SGS-THOMSON MICROELECTRONICS

APPLICATION NOTE

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

CONTENTS **Page**

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.

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 : ± 6dB.
- Frequency Offset : ± 1.5%
- DTMF Application :

t_{ON} (ms)	t_{OFF} (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 ± 6dB of twist, the componant must detect DTMF digits with -1dBm of magnitude (because one -1dBm and one -7dBm sine componant 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 ± 6dB of twist, the componant must detect DTMF digits with -42dBm of magnitude (because one -42dBm and one -36dBm sine componant give a -35dBm signal on the line). That condition is met with Revision 1.4 and is limited to two -38dBm sine amplitude in Revisqion 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 programmation 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   comparaison threshold between 1209 and 1336Hz
MW F4 17 00 14   comparaison threshold between 1336 and 1477Hz
MW F5 17 00 14   comparaison 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_{ON}/t_{OFF} 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 ± 6dB of twist. Each digit is described with two frequencies: f_{LOW} and f_{HIGH}. 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_{LOW} use a 1.5% offset for f_{LOW} and a nominal value for f_{HIGH}.

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

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

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

8 - MEASUREMENT WITH REVISION 1.3 - FREQUENCY OFFSET 1.5%

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

DIGIT *

Level (dBm)	f_{LOW} (Hz)	f_{HIGH} (Hz)	Status f_{LOW}	Status f_{HIGH}
0	955 (+1.5%)	1227 (+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 (-1.5%)	1191 (-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 6

Level (dBm)	f_{LOW} (Hz)	f_{HIGH} (Hz)	Status f_{LOW}	Status f_{HIGH}
0	782 (+1.5%)	1499 (+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 (-1.5%)	1455 (-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 8

Level (dBm)	f_{LOW} (Hz)	f_{HIGH} (Hz)	Status f_{LOW}	Status f_{HIGH}
0	865 (+1.5%)	1356 (+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 (-1.5%)	1316 (-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

DIGIT A

Level (dBm)	f_{LOW} (Hz)	f_{HIGH} (Hz)	Status f_{LOW}	Status f_{HIGH}
0	708 (+1.5%)	1658 (+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 (-1.5%)	1608 (-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

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

DIGIT *

Level (dBm)	f_{LOW} (Hz)	f_{HIGH} (Hz)	Status f_{LOW}	Status f_{HIGH}
0	955 (+1.5%)	1227 (+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 (-1.5%)	1191 (-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 6

Level (dBm)	f_{LOW} (Hz)	f_{HIGH} (Hz)	Status f_{LOW}	Status f_{HIGH}
0	782 (+1.5%)	1499 (+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 (-1.5%)	1455 (-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 8

Level (dBm)	f_{LOW} (Hz)	f_{HIGH} (Hz)	Status f_{LOW}	Status f_{HIGH}
0	865 (+1.5%)	1356 (+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 (-1.5%)	1316 (-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

DIGIT A

Level (dBm)	f_{LOW} (Hz)	f_{HIGH} (Hz)	Status f_{LOW}	Status f_{HIGH}
0	708 (+1.5%)	1658 (+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 (-1.5%)	1608 (-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

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

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

DIGIT *

Level (dBm)	f_{LOW} (Hz)	f_{HIGH} (Hz)	Status f_{LOW}	Status f_{HIGH}
0	955 (+1.5%)	1227 (+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 (-1.5%)	1191 (-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 6

Level (dBm)	f_{LOW} (Hz)	f_{HIGH} (Hz)	Status f_{LOW}	Status f_{HIGH}
0	782 (+1.5%)	1499 (+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 (-1.5%)	1455 (-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 8

Level (dBm)	f_{LOW} (Hz)	f_{HIGH} (Hz)	Status f_{LOW}	Status f_{HIGH}
0	865 (+1.5%)	1356 (+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 (-1.5%)	1316 (-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

DIGIT A

Level (dBm)	f_{LOW} (Hz)	f_{HIGH} (Hz)	Status f_{LOW}	Status f_{HIGH}
0	708 (+1.5%)	1658 (+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 (-1.5%)	1608 (-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

9 - MEASUREMENT WITH REVISION 1.4 - FREQUENCY OFFSET 1.5%

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

DIGIT *

Level (dBm)	f_{LOW} (Hz)	f_{HIGH} (Hz)	Status f_{LOW}	Status f_{HIGH}
0	955 (+1.5%)	1227 (+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 (-1.5%)	1191 (-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 6

Level (dBm)	f_{LOW} (Hz)	f_{HIGH} (Hz)	Status f_{LOW}	Status f_{HIGH}
0	782 (+1.5%)	1499 (+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 (-1.5%)	1455 (-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

Level (dBm)	f_{LOW} (Hz)	f_{HIGH} (Hz)	Status f_{LOW}	Status f_{HIGH}
0	865 (+1.5%)	1356 (+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 (-1.5%)	1316 (-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_{LOW} (Hz)	f_{HIGH} (Hz)	Status f_{LOW}	Status f_{HIGH}
0	708 (+1.5%)	1658 (+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 (-1.5%)	1608 (-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

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

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

DIGIT *

Level (dBm)	f_{LOW} (Hz)	f_{HIGH} (Hz)	Status f_{LOW}	Status f_{HIGH}
0	955 (+1.5%)	1227 (+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 (-1.5%)	1191 (-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 6

Level (dBm)	f_{LOW} (Hz)	f_{HIGH} (Hz)	Status f_{LOW}	Status f_{HIGH}
0	782 (+1.5%)	1499 (+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 (-1.5%)	1455 (-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

Level (dBm)	f_{LOW} (Hz)	f_{HIGH} (Hz)	Status f_{LOW}	Status f_{HIGH}
0	865 (+1.5%)	1356 (+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 (-1.5%)	1316 (-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_{LOW} (Hz)	f_{HIGH} (Hz)	Status f_{LOW}	Status f_{HIGH}
0	708 (+1.5%)	1658 (+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 (-1.5%)	1608 (-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

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

DIGIT *

Level (dBm)	f_{LOW} (Hz)	f_{HIGH} (Hz)	Status f_{LOW}	Status f_{HIGH}
0	955 (+1.5%)	1227 (+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 (-1.5%)	1191 (-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 6

Level (dBm)	f_{LOW} (Hz)	f_{HIGH} (Hz)	Status f_{LOW}	Status f_{HIGH}
0	782 (+1.5%)	1499 (+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 (-1.5%)	1455 (-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

Level (dBm)	f_{LOW} (Hz)	f_{HIGH} (Hz)	Status f_{LOW}	Status f_{HIGH}
0	865 (+1.5%)	1356 (+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 (-1.5%)	1316 (-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_{LOW} (Hz)	f_{HIGH} (Hz)	Status f_{LOW}	Status f_{HIGH}
0	708 (+1.5%)	1658 (+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 (-1.5%)	1608 (-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, perharps 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