MPCS-3120 Series

DIP8, DC Input, 3.0A Gate Driver Optocoupler

Description

The MPCS-3120 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-3120 series can be used to drive a discrete power stage which drives the IGBT gate.

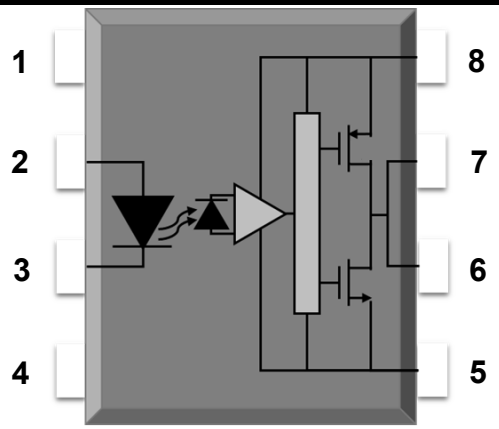
Features

- 3.0 A maximum peak output current
- Rail-to-rail output voltage
- 110 ns maximum propagation delay
- Under Voltage Lock-Out protection (U_{VLO}) 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

- Plasma Display Panel
- IGBT/MOSFET gate drive
- Industrial Inverter
- Induction heating
- Uninterruptible power supply (UPS)

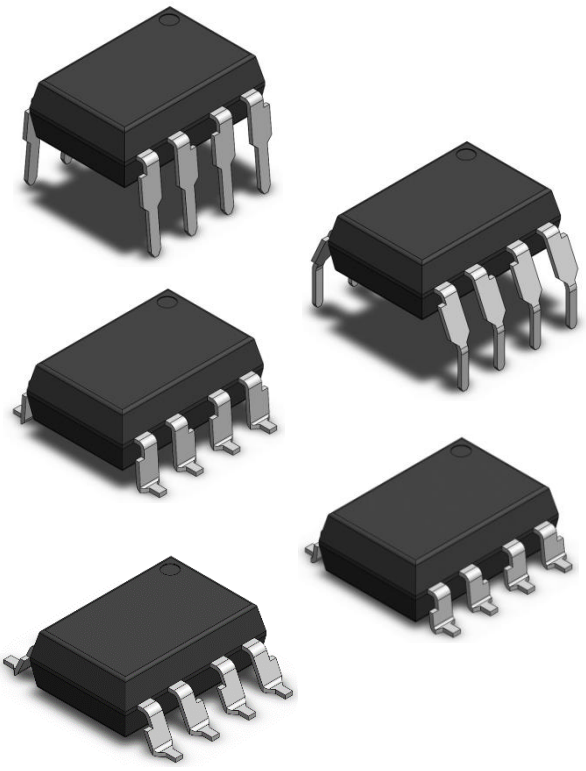
SCHEMATIC



PIN DEFINITION

1. NC	**8. V_{CC}**
2. Anode	**7. V_O**
3. Cathode	**6. V_O**
4. NC	**5. 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	-
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	Vcc	V	-
Power Dissipation	P_I	-	45	mW	-
Output IC Power Dissipation	P_O	-	250	mW	-
Isolation Voltage	V_{iso}	5000	-	Vrms	2
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

Note 2. AC For 1 Minute, R.H. =40~60%

TRUTH TABLE

LED	V_O
Off	Low
On	High

Note: A ceramic capacitor (0.1 μF) should be connected between pin 8 and pin 5 to stabilize the operation of a high gain linear amplifier. Otherwise, this Photocoupler may not switch properly.

ELECTRICAL OPTICAL CHARACTERISTICS

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION	NOTE
INPUT CHARACTERISTICS							
Input Forward Voltage	V_F	1.6	2	2.4	V	I_F = 10mA	-
Input Reverse Voltage	B_{VR}	5	-	-	V	I_R = 10μA	-
Input Threshold Current (Low to High)	I_{FLH}	-	1.0	5	mA	V_{CC} = 30 V, V_O > 5V	-
Input Threshold Voltage (High to Low)	V_{FHL}	0.8	-	-	V	V_{CC} = 30 V, V_O < 5V	-
Input Capacitance	C_{IN}	-	60	-	pF	f = 1 MHz, V_F = 0 V	-
OUTPUT CHARACTERISTICS							
High Level Supply Current	I_{CCH}	-	1.6	3.0	mA	I_F = 10 mA, V_{CC} = 30V, V_O = Open	-
Low Level Supply Current	I_{CCL}	-	2.0	3.0	mA	I_F = 0 mA, V_{CC} = 30V, V_O = Open	-
High level output current	I_{OH}	-	-	-1.0	A	V_O = (V_{CC} – 1.5 V)	1
		-	-	-3.0		V_O = (V_{CC} – 4 V)	2
Low level output current	I_{OL}	1.0	-	-	A	V_O = (V_{EE} + 1.5 V)	1
		3.0	-	-		V_O = (V_{EE} + 4 V)	2
High level output voltage	V_{OH}	V_{CC} - 0.3	V_{CC} - 0.15	-	V	I_F = 10mA, I_O = -100mA	-
Low level output voltage	V_{OL}	-	V_{EE} + 0.1	V_{EE} + 0.25	V	I_F = 0mA, I_O = 100mA	-
U_{VLO} Threshold	V_{UVLO+}	11.0	12.5	13.5	V	V_O > 5V, I_F = 10 mA	-
	V_{UVLO-}	9.5	11.1	12.0	V	V_O < 5V, I_F = 10 mA	
U_{VLO} Hysteresis	U_{VLOHYS}	-	1.4	-	V	-	-

All Typical values at T_A = 25°C and V_{CC} – V_{EE} = 30 V, unless otherwise specified;

Note 1: Maximum pulse width = 50 μs.

Note 2: Maximum pulse width = 10 μs.

SWITCHING SPECIFICATION

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION	NOTE
Propagation Delay Time to High Output Level	t_{PLH}	-	60	110	ns	R_g = 10Ω, C_g = 25nF, f = 10 kHz, Duty Cycle = 50% I_F = 7 to 16 mA, V_{CC} = 10 to 30V V_{EE} = ground	
Propagation Delay Time to Low Output Level	t_{PHL}	-	70	110	ns		
Pulse Width Distortion	P_{WD}	-	5	100	ns		
Propagation delay difference between any two parts or channels	P_{DD}	-100	-	100	ns		1
Output Rise Time (10 to 90%)	t_r	-	5	-	ns		
Output Fall Time (90 to 10%)	t_f	-	5	-	ns		
Common mode transient immunity at high level output	$\|CM_H\|$	35	-	-	KV/us	T_A = 25°C, I_F = 10 to 16 mA, V_{CM} = 1500 V, V_{CC} = 30 V	2
Common mode transient immunity at low level output	$\|CM_L\|$	35	-	-	KV/us	T_A = 25°C, V_F = 0 V, V_{CM} = 1500 V, V_{CC} = 30 V	3

All Typical values at T_A = 25°C and V_{CC} – V_{EE} = 30 V, unless otherwise specified;

Note 1: The difference between t_{PHL} and t_{PLH} between any two parts under same test conditions.

Note 2: CM_H is the maximum rate of rise of the common mode voltage that can be sustained with the output voltage in the logic high state (V_O > 15 V).

Note 3: CM_L is the maximum rate of fall of the common mode voltage that can be sustained with the output voltage in the logic low state (V_O < 1 V).

TYPICAL PERFORMANCE CURVES & TEST CIRCUITS

Fig.1 High output rail voltage vs. Temperature

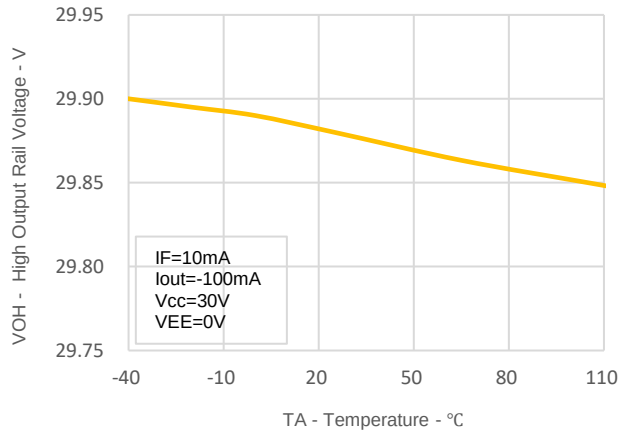


Fig.2 V_{OH} vs. Temperature

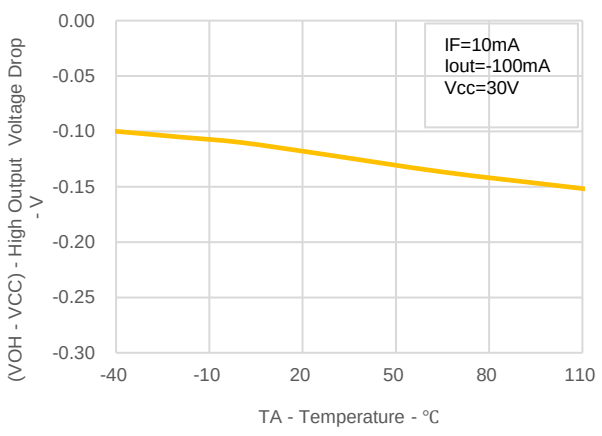


Fig.3 V_{OL} vs. Temperature

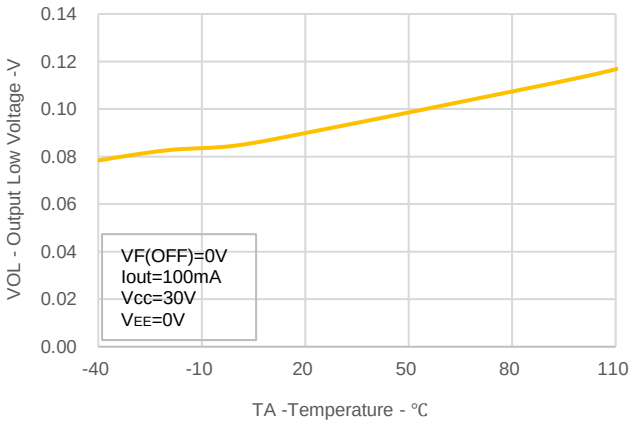


Fig.4 I_{CC} vs. Temperature

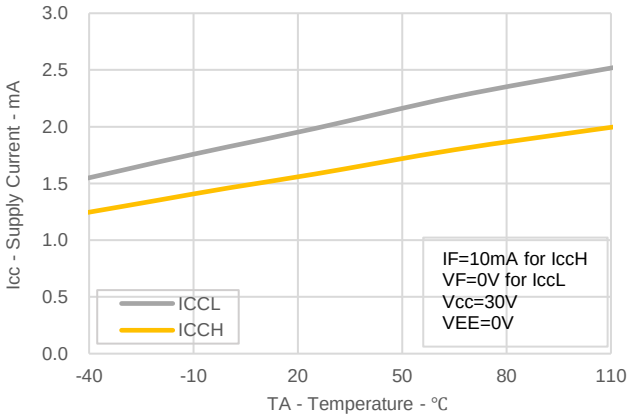


Fig.5 I_{CC} vs. V_{CC}

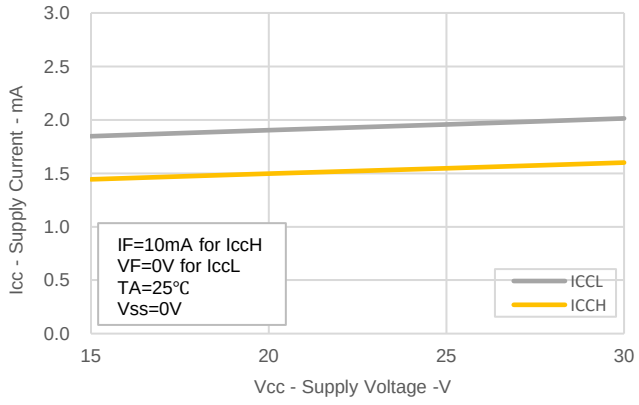


Fig.6 I_{FLH} vs. Hysteresis

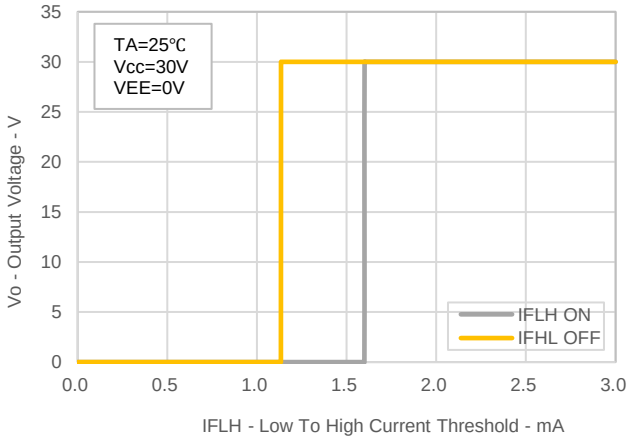


Fig.7 I_{FH} vs. Temperature

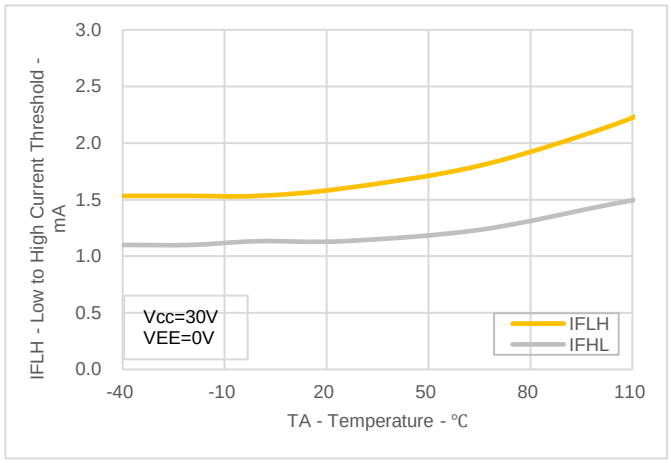


Fig.8 Propagation Delays vs. V_{CC}

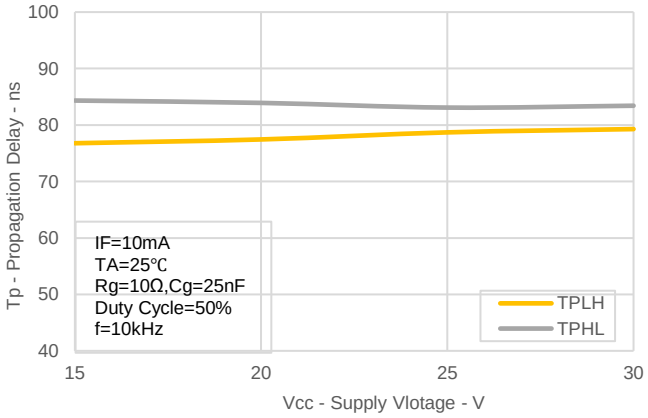


Fig.9 Propagation Delays vs. I_F

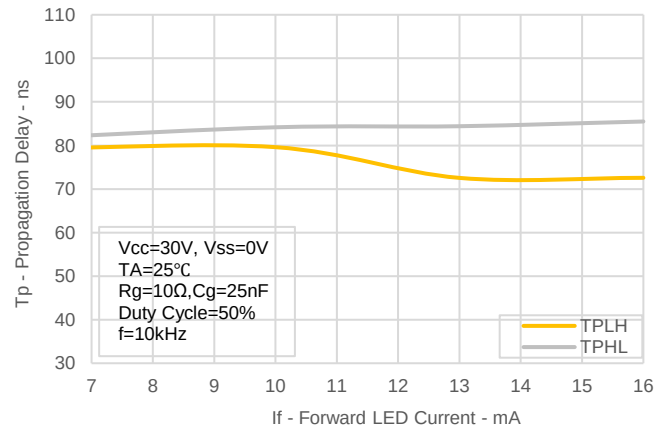


Fig.10 Propagation Delays vs. Temperature

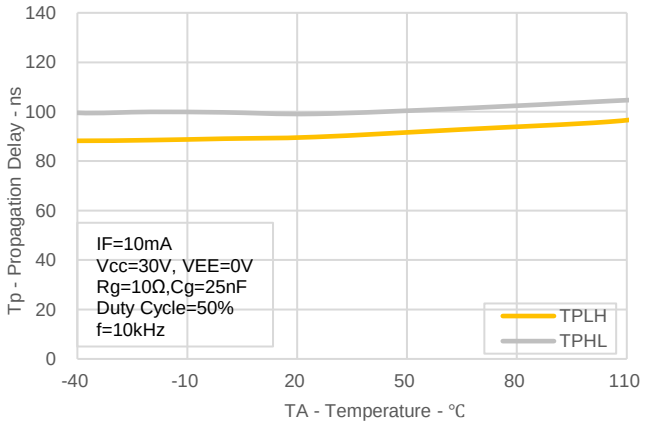


Fig.11 Propagation Delays vs. R_g

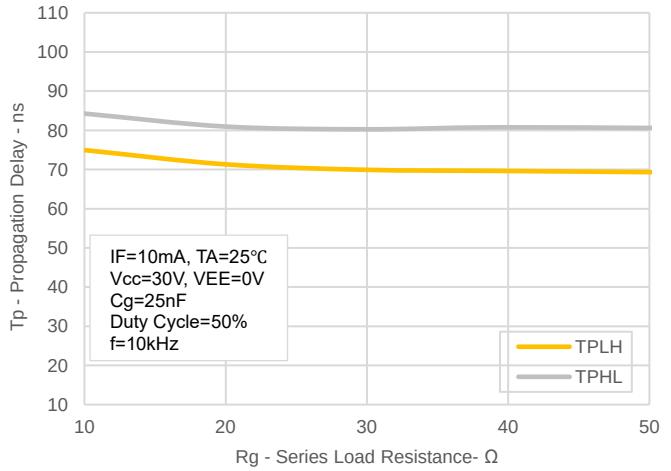


Fig.12 Propagation Delays vs. C_g

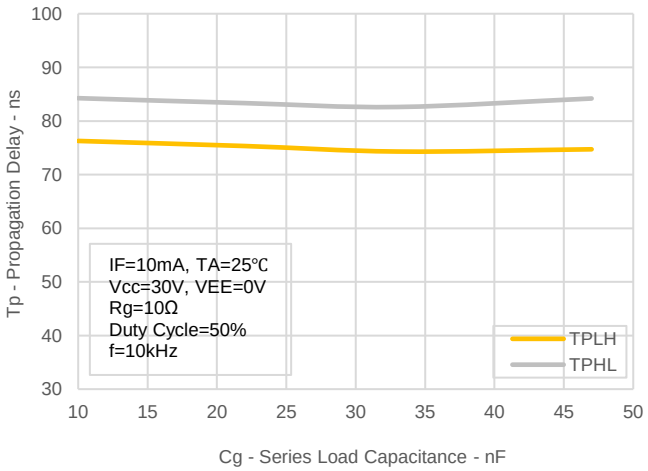


Fig.13 Input Current vs. Forward Voltage

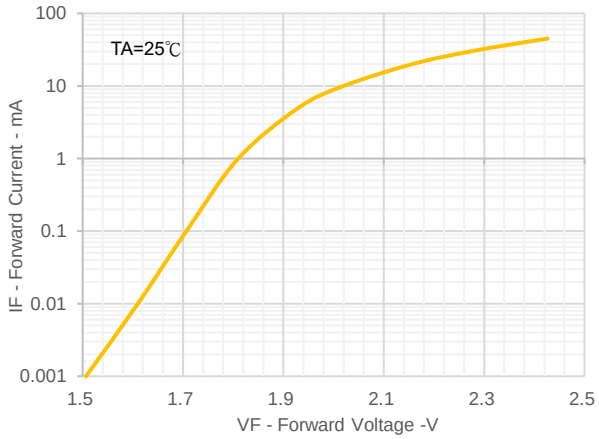


Fig.14 I_{OH} Test Circuit

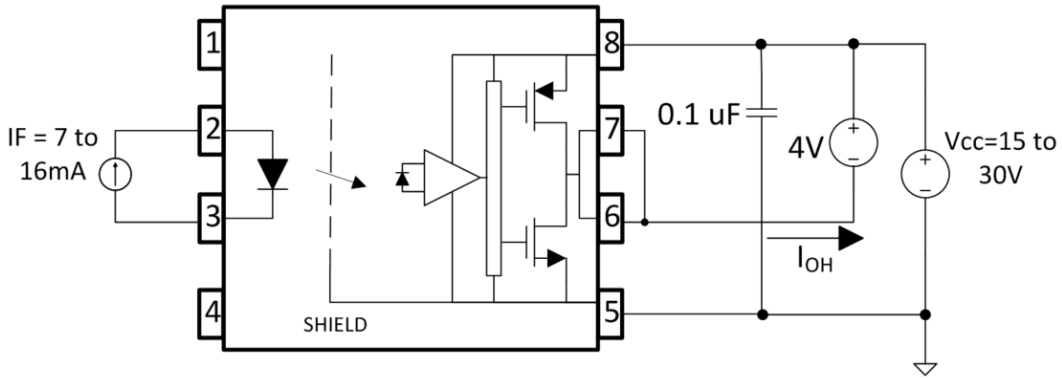


Fig.15 I_{OL} Test Circuit

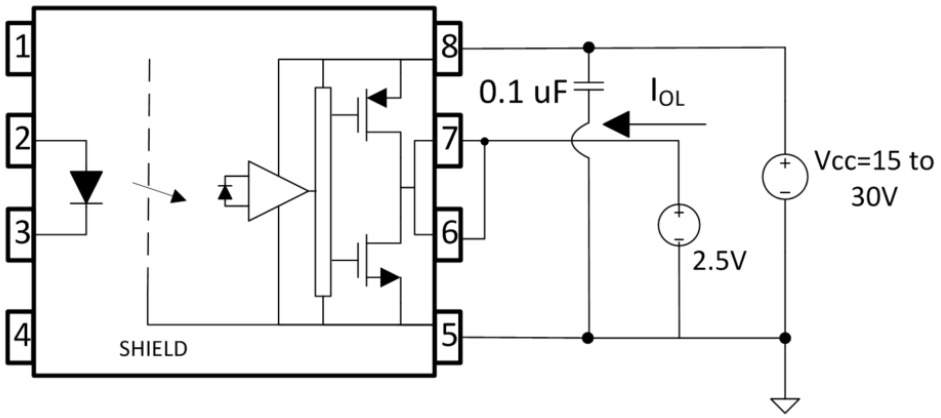


Fig.16 t_{PHL}, t_{PLH}, t_r and t_f Test Circuit and Waveforms

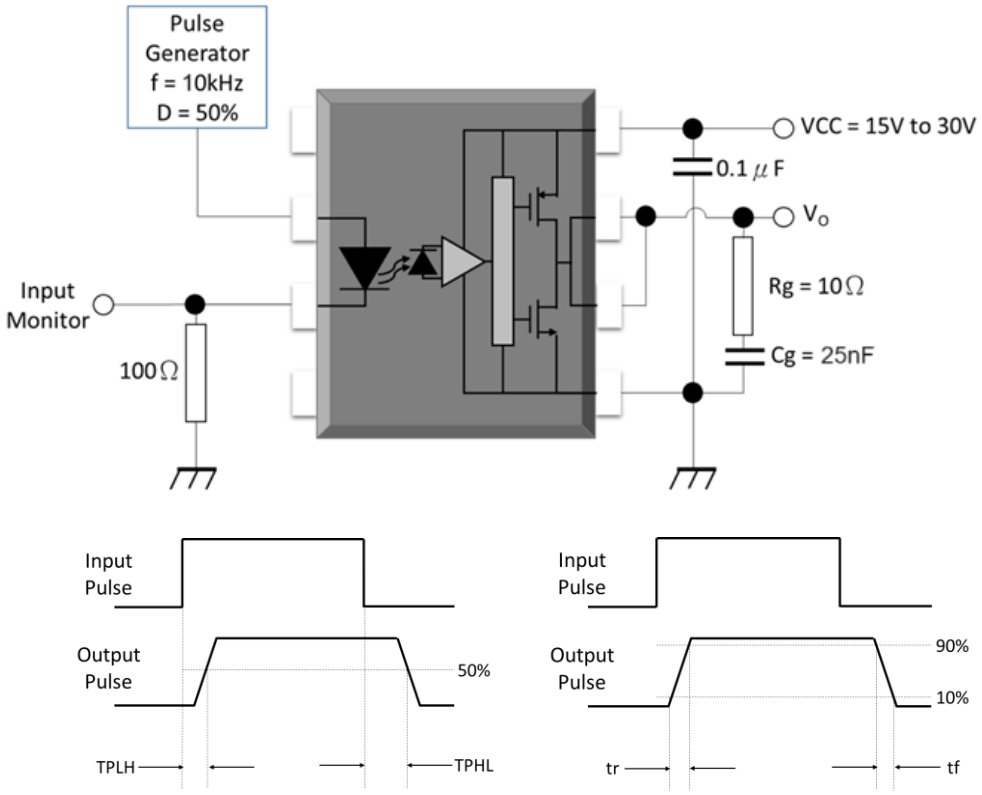
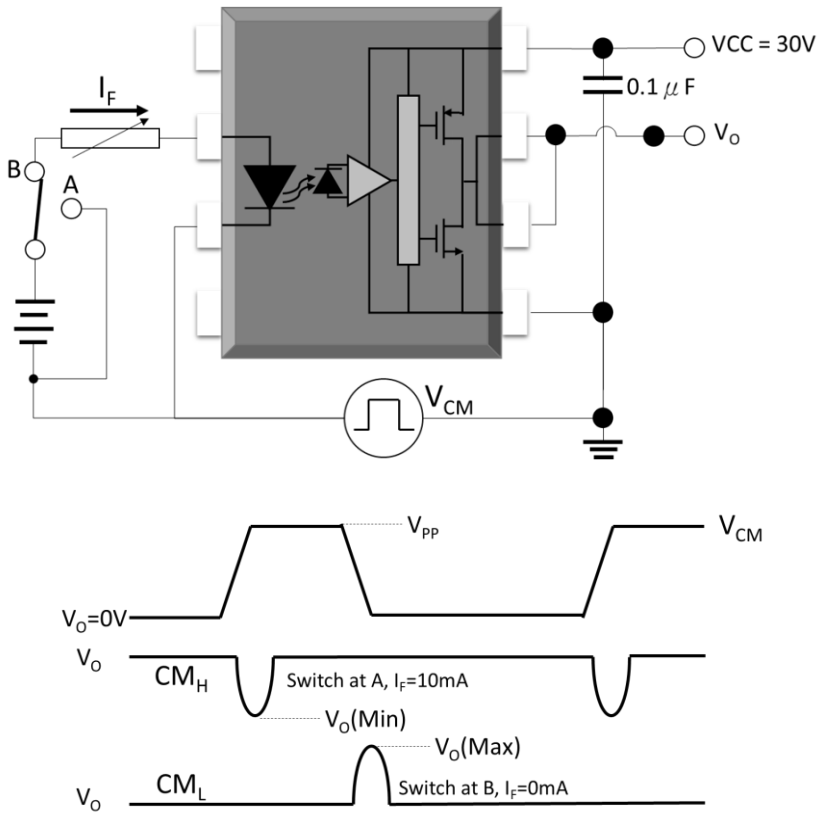
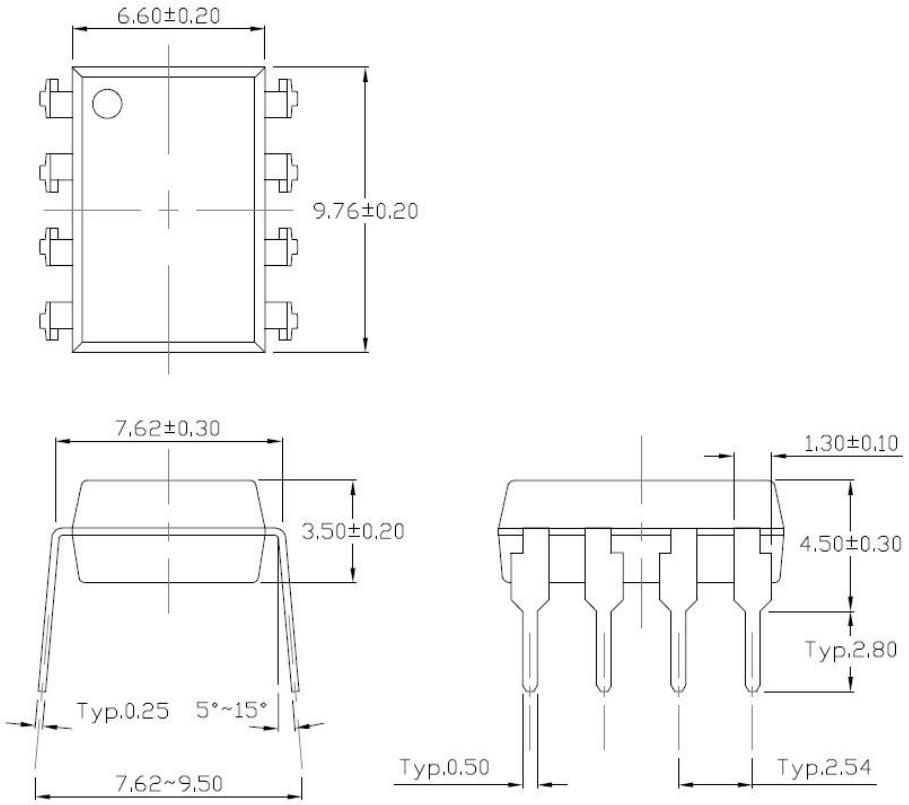


Fig.17 CMR Test Circuit with Split Resistors Network and Waveforms

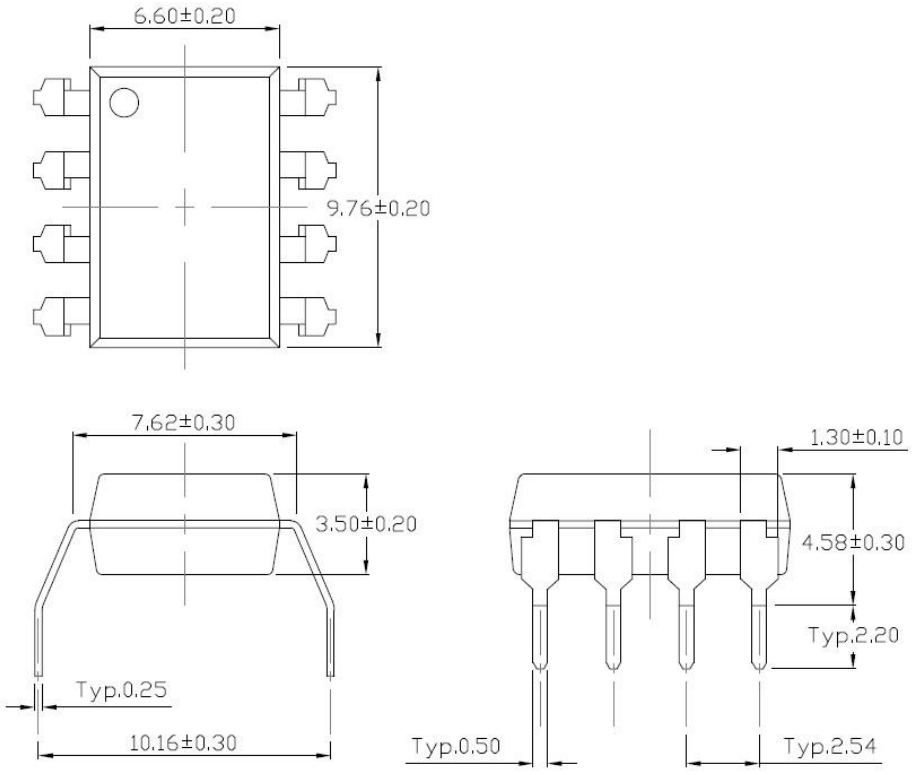


PACKAGE DIMENSIONS (Dimensions in mm unless otherwise stated)

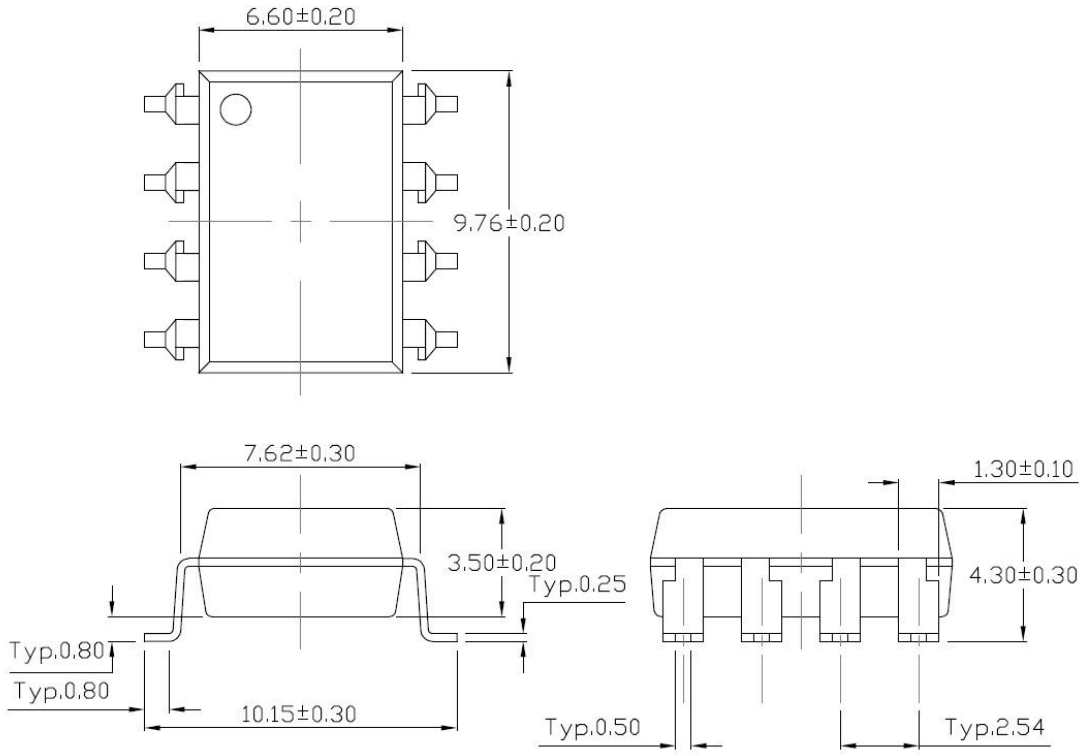
Standard DIP – Through Hole (DIP Type)



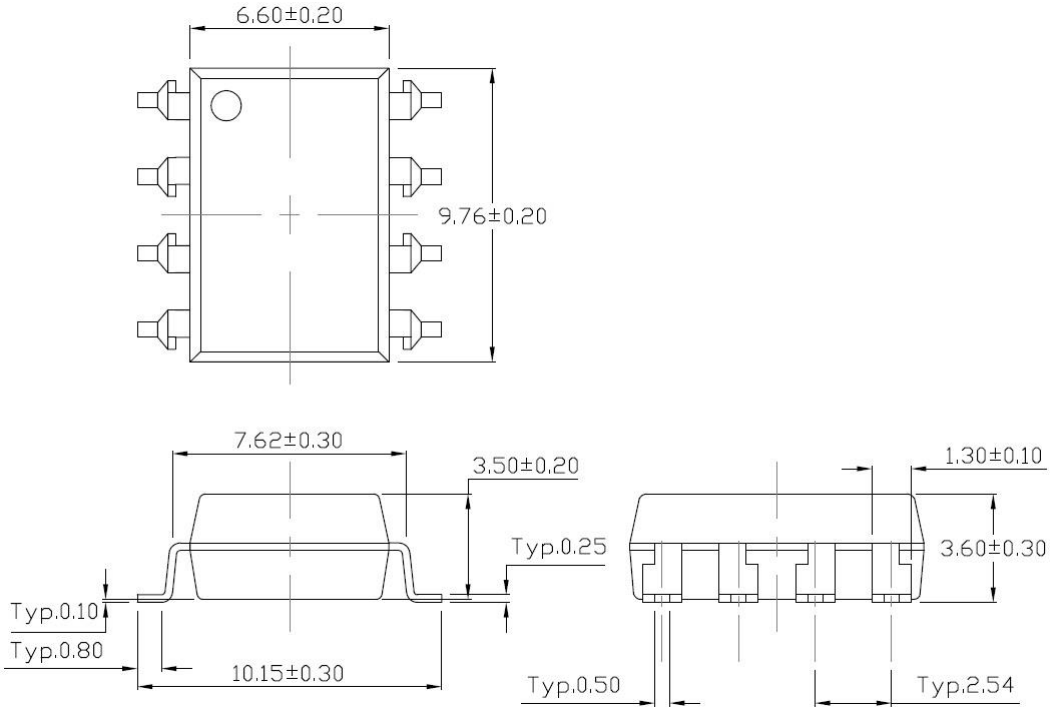
Gullwing (400mil) Lead Forming – Through Hole (M Type)



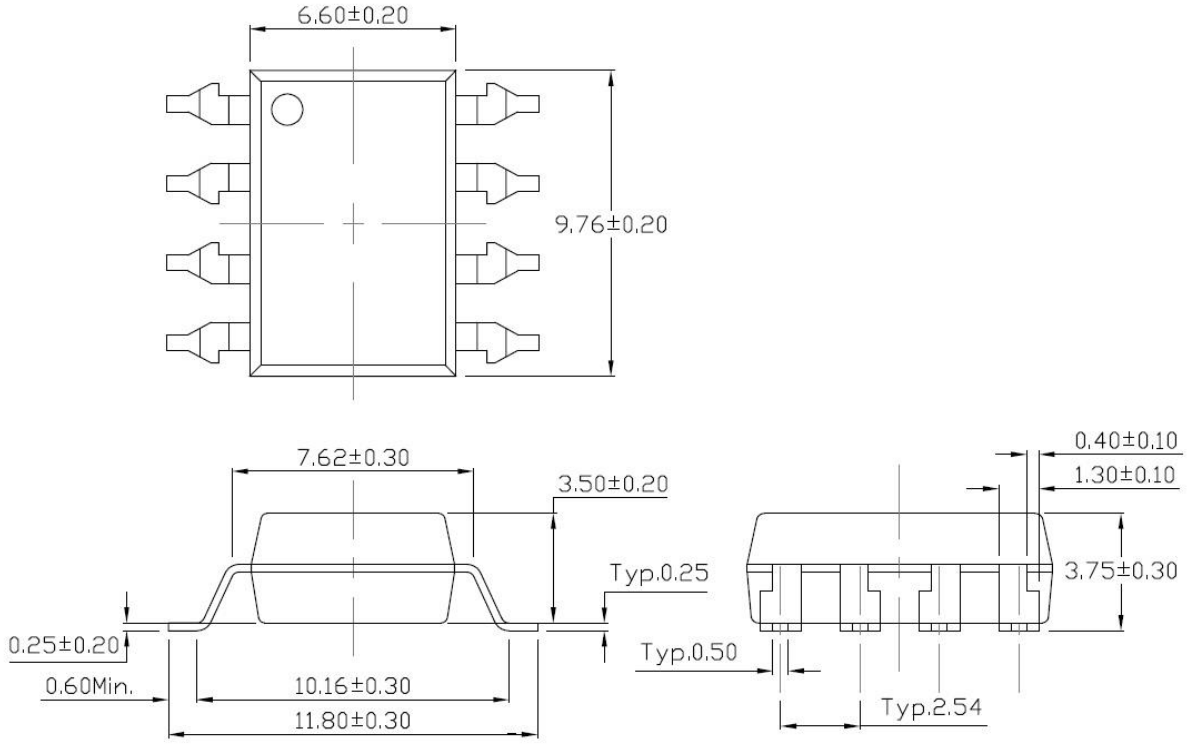
Surface Mount Lead Forming (S Type)



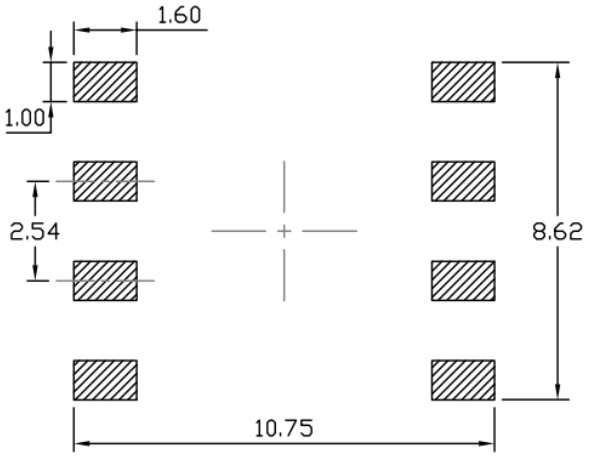
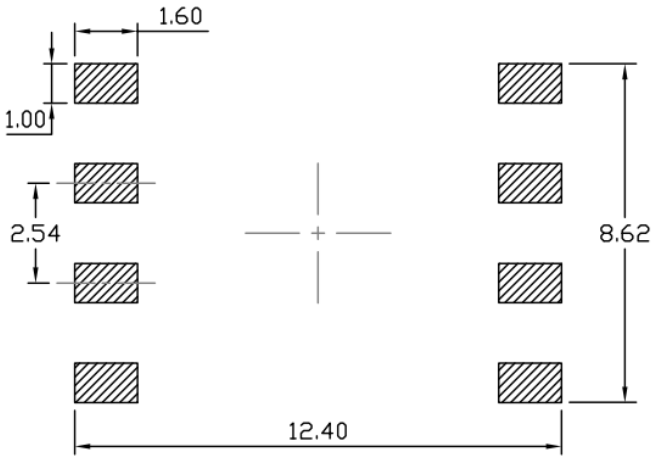
Surface Mount (Low Profile) Lead Forming (SL Type)



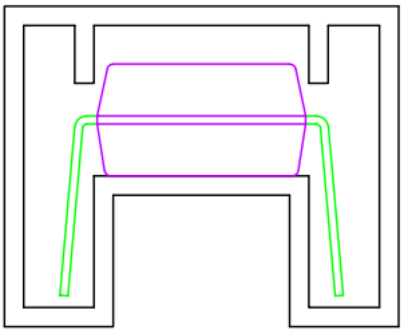
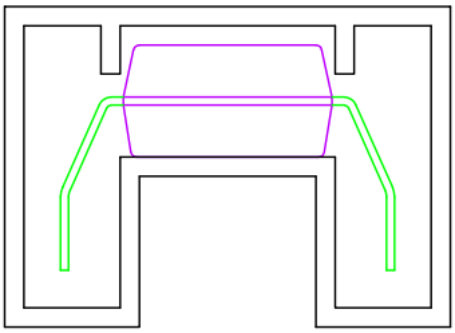
Long Creepage Distance For Surface Mount Type (Option SM)



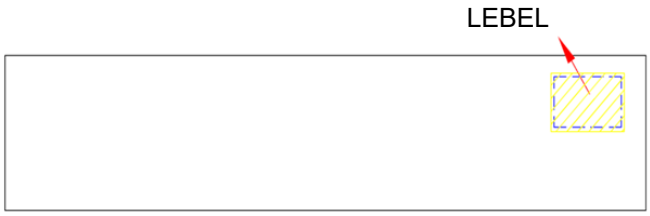
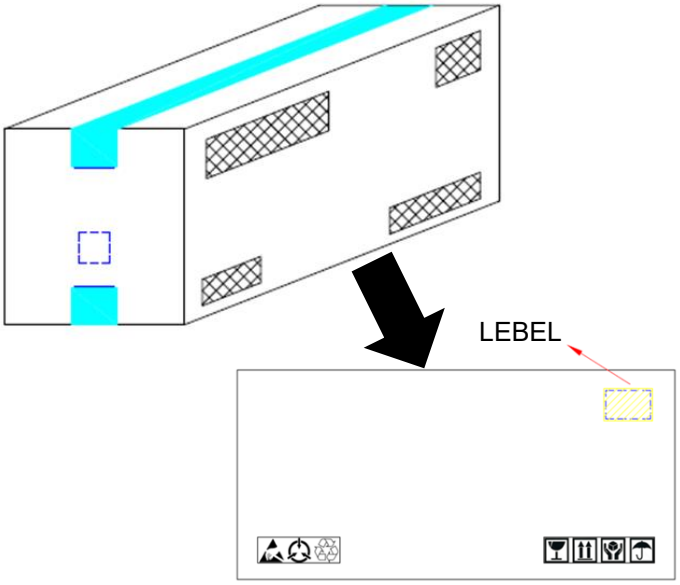
RECOMMENDED SOLDER MASK (Dimensions in mm unless otherwise stated)

Surface Mount Lead Forming (S/SL Type)	Long Creepage Distance For Surface Mount Type (Option SM)
	

TUBE SPECIFICATIONS (Dimensions in mm unless otherwise stated)

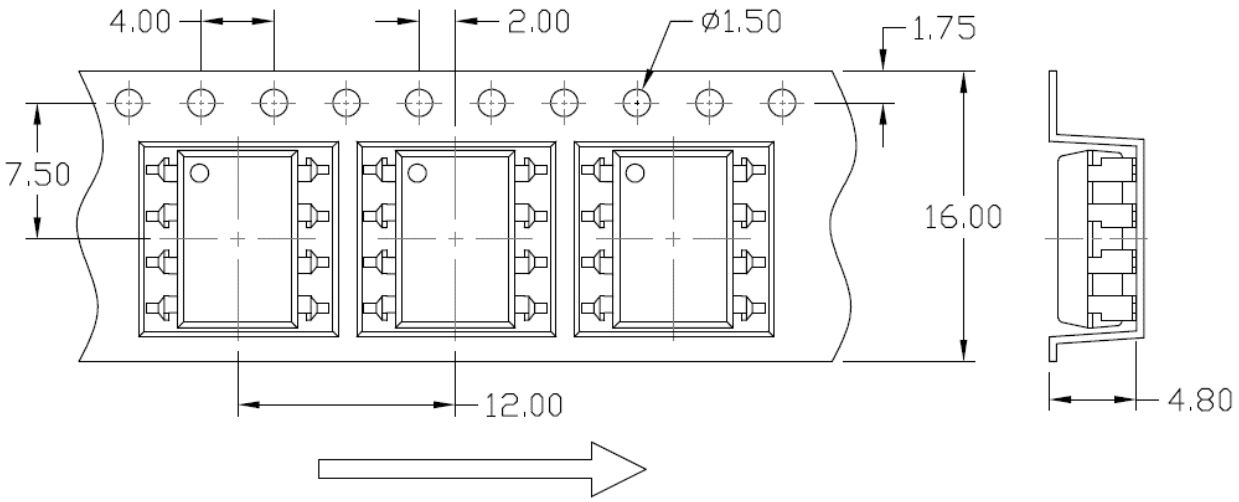
Standard DIP	Option M
 L x W x H = 12.3mm x 10mm x 500mm	 L x W x H = 12.3mm x 10mm x 500mm

BOX SPECIFICATIONS (Tube Type)

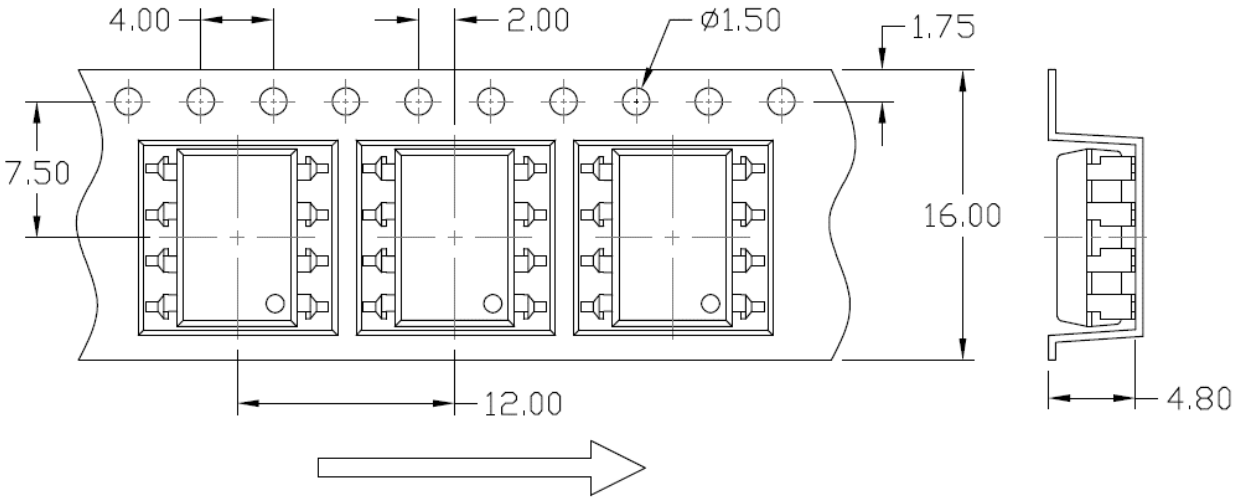
Inner Box	Outer Box
 L x W x H = 52.5cm x 10.7cm x 4.7cm	 L x W x H = 53.5cm x 23.5cm x 25.5cm

CARRIER TAPE SPECIFICATIONS (Dimensions in mm unless otherwise stated)

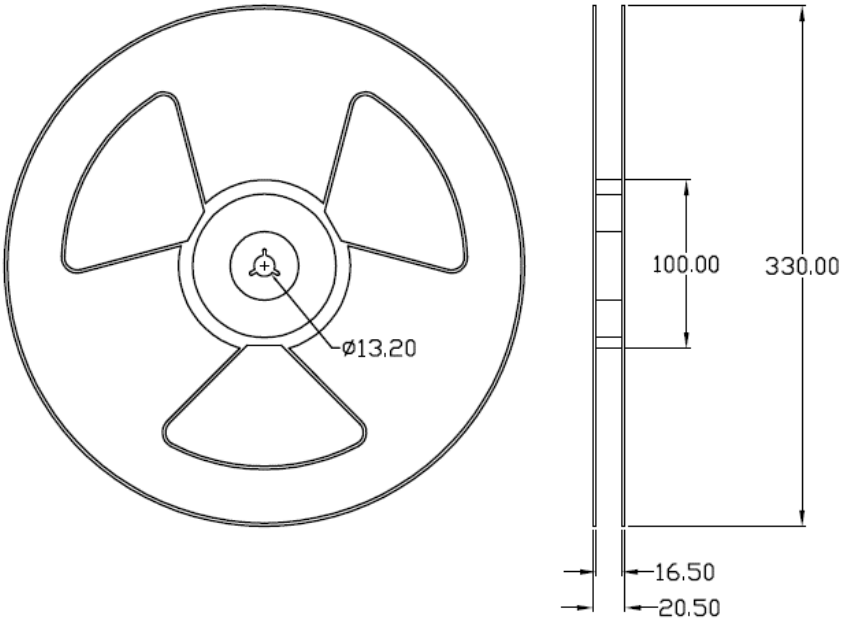
Option T1



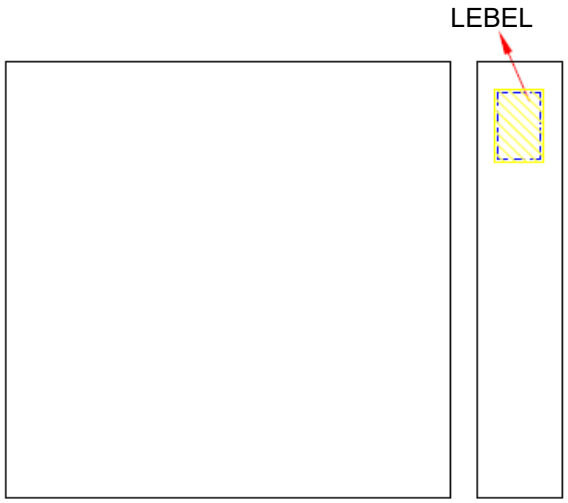
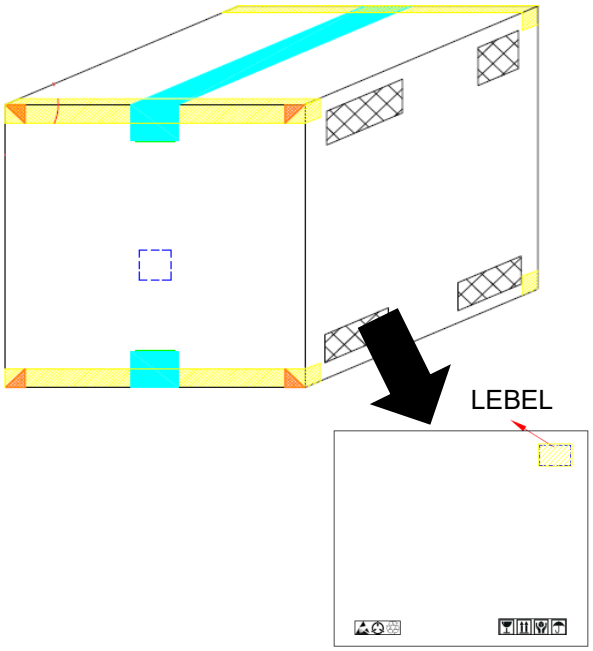
Option T2



REEL SPECIFICATIONS (Dimensions in mm unless otherwise stated)

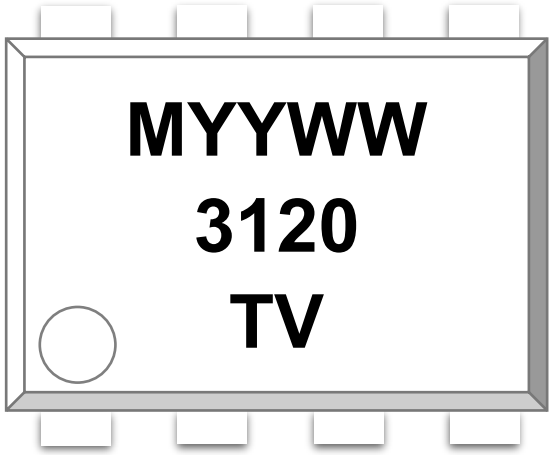


BOX SPECIFICATIONS (Reel Type)

INNER BOX	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



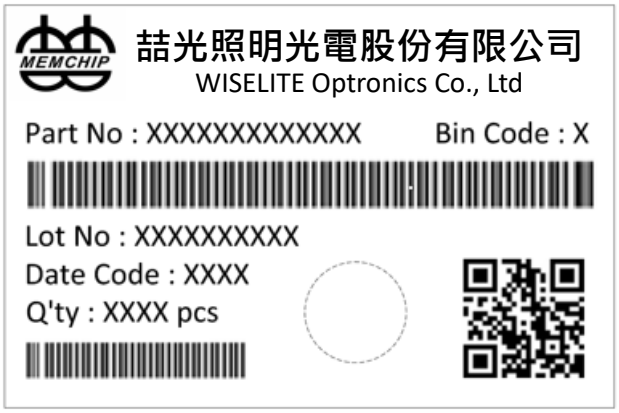
M : Company Abbr.
YY : Year date code
WW : 2-digit work week
3120 : Part Number
T : Factory identification mark
V :VDE Identification(Option)

ORDERING INFORMATION

MPCS-3120(Y)(Z)-GV

MPCS – Company Abbr.
3120 – Part Number
Y – Lead Form Option(None/M/S/SL/SM)
(None-7mm Clearance or M-10mm Clearance or S/SL-10mm Clearance or SM-11.8mm Clearance)
Z – Tape and Reel Option(None/T1/T2)
G – Green Option(G: Green, None: Non-Green)
V – VDE Option(V or None)

LABEL INFORMATION

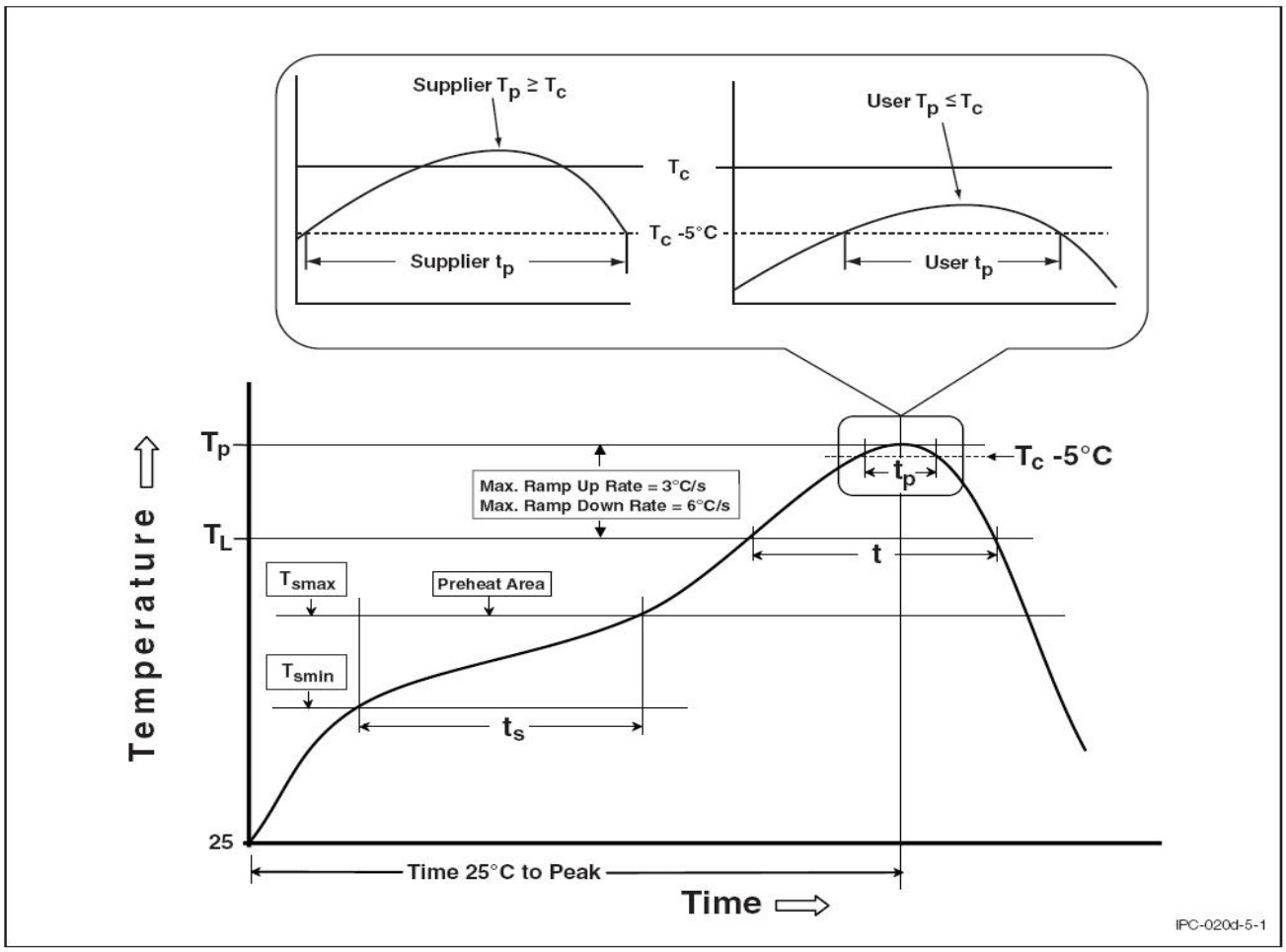


PACKING QUANTITY

Option	Quantity	Quantity – Inner box	Quantity – Outer box
None	45 Units/Tube	32 Tubes/Inner box	10 Inner box/Outer box = 14.4k Units
M	45 Units/Tube	32 Tubes/Inner box	10 Inner box/Outer box = 14.4k Units
S(T1)	1000 Units/Reel	3 Reels/Inner box	5 Inner box/Outer box = 15k Units
S(T2)	1000 Units/Reel	3 Reels/Inner box	5 Inner box/Outer box = 15k Units
SL(T1)	1000 Units/Reel	3 Reels/Inner box	5 Inner box/Outer box = 15k Units
SL(T2)	1000 Units/Reel	3 Reels/Inner box	5 Inner box/Outer box = 15k Units
SM(T1)	1000 Units/Reel	3 Reels/Inner box	5 Inner box/Outer box = 15k Units
SM(T2)	1000 Units/Reel	3 Reels/Inner box	5 Inner box/Outer box = 15k Units

REFLOW INFORMATION

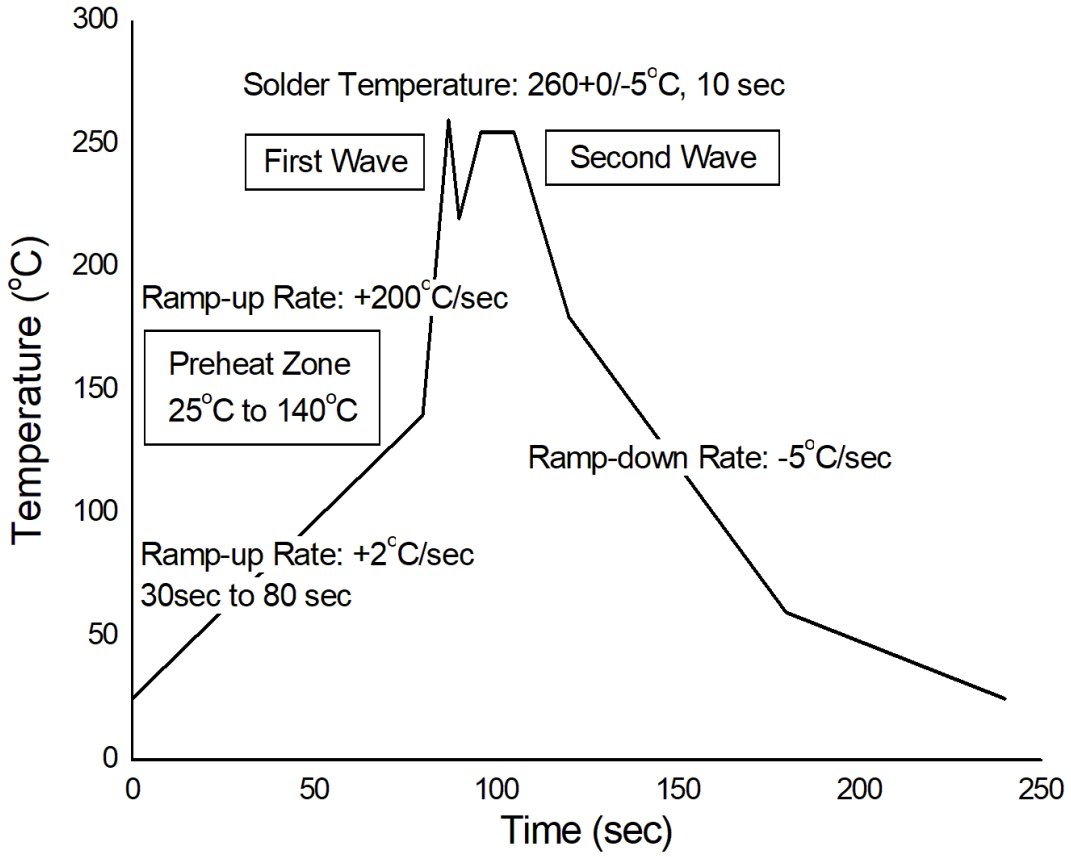
REFLOW PROFILE



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.