



advanced card systems ltd



# AC1030

ACS Microcontroller Unit

Technical Data Sheet

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# CARD READER CHIPSET (AC-SET FOR SERIAL OR USB)

	<b>AC1030</b>
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## 1. INTRODUCTION

The AC-Set Chip (AC1030) is a single chip solution for Serial or USB Smart Card Reader. It is an interface for the communication between a host computer (for example, a PC) and a smart card.

Different types of smart cards have different commands and different communication protocols. This prevents in most cases the direct communication between a smart card and a computer. The AC-Set establishes a uniform interface from the host computer to the smart card for a wide variety of cards. By taking care of the electrical interface, communication protocol handling and the card specific particulars, it releases the computer software programmer of getting involved with the technical details of the smart card operation, which are in many cases not relevant for the implementation of a smart card system.

The AC-Set chip is connected to the host computer through serial port or Universal Serial Bus interface. The AC1030 accepts commands from the computer, and carries out the specified function at the smart card and returns the requested data or status information.

## 2. FEATURES

- ISO7816-1/2/3 compatible smart card interface
- Supports most common memory-based smart cards (2-wire bus, 3-wire bus)
- Supports CPU-based cards with T=0 and/or T=1 protocol
- Supports PPS (protocol and parameter selection) procedure
- Supports up to 256 serial readers via serial RS232 interface
- Automatic detection memory-based card or MCU-based card
- Smart card interface short circuit protected
- Power up/down sequence compatible to ISO7816 for signal integrity
- Automatic detection of card insertion and removal
- Serial or USB interface to host computer with simple command structure
- 34-Pin SOIC for AC1030
- Operating temperature range: 0°C to 70°C (AC1030)
- Power supply at 4.0V – 5.25V

	Serial Port	USB
CLK frequency for MCU-based cards	3.6864MHz	4.00MHz

## 3. Applications

- PC keyboard, Pay TV
- Personal computer, Network computer
- PC peripheral device, Vending machine
- Payphone, Terminals
- PDA, ATM, Loyalty

### 4. Pin Assignments (For Serial or USB)

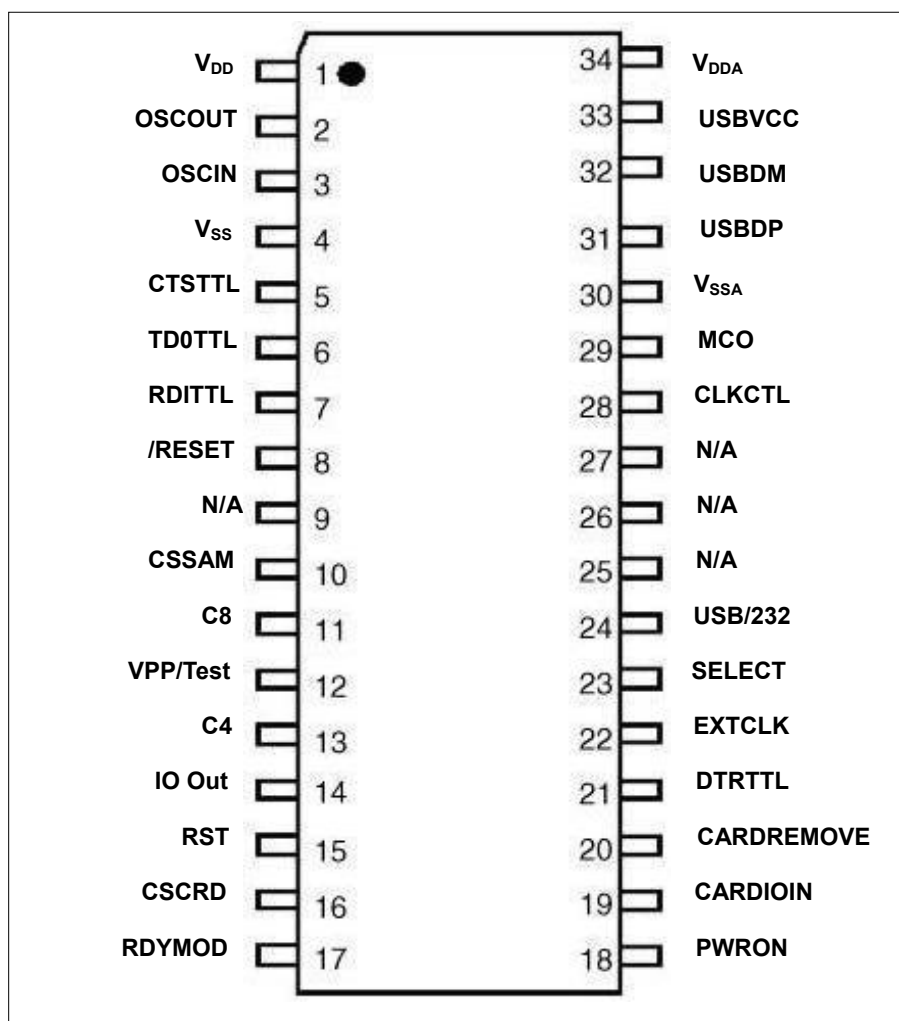


Figure 1. 34-Pin SOIC for AC1030

## 5. Pin Function Description (For serial only)

Pin	Signal	Description
1	V <sub>DD</sub>	Power Supply
2	OSCOUT	Output of the on-chip oscillator.
3	OSCIN	Connect 22.1184 MHz parallel resonant Crystal between OSCIN & OSCOUT.
4	V <sub>SS</sub>	Power Ground
5	CTSTTL	To be Connected to CTS (TTL)
6	TD0TTL	To be Connected to TDO (TTL)
7	RDITTL	To be Connected to RDI (TTL)
8	/RESET	Logic Zero on the RESET pin forces AC1030 to a known start-up state.
9	N/A	No Connection
10	CSSAM	Reserved Pin, to be left unconnected
11	C8	Reserved Pin, to be left unconnected
12	VPP/Test	To be Connected to V <sub>ss</sub>
13	C4	Reserved Pin, to be left unconnected
14	IO Out	Data Output for Smart Card interface (C7).
15	RST	Reset for Smart Card Interface (C2)
16	CSCRD	Reserved Pin, to be left unconnected
17	RDYMOD	Control output for Data direction
18	PWRON	Control output for Card Power Enable, Clock Enable and Data-IN Enable
19	CARDIOIN	Data input from Smart Card Interface (C7)
20	CARDREMOVE	Card Insertion Status from End-of-Travel Switch, LOW when Card is inserted.
21	DTRTTL	Reserved Pin, to be left unconnected
22	EXTCLK	Reserved Pin, to be left unconnected
23	SELECT	Reserved for future use. To be connected to V <sub>ss</sub>
24	USB/232	Host Interface selection input. To be connected to V <sub>ss</sub>
25	N/A	No Connection
26	N/A	No Connection
27	N/A	No Connection
28	CLKCTL	Clock-stop control output. To be pulled-up with 22K resistor to V <sub>DD</sub> .
29	MCO	Main Clock Output, divide by 2 externally for Smart Card Interface CLK (C3)
30	V <sub>SSA</sub>	Analog Ground, to be connected to Power Ground.
31	USBDP	Reserved Pin, to be left unconnected
32	USBDM	Reserved Pin, to be left unconnected
33	USBVCC	Reserved Pin, to be left unconnected
34	V <sub>DDA</sub>	Analog Supply Voltage

## 6. Pin Function Description (For USB only)

Pin	Signal	Description
1	V <sub>DD</sub>	Power Supply
2	OSCOOUT	Output of the on-chip oscillator.
3	OSCIN	Connect 24 MHz parallel resonant Crystal between OSCIN & OSCOUT.
4	V <sub>SS</sub>	Power Ground
5	CTSTTL	Reserved Pin, to be left unconnected
6	TD0TTL	Reserved Pin, to be left unconnected
7	RDITTL	Reserved Pin, to be left unconnected
8	/RESET	Logic Zero on the RESET pin forces AC1030 to a known start-up state.
9	N/A	No Connection
10	CSSAM	Reserved Pin, to be left unconnected
11	C8	Reserved Pin, to be left unconnected
12	VPP/Test	To be Connected to V <sub>ss</sub>
13	C4	Reserved Pin, to be left unconnected
14	IO Out	Data Output for Smart Card interface (C7).
15	RST	Reset for Smart Card Interface (C2)
16	CSCRD	Reserved Pin, to be left unconnected
17	RDYMOD	Control output for Data direction
18	PWRON	Control output for Card Power Enable, Clock Enable and Data-IN Enable
19	CARDIOIN	Data input from Smart Card Interface (C7)
20	CARDREMOVE	Card Insertion Status from End-of-Travel Switch, LOW when Card is inserted.
21	DTRTTL	Reserved Pin, to be left unconnected
22	EXTCLK	Reserved Pin, to be left unconnected
23	SELECT	Reserved for future use. To be connected to V <sub>ss</sub>
24	USB/232	Host Interface selection input. To be pulled-up with 10K resistor to V <sub>DD</sub>
25	N/A	No Connection
26	N/A	No Connection
27	N/A	No Connection
28	CLKCTL	Clock-stop control output. To be pulled-up with 10K resistor to V <sub>DD</sub> .
29	MCO	Main Clock Output, divide by 2 externally for Smart Card Interface CLK (C3)
30	V <sub>SSA</sub>	Analog Ground, to be connected to Power Ground.
31	USBDP	USB Bi-directional Data (DATA +)
32	USBDM	USB Bi-directional Data (DATA -). Connect 1K5 resistor to USBVCC pin 33
33	USBVCC	USB Power Supply.
34	V <sub>DDA</sub>	Analog Supply Voltage

## 7. Maximum Ratings

AC1030 contains circuitry that protects the inputs against damage from high static voltages or electric fields; however, do not apply voltages higher than those specified in the table below. Keep  $V_{IN}$  and  $V_{OUT}$  within the range  $V_{SS} \leq (V_{IN} \text{ or } V_{OUT}) \leq V_{DD}$ . Stresses above those listed as “Absolute Maximum Ratings” may cause permanent damage to the device. Functional operation of the device at these conditions is not implied. Exposure to maximum rating conditions for extended periods may affect reliability.

### 7.1 Absolute Maximum Ratings (Voltage Referenced to Vss)

Rating	Symbol	Value	Unit
Recommended Supply Voltage	$V_{DD}$	-0.3 to +7.0	V
Total Current into $V_{DD}/V_{SS}$	$I_{VDD} / I_{VSS}$	80/80	mA
Current Drain Per Pin (Excluding $V_{DD}$ and $V_{SS}$ )	I	25	mA
Ambient Temperature Range	$T_A$	$T_L$ to $T_H$ 0 to +70	°C
Storage Temperature Range	$T_{STG}$	-65 to +150	°C

### 7.2 I/O Port Characteristics

( $T_A = 0$  to  $70$  °C unless otherwise specified)

Symbol	Parameter	Condition	Min	Typ	Max	Unit
$V_{OL}$	Output Low level voltage	$I_{OL} = -1.6$ mA, $V_{DD}=5V$			0.4	V
$V_{OH}$	Output high level voltage	$I_{OH} = 1.6$ mA	$V_{DD}-0.8$			V
$V_{IH}$	Input high level voltage	Leading Edge	$0.7 \times V_{DD}$		$V_{DD}$	V
$V_{IL}$	Input Low level voltage	Trailing Edge	$V_{SS}$		$0.3 \times V_{DD}$	V
$T_{TR}$	Output Transition time	$CL=50pF$ , 10% to 90%		25		nS

### 7.3 USB Interface Characteristics (For USB only)

( $T_A = 0$  to  $70$  °C,  $V_{DD} = 4.0$  to  $5.25V$  unless otherwise specified)

Parameter	Symbol	Conditions	Min	Max	Unit
Differential input sensitivity	VDI	I(D+,D-)	0.2		V
Differential Common Mode Range	VCM	Includes VDI range	0.8	2.5	V
Single Ended Receiver Threshold	VSE		0.8	2.0	V
Static Output Low	VOL	$R_L=1.5Kohms$ to $3.6V$		0.3	V
Static Output High	VOH	$R_L=15Kohms$ to $V_{SS}$	2.8	3.6	V
USBVCC : voltage level	USBV	$V_{DD} = 5V$	3.0	3.6	V

## 7.4 Control Timing Characteristics

( $T_A = 0$  to  $70$  °C unless otherwise specified)

Symbol	Parameter	Condition	Min	Typ	Max	Unit
$F_{OSC}$	Crystal frequency	Note 1		22.1184 (Serial) 24 (USB)		MHz
$F_{CPU}$	Operating frequency	Note 1		7.3728 (Serial) 8 (USB)		MHz
$T_{RL}$	External reset pulse width		200			nS
$T_{OXOV}$	Crystal Oscillator start time				50	mS
$T_{DDR}$	Power up rise time	From $V_{DD}$ 0 to 4V			100	mS

### Note 1:

(1) For proper operation of the Reader, 22.1184 MHz crystal should be used when the interface is serial.

(2) For proper operation of the Reader, 24 MHz crystal should be used when the interface is USB.

### 8. Application Example (For serial port interface)

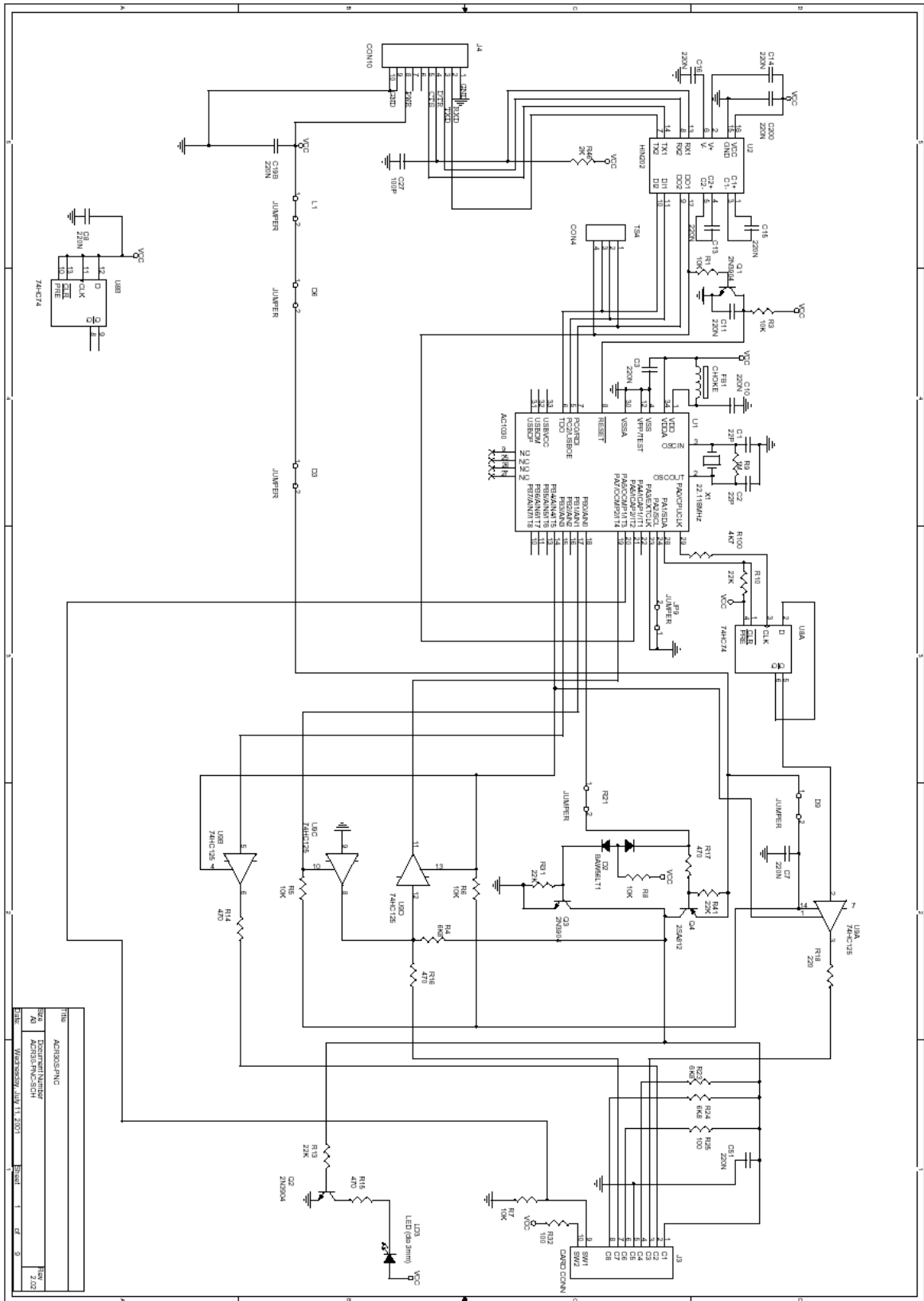


Figure 2. Card Reader Application of AC1030 (Serial connection)

### 9. Application Example (For USB port interface)

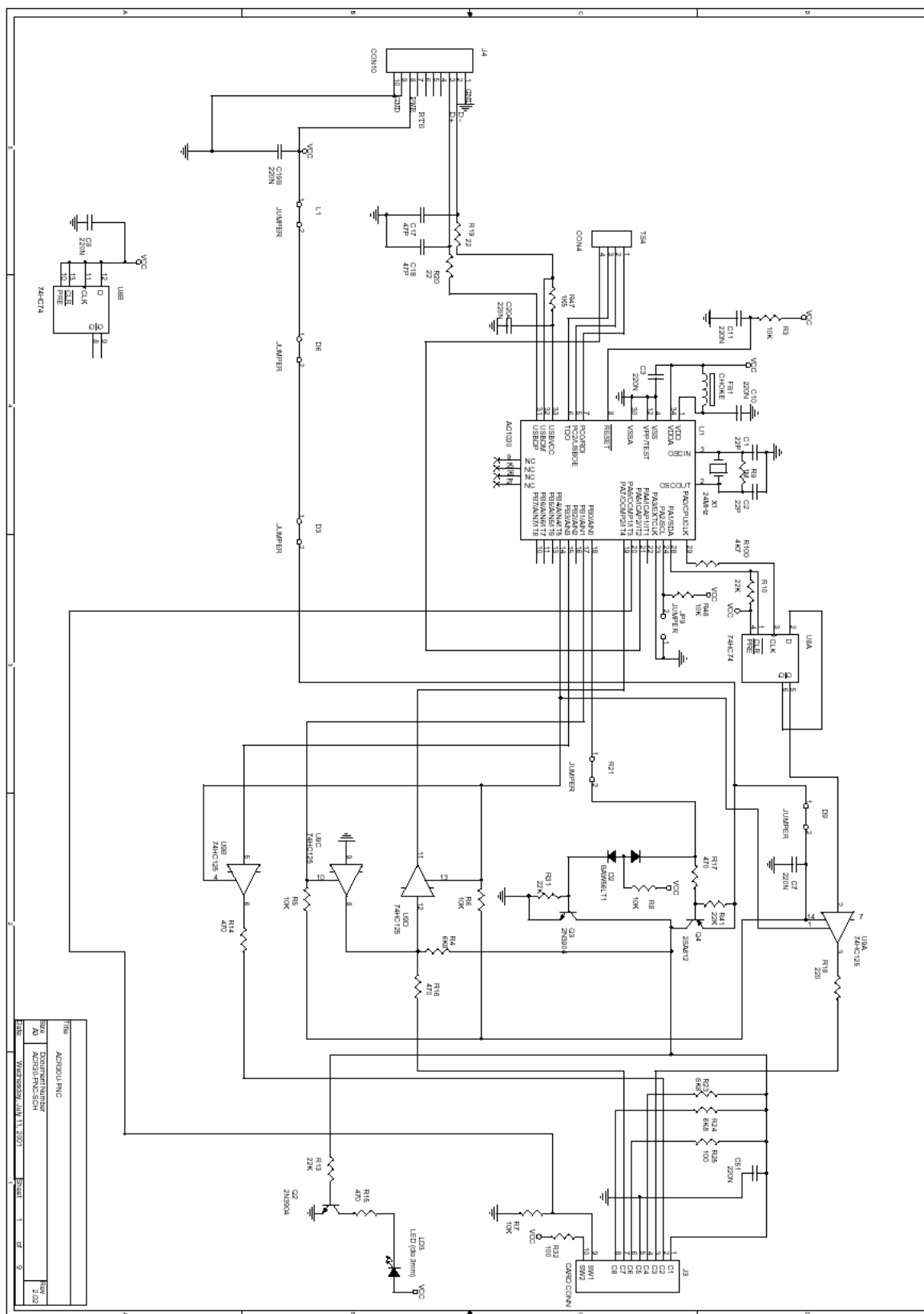


Figure 3. Card Reader Application of AC1030 (USB connection)

**34-Pin Shrink Plastic Small Outline Package, 300-mil Width**

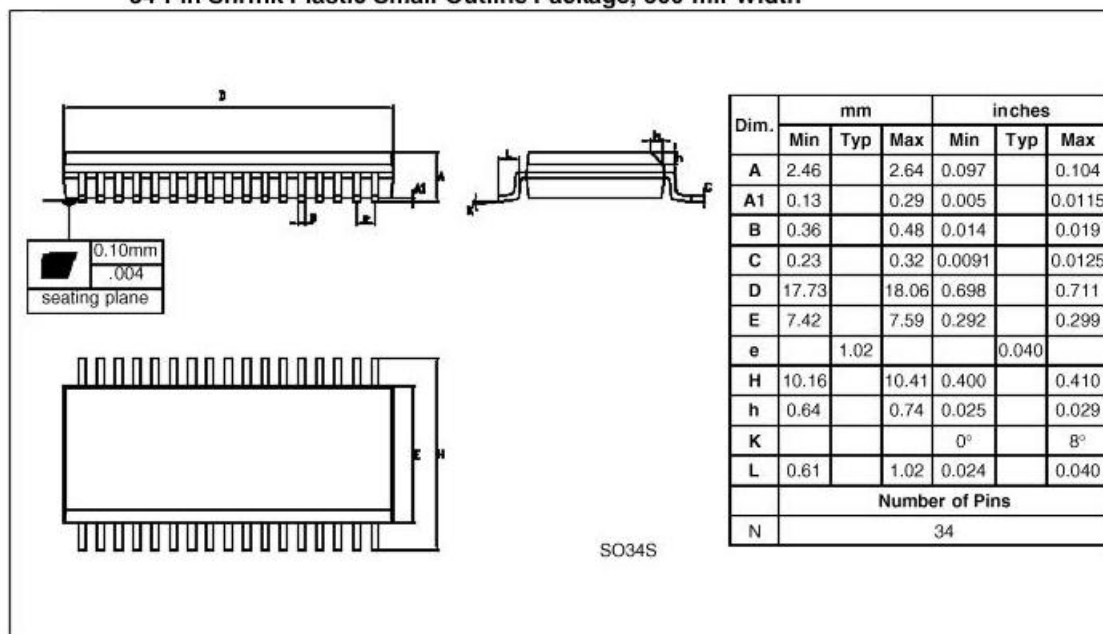


Figure 4. Package Drawing

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