

*RoHS Compliant*

## **USB-Disk Module II**

*Specification*

**April 23, 2009**

*Version 1.5*



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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: 20 MB/s
- **Intelligent USB Module**
  - Implements dynamic wear-leveling algorithms to substantially increase longevity of flash media
  - BCH (6/12 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
  - Windows XP Professional<sup>1</sup>
- **Temperature ranges**
  - 0°C to 70°C for operation (standard)
  - -40°C to 85°C for operation (ET <sup>2</sup>)
  - -40°C to 100°C for storage
- **Low power consumption (typical)**
  - Active mode: 110 mA
  - Sleep mode: 450  $\mu$ A
- **Connector**
  - 10-pin (2x5) female header
- **RoHS Compliant**

1. Please order NR type. Only support Standard Temperature 2GB, 4GB, 8GB capacity  
2. Extended Temperature

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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

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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 6/12 random single-bit errors for each 512-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.

## 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.

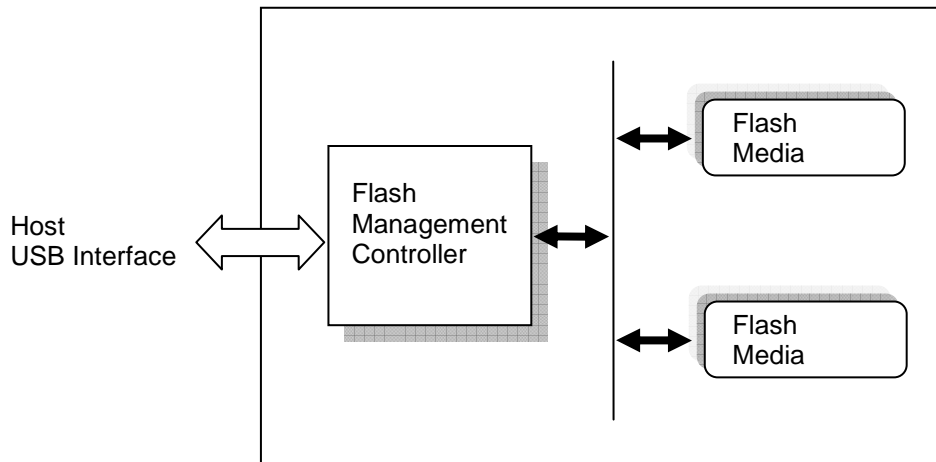
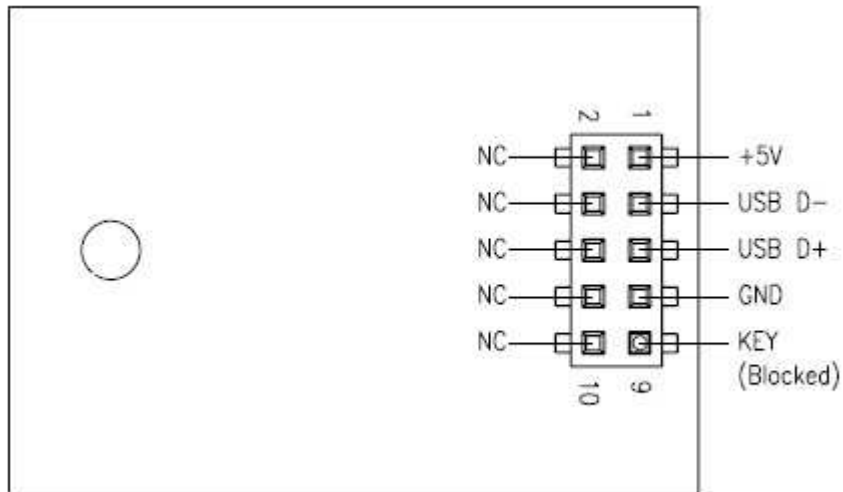


Figure 2-1: Functional block diagram

### 3. Pin Assignment

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

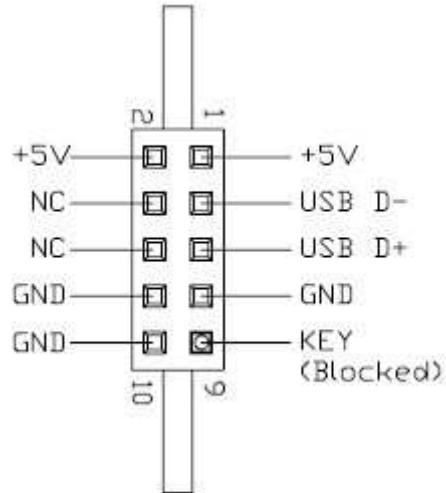
#### 3.1 Type A, Type B, Type C, and Type E



**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

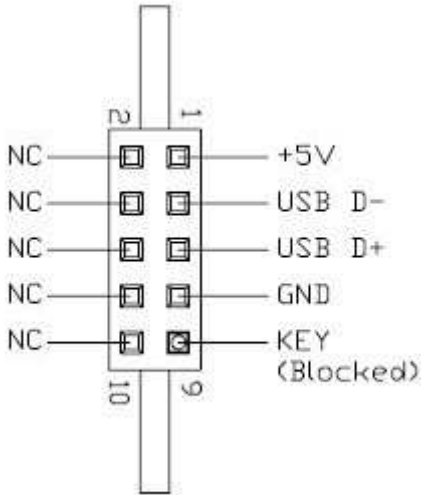
### 3.2 Type D ( STD )



**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

### 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



## 4. Capacity Specifications

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

**Table 4-1: Capacity Specification**

Density	Total Bytes
256MB	253,739,008
512 MB	511,688,704
1GB	1,027,588,096
2GB	2,059,386,880
4GB	4,118,790,144
8GB	8,237,596,672

### 4.1 Functional Specifications

**Table 4-2: Performance Specifications**

	USB 2.0 High-Speed (Max.)
Sustained Read	30 MB/sec
Sustained Write	20 MB/sec

### 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**

<b>Temperature</b>	Operation	0°C to 70°C (standard); -40°C to 85°C (extended temperature)
	Storage	-40°C to 100°C
<b>Vibration</b>	10 Hz to 500 Hz, 15G, 3 axes, 30 minutes (IEC 68-2-6)	
<b>Shock</b>	Duration: 11 ms, 50G, 3 axes, 18 times (IEC 68-2-27)	
<b>EMC</b>	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°C to 70°C	4.5-5.5V
Extended Temperature	-40°C to 85°C	

**Table 5-2:** Absolute maximum power pin stress ratings

Parameter	Symbol	Min	Max	Unit
Power Supply Input	VDD	-0.3	5.5	V
Voltage on any pin except VDD with respect to GND	VIN	-0.3	5.8	V

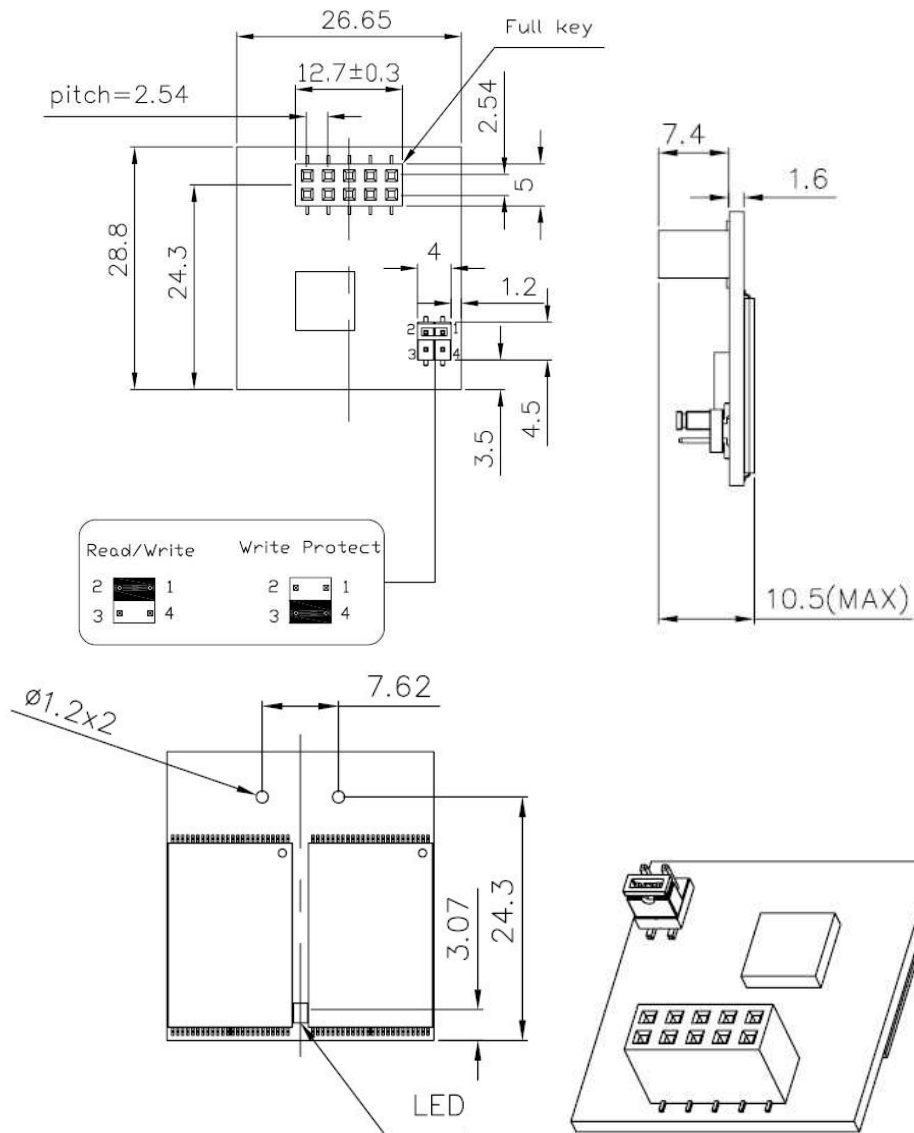
## 6. Physical Dimension

### 6.1 Horizontal Design

#### 6.1.1 Type A (STD 90D)

Standard 90 degree

<b>Length</b>	28.8mm	<b>Width</b>	26.65mm	<b>Height (Max)</b>	10.5 mm
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Unit: mm  
 Tolerance: ±0.2

# USB-Disk Module II

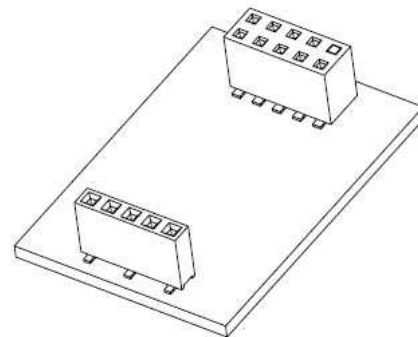
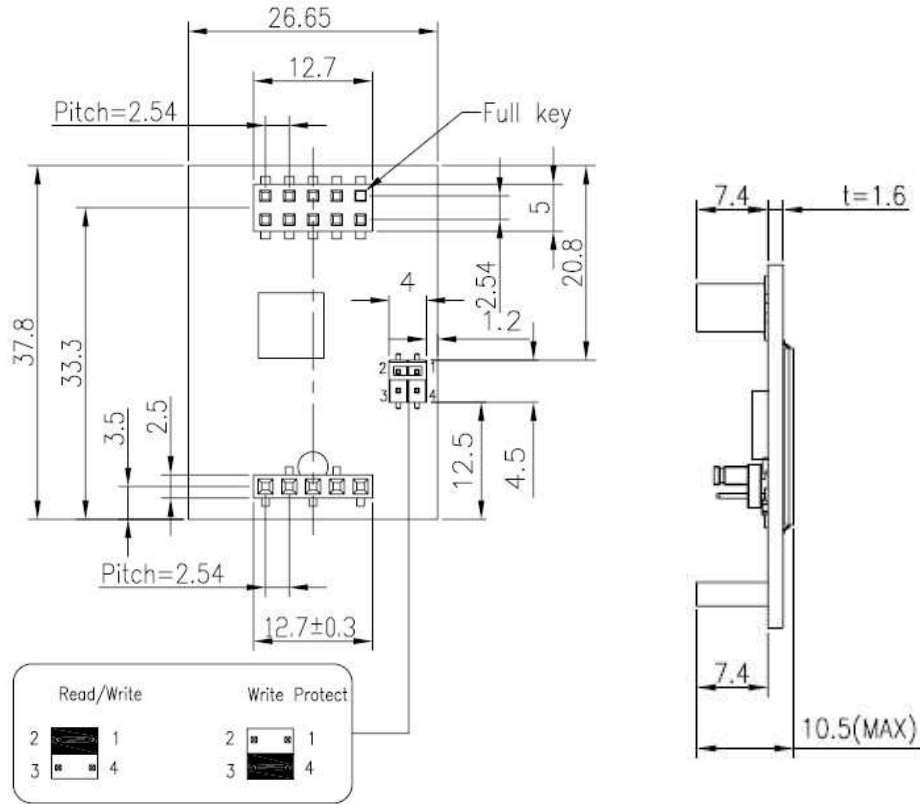
## AP-UMxxxxXXXXG-XXXX



### 6.1.2 Type B (STD 90D-MH)

Standard 90 Degree Mounting Header

<b>Length</b>	37.8mm	<b>Width</b>	26.65mm	<b>Height (Max)</b>	10.5 mm
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Unit: mm  
Tolerance: ±0.2

# USB-Disk Module II

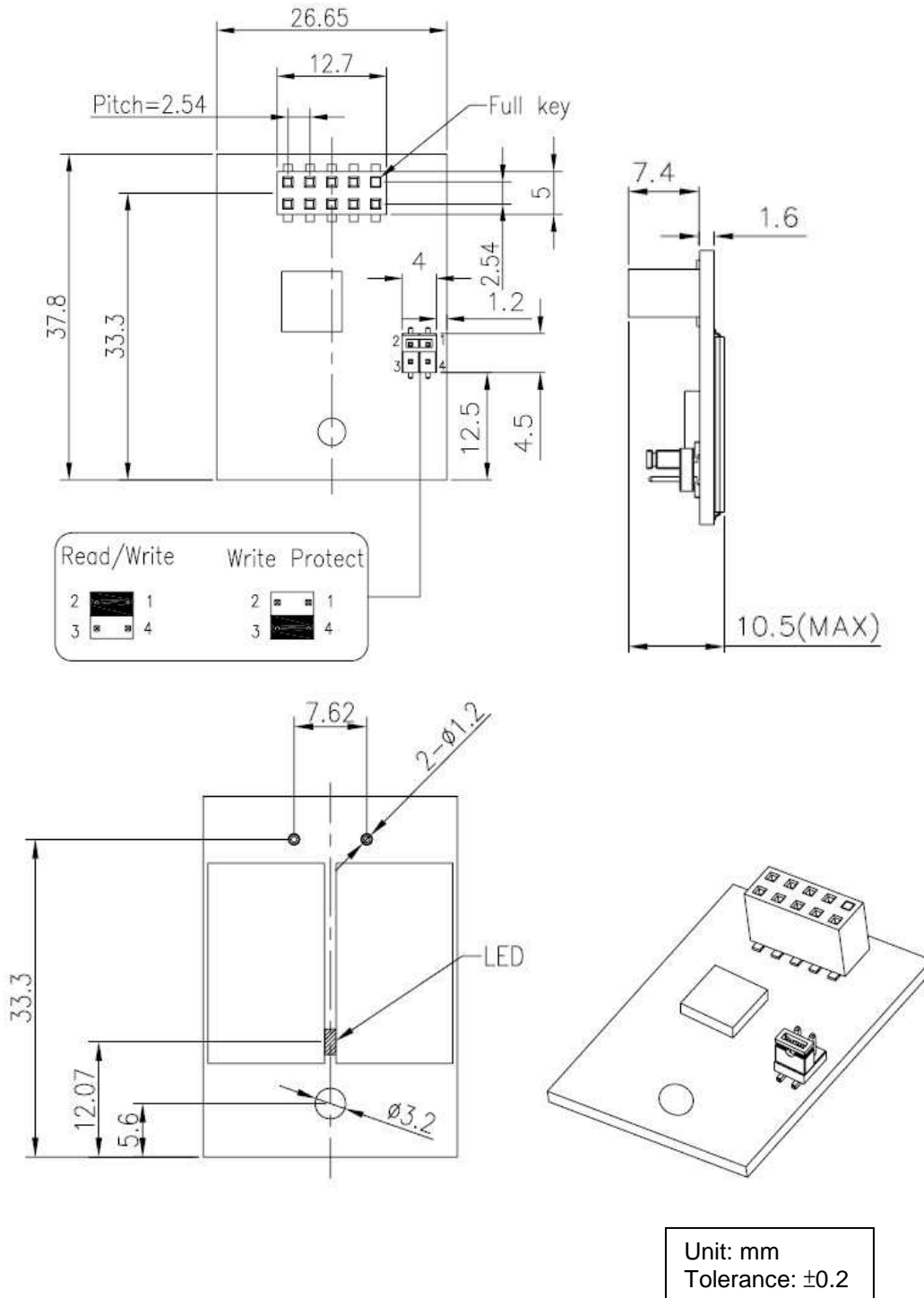
## AP-UMxxxxXXXXG-XXXX



### 6.1.3 Type C (STD 90D-MS)

Standard 90 Degree Mounting Screw

<b>Length</b>	37.8mm	<b>Width</b>	26.65mm	<b>Height (Max)</b>	10.5 mm
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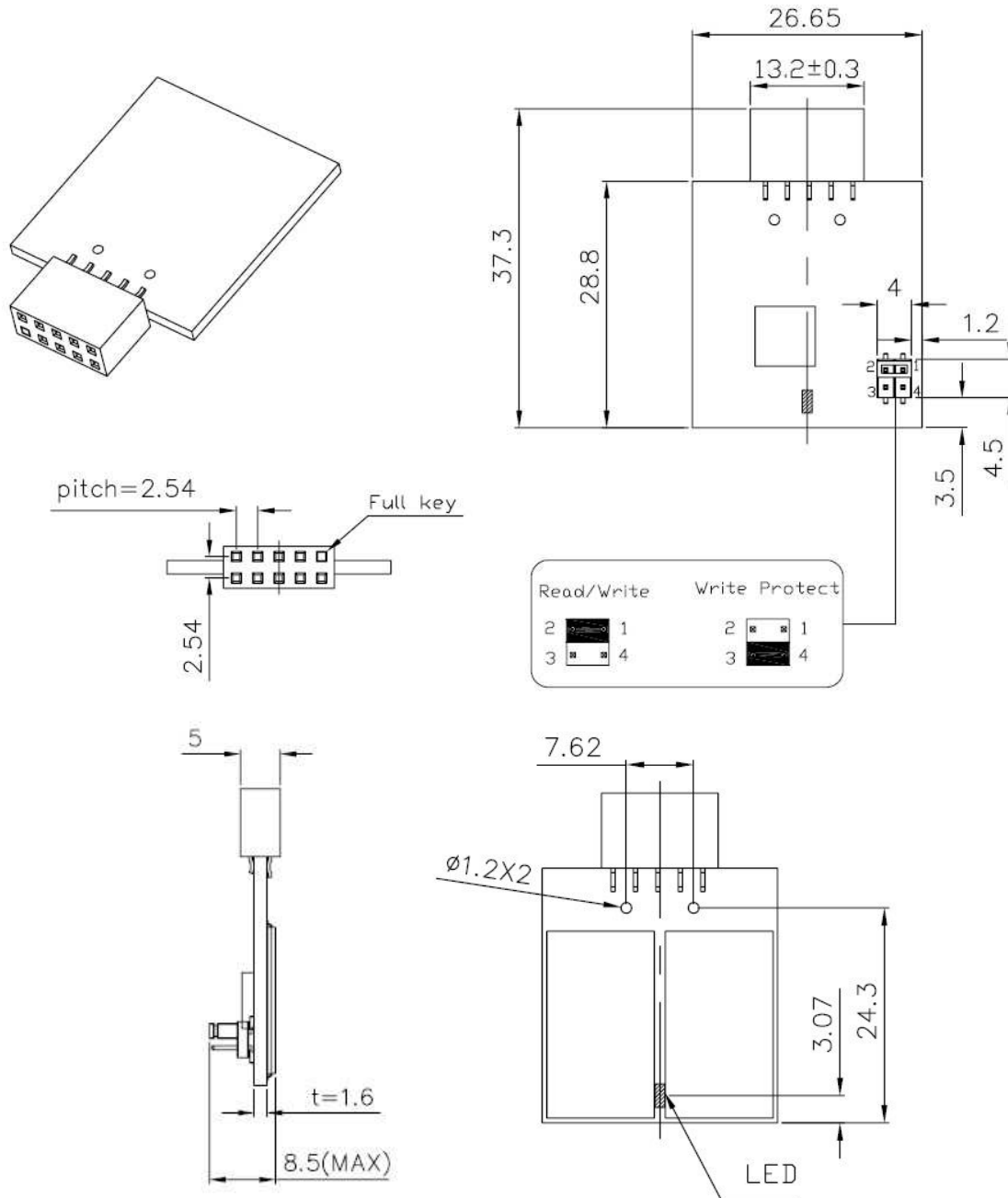


## 6.2 Vertical Design

### 6.2.1 Type D (STD 180D)

Standard 180 Degree

<b>Length</b>	37.3mm	<b>Width</b>	26.65mm	<b>Height (Max)</b>	8.5 mm
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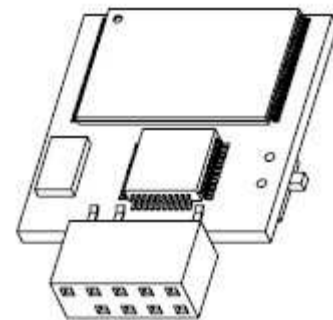
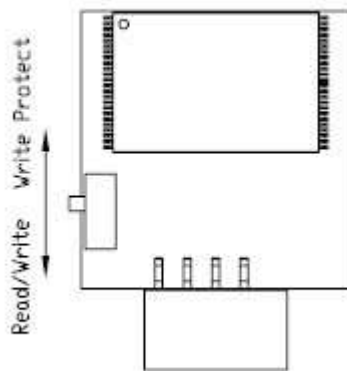
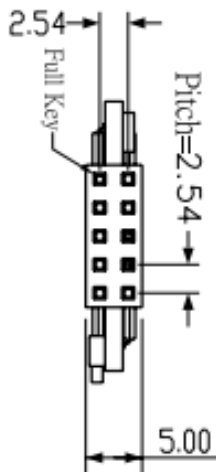
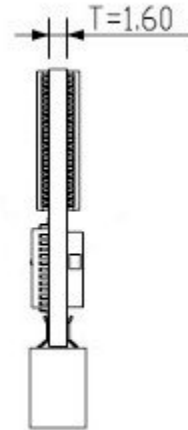
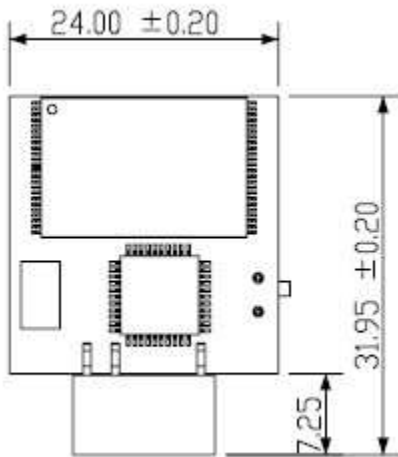
Unit: mm  
 Tolerance: ±0.2

## 6.3 Low Profile Design

### 6.3.1 Type D (LP 180D)

Low Profile 180 Degree

<b>Length</b>	31.95 <sub>mm</sub>	<b>Width</b>	24 <sub>mm</sub>	<b>Height (Max)</b>	5 <sub>mm</sub>
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Unit: mm  
 Tolerance: ±0.2

# USB-Disk Module II

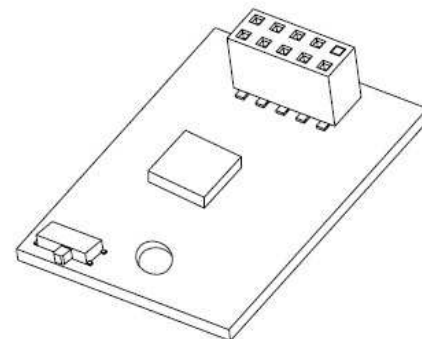
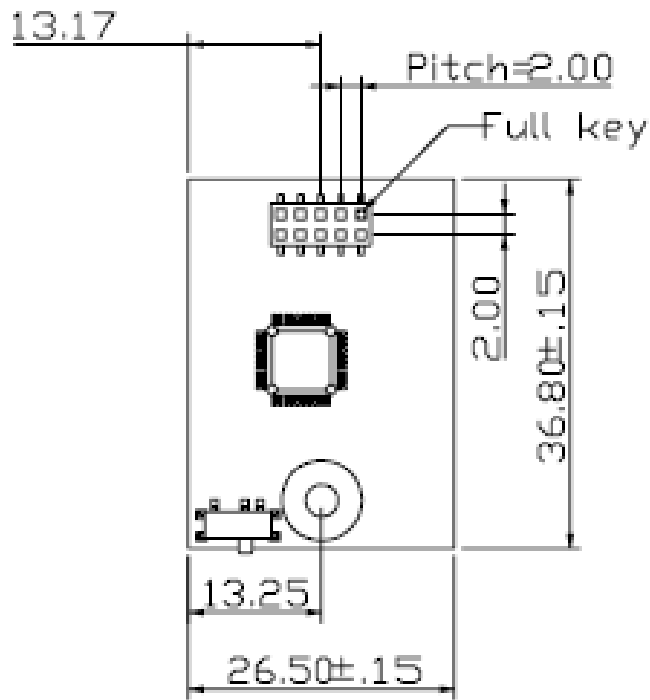
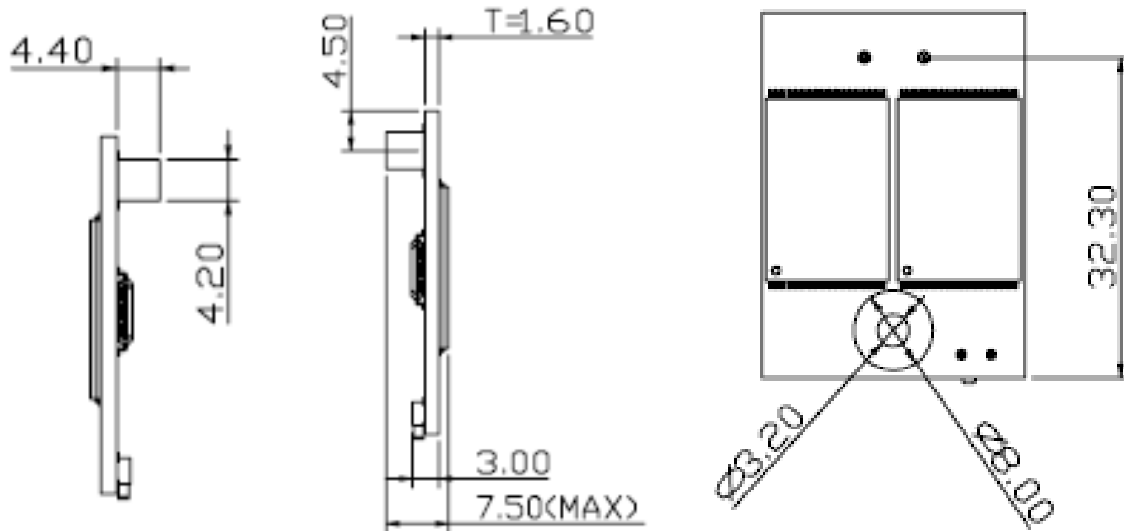
## AP-UMxxxxXXXXG-XXXX



### 6.3.2 Type E (LP 90D-MS)

Low Profile 90 Degree Mounting Screw

<b>Length</b>	36.8mm	<b>Width</b>	26.5mm	<b>Height (Max)</b>	7.5 mm
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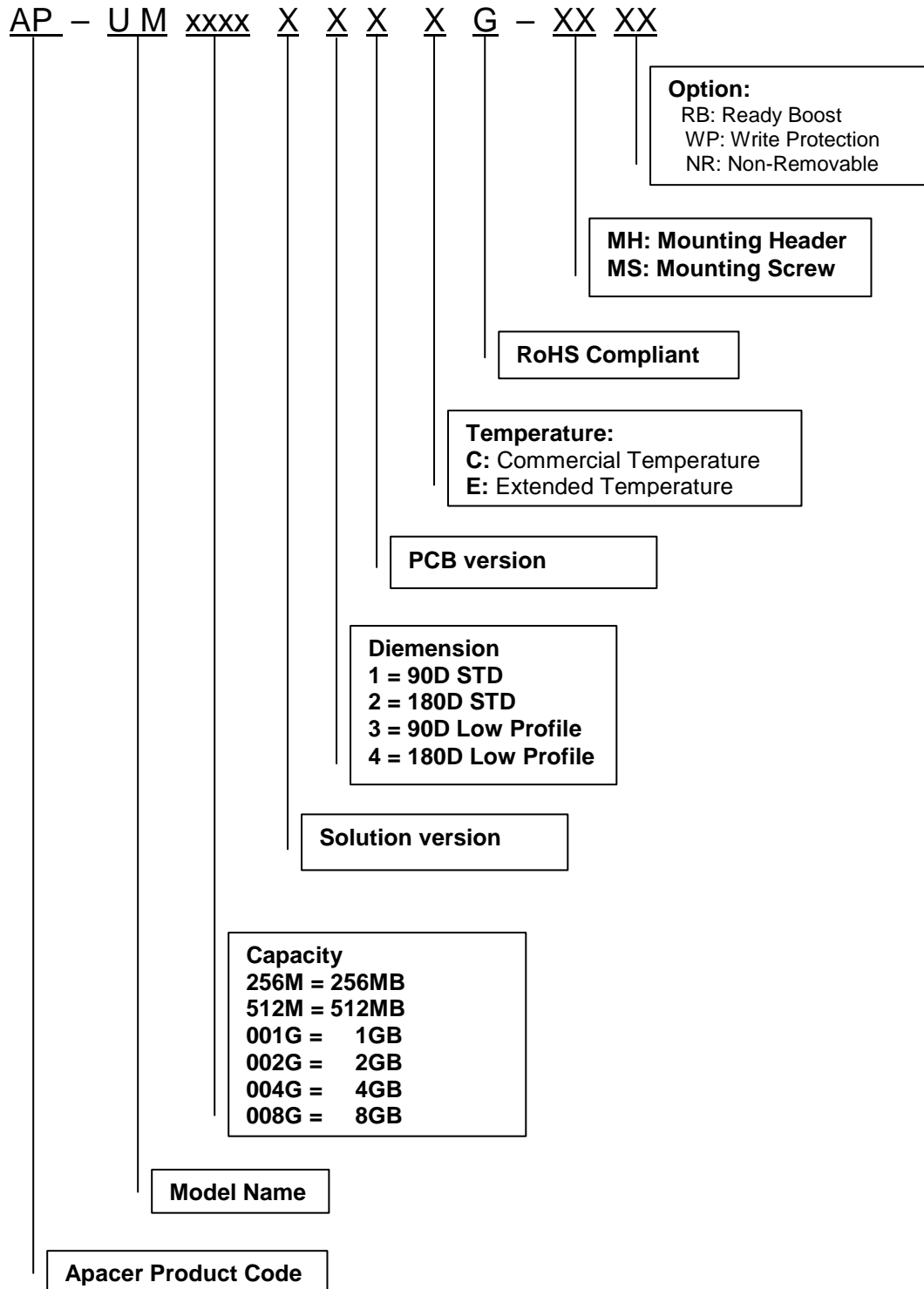
Write Protect    Read/Write

Unit: mm  
 Tolerance: ±0.2



## 7. Product Ordering Information

### 7.1 Product Code Designation



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## 7.2 Valid Combinations

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### 7.2.1 Type A (STD 90D)

Standard 90 degree

Capacity	Standard	Extended Temperature
256MB	AP-UM256ME10CG	AP-UM256MD10EG
512MB	AP-UM512ME10CG	AP-UM512MD10EG
1GB	AP-UM001GE10CG	AP-UM001GD10EG
2GB	AP-UM002GE10CG	AP-UM002GD10EG
4GB	AP-UM004GE10CG	AP-UM004GD10EG
8GB	AP-UM008GE10CG	AP-UM008GD10EG

### 7.2.2 Type B (STD 90D-MH)

Standard 90 Degree Mounting Header

Capacity	Standard	Extended Temperature
256MB	AP-UM256ME10CG-MH	AP-UM256MD10EG-MH
512MB	AP-UM512ME10CG-MH	AP-UM512MD10EG-MH
1GB	AP-UM001GE10CG-MH	AP-UM001GD10EG-MH
2GB	AP-UM002GE10CG-MH	AP-UM002GD10EG-MH
4GB	AP-UM004GE10CG-MH	AP-UM004GD10EG-MH
8GB	AP-UM008GE10CG-MH	AP-UM008GD10EG-MH

### 7.2.3 Type C (STD 90D-MS)

Standard 90 Degree Mounting Screw

Capacity	Standard	Extended Temperature
256MB	AP-UM256ME10CG-MS	AP-UM256MD10EG-MS
512MB	AP-UM512ME10CG-MS	AP-UM512MD10EG-MS
1GB	AP-UM001GE10CG-MS	AP-UM001GD10EG-MS
2GB	AP-UM002GE10CG-MS	AP-UM002GD10EG-MS
4GB	AP-UM004GE10CG-MS	AP-UM004GD10EG-MS
8GB	AP-UM008GE10CG-MS	AP-UM008GD10EG-MS

## USB-Disk Module II

### AP-UMxxxxXXXXG-XXXX



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#### 7.2.4 Type D (STD 180D)

Standard 180 Degree

Capacity	Standard	Extended Temperature
256MB	AP-UM256ME20CG	AP-UM256MD20EG
512MB	AP-UM512ME20CG	AP-UM512MD20EG
1GB	AP-UM001GE20CG	AP-UM001GD20EG
2GB	AP-UM002GE20CG	AP-UM002GD20EG
4GB	AP-UM004GE20CG	AP-UM004GD20EG
8GB	AP-UM008GE20CG	AP-UM008GD20EG

#### 7.2.5 Type D (LP 180D)

Low Profile 180 Degree

Capacity	Standard	Extended Temperature
256MB	AP-UM256ME40CG	AP-UM256MD40EG
512MB	AP-UM512ME40CG	AP-UM512MD40EG
1GB	AP-UM001GE40CG	AP-UM001GD40EG
2GB	AP-UM002GE40CG	AP-UM002GD40EG
4GB	AP-UM004GE40CG	AP-UM004GD40EG
8GB	AP-UM008GE40CG	AP-UM008GD40EG

#### 7.2.6 Type E (LP 90D-MS)

Low Profile 90 Degree Mounting Screw

Capacity	Standard	Extended Temperature
256MB	AP-UM256ME31CG-MS	AP-UM256MD31EG-MS
512MB	AP-UM512ME31CG-MS	AP-UM512MD31EG-MS
1GB	AP-UM001GE31CG-MS	AP-UM001GD31EG-MS
2GB	AP-UM002GE31CG-MS	AP-UM002GD31EG-MS
4GB	AP-UM004GE31CG-MS	AP-UM004GD31EG-MS
8GB	AP-UM008GE31CG-MS	AP-UM008GD31EG-MS

**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 5, 2008
1.1	Product Ordering Information Updated	September 30, 2008
1.2	Pin Assignment Updated	December 17, 2008
1.3	Type E dimension & ECC capability updated	March 18, 2009
1.4	Feature Context & Product Ordering Information updated	April 21, 2009
1.5	Type D (LP 180D) drawing updated	April 23, 2009

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## Global Presence

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