OTi-2126

7 In 1 Card Reader Controller

■ OVERVIEW

The OTi-2126 is a high-performance and cost-effective Flash Card Reader/Writer Controller developed for interfacing USB2.0 bus to seven types of storage devices: Compact Flash ™ (CF) type I & type II, Micro Drive, SmartMedia ™ (SM), Secure Digital ™ (SD), Multi Media Card ™ (MMC), MemoryStick ™ (MS), and MemoryStick Pro ™. The controller is USB2.0 High-speed for superior data transfer, and complies with USB Mass Storage Class specification ver.1.0 to provide “plug-and-play” function.

The controller also features high integration. It consists of USB 2.0 high-speed transceiver, 8051 microprocessor, interface circuitry of the seven storage devices, 48KB Mask ROM, and 384B SRAM on one chip. The chip is available in 128-pin TQFP package.

Flexibility in firmware upgrade or customization is ensured. The OTi-2126 provides read/write function from/to external Flash memory via USB interface.

Real-time ECC algorithm is implemented to ensure data integrity while still maintaining high data transfer rate.

This controller can operate on Windows XP, Windows 2000, Windows Me, and Mas OS without installing any driver.

■ FEATURES

- Supports CompactFlash ™ (CF) Type I &Type II, SmartMedia ™ (SM), Memory Stick Pro ™ MemoryStick ™ (MS), Secure Digital ™ (SD) and Multi Media Card ™ (MMC) interface on one chip.
- Complies with 480Mbps Universal Serial Bus specification rev.2.0.
- Complies with USB Storage Class specification rev.1.0. (Bulk only protocol).
- Operating System supported: Win XP/ 2000/ Me/ 98/ 98SE; Mac OS 9.x/ X.
- Supports 1 device address and up to 3 endpoints: Control (0)/ Bulk Read (1)/ Bulk Write (2)/ Interrupt (3), and 3 optional Bulk Read/ Write endpoints pair.

- Integrated USB 2.0 transceiver and Serial Interface Engine (SIE).
- Integrated 8051 micro-controller with enhanced feature:
  - — Supports 24MHz clock rate.
  - — 1 clock per instruction cycle.
  - — Embedded 48KB Mask ROM and 384B SRAM.
  - — Supports external 64KB ROM/ Flash for design flexibility.
- Supports firmware upgrade via USB interface.
- Supports external flash read/ write for firmware customization.
- Supports serial EEPROM 93C46 interface for the flexibility of vendor or firmware parameters with EEPROM size up to 128 Bytes.
- High efficiency card interface hardware engine for data transfer.
- CompactFlash ™ interface:
  - — Supports address up to 16 bits, with fix and incremental mode.
  - — Supports 8 / 16 bit data mode and different timing.
  - — Supports WAIT# detection.
  - — Supports multi signal level (3.3 / 5V).
  - — Other control signals like CD1#, CD2#, CE1#, CE2# … etc.
- SmartMedia ™ interface:
  - — Supports address up to 4 bytes, 8 bit data width and different speed.
  - — Supports different page size, and automatic append redundant area data (8/16 bytes).
  - — Hardware ECC generation and verification.
  - — Supports firmware correct page ECC error capability.

— Supports automatic page copy (source page read + destination page write).

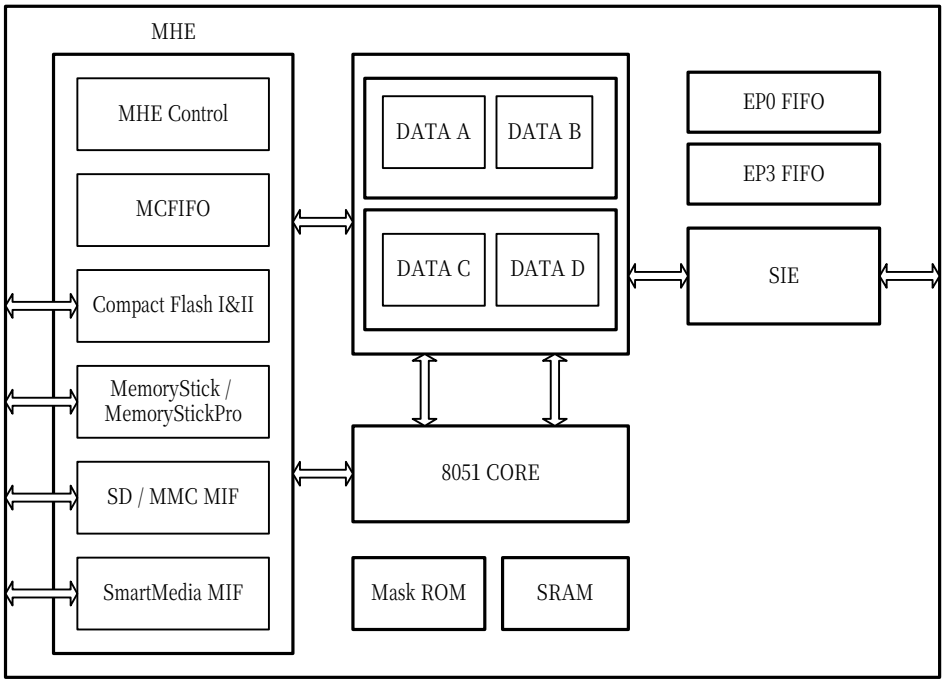
- MemoryStickPro ™ interface
  - — Complies with MemoryStickPro interface specification.
  - — Supports hardware BS/SDIO/SCLK signals.
  - — Supports hardware 4 bit data bus.
  - — Supports automatic CRC16 generation and verification.
  - — Supports hardware CMD timeout detection.
  - — Supports different clock rate up to 24 MHz.
- MemoryStick ™ interface
  - — Complies with MemoryStick interface specification.
  - — Supports hardware BS/SDIO/SCLK signals.
  - — Supports hardware 1 bit data bus.
  - — Supports automatic CRC16 generation and verification.
  - — Supports different clock rate up to 24 MHz.
- Secure Digital ™ / Multi Media Card ™ interface
  - — Complies with Secure Digital / MMC interface specification.
  - — Supports both SD / MMC mode access: CLK/CMD/DAT0/DAT1/DAT2/DAT3.
  - — Command transmit and response receive can be enabled separately.
  - — Automatic CRC7 generation for command and CRC7 verification for response on CMD.
  - — Supports automatic CRC16 generation and verification on DAT3-0.
  - — In addition to full packet transaction, optional single byte/ bit operation on both CMD and DAT line / lines.

— Data processing in block or byte.

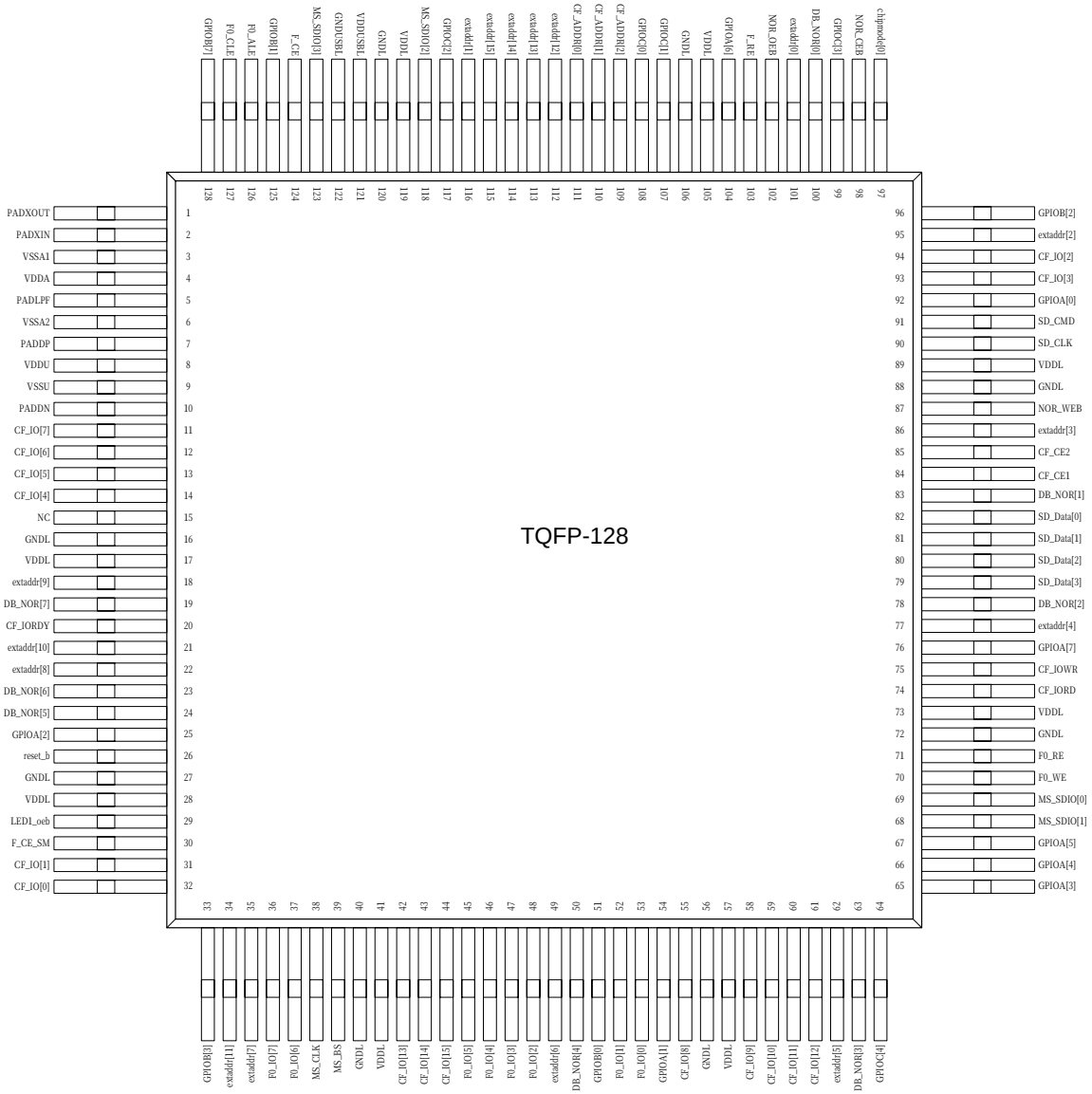
— Supports different clock rate from 375 KHz to 24 MHz.

- ♦ Dedicated power control pins for different cards and power / busy indication.
- ♦ Built-in power-on reset (POR).
- ♦ 3.3 Volt operation.
- ♦ Pin assignment fits to card sockets to provide easier PCB layout.
- ♦ 128-pin TQFP package is available

■ BLOCK DIAGARAM



■ PIN CONFIGURATION



■ PIN DESCRIPTION

The OTi-2126 is available in 128-pin TQFP package to provide low-cost.

Pin No.	Pad Name	Attribute	Description
1	PADXOUT	O	Crystal Output
2	PADXIN	I	Crystal Input
3	VSSA1	P	Along Ground 1
4	VDDA	P	Along Power 1
5	PADLPF	O	PADLPF
6	VSSA2	P	Along Ground 2
7	PADDP	I/O	PADDP
8	VDDU	P	VDDU
9	VSSU	P	VSSU
10	PADDN	O	PADDN
11	CF_IO[7]	I/O	Compact Flash IO[7]
12	CF_IO[6]	I/O	Compact Flash IO[6]
13	CF_IO[5]	I/O	Compact Flash IO[5]
14	CF_IO[4]	I/O	Compact Flash [4]
15	NC		NC
16	GNDL	P	Logic Ground
17	VDDL	P	Logic Power
18	extaddr[9]	I	extaddr[9]
19	DB_NOR[7]	I/O	DB_NOR[7]
20	CF_IORDY	I/O	CF_IORDY
21	extaddr[10]	I	extaddr[10]
22	extaddr[8]	I	extaddr[8]
23	DB_NOR[6]	I/O	DB_NOR[6]
24	DB_NOR[5]	I/O	DB_NOR[5]
25	GPIOA[2]	I/O	SD_CD
26	reset_b	I	Ext. Power on Reset Input
27	GNDL	P	Logic Ground
28	VDDL	P	Logic Power
29	LED1_oeb	O	UFD LED indicator
30	F_CE_SM	O	F_CE_SM

31	CF_IO[1]	I/O	CF_IO[1]
32	CF_IO[0]	I/O	CF_IO[0]
33	GPIOB[3]	I/O	GPIOB[3]
34	extaddr[11]	I	extaddr[11]
35	extaddr[7]	I	extaddr[7]
36	F0_IO[7]	I/O	F0_IO[7]
37	F0_IO[6]	I/O	F0_IO[6]
38	MS_CLK	I/O	Memory Stick CLK
39	MS_BS	O	Memory Stick BS
40	GNDL	P	Logic Ground
41	VDDL	P	Logic Power
42	CF_IO[13]	I/O	CF_IO[13]
43	CF_IO[14]	I/O	CF_IO[14]
44	CF_IO[15]	I/O	CF_IO[15]
45	F0_IO[5]	I/O	F0_IO[5]
46	F0_IO[4]	I/O	F0_IO[4]
47	F0_IO[3]	I/O	F0_IO[3]
48	F0_IO[2]	I/O	F0_IO[2]
49	extaddr[6]	I	extaddr[6]
50	DB_NOR[4]	I/O	DB_NOR[4]
51	GPIOB[0]	I/O	Memory Stick PC
52	F0_IO[1]	I/O	F0_IO[1]
53	F0_IO[0]	I/O	F0_IO[0]
54	GPIOA[1]	I/O	Memory Stick CD
55	CF_IO[8]	I/O	CF_IO[8]
56	GNDL	P	Logic Ground
57	VDDL	P	Logic Power
58	CF_IO[9]	I/O	CF_IO[9]
59	CF_IO[10]	I/O	CF_IO[10]
60	CF_IO[11]	I/O	CF_IO[11]
61	CF_IO[12]	I/O	CF_IO[12]
62	extaddr[5]	I	extaddr[5]
63	DB_NOR[3]	I/O	DB_NOR[3]

64	GPIOC[4]	I/O	SM PC
65	GPIOA[3]	I/O	Compact Flash CD
66	GPIOA[4]	O/	Smart Media CD
67	GPIOA[5]	I/O	CF_rii
68	MS_SDIO[1]	I/O	MS_SDIO[1]
69	MS_SDIO[0]	I/O	MS_SDIO[0]
70	F0_WE	O	F0_WE
71	F0_RE	O	F0_RE
72	GNDL	P	Logic Ground
73	VDDL	P	Logic Power
74	CF_IORD	I/O	CF_IORD
75	CF_IOWR	I/O	CF_IOWR
76	GPIOA[7]	I/O	93C46 Data Input
77	extaddr[4]	I	extaddr[4]
78	DB_NOR[2]	I/O	DB_NOR[2]
79	SD_Data[3]	I/O	SD_Data[3]
80	SD_Data[2]	I/O	SD_Data[2]
81	SD_Data[1]	I/O	SD_Data[1]
82	SD_Data[0]	I/O	SD_Data[0]
83	DB_NOR[1]	I/O	DB_NOR[1]
84	CF_CE1	O	Compact Flash CE1
85	CF_CE2	O	Compact Flash CE2
86	extaddr[3]	I	extaddr[3]
87	NOR_WEB	I/O	NOR Flash write enable
88	GNDL	P	Logic Ground
89	VDDL	P	Logic Power
90	SD_CLK	I	SD_CLK
91	SD_CMD	I	SD_CMD
92	GPIOA[0]	I/O	SM write portect
93	CF_IO[3]	I/O	CF_IO[3]
94	CF_IO[2]	I/O	CF_IO[2]
95	extaddr[2]	I	extaddr[2]
96	GPIOB[2]	I/O	PC_CF, O

97	chipmode[0]	I	chipmode[0]
98	NOR_CEB	O	NOR Flash chip enable
99	GPIOC[3]	I/O	Compact Flash Reset
100	DB_NOR[0]	I/O	DB_NOR[0]
101	extaddr[0]	I	extaddr[0]
102	NOR_OEB	O	NOR Flash Output enable
103	F_RB	I	F_RB
104	GPIOA[6]	I/O	WP_SD, I
105	VDDL	P	Logic Power
106	GNDL	P	Logic Ground
107	GPIOC[1]	I/O	SD LED indicator
108	GPIOC[0]	I/O	Memory Stick LED indicator
109	CF_ADDR[2]	I/O	CF_ADDR[2]
110	CF_ADDR[1]	I/O	CF_ADDR[1]/EE_out[1](GPIOBout[6])
111	CF_ADDR[0]	I/O	CF_ADDR[0]/EE_out[0](GPIOBout[5])
112	extaddr[12]	I	extaddr[12]
113	extaddr[13]	I	extaddr[13]
114	extaddr[14]	I	extaddr[14]
115	extaddr[15]	I	extaddr[15]
116	extaddr[1]	I	extaddr[1]
117	GPIOC[2]	I/O	CF LED indicator
118	MS_SDIO[2]	I/O	Memory Stick SDIO 2
119	VDDL	P	Logic Power
120	GNDL	P	Logic Ground
121	VDDUSBL	P	USB Logic Power
122	GNDUSBL	P	USB Logic Ground
123	MS_SDIO[3]	I/O	Memory Stick SDIO 3
124	F_CE	I	F_CE
125	GPIOB[1]	I/O	PC_SD, O
126	F0_ALE	O	F0_ALE
127	F0_CLE	O	F0_CLE
128	GPIOB7	I/O	93C46 Data Output 2

■ D.C. CHARACTERS

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

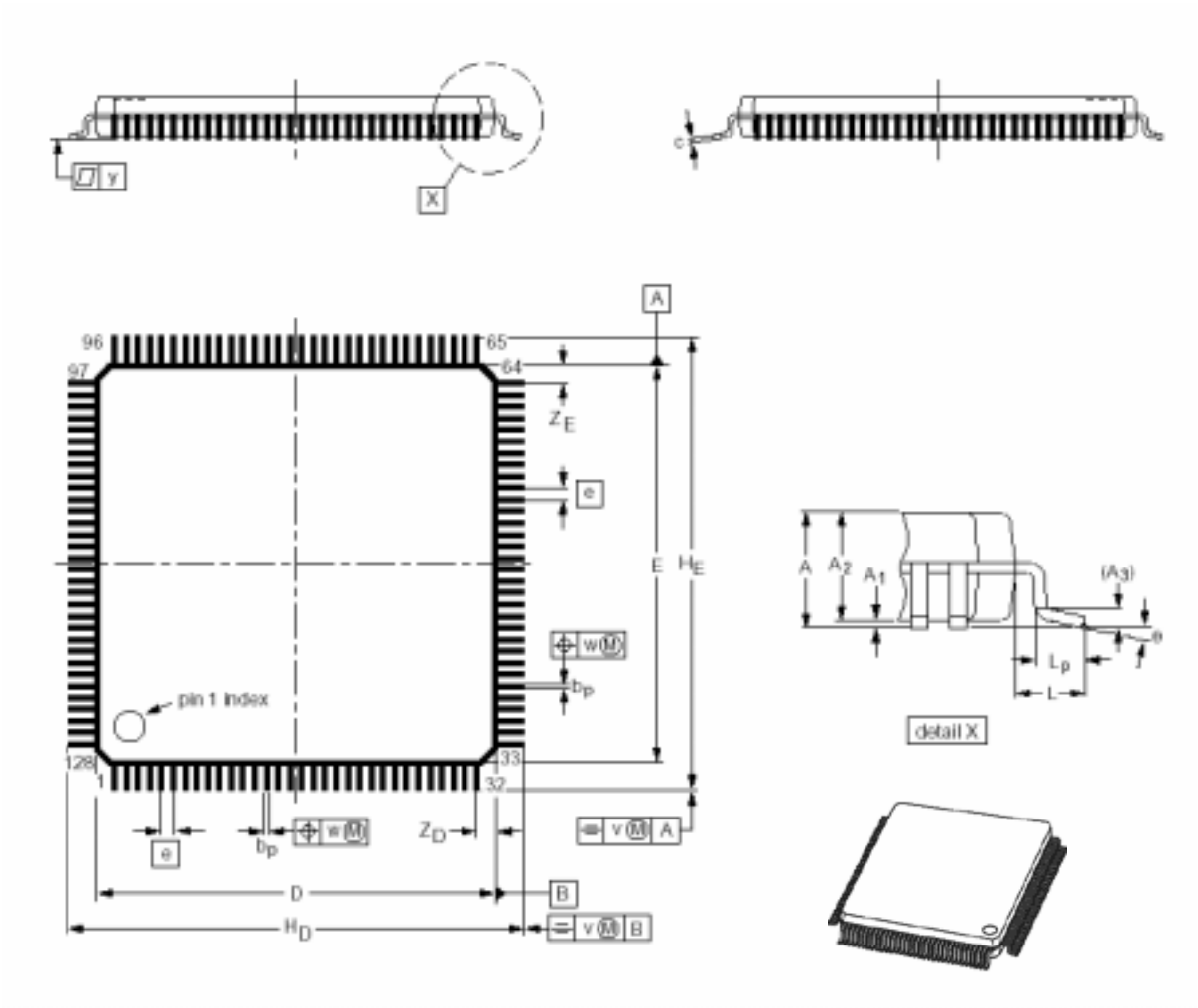
Parameter	Symbol	MIN	TYP	MAX	Unit
Power Supply	VDD	3	3.3	3.6	V
Input Voltage	VIH	0.9x VDD	--	5	V
	VIL	-0.3	--	0.2 x VDD	V
Output Voltage	VOH	VDD-0.4	--	--	V
	VOL	--	--	0.4	V
Input leakage current	ILK	-1	--	1	uA
Working Current	IRW	--		--	mA
Operating Temperature	Ta	0		70	°C
Storage Temperature	Ts	-55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

TQFP-128: plastic low profile quad flat package; 128 leads; body 14 x 14 x 1 mm



DIMENSIONS (mm are the original dimensions)

UNIT	A Max.	A_1	A_2	A_3	bp	c	$D^{(1)}$	$E^{(1)}$	e	H_D	H_E	L	Lp	v	W	y	$Z_D^{(10)}$	$Z_E^{(1)}$	θ
mm	1.2	0.15 0.05	1.05 0.95	0.25	0.23 0.13	0.20 0.09	14.1 13.9	14.1 13.9	0.4	16.15 15.85	16.15 15.85	1	0.75 0.45	0.2	0.07	0.08	0.95 0.65	0.95 0.65	7° 0°

Note

1. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

Note:

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

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