P60D042_SDS

SmartMX2 Family P60D042y

Rev. 3.0 — 27 September 2016

Public product data sheet
COMPANY PUBLIC

1 General description

The P60D042 dual-interface secure microcontroller is part of the most recent P60-Step-Up! family generation and builds on the IntegralSecurity architecture. It delivers unprecedented security, extended memory footprint, and highest performance across all typical up-to-date requested fast transaction cases in Payment and eGov. Furthermore, it comes with comprehensive options of ready-to-use MIFARE™ functionality and certified crypto library modules and can be ordered in various advanced package options for contact, dual interface, and contactless operation.

2 Features and benefits

2.1 Key features

- User EEPROM: up to 40 KB
- User ROM: 384 KB
- User RAM: up to 8128 Bytes
- Dual Interface Type according to ISO/IEC 14443/7816
- Rich option choice of certified convergence implementations:
  - y = P (Plain, no convergence implementations)
  - y = M (MIFARE Plus/Classic implementation)
  - y = D (MIFARE DESFire EV1 implementation)
  - y = J (Joint, common MIFARE Plus/Classic/DESFire EV1 implementation)
- Contactless VHBR data rate up to 1.7 Mbit/s (card to reader)
- Hardware-based Physically Unclonable Function (PUF) implemented: provides strong protection for secret keys and data
- SmartICE Development tool chain with true bond-out chip and Softmasking Device allows faster time to market

2.2 Hardware features

- Economic and resilient ROM/EEPROM design
  - data retention time: 25 years minimum
  - endurance: 500000 cycles
  - versatile EEPROM programming: 1 B to 128 B at a time
- SmartMX2 CPU with orthogonal instruction set offering 32-/24-/16-/8-bit instructions optimized for secured and low-power smart card applications
- Dedicated high-performance secure coprocessor FAME2 for Public Key Infrastructure (PKI) cryptography (RSA, ECC)
- High-performance secured hardware support for symmetric block cipher algorithms:

  - Dual/triple DES and AES, all key lengths
  - Dedicated hardware support for SEED and OSCCA algorithms, multiple key and data register sets for parallel data/key loading and calculation
- True Random Number Generator (compliant to AIS-31)
- 16-bit and 32-bit CRC coprocessor supporting fast memory-verify functionality Memory Management Unit (MMU):
  - 16 segment cache entries and performance improvements
  - Supporting integral concept for secure code fetch and execution
- Copy Machine offering data transfer between all Special Function Registers and all Memory instances without CPU interaction
- Watchdog Timer supporting secure code execution, Time Stamp Counter, Real Time Clock
- Continuous operation from 1.62 V up to 5.5 V
- Operating ambient temperature from -25 °C to +85 °C
- Selection of optimized antenna adaptations for respectively Class 1 ("ID1") and Class 2 ("1/2 ID1") antenna dimensions; additional option of common adaptation for both Class1 and Class2

2.3 Security features

- Outstanding Glue Logic chip layout based on the IntegralSecurity™ architecture concept:
  - Most efficient and proven protection against reverse engineering
  - Impossible to recognize logical blocks by means of optical inspection
- Advanced security sensors on clock, temperature, supply voltage, light, and single fault injection
- Active and dynamic shielding
- Advanced memory security (encryption and physical measures) for RAM, EEPROM and ROM
- OS controlled access restriction mechanism to peripherals in user mode
- Programmable card disable feature
- Physically Unclonable Function hardware support to secure keys against new attack scenarios
- Metal layer design for highest attack resilience
- No general standard core or re-used hard macro applied
- No use of ROM-based micro code
- Selection of optimized antenna adaptations for respectively Class 1 (ID1) and Class 2 (1/2 ID1) antenna dimensions, additional option of common adaptation for both Class1 and Class2
- Certificates and approvals; Common Criteria up to EAL6+, EMVCo, and CUP
- One common certificate for controllers with or without MIFARE functionality offers high re-use for any composite certification

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2.4 Additional features

- CC security certified crypto library as a commercial option:
  - Consists of easy to use APIs for all algorithms, allows for dynamic use of memory resources
  - Safeguards secure operation in both contact and contactless mode
  - Includes state-of-the-art and future-proof built-in security features to avoid power (SPA/DPA), timing and fault attacks (DFA)
  - Every module is available separately
  - RSA encryption and decryption (256 … 4096 bit key length)
  - RSA signature generation and verification (256 … 4096 bit key length)
  - RSA key generation (plain and CRT format, 256 … 4096 bit key length)
  - ECC over GF(p) signature generation and verification (128 … 576 bit key length
  - ECC over GF(p) key generation and Diffie-Hellman key exchange (128 … 576 bit key length)
  - ECC over GF(p) full point addition
  - SHA-1, SHA-224, SHA-256, SHA-384 and SHA-512 hash computation
  - DES encryption, decryption and MAC (S-DES and T-DES with 2 & 3 keys)
  - AES encryption, decryption and MAC calculation (128, 192, 256 bit key length)
  - Pseudo Random number generation based on a deterministic random number generator, generator of type K4
- Rich set of MIFARE™ Flex configuration options available as selectable mix of card data sizes:
  - MIFARE Classic/Plus (up to 4 KB)
  - MIFARE DESFire EV1 (up to 32 KB)
  - In-built functionality, no additional User ROM area needed
- Service on batch, wafer or die-individual security data, secure transport keys:
  - Various EEPROM initialization options available to facilitate customer's personalization
  - Comprehensive offer on NXP Trust Provisioning service options

3 Development tools

- Development tool chain, based on approved suppliers Keil and Ashling:
  - Well-perceived µVision user interface
  - Fast and efficient compiler, loader and timing-accurate simulator software
  - High-performance emulation hardware "SmartICE series"
  - Close-to-product emulation safeguarded via a true bond-out controller
- Dual Interface Softmask Device (SMD) P60D289 for fast Flash-based prototyping
- Tutorial Libraries with dedicated customer application support via local NXP Field Application Engineers

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4 Packages and applications

- Rich selection of contact, dual interface, and contactless chip modules on tape:
  - Approved selection of gold-plated and palladium-plated chip modules (Figure 1)
  - Benchmark in thinnest contactless modules (Figure 2)
  - Benchmark in robust molded modules
  - Wafer deliveries in different thicknesses on Film Frame Carrier (FFC), Figure 3
- Full coverage of today's performance needs for:
  - Payment and eGov applications
  - Transport & access management
  - Device authentication
  - Wearables and Internet of Things (IoT)

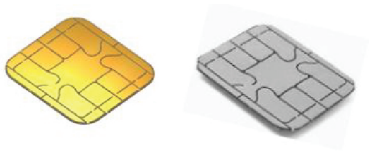


Figure 1. Gold-plated and palladium-plated modules



Figure 2. Contactless module



Figure 3. FFC

5 Revision history

Table 1. Revision history

Document ID	Release date	Data sheet status	Change notice	Supercedes
P60D042_SDS v.3	20160927	Product data sheet	-	-

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6.1 Data sheet status

Document status[1][2]	Product status[3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

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