

MST 8012

Spec No: 2409_E_V0.01

低功耗可编程振荡器

■特性:

- 1 MHz 到 180 MHz间任意频率精确到1Hz
- 100% 引脚兼容并替换石英振荡器
- 出色的总频率稳定性: 低至 ± 3 ppm
- 低功耗: 4.5 mA (典型值), $V_{DD}=1.8V$ 条件
- V_{DD} 电源范围: 1.62V 至 3.63V
- 抗冲击: 可承受至少 60,000 g 的冲击
抗振动: 可承受至少70g
G灵敏度: <0.1 ppb/g
- 待机模式可延长电池寿命
- 5 ms 的快速启动时间
- LVCMOS/HCMOS 兼容输出
- 行业标准封装: 2.0x1.6, 2.5 x 2.0, 3.2 x 2.5 mm x mm
- 符合RoHS, REACH 规范, Pb-free, Halogen-free



■应用:

- DVR, IP高清摄像头, 平板电脑, 固态硬盘, 数据中心, 服务器, PLC, 工业控制, 电力设备, 新能源, 医疗设备等.

1. 系统框图

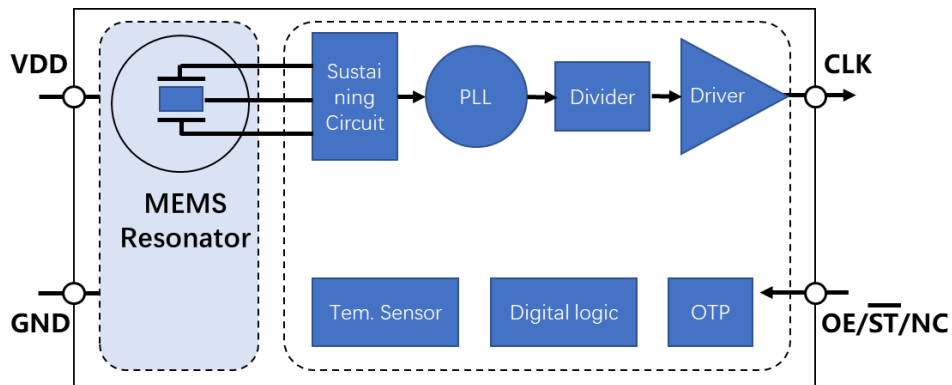


图1. MST8012 框图

2. 引脚定义:

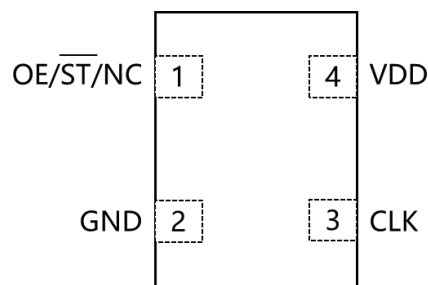


图 2. 引脚定义 SMD 封装 (顶视图)

引脚	符号	I/O	功能描述
1	OE/ST /NC	OE:输出使能	H [1]: 指定频率输出 L: 输出为高阻抗。仅禁用输出驱动程序。
		$\overline{\text{ST}}$:待机	H [1]: 指定频率输出 L: 输出低 (弱下拉),设备进入待机模式。电源电流减小至I_std。
		NC: 无连接	GND 和 VDD 之间的任何电压或开路[1]: 指定频率输出。引脚 1 没有功能。
2	GND	电源地	电气接地
3	CLK	CLK 输出	振荡器输出
4	VDD	电源	电源电压[2]

表1. 引脚功能

注:

1. 在OE或ST模式下, 如果引脚1外部上拉, 则建议使用10 kΩ或更小的上拉电阻。如果引脚 1 需要保持悬空状态, 请使用 NC 选项。
2. VDD 和 GND 之间需要值为 0.1 μF 或更高的去耦电容。

3. 电气规格

3.1 绝对最大限值

尝试在绝对最大额定值之外的操作可能会对器件造成永久性损坏。IC的实际性能仅在工作规格范围内保证, 而不是绝对最大额定值。

参数	最小	最大	单位
连续电源电压范围 (VDD)	-0.5	4.0	V
储存温度	-65	150	°C
静电放电	---	2000	V
焊接温度 (遵循标准无铅焊接指南)	---	260	°C
结温 ^[3]	---	150	°C

注: 3. 长时间超过此温度可能会损坏设备。

3.2 环境合规

参数	条件/测试方法
抗机械冲击性	MIL-STD-883F, Method2002
机械抗振性	MIL-STD-883F, Method 2007
温度循环	JESD22, Method A104
可焊性	MIL-STD-883F, Method2003
湿敏感度等级 (MSL)	MSL1 @ 260°C

3.3 电气特性

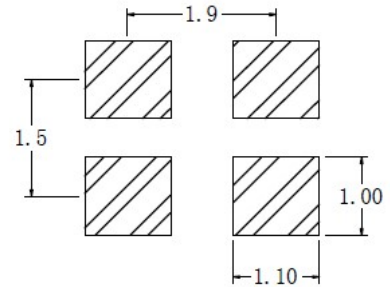
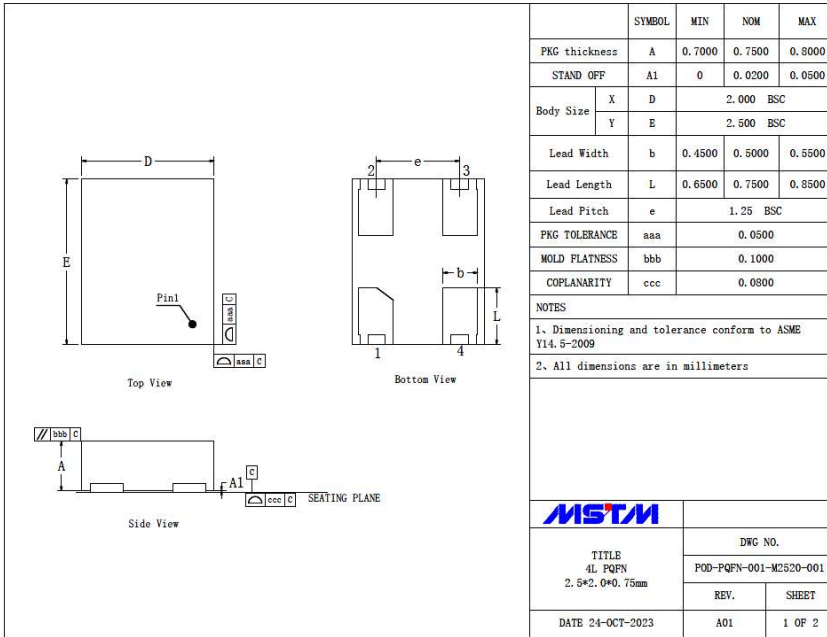
参数	符号	最小	典型	最大	单位	条件
输出频率范围	F	1	-	180	MHz	
频率稳定性	F_stab	-3	-	+3	ppm	包括 +25°C 时的初始容差、+25°C 下的第一年老化以及工作温度、额定电源电压和负载的变化。
		-5	-	+5	ppm	
		-10	-	+10	ppm	
工作温度范围	T_use	-20	-	+70	°C	商用级
		-40	-	+85		工业级
		-40	-	+105		扩展工业级
		-40	-	+125		车规级 *请联系我们
		-55	-	+125		扩展车规 *请联系我们
电源电压	VDD_1.8	1.62	1.8	1.98	V	
	VDD_2.5	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		
电流功耗	I _{dd}	-	+4.9	-	mA	无负载条件, F = 20 MHz, VDD = +2.8V to 3.3 V
		-	+4.5	-		无负载条件, F = 20 MHz, VDD = +2.5V
		-	+4.2	-		无负载条件, F = 20 MHz, VDD = +1.8V
OE 禁用时功耗	I _{OD}	-	+4.8	-	mA	VDD = +2.5V to +3.3V, OE = GND, 输出高阻态
		-	+4.5	-		VDD = +1.8V, OE = GND, 输出高阻态
待机功耗	I _{std}	-	+1.5	-	µA	\overline{ST} = GND, VDD = +2.8V to +3.3V, 输出弱下拉
		-	+0.8	-		\overline{ST} = GND, VDD = +2.5V, 输出弱下拉
		-	+0.6	-		\overline{ST} = GND, VDD = +1.8V, 输出弱下拉
占空比	DC	45	50	55	%	全电压范围
输出低电压	V _{OL}	-	-	VDD×0.1	V	IOL = 4 mA (VDD_3.0 and VDD_3.3)
输出高电压	V _{OH}	VDD×0.9	-	-	V	IOH = -4 mA (VDD_3.0 and VDD_3.3)
上升和下降时间	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%
输入低电压	VIL	-	-	VDD×0.3	V	Pin 1, OE 或 \overline{ST}
输入高电压	VIH	VDD×0.7	-	--	V	Pin 1, OE 或 \overline{ST}
启动时间	T _{start}	-	5.0	--	ms	从VDD达到其额定最小值的时间开始测量
启用和禁用时间	T _{oe}	-	-	130	ns	F = 180 MHz. 其它频率, T _{oe} = 100 ns + 3×cycles
恢复时间	T _{resume}	-	5.0	-	ms	从ST引脚超过50%阈值时开始测量
RMS周期抖动	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 周期抖动	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 随机抖动	T_phj	-	0.5	-	ps	F = 75 MHz, 积分带宽 = 900 kHz to 7.5 MHz
		-	1.3	-	ps	F = 75 MHz, 积分带宽 = 12 kHz to 20 MHz
包装数量	1000pcs./料盘 或 3000pcs./料盘 (φ180: 2016, 2520, 3225 package)					

4. 产品尺寸和焊盘推荐

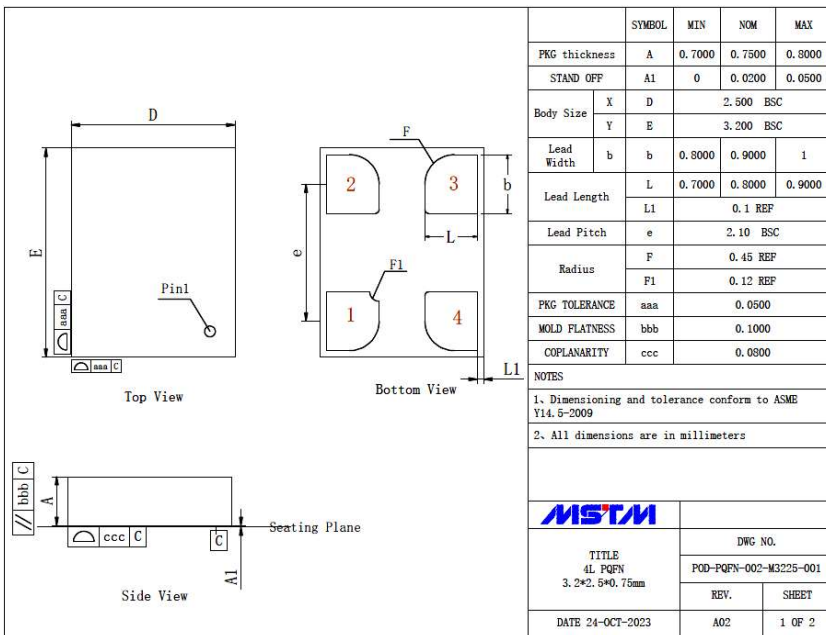
封装尺寸-外形尺寸 (单位: mm)	推荐焊盘尺寸 (单位: mm)																																																																															
<p>2.0 x 1.6 x 0.75 mm</p> <table border="1"> <thead> <tr> <th></th> <th>SYMBOL</th> <th>MIN</th> <th>NOM</th> <th>MAX</th> </tr> </thead> <tbody> <tr> <td>PKG thickness</td> <td>A</td> <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 ESC</td> </tr> <tr> <td>Y</td> <td colspan="3">E 2.000 ESC</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 ESC</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> </tbody> </table> <p>NOTES</p> <p>1. Dimensioning and tolerance conform to ASME Y14.5-2009</p> <p>2. All dimensions are in millimeters</p> <div style="text-align: center;"> </div> <table border="1"> <tr> <td colspan="2">TITLE</td> <td colspan="2">DWG NO.</td> </tr> <tr> <td colspan="2">4L PQFN</td> <td colspan="2">F0D-PQFN-001-M2016-001</td> </tr> <tr> <td colspan="2">2.0*1.6*0.75mm</td> <td>REV.</td> <td>SHEET</td> </tr> <tr> <td colspan="2">DATE 24-OCT-2023</td> <td>A01</td> <td>1 OF 2</td> </tr> </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 ESC			Y	E 2.000 ESC			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 ESC			RADIUS	F	0.100 REF			PKG TOLERANCE	aaa	0.0500			MOLD FLATNESS	bbb	0.1000			COPLANARITY	ccc	0.0800			TITLE		DWG NO.		4L PQFN		F0D-PQFN-001-M2016-001		2.0*1.6*0.75mm		REV.	SHEET	DATE 24-OCT-2023		A01	1 OF 2	
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2.5 x 2.0 x 0.75 mm

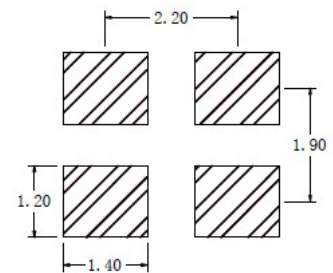


封装尺寸-外形尺寸 (单位: mm)

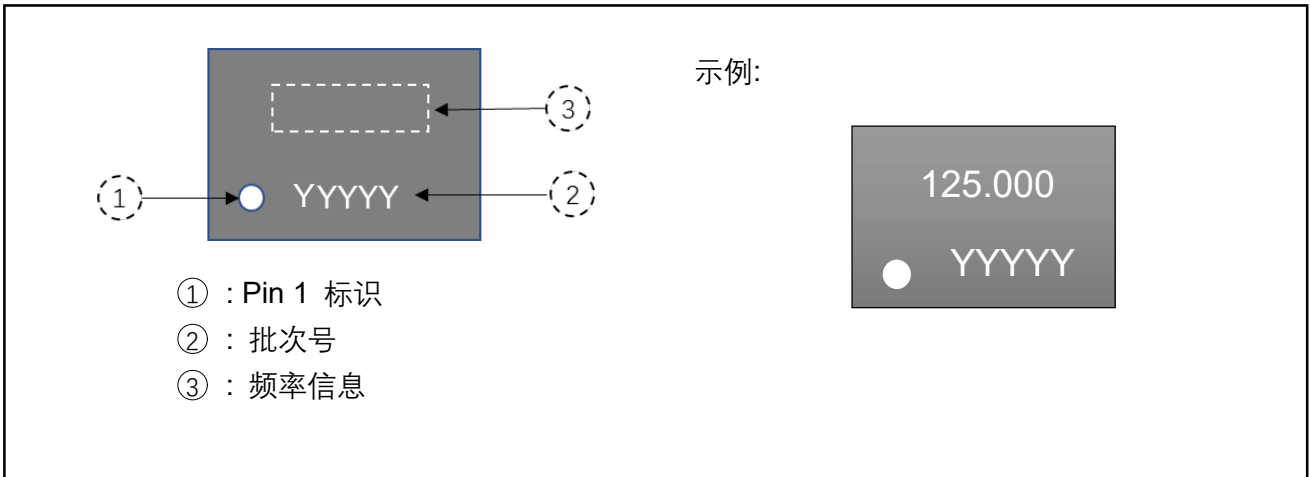
3.2 x 2.5 x 0.75 mm



推荐焊盘尺寸 (单位: mm)

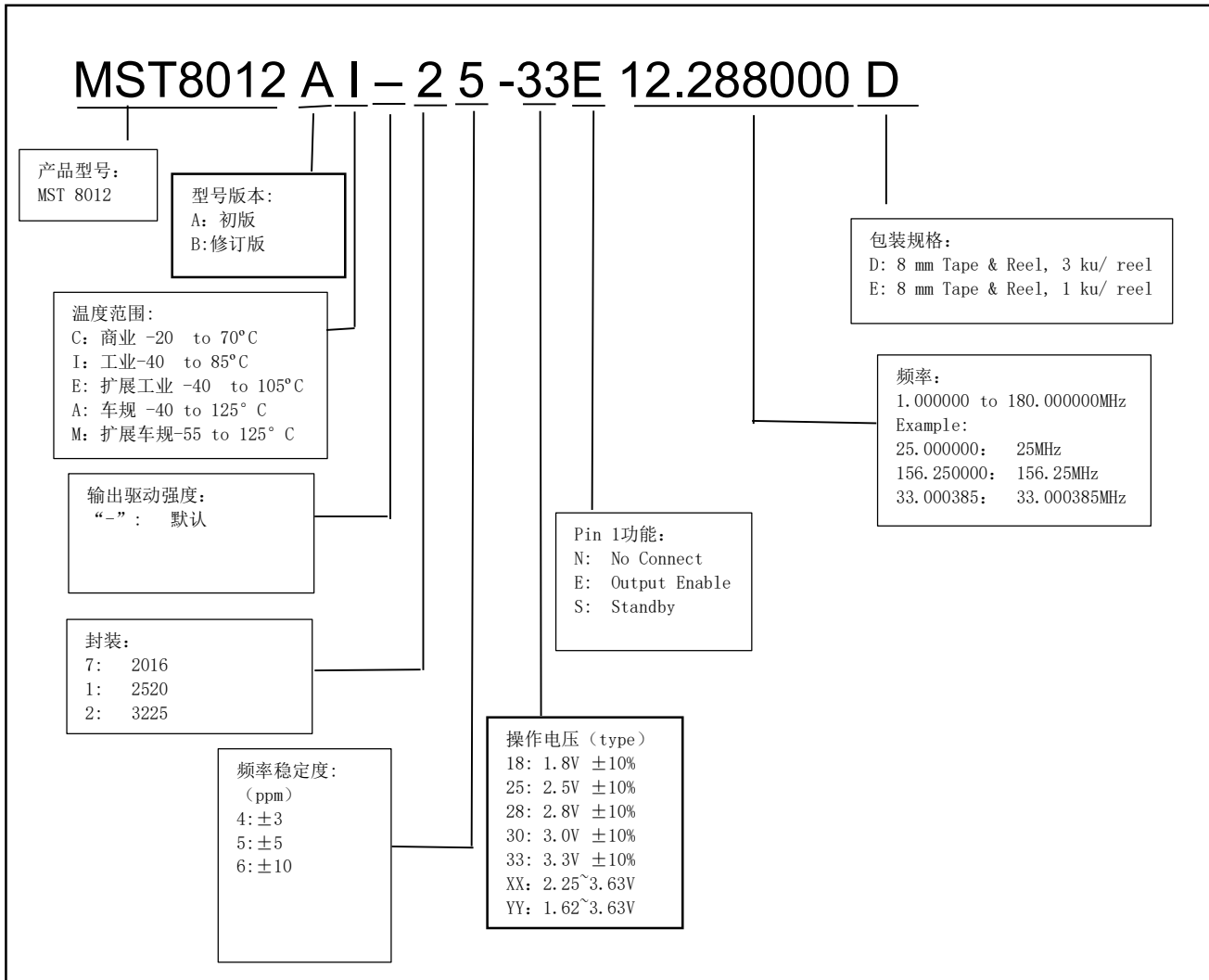


5. 丝印描述 (标准丝印)



6. 器件订购信息

器件编号指南仅供MST8011订货.



7. 测试电路和波形

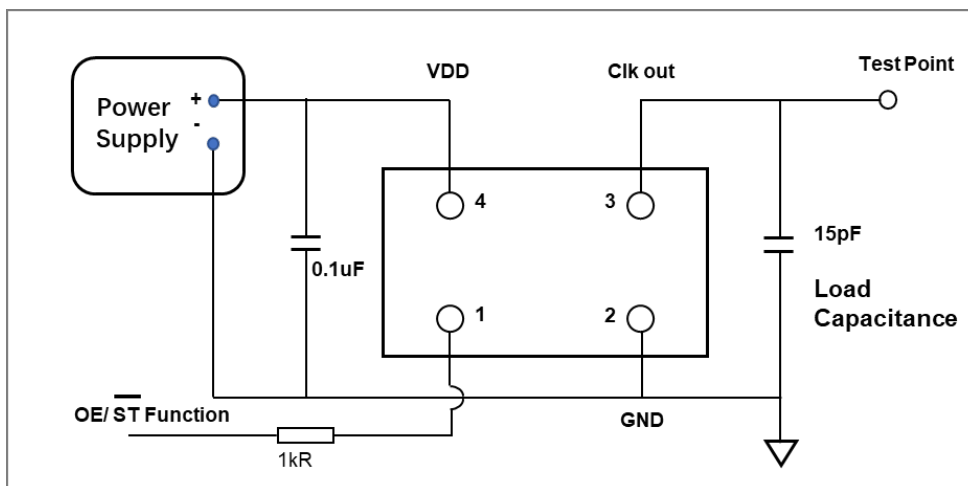


图 3. 测试回路

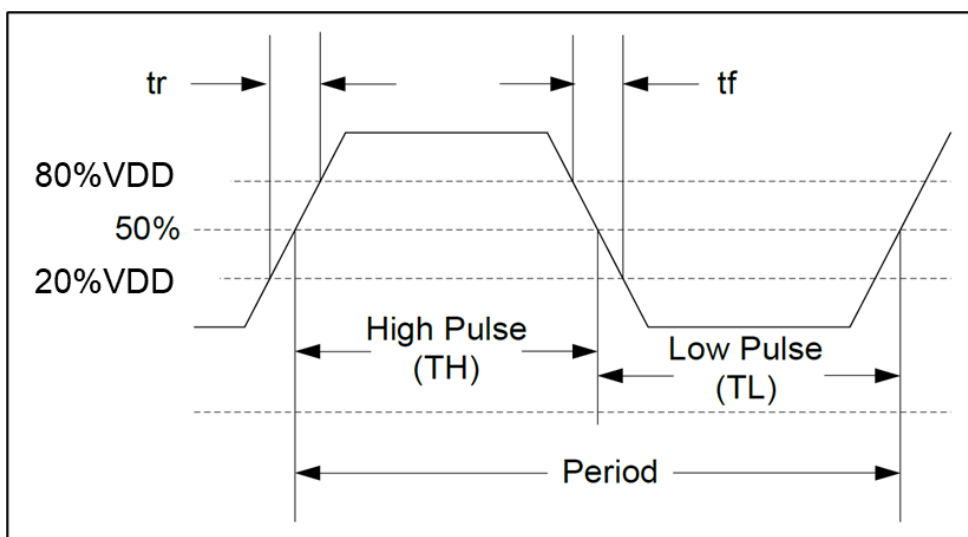


图 4. 波形

条件:

- (1) 示波器
带宽应至少为测量频率的 5 倍。
探头接地应靠近测试点放置，引线长度应尽可能短。
- (2) 负载电容包括探头电容。
- (3) 在靠近器件的 VCC 和 GND 引脚之间应连接一个 0.1 μ F 去耦电容。
- (4) 电源
电源阻抗应尽可能低，GND线应尽可能短

8. 回流焊曲线

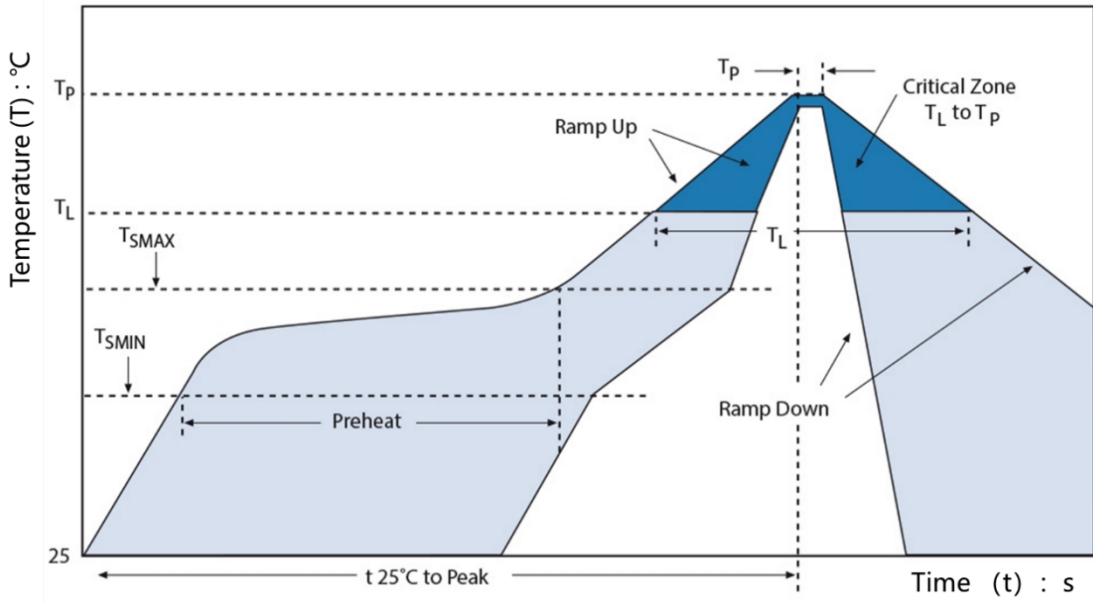


图5 . 回流焊曲线

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

备注:

图 5 所示的回流焊曲线符合 IPC/JEDEC J-STD-020 标准，适用于所有 MSTM 产品和封装。配置文件的相关详细信息请查看标准文档。优化的回流曲线取决于几个因素，例如焊膏、电路板密度和所用回流焊设备的类型

9. 修订历史

发布日期	版本	变更信息
2024.09.24	V0.01	初版规格书

10. 重要声明:

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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

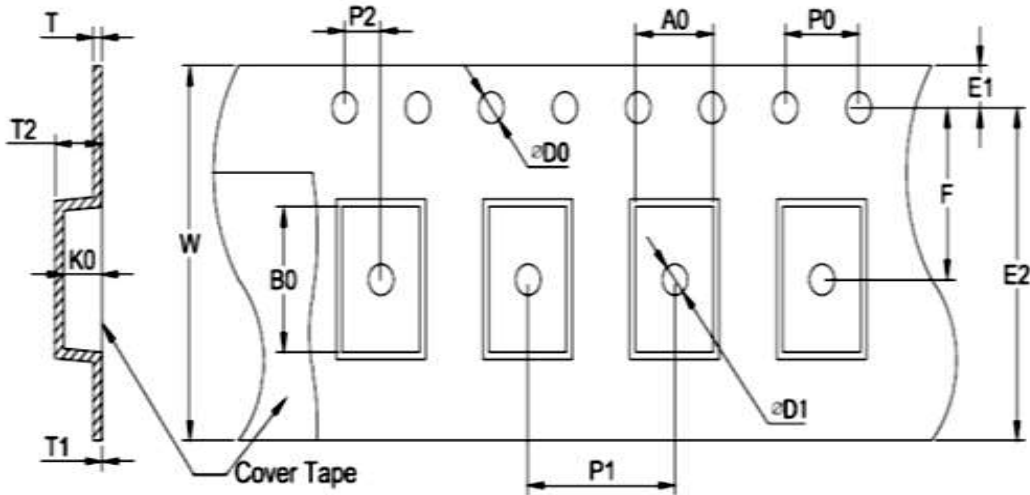


Table-1

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

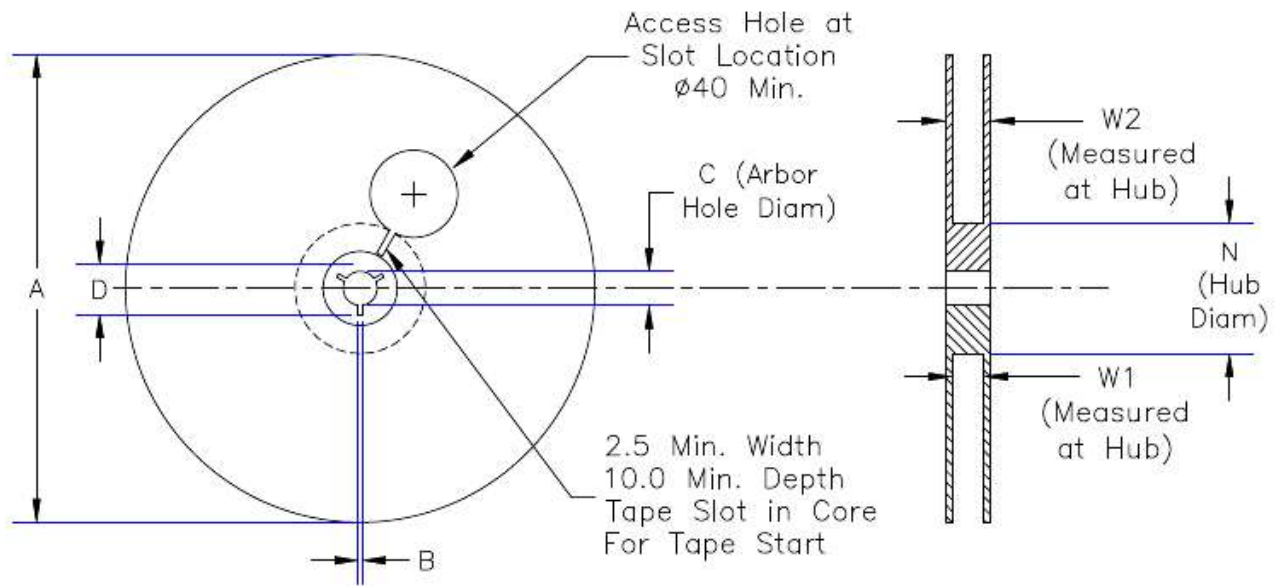
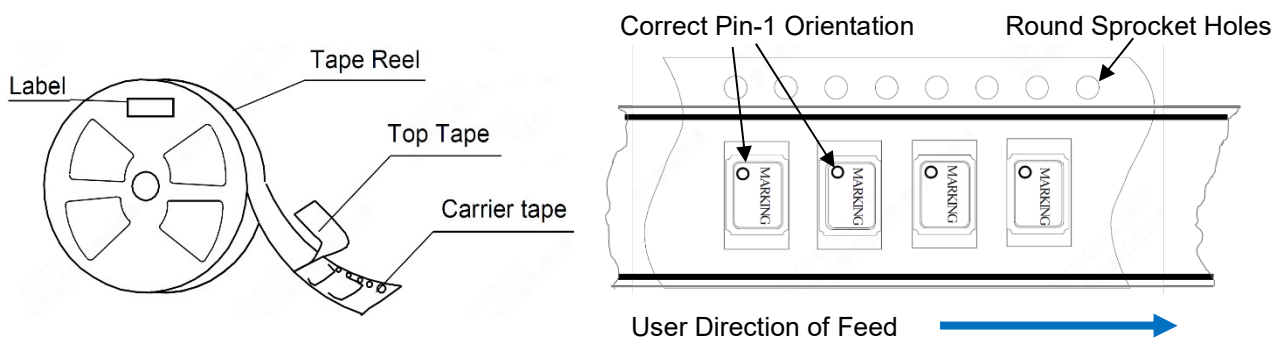


Table-2:

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

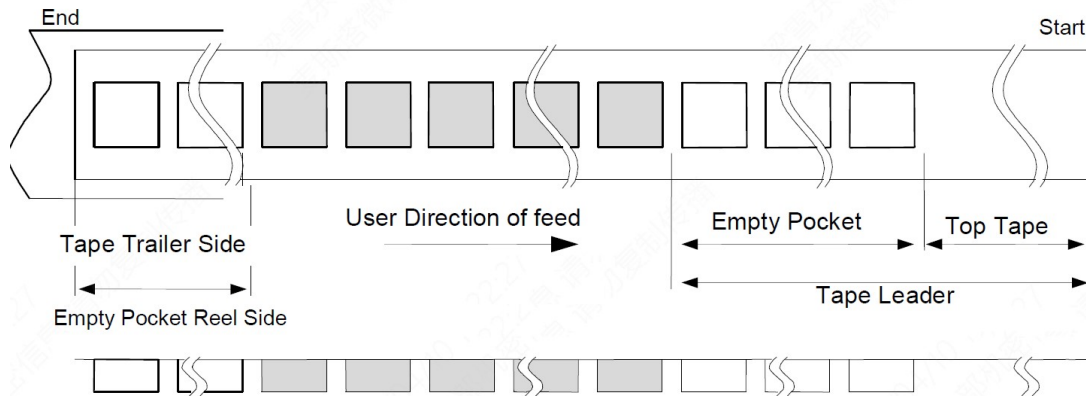


Table-3

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.

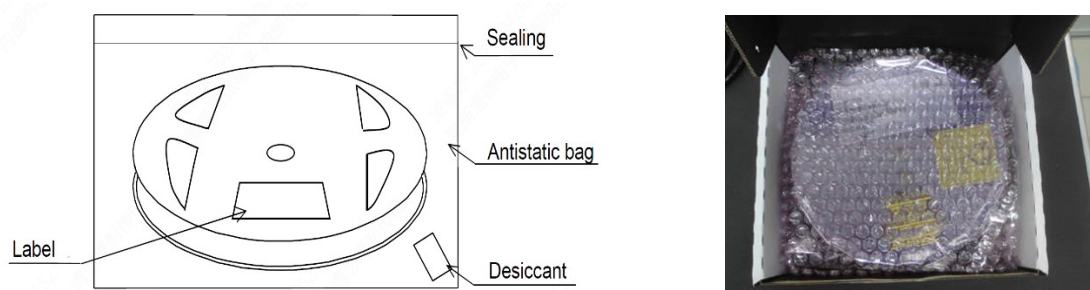
MST 8011T- 22 E 25.000000 **D**

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

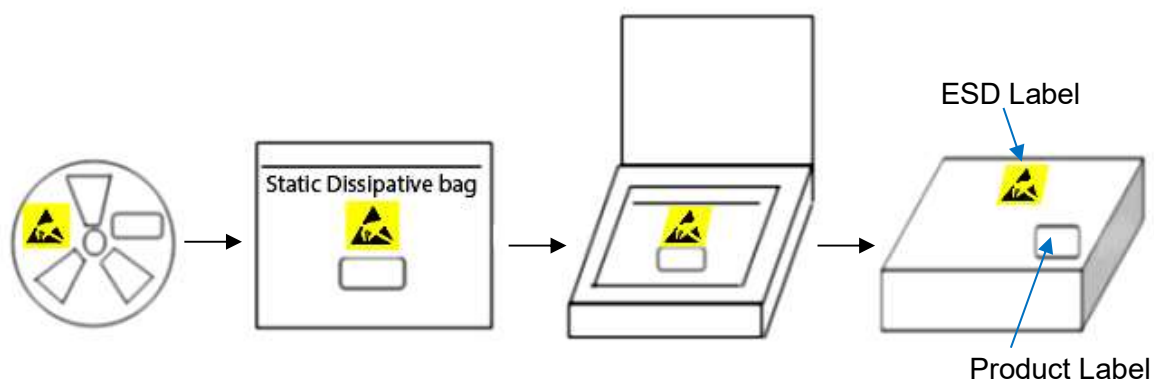
Suffix	Packaging Method	Package Size (mm)	Reel Size (inches)	Qty per Reel
D	8mm Tape & Reel	3.2 x 2.5	7	3000
	8mm Tape & Reel	2.5 x 2.0	7	3000
	8mm Tape & Reel	2.0 x 1.6	7	3000
	8mm Tape & Reel	2.0 x 1.2	7	3000
	8mm Tape & Reel	1.5 x 0.8	7	3000
E	8mm Tape & Reel	3.2 x 2.5	7	1000
	8mm Tape & Reel	2.5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



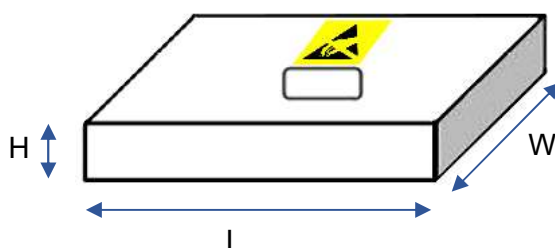
(2) Pizza box/Inner box dimensions are provided below

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.

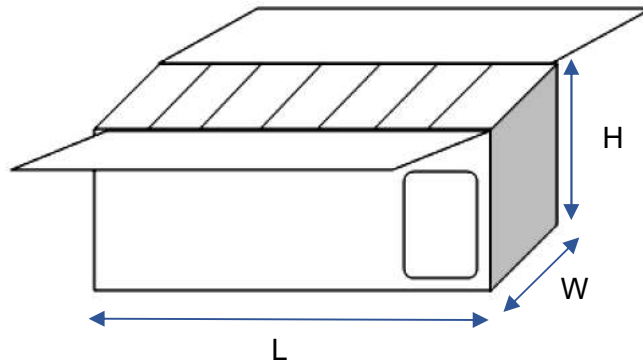


Table-7: The shipping carton Dimension

Material description:		7 -inch carton specifications		
Type:		A	B	C
Reel size.		7 -inch	7 -inch	7 -inch
Carton size	L(mm)	230mm	240mm	240mm
	W(mm)	220mm	220mm	220mm
	H(mm)	220mm	260mm	300mm
Number:	Thick Pizza Box	4	5	6
	Thin Pizza Box	6	7	8

Material description:		13 -inch carton specifications		
Type:		D	E	F
Reel size.		13-inch	13-inch	13-inch
Carton size	L(mm)	380mm	350mm	370mm
	W(mm)	380mm	360mm	360mm
	H(mm)	220mm	260mm	300mm
Number:	Thick Pizza Box	4	5	6
	Thin Pizza Box	6	7	8

[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.