MPCS-M701 Series

SOP5, DC Input, 15Mbit/s High Speed Logic Gate Photo Coupler

Description

The MPCS-M701 series is an optically coupled gate that combines a light emitting diode and an integrated high gain photo detector. The output of the detector IC is totem pole which eliminates the need for a pull up resistor. The internal shield provides a guaranteed common mode transient immunity specification of 10,000 V/μs for the MPCS-M701 series.

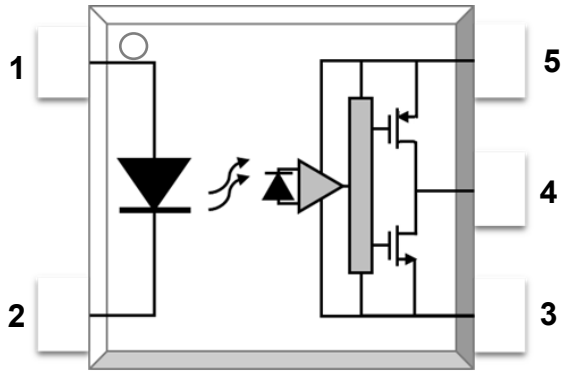
Features

- High isolation 3750 VRMS
- MSL class 1
- Guaranteed performance over temperature -40°C ~ +110°C.
- Totem pole output
- Supply Voltage V_{CC} from 4.5V to 5.5V
- Data transfer rate: 15Mbit/s minimum
- Short Maximum Propagation Delays
- Minimized Pulse Width Distortion (PWD)
- Very High Common Mode Rejection (CMR)

Applications

- Programmable Logic Controllers (PLCs)
- Battery Management System (BMS)
- Industrial Inverters

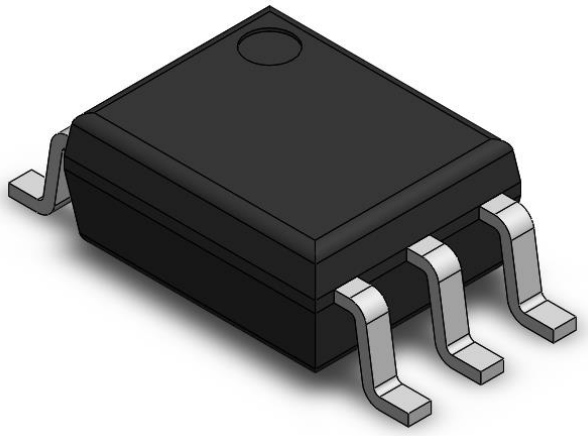
SCHEMATIC



PIN DEFINITION

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

PACKAGE OUTLINE



ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	VALUE	UNIT	Note
INPUT				
Forward Current	I_F	25	mA	-
Peak Forward Current	I_{FP}	50	mA	1
Peak Transient Current	$I_{F(trans)}$	1	A	2
Operating Frequency	f	50	kHz	-
Reverse Voltage	V_R	5	V	-
Input Power Dissipation	P_I	45	mW	-
OUTPUT				
Supply Voltage	V_{CC}	7	V	-
Output Collector Current	I_O	50	mA	-
Output Collector Voltage	V_O	7	V	-
Output Collector Power Dissipation	P_o	85	mW	-
Lead Solder Temperature	T_{sol}	260	°C	-
COMMON				
Isolation Voltage	V_{iso}	3750	Vrms	3
Operating Temperature	T_{opr}	-40~110	°C	-
Storage Temperature	T_{stg}	-55~125	°C	-
Soldering Temperature	T_{sol}	260	°C	4

Note 1. 50% duty, 1ms P.W

Note 2. ≤1μs P.W,300pps

Note 3. AC For 1 Minute, R.H. = 40 ~ 60%

Note 4. For 10 seconds

RECOMMENDED OPERATION CONDITIONS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Operating Temperature	T_A	-40	110	°C
Supply Voltage	V_{CC}	4.5	5.5	V
Input Current High Level	I_{FLH}	5	15	mA
Input Voltage Low Level	V_{FHL}	-3.0	0.8	V
Fan Out (at RL = 1 KΩ)	N	-	5	TTL Loads
Output Pull-up Resistor	R_L	330	4K	Ω

TRUTH TABLE	
LED	OUT
ON	L
OFF	H

ELECTRICAL OPTICAL CHARACTERISTICS (DC)							
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION	NOTE
INPUT CHARACTERISTICS							
High Level Output Current	I_{OH}	-	0.3	100	μA	V_{CC} =5.5V, V_O =5.5V, V_F =0.8V	-
Input Threshold Current	I_{TH}	-	0.8	5.0	mA	V_{CC} =5.5V, V_O=0.6V, I_{OL}>13 mA	-
Low Level Output Voltage	V_{OL}	-	0.14	0.6	V	V_{CC} = 5.5V, I_F = 5 mA, $I_{OL(Sinking)}$ = 13 mA	-
High Level Supply Current	I_{CCH}	-	2.7	7.5	mA	V_{CC} = 5.5V, I_F = 0 mA,	-
Low Level Supply Current	I_{CCL}	-	2.6	10.5	mA	V_{CC} = 5.5V, I_F = 10 mA	-
Input Forward Voltage	V_F	1.6	2.0	2.4	V	I_F = 10 mA	-
Input Reverse Breakdown Voltage	B_{VR}	5	-	-	V	I_R = 10 μA	-
Input Capacitance	C_{IN}	-	60	-	pF	f = 1 MHz, V_F = 0V	-

Note: Over recommended operating conditions unless otherwise specified. All typicals at V_{CC} = 5V, T_A = 25°C.

SWITCHING SPECIFICATION (AC)

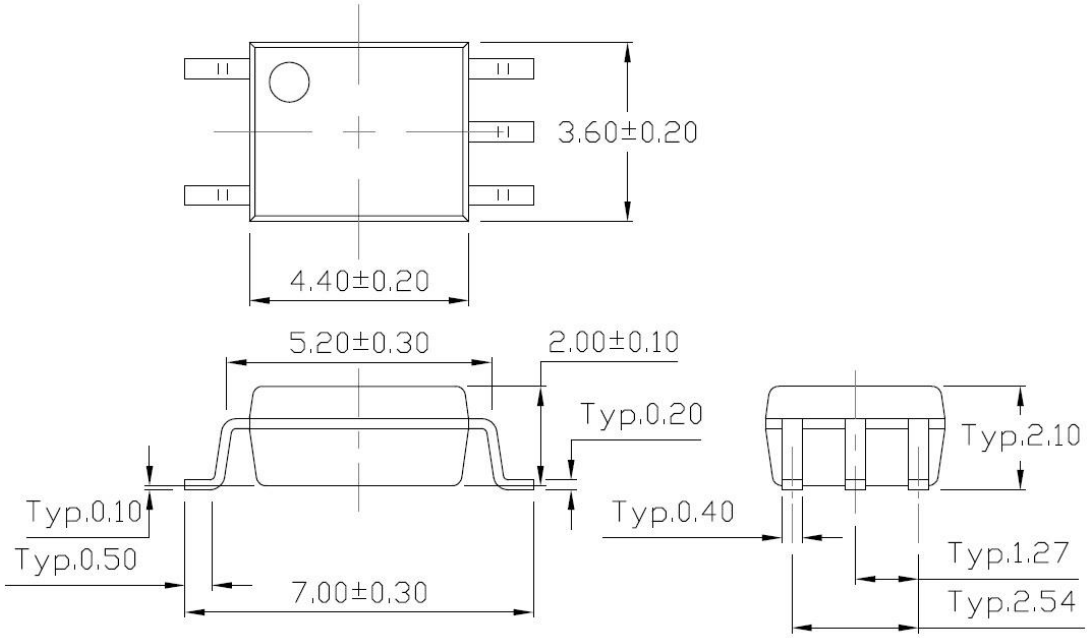
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION	NOTE
Propagation Delay Time to High Output Level	t_{PLH}	-	36	75	ns	V_{CC} = 5V, I_F = 7.5 mA, R_L = 350Ω, C_L = 15 pF	-
Propagation Delay Time to Low Output Level	t_{PHL}	-	25	75			-
Pulse Width Distortion	$\|t_{PHL}-t_{PLH}\|$	-	11	40			-
Propagation Delay Skew	t_{PSK}	-	-	50			-
Output Rise Time (10 to 90%)	t_r	-	3	-			-
Output Fall Time (90 to 10%)	t_f	-	2.5	-			-
Common mode transient immunity at high level output	$\|CM_H\|$	10	15	-	kV/μs	V_{CC} = 5V, I_F = 0mA, $V_{O(MIN)}$ = 2V, R_L = 350Ω, V_{CM} = 1000V	1
Common mode transient immunity at low level output	$\|CM_L\|$	10	15	-	kV/μs	V_{CC} = 5V, I_F = 7.5 mA, $V_{O(MAX)}$ = 0.8V, R_L = 350Ω, V_{CM} = 1000V	2

Note: Over recommended operating conditions T_A = –40°C to 100°C, V_{CC} = 5V, I_F = 7.5 mA unless otherwise specified. All typicals at V_{CC} = 5V, T_A = 25 °C.

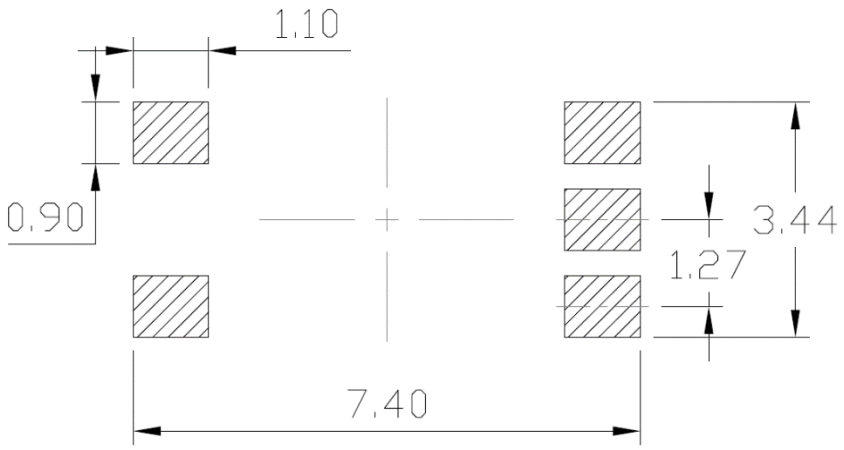
Note1: CM_H is the maximum tolerable rate of rise of the common mode voltage to assure that the output will remain in a high logic state (that is, V_{OUT} > 2.0V).

Note2: 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 (that is, V_{OUT} > 0.8V).

PACKAGE DIMENSIONS (Dimensions in mm unless otherwise stated)

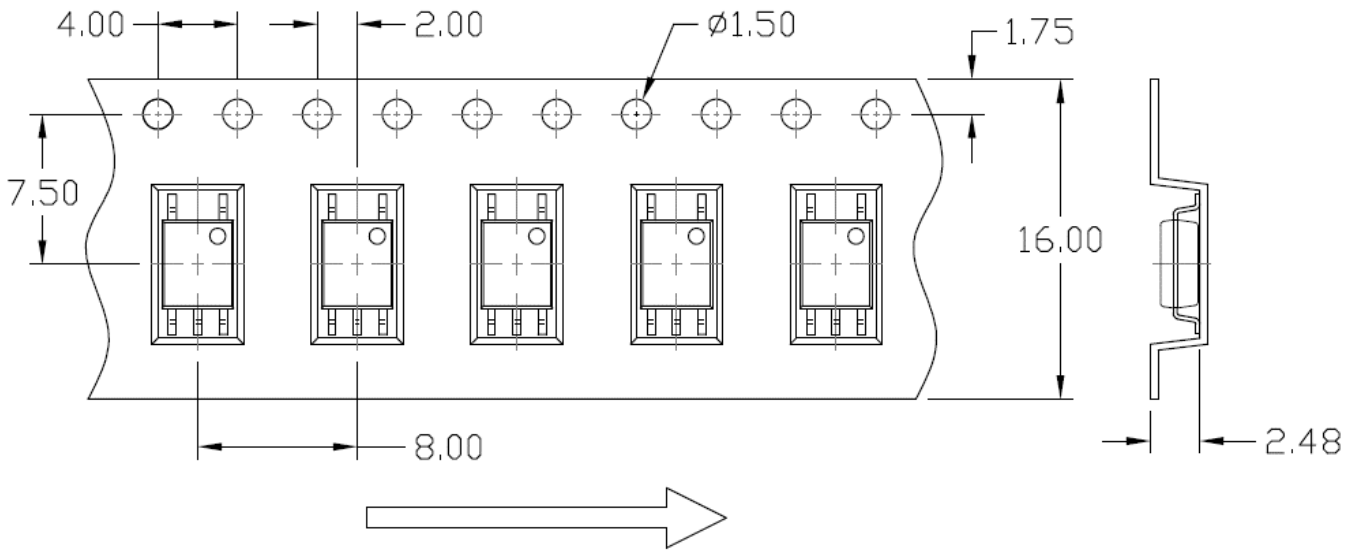


RECOMMENDED SOLDER MASK (Dimensions in mm unless otherwise stated)

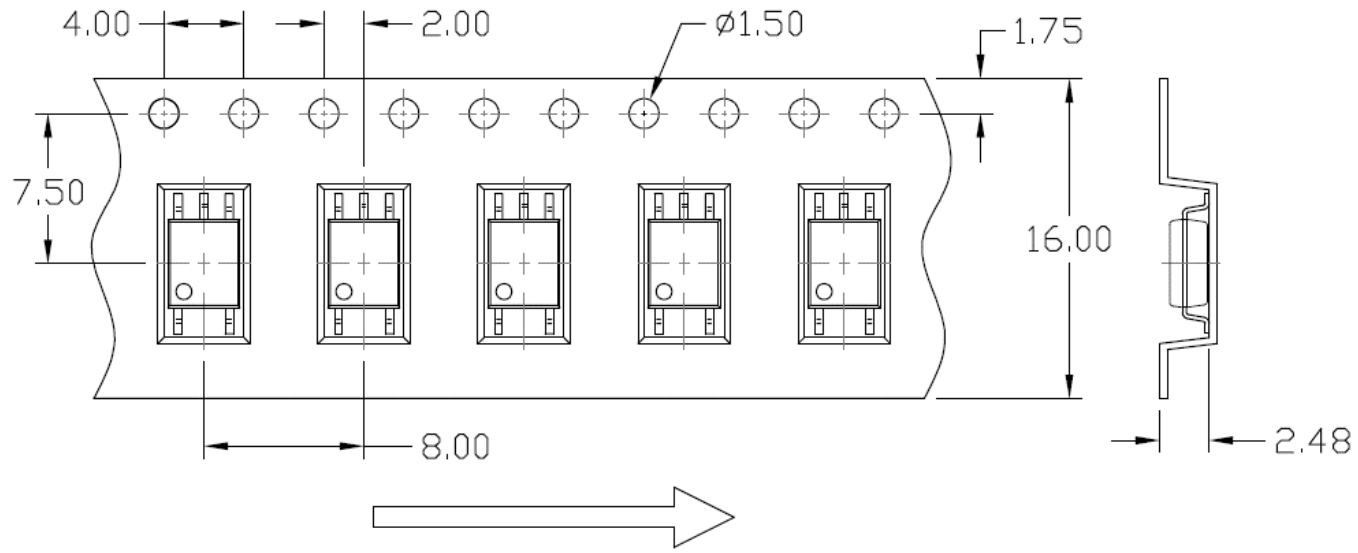


CARRIER TAPE SPECIFICATIONS (Dimensions in mm unless otherwise stated)

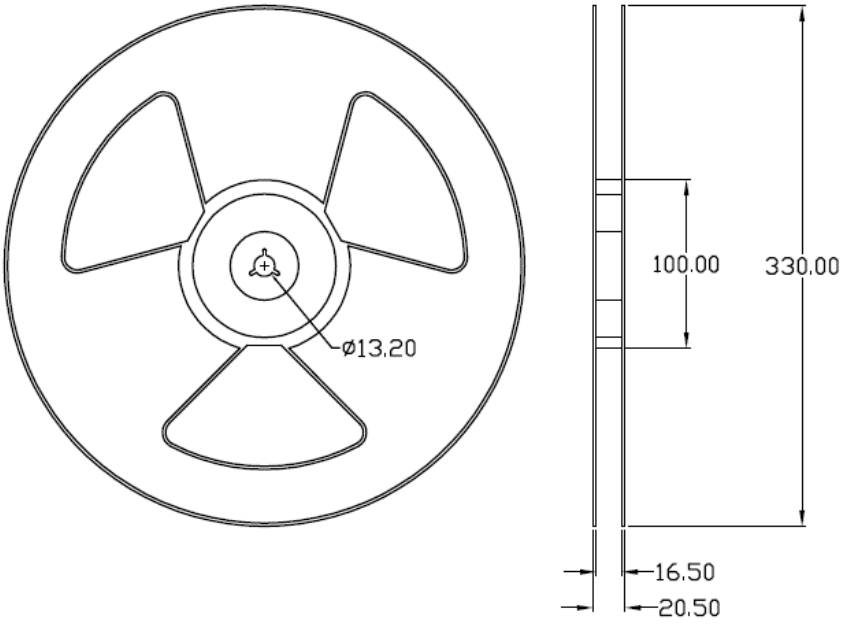
Option T1



Option T2

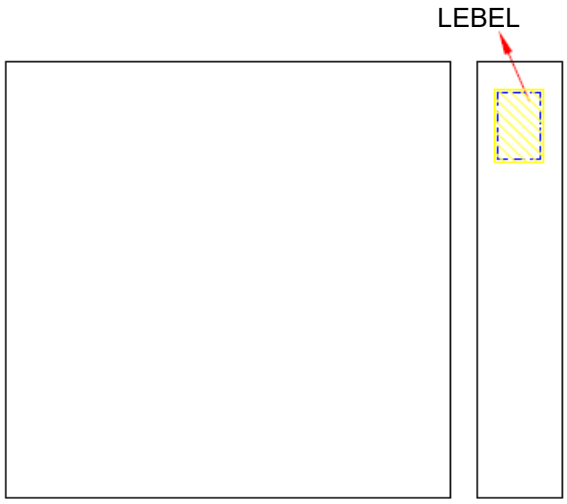


REEL SPECIFICATIONS (Dimensions in mm unless otherwise stated)



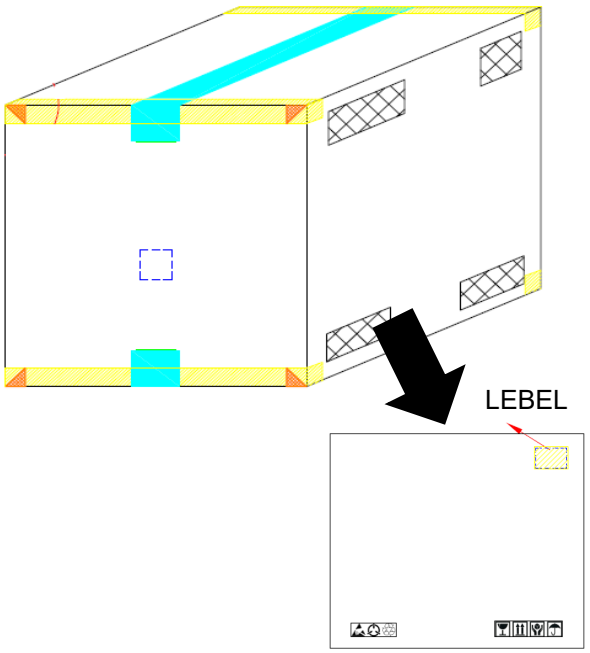
BOX SPECIFICATIONS (Reel Type)

INNER BOX



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

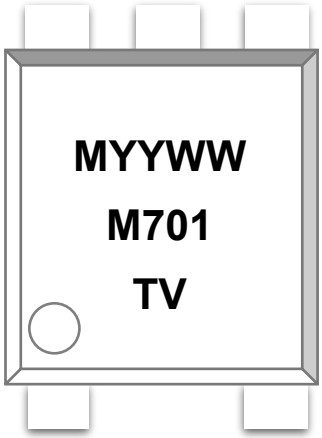
OUTER BOX



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

ORDERING AND MARKING INFORMATION

MARKING INFORMATION



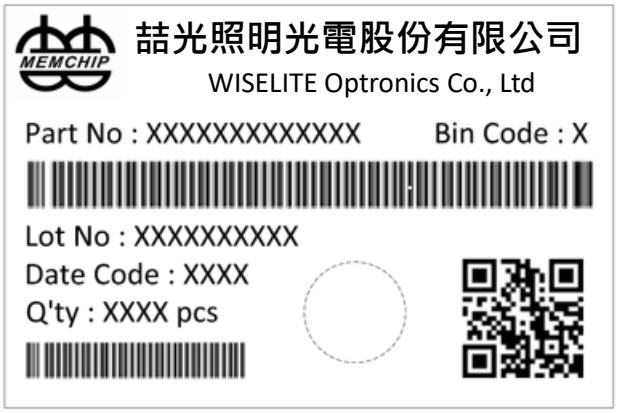
M : Company Abbr.
YY : Year date code
WW : 2-digit work week
M701 : Part Number
T : Factory identification mark
V :VDE Identification(Option)

ORDERING INFORMATION

MPCS-M701(Z)-GV

MPC – Company Abbr.
S – Stack
M701 – Part Number
Z – Tape and Reel Option (T1/T2)
G – Green Part
V –VDE Option (V or None)

LABEL INFORMATION

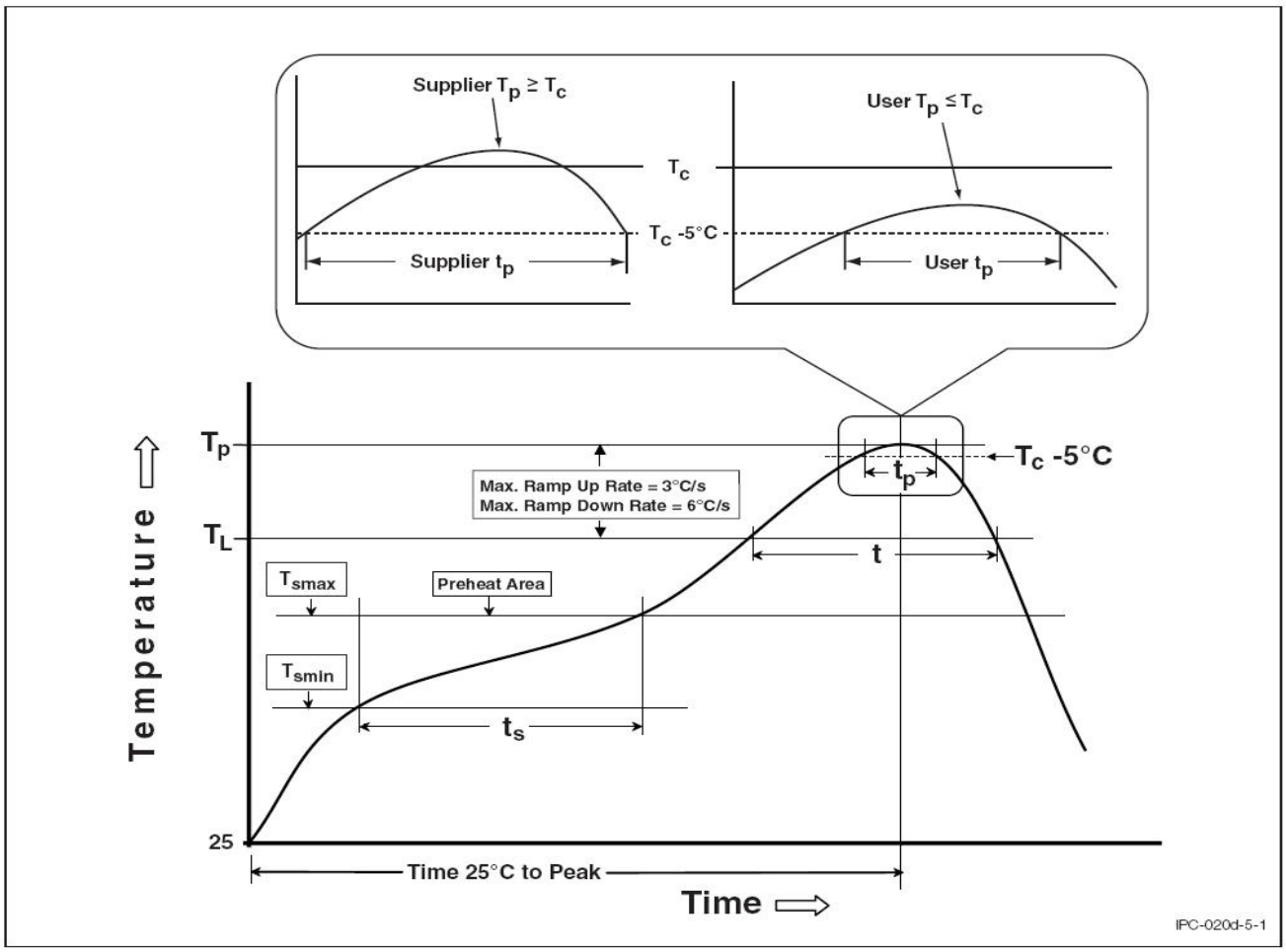


PACKING QUANTITY

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

REFLOW INFORMATION

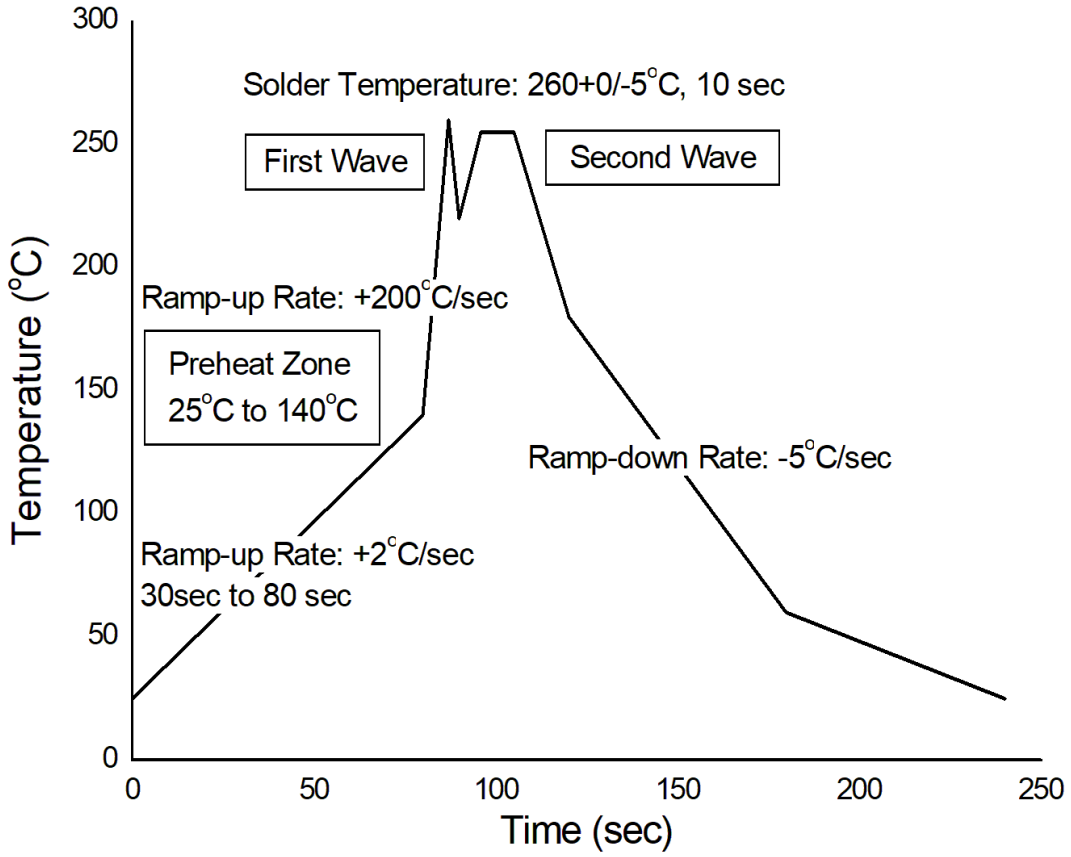
REFLOW PROFILE



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.