1. General Description

The eKF5250 provides a high-performance interface to bridge USB and NAND Flash compliance device which can be used to implement of flash memory storage device with USB interface. It contains a 8-bit RISC processor to greatly reduce firmware development work.

The eKF5250 has a phase Lock Loop(PLL) embedded. The PLL provided all clocks needed in this Controller. It needs an externally provided clock operating in 2 Mhz.

The eKF5250 can control up to 4 pieces of NAND Flash memory. The flash capacity can be 16M bytes up to 256M bytes. And these chips can be any combination. It has been optimized to support Toshiba and Samsung flash memory designs. The controller has write-protected ability to prevent writing data to flash. For read/write operation, the controller can achieve 1000KB /800KB throughput.

This controller can operate in Win XP, Win2000, Windows ME without any driver installation.

2. Features

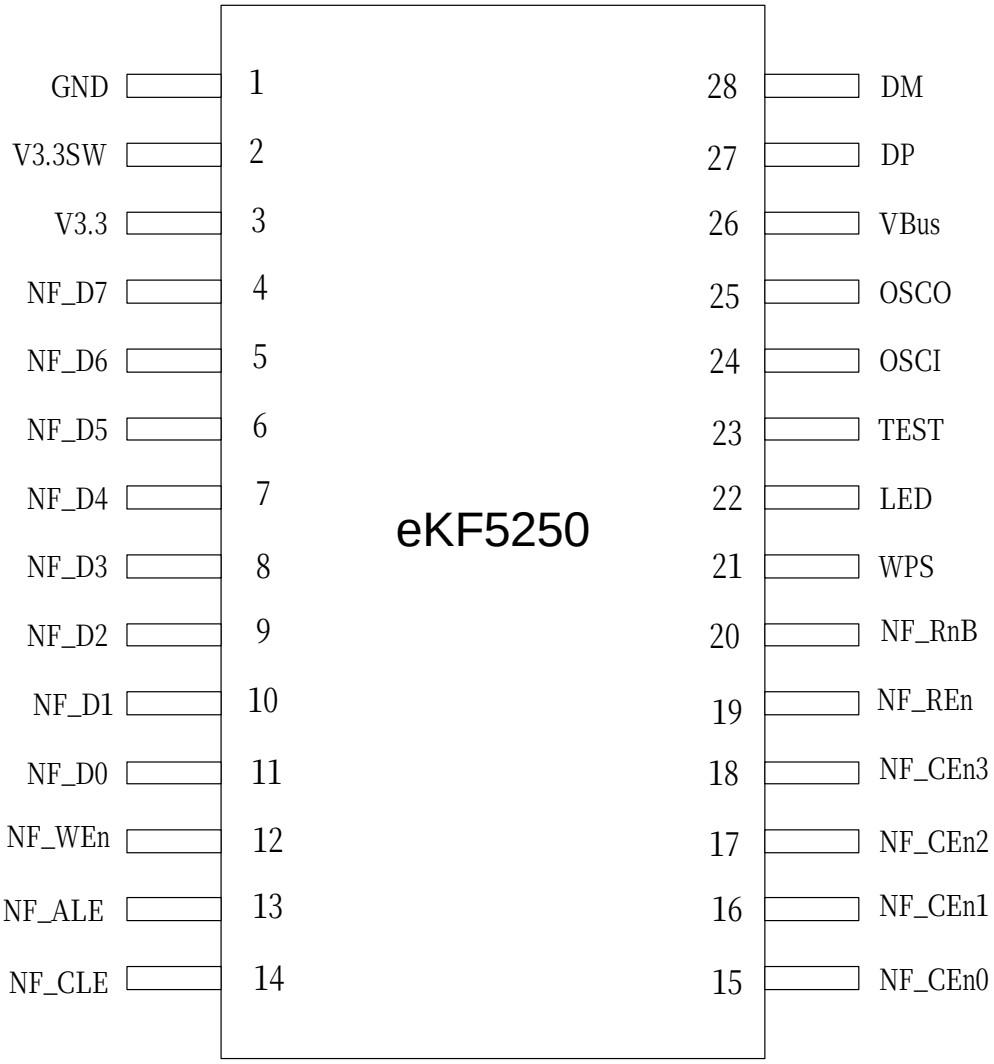
- USB Specification v1.1 Compliant
- USB Mass Storage Class v1.0 Compliant
- Support 12 Mbits/s Full Speed Serial Data Transmission
- Support USB Mass Storage Class Bulk-Only Spec.
- USB bus-powered capability
- Build in PLL used to generate clock for USB. And MCU.
- Total 3 Endpoints. Endpoint 0 is the default control endpoint. Endpoint 1 is the Bulk-in endpoint. Endpoint 2 is the Bulk-out endpoint.
- 4K x 13 on chip ROM(Program).
- Support wear leveling
- Support write-protected ability.
- Higher reliability : ECC on the fly
- Support ping-pong buffer(Two 536x8 bits) for data transfer to/from NAND Flash
- Support 4 pieces of NAND Flash.memory
- 8 Level stack for subroutine nesting.
- 1 LED sink pin with internal serial resistor.
- One 8 bits general purpose timer.
- Watchdog Timer with its own on-chip RC oscillator

- Supports saving power mode(SLEEP MODE)
- MCU run at 16MHz.
- Performance：Read(1000K Bytes/s), Write(800K Bytes/s) Max.
- Package：SSOP28

3. Applications

- NAND Flash Controller
- Smart Media Controller

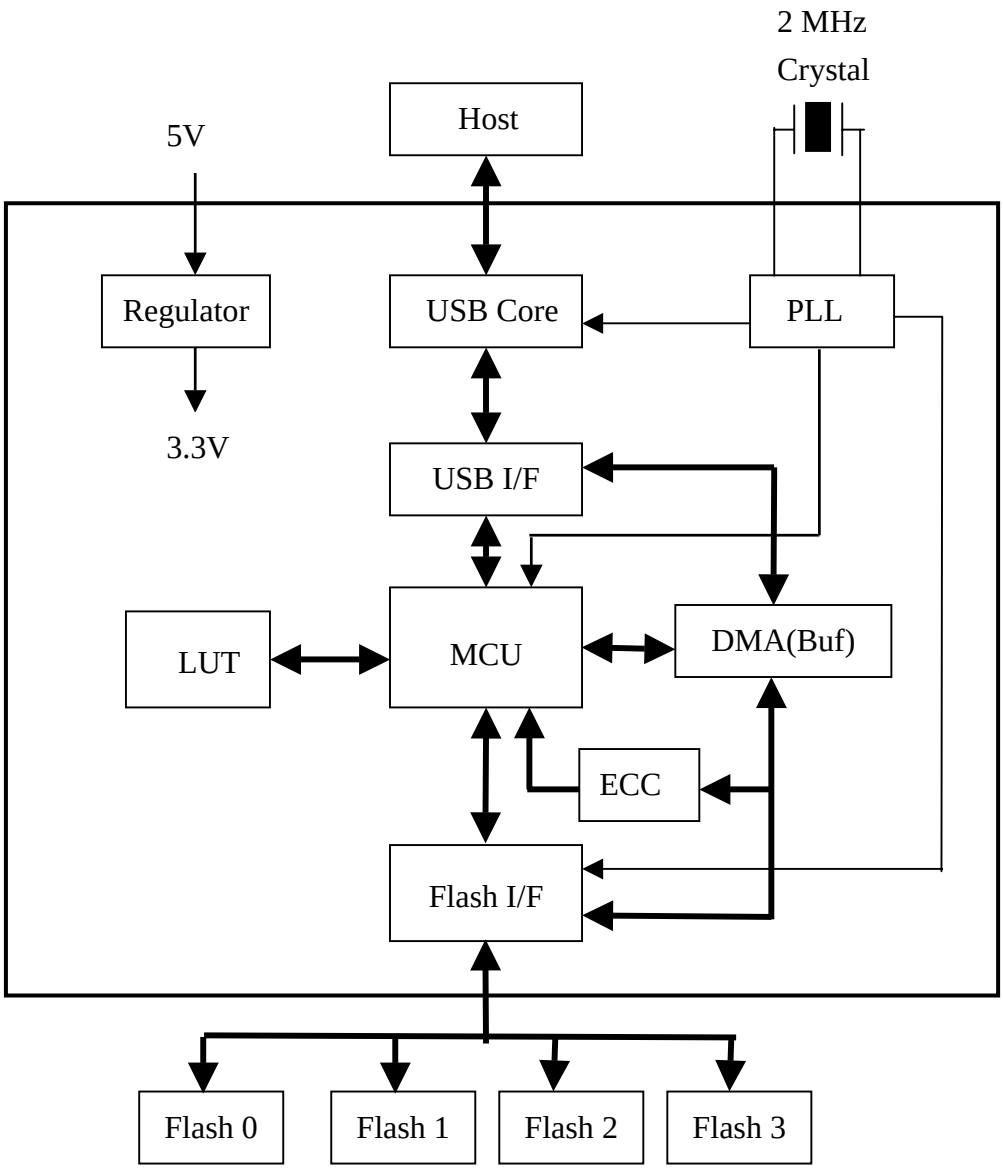
4. Pin Configuration



5. Pin Description

Name	I/O type	Description	Note
Power and ground pin			
Vbus	-	Power supply	
GND	-	Ground	
V3.3	O	3.3V output voltage	
USB analog signal			
DP	I/O	USB plus data line interface	
DM	I/O	USB minus data line interface	
V3.3SW	O	1.5Kohm pull high terminal	
NAND Flash interface signal			
NF_CEn0	I/O	Chip enable for NAND Flash 0	I/O7
NF_CEn1	I/O	Chip enable for NAND Flash 1	I/O7
NF_CEn2	I/O	Chip enable for NAND Flash 2	I/O7
NF_CEn3	I/O	Chip enable for NAND Flash 3	I/O7
NF_D7~0	I/O	Data input/output for NAND Flash	I/O7
NF_WEn	O	Write enable for NAND Flash	O9
NF_REn	O	Read enable for NAND Flash	O9
NF_ALE	O	Address latch enable for NAND Flash	O8
NF_CLE	O	Command latch enable for NAND Flash	O8
NF_RnB	I	NAND Flash Ready or Busy	I-U5
MISC			
OSCI	I	Crystal input terminal or external clock input	
OSCO	O	Output terminal for crystal osc. or external clock	
LED	O	LED sink pin	O10
WPS	I	Write protect switch	I-U50
TEST	I	TEST Pin	I-L10

6. Block Diagram



7. Function Description

To help the system manufactures to build high quality, low cost USB storage systems, several special feature which described as below are implement. The eKF5250 support the down-grade/untested NAND Flash. By testing the target NAND flash, if bad block is found, the controller will mark this bad block and will not use this block hereafter. Therefore, the integrated test software including format program will be support.

To reduce cost and increase performance and reliability, the eKF5250 build-in SRAM (Look-Up-Table) to support logical-to physical address translation. The eKF5250 also build-in ECC function, the real time ECC correction keeps the data integrity while still maintains the high data transfer rate.

Regarding flash, erase/program operation by the high voltage can cause oxide degradation and failure if it is repeated without limit. The wear-level algorithm is implement in the firmware. Update data of a block into a physically different with new link list also help alleviates repetitive cycling.

The 5 volts to 3.3 volts regulator is build-in, so no regulator needed externally. The BOM will be reduced.

No driver needed under Microsoft Windows ME/2000/XP, driver will be supported for Windows 98.

8. Absolute Maximum Ratings

Symbol	Min	Max	Unit
Temperature under bias	0	70	ºC
Storage temperature	-65	150	ºC
Input voltage	-0.5	6.0	V
Output voltage	-0.5	6.0	V

9. DC Electrical Characteristic(T = 0ºC ~70ºC, V_D=3.3V, GND=0V)

9.1 I/O7

Symbol	Parameter	Condition	Min	Typ	Max	Unit
VIH1	Input High Voltage		2.0			V
VIL1	Input Low Voltage				0.8	V
VOH1	Output High Voltage	IOH = -7.0mA	2.4			V
VOL1	Output Low Voltage	IOL = 7.0mA			0.4	V

9.2 O8

Symbol	Parameter	Condition	Min	Typ	Max	Unit
VOH2	Output High Voltage	IOH = -8.0mA	2.4			V
VOL2	Output Low Voltage	IOL = 8.0mA			0.4	V

9.3 O9

Symbol	Parameter	Condition	Min	Typ	Max	Unit
VOH3	Output High Voltage	IOH = -9.0mA	2.4			V
VOL3	Output Low Voltage	IOL = 9.0mA			0.4	V

9.4 O10

Symbol	Parameter	Condition	Min	Typ	Max	Unit
VOH4	Output High Voltage	IOH = -8.0mA	2.4			V
VOL4	Output Low Voltage	IOL = 10.0mA	-10%	1.3	+10%	V

9.5 I-U5

Symbol	Parameter	Condition	Min	Typ	Max	Unit
VIH5	Input High Voltage		2.0			V
VIL5	Input Low Voltage				0.8	V
R_{U5}	Pull-high resistor		-20%	5	+20%	KΩ

9.6 I-U50

Symbol	Parameter	Condition	Min	Typ	Max	Unit
VIH6	Input High Voltage		2.0			V
VIL6	Input Low Voltage				0.8	V
R_{u6}	Pull-high resistor		-20%	50	+20%	KΩ

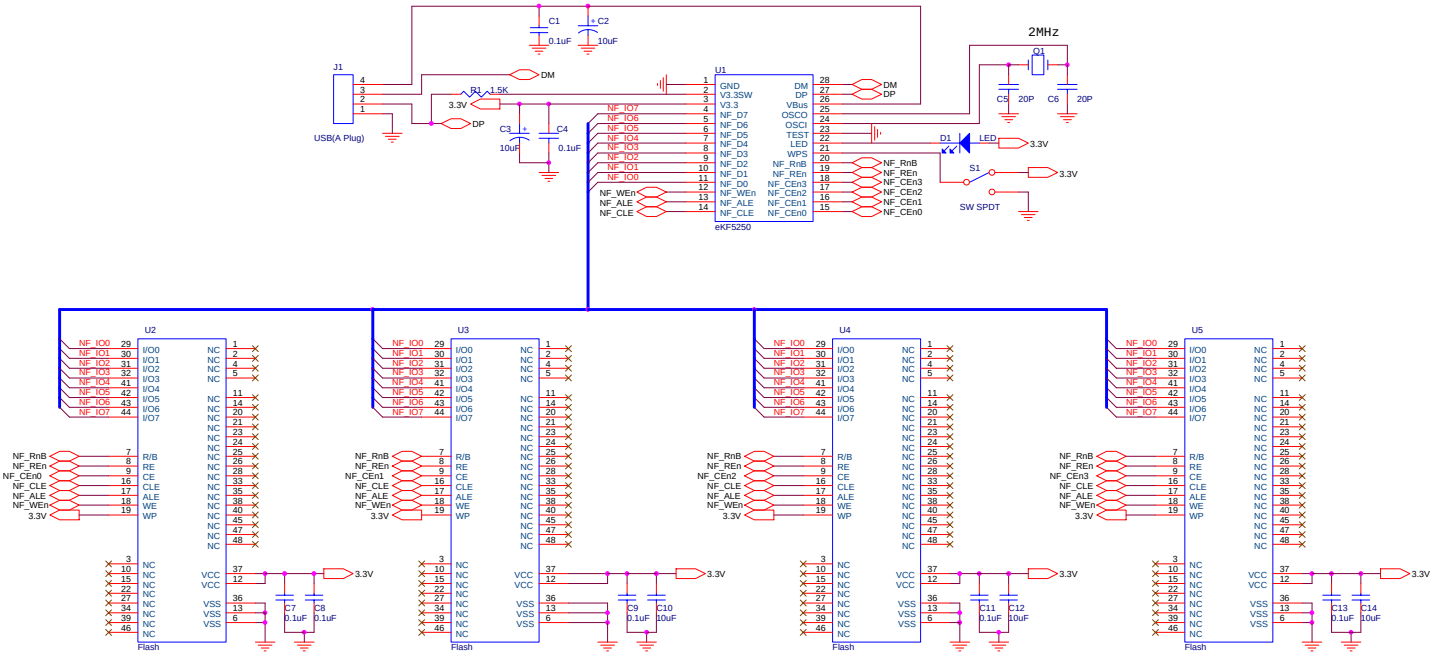
9.7 I-L10

Symbol	Parameter	Condition	Min	Typ	Max	Unit
VIH7	Input High Voltage		2.0			V
VIL7	Input Low Voltage				0.8	V
R_{u7}	Pull-low resistor		-20%	10	+20%	KΩ

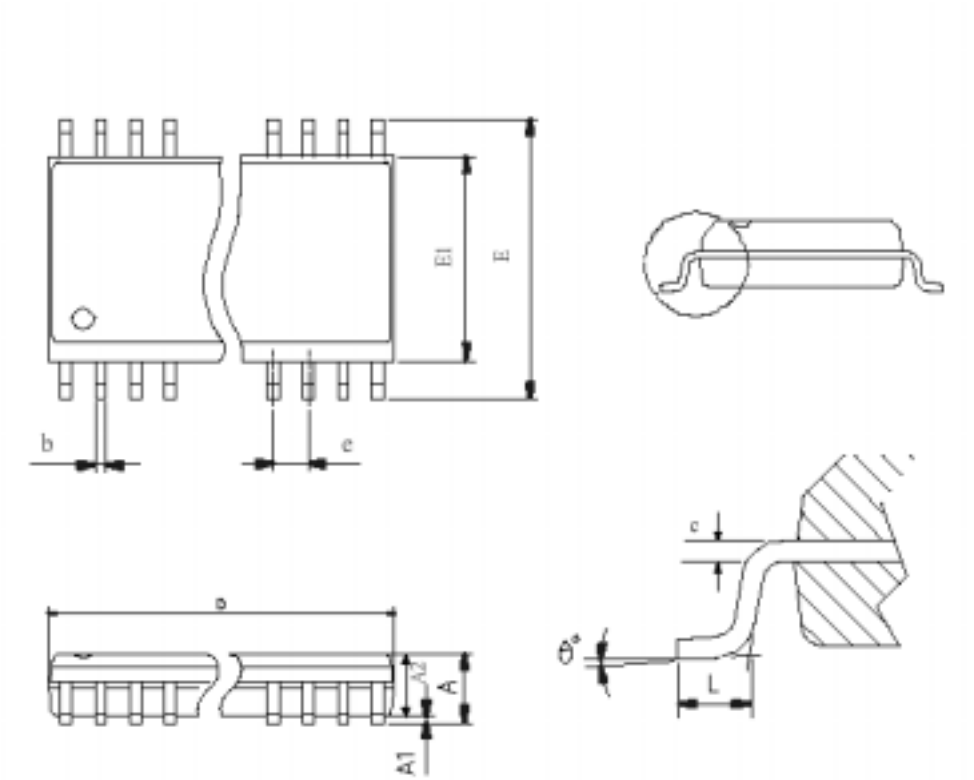
9.8 MISC

Symbol	Parameter	Condition	Min	Typ	Max	Unit
Vbus	USB bus power		4.4		5.25	V
IIL	Input Leakage Current	VIN = VD			±1	μA
VIHX	Clock Input High Voltage	OSCI	2.5			V
VILX	Clock Input Low Voltage	OSCI			1.0	V
ISB	Power down current				450	μA
ICC	Operating supply current				33	mA

10. Application Circuit



11. Package



Symbal	Min	Normal	Max
A			2.130
A1	0.050		0.250
A2	1.620	1.750	1.880
b	0.220		0.380
c	0.090		0.200
E	7.400	7.800	8.200
E1	5.000	5.300	5.600
D	9.900	10.200	10.500
L	0.630	0.900	1.030
e	0.650(TYP)		
θ	0	4	8

Unit : mm

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