

## **PINpad 1000se / Qx1000 Product Description**

The PINpad 1000SE CTLS is a peripheral data entry device that accepts and encrypts Personal Identification Numbers (PINs) in addition to accepting contactless card input. Typically, a PIN is a four- to twelve-digit code, known only by the customer and the issuer. A PIN is requested during a transaction to verify that a customer is authorized to use the account (card) offered. The PIN also serves as the electronic signature for the credit or debit transaction. The contactless card reader allows user to quickly pay for items using their contactless card and tapping it on the device, thus completing the transaction without further input.

The PINpad 1000se / Qx1000 Product consists of the following main circuits:

- An Intentional Radiator / Receiver operating in frequency of 13.56 MHz.
- RS-232 / USB Serial Communication.
- A Central Processing Unit (CPU) and Peripherals.
- An External AC/DC Adapter Unit.

The detailed explanations about each one of the above-mentioned circuits is given below (see the attached PP1000\_CTLS Reader Block-Diagram: USB / RS-232 Model).

### 1. 13.56 MHz Intentional Radiator / Receiver

This circuit is comprised of a Communication Chip, NXP PN512, Transmit and Receive Matching Circuits and a Loop Antenna, the operation of which is explained as follows:

- In the Transmit Path, the NXP PN512 Transmit Portion sends a 13.56 MHz, DSB Modulated Signal through the Transmitter Matching Booster to a Loop Antenna, which creates a Magnetic Field used for powering a contactless smart card and sending it modulated signals.
- In the Receive Path, when a contactless smart card is brought close to a designated region at the PINpad 1000se / Qx1000 Product (located and marked with a Contactless Symbol) at the Upper Part of the Product's Front Panel, the Loop Antenna receives modulated signals from the card and forward them, through the Receiver Matching Circuit, to the NXP PN512 Receive Portion for further processing.
- The Loop Antenna is built from a PCB containing two turns for creating magnetic field intensity that can be used for powering the contactless smart card and for sending and receiving data to and from the card.
- The sensing of the data from the contactless smart card is made possible by measuring and attributing different magnetic field loadings to each one of the characters being communicated.
- The information received from the contactless smart card, as decoded by the NXP PN512 IC, is forwarded to the ASIC for further processing.
- The NXP PN512 performs communications with the ASIC over an SPI bus.

### 2. RS-232 / USB Serial Communication

The Communication Circuitry between the PINpad 1000se / Qx1000 and an external controller is implemented by using either an RS-232 or a USB Communication IC, as follows:

#### 2.1. From and To the PINpad 1000se / Qx1000 RS-232 or USB Communication IC To and From the External World, respectively.

- RS-232 Communication: An RJ-11 Cable having an RJ-11 Male Connector at one side is plugged into the PINpad 1000se / Qx1000's RJ-11 jack; the other side of the cable having a connector suitable for the external controller's RS-232 connector is plugged into the external controller. The input DC Voltage (7.5 V – 20.0 V) used for supplying the PINpad 1000se / Qx1000 Product is brought by connection to a special DC jack located on the connector, or directly from the external controller, depending on the configuration. The RS-232 Communication IC is fed from a 3.3 VDC Internal Power Supply, which is obtained from a chain of two successive power supplies: (1) Input DC Voltage to 5.8 VDC and (2) 5.8 VDC to 3.3 VDC.
- USB Communication: An RJ-11 Cable having an RJ-11 Male Connector at one side is plugged into an RJ-11 Jack that is placed on the PINpad 1000se / Qx1000 Product; the other side of the RJ-11 Cable having a USB Connector is plugged into the external controller's USB host jack. The input DC Voltage (7.5 V – 20.0 V) used for feeding the PINpad 1000se / Qx1000 Product is brought by connection to a special DC jack located at a split from the above-mentioned USB connector. The USB Communication IC is fed from a 5.0 VDC Internal Power Supply, which is fed from the 7.5 VDC to 20.0 VDC Input DC Voltage.

### 3. Central Processing Unit and Peripherals

3.1. The CPU is an ASIC containing an ARM7 TDMI & 64 Kbyte RAM Core. The following Peripherals support the CPU:

- 512 Kbyte RAM: Data storage.
- 2 Mbyte FLASH Memory: Contains the Operating System and Application SW.
- SAM (Security Access Module) Interface IC: Available for optional customer-specific encryption key storage and processing.
- Supervisor Mechanism Circuitry: Prevents customer code writing into reserved locations of the 512 Kbyte RAM, where sensitive information such as bank encryption keys may exist.
- Security Module: Identifies unauthorized physical penetrations into the PINpad 1000se / Qx1000 Product, in which case Tampered Device State is declared, causing the automatic erasure of secret encryption keys and SW and, consequently, transactions are completely prevented.
- Power & Reset Control Circuitry: Checks the level of the 3.3 VDC and resets the PINpad 1000se / Qx1000 Product in case that this voltage drops below a specific level.
- Frequency Select: Selects the Buzzer Frequency to be either 750 Hz or 1,500 Hz.
- LCD Interface: Enables the user to read messages displayed by the Transaction Application. Diagnostics and other control messages that are relevant to the PINpad 1000se / Qx1000 functionality can be displayed.
- Keyboard Circuit: Enables the user to enter his Personal Identification Number (PIN) for Authentication of the cardholder after the contactless smart card information is processed. (This option is possible in the PINpad 1000se Product only; it is not implemented in the Qx1000 Product).

3.2. The Main Functions of the CPU and its Peripherals are as follows:

- Transaction processing, including data communication with the contactless smart card.
- User Interface (using the Keypad and LCD).
- Peripheral Communication Timing.
- Serial Communication (either RS-232 or USB).
- Encryption and decryption.

### 4. External AC/DC Adapter Unit

The PINpad 1000se/ Qx1000 Product is optionally powered by 7.5 – 20.0 VDC supplied from an External AC / DC Adapter fed from the AC Mains Voltage (100 – 240 VAC, 50 – 60 Hz); the connection of this DC Voltage to the PINpad 1000se / Qx1000 Product is explained in Paragraph 2 above.