Description

The MPCS-341 U 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/150 A. For IGBTs with higher ratings, the MPCS-341 U series can be used to drive a discrete power stage which drives the IGBT gate.

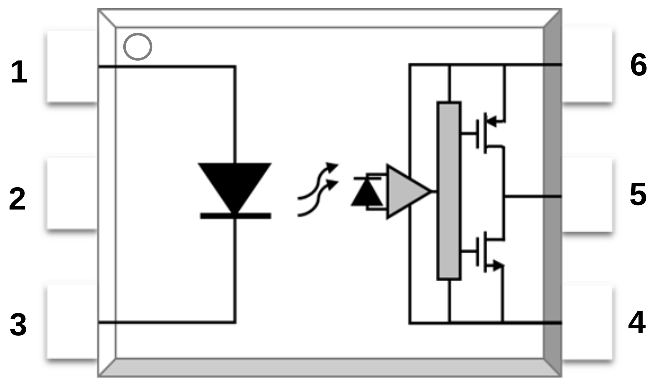
Features

- 3.0 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 (V_{CC})
- Guaranteed performance over temperature -40°C ~ +110°C.
- Regulatory Approvals
  - UL - UL1577
  - VDE - EN60747-5-5(VDE0884-5)
  - CQC – GB4943.1, GB8898

Applications

- IGBT/MOSFET gate drive
- Uninterruptible power supply (UPS)
- Industrial Inverter
- AC/Brushless DC motor drives
- Switching power suppliers

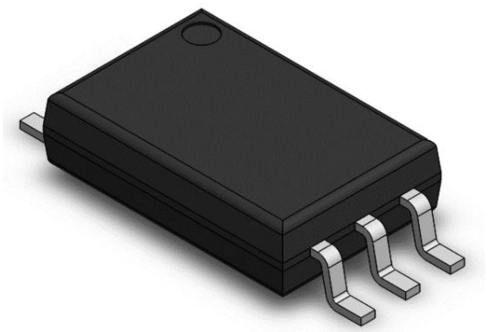
SCHEMATIC

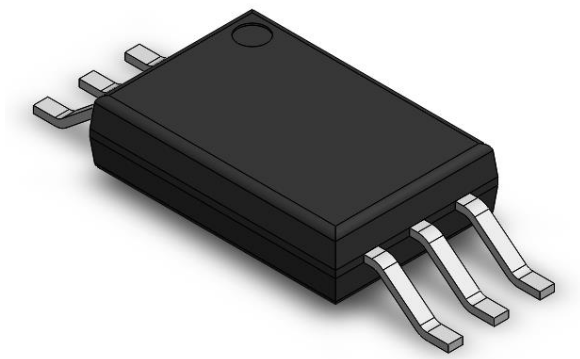


PIN DEFINITION

1. Anode
2. NC
3. Cathode
6. V_{CC}
5. V_O
4. GND

PACKAGE OUTLINE





TRUTH TABLE

LED	V_{CC}-V_{SS} (Turn-ON, +ve going)	V_{CC}-V_{SS} (Turn-OFF, -ve going)	VO
OFF	0 - 30 V	0 - 30 V	Low
ON	0 – 6.9 V	0 – 5.9 V	Low
ON	6.9 – 8.7 V	5.9 – 7.5 V	Transition
ON	8.7 - 30 V	7.5 - 30 V	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	$I_{OH(PEAK)}$	-	3.0	A	1
"Low" Peak Output Current	$I_{OL(PEAK)}$	-	3.0	A	1
Output Voltage	$V_{O(PEAK)}$	-0.5	Vcc	V	-
Power Dissipation	P_I	-	45	mW	-
Output IC Power Dissipation	P_O	-	700	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 OPERATION CONDITIONS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Operating Temperature	T_A	-40	110	°C
Supply Voltage	V_{CC}	10	30	V
Input Current (ON)	$I_{F(ON)}$	5	16	mA
Input Voltage (OFF)	$V_{F(OFF)}$	-3.0	0.8	V

ELECTRICAL OPTICAL CHARACTERISTICS

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION	NOTE
INPUT CHARACTERISTICS							
Input Forward Voltage	V_F	1.6	1.9	2.4	V	IF=10mA	-
Input Forward Voltage Temperature Coefficient	$\Delta V_F / \Delta T$	-	-1.237	-	mV/°C	IF=10mA	-
Input Reverse Voltage	BV_R	5	-	-	V	IR = 10μA	-
Input Threshold Current (Low to High)	I_{FLH}	-	0.9	2	mA	V_O > 5V, I_O = 0A	-
Input Threshold Voltage (High to Low)	V_{FHL}	0.8	-	-	V	VCC = 30 V, VO < 5V	-
Input Capacitance	C_{IN}	-	60	-	pF	f = 1 MHz, VF = 0 V	-
OUTPUT CHARACTERISTICS							
High Level Supply Current	I_{CCH}	-	1.70	3	mA	I_F = 10 mA, VCC = 30V, VO = Open	-
Low Level Supply Current	I_{CCL}	-	2.11	3	mA	I_F = 0 mA, VCC = 30V, VO = Open	-
High level output current	I_{OH}	3.0	-	-	A	I_F = 10 mA, VCC = 30V VO = VCC - 15	1
Low level output current	I_{OL}	3.0	-	-	A	I_F = 0 mA, VCC = 30V VO = VSS + 15	1
High level output voltage	V_{OH}	29.7	29.88	-	V	IF = 10mA, IO = -100mA	2,3
Low level output voltage	V_{OL}	-	0.1	0.3	V	I_F = 0 mA, IO = 100 mA	-
UVLO Threshold	V_{UVLO+}	6.9	7.9	8.7	V	VO > 5V, IF = 10 mA	-
	V_{UVLO-}	5.9	6.8	7.5	V	VO < 5V, IF = 10 mA	-

Note: 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 SPECIFICATION

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION	NOTE
Propagation Delay Time to Low Output Level	t_{PLH}	-	61.3	110	ns	Rg = 10 Ω, Cg = 25 nF, f = 10kHz, Duty Cycle = 50% IF = 10mA, VCC = 30V	-
Propagation Delay Time to High Output Level	t_{PHL}	-	70.0	110			-
Pulse Width Distortion	P_{WD}	-	22	70			-
Propagation Delay Difference Between Any Two Parts	P_{DD} (t_{PHL} - t_{PLH})	-100	-	+100			-
Output Rise Time (20 to 80%)	t_r	-	20	-			-
Output Fall Time (80 to 20%)	t_f	-	15	-			-
Common mode transient immunity at high level output	$\|CM_H\|$	20	40	-	kV/μs	IF= 7 to 16mA VCC= 30V, TA= 25 °C, VCM= 1kV	1,2
Common mode transient immunity at low level output	$\|CM_L\|$	20	40	-	kV/μs	IF=0mA VCC= 30V, TA= 25 °C, VCM= 1kV	1,3

Note: 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, VCM, to assure that the output will remain in the high state (meaning VO > 15.0V).

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	SYMBOL	DEVICE	MIN.	TYP.	MAX.	UNIT	TEST CONDITION	NOTE
Withstand Insulation Test Voltage	V_{ISO}	MPCS-341P	5000	-	-	V	RH ≤ 40%-60%, t = 1min, T_A = 25 °C	1,2
		MPCS-341W						
Input-Output Resistance	R_{I-O}	-	-	10^{12}	-	Ω	V_{I-O} = 500V DC	1

Note: 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: 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

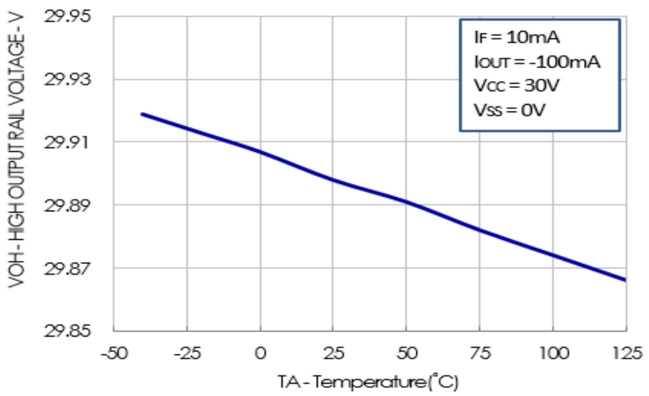


Fig.2 V_{OH} vs. Temperature

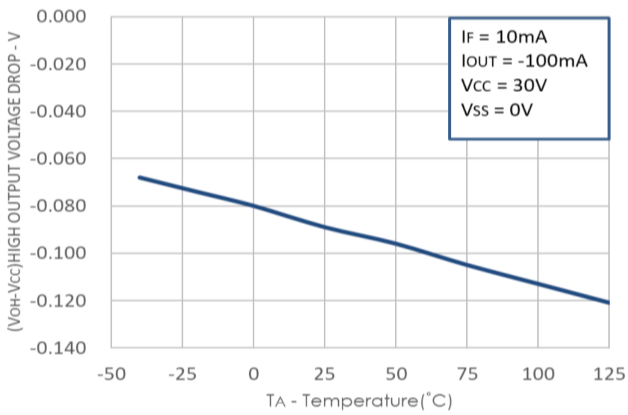


Fig.3 V_{OL} vs. Temperature

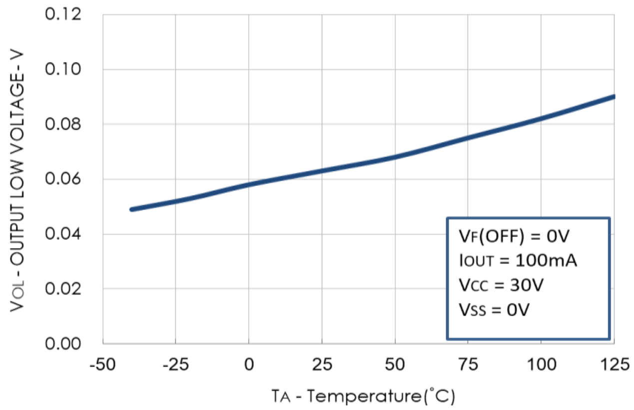


Fig.4 I_{CC} vs. Temperature

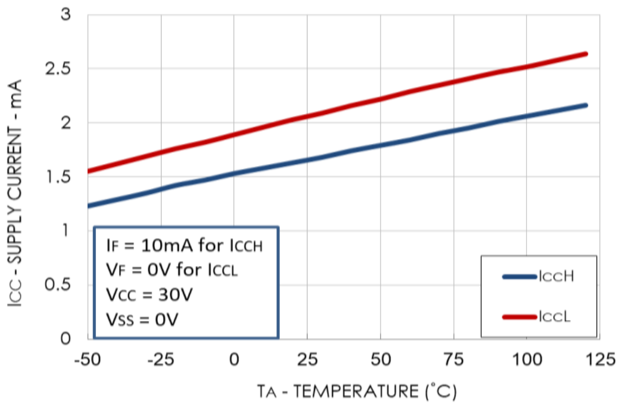


Fig.5 I_{CC} vs. V_{CC}

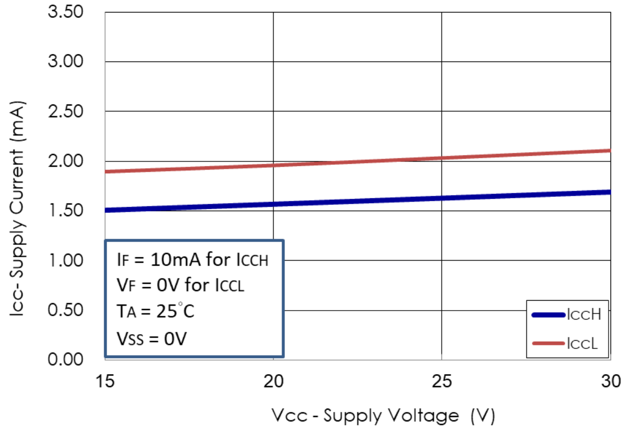


Fig.6 I_{FLH} vs. Hysteresis

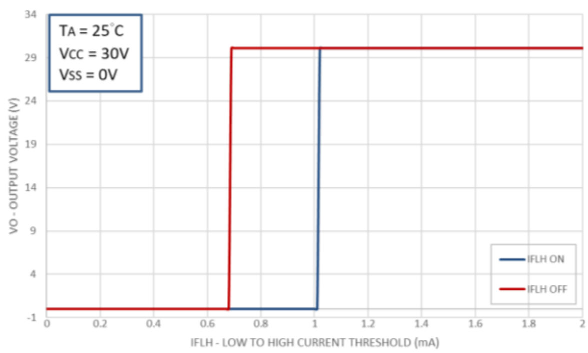


Fig.7 I_{FH} vs. Temperature

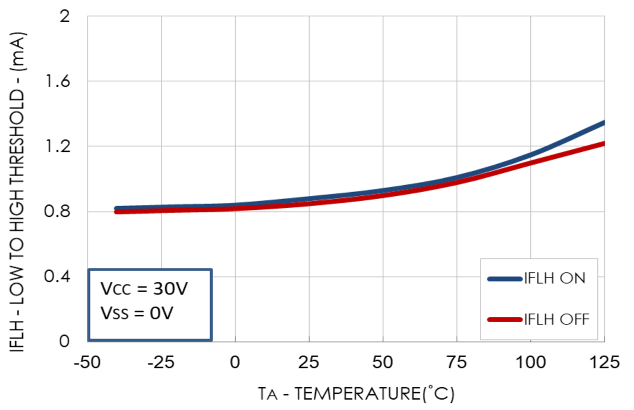


Fig.8 Propagation Delays vs. V_{CC}

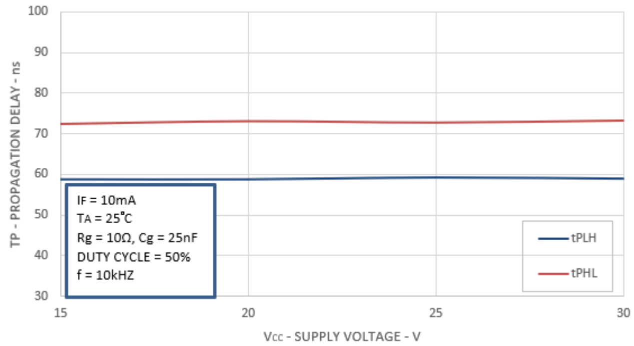


Fig.9 Propagation Delays vs. I_F

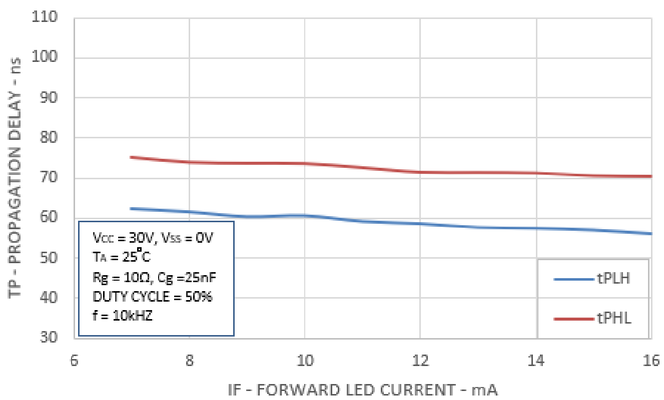


Fig.10 Propagation Delays vs. Temperature

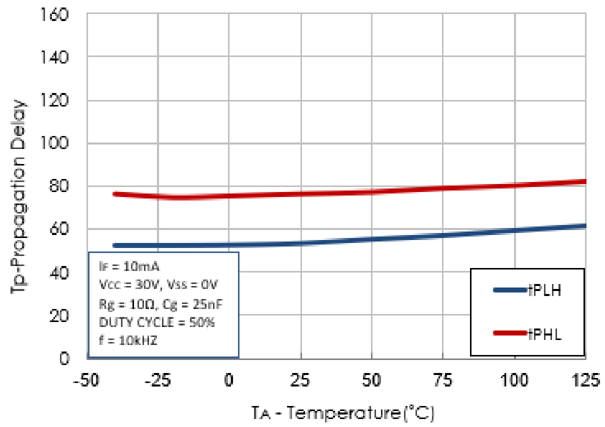


Fig.11 Propagation Delays vs. R_g

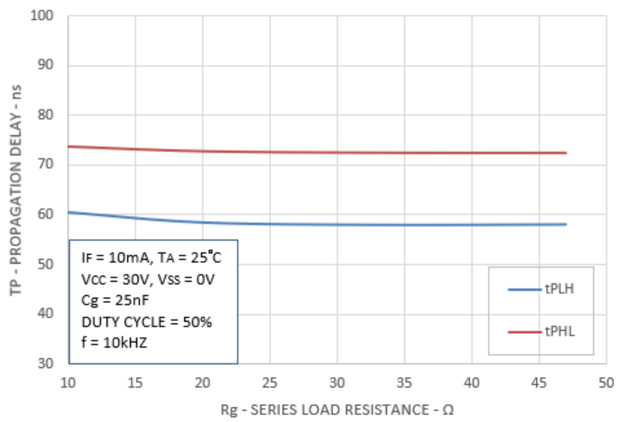


Fig.12 Propagation Delays vs. C_g

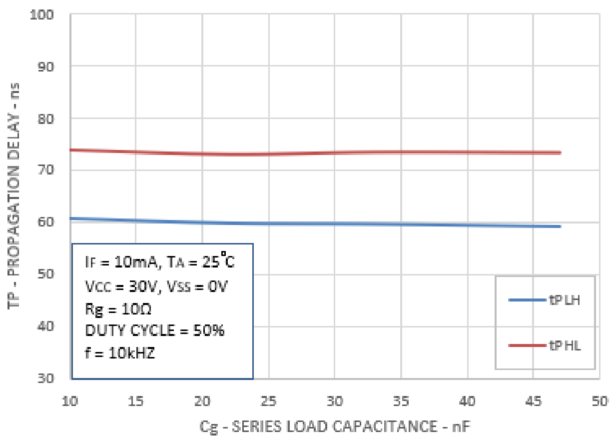


Fig.13 Input Current vs. Forward Voltage

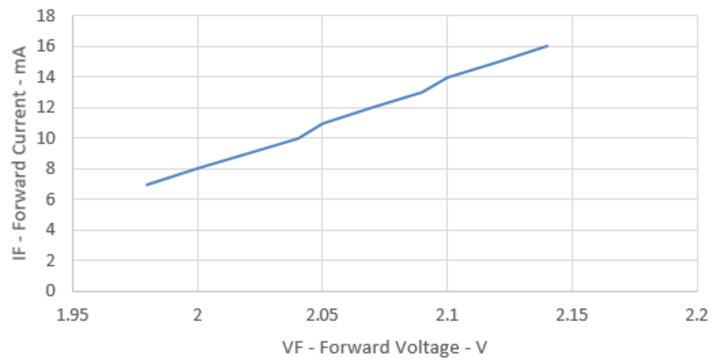


Fig.14 I_{OH} Test Circuit

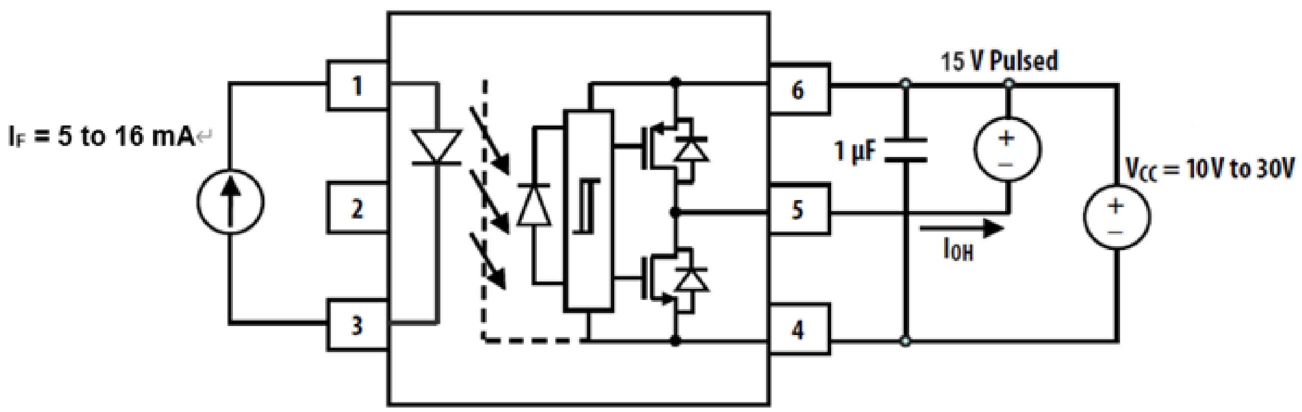


Fig.15 I_{OL} Test Circuit

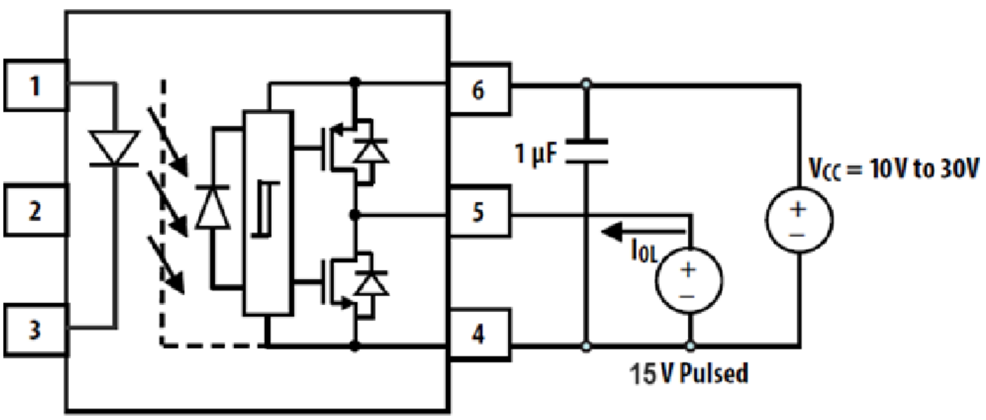


Fig.16 V_{OH} Test Circuit

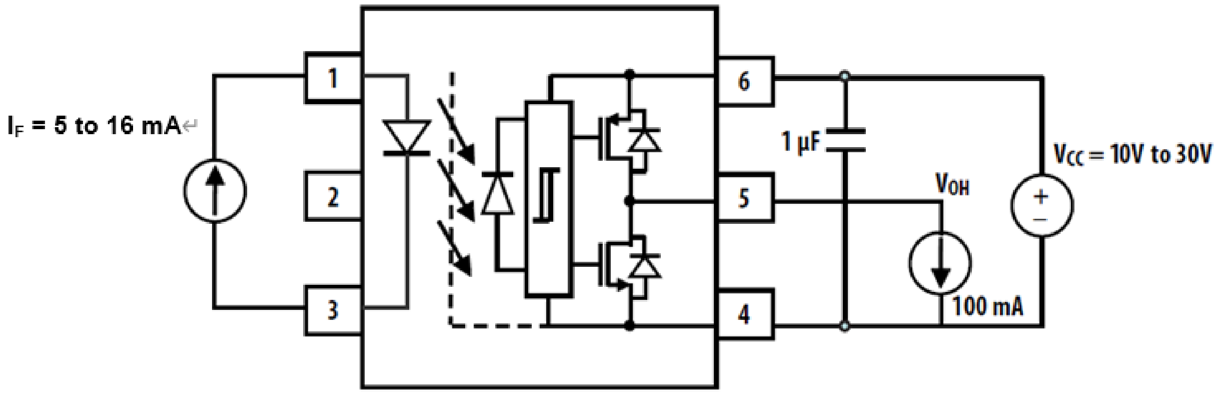


Fig.17 V_{OL} Test Circuit

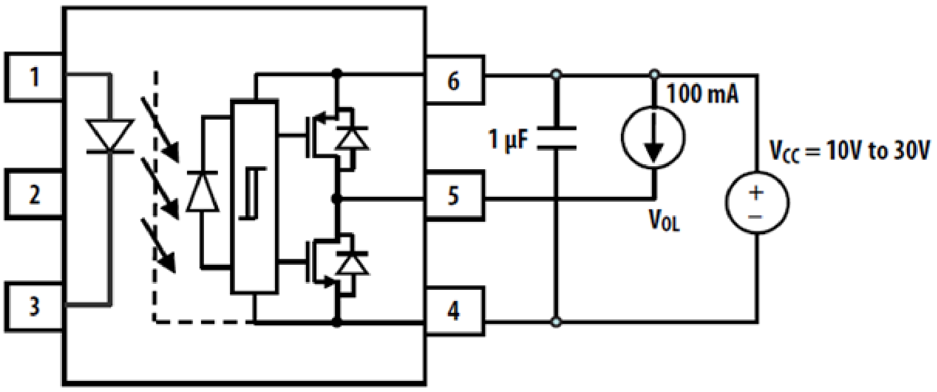


Fig.18 I_{FLH} Test Circuit

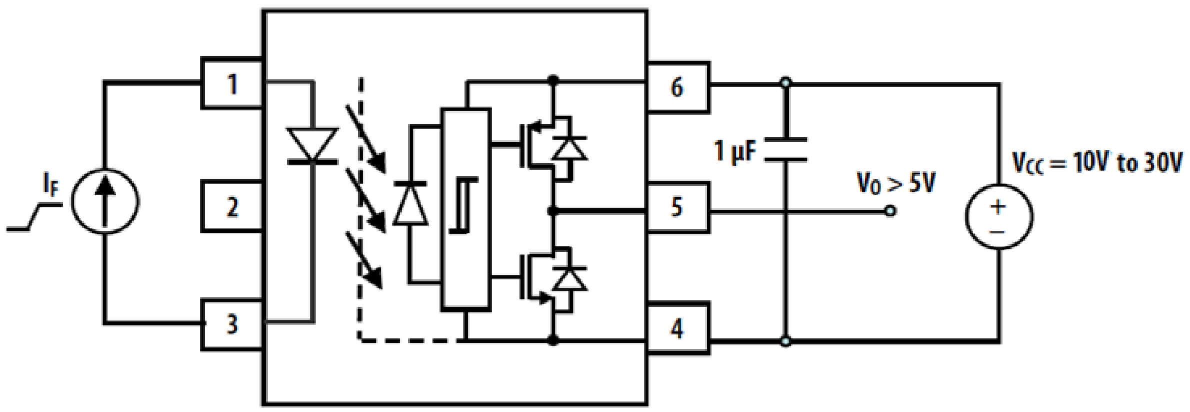


Fig.19 U_{VLO} Test Circuit

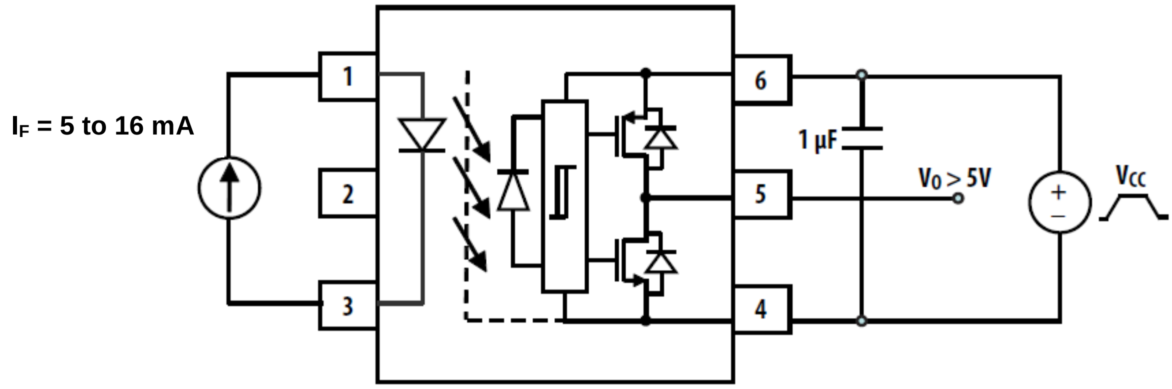


Fig.20 t_{PHL}, t_{PLH}, t_r and t_f Test Circuit and Waveforms

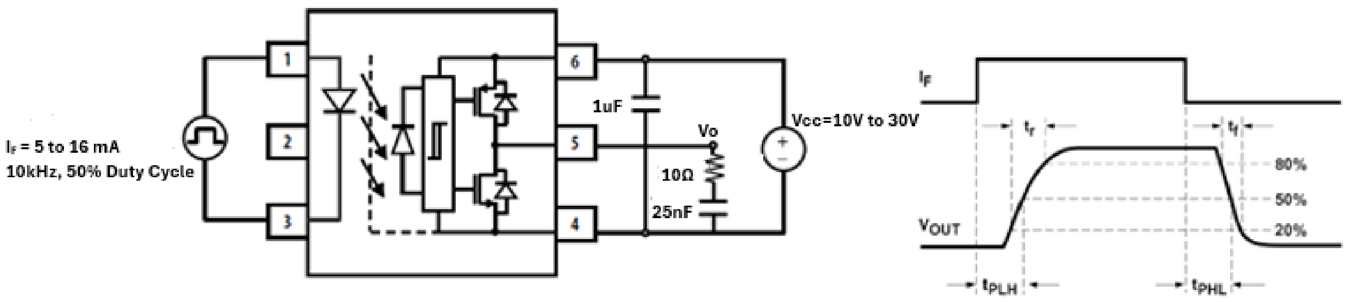
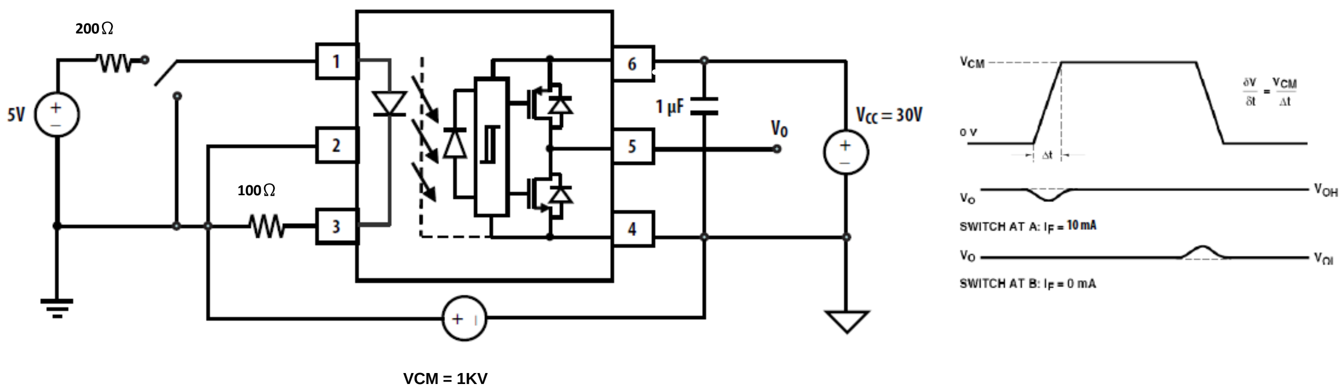
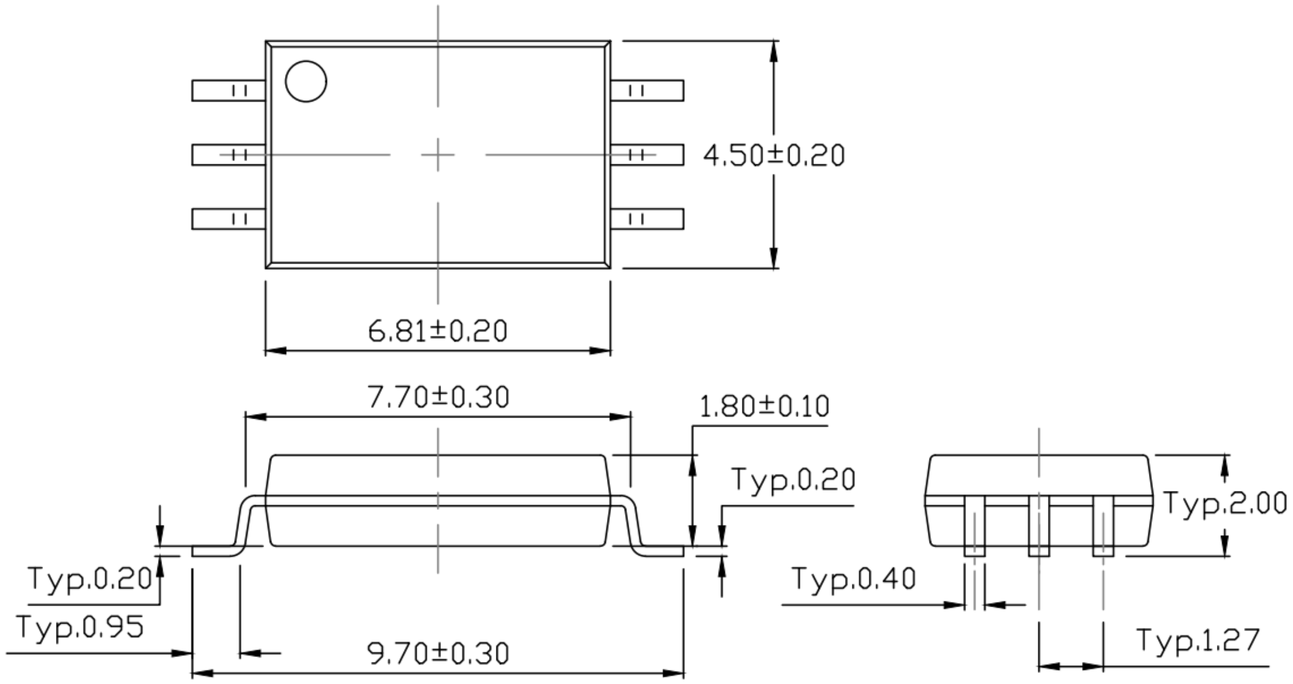


Fig.21 CMR Test Circuit with Split Resistors Network and Waveforms



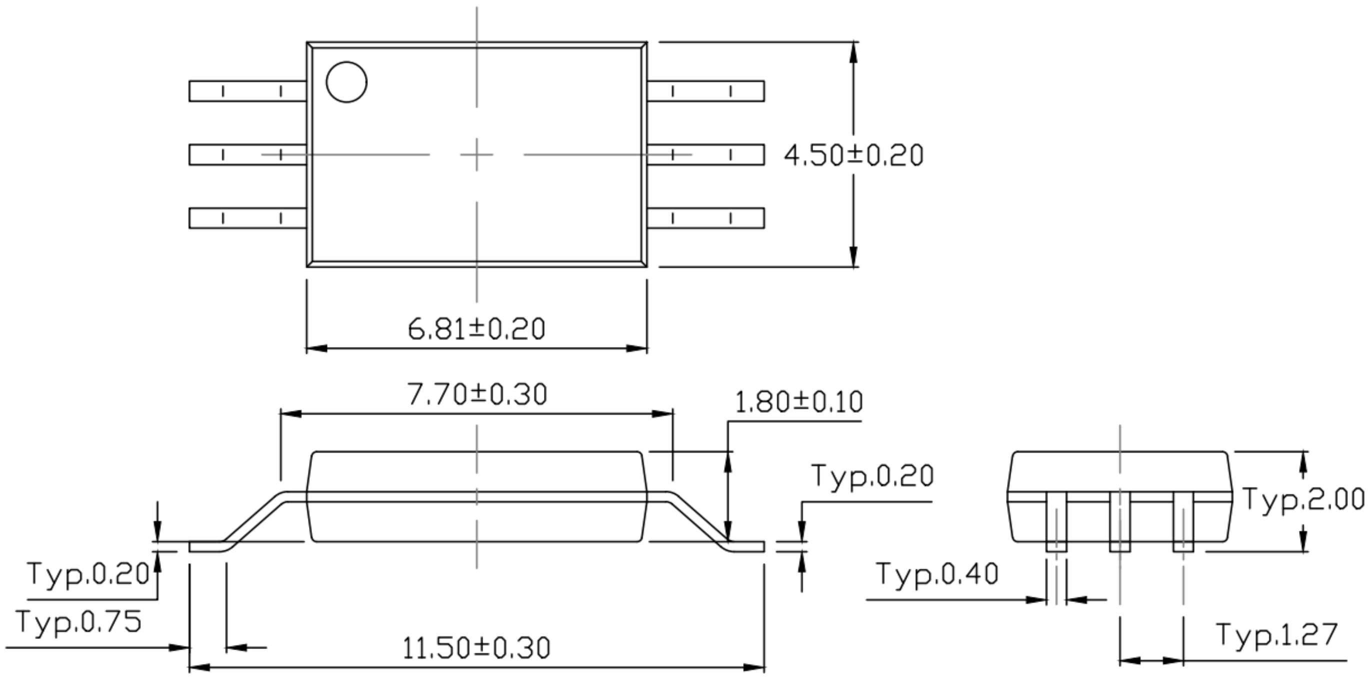
PACKAGE DIMENSIONS (Dimensions in mm unless otherwise stated)

Surface Mount Lead Forming (P Type)



General Tolerance: +/-0.25mm

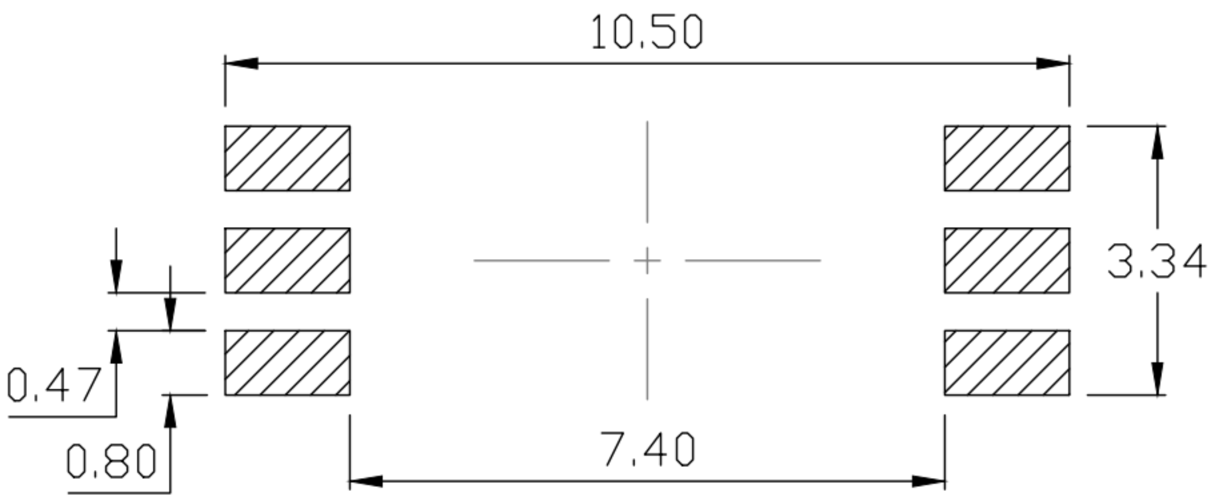
Surface Mount (Gullwing) Lead Forming (W Type)



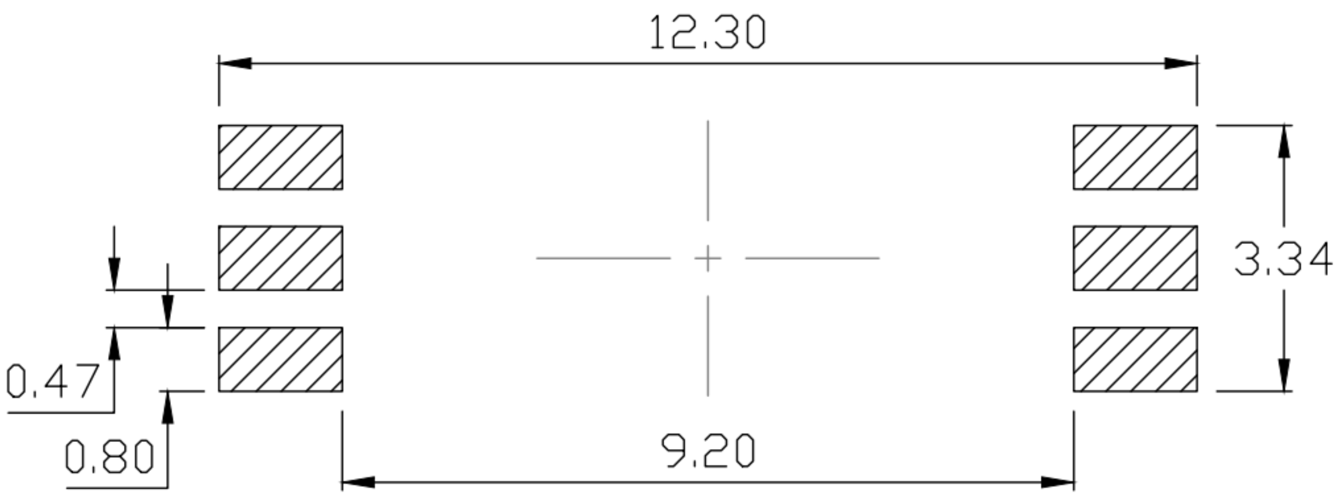
General Tolerance: +/-0.25mm

RECOMMENDED SOLDER MASK (Dimensions in mm unless otherwise stated)

Surface Mount Lead Forming (P Type)

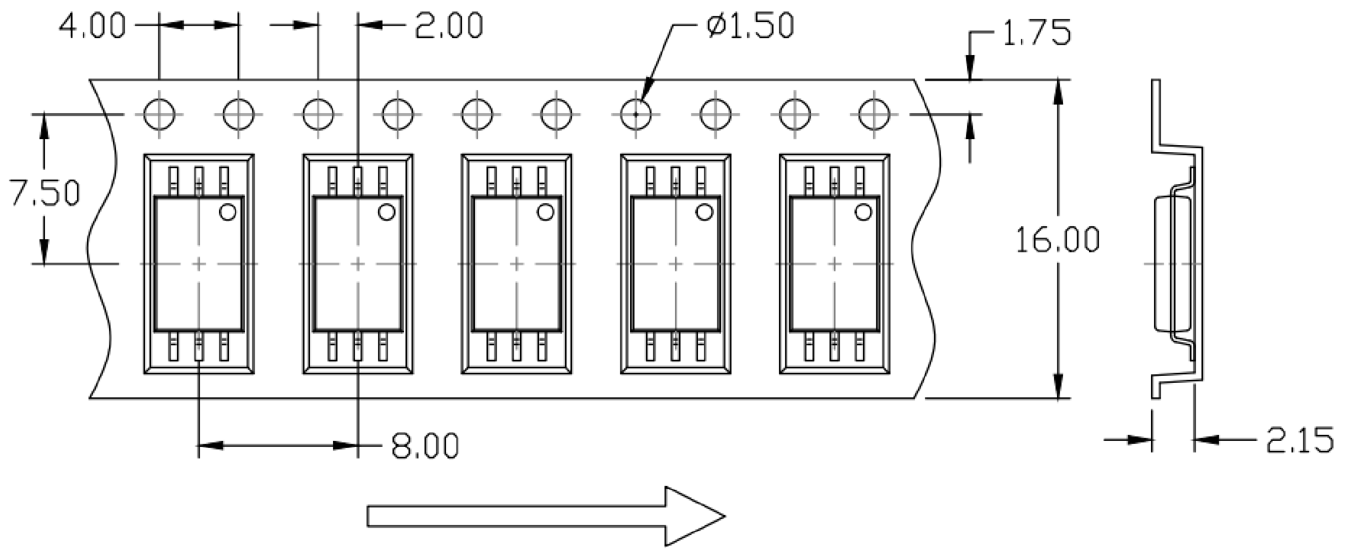


Surface Mount (Gullwing) Lead Forming (W Type)

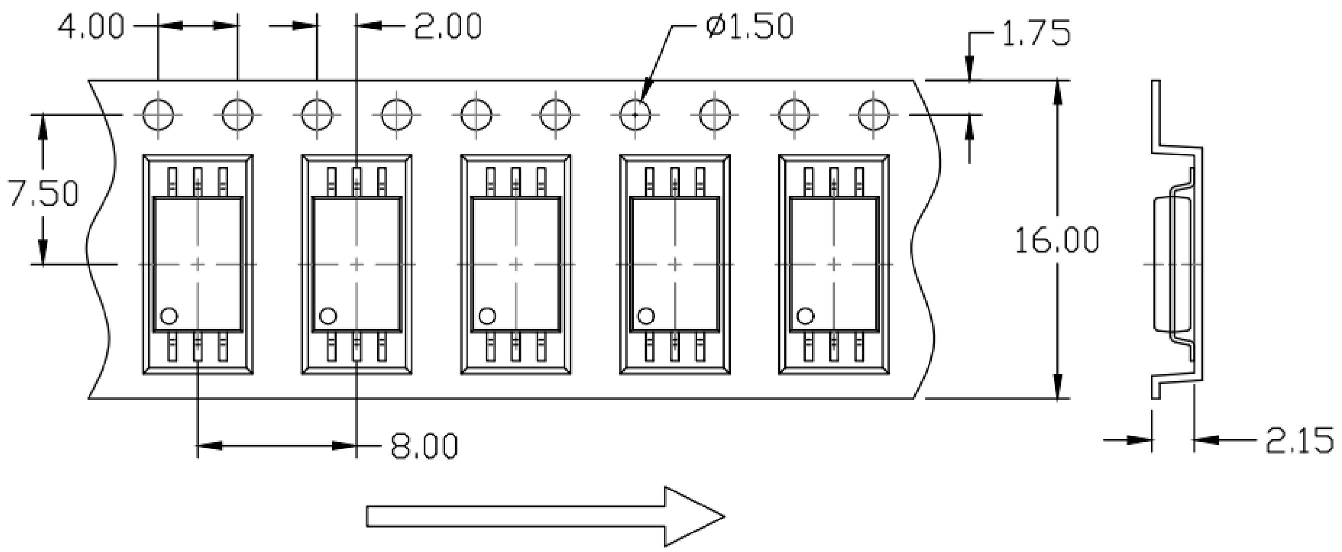


CARRIER TAPE SPECIFICATIONS (Dimensions in mm unless otherwise stated)

Surface Mount Lead Forming (P Type) Option T1

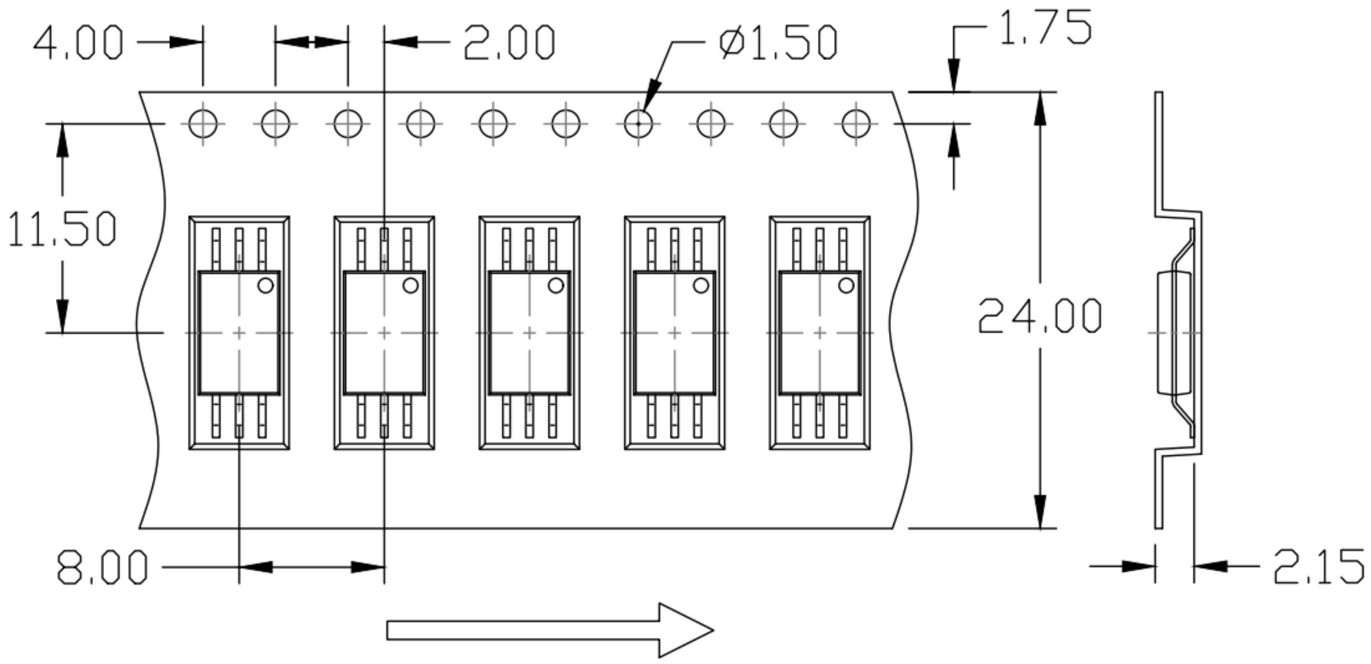


Surface Mount Lead Forming (P Type) Option T2

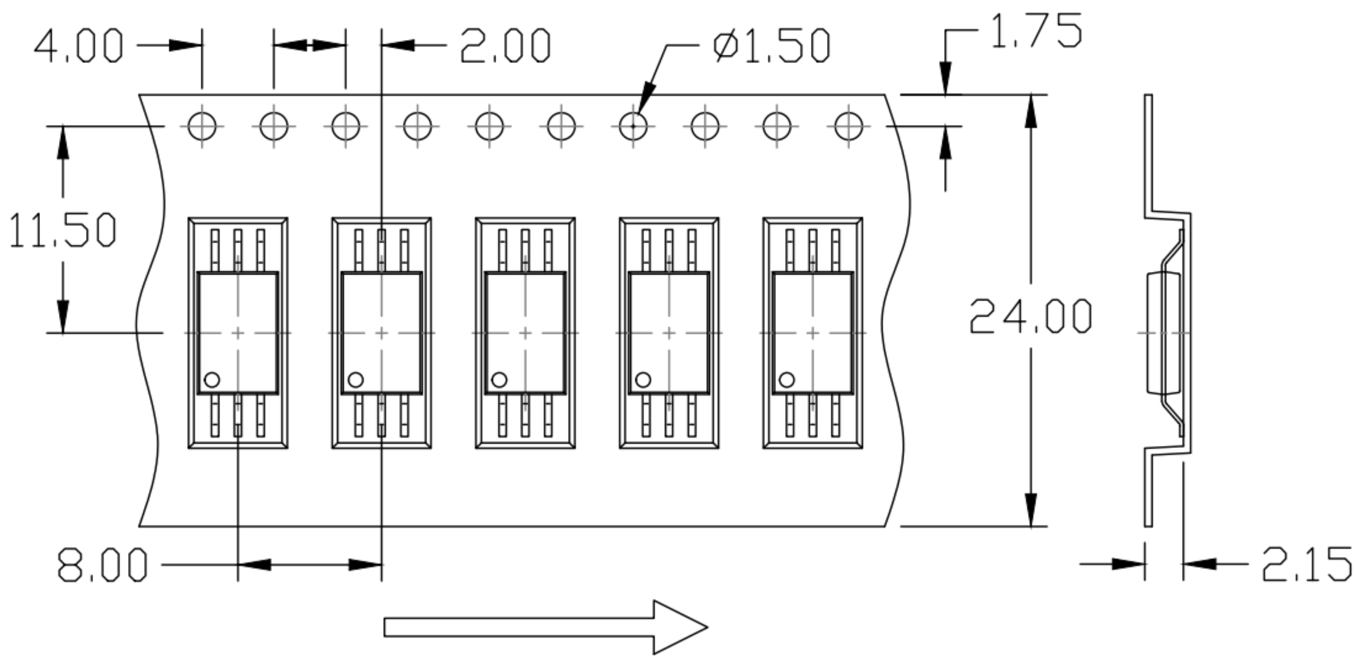


CARRIER TAPE SPECIFICATIONS (Dimensions in mm unless otherwise stated)

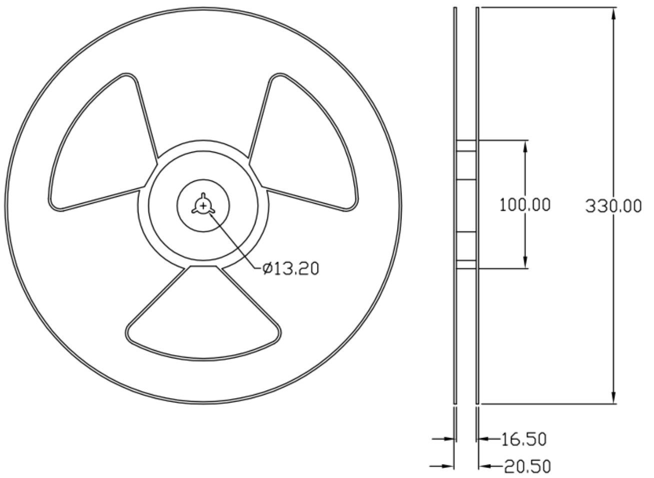
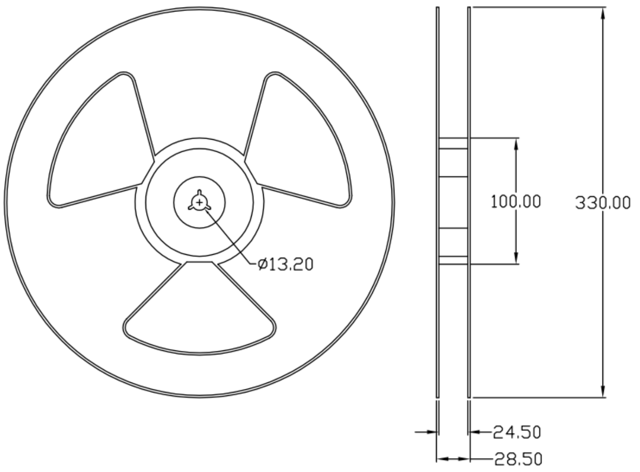
Surface Mount (Gullwing) Lead Forming (W Type) Option T1



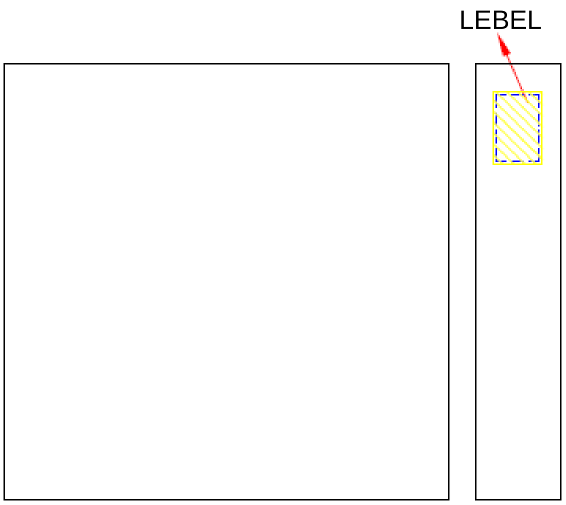
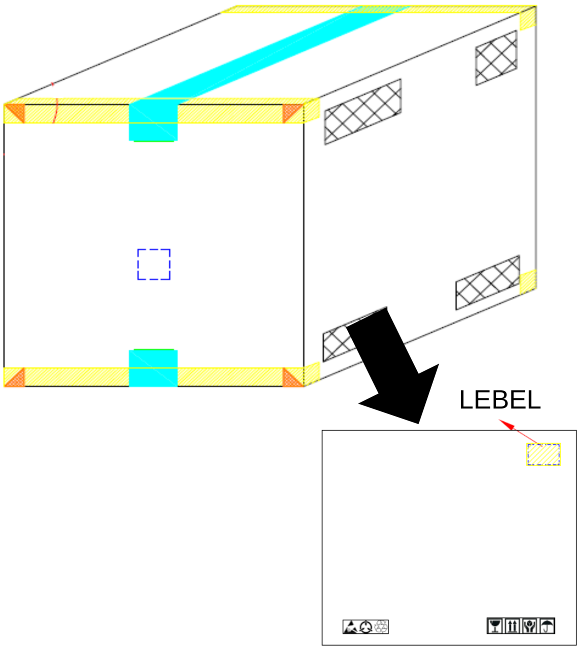
Surface Mount (Gullwing) Lead Forming (W Type) Option T2



REEL SPECIFICATIONS (Dimensions in mm unless otherwise stated)

Surface Mount Lead Forming (P Type)	Surface Mount (Gullwing) Lead Forming (W Type)
	

BOX SPECIFICATIONS (Reel Type)

INNER BOX	OUTER BOX
	
L x W x H = 36cm x 36cm x 6.9cm	L x W x H = 45cm x 38cm x 38cm

ORDERING AND MARKING INFORMATION

MARKING INFORMATION

M : Company Abbr.
YY : Year date code
WW : 2-digit work week
341 ：Part Number
T or H : Factory identification mark
V : VDE Identification(Option)
U : V_{CC} 10-30V(Option)

ORDERING INFORMATION

MPCS-341(P/W)-ZV-U

MPC – Company Abbr.
S – Stack
341 – Part Number
P/W – Lead Form Option
(P-9mm Clearance or W-11mm Clearance)
Z – Tape and Reel Option (T1/T2)
V –VDE Option (V or None)
U –V_{CC} 10-30V Option

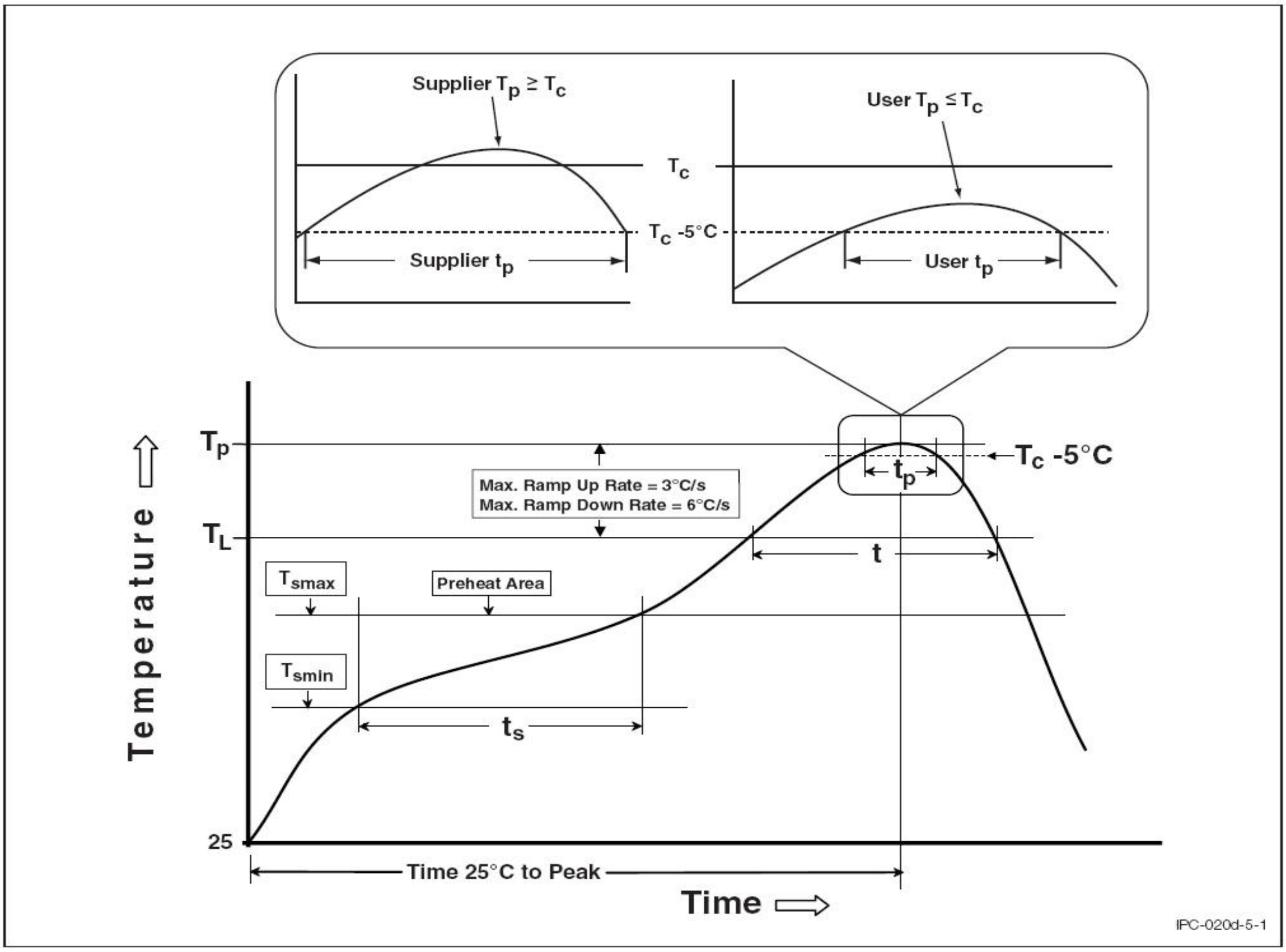
LABEL INFORMATION

PACKING QUANTITY

Option	Quantity	Quantity – Inner box	Quantity – Outer box
Option P T1/T2	3000 Units/Reel	3 Reels/Inner box	5 Inner box/Outer box = 45k Units
Option W T1/T2	3000 Units/Reel	2 Reels/Inner box	5 Inner box/Outer box = 30k Units

REFLOW INFORMATION

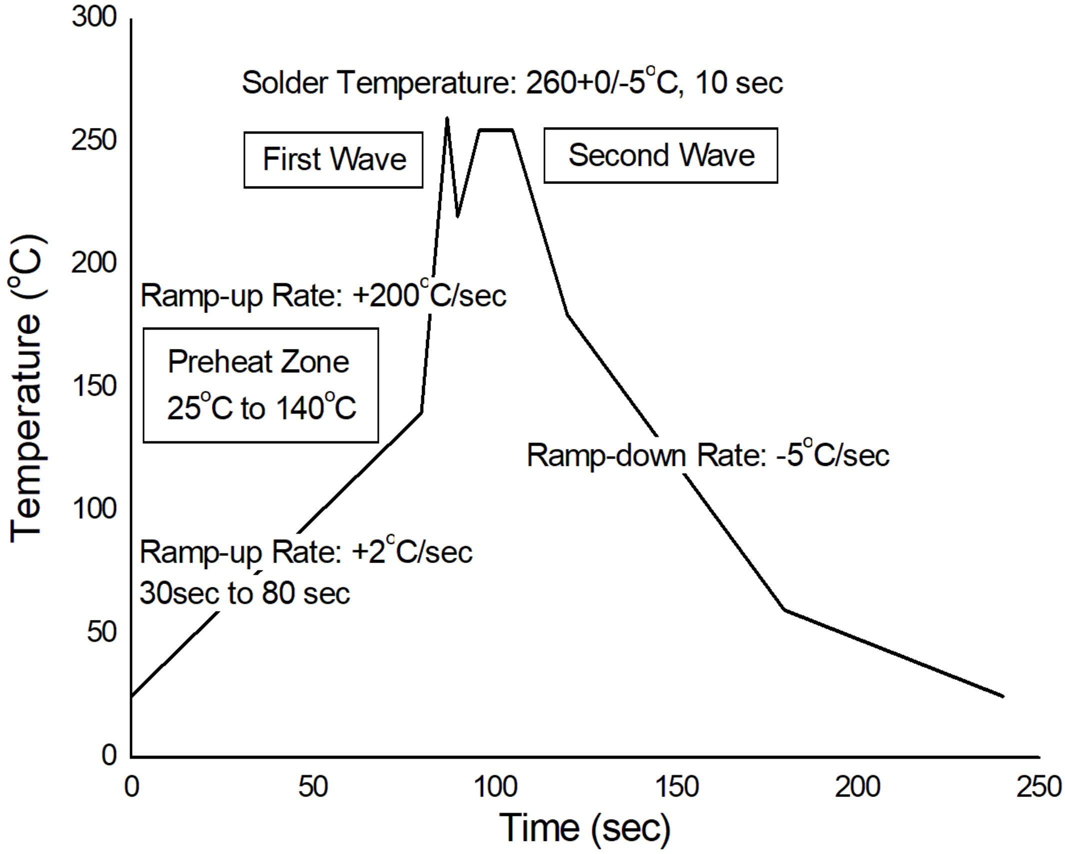
REFLOW PROFILE



Profile Feature	Sn-Pb Assembly Profile	Pb-Free Assembly Profile
Temperature Min. (Tsmin)	100°C	150°C
Temperature Max. (Tsmax)	150°C	200°C
Time (ts) from (Tsmin to Tsmax)	60-120 seconds	60-120 seconds
Ramp-up Rate (tL to tP)	3°C/second max.	3°C/second max.
Liquidous Temperature (TL)	183°C	217°C
Time (tL) Maintained Above (TL)	60 – 150 seconds	60 – 150 seconds
Peak Body Package Temperature	235°C +0°C / -5°C	260°C +0°C / -5°C
Time (tP) within 5°C of 260°C	20 seconds	30 seconds
Ramp-down Rate (TP to TL)	6°C/second max	6°C/second max
Time 25°C to Peak Temperature	6 minutes max.	8 minutes max.

TEMPERATURE PROFILE OF SOLDERING

WAVE SOLDERING (JESD22-A111 COMPLIANT)



HAND SOLDERING BY SOLDERING IRON

Soldering Temperature	380+0/-5°C
Soldering Time	3 sec max.
One time soldering is recommended for all soldering method.	
Do not solder more than three times for IR reflow soldering.	

DISCLAIMER

- WISELITE is continually improving the quality, reliability, function and design. WISELITE reserves the right to make changes without further notices.
- The characteristic curves shown in this datasheet are representing typical performance which are not guaranteed.
- WISELITE makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, WISELITE disclaims (a) any and all liability arising out of the application or use of any product, (b) any and all liability, including without limitation special, consequential or incidental damages, and (c) any and all implied warranties, including warranties of fitness for particular.
- The products shown in this publication are designed for the general use in electronic applications such as office automation, equipment, communications devices, audio/visual equipment, electrical application and instrumentation purpose, non-infringement and merchantability.
- This product is not intended to be used for military, aircraft, medical, life sustaining or lifesaving applications or any other application which can result in human injury or death.
- Please contact WISELITE sales agent for special application request.
- Immerge unit’s body in solder paste is not recommended.
- Parameters provided in datasheets may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated in each customer application by the customer’s technical experts. Product specifications do not expand or otherwise modify WISELITE’s terms and conditions of purchase, including but not limited to the warranty expressed therein.
- Discoloration might be occurred on the package surface after soldering, reflow or long-time use. It neither impacts the performance nor reliability.