

Migrating from CY14B101QX/CY14B512QX/CY14B256QX to CY14B101QXA/ CY14B512QXA/CY14B256QXA

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Associated Project: No
Associated Part Family: Serial (SPI) nvSRAM
Software Version: None
Related Application Notes: None

AN72390 provides details for migrating from the CY14B101QX/CY14B512QX/CY14B256QX nvSRAM parts to CY14B101QXA/CY14B512QXA/CY14B256QXA parts in applications. This application note also lists the parameter differences between the parts and the design considerations for migration when converting applications to CY14B101QXA/CY14B512QXA/CY14B256QXA.

Introduction

Cypress CY14B101QXA is a 3 V, 1-Mbit (128K x 8) serial (SPI) nvSRAM in 0.13 micron technology. This part is functionally equivalent to the CY14B101QX in the same technology with a few parameter enhancements and additional features. Due to these enhancements, there are a few differences in parameters. This application note highlights the differences between the CY14B101QX and the CY14B101QXA and lists the parameters of significance that must be considered while migrating. These differences and considerations are applicable to CY14B512QXA (3 V, 64K x 8, 512-Kbit) and CY14B256QXA (3 V, 32K x 8, 256-Kbit) serial (SPI) nvSRAMs, which are the replacement parts for CY14B512QX and CY14B256QX devices, respectively. This application note is described with respect to CY14B101QX and CY14B101QXA in the following sections. The same description applies to CY14B512QX/CY14B256QX and CY14B512QXA/CY14B256QXA.

Overview

The following tables compare the features and parameters of the two parts.

Table 1. Part Number Description

| Description | Original Part Number | Replacement Part Number | Configuration |
|-------------|----------------------|-------------------------|--|
| 128K x 8 | CY14B101Q1 | CY14B101Q1A | No VCAP (no AutoStore) |
| 128K x 8 | CY14B101Q2 | CY14B101Q2A | VCAP (with AutoStore), no \overline{WP} pin |
| 128K x 8 | CY14B101Q3 | CY14B101Q3A | VCAP (with AutoStore), with \overline{WP} pin, with \overline{HSB} pin |

Operating Temperature Range

The CY14B101QX and CY14B101QXA are both offered in the industrial temperature range.

Feature Set

Both the parts share the same overall feature set. There are a few additional features in the new device. These are listed in [Table 2](#).

Table 2. Feature Set Comparison

| Feature Set | CY14B101QX | CY14B101QXA |
|--------------------------------|---------------|-----------------|
| SPI clock speed | 40 MHz | 40 MHz, 104 MHz |
| AutoStore* | Identical | |
| Hardware STORE* | Identical | |
| Read/Write instructions | Identical | |
| Special NV Instructions | | |
| Software STORE | Identical | |
| Software RECALL | | |
| AutoStore Enable/Disable* | | |
| Special instructions | | |
| SPI Fast read | Not Available | 104 MHz |
| SLEEP | Not Available | Available |
| Serial Number | | |
| Device ID | | |

* Availability of AutoStore and Hardware STORE features depends on the package option selected and are identical in the old and new parts.

Packages

CY14B101QXA is pin compatible with CY14B101QX and is available in 8-SOIC and 16-SOIC packages. The 8-pin SOIC can replace the 8-DFN in all footprints.

Table 3. Packages Comparison

| Package Option | CY14B101QX | CY14B101QXA |
|----------------|-------------|-------------|
| Q1, Q2 | 8 DFN | 8-pin SOIC |
| Q3 | 16-pin SOIC | 16-pin SOIC |

Parameters

The CY14B101QXA is a drop in replacement for CY14B101QX and will require no changes in the application board. However, the differences in parameters should be considered before replacing one part with the other. Table 4 lists the differences in parameters between CY14B101QX and CY14B101QXA.

Table 4. Parameter Comparison

| Parameter | Description | CY14B101QX | | CY14B101QXA | | Unit |
|--|---|-----------------------------------|-----|-------------|------|------|
| | | Min | Max | Min | Max | |
| DC Parameters | | | | | | |
| I _{CC1} | Average V _{CC} current, f _{SCK} = 40 MHz | - | 10 | - | 3 | mA |
| | Average V _{CC} current, f _{SCK} = 104 MHz | 104 MHz clock speed not available | | - | 10 | mA |
| I _{CC2} | Average V _{CC} current during STORE | - | 10 | - | 3 | mA |
| I _{CC4} | Average V _{CAP} current during AutoStore cycle | - | 5 | - | 3 | mA |
| I _{SB} | Average V _{CC} current | - | 5 | - | 0.15 | mA |
| I _{ZZ} | Sleep mode current | Feature not available | | - | 8 | μA |
| V _{CAP} | Storage capacitor | 61 | 180 | 42 | 180 | μF |
| AC Switching Parameters | | | | | | |
| All AC parameters are identical and additionally the CY14B101QXA has 104 MHz specs | | | | | | |
| Software Controlled Operations Parameters | | | | | | |
| t _{RECALL} | RECALL duration | - | 200 | - | 600 | μs |
| t _{SS} | Soft sequence processing time | - | 100 | - | 500 | μs |

Instruction Set

The CY14B101QXA has the same SPI instruction set as the CY14B101QX for all functions. Hence, users do not need to make any changes to the opcodes. The CY14B101QXA part additionally has more features such as Fast Read, SLEEP, Serial Number, and Device ID which are not available in the CY14B101QX part. Users interested in using these features can refer to the datasheet for additional detail.

Status Register Bit Definition

Bits 4, 5 and 6 in status register are Don't Care in CY14B101QX while in CY14B101QXA, bit 6 is used as Serial Number Lock and Bits 4 and 5 are Don't care. The differences in these bits is shown in [Table 5](#).

Table 5. Status Register Bits

| Bit | Definition | |
|--------------|--|--|
| | CY14B101QX | CY14B101QXA |
| Bit 0 (RDY) | Ready | |
| Bit 1 (WEN) | Write Enable | |
| Bit 2 (BP0) | Block protect bit '0' | |
| Bit 3 (BP1) | Block protect bit '1' | |
| Bit 4, Bit 5 | Don't Care, Factory default is "0" These bits are writable. On power-up, these bits are written with "0" | Don't Care, Factory default is "0" These bits are non-writable. These bits always return "0" upon read |
| Bit 6 | Don't Care Bits are writable. On power-up, bits are written with "0" | Serial Number Lock , Factory default is "0" Set to "1" by user for locking serial number. When written with "1" and STOREd, the bit will stay at "1" through power cycles and cannot be written with "0" subsequently |
| Bit 7 (WPEN) | Write protect enable bit | |

Critical Considerations

The impact of the differences in CY14B101QXA with respect to the CY14B101QX in existing applications is discussed below. Board designers are recommended to review the detailed datasheets when converting to the new part.

DC and AC Parameter differences

All the DC and AC parameters are the same or better in the CY14B101QXA part and hence the CY14B101QXA part can directly replace the CY14B101QX part. Existing applications can directly benefit from the low power consumption in the CY14B101QXA part, such as 3 mA I_{CC1} and 150 μ A I_{SB} compared to 10 mA I_{CC1} and 5 mA I_{SB} in the CY14B101QX part. The CY14B101QXA part also has additional features such as 104 MHz operation and SLEEP mode which can be used by making suitable changes in the controller firmware.

Software Controlled NV Operation Parameters

Due to the low power design, the processing time for the special NV operations (t_{RECALL} and t_{SS}) are higher in the CY14B101QXA part. These parameters could affect applications which use the special NV instructions for Software RECALL and AutoStore Enable/Disable. When these instructions are executed, the CY14B101QXA part take 400 μ s longer to complete the execution and hence users should allow an additional wait time before accessing the nvSRAM again. This is shown in [Table 6](#).

Table 6. NV Operation Timing Comparison

| Instruction Category | Instruction Name | Opcode | Duration | |
|--------------------------------|------------------|--------|--------------------|-------------|
| | | | CY14B101QX | CY14B101QXA |
| Special NV Instructions | | | | |
| Software STORE | STORE | 0x3C | 8 ms in both parts | |
| Software RECALL | RECALL | 0x60 | 200 μ s | 600 μ s |
| AutoStore Enable | ASENB | 0x59 | 100 μ s | 500 μ s |
| AutoStore Disable | ASDISB | 0x19 | 100 μ s | 500 μ s |

Status Register bits 4, 5, 6 (Don't Care bits)

In the CY14B101QX part, the Don't Care bits 4-6 are writable and return "0" on power up. In the CY14B101QXA part, only Bit 6 is writable (being SNL bit) and will return "1" once written with "1". This difference would not affect any application where the Don't Care bits are left at "0". If any application was writing into these bits, then the difference in these bits needs to be considered.

PCB Layout Considerations

The CY14B101QX is available in 8-DFN and 16-SOIC packages. The CY14B101QXA is available in 8-pin SOIC and 16-pin SOIC packages which are footprint compatible with the packages of the older part. Figure 1 and Figure 2 show the compatibility of the 8-DFN footprint for the 8-pin SOIC package. Please see the device datasheets for the package diagrams.

Figure 1. 8-DFN land pattern and 8-DFN

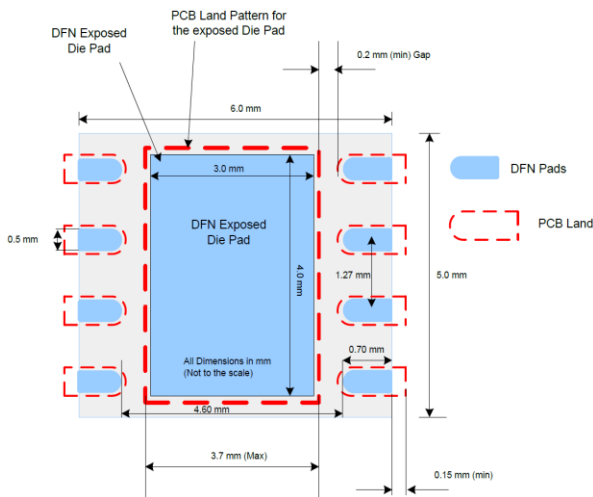
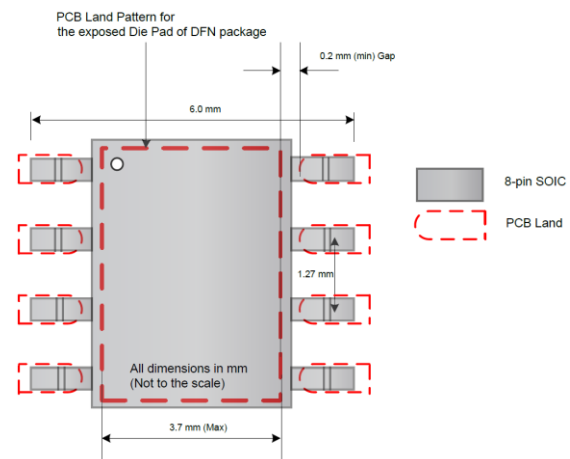


Figure 2. 8-DFN land pattern and 8-SOIC



Details of Improvement

This section describes the enhancement in $\overline{\text{HOLD}}$ operation in the CY14B101QXA part.

$\overline{\text{HOLD}}$ Function

The CY14B101QX part require $\overline{\text{CS}}$ to remain LOW along with $\overline{\text{HOLD}}$ pin to pause communication. See Figure 3. In the CY14B101QXA part, $\overline{\text{CS}}$ can toggle after $\overline{\text{HOLD}}$ is asserted and serial communication is paused by holding $\overline{\text{HOLD}}$ pin alone LOW. See Figure 4.

Figure 3. $\overline{\text{HOLD}}$ Operation in CY14B101QX

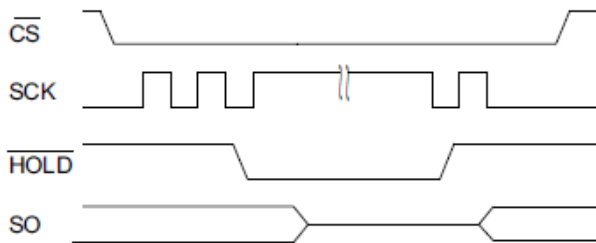
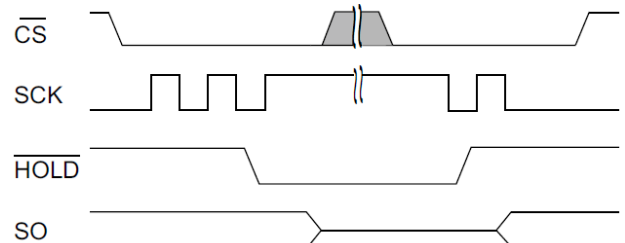


Figure 4. $\overline{\text{HOLD}}$ Operation in CY14B101QXA



Summary

This application note discusses the differences between CY14B101QXA, the new version, and the older CY14B101QX. CY14B101QXA is pin compatible with and can replace the CY14B101QX devices with no changes to the PCB and minimum changes to the firmware in most applications. This application note is also applicable for CY14B512QXA replacing CY14B512QX and CY14B256QXA replacing CY14B256QX.

Document History

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| Revision | ECN | Orig. of Change | Submission Date | Description of Change |
|----------|---------|-----------------|-----------------|---|
| ** | 3372655 | GVCH | 11/25/2011 | New Spec. |
| *A | 3618997 | GVCH | 05/16/2012 | Replaced “Converting” with “Migrating” in Document Title. Updated Abstract (Reworded for better understanding). Updated text for more clarity. No change in technical content. Updated to new template. |
| *B | 4591703 | PSR | 12/09/2014 | No change in technical content. Updated to new template. Completing Sunset Review. |
| *C | 5850863 | HARA | 08/17/2017 | Updated logo and copyright. |

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