

UD info Corp.

Industrial uSSD
MSC-F6UD Series
Product DataSheet

UD info CORP.

3F-4, No.8, Ln. 609, Sec. 5, Chongxin Rd., Sanchong Dist., New Taipei City 241, Taiwan (R.O.C.)

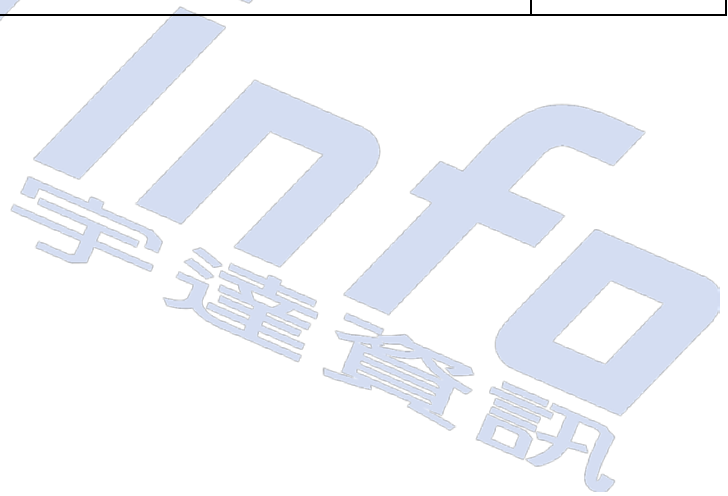
TEL: +886-2-7713-6050 FAX: +886-2-8511-3151

E-mail: sales@UDinfo.com.tw

1.	Introduction	5
1.1.	General Description	5
1.2.	Block Diagram	5
2.	Product Specifications	6
3.	Environmental Specifications	9
3.1.	Environmental Conditions	9
3.2.	Package Qualification	10
3.3.	MTBF.....	11
3.4.	Certification & Compliance.....	11
4.	Electrical Specifications	12
4.1.	Supply Voltage.....	12
4.2.	Power Consumption.....	12
5.	Interface	13
5.1.	Pin Assignment and Descriptions	13
6.	Supported Commands	19
6.1.	ATA Command List	19
6.2.	Identify Device Data	20
7.	Physical Dimension	25
8.	Partnumber decoder	28

Revision History

Revision	Draft Date	History	Author
1.0	2014/8/25	New release	Golden Lee
1.1	2014/9/17	Add wide temperature condition	Golden Lee
1.2	2014/11/11	Modify Partnumber decoder	Golden Lee
1.3	2014/12/9	Modify lowest capacity MLC from 8GB pSLC from 4GB	Golden Lee
1.4	2014/12/16	Update pin assignment in table 5-1	Golden Lee
1.5	2015/2/6	Add GPIO special function 1. GPIO2 for write protect function 2. GPIO3 for Quick Erase function	Golden Lee
1.6	2015/12/14	Add 15nm Flash support	Golden Lee
1.7	2016/4/21	Add capacity information & performance & power consumption for each capacity	Golden Lee



Product Overview

- **Capacity**
 - MLC: 8GB up to 128GB
 - pSLC: 4GB up to 64GB
- **SATA Interface**
 - SATA 1.5Gbps, 3Gbps, and 6Gbps interface
- **Flash Interface**
 - Flash Type: MLC and pSLC
- **Performance**
 - Read: up to 500 MB/s
 - Write: up to 185 MB/s
- **Power Consumption**^{Note1}
 - Active mode: < 1475mW
 - Idle mode: < 270mW
 - DEVSLP mode: < 5mW
- **TBW (Terabyte Written)**
 - pSLC: 1025 TBW for 64GB
 - MLC: 317 TBW for 128GB
- **MTBF**
 - MLC: 2,000,000 hours
 - pSLC: 2,500,000 hours
- **Advanced Flash Management**
 - Static and Dynamic Wear Leveling
 - Bad Block Management
 - TRIM
 - SMART
 - Over-Provision
 - Firmware Update
- **Low Power Management**
 - DEVSLP Mode (Optional)
 - DIPM/HIPM Mode
- **Temperature Range**
 - Operation (Standard): 0°C ~ 70°C
 - Operation (Wide): -40°C ~ 85°C
 - Storage: -40°C ~ 85°C
- **Compliant**
 - RoHS
 - CE & FCC

Notes:

1. Please see "Power Consumption" for details.

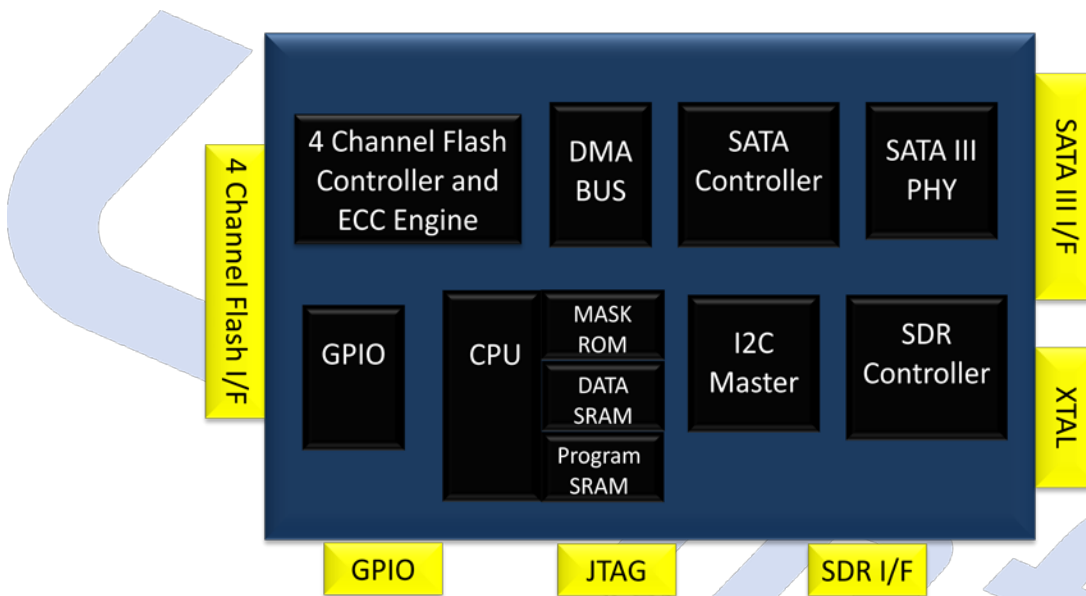
1. INTRODUCTION



1.1. General Description

UDinfo's MSC-F6UD delivers all the advantages of Flash Disk technology with the Serial ATA I/II/III interface in an embedded BGA form factor. Its capacity could provide a wide range from 4GB to 128GB. Moreover, it can reach up to 520MB/s read as well as 185MB/s write high performance, and lower power consumption makes it an ideal storage choice for high performance demanding mobile devices.

1.2. Block Diagram



MSC-F6UD Block Diagram

2. PRODUCT SPECIFICATIONS



- **Capacity**
 - MLC: From 8GB up to 128GB (support 48-bit addressing mode)
 - pSLC: From 4GB up to 64GB (support 48-bit addressing mode)
- **Electrical/Physical Interface**
 - SATA Interface
 - ◆ Compliant with SATA Revision 3.0
 - ◆ Compatible with SATA 1.5Gbps, 3Gbps and 6Gbps interface
 - ◆ Support power management
 - ◆ Support expanded register for SATA protocol 48 bits addressing mode
 - ◆ Self-calibrated and embedded termination resistor at transmitter
 - Flash IO
 - ◆ Support 1.8V and 3.3V voltage level
 - ◆ Support 3.3V for conventional Asynchronous Flash
- **NAND Flash**
 - Toshiba A19nm/15nm MLC, Toggle1.0 and Toggle2.0
 - Support 4KB/8KB/16KB per page NAND Flash Memory
- **ECC Scheme**
 - Up to 72 bits / 1K Byte
- **Operation Voltage Supply**
 - 3.3V ± 5% / 1.8V ± 5% / 1.2V ± 5%
- **Power Saving Implementation**
 - Idle / Sleep / Partial / Slumber / DEVSLP mode
- **Built-in 32-Bit Microcontroller (Core)**
- **UART function**
- **Implement Voltage Detector**
- **Implement Thermal Sensor**
- **GPIO**
- **Support SMART and TRIM commands**
- **Support Write Protect function (optional)**
- **Support Quick Erase function (optional)**

UD info CORP. TEL: +886-2-7713-6050 FAX: +886-2-8511-3151

3F-4, No.8, Ln. 609, Sec. 5, Chongxin Rd., Sanchong Dist., New Taipei City 241, Taiwan (R.O.C.)

- **Capacity Information**

Capacity	Cylinders	Heads	Sectors	Total Sectors	User Data Size
4GB	7,773	16	63	7,835,184	Depended on file management
8GB	15,525	16	63	15,649,200	
16GB	16,383	16	63	31,277,232	
32GB	16,383	16	63	62,533,296	
64GB	16,383	16	63	125,045,424	
128GB	16,383	16	63	250,069,680	

- **Performance**

- **MLC:**

Capacity	Flash Structure	Flash Type	Sequential	
			Read (MB/s)	Write (MB/s)
8GB	8GB x 1	15nm, TSOP	150	95
16GB	16GB x 1	15nm, TSOP	130	80
32GB	16GB x 2	15nm, TSOP	300	160
64GB	16GB x 4	15nm, TSOP	500	185
128GB	16GB x 8	15nm, TSOP	495	175

- **pSLC:**

Capacity	Flash Structure	Flash Type	Sequential	
			Read (MB/s)	Write (MB/s)
4GB	8GB x 1	15nm, TSOP	155	105
8GB	16GB x 1	15nm, TSOP	135	95
16GB	16GB x 2	15nm, TSOP	310	150
32GB	16GB x 4	15nm, TSOP	500	175
64GB	16GB x 8	15nm, TSOP	500	185

Notes:

1. The performance was estimated based on Toshiba 15nm MLC NAND flash.
2. Performance may differ according to flash configuration and platform.
3. The table above is for reference only.

- TBW (Terabytes Written)

- MLC:

Capacity	Flash Structure	TBW
8GB	8GB x 1	19
16GB	16GB x 1	39
32GB	16GB x 2	79
64GB	16GB x 4	158
128GB	16GB x 8	317

- pSLC:

Capacity	Flash Structure	TBW
4GB	8GB x 1	64
8GB	16GB x 1	128
16GB	16GB x 2	256
32GB	16GB x 4	512
64GB	16GB x 8	1025

Notes:

1. Samples were built using Toshiba 15nm MLC NAND flash.
2. TBW may differ according to flash configuration and platform.
3. The endurance of SSD could be estimated based on user behavior, NAND endurance cycles, and write amplification factor. It is not guaranteed by flash vendor.

3. ENVIRONMENTAL SPECIFICATIONS



3.1. Environmental Conditions

Temperature and Humidity

- Storage Temperature range
 - -40°C to 85°C
- Operation Temperature Range
 - Commercial grade : 0°C ~ 70°C
 - Industrial grade: -40°C ~ 85°C
- Humidity: RH 95% under 40°C (in operation)

Table 3-1 High Temperature Test Condition

	Temperature	Humidity	Test Time
Operation	85°C	0% RH	72 hours
Storage	85°C	0% RH	168 hours

Result: No any abnormality is detected.

Table 3-2 Low Temperature Test Condition

	Temperature	Humidity	Test Time
Operation	-25°C	0% RH	72 hours
Storage	-40°C	0% RH	168 hours

Result: No any abnormality is detected.

Table 3-3 High Humidity Test Condition

	Temperature	Humidity	Test Time
Operation	40°C	95% RH	72 hours
Storage	40°C	95% RH	96 hours

Result: No any abnormality is detected.

Table 3-4 Temperature Cycle Test

	Temperature	Test Time	Cycle
Operation	-25°C	30 min	20 Cycles
	85°C	30 min	
Storage	-40°C	30 min	50 Cycles
	85°C	30 min	

Result: No any abnormality is detected.

Electrostatic Discharge (ESD)

Table 3-5 Contact ESD Specification

Device	Capacity	Temperature	Relative Humidity	+/- 4KV	Result
Micro SSD	8GB	23.0°C	49% (RH)	Device functions are affected, but EUT will be back to its normal or operational state automatically.	PASS
	16GB				
	32GB				
	64GB				
	128GB				

EMI Compliance

- FCC: CISPR22
- CE: EN55022
- BSMI 13438

3.2. Package Qualification

High Temperature Storage Life Test (HTSL)

Table 3-6 HTSL Test

Parameter	Test Condition	
Storage	Temperature	Test Duration
	150°C	168/1000 hours

Result: No any abnormality is detected.

Solderability Test

Table 3-7 Solderability Test

Parameter	Test Condition
Storage	85°C/85% RH 16 hours, bake 1 hour at 125°C.
	Molten solder temperature: 245± 5°C
	Dwell time: 5 seconds

Note: Spec: > 95% of coating area, pinhole, voids, do not exceed 5% of total area.

Result: Pass.

Pre-condition Test

Table 3-8 Pre-condition Test

UD info CORP. TEL: +886-2-7713-6050 FAX: +886-2-8511-3151
3F-4, No.8, Ln. 609, Sec. 5, Chongxin Rd., Sanchong Dist., New Taipei City 241, Taiwan (R.O.C.)

Parameter	Test Method	Test Condition
Storage	JEDS 22-A113-F	1. Temperature Cycle (-65°C/150°C, 5 cycles)
		2. Baking (125°C, 24 hours)
		3. Temp & Humidity Soaking (30°C/60% RH, 192 hours)
		4. IR Reflow 3 cycles

Note: The parts passing this test will be used to do HAST and TCT.

Results: 1. No any abnormality is detected.

2. On SAT inspection, no interfacial delamination was detected on die surface.

High Acceleration Stress Test (HAST/unbias)

Table 3-9 High Acceleration Stress Test

Parameter	Test Method	Test Condition		
Storage	JEDS 22-A110-D	Ambient	Ambient	Test Duration
		Temperature	Humidity	
		130°C	85% RH	96 hours

Result: No any abnormality is detected.

Temperature Cycling Test (TCT)

Table 3-10 Temperature Cycling Test

Parameter	Test Method	Test Condition		
Storage	JEDS 22-A104-D	High Temperature	Low Temperature	Test Duration
		150°C	-65°C	200/500 cycles

Result: No any abnormality is detected.

3.3. MTBF

MTBF, an acronym for Mean Time Between Failures, is a measure of a device's reliability. Its value represents the average time between a repair and the next failure. The measure is typically in units of hours. The higher the MTBF value, the higher the reliability of the device. The predicted result of UDinfo's MSC-F6UD is up to 2,500,000 hours.

3.4. Certification & Compliance

- SATA III (SATA Rev. 3.0)
- Up to ATA/ATAPI-8 (Including S.M.A.R.T)

UD info CORP. TEL: +886-2-7713-6050 FAX: +886-2-8511-3151
 3F-4, No.8, Ln. 609, Sec. 5, Chongxin Rd., Sanchong Dist., New Taipei City 241, Taiwan (R.O.C.)

4. ELECTRICAL SPECIFICATIONS



4.1. Supply Voltage

Table 4-1 Supply Voltage

Parameter	Rating
VCC	3.3V
VCCQ	1.8V
VDDC	1.2V
VDD	1.2V

4.2. Power Consumption

■ MLC

Capacity	Flash Structure	Flash Type	Read	Write	Partial	Slumber	Idle	DEVSLP
8GB	8GB x 1	15nm, TSOP	810	865	50	30	260	3.6
16GB	16GB x 1	15nm, TSOP	850	900	50	30	261	3.6
32GB	16GB x 2	15nm, TSOP	1000	1100	50	30	261	3.6
64GB	16GB x 4	15nm, TSOP	1325	1250	55	35	265	3.6
128GB	16GB x 8	15nm, TSOP	1305	1475	55	35	265	3.6

Unit: mW

■ pSLC

Capacity	Flash Structure	Flash Type	Read	Write	Partial	Slumber	Idle	DEVSLP
4GB	8GB x 1	15nm, TSOP	830	830	50	28	260	3.6
8GB	16GB x 1	15nm, TSOP	930	930	55	30	265	3.6
16GB	16GB x 2	15nm, TSOP	1150	1150	60	30	265	3.6
32GB	16GB x 4	15nm, TSOP	1300	1300	60	30	265	3.6
64GB	16GB x 8	15nm, TSOP	1450	1450	60	35	270	3.6

Unit: mW

NOTES:

1. It's average value of power consumption based on 100% conversion efficiency.
2. Samples are made of Toshiba Toggle NAND Flash.
3. The total measured power voltage includes 1.2V, 1.8V, and 3.3V.
4. Sequential R/W is measures while testing 4000MB sequential R/W 5 times by CrystalDiskMark.
5. Power Consumption may vary from flash configuration, SDR configuration, or platform.

5. INTERFACE



5.1. Pin Assignment and Descriptions

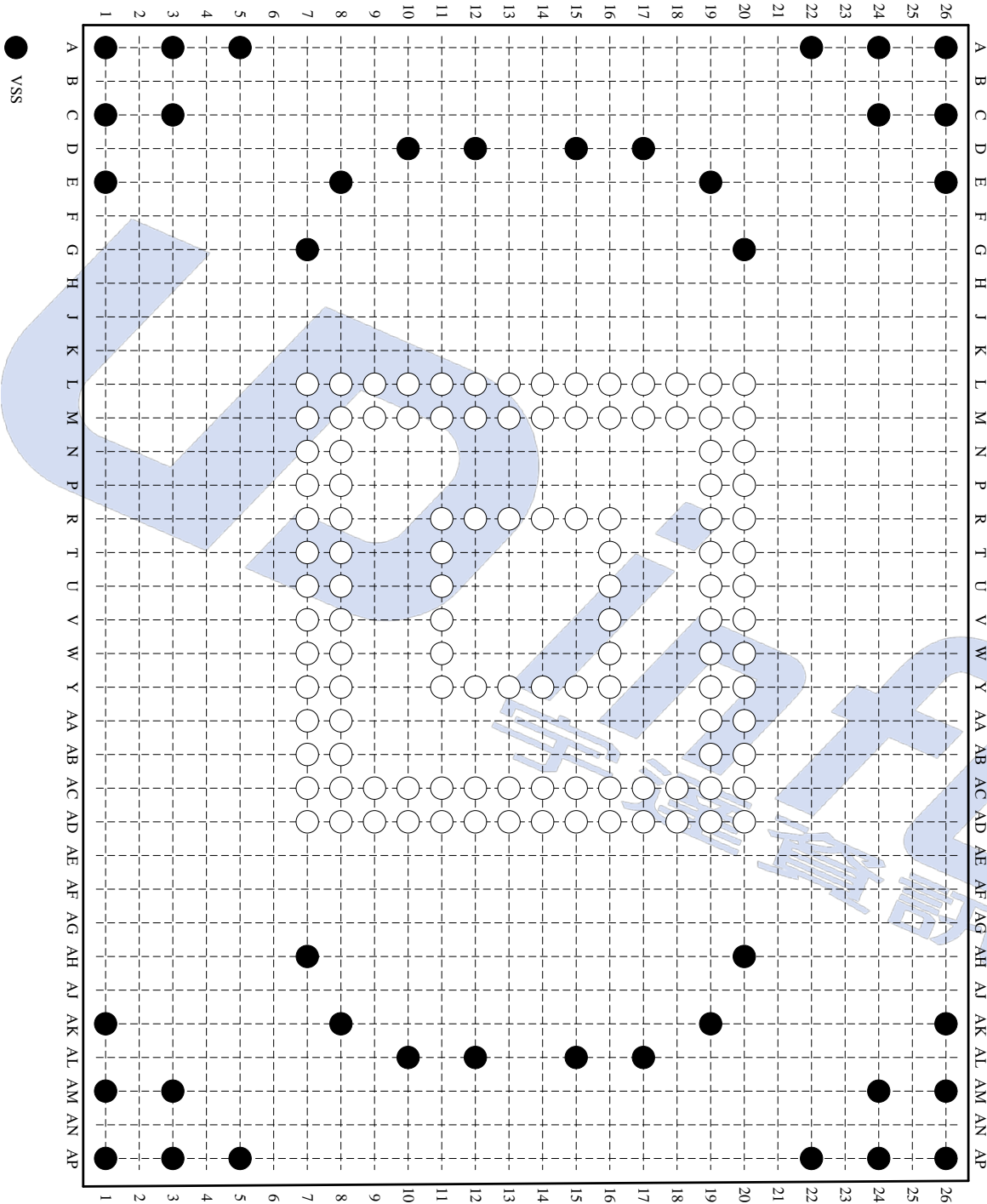


Figure 5-1 Pin Assignment (Top View)



Figure 5-2 Pin Assignment

Table 5-1 Pin Descriptions

Pin Name	BGA 156	Pin Type	PU/PD	Description
UART/GPIO				
XTXD	M12	O	PU 50K	UART transmit/receive port
XRXD	AA20	I		
GPIO0	AC14	IO	PD 50K	General purpose input/output pins
GPIO1	AD13			
GPIO2	AC13			
GPIO3	AD11			
GPIO6	AD9			
Note: 1. GPIO2 Reserve for Write Protect (Active high) 2. GPIO3 Reserve for Quick Erase (Active low) Type 1: Erase all operation blocks. Type 2: Erase user data only.				
SATA Interface signals				
SATA_RX_N	R7	I		Differential Signal Pair A. SATA Device Receive Signal Differential Pair.
SATA_RX_P	P7			
SATA_TX_N	U7	O		Differential Signal Pair B. SATA Device Transmit Signal Differential Pair.
SATA_TX_P	V7			
DAS	M13	O		Device Activity Signal
SATA_VCC	U8 V8			+3.3V
SATA_VDD	P8 R8			+1.2V
SATA_VSS	N7 T7 W7			Ground
Control Signals				
XTAL_IN	M10	I		Crystal input/output pin. (40MHz)
XTAL_OUT	L9	O		
PWR_RESETN	M9	I		Hardware Reset, low active.
Power supply Signals				
VCC	L12			+3.3V
	M11			
	R13			
	R14			
	R15			
	R16			
	R19			
	R20			
	T16			
	U16			
	V11			
	Y19			
	Y20			
	AA19			
AC8				
VDDC	W11 Y11			+1.2V

UD info CORP. TEL: +886-2-7713-6050 FAX: +886-2-8511-3151

3F-4, No.8, Ln. 609, Sec. 5, Chongxin Rd., Sanchong Dist., New Taipei City 241, Taiwan (R.O.C.)

	Y12			
	Y13			
VCCQ	V16 W16 Y16			+1.8V
VDD	R11 T11			+1.2V for PLL
GND Signals				
VSS	R12 U11 L7 L8 M7 L11 L19 L20 M19 M20 N19 P19 AC20 AD20 AD19 AD8 AD7 T8 Y14 Y15 U19 P20 U20 V19 AC7 AB7 N8 A1 C1 E1 AK1 AM1			Ground
VSS	AP1 A3 C3 AM3 AP3 A5 AP5 G7 AH7 E8 AK8 D10 AL10 D12 AL12			Ground

	D15 AL15 D17 AL17 E19 AK19 G20 AH20 A22 AP22 A24 C24 AM24 AP24 A26 C26 E26 AK26 AM26 AP26			
Other Signals				
DEVSLP	AC9	I	PU 50K	DEVICE SLEEP, High active. (Normal is Low)
	L15 L16 L17 L18 AA8 AA7 AB19 AB20 AB8 AC10 AC11 AC15 AC16 AC17 AC18 AC19			
NC	AD10 AD12 AD14 AD15 AD16 AD17 AD18 L10 M16 M17 M8 T19 T20 W19 W8 Y7 Y8	--	--	DNU

	L13			
	L14			
	M14			
	M15			
	M18			
	N20			
	V20			
	W20			
	AC12			



6. SUPPORTED COMMANDS



6.1. ATA Command List

Code	Description	Code	Description
00h	NOP	97h	IDLE
06h	Data Set Management	98h	CHECK POWER MODE
10h-1Fh	Recalibrate	99h	SLEEP
20h	Read Sectors	B0h	SMART
21h	Read Sectors without Retry	B1h	DEVICE CONFIGURATION
24h	Read Sectors EXT	C4h	Read Multiple
25h	Read DMA EXT	C5h	Write Multiple
27h	Read Native Max Address EXT	C6h	Set Multiple Mode
29h	Read Multiple EXT	C8h	Read DMA
2Fh	Read Log EXT	C9h	Read DMA without Retry
30h	Write Sectors	CAh	Write DMA
31h	Write Sectors without Retry	CBh	Write DMA without Retry
34h	Write Sectors EXT	CEh	Write Multiple FUA EXT
35h	Write DMA EXT	E0h	Standby Immediate
37h	Set Native Max Address EXT	E1h	Idle Immediate
38h	CFA WRITE SECTORS WITHOUT ERASE	E2h	Standby
39h	Write Multiple EXT	E3h	Idle
3Dh	Write DMA FUA EXT	E4h	Read Buffer
3Fh	Write Long EXT	E5h	Check Power Mode
40h	Read Verify Sectors	E6h	Sleep
41h	Read Verify Sectors without Retry	E7h	Flush Cache
42h	Read Verify Sectors EXT	E8h	Write Buffer
45h	WRITE UNCORRECTABLE EXT	EAh	Flush Cache EXT
60h	Read FPDMA Queued	ECh	Identify Device
61h	Write FPDMA Queued	EFh	Set Features
70h-7Fh	Seek	F1h	Security Set Password
90h	Execute Device Diagnostic	F2h	Security Unlock
91h	Initialize Device Parameters	F3h	Security Erase Prepare
92h	Download Microcode	F4h	Security Erase Unit
93h	DOWNLOAD MICROCODE DMA	F5h	Security Freeze Lock
94h	STANDBY IMMEDIATE	F6h	Security Disable Password
95h	IDLE IMMEDIATE	F8h	Read Native Max Address
96h	STANDBY	F9h	Set Max Address

UD info CORP. TEL: +886-2-7713-6050 FAX: +886-2-8511-3151

3F-4, No.8, Ln. 609, Sec. 5, Chongxin Rd., Sanchong Dist., New Taipei City 241, Taiwan (R.O.C.)

6.2. Identify Device Data

The following table details the sector data returned by the IDENTIFY DEVICE command.

Word	F: Fixed V: Variable X: Both	Default Value	Description
0	F	0040h	General configuration bit-significant information
1	X	*1	Obsolete – Number of logical cylinders
2	V	C837h	Specific configuration
3	X	0010h	Obsolete – Number of logical heads (16)
4-5	X	00000000h	Retired
6	X	003Fh	Obsolete – Number of logical sectors per logical track (63)
7-8	V	00000000h	Reserved for assignment by the Compact Flash Association
9	X	0000h	Retired
10-19	F	Varies	Serial number (20 ASCII characters)
20-21	X	0000h	Retired
22	X	0000h	Obsolete
23-26	F	Varies	Firmware revision (8 ASCII characters)
27-46	F	Varies	Model number (xxxxxxxx)
47	F	8010h	7:0- Maximum number of sectors transferred per interrupt on MULTIPLE commands
48	F	4000h	Trusted Computing feature set options(not support)
49	F	2F00h	Capabilities
50	F	4000h	Capabilities
51-52	X	000000000h	Obsolete
53	F	0007h	Words 88 and 70:64 valid
54	X	*1	Obsolete – Number of logical cylinders
55	X	0010h	Obsolete – Number of logical heads (16)
56	X	003Fh	Obsolete – Number of logical sectors per track (63)
57-58	X	*2	Obsolete – Current capacity in sectors
59	F	0110h	Number of sectors transferred per interrupt on MULTIPLE commands
60-61	F	*3	Maximum number of sector (28bit LBA mode)
62	X	0000h	Obsolete
63	F	0407h	Multi-word DMA modes supported/selected

UD info CORP. TEL: +886-2-7713-6050 FAX: +886-2-8511-3151

3F-4, No.8, Ln. 609, Sec. 5, Chongxin Rd., Sanchong Dist., New Taipei City 241, Taiwan (R.O.C.)

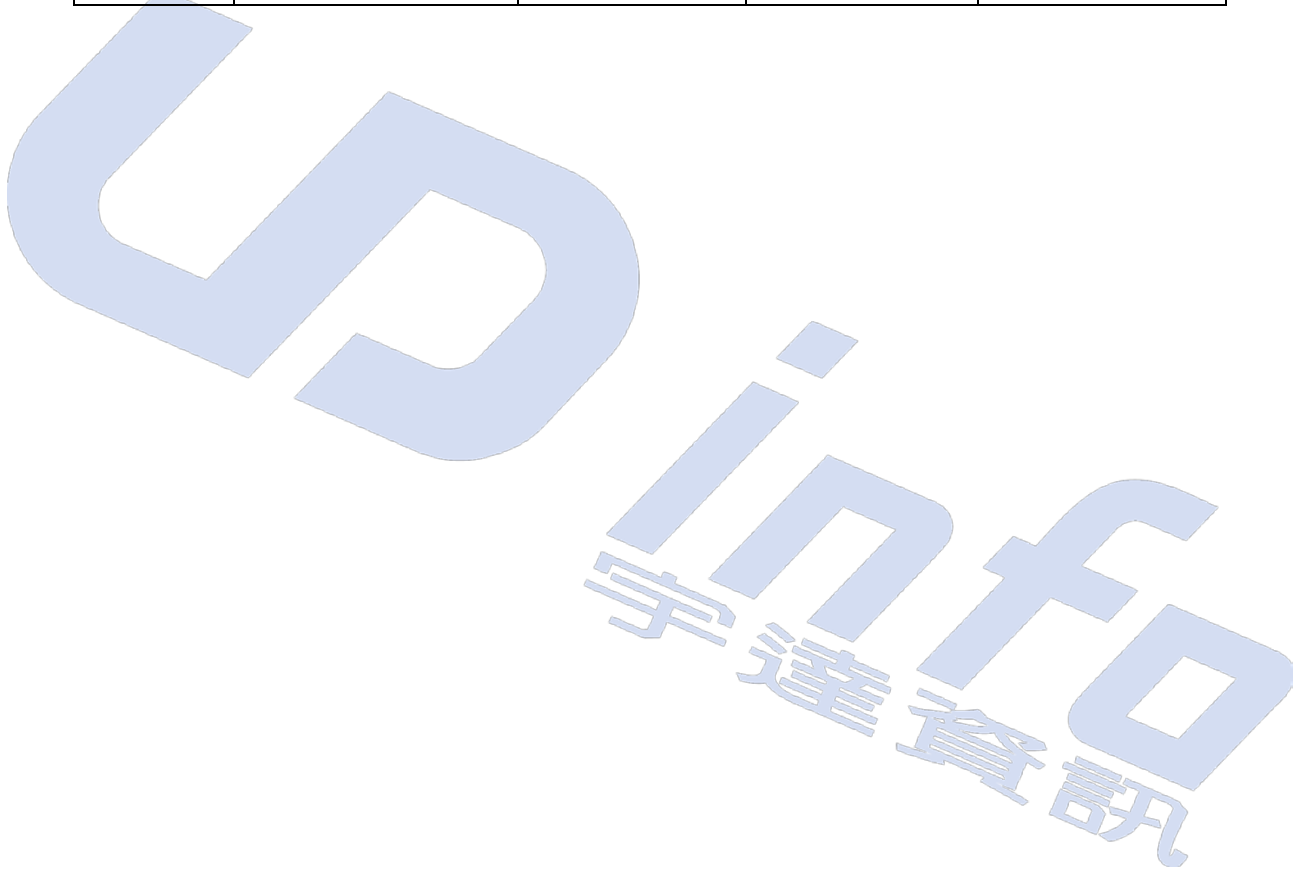
Word	F: Fixed V: Variable X: Both	Default Value	Description
64	F	0003h	PIO modes supported
65	F	0078h	Minimum Multiword DMA transfer cycle time per word
66	F	0078h	Manufacturer's recommended Multiword DMA transfer cycle time
67	F	0078h	Minimum PIO transfer cycle time without flow control
68	F	0078h	Minimum PIO transfer cycle time with IORDY flow control
69	F	0100h	Additional Supported (support download microcode DMA)
70	F	0000h	Reserved
71-74	F	0000000000000000 0h	Reserved for the IDENTIFY PACKET DEVICE command
75	F	001Fh	Queue depth
76	F	670eh	Serial SATA capabilities
77	F	0084h	Serial ATA Additional Capabilities
78	F	014Ch	Serial ATA features supported
79	V	0040h	Serial ATA features enabled
80	F	07F8h	Major Version Number
81	F	0000h	Minor Version Number
82	F	346bh	Command set supported
83	F	7d09h	Command set supported
84	F	6063h	Command set/feature supported extension
85	V	3469h	Command set/feature enabled
86	V	bc01h	Command set/feature enabled
87	V	6063h	Command set/feature default
88	V	003Fh	Ultra DMA Modes
89	F	0001h	Time required for security erase unit completion
90	F	001Eh	Time required for Enhanced security erase completion
91	V	0000h	Current advanced power management value
92	V	FFFEh	Master Password Revision Code
93	F	0000h	Hardware reset result. The contents of the bits (12:0) of this word can be changed only during the execution of hardware reset.

Word	F: Fixed V: Variable X: Both	Default Value	Description
94	V	0000h	Vendor's recommended and actual acoustic management value
95	F	0000h	Stream Minimum Request Size
96	V	0000h	Streaming Transfer Time – DMA
97	V	0000h	Streaming Access Latency – DMA and PIO
98-99	F	0000h	Streaming Performance Granularity
100-103	V	*4	Maximum user LBA for 48 bit Address feature set
104	V	0000h	Streaming Transfer Time – PIO
105	F	0008h	Maximum number of 512-byte blocks per DATA SET MANAGEMENT command
106	F	4000h	Physical sector size/Logical sector size
107	F	0000h	Inter-seek delay for ISO-7779 acoustic testing in microseconds
108-111	F	0000000000000000 0h	Unique ID
112-115	F	0000000000000000 0h	Reserved
116	V	0000h	Reserved
117-118	F	00000000h	Words per logical Sector
119	F	4014h	Supported settings
120	F	4014h	Command set/Feature Enabled/Supported
121-126	F	0h	Reserved
127	F	0h	Removable Media Status Notification feature set support
128	V	0021h	Security status
129-140	X	0h	Vendor specific
141	X	0001h	Vendor specific
142-159	X	0h	Vendor specific
160	F	0h	Compact Flash Association (CFA) power mode 1
161-167	X	0h	Reserved for assignment by the CFA
168	F	3h 2.5 inch 4h 1.8 inch 5h Less than 1.8 inch	Device Nominal Form Factor

Word	F: Fixed V: Variable X: Both	Default Value	Description
169	F	0001h	DATA SET MANAGEMENT command is supported
170-173	F	0h	Additional Product Identifier
174-175		0h	Reserve
176-205	V	0h	Current media serial number
206	F	0h	SCT Command Transport
207-208	F	0h	Reserved
209	F	4000h	Alignment of logical blocks within a physical block
210-211	V	0000h	Write-Read-Verify Sector Count Mode 3 (not support)
212-213	F	0000h	Write-Read-Verify Sector Count Mode 2 (not support)
214-216		0000h	NV Cache relate (not support)
217	F	0001h	Non-rotating media device
218	F	0h	Reserved
219	F	0h	NV Cache relate (not support)
220	V	0h	Write read verify feature set current mode
221		0h	Reserved
222	F	107Fh	Transport major version number
223	F	0h	Transport minor version number
224-229		0h	reserved
230-233		0h	Extend number of user addressable sectors
234		0001h	Minimum number of 512-byte data blocks per DOWNLOAD MICROCODE command for mode 03h
235		0080h	Maximum number of 512-byte data blocks per DOWNLOAD MICROCODE command for mode 03h
236-254	F	0h	Reserved
255	X	XXA5h XX is variable	Integrity word (Checksum and Signature)

■ List of Device Identification for Each Capacity

Capacity (GB)	*1 (Word 1/Word 54)	*2 (Word 57–58)	*3 (Word 60–61)	*4 (Word 100–103)
4	1E5Dh	778E30h	778E30h	778E30h
8	3CA5h	EEC9B0h	EEC9B0h	EEC9B0h
16	3FFFh	FBFC10h	1DD40B0h	1DD40B0h
32	3FFFh	FBFC10h	3BA2EB0h	3BA2EB0h
64	3FFFh	FBFC10h	7740AB0h	7740AB0h
128	3FFFh	FBFC10h	EE7C2B0h	EE7C2B0h

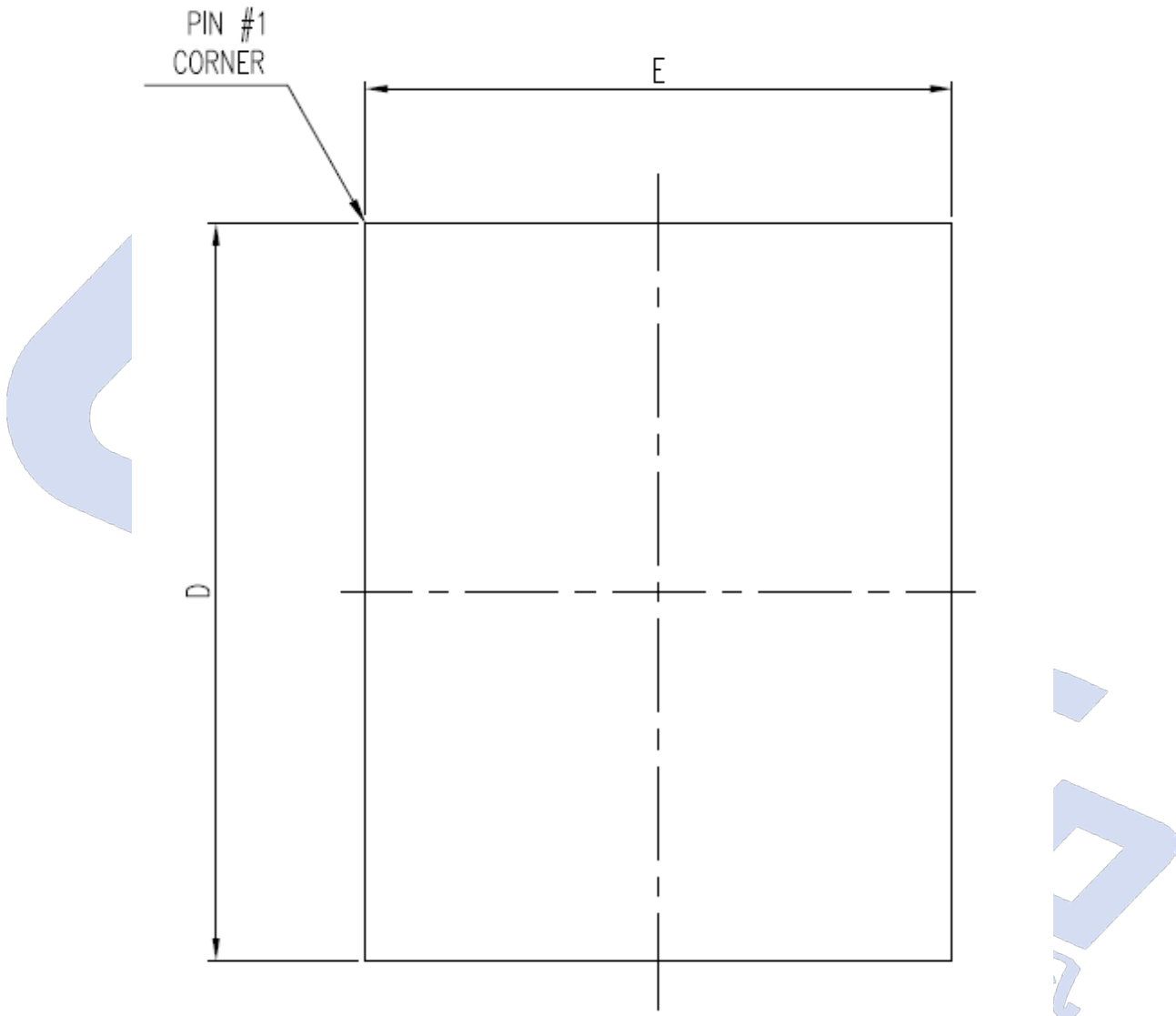


7. PHYSICAL DIMENSION

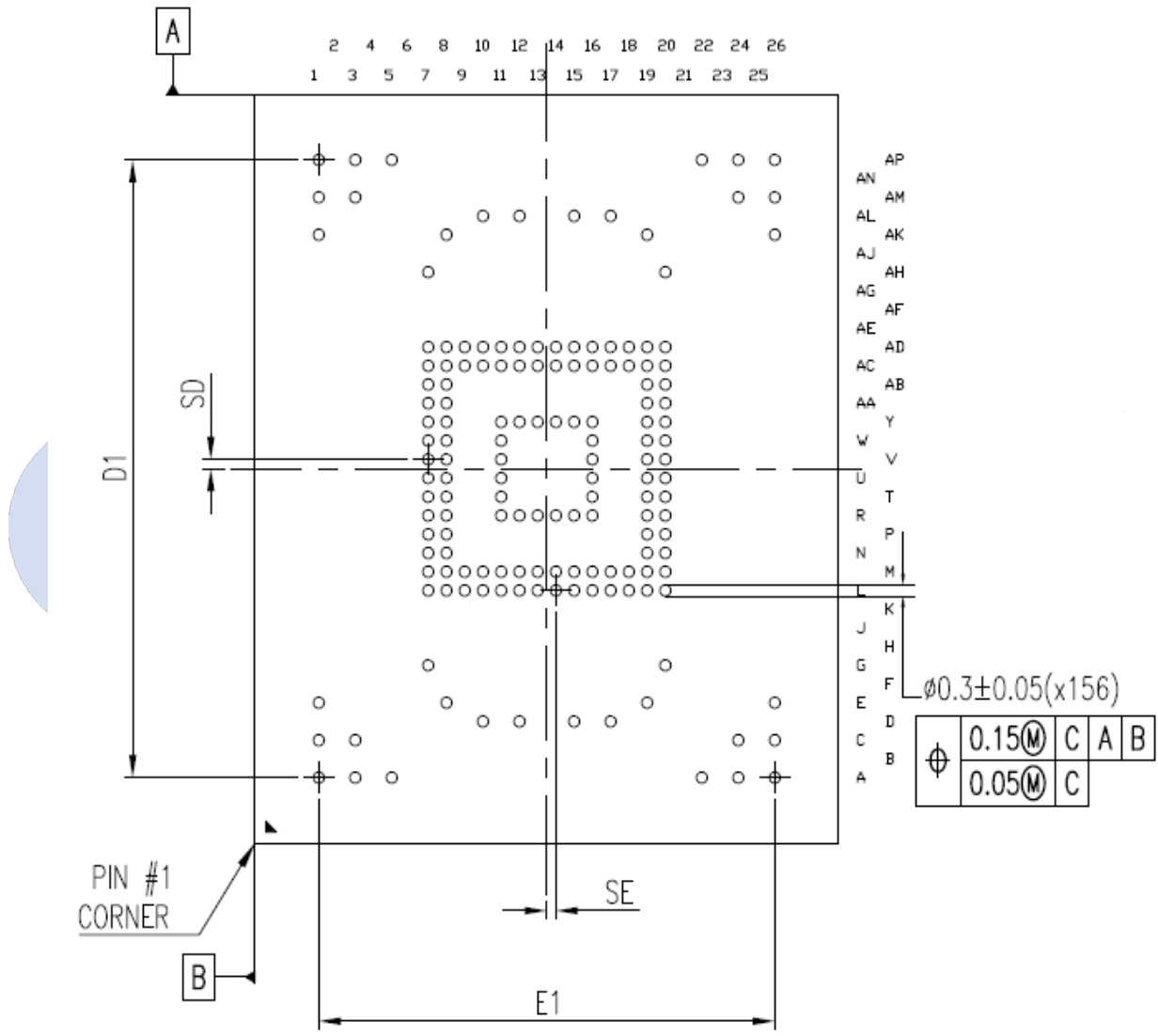


Dimension: 16mm(L) x 20mm(W) x 1.4mm(H)

Top View

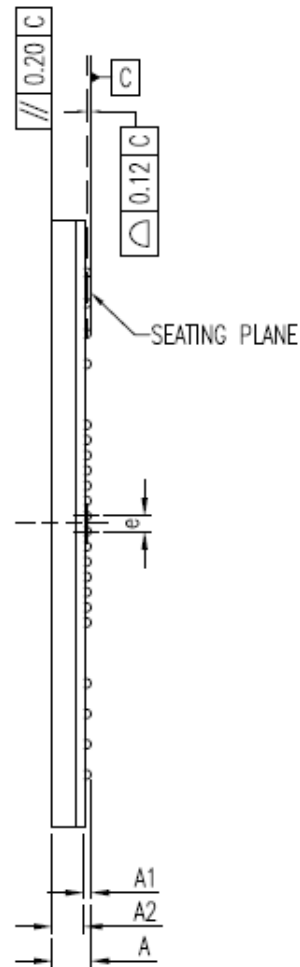


Bottom View



Number	SE (MM)	SD (MM)	D1 (MM)	E1 (MM)
156 balls	0.25 BSC.	0.25 BSC.	16.50 BSC.	12.50 BSC.

Side View



Symbol	Dimension In MM		
	MIN.	NOM.	MAX.
A	--	--	1.4
A1	0.15	--	--
A2	--	--	1.2
b	0.25	0.30	0.35
D	19.90	20.00	20.10
E	15.90	16.00	16.10
e	0.5 BSC.		
JEDEC	MO-276		

8. PARTNUMBER DECODER



MSC-F6UDX⁸X⁹X¹⁰X¹¹X¹²X¹³X¹⁴X¹⁵X¹⁶X¹⁷

X ¹ X ² X ³	X ⁴ X ⁵	X ⁶ X ⁷	X ⁸ X ⁹ X ¹⁰ X ¹¹ X ¹²	X ¹³	X ¹⁴	X ¹⁵	X ¹⁶ X ¹⁷
MSC	F6	UD	004GB 032GB 008GB 064GB 016GB 128GB	K: MLC Standard (0°C ~ +70°C) M: MLC Industrial (-40°C ~ +85°C) P: pSLC Standard (0°C ~ +70°C) F: pSLC Industrial (-40°C ~ +85°C)	4	P	blank

