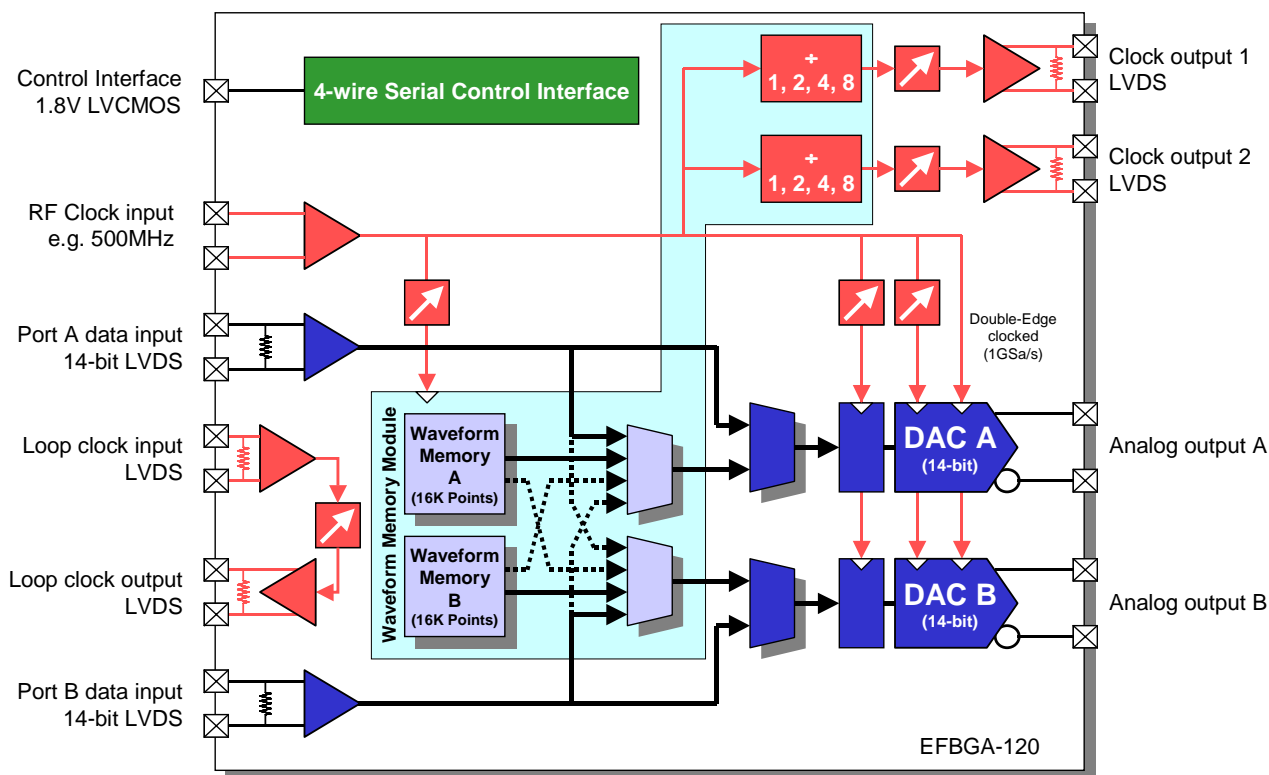




## Functional Overview

The MB86064 is a high performance Dual 14-bit 1GSa/s DAC. In addition to two DAC cores the device features a host of features designed to help both system integration and operation. A functional block diagram is shown in Figure 1. Analog performance at high frequencies is enhanced by novel current switch and switch driver designs which provide constant data-independent switching delay, reducing jitter and distortion.



**Figure 1 MB86064 Functional Block Diagram**

The device requires an input clock at half the DAC conversion rate as each DAC core is clocked on both edges of the input clock. Each DAC core can be regarded as two interleaved DACs, each running at half rate. The main reason for adopting this approach is that the switch driver inherently includes a multiplex function through its two input ports. Compared to a conventional switch driver this allows twice as long to acquire and convert, though because the two paths share current sources they match exactly at low frequencies. A characteristic of this architecture is a suppressed image appearing reflected about  $F_s(\text{dac})/4$  of  $F_{\text{clk}} - F_{\text{sig}}$ . Duty cycle error in the input clock will exacerbate this image, but can be minimised by trimming the differential DC offset at the clock input pins.

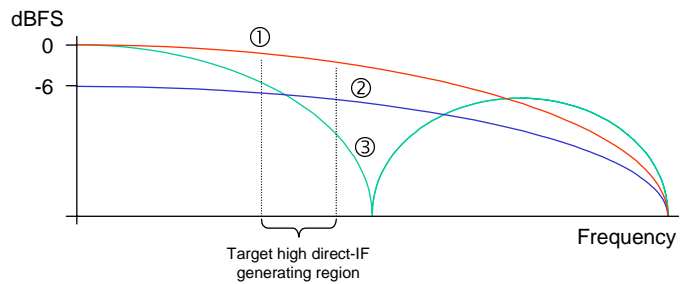
The big advantage of this approach compared to a single DAC running at half the rate is much reduced  $\sin x/x$  roll off, which gives increased output power and better in-band flatness when generating high output frequencies (e.g. 200MHz and above). This is illustrated in Figure 2 as line 1. An alternative approach using a return-to-zero output stage has the same  $\sin x/x$  roll off (and switch driver speed) but 6dB lower output power and a large image at  $F_{\text{clk}} - F_{\text{out}}$ . See Line 2.

## MB86064 Dual 14-bit 1GSa/s DAC

Line 3 illustrates a conventional DAC running at half rate.

### Input Data

Unsigned binary data to each DAC core is input via a dedicated parallel LVDS port. As with the DAC core, data is latched on every rising and falling edge of the clock in a pseudo DDR mode. For synchronisation of data generator(s) two LVDS clock outputs and a Loop-Clock facility are provided.



**Figure 2 Benefits of DAC core architecture to Sinx/x response**

### Loop-Clock

Maintaining valid clock-to-data timing becomes increasingly difficult at higher clock rates, particularly taking into account device-to-device variations. The MB86064 minimises potential problems through its DDR data interface and by providing a loop-clock facility. The on-chip 'loop' consists of an LVDS input connected to an LVDS output, through a programmable delay stage. This loop-through, and the associated tracking from the data generating device, should be incorporated in the feedback loop of a Delay-Locked Loop (DLL) or Phase-Locked Loop (PLL) clock generator, within the data generating device. This enables the system to compensate for variations in input/output delays in both the data generating device and the DAC.

### Performance Enhancement Features

Each DAC core integrates a number of performance enhancing features. Performance levels now reach the level sought after for next generation systems and high direct-IF architectures.

### Serial Control Interface

A Fujitsu 4-wire serial interface is provided for configuration and control of the DAC. Programmed data is stored in a number of read/writable registers.

### Waveform Memory Module

The MB86064 incorporates a Waveform Memory Module featuring two 16k point on-chip waveform memories. These allow the DAC cores to be driven with user programmed waveforms without the need for external high speed, pattern generators.

### Development Kit

A comprehensive Development Kit (DK), DK86064, is available which comprises a number of modules. A base motherboard provides an interface to the DAC, Clock and Data modules. Also included is a PC USB Interface Lead & Control Software.

For further details, please refer to the associated documentation.



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