

RoHS Compliant
USB Disk Module Series
Datasheet for UDM3 SLC NAND Based Module

June 10, 2014

Revision 2.2



***This Specification Describes the Features and Capabilities of
the Standard and Industrial Temperature
USB Disk Modules***

***Please Contact Fortasa Memory Systems Sales for any
Custom Features Required For Your Specific Application***



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Features:

- **USB2.0 High-Speed and USB1.1 Full-Speed Compatible interface**
- **Module Capacity**
 - 512 MB
 - 1, 2, 4, 8, 16, 32 GB
- **Fast sustained read performance**
 - Sustained read: up to 34 MB/s
- **Fast sustained write performance**
 - Sustained write: up to 22 MB/s
- **Intelligent USB Module**
 - Dynamic wear-leveling algorithms to increase life expectancy of flash media
 - BCH (24-bit) Error Detection Code/Error Correction Code (EDC/ECC)
 - Power interruption data protection circuitry
- **NAND flash type: SLC**
- **Zero Power Data Retention**
 - Batteries not required for data storage
- **Support Ready Boost for Windows Vista**
- **Support boot-up function for OS**
 - Windows XP Embedded
 - Windows CE
 - Linux
 - Windows 7 Embedded
- **Temperature ranges**
 - 0°C to 70°C for operation (Standard Temperature)
 - -40°C to 85°C for operation (Industrial Temperature)
 - -40°C to 100°C for storage
- **Low power consumption (typical)**
 - Active mode: 181 mA
 - Sleep mode: 68 mA
- **Connector**
 - 10-pin (2x5) female header
- **RoHS Compliant**

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1. General Description

Fortasa USB Disk Module (UDM) is a high performance, embedded solid state drive (SSD) designed to replace a conventional IDE hard disk drive. UDM SSD can be plugged into a standard Embedded USB connector commonly found in desktops, portable PC systems and industrial PC systems. This product is well suited for embedded flash storage applications offering new and expanded functionality small form factor, better performance and increased reliability.

1.1 Performance-optimized Controller

The heart of an UDM is the USB controller, which translates standard USB signals into the data and controls of the flash media. This proprietary USB controller is specifically designed to attain high data throughput from host to flash.

1.1.1 Error Correction Code (ECC)

The UDM uses BCH Error Detection Code (EDC) and Error Correction Code (ECC) algorithms which corrects up to 24 random single-bit errors for each 1024 byte block of data. High performance is achieved through hardware-based error detection and correction.

1.1.2 Wear-Leveling

Flash memory can be erased a limited number of times, This number is called the erase cycle limit, or write endurance limit, The erase cycle limit applies to each individual erase block in the flash device. In a typical application, and especially if a file system is used, specific pages are constantly updated (e.g. the page that contains the FAT, registry, etc.). Without any special handling, these pages would wear out more rapidly than other pages, reducing the lifetime of the entire flash.

To overcome this inherent deficiency, Fortasa's USB-Disk Module (UDM) uses wear-leveling algorithm. This wear-leveling method ensures that consecutive writes of a specific sector are not written physically to the same page in the flash. This algorithm spreads flash media usage evenly across all pages, thereby maximizing flash lifetime.

2. Functional Block Diagram

The USB-Disk Module (UDM) contains a controller, embedded firmware, and Flash Media with a female connector. The UDM interfaces with the host system allowing data to be written to and read from the Flash Media.

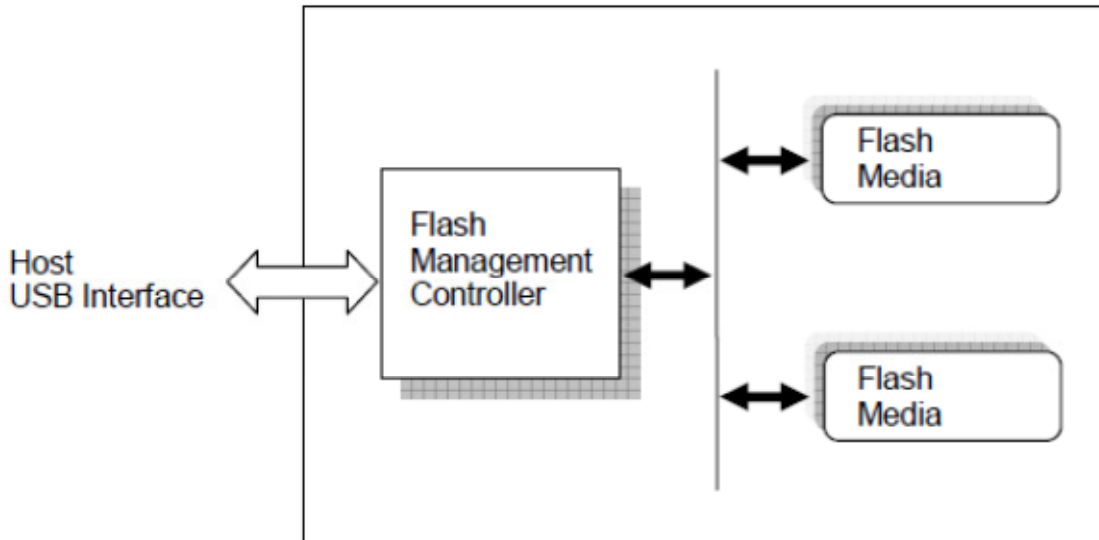


Figure 2-1: Functional block diagram

3. Pin Assignment

This section provides information on pin assignments and signal descriptions.

3.1 Type A, B, C and E

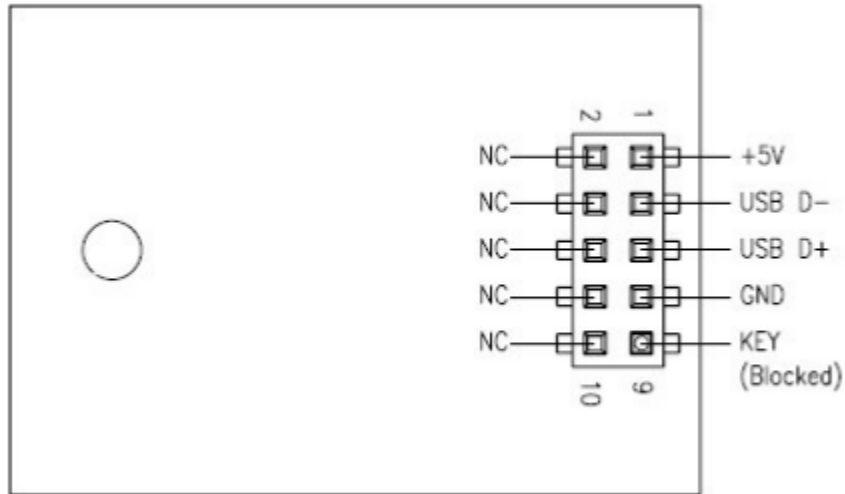


Table 3-1: Pin Assignment of the 10-pin configuration in Type A, B, C, and E Modules

Pin	Signal Description	Pin	Signal Description
1	Vcc (5V)	2	NC
3	USB D-	4	NC
5	USB D+	6	NC
7	GND	8	NC
9	Key (Blocked)	10	NC

3.2 Type D (STD Profile)

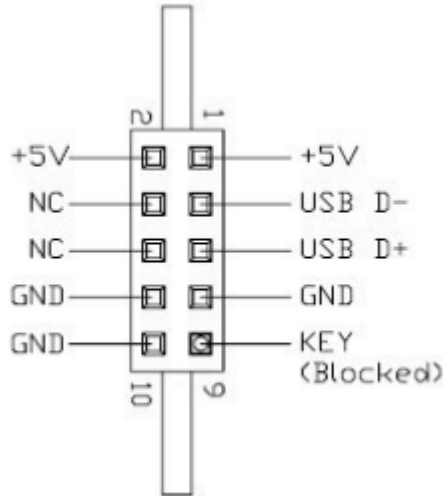


Table 3-2: Pin Assignment of the 10-pin configuration in Type D (STD Profile)

Pin	Signal Description	Pin	Signal Description
1	Vcc (5V)	2	Vcc (5V)
3	USB D-	4	NC
5	USB D+	6	NC
7	GND	8	GND
9	Key (Blocked)	10	GND

3.3 Type D (Low Profile)

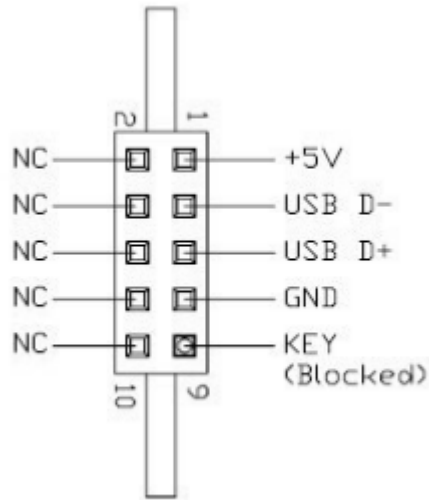


Table 3-3: Pin Assignment of the 10-pin configuration in Type D (Low Profile)

Pin	Signal Description	Pin	Signal Description
1	Vcc (5V)	2	NC
3	USB D-	4	NC
5	USB D+	6	NC
7	GND	8	NC
9	Key (Blocked)	10	NC

4. Technical Specifications

4.1 Capacity Specifications

The OEM USB-Module product family is available in the following capacities.

Table 4-1: Capacity Specification

Capacity	Total Bytes
256 MB	254,509,056
512 MB	512,458,752
1GB	1,029,406,720
2GB	2,061,205,504
4GB	4,120,920,064
8GB	8,248,131,584
16GB	16,030,662,656
32GB	32,061,292,544

4.2 Functional Specifications

Table 4-2: Performance Specifications

Performance \ Capacity	Capacity							
	256MB	512MB	1GB	2GB	4GB	8GB	16GB	32GB
Sustained read (MB/s)	31	31	32	34	28	32	34	31
Sustained write (MB/s)	10	15	19	19	21	15	22	21

4.3 Environmental Specifications

Environmental specification of the USB-Disk Module (UDM) product family which follows the MIL-STD-810F standards is available as shown in Table 4-2.

Table 4-2: Environmental Specifications

Environment		Specification
Temperature	Operation	0°C to 70°C (standard); -40°C to 85°C (industrial)
	Storage	-40°C to 100°C
Vibration		Sine wave 10 Hz to 500 Hz, 50 m/s ² , 3 axes (IEC 68-2-6, non-operating)
Shock		Half sine wave 50G, 6 axes, 18 times (IEC 68-2-27, non-operating)

5. Electrical Specification

Caution: Absolute Maximum Stress Ratings – Applied conditions greater than those listed under “Absolute Maximum Stress Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these conditions or conditions greater than those defined in the operational sections of this data sheet is not implied. Exposure to absolute maximum stress rating conditions may affect device reliability.

Table 5-1: Operating range

Range	Ambient Temperature	5V
Standard	0°C to +70°C	4.5-5.5V
Industrial	-40°C to +85°C	

Table 5-2: Absolute maximum power pin stress ratings

Parameter	Symbol	Min	Max
Power Supply Input	V _{DD}	-0.3V	5.5V
Voltage on any flash media interface pin with respect to GND	V	-0.3V	5.8V

Table 5-3: AC Characteristics Full Speed

Parameter	Symbol	Min	Typ	Max	Unit
Rise Time	T _{FR}	4	-	20	ns
Fall Time	T _{FF}	4	-	20	ns
Differential Rise and Fall Time Matching	T _{FRFM}	90	-	111.11	%
Driver Output Resistance	Z _{DRV}	28	-	44	Ω

Table 5-4: AC Characteristics High Speed

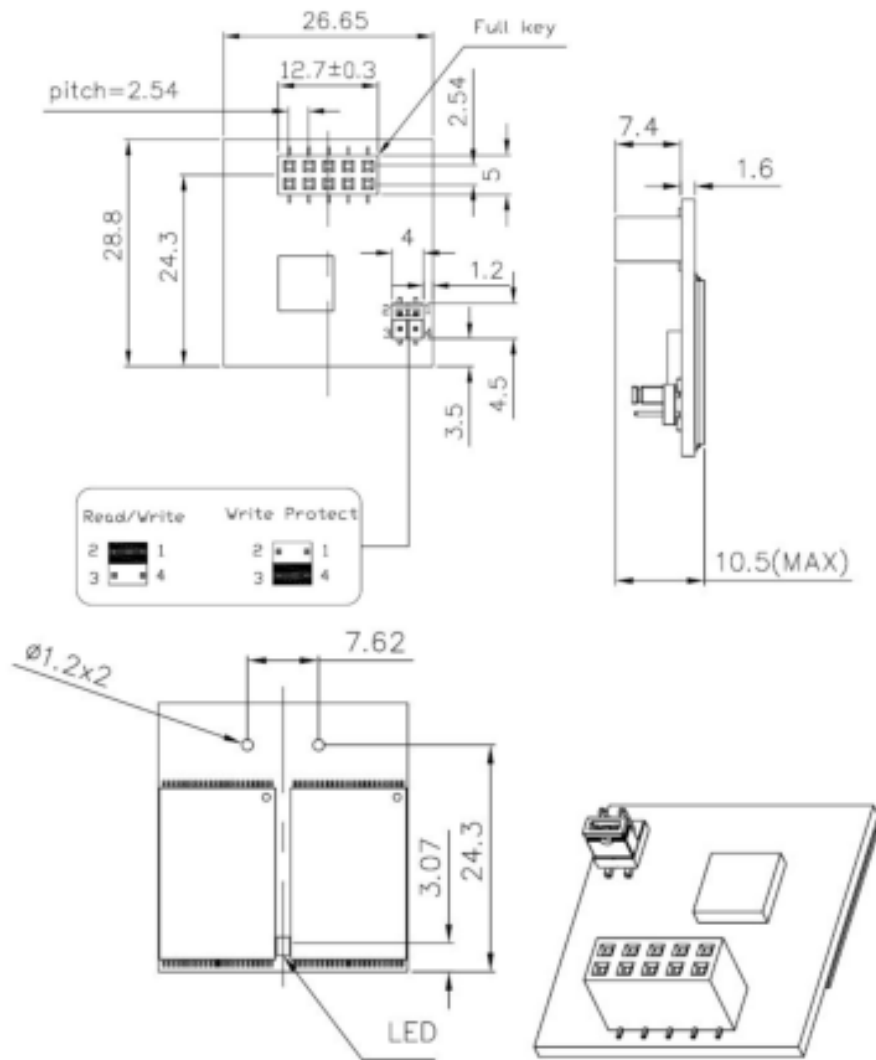
Parameter	Symbol	Min	Typ	Max	Unit
Rise Time (10%-90%)	T _{HSR}	500	-	-	ps
Fall Time (10%-90%)	T _{HSF}	500	-	-	ps
Driver Output Resistance	Z _{HSDRV}	40.5	-	49.5	Ω

6. Physical Dimension

6.1 Horizontal Design

6.1.1 Type A (STD 90 Degrees)

Length	28.8mm	Width	26.65mm	Height (Max)	10.5 mm
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Unit: mm
 Tolerance: ± 0.20

USB Disk Module

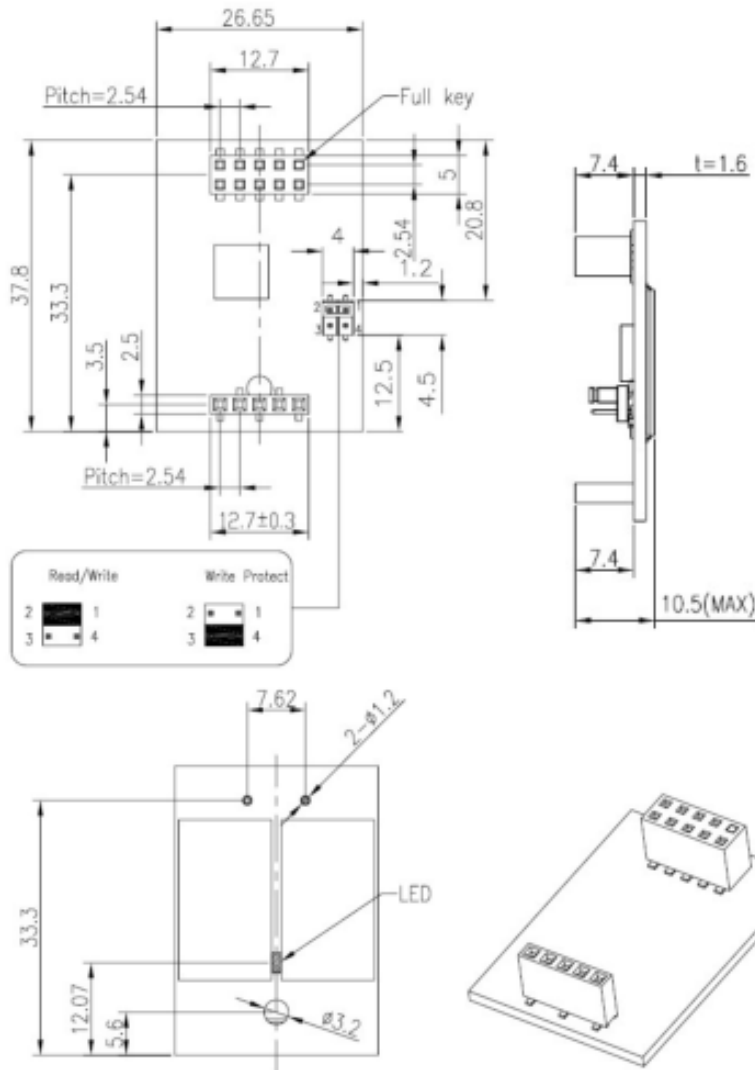
FMS-UMxxxxXXXXS-XXXXX



6.1.2 Type B (STD 90D-MH)

Standard 90 Degree with Mounting Header

Length	37.8mm	Width	26.65mm	Height (Max)	10.5 mm
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Unit: mm
Tolerance: ± 0.20

USB Disk Module

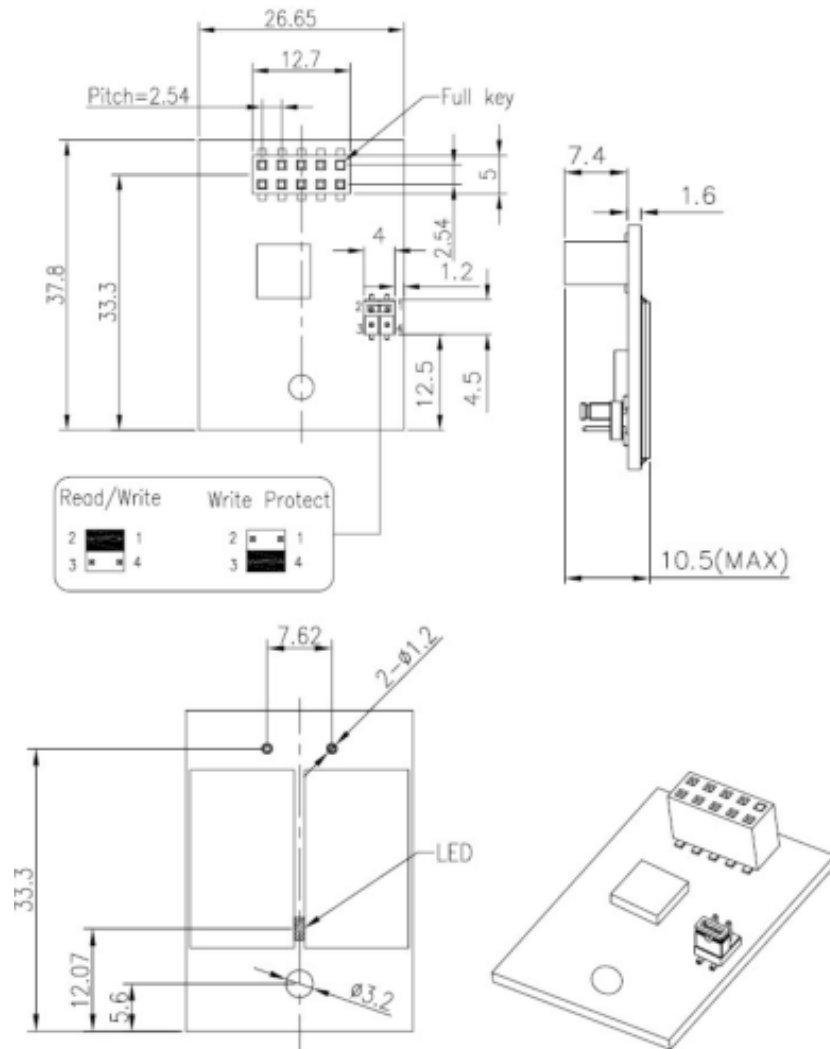
FMS-UMxxxxXXXXS-XXXXX



6.1.3 Type C (STD 90D-MS)

Standard 90 Degree with Mounting Screw

Length	37.8mm	Width	26.65mm	Height (Max)	10.5 mm
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Unit: mm
Tolerance: ± 0.20

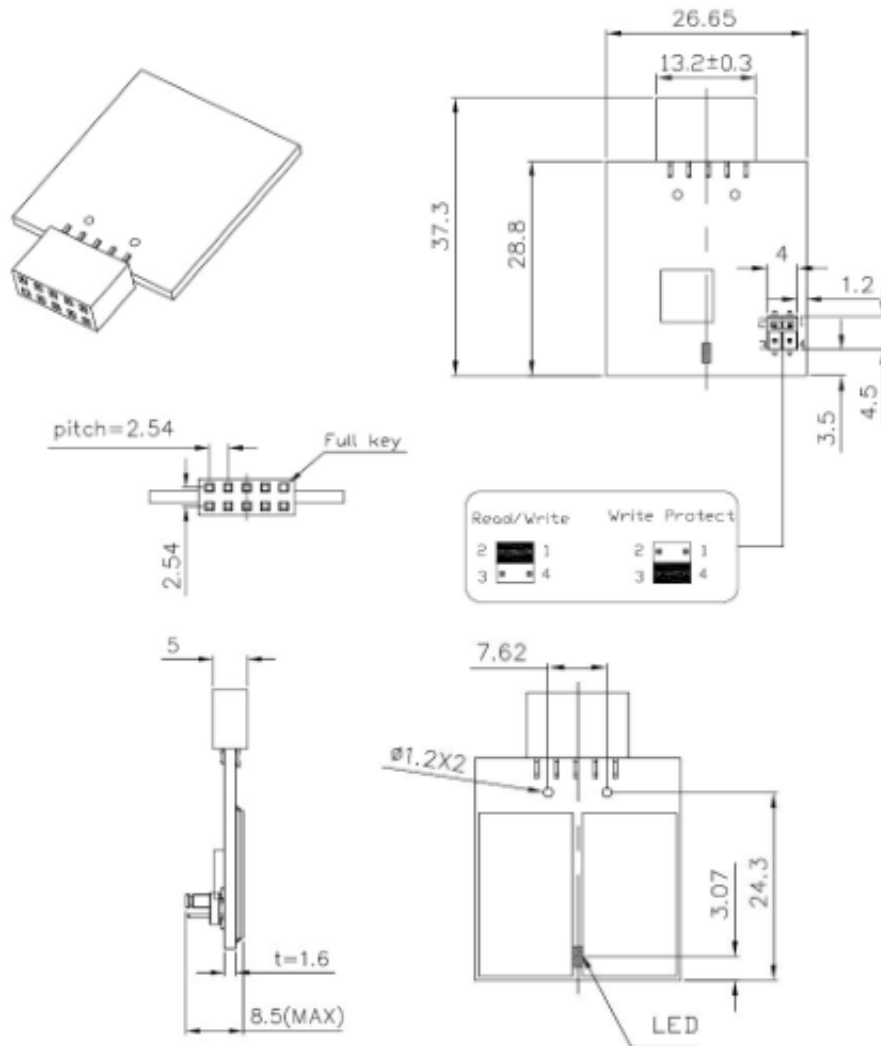
USB Disk Module FMS-UMxxxxXXXXS-XXXXX



6.2 Vertical Design

6.2.1 Type D (STD 180D) Standard 180 Degree

Length	37.3 mm	Width	26.65mm	Height (Max)	8.5 mm
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Unit: mm
Tolerance: ± 0.20

USB Disk Module

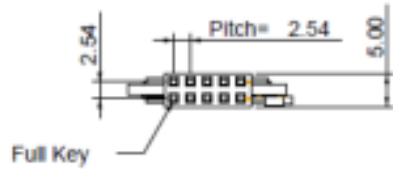
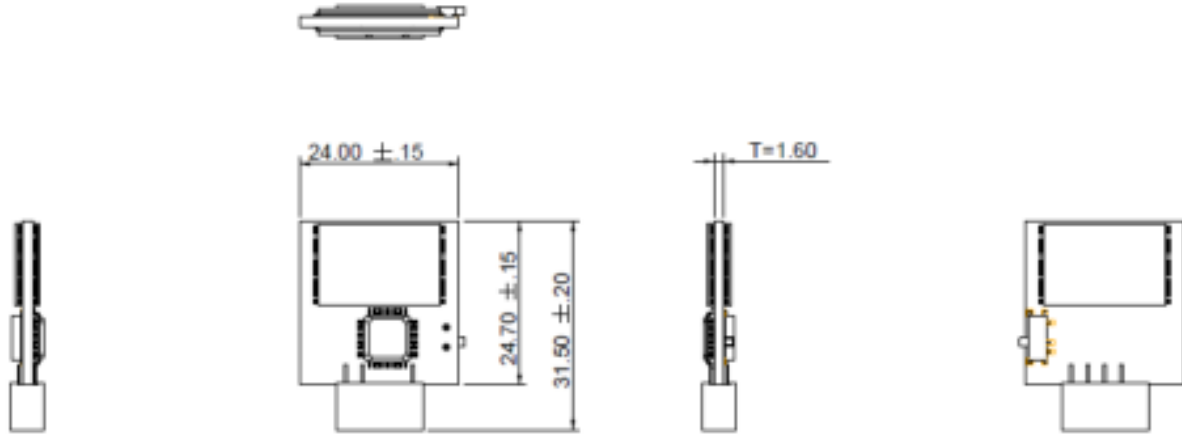
FMS-UMxxxxXXXXS-XXXXX



6.2.2 Type D (LP 180D)

Low Profile 180 Degree

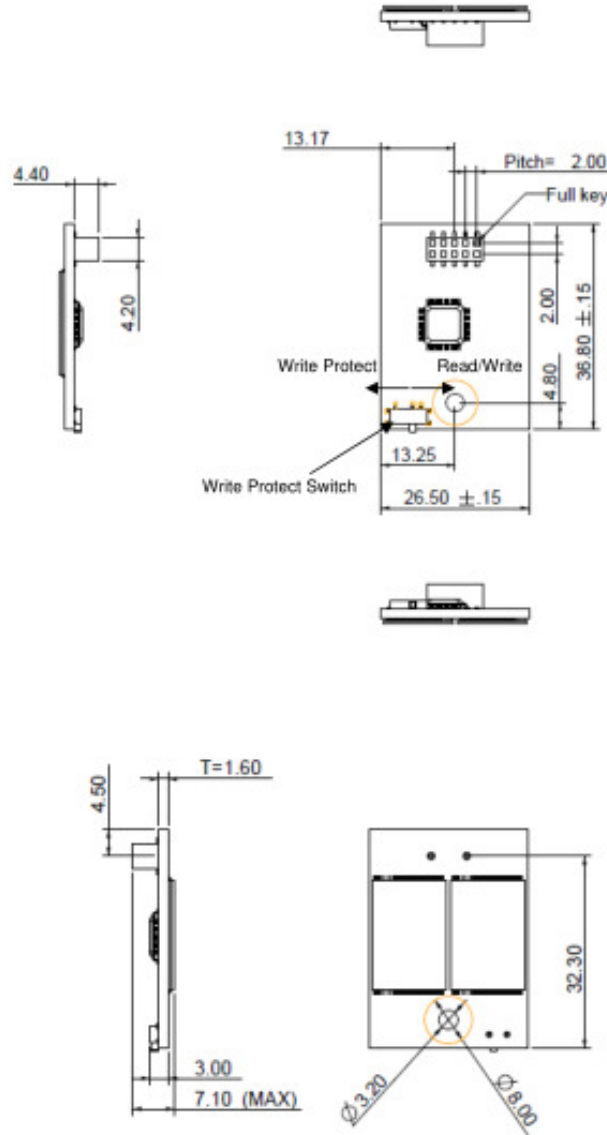
Length	31.50 mm	Width	24mm	Height (Max)	5 mm
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Unit: mm
Tolerance: ± 0.20

6.2.3 Type E (LP 90D-MS)
Low Profile 90 Degree with Mounting Screw

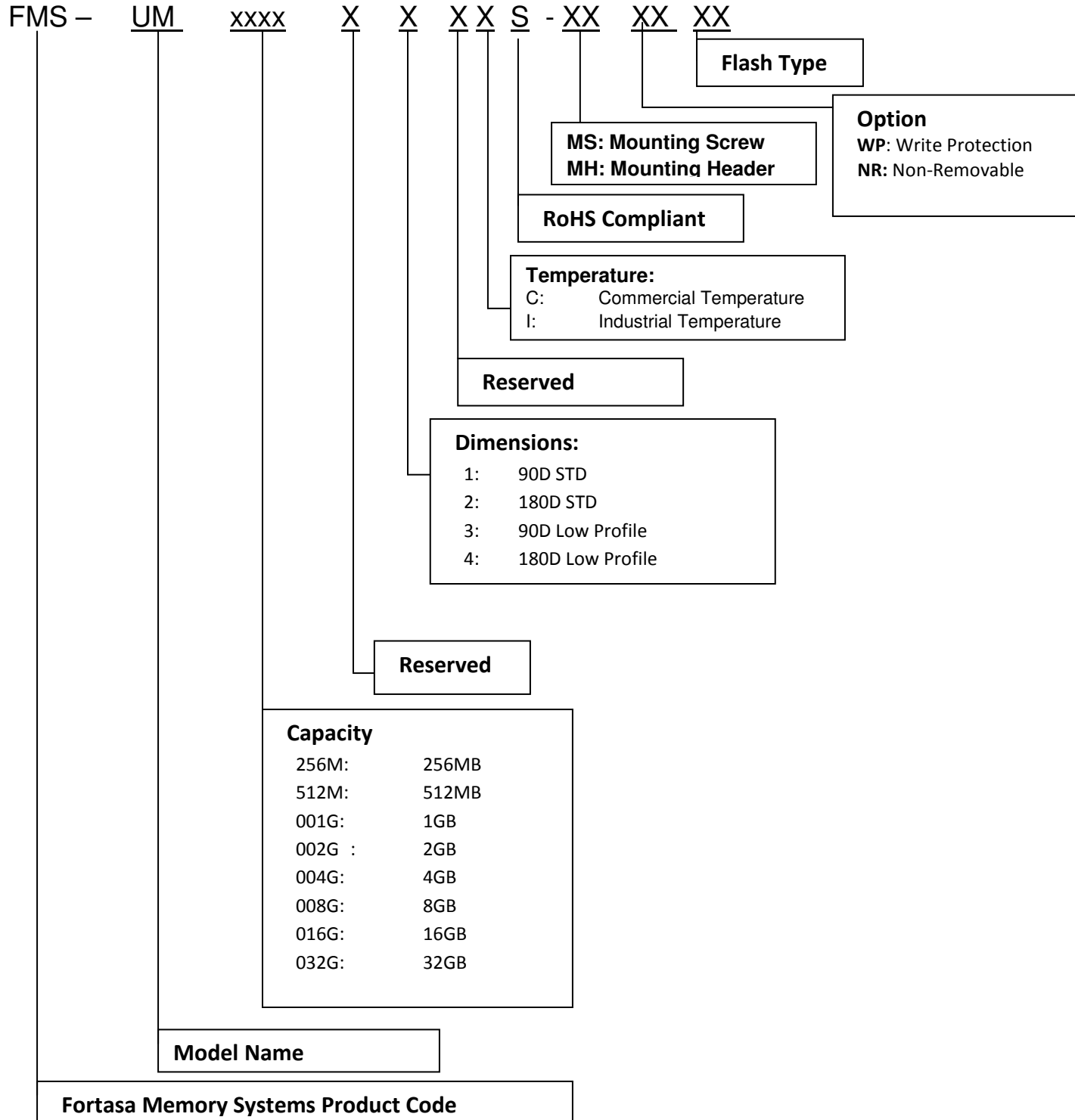
Length	36.80mm	Width	26.5 mm	Height (Max)	7.10 mm
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Unit: mm
Tolerance: ± 0.20

7. Product Ordering Information

7.1 Product Code Designation



7.2 Valid Combinations

7.2.1 Type A (STD 90D)

Standard 90 Degree

Capacity	Standard Temperature	Industrial Temperature
256MB	FMS-UM256MK10CS-2T	FMS-UM256MD10IS-2T
512MB	FMS-UM512MK10CS-2T	FMS-UM512MD10IS-2T
1GB	FMS-UM001GK10CS-2T	FMS-UM001GD10IS-2T
2GB	FMS-UM002GK10CS-2T	FMS-UM002GD10IS-2T
4GB	FMS-UM004GK10CS-2T	FMS-UM004GD10IS-2T
8GB	FMS-UM008GK10CS-2T	FMS-UM008GD10IS-2T
16GB	FMS-UM016GK10CS-2T	FMS-UM016GD10IS-2T
32GB	FMS-UM032GK10CS-2T	FMS-UM032GD10IS-2T

7.2.2 Type B (STD 90D-MH)

Standard 90 Degree – Mounting Header

Capacity	Standard Temperature	Industrial Temperature
256MB	FMS-UM256MK10CS-2MHT	FMS-UM256MD10IS-2MHT
512MB	FMS-UM512MK10CS-2MHT	FMS-UM512MD10IS-2MHT
1GB	FMS-UM001GK10CS-2MHT	FMS-UM001GD10IS-2MHT
2GB	FMS-UM002GK10CS-2MHT	FMS-UM002GD10IS-2MHT
4GB	FMS-UM004GK10CS-2MHT	FMS-UM004GD10IS-2MHT
8GB	FMS-UM008GK10CS-2MHT	FMS-UM008GD10IS-2MHT
16GB	FMS-UM016GK10CS-2MHT	FMS-UM016GD10IS-2MHT
32GB	FMS-UM032GK10CS-2MHT	FMS-UM032GD10IS-2MHT

7.2.3 Type C (STD 90D-MS)

Standard 90 Degree Mounting Screw

Capacity	Standard Temperature	Industrial Temperature
256MB	FMS-UM256MK10CS-2MST	FMS-UM256MD10IS-2MST
512MB	FMS-UM512MK10CS-2MST	FMS-UM512MD10IS-2MST
1GB	FMS-UM001GK10CS-2MST	FMS-UM001GD10IS-2MST
2GB	FMS-UM002GK10CS-2MST	FMS-UM002GD10IS-2MST
4GB	FMS-UM004GK10CS-2MST	FMS-UM004GD10IS-2MST
8GB	FMS-UM008GK10CS-2MST	FMS-UM008GD10IS-2MST
16GB	FMS-UM016GK10CS-2MST	FMS-UM016GD10IS-2MST
32GB	FMS-UM032GK10CS-2MST	FMS-UM032GD10IS-2MST

7.2.4 Type D (STD 180D)

Standard Profile - 180 Degree

Capacity	Standard Temperature	Industrial Temperature
256MB	FMS-UM256MK42CS-2T	FMS-UM256ML42IS-2T
512MB	FMS-UM512MK42CS-2T	FMS-UM512ML42IS-2T
1GB	FMS-UM001GK42CS-S	FMS-UM001GL42IS-2T
2GB	FMS-UM002GK42CS-2T	FMS-UM002GL42IS-2T
4GB	FMS-UM004GK42CS-2T	FMS-UM004GL42IS-2T
8GB	FMS-UM008GK42CS-2T	FMS-UM008GL42IS-2T
16GB	FMS-UM016GK42CS-2T	FMS-UM016GL42IS-2T
32GB	FMS-UM032GK42CS-2T	FMS-UM032GL42IS-2T

7.2.5 Type D (LP 180D)

Low Profile 180 Degree

Capacity	Standard Temperature	Industrial Temperature
256MB	FMS-UM256MK42CS-2T	FMS-UM256ML42IS-2T
512MB	FMS-UM512MK42CS-2T	FMS-UM512ML42IS-2T
1GB	FMS-UM001GK42CS-S	FMS-UM001GL42IS-2T
2GB	FMS-UM002GK42CS-2T	FMS-UM002GL42IS-2T
4GB	FMS-UM004GK42CS-2T	FMS-UM004GL42IS-2T
8GB	FMS-UM008GK42CS-2T	FMS-UM008GL42IS-2T

7.2.6 Type E (LP 90D-MS)

Low Profile 90 Degree Mounting Screw

Capacity	Standard Temperature	Industrial Temperature
256MB	FMS-UM256MK31CS-2MST	FMS-UM256ML31IS-2MST
512MB	FMS-UM512MK31CS-2MST	FMS-UM512ML31IS-2MST
1GB	FMS-UM001GK31CS-2MST	FMS-UM001GL31IS-2MST
2GB	FMS-UM002GK31CS-2MST	FMS-UM002GL31IS-2MST
4GB	FMS-UM004GK31CS-2MST	FMS-UM004GL31IS-2MST
8GB	FMS-UM008GK31CS-2MST	FMS-UM008GL31IS-2MST

8. Revision History

Revision	Description	Date
1.0	Official Release	April 26, 2011
1.1	Revised Capacity Specifications	May 24, 2011
1.2	Added 16GB and 32GB models	June 29, 2012
1.3	Updated Type-E Mechanical Diagram	July 18, 2012
2.0	Revised Part Numbering to incorporate new NAND Flash	April 11, 2013
2.1	Updated Performance and Power specs	July 26, 2013
2.2	Revised Type-D – LP Mechanical Drawing	June 10, 2014