

RoHS Compliant

USB-Disk Module 3

Specification

January 13, 2011

Preliminary

For Internal Evaluation

Apacer
Access the best

Apacer Technology Inc.

4th Fl., 75 Xintai 5th Rd., Sec.1, Hsichih, New Taipei City, Taiwan 221

Tel: +886-2-2698-2888 Fax: +886-2-2698-2889

www.apacer.com

FEATURES:

- **USB2.0 High-Speed and USB1.1 Full-Speed compatible interface**
- **Capacity**
 - 512 MB, 1, 2, 4, 8 GB
- **Fast sustained read performance**
 - Sustained read: 35 MB/s
- **Fast sustained write performance**
 - Sustained write: 25 MB/s
- **Intelligent USB Module**
 - BCH (14/28 bit) Error Detection Code/Error Correction Code (EDC/ECC)
 - Intrinsic data integrity after power loss
 - Data Encryption
 - Implements advanced wear-leveling algorithms to substantially increase longevity of flash media
- **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**
 - Linux
 - Windows CE
 - Windows XP Embedded
 - Windows 7 Embedded
- **Temperature ranges**
 - 0°C to 70°C for operation (standard)
 - -40°C to 85°C for operation (ET*)
 - -40°C to 100°C for storage
- **Low power consumption (typical)**
 - Active mode: TBD mA
 - Sleep mode: TBD μ A
- **Connector**
 - 10-pin (2x5) female header
- **RoHS Compliant**
- **Support Non-Removable Setting****

*Extended Temperature

**Standard Temperature Exclusive

TABLE OF CONTENTS

1. General Description	3
1.1 Performance-optimized Controller.....	3
1.1.1 Error Correction Code (ECC)	3
1.1.2 Data Encryption.....	3
1.1.3 Advanced Wear-Leveling	3
2. Functional Block Diagram.....	4
3. Pin Assignment.....	5
3.1 Type C and Type E.....	5
3.2 Type D (Low Profile).....	6
4. Capacity Specifications	7
4.1 Performance Specifications.....	7
4.2 Environmental Specifications	7
5. Electrical Specification	8
5.1 AC Characteristics.....	9
6. Physical Dimension	10
6.1 Horizontal Design	10
6.1.1 Type C (STD 90D-MS).....	10
6.2 Low Profile Design.....	11
6.2.1 Type D (LP 180D).....	11
6.2.2 Type E (LP 90D-MS).....	12
7. Product Ordering Information.....	13
7.1 Product Code Designations.....	13
7.2 Valid Combinations.....	14
7.2.1 Type C (STD 90D-MS).....	14
7.2.2 Type D (LP 180D).....	14
7.2.3 Type E (LP 90D-MS).....	14

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 Error Correction Code (ECC)

The UDM uses BCH Error Detection Code (EDC) and Error Correction Code (ECC) algorithms which correct up to 14/28 random single-bit errors for each 512/1K byte block of data depending on spare area of flash memory. High performance is achieved through hardware-based error detection and correction.

1.1.2 Data Encryption

The UDM comes with 128 bits AES algorithm realized by hardware which makes it unique in protecting data store within.

1.1.3 Advanced 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.

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.

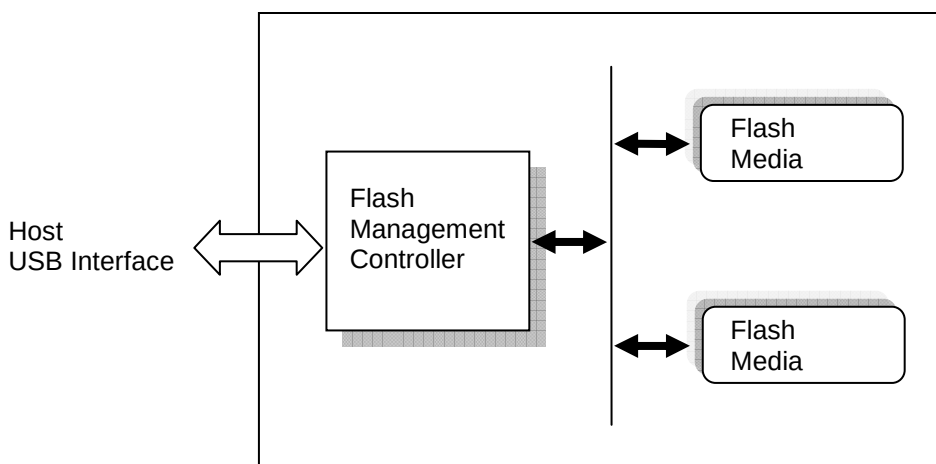


Figure 2-1: Functional block diagram

3. Pin Assignment

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

3.1 Type C and Type E

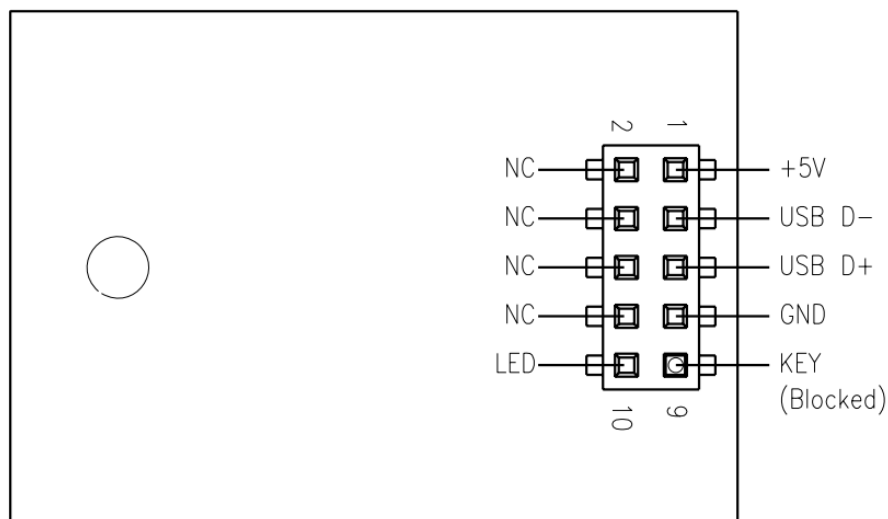


Table 3-1: Pin Assignment of the 10-pin configuration in Type C and Type E

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	LED

3.2 Type D (Low Profile)

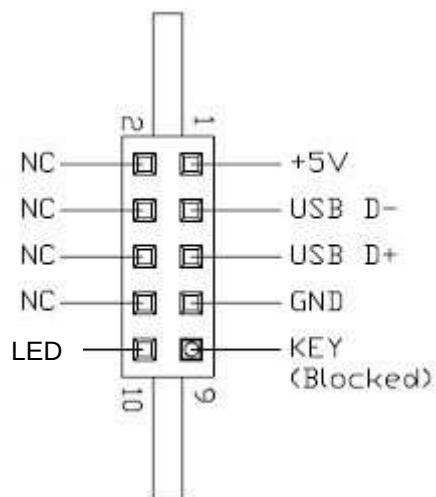


Table 3-3: Pin Assignment of the 10-pin configuration in Type D (Low Profile)

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	LED

4. Capacity Specifications

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

Table 4-1: Capacity Specification

Capacity	Total Bytes
512 MB	TBD
1 GB	TBD
2 GB	TBD
4 GB	TBD
8 GB	TBD

4.1 Performance Specifications

Table 4-2: Performance Specifications

	USB 2.0 High-Speed (Max.)
Sustained Read	Up to 35 MB/sec
Sustained Write	Up to 25 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 4-3.

Table 4-3: Environmental Specifications

Item	Specification
Non-Operating temp.	-40~100(°C)
Operating temp.	0~70(°C)
Non-Operating shock	1500(G)/0.5(ms), half-sine wave, 3 axis/6 direction
Operating shock	50(G)/11(ms), half-sine wave, 3 axis/6 direction
Non-Operating vibration	10~2000(Hz), 15(G), sine wave, 3axis
Operating vibration	20~2000(Hz), 7.7(Grms), random wave, 3axis
Operating humidity	10~95(%) R.H, non-condensing, 35(°C) max. wet bulb temp.

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
Input Voltage	V _{IN}	-0.3	5.25	V
Storage Temperature	T _{STG}	-40	100	°C

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

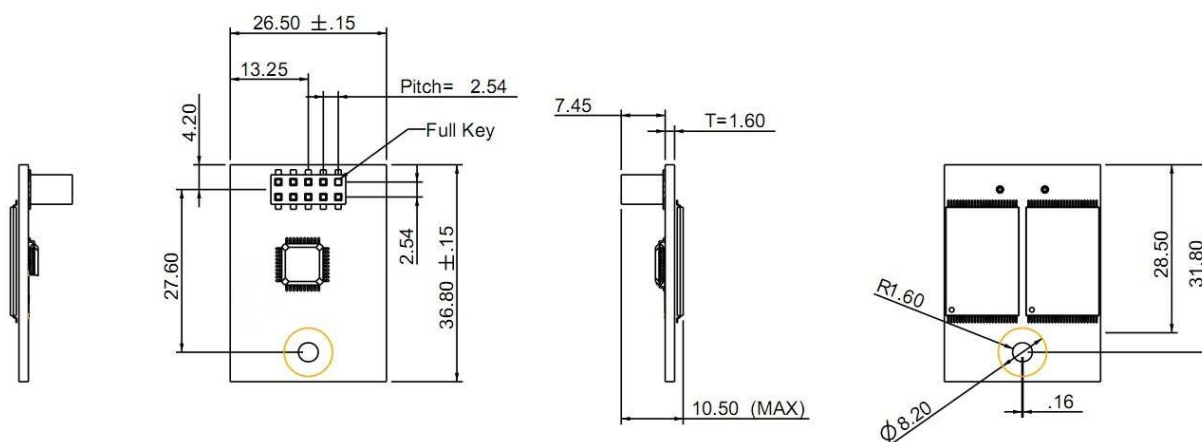
6. Physical Dimension

6.1 Horizontal Design

6.1.1 Type C (STD 90D-MS)

Standard 90 Degree Mounting Screw

Length	36.8 mm	Width	26.5 mm	Height (Max)	10.5 mm
--------	---------	-------	---------	--------------	---------



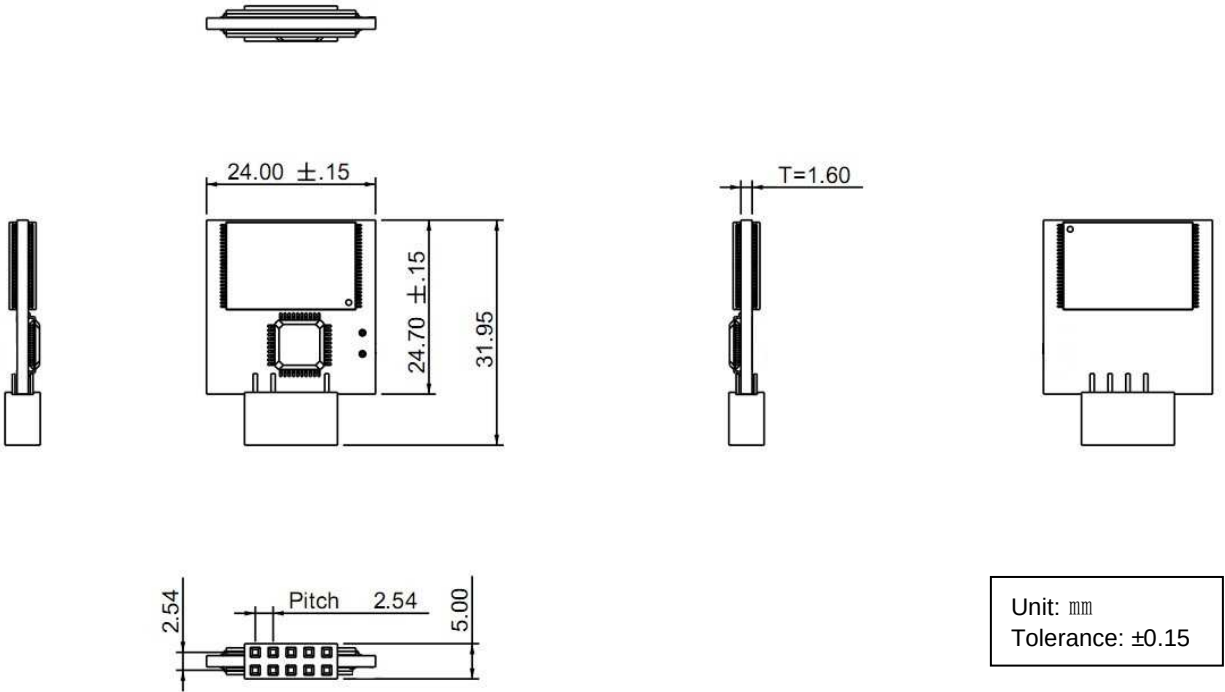
Unit: mm
Tolerance: ±0.15

6.2 Low Profile Design

6.2.1 Type D (LP 180D)

Low Profile 180 Degree

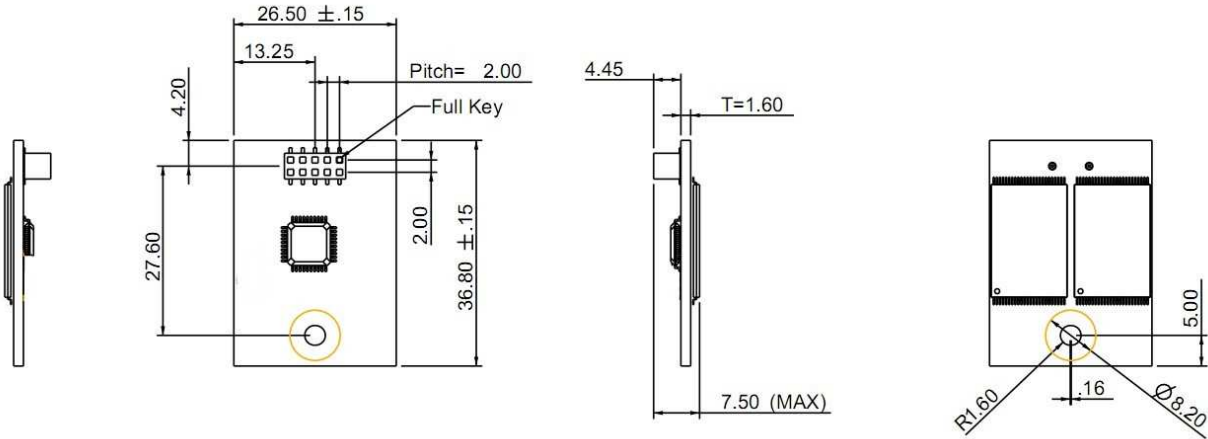
Length	31.95 mm	Width	24 mm	Height (Max)	5 mm
--------	----------	-------	-------	--------------	------



6.2.2 Type E (LP 90D-MS)

Low Profile 90 Degree Mounting Screw

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

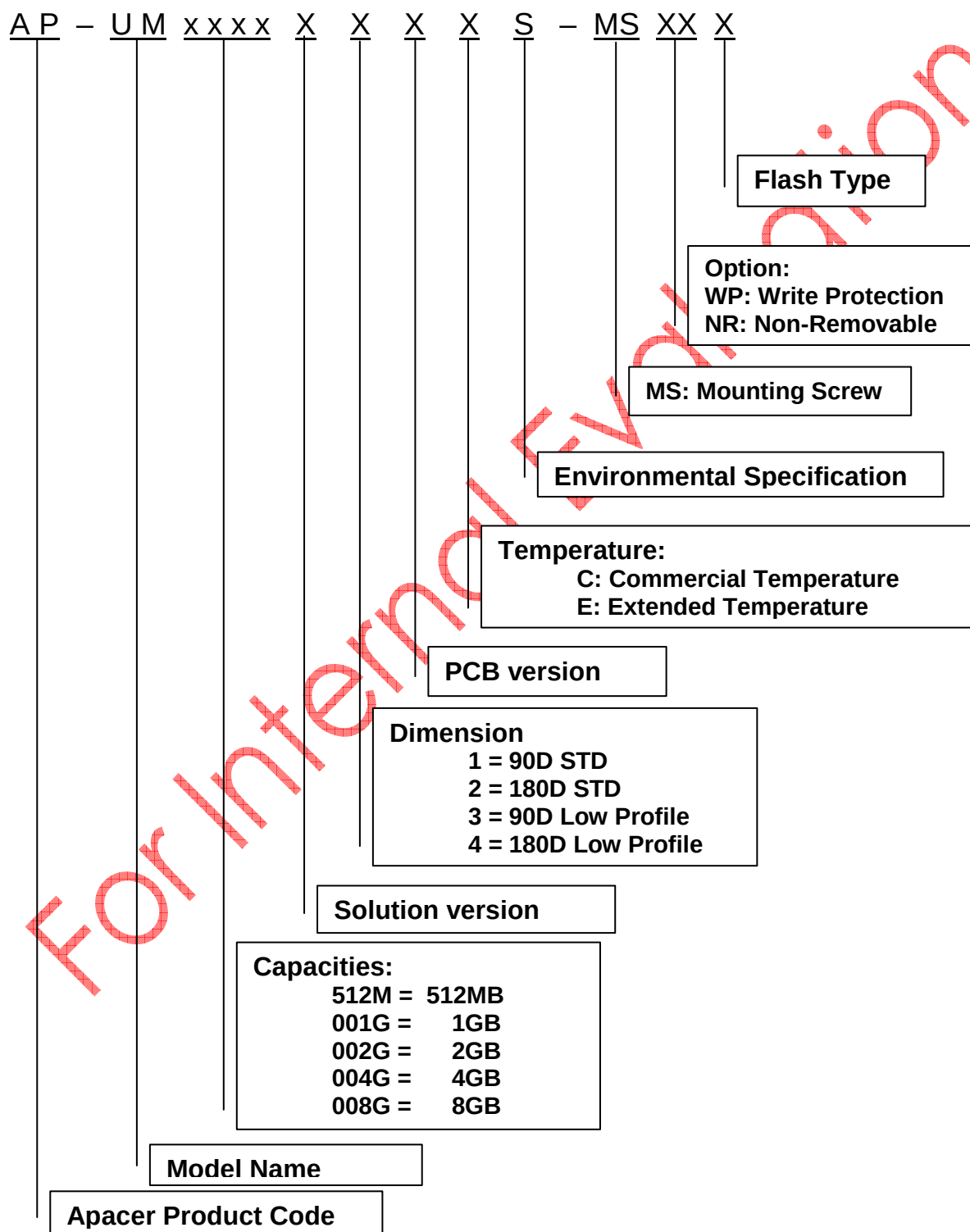


Unit: mm
Tolerance: ±0.15

For Internal Use

7. Product Ordering Information

7.1 Product Code Designations



7.2 Valid Combinations

7.2.1 Type C (STD 90D-MS)

Standard 90 Degree Mounting Screw

Capacity	Standard	Extended Temperature
512 MB	AP-UM512MK10CS-MSS	AP-UM512ML10ES-MSS
1 GB	AP-UM001GK10CS-MSS	AP-UM001GL10ES-MSS
2 GB	AP-UM002GK10CS-MSS	AP-UM002GL10ES-MSS
4 GB	AP-UM004GK10CS-MSS	AP-UM004GL10ES-MSS
8 GB	AP-UM008GK10CS-MST	AP-UM008GL10ES-MST

7.2.2 Type D (LP 180D)

Low Profile 180 Degree

Capacity	Standard	Extended Temperature
512 MB	AP-UM512MK42CS-S	AP-UM512ML42ES-S
1 GB	AP-UM001GK42CS-S	AP-UM001GL42ES-S
2 GB	AP-UM002GK42CS-S	AP-UM002GL42ES-S
4 GB	AP-UM004GK42CS-S	AP-UM004GL42ES-S
8 GB	AP-UM008GK42CS-T	AP-UM008GL42ES-T

7.2.3 Type E (LP 90D-MS)

Low Profile 90 Degree Mounting Screw

Capacity	Standard	Extended Temperature
512 MB	AP-UM512MK31CS-MSS	AP-UM512ML31ES-MSS
1 GB	AP-UM001GK31CS-MSS	AP-UM001GL31ES-MSS
2 GB	AP-UM002GK31CS-MSS	AP-UM002GL31ES-MSS
4 GB	AP-UM004GK31CS-MSS	AP-UM004GL31ES-MSS
8 GB	AP-UM008GK31CS-MST	AP-UM008GL31ES-MST

Revision History

Revision	Description	Date
0.1	Preliminary release	01/07/2011
0.2	Context refined	01/10/2011
0.3	Updated feature details & pin assignments drawings	01/11/2011
0.4	Updated environment specifications	01/14/2011

For Internal Evaluation

Global Presence

Taiwan (Headquarters)	Apacer Technology Inc. 4 th Fl, 75 Xintai 5 th Rd., Sec.1 Hsichih, New Taipei City Taiwan 221 R.O.C. Tel: +886-2-2698-2888 Fax: +886-2-2698-2889 amtsales@apacer.com
U.S.A.	Apacer Memory America, Inc. 386 Fairview Way, Suite102, Milpitas, CA 95035 Tel: 1-408-518-8699 Fax: 1-408-935-9611 sa@apacerus.com
Japan	Apacer Technology Corp. 5F, Matsura Bldg., Shiba, Minato-Ku Tokyo, 105-0014, Japan Tel: 81-3-5419-2668 Fax: 81-3-5419-0018 jpservices@apacer.com
Europe	Apacer Technology B.V. Aziëlaan 22, 5232 BA 's-Hertogenbosch, The Netherlands Tel: 31-73-645-9620 Fax: 31-73-645-9629 sales@apacer.nl
China	Apacer Electronic (Shanghai) Co., Ltd 1301, No.251,Xiaomugiao Road, Shanghai, 200032, China Tel: 86-21-5529-0222 Fax: 86-21-5206-6939 sales@apacer.com.cn
India	Apacer Technologies Pvt Ltd, #1064, 1st Floor, 7th 'A' Main, 3rd Block Koramangala, Bangalore – 560 034 Tel: +91 80 4152 9061/62/63 Fax: +91 80 4170 0215 sales_india@apacer.com