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**Technical Specifications**

TOTTOLI SIM-chip is a high-performance and secure solution, that meets international and industry standards, such as ISO, Oracle, Global platform, 3GPP and ETSI.

To improve the overall performance of the virtual machine we use a 32-bit Java Card API microcontroller in SIM-chips. In addition, TOTTOLI M2M platform provides a high level of configuration tools settings and software development.

**Key features**

1. 2G / 3G USIM or 4G LTE configurations for M2M applications

2. available in 2 form-factors: 8 pins COB-module (2ff) or QFN8 (6x5mm package)

3. Virtual machine Java Card 2.2.1 and global support of the platform 2.1.1

4. Dynamic memory and logging objects management

5. Advanced customization options and support for software development tools.

**Hardware Features**

TOTTOLI SIM M2M is set on ST32 protected microcontrollers family STMicroelectronics and it supports two main temperature ranges: standard (up to + 85 ° C) and extended (up to +105 ° C). TOTTOLI SIM M2M operating system provides universal functions for files and applications configuration from 64 KB to 300 KB depending on:

- physical handset memory (256, 320, 416 and 512 KB of flash memory);
- additional features, such as extended OS modules or Java Card client's applets.

**Other hardware features:**

- ARM Cortex ™ M3 32-bit RISC core;
- Up to 512 KB of shared flash memory and up to 300 KB available for users;
- 8 or 12 KB of operating memory (depends on the core);
- profound static electricity protection;
- operating voltage range ISO / IEC 7816-3; communication protocol 4kV1.8V, 3V and 5V (T = 0 and T = 1);
- transfer rate: 16, 32, 64 or 372 ETU;
- 10 years of data storage at + 85 ° C (standard range) and at + 105 ° C (extended) or 15 years at + 85 ° C (extended);

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- 100000 cycles of rewriting at + 85 ° C (standard range) or 500000 cycles of rewriting on a page at +105 ° C (extended range)
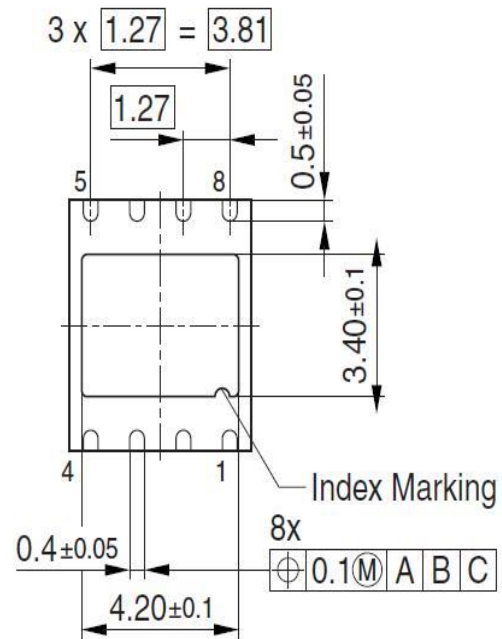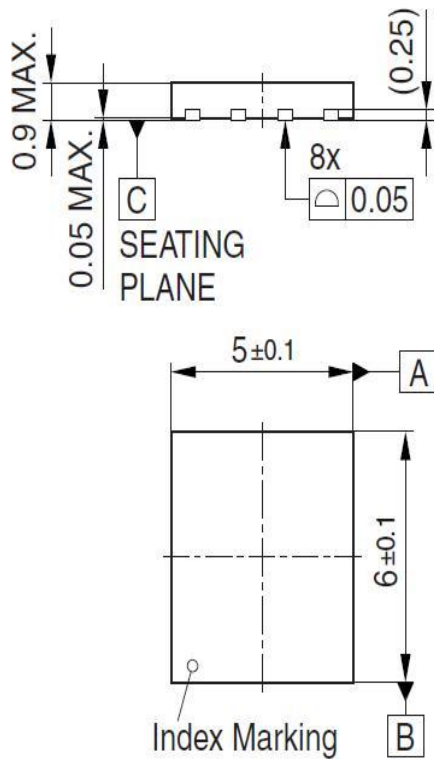
**Durability**

ST32 hardware guarantees 500,000 cycles of rewriting at + 105 ° C, provided that the limit of 50 million of write / erase cycles in one 64-KB sector has not been exceeded.

Besides of the TOTTOLI hardware durability, SIM M2M OS implements specific features, such as logging of frequently updated memory fields in order to increase durability to a minimum of 2 million of rewrite cycles. Such durability is available for frequently updated files or Java Card objects. The number of rewriting cycles can be increased by additional flash memory space.
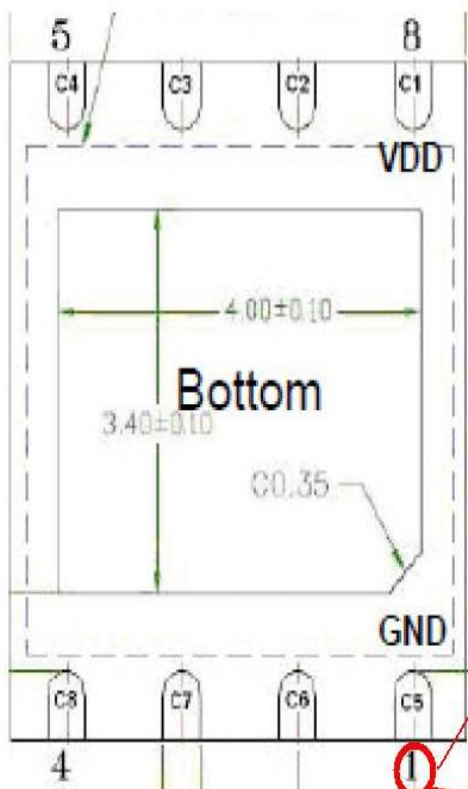
**Integration of a SIM-chip in a Handset**

It does not take a GSM handset developer long to figure out how to connect a SIM-chip to a GSM module. SIM-chip, like a SIM card, has VCC, I / O, RST, CLK and GND pins, and its connection diagram does not alomost differ from a SIM card one. There is only one exception: a protection diode is not needed, as lines cannot be damaged with static electricity.

Protective diodes are recommended for handsets on SIM cards, because it is the case when a user can touch holder electrical contacts and "give" the static voltage to the device. As SIM-chips and SIM-cards are identical, it is allowed to connect a SIM-chip to one GSM-module in combination with a SIM-card. In this case, a handset developer must provide competent multiplexing between identification modules. An electrical circuit does not need to be modified, but a printed circuit board pattern will change significantly, as it will have lots of space. A SIM-chip is made with VQFN-8 form factor and occupies only 30 mm$^2$ on the printed circuit board.

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0.9 MAX.

0.05 MAX.

(0.25)

8x

□ 0.05

C

SEATING PLANE

5±0.1   A

6±0.1

Index Marking   B

3 x 1.27 = 3.81

1.27

0.5±0.05

5   8

3.40±0.1

4   1

Index Marking

0.4±0.05

4.20±0.1

8x

⊕ 0.1Ⓜ A B C

Bottom view

5   8

C4   C3   C2   C1

VDD

4.00±0.10

Bottom

3.40±0.10

C0.35

GND

C8   C7   C6   C5

4

PINOUTS

Pin #01 = Vss (GND)

Pin #02 = NA

Pin #03 = I/O 0

Pin #06 = CLK

Pin #07 = RST

Pin #08 = VDD

The default pinout configuration proposed is compliant with MFF2 pinout as per ETSI TS 102 671

Pin

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**SIM-chips control**

SIM-chips features and electrical parameters control is implemented by means of OTA (Over The Air). This technology allows to remotely change technical SIM-chip parameters, such as:

1. SMSC number change;

2. PLMN/FPLMN file change;

3. Service Provider Name substitution at the branding stage;

4. Java-applets installation and deinstallation;

5. Java-applets and their settings modification;

6. SIM-card service files and java-applets error handling.

**Multi IMSI**

This solution allows manufacturers to optimize roaming and provide additional services. Multi IMSI is a special SIM-applet that can activate several IMSIs within one SIM-card/SIM-chip. The applet can simultaneously store multiple IMSI numbers, their corresponding authentication parameters, and other specific data. IMSI change supports automatic and manual mode. The automatic mode presupposes IMSI change without subscriber's participation and it depends on the subscriber's network. In manual mode, a subscriber can independently change IMSI via the SIM-menu or USSD-command.