FSS-314 Series

0.8A, Gate Driver Photo Coupler

Data Sheet

Description

The FSS-314 series is a photocoupler in a 6-pin stretched SO-6 package that contains an LED optically coupled to an integrated circuit with a power output stage. This photocoupler is ideally suited for driving power IGBTs and MOSFETs used in motor control inverter applications and inverters in power supply system.
The photocoupler operational parameters are guaranteed over the temperature range from -40°C ~ +110°C.

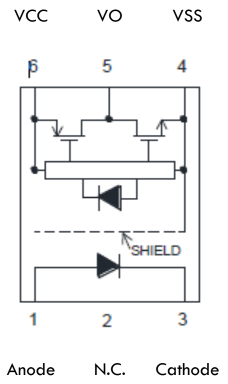
Features

- V_{ISO} : 5000 (Vrms)
- 0.8 A maximum peak output current
- Rail-to-rail output voltage
- 110 ns maximum propagation delay
- Under Voltage Lock-Out protection (UVLO) with hysteresis
- Wide operating range: 10 to 30 Volts (VCC)
- Guaranteed performance over temperature -40°C ~ +110°C.
- Safety agency certification
  - ✓ UL 1577 approved
  - ✓ VDE approved DIN_EN/IEC60747-5-2
  - ✓ CQC – GB4943.1, GB8898

Applications

- Isolated IGBT/Power MOSFET gate drive
- Industrial Inverter
- AC brushless and DC motor drives
- Induction Heating

Functional Diagram



Marking

F	: Company Abbr.
YY	: Year date code
WW	: 2-digit work week
314	: Part Number
H	: Factory identification mark
V	: VDE Identification(Option)

Ordering Information

To order, choose a part number from the part number column. Contact sales representative or authorized distributor for information.

(Example of Item Name)

FSS-314(P/W)-(T1)V

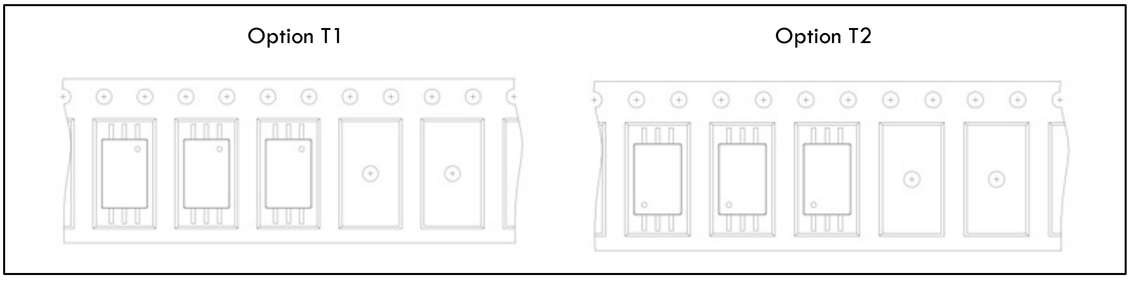
Company Abbr. | Stack | Part Number | Lead Form Option | Tape and Reel Option(T1/T2) | VDE Option (V or None)

- P - 9mm Clearance
- W -11mm Clearance

* Reference Fig 1

Item Name	Lead Form Option	VDE Option	Tape and Reel Option	Packing(MOQ)
FSS-314P-T1V	9mm Clearance	V	Option T1	300K
FSS-314P-T1V				
FSS-314W-T1	11mm Clearance			
FSS-314W-T1				
FSS-314P-T2V	9mm Clearance	V	Option T2	
FSS-314P-T2V				
FSS-314W-T2	11mm Clearance			
FSS-314W-T2				

Fig 1



Truth Table

LED	V_{CC}-V_{SS} (Turn-ON, +ve going)	V_{CC}-V_{SS} (Turn-OFF, -ve going)	VO
Off	0V to 30V	0V to 30V	Low
On	0V to 6.9V	0V to 5.9V	Low
On	6.9V to 8.7V	5.9V to 7.5V	Transition
On	8.7V to 30V	7.5V to 30V	High

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

Absolute Maximum Ratings

PARAMETER	SYMBOL	Min	Max	UNIT	Note
Storage Temperature	T_{stg}	-55	125	°C	-
Operating Temperature	T_{opr}	-40	110	°C	-
Output IC Junction Temperature	T_J	-	125	°C	-
Total Output Supply Voltage	$(V_{CC} - V_{SS})$	0	35	V	-
Average Forward Input Current	I_F	-	20	mA	-
Reverse Input Voltage	V_R	-	5	V	-
"High" Peak Output Current	$I_{OH(PEAK)}$		0.8	A	1
"Low" Peak Output Current	$I_{OL(PEAK)}$		0.8	A	1
Output Voltage	$V_{O(PEAK)}$	-0.5	Vcc	V	-
Power Dissipation	P_I	-	45	mW	-
Output IC Power Dissipation	P_O	-	250	mW	-
Lead Solder Temperature	T_{sol}	-	260	°C	-

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.

Note 1: Exponential waveform. Pulse width ≤ 10 μs, f ≤ 15 kHz

Recommended Operating Conditions

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Operating Temperature	T_A	-40	110	°C
Supply Voltage	V_{CC}	10	30	V
Input Current (ON)	$I_{F(ON)}$	7	16	mA
Input Voltage (OFF)	$V_{F(OFF)}$	-3.0	0.8	V

Electrical Specifications

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION	NOTE
INPUT CHARACTERISTICS							
Forward Voltage	V_F	1.6	1.9	2.4	V	I_F= 10 mA	-
Input Forward Voltage Temperature Coefficient	ΔVF/ ΔT	-	-1.237	-	mV/°C	IF=10mA	-
Input Reverse Voltage	BVR	5	-	-	V	IR = 10μA	-
Input Threshold Current (Low to High)	IFLH	-	0.6	2	mA	V_O > 5V, I_O = 0A	-
Input Threshold Voltage (High to Low)	VFHL	0.8	-	-	V	VCC = 30 V, VO < 5V	-
Input Capacitance	CIN	-	60	-	pF	VF = 0, f = 1MHz	-
OUTPUT CHARACTERISTICS							
High Level Supply Current	I_{CCH}	-	1.55	3	mA	I_F = 10 mA, V_{CC} = 30 V, V_O = Open, Rg = 30Ω, Cg = 3 nF	
Low Level Supply Current	I_{CCL}	-	1.92	3	mA	I_F = 0 mA, V_{CC} = 30 V, V_O = Open, Rg = 30Ω, Cg = 3 nF	
High Level Output Voltage	V_{OH}	29.4	29.69	-	V	I_F = 10 mA, I_O = -100 mA	2,3
Low Level Output Voltage	V_{OL}	-	0.17	0.4	V	I_F = 0 mA, I_O = 100 mA	
High Level Output Current	I_{OH}	0.8	-	-	A	I_F = 10 mA, V_{CC} = 30V V_O = V_{CC} - 4	1
Low Level Output Current	I_{OL}	0.8	-	-	A	I_F = 0 mA, V_{CC} = 30V V_O = V_{SS} + 4	1
Under Voltage Lockout Threshold	VUVLO+	6.9	7.8	8.7	V	V_O > 5V, I_F = 10 mA	
	VUVLO-	5.9	6.9	7.5	V	V_O < 5V, I_F = 10 mA	

All Typical values at T_A = 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 VOH is measured with a dc load current. When driving capacitive loads, VOH will approach VCC as IOH approaches zero amps.
Note 3: Maximum pulse width = 1 ms.

Switching Specifications

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION	NOTE
SWITCHING CHARACTERISTICS							
Propagation Delay Time to Output Low Level	t_{PHL}	-	54	110	ns	Rg = 47 Ω, Cg = 3 nF, f = 10kHz, Duty Cycle = 50% I_F = 10mA, V_{CC} = 30V	-
Propagation Delay Time to Output High Level	t_{PLH}	-	69	110	ns		-
Pulse Width Distortion	PWD	-	22	70	ns		-
Propagation Delay Difference Between Any Two Parts	PDD (t_{PHL} - t_{PLH})	-100	-	+100	ns		-
Rise Time	t_r	-	35	-	ns		-
Fall Time	t_f	-	25	-	ns		-
Common Mode Transient Immunity at Logic High	CM_H	20	40	-	kV/µs	I_F=7 to 16mA V_{CC}= 30V, T_A= 25 °C, V_{CM}= 1kV	1,2
Common Mode Transient Immunity at Logic Low	CM_L	20	40	-	kV/µs	I_F=0mA V_{CC}= 30V, T_A= 25 °C, V_{CM}= 1kV	1,3

All Typical values at TA = 25°C and VCC – VSS = 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, VCM, to assure that the output will remain in the high state (meaning VO > 10.0V).

Note 3: Common mode transient immunity in a low state is the maximum tolerable dVCM/dt of the common mode pulse, VCM, to assure that the output will remain in

a low state (meaning VO < 1.0V).

Isolation Characteristic

Parameter	Symbo	Device	Min.	Typ.	Max.	Unit	Test Condition	Note
Withstand Insulation Test Voltage	V_{ISO}	FSS-314P FSS-314W	5000	-	-	V	RH ≤ 40%-60%, t = 1min, T_A = 25 °C	1,2
Input-Output Resistance	R_{I-O}	-	-	10^{12}	-	Ω	V_{I-O} = 500V DC	1

All Typical values at TA = 25°C and VCC – VSS = 30 V, unless otherwise specified; all minimum and maximum specifications are at recommended operating condition.

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

Note 2: 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.

Typical Performance Curves & Test Circuits

Fig.1 High output rail voltage vs. Temperature

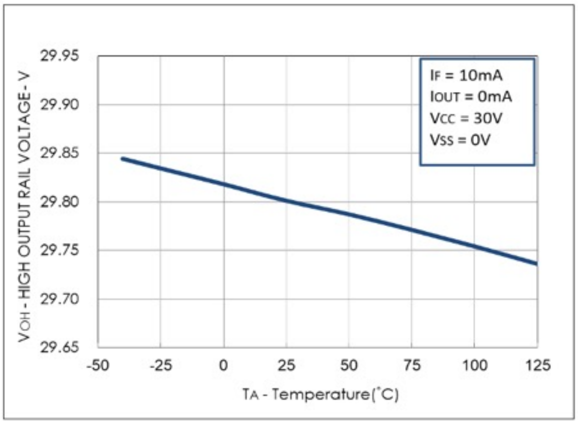


Fig.2 V_{OH} vs. Temperature

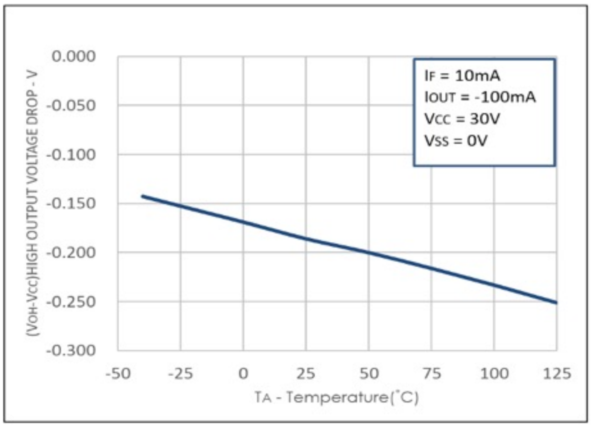


Fig.3 V_{OL} vs. Temperature

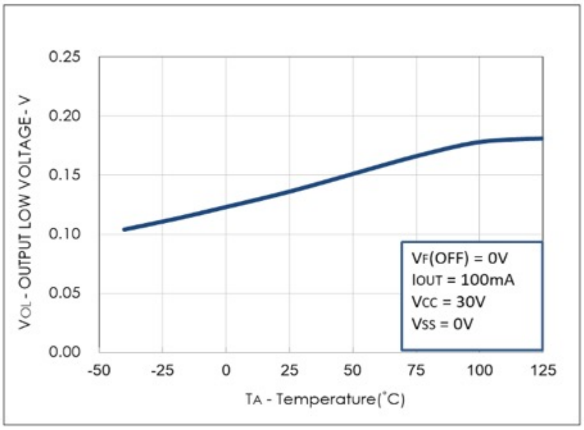


Fig.4 I_{CC} vs. Temperature

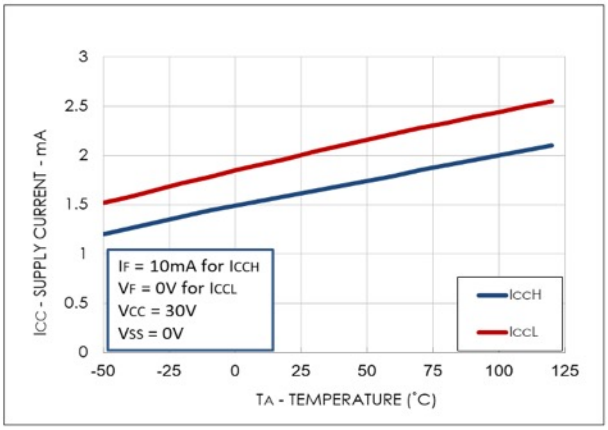


Fig.5 I_{CC} vs. V_{CC}

Fig.6 I_{FLH} vs. Hysteresis

Fig.5 I_{CC} vs. V_{CC}

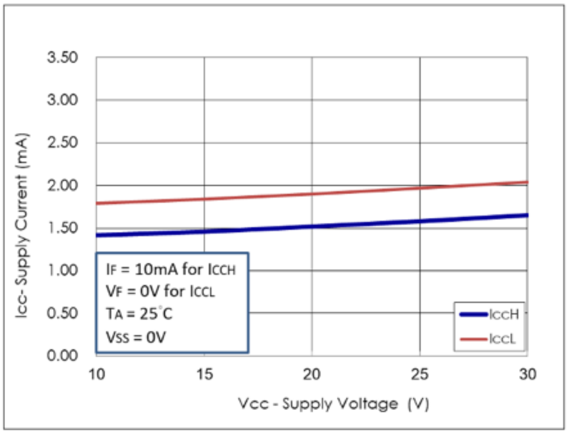


Fig.6 I_{FLH} vs. Hysteresis

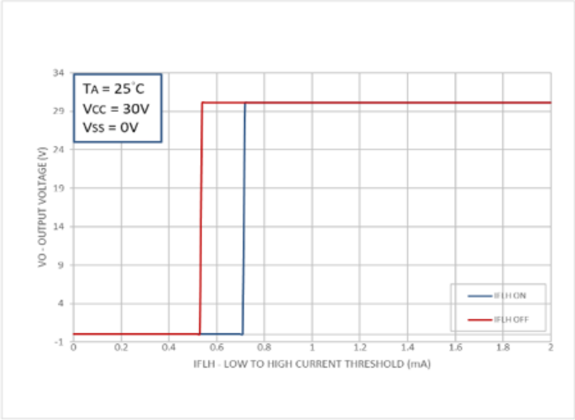


Fig.7 I_{FH} vs. Temperature

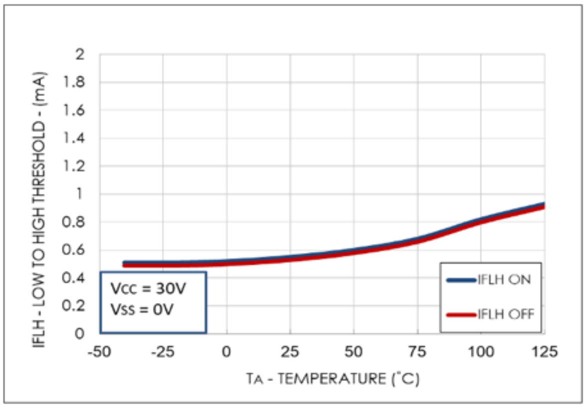


Fig.8 Propagation Delays vs. V_{CC}

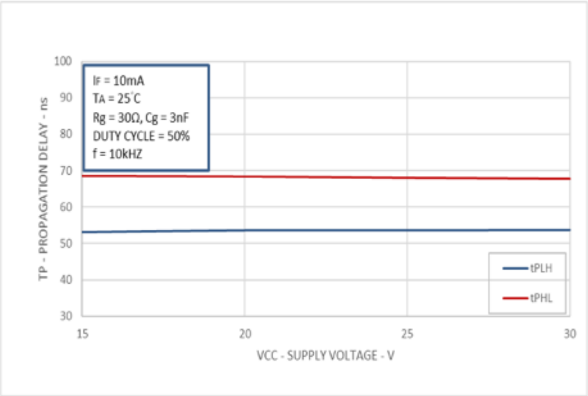


Fig.9 Propagation Delays vs. I_F

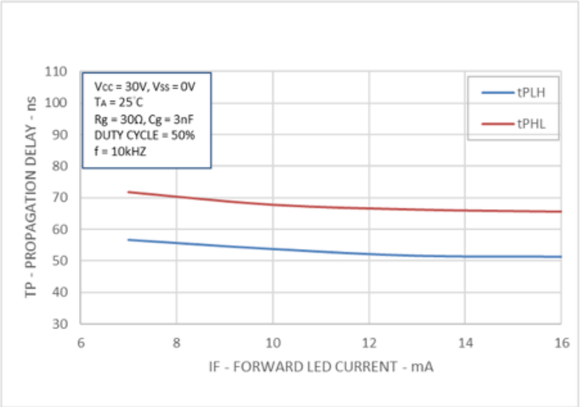


Fig.10 Propagation Delays vs. Temperature

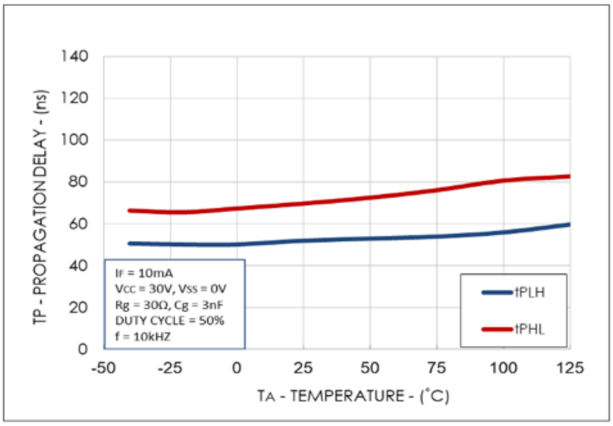


Fig.11 Propagation Delays vs. Rg

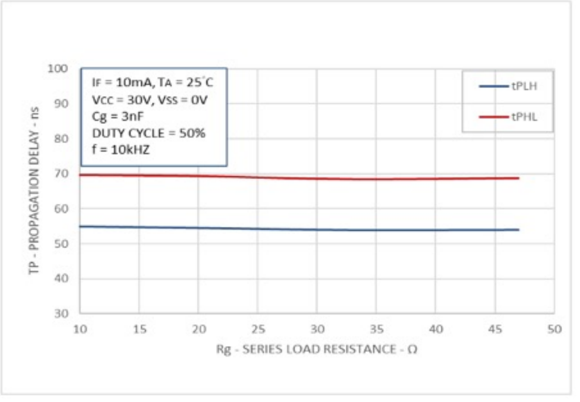


Fig.12 Propagation Delays vs. Cg

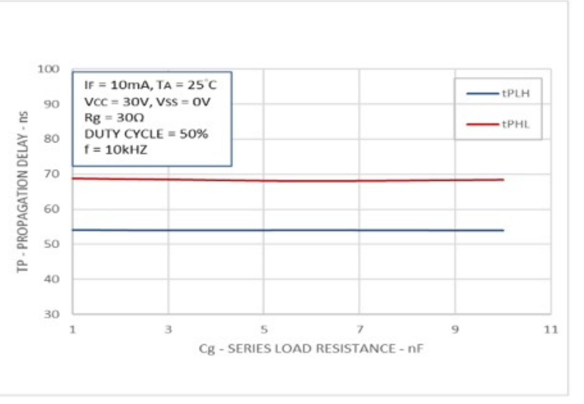


Fig.13 Input Current vs. Forward Voltage

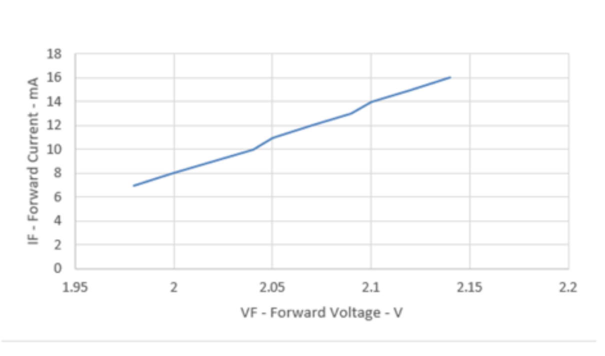


Fig.14 I_{OH} Test Circuit

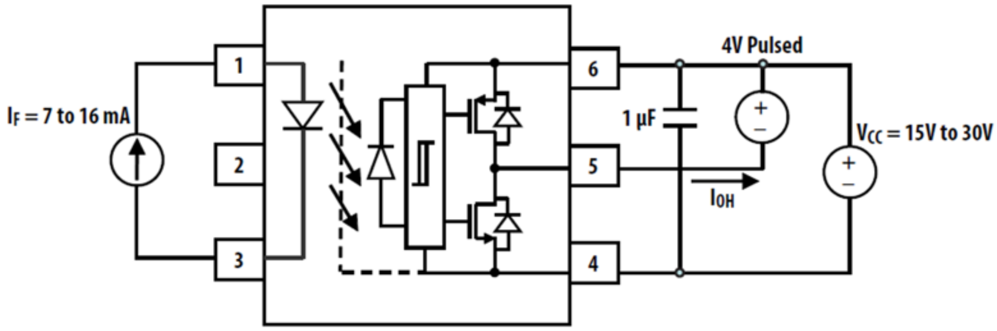


Fig.15 I_{OL} Test Circuit

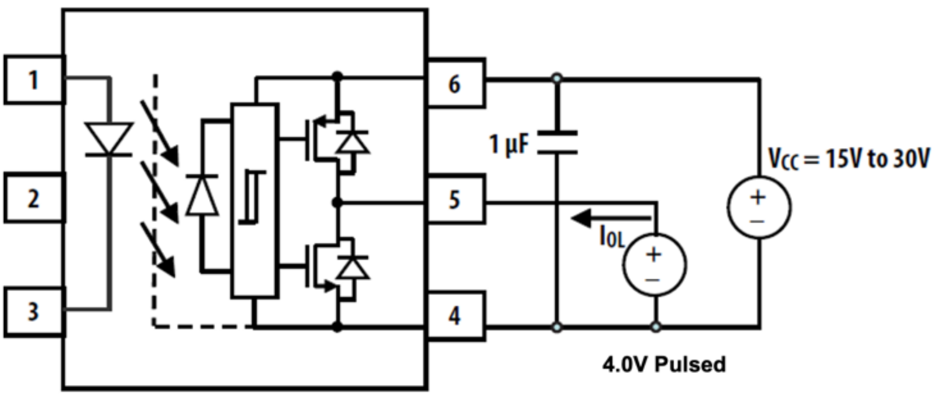


Fig.16 V_{OH} Test Circuit

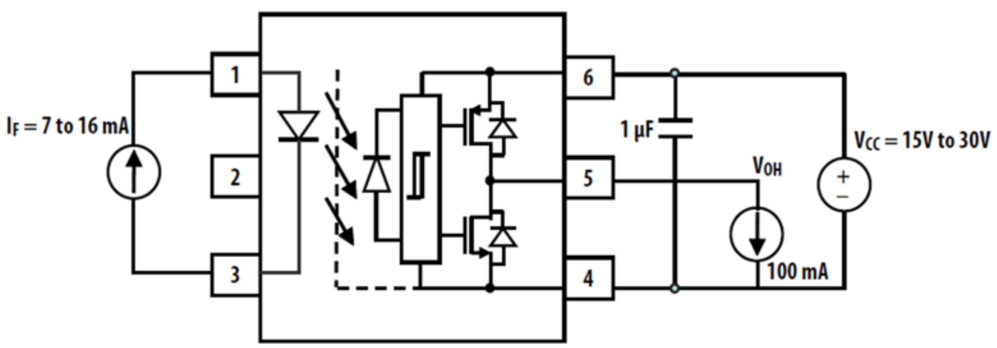


Fig.17 V_{OL} Test Circuit

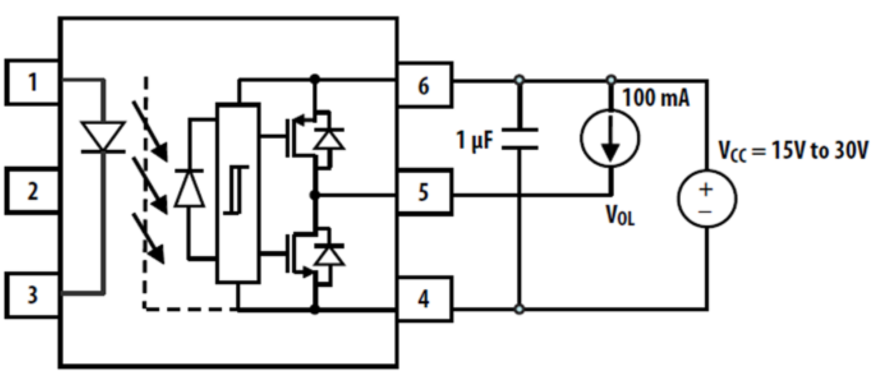


Fig.18 I_{FLH} Test Circuit

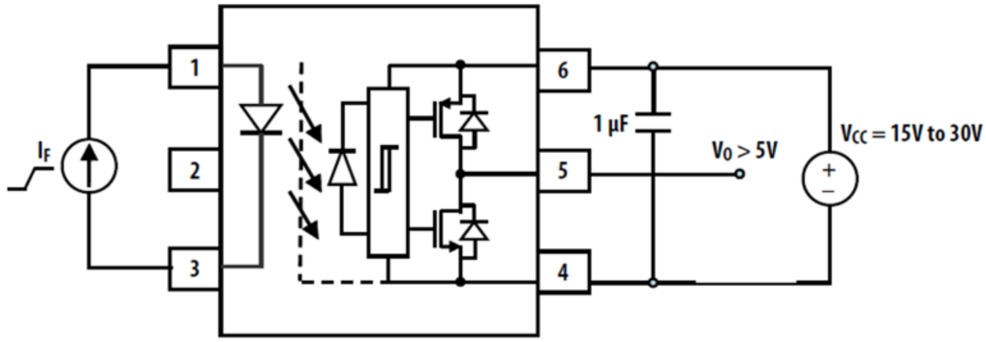


Fig.19 UVLO Test Circuit

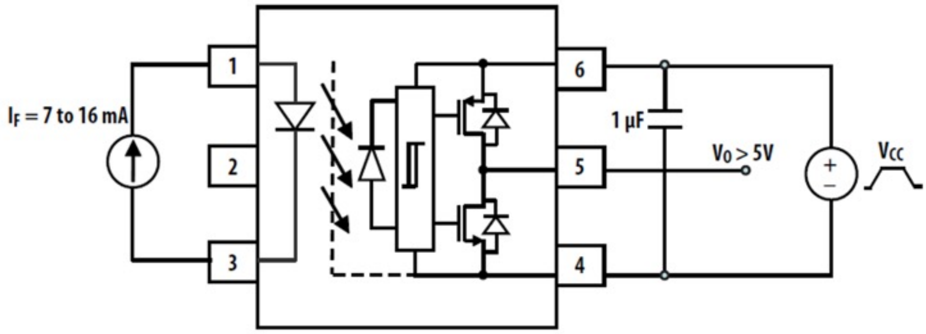


Fig.20 tPHL, tPLH, tr and tf Test Circuit and Waveforms

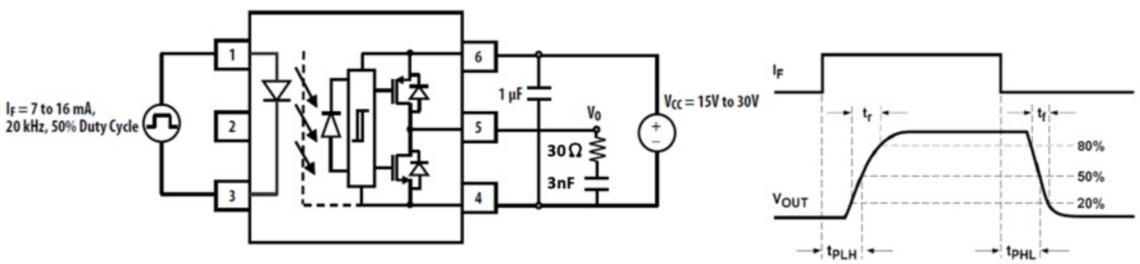
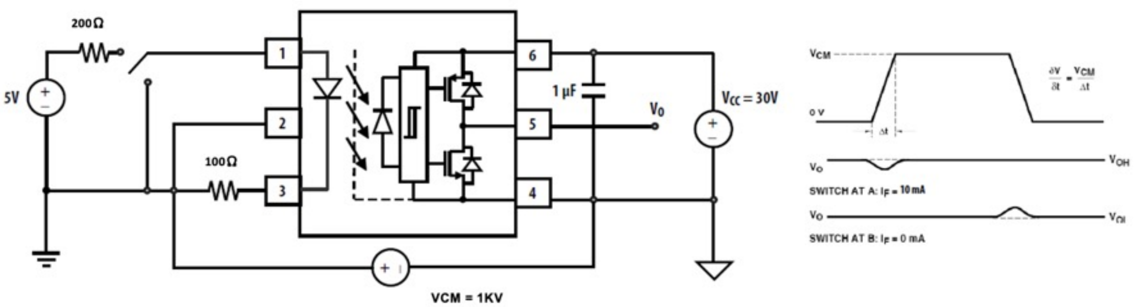
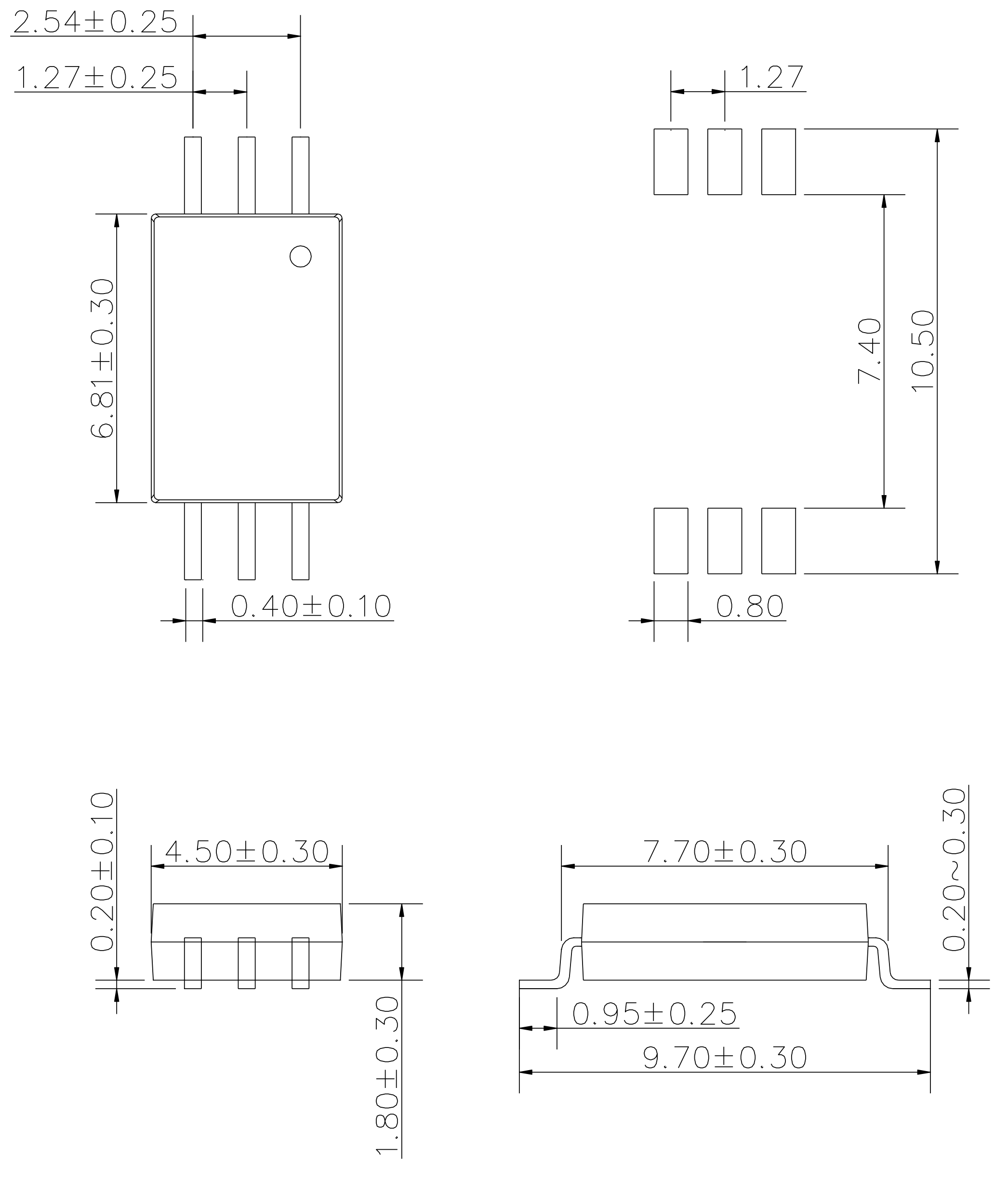


Fig.21 CMR Test Circuit with Split Resistors Network and Waveforms



Package Outline Drawings

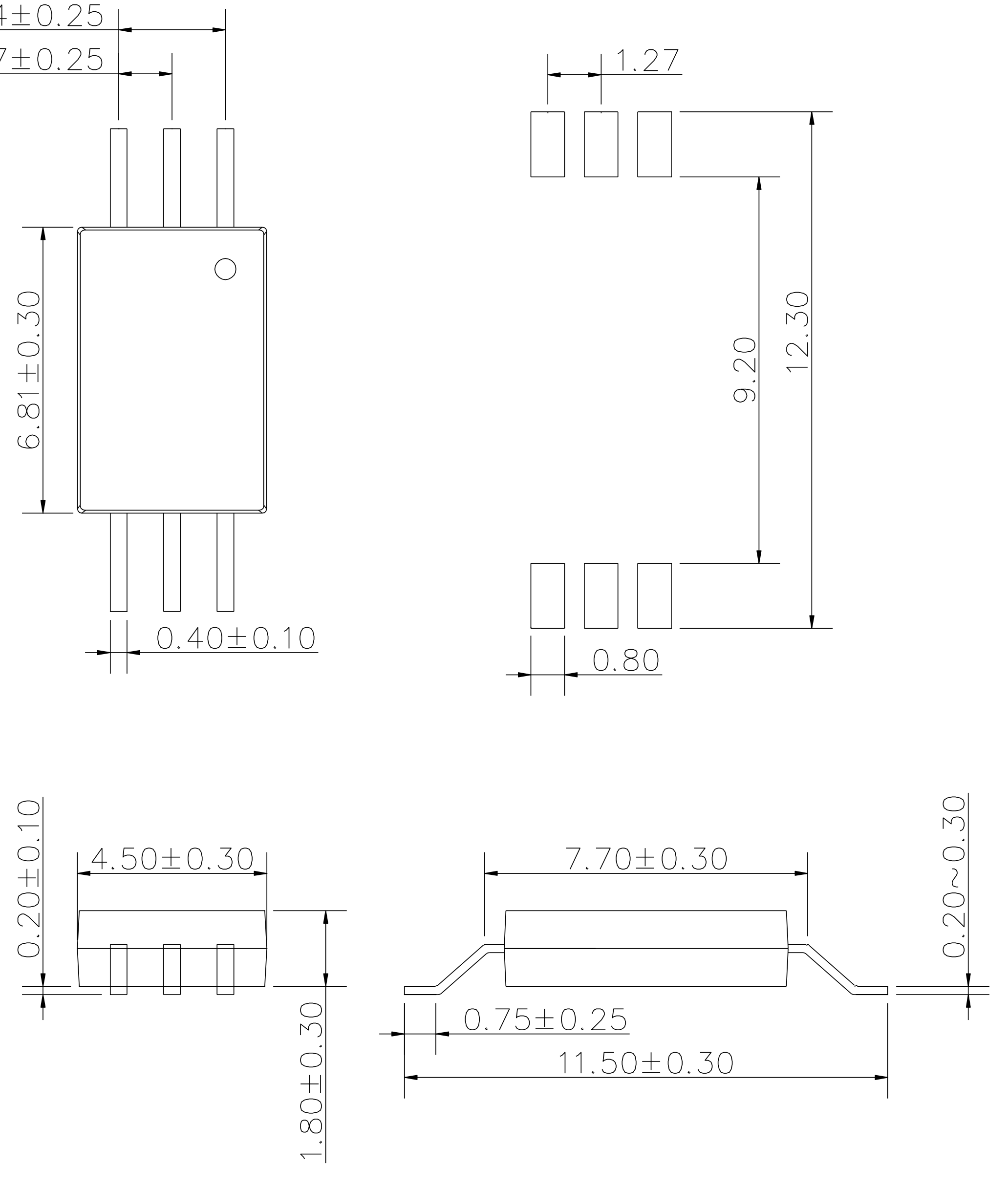
Surface Mount Lead Forming - P type Dimension



Dimensions in mm unless otherwise stated

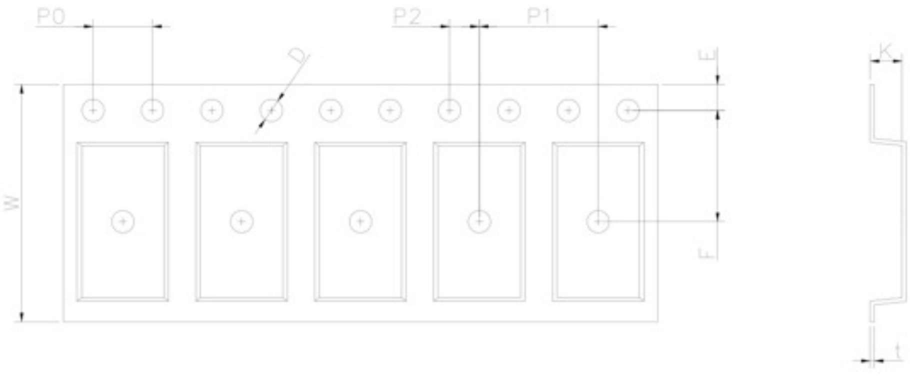
Package Outline Drawings

Surface Mount Lead Forming - W type Dimension



Dimensions in mm unless otherwise stated

Taping Dimensions



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

Dimensions in mm unless otherwise stated

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