Memristor Presentation

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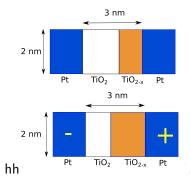
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Outline

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- 4 Read/Write Models for a Memristor Based 1T1R Cell
- Conclusion

The Memristor

- Two-terminal, non-volatile device
- Made of resistant TiO_2 and conductive TiO_{2-x}
- Applying voltage alters the state



Comparison to Other Memories

Not shown in the chart:

- Memristors are potentially cheaper to manufacture than flash.
- DRAM energy shown does not account for refreshing.

Table 1 Comparison of data storage technologies. (Data drawn from public sources and HP internal research)

	Memristor	PCM	STT- RAM	DRAM	Flash	HD
Chip area per bit (F²)	4	8-16	14-64	6-8	4-8	n/a
Energy per bit (pJ) ²	0.1-3	2-100	0.1-1	2-4	101-10-	10 [€] −10 ⁷
Read time (ns)	<10	20-70	10-30	10-50	25,000	5-8x10 ⁶
Write time (ns)	20-30	50-500	13 -9 5	10-50	200,000	5-8x10 ⁶
Retention	>10 years	<10 years	Weeks	<second< td=""><td>~10 years</td><td>~10 years</td></second<>	~10 years	~10 years
Endurance (cycles)	~1012	10 ⁷ -10 ⁸	10 ¹⁵	>1017	10³−10€	10 ¹⁵ ?
3D capability	Yes	No	No	No	Yes	n/a

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Discussion

Questions?