



# IPs for Electronic Toll Collection (ETC)

Benefit from our experience

DELTA has been developing custom specified chips for ETC since 1984. Our work is based on following of our IP:

## Digital IPs

### Processors

- V8 / 8051 / PIC 8 bit RISC
- 32 bit LEON processor
- ARM7 TDMI
- Open MSP430

### Co-processors

- DES / 3DES processor
- AES encryption
- SHA-1 hashing

### Power management

- GSS state controller

### Interfaces

- I<sup>2</sup>C core
- UART
- HDLC (High-level Data Link Controller) for DSRC
- USB 1.1 core

### RFID area

- Read/write RFID IC with I<sup>2</sup>C
- ISO 14443 modulator / demodulator
- ISO 15693 modulator / demodulator

### Timers

- RTC (Real Time Clock) timers
- Customizable timers

### Memories

- ROM
- SRAM
- OTP (0.5  $\mu$ m)
- EEPROM (0.25  $\mu$ m, 0.18  $\mu$ m)
- Flash (0.18  $\mu$ m)

## Analog IPs

### Power management

- Bandgap ref.
- ULP voltage regulator
- Voltage reg. (LDO)
- POR (Power On Reset) Brown Out Detectors

### RFID interfaces

- ISO 14443 / ISO 15693 analog front ends (multi standard support)
- ISO 18000-6c / EPC GEN2 UHF front end

### Interfaces

- LVDS (Low-Voltage Differential Signaling) I/Os

### Signal conditioning

- ADC 8-10 bit SAR
- DAC 8-10 bit
- Sigma-Delta ADC 16 - 24 bit
- Bandgap ref
- Amplifiers (instrumentation, transconductance, differential, LNA)
- Comparators
- Switch CAP amplifiers with offset compensation
- PWM (Pulse Width Modulator) for driving piezoelectric speaker

### Oscillators and PLLs

- PLL (32 kHz – 4 / 12 / 16 MHz)
- RC oscillator ULP (Ultra Low Power) from 32 kHz to 16 MHz, trimable and programmable
- ULP (Ultra Low Power) crystal oscillator

For further information please contact us

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