MPCS-611 Series

LSOP6, DC Input, 10Mbit/s High Speed Logic Gate Photo Coupler

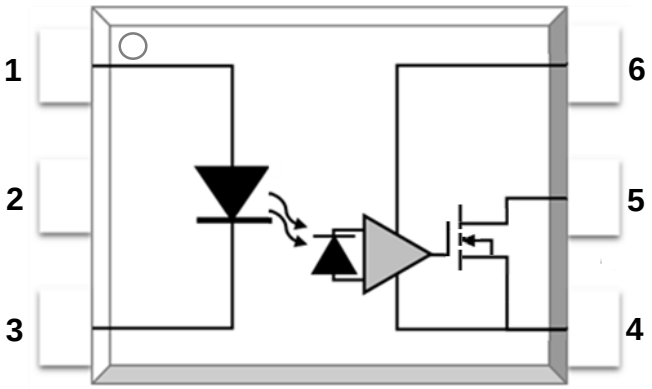
Description

The MPCS-611 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 open drain NMOS-transistor output stage. The internal shield provides a guaranteed common mode transient immunity specification of 10,000 V/μs for the MPCS-611 series. This unique design provides maximum AC and DC circuit isolation while achieving TTL compatibility. The optocoupler AC and DC operational parameters are guaranteed from –40°C to +110°C, allowing trouble-free system performance. The MPCS-611 series is suitable for high-speed logic interfacing, input/output buffering, as line receivers in environments that conventional line receivers cannot tolerate and are recommended for use in extremely high ground or induced noise environments.

Features

- 10 kV/μs minimum Common Mode Rejection (CMR) at VCM = 1000V
- High speed: 10 MBd typical
- LSTTL/TTL compatible
- Low input current capability: 5 mA
- Guaranteed ac and dc performance over -40°C ~ +110°C
- Regulatory Approvals
  - UL - UL1577
  - VDE - EN60747-5-5(VDE0884-5)
  - CQC – GB4943.1, GB8898

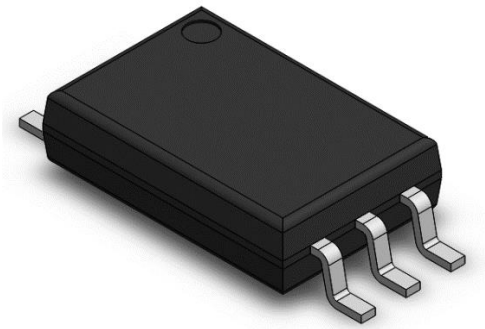
SCHEMATIC

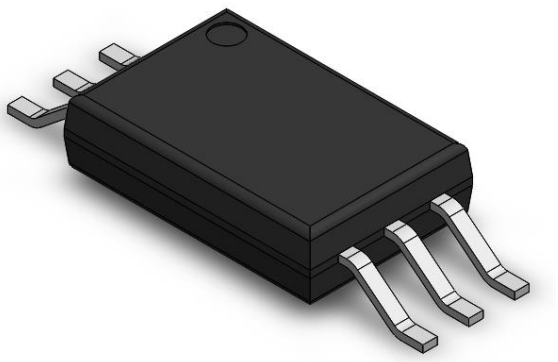


PIN DEFINITION

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

PACKAGE OUTLINE





Applications

- Isolated line receiver
- Computer-peripheral interfaces
- Microprocessor system interfaces
- Digital isolation for A/D, D/A conversion
- Switching power supply
- Instrument input/output isolation
- Ground loop elimination
- Pulse transformer replacement
- Power transistor isolation in motor drives
- Isolation of high speed logic systems

TRUTH TABLE	
ON	LOW
OFF	HIGH

ABSOLUTE MAXIMUM RATINGS					
PARAMETER	SYMBOL	MIN.	MAX.	UNIT	NOTE
Storage Temperature	T_{stg}	-55	125	°C	-
Operating Temperature	T_{opr}	-40	110	°C	-
Forward Input Current	I_F	-	20	mA	1
Reverse Input Voltage	V_R	-	5	V	-
Input Power Dissipation	P_I	-	45	mW	-
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	-

Note 1: Peaking circuits may produce transient input currents up to 50 mA, 50ns maximum pulse width, provided average current does not exceed 20 mA.

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

ELECTRICAL OPTICAL CHARACTERISTICS (DC)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION	NOTE
INPUT CHARACTERISTICS							
High Level Output Current	I_{OH}	-	0.35	100	μA	V_{CC} =5.5V, V_O =5.5V, V_F =0.8V	-
Input Threshold Current	I_{TH}	-	1.0	5.0	mA	V_{CC} =5.5V, V_O=0.6V, I_{OL}>13 mA	-
Low Level Output Voltage	V_{OL}	-	0.25	0.6	V	V_{CC} = 5.5V, I_F = 5 mA, $I_{OL(Sinking)}$ = 13 mA	-
High Level Supply Current	I_{CCH}	-	5.6	7.5	mA	V_{CC} = 5.5V, I_F = 0 mA,	-
Low Level Supply Current	I_{CCL}	-	5.2	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}	-	60	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}	-	35	75			-
Pulse Width Distortion	$\|t_{PHL}-t_{PLH}\|$	-	25	40			-
Propagation Delay Skew	t_{PSK}	-	-	50			-
Output Rise Time (10 to 90%)	t_r	-	30	-			-
Output Fall Time (90 to 10%)	t_f	-	3	-			-
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).

ISOLATION CHARACTERISTIC

PARAMETER	SYMBOL	DEVICE	MIN.	TYP.	MAX.	UNIT	TEST CONDITION	NOTE
Withstand Insulation Test Voltage	V_{ISO}	MPCS-611P MPCS-611W	5000	-	-	V	RH ≤ 40%-60%, t = 1min, T_A = 25 °C	1,2
Input-Output Resistance	R_{I-O}	-	-	10^{12}	-	Ω	V_{I-O} = 500V DC	1

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 Level Output Current vs. Temp.

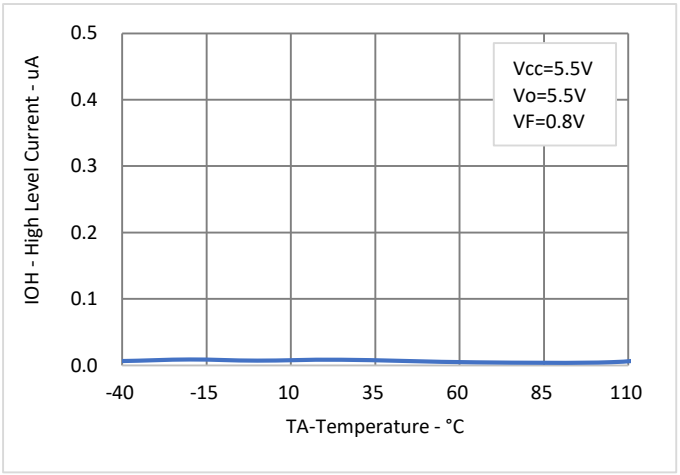


Fig.2 Low Level Output Voltage vs. Temp.

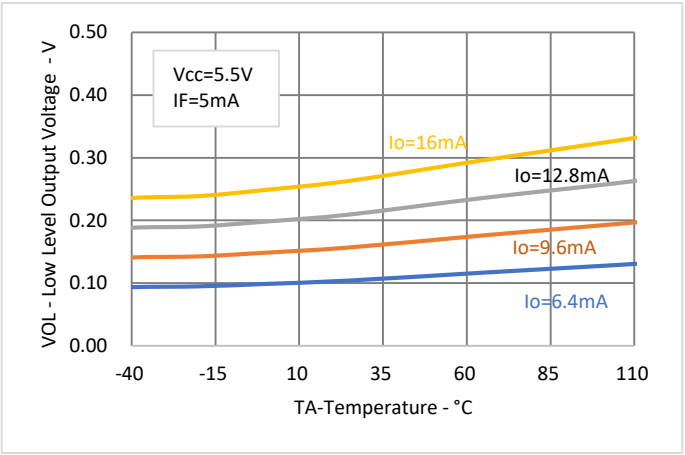


Fig.3 Input Diode Forward Characteristic

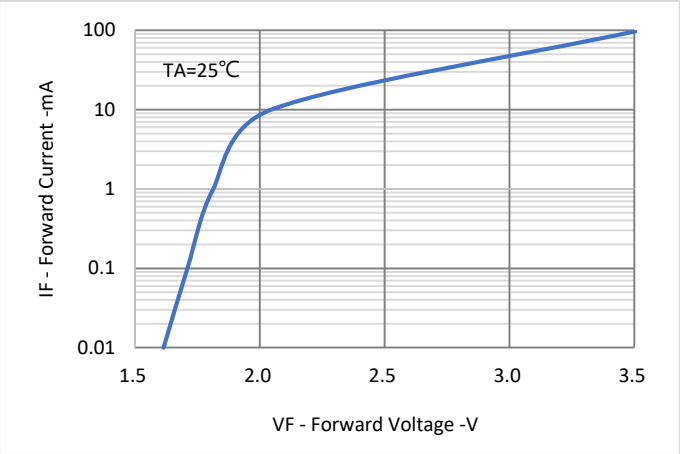


Fig.4 Output Voltage vs. Input Current

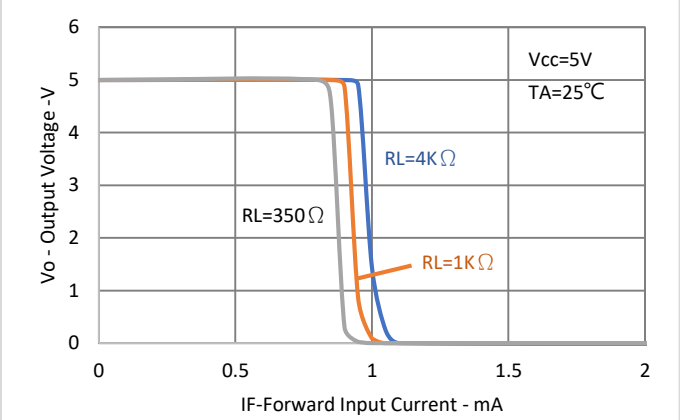


Fig.5 Low Level Output Current vs. Temp

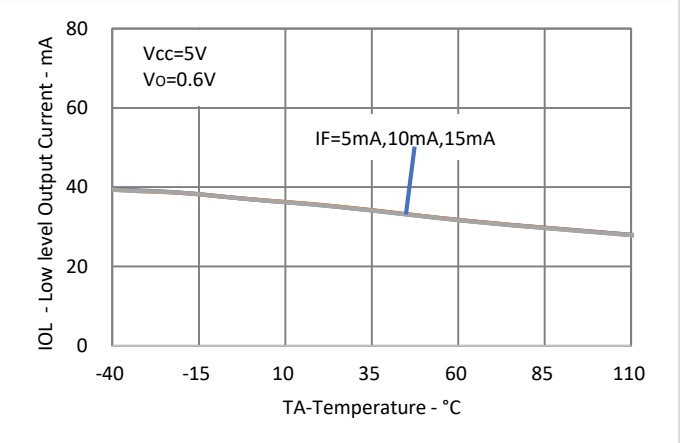


Fig.6 Propagation Delay vs. Temperature

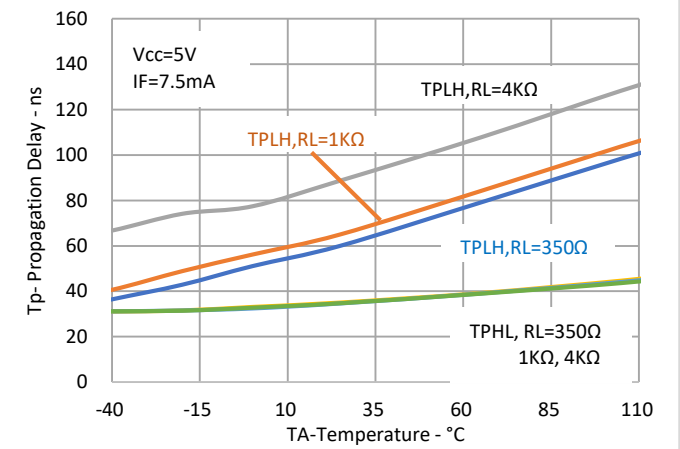


Fig.7 Propagation Delay vs. Input Current

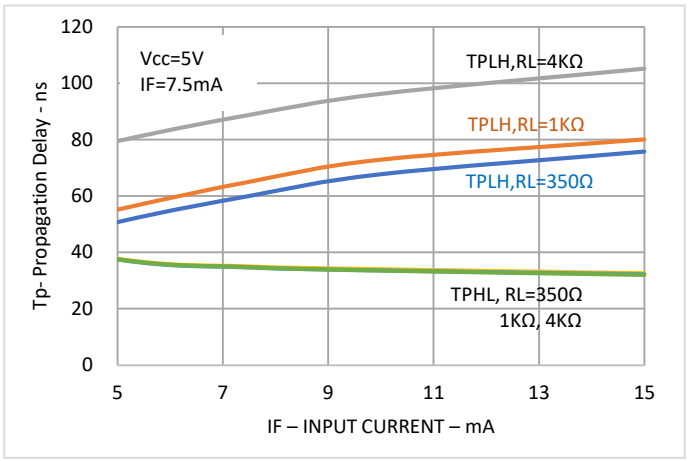


Fig.8 Pulse Width Distortion vs. Temperature

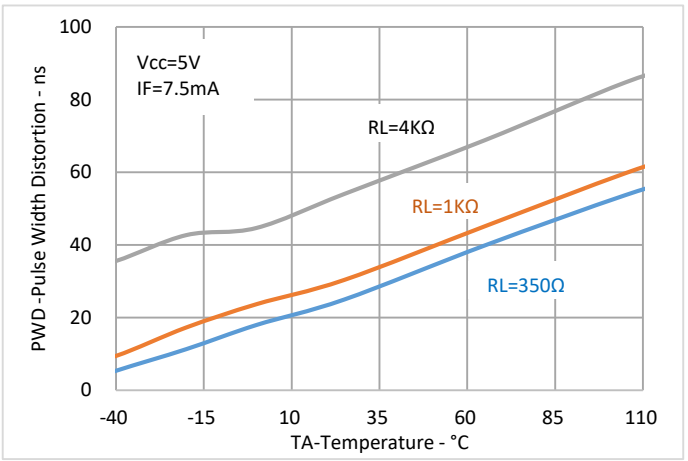


Fig.9 Rise and Fall Time vs. Temperature

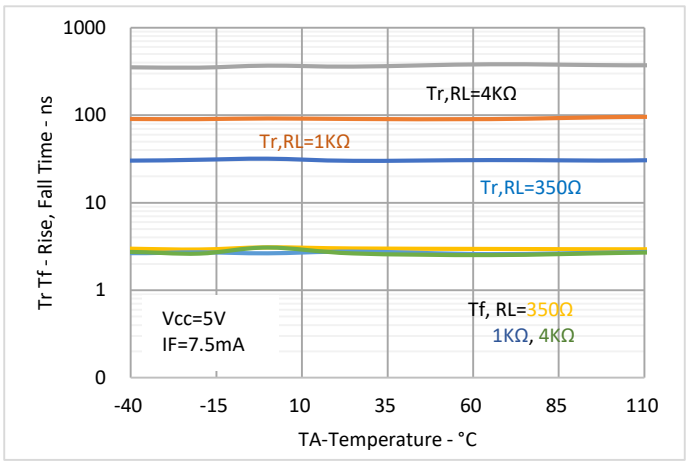


Fig.10 Input Threshold Current vs. Temp

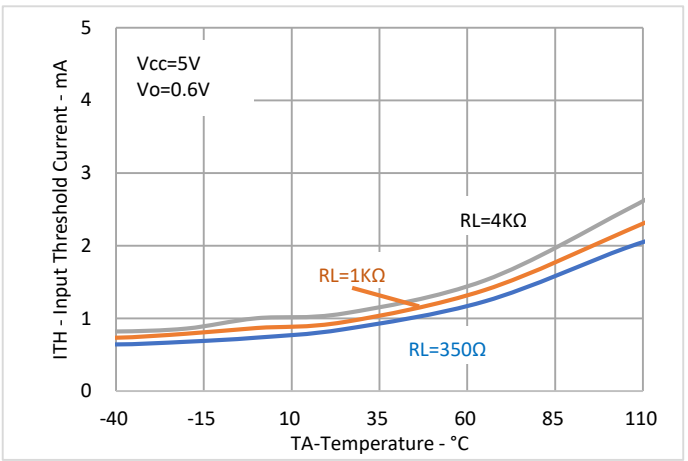


Fig.11 Test Circuit for t_{PHL} and t_{PLH}

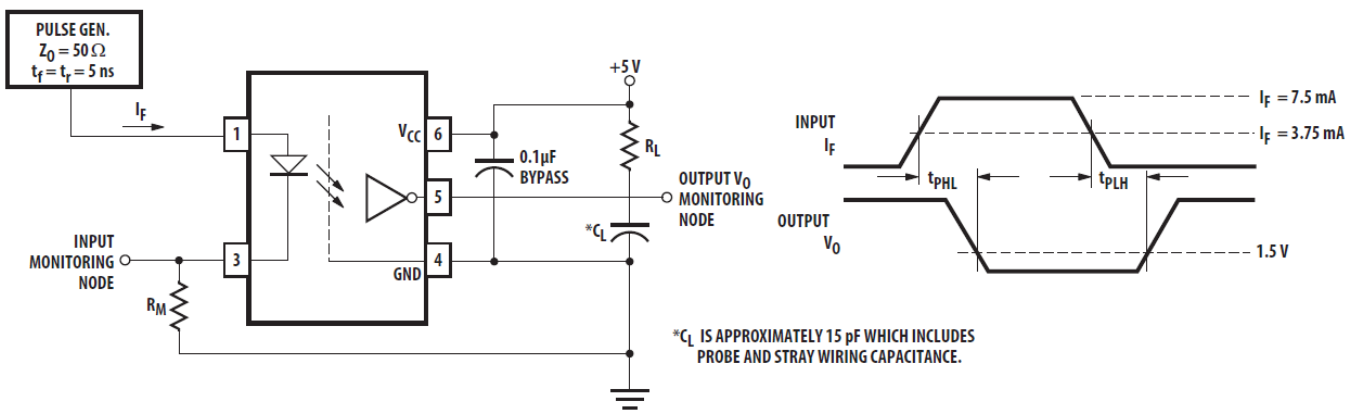
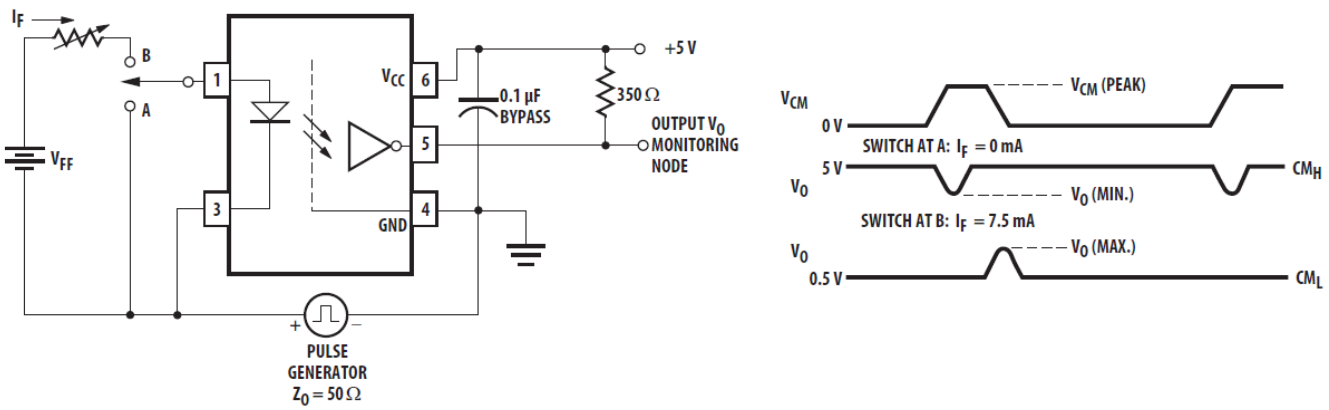
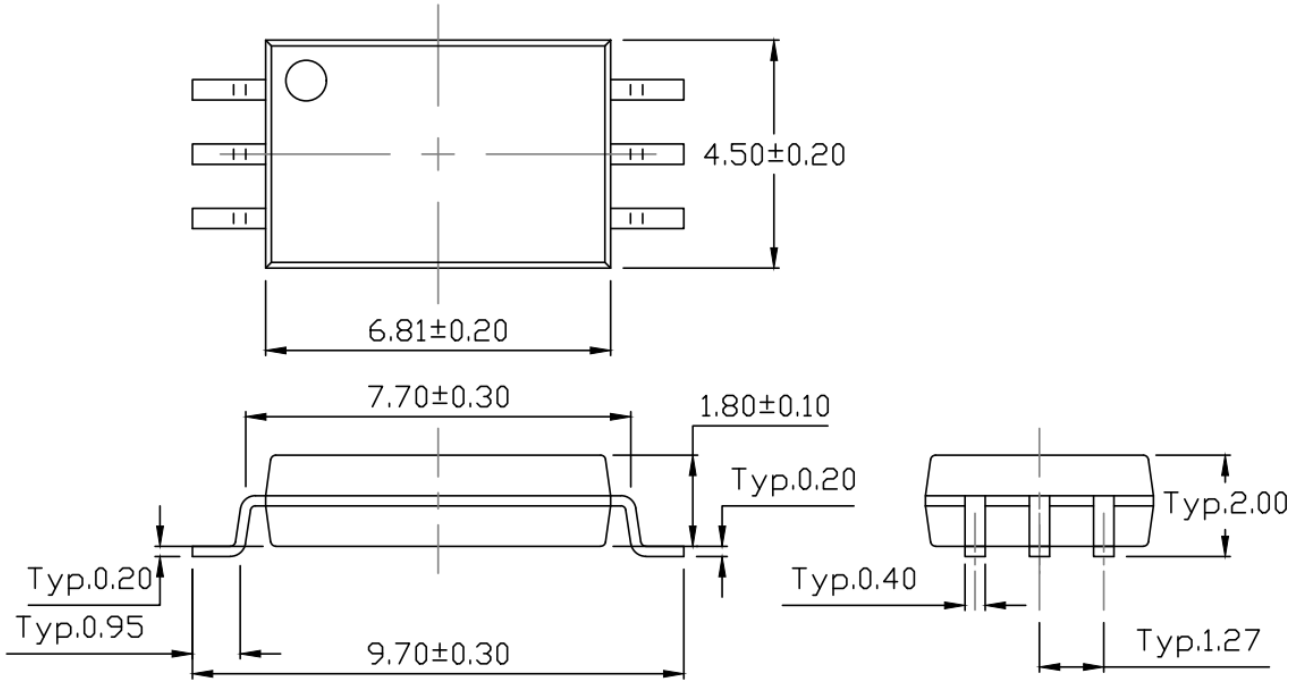


Fig.12 Test Circuit for Common Mode Transient Immunity and Typical Waveforms

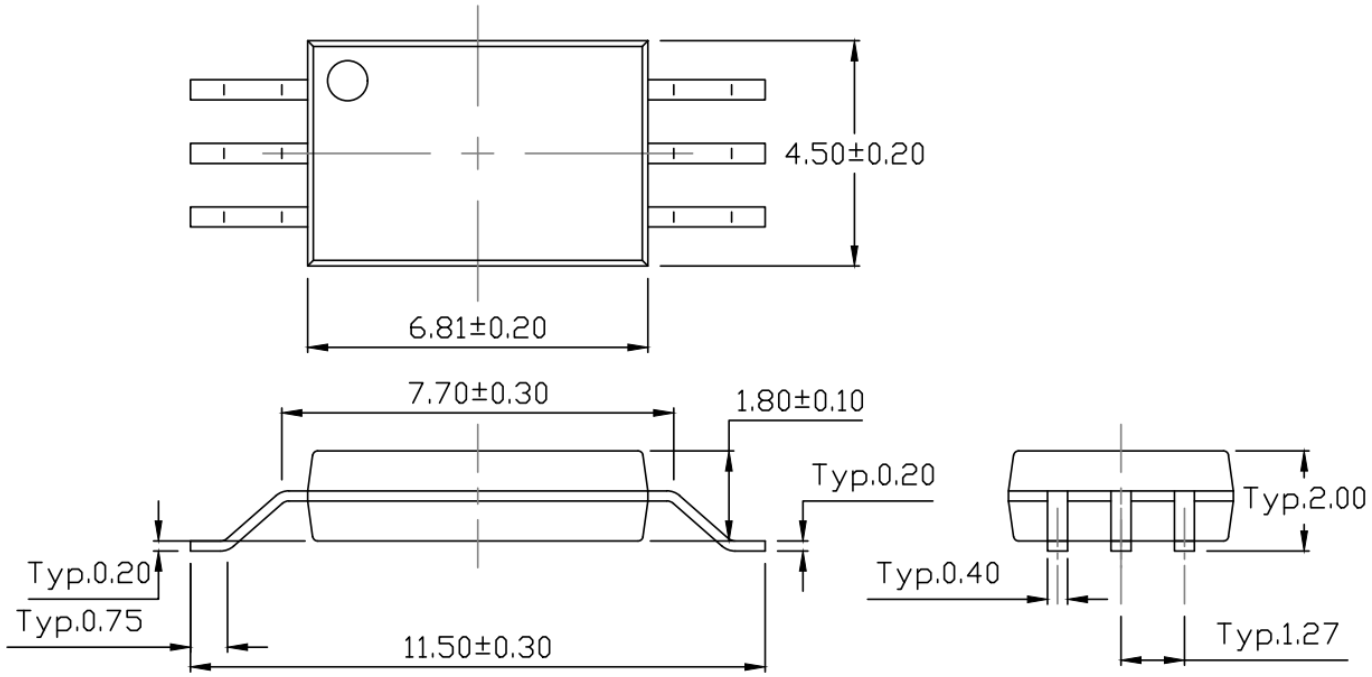


PACKAGE DIMENSIONS (Dimensions in mm unless otherwise stated)

Surface Mount Lead Forming (P Type)

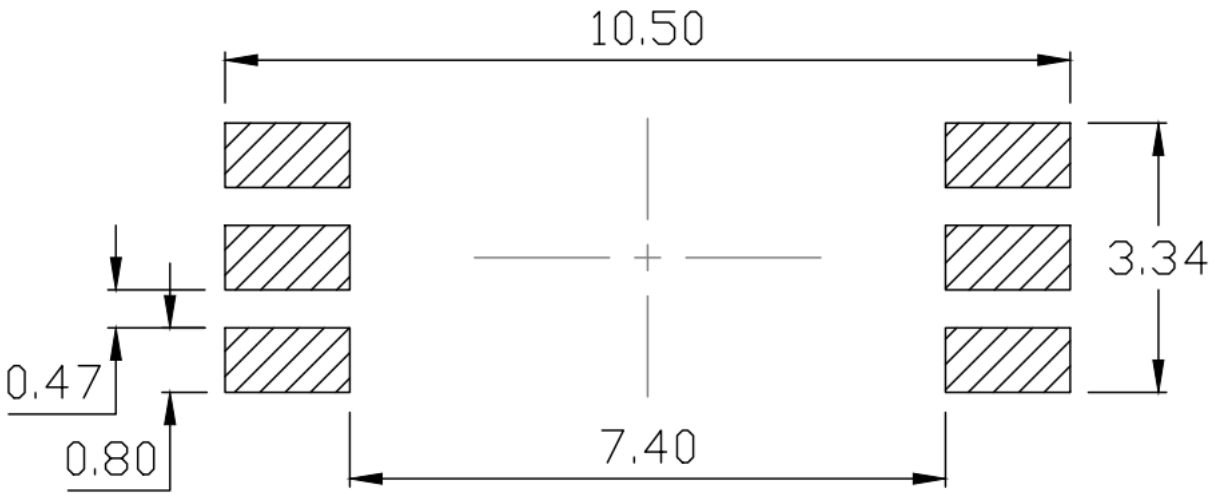


Surface Mount (Gullwing) Lead Forming (W Type)

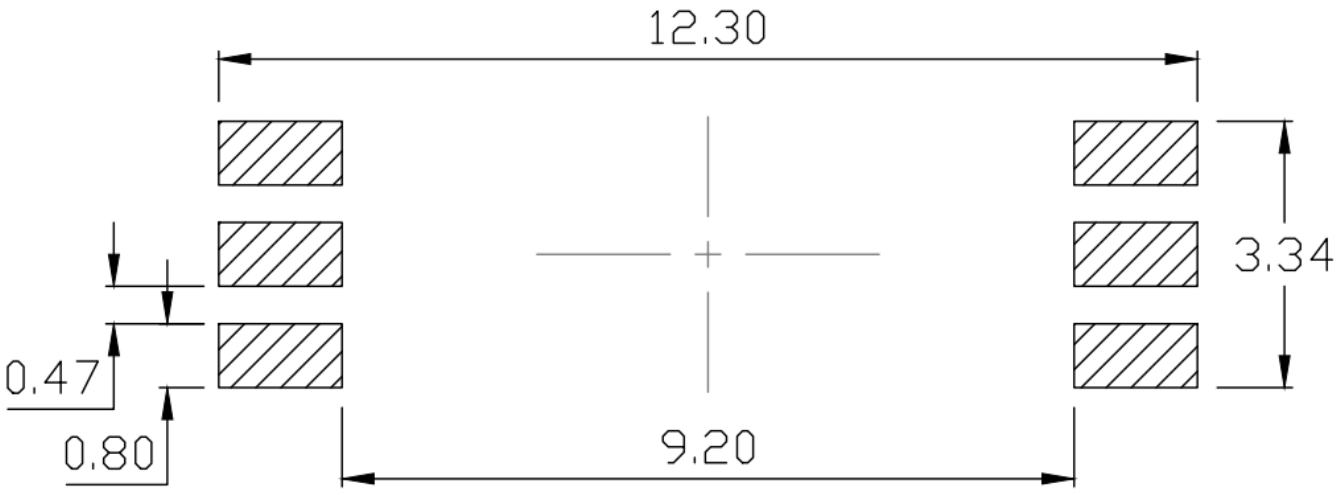


RECOMMENDED SOLDER MASK (Dimensions in mm unless otherwise stated)

Surface Mount Lead Forming (P Type)

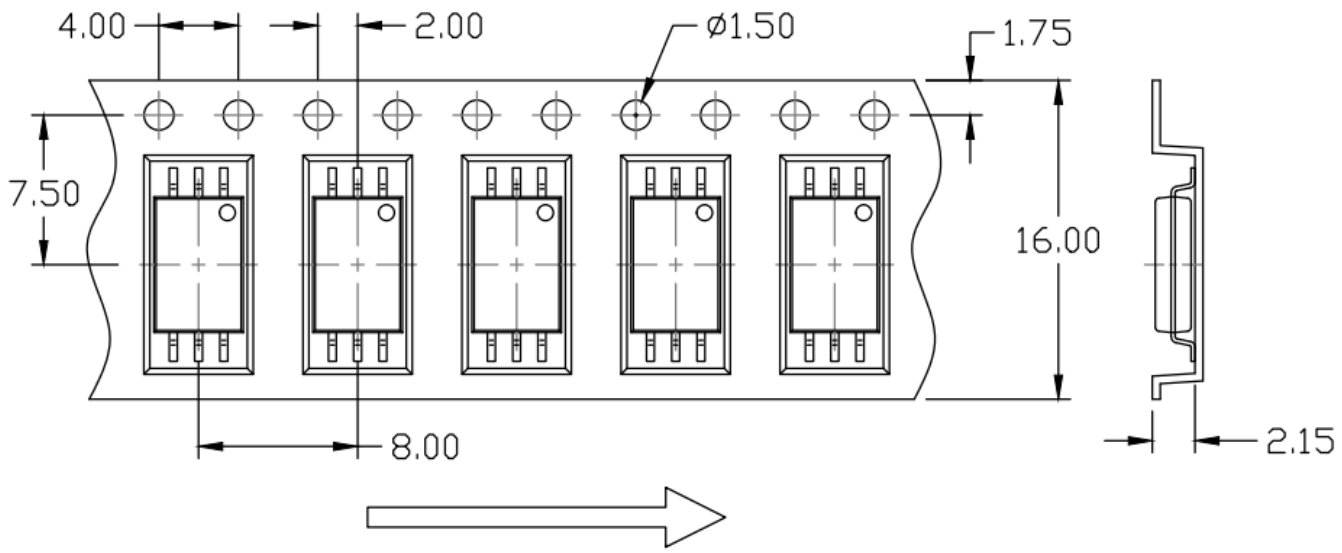


Surface Mount (Gullwing) Lead Forming (W Type)

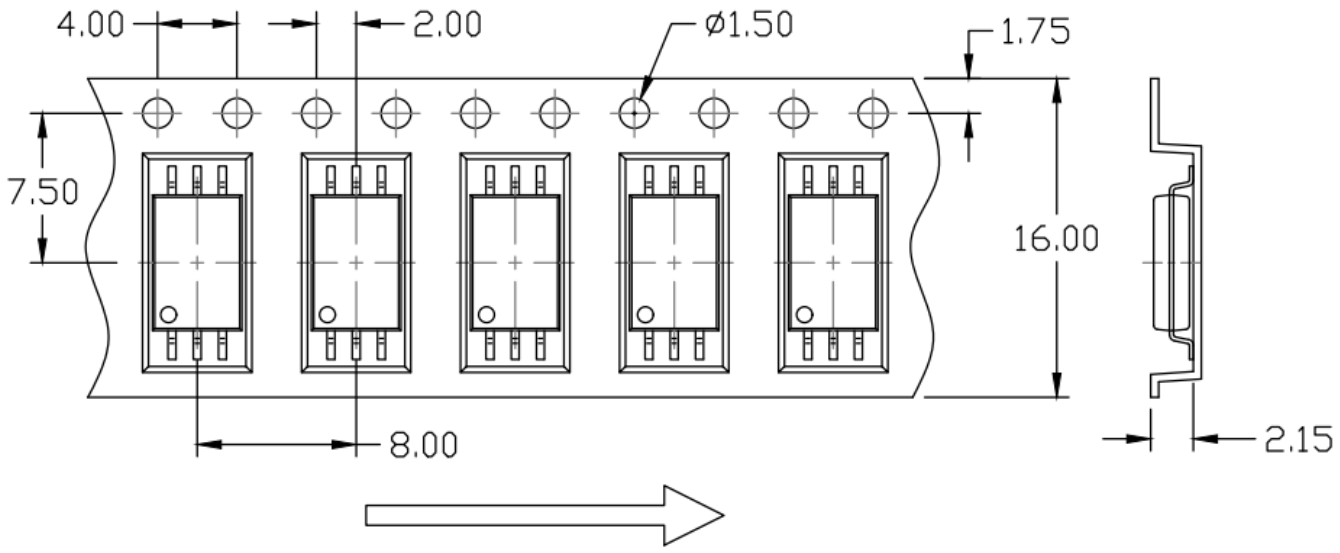


CARRIER TAPE SPECIFICATIONS (Dimensions in mm unless otherwise stated)

Surface Mount Lead Forming (P Type) Option T1

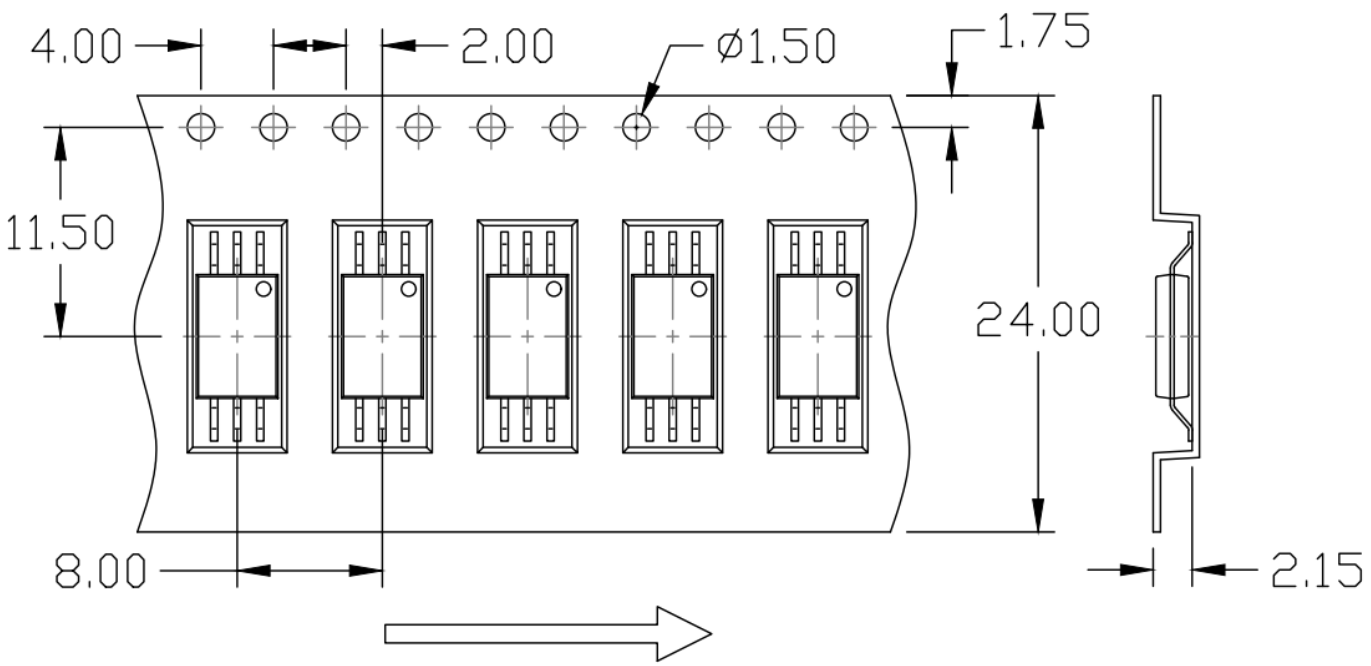


Surface Mount Lead Forming (P Type) Option T2

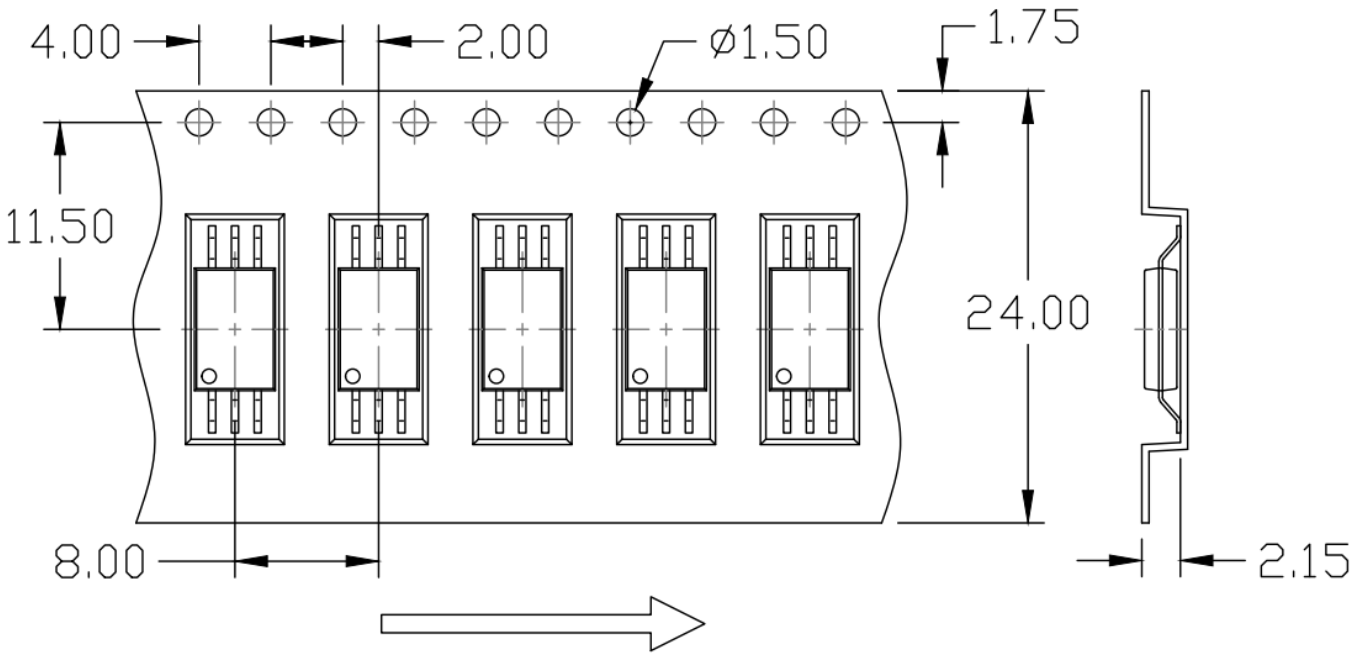


CARRIER TAPE SPECIFICATIONS (Dimensions in mm unless otherwise stated)

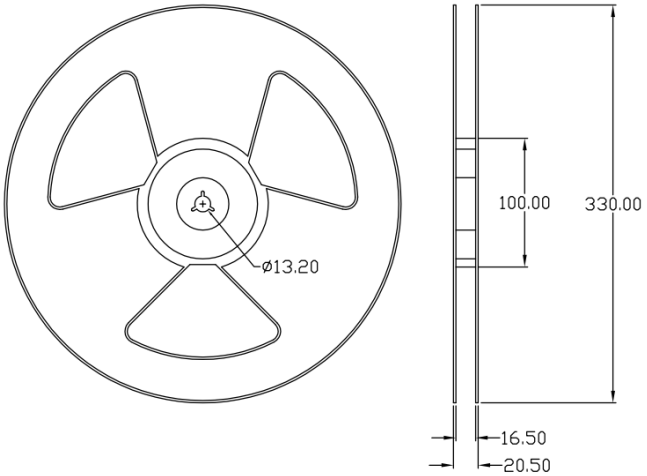
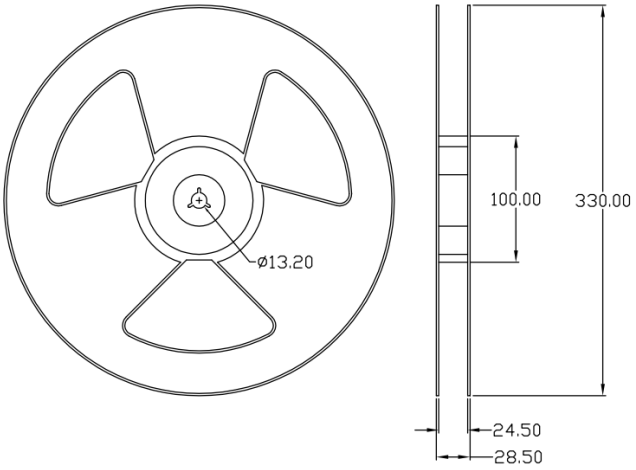
Surface Mount (Gullwing) Lead Forming (W Type) Option T1



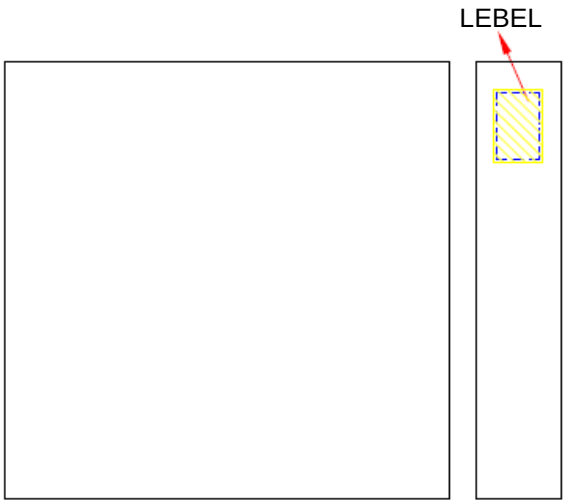
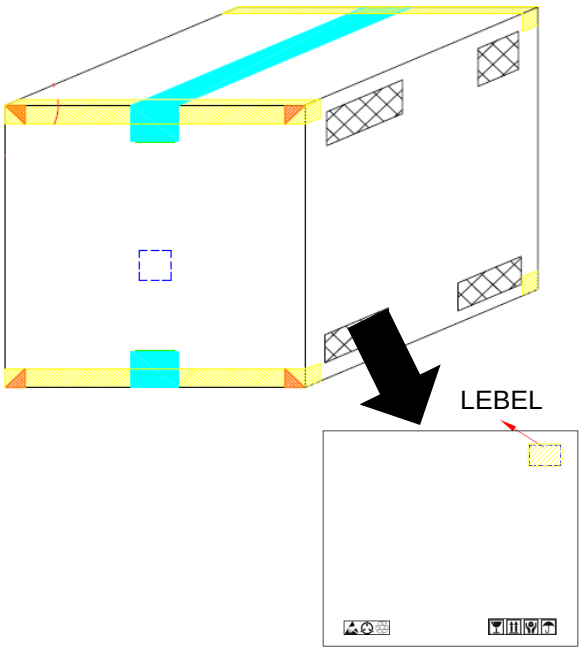
Surface Mount (Gullwing) Lead Forming (W Type) Option T2



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

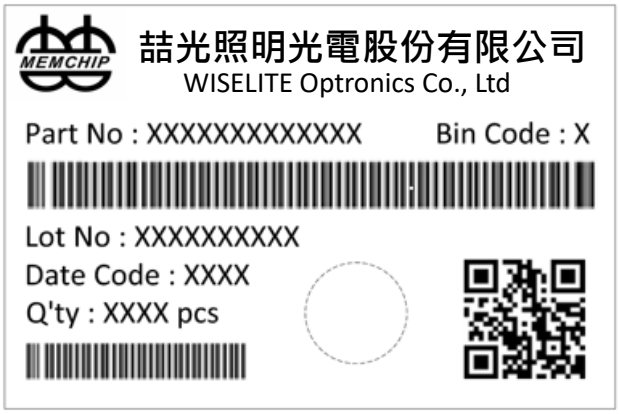
M : Company Abbr.
YY : Year date code
WW : 2-digit work week
611 : Part Number
T or H : Factory identification mark
V : VDE Identification(Option)

ORDERING INFORMATION

MPCS-611 (P/W)-ZV

MPC – Company Abbr.
S – Stack
611 – 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

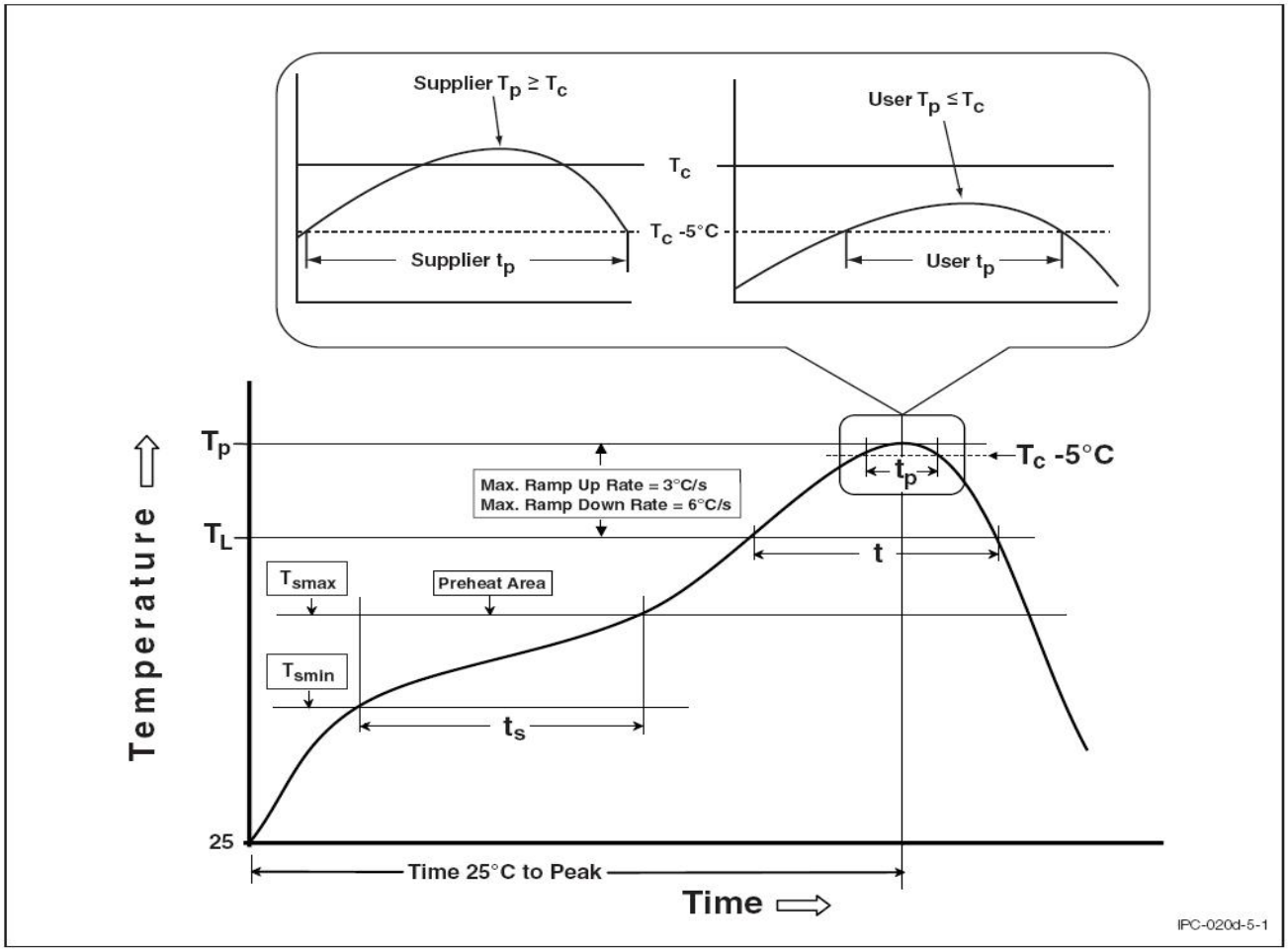


PACKING QUANTITY

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

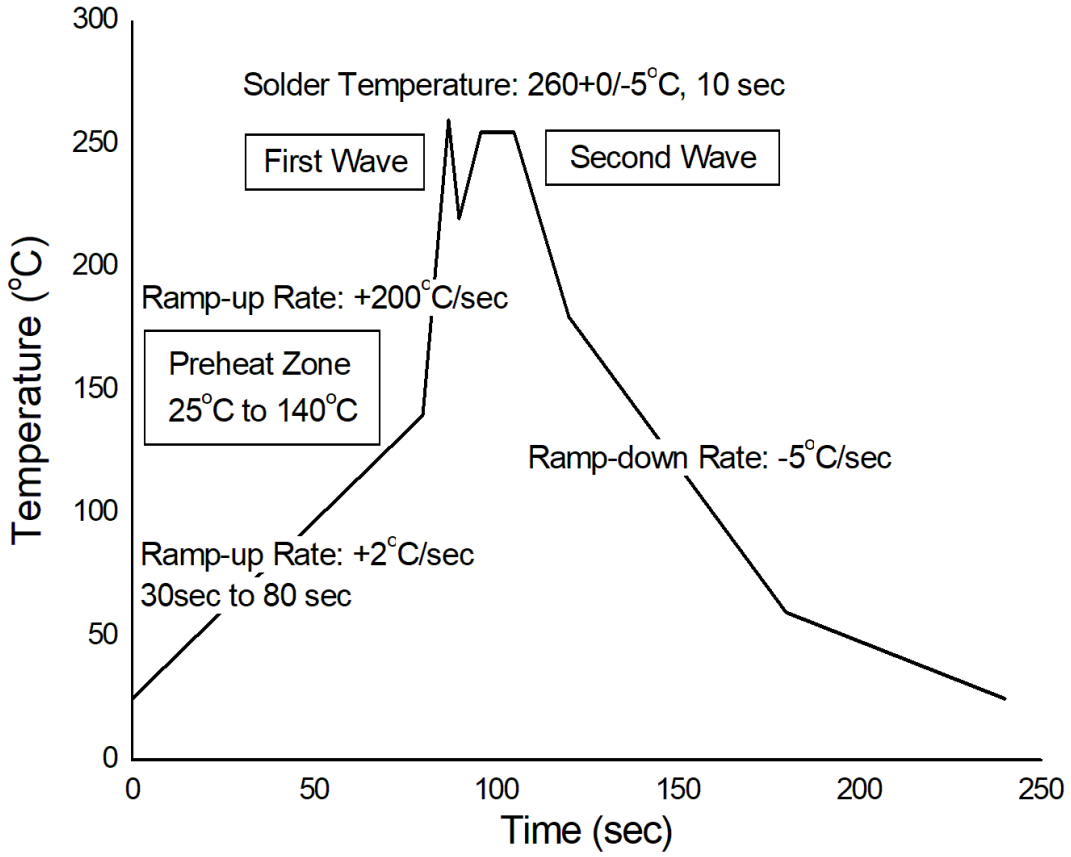
REFLOW PROFILE



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.