

# X3 Frequency Multiplier

RMK-3-212+

50Ω Output 1200 to 2100 MHz



CASE STYLE: TT1224

## The Big Deal

- Wide bandwidth, 1200 to 2100 MHz output
- Wide input power range, +12 to +17 dBm
- Low conversion loss, 14 dB typ.
- Good harmonic suppression: F2, 50 dBc; F4, 53 dBc

## Product Overview

Mini-Circuits' RMK-3-212+ frequency multiplier provides a multiplication factor of 3, converting input frequencies from 400 to 700 MHz into output frequencies from 1200 to 2100 MHz, supporting applications such as synthesizers, local oscillators, satellite up and down converters and more. The unit provides an input power range from +12 to +17 dBm, low conversion loss of 14 dB and good harmonic suppression. The multiplier comes housed in a miniature, surface-mount package (0.25 x 0.31 x 0.16") ideal for dense circuit board layouts.

| Feature                                                                                                          | Advantages                                                                                                            |
|------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|
| Low conversion loss, 14 dB typ.                                                                                  | With a low conversion loss, the unit produces higher output power, reducing the need for amplification.               |
| Very good harmonic suppression <ul style="list-style-type: none"><li>• F2, 50 dBc</li><li>• F4, 53 dBc</li></ul> | Reduces spurious signals and the need for additional filtering.                                                       |
| Wide bandwidth                                                                                                   | With an output frequency range spanning 1200 to 2100 MHz, this multiplier covers a wide range of applications.        |
| Wide input power range, +12 to +17 dBm                                                                           | Wide input power signal range accommodates different input signal levels while still maintaining low conversion loss. |
| Low cost                                                                                                         | Provides an easy, cost-effective solution for generating high-frequency signals from a lower frequency signal source. |
| Small size                                                                                                       | Measuring only 0.25 x 0.31 x 0.16", the RMK-3-212+ saves space in crowded PCB layouts.                                |

### Notes

- A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.  
B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.  
C. The parts covered by this specification document are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the Standard Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at [www.minicircuits.com/MCLStore/terms.jsp](http://www.minicircuits.com/MCLStore/terms.jsp)



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## Maximum Ratings

|                                                                 |                |
|-----------------------------------------------------------------|----------------|
| Operating Temperature                                           | -40°C to 85°C  |
| Storage Temperature                                             | -55°C to 100°C |
| RF Input Power                                                  | 20 dBm         |
| Permanent damage may occur if any of these limits are exceeded. |                |

## Pin Connections

|        |         |
|--------|---------|
| INPUT  | 1       |
| OUTPUT | 4       |
| GROUND | 2,3,5,6 |

## Features

- broadband
- low conversion loss, 14 dB typ.
- high rejection F2, 50 dBc typ; F4, 53 dBc typ
- low cost
- aqueous washable

## Applications

- synthesizers
- local oscillators
- satellite up and down converters



Generic photo used for illustration purposes only  
CASE STYLE: TT1224

+RoHS Compliant

The +Suffix identifies RoHS Compliance. See our web site for RoHS Compliance methodologies and qualifications

| Reel Size | Devices/Reel         |
|-----------|----------------------|
| 7"        | 10, 20, 50, 100, 200 |
| 13"       | 500                  |

## Electrical Specifications at 25°C

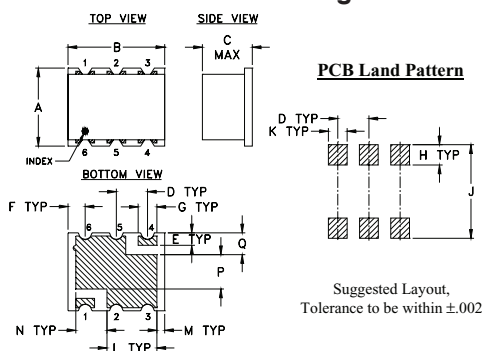
| Parameter                    | Min. | Typ. | Max. | Unit |
|------------------------------|------|------|------|------|
| Multiplier Factor            |      | 3    |      |      |
| Frequency Range, Input (F1)  | 400  | —    | 700  | MHz  |
| Frequency Range, Output (F3) | 1200 | —    | 2100 | MHz  |
| Input Power                  | 12   | —    | 17   | dBm  |
| Conversion Loss              |      | 14   | 19   | dB   |
| Harmonic Output*             | F1   | -10  | -1.4 | —    |
|                              | F2   | 33   | 50   | —    |
|                              | F4   | 30   | 53   | —    |

\* Harmonics of input frequency below the power level of F3

## Typical Performance Data

| Frequency   |              | Harmonic Rejection Below F3, (dBc)<br>at RF Input Power 17 dBm |       |        |        |
|-------------|--------------|----------------------------------------------------------------|-------|--------|--------|
| Input (MHz) | Output (MHz) | Conv. Loss (dB) F3                                             | F1    | F2     | F4     |
| 400.00      | 1200.00      | 15.96                                                          | -6.10 | -54.79 | -54.66 |
| 420.00      | 1260.00      | 15.48                                                          | -5.64 | -65.42 | -56.75 |
| 450.00      | 1350.00      | 15.10                                                          | -4.87 | -58.81 | -57.48 |
| 500.00      | 1500.00      | 15.14                                                          | -3.10 | -56.70 | -60.08 |
| 540.00      | 1620.00      | 14.36                                                          | -2.26 | -55.71 | -59.08 |
| 600.00      | 1800.00      | 14.85                                                          | -0.09 | -53.88 | -55.14 |
| 620.00      | 1860.00      | 15.16                                                          | 0.64  | -52.35 | -55.34 |
| 640.00      | 1920.00      | 14.68                                                          | 1.07  | -53.47 | -53.53 |
| 660.00      | 1980.00      | 15.22                                                          | 1.82  | -53.78 | -51.42 |
| 700.00      | 2100.00      | 14.91                                                          | 2.75  | -53.19 | -50.71 |

## Outline Drawing



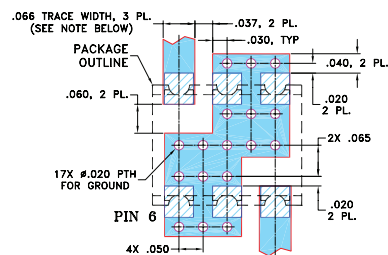
### PCB Land Pattern

Suggested Layout,  
Tolerance to be within ±.002

## Outline Dimensions (inch)

| A    | B    | C    | D    | E    | F    | G    | H     |
|------|------|------|------|------|------|------|-------|
| .25  | .31  | .16  | .100 | .040 | .055 | .060 | .065  |
| 6.35 | 7.87 | 4.06 | 2.54 | 1.02 | 1.40 | 1.52 | 1.65  |
| J    | K    | L    | M    | N    | P    | Q    | wt.   |
| .300 | .060 | .160 | .025 | .100 | .110 | .070 | grams |
| 7.62 | 1.52 | 4.06 | 0.64 | 2.54 | 2.79 | 1.78 | 0.16  |

## Demo Board MCL P/N: TB-393 Suggested PCB Layout (PL-258)



NOTES: 1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .030" ± .002"; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.  
2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.  
3. DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)  
4. DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

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