

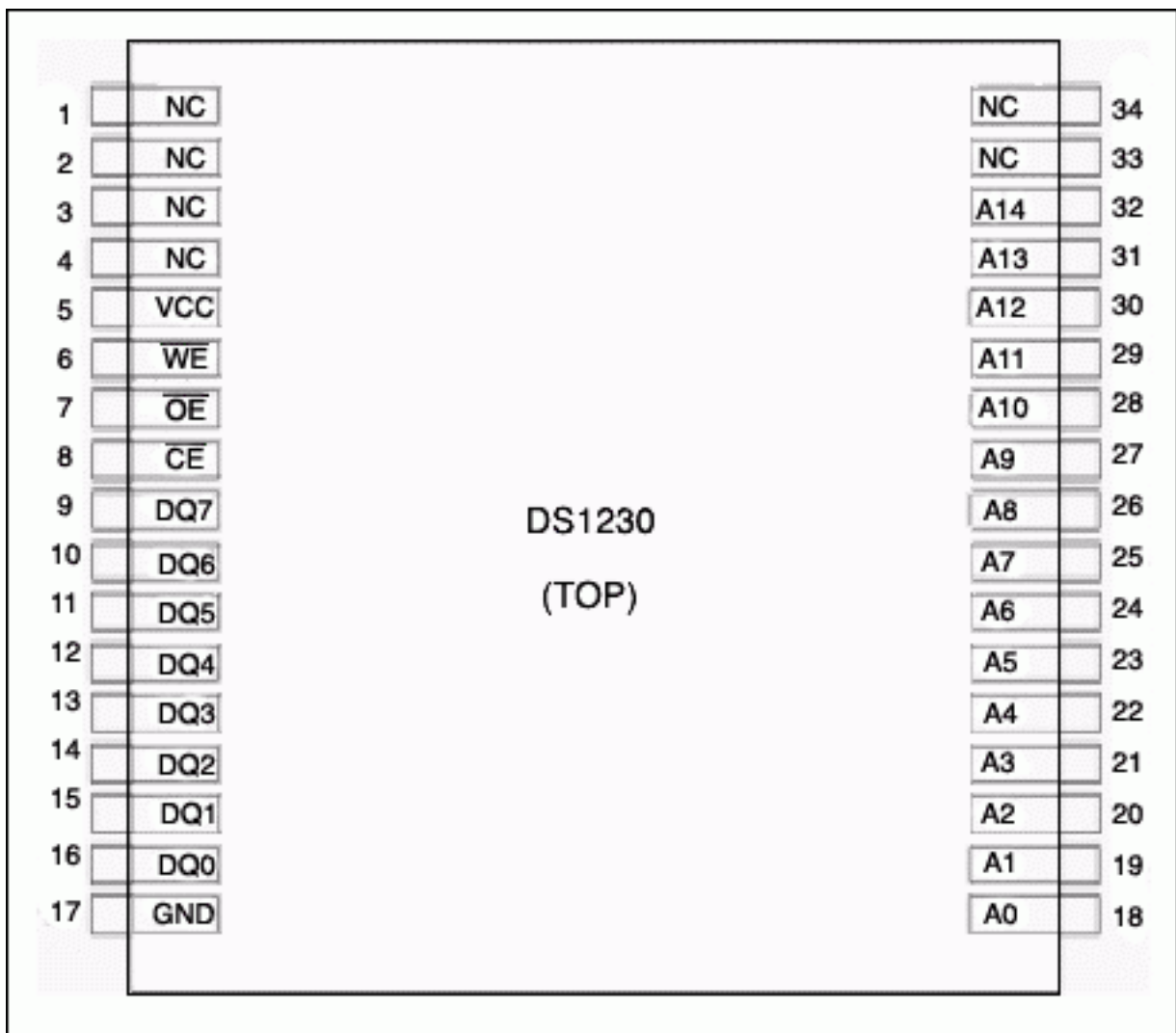
App Note 3118: Replacing a PowerCap Module with a Reflowable BGA Module

In order to facilitate conversion of an existing PCB design utilizing a NV SRAM PowerCap® Module to the equivalent NV SRAM Single-Piece Reflowable BGA Module, there are a few simple steps required to first verify that the existing board layout can accept the BGA package without any modifications. This replacement procedure should be restricted to those installations where an existing PowerCap product is to be replaced by its equivalent electrical sister product in the BGA packaging style. For the purposes of this discussion, the DS1230YP-70 (256kb 5V 70ns PowerCap) will be the product to be replaced with a DS2030Y-70 (256kb 5V 70ns BGA).*

Electrical Requirements

The electrical pin-out of the BGA-based modules has been defined to follow the equivalent density and configuration of the PowerCap products up through the 4Mb density (DS1250). The PowerCap package definition is limited to 34 pins, and with today's larger memory densities and other desired user features, there are no unused pins to allow for further expansion. The BGA package will allow for future product line growth, as any new user features or additional address inputs will be routed through previously undefined locations on the 256-ball electrical interface.

In the specific case of the DS1230YP-70, only 28 of the 34 pins have active signals. The DS2030Y-70 has been defined to use the same 28 signal definitions, with 4 balls-per-signal provided for redundant connectivity. (See Figure 1) Likewise, a DS2045 will match with the DS1245 PowerCap footprint and the DS2050 will match the DS1250 PowerCap footprint. Refer to Table 1 for a cross-reference to BGA product selections available.



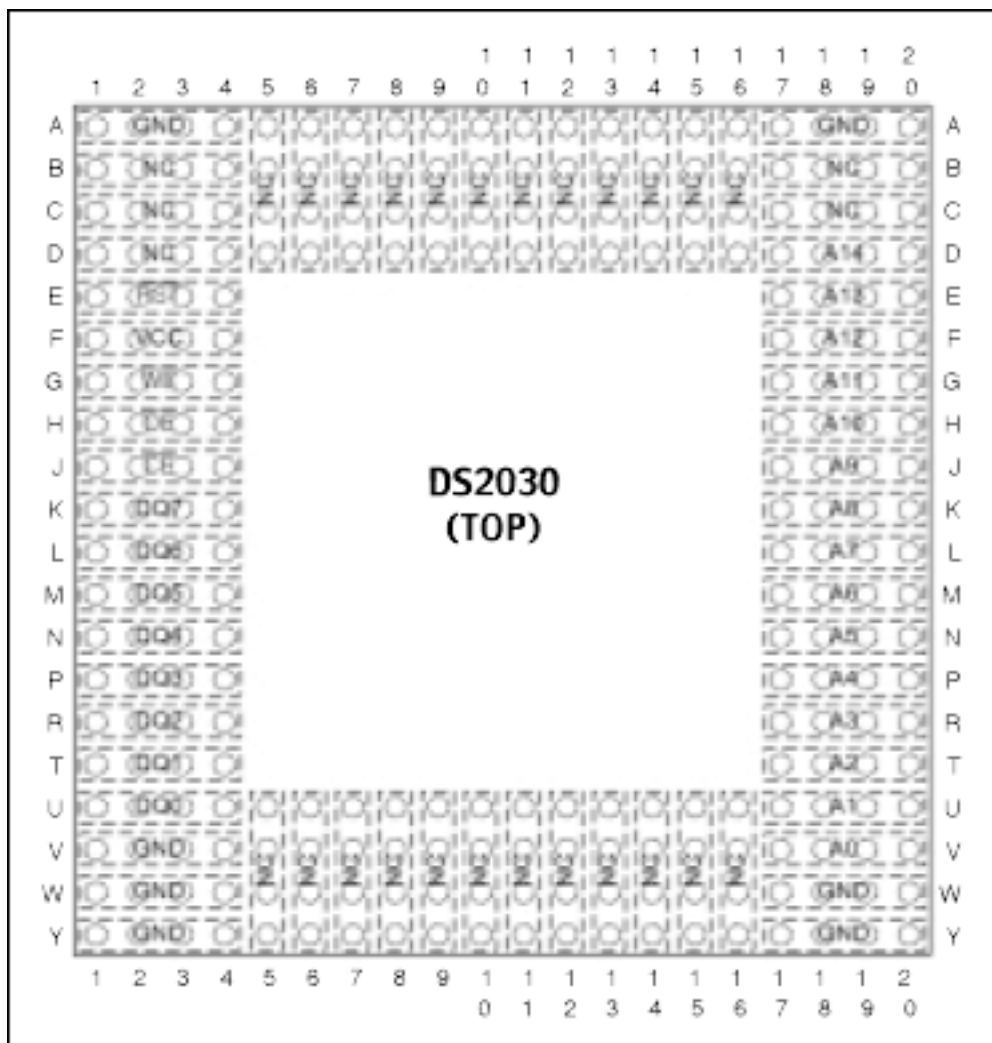


Figure 1. Pin Connections.

Electrical performance specifications for the DS2030Y-70 are identical to the DS1230YP-70. No application adjustments should be required in the control logic, timing deskew, or system memory mapping to accept the new package. The addition of the Reset Output (\overline{RST}) on the DS2030 (balls E1-E4) will not create any applications conflict, providing that the existing board layout had either no connection or a pull-up resistor to VCC on pin 4. This output functions identically to the Reset Output (\overline{RST}) offered on pin 4 of the DS1330, DS1345, and DS1350 modules, and can be utilized in place of a separate Microprocessor Supervisory device, if desired.

All BGA-based NV SRAM products are rated for -40° C to +85° C temperature range, eliminating the need for separate commercial vs. industrial ordering information previously used on PowerCaps.

Table 1. PowerCap to BGA Cross-Reference

Memory Density	Supply Voltage	Read Access Time	PowerCap Part Number	BGA Part Number
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256kb	5V	70ns	DS1230YP-70	DS2030Y-70
			DS1230ABP-70	DS2030AB-70
	100ns		DS1230YP-100	DS2030Y-100
			DS1230ABP-100	DS2030AB-100
3.3V	100ns or 150ns	DS1230WP-*** ⁽¹⁾	DS2030W-100	
1Mb	5V	70ns	DS1245YP-70	DS2045Y-70
			DS1245ABP-70	DS2045AB-70
	100ns		DS1245YP-100	DS2045Y-100
			DS1245ABP-70	DS2045AB-70
3.3V	100ns or 150ns	DS1245WP-*** ⁽¹⁾	DS2045W-100	
4Mb	3.3V	100ns or 150ns	DS1250WP-*** ⁽¹⁾	DS2050W-100
8Mb	3.3V	100ns	n/a	DS2065W-100

(1) *** denotes any speed grade.

Mechanical Requirements

A fundamental requirement for placement of the BGA module over a PowerCap land pattern is that no signal traces can exist on the component surface of the customer's board in the "keep out" area (see Figure 2). This is to prevent any accidental shorting of customer circuitry to the additional balls on the BGA module.

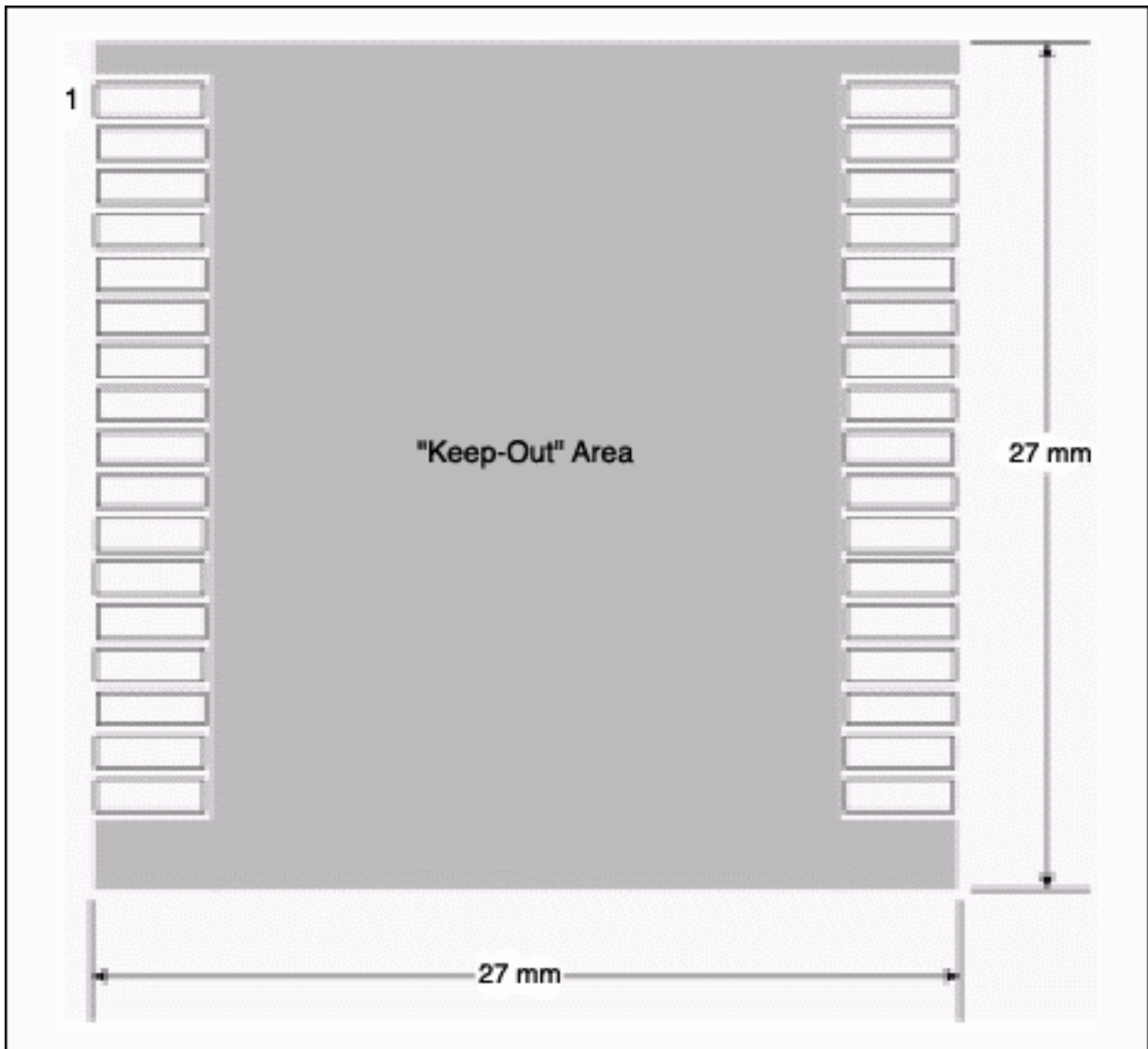


Figure 2. Keep-Out Area.

A second condition for placement of the BGA module is the verification of sufficient topside clearance to any adjacent components, as the BGA is slightly larger in surface area (27mm^2) versus the PowerCap ($23.5\text{mm} \times 25\text{mm}$). To facilitate this BGA replacement, balls B1 and B2 must be aligned to the PowerCap PCB land for Pin 1 and balls B19 and B20 should be aligned to the PowerCap PCB land for Pin 34. The additional ground balls on the corners of the BGA package (rows A, W, & Y) are not critical to the device operation for this evaluation, and are connected internally to balls V1-V4 (GND).

Figure 3 shows the approximate alignment of a BGA module overlaid upon the recommended PowerCap land pattern. Any lateral deviation in the ball-to-land connection is not deemed critical for this evaluation, as each signal is connected to 4 balls on the BGA substrate in the horizontal orientation. (See also Figure 1 for BGA pin connections.)

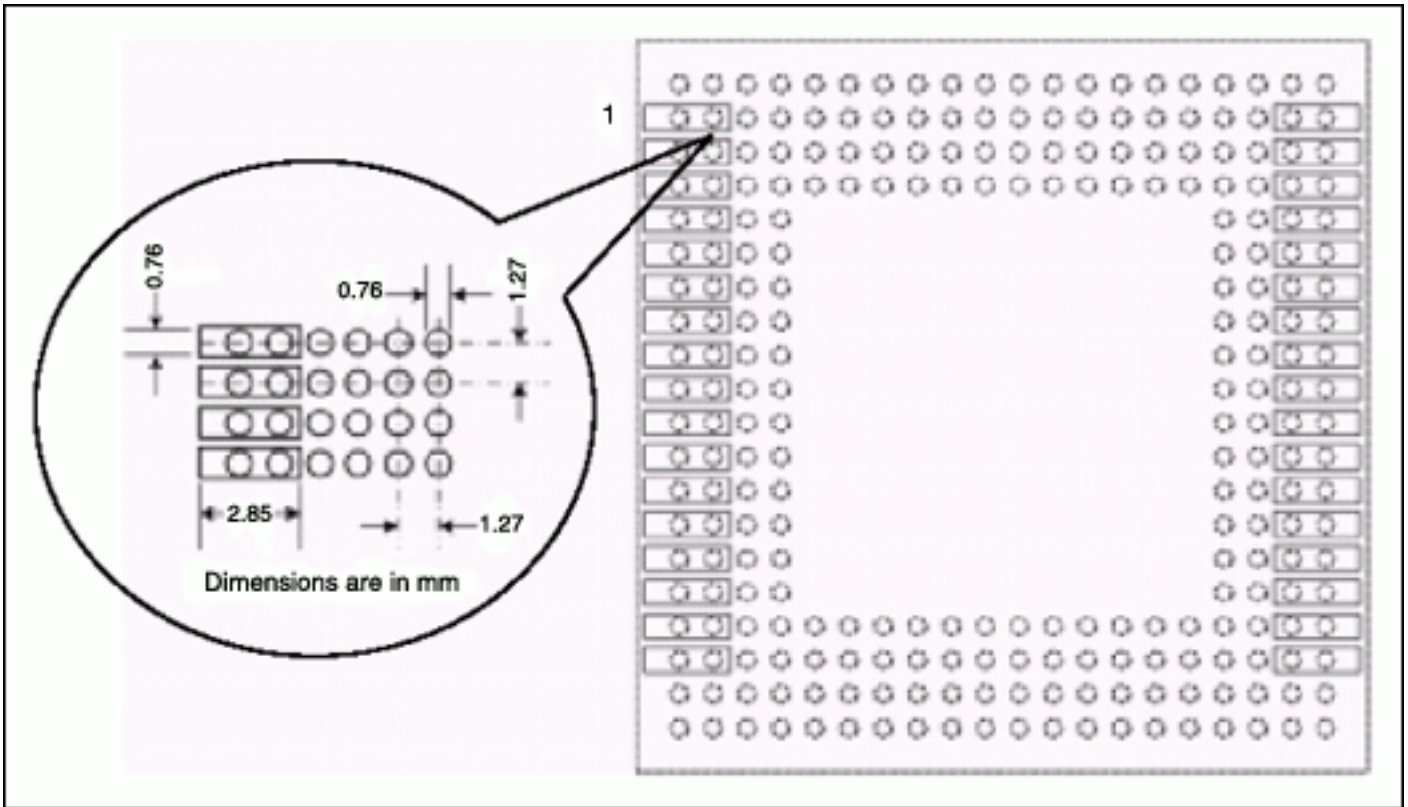


Figure 3. BGA Overlay to PowerCap Footprint.

Since the PowerCap lands are rectangular and lack the general design rule considerations used for a BGA ball, this procedure should only be used for a temporary evaluation of the BGA-based product, and should not be considered as the optimized production implementation in a existing system installation.

Eutectic Reflow Soldering Profile

For the DS2030 and other Dallas Single-Piece BGA NV SRAM Modules (refer to Table 1), we recommend using the J-STD-020B soldering profile for Large Packages (see excerpt below).

Table 2. Recommended Reflow Profile

Profile Feature	Sn-Pb Eutectic Assembly
Average ramp-up rate (T_L to T_P)	3°C/second max.
Preheat <ul style="list-style-type: none"> - Temperature Min (T_{Smin}) - Temperature Max (T_{Smax}) - Time (min to max) (ts) 	100°C 150°C 60-120 seconds
T_{Smax} to T_L <ul style="list-style-type: none"> - Ramp-up rate 	
Time maintained above: <ul style="list-style-type: none"> - Temperature (T_L) - Time (t_L) 	183°C 60-150 seconds
Peak Temperature (T_P)	225 +0/-5°C
Time within 5°C of actual Peak Temperature (T_P)	10-30 seconds
Ramp-down rate	6°C/second max.
Time 25°C to Peak Temperature	6 minutes max.

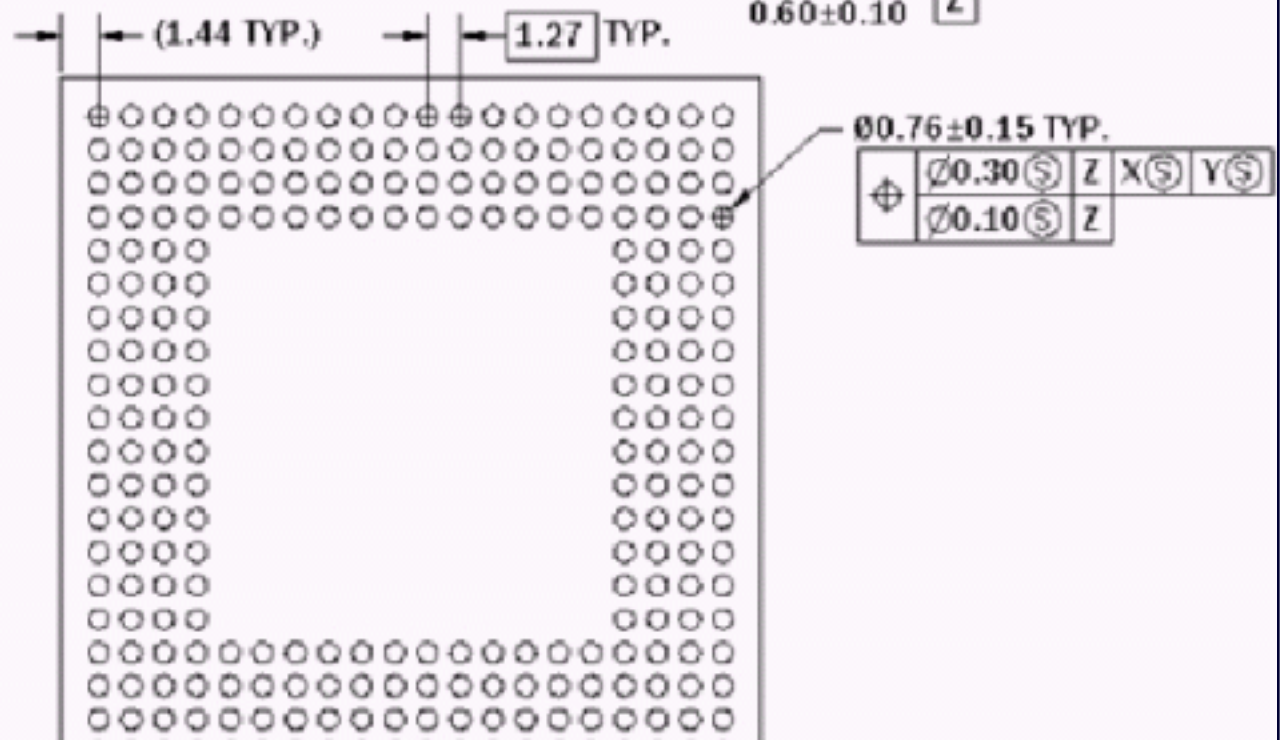
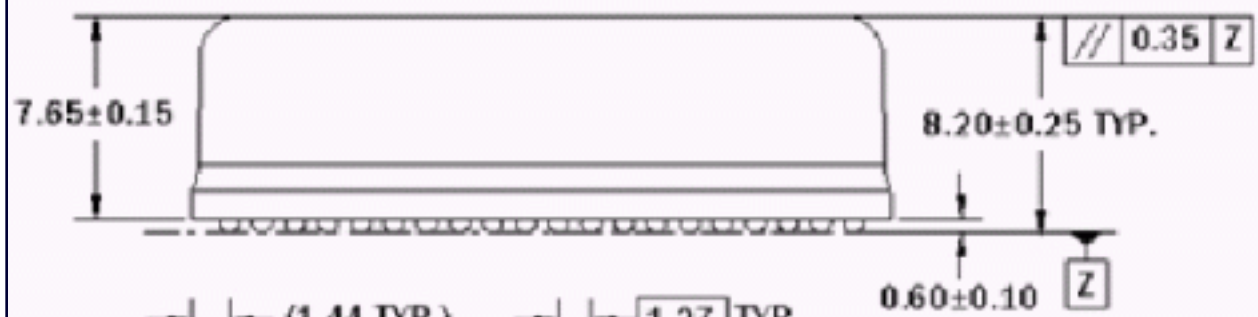
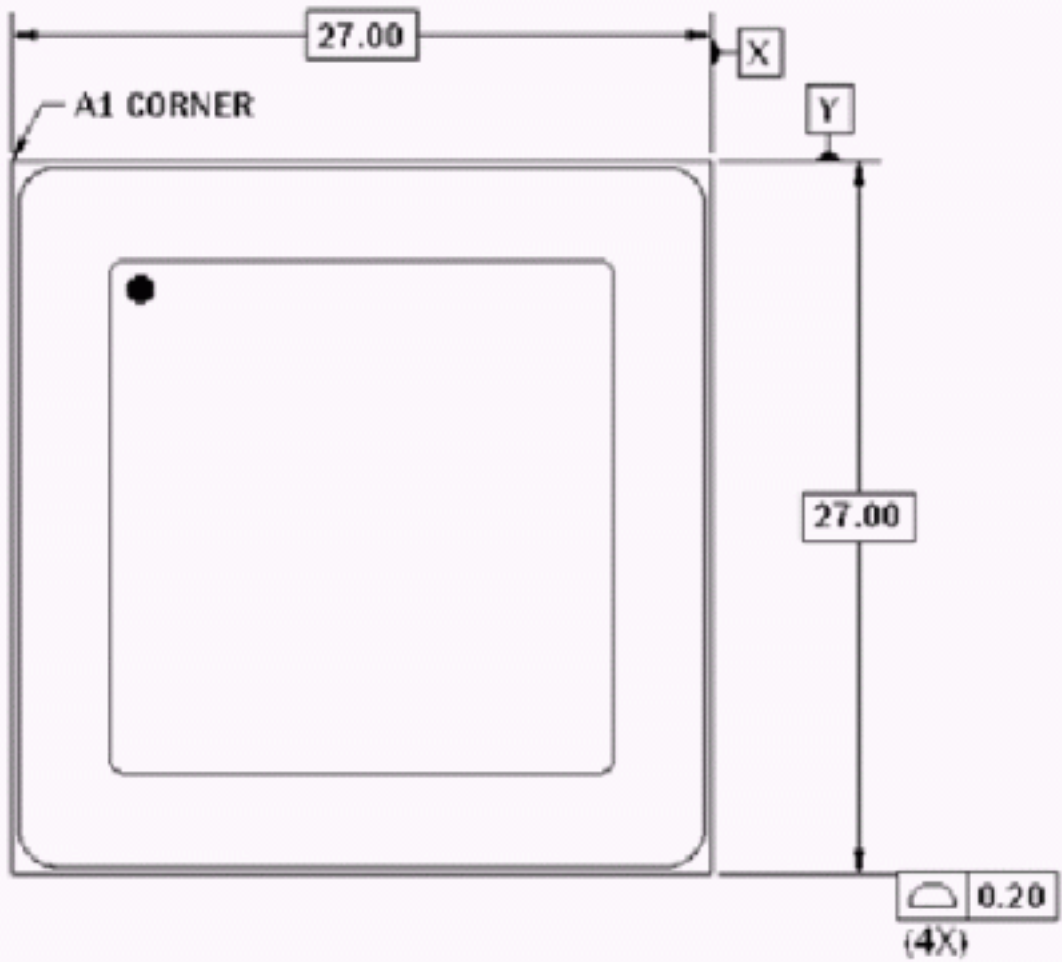
Note: All temperatures refer to topside of the package, measured on the package body surface.

Package Dimensions

With the exception of height (Z), the DS2030 and other Dallas BGA NV SRAM Modules ⁽¹⁾ are manufactured to be compatible with industry-standard 27mm² BGA packages.

1) does not include DS3835C-RR3

Note: All dimensions are shown in millimeters





Questions/comments/suggestions concerning this application note can be sent to:
MixedSignal.Apps@dalsemi.com

PowerCap is a registered trademark of Dallas Semiconductor.
*Future product---contact factory for availability.

More Information

- DS1230AB: [QuickView](#) -- [Full \(PDF\) Data Sheet](#) -- [Free Samples](#)
- DS1230W: [QuickView](#) -- [Full \(PDF\) Data Sheet](#) -- [Free Samples](#)
- DS1230Y: [QuickView](#) -- [Full \(PDF\) Data Sheet](#) -- [Free Samples](#)
- DS1245AB: [QuickView](#) -- [Full \(PDF\) Data Sheet](#) -- [Free Samples](#)
- DS1245W: [QuickView](#) -- [Full \(PDF\) Data Sheet](#) -- [Free Samples](#)
- DS1245Y: [QuickView](#) -- [Full \(PDF\) Data Sheet](#) -- [Free Samples](#)
- DS1250AB: [QuickView](#) -- [Full \(PDF\) Data Sheet](#) -- [Free Samples](#)
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- DS1250Y: [QuickView](#) -- [Full \(PDF\) Data Sheet](#) -- [Free Samples](#)
- DS1330AB: [QuickView](#) -- [Full \(PDF\) Data Sheet](#) -- [Free Samples](#)
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- DS1350W: [QuickView](#) -- [Full \(PDF\) Data Sheet](#) -- [Free Samples](#)
- DS1350Y: [QuickView](#) -- [Full \(PDF\) Data Sheet](#) -- [Free Samples](#)
- 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](#)