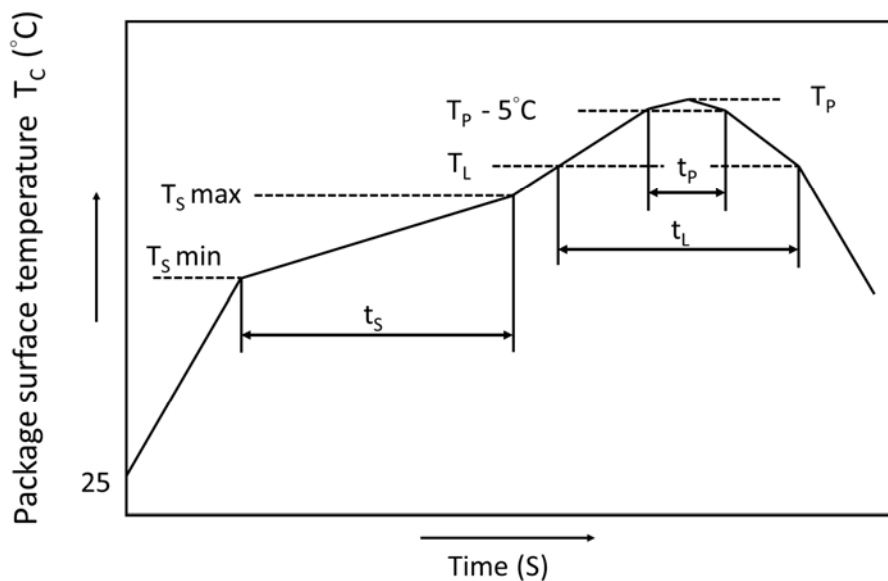


● Recommended Soldering Conditions

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	$^\circ\text{C}$
Preheat time	t_s	60	120	s
Ramp-up rate (T_L to T_P)			3	$^\circ\text{C/s}$
Liquidus temperature	T_L	217		$^\circ\text{C}$
Time above T_L	t_L	60	100	s
Peak Temperature	T_P		260	$^\circ\text{C}$
Time during which T_c is between ($T_P - 5$) and T_P	t_p		20	s
Ramp-down rate			6	$^\circ\text{C/s}$

- **Numbering System**

KPC483 (Y)-(Z)

Notes:

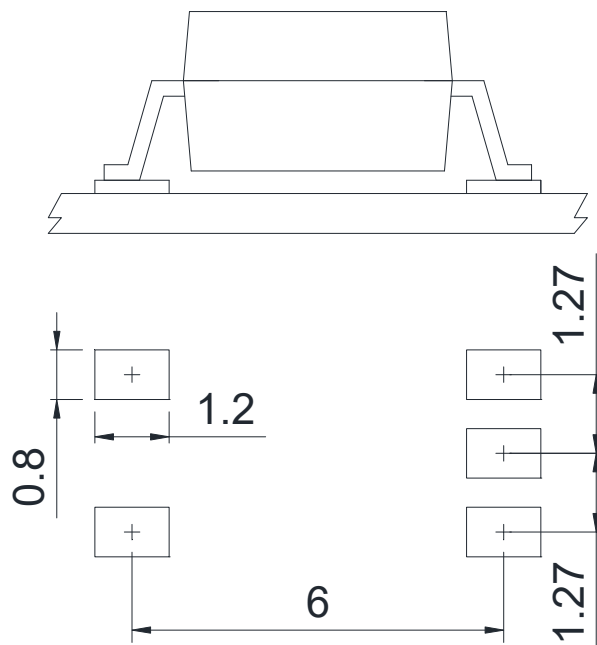
KPC483 = Part No.

Y = Tape and reel option (TLD or TRU)

Z = VDE option (V or None)

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

- **Application Notice**

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