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**ST75C520 - A COMPLETE DTMF DETECTION  
CHECKING FROM REVISION 1.2 TO REVISION 1.4**

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**1 - INTRODUCTION**

In this application note is described various DTMF detection tests done with Revision 1.3 and Revision 1.4 of the ST75C520. The aim of this document is to show the performances of the DTMF detection function and the benefits the Revision 1.4 gives.

# ST75C520 REVISION 1.4 DTMF DETECTION REPORT

## 2 - DTMF DETECTION REQUIREMENTS

Hereafter are described the test conditions used for the DTMF performance measurements :

- Level of DTMF signal at RXA Pin :  
4.5dBm to 39.5dBm
- Twist :  $\pm 6$ dB.
- Frequency Offset :  $\pm 1.5\%$
- DTMF Application :

| t <sub>ON</sub> (ms) | t <sub>OFF</sub> (ms) | Nature of the test                         |
|----------------------|-----------------------|--|
| 55                   | 45                    | Detection fiability                        |
| 150                  | 65                    | Detection fiability and STA_DTMF stability |
| 500                  | 500                   |  |

## 3 - MEASUREMENTS CONDITIONS

The level of DTMF digits is measured on the line. Because there is an attenuation of -4.5dB on our DAA, we check that level from 0dBm to -35dBm. We are using on the line a current loop of 30mA to simulate telephone conditions. For the dynamic tests, we use the following sequence sent automatically by the HP8904A Multifunction Synthesizer DC-600kHz :

1 2 3 4 5 6 7 8 9 A B C D \* # 1 2 3 4 5 6 ...

The dynamic tests are done in part 1 and 2. The static test with frequency offset are done in part 3 and 4. Please note that all the measures done for Rev 1.3 are valid for Rev 1.2. And all the measures done for Rev 1.4 are valid for the future Rev 1.5. In order to meet 0dBm on the line with  $\pm 6$ dB of twist, the component must detect DTMF digits with -1dBm of magnitude (because one -1dBm and one -7dBm sine component give a 0dBm signal on the line). However, SGS-THOMSON only guarantees two -3dBm sine amplitude because of the limited detection dynamic of the ST75C520.

In order to meet -35dBm on the line with  $\pm 6$ dB of twist, the component must detect DTMF digits with -42dBm of magnitude (because one -42dBm and one -36dBm sine component give a -35dBm signal on the line). That condition is met with Revision 1.4 and is limited to two -38dBm sine amplitude in Revision 1.2 and 1.3.

## 4 - GLOSSARY

### 4.1 - The Three ST75C520 Set-up Modes in DTMF Detection

For each part you will find three different paragraphs that correspond to three programming mode for the ST75C520 :

- The Default Mode : for Rev 1.2 and 1.3, nothing is added. For Rev 1.4, some Memory Writes have been added in order to meet the requirements (by default, Rev 1.4 detects from -1dBm to -35dBm with a good speech immunity) :

- MW 4A 13 89 05 1dB attenuation for the 1209Hz filter
- MW F2 17 00 14 comparison threshold between 1209 and 1336Hz
- MW F4 17 00 14 comparison threshold between 1336 and 1477Hz
- MW F5 17 00 14 comparison threshold between 1336 and 1209Hz
- MW 2E 12 60 00 lower threshold for low pass filter
- MW 2F 12 60 00 lower threshold for high pass filter

- The ANALOG GAIN Frozen mode : in that mode, the analog gain is frozen :

- MW D2 17 02 00 analog gain frozen
- CONF 04 DTMF detection enable

For Rev 1.2 and 1.3, you have to use after CONF command the following sequence in order to keep the detection dynamic :

- MW EA 12 A5 0A Lowpass gain
- MW 02 13 5E 65 Hipass gain
- MW 2E 12 E0 00 higher threshold for low pass filter
- MW 2F 12 E0 00 higher threshold for high pass filter
- MW 1A 13 8A 02 gain for 697Hz filter
- MW 26 13 30 03 gain for 770Hz filter
- MW 32 13 00 02 gain for 852Hz filter
- MW 3E 13 40 04 gain for 941Hz filter

- The ANALOG GAIN Time Constant Low : in that mode, the time constant of the analog gain is lowered in order to avoid STA\_DTMF instability :

- CONF 04 DTMF detection enable
- MW DE 17 00 F0 analog gain time constant low

### 4.2 - The Three Comments

You will find three different comments on the following tables :

- False digits : some digits has been added during the test.
- Digits not detected or No detect : some digits are not detected or no digits are detected at all.
- ok : all digits sent by the generator during the test have been detected with no loss and no added digits.

## 5 - HOW TO USE THE DTMF DETECTION REPORT

The tables used in part 2 and 3 describes DTMF detection with four t<sub>ON</sub>/t<sub>OFF</sub> cases (continue, 55/45, 150/65, 500/500). The tables used in part 4 and 5 describes DTMF detection with 1.5% of frequency offset and  $\pm 6$ dB of twist. Each digit is described with two frequencies: f<sub>LOW</sub> and f<sub>HIGH</sub>. And when we test +1.5% on one frequency, we have chosen to keep the other nominal. Thus for example the result of the status f<sub>LOW</sub> use a 1.5% offset for f<sub>LOW</sub> and a nominal value for f<sub>HIGH</sub>.

Hereunder is remembered the nominal frequencies of the DTMF digits :

|        | 697Hz | 770Hz | 852Hz | 941Hz |
|--------|-------|-------|-------|-------|
| 1209Hz | 1     | 4     | 7     | *     |
| 1336Hz | 2     | 5     | 8     | 0     |
| 1477Hz | 3     | 6     | 9     | #     |
| 1633Hz | A     | B     | C     | D     |

## ST75C520 REVISION 1.4 DTMF DETECTION REPORT

### 6 - MEASUREMENTS WITH REVISION 1.3 - NOMINAL FREQUENCIES

#### 6.1 - Nominal frequencies, no twist - Default mode

| Line Level (dB) | Continue | 55/45        | 150/65       | 500/500      |
|-----------------|----------|--------------|--------------|--------------|
| 0               | ok       | ok           | ok           | ok           |
| -5              | ok       | ok           | ok           | ok           |
| -10             | ok       | ok           | ok           | ok           |
| -15.5           | False *  | False Digits | False Digits | False *      |
| -19.5           | ok       | ok           | ok           | ok           |
| -26             | ok       | ok           | ok           | ok           |
| -29             | ok       | ok           | ok           | ok           |
| -35             | False *  | ok           | False Digits | False Digits |

#### 6.2 - Nominal frequencies, no twist - frozen gain - new 852Hz filter - new thresholds

| Line Level (dB) | Continue            | 55/45               | 150/65              | 500/500             |
|-----------------|---------------------|---------------------|---------------------|---------------------|
| 0               | ok                  | ok                  | ok                  | ok                  |
| -5              | ok                  | ok                  | ok                  | ok                  |
| -10             | ok                  | ok                  | ok                  | ok                  |
| -15.5           | ok                  | ok                  | ok                  | ok                  |
| -19.5           | ok                  | ok                  | ok                  | ok                  |
| -26             | ok                  | ok                  | ok                  | ok                  |
| -29             | ok                  | ok                  | ok                  | ok                  |
| -35             | Digits not detected | Digits not detected | Digits not detected | Digits not detected |

#### 6.3 - Nominal frequencies, no twist - ANALOG GAIN time constant low

| Line Level (dB) | Continue     | 55/45 | 150/65       | 500/500      |
|-----------------|--------------|-------|--------------|--------------|
| 0               | ok           | ok    | ok           | ok           |
| -5              | ok           | ok    | ok           | ok           |
| -10             | ok           | ok    | ok           | ok           |
| -15.5           | ok           | ok    | ok           | ok           |
| -19.5           | ok           | ok    | ok           | ok           |
| -26             | ok           | ok    | ok           | ok           |
| -29             | ok           | ok    | ok           | ok           |
| -35             | False Digits | ok    | False Digits | False Digits |

## ST75C520 REVISION 1.4 DTMF DETECTION REPORT

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### 7 - MEASUREMENTS WITH REVISION 1.4 - NOMINAL FREQUENCIES

#### 7.1 - Nominal frequencies, no twist - Default mode

| Line Level (dB) | Continue | 55/45 | 150/65 | 500/500 |
|-----------------|----------|-------|--------|---------|
| 0               | ok       | ok    | ok     | ok      |
| -5              | ok       | ok    | ok     | ok      |
| -10             | ok       | ok    | ok     | ok      |
| -15.5           | False *  | ok    | ok     | False * |
| -19.5           | ok       | ok    | ok     | ok      |
| -26             | ok       | ok    | ok     | ok      |
| -29             | ok       | ok    | ok     | ok      |
| -35             | ok       | ok    | ok     | ok      |

#### 7.2 - Nominal frequencies, no twist - ANALOG GAIN frozen

| Line Level (dB) | Continue | 55/45 | 150/65 | 500/500 |
|-----------------|----------|-------|--------|---------|
| 0               | ok       | ok    | ok     | ok      |
| -5              | ok       | ok    | ok     | ok      |
| -10             | ok       | ok    | ok     | ok      |
| -15.5           | ok       | ok    | ok     | ok      |
| -19.5           | ok       | ok    | ok     | ok      |
| -26             | ok       | ok    | ok     | ok      |
| -29             | ok       | ok    | ok     | ok      |
| -35             | ok       | ok    | ok     | ok      |

#### 7.3 - Frequencies, no twist - ANALOG GAIN time constant low

| Line Level (dB) | Continue | 55/45 | 150/65 | 500/500 |
|-----------------|----------|-------|--------|---------|
| 0               | ok       | ok    | ok     | ok      |
| -5              | ok       | ok    | ok     | ok      |
| -10             | ok       | ok    | ok     | ok      |
| -15.5           | ok       | ok    | ok     | ok      |
| -19.5           | ok       | ok    | ok     | ok      |
| -26             | ok       | ok    | ok     | ok      |
| -29             | ok       | ok    | ok     | ok      |
| -35             | ok       | ok    | ok     | ok      |

## ST75C520 REVISION 1.4 DTMF DETECTION REPORT

### 8 - MEASUREMENT WITH REVISION 1.3 - FREQUENCY OFFSET 1.5%

#### 8.1 - Frequency offset 1.5% , no twist - Default mode

| Level (dBm) | f <sub>LOW</sub> (Hz) | f <sub>HIGH</sub> (Hz) | Status f <sub>LOW</sub> | Status f <sub>HIGH</sub> |
|-------------|-----------------------|------------------------|-------------------------|--------------------------|
|-------------|-----------------------|------------------------|-------------------------|--------------------------|

DIGIT \*

| Level (dBm) | f <sub>LOW</sub> (Hz) | f <sub>HIGH</sub> (Hz) | Status f <sub>LOW</sub> | Status f <sub>HIGH</sub> |
|-------------|-----------------------|------------------------|-------------------------|--------------------------|
| 0           | 955<br>(+1.5%)        | 1227<br>(+1.5%)        | ok                      | ok                       |
| -5          |                       |                        | ok                      | ok                       |
| -9.5        |                       |                        | ok                      | ok                       |
| -15.5       |                       |                        | False *                 | False *                  |
| -19.5       |                       |                        | ok                      | ok                       |
| -25.5       |                       |                        | ok                      | ok                       |
| -29         |                       |                        | False *                 | False *                  |
| -35         |                       |                        | ok                      | ok                       |
| 0           | 927<br>(-1.5%)        | 1191<br>(-1.5%)        | ok                      | ok                       |
| -5          |                       |                        | False *                 | ok                       |
| -9.5        |                       |                        | False *                 | ok                       |
| -15.5       |                       |                        | False *                 | False *                  |
| -19.5       |                       |                        | False *                 | ok                       |
| -25.5       |                       |                        | False *                 | ok                       |
| -29         |                       |                        | False *                 | False *                  |
| -35         |                       |                        | False *                 | False *                  |

DIGIT 8

| Level (dBm) | f <sub>LOW</sub> (Hz) | f <sub>HIGH</sub> (Hz) | Status f <sub>LOW</sub> | Status f <sub>HIGH</sub> |
|-------------|-----------------------|------------------------|-------------------------|--------------------------|
| 0           | 865<br>(+1.5%)        | 1356<br>(+1.5%)        | ok                      | ok                       |
| -5          |                       |                        | False 8                 | ok                       |
| -9.5        |                       |                        | False 8                 | ok                       |
| -15.5       |                       |                        | False 8                 | ok                       |
| -19.5       |                       |                        | False 8                 | ok                       |
| -25.5       |                       |                        | False 8                 | False 8                  |
| -29         |                       |                        | False 8                 | False 8                  |
| -35         |                       |                        | False 8                 | False 8                  |
| 0           | 839<br>(-1.5%)        | 1316<br>(-1.5%)        | ok                      | ok                       |
| -5          |                       |                        | ok                      | ok                       |
| -9.5        |                       |                        | ok                      | ok                       |
| -15.5       |                       |                        | ok                      | ok                       |
| -19.5       |                       |                        | ok                      | ok                       |
| -25.5       |                       |                        | False 8                 | False 8                  |
| -29         |                       |                        | False 8                 | False 8                  |
| -35         |                       |                        | ok                      | False 8                  |

| Level (dBm) | f <sub>LOW</sub> (Hz) | f <sub>HIGH</sub> (Hz) | Status f <sub>LOW</sub> | Status f <sub>HIGH</sub> |
|-------------|-----------------------|------------------------|-------------------------|--------------------------|
|-------------|-----------------------|------------------------|-------------------------|--------------------------|

DIGIT 6

| Level (dBm) | f <sub>LOW</sub> (Hz) | f <sub>HIGH</sub> (Hz) | Status f <sub>LOW</sub> | Status f <sub>HIGH</sub> |
|-------------|-----------------------|------------------------|-------------------------|--------------------------|
| 0           | 782<br>(+1.5%)        | 1499<br>(+1.5%)        | ok                      | ok                       |
| -5          |                       |                        | ok                      | ok                       |
| -9.5        |                       |                        | ok                      | ok                       |
| -15.5       |                       |                        | False 6                 | ok                       |
| -19.5       |                       |                        | False 6                 | ok                       |
| -25.5       |                       |                        | False 6                 | ok                       |
| -29         |                       |                        | False 6                 | False 6                  |
| -35         |                       |                        | False 6                 | False 6                  |
| 0           | 758<br>(-1.5%)        | 1455<br>(-1.5%)        | ok                      | ok                       |
| -5          |                       |                        | ok                      | ok                       |
| -9.5        |                       |                        | ok                      | ok                       |
| -15.5       |                       |                        | ok                      | ok                       |
| -19.5       |                       |                        | ok                      | ok                       |
| -25.5       |                       |                        | False 6                 | ok                       |
| -29         |                       |                        | False 6                 | False 6                  |
| -35         |                       |                        | False 6                 | False 6                  |

DIGIT A

| Level (dBm) | f <sub>LOW</sub> (Hz) | f <sub>HIGH</sub> (Hz) | Status f <sub>LOW</sub> | Status f <sub>HIGH</sub> |
|-------------|-----------------------|------------------------|-------------------------|--------------------------|
| 0           | 708<br>(+1.5%)        | 1658<br>(+1.5%)        | False A                 | ok                       |
| -5          |                       |                        | False A                 | ok                       |
| -9.5        |                       |                        | False A                 | ok                       |
| -15.5       |                       |                        | False A                 | ok                       |
| -19.5       |                       |                        | False A                 | ok                       |
| -25.5       |                       |                        | False A                 | ok                       |
| -29         |                       |                        | False A                 | False A                  |
| -35         |                       |                        | False A                 | False A                  |
| 0           | 686<br>(-1.5%)        | 1608<br>(-1.5%)        | ok                      | ok                       |
| -5          |                       |                        | ok                      | ok                       |
| -9.5        |                       |                        | ok                      | ok                       |
| -15.5       |                       |                        | ok                      | ok                       |
| -19.5       |                       |                        | False A                 | ok                       |
| -25.5       |                       |                        | ok                      | ok                       |
| -29         |                       |                        | False A                 | False A                  |
| -35         |                       |                        | False A                 | False A                  |

# ST75C520 REVISION 1.4 DTMF DETECTION REPORT

## 8 - MEASUREMENT WITH REVISION 1.3 - FREQUENCY OFFSET 1.5% (continued)

### 8.2 - Frequency offset 1.5% , no twist - ANALOG GAIN Frozen, new 852Hz filter, new thresholds

| Level (dBm) | f <sub>LOW</sub> (Hz) | f <sub>HIGH</sub> (Hz) | Status f <sub>LOW</sub> | Status f <sub>HIGH</sub> |
|-------------|-----------------------|------------------------|-------------------------|--------------------------|
|-------------|-----------------------|------------------------|-------------------------|--------------------------|

DIGIT \*

| Level (dBm) | f <sub>LOW</sub> (Hz) | f <sub>HIGH</sub> (Hz) | Status f <sub>LOW</sub> | Status f <sub>HIGH</sub> |
|-------------|-----------------------|------------------------|-------------------------|--------------------------|
| 0           | 955<br>(+1.5%)        | 1227<br>(+1.5%)        | ok                      | False *                  |
| -5          |                       |                        | ok                      | ok                       |
| -9.5        |                       |                        | ok                      | ok                       |
| -15.5       |                       |                        | ok                      | False *                  |
| -19.5       |                       |                        | ok                      | ok                       |
| -25.5       |                       |                        | ok                      | ok                       |
| -29         |                       |                        | ok                      | ok                       |
| -35         |                       |                        | False *                 | False *                  |
| 0           | 927<br>(-1.5%)        | 1191<br>(-1.5%)        | No detect               | False *                  |
| -5          |                       |                        | False *                 | ok                       |
| -9.5        |                       |                        | False *                 | ok                       |
| -15.5       |                       |                        | False *                 | ok                       |
| -19.5       |                       |                        | False *                 | ok                       |
| -25.5       |                       |                        | False *                 | ok                       |
| -29         |                       |                        | False *                 | ok                       |
| -35         |                       |                        | False *                 | False *                  |

DIGIT 8

| Level (dBm) | f <sub>LOW</sub> (Hz) | f <sub>HIGH</sub> (Hz) | Status f <sub>LOW</sub> | Status f <sub>HIGH</sub> |
|-------------|-----------------------|------------------------|-------------------------|--------------------------|
| 0           | 865<br>(+1.5%)        | 1356<br>(+1.5%)        | False 8                 | False 8                  |
| -5          |                       |                        | False 8                 | ok                       |
| -9.5        |                       |                        | False 8                 | ok                       |
| -15.5       |                       |                        | False 8                 | False 8                  |
| -19.5       |                       |                        | False 8                 | False 8                  |
| -25.5       |                       |                        | False 8                 | ok                       |
| -29         |                       |                        | False 8                 | ok                       |
| -35         |                       |                        | False 8                 | False 8                  |
| 0           | 839<br>(-1.5%)        | 1316<br>(-1.5%)        | ok                      | ok                       |
| -5          |                       |                        | ok                      | ok                       |
| -9.5        |                       |                        | ok                      | ok                       |
| -15.5       |                       |                        | False 8                 | False 8                  |
| -19.5       |                       |                        | False 8                 | False 8                  |
| -25.5       |                       |                        | False 8                 | ok                       |
| -29         |                       |                        | ok                      | ok                       |
| -35         |                       |                        | False 8                 | False 8                  |

| Level (dBm) | f <sub>LOW</sub> (Hz) | f <sub>HIGH</sub> (Hz) | Status f <sub>LOW</sub> | Status f <sub>HIGH</sub> |
|-------------|-----------------------|------------------------|-------------------------|--------------------------|
|-------------|-----------------------|------------------------|-------------------------|--------------------------|

DIGIT 6

| Level (dBm) | f <sub>LOW</sub> (Hz) | f <sub>HIGH</sub> (Hz) | Status f <sub>LOW</sub> | Status f <sub>HIGH</sub> |
|-------------|-----------------------|------------------------|-------------------------|--------------------------|
| 0           | 782<br>(+1.5%)        | 1499<br>(+1.5%)        | No detect               | False 6                  |
| -5          |                       |                        | False 6                 | ok                       |
| -9.5        |                       |                        | False 6                 | ok                       |
| -15.5       |                       |                        | False 6                 | False 6                  |
| -19.5       |                       |                        | False 6                 | ok                       |
| -25.5       |                       |                        | False 6                 | ok                       |
| -29         |                       |                        | False 6                 | ok                       |
| -35         |                       |                        | False 6                 | False 6                  |
| 0           | 758<br>(-1.5%)        | 1455<br>(-1.5%)        | ok                      | ok                       |
| -5          |                       |                        | ok                      | ok                       |
| -9.5        |                       |                        | ok                      | ok                       |
| -15.5       |                       |                        | False 6                 | False 6                  |
| -19.5       |                       |                        | False 6                 | ok                       |
| -25.5       |                       |                        | False 6                 | ok                       |
| -29         |                       |                        | ok                      | ok                       |
| -35         |                       |                        | False 6                 | False 6                  |

DIGIT A

| Level (dBm) | f <sub>LOW</sub> (Hz) | f <sub>HIGH</sub> (Hz) | Status f <sub>LOW</sub> | Status f <sub>HIGH</sub> |
|-------------|-----------------------|------------------------|-------------------------|--------------------------|
| 0           | 708<br>(+1.5%)        | 1658<br>(+1.5%)        | No detect               | ok                       |
| -5          |                       |                        | False A                 | ok                       |
| -9.5        |                       |                        | False A                 | ok                       |
| -15.5       |                       |                        | False A                 | False A                  |
| -19.5       |                       |                        | False A                 | ok                       |
| -25.5       |                       |                        | False A                 | False A                  |
| -29         |                       |                        | False A                 | ok                       |
| -35         |                       |                        | False A                 | False A                  |
| 0           | 686<br>(-1.5%)        | 1608<br>(-1.5%)        | ok                      | ok                       |
| -5          |                       |                        | ok                      | ok                       |
| -9.5        |                       |                        | ok                      | ok                       |
| -15.5       |                       |                        | False A                 | False A                  |
| -19.5       |                       |                        | False A                 | False A                  |
| -25.5       |                       |                        | False A                 | False A                  |
| -29         |                       |                        | ok                      | ok                       |
| -35         |                       |                        | ok                      | False A                  |

## ST75C520 REVISION 1.4 DTMF DETECTION REPORT

### 8 - MEASUREMENT WITH REVISION 1.3 - FREQUENCY OFFSET 1.5% (continued)

#### 8.3 - Frequency offset 1.5% , no twist - ANALOG GAIN time constant low

| Level (dBm) | f <sub>LOW</sub> (Hz) | f <sub>HIGH</sub> (Hz) | Status f <sub>LOW</sub> | Status f <sub>HIGH</sub> |
|-------------|-----------------------|------------------------|-------------------------|--------------------------|
|-------------|-----------------------|------------------------|-------------------------|--------------------------|

DIGIT \*

| Level (dBm) | f <sub>LOW</sub> (Hz) | f <sub>HIGH</sub> (Hz) | Status f <sub>LOW</sub> | Status f <sub>HIGH</sub> |
|-------------|-----------------------|------------------------|-------------------------|--------------------------|
| 0           | 955<br>(+1.5%)        | 1227<br>(+1.5%)        | ok                      | ok                       |
| -5          |                       |                        | ok                      | ok                       |
| -9.5        |                       |                        | ok                      | ok                       |
| -15.5       |                       |                        | ok                      | ok                       |
| -19.5       |                       |                        | ok                      | ok                       |
| -25.5       |                       |                        | ok                      | ok                       |
| -29         |                       |                        | False *                 | False *                  |
| -35         |                       |                        | False *                 | False *                  |
| 0           | 927<br>(-1.5%)        | 1191<br>(-1.5%)        | False *                 | ok                       |
| -5          |                       |                        | False *                 | ok                       |
| -9.5        |                       |                        | False *                 | ok                       |
| -15.5       |                       |                        | False *                 | ok                       |
| -19.5       |                       |                        | False *                 | ok                       |
| -25.5       |                       |                        | False *                 | ok                       |
| -29         |                       |                        | False *                 | False *                  |
| -35         |                       |                        | False *                 | False *                  |

DIGIT 8

| Level (dBm) | f <sub>LOW</sub> (Hz) | f <sub>HIGH</sub> (Hz) | Status f <sub>LOW</sub> | Status f <sub>HIGH</sub> |
|-------------|-----------------------|------------------------|-------------------------|--------------------------|
| 0           | 865<br>(+1.5%)        | 1356<br>(+1.5%)        | False 8                 | ok                       |
| -5          |                       |                        | False 8                 | ok                       |
| -9.5        |                       |                        | False 8                 | ok                       |
| -15.5       |                       |                        | False 8                 | ok                       |
| -19.5       |                       |                        | False 8                 | ok                       |
| -25.5       |                       |                        | False 8                 | False 8                  |
| -29         |                       |                        | False 8                 | False 8                  |
| -35         |                       |                        | False 8                 | False 8                  |
| 0           | 839<br>(-1.5%)        | 1316<br>(-1.5%)        | ok                      | ok                       |
| -5          |                       |                        | ok                      | ok                       |
| -9.5        |                       |                        | ok                      | ok                       |
| -15.5       |                       |                        | ok                      | ok                       |
| -19.5       |                       |                        | ok                      | ok                       |
| -25.5       |                       |                        | False 8                 | False 8                  |
| -29         |                       |                        | False 8                 | False 8                  |
| -35         |                       |                        | False 8                 | False 8                  |

| Level (dBm) | f <sub>LOW</sub> (Hz) | f <sub>HIGH</sub> (Hz) | Status f <sub>LOW</sub> | Status f <sub>HIGH</sub> |
|-------------|-----------------------|------------------------|-------------------------|--------------------------|
|-------------|-----------------------|------------------------|-------------------------|--------------------------|

DIGIT 6

| Level (dBm) | f <sub>LOW</sub> (Hz) | f <sub>HIGH</sub> (Hz) | Status f <sub>LOW</sub> | Status f <sub>HIGH</sub> |
|-------------|-----------------------|------------------------|-------------------------|--------------------------|
| 0           | 782<br>(+1.5%)        | 1499<br>(+1.5%)        | ok                      | ok                       |
| -5          |                       |                        | ok                      | ok                       |
| -9.5        |                       |                        | ok                      | ok                       |
| -15.5       |                       |                        | False 6                 | ok                       |
| -19.5       |                       |                        | False 6                 | ok                       |
| -25.5       |                       |                        | False 6                 | ok                       |
| -29         |                       |                        | False 6                 | False 6                  |
| -35         |                       |                        | False 6                 | False 6                  |
| 0           | 758<br>(-1.5%)        | 1455<br>(-1.5%)        | ok                      | ok                       |
| -5          |                       |                        | ok                      | ok                       |
| -9.5        |                       |                        | ok                      | ok                       |
| -15.5       |                       |                        | ok                      | ok                       |
| -19.5       |                       |                        | ok                      | ok                       |
| -25.5       |                       |                        | False 6                 | ok                       |
| -29         |                       |                        | False 6                 | False 6                  |
| -35         |                       |                        | False 6                 | False 6                  |

DIGIT A

| Level (dBm) | f <sub>LOW</sub> (Hz) | f <sub>HIGH</sub> (Hz) | Status f <sub>LOW</sub> | Status f <sub>HIGH</sub> |
|-------------|-----------------------|------------------------|-------------------------|--------------------------|
| 0           | 708<br>(+1.5%)        | 1658<br>(+1.5%)        | False A                 | ok                       |
| -5          |                       |                        | False A                 | ok                       |
| -9.5        |                       |                        | False A                 | ok                       |
| -15.5       |                       |                        | False A                 | ok                       |
| -19.5       |                       |                        | False A                 | ok                       |
| -25.5       |                       |                        | False A                 | ok                       |
| -29         |                       |                        | False A                 | False A                  |
| -35         |                       |                        | False A                 | False A                  |
| 0           | 686<br>(-1.5%)        | 1608<br>(-1.5%)        | ok                      | ok                       |
| -5          |                       |                        | ok                      | ok                       |
| -9.5        |                       |                        | ok                      | ok                       |
| -15.5       |                       |                        | ok                      | ok                       |
| -19.5       |                       |                        | False A                 | ok                       |
| -25.5       |                       |                        | ok                      | ok                       |
| -29         |                       |                        | False A                 | False A                  |
| -35         |                       |                        | False A                 | False A                  |

# ST75C520 REVISION 1.4 DTMF DETECTION REPORT

## 9 - MEASUREMENT WITH REVISION 1.4 - FREQUENCY OFFSET 1.5%

### 9.1 - Frequency offset 1.5% , 6dB of twist - Default mode

| Level (dBm) | f <sub>LOW</sub> (Hz) | f <sub>HIGH</sub> (Hz) | Status f <sub>LOW</sub> | Status f <sub>HIGH</sub> |
|-------------|-----------------------|------------------------|-------------------------|--------------------------|
|-------------|-----------------------|------------------------|-------------------------|--------------------------|

DIGIT \*

| Level (dBm) | f <sub>LOW</sub> (Hz) | f <sub>HIGH</sub> (Hz) | Status f <sub>LOW</sub> | Status f <sub>HIGH</sub> |
|-------------|-----------------------|------------------------|-------------------------|--------------------------|
| 0           | 955<br>(+1.5%)        | 1227<br>(+1.5%)        | ok                      | ok                       |
| -5          |                       |                        | ok                      | ok                       |
| -9.5        |                       |                        | ok                      | ok                       |
| -15.5       |                       |                        | False *                 | ok                       |
| -19.5       |                       |                        | ok                      | ok                       |
| -25.5       |                       |                        | ok                      | ok                       |
| -29         |                       |                        | ok                      | ok                       |
| -35         |                       |                        | ok                      | ok                       |
| 0           | 927<br>(-1.5%)        | 1191<br>(-1.5%)        | ok                      | ok                       |
| -5          |                       |                        | ok                      | ok                       |
| -9.5        |                       |                        | ok                      | ok                       |
| -15.5       |                       |                        | ok                      | False *                  |
| -19.5       |                       |                        | ok                      | ok                       |
| -25.5       |                       |                        | ok                      | ok                       |
| -29         |                       |                        | ok                      | ok                       |
| -35         |                       |                        | ok                      | ok                       |

DIGIT 8

| Level (dBm) | f <sub>LOW</sub> (Hz) | f <sub>HIGH</sub> (Hz) | Status f <sub>LOW</sub> | Status f <sub>HIGH</sub> |
|-------------|-----------------------|------------------------|-------------------------|--------------------------|
| 0           | 865<br>(+1.5%)        | 1356<br>(+1.5%)        | ok                      | ok                       |
| -5          |                       |                        | ok                      | ok                       |
| -9.5        |                       |                        | ok                      | ok                       |
| -15.5       |                       |                        | ok                      | ok                       |
| -19.5       |                       |                        | ok                      | ok                       |
| -25.5       |                       |                        | ok                      | ok                       |
| -29         |                       |                        | ok                      | ok                       |
| -35         |                       |                        | ok                      | ok                       |
| 0           | 839<br>(-1.5%)        | 1316<br>(-1.5%)        | ok                      | ok                       |
| -5          |                       |                        | ok                      | ok                       |
| -9.5        |                       |                        | ok                      | ok                       |
| -15.5       |                       |                        | ok                      | ok                       |
| -19.5       |                       |                        | ok                      | ok                       |
| -25.5       |                       |                        | ok                      | ok                       |
| -29         |                       |                        | ok                      | ok                       |
| -35         |                       |                        | ok                      | ok                       |

| Level (dBm) | f <sub>LOW</sub> (Hz) | f <sub>HIGH</sub> (Hz) | Status f <sub>LOW</sub> | Status f <sub>HIGH</sub> |
|-------------|-----------------------|------------------------|-------------------------|--------------------------|
|-------------|-----------------------|------------------------|-------------------------|--------------------------|

DIGIT 6

| Level (dBm) | f <sub>LOW</sub> (Hz) | f <sub>HIGH</sub> (Hz) | Status f <sub>LOW</sub> | Status f <sub>HIGH</sub> |
|-------------|-----------------------|------------------------|-------------------------|--------------------------|
| 0           | 782<br>(+1.5%)        | 1499<br>(+1.5%)        | ok                      | ok                       |
| -5          |                       |                        | ok                      | ok                       |
| -9.5        |                       |                        | ok                      | ok                       |
| -15.5       |                       |                        | ok                      | ok                       |
| -19.5       |                       |                        | ok                      | ok                       |
| -25.5       |                       |                        | ok                      | ok                       |
| -29         |                       |                        | ok                      | ok                       |
| -35         |                       |                        | ok                      | ok                       |
| 0           | 758<br>(-1.5%)        | 1455<br>(-1.5%)        | ok                      | ok                       |
| -5          |                       |                        | ok                      | ok                       |
| -9.5        |                       |                        | ok                      | ok                       |
| -15.5       |                       |                        | ok                      | ok                       |
| -19.5       |                       |                        | ok                      | ok                       |
| -25.5       |                       |                        | ok                      | ok                       |
| -29         |                       |                        | ok                      | ok                       |
| -35         |                       |                        | ok                      | ok                       |

DIGIT A

| Level (dBm) | f <sub>LOW</sub> (Hz) | f <sub>HIGH</sub> (Hz) | Status f <sub>LOW</sub> | Status f <sub>HIGH</sub> |
|-------------|-----------------------|------------------------|-------------------------|--------------------------|
| 0           | 708<br>(+1.5%)        | 1658<br>(+1.5%)        | ok                      | ok                       |
| -5          |                       |                        | ok                      | ok                       |
| -9.5        |                       |                        | ok                      | ok                       |
| -15.5       |                       |                        | ok                      | ok                       |
| -19.5       |                       |                        | ok                      | ok                       |
| -25.5       |                       |                        | ok                      | ok                       |
| -29         |                       |                        | ok                      | ok                       |
| -35         |                       |                        | ok                      | ok                       |
| 0           | 686<br>(-1.5%)        | 1608<br>(-1.5%)        | ok                      | ok                       |
| -5          |                       |                        | ok                      | ok                       |
| -9.5        |                       |                        | ok                      | ok                       |
| -15.5       |                       |                        | ok                      | ok                       |
| -19.5       |                       |                        | ok                      | ok                       |
| -25.5       |                       |                        | ok                      | ok                       |
| -29         |                       |                        | ok                      | ok                       |
| -35         |                       |                        | ok                      | ok                       |



**ST75C520 REVISION 1.4 DTMF DETECTION REPORT**

**9 - MEASUREMENT WITH REVISION 1.4 - FREQUENCY OFFSET 1.5% (continued)**

**9.2 - Frequency offset 1.5% , 6dB of twist - ANALOG GAIN Frozen**

| Level (dBm) | f <sub>LOW</sub> (Hz) | f <sub>HIGH</sub> (Hz) | Status f <sub>LOW</sub> | Status f <sub>HIGH</sub> |
|-------------|-----------------------|------------------------|-------------------------|--------------------------|
|-------------|-----------------------|------------------------|-------------------------|--------------------------|

DIGIT \*

|       |                |                 |    |    |
|-------|----------------|-----------------|----|----|
| 0     | 955<br>(+1.5%) | 1227<br>(+1.5%) | ok | ok |
| -5    |                |                 | ok | ok |
| -9.5  |                |                 | ok | ok |
| -15.5 |                |                 | ok | ok |
| -19.5 |                |                 | ok | ok |
| -25.5 |                |                 | ok | ok |
| -29   |                |                 | ok | ok |
| -35   |                |                 | ok | ok |
| 0     | 927<br>(-1.5%) | 1191<br>(-1.5%) | ok | ok |
| -5    |                |                 | ok | ok |
| -9.5  |                |                 | ok | ok |
| -15.5 |                |                 | ok | ok |
| -19.5 |                |                 | ok | ok |
| -25.5 |                |                 | ok | ok |
| -29   |                |                 | ok | ok |
| -35   |                |                 | ok | ok |

DIGIT 8

|       |                |                 |    |    |
|-------|----------------|-----------------|----|----|
| 0     | 865<br>(+1.5%) | 1356<br>(+1.5%) | ok | ok |
| -5    |                |                 | ok | ok |
| -9.5  |                |                 | ok | ok |
| -15.5 |                |                 | ok | ok |
| -19.5 |                |                 | ok | ok |
| -25.5 |                |                 | ok | ok |
| -29   |                |                 | ok | ok |
| -35   |                |                 | ok | ok |
| 0     | 839<br>(-1.5%) | 1316<br>(-1.5%) | ok | ok |
| -5    |                |                 | ok | ok |
| -9.5  |                |                 | ok | ok |
| -15.5 |                |                 | ok | ok |
| -19.5 |                |                 | ok | ok |
| -25.5 |                |                 | ok | ok |
| -29   |                |                 | ok | ok |
| -35   |                |                 | ok | ok |

| Level (dBm) | f <sub>LOW</sub> (Hz) | f <sub>HIGH</sub> (Hz) | Status f <sub>LOW</sub> | Status f <sub>HIGH</sub> |
|-------------|-----------------------|------------------------|-------------------------|--------------------------|
|-------------|-----------------------|------------------------|-------------------------|--------------------------|

DIGIT 6

|       |                |                 |    |    |
|-------|----------------|-----------------|----|----|
| 0     | 782<br>(+1.5%) | 1499<br>(+1.5%) | ok | ok |
| -5    |                |                 | ok | ok |
| -9.5  |                |                 | ok | ok |
| -15.5 |                |                 | ok | ok |
| -19.5 |                |                 | ok | ok |
| -25.5 |                |                 | ok | ok |
| -29   |                |                 | ok | ok |
| -35   |                |                 | ok | ok |
| 0     | 758<br>(-1.5%) | 1455<br>(-1.5%) | ok | ok |
| -5    |                |                 | ok | ok |
| -9.5  |                |                 | ok | ok |
| -15.5 |                |                 | ok | ok |
| -19.5 |                |                 | ok | ok |
| -25.5 |                |                 | ok | ok |
| -29   |                |                 | ok | ok |
| -35   |                |                 | ok | ok |

DIGIT A

|       |                |                 |    |    |
|-------|----------------|-----------------|----|----|
| 0     | 708<br>(+1.5%) | 1658<br>(+1.5%) | ok | ok |
| -5    |                |                 | ok | ok |
| -9.5  |                |                 | ok | ok |
| -15.5 |                |                 | ok | ok |
| -19.5 |                |                 | ok | ok |
| -25.5 |                |                 | ok | ok |
| -29   |                |                 | ok | ok |
| -35   |                |                 | ok | ok |
| 0     | 686<br>(-1.5%) | 1608<br>(-1.5%) | ok | ok |
| -5    |                |                 | ok | ok |
| -9.5  |                |                 | ok | ok |
| -15.5 |                |                 | ok | ok |
| -19.5 |                |                 | ok | ok |
| -25.5 |                |                 | ok | ok |
| -29   |                |                 | ok | ok |
| -35   |                |                 | ok | ok |

# ST75C520 REVISION 1.4 DTMF DETECTION REPORT

## 9 - MEASUREMENT WITH REVISION 1.4 - FREQUENCY OFFSET 1.5% (continued)

### 9.3 - Frequency offset 1.5% , 6dB of twist - ANALOG GAIN time constant low

| Level (dBm) | f <sub>LOW</sub> (Hz) | f <sub>HIGH</sub> (Hz) | Status f <sub>LOW</sub> | Status f <sub>HIGH</sub> |
|-------------|-----------------------|------------------------|-------------------------|--------------------------|
|-------------|-----------------------|------------------------|-------------------------|--------------------------|

DIGIT \*

|       |                |                 |    |    |
|-------|----------------|-----------------|----|----|
| 0     | 955<br>(+1.5%) | 1227<br>(+1.5%) | ok | ok |
| -5    |                |                 | ok | ok |
| -9.5  |                |                 | ok | ok |
| -15.5 |                |                 | ok | ok |
| -19.5 |                |                 | ok | ok |
| -25.5 |                |                 | ok | ok |
| -29   |                |                 | ok | ok |
| -35   |                |                 | ok | ok |
| 0     | 927<br>(-1.5%) | 1191<br>(-1.5%) | ok | ok |
| -5    |                |                 | ok | ok |
| -9.5  |                |                 | ok | ok |
| -15.5 |                |                 | ok | ok |
| -19.5 |                |                 | ok | ok |
| -25.5 |                |                 | ok | ok |
| -29   |                |                 | ok | ok |
| -35   |                |                 | ok | ok |

DIGIT 8

|       |                |                 |    |    |
|-------|----------------|-----------------|----|----|
| 0     | 865<br>(+1.5%) | 1356<br>(+1.5%) | ok | ok |
| -5    |                |                 | ok | ok |
| -9.5  |                |                 | ok | ok |
| -15.5 |                |                 | ok | ok |
| -19.5 |                |                 | ok | ok |
| -25.5 |                |                 | ok | ok |
| -29   |                |                 | ok | ok |
| -35   |                |                 | ok | ok |
| 0     | 839<br>(-1.5%) | 1316<br>(-1.5%) | ok | ok |
| -5    |                |                 | ok | ok |
| -9.5  |                |                 | ok | ok |
| -15.5 |                |                 | ok | ok |
| -19.5 |                |                 | ok | ok |
| -25.5 |                |                 | ok | ok |
| -29   |                |                 | ok | ok |
| -35   |                |                 | ok | ok |

| Level (dBm) | f <sub>LOW</sub> (Hz) | f <sub>HIGH</sub> (Hz) | Status f <sub>LOW</sub> | Status f <sub>HIGH</sub> |
|-------------|-----------------------|------------------------|-------------------------|--------------------------|
|-------------|-----------------------|------------------------|-------------------------|--------------------------|

DIGIT 6

|       |                |                 |    |    |
|-------|----------------|-----------------|----|----|
| 0     | 782<br>(+1.5%) | 1499<br>(+1.5%) | ok | ok |
| -5    |                |                 | ok | ok |
| -9.5  |                |                 | ok | ok |
| -15.5 |                |                 | ok | ok |
| -19.5 |                |                 | ok | ok |
| -25.5 |                |                 | ok | ok |
| -29   |                |                 | ok | ok |
| -35   |                |                 | ok | ok |
| 0     | 758<br>(-1.5%) | 1455<br>(-1.5%) | ok | ok |
| -5    |                |                 | ok | ok |
| -9.5  |                |                 | ok | ok |
| -15.5 |                |                 | ok | ok |
| -19.5 |                |                 | ok | ok |
| -25.5 |                |                 | ok | ok |
| -29   |                |                 | ok | ok |
| -35   |                |                 | ok | ok |

DIGIT A

|       |                |                 |    |    |
|-------|----------------|-----------------|----|----|
| 0     | 708<br>(+1.5%) | 1658<br>(+1.5%) | ok | ok |
| -5    |                |                 | ok | ok |
| -9.5  |                |                 | ok | ok |
| -15.5 |                |                 | ok | ok |
| -19.5 |                |                 | ok | ok |
| -25.5 |                |                 | ok | ok |
| -29   |                |                 | ok | ok |
| -35   |                |                 | ok | ok |
| 0     | 686<br>(-1.5%) | 1608<br>(-1.5%) | ok | ok |
| -5    |                |                 | ok | ok |
| -9.5  |                |                 | ok | ok |
| -15.5 |                |                 | ok | ok |
| -19.5 |                |                 | ok | ok |
| -25.5 |                |                 | ok | ok |
| -29   |                |                 | ok | ok |
| -35   |                |                 | ok | ok |

### 10 - CONCLUSION

It is clear in this document that the Revision 1.4 is more efficient in DTMF detection field than Revision 1.3. In addition, SGS-THOMSON proposes some Memory Writes (see paragraph 3.1 page 2) in order to further improve Revision 1.4 behaviour toward frequency offset. Anyway, perhaps the customer will find that Revision 1.3 is

not good enough with 1.5% of frequency offset. But SGS-THOMSON points out that Revision 1.3 should work with less drastic specifications (1% only for example). To conclude, we hope that Revision 1.3 will meet your basic specifications and Revision 1.4 will content all your requirements in DTMF detection

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