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● Description

The KT0341 series Photocoupler is ideally suited for driving power IGBTs and MOSFETs used in motor control inverter applications and inverters in power supply system. It contains an LED optically coupled to an integrated circuit with a power output stage.

The 3.0A peak output current is capable of directly driving most IGBTs with ratings up to 1200 V/200 A. For IGBTs with higher ratings, the KT341 series can be used to drive a discrete power stage which drives the IGBT gate.

The Photocoupler operational parameters are guaranteed over the temperature range from -40°C ~ +110°C.

● Features

1. 3.0 A maximum peak output current
2. Rail-to-rail output voltage
3. 110 ns maximum propagation delay
4. Under Voltage Lock-Out protection (UVLO) with hysteresis
5. Wide operating range: 15 to 30 Volts (V_{CC})
6. Guaranteed performance over temperature -40°C ~ +110°C.
7. MSL class 1
8. Agency Approvals:
   • UL Approved : UL1577
   • VDE Approved : DIN EN60747-5-5
     V_{IORM} = 891Vpeak for KT0341P
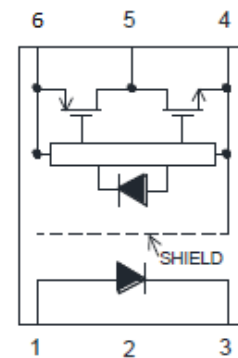 V_{IORM} = 1140Vpeak for KT0341W

● Applications

• Industrial inverter
• IGBT/Power MOSFET gate drive
• Uninterruptible power supply (UPS)
• AC brushless and DC motor drives
• Switching power suppliers

● Schematic

1. Anode	4. V_{SS}
2. N.C.	5. Vo (Output)
3. Cathode	6. Vcc

● Truth Table

LED	V_{CC}-V_{SS} (Turn-ON, +ve going)	V_{CC}-V_{SS} (Turn-OFF, -ve going)	V_O
OFF	0 V to 30 V	0 V to 30 V	Low
ON	0 V to 11.0 V	0 V to 9.5 V	Low
ON	11.0 V to 13.5 V	9.5 V to 12 V	Transition
ON	13.5 V to 30 V	12 V to 30 V	High

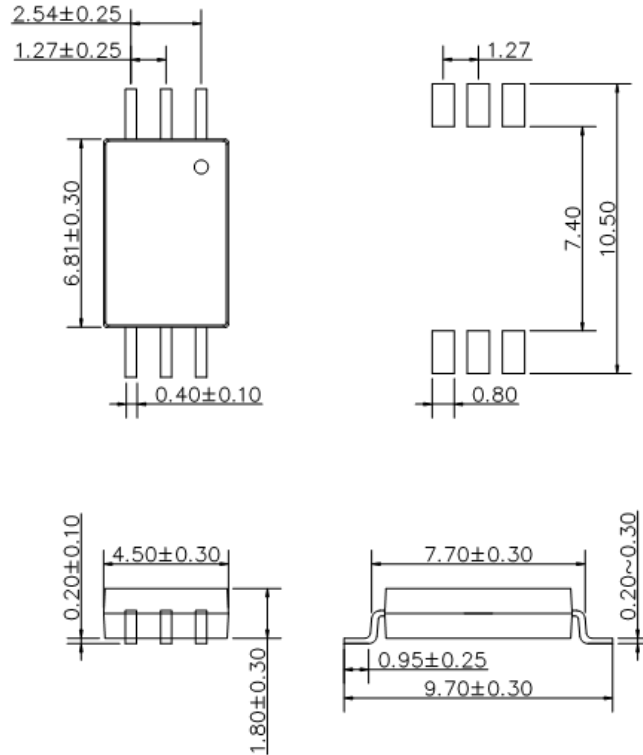Note: A 0.1μF bypass capacitor must be connected between Pin 4 and 6.

● **Outside Dimension**

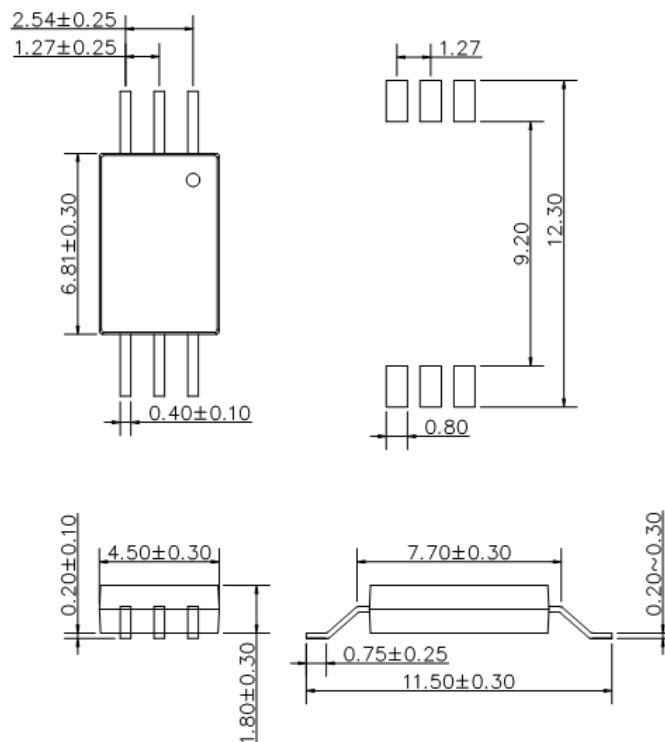## Surface Mount Lead Forming

1. P type   (Unit : mm)

2. W type

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● **Device Marking**

```
cosmo
0341
YWW
```
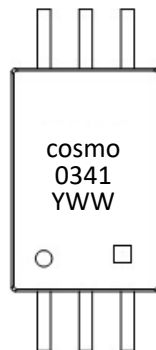
Notes:

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YWW   Y: Year code / WW: Week code
☐   V or None: VDE Option

● **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	"H" peak output current (*Note 2)	$I_{OH(PEAK)}$	3.0	A
	"L" peak output current (*Note 2)	$I_{OL(PEAK)}$	3.0	A
	Output voltage	$V_{O(PEAK)}$	-0.5~V_{CC}	V
	Total output supply voltage	V_{CC}-V_{SS}	0~35	V
	Junction temperature	T_J	125	°C
Power Dissipation		P_I	45	mW
Output IC Power Dissipation		P_O	700	mW
Operating temperature range		T_{opr}	-40~110	°C
Storage temperature range		T_{stg}	-55~125	°C
Lead soldering temperature (10s)		T_{sol}	260	°C
Isolation voltage (t=1min.,R.H ≤ 40%~60%) (*Note 3,4,5)		V_{ISO}	5000	V

Note: Ambient temperature = 25°C, unless otherwise specified. 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.

*Note1: Pulse width Pw ≤ 1μs,300pps.

*Note2: Exponential waveform. Pulse width ≤ 10 μs, f ≤ 15 kHz

*Note3: $V_{CC} – V_{SS}$ = 30 V, unless otherwise specified; all minimum and maximum specifications are at recommended operating condition.

*Note4: Device is considered a two terminal device: pins 1, 2, 3 are shorted together and pins 4, 5, 6 are shorted together.

*Note5: According to UL1577, each photocoupler is tested by applying an insulation test voltage 6000VRMS for one second. This test is performed before the 100% production test for partial discharge.

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● **Electrical Characteristics** (Ta = 25°C)

Parameter		Symbol	Test Condition		Min.	Typ.	Max.	Unit
Input forward voltage		V_F	I_F=10mA		1.6	1.9	2.4	V
Temperature coefficient of forward voltage		$\Delta V_F/\Delta Ta$	I_F=10mA		—	-1.237	—	mV/°C
Input reverse voltage		BV_R	I_R=10μA		5	—	—	V
Input capacitance		C_{IN}	V_F=0V, f=1MHz		—	60	—	pF
Output current (*Note 1)	"H" level	I_{OH}	V_{CC}=30V	I_F=10mA V_O=V_{CC} - 4	3.0	—	—	A
	"L" level	I_{OL}		I_F=0 mA V_O=V_{SS} +4	3.0	—	—	
Output voltage (*Note 2,3)	"H" level	V_{OH}	I_F=10mA, I_O=-100 mA		29.7	29.88	—	V
	"L" level	V_{OL}	I_F=0mA, I_O=100 mA		—	0.1	0.3	
Supply current	"H" level	I_{CCH}	V_{CC}=30V, I_F=10mA, V_O=Open, Rg=10Ω, Cg = 6 nF		—	1.7	3	mA
	"L" level	I_{CCL}	V_{CC}=30V, I_F=0mA, V_O=Open, Rg=10Ω, Cg=6 nF		—	2.11	3	
Threshold input current	"Output L→H"	I_{FLH}	V_O> 5V, I_O=0A		—	0.9	2	mA
Threshold input voltage	"Output H→L"	V_{FHL}	V_{CC}=30V, V_O<5V		0.8	—	—	V
Under Voltage Lockout Threshold		V_{UVLO+}	V_O > 5V, I_F = 10 mA		11.0	12.6	13.5	V
		V_{UVLO-}	V_O < 5V, I_F = 10 mA		9.5	11.2	12.0	V
UVLO Hysteresis		$UVLO_{HYS}$	—		—	1.4	—	V
Supply voltage		V_{CC}			15	—	30	V
Resistance (input-output)		R_{I-O}	V_{I-O}=500VDC		—	10^{12}	—	Ω

All Typical values at Ta = 25°C and $V_{CC} – V_{SS}$ = 30 V, unless otherwise specified; all minimum and maximum specifications are at recommended operating condition.

Note 1: Maximum pulse width = 10 μs.

Note 2: In this test V_{OH} is measured with a DC load current. When driving capacitive loads, V_{OH} will approach V_{CC} as I_{OH} approaches zero amps.

Note 3: Maximum pulse width = 1 ms.

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● Recommend Operation Conditions

Parameter	Symbol	Min.	Max.	Unit
Operating Temperature	T_A	-40	110	°C
Supply Voltage	V_{CC}	15	30	V
Input Current (ON)	$I_{F(ON)}$	7	16	mA
Input Voltage (OFF)	$V_{F(OFF)}$	-3.0	0.8	V

● Switching Characteristics
(Ta = 25°C)

Parameter		Symbol	Test Condition	Min.	Typ.	Max.	Unit
Propagation delay time	"L→H"	t_{PLH}	Rg=10 Ω, Cg=25 nF, I_F=10mA, f =10kHz, Duty Cycle =50% V_{CC} = 30V	—	61.3	110	ns
	"H→L"	t_{PHL}		—	74.5	110	
Pulse Width Distortion		PWD		—	22	70	
Propagation Delay Difference Between Any Two Parts		PDD (t_{PHL} - t_{PLH})		-100	—	+100	
Output rise time		t_r		—	20	—	
Output fall time		t_f		—	15	—	
Common mode transient immunity at high level output (*Note 1,2)		CM_H	V_{CM}=1KV, I_F=7~16mA V_{CC}=30V, Ta=25°C	20	40	—	KV / μs
Common mode transient immunity at low level output (*Note 1,3)		CM_L	V_{CM}=1KV, I_F=0mA V_{CC}=30V, Ta=25°C	20	40	—	KV / μs

All Typical values at Ta = 25°C and $V_{CC} - V_{SS}$ = 30 V, unless otherwise specified; all minimum and maximum specifications are at recommended operating condition.

Note 1:Pin 2 needs to be connected to LED common.

Note 2: Common mode transient immunity in the high state is the maximum tolerable dVCM/dt of the common mode pulse, V_{CM}, to assure that the output will remain in the high state (meaning $V_O > 15.0V$).

Note 3: Common mode transient immunity in a low state is the maximum tolerable dVCM/dt of the common mode pulse, V_{CM}, to assure that the output will remain in a low state (meaning $V_O < 1.0V$).

Fig.1 High output rail voltage vs. Temperature
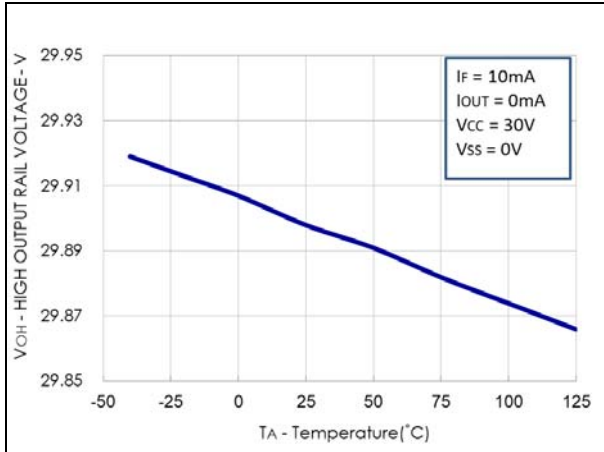
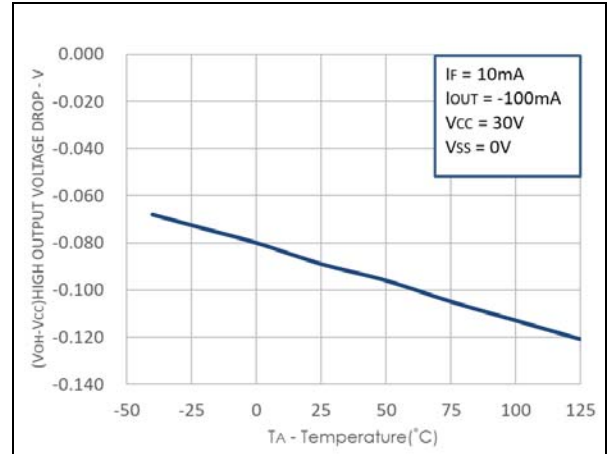### Fig.2 V_OH vs. Temperatures

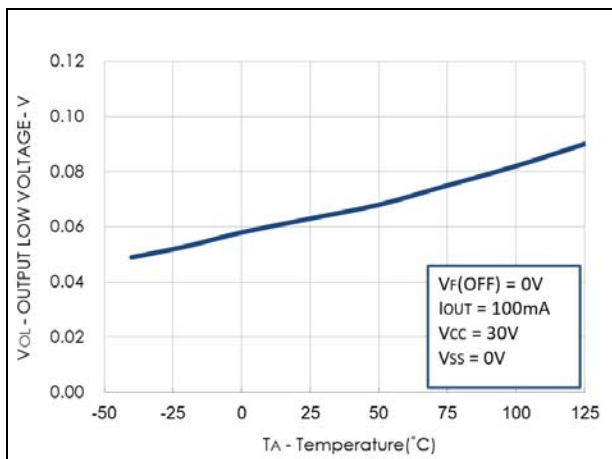### Fig.3 V_OL vs. Temperature

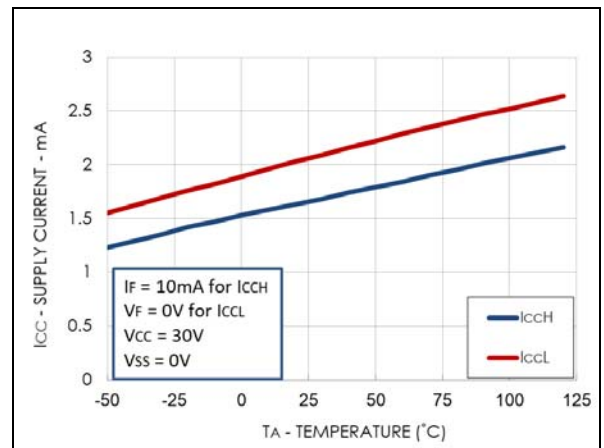### Fig.4 I_CC vs. Temperature

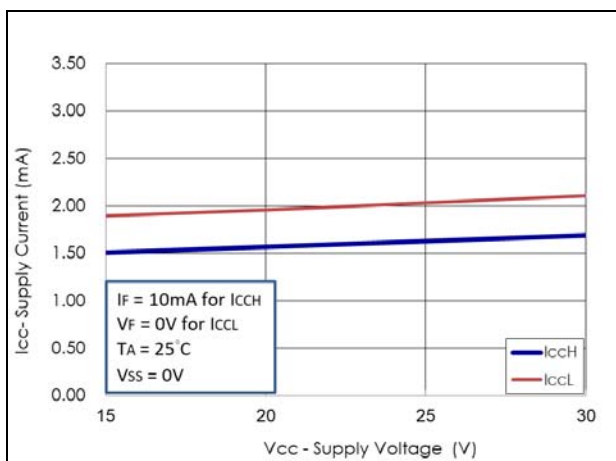

Fig.5 I_CC vs. V_CC

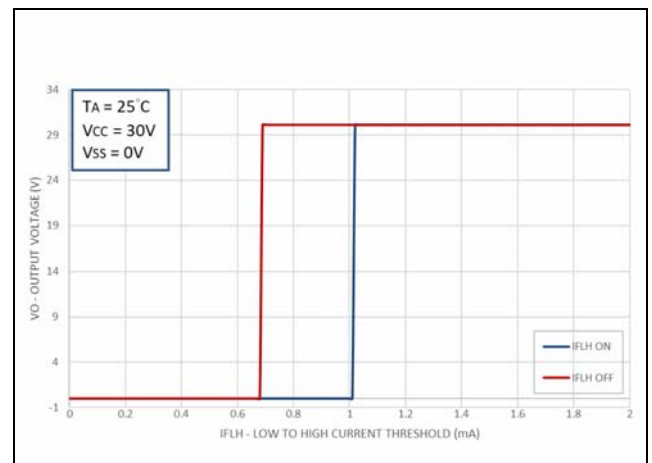### Fig.6 I_FLH vs. Hysteresis
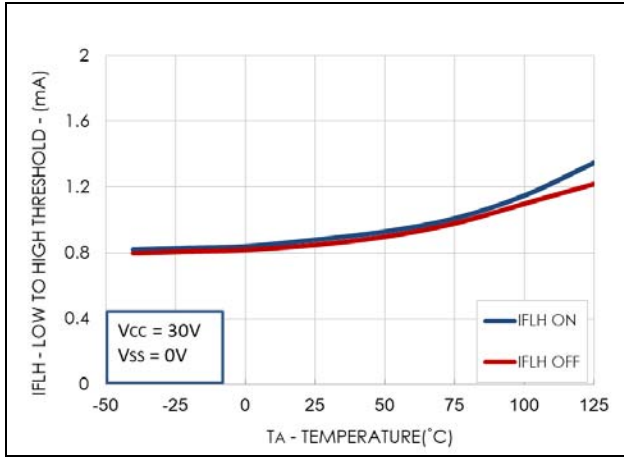
Fig.7   I$_{FH}$ vs. Temperature

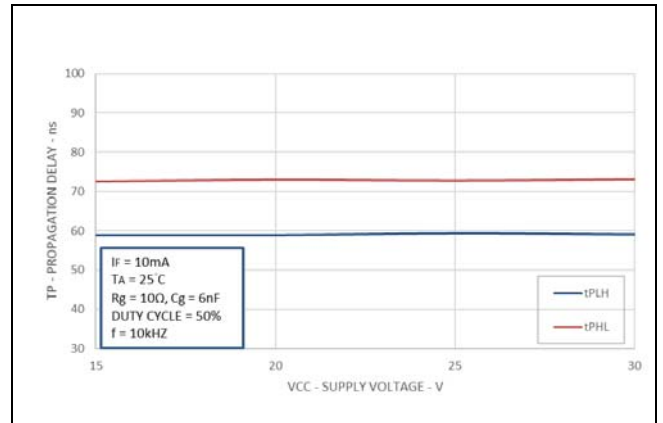**Fig.8   Propagation Delays vs. V$_{CC}$**

Fig.9   Propagation Delays vs. I$_F$
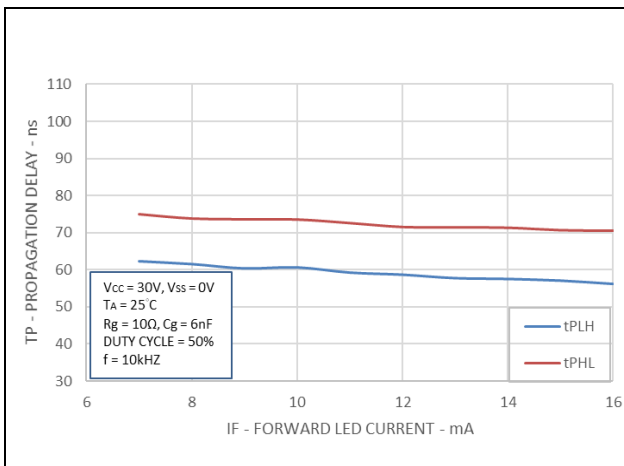
Fig.10   Propagation Delays vs. Temperature
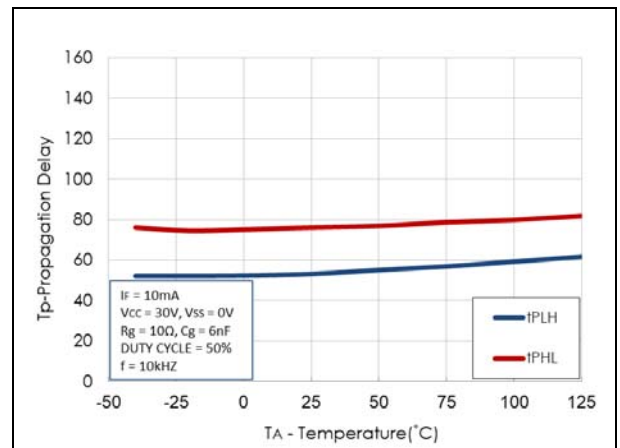
Fig.11   Propagation Delays vs. Rg
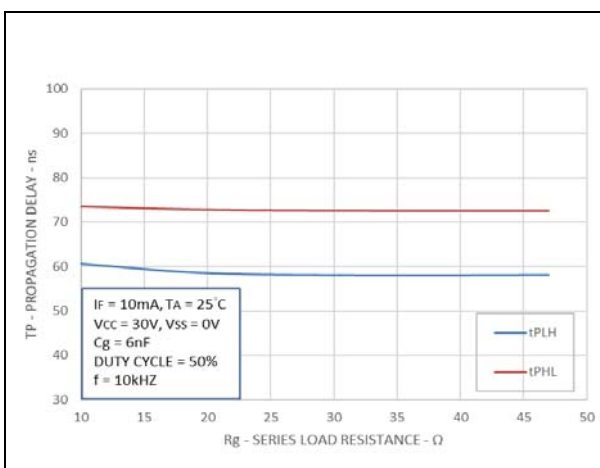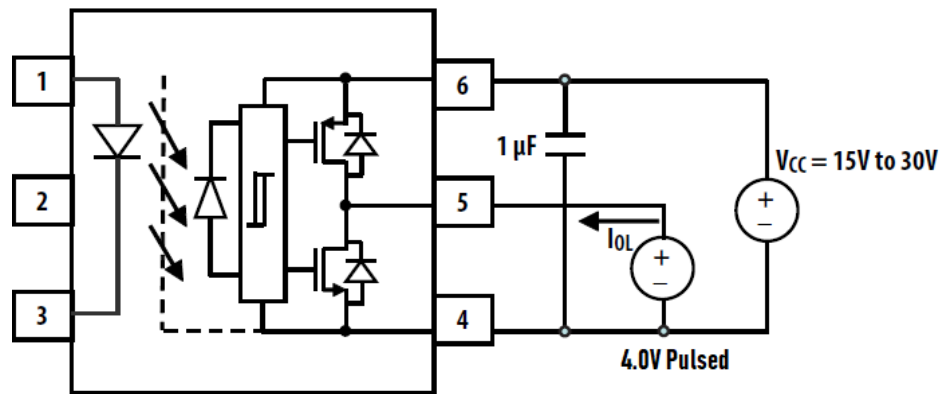

Fig.12   Propagation Delays vs. Cg
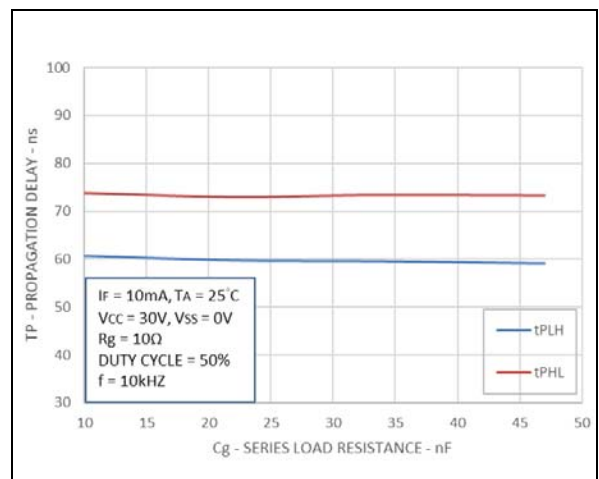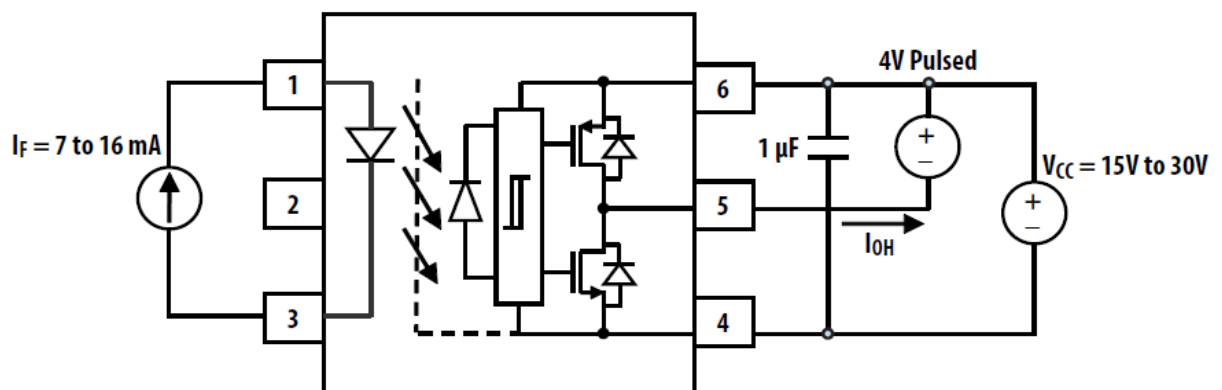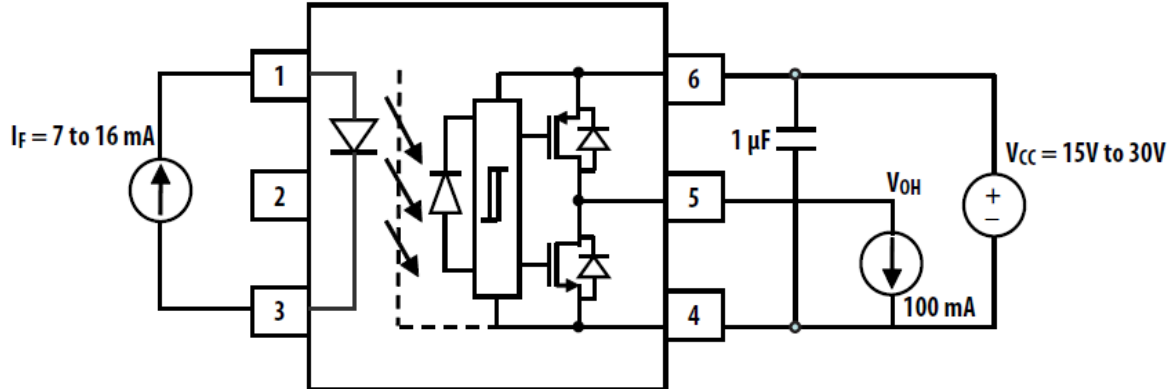
Fig.13   Input Current vs. Forward Voltage
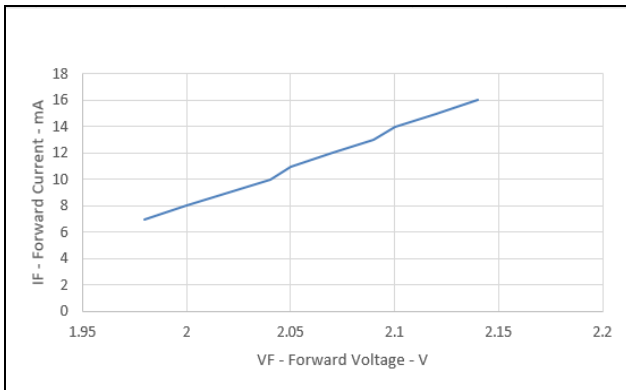
- **Test Circuit**
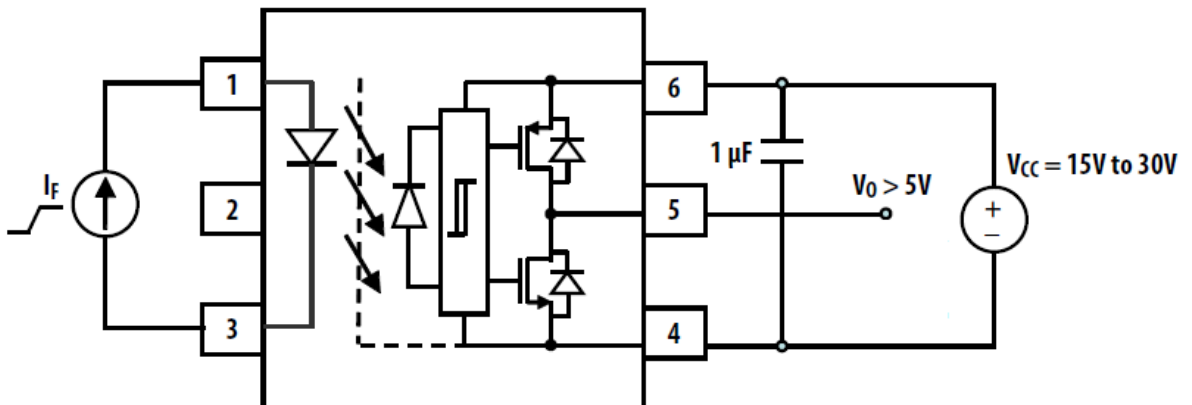
1. I_{OL} Measure

2. I_{OH} Measure

3. V_{OH} Measure

4. V_{OL} Measure

5. I_{FLH} Measure

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6. UVLO Measure

$I_F = 7$ to 16 mA

1 µF

$V_0 > 5V$

V_{CC}
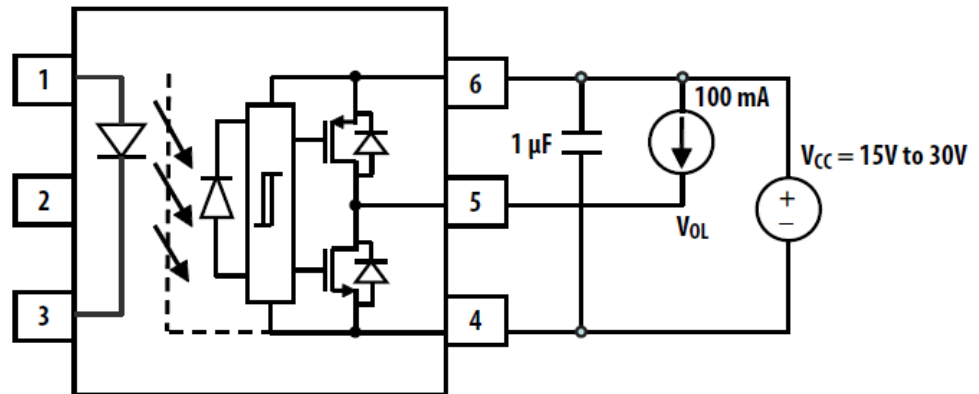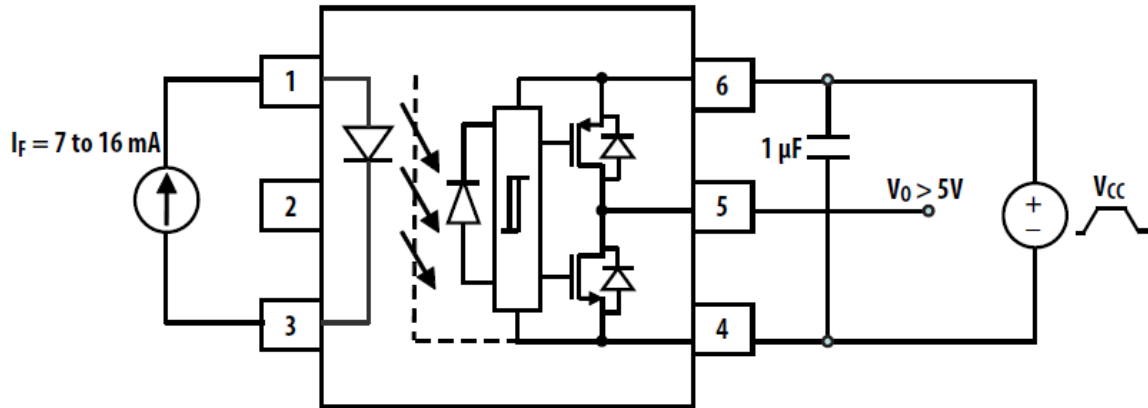
7. t_{PHL}, t_{PLH}, t_r and t_f Measure and Waveforms

$I_F = 7$ to 16 mA,
20 kHz, 50% Duty Cycle

1 µF

V_0

10 Ω

6 nF

$V_{CC} = 15V$ to 30V

I_F

t_r t_f

V_{OUT} 80%
50%
20%

t_{PLH} t_{PHL}
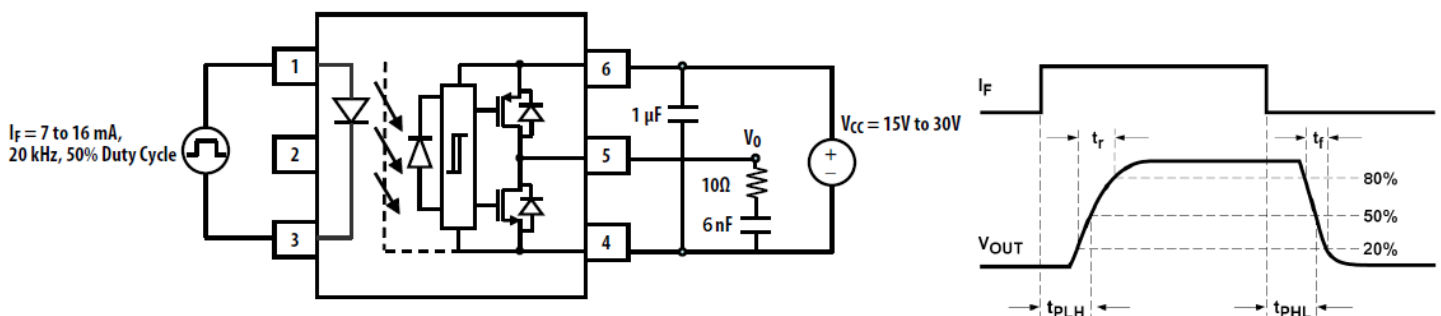
8. CMR Measure with Split Resistors Network and Waveforms

200 Ω

5V

100 Ω

1 µF

V_0

$V_{CC} = 30V$

$V_{CM} = 1500V$

V_{CM}

0 V

$\frac{\partial V}{\partial t} = \frac{V_{CM}}{\Delta t}$

Δt

V_0 V_{OH}

SWITCH AT A: $I_F = 10$ mA

V_0 V_{OI}

SWITCH AT B: $I_F = 0$ mA

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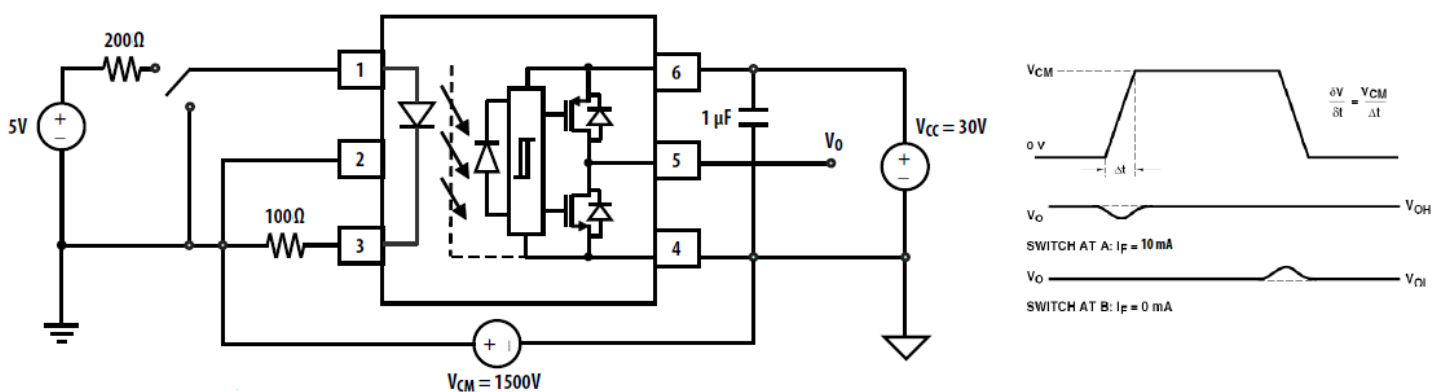
- **Recommended Soldering Conditions**

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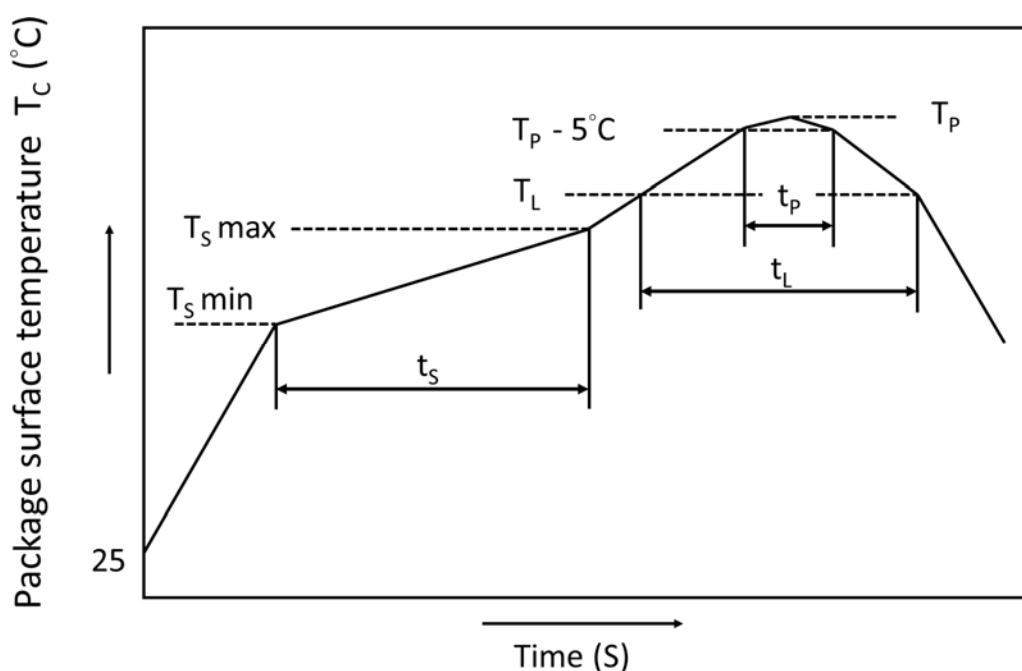
Profile Item	Symbol	Min.	Max.	Unit
Preheat temperature	T_S	150	200	°C
Preheat time	t_S	60	120	s
Ramp-up rate (T_L to T_P)	-	—	3	°C/s
Liquidus temperature	T_L	217		°C
Time above T_L	t_L	60	100	s
Peak Temperature	T_P	—	260	°C
Time during which T_C is between (T_P - 5) and T_P	t_P	—	20	s
Ramp-down rate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

● **Numbering System**

KT0341 X (Y)-(Z)

Notes:

KT0341 = Part No.

X = Lead form option (P、W)

Y = Tape and reel option (TLD、TRU)

Z = VDE option (V、None)

Option	Description	Packing quantity
P (TLD)	surface mount type package + TLD tape & reel option (9mm clearance)	3000 units per reel
P (TRU)	surface mount type package + TRU tape & reel option (9mm clearance)	3000 units per reel
W (TLD)	long creepage distance for surface mount type package + TLD tape & reel option (11mm clearance)	3000 units per reel
W (TRU)	long creepage distance for surface mount type package + TRU tape & reel option (11mm clearance)	3000 units per reel

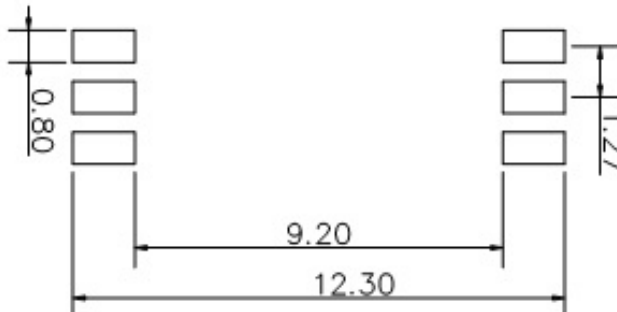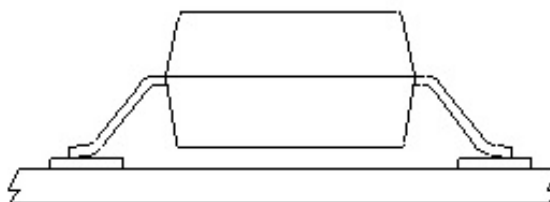● **Recommended Pad Layout for Surface Mount Lead Form**
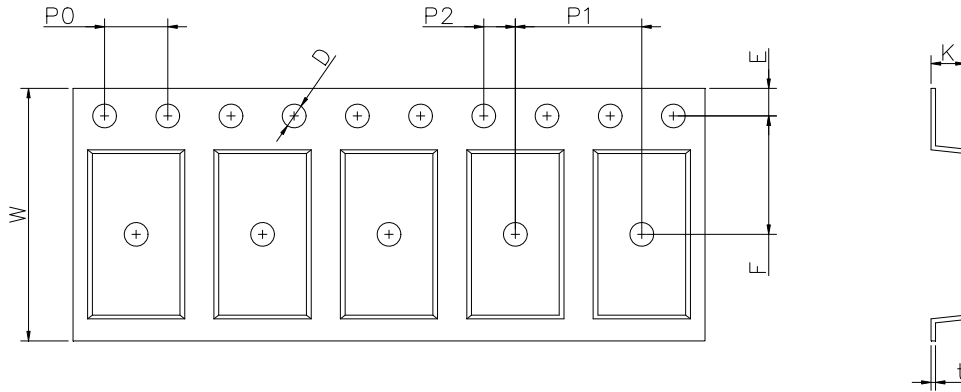

1. Surface mount type — 6LSOP-P type
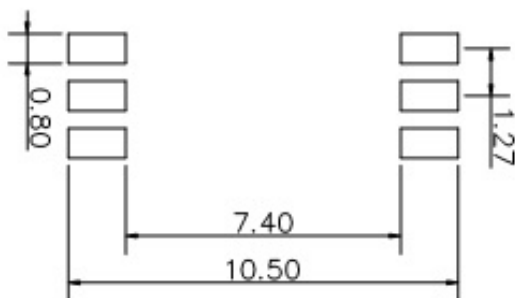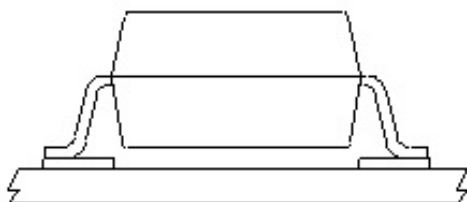
2. Long creepage distance for surface mount type — 6LSOP-W type

Unit :mm

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● **LSOP6 Carrier Tape & Reel**

Dimension Symbol	D	E	F	P0	P1	P2	t	W	K
P type Dimension (mm)	1.5±0.1	1.75±0.1	7.5±0.1	4.0±0.1	8.0±0.1	2.0±0.1	0.3±0.1	16.0±0.3	2.15±0.1
W type Dimension (mm)	1.5±0.1	1.75±0.1	11.5±0.1	4.0±0.1	8.0±0.1	2.0±0.1	0.3±0.1	24.0±0.3	2.52±0.1

TRU
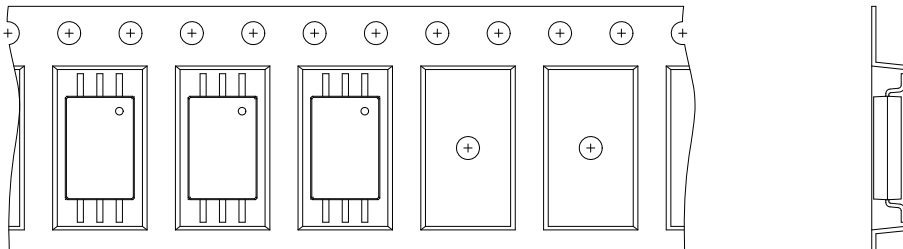
TLD
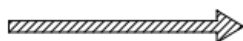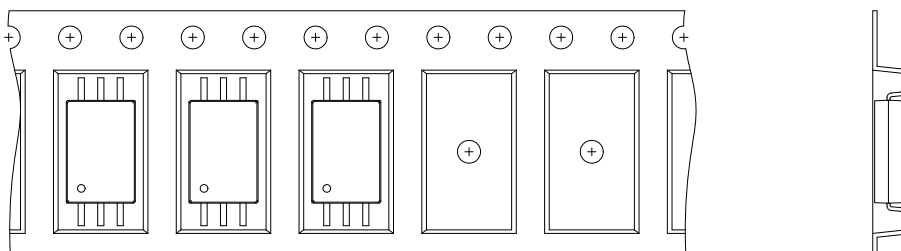
Direction of feed from reel

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