



MMIC SURFACE MOUNT

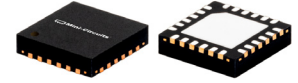
X3 Frequency Multiplier

CY3-223+

50Ω Output 10 to 22 GHz

THE BIG DEAL

- Ultra-wideband, output from 10 to 22 GHz
- Wide input power range, +12 to +18 dBm
- Low Conversion Loss, 17 dB Typ.
- Good Fundamental and Harmonic Suppression:
F1 > +34 dBc; F2 > +45 dBc; F4 > +50 dBc
- Tiny size, 4 x 4mm 24L



Generic photo used for illustration purposes only
CASE STYLE: DG1847

+RoHS Compliant
The +Suffix identifies RoHS Compliance.
See our website for methodologies and qualifications

APPLICATIONS

- 5G MIMO and Back Haul Radio Systems
- Satellite Communications
- Test and Measurement Equipment
- Radar, EW, and ECM Defense Systems

PRODUCT OVERVIEW

Mini-Circuits' CY3-223+ is an ultra-wideband MMIC Frequency Tripler, converting input frequencies from 3.33 to 7.33 GHz into output frequencies from 10 to 22 GHz. Its wide output range makes this model suitable for broadband systems as well as a wide variety of narrow-band applications. Utilizing GaAs HBT technology, the multiplier comes housed in a tiny 4x4mm 24L MCLP package and offers excellent repeatability, low inductance, and good thermal efficiency.

KEY FEATURES

| Feature | Advantages |
|---|---|
| Broadband, 10 to 22 GHz output | With an output frequency range spanning 10 to 22 GHz, this multiplier supports broadband applications such as defense and instrumentation as well as a wide range of narrowband system requirements including 5G. |
| Excellent fundamental and harmonic suppression: <ul style="list-style-type: none"> • F1 +34 dBc • F2 +45 dBc • F4 +50 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. |



ELECTRICAL SPECIFICATIONS¹ AT 25°C AND Z₀ = 50Ω, UNLESS NOTED OTHERWISE

| Parameter | Input Frequency (GHz) | RF Input = +12 dBm | | | Unit | |
|------------------------------|-----------------------|--------------------|------|------|------|-----|
| | | Min. | Typ. | Max. | | |
| Multiplication Factor | | | 3 | | | |
| Frequency Range, Input (F1) | | 3.33 | - | 7.33 | GHz | |
| Frequency Range, Output (F3) | | 10 | - | 22 | GHz | |
| Input Power | | +12 | - | +18 | dBm | |
| Conversion Loss | 3.33 | - | 22.0 | 26.2 | dB | |
| | 4 | - | 18.0 | 22.1 | | |
| | 5 | - | 16.4 | 20.4 | | |
| | 6 | - | 18.2 | 23.0 | | |
| | 7.33 | - | 22.1 | 27.5 | | |
| Harmonic Output ² | F1 | 3.33 | - | 45.8 | - | dBc |
| | | 4 | - | 49.8 | - | |
| | | 5 | - | 46.6 | - | |
| | | 6 | - | 44.9 | - | |
| | | 7.33 | - | 22.1 | - | |
| | F2 | 3.3 | - | 86.1 | - | dBc |
| | | 4 | - | 71.9 | - | |
| | | 5 | - | 55.1 | - | |
| | | 6 | - | 45.0 | - | |
| | | 7.33 | - | 39.9 | - | |
| | F4 | 3.33 | - | 47.9 | - | dBc |
| | | 4 | - | 48.9 | - | |
| | | 5 | - | 56.2 | - | |
| | | 6 | - | 51.7 | - | |
| | | 7.33 | - | 40.9 | - | |

1. Measured on Mini-Circuits Characterization Test Board TB-CY3-223C+.

2. Harmonics of input frequency below the power level of F3.

MAXIMUM RATINGS³

| Parameter | Ratings |
|-----------------------|------------------------|
| Operating Temperature | -40°C to +85°C |
| Storage Temperature | -65°C to +150°C |
| Input RF Power | +22 dBm (5 minute max) |
| | +19 dBm (Continuous) |

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



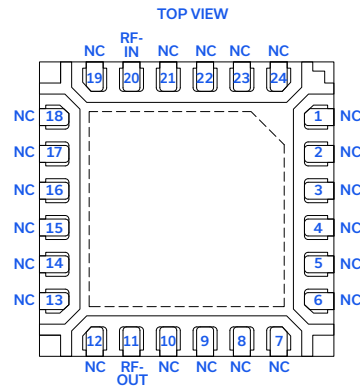
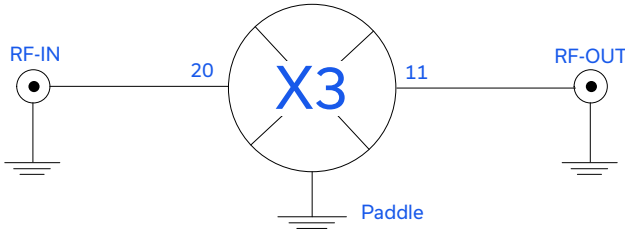
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SIMPLIFIED SCHEMATIC AND PAD DESCRIPTION



| Function | Pad Number | Description |
|----------------|--------------------|---|
| RF-IN | 20 | RF-Input Pad. |
| RF-OUT | 11 | RF-Output Pad. |
| Ground | Paddle | Connects to ground |
| No Connections | 1-10, 12-19, 21-24 | Not used internally. Connected to ground on test board. |

APPLICATION AND CHARACTERIZATION CIRCUIT

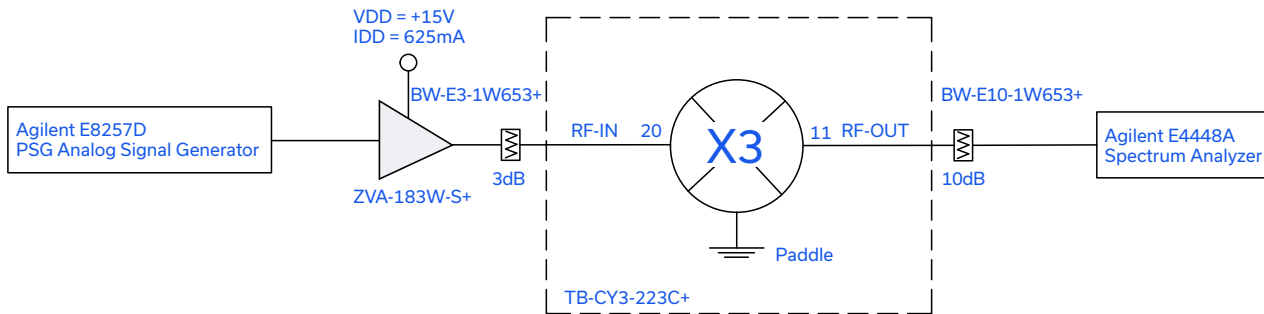


Fig 1. Application and Characterization Circuit

Note: This block diagram is used for characterization. (DUT is soldered and measured on Mini-Circuits Characterization Test Board TB-CY3-223C+) Conversion Loss and Harmonic Output are measured using Agilent E4448A PSA Spectrum Analyzer.

PRODUCT MARKING



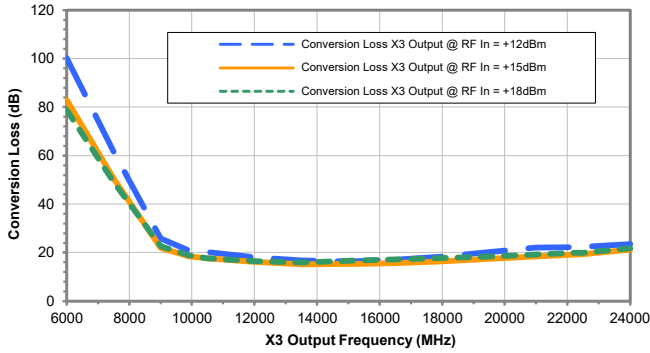
Marking may contain other features or characters for internal lot control



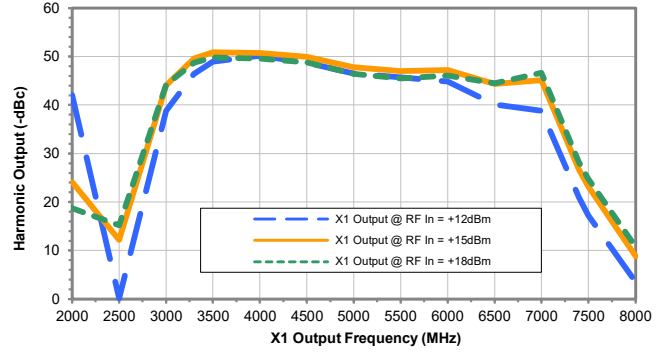


TYPICAL PERFORMANCE CURVES

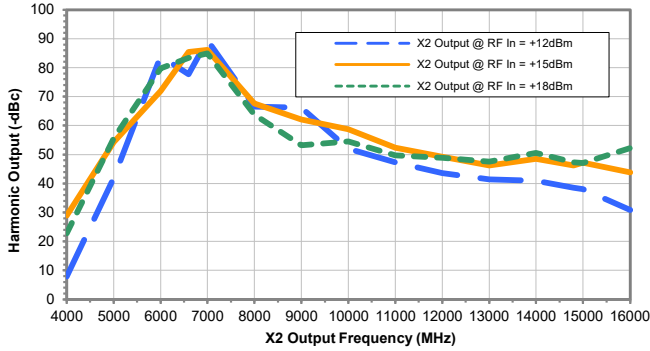
Conversion Loss X3 Output
Temperature = +25°C



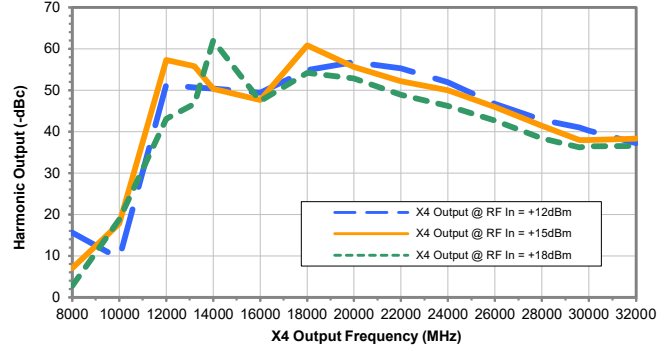
Harmonic X1 Output
Temperature = +25°C



Harmonic X2 Output
Temperature = +25°C



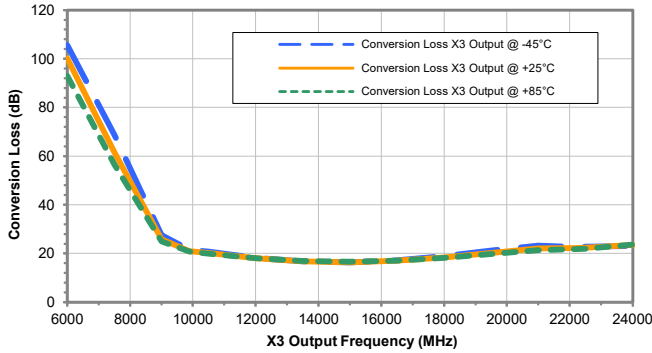
Harmonic X4 Output
Temperature = +25°C



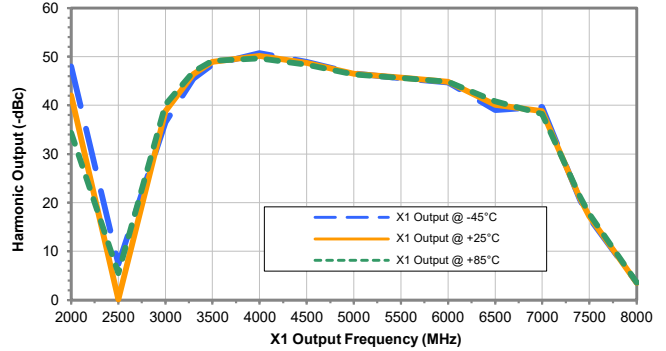


TYPICAL PERFORMANCE CURVES

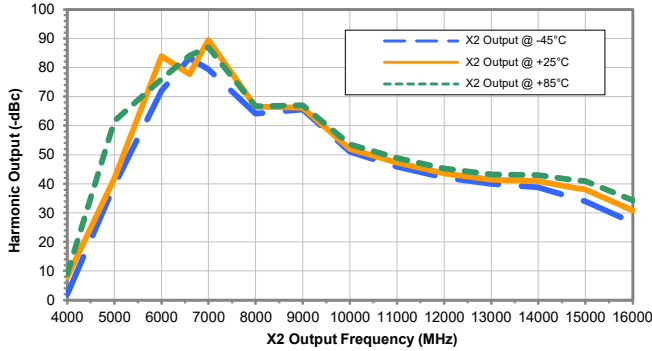
Conversion Loss X3 Output
RF In = +12dBm



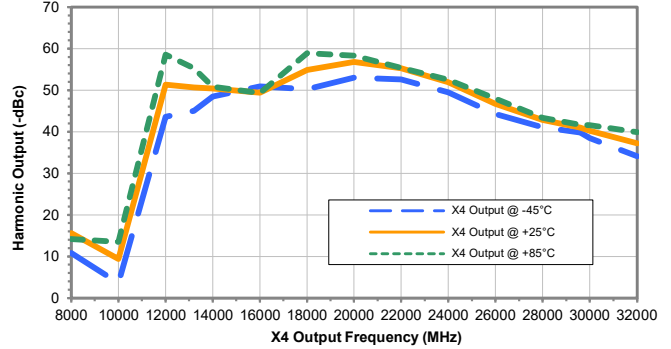
Harmonic X1 Output
RF In = +12dBm



Harmonic X2 Output
RF In = +12dBm



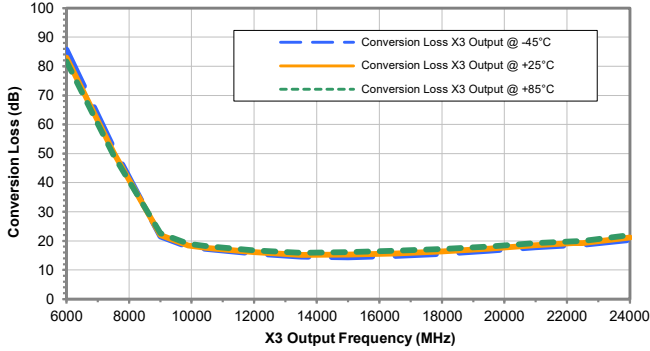
Harmonic X4 Output
RF In = +12dBm



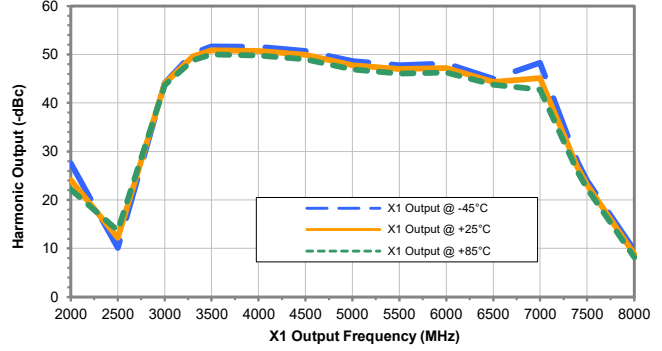


TYPICAL PERFORMANCE CURVES

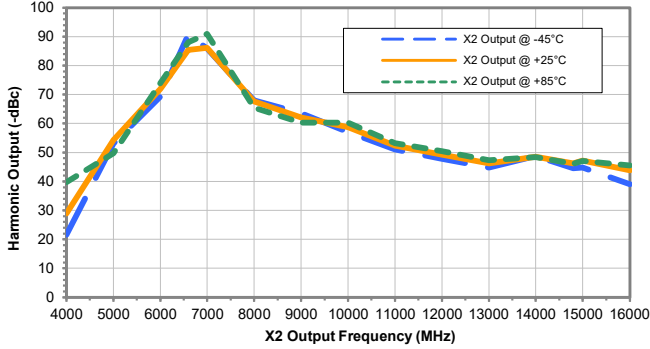
Conversion Loss X3 Output
RF In = +15dBm



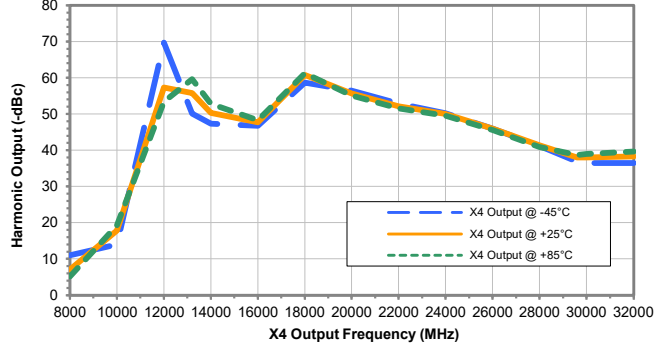
Harmonic X1 Output
RF In = +15dBm



Harmonic X2 Output
RF In = +15dBm



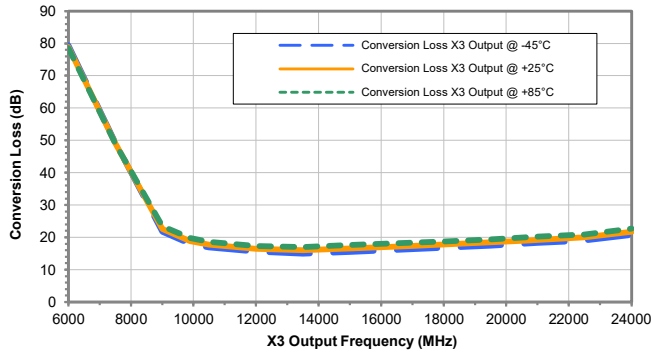
Harmonic X4 Output
RF In = +15dBm



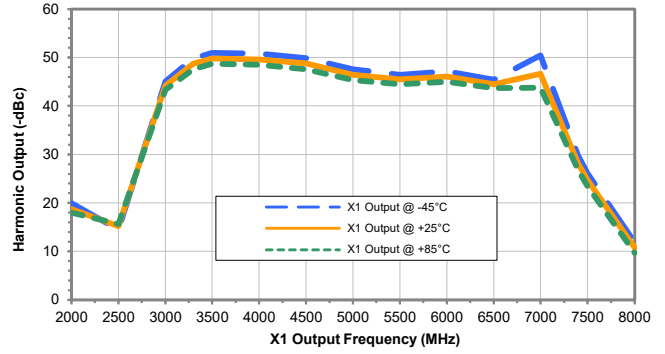


TYPICAL PERFORMANCE CURVES

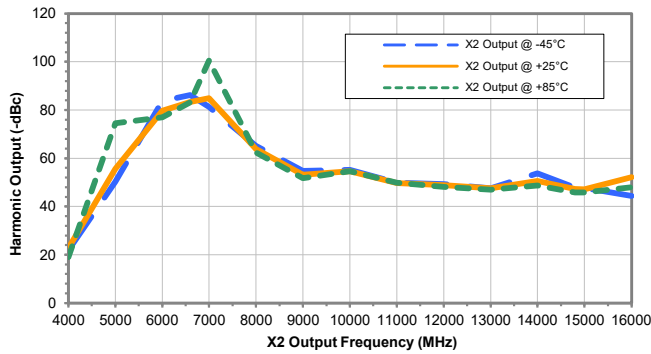
Conversion Loss X3 Output
RF In = +18dBm



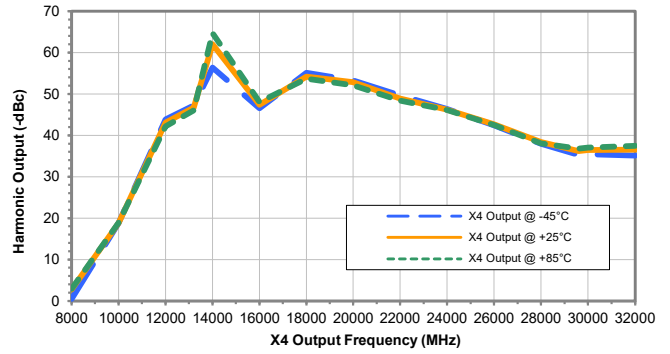
Harmonic X1 Output
RF In = +18dBm



Harmonic X2 Output
RF In = +18dBm



Harmonic X4 Output
RF In = +18dBm





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50Ω Output 10 to 22 GHz

ADDITIONAL DETAILED TECHNICAL INFORMATION IS AVAILABLE ON OUR DASH BOARD. TO ACCESS [CLICK HERE](#)

| | |
|---------------------------------------|--|
| Performance Data | Data Table |
| | Swept Graphs |
| | S-Parameter (S2P Files) Data Set (.zip file) |
| Case Style | DG1847 Plastic package, exposed paddle, lead finish: Matte-Tin |
| Tape & Reel | F68 |
| Standard quantities available on reel | 7" reels with 20, 50, 100, 200, 500 or 1K and 2k devices |
| Suggested Layout for PCB Design | PL-732 |
| Evaluation Board | TB-CY3-223C+ |
| Environmental Ratings | ENV08T1 |

ESD RATING

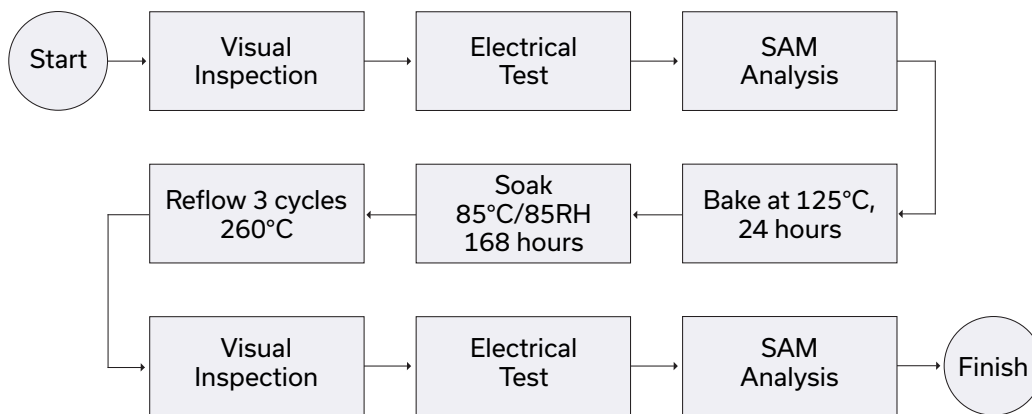
Human body model (HBM): Class 1B (500V to < 1000V) in accordance with ANSI/ESD 5.1-2001

Charged Device Model (CDM): Class 1B (500V to < 1000V) in accordance with ANSI/ESD 5.2-2001

MSL RATING

Moisture Sensitivity: MSL1 in accordance with IPC/JEDEC J-STD-020D

MSL TEST FLOW CHART



NOTES

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