



# MPCS-343 Series

LSOP6, DC Input, 4.0A Gate Driver Optocoupler

## Description

The MPCS-343 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 4.0A peak output current is capable of directly driving most IGBTs with ratings up to 1200 V/200 A. For IGBTs with higher ratings, the MPCS-343 series can be used to drive a discrete power stage which drives the IGBT gate.

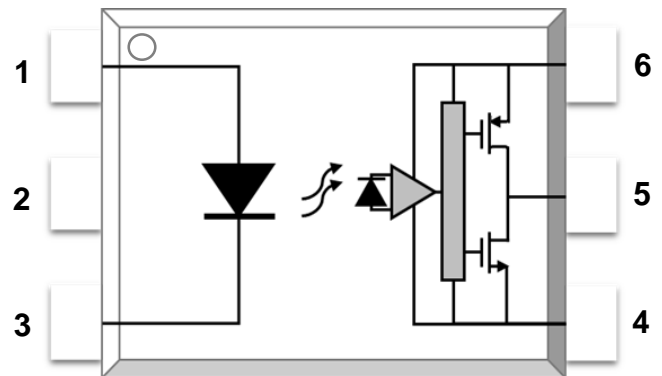
## Features

- 4.0 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: 15 to 30 Volts ( $V_{CC}$ )
- Guaranteed performance over temperature -  $40^{\circ}\text{C} \sim +110^{\circ}\text{C}$ .
- 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

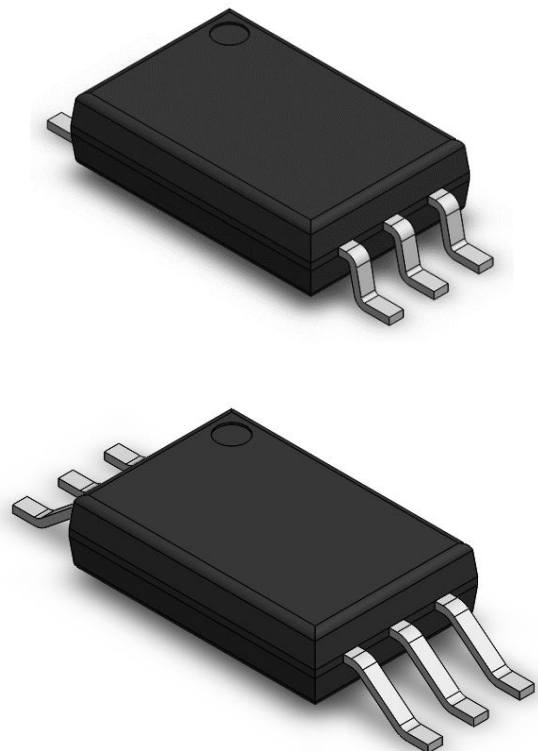
## SCHEMATIC



## PIN DEFINITION

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

## PACKAGE OUTLINE





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## 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 - 11.0 V	0 - 9.5 V	Low
ON	11.0 - 13.5 V	9.5 - 12 V	Transition
ON	13.5 - 30 V	12 - 30 V	High

Note: A 0.1 $\mu$ F 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	$I_{OH(PEAK)}$	-	4.0	A	1
“Low” Peak Output Current	$I_{OL(PEAK)}$	-	4.0	A	1
Output Voltage	$V_{O(PEAK)}$	-0.5	$V_{CC}$	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  $\leq 10 \mu s$ ,  $f \leq 15 \text{ kHz}$

## RECOMMENDED OPERATION CONDITIONS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Operating Temperature	$T_A$	-40	110	°C
Supply Voltage	$V_{CC}$	15	30	V
Input Current (ON)	$I_{F(ON)}$	5	16	mA
Input Voltage (OFF)	$V_{F(OFF)}$	-3.0	0.8	V



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## 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	$I_F = 10\text{mA}$	-
Input Forward Voltage Temperature Coefficient	$\Delta V_F / \Delta T$	-	-1.237	-	mV/°C	$I_F = 10\text{mA}$	-
Input Reverse Voltage	$BV_R$	5	-	-	V	$I_R = 10\mu\text{A}$	-
Input Threshold Current (Low to High)	$I_{FLH}$	-	0.9	2	mA	$V_O > 5\text{V}, I_O = 0\text{A}$	-
Input Threshold Voltage (High to Low)	$V_{FHL}$	0.8	-	-	V	$V_{CC} = 30\text{V}, V_O < 5\text{V}$	-
Input Capacitance	$C_{IN}$	-	60	-	pF	$f = 1\text{MHz}, V_F = 0\text{V}$	-
OUTPUT CHARACTERISTICS							
High Level Supply Current	$I_{CCH}$	-	1.70	3	mA	$I_F = 10\text{mA}, V_{CC} = 30\text{V}, V_O = \text{Open}$	-
Low Level Supply Current	$I_{CCL}$	-	2.11	3	mA	$I_F = 0\text{mA}, V_{CC} = 30\text{V}, V_O = \text{Open}$	-
High level output current	$I_{OH}$	4.0	-	-	A	$I_F = 10\text{mA}, V_{CC} = 30\text{V}, V_O = V_{CC} - 15$	1
Low level output current	$I_{OL}$	4.0	-	-	A	$I_F = 0\text{mA}, V_{CC} = 30\text{V}, V_O = V_{SS} + 15$	1
High level output voltage	$V_{OH}$	29.7	29.88	-	V	$I_F = 10\text{mA}, I_O = -100\text{mA}$	2,3
Low level output voltage	$V_{OL}$	-	0.1	0.3	V	$I_F = 0\text{mA}, I_O = 100\text{mA}$	-
UVLO Threshold	$V_{UVLO+}$	11.0	12.6	13.5	V	$V_O > 5\text{V}, I_F = 10\text{mA}$	-
	$V_{UVLO-}$	9.5	11.2	12.0	V	$V_O < 5\text{V}, I_F = 10\text{mA}$	-

Note: All Typical values at  $T_A = 25^\circ\text{C}$  and  $V_{CC} - V_{SS} = 30\text{V}$ , unless otherwise specified; all minimum and maximum specifications are at recommended operating condition.

Note 1: Maximum pulse width = 10  $\mu\text{s}$ .

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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### SWITCHING SPECIFICATION

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION	NOTE
Propagation Delay Time to Low Output Level	$t_{PLH}$	-	74.5	110	ns	$R_g = 10\ \Omega$ , $C_g = 25\ \text{nF}$ , $f = 10\text{kHz}$ , Duty Cycle = 50% $I_F = 10\text{mA}$ , $V_{CC} = 30\text{V}$	-
Propagation Delay Time to High Output Level	$t_{PHL}$	-	61.3	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/ $\mu\text{s}$	$I_F = 7\text{ to }16\text{mA}$ $V_{CC} = 30\text{V}$ , $T_A = 25\ ^\circ\text{C}$ , $V_{CM} = 1\text{kV}$	1,2
Common mode transient immunity at low level output	$ CM_L $	20	40	-	kV/ $\mu\text{s}$	$I_F = 0\text{mA}$ $V_{CC} = 30\text{V}$ , $T_A = 25\ ^\circ\text{C}$ , $V_{CM} = 1\text{kV}$	1,3

Note: All Typical values at  $T_A = 25^\circ\text{C}$  and  $V_{CC} - V_{SS} = 30\text{V}$ , 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  $dV_{CM}/dt$  of the common mode pulse,  $V_{CM}$ , to assure that the output will remain in the high state (meaning  $V_O > 15.0\text{V}$ ).

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



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### ISOLATION CHARACTERISTIC

PARAMETER	SYMBOL	DEVICE	MIN.	TYP.	MAX.	UNIT	TEST CONDITION	NOTE
Withstand Insulation Test Voltage	$V_{ISO}$	MPCS-343P	5000	-	-	V	RH $\leq$ 40%-60%, t = 1min, T <sub>A</sub> = 25 °C	1,2
		MPCS-343W						
Input-Output Resistance	R <sub>I-O</sub>	-	-	10 <sup>12</sup>	-	$\Omega$	V <sub>I-O</sub> = 500V DC	1

Note: All Typical values at T<sub>A</sub> = 25°C and V<sub>CC</sub> – V<sub>SS</sub> = 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.



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## TYPICAL PERFORMANCE CURVES & TEST CIRCUITS

Fig.1 High output rail voltage vs. Temperature

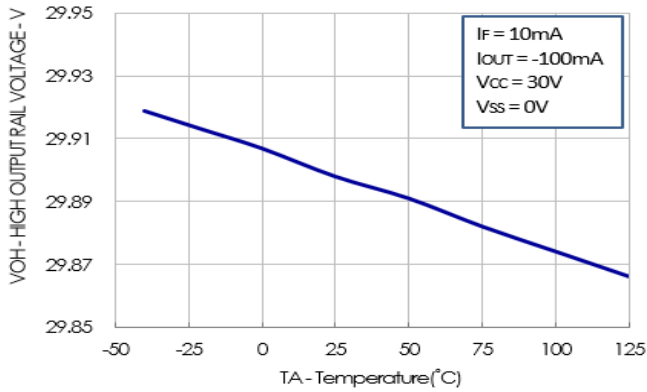


Fig.2 VOH vs. Temperature

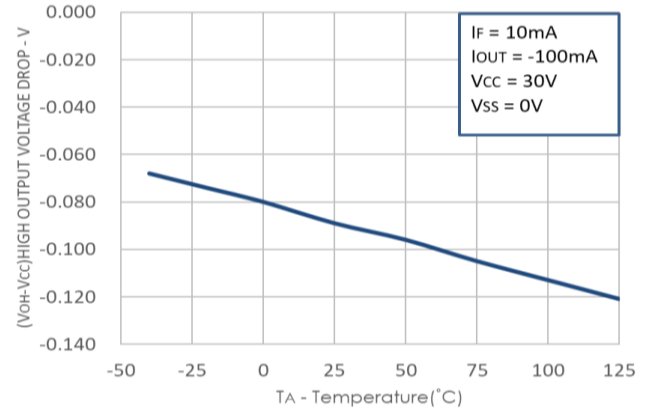


Fig.3 VOL vs. Temperature

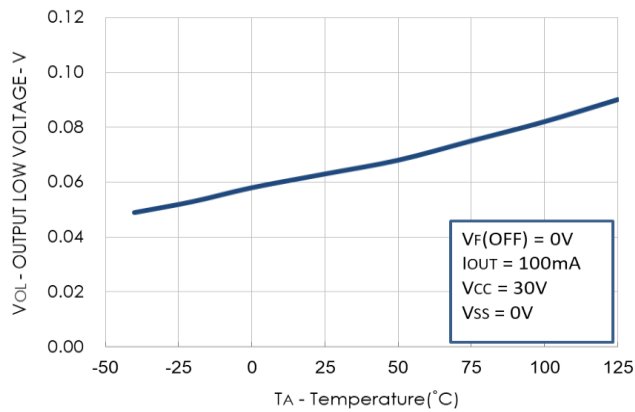


Fig.4 ICC vs. Temperature

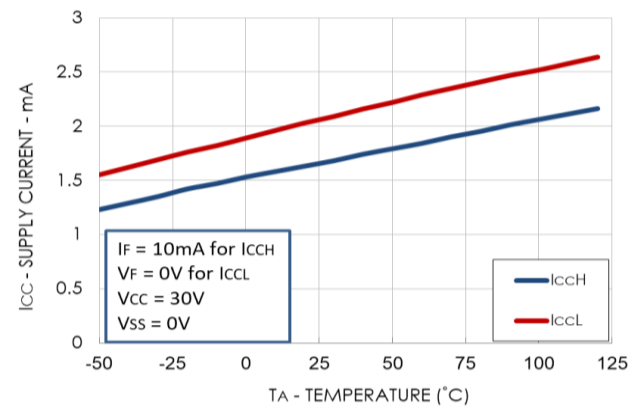


Fig.5 ICC vs. VCC

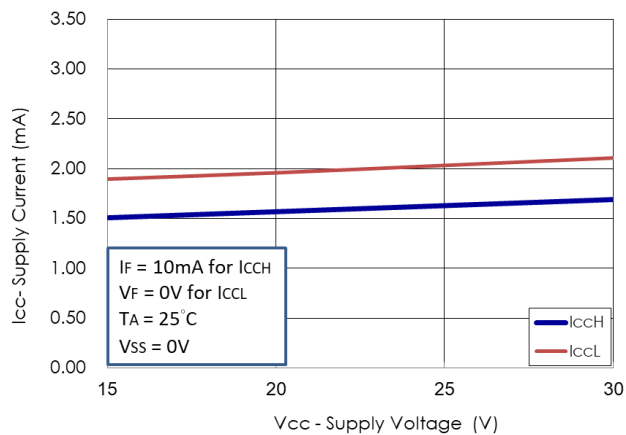
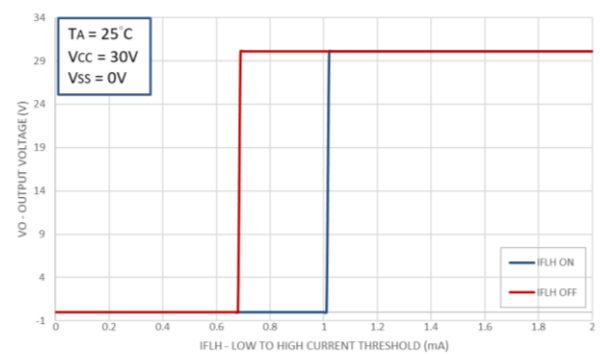


Fig.6 IFLH vs. Hysteresis





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Fig.7  $I_{FH}$  vs. Temperature

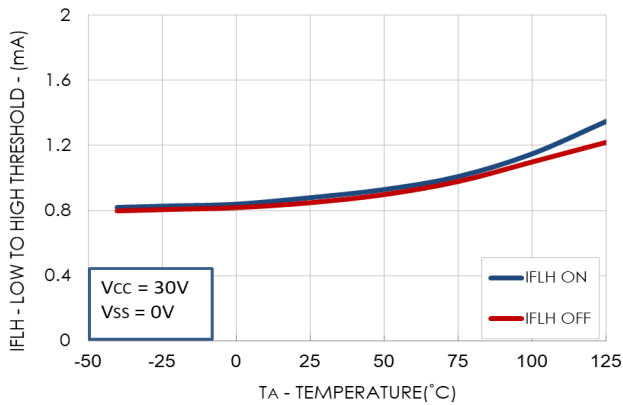


Fig.8 Propagation Delays vs.  $V_{CC}$

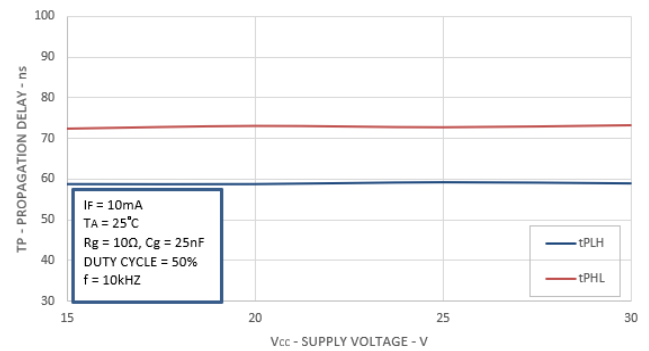


Fig.9 Propagation Delays vs.  $I_F$

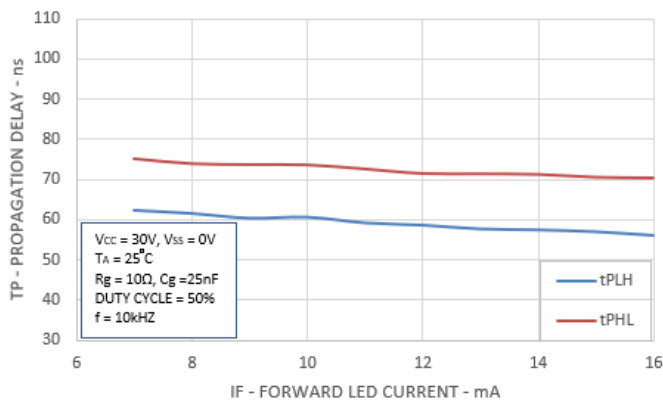


Fig.10 Propagation Delays vs. Temperature

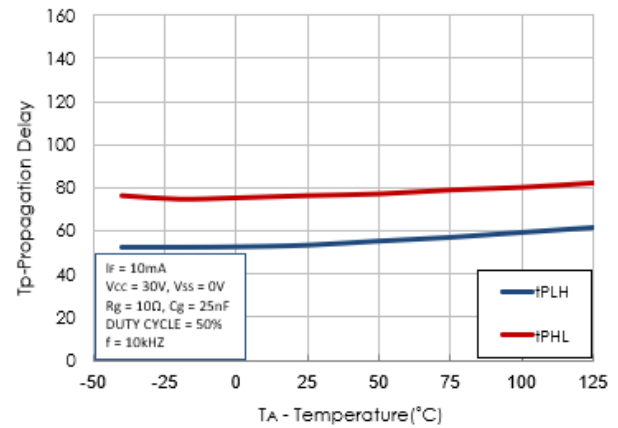


Fig.11 Propagation Delays vs.  $R_g$

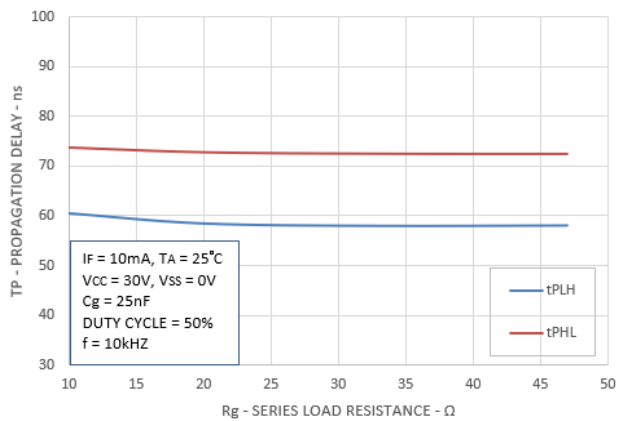
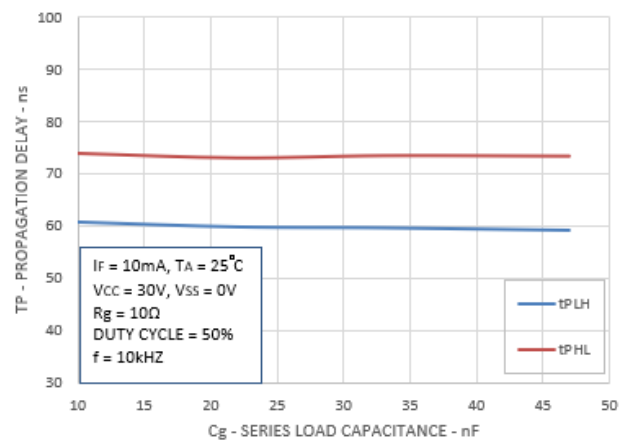
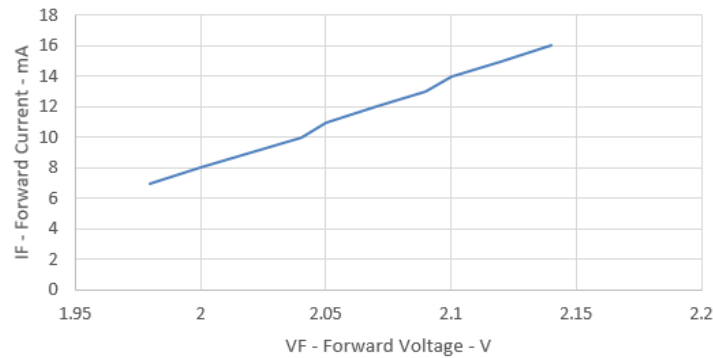


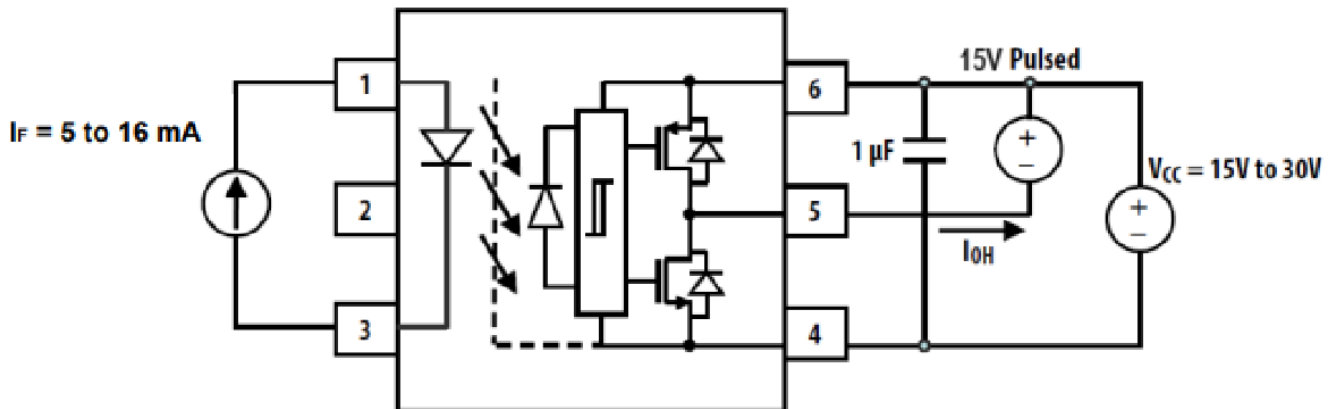
Fig.12 Propagation Delays vs.  $C_g$



**Fig.13 Input Current vs. Forward Voltage**



**Fig.14  $I_{OH}$  Test Circuit**



**Fig.15  $I_{OL}$  Test Circuit**

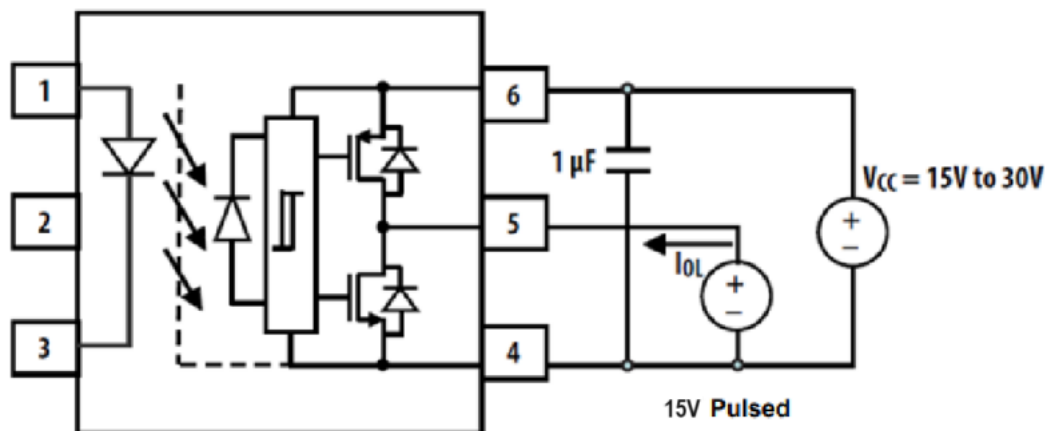




Fig.16  $V_{OH}$  Test Circuit

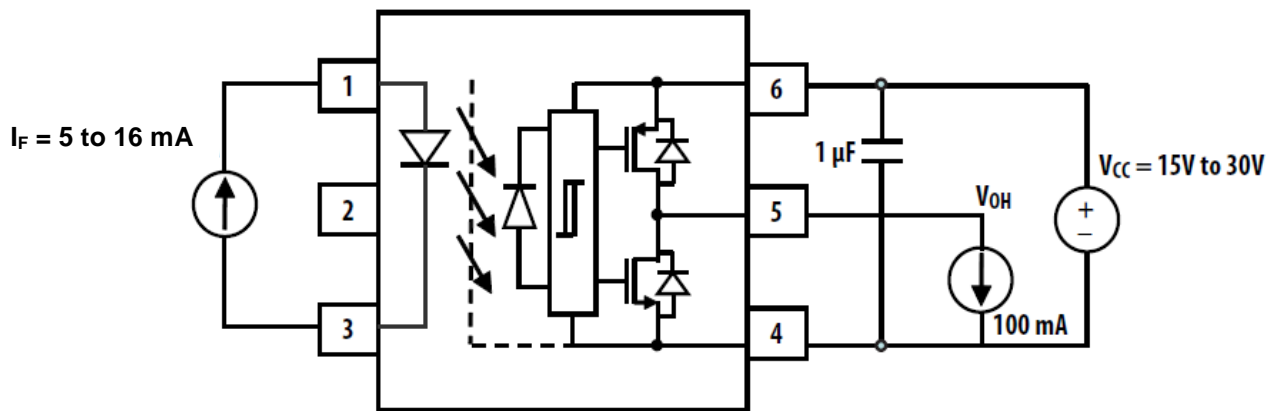


Fig.17  $V_{OL}$  Test Circuit

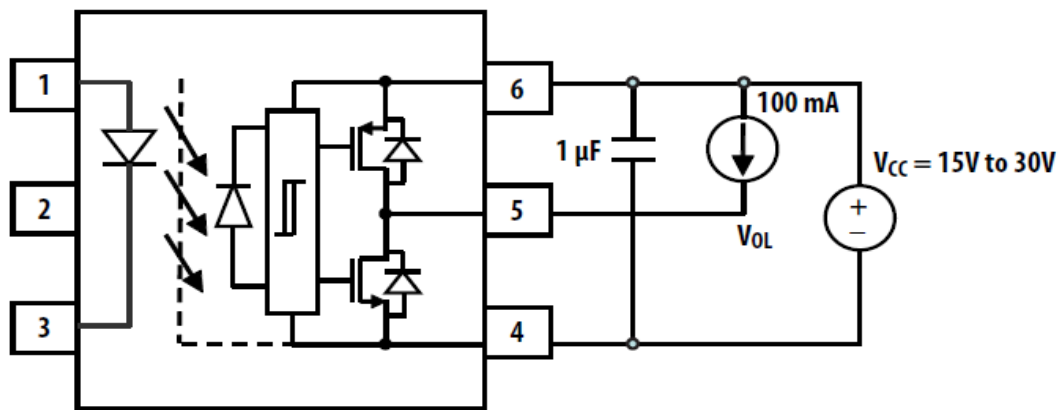


Fig.18  $I_{FLH}$  Test Circuit

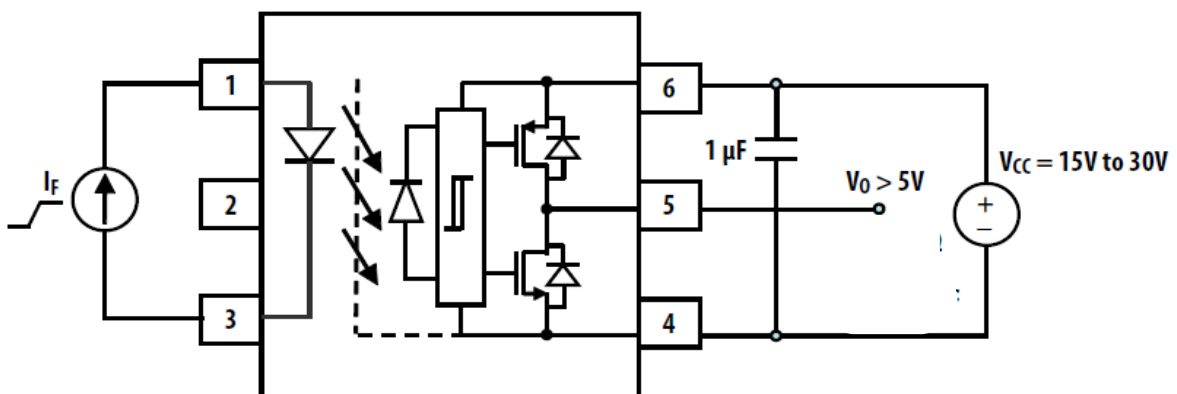


Fig.19  $U_{VLO}$  Test Circuit

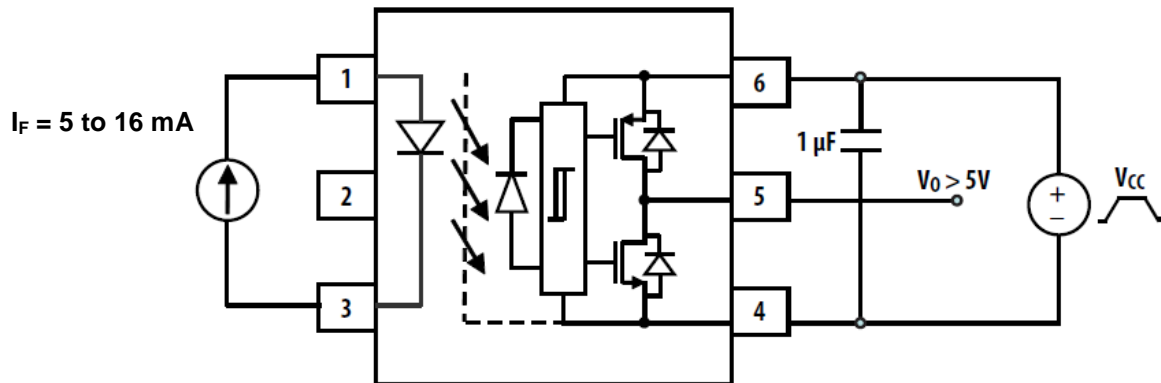


Fig.20  $t_{PHL}$ ,  $t_{PLH}$ ,  $t_r$  and  $t_f$  Test Circuit and Waveforms

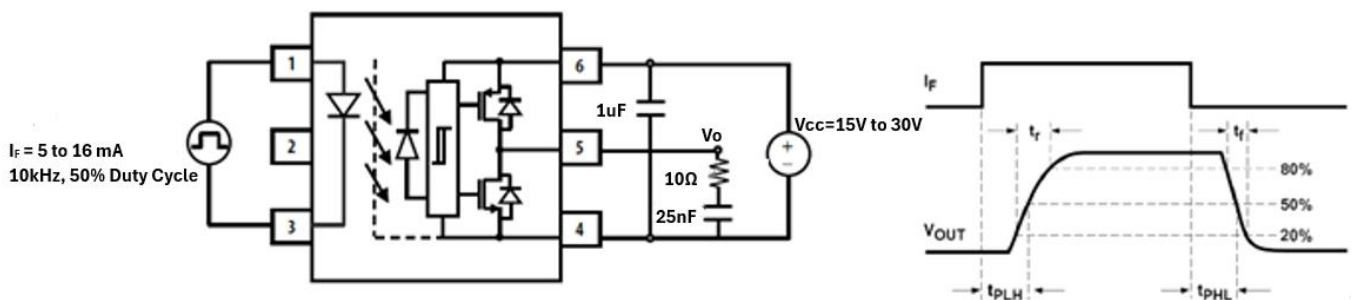
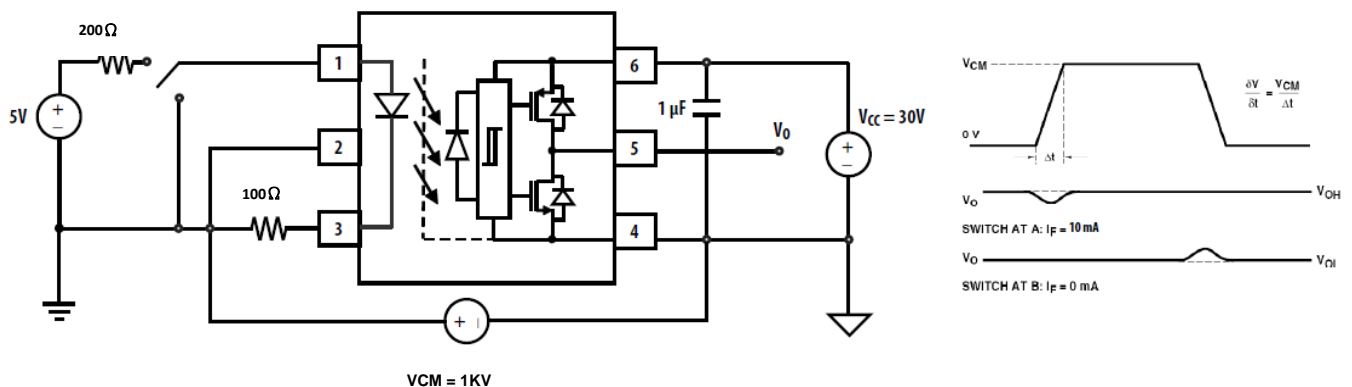
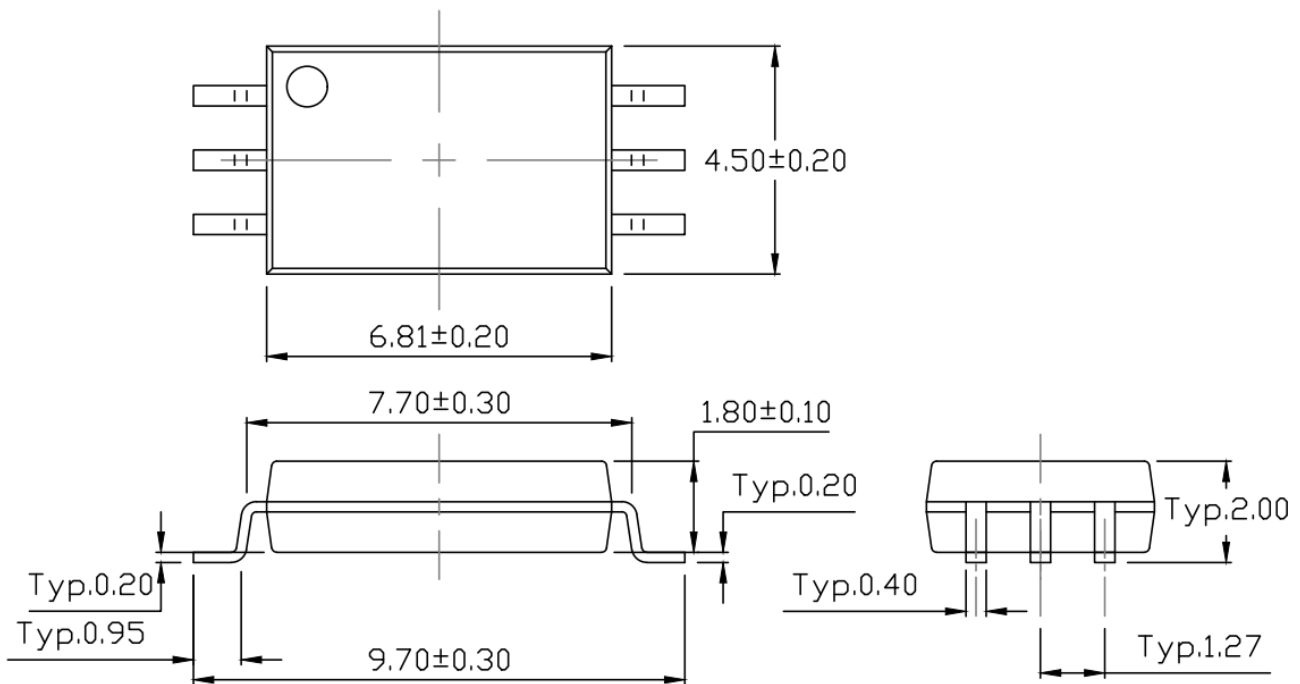


Fig.21 CMR Test Circuit with Split Resistors Network and Waveforms



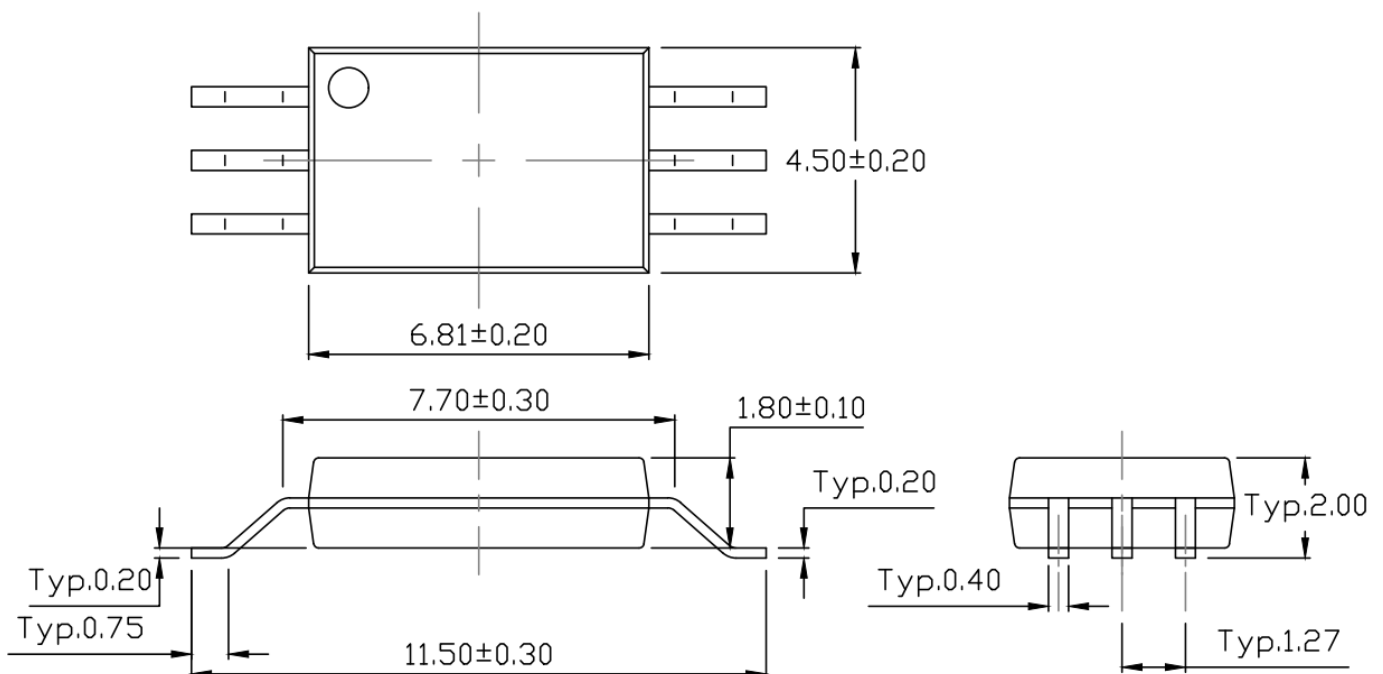
## PACKAGE DIMENSIONS (Dimensions in mm unless otherwise stated)

## Surface Mount Lead Forming (P Type)



General Tolerance: +/-0.25mm

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



General Tolerance: +/-0.25mm

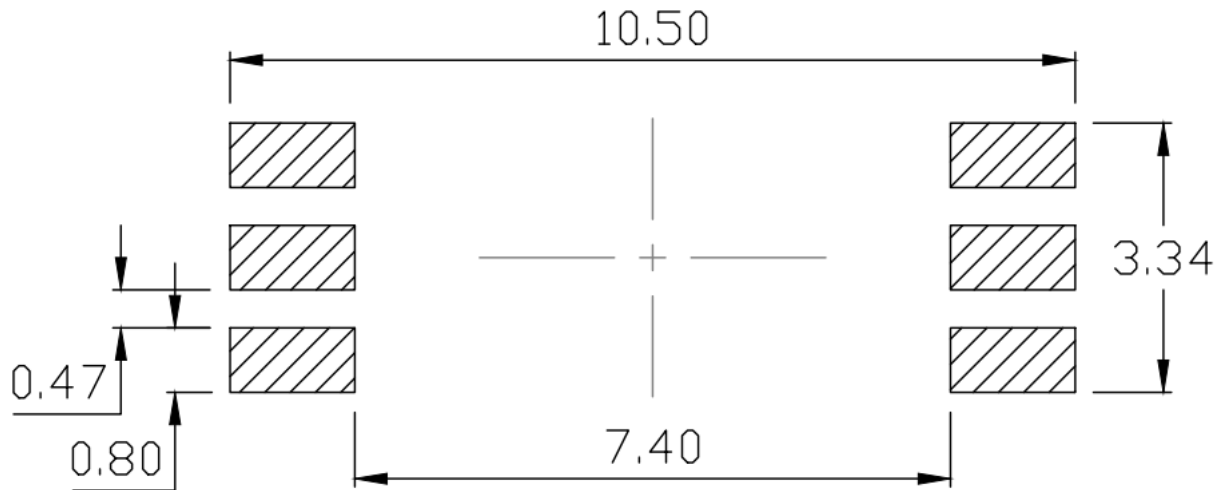


## MPCS-343 Series

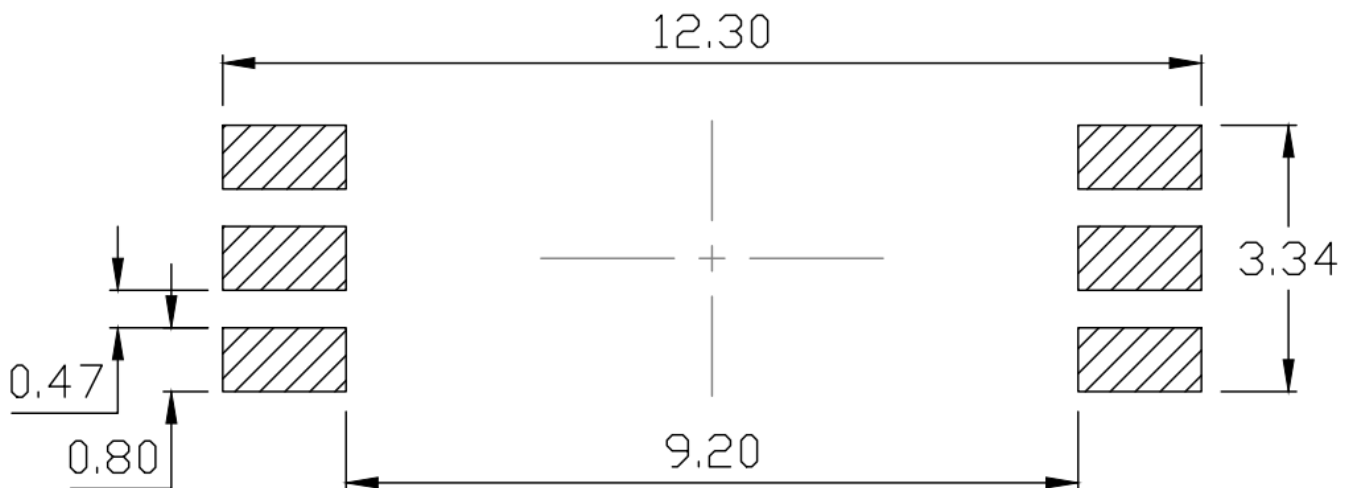
LSOP6, DC Input, 4.0A Gate Driver Optocoupler

### RECOMMENDED SOLDER MASK (Dimensions in mm unless otherwise stated)

#### Surface Mount Lead Forming (P Type)



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



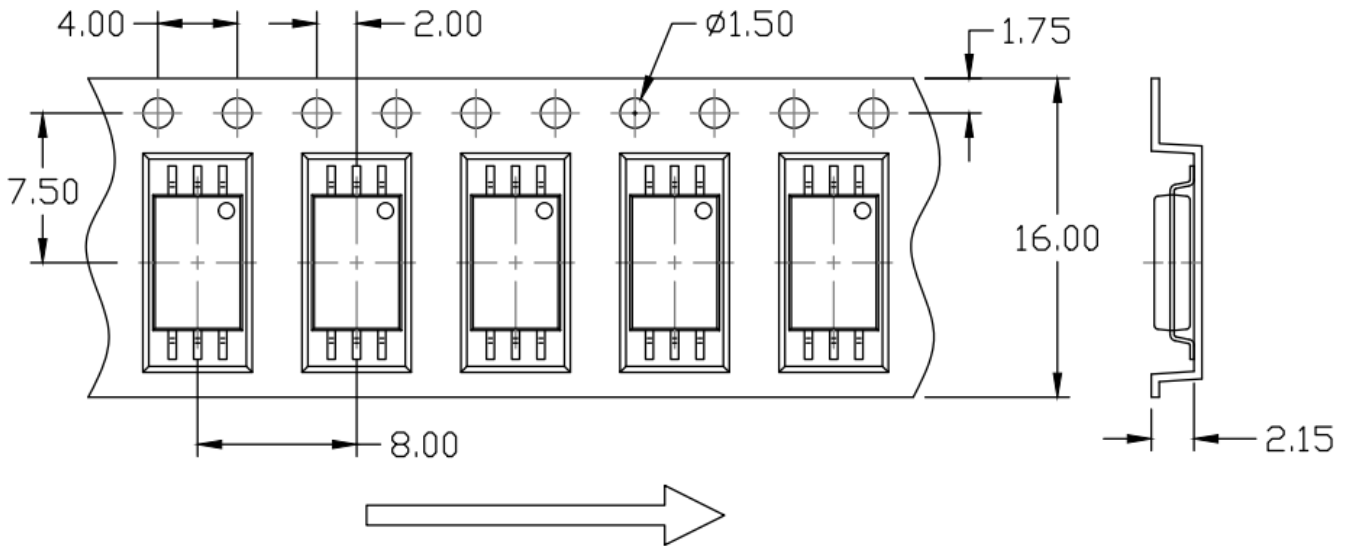


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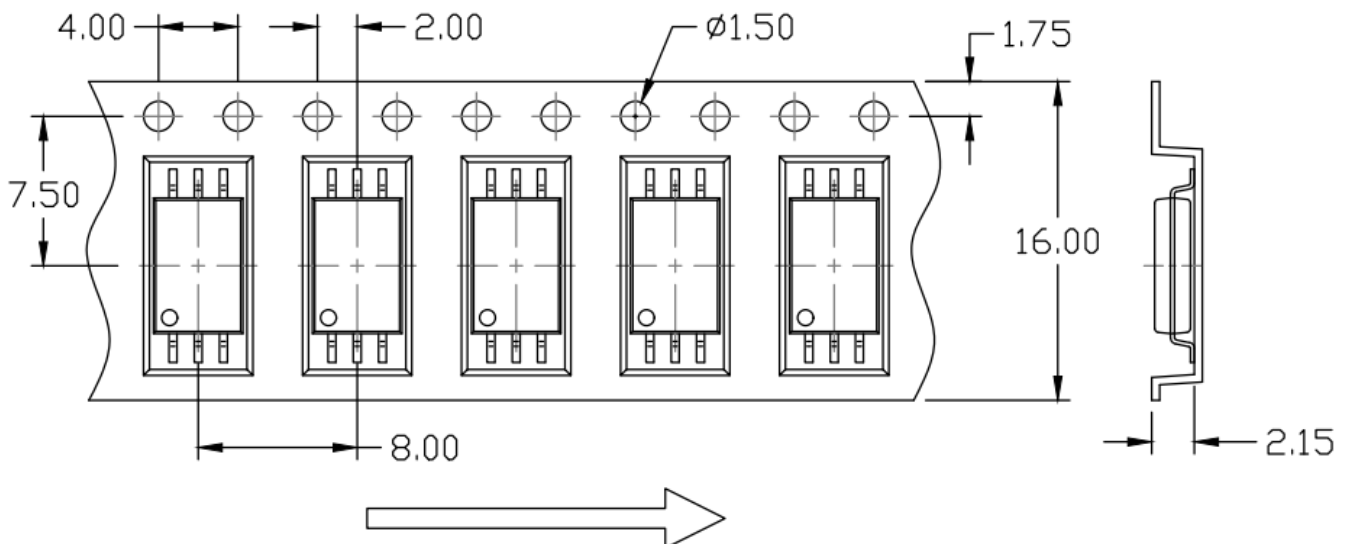
LSOP6, DC Input, 4.0A Gate Driver Optocoupler

## 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



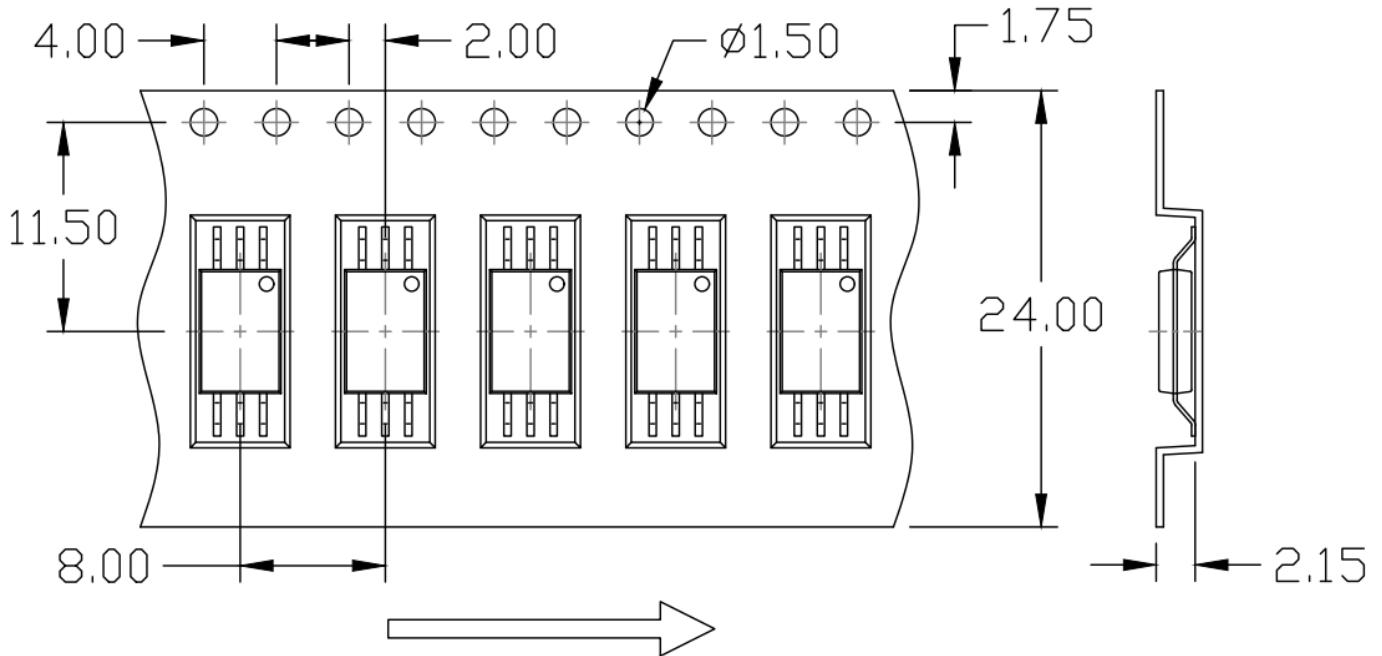


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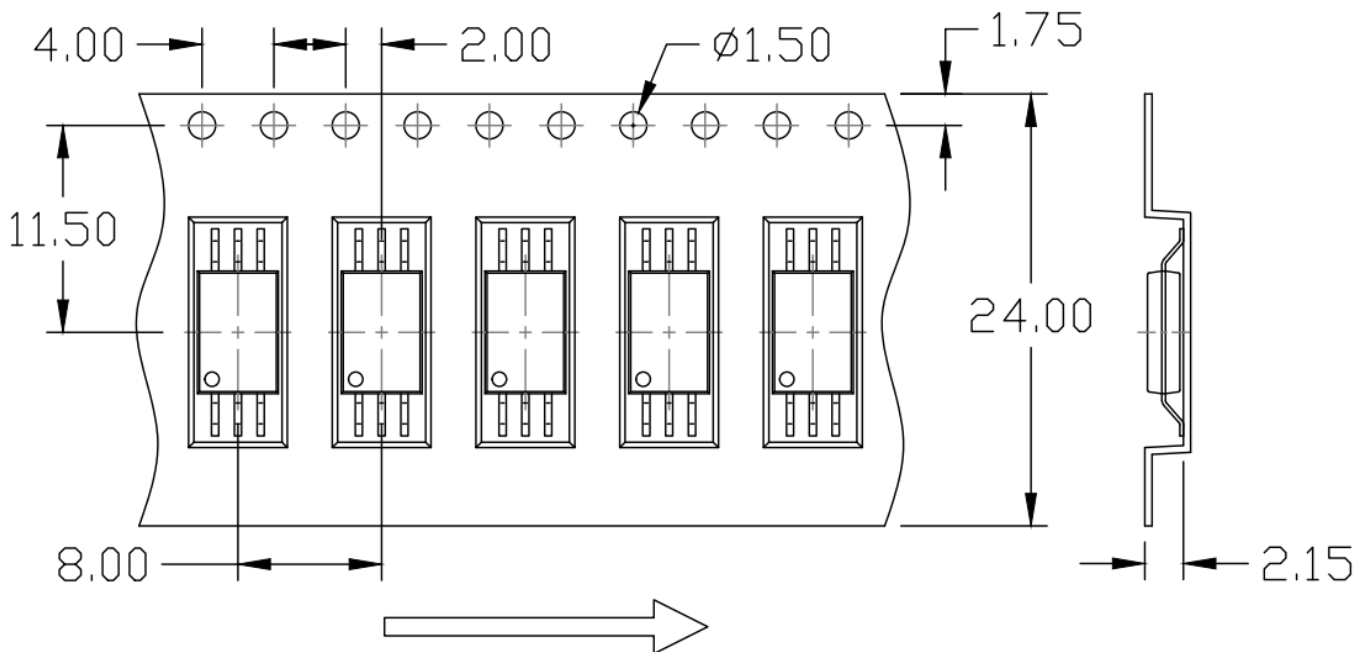
LSOP6, DC Input, 4.0A Gate Driver Optocoupler

## CARRIER TAPE SPECIFICATIONS (Dimensions in mm unless otherwise stated)

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

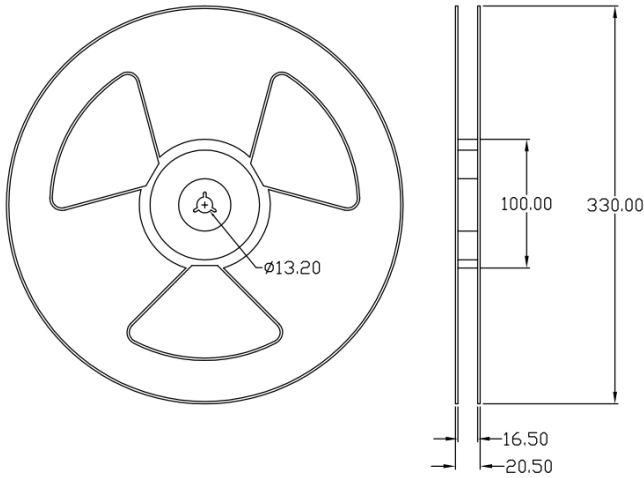


### Surface Mount (Gullwing) Lead Forming (W Type) Option T2

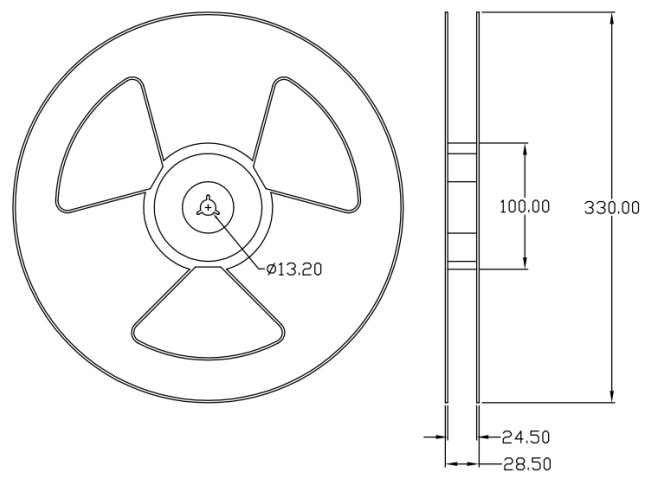


### REEL SPECIFICATIONS (Dimensions in mm unless otherwise stated)

Surface Mount Lead Forming (P Type)

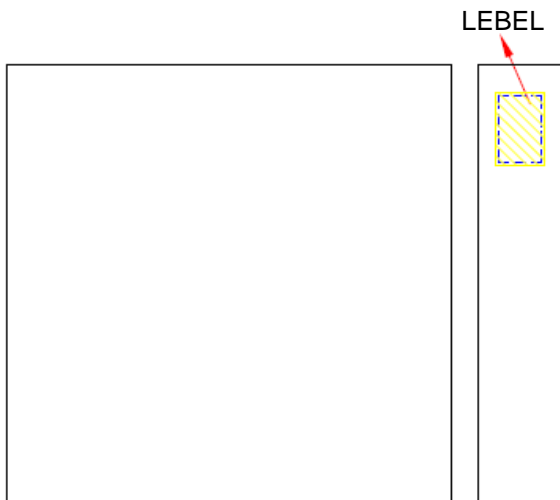


Surface Mount (Gullwing) Lead Forming (W Type)



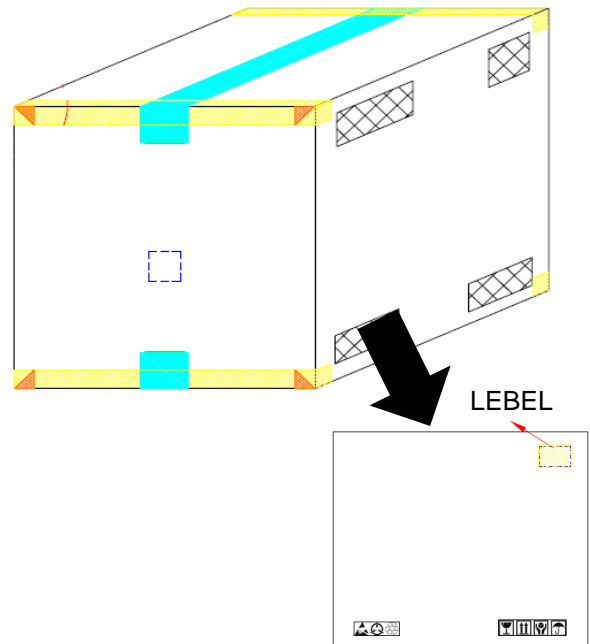
### BOX SPECIFICATIONS (Reel Type)

INNER BOX



L x W x H = 36cm x 36cm x 6.9cm

OUTER BOX



L x W x H = 45cm x 38cm x 38cm



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### ORDERING AND MARKING INFORMATION

#### MARKING INFORMATION



M : Company Abbr.  
YY : Year date code  
WW : 2-digit work week  
343 : Part Number  
T or H : Factory identification mark  
V : VDE Identification(Optional)

#### ORDERING INFORMATION

### MPCS-343(P/W)-ZV

MPC – Company Abbr.  
S – Stack  
343 – 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)

#### LABEL INFORMATION



喆光照明光電股份有限公司  
WISELITE Optronics Co., Ltd

Part No : XXXXXXXXXXXXX Bin Code : X



Lot No : XXXXXXXXXXXX

Date Code : XXXX

Q'ty : XXXX pcs



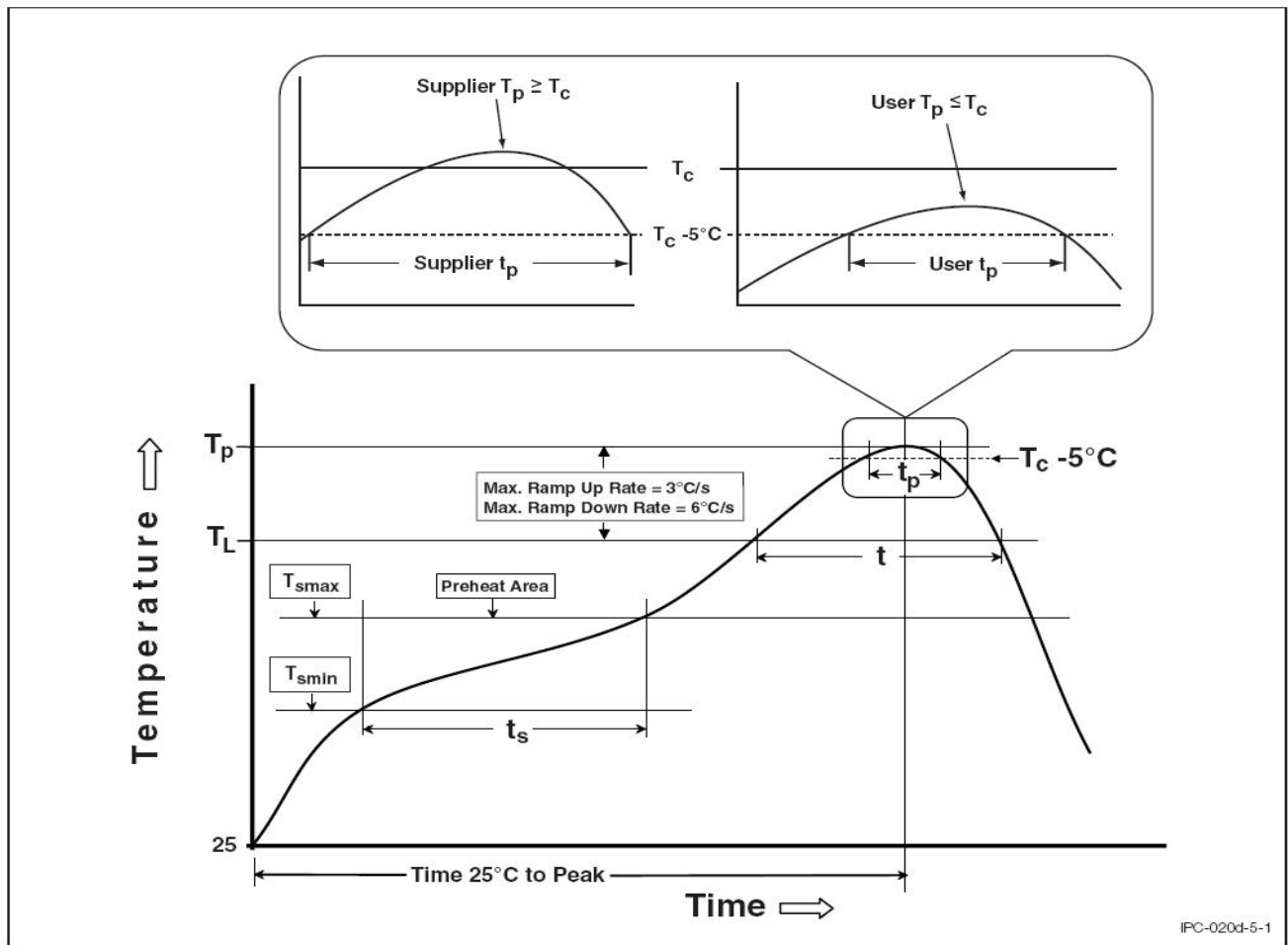
#### PACKING QUANTITY

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

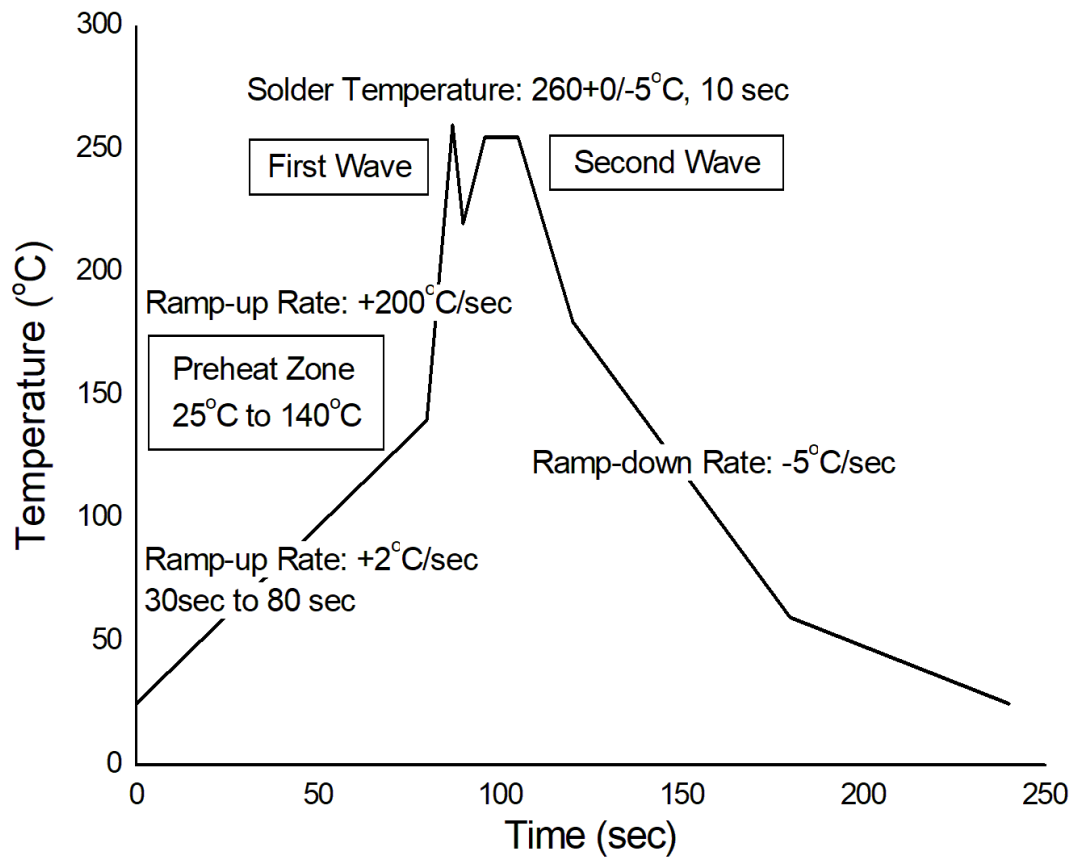


Profile Feature	Sn-Pb Assembly Profile	Pb-Free Assembly Profile
Temperature Min. (T <sub>smin</sub> )	100°C	150°C
Temperature Max. (T <sub>smax</sub> )	150°C	200°C
Time (t <sub>s</sub> ) from (T <sub>smin</sub> to T <sub>smax</sub> )	60-120 seconds	60-120 seconds
Ramp-up Rate (t <sub>L</sub> to t <sub>p</sub> )	3°C/second max.	3°C/second max.
Liquidous Temperature (T <sub>L</sub> )	183°C	217°C
Time (t <sub>L</sub> ) Maintained Above (T <sub>L</sub> )	60 – 150 seconds	60 – 150 seconds
Peak Body Package Temperature	235°C +0°C / -5°C	260°C +0°C / -5°C
Time (t <sub>p</sub> ) within 5°C of 260°C	20 seconds	30 seconds
Ramp-down Rate (T <sub>p</sub> to T <sub>L</sub> )	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±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.
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- 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.