1.8” Super Small Slim HDD

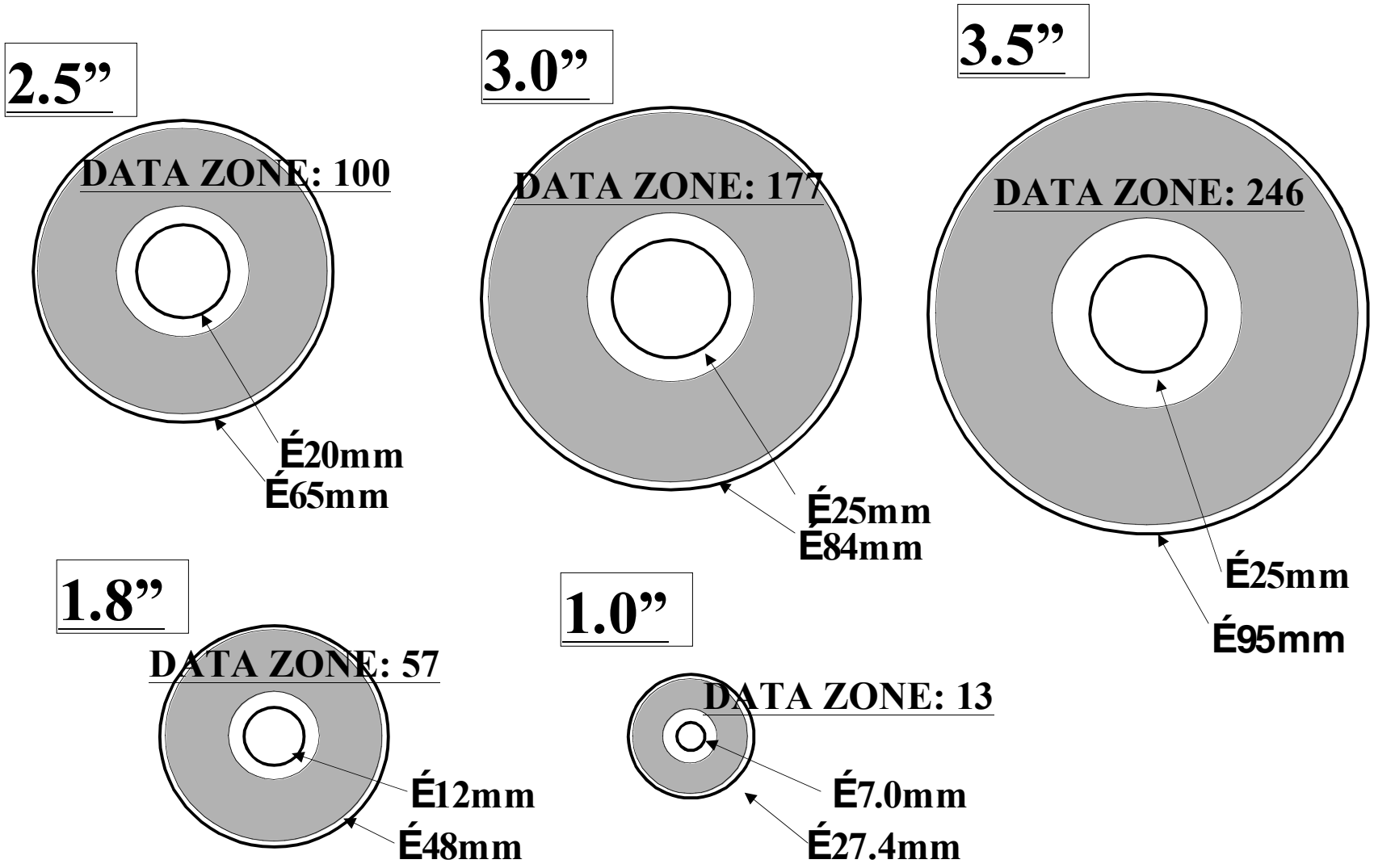
Digital Media Network Company

Storage Device Division

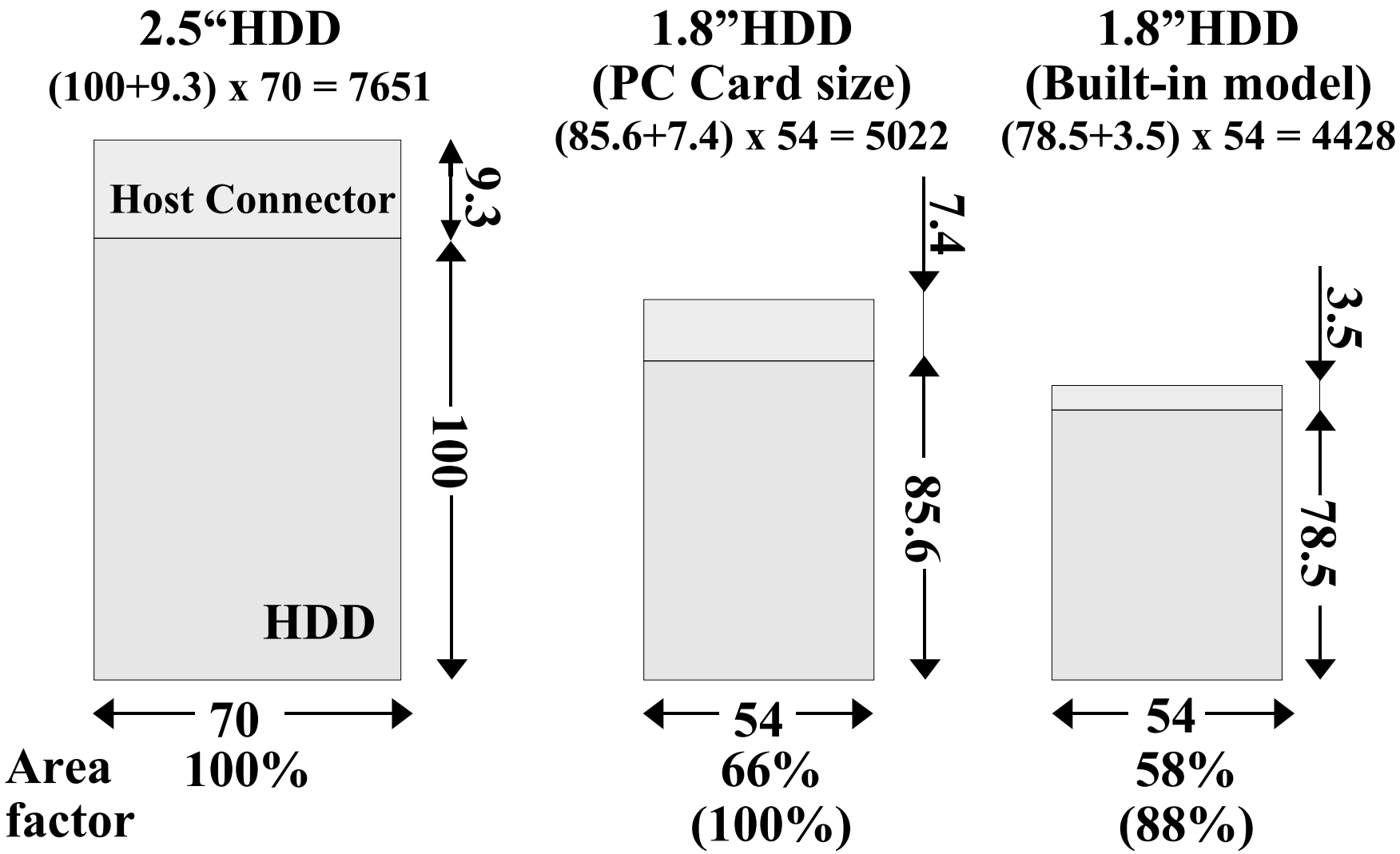
Why 1.8” HDD?

- ***Larger Capacity***
  - **About half of the 2.5” drive’s capacity**
  - **Can record about 1 hour MPEG2 SDTV (with 2.0GB)**
- ***Lower Power Consumption***
  - **Will be better storage for mobile devices**
- ***Standard Interface***
  - **PC-Card is a standard interface in notebook PCs**
  - **Used as a bridging media between notebook PCs**
  - **Can be used as an embedded storage device**

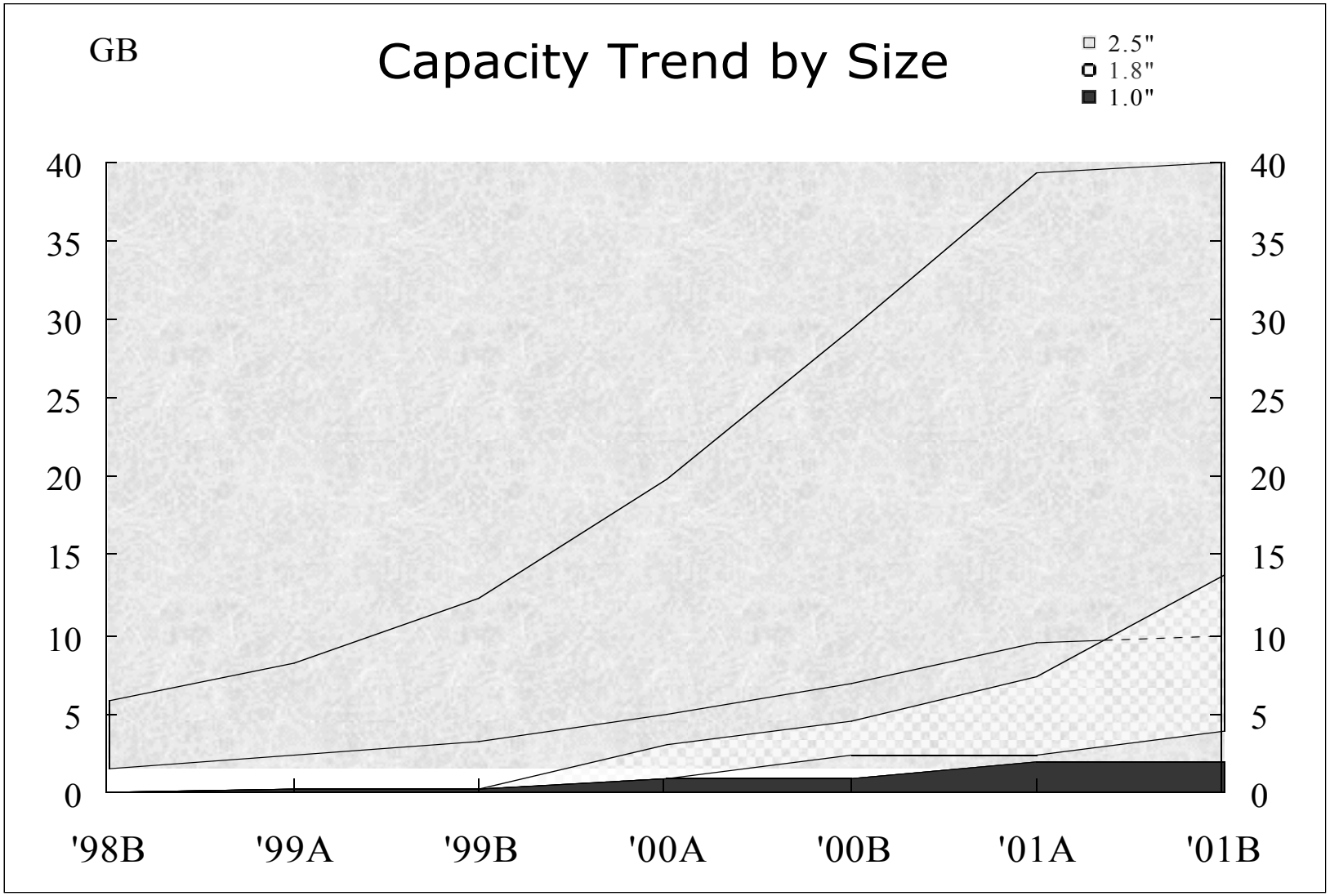
Form Factor : Media Size



Form Factor : Comparison of Foot Print



Capacity Trend by Form Factor



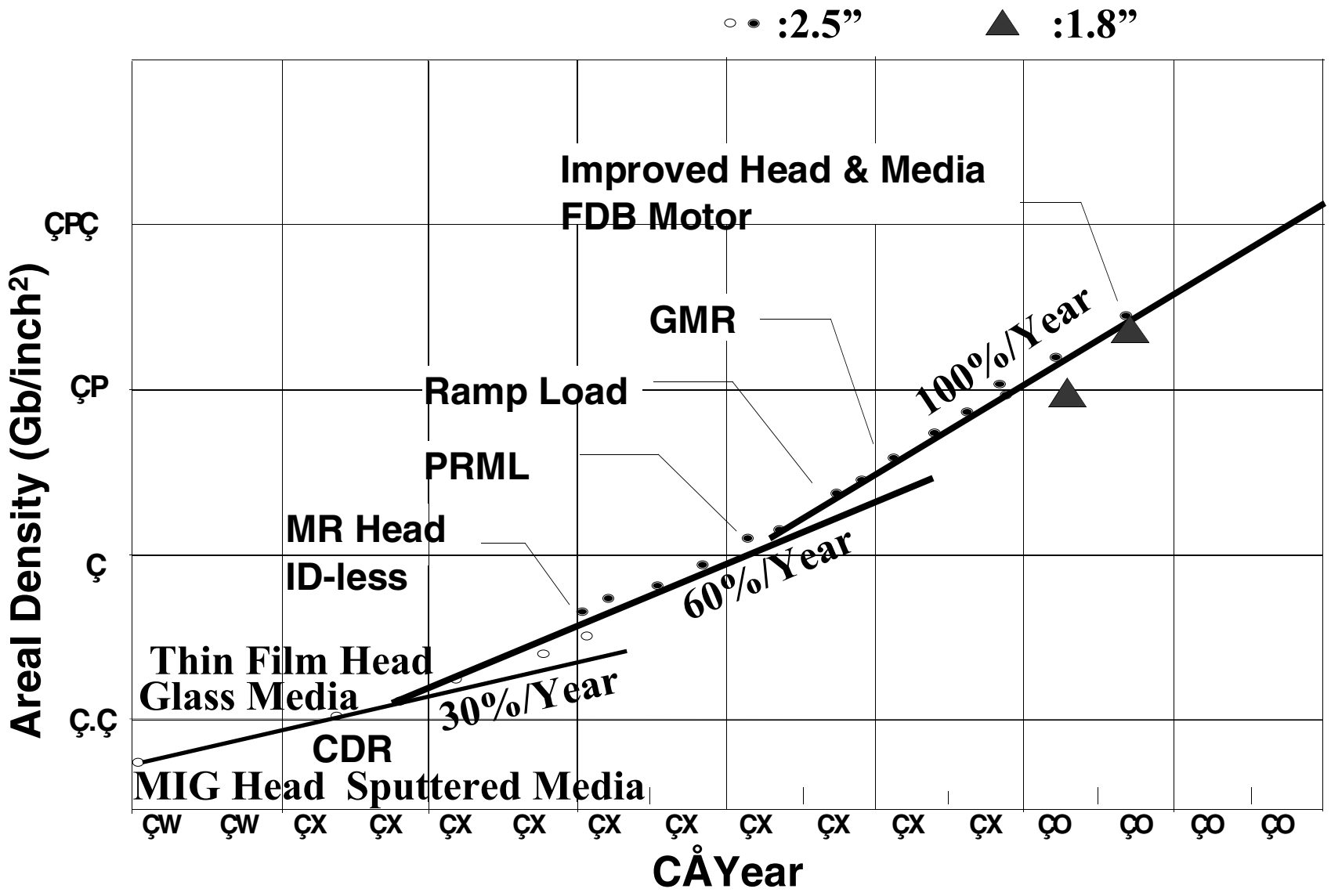
Product Concept

- ***Provides small, light, silent and low power HDD with sufficiently large capacity*.**
  - **For PC-Card as a bridging media**
- ***Provides further small footprint HDD with abundantly large capacity for advanced usage*.**
  - **For built-in drive as ATA interface embedded storage of mobile products**
- ***Use the same technology (head, media, channel) proven on the former generation 2.5" HDD***
  - **Development was focused on mechanical design and production equipment.**
  - **Parts mounting technology as well as chip size IC package are important.**

Key Technologies

- ***High Recording Density***
  - **5GB/Disk : 22.4Gbpsi (41.6KTPI, 538KBPI)**
  - **Advanced servo control**
- ***Small Form Factor***
  - **LSI : Ball Grid Array, Low profile package**
  - **Mechanical parts: Thinner SPM, VCM, etc.**
- ***Low Power Consumption***
  - **3.3 Volt operation**
  - **High efficiency VCM and lower inertia carriage**
- ***Mechanics***
  - **Inertia latch mechanism with ramp-load**
  - **High stiffness base plate and SPM**
- ***Low Acoustics***
  - **About 10dB less than those of 2.5”**

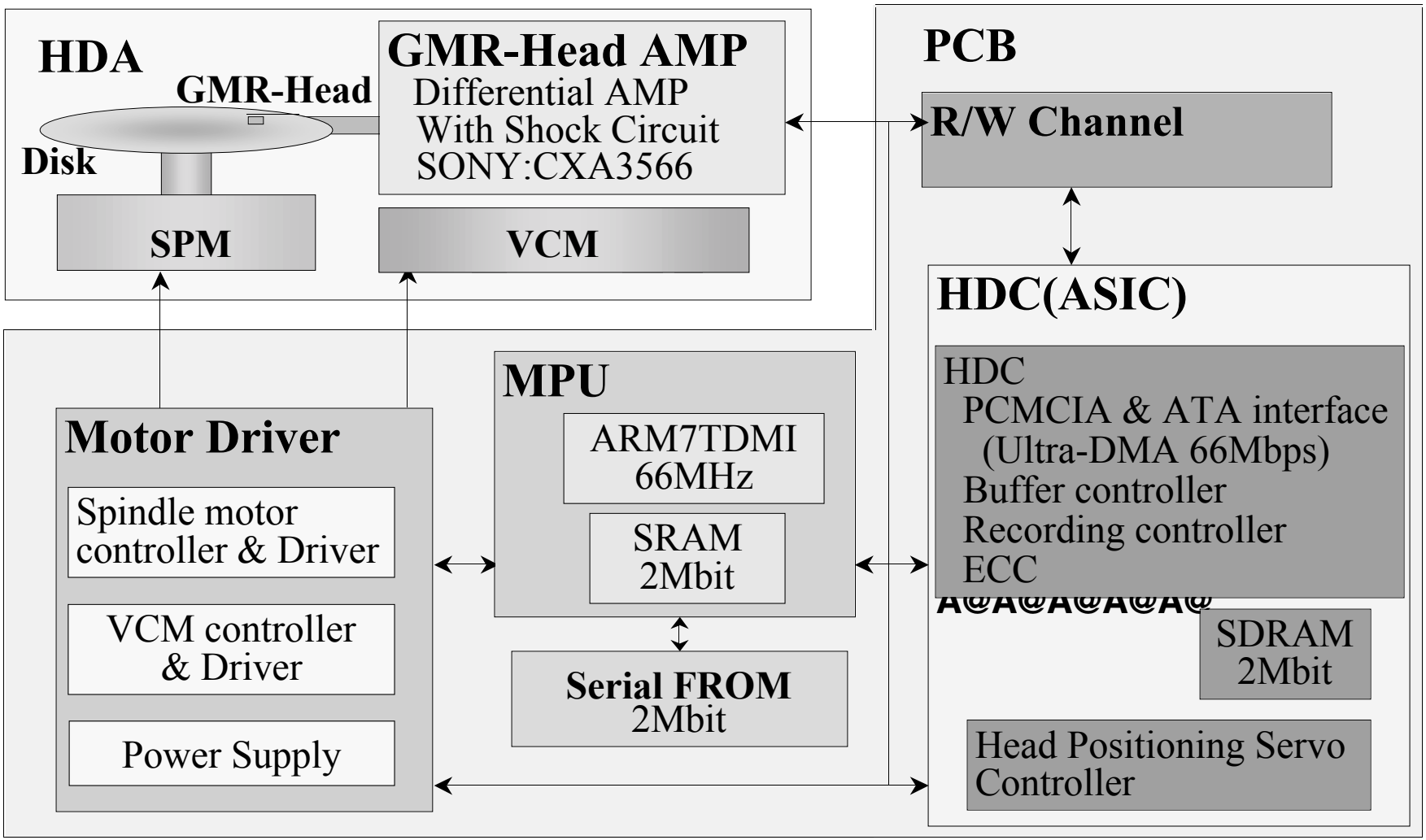
Recording Density



Small and slim form factor

- ***Printed Circuits Board***
  - **Use of integrated LSI's**
  - **Low profile package of 0.5mm thickness BGA**
  - **PCB of 0.45mm thickness**
- ***Base plate***
  - **Sheet metal of 0.6mm thickness**
  - **Steel base plate by press process**
  - **Used as a yoke of magnet**
- ***Spindle Motor***
  - **Spindle motor of 4.05mm thickness**
  - **Inner rotor type with ball bearings**
  - **Same size of balls used in 2.5"HDD for higher shock resistance**

Block Diagram : 5GB Card type



LSI's (1/2)

- **HDC(ASIC)**
  - **0.25um CMOS, 5.5x5.5mm, 2Mbit SDRAM+220Kgates**
  - **PC Card Bus & ATA interface, 5V Tolerant Inputs/Outputs**
    7Burst - 3Way interleave ECC, Ultra-DMA 66Mbps
    Servo Controller, Cache & Buffer controller

- **MPU**
  - **0.15um CMOS, 5.0x5.0mm**
  - **ARM7 Core, 2Mbits SRAM, 16Kbits ROM & Peripherals**

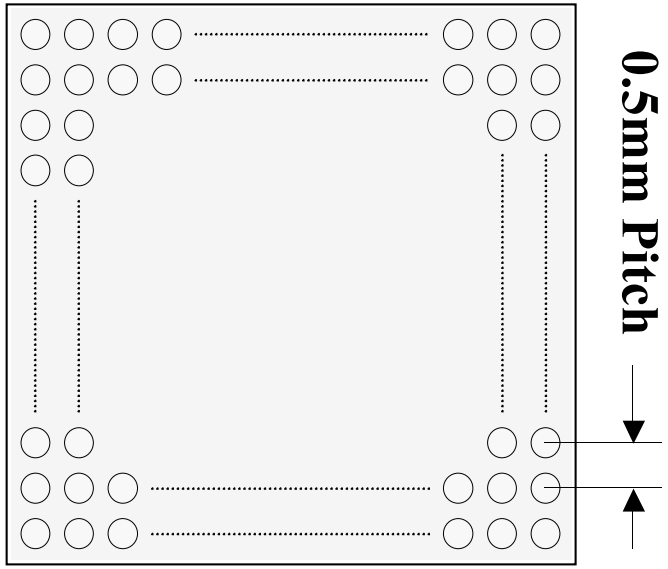
- **R/W Channel** : Marvell - 88C4310
  - **0.25um CMOS, 3.5x3.5mm**
  - **32-34/64-66 ENDEC with Post-Processor**
    Modified EE PRML
    Servo Detector & Demodulator for Digital Servo Control
    Data Rate : Up to 550Mbps (Drive's Data Rate: 90-130Mbps)

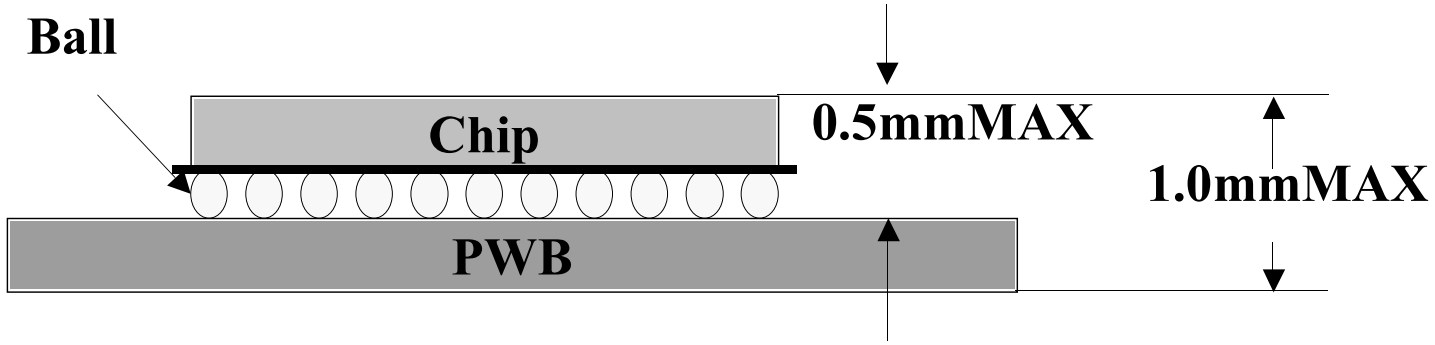
LSI's (2/2)

- **Motor Driver** : TI - TLS2256(Toki)
  - **0.8um Linear Bi-CMOS**
  - **Spindle Motor Controller with 600mA Driver**
    FLL & PLL Speed Controller
    Voice Coil Motor Controller with 400mA Driver
    12bit DAC/ADC
    Ramp Load Control & Emergency Retract Circuits
    Power Controller
    3.3, 2.5 & 1.8V Outputs for 5 or 3.3V Input
    Power Monitor for Input & Output Voltages
    Shock Sensor & Detector Circuits

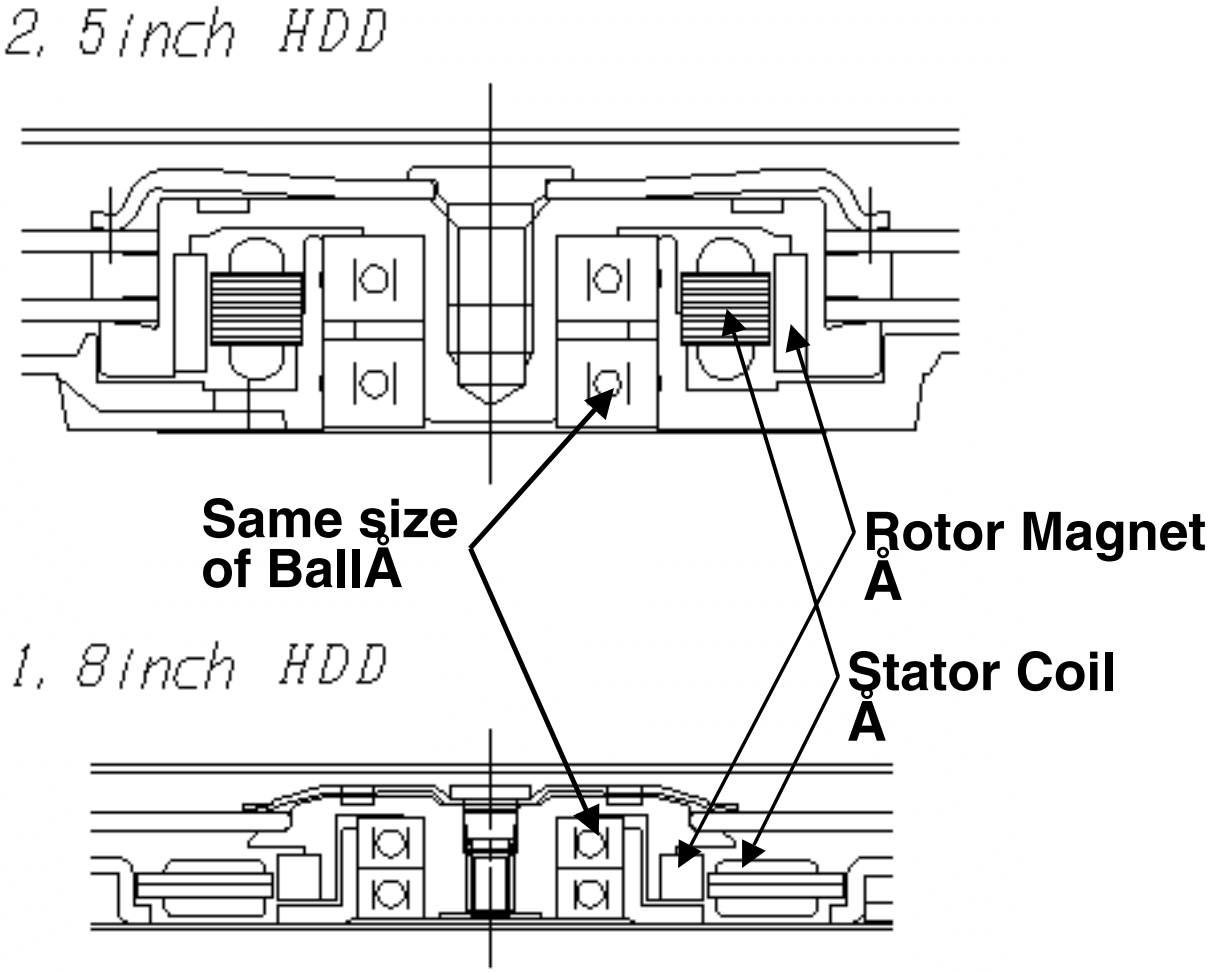
Smaller & Low Profile Package

- et-BGA
  (Extremely Thin Ball Grid Array)
- Wafer Level BGA
  (Chip Size Package)
- 0.5mm height





Spindle Motor



Advanced Tracking Technology

- ***Adaptive Feed-forward Control***
  - **Compensating large media shift and disk deflection**

- ***High Performance Servo Controller***
  - **Improving servo stability by reduced output delay**

- ***Multi-rate Control***
  - **Extending servo bandwidth by reduced phase delay**
  - **Canceling arm-suspension vibratory mode**

Acoustic Noise(Sound Power)

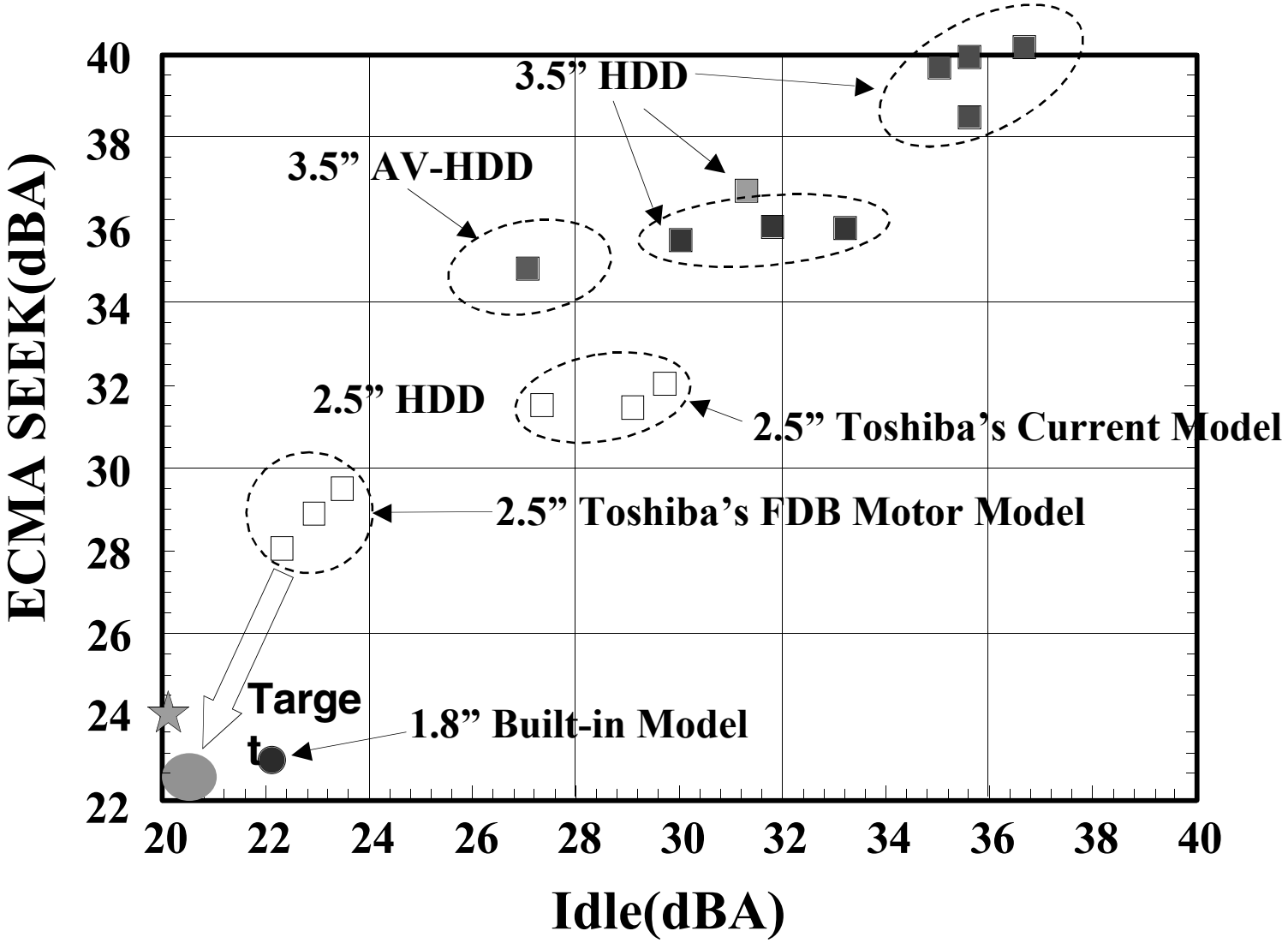


Table-1 1.8" HDD, Major specifications

		PC Card Type		Built- in Type		2.5"
Model		**2GB 1 Disk**	**5GB 1 Disk**	**5GB 1 Disk**	**10GB 2 Disks**	**10GB 1 Disk**
Capacity (Gbytes)		**2.0**	**5.0**	**5.0**	**10.0**	**10.1**
Number of disks		**1**	←	←	**2**	**1**
Number of heads		**2**	←	←	**4**	**2**
TPI (k)		**24.2**	**41.6**	←	←	**36.0**
BPI (k)		**372**	**507**	**538**	←	**489**
Recording density (Gbpsi)		**9.0**	**21.1**	**22.4**	←	**17.6**
Rotation speed (RPM)		**4,200**	**3,990**	**4,200**	←	←
Transfer ?@rate	**Internal (Mbits/sec)**	**75 - 130**	**94 - 123**	**118 - 175**	←	**121 - 234**
	Host (Mbytes/sec)					
	ATA					
	?@Ultra DMA mode	**66.7**	←	←	←	←
	?@PIO mode	**16.6**	←	←	←	←
	PC Card					
	?@Memory mode	**20**	←			
	?@I/O mode	**5.2**	←			
Buffer size (kbytes)		**256**	**1,024**	←	←	←
Average seek time(msec)		**15**	←	←	←	**13**

Table-1 1.8” HDD, Major specifications

		PC Card Type		Built- in Type		2.5”
Model		2GB 1 Disk	5GB 1 Disk	5GB 1 Disk	10GB 2 Disks	10GB 1 Disk
Supply voltage (volts)		3.3 or 5	←	3.3	←	5
Power consumption (W Typ.)	Read/Write	1.2 / 1.3	←	1.3 / 1.3	←	2.2/2.2
	Low power Idle	0.5	←	←	←	0.7
	Stand-by	0.23	←	←	←	0.3
Shock (G's)	Operation	150	200	←	←	150
	Non-operation	1,000	←	←	←	700
Acoustics idle mode (dB Typ.)		22	←	←	←	32
Dimension (mm)	Width	54	←	←	←	69.85
	Depth	85.6	←	78.5	78.5	100
	Height	5	←	←	8	9.5
Weight (gram)		55	←	50	60	94

END

Thank you

Y. Hashimoto