DRMX_M.2 User Guide

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WARNING

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation of the device.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
—Reorient or relocate the receiving antenna.
—Increase the separation between the equipment and receiver.
—Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
—Consult the dealer or an experienced radio/TV technician for help

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1. Introduction

The Kinara DRMX_M.2 module features the Ara-1 Edge AI Processor which delivers industry-leading performance and low latency at low power levels, making them suitable for edge applications such as smart retail, smart cities, factory automation, robotics and drones.

2. Description

The DRMX_M.2 module plugs into the PCIe M.2 M-key slot available in many PC and embedded platforms, making it easy to enhance or enable AI inferencing in any system with an M.2 slot. This module features the Kinara Ara-1 processor, DDR memory for model storage and all the required hardware components. When combined with the easy-to-use SDK that allows for effort-less compilation of trained models, users can be running inference on supported models in minutes. The Ara-1 driver and application stack allows for quick software integration with supported host platform and at run time, consumes minimal host compute and memory resources.

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3. Product Features

- **Ara-1 Edge Ai Processor**
  - 800MHz clock speed
  - Polymorphic Dataflow Architecture
  - State-of-the-art model support
  - Multiple Model support
  - Multi-chip support for scalable performance
  - Latency optimized

- **AI Applications**
  - Facial Detection
  - Facial Recognition
  - Object Localization and Detection
  - Object Tracking
  - Activity Recognition
  - Semantic Segmentation
  - Pose Estimation

- **Performance**
  - Resnet50
    100 ips, 10ms latency
  - MobileNetV1
    544 ips, 1.84ms latency
  - MobileNetV1 SSD
    183 ips, 5.4ms latency

- Memory: 1GB Integrated LPDDR4
- Host Interface: PCIe Gen 3 x4
- Form Factor: M.2-2280 (M-key)

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4. Specification

The detailed specification of the DRMX_M.2 module is provided below. DRMX_M.2 is available in 2 configurations:

a) M.2 board with passive heatsink (most common)
b) M.2 board (PCBA) only

System designers may choose to provide their own thermal solution for the DRMX_M.2. Please contact Kinara for the thermal design guide to ensure sufficient cooling for the board.

Physical Features	
Dimensions	22 x 80 x 10 mm (w/heatsink) 22 x 80 x 3.8 mm (w/out heatsink)
Weight	28 g (passive heatsink) 7 g (board only)
Host Interface	
Hardware Interface	M.2 M-key 2280
High Speed Interface	PCIe Gen3 x1, x2, x4
Operating Voltage/Power	
DC Supply	3.3V +/- 5%
Thermal Design Power	6W (800MHz), 4.5W (600MHz)
Cooling	Heatsink Passive
Environmental and Reliability	
Operating Temperature	0°C – 50°C
Storage Temperature	-40°C – 85°C
Operating Humidity	5%- 90% relative humidity
Storage Humidity	5%- 95% relative humidity
Certification	CE/FCC Class B

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5. Power Consumption and Thermal Consideration

Typical 25°C

Model	Operating Freq 600MHz	Operating Freq 800MHz
ResNet50-v1	4.0W (13.9ms @ 72 ips)	5.8 W (10ms @ 100 ips)
MobileNet-v1	3.9W (2.27ms @ 439 ips)	5.7W (1.84ms @ 544 ips)

The DRMX_M.2 module has the following thermal parameters and requires airflow in the system for proper operation and prevent overheating.

Airflow	Thermal resistance θ_{JA} (°C/W)
1 m/s	5.16
2 m/s	3.71

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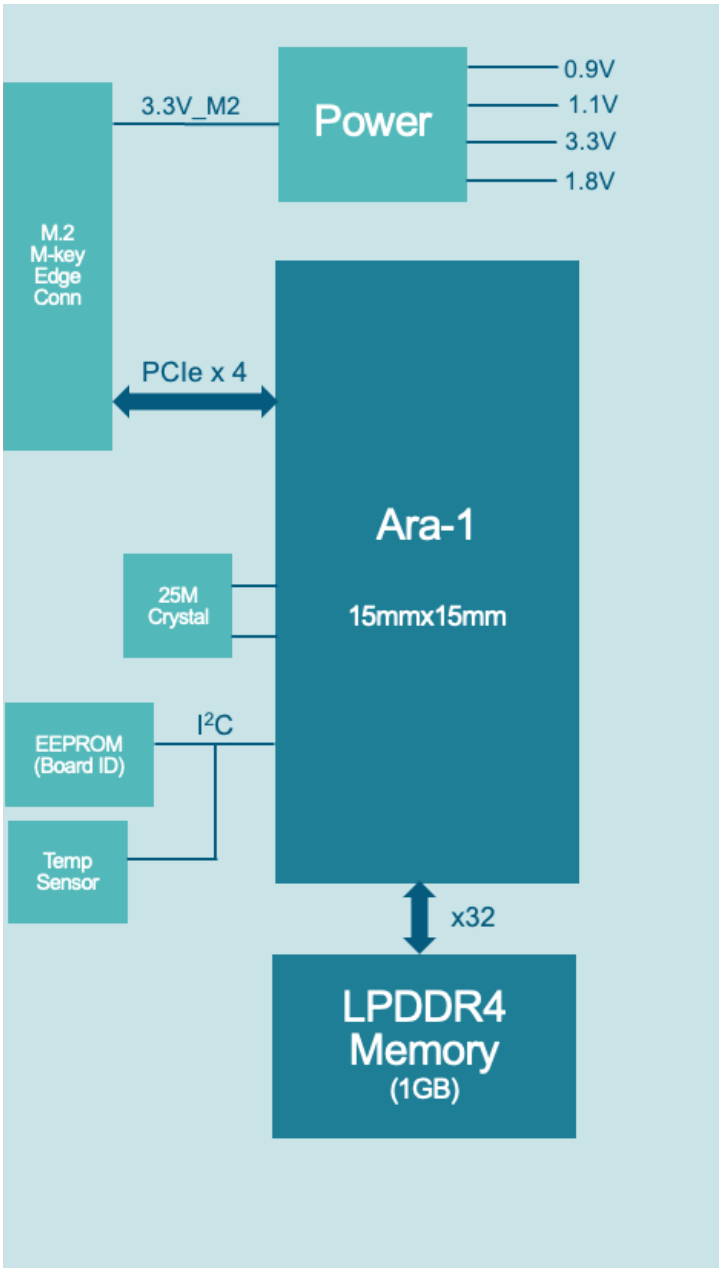
6. Block Diagram



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7. Connector Pinout

Signal		Pins	Signal
3.3V	74	73	GND
3.3V	72	71	GND
3.3V	70	69	PEDET#
NC	68	67	NC
Module Key-M	66	65	Module Key-M
Module Key-M	64	63	Module Key-M
Module Key-M	62	61	Module Key-M
Module Key-M	60	59	Module Key-M
I2C_CLK (I)(0/3.3V)	58	57	GND
I2C_DATA (I)(0/3.3V)	56	55	P_REFCLKP
PEWAKE#	54	53	P_REFCLKN
P_CLKREQN	52	51	GND
P_PERSTN	50	49	P_RXP0
NC	48	47	P_RXN0
NC	46	45	GND
NC	44	43	P_TXP0
NC	42	41	P_TXN0
NC	40	39	GND
NC	38	37	P_RXP1
NC	36	35	P_RXN1
NC	34	33	GND
NC	32	31	P_TXP1
NC	30	29	P_TXN1
NC	28	27	GND
NC	26	25	P_RXP2
NC	24	23	P_RXN2
NC	22	21	GND
NC	20	19	P_TXP2
3.3V	18	17	P_TXN2
3.3V	16	15	GND
3.3V	14	13	P_RXP3
3.3V	12	11	P_RXN3
NC	10	9	GND
NC	8	7	P_TXP3
NC	6	5	P_TXN3
3.3V	4	3	GND
3.3V	2	1	GND

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8. Application- System Requirements

The DRMX_M.2 module has been tested with several host platforms as shown below with the requirements as shown below.

Parameter	Comment
M.2 Slot	M-key
Operating Systems	CentOS 8, Ubuntu 20.04
Processor Architectures	x86_64, Arm-64
Processors (tested)	Intel, NXP, Nvidia, Qualcomm, Xilinx
RAM	>=4GB
Disk Space	>=40GB
Python	>=3.7
Shell	bash or equivalent

9. Ordering Information

Part Number	Description
M.2-M-Key	Kinara Ara-1 accelerator model.

Note 1: The M.2 PCBA have components that are rated industrial grad

10. Installation

Please refer below pic to install DRMX_M.2 module in M.2 slot of the host CPU, in this case we have used Intel NUC module

11. Setup

After power ON -

1. Execute the below command and check the number of Drax modules detected
   - Command: *lspci*
   - DRMX_M.2 Module need to be detected

The devices with 1e58:0001 is the DRMX_M.2 module

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12. Execution steps:

3.1 Run Inference Proxy:

- Command:
  sudo $DV_TGT_ROOT/dvproxy/x86_rel/dvinfproxy -f $DV_TGT_ROOT/dvproxy/x86_rel/firmware --sock /var/run/dvproxy.sock --daemon

3.2 Run nnapp_async_performance:

- Command:
  sudo $DV_TGT_ROOT/dvproxy/x86_rel/nnapp_async_perf -m <path to model.dvm file> -i <no. of iterations> -b <batch size> -e <string>

  - Example:
    sudo $DV_TGT_ROOT/dvproxy/x86_rel/nnapp_async_perf -m <path to the model.dvm file> -i 10 -b 128 -e all

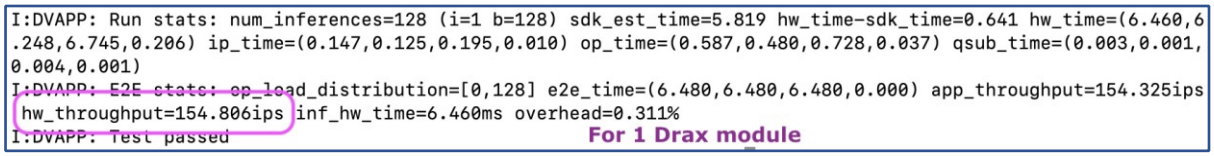
Note:

- -e <string> or --ep <string> is an endpoint string to run inference.
- Set *"-e all"*, to let all M.2 modules active

13. Results:

4.1: Performance of DRMX_M.2 module:

obtained by running performance metric nnapp_async_perf



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