



## Information Embedded Components



# TopSec ID Module B.1 with UPEK

TouchChip Capacitive Area Sensor  
TCS1CM + TCS2CN

for Fingerprint Recognition

## Brief Product Description

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TopSec ID module known as one of the smallest, cheapest and most powerful embedded fingerprint OEM modules worldwide combines fingerprint security with your products and systems in an easy, safe, quick and cheap way.

Manufacturers of door locks, Time & Attendance systems, personal safes, entrances, briefcases, automobiles, mobile applications, etc. will be able to integrate biometrics-enabled authentication technology without any extensive biometric knowledge and in a much shorter time frame than ever before and at the same time take advantage of MB fingerMetrica's continuously development and enhancements in fingerprint recognition algorithms, which are downloadable over Firmware Upgrade functions.

As a stand-alone fingerprint authentication module with its built in recognition algorithms in a stamp size format it is ideal for embedded system applications where biometric fingerprint security is needed.

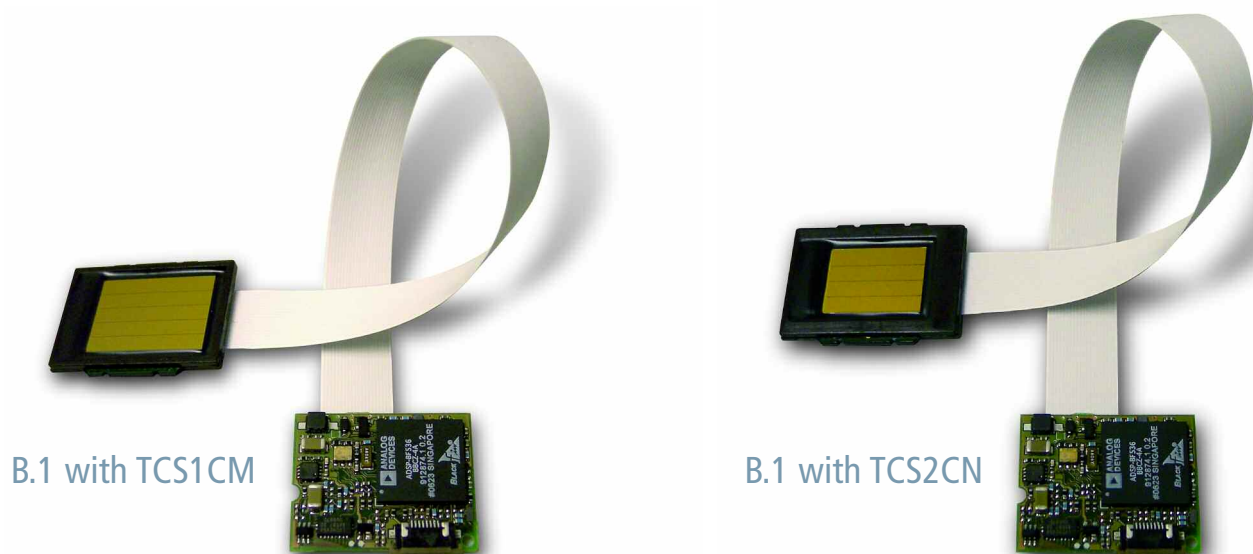
The TopSec ID module B.1 is designed for manufacturers searching for an inexpensive, reliable and easy-to-integrate biometric PC independent sub-system and allows the benefits of fingerprint technology to be deployed to other applications.

TopSec ID module is the latest in fingerprint technology and is available to all security-related manufacturers, which have, up until now, only operated with keys, codes, cards, and passwords or without any security mechanisms.

This product line offers highest recognition rates and robustness through its leading patented core algorithm technology and provides an excellent high performant architecture for encoding and comparing fingerprints while storing fingerprint templates locally on its memory.

The TopSec ID module is full functionally independently of computer or network. The module is usable for 1:1 verification, 1:few identification and 1:many identification up to 5000 references locally stored in the on board memory – due to this approach TopSec ID module provides highest flexibility in customer solutions which minimizes the development effort for one OEM product, while planning a wide range of different customer products.

## TopSec ID Module B.1



The TopSec ID module is composed of processing unit and UPEK sensor units. This complete fingerprint solution offers the user a complete package consisting of capacitive fingerprint sensors, processor and non-volatile memory, which securely stores the integrated fingerprint analysis software and the authorized user's biometric data.

The processing unit with 32bit high efficiency DSP, SRAM and Flash memory communicates with a host device and executes the whole processes related to fingerprint authentication. Its efficient fingerprint-capturing, encoding and matching algorithms together with combination of highly improved image quality of supported UPEK sensors provide a highly accurate and fast fingerprint recognition subsystem. TopSec ID Module B.1 currently supports both UPEK capacitive fingerprint area sensors TCS1/TCS2 with its robust sensor technology - so the processor unit and the supported sensors comparably perform high security level, durability/reliability and high image capturing capability. Both fingerprint sensors, UPEK TCS1 and UPEK TCS2 with their superior thick protective coating prevent the user from touching the sensor chip surface. The coating also protects the sensor against ESD well above 15kV as well as for extreme wear-and-tear ( $\geq 1$  million tips). The sensors have field test confirmed very high image quality that utilizes all 256 gray scale values in each pixel.



The TopSec ID module B.1 is distinguished by its extremely small size and low current consumption, both in operation and in the standby (idle mode) modes.

The TopSec ID module B.1 has appropriate power save modes and can operate in autonomous or host controlled mode. It is therefore suited for battery-operated applications, while established systems can be completed without large technical expenditure.

With measurements of only 25mm x 20mm the module is well suited for integration into almost any type of product. The flexible mounting technology together with the easy to integrate serial command interface drastically reduces time-to-market for product developers wanting to utilize biometric technology.

The flexibility of how you integrate the module is very high and it can be connected to a motherboard via a board-to-board connector or by using a standard ribbon cable.

The TopSec ID module B.1 has 2 serial command interfaces for command control of the biometric processes and archive management and file administration functions and for the output of verification or identification results. The module can easily be built in to any application and be controlled by a host processor sending simple commands for enrolment and authentication via a serial interface.

Fingerprint templates are automatically created and stored by the module in its internal memory during local enrolment and bio data download and can be retrieved from the module for external storage. The module can easily be used together with external storage of fingerprint templates from central databases, smart cards, portable flash memories, etc.

The TopSec ID module works as follows: while the fingerprint sensor produces a picture of the surface of the skin showing its unique characteristics, the pattern recognition software runs on the processor and calculates the unique features of the finger and thus the respective person. Should it be necessary, the current reference can be compared with the archive entries in the FlashRom during the comparison process, and accordingly, the accept or block signal is indicated.

In comparison with processing of biometric data in the PC, the module solution has many security advantages in terms of how easily biometric data can be manipulated or compromised. Optionally cryptographic mechanisms are implemented to secure communication and biometric data.

### Features/Functions/Highlights:

- ROHS compliant
- All-in-one Stand-Alone Unit, no additional extensive hardware needed
- One of the smallest autonomous embedded modules worldwide for enrolment, verification and 1:many identification
- Flexible configuration: Enrolment / 1:1 verification / 1:few identification / 1:N identification all possible
- Support of multiple communication interfaces enables fast integration and software based maintenance
- Low cost OEM fingerprint module – competitive price
- Top results in FVC biometric algorithm comparison – (FVC qualified algorithm)
- Outstanding authentication performance and excellent authentication accuracy
- Outstanding 1:1 and 1:N matching speed (highest recognition speed)
- Compact and small size – optimal size for lock/strike plate - applicable to diverse products
- Support of Testech robust area sized optical sensor (620 dpi resolution)
- Serial HOST interface with simple protocol – Easy integration interface to connect to existing applications without large technical expenditures - powerful industry-proven command interface function library – using the application programming interface, it is extremely easy for designers to add fingerprint authentication features into their products without any in-depth knowledge of biometrics.
- Fingerprint data encryption (optional)
- Low power consumption, wide operating range voltage supply and power save modes
- Fast power-on time (< 200ms)
- Suited for battery operation (over battery supply external circuit) - battery operation for more than 30,000 uses when using 3-4 standard A4 batteries - module switched on via external circuit
- Supports autonomous and host controlled mode operation via firmware versions
- Easy Combination with RFID technology possible (Template on Card verification for e.g. LEGIC and MIFARE RFID cards or other contact based cards)
- Wide Range of working temperature - suitable for outdoor application environmental influence
- Sensor and Module Self Test capability for service and maintenance

- Easy firmware improvement/upgrade capability through Firmware download function
- Compatibility of sensor usage (protocol and archive) with other sensors
- Performant User data management and flash reliability management to ensure highest reliability for flash write cycles - Powerful Flash memory organisation/reorganisation to provide storage capacity whenever required after physical flash deletion, power interruption, etc.
- Protected System parameter configuration (security level, trigger mode, operating mode, encoded enrolment prints per finger, release unit signal timing, shut down timer, communication rate, sensor readout mode, sensor dynamic mode, fast or full identification mode, size of person specific data etc.).
- Template compatibility between embedded module and PC based SDK
- Comfortable archive management to reduce main application expenditure for archive and user management
- Off mode control for connected sensors to optimise sensor reliability/ durability
- Image trigger mode to capture best fingerprint images for enrolment and authentication
- Match score enrolment strategy to increase and optimise enrolment reference quality (stores the best 2 or 3 references out of all enrolment references per finger after successful adjustment to optimize sensor and area coverage (minutia counts and minutia quality)
- Approx. 20 commands for Enrolment, Identification, Verification, Bio Data Extraction, User Data Archive Management, module parametrisation and management, status readout and module/sensor test, image readout and firmware download.
- Standard compatibility with ISO and ANSI template format

## Supported Sensors Specification:



## General Description

The UPEK sensors are based on the patented TouchChip technology, which is an active fingerprint sensing technology providing a high level of signal to noise. The UPEK area sensors are available in two different sizes, in which TCS1 is the sensor with the largest active area available among all silicon sensors.

Thick coating 5 x of competition protects against dust, humidity and dirt as well as scratching, abrasion and chemical contamination.

## Features

- > High-performance silicon sensors
- > Low power consumption – ideal for portable and/or battery powered systems
- > Compact size and low profile optimized for portable devices
- > Active capacitive sensing technology ensures highest quality images
- > Image acquisition via easy-to-use API
- > Windowing and sub-sampling capability
- > PerfectPrint® optimization software: quality image for all skin types and environmental conditions
- > True 508 dpi 8-bit grayscale image
- > Fully industrialized production
- > 10 years lifetime expected based on extrapolation of accelerated life test data

## Product Specifications

- > ROHS compliant
- > ESD tolerant:  $\pm 15\text{kV}$
- > Package dimensions: 27 x 20.4 x 3.5mm
- > Connector: 20-pin flex connector
- > I/O interface: 8-bit RAM interface
- > Active sensor size: TCS1 = 12.8 x 18.0mm; TCS2 = 10.4 x 14.4mm
- > Array size: TCS1 = 256 x 360 pixels; TCS2 = 208 x 288 pixels
- > Array pitch: 50 microns
- > Image resolution: 508 DPI
- > Capture rate: TCS1 = 14fps; TCS2 = 15fps
- > Power consumption (3 power consumption modes):
  - Nominal: TCS1 = 20mA; TCS2 = 16mA
  - Stand-by: TCS1 = 7mA; TCS2 = 7mA
  - Sleep: TCS1 = 1mA; TCS2 = <1mAAll modes = supply voltage: 5V
- > Environmental specifications:
  - Operating temperature range: 0 to 40°C
  - Storage temperature range: -40 to 85°C
  - Extended operating temperature range: -20 to 50°C
  - Operating humidity: 5 to 95% RH @ 30°C

## Specification/Features/Technical Data of TopSec ID Module B.1:

CPU/Processor:	Analog Devices DSP Blackfin 536
Flash:	3 MB for archive and firmware
Enrolment time:	< 1 sec for each reference
Verification time:	< 1 sec
Computing time:	< 1 second for encoding + matching (verification) + 2ms average time for each further reference matching (identification)
Template size and standard:	Encoding time: <900ms (1 to 5 successful encodings for enrolment) max. 256 Bytes (minutia matching)– 6 Byte Header and 4 Bytes for each minutia – easy adjustable to DIN V66400 compact format (161 Bytes); template standard support according ANSI INCITS 378-2004, ISO/IEC FDIS 19794-2-2004 - Finger Minutia Record Format and Finger Minutia Card Format
Template capacity:	up to 5000 at 3 MB (minutia matcher)
HOST communication:	2 asynchronous serial IF; 3,3V/5V CMOS; 9,6kBit/s – 115,2 kBit/s
HOST-connector	30poled FPC's (interfaces, power, on/off, etc.)
HOST-interfaces:	2UART's or UART + RS232 – RS232 level adjustment externally/in line); PC-connection and controller connection at the same time; first in first serve; interface adaption for RS232/RS485/RS422 (optional), SPI or I <sup>2</sup> C (optional)
Supply Voltage:	3,3V-6,5V DC
PCB Board Size:	25mm x 20mm x 4,0mm (LxWxH)
Power Consumption:	max. 200mA (sensor on), average: 120mA (sensor off), idle: 30-70mA, off<10µA
Power On Time:	<200ms
False Rejection Rate: (FRR)	< 5 x10 <sup>-3</sup> (real using scenario and cooperative user)
False Acceptance Rate: (FAR)	<10 <sup>-5</sup> (real using scenario and cooperative user)
EER:	<0,1 %
Fingerprint Angular variable:	+/- 15 Grad (adjustable) – depending on full archive match identification time requirements

### Security-Levels:

Low	medium	high
>27	>34	>43
10-3 FAR	10-5 FAR	10-7 FAR
< 5% FRR	< 10% FRR	10%-15% FRR (15-20)

Configurable Archive:	up to 5000 storable fingerprints (max. 256 Byte/Reference)
Max.Number of Templates at 3 MB Flash	128 byte to 16 K byte specific user data per person (adjustments/settings via configuration command) Match Score Enrolment Processing: 1-10 fingers per person 1-5 enrolment references per finger (adjustable) best 2 or 3 references of 5 best 2 or 3 references of 4 best 2 or 3 referneces of 3 2 of 2 references 1 of 1 reference
Reprogrammable external I/O:	reprogrammable GP/O lines available (e. g. key/indication line)
Enrolment:	local enrolment or per download of BIO data into the TopSec ID module B.1
Operating Modes:	Host Controlled via commands (see Biometric modes); Autonomous mode through usage of GP/O lines
Biometric Modes:	<ul style="list-style-type: none"><li>- <b>Identification Mode (Full/Fast)</b> Encoding + Matching with Bio Flash entries within the TopSec ID Module</li><li>- <b>2 different verification modi</b> with templates from external memory (smart card or other) without flash access with USER ID preselection addressing the persons bio entry in the flash memory</li><li>- <b>Encoder Mode</b> TopSec ID module delivers the bio data; matching is provided in the responsible HOST-application (e.g. PC or MOC)</li></ul>
Mechanical/Climatic Qualification:	indoor/outdoor; working/storage temperature, -20° – +50° degree, portable
CE-licenses:	EMV qualification documents (OEM integration); CE/(FCC)- standard ; no own license
Security Mechanisms:	parametrisation password protected Different operating modes (command restriction) Templates of last print are stored (rejection in cases of latency/fake counter-measure) Bio data encryption, secure data communication, module authentication (optional)



## Command Functions:

- User identification
- User verification
- Extraction of the user's biometric data
- Enrolment of a new user (via the connected sensor)
- Enrolment of a new finger (via the connected sensor)
- TopSec ID module/sensor configuration and configuration readout
- Testing of the TopSec ID module status
- Testing of the archive's memory status from the TopSec ID module (occupied, free)
- Loading of the firmware in the TopSec ID module (FW- update)
- Build in test of the TopSec ID module/sensor
- Editing of data records in the archive module (deletion of person, finger, complete archive)
- Modification of a user's data in the archive module (user data)
- Request a free user ID from the module
- Saving/loading of new user's data records (user + BIO data) in the TopSec ID modules Flash memory (archive structure by external loading)
- Reading of the user's data records (user + BIO data) from the TopSec ID module archive (archiving, list of stored users, saving of module archive)
- Readout of sensor image
- Retrieval of stored fingers per User ID
- Other test functions

## Further Products:

- Software development kit TopSec ID module SDK A1.05
- ID Device SDK - Server PC based SDK
- USB and TCP/IP connection for B.x Family
- B-REAL - Algorithm licensing

## Mechanical Dimensions and mounting

The mechanical drawings (part of datasheets) for the TopSec ID module B.1 and UPEK sensors include all necessary informations for mounting and cabling, also included is the connector type and flexprint cable type specification and supplier addresses for your required parts.

In addition the documentation includes suggestions and checklists for the fingertip sensors mechanical mounting to optimize the assembly and alignment of the finger guidance which is an essential influence to achieve highest recognition accuracy.

**Extended operating temperature (-20° C to +50° C / normal 0° C to +40° C – dry heat, cold, humidity steady state, temperature change, humidity changing state)**

**Storage temperature (-40° C - +85° C – dry heat, cold, humidity steady state, rapid temperature change)**

The module and sensors are tested against the above operating and storage temperature requirements and fulfil indoor and outdoor temperature profiles. For details refer to datasheet.

## Mechanical Qualification (Vibration and Shock) – refer to datasheet.

With respect to mechanical qualification for vibration and shock the module and sensors are qualified for fix mounted and portable operation and applications. For details refer to datasheet.

## EMC-/ESD Qualification (Radiated emission, radiated immunity, electrostatic discharge) – refer to datasheet

Regarding EMC-/ESD qualification for radiated emission, radiated immunity and electrostatic discharge the modules and sensors were pretested to minimize the risc for the final CE/FCC qualification for the end product, that means that module and sensors as an OEM product fulfil the endproduct requirements.

### For below listed additional test and qualifications refer to datasheet

- Sunlight Resistance
- Chemical Resistance
- Abrasive Resistance (1 million tips)
- Scratch resistance (pencil test)
- Product safety according to EN60950 and ICE60950 (TÜV certified)
- Reliability 0,3% failure 1000h at 40 degrees

## Integration Support

The TopSec ID module has been conceptualised for OEM integration in various applications and is used for biometric identification and verification. We provide a Software Development Kit for it including all necessary informations. For technical integration support please contact our technical staff.

## Potential application areas:

- Access Control
- Door Lock and Safe
- POS system
- Smart card, ATM
- Time and attendance managements
- PDA/Mobile systems (refer to Technology Licensing: B-REAL)
- Personal Access of portable system (PDA, mobile phones, Notebooks)
- Password of Information Access Security (PC, Workstation, networks and machine controller)
- Powerful Personal Identification (BioSCard, ID Card, Credit Card & Smart Card)
- Remote control
- Access systems (safe deposits, automobile sector, locks, keys)
- PC-keys/PC-mouse (password replacement, boot protection, homebanking, network access)
- Card readers
- Defensive arms (child protection, secure weapons, weapon saves)
- Time registration and Attendance systems
- Theft protection for mobile devices, car radios, notebooks
- Medical devices
- Printer and Fax devices
- Measuring and control equipment
- Transport boxes
- Weapon saves
- Alarm devices
- Automotive control