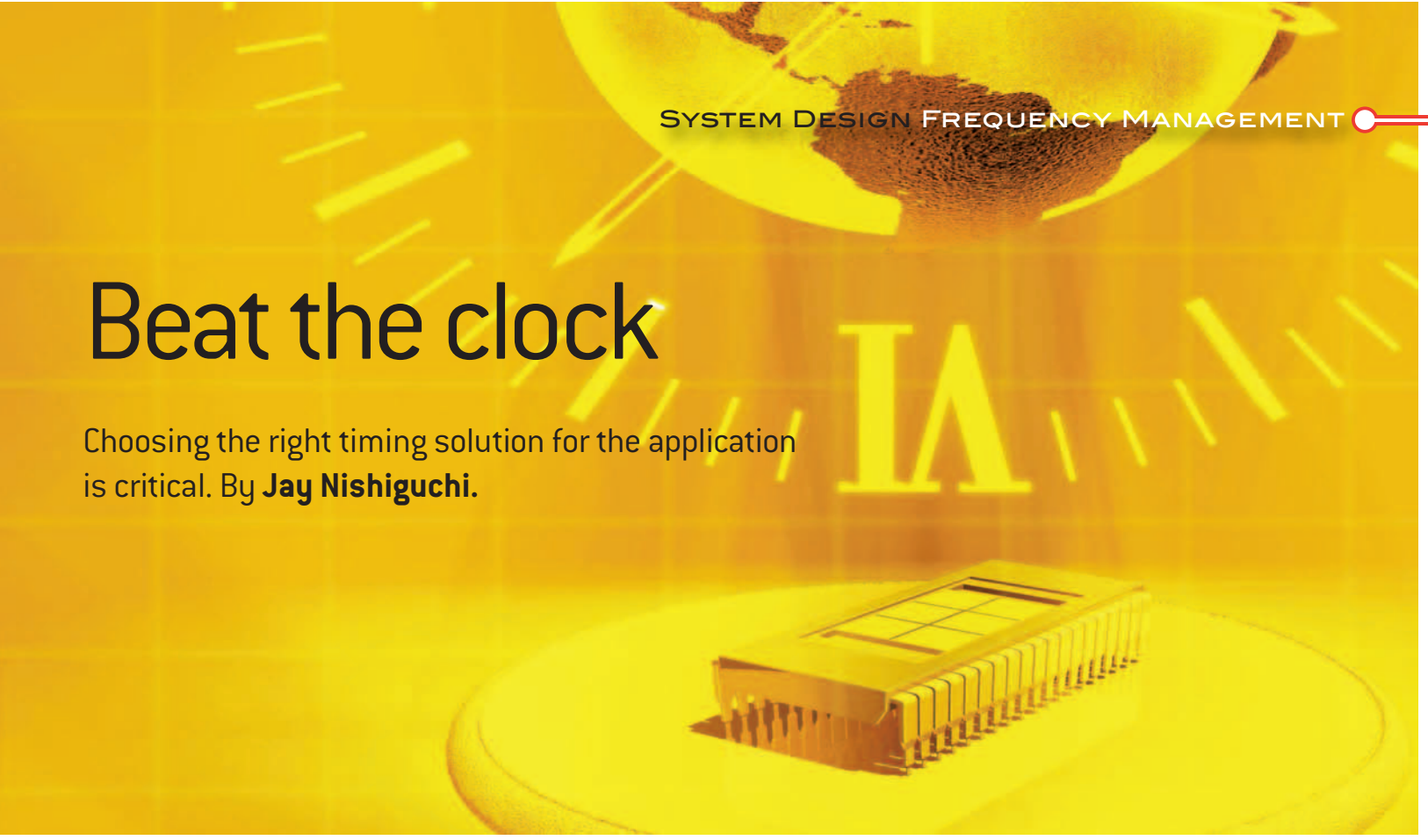


Beat the clock

Choosing the right timing solution for the application is critical. By **Jay Nishiguchi.**

Clocks are the 'heart beat' of almost all electronic systems and clock management is an especially important part of the overall system design. Since clock accuracy, stability and overall signal quality affect system performance, choosing the right timing solution that fits the design application is critical.

Four basic steps define the process of selecting the right timing solution:

- determine system clocking requirements
- identify the clock components that meet system requirements
- obtain clock component samples
- evaluate and qualify samples.

Each system application has its own combination of features, performance, and cost requirements. Questions, like those listed below, are just a few that must be answered by the system designer.

- what frequency do i l need?
- what is the maximum frequency variation tolerance?
- what signal voltage and interface standards are required?
- what are the jitter and/or phase noise system requirements?
- is power consumption or emi regulation a concern?
- is package size a priority?
- is solution cost a priority?
- is speed to samples a priority?

For example, the clock requirements for communications, consumer and mobile applications are very different. A communications system such as a wireless base station may not need the smallest package, but will require low jitter and phase noise. These requirements vary significantly from that of a consumer application, such as a printer, which may be most concerned with emi compliance or cost, or from that of a mobile phone where the emphasis is on package size and power consumption.

Once the system clocking requirements are determined, the system designer's next challenge will be to identify the clock components that will deliver the desired feature, performance, and price combination. This task can be daunting, given the number of timing solutions available today.

Cypress Semiconductor offers the system designer a simple solution for finding, configuring and programming a customised timing solution tailored to meet application requirements. Cypress' latest timing solution software wizard – CyClockWizard – enables users to customise timing solutions to meet their requirements in three easy steps:

- identify the right clock components through a parametric search engine
- custom configure the identified device using an intuitive gui
- program the devices for engineering evaluation.

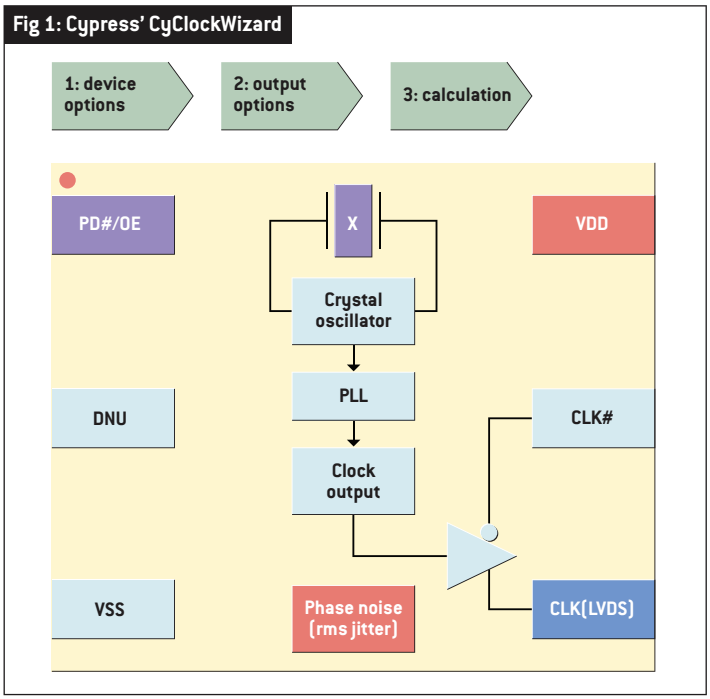
CyClockWizard, which can be downloaded from Cypress' website, allows the user to explore Cypress' entire timing solution portfolio of crystal oscillators, clock generators and buffers. Users can specify parameters such as frequency, voltage, signal type, package and temperature range to quickly find solutions. The search can be further enhanced with special performance requirements such as spread spectrum modulation type for emi reduction.

For example, the search for an eight output, cmos zero delay buffer with 100MHz input/output frequencies in an soic package and suitable for use in the industrial temperature range would yield the CY2308SXI-1 buffer. However, specifying a 50MHz input without changing the other parameters would change the search result to theCY2308SXI1-4 buffer.

In some cases, the requirement for a particular clocking frequency or other requirement will direct the user to a programmable solution that can be configured to suit user requirements. Once a clock component is identified, the CyClockWizard GUI allows the user to define the details of the pin out (for example, configuring a pin as either a power down or output enable) and configuration (for example, frequency) and compiles a JEDEC file that can be used to program the component.

FleXO, Cypress' latest family of programmable low phase noise clocks has a typical rms phase jitter of 0.6ps at frequencies up to 690MHz. This is a good example to illustrate the combined search and configuration capabilities of

Fig 1: Cypress' CyClockWizard



CyClockWizard. FleXO is offered as a crystal oscillator in a 6pin 5 x 3.2mm LCC package, as well as a clock generator in 8 and 16pin tssops. Although Cypress has many devices in the FleXO family, CyClockWizard can identify the most suitable FleXO product based on the requirements for a high performance clock.

FleXO's pin out, frequency, voltagev and output type, as well as options for i2c or pin selectable frequency margining – the ability to change frequencies in 0.2ppm increments for system testing purposes – would then be selected or configured through the GUI as part of the configuration process. Additionally, for FleXO, the user can choose a phase noise profile that best meets system requirements.

Having identified the solution that best meets the specific system requirements, the next challenge for the designer is obtaining clock device samples. While distributors often stock standard frequency timing products, custom, non standard clocking requirements typically have eight to ten week lead times, due to design changes and manufacturing cycle times. CyClockWizard reduces lead times by allowing the system designer to either program a stocked blank chip sample directly or to generate the necessary configuration that can be used by a distributor or sales office to create programmed samples.

In the FleXO example above, once the chip configuration is finalised, it can be used to immediately program a FleXO device with the CY3675- CLKMAKER, a portable clock device programmer which connects to a pc or laptop via USB cable and is fully supported by CyClockWizard. If CyClockWizard detects that a CY3675-CLKMAKER is connected to a computer, the user can instantly program samples.

Alternatively, if the user does not have access to a CLKMAKER, programmed samples can be obtained by emailing the configuration file to a distributor or sales office.

The system designer's final challenge is to evaluate the potential solution. During the evaluation cycle, new samples with slight variations of clock configurations may be required because the system designer needs to:

- vary the system frequency to check for system robustness
- change spread spectrum settings to optimise emi compliance, or
- change clock parameters due to new system requirements or upgrades.

For example, during system robustness evaluation or emi compliance testing, a pin selectable i²c configurable or programmable solution would allow the adjustment of parameters such as frequency, spread spectrum percentages and modulation rate while measuring system response.

As another example, if a system upgrade requires a faster clock or the addition of a daughter card that requires the clock to drive two loads instead of one, a programmable solution can accommodate such changes by adjusting its output signal drive strength or frequency settings. New samples can be generated quickly without waiting for silicon revisions.

Cypress' portfolio of programmable clock solutions supports faster evaluation cycles with features such as:

- i²c or special programming interface
- user selectable frequency margining (via i²c or pin control)
- programmable spread spectrum emi reduction (via i²c or pin control).

Cypress' CyClockWizard provides access to these features and allows quick generation of programmed samples through an easy to use GUI in a single integrated software tool, thus simplifying the system designer's task to identify, obtain and qualify timing solutions that meet their particular requirements.

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