AT88RF1354

13.56 Mhz RF Smart Card Reader IC

Features

RF Communications Interface is independent of Microcontroller Interface
- **Data is buffered within Reader IC**
- **RF Communication formatting and timing handled by Reader IC**
- **Microcontroller is not burdened by RF encoding and protocol tasks.**
- **Internal CRC generation and error checking (CRC_B)**

ISO/IEC 14443-2 Compliant Signaling
- **106 kbit/s Type B communications**

ISO/IEC 14443-3 Frame Format Compliant
- **Type B standard frame**

Serial Communications Interface
- **SPI or TWI programmed by interface mode select pin**
- **Two-Wire Interface Communication up to 1 Mhz**
- **SPI Mode 0 Slave device with clock speed up to 2 Mhz**

36 pin QFN Package (6 x 6 mm body, 0.5 mm lead pitch)
Industrial Temperature Range (-40 to +85 C case temp)
Supply Voltage: 3.0 to 3.6 volts or 4.5 to 5.5 volts

Description

The AT88RF1354 is a smart ISO/IEC 14443 Type B RF Reader IC. The AT88RF1354 communicates with RFID Transponders or Contactless Smartcards using the industry standard ISO/IEC 14443-2 Type B signal modulation scheme and ISO/IEC 14443-3 Type B frame format. Data is exchanged half duplex at a 106k bit per second rate. A two byte CRC_B provides communication error detection capability.

The AT88RF1354 is compatible with 3.3 V and 5 V host microcontrollers with two-wire or SPI serial interfaces. In two-wire interface mode the AT88RF1354 operates as a TWI slave and requires four microcontroller pins for data communication and handshaking. In SPI interface mode the AT88RF1354 operates as a mode 0 SPI slave and requires six microcontroller pins for data communication and handshaking.

To communicate with an RFID transponder the host microcontroller sends a data packet for transmission over the RF communications channel, and receives the response data packet that is received from the transponder over the RF communications channel. AT88RF1354 performs all RF communication packet formatting, decoding, and communication error checking. The host microcontroller is not burdened with RF encoding, timing, or protocol functions since these tasks are all performed by the AT88RF1354.

Block Diagram

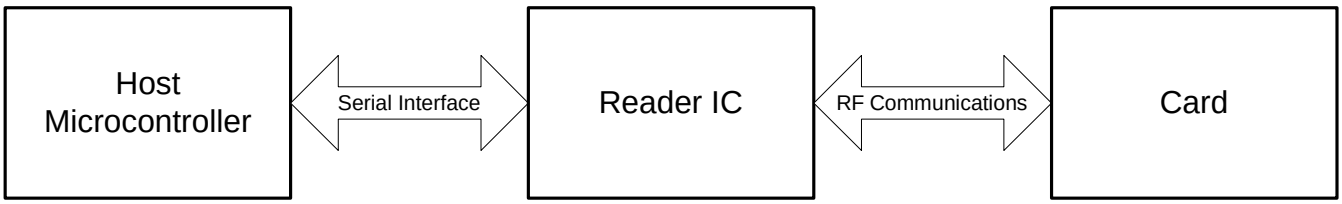

Figure 1. Block diagram of a RFID system using the AT88RF1354 Reader IC

Command Set

Command Name	Description	Code
Abort	Exit Command in Progress	$0D
Clear	Exit Command in Progress, Clear Buffer, Turn RF OFF	$0E
Poll Continous	Poll Continuously for Type B PICCs	$02
Poll Single	Poll Once for Type B PICCs	$01
Read Buffer	Read Data Buffer	$08
Read Register	Read Configuration Register	$07
RF OFF	Turn Off 13.56 MHz RF Field	$0B
RF ON	Turn On 13.56 MHz RF Field	$0A
Sleep	Activate Standby Mode	$0C
TX Data	Transmit Data to PICC and Receive the Response	$03
Write Buffer	Write Data Buffer	$09
Write Register	Write Configuration Register	$06
All Other Command Code Values Are Not Supported		

Pin List

QFN Pin	Package Pin Name	Description	Pin Type
1	Vcc_ANT	Power for ANT drivers Only	Power
2	Vss_ANT	Ground for ANT drivers Only	Ground
3	ANT	Antenna Driver 2	Output
4	Xtal1	Crystal Pin 1	Xtal Buffer
5	Xtal2	Crystal Pin 2	
6	C5	Bypass Capacitance	Output
7	Test1	VSS by Customer	TEST input
8	CLKO	Programmable Clock Output from PLL	Output
9	ResetB	Reset Bar from Microcontroller	Input
10	ISEL	Select SPI or 2-wire mode	Input
11	TestD	N/C by customer (Programmable I/O)	I/O
12	Istat	SPI Interface Status	Output
13	SSB	SPI Interface "Slave Select"	Input
14	SCK	SPI / 2-wire Serial Data Clock	Input
15	SDI	SPI Serial Data Input (2-wire data i/o)	I/O
16	Test2	VSS by Customer	TEST input
17	Test3	VSS by Customer	TEST input
19	SDO	SPI Serial Data Output	Output
20	ADDR	TWI Address Select	Input
21	C1	Bypass Capacitance	Output
22	Vss	Ground	Power
23	VssA	Ground	Power
24	Vcc	Power for digital and analog circuits	Power
25	C4	Bypass Capacitance	Output
26	C2	Bypass Capacitance	Output
27	C3	Bypass Capacitance	Output
29	C7	Bypass Capacitance	Output
31	TestR	N/C by customer	Analog Out
32	RFin	Input to Receiver	Input
34	Rmod	Modulation Depth Resistor (optional)	Analog
35	C6	Bypass Capacitance	Output

Typical Power Consumption

Typical Power Consumption (+35 C)	3.6 V Supply	5.5 V Supply
Reader Active, RF Field ON	170 mA	200 mA
Reader Active, RF Field OFF	*TBD*	*TBD*
Reader Idle, RF Field OFF	10 mA	15 mA
Reader in Standby, PLL On, Osc On	*TBD*	*TBD*
Reader in Standby, PLL Off, Osc On	*TBD*	*TBD*
Reader in Standby, PLL Off, Osc Off	1 mA	1.5 mA
Preliminary Estimate. Full Characterization is Required		

Absolute Maximum Ratings *

Absolute Maximum Rating	
Operating Temperature (case temp)	-40 C to +85 C
Storage Temperature (case temp)	-65 C to +150 C
Vcc	6 V
Vcc_ANT	6 V
Power Dissipation	2 Watts
HBM ESD	2000 V minimum

* NOTICE: Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability. This product package includes an integrated (exposed thermal pad) heatsink that must be soldered to the printed circuit board; failure to adequately heatsink this product will affect device reliability.

Preproduction Ordering Codes

Ordering Code	Package	Temperature Range
ATD88RF1354-ZU	36 pin QFN thermal package, 6 x 6 mm, Green	Industrial (-40 C to 85 C)

Production Ordering Codes

Ordering Code	Package	Temperature Range
AT88RF1354-ZU	36 pin QFN thermal package, 6 x 6 mm, Green	Industrial (-40 C to 85 C)

Package Drawing

THIS PAGE IS RESERVED FOR

Mechanical Drawing of 6 mm x 6 mm QFN package with 36 pins

Package Characteristics:

- 6 mm x 6 mm Body
- 1.0 mm Maximum Body Thickness
- 0.50 mm lead pitch
- 3.7 mm x 3.7 mm exposed thermal pad
- “Green” lead-free, halogen-free composition