

# Cervoz Industrial Embedded Module

Half Slim

Titan Series (3D TLC NAND)

T380 Family

*Product Datasheet*



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## Revision History

Date	Revision	Description
2019.10.01	1.0	First Released
2022.12.30	1.1	MTBF and TBW Updated



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## 1. Product Overview

### 1.1 Introduction

Cervoz Industrial Half Slim Embedded Module T380 family is a Solid State Disk product that is in compliance with the SATA III standards. The device design is based on the 7pin for data segment and 15pin for power segment standards. The Half Slim Embedded Module T380 family fits in any 7+15 SATA sockets on a motherboard; it can be used for both booting or storage purposes.

T380 family uses SSD grade quality 3D NAND flash memory from the industry leading manufacturer Micron. Cervoz's firmware builds in a powerful ECC algorithm call Low-Density Parity Check (LDPC) decoding to improve data reliability. This product includes various capacities to choose from.

T380 family offers outstanding performance and reliability; the product family is a good cost-effective solution for semi-industrial and high-capacity storage applications.

### 1.2 Feature

- Compliant with SATA III 6.0Gb/s
- 3D TLC NAND flash memory
- Capacity: 64GB ~ 2TB
- End-to-End data protection
- SLC write cache technology
- Operating as boot disk
- Static and dynamic wear leveling
- Bad block management
- S.M.A.R.T. & TRIM command

### 1.3 Product Appearance & Models

#### Cervoz Industrial Half Slim Module T380



T380 Family Standard Temp. (0°C ~ 70°C) Model No.	T380 Family Wide Temp. (-40°C ~ 85°C) Model No.	Capacity
CIE-HST380MLF064GS	CIE-HST380MLF064GW	64GB
CIE-HST380MMF128GS	CIE-HST380MMF128GW	128GB
CIE-HST380MMF256GS	CIE-HST380MMF256GW	256GB
CIE-HST380MOF512GS	CIE-HST380MOF512GW	512GB
CIE-HST380MOF001TS	CIE-HST380MOF001TW	1TB
CIE-HST380MOF002TS	CIE-HST380MOF002TW	2TB

**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 92.5% 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

<b>Form Factor</b>	Half Slim
<b>Interface</b>	SATA III 6.0Gb/s (backward compatible to 3.0Gb/s, 1.5Gb/s)
<b>Connector</b>	SATA (7 + 15 pin)
<b>NAND Flash Type</b>	3D TLC NAND
<b>Capacity</b>	64GB/128GB/256GB/512GB/1TB/2TB
<b>Sequential Read</b>	up to 560MB/s
<b>Sequential Write</b>	up to 505MB/s
<b>ECC Scheme</b>	Applies the LDPC (Low Density Parity Check) of ECC algorithm
<b>MTBF</b>	>3,000,000 hours
<b>TeraByte Written (TBW)</b>	64GB : 109 128GB : 219 256GB : 438 512GB : 875 1TB : 1750 2TB : 3500
<b>Low Power Management</b>	DIPM / HIPM mode
<b>Supply Voltage</b>	5V DC +/-5%
<b>Power Consumption</b>	Active mode: < 1450mW Idle mode: < 200mW
<b>Dimension (LxWxH)</b>	54.00*39.00*5.50mm

## 2.2 Performance

The performance was measured with below PC configuration:

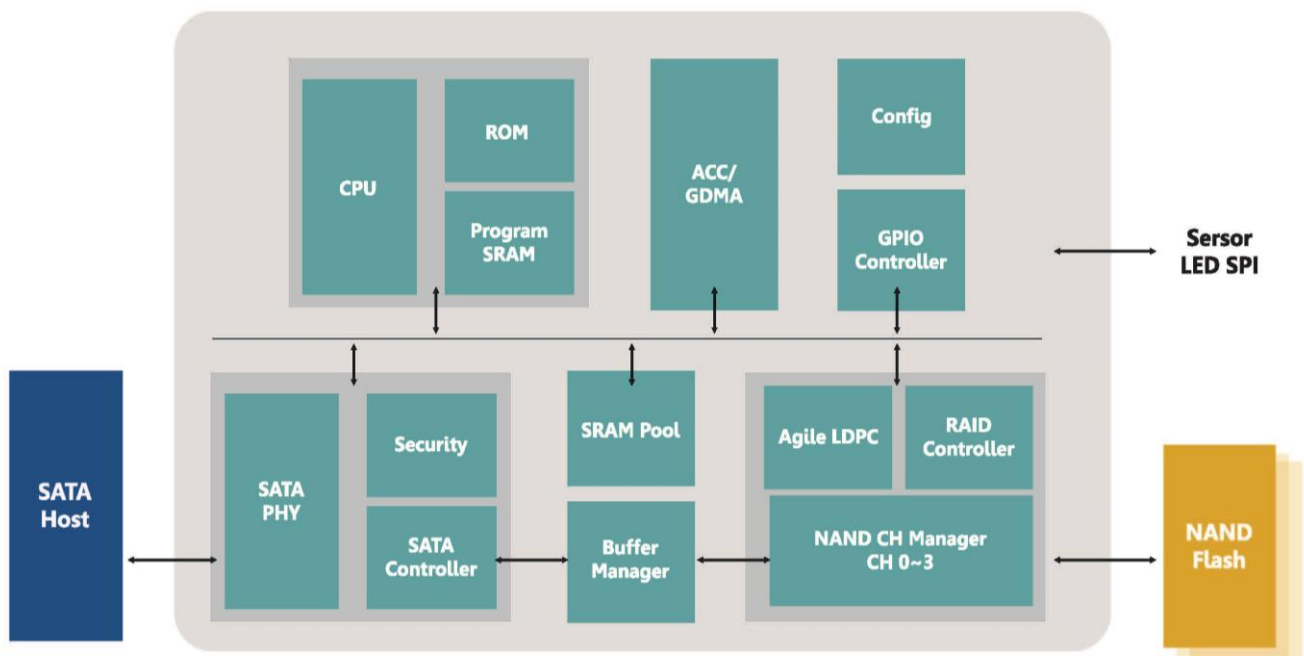
- Platform: GIGABYTE GA-Z170-HD3P
- RAM: Cervoz CIR-S4DUSS2404G (DDR4 4G 2400MHz)
- Operation Systems: Windows 10
- Testing Utility: Crystal Disk Mark v5.1.0
- SATAIII port (6.0 Gb/s) performance

Capacity	64GB	128GB	256GB	512GB	1TB	2TB
Sequential Read (Q32T1)	290MB/s	470MB/s	560MB/s	560MB/s	560MB/s	555MB/s
Sequential Write (Q32T1)	235MB/s	470MB/s	495MB/s	505MB/s	505MB/s	505MB/s
4KB Random Read (Q32T1)	90MB/s	180MB/s	280MB/s	280MB/s	280MB/s	285MB/s
4KB Random Write (Q32T1)	210MB/s	220MB/s	225MB/s	220MB/s	220MB/s	215MB/s

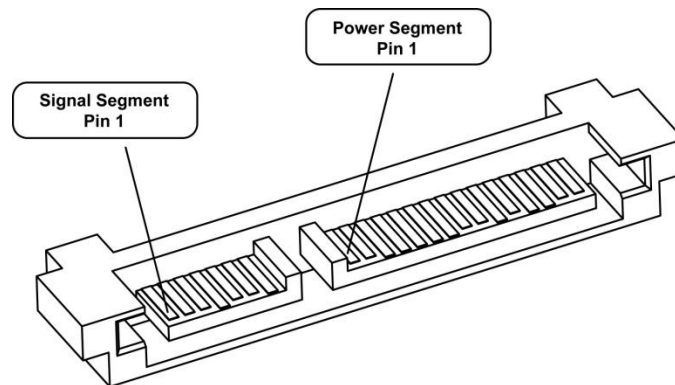
Actual performance might differ based on different using conditions and environment.

## 2.3 Electronic Specifications

### 2.3.1 Block Diagram



### 2.3.2 Pin Assignment



Group	Pin No.	Function	Description
Signal Segment	S1	GND	Ground
	S2	A+	Differential Signal Pair A
	S3	A –	Differential Signal Pair A
	S4	GND	Ground
	S5	B –	Differential Signal Pair B
	S6	B+	Differential Signal Pair B
	S7	GND	Ground
<b>Key &amp; Spacing</b>			
Power Segment	P1	NC	Not Used (3.3V Power)
	P2	NC	Not Used (3.3V Power)
	P3	NC	Not Used
	P4	GND	Ground
	P5	GND	Ground
	P6	GND	Ground
	P7	V5	5V Power, Pre-charge
	P8	V5	5V Power
	P9	V5	5V Power
	P10	GND	Ground
	P11	Reserved	Reserved
	P12	GND	Ground
	P13	NC	Not Used(12V Power, Pre-charge)
	P14	NC	Not Used (12V Power)
	P15	NC	Not Used (12V Power)

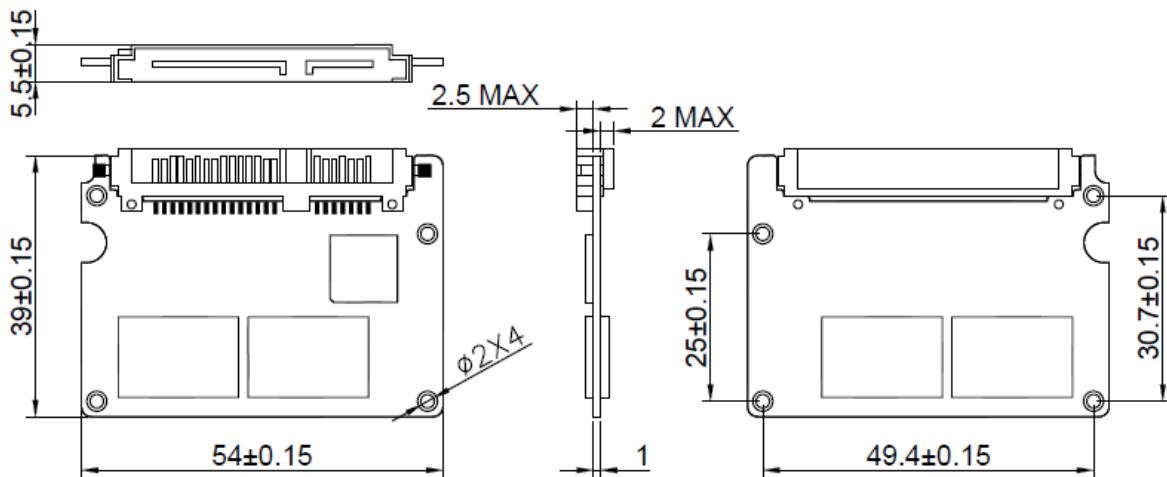


## 2.4 Environmental Specifications

Type		Value
<b>Temperature</b>	Standard Temperature Operating:	0°C~70°C
	Standard Temperature Storage:	-40°C~85°C
	Wide Temperature Operating:	-40°C~85°C
	Wide Temperature Storage:	-50°C~95°C
<b>Humidity</b>	Operating & Storage	5~95%, Non-Condensing
<b>Vibration</b>	Non-Operating	20G, 10Hz~2000Hz
<b>Shock</b>	Non-Operating	1500G, 0.5ms

## 2.5 Mechanical Specifications

Type	Value
Form Factor	Half Slim
Length	54.00mm +/-0.15mm
Width	39.00mm +/-0.15mm
Thickness	5.50mm +/-0.15mm



### 3. Supported Command

#### 3.1 List of Command Sets

Command Name	Code	PARAMETERS USED					
		SC	SC	SC	SC	SC	SC
CHECK POWER MODE	E5h	X	X	X	X	X	X
EXECUTE DIAGNOSTICS	90h	X	X	X	X	X	X
FLUSH CACHE	E7h	X	X	X	X	X	X
IDENTIFY DEVICE	ECh	X	X	X	X	X	X
IDLE	E3h	O	O	O	O	O	O
IDLE IMMEDIATE	E1h	X	X	X	X	X	X
INITIALIZE DEVICE PARAMETERS	91h	O	O	O	O	O	O
READ DMA	C8h	O	O	O	O	O	O
READ DMA EXT	25h	O	O	O	O	O	O
READ FPDMA QUEUED	60h	O	O	O	O	O	O
READ LOG DMA EXT	47h	O	O	O	O	O	O
READ LOG EXT	2Fh	O	O	O	O	O	O
READ MULTIPLE	C4h	O	O	O	O	O	O
READ SECTOR(S)	20h or 21h	O	O	O	O	O	O
READ VERIFY SECTOR(S)	40h or 41h	O	O	O	O	O	O
RECALIBRATE	10h	X	X	X	X	X	X
SECURITY DISABLE PASSWORD	F6h	X	X	X	X	X	X
SECURITY ERASE PREPARE	F3h	X	X	X	X	X	X
SECURITY ERASE UNIT	F4h	X	X	X	X	X	X
SECURITY FREEZE LOCK	F5h	X	X	X	X	X	X
SECURITY SET PASSWORD	F1h	X	X	X	X	X	X
SECURITY UNLOCK	F2h	X	X	X	X	X	X
SEEK	7xh	X	X	X	X	X	X
SET FEATURES	EFh	O	O	O	O	O	O
SET MULTIPLE MODE	C6h	O	O	O	O	O	O
SLEEP	E6h	X	X	X	X	X	X
SMART	B0h	X	X	X	X	X	X
STANDBY	E2h	X	X	X	X	X	X
STANDBY IMMEDIATE	E0h	X	X	X	X	X	X
WRITE DMA	CAh	O	O	O	O	O	O
WRITE DMA EXT	35h	O	O	O	O	O	O

WRITE FPDMA QUEUED	61h	0	0	0	0	0	0
WRITE LOG DMA EXT	57h	0	0	0	0	0	0
WRITE LOG EXT	3Fh	0	0	0	0	0	0
WRITE MULTIPLE	C5h	0	0	0	0	0	0
WRITE SECTOR(S)	30h or 31h	0	0	0	0	0	0

Note:

0 = Valid

X = Don't care

SC = Sector Count Register

SN = Sector Number Register

CY = Cylinder Low/High Register

DR = DEVICE SELECT Bit (DEVICE/HEAD Register Bit 4)

HD = HEAD SELECT Bit (DEVICE/HEAD Register Bit 3-0)

FT = Features Register

#### 4. 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)	NAND Flash	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
7S	SATA Disk 7pin Vertical Short
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)
T	Titan Series(TLC)

#### 4. Cervoz Family Code

Bus and Internal Control for Cervoz Product Families

##### 5. NAND Flash

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
O	4Tb

## 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
128G	128GB
256G	256GB
512G	512GB
001T	1TB
002T	2TB

## 9. Operating Temperature

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