

ATAPI Memory Card Drive

--- ATPx-xxxxxx Series ---

OUTLINE

The drive in this series controls a compact flash memory card (abbreviated as CF below) via an ATA/ATAPI interface in a personal computer. This series is available in two models: 2.5-inch and 3.5-inch models. The 3.5-inch model provides two CF slots: one can be used as a fixed disk (A Slot master specification) similar to a hard disk drive; the other can be used as a removable disk (B Slot slave specification), which can be inserted and withdrawn like a floppy disk or MO disk, even while the OS is being activated. The 2.5-inch model provides one compact-flash slot, which can be used for a removable disk similar to a hard or floppy disk. These types of drives allow Master/Slave switching by using jumper pins and setting of write protection (write inhibition) with respect to media by using the DIP switch. The drive in this series operates from a single 5-V power source and supports data transfer modes up to PIO mode 3. Since a compact flash used for the drive in this series is a semiconductor nonvolatile memory card, so it is ideal for applications that must withstand environmental stress, such as ATMs (automatic teller machines), FA (factory automation) equipment, POS (point of sales) terminals, measuring instruments, ticket vending machines, parking systems.

FEATURES

Form factor	2.5-inch type: removable disk (CF TYPE I X 1 slot)
	3.5-inch type: removable disk (CF TYPE II) + fixed disk (CF TYPE I)
ATA/ATAPI Interfaces	PIO mode 3
	ATA-4 command set compatible
	ATAPI packet command set compatible
Power supply	Vcc = 5.0 V \pm 10%
Operating temperature	0°C to 60°C
Performance	Burst data transfer rate(Drive-Host)11.1MB/sec (max)
	Sustained write speed 950 KB/sec (max)
	Sustained read speed 1000 KB/sec (max)

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Product Models2.5inch

Model No.
ATP2-CFR01

3.5inch

Model No.	Fixed disk Capacity
ATP3-CFLR01	-
ATP3-016MBA	16MB
ATP3-032MBA	32MB
ATP3-048MBA	48MB
ATP3-064MBA	64MB
ATP3-096MBA	96MB
ATP3-128MBA	128MB
ATP3-160MBA	160MB
ATP3-192MBA	192MB
ATP3-256MBA	256MB
ATP3-320MBA	320MB
ATP3-384MBA	384MB
ATP3-512MBA	512MB

* Regarding the fixed disk(CF), please refer to the specifications of CFC/CFI-xxxMBA series.

Product Specifications**Performance:**

To/from host	11.1MB/sec (max theoretical)
Sustained write	950KB/sec (max)
Sustained read	1000KB/sec (max)

Operating Voltage:

5V +/- 10%

Power Consumption:

Active mode	T.B.D mA (typ)
Idle mode	T.B.D mA (max)
Sleep mode	T.B.D mA (max)

Environmental Specification:

Operating temperature	0°C to 60°C
Storage temperature	-20°C to 80°C
Humidity	85% (Max) [non-condensing]
Shock resistance	9800m/s ² (max) (three axis directions) [non-operating mode]
Vibration resistance	147m/s ² peak (25Hz - 2000Hz) [operating mode]
* The interface connector should be mechanically secured if it will be subject to vibrations and physical shock.	

Electrical Performance**Absolute maximum ratings**

SYMBOL	RATING	VALUE	UNIT
V _{cc}	Power Supply Voltage	-0.6 to 6.0	V
V _{in}	Input Voltage	-0.3 to V _{CC} +0.3	V
T _{stg}	Storage Temperature	-20 to 80	°C
T _{opr}	Operating Temperature	-0 to 60	°C

Recommended DC operating conditions

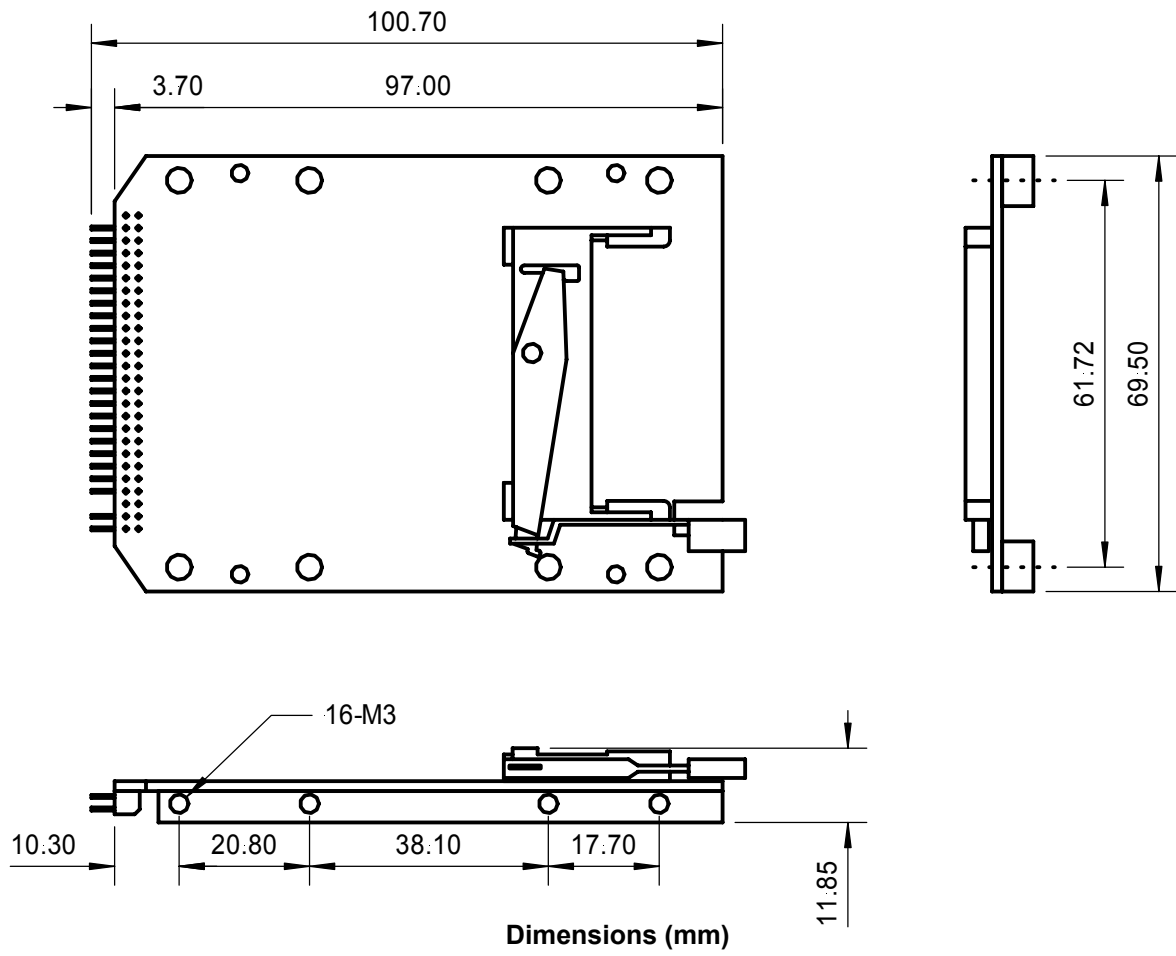
SYMBOL	PARAMETER	MIN	MAX	UNIT
V _{cc}	Power Supply Voltage	4.5	5.5	V
V _{iH}	High Level Input Voltage	2.0	-	V
V _{iL}	Low Level Input Voltage	-	0.8	V

DC characteristics (T_a = 0°C ~ 60°C, V_{cc} = 5.0V±10%)

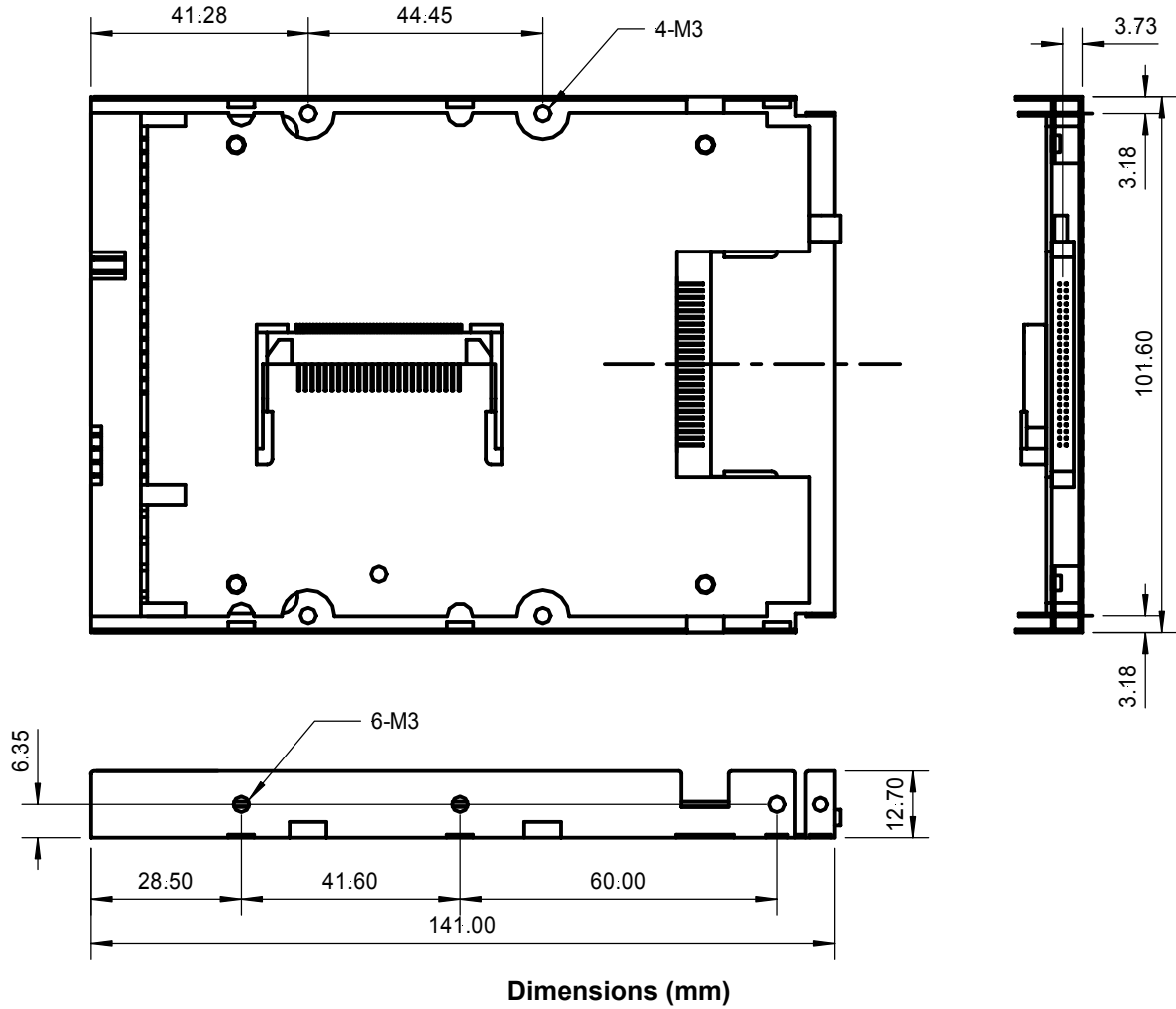
SYMBOL	PARAMETER	MIN	TYP	MAX	UNIT
I _{cco}	Operating Current	-	T.B.D	-	mA
I _{ccs}	Sleep Mode Current	-	-	T.B.D	mA
V _{oH}	High Level Output Voltage	2.4	-	-	V
V _{oL}	Low Level Output Voltage	-	-	0.4	V

Mechanical Specification

2.5inch

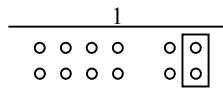


3.5inch

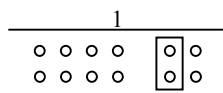


Master/Slave Setting

2.5inch

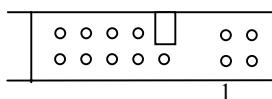


Master

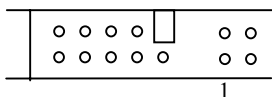


Slave

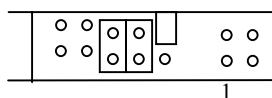
3.5inch



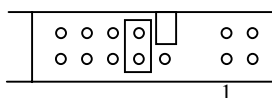
Fixed side : Master
Removable side : Slave *



Fixed side : none
Removable side : Slave



Fixed side : Slave
Removable side : Master *



Fixed side : none
Removable side : Master

* When using the removable side together with the fixed side, other equipment (such as an HDD) cannot be connected on the same cable.

Write Protect and Boot Setting

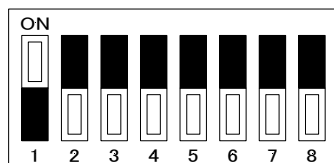
The drive in this series includes a printed circuit board with a DIP switch assembly (in both the 2.5-inch and 3.5-inch models) and jumper pins (only in the 3.5-inch model). Their settings enable inhibition of writing data into the compact flash and start up of the host system by the OS installed in the compact flash.

* The above setting is not available for a fixed disk(CF).

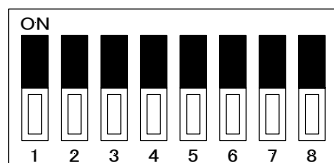
* The host device can't recognize the existence of CF if it is not installed even the boot setted.

【DIP switch settings for both 2.5-inch/3.5-inch models】

Write Protect

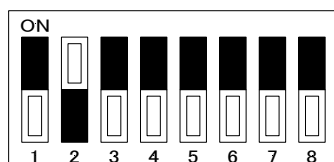


Write Protect : **ON**

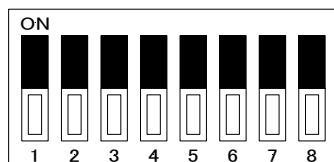


Write Protect : **OFF**

Boot



Boot : **ON**

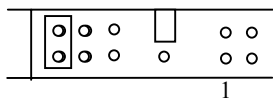


Boot : **OFF**

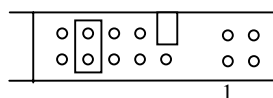
Setting of jumper pins for 3.5-inch model

The 3.5-inch model allows Write Protect/Boot setting by using the jumper pins included with the I/F connector and jumper pins provided adjacent to the front side CF slot.

【Setting by I/F connector side jumper pins】



Write Protect : **ON**



Boot : **ON**

Pin Assignments

Pin Num	Signal Name	Pin Type	Pin Num	Signal Name	Pin Type
1	-RESET	I	2	GND	—
3	DD7	I/O	4	DD8	I/O
5	DD6	I/O	6	DD9	I/O
7	DD5	I/O	8	DD10	I/O
9	DD4	I/O	10	DD11	I/O
11	DD3	I/O	12	DD12	I/O
13	DD2	I/O	14	DD13	I/O
15	DD1	I/O	16	DD14	I/O
17	DD0	I/O	18	DD15	I/O
19	GND	—	20	KEY(NC)	—
21	DMARQ(NC)	—	22	GND	—
23	-DIOW	I	24	GND	—
25	-DIOR	I	26	GND	—
27	IORDY	O	28	CSEL	I
29	-DMACK(NC)	—	30	GND	—
31	INTRQ	O	32	Reserved	—
33	DA1	I	34	-PDIAG	I/O
35	DA0	I	36	DA2	I
37	-CS0	I	38	-CS1	I
39	-DASP	I/O	40	GND	—
41	+5V	—	42	+5V	—
43	NC	—	44	NC	—

* Pins 41 to 44 are not present in 3.5-inch models; only present in 2.5-inch models.

* The drive may be destroyed if the connector is inserted upside down.

Signal Descriptions

Signal Name	Dir.	Pin#	Description
-RESET	I	1	Used by the host to reset the device. Driven by the host. Activated by 'L.'
DD[0:15]	I/O	3-18	Used to transfer commands, data, status information between the host and the device. DD0 is the least significant bit; DD15 is the most significant bit.
-DIOW	I	23	A strobe signal asserted by the host to write data into a drive register.
-DIOR	I	25	A strobe signal asserted by the host to read data from a drive register.
INTRQ	O	31	Used by a selected device to interrupt the host system. The nEN bit is cleared to "0." If the device is selected, this signal drives it through a tri-state buffer. If the nEN bit is set to 1 or no device is selected, the buffer is set to the tri-state.
DA[0: 2]	I	33,35,36	Used to select one of the eight registers in the I/O register.
-CS0,-CS1	I	37,38	Used to select the Command Block Register or the Control Block Register.
CSEL	I	28	Recognizes if a device is Master (0) or Slave (1). If CSEL is negated, the device is Master; if CSEL is asserted, the device is Slave.
-PDIAG	I/O	34	Open drain output. Used to notify the Master that the Slave has completed the Execute Diagnostic command.
-DASP	I/O	39	Open drain output. Used to indicate that the device is active or a Slave exists.
GND		2,19,22,24,26,30,40,	Ground

I/O Register Specifications

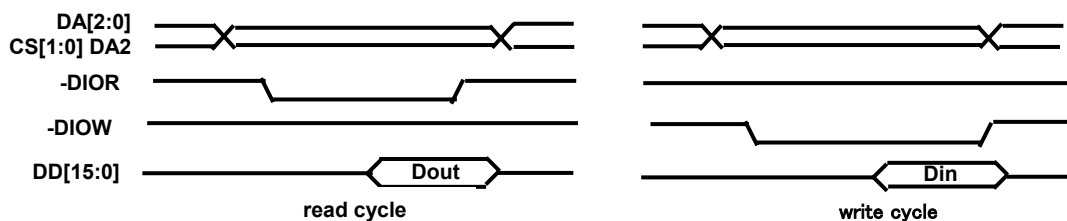
Communication between the host system and the device is performed via the I/O registers of the device. Read and write accesses to the register are possible according to the following logic.

I/O Register Addresses

The combinations of DA0 to DA2 will be shown in the following table.

-CS1	-CS0	DA2	DA1	DA0	-DIOR=L		-DIOW=L	
					ATA	ATAPI	ATA	ATAPI
1	0	0	0	0	Data	←	Data	←
1	0	0	0	1	Error	←	Feature	←
1	0	0	1	0	Sector count	Interrupt Reason	Sector count	-
1	0	0	1	1	Sector number	-	Sector number	-
1	0	1	0	0	Cylinder low	Byte Count Low	Cylinder low	Byte Count Low
1	0	1	0	1	Cylinder high	Byte Count High	Cylinder high	Byte Count High
1	0	1	1	0	Device/Head	←	Drive head	←
1	0	1	1	1	Status	←	Command	←
0	1	1	1	0	Alt. status	←	Device control	←

Register Access Timing Example



1. Data register(ATA&ATAPI): This register is a 16-bit read/write register used for data transfer between the drive and host.

bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
DD0 to DD15															

2. Error register(ATA&ATAPI): This register is a read-only register, and used for analysis of the cause(s) of a drive access error. This register is valid when the BSY bits of the Status register and Alternate Status register are set to '0'.

[ATA]

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
BBK	UNC	"0"	IDNF	"0"	ABRT	"0"	AMNF

bit	Name	Function
7	BBK(Bad Block detected)	This bit is set when a bad block is detected.
6	UNC(Data ECC error)	This bit is set on occurrence of an unrecoverable error during a read operation on the drive.
4	IDNF(ID Not Found)	This bit is set when an error exists in a sector to be accessed and when the sector does not exist.
2	ABRT(ABoRTed command)	This bit is set when a command is aborted due to the drive status (Not ready, Write fault, Invalid command, etc.)
0	AMNF(Address Mark Not Found)	This bit is set on occurrence of a typical error.

[ATAPI]

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
Sense Key				"0"	ABRT	"0"	"0"

bit	Name	Function
7-4	Sense Key	This bit indicates the cause(s) of an error.
2	ABRT(ABoRTed command)	This bit is set when the values of an issued ATA command code and the task file register are not correct.

3. Feature register(ATA&ATAPI): This register is a write-only register, and provides information about functions of a drive the host wants to use.

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
Feature byte							

4. Sector count (ATA) Interrupt Reason(ATAPI) register: This register contains the number of sectors of data requested to be transferred between the host and drive for ATA, and during a read or write operation. A value of zero designates 256 sectors. For ATAPI, this register is used to report the interrupt source of the INTRQ signal.

[ATA]	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
Sector count byte								

[ATAPI]	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
"0"							I/O	C/D

bit	Name	Function
1	I/O	Indicates the data transfer direction.
0	C/D	Indicates the meaning of the transfer.

I/O	C/D	Function
0	1	Transfers a packet command.
1	0	Data or parameter transfer (from drive to host).
0	0	Data or parameter transfer (form host to drive).
1	1	Enables completion status value of the Status register.

5. Sector number(ATA) unused register: This register contains the number of the first sector to be transferred by the sector transfer commands described below. Not used for ATAPI.

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
Sector number byte							

6. Cylinder low(ATA) Byte Count Low(ATAPI) register: This register contains the lower eight bits of the number of the first cylinder to be transferred by the sector transfer commands described below for ATA. For ATAPI, the lower eight bits of the count of the byte to be transferred are set.

[ATA]	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
Cylinder low byte								

[ATAPI]	bit7	Bit6	bit5	bit4	bit3	bit2	bit1	bit0
(PACKET COMMAND) Byte Count LSB								

7. Cylinder high(ATA) Byte Count High(ATAPI) register: This register contains the higher eight bits of the number of the first cylinder to be transferred by the sector transfer commands described below. At the time of ATAPI, the higher eight bits of the count of the byte to be transferred.

[ATA]	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
Cylinder high byte								

[ATAPI]	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
(PACKET COMMAND) Byte Count LSB								

8. Device/head register(ATA&ATAPI): This register is used to select a drive number and a head number for the commands described below.

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
Obsolete	LBA	Obsolete	DRV	Head number			

bit	Name	Function
7	Obsolete	This bit is set to '1'. (Ignored for ATAPI.)
6	LBA	LBA is a flag used to select the cylinder/head/sector (CHS) mode or logic block address (LBA) mode. If LBA = 0, the CHS mode is selected; if LBA = 1, the LBA mode is selected. In the LBA mode, the logical block addresses are assigned as follows. LBA07-LBA00: Sector Number Register D7-D0. LBA15-LBA08: Cylinder Low Register D7-D0. LBA23-LBA16: Cylinder High Register D7-D0. LBA27-LBA24: Drive / Head Register bits HS3-HS0.
5	Obsolete	This bit is set to '1'. (Ignored for ATAPI.)
4	DEV(Device select)	This bit is used to select master (drive 0) and slave (drive 1) in the Master/Slave configuration. If it is set to '0', the drive is selected as Master.
3	Head number	This bit is used to select a head number for the commands described below. Bit 3 is the most significant bit (MSB). (Ignored for ATAPI).

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