Ours Technology Inc.

OTi-2168

USB 2.0 FLASH DISK CONTROLLER

■ DESCRIPTION

The flash disk controller (OTi-2168) is a USB2.0 mass storage class controller used to make a linear flash device array look likes a normal disk, hiding the flash related problems with erasing.

The OTi-2168 is a controller with USB interface. The USB interface is for high speed operation (480Mb/s). It conforms to USB Specification, Version 2.0. The USB transceiver is embedded in this controller. With stable slew-rate control, the controller reduces EMI.

The OTi-2168 has a Phase Lock Loop (PLL) embedded. The PLL provides all clocks needed in this controller. It needs an externally provided clock operating in 12MHz.

The OTi-2168 can control up to 8 pieces of NAND flash memory. The flash capacity can be 32M bits up to 4G bits. And these chips can be any combination. It has been optimized to support Toshiba and Samsung flash memory designs. It also supports Samsung's K9F and K9W Series flash. The controller has write-protected ability to prevent writing data to flash. The controller has one LED control pin. You can program one of the display modes - operation, suspend, and standby, through provided production program. Comprehensive application software for security function with Windows OS is also available.

This controller can operate in Win XP, Win2000, Windows Me, and Mac OS without any driver installation.

The OTi-2168 is available in cost-saving 48-pin LQFP (7mmX7mm) package.

■ FEATURES

- Mass storage class controller with Universal Serial Bus interface
- USB Specification Compliance
  - — Conforms to high-speed (480Mb/s) USB Specification, Version 2.0
  - — Meet bus power specification
- Integrated USB transceiver
  - — Dynamic feedback control
  - — Stable slew rate, independent of external loading
- Integrated USB Serial Interface Engine (SIE)
- Integrated RISC micro-controller
  - — High-performance RISC architecture
  - — Single cycle instruction execution
- 12 MHz external clock
- 3.3 V power operation

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USB 2.0 FLASH DISK CONTROLLER

- Integrated PLL
- Support up to 8 pieces of NAND Flash memory with write-protected ability
- Support Toshiba and Samsung's K9K series flash
- Support Samsung's K9F and K9W series flash
- Support wear-leveling algorithm
- Higher reliability: ECC on the fly
- Automatic bad block management
- Supported OS:

  Win XP, Win2000, Windows ME, Linux 2.4 above, and MAC OS 9.0 & higher

  Win 98/Win98SE driver available

  Mac 8.6 mass storage driver available from Apple

  Multiple LUN Windows driver is available
- Configurable Vendor ID/Product ID (VID/PID)
- Small form factor - standard 48-pin LQFP (7mmX7mm) package

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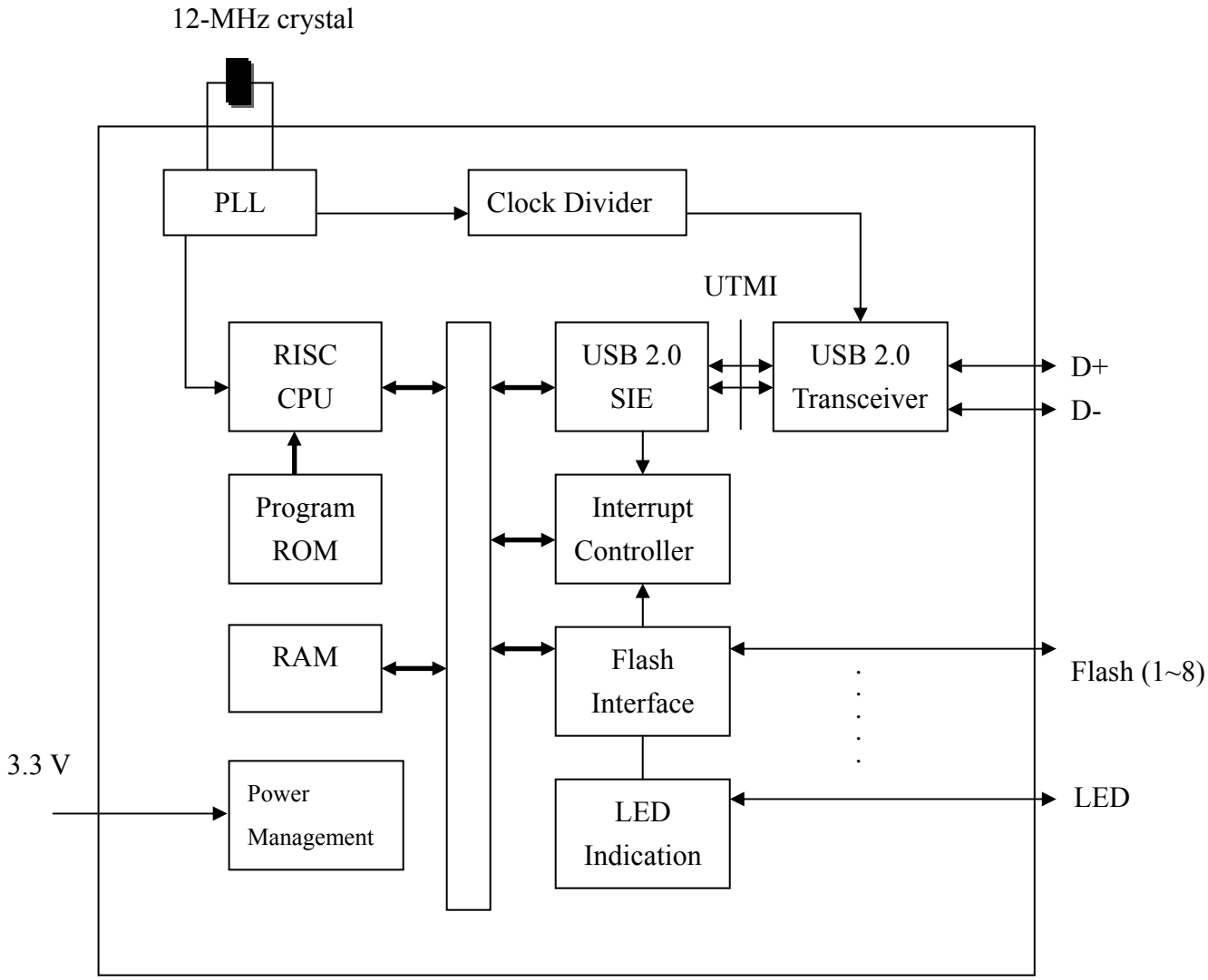
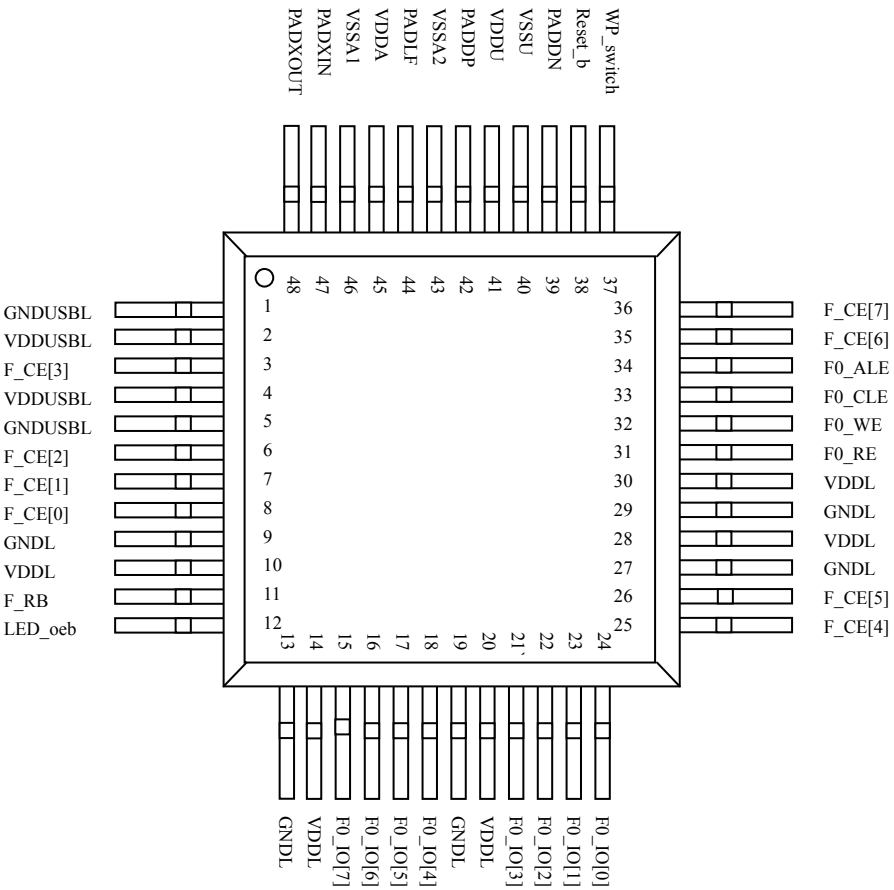
■ BLOCK DIAGRAM



■ PIN CONFIGURATION

LQFP 48 L



■ PIN DESCRIPTION

Pin Name	Attribute	Description	Pin #
GNDUSBL	P	USB logic ground	1
VDDUSBL	P	3.3 V USB logic power	2
F_CE[3]	O	Flash Chip Enable – Chip 3	3
VDDUSBL	P	3.3 V USB logic power	4
GNDUSBL	P	USB logic ground	5
F_CE[2]	O	Flash Chip Enable – Chip 2	6
F_CE[1]	O	Flash Chip Enable – Chip 1	7
F_CE[0]	O	Flash Chip Enable – Chip 0	8
GNDL	P	Logic ground	9
VDDL	P	3.3 Logic power input	10
F_RB	I	Flash Ready/Busy	11
LED1_oeb	O	LED1 indication(open drain)	12
GNDL	P	Logic ground	13
VDDL	P	3.3 Logic power input	14
F0_IO[7]	I/O	Flash data bus – bit 7	15
F0_IO[6]	I/O	Flash data bus – bit 6	16
F0_IO[5]	I/O	Flash data bus – bit 5	17
F0_IO[4]	I/O	Flash data bus – bit 4	18
GNDL	P	Logic ground	19
VDDL	P	3.3 Logic power input	20
F0_IO[3]	I/O	Flash data bus – bit 3	21
F0_IO[2]	I/O	Flash data bus – bit 2	22
F0_IO[1]	I/O	Flash data bus – bit 1	23
F0_IO[0]	I/O	Flash data bus – bit 0	24
F_CE[4]	O	Flash Chip Enable – Chip 4	25
F_CE[5]	O	Flash Chip Enable – Chip 5	26
GNDL	P	Logic ground	27
VDDL	P	3.3 Logic power input	28
GNDL	P	Logic ground	29
VDDL	P	3.3 Logic power input	30
F0_RE	O	Group 1 Flash Read Enable	31

F0_WE	O	Flash Write Enable	32
F0_CLE	O	Group 1 Flash Command Latch Enable	33
F0_ALE	O	Group 1 Flash Address Latch Enable	34
F_CE[6]	O	Flash Chip Enable – Chip 6	35
F_CE[7]	O	Flash Chip Enable – Chip 7	36
WP_switch	I	Write protect switch input	37
Reset_b	I	Power on Reset input	38
PADDN	I/O	USB D-	39
VSSU	P	Analog Ground	40
VDDU	P	Analog Power	41
PADDP	I/O	USB D+	42
VSSA2	P	Analog ground 2	43
PADLF	I/O	Reserved	44
VDDA	P	Analog power	45
VSSA1	P	Analog ground	46
PADXIN	I	Crystal input (12 MHz)	47
PADXOUT	O	Crystal output	48

■ D.C. CHARACTERS

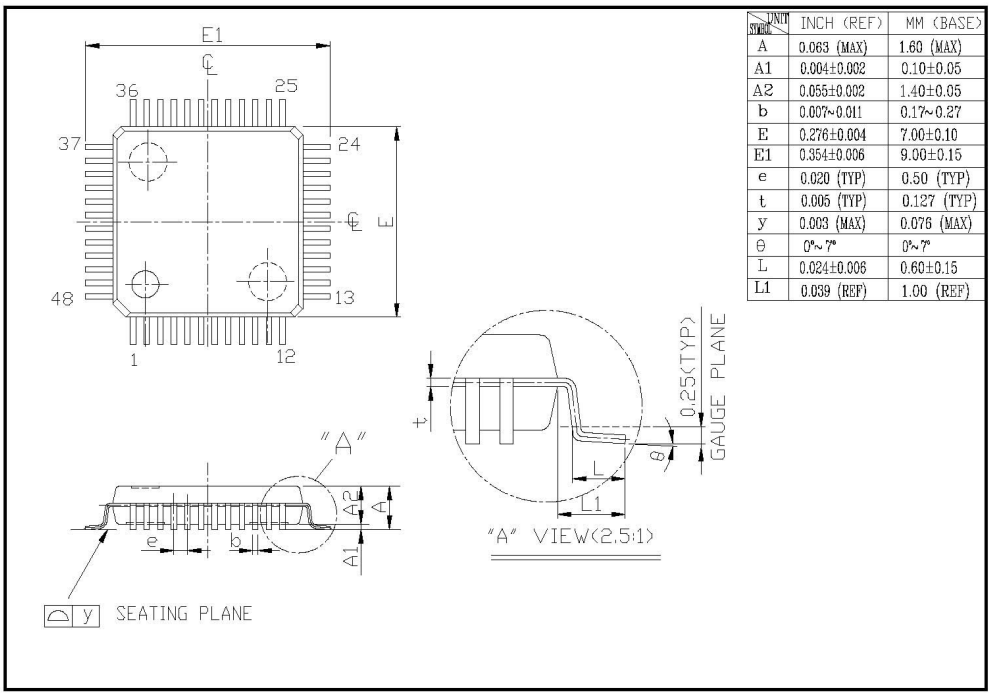
DC Characteristics-1 (Ta=0 °C to +70 °C, Vcc = 3.3V ±10%)

Parameter	Symbol	MIN	TYP	MAX	Unit
Power Supply	VDD	3	3.3	3.6	V
Input Voltage	VIH	0.9x VDD	--	5	V
	VIL	-0.3	--	0.2 x VDD	V
Output Voltage	VOH	VDD-0.4	--	--	V
	VOL	--	--	0.4	V
Input leakage current	ILK	-1	--	1	uA
Working Current	IRW	--		--	mA
Operating Temperature	Ta	0		70	°C
Storage Temperature	Ts	-55		+150	°C
IO output current	IOH	--	4	--	mA
	IOL	--	4	--	mA

■ A.C. CHARACTERS

Parameter	Symbol	MIN	TYP	MAX	Unit
Input rising delay	TPIlh	0.35(2PF)	0.4(4PF)	0.54(8PF)	ns
Input falling delay	TPIhl	0.46(2PF)	0.53(4PF)	0.64(8PF)	ns
Output rising delay	TPOlh	1.35(10PF)	1.97(30PF)	2.59(50pF)	ns
Output falling delay	TPOhl	1.61(10PF)	2.41(30PF)	3.21(50pF)	ns

■ PACKAGE INFORMATION



SYMBOL \ UNIT	INCH (REF)	MM (BASE)
A	0.063 (MAX)	1.60 (MAX)
A1	0.004±0.002	0.10±0.05
A2	0.055±0.002	1.40±0.05
b	0.007~0.011	0.17~0.27
E	0.276±0.004	7.00±0.10
E1	0.354±0.006	9.00±0.15
e	0.020 (TYP)	0.50 (TYP)
t	0.005 (TYP)	0.127 (TYP)
y	0.003 (MAX)	0.076 (MAX)
θ	0°~7°	0°~7°
L	0.024±0.006	0.60±0.15
L1	0.039 (REF)	1.00 (REF)

Note:

OTI reserves the right to make any changes without further notice to any products herein.

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