

Cervoz Industrial Embedded Module

M.2 2280 NVMe

Momentum Series (MLC)

M410 Family

Product Datasheet



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Revision History

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2016.09.26	1.0	First Released



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1. Product Overview

1.1 Introduction

Cervoz Industrial M.2 2280 Embedded Module M410 family is a Solid State Flash Disk product that is in compliance with the M.2 and PCIe Gen3 x4 standards. M.2 2280 M410 family fits in any M.2 2280-D5-M sockets in a PC or motherboard; it can be used for both booting and storage purposes.

M410 family uses superior quality preselected multi-level cell (MLC) NAND flash memory from the industry leading manufacturer Toshiba. This product includes various capacities to choose from.

M410 family offers outstanding performance and reliability; the product family is a perfect solution for price sensitive semi-industrial and general industrial applications.

1.2 Feature

- Compliant with PCIe Gen3 x 4 interface (backward compatible to Gen1 and Gen2)
- Compliance:
 - NVMe 1.2
 - PCI Express Base 3.0
- MLC NAND flash memory
- Capacity: 120GB ~ 960GB
- With DDR3 DRAM Buffer
- Operating as boot disk
- Product includes Standard Temperature range
- Static and dynamic wear leveling
- Bad block management
- S.M.A.R.T. & TRIM command
- Power Saving Modes:
 - Support APST
 - Support ASPM
 - Support L1.2
- Over-Provision
- Support up to Queue Depth 64K
- Fully compatible with Windows 8.1, Windows 10, Mac OS, and Linux*
- RoHS compliant

*Microsoft recommends when use the M.2 NVMe SSD the driver for windows 8.1 and above is required.

Mac and Linux system users need to make sure whether there is a driver support M.2 NVMe SSD or not.

1.3 Product Appearance & Models

Cervoz Industrial M.2 2280 Module M410



M410 Family Standard Temp. (0°C ~ 65°C) Model No.	Capacity
CIE-M8M410TKD120GC	120GB
CIE-M8M410TLD240GC	240GB
CIE-M8M410TMD480GC	480GB
CIE-M8M410TND960GC	960GB

Please Note:

Since certain storage capacity has to be reserved for firmware and controller management purposes; the physical capacity of the SATA flash module will be approximately 93% of the indicated capacity. If you need to install an image that has the exact (or close to) the indicated size of the flash module, please choose your flash module with a greater capacity.

2. Product Specifications

2.1 General Specifications

Form Factor	M.2 PCIe 2280
Interface	PCIe Gen3 x4(backward compatible to Gen1 and Gen2)
Connector	M.2 2280-D5-M
NAND Flash Type	MLC
Capacity	120GB/240GB/480GB/960GB
Sequential Read	up to 2,770MB/s
Sequential Write	up to 1,525MB/s
DDR3 DRAM Buffer	Included
ECC Scheme	up to 120bits / 2K Byte
MTBF	2,000,000 hours
TeraByte Written (TBW)	120GB : 117 240GB : 234 480GB : 468 960GB : 937
Supply Voltage	+3.3V DC +/-5%
Power Consumption	Active mode: < 6930mW Idle mode: < 400mW
Dimension (LxWxH)	80.00*22.00*3.90mm

2.2 Performance

The performance was measured with below PC configuration:

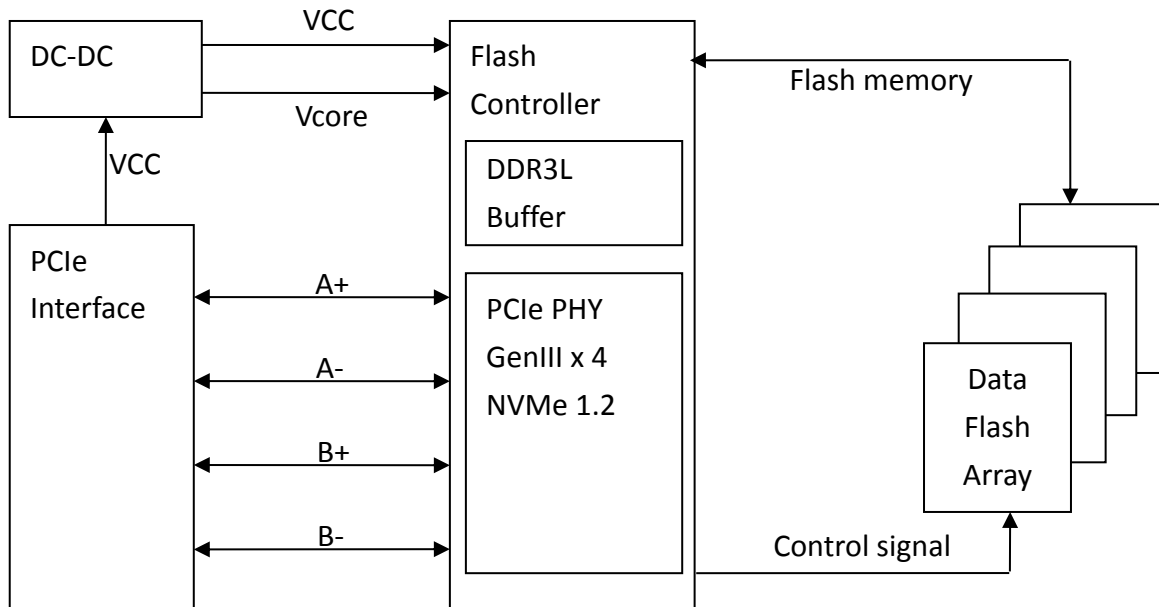
- Platform: GIGABYTE GA-B150M-HD3 DDR3 (Intel B150)
- RAM: Cervoz CIR-S3DUSG1301G(DDR3 1G 1333MHz) x 2
- Operation Systems: Windows 7 SP1
- Testing Utility: Crystal Disk Mark v3.0 x64
- SATAIII port (6.0 Gb/s) performance

Capacity	120GB	240GB	480GB	960GB
Sequential Read (max.)	1925MB/s	2775MB/s	2770MB/s	2770MB/s
Sequential Write (max.)	1455MB/s	1535MB/s	1545MB/s	1525MB/s
4KB Random Read (QD32)	1050MB/s	1160MB/s	1080MB/s	1140MB/s
4KB Random Write (QD32)	1270MB/s	1330MB/s	1335MB/s	1325MB/s

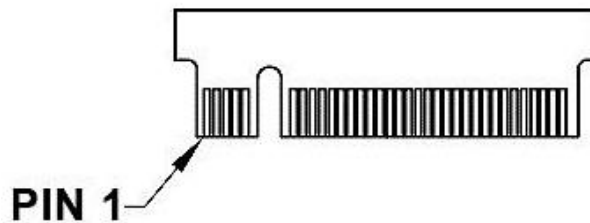
Actual performance may vary depending on use conditions and environment

2.3 Electronic Specifications

2.3.1 Block Diagram



2.3.2 Pin Assignment



Pin #	Pin Description	Signal Name	Pin #	Pin Description	Signal Name
1	Ground	GND	8	Not Used	NC
2	3.3V power in	+3.3V	9	Ground	GND
3	Ground	GND	10	Status indicators via LED devices	LED1#(O)
4	3.3V power in	+3.3V	11	PCIe RX Differential signal defined by the PCI Express M.2 spec	PERn3
5	PCIe TX Differential signal defined by the PCI Express M.2 spec	PETn3	12	3.3V power in	+3.3V
6	Not Used	NC	13	PCIe RX Differential signals defined by the PCI Express M.2 spec.	PERp3
7	PCIe TX Differential signal defined by the PCI Express M.2 spec	PETp3	14	3.3V power in	+3.3V

Pin #	Pin Description	Signal Name	Pin #	Pin Description	Signal Name
15	Ground	GND	34	Not Used	NC
16	3.3V power in	+3.3V	35	PCIe RX Differential signal defined by the PCI Express M.2 spec	PERn1
17	PCIe TX Differential signal defined by the PCI Express M.2 spec	PETn2	36	Not Used	NC
18	3.3V power in	+3.3V	37	PCIe RX Differential signal defined by the PCI Express M.2 spec	PERp1
19	PCIe TX Differential signal defined by the PCI Express M.2 spec	PETp2	38	Not Used	NC
20	Not Used	NC	39	Ground	GND
21	Ground	GND	40	Not Used	NC
22	Not Used	NC	41	PCIe TX Differential signal defined by the PCI Express M.2 spec	PETn0
23	PCIe RX Differential signal defined by the PCI Express M.2 spec	PERn2	42	Not Used	NC
24	Not Used	NC	43	PCIe TX Differential signal defined by the PCI Express M.2 spec	PETp0
25	PCIe RX Differential signal defined by the PCI Express M.2 spec	PERp2	44	Not Used	NC
26	Not Used	NC	45	Ground	GND
27	Ground	GND	46	Not Used	NC
28	Not Used	NC	47	PCIe RX Differential signal defined by the PCI Express M.2 spec	PERn0
29	PCIe TX Differential signal defined by the PCI Express M.2 spec	PETn1	48	Not Used	NC
30	Not Used	NC	49	PCIe RX Differential signal defined by the PCI Express M.2 spec	PERp0
31	PCIe TX Differential signal defined by the PCI Express M.2 spec	PETp1	50	PE-Reset is a functional reset to the card as defined by the PCIe Mini CEM specification.	PERST#(I/O)(0/3.3V)
32	Not Used	NC	51	Ground	GND
33	Ground	GND	52	Clock Request is a reference clock request signal as defined by the PCIe Mini CEM specification; Also used by L1 PM Substates.	CLKREQ#(I/O)(0/3.3V)

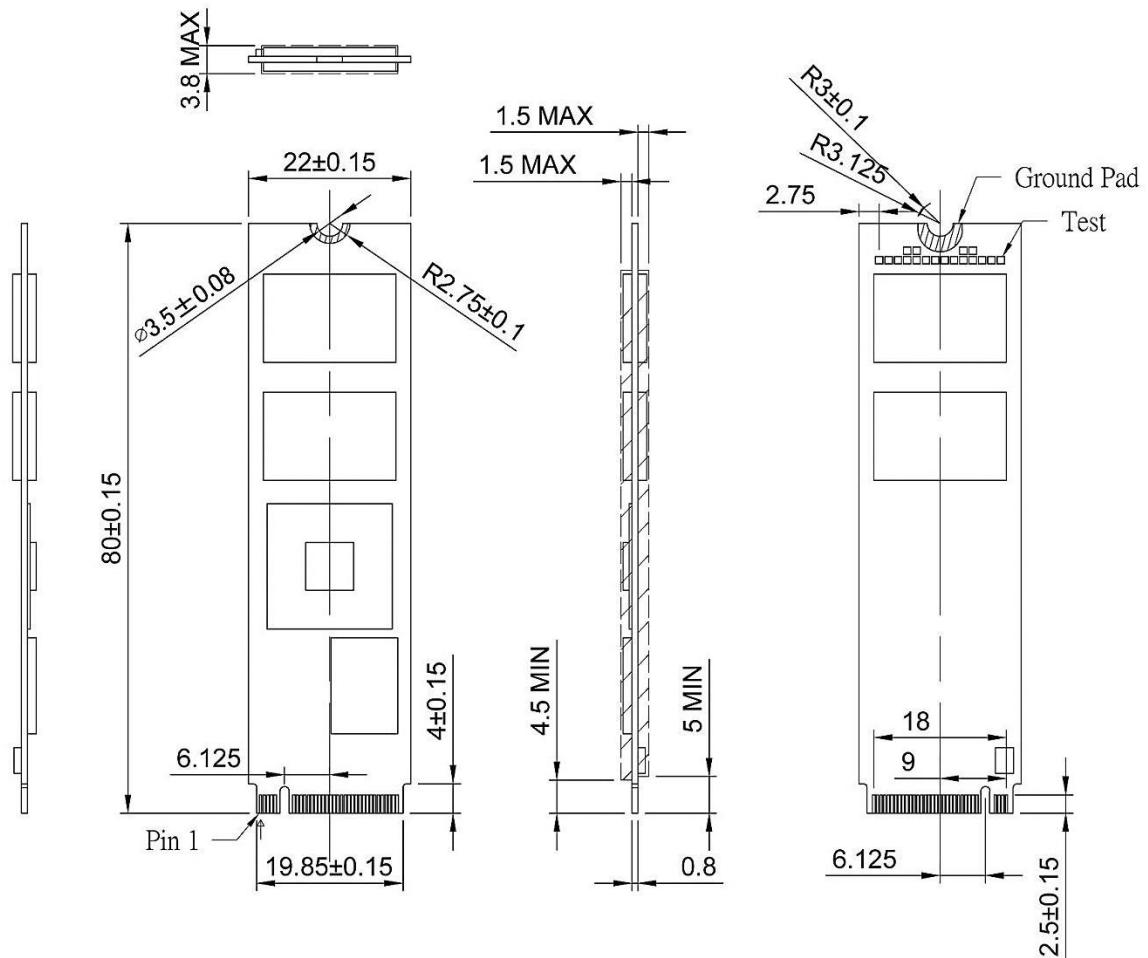
Pin #	Pin Description	Signal Name	Pin #	Pin Description	Signal Name
53	PCIe Reference Clock signals (100 MHz) defined by the PCI Express M.2 spec.	REFCLKn	65	Module Key	Key
54	PCIe PME Wake. Open Drain with pull up on platform; Active Low.	PEWAKE#(I/O) (0/3.3V)	66	Module Key	Key
55	PCIe Reference Clock signals (100 MHz) defined by the PCI Express M.2 spec.	REFCLKp	67	Not Used	NC
56	Manufacturing Data line. Used for SSD manufacturing only. Not used in normal operation. Pins should be left N/C in platform Socket.	Reserved for MFG DATA	68	32.768 kHz clock supply input that is provided by the platform chipset to reduce power and cost for the module.	SUSCLK(32KHz)) (I)(0/3.3V)
57	Ground	GND	69	Host I/F Indication; No Connect for PCIe.	PEDET (NC-PCIe)
58	Manufacturing Clock line. Used for SSD manufacturing only. Not used in normal operation. Pins should be left N/C in platform Socket.	Reserved for MFG CLOCK	70	3.3V power in	+3.3V
59	Module Key	Key	71	Ground	GND
60	Module Key	Key	72	3.3V power in	+3.3V
61	Module Key	Key	73	Ground	GND
62	Module Key	Key	74	3.3V power in	+3.3V
63	Module Key	Key	75	Ground	GND
64	Module Key	Key			

2.4 Environmental Specifications

Type		Value
Temperature	Standard Temperature Operating:	0°C~65°C
	Standard Temperature Storage:	-40°C~85°C
Humidity	Operating & Storage	10~95%, Non-Condensing
Vibration	Non-Operating	20G, 10Hz~2000Hz
Shock	Non-Operating	1500G, 0.5ms

2.5 Mechanical Specifications

Type	Value
Form Factor	M.2 2280-D5-M
Length	80.00mm +/-0.15mm
Width	22.00mm +/-0.15mm
Thickness	3.90mm +/-0.08mm



3. Supported Command

3.1 List of Command Sets

Admin Commands	
Code	Description
00h	Delete I/O Submission Queue
01h	Create I/O Submission Queue
02h	Get Log Page
04h	Delete I/O Completion Queue
05h	Create I/O Completion Queue
06h	Identify
08h	Abort
09h	Set Features
0Ah	Get Features
0Ch	Asynchronous Event Request
10h	Firmware Activate
11h	Firmware Image Download
Admin Commands – NVM Command Set Specific	
Code	Description
80h	Format NVM
81h	Security Send
82h	Security Receive
NVM Commands	
Code	Description
00h	Flush
01h	Write
02h	Read
04h	Write Uncorrectable
05h	Compare
08h	Write Zeroes
09h	Dataset Management

Part No. Decoder

4.1 Part No. Decoder

1	-	2	3	4	5	6	7	8	9
Product Line	-	Form Factor	Product Series	Cervoz Family Code (Bus / Internal Control)	Flash Brand	Flash Capacity	Flash Mode	Module Capacity	Operating Temp.
XXX	-	XX	X	XXX	X	X	X	XXXX	X

1. Product Line

CIS	Cervoz Industrial SSD
CIM	Cervoz Industrial Memory Card
CIE	Cervoz Industrial Embedded Module

2. Form Factor

2S	2.5" SATA
2P	2.5" PATA
CF	CompactFlash
CA	CFast
MS	mSATA
HM	Half Size mSATA
HS	Half Slim
M4	M.2 2242
M6	M.2 2260
M8	M.2 2280
0V	PATA Disk 40pin Vertical
4V	PATA Disk 44pin Vertical
4L	PATA Disk 44pin Horizontal Left
7T	SATA Disk 7pin Vertical Tall
7L	SATA Disk 7pin Horizontal Left
7R	SATA Disk 7pin Horizontal Right

3. Product Series

S	Supreme Series (SLC)
R	Reliance Series (RO-MLC)
M	Momentum Series (MLC)

4. Cervoz Family Code

Bus and Internal Control for Cervoz Product Families

5. Flash Brand

M	Micron
T	Toshiba

6. Flash Capacity

A	256Mb
B	512Mb

C	1Gb
D	2Gb
E	4Gb
F	8Gb
G	16Gb
H	32Gb
I	64Gb
J	128Gb
K	256Gb
L	512Gb
M	1Tb
N	2Tb

7. Flash Mode

Internal Control for Flash Mode

8. Module Capacity

128M	128MB
256M	256MB
512M	512MB
001G	1GB
002G	2GB
004G	4GB
008G	8GB
016G	16GB
032G	32GB
064G	64GB
120G	120GB
128G	128GB
240G	240GB
256G	256GB
480G	480GB
512G	512GB
960G	960GB
001T	1TB

9. Operating Temperature

C	Standard Grade (0~ +65°C)
S	Standard Grade (0~ +70°C)
W	Wide Temperature Grade (-40 ~ +85°C)