



MPCS-481 Series

IPM Photo Coupler

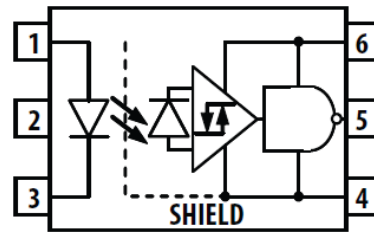
Description

The MPCS-481 series fast speed photocoupler contains a LED and photo detector with built-in Schmitt trigger to provide logic-compatible waveforms, eliminating the need for additional wave shaping. The totem pole output eliminates the need for a pull up resistor and allows for direct drive Intelligent Power Module or gate drive. Minimized propagation delay difference between devices makes these optocouplers excellent solutions for improving inverter efficiency through reduced switching dead time.

Features

- Totem pole output
- Truth Table Guaranteed: VCC from 4.5V to 30V
- Performance Specified for Common IPM Applications Over Industrial Temperature Range.
- Short Maximum Propagation Delays
- Minimized Pulse Width Distortion (PWD)
- Very High Common Mode Rejection (CMR)
- Hysteresis
- 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	6.V _{DD}
	5.VO
3.Cathode	4.GND

PACKAGE





MPCS-481 Series

IPM Photo Coupler

Applications

- IPM Interface Isolation
- Isolated IGBT/MOSFET Gate Drive
- AC and Brushless DC Motor Drives
- Industrial Inverters
- General Digital Isolation

TRUTH TABLE	
LED	OUT
ON	L
OFF	H

Note: A 0.1 μ F bypass capacitor must be connected between Pin 4 and 6.

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	-
Average Forward Input Current	I _F	-	20	mA	-
Reverse Input Voltage	V _R	-	5	V	-
Output Collector Current	I _o		50	mA	
Supply Voltage	V _{CC}	0	35	V	
Output Collector Voltage	V _o	-0.5	V _{cc}	V	-
Total Package Power Dissipation	P _T	-	145	mW	-
Lead Solder Temperature	T _{sol}	-	260	°C	-

Note: A ceramic capacitor (0.1 μ F) should be connected between pin 6 and pin 4 to stabilize the operation of a high gain linear amplifier. Otherwise, this Photocoupler may not switch properly. The bypass capacitor should be placed within 1 cm of each pin.



RECOMMENDED OPERATION CONDITIONS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Operating Temperature	T _A	-40	110	°C
Supply Voltage ¹	V _{CC}	4.5	30	V
Input Current (ON) ²	I _{F(ON)}	1.6	5	mA
Input Voltage (OFF)	V _{F(OFF)}		0.8	V

Note 1: Detector requires a VCC of 4.5 V or higher for stable operation as output might be unstable if VCC is lower than 4.5 V. Be sure to check the power ON/OFF operation other than the supply current.

Note 2: The initial switching threshold is 1.6 mA or less. It is recommended that 2.2 mA be used to permit at least a 20% LED degradation guard band.

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	I _F =10mA	-
Input Forward Voltage Temperature Coefficient	ΔV _F /ΔT	-	-1.237	-	mV/°C	I _F =10mA	-
Input Reverse Voltage	BV _R	5	-	-	V	I _R = 10μA	-
Input Threshold Current (High to Low)	I _{FHL}	-	0.25	1.5	mA	V _{CC} = 30 V, V _O < 5V	-
Input Threshold Voltage (Low to High)	V _{FLH}	0.8	-	-	V	V _{CC} = 30 V, V _O > 5V	-
Input Capacitance	C _{IN}	-	60	-	pF	f = 1 MHz, V _F = 0 V	2
OUTPUT CHARACTERISTICS							
High Level Supply Current	I _{CCH}	-	-	3.0	mA	V _{CC} = 5.5 V, V _F = 0V, I _O = 0 mA	-
			1.9	3.0	mA	V _{CC} = 30 V, V _F = 0V, I _O = 0 mA	
Low Level Supply Current	I _{CCL}	-	-	3.0	mA	V _{CC} = 5.5 V, I _F = 5 mA, I _O = 0 mA	-
			2.0	3.0	mA	V _{CC} = 30 V, I _F = 5 mA, I _O = 0 mA	
High level output current	I _{OH}	-	-	-160	mA	V _{CC} = 5.5V, V _F = 0V, V _O = GND	1
		-	-	-200		V _{CC} = 20V, V _F = 0V, V _O = GND	
Low level output current	I _{OL}	160	-	-	mA	V _O =V _{CC} = 5.5V, I _F = 5 mA	1
		200	-	-		V _O =V _{CC} = 20V, I _F = 5 mA	
High level output voltage	V _{OH}	V _{CC} - 0.5	V _{CC} - 0.05	-	V	I _{OL} = -6.5mA	-
Low level output voltage	V _{OL}	-	0.09	0.5	V	I _{OL} = 6.5mA	-

Rev: 1.5

Release Date: 2022/8/8



MPCS-481 Series

IPM Photo Coupler

Specified over recommended temperature ($T_A = -40^{\circ}\text{C}$ to $+110^{\circ}\text{C}$, $+4.5\text{V} \leq V_{CC} \leq 30\text{V}$), $I_F(\text{ON}) = 1.6\text{mA}$ to 5mA , $V_F(\text{OFF}) = 0\text{V}$ to 0.8V , unless otherwise specified. All typicals at $T_A = 25^{\circ}\text{C}$.

Note 1: Duration of output short circuit time should not exceed $10\ \mu\text{s}$.

Note 2: Input capacitance is measured between pin 1 and pin 3.

SWITCHING SPECIFICATION							
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION	NOTE
SWITCHING CHARACTERISTICS							
Propagation Delay Time to Output Low Level	t_{PHL}	-	90	220	ns	$f = 10\text{kHz}$, Duty Cycle = 50% $I_F = 2\text{mA}$, $V_{CC} = 30\text{V}$	1
Propagation Delay Time to Output High Level	t_{PLH}	-	110	220	ns		1
Pulse Width Distortion	PWD	-	20	120	ns		2
Propagation Delay Difference Between Any Two Parts	PDD ($t_{\text{PHL}} - t_{\text{PLH}}$)	-200	-	+200	ns		3
Rise Time	t_r	-	6	-	ns		
Fall Time	t_f	-	7	-	ns		
Common Mode Transient Immunity at Logic High	CM_H	20	-	-	$\text{kV}/\mu\text{s}$	$V_F = 0\text{V}$ $V_{CC} = 5\text{V}$, $T_A = 25^{\circ}\text{C}$, $V_{CM} = 1.5\text{KV}$	4
Common Mode Transient Immunity at Logic Low	CM_L	20	-	-	$\text{kV}/\mu\text{s}$	$I_F = 4\text{mA}$ $V_{CC} = 5\text{V}$, $T_A = 25^{\circ}\text{C}$, $V_{CM} = 1.5\text{KV}$	4

Over recommended operating conditions $T_A = -40^{\circ}\text{C}$ to 105°C , $V_{CC} = +4.5\text{V}$ to 30V , $I_F(\text{ON}) = 1.6\text{mA}$ to 5mA , $V_F(\text{OFF}) = 0\text{V}$ to 0.8V , unless otherwise specified. All typicals at $T_A = 25^{\circ}\text{C}$.

Note 1: The t_{PLH} propagation delay is measured from the 50% point on the leading edge of the input pulse to the 1.3 V point on the leading edge of the output pulse. The t_{PHL} propagation delay is measured from the 50% point on the trailing edge of the input pulse to the 1.3 V point on the trailing edge of the output pulse.

Note 2: Pulse Width Distortion (PWD) is defined as $|t_{\text{PHL}} - t_{\text{PLH}}|$ for any given device.

Note 3: The difference of t_{PLH} and t_{PHL} between any two devices under the same test condition.

Note 4: CM_H is the maximum slew rate of the common mode voltage that can be sustained with the output voltage in the logic high state, $V_O > 2.0\text{V}$. CM_L is the maximum slew rate of the common mode voltage that can be sustained with the output voltage in the logic low state, $V_O < 0.8\text{V}$. Note: Equal value split resistors ($R_{in}/2$) must be used at both ends of the LED.

ISOLATION CHARACTERISTIC

Parameter	Symbol	Device	Min.	Typ.	Max.	Unit	Test Condition	Note
Withstand Insulation Test Voltage	V_{ISO}	MPCS-481P	5000	-	-	V	RH \leq 40%-60%, t = 1min, T _A = 25 °C	1,2
		MPCS-481W						
Input-Output Resistance	R_{I-O}	-	-	10 ¹²	-	Ω	V _{I-O} = 500V DC	1

All Typical values at T_A = 25°C

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.

TEST CIRCUITS

Fig.1 Test Circuit for t_{PLH} · t_{PHL} · t_r and t_f

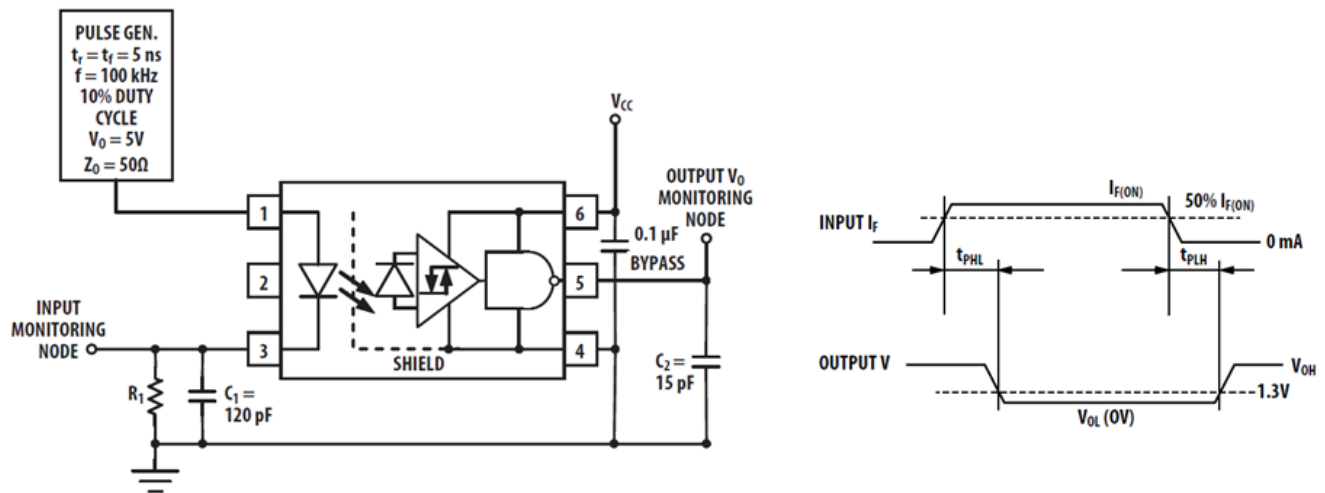
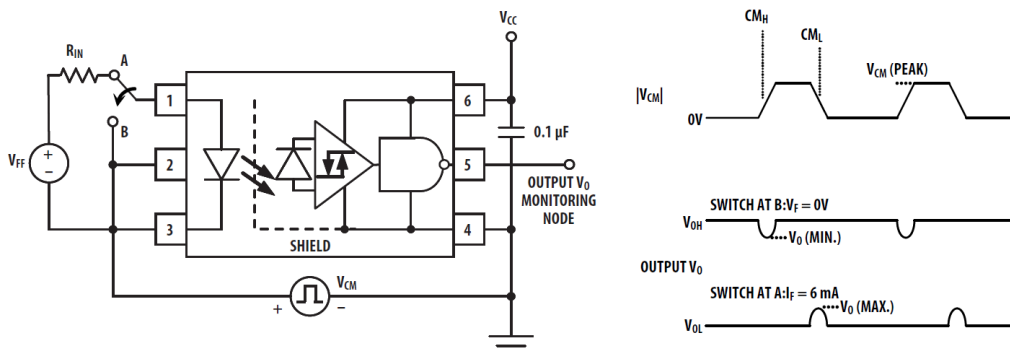


Fig.2 Common Mode Transient Immunity Test Circuit and Typical Waveforms





TYPICAL PERFORMANCE CURVES & TEST CIRCUITS

Fig.1 VOL vs. Temperature

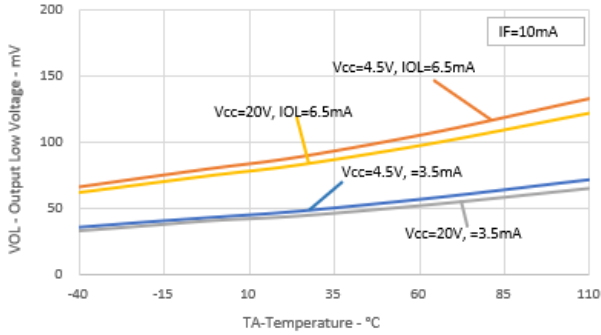


Fig.2 VOH vs. Temperature

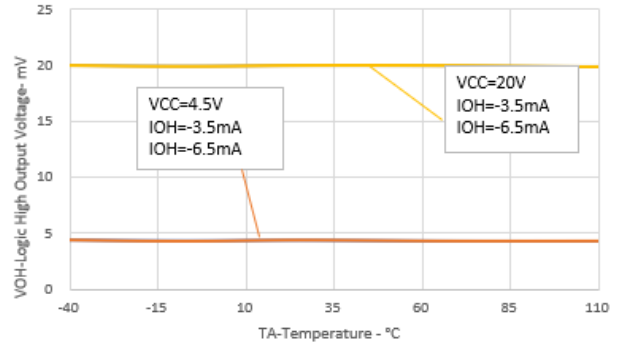


Fig.3 I_{FLH} Hysteresis

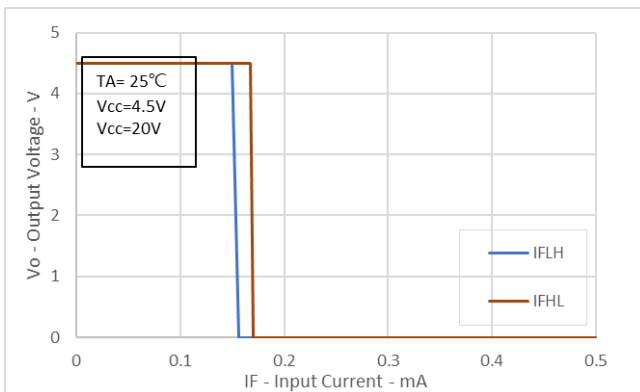


Fig.4 I_{FLH} vs. Temperature

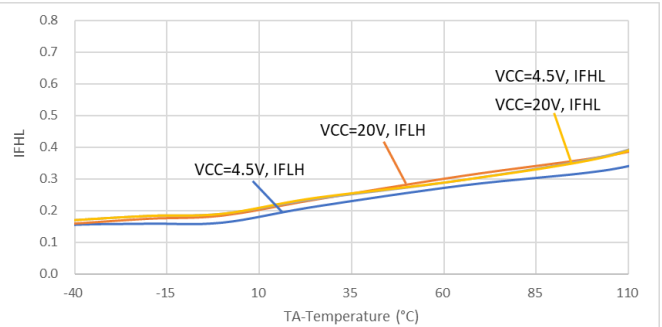


Fig.5 Input Current vs. Voltage

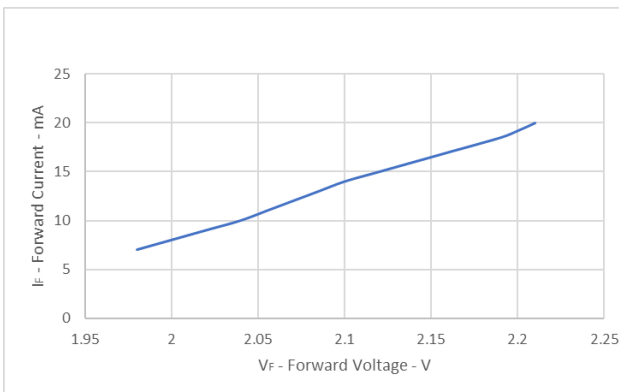
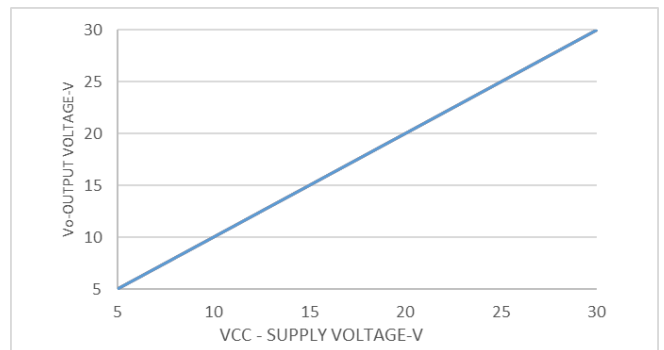


Fig. 6 Supply Voltage vs. Output Voltage





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Fig.7 Propagation Delays vs. Temperature

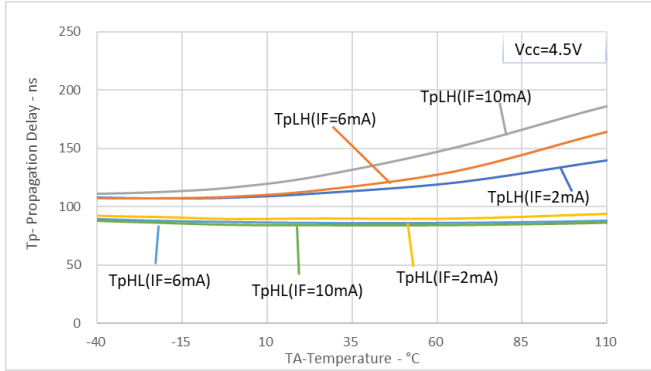


Fig.8 Propagation Delays vs. Temperature

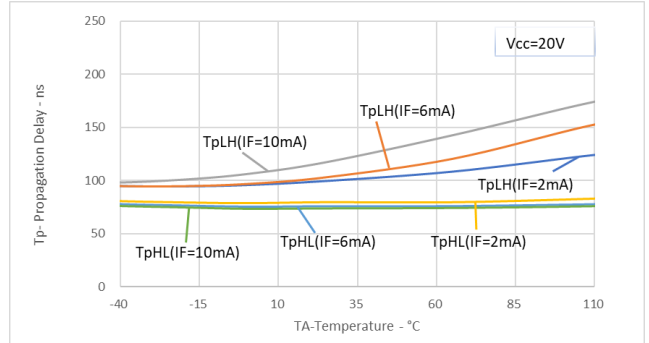
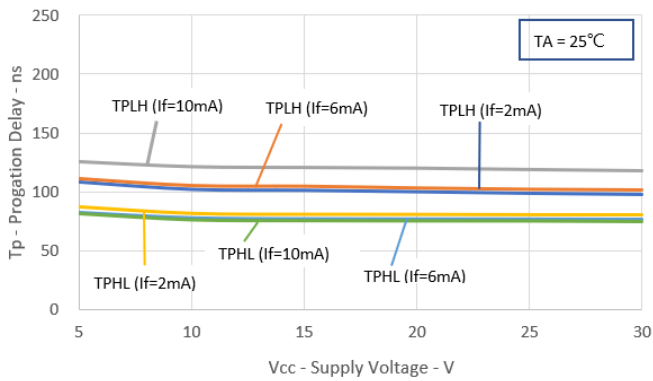


Fig.9 Propagation Delays vs. V_{CC}





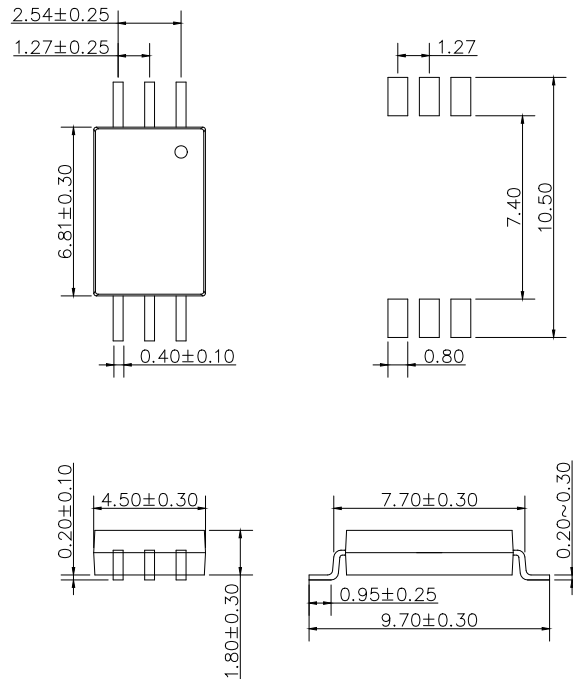
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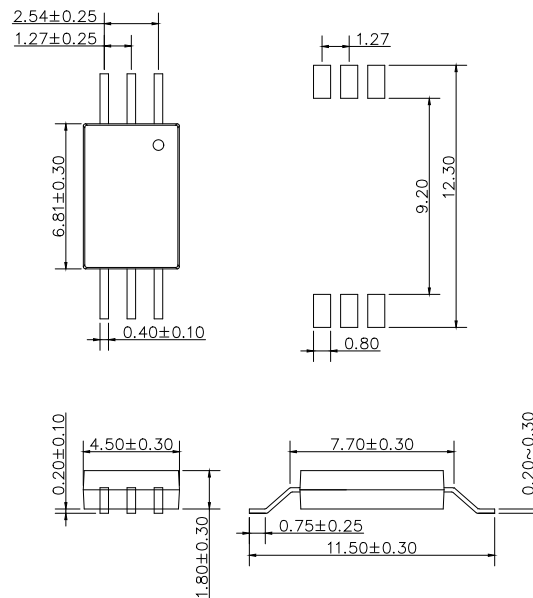
PACKAGE DIMENSIONS (Dimensions in mm unless otherwise stated)

Surface Mount Lead Forming

P type Dimension



W type Dimension



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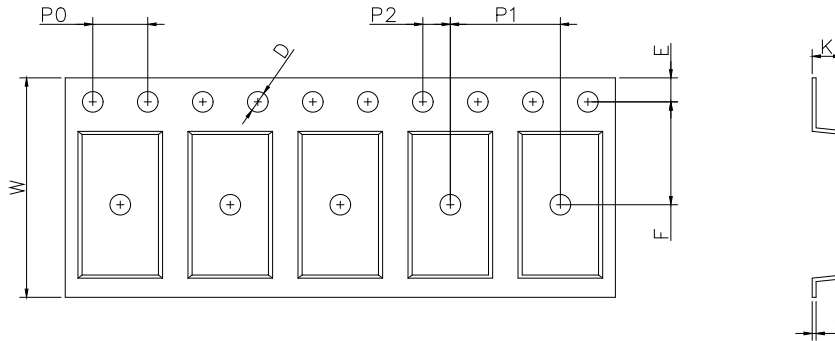


MPCS-481 Series

IPM Photo Coupler

TAPING DIMENSIONS (Dimensions in mm unless otherwise stated)

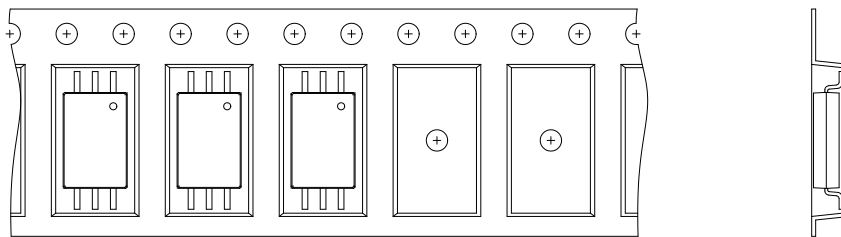
Taping Dimensions



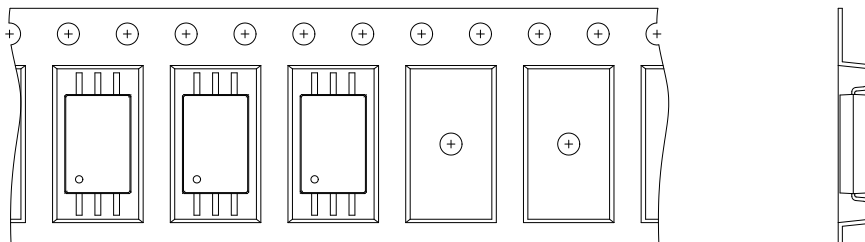
Dimension Symbol	D	E	F	P0	P1	P2	t	W	K
P type Dimension (mm)	1.5±0.1	1.75±0.1	7.5±0.1	4.0±0.1	8.0±0.1	2.0±0.1	0.3±0.1	16.0±0.3	2.15±0.1
W type Dimension (mm)	1.5±0.1	1.75±0.1	11.5±0.1	4.0±0.1	8.0±0.1	2.0±0.1	0.3±0.1	24.0±0.3	2.52±0.1

Tape & Reel Packing Specifications

Option T1



Option T2

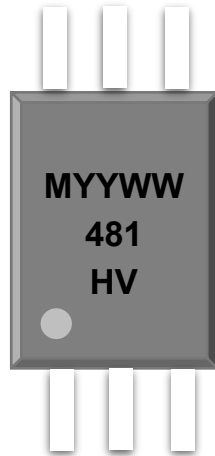




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MARKING INFORMATION



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

ORDERING INFORMATION

MPCS-481(P/W)-ZV

MPC – Company Abbr.

S – Stack

481 – Part Number

P/W – Lead Form Option

(P-9mm Clearance or W-11mm Clearance)

Z – Tape and Reel Option (T1/T2)

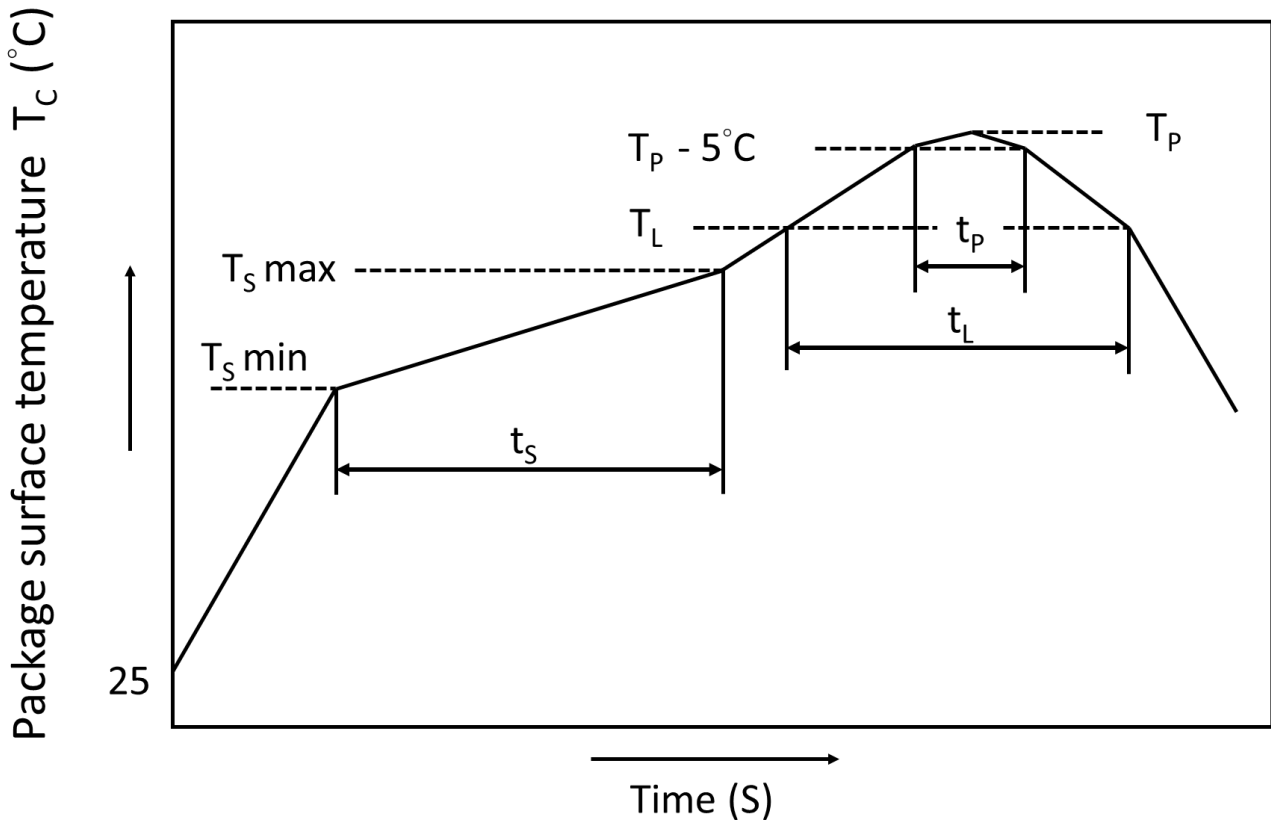
V – VDE Option (V or None)



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



DISCLAIMER

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- The characteristic curves shown in this datasheet are representing typical performance which are not guaranteed.
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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 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.



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版本 Rev.	生效日期 Effective Date	作者 Applicant	內容 Change Description
1.0	2022/3/4	陳秉慈	新制訂
1.1	2022/4/18	陳秉慈	TEST CIRCUITS 波型圖修改
1.2	2022/5/5	陳秉慈	調整 IFLH.VFHL 內容
1.3	2022/6/6	陳秉慈	調整 ELECTRICAL OPTICAL CHARACTERISTICS 備註說明 Note 1: Duration of output short circuit time should not exceed 10 μ s.
1.4	2022/7/12	陳秉慈	新增 Safety standards 內容
1.5	2022/8/8	陳秉慈	調整電壓輸入內容

单击下面可查看定价，库存，交付和生命周期等信息

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