



SIERRA
WIRELESS™

Wide Area Wireless Technology in the Point of Sale Environment

Olivier Amiot
Sierra Wireless, Inc.
January, 2010

Introduction:

Wireless point of sale (POS) terminals refers to the communication devices, including hardware and software, used for a payment transaction.

Over the last few years, customer buying patterns have indicated a major shift away from cash to debit card electronic payment for purchases. This shift from cash to debit has also translated into a number of concerns regarding the overall payment process, including ease of use and security.

From a user's perspective the payment system, and POS terminal, should be intuitive, easy to use and comfortable to hold. Transaction information should be legible, processed quickly and be transferred securely. Speeds at which transaction are processed continue to be an ongoing concern as the user will get nervous if the transaction takes too long to be completed.

Integrating wireless into POS devices

Wireless robustness and power consumption have become increasingly critical parameters in the design of a payment terminal or device.

In order to achieve secure and reliable communication with low power consumption, a wireless module embedded into a POS terminal must be compliant with requirements described in this white paper.

Requirement:

Use cases can be categorized in two groups depending on usage environments:

- A static environment, typically a shop or restaurant
- A dynamic environment: payment transactions in a moving vehicle such as a moving train; payments in a vehicle such as a taxi which has been moving and has stopped to finalize payment

The static environment case:

Criteria to consider when integrating wireless embedded modules include:

- Power consumption
- Ability to address the different radio bands with the same radio performance
- Radio performance including sensibility
- AT commands and latency

The dynamic environment case:

Criteria to consider when integrating wireless embedded modules in this environment include:

- Power consumption
- Ability to address the different radio bands with the same radio performance
- Radio performance including sensibility
- AT commands and latency
- Ability to attach and detach from network

Like any processor, the wireless embedded module has several modes to adapt its power consumption to different application use cases, which can be triggered according to the status:

- **OFF mode:** Nothing is powered in the wireless module CPU, and no service is available

- **ALARM mode:** The RTC is powered in the wireless module CPU which can be alerted either on pre-programmed RTC alarm expiration or on user request (ON/OFF pin out).
- **SLEEP mode:** The wireless module CPU is fully powered but the internal processor is in sleep mode. The software is suspended waiting for RTC alarm expiration or wireless paging when the GSM stack is enabled, via external interruption or keypad press.
- **ACTIVE mode:** The wireless module CPU is fully powered and all services are available.

Most common power consumption modes used are both sleep mode and active mode. In active mode, there is a strategic pattern to monitor transaction time and peak consumption, allowing further POS terminal miniaturization by reducing the battery power, as well as extending battery life.

One typical pattern is when the POS terminal is simultaneously printing the voucher and exchanging data for the payment transaction. These simultaneous actions are as depicted in figure 1. In order to prevent the use of a more powerful and expensive battery, and to ensure safe and consistent transaction speeds, the transmitted burst in GSM radio frame is detected before it happens in order to stop the printing application from being suspended, thereby ensuring the printing transaction is completed.

Having the ability to control the GSM radio stack for both detecting transmitted bursts and monitoring consumption mode on events are key enablers for securing consumption and speed performances during transactions.

Image 1 Depicts GSM radio frame interruption patterns

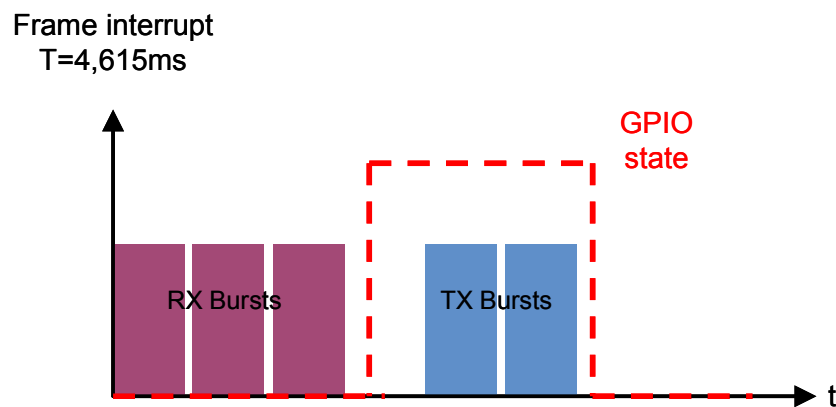
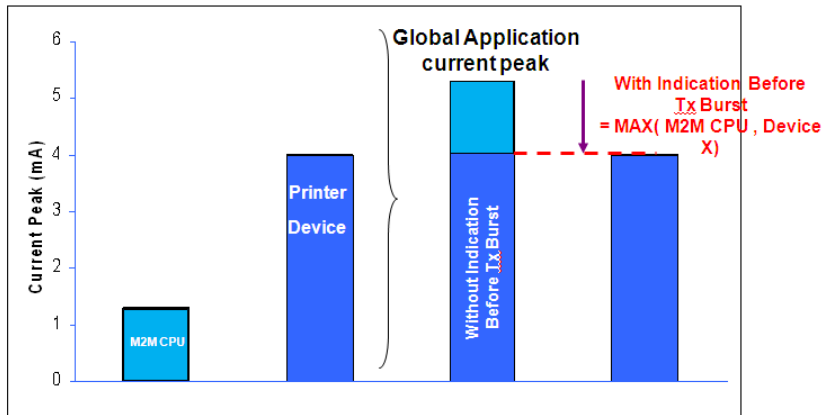


Image 2 denotes peak current consumption



POS terminals are today deployed in most countries around the world, and therefore should be exchanging data on numerous types of network and wireless technologies including GPRS, EDGE, CDMA, CDMA RUIIM, WCDMA and TD-SCDMA.

At the design stage, it is very important for the POS terminal maker to have a portfolio of wireless modules that can address different network and wireless technologies, without having to change the mechanical platform, and with minimal change in the electronic and/or software interface. This will help to reduce development costs and expedite time to market requirements.

Minimizing changes brings additional control on performance monitoring, especially on the radio behavior, as the other elements of the POS terminal remain the same. Having the ability to source wireless modules that can address different technologies with the same form factor and electronic/software interface is a must to optimize the POS terminal implementation and overall performance.

Radio performance is linked to hardware and software. RF sensibility, good noise rejection, and stable connections are expected from the hardware side. POS applications require specific knowledge on the software and firmware stack side to enable fast attach or detach capabilities, especially for the dynamic use case, but also to enable optimization of specific AT commands to reduce latency, and to improve speed transaction performance as well as the power-up sequence.

Conclusion:

Monitoring and controlling the RF technologies, the software and the stack performances on the wireless module have proven to bring significant benefits including consistent transaction speeds and reduced power consumption to the POS terminal. A product family having the same form factor and hardware and software interface provides unique opportunities for POS manufacturers to leverage cost savings, smooth integration, maximized reuse of their platform, improved time to market and solid return on investment.