1 FEATURES

- Security Transponder and Remote Keyless Entry chip
- 32 bit unique device identification (serial number) and product type identification.
- 128 Bit EEPROM for user data storage
- 14-pin SO package

Security Transponder

- Compatible with transponder family PCF7936
- Fast mutual authentication, 39ms
- 48 bit Secret Key
- EEPROM read/write protection features
- Excellent sensitivity in read and write mode

Remote Control

- Four user buttons (15 + 1 commands)
- LED acknowledgment of transmission
- 42 bit rolling code
- 48 bit Remote Secret Key
- Rolling code synchronization via transponder
- Programmable data rate and frame repetition rate
- Clock input as external data rate reference
- Single cell operation, 2.0V to 3.6V
- Battery low detection via transponder interface
- Ultra low power consumption
- Low tolerance on-chip RC oscillator

2 GENERAL DESCRIPTION

The PCF7946AT is a high performance Security Transponder and Remote Keyless Entry chip for automotive applications that combines vehicle Immobilization and Remote Keyless Entry functions in the same device.

To serve the function of a Security Transponder an external coil has to be connected to the device, in order to provide contactless communication with the basestation as well as to derive the device power supply from the magnetic field established by the basestation. No additional battery supply is needed. The basic transponder operation is compatible with the transponder family PCF7936, except for the Password and Read-Only modes, which are not supported. The Security Transponder features secure contactless authentication, employing a Secret Key and a random number in order to cipher any communication between the device and the basestation. Like the Security Transponder family PCF7936, the PCF7946AT features a factory programmed unique serial number that also serves as product type identification.

To serve Remote Keyless Entry functions an external IR or UHF transmitter has to be connected to the device that transmits the rolling code telegram to a corresponding receiver. The PCF7946AT and the transmitter are supplied from a battery (Lithium type, single cell). The PCF7946AT supports up to four user buttons that can generate up to 15 different commands upon button press. In addition the PCF7946AT can signal a button release condition to the receiver. A LED output acknowledges transmission of the rolling code telegram.

The PCF7946AT can operate with IR or RF (VHF/UHF) based transmitters. In case of a IR transmission, the PCF7946AT supports sub-carrier modulation to minimize power consumption. In case of a RF transmission the PCF7946AT supports ASK and FSK modulation with manchester encoding.

Device timing is derived from a low tolerant on-chip RC oscillator. In case an accurate transmission data rate is required, the PCF7946AT rolling code generator may be clocked from an external source, e.g. PLL reference clock.

3 ORDERING INFORMATION

EXTENDED TYPE NUMBER	PACKAGE			TEMPERATURE RANGE (°C)
	NAME	DESCRIPTION	OUTLINE VERSION	
PCF 7946AT/1081	SO14	plastic small outline package, 14 pin	SOT108-1	-40°C to +85°C [1)]

Note

1. The operating temperature range for the Remote Control Circuitry is restricted to -20°C to +70°C, see section 13.

4 BLOCK DIAGRAM

The PCF7946AT features a high degree of integration and requires few external components only, to operate as Security Transponder or Remote Keyless Entry encoder. The device incorporates the following circuitry, see Figure 1.

Security Transponder

- Contactless Interface
- EEPROM (384 Bit)
- Control Logic
- Calculation Unit (security algorithm)

Remote Control

- Interface Control
- Rolling Code Generator
- Modulator
- Control Logic
- RC oscillator
- LED Control

Power management

- Supply Switch Logic
- Battery Power On Reset
- Sequence Increment Register (SI)
- Reset Logic

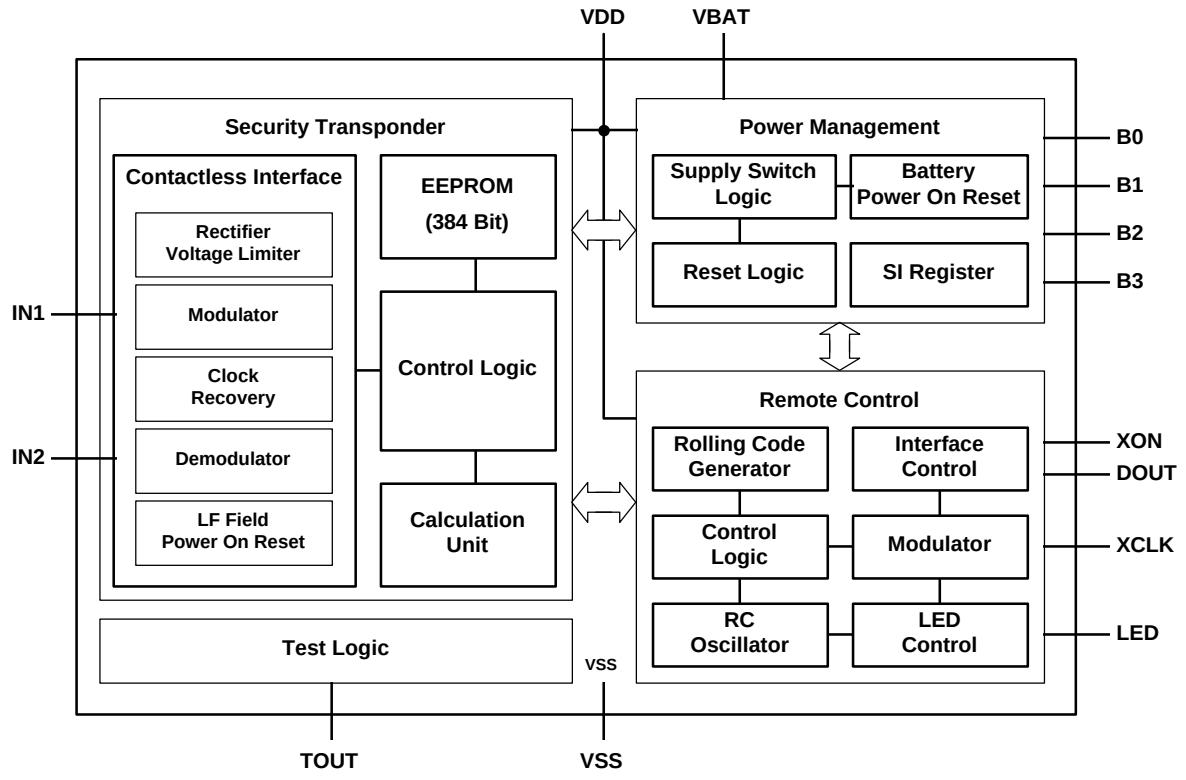


Figure 1. Block Diagram

5 TYPICAL APPLICATION

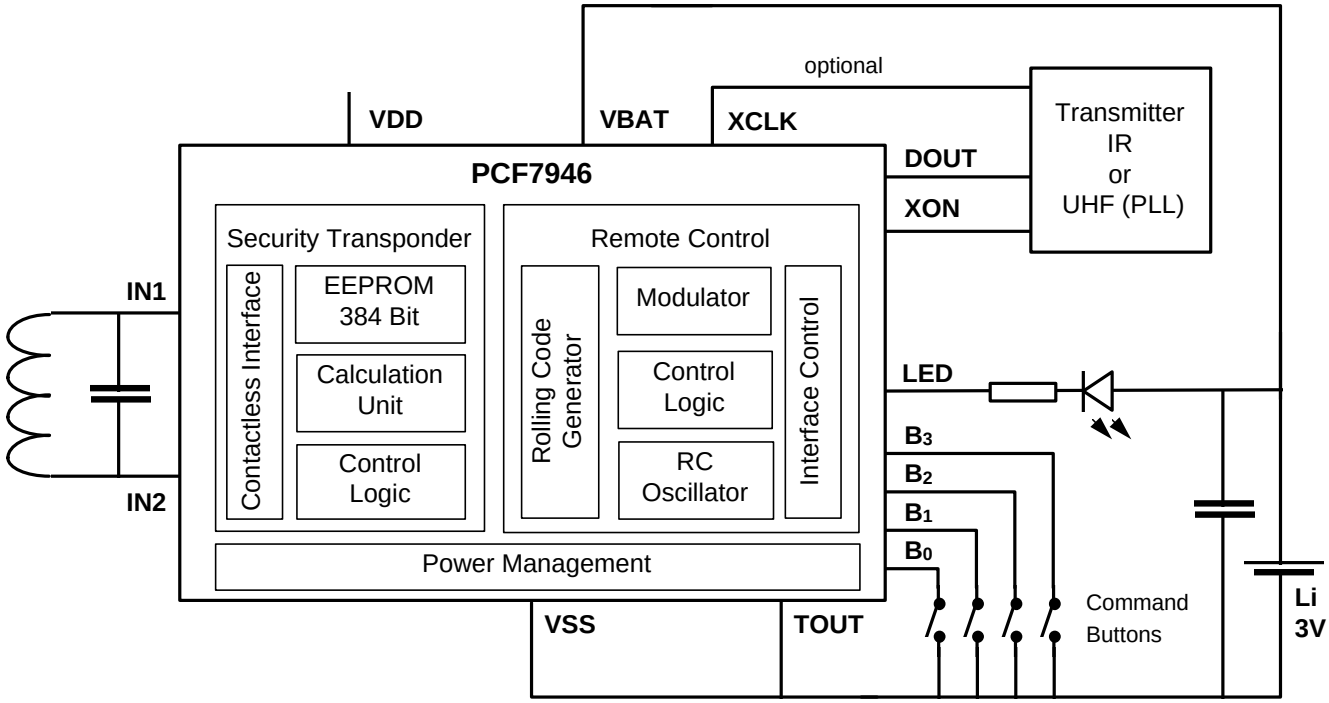


Figure 2. Typical Application

6 QUICK REFERENCE DATA

6.1 Transponder Circuitry

PARAMETER	VALUE	UNIT
Carrier frequency	125	kHz
Data rate - read - write	 4.0 5.2	 kbit/s kbit/s
Data coding - read - write	 Manchester or Bi-Phase Binary Pulse Length Modulation (BPLM)	
Data transmission mode	Half-Duplex	
Modulation	Amplitude Shift Keying (ASK)	
Memory size	384	bit
Identifier (serial number and product type ID)	32	bit
Secret Key	48	bit
Authentication time	39	ms
Special Features	• Ciphered mutual authentication • Ciphered data transmission • 128 bit user EEPROM with programmable write protection • Compatible with Security Transponder family PCF7936	

6.2 Remote Circuitry

PARAMETER	VALUE	UNIT
Operating supply voltage	2.0 - 3.6	V
Supply current	0.3	mA
Power-down current	0.3	µA
Data rate - On-chip RC Oscillator - External clock reference	 2 or 4 10 (MAX)	 kbit/s kbit/s
Data coding	Manchester	
Button commands (up to four user buttons)	15 + 1	
Rolling code length	42	bit
Remote Secret Key	48	bit
Identifier (serial number and product type ID)	32	bit
Special Features	• Synchronization of rolling code via transponder interface • Programmable LED acknowledgement • Supports ASK/FSK transmitter devices (PLL) • Sub-carrier mode for Infra-Red applications	

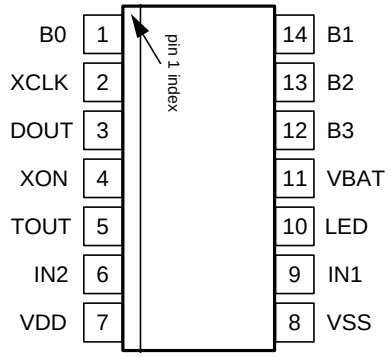
7 PINNING

Table 1. Pin Assignment

PIN	FUNCTION	DESCRIPTION	NOTE
1	B0	Input, Command Button 0	
2	XCLK	Input, External Data Clock Reference	
3	DOUT	Output, Remote Data	
4	XON	Output, Transmitter Power On	
5	TOUT	Device Test	1
6	IN2	Input, Transponder Interface (Coil)	
7	VDD	Internal Supply Voltage	
8	VSS	Common Ground (Battery neg. Terminal)	
9	IN1	Input, Transponder Interface (Coil)	
10	LED	Output, LED	
11	VBAT	Battery Supply Voltage (Battery pos. Terminal)	
12	B3	Input, Command Button 3	
13	B2	Input, Command Button 2	
14	B1	Input, Command Button 1	

Note

1. Reserved for factory test purposes, although TOUT features an on-chip pull down resistor, this pin has to be connected to ground during normal device operation.



Pin Configuration