

SWPM102 Low Power Programmable Oscillator, 1MHz to 180MHz

Feature:

- Any frequency between 1 MHz and 180 MHz accurate to 6 decimal places
- 100% pin-to-pin drop-in replacement to quartz-based XO
- Excellent total frequency stability as low as ± 20 ppm
- Low power consumption of 4.5 mA typical at 1.8 V
- VDD supply range: 1.62V to 3.63V
- Best Shock Robustness: withstand at least 50,000 g shock
- Standby mode for longer battery life
- Fast startup time of 5 ms
- LVCMOS/HCMOS compatible output
- RoHS and REACH compliant, Pb-free, Halogen-free and Antimony-free
- Industry-standard packages: 2.0x1.6, 2.5 x 2.0, 3.2 x 2.5 mm x mm



KEY FEATURES

- Quartz-free and MEMS-free without mechanical moving parts
- CMOS compatible output
- Available with frequencies from 1MHz to 180MHz
- Low jitter: 1.3 ps Typ RMS (12 kHz – 20 MHz bandwidth)
- Temperature stability:
 - ± 20 ppm (-40 to 85°C)
 - ± 25 ppm (-40 to 105°C)
 - ± 50 ppm (-40 to 125°C)
 - ± 50 ppm (-55 to 125°C)
- Integrated LDO for on-chip power supply noise filtering
- Support continuous 1.62V to 3.63V V_{DD} supply operation
- Industrial standard packages: 2.0x1.6, 2.5x2.0, 3.2x2.5 mm x mm

APPLICATIONS

- DVR, IP CAM, Tablets, SSD, PLC,
- Industrial control, Power equipment,
- Household appliances · New energy,
- Health Medical · Data centers, Servers · etc.

1. System Block Diagram

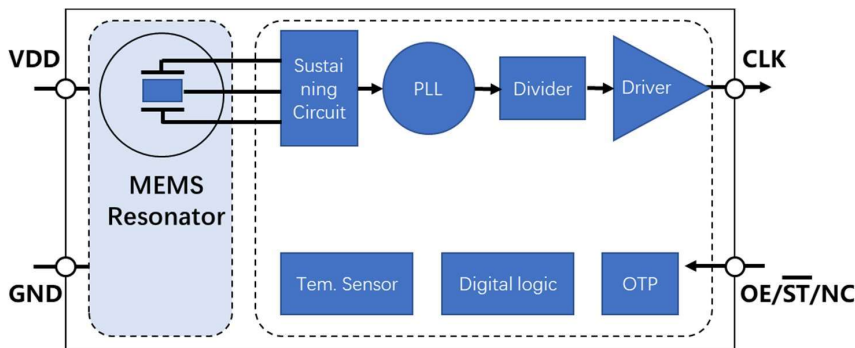


Figure 1. SWPM0102 Block Diagram

2. Pin Configuration:

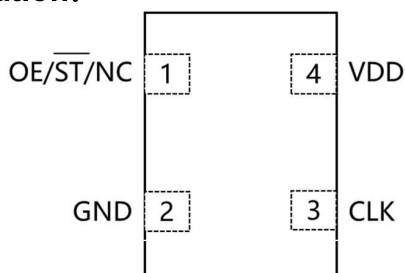
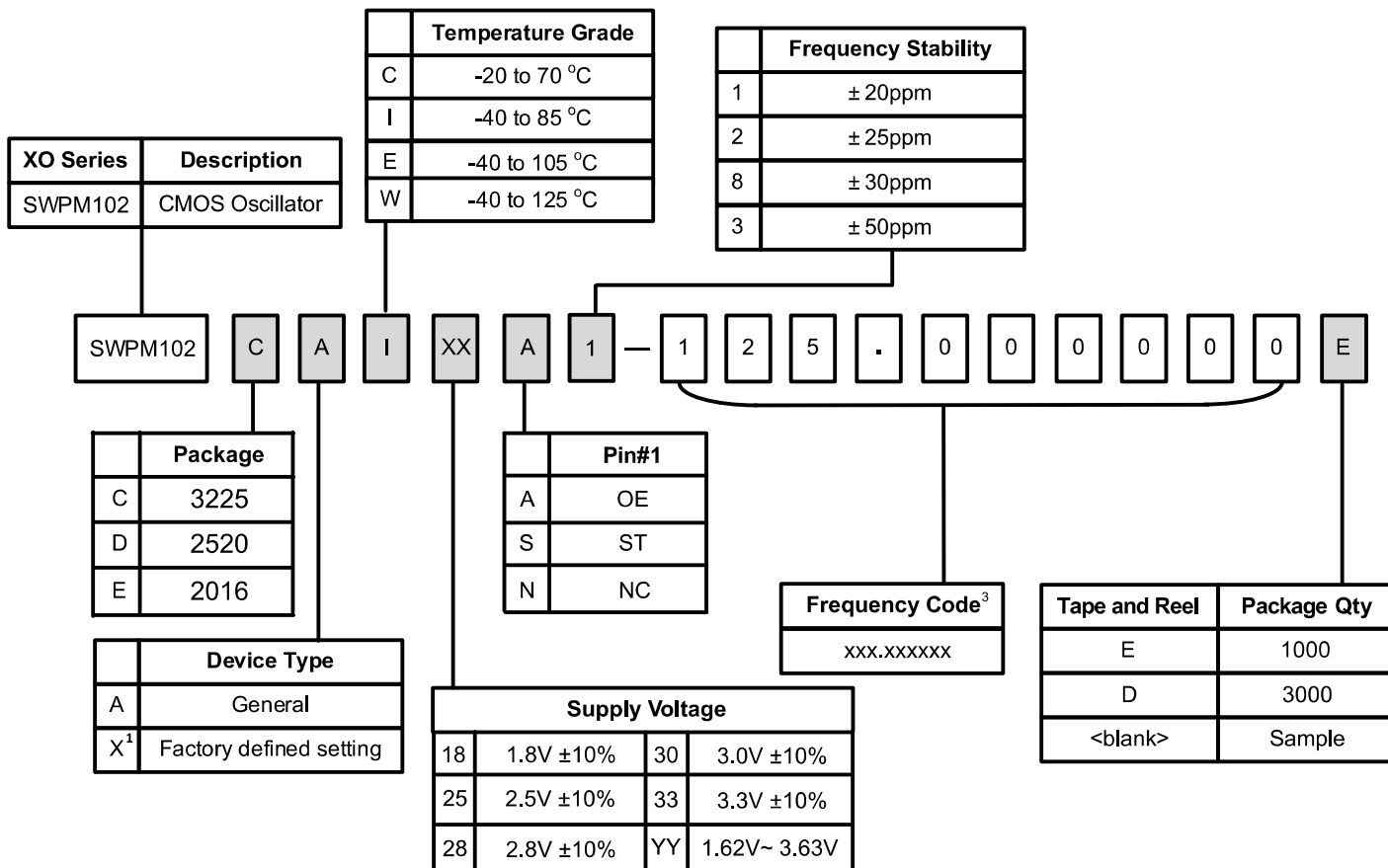


Figure 2. Pin Assignments SMD Package (Top View)

Pin #	Descriptions
1	Selectable via ordering option OE = Output Enable ST = Standby NC = No Connect
2	GND = Ground
3	CLK = Clock output
4	VDD = Power supply

3. Ordering Guide

The SWPM102 Oscillator supports options including frequency and OE/ACT pin, as shown in the chart below. Specific device configurations are programmed into the part at time of shipment, and samples are available in 1 weeks.



Notes:

1. "X" refers to the ID for the unique configuration with factory-defined settings, the value ranges from "A" to "F".
2. Contact starwavecorp.com/contact-us for advanced -40~125°C option.
3. For example: 125 MHz = 125.000000; 33.33333 MHz = 33.333330.

4. Electrical Specifications

Table 2.1. Electrical Specifications

Parameters	Symbol	Min.	Typ.	Max.	Unit	Condition
Output Frequency Range	F	1	-	180	MHz	
Frequency Stability	F_stab	-20	-	+20	ppm	Inclusive of initial tolerance at +25°C, 1st year aging at +25°C, and variations over operating temperature, rated power supply voltage and load.
		-25	-	+25	ppm	
Operating Temperature range	T_use	-20	-	+70	°C	Commercial
		-40	-	+85		Industrial
		-40	-	+105		Extended Industrial
		-40	-	+125		Automotive Level *Please contact us
		-55	-	+125		Extreme temperature *Please contact us
Supply Voltage	VDD_1.8	1.62	1.8	1.98	V	
	VDD_2.5	2.25	2.5	2.75		
	VDD_2.8	2.52	2.8	3.08		
	VDD_3.0	2.7	3.0	3.3		
	VDD_3.3	2.97	3.3	3.63		
	VDD	1.62	-	3.63		
Current Consumption	I _{dd}	-	+4.9	-	mA	No load condition, F = 20 MHz, VDD = +2.8V to 3.3 V
		-	+4.5	-		No load condition, F = 20 MHz, VDD = +2.5V
		-	+4.2	-		No load condition, F = 20 MHz, VDD = +1.8V
OE Disable Current	I _{OD}	-	+4.8	-	mA	VDD= +2.5V to +3.3V, OE = GND, Output in high-Z state
		-	+4.5	-		VDD= +1.8V, OE = GND, Output in high-Z state
Standby Current	I _{std}	-	+1.5	-	µA	\overline{ST} = GND, VDD = +2.8V to +3.3V, Output is pulled down
		-	+0.8	-		\overline{ST} = GND, VDD = +2.5V, Output is pulled down
		-	+0.6	-		\overline{ST} = GND, VDD= +1.8V, Output is pulled down
Duty Cycle	DC	45	50	55	%	All VDD
Output Low Voltage	V _{OL}	-	-	VDD×0.1	V	IOL = 4 mA (VDD_3.0 and VDD_3.3)
Output High Voltage	V _{OH}	VDD×0.9	-	-	V	IOH = -4 mA (VDD_3.0 and VDD_3.3)
Rise and Fall Time	Tr, Tf	-	1.7	-	ns	VDD = +2.5V, +2.8V, +3.0V or +3.3V, 20% to 80%
		-	2.2	-		VDD = +1.8V, 20% to 80%
		-	1.9	-		VDD = +2.25V to +3.63V, 20% to 80%
Input Low Voltage	V _{IL}	-	-	VDD×0.3	V	Pin 1, OE or \overline{ST}
Input High Voltage	V _{IH}	VDD×0.7	-	--	V	Pin 1, OE or \overline{ST}
Start-up Time	T _{start}	-	5.0	--	ms	Measured from the time VDD reaches its rated minimum value
Enable and Disable Time	T _{oe}	-	-	130	ns	F=180MHz, For other frequencies, T _{oe} = 100 ns + 3×cycles
Resume Time	T _{resume}	-	5.0	-	ms	Measured from the time ST pin crosses 50% threshold
RMS Period Jitter	T _{jitt}	-	2.2	-	ps	F = 75 MHz, VDD = +2.5V, +2.8V, +3.0V or +3.3V
		-	2.8	-	ps	F = 75 MHz, VDD = +1.8V
Peak-to-peak Period Jitter	T _{pk}	-	23.3	-	ps	F = 75 MHz, VDD = +2.5V, +2.8V, +3.0V or +3.3V
		-	28.5	-	ps	F = 75 MHz, VDD = +1.8V
RMS Phase Jitter	T _{phj}	-	0.5	-	ps	F= 75 MHz, Integration bandwidth = 900kHz to 7.5 MHz

5. Test Circuit and Waveform

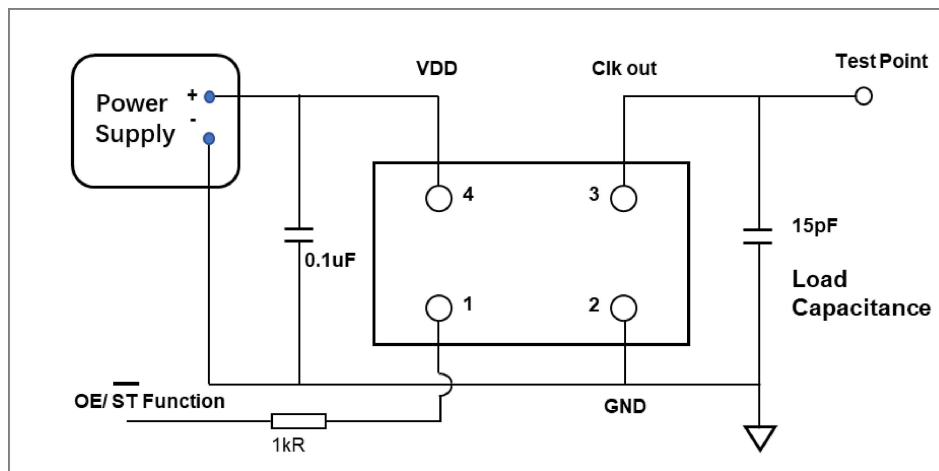
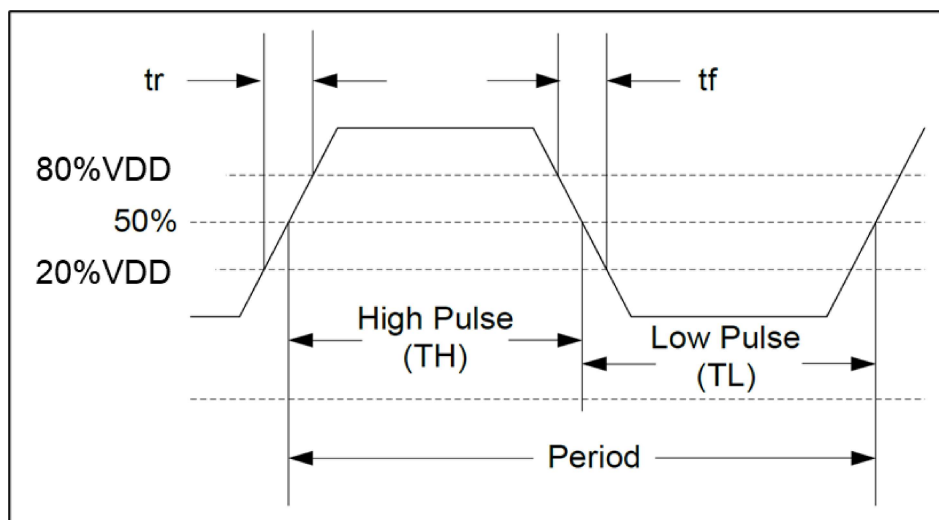


图 3. 测试回路



Condition

(1) Oscilloscope

The bandwidth should be minimum 5 times wider than measurement frequency.

The probe ground should be placed closely to the test point and the lead length should be as short as possible.

(2) Load Capacitance includes probe capacitance.

(3) A 0.1 µF bypass capacitor should be connected between VDD and GND pins located close to the device.

(4) Power Supply

Power supply impedance should be as low as possible and GND line should be as short as possible.

6.Reflow Profiles

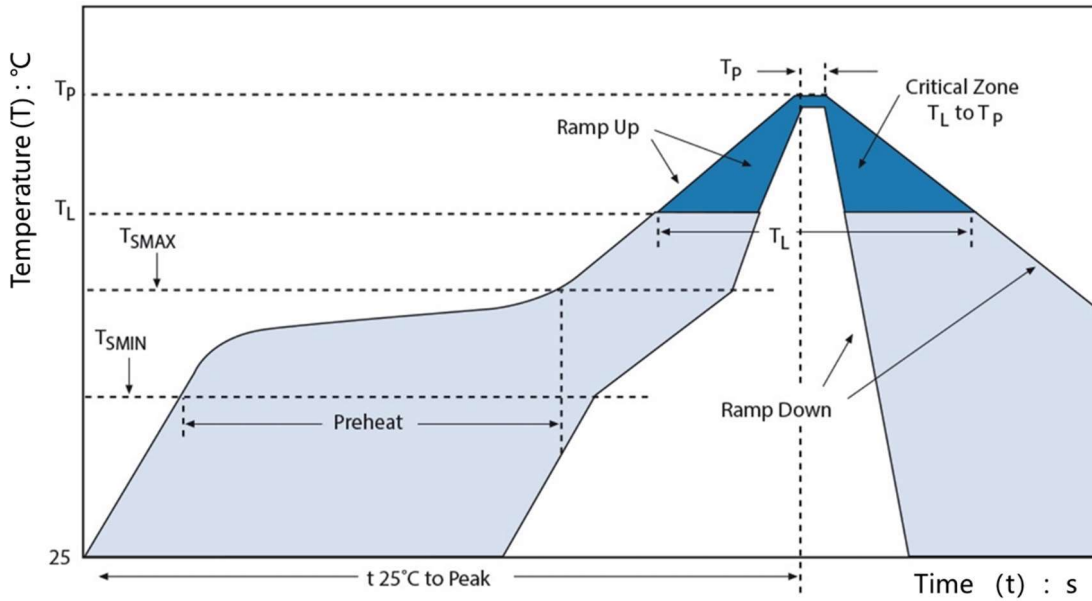


Figure 5. Reflow Soldering Profile

IPC/JEDEC Standard	IPC/JEDEC J-STD-020
Ts MAX to TL (Ramp-up Rate)	3°C/second Maximum

Notes:

The solder reflow profile shown in Figure 5 is IPC/JEDEC J-STD-020 compliant and applies to all STAR products and packages. The relevant details of the profile please check the Standard document. An optimized reflow profile depends on several factors such as the solder paste, board density, and type of reflow equipment used.

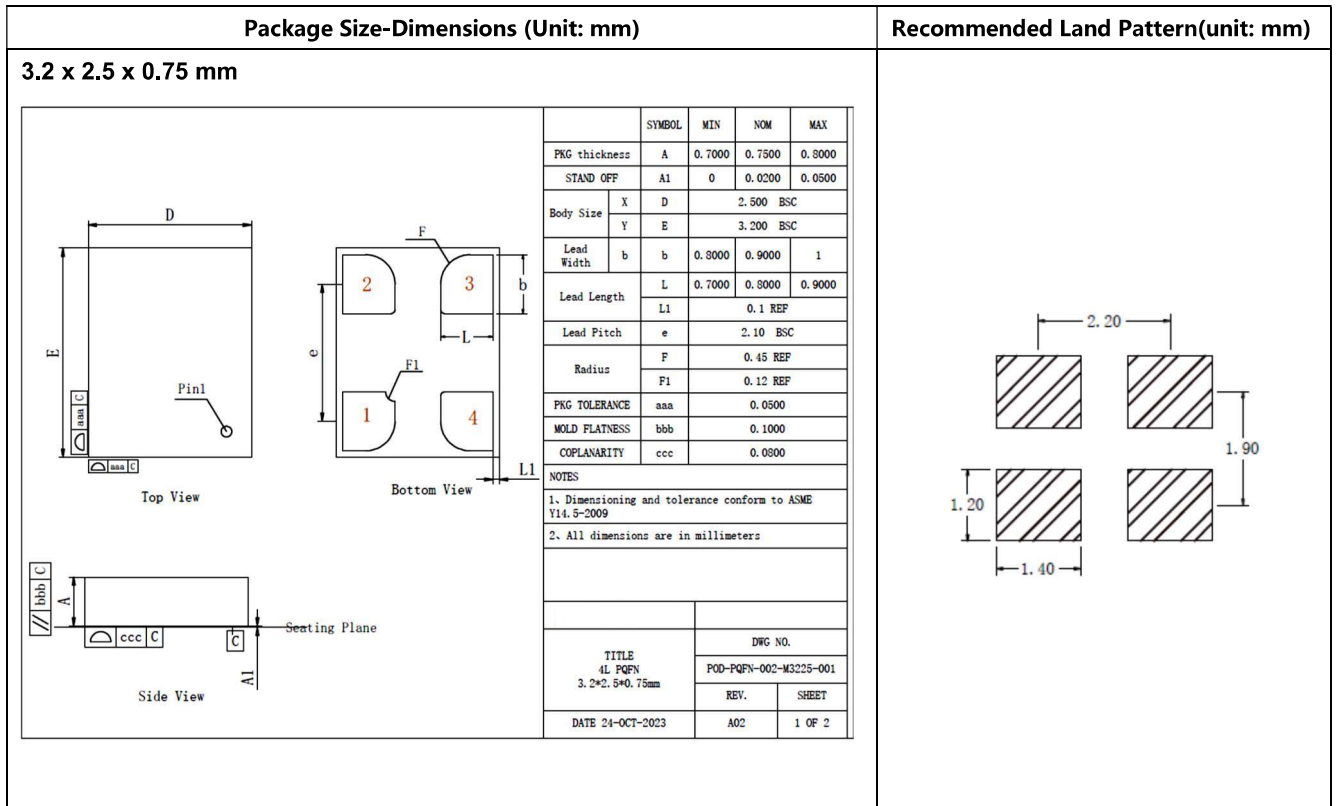
7.1/1 Dimensions and Patterns

The figure below illustrates the package details for the SWPM102. The table below lists the values for the dimensions shown in the illustration.

Package Size-Dimensions (Unit: mm)	Recommended Land Pattern(unit: mm)																																																																																													
<p>2.0 x 1.6 x 0.75 mm</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th></th> <th>SYMBOL</th> <th>MIN</th> <th>NOM</th> <th>MAX</th> </tr> </thead> <tbody> <tr> <td>PKG thickness</td> <td>A</td> <td>0.7000</td> <td>0.7500</td> <td>0.8000</td> </tr> <tr> <td>STAND OFF</td> <td>A1</td> <td>0</td> <td>0.0200</td> <td>0.0500</td> </tr> <tr> <td rowspan="2">Body Size</td> <td>X</td> <td colspan="3">D 1.600 BSC</td> </tr> <tr> <td>Y</td> <td colspan="3">E 2.000 BSC</td> </tr> <tr> <td rowspan="2">Lead Width</td> <td>b</td> <td>0.4300</td> <td>0.4800</td> <td>0.5300</td> </tr> <tr> <td>b1</td> <td>0.0500</td> <td>0.0100</td> <td>0.1500</td> </tr> <tr> <td>Lead Length</td> <td>L</td> <td>0.5800</td> <td>0.6800</td> <td>0.7800</td> </tr> <tr> <td>Lead Pitch</td> <td>e</td> <td colspan="3">0.930 BSC</td> </tr> <tr> <td>RADIUS</td> <td>F</td> <td colspan="3">0.100 REF</td> </tr> <tr> <td>PKG TOLERANCE</td> <td>aaa</td> <td colspan="3">0.0500</td> </tr> <tr> <td>MOLD FLATNESS</td> <td>bbb</td> <td colspan="3">0.1000</td> </tr> <tr> <td>COPLANARITY</td> <td>ccc</td> <td colspan="3">0.0800</td> </tr> <tr> <td colspan="5">NOTES</td> </tr> <tr> <td colspan="5">1. Dimensioning and tolerance conform to ASME Y14.5-2009</td> </tr> <tr> <td colspan="5">2. All dimensions are in millimeters</td> </tr> <tr> <td colspan="2" style="text-align: center;">TITLE 4L PQFN 2.0*1.6*0.75mm</td> <td colspan="3" style="text-align: center;">DWG NO. POD-PQFN-001-M2016-001</td> </tr> <tr> <td colspan="2"></td> <td style="text-align: center;">REV.</td> <td colspan="2" style="text-align: center;">SHEET</td> </tr> <tr> <td colspan="2">DATE 24-OCT-2023</td> <td style="text-align: center;">A01</td> <td colspan="2" style="text-align: center;">1 OF 2</td> </tr> </tbody> </table>		SYMBOL	MIN	NOM	MAX	PKG thickness	A	0.7000	0.7500	0.8000	STAND OFF	A1	0	0.0200	0.0500	Body Size	X	D 1.600 BSC			Y	E 2.000 BSC			Lead Width	b	0.4300	0.4800	0.5300	b1	0.0500	0.0100	0.1500	Lead Length	L	0.5800	0.6800	0.7800	Lead Pitch	e	0.930 BSC			RADIUS	F	0.100 REF			PKG TOLERANCE	aaa	0.0500			MOLD FLATNESS	bbb	0.1000			COPLANARITY	ccc	0.0800			NOTES					1. Dimensioning and tolerance conform to ASME Y14.5-2009					2. All dimensions are in millimeters					TITLE 4L PQFN 2.0*1.6*0.75mm		DWG NO. POD-PQFN-001-M2016-001					REV.	SHEET		DATE 24-OCT-2023		A01	1 OF 2		
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7.1/2 Dimensions and Patterns

The figure below illustrates the package details for the SWPM102. The table below lists the values for the dimensions shown in the illustration.



8 Top Marking

The figure below illustrates the mark specification for the SWPM102. The table below lists the line information.



[1] Taping specification

The carrier tape basic dimensions are based on EIA-481

(1) Tape dimensions

Material of the Carrier Tape: PS

Material of the Cover Tape (Top Tape): PET+PE

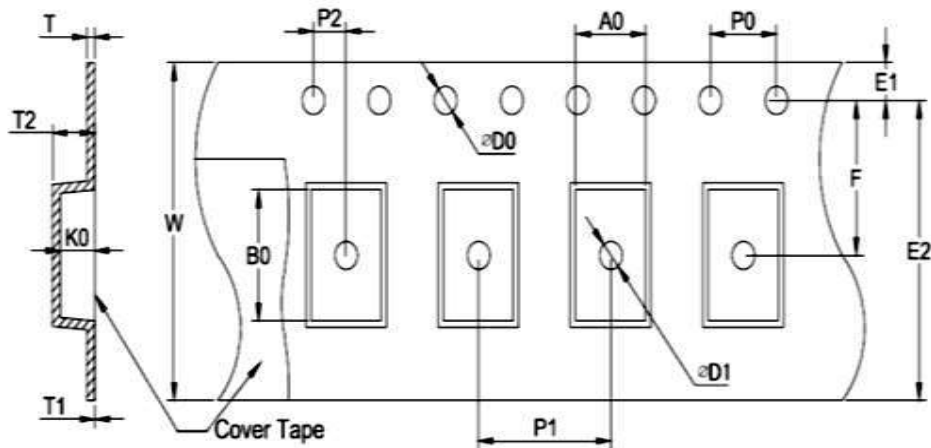


Table-1

Package	Tape size	D0	D1	E1	F	P0	P1	P2
PQFN-M3225	8	1.6±0.1	1.0±0.1	1.75±0.1	3.5±0.1	4.0±0.1	4.0±0.1	2.0±0.05
PQFN-M2520	8	1.5±0.1	1.0±0.1	1.75±0.1	3.5±0.1	4.0±0.1	4.0±0.1	2.0±0.05
PQFN-M2016	8	1.6±0.1	1.0±0.1	1.75±0.1	3.5±0.1	4.0±0.1	4.0±0.1	2.0±0.05

Package	Tape size	T	T1	W	A0	B0	K0	
PQFN-M3225	8	0.2±0.1	0.05±0.01	8±0.1	2.75±0.1	3.45±0.1	1.0±0.1	
PQFN-M2520	8	0.2±0.1	0.05±0.01	8±0.1	2.25±0.1	2.7±0.1	0.9±0.1	
PQFN-M2016	8	0.2±0.1	0.05±0.01	8±0.1	1.8±0.1	2.25±0.1	1.0±0.1	

Note: All dimensions are in mm

(2) Reel dimensions

Material of the Reel: PS

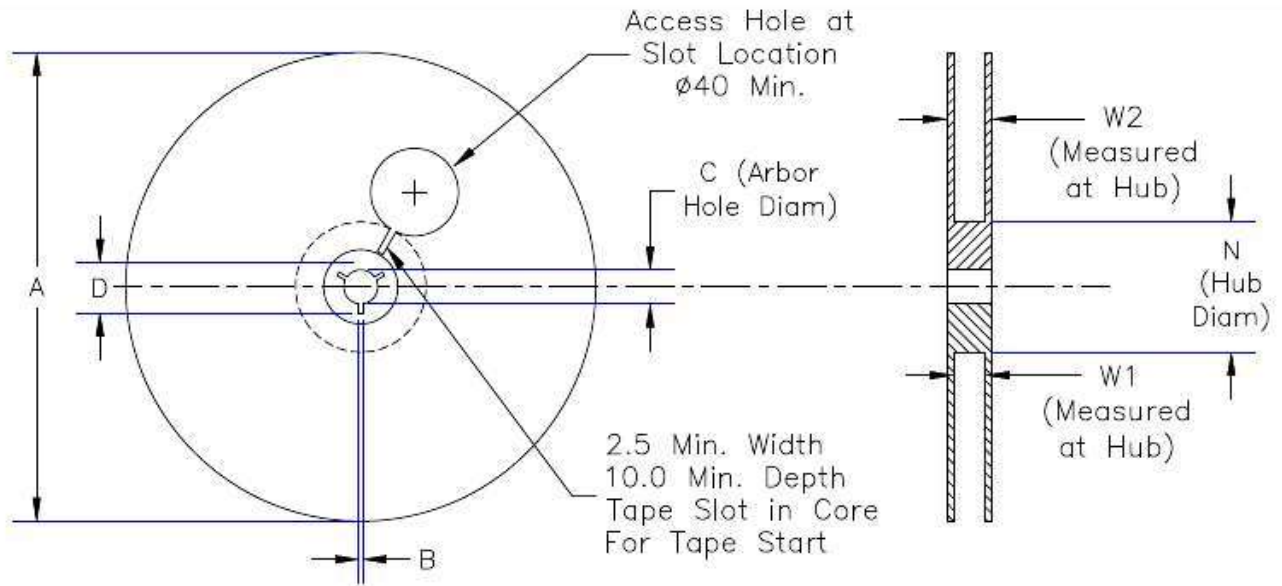
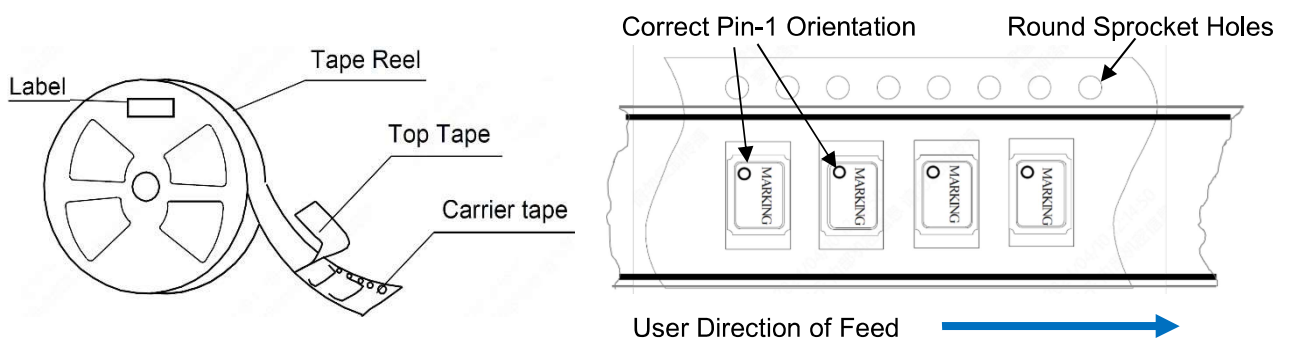


Table-2:

Reel type.	Tape Size	A	B Min.	C	N	W1	W2 Max.
7-inch reel	8	180±2	1.5	13.0±2	60±3	8.5±2	16
13-inch reel	8	330±2	1.5	13.0±2	100±0.5	8.5±2	16

Note: All dimensions are in mm

(3) Packing:



(4)Tape Start & End Point

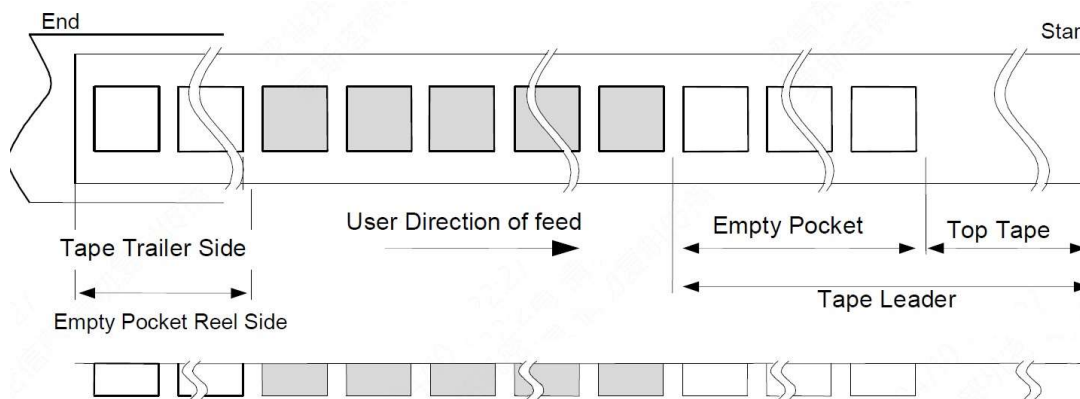


Table-3

Item		Empty Space	Note
Tape Leader	Top Tape	Min. 1 000 mm	Feeding in the Top tape, the tip is fixed with tape.
	Carrier Tape	Min. 160 mm	
Tape Trailer	Top Tape	Min. 0 mm	Tip is fixed to the reel.
	Carrier Tape	Min. 160 mm	

The next table provides the ordering details for tape and reel quantity, reel size. “Suffix” character is the last character in the part number string as shown in the example below.

SWPM102DAI33E1-25.000000D

Table-4: Tape & Reel Option Selections with Part Number Coding:

Suffix	Packaging Method	Package Size (mm)	Reel Size (inches)	Qty per Reel
D	8mm Tape & Reel	3.2 x 2.5	7	3000
	8mm Tape & Reel	2.5 x 2.0	7	3000
	8mm Tape & Reel	2.0 x 1.6	7	3000
	8mm Tape & Reel	2.0 x 1.2	7	3000
	8mm Tape & Reel	1.5 x 0.8	7	3000
E	8mm Tape & Reel	3.2 x 2.5	7	1000
	8mm Tape & Reel	2.5 x 2.0	7	1000
	8mm Tape & Reel	2.0 x 1.6	7	1000
	8mm Tape & Reel	2.0 x 1.2	7	1000
	8mm Tape & Reel	1.5 x 0.8	7	1000

[5] Storage environment

- (1) Before open the packing, we recommend to keep less than +30 C and 85 %RH of Humidity, and to use it less than 6 months after delivery.
- (2) We recommend to open Package in immediately before use. After open Package, We recommend to keeps less than 6 month. No need dry air before soldering work if it is less than temperature +30 C, 85 humidity %RH.
- (3) Not to storage with some erosive chemicals.
- (4) Nothing is allowed to put on the reel or carton to prevent mechanical damage.

9 IMPORTANT NOTICE AND DISCLAIMER

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