



Datasheet

MA2020

SATA2 mSATA Solid State Drive

Preliminary version 1.0

July 2013

Document Version

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CONTENT

- 1. INTRODUCTION.....4**
 - 1.1 GENERAL DESCRIPTION.....4
 - 1.2 FEATURE4
 - 1.3 APPLICATION5
 - 1.4 SSD FUNCTIONAL BLOCK DIAGRAM5
 - 1.5 PART NUMBER DEFINITION6
 - 1.6 ORDERING INFORMATION.....6
 - 1.7 SYSTEM PERFORMANCE.....7

- 2. PRODUCT SPECIFICATION8**
 - 2.1 DIMENSION.....8
 - 2.2 PRODUCT OUTLINE8
 - 2.3 PIN OUT9

- 3. COMMAND DESCRIPTIONS 11**
 - 3.1 SUPPORTED ATA COMMANDS..... 11
 - 3.2 IDENTIFY DEVICE (ECH)12
 - 3.3 SMART FEATURE SET15

- 4. ELECTRICAL CHARACTERISTIC.....16**
 - 4.1 SUPPLY VOLTAGE.....16
 - 4.2 SYSTEM POWER CONSUMPTION16

1. Introduction

1.1 General Description

Pretec MA2020 mSATA SSD (Solid State Drive), available in memory capacities 32GB · 64GB · 128GB, this is the best solution for Ultrabook, notebook, Tablet PC and Industrial Equipment as a storage device. The Pretec mSATA SSD is the best choice of high performance and low power consumption solution.

MA2020 is designed to meet the stringent demands of server environments and enterprise applications. These new premium offerings are the pinnacle storage option excelling in performance, reliability, and power consumption that offer professionals and enthusiasts an unparalleled computing experience.

1.2 Feature

- Compliant with Serial ATA Revision 2.6 specification
- 1.5Gbps/ 3.0Gbps interface rate
- Supports TRIM command based on ATA-8
- Supports 48-bit Logical Block Addressing (LBA)
- Supports partial and slumber mode
- S.M.A.R.T. command transport (SCT) technology
- Superior wear-leveling
- Intelligent Flash memory block management
- Up to 40 bits correctable per 512-byte sector (BCH) ECC Recovery
- Self-monitoring
- RoHS CE and FCC compatibility
- Halogen-free
- Supports Firmware upgrade function
- Shock/Vibration
 - Operating 1,500G duration 0.5ms half sine wave
 - Vibration 20Gpeak 10~2000Hz with (15mins/Axis) 3axis
- Humidity:
 - 0°C~55°C/5~95% RH 10cycles
- Temperature
 - Standard Operating Temperature: 0°C~70°C
 - Extended Operating Temperature: -40°C~85°C
 - Storage Temperature: - 55°C~95°C

Spec

| Item | Size | Capacity |
|-------------|----------------|---------------------|
| mSATA (MLC) | 50.9x 30x3.7mm | 32GB · 64GB · 128GB |

Performance

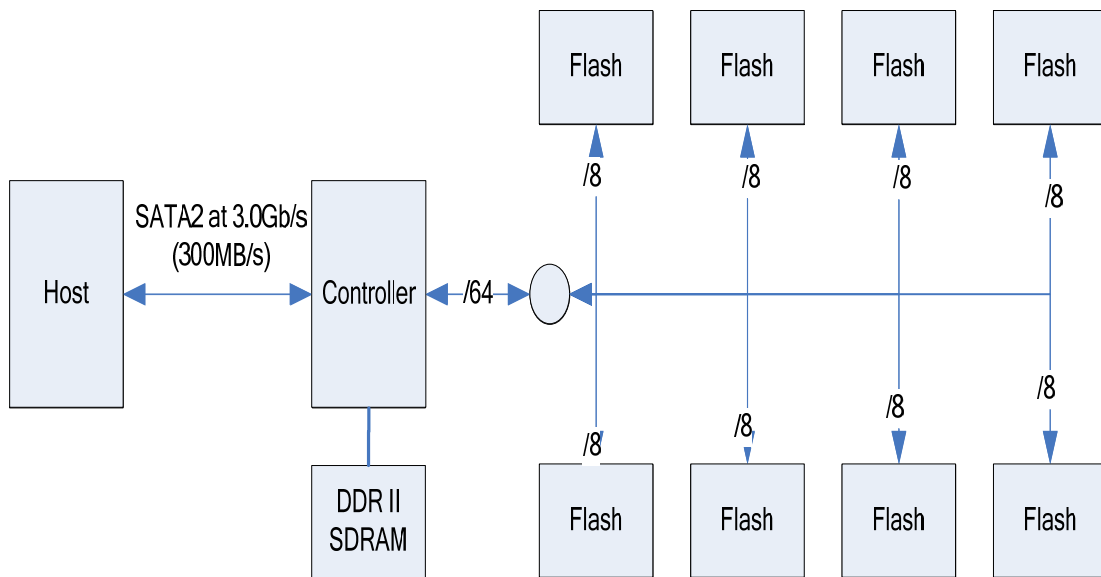
| Item | Max Read | Max Write | Random 4K read | Random 4K write |
|---------------|-----------|----------------|------------------|------------------|
| 2.5Inch (MLC) | 250MB/Sec | Up to 90MB/Sec | Up to 3,180 IOPS | Up to 2,360 IOPS |

1.3 Application

Consumer application: Desktops, Laptops, Printers, Smart TV, STB, etc.

Industrial PCs: Rugged laptops, military devices, thin clients, POS, telecom, medical instruments, etc.

1.4 SSD Functional Block Diagram



1.5 Part Number Definition

| Code | Definition | symbol | Description |
|--|----------------|--------|--------------|
| X ₁ X ₂ | Interface | MA | mSATA |
| X ₃ X ₄ X ₅ X ₆ | Model Series | 2020 | SATA II |
| X ₇ X ₈ X ₉ X ₁₀ | Total Capacity | 032G | 32GB |
| | | 064G | 64GB |
| | | 128G | 128GB |
| X ₁₁ | Housing | Q | None Housing |

1.6 Ordering Information

| Part Number | Capacity | Description |
|-------------|----------|----------------------------------|
| MA2020032GQ | 32 GB | MA2020 / 32GB SATA II mSATA SSD |
| MA2020064GQ | 64 GB | MA2020 / 64GB SATA II mSATA SSD |
| MA2020128GQ | 128 GB | MA2020 / 128GB SATA II mSATA SSD |

1.7 System Performance

Test program: ATTO

| Capacity | Sequential Read Sector | Sequential Write Sector |
|----------|------------------------|-------------------------|
| 32GB | 190 MB/s | 80 MB/s |
| 64GB | 245 MB/s | 99 MB/s |
| 128GB | 252 MB/s | 91 MB/s |

Test program: CrystalDiskMark 3.0

| Capacity | Sequential Read | Sequential Write | 4K Read | 4K Write | 4K QD32 Read | 4K QD32 Write |
|----------|-----------------|------------------|------------|-----------|--------------|---------------|
| 32GB | 181 MB/s | 80 MB/s | 11.03 MB/s | 9 MB/s | 16.4 MB/s | 9 MB/s |
| 64GB | 219 MB/s | 97 MB/s | 12.81 MB/s | 9.76 MB/s | 17.9 MB/s | 9.9 MB/s |
| 128GB | 219 MB/s | 91 MB/s | 13.14 MB/s | 9.3 MB/s | 18.03 MB/s | 9.36 MB/s |

Test program: AS SSD

| Capacity | Sequential Read | Sequential Write | 4K Read IOPS | 4K Write IOPS | 4K-64Thrd Read IOPS | 4K-64Thrd Write IOPS |
|----------|-----------------|------------------|--------------|---------------|---------------------|----------------------|
| 32GB | 178 MB/s | 77 MB/s | 3105 | 2135 | 4117 | 1002 |
| 64GB | 209 MB/s | 94 MB/s | 3150 | 2369 | 4211 | 1013 |
| 128GB | 210 MB/s | 87 MB/s | 3181 | 2273 | 4307 | 1373 |

Actual performance may vary depending on use conditions and environment

2. Product Specification

2.1 Dimension

| Form Factor | Measures |
|-------------|-----------------------|
| mSATA | 50.9mm x 30mm x 3.7mm |

2.2 Product Outline

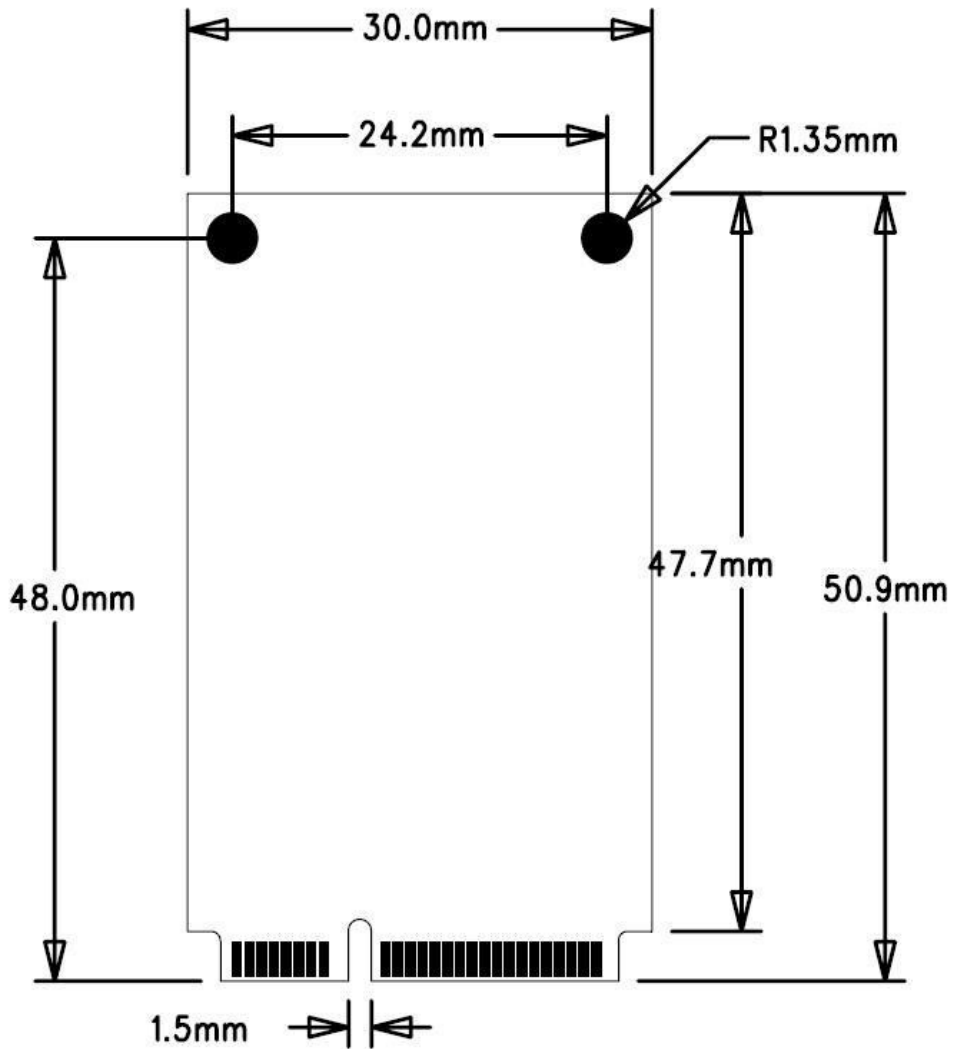


Figure 1: Mechanical Dimensions of mSATA MA2020 SSD

2.3 Pin out

Pin Assignment and Description

| Pin# | Assignmen | Description | Pin# | Assignment | Description |
|------|-----------|--------------------------------------|------|------------|------------------------|
| 1 | | No Connect | 2 | +3.3V | 3.3V Source |
| 3 | | No Connect | 4 | GND | Return Current Path |
| 5 | | No Connect | 6 | | No Connect |
| 7 | | No Connect | 8 | | No Connect |
| 9 | GND | Return Current Path | 10 | | No Connect |
| 11 | | No Connect | 12 | | No Connect |
| 13 | | No Connect | 14 | | No Connect |
| 15 | GND | Return Current Path | 16 | | No Connect |
| 17 | | No Connect | 18 | GND | Return Current Path |
| 19 | | No Connect | 20 | | No Connect |
| 21 | GND | Return Current Path | 22 | | No Connect |
| 23 | +B - TXP | Transmitter Differential Signal Pair | 24 | +3.3V | 3.3V Source |
| 25 | -B - TXN | Transmitter Differential Signal Pair | 26 | ND | Return Current Path |
| 27 | GND | Return Cu rent Path | 28 | | No Connect |
| 29 | GND | Return Cu rent Path | 30 | | No Connect |
| 31 | -A - RXN | Receiver Differential Signal Pair | 32 | | No Connect |
| 33 | +A - RXP | Receiver Differential SiQnal Pair | 34 | GND | Return Cu rent Path |
| 35 | GND | Return Cu rent Path | 36 | | No Connect |
| 37 | GND | Return Cu rent Path | 38 | | No Connect |
| 39 | +3.3V | 3.3V Source | 40 | GND | Return Cu rent Path |
| 41 | +3.3V | 3.3V Source | 42 | PWR LOSS | Power Loss Indicator |
| 43 | | No Connect | 44 | DEVSLP | SATA PHY Power Control |
| 45 | | No Connect | 46 | | No Connect |

| | | | | | |
|----|--------------------|--------------------------|----|-------|---------------------|
| 47 | | No Connect | 48 | | No Connect |
| 49 | DA/DSS | Device Activity | 50 | GND | Return Current Path |
| 51 | Presence Detection | Pulled low by the device | 52 | +3.3V | 3.3V Source |

3.Command Descriptions

3.1 SUPPORTED ATA COMMANDS

| Command | Code | Protocol |
|-------------------------------------|------------|-------------------|
| General Feature Set | | |
| Execute Drive Diagnostic | 90h | Device diagnostic |
| Flush Cache | E7h | Non-data |
| Identify Device | ECh | PIO data-in |
| Initialize Drive Parameters | 91h | Non-data |
| Read DMA | C8h | DMA |
| Read Log Ext | 2Fh | PIO data-in |
| Read Multiple | C4h | PIO data-in |
| Read Sector(s) | 20h | PIO data-in |
| Read Verify Sector(s) | 40h or 41h | Non-data |
| Set Feature | EFh | Non-data |
| Set Multiple Mode | C6h | Non-data |
| Write DMA | CAh | DMA |
| Write Multiple | C5h | PIO data-out |
| Write Sector(s) | 30h | PIO data-out |
| NOP | 00h | Non-data |
| Read Buffer | E4h | PIO data-in |
| Write Buffer | E8h | PIO data-out |
| Power Management Feature Set | | |
| Check Power Mode | E5h or 98h | Non-data |
| Idle | E3h or 97h | Non-data |
| Idle Immediate | E1h or 95h | Non-data |
| Sleep | E6h or 99h | Non-data |
| Standby | E2h or 96h | Non-data |
| Standby Immediate | E0h or 94h | Non-data |
| Security Mode Feature Set | | |
| Security Set Password | F1h | PIO data-out |
| Security Unlock | F2h | PIO data-out |
| Security Erase Prepare | F3h | Non-data |
| Security Erase Unit | F4h | PIO data-out |
| Security Freeze Lock | F5h | Non-data |
| Security Disable Password | F6h | PIO data-out |
| SMART Feature Set | | |
| SMART Disable Operations | B0h | Non-data |
| SMART Enable/Disable Autosave | B0h | Non-data |

| | | |
|--|-----|--------------|
| SMART Enable Operations | B0h | Non-data |
| SMART Execute OFF-LINE Immediate | B0h | Non-data |
| SMART Read Data | B0h | PIO data-in |
| SMART Read Threshold | B0h | PIO data-in |
| SMART Return Status | B0h | Non-data |
| SMART Save Attribute Values | B0h | Non-data |
| Host Protected Area Feature Set | | |
| Read Native Max Address | F8h | Non-data |
| Set Max Address | F9h | Non-data |
| Set Max Set Password | F9h | PIO data-out |
| Set Max Lock | F9h | Non-data |
| Set Max Freeze Lock | F9h | Non-data |
| Set Max Unlock | F9h | PIO data-out |
| 48-bit Address Feature Set | | |
| Flush Cache Ext | EAh | Non-data |
| Read Sector(s) Ext | 24h | PIO data-in |
| Read DMA Ext | 25h | DMA |
| Read Multiple Ext | 29h | PIO data-in |
| Read Native Max Address Ext | 27h | Non-data |
| Read Verify Sector(s) Ext | 42h | Non-data |
| Set Max Address Ext | 37h | Non-data |
| Write DMA Ext | 35h | DMA |
| Write Multiple Ext | 39h | PIO data-out |
| Write Sector(s) Ext | 34h | PIO data-out |
| NCQ Feature Set | | |
| Read FPDMA Queued | 60h | DMA Queued |
| Write FPDMA Queued | 61h | DMA Queued |
| Other | | |
| Data Set Management | 06h | DMA |
| Seek | 70h | Non-data |

3.2 IDENTIFY DEVICE (ECh)

| Word | Value | Description |
|------|-------|-----------------------------|
| 0 | 0040h | General configuration |
| 1 | xxxxh | Default number of cylinders |
| 2 | 0000h | Reserved |
| 3 | 00XXh | Default number of heads |
| 4 | 0000h | Obsolete |

| | | |
|-------|-------|--|
| 5 | 0240h | Obsolete |
| 6 | xxxxh | Default number of heads |
| 7-8 | xxxxh | Number of sectors per card (Word 7 = MSW, Word 8 = LSW) |
| 9 | 0000h | Obsolete |
| 10-19 | xxxxh | Serial number (20 ASCII characters) |
| 20-21 | 0002h | Obsolete |
| 22 | 0000h | Obsolete |
| 23-26 | xxxxh | Firmware revision in ASCII. Big Endian Byte Order in Word. |
| 27-46 | xxxxh | Model number in ASCII (Left justified). Big Endian Byte Order in Word. |
| 47 | 8000h | Maximum number of sectors on multiple commands |
| 48 | 0000h | Reserved |
| 49 | 0F00h | Capabilities |
| 50 | 4000h | Capabilities |
| 51 | 0200h | PIO data transfer cycle timing mode |
| 52 | 0000h | Obsolete |
| 53 | 0007h | Reserved |
| 54 | xxxxh | Obsolete |
| 55 | xxxxh | Current numbers of heads |
| 56 | xxxxh | Current sectors per track |
| 57-58 | xxxxh | Current capacity in sectors (LBAs) (Word 57 = LSW , Word 58 = MSW) |
| 59 | 0000h | Multiple sector setting |
| 60-61 | xxxxh | Total number of user addressable sectors |
| 62 | 0000h | Reserved |
| 63 | 0007h | Multi-word DMA transfer Supports MDMA Mode 0, 1 and 2 |
| 64 | 0003h | Advanced PIO modes supported |
| 65 | 0078h | Minimum Multiword DMA transfer cycle time per word |
| 66 | 0078h | Manufacturer's recommended Multiword DMA transfer cycle time |
| 67 | 0078h | Minimum PIO transfer cycle time without flow control |
| 68 | 0078h | Minimum PIO transfer cycle time with IORDY flow control |
| 69-74 | 4020h | Additional Supported |
| 70-74 | 0000h | Reserved |
| 75 | 0000h | Queue depth |
| 76 | xxxxh | Serial ATA Capabilities |
| 77 | 0000h | Reserved |

| | | |
|-----------|-------|---|
| 78 | 0008h | Device supports initiating interface power management |
| 79 | 0040h | Reserved |
| 80 | 03F0h | Major version number (ATAPI-7) |
| 81 | 0000h | Minor version number |
| 82 | 742Bh | Command sets supported 0 |
| 83 | 7500h | Command sets supported 1 |
| 84 | 4020h | Command sets supported 2 |
| 85-87 | xxxxh | Command set/feature enabled |
| 88 | 007Fh | Time required for Security erase unit completion |
| 89 | 0003h | Time required for Enhanced security erase unit completion |
| 90 | 0000h | Current Advanced power management value |
| 91 | 0000h | Master Password Revision Code |
| 92 | FFFEh | Reserved |
| 93-99 | 0000h | Time required for Security erase unit completion |
| 100-103 | xxxxh | Reserved |
| 104 | 0000h | Reserved |
| 105 | 0100h | Maximum number of 512-byte blocks per DATA SET MANAGEMENT Command |
| 106-127 | 0000h | Reserved |
| 128 | 0001h | Security status |
| 129 - 159 | 0000h | Vendor unique bytes |
| 160 | 0000h | Power requirement description |
| 161 | 0000h | Reserved |
| 162 | 0000h | Key management schemes supported |
| 163 | 0000h | CF Advanced True IDE Timing Mode Capability and Setting |
| 164 - 168 | 0000h | Reserved |
| 169 | 0001h | Data Set Management Support |
| 170 - 216 | 0000h | Reserved |
| 217 | 0100h | Non-rotating media (SSD) |
| 218 - 254 | 0000h | Reserved |
| 255 | xxxxh | Integrity word |

Note: X = the content of the word may be fixed or variable.

3.3 SMART Feature Set

The MA2020 supports the SMART (Self-Monitoring, Analysis and Reporting Technology) command set and defines some vendor-specific data to report spare/bad block numbers in each memory management unit.

| Value | Command | Value | Command |
|-------|----------------------------|-------|--------------------------|
| D0h | Read Data | D5h | Reserved |
| D1h | Read Attribute Threshold | D6h | Reserved |
| D2h | Enable/Disable Autosave | D8h | Enable SMART Operations |
| D3h | Save Attribute Values | D9h | Disable SMART Operations |
| D4h | Execute OFF-LINE Immediate | DAh | Return Status |

4. Electrical Characteristic

4.1 Supply Voltage

| Item | Requirements |
|------------------------|---------------------------|
| Allowable voltage | 3.3V \pm 5% |
| Allowable noise/ripple | 70mV p-p or less, 0~30MHz |

4.2 System Power Consumption

| Power | Typical |
|--------|---------|
| Idle | TBD |
| Active | TBD |

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