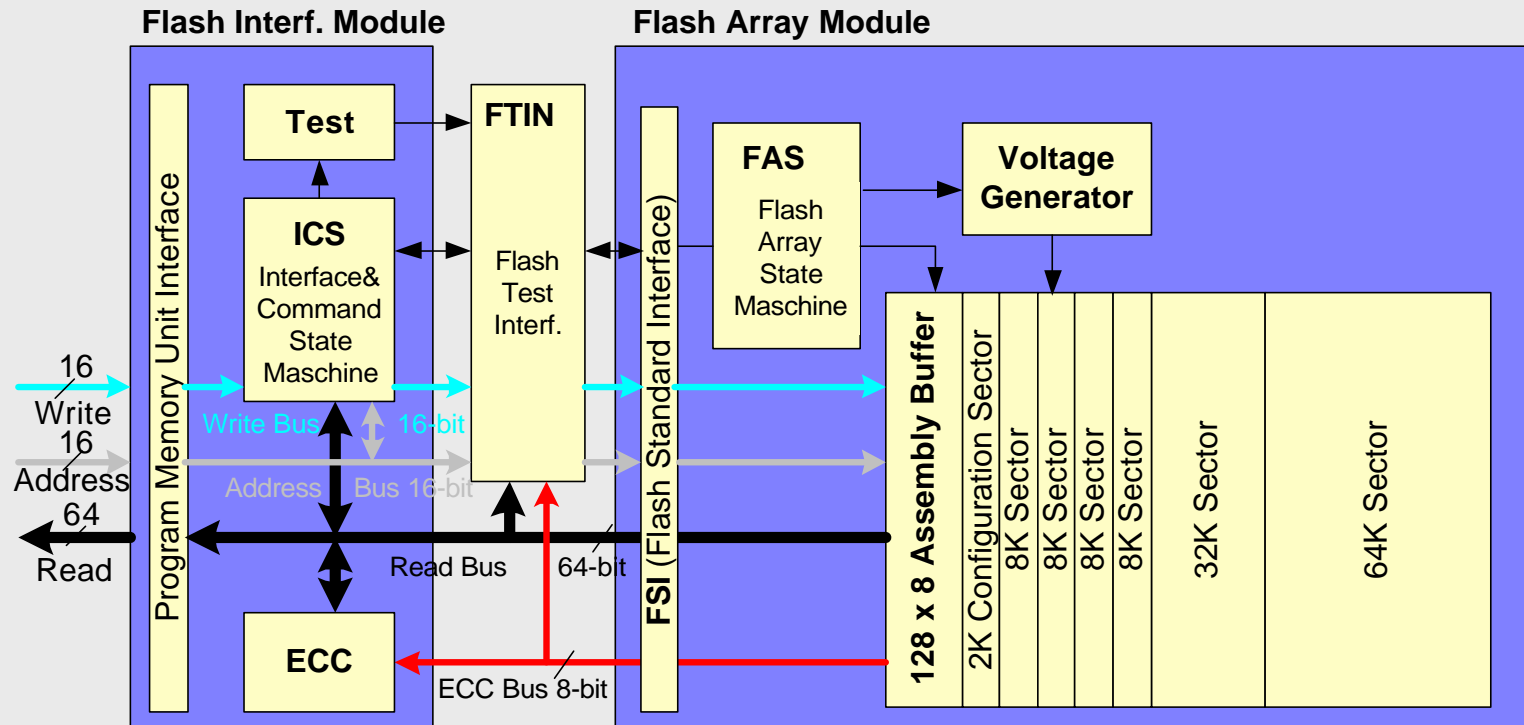


XC16x Flash Module Block Diagram



XC16x Flash Module

Flash Commands

■ Reset to Read

- Resets the internal state machine
- returns to read mode

■ Enter Page Mode

- Enter page mode
- resets assembly buffer pointer

■ Load Page Word

- 16 bit words are loaded to the assembly buffer

■ Write Page:

- writes content of assembly buffer to Flash

■ Write User Configuration Page

- writes content of assembly buffer to configuration sector

XC16x Flash Module

Flash Commands

- Erase Standard Sector
 - the addressed standard sector is erased
- Erase 8K Sector
 - the addressed 8K sector is erased
- Erase Wordline
 - the addressed wordline is erased (256bytes)
- Erase User Configuration Wordline
 - the addressed wordline in the user configuration sector is erased
- Disable Sector Write Protection
 - disable temporarily sector write protection of all protected sectors

XC16x Flash Module

Flash Commands

■ Disable Read Protection

- disable temporarily Flash read protection and full write protection of whole Flash modul

■ Re-Enable Read/Write Protection

- resumes all kind of temporarily protection installations

■ Write Margin Register

- Overwrite the Flash margin register

■ Clear Status

- error flags and write status bits are cleared

XC16x Flash Module Command Sequence

Command Sequence	1.Cycle		2.Cycle		3.Cycle		4.Cycle	
	Addr	Data	Addr	Data	Addr	Data	Addr	Data
Reset to Read	xxAA	xxF0						
Enter Page Mode	xxAA	xx50						
Load Page Word	xxF2	WD						
Write Page	xxAA	xxA0	PA	xxAA				
Write User Configuration Page	xxAA	xxA5	UCPA	xxAA				
Erase Standard Sector	xxAA	xx80	xx54	xxAA	SA	xx30		
Erase 8K Sector	xxAA	xx80	xx54	xxAA	8KSA	xx33		
Erase Wordline	xxAA	xx80	xx54	xxAA	WLA	xx03		
Erase User Configuration WL	xxAA	xx80	xx54	xxA5	UCWLA	xx53		

WD: Write Data

PA: Page address

SA: Sector Address

WLA: Wordline address

UCPA: User Configuration Page Address

8KSA: 8k sector address

UCWLA: User Config. Wordline Address

XC16x Flash Module Command Sequence

Command Sequence	1.Cycle		2.Cycle		3.Cycle		4.Cycle	
	Addr	Data	Addr	Data	Addr	Data	Addr	Data
Disable Sector Write Protection	xx3C	xxUL	xx54	1.Passw	xxAA	2.Passw	xx5A	xx05
Disable Read Protection	xx3C	xx00	xx54	1.Passw	xxAA	2.Passw	xx5A	xx05
Re-Enable RD/WR Protection	xx5E	xx5E						
Read Status/Margin Register	RA	RegDat						
Write Margin	xxAA	xxFA	RA	WD				
Clear Status	xxAA	xxF5						

UL: User Protection Level

RegData: Read data from addressed register

1. Passw./2.Passw.: User Password

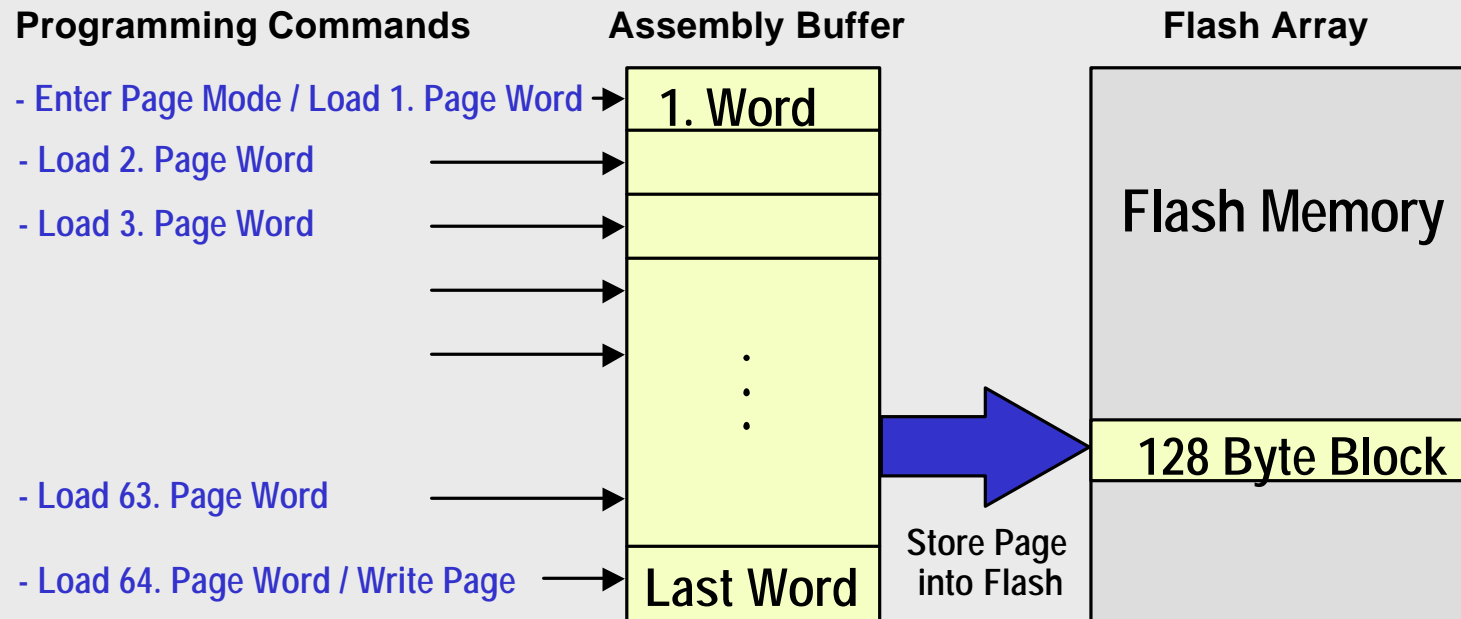
WD: Write Data

RA: Register address

XC16x Flash Module Programming Sequence

■ Programming a 64 word Page:

- programming is done by a load / store procedure with the assembly buffer



XC16x Flash Module

Flash Status Register

-	-	SUL	-	PRO IN	PRO DI	DB ER	SB ER	PRO ER	SQ ER	-	OP ER	PAG E	ERA SE	PRO G	BUS Y
---	---	-----	---	-----------	-----------	----------	----------	-----------	----------	---	----------	----------	-----------	----------	----------

■ Status bits in FSR:

- BUSY Flash Busy Busy with programming or erase;
not in read mode
- PROG Programming State Flash busy with programming
- ERASE Erase State Flash busy with erase operation
- PAGE Page Burst Mode Flash in page mode

XC16x Flash Module

Flash Status Register

-	-	SUL	-	PRO IN	PRO DI	DB ER	SB ER	PRO ER	SQ ER	-	OP ER	PAG E	ERA SE	PRO G	BUS Y
---	---	-----	---	-----------	-----------	----------	----------	-----------	----------	---	----------	----------	-----------	----------	----------

■ Error bits in FSR:

- OPER Operation Error Flash programming or erase operation not finished because of (warm) reset request
- SQER Sequence Error Improper command or address in command sequence
- PROER Protection Error Protection Error because of not allowed command or wrong password
- SBER Single Bit Error **detected** and **corrected** Single Bit Error **detected** and **corrected**
- DBER Double Bit Error **detected** Double Bit Error **detected**

XC16x Flash Module

Flash Status Register

-	-	SUL	-	PRO IN	PRO DI	DB ER	SB ER	PRO ER	SQ ER	-	OP ER	PAG E	ERA SE	PRO G	BUS Y
---	---	-----	---	-----------	-----------	----------	----------	-----------	----------	---	----------	----------	-----------	----------	----------

■ Protection bits in FSR:

- PRODI Protection Disabled State Read protection is disabled
- PROIN Protection Installed Read / write protection correctly installed and confirmed
- SUL Sector Unlocked State All write protected sectors are temporarily locked

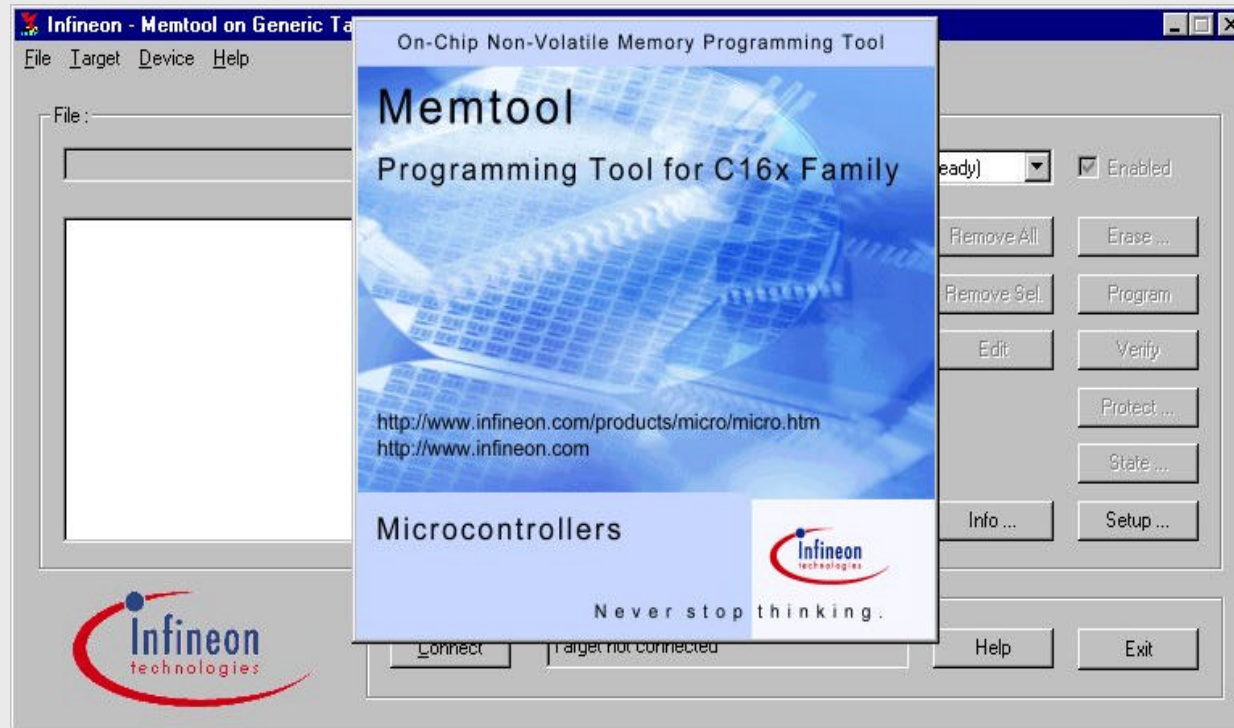
XC16x Flash Module

Hardware Error Correction ECC

- Error Correction based on Hamming Distance
- Significant and proven quality improvements
- Hamming distance of 4 for
 - 1-bit error correction and 2-bit error detection
 - 72-bit word length for 64-bit information length
 - Error correction for full 72-bit word
- Online error correction during code execution
 - XOR based fast parallel approach
 - Parallel read out of 72-bit word and fast error detection and correction
 - Correction of all kinds of memory fails
- Flags in flash status register in case of error correction or detection

XC16x Flash Module Flash Tools

- Memtool XC - freeware flash programming tool



- ◆ Uses boot strap loader on ASC0 to get access
- ◆ Memory can be read and programmed fast and reliably
- ◆ Intuitive user interface