

# I<sup>2</sup>S Triggering and Hardware-based Decode (Option SND) for Agilent InfiniiVision Oscilloscopes

## Data Sheet

Find and debug intermittent errors and signal integrity problems faster

### Features:

- I<sup>2</sup>S serial bus triggering
- I<sup>2</sup>S hardware-based protocol decoding
- User-selectable signal alignment selections
- Multiple triggering selections



I<sup>2</sup>S (Inter-IC Sound, or Integrated Interchip Sound), is an electrical serial bus interface standard used for connecting digital audio devices together, such as compact disc, digital audio tape, digital sound processors, and digital TV sound. Traditional methods of debugging serial busses such as I<sup>2</sup>S includes manual bit counting. But this visual technique of counting “1’s” and “0’s” can be tedious and prone to errors, especially since I<sup>2</sup>S is typically formatted in a 2’s complement format.

Agilent Technologies’ serial bus options for the InfiniiVision oscilloscopes not only offers powerful triggering, but also provides unique hardware-accelerated decoding to help you debug audio designs with the I<sup>2</sup>S bus faster. With the industry’s fastest serial decode update rates, you can more easily find and debug random and intermittent errors and signal integrity problems that you could easily miss using other serial bus decode tools.



**Agilent Technologies**

Other oscilloscope solutions with serial bus triggering and protocol decode typically use software post-processing techniques to decode serial packets/frames. Using these software techniques, waveform- and decode-update rates tend to be slow (sometimes seconds per update), especially when you use deep memory, which is often required to capture multiple packetized serial signals.

Figure 1 shows an example of decoding a stream of 2 channels of transmitted 8-bit audio data based on standard WS/SCLK timing alignment. The trigger condition for this example was set to synchronize on an “increasing” data value generated by the left channel of digital transmission captured on channel-1 of the oscilloscope (yellow trace).

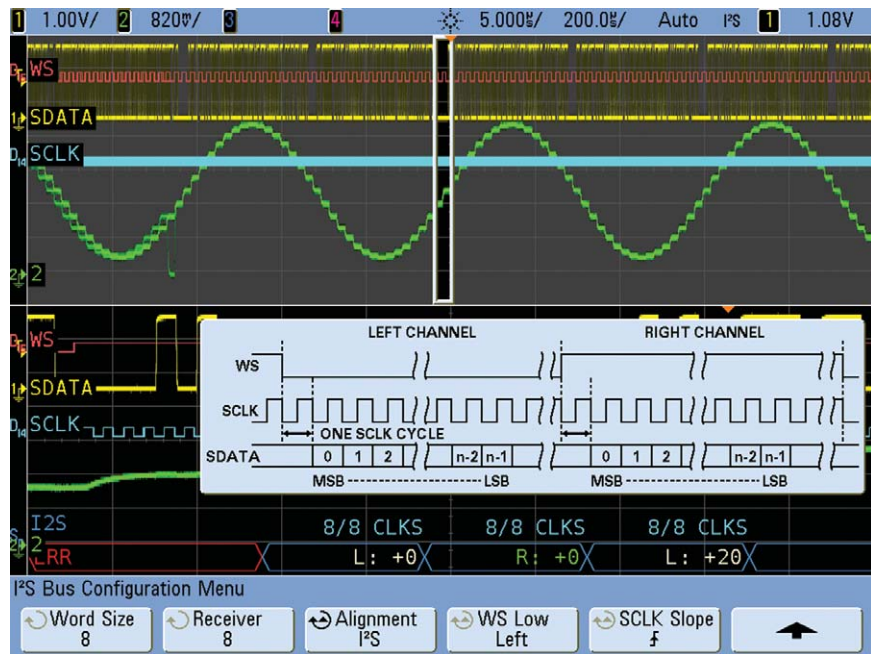


Figure 1: An InfiniiVision series oscilloscope capturing and decoding 2 channels of I2S audio data.

### Performance characteristics

SCLK, WS, and SDATA source	Analog channels 1, 2, 3, or 4 Digital channels D0 – D15 (on MSO models)
<b>Bus Configuration:</b>	
Transmitted Word Size	4 to 32 (user selectable)
Decoded/Receiver Word Size	4 to 32 (user selectable)
Alignment	Standard, Left-justified, or Right-justified
Word Select - Low	Left-channel or Right-channel
SCLK Slope	Rising edge or Falling edge
Decoded Base	Hex (2's complement) or Signed Decimal
<b>Triggering:</b>	
Audio Channel	Audio Left, Audio Right, or Either
Trigger Modes	= (Equal to entered data value) ≠ (Not equal to entered data value) < (Less than entered data value) > (Greater than entered data value) >> (Within range of entered data values) << (Out of range of entered data values) Increasing value that crosses armed (<=) and trigger (>=) entered data values Decreasing value that crosses armed (>=) and trigger (<=) entered data values
<b>Color-coded decode:</b>	
Left Channel	R: “decoded value” in green
Right Channel	L: “decoded value” in white
Error	ERR in red (mismatch between transmitted and received word size, or invalid input signaling)
Word Size Indicator	“# of TX / # of RX” CLKS in blue displayed above each decoded word

## Agilent InfiniiVision Portfolio

Agilent's InfiniiVision lineup includes 5000, 6000 and 7000 Series oscilloscopes. These share a number of advanced hardware and software technology blocks. Use the following selection guide to determine which best matches your specific needs.



**Largest display,  
shallow depth**



**Optional battery,  
100 MHz MSO**



**Ideal for ATE  
rackmount  
applications**



**Smallest form  
factor, lowest  
price**

Bandwidth	7000 Series	6000S Series	6000L Series	5000 Series
100 MHz Bandwidth	•	•	•	•
300/350 MHz Bandwidth	•	•	•	•
500 MHz Bandwidth	•	•	•	•
1 GHz Bandwidth	•	•	•	
MSO Models	•	•	•	
GPIB Connectivity		•	•	•
Rackmount height	7U	5U	1U	5U
Battery option		•		
Display size	12.1"	6.3"		6.3"
Footprint (WxHxD)	17.9"x 10.9"x 6.8"	15.7"x 7.4"x 11.1"	17.1"x 1.7"x 10.6"	15.2"x 7.4"x 6.9"



### Agilent's InfiniiVision oscilloscope portfolio offers:

- A variety of form factors to fit your environment
- Responsive controls and best signal visibility
- Insightful application software
- Responsive deep memory with MegaZoom III

## Ordering Information

The I<sup>2</sup>S trigger and decode option is compatible with all 4-channel and 4+16 channel Agilent InfiniiVision Series oscilloscopes (5000, 6000, and 7000 series scopes). This option is available as a factory-installed option if ordered as Option-SND along with a specific oscilloscope model, or existing InfiniiVision Series oscilloscope users can order this option as an after-purchase product upgrade (N5468A).

Model number user installed	Option number factory installed	Description
N5468A	SND	I <sup>2</sup> S triggering and decode (4 and 4+16 channel models only)
N5457A	232	RS232/UART triggering and decode (4 and 4+16 channel models only)
N5423A	LSS	I <sup>2</sup> C/SPI serial decode option (4 and 4+16 channel models only)
N5424A	AMS	CAN/LIN automotive triggering and decode (4 and 4+16 channel models only)
N5454A	SGM	Segmented Memory

Note that additional options and accessories are available for Agilent InfiniiVision Series oscilloscopes. Refer to the appropriate 5000, 6000, or 7000 Series data sheet for ordering information about these additional options and accessories, as well as ordering information for specific oscilloscope models.

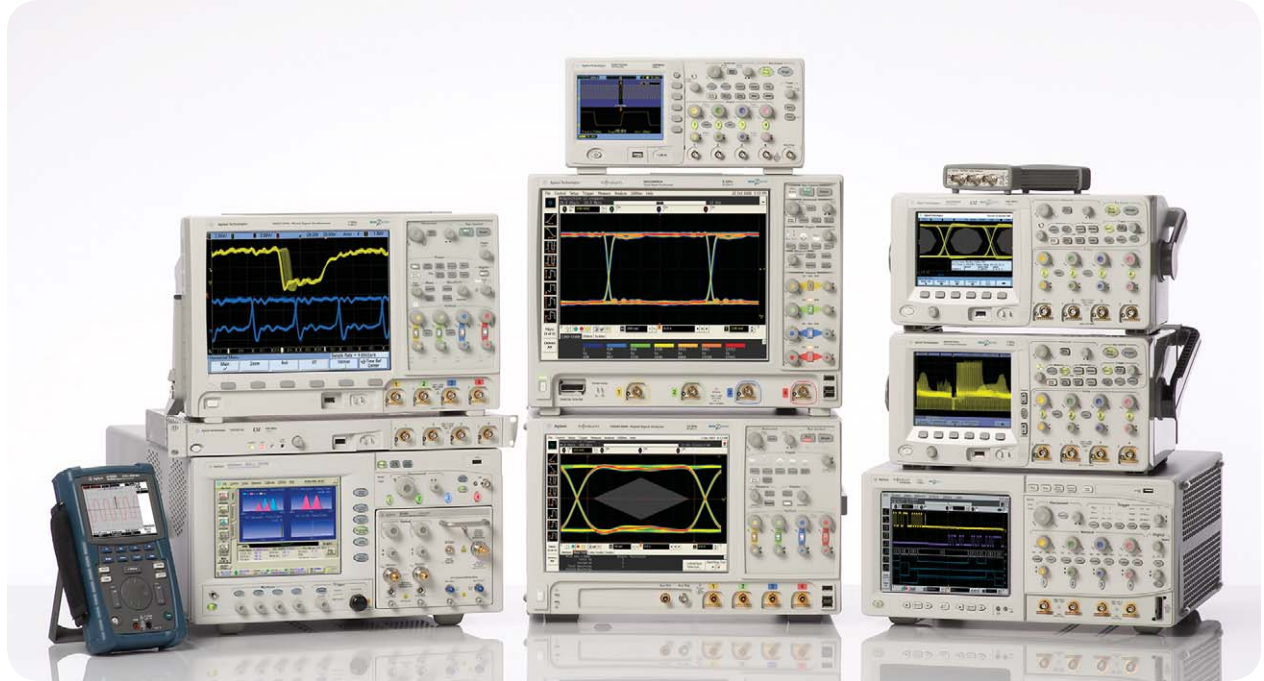
## Related Agilent literature

Publication title	Publication type	Publication number
<i>Agilent Technologies Oscilloscope Family Brochure</i>	Brochure	5989-7650EN
<i>Agilent 7000 Series InfiniiVision Oscilloscopes</i>	Data sheet	5989-7736EN
<i>Agilent 6000 Series InfiniiVision Oscilloscopes</i>	Data sheet	5989-2000EN
<i>Agilent 5000 Series InfiniiVision Oscilloscopes</i>	Data sheet	5989-6110EN
<i>Agilent InfiniiVision Series Oscilloscope Probes and Accessories</i>	Data sheet	5968-8153EN
<i>Segmented Memory Acquisition (5454A) for Agilent InfiniiVision Series Oscilloscopes</i>	Data sheet	5989-7833EN
<i>RS-232/UART Triggering and hardware-based decode (N5457A for Agilent InfiniiVision Series Oscilloscopes)</i>	Data sheet	5989-7832EN
<i>I2C and SPI triggering and hardware-based decode (N5423A) for Agilent InfiniiVision Series Oscilloscopes</i>	Data sheet	5989-5126EN
<i>CAN/LIN (N5424A) decode and triggering option for Agilent InfiniiVision Series Oscilloscopes</i>	Data sheet	5989-6220EN
<i>Evaluating Oscilloscopes for Best Signal Visibility</i>	Application note	5989-7885EN
<i>Debugging Embedded Mixed-Signal Designs Using Mixed Signal Oscilloscopes</i>	Application note	5989-3702EN
<i>Using an Agilent InfiniiVision MSO to Debug an Automotive CAN Bus</i>	Application note	5989-5049EN
<i>Choosing an Oscilloscope with the Right Bandwidth for your Applications</i>	Application note	5989-5733EN
<i>Evaluating Oscilloscope Sample Rates vs. Sampling Fidelity</i>	Application note	5989-5732EN
<i>Evaluating Oscilloscope Vertical Noise Characteristics</i>	Application note	5989-3020EN

To download these documents, insert the publication number in the URL:  
**<http://cp.literature.agilent.com/litweb/pdf/xxxx-xxxxEN.pdf>**

### Product Web site

For the most up-to-date and complete application and product information, please visit our product Web site at: **[www.agilent.com/find/i2s](http://www.agilent.com/find/i2s)**



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