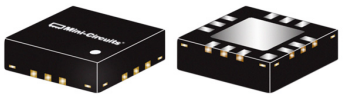
X2 *MMIC Surface Mount*

# Frequency Multiplier

## CY2-283+

50Ω Output 7 to 28 GHz



CASE STYLE: DQ1225

## The Big Deal

- Ultra-wideband, output from 7 to 28 GHz
- Wide input power range, +12 to +18 dBm
- Low conversion loss, 13 dB
- Good fundamental and harmonic suppression: F1, 34 dBc; F3, 40 dBc
- Tiny size, 3 x 3 x 0.89mm

## Product Overview

Mini-Circuits' CY2-283+ is an ultra-wideband MMIC frequency doubler, converting input frequencies from 3.5 to 14 GHz into output frequencies from 7 to 28 GHz. Its wide output range makes this model suitable for broadband systems as well as a wide variety of narrowband applications. Utilizing GaAs HBT technology, the multiplier comes housed in a tiny 3 x 3 x 0.89mm MCLP package and offers excellent repeatability, low inductance, and good thermal efficiency.

## Key Features

| Feature | Advantages |
|---|---|
| Broadband, 7 to 28 GHz output | With an output frequency range spanning 7 to 28 GHz, this multiplier supports broadband applications such as defense and instrumentation as well as a wide range of narrowband system requirements including 5G. |
| Low conversion loss, 13 dB typ. | With a low conversion loss, CY2-283+ produces higher output power, reducing the need for post amplification. |
| Excellent fundamental and harmonic suppression:<br>• F1, 34 dBc<br>• F3, 40 dBc<br>• F4, 23 dBc | Reduces spurious signals and the need for additional filtering. |
| Wide input power range, +12 to +18 dBm | Wide input power signal range accommodates different input signal levels while still maintaining a low conversion loss. |
| 3 x 3 mm, 12 lead MCLP package | Low inductance, repeatable transitions, and excellent thermal contact to the PCB |

# X2 MMIC Surface Mount
# Frequency Multiplier

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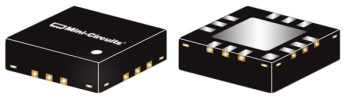
50Ω Output 7 to 28 GHz

## Features

- Wideband, output 7 to 28 GHz
- Low conversion loss, 13 dB typ.
- High fundamental & harmonic suppression, F1, 34 dBc typ.; F3, 40 dBc typ.; F4, 23 dBc typ.
- Miniature size 3 x 3 x 0.89mm
- Aqueous washable



CASE STYLE: DQ1225

## Applications

- Synthesizers
- Local Oscillators
- 5G

***+RoHS Compliant***

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

## Electrical Specifications[1] at 25°C

| Parameter | Input Frequency (GHz) | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Multiplier Factor | | | 2 | | |
| Frequency Range, Input (F1) | | 3.5 | — | 12 | GHz |
| | | 12 | — | 14 | |
| Frequency Range, Output (F2) | | 7 | — | 24 | GHz |
| | | 24 | — | 28 | |
| Input Power | | 12 | — | 18 | dBm |
| Conversion Loss | 3.5-12 | — | 13 | 17.5 | dB |
| | 12-14 | — | 17 | 22.5 | |
| Harmonic Output[2] F1 | 3.5-12 | — | 34 | — | dBc |
| | 12-14 | — | 17 | — | |
| Harmonic Output[2] F3 | 3.5-12 | — | 40 | — | |
| | 12-14 | — | 47 | — | |
| Harmonic Output[2] F4 | 3.5-12 | — | 23 | — | |

1. At +15 dBm input power measured on Mini-Circuits test board TB-973-CY2283C+
2. Harmonics of input frequency below the power of F2. Harmonics are measured to 50 GHz.

## Maximum Ratings

| Parameter | Ratings |
|---|---|
| Operating Temperature | -40°C to 85°C |
| Storage Temperature | -65°C to 150°C |
| Input RF Power | 21dBm |

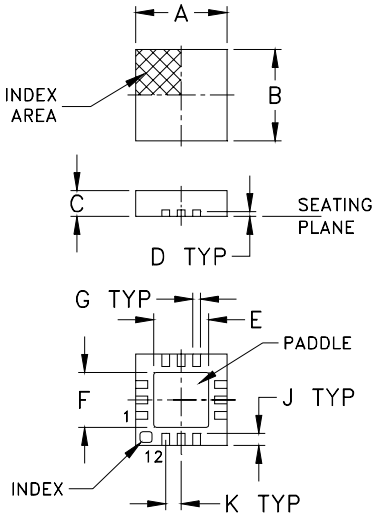
Permanent damage may occur if any of these limits are exceeded.

## Pad Connections

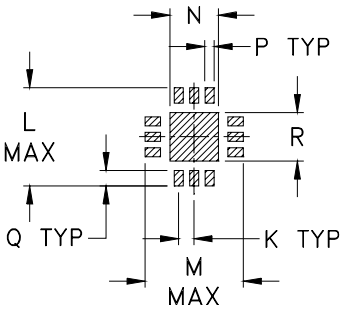
| Function | Pad Number |
|---|---|
| Input | 5 |
| Output | 11 |
| Ground | 4,6,10,12 & paddle |
| No Connections | all others |

ESD rating
Human body model (HBM): Class 1C (1000 to<2000V) in accordance with ANSI/ESD 5.1-2007

## Outline Drawing




### PCB Land Pattern




Suggested Layout,
Tolerance to be within ±.002

Lead Finish: Matte-Tin.

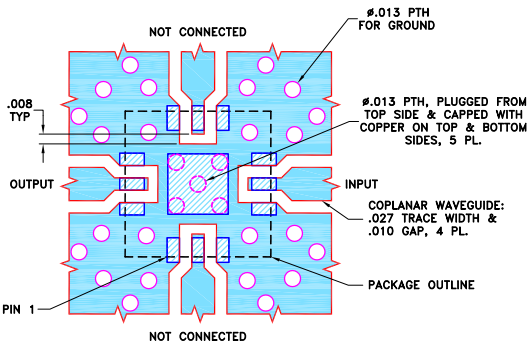
## Product Marking


## Outline Dimensions (inch / mm)

| A | B | C | D | E | F | G | H | J |
|---|---|---|---|---|---|---|---|---|
| .118 | .118 | .035 | .008 | .057 | .057 | .009 | --- | .016 |
| 3.00 | 3.00 | 0.89 | 0.20 | 1.45 | 1.45 | 0.23 | --- | 0.41 |

| K | L | M | N | P | Q | R | wt |
|---|---|---|---|---|---|---|---|
| .020 | .127 | .127 | .049 | .010 | .020 | .049 | grams |
| 0.51 | 3.23 | 3.23 | 1.24 | 0.25 | 0.51 | 1.24 | 0.02 |

### *Demo Board MCL P/N: TB-973-CY2283C+*
### *Suggested PCB Layout (PL-541)*



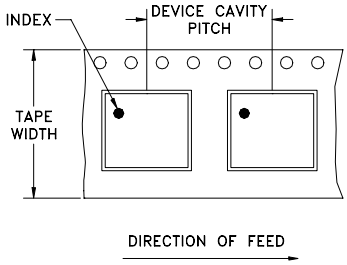

NOTES:
1. TRACE WIDTH PARAMETERS ARE SHOWN FOR TACONIC TLY-5 WITH DIELECTRIC THICKNESS .010"±.001". COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH AND GAP MAY NEED TO BE MODIFIED.
2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER).

DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK.

## Tape and Reel (F66)

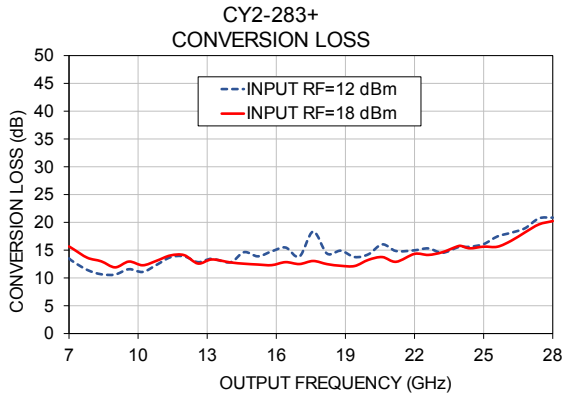
DEVICE ORIENTATION IN T&R

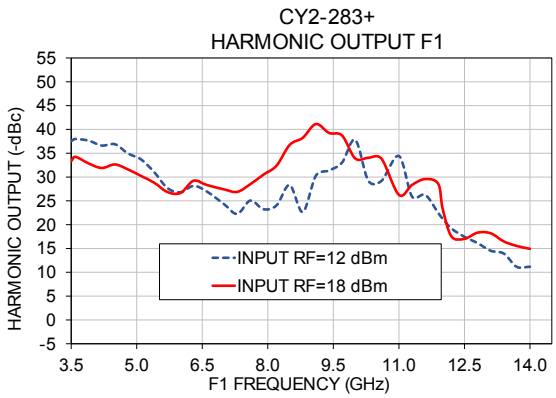


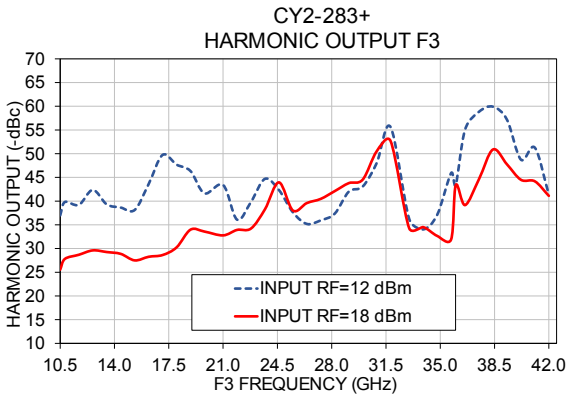

| Tape Width, mm | Device Cavity Pitch, mm | Reel Size, inches | Devices per Reel see note | |
|---|---|---|---|---|
| 8 | 4 | 7 | Small quantity standard | 20 |
| | | | | 50 |
| | | | | 100 |
| | | | | 200 |
| | | | | 500 |
| | | 7 | Standard | 1000, 2000 |

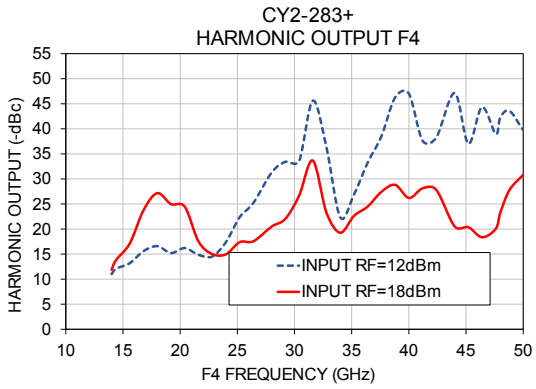
## Typical Performance Data

| Input Frequency (GHz) | INPUT RF= 12 dBm Conversion Loss (dB) | Harmonic Output Below F2 (dBc) | | | INPUT RF= 18 dBm Conversion Loss (dB) | Harmonic Output Below F2 (dBc) | | |
|---|---|---|---|---|---|---|---|---|
| | F2 | F1 | F3 | F4 | F2 | F1 | F3 | F4 |
| 3.50 | 13.52 | 37.55 | 37.00 | 11.00 | 15.67 | 33.33 | 25.55 | 11.88 |
| 4.20 | 10.66 | 36.61 | 42.37 | 15.60 | 12.99 | 31.90 | 29.61 | 23.79 |
| 5.10 | 11.09 | 33.69 | 38.13 | 16.20 | 12.28 | 30.22 | 27.50 | 24.48 |
| 6.00 | 13.89 | 26.80 | 47.69 | 17.37 | 14.10 | 26.66 | 30.24 | 14.96 |
| 6.60 | 13.45 | 26.98 | 41.64 | 25.21 | 13.33 | 28.34 | 33.58 | 17.56 |
| 7.00 | 12.82 | 24.30 | 43.41 | 31.27 | 12.80 | 27.40 | 32.78 | 20.49 |
| 7.60 | 13.89 | 25.06 | 39.84 | 33.55 | 12.42 | 28.51 | 34.22 | 26.66 |
| 8.20 | 15.48 | 24.06 | 42.34 | 36.21 | 12.85 | 32.40 | 43.95 | 23.22 |
| 9.10 | 14.39 | 30.29 | 35.94 | 33.25 | 12.49 | 41.13 | 40.48 | 24.49 |
| 10.00 | 14.26 | 37.81 | 43.07 | 47.00 | 13.26 | 33.90 | 44.53 | 26.20 |
| 11.00 | 14.98 | 34.41 | 36.22 | 47.14 | 14.33 | 26.26 | 34.26 | 20.52 |
| 12.00 | 15.62 | 21.26 | 43.46 | 42.31 | 15.78 | 23.43 | 43.37 | 23.29 |
| 13.10 | 18.14 | 14.52 | 57.18 | -- | 16.70 | 18.20 | 47.76 | -- |
| 13.70 | 20.72 | 11.14 | 51.26 | -- | 19.64 | 15.53 | 44.17 | -- |
| 14.00 | 20.85 | 11.18 | 41.38 | -- | 20.23 | 14.94 | 41.11 | -- |




## Additional 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.
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