



MPCS-341 Series

LSOP6, DC Input, 3.0A Gate Driver Optocoupler

Description

The MPCS-341 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 series can be used to drive a discrete power stage which drives the IGBT gate.

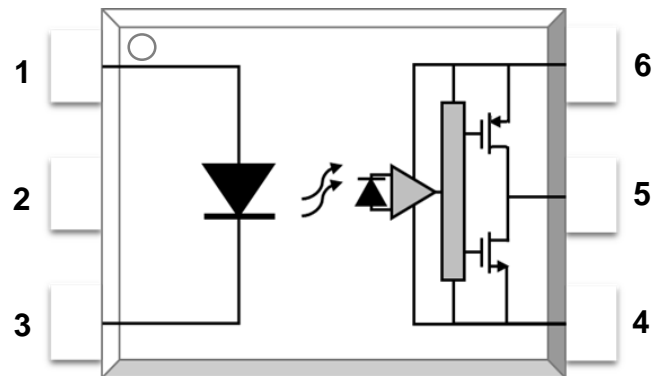
Features

- 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: 15 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

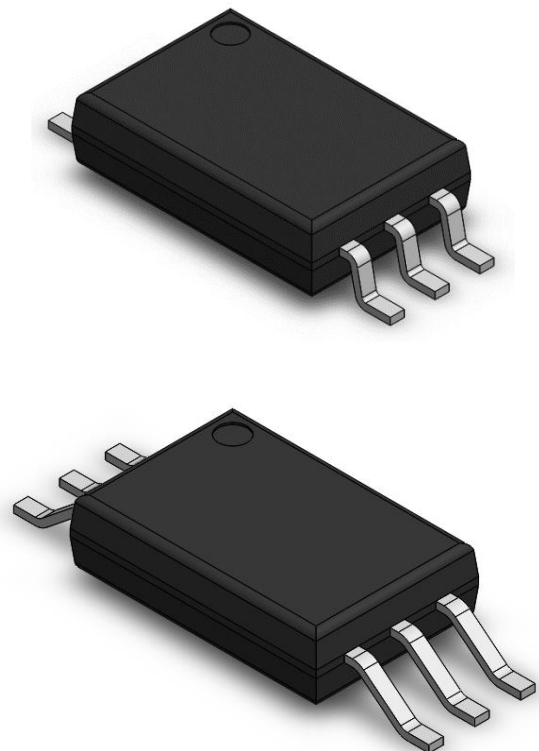
SCHEMATIC



PIN DEFINITION

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

PACKAGE OUTLINE





MPCS-341 Series

LSOP6, DC Input, 3.0A Gate Driver Optocoupler

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 0.1µF 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	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 ≤ 10 µs, f ≤ 15 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



MPCS-341 Series

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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}	3.0	-	-	A	$I_F = 10\text{mA}, V_{CC} = 30\text{V}, V_O = V_{CC} - 15$	1
Low level output current	I_{OL}	3.0	-	-	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 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.



MPCS-341 Series

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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	Rg = 10 Ω , Cg = 25 nF, f = 10kHz, Duty Cycle = 50% I _F = 10mA, V _{CC} = 30V	-
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/ μ s	I _F = 7 to 16mA V _{CC} = 30V, T _A = 25 °C, V _{CM} = 1kV	1,2
Common mode transient immunity at low level output	CM _L	20	40	-	kV/ μ s	I _F = 0mA V _{CC} = 30V, T _A = 25 °C, V _{CM} = 1kV	1,3

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: 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 > 15.0V).

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 < 1.0V).



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LSOP6, DC Input, 3.0A Gate Driver Optocoupler

ISOLATION CHARACTERISTIC

PARAMETER	SYMBOL	DEVICE	MIN.	TYP.	MAX.	UNIT	TEST CONDITION	NOTE
Withstand Insulation Test Voltage	V_{ISO}	MPCS-341P	5000	-	-	V	RH \leq 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

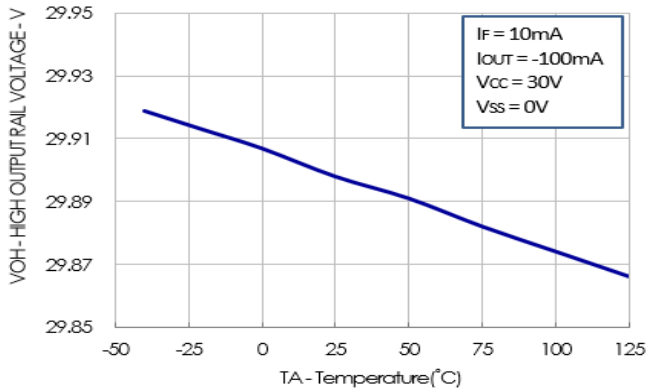


Fig.2 V_{OH} vs. Temperature

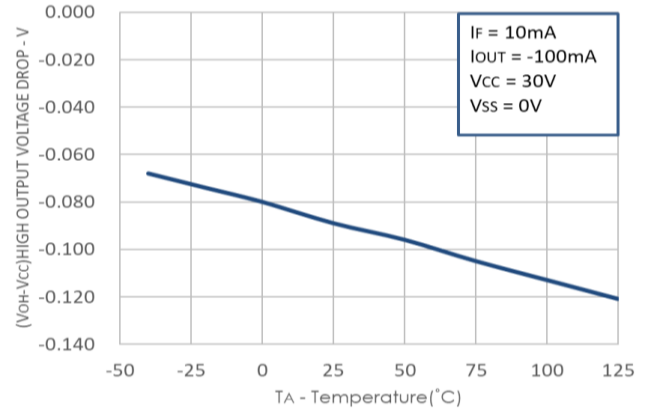


Fig.3 V_{OL} vs. Temperature

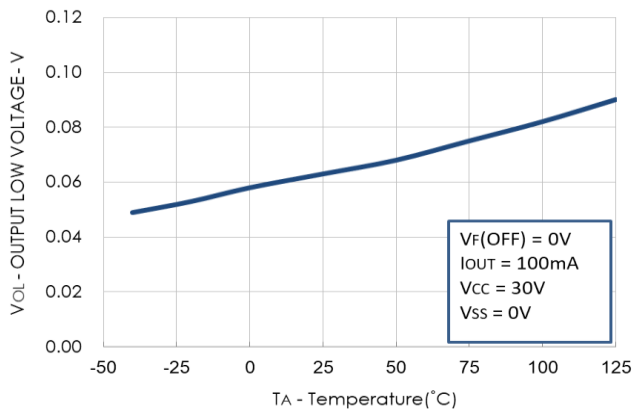


Fig.4 I_{CC} vs. Temperature

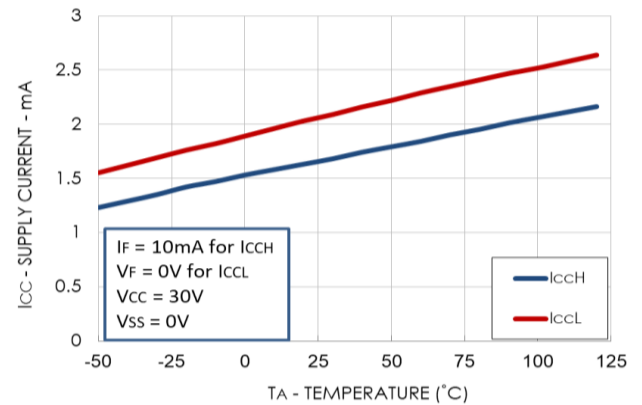


Fig.5 I_{CC} vs. V_{CC}

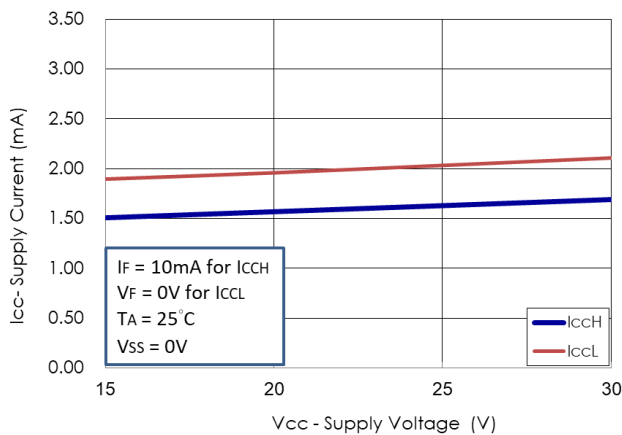
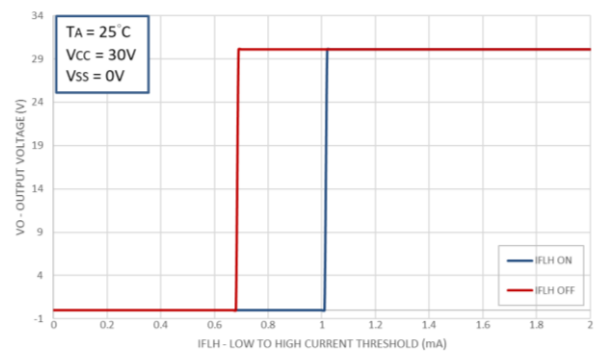


Fig.6 I_{FLH} vs. Hysteresis





MPCS-341 Series

LSOP6, DC Input, 3.0A Gate Driver Optocoupler

Fig.7 I_{FH} vs. Temperature

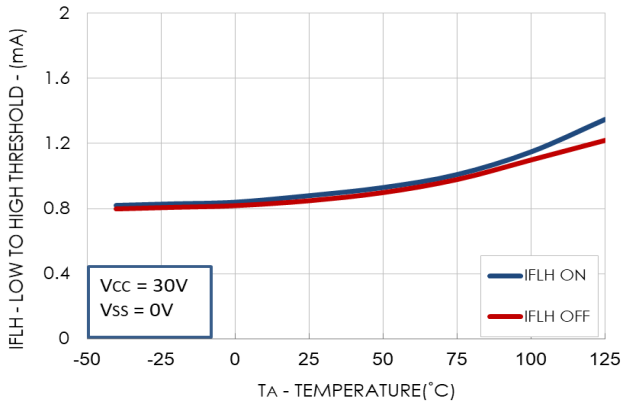


Fig.8 Propagation Delays vs. V_{CC}

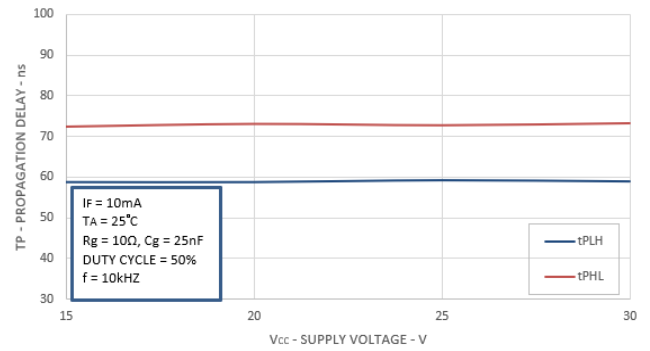


Fig.9 Propagation Delays vs. I_F

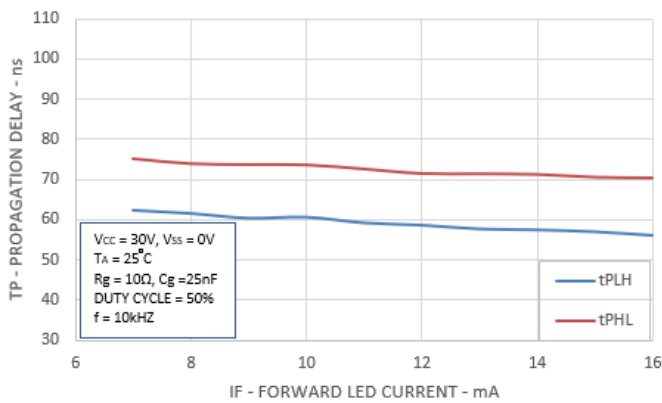


Fig.10 Propagation Delays vs. Temperature

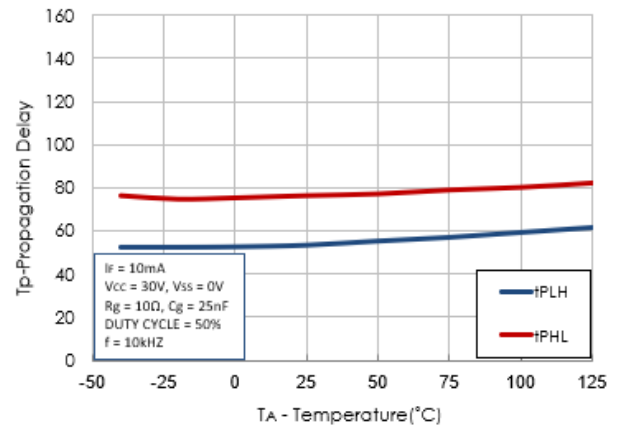


Fig.11 Propagation Delays vs. R_g

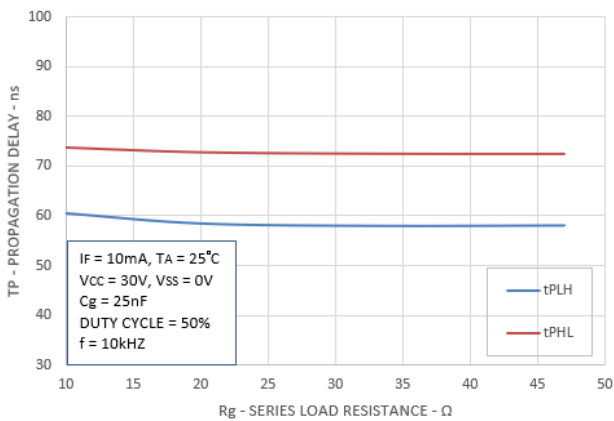


Fig.12 Propagation Delays vs. C_g

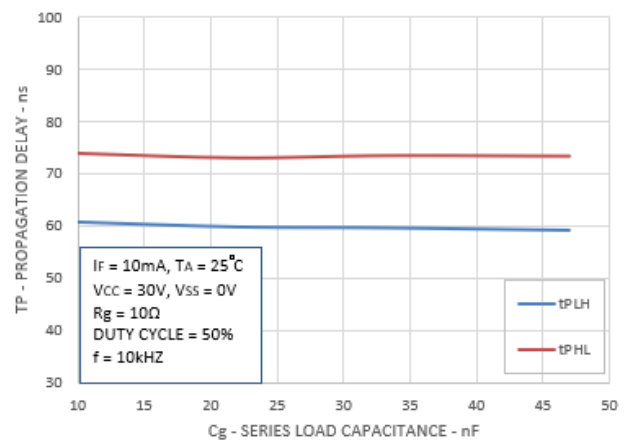


Fig.13 Input Current vs. Forward Voltage

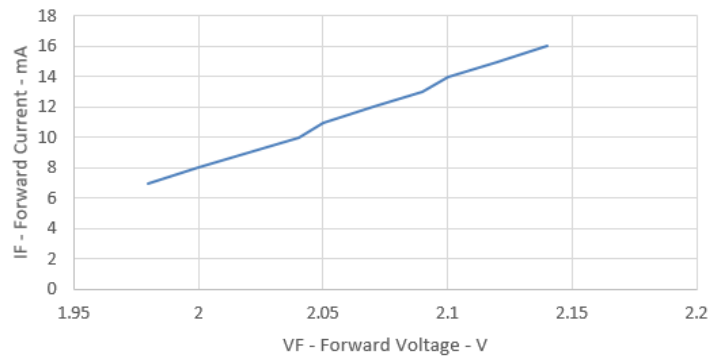


Fig.14 I_{OH} Test Circuit

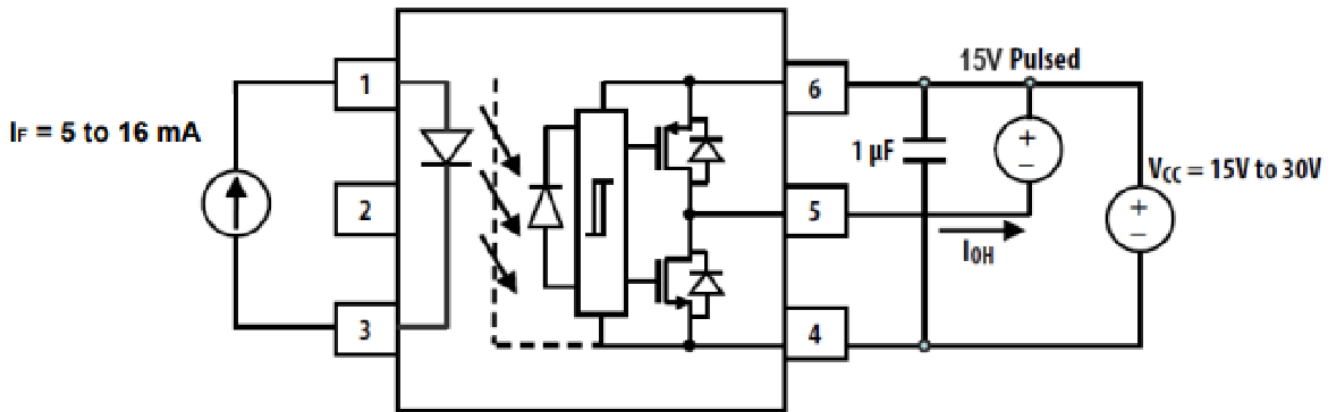


Fig.15 I_{OL} Test Circuit

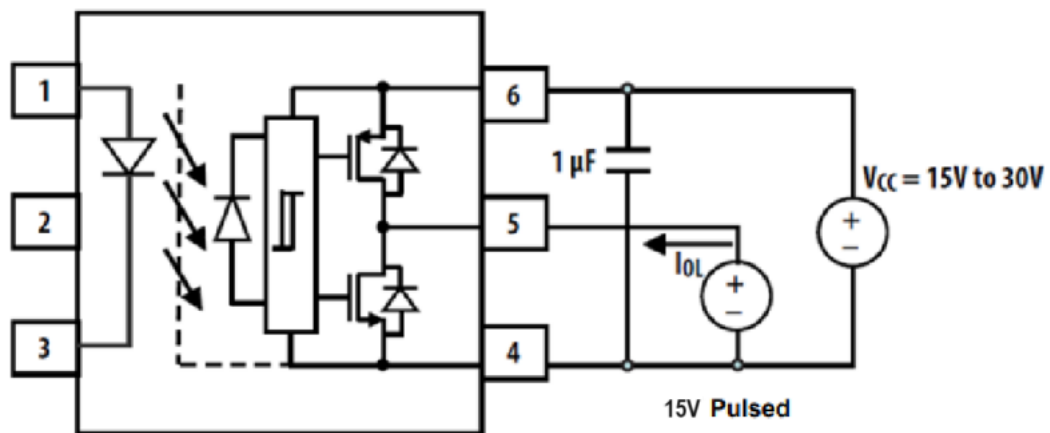


Fig.16 V_{OH} Test Circuit

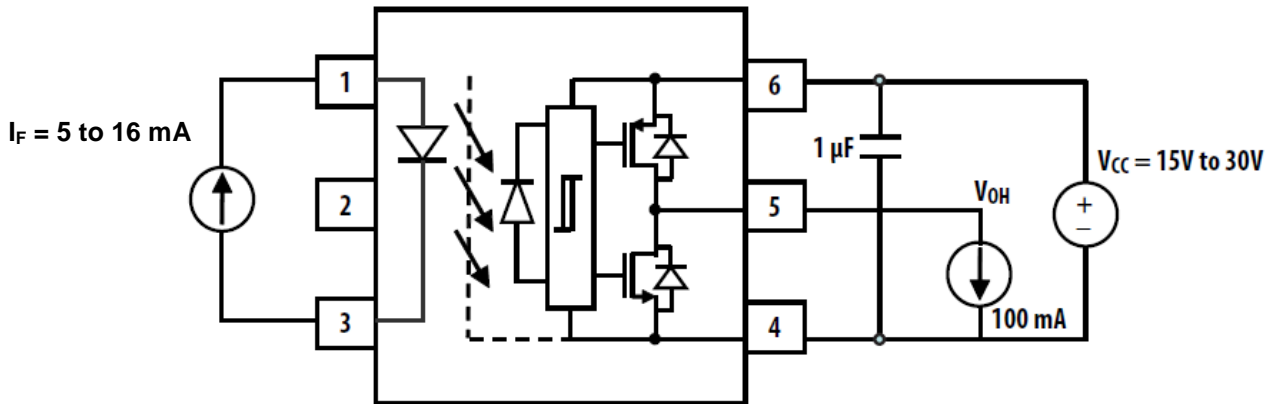


Fig.17 V_{OL} Test Circuit

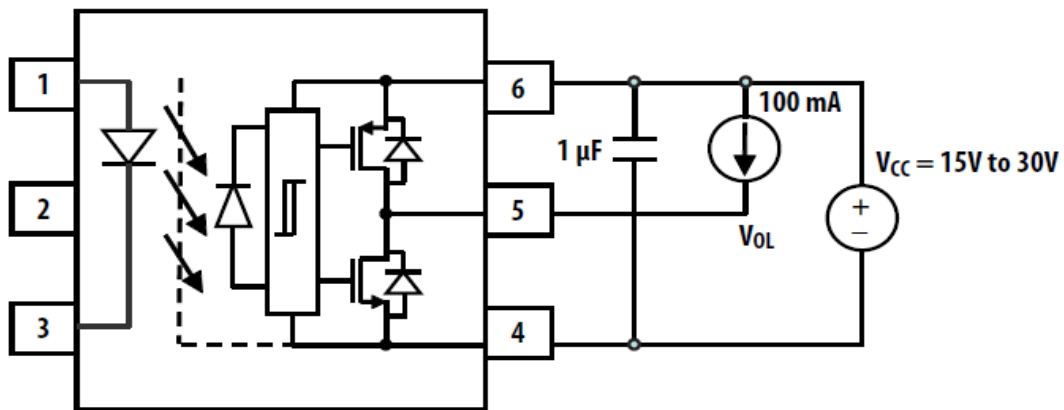


Fig.18 I_{FLH} Test Circuit

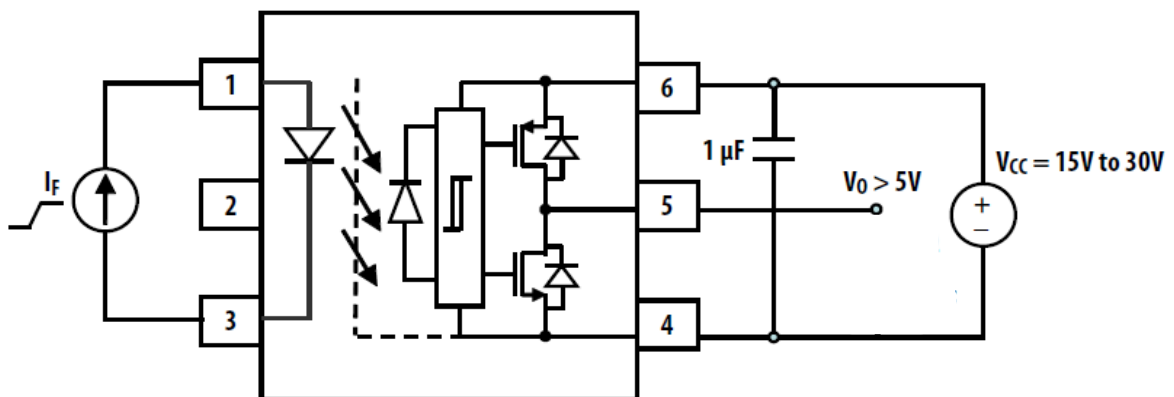


Fig.19 U_{VL0} Test Circuit

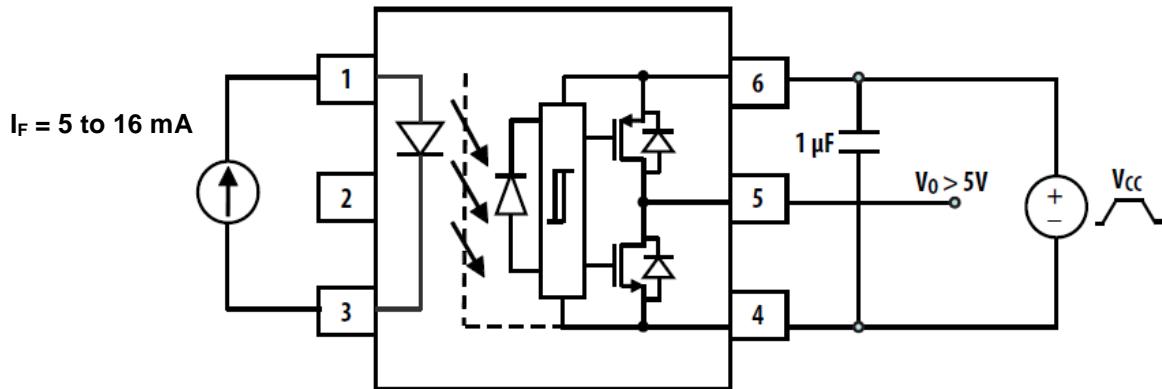


Fig.20 t_{PHL}, t_{PLH}, t_r and t_f Test Circuit and Waveforms

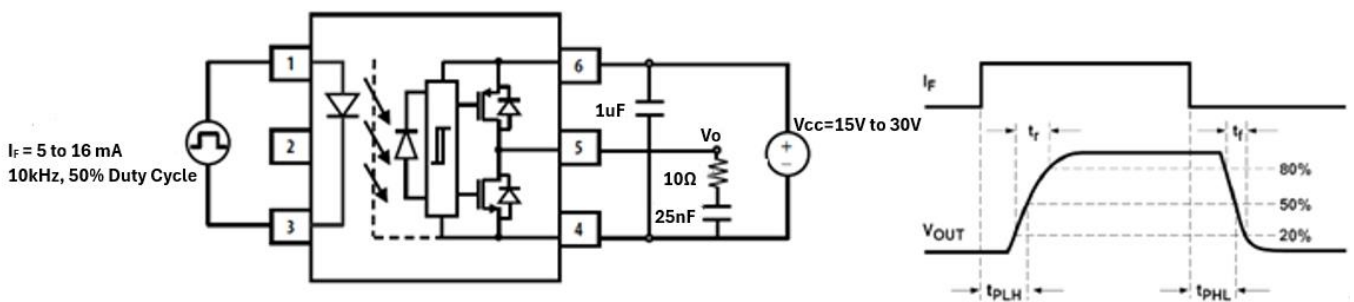
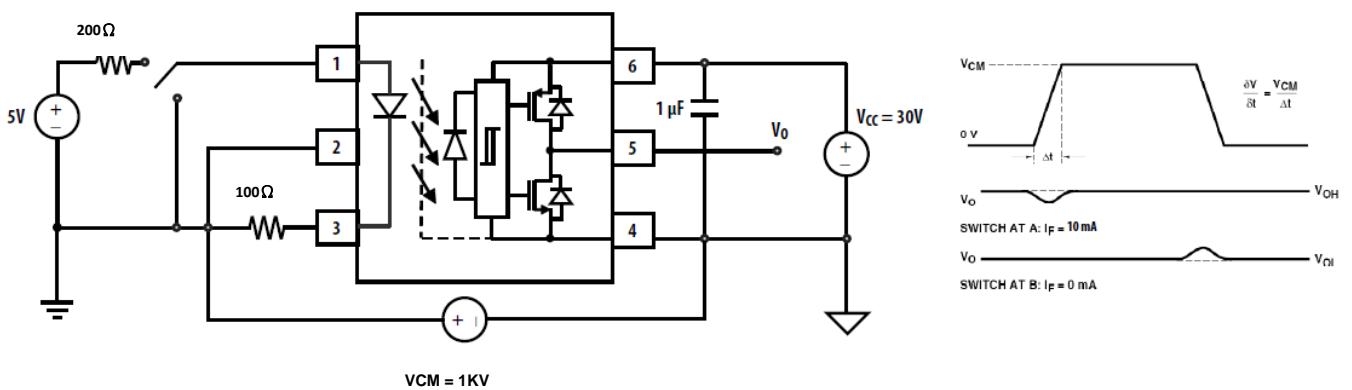


Fig.21 CMR Test Circuit with Split Resistors Network and Waveforms



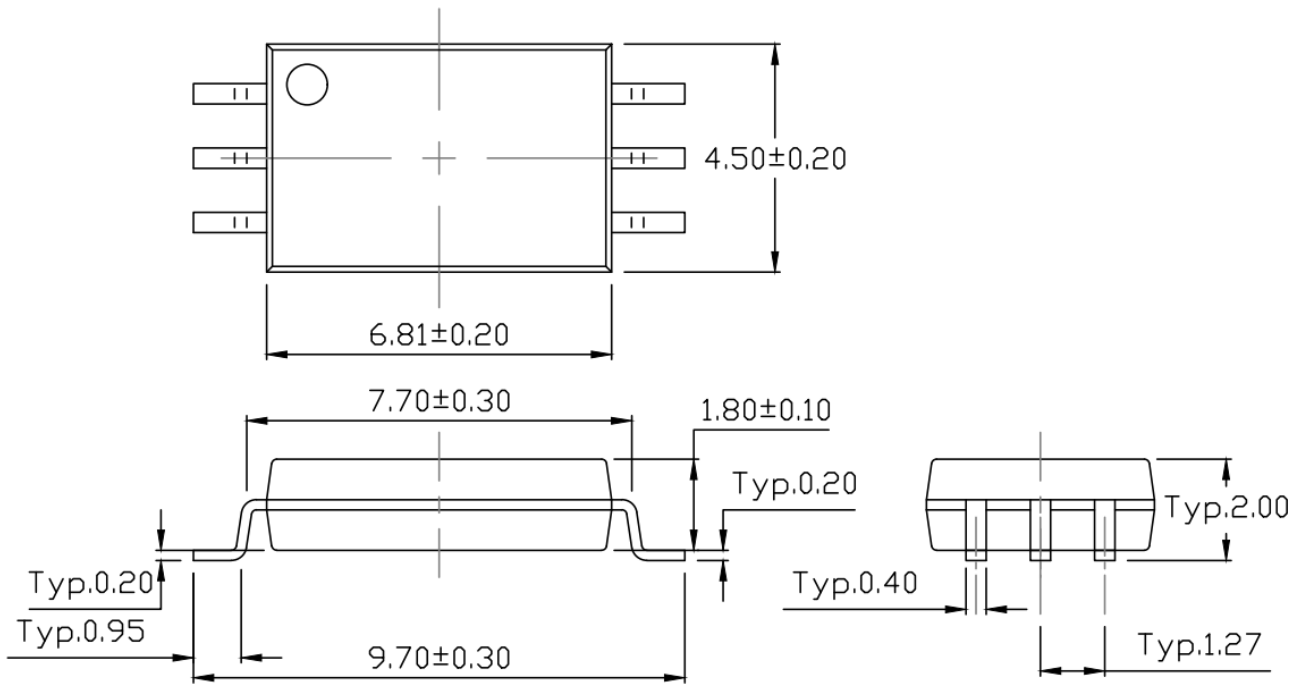


MPCS-341 Series

LSOP6, DC Input, 3.0A Gate Driver Optocoupler

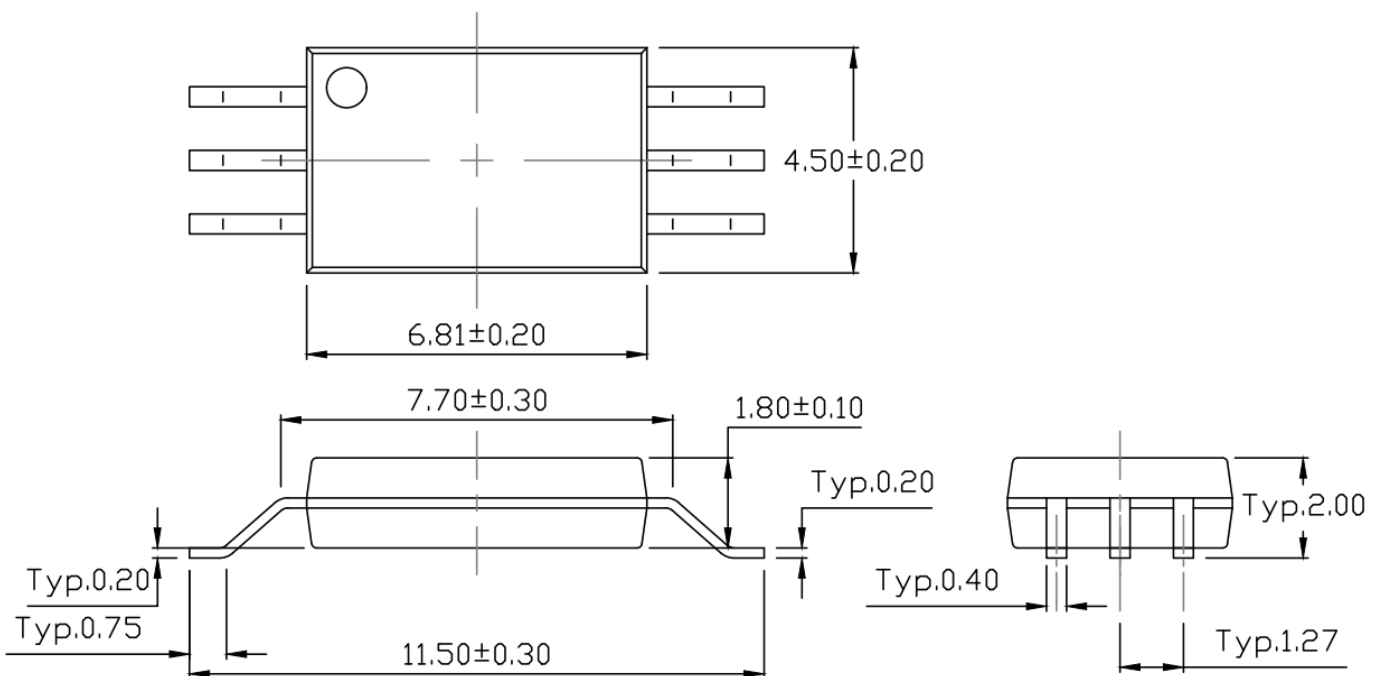
PACKAGE DIMENSIONS (Dimensions in mm unless otherwise stated)

Surface Mount Lead Forming (P Type)



General Tolerance: ± 0.25 mm

Surface Mount (Gullwing) Lead Forming (W Type)



General Tolerance: ± 0.25 mm

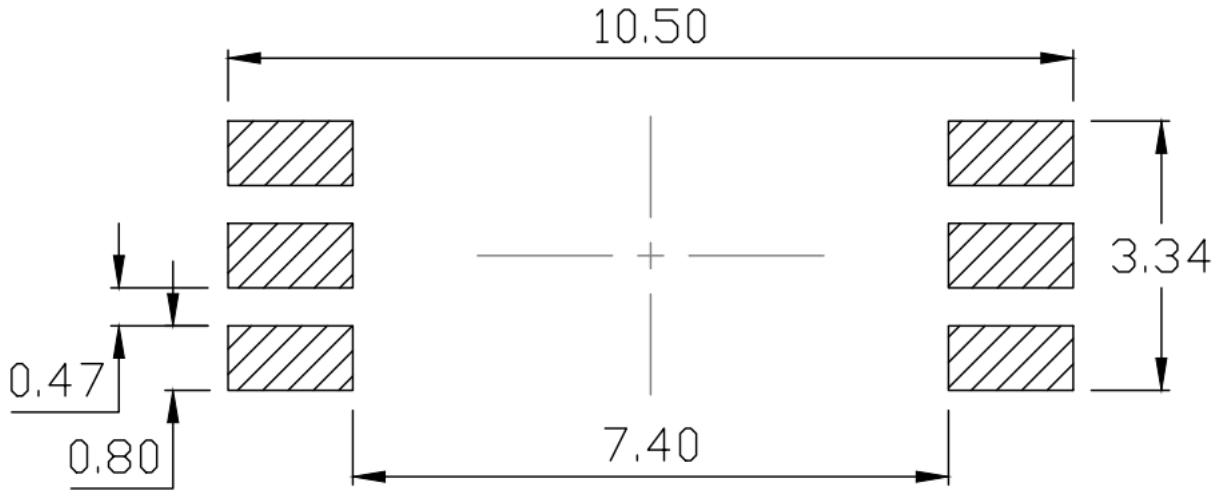


MPCS-341 Series

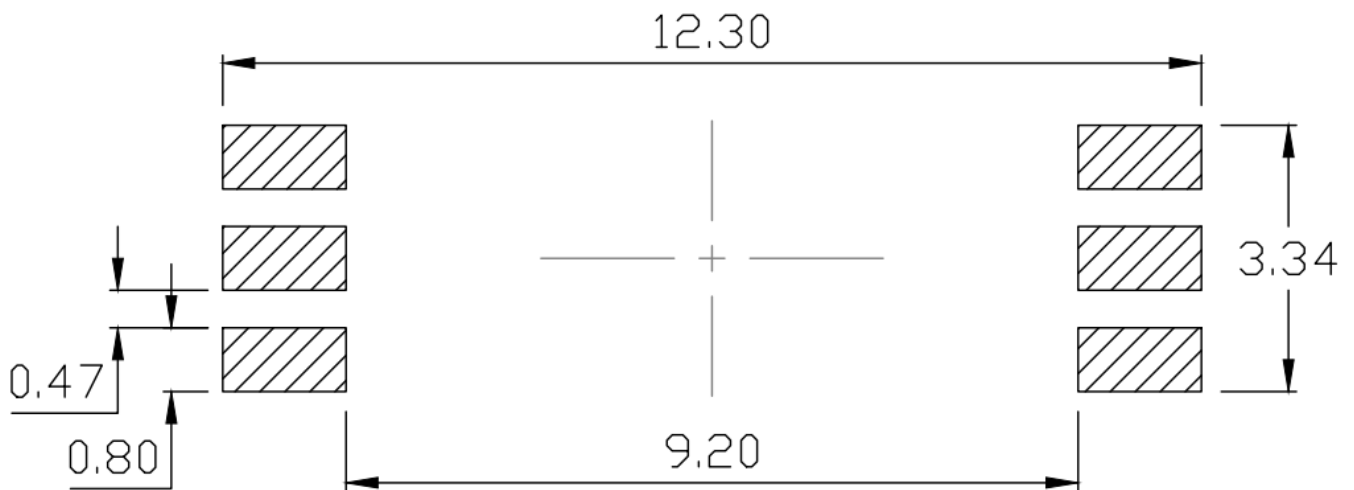
LSOP6, DC Input, 3.0A Gate Driver Optocoupler

RECOMMENDED SOLDER MASK (Dimensions in mm unless otherwise stated)

Surface Mount Lead Forming (P Type)



Surface Mount (Gullwing) Lead Forming (W Type)



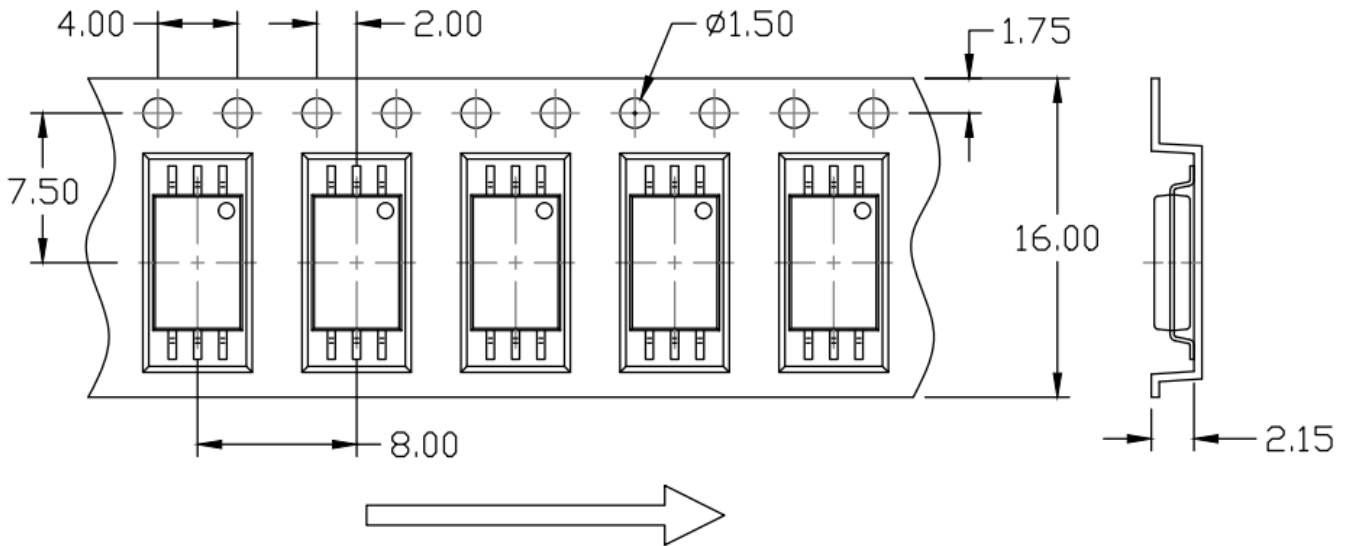


MPCS-341 Series

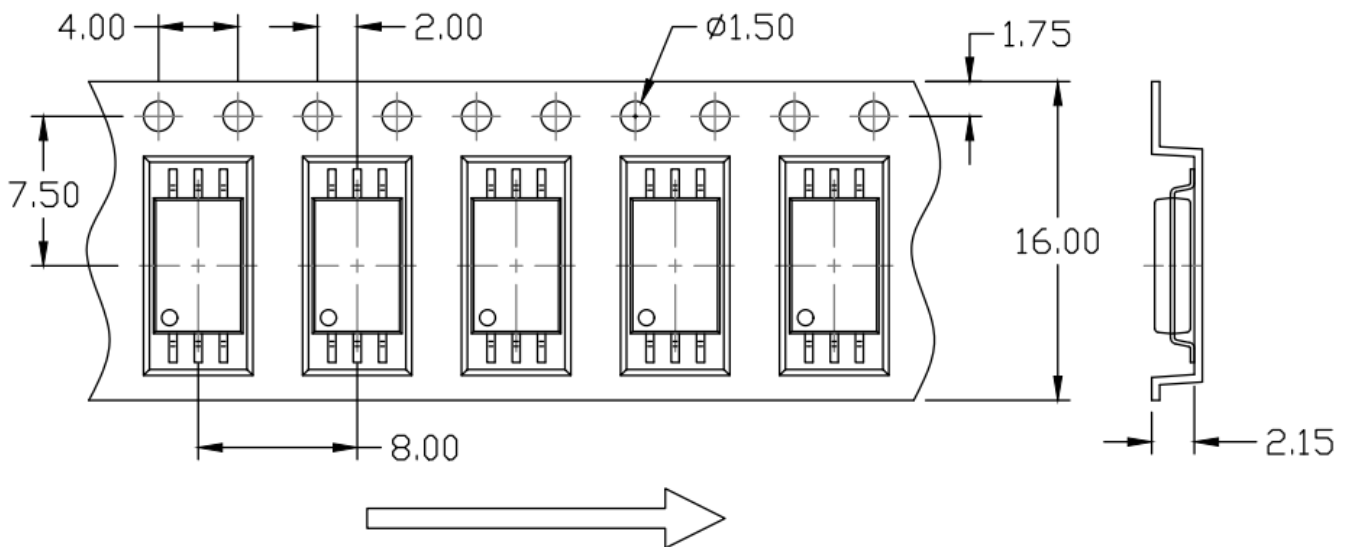
LSOP6, DC Input, 3.0A Gate Driver Optocoupler

CARRIER TAPE SPECIFICATIONS (Dimensions in mm unless otherwise stated)

Surface Mount Lead Forming (P Type) Option T1

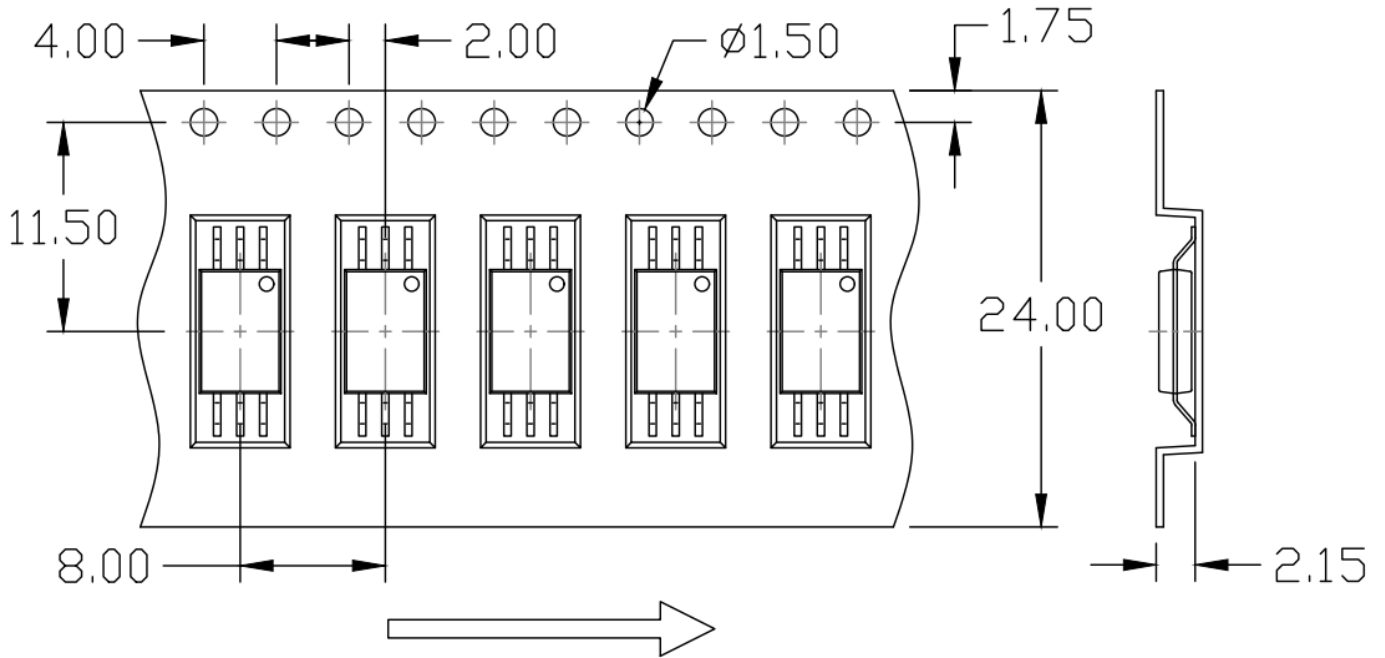


Surface Mount Lead Forming (P Type) Option T2

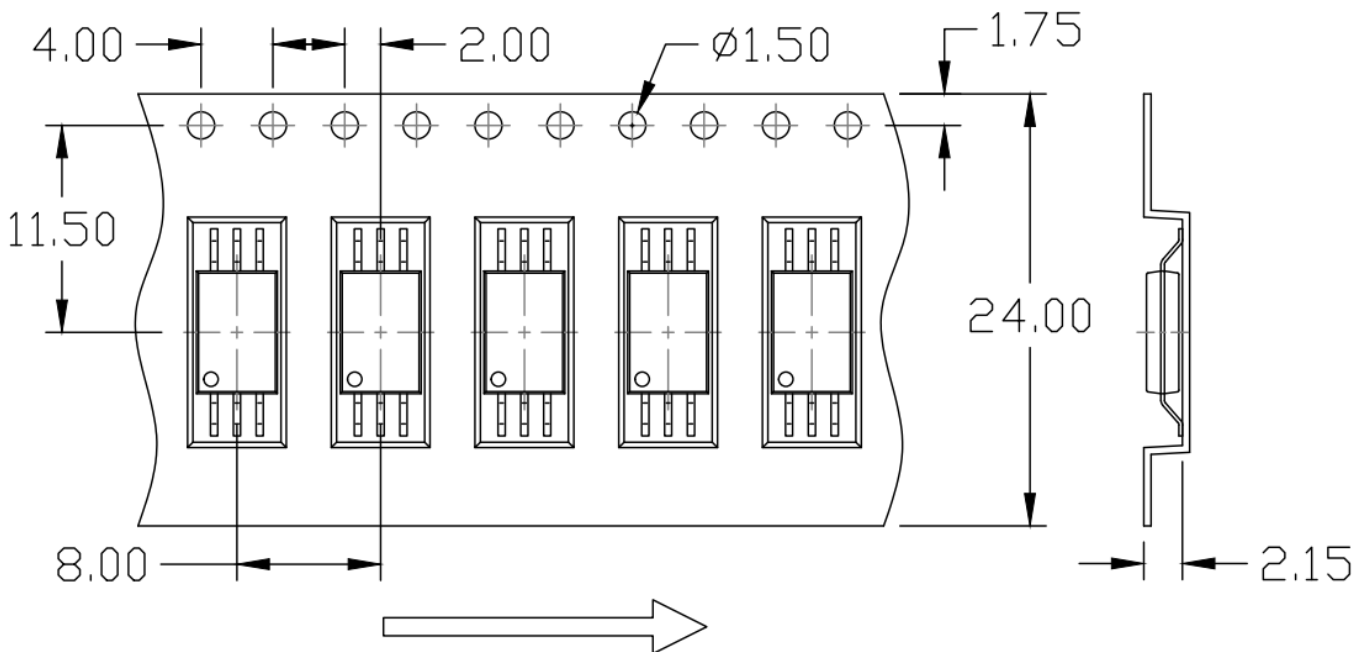


CARRIER TAPE SPECIFICATIONS (Dimensions in mm unless otherwise stated)

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

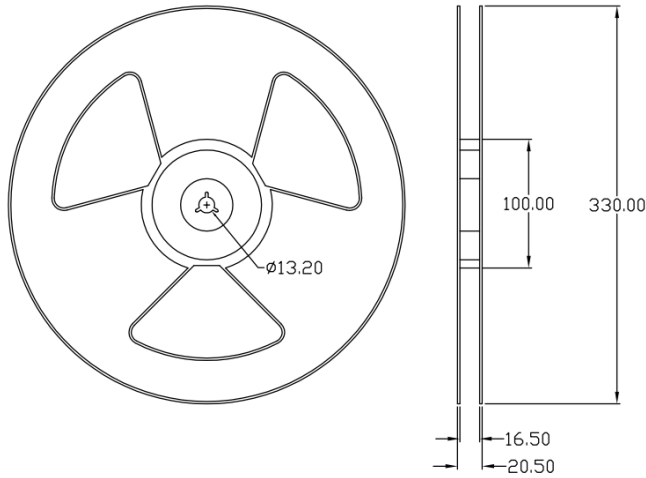


Surface Mount (Gullwing) Lead Forming (W Type) Option T2

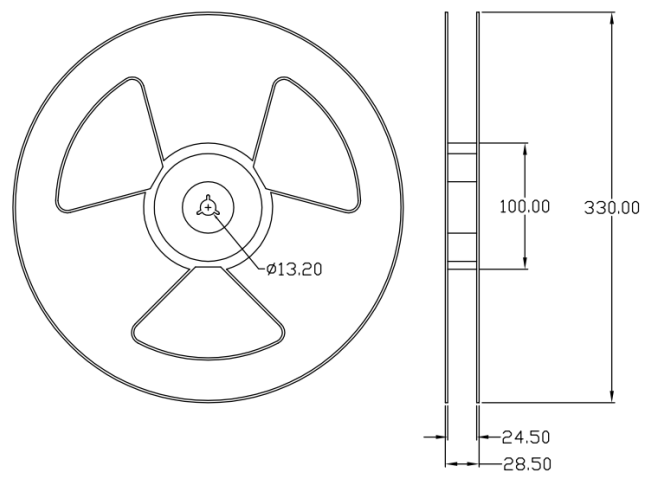


REEL SPECIFICATIONS (Dimensions in mm unless otherwise stated)

Surface Mount Lead Forming (P Type)

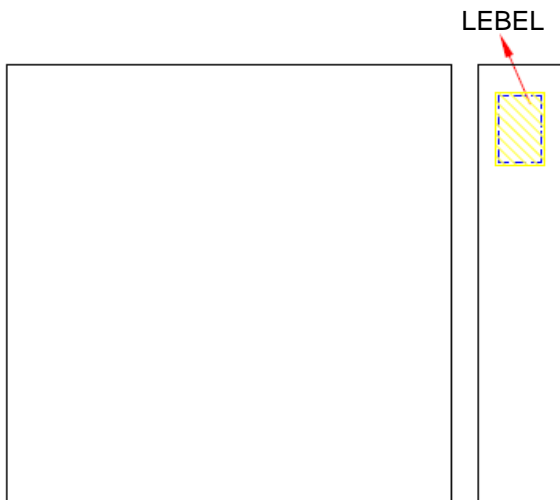


Surface Mount (Gullwing) Lead Forming (W Type)



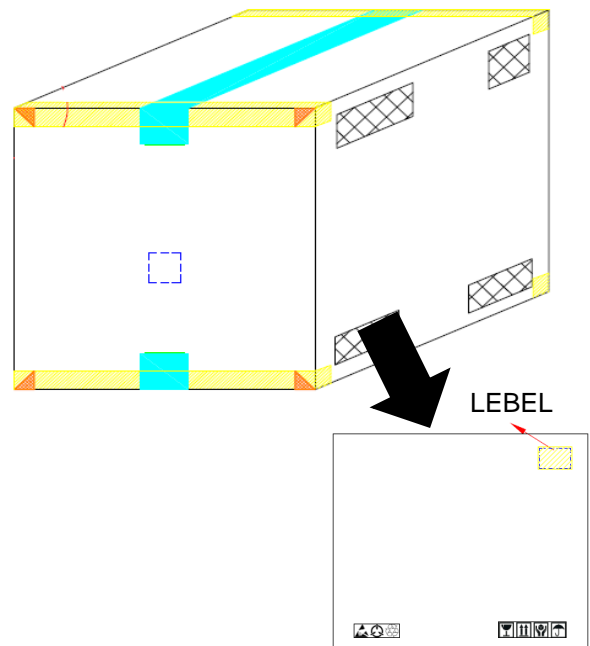
BOX SPECIFICATIONS (Reel Type)

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
 341 : Part Number
 T or H : Factory identification mark
 V : VDE Identification(Option)

ORDERING INFORMATION

MPCS-341(P/W)-ZV

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)

LABEL INFORMATION

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

Part No : XXXXXXXXXXXXXXXX Bin Code : X

Lot No : XXXXXXXXXXXX

Date Code : XXXX

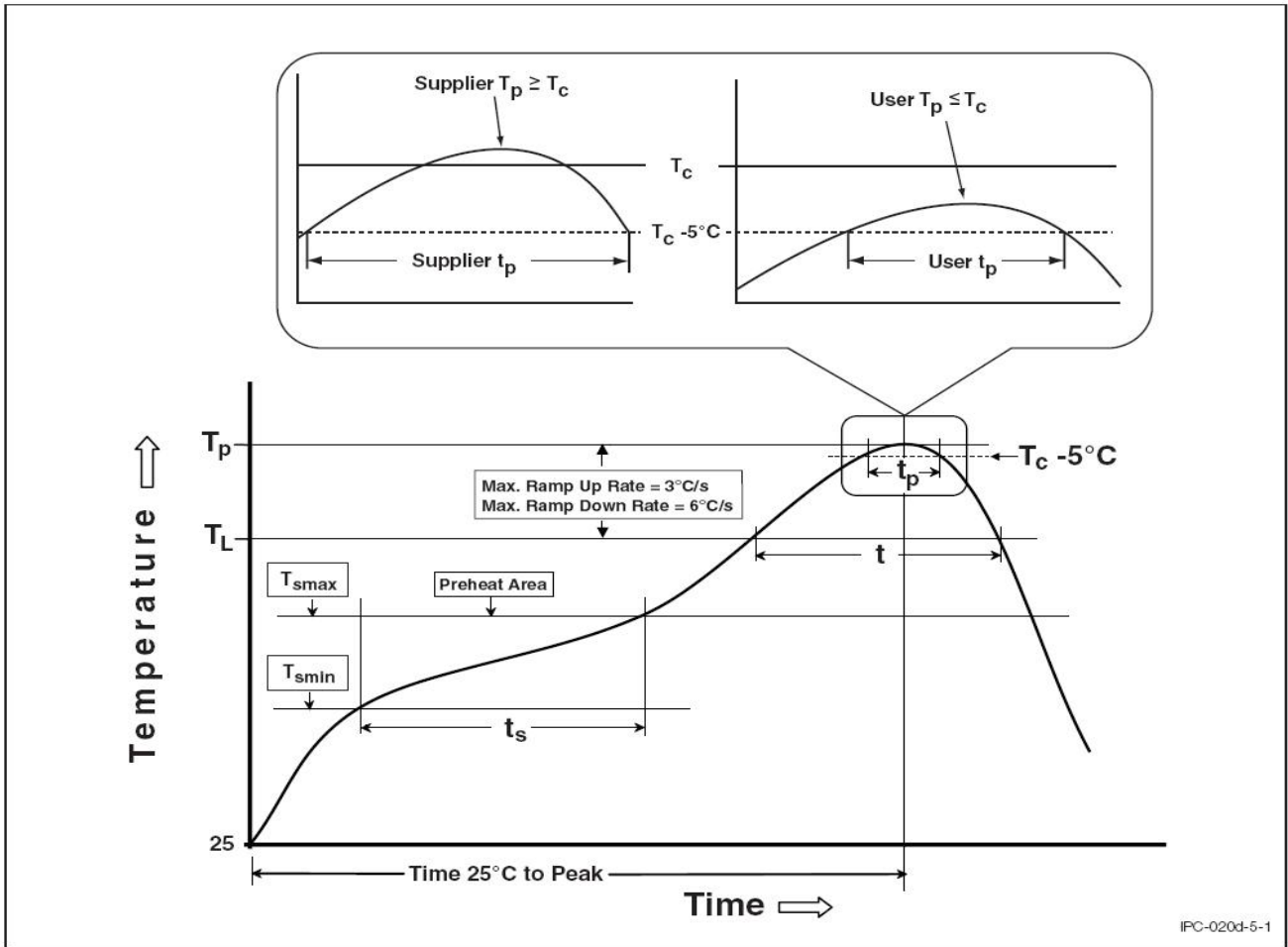
Q'ty : XXXX pcs

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_{smin})	100°C	150°C
Temperature Max. (T_{smax})	150°C	200°C
Time (t_s) from (T_{smin} to T_{smax})	60-120 seconds	60-120 seconds
Ramp-up Rate (t_L to t_P)	$3^\circ\text{C/second max.}$	$3^\circ\text{C/second max.}$
Liquidous Temperature (T_L)	183°C	217°C
Time (t_L) Maintained Above (T_L)	60 – 150 seconds	60 – 150 seconds
Peak Body Package Temperature	$235^\circ\text{C} +0^\circ\text{C} / -5^\circ\text{C}$	$260^\circ\text{C} +0^\circ\text{C} / -5^\circ\text{C}$
Time (t_P) within 5°C of 260°C	20 seconds	30 seconds
Ramp-down Rate (T_P to T_L)	$6^\circ\text{C/second max}$	$6^\circ\text{C/second max}$
Time 25°C to Peak Temperature	6 minutes max.	8 minutes max.

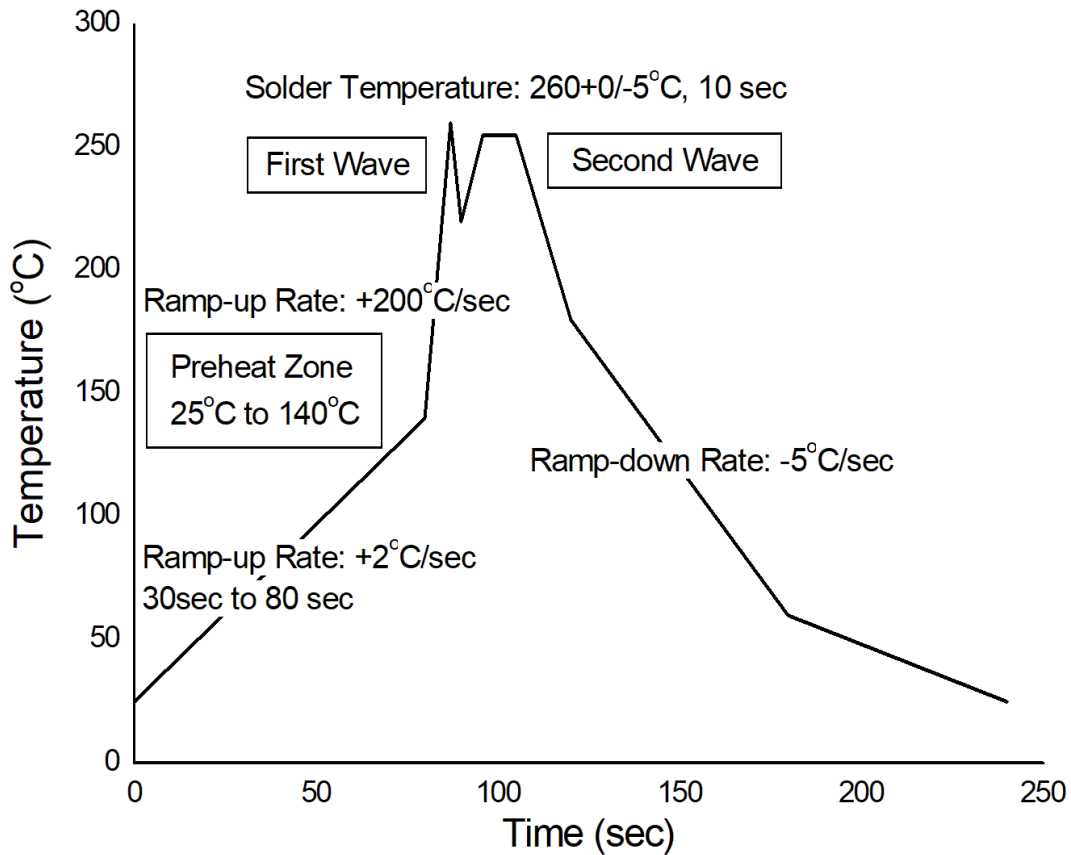


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TEMPERATURE PROFILE OF SOLDERING

WAVE SOLDERING (JESD22-A111 COMPLIANT)



HAND SOLDERING BY SOLDERING IRON

Soldering Temperature	380+0/-5°C
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Soldering Time	3 sec max.
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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.
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- 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.

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