



# Java on a Chip



## Technical Specification

JoC Module

Javaino - JoC Reference Board

Version 1.5

Document Date: August 6, 2019

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## General Description

The Javaino – JoC Reference Board provides a comfortable way to configure and program the JoC hardware without dealing with difficult and complex low level functions. All that is needed is a computer running the JoC Manager and a USB connection to start with the development. No additional power supply is required to run a Java binary. An additional power supply must be used if the total current of the JoC or the Javaino exceeds 500mA. The JoC Module provides the functionality of the on board microcontroller via an easy to use Java API.

## JoC Module

This JoC module is as compact as possible for easy integration in small housing.

## Features

Item	JoC Module
Package Size	24 x 36 mm
Integration	SMD or THT 2mm pitch
USB	Device / Full Speed
2 x RS232 (TTL)	up to 460,800 Baud
I <sup>2</sup> C	Master or Slave / up to 400 kHz <sup>2)</sup>
SPI	Master or Slave / up to 7 MHz
Keyboard	matrix scanning for up to 128 keys <sup>1)</sup>
Rotary Encoder	Yes
Outputs	up to 32 <sup>1)</sup>
Inputs	up to 32 <sup>1)</sup>
ADC	12-bit / up to 4 <sup>1)</sup>
DAC	single 10-bit
PWM	up to 6 <sup>1)</sup>
Real-Time Clock (RTC)	Yes
Flash Memory for Java Binary	~400kByte
RAM for Java Heap	~32kByte
JoC-Controller	operating at 100 MHz

Notes:

- <sup>1)</sup> Fully customizable assignments of inputs, outputs, ADCs, PWMs and keyboard columns.  
<sup>2)</sup> Two external 3.3 k $\Omega$  pull up resistors connected to V<sub>O,3.3</sub> are required for I<sup>2</sup>C.  
 These resistors must be connected between SCL and V<sub>O,3.3</sub> and SDL and V<sub>O,3.3</sub>

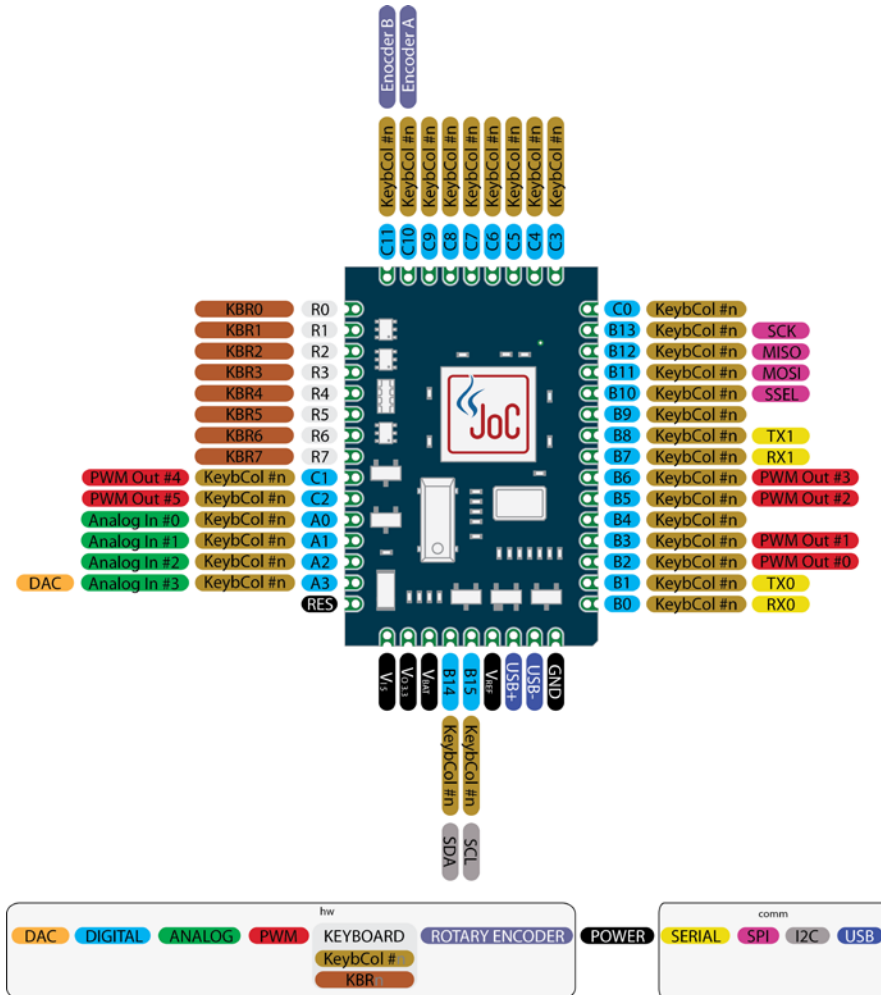
## Electrical and Thermal Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit
Supply Voltage JoC V2	V <sub>I,5</sub>	4.1	5.0	5.1	V
Supply Voltage JoC V3	V <sub>I,5</sub>	3.5	5.0	5.5	V
Output Voltage	V <sub>O,3.3</sub>	2.7	3.3	3.6	V
Input Voltage H Level <sup>1)2)</sup>	V <sub>IH</sub>	2.4	-	3.3	V
Input Voltage L Level <sup>1)</sup>	V <sub>IL</sub>	0.0	-	0.8	V
Input Voltage for RTC	V <sub>Bat</sub>	0.0	3.0	4.6	V
ADC Positive Reference Voltage	V <sub>Ref</sub>		3.3	4.6	V
DAC Output Voltage <sup>4)</sup>	A3	0.0	-	3.3	V
DAC Output Current	A3	-	-	0.7	$\mu$ A
Output Current for digital outputs	I <sub>O,DO</sub>			3.5	mA
V <sub>BAT</sub> Current	I <sub>BAT</sub>		1.44		$\mu$ A
Current consumption @ V <sub>I,5</sub> = 5V <sup>3)</sup>	I <sub>5V</sub>		62		mA
Operating Temperature	T <sub>OP</sub>	-40.0	-	85.0	$^{\circ}$ C

Notes:

- 1) For digital inputs only
- 2) Digital inputs are 5 volt tolerant (except A0 – A3)
- 3) No I/O ports active
- 4) The maximum output voltage depends on the voltage of  $V_{REF}$  pin. The onboard circuit supply for  $V_{REF}$  is adjusted to the  $V_{O3.3}$  voltage. The  $V_{REF}$  voltage should never exceed 3.3V if the DAC function is used.

**Pinout**

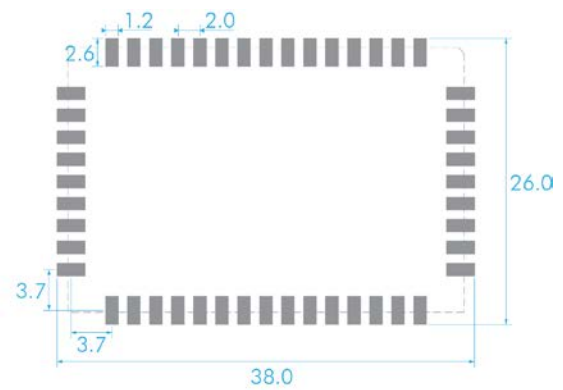
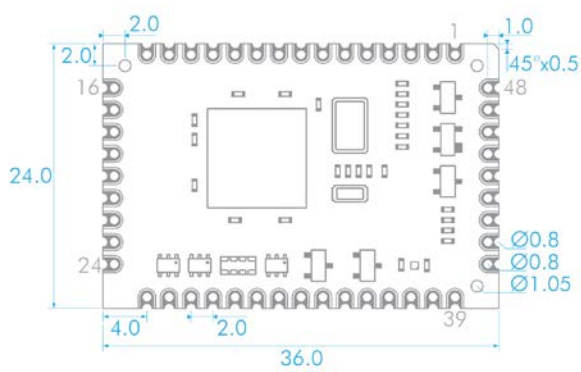


Note: B0: pull this pin to GND with an external 1k resistor on power up to erase Java Binary  
 B7: pull this pin to GND with an external 1k resistor on power up to force serial number 0  
 The 'Settings' tab within the JoC Manager is used for pin configuration  
 External pull up resistors are required for I2C conncted between SCL and V0.3 and SDA and V0.3

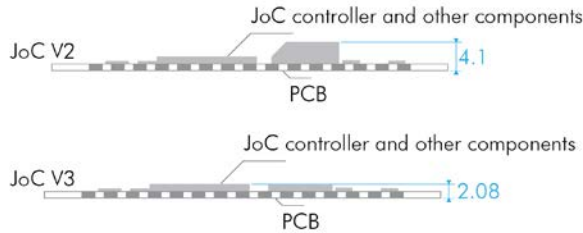
## Mechanical Specification

The following table includes the physical dimensions of the JoC hardware version. We recommend no traces or vias under the module.

Item	JoC Module	Unit
Module dimension	24.0 x 36.0	mm
Total module thickness <b>JoC V2</b>	4.1	mm
Total module thickness <b>JoC V3</b>	2.08	mm
Placement holes (close to the corner)	3 x Ø1.05	mm
2.0mm header pin through holes	48 x Ø0.8	mm
Castellated holes	48 x Ø0.8	mm



Recommended land pattern



Dimensions are in millimeters

## Javaino – JoC Reference Board

The JoC module mounted on the JoC reference board provides a development environment that can be easily connected to other peripheral devices.

### Features

Item	Javaino – JoC Reference Board
USB	Device / Full Speed
2 x RS232 (TTL)	up to 460,800 Baud
I <sup>2</sup> C	Master or Slave / up to 400 kHz <sup>2)</sup> <sup>3)</sup>
SPI	Master or Slave / up to 7 MHz
Keyboard	matrix scanning for up to 128 keys <sup>1)</sup>
Rotary encoder	Yes
Outputs	up to 32 <sup>1)</sup>
Inputs	up to 32 <sup>1)</sup>
ADC	12-bit / up to 4 <sup>1)</sup>
DAC	single 10-bit
PWM	up to 6 <sup>1)</sup>
Real-Time Clock (RTC)	Yes
Battery holder for RTC	Yes
Flash memory for Java binary	~400kByte
RAM for Java heap	~32kByte
JoC-Controller	operating at 100 MHz

Notes:

- <sup>1)</sup> Fully customizable assignments of inputs, outputs, ADCs, PWMs and keyboard columns.
- <sup>2)</sup> Two external 3.3 kΩ pull up resistors connected to V<sub>O 3.3</sub> are required for I<sup>2</sup>C.
- <sup>3)</sup> The Javaino provides the possibility to connect two resistors directly on the board trough SMT. These SMT resistors can be placed near by the R7 pin that is visible on the Javaino pinout.

### Electrical and Thermal Characteristics

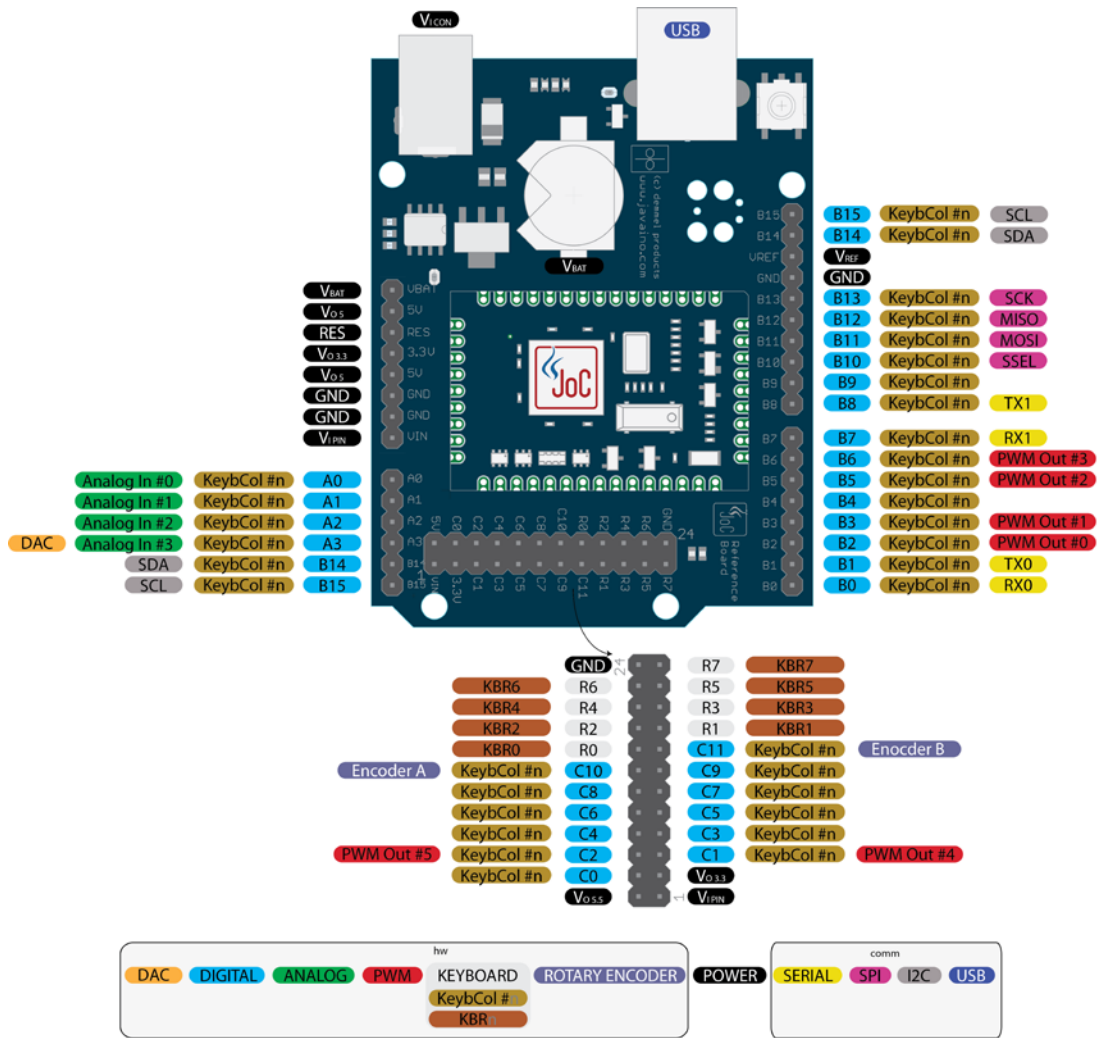
Item	Symbol	Min.	Typ.	Max.	Unit
Supply Voltage Power Connector	V <sub>I CON</sub>	7.0	-	15.0	V
Supply Voltage Pin	V <sub>I PIN</sub>	7.0	-	14.3	V
Output Voltage 5V	V <sub>O 5</sub>	4.9	5.0	5.1	V
Output Voltage 3.3V	V <sub>O 3.3</sub>	3.2	3.3	3.4	V
Input Voltage for RTC	V <sub>Bat</sub>	0.0	3.0	4.6	V
ADC Positive Reference Voltage	V <sub>Ref</sub>	-	3.3	4.6	V
DAC Output Voltage <sup>6)</sup>	A3	0.0	-	3.3	V
DAC Output Current	A3	-	-	0.7	μA
Input Voltage H Level <sup>1)</sup> <sup>2)</sup>	V <sub>IH</sub>	2.4	-	3.3	V
Input Voltage L Level <sup>1)</sup>	V <sub>IL</sub>	0.0	-	0.8	V
Output Current for Digital Outputs	I <sub>O DO</sub>			3.5	mA
V <sub>Bat</sub> Current	I <sub>Bat</sub>		1.44		μA
Current consumption @ V <sub>I CON</sub> = 9V <sup>3)</sup> <sup>4)</sup>	I <sub>in</sub>		91.0		mA
Current consumption @ V <sub>I CON</sub> = 9V <sup>3)</sup> <sup>5)</sup>	I <sub>in</sub>		78.0		mA
Current consumption @ V <sub>USB</sub> = 5V <sup>3)</sup> <sup>4)</sup>	I <sub>USB</sub>		84.0		mA
Current consumption @ V <sub>USB</sub> = 5V <sup>3)</sup> <sup>5)</sup>	I <sub>USB</sub>		76.0		mA
Operating Temperature	T <sub>OP</sub>	-40.0	-	85.0	°C

Notes:

- <sup>1)</sup> For digital inputs only
- <sup>2)</sup> Digital inputs are 5-volt tolerant (except A0 – A3)

- 3) No I/O ports active
- 4) with power and B13 LEDs mounted on Javaino
- 5) with power LED mounted on Javaino
- 6) The maximum output voltage depends on the voltage of  $V_{REF}$  pin. The onboard circuit supply for  $V_{REF}$  is adjusted to the  $V_{O3.3}$  voltage. The  $V_{REF}$  voltage should never exceed 3.3V if the DAC function is used.

### Pinout



Note: B0: pull this pin to GND with an external 1k resistor on power up to erase Java Binary  
 B7: pull this pin to GND with an external 1k resistor on power up to force serial number 0  
 The 'Settings' tab within the JoC Manager is used for pin configuration  
 According to use PC, 3.3 k pull up resistors should be connected via SMT near by R7 pin

### Mechanical Specification

The following table includes the physical dimensions of the 'Javaino V3' hardware version.

Item	Javaino – JoC Reference Board	Unit
Module Dimension	53.5 x 74.0	mm
Total Module Thickness	14.6	mm

## **General Information**

A program written and compiled with the JoC Manager is also known as Java binary. This binary is downloaded to an already connected JoC or Javaino with the 'Run' button or with 'Deploy' and starts automatically. The Java binary starts automatically after system start.

### **Erase Java Binary**

The JoC provides the possibility to erase an already downloaded Java binary. The B0 pin should be pulled to ground through 1k resistor at power up to erase the Java binary. This connection should be removed after the enumeration process of the JoC.

### **Force Serial Number 0**

A unique serial number, e.g.: JOC-DPI-00000131265-3F23, is displayed within the JoC Manager 'Java' tab if a JoC or Javaino is connected to the computer via USB. The USB driver of a Windows operating system installs itself automatically when the JoC or Javaino is connected the first time. It is possible to force this serial number to 0 to program a larger quantity without the need to reinstall the USB driver each time. The B7 pin must be pulled to ground through 1k resistor to force serial number 0 at power up. This connection should be removed after the enumeration process of the JoC.

### **Enable Pin Functions**

The JoC hardware pins should be enabled and assigned with the pin specific function within the JoC Manager 'Setting' tab. Otherwise, an exception is thrown if the required function is not enabled and assigned.

### **System Start**

A system start should be performed by connecting the RES reset pin to GND ground. This task is also accomplished with the reset button on the Javaino board next to the USB connector. Furthermore, a system start is automatically performed after power on.

### **Enumeration**

The JoC Manager starts the enumeration process automatically if a single JoC device is connected via USB. After this enumeration, the JoC is displayed as a USB device with a unique serial number.

### **Hardware Version**

The hardware version is visible on the PCB. A click on the 'Properties' button within the JoC Manager 'Java' tab opens the 'JoC Properties' window. This window displays general information about the hardware, boot loader, and firmware. The 'General' class provides another way to get specific information about the hardware. Basically, this information counts only for the JoC module and not for the Javaino. All hardware versions are listed in the following table.

Release Date	PCB Rev. Nr.	Manager Rev. Nr.	Revision Details
May 17, 2019	JoC V3	2.0	module height changed
February 22, 2019	JoC V2	2.0	Initial release
February 22, 2019	Javaino V3	-	Initial release



## **Compliance with EU Regulation**

demmel products gmbh declares compliance with the applicable RoHS directive and REACH regulation:

- Restriction of the use of certain Hazardous Substances (RoHS), directive 2011/65/EU
- Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), regulation EC No 1907/2006

We provide the declarations of conformity for each of our products upon request – please contact us.

## **Revision History**

Date	Rev. #	Revision Details
August 06, 2019	1.5	'Pinout's had wrong SPI pin assignment
May 17, 2019	1.4	JoC V3 added to 'JoC Module – Mechanical Specification' and 'JoC Module – Electrical and Thermal Characteristics'
April 13, 2019	1.3	DAC added; I <sup>2</sup> C pull up documented
April 03, 2019	1.2	Changes to the 'JoC Module – Mechanical Specification'
March 25, 2019	1.1	Additional 'General Information' added to this document
February 22, 2019	1.0	Initial release

If you find any errors in this document, please contact demmel products at [info@joc.systems](mailto:info@joc.systems)