Sales: 408-778-9952 | General: 408-778-4200 | Fax: 408-778-4300
Sales & Customer Support: sales@markimicrowave.com
Tech Support: support@markimicrowave.com

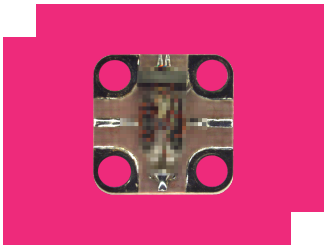
T3-20GLES-1

Two-Tone-Terminator Mixer

DEVICE OVERVIEW

General Description

The T3-20G is a high performance mixer featuring LO/RF from 10 MHz to 20 GHz and IF from 1 MHz to 10 GHz. As with all T3 mixers, this mixer offers unparalleled nonlinear performance in terms of IIP3, P1dB, and spurious performance with a flexible LO drive requirement from +15 dBm to +25 dBm. The T3-20G is offered in connectorized, surface mount, and drop-in style packaging, suitable for any type of system level integration. The T3-20G differs from its sister product the T3-20 in that the T3-20G is built using GaAs diodes instead of Si.



Features

- Ultra-Broadband RF, LO, and IF
- Compatible with Sine or Square-Wave LO
- Square-Wave LO delivers Industry-Leading Spurious, IP3, and P_{1dB} Performance

Applications

N/A

Functional Block Diagram

N/A

Part Ordering Options

Part Number	Description	Package	Green Status	Product Lifecycle	Export Classification
T3-20GLES-2	Two-Tone-Terminator Mixer	ES	Consult Factory	Released	EAR99
T3-20GLES-1	Two-Tone-Terminator Mixer	ES	Non-RoHS	Released	EAR99

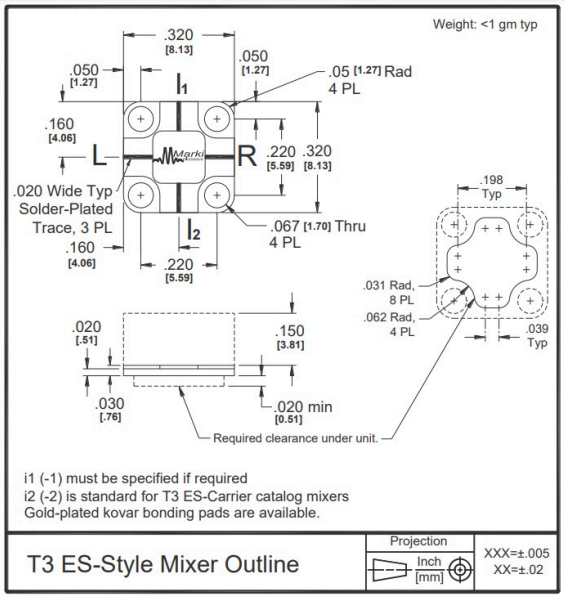
Table Of Contents

Revision History

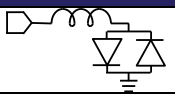
Revision Code	Revision Date	Comment
-	2020-07-07	Pre-release Draft

Port Configuration and Functions

Port Diagram



Port Functions

Port	Function	Description	Equivalent Circuit for Package
IF	IF	The IF port is DC blocked and AC matched to 50 Ohms from 1 MHz to 10 GHz.	
LO	LO	The LO port is DC short to ground and AC matched to 50 Ohms from 10 MHz to 20 GHz. Blocking capacitor is optional.	
RF	RF	The RF port is DC short to ground and AC matched to 50 Ohms from 10 MHz to 20 GHz. Blocking capacitor is optional.	

Specifications

Absolute Maximum Ratings

Parameter	Maximum Rating	Unit
LO DC Current	1	Amp
Maximum Operating Temperature	100	°C
Maximum Storage Temperature	125	°C
Minimum Operating Temperature	-55	°C
Minimum Storage Temperature	-65	°C
RF DC Current	1	Amp
RF Power Handling (RF+LO), (L -Version)	25	dBm

Package Information

Parameter	Details	Rating
ESD	250 to < 500 Volts	HBM Class 1A
Dimensions	-	8.13 x 8.13 mm

Recommended Operating Conditions

Parameter	Min	Nominal	Max	Unit
LO Input Power	15	-	25	-

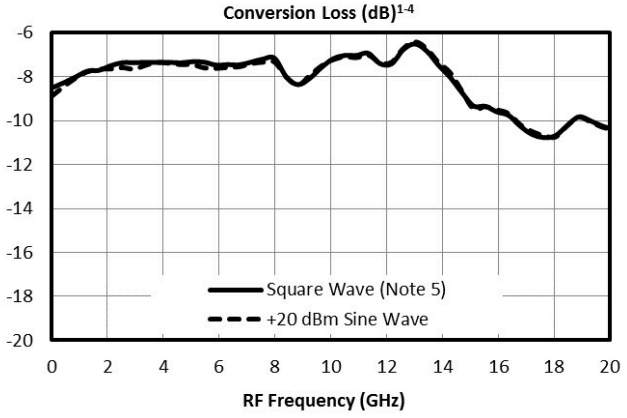
Electrical Specifications

Specifications guaranteed from -55 to +100°C, measured in a 50Ω system.

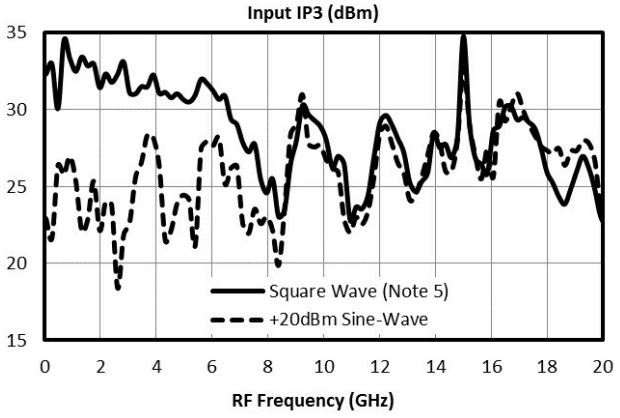
Parameter	Test Conditions	Min	Typ	Max	Unit
IF Frequency Range	-	0.001	-	10	GHz
LO Frequency Range	-	0.01	-	20	GHz
RF Frequency Range	-	0.01	-	20	GHz
Conversion Loss	LO/RF=.01-20 GHz IF=.001-2 GHz	-	7.5	12.5	dB
Conversion Loss	LO/RF=.01-20 GHz IF=.001-5 GHz	-	8.5	14	dB
Input IP3	-	-	27	-	dBm
Isolation, LO to IF	LO/RF=.01-20 GHz	15	-	-	dB
Isolation, LO to RF	LO/RF=.01-20 GHz	15	-	-	dB
Isolation, LO to RF	-	-	25	-	dB

Typical Performance

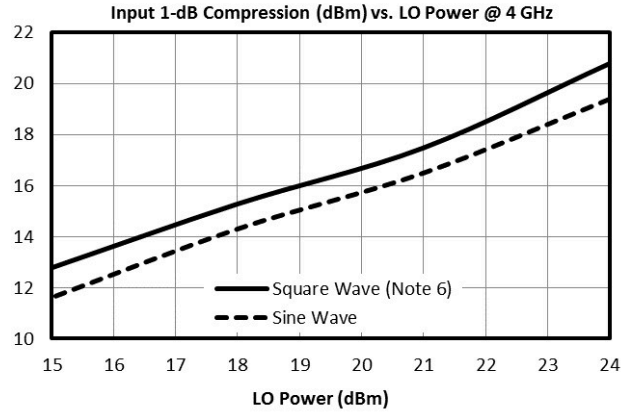
Conversion Loss (dB)[1-4]



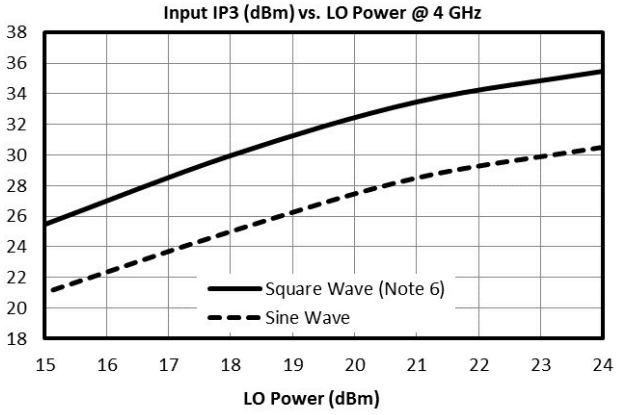
Input IP3 (dBm)



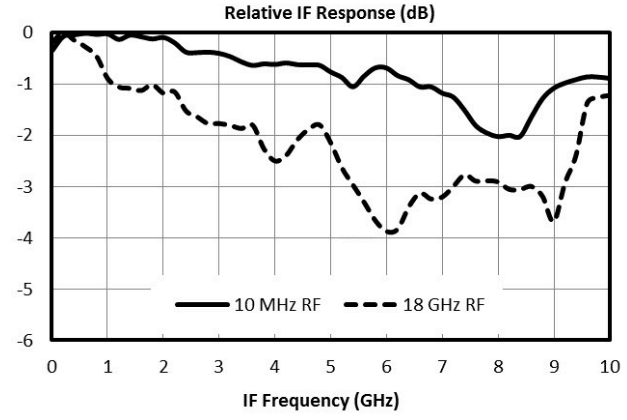
Input 1-dB Compression (dBm) vs. LO Power @ 4 GHz



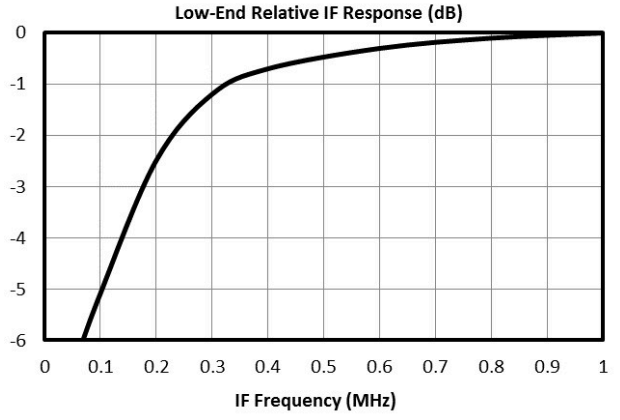
Input IP3 (dBm) vs. LO Power @ 4 GHz



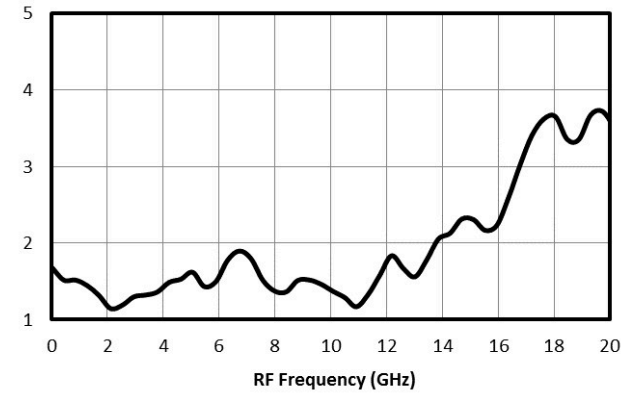
Relative IF Response (dB)



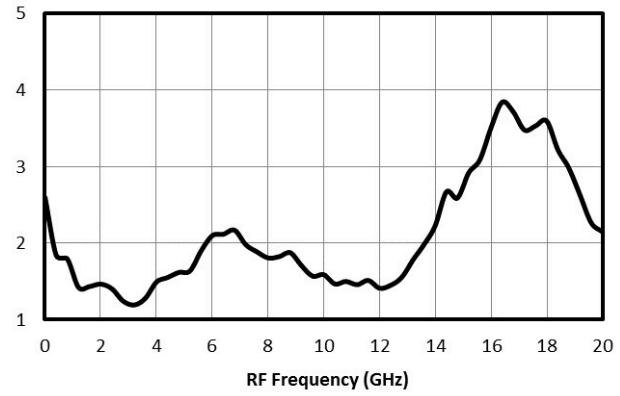
Low-End Relative IF Response (dB)



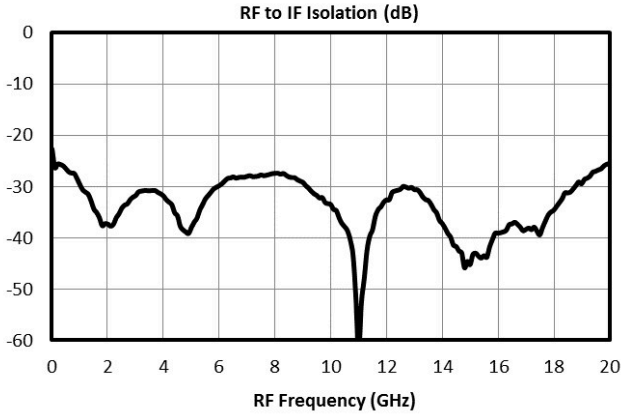
RF VSWR



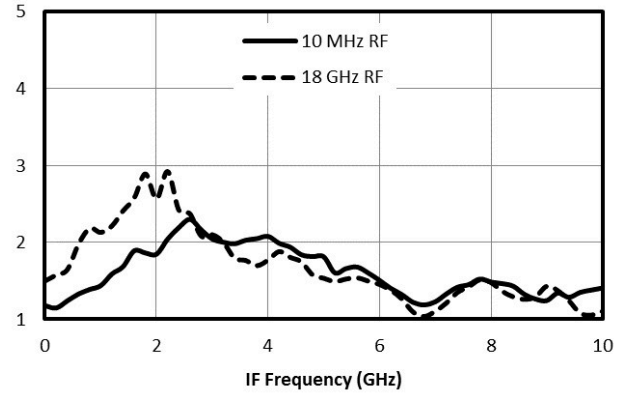
LO VSWR



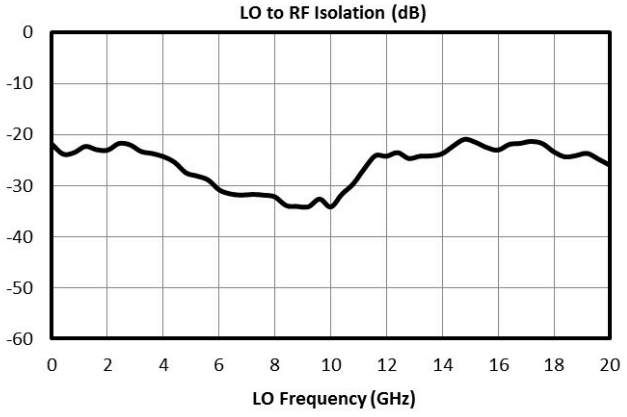
RF to IF Isolation (dB)



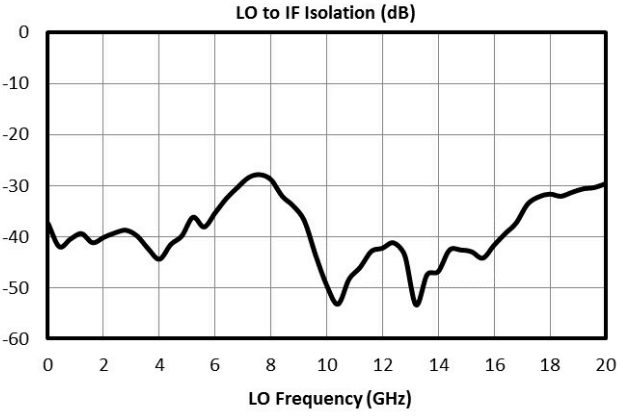
IF VSWR



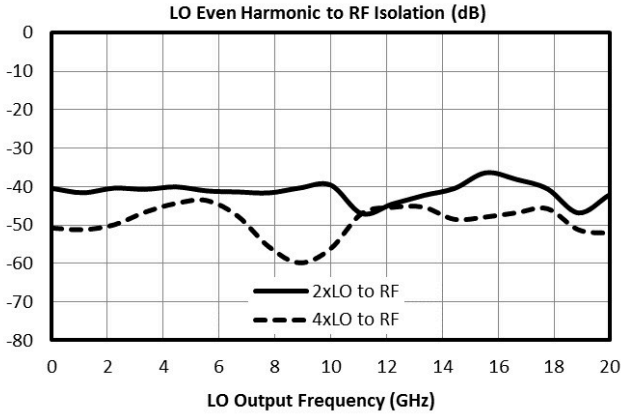
LO to RF Isolation (dB)



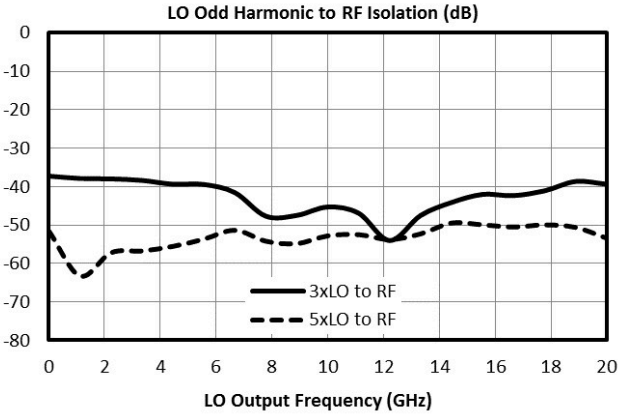
LO to IF Isolation (dB)



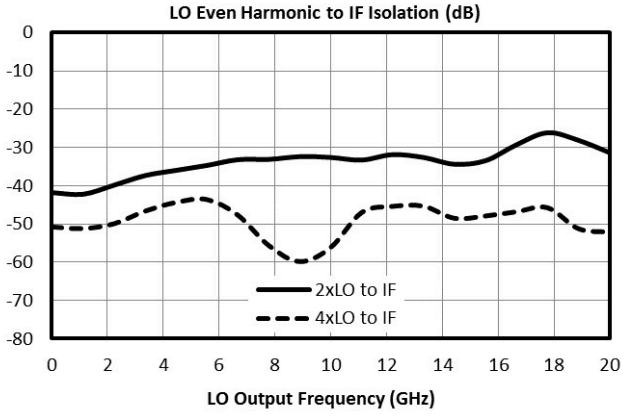
LO Even Harmonic to RF Isolation (dB)



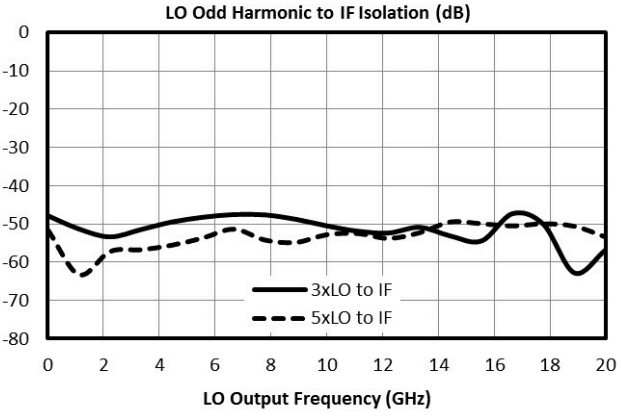
LO Odd Harmonic to RF Isolation (dB)



LO Even Harmonic to IF Isolation (dB)



LO Odd Harmonic to IF Isolation (dB)



Spur Table

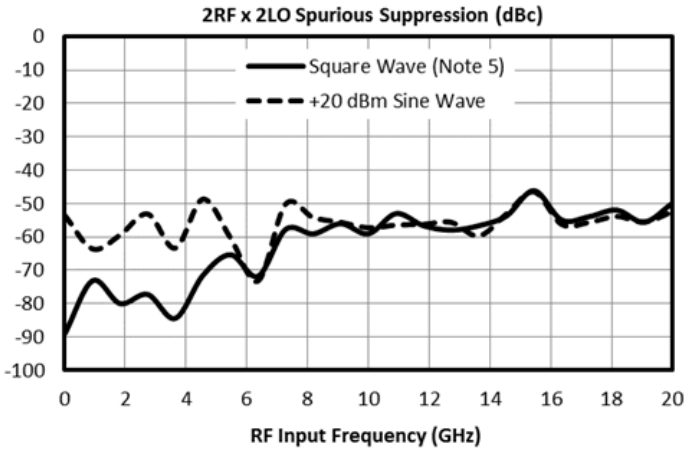
Downconversion Spurious Suppression

Spurious data is taken by selecting RF and LO frequencies (+mLO+nRF) within the 10 MHz to 20 GHz RF/LO bands, which create a 100 MHz IF spurious output. The mixer is swept across the full spurious band and the mean is calculated. The numbers shown in the table below are for a -10 dBm RF input. Spurious suppression is scaled for different RF power levels by (n-1), where "n" is the RF spur order. For example, the 2RFx2LO spur is 63 dBc for a -10 dBm input, so a -20 dBm RF input creates a spur that is (2-1) x (-10 dB) dB lower, or 73 dBc.

Typical Downconversion Spurious Suppression (dBc): Square Wave (Sine Wave) LO[5]

-10 dBm RF Input	0xLO	1xLO	2xLO	3xLO	4xLO	5xLO
0xRF	----------	See LO to IF Isolation and LO Harmonic to IF Isolation Plots (Page 3)				
1xRF	20 (23)	Reference	23 (32)	10 (11)	23 (34)	15 (19)
2xRF	66 (64)	69 (65)	63 (56)	67 (63)	67 (55)	72 (60)
3xRF	100 (96)	88 (80)	92 (90)	85 (78)	92 (89)	90 (75)
4xRF	>110	>110	>110	>110	>110	>110
5xRF	>120	>120	>120	>120	>120	>120

A sample downconversion spurious sweep is shown below. An LO which is 100 MHz higher than the RF is used to create a 100 MHz reference IF. A second LO is used to create a 2x2 spurious IF, also at 100 MHz (50 MHz fundamental IF). The difference between these two output levels is the spurious suppression in dBc. The mean value across the full 10 MHz to 20 GHz RF input band is the number shown in the table above.



Downconversion 2RFx2LO Spurious Data Example:

RF Input: 10 MHz to 20.0 GHz @ -10 dBm
LO for Reference: 110 MHz to 20.1 GHz
LO for Spurious: 60 MHz to 20.05 GHz
IF Output: 100 MHz

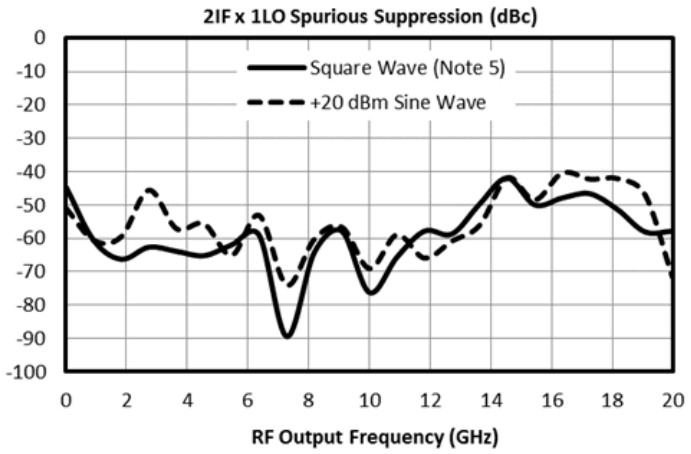
Upconversion Spurious Suppression

Spurious data is taken by mixing a 100 MHz IF with LO frequencies (+mLO+nIF), which creates an RF within the 10 MHz to 20 GHz RF band. The mixer is swept across the full spurious output band and the mean is calculated. The numbers shown in the table below are for a -10 dBm IF input. Spurious suppression is scaled for different IF input power levels by (n-1), where "n" is the IF spur order. For example, the 2IFx1LO spur is typically 59 dBc for a -10 dBm input, so a -20 dBm IF input creates a spur that is (2-1) x (-10 dB) dB lower, or 69 dBc.

Typical Upconversion Spurious Suppression (dBc): Square Wave (Sine Wave) LO[5]

-10 dBm IF Input	0xLO	1xLO	2xLO	3xLO	4xLO	5xLO
0xIF	----------	See LO to RF Isolation and LO Harmonic to RF Isolation Plots (Page 3)				
1xIF	23 (28)	Reference	27 (30)	10 (11)	27 (37)	15 (20)
2xIF	69 (65)	59 (52)	67 (58)	66 (56)	70 (62)	66 (56)
3xIF	98 (104)	86 (74)	101 (84)	92 (69)	100 (82)	95 (70)
4xIF	>110	>110	>110	>110	>110	>110
5xIF	>120	>120	>120	>120	>120	>120

A sample upconversion spurious sweep is shown below. A 100 MHz reference IF input is used to create an RF output that is 100 MHz below the LO input (LO-IF=RF). A second LO (100 MHz higher) is combined with the same 100 MHz IF input (LO-2xIF=RF) to create the same 10 MHz to 20 GHz RF output band. The difference between these two output levels is the spurious suppression in dBc. The mean value across the full RF output band is the number shown in the table above.



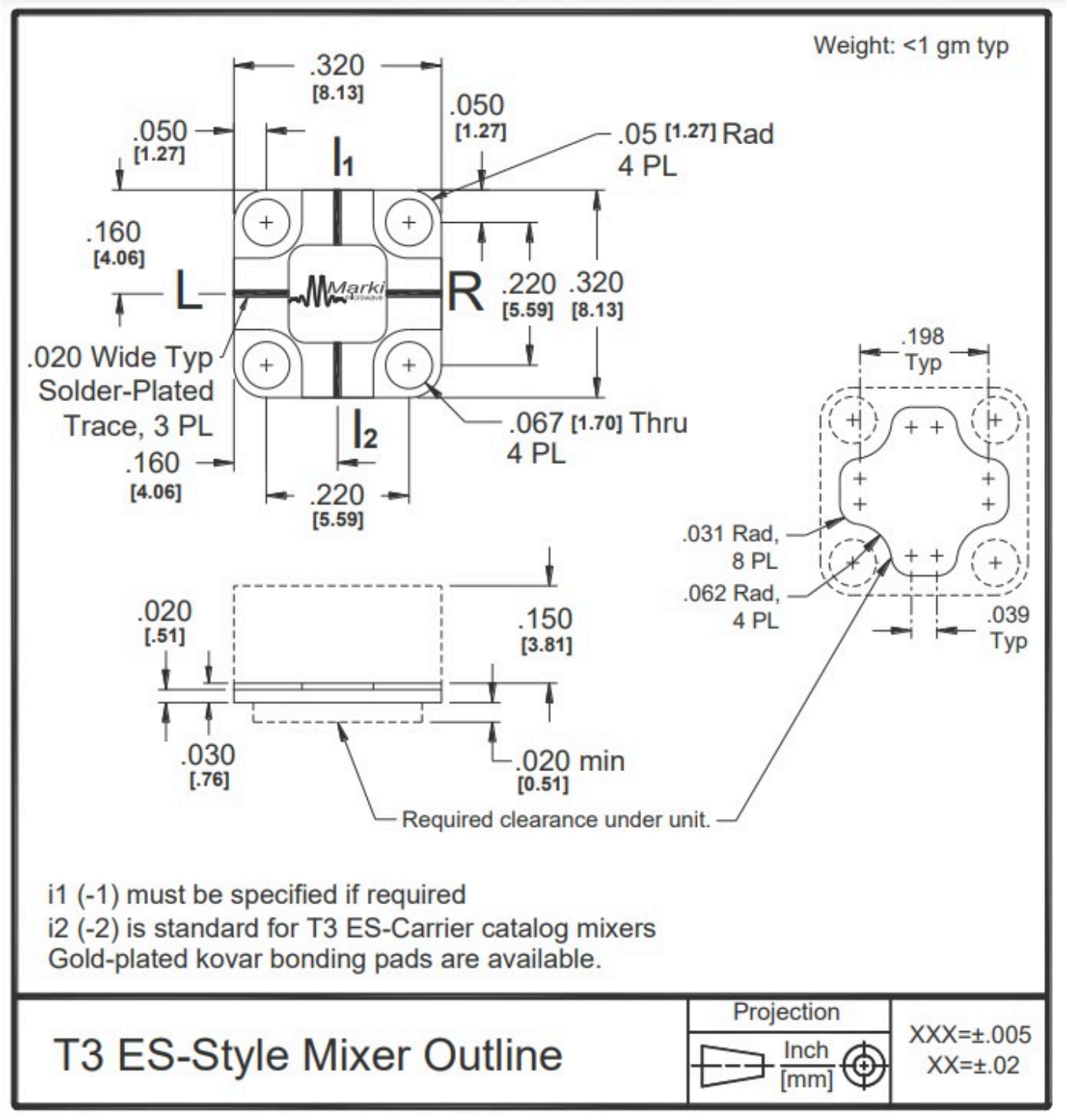
Upconversion 2IF x 1LO Spurious Data Example:

IF Input: 100 MHz @ -10 dBm
LO for Reference: 110 MHz to 20.1 GHz
LO for Spurious: 210 MHz to 20.2 GHz
RF Output: 10 MHz to 20 GHz

Mechanical Data

Outline Drawing

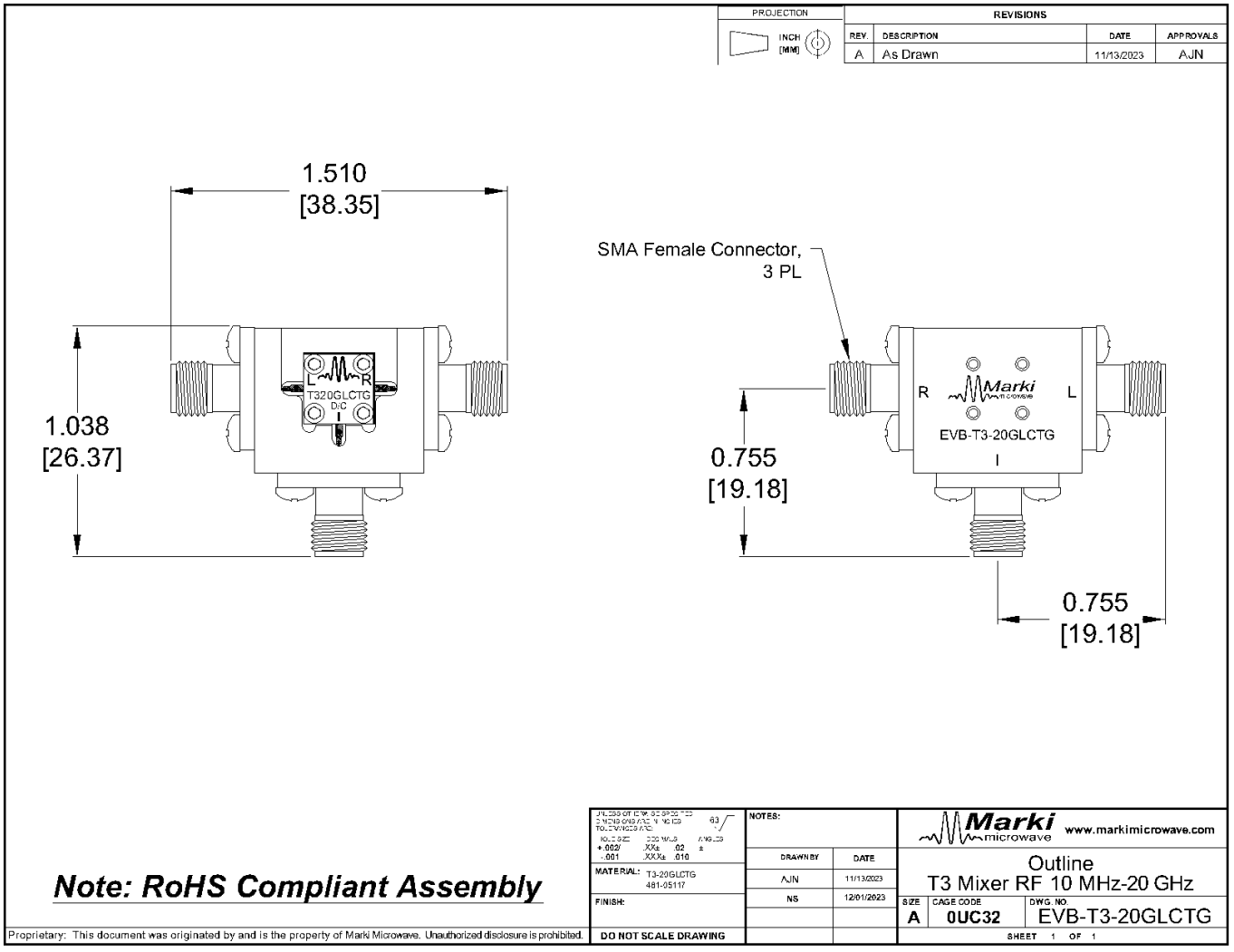
Download : Outline 2D Drawing



Evaluation Board - Performance Data

Parameter	Test Conditions	Frequency Range (GHz)	Min	Typ	Max	Unit
Input IP3	-	-	-	27	-	dBm
Isolation, LO to RF	-	-	-	25	-	dB

Evaluation Board - Outline Drawing



Notes

1. Mixer Conversion Loss Plot IF frequency is 100 MHz.

2. Mixer Noise Figure typically measures within 0.5 dB of conversion loss for IF frequencies greater than 5 MHz.

3. Conversion Loss typically degrades less than 0.5 dB for LO drives 2 dB below the lowest and 3 dB above highest nominal LO drive levels.

4. Conversion Loss typically degrades less than 0.5 dB at +100°C and improves less than 0.5 dB at -55°C.

5. Square Wave Drive created with a chain to two ADM1-0026SM, biased at + 7/-0.25 Volts, with a +10 dBm input. Sine Wave data is taken with a +20 dBm LO input.

6. Square Wave Drive created with an ADM1-0026SM, biased at + 7/-0.25 Volts, driving an ADM3-0022PA, biased at +7/+15/-0.25/-0.65V.

7. Specifications are subject to change without notice. Contact Marki Microwave for the most recent specifications and data sheets.

8. Catalog mixer circuits are continually improved. Configuration control requires custom mixer model numbers and specifications.