



Industrial mSATA mini Specification

(XTREME SERIES, 3D TLC)

Version 1.1

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1. GENERAL DESCRIPTION



1.1. Introduction

FLEXON's XTREME mSATA mini has SATA III interface, and is fully compliant with the standard mSATA-mini form factor, known as JEDEC MO-300 standard. It is DRAM-less design with good performance & high reliability, and suitable for embedded applications.

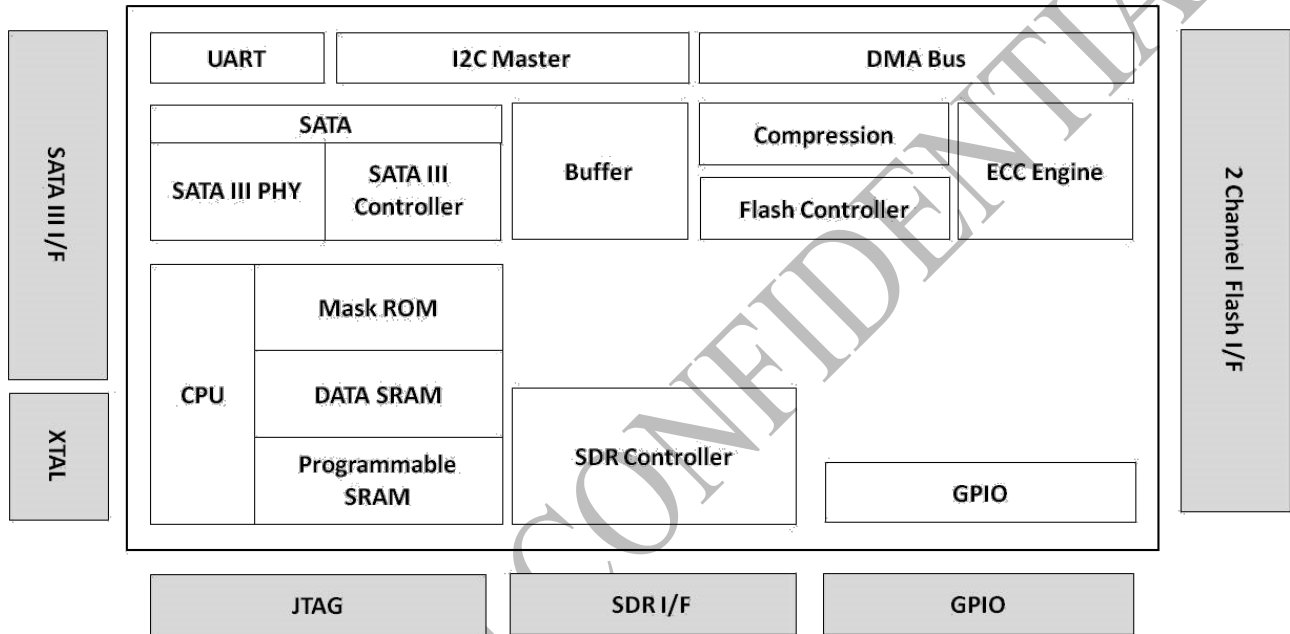


Figure 1-1 XTREME mSATA mini Controller Block Diagram

1.2. Product Overview

❖ Flash

- 3D TLC

❖ Capacity

- 16GB up to 128GB

❖ SATA Interface

- Compliant with SATA Revision 3.2
- Compatible with SATA 1.5Gbps, 3Gbps and 6Gbps interface

❖ ECC Scheme

- XTREME mSATA mini applies the LDPC (Low Density Parity Check) of ECC algorithm

❖ UART Function

❖ GPIO

❖ Support SMART and TRIM commands

❖ Low Power Management

❖ Power Loss Protection Algorithm

❖ Data Compression Technique

❖ Temperature Range

- Operation (Silver): 0°C ~ 70°C
- Operation (Diamond): -40°C ~ 85°C
- Storage: -40°C ~ 85°C

❖ RoHS Compliant

2.1. Performance

Capacity	Sequential	
	Read (MB/s)	Write (MB/s)
16GB	295	125
30/32GB	300	125
60/64GB	550	255
120/128GB	550	450

Table 2-1 Performance of XTREME mSATA mini

NOTES:

1. The performance was measured using CrystalDiskMarkv5.0x64 with SATA 6Gbps host.
2. Performance may differ according to flash configuration and platform.

2.2. Power

Table 2-2 Supply Voltage of XTREME mSATA mini

Parameter	Rating
Operating Voltage	3.3V,+/-5%

Table 2-3 Power Consumption of XTREME mSATA mini (Unit: mW)

Capacity	Read	Write	Partial	Slumber	Idle	DEVSLP
16GB	900	800	15	10	300	4.9
30/32GB	900	800	15	10	300	4.9
60/64GB	1,200	1,030	15	10	300	4.9
120/128GB	1,230	1,330	15	10	300	4.9

NOTE:

1. Power Consumption may differ from flash configuration and platform.



2.3. TBW (Terabytes Written)

Capacity	TBW
16GB	22
32GB	40
64GB	82
128GB	162

NOTES:

1. TBW may differ according to flash configuration and platform.
2. Samples were tested under JESD218A endurance test method and JESD219A endurance workloads specification.

2.4. MTBF

MTBF, an acronym for Mean Time Between Failures, is a measure of a device's reliability. Its value represents the average time between a repair and the next failure. The predicted result of FLEXXON's XTREME mSATA mini is more than 2 million hours.

2.5. Data Retention

- 10 years if > 90% life remaining (@25C)
- 1 year if < 10% life remaining (@25C)

3. ENVIRONMENTAL SPECIFICATIONS



Test Items	Test Conditions
Storage Temperature	-40°C ~ 85°C
Operating Temperature	Silver Grade: 0°C ~ 70°C Diamond Grade: -40°C ~ 85°C
Storage Humidity	55°C, 95% RH
Operating Humidity	55°C, 95% RH
Shock	1500G, Half Sin Pulse Duration 0.5ms
Vibration	80Hz ~ 2000Hz/20G, 20Hz ~ 80Hz/1.52mm, 3 axis/60min
Drop	80cm free fall, 6 face of each unit, 2 times each
Bending	≥ 50N, Hold 1 min/5 times
ESD	24°C, 49% RH, +/-4KV

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Table 4-1 ATA Command List

Op Code	Description	Op Code	Description		
00h	NOP	C9h	Read DMA without Retry		
06h	Data Set Management	CAh	Write DMA		
10h-1Fh	Recalibrate	CBh	Write DMA without Retry		
20h	Read Sectors	CEh	Write Multiple FUA EXT		
21h	Read Sectors without Retry	E0h	Standby Immediate		
24h	Read Sectors EXT	E1h	Idle Immediate		
25h	Read DMA EXT	E2h	Standby		
27h	Read Native Max Address EXT	E3h	Idle		
29h	Read Multiple EXT	E4h	Read Buffer		
2Fh	Read Log EXT	E5h	Check Power Mode		
30h	Write Sectors	E6h	Sleep		
31h	Write Sectors without Retry	E7h	Flush Cache		
34h	Write Sectors EXT	E8h	Write Buffer		
35h	Write DMA EXT	E9h	READ BUFFER DMA		
37h	Set Native Max Address EXT	EAh	Flush Cache EXT		
38h	CFA Write Sectors Without Erase	EBh	Write Buffer DMA		
39h	Write Multiple EXT	ECh	Identify Device		
3Dh	Write DMA FUA EXT	EFh	Set Features		
3Fh	Write Long EXT	EFh	02h	Enable volatile write cache	
40h	Read Verify Sectors	EFh	03h	Set transfer mode	
41h	Read Verify Sectors without Retry	EFh	05h	Enable the APM feature set	
42h	Read Verify Sectors EXT	EFh	10h	Enable use of SATA features et	
44h	Zero EXT	EFh	10h	02h	Enable DMA Setup FIS Auto-Activate optimization
45h	Write Uncorrectable EXT	EFh	10h	03h	Enable Device-initiated interface power state (DIPM) transitions
47h	Read Log DMA EXT	EFh	10h	06h	Enable Software Settings Preservation (SSP)
57h	Write Log DMA EXT	EFh	10h	07h	Enable Device Automatic Partial to Slumber transitions
60h	Read FPDMA Queued	EFh	10h	09h	Enable Device Sleep
61h	Write FPDMA Queued	EFh	55h		Disable read look-ahead
70h-7Fh	Seek	EFh	66h		Disable reverting to power-on defaults

Op Code		Description	Op Code		Description	
90h		Execute Device Diagnostic	EFh	82h	Disable volatile write cache	
91h		Initialize Device Parameters	EFh	85h	Disable the APM feature set	
92h		Download Microcode	EFh	90h	Disable use of SATA feature set	
93h		Download Microcode DMA	EFh	90h	02h	Disable DMA Setup FIS Auto-Activate optimization
B0h		SMART	EFh	90h	03h	Disable Device-initiated interface power state (DIPM) transitions
B0h	D0h	SMART READ DATA	EFh	90h	06h	Disable Software Settings Preservation (SSP)
B0h	D1h	SMART READ ATTRIBUTE THRESHOLDS	EFh	90h	07h	Disable Device Automatic Partial to Slumber transitions
B0h	D2h	SMART ENABLE/DISABLE ATTRIBUTE AUTOSAVE	EFh	90h	09h	Disable Device Sleep
B0h	D3h	SMART SAVE ATTRIBUTE VALUES	EFh	AAh		Enable read look-ahead
B0h	D4h	SMART EXECUTE OFF-LINE IMMEDIATE	EFh	CCh		Enable reverting to power-on defaults
B0h	D5h	SMART READ LOG		F1h		Security Set Password
B0h	D6h	SMART WRITE LOG		F2h		Security Unlock
B0h	D8h	SMART ENABLE OPERATIONS		F3h		Security Erase Prepare
B0h	D9h	SMART DISABLE OPERATIONS		F4h		Security Erase Unit
B0h	DAh	SMART RETURN STATUS		F5h		Security Freeze Lock
B0h	DBh	SMART ENABLE/DISABLE AUTOMATIC OFF-LINE		F6h		Security Disable Password
B1h		Device Configuration		F8h		Read Native Max Address
B4h		Sanitize		F9h		Set Max Address
C4h		Read Multiple	F9h	01h		SET MAX SET PASSWORD
C5h		Write Multiple	F9h	02h		SET MAXLOCK
C6h		Set Multiple Mode	F9h	03h		SET MAX UNLOCK
C8h		Read DMA	F9h	04h		SET MAX FREEZE LOCK

Table 5-1 Pin Assignment and Description of XTREME mSATA mini

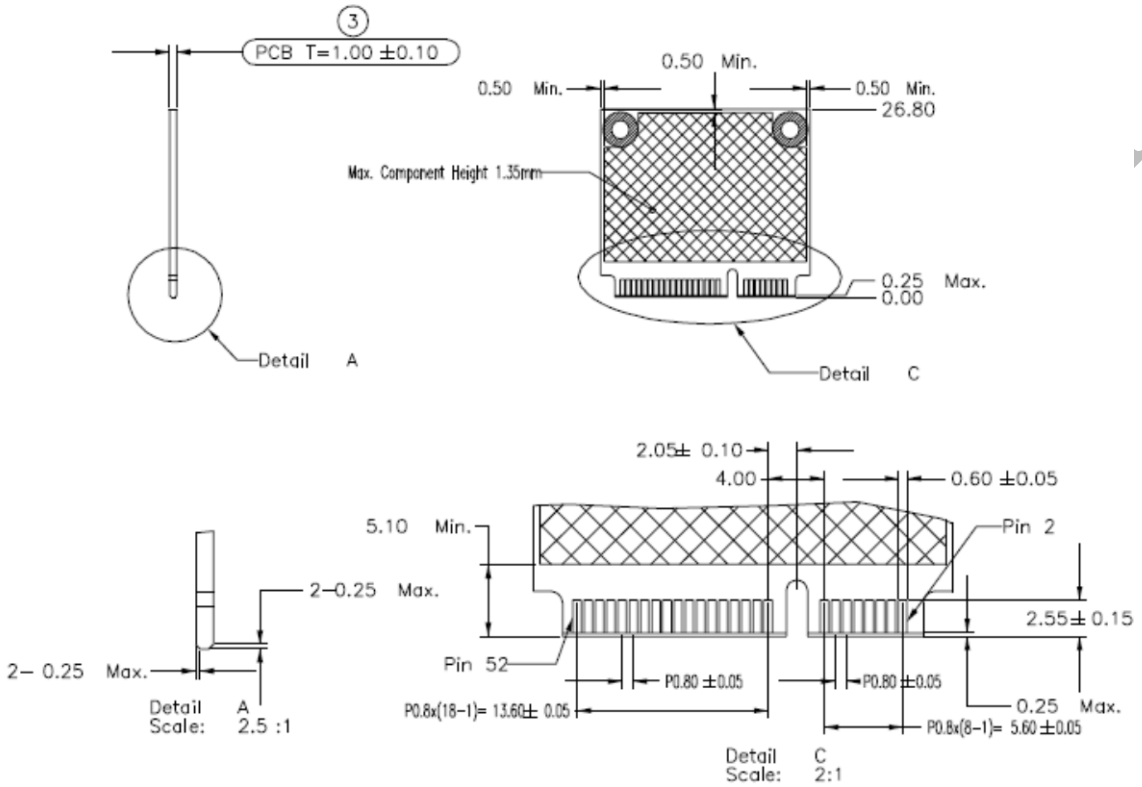
Pin #	mSATA Pin	Description
1	NC	No Connect
2	+3.3V	3.3V Source
3	NC	No Connect
4	DGND	Digital GND
5	NC	No Connect
6	NC	No Connect
7	NC	No Connect
8	NC	No Connect
9	DGND	Digital GND
10	NC	No Connect
11	NC	No Connect
12	NC	No Connect
13	NC	No Connect
14	NC	No Connect
15	DGND	Digital GND
16	NC	No Connect
17	NC	No Connect
18	DGND	Digital GND
19	NC	No Connect
20	NC	No Connect
21	SATA GND	SATA Ground Return Pin
22	NC	No Connect
23	TXP (out)	Host Receiver Differential Signal Pair
24	+3.3V	3.3V Source
25	TXN (out)	Host Receiver Differential Signal Pair
26	SATA GND	SATA Ground Return Pin
27	SATA GND	SATA Ground Return Pin
28	NC	No Connect
29	SATA GND	SATA Ground Return Pin
30	NC	No Connect
31	RXN (in)	Host Transmitter Differential Signal Pair
32	NC	No Connect

Pin #	mSATA Pin	Description
33	RXP (in)	Host Transmitter Differential Signal Pair
34	DGND	Digital GND
35	SATA GND	SATA Ground Return Pin
36	NC	No Connect
37	SATA GND	SATA Ground Return Pin
38	NC	No Connect
39	+3.3V	3.3V Source
40	DGND	Digital GND
41	+3.3V	3.3V Source
42	NC	No Connect
43	NC	No Connect
44	DEVSLP	Enter/Exit DevSleep
45	NC	Reserved pin
46	NC	No Connect
47	NC	Reserved pin
48	NC	No Connect
49	DAS	Device Activity Signal
50	DGND	Digital GND
51	GND	Default connect to GND
52	+3.3V	3.3V Source

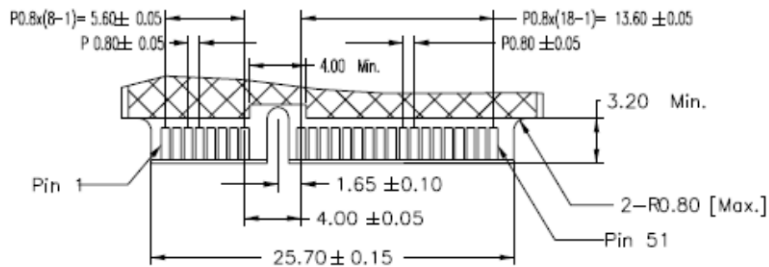
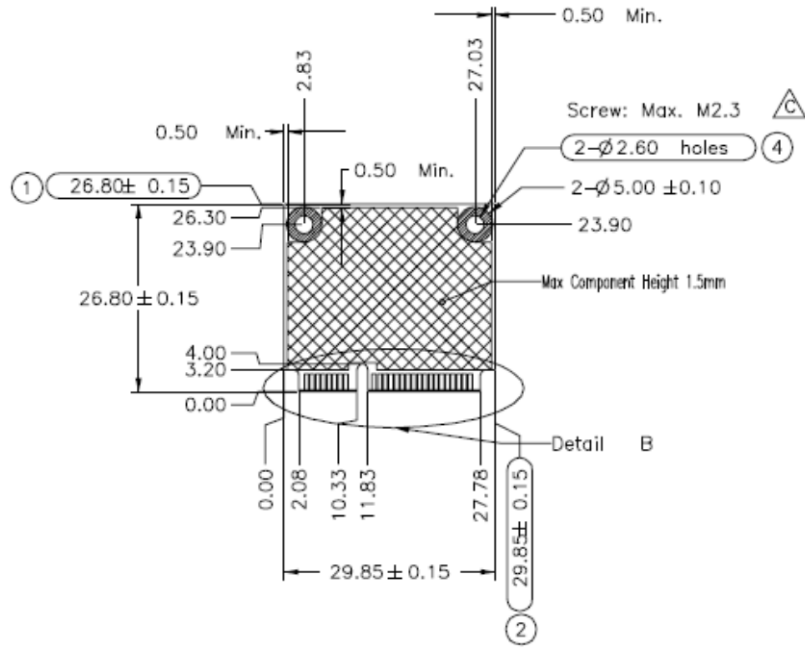
6. PHYSICAL DIMENSION



Dimension: 26.8mm(L) x 29.85mm(W) x 1mm(H)



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Notes :

- 1. = Max Component Height is
- 2. = No Component
- 3. = No Component / Signal Vias / Signal Copper/Print
- 4. General Tolerance : ± 0.1 mm

5. Card Thickness applies accross tab and includes plating and/or metalization

6. Check Point: ① ~ ④

7. Screw Max. Size M2.3

7. ORDERING INFORMATION



Capacity	MPN (Silver)	MPN (Diamond)
16GB	FSSG016GBS-SB00	FSSG016GBE-SB00
32GB	FSSG032GBS-SB00	FSSG032GBE-SB00
30GB	FSSG030GBS-SB00	FSSG030GBE-SB00
64GB	FSSG064GBS-SB00	FSSG064GBE-SB00
60GB	FSSG060GBS-SB00	FSSG060GBE-SB00
128GB	FSSG128GBS-SB00	FSSG128GBE-SB00
120GB	FSSG120GBS-SB00	FSSG120GBE-SB00

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Revision History

Revision	Draft Date	History
1.0	2018/09	First release
1.1	2019/03	Update template

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