AC1050

ACS Microcontroller Unit

Technical Data Sheet

Advanced Card Systems Ltd.
Room 302, 3/F., Shun Fat Industrial building,
17 Wang Hoi Road, Kowloon Bay,Kowloon, Hong Kong.

Tel: 852-2796 7873 Fax: 852-2796 1286
Website: www.acs.com.hk E-mail : info@acs.com.hk

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1. INTRODUCTION

The AC-Set Chipset (AC1050) is a multiple slots (4 slots) smart card reader co-proccesor with optional features for keypads, LCD display and magnetic stripe reader, all in one chip. A serail TTL interface is provided, with communication protocol made available to allow the developer to have full control of all resources supported by AC1050 i.e. smart cards, keypads, displays and magnetic stripe reader.
AC1050 firmware is currently under EMV Level 1 certification and is expected to pass level 1 testing before end Q1 2002. AC1050 supports T=0 and T=1 smart cards and there is plan to enhance the chip with memory smart card supports. AC1050 is truly ISO-7816 part 3 compliance.

ACS ACR50 smart card reader is based on AC1050. Therefore drivers for AC1050 based reader, including PC/SC driver is available.

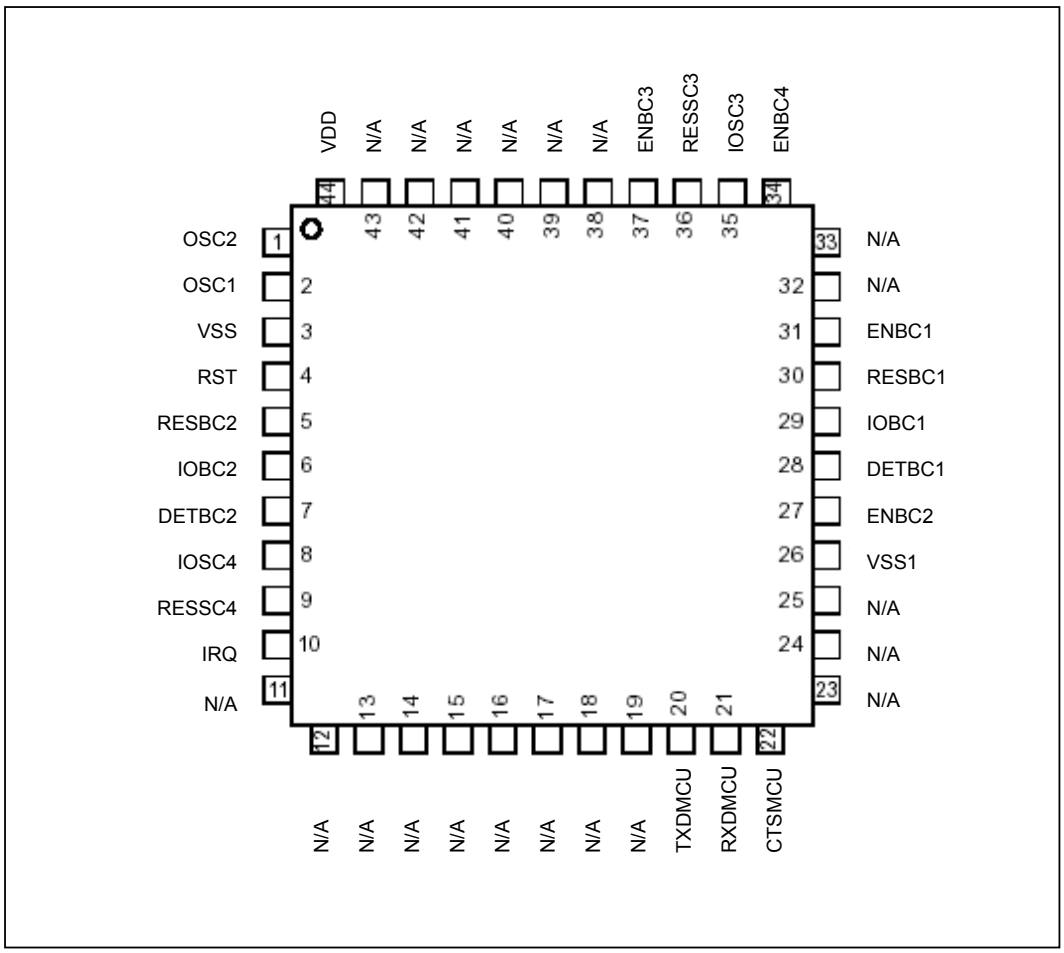
2. FEATURES

- ISO7816-3 compliance smart card interface (EMV Level 1 certified)
- Support 4 smart cards – 2 full size smart cards, 2 plug-in smart cards
- Optional keypad support
- Optional LCD display support
- Optional magnetic stripe reader support
- Supports CPU-based cards with T=0 and/or T=1 protocol
- Supports PTS (protocol type selection) procedure
- Smart card interface short circuit protected
- Serial interface to host computer with simple command structure
- Selectable baudrate of serial interface to host system, 19200 bit/s
- 44-Pin Quad Flat Pack
- Operating temperature range: 0^{o}C to 85^{o}C
- Power supply at 4.5V – 5.5V
- 8 mA consumption, typical

3. Applications

- PC Connect smart card reader for PKI, E-commerce, Home Banking
- Smart card reader PINpad for ECR, EDC and POS terminal
- Keyboard, TV Set-top box, Personal computer, Network computer
- PC peripheral device, Vending machine, Payphone
- Health card, Terminals, Loyalty
- Physical Access Controller

4. Pin Assignment



Note :

1) N/A = No used
2) OSC1, OSC2 are 3.3V pins

Figure 1. 44-Pin QFP Pin Assignments

5. Pin Function description

Pin	Name	Description
1	OSC2	On chip oscillator output
2	OSC1	Connect 24MHz parallel resonant crystal between OSC1 and OSC2
3	VSS	Power supply ground
4	$\overline{RST}$	A logic 0 on this pin forces the chip to a known startup state, allowing a reset of entire system
5	RESBC2	Reset for slot 2 card interface (C2)
6	IOBC2	I/O for slot 2 card interface (C7)
7	DETBC2	Card detect switch for slot 2, logic 0 should apply to this pin when card is inserted
8	IOSC4	I/O for slot 4 card interface (C7)
9	RESSC4	Reset for slot 4 card interface (C2)
10	$\overline{IRQ}$	Reserved pin. Always pull high this pin
11	Not use	Leave this pin unconnected
12	Not use	Leave this pin unconnected
13	Not use	Leave this pin unconnected
14	Not use	Leave this pin unconnected
15	Not use	Leave this pin unconnected
16	Not use	Leave this pin unconnected
17	Not use	Leave this pin unconnected
18	Not use	Leave this pin unconnected
19	Not use	Leave this pin unconnected
20	TXDMCU	TXD signal at TTL level for serial communication with host PC
21	RXDMCU	RXD signal at TTL level for serial communication with host PC
22	CTSMCU	CTS signal at TTL level for serial communication with host PC
23	Not use	Leave this pin unconnected
24	Not use	Leave this pin unconnected
25	Not use	Leave this pin unconnected
26	VSS1	Power supply ground
27	ENBC2	Slot 2 card interface enable and power (C1)
28	DETBC1	Card detect switch for slot 1, logic 0 should apply to this pin when card is inserted
29	IOBC1	I/O for slot 1 card interface (C7)
30	RESBC1	Reset for slot 1 card interface (C2)
31	ENBC1	Slot 1 card interface enable and power (C1)
32	Not use	Leave this pin unconnected
33	Not use	Leave this pin unconnected
34	ENBC4	Slot 4 card interface enable and power (C1)
35	IOSC3	I/O for slot 3 card interface (C7)
36	RESSC3	Reset for slot 3 card interface (C2)
37	ENBC3	Slot 3 card interface enable and power (C1)
38	Not use	Leave this pin unconnected
39	Not use	Leave this pin unconnected
40	Not use	Leave this pin unconnected
41	Not use	Leave this pin unconnected
42	Not use	Leave this pin unconnected
43	Not use	Leave this pin unconnected
44	VDD	Power supply input

6. Absolute Maximum Rating

Maximum ratings are the extreme limits to which the MCU can be exposed without permanently damaging it.

Note :
This device is not guaranteed to operate properly at the maximum ratings. Refer to 19.6 DC electrical characteristics for guaranteed.

Characteristic	Symbol	Value	Unit
Supply Voltage	V_{DD}	-0.3 to + 5.5	V
Input Voltage	V_{IN}	V_{SS}-0.3 to V_{DD}+0.3	V
Maximum Current Per Pin Excluding V_{DD} and V_{SS}	I	±25	mA
Storage Temperature	T_{STG}	-55 to +150	°C
Maximum Current out of Vss	I_{MVSS}	100	mA
Maximum Current Into V_{DD}	I_{MVDD}	100	mA

Note : voltages referenced to Vss.

Note :

This device contain circuitry to protect the inputs against damage due to high static voltages or electric fields; however, it is advised that normal precautions be taken to avoid application of any voltage higher than maximum-rated voltages to this high-impedance circuit. For proper operation, it is recommended that VIN and VOUT be constrained to the range $V_{DD} \geq (V_{IN}$ or $V_{OUT}) \geq V_{SS}$. Reliability of operation is enhanced if unused inputs are connected to an appropriate logic voltage level (for example. Either VSS or VDD)

7. Functional Operating Range

Characteristic	Symbol	Value	Unit
Operating Temperature Range	T_A	0 to 85	°C
Operating Voltage Range	V_{DD}	4.5 to 5.5	V

8. Thermal Characteristics

Characteristic	Symbol	Value	Unit
Thermal Resistance QFD (44Pins) SDIP (42 Pins)	θ_{JA}	 95 60	°C/W
I/O Pin Power Dissipation	$P_{I/O}$	User determined	W
Power dissipation	P_D	$P_D = (I_{DD} \times V_{DD}) + P_{I/O} = K/(T_J + 273\ °C)$	W
Constant	K	$P_D \times (TA + 273\ °C) + P_D^2 \times \theta_{JA}$	W/°C
Average Junction Temperature	T_J	$TA + (PD \times \theta_{JA})$	°C
Maximum Junction Temperature	T_{JM}	100	°C

Notes
(1) Power dissipation is a function of temperature.
(2) K is a constant unique to the device. K can be determined for a known T_A and measured P_D. With this value of K, P_D and T_J can be determined for any value of T_A.

9. DC Electrical Characteristics

Characteristic	Symbol	Min	Typ	Max	Unit
Output high Voltage (I_{LOAD} = -2.0mA) All I/O Pins (except OSC2)	V_{OH}	V_{DD}-0.8	---	---	V
Output Low Voltage (I_{LOAD} = 1.6mA) All I/O Pins (except OSC2) OSC2	V_{OL}	---	---	 0.4 0.4	V
Input High Voltage All port (except IRQ, RST) OSC1	V_{IH}	 0.7 x V_{DD} 2.0 0.7 x 2/3 V_{DD}	---	 V_{DD} V_{DD} 2/3 V_{DD}	V
Input low Voltage All port (except IRQ, RST) OSC1	 V_{IL}	 V_{SS} V_{SS} V_{SS}	---	 0.2 x V_{DD} 0.8 0.2 x 2/3V_{DD}	V
VDD supply current Run Wait Stop 0°C to 85 °C	I_{DD}	---	 8 4 2	 12 8 5	 mA mA mA
I/O ports Hi-Z leakage current	I_{IL}	---	---	±10	μA
Input current	I_{IN}	---	---	±1	μA
Capacitance Posrts(as input or output)	C_{OUT} C_{IN}	---	---	12 8	PF
POR ReArm voltage	V_{POR}	0		100	MV
POR Rise Time Ramp Rate	V_{POR}	0.035	---	---	V/ms
Monitor Mode Entry Voltage	V_{TST}	VDD +2.5	---	8	V
Pull-up Resistor RST, IRQ	R_{PU}	20	45	65	kΩ
Low-voltage inhibit, trip falling voltage	V_{TRIPF}	3.4	3.6	3.8	V
Low-voltage inhibit, trip rising voltage	V_{TRIPR}	3.6	3.8	4.0	V
Low-voltage inhibit, reset/recover voltage	V_{HYS}	---	200	---	mV
RAM data retention voltage	V_{RDR}	2	---	---	V

10. Application example

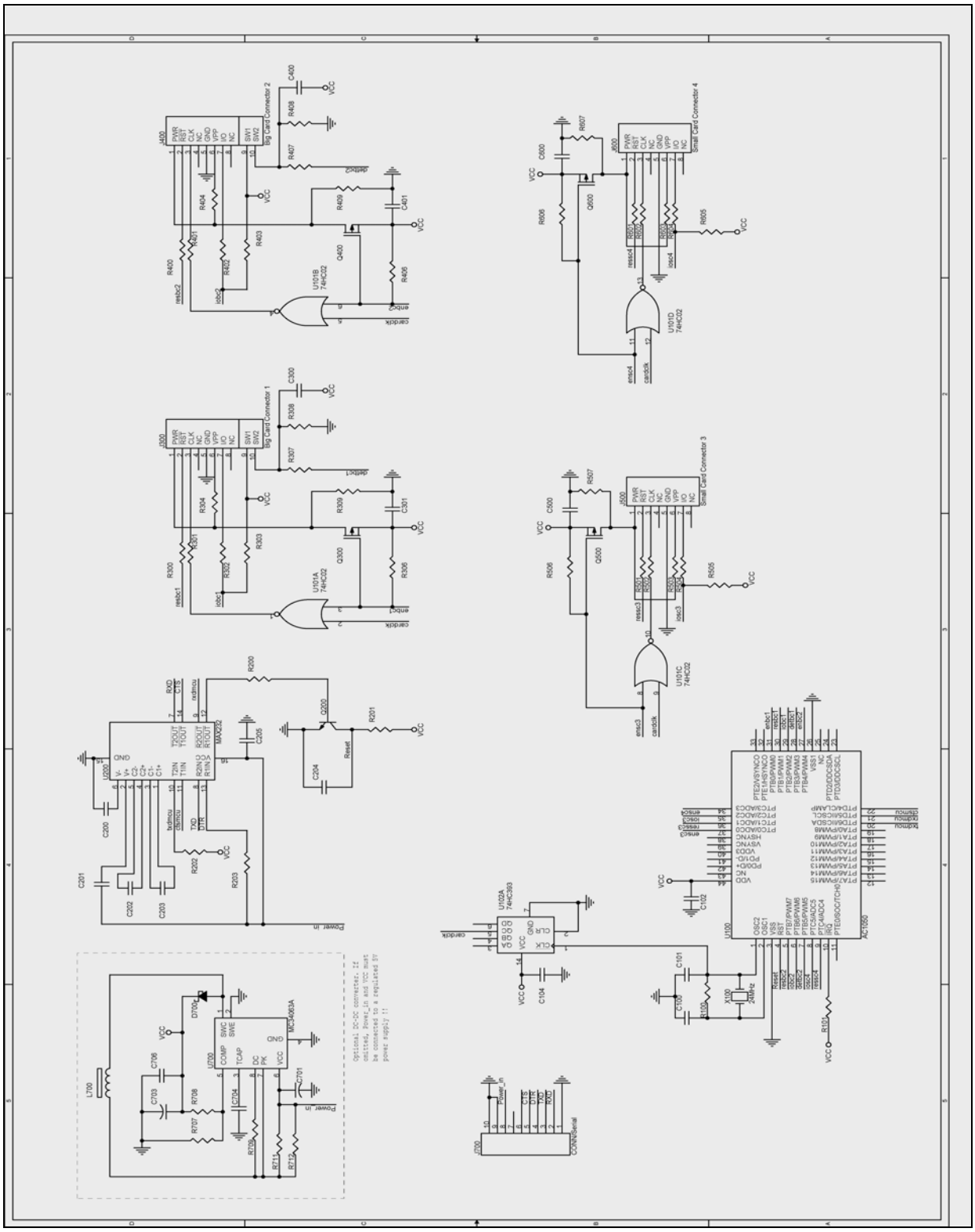


Figure 2. Card reader application of AC1050