



#### 示波器實機量測研習營

Raymond Tseng, 品勛科技股份有限公司(Keysight優秀業績經銷商) April 13rd. 2022



# **Keysight Authorized Distributor**

#### -是德科技年度優秀業績經銷商\_品勛科技股份有限公司



# >分別於台北、新竹、台南皆有據點 >專業AE 團隊 / 設有開放實驗室 >提供到府教育訓練 >線上諮詢/即時服務



即時示波器的重要特性

當設計變得越來越複雜,專業的主流桌上型除錯和分析工具標準也隨之提高。新的 Infiniium EXR 系列混合信號示波器(EXR 系列)是為專業工程師提供的通用型除錯工具。Infiniium EXR 採用先進的 ASIC,可支援 7 種整合式應用,包括示波器、數位電壓錶(DVM)、波形產生器、波特圖繪圖儀、計數器、協定分析儀和 邏輯分析儀。EXR 系列提供多達 8 個類比通道,並以 16 個獨立的數位通道同時在 2.5 GHz 下運作。

本講座將深入介紹Infiniium EXR混合信示波器的功能與特色,協助專業工程師快速的看見問題、解決問題,完成量測結果。

#### Lab:

- 快速眼圖(Quick Eye Diagram)量測 (30 mins)
- 多通道電源時序(Multi-Channel Power Sequence) 量測 (30 mins)
- 除錯獵人(Fault Hunter)功能 (30 mins)
- 電源完整性與波德圖 (Power integrity & FRA) 測試 (40mins)



#### Agenda:

- 1:00 1:30 p.m. 報到
- 1:30 2:30 p.m. 即時示波器的重要特性
- 2:45 4:55 p.m. 實機操作體驗
  - 快速眼圖(Quick Eye Diagram)量測
  - 多通道電源時序(Multi-Channel Power Sequence) 量測
  - 除錯獵人(Fault Hunter)功能
  - 電源完整性與波德圖 (Power integrity & FRA) 測試

4:55 - 5:00 p.m. 問卷回填及幸運抽獎

#### **Meet the Infiniium EXR-Series**



#### **Standard Performance**

- 100 Mpts per channel memory
- 500 GB SSD
- 4 digit DVM, 10 digit counters
- Hardware accelerated plotting
- Segmented / history mode
- Fault Hunter
- Eye diagrams, clock recovery
- FFT, 50+ voltage/timing measurements
- Training signals, auto demo modes



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	Key Spec	ifications		
Analog Channels		4 or 8, up	gradeable	
Bandwidth	500 MHz → 2.5 GHz			
Sample rate	16 GSa/s			
Memory Depth	100 Mpts/ch → 400 Mpts/ch			
Update Rate		>200,00	0 wfm/s	
Resolution (high res)		10 bits (	(16 bits)	
	500 MHz 1 GHz 2 GHz 2.5 GHz			
ENOB	8.2	8	7.6	7.5
Noise @ 1 mV/div	63 μV 73 μV 91 μV 100 μV			100 µV
Logic Analysis	16 channels, separate connector			
DVM	4 digits			
Counter		2x 10 digit	, 1x 8 digit	
AWG / FRA	50 MHz			
	4 Ch. 8 Ch.			Ch.
Max power draw	450	) W	650	) W
Weight	13.8 kg 14.5 kg			5 kg
Dimensions	H: 3	33 cm // W: 4	4 cm // D: 22	cm

### See an Accurate Representation of Your Signals



#### More Accurate

- ✓ High effective number of bits (up to 9.0)
- ✓ High resolution (up to 16 bits)
- $\checkmark$  Low noise (down to 43  $\mu V)$
- ✓ Accurate timebase (8 parts per billion)

#### More Capability

- ✓ 100 Mpts/ch standard memory \*
- ✓ 2.5 GHz on 8 channels \*
- ✓ 16 GSa/s on 8 channels \*
- ✓ Full HD 1920x1080 resolution



Better than key competitors!







#### **Testing Throughout the Power Ecosystem**









### Power Conversion

# Power Up/Down Sequencing

# Power Rails / Distribution

#### Power Consumption

#### 

## **Power Conversion – D9010PWRA**

- 20 different input, output, and switching device analysis
- PSRR, Control Loop Response to 50 MHz (using WaveGen)- i.e., Bode plots
- Setup Wizard to walk you through connection procedures
- Automatic Deskew
- High-accuracy voltage and current probes to select from

Power Analysis		🎄 ? 🗙
Setup Wizard 🏑 🏷		
On		
Analysis		Description
All Measurements	Modulation	
Input Measurements	Slew Rate	
Switching Measurements	Safe Operating Area	
Output Measurements	Rds(on) & Vce(sat)	
Frequency Response Measurements 🔻	Switching Loss	



#### 1 Voltage

- Connect probe + input to the Drain of the MOSFET.
- Connect probe input to the Source of the MOSFET.
- Select the appropriate attenuation ratio of the probe.

#### 🗿 Current

 Connect the current probe to the Source of the MOSFET with the direction of the arrow pointing towards the current flow.





### **Power Up/Down Sequencing / PMIC Test – Standard**

- Mask testing on every channel
- "One page report" with timing measurements and failures on screen
- Analyze control signals with protocol trigger/decoding



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# **Power Distribution – D9010POWA**

- Measure DC power rail quality with N7020A probe solution •
- Perform "what if" analysis by simulating a cleaner power rail and seeing • the net benefits to signal integrity





# **Power Consumption – N2820A/N2821A**

Industry's only shunt resistor current probe: N2820A-Series Current Probes

- ✓ High Sensitivity
- ✓ High Dynamic Range
- $\checkmark~R_{SENSE}$ : 1m $\Omega$  to 1M $\Omega$

Capture and analyze low level current flow in the device under test to characterize subcircuits or measure current consumption of wireless batterypowered devices or integrated circuits



# **Protocol Layer Testing**

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- Hardware triggering lets you capture physical layer anomalies
- Powerful trigger and decode customization to drill down farther
- Test your signals against industry standards with compliance tests

File Control Setup Display Trigger Measure/Mark Math Analyze Utilities Demos Help			warzozo 👬 KEYSIGHT
			53
Wavefum Window 1	<ul> <li>9 Instant Listing : Ethernet 1008ASE-TX</li> </ul>	Packet Lister	<u>0</u> - 1
₹ S00 mV/ -500 mV	Padets	we have been a set of the set of	
	Index Time Memory 1: IEEE 802.3	Source Port Source MAC Source IP	Destination Port Destination MAC Destination IP
	1 -1.49860184538 ms IPv6 ICMP Parameter Probl	em C2-00-51-FA-00-00 2001:0068:0000:0012:0000:0000:0000:0000	11 C2-01-31-FA-00-00 2001:0D68:0000:00
	2 -1.46198204404 ms IPvb Packet	00-30-D3-21-12-3D 8000:0000:0230:D3FF:FE21:123D:FF0 61303 00-08-E3-EE-E0.00 146-208-217-60	2 33-33-00-00-00-FB 000000000000000000000000000
	4 -1.44748245823 ms IPv4 UDP	59273 BC-30-5B-CF-77-27 141.121.237.244	MS_SSDP 01-00-5E-7F-FF-FA_239.255.255.250
	5 -1.41372286456 ms IPv4 ICMP Information Rep	NY 98-48-E1-C6-2A-95 141.121.237.191	FF-FF-FF-FF-FF-FF 141.121.239.05
2 And a maintained and a maintained in the process of the process	6 -1.40132301432 ms IPv6 ICMP Parameter Probl	lem C2-00-51-FA-00-00 2001:0DB8:0000:0012:0000:0000:000	1 C2-01-51-FA-00-00 2001:0066:0000:00
2 and the proceeding of the proceeding of the process of the proceeding of the proceeding of the process of the proceeding of the process of the proceeding of the process of the proceeding of the proce	7 -1.38460321840 ms IPv5 Packet	00-30-D3-21-12-3D 8000:0000:0000:0230:D3FF:FE21:123D:FF0	2 33-33-00-00-FB 0000:0000:0000:00
	8 -1.37516333213 ms IPv4 TCP	61303 00-08-E3-FF-FD-90 146.208.217.60	RDP 98-48-E1-C6-24-95 141.121.237.191
	al III	the second se	
	Symbols - 7 D	Detais	Header ·
	mV Index Time Data * indicates n	Generated Fields	
	1114 -1.41236288169 ms C1	Packet Details	
	Cumhal Table	- IEEE 802.3	Destruction MMC[47:10
	Symbol Table	Destination MAC = FF-FF-FF-FF-FF Hardware Address	60717111
	1118 -1.41204288559 ms 20	Source MAC = 98-48-E1-C6-2A-95 Handware Address	Decination MAC[13:0]
- And the international statement of the property of the pr	1119 -1.41196288560 ms 30	Length/Type – Internet Protocol version 4 (IPv4)	04717
	1120 -1.41188288758 mt 10	- 1994	Source MA((3119)
	1122 -1.41122288943 mt C2	Internet Header Length = 5 Decimal	0wE1C62A95
	1123 -1.41164289037 ms D8	Differentiated Services = Default PHB	Length/Type Wission
	1124 -1.41156289127 ms 97	Explicit Congestion Notification - Non-ECT (Non ECN-Capable Transpor	0x0000 0x4
	1125 -1.41148289218 ms DE	Total Length = 28 Decimal	Total Length
	mV 1126 -1.41140289319 ms FB	- Identification = 04FB Hex Descent (That) = 0.0 feature	0+0010
	1127 -1.41132289407 ms DB	-Don't Fragment = Not Set	R D M fragment Offuet Tim
	1129 -1.41116289586 ms FE	More Fragments = Set	0 0 1 0x0002
	1130 -1.41108289596 ms 50	Fragment Offset – 2 Decimal	Header Checksum
Consideration of the second se second second se	1131 -1.41100289788 ms 1	Time To Live = 3 Decimal	0/9820
	0 V 1132 -1.41092289886 ms 0	Protocol = Internet Control Message Protocol (ICMP)	Source (P[15:0]
	1133 -1.41084289978 ms CE	Source IP = 141.121.237.191 Dot Notation	OxEDDF
	1135 -1.41068290169 ms 30	Destination IP = 141.121.239.05 Dot Notation	Dettination IP[15:0]
	1136 -1.41060290274 ms 51	e ICMP	over 11
	1137 -1.41052290362 ms 0	Type – Information Reply	Oreclasum
	0 V 1138 -1.41044290455 ms 10	Code = 0 Decimal	046019
	1139 -1,41036290345 ms 0	Identifier = 0115 Hay	Sequence number
	1141 -1.41020290744 ms 0	Sequence number = 0001 Hex	0+0001
IPV4 ICMP Inférmation Reply	1142 -1:41012290849 ms 0	Payload - 00 00 00 00 00 00 00 00 00 00 00 00 0	Payload[127.96]
	1143 -1.41004290947 ms 0	FCS CRC = 8A87 85DB (GOOD)	0-000000
In-Line Decode	0 V 1144 -1.40996291048 ms 0		Cold State of Co
	1145 -1.40988291150 ms 0	· · · · · · · · · · · · · · · · · · ·	Header Details
	1147 -1.40972291347 ms 0	and a second	***********
	1148 -1.40954291449 ms 0	0001: 00 00 00 00 00 00 00 00 00	0-0000000
	1149 -1.40956291552 ms 0	008: 00 00 00 00 00 00 00	Payload[31.0]
146 m 146 m 144 m 143 m 143 m 143 m 144 m 146 m 146 m 146	1150 -1.40948291651 ms 0		0-0000000
-1410 ms -1410 ms -1400 ms	1151 -1.40940291753 ms 0	Payload Details	PCS CRC
[] [] [1.00 µs/ -1.4111676646 ms ] [] [] [] [] [] [] [] [] [] [] [] [] [		r dylodd Dotallo	< <u> </u>

Low Speed Serial	Embedded
l <sup>2</sup> C	USB 2.0 <sup>1</sup>
SPI	eUSB2
Quad SPI	USB-PD
eSPI	10/100 Ethernet <sup>1</sup>
Quad eSPI	
RS232/UART	
l <sup>2</sup> S	
SVID	MIPI
JTAG <sup>2</sup>	RFEE <sup>2</sup>
Manchester	I3C
Automotive	SPMI
CAN / CAN FD	
LIN	Military / Aero
SENT	ARINC 429
FlexRay <sup>2</sup>	MIL STD 1553
100Base-T1 <sup>1</sup>	SpaceWire

1. Compliance Test Also Offered

2. Software trigger

# **Physical Layer Testing**

#### Trigger by Waveform Shape – D9010SCNA Event Identification Software

 ✓ InfiniiScan Zone Trigger: draw zones for a signal to hit or miss, or based on measured parameters.

#### Timing, Vertical, and Phase Noise – D9010JITA

 ✓ Analyze, measure, deconstruct and plot different components of jitter and noise

#### Cable and Fixture Removal – D9010DMBA

✓ Widen eyes by removing effects of cables or fixtures

#### Equalization and Crosstalk – D9020ASIA

- ✓ Widen eyes by removing effects of channel noise, ISI
- ✓ Simulate and remove effects of aggressors on signals

#### **PAM-3 – D9010PAMA**

Measurements clock recovery, and eye diagrams





#### **Reduce Bench Clutter – 7 Instruments in 1**



Integra	ted Instruments
Digital Oscilloscope	Digital Voltmeter
_ogic Analyzer (MSO)	Counter
Protocol Analyzer	Function Generator
	Frequency Response Analyzer
	<complex-block></complex-block>

#### Logic Analysis (MSO)

Correlate analog and digital domains synchronously using MSO capability!

- ✓ Use symbols to quickly interpret waveforms
- Use digital channels for protocol trigger and decode (I<sup>2</sup>C, SPI, RS-232, JTAG, USB etc)
- Combine with oscilloscope channels to trigger across up to 24 channels simultaneously

ations
16
8 GSa/s
31.25 Mpts/ch
2 ns
>200 MHz

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#### **DVM / Counter**

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- Avoid turning on a channel, scaling, and optimizing the display for simple voltage and frequency measurements
- Separate signal path behind the input BNC
- More accurate than a traditional measurement

	DVM Specifications
Digits	4
Sources	Analog Channels 1 thru 8
Modes	AC <sub>RMS</sub> , DC, DC <sub>RMS</sub>
	Counter Specifications
Digits	2x 10 digit, 1x 8 digit
Sources	Analog Channels 1 thru 4
Modes	10 digit counters: frequency, period, totalize 8 digit counter: trigger qualified A/B ratio of 10 digit counters
Maximum Frequency	Bandwidth of Scope

#### **WaveGen / Bode Plotter**



Use the WaveGen to send command signals, simulate added channel noise, see frequency response, and stress test your designs with ease!



#### **Bode Plot Specifications**

Frequency Mode	Single or Swept
Frequency Range	10 Hz to 50 MHz
Number of Test Points	1 to 1,000 points across test range
Test Results	Gain and phase plots, automatic gain/phase margin

Modulation

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AM, FM, FSK

#### **Optimize Your Lab Time - Infiniium Offline**



#### D9010BSEO – Analyze Data Anywhere

•Expand the use of one scope amongst several users:

•Record deep data from the actual scope to analyze waveforms in-depth at your desk, including changing parameters for deeper inspection using an identical 2D scope on your PC. (No learning curve required for a laptop-based scope interface).

•Save set-up parameters for your next session.

•Share data with remote experts to analyze in-depth. Others can fully adjust waveforms from a laptop to find what they need.

•Save waveforms to compare and document iterative designs.

•Present in-depth **design review** evidence by demonstrating changes via captured waveforms, zooming in or changing settings as needed during the meeting.



#### **Always Fast – No Special Modes**

Metric	Why You Should Care	EXR-Series	Comparable Oscilloscope
Triggering (wfm/s)	See more of your signal	>200,000 <b>(&gt;200x faster)</b>	1,000
Averaging (wfm/s)	Noise reduction on repetitive signals	>12,000 <b>(&gt;120x faster)</b>	100
Measurements (meas/s)	Reach 6ơ quicker	>300,000 <b>(20% faster)</b>	250,000
Eye plotting (UI/s)	Identify transients and jitter	>750,000 <b>(&gt;50x faster)</b>	15,000
The Infiniium EXR-Series builds faster than most oscilloscopes of time, the EXR-Series capture comparable oscilloscope capture	s <b>eye diagrams over 50 times</b> in its class. In the same amount es 5.7 million UI while a res only 0.12 million UI.	Real-Time Eye 5.72141 MUI 320 Wfms	Real-Time Eye 116.630 kUI 7 Wfms
The Infiniium EXR-Series displ times faster than most oscillos the EXR-Series triggers 170,00	<b>ays your waveform over 200</b> copes in its class. On this signal, 0 times per second, while a		

the EXR-Series triggers 170,000 times per second, while a comparable oscilloscope triggers only 500 times per second. You can easily see the difference in quality.



#### **One-Click Debug - Fault Hunter**

- ALL NEW Fault Hunter automatically finds signal anomalies
- View button to **see waveform issues**
- Analyze glitches, slow edges, runts

ault Hunter ? X Fault Hunter automatically finds the most common types of signal faults. It begins by getting statistics on standard measurements and then runs tests to find outliers. Setup Source Duration O Triggering - Finds rare faults, restricted limits. Autoscale Y Channel 2 V Run for a minute Limit Test - May miss rare faults, unrestricted limits Control Auto Setup 🖌 Run All after Auto Setup 🛛 Run All Tests Results Test Result Mean Std Dev Acceptable Range Run View Copy to Trig >17.3951 ns V A Positive Glitch Failed 34.8 ns 184 ps **Negative Glitch** Passed 34.8 ns 9.32 ns > 17.3951 ns YA Run View Copy to Trig Run View Copy to Trig Slow Rising Edge 11.1 ns 356 ps < 12.2036 ns Y A Passed Run View Copy to Trig YA Slow Falling Edge Passed 11.5 ns 378 ps <12.6759 ns Run View Copy to Trig Positive Runt and < 237.0 mV 9.19 mV > -209.8 mV ailed Low -359 mV : Hi 385 mV Run View Copy to Trig Low -359 mV : Hi 385 mV 9.19 mV > -209.8 mV and < 237.0 mV Negative Runt Passed

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Never miss an intermittent signal fault again

Debug faster and with confidence

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#### **Save Time – Quick Setups**

Execute tests with one click using our exclusive "Quick" features!

- ✓ Quick Measurements
- ✓ Quick Trigger/Decode
- ✓ Quick Fault Hunter
- ✓ Quick Eye Diagrams
- ✓ Quick Jitter Decomposition

Measurement	Current	Mean	Min	Max	Range (Max-Min)	Std Dev	Count
1 V p-p(1)	904 mV	889 mV	ε <b>λ</b> 96 mV	932 mV	125 mV	36.5 mV	46598
2 Period(1)	59.8 ns	70.2 ns	39.6 ns	140 ns	101 ns	31.2 ns	28000
3 Frequency(1)	16.7 MHz	16.8 MHz	7.12 MHz	25.3 MHz	18.2 MHz	6.30 MHz	28000
4 Rise time(1)	15.0 ns	14.9 ns	10.8 ns	20.1 ns	9.31 ns	1.31 ns	41122
5 Fall time(1)	16.4 ns	14.7 ns	9.18 ns	19.1 ns	9.89 ns	1.70 ns	42865
6 V max(1)	469 mV	434 mV	334 mV	474 mV	140 mV	41.3 mV	46598
7 V min(1)	-435 mV	-455 mV	-485 mV	-356 mV	130 mV	24.1 mV	46598
8 + width(1)	40.0 ns	41.1 ns	18.6 ns	101 ns	82.8 ns	21.7 ns	31131
9 - width(1)	19.9 ns	35.7 ns	18.4 ns	80.3 ns	62.0 ns	19.1 ns	34259
10 Duty cycle(1)	66.8 %	53.3 %	24.6 %	76.9 %	52.4 %	14.2 %	28000

Analyze Utilities Demos Help Gallery...  $\sim\sim\sim\sim\sim$ Quick Eye Diagrams Channel 1 Ouick Jitter 2 Channel 2 **Quick Fault Hunter** Channel 3 Analysis Diagram... 🙆 Channel 4 CrossTalk... Channel 5 Equalization... 6 Channel 6 Fault Hunter... 🕖 Channel 7 Histogram... Channel 8 Jitter/Noise... Limit Test & Search...



#### **Save Time – Automatic Setup Wizards**

Setup wizards walk you step by step through every setting you need to adjust for the best measurement results!

- ✓ Switch Mode Power
- ✓ Power Integrity
- ✓ Real-Time Eyes
- ✓ Measurement Analysis
- ✓ Crosstalk
- ✓ Jitter Decomposition
- ✓ ...And More!



#### Save Time – One Click Help

Access built-in help for any menu with a single click!



#### **Hardware Configuration**

# EXR258A Bandwidth (x100 MHz)

Instrument Upgrades	Model
Add memory, 200/400 Mpts/ch	EXR2MEM
Add AWG, 50 MHz	EXR2WAV
Add MSO, 16 channels	EXR2MSO
	<u> 1958</u>
Additional Equipment	Model
Additional Equipment Extra SSD, 500 GB / 1 TB (removable)	Model EXR2SSD
Additional Equipment Extra SSD, 500 GB / 1 TB (removable) Rackmount kit, 8U	Model EXR2SSD EXR2RACK

BNC(m) - SMA(f) Adapters

GPIB adapter (ICS Electronics)

Model Numbers by Bandwidth and Channels		
Bandwidth	4 Channels	8 Channels
500 MHz	EXR054A	EXR058A
1 GHz	EXR104A	EXR108A
2 GHz	EXR204A	EXR208A
2.5 GHz	EXR254A	EXR258A

#### 

Calibration Options	Model
ISO 17025 Cal. (Not Accredited)	EXR000-1A7
ISO 17025 Cal. (Accredited)	EXR000-AMG

Future Upgrades Model

54855-67604

4865B<sup>3</sup>

Add bandwidth, up to 2.5 GHz	EXR2BW
Add analog channels, 4 to 8	EXR28CH

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Software Configuration		Power Applications	Model
Protocol Decode/Trigger Applications	Model	Power Integrity (Rails, Distribution)	D9010POWA
I <sup>2</sup> C, SPI, Quad SPI, RS232/UART, I <sup>2</sup> S, SVID, Manchester, eSPI <sup>1</sup> , JTAG <sup>1</sup>	D9010LSSP	Switch Mode Power (w/ FRA)	D9010PWRA
USB 2.0, USB-PD, 10/100 Ethernet	D9010EMBP	Signal Integrity Applications	Model
CAN/CAN-FD/CAN-dbc, LIN, SENT	D9010AUTP	EZJit Complete: Jitter Analysis	D9010JITA
I <sup>3</sup> C, SPMI, RFFE	D9010MPLP	InfiniiScan Zone Triggering	D9010SCNA
ARINC 429, MIL-1553, SpaceWire	D9010MILP	De-Embedding	D9010DMBA
Infiniium Basic Protocol Trigger/Decode Bundle: Includes all of the above	D9011BDLP	Equalization and Crosstalk	D9020ASIA
Automotive Ethernet	D9020AUTP	Advanced Applications	Model
		PAM-3 and PAM-4 Analysis	D9010PAMA
Offline Applications (PC Based)	Model	User-Defined Application	D9010UDAA
Infiniium Offline (full Infiniium UI)	D9010BSEO	Compliance Applications	Model
EZJit Complete Offline	D9010JITO		
DMBA + ASIA + PAMA Offline	D9010ASIO		D90100SBC
Protocol Decode Offline (Protocols are	D9010LSPO	10/100 Ethernet	D9010ETHC
split up in two packages, see datasheet)	D9010HSPO	Automotive Ethernet	AE6900T

#### A Range of Keysight Oscilloscopes











	1	nfiniiVision Class Scopes	;	Infiniium C	lass Scopes
	3000T X-Series	4000 X-Series	6000 X-Series	S-Series	<b>EXR-Series</b>
Channels	2, 4	2, 4	2, 4	4	4, 8
Max Bandwidth	100 MHz → 1 GHz	100 MHz → 1.5 GHz <sup>1</sup>	1 GHz → 6 GHz <sup>2</sup>	500 MHz → 8 GHz <sup>2</sup>	500 MHz → 2.5 GHz
Sample Rate <sup>3</sup>	2.5 GSa/s	2.5 GSa/s	10 GSa/s	10 GSa/s	16 GSa/s
Max Memory <sup>3</sup>	2 Mpts	2 Mpts	2 Mpts	400 Mpts	400 Mpts
ADC	8 bits	8 bits	8 bits	10 bits	10 bits
WaveGen	1x 20 MHz	2x 20 MHz	2x 20 MHz	N/A	1x 50 MHz
MSO	16 channels	16 channels	16 channels	16 channels	16 channels
Operating System	Embedded	Embedded	Embedded	Windows 10	Windows 10
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1. Max bandwidth is 1 GHz with four channels on

2. Max bandwidth is 4 GHz with four channels

3. Specified with all analog channels on



# All-New Hi-Z+ Passive Probing System



#### **Hi-Z+ Passive Probing System**

Perfect for demanding high-voltage, fast signals, Keysight's new Hi-Z+ passive probing system delivers never before seen performance in a compact, rugged design.

#### PP0001A...

- ✓ 1 GHz of bandwidth and 300 V<sub>RMS</sub> of input voltage
   PP0002A...
- ✓ 800 MHz bandwidth and 1.2 kV<sub>RMS</sub> input voltage
   PP0003A...
- ✓ MMCX probing with 1 GHz bandwidth and 30  $V_{RMS}$  input voltage

#### All three offer...

- ✓ A broad selection of connection accessories available
- ✓ Compact, rugged 5 mm tip for probing the tightest spaces



	PP0001A	PP0002A	PP0003A
Bandwidth	1 GHz	800 MHz	1 GHz
Voltage (rms)	300	1200	30
Voltage (peak)*	1500	3000	42.4
Input to scope	Via PP0004A	Via PP0004A	Via PP0004A
Tip style	Cartridge tip	Cartridge tip	MMCX

\*peak overvoltage is allowed for a duration of a few milliseconds or less.

#### **Hi-Z+ Passive Probing System**

Part Kit	Description	Notes	Standard?
PP0011A	PP0001A / PP0002A accessory kit	Channel ID rings, grabber hook, BNC adapter, ground springs, ground clip	Yes
PP0013A	PP0003A accessory kit	Channel ID rings, redblack mini grabbers, MMCX to square adapter	Yes
PP0014A	PP0001A fixed cartridge accessory kit	Probe tip cartridge, protective tip covers	Yes
PP0017A	PP0001A adapter kit	Square socket probe tip adapters, PCB to probe tip adapters	No
PP0018A	PP0002A fixed cartridge accessory kit	Probe tip cartridge, protective tip covers	Yes
PP0019A	PP0002A adapter kit	Square socket probe tip adapters, PCB to probe tip adapters	No

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Qty 2

PCB to Probe

Tip Adapter

#### PP0001A Probe - Standard Accessories



#### **Target Markets, Applications**

#### **Target Customers**

- R&D Design
- R&D Validation
- Installation and Maintenance

#### Applications

- High Power Converters
- High Power Semiconductors
- Large Motor Drive Design
- Gallium Nitride (GaN) devices



# **KEYSIGHT**



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# Labs





#### Demo 1: Quick Eye Diagram (30 mins)

- 1. Select **Setup > Factory Default**. This resets the scope.
- Select Setup > Waveform Generator. Under the Type dropdown, switch it from Sine to Demo. In the Demo dropdown that appears below that, select Real-Time Eye. Then click the On checkbox in the top left of the dialog to enable the signal. Close the dialog.
- 3. Change the time scale to **50us/scale**, **200mV/scale**
- 4. Navigate to Analyze > Quick Eye Diagrams > Channel 1
- 5. Navigate to **Analyze > Quick Jitter > Channel 1**
- 6. In Graphs > Select all graphs





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#### **Demo 2: Multi-Channel Power Sequence (30 mins)**

- 1. Select **Setup > Factory** Default. This resets the scope.
- 2. Select **all 8 channels** and see the difference between **Separate/Tile/Overlay**
- 3. Select Analyze > Mask Test > Select Channel > Auto Mask.
- 4. You can create mask for every channel for power sequence testing.







#### **Demo 3: Fault Hunter (30 mins)**

- 1. Call out the signal issues on screen. This would be perfect to use with Fault Hunter.
- 2. Navigate to Analyze > Quick Fault Hunter > Channel 1.
- 3. When all tests are complete, click View for one of the test failures.
- 4. Then click **Copy to Trig**. Click the trigger shortcut to show how Fault Hunter copies the failure condition to a trigger for additional captures!
- 5. Go to **Measure/Mark > COUNTER**; Turn on the Counter C to period to see how often the error condition happens.







#### Demo 4: Bode Plot (20 mins)

- 1. Connect the **DSOXBODE** training board directly to the oscilloscope's **Gen Out BNC**.
- 2. Connect a passive probe between the **channel-1** input BNC of your scope to the training board's **VIN CH1** test pin. Connect the probe's ground lead to one the test pins labeled GND.
- 3. Connect a passive probe between the **channel-2** input BNC of your scope to the training board's **BPF OUT CH2** test pin. Connect this probe's ground lead to the other test pin labeled GND.
- 4. Navigate to **Analysis > Power Analysis**.
- One the Analysis Menu, click on Frequency Response Measurements and click Control Loop Response(Bode) at sub menu.
- 6. Change the Stop Freq setting to 10 MHz.
- 7. Change the Points setting (number of different frequencies to test) from **60 to 300**.
- 8. Change the Amplitude from **200 mVpp to 500 mVpp**.
- 9. Click ON



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#### **Demo 4: Power Integrity (20 mins)**

- 1. Navigate to **Analyze > CrossTalk** 
  - Crosstalk: Data & Data
  - Power Integrity: Power & Data
- 2. Navigate to **Demos > Tutorials & Demos**
- 3. Naviate to Analysis > Power Integrity
- 4. Click Load Demo
- 5. Change the Points setting (number of different frequencies to test) from **60 to 300**.
- 6. While not related to History/Segmented, I usually find this a nice time to show the ADC Resolution dropdown. Watch my demo video for more details if desired.



# **KEYSIGHT**



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