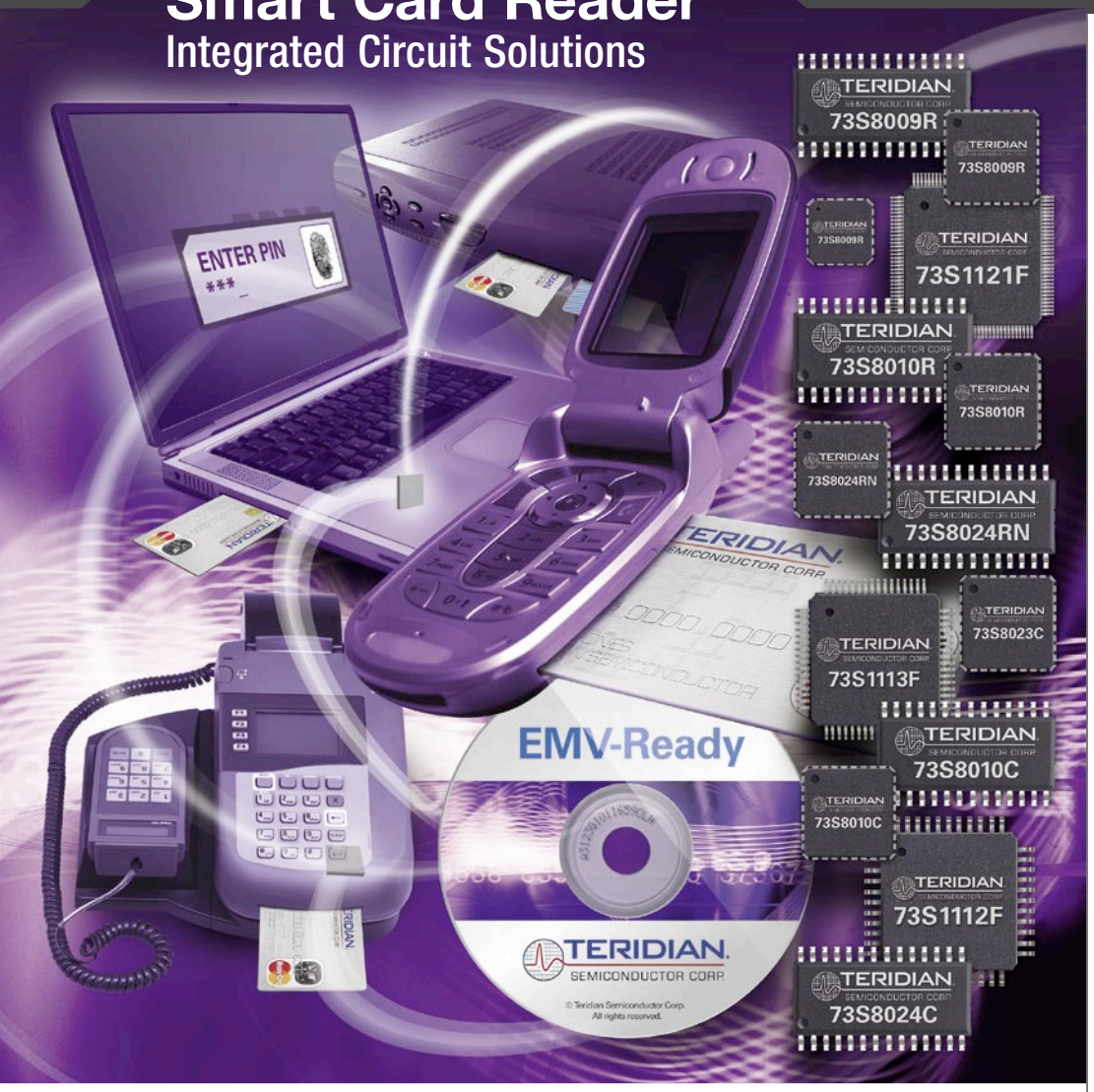
Smart Card Reader
Integrated Circuit Solutions



"If you think the cards are smart, you should see the readers…"

Whenever you need to implement a smart card reader into your system, Teridian Semiconductor has a solution that is easy to implement and certify against applicable standards such as ISO7816-4, EMV2000, NDS and JICSAP.

Teridian Semiconductor offers the widest range of smart card reader ICs, from low-cost card interfaces to intelligent system-on-chips with optionnal turnkey firmware stacks, such as the Teridian "EMV-Ready", that can be controlled by serial commands. Furthermore, Teridian's first class customer support and environmentally friendly lead-free and green materials are available for all Teridian products.

Teridian offers with its controller-based solution a comprehensive set of libraries (API), taking care of all teh low-level control of the system-on-chip, including a pre-approved stack against EMV4.1 (level1). Additionally, Teridian can provide a CCID reference design (firmware and driver) to easily develop a custom application.

Teridian's smart card reader software stacks are offered free-of-charge and royalty free. Moreover, these software stacks have been submitted to independent certification labs such as EMV, USB, and WHQL, which means that technical certification issues are already well understood. In addition, Teridian's engineers are there to help you to analyze and solve any problems you might encounter.

Should there be a need for formal EMV certification, Teridian Semiconductor works with EMV-accredited laboratories already familiar with Teridian's products, so quick and seamless certification services are available.

Should there be a need for particular turnkey solutions, Teridian Semiconductor has partnered with third party developers who can provide dedicated development services.

Applications

- ***Audio-Video:*** *Set-Top-Boxes, Digital TVs, DVD & HDD Recorders: Smart card reader slots for Conditional Access, Pay-per-View and payment*
- ***Payment:*** *PINpad readers, Point-of-SalesTerminals, Multiple SAM Architectures*
- ***Utility Meters:*** *Pre-payment slots*
- ***PC:*** *Smart card reader slots embedded in laptops*
- ***Digital Identity (Corporate IDs, Government and Health-Care IDs):*** *Hand-held Smart Card Readers and PINpads*
- ***E-Banking:*** *MasterCard CAP and similar handheld readers (connected PINpads)*
- ***Portable Devices:*** *Cell-phones and PDAs*

TERIDIAN
SEMICONDUCTOR CORP.
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Smart Card Interface IC Solutions

Advantages

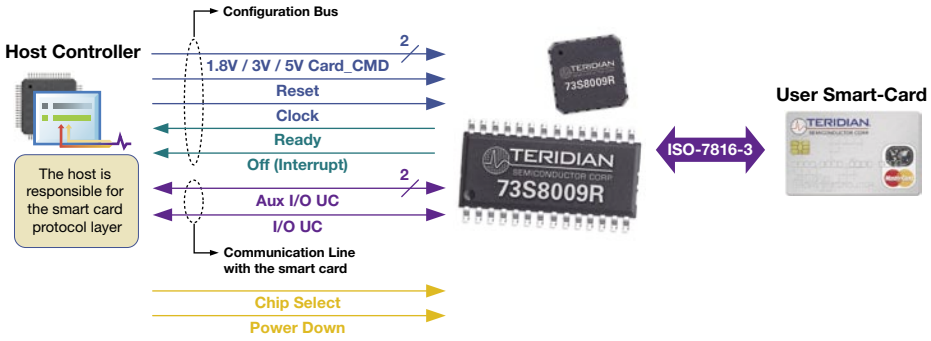
- *World's lowest-cost ICs*
- *LDO Regulator-based (73S80xxR series) or DC-DC Converter based (73S800xxC series) to adapt to the system power-supply available*
- *Approved for use with EMV 4.0/4.1 and NDS Videoguard (73S8024RN)*
- *Advantageous replacement of the former TDA8004 and TDA8002*
  - *No firmware changes required*
- *High current capabilities: ICC up to 90mA supplied to the card: The highest of the industry!*
- *Very-low power: 73S80xxC series offer high-efficiency DC-DC converters and a power down mode: ideal for battery powered applications, such as POS terminals, PDAs and cell phones*
- *Low power dissipation: Up to 500mW are saved compared to former TDA8004 /TDA8002 solutions!*
- *Small size: Offered in SO28 for pin-to-pin compatibility with industry standards, the Teridian 73S80xx are also available in QFN32 and QFN20 packages, that makes them the smallest card interfaces of the industry!*

Teridian 73S80xxR and 73S80xxC Smart Card Interface Integrated Circuits

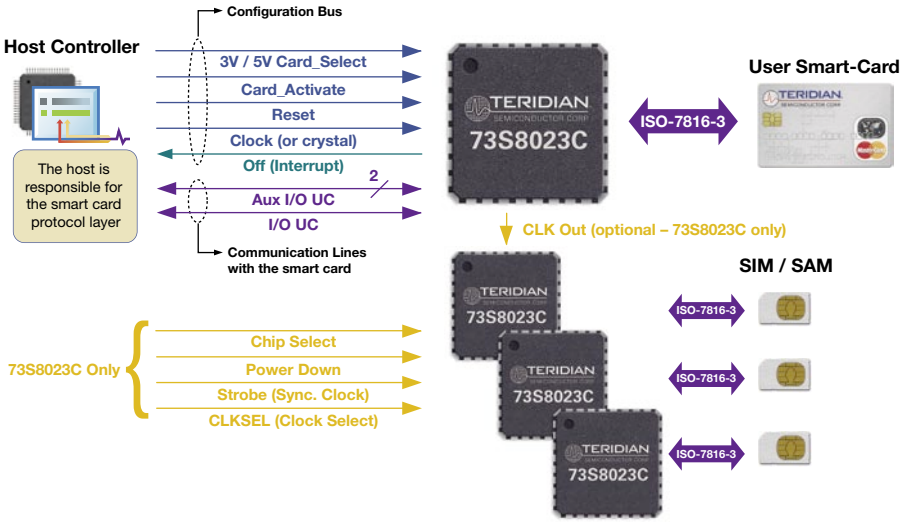
Teridian offer low-cost smart card interface ICs. These solutions are suitable when the host microcontroller within the application can handle the smart card protocol layer (implementation of an ISO-7816 UART, management of timings and T=0 / T=1 protocols, compliance with EMV2000 protocol layer etc).

Teridian offers several card interface devices, which are configurable via I^2C (Teridian 73S8010x) or via dedicated digital I/Os (Teridian 73S8024x and 73S8009R). In all cases, the half duplex I/O line must be connected to a host, which is responsible for implementing the T=0 / T=1 asynchronous protocol with the card (or synchronous protocol for memory cards).

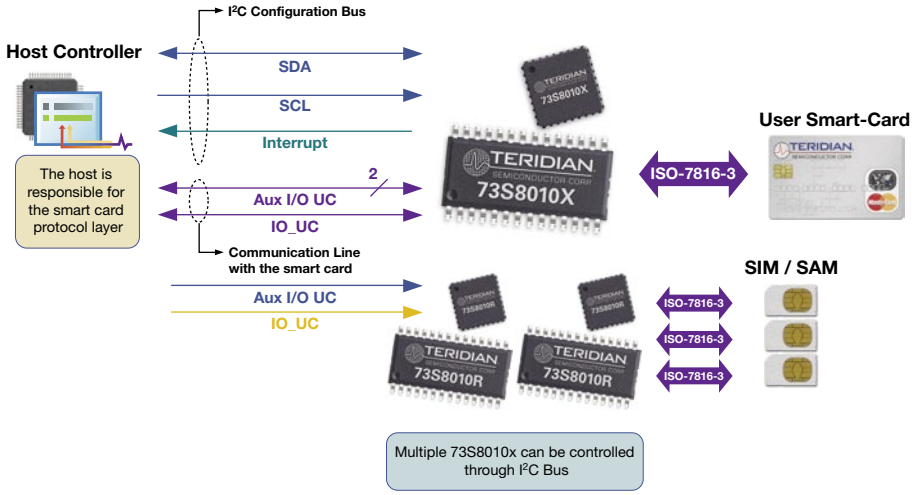
Connection of Teridian 73S8009R for a single Card Architecture



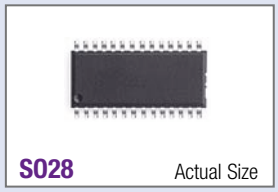
Connection of Teridian Teridian 73S8024x/73S8023 for a single or multiple Card/ SAM Architecture

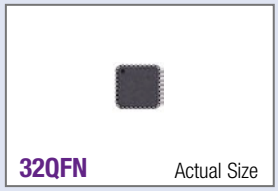


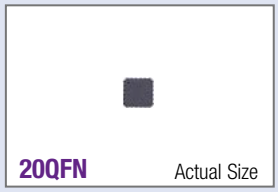
Connection of Teridian 73S8010X for a single or multiple Card / SAM Architecture



IC Packaging







Product Selector Guide

Smart Card Interface ICs:

New!

		73S8009R	73S8010R	73S8024RN	73S8010C	73S8024C	73S8023C
Smart Card Reader IC Type		ISO-7816 Electrical Interface IC					
EMV		4.1	4.0	4.0	4.0	4.0	4.0
NDS-Approved				■			
ICC Max		90mA			65mA		
Card Voltage Generator		LDO Regulator			Step-up Converter (Inductor-based)		
ISO7816-3 Card activation / Deactivation sequencer		Emergency (*) deactivation only	■	■	■	■	■
Card Voltages		1.8V, 3V & 5V	3V & 5V				
Card Pins-ESD Rating		6KV					
Host Interface	Type	Digital I/Os	I²C	Digital I/Os	I²C	Digital I/Os	Digital I/Os
	Voltage	2.7V to 3.6V	2.7V to 5.5V		2.7V to 3.6V		
Firmware Compatibility			TDA8020	TDA8004	TDA8020	TDA8004	TDA8002
Full support for synchronous Cards		■					■
Capability to control multiple ICs in parallel (I²C or Chip Select)		■	■		■		■
Power Down mode		■			■	■	■
Operating Temperature Range		-40°C to +85°C					
Operating Voltage		4.75V to 5.5V(**)			2.7V to 3.6V		
Packages	20 QFN	■		■			
	32 QFN		■	■	■		■
	28 SO	■	■	■	■	■	

(*) In normal operating mode, and for a maximum flexibility for the designer, the host microcontroller is responsible for the card activation /deactivation. The 73S8009R incorporates an ISO-7816-3 deactivation sequencer that controls the card signals in case of fault detection.
(**) System power supply can be lower than 5V to support 1.8V / 3V cards only.

Smart Card Reader IC Solutions

Applications

- *Handheld Readers and PINpads:*
  - *E-Banking (Ideal for MasterCard CAP and similar schemes)*
  - *PINpad readers for Logical Access and Digital Signature*
  - *PINpad readers for Government Ids*
- *PCs:*
  - *Card readers built-into Laptops (USB or ExpressCard™)*
  - *Card readers for Desktops (connected PINpads or transparent readers)*

73S1215 key features

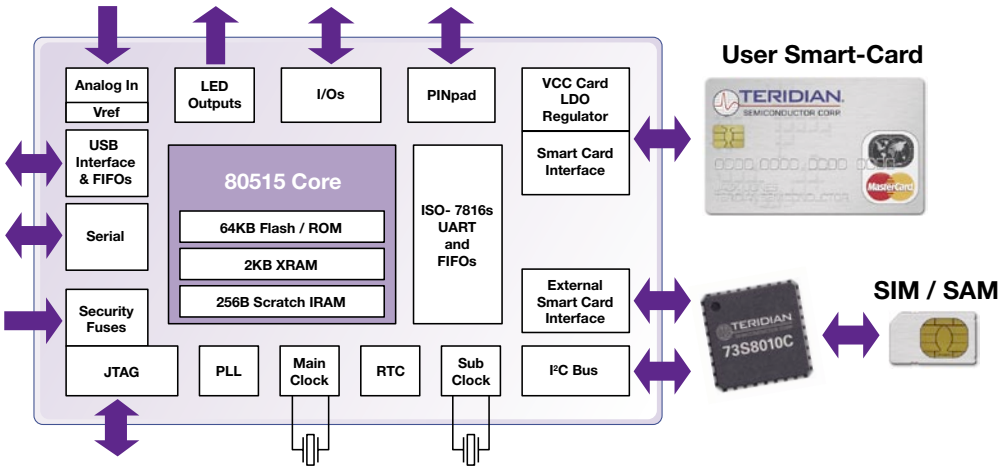
- *80515 CPU: Instruction set compatible with 8052*
- *24MIPS: Similar to an ARM7! Suitable for PIN encryption and digital signature*
- *64KB Flash / ROM + 2KB user XRAM*
- *USB with dedicated FIFOs*
- *ISO7816 UART with dedicated FIFOs*
- *ISO7816 / EMV analog interface*
- *External card interfaces can be controlled though a built-in I²C*
- *Low-power mode*
- *A single crystal is required: 4MHz to 16MHz (programmable)*
- *Optional 32KHz crystal with RTC*
- *PINpad, user I/Os, serial interface, analog input and more...*

Teridian introduces the 73S1215, a highly innovative single chip solution for USB-connected smart card readers:

The new Teridian 73S1215 system-on-chip has been developed to specifically target the requirements of low-cost USB-connected smart card readers. Available in a small QFN44 (7mm x 7mm) package, the 73S1215 is ideally suited to building card reader modules for laptops and desktop PCs. Whereas the QFN68 or die options are more suitable for handheld PINpad smart card readers in applications such as MasterCard CAP and Digital Signature.

The choice of embedded memories (64KB Flash / ROM and 2KB RAM) is a trade-off between market requirements and cost. The CPU is an 80515 core, having an instruction set compatible with the industry standard 8052, but only requiring 1 clock-cycle per instruction, offering up to 24MIPS of processing. Such performance makes PIN encryption possible, as well as high-speed computation for encryption / decryption or Digital Signature. Additionally, the 73S1215 is accompanied by the most comprehensive software library available, including USB and ISO7816 protocol layers which are pre-approved against EMV4.1, and libraries to support additional external card interfaces using Teridian 73S8010 devices on the I²C bus (optional).

A reference design for a CCID compliant application is also available, that can be compatible with either Microsoft XP CCID driver, or with Teridian's own CCID driver (available under request), implementing added features such as PINpad, LCD display and multi card support, which are not supported today by the Microsoft CCID driver.



Advantages

- *Highly integrated SoC:*
  - *The 73S1121F is the only microcontroller IC with 2 smart card interfaces, 1 USB and an 8-bit CPU with a large amount of RAM and Flash.*
  - *Other integrated features such as built-in 32kHz with semi-soft RTC, keyboard interface, and analog inputs represent cost savings.*
- *The Largest embedded memories:*
  - *64KB Flash (program memory)*
  - *4KB user RAM (8052 XRAM)*
  - *Possibility to add external memories for applications that need it (73S1121F only)*
- *Comprehensive software libraries:*
  - *USB and smart card protocols (T=0 & T=1), pre-certified against EMV2000 (4.0) and Microsoft WHQL*
  - *Turnkey solution "EMV-Ready"*
  - *CCID Reference design*

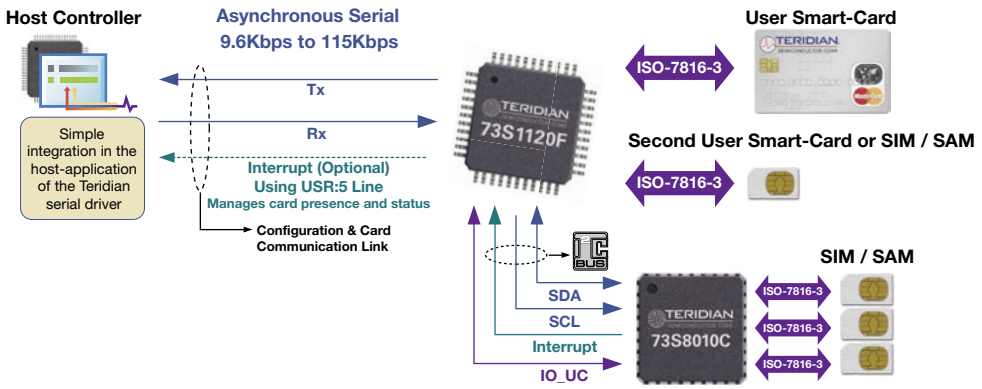
Smart Card Reader Controller IC Solutions: The 73S11xxF Family:

Teridian has developed a comprehensive range of 8-bit 80C52 microcontrollers with built-in smart card interfaces (single or dual) and communication capabilities (serial and USB). Other features available in the Teridian 73S11xxF series include a PIN-pad interface, an LCD driver interface, GPIOs, RTC, and analog inputs. The Teridian 73S1121F is a superset product that offers a dual smart card interface, USB interface, PIN-pad, and multiple I/Os in a single chip. The 73S1113F is a single USB smart card reader controller dedicated to PIN-pad smart card readers. The Teridian 73S1112F / 73S1120F are respectively single/dual smart card reader controllers with a serial link, making them particularly suitable for integration of a single/dual smart card reader function in a system.

Teridian 73S1120F and 73S1112F Integrated Circuits, pre-programmed with Teridian "EMV-Ready"

Some applications require a smart card reader capability, i.e. an ISO7816-3 type card reader must be incorporated into a system. Implementation of such a card reader can be a time-consuming task, requiring in-depth smart card experience, especially when it comes to implementing the software protocol layer used to communicate with the smart card (typically T=0 and T=1 protocols when supporting asynchronous cards). The Teridian 73S1112F and 73S1120F ICs, pre-programmed with Teridian "EMV-Ready" firmware will help dramatically simplify the design and shorten development and certification timescales. Whenever compliance with EMV 4.1 standard, but also with GSM11-11 or JICSAP standards is required, Teridian EMV-Ready is the right solution. Our devices can be immediately connected to any host controller through a serial link. While the Teridian 73S1112F takes care of the smart card protocol layer, the host controller is only required to exchange a few PC/SC commands through the serial link. These commands are encapsulated using a Teridian proprietary protocol, that handles error detection and correction. Included in the package, Teridian provides the host code that implements protocol encapsulation and PC/SC formatting, giving the developer an extremely efficient way to implement a card reader function. Teridian 73S1112F and its "EMV-Ready" software is a ready-to-use single smart card reader, whereas the 73S1120F is a dual card reader, with the flexibility to connect external 73S8010X ICs, in case additional SIM cards must be supported.

Connectivity of a ready-to-use Teridian 73S1120F, pre-programmed with "EMV-Ready" firmware stack



Product Selector Guide

Smart Card Reader Controller ICs:

		New!		New!		
		73S1215	73S1121F	73S1120F	73S1113F	73S1112F
	Smart Card Reader IC Type	80515 Controller w/built-in ISO7816, USB & 12C	8052 Controller w/built-in dual ISO7816 & USB	8052 Controller w/built-in dual ISO7816 & serial	8052 Controller w/built-in single ISO7816 & USB	8052 Controller w/built-in single ISO7816 & serial
Software	Optional Teridian "EMV-Ready" Application (*)			■		■
	API Libraries	■	■	■	■	■
Smart Card Interfaces	Built-in Smart Card Interfaces	1	2	2	1	1
	Optional External Card Interfaces	■	■	■	■	
	EMV 4.0 / 4.1 Compliant	■	■	■	■	■
	ICC Max	90mA	65mA	65mA	65mA	65mA
	Card Voltage Generator	LDO Regulator	Step-up (Cap)	Step-up (Cap)	Step-up (Cap)	Step-up (Cap)
	Card Voltages	1.8V, 3V and 5V	3V and 5V	3V and 5V	3V and 5V	3V and 5V
	ESD Rating	6KV	5KV	5KV	5KV	5KV
Controller	CPU Type	80515	80C52	80C52	80C52	80C52
	CPU Clock Max	24MHz	24MHz	24MHz	24MHz	24MHz
	MIPS	24	2	2	2	2
	Program Memory (Built-in)	64KB	64KB	64KB	64KB	64KB
	User Data RAM (XRAM)	2KB	4KB	4KB	4KB	4KB
	External Memory Interface		■			
	Flash Information Block		128B	128B	128B	128B
	Boot Loader	■ (Soft)	■ (ROM)	■ (ROM)	■ (ROM)	■ (ROM)
	Main Oscillator	4MHz to 16MHz	12MHz	12MHz	12MHz	12MHz
	Sub Oscillator	32KHz	32KHz			
	RTC	■ (Hard)	■ (Soft)			
Communication	USB Device Full Speed	■	■		■	
	USB–Number of Endpoints	4	4		4	
	Asynchronous Serial Interface	■	■	■	■	■
Peripherals	Keyboard Interface	5x6	5x6		5x5	
	User I/Os	9	8	8	8	3
	LCD I/Os		7	7	7	
	GP I/Os		4			
	Analog Inputs	1	3		1	
Miscellaneous	Operating Temperature Range	-40˚C to 85˚C	0˚C to 85˚C	0˚C to 85˚C	0˚C to 85˚C	0˚C to 85˚C
	Operating Voltage	2.7V to 3.6V	2.7V to 3.6V	2.7V to 3.6V (**)	2.7V to 3.6V (**)	2.7V to 3.6V (**)
		4.75V to 5.5V	NA	NA	NA	NA
	Packages	QFN44	TQFP128	LQFP64	LQFP64	LQFP44
		QFN68	Die			
		Die				

(*) Flash memory pre-loaded with Teridian "EMV-Ready" application
(**) 3V Min for use with USB

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