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In data sheets and application notes which still contain NXP or Philips Semiconductors references, use the references to Nexperia, as shown below.

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Kind regards,

Team Nexperia

Less is more when you design with configurable and combination logic

By Daniel Jensen, Regional Marketing Manager, NXP Semiconductors

Summary

If you'd like to squeeze more functionality into less space, while simplifying inventory and reducing system cost, then check out NXP's configurable and combination logic. These flexible and innovative devices give you more ways to implement logic functions, so you can potentially reduce pin count, lower system cost, and improve inventory management and qualification expenses during development. To learn more, read our short article about the why and how of using configurable and combination logic.

Do more with less

What if you really could do more with less? NXP's configurable and combination logic devices make it possible, by giving you more ways to implement the "glue" logic functions commonly found in today's complex systems.

These flexible and innovative single-package devices let you replace discrete logic solutions with a configurable or combination logic device, so you can potentially reduce pin count, device count, system cost, and assembly-related expenses. These devices can also simplify inventory control and reduce qualification effort, since there are fewer discrete logic devices to deal with.

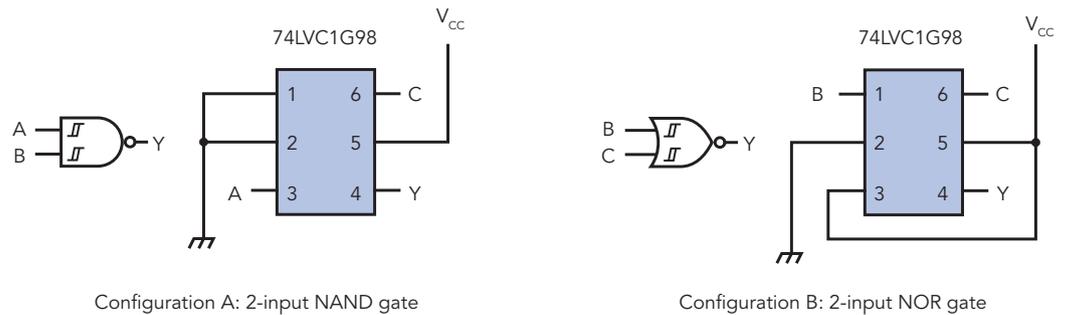## What is configurable logic?

Configurable logic places nine or more functions in a single package. The pin configuration determines which logic function the device performs, so you can use just one device type to perform multiple functions in your system.
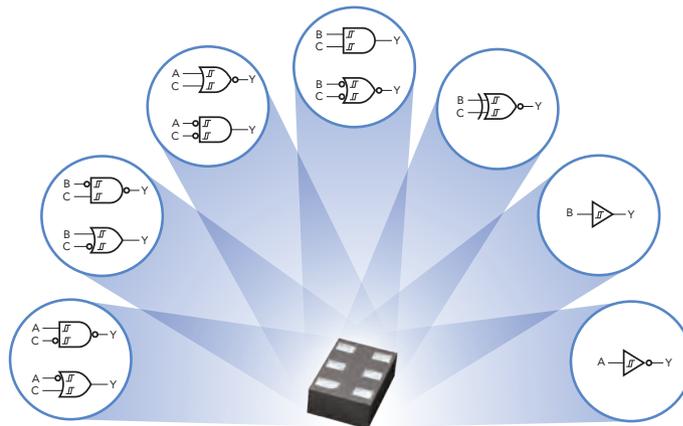
Configurable logic = one package, nine or more functions

You select the logic function by changing which pins are tied to GND, V_{CC}, or selected as the device I/O. The diagram gives an example, using the 74LVC1G98, a low-power multi-function gate with Schmitt-trigger inputs.

Configuration A: 2-input NAND gate   Configuration B: 2-input NOR gate

With configurable logic, the pin configuration determines which logic function the device performs

On the 74LVC1G98, two of the available functions are a 2-input NAND gate and a 2-input NOR gate. To implement the 74LVC1G98 as a NAND gate, select pins 3 and 6 as inputs, and pin 4 as the output. Pins 1 and 2 are tied to GND, while pin 5 is tied to V_{CC} (Configuration A). To use it as a NOR gate, simply select pins 1 and 6 as inputs, and pin 4 as the output. Pin 2 is tied to GND, while pins 3 and 5 are tied to V_{CC} (Configuration B). The 74LVC1G98 can replace all of the 2-input NAND and 2-input NOR gates maintained in inventory, thus reducing component types that must be qualified and stocked in inventory. In addition, higher volume price points can be achieved by pooling various device functions into one category.

Benefits of configurable logic

From a logistics standpoint, configurable logic can reduce inventory costs, because one device can be programmed to perform different functions, and can simplify device qualification, because fewer devices need to be qualified. Configurable logic solutions from NXP also offer an integrated level-shifter option, which can save board space and lower system cost, because one small device can replace multiple discrete components.

NXP's configurable-logic portfolio

NXP's configurable logic covers nine basic functions, with options for complex variants of these functions. The family includes devices with 2-input AND, OR, NAND, NOR, XOR, or XNOR gates, plus inverters and buffers, and a 2:1 mux. There are also versions that integrate level translation, for use in mixed-voltage systems, and versions that support an Output Enable (EN) function. Schmitt-trigger inputs let each device interface with slow transitioning inputs, and all the devices are housed in small-footprint, dark-green packages that are free of halogen and lead.

NXP's configurable logic is available for the LVC and AUP families, as well as for the low-voltage AXP logic family, which supports voltages down to 0.7 V.

Learn more: www.nxp.com/products/logic/gates/configurable_multiple_function_gates/

What is combination logic?

Combination logic places two or more dissimilar functions in a single package, so you can use one device, instead of multiple discretes, to perform a series of functions. The functions can either be internally cascaded or fully independent.
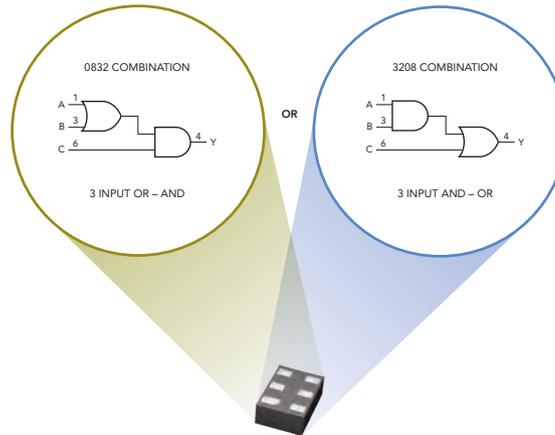
Combination logic = one package, two or more different functions

Benefits of combination logic

Combination logic can be especially advantageous in applications that have dissimilar logic functions close to each other. They can also be particularly useful in applications that use a standard combination of dissimilar functions, as in the output stage of a mobile phone, where an OR gate is followed by an AND gate. Combination logic makes quick work of configuring these kinds of logic functions, and can improve signal performance because the internally connected signals eliminate the delay associated with I/O buffers. Having two or three logic functions in one package also simplifies inventory and manufacturing, reduces package count, and lowers the number of pins, for fewer traces.

The NXP combination-logic portfolio

NXP's combination logic, available with the low-power AUP logic family, comes in single-, dual-, and triple-gate formats.
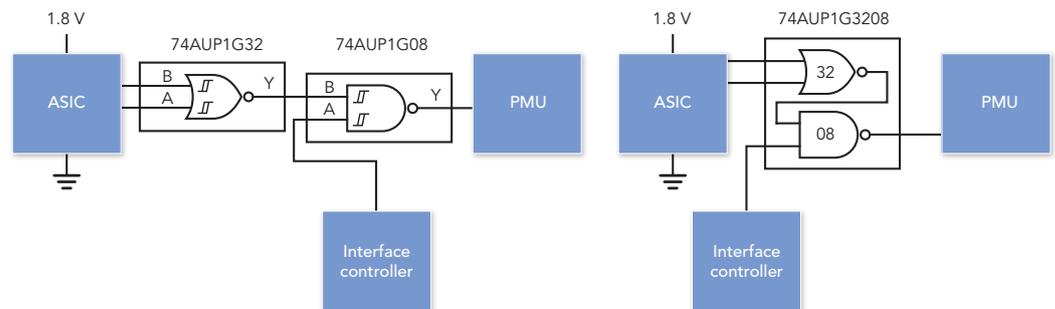
Configuration A: Discrete logic solution

Configuration B: Combination logic solution

In this application, single-gate combination logic lets you use one device instead of two

Single-gate combination logic

A single-gate device integrates two dissimilar functions into one device. The output of one function is connected internally, on the die, to an input of the second function. The internally routed signals eliminate I/O buffers, and thus improve performance. Also, the pin count for the device is lower since the internally routed signals no longer require package pins, and share the power and ground connections.

Dual-gate combination logic

A dual-gate device integrates two dissimilar functions into one device, but the two functions are fully independent. This can save space in systems that need two different functions in close proximity. The I/O signals for each gate are available outside the device but, because the two gates share power and ground, pin count is still lower than with a discrete solution.

Triple-gate combination logic

A triple-gate device integrates three dissimilar functions into one device. All three are fully independent and not connected within the package. Due to pin limitations, triple-gate devices are only available as buffers or inverters.

Learn more: www.nxp.com/products/logic/gates/combination/

Conclusion

Today's designers are continually being pushed to do more with less. NXP's configurable and combination logic solutions make it easy to meet this goal, by reducing system cost, lowering component count, and eliminating board traces. They also help limit the engineering resources required for device qualification, and simplify inventory management and expense by reducing the number of devices maintained in inventory. For more on NXP logic, visit www.nxp.com/logic.

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