MPCS-611 Series

High Speed 10MBit/s Photo Coupler

Description

The MPCS-611 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 an open collector Schottky clamped transistor. The internal shield provides a guaranteed common mode transient immunity specification of 10,000 V/µs for the MPCS-611.

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 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.

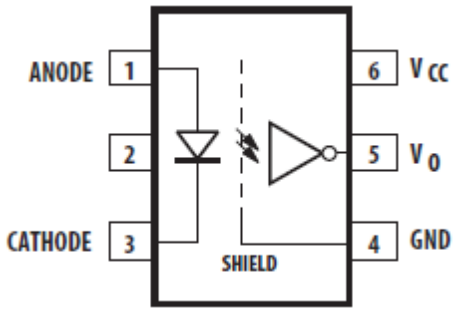
•Safety standards –

-UL-approved: UL1577, File No.E508942

-VDE-approved: DIN EN IEC 60747-5-5 (VDE 0884-5):2021-10; EN IEC 60747- 5-5:2020, Certificate No.40054662

-CQC-approved: GB4943.1-2011, Certificate No.CQC21001290290

SCHEMATIC



PIN DEFINITION

1.Anode	4.GND
3.Cathode	5.VO
	6.VCC

PACKAGE

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

ABSOLUTE MAXIMUM RATINGS					
PARAMETER	SYMBOL	Min	Max	UNIT	Note
Storage Temperature	T_{stg}	-55	125	°C	-
Operating Temperature	T_{opr}	-40	110	°C	-
Average 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_I	-	85	mW	-
Lead Solder Temperature	T_{sol}	-	260	°C	-

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

RECOMMENDED OPERATION CONDITIONS				
PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Operating Temperature	TA	-40	110	°C
Supply Voltage	VCC	4.5	5.5	V
Input Current High Level	IFLH	5	15	mA
Input Voltage Low Level	VFHL	-3.0	0.8	V
Fan Out (at RL = 1 KΩ)	N		5	TTL Loads
Output Pull-up Resistor	RL	330	4K	Ω

Electrical Specifications (DC)

Over recommended operating conditions unless otherwise specified. All typicals at VCC = 5V, TA = 25°C.

ELECTRICAL OPTICAL CHARACTERISTICS							
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION	NOTE
INPUT CHARACTERISTICS							
High Level Output Current	I_{OH}	-	0.35	100	μA	VCC = 5.5V, VO = 5.5V, VF = 0.8V	-
Input Threshold Current	I_{TH}	-	1.0	5.0	mA	VCC = 5.5V, VO = 0.6V, IOL > 13 mA	-
Low Level Output Voltage	V_{OL}	-	0.25	0.6	V	VCC = 5.5V, IF = 5 mA, IOL(Sinking) = 13 mA	-
High Level Supply Current	I_{CCH}	-	5.6	7.5	mA	VCC = 5.5V, IF = 0 mA,	-
Low Level Supply Current	I_{CCL}	-	5.2	10.5	mA	VCC = 5.5V, IF = 10 mA	-
Input Forward Voltage	V_F	1.6	2.0	2.4	V	IF = 10 mA	-
Input Reverse Breakdown Voltage	BV_R	5	-	-	V	IR = 10 μA	-
Input Capacitance	C_{IN}	-	60	-	pF	f = 1 MHz, VF = 0V	-

Switching Specifications (AC)

Over recommended operating conditions TA = –40°C to 100°C, VCC = 5V, IF = 7.5 mA unless otherwise specified.

All typicals at VCC = 5V, TA = 25 °C.

SWITCHING SPECIFICATION							
Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Condition	Note
Propagation Delay Time to High Output Level	tPLH	-	60	75	ns	VCC = 5V, IF = 7.5 mA, RL = 350Ω, CL = 15 pF	-
Propagation Delay Time to Low Output Level	tPHL	-	35	75			-
Pulse Width Distortion	|tPHL-tPLH|	-	25	40			-
Propagation Delay Skew	tPSK	-	-	50			-
Output Rise Time (10 to 90%)	tr	-	30	-			-
Output Fall Time (90 to 10%)	tf	-	3	-			-
Common mode transient immunity at high level output	|CMH|	10	15	-	kV/μs	VCC = 5V, IF = 0 mA, VO(MIN) = 2V,RL = 350Ω, VCM = 1000V	1
Common mode transient immunity at low level output	|CML|	10	15	-	kV/μs	VCC = 5V, IF = 7.5 mA, VO(MAX) = 0.8V,RL = 350Ω, VCM = 1000V	2

Note1 CMH 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, VOUT > 2.0V).

Note2 CML 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, VOUT > 0.8V).

ISOLATION CHARACTERISTIC								
Parameter	Symbo	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

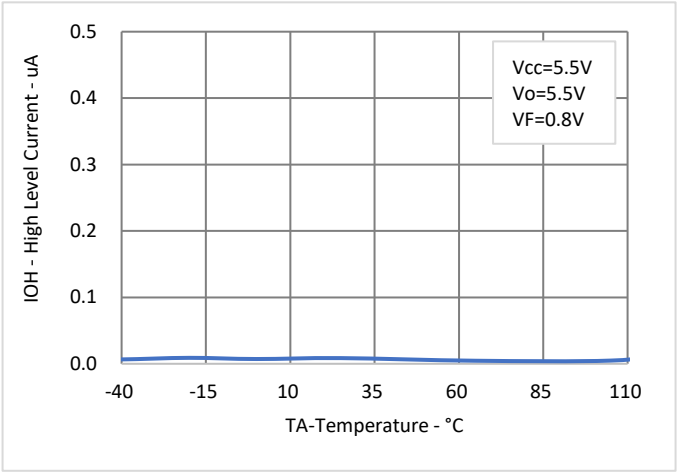


Fig.2 Low Level Output Voltage vs. Temp

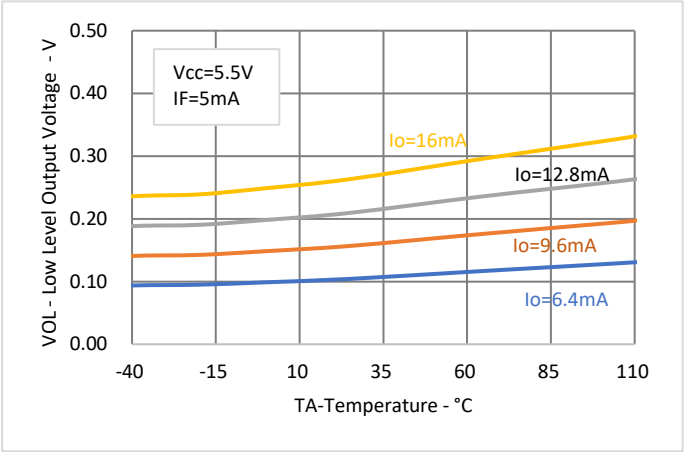


Fig.3 Input Diode Forward Characteristic

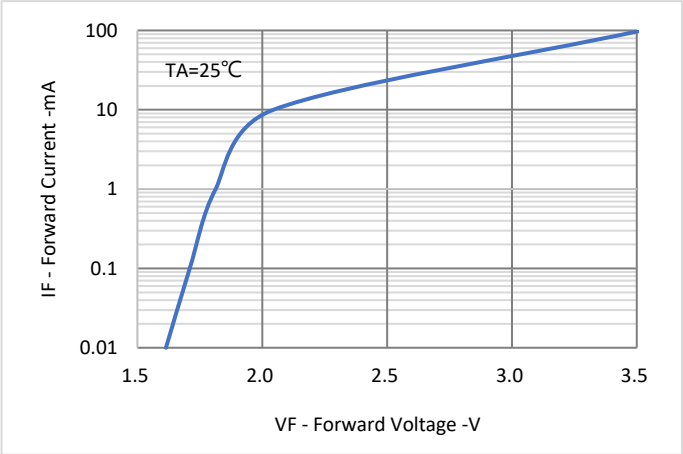


Fig.4 Output Voltage vs. Input Current

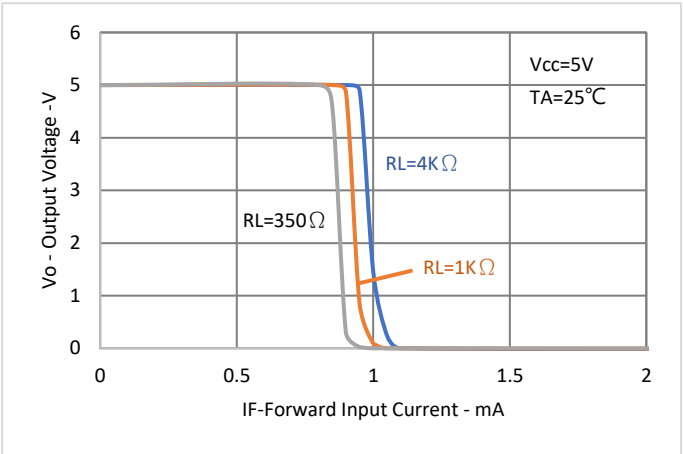


Fig.5 Low Level Output Current vs. Temp

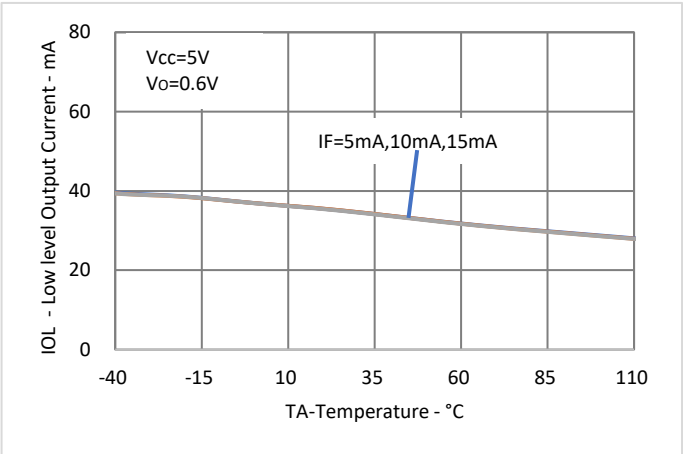


Fig.6 Propagation Delay vs. Temperature

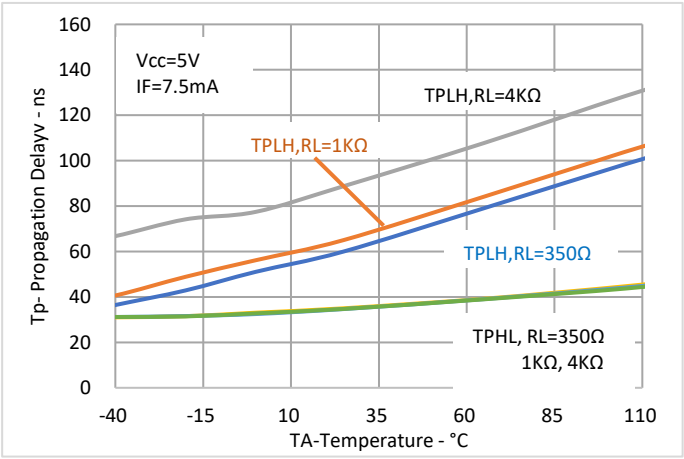


Fig.7 Propagation Delay vs. Input Current

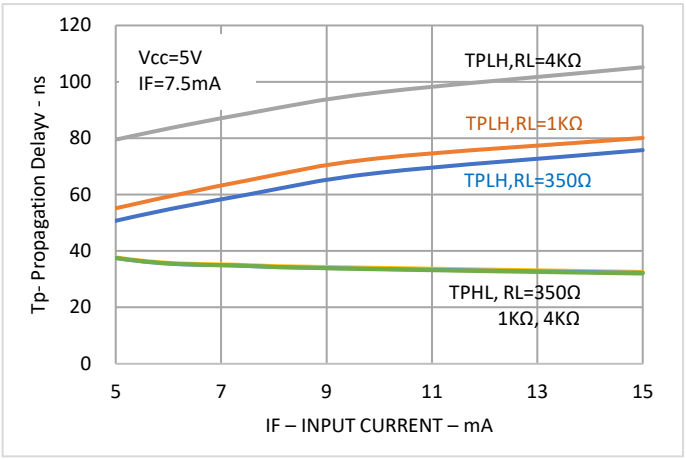


Fig.8 Pulse Width Distortion vs. Temperature

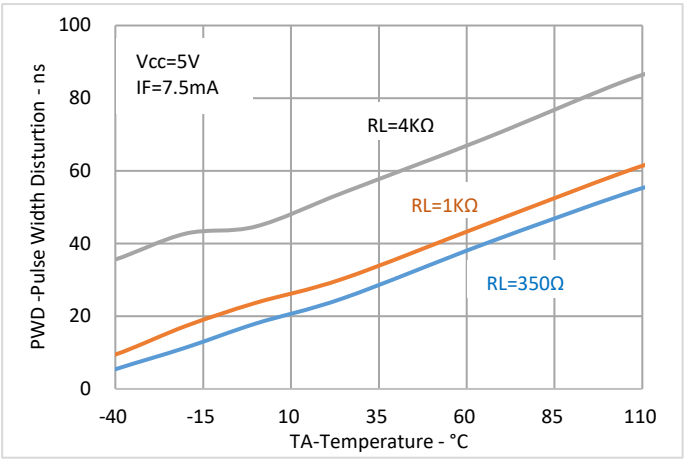


Fig.9 Rise and Fall Time vs. Temperature

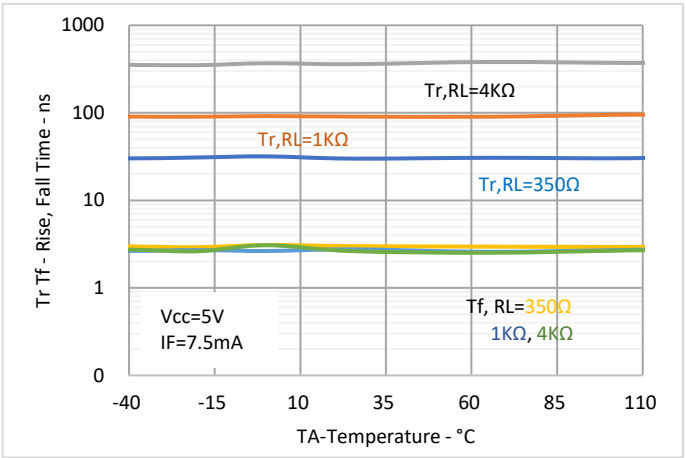


Fig.10 Input Threshold Current vs. Temp

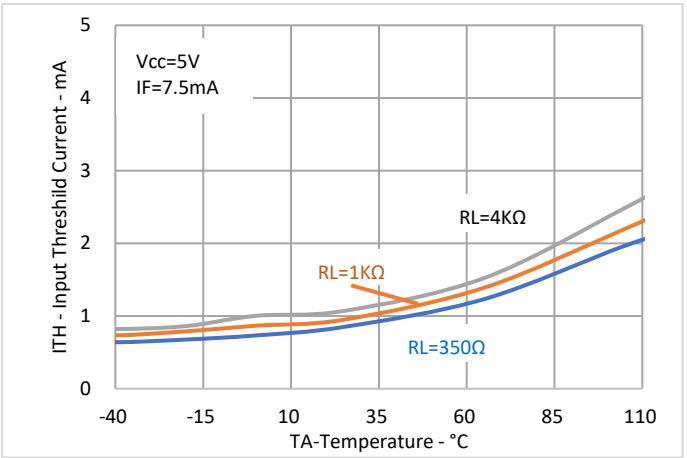


Fig.11 Test Circuit for tPHL and tPLH

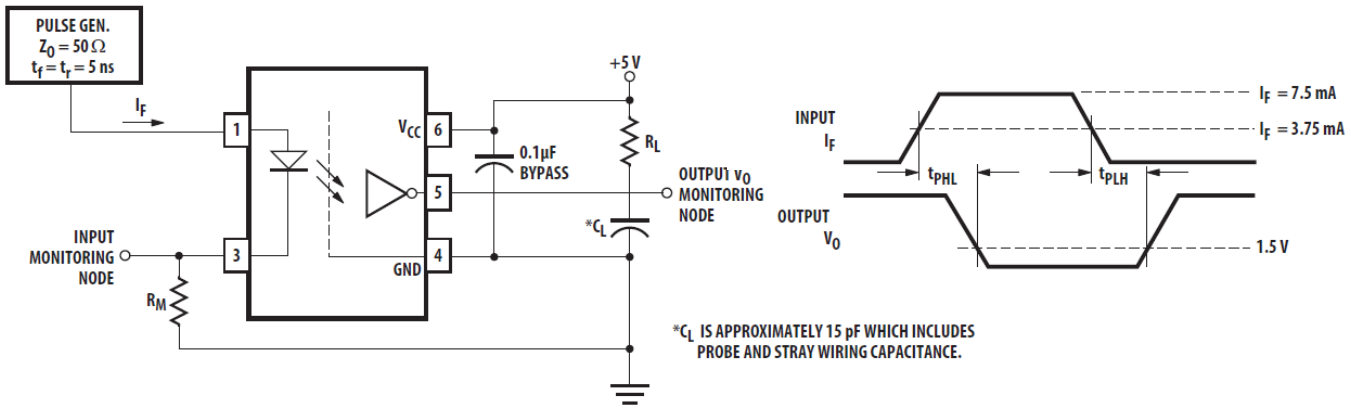
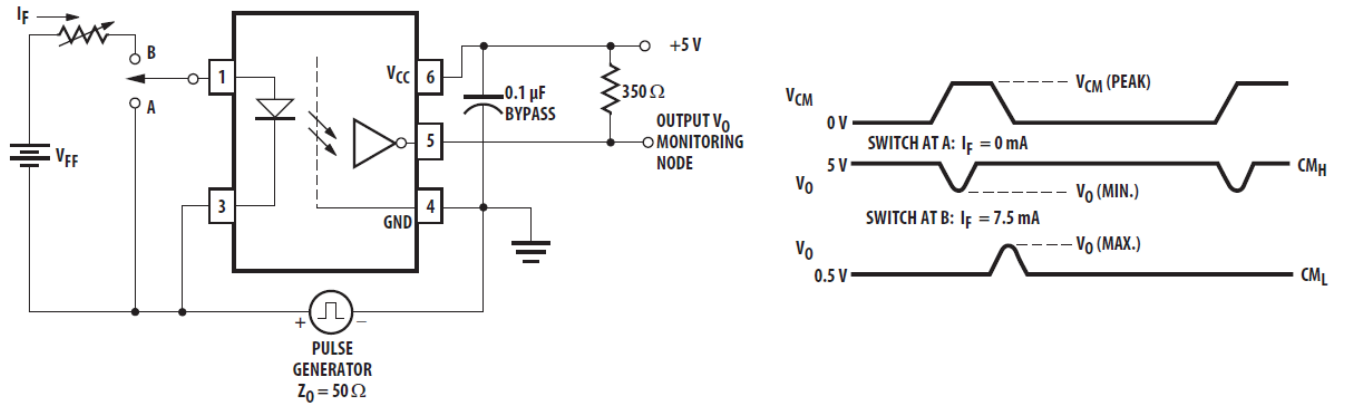


Fig.12 Test Circuit for Common Mode Transient Immunity and Typical Waveforms

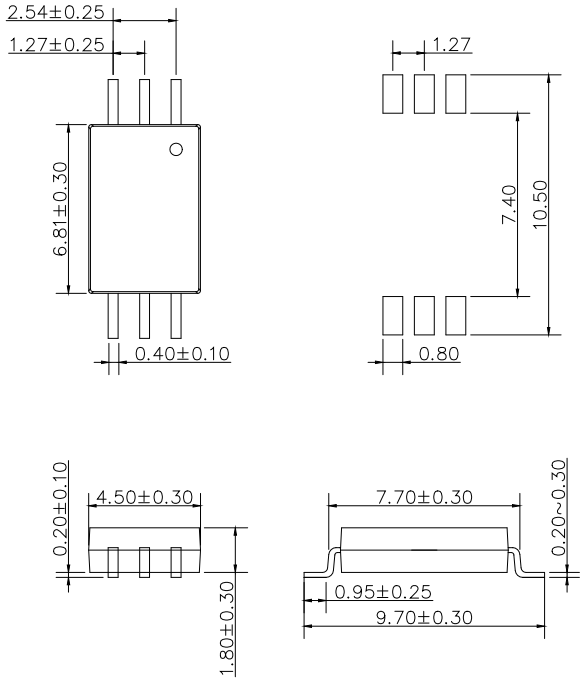


VCM = 1KV

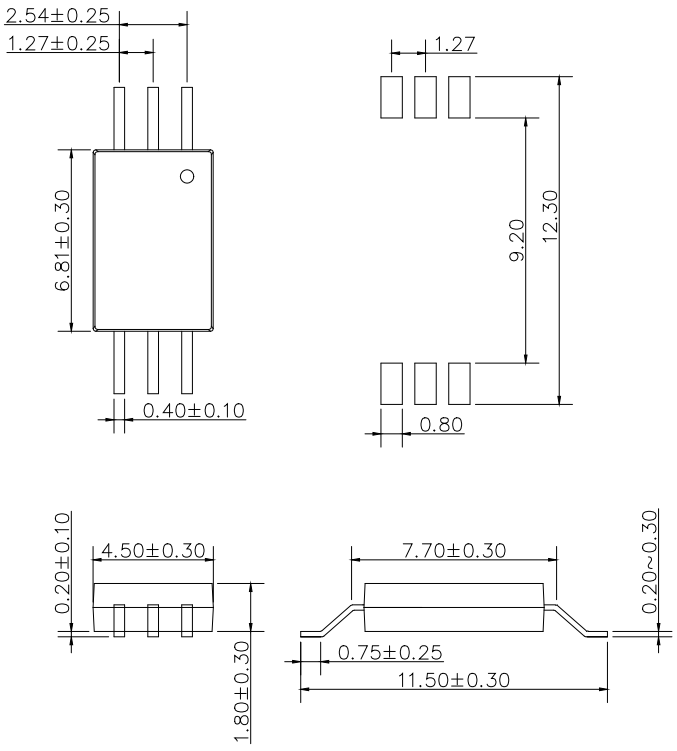
PACKAGE DIMENSIONS (Dimensions in mm unless otherwise stated)

Surface Mount Lead Forming

P type Dimension

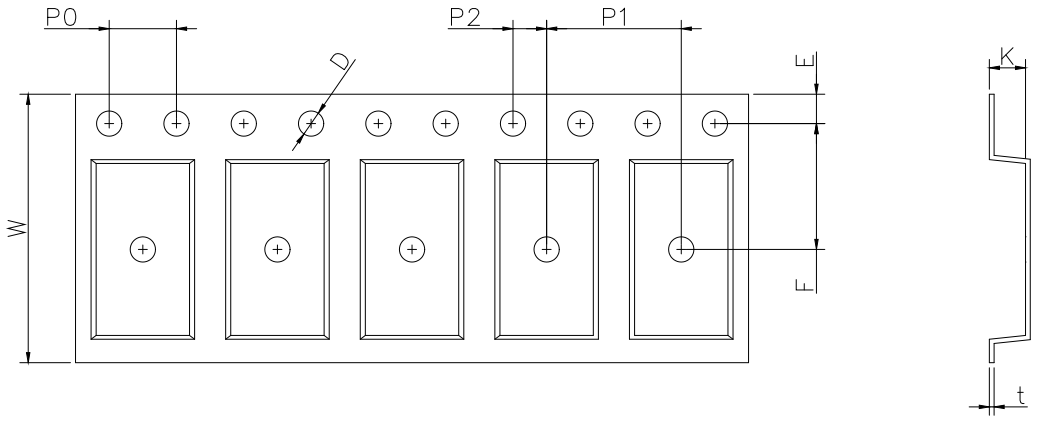


W type Dimension



TAPING DIMENSIONS (Dimensions in mm unless otherwise stated)

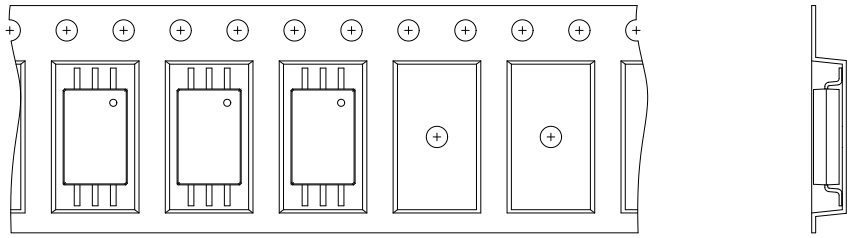
P type Taping Dimensions



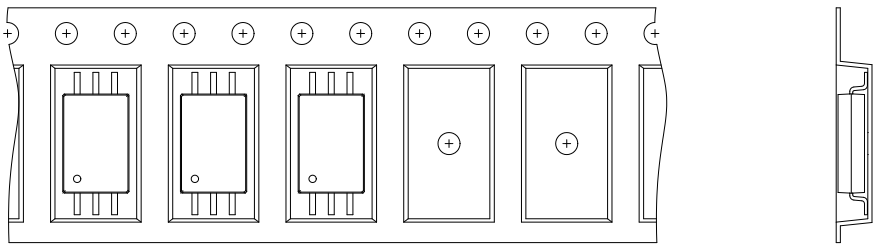
Dimension Symbol	D	E	F	P0	P1	P2	t	W	K
Dimension (mm)	1.5±0.1	1.75±0.1	7.5±0.1	4.0±0.1	8.0±0.1	2.0±0.1	0.3±0.1	16.0±0.3	2.15±0.1

Tape & Reel Packing Specifications

Option T1



Option T2



MARKING INFORMATION

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

ORDERING INFORMATION

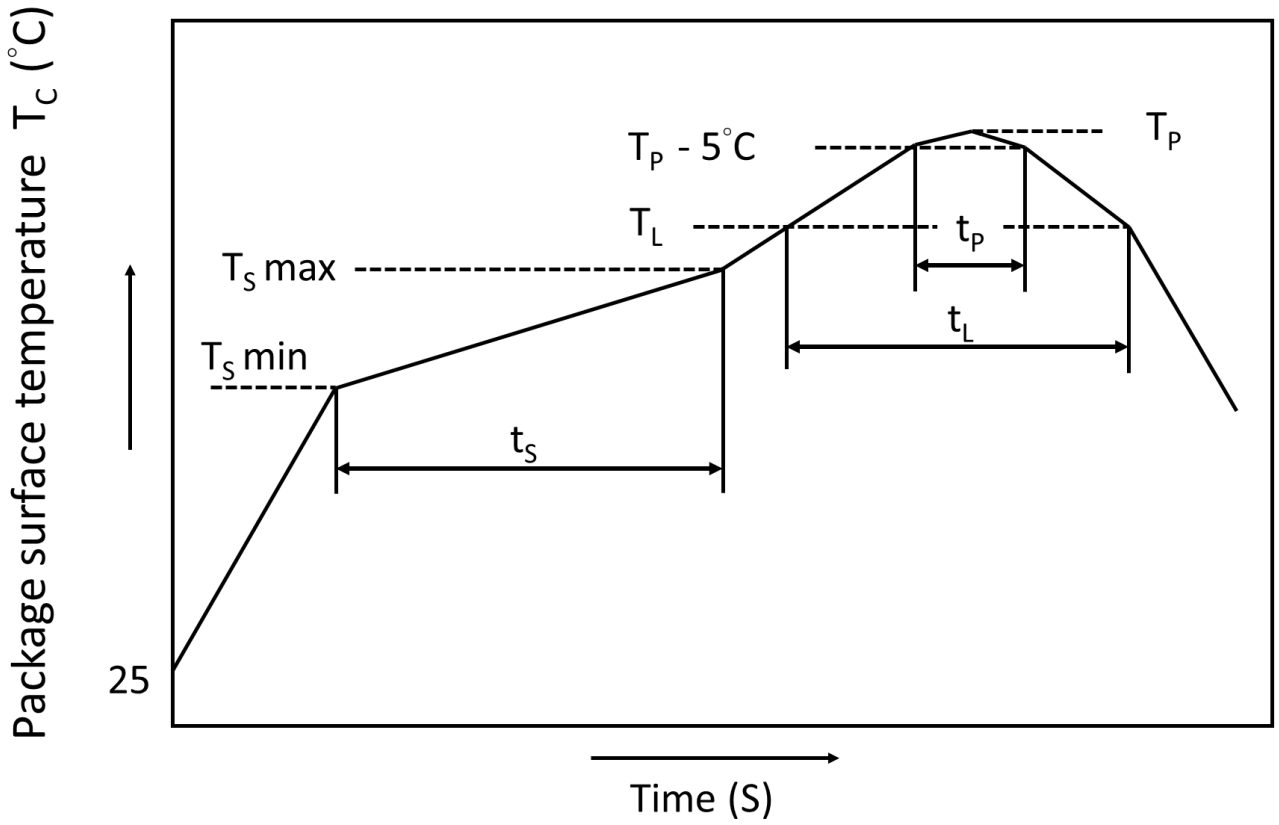
MPCS-611(P/W)-ZV

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)

Precautions for Soldering

IR Reflow soldering

One time soldering reflow is recommended within the condition of temperature and time profile shown below. Do not solder more than three times.



	Symbol	Min	Max	Unit
Preheat temperature	T_S	150	200	°C
Preheat time	t_S	60	120	s
Ramp-up rate (T_L to T_P)			3	°C/s
Liquidus temperature	T_L	217		°C
Time above T_L	t_L	60	100	s
Peak Temperature	T_P		260	°C
Time during which T_C is between (T_P - 5) and T_P	t_P		20	s
Ramp-down rate			6	°C/s

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- 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 MEMCHIP 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 MEMCHIP'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.

版本 Rev.	生效日期 Effective Date	作者 Applicant	內容 Change Description
1.0	2022/7/26	陳秉慈	新制訂