



# MP Series Quartz Crystal

## Features

- Standard HC-49/U Metal Package
- Fundamental and 3<sup>rd</sup> Overtone Crystal Design
- Frequency Range 1.8432 – 64MHz
- Frequency Tolerance, ±30ppm Standard
- Frequency Stability, ±50ppm Standard
- Operating Temperature Range -20°C to +70°C or -40°C to +85°C
- Tape and Reel Packaging Available



Part Dimensions:  
13.46 × 10.85 × 3.8mm • 963.91mg

## Applications

- Wireless Communications
- Broadband Access
- FPGA/Microcontrollers
- Computer Peripherals
- Microprocessors
- Test and Measurement
- Consumer Electronics
- Portable Equipment

## Description

CTS MP Series incorporates a high Q quartz resonator in a proven resistance-weld metal package. It is ideal for supporting a wide range of commercial and industrial applications.

## Ordering Information

| Model | Frequency/Load Code              | Packaging                         | Temperature Range       | Product Options  |
|-------|----------------------------------|-----------------------------------|-------------------------|--|
| MP    | XXX or XXXX                      | -                                 |                         |  |
|       | Code      Frequency              |                                   | Code      Temp. Range   |  |
|       | Frequency/Load Code <sup>1</sup> |                                   | Blank   -20°C to +70°C  |  |
|       |                                  |                                   | E        -40°C to +85°C |  |
|       |                                  | Code      Packing                 |                         | Code      Option   |
|       |                                  | Blank     Bulk <sup>2</sup>       |                         | Blank     No Option  |
|       |                                  | 1        Tape & Reel <sup>3</sup> |                         | INS       Insulation Spacer                                  |
|       |                                  | 2        Radial Taping            |                         | SMMC     Surface Mount Lead Form<br>w/ Metal Clip Third Lead |

Notes:

- 1] Refer to Standard Product Part Numbers tables on Page 2.
- 2] Standard packaging is bulk in a bag.
- 3] SMMC Product Option only.

**Not all performance combinations and frequencies may be available.  
Contact your local CTS Representative or CTS Customer Service for availability.**

This product is specified for use only in standard commercial applications. Supplier disclaims all express and implied warranties and liability in connection with any use of this product in any non-commercial applications or in any application that may expose the product to conditions that are outside of the tolerances provided in its specification.



Standard Product Part Numbers

Part numbers in **BOLD** are commonly stock items through CTS authorized distributors. Non-bold numbers may be stocked or are available for order.

| FREQUENCY [MHz] | PART NUMBER [-20°C/+70°C] | PART NUMBER [-40°C/+85°C] | LOAD CAPACITANCE | OPERATING MODE | FREQUENCY [MHz] | PART NUMBER [-20°C/+70°C] | PART NUMBER [-40°C/+85°C] | LOAD CAPACITANCE | OPERATING MODE |
|-----------------|---------------------------|---------------------------|------------------|----------------|-----------------|---------------------------|---------------------------|------------------|----------------|
| 1.843200        | MP018A                    | MP018A-E                  | Series           | Fundamental    | 8.000000        | <b>MP080</b>              | MP080-E                   | Series           | Fundamental    |
| 1.843200        | MP018B                    | MP018B-E                  | 18pF             | Fundamental    | 8.000000        | <b>MP080A</b>             | MP080A-E                  | 20pF             | Fundamental    |
| 1.843200        | <b>MP018S</b>             | MP018S-E                  | 13pF             | Fundamental    | 8.000000        | <b>MP080B</b>             | <b>MP080B-E</b>           | 18pF             | Fundamental    |
| 2.000000        | MP020A                    | MP020A-E                  | Series           | Fundamental    | 8.000000        | MP080C                    | MP080C-E                  | 32pF             | Fundamental    |
| 2.000000        | <b>MP020S</b>             | MP020S-E                  | 20pF             | Fundamental    | 8.192000        | MP081B                    | MP081B-E                  | 18pF             | Fundamental    |
| 2.000000        | <b>MP020B</b>             | <b>MP020B-E</b>           | 18pF             | Fundamental    | 9.216000        | MP092B                    | MP092B-E                  | 18pF             | Fundamental    |
| 2.457600        | <b>MP024S</b>             | MP024S-E                  | 32pF             | Fundamental    | 9.830400        | MP098A                    | MP098A-E                  | Series           | Fundamental    |
| 3.579545        | MP036                     | MP036-E                   | Series           | Fundamental    | 9.830400        | <b>MP098</b>              | MP098-E                   | 20pF             | Fundamental    |
| 3.579545        | <b>MP036S</b>             | MP036S-E                  | 18pF             | Fundamental    | 9.830400        | <b>MP098B</b>             | <b>MP098B-E</b>           | 18pF             | Fundamental    |
| 3.686400        | MP037A                    | MP037A-E                  | Series           | Fundamental    | 10.000000       | <b>MP100</b>              | MP100-E                   | Series           | Fundamental    |
| 3.686400        | <b>MP037</b>              | MP037-E                   | 20pF             | Fundamental    | 10.000000       | MP100A                    | MP100A-E                  | 20pF             | Fundamental    |
| 3.686400        | <b>MP037B</b>             | <b>MP037B-E</b>           | 18pF             | Fundamental    | 10.000000       | MP100B                    | MP100B-E                  | 18pF             | Fundamental    |
| 4.000000        | <b>MP04A</b>              | MP04A-E                   | Series           | Fundamental    | 10.000000       | <b>MP101</b>              | MP101-E                   | 30pF             | Fundamental    |
| 4.000000        | <b>MP040</b>              | MP040-E                   | 20pF             | Fundamental    | 10.738635       | <b>MP107</b>              | MP107-E                   | 32pF             | Fundamental    |
| 4.000000        | <b>MP040B</b>             | <b>MP040B-E</b>           | 18pF             | Fundamental    | 11.000000       | MP110B                    | MP110B-E                  | Series           | Fundamental    |
| 4.032000        | MP043A                    | MP043A-E                  | Series           | Fundamental    | 11.000000       | MP110A                    | MP110A-E                  | 20pF             | Fundamental    |
| 4.032000        | MP043                     | MP043-E                   | 20pF             | Fundamental    | 11.000000       | <b>MP110</b>              | MP110-E                   | 18pF             | Fundamental    |
| 4.096000        | MP042A                    | MP042A-E                  | 20pF             | Fundamental    | 11.059200       | <b>MP111</b>              | MP111-E                   | Series           | Fundamental    |
| 4.194304        | <b>MP041</b>              | MP041-E                   | 12pF             | Fundamental    | 11.059200       | MP111A                    | MP111A-E                  | 20pF             | Fundamental    |
| 4.915200        | MP049A                    | MP049A-E                  | Series           | Fundamental    | 11.059200       | MP111B                    | MP111B-E                  | 18pF             | Fundamental    |
| 4.915200        | <b>MP042</b>              | MP042-E                   | 20pF             | Fundamental    | 11.059200       | MP111C                    | MP111C-E                  | 32pF             | Fundamental    |
| 4.915200        | <b>MP049B</b>             | <b>MP049B-E</b>           | 18pF             | Fundamental    | 12.000000       | <b>MP120</b>              | MP120-E                   | Series           | Fundamental    |
| 5.000000        | <b>MP05B</b>              | MP05B-E                   | Series           | Fundamental    | 12.000000       | MP120A                    | MP120A-E                  | 20pF             | Fundamental    |
| 5.000000        | <b>MP05A</b>              | MP05A-E                   | 20pF             | Fundamental    | 12.000000       | MP120B                    | MP120B-E                  | 18pF             | Fundamental    |
| 5.000000        | <b>MP050C</b>             | <b>MP050C-E</b>           | 18pF             | Fundamental    | 12.000000       | MP120C                    | MP120C-E                  | 32pF             | Fundamental    |
| 5.068000        | <b>MP050</b>              | MP050-E                   | Series           | Fundamental    | 12.288000       | MP122C                    | MP122C-E                  | Series           | Fundamental    |
| 5.068000        | MP051A                    | MP051A-E                  | 20pF             | Fundamental    | 12.288000       | MP122A                    | MP122A-E                  | 20pF             | Fundamental    |
| 5.185000        | MP052                     | MP052-E                   | Series           | Fundamental    | 12.288000       | MP122B                    | MP122B-E                  | 18pF             | Fundamental    |
| 5.185000        | MP051                     | MP051-E                   | 20pF             | Fundamental    | 12.288000       | <b>MP122</b>              | MP122-E                   | 32pF             | Fundamental    |
| 5.185000        | MP052C                    | MP052C-E                  | 32pF             | Fundamental    | 14.318180       | <b>MP143</b>              | MP143-E                   | Series           | Fundamental    |
| 5.500000        | MP055B                    | MP055B-E                  | 18pF             | Fundamental    | 14.318180       | <b>MP143B</b>             | <b>MP143B-E</b>           | 18pF             | Fundamental    |
| 5.714300        | MP057                     | MP057-E                   | Series           | Fundamental    | 14.745600       | <b>MP147</b>              | MP147-E                   | Series           | Fundamental    |
| 5.714300        | MP057A                    | MP057A-E                  | 20pF             | Fundamental    | 14.745600       | MP147A                    | MP147A-E                  | 20pF             | Fundamental    |
| 6.000000        | MP060A                    | MP060A-E                  | Series           | Fundamental    | 14.745600       | MP147B                    | MP147B-E                  | 18pF             | Fundamental    |
| 6.000000        | <b>MP060</b>              | MP060-E                   | 20pF             | Fundamental    | 15.000000       | <b>MP150</b>              | MP150-E                   | Series           | Fundamental    |
| 6.000000        | <b>MP060B</b>             | <b>MP060B-E</b>           | 18pF             | Fundamental    | 16.000000       | <b>MP160</b>              | MP160-E                   | Series           | Fundamental    |
| 6.000000        | MP060C                    | MP060C-E                  | 32pF             | Fundamental    | 16.000000       | MP160A                    | MP160A-E                  | 20pF             | Fundamental    |
| 6.144000        | <b>MP061</b>              | MP061-E                   | 20pF             | Fundamental    | 16.000000       | MP160B                    | MP160B-E                  | 18pF             | Fundamental    |
| 6.144000        | MP061C                    | MP061C-E                  | 32pF             | Fundamental    | 18.000000       | MP180                     | MP180-E                   | Series           | Fundamental    |
| 6.250000        | MP062                     | MP062-E                   | 30pF             | Fundamental    | 18.432000       | <b>MP184</b>              | MP184-E                   | Series           | Fundamental    |
| 6.400000        | MP064                     | MP064-E                   | 20pF             | Fundamental    | 18.432000       | MP184A                    | MP184A-E                  | 20pF             | Fundamental    |
| 6.553600        | MP065                     | MP065-E                   | 20pF             | Fundamental    | 18.432000       | MP184B                    | MP184B-E                  | 18pF             | Fundamental    |
| 6.553600        | MP065C                    | MP065C-E                  | 12pF             | Fundamental    | 19.660800       | <b>MP196</b>              | MP196-E                   | Series           | Fundamental    |
| 7.372800        | <b>MP073</b>              | MP073-E                   | Series           | Fundamental    | 19.660800       | MP196A                    | MP196A-E                  | 20pF             | Fundamental    |
| 7.372800        | MP073A                    | MP073A-E                  | 20pF             | Fundamental    | 19.660800       | MP196B                    | MP196B-E                  | 18pF             | Fundamental    |
| 7.372800        | MP073B                    | MP073B-E                  | 18pF             | Fundamental    |                 |                           |                           |                  |                |



Standard Product Part Numbers Continued

Part numbers in **BOLD** are commonly stock items through CTS authorized distributors. Non-bold numbers may be stocked or are available for order.

| FREQUENCY<br>[MHz] | PART NUMBER<br>[-20°C/+70°C] | PART NUMBER<br>[-40°C/+85°C] | LOAD<br>CAPACITANCE | OPERATING<br>MODE |
|--------------------|------------------------------|------------------------------|---------------------|-------------------|
| 20.000000          | <b>MP200</b>                 | MP200-E                      | Series              | Fundamental       |
| 20.000000          | MP200A                       | MP200A-E                     | 20pF                | Fundamental       |
| 20.000000          | MP200B                       | MP200B-E                     | 18pF                | Fundamental       |
| 22.118400          | <b>MP221A</b>                | MP221A-E                     | Series              | Fundamental       |
| 22.118400          | <b>MP221</b>                 | MP221-E                      | 20pF                | Fundamental       |
| 22.118400          | MP221B                       | MP221B-E                     | 18pF                | Fundamental       |
| 24.000000          | <b>MP240</b>                 | MP240-E                      | Series              | Fundamental       |
| 24.000000          | MP240A                       | MP240A-E                     | 20pF                | Fundamental       |
| 24.000000          | MP240B                       | MP240B-E                     | 18pF                | Fundamental       |
| 24.576000          | <b>MP245</b>                 | MP245-E                      | Series              | Fundamental       |
| 24.576000          | MP245B                       | MP245B-E                     | 18pF                | Fundamental       |
| 25.000000          | <b>MP250</b>                 | MP250-E                      | Series              | Fundamental       |
| 25.000000          | MP250A                       | MP250A-E                     | 20pF                | Fundamental       |
| 25.000000          | MP250B                       | MP250B-E                     | 18pF                | Fundamental       |
| 27.000000          | MP270                        | MP270-E                      | Series              | 3rd Overtone      |
| 27.000000          | MP270B                       | MP270B-E                     | 18pF                | 3rd Overtone      |
| 32.000000          | MP320A                       | MP320A-E                     | 20pF                | 3rd Overtone      |
| 32.000000          | MP320B                       | MP320B-E                     | 18pF                | 3rd Overtone      |
| 32.768000          | MP327B                       | MP327B-E                     | 18pF                | 3rd Overtone      |
| 36.000000          | MP360                        | MP360-E                      | Series              | 3rd Overtone      |
| 40.000000          | MP400                        | MP400-E                      | 20pF                | 3rd Overtone      |
| 48.000000          | MP480                        | MP480-E                      | Series              | 3rd Overtone      |
| 48.000000          | MP480A                       | MP480A-E                     | 20pF                | 3rd Overtone      |
| 48.000000          | MP480B                       | MP480B-E                     | 18pF                | 3rd Overtone      |
| 50.000000          | MP500B                       | MP500B-E                     | 18pF                | 3rd Overtone      |
| 64.000000          | MP640B                       | MP640B-E                     | 18pF                | 3rd Overtone      |



## Electrical Specifications

### Operating Conditions

| PARAMETER             | SYMBOL    | CONDITIONS | MIN        | TYP | MAX        | UNIT |
|-----------------------|-----------|------------|------------|-----|------------|------|
| Operating Temperature | $T_A$     | -          | -20<br>-40 | +25 | +70<br>+85 | °C   |
| Storage Temperature   | $T_{STG}$ | -          | -40        | -   | +125       | °C   |

### Frequency Stability

| PARAMETER           | SYMBOL            | CONDITIONS                  | MIN | TYP         | MAX | UNIT |
|---------------------|-------------------|-----------------------------|-----|-------------|-----|------|
| Frequency Range     |                   |                             |     |             |     |      |
| Fundamental         | $f_0$             | -                           |     | 1.8432 - 30 |     | MHz  |
| 3rd Overtone        |                   |                             |     | 24 - 64     |     |      |
| Frequency Tolerance | $\Delta f/f_0$    | @ +25°C                     | -30 | -           | 30  | ppm  |
| Frequency Stability | $\Delta f/f_{25}$ | Referenced to +25°C reading | -50 | -           | 50  | ppm  |
| Aging               | $\Delta f/f_0$    | Typical per year @ +25°C    | -5  | ±3          | 5   | ppm  |

### Crystal Parameters

| PARAMETER             | SYMBOL | CONDITIONS         | MIN                         | TYP | MAX  | UNIT |
|-----------------------|--------|--------------------|-----------------------------|-----|------|------|
| Operating Mode        | -      | -                  | Fundamental or 3rd Overtone |     |      | -    |
| Crystal Cut           | -      | -                  | AT-Cut                      |     |      | -    |
| Load Capacitance      | $C_L$  | -                  | Note 1                      |     |      | pF   |
| Shunt Capacitance     | $C_0$  | -                  | -                           | -   | 7.0  | pF   |
| Series Resistance     |        |                    |                             |     |      |      |
|                       |        | 1.8MHz - <2.0MHz   | -                           | -   | 600  |      |
|                       |        | 2.0MHz - <3.0MHz   | -                           | -   | 500  |      |
|                       |        | 3.0MHz - <3.5MHz   | -                           | -   | 150  |      |
|                       |        | 3.5MHz - <4.0MHz   | -                           | -   | 120  |      |
|                       |        | 4.0MHz - <5.0MHz   | -                           | -   | 100  |      |
| Fundamental           | $R_1$  | 5.0MHz - <6.0MHz   | -                           | -   | 80   | Ω    |
|                       |        | 6.0MHz - <7.0MHz   | -                           | -   | 60   |      |
|                       |        | 7.0MHz - <8.0MHz   | -                           | -   | 50   |      |
|                       |        | 8.0MHz - <10.0MHz  | -                           | -   | 40   |      |
|                       |        | 10.0MHz - <13.0MHz | -                           | -   | 30   |      |
|                       |        | 13.0MHz - 30.0MHz  | -                           | -   | 25   |      |
| 3rd Overtone          |        | 24.0MHz - 64.0MHz  | -                           | -   | 55   |      |
| Drive Level           | DL     | -                  | -                           | 100 | 1000 | μW   |
| Insulation Resistance | $R_i$  | +100Vdc ±15Vdc     | 500                         | -   | -    | MΩ   |

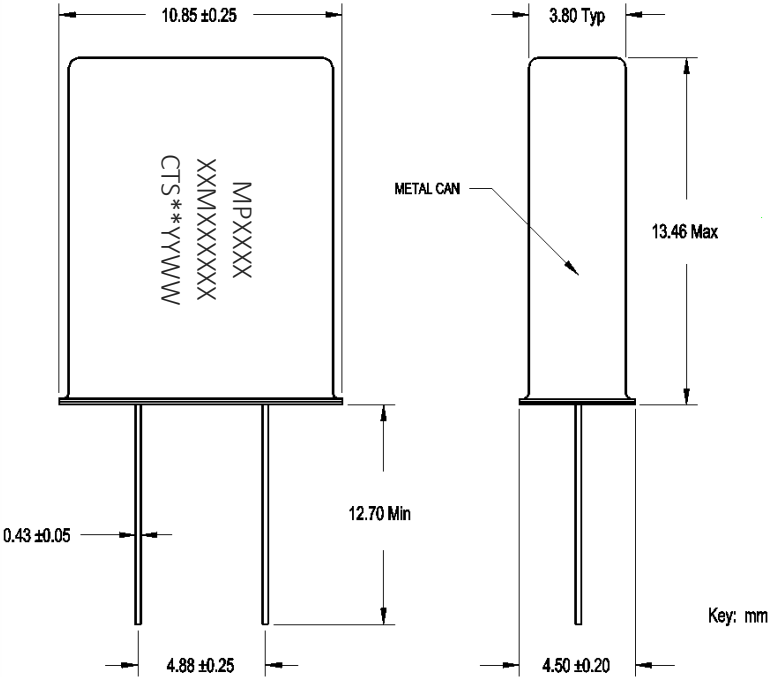
1.] Refer to Standard Product Part Numbers table on Pages 2.

$\Delta f/f_0$  - Frequency deviation referenced to nominal frequency.

$\Delta f/f_{25}$  - Frequency deviation over operating temperature range, referenced to +25°C frequency.

Mechanical Specifications

MP Package Drawing



Marking Information

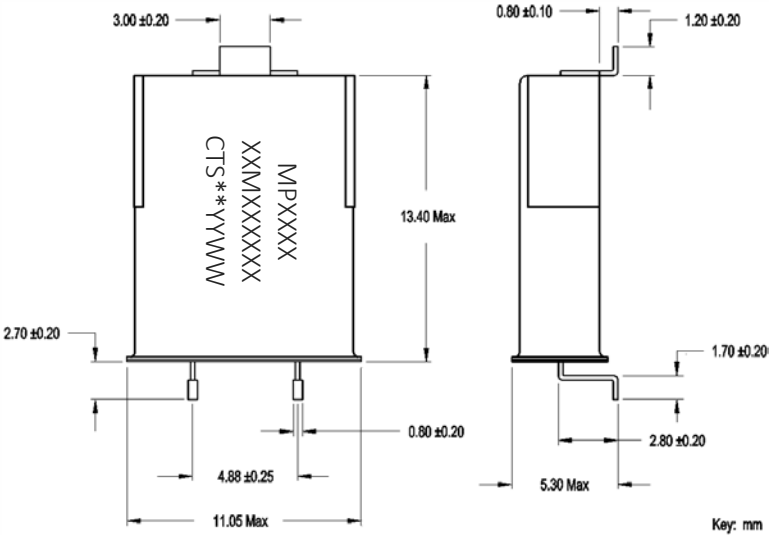
1. MPXXXX – CTS Part Number.  
[Per Ordering Information format.]  
XXMXXXXXX – Frequency is marked with only leading significant digits before the ‘M’ and 4 – 6 digits after the ‘M’ [including zeros].  
Ex. XMXXXXXX – 3M579545  
XXMXXXXXX – 14M31818  
XXMXXXXXX – 20M0000
2. \*\* – Manufacturing Site Code.
3. YYWW – Date Code; YY = year, WW = week.



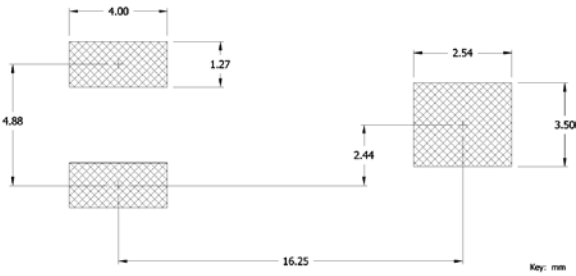
Notes

1. JEDEC termination code (e1). Barrier-plating is nickel [Ni] with tin-silver-copper [SnAgCu] lead finish.
2. Manual soldering with application to PCB and device terminals, 2 times. Solder iron temperature [@ tip] +350°C maximum, 10 seconds maximum.
3. MSL = 1.

MP-SMMC – Package Drawing



Recommended Pad Layout

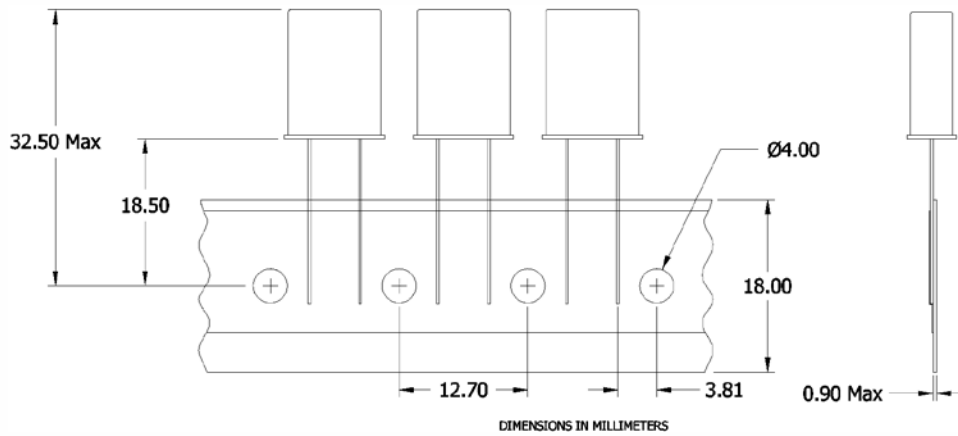


## Packaging – MP, Bulk in Bag or Radial Taping

### Bulk in Bag – Standard

Packaging is bulk in anti-static plastic bag.

### Radial Taping – Optional

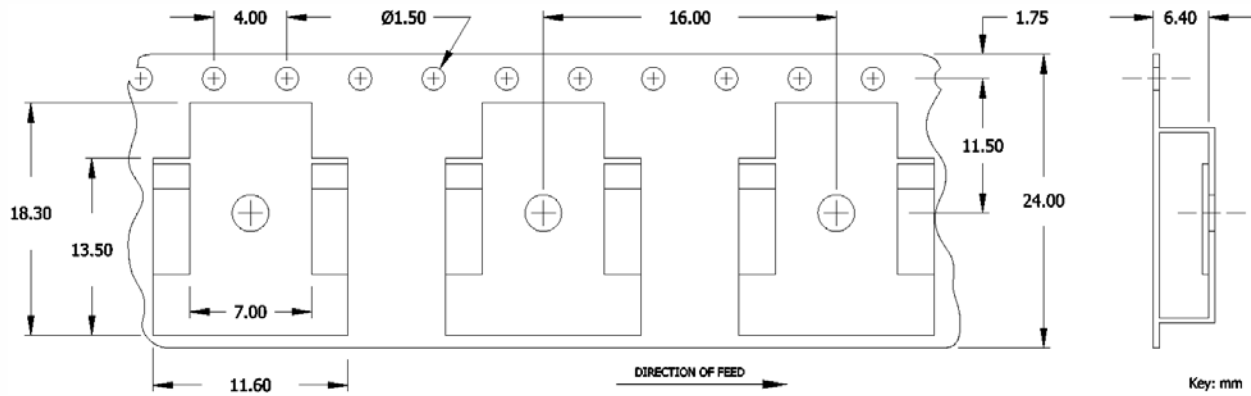


### Notes

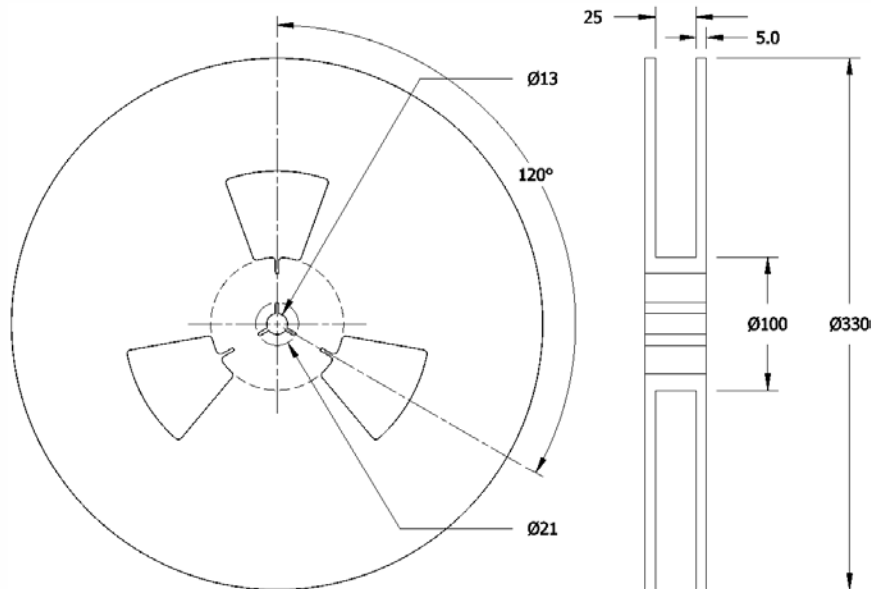
1. Complete CTS part number, frequency value, date code and manufacturing site code information must appear on bag, reel and carton labels.

### Packaging – MP-SMMC, Tape and Reel

#### Tape Drawing



#### Reel Drawing



#### Notes

1. Complete CTS part number, frequency value, date code and manufacturing site code information must appear on reel and carton labels.