

TagMaster AB

ScriptTag™ S1251

General purpose R/W Card

ScriptTag S1251 is a credit card shaped 2.45 GHz R/W tag. It is communicated with via microwaves and stores 606 bits, e. g. as 82 7-bit ASCII characters and a 32 bit data checksum. A factory coded "mark" with 8 decimal digits and a special 32-bit mark checksum give the tag a unique and substitution safe identity.

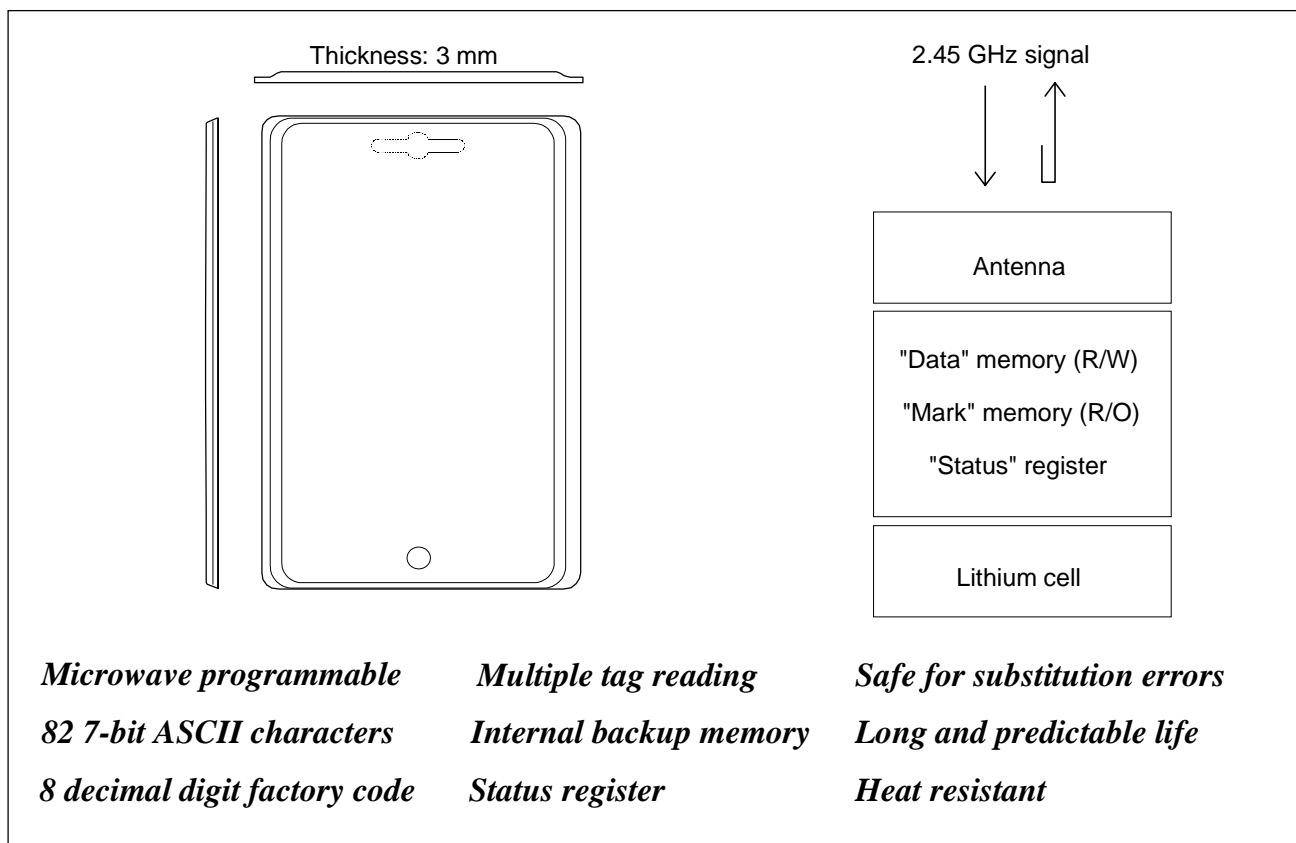
The tag can be formatted via microwaves for different operating modes regarding memory size, response interval, response type (e. g. random mode for reading of several tags in the zone) and data speed.

A status register for memory and lithium cell monitoring is included. If ScriptTag should exit the write zone during programming, a "failed write" bit is set to warn the user that an unsuccessful write attempt has occurred. A backup memory holds the old data, to be read at any time also after the failed write attempt.

Environmentally harmless lithium cell supply gives long reading range, high reading speed and multi tag possibility. Cell life is dependent on tag operating mode, but is independent of how often it is read or written to as well as from exposure to electrically noisy environments. The cell resists long term operation at elevated temperatures. When the capacity is about to run out, the status register warns via a "battery low" bit.

ScriptTag can be fitted by a clip, a standard credit card holder and by magnetic or adhesive tape. It is also prepared with holes for M3 screws.

The design is vibration resistant, watertight, corrosion free, UV stable and withstands most chemicals. The front panel is made from a polymer that can be printed on according to user requirements. The back panel is equipped with type code and serial number.



CONFIDENT

Reading range

ScriptTag S1251 receives/reflects its signals through the front panel and rejects signals in the back direction. The maximum reading range is defined by a number of factors, all resulting in R parameters for the tag and communicator. Multiply these factors and the resulting reading range in meters is found.

Example: The $R_{1251, \text{low speed}}$ for S1251 is 1.5 and the R_{1500} for the S1500 communicator is 2.7, resulting in a reading range R of $1.5 * 2.7 = 4.0$ meters.

The tag reads at all distances from the maximum reading distance down to zero. The maximum reading range can be reduced by power and sensitivity setting commands in the communicator.

Writing range

A detection circuit forwards write signals from the communicator to the tag memory. The writing range is defined by a number of factors, all resulting in W parameters for the tag and the communicator. Multiply these to find the resulting writing range in meters.

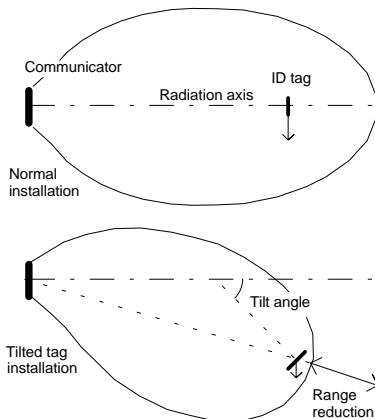
Example: The W_{1251} for S1251 is 0.5 and the W_{1500} for the S1500 communicator is 1.0, resulting in a writing range W of $0.5 * 1.0 = 0.5$ meters.

The tag writes at all distances from the maximum writing distance down to zero.

Lobe shape

The typical lobe shape is found in the communicator's data sheet. Usually the communicators have circular polarisation, making reading and writing unaffected by tag rotation around the radiation axis. The lobe is unaffected if ScriptTag S1251 is mounted on a metal surface, and non metallic materials in front of the tag usually have little effect on the range.

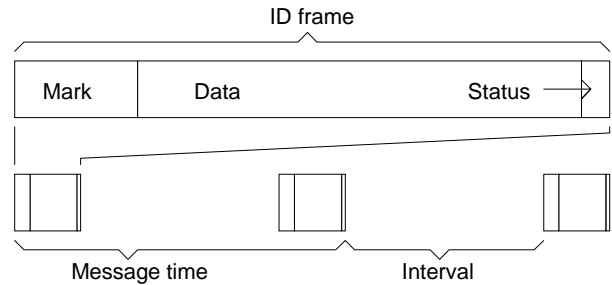
If the tag is very tilted in relation to the radiation axis, the lobe is "squinted" in direction to the position where the tag faces the communicator. See figure:



Communication

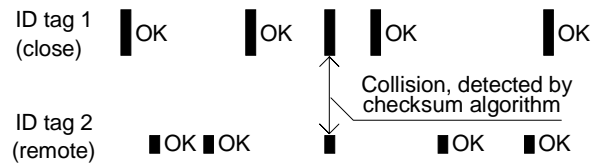
ScriptTag S1251 repeatedly reflects data to any Confident communicator, regardless of which frequency in the operational band 2.435 - 2.465 GHz that is used. If communicators at different frequencies illuminate the tag, it can be read by all of these.

The reflected data comprises a factory coded "mark" from the permanent R/O memory, "data" from the R/W memory and a "status" field. A sequence of "mark" + "data" + "status" is called an "ID frame".



The ID frame is given with constant or random intervals, as formatted. Two subsequent ID frames with an interval in between is called a "message time".

When ScriptTag S1251 is set to a random interval mode, it is possible to read multiple tags in the lobe:



When collisions occur, a checksum algorithm in the communicator cancels these ID frames. In a worst case situation, e.g. if all tags would be at the range limit, the likelihood for a substitution error (wrong interpretation) is less than one in $5 \cdot 10^9$ read tags thanks to the 32 bit checksum.

	Average	Comfort	Safe
	(ms)	(ms)	(ms)
<u>Tags in the zone</u>			
2 tags	200	600	800
3 tags	350	1000	1400
4 tags	500	1400	2000

If more than 4 tags are expected in the zone, it may be appropriate to set the tag to longer intervals. The figures above assumes that the tag is formatted to MR4H, i.e. mini memory, random interval 4 and high speed (see chapter *Operating modes* for definitions).

Operating modes

The tag can be set to different operating modes by microwave write commands. Parameters affected are memory size, interval type, interval length and data speed.

Memory modes

M-mini 46 bits, e.g. 4 digits + check
Q-quarter 186 bits, e.g. 22 ASCII (7 bit) + check
F-full 606 bits, e.g. 82 ASCII (7 bit) + check

Interval type modes

C-constant i.e. interval is constant between ID frames
R-random i.e. interval is varying randomly

Interval length modes

0-zero i.e. continuous
4-small i.e. 4 times the ID frame time
8-medium i.e. 8 times the ID frame time

Data speed modes

L-low reading 4 kbps, writing 4 kbps
H-high reading 16 kbps, writing 4 kbps

Modes are designated MC0L, MR4H, FC0H etc., and are possible in all combinations. Interval 16 can also be used. A short guide to how the mode setting optimises each situation is given below.

Formatting

Memory modes
 Interval type/length
 Data speed

Optimises

Storage space vs speed
 Speed and multiplicity vs life
 Reading range vs speed

Tag reading

The table shows the max message time (Tmm), i.e. the time for two ID frames and an interval. It also shows the cell life at room temperature in low data speed mode. The cell life is independent from how often the tag is read or written and the tag can be stored up to 2000 hours at 85°C with less than 10% reduction in the cell life as specified below.

	Tmm at speed		Cell life (years)
	High (ms)	Low (ms)	
<u>Mini memory</u>			
MC0-H/L	50	130	6
MC4-H/L	100	360	6
MC8-H/L	170	660	10
MR4-H/L	170	660	9
<u>Quarter memory</u>			
QC0-H/L	70	240	6
QC4-H/L	180	700	9
QC8-H/L	350		10
QR4-H/L	350	1300	9
<u>Full memory</u>			
FC0-H/L	140	520	6
FC4-H/L	370	1400	9
FC8-H/L	750		10
FR4-H/L	750		10

Tag writing

The writing time depends on the tag operating mode and a statistical time distribution. For manual processes, where the user is given a "write complete" signal by a buzzer, LED or the like, two levels are specified; "average" and "comfort". The latter defines a time frame within which it is guaranteed that the writing is completed in more than 99 % of the cases.

For processes where waiting cannot be arranged, a high security level, "factory", is specified. This level defines a write security of min 99.999 % (1:100 000).

Some fields are left blank to indicate that the mode normally is too slow, and therefore not recommended.

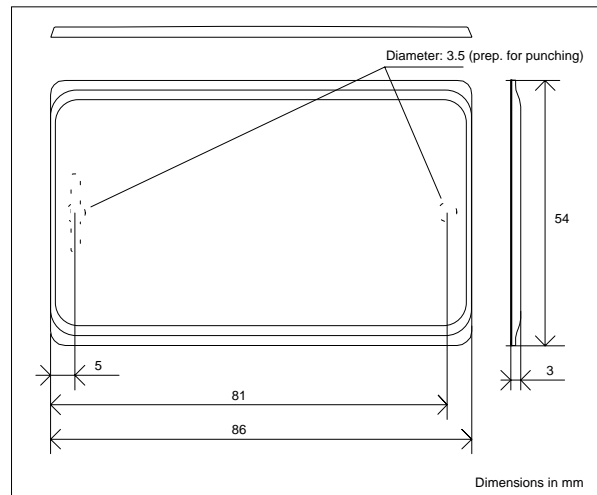
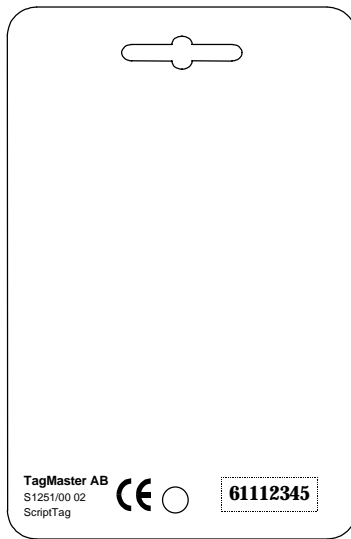
	High speed	Average	Comfort	Factory
			99%	99.999%
<u>Mini memory</u>	(ms)	(ms)	(ms)	(ms)
MC0H	200	300	600	600
MC4H	300	400	800	800
MC8H	300	900	2100	2100
MR4H	300	900	2100	2100
<u>Quarter memory</u>				
QC0H	300	400	800	800
QC4H	500	1000	2300	2300
QC8H	500	1900	4800	4800
QR4H	500	1800	4500	4500
<u>Full memory</u>				
FC0H	400	1300	3000	3000
FC4H	800	2600	6000	6000
FC8H	1700			
FR4H	1300			

	Low speed	Average	Comfort	Factory
			99%	99.999%
<u>Mini memory</u>	(ms)	(ms)	(ms)	(ms)
MC0L	300	600	1400	1400
MC4L	500	1200	2800	2800
MC8L	900	2600	6000	6000
MR4L	800	2700		
<u>Quarter memory</u>				
QC0L	500	1300	2900	2900
QC4L	1000	2900		
QC8L	2400			
QR4L	1800			
<u>Full memory</u>				
FC0L	1100	3200		
FC4L	2500			
FC8L				
FR4L				

A backup function is provided to handle the case when the tag by accident is taken out from the write zone while it receives data via the microwaves. Then the old data is automatically restored from the tag backup memory, and a "failed write" flag is set in the status register to give automatic warning to the user system.

Mechanical data

Product information according to the figure below is printed on the ScriptTag back panel.



For security reasons, there is no relation between the serial number and the 8 digit electronic “mark”. Both are running numbers that never are repeated.

Weight	15 grams
Front colour	Light grey
Back colour	Light grey
Front material	Polymer
Back material	Polymer
Sealing method	Adhesive

The revision code is for internal use only.

Communication range data

Reading range parameter:	$R_{low\ speed}$	1.5	(4.0m with S1500 and S1501, 6.0m with S1503)
	$R_{high\ speed}$	1.0	(2.7m with S1500 and S1501, 4.0m with S1503)
Writing range parameter:	W	Min: 0.25, Typ: 0.5	(minimum 0.25m with S1500, S1501 and S1503)

The interpretation of the R and W parameters are described in the Communicator data sheets S1500, S1501 and S1503.

Environmental data

Cold IEC68-2-1 Ad	- 20 °C	Shock IEC68-2-27 test Ea	500 g 1 ms, 100x 3 dir	Immunity prETS 300 683	Acc. to CE leg.
Heat IEC68-2-2 Bd	+ 85 °C	Bump IEC68-2-29 Eb	40 g 6 ms, 1000x 3 dir	Emission I-ETS 300 440	Acc. to CE leg.
Sealing IEC 529	IP 67	Free fall IEC68-2-32 Ed	1.0 m, 100x	Solar radiation IEC68-2-5 Sa C	1120 W/sqm 56 days

Options

The ordering code of the product in this data sheet is “ScriptTag S1251/00”.

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This document

Specifications are subject to change without prior notice.

Representative: ds1251bc 9909

