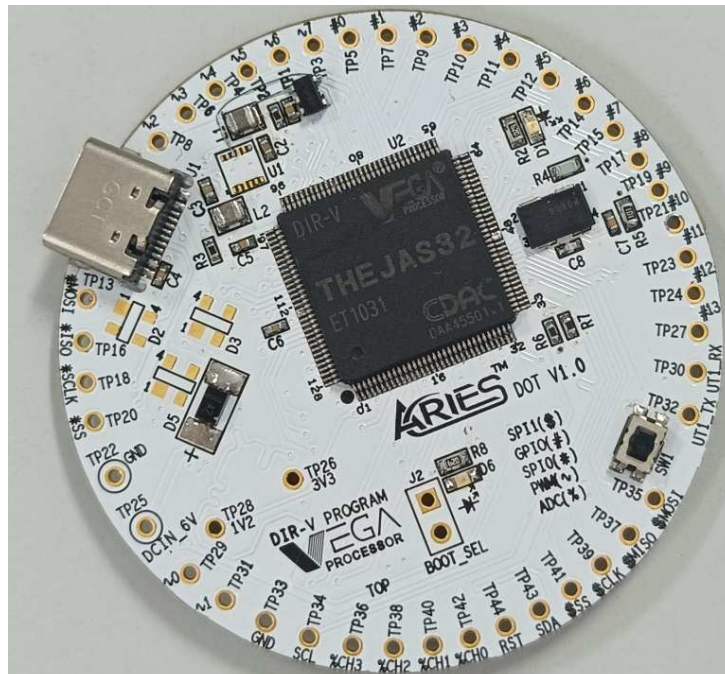


## Product Reference Manual



### Description

The ARIES DOT v1.0 is a circular development platform based on indigenously developed THEJAS32 SoC and a “Made in India” product to get started with basic microprocessor programming and embedded systems. This board is built upon a RISC-V ISA compliant VEGA Processor with easy-to-use hardware and software. The VEGA SDK also provides full ecosystem with numerous examples and support documentation. This board is designed and developed by Centre for Development of Advanced Computing (C-DAC) as part of the Digital India RISC-V (DIR-V) Program, by the Ministry of Electronics and Information Technology, Government of India.

### Target areas/Applications

Gesture controlled devices, Health monitoring devices, Low power IoT, Sensor fusion, Smart Meter, System supervisors, Remote sensors, Wearable devices, Toy and electronic education equipment, Legacy 8/16-bit applications, Industrial networking and many more...

## Features

### Controller

**THEJAS32 SoC** with **VEGA ET1031** Microprocessor

### Memory

2MB Flash

256KB SRAM

### Peripherals

- PWM Pins : 8 nos
- Analog Input Pins : 4 nos
- SPI : 2 nos
- UART : 2 nos
- I2C : 1 nos
- GPIOs : 15 nos (14xGPIO, 1x LED)

### Clock Speed

Clock Speed : 100MHz

### Power

- Input Voltage : 5 V DC
- DC Current per I/O Pin : 12 mA
- IO Voltage : 3.3 V

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## 1. The Board

ARIES DOT v1.0 is a development platform based on THEJAS32 ASIC which operates at a frequency of 100MHz. THEJAS32 SoC includes VEGA ET1031 Microprocessor, 256KB internal SRAM, Three UARTs, Four SPIs, Three TIMERS, Eight PWMs, Three I2C interfaces, 32 GPIOs etc. This board contains everything needed to support standalone operation. To get started simply connect the board to a computer with a Micro-C USB Cable or a battery.

## 2. Ratings

### 2.1 Recommended Operating Conditions

Symbol	Description	Min	Max
	Conservative thermal limits for the whole board:	-0 °C (100°F)	85 °C ( 185°F)

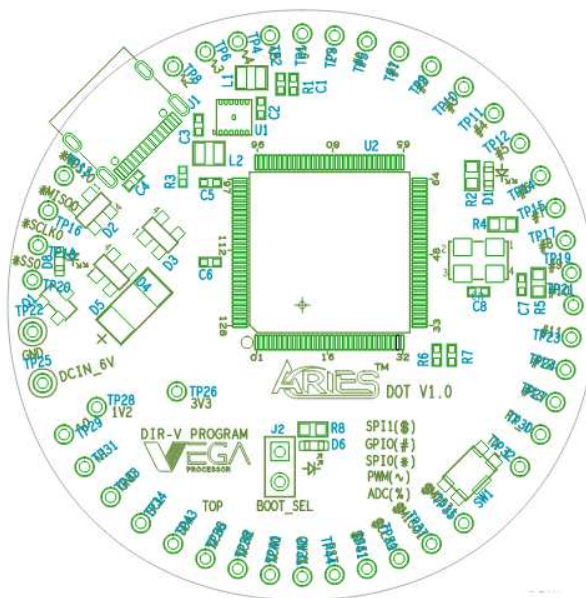
### 2.2 Power Consumption

Symbol	Description	Min	Typ	Max	Unit
VINMax	Maximum input voltage from VIN pad		-	5	V
VUSBMax	Maximum input voltage from USB connector	-	5.5	V	
PMax	DC Current per I/O Pin	-	-	12	mA

## 3. Functional Overview

### 3.1 Board Topology

Top view



Ref.	Description	Ref.	Description
J1	USB C Connector	U2	THEJAS32 SoC
J2	Boot Select Header	U1	Regulator
SW1	Reset Button	U4	100 MHz Oscillator
D1	LED	D6	Processor HeartBeat LED

### 3.2 Processor

The main controller is THEAJ32 SoC which operates at a frequency of 100MHz. It includes VEGA ET1031 Microprocessor, 256KB internal SRAM, Three UARTs, Four SPIs, Three TIMERS, Eight PWMs, Three I2C interface, 32 GPIOs. Most of its pins are connected to the external headers, however some are reserved for internal communication.

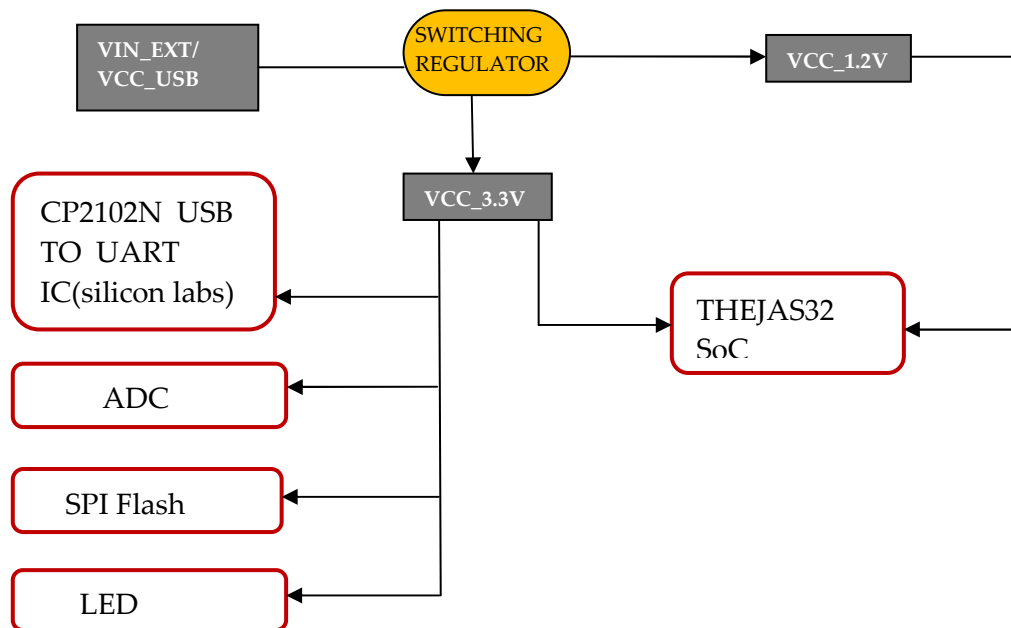
### 3.3 THEJAS32 pinout

Pin #	Pin Name	Pin Description
1	GPIO1(3)	General purpose IO.
2	GPIO1(2)	General purpose IO.
3	PVSSIOC23	Ground reference for IO pins.
4	PVDDIO23	Positive supply for IO pins. Connect to 3.3V supply.
5	GPIO1(1)	General purpose IO.
6	GPIO1(0)	General purpose IO.
7	SPI3MOSI	SPI 3 Master Out Slave In.
8	PVDDC18	Positive supply for logic. Connect to 1.2V supply.
9	PVSSC18	Ground reference for logic.
10	SPI3MISO	SPI 3 Master In Slave Out.
11	SPI3CLK	SPI 3 Clock.
12	SPI3CSN	SPI 3 Chip Select.
13	PVSSIOC21	Ground reference for IO pins.
14	PVDDIO21	Positive supply for IO pins. Connect to 3.3V supply.
15	BOOT	Boot select.
16	PROCBT	Heart beat signal.
17	TEDTUPD	Connect to GND.
18	PVDDC17	Positive supply for logic. Connect to 1.2V supply.
19	PVSSC17	Ground reference for logic.
20	TSTCLK	Connect to GND through a 1K resistor.
21	TJTAGTDO	JTAG TDO. Left unconnected.
22	TJTAGTMS	JTAG TMS. Connect to GND through a 1K resistor.
23	TJTAGTDI	JTAG TDI. Connect to GND through a 1K resistor.
24	PVSSIOC19	Ground reference for IO pins.
25	PVDDIO19	Positive supply for IO pins. Connect to 3.3V supply.
26	PVDDC16	Positive supply for logic. Connect to 1.2V supply.
27	PVSSC16	Ground reference for logic.
28	TJTAGTCK	JTAG TCK. Connect to GND through a 1K resistor
29	TJTAGTRST	JTAG TRST. Connect to GND through a 1K resistor
30	TSTMODE	Test mode select. Connect to GND through a 1K resistor.
31	IIC2SDA	I2C 2 Serial Data.
32	IIC2SCL	I2C 2 Serial Clock.

33	IIC0SCL	I2C 0 Serial Clock.
34	IIC0SDA	I2C 0 Serial Data.
35	PVSSC14	Ground reference for logic.
36	PVDDC14	Positive supply for logic. Connect to 1.2V supply.
37	PVDDIO17	Positive supply for IO pins. Connect to 3.3V supply.
38	PVSSIOC17	Ground reference for IO pins.
39	SPI1CSN	SPI 1 Chip Select.
40	SPI1CLK	SPI 1 Clock.
41	SPI1MISO	SPI 1 Master In Slave Out.
42	SPI1MOSI	SPI 1 Master Out Slave In.
43	RSTIN	Reset.
44	CLKSYS	System Clock.
45	URT1SOUT	UART 1 Serial Out / Transmit.
46	PVDDIO15	Positive supply for IO pins. Connect to 3.3V supply.
47	PVSSIOC15	Ground reference for IO pins.
48	PVSSC12	Ground reference for logic.
49	PVDDC12	Positive supply for logic. Connect to 1.2V supply.
50	URT1SIN	UART 1 Serial In / Receive.
51	GPIO0(15)	General purpose IO.
52	GPIO0(14)	General purpose IO.
53	GPIO0(13)	General purpose IO.
54	GPIO0(12)	General purpose IO.
55	GPIO0(11)	General purpose IO.
56	PVSSC11	Ground reference for logic.
57	PVDDC11	Positive supply for logic. Connect to 1.2V supply.
58	GPIO0(10)	General purpose IO.
59	PVDDIO13	Positive supply for IO pins. Connect to 3.3V supply.
60	PVSSIOC13	Ground reference for IO pins.
61	GPIO0(9)	General purpose IO.
62	GPIO0(8)	General purpose IO.
63	GPIO0(7)	General purpose IO.
64	GPIO0(6)	General purpose IO.
65	GPIO0(5)	General purpose IO.
66	GPIO0(4)	General purpose IO.
67	PVSSC9	Ground reference for logic.
68	PVDDC9	Positive supply for logic. Connect to 1.2V supply.
69	PVDDIO11	Positive supply for IO pins. Connect to 3.3V supply.
70	PVSSIOC11	Ground reference for IO pins.
71	GPIO0(3)	General purpose IO.
72	GPIO0(2)	General purpose IO.
73	GPIO0(1)	General purpose IO.
74	GPIO0(0)	General purpose IO.
75	PWM(7)	Pulse Width Modulation.
76	PWM(6)	Pulse Width Modulation.
77	PWM(5)	Pulse Width Modulation.
78	PVSSC7	Ground reference for logic.
79	PVDDC7	Positive supply for logic. Connect to 1.2V supply.
80	PWM(4)	Pulse Width Modulation.

81	PWM(3)	Pulse Width Modulation.
82	PWM(2)	Pulse Width Modulation.
83	PVDDIO8	IO Power Supply VDD pin.
84	PVSSIOC8	Ground reference for IO pins.
85	PWM(1)	Pulse Width Modulation.
86	PWM(0)	Pulse Width Modulation.
87	SPI0MOSI	SPI 0 Master Out Slave In.
88	PVSSC6	Ground reference for logic.
89	PVDDC6	Positive supply for logic. Connect to 1.2V supply.
90	SPI0MISO	SPI 0 Master In Slave Out.
91	SPI0CLK	SPI 0 Clock.
92	SPI0CSN	SPI 0 Chip Select.
93	PVDDIO6	Positive supply for IO pins. Connect to 3.3V supply.
94	PVSSIOC6	Ground reference for IO pins.
95	IIC1SDA	I2C 1 Serial Data.
96	IIC1SCL	I2C 1 Serial Clock.
97	SPI2MOSI	SPI 2 Master Out Slave In.
98	SPI2MISO	SPI 2 Master In Slave Out.
99	PVDDC4	Positive supply for logic. Connect to 1.2V supply.
100	PVSSC4	Ground reference for logic.
101	SPI2CLK	SPI 2 Clock.
102	SPI2CSN	SPI 2 Chip Select.
103	PVSSIOC4	Ground reference for IO pins.
104	PVDDIO4	Positive supply for IO pins. Connect to 3.3V supply.
105	URT2SIN	UART 2 Serial In / Receive.
106	URT2SOUT	UART 2 Serial Out / Transmit.
107	URT0SIN	UART 0 Serial In / Receive.
108	URT0SOUT	UART 0 Serial Out / Transmit.
109	GPIO1(15)	General purpose IO.
110	GPIO1(14)	General purpose IO.
111	GPIO1(13)	General purpose IO.
112	PVDDC2	Positive supply for logic. Connect to 1.2V supply.
113	PVSSC2	Ground reference for logic.
114	PVSSIOC2	Ground reference for IO pins.
115	PVDDIO2	Positive supply for IO pins. Connect to 3.3V supply.
116	GPIO1(12)	General purpose IO.
117	GPIO1(11)	General purpose IO.
118	GPIO1(10)	General purpose IO.
119	GPIO1(9)	General purpose IO.
120	GPIO1(8)	General purpose IO.
121	GPIO1(7)	General purpose IO.
122	GPIO1(6)	General purpose IO.
123	PVSSIOC0	Ground reference for IO pins.
124	PVDDIO0	Positive supply for IO pins. Connect to 3.3V supply.
125	PVDDC0	Positive supply for logic. Connect to 1.2V supply.
126	PVSSC0	Ground reference for logic.
127	GPIO1(5)	General purpose IO.
128	GPIO1(4)	General purpose IO.

### 3.4 Power Tree



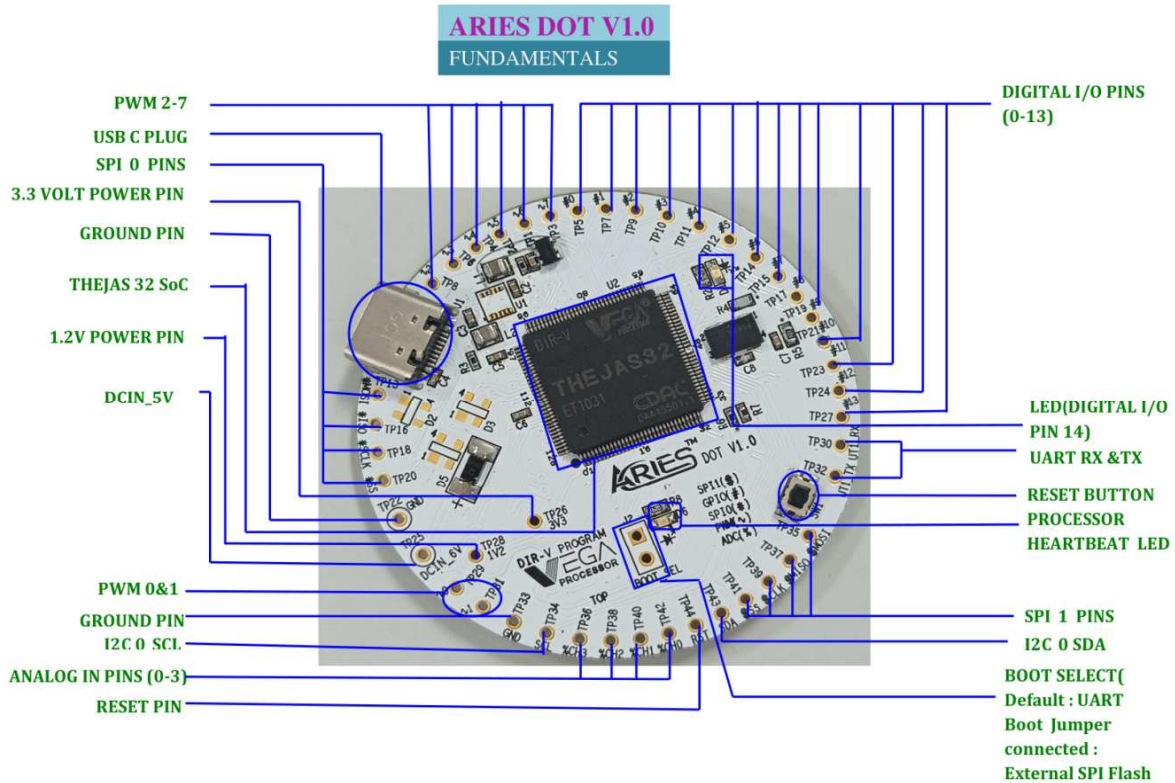
## 4. Board Operation

### 4.1 Getting Started

- To use Vega Arduino IDE for programming follow the steps given in the link below
  - For Linux; <https://bit.ly/vega-linux>
  - For Windows; <https://bit.ly/vega-windows>
- To use Eclipse IDE for programming follow the steps given in the link below
  - <https://cdac-vega.gitlab.io/sdkuserguide.html>



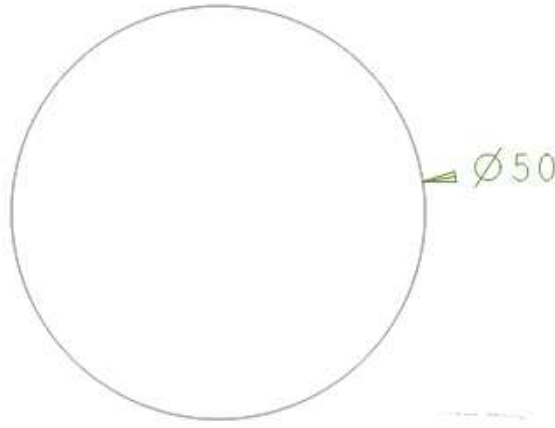
## 5. Connector pinout



SL NO.	SPECIFICATIONS	THEJAS 32	ARIES BOARD	REMARKS	
1	SPI (3)	SPIO_SS	TP_20		
2		SPIO_SCLK	TP_18		
3		SPIO_MISO	TP_16		
4		SPIO_MOSI	TP_13		
5		SPI1_SS	TP_41		
6		SPI1_SCLK	TP_39		
7		SPI1_MISO	TP_37		
8		SPI1_MOSI	TP_35		
9		SPI3_SS	U5_1		Connected to SPI BOOT FLASH IC
10		SPI3_SCLK	U5_6		
11		SPI3_MISO	U5_2		
12		SPI3_MOSI	U5_5		
13	I2C (2)	I2C0_SCL	TP_41	Connected to ADC IC	
14		I2C0_SDA	TP_34		
15		I2C2_SCL	U6_10		
16		I2C2_SDA	U6_9		

17	UART (2)	UART0_RXD	U4_17	Connected to UART TO USB INTERFACE IC
18		UART0_TXD	U4_18	
19		UART1_RX	TP_30	
20		UART1_TX	TP_32	
21	PWM (8)	PWM[0]	TP_29	
22		PWM[1]	TP_31	
23		PWM[2]	TP_8	
24		PWM[3]	TP_6	
25		PWM[4]	TP_4	
26		PWM[5]	TP_2	
27		PWM[6]	TP_1	
28		PWM[7]	TP_3	
29	GPIO (15)	GPIO0	TP_5	
30		GPIO1	TP_7	
31		GPIO2	TP_9	
32		GPIO3	TP_10	
33		GPIO4	TP_11	
34		GPIO5	TP_12	
35		GPIO6	TP_14	
36		GPIO7	TP_15	
37		GPIO8	TP_17	
38		GPIO9	TP_19	
39		GPIO10	TP_21	
40		GPIO11	TP_23	
41		GPIO12	TP_24	
42		GPIO13	TP_27	
43		GPIO14	D1_1	Connected to LED
44	CLOCK	CLK_100M	U3_3	Connected to OSCILLATOR
45	RESET		SW1	Connected to RESET
46	HEART BEAT LED	PROC_HEART_BEAT	LD6_1	Connected to LED
47	BOOT SELECT	BOOT_SEL	J2_1	Connected to HEADER J2
48	ADC_CH0	_	TP_42	
49	ADC_CH1	_	TP_40	
50	ADC_CH2	_	TP_38	
51	ADC_CH3	_	TP_36	

5.1 Board Outline & Mounting Holes



( Dimensions in mm[mil] )

6. Company Information

<b>Company name</b>	<b>C-DAC</b>
Company Address	Hardware Design Group Centre for Development of Advanced Computing (C-DAC) Thiruvananthapuram, Kerala – 695033 Fax: 0471-2723456 Email: <a href="mailto:vega@cdac.in">vega@cdac.in</a> <a href="http://www.vegaprocessors.in">www.vegaprocessors.in</a> <a href="http://www.cdac.in">www.cdac.in</a>

7. Reference Documentation

Reference	Link
ARIES DoT v1.0 details	<a href="https://vegaprocessors.in/devboards/ariesdot.html">https://vegaprocessors.in/devboards/ariesdot.html</a>