



TWO-TONE-TERMINATOR MIXER/LO-AMPLIFIER

T3A3-08

The T3A3-08 is a broadband Two-Tone-Terminator (T3) mixer integrated with a single positive bias only LO buffer amplifier. The T3A3 is a cost effective, “plug and play” solution for applications where excellent mixer linearity is required (IIP3, spurious and $P_{1\text{dB}}$) with low (0 dBm) Sine Wave drive. The T3A3 is extremely power efficient (+5V @ 145 mA) while still delivering excellent linearity from 10 MHz to 8 GHz.



Features

- Optimized square-wave LO amplifier integrated with T3 mixer
- High IIP3 performance with 0 dBm sine wave input
- Application Note: [T3 Mixer Primer](#)
- Power efficient design (+5 V @ 145 mA)
- Low cost plug and play solution shortens design cycle and time to market
- Available in .920" x .320" [CKG](#) Package (PCB [Footprint](#))

Electrical Specifications - Specifications guaranteed from -30 to +70°C, measured in a 50Ω system.

Parameter	LO (GHz)	RF (GHz)	IF (GHz)	Min	Typ	Max
Conversion Loss (dB)	.01-8	.01-8	.001-0.5		See Plots	9.0
	.01-8	.01-8	.001-4.0			10.5
Noise Figure (dB)	.01-8	.01-8	.001-4.0		See Plot	
LO Drive Level (dBm)				-1	0	+3
LO Leakage (dBm)						
LO-RF	.01-8	.01-8			See Plots	
LO-IF	.01-8	.01-8				
RF-IF Isolation (dB)	.01-8	.01-8			See Plot	
Input 1 dB Compression (dBm)	.01-8	.01-8		+17	+18	
Input Two-Tone Third Order Intercept Point (dBm)	.01-8	.01-8			See Plot	
Bias Requirements (mA) ¹ +5.0 Volts DC						145
						200

¹Positive-bias only required.

Part Number Options

Please specify diode level and package style by adding to model number.				
Package Style		Examples		
Connectorized	CKP	T3A3-08CKP, T3A3-08CKG-2		
Surface Mount ^{1,2}	CKG (RoHS)	T3A3-08 (Model)	CKG (Package)	-2 (I-Port Configuration)

¹Connectorized test fixtures available for most surface mount packages. Consult factory.

²For non-connectorized packages, specify I-port configuration by adding -1 or -2 suffix to model number. Default is -2 configuration when not specified.

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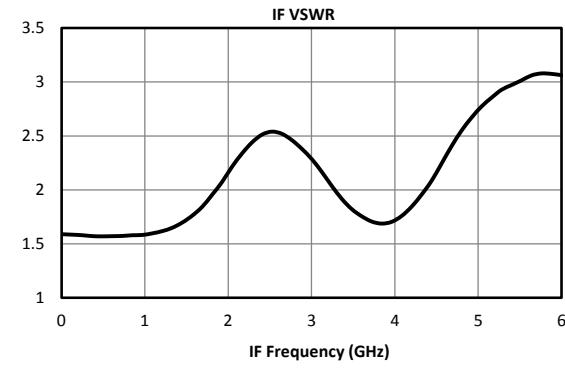
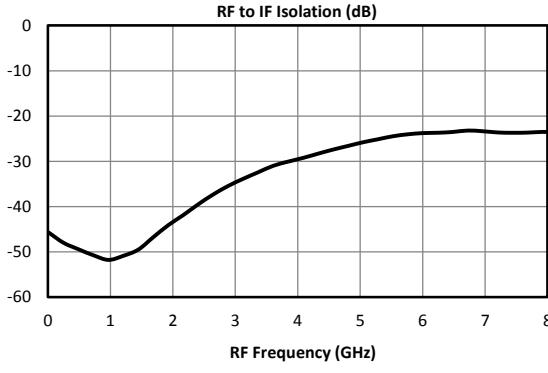
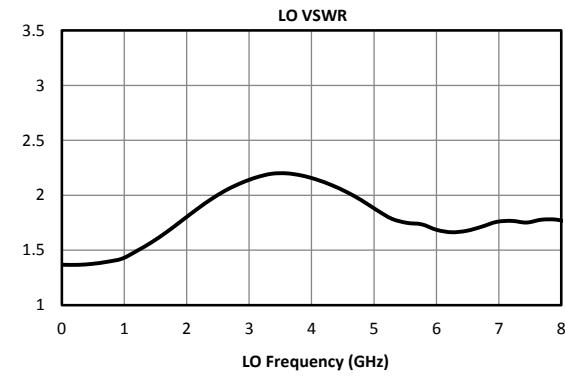
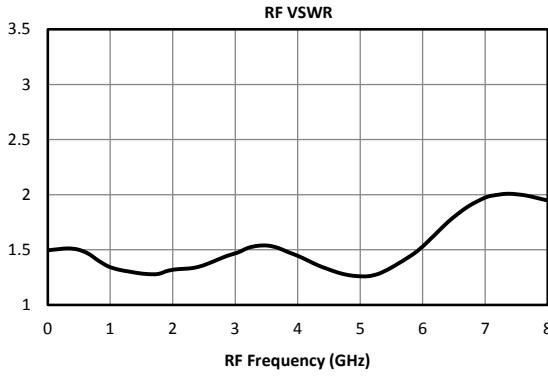
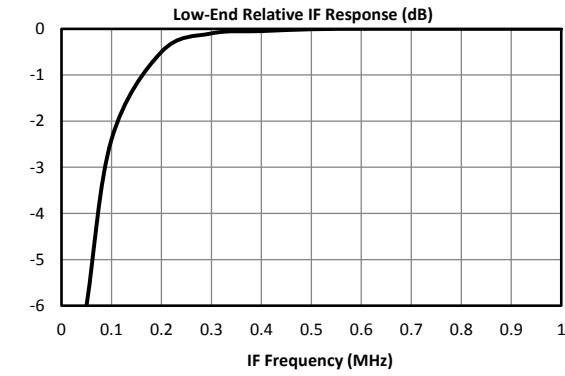
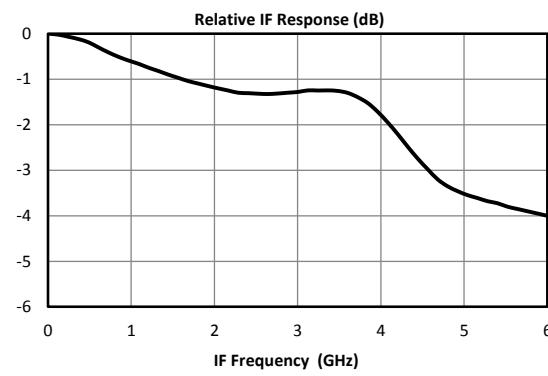
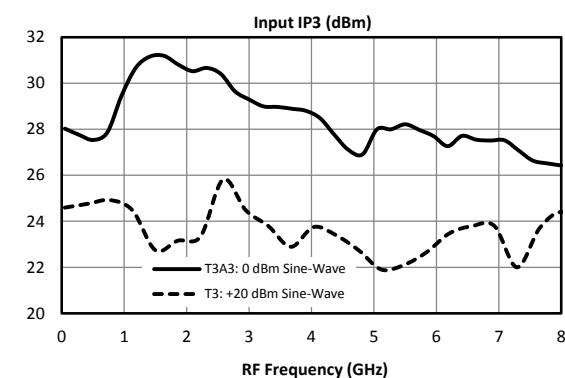
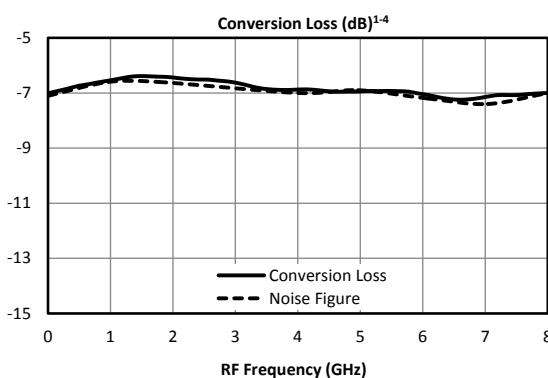
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**LO/RF 10 MHz to 8 GHz
IF 1 MHz to 4 GHz**

Typical Performance



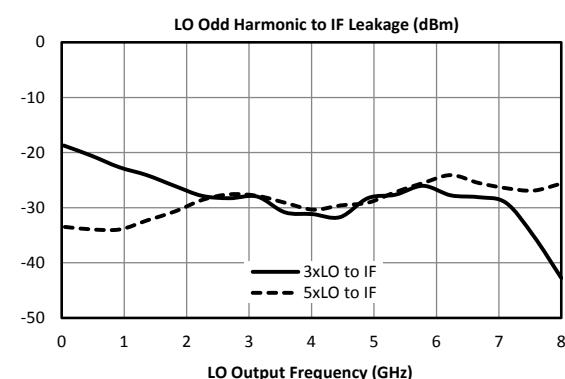
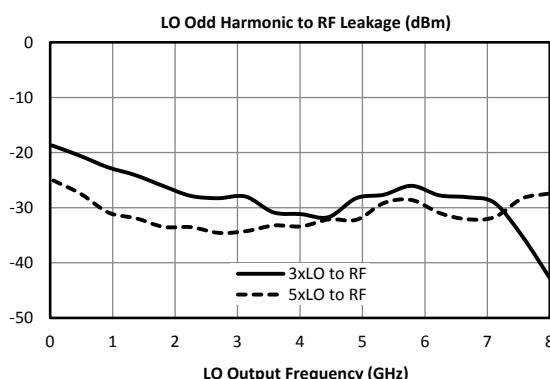
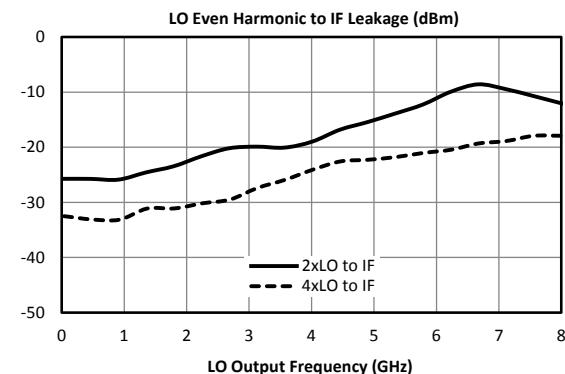
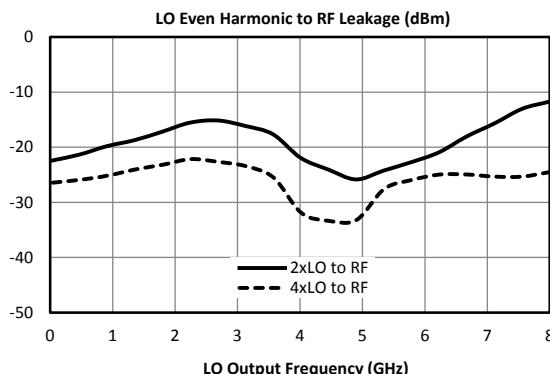
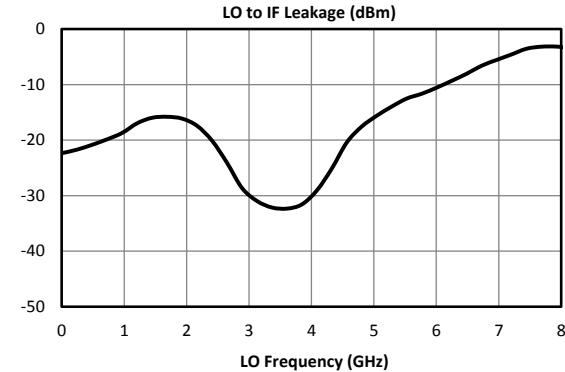
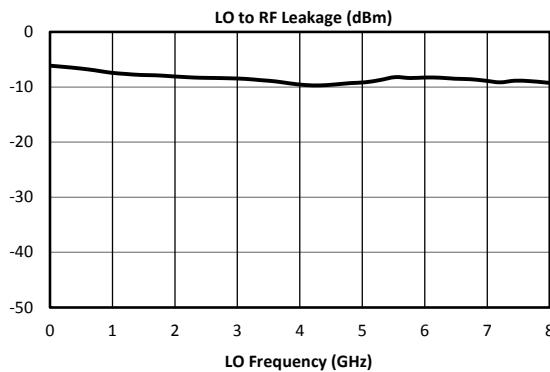
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LO/RF 10 MHz to 8 GHz
IF 1 MHz to 4 GHz

Typical Performance



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**LO/RF 10 MHz to 8 GHz
IF 1 MHz to 4 GHz**

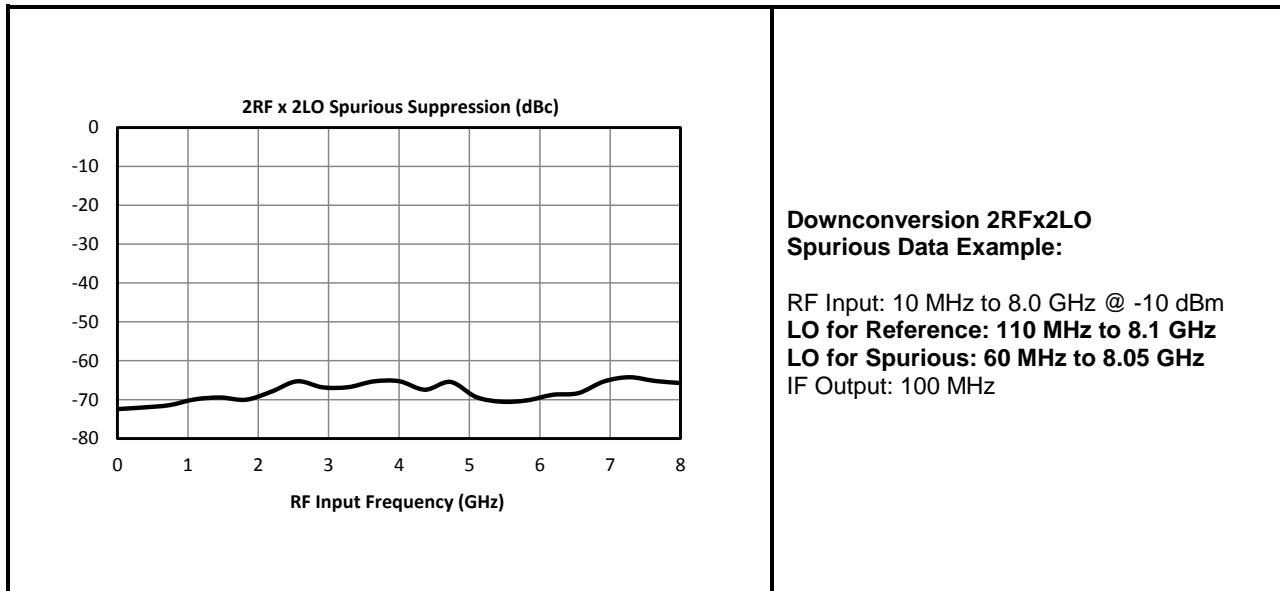
Downconversion Spurious Suppression

Spurious data is taken by selecting RF and LO frequencies ($+m\text{LO}+n\text{RF}$) within the 10 MHz to 8 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 68 dBc for a -10 dBm input, so a -20 dBm RF input creates a spur that is $(2-1) \times (-10 \text{ dB})$ dB lower, or 78 dBc.

Typical Downconversion Spurious Suppression (dBc): 0 dBm Sine Wave LO

-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	22	Reference	25	11	22	17
2xRF	66	65	68	65	66	67
3xRF	98	88	93	84	88	83
4xRF	>110	>110	>110	>110	>110	>110
5xRF	>120	>120	>120	>120	>120	>120

A sample downconversion spurious sweep is shown below. An LO 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 8 GHz RF input band is the number shown in the table above.



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**LO/RF 10 MHz to 8 GHz
IF 1 MHz to 4 GHz**

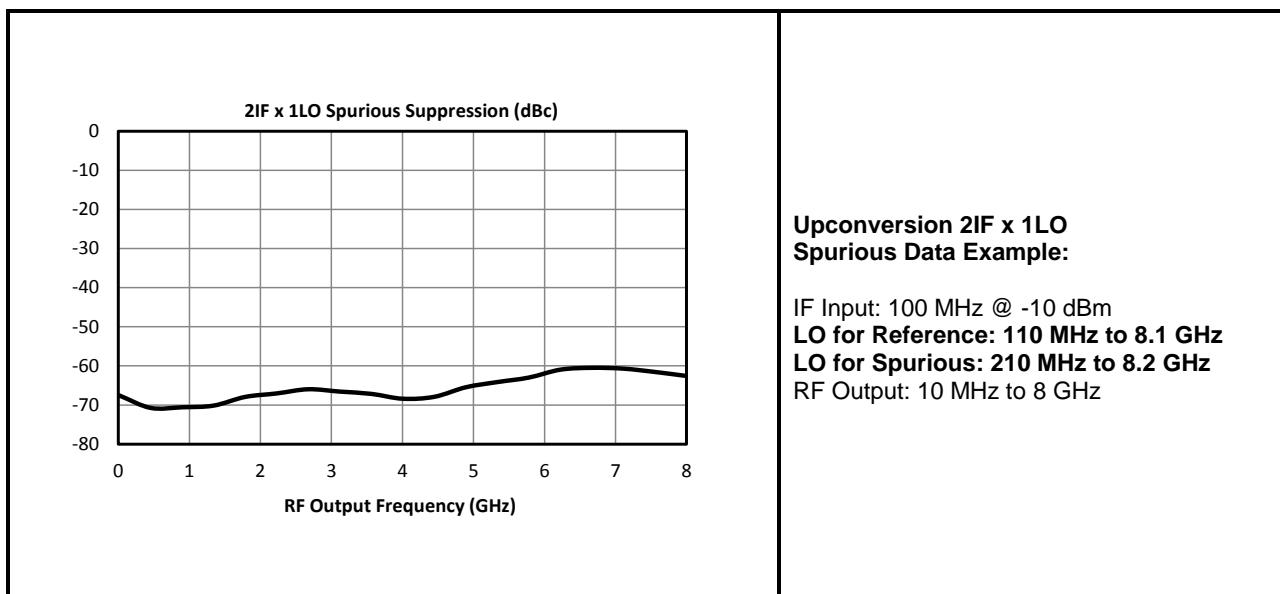
Upconversion Spurious Suppression

Spurious data is taken by mixing a 100 MHz IF with LO frequencies ($+m\text{LO}+n\text{IF}$), which creates an RF within the 10 MHz to 8 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 66 dBc for a -10 dBm input, so a -20 dBm IF input creates a spur that is $(2-1) \times (-10 \text{ dB})$ dB lower, or 76 dBc.

Typical Upconversion Spurious Suppression (dBc): 0 dBm Sine Wave LO

-10 dBm RF Input	0xLO	1xLO	2xLO	3xLO	4xLO	5xLO
0xIF	-----	See LO to RF Isolation and LO Harmonic to RF Isolation Plots (Page 3)				
1xIF	14	Reference	23	11	22	17
2xIF	74	66	70	64	66	67
3xIF	98	87	92	85	87	84
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 8 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.

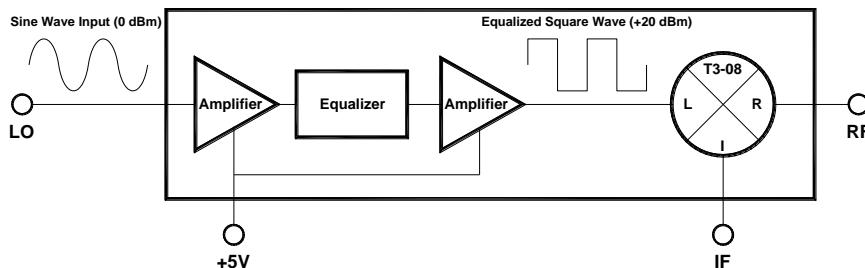


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**LO/RF 10 MHz to 8 GHz
IF 1 MHz to 4 GHz**



Port	Description	DC Interface Schematic
LO	The LO port is DC blocked and AC matched to 50 Ohms from 10 MHz to 8 GHz.	LO \circ H $_{1\text{uF}}$
RF	The RF port is DC short to ground and AC matched to 50 Ohms from 10 MHz to 8 GHz. Blocking capacitor is optional.	RF \circ H $_{\text{---}}$
IF	The IF port is DC blocked and AC matched to 50 Ohms from 1 MHz to 4 GHz.	IF \circ H $_{2\text{uF}}$

Absolute Maximum Ratings	
Parameter	Maximum Rating
RF DC Current	1 Amp
LO DC Voltage	6 Volts
RF Power Handling	+25 dBm
LO Power Handling	+15 dBm
Operating Temperature	-30°C to +70°C
Storage Temperature	-65°C to +125°C
ESD Sensitivity (HBM)	Class 0

DATA SHEET 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 at +70°C and improves less than 0.5 dB at -30°C.
4. Specifications are subject to change without notice. Contact Marki Microwave for the most recent specifications and data sheets.
5. Catalog mixer circuits are continually improved. Configuration control requires custom mixer model numbers and specifications.

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