

eKF5280

USB2.0 Flash Controller

Product Specification

DOC. VERSION 1.0

ELAN MICROELECTRONICS CORP.

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Specification Revision History

Doc. Version	Revision Description	Date
1.0	Initial Released Version	2006/02/23



1 Description

The eKF5280 Flash Controller provides a high-performance interface for bridging USB2.0 and NAND Flash compliance device, thus allowing the device to implement flash memory storage function through USB interface. The eKF5280 contains an 8-bit RISC processor which could significantly reduce efforts of firmware development. Furthermore, the Controller is embedded with a Phase Lock Loop (PLL). The PLL provides all the internal clocks needed by the Controller. However, the required 12 MHz external clock has to be provided externally.

The eKF5280 is capable of controlling up to 8 pieces of NAND Flash memory with flash capacity ranging from 16M bytes to 512M bytes. The Controller can be available in a number of feature combinations to accommodate customer's requirements. It has been optimized to support Toshiba, Samsung and Hynix/ST SLC (single level cell) flash memory designs. The controller has a write-protect feature for preventing accidental writing to flash.

2 Features

- USB Specification v2.0 Compliant
- USB Mass Storage Class v1.0 Compliant
- Supports 480 MBits/s Full High 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
- Oscillator: 12MHz
- Supports a total of 4 Endpoints:
 - Endpoint 0 is the default control endpoint
 - Endpoint 1 is the Bulk-in endpoint
 - Endpoint 2 is the Bulk-out endpoint
 - Endpoint 3 is the Interrupt-in endpoint
- Support ping-pong buffer(two 2120x8 bits) for data transfer to/from NAND Flash
- Support up to 8 pieces of NAND Flash memory
- 1 LED sink pins with internal serial resistor
- Support wear leveling
- Support write-protected ability
- Higher reliability: ECC on the fly
- Support untested/downgrade NAND Flash
- Embedded 5-3.3 regulator, and 3.3-2.5 regulator
- One 8-bit general purpose timer



- Supports saving power (SLEEP) mode
- 8K x 13 on chip ROM (Program)
- 8-Level stack for subroutine nesting
- MCU runs at 30MHz
- Performance: Read (11M Bytes/s), Write (8M Bytes/s) Max
- Supported OS: Win XP, Win 2000, Win ME, and MAC OS 9.0 & higher.
Win 98 driver available upon request.
- Package : LQFP48 (7mm * 7mm)

3 Unique Function Descriptions

The following special features may be implemented to assist system manufactures in making high quality, low cost USB storage systems.

- The eKF5280 supports down-graded/untested NAND Flash. During testing of the target NAND flash, if a flawed block is found, the controller will mark and isolate this defective block. Consequently, the isolated block is excluded from operation thereafter. The test software for this function is included in the supporting programs provided with the controller.
- To reduce cost and increase performance & reliability, the eKF5280 is equipped with a built-in SRAM Look-Up-Table to support logical-to-physical address translation.
- The eKF5280 is also embedded with a built-in ECC function. The real time ECC correction maintains the data integrity while preserving the high data transfer rate at the same time.
- A wear-level algorithm is implemented in the eKF5280 firmware to prevent oxide degradation and subsequent failure from numerous repetitions of flash erase/programming operation on the same block at high voltage. This algorithm updates the data of a block into different new physical links to alleviate repetitive cycling on the same block.
- The eKF5280 is also equipped with a built-in 5 volt to 3.3 volt regulator. So there is no need for an external regulator. Hence your BOM cost is reduced.
- No additional driver is required for eKF5280 operation. It works readily with Win XP, Win 2000, Win ME, and MAC OS 9.0 & higher (Win 98 is also supported after installing a separate driver).

4 Applications

- NAND Flash Controller
- Smart Media Controller

5 Pin Configuration and Assignment

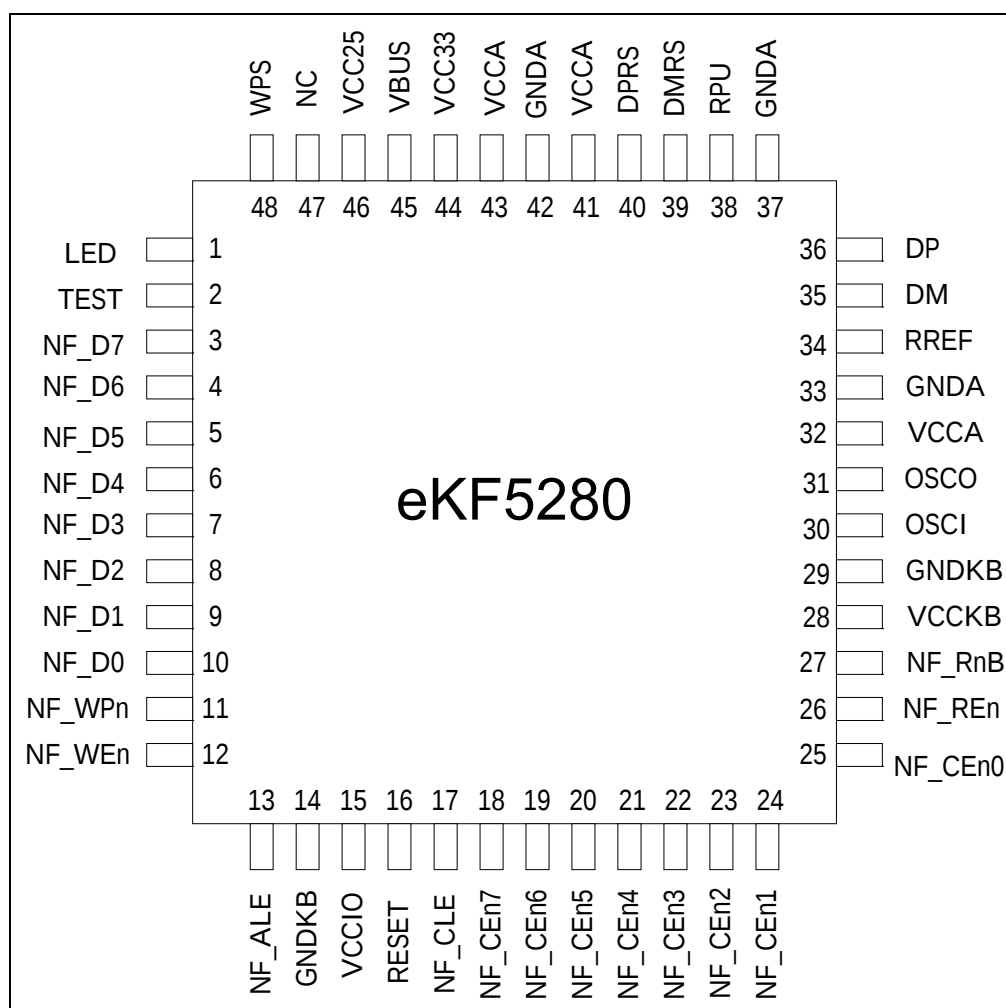


Figure 4-1 eKF5280 Pin Configuration and Assignment

6 Pin Descriptions

Pin Name	I/O Type	Description	Remarks
Power and Ground Pin			
VBUS	-	USB bus power	5.0V
VCCA	-	Internal regulator output for analog supply voltage	3.3V
GNDA	-	Analog ground	-
VCCKB	-	Internal regulator output for transceiver digital core	2.5V
GNDKB	-	Digital ground	-
VCCIO	-	Internal regulator output for I/O port	3.3V
VCC25	-	Internal regulator output for digital core	2.5V
VCC33	-	Internal regulator output	3.3V
USB Analog Signal			
DP	I/O	USB plus data line interface	-
DM	I/O	USB minus data line interface	-
DPRS	I	USB1.1 data in data positive pin terminal, connected to external resistor(39Ω±5%)	-
DMRS	I	USB1.1 data in data negative pin terminal, connected to external resistor (39Ω±5%)	-
RPU	I	Connect external resistor (1.5KΩ±5%) to AVCC	-
RREF	I	Connect external reference resistor (12.1 KΩ±1%) to analog ground(GNDA)	-
NAND Flash Interface Signal			
NF_CEn0~7	I/O	Chip enable for NAND Flash	I/O8
NF_RnB	I	NAND Flash Ready or Busy	I/O-U5
NF_REn	O	Read enable for NAND Flash	I/O12
NF_CLE	O	Command latch enable for NAND Flash	I/O12
NF_ALE	O	Address latch enable for NAND Flash	I/O12
NF_WEn	O	Write enable for NAND Flash	I/O12
NF_WPn	O	Write protect for NAND Flash	I/O8
NF_D0~7	I/O	Data input/output for NAND Flash	I/O12
Miscellaneous			
LED	O	LED sink pin	I/O10
OSCI	I	Crystal input terminal or external clock input	-
OSCO	O	Output terminal for crystal oscillator or external clock	-
WPS	I	Write protect switch	I/O-U50
TEST	I	TEST Pin	I/O-L
RESET	I	Reset Pin (2 nd reset source in case of POR failure)	I-S

7 Function Block Diagram

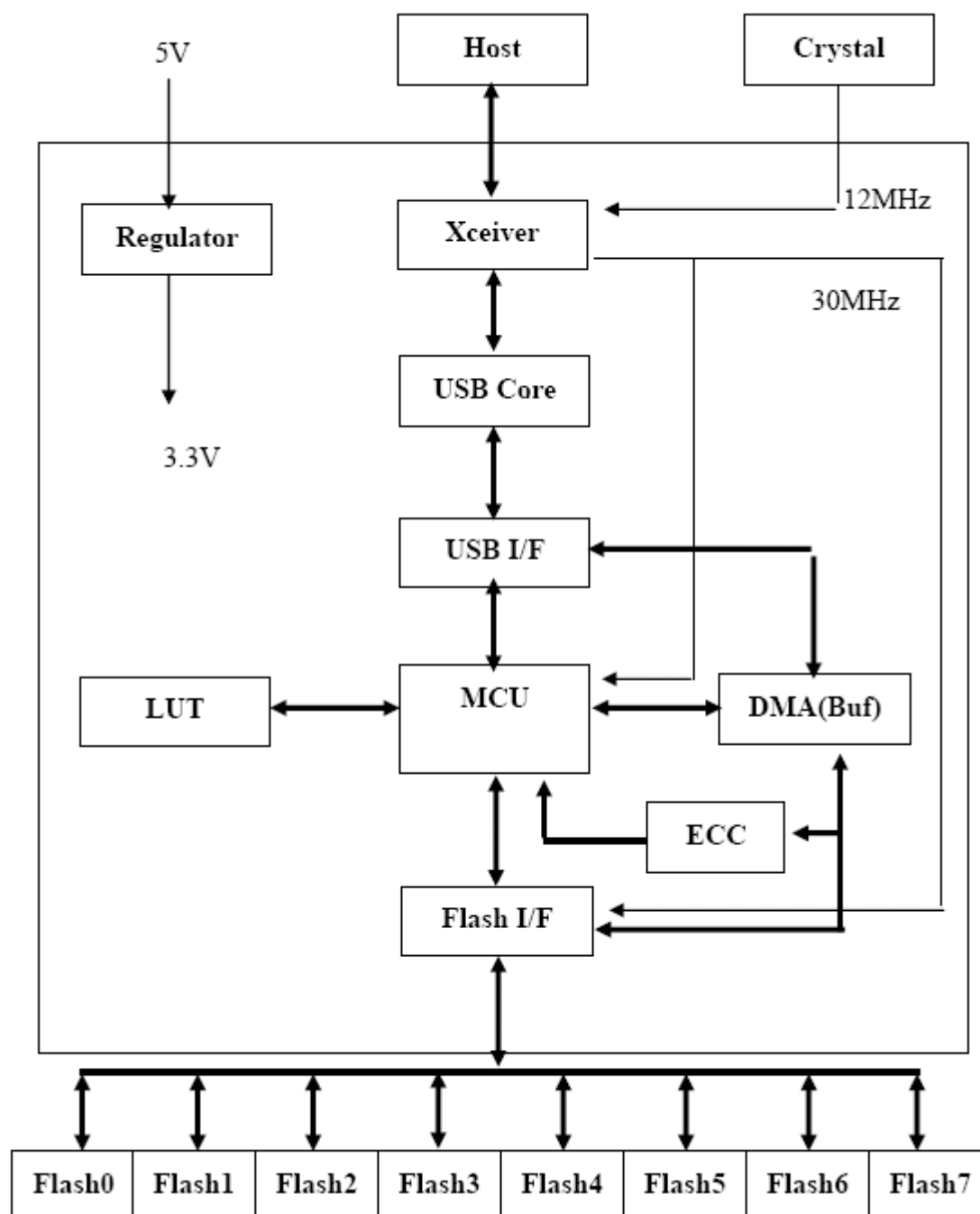


Figure 6-1 eKF5280 Functional Block Diagram

8 DC Electrical Characteristic

8.1 MISC

■ (Ta=0°C~70°C, VD=3.3V, VSS=0V)

Symbol	Parameter	Condition	Min	Typ	Max	Unit
VBUS	USB bus power		4.4	5.0	5.25	V
VCC33	3.3-V Regulator output		3.0	3.3	3.6	V
VCC25	2.5-V Regulator output		2.25	2.5	2.75	V
ICC33	Operating supply current for 3.3-V Regulator				150	mA
ICC25	Operating supply current for 2.5-V Regulator				100	mA
IIL	Input Leakage Current	VIN = VD, VSS			±1	μA
VIHX	Clock Input High Voltage	OSCI	2.5			V
VILX	Clock Input Low Voltage	OSCI			1.0	V
ISB	Power down current	All input and I/O pin at VD, WDT enabled			150	μA
ICC	Operating supply current				110	mA

8.2 I/O8

Symbol	Parameter	Condition	Min	Typ	Max	Unit
VIH	Input High Voltage		2.0			V
VIL	Input Low Voltage				0.8	V
VOH	Output High Voltage	IOH = -8.0mA	2.4			V
VOL	Output Low Voltage	IOL = 8.0mA			0.4	V

8.3 I/O12

Symbol	Parameter	Condition	Min	Typ	Max	Unit
VIH	Input High Voltage		2.0			V
VIL	Input Low Voltage				0.8	V
VOH	Output High Voltage	IOH = -12.0mA	2.4			V
VOL	Output Low Voltage	IOL = 12.0mA			0.4	V



8.4 I/O10

Symbol	Parameter	Condition	Min	Typ	Max	Unit
VIH	Input High Voltage		2.0			V
VIL	Input Low Voltage				0.8	V
VOH	Output High Voltage	IOH = -8.0mA	2.4			V
VOL	Output Low Voltage	IOL = 10.0mA	-10%	1.3	10%	V

8.5 I/O-U5

Symbol	Parameter	Condition	Min	Typ	Max	Unit
VIH	Input High Voltage		2.0			V
VIL	Input Low Voltage				0.8	V
VOH	Output High Voltage	IOH = -8.0mA	2.4			V
VOL	Output Low Voltage	IOL = 8.0mA			0.4	V
Ru	Pull-high resistor(For NF_RnB Pin)		-20%	5	+20%	K Ω

8.6 I/O-U50

Symbol	Parameter	Condition	Min	Typ	Max	Unit
VIH	Input High Voltage		2.0			V
VIL	Input Low Voltage				0.8	V
VOH	Output High Voltage	IOH = -8.0mA	2.4			V
VOL	Output Low Voltage	IOL = 8.0mA			0.4	V
Ru	Pull-high resistor(For WPS Pin)		-20%	50	+20%	K Ω

8.7 I-L

Symbol	Parameter	Condition	Min	Typ	Max	Unit
Rd	Pull-low resistor		-20%	10	+20%	K Ω

8.8 I-S

Symbol	Parameter	Min	Typ	Max	Unit	Output
VIH	Schmitt trigger Input High Voltage		2.0		V	0V
VIL	Schmitt trigger Input Low Voltage		0.7		V	2.5V

9 Absolute Maximum Ratings

Operating temperature: 0 ° C to 70 ° C
Storage temperature: -65 ° C to 150 ° C
Input voltage: -0.5V to +6.0V
Output voltage: -0.5V to +6.0V

10 Flash Compatibility Support with Samsung, Hynix, ST and Toshiba

		Part number
Samsung	16MB	K9F2808U0C
	32MB	K9F5608U0B
		K9F5608U0C
	64MB	K9F1208U0M
		K9F1208U0A(B,C)
	128MB	K9F1G08U0M
		K9K1G08U0M
		K9F1G08U0A
		K9K1G08U0A
		K9T1G08U0M
	256MB	K9K2G08U0A
		K9F2G08U0M
	512MB	K9F4G08U0M
		K9W4G08U1M
		K9K4G08U0M
Hynix	32MB	HY27US08561M
	64MB	HY27US08121M
	128MB	HY27UA081G1M
		HY27UF081G2M
	256MB	HY27UB082G4M
		HY27UG082G2M
	512MB	HY27UH084G2M
ST	64MB	NAND512W3A
	128MB	NAND01GW3A
		NAND01GW3B
Toshiba	128MB	TC58NVG0S3AFT05
	256MB	TH58NVG1S3AFT(00/05)
		TC58NVG1S3BFT00
	512MB	TH58NVG2S3BFT00

Figure 11-1 eKF5280 Application Circuit

