

RoHS Compliant
USB-Disk Module II *Plus*
Product Specifications

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Version 1.9



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Specifications Overview:

- **USB2.0 High-Speed and USB1.1 Full-Speed Compatible Interface**
- **Capacity**
 - 256, 512 MB
 - 1, 2, 4, 8, 16, 32 GB
- **Performance***
 - Sequential read: Up to 31 MB/sec
 - Sequential write: Up to 25 MB/sec
- **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
- **Extended Data Protection (optional)**
 - Write protection setting by jumper for prevention of data overwrites
- **NAND Flash Type: SLC**
- **MTBF: >2,000,000 hours**
- **Temperature Range**
 - Operating:
 - Standard: 0°C to 70°C
 - Wide: -40°C to 85°C
 - Storage: -40°C to 100°C
- **Power Consumption**
 - Operating voltage: 5V (with a certain percentage of tolerance)
 - Active mode: 181 mA
 - Idle mode: 450 μ A
- **Connector**
 - 10-pin (2x5) female header
- **Supports Boot-Up Function for OS**
 - Windows XP Embedded
 - Windows CE
 - Linux
- **Supports Ready Boost for Vista**
- **Supports Non-Removable Setting**
- **RoHS Compliant**

*Varies from capacities. The values for performances and power consumptions presented are typical and may vary depending on flash configurations or platform settings. The term idle refers to the standby state of the device.

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1. General Descriptions

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 Algorithms

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 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

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.

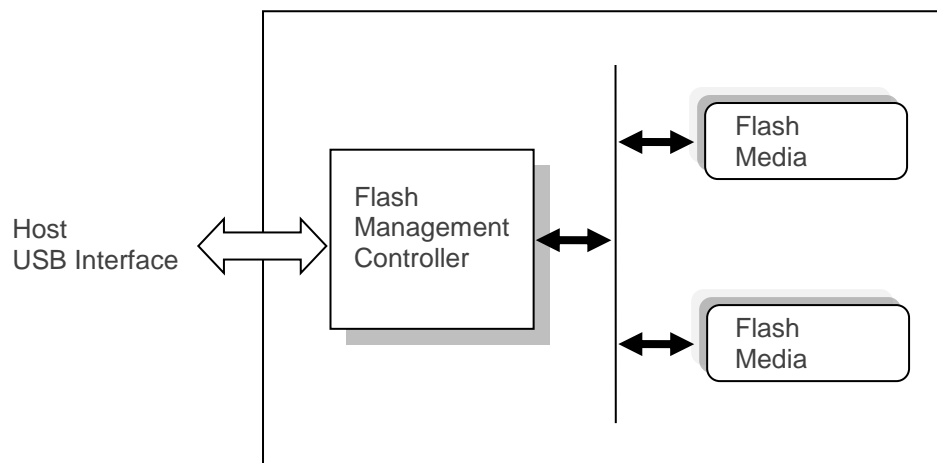


Figure 2-1 Functional Block Diagram

3. Pin Assignments

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

3.1 Type A, Type B, and Type C

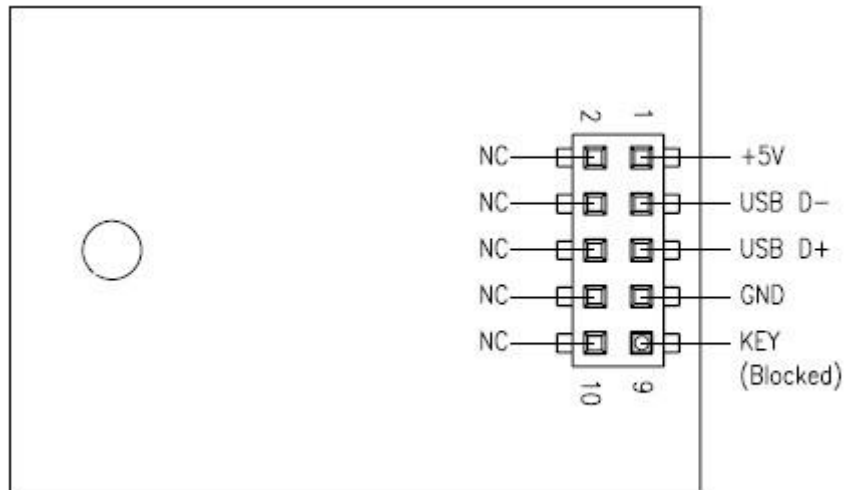


Table 3-1 Pin Assignment of the 10-Pin Configuration in Type A, Type B, Type C and Type E

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)

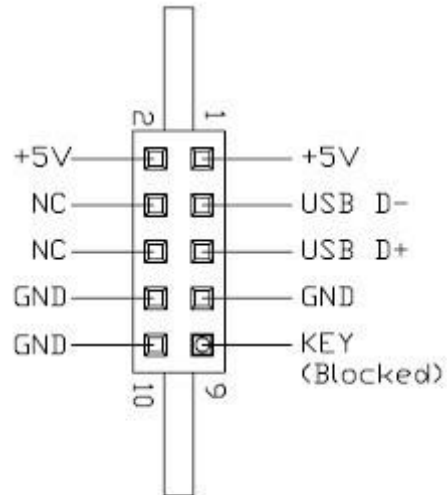


Table 3-2 Pin Assignment of the 10-Pin Configuration in Type D (STD)

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)

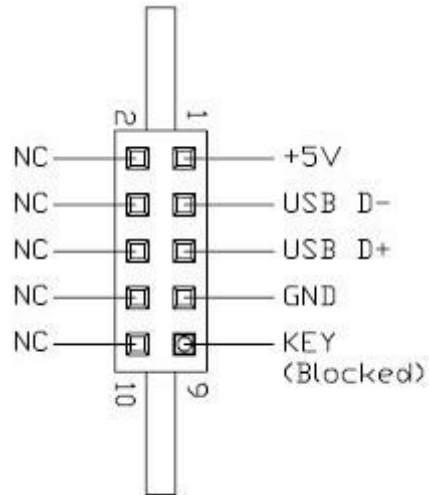


Table 3-3 Pin Assignment of the 10-Pin Configuration in Type D (LP)

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

3.4 Type E (LP)

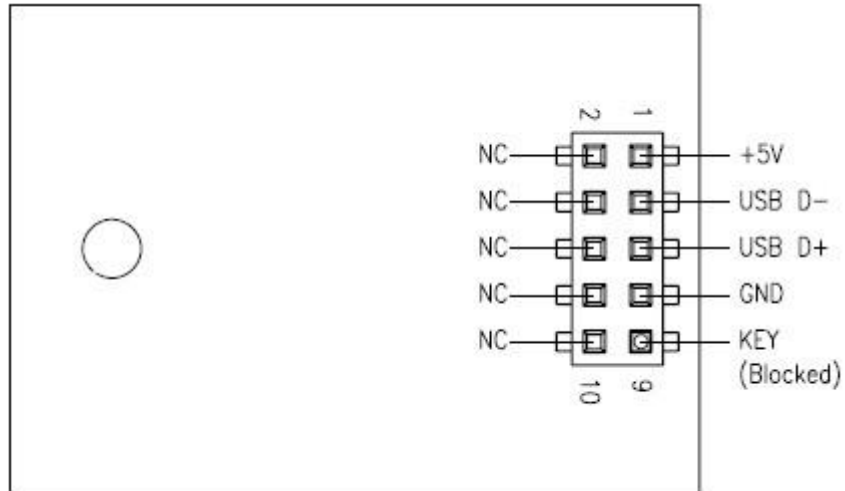


Table 3-4 Pin Assignment of the 10-Pin Configuration in Type A, Type B, Type C and Type E (LP)

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. Performance & Reliability Specifications

4.1 Capacity Specifications

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

Table 4-1 Capacity Specifications

Capacity	Total bytes*
256 MB	254,509,056
512 MB	512,458,752
1 GB	1,028,358,144
2 GB	2,060,156,928
4 GB	4,120,920,064
8 GB	8,248,131,584
16 GB	16,030,662,656
32 GB	32,065,486,848

Note: The number of total bytes may vary depending on the file system in use.

4.2 Performance Specifications

Table 4-2 Performance Specifications

Capacity \ Performance	256 MB	512 MB	1 GB	2 GB	4 GB	8 GB	16 GB	32 GB
	Sequential Read* (MB/s)	15	25	25	25	30	25	31
Sequential Write* (MB/s)	9	10	10	15	25	20	21	21

Note:

Results may differ from various flash configurations or host system setting.

*Sequential performance is based on CrystalDiskMark 5.2.1 with file size 1,000MB.

4.3 Environmental Specifications

Environmental specification of the USB-Disk Module (UDM) product family is available in Table 4-3.

Table 4-3 Environmental Specifications

Item	Specifications
Operating temp.	0°C to 70°C (Standard); -40°C to 85°C (Wide)
Non-operating temp.	-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)
EMC	FCC, CE

4.4 Mean Time Between Failures (MTBF)

Mean Time Between Failures (MTBF) is predicted based on reliability data for the individual components in Apacer's USB flash drive. Serving as statistical reference, the prediction result for Apacer's USB is more than 2,000,000 hours.

Note: The MTBF is predicated and calculated based on "Telcordia Technologies Special Report, SR-332, Issue 2" method.

5. Electrical Specifications

5.1 Operating Conditions

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

Item	Range
Supply Voltage	5V \pm 5% (4.5-5.5V)
Standard Temperature	0°C to 70°C
Wide Temperature	-40°C to 85°C

Table 5-2 Absolute Maximum Power Pin Stress Ratings

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

5.2 AC Characteristics

Table 5-3 AC Characteristics Full Speed

Parameter	Symbol	Min	Typ	Max	Unit
Rise Time	TFR	4	—	20	ns
Fall Time	TFF	4	—	20	ns
Differential Rise and Fall Time Matching	TFRFM	90		111.11	%
Driver Output Resistance	ZDRV	28	—	44	Ω

Table 5-4 AC Characteristics High Speed

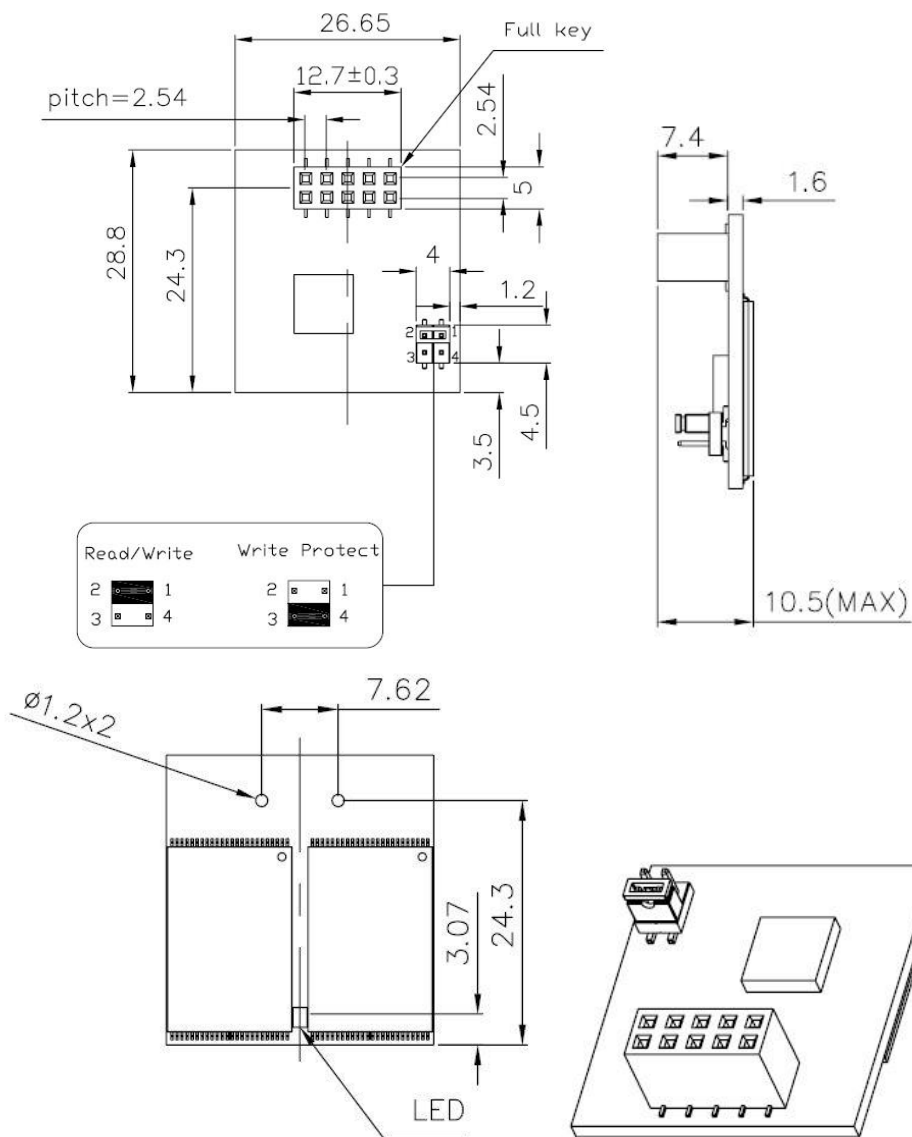
Parameter	Symbol	Min	Typ	Max	Unit
Rise Time (10%~90%)	T _{HSR}	500	—	—	ps
Fall Time (10%~90%)	T _{HSF}	500	—	—	ps
Driver Output Resistance	Z _{HSDRV}	40.5	—	49.5	Ω

6. Physical Characteristics

6.1 Horizontal Design

6.1.1 Type A (STD 90D) Standard 90 degree

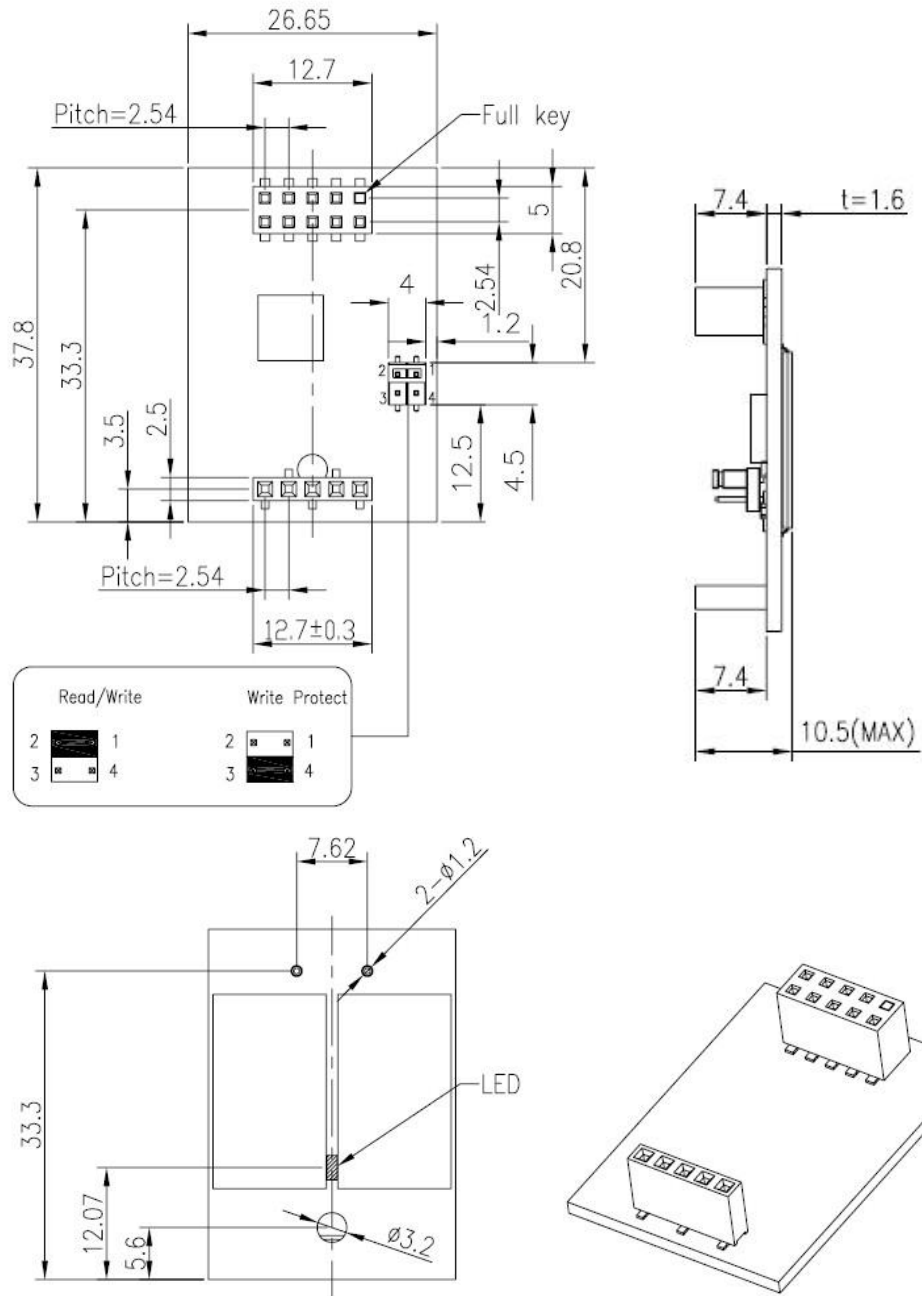
Length	Width	Height (Max)
28.8mm	26.65mm	10.5mm



Unit: mm
Tolerance: ± 0.2

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

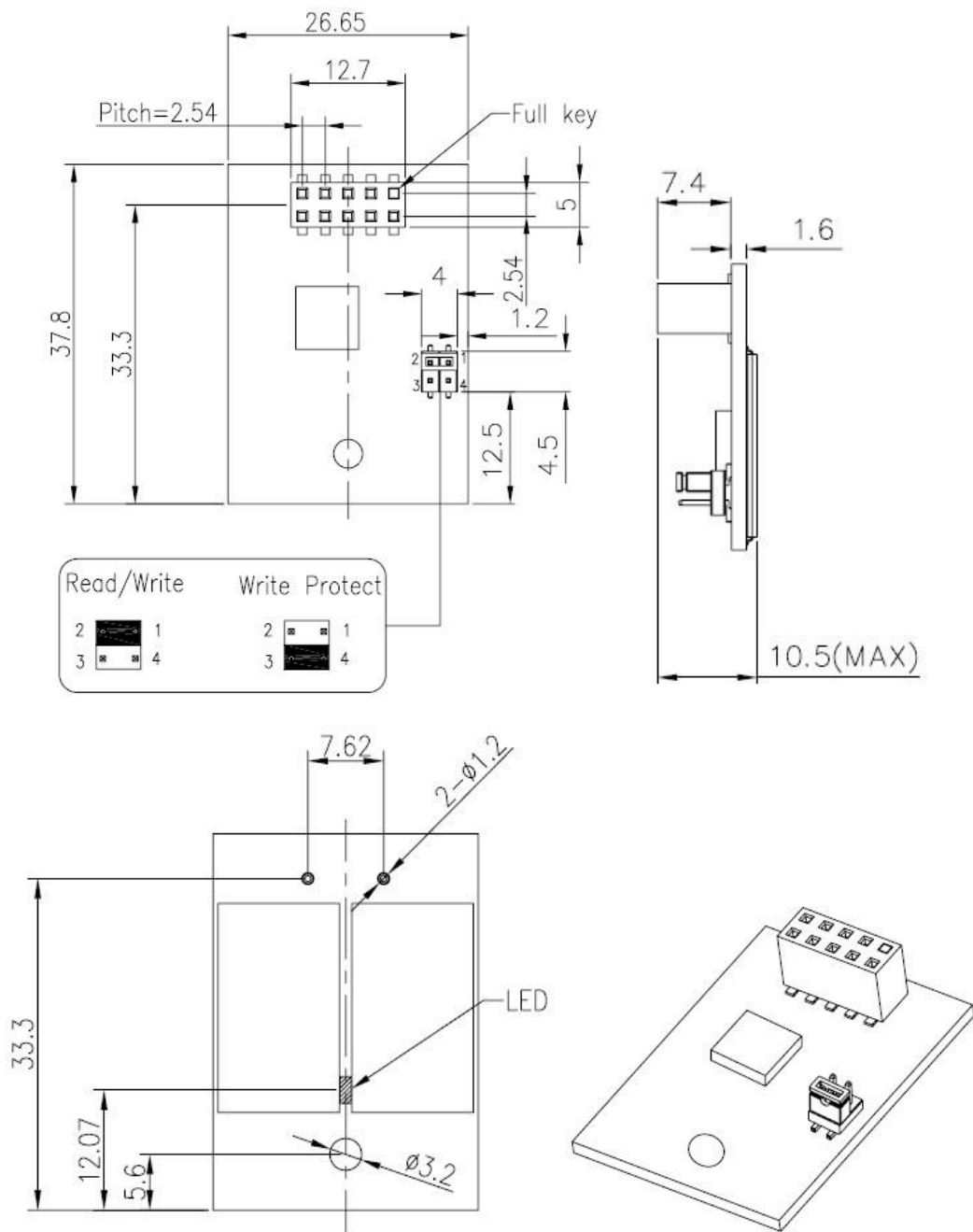
Length	Width	Height (Max)
37.8mm	26.65mm	10.5mm



Unit: mm
Tolerance: ±0.2

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

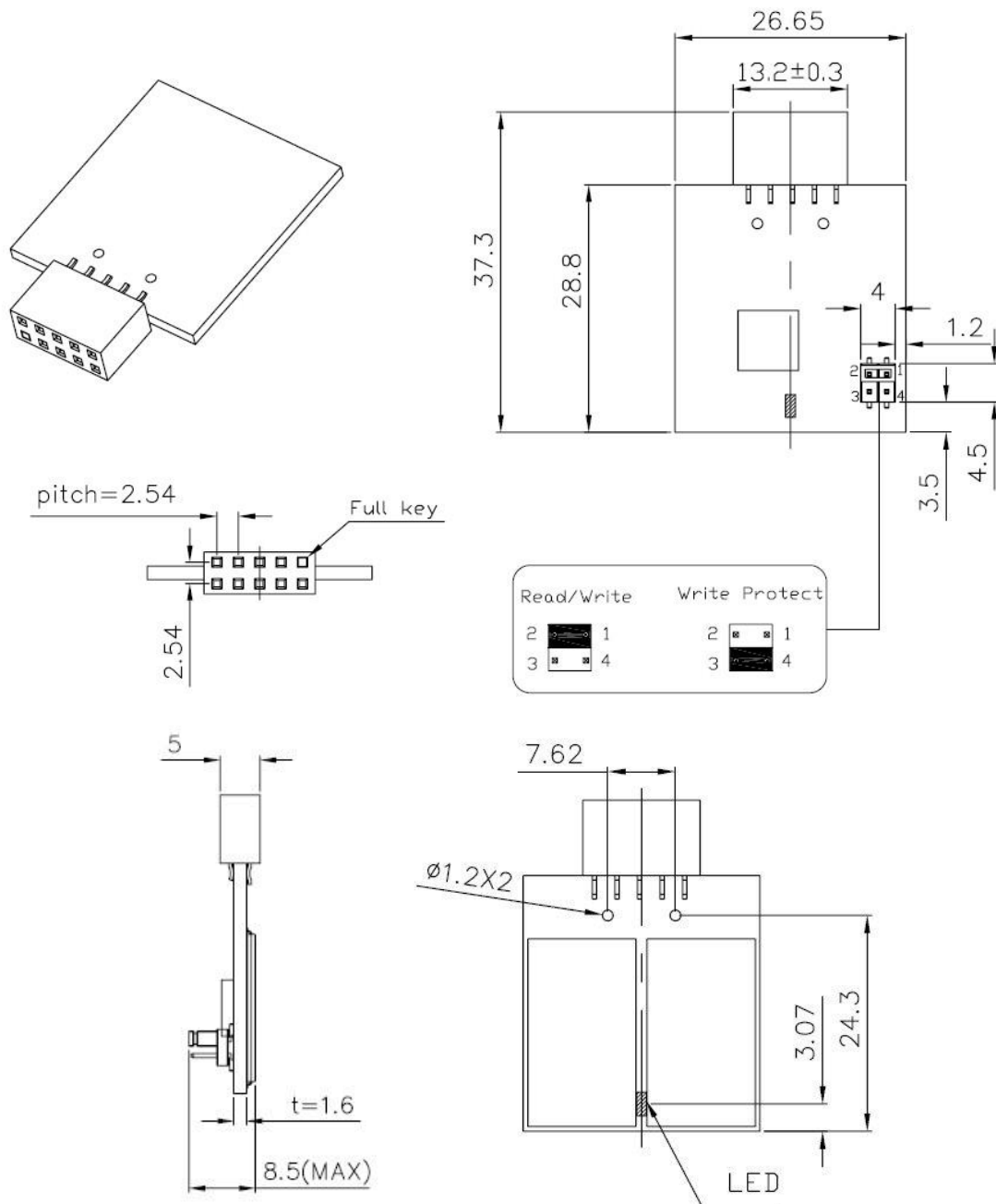
Length	Width	Height (Max)
37.8mm	26.65mm	10.5mm



6.2 Vertical Design

6.2.1 Type D (STD 180D) Standard 180 Degree

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

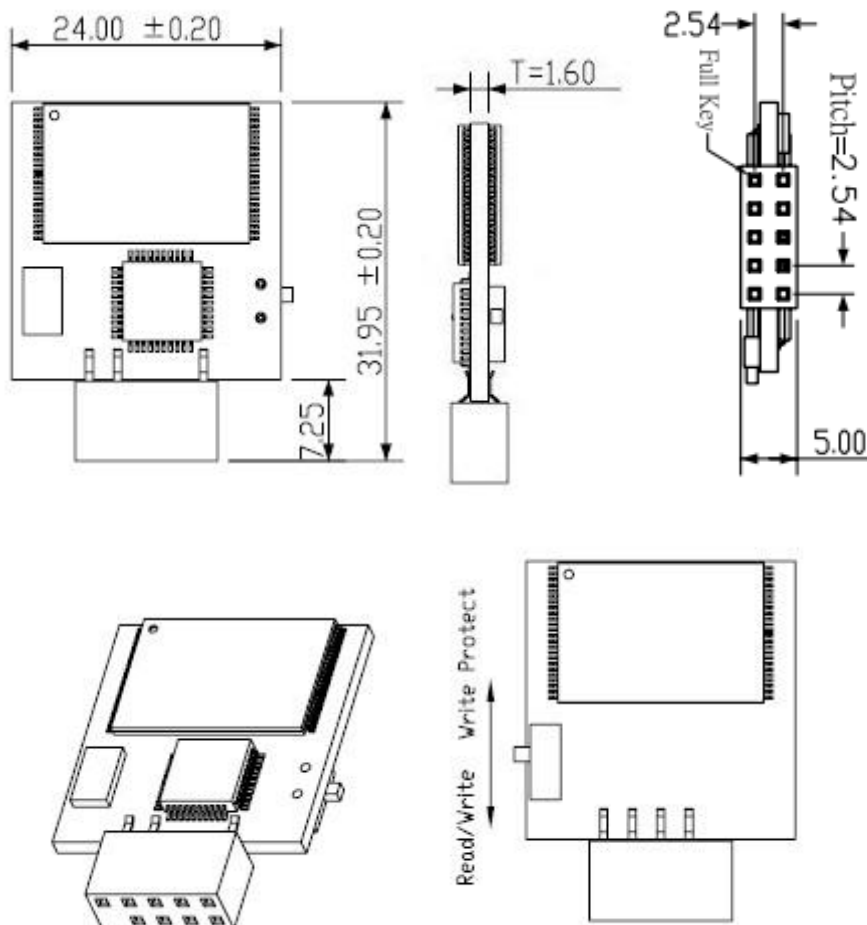


Unit: mm
Tolerance: ±0.2

6.3 Low Profile Design

6.3.1 Type D (LP 180D) Low Profile 180 Degree

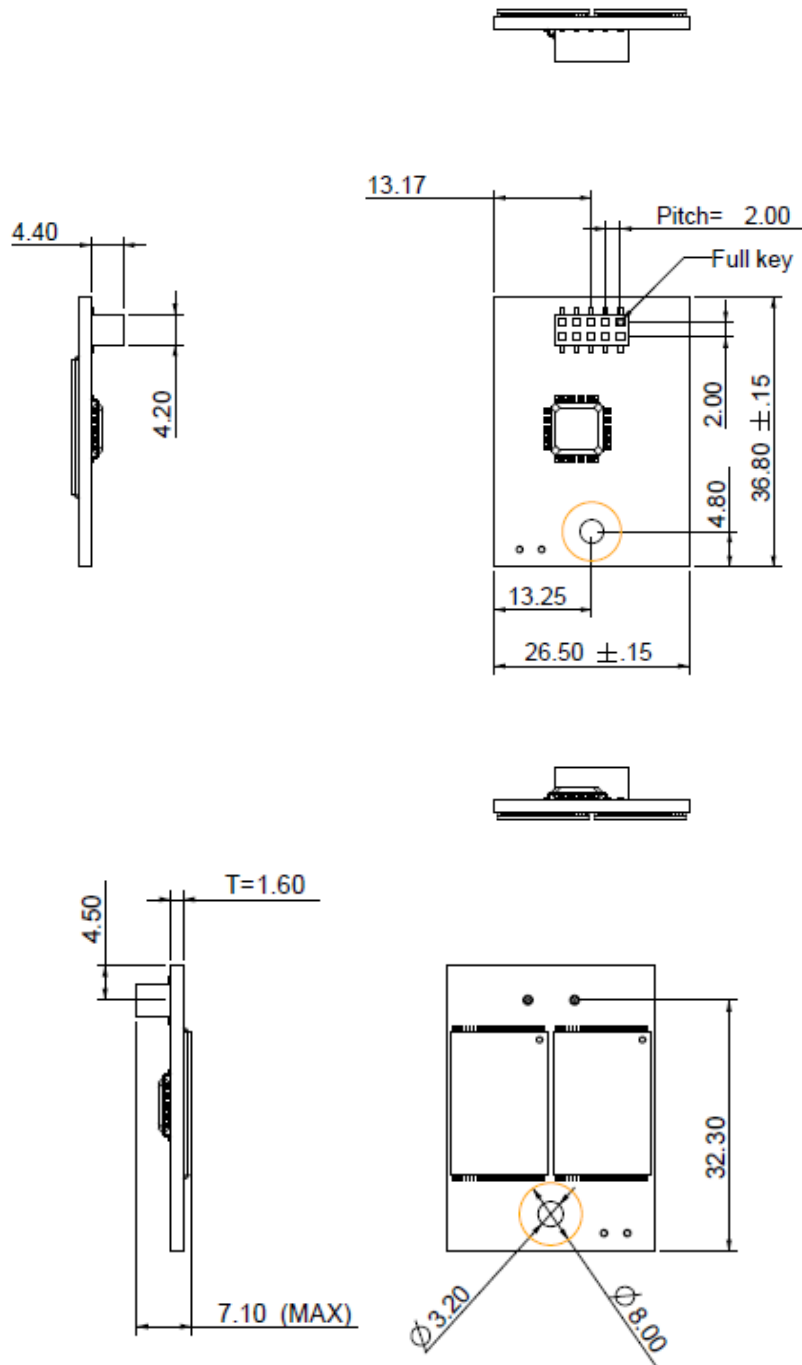
Length	Width	Height (Max)
31.95mm	24mm	5mm



Unit: mm
Tolerance: ± 0.2

6.3.2 Type E (LP 90D) Low Profile 90 Degree

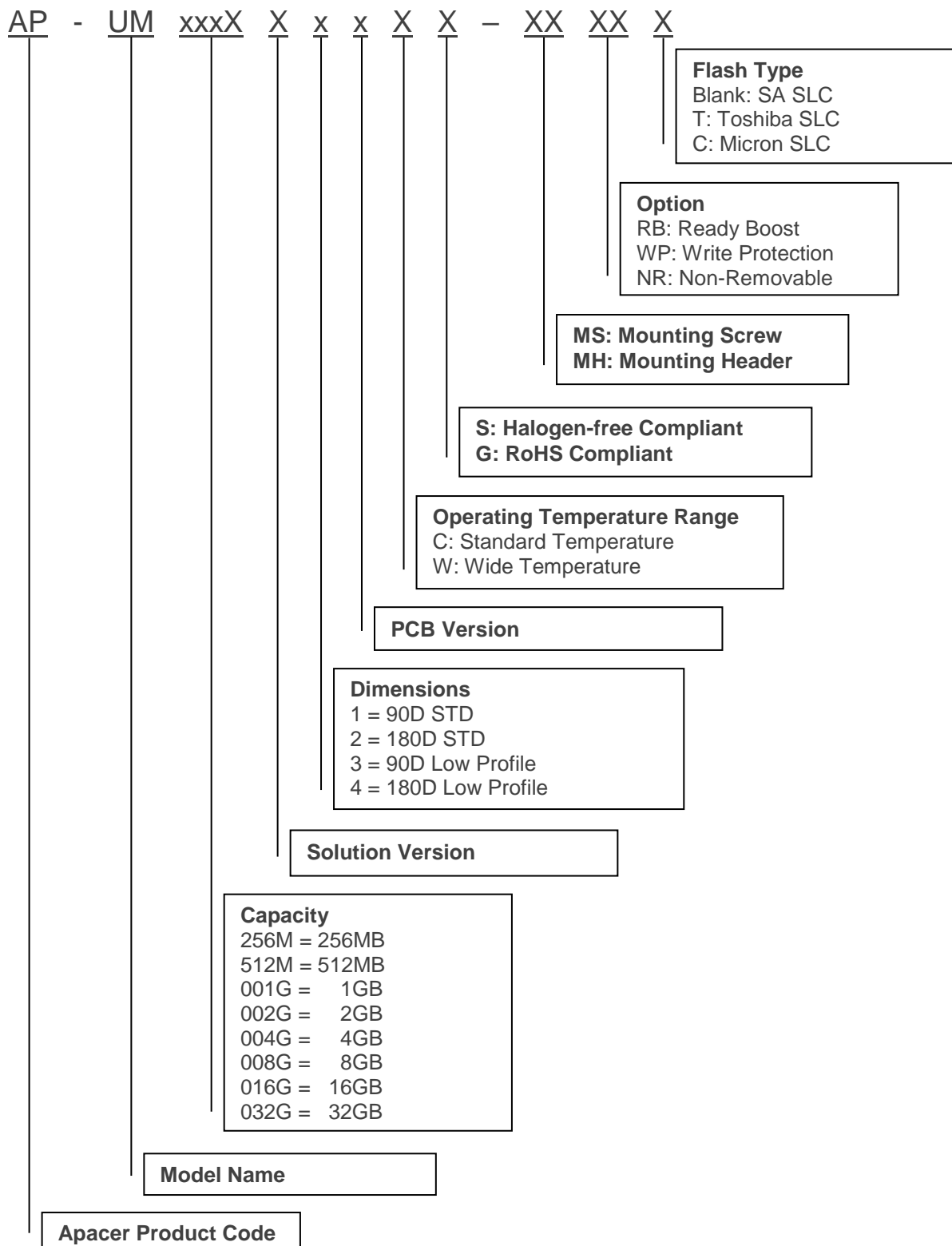
Length	Width	Height (Max)
36.80mm	26.50mm	7.10mm



Unit: mm
Tolerance: ± 0.2

7. Product Ordering Information

7.1 Product Code Designations



7.2 Valid Combinations

7.2.1 Type A (STD 90D) Standard 90 Degree

Capacity	Standard Temperature	Wide 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
16GB	AP-UM016GR13CS-C	AP-UM016GT13ES-C
32GB	AP-UM032GR13CS-C	AP-UM032GT13ES-C

7.2.2 Type B (STD 90D-MH) Standard 90 Degree Mounting Header

Capacity	Standard Temperature	Wide 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
16GB	AP-UM016GR13CS-MHC	AP-UM016GT13ES-MHC
32GB	AP-UM032GR13CS-MHC	AP-UM032GT13ES-MHC

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

Capacity	Standard Temperature	Wide 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
16GB	AP-UM016GR13CS-MSC	AP-UM016GT13ES-MSC
32GB	AP-UM032GR13CS-MSC	AP-UM032GT13ES-MSC

7.2.4 Type D (STD 180D) Standard 180 Degree

Capacity	Standard Temperature	Wide 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
16GB	AP-UM016GR23CS-C	AP-UM016GT23ES-C
32GB	AP-UM032GR23CS-C	AP-UM032GT23ES-C

7.2.5 Type D (LP 180D) – Low Profile 180 Degree

Capacity	Standard Temperature	Wide 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 Temperature	Wide 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

7.2.7 Type A (STD 90D) – NR Standard 90 Degree

Capacity	Standard Temperature	Wide Temperature
256MB	AP-UM256MN10CS-NR	AP-UM256MQ10ES-NR
512MB	AP-UM512MN10CS-NR	AP-UM512MQ10ES-NR
1GB	AP-UM001GN10CS-NR	AP-UM001GQ10ES-NR
2GB	AP-UM002GN10CS-NR	AP-UM002GQ10ES-NR
4GB	AP-UM004GN10CS-NR	AP-UM004GQ10ES-NR
8GB	AP-UM008GN10CS-NRT	AP-UM008GQ10ES-NRT
16GB	AP-UM016GR13CS-NRC	AP-UM016GT13ES-NRC
32GB	AP-UM032GR13CS-NRC	AP-UM032GT13ES-NRC

7.2.8 Type B (STD 90D-MH) – NR Standard 90 Degree Mounting Header

Capacity	Standard Temperature	Wide Temperature
256MB	AP-UM256MN10CS-MHNR	AP-UM256MQ10ES-MHNR
512MB	AP-UM512MN10CS-MHNR	AP-UM512MQ10ES-MHNR
1GB	AP-UM001GN10CS-MHNR	AP-UM001GQ10ES-MHNR
2GB	AP-UM002GN10CS-MHNR	AP-UM002GQ10ES-MHNR
4GB	AP-UM004GN10CS-MHNR	AP-UM004GQ10ES-MHNR
8GB	AP-UM008GN10CS-MHNRT	AP-UM008GQ10ES-MHNRT
16GB	AP-UM016GR13CS-MHNRC	AP-UM016GT13ES-MHNRC
32GB	AP-UM032GR13CS-MHNRC	AP-UM032GT13ES-MHNRC

7.2.9 Type C (STD 90D-MS) – NR Standard 90 Degree Mounting Screw

Capacity	Standard Temperature	Wide Temperature
256MB	AP-UM256MN10CS-MSNR	AP-UM256MQ10ES-MSNR
512MB	AP-UM512MN10CS-MSNR	AP-UM512MQ10ES-MSNR
1GB	AP-UM001GN10CS-MSNR	AP-UM001GQ10ES-MSNR
2GB	AP-UM002GN10CS-MSNR	AP-UM002GQ10ES-MSNR
4GB	AP-UM004GN10CS-MSNR	AP-UM004GQ10ES-MSNR
8GB	AP-UM008GN10CS-MSNRT	AP-UM008GQ10ES-MSNRT
16GB	AP-UM016GR13CS-MSNRC	AP-UM016GT13ES-MSNRC
32GB	AP-UM032GR13CS-MSNRC	AP-UM032GT13ES-MSNRC

7.2.10 Type D (STD 180D) – NR Standard 180 Degree

Capacity	Standard Temperature	Wide Temperature
256MB	AP-UM256MN20CS-NR	AP-UM256MQ20ES-NR
512MB	AP-UM512MN20CS-NR	AP-UM512MQ20ES-NR
1GB	AP-UM001GN20CS-NR	AP-UM001GQ20ES-NR
2GB	AP-UM002GN20CS-NR	AP-UM002GQ20ES-NR
4GB	AP-UM004GN20CS-NR	AP-UM004GQ20ES-NR
8GB	AP-UM008GN20CS-NRT	AP-UM008GQ20ES-NRT
16GB	AP-UM016GR23CS-NRC	AP-UM016GT23ES-NRC
32GB	AP-UM032GR23CS-NRC	AP-UM032GT23ES-NRC

7.2.11 Type D (LP 180D) – NR Low Profile 180 Degree

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

7.2.12 Type E (LP 90D-MS) – NR Low Profile 90 Degree Mounting Screw

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

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.

Revision History

Revision	Description	Date
1.0	Initial release	5/16/2011
1.1	Revised Capacity Specifications	5/24/2011
1.2	Revised Product Ordering Information Updated address for our branch in Europe	4/10/2012
1.3	Added MTBF section	5/10/2012
1.4	Added Non-removable model types into Product Ordering Information	6/20/2012
1.5	Added 16GB & 32GB models	6/29/2012
1.6	Updated Type-E mechanical diagram	7/18/2012
1.7	Updated contact phone number of Apacer office in America	8/30/2012
1.8	Revised product ordering information	2/20/2013
1.9	Updated storage temperature from -40°C-85°C to -40°C-100°C	11/23/2021

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