



SK6211Bx

Enhanced UFD Controller

Rev. 3.00

Mar. 24, 2008

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Revision History

Date	Rev	Description
Sep. 12, 2007	1.00	● Establishment.
Dec. 17, 2007	2.00	● Pin name modification.
Jan. 18, 2008	2.10	● Modification of # of CE.
Feb. 01, 2008	2.20	● Add data of I _{DD} and I _{STD}
Mar. 24, 2008	3.00	● Add a new item SK6211BANC

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1. Description

The SK6211 is an Enhanced USB2.0 Flash Disk controller that complies with USB version2.0 specification and USB Mass Storage Class version 1.0 specification. Besides full speed 12Mbps complied with USB1.1 specification, SK6211 can provide a 480Mbps transfer rate. Designed with an enhanced power control circuit, the SK6211 fully complies with USB power specifications for bus-powered devices, making it capable of bus-powered operation.

Besides rich features for UFD application, SK6211 is also addressing how to co-work with next generation NAND which are manufactured in the most advance technology. In order to interface with 50nm NAND, SK6211 ECC capability can correct up to 13 bits error.

❑ **Reliable ECC for 50nm NAND**

SK6211 ECC can provide 13-bit BCH or 8-symbol RS error correction code for 50nm MLC.

❑ **Performance & Low Power**

When dual-channel mode enabled, SK6211 can reach the theoretical limit at 34MB/s for read access and 28MB/s for write access in HDBench.

As emerging of Vista, SK6211 also implements a patenting algorithm to meet *ReadyBoost™* requirement. Any UFD with SK6211 can easily meet 5 MB/sec throughput for random 4KB reads and 3 MB/sec throughput for random 512KB writes and market the UFD with enhancement for Windows® *ReadyBoost™*.

❑ **Saving BOM Cost**

SK6211 required the least numbers of passive components compared with competitor's solution. Moreover, built-in regulator and POR (power-on-reset) can also save BOM cost.

Regarding as FCC ClassB regulatoin, SK6211 had already proven to pass FCC/CE ClassB certification without choke. It will be the biggest benefit to customer BOM cost. Therefore UFD with SK6211 will have the best competitive price in the world.

❑ **Compatibility & Flash Support**

With our superior designs, SK6211 runs smoothly on all most available host systems and supports all kinds of NAND Flash memories from Samsung, Hynix, Toshiba, Intel, Micron and other company, either SLC or MLC, either small-page, 2K page or 4K page, and either x8 or x16 data width. The SK6211 allows the direct connection of up to 8 NAND Flash chips by 4 CE pins.

Therefore, SK6211 will be best choice according to cost per performance.

2. Order Information

Part #	Description	Package
SK6211BAPC	4 CE, 2 WE, 16-bit data width (up to eight x8 NAND Flash), Multi-Partition.	48-pin LQFP
SK6211BANC	8 CE, 1 WE, 8-bit data width (up to eight x8 NAND Flash), Multi-Partition.	46-pin LQFN

3. Features

- ☒ Worldwide first UFD controller for 50nm NAND:
 - ☐ 13-bit BCH or 8-symbol RS error control coding (ECC) suitable for MLC.
 - ☐ Sufficient embedded buffer for 4K page NAND.

- ☒ Passing FCC ClassB without choke.
Built-in regulator and power-on reset (POR) to save BOM.
The least passive components, 13 pcs including R, C, X'tal and LED.

- ☒ Outstanding R/W performance:
 - ☐ HDBench : Read: 34MB/s and Write: 28MB/s.
 - ☐ *ReadyBoost*[™] : >5 MB/sec throughput for random 4KB reads and,
>3 MB/sec throughput for random 512KB writes

- ☒ Enable Multi-Partition features:
 - ☐ One Read-only Partition, two Read-Write Partitions and one Hidden Partition.
 - ☐ Read-only Partition is designated for AutoRun feature.
 - ☐ UFD can have up to two LUNs due to two Read-Write Partitions.
 - ☐ Each Read-Write Partition can be divided into Public Zone and Private Zone further.
 - ☐ Private Zone can be protected by password.
 - ☐ Capacity of each Partition and Zone can sizeable while factory initialization or by application program through vendor specific command.

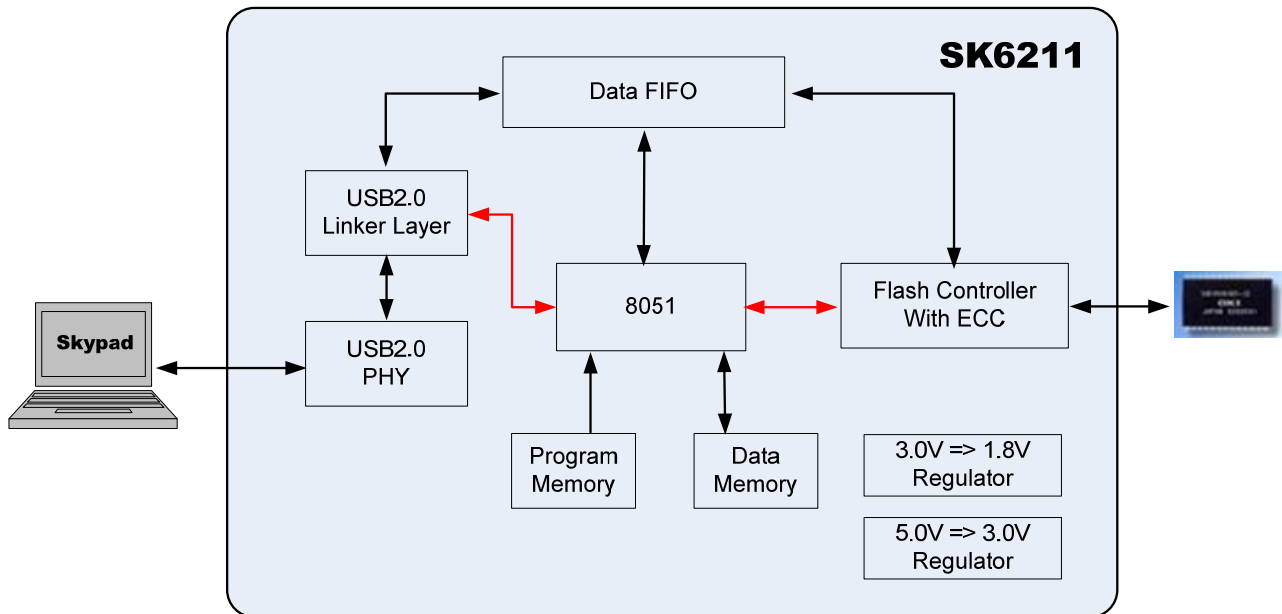
- ☒ USB Interface:
 - ☐ Complied with high-speed USB 2.0 interface, backward compatible with USB 1.1.
 - ☐ Complied with USB Mass Storage Class specification v1.0.
 - ☐ Complied with USB bus-powered devices specification.
 - ☐ Integrated USB 2.0 Transceiver Macrocell Interface (UTMI) and Serial Interface Engine (SIE).

- ☒ Varieties of Supported NAND:
 - ☐ SLC and MLC from Samsung, Hynix, Toshiba, Intel, Micron and STM.
 - ☐ Kinds of page size: 2K large-page and 4K large-page.
 - ☐ Kinds of plane: Single-plane and Two-plane.

- ☒ NAND Interface:
 - ☐ Either single channel (x8 data width) or dual channel (x16 data width)
 - ☐ Support 4 CE pins, i.e. 8 NAND chips.
 - ☐ Up to 32GBytes addressing space.

- ☒ Configurable VID, PID, vendor name and product name.
LED indication of UFD operating status and programmable blinking rate.
Write-Protect feature to protect all UFD data from writing or erasing.

4. Block Diagram

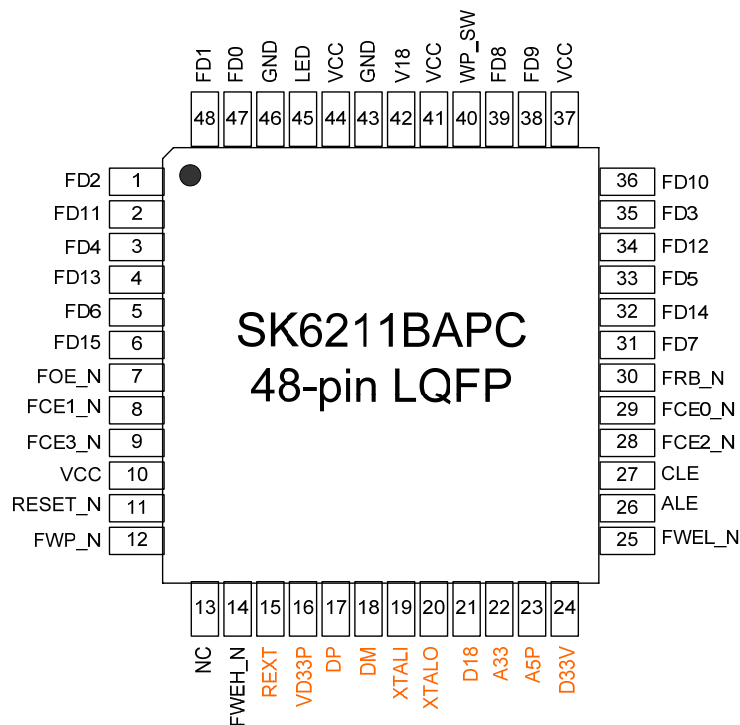


5. Pin Assignment

5.1 48-pin LQFP SK6211BAPC

Pin #	Pin Name	Type	Description
1	FD2	I/O	Flash data bus bit2.
2	FD11	I/O	Flash data bus bit11.
3	FD4	I/O	Flash data bus bit4.
4	FD13	I/O	Flash data bus bit13.
5	FD6	I/O	Flash data bus bit6.
6	FD15	I/O	Flash data bus bit15.
7	FOE_N	O	Flash read enable.
8	FCE1_N	O	Flash chip enable 1.
9	FCE3_N	O	Flash chip enable 3.
10	VCC	Power	Digital power input.
11	RESET_N	In	Controller reset.
12	FWP_N	O	Flash write protect.
13	NC	-----	No connection for normal use.
14	FWEH_N	O	Flash write enable 1 for high byte data.
15	REXT	In	USB PHY reference resistor.
16	VD33P	Power	USB PHY power input.
17	DP	I/O	USB D+.
18	DM	I/O	USB D-.
19	XTALI	In	Oscillator input.
20	XTALO	O	Oscillator output.
21	D18	Power	Regulated 1.8V power output.
22	A33	Power	Analog power output.
23	A5P	Power	Vbus power input.
24	D33V	Power	Digital power output.
25	FWEL_N	O	Flash write enable 0 for low byte data.
26	ALE	O	Flash address latch enable.
27	CLE	O	Flash command latch enable.
28	FCE2_N	O	Flash chip enable 2.
29	FCE0_N	O	Flash chip enable 0.
30	FRB_N	In	Flash ready/busy.
31	FD7	I/O	Flash data bus bit7.
32	FD14	I/O	Flash data bus bit14.

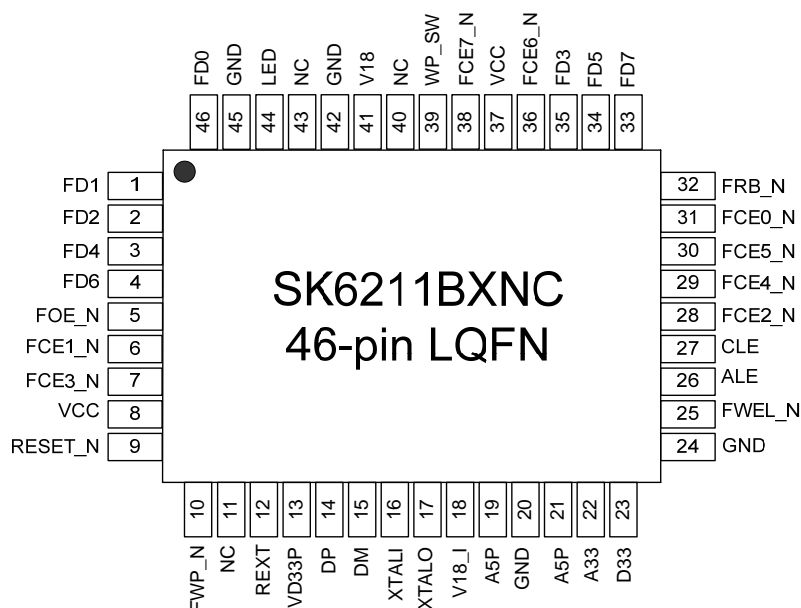
Pin #	Pin Name	Type	Description
33	FD5	I/O	Flash data bus bit5.
34	FD12	I/O	Flash data bus bit12.
35	FD3	I/O	Flash data bus bit3.
36	FD10	I/O	Flash data bus bit10.
37	VCC	Power	Digital power input.
38	FD9	I/O	Flash data bus bit9.
39	FD8	I/O	Flash data bus bit8.
40	WP_SW	In	Write protect switch.
41	VCC	Power	Digital power input.
42	V18	Power	Digital power input.
43	GND	Power	Ground.
44	VCC	Power	Digital power input.
45	LED	O	LED output.
46	GND	Power	Ground.
47	FD0	I/O	Flash data bus bit0.
48	FD1	I/O	Flash data bus bit1.



5.2 46-pin LQFN SK6211BANC

Pin #	Pin Name	Type	Description
1	FD1	I/O	Flash data bus bit1.
2	FD2	I/O	Flash data bus bit2.
3	FD4	I/O	Flash data bus bit4.
4	FD6	I/O	Flash data bus bit6.
5	FOE_N	O	Flash read enable.
6	FCE1_N	O	Flash chip enable 1.
7	FCE3_N	O	Flash chip enable 3.
8	VCC	Power	Digital 3.3V power input.
9	RESET_N	In	Controller reset.
10	FWP_N	O	Flash write protect.
11	NC	-----	No connection for normal use.

Pin #	Pin Name	Type	Description
12	REXT	In	USB PHY reference resistor.
13	VD33P	Power	USB PHY 3.3V power input.
14	DP	I/O	USB D+.
15	DM	I/O	USB D-.
16	XTALI	In	Oscillator input.
17	XTALO	O	Oscillator output.
18	V18_I	Power	USB PHY 1.8V power input.
19	A5P	Power	Vbus power input.
20	GND	Power	Ground.
21	A5P	Power	Vbus power input.
22	A33	Power	Analog 3.3V power output.
23	D33	Power	Digital 3.3V power output.
24	GND	Power	Ground.
25	FWEL_N	O	Flash write enable 0 for low byte data.
26	ALE	O	Flash address latch enable.
27	CLE	O	Flash command latch enable.
28	FCE2_N	O	Flash chip enable 2.
29	FCE4_N	O	Flash chip enable 4.
30	FCE5_N	O	Flash chip enable 5.
31	FCE0_N	O	Flash chip enable 0.
32	FRB_N	In	Flash ready/busy.
33	FD7	I/O	Flash data bus bit7.
34	FD5	I/O	Flash data bus bit5.
35	FD3	I/O	Flash data bus bit3.
36	FCE6_N	O	Flash chip enable 6.
37	VCC	Power	Digital 3.3V power input.
38	FCE7_N	O	Flash chip enable 7.
39	WP_SW	In	Write protect switch.
40	NC	-----	No connection for normal use.
41	V18	Power	Digital 1.8V power output.
42	GND	Power	Ground.
43	NC	-----	No connection for normal use.
44	LED	O	LED output.
45	GND	Power	Ground.
46	FD0	I/O	Flash data bus bit0.



6. Electrical Specifications

6.1 Absolute Maximum Ratings

Following table shows SK6211 stress ratings only. Extended exposure to the maximum ratings might degrade device reliability. Although has protective circuitry to resist damage from electrostatic discharge (ESD), precautions should always be taken to avoid high voltage or electric field.

Symbol	Parameter	Min	Max	Unit
Tstorage	Storage Temperature	- 55	+125	°C
Ta	Ambient Operating Temperature, Commercial	0	75	°C
VD33P	Analog 3.3V Input Voltage	- 0.3	3.6	V
VCC	Digital 3.3V Input Voltage	- 0.3	3.6	V
VA5P	USB +5.0V Input Voltage	-----	5.25	V

6.2 DC Characteristics

Unless otherwise noted, all test conditions are as follows:

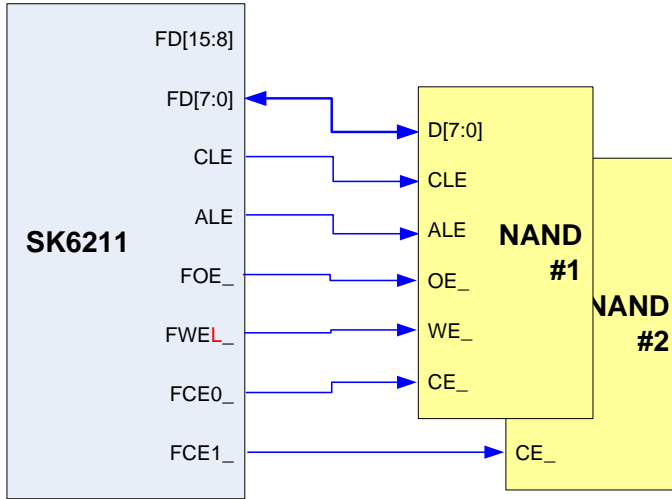
GND=0V, VCC =3.3V±5%, V18=1.8V±5%, Ta=25°C.

Symbol	Description	Min.	Typ.	Max.	Unit
VA5P	USB +5.0V Input Voltage	4.40	5.0	5.25	V
VD33V VA33	Regulator 3.3V Output Voltage	3.0	3.3	3.6	V
VV18	Regulated 1.8V Output Voltage	1.62	1.8	1.98	V
VIH	Input Voltage High	0.625V _{CC}		V _{CC} +0.3	V
VIL	Input Voltage Low	V _{SS} -0.3		0.25V _{CC}	V
VOH	Output Voltage High	0.75V _{CC}			V

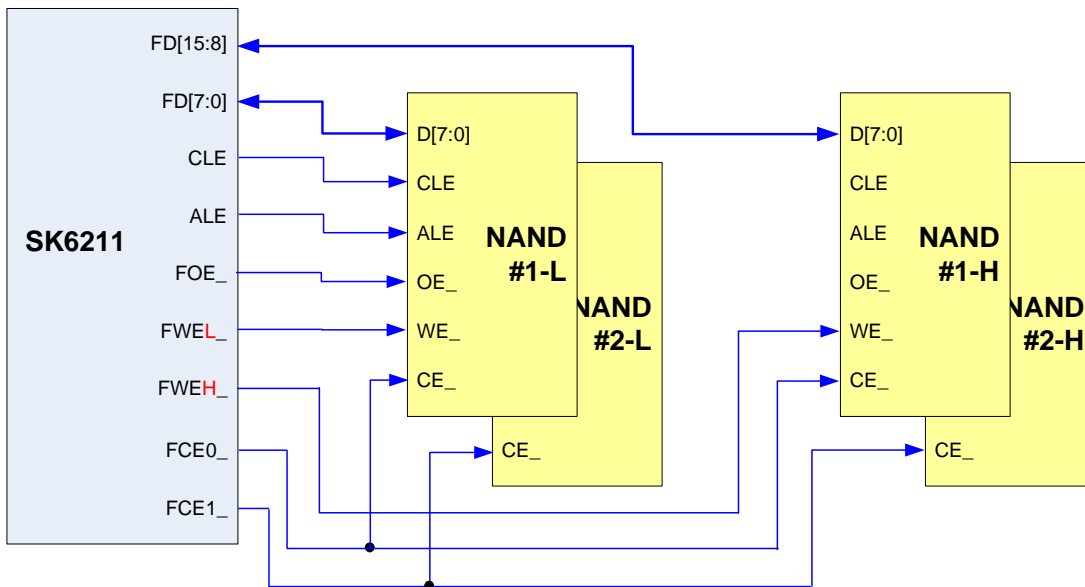
Symbol	Description	Min.	Typ.	Max.	Unit
V _{OL}	Output Voltage Low			0.125V _{CC}	V
C _{in}	Input Pin Capacitance			10	pF
I _{REG}	5V => 3V regulator supply current		300		mA
I _{DD}	Operating Current		80		mA
I _{STD}	Standby Current		45		mA

7. Application Examples

7.1 Single Channel (Byte mode)

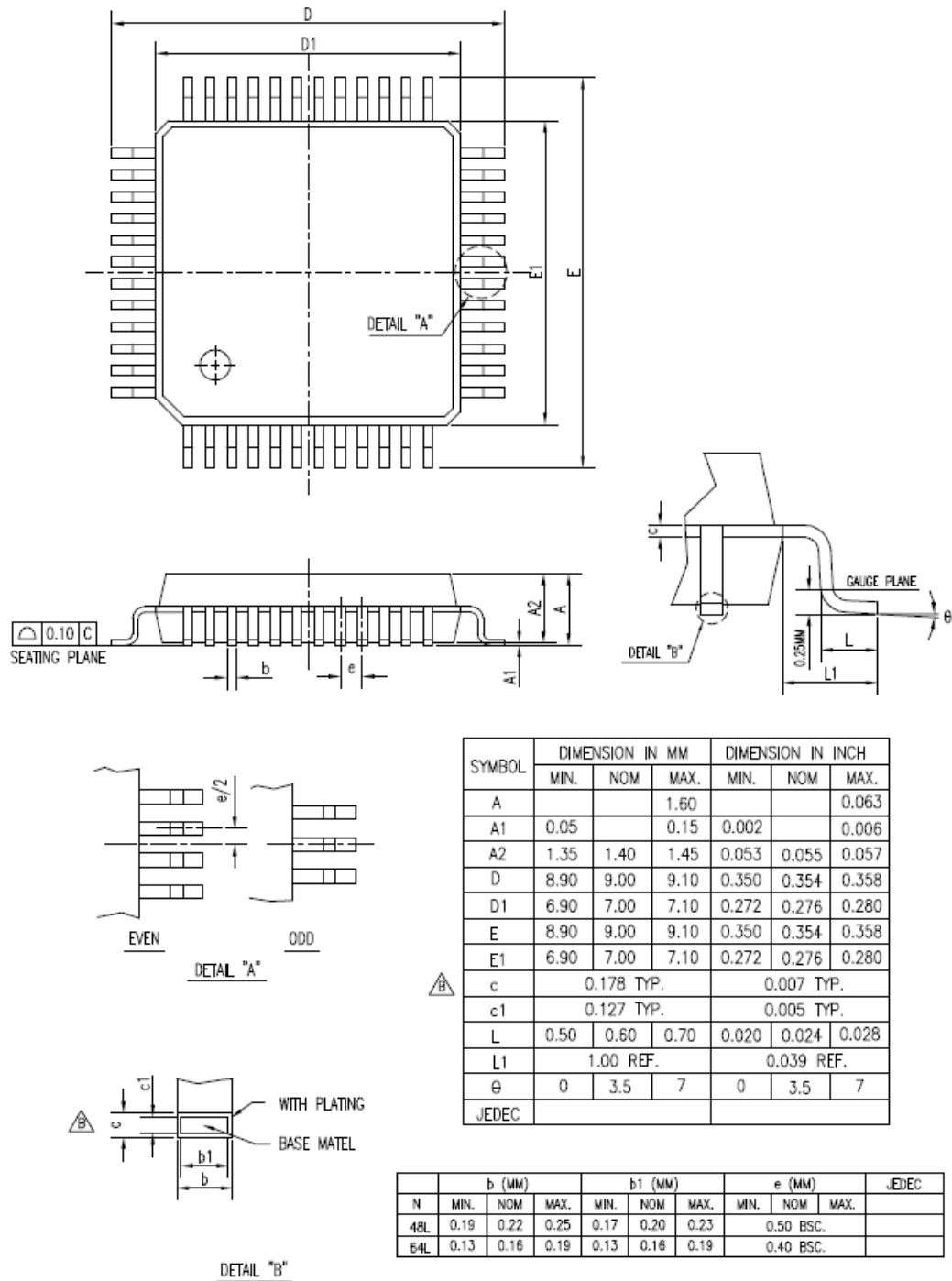


7.2 Dual Channel (Word mode)

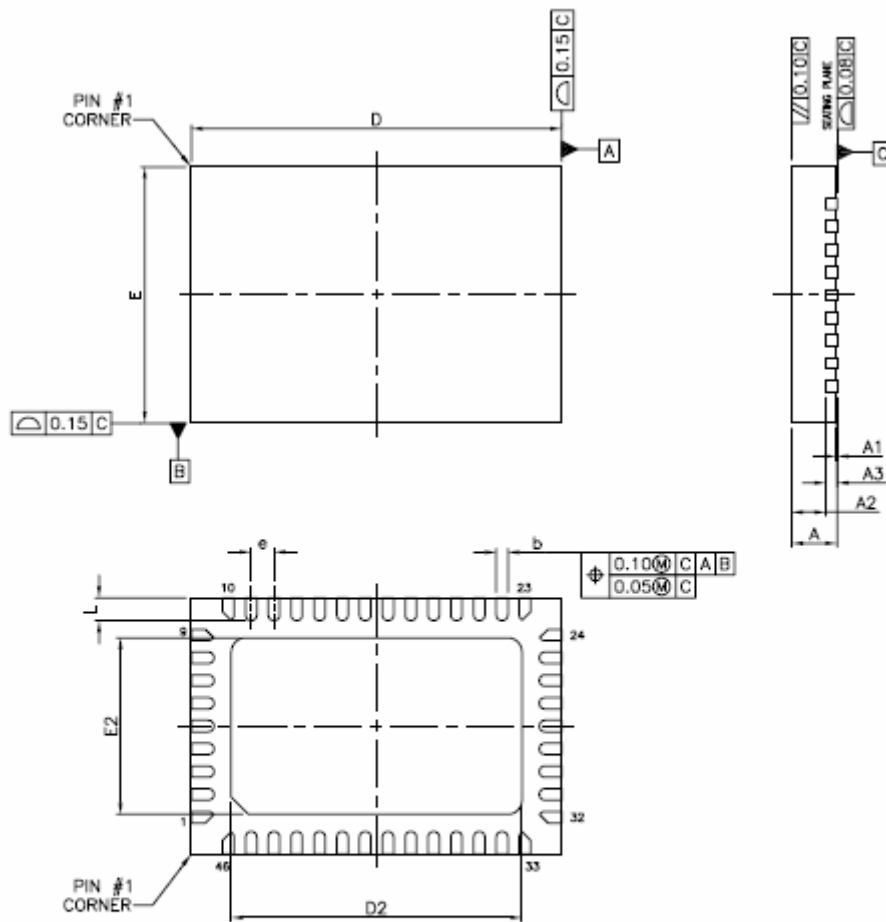


8. Package Dimension

8.1 48-pin LQFP



8.2 46-pin LQFN



SYMBOL	DIMENSION IN MM			DIMENSION IN INCH		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.76	0.80	0.84	0.030	0.031	0.033
A1	0.00	0.02	0.04	0.0000	0.0008	0.0015
A2	0.57	0.60	0.63	0.022	0.024	0.025
A3	0.20 REF.			0.008 REF.		
D	6.40	6.50	6.60	0.252	0.256	0.260
E	4.40	4.50	4.60	0.173	0.177	0.181
JEDEC	MO-220 (REF.)					