

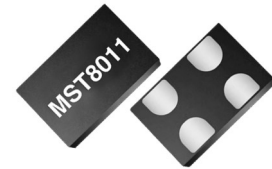
MST 8011

Spec No: 2309_E_V0.03

Low Power Programmable Oscillator

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 ± 10 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



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

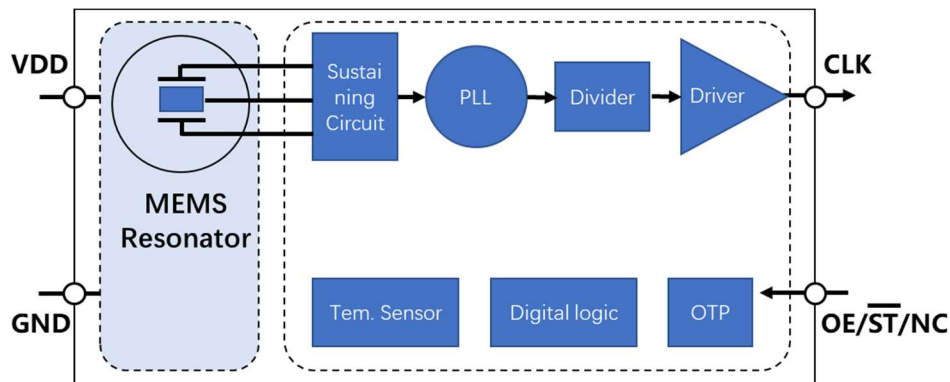


Figure 1. MST8011 Block Diagram

2. Pin Configuration:

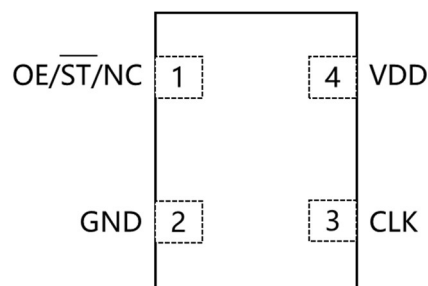


Figure 2. Pin Assignments SMD Package (Top View)

Pin	Symbol	I/O	Functionality
1	OE/ \overline{ST} /NC	Output Enable	H [1] : specified frequency output L: output is high impedance. Only output driver is disabled.
		Standby	H [1] : specified frequency output L: output is low (weak pull down). Device goes to sleep mode. Supply current reduces to I _{std} .
		No Connect	Any voltage between 0 and VDD or Open [1]: Specified frequency output. Pin 1 has no function.
2	GND	Power Supply Ground	Electrical ground
3	CLK	CLK Out	Oscillator output
4	VDD	Power Supply	Power supply voltage[2]

Table 1. Pin Functions

Notes:

1. In OE or \overline{ST} mode, a pull-up resistor of 10 kΩ or less is recommended if pin 1 is not externally driven. If pin 1 needs to be left floating, use the NC option.
2. A capacitor of value 0.1 μF or higher between VDD and GND is required.

3. Electrical Specifications

3.1 Absolute Maximum Ratings

Attempted operation outside the absolute maximum ratings may cause permanent damage to the part. Actual performance of the IC is only guaranteed within the operational specifications, not at absolute maximum ratings.

Parameter	Min	Max	Unit
Continuous Power Supply Voltage Range (VDD)	-0.5	4.0	V
Storage Temperature	-65	150	°C
Electrostatic Discharge	---	2000	V
Soldering Temperature (follow standard Pb free soldering guidelines)	---	260	°C
Junction Temperature ^[3]	---	150	°C

Note: 3.Exceeding this temperature for extended period of time may damage the device.

3.2 Environmental Compliance

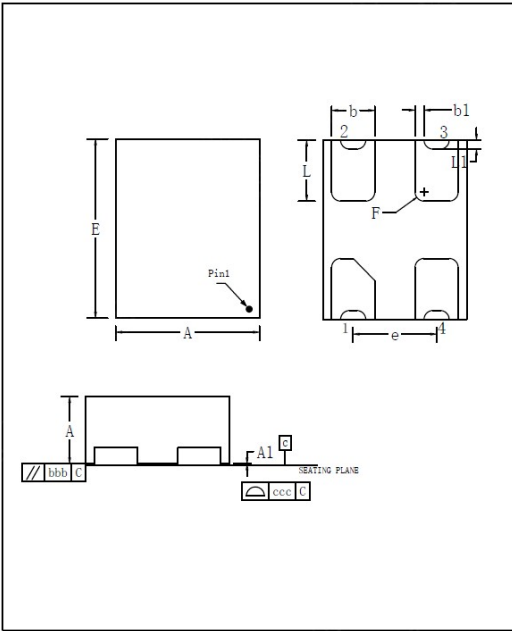
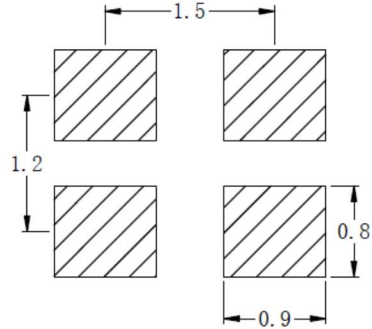



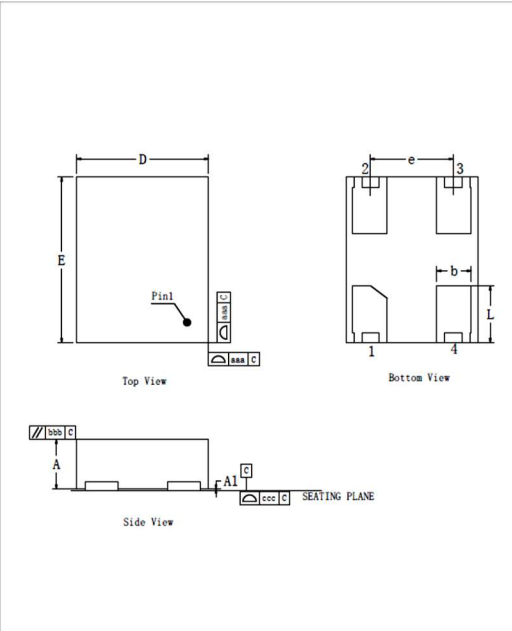
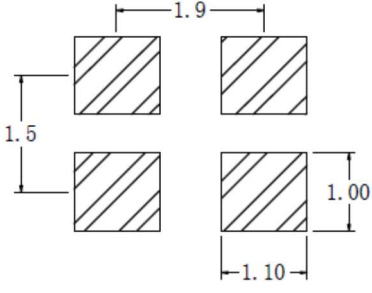



Parameter	Condition/Test Method
Mechanical Shock Resistance	MIL-STD-883F, Method2002
Mechanical Vibration Resistance	MIL-STD-883F, Method 2007
Temperature Cycle	JESD22, Method A104
Solderability	MIL-STD-883F, Method2003
Moisture Sensitivity Level (MSL)	MSL1 @ 260°C

3.3 Electrical Characteristics

Parameters	Symbol	Min.	Typ.	Max.	Unit	Condition
Output Frequency Range	F	1	-	180	MHz	
Frequency Stability	F_stab	-10	-	+10	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.
		-20	-	+20	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	VIL	-	-	VDD×0.3	V	Pin 1, OE or \overline{ST}
Input High Voltage	VIH	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

(random)		-	1.3	-	ps	F = 75 MHz, Integration bandwidth = 12 kHz to 20 MHz
Packing Unit	1000pcs./reel or 3000pcs./reel (φ180: 2016, 2520, 3225 package)					

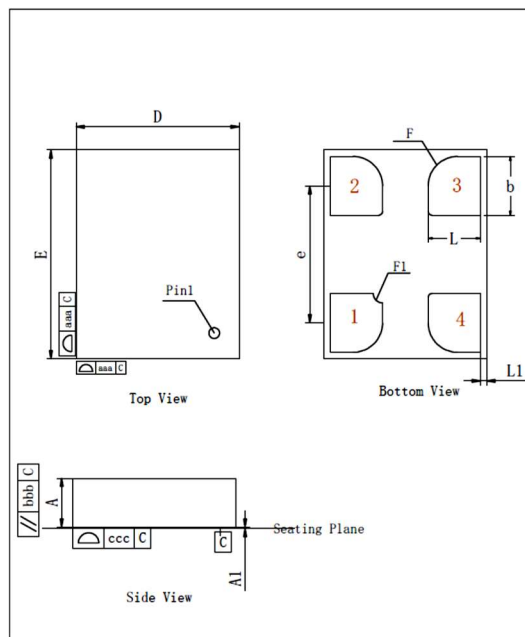
4. Dimensions and Patterns

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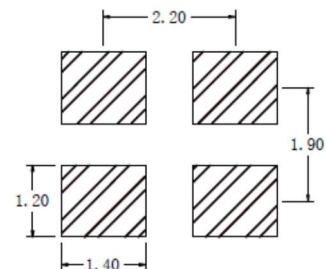
Package Size-Dimensions (Unit: mm)

Recommended Land Pattern(unit: mm)

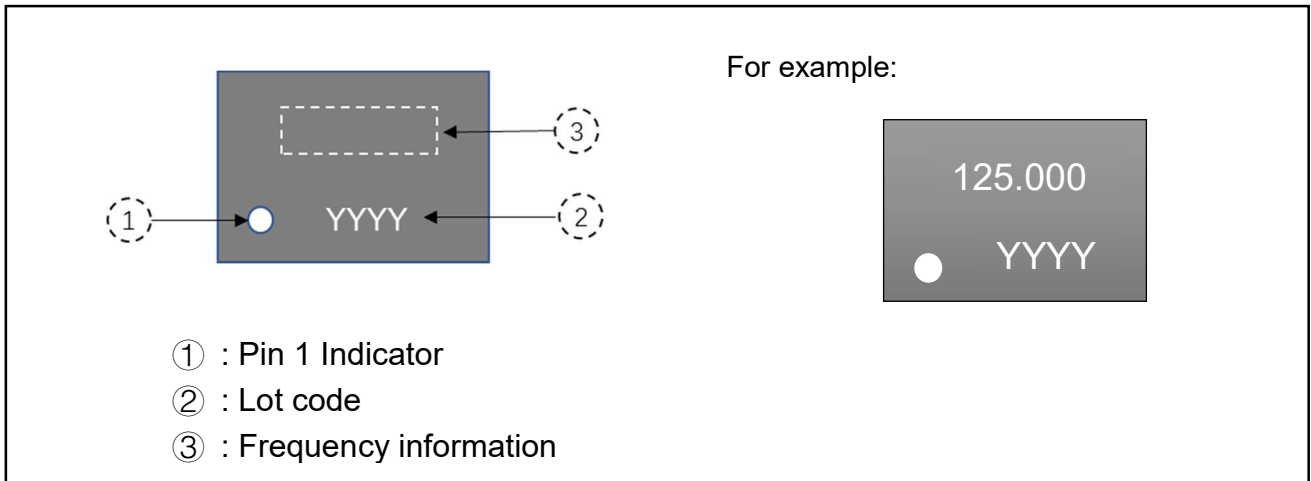
3.2 x 2.5 x 0.75 mm



	SYMBOL	MIN	NOM	MAX
PKG thickness	A	0.7000	0.7500	0.8000
STAND OFF	A1	0	0.0200	0.0500
Body Size	X	2.500 BSC		
	Y	3.200 BSC		
Lead Width	b	0.3000	0.9000	1
	L	0.7000	0.9000	0.9000
Lead Length	L1	0.1 REF		
	e	2.10 BSC		
Radius	F	0.45 REF		
	F1	0.12 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				
MSTM				
TITLE		DWG NO.		
4L PQFN		POD-PQFN-002-M3225-001		
3.2*2.5*0.75mm		REV.	SHEET	
DATE 24-OCT-2023		A02	1 OF 2	

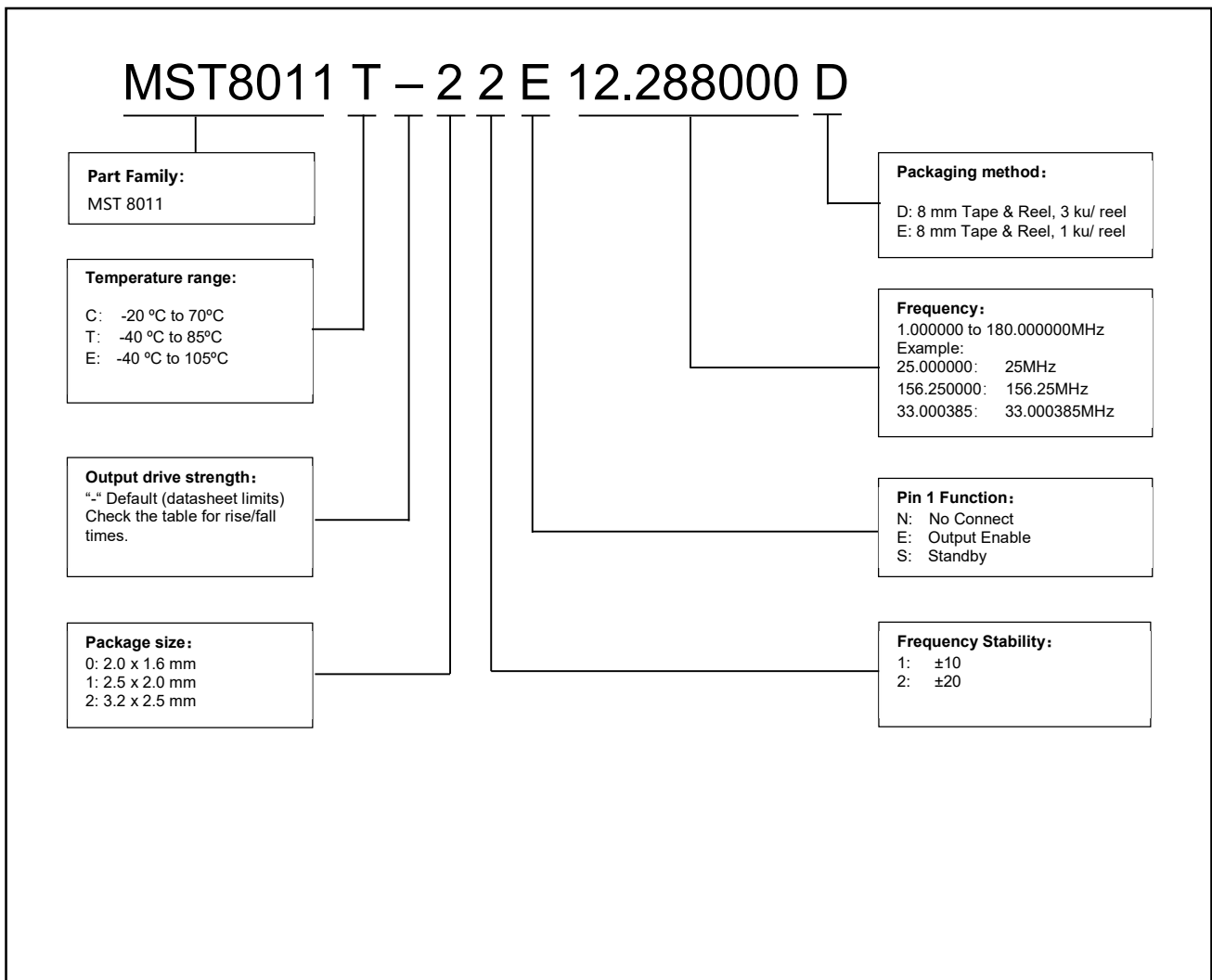


5. Marking Information (Standard mark)



6. Device Ordering Information

The Part No. Guide is for MST 8011's Ordering.



7. Test Circuit and Waveform

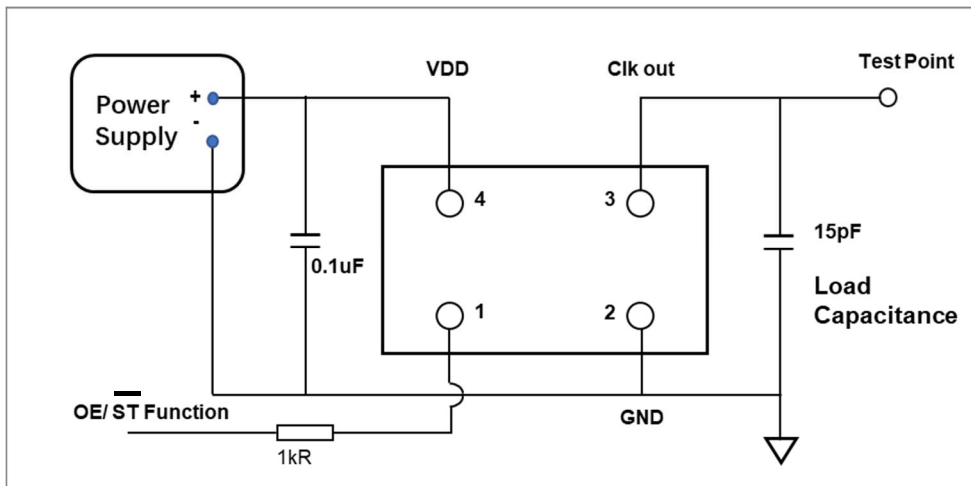


Figure 3. Test Circuit

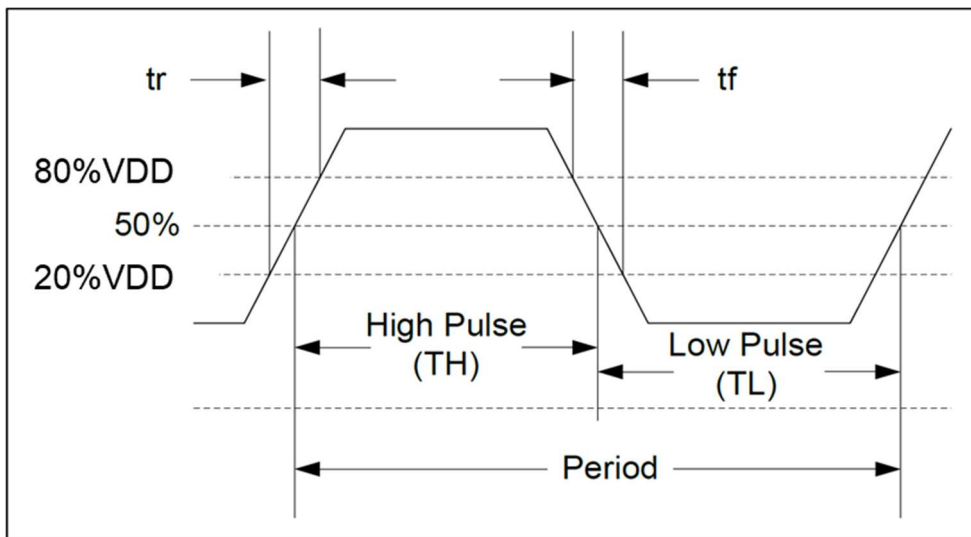


Figure 4. Waveform

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.

8.Reflow Profiles

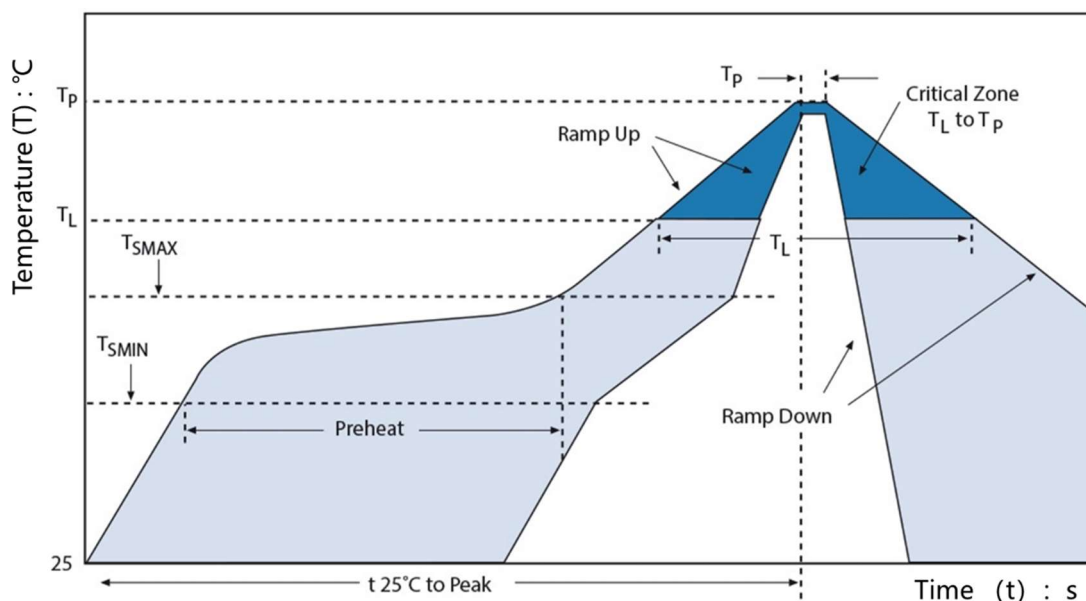


Figure 5. Reflow Soldering Profile

IPC/JEDEC Standard	IPC/JEDEC J-STD-020
T_S MAX to T_L (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 MSTM 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.

9. Revision History

Release Date	Revision	Change information
2023.09.27	V0.01	Preliminary datasheet release
2023.10.25	V0.02	Some parameter updates
2024.04.10	V0.03	Add packing specification

10. Important Notes:

MSTM provides technical and reliability data (including data sheets), design resources (including reference designs), applications or other design advice, network tools, security information and other resources "as is" without warranty of any kind, either express or implied, including, but not limited to, the implied warranties of merchantability, fitness for a particular purpose, or non-infringement of any third party's intellectual property rights. These resources are available for professional developers to design using Meista products. You will be solely responsible for:

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2. Design, verify and test your application;
3. Ensure that your application meets the appropriate standards and any other safety, security, or other requirements.

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PACKING SPECIFICATION

[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

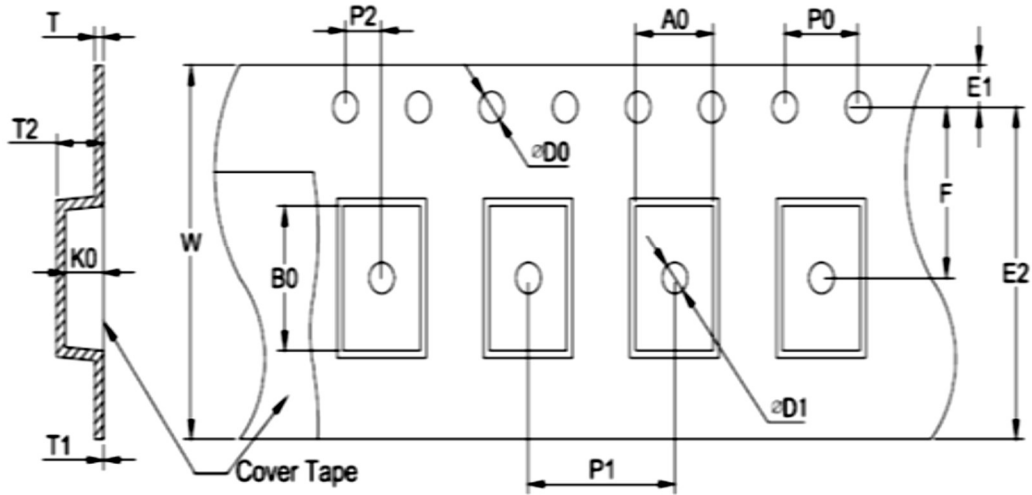


Table-1

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

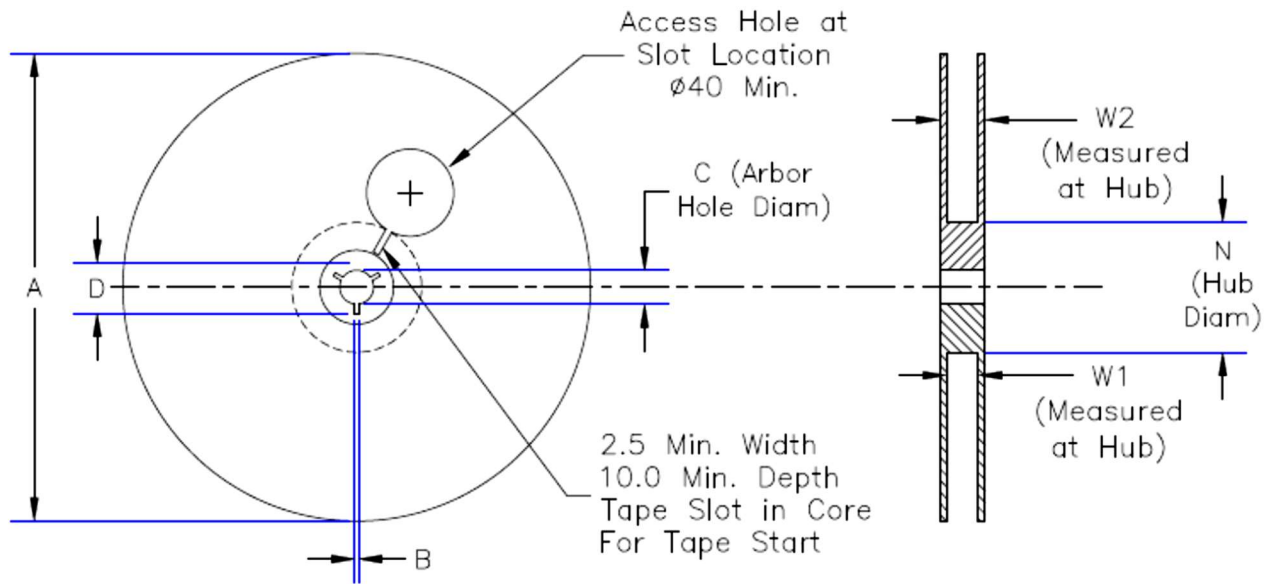
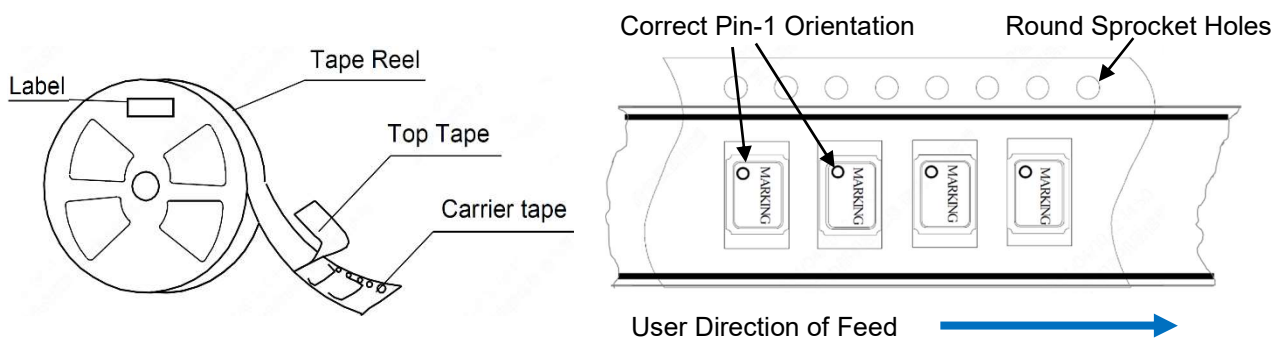


Table-2:

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

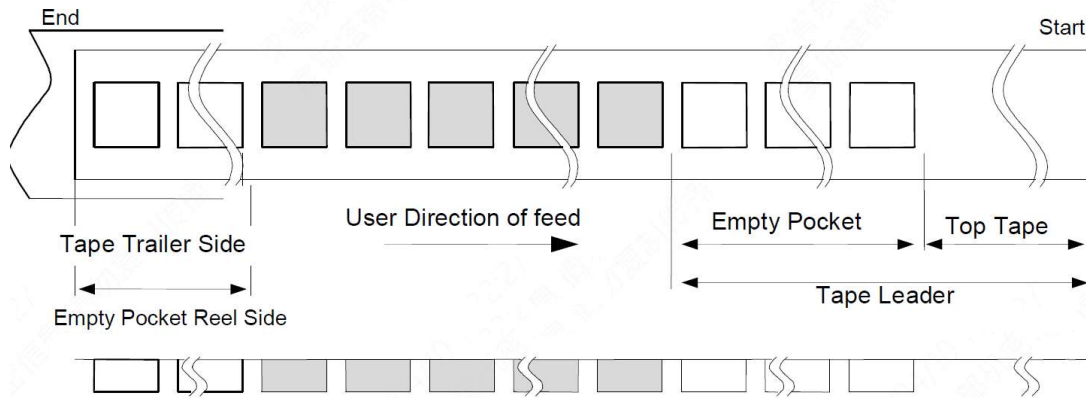


Table-3

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.

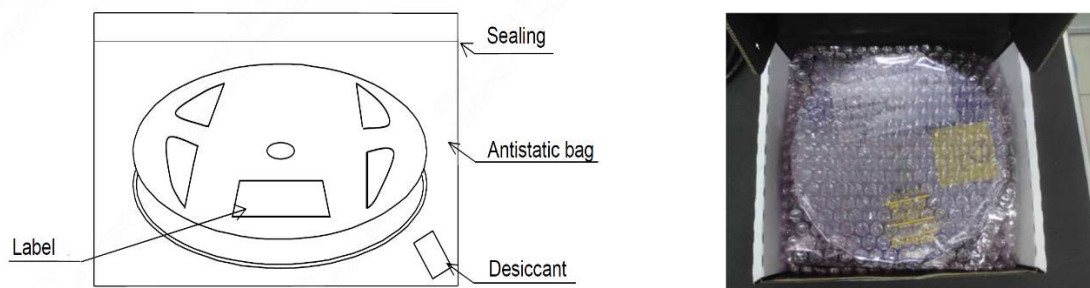
MST 8011T- 22 E 25.000000 **D**

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

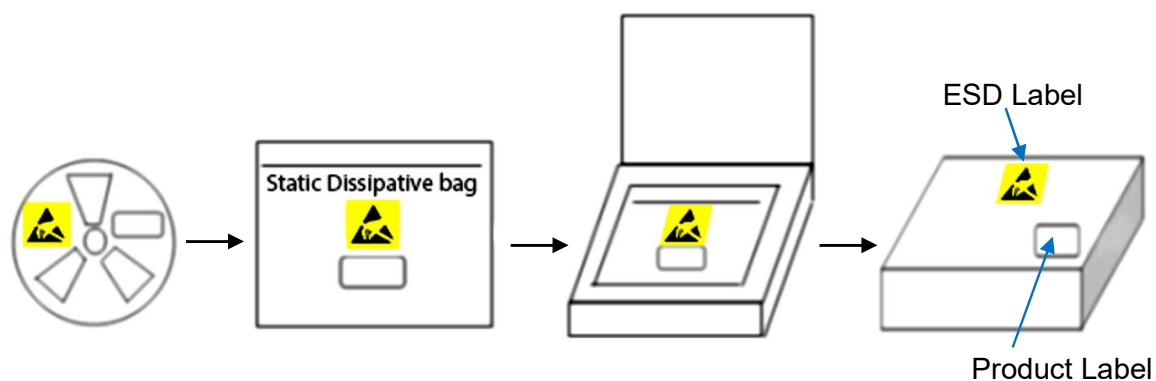
Suffix	Packaging Method	Package Size (mm)	Reel Size (inches)	Qty per Reel
D	8mm Tape & Reel	3.2 x 2.5	7	3000
	8mm Tape & Reel	2.5 x 2.0	7	3000
	8mm Tape & Reel	2.0 x 1.6	7	3000
	8mm Tape & Reel	2.0 x 1.2	7	3000
	8mm Tape & Reel	1.5 x 0.8	7	3000
E	8mm Tape & Reel	3.2 x 2.5	7	1000
	8mm Tape & Reel	2.5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

[2] Shipping carton

(1) The sealed reel is placed in a static dissipative ESD bag. An ESD label and product label is placed on the ESD bag.



Inner Box/Pizza Box Packing Flow:



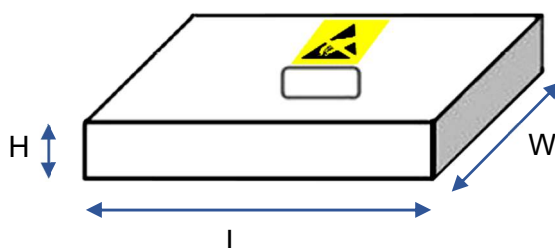
(2) Pizza box/Inner box dimensions are provided below

Table-5: Thick Pizza Box Dimension

Reel size	Length (L)	Width (W)	Height (H)	Note
7 inch reel	210mm	190mm	50mm	Tolerance 20 mm
13 inch reel	360mm	340mm	50mm	

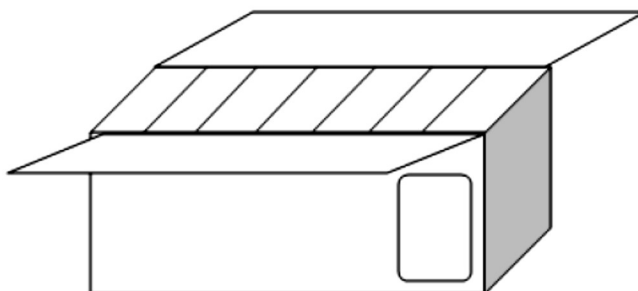
Table-6: Thin Pizza Box Dimension

Reel size	Length (L)	Width (W)	Height (H)	Note
7 inch reel	220mm	205mm	35mm	Tolerance 5 mm
13 inch reel	346mm	346mm	35mm	



(3) Packing pizza boxes in shipping carton

All pizza boxes will be placed vertically in the shipping carton. Each shipping carton will have the maximum number of pizza boxes which will fit in the carton. Antistatic bubble wrap or popcorn will be used as filler for empty space.



[3] Package Labeling

(1) Inner Box/ Pizza Box Labeling (TBD)

(2) Outer Box/Carton Labeling (TBD)

[4] 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.

[5] Handling

To handle with care to prevent the damage of tape, reel and products.