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User's Manual

Disk On Module

Version 3.2

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Contents:

A. Product Information

The Micro Disk Module is solid-state design and IDE compatible. It is an ideal replacement for standard IDE hard disk. It's a solid-state design offers no seek errors even under extreme shock and vibration conditions. The Micro Disk Module is extremely small and highly suitable for rugged environments, thus providing an excellent solution for mobile applications with space limitations. It is fully compatible with all consumer applications designed for data storage, allowing simple use for the end user. The Micro Disk Module is O/S independent, thus offering an optimal solution for embedded systems operating in non-standard computing environments. It provides memory storage for mobile computing applications, consumer electronics and embedded systems.

The Micro Disk Module is IDE compatible and offering various capacities. It has low power consumption and can operate from a single 3.3/5.0 Volt power supply. The operating temperature grade is commercial operating temperature grade (0℃~+70℃) and industrial operating temperature grade (-40℃~+85℃). Optional vertical type with case and horizontal type include rightwards side or leftwards side.

B. System Features

- Industry ATAPI-5 Standard Compliant.
- Max Capacity supported: 8GByte.
- Optional designs for vertical type and horizontal type
- High reliability assured based on the internal ECC (Error Correcting Code) function.
- Reliable wear-leveling algorithm to ensure the best of flash endurance.
- Auto Standby and Sleep Mode supported.
- Flexible file system structure.
- Dual Channel operation supported for performance enhancement.
- Automatic Recognition and Initialization of flash devices.
- Excellent performance supporting Ultra DMA Mode 4.
- Capacity supported: 128MB, 256MB, 512MB, 1GB, 2GB, 4GB, 8GB

C. Specifications

Compatibility	PC ATA and True IDE	
Flash Technology	NAND Type SLC Flash Memory Base	
	40-pin	44-pin
Form Factor	Vertical Type	Vertical Type
	Horizontal Leftward Type	Horizontal Leftward Type
	Horizontal Rightward Type	Horizontal Rightward Type
Connector Types	2.54mm Female	2.00mm Female
Master/Slave	Setup By Jump	Setup By Switch
System Performance		
Data Transfer Mode	PIO Mode 4 or UDMA Mode 4	
Sequential Read	20Mbytes / sec Max.	
Sequential Write	19Mbytes / sec Max.	
Average Access Time	2ms (estimated)	
Environmental Specification		
Standard Temperature	Operation	0ºC ~ +70ºC
	Non-operation	-20ºC ~ +80ºC
Wide Temperature	Operation	-40ºC ~ +85ºC
	Non-operation	-50ºC ~ +95ºC
Vibration	Operation max	20 G
	Non-operation max	20 G
Humidity	Operation max	5~95% non-condensing
	Non-operation max	5~95% non-condensing
Shock	Operation max	1500 G
	Non-operation max	1500 G
Reliability		
MTBF	> 1,000,000 hours	
Error Code Correction	4 bits ECC Code	
Endurance	Greater than 1,000,000 cycles logically contributed by Wear-leveling and advanced bad sector management algorithms	
Data Reliability	< 1 non-recoverable error 10^{14} bits read	
Data Retention	10 years	
Power Consumption		
Power Voltage	+3.3V ± 5%	+5V ± 10%
Read	57.7mA(Typ.)	57.7mA(Typ.)
Write	60mA(Typ.)	60mA(Typ.)
Sleep Mode	2.3mA(Typ.)	2.3mA(Typ.)
Power input(for 40 pin)	A power cable with 4pin to 2pin connector	

D. Pin Assignments and Signal Descriptions

D.1 Pin Assignments

Pin #	Pin Name	Pin Type	Pin #	Pin Name	Pin Type
1	-RESET	I	2	GND	Ground
3	Data 7	I/O	4	Data 8	I/O
5	Data 6	I/O	6	Data 9	I/O
7	Data 5	I/O	8	Data 10	I/O
9	Data 4	I/O	10	Data 11	I/O
11	Data 3	I/O	12	Data 12	I/O
13	Data 2	I/O	14	Data 13	I/O
15	Data 1	I/O	16	Data 14	I/O
17	Data 0	I/O	18	Data 15	I/O
19	Ground	Power	20	Key Pin	Power
21	Reserved	--	22	GND	Ground
23	-IOW	I	24	GND	Ground
25	-IOR	I	26	GND	Ground
27	IORDY	O	28	Reserved	--
29	Reserved	--	30	GND	Ground
31	IRQ	O	32	-IOCS16	O
33	A1	I	34	-PDIAG	I/O
35	A0	I	36	A2	I
37	-CS0	I	38	-CSI	I
39	DASP	I/O	40	GND	Ground
41	VCC1	Power	42	VCC1	Power
43	GND1	Ground	44	Reserved2	Ground

Note:

1. *1: These 4 pins are for IDE 44-pin standard.*
2. *2: 44 Pin use for Ground.*

D.2 Signal Descriptions

Signal Name	Dir.	Pin	Description
RESET	I	1	This pin Host Reset. Reset signal is from the host and it is active low.
Data [15:0]	I/O	3-18	These lines carry Data, Command and Status information between the host and controller.D0 is LSB and D15 is MSB.
IOW	I	23	The I/O Write Strobe pulse is used to clock I/O data on the Data bus into the controller registers. The clocking will occur on the negative to the positive edge of the signal (trailing edge).
IOR	I	25	This is an I/O Read strobe generated by the host. This signal gates I/O data into the bus from the controller. The clocking will occur on the negative to the positive edge of the signal (trailing edge).
IRQ	O	31	This is an interrupt request from the controller to host, asking for service. The output of this signal is tri-state when the interrupt are disabled by the host.
A[2:0]	I	33,35,36	A[2:0] are used to select the one of eight registers in the Task File.
CSO,CS	I	37,38	-CSO is the chip select for the task file registers while –CS1 is used to select the Alternate Status Register and the Device Control Register.
IORDY	O	27	This signal is negated to extend the host transfer cycle of any host register access (Read or Write) when the device is not ready to respond to a data transfer request.
IOCS16	O	32	This open drain output signal is asserted low by the controller to indicate to the host the current cycle is a 16-bit (word) data transfer.
PDIAG	I/O	34	This bi-directional open drain signal is asserted by the slave after an Execute Diagnostic command to indicate to the master it has passed it's diagnostics.
DASP	I/O	39	This open drain output is asserted low any time the drive is active. In a Master/Slave configuration, this signal is used the slave to inform the master which has slave present.
GND		02,19,22,24, 26,30,40,43	Ground
VCC		20,41,42	+5V or 3.3V Power

E. System Power Consumption

Dc Input Voltage (VCC)	3.3V / 5V ±5%	
+5V Current (Average Value)	Maximum stand by current	160uA
	Maximum loading current	150uA

F. Power Management

Micro Disk Module provides automatic power saving mode.

1. Standby Mode : When Micro Disk Module finished initialization after power reset or hardware reset, it goes into Standby Mode to wait for Command In or Soft Reset.

2. Active Mode : If Micro Disk Module received any Command In or Soft Reset, it goes into Active Mode. In Active Mode, it is capable of executing any ATA commands. The power consumption is the greatest in this mode.

3. Sleep Mode : The Micro Disk Module will enter Sleep Mode if there is no Command In or Soft Reset from the host for about 4ms or sleep command is asserted. This time interval can be modified by firmware if necessary. Sleep Mode provides the lowest power consumption. During Sleep Mode, the system main clock is stopped. This mode can be waked up from hardware reset, software reset or any ATA command asserted.

G. Electrical Specifications

Symbol	Parameter	Rating	Units
VCC	Power Supply	-0.3 to 5.5	V
VIN	Input Voltage	-0.3 to VCC +0.3	V
VOUT	Output Voltage	-0.3 to VCC +0.3	V
VCCQ	Power supply for host I/O and embedded regulator	-0.6 to 5.5	V
VIN_HOST	Input voltage for host I/O	-0.3 to VCCQ +0.3	V
VOUT_HOST	Output voltage for host I/O	-0.3 to VCCQ +0.3	V
TOPR-I	Operating temperature for industrial grade	-40° to +85°	℃
TOPR	Operating temperature for commercial grade	0° to +70°	℃
TSTG	Storage temperature	-55° to 150°	℃

H. DC Characters

H.1. DC Characteristics (TOPRi = -40℃~ +85℃, Vcc = 3.3V ~3.6V)

Symbol	Parameter	Condition	MIN.	TYP.	MAX.	Units
VIL	Input low voltage	CMOS			0.2*Vcc	V
VIH	Input high voltage	CMOS	2.0			V
Vt-	Schimitt trigger negative going threshold voltage	CMOS	0.9			V
Vt+	Schimitt trigger negative going threshold voltage	CMOS			2.5	V
VOL	Output low voltage	IOL=4,8mA			0.4	V
VOH	Output high voltage	IOH=4,8mA	Vcc-0.8			V
Rt	Input Pull-up/down resistance	VIL=0V or VIH=Vcc		75		KΩ

H.2. DC Characteristics (TOPRi = -40℃~ +85℃, Vcc = 4.5V ~5.5V)

Symbol	Parameter	Condition	MIN.	TYP.	MAX.	Units
VIL	Input low voltage	COMS(*1)			0.2*Vcc	V
VIH	Input low voltage	COMS(*1)	20.			V
VILQ	Host I/F pin input low voltage	TTL(*2)			0.8	V
VIHQ	Host I/F pin input high voltage	TTL(*2)	20			V
Vt-	Schmitt trigger negative going threshold voltage	VCCQ(*2)	0.8			V
Vt+	Schmitt trigger negative going threshold voltage	VCCQ(2)			2.0	V
Vt-	Schmitt trigger negative going threshold voltage	Vcc(*1)	0.9			V
Vt+	Schmitt trigger negative going threshold voltage	Vcc(*1)			2.5	V
VOL	Output low voltage	IOL=4.8mA			0.4	V
VOH	Output high voltage	IOH=4.8mA	Vcc-0.8			V
VOLQ	Host I/F pin output low voltage	IOL=4.8mA			0.4	V
VOHQ	Host I/F pin output high voltage	IOH=4.8mA	VCCQ-0.8			V
Rt	Input Pull-up / down resistance	VIL=0V or VIH=VCC		75		KΩ

Note:

3. 1. For the pins, which were driven by Vcc.
4. 2. For the host interface pins only, which were driven by Vcc.

I. AC Characters

AC Characteristics (Ta = -40℃~ +85℃, Vcc = 5V ±10%, Vcc = 3.3V±5%)

I.1 The IDE Mode Access Read AC Characteristics

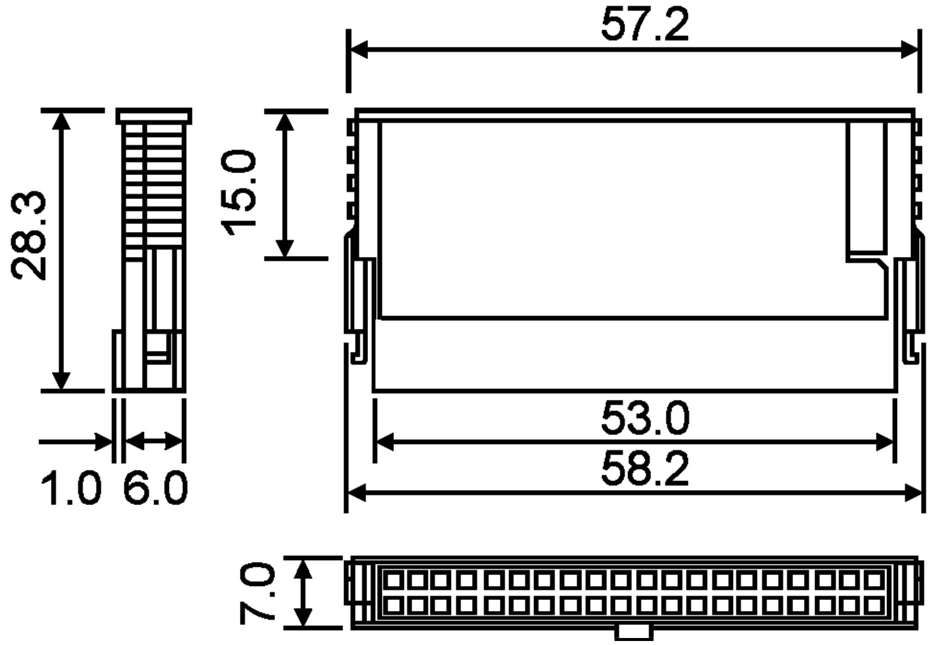
Parameter	Symbol	Min	Typ	Max	Unit
Data delay after IORD	td(IORD)	-	-	50	ns
Data hold following IORD	th(IORD)	5	-	-	ns
IORD width time	tw(IORD)	70	-	-	ns
Address setup before IORD	tsuA(IORD)	25	-	-	ns
Address hold following IORD	ThA(IORD)	10	-	-	ns
CE setup before IORD	tsuCE(IORD)	25	-	-	ns
CE hold following IORD	thCE(IORD)	10	-	-	ns
IOCS16 delay falling from address	tdfIOCS16(ADR)	-	-	35	ns
IOCS16 delay rising from address	tSIOCS16(ADR)	-	-	35	ns

I.2 True IDE Mode Access Write AC Characteristics

Parameter	Symbol	Min	Typ	Max	Unit
Data delay before IOWR	td(IOWR)	20	-	-	ns
Data hold following IOWR	th(IOWR)	10	-	-	ns
IORD width time	tw(IOWR)	70	-	-	ns
Address setup before IOWR	tsuA(IOWR)	15	-	-	ns
Address hold following IOWR	thA(IOWR)	10	-	-	ns
CE setup before IOWR	tsuCE(IOWR)	5	-	-	ns
CE hold following IOWR	thCE(IOWR)	10	-	-	ns
IOCS16 delay falling from address	tdfIOCS16(ADR)	-	-	35	ns
IOCS16 delay rising from address	tSIOCS16(ADR)	-	-	35	ns

J. Product Model and Physical Specification

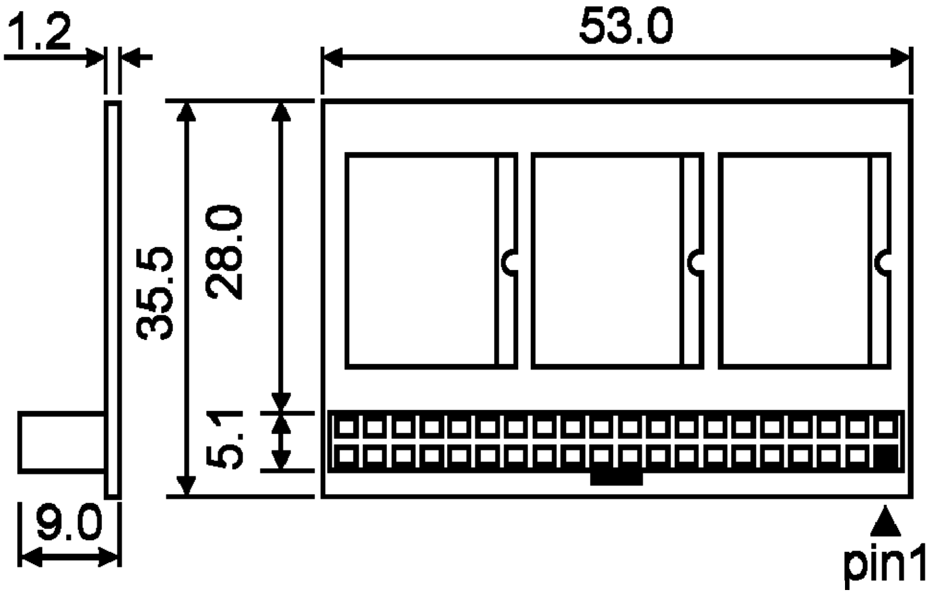
40 Pin Vertical Physical Specification



40 Pin Vertical Product Model Name

Standard Temperature (0ºC ~ +70ºC)	Wide Temperature (-40ºC ~ +85ºC)
MDM-0VSU128MBPCF	MDM-0VSU128MBPIF
MDM-0VSU256MBPCF	MDM-0VSU256MBPIF
MDM-0VSU512MBPCF	MDM-0VSU512MBPIF
MDM-0VSU001GBPCF	MDM-0VSU001GBPIF
MDM-0VSU002GBPCF	MDM-0VSU002GBPIF
MDM-0VSU004GBPCF	MDM-0VSU004GBPIF

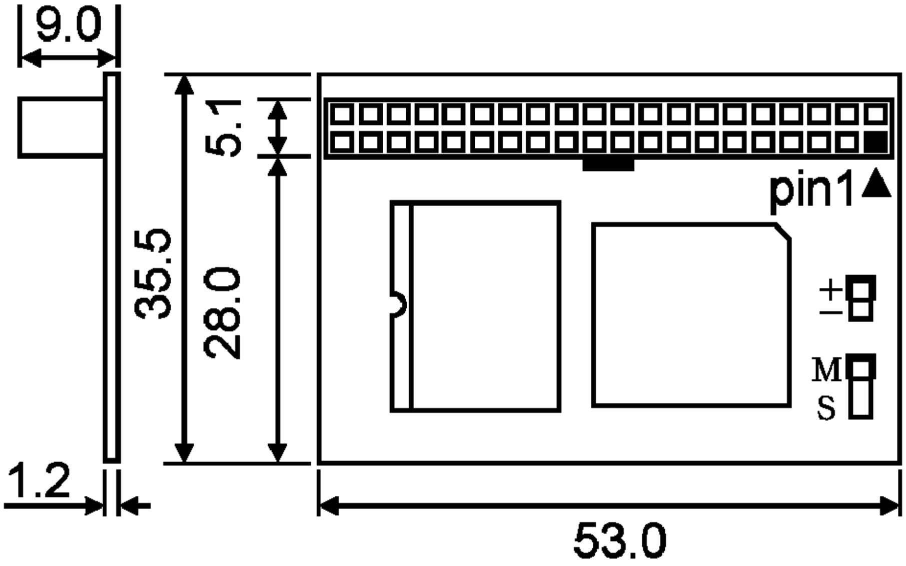
- ## 40 Pin Left Side Physical Specification



- ## 40 Pin Left Side Product Model Name

Standard Temperature (0ºC ~ +70ºC)	Wide Temperature (-40ºC ~ +85ºC)
MDM-0LSU128MBPCF	MDM-0LSU128MBPIF
MDM-0LSU256MBPCF	MDM-0LSU256MBPIF
MDM-0LSU512MBPCF	MDM-0LSU512MBPIF
MDM-0LSU001GBPCF	MDM-0LSU001GBPIF
MDM-0LSU002GBPCF	MDM-0LSU002GBPIF
MDM-0LSU004GBPCF	MDM-0LSU004GBPIF
MDM-0LSU008GBPCF	MDM-0LSU008GBPIF

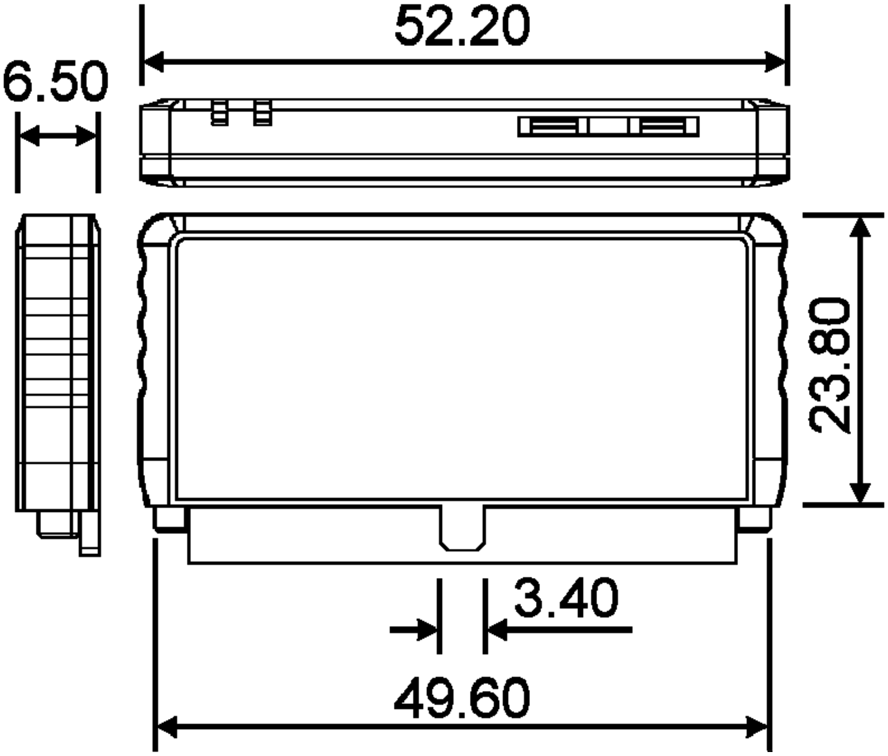
- ## 40 Pin Right Side Physical Specification



- ## 40 Pin Right Side Product Model Name

Standard Temperature (0ºC ~ +70ºC)	Wide Temperature (-40ºC ~ +85ºC)
MDM-0RSU128MBPCF	MDM-0RSU128MBPIF
MDM-0RSU256MBPCF	MDM-0RSU256MBPIF
MDM-0RSU512MBPCF	MDM-0RSU512MBPIF
MDM-0RSU001GBPCF	MDM-0RSU001GBPIF
MDM-0RSU002GBPCF	MDM-0RSU002GBPIF
MDM-0RSU004GBPCF	MDM-0RSU004GBPIF
MDM-0RSU008GBPCF	MDM-0RSU008GBPIF

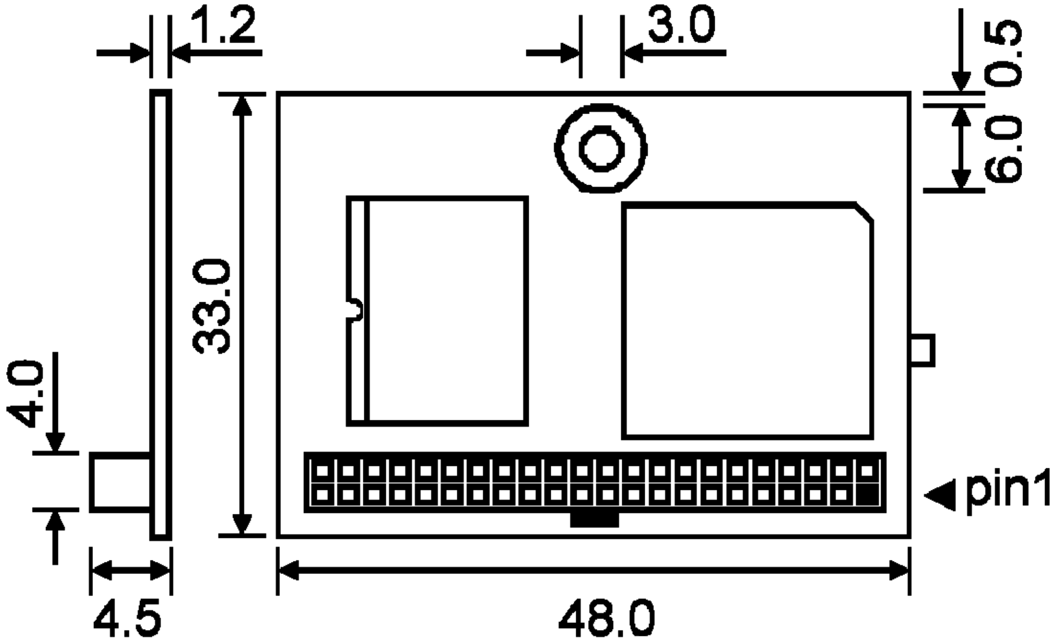
- ## 44 Pin Vertical Physical Specification



- ## 44 Pin Vertical Product Model Name

Standard Temperature (0ºC ~ +70ºC)	Wide Temperature (-40ºC ~ +85ºC)
MDM-4VSU128MBPCF	MDM-4VSU128MBPIF
MDM-4VSU256MBPCF	MDM-4VSU256MBPIF
MDM-4VSU512MBPCF	MDM-4VSU512MBPIF
MDM-4VSU001GBPCF	MDM-4VSU001GBPIF
MDM-4VSU002GBPCF	MDM-4VSU002GBPIF
MDM-4VSU004GBPCF	MDM-4VSU004GBPIF

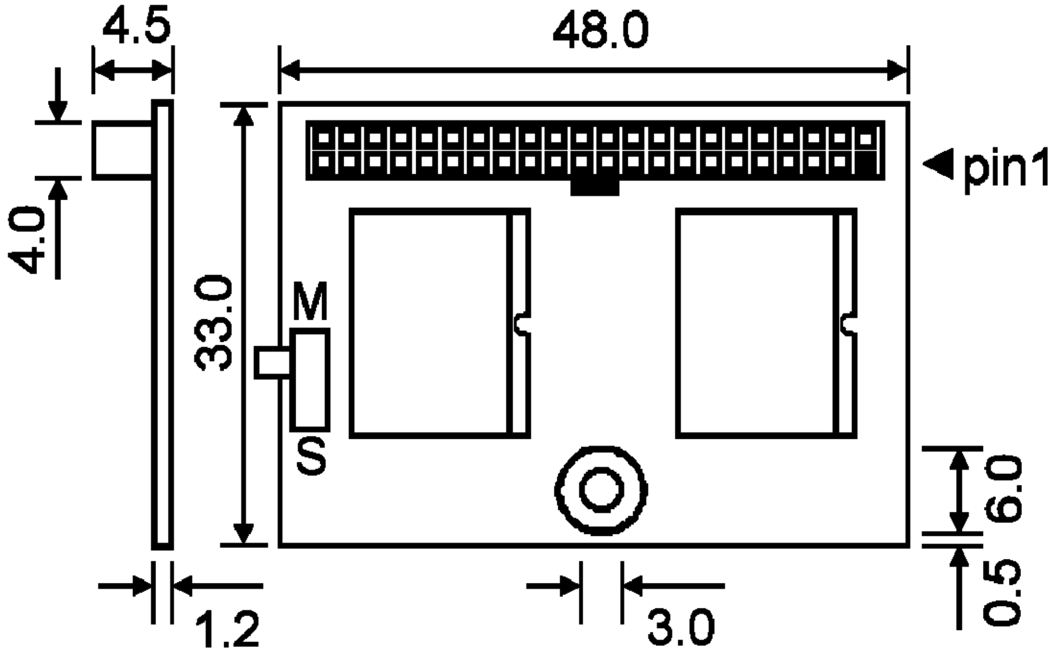
- ## 44 Pin Left Side Physical Specification



- ## 44 Pin Left Side Product Model Name

Standard Temperature (0ºC ~ +70ºC)	Wide Temperature (-40ºC ~ +85ºC)
MDM-4LSU128MBPCF	MDM-4LSU128MBPIF
MDM-4LSU256MBPCF	MDM-4LSU256MBPIF
MDM-4LSU512MBPCF	MDM-4LSU512MBPIF
MDM-4LSU001GBPCF	MDM-4LSU001GBPIF
MDM-4LSU002GBPCF	MDM-4LSU002GBPIF
MDM-4LSU004GBPCF	MDM-4LSU004GBPIF

- ## 44 Pin Right Side Physical Specification



- ## 44 Pin Right Side Product Model Name

Standard Temperature (0ºC ~ +70ºC)	Wide Temperature (-40ºC ~ +85ºC)
MDM-4RSU128MBPCF	MDM-4RSU128MBPIF
MDM-4RSU256MBPCF	MDM-4RSU256MBPIF
MDM-4RSU512MBPCF	MDM-4RSU512MBPIF
MDM-4RSU001GBPCF	MDM-4RSU001GBPIF
MDM-4RSU002GBPCF	MDM-4RSU002GBPIF
MDM-4RSU004GBPCF	MDM-4RSU004GBPIF

K. Part Number Decoder

$X_1X_2X_3$-$X_4X_5X_6X_7X_8X_9X_{10}X_{11}X_{12}X_{13}X_{14}X_{15}$

$X_1X_2X_3$: Product Name

MDM: Micro Disk Module
CFC: Compact Flash Card
FDK: Flash Disk Module
ATA: PCMCIA Card
UFD: USB Flash Disk
MDS: Micro Disk SATA Module
SDC: SD Card

X_4 X_5: Connector Position

For MDM

0V: 40 pin Vertical
0L: 40 pin Horizontal Left Side
0R: 40 pin Horizontal Right Side
4V: 44 pin Vertical
4L: 44 pin Horizontal Left Side
4R: 44 pin Horizontal Right Side

For CFC

50: CompactFlash Connector

For FDK

35: 3.5” FDK Connector
25: 2.5” FDK Connector

For ATA

68: PCMCIA connector

For MDS

7L: Left Side
7R: Right Side

For SDC

09: SDC Connector

X_6X_7: Controller Number

S0: SSS-883X
SH: SSS-886X
SU: SSS-8873 or SSS-8883
AF: Alcor AU698X

$X_8X_9X_{10}X_{11}X_{12}$: Product Capacity

016MB: 16M Byte
032MB: 32M Byte
064MB: 64M Byte
128MB: 128M Byte
256MB: 256M Byte
512MB: 512M Byte
001GB: 1G Byte
002GB: 2G Byte
004GB: 4G Byte
008GB: 8G Byte

X_{13}: Pb

Y: Pb
P: Pb free

X_{14}: Operation Temperature

I: Wide Temperature(-40~+85℃)
C: Standard Temperature(0~+70℃)

X_{15}: Disk Mode

F: Fix Disk Mode
R: Removable Disk Mode
A: Auto Detect Disk Mode

Any advice or comments about our products and service, or anything we can help you with please don't hesitate to contact with us. We will do our best to support your products, projects and business.

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