55 nm SoC Technology

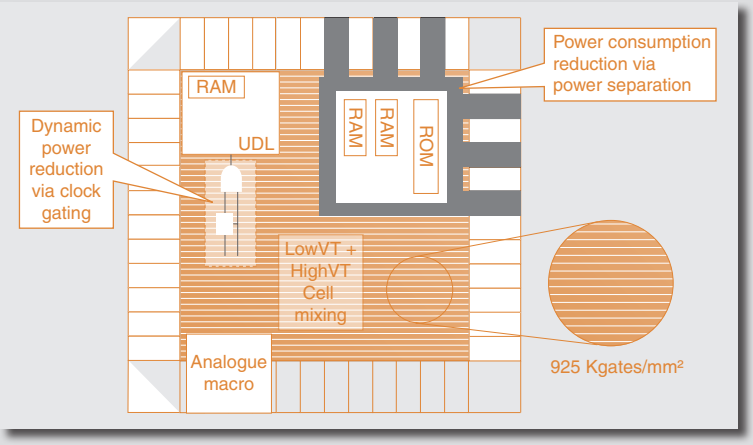
# CB-55 Cell-based CMOS ICs

Renesas Electronics' new CB-55 cell-based ASIC takes system-on-chip (SoC) technology a big step forward. Leakage current in the CB-55 is reduced by a factor of 6 using the brand-new high-k over silicon dioxide transistor technology. This approach allows a choice of two operating environments simply by selecting the core power: either high performance at low power, or standard performance at even lower power. The CB-55 can accommodate very high gate and memory densities while efficiently bundling CPU cores and high-speed interfaces on one chip.

## Features

- 55 nm technology
- Up to 7 metal layers
- Very high gate count: 200 million gates (raw)
- 1.0 and 1.2 V core voltage optimized architecture
- Extremely low power consumption down to 0.29 nW/MHz/gate
- Extremely low leakage current using high-k transistors over silicon dioxide
- I/O voltage options: 1.8, 2.5, 3.3 V
- Flexible I/O structure supports USB, HDMI, S-ATA, PCI
- Various package types: PBGA, FPBGA, FCBG

## Schema




## Product Outline

| | CB-55 | |
|---|---|---|
| Node length (Lnode) | 55 nm (50 nm gate length) | |
| Metal Layers | Up to 7 | |
| Gate count (raw) | 200 M gates | |
| Gate density (raw) | 925 k gates/mm² | |
| Core VDD | 1.0 ± 0.1 V | 1.2 ±0.1 V |
| Power consumption* | 0.29 nW/MHz/gate | 0.40 nW/MHz/gate |
| | 31.7 ps | 450 MHz |
| System frequency | 233 MHz | |
| Gate length (Lpoly) voltage | 50 nm | |
| Gate dialectric | HfSiOx | |
| I/O levels | 1.8, 2.5, 3.3 V | |
| Package and pad type | 30 µm staggered PAD, 50 µm inline pad for PBGA and FPBGA, 120 µm staggered bump for FCBGA | |

* Activity factor is 0.1

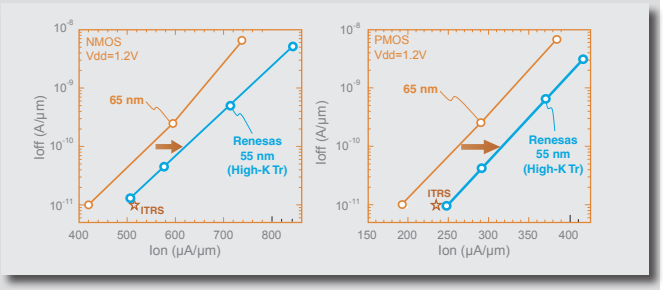
## Architecture

The CB-55 technology offers a choice of three different transistor types that can be configured for an optimal balance of performance, power consumption and integration level on the same chip. Moreover, the high-k over silicon dioxide transistor technology reduces the leakage current considerably. The core voltage can be selected, for instance, to achieve an optimal speed for the CPU cores and low power consumption for the remainder of the user logic.

## Power Consumption

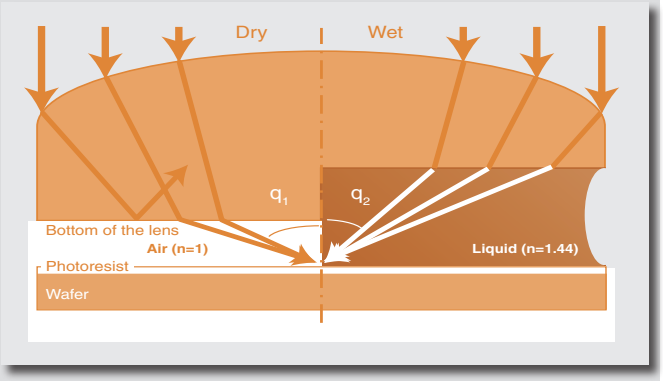
Major technology improvements have substantially reduced power consumption. These include the brand new high-k over silicon dioxide transistor, which reduces leakage current, and the selectable core voltage, which improves overall system speed and consumption.

Renesas Electronics also offers various design method solutions to obtain highest performance at lowest consumption. These include power separation to allow hibernation of part of the chip that is not used, clock gating to reduce dynamic power, and mixed cells to achieve the best performance with minimum consumption.




## Production

As a leading edge company, Renesas Electronics is the first Japanese company to adopt the Liquid Immersion Lithography technology for mass production and uses it on 55 nm devices. This process, using a method that fills the space between lens and wafer with water, enables advanced resolution and high stability of mass production.




## Additional Features

**IPs –** CPU cores like standard ARM cores plus peripheralcan be obtained from our product IP portfolio. Application-specific cores for networking (Ethernet), consumer (HDMI), and PC (USB, PCI express, S-ATA) help to build genuine SoC designs. Analog cores like PLLs, ADCs and DACs complete the wide choice of macros.

**Interfacing –** With I/O voltages of 1.8, 2.5 and 3.3 V the CB-55-L I/O structure provides full interfacing support. Ready-to-use USB, S-ATA, HDMI, PCI express standards provide the latest version of these high-speed interfaces. A range of package types, eg, PBGA, FPBGA and FCBGA, meets the requirements of all kinds of application.

**RAMs –** CB-55 comes with very high density RAMs to satisfy the needs of complex ASICs with embedded SDRAM and DRAMs. Renesas Electronics' eRAM technology eliminates the usual bottleneck between the chip and separate memory with all the benefits of fast memory access and high overall system speeds.

**Application focus –** CB-55's features allow fitting perfectly for applications that require the combination of low power consumption, high integration rate and high performances with a high amount of high-density RAM.



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