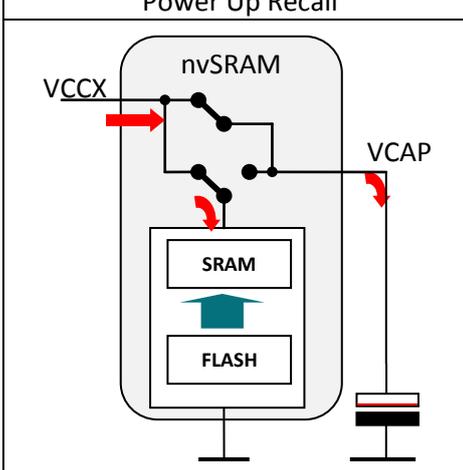
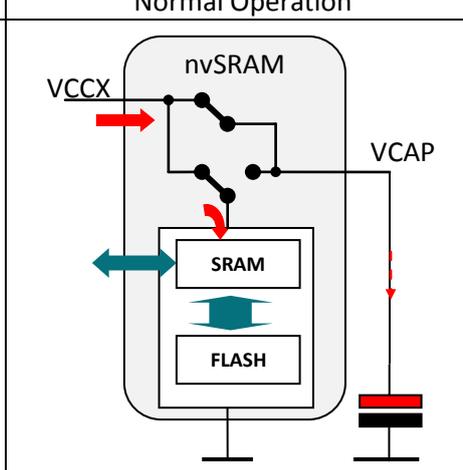
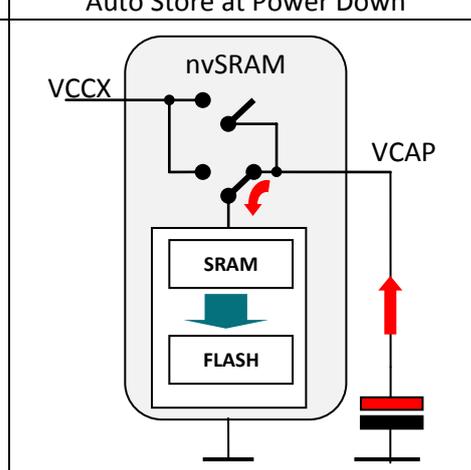
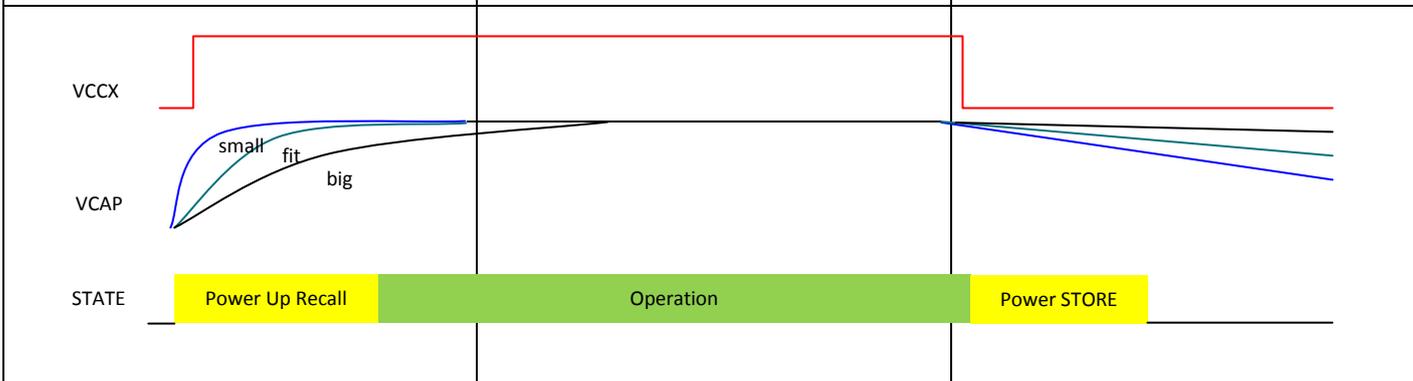


AN200 Safe Solutions for Store Capacitors

Introduction

NvSRAM feature two memories in one device. The volatile SRAM can be accessed from outside and is used to read and write the device. In difference, the nonvolatile SONOS FLASH is used to store data permanently. Reading the FLASH happens automatically at power-up or on instruction while normal operation. Writing the FLASH can be done by command while normal operation or automatically at power down.

Since VCCX may drop very fast, the energy needed for safe auto store execution must come from an independent backup power supply. The SONOS FLASH in nvSRAM is designed for extreme energy efficiency, that's why a small capacitor is sufficient to provide the energy needed to execute the Store operation. Reliability and correct rating of the store capacitor are essential for safe auto store execution.

Power Up Recall	Normal Operation	Auto Store at Power Down
		
<p>VCCX provides power to memory and charges the capacitor</p> <p>Flash data are loaded to SRAM</p>	<p>VCCX provides Power to memory and maintains the capacitor</p> <p>Access to SRAM and STORE/RECALL are possible</p>	<p>VCCX is disconnected</p> <p>VCAP provides power to memory</p> <p>Auto STORE operation may be executed</p>
		

Correct STORE Capacitor Rating

Two critical capacity values has to be taken in account for rating the store capacitor.

The store capacitor must be:

1. small enough to be charged after the first write access has been executed
2. big enough to store sufficient energy for exactly one Store operation

Anvo-Systems Dresden is continuously improving the energy efficiency of our products. This results in reduced needs for capacity values. The corresponding values are specified in the data sheet and have to be taken in account.

STORE Capacitor Technology

The typical value for a nvSRAM store capacitor is between 4.7 μ F and 68 μ F. In acceptable body sizes and operating voltages, these capacitors are available in different technologies such as:

- Aluminum Electrolytic Capacitor
- Tantalum Electrolytic Capacitor
- Class-II Ceramic Capacitors
- Silicon Capacitors

Depending on the application requirements a suited capacitor technology has to be selected. The following table gives a short overview about possible choices. In many cases

Type of Capacitor	Temperature Range	Endurance	Capacity	est. Price/€ 22 μ F 6.3V	Capacity depends on
Aluminum Electrolytic Capacitor	-55°C ... 105°C	5000h@105°C	1 μ F to 15mF	0,08	
Aluminum Electrolytic Capacitor	-55°C ... +125°C	8000h@125°C	1 μ F to 10mF	0,5	
Tantalum Electrolytic Capacitor	-55°C ... +125°C		0.1 μ F to 1mF	0,2	Temperature
Class-II Ceramic Capacitors (X7R)	-55°C ... +125°C		100p to 47 μ F	0,1	Voltage, Temperature
Class-II Ceramic Capacitors (X5R)	-55°C ... +85°C		100p to 68 μ F	0,09	Voltage, Temperature
Silicon Capacitors	-55°C ... +125°C		0,2 μ F / mm ²		

References:

Version History

02.12.2011 Initial Version

02.01.2012 added X5R