EVAJIG

Turnkey PCBA testing & provisioning

EVAjig 1.0 Specifications

by

EVABITS

Revision history

DATE	DOCUMENT VERSION	CHANGES
4-10-2023	1.0	Initial document

Contact information

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EVAjig key specifications

The EVAjig programs and tests PCBAs using a bed of nails, targeted at cost efficiency of short production runs. Such PCBAs may otherwise be produced without testing or tested with client-supplied testers. The EVAjig provides a single platform, interface and backend which significantly reduces development time (for the end client), training and handling time (for the assembler), while providing state-of-the-art traceability. The low-cost, PCBA-specific cassettes have short production lead times and are interchangeable and can be replaced quickly and easily.

Key features

- Testbed for (functional) PCBA testing, programming and provisioning
- Generic platform enables a large number of test out of the box
- Extensions possible for PCBA-specific test functionality
- Up to 12 DUTs per panel tested in parallel
- Cassettes are interchangeable and can be replaced in a matter of seconds; no tools required
- Cloud backend ensures full traceability of products, tests and test reports
- Short lead time and low-cost cassettes make this platform particularly suitable for short production runs
- Dispense with issues associated with testers built by clients, such as: training time, downtime by malfunctioning, maintenance and storage

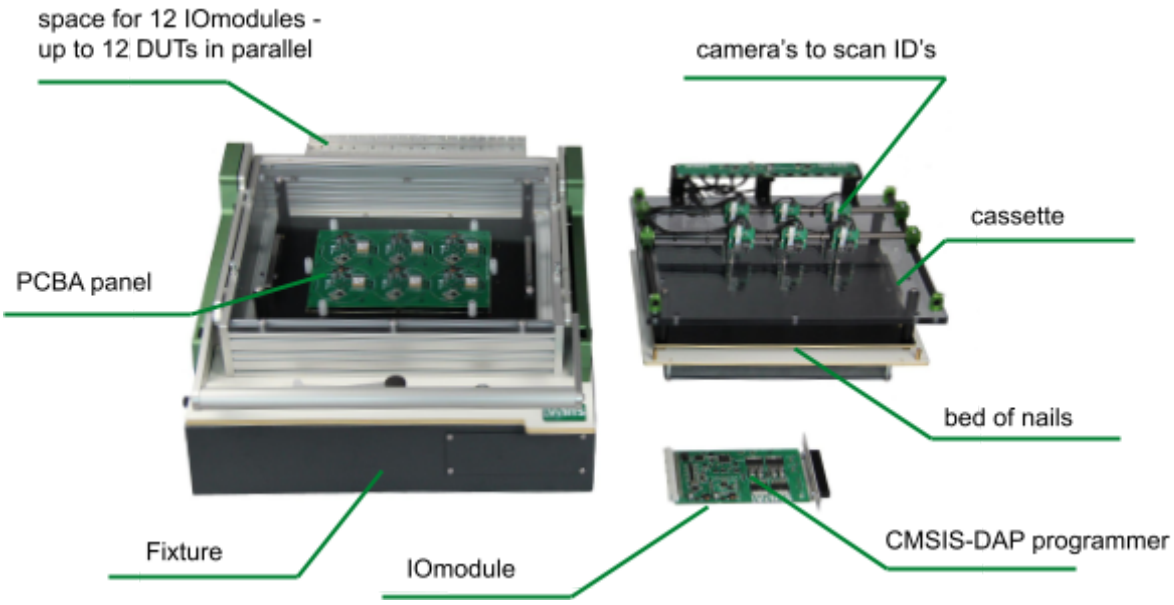
Benefits for the Client

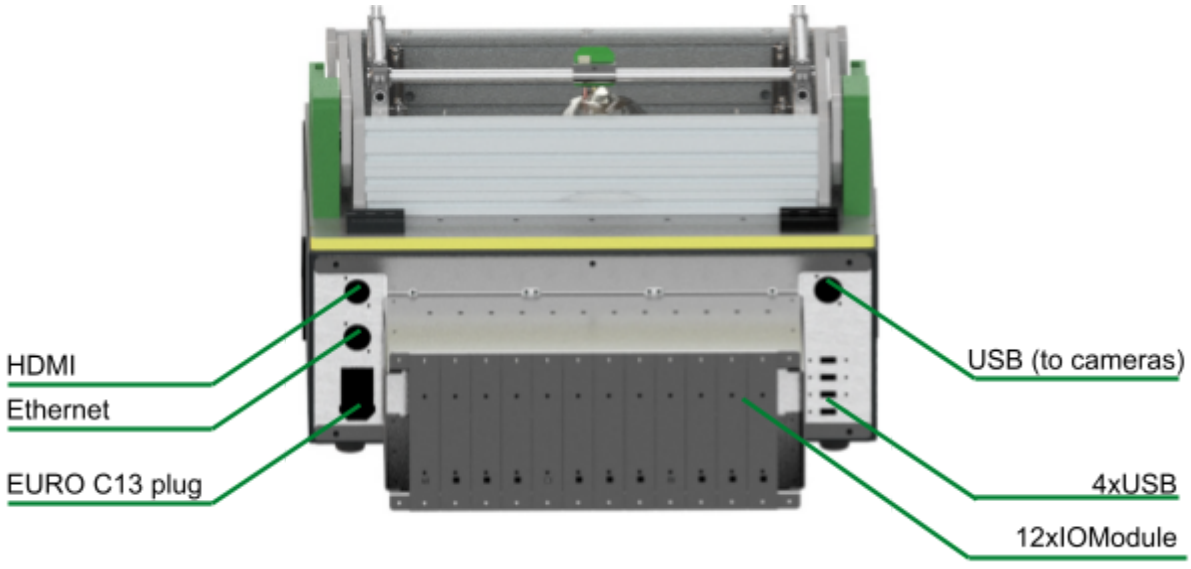
- Professional testing at low cost, thus effective for small series
- Less resources spent on production, so more can be spent on development
- Short lead times
- Many test capabilities provided out of the box
- Full traceability of products
- Hardware and software extensions can be made to integrate specific tests

Benefits for the Assembler

- Single platform for many PCBAs
    - Less time spent on training staff
    - Integration into company software
    - Less storage space
- Increase customer value
- Support by EVAbits
    - Updates and upgrades

System overview





Functional specifications

Fixture

- 12x IO module
- EURO C13 power plug
- 4x USB-A
- 1x USB-C (dedicated for use with camera module)
- 1x HDMI
- 1x RJ45 / Ethernet
- Size (WxDxH): 470 x 680 x 330 [mm]
- Cassettes:
    - Generic PCB edge connector interface with 3x300 pins
    - Insertion lever
    - Protection against closing top when cassette is not inserted properly
- Operation:
    - Requires external screen, keyboard and mouse
    - Dedicated operator interface
    - Remote updates

Cassette

- DUT-specific placement of pogo pins, push fingers and cameras
- Generic PCB edge interface with 3x300 pins
- Recognition of cassette and test definition on insertion
- Maximum DUT size (WxD):
    - area with testpads: 290x200 [mm]
    - physical size: 300x220 [mm]
- Camera module:
    - Automated scanning of QR code or barcode stickers
    - Supports many formats
    - USB interface to fixture

IO module

- Power & Voltage:
  - 4x 12-bit adjustable voltage source between +/- 24V
  - software settable maximum current setting 0 to 4A
  - Power sources are shared with Analog Out (AO)
- Programming:
  - CMSIS-DAP adapter with SWD/JTAG, supporting ARM-based and popular RISC-V-based processors, DSPs and FPGAs
- Protocols:
  - I2C, SPI, UART, RS232, RS485, Ethernet
- Connectivity
  - Bluetooth, WIFI, LoRa
- Analog:
  - 18x DIO
    - at 1.8, 3.3 or 5V, settable by a reference voltage pin
  - 8x AI between +/-24V
  - 4x AO between +/- 24V shared with power sources

Backend

- Portal for Electronics Manufacturing Service companies (EMSs)
  - Upload board/panel gerber files
  - Production run statistics
  - Access reports
- Portal for end clients
  - Upload gerbers
  - Upload binary or hex files
  - Create test definitions
  - Create work descriptions (operator views)
  - Access reports
- API
  - Direct access to data
- Full traceability
  - Long-term storage of test definitions, binaries and reports

Operator Interface

- Adapts to cassette on insertion
- Detailed work instructions
- Various user levels
- Minimizes handling / clicking
- Export results by
  - network / USB printer
  - JSON, CSV, PDF
  - cloud database API

Electrical specifications

EVAjig:

ITEM	VALUE	DESCRIPTION
power	240V, 1A (slow fuse)	EURO C13 cable
connectivity	1x HDMI 4x USB 1x Ethernet	Ethernet is required to access EVAjig backend
wireless	WIFI, BT(5.1)	Wireless is used for PCBA tests only

IO module:

ITEM	VALUE	DESCRIPTION
power	+/-24V, 6A	
connectivity	1x USB-C 1x 96-pin (DIN 4162) 1x aux programming port	internal internal internal
4x PWR or Analog Out	voltage set -24V to 24V current limit 0 to 8A 12 bit	
1x 3.3V	1.0A fused	
1x 5.0V	1.0A fused	
1x JTAG (SWD)		
1x ETH	10/100Mbit	prolonged throughput is limited to 10Mbit
2x RS485		
1x RS232		
2x SERCOM	U(S)ART, or SPI, or I2C	4 signals per SERCOM
18x Digital in/out	static, PWM, FREQ	voltage level defined by Vref

1x Vref	1.2 to 5.0V	reference voltage for DIO
8x Analog in	-24V to 24V, 24bit, 100 ksps	

Mechanical specifications

EVAjig:

ITEM	VALUE	DESCRIPTION
dimensions (w/o cassette)	466x680x290	WxDxH, when closed
dimensions (w/ cassette, w/ camera module)	466x680x330	WxDxH, when closed

All dimensions in mm. A separate (touch)screen required for operation is not included.

Cassette:

ITEM	VALUE	DESCRIPTION
dimensions (w/o camera module)	373x330x127	WxDxH, when stored
dimensions (w/ camera module)	373x330x197	WxDxH, when stored

All dimensions in mm.

DUT and panel design guidelines

General information

	min	max	note
DUTs per panel	1	12	
Test pad diameter	1.50	-	
Test pad spacing	3.00	-	center to center
Panel size*	-	290x200	(WxD) area with testpads
	-	300x220	(WxD) max physical size
Alignment hole diameter	3.00	3.20	place 2 along panel edge diagonally opposite each other

*Units are in mm unless noted otherwise. * Maximum panel sizes consider the standard sized fixture, contact EVAbits for PCBAs that require larger test areas.*

The IO modules typically test a single DUT in a panel. For more complex DUTs that require more testpoints than a single IO module can offer, there's the option to have 2 or more IO modules handle a DUT.
Standard PCBs are assumed to be 1.6mm thick.

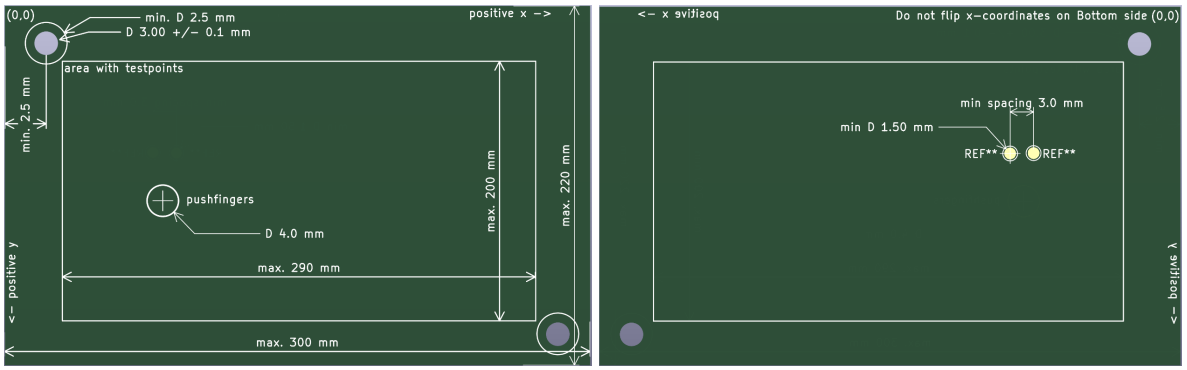
DUT Identification

QR code	5.0x5.0 mm - 1024px		black on white stickers
Data Matrix	5.0x5.0 mm - 256 px		black on white stickers
Barcodes			T.B.D.

For all scanning methods a maximum encoded data length of 255 bytes must be observed. The identification (sticker) is assumed to be on the PCB surface.

Hardware design recommendations

- Place all test pads on the bottom layer
- If there is not enough space for test pads, the panel frame can be used
- Distribute the test points over the PCB area to reduce mechanical stress exerted by pogo pins
- Inline test pads are preferred over endpoint pads (to prevent antenna effects)
    - If that is not possible, make sure the trace length to the endpoint pad is as short as possible
- The pushfingers pressing the PCBA onto the pogo pins benefit from:
    - placement above a component-free area on the top side
    - placement close to (a cluster of) test pads
    - please consider an area of ~4.0mm diameter or larger
- Place two alignment holes near the panel edge for precise alignment.
    - Two diagonally opposite corners, top-left and bottom-right, are recommended
- Components on the bottom side that are higher than 3.0mm require an additional cutout in the cassette
- Please contact EVAbits when components on the bottom side are higher than 8.0mm



Software and Test design recommendations

- Put concise information on any of the communication ports, indicating:
    - success within a specified time
    - failure and no response is same as the absence of success within a certain time
- Check every functionality individually and report back on each one to enable better fault-finding
- A single variable per line can be read and used in testing (UART) communication
    - make sure such a line can be uniquely found, for example:
        - “<unique identifier>: 3.33V\r\n”
- Consider the option to provide separate firmwares for production self-test and provisioning