

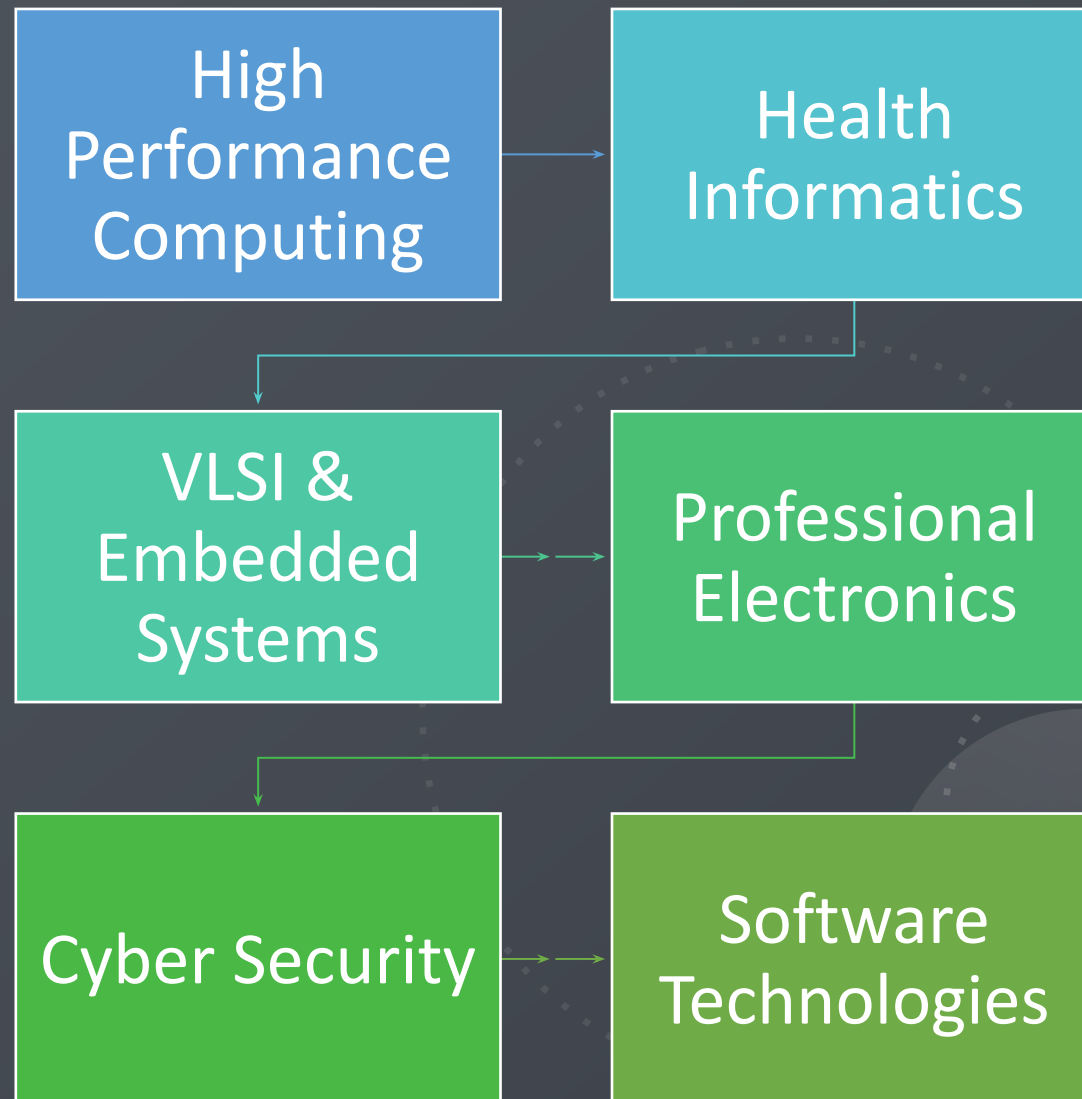
# VEGA Processors

Making India AtmaNirbhar in Swadeshi Compute  
Designs

3 -12-2021

S Krishnakumar Rao  
C-DAC

# CDAC – R&D organisation under MeitY





# Hardware Design Group – Thrust Areas

Product designs for Industrial, Consumer, Automotive and Bio-Medical Applications

Total product implementations using ASIC Technology

IP development for ASIC implementations

ASIC Consultancy Services

Design Verification Services

# Expertise

Microprocessor Design

ASIC design and FPGA implementations

Analog and Mixed Signal IC design

High speed PCB design

Embedded System development

Ergonomics, tooling and mechanical design

Precision assembly and testing

Field deployment of products and ToT

# ASTRA – IP Portfolio

EROTG1 USB On-The-Go	ERUSB2 USB Host / Device Controller	ERSDRAM SDRAM Controller	ERPCle PCI Express Endpoint
ERSATAII SATA Host Controller	ERMAC 10 / 100 /1000	ERSDHC SDHost Controller	ER15530 Manchester Encoder Decoder
ER-eMMC eMMC Controller	ER146818 Real Time Clock	ERTIMER Timer	ER16C450 UART
ERSPI SPI	ERQSPI QSPI	ERPWM PWM	ERI2C I2C
ERWDT Watchdog	ERDMA DMA Controller	ERPLIC Interrupt Controller	ERGPIO GPIO

# Background

Need for indigenous Microprocessors -  
Significant due to the accentuated use of  
electronic systems and its applications.

Microprocessor Development Programme (MDP)  
– funded by MeitY, aims to achieve self-reliance  
in Microprocessor Technology.

C-DAC -responsible for the design and  
development of a family of Microprocessors, IPs,  
SoCs and Ecosystem

# Objectives

Development of a series of Processors and reusable peripheral IP cores

Design and develop a SoC ASIC integrating the 64-bit Quad Core 2GHz RISC Processor with peripheral IPs

Making available the full Ecosystem for the processor

Resource Centre - Processors, IPs and eco-system for hardware designers/users of the Microprocessor.





# VEGA Processors



32 bit Microcontroller Class



64 bit Application Core



64 bit, 16 stage High Performance Application Core



64 bit, 16 stage High Performance Application Dual Core



64 bit, 16 stage High Performance Application Quad Core

# VEGA SoCs

Development and fabrication of SoCs integrating VEGA Processors with various System, Communication and Peripheral IPs.

The first VEGA microprocessor-based SoC chip '**THEJAS32**', a 32-bit Single core SoC taped out in SilTerra 130nm process

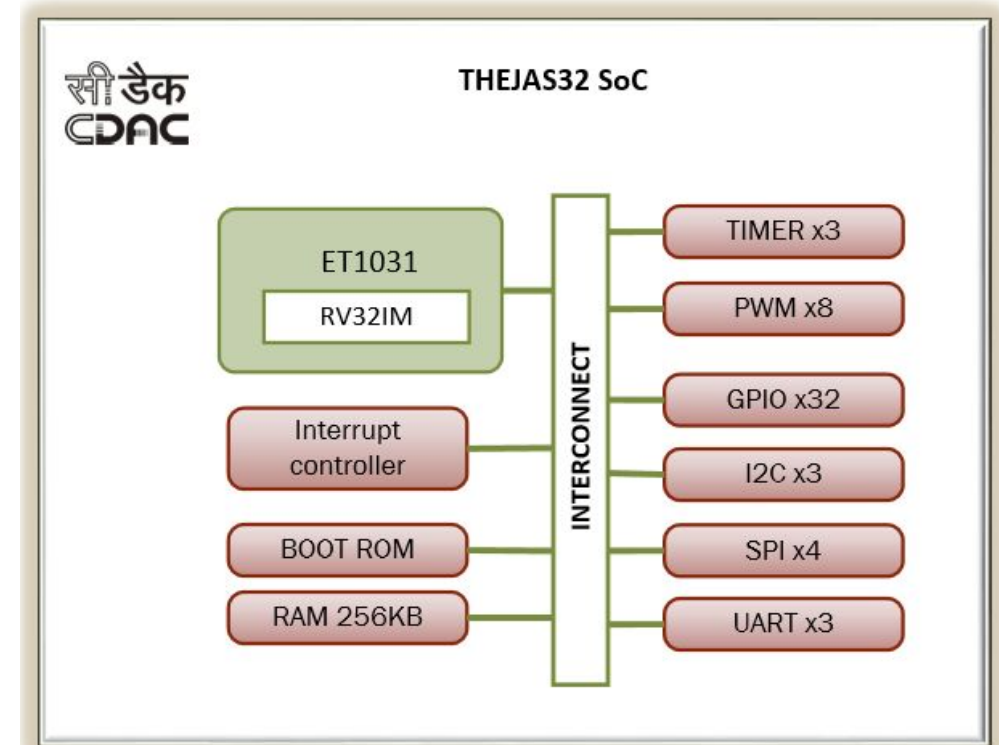
'**THEJAS64**', a 64-bit Single core SoC chip taped out in SCL 180nm process.

Design implementation of '**DHRUV64**', a 64-bit Dual core SoC is in progress. This will be followed by '**DHANUSH64**', high performance 64-bit Quad core SoC variants.

# THEJAS32 SoC ASIC

## Key features

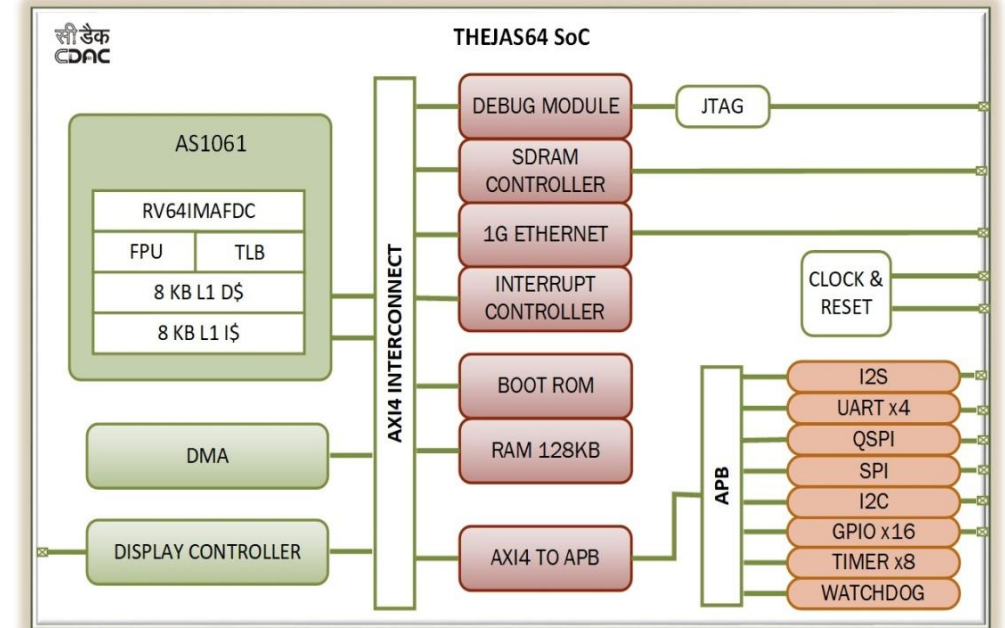
- VEGA ET1031 Processor
- 256KB internal SRAM
- UARTs
- SPIs
- TIMERS
- PWMs
- I2C interfaces
- GPIOs
- 3.3V IO
- Frequency: 100MHz



# THEJAS64 SoC ASIC

## Key features

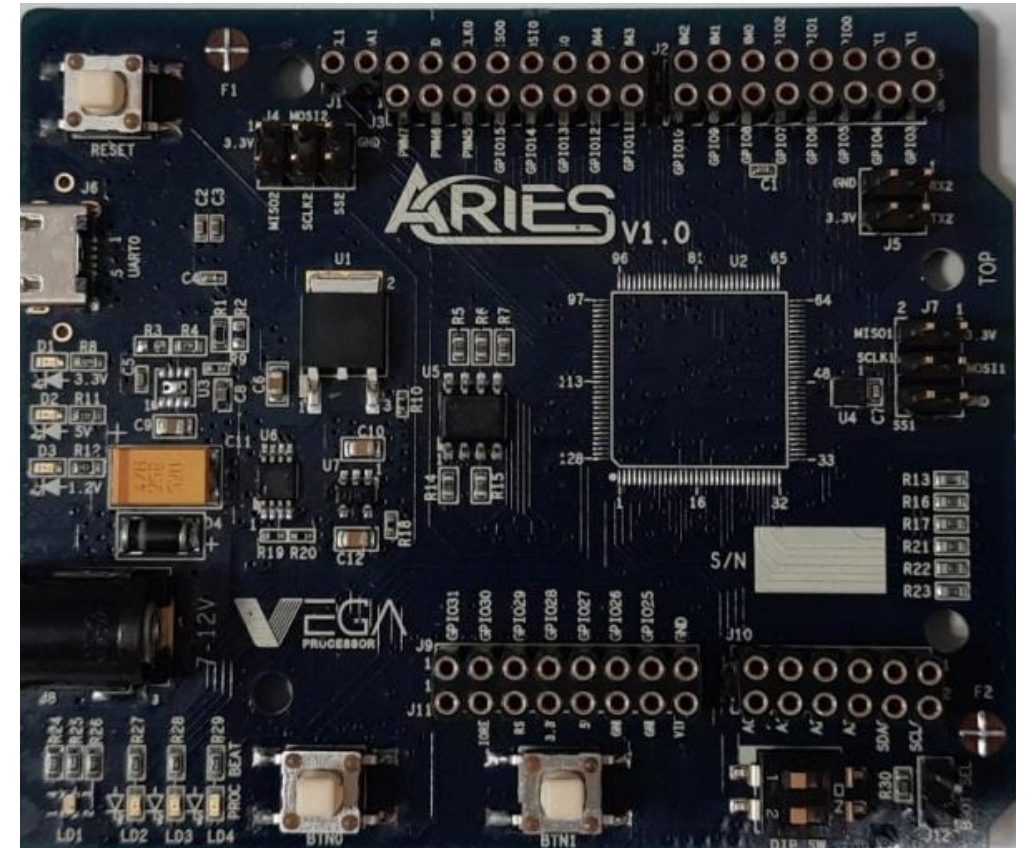
- VEGA AS1061 Processor
- 128KB internal SRAM
- 256MB SDRAM support
- 64MB Boot Flash via QSPI
- UARTs
- SPI
- TIMERS
- I2C
- GPIOs
- 3.3V IO
- Frequency : 80MHz



# ARIES Development Boards

## Key features

- Processor : VEGA ET1031
- RAM : 256KB
- Flash : 2MB
- UART : 3 nos
- SPI : 3 nos
- Timer : 3 nos
- PWM : 8 nos
- I2C : 2 nos
- ADC : 4 channel
- GPIO : 32 nos

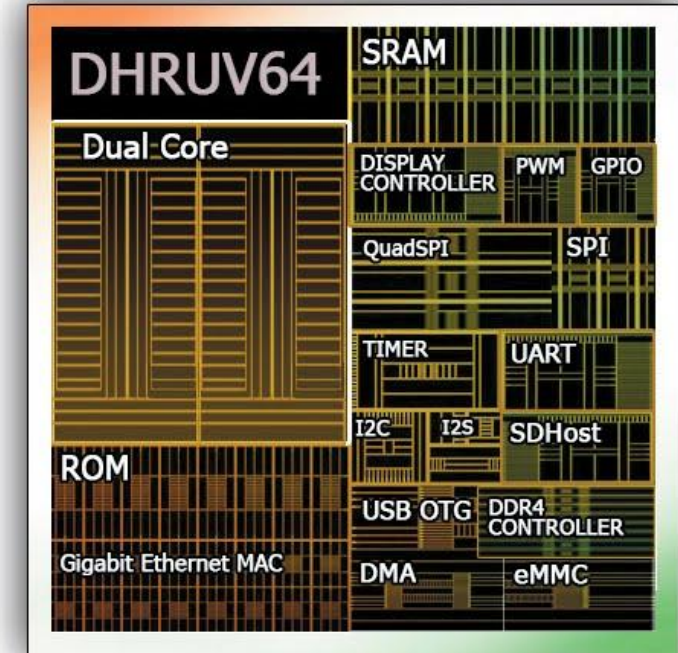




# DHRUV64 SoC

64 bit Dual Core SoC

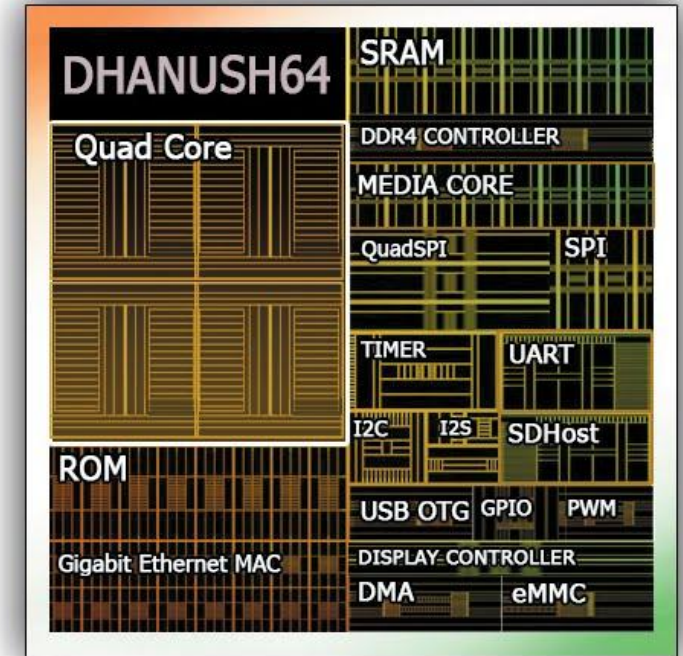
- Superscalar Out-Of-Order
- Application Core
- 1 GHz CPU Performance



# DHANUSH64 SoC

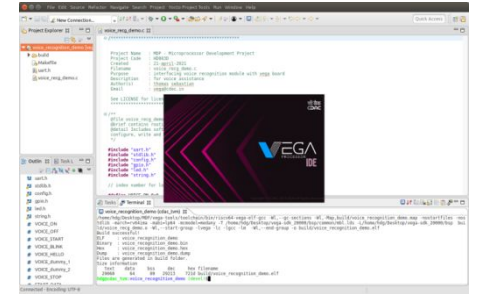
64 bit Quad Core SoC

- Superscalar Out-Of-Order
- Multimedia Core
- 2 GHz CPU Performance



# VEGA Ecosystem

- Eclipse based IDE
- Operating systems (Linux, Zephyr, FreeRTOS, Fedora, Debian)
- Linux Devices Drivers
- Board support packages
- 75+ libraries for IoT applications
- Compiler Tools
- Documentation
- Discussion forum
- Tutorial videos



# Target applications

- Internet-of-Things
- Consumer electronics
- Medical devices
- Power electronics
- Single board computers
- Industrial automation
- Intelligent transportation



- Strategic advantage - India will own the IP for high-end microprocessors
- Mission Mode project dedicated for total implementation by interaction with academic & industry



## Industry

## Private Organizations



# Key Benefits

- Silicon based deliverables, directly deployable in products
- Comprehensive hardware and software ecosystem for microprocessor based product design

# Key Benefits

- Self-reliance, with clear financial and strategic advantages
- Pave the way to Indian-designed and manufactured electronics chips and hardware - leading to success in MAKE IN INDIA initiative



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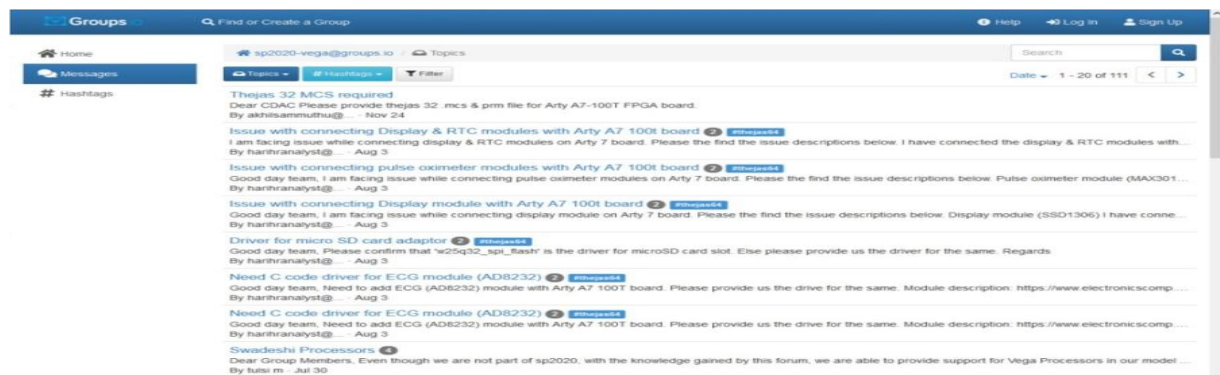
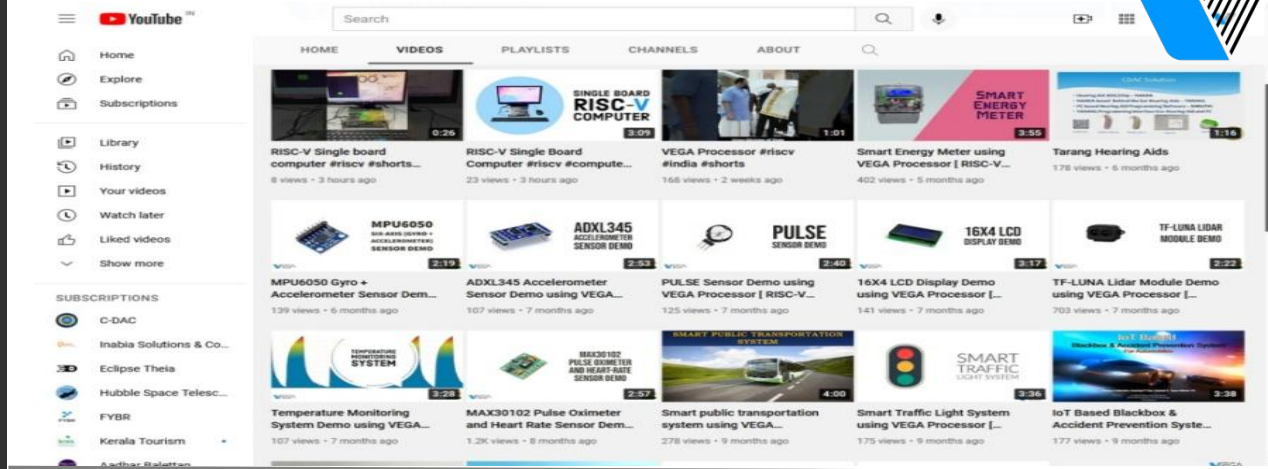
AATMANIRBHAR BHARAT.

# Swadeshi Microprocessor Challenge


- C-DAC has had the opportunity to be part of the Challenge, launched by MeitY to proliferate use of indigenous microprocessors.
- Two SoCs, THEJAS32 and THEJAS64 based on VEGA 32-bit and 64-bit processors made available for the Challenge
- The VEGA based SoCs successfully deployed in various designs by the participating teams comprising of academia and start-ups
- Actively involved in providing support for the conduct of the challenge.



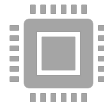
# Swadeshi Microprocessor Challenge



# Opportunity




CUSTOM SOC  
DEVELOPMENT AND  
DEPLOYMENT



CO-DEVELOPMENT OF  
ELECTRONIC  
PRODUCTS BASED ON  
VEGA PROCESSOR SOC



AFFORDABLE SILICON  
PROVEN IPS



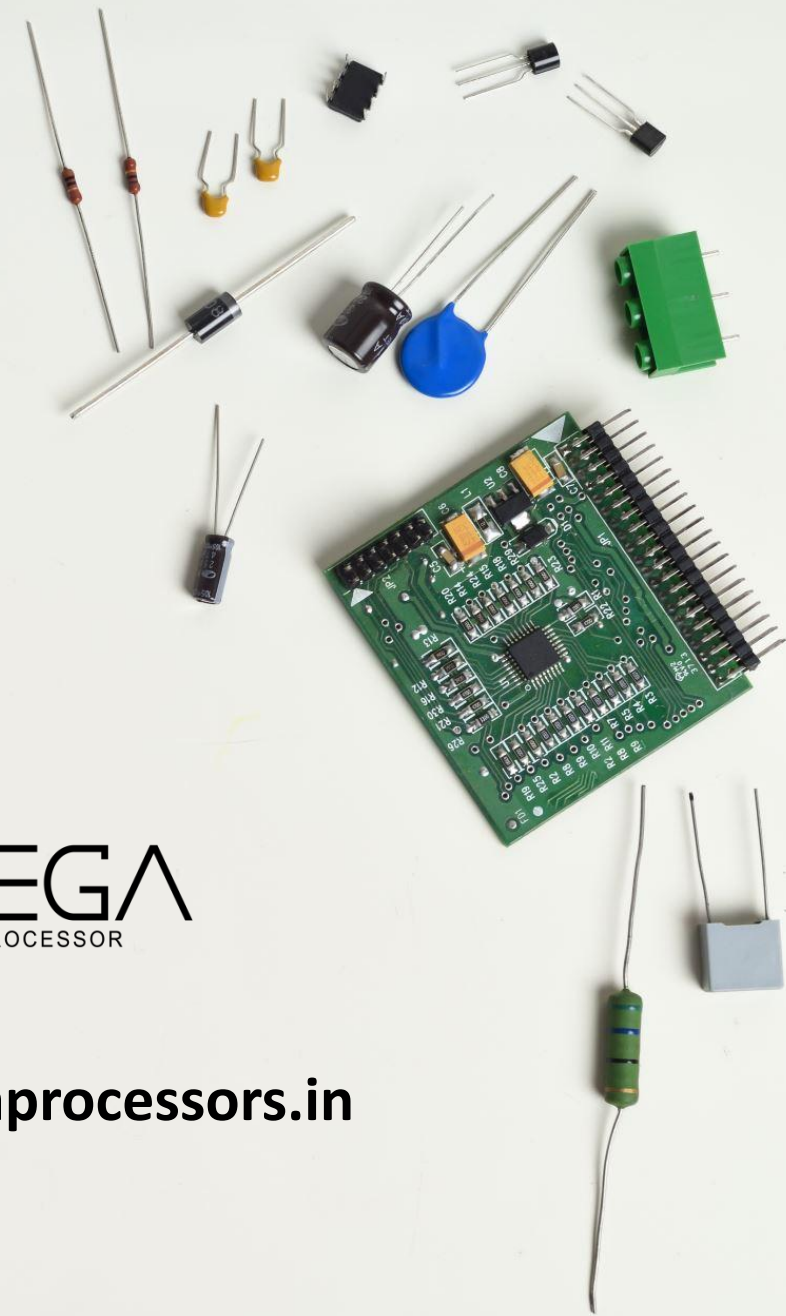
FASTER PRODUCT TO  
MARKET THROUGH  
DEDICATED SUPPORT  
AND COMPREHENSIVE  
ECOSYSTEM



# THANK YOU



[www.vegaprocessors.in](http://www.vegaprocessors.in)



# VEGA based SoCs

