DATA SHEET

i3070 Series 6

In-Circuit Test Systems

Stay Connected. Evolve Continuously.

KEYSIGHT TECHNOLOGIES

Introduction

The Keysight i3070 Series 6 In-Circuit Test (ICT) system is designed to bring industry-leading in-circuit testing technologies into your Printed Circuit Board Assembly (PCBA) manufacturing. This system is Industrial 4.0 ready and caters to in-circuit testing for a wide range of PCBA sizes and applications such as Internet of Things, 5G Communication, Automotive and Energy.

With a unique fixture design, i3070 offers the shortest signal path between measurement circuitry and devices under test, this principle is the key to minimize undesired effects from parasitic capacitance, improved immunity to crosstalk, and eliminate stray signal coupling effects for a more consistent and repeatable measurement result.

i3070 Series 6 Family

i3070 Series 6 family offers a specific test capability that can be expanded in both hardware and software capabilities to meet your future growth needs in your manufacturing.

i3070 Series 6 family	Max Nodes	Foot Print
E9903G	5184	Width 1490 mm (58.66 in) Depth 935 mm (36.81 in) Height 887 mm (34.92 in)
E9902G	2592	Width 1490 mm (58.66 in) Depth 935 mm (36.81 in) Height 887 mm (34.92 in)
E9905G	2592	Width 954 mm (37.56 in) Depth 935 mm (36.81 in) Height 887 mm (34.92 in)

i3070 Series 6 System Summary

	Mux System	UnMux System
Full System Node Capability		
Max Node of E9903G	5184	5184
Max Node of E9902G	2592	2592
Max Node of E9905G	2592	2592
Full System Analog Capability		
Shorts test programmable threshold	2 Ω to 1000	2 Ω to 1000
Resistance, Potentiometer measurements	0.1 Ω to 10 MΩ	0.1 Ω to 10 MΩ
Capacitance measurements	10 pf to 10 mf	10 pf to 10 mf
Inductance measurements	5 µH to 100 H	5 µH to 100 H
Diode measurements	± 0 V–19V	± 0 V–19V
Zener diode measurements	± 0 V–60V	± 0 V–60V
Transistor measurements (Beta)	10–1000	10–1000
FET measurements (On Resistance)	5 Ω–500 Ω	5 Ω–500 Ω
Fuse, Jumper, Switch measurements	0.1 Ω–500 Ω	0.1 Ω–500 Ω
Arbitrary waveform generator	1 Hz to 20 kHz	1 Hz to 20 kHz
Waveform digitizer	40k samples/sec, 8192 samples	
Function generator (DC, Sine, Square, and Triangle)	0 to ±10 V, 0.5 Hz to 20 kHz	0 to ±10 V, 0.5 Hz to 20 kHz
Auxiliary DC voltage source	0 to ±10 V; 30 or 150mA	0 to ±10 V; 30 or 150mA
DC detector	0 to 160 V	0 to 160 V
Universal counter: frequency, pulse, and time interval measurements	1 Hz to 60 MHz; 30 ns to 1s	1 Hz to 60 MHz; 30 ns to 1s
Analog functional test access ports	E9903G: 8	E9903G: 8
	E9902G 4	E9902G 4
	E9905G 4	E9905G 4
Full System Digital Capability		
Max Drive and Receive channels	E9903G: 576	E9903G: 5184
	E9902G 288	E9902G 2592
	E9905G 288	E9905G 2592
Pin-by-pin programmable drive and receive resources	1 ns programming resolution 3.5 to +5.0 V logic levels 25 to 250 V/µs slew rate in 25 V/µs steps, Pull-up/pull-down	2 ns programming resolution 0 to +5.0 V drive level 0 to +4.875 V receive level Pull-up/pull-down or AC termination loads
Logic analyzer	bit-by-bit, and CRC capture modes	bit-by-bit, and CRC capture modes
Drive edge placement accuracy (any driver)	±5 ns (typical) ±700 mA sourcing, 500 mA sinking backdrive current	±15 ns (typical) ±750 mA peak, ±100 mA continuous backdrive current
Drive voltage accuracy	2.206 mV programming resolution ±100 mV	20 mV programming resolution ± 2% of setting ±20 mV

Receive edge placement accuracy (any receiver):	±5 ns (typical)	±15 ns (typical)
Receive voltage accuracy	2.2 mV (typical) programming resolution ±100 mV	20 mV programming resolution ±2% of setting ± 100 mV (typical)
Pattern rate	6.25, 12.5. 20 million/second	6.25 million/second
ASIC test length no reload	> 4M vectors (typical)	> 4M vectors (typical)
Boundary-scan test length no reload	> 4.8M vectors (typical)	> 4.8M vectors (typical)
RAM test length no reload	> 64M vectors (typical)	> 64M vectors (typical)
ROM test length no reload	> 256M vectors (typical)	> 256M vectors (typical)
Clocks Sync to Clock	625 kHz to 50 MHz 160 kHz to 80 MHz	625 kHz to 50 MHz 160 kHz to 80 MHz
Standard Peripherals		
PC Controller	Windows 10 64-bit	Windows 10 64-bit
Guided hand-held probe	Yes	Yes
Repair ticket printer	Yes	Yes
Standard System Software / Features		
Board Test Insight	Yes	Yes
Board Consultant	Yes	No
Fixture Consultant	Yes	No
Test Consultant	Yes	No
IPG-II Analog Program Generator	Yes	Yes
Pushbutton Debug	Yes	Yes
Automatic 6-wire analog in-circuit tests	Yes	Yes
Automatic digital test generation	Yes	Yes
Safeguard ICT analysis	Yes	Yes
Automatic global digital disable	Yes	Yes
Device test libraries	Yes	Yes
Multiple Board Versions	Yes	Yes
Long and Short-wire Fixturing Technology	Yes	Yes
Dual-well Fixturing Technology	Yes	Yes
Vectorless Test EP/intelligent Vectorless Test EP	Yes	Yes
Connect Check	Yes	Yes
Boundary-scan (IEEE 1149.1)	Yes	Yes
PanelTest	Yes	Yes
Throughput Multiplier	Yes	Yes
Polarity Check Technology	Yes	Yes
Access Consultant	Yes	Yes
Board Test Grader	Yes	Yes
Coverage Analyst	Yes	Yes
Data Log Converter	Yes	Yes
Pushbutton Q-STATS	Yes	Yes
System Confirmation / Diagnostics	Yes	Yes
i3070 Software	Yes	Yes
Datalogging	Yes	Yes

Optional System Accessories and Software		
HybridPlus-DD cards (144 nodes, 16 D/R)	Yes	No
AnalogPlus-DD cards (144 nodes, 0 D/R)	Yes	No
HybridPlus-DD cards (144 nodes, 144 D/R)	No	Yes
AccessPlus card	Yes	No
Utility card	Yes	Yes
Barcode Reader [1]	Yes	Yes
Pin Verification Fixture	Yes	Yes
Programmable DUT Power Supply	Yes	Yes
Advanced Throughput Multiplier	Yes	Yes
Drive Thru Test	Yes	Yes
InterconnectPlus Boundary-scan (IEEE 1149.1 and 1149.6)	Yes	Yes
Automated Silicon Nails	Yes	Yes
Cover-Extend Technology	Yes	Yes
Flash70 Software	Yes	Yes
In-System Programming (Flash ISP and PLD ISP)	Yes	Yes
nanoVTEP hardware	Yes	Yes
External Device Link Library	Yes	Yes
Additional Test Development [2]	Yes	Yes

1. For i3070 Inline System only
2. Additional licenses are inexpensively gained by purchasing the i3070 development software for installation on individual PCs.

Unpowered / Analog In-Circuit Test Measurement Specification

Shorts and Opens

Source Impedance: 100 Ω

Parameter	Specification
Programmable Threshold Range	
Short	2–1000 Ω
Open	2–1000 Ω
Programming Resolution	1.0 Ω
Accuracy	±(0.25% + 2.2 Ω)
Programmable Settling Time	
Minimum	0 µs
Maximum	3.2768 s
Default	50 µs
Programming Resolution	50 µs
Test Voltage	0.1 V DC

Resistor / Potentiometer

Unguarded Tests
Source Voltage: 0.1 VDC

Range	Measurement Type	Accuracy
0.1 Ω –10 Ω	4-wire (using ED, EN, & OXT options)	±1.5%
10 Ω – 300 Ω	4-wire (using ED, EN, & OXT options)	±1.0%
300 Ω – 10 kΩ	4-wire (using ED, EN, & OXT options)	±0.25%
	2-wire	±1.0%*
10 kΩ – 100 kΩ	2-wire (using ED, EN, & OXT options)	±0.25%
	2-wire	±1.0%
100 kΩ – 1 MΩ	2-wire (using ED, EN, & OXT options)	2-wire
	2-wire	±0.5% ±2.5%
1.0 MΩ – 10 MΩ	2-wire (using ED, EN, & OXT options)	±5.0%

* Plus system residual ≤ 3.5 Ω

Unguarded Tests (Using DMC on ASRU-N)
Source Voltage: 0.1 VDC

Range	Measurement Type	Accuracy
1 Ω – 300 Ω	4-wire (using ED option)	±1.0%
300 Ω – 10 kΩ	4-wire (using ED option)	±0.25%
	2-wire	±1.0%*
10 kΩ – 100 kΩ	2-wire (using ED option)	±0.25%
	2-wire	±1.0%
100 kΩ – 1 MΩ	2-wire (using ED option)	±0.5%
	2-wire	±2.5%
1.0 MΩ – 10 MΩ	2-wire (using ED option)	±5.0%

* Plus system residual ≤ 3.5 Ω

High Guard Ratio Tests

Range	Measurement Type	Accuracy
10 kΩ	6-wire (using ED, EN, & OXT options) (Source Voltage: 1.0 VDC) (Guard Ratio: 1000 to 1 on both legs of guard circuit)	±2.5%
100 kΩ	6-wire (using ED, EN, & OXT options) (Source Voltage: 0.1 VDC) (Guard Ratio: 1,000,000 to 1)	±1.0% (typ)

* High/Ultra-High guard ratio is not supported in tests using DMC on the ASRU-N card

Capacitor

Unguarded Tests
Source Voltage: 0.1 VAC
Dissipation Factor: ≤ 1.0

Range	Measurement Type	Accuracy
10 pF – 0.5 µF	2-wire (using ED & OXT options)	±2.0%*
0.5 µF – 10,000 µF	4-wire (using ED, EN, & OXT options)	±2.0%

* Plus system residual: ±1 pF with capacitor compensation, 0 to +40 pF typical without capacitor compensation.

Unguarded Tests (using DMC on ASRU-N)
Source Voltage: 0.1 VAC
Dissipation Factor: ≤ 1.0

Range	Measurement Type	Accuracy
10 pF – 0.5 µF	2-wire (using ED option)	±2.0%*
0.5 µF – 100 µF	4-wire (using ED option)	±2.0%

* Plus system residual: ±2.5 pF with capacitor compensation, 0 to +40 pF typical without capacitor compensation.
100k and 200k test frequencies are available when using DMC on the ASRU-N card.

Guarded Tests
Source Voltage: 0.1 VAC
Test Frequency: 1024 Hz
Dissipation Factor: ≤ 1.0
Guard Ratio: 1000 to 1 on both legs of guard circuit

Value	Measurement Type	Accuracy
1000 pF	6-wire (using ED, EN, & OXT options)	±6.0%

* Guard sense lines are not supported in tests using DMC on the ASRU-N card. Tests using source and detector sense lines are allowed.

Inductor

Unguarded Tests
Source Voltage: 0.1 VAC
Quality Factor: ω 1.0

Range	Measurement Type	Accuracy
5 µH – 50 mH	4-wire (using EN option)	±2.0%*
50 mH – 1.59 H	2-wire (using EN option)	±2.0%
1.59 H – 10 H	2-wire (using ED and EN options)	±2.0%
10 H – 100 H	2-wire (using ED and EN options)	±3.0%

***** Plus system residual: 1 µH.

Unguarded Tests (using DMC on ASRU-N)
Source Voltage: 0.1 VAC
Quality Factor: ω 1.0

Range	Measurement Type	Accuracy
5 µH – 50 mH	4-wire	±2.0%*
50 mH – 1.59 H	2-wire	±2.0%
1.59 H – 10 H	2-wire (using ED options)	±2.0%
10 H – 100 H	2-wire (using ED options)	±3.0%

* Plus system residual: 1 µH. 100k and 200k test frequencies are available when using DMC on the ASRU-N card.

Guarded Tests
Source Voltage: 0.1 VAC
Test Frequency: 8192 Hz
Dissipation Factor: ≥ 1.64

Value	Measurement Type	Accuracy
10 mH	6-wire (using ED and EN options)	±5.0%

Guard sense lines are not supported in tests using DMC on the ASRU-N card. Tests using source and detector sense lines are allowed

Diode

Unguarded Tests
Default Current: 1 mA
Programmable Range: Up to 100 mA

Range	Measurement Type	Accuracy
± 0V – 19 V	±(1.0% of reading + 4 mV)*	± 0V–19 V

* Plus system residual: ≤ 3.5 mV/mA

Zener Diode

Unguarded Tests
Default Current: 1 mA
Programmable Range: Up to 100 mA

Range	Accuracy
± 0V – 18 V	±(1.0% of reading + 4 mV)*

* Plus system residual: ≤ 3.5 mV/mA

High Voltage Zener

Default Current: 1 mA to 5 mA
Programmable Range: Up to 50 mA

Range	Accuracy
18V – 60 V	± 3.0% of reading

* Test is executed in pre-powered mode.

Bipolar Transistor (Beta Test)

Unguarded Tests
Programmable DC Emitter Bias
Current Range: 100 µA to 100 mA

Beta Range	Accuracy
10 – 1000	±15%

Depletion Field Effect Transistor

Unguarded Tests
Voltage Range: 0 to 10 V
Default Voltage: 0.1 V

On Resistance Range	Accuracy
5 Ω – 500 Ω	±1.5%*

* Plus system residual: ≤ 3.5 Ω

Fuse, Switch, and Jumper

Unguarded Tests
Default Voltage: 0.1 V

On Resistance Range	Accuracy
0.1 Ω – 500 Ω	±1.5%
1.0 Ω – 500 Ω	±1.0% (ASRU-N DMC)

* Plus system residual: ≤ 3.5 Ω

Vectorless Test EP

Source Voltage: 200 mV
Test Frequency: 8192 Hz

Parameter	Specification	Correlate Capacitance
Programmable Low Threshold	1 – 1000	0.5 fF – 750 pF
Programmable High Threshold	1 – 1000	0.5 fF – 750 pF
Programming Resolution	1	0.5 fF – 2 fF
Test Speed (typical)	500 pins per second	

Polarity Check

Source Voltage: 200 mV

Parameter	Specification*
Test Range (total parallel capacitance)	up to 2000 µF
Test Range (stand-alone capacitance)	up to 4000 µF
Test Speed	10–15 capacitors per second (typical)

* Range varies with types of packaging used for capacitors.

Powered / Functional Test Measurement Specification

Built-in Instruments

Universal Source (Four Quadrant)

Programmable Current Limit: 30 mA or 150 mA
Programmable Termination: 5, 50, 500, or 5,000 Ω
Output Resistance: ≤ 2.2 Ω

Application	**Characteristic**		
DC Voltage Source	Four Quadrant and Auto-ranging		
	Range	Programming Resolution	Accuracy
	±0.1 V	50 µV	± 0.1% ± 3 mV
	±10 V	5 mV	± 0.1% ± 10 mV
Functional Generator			
Sine Wave	Distortion (THD): < 1%		
	Range	Programming Resolution	Accuracy
	±7.071 Vrms[1]	5 mV (Mux) 2 mV (UnMux)	± 2.0% ± 5 mVAC
Square Wave	Rise Time (10%–90% of 0–5 V): 2.5 µs (typical)		
	Range	Programming Resolution	Accuracy
	± 0–10 V[1]	5 mV	± 2.0% ± 5 mVAC
Triangle Wave	Linearity (10%–90%): 2% (typical)		
	Range	Programming Resolution	Accuracy
	± 0–10 V[1]	5 mV	± 3.0% ± 5 mVAC
Frequency	Range	Resolution	Accuracy
	1–20 kHz	1 Hz	±0.015%
Jitter[2]	Sine Wave	Square Wave	Triangle Wave
	0.25 µs	2.2 µs	0.25 µs
DC Offset Voltage	Range	Accuracy	
	± 0–10 V[1]	±15 mV	
Arbitrary Waveform Generator	1–1024 samples	4096 samples	3 dB bandwidth
Frequency Range	1–32,768 Hz	1–8,192 Hz	120 kHz
Voltage Range	–10.0 to 10.0 V	–10.0 to 10.0 V	

1. Peaks of waveform plus programmed offset must be between ±10 V.
2. Maximum edge to edge.

Auxiliary DC Voltage Source (Four Quadrant)

Programmable Current Limit: 30 mA or 150 mA
Output Resistance: ≤ 2.2 Ω

Range	**Programming Resolution**	**Accuracy**
±10 V	5 mV	± 0.1% ± 10 mV

Differential Detector DC

DC Voltage Detection

Characteristic	**Specification**	
Resolution	16 bits (15 bits plus sign), < 0.005% of range	
Converter	Integrator for noise rejection.	
Converter Speeds	Normal	500 µs integration (high-frequency noise rejection)

	Line Rejection	16.667 ms or 20.000 ms (60 Hz or 50 Hz systems: power line, high-frequency rejection)
Accuracy[1]	Normal / Line Rejection	± (0.1% of reading + 0.2% of range + 600 µV)
Line Rejection	60 dB[2]	
Input Types	Differential, HI (I bus) and LO (L bus)	
Peak Differential Input Voltage	< ±160 VDC	
Maximum Voltage to Ground	±100 V peak	
Input Capacitance	1000 pF[3]	
DC Common Mode Rejection Ratio (1 kΩ imbalance in either lead)	Range	Specification
	± (0.039 to 10) V	> 80 dB V/V
	± (20 to 160) V	> 50 dB V/V

1. Add 0.12% of reading for attenuated ranges.
2. Line frequency within ± 0.1% and peak voltage is within expected range.
3. Either input referenced to system ground.
4. Autoranging for speed advantage, auto-range up when input is over-ranged

Range (volts)	Common Mode Range	Common Mode Input Resistance (ohms) (typical)	Differential Input Resistance (ohms) (typical)
160	± 100 V	240 k	1 M
80	± 100 V	240 k	1 M
40	± 100 V	240 k	1 M
20	± 100 V	240 k	1 M
10	± 10 V	> 100 M	> 100 M
5	± 10 V	> 100 M	> 100 M
2.5	± 10 V	> 100 M	> 100 M
1.25	± 10 V	> 100 M	> 100 M
0.625	± 10 V	> 100 M	> 100 M
0.3125	± 10 V	> 100 M	> 100 M
0.1562500	± 10 V	> 100 M	> 100 M
0.0781250	± 10 V	> 100 M	> 100 M
0.0390625	± 10 V	> 100 M	> 100 M

Differential Detector AC

True RMS AC Detection

Characteristics	Specification	
Resolution	16 bits (15 bits plus sign), < 0.005% of range	
Converter	Uses 16-bit successive approximation converter running at 40,000 samples/second (nominal) to convert, store, and analyze the rms value of the input waveform over one of the two user selectable time windows. Digital Signal Processing (DSP) techniques are utilized to determine and remove the DC component. Measurement speed for voltages with DC components is faster than capacitor coupled AC converters.	
Converter Modes	Normal	8192 samples at 40,000 samples/second (0.2048 sec window)
	Fast	1024 samples at 40,000 samples/second (0.0256 sec window)
Input	Differential, HI (I bus) and LO (L bus)	
Peak Differential Input Voltage	< ±160 VDC	
Maximum Voltage to Ground	±100 V peak	
Input Capacitance	< 1000 pF (either input referenced to system ground, other lead tied to system ground).	
DC Rejection Ratio	Normal	78 dB (typical)
	Fast	60 dB (typical)

* Autoranging for speed advantage, autorange up when input is over-ranged

Frequency Range	Accuracy *
Normal Mode	
10–50 Hz	± (4% of reading + 0.02% of range + 100 µV)
50–300 Hz	± (1% of reading + 0.02% of range + 100 µV)
300 Hz–3 kHz	± (0.2% of reading + 0.02% of range + 100 µV)
3–10 kHz	± (2% of reading + 0.02% of range + 600 µV)
10–19 kHz	± (5% of reading + 0.02% of range + 600 µV)
Fast Mode	
50–200 Hz	± (7% of reading + 0.02% of range + 100 µV)
200–400 Hz	± (2% of reading + 0.02% of range + 100 mV)
400 Hz–5 kHz	± (1% of reading + 0.02% of range + 100 µV)
5–10 kHz	± (2% of reading + 0.02% of range + 600 µV)
10–19 kHz	± (5% of reading + 0.02% of range + 600 µV)

* Add 0.12% of reading for attenuated ranges (> 7.07 VAC); see DC voltage detection specifications for impedance of each voltage range.

Waveform Digitizer

Parameter	Specification
Interval between samples	25 µs–51.2 ms
Number of samples	1–8192
Settling time	25 µs
Noise	0.2% of range + 10 mV

Frequency/Time Interval Counter

The frequency/time interval counter has two input channels (Channel A and Channel B) and an external-internal arming trigger which can be switched to any clock receiver pin on the Control card, Hybrid-144 Non-multiplexed, or HybridPlus-DD card to perform time interval, pulse width, and frequency measurements.

Input Voltage Range: 0 to 4.875 V (Hybrid-144 pin card)
-3.5 to 5.0 V (Hybrid-DD pin card)

Measurement	Specification		
	Range	Accuracy *	
Time Interval	100 ns–1 sec	± (10 ns + 0.01% + 2 x trigger error)	
Pulse Width	25 ns–1 sec	± (5 ns + 0.01% + 2 x trigger error)	Positive or negative slope
	Range	Threshold Accuracy *	
Frequency	1 Hz–20 MHz	± 0.1 V on any pin card	Positive or negative slope
	2 Hz–60 MHz	TTL level on Control card clock receivers	Positive or negative slope
	Minimum Gate Delay	Resolution	Accuracy
	0.5 ms	0.02%	0.03%
	100 ms	0.0001%	0.01%

* Input signals to tester must have a slew rate ≥ 100 V/µs in 0.2 to 3.5 V range. Trigger error = 80 mV/(input signal slew rate).

Power Monitoring Circuit (PMC)

Parameter	Specification
Channels per ASRU card	3
Voltage limit range	1.0 to 50 V
Recommended voltage limit range	1.8 to 50 V
Accuracy	1.22% of reading

External Functional Test Instruments

Functional Test Access port

Parameter	Specification
Characteristic Impedance	50 Ω (typical)
Minimum DC Insulation Resistance	1 MΩ
Maximum Voltage	±100 V peak (port to system ground)
Maximum Current	±500 mA peak per port
Maximum Power	7.5 VA per port
Minimum DC Insulation Resistance	10 MΩ
Total Capacitance	< 900 pF port to ground
3 dB Bandwidth	12 MHz (typical) to and from any HybridPlus-DD pin
Crosstalk at 1 MHz	< –45 dB (50 Ω source and load)

***** External instruments can trigger frequency, pulse width, and time interval measurements.

Digital In-circuit Test and Functional Test

Edge Placement Accuracy

Parameter	Specification
Mux Systems (1)	
EPA Internally Referenced	±5 ns typical, ±10 ns warranted
EPA Externally Referenced	±7 ns typical, ±15 ns warranted
UnMux Systems (2)	
EPA Internally Referenced	±15 ns typical, ±20 ns warranted
EPA Externally Referenced	±17 ns typical, ±24 ns warranted

1. Drivers are programmed for 0.2–3.5 V and a 225 V/µs slew rate into 100 Ω non high impedance state and measured at 1.5 V. Receivers are programmed to 1.5 V, 325 kHz DUT ≤ 20 MHz. Input signals to tester must have a slew rate ≥ 225 V/µs.
2. Drivers are programmed to 3.5 V into 100 Ω non high impedance state and measured at 1.5 V. Receivers are programmed to 1.5 V, 325 kHz DUT ≤ 20 MHz. Input signals to tester must have a slew rate ≥ 225 V/µs.

Pattern Rate

Parameter	Specification
Mux Systems (1)	
Minimum Pattern Rate	330/sec
Maximum Pattern Rate	6.25 M/sec, 12.5 M/sec, or 20 M/sec
UnMux Systems (2)	
Minimum Pattern Rate	330/sec
Maximum Pattern Rate	6.25 M/sec

1. Drivers are programmed for 0.2–3.5 V and a 225 V/µs slew rate into 100 Ω non high impedance state and measured at 1.5 V. Receivers are programmed to 1.5 V, 325 kHz DUT ≤ clock of 20 MHz. Input signals to tester must have a slew rate of 225 V/µs.
2. Drivers have fixed rise and fall times of approximately 15 ns.

Guide Probe

Parameter		Specification
Programmable Receiver Voltage Range	Low Threshold	–3.5 to 5.0 V
	High Threshold	–3.5 to 5.0 V
	Programming Resolution	5.25 mV
	Accuracy	±150 mV
Maximum Input Voltage		±12 V
Bandwidth (using ground clip)		50 MHz
Input Resistance		20 kΩ
Input Capacitance		10 pF

Additional Digital Specifications

Module Control Card

High-speed Clocks and Clock Receivers

TTL Compatible Input and Output

Parameter	Specification	
Number of Clock Drivers/Control Card		1
Clock Driver Multiplex Ratio		2:1
Clock Driver Frequency Range	Minimum	625 kHz
	Maximum	50 MHz
	Resolution[1]	± 1% of frequency
Number of Clock Receivers/Control Card		2
Clock Receiver Frequency	Minimum	160 kHz
	Maximum	80 MHz

1. Add ± 1 ns for periods over 100 ns.

Even Triggers

Parameter	Specification
Number of Triggers/ Control Card	3
Trigger Multiplex Ratio	2:1
Start-up Delay	550 ns (11 events)
Number of Triggers/ Control Card	3
Minimum Pattern Rate	330/sec

Capture Ram

Parameter	Specification
Serial Capture RAM depth	1,048,576 (1 Mb)

General-Purpose Relays

Parameter	Specification
Number of General-Purpose Relays/Control Card	8
Maximum Voltage to Earth	±100 V peak
Maximum Switching Voltage	100 V peak
Maximum Switching Power	30 W
Maximum Switching Current	750 mA
Maximum Carry Current	750 mA
General-Purpose Relay Resistance	60 mΩ
Switching Time (typical)	50 ms

Debug Ports

Output Voltage: TTL levels

Parameter	Specification*
Clock Port	Sequencer or event clock
Data Port	Buffered data from a receiver
Synchronization Port	Sync pulses added in digital test debug

* Systematic delay is typically 100–200 ns

Pin Cards and Test Access

Pin Cards for UnMux Systems

Maximum Number of Resources

	1-Module	2-Module	4-Module
Pins / Nodes	1,296	2,592	5,184
Drive Channels	1,296	2,592	5,184
Receive Channels	1,296	2,592	5,184
Hybrid-144 pin Card*	9	18	36
Utility Card*	1	2	4

* Maximum number of cards per module = 9.

Hybrid-144 non-multiplex pin card

Parameter	Specification
Number of Pins/Card	144
Number of Channels/Card	144
Number of Drive Channels/Card	144
Number of Receive Channels/Card	144
Number of Grounds/Card	156
Multiplexing Ratio	1:1
Overdrive Capability	Yes
nanoVTEP Technology Capability	Yes

Hybrid-144 Non-multiplexed Pin Card Receivers

Parameter		Specification
Programmable Receive Delay Time	Minimum	0 ns
	Maximum	Programmed vector cycle time
	Resolution	2 ns (typical)
	Accuracy (same card)	±8 ns typical, ±11 ns warranted
Input Voltage Range		0–4.875 V
Input Bias Current		+150 µA maximum[1]
Parallel Capture RAM		128 bits
Response Compression		IEEE CRC-32 polynomial [2]
Receiver Threshold Voltage	Range	0–4.875 V
	Programming Resolution	20 mV (typical)
	Static Accuracy	± 2% of setting ± 100 mV (typical)
Termination	Pull-Up Resistor	1000 Ω
	Pull-Down Resistor	383 Ω
	AC	150 pF, 68.1 Ω in series

1. Varies with voltage.
2. Polynomial is $1 + x^2 + x^4 + x^5 + x^7 + x^8 + x^{10} + x^{11} + x^{12} + x^{16} + x^{22} + x^{23} + x^{26} + x^{32}$

Hybrid-144 Non-multiplexed Pin Card Drivers

Parameter		Specification
Frequency Range as a Clock	Minimum	625 kHz
	Maximum	10 MHz
	Programming Resolution[1]	≤ 1% of frequency
Programmable Vector Cycle Time	Minimum	160 ns
	Maximum	1.5 ms
	Resolution[1]	1% of vector cycle
	Programming Resolution	1 ns

Output Skew (same card)		±5 ns typical, ±8 ns warranted
Rise Time/Fall Time (no load)		15 ns (typical)
Driver Voltage (no load)	Range	0–5.0 V
	Programming Resolution	20 mV
Output Backdrive Current	Static Accuracy	± 2% of setting ± 20 mV
	Peak[2]	±750 mA
	Continuous	±100 mA
DC Output Resistance		1.0 Ω (typical)
Minimum Pulse Width Generation (TTL)		50 ns
High-Impedance State Leakage Current[3]		–150 µA
Programmable Device Test Time-out	Minimum	5.0 µs
	Maximum	429 s

1. Add ±1 ns for periods over 100 ns.
2. Maximum width 2 ms, maximum duty cycle 10%.
3. Varies with voltage.

Parameter	Specification
Hybrid-144 Non-multiplexed Pin Card Drive/Receive Pins	
Capacitance: Tri-State	130 pF
Capacitance: Disconnected	24 pF
Hybrid-144 Non-multiplexed Pin Card Relays	
Maximum Voltage to Earth	±100 V peak
Maximum Current	750 mA
Maximum Switching Power	7.5 VA

Pin Cards for Mux Systems

Maximum Number of Resources

	1-Module	2-Module	4-Module
Pins / Nodes	1,296	2,592	5,184
Drive Channels	1,296	2,592	5,184
Receive Channels	1,296	2,592	5,184
HybridPlus-DD Card*	9	18	36
AnalogPlus-DD Card*	8	16	32
AccessPlus Card*	8	16	32
Utility Card*	1	2	4

* Maximum number of cards per module = 9.

HybridPlus-DD Card

Parameter	Specification
Number of Pins/Card	144*
Number of Channels/Card (Split Driver-Receiver)	32
Number of Drive Channels/Card	16
Number of Receive Channels/Card	16
Multiplexing Ratio	2:9
Overdrive Capability	Yes
nanoVTEP Capability	Yes*

* Also applicable to AnalogPlus DD

HybridPlus-DD and AnalogPlus-DD Relays

Parameter	Specification
Maximum Voltage to Earth	±100 V peak
Maximum Current (constant)	500 mA

Maximum Current (pulsing)	700 mA
Maximum Switching Power	7.5 VA

HybridPlus-DD Card Receivers

Parameter		Specification
Programmable Receive Delay Time	Minimum	0 ns
	Maximum	3.0 ms
	Resolution	4 ns + 1% of vector cycle
	Programming Resolution	1 ns
Maximum Input Voltage		12.0 V and –12.0 V
Parallel Capture RAM		128 bits
Pull-Up Curent Source		2.0 mA (typical)
Pull-Down Curent Source		5.0 mA (typical)
Receiver Threshold Voltage Range	Low Threshold	–3.5 to 5.0 V
	High Threshold	–3.5 to 5.0 V
	Programming Resolution	2.2 mV (typical)
	Accuracy	±100 mV
Input Bias Current		±30 µA
Input Capacitance		83 pF
Disconnected Capacitance		12 to 23 pF (typical)
Bi-directional Capacitance		160 pF (typical)

HybridPlus-DD Card Drivers

Parameter		Specification
Frequency Range as a Clock	Minimum	625 kHz
	Maximum[1]	6.25, 12.5, or 20 MHz
	Programming Resolution[2]	≤1% of frequency
Programmable Vector Cycle Time	Minimum[1]	160, 80, or 50 ns
	Maximum	1.5 ms
	Resolution[2]	1% of vector cycle
	Programming Resolution	1 ns
Peak Backdrive Current	–3.5 to + 5.0 V source	750 mA
	–3.5 to + 5.0 V sink	–500 mA
Continuous Output Current	Maximum Continuous Source Current	100 mA
	Maximum Continuous Sink Current	100 mA
Slew Rate (into 100 Ω) Rising and Falling	Minimum	25 V/µs
	Maximum	275 V/µs
	Programming Resolution	25 V/µs
Driver Voltage	Range[3]	–3.5 to 5.0 V
	Programming Resolution	2.206 mV
	Static Accuracy (no load)	±100 mV
Minimum Pulse Width Generation (TTL)		50 ns
High-Impedance State Leakage Current	I_L at V_O = +3 V	25 to 150 µA
	I_L at V_O = –2 V	–150 to 0 µA
	V_O at I_L = 0 A	–0.7 to 0.7 V
Programmable Device Test Time-out	Minimum	5.0 µs
	Maximum	429 s
Programming Resolution		100 ns
DC Output Resistance (at 500 mA)		1.15 to 2.0 Ω
Driver High-Impedance State Capacitance		125 pF (typical)
Disconnected Capacitance		12 to 23 pF (typical)

Bi-directional Capacitance	160 pF (typical)

1. Frequency and cycle time depend on HybridPlus-DD Card options 6, 12, or 20.
2. Add ±1 ns for periods over 100 ns.
3. Driver overvoltage trip points: 7.0 V and -5.5V.

AccessPlus Card

Parameter	High-Frequency Ports	General-Purpose Instrument Ports		General-Purpose Relays
		Coax Mode	Differential Mode	
Number of Ports	8	10 multiplexed to 28 pairs		24
Bandwidth: 3 dB point	100 MHz	25 MHz	45 MHz	
6 dB point	176 MHz	50 MHz	100 MHz	
Crosstalk: < 1 MHz	–80 dB	–45 dB	–65 dB	
Maximum Signal Voltage to Earth	100 V peak	100 V peak	200 V peak	100 V peak
Maximum Carrying/Switching Current	0.5 A	0.5 A	0.5 A	
Maximum Power	7.5 VA	7.5 VA	40 VA	30 VA
Maximum Standoff Voltage to Earth	200 V peak	200 V peak	200 V peak	200 V peak
Maximum Power			82 dB	

Utility Card

External Device

Parameter	Specification
Physical Dimensions	75 x 152.55 mm (2.953” x 6.006”) (Nominal thickness of PCB = 0.062")
Component Placement	Both sides allowed; not exceeding 3 mm on the top side and 10 mm on the bottom side
Physical Interface	Samtec 30 position 1.27 mm Tiger Eye Header board-to-board connector with a stacking height of 6.35 mm (02 x 30 position connector used).
Inputs	1 USB port (via the 30 pin connector) 1 Ethernet port
Outputs	18 pins with disconnect relays to MINT pins (with 4 pins capable of up to 2 A each)
Power supply	5 V @ 500 mA (maximum), or 12 V @ 2 A (maximum), or externally routed (maximum of 12 V @ 2 A)
Communication	Via USB 2.0 to the host PC/workstation or Ethernet communication via a class 2 switch controller

Balanced Multiplexing Port

Parameter	Specification
Number of Port	2 x 1:4 mux
Bandwidth	3 dB bandwidth (at 35 MHz ± 3 MHz)
Crosstalk	< 1 MHz (–55 dB ± 2 dB)
Maximum Current	2 ± 0.5 A (carrying capability)
Impedance	Balanced mux = 75 Ω per pair (estimated)

System Specification

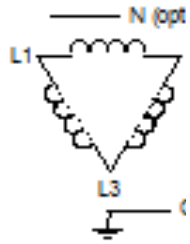
Device Under Test (DUT) Power Supplies

DUT Supply Source	Output Ratings
N6751A Modular Power Supply	0-50 V, 0-5 A, 50 W
N6752A Modular Power Supply	0-50 V, 0-10 A, 100 W
N6773A Modular Power Supply	0-20 V, 0-15 A, 300 W
N6746B Modular Power Supply	0-100 V, 0-1 A, 100 W
N5747 Power Supply	0 to 50 V, 0 to 10 A, 500W

Input Voltage and Current

Power Option Matrix

Power Option	Voltage line-to-neutral	Full-Load Amps (FLA) for:		
		4-Module	2-Module	1-Module
3PD	200	24	18	13
	220	24	18	13
	230	24	18	13
	240	24	18	13
3PY	208	24	18	13
	220	24	18	13
3PN	220/380	16	10	9
	230/400	16	10	9
	240/415	16	10	9



Three-Phase Delta* Three-Phase Wye* Three-Phase Wye with Neutral

* Neutral is not used by the systems for power options 3PD and 3PY. Neutral is shown in the diagrams because it is cabled into the PDU.

Environmental Requirements

	Operating Temperature	Operating Humidity	Storage Temperature
Testhead	0°C to 40°C (32°F to 104°F)	5 to 80 % non-condensing	–40°C to 70°C (–40°F to 158°F)
Controller	5°C to 45°C (41°F to 113°F)	20 to 80 % non-condensing	–40°C to 65°C (–40°F to 149°F)

* Testhead over-temperature shutdown is typically at 55°C. Auto-adjust will occur automatically for ±5°C changes in temperature.

Dimensions and Weights

Four-Module System (E9903G)	Width	Depth	Height	Weight
Testhead	1490 mm (58.66 in)	935 mm (36.81 in)	887 mm (34.92 in)	523 kg (1153 lb)
Packaged for shipment	2134 mm (84.02 in)	1219 mm (47.99 in)	1377 mm (54.21 in)	776 kg (1710 lb)

Two-Module System (E9902G)				
Testhead	1490 mm (58.66 in)	935 mm (36.81 in)	887 mm (34.92 in)	425 kg (937 lb)
Packaged for shipment	2134 mm (84.02 in)	1219 mm (47.99 in)	1377 mm (54.21 in)	678 kg (1495 lb)
Two-Module System (E9905G)				
Testhead	954 mm (37.56 in)	935 mm (36.81 in)	887 mm (34.92 in)	386 kg (851 lb)
Packaged for shipment	1555 mm (61.22 in)	1219 mm (47.99 in)	1377 mm (54.21 in)	561 kg (1237 lb)

Vacuum and Compressed Air

DUT Supply Source	Output Ratings
Number of Vacuum Ports/Module	2 ports for 1- and 2-module systems 4 ports for 4-module systems
Vacuum Connector Diameter	2.54 cm (1 in) male
Compressed Air Connector	Parker 20 or 30 series 0.25 inch coupler
Vacuum Value Control Voltage	24 VDC at 1 A maximum
Minimum Free Air Displacement (Vacuum)	68 m^3/hr (40 SCFM)
Minimum Compressed Air Pressure	4.9 kg/cm^2 (70 psi) non-lubricated
Maximum Compressed Air Pressure	10.6 kg/cm^2 (150 psi) non-lubricated

Fixture Specification

Fixture Kit	Maximum PC Board Size	Maximum Probable Area	Approximate Storage Dimensions L x W x H	Kit Weight
Long Wire Fixture				
Standard	450 x 396 mm 17.7 x 15.6 in	389 x 364 mm 15.3 x 14.3 in	457 x 401 x 147 mm 18.0 x 18.5 x 5.8 in	10.5 kg 23.1 lb
Large	450 x 757 mm 17.7 x 29.8 in	389 x 726 mm 15.3 x 28.6 in	457 x 775 x 147 mm 18.0 x 30.5 x 5.8 in	19 kg 41.8 lb
Short Wire Fixture				
Standard	450 x 396 mm 17.7 x 15.6 in	414 x 374 mm 16.3 x 14.7 in	457 x 452 x 83 mm 18.0 x 17.8 x 3.25 in	10.7 kg 23.5 lb
Large	450 x 757 mm 17.7 x 29.8 in	414 x 735 mm 16.3 x 28.9 in	457 x 813 x 83 mm 18.0 x 32.0 x 3.25 in	18.6 kg 41.0 lb

Conclusion

All i3070 In-Circuit Test systems are designed based on common hardware and software platform, enabling maximum compatibility an offers best-in-class performance in transportability, stability and repeatability.

For more information, please refer to www.keysight.com/find/ICT

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