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KPC456 Series

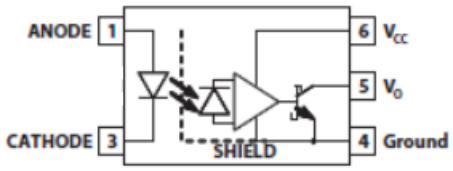
5PIN HIGH-SPEED OUTPUT PHOTOCOUPLER

Description

The KPC456 consists of a GaAsP LED optically coupled to an integrated high gain photo detector. Minimized propagation delay difference between devices make these Photo couplers excellent solutions for improving inverter efficiency through reduced switching dead time.

Specifications and performance plots are given for typical IPM applications.

Schematic



1. Anode
3. Cathode
4. GND
5. Vo
6. Vcc

Features

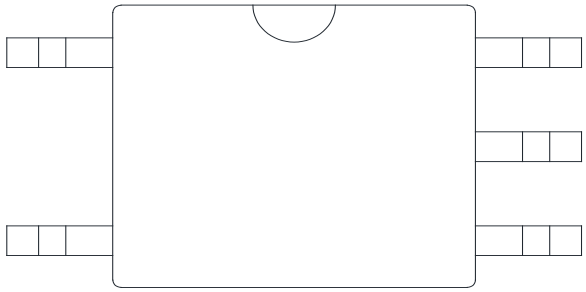
- Performance specified for common IPM applications over industrial temperature range: -40° C to 110° C
- Fast maximum propagation delays tPHL = 400 ns, tPLH = 550 ns
- Minimized Pulse Width Distortion (PWD = 370 ns)
- Very high Common Mode Rejection (CMR):15 kV/s at VCM = 1500 V
- CTR > 44% at IF = 10 mA
- Safety Approvals:
  CQC GB4943.1-2022

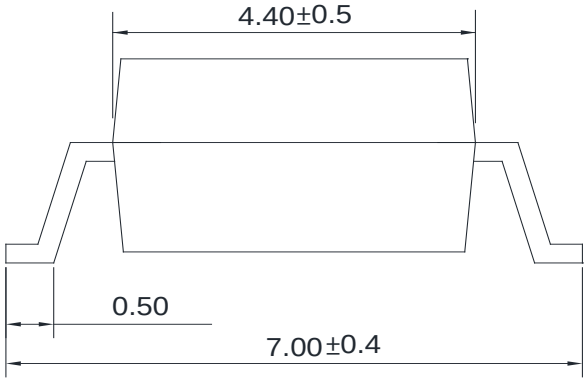
Applications

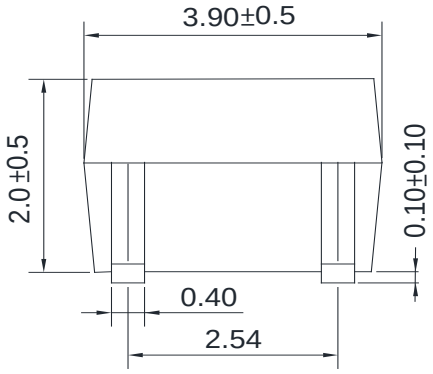
- IPM isolation
- Isolated IGBT/MOSFET gate drive
- AC and brushless dc motor drives
- Industrial inverters

Outside Dimension

Unit : mm

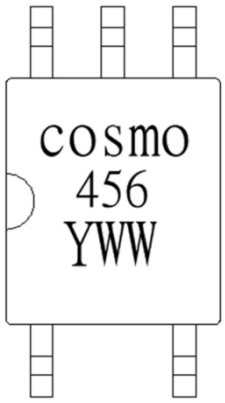






TOLERANCE: ±0.2mm

Device Marking



Notes:

cosmo
456
YWW Y: Year code / WW: Week code

● Absolute Maximum Ratings

(Ta=25℃)

Parameter		Symbol	Rating	Unit
Input	Forward current	I_F	25	mA
	Peak forward current (1)	I_{FM}	40	mA
	Reverse voltage	V_R	5	V
	Power dissipation	P_D	45	mW
Output	Supply voltage	V_{CC}	30	V
	Output voltage	V_O	30	V
	Output current	I_O	25	mA
	Output power dissipation	P_C	130	mW
Isolation voltage (2)		Viso	3750	Vrms
Operating temperature		Topr	-40 to +110	℃
Storage temperature		Tstg	-50 to +125	℃
Soldering temperature 10 seconds		Tsol	260	℃

Note 1: Pulse width (PW) ≤ 1 ms, duty = 50 %
Note 2: This device is considered as a two-terminal device: Pins 1 and 3 are shorted together, and pins 4, 5 and 6 are shorted together.

● Electro-optical Characteristics

Over recommended operating conditions unless otherwise specified:
TA = -40° C to +110° C, VCC = +4.5 V to 30 V, IF(on) = 10 mA to 20 mA, VF(off) = -5 V to 0.8 V

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Input forward voltage	V_F	I_F=10mA	-	1.5	1.8	V
Input reverse voltage	V_{BR}	I_R=10uA	5	-	-	V
Input capacitance	C_{IN}	VF=0, f=1MH$_Z$	-	60	-	pF
Current Transfer Ratio	CTR	I_F = 10 mA, V_O = 0.6V	44	90	-	%
Low Level Output Current	I_{OL}	I_F = 10 mA, V_O = 0.6V	4.5	9	-	mA
High Level Output Current	I_{OH}	V_F = 0.8V	-	5	50	uA
Low Level Output Voltage	V_{OL}	IO = 2.4 mA	-	0.3	0.6	V
High Level Supply Current	I_{CCH}	VF = 0.8V, VO = Open	-	0.6	1.3	mA
Low Level Supply Current	I_{CCL}	IF = 10 mA, VO = Open	-	0.6	1.3	mA
Input Threshold Current	I_{TH}	VO = 0.8V, IO = 0.75 mA	-	1.5	5.0	mA
Isolation resistance (input-output) (3)	R_{I-O}	V_{I-O}=500V	-	10^{12}	-	Ω
Capacitance (input-output) (3)	C_{I-O}	f=1MH$_Z$	-	0.6	-	pF

Note 3: This device is considered as a two-terminal device: Pins 1 and 3 are shorted together, and pins 4, 5 and 6 are shorted together

● Switching Specifications

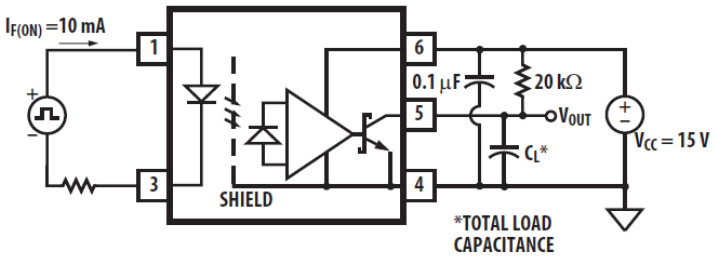
Over recommended operating conditions unless otherwise specified:
TA = -40° C to +110° C, VCC = +4.5 V to 30 V, IF(on) = 10 mA to 20 mA, VF(off) = -5 V to 0.8 V

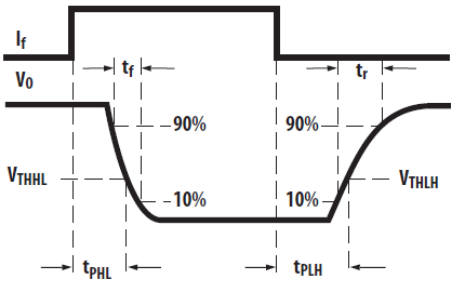
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Propagation delay time to high output level	t_{PLH}	IF(on) = 10 mA, VF(off) = 0.8 V, VCC = 15.0 V, VTHLH = 2.0 V, VTHHL = 1.5 V	270	400	550	ns
Propagation delay time to low output level	t_{PHL}		30	200	400	ns
Pulse Width Distortion	PWD		-	200	450	ns
Propagation Delay Skew	t_{PLH}-t_{PHL}		-150	200	450	ns
High level Common Mode Transient Immunity	CM_H	Vcc=15V, IF = 0 mA, VO > 3.0 V V_{CM}=1500V, CL=100 Pf, TA= 25° C	15	30	-	KV/us
Low level Common Mode Transient Immunity	CM_L	VCC = 15 V, IF = 10 mA, VO < 1.0 V CL = 100 pF, VCM = 1500 V, TA= 25° C	15	30	-	KV/us

● Recommended Operating Conditions

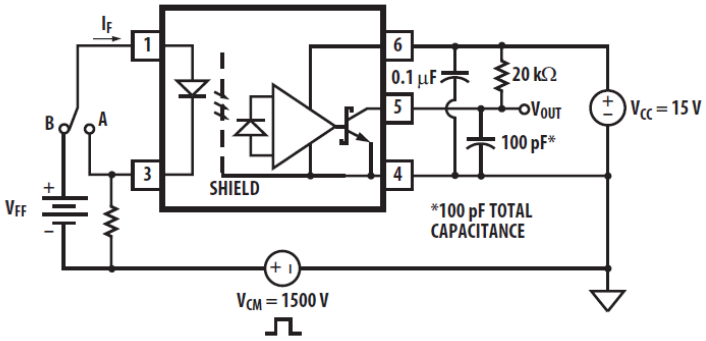
Parameter	Symbol	Min	Max	Unit
Input current (On)	I_{Fon}	10	20	mA
Input voltage (Off)	V_{Foff}	-5	0.8	V
Output voltage	V_O	0	30	V
Supply voltage	V_{CC}	4.5	30	V
Operating temperature	T_{opr}	-40	+110	℃

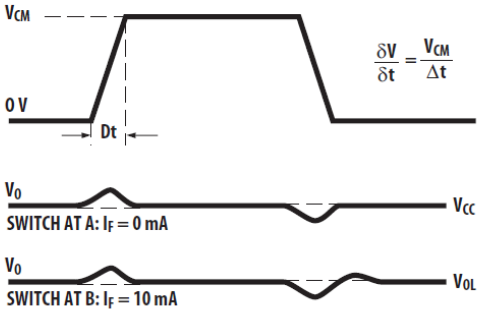
- **Test Circuit for Propagation Delay time**





- **Test Circuit for Instantaneous Common Mode Rejection Voltage**





Characteristics Curves

Fig.1.Forward Current V.S. Forward Voltage

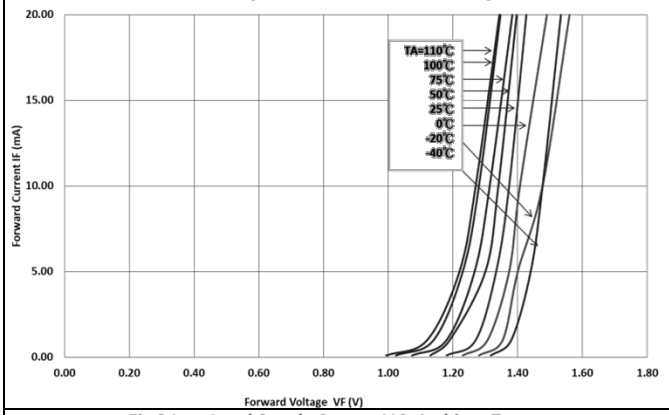


Fig.2.Normalized Output Current V.S. Ambient Temperature

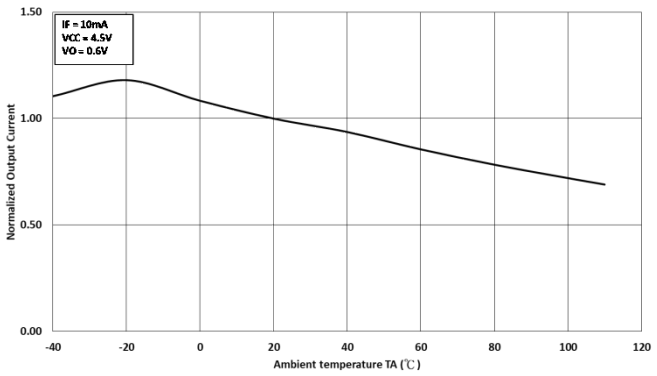


Fig.3.Low-Level Supply Current V.S. Ambient Temperature

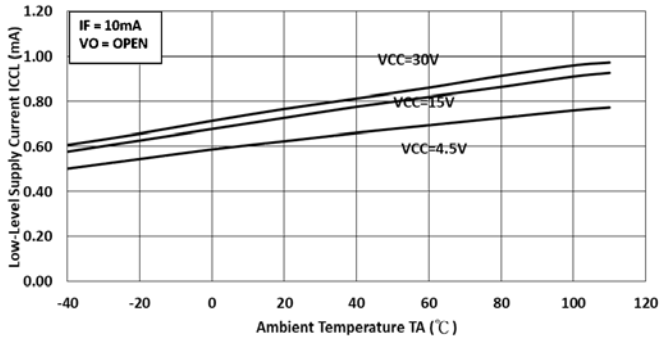


Fig.4.High-Level Supply Current V.S. Ambient Temperature

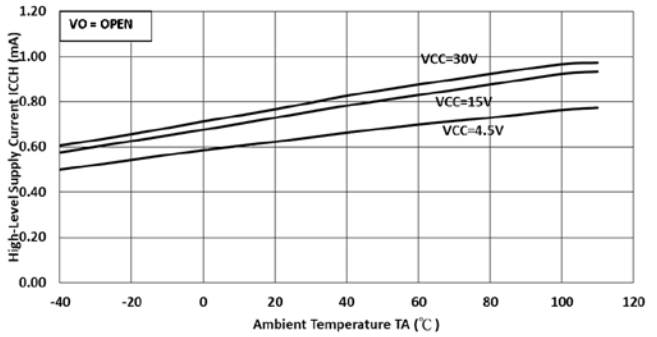


Fig.5.Output Current V.S. Forward Current

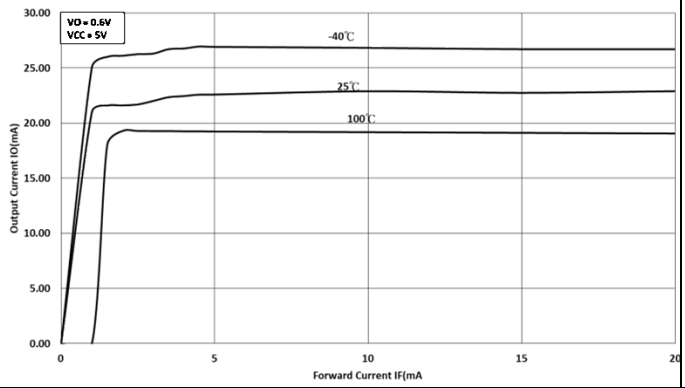


Fig.6.Output Current V.S. Forward Current

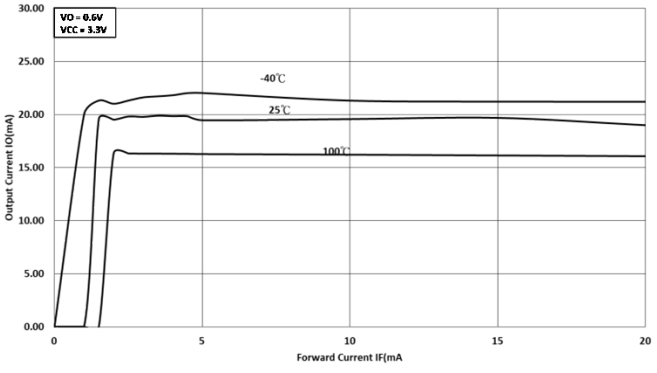


Fig.7.Output Voltage V.S. Forward Current

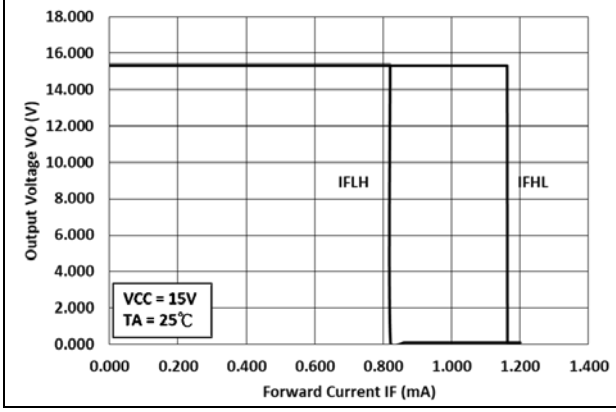


Fig.8.Forward Voltage V.S. Ambient Temperature VF(V)

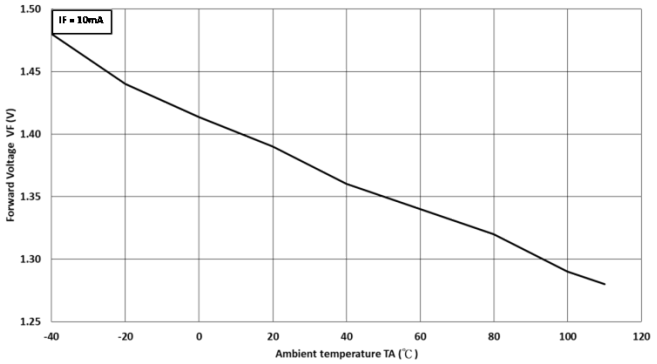


Fig.9.Low-Level Output Voltage V.S. Ambient Temperature VOL(mV)

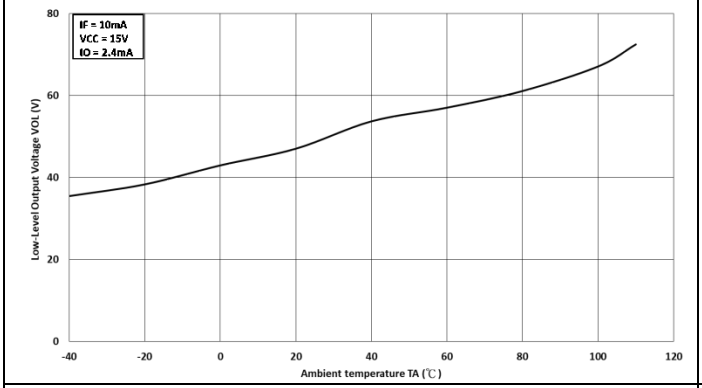


Fig.10.Low-Level Output Current V.S. Ambient Temperature VO(mV)

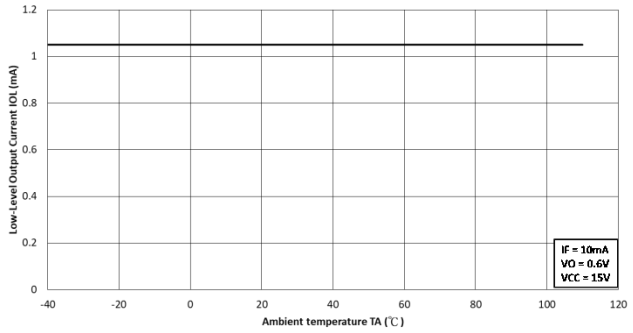


Fig.11.High-Level Output Current V.S. Ambient Temperature

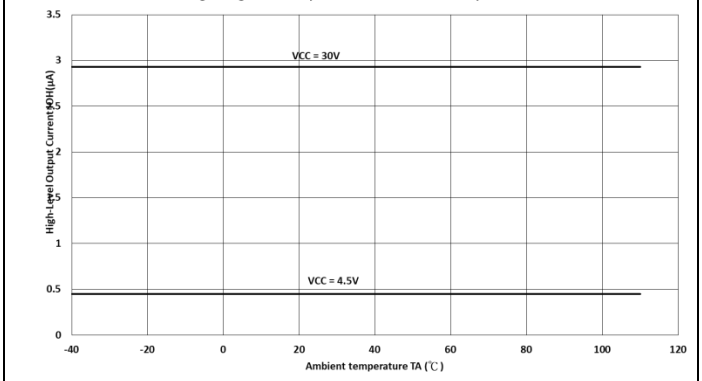


Fig.12.Threshold Current V.S. Ambient Temperature

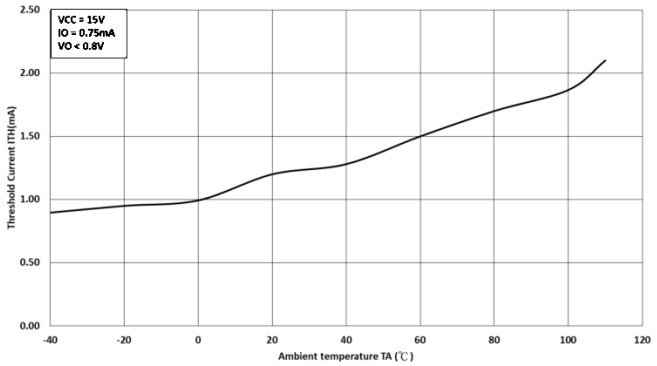


Fig.13.Propagation Delay Time V.S. Ambient Temperature

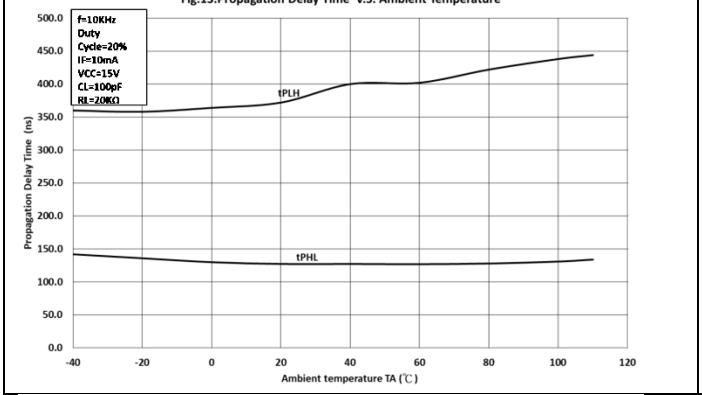


Fig.14.Propagation Delay Time V.S. Forward Current

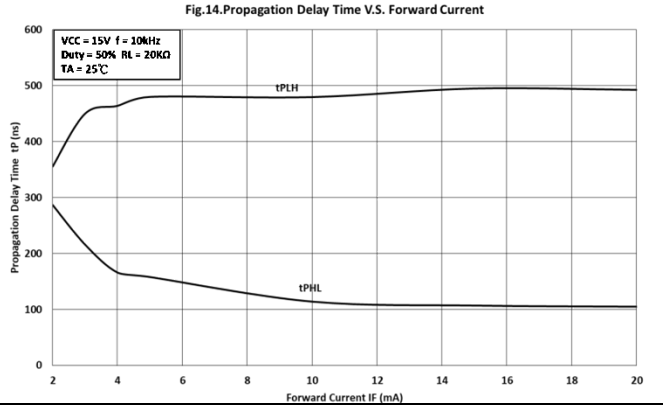


Fig.15.Propagation Delay Time V.S. Forward Current

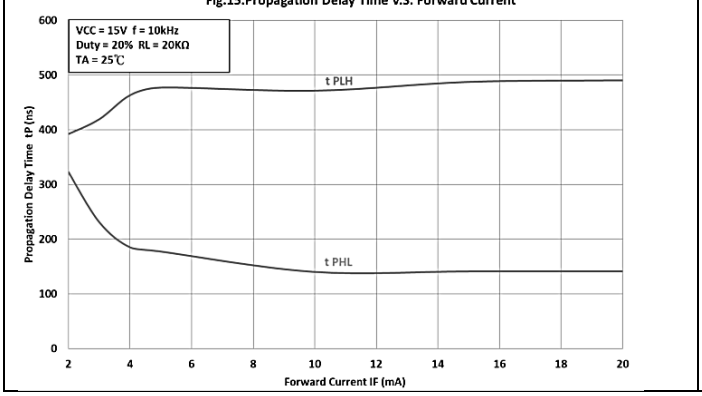


Fig.16.Propagatiom Delay V.S. Input Current

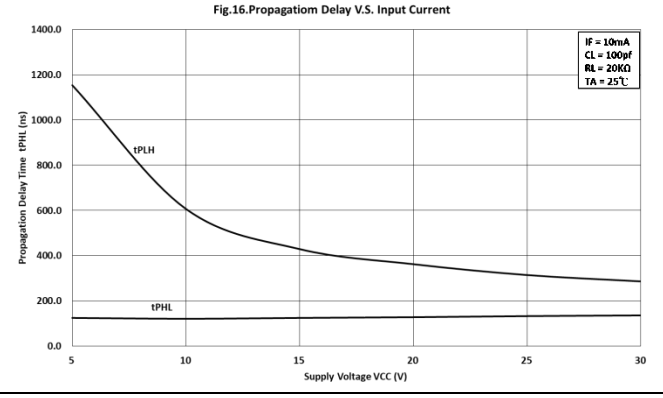


Fig.17.Propagation Delay v.s. Load Capacitance

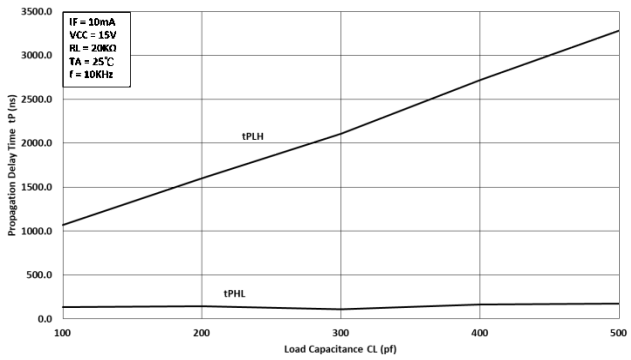
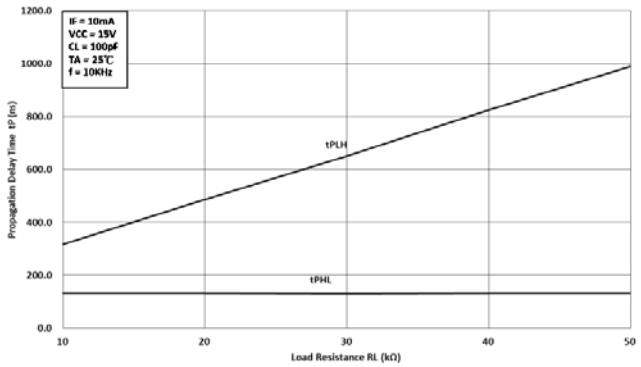


Fig.18.Propagation Delay v.s. Load Capacitance

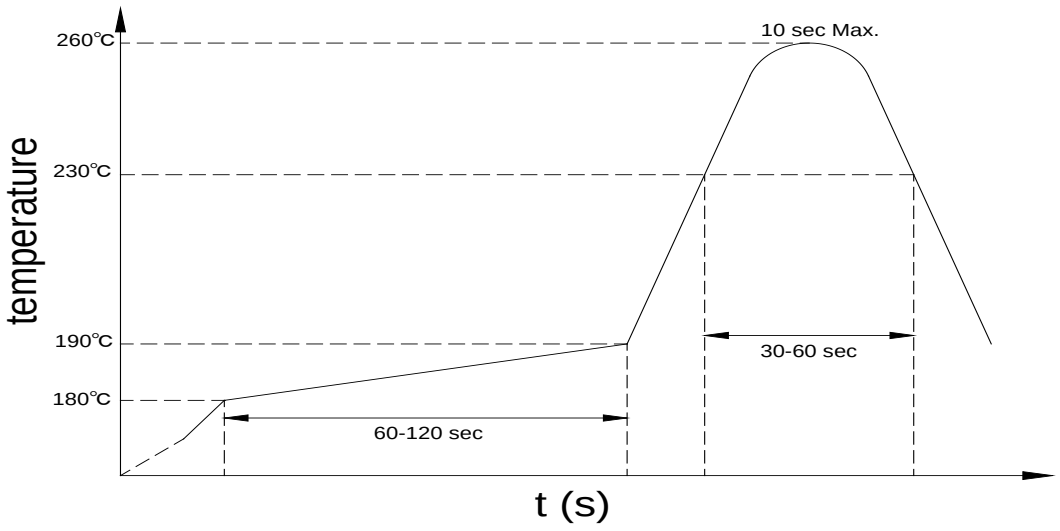


● Recommended Soldering Conditions

(a) Infrared reflow soldering：

- ■ Peak reflow soldering： 260℃ or below (package surface temperature)
- ■ Time of peak reflow temperature： 10 sec
- ■ Time of temperature higher than 230℃： 30-60 sec
- ■ Time to preheat temperature from 180~190℃： 60-120 sec
- ■ Time(s) of reflow： Two
- ■ Flux： Rosin flux containing small amount of chlorine (The flux with a maximum chlorine content of 0.2 Wt% is recommended.)

Recommended Temperature Profile of Infrared Reflow



(b) Wave soldering：

- ■ Temperature： 260℃ or below (molten solder temperature)
- ■ Time： 10 seconds or less
- ■ Preheating conditions： 120℃ or below (package surface temperature)
- ■ Time(s) of reflow： One
- ■ Flux： Rosin flux containing small amount of chlorine (The flux with a maximum chlorine content of 0.2 Wt% is recommended.)

(c) Cautions：

- ■ Fluxes： Avoid removing the residual flux with freon-based and chlorine-based cleaning solvent.
- ■ Avoid shorting between portion of frame and leads.

- **Numbering System**

KPC456 (Z)

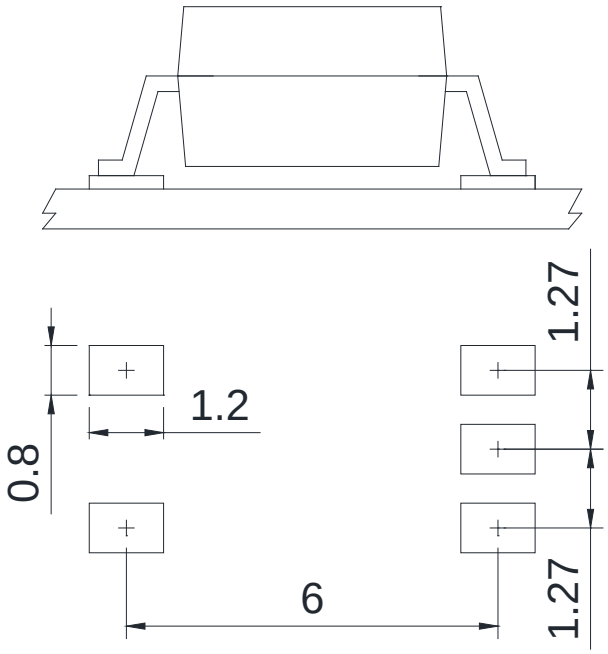
Notes:

KPC456 = Part No.

Z = Tape and reel option (TLD, TRU)

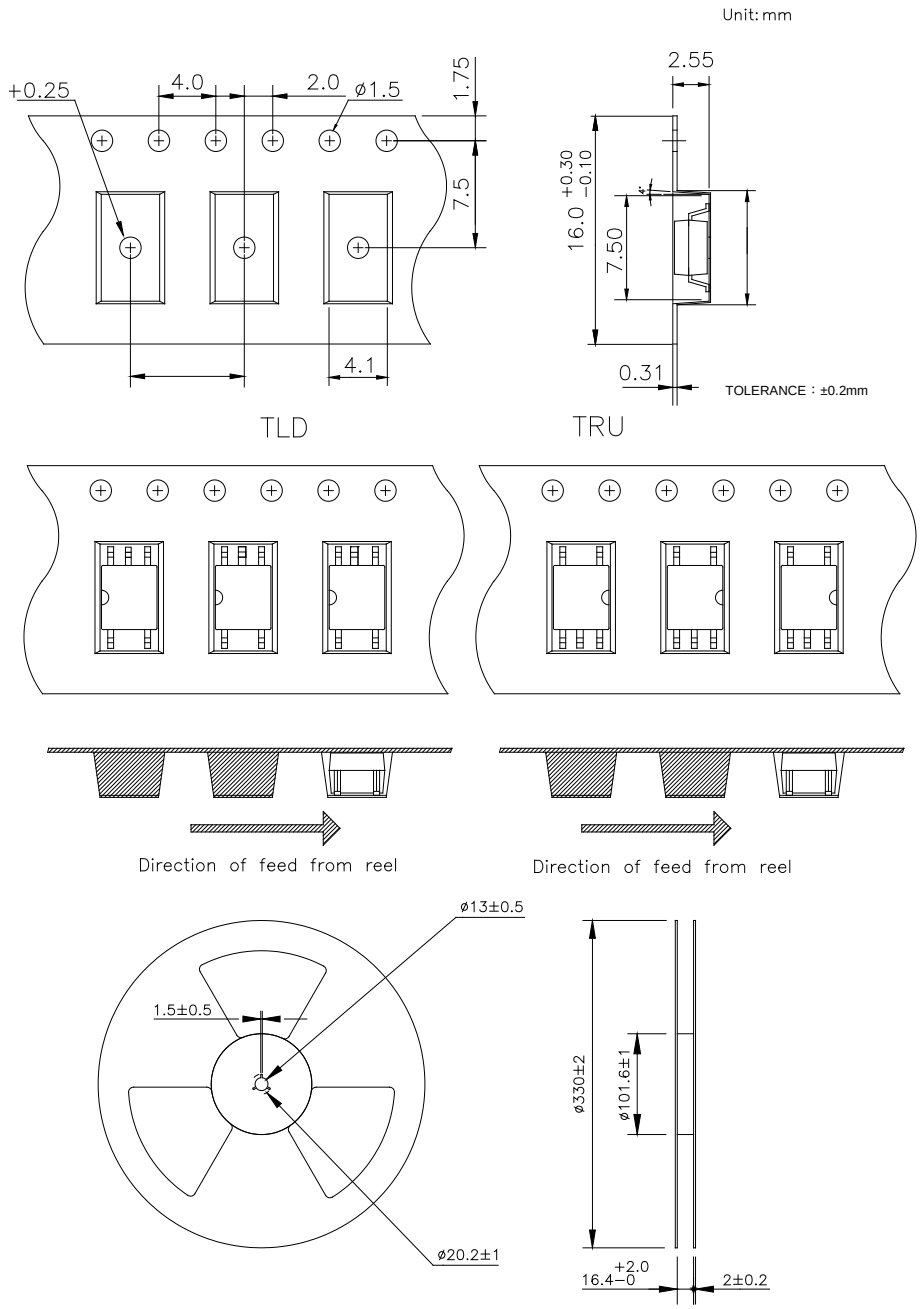
Option	Description	Packing quantity
TLD	TLD tape & reel option	3000 units per reel
TRU	TRU tape & reel option	3000 units per reel

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



Unit : mm

● SOP Carrier Tape & Reel



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