W83L761G

WINBOND
H/W MONITORING IC

Ⓦinbond
Electronics Corp.

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1. GENERAL DESCRIPTION

W83L761G is a hardware monitoring IC with high temperature accuracy, low-power consumption, and SPI (Serial Peripheral Interface) interface. W83L761G has an on-chip thermal sensor and an 8–bits ADC (Analog to Digital Converter) to convert the monitored temperature values. The temperature resolution and accuracy is 0.5 °C and ±3 °C, respectively, and the operation temperature is from -20°C to + 120°C.

W83L761G is available in SOT23-5 package. The working voltage ranges from 3V to 5.5V. Small package dimension, 2.9mm × 2.8mm (including the pin length), low power consumption and simple SPI interface make W83L761G easy to use in every application filed.

2. FEATURES

Monitoring Items - Temperature

- Measure the temperature with high accuracy.
- One on-chip thermal sensor.

General

- Interface: SPI control.
- 3V~5.5V V_{CC} operation.
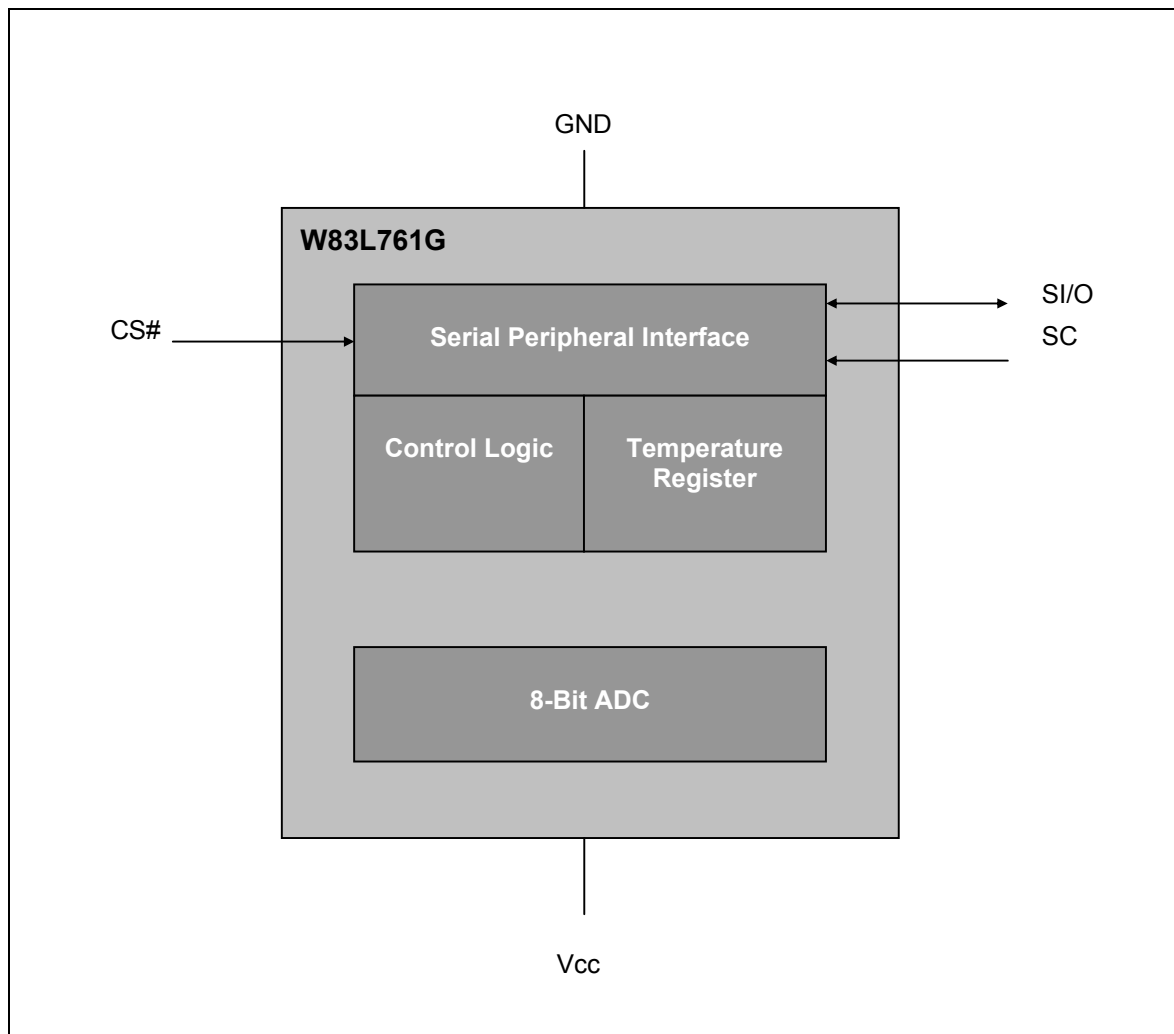
Package

- 5-pin SOT-23-5.
- Dimension: 2.9mm × 2.8mm.

3. KEY SPECIFICATIONS

- Monitoring temperature range and accuracy:
  -20 °C ~ +120 °C $\pm$ 3°C(@70°C)

- Supply voltage   3V~5.5V

- Operating supply current   3V: 2 mA typ.
                               5V: 2.8 mA typ.

- Power down supply current   3V: 300 uA typ.
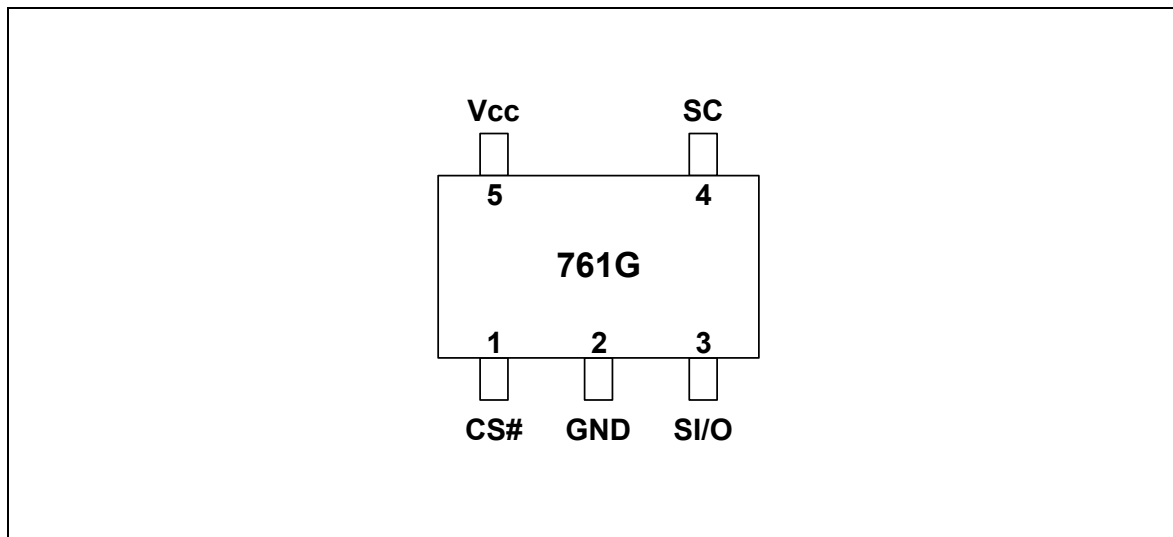   5V: 900 uA typ.

- ADC resolution   8 Bits

4. BLOCK DIAGRAM

GND

W83L761G

SI/O

CS#

Serial Peripheral Interface

SC

Control Logic   **Temperature Register**

8-Bit ADC

Vcc

5. PIN CONFIGURATION

```
        Vcc              SC
         □               □

      ┌──────────────────────┐
      │  5               4   │
      │                      │
      │       761G           │
      │                      │
      │  1      2       3    │
      └──────────────────────┘
         □      □       □

        CS#    GND     SI/O
```

6. PIN DESCRIPTION

I/O$_{12ts}$	TTL level and schmitt trigger with 12 mA source-sink capability
IN$_{ts}$	TTL level input pin and schmitt trigger

PIN NAME	NO	PIN TYPE	DESCRIPTION
CS#	1	IN $_{ts}$	Chip select input from Controller.
GND	2	-	System ground.
SI/O	3	I/O $_{12ts}$	Slave input/output – Serial bus bidirectional data line – from and to Controller.
SC	4	IN $_{ts}$	Slave clock from controller.
V$_{CC}$	5	Power	3.0V ~ 5.5 V power supply. Bypass with 0.1 µF ceramic capacitors.

7. FUNCTIONAL DESCRIPTION

7.1 General Description

W83L761G is a hardware monitoring IC with high temperature accuracy. W83L761G will be accessed by SPI (Serial Peripheral Interface) interface. An 8-bit analog-to-digital converter (ADC) is built inside W83L761G for monitored temperature converting. Shutdown mode is enabled by writing XXFF to W83L761G, and will always output 800Fh.

7.2 Access Interface

W83L761G acts as a slave device on SPI compatible bus. CS# acts as the trigger of the W83L761G. W83L761G would not response to the serial interface bus unless CS# acts low. SC is the serial clock issued by the host. The data is received at the rising edge of the SC, and transmitted at the falling edge of the SC.

There are three kinds of access types. Figure 1 shows the first access type, continuous reading 8-bit frame from 761G. Here, "continuous" means the CS# does not de-asserted while reading out data. At the end of last bit, host must output high on CS# to terminate the cycle. This access type is used to readout W83L761G 8-bit temperature.
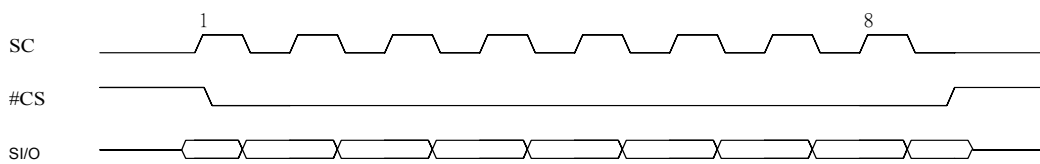

Figure 1 Continuous Reading 8 bit frame

The second access type is continuous reading 16-bit frame from W83L761G, and is illustrated in figure 2. After first byte readout, host will not de-assert CS#, but will continue to send SC until next byte is read out and then de-assert CS#.
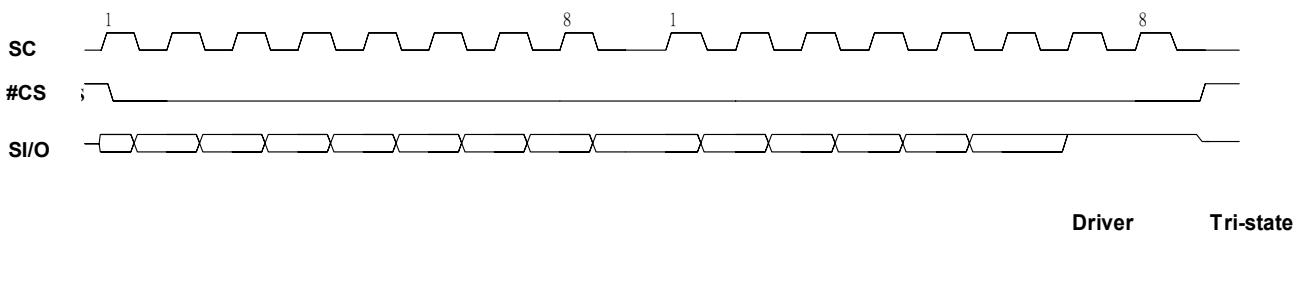

Driver   **Tri-state**

Figure 2 Continuous Reading 16 bit frame

The last access type, used for host to issue shut-down command, is shown in figure 3. After reading 2 bytes temperature from W83L761G, host continues to send clock and 2 more bytes command. During all 4 bytes, the CS# never de-asserts.
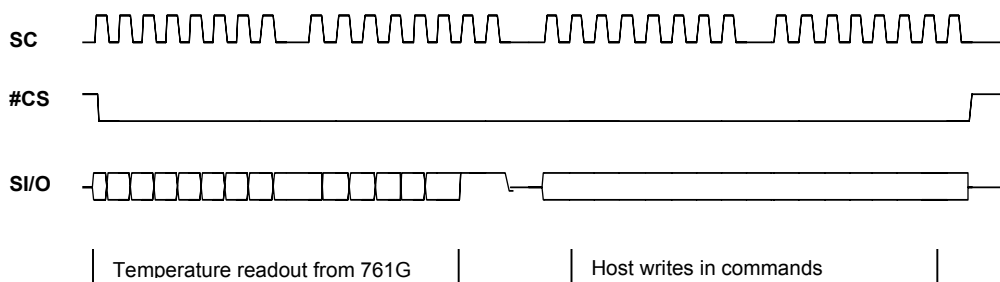

Figure 3 Shutdown Control

7.3 Temperature Measurement Machine

W83L761G temperature data format is 8-bit/10-bit complement. The 8-bit/10-bit temperature data can be obtained by reading the temperature register return format (section 8.2). The format of temperature data is shown in Table 1.

TEMPERATURE	8-BIT DIGITAL OUTPUT		10-BIT DIGITAL OUTPUT	
	8-BIT BINARY	8-BIT HEX	10-BIT BINARY	10-BIT HEX
+125°C	0011,1110	3Eh	00,1111,1010	0FAh
+25°C	0000,1100	0Ch	00,0011,0010	032h
+1°C	0000,0000	00h	00,0000,0010	002h
+0.5°C	-	-	00,0000,0001	001h
+0°C	0000,0000	00h	00,0000,0000	000h
-0.5°C	-	-	11,1111,1111	3FFh
-1°C	1111,1111	FFh	11,1111,1110	3FFh
-25°C	1111,0011	F3h	11,1100,1110	3CEh
-55°C	1110,0100	E4h	11,1001,0010	392h

Table 1

8. CONTROL AND STATUS REGISTER

8.1 Configuration Register (Write Only)

(Selects shutdown or continuous conversion mode)

D15	D14	D13	D12	D11	D10	D9	D8
X	X	X	X	X	X	X	X

D7	D6	D5	D4	D3	D2	D1	D0
Command							

D15-D0 set to XX FF hexes enables shutdown mode.

D15-D0 set to XX 00 hexes enables continuous conversion mode.

Note: Setting D15-D0 to any other values may place the W83L761G into a manufacturer's test mode. These test modes are used for Winbond production testing only.

8.2 Temperature Register Return Format (Read at Normal Mode, Read Only)

D15	D14	D13	D12	D11	D10	D9	D8
MSB	Bit8	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2

D7	D6	D5	D4	D3	D2	D1	D0
Bit1	Bit0	0	0	0	0	1	1

D15-D6: Temperature data. One LSB=0.5 ºC. Two`s complement format

D5-D2: Logic 0 will be output on SI/O.

D1-D0: Logic 1 will be output on SI/O.

8.3 Manufacturer's / Device ID Register Return Format (Read at Power-Down Mode, Read Only)

D15	D14	D13	D12	D11	D10	D9	D8
1	0	0	0	0	0	0	0

D7	D6	D5	D4	D3	D2	D1	D0
0	0	0	0	1	1	1	1

D15-D2: Manufacturer's / Device ID data. This register accessed whenever the W83L761G is in shutdown mode.

D1-D0: Logic 1 will be output on SI/O.

9. ELECTRICAL CHARACTERISTIC

9.1 Absolute Maximum Ratings

PARAMETER	RATING	UNIT
Power Supply Voltage	-0.5 to 7.0	V
Input Voltage	3 to 5.5	V
Operating Temperature	-20 to + 125	$^\circ$ C
Storage Temperature	-50 to +150	$^\circ$ C

Note: Exposure to conditions beyond those listed under Absolute Maximum Ratings may adversely affect the life and reliability of the device.

9.2 DC Characteristics

(Ta = 0° C to 70° C, VDD = 3.3V $\pm$ 10%, VSS = 0V)

PARAMETER	SYM.	MIN.	TYP.	MAX.	UNIT	CONDITIONS
I/O_{12ts} – TTL level bi-directional pin with source-sink capability of 12 mA and schmitt-trigger level input						
Input Low Threshold Voltage	Vt-	0.5	0.8	1.1	V	VDD = 3.3 V
Input High Threshold Voltage	Vt+	1.6	2.0	2.4	V	VDD = 3.3 V
Hysteresis	VTH	0.5	1.2		V	VDD = 3.3 V
Output Low Voltage	VOL			0.4	V	IOL = 12 mA
Output High Voltage	VOH	2.4			V	IOH = - 12 mA
Input High Leakage	ILIH			+10	μA	VIN = VDD
Input Low Leakage	ILIL			-10	μA	VIN = 0V
IN_{ts} - TTL level Schmitt-triggered input pin						
Input Low Threshold Voltage	Vt-	0.5	0.8	1.1	V	VDD = 3.3 V
Input High Threshold Voltage	Vt+	1.6	2.0	2.4	V	VDD = 3.3 V
Hysteresis	VTH	0.5	1.2		V	VDD = 3.3 V
Input High Leakage	ILIH			+10	μA	VIN = VDD
Input Low Leakage	ILIL			-10	μA	VIN = 0 V

9.3 AC Characteristics

PARAMETER	SYMBOL	TYP.	UNITS
SC (Clock) Period	T1	0.16	μs
CS# to SC (Clock) High Set-Up Time	T2	100	ns
CS# to Data Out (SO) Delay	T3	70	ns
SC (Clock) Low to Data Out (SO) Delay	T4	70	ns
CS# High to Data Out (SO) TRI-STATE	T5	200	ns
SC and SI/O Rise Time	TR	10	ns
SC and SI/O Fall Time	TF	10	ns

SC (Clock) High to Data in (SI) Hold Time	T6	50	ns
Data In (SI) Set-Up Time to SC (Clock) High	T7	30	ns
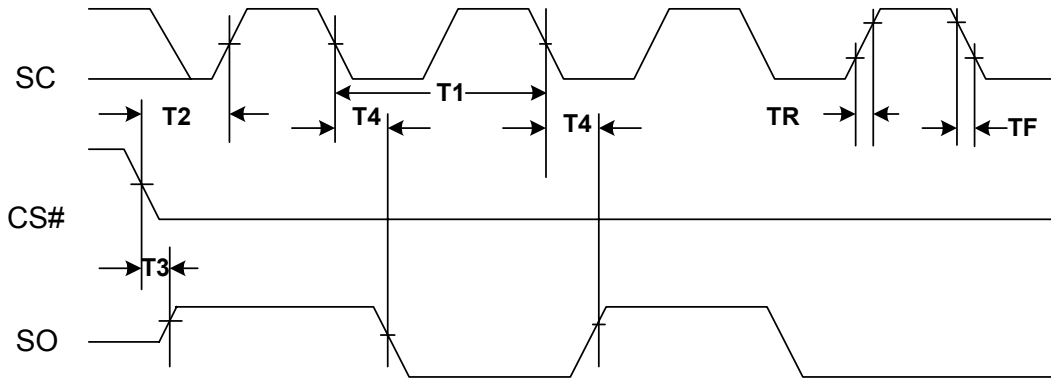
Data Output Timing Diagram
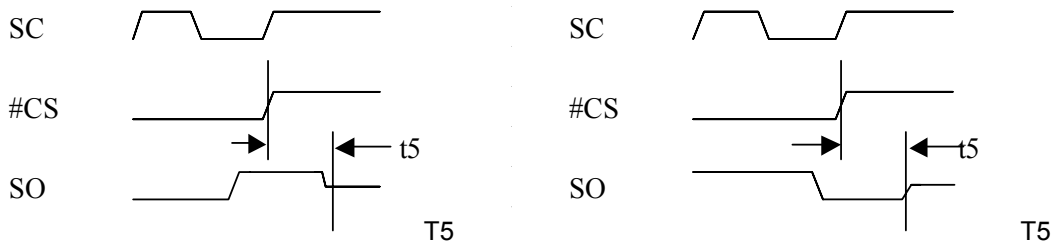
TRI-STATE Data Output Timing Diagram
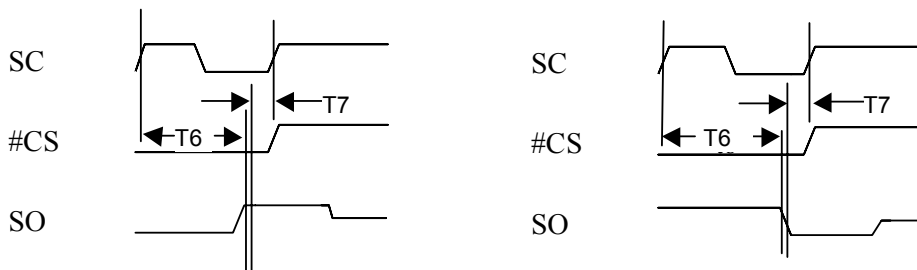
Data Input Timing Diagram

10. THE TOP MARKING

The top marking of W83L761G

W83L761G
2826978Y-61
443OB

Left: Winbond logo

1st line: Winbond logo and the type number: W83L761G

2nd line: Tracking code 2 826978Y-61

3rd line: Tracking code   443 O B

        443: packages made in '04, week 43

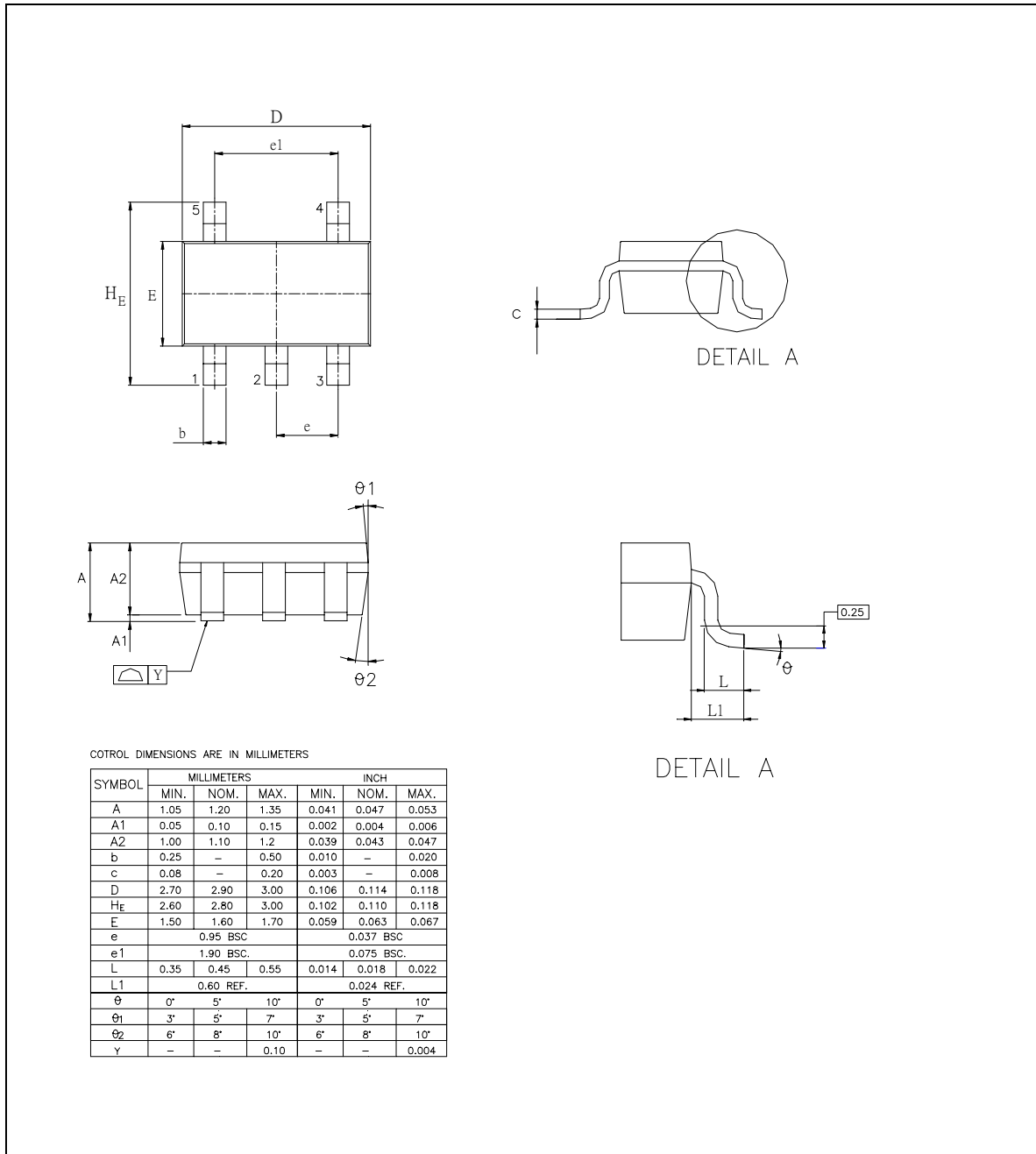   **O**: assembly house ID; A means ASE, S means SPIL, O means OSE
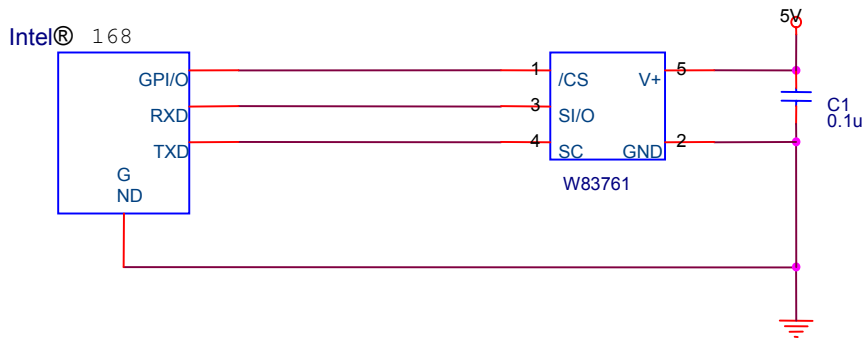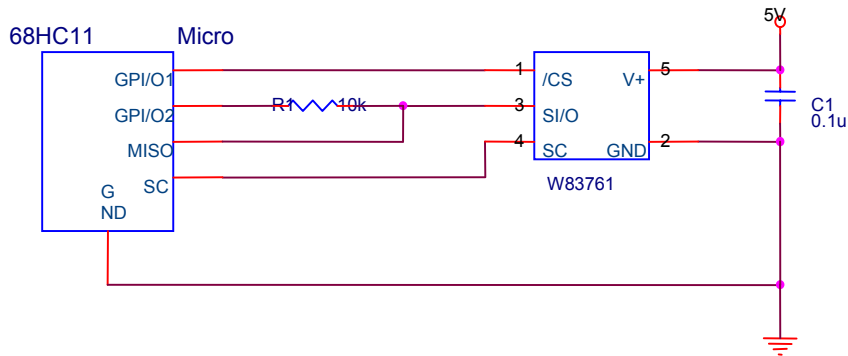
        B: IC revision

11. PACKAGE SPECIFICATION

SOT23-5

COTROL DIMENSIONS ARE IN MILIMETERS

SYMBOL	MILLIMETERS			INCH		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	1.05	1.20	1.35	0.041	0.047	0.053
A1	0.05	0.10	0.15	0.002	0.004	0.006
A2	1.00	1.10	1.2	0.039	0.043	0.047
b	0.25	–	0.50	0.010	–	0.020
c	0.08	–	0.20	0.003	–	0.008
D	2.70	2.90	3.00	0.106	0.114	0.118
H$_E$	2.60	2.80	3.00	0.102	0.110	0.118
E	1.50	1.60	1.70	0.059	0.063	0.067
e	0.95 BSC			0.037 BSC		
e1	1.90 BSC.			0.075 BSC.		
L	0.35	0.45	0.55	0.014	0.018	0.022
L1	0.60 REF.			0.024 REF.		
θ	0°	5°	10°	0°	5°	10°
θ1	3°	5°	7°	3°	5°	7°
θ2	6°	8°	10°	6°	8°	10°
Y	–	–	0.10	–	–	0.004

12. APPLICATION CIRCUITS

68HC11   Micro

		W83761	
GPI/O1	1	/CS	V+	5
GPI/O2	3	SI/O	
MISO	4	SC	GND	2
SC			
G ND			

R1 10k

C1
0.1u

5V

Intel® 168

		W83761	
GPI/O	1	/CS	V+	5
RXD	3	SI/O	
TXD	4	SC	GND	2
G ND			

C1
0.1u

5V

Title			
	Winbond Hardware		
Size A	Document W83761 Application Circuit		Rev 0.2
Date: Monday, November 24,	Sheet 1 of 1		

REVISION HISTORY

VERSION	DATE	PAGE	DESCRIPTION
1.0	April 18, 2005	12	ADD Important Notice

Important Notice

Winbond products are not designed, intended, authorized or warranted for use as components in systems or equipment intended for surgical implantation, atomic energy control instruments, airplane or spaceship instruments, transportation instruments, traffic signal instruments, combustion control instruments, or for other applications intended to support or sustain life. Further more, Winbond products are not intended for applications wherein failure of Winbond products could result or lead to a situation wherein personal injury, death or severe property or environmental damage could occur.

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