

## ST25DV04KC, ST25DV16KC and ST25DV64KC device limitations

### Silicon identification

The ST25DV-I2C series is a dynamic NFC/RFID tag ICs with 4, 16 or 64-Kbit EEPROM and fast transfer mode capability.

Table 1 shows the full list of impacted part numbers (hereinafter referred to as ST25DVxxKC). These parts are identified physically by their marking or directly in the application by reading the I<sup>2</sup>C product revision byte.

**Table 1. Device summary**

References	Package	Ordering code	IC reference	Product code	
ST25DV04KC	SO8N	ST25DV04KC-IE6S3	50h	50h	
		ST25DV04KC-IE8S3			
	TSS0P8	ST25DV04KC-IE6T3			
		ST25DV04KC-IE8T3			
	UFDFPN8	ST25DV04KC-IE6C3			
		ST25DV04KC-IE8C3			
	UFDFPN12	ST25DV04KC-JF6D3			52h
		ST25DV04KC-JF8D3			
WLCSP10	ST25DV04KC-JF6L3				
ST25DV16KC	SO8N	ST25DV16KC-IE6S3	51h	51h	
		ST25DV16KC-IE8S3			
	TSS0P8	ST25DV16KC-IE6T3			
		ST25DV16KC-IE8T3			
	UFDFPN8	ST25DV16KC-IE8C3			
		ST25DV16KC-IE6C3			
	UFDFPN12	ST25DV16KC-JF6D3			53h
		ST25DV16KC-JF8D3			
ST25DV64KC	SO8N	ST25DV64KC-IE6S3	51h	51h	
		ST25DV64KC-IE8S3			
	TSS0P8	ST25DV64KC-IE6T3			
		ST25DV64KC-IE8T3			
	UFDFPN8	ST25DV64KC-IE8C3			
		ST25DV64KC-IE6C3			
	UFDFPN12	ST25DV64KC-JF6D3			53h
		ST25DV64KC-JF8D3			

The IC reference (IC\_REF register) is read from I<sup>2</sup>C at address 0017h (device select code E2 = 1) or from RF by issuing a *get system information* or an *extended get system information* command.

The product code is read from I<sup>2</sup>C at address 001Dh or from RF by issuing an *inventory*, a *get system information* or an *extended get system information* command.

The product revision (IC\_REV register) is read from I<sup>2</sup>C at address 0020h (device select code E2 = 1).

# 1 Limitations

Table 2 gives quick references to all documented device limitations of ST25DVxxKC and their status:

- A = workaround available
- N = no workaround available
- P = partial workaround available
- '-' and grayed = fixed.

Applicability of a workaround depends on specific conditions of the target application. Adoption of a workaround may cause restrictions to the target application. Workaround for a limitation is deemed partial if it only reduces the rate of occurrence and/or consequences of the limitation, or if it is fully effective for only a subset of instances on the device or in only a subset of operating modes, of the concerned function.

**Table 2. Summary of silicon limitations**

Links to silicon limitations		Workaround
Power supply	Potential RF and I <sup>2</sup> C lock if V <sub>CC</sub> gets disconnected then reconnected when RF field is present	A
Fast transfer mode limitation	RF_PUT_MSG bit wrongly cleared after I <sup>2</sup> C reading MB_LEN_Dyn if message is 256 bytes long	A
Communication limitation	Communication limitation on a marginal portion of production parts (sub-carrier frequency drift)	A

## 1.1 Power supply limitations

### 1.1.1 Potential RF and I<sup>2</sup>C lock if V<sub>CC</sub> gets disconnected then reconnected when RF field is present

**Impacted devices:** All ST25DVxxKC devices.

**Description**

When the device is powered both by V<sub>CC</sub> and RF field, if V<sub>CC</sub> pin gets disconnected and left floating (i.e. V<sub>CC</sub> is connected to a microcontroller GPIO, and the GPIO configuration is changed from output to HiZ), the ST25DVxxKC enter an unexpected state where approximately 1.4 V is present on the floating V<sub>CC</sub> pin.

Once the unexpected V<sub>CC</sub> at 1.4 V state is reached, the ST25DV-I2C returns to its normal state in the following conditions:

- If RF field disappears (the ST25DV-I2C goes completely off and restarts in normal state when either RF field or V<sub>CC</sub> power come back)
- If any RF command is received (V<sub>CC</sub> then goes to 0 V)
- If V<sub>CC</sub> rises again to its nominal value (>1.8 V).

Nevertheless, if during this unexpected V<sub>CC</sub> at 1.4 V state, the V<sub>CC</sub> is pulled down to 0 V and then to its nominal value (1.4 V, then 0 V, then above 1.8 V), the ST25DV-I2C can enter a deadlock state where all I<sup>2</sup>C accesses are not acknowledged and any RF command is answered with error 0Fh.

The trigger of the deadlock is dependent upon the duration of the negative pulse on V<sub>CC</sub>.

The negative pulse is acting as a discharge of internal capacitors of the ST25DV-I2C. If the pulse is shorter than 1 ms, the capacitors are not fully discharged and correct internal reset is not occurring, setting the ST25DV-I2C in deadlock state.

### Workaround

Several workarounds are available:

- Proper reset is done on  $V_{CC}$  side before disconnecting  $V_{CC}$  (before configuring the GPIO that controls  $V_{CC}$  to HiZ), with duration >1 ms
- Proper reset is done on  $V_{CC}$  side before connecting again  $V_{CC}$  (before configuring the GPIO that controls  $V_{CC}$  from HiZ to its nominal value), with duration >1 ms
- If the glitch to 0 V on  $V_{CC}$  that triggers the deadlock state is short enough, an additional capacitor on  $V_{CC}$  with time constant longer than the glitch can filter it
- On ST25DV-I2C versions with product codes 51h and 53h, it is possible to properly reset the device by setting the LPD pin high

## 1.2 Fast transfer mode limitations

### 1.2.1 RF\_PUT\_MSG bit wrongly cleared after I<sup>2</sup>C reading MB\_LEN\_Dyn if message is 256 bytes long

**Impacted devices:** All ST25DVxxKC devices.

#### Description

At the end of a valid RF Write Message command in mailbox, the RF\_PUT\_MSG flag is set in MB\_CTRL\_Dyn register. This flag must be cleared only if the mailbox is deactivated or if the I<sup>2</sup>C has read the complete message, or if the watchdog is triggered. But if the message is 256 bytes long, and if the first I<sup>2</sup>C command after the RF has written the message is a read of MB\_LEN\_Dyn register (user address 2007h), the RF\_PUT\_MSG flag is wrongly cleared.

#### Workaround

After the RF has written a message in the mailbox, it is recommended to check the MB\_CTRL\_Dyn register to verify if a message is present, before reading MB\_LEN\_Dyn to check its size. Therefore, it is recommended for the I<sup>2</sup>C host to read first MB\_CTRL\_Dyn, then MB\_LEN\_dyn, then the message in mailbox. This can be done in a single read sequential command, starting at address 2006h (MB\_CTRL\_Dyn) and ending at end of the mailbox (258 bytes are read). This sequentially reads the MB\_CTRL\_Dyn register, the MB\_LEN\_Dyn register and the full mailbox content.

## 1.3 Communication limitation

### 1.3.1 Communication limitation on a marginal portion of production parts (sub-carrier frequency drift)

**Impacted device:** All ST25DVxxKC devices.

#### Description

In a limited portion of the reading range, and on marginal portion of production parts, communications between some NFC readers and the ST25 products listed above may be lost (communication hole). The communication loss is more likely to occur as the ambient temperature decreases.

The reader and the tag antennas dimensions are impacting the distance where the communication hole happens. The failure mechanism is a loss of clock cycles during the tag back-scattering under some field conditions.

Therefore, the tag response may be transmitted with a sub-carrier frequency drift and not be decoded properly by some readers.

#### Workarounds

- As the communication hole happens only at certain field strength, moving the tag closer or farther to the reader can allow communication with the tag. Applications where the ST25DV is in movement ("tap" gesture, moving parts in production line,...) are less likely to experience the communication loss, as the communication protocol includes retries
- As the temperature has an impact on the issue, using the tag in higher temperature can allow communication with the tag
- Replacing device with a ST25DVxxKC revision 13h (please contact your local ST sales office for availability on specific options).

- Some RF readers are not sensitive to a sub-carrier frequency drift. Reading hole is not seen when using those readers. Recommended readers: ST25R3916, ST25R3916B, ST25R3917, ST25R3917B, ST25R3918, ST25R3919B, ST25R3911B, ST25R3912, ST25R3914, ST25R3915, ST25R3920, and ST25R3920B

## Revision history

**Table 3. Document revision history**

Date	Version	Changes
28-Jun-2023	1	Initial release.
03-Jul-2023	2	Removed former <i>Section 1.2.1: Fast transfer mode watchdog not started correctly after an I<sup>2</sup>C write message in mailbox</i> (product not impacted by this limitation).
04-Jan-2024	3	Updated <a href="#">Section Silicon identification</a>

## Contents

<b>1</b>	<b>Limitations</b> .....	<b>2</b>
1.1	Power supply limitations .....	2
1.1.1	Potential RF and I <sup>2</sup> C lock if V <sub>CC</sub> gets disconnected then reconnected when RF field is present .....	2
1.2	Fast transfer mode limitations .....	3
1.2.1	RF_PUT_MSG bit wrongly cleared after I <sup>2</sup> C reading MB_LEN_Dyn if message is 256 bytes long .....	3
1.3	Communication limitation .....	3
1.3.1	Communication limitation on a marginal portion of production parts (sub-carrier frequency drift) .....	3
	<b>Revision history</b> .....	<b>5</b>
	<b>List of tables</b> .....	<b>7</b>

## List of tables

<b>Table 1.</b>	Device summary . . . . .	1
<b>Table 2.</b>	Summary of silicon limitations . . . . .	2
<b>Table 3.</b>	Document revision history . . . . .	5

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