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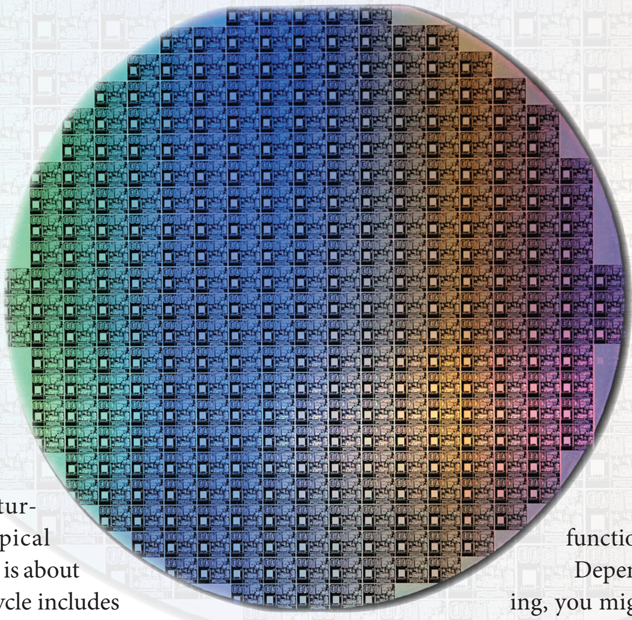
Longer life for Old Semiconductors

It can be hard to get a continuing supply of obsolete parts without help from a special kind of component manufacturer.



The average manufacturing life cycle of a typical semiconductor device is about three years. The life cycle includes introduction, design-in, integration, production, low-volume use, and end-of-life phases. The inevitable end-of-life (EOL) announcement can pose a problem for OEMs. The fact that a manufacturer declares the EOL of a semiconductor device does not mean demand for that part ceases.

To meet the continuing demand for obsolete parts, designers need to plan for continuing production in an economical way. They also must protect themselves against the risk of getting counterfeit or substandard parts.

Consider the case of a manufacturer that supplies the railroad, marine, drilling, wind, and mining industries. A high percentage of its products are in use for 20+ years. It received an EOL announcement for a semiconductor part and had little more than six months to weigh the options before production and field-maintenance issues arose.

The best scenario for an OEM is find a drop-in replacement device. Obviously a “pin-for-pin” replacement, supplied by a trusted source, bypasses virtually all the obstacles of other options. The problem is the extreme difficulty in finding a semiconductor device that matches the exact form, fit, and function as the original.

Depending on your level of funding, you might choose to make a “last-time buy” of the semiconductor device from the original manufacturer. But it can be daunting to estimate the number of devices to purchase. It involves projecting demand over the remaining life cycle of the end product. A last-time buy can create other difficulties that range from the impact on short-term cash flow for the initial purchase, to the expense of storing and maintaining the resulting inventory for years to come.

The need for obsolete or discontinued semiconductors has led to mushrooming gray-market practices. Manufacturers desperate for a critical semiconductor device often have little choice than to deal with brokers on the gray market. One of the realities in this scenario is a lack of traceability. In most cases, the device in question has passed through many hands, and documentation of its origin is completely lost.

Sometimes suppliers purposely lose traceability because of a questionable origin. Of course, an unauthorized source may not be the most reliable business partner. There are no guarantees that devices procured through gray-market networks are genuine or that they have been stored and handled in ways that ensure quality and reliability. There is also no guarantee about the continuing supply of such devices or their price.

Counterfeit parts are a growing problem as well. Counterfeiters are becoming more sophisticated, and many companies report receiving remarked devices with falsified part numbers or company logos, empty packages or broken devices, fictitious RoHS-compliance paperwork, and counterfeit chips.

In the absence of a drop-in replacement, some OEMs elect to eliminate the part by redesigning the system. Of course, a redesign can be costly and bring production delays as the new system goes through retesting and requalification. It may be impractical due to the associated costs and the lead times.

In some cases the original manufacturer may authorize another vendor to continue making the discontinued device. There are several companies, dubbed authorized continuing semiconductor manufacturers, that make a business of supplying discontinued semiconductors. They will use the original manufacturer's design, tooling, wafer and die, and manufacturing technology to build traceable new components. The new manufacturer will also typically acquire all remaining inventory including packaged devices, finished product, wafer and die, test equipment, and original build documentation. Working from original source-control drawings, engineers facilitate the transfer of technology to ensure the recreated semiconductor devices are exact replicas of the original, matching its performance and physical dimensions.

Consider one particular EOL event where the OEM could not find a drop-in replacement part. The company bought up the remaining part inventory while it worked with an authorized continuing manufacturer, **Rochester Electronics,** Newburyport, Mass. Through its Extension-Of-Life programs, Rochester supplied qualified parts delivering the same performance as the original devices.

If the original device no longer exists, continuing semiconductor manufacturers can replicate it with the permission of the original manufacturer. Through a special Semiconductor Replication Process (SRP, a trademarked term), the contractually licensed manufacturer reverse-engineers a pin-for-pin replacement part with matched cycle-for-cycle timing and performance of the original.

Even when the design archive is no longer available, design engineers can build the component from available die. Engineers redraw and/or redesign the device using images from scopes, including a scanning electron microscope and state-of-the-art computer technology. The replicated device is guaranteed to duplicate the original semiconductor's performance in form, fit and function. This transfer of technology eliminates any potential legal issues from patent or intellectual property concerns.

REPLICATION VERSUS DUPLICATION

Designers should note that replication is quite different from device emulation. Emulation methods are loose, less-precise processes that attempt to mimic behaviors of target designs. They typically do so using a different system of cell libraries, process standards, and simulated — not original — data. Original manufacturers are rarely asked for authorization to make emulated devices, and emulated semiconductors are integrated into system software by digitally attempting to "convince" the design that a new device is really an exact replica of the original OEM device.

Emulated devices rarely function exactly like the original. As a result, it's not possible to exactly reproduce the external behavior of the original device, possibly causing system problems. The emulated device is also more likely to eventually fail or not perform completely to the original specifications.

Device replication typically takes place contractually. Authorized sources place devices into bonded inventory at the behest of a customer. Devices are stored in dedicated temperature and humidity-controlled warehouses. Customers get their parts through a customized and managed program. There are typically agreements in place that alleviate many of the problems that arise at component end of life, including last-time buys and inventory storage costs.

OEMs examining end-of-life options must consider cost instead of price. Gray-market components are cheaper and usually boast short lead times, but semiconductor devices from unauthorized [potentially counterfeit] sources are more costly overall. That's because they can bring the baggage of manufacturing downtime and/or failure of the end product if the part turns out to be faulty or counterfeit. These costs far outweigh the up-front savings, the damaged reputation of the company, and the loss of trust among customers.

Rather than go through such travails, OEMs should plan accordingly and develop partnerships with authorized sources to assure genuine devices will remain in production during the product life cycle. Ditto for planning component EOL. Partnership with an authorized manufacturer/distributor can extend the life of a device, eliminate last-time buys or inventory storage.

Authorized manufacturer/distributors typically offer OEMs special product agreements that effectively guard against the problems of end-of-life announcements. This type of agreement gives OEMs access to parts through customized, comprehensive, scheduled and managed programs. md

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