IC1210-F128LQ

USB2.0 ALL-IN-ONE Flash Card Reader Controller

1. FEATURES

- High speed 8-bit micro-controller with 4 system clock per machine cycle
- Instruction-set compatible with MCS-52
- Embedded 32K-byte program flash ROM for product quick delivery. In System Programming, ISP, is supported through USB port during normal operation, or through serial port in test mode.
- Built in fixed address 256 bytes data RAM.
- Built in floating address 5K bytes data RAM
- System power saving mode ready, idle & power down modes.
- Three programmable 16-bit timer/counter and watchdog timer.
- Compliant with USB Specification Rev.2.0, supports both high speed (480M bps) and full speed (12M bps) device function. Two device interface available. Four endpoints, “CONTROL / INTERRUPT IN / BULK IN / BULK OUT”, for interface 0 and “INTERRUPT IN” endpoint only for interface 1.
- Master/Slave IIC and UART/RS-232 interface for external device communication.
- Compact Flash Card interface complies with Compact Flash Specification Rev.1.4, which is compatible with most hard disk drives and IBM micro drive.
- Smart Media Card interface complies with Smart Media Specification Rev.1.1 and Smart Media Identify Number Specification Version 1.1
- xD Picture Card interface compiles with xD Picture Card standard Format Specifications version 1.0
- NAND type flash chip interface supported (including 1/2/4Gbit single die and complete MLC family up to 2Gbit)
- Multi Media Card interface complies with Multi Media Card System Specification Rev. 3.3.
- SD Card interface complies with SD Card System Specification Rev. 1.01
- Memory Stick Card interface compiles with Memory Stick Standard Format Specifications version 1.3
- Memory Stick Duo Card interface compiles with Memory Stick Duo Standard Format Specifications version 1.02
- Memory Stick Pro Card interface compiles with Memory Stick Pro Standard Format Specifications version 1.0
- Memory Stick ROM Card interface compiles with Memory Stick ROM Standard Format Specifications version 1.0
- Built-in hardware ECC (Error Correction Code) check for Smart Media Card/NAND type flash chip one bit error correction and two bit error detection.
- Built-in hardware CRC check for MMC and SD cards.
- Build in three power switches to control external components.
- Build in programmable GPIO pull up/down resistor including “tri-state” option
- 3.0~3.6V supply.
- 128pin LQFP Pb free package is available.

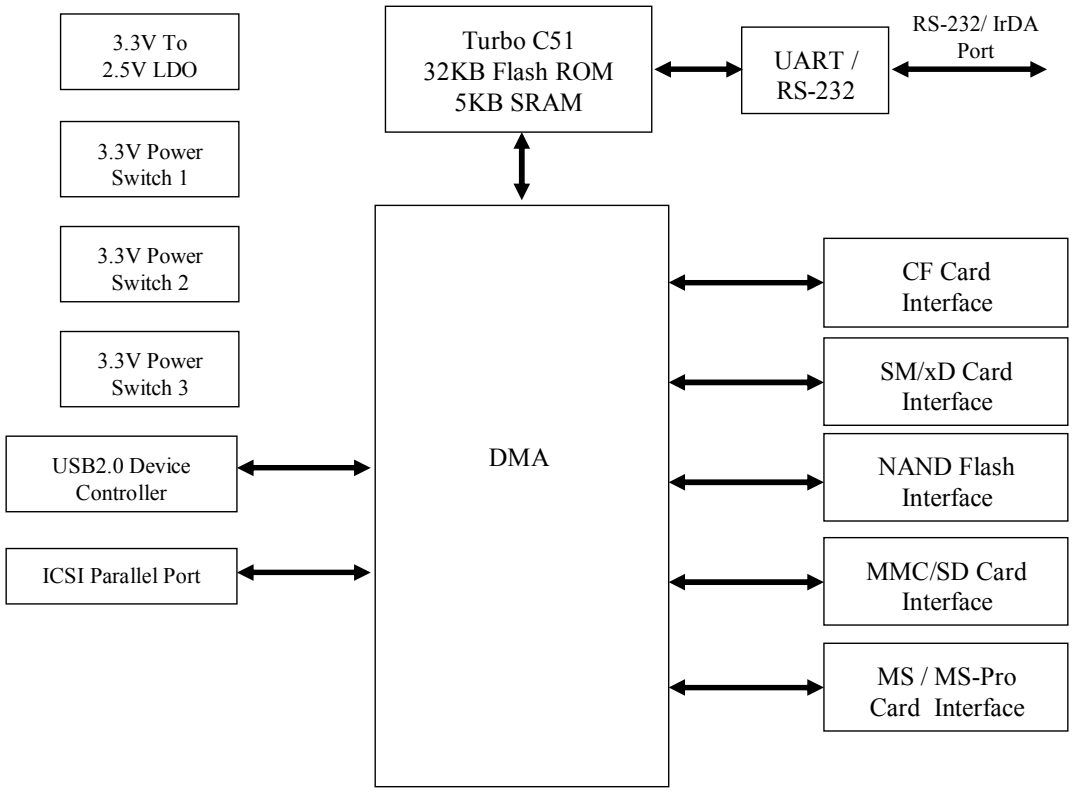
2. GENERAL DESCRIPTION

IC1210 includes a turbo MSC-52 family CPU core, 32K-byte internal program Flash-ROM, 5K bytes SRAM, USB2.0 function block, CF/SM/xD/MMC/SD/MS/MS Duo/MS Pro flash card interface, IBM micro drive interface, NAND type flash chip interface and IIC master & slave blocks in 128 pin LQFP package.

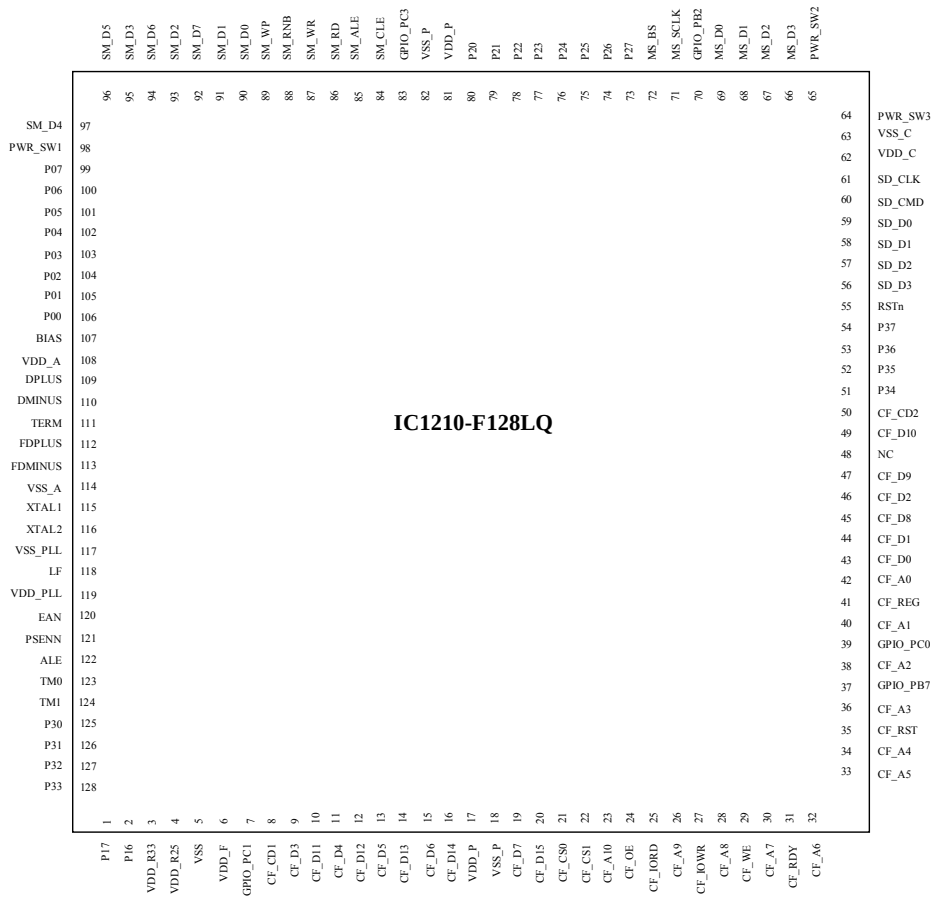
The IC1210 embedded high/full speed USB2.0 port to communicate with USB2.0 host. For those early development, code always changing application or if user want to secure their product compatibility issue, IC1210 provides a flexible solution with embedded 32K bytes program Flash-ROM. User can update her/his ROM code through built in USB-ISP function. With these special designs, user doesn't need to power down the chip in advance, just hot plug into USB ports then firmware code get updated by executing ICSI provided AP. User can also update firmware code through serial port in test/programming mode.

IC1210 embedded three set of power switches to make sure whole system power is under control and reduce system BOM cost. IC1210 can support embedded CPU data memory space up to 6K bytes by turning off central control function. Please note, traditional external ROM/SRAM functions are still available via port0 and port2. User needs to watch external data RAM address map without overlapping.

3. BLOCK DIAGRAM



4. PIN ASSIGNMENT



Function	Signal Name	Dir	Pin Number	Description
USB & XTAL	BIAS	IO	107	Connect 9K ohm bias pull-down resistor to VSS_A
	VDD_A	P	108	Analog 3.3V power pin
	DPLUS	IO	109	USB data pin Data Plus for high speed traffic
	DMINUS	IO	110	USB data pin Data Minus for high speed traffic
	TERM	IO	111	Connect 1.5K ohm termination resistor to VDD_A
	FDPLUS	IO	112	USB data pin Data Plus for full speed traffic
	FDMINUS	P	113	USB data pin Data Minus for full speed traffic
	VSS_A	P	114	Analog ground
	XTAL1	I	115	XTAL oscillator input pin
	XTAL2	O	116	XTAL oscillator output pin
	VSS_PLL	P	117	PLL digital ground
	LF	O	118	PLL loop filter
	VDD_PLL	P	119	PLL digital 3.3V power pin

Function	Signal Name	Dir	Pin Number	Description
Parallel Port	PP_D0	IO_TR	90	Parallel port data bus bit 0
	PP_D1	IO_TR	91	Parallel port data bus bit 1
	PP_D2	IO_TR	93	Parallel port data bus bit 2
	PP_D3	IO_TR	95	Parallel port data bus bit 3
	PP_D4	IO_TR	97	Parallel port data bus bit 4
	PP_D5	IO_TR	96	Parallel port data bus bit 5
	PP_D6	IO_TR	94	Parallel port data bus bit 6
	PP_D7	IO_TR	92	Parallel port data bus bit 7
	PP_RW	IO_PU	86	Parallel port read/write control pin
	PP_RDY	IO_PU	85	Parallel port READY signal pin
	PP_EN	IO_TR	88	Parallel port enable pin
	PP_DIR	IO_PU	84	Parallel port direction control pin
CF Card	CF_D0	IO_TR	43	CF card data bus bit 0 pin
	CF_D1	IO_TR	44	CF card data bus bit 1 pin
	CF_D2	IO_TR	46	CF card data bus bit 2 pin
	CF_D3	IO_TR	9	CF card data bus bit 3 pin
	CF_D4	IO_TR	11	CF card data bus bit 4 pin
	CF_D5	IO_TR	13	CF card data bus bit 5 pin
	CF_D6	IO_TR	15	CF card data bus bit 6 pin
	CF_D7	IO_TR	19	CF card data bus bit 7 pin
	CF_D8	IO_TR	45	CF card data bus bit 8 pin
	CF_D9	IO_TR	47	CF card data bus bit 9 pin
	CF_D10	IO_TR	48	CF card data bus bit 10 pin
	CF_D11	IO_TR	10	CF card data bus bit 11 pin
	CF_D12	IO_TR	12	CF card data bus bit 12 pin
	CF_D13	IO_TR	14	CF card data bus bit 13 pin
	CF_D14	IO_TR	16	CF card data bus bit 14 pin
	CF_D15	IO_TR	6	CF card data bus bit 15 pin
	CF_A0	IO_TR	42	CF card address bit 0 pin
	CF_A1	IO_TR	40	CF card address bit 1 pin
	CF_A2	IO_TR	38	CF card address bit 2 pin
	CF_A3	IO_TR	36	CF card address bit 3 pin
	CF_A4	IO_TR	34	CF card address bit 4 pin
	CF_A5	IO_TR	33	CF card address bit 5 pin
	CF_A6	IO_TR	32	CF card address bit 6 pin
	CF_A7	IO_TR	30	CF card address bit 7 pin
	CF_A8	IO_TR	28	CF card address bit 8 pin
	CF_A9	IO_TR	26	CF card address bit 9 pin
	CF_A10	IO_TR	23	CF card address bit 10 pin
	CF_CS0	IO_TR	21	Card select pin 0
	CF_CS1	IO_TR	22	Card select pin 1
	CF_OE	IO_TR	24	Output enable strobe pin
	CF_IORD	IO_TR	25	Read strobe pin to CF card
	CF_IOWR	IO_TR	27	Write strobe pin to CF card
	CF_WE	IO_TR	29	Write enable strobe for CF card memory mode and I/O mode
	CF_RDY	IO_TR	31	Ready pin to indicate the CF card is read to accept a new data transfer
	CF_RST	IO_TR	35	Reset pin to CF card, active low
	CF_REG	IO_TR	41	CF Card Attribute Memory select pin in memory mode
	CF_CD1	IO_PU	8	Card detection pin 1

Function	Signal Name	Dir	Pin Number	Description
	CF_CD2	IO_PU	49	Card detection pin 2
SM Card	SM_D0	IO_TR	90	SM card data bus bit 0 pin
	SM_D1	IO_TR	91	SM card data bus bit 1 pin
	SM_D2	IO_TR	93	SM card data bus bit 2 pin
	SM_D3	IO_TR	95	SM card data bus bit 3 pin
	SM_D4	IO_TR	97	SM card data bus bit 4 pin
	SM_D5	IO_TR	96	SM card data bus bit 5 pin
	SM_D6	IO_TR	94	SM card data bus bit 6 pin
	SM_D7	IO_TR	92	SM card data bus bit 7 pin
	SM_RD	IO_TR	86	Read enable pin, active low
	SM_WR	IO_TR	87	Write enable pin, active low
	SM_CLE	IO_TR	84	Command latch enable pin
	GPIO_PC3	IO_TR	83	GPIO pin, used for SM Card detect pin
	SM_RNB	IO_TR	88	Ready/Busy pin
	SM_ALE	IO_TR	85	Address latch enable pin
	SM_WP	IO_TR	89	Write protect pin, active low
MMC/SD Card	SD_D0	IO_TR	59	MMC/SD card data bus bit 0 pin
	SD_D1	IO_TR	58	SD card data bus bit 1 pin
	SD_D2	IO_TR	57	SD card data bus bit 2 pin
	SD_D3	IO_TR	56	SD card data bus bit 3 pin
	SD_CLK	IO_TR	61	MMC/SD card clock pin
	SD_CMD	IO_TR	60	MMC/SD card command pin
MS / MS-Pro Card	MS_BS	IO_TR	72	MS card bus stat signal pin
	MS_SCLK	IO_TR	71	MS card clock signal pin
	GPIO_PB2	IO_TR	70	GPIO pin, used for MS card insertion/extraction detect pin
	MS_D0	IO_TR	69	MS card data bus bit 0 pin
	MS_D1	IO_TR	68	MS card data bus bit 1 pin
	MS_D2	IO_TR	67	MS card data bus bit 2 pin
	MS_D3	IO_TR	66	MS card data bus bit 3 pin
MP3	MP3_D	IO_TR	23	MP3 bit stream output pin, software set MUX bit to turn on this function, software set MUX bit to turn on this function
	MP3_CLK	IO_TR	26	MP3 bit stream transmit clock pin, software set MUX bit to turn on this function, software set MUX bit to turn on this function
	MP3_REQ	IO_TR	24	MP3 bit stream request pin, software set MUX bit to turn on this function, software set MUX bit to turn on this function
Master/Slave IIC	IIC_CL	IO_TR	126	IIC clock pin
	IIC_DA	IO_TR	125	IIC data pin
GPIO	P00	IO_TR	106	Port 0 bit 0
	P01	IO_TR	105	Port 0 bit 1
	P02	IO_TR	104	Port 0 bit 2
	P03	IO_TR	103	Port 0 bit 3
	P04	IO_TR	102	Port 0 bit 4
	P05	IO_TR	101	Port 0 bit 5
	P06	IO_TR	100	Port 0 bit 6
	P07	IO_TR	99	Port 0 bit 7

Function	Signal Name	Dir	Pin Number	Description
	P10	IO_TR	45	Port 1 bit 0
	P11	IO_TR	46	Port 1 bit 1
	P12	IO_TR	47	Port 1 bit 2
	P13	IO_TR	48	Port 1 bit 3
	P14	IO_TR	8	Port 1 bit 4
	P15	IO_TR	49	Port 1 bit 5
	P16	IO_TR	2	Port 1 bit 6
	P17	IO_TR	1	Port 1 bit 7
	P20	IO_TR	80	Port 2 bit 0
	P21	IO_TR	79	Port 2 bit 1
	P22	IO_TR	78	Port 2 bit 2
	P23	IO_TR	77	Port 2 bit 3
	P24	IO_TR	76	Port 2 bit 4
	P25	IO_TR	75	Port 2 bit 5
	P26	IO_TR	74	Port 2 bit 6
	P27	IO_TR	73	Port 2 bit 7
	P30	IO_PU	125	Port 3 bit 0
	P31	IO_PU	126	Port 3 bit 1
	P32	IO_TR	127	Port 3 bit 2
	P33	IO_TR	128	Port 3 bit 3
	P34	IO_TR	51	Port 3 bit 4
	P35	IO_TR	52	Port 3 bit 5
	P36	IO_TR	53	Port 3 bit 6
	P37	IO_TR	54	Port 3 bit 7
	P40	IO_TR	9	Port 4 bit 0
	P41	IO_TR	10	Port 4 bit 1
	P42	IO_TR	11	Port 4 bit 2
	P43	IO_TR	12	Port 4 bit 3
	P44	IO_TR	13	Port 4 bit 4
	P45	IO_TR	14	Port 4 bit 5
	P46	IO_TR	15	Port 4 bit 6
	P47	IO_TR	16	Port 4 bit 7
	P50	IO_TR	106	Port 5 bit 0, share pin with port 0 bit 0, software set MUX bit to turn on this function
	P51	IO_TR	105	Port 5 bit 1, share pin with port 0 bit 1, software set MUX bit to turn on this function
	P52	IO_TR	104	Port 5 bit 2, share pin with port 0 bit 2, software set MUX bit to turn on this function
	P53	IO_TR	103	Port 5 bit 3, share pin with port 0 bit 3, software set MUX bit to turn on this function
	P54	IO_TR	102	Port 5 bit 4, share pin with port 0 bit 4, software set MUX bit to turn on this function
	P55	IO_TR	101	Port 5 bit 5, share pin with port 0 bit 5, software set MUX bit to turn on this function
	P56	IO_TR	100	Port 5 bit 6, share pin with port 0 bit 6, software set MUX bit to turn on this function
	P57	IO_TR	99	Port 5 bit 7, share pin with port 0 bit 7, software set MUX bit to turn on this function
	P60	IO_TR	80	Port 6 bit 0, share pin with port 1 bit 0, software set MUX bit to turn on this function
	P61	IO_TR	79	Port 6 bit 1, share pin with port 1 bit 1, software set MUX bit to turn on this function

Function	Signal Name	Dir	Pin Number	Description
	P62	IO_TR	78	Port 6 bit 2, share pin with port 1 bit 2, software set MUX bit to turn on this function
	P63	IO_TR	77	Port 6 bit 3, share pin with port 1 bit 3, software set MUX bit to turn on this function
	P64	IO_TR	76	Port 6 bit 4, share pin with port 1 bit 4, software set MUX bit to turn on this function
	P65	IO_TR	75	Port 6 bit 5, share pin with port 1 bit 5, software set MUX bit to turn on this function
	P66	IO_TR	74	Port 6 bit 6, share pin with port 1 bit 6, software set MUX bit to turn on this function
	P67	IO_TR	73	Port 6 bit 7, share pin with port 1 bit 7, software set MUX bit to turn on this function
	P70	IO_TR	21	Port 7 bit 0
	P71	IO_TR	22	Port 7 bit 1
	P72	IO_TR	23	Port 7 bit 2
	P73	IO_TR	24	Port 7 bit 3
	P74	IO_TR	25	Port 7 bit 4
	P75	IO_TR	26	Port 7 bit 5
	P76	IO_TR	27	Port 7 bit 6
	P77	IO_TR	28	Port 7 bit 7
	P80	IO_TR	29	Port 8 bit 0
	P81	IO_TR	30	Port 8 bit 1
	P82	IO_TR	31	Port 8 bit 2
	P83	IO_TR	32	Port 8 bit 3
	P84	IO_TR	33	Port 8 bit 4
	P85	IO_TR	34	Port 8 bit 5
	P86	IO_TR	35	Port 8 bit 6
	P87	IO_TR	36	Port 8 bit 7
	P90	IO_TR	38	Port 9 bit 0
	P91	IO_TR	40	Port 9 bit 1
	P92	IO_TR	41	Port 9 bit 2
	P93	IO_TR	42	Port 9 bit 3
	P94	IO_TR	19	Port 9 bit 4
	P95	IO_TR	20	Port 9 bit 5
	P96	IO_TR	43	Port 9 bit 6
	P97	IO_TR	44	Port 9 bit 7
	PA0	IO_TR	90	Port A bit 0
	PA1	IO_TR	91	Port A bit 1
	PA2	IO_TR	93	Port A bit 2
	PA3	IO_TR	95	Port A bit 3
	PA4	IO_TR	97	Port A bit 4
	PA5	IO_TR	96	Port A bit 5
	PA6	IO_TR	94	Port A bit 6
	PA7	IO_TR	92	Port A bit 7
	PB0	IO_TR	72	Port B bit 0
	PB1	IO_TR	71	Port B bit 1
	PB2	IO_TR	70	Port B bit 2
	PB3	IO_TR	86	Port B bit 3
	PB4	IO_TR	87	Port B bit 4
	PB5	IO_TR	84	Port B bit 5
	PB6	IO_TR	48	Port B bit 6
	PB7	IO_TR	37	Port B bit 7

Function	Signal Name	Dir	Pin Number	Description
	PC0	IO_TR	39	Port C bit 0
	PC1	IO_TR	7	Port C bit 1
	PC2	IO_TR	85	Port C bit 2
	PC3	IO_TR	83	Port C bit 3
	PC4	IO_TR	88	Port C bit 4
	PC5	IO_TR	89	Port C bit 5
	PC6	IO_TR	61	Port C bit 6
	PC7	IO_TR	60	Port C bit 7
	PD0	IO_TR	59	Port D bit 0
	PD1	IO_TR	58	Port D bit 1
	PD2	IO_TR	57	Port D bit 2
	PD3	IO_TR	56	Port D bit 3
	PD4	IO_TR	69	Port D bit 4
	PD5	IO_TR	68	Port D bit 5
	PD6	IO_TR	67	Port D bit 6
	PD7	IO_TR	66	Port D bit 7
	PG0	IO_TR	50	Port G bit 0
General	VSS	P	5	Digital ground pin
	VSS_P	P	18	Digital ground pin
	VSS_C	P	63	Digital ground pin
	VSS_P	P	82	Digital ground pin
	VDD_F	P	6	Digital 3.3V power pin
	VDD_P	P	17	Digital 3.3V power pin
	VDD_C	P	62	Digital 2.5V power pin
	VDD_P	P	81	Digital 3.3V power pin
	VDD_R33	P	3	Internal regulator 3.3V input
	VDD_R25	P	4	Internal regulator 2.5V output
	PWR_SW1	P	98	Power switch for 40mA output
	PWR_SW2	P	65	Power switch for 40mA output
	PWR_SW3	P	64	Power switch for 60mA output
	RSTn	I	55	System reset pin, active low
	ALE	O	122	Address latch enable pin
	EAN	I	120	External access enable pin
	PSENN	O	121	Program strobe enable pin
	TM0	I	123	System speed setting bit 0, default is low
	TM1	I	124	System speed setting bit 1, default is low

5. APPLICATION EXAMPLE

USB as major interface

- External all-in-one flash card reader
- PC embedded all-in-one flash card reader

Others

- RS-232 card reader
- Flash Card / NAND flash based MP3 player

6. OPERATING RANGES

Commercial devices case temperature	0 to +70 ℃
VCC supply voltage	+3.0 to 3.6V
Input Voltage	Vss-0.3, V_{DD}+0.3
Oscillator frequency	12 MHz

Operating ranges define those limits between which the functionality of the device is guaranteed.

	Normal	Min.	Max	Unit
Supply voltage	3.3	3.0	3.6	V
High-level input voltage VIH		0.7VCC	VCC	V
Low-level input voltage VIL		0	0.3VCC	V
High-level output voltage VOH		0.8VCC		V
Low-level output voltage VOL			0.2VCC	V

7. DC CHARACTERISTICS

Parameters	Value
Power supply voltage	3.5V for Pre-driver; 4.6V for Post-driver
Input Voltage	6.0V
Output Voltage	4.6V
Operation Temperature	-40°C ~ +125°C
Storage Temperature	-65°C ~ +150 °C

Table Absolute Maximum Ratings

Note: Long-term exposure to absolute maximum ratings may affect device reliability, and permanent damage may occur if operate exceeding the rating. The device should be operated under recommended operating condition.

Parameter	Symbol	Condition	Min.	Nom.	Max.
Input Low Voltage	VIL		0V		0.8V
Input High Voltage	VIH		2.0V		3.6V
Output low voltage	VOL	VDD_C= 2.5V, VDD_P=3.3V, IOL = 2mA			0.4V
Output high voltage	VOH	VDD_C= 2.5V, VDD_P=3.3V, IOH = -2mA	2.4V		
Low level output current	IOL	VOL=0.4V	4.2mA	6mA	8.6mA
Input leakage current	II				±1uA
Output leakage current	IOZ				±10uA

(T_A = 0°C - 70°C, VDD_P, VDD_A = 3.3V±10%, VDD_C, VDD_F, VDD_PLL = 2.5V±10%)

Table Logic pins DC Electrical Characteristics

7.1. USB AT FULL SPEED

Parameter	Conditions	Min.	Nom.	Max.	Units
Differential Input		0.2			V
Differential Common Mode		0.8		2.5	V
SE Low Level				0.8	V
SE High Level		2.0			V
SE Hysteresis		0.1		0.3	V
Low Level	Pull-up Resistor on DP 1.5KΩ			0.3	V
High Level	Pull-Down Resistor on DM 15KΩ	2.8		3.6	V
Output Impedance		40.5	45	49.5	Ω
Input Impedance	Transmit & RPU disable	1			MΩ

Table USB Full Speed DPLUS/DMINUS Pins DC Electrical Characteristics

7.2. USB AT HIGH SPEED

Parameter	Conditions	Min.	Nom.	Max.	Units
Differential Input		0.2			V
Common Mode		0.8		2.5	V
Squelch Differential Threshold				0.8	V
Un-Squelch Differential Threshold		2.0			V
Low Level	45Ω Precision load	-10		10	mV
High Level	45Ω Precision load	300		475	mV
Idle Level		-10		10	mV
Chirp J Differential Voltage	HS termination Resistor disabled, Pull-up Resistor Connected	700		1100	mV
Chirp K Differential Voltage	HS termination Resistor disabled, Pull-up Resistor Connected	-900		-500	mV

Table USB High Speed DPLUS/DMINUS Pins DC Electrical Characteristics

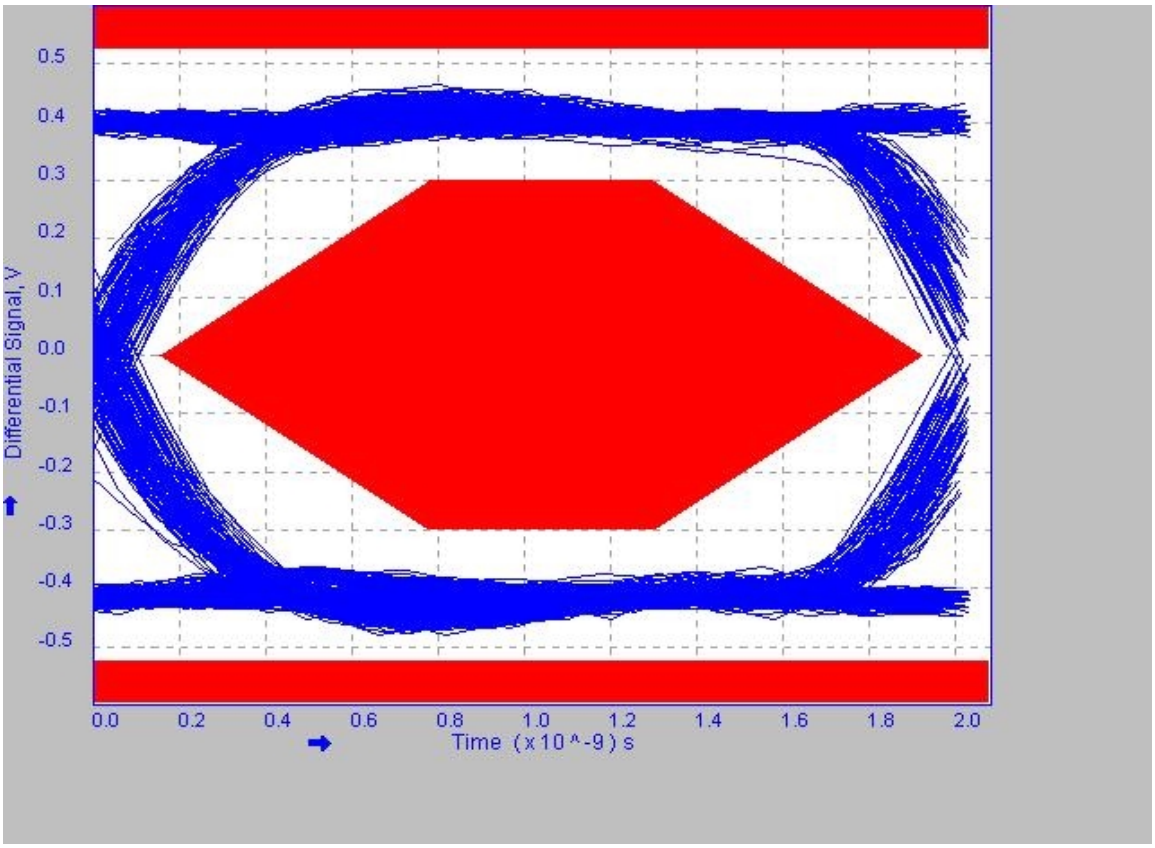
8. AC CHARACTERISTICS

8.1. USB AT FULL SPEED

Parameter	Conditions	Min.	Nom.	Max.	Units
Rise/Fall Time	50pf, 10~90%	4		20	ns
Cross Over Voltage	Excludes the First Transition From Idle State	1.3		2.0	V
Rise/Fall Time Mismatch		90		111.11	%

8.2. USB AT HIGH SPEED

Parameter	Conditions	Min.	Nom.	Max.	Units
Differential Rise/Fall Time		500			ps
Transmit Eye Diagram	Refer to NSTL test report				
Receive Requirements	Refer to NSTL test report				
Input Jitter Tolerance	Refer to NSTL test report				



9. PACKAGE & FINAL PRODUCT INFORMATION

Type	Body Size (mm)	Pin Length (mm)	Pin Pitch (mm)
128 pin LQFP Pb-Free	14 x 14 x 1.4	0.75	0.4