MODEL HX2410

CW to CMOS Conversion Amplifier

ULTRA LOW JITTER

- **Convert Sinusoid (CW) to CMOS Logic**
- **Reduce effects of Trigger Jitter**
- **Increase Oscilloscope Accuracy**
- **Trigger Frequency: 5MHz to 200MHz**
- **Adjustable CMOS Logic Level**
- **Integrated Ultra Low Noise Bias Network**

SUMMARY

The **HX2410 CW to CMOS Conversion Amplifier** is intended for use as a peripheral component in precision oscilloscope test applications. The HX2410 eliminates trigger induced jitter that is caused by the low slew rate of low frequency sinusoidal (CW) trigger signals, ultimately resulting in inaccurate oscilloscope measurements. The proprietary architecture maintains the integrity of an ultra low phase noise sinusoidal (CW) signal while converting it to a CMOS Logic level exhibiting the absolute lowest jitter available (see Figures 2-3).

Users can mechanically fine tune the CMOS Logic output voltage (V_{SET}) between 1.8V to 5.0V. All units are final performance tested and delivered at 5.0V output for optimized jitter performance. Holzworth products are 100% final performance tested for phase noise (jitter) verification.

The **HX2410 CW to CMOS Conversion Amplifier** is also available with Holzworth's multi-channel RF Synthesizer products as an integrated option. Smaller form factors with fixed CMOS output levels are also available for OEM applications. Inquire directly with Holzworth Instrumentation or a Sales Representative for more information.

SPECIFICATIONS [2] *PRELIMINARY*

Parameter	MIN	TYP	MAX	Units	Comments
Output Voltage (CMOS Logic)	1.8		5.0	V	Adjustable via V_{SET} Mechanical Screw
Input Frequency Range	5		200	MHz	Extended Range : 100kHz to 250MHz (no spec)
Input Power Range					
V_{SET} = 1.8V	0		+9	dBm	V_{SET} Dependent (V_{P-P} into 50Ω, ≤ V_{SET})
V_{SET} = 2.5V	0		+12	dBm	
V_{SET} = 3.3V	0		+14	dBm	
V_{SET} = 5.0V	0		+18	dBm	
Output Impedance		50		ohms	
Additive Phase Noise		-160		dBc/Hz	100MHz, 10kHz Offset, P_{IN}=+9dBm, V_{SET} = 5V
RMS Phase Jitter					
10Hz to 100Hz		5		fs	100MHz, P_{IN}=+9dBm, V_{SET} = 5V
20kHz to 20MHz		6		fs	100MHz, P_{IN}=+9dBm, V_{SET} = 5V
Rise Time / Fall Time (T_r/T_f)		900		ps	10% - 90% (500MHz Oscilloscope)
DC Voltage Supply	7		12	V_{DC}	SMB Connector
Form Factor (L x W x H)	1.75in x 1.5in x 0.5in, not including SMA/SMB connectors				

[1] Final performance verification at 100MHz, V_{SET}=5V, P_{IN}=+9dBm

[2] Specifications are subject to change per the discretion of Holzworth Instrumentation, Inc.

RoHS Compliant

OSCILLOSCOPE PERFORMANCE IMPROVEMENT

Even the highest performing oscilloscopes are subject to trigger jitter that is caused by the low slew rate of low frequency sinusoidal (CW) trigger signals, ultimately resulting in inaccurate oscilloscope measurements. The Figure 1 block diagram outlines the test system setup for the data presented in Figures 2 and 3.

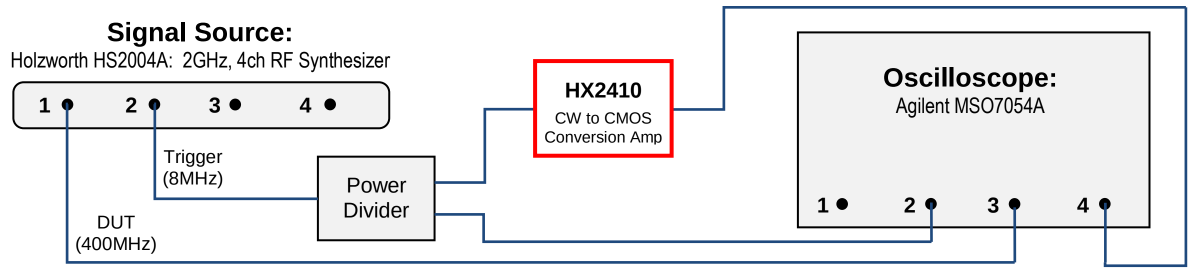


Figure 1: Test Setup for Demonstration of Trigger Jitter Improvement

The data included here demonstrates improved oscilloscope measurement performance achieved via the implementation of an **HX2410 CW to CMOS Conversion Amplifier** to convert a highly stable, yet slow edged sinusoidal trigger signal to a CMOS Logic signal.

Figure 2 demonstrates the perceived jitter of a measured DUT signal when using an 8MHz CW trigger signal. Even though the sinusoidal trigger signal exhibits extremely low jitter, the displayed jitter in the DUT measurement is due to oscilloscope trigger jitter and is not representative of actual DUT performance.

In comparison, Figure 3 shows the elimination of trigger induced jitter by converting the same 8MHz sinusoid to a fast rising edge. Using **HX2410 CW to CMOS Conversion Amplifier** reduces trigger jitter, allowing for actual DUT performance to be observed.

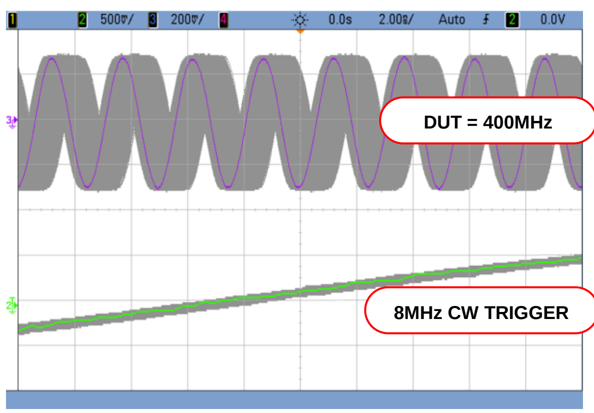


Figure 2: Undesired Sinusoidal Trigger Jitter
(DUT [ch3]: 400MHz; Trigger [ch2]: +8dBm, 8MHz, No HX2410)

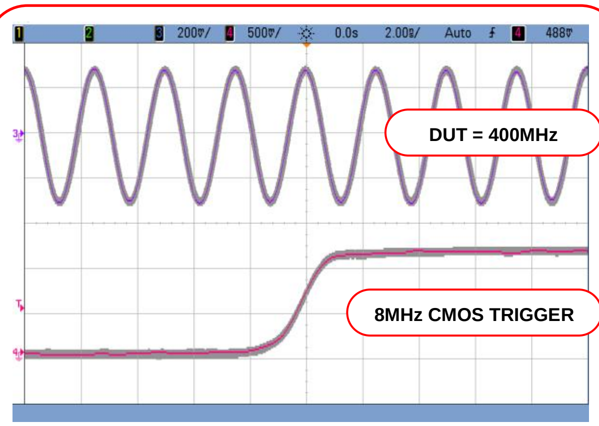


Figure 3: HX2410 Reduction of Trigger Jitter
(DUT [ch3]: 400MHz; Trigger [ch4]: +8dBm, 8MHz into HX2410)

FINAL NOTE: The RF Synthesizer used to generate the 8MHz trigger and the DUT signal is Holzworth model HS2004A, which exhibits industry leading phase noise/jitter performance. The phase jitter of the HS2004A RF Synthesizer exhibits less than 30fs of jitter at 8MHz. As shown in Figure 2, the purest sinusoidal trigger signal can still induce jitter due to low slew rates at the trigger threshold.

HX2410 PERFORMANCE DATA

The data presented here was collected under ambient laboratory conditions.

Figure 4 shows a pure CW 8MHz sinusoid and the resultant converted CMOS Logic signal after being conditioned by an HX2410 CW to CMOS Conversion Amplifier.

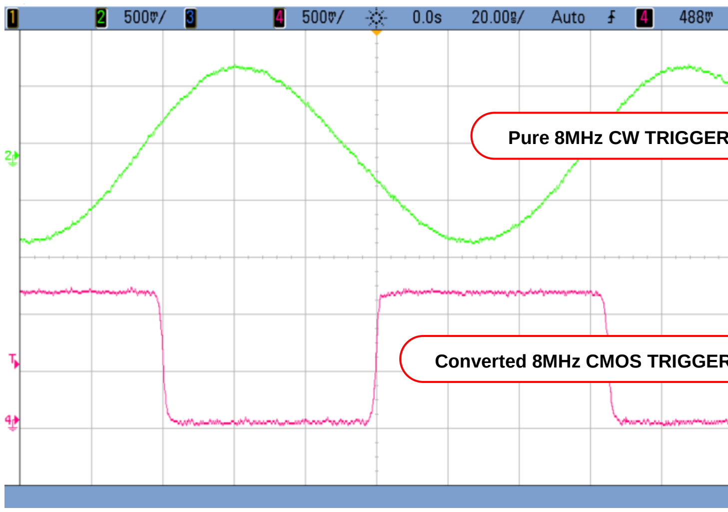


Figure 4: CW to CMOS Logic Conversion
([ch2]: +8dBm, 8MHz, No HX2410; [ch4]: +8dBm, 8MHz, into HX2410, V_{SET}=1.5V)

Figure 5 plots the typical additive phase noise performance of the HX2410 CW to CMOS Conversion Amplifier with a 100MHz input frequency.

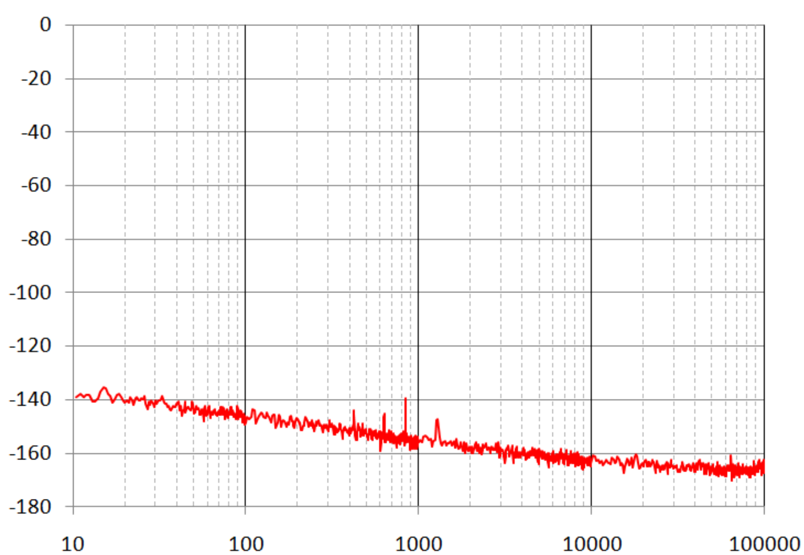
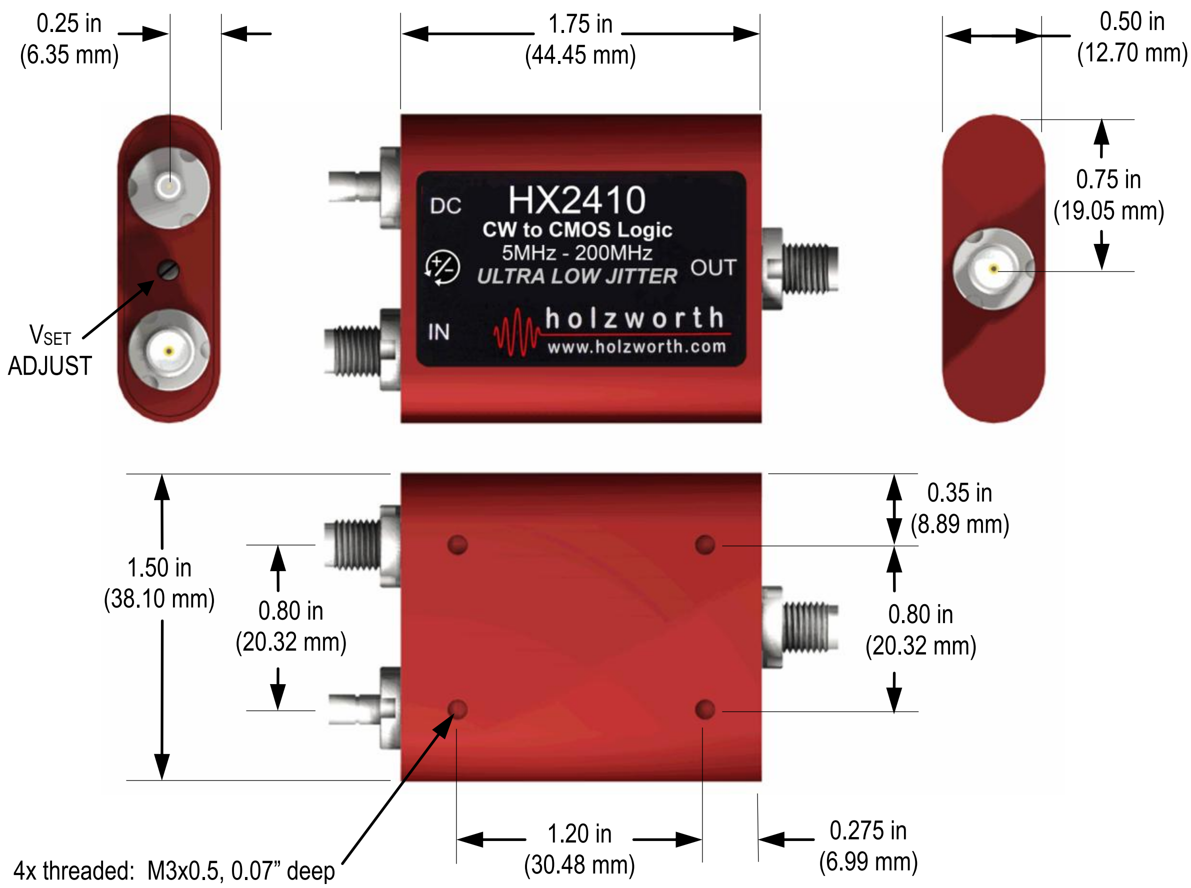


Figure 5: HX2410 Additive Phase Noise
(Freq = 100MHz, P_{INPUT} = +9dBm, V_{SET} = 5V)

MECHANICAL

The **HX2410 CW to CMOS Conversion Amplifier** comes in a compact, shielded housing complete with threaded mounting holes for ease of system integration into various test sets. More compact package options with fixed CMOS output levels are available for OEM applications. Inquire directly with Holzworth Instrumentation or a Sales Representative.



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WARRANTY

All Holzworth amplifiers come with a 1 year 100% product warranty covering manufacturing defects. All product repairs and maintenance must be performed by Holzworth Instrumentation. Holzworth reserves the right to invalidate the warranty for any product that has been tampered with or used improperly. Refer to Holzworth Terms & Conditions of Sales for more details.