CE-ATA HDD Interface
Enabling Efficient Drive Integration

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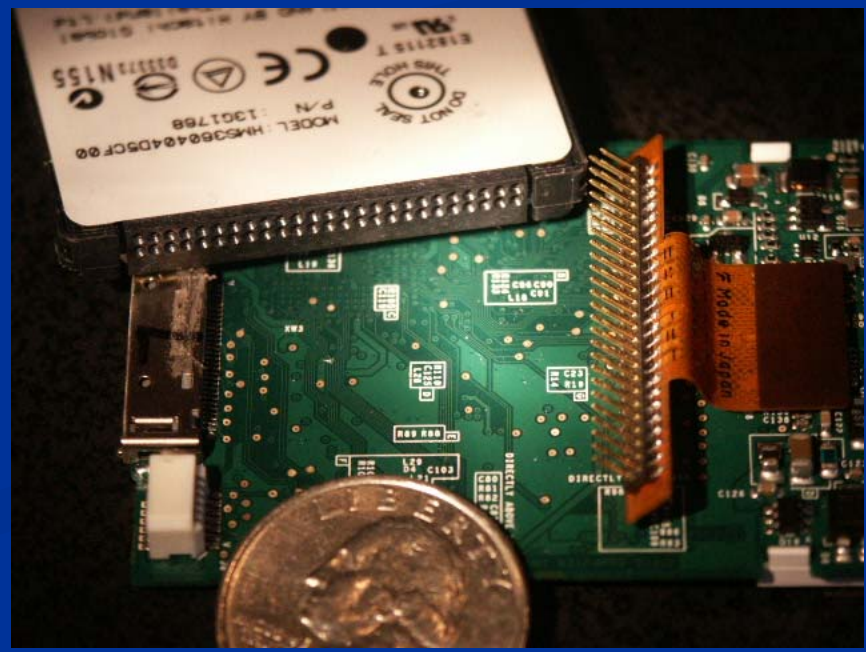
February 2005

Portable CE Storage Landscape

- Flash has been dominant mass storage technology for much of the portable consumer space
- Flash interfaces have evolved to a highly-tailored and extremely efficient solution
  - Protocols built around flash behavior
  - Low pin counts
  - Low voltages
  - Compact size
- Efficient interface makes flash attractive in low-end applications
  - Excellent integration efficiency

HDDs Handicapped

- Currently available small form factor HDD interface is CF+
  - 50-pin interface/connector
  - Large physical connector size
  - Parallel ATA crammed into a small space
  - High voltage signaling and parallel ATA heritage
- Small formfactor HDDs need an interface as efficient as those available for flash
  - Integration penalty for using HDDs detrimental to their increased use
  - Interface is at the heart of the HDD integration penalty
  - CE-ATA formed to address this integration issue



CE-ATA Technical Essence

- Augment MMC interface with enhancements tailored to efficient support of ATA HDDs
  - MMC is a proven and well-established interface to build on for portable CE applications
- Enhancements coordinated with MMCA and liaison relationship established
  - Ensure base MMC compatibility/alignment realized
  - Goal is if you don't use any CE-ATA tailored enhancements, conceptually revert to MMC behavior/operation
- Initial effort focused on embedded applications
  - Get the fast TTM work done first to enable initial applications and expand with additional capability to support additional usage models

Streamlining ATA

- CE-ATA supports a small subset (< 1/10th) of the ATA command set. Bare essentials only, but forward-looking with 48-bit support.
  - IDENTIFY_DEVICE
  - READ_DMA_EXT
  - WRITE_DMA_EXT
  - STANDBY_IMMEDIATE
  - FLUSH_CACHE_EXT
- Streamlined command set reduces firmware and overall implementation complexity while simplifying validation
- New facility defined to provide information previously available only through SMART

Streamlined SMART

- SMART replaced with set of mapped registers with relevant info
  - All the SMART mechanism complexities jettisoned
  - The most useful information from SMART retained without any ATA commands necessary to support

scrTempC	**Current temperature reading**
scrTempMaxP	**Peak maximum temperature exposure**
scrTempMinP	**Peak minimum temperature exposure**
scrReallocsA	**Accumulated number of reallocated sectors**
scrERetractsA	**Accumulated number of uncontrolled retracts**

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4K Block Size

- CE-ATA directly supports 4K sectors
  - Drives with 512-byte sectors interoperate seamlessly

Register	7	6	5	4	3	2	1	0
Features	Reserved							
Features (exp)	Reserved							
Sector Count	Sector Count (7:3)					0	0	0
Sector Count (exp)	Sector Count (15:8)							
LBA Low	LBA (7:3)					0	0	0
LBA Low (exp)	LBA (31:24)							
LBA Mid	LBA (15:8)							
LBA Mid (exp)	LBA (39:32)							
LBA High	LBA (23:16)							
LBA High (exp)	LBA (47:40)							
Device/Head	Reserved							
Command	25h							

GRANULARITY

ALIGNMENT

Taskfile Mapping & Signature

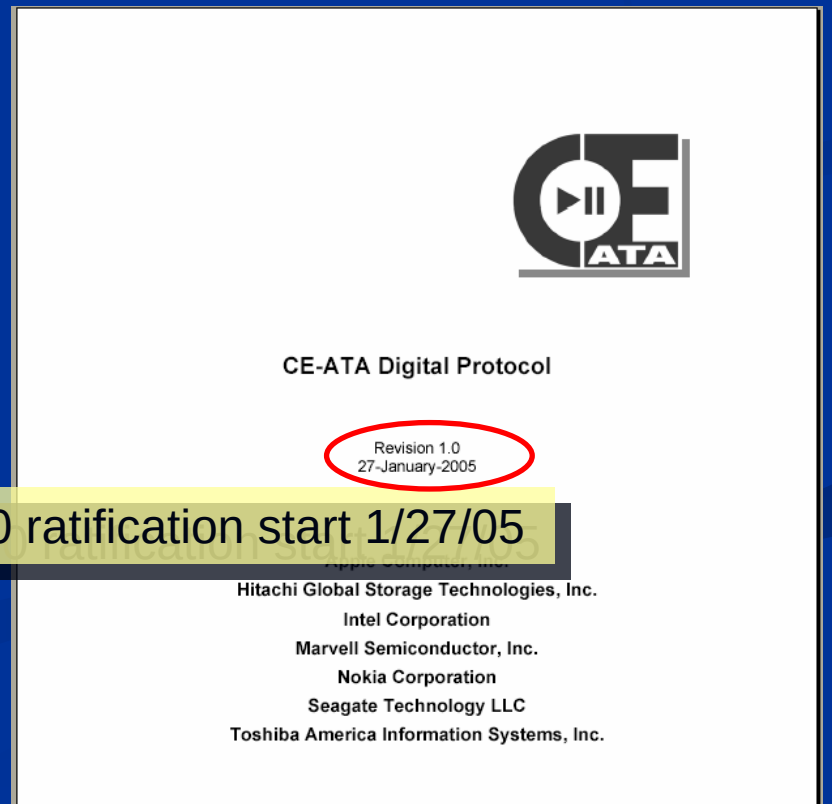
Register Address	ATA Register (8-bit)	Reset Value (read)							
0	Reserved	R							
1	Features (exp)	R							
2	Sector Count (exp)	R							
3	LBA Low (exp)	R							
4	LBA Mid (exp)	R							
5	LBA High (exp)	R							
6	Control	R	R	R	R	R	0	1	0
7	Reserved	R							
8	Reserved	R							
9	Features/Error	R	R	R	R	R	R	R	R
10	Sector Count	RESERVED							
11	LBA Low	RESERVED							
12	LBA Mid	0xCE							
13	LBA High	0xAA							
14	Device/Head	R							
15	Command/Status	0	1	na	na	na	na	na	0

Interrupts disabled by default (nIEN=1)

Signature partitioned to accommodate MMC dual-mode signature

CE-ATA Status

- Digital protocol specification completed and ratification underway
  - Protocol specification defines all aspects of CE-ATA other than the connector & interconnect
  - Protocol team pursuing design supplements to ease development/deployment
- Connector and interconnect specification progressing well
  - Solid foundation with 0.5 draft spec



*Other brands and names are the property of their respective owners.

Stellar CE-ATA Industry Support

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