

**Winbond  
Integrated Media Reader  
W83L519D**

**W83L519D**  
**Datasheet Revision History**

	Pages	Dates	Version	Version on Web	Main Contents
1		02/Jul.	1.0	1.0	1 <sup>st</sup> Release
2		02/Sep.	1.01	1.01	Remove GPIO function and modify recommend circuit.
3					
4					
5					
6					
7					
8					

Please note that all data and specifications are subject to change without notice. All the trademarks of products and companies mentioned in this data sheet belong to their respective owners.

**LIFE SUPPORT APPLICATIONS**

These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Winbond customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Winbond for any damages resulting from such improper use or sales.

## **CONTENT**

<b>1</b>	<b>GENERAL DESCRIPTION.....</b>	<b>3</b>
<b>2</b>	<b>FUNCTIONS.....</b>	<b>4</b>
2.1	GENERAL .....	4
2.2	SMART CARD INTERFACE .....	4
2.3	MEMORY STICK INTERFACE.....	4
2.4	SD MEMORY CARD INTERFACE .....	4
2.5	PACKAGE .....	4
<b>3</b>	<b>PIN CONFIGURATION .....</b>	<b>5</b>
<b>4</b>	<b>PIN DESCRIPTION .....</b>	<b>6</b>
4.1	BUS INTERFACE.....	6
4.2	SMART CARD INTERFACE PINS.....	7
4.3	MEMORY STICK INTERFACE/SD MEMORY INTERFACE PINS.....	8
4.4	CRYSTAL AND POWER PINS.....	9
<b>5</b>	<b>CONFIGURATION REGISTER .....</b>	<b>10</b>
5.1	PLUG AND PLAY CONFIGURATION .....	10
5.2	COMPATIBLE PNP.....	10
5.2.1	<i>Extended Function Register .....</i>	<i>10</i>
5.2.2	<i>Extended Functions Enable Register (EFER) .....</i>	<i>11</i>
5.2.3	<i>Extended Function Index Register (EFIR), Extended Function Data Register (EFDR) .....</i>	<i>11</i>
5.3	CONFIGURATION SEQUENCE .....	11
5.3.1	<i>Software programming example .....</i>	<i>12</i>
5.4	GLOBAL REGISTERS .....	12
5.5	LOGICAL DEVICE 0 (SMART CARD INTERFACE).....	14
5.6	LOGICAL DEVICE 1 (MEMORY STICK INTERFACE) .....	15
5.7	LOGICAL DEVICE 3 (SD MEMORY INTERFACE) .....	15
<b>6</b>	<b>ORDERING INSTRUCTION.....</b>	<b>17</b>
<b>7</b>	<b>HOW TO READ THE TOP MARKING.....</b>	<b>17</b>
<b>8</b>	<b>PACKAGE DRAWING AND DIMENSIONS .....</b>	<b>17</b>
<b>9</b>	<b>THE W83L519D SCHEMATIC.....</b>	<b>18</b>

## **1 GENERAL DESCRIPTION**

W83L519D is Winbond's innovative solution to a new class of storage devices for IA Notebook, Desktop PC and PC system-related products. It incorporates a security Application: Smart Card Interface and two most promising compact storage interfaces: Memory Stick interface, and Secure Digital Memory Card interface in IT era.

To cater boundless IT implementation possibilities, W83L519D can be configured to interface with host through ISA bus. Base on the ISA interface, one Smart Card Interface port and an optional Memory Stick/SD memory Interface ports are provided. The kind of versatility allows user to design very cost-effective products in a very flexible way.

The whole chip of W83L519D operates at voltage level of 3.3 V except Smart Card Interface port's I/O pins and ISA bus interface that are at 5 V to be compatible with mainstream Smart Card implementations. Advanced power management feature further optimizes power consumption whether in operation or in power down mode.

W83L519D comes as a 48-pin LQFP streamline package. Combining with powerful functions, effective power management, and versatile configurability, this integrated media reader offers a perfect approach for design of storage device of IT products.

The trademarks and intellectual property rights of Memory Stick belong to SONY Corporation. Information check: <http://www.memorystick.org/>

The trademarks and intellectual property rights of Secure Digital belong to SD Group. Information check: <http://www.sdcard.org/>

## **2 FUNCTIONS**

### **2.1 General**

- ☐ Support ISA bus
- ☐ Programmable configuration settings
- ☐ 48 MHz crystal inputs

### **2.2 Smart Card Interface**

- ☐ ISO-7816 compliant
- ☐ PC/SC T=0, T=1 compliant
- ☐ 16-byte transmitter FIFO and 16-byte receiver FIFO
- ☐ FIFO threshold interrupt to optimize system performance
- ☐ Programmable transmission clock frequency
- ☐ Versatile baud rate configuration
- ☐ UART-like register file structure

### **2.3 Memory Stick Interface**

- ☐ Memory Stick Standard Format Specifications ver. 1.3 compliant
- ☐ Support interrupt polling transmission
- ☐ Support FIFO threshold interrupt to optimize system performance
- ☐ Automatic clock halt to prevent underrun/overrun
- ☐ 16 MHz interface clock

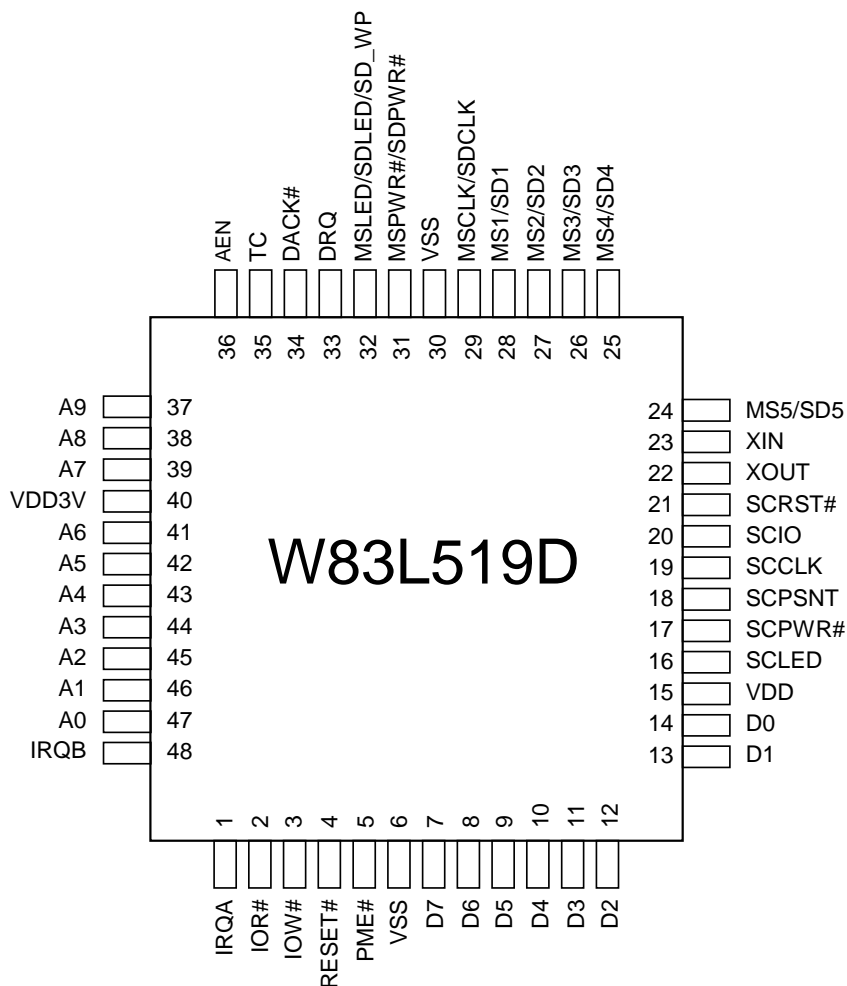
### **2.4 SD Memory Card Interface**

- ☐ SD Memory Card Specifications: Part 1 PHYSICAL LAYER SPECIFICATION Version 1.0 Compliant
- ☐ Support interrupt polling transmission
- ☐ Support FIFO threshold interrupt to leverage system performance
- ☐ 24 MHz interface clock

### **2.5 Package**

- ☐ 48-pin LQFP

## 3 PIN CONFIGURATION



## 4 PIN DESCRIPTION

Note:

IN <sub>tp3</sub>	- 3.3V TTL level input pin
IN <sub>ts</sub>	- 5V TTL level Schmitt-trigger input pin
IN <sub>tsp3</sub>	- 3.3V TTL level Schmitt-trigger input pin
I/O <sub>12t</sub>	- 5V TTL level bi-directional pin with 12 mA drive-sink capability
I/O <sub>24t</sub>	- 5V TTL level bi-directional pin with 24 mA drive-sink capability
I/O <sub>24tp3</sub>	- 3.3V TTL level bi-directional pin with 24 mA drive-sink capability
O <sub>2</sub>	- 5V output pin with 2 mA drive-sink capability
O <sub>12</sub>	- 5V output pin with 12 mA drive-sink capability
O <sub>24p3</sub>	- 3.3V output pin with 24 mA drive-sink capability
OD <sub>12</sub>	- Open-drain output pin with 12 mA sink capability

### 4.1 Bus Interface

SYMBOL	PIN	I/O	FUNCTION
RESET#	4	IN <sub>tsp3</sub>	Active-low system reset signal.
IOW#	3	IN <sub>tsp3</sub>	ISA configuration: Active-low signal to enable ISA I/O write accesses.
IOR#	2	IN <sub>tsp3</sub>	ISA configuration: Active-low signal to enable ISA I/O read accesses.
IRQA	1	O <sub>24p3</sub>	ISA configuration: Interrupt output of Smart Card interface port.
IRQB	48	O <sub>24p3</sub>	ISA configuration: Interrupt output of Memory Stick/SD Memory Card interface port.
A0	47	IN <sub>tp3</sub>	ISA configuration: Address bit 0.
A1	46	IN <sub>tp3</sub>	ISA configuration: Address bit 1.
A2	45	IN <sub>tp3</sub>	ISA configuration: Address bit 2.
A3	44	IN <sub>tp3</sub>	ISA configuration: Address bit 3.
A4	43	IN <sub>tp3</sub>	ISA configuration: Address bit 4.
A5	42	IN <sub>tp3</sub>	ISA configuration: Address bit 5.
A6	41	IN <sub>tp3</sub>	ISA configuration: Address bit 6.
A7	39	IN <sub>tp3</sub>	ISA configuration: Address bit 7.
A8	38	IN <sub>tp3</sub>	ISA configuration: Address bit 8.
A9	37	IN <sub>tp3</sub>	ISA configuration: Address bit 9.

**4.1 Bus Interface (continued.)**

<b>SYMBOL</b>	<b>PIN</b>	<b>I/O</b>	<b>FUNCTION</b>
AEN	36	IN <sub>tp3</sub>	ISA configuration: Active-low I/O address enable signal. It is pulled high in DMA accesses.
TC	35	IN <sub>tp3</sub>	ISA configuration: This pin signals termination of DMA accesses.
DACK#	34	IN <sub>tp3</sub>	ISA configuration: DMA acknowledge. This active-low signal validates DMA accesses.
DRQ	33	O <sub>24p3</sub>	ISA configuration: DMA request signal.
D7	7	I/O <sub>12t</sub>	ISA configuration: System data bit 7.
D6	8	I/O <sub>12t</sub>	ISA configuration: System data bit 6.
D5	9	I/O <sub>12t</sub>	ISA configuration: System data bit 5.
D4	10	I/O <sub>12t</sub>	ISA configuration: System data bit 4.
D3	11	I/O <sub>12t</sub>	ISA configuration: System data bit 3.
D2	12	I/O <sub>12t</sub>	ISA configuration: System data bit 2.
D1	13	I/O <sub>24t</sub>	ISA configuration: System data bit 1.
D0	14	I/O <sub>24t</sub>	ISA configuration: System data bit 0.
PME#	5	OD <sub>12</sub>	Active-low PME event.

**4.2 Smart Card Interface Pins**

<b>SYMBOL</b>	<b>PIN</b>	<b>I/O</b>	<b>FUNCTION</b>
SCLED	16	O <sub>24</sub>	This pin outputs an oscillating clock signal of various frequencies depending on traffic of primary Smart Card interface.
SCPWR#	17	O <sub>24</sub>	Primary Smart Card interface power control signal.
SCPSNT	18	IN <sub>ts</sub>	Primary Smart Card interface card present detection Schmitt-trigger input.
SCCLK	19	O <sub>2</sub>	Primary Smart Card interface clock output.
SCIO	20	I/O <sub>12t</sub>	Primary Smart Card interface data I/O channel.
SCRST#	21	O <sub>12</sub>	Primary Smart Card interface reset output.



### 4.3 Memory Stick Interface/SD Memory Interface Pins

SYMBOL	PIN	I/O	FUNCTION
MSLED	32	O <sub>24p3</sub>	MS/SD select = 0, MS function - This pin outputs an oscillating clock signal of various frequencies depending on traffic of primary Memory Stick interface;
SDLED		O <sub>24p3</sub>	MS/SD select = 1, SD function - This pin outputs an oscillating clock signal of various frequencies depending on traffic of primary SD memory card interface.
SD_WP		IN <sub>ts</sub>	MS/SD select = 1, SD function – Write protect input signal.
MSPWR#	31	O <sub>24p3</sub>	MS/SD select = 0, MS function - This pin is power control signal for primary Memory Stick interface;
SDPWR#		O <sub>24p3</sub>	MS/SD select = 1, SD function - This pin is power control signal for primary SD memory card interface.
MSCLK	29	O <sub>24p3</sub>	MS/SD select = 0, MS function - This pin is SCLK for primary Memory Stick interface;
SDCLK		O <sub>24p3</sub>	MS/SD select = 1, SD function - This pin is CLK for primary SD memory card interface.
MS1	28	O <sub>24p3</sub>	MS/SD select = 0, MS function - This pin is MS1 for primary Memory Stick interface;
SD1		I/O <sub>24tp3</sub>	MS/SD select = 1, SD function - This pin is SD1 for primary SD memory card interface.
MS2	27	I/O <sub>24tp3</sub>	MS/SD select = 0, MS function - This pin is MS2 for primary Memory Stick interface;
SD2		I/O <sub>24tp3</sub>	MS/SD select = 1, SD function - This pin is SD2 for primary SD memory card interface.
MS3	26	---	MS/SD select = 0, MS function - This pin is MS3 for primary Memory Stick interface;
SD3		I/O <sub>24tp3</sub>	MS/SD select = 1, SD function - This pin is SD3 for primary SD memory card interface.
MS4	25	IN <sub>tsp3</sub>	MS/SD select = 0, MS function - This pin is MS4 for primary Memory Stick interface;
SD4		I/O <sub>24tp3</sub>	MS/SD select = 1, SD function - This pin is SD4 for primary SD memory card interface.

## 4.3 Memory Stick Interface/SD Memory Interface Pins (Continued.)

SYMBOL	PIN	I/O	FUNCTION
MS5	24	---	MS/SD select = 0, MS function - This pin is MS5 for primary Memory Stick interface;
SD5		I/O <sub>24tp3</sub>	MS/SD select = 1, SD function - This pin is SD5 for primary SD memory card interface.

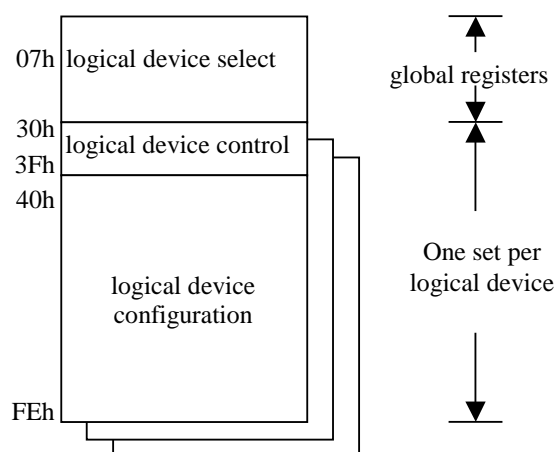
## 4.4 Crystal and Power Pins

SYMBOL	PIN	FUNCTION
XOUT, XIN	22, 23	Connected to a 48 MHz crystal and function as the working clock for all the media reader interfaces.
VDD3V	40	+3.3V power supply for host interface, MSI/SDI interfaces, and internal core.
VDD	15	+5V power supply for Smart Card interface I/O pins.
VSS	6, 30	Ground.

## 5 CONFIGURATION REGISTER

### 5.1 Plug and Play Configuration

W83L519D implement compatible PNP protocol to access configuration registers for setting up different types of configurations. There are three Logical Devices (Logical Device 0 to Logical Device 2) in W83L518D/W83L519D which correspond to three major functions: Smart Card Interface (logical device 0), Memory Stick Interface/SD memory Interface (logical device 1), GPIO (logical device 2). Each Logical Device has its own configuration registers (CR30 and above). Host can access those registers by writing an appropriate logical device number into logical device select register at CR7 first.



### 5.2 Compatible PnP

#### 5.2.1 Extended Function Register

W83L518D/W83L519D provide two methods to enter Extended Function mode (compatible PnP) and access configuration registers dependent on value of HEFRAS (bit 6 of CR26) as follows:

HEFRAS	address and value
0	write 83h to I/O address 2Eh twice
1	write 83h to I/O address 4Eh twice

In Compatible PnP, a specific value (83h) must be written twice to the Extended Function Enable Register (EFER at I/O address 2Eh or 4Eh). Secondly, an index value (02h, 07h-FFh) must be written to the Extended Function Index Register (EFIR, I/O address at 2Eh or 4Eh which is the same as EFER) to identify which configuration register is to be accessed. User can then access the addressed configuration register through the Extended Function Data Register (EFDR, I/O address at 2Fh or 4Fh).

After programming of the configuration register is completed, another specific value (AAh) should be written to EFER to leave Extended Function mode to prevent inadvertent accesses to those configuration registers. User may write a "1" to bit 5 of CR26 (LOCKREG) to prevent configuration registers from accidental accesses.

### **5.2.2 Extended Functions Enable Register (EFER)**

After a power-on reset, W83L518D/W83L519D enters the default operation mode. A specific value must be programmed into the Extended Function Enable Register (EFER) so that configuration registers can be accessed. On a PC/AT system, its I/O address is 2Eh or 4Eh (as described in previous section).

### **5.2.3 Extended Function Index Register (EFIR), Extended Function Data Register (EFDR)**

After entering Extended Function mode, Extended Function Index Register (EFIR) must be written with an index value (02h, 07h-FEh) to specify which configuration register is to be accessed through Extended Function Data Register (EFDR). EFIR is a write-only register at I/O address 2Eh or 4Eh (as described in section 6.2.1) on a PC/AT system and EFDR is a read/write register at I/O address 2Fh or 4Fh.

## **5.3 Configuration Sequence**

To program configuration registers, specific configuration sequence must be followed:

- (1) Write 83h to EFER twice to enter Extended Function mode.
- (2) Select logical device select register by writing 07h to EFIR.
- (3) Select logical device by writing a value to EFDR.
- (4) Select control/configuration register by writing its index to EFIR.
- (5) Access selected control/configuration register through EFDR.
- (6) Repeat step 4 ~ 5 as needed.
- (7) Leave Extended Function mode by writing AAh to EFER.

Step 2 and step 3 are not necessary for accessing global register (index 00h to 2Fh).

### 5.3.1 Software programming example

The following example is written in Intel 8086 assembly language. EFER and EFIR are assumed to be at 2Eh, and EFDR is at 2Fh. Use 4Eh/4Fh instead of 2Eh/2Fh if HEFRAS (bit 6 of CR26) is set.

```

;-----
; Enter Extended Function mode, interruptible double-write |
;-----
MOV     DX, 2Eh
MOV     AL, 83h
OUT     DX, AL
OUT     DX, AL
;-----
; Configure logical device 1, configuration register CRF0 |
;-----
MOV     DX, 2Eh
MOV     AL, 07h
OUT     DX, AL          ; point to Logical Device Number Reg.
MOV     DX, 2Fh
MOV     AL, 01h
OUT     DX, AL          ; select logical device 1
;
MOV     DX, 2Eh
MOV     AL, F0h
OUT     DX, AL          ; select CRF0
MOV     DX, 2Fh
MOV     AL, 3Ch
OUT     DX, AL          ; update CRF0 with value 3CH
;-----
; Exit extended function mode |
;-----
MOV     DX, 2Eh
MOV     AL, AAh
OUT     DX, AL

```

## 5.4 Global Registers

### CR02 (Default 00h, write only)

Bit [7:1]: Reserved.

Bit 0: SWRST

= 0      Normal operation.

= 1      Software reset.

### CR07 (Default 00h)

Bit [7:0]: Logical Device Number.

### CR20 (read only)

Bit [7:0]: Device ID number (higher byte).

= 71h

**CR21 (read only)**

Bit [7:0]: Device ID number (lower byte)

= 2Xh

**CR22 (Default 80h)**

Bit 7: SCPWD

= 0      Power down Smart Card interface.

= 1      No Power down.

Bit 6: MSPWD

= 0      Power down Memory Stick interface.

= 1      No Power down.

Bit 5: SDPWD

= 0      Power down SD memory card interface.

= 1      No Power down.

Bit [4:0]: Reserved.

**CR23 (Default 00h)**

Bit 7: PME\_EN. Power management event enable bit.

= 0      PME\_L function is disabled.

= 1      Enable to issue a low pulse on PME\_L when a power management event occurs.

Bit 6: MSPME\_EN. Memory Stick interface power management event enable bit.

= 0      Memory Stick interface power management event is disabled.

= 1      Enable Memory Stick interface power management event to issue a low pulse on PME\_L when PME\_EN is also enabled.

Bit 5: SDPME\_EN. SD memory card interface power management event enable bit.

= 0      SD memory card interface power management event is disabled.

= 1      Enable SD memory card interface power management event to issue a low pulse on PME\_L when PME\_EN is also enabled.

Bit 4: SCPME\_EN. Smart Card interface power management event enable bit.

= 0      Smart Card interface power management event is disabled.

= 1      Enable Smart Card interface power management event to issue a low pulse on PME\_L when PME\_EN is also enabled.

Bit [3:0]: Reserved.

**CR24 (Default 00h)**

Bit 7: Reserved.

Bit 6: MSPME\_STS. Memory Stick interface power management event status bit.

- = 0 No Memory Stick interface power management event occurs.
- = 1 Memory Stick interface power management event occurs.
- Bit 5: SDPME\_STS. SD memory card interface power management event status bit.
  - = 0 No SD memory card interface power management event occurs.
  - = 1 SD memory card interface power management event occurs.
- Bit 4: SCPME\_STS. Smart Card interface power management event status bit.
  - = 0 No Smart Card interface power management event occurs.
  - = 1 No Smart Card interface power management event occurs.
- Bit [3:0]: Reserved.

**CR26 (Default 00h)**

- Bit 7: Reserved
- Bit 6: HEFRAS, Extended Function Register Address Select.
  - = 0 Extended Function Registers are at 2Eh/2Fh.
  - = 1 Extended Function Registers are at 4Eh/4Fh.
- Bit 5: LOCKREG
  - = 0 Enable accesses of Configuration Registers.
  - = 1 Disable accesses of Configuration Registers.
- Bit [4:0]: Reserved

**5.5 Logical Device 0 (Smart Card Interface)****CR30 (Default 0x00)**

- Bit [7:1]: Reserved.
- Bit 0: Logical device active bit.
  - = 0 Logical device is inactive.
  - = 1 Activates the logical device.

**CR60, CR61 (Default 0x00, 0x00)**

These two registers select Smart Card base address [0x100:0xFFFF] on 8-byte boundary.

**CR70 (Default 0x00)**

- Bit [7:4]: Reserved.
- Bit [3:0]: These bits select IRQ resource for Smart Card interface.

**CRF0 (Default 0x00)**

- Bit [7:1]: Reserved.
- Bit 0: SCPSNT\_POL (Smart Card PreSeNT POLarity). SCPSNT polarity bit.
  - = 0 SCPSNT is active high.
  - = 1 SCPSNT is active low.

## 5.6 Logical Device 1 (Memory Stick Interface)

### CR30 (Default 0x00)

Bit [7:1]: Reserved.

Bit 0: Logical device active bit.

= 0: Logical device is inactive.

= 1: Activates the logical device.

### CR60, CR61 (Default 0x00, 0x00)

These two registers select MSI base address [0x100:0xFFFF] on 8-byte boundary.

### CR70 (Default 0x00)

Bit [7:4]: Reserved.

Bit [3:0]: These bits select IRQ resource for MSI.

### CR74 (Default 0x04)

Bit [7:4]: Reserved.

Bit [3:0]: These bits select DRQ resource for MSI.

## 5.7 Logical Device 3 (SD Memory Interface)

### CR30 (Default 0x00)

Bit [7:1]: Reserved.

Bit 0: Logical device active bit.

= 0 Logical device is inactive.

= 1 Activates the logical device.

### CR60, CR61 (Default 0x00, 0x00)

These two registers select SD Card interface base address [0x100:0xFFFF] on 8-byte boundary.

### CR70 (Default 0x00)

Bit [7:4]: Reserved.

Bit [3:0]: These bits select IRQ resource for SD interface.

### CR74 (Default 0x00)

Bit [7:4]: Reserved.

Bit [3:0]: These bits select DRQ resource for SD interface.

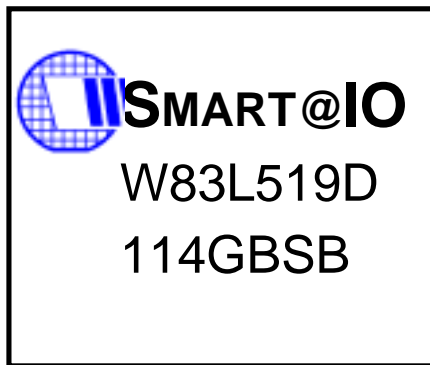




## 6 ORDERING INSTRUCTION

PART NO.	PACKAGE	REMARKS
W83L519D	48-pin LQFP	

## 7 HOW TO READ THE TOP MARKING



1st line: Winbond logo and the SMART@IO Trademark

2nd line: The chip part number.

3rd line: Tracking code 114 G BSB

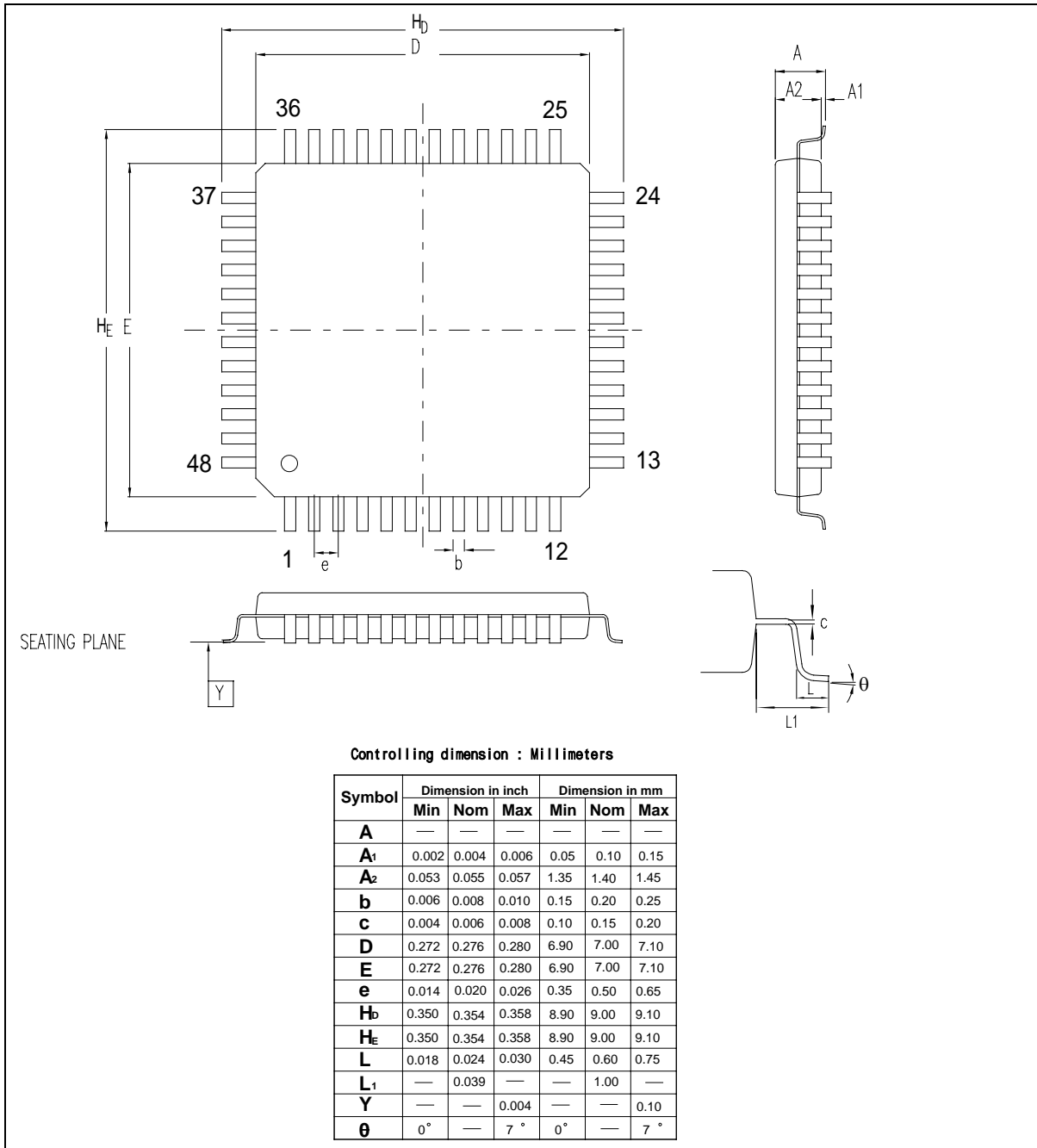
114: packages made in '01, week 14

G: assembly house ID; O means OSE, G means GR, ...

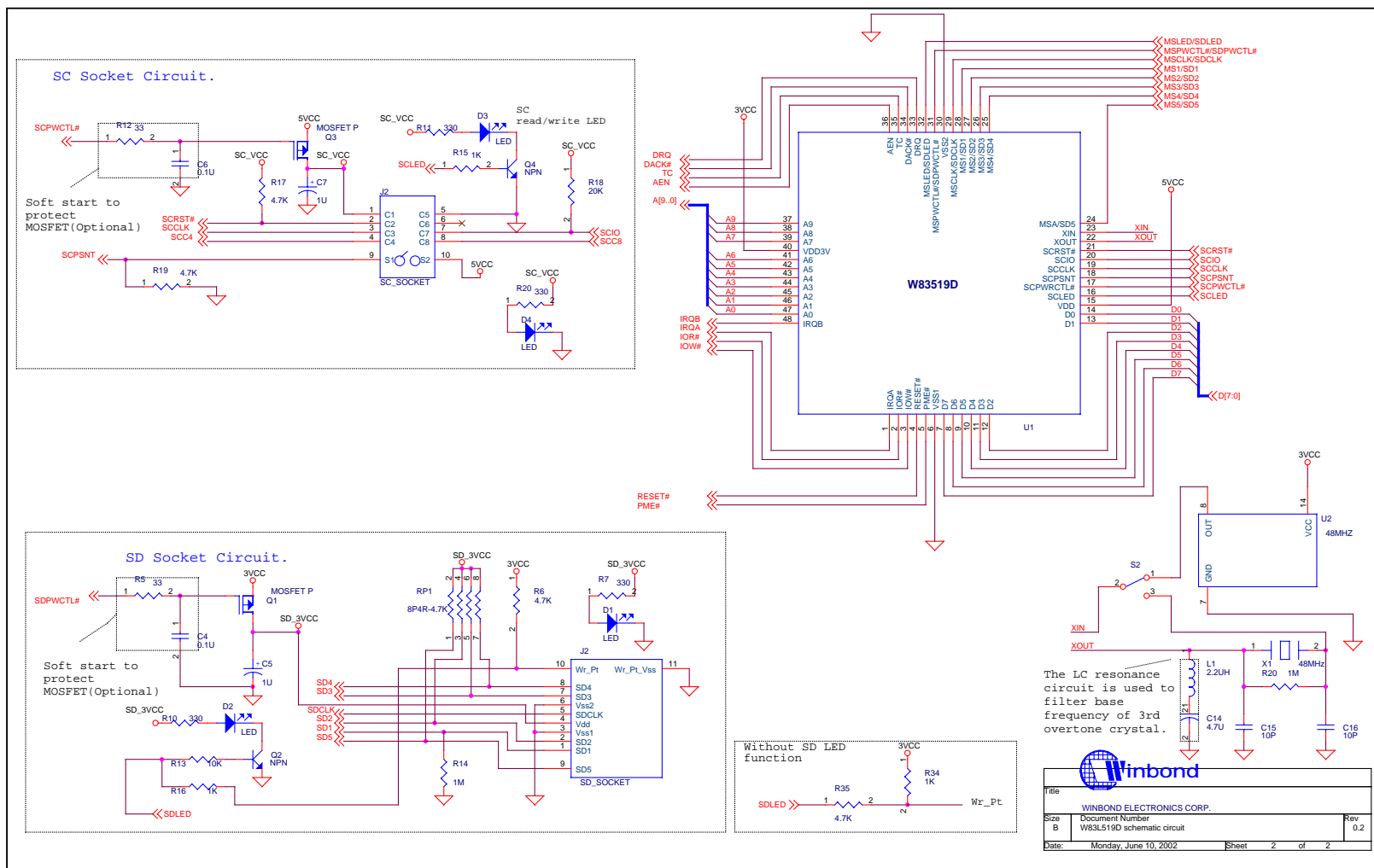
BSB: IC revision

## 8 PACKAGE DRAWING AND DIMENSIONS

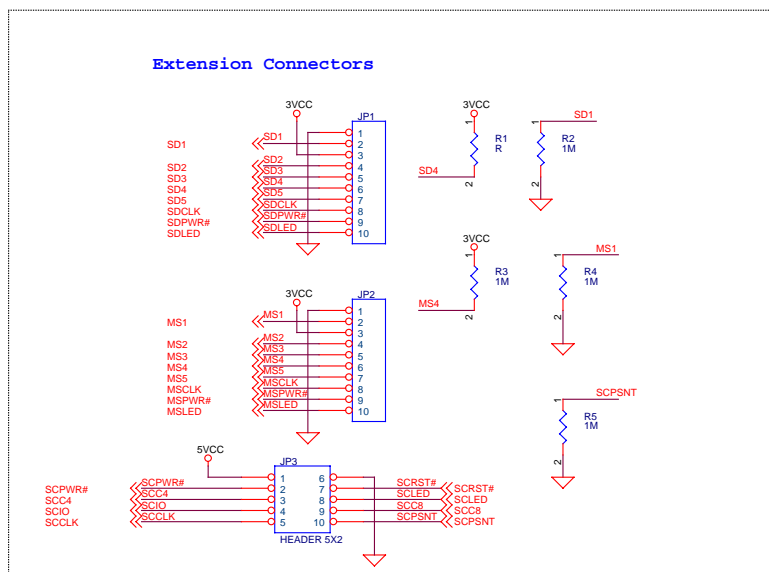
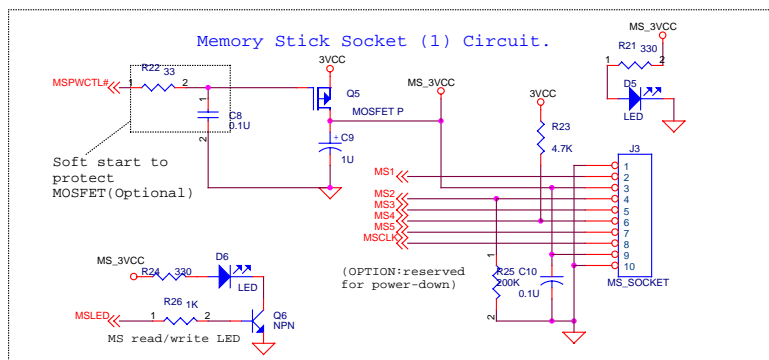
Package- 48-pin LQFP



## 9 THE W83L519D SCHEMATIC



## The W83L519D Schematic

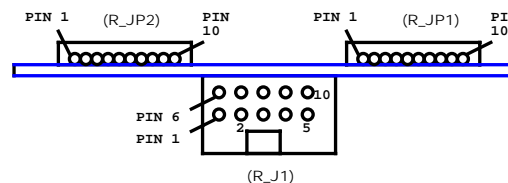


## Winbond Recommended Reader Board

### <<Connector Side>>

R\_JP1,2: 1x10 ; 2.0 mm(pitch)

R\_J1 : 2x5 ; 2.54 mm(pitch)



**Note 1:**These IRQ signals (IRQA,IRQB) can tie to IRQX(IRQ3,4,...) of ISA bus or compatible ones.

**Note 2:**These DMA signals (DRQ,DACK#) can tie to which pair (DRQ1,DACK1#,...) of ISA bus or compatible ones.(except 16 bits DMA transaction)

**Note 3:**The RESET# should be connected with a low asserted signal.(active low)

**Note 4:**There is either function of SD and MS can be used and depeneded on the design.

**Note 5:**If any of SC or MS/SD function isn't intened to use, signal SCPSNT should be tied to a pull-down resitor and MS4/SD4 to a pull-high one. (recommended: 4.7K Ohm )

**Note 6:**The trade marks and intellectual property rights of Memory Stick belong to SONY Corporation.  
Information check: <http://www.memorystick.org>



Title		
WINBOND ELECTRONICS CORP.		
Size	Document Number	Rev
B	W83L519D schematic circuit	0.2
Date:	Monday, June 10, 2002	Sheet 2 of 2



# W83L519D



## Headquarters

No. 4, Creation Rd. III  
Science-Based Industrial Park  
Hsinchu, Taiwan  
TEL: 886-35-770066  
FAX: 886-35-789467  
www: <http://www.winbond.com.tw/>

## Winbond Electronics (H.K.) Ltd.

Rm. 803, World Trade Square, Tower II  
123 Hoi Bun Rd., Kwun Tong  
Kowloon, Hong Kong  
TEL: 852-27516023-7  
FAX: 852-27552064

## Winbond Electronics

(North America) Corp.  
2727 North First Street  
San Jose, California 95134  
TEL: 1-408-9436666  
FAX: 1-408-9436668

## Taipei Office

9F, No. 480, Rueiguang Road, Neihsu District,  
Taipei, 114, Taiwan  
TEL: 886-2-81777168  
FAX: 886-2-87153579

**Please note that all data and specifications are subject to change without notice.  
All the trademarks of products and companies mentioned in this data sheet  
belong to their respective owners.**

These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Winbond customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Winbond for any damages resulting from such improper use or sale