RoHS Compliant

USB-Disk Module Ⅱ *Plus*

Specification

May 24, 2011

Version 1.1

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FEATURES:

- **USB2.0 High-Speed and USB1.1 Full-Speed compatible interface**
- **Capacity**
  - 256, 512 MB
  - 1, 2, 4, 8 GB
- **Fast sustained read performance**
  - Sustained read: 30 MB/s
- **Fast sustained write performance**
  - Sustained write: 25 MB/s
- **Intelligent USB Module**
  - Implements dynamic wear-leveling algorithms to substantially increase longevity of flash media
  - BCH (24 bit) Error Detection Code/Error Correction Code (EDC/ECC)
  - Intrinsic data integrity after power loss
  - Wear leveling algorithm that provides more reliable data storage over an extended period
- **Extended Data Protection (Optional)**
  - Write protection setting by jumper for prevention of data overwrites.
- **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
- **Temperature ranges**
  - 0℃ to 70℃ for operation (standard)
  - -40℃ to 85℃ for operation (ET [1])
  - -40℃ to 100℃ for storage
- **Power consumption (typical)**
  - Active mode: 181 mA
  - Sleep mode: 402 μA
- **Connector**
  - 10-pin (2x5) female header
- **RoHS Compliant**
- **Support Non-Removable Setting**[2]

1. Extended Temperature
2. Standard Temperature Exclusive

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1. General Description

Apacer's 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 as well as more cost-effective designs, 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 Power Management Unit (PMU)

The power management unit (PMU) controls the power consumption of the UDM. It can dramatically extend product battery life by leaving the idle part of the circuitry into sleep mode. The PMU has zero wake-up latency.

1.1.2 SRAM Buffer

The SRAM buffer is a key contributor to the USB controller performance. It optimizes data writes to the flash.

1.1.3 Error Correction Code (ECC)

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

1.1.4 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, Apacer'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.

1.1.5 Write Protection Mode (Optional)

When the device is configured to the Write-Protection mode, it enhances the data security and protection. This feature prevents the stored data from inadvertent system writes or erases, and viruses.

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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.

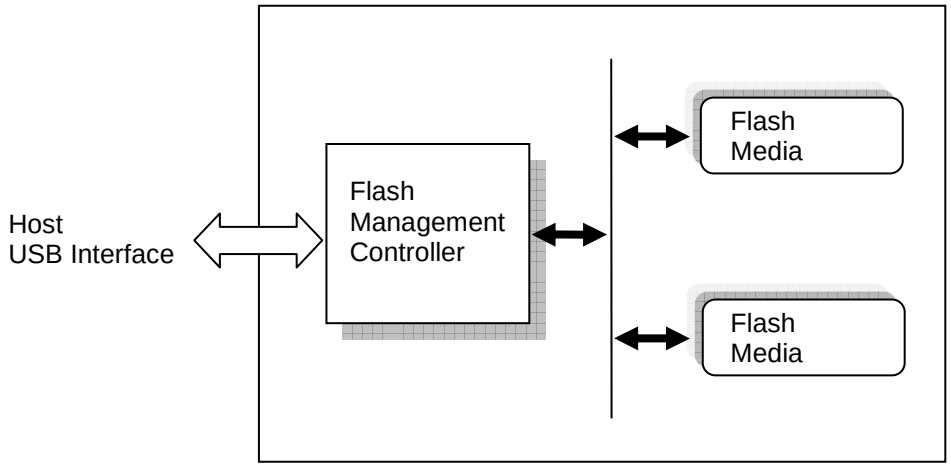


Figure 2-1: Functional block diagram

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3. Pin Assignment

This chapter provides the information on the pin assignments and signal descriptions.

3.1 Type A, Type B, Type C, and Type E

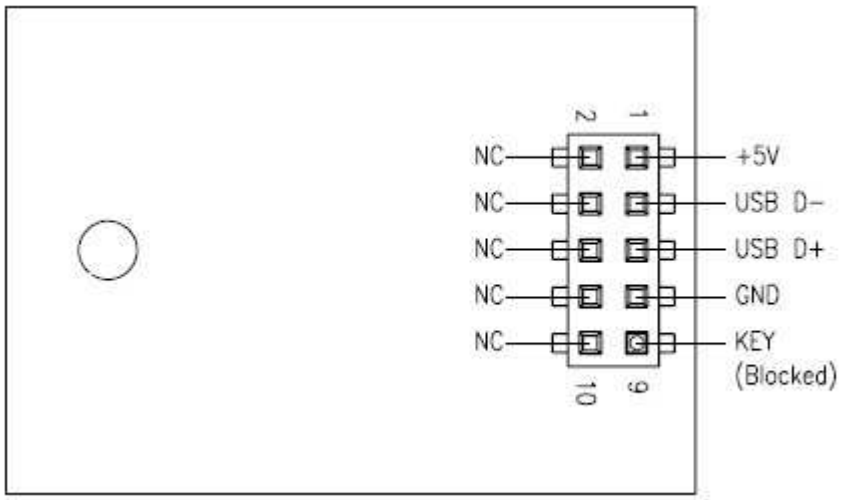


Table 3-1: Pin Assignment of the 10-pin configuration in Type A, Type B, Type C, and Type E

Pin	Signal	Pin	Signal
1	+5V	2	N.C
3	USB D-	4	N.C
5	USB D+	6	N.C
7	GND	8	N.C
9	Key (Blocked)	10	N.C

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3.2 Type D（STD）

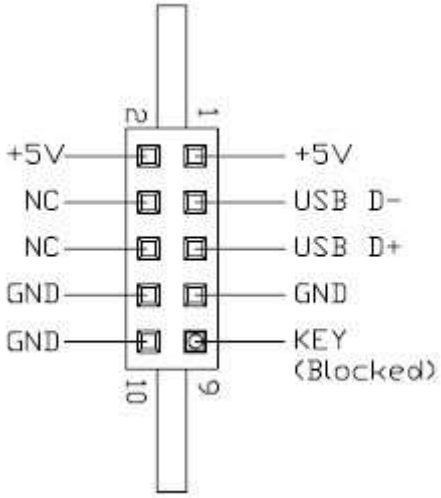


Table 3-2: Pin Assignment of the 10-pin configuration in Type D (STD)

Pin	Signal	Pin	Signal
1	+5V	2	+5V
3	USB D-	4	N.C
5	USB D+	6	N.C
7	GND	8	GND
9	Key (Blocked)	10	GND

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3.3 Type D（LP）

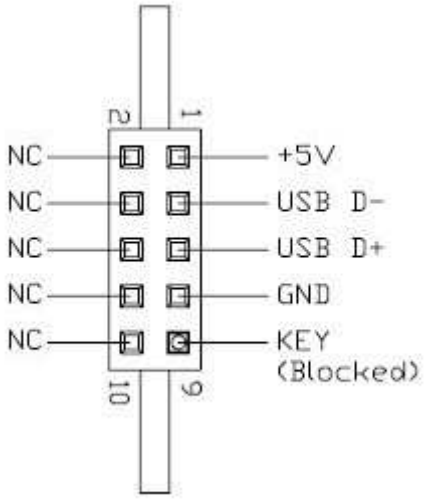


Table 3-3: Pin Assignment of the 10-pin configuration in Type D (LP)

Pin	Signal	Pin	Signal
1	+5V	2	N.C
3	USB D-	4	N.C
5	USB D+	6	N.C
7	GND	8	N.C
9	Key (Blocked)	10	N.C

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4. Capacity Specifications

The USB-Disk Module product family is available as below table matrix.

Table 4-1: Capacity Specification

Density	Total Bytes
256MB	254,509,056
512 MB	512,458,752
1GB	1,028,358,144
2GB	2,060,156,928
4GB	4,120,920,064
8GB	8,248,131,584

4.1 Functional Specifications

Table 4-2: Performance Specifications

Capacity / Performance	256 MB	512 MB / 1 GB	2 GB	4 GB	8 GB
Sustained read (MB/s)	15	25	25	30	25
Sustained write (MB/s)	9	10	15	25	20

4.2 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

Temperature	Operation	0℃ to 70℃ (Std.); -40℃ to 85℃ (Ext. Temp.)
	Storage	-40℃ to 100℃
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)	
EMC	FCC, CE	

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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	Voltage
Standard	0℃ to 70℃	4.5-5.5V
Extended Temperature	-40℃ to 85℃	

Table 5-2: Absolute maximum power pin stress ratings

Parameter	Symbol	Min	Max	Unit
Power Supply Input	V_{DD}- V_{SS}	-0.3	5.5	V
Voltage on any pin except VDD with respect to GND	V_{IN}	–ss - 0.3	V_{DD} +0.3	V

5.1 AC Characteristics

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

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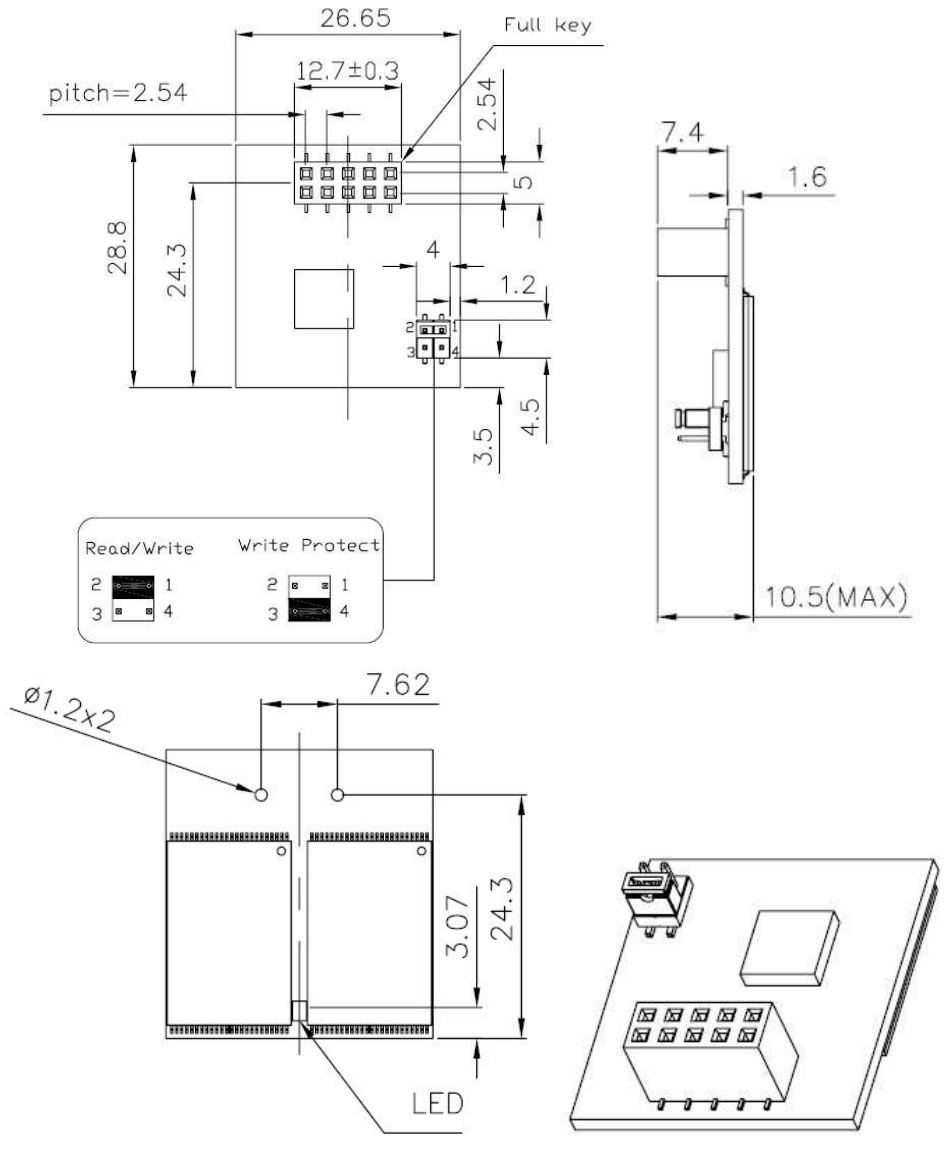
6. Physical Dimension

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



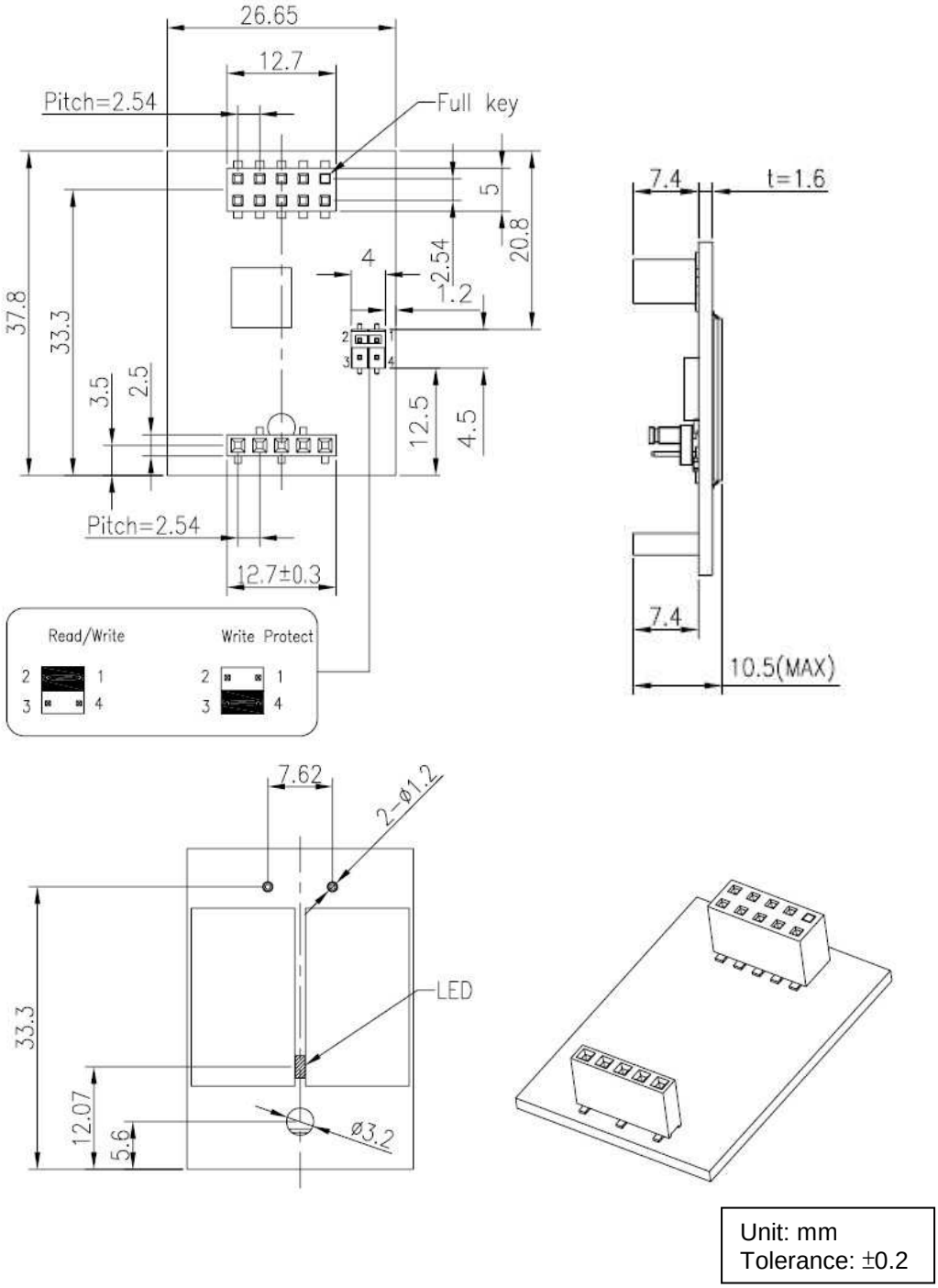
Unit: mm
Tolerance: ±0.2

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6.1.2 Type B (STD 90D-MH)

Standard 90 Degree Mounting Header

Length	37.8mm	Width	26.65mm	Height (Max)	10.5 mm



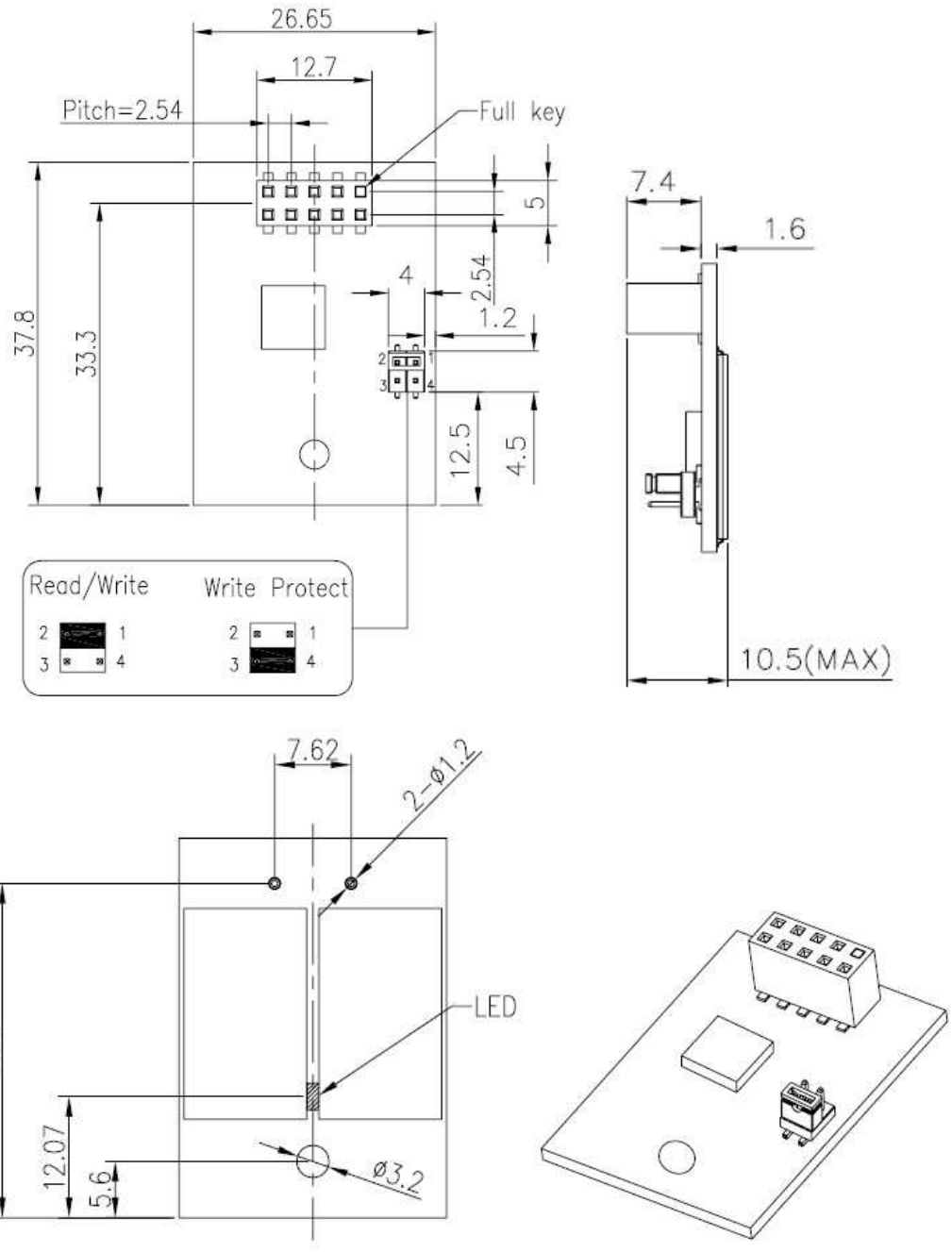
Unit: mm
Tolerance: ±0.2

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6.1.3 Type C (STD 90D-MS)

Standard 90 Degree Mounting Screw

Length	37.8mm	Width	26.65mm	Height (Max)	10.5 mm



Unit: mm
Tolerance: ±0.2

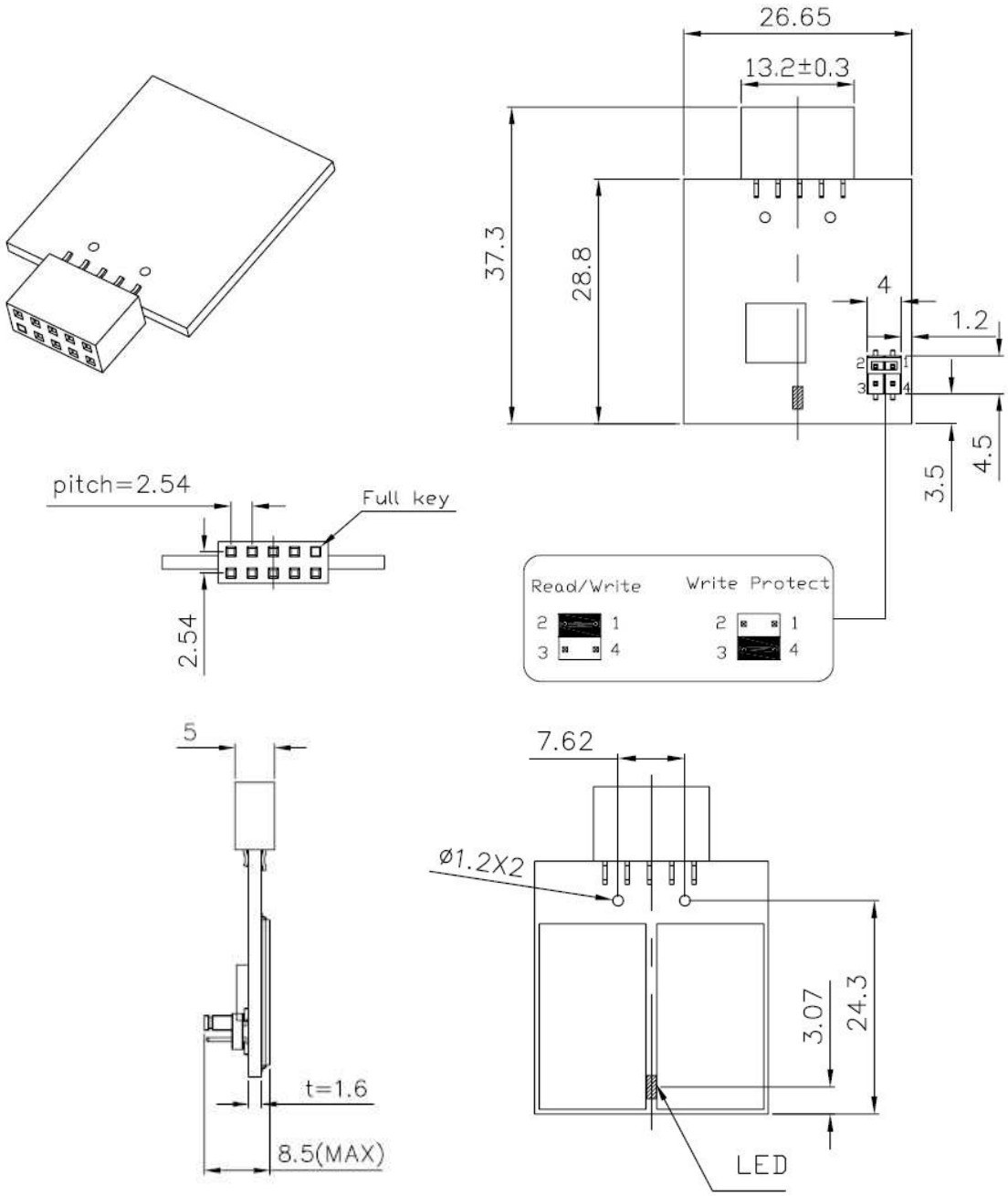
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6.2 Vertical Design

6.2.1 Type D (STD 180D)

Standard 180 Degree

Length	37.3mm	Width	26.65mm	Height (Max)	8.5 mm



Unit: mm
Tolerance: ±0.2

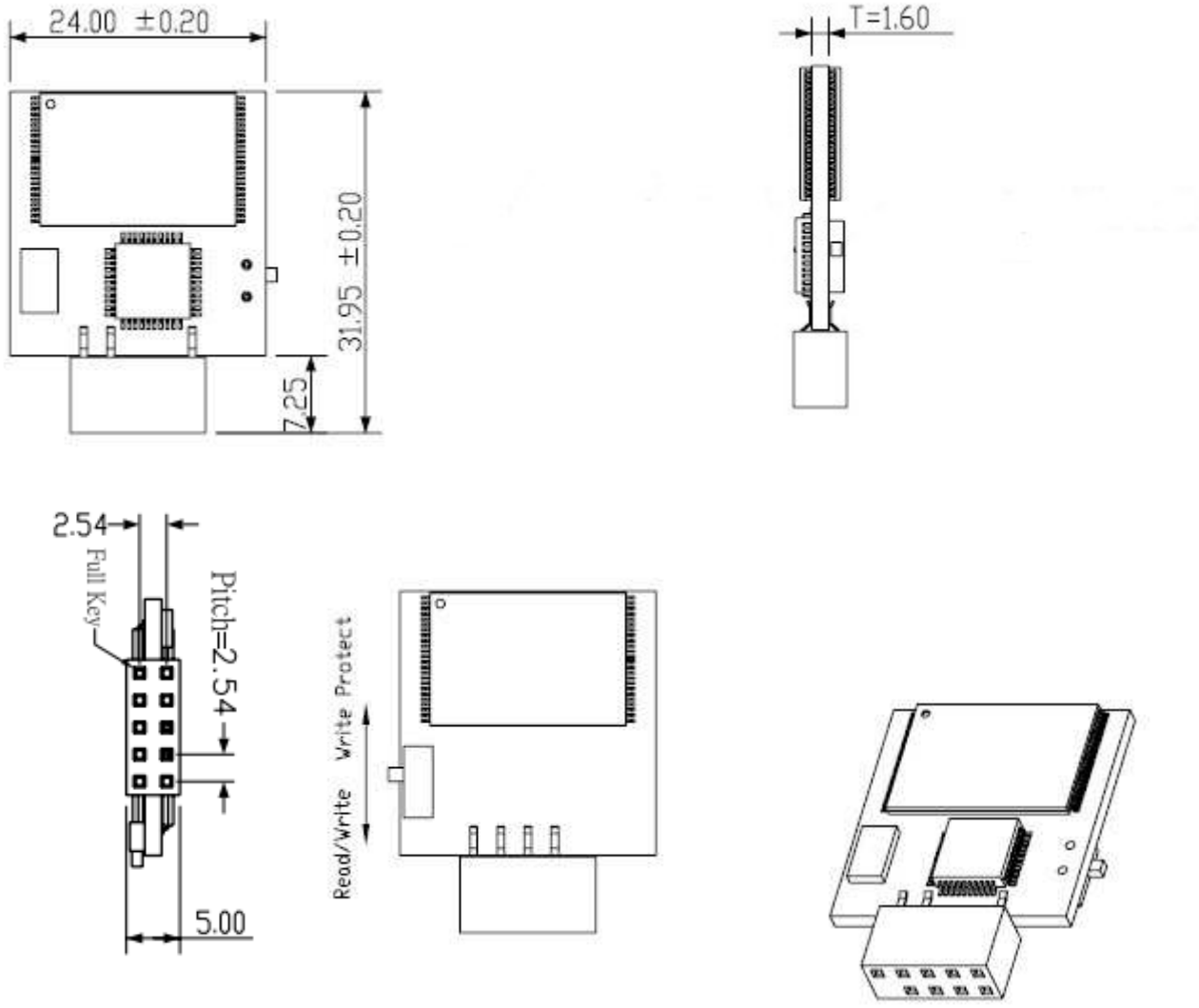
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6.3 Low Profile Design

6.3.1 Type D (LP 180D)

Low Profile 180 Degree

Length	31.95mm	Width	24mm	Height (Max)	5 mm



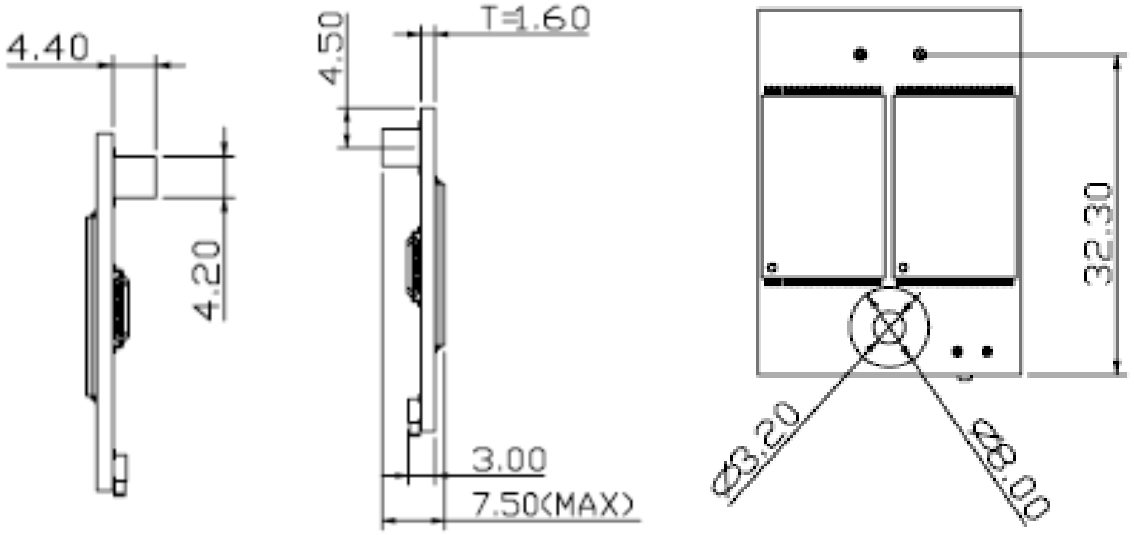
Unit: mm
Tolerance: ±0.2

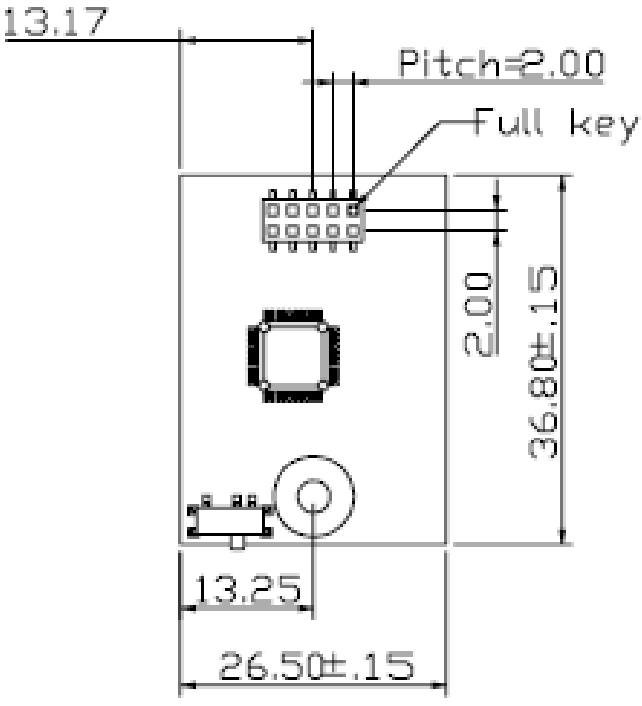
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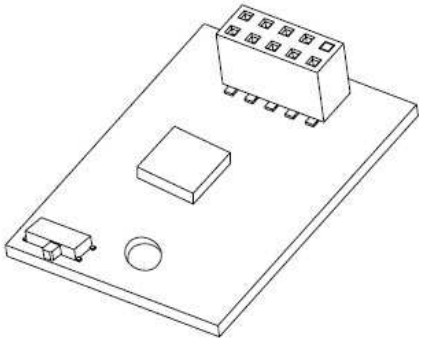
6.3.2 Type E (LP 90D-MS)

Low Profile 90 Degree Mounting Screw

Length	36.8mm	Width	26.5mm	Height (Max)	7.5 mm







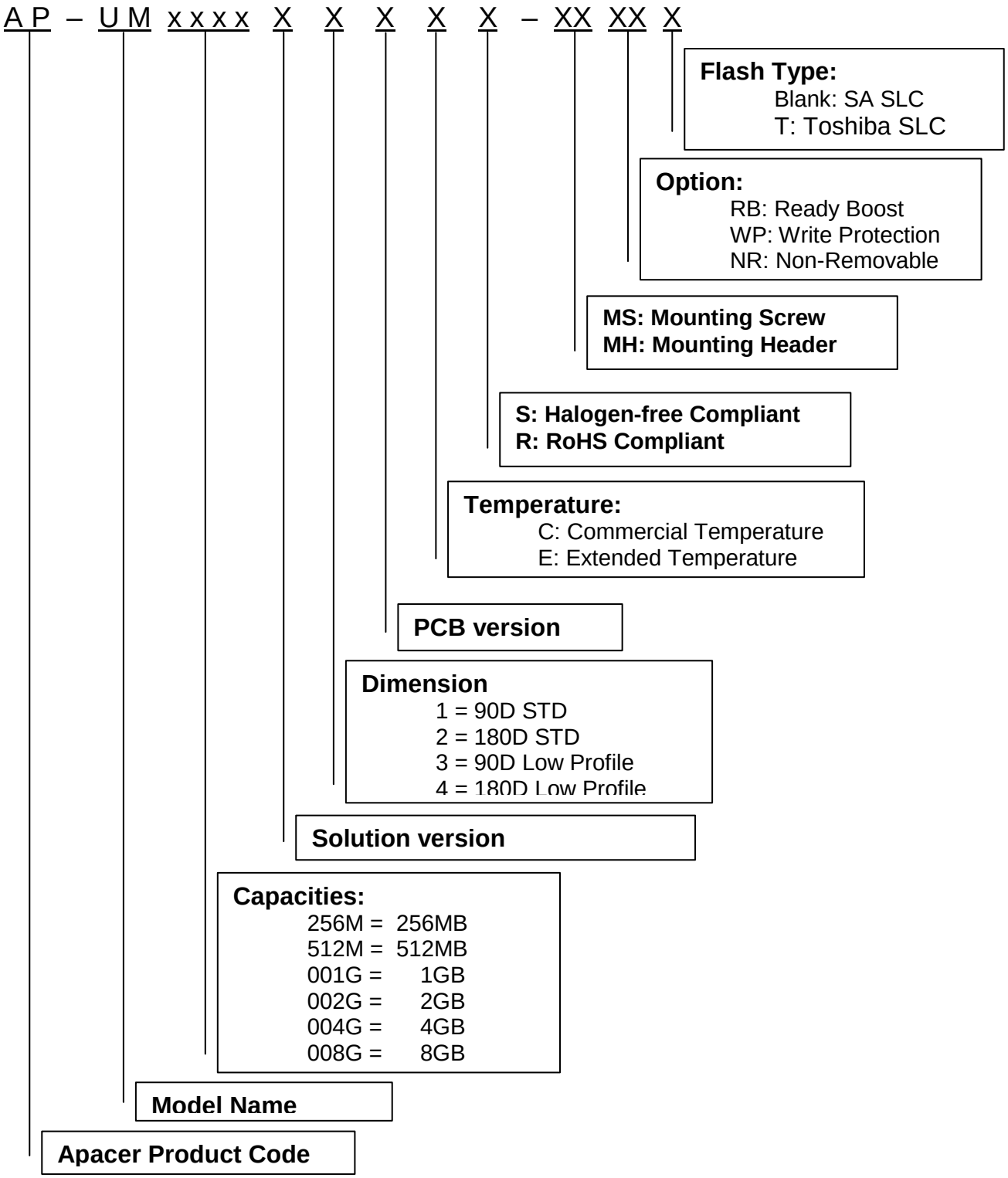
Write Protect Read/Write

Unit: mm
Tolerance: ±0.2

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7. Product Ordering Information

7.1 Product Code Designation



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7.2 Valid Combinations

7.2.1 Type A (STD 90D)

Standard 90 degree

Capacity	Standard	Extended Temperature
256MB	AP-UM256MN10CS	AP-UM256MQ10ES
512MB	AP-UM512MN10CS	AP-UM512MQ10ES
1GB	AP-UM001GN10CS	AP-UM001GQ10ES
2GB	AP-UM002GN10CS	AP-UM002GQ10ES
4GB	AP-UM004GN10CS	AP-UM004GQ10ES
8GB	AP-UM008GN10CS-T	AP-UM008GQ10ES-T

7.2.2 Type B (STD 90D-MH)

Standard 90 Degree Mounting Header

Capacity	Standard	Extended Temperature
256MB	AP-UM256MN10CS-MH	AP-UM256MQ10ES-MH
512MB	AP-UM512MN10CS-MH	AP-UM512MQ10ES-MH
1GB	AP-UM001GN10CS-MH	AP-UM001GQ10ES-MH
2GB	AP-UM002GN10CS-MH	AP-UM002GQ10ES-MH
4GB	AP-UM004GN10CS-MH	AP-UM004GQ10ES-MH
8GB	AP-UM008GN10CS-MHT	AP-UM008GQ10ES-MHT

7.2.3 Type C (STD 90D-MS)

Standard 90 Degree Mounting Screw

Capacity	Standard	Extended Temperature
256MB	AP-UM256MN10CS-MS	AP-UM256MQ10ES-MS
512MB	AP-UM512MN10CS-MS	AP-UM512MQ10ES-MS
1GB	AP-UM001GN10CS-MS	AP-UM001GQ10ES-MS
2GB	AP-UM002GN10CS-MS	AP-UM002GQ10ES-MS
4GB	AP-UM004GN10CS-MS	AP-UM004GQ10ES-MS
8GB	AP-UM008GN10CS-MST	AP-UM008GQ10ES-MST

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7.2.4 Type D (STD 180D)

Standard 180 Degree

Capacity	Standard	Extended Temperature
256MB	AP-UM256MN20CS	AP-UM256MQ20ES
512MB	AP-UM512MN20CS	AP-UM512MQ20ES
1GB	AP-UM001GN20CS	AP-UM001GQ20ES
2GB	AP-UM002GN20CS	AP-UM002GQ20ES
4GB	AP-UM004GN20CS	AP-UM004GQ20ES
8GB	AP-UM008GN20CS-T	AP-UM008GQ20ES-T

7.2.5 Type D (LP 180D)

Low Profile 180 Degree

Capacity	Standard	Extended Temperature
256MB	AP-UM256MN40CG	AP-UM256MQ40EG
512MB	AP-UM512MN40CG	AP-UM512MQ40EG
1GB	AP-UM001GN40CG	AP-UM001GQ40EG
2GB	AP-UM002GN40CG	AP-UM002GQ40EG
4GB	AP-UM004GN40CG	AP-UM004GQ40EG
8GB	AP-UM008GN40CG-T	AP-UM008GQ40EG-T

7.2.6 Type E (LP 90D-MS)

Low Profile 90 Degree Mounting Screw

Capacity	Standard	Extended Temperature
256MB	AP-UM256MN31CG-MS	AP-UM256MQ31EG-MS
512MB	AP-UM512MN31CG-MS	AP-UM512MQ31EG-MS
1GB	AP-UM001GN31CG-MS	AP-UM001GQ31EG-MS
2GB	AP-UM002GN31CG-MS	AP-UM002GQ31EG-MS
4GB	AP-UM004GN31CG-MS	AP-UM004GQ31EG-MS
8GB	AP-UM008GN31CG-MST	AP-UM008GQ31EG-MST

Note: Valid combinations are those products in mass production or will be in mass production. Consult your Apacer sales representative to confirm availability of valid combinations and to determine availability of new combinations.

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Revision History

Revision	Description	Date
1.0	Official Release	May 16, 2011
1.1	Revised Capacity Specifications	May 24, 2011

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