

# SRAM Card With Two Rechargeable Batteries

## Product Specification

**Preliminary Version 1.1**

**July 2009**

**PRETEC/C-ONE Technology Corp.**

Corporate Headquarters

8F, NO5, Lane 345, Yang Guang St., Neihu, Taipei, Taiwan

TEL: +886-2-2659-4380 Fax: +886-2-2659-4390

***[www.pretec.com](http://www.pretec.com)***

## Document Version

Version	Description	Date	Editor	Approved by
1.0	Preliminary	25,Mar.,2009	Amos Chung	Alvin Yu
1.1	Update	2,July,2009	Amos Chung	Alvin Yu



The PCMCIA are trademarks of PCMCIA association.

Product Names mentioned herein are for identification purposes only and may be trademarks and/or registered trademarks of their respective companies.

This document provides information regarding to Pretec's PCMCIA SRAM card product specification and is subject to change without any prior notice. No part in this report shall be distributed, reproduced, or disclosed in whole or in part without prior written permission of Pretec.

All rights reserved.

**Pretec/C-ONE Technology Corp.**

## Contents

<b>1. INTRODUCTION</b> .....	<b>4</b>
1.1. GENERAL DESCRIPTION .....	4
1.2. FEATURES.....	4
1.3. PRODUCT NUMBER DEFINITION .....	5
<b>2. PRODUCT SPECIFICATION</b> .....	<b>6</b>
2.1. COMMERCIAL GRADE (0°C ~ +70°C) .....	6
2.2. INDUSTRIAL GRADE (-40°C ~ +85°C) .....	6
2.3. PIN CONFIGURATION.....	7
2.4. PIN DESCRIPTION .....	7
2.5. PIN LOCATION .....	8
2.6. RECOMMENDED OPERATING CONDITIONS .....	8
2.7. COMMENTS.....	8
<b>3. PRODUCT MODEL</b> .....	<b>9</b>
3.1. FUNCTION WITHOUT WRITE PROTECTED .....	9
3.2. FUNCTION WITH WRITE PROTECTED .....	9
3.3. COMMON MEMORY ADDRESS CONFIGURATION .....	10
3.3.1. USING 8-BIT DATA BUS (CE2*=VIH, CE1*=VI L).....	10
3.3.2. USING 8-BIT DATA BUS (CE2*=VIL, CE1*=VIH).....	11
3.3.3. USING 16-BIT DATA BUS (CE2*=VIL, CE1*=VIL) .....	11
3.4. ABSOLUTE MAXIMUM RATINGS .....	11
3.5. DC ELECTRICAL CHARACTERISTIC .....	12
3.6. BATTERY CHARACTERISTICS.....	12
3.7. AC ELECTRICAL CHARACTERISTICS ( COMMON MEMORY ).....	13
3.7.1. Read Cycle.....	13
3.7.2. Write Cycle .....	13
3.8. AC CHARACTERISTICS TEST CONDITIONS .....	14
3.9. INPUT / OUTPUT CAPACITANCE .....	14
3.10. LITHIUM ION BATTERY .....	15

## 1. Introduction

### 1.1. General Description

PRETEC/C-ONE offers a high performance PCMCIA / JEIDA international standard SRAM with extended battery capacity and low power consumption.

With the high capacity of rechargeable battery design, C-ONE SRAM card is able to have better data retention for double or quad power than usual.

Flexible design for optional 8K, 2K or 0K bytes attribute memory, ruggedized metal construction for extreme environmental protection, or hardware write protect switch in plastic housing for freedom of choice or water-resistant metal housing without hardware write protect switch for outermost ruggedness.

### 1.2. Features

PCMCIA / JEIDA standard	Rechargeable battery design with Double or Quad power for longer battery life
1M bytes ~ 16M bytes memory capacity	Battery capacity: Type I : 60mAh (30mAh*2) Type II : 130mAh (65mAh*2)
Byte (x8) / word (x16) data bus selectable	Connector type : 68 pins with 2 rows
Fast access time : 120ns (maximum)	Credit card size Type I : 54.0 x 85.6 x 3.3 (mm)
Wide range Vcc operation (5V/3.3V)	Credit card size Type II : 54.0 x 85.6 x 5 (mm)
Ruggedized metal construction for extreme environmental protection	Extended temperature or Industrial temperature range available
Hardware write protect switch in plastic housing for freedom of choice, or water-resistant metal housing without hardware write protect switch for outermost ruggedness	Attribute memory : 8 KB (optional 2KB/0KB by special request)



## 2. Product Specification

### 2.1. Commercial Grade (0°C ~ +70°C)

As 8KB A/M. Plastic (Type I 60mAh, Type II 130mAh) for example

Part NO.	Capacity	Description
S6F201C	1MB	SRAM 1MB Plastic Type I 0°C ~ +70°C
S6F202C	2MB	SRAM 2MB Plastic Type I 0°C ~ +70°C
S6F204C	4MB	SRAM 4MB Plastic Type I 0°C ~ +70°C
S6F206C	6MB	SRAM 6MB Plastic Type I 0°C ~ +70°C
S6F208C	8MB	SRAM 8MB Plastic Type I 0°C ~ +70°C
S6F216C	16MB	SRAM 16MB Plastic Type I 0°C ~ +70°C
S6P401C	1MB	SRAM 1MB Plastic Type II 0°C ~ +70°C
S6P402C	2MB	SRAM 2MB Plastic Type II 0°C ~ +70°C
S6P404C	4MB	SRAM 4MB Plastic Type II 0°C ~ +70°C
S6P406C	6MB	SRAM 6MB Plastic Type II 0°C ~ +70°C
S6P408C	8MB	SRAM 8MB Plastic Type II 0°C ~ +70°C
S6P416C	16MB	SRAM 16MB Plastic Type II 0°C ~ +70°C

### 2.2. Industrial Grade (-40°C ~ +85°C)

As 8KB A/M, Metal (Type I 60mAh, Type II 130mAh) for example

Part NO.	Capacity	Description
S6M201E	1MB	SRAM 1MB Metal Type I -40°C ~ +85°C
S6M202E	2MB	SRAM 2MB Metal Type I -40°C ~ +85°C
S6M204E	4MB	SRAM 4MB Metal Type I -40°C ~ +85°C
S6M206E	6MB	SRAM 6MB Metal Type I -40°C ~ +85°C
S6M208E	8MB	SRAM 8MB Metal Type I -40°C ~ +85°C
S6M216E	16MB	SRAM 16MB Metal Type I -40°C ~ +85°C
S6R401E	1MB	SRAM 1MB Metal Type II -40°C ~ +85°C
S6R402E	2MB	SRAM 2MB Metal Type II -40°C ~ +85°C

S6R404E	4MB	SRAM 4MB Metal Type II -40°C ~ +85°C
S6R406E	6MB	SRAM 6MB Metal Type II -40°C ~ +85°C
S6R408E	8MB	SRAM 8MB Metal Type II -40°C ~ +85°C
S6R416E	16MB	SRAM 16MB Metal Type II -40°C ~ +85°C

### 2.3. Pin Configuration

Pin No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Pin Name	GN D	D3	D4	D5	D6	D7	CE1	A10	OE*	A11	A9	A8	A13	A14	WE*	BUS Y*
Pin No.	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Pin Name	VC C	NC	A16	A15	A12	A7	A6	A5	A4	A3	A2	A1	A0	D0	D1	D2
Pin No.	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
Pin Name	WP	GND	GND	CD*	D11	D12	D13	D14	D15	CE2	NC	NC	NC	A17	A18	A19
Pin No.	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64
Pin Name	A20	A21	VCC	NC	A22	A23	NC	NC	NC	NC	NC	NC	REG	BVD2	BVD1	D8
Pin No.	65	66	67	68												
Pin Name	D9	D10	CD2	GND												

Note : \* mean low active

### 2.4. Pin Description

Symbol	Function	I/O
A0 - A23	Addresses	I
D0 - D15	Data Inputs/Outputs	I/O
CE1*/CE2*	Card Enable	I
OE*	Output Enable	I
WE*	Write Enable	I

REG*	Attribute Memory Enable	I
WP	Write-protect Detect	O
BVD1*/BVD2*	Battery Voltage Detect	O
BUSY*	Busy Output (Open drain)	O
CD1*/CD2*	Card Detect (tied to GND internally)	O
VCC	+5 Volt Power Supply (3.3Volt optional)	-
GND	Ground	-
NC	No Connection	-

Note : \* mean low active

## 2.5. Pin Location

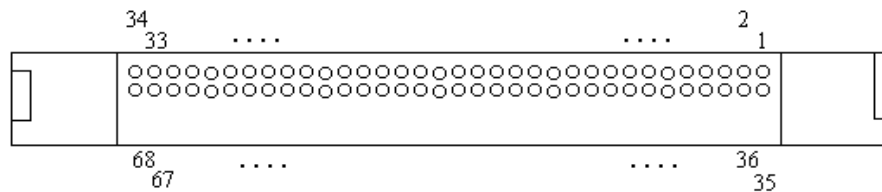


Figure 1 : Bottom View (Connector Side)

## 2.6. Recommended Operating Conditions

Parameter	Symbol	Min.	Max.	Unit
Supply Voltage	VCC	3/4.5	3.6/5.5	V
Input High Voltage	V <sub>IH</sub>	0.7VCC	VCC + 0.3	V
Input Low Voltage	V <sub>IL</sub>	- 0.3	0.8	V
Battery Voltage	V <sub>BAT</sub>	2.37		V
Operating Temperature ( Commercial )	T <sub>OPR</sub>	0	60	°C
Operating Temperature ( Industrial )	T <sub>OPR</sub>	-40	85	°C
Relative Humidity (non-condensing)	H <sub>UM</sub>		95	%

## 2.7. Comments

Stress above those listed under “Absolute Maximum Ratings” may cause permanent damage to the products. These are stress rating only. Functional operation of these products at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect product reliability.



### 3. Product Model

#### 3.1. Function without write protected

Function	REG*	CE2*	CE1*	A0	OE*	WE*	WP	D15 - D8	D7 - D0
Read C/M (x8)	H	H	L	L	L	H	L	High - Z	Even Byte Data Out
Read C/M (x8)	H	H	L	H	L	H	L	High - Z	Odd Byte Data Out
Read C/M (x8)	H	L	H	X	L	H	L	Odd Byte Data Out	High - Z
Read C/M (x16)	H	L	L	X	L	H	L	Odd Byte Data Out	Even Byte Data Out
Write C/M (x8)	H	H	L	L	H	L	L	X	Even Byte Data In
Write C/M (x8)	H	H	L	H	H	L	L	X	Odd Byte Data In
Write C/M (x8)	H	L	H	X	H	L	L	Odd Byte Data In	X
Write C/M (x16)	H	L	L	X	H	L	L	Odd Byte Data In	Even Byte Data In
Standby	X	H	H	X	X	X	L	High - Z	High - Z
Output Disable	X	X	X	X	H	H	L	High - Z	High - Z
Read A/M (x8)	L	H	L	L	L	H	L	High - Z	Even Byte Data Out
Read A/M (x8)	L	H	L	H	L	H	L	High - Z	Data Out (invalid)
Read A/M (x8)	L	L	H	X	L	H	L	Data Out (invalid)	High - Z
Read A/M (x16)	L	L	L	X	L	H	L	Data Out (invalid)	Even Byte Data Out
Write A/M (x8)	L	H	L	L	H	L	L	X	Even Byte Data In
Write A/M (x8)	L	H	L	H	H	L	L	X	X
Write A/M (x8)	L	L	H	X	H	L	L	X	X
Write A/M (x16)	L	L	L	X	H	L	L	X	Even Byte Data In

Note : \* mean low active

#### 3.2. Function with write protected

Function	REG*	CE2*	CE1*	A0	OE*	WE*	WP	D15 - D8	D7 - D0
Read C/M (x8)	H	H	L	L	L	H	H	High - Z	Even Byte Data Out
Read C/M (x8)	H	H	L	H	L	H	H	High - Z	Odd Byte Data Out
Read C/M (x8)	H	L	H	X	L	H	H	Odd Byte Data Out	High - Z

Read C/M (x16)	H	L	L	X	L	H	H	Odd Byte Data Out	Even Byte Data Out
Write C/M (x8)	H	H	L	L	H	L	H	X	X
Write C/M (x8)	H	H	L	H	H	L	H	X	X
Write C/M (x8)	H	L	H	X	H	L	H	X	X
Write C/M (x16)	H	L	L	X	H	L	H	X	X
Standby	X	H	H	X	X	X	H	High - Z	High - Z
Output Disable	X	X	X	X	H	H	H	High - Z	High - Z
Read A/M (x8)	L	H	L	L	L	H	H	High - Z	Even Byte Data Out
Read A/M (x8)	L	H	L	H	L	H	H	High - Z	Data Out (invalid)
Read A/M (x8)	L	L	H	X	L	H	H	Data Out (invalid)	High - Z
Read A/M (x16)	L	L	L	X	L	H	H	Data Out (invalid)	Even Byte Data Out
Write A/M (x8)	L	H	L	L	H	L	H	X	X
Write A/M (x8)	L	H	L	H	H	L	H	X	X
Write A/M (x8)	L	L	H	X	H	L	H	X	X
Write A/M (x16)	L	L	L	X	H	L	H	X	X

Note :

Definition : C/M = Common Memory, A/M = Attribute Memory

L =  $V_{IL}$ ; H =  $V_{IH}$ ; X = Don't care (can be either  $V_{IH}$  or  $V_{IL}$ )

\* mean low active

### 3.3. Common Memory Address Configuration

#### 3.3.1. Using 8-bit Data Bus ( $CE2^*=V_{IH}$ , $CE1^*=V_{IL}$ )

A23 to A0	D15 -- D8	D7 -- D0
0000 0000 0000 0000 0000 0000	High - Z	Address 0
0000 0000 0000 0000 0000 0001	High - Z	Address 1
0000 0000 0000 0000 0000 0010	High - Z	Address 2
:	:	:
1111 1111 1111 1111 1111 1101	High - Z	Address 16777213
1111 1111 1111 1111 1111 1110	High - Z	Address 16777214
1111 1111 1111 1111 1111 1111	High - Z	Address 16777215

### 3.3.2. Using 8-bit Data Bus (CE2\*=V<sub>IL</sub>, CE1\*=V<sub>IH</sub>)

A23 to A0	D15 -- D8	D7 -- D0
0000 0000 0000 0000 0000 000X	Address 1	High - Z
0000 0000 0000 0000 0000 001X	Address 3	High - Z
0000 0000 0000 0000 0000 010X	Address 5	High - Z
:	:	:
1111 1111 1111 1111 1111 101X	Address 16777211	High - Z
1111 1111 1111 1111 1111 110X	Address 16777213	High - Z
1111 1111 1111 1111 1111 111X	Address 16777215	High - Z

### 3.3.3. Using 16-bit Data Bus (CE2\*=V<sub>IL</sub>, CE1\*=V<sub>IL</sub>)

A23 to A0	D15 -- D8	D7 -- D0
0000 0000 0000 0000 0000 000X	Address 1	Address 0
0000 0000 0000 0000 0000 001X	Address 3	Address 2
0000 0000 0000 0000 0000 010X	Address 5	Address 4
:	:	:
1111 1111 1111 1111 1111 101X	Address 16777211	Address 16777210
1111 1111 1111 1111 1111 110X	Address 16777213	Address 16777212
1111 1111 1111 1111 1111 111X	Address 16777215	Address 16777214

Note :

The above tables are examples for 8M bytes /4M words SRAM cards.

Definition : L = V<sub>IL</sub>; H = V<sub>IH</sub>; X = Don't care (can be either V<sub>IH</sub> or V<sub>IL</sub>)

### 3.4. Absolute Maximum Ratings

Operating Temperature (ambient)	
Commercial	0 °C to 70 °C
Industrial	-40 °C to 85 °C
Storage Temperature (ambient)	
Commercial	0 °C to 70 °C
Industrial	-40 °C to 85 °C
Power of Voltage	
Voltage on any pin relative to V <sub>ss</sub>	-0.5 to V <sub>CC</sub> + 0.3 (6V max.)
V <sub>cc</sub> supply Voltage relative to V <sub>ss</sub>	-0.5 to + 6.0V

### 3.5. DC Electrical Characteristic

Symbol	Parameter	Min.	Max.	Unit	Test Conditions
ICC	Vcc Operating Current	<12mA	20	mA	Vcc=5.25V, Icycle=150ns
ICCS	Vcc Standby Current	<5mA	10	mA	Vcc=5.25V, Control Signals=Vcc
ILI	Input Leakage Current		±10	uA	Vcc-Vcc Max, Vin=Vcc or Vss
ILO	Output Leakage Current		±10	uA	Vcc-Vcc Max, Vin=Vcc or Vss
VOH	Output High Voltage	3.8		V	IOH = -2mA
VOL	Output Low Voltage		0.4	V	IOL = 3.2mA
VIH	Input High Voltage	0.7Vcc	Vcc+0.3	V	
VIL	Input Low Voltage	-0.3	0.3Vcc	V	

### 3.6. Battery Characteristics

Parameter	Density	Notes	Type I	Type II	Units	Condition
Battery Life	All	1	10		Years	Normal Operation, T=25°C
Battery Backup Time	1 MB	2	42	82	Months	Battery backup time is a calculated value and is not guaranteed. This is should not be use to schedule battery recharging ( Temp. 25°C)
	2 MB		42	82		
	4 MB		42	82		
	6 MB		42	82		
	8 MB		40	80		
	16 MB		40	80		

Notes:

1. Battery Life refer to functional lifetime of battery
2. Battery Backup time is density and temperature dependent

### 3.7. AC Electrical Characteristics ( Common Memory )

#### 3.7.1. Read Cycle

JEDEC PARAMETER NAME	PARAMETER NAME	DESCRIPTION	CYCLE TIME : 55ns (V <sub>CC</sub> = 3.0~5.5V)			CYCLE TIME : 70ns (V <sub>CC</sub> = 2.7~5.5V)			UNITS
			MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
t <sub>AVAX</sub>	t <sub>RC</sub>	Read Cycle Time	55	--	--	70	--	--	ns
t <sub>AVQX</sub>	t <sub>AA</sub>	Address Access Time	--	--	55	--	--	70	ns
t <sub>E1LQV</sub>	t <sub>ACS1</sub>	Chip Select Access Time ( $\overline{\text{CE1}}$ )	--	--	55	--	--	70	ns
t <sub>E2HQV</sub>	t <sub>ACS2</sub>	Chip Select Access Time ( $\overline{\text{CE2}}$ )	--	--	55	--	--	70	ns
t <sub>GLQV</sub>	t <sub>oE</sub>	Output Enable to Output Valid	--	--	25	--	--	30	ns
t <sub>E1LQX</sub>	t <sub>CLZ1</sub>	Chip Select to Output Low Z ( $\overline{\text{CE1}}$ )	10	--	--	10	--	--	ns
t <sub>E2HQX</sub>	t <sub>CLZ2</sub>	Chip Select to Output Low Z ( $\overline{\text{CE2}}$ )	10	--	--	10	--	--	ns
t <sub>GLQX</sub>	t <sub>OLZ</sub>	Output Enable to Output Low Z	10	--	--	10	--	--	ns
t <sub>E1HQZ</sub>	t <sub>CHZ1</sub>	Chip Select to Output High Z ( $\overline{\text{CE1}}$ )	--	--	30	--	--	35	ns
t <sub>E2LQZ</sub>	t <sub>CHZ2</sub>	Chip Select to Output High Z ( $\overline{\text{CE2}}$ )	--	--	30	--	--	35	ns
t <sub>GHQZ</sub>	t <sub>OHZ</sub>	Output Enable to Output High Z	--	--	25	--	--	30	ns
t <sub>AVQX</sub>	t <sub>OH</sub>	Data Hold from Address Change	10	--	--	10	--	--	ns

#### 3.7.2. Write Cycle

JEDEC PARAMETER NAME	PARAMETER NAME	DESCRIPTION	CYCLE TIME : 55ns (V <sub>CC</sub> = 3.0~5.5V)			CYCLE TIME : 70ns (V <sub>CC</sub> = 2.7~5.5V)			UNITS
			MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
t <sub>AVAX</sub>	t <sub>wc</sub>	Write Cycle Time	55	--	--	70	--	--	ns
t <sub>AVWL</sub>	t <sub>As</sub>	Chip Select to End of Write	0	--	--	0	--	--	ns
t <sub>AVWH</sub>	t <sub>AW</sub>	Address Set up Time	40	--	--	50	--	--	ns
t <sub>E1LWH</sub>	t <sub>cw</sub>	Address Valid to End of Write	40	--	--	50	--	--	ns
t <sub>WLWH</sub>	t <sub>wP</sub>	Write Pulse Width	30	--	--	35	--	--	ns
t <sub>WHAX</sub>	t <sub>wR1</sub>	Write Recovery Time ( $\overline{\text{CE1}}$ , $\overline{\text{WE}}$ )	0	--	--	0	--	--	ns
t <sub>E2LAX</sub>	t <sub>wR2</sub>	Write Recovery Time ( $\overline{\text{CE2}}$ )	0	--	--	0	--	--	ns
t <sub>WLQZ</sub>	t <sub>wHZ</sub>	Write to Output High Z	--	--	25	--	--	30	ns
t <sub>DVWH</sub>	t <sub>dw</sub>	Data to Write Time Overlap	25	--	--	30	--	--	ns
t <sub>WHDX</sub>	t <sub>dh</sub>	Data Hold from Write Time	0	--	--	0	--	--	ns
t <sub>GHQZ</sub>	t <sub>OHZ</sub>	Output Disable to Output in High Z	--	--	25	--	--	30	ns
t <sub>WHQX</sub>	t <sub>ow</sub>	End of Write to Output Active	5	--	--	5	--	--	ns

### 3.8. AC Characteristics Test Conditions

Input Pulse Level	$V_{OH} = 0.7V_{cc}$ , $V_{IL} = 0.8V$
Input Rise and Fall Time	5ns (max.)
Timing Measurement Reference Level	$V_{IH} / V_{IL} = 2.4V / 0.6V$ , $V_{OH} / V_{OL} = 2V / 0.8V$
Output Load	1TTL Gate + 100PF (Figure 2)

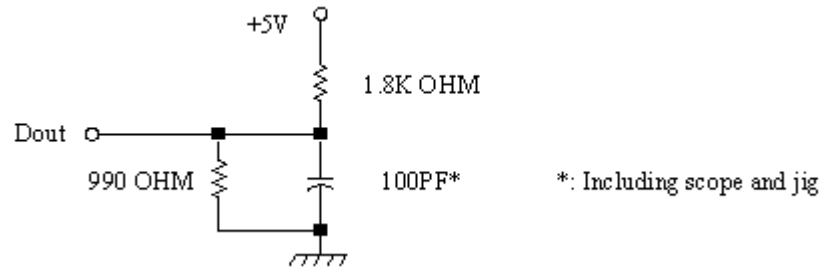


Figure 2 : AC Output Load

### 3.9. Input / Output Capacitance

( $T_a = 25^{\circ}C$ ,  $f = 1MHz$ ,  $V_{in}/V_{out} = 0V$ )

Symbol	Parameter	Min.	Max.	Unit
Cin	Input Capacitance		110	PF
Ci/o	I/O Capacitance		35	PF

Notes:

These parameters are sampled not 100% tested.

### 3.10. Lithium Ion Battery

- Recharges at standby voltage
- Typical < 100 $\mu$ A for fully charged
- Maximum 10mA for fully discharged
- Backup battery average charge 6 months (lower densities have longer charge times, higher densities have shorter charge times)



This document provides information regarding to Pretec PCMCIA SRAM card product specification and is subject to change without any prior notice. No part in this report shall be distributed, reproduced, or disclosed in whole or in part without prior written permission of C-ONE.

