MPCS-480 Series

LSOP6, DC Input, IPM Photo coupler

Description

The MPCS-480 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.

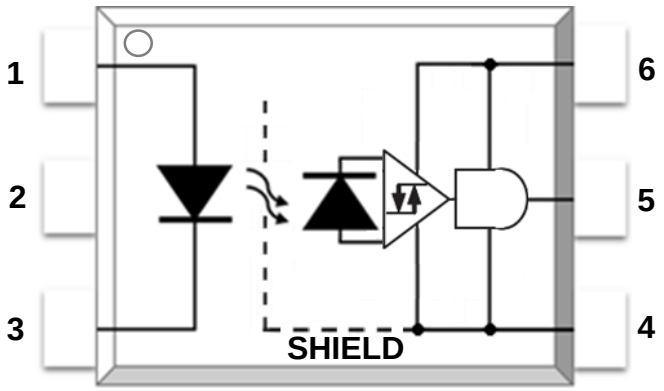
Features

- Totem pole output
- Truth Table Guaranteed: V_{CC} 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)
- Regulatory Approvals
  - UL - UL1577
  - VDE - EN60747-5-5(VDE0884-5)
  - CQC – GB4943.1, GB8898

Applications

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

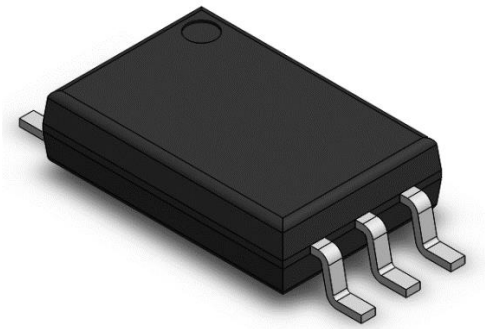
SCHEMATIC

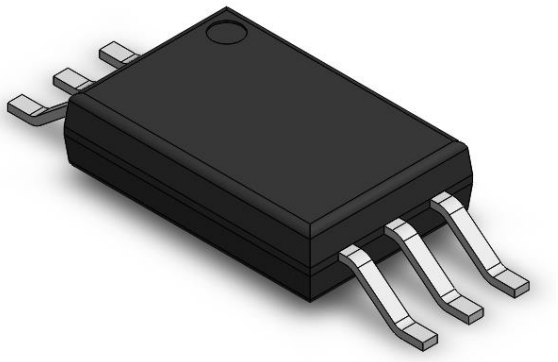


PIN DEFINITION

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

PACKAGE OUTLINE





TRUTH TABLE	
LED	OUT
ON	H
OFF	L

Note: A 0.1μF 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	35	V	-
Total Package Power Dissipation	P_T	-	145	mW	-
Lead Solder Temperature	T_{sol}	-	260	°C	-

Note: A ceramic capacitor (0.1 μF) 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 V_{CC} of 4.5 V or higher for stable operation as output might be unstable if V_{CC} 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							
Forward Voltage	V_F	1.6	2.0	2.4	V	I_F= 10 mA	-
Input Forward Voltage Temperature Coefficient	$\Delta V_F/ \Delta T$	-	-1.237	-	mV/°C	IF=10mA	-
Input Reverse Voltage	BV_R	5	-	-	V	IR = 10μA	-
Input Threshold Current (Low to High)	I_{FLH}	-	0.2	1.5	mA	VCC = 30 V, VO > 5V	-
Input Threshold Voltage (High to Low)	V_{FHL}	0.8	-	-	V	VCC = 30 V, VO < 5V	-
Input Capacitance	C_{IN}	-	60	-	pF	VF = 0 V, f = 1 MHz	1
OUTPUT CHARACTERISTICS							
High Level Supply Current	I_{CCH}	-	-	3.0	mA	V_{CC} = 5.5V, I_F = 5mA, I_O =0mA	-
		-	1.9	3.0	mA	V_{CC} = 30V, I_F = 5mA, I_O =0mA	
Low Level Supply Current	I_{CCL}	-	-	3.0	mA	V_{CC} = 5.5V, V_F = 0V, I_O =0mA	-
			2.0	3.0	mA	V_{CC} = 30V, V_F = 0V, I_O =0mA	
High level output current	I_{OH}	-	-	-100	mA	V_{CC} = 5.5V, I_F = 5mA, V_O = GND	2
		-	-	-200		V_{CC} = 20V, I_F = 5mA, V_O = GND	
Low level output current	I_{OL}	100	-	-	mA	V_O =V_{CC} = 5.5V, V_F = 0V	2
		200	-	-		V_O =V_{CC} = 20V, V_F = 0V	
High Level Output Voltage	V_{OH}	V_{CC} -0.5	V_{CC} -0.04	-	V	I_{OL} = -6.5mA	-
Low Level Output Voltage	V_{OL}	-	0.09	0.5	V	I_{OL} = 6.5mA	-

Specified over recommended temperature (TA = -40°C to +110°C, +4.5V ≤ VCC ≤ 30V), IF(ON) = 1.6mA to 5mA, VF(OFF) = 0V to 0.8V, unless otherwise specified. All typicals at TA = 25℃.

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

Note 2: Duration of output short circuit time should not exceed 10 μs.

SWITCHING SPECIFICATION

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION	NOTE
SWITCHING CHARACTERISTICS							
Propagation Delay Time to Output Low Level	t_{PHL}	-	110	220	ns	f = 10kHz, Duty Cycle = 50% I_F = 2mA, V_{CC} = 30V	1
Propagation Delay Time to Output High Level	t_{PLH}	-	90	220	ns		1
Pulse Width Distortion	P_{WD}	-	20	120	ns		2
Propagation Delay Difference Between Any Two Parts	P_{DD} (t_{PHL} - t_{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	-	-	kV/μs	I_F=4.0mA V_{CC}= 5V, T_A= 25 °C, V_{CM}= 1.5kV	4
Common Mode Transient Immunity at Logic Low	CM_L	20	-	-	kV/μs	I_F=0mA V_{CC}= 5V, T_A= 25 °C, V_{CM}= 1.5kV	4

Over recommended operating conditions T_A = -40° C to 105° C, V_{CC} = +4.5 V to 30 V, $I_{F(ON)}$ = 1.6 mA to 5 mA, $V_{F(OFF)}$ = 0 V to 0.8 V, unless otherwise specified. All typicals at T_A = 25°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 $|t_{PHL} - t_{PLH}|$ 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: CMH 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 V. CML 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 V. Note: Equal value split resistors (Rin/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-480P MPCS-480W	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

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

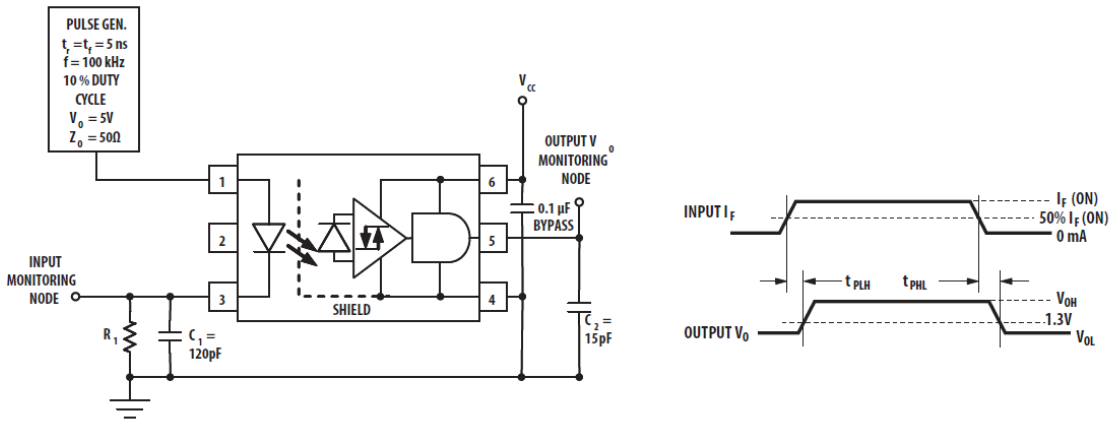
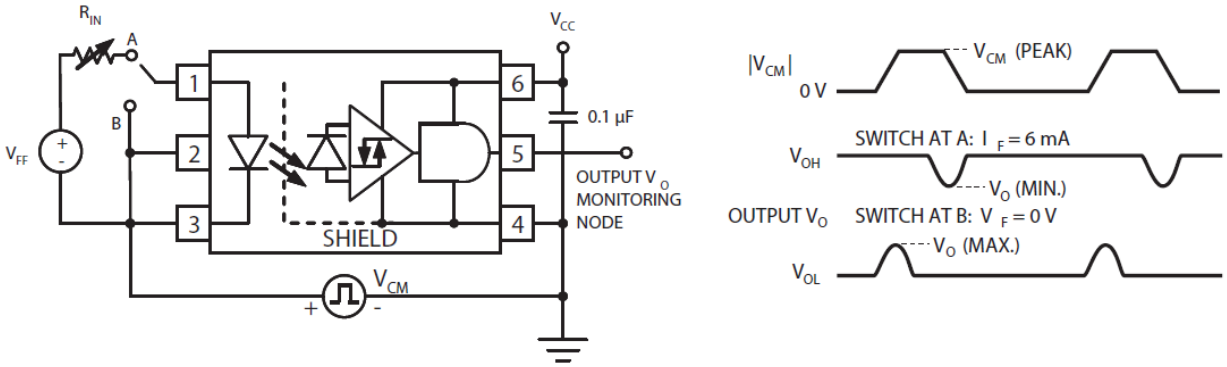


Fig.2 Common Mode Transient Immunity Test Circuit and Typical Waveforms



TYPICAL PERFORMANCE CURVES

Fig.1 V_{OL} vs. Temperature

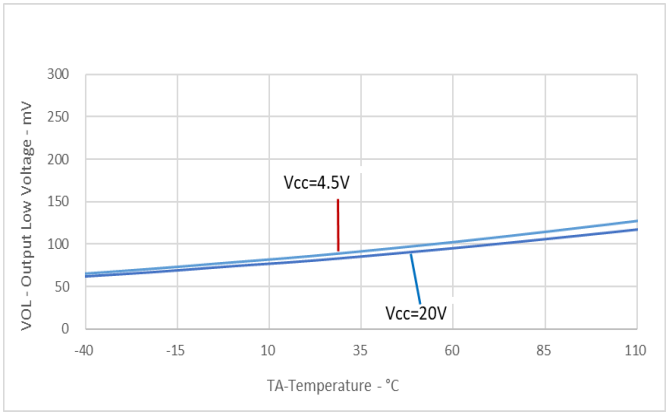


Fig.2 V_{OH} vs. Temperature

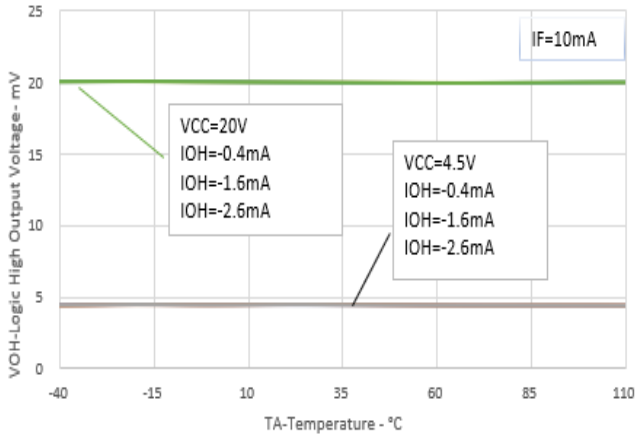


Fig.3 I_{FLH} vs. Hysteresis

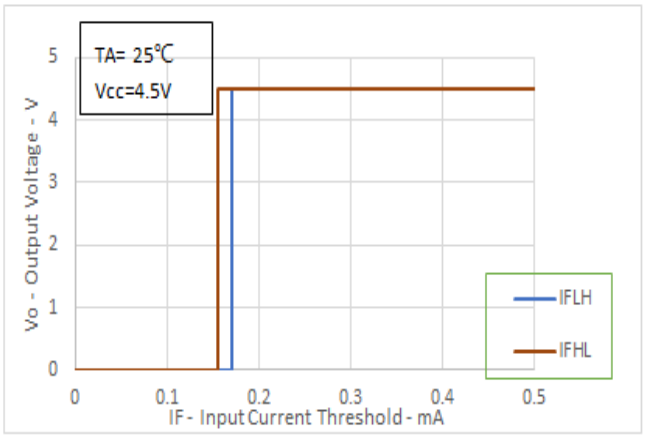


Fig.4 I_{FLH} vs. Temperature

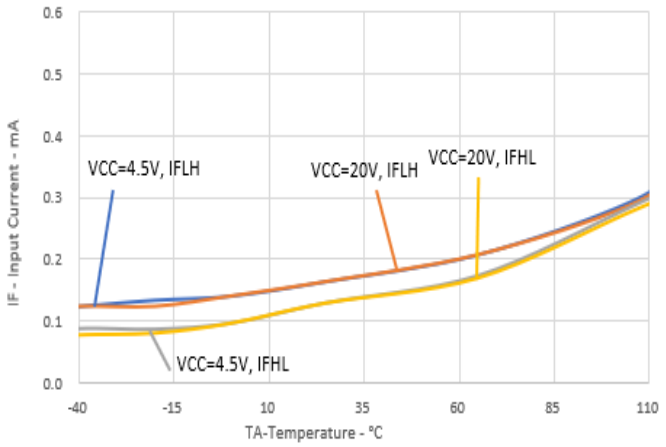


Fig.5 Input Current vs. Voltage

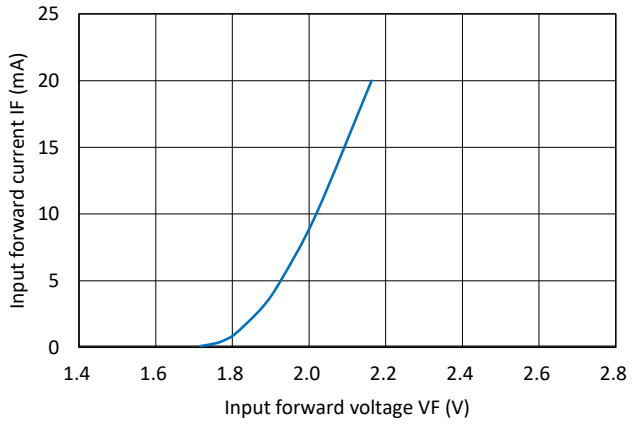


Fig.6 Supply Voltage vs. Output Voltage

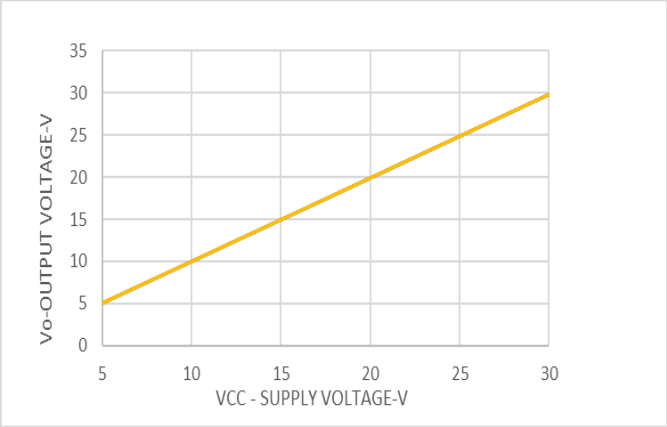


Fig.7 Propagation Delays vs. Temperature

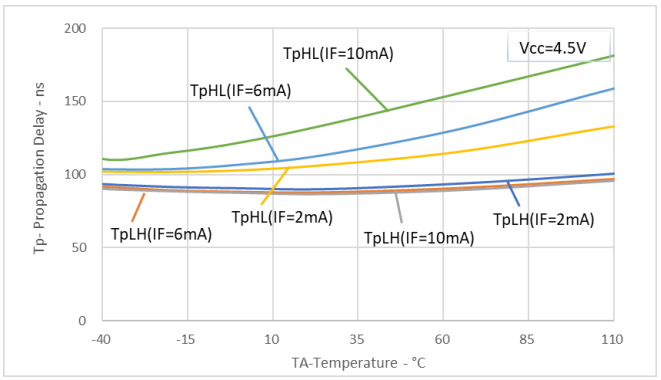


Fig.8 Propagation Delays vs. Temperature

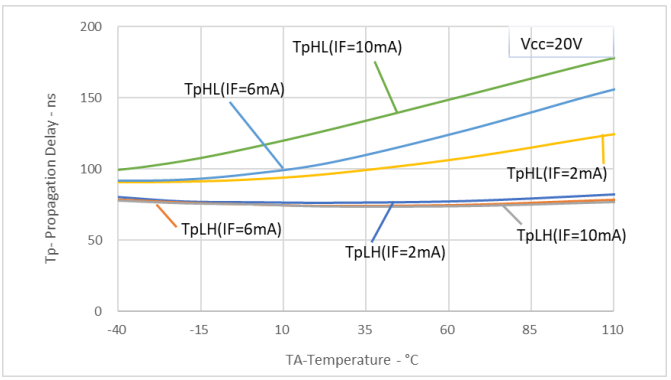
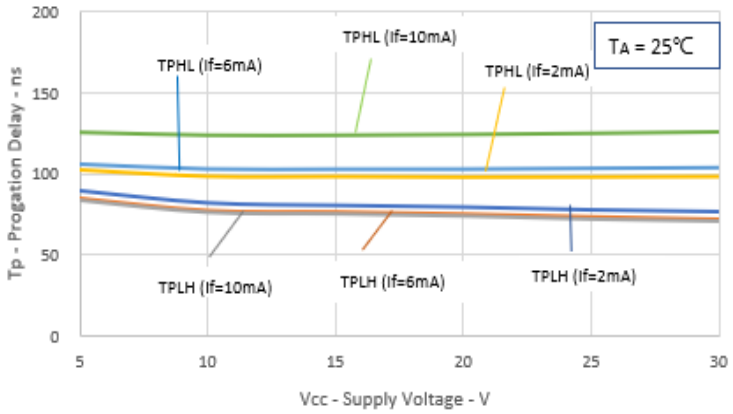
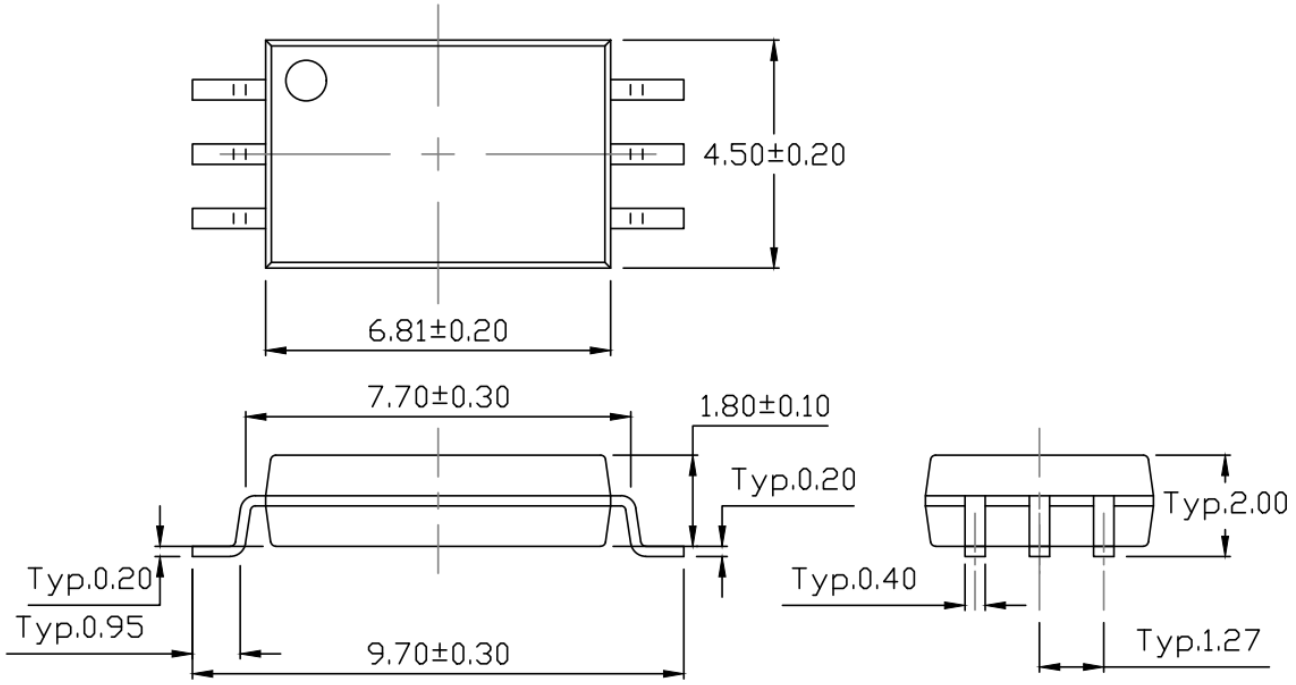


Fig.9 Propagation Delays vs. V_{CC}

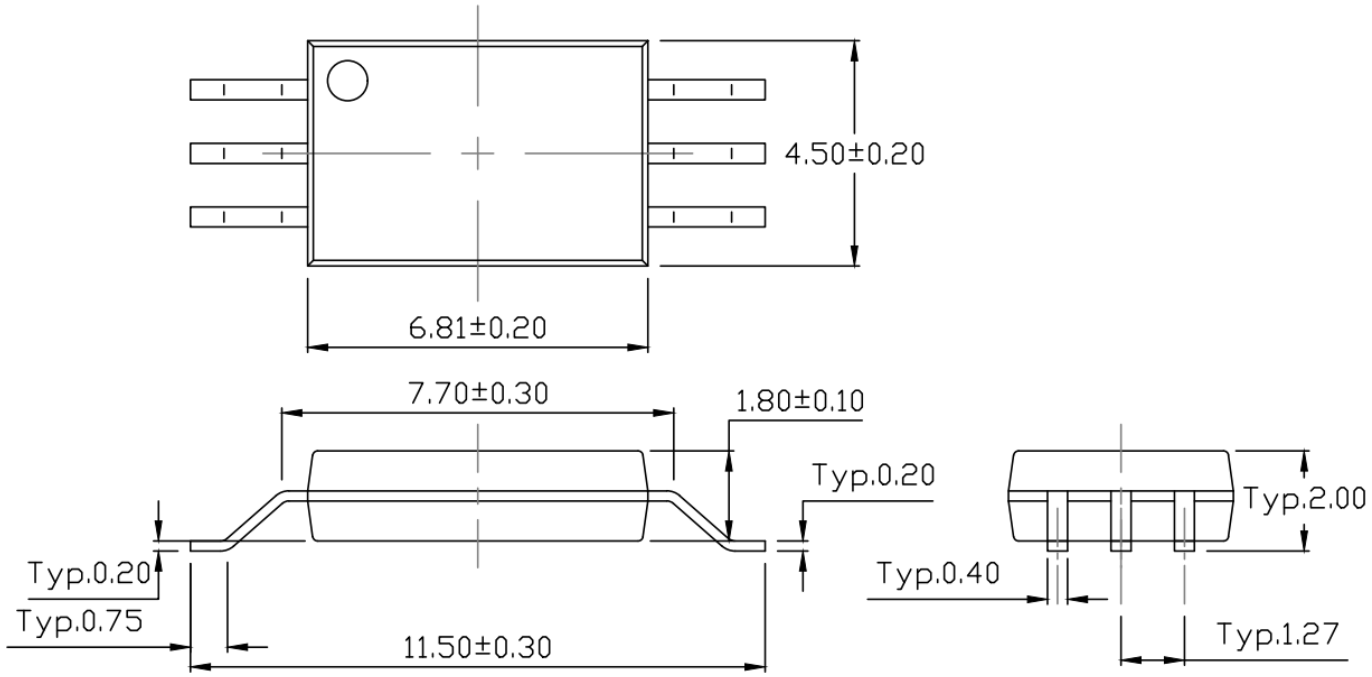


PACKAGE DIMENSIONS (Dimensions in mm unless otherwise stated)

Surface Mount Lead Forming (P Type)

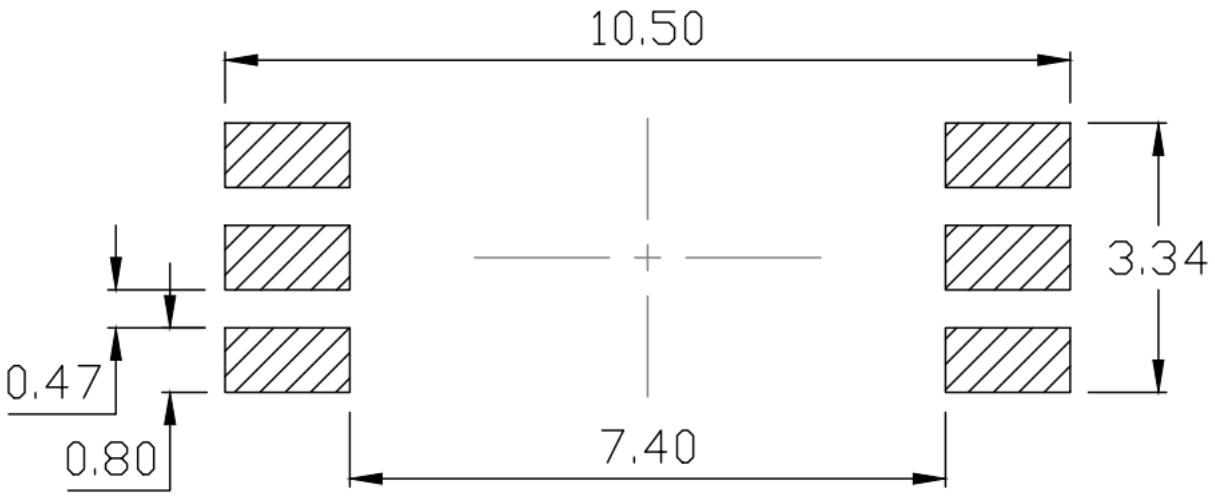


Surface Mount (Gullwing) Lead Forming (W Type)

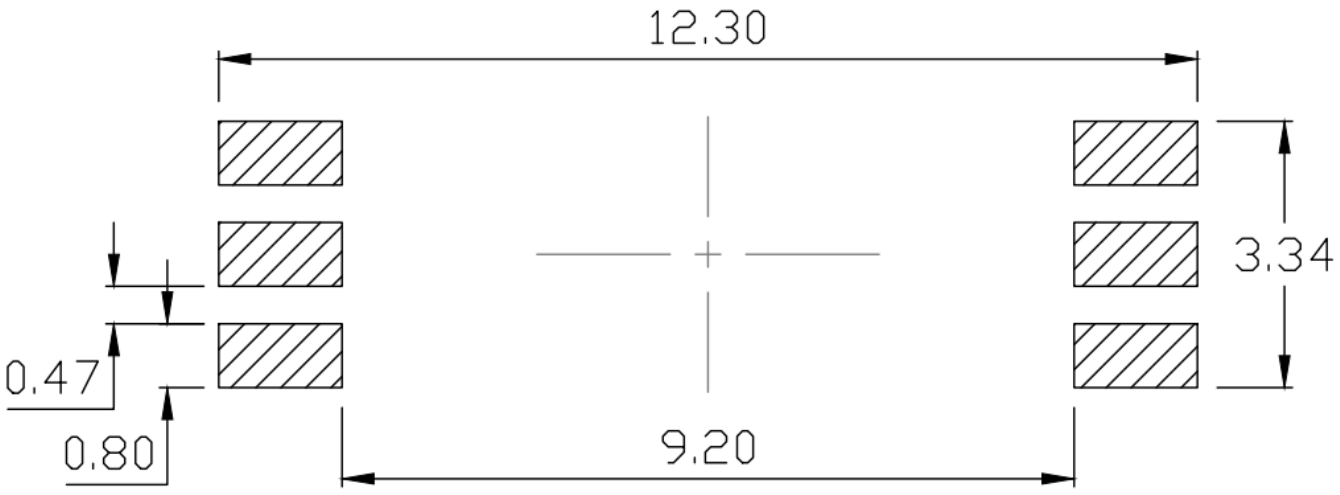


RECOMMENDED SOLDER MASK (Dimensions in mm unless otherwise stated)

Surface Mount Lead Forming (P Type)

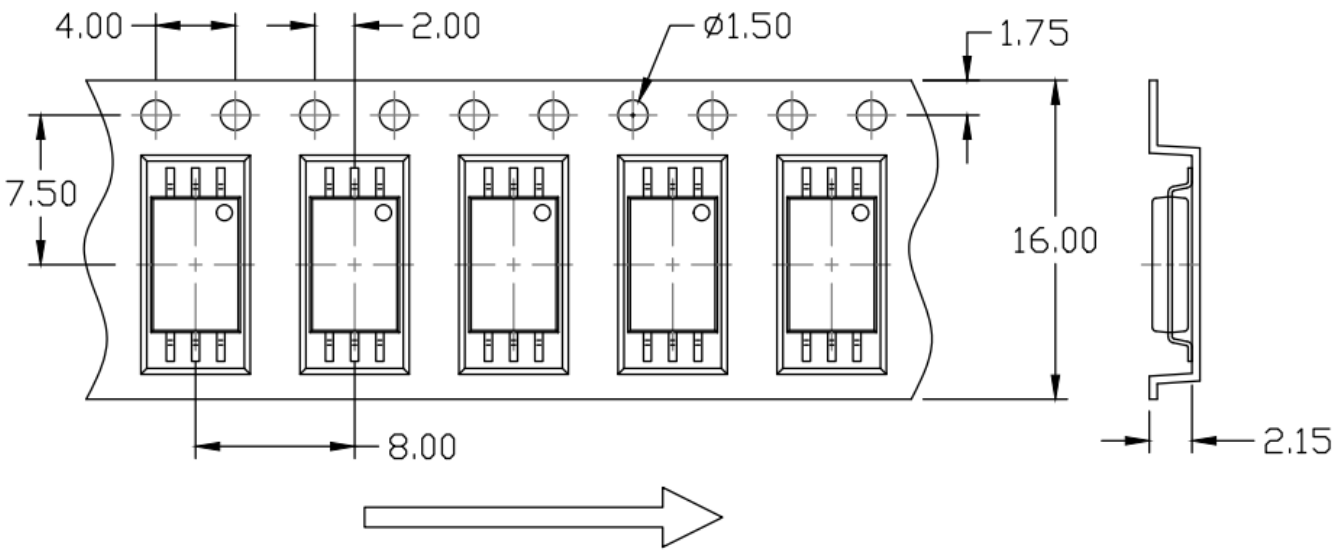


Surface Mount (Gullwing) Lead Forming (W Type)

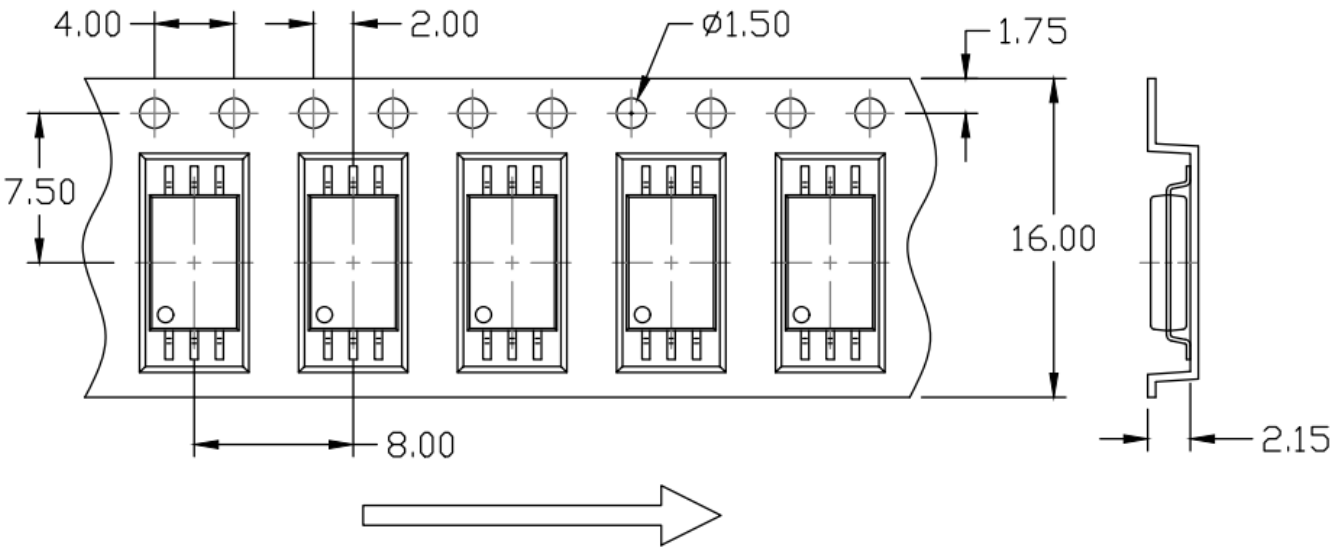


CARRIER TAPE SPECIFICATIONS (Dimensions in mm unless otherwise stated)

Surface Mount Lead Forming (P Type) Option T1

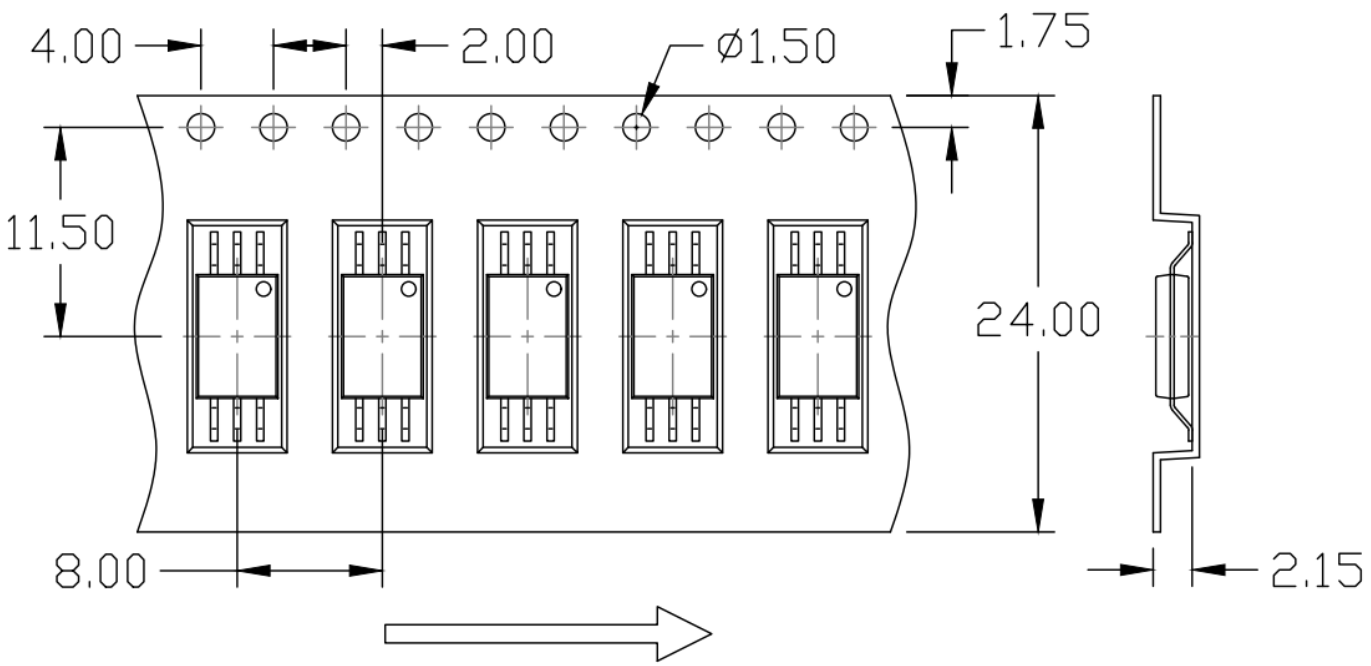


Surface Mount Lead Forming (P Type) Option T2

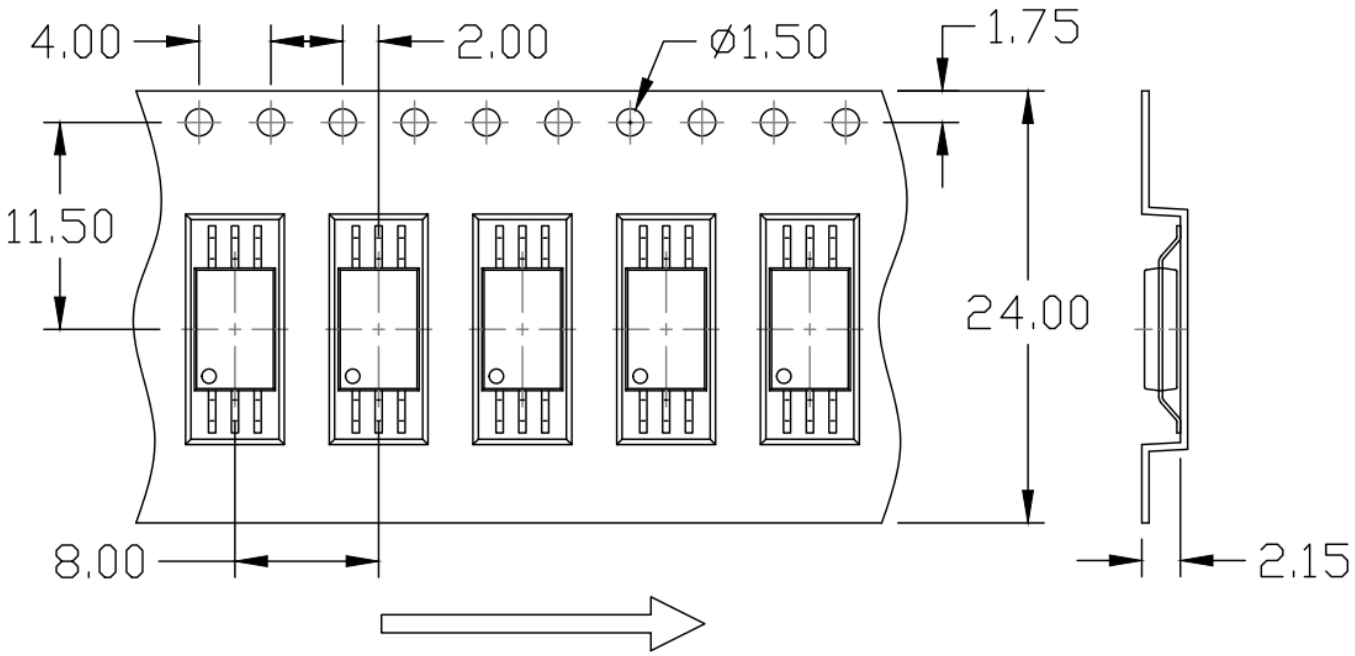


CARRIER TAPE SPECIFICATIONS (Dimensions in mm unless otherwise stated)

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

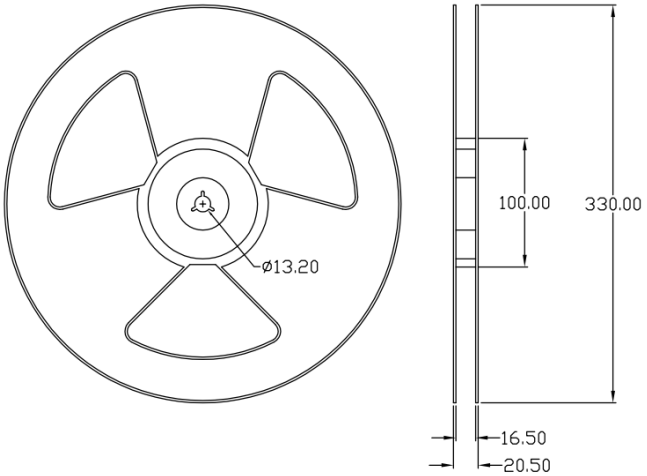


Surface Mount (Gullwing) Lead Forming (W Type) Option T2

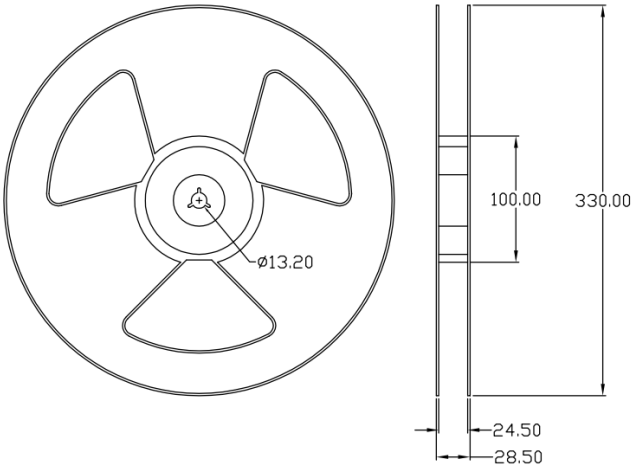


REEL SPECIFICATIONS (Dimensions in mm unless otherwise stated)

Surface Mount Lead Forming (P Type)

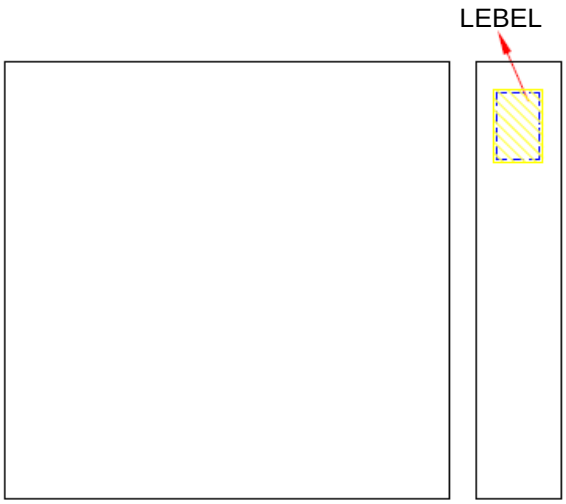


Surface Mount (Gullwing) Lead Forming (W Type)



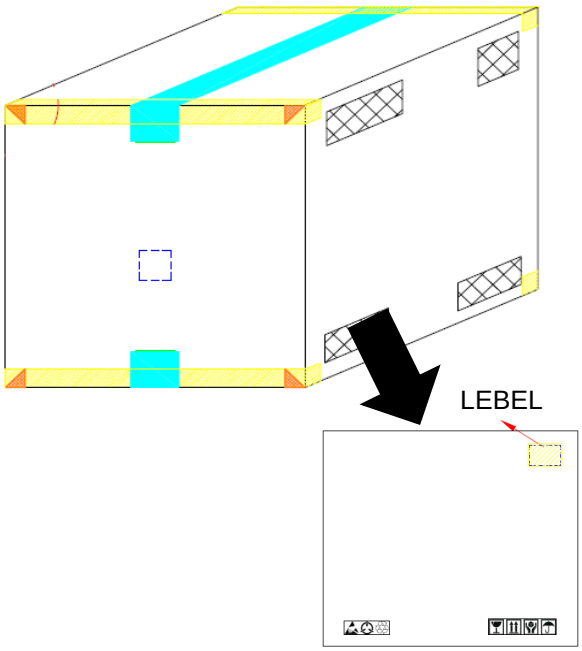
BOX SPECIFICATIONS (Reel Type)

INNER BOX



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

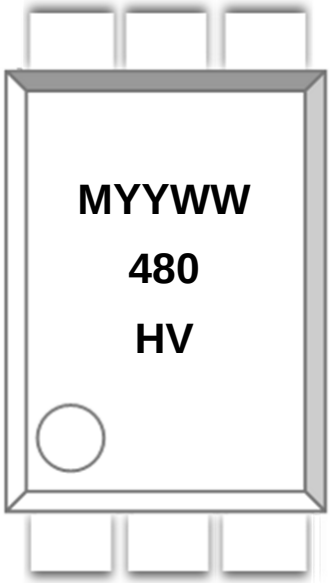
OUTER BOX



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
480 : Part Number
T or H : Factory identification mark
V : VDE Identification(Option)

ORDERING INFORMATION

MPCS-480(P/W)-ZV

MPC – Company Abbr.
S – Stack
480 – 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)

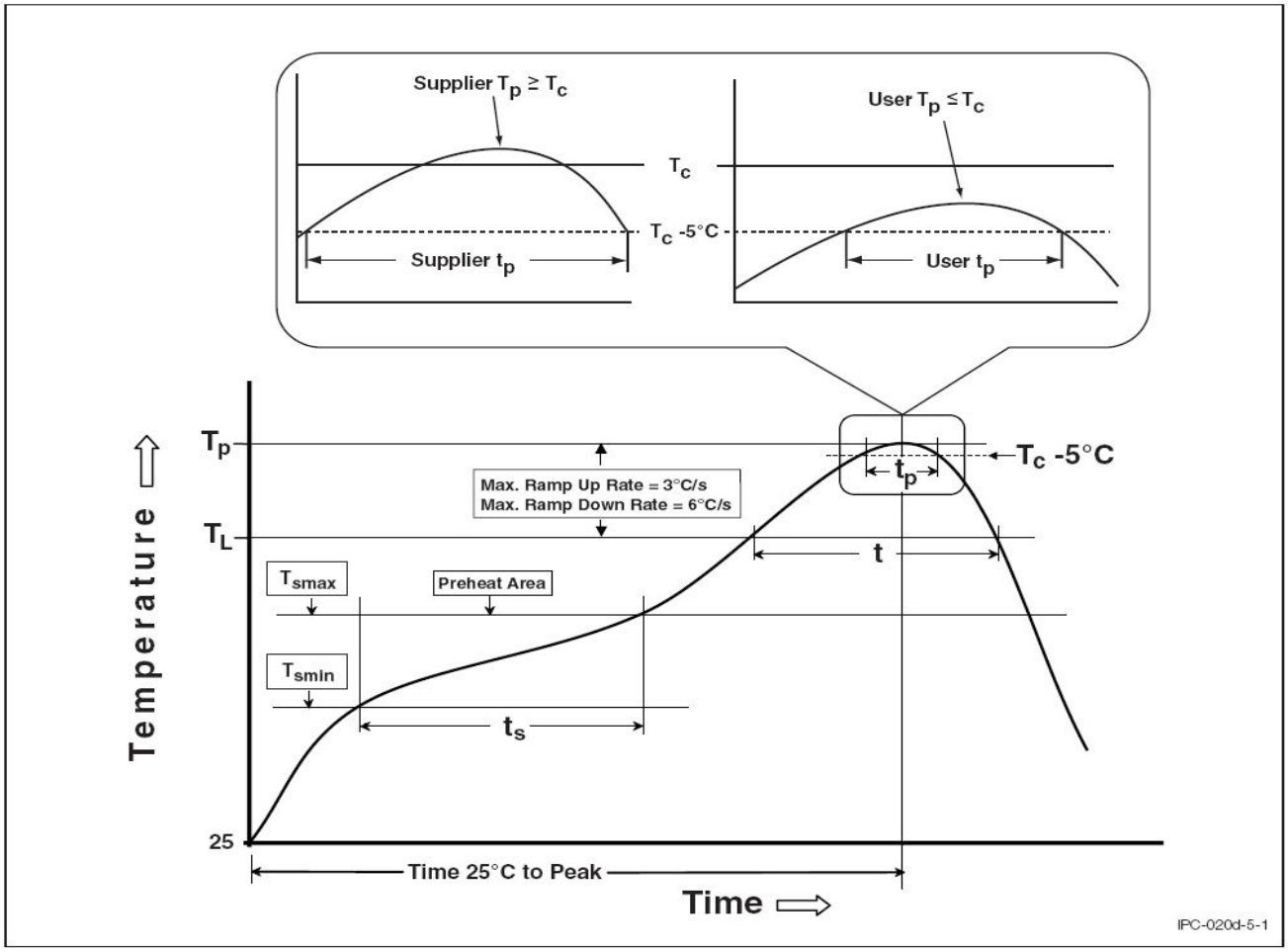
LABEL INFORMATION

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

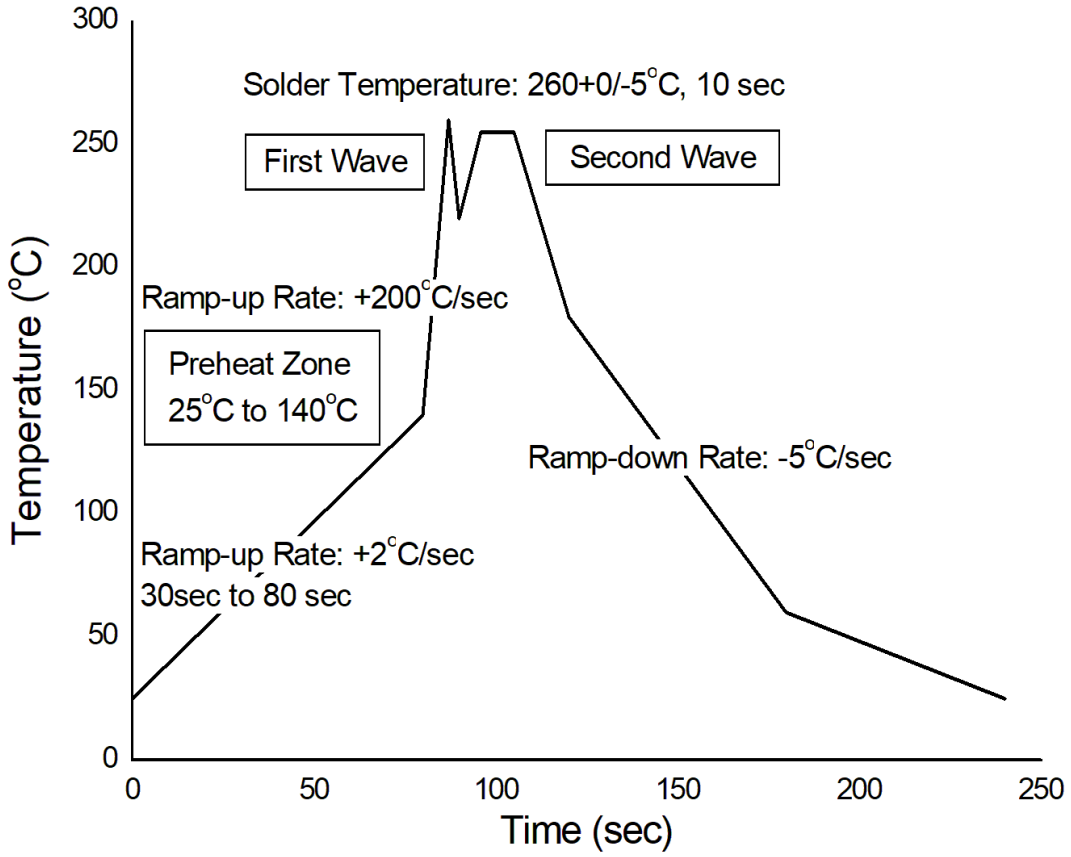
REFLOW PROFILE



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.

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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