

RoHS Compliant
USB Disk Module Series
Datasheet for UDM2 MLC NAND Based Module

December 1, 2015
Revision 1.7



***This Specification Describes the Features and Capabilities of
the Standard 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**
 - 4, 8, 16, 32, 64 GB
- **Fast sustained read performance**
 - Sustained read: up to 33 MB/s
- **Fast sustained write performance**
 - Sustained write: up to 16 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: MLC**
- **Zero Power Data Retention**
 - Batteries not required for data storage
- **Support Ready Boost for Windows Vista**
- **Extended Data Protection (Optional)**
 - Write protection through jumper to prevent data overwrites
- **Support boot-up function for OS**
 - Windows XP Embedded
 - Windows CE
 - Linux
 - Windows 7 Embedded
- **Temperature ranges**
 - Operation:
 - Standard Temperature: 0°C to 70°C
 - Industrial Temperature: -40°C to 85°C
 - Storage: -40°C to 100°C
- **Low power consumption (typical)**
 - Active mode: 175 mA
 - Sleep mode: 80 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 algorithm ensures that consecutive writes of a specific sector are not written physically to the same page in the flash. This spreads flash media usage evenly across all pages, thereby maximizing flash lifetime.

The wear-leveling mechanism provides more than 100,000 write/erase cycles for reliable data storage over an extended period.

1.1.3 Write Protection Mode (Optional)

As an enhanced security option, the USB Disk Module can be fitted with the Write Protect jumper setting. Once enabled, the Write Protect jumper will disable all destructive commands issued to the USB Module. Typically the Write Protect setting is used after the file image has been loaded on the module to prevent any access to the stored data.

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.

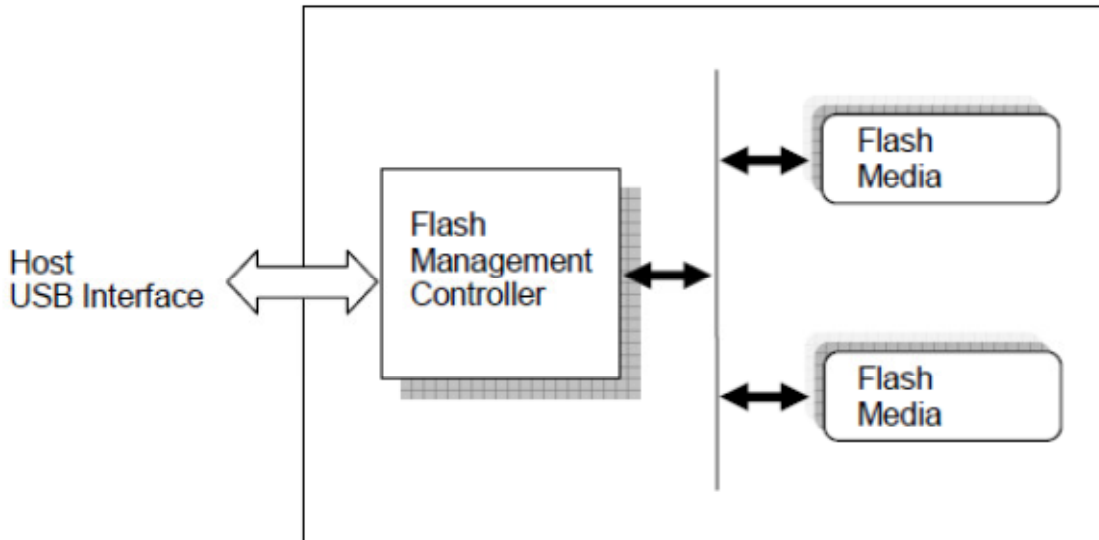


Figure 2-1: Functional block diagram

3. Pin Assignment

This section provides information on pin assignments and signal descriptions.

3.1 Type A, B and C

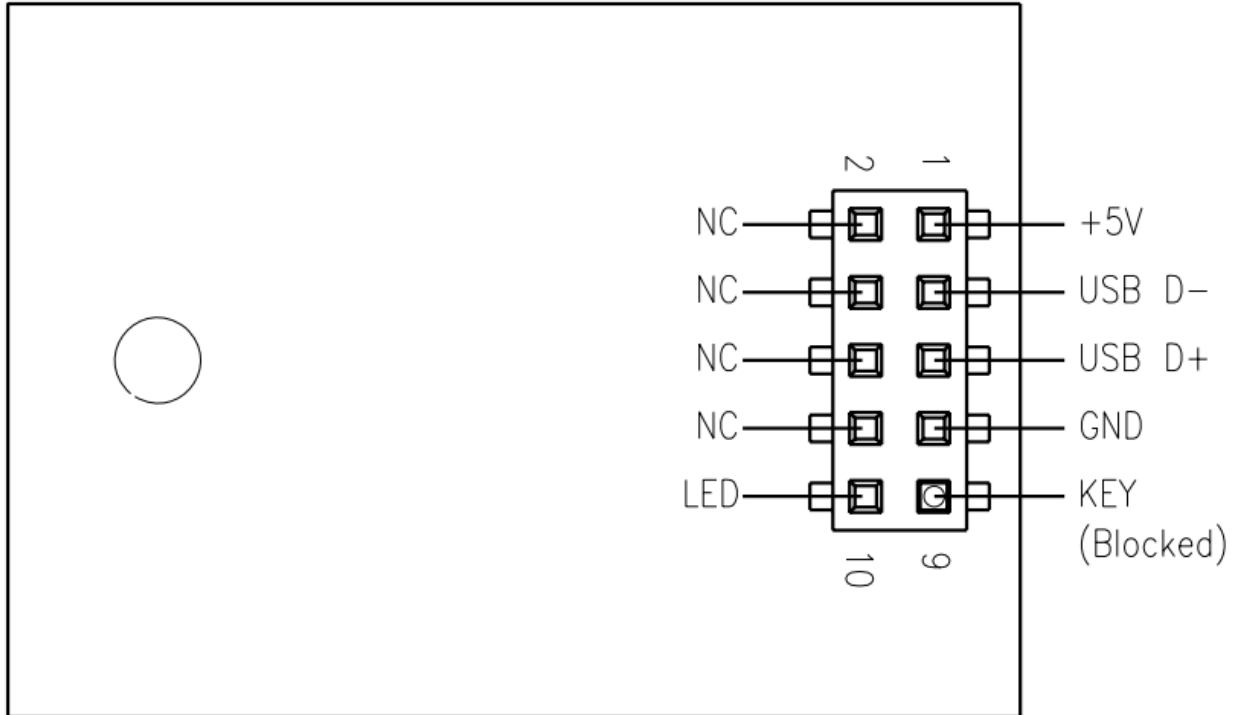


Table 3-1: Pin Assignment of the 10-pin configuration in Type C, and Type E Modules

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 (Low Profile)

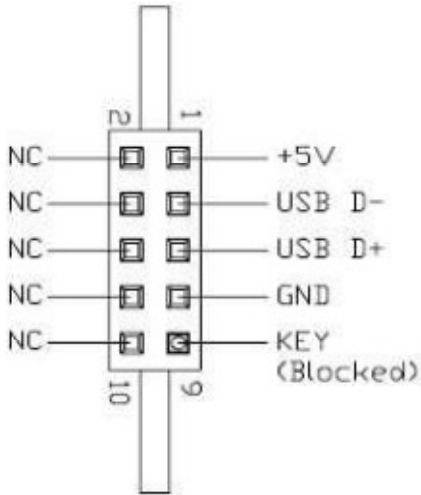


Table 3-2: Pin Assignment of the 10-pin configuration in Type D (Low Profile)

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



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
4GB	4,001,382,400
8GB	8,011,153,408
16GB	16,030,662,656
32GB	32,061,325,312
64GB	64,139,362,304

4.2 Functional Specifications

Table 4-2: Performance Specifications

Capacity \ Performance	4GB	8GB	16GB	32GB	64GB
Sustained read (MB/s)	32	32	33	33	33
Sustained write (MB/s)	10	10	14	16	16

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 4-3.

Table 4-3: Environmental Specifications

Environment		Specification
Temperature	Operation	0°C to 70°C (standard)
	Storage	-40°C to 100°C
Vibration		10 Hz to 500 Hz, 15G, 3 axes, 30 minutes (IEC 68-2-6)
Shock		Duration: 11 ms, 50G, 3 axes, 18 times (IEC 68-2-27)

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 _{IN}	-0.3V	5.8V

Table 5-3: Typical Power Consumption

Performance \ Capacity	4GB	8GB	16GB	32GB	64GB
	Active Mode (mA)	120	120	135	175
Idle Mode (mA)	75	75	80	80	80

Table 5-4: 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 5-5: 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

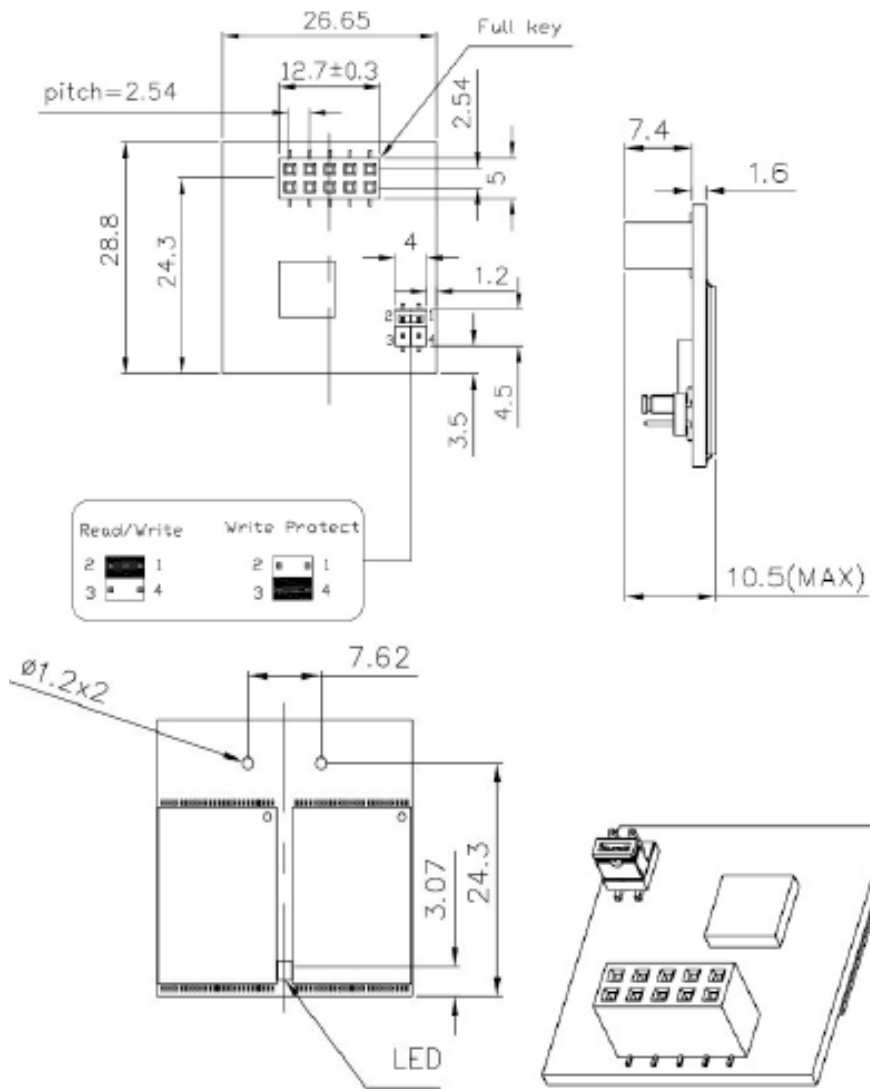
6. Physical Dimension

6.1 Horizontal Design

6.1.1 Type A (STD 90D)

Standard 90 Degree

Length	28.8mm	Width	26.65mm	Height (Max)	10.5 mm
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Unit: mm
 Tolerance: ± 0.2

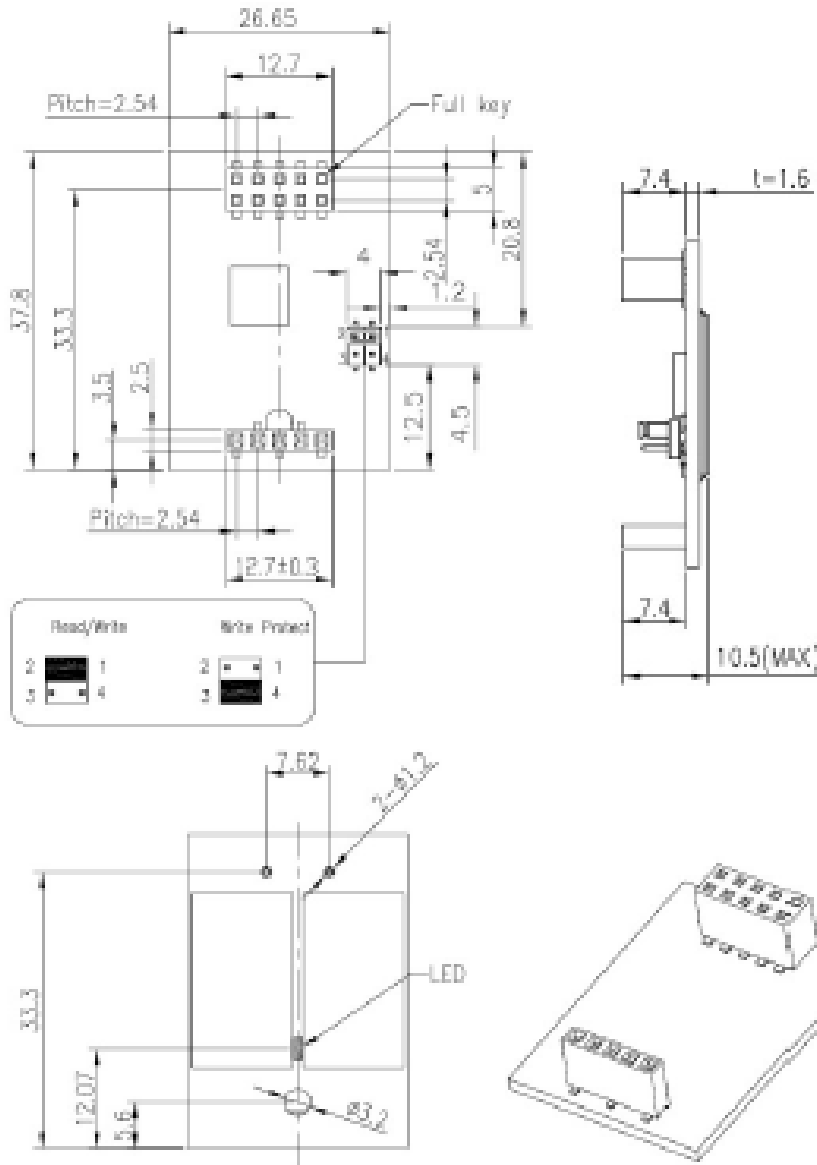
USB Disk Module

FMS-UDMxxxxXXXXS-XXXXXM



6.1.2 Type B (STD 90D with Mounting Header) Standard 90 Degree Mounting Header

Length	37.8 mm	Width	26.65 mm	Height (Max)	10.5 mm
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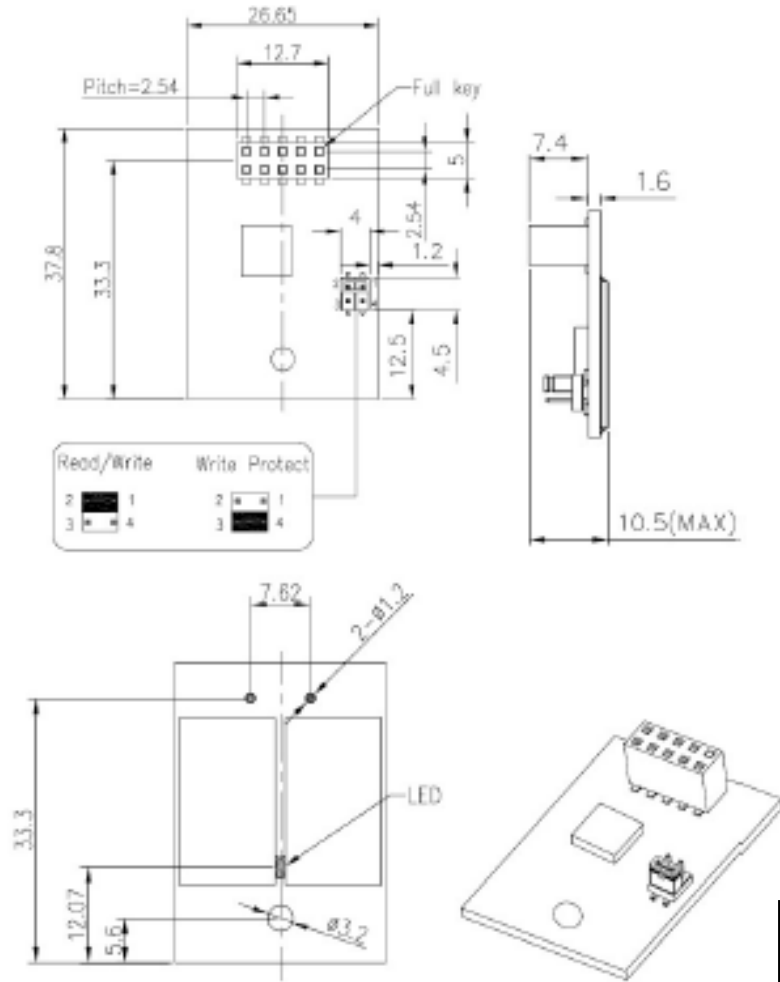
Unit: mm
Tolerance: ± 0.2

USB Disk Module FMS-UDMxxxxXXXS-XXXXXM



6.1.3 Type C (STD 90D-MS) Standard 90 Degree Mounting Screw

Length	37.8 mm	Width	26.5 mm	Height (Max)	10.5 mm
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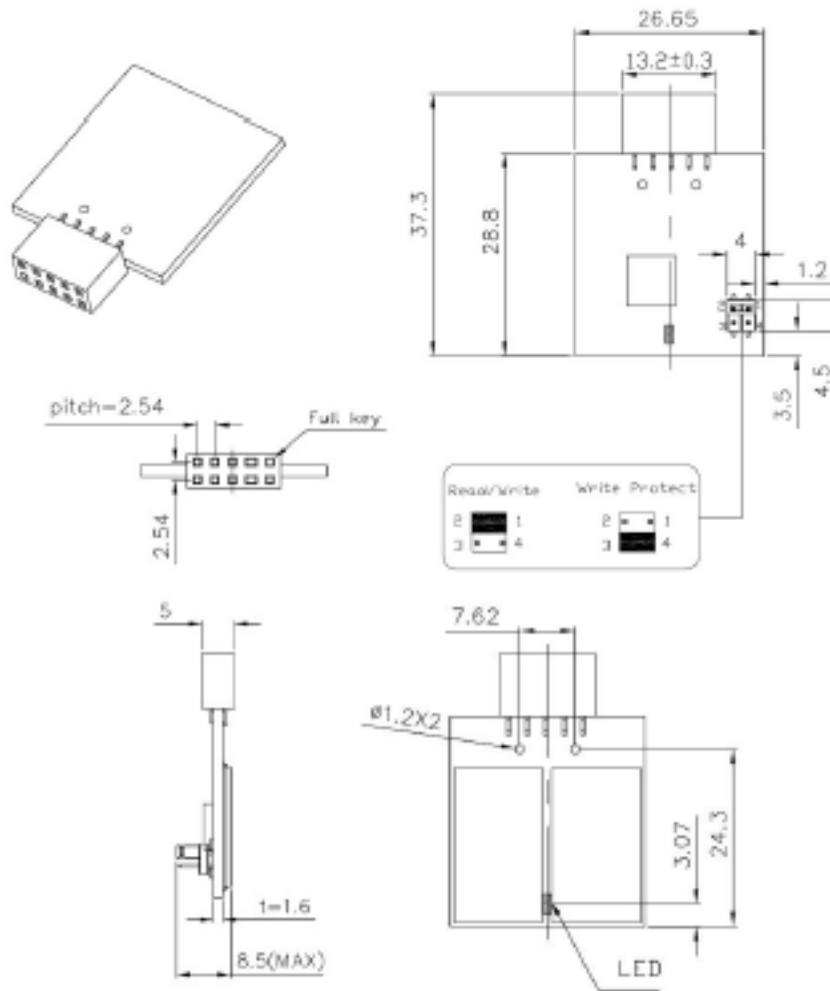
Unit: mm
Tolerance: ± 0.2

6.2 Vertical Design

6.2.1 Type D (STD 180D)

Standard 180 Degree

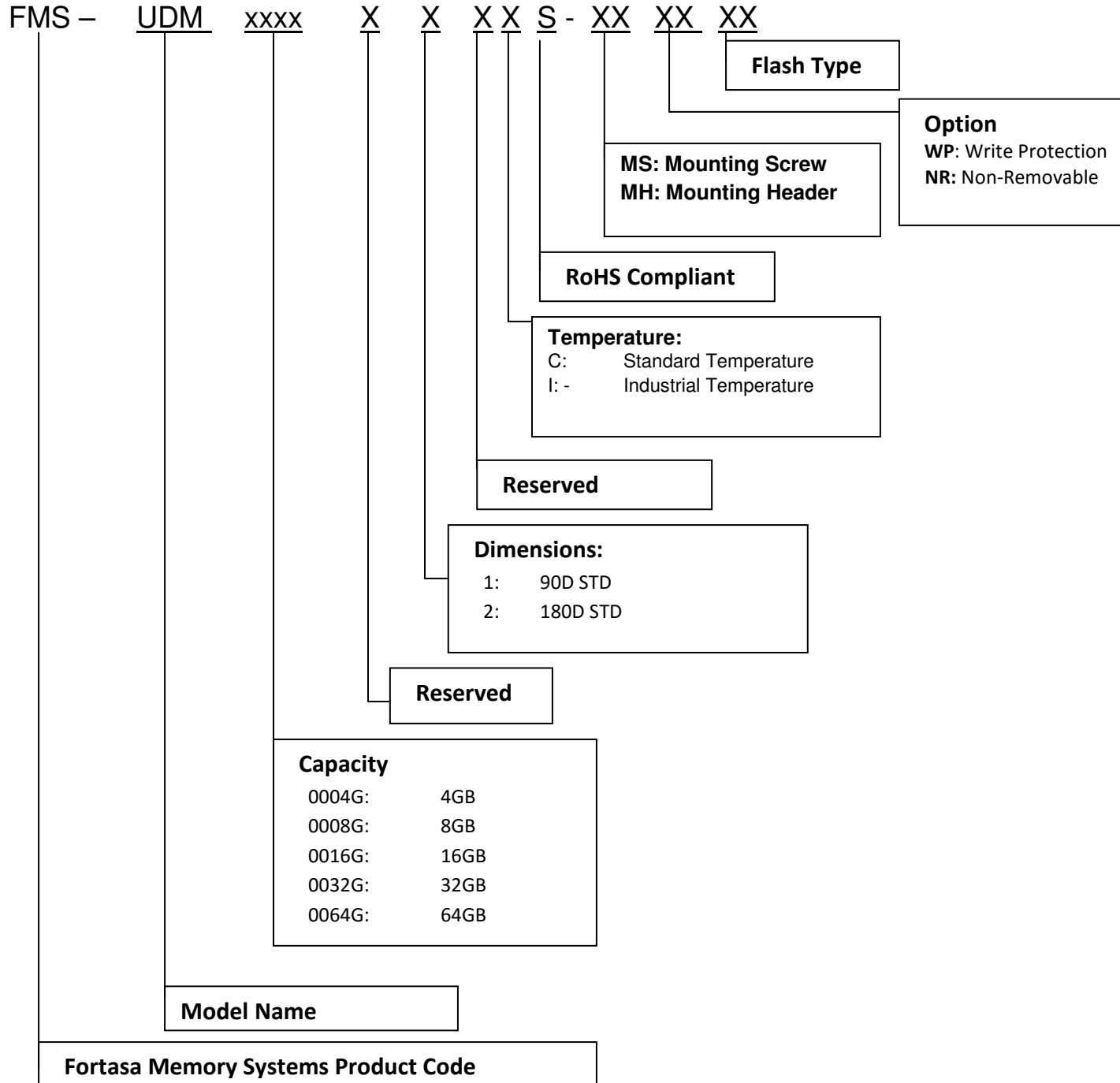
Length	37.3 mm	Width	26.5 mm	Height (Max)	8.5 mm
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Unit: mm
 Tolerance: ± 0.2

7. Product Ordering Information

7.1 Product Code Designation



7.2 Valid Combinations

7.2.1 Type C (STD 90D)

Standard 90 Degree

Capacity	Standard Temperature	Industrial Temperature
4GB	FMS-UDM004GR13CS-CM	FMS-UDM004GR13IS-CM
8GB	FMS-UDM008GR13CS-CM	FMS-UDM008GR13IS-CM
16GB	FMS-UDM016GR13CS-CM	FMS-UDM016GR13IS-CM
32GB	FMS-UDM032GR13CS-CM	FMS-UDM032GR13IS-CM
64GB	FMS-UDM064GR13CS-CM	FMS-UDM064GR13IS-CM

7.2.2 Type B (STD 90D-MH)

Standard 90 Degree Mounting Header

Capacity	Standard Temperature	Industrial Temperature
4GB	FMS-UDM004GR13CS-MHCM	FMS-UDM004GR13IS-MHCM
8GB	FMS-UDM008GR13CS-MHCM	FMS-UDM008GR13IS-MHCM
16GB	FMS-UDM016GR13CS-MHCM	FMS-UDM016GR13IS-MHCM
32GB	FMS-UDM032GR13CS-MHCM	FMS-UDM032GR13IS-MHCM
64GB	FMS-UDM064GR13CS-MHCM	FMS-UDM064GR13IS-MHCM

7.2.3 Type C (STD 90D-MS)

Standard 90 degree Mounting Screw

Capacity	Standard Temperature	Industrial Temperature
4GB	FMS-UDM004GR13CS-MSCM	FMS-UDM004GR13IS-MSCM
8GB	FMS-UDM008GR13CS-MSCM	FMS-UDM008GR13IS-MSCM
16GB	FMS-UDM016GR13CS-MSCM	FMS-UDM016GR13IS-MSCM
32GB	FMS-UDM032GR13CS-MSCM	FMS-UDM032GR13IS-MSCM
64GB	FMS-UDM064GR13CS-MSCM	FMS-UDM064GR13IS-MSCM

USB Disk Module

FMS-UDMxxxxXXXS-XXXXM



7.2.4 Type D (STD 180D)

Standard 180 Degree

Capacity	Standard Temperature	Industrial Temperature
4GB	FMS-UDM004GR23CS-CM	FMS-UDM004GR23IS-CM
8GB	FMS-UDM008GR23CS-CM	FMS-UDM008GR23IS-CM
16GB	FMS-UDM016GR23CS-CM	FMS-UDM016GR23IS-CM
32GB	FMS-UDM032GR23CS-CM	FMS-UDM032GR23IS-CM
64GB	FMS-UDM064GR23CS-CM	FMS-UDM064GR23IS-CM

8. Revision History

Revision	Description	Date
1.0	Official Release	December 13, 2011
1.1	Updated Performance Table	May 10, 2012
1.2	Updated Power Consumption	June 29, 2012
1.3	Updated Product Ordering Information	February 3, 2015
1.4	Updated Fortasa Corporate Location	February 28, 2015
1.5	Added Industrial Temperature Support	March 10, 2015
1.6	Revised Industrial Temperature Part Numbers	March 23, 2015
1.7	Updated Power Consumption Section	December 1, 2015