MPCS-50L Series

LSOP6, DC Input, High Speed 1MBit/s Optocoupler

Description

The MPCS-50L series consists of a high efficient AlGaP Light Emitting Diode and a high speed optical detector. This design provides excellent AC and DC isolation between the input and output sides of the Optocoupler. The output of the optical detector features an open collector Schottky clamped transistor. The internal shield ensures high common mode transient immunity. A guaranteed common mode transient immunity is up to 15KV/μs (min.)

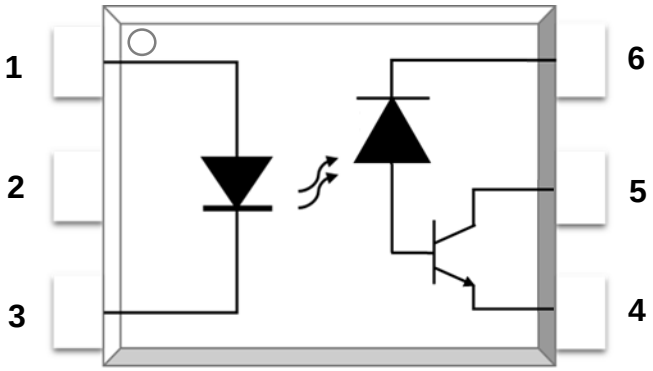
Features

- High speed – 1MBd typical
- Very high common mode transient immunity: 15K V/μs at VCM = 1500 V guaranteed
- Guarantee performance from temperature range: -40°C to 110°C
- TTL compatible and Open collector output
- Regulatory Approvals
  - UL - UL1577
  - VDE - EN60747-5-5(VDE0884-5)
  - CQC – GB4943.1, GB8898

Applications

- Digital signal isolation
- Communications interface
- Micro-controller interface
- Feedback elements in switching power supplies
- Digital isolation for A/D, D/A conversion Digital field

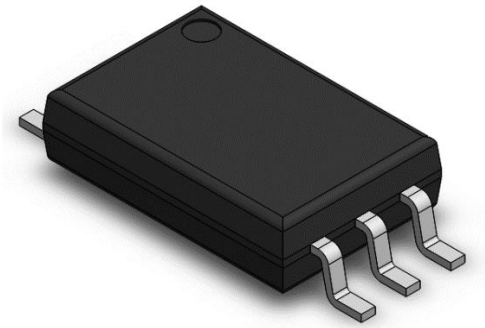
SCHEMATIC

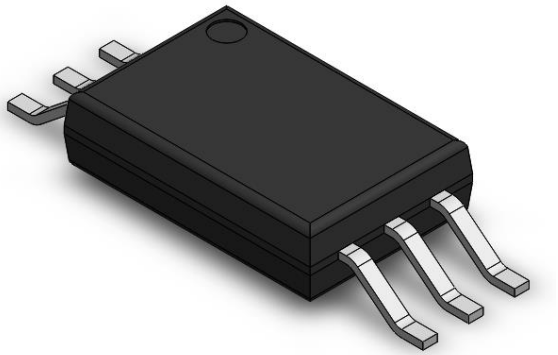


PIN DEFINITION

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

PACKAGE OUTLINE





ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT	NOTE
Storage Temperature	T_{stg}	-55	125	°C	-
Operating Temperature	T_{opr}	-40	110	°C	-
Supply Voltage	V_{CC}	-0.5	30	V	-
Average Forward Input Current	I_F	-	25	mA	-
Reverse Input Voltage	V_R	-	5	V	-
Input Power Dissipation	P_I	-	45	mW	-
Output Collector Current	I_O	-	8	mA	-
Output Collector Voltage	V_O	-0.5	20	V	-
Output Collector Power Dissipation	P_O	-	100	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.

ELECTRICAL OPTICAL CHARACTERISTICS

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION	NOTE
INPUT CHARACTERISTICS							
Input Forward Voltage	V_F	1.6	2.0	2.4	V	IF =16mA, TA=25 °C	-
Input Reverse Voltage	BVR	5	-	-	V	IR = 10μA	-
Current transfer ratio	CTR	20	100	-	%	IF = 16mA; VCC = 4.5V; TA = 25 °C; VO = 0.4V	1
		15	110	-		IF = 16mA; VCC = 4.5V; TA = 25°C; VO = 0.5V	
Logic low output voltage output voltage	V_{OL}	-	0.1	0.4	V	IF = 16mA;VCC = 4.5V; Io = 3.0mA; TA = 25°C	-
		-	-	0.5		IF = 16mA;VCC = 4.5V; Io = 2.4mA; TA = 25°C	-
Logic high output current	I_{OH}	-	0.002	0.5	μA	IF = 0mA, VO = VCC = 5.5V, TA = 25°C	-
		-	0.013	1		IF = 0mA, VO = VCC = 15V TA = 25°C	-
		-	-	50		TA = 0 ~ 70°C	
Logic low supply current	I_{CCL}	-	230	-		IF = 16mA, Vo = open (VCC=30V)	
Logic high supply current	I_{CCH}	-	0.002	1		IF = 0mA, Vo = open ; TA = 25°C (VCC = 30V)	

Note: All Typical values at TA = 25°C unless otherwise specified. All minimum and maximum specifications are at recommended operating condition.

Note1: Current Transfer Ratio in percent is defined as the ratio of output collector current, IO, to the forward LED input current, IF, times 100%.

SWITCHING SPECIFICATION

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION		NOTE
Propagation Delay Time to Low Output Level	t_{PHL}	-	250	800	ns	TA = 25°C	RL=1.9KΩ	2
		-	-	800		0 ~ 100°C		
	t_{PLH}	-	650	800		TA = 25°C		1
		-	-	800		0 ~ 100°C		
Logic High Common Mode Transient Immunity	$\|CM_H\|$	15	25	-	KV/μs	IF = 0mA;VCM = 1500Vp-p; CL = 15 pF; TA=25°C , RL=1.9KΩ		3
Logic Low Common Mode Transient Immunity	$\|CM_L\|$	15	25	-	KV/μs	IF = 16mA;VCM = 1500Vp-p CL = 15 pF; TA = 25°C , RL = 1.9KΩ		4

Note: All Typical values at TA = 25°C unless otherwise specified. All minimum and maximum specifications are at recommended operating condition.

Note 1: t_{PLH} (propagation delay) is measured from the 3.75 mA point on the falling edge of the input pulse to the 1.5 V point on the rising edge of the output pulse.

Note 2: t_{PHL} (propagation delay) is measured from the 3.75 mA point on the rising edge of the input pulse to the 1.5 V point on the falling edge of the output pulse.

Note 3: CM_H is the maximum tolerable rate of rise of the common mode voltage to assure that the output will remain in a high logic state.

Note 4: CM_L is the maximum tolerable rate of fall of the common mode voltage to assure that the output will remain in a low logic state.

ISOLATION CHARACTERISTIC

PARAMETER	SYMBOL	DEVICE	MIN.	TYP.	MAX.	UNIT	TEST CONDITION	NOTE
Withstand Insulation Test Voltage	V_{ISO}	MPCS-50LP	5000	-	-	V	RH ≤ 40%-60%, t = 1min, T_A = 25 °C	1,2
		MPCS-50LW						
Input-Output Resistance	R_{I-O}	-	-	10^{12}	-	Ω	V_{I-O} = 500V DC	1

Note: All Typical values at TA = 25°C 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 shorted together, and pins 4, 5, 6 shorted together.

Note 2: In accordance with UL1577, each optocoupler is proof tested by applying an insulation test voltage 6000 Vrms for one second (leakage current less than 10 uA).

TYPICAL PERFORMANCE CURVES & TEST CIRCUITS

Fig.1 DC and Pulsed Transfer Characteristics

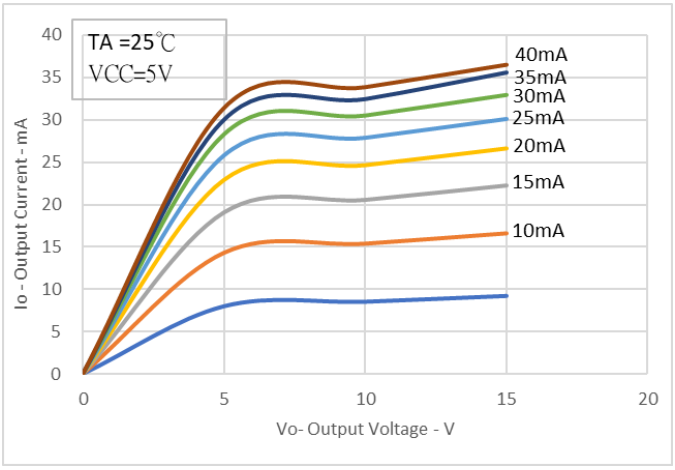


Fig.2 Input Current vs. Forward Voltage

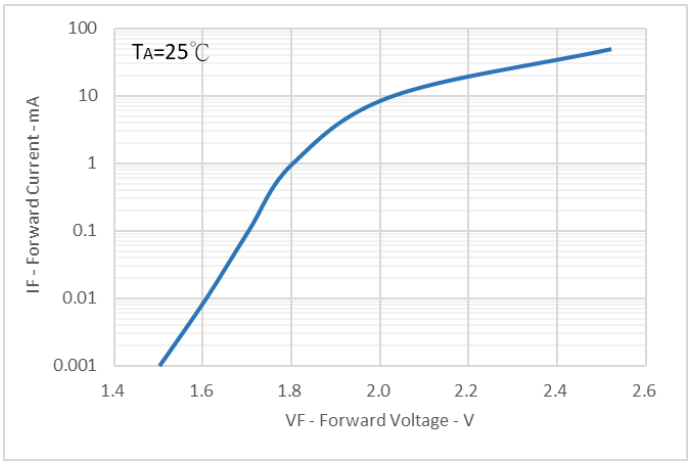


Fig.3 Propagation Delay vs. Load Resistance

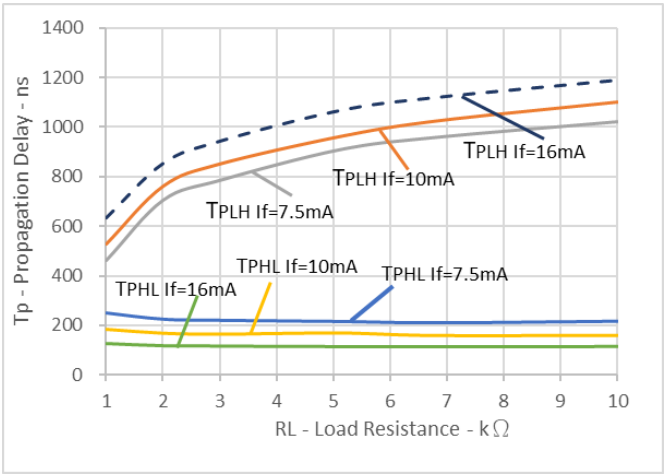


Fig.4 Current Transfer Ratio vs. Input Current

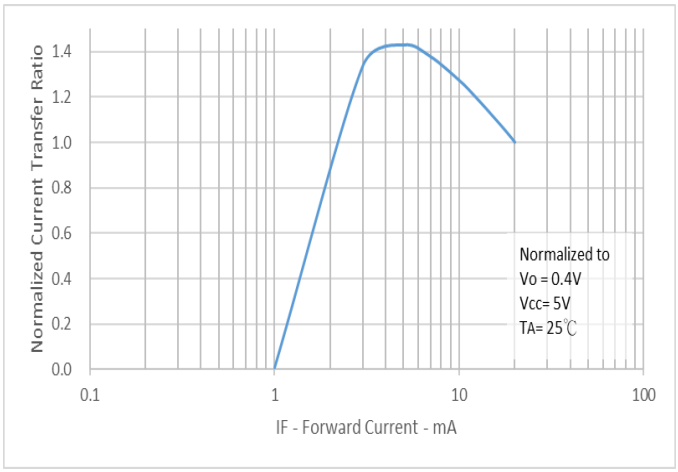


Fig.5 Current Transfer Ration vs. Temperature

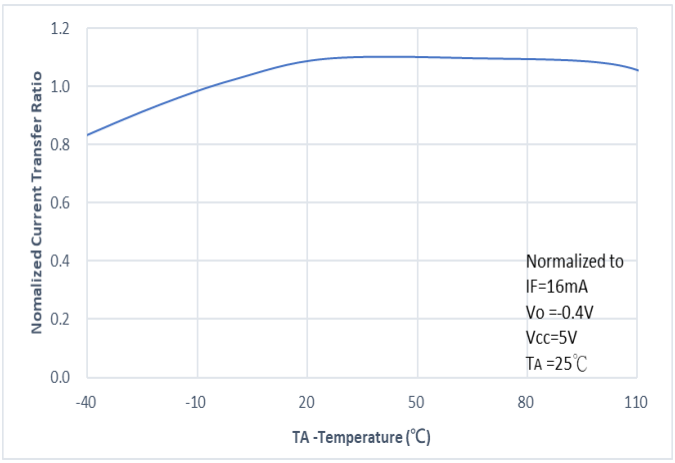


Fig.6 Propagation Delay Time vs. Temperature

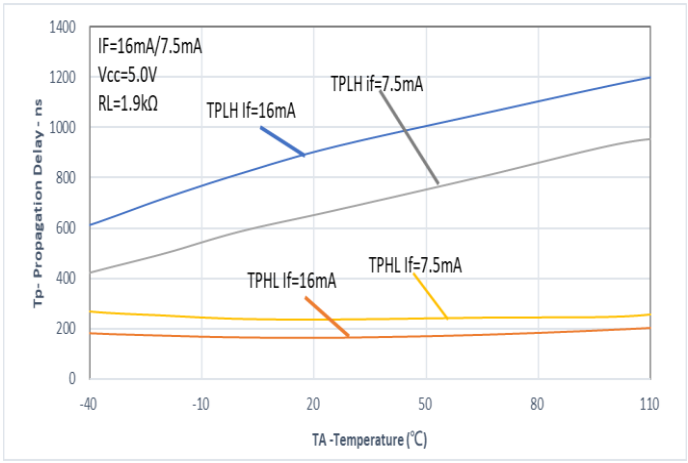


Fig.7 Logic High Output Current vs. Temperature

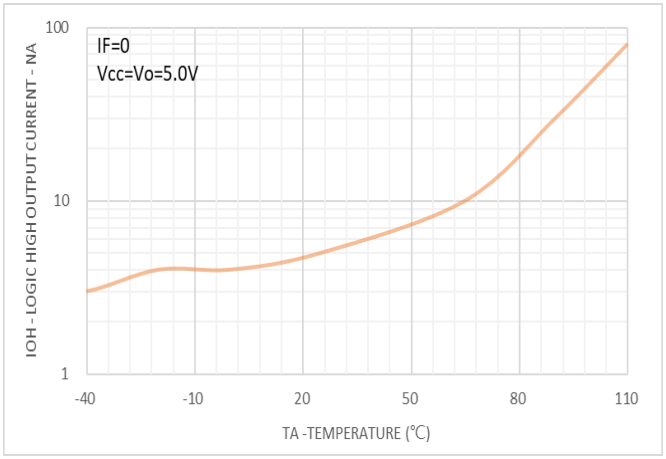


Fig.8 Frequency Response

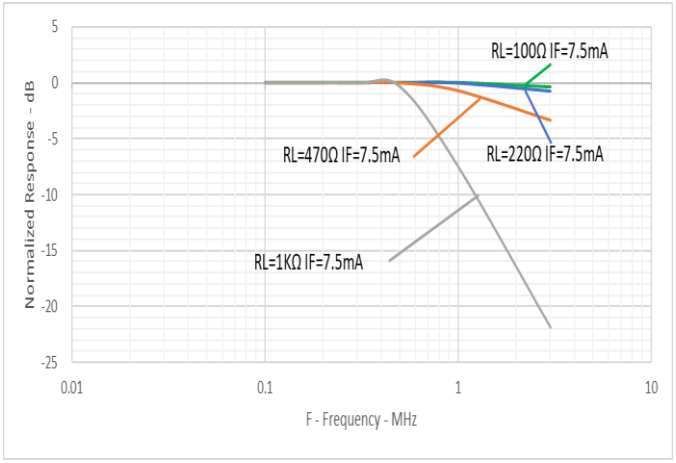


Fig.9 Test Circuit for t_{PHL} and t_{PLH}

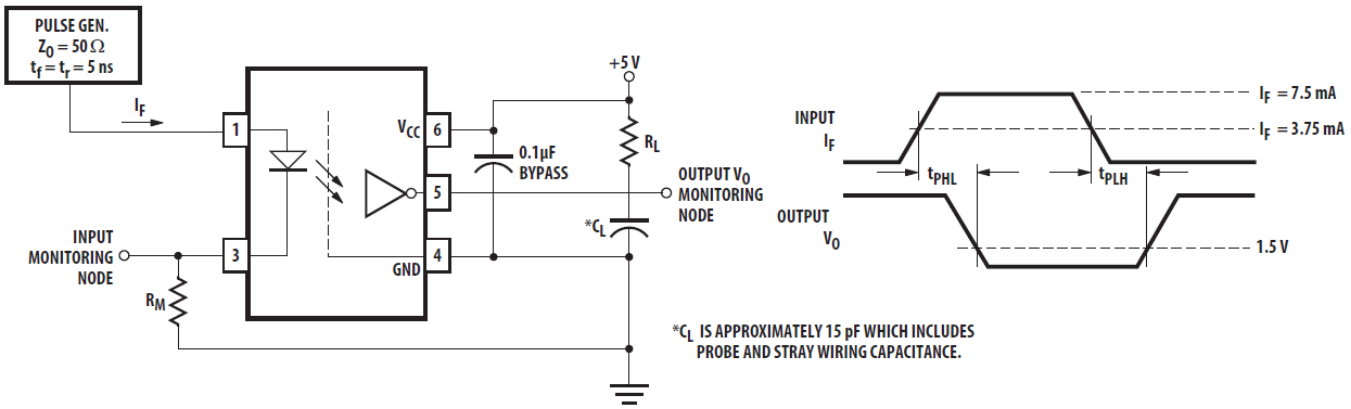
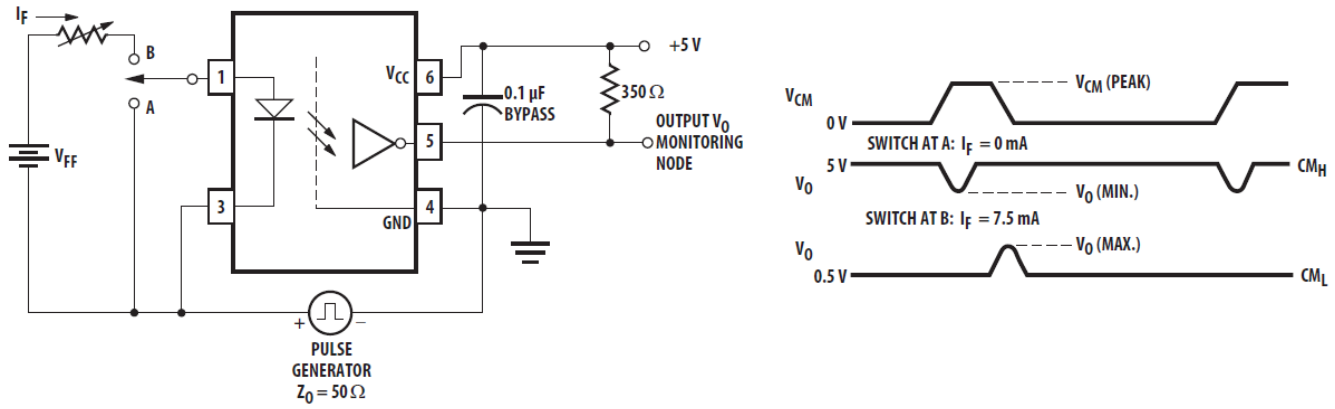
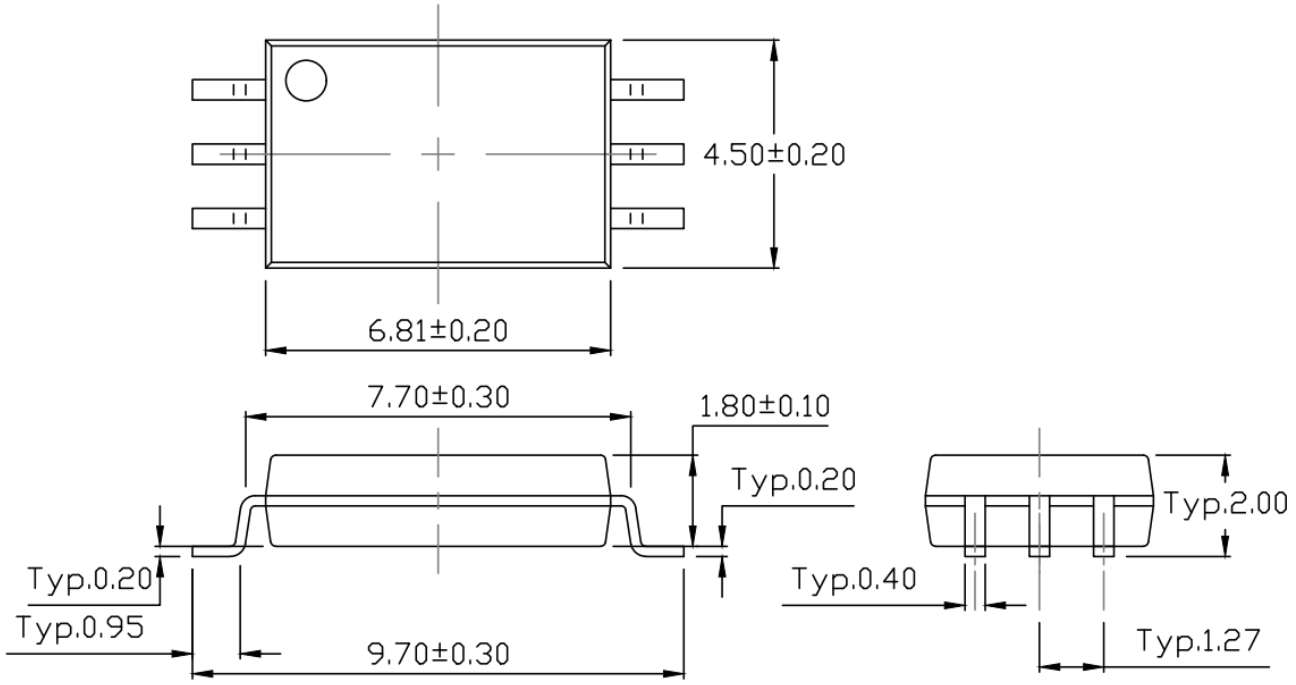


Fig.10 Test Circuit for Common Mode Transient Immunity and Typical Waveforms

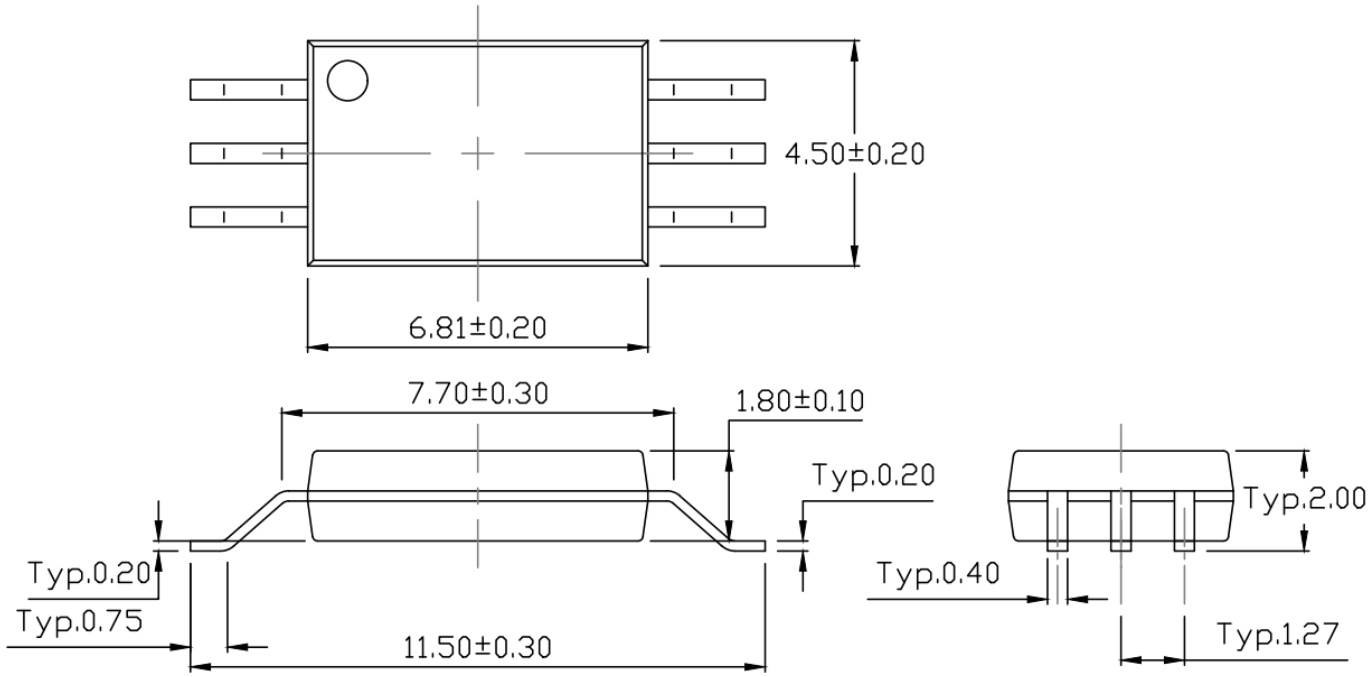


PACKAGE DIMENSIONS (Dimensions in mm unless otherwise stated)

Surface Mount Lead Forming (P Type)

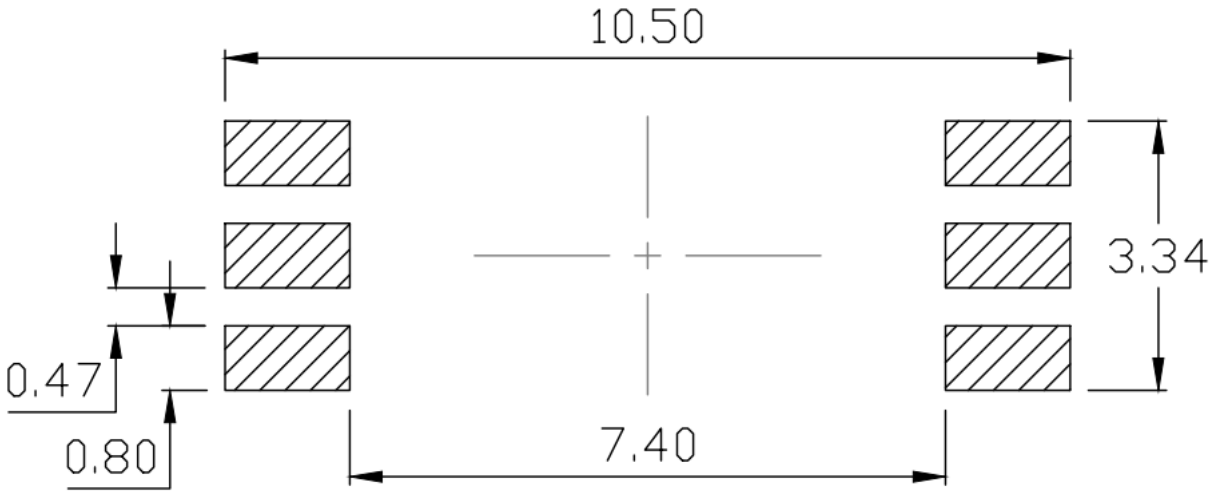


Surface Mount (Gullwing) Lead Forming (W Type)

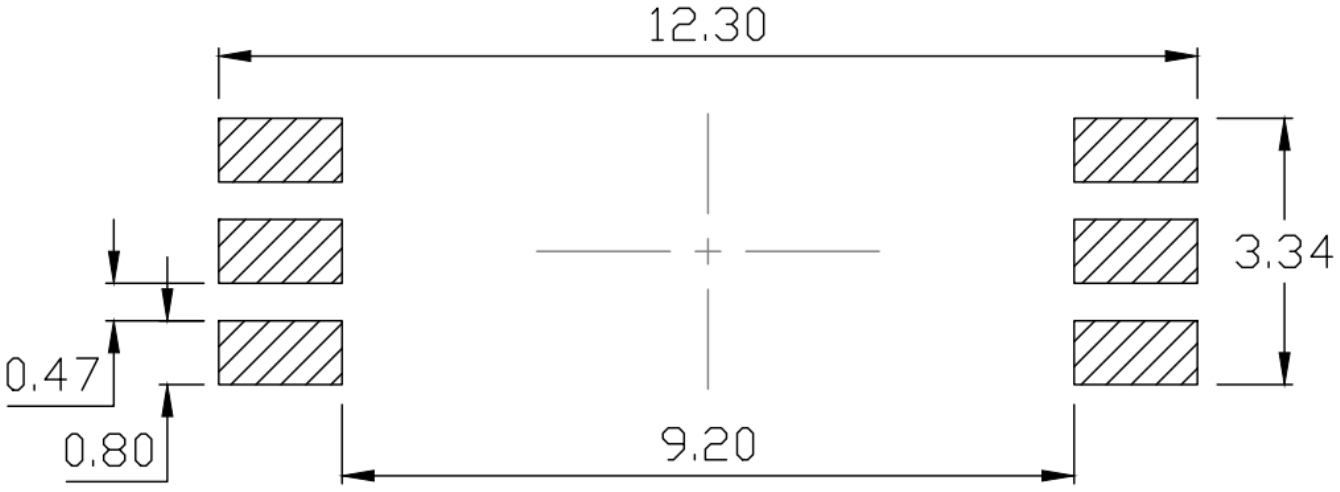


RECOMMENDED SOLDER MASK (Dimensions in mm unless otherwise stated)

Surface Mount Lead Forming (P Type)

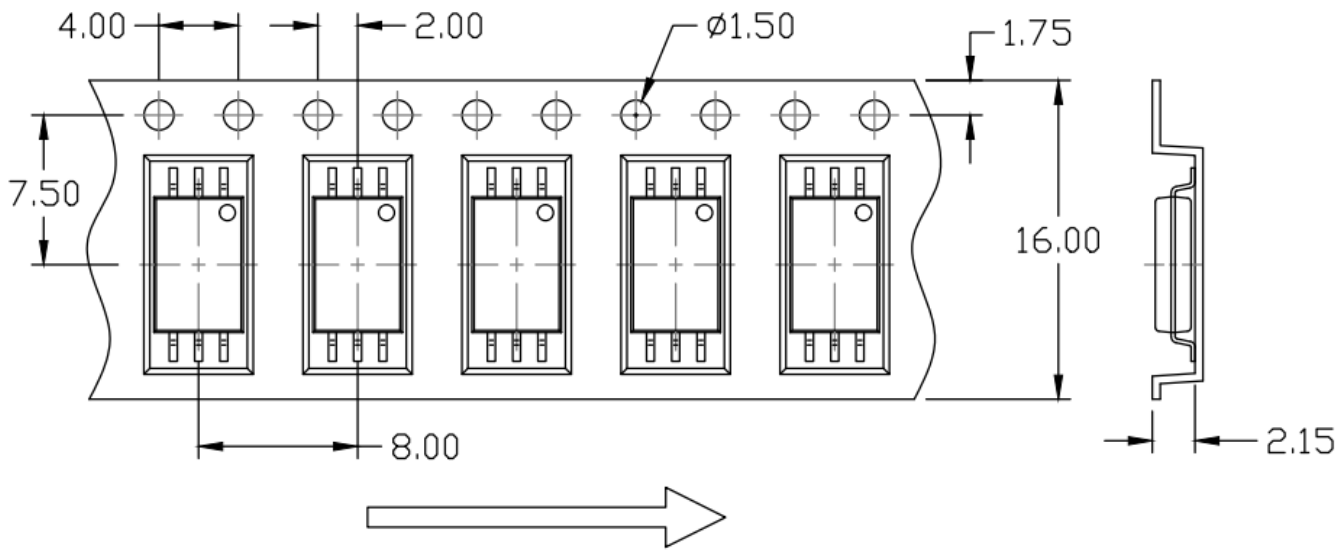


Surface Mount (Gullwing) Lead Forming (W Type)

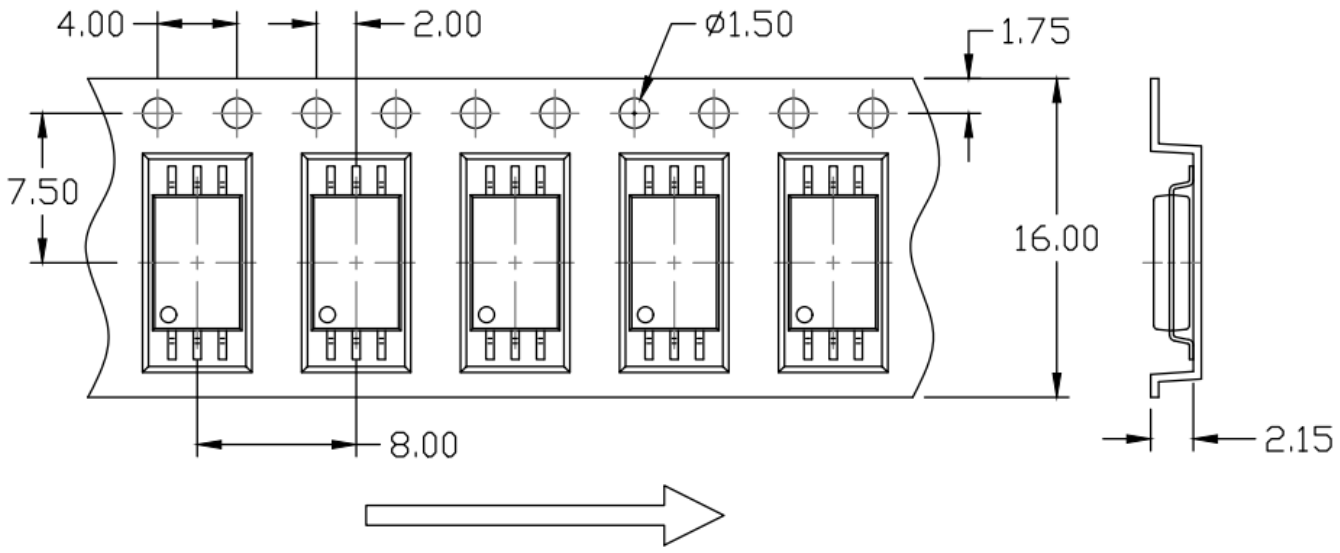


CARRIER TAPE SPECIFICATIONS (Dimensions in mm unless otherwise stated)

Surface Mount Lead Forming (P Type) Option T1

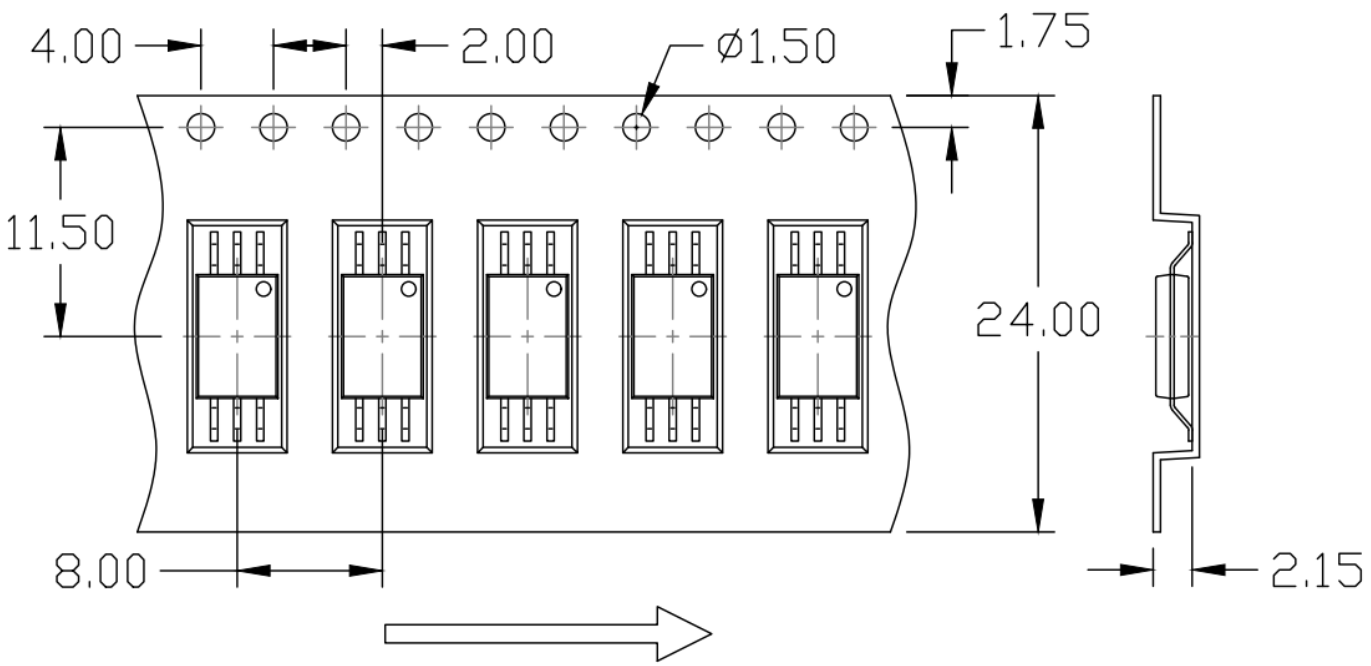


Surface Mount Lead Forming (P Type) Option T2

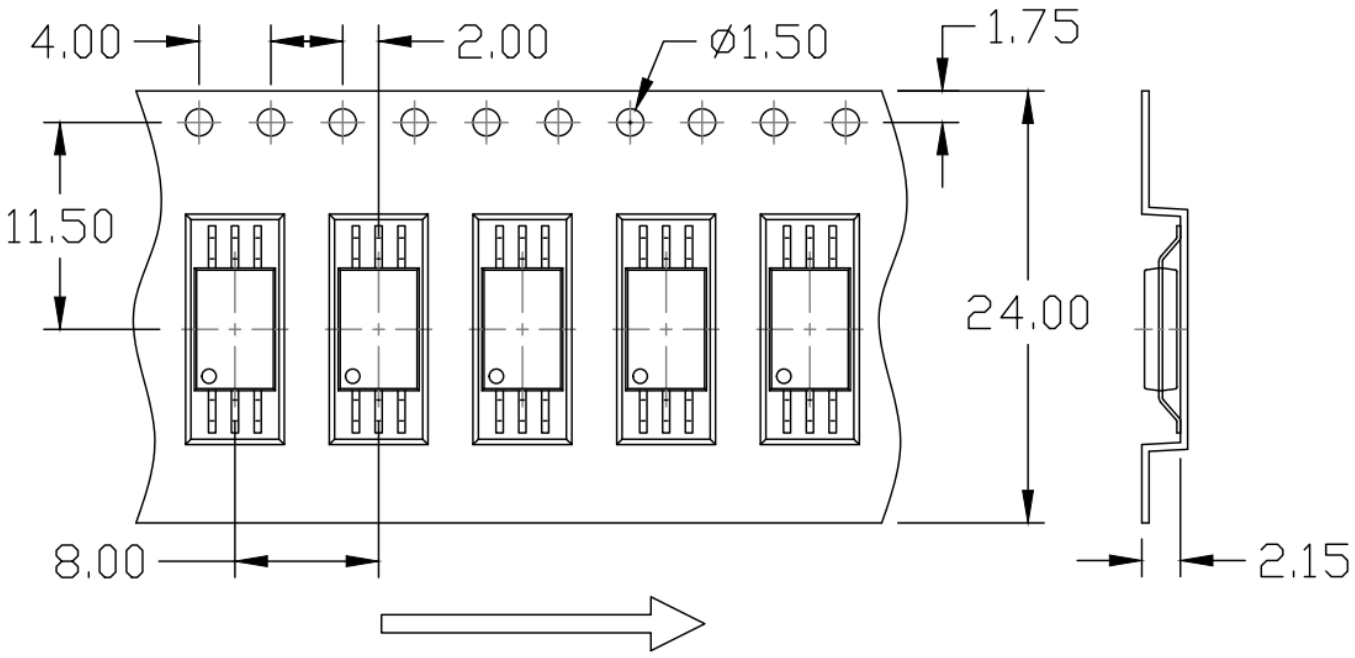


CARRIER TAPE SPECIFICATIONS (Dimensions in mm unless otherwise stated)

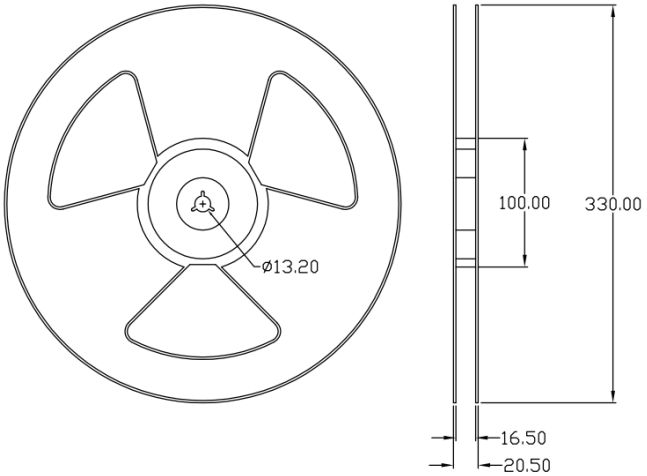
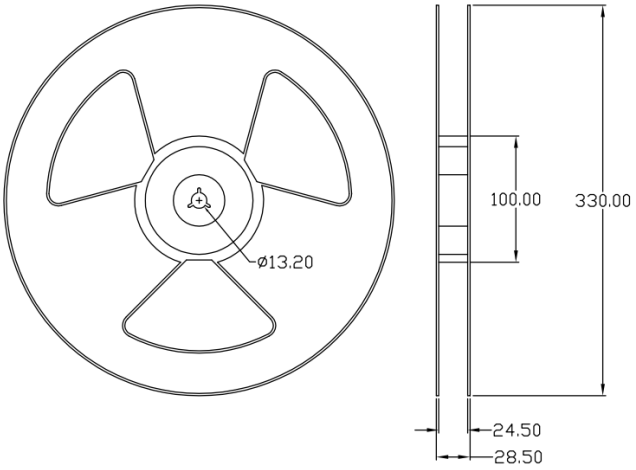
Surface Mount (Gullwing) Lead Forming (W Type) Option T1



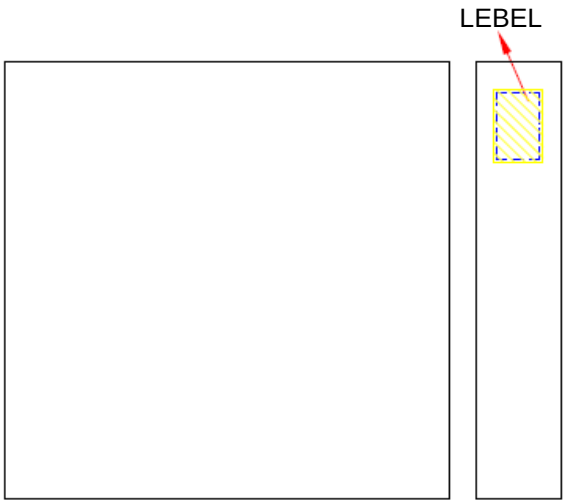
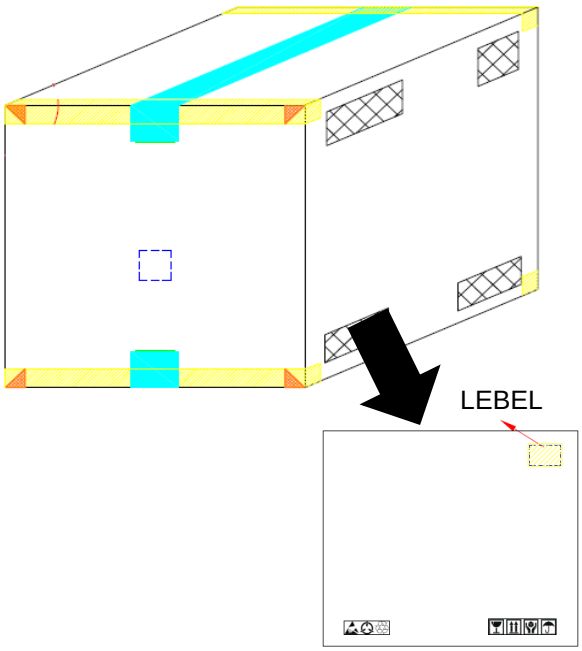
Surface Mount (Gullwing) Lead Forming (W Type) Option T2



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

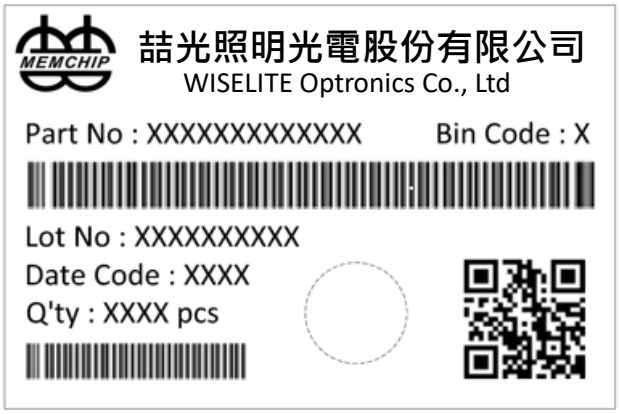
M : Company Abbr.
YY : Year date code
WW : 2-digit work week
50L : Part Number
T or H : Factory identification mark
V : VDE Identification(Option)

ORDERING INFORMATION

MPCS-50L(P/W)-ZV

MPC – Company Abbr.
S – Stack
50L – 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

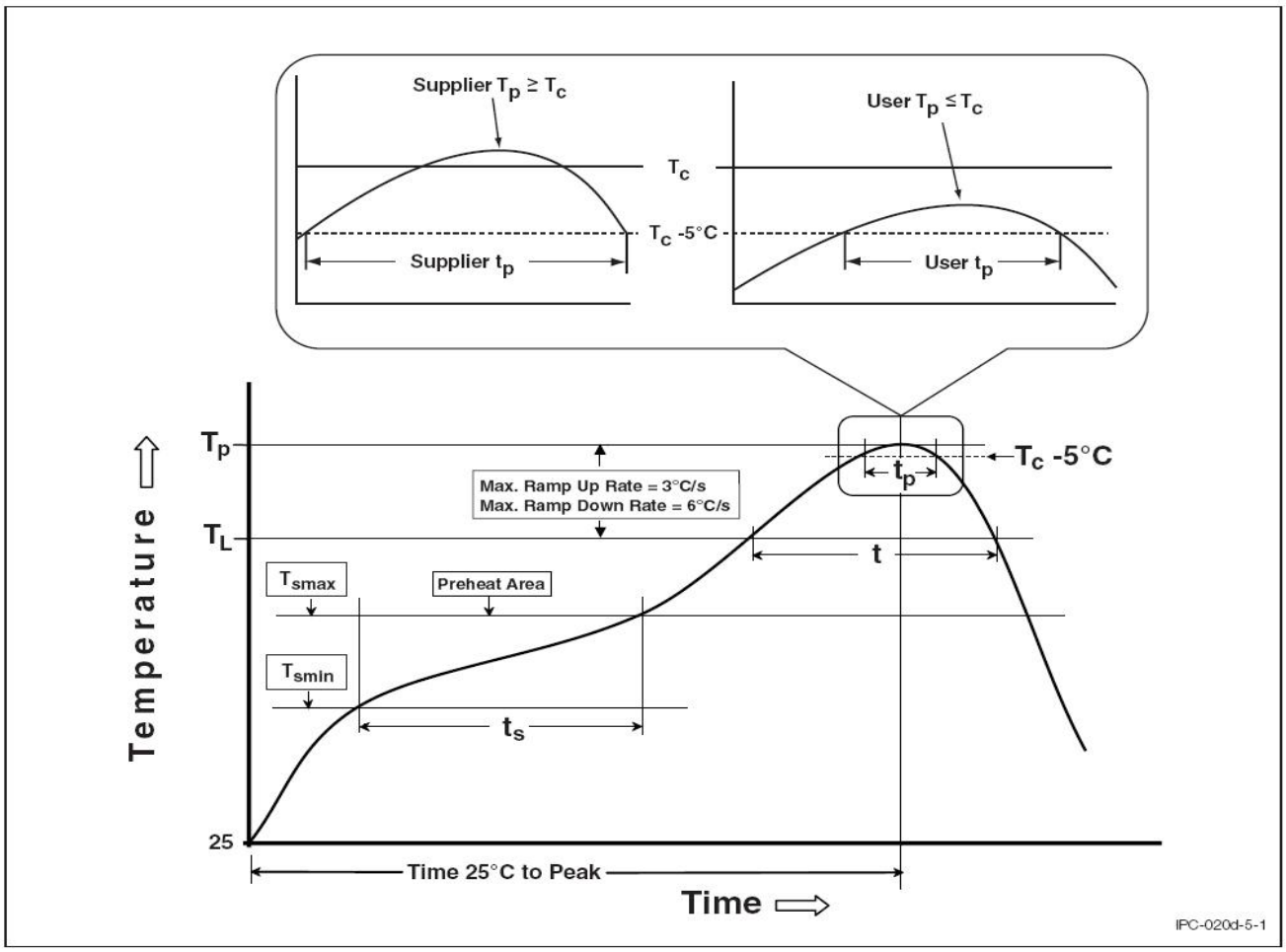


PACKING QUANTITY

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

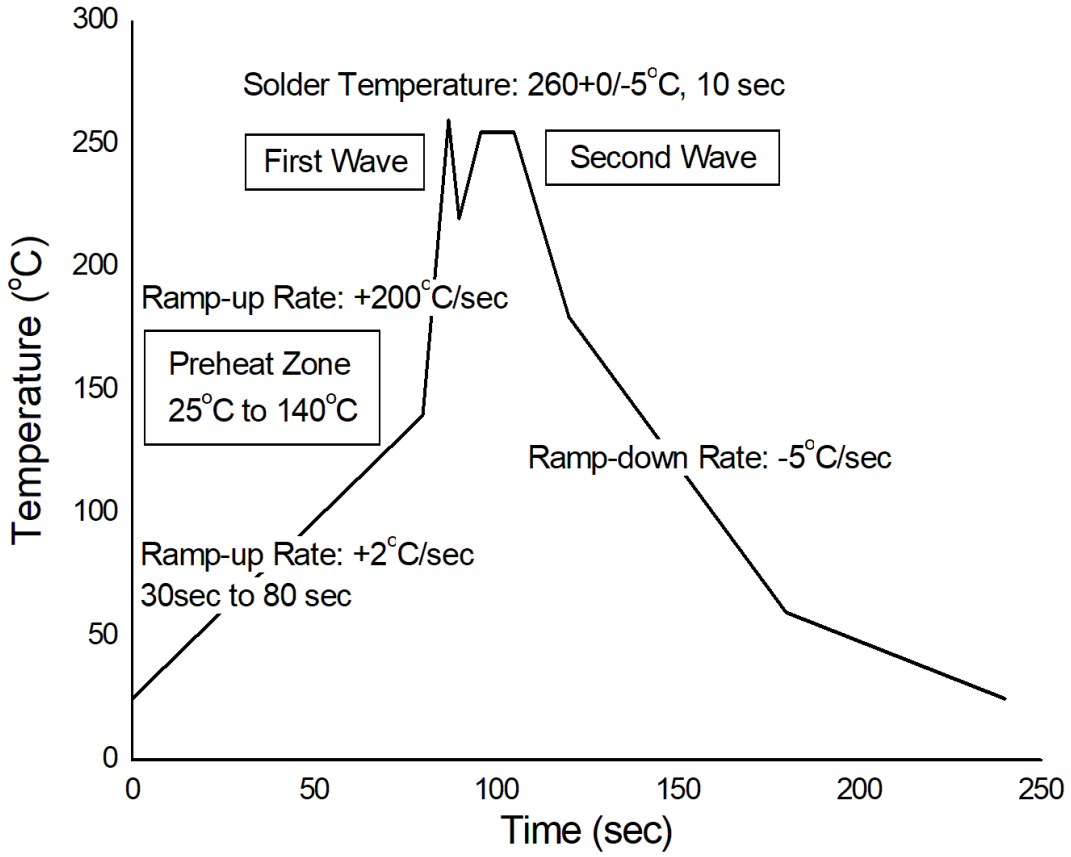
REFLOW PROFILE



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.