



# LEGIC 6000 series

## General Information

# SM-63x0 EMS Manufacturer Information

Classification: Public (Info Level 1)

Document No.: LR6-22-101b

Edition: 09.2020

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## 1 About this document

**Scope** This document provides hardware information of the LEGIC 6000 series reader chips SM-63x0 with hardware versions V1.1 and V1.2 and with LEGIC OS50. This document includes information relevant for electronics manufacturing services.

**Target users** This document is aimed at hardware and software engineers of electronics manufacturing services (EMS).

**Terms and abbreviations** The following table lists only terms and abbreviations used exclusively in this document:

Term	Description
SM-63x0	Abbreviation for any 6000 series reader chip type (SM-6300, SM-6300 <i>init</i> , SM-6310 and SM-6310 <i>init</i> )

Table 1: Terms and abbreviations

### Document conventions



This symbol marks warnings and important passages.

Description	Example
Notes and examples appear in italics	<i>Note</i>
Commands appear in capital letters	SEARCH
Hexadecimal figures appear in the form 0xnm	0x23
Code snippets appear in monospace font	// PARAMETER
User input appear in monospace font	Enter phone#+410765678899.
GUI elements appear in bold font	Click <b>Create</b> .
New or important terms appear in bold font	<b>APPL_STATE [Reset]:</b> A hardware reset is executed after the answer has been sent and all volatile keys are lost.

Table 2: Typographical conventions

### Change history

Change	Edition	Doc. No.
New edition	09.2020	LR6-22-101a
Minor changes	09.2020	LR6-22-101b

Table 3: Change history

## 2 Technical data

**Type designation**

Pin 1 designator →

Product name → SM-6300

Hardware version → V12 M5LLLLY

Y for Year  
M for Month  
LLLL for lot number

0956c

Illustration 1: SM-63x0 type designation

- Notes**
- The hardware version can also be read with the GET\_IDB [VERSIONS] command. Example: 0x04 = SM-6300
  - The firmware version (LEGIC OS50) can be read with the GET\_IDB [VERSIONS] command. Example: 0x01 07 03 00 = V1.7.3.0
  - The Security Modules are delivered on tape.

### Ambient conditions

Designation	Min.	Typ.	Max.	Conditions
<b>Operation</b>				
Ambient temperature	-40 °C	25 °C	85 °C	
Junction temperature			110 °C	
Thermal resistance		29.7 °C/W		Junction to case
Power dissipation double supply		865 mW*		"RF on" state, VCC = 5 V, I = 173 mA
Power dissipation single supply		330 mW**		"RF on" state, VCC = 3.3 V, I = 112 mA
Power dissipation digital supply		46 mW		DVCC = 3.3 V, 14 mA
<b>Storage, transport</b>				
Ambient temperature	-40 °C		105 °C	

Table 4: Ambient conditions

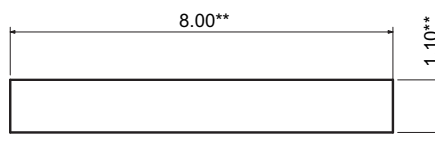
Legend: \* 345 mW emitted by antenna  
 \*\* 125 mW emitted by antenna

### Package

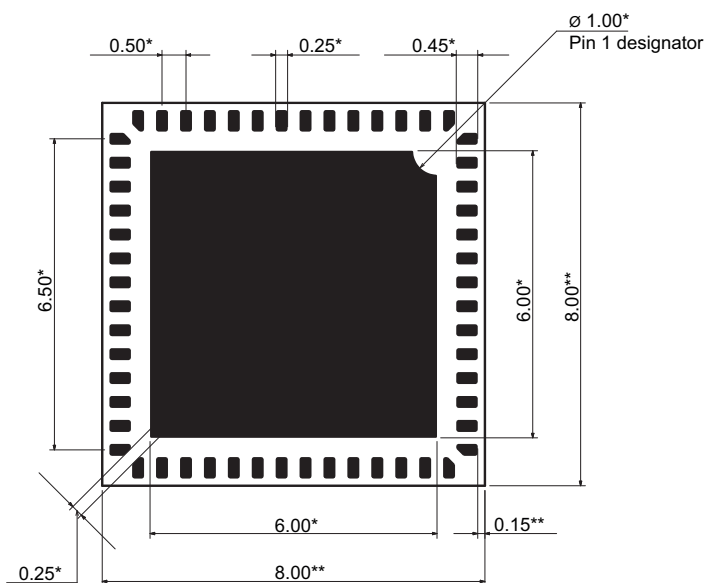
Designation	Value	Conditions
Type	PQFN 56 (MLPQ)	56 pins (+GND plane)
Grid	0.5 mm	
Dimensions	8 x 8 x 1.1 mm	→ see "dimensional diagram"
Pin surface plating	Au	Cu, Au flash plating
Moisture sensitive level (MSL)	Level 3	acc. to JEDEC J-STD-020D, → see "Moisture sensitivity" in chapter Processing

Table 5: Package specifications

Dimensional diagram



Side view



Bottom view

\* Tolerances  $\pm 0.05$  mm, defined by PCB substrate  
\*\* Tolerances  $\pm 0.1$  mm, related to package outline  
All measurements in mm

0909b

Illustration 2: PQFN measuring

### 3 Processing

**PCB plating** It is recommended to use chemical NiAu plating.

**PCB footprint** The following PCB footprint is recommended for engineering samples:

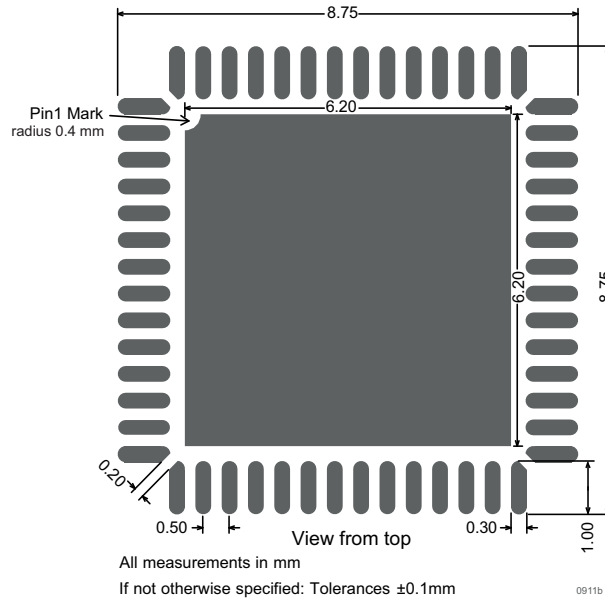


Illustration 3: PCB footprint for engineering samples

The following PCB footprint is recommended for series production:

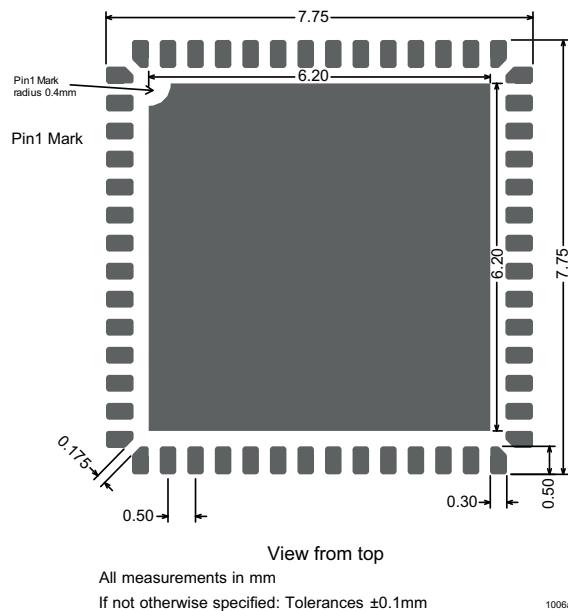
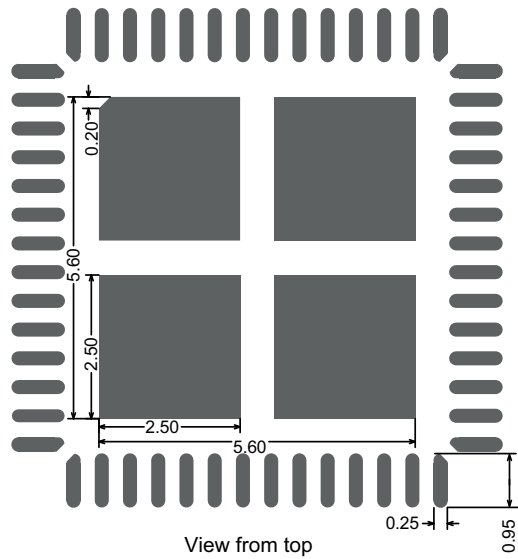


Illustration 4: PCB footprint for series production

**Solder Mask clearance** A clearance of 60-75 µm is recommended between the copper land and the solder mask.

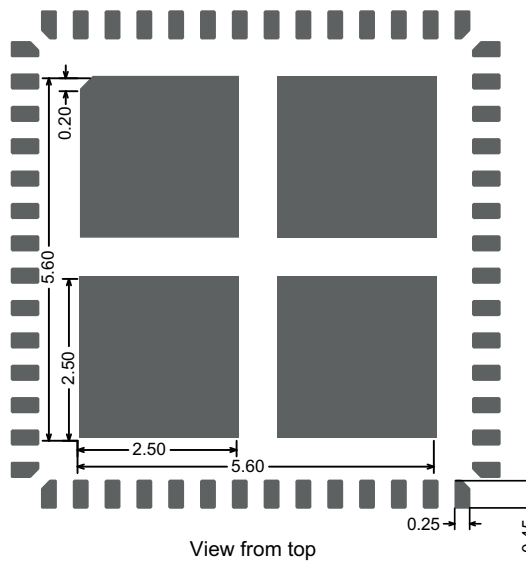
**Solder paste stencil design** The following stencil design is recommended for applying the solder paste in engineering samples:



All measurements in mm  
If not otherwise specified: Tolerances  $\pm 0.1$ mm 0912c

Illustration 5: Solder paste measuring for engineering samples

The following stencil design is recommended for applying the solder paste in series production:



All measurements in mm  
If not otherwise specified: Tolerances  $\pm 0.1$ mm 1007a

Illustration 6: Solder paste measuring for series paste

**Soldering conditions** The following RoHS compliant soldering conditions are recommended:

- Soldering conditions: IPC/JEDEC J-STD-020D
- Solder paste: Lead-free, recommended: ALPHA® OM-338-T
- PCB surface plating: Chem. NiAu
- Soldering profile:

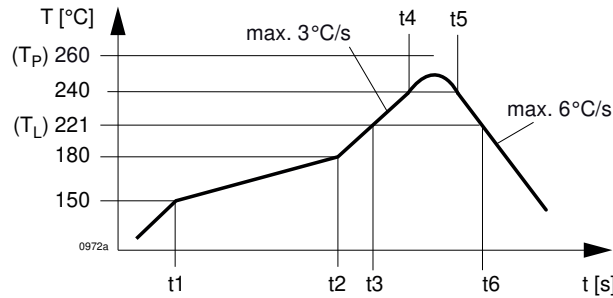


Illustration 7: Soldering profile

	Temperature [°C]	Phase	Time [s]	
			Typ.	Max.
Preheating	150 ... 180	t1 ... t2	40	120
Heating (liquidus, $T_L$ )	> 220	t3 ... t6	45	60
Soldering	240 ... 250	t4 ... t5		3
Max. temperature ( $T_P$ )	< 260	-	-	-

Table 6: Soldering profile

**Moisture sensitivity** The Security Module package is sensitive to moisture. Moisture trapped inside the package can expand during the reflow soldering process and thus damage the package.

The Security Module has a moisture sensitive level (MSL) = 3 according to IPC/JEDEC J-STD-020D. When removed from the sealed bag, the Security Module must be processed within the time given on the bag label.

**Ultrasonic cleaning**



**NOTICE**

**Ultrasonic cleaning can cause damage to the incorporated crystals**

» Therefore, ultrasonic cleaning is not recommended

**ESD protection**



**NOTICE**

**Danger to electronical components caused by electrostatic discharge**

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

» Handle integrated circuits with appropriate precautions to avoid ESD damage



## 4 Appendix

### ESD guideline



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Please observe the following ESD protection regulations (ESD = Electro- Static Discharge) when handling the microchips:

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**Handling components** The reader chip has to be kept in the closed original ESD protective packaging at all times when in storage and during transportation. Components may only be removed from the ESD protective packaging in workplaces which are designed for such activities and which are ESD secure. Do not remove the components until you are at the exact location where they will be processed. Components may only be removed from the ESD protective packaging by persons familiar with and observing both the general and the ESD regulations described here.

**Ambient conditions** To avoid static electricity discharge (ESD) while working, comply with the following regulations:

#### General:

- Designate ESD secure zones
- Post the ESD regulations
- Check the ESD protective regulations periodically (electrical conductivity)
- Designate grounded discharge surfaces at the entrance of ESD zones for people who enter
- Ensure sufficient relative humidity (min. 45 %)
- Use only anti-static clear plastic binders (for work papers)
- Instruct participating employees
- Inform non-participating employees
- Ensure that all employees and visitors comply with the regulations

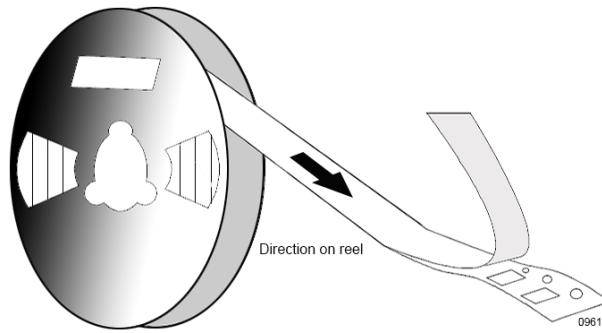
#### Workplace:

- Electrically-conductive work substrate grounded
- Electrically-conductive wristband grounded
- Electrically-conductive work chair
- Electrically-conductive flooring grounded
- Grounded machines and furniture
- Connect all work equipment mentioned above to the same ground potential

#### Employees:

- Always wear (contact with skin) and ground wristband when working
- Wear electrically-conductive work coat
- Wear electrically-conductive shoes or discharging contact strips
- Work with ESD components in ESD secure workplaces only

**SM-6x00 delivery forms** The following delivery forms are available:  
Tape and Reel

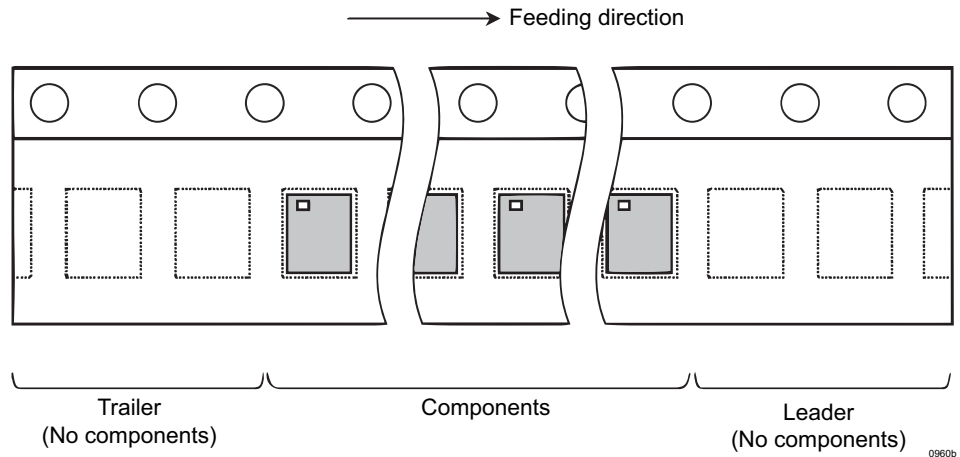


*Illustration 8: Tape and Reel*

Parts per reel	200 or 500 pcs
Reel diameter	7"
Carrier width	16 mm
Carrier pitch	12 mm

**Cut Tape** Quantity 10 ... 199 pcs  
Without leader / trailer → see section "Tape leader and trailer dimensions" below

**Tape leader and trailer dimensions**



*Illustration 9: Carrier tape*

	<b>Tape and Reel</b>	<b>Cut Tape</b>
Trailer	160 mm min.	0 mm
Leader	400 mm min.	0 mm

*Table 7: Dimensions depending on delivery form*

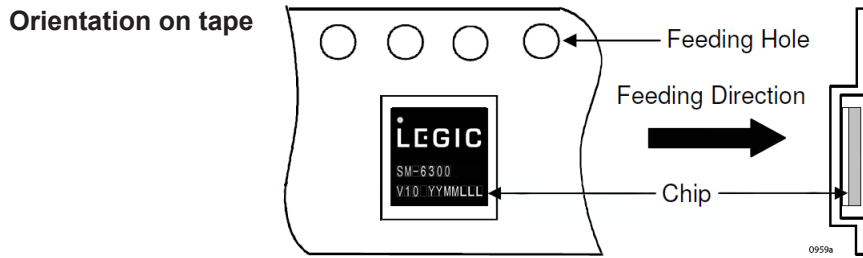


Illustration 10: Orientation on carrier tape

**Packing** Cardboard box

### 4.1 RoHS Declaration

LEGIC Identsystems Ltd

Binzackerstrasse 41

CH-8620 Wetzikon, Switzerland

declares herewith that the products mentioned above are in compliance with directive 2011/65/EU of the European Parliament and of the council of 8<sup>th</sup> June 2011 on the "Restriction of the use of certain hazardous substances in electrical and electronic equipment - (RoHS Directive)".

<b>Smartcard ICs</b>		
LEGIC prime	MIM256-MN	Wafer
LEGIC prime	MIM1024-MN	Wafer
LEGIC advant	ATC256-MV410	Wafer
LEGIC advant	ATC1024-MV010	Wafer
LEGIC advant	ATC1024-MV110	Wafer
LEGIC advant	ATC4096-MP311	Wafer / MOA4 Module
LEGIC advant	ATC4096-MP312	Wafer / MOB6 Module
LEGIC advant	CTC4096-MP410	Wafer
LEGIC advant	CTC4096-MM410	Wafer

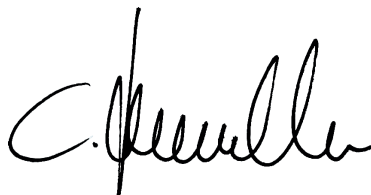
<b>Reader ICs</b>	
All 4000 series reader ICs	
All 6000 series reader ICs	

These hazardous substances are:

- Mercury
- Lead
- Cadmium
- Hexavalent chromium
- Polybrominated biphenols (PBB)
- Polybrominated diphenol ethers (PBDE)
- Di (2-ethylhexyl) phthalate (DEHP) \*
- Butyl benzyl phthalate (BBT) \*
- Diethyl phthalate (DEHP) \*
- Diisobutyl phthalate (DIBP) \*

\* In accordance with amendment under Commission Delegated Directive (EU) 2015/863.

Wetzikon, 28<sup>th</sup> June 2019



Christoph Beckenbauer  
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ppa Marcel Plüss  
Vice President Innovation & Technology