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Frequently Asked Questions about Single-Piece NV SRAM Modules

This application note addresses some of the most common questions about the DS20xx-family of Single-Piece Reflowable NV SRAM Modules.

The DS20xx family of single-piece reflowable NV SRAM modules introduces a new era in battery-backed memory applications. For the first time, Maxim/Dallas Semiconductor offers component-level ease of assembly with virtually infinite(1) product field lifetimes in a battery-backed memory.

Part Number	Density	Operating Voltage (V)	Similar to
DS2030	256kb	5 or 3.3	DS1230, DS1330
DS2045	1Mb	5V or 3.3	DS1245, DS1345
DS2050(2)	4Mb	3.3	DS1250, DS1350
DS2065(2)	8Mb	3.3	DS1265

(1) Estimated field lifetime expectancies may exceed 60 years.
(2) Product in development.

What is new about the BGA NV SRAM modules?
Three fundamental issues with battery-backed memory products are addressed with the DS20xx family of NV SRAMs:

1. The single-piece construction uses a JEDEC-standard BGA footprint
2. The products are fully compatible with convection-reflow soldering operations
3. The Manganese-Lithium (ML) rechargeable battery eliminates the concern of battery life expectancy in most field installations

What advantage is there in using a BGA footprint?
The DIP module pinouts generally required that the user modify their board layout every time a density change was needed. The PowerCap® package attempted to address this upgrading problem by defining a common footprint up to 4Mb, the point at which we consumed available pins. The JEDEC-standard 27mm^2, 256-ball, BGA module footprint allows for quadruple-ball redundancy on every input, while providing the designer with system expansion capability for future product needs.

How can a battery survive convection reflow temperatures?
The heart of the new DS20xx family is the ML-chemistry battery. After decades of battery development, a proprietary coin cell is finally available that can survive the same assembly process rigors required of the ICs that it must support.

What is the Manganese-Lithium coin-cell chemistry about? There are several popular formulations used to make coin-cell batteries. Some of those chemistries have better characteristics over temperature than others. Most have physical limitations on elevated temperature exposure, which has traditionally restricted those battery-backed products from reflow soldering operations.

The ML-chemistry battery is an engineered solution developed specifically for modern materials and manufacturing techniques. The ML-chemistry battery delivers a coin cell that can tolerate multiple reflow exposures without any significant degradation in the physical or electrical properties of that cell.

The ML-chemistry battery is a secondary (rechargeable) lithium coin cell. Maxim/Dallas Semiconductor developed a NV controller/charger device specifically both to provide the same proven supply monitoring and control used in prior controller designs, and additionally to supply the float-charge characteristics desired for use with ML batteries.

Is there no concern about the battery exploding?
The melting point of pure metallic lithium (primary cell anode material) prevents those cells from surviving the thermal exposures required for SMT soldering. The ML cell, however, has been designed specifically to tolerate +225° C exposure. Endurance testing has shown the ML cell to withstand short-term peaks above +300° C without catastrophic damage.

So how does the ML charger work?
Whenever V_{CC} is greater than the power-fail trip point (V_{TP}), an internal regulator charges the battery. The UL-approved charger circuit includes short-circuit protection and a temperature-stabilized voltage reference for on-demand charging of the internal battery. Typical data-retention expectations of 3 years per charge cycle are achievable.

The product is shipped with the battery ~60% charged. No pre-assembly battery charging should be attempted.

Approximately 96 hours of charging time is required to fully charge a depleted battery.

What is the functional difference between a DS1230 and a DS2030?
The two products are essentially identical, except for one significant electrical difference: an added RST output on the DS20xx family of NV SRAM products. Applications presently using the DS1230 will be able to accept the DS2030 without any timing adjustments. The same is true of

the 1Mb, 4Mb, and 8Mb products: common timing specifications and pin-outs allow for easy upgrade.

Is there any special assembly tooling required to handle this package?
No. The footprint is the JEDEC standard 27mm^2, 256-ball BGA (1.27mm pitch), with the package height the only unique dimension to the Dallas Semiconductor parts. This package complies with the J-STD-020C recommended reflow soldering profile, and is rated at a Moisture Level 3.

The BGA modules may be cleaned using aqueous-based cleaning solutions. No special precautions are required for board cleaning.

Refer to the IPC-610 standard for soldering acceptability. The customer should not attempt to re-ball or reuse the device after removal.

Are there other reflow-compatible NV SRAMs available?
Yes, the PowerCap® package was also designed to tolerate reflow soldering exposures to the component base. However, the PowerCap's 2-piece construction requires additional logistic controls to assure that both pieces (component base and battery cap) are ordered, stocked, and installed properly.

How should I determine which type of module best fits my application?
If one ignores the convenience of the SMT-friendly single-piece modules, the one fundamental question that must be addressed is the anticipated shelf life of system spares. If continuous data retention of more than 2 years is required, a primary lithium-based product like the DS1230 may still be required. However, if the system is intended to be powered on for at least four consecutive days every-other-year, the DS20xx family can easily outlive a primary cell-based product by decades.

Is Dallas Semiconductor moving away from primary lithium-battery technology?
Absolutely not. The long-term data-retention capability of the primary lithium coin-cell module construction still holds an advantage in many applications. If the application demands continuous multiyear data storage without external power, the choice is still a primary lithium-based product.

For many applications such as servers, RAID arrays, or other high-end industrial control systems intended for 24/7 operation, the data retention demands are usually short-term, but retaining mission-critical data is also very critical. With the DS20xx family, the secondary cell will typically provide about three years of backup capacity if the system had been running for 96 hours prior to loss of system power.

Questions/comments/suggestions concerning this application note can be sent to:
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More Information

DS2030AB:	QuickView	Full (PDF) Data Sheet	Free Samples
DS2030W:	QuickView	Full (PDF) Data Sheet	Free Samples
DS2030Y:	QuickView	Full (PDF) Data Sheet	Free Samples
DS2045AB:	QuickView	Full (PDF) Data Sheet	Free Samples
DS2045W:	QuickView	Full (PDF) Data Sheet	Free Samples
DS2045Y:	QuickView	Full (PDF) Data Sheet	Free Samples
DS2050W:	QuickView	Full (PDF) Data Sheet	
DS2065W:	QuickView	Full (PDF) Data Sheet	