SGS-THOMSON MICROELECTRONICS

APPLICATION NOTE

ST75C502 - DEFAULT TONE DETECTORS

1 - INTRODUCTION

The purpose of this application note is to describe the default setup for the tone detection, and the way they are managed during the Automode Handshake.

Refer to ST75C502 for explanation of the Tone detectors.

The 16 cells of the tone detectors are used, by the ST75C502, for various functions. The internal variable **_NTDCELL** define the number of tone detectors currently executed by the DSP.

This number is set to 16 after a RESET, and will be set to 0 as soon as the Autobaud phase is completed. The Autobaud Handshake is complete when we perfectly know the transmission standard.

While configuring for DTMF Detection, the upper 12 cells are overwritten to detect the 8 DTMF tones, plus 4 cells to split the band for differentiate Low group and High group of tones.

Refer to the Appendix for the default wiring of the tone detector.

2 - CELL DESCRIPTION

The First cell (#0) is programmed as a 440Hz tone detector (Call Waiting Detection) and is never changed whatever the DSP is doing. After a RESET (or ***init*** command) or any ***conf*** command, its parameters are set to detect the 440Hz single tone.

The template of this Tschebyscheff filter is :

Name	Cell Number	Type	Pass Band (Hz)	Stop Band (Hz)	Ripple (dB)	Reject (dB)
CALLWAIT	0	Band Pass	430, 450	340, 540	0.1	25

The second and third cell (#1 and #2) are used for Call progress detection. It is a Low pass filter with a cutoff frequency of 650 Hz. this filter like the previous one is never changed.

The template of this Tschebyscheff filter is :

Name	Cell Number	Type	Pass Band (Hz)	Stop Band (Hz)	Ripple (dB)	Reject (dB)
CPLOW	1, 2	Low Pass	0, 650	1000	0.2	45

Due to the DAA implementation and to the ST7544 analog front end receive filter, the frequencies below 300Hz are attenuated. Refer to Measurement Report for the detection area.

The cell mumber 3 and 4 are used for Call progress tone detection. It is a High pass filter with a cutoff frequency of 600Hz.

The template of this Tschebyscheff filter is :

Name	Cell Number	Type	Pass Band (Hz)	Stop Band (Hz)	Ripple (dB)	Reject (dB)
CPHIGH	3,4	High Pass	600, 3600	400	0.2	45

Frequencies above 3200Hz are attenuated due to the DAA and the ST7544 Receive filter.

While using the DTMF Mode (with a ***conf*** command) the cell 4 to 15 are overwritten with the DTMF detector parameters.

Starting from cell 5 the following 11 Cells are used for Autobaud Handshake. The default autobaud mode corresponds to the V.32bis Originate mode. While selecting the Answer mode (with a ***conf*** command) some cells are overwritten.

Cell number 5 and 6 are used to remove from the received signal what we are transmitting. This give a better immunity to noise than regular comparators. The corresponding filters are notch filters to remove the 2100Hz Answer tone in answer mode and the 1800Hz AA V.32bis tone in the originate mode.

The templates of these Butterworth filters are :

Mode	Name	Cell Number	Type	Pass Band (Hz)	Stop Band (Hz)	Ripple (dB)	Reject (dB)
Orig	AZ1800	5,6	Notch	1650, 1950	1780, 1820	3	30
Answer	OZ2100	5,6	Notch	1950, 2250	2080, 2120	3	30

Cell number 7 and 8 are used to detect the V.32bis AC tone. This signal is composed of a 600Hz and 3000Hz tones. Due to the possible amplitude distortion introduced by the telephone line only the 600Hz is used for AC detector. In Answer mode these cells are not used.

The template of this Tchebyscheff filter is :

Name	Cell Number	Type	Pass Band (Hz)	Stop Band (Hz)	Ripple (dB)	Reject (dB)
AN600	7, 8	Band Pass	580, 620	500, 700	0.3	45

Cell number 9 is used to detect the V.23 1300Hz Mark tone in Originate mode and the V.23 390Hz in Answer Mode.

The template of these Eliptic filters are :

Mode	Name	Cell Number	Type	Pass Band (Hz)	Stop Band (Hz)	Ripple (dB)	Reject (dB)
Orig	AN1300	9	Band Pass	1275, 1325	1000, 1600	0.5	45
Answ	ORG390	9	Band Pass	360, 420	200, 650	1	40

Cell number 10 and 11 are used to detect the V.21 1650Hz Mark tone in originate Mode and V.21 980Hz Mark tone in Answer Mode.

The template of these Tchebyscheff filters are :

Mode	Name	Cell Number	Type	Pass Band (Hz)	Stop Band (Hz)	Ripple (dB)	Reject (dB)
Orig	AN1650	10,11	Band Pass	1625, 1675	1500, 1800	0.1	45
Answ	ORG980	10,11	Band Pass	968, 992	900, 1060	0.05	45

Cell number 12 and 13 are used to detect CCITT 2100Hz Answer tone while in Originate mode and the V.32bis AA signal (1800Hz) while in Answer mode.

The template of these Tchebyscheff filters are :

Mode	Name	Cell Number	Type	Pass Band (Hz)	Stop Band (Hz)	Ripple (dB)	Reject (dB)
Orig	ANS2100	12,13	Band Pass	2080, 2120	2030, 2170	0.3	45
Answer	ORG1800	12,13	Band Pass	1780, 1820	1700, 1900	0.3	45

In Originate Mode the Cells number 14 and 15 are used to detect the Bell 212 and Bell 103 Answer 2225Hz Answer tone. This filter covers also the V.22 unscrambled "1" at the beginning of the answer mode handshake.

In Answer Mode these cells are used to detect the Bell 103 1270Hz.

The template of these Tchebyscheff filters are :

Mode	Name	Cell Number	Type	Pass Band (Hz)	Stop Band (Hz)	Ripple (dB)	Reject (dB)
Orig	ANS2225	14,15	Band Pass	2205, 2270	2140, 2360	0.5	45
Answ	ORG1270	14,15	Band Pass	1250, 1290	1150, 1390	0.1	45

3 - BIT DESCRIPTION

Refer to the Appendix for the default wiring of the cells

The 16 bits output of the tone detectors have the following meaning.

Word	Bit	Description	
0	0	440Hz higher than -36dBm	
0	1	wide band signal higher than -27dBm	
0	2	Low Pass signal (650Hz) higher than -36dBm	
0	3	High Pass signal (600Hz) higher than -36dBm	
0	4	Low Pass signal higher than High Pass signal	
		Originate	**Answer**
0	5	signal without 1800Hz higher than -45dBm	signal without 2100Hz higher than -45dBm
0	6	V.32bis AC signal higher than -45dBm	not used
0	7	AC signal higher than wide signal without 1800Hz	not used
1	0	V.23 1300Hz Mark signal higher than -45dBm	V.23 390Hz Mark signal higher than -41dBm
1	1	V.23 1300Hz signal higher than wide signal without 1800Hz	V.23 390Hz signal higher than wide signal without 2100Hz + 4dB
1	2	V.21 1650Hz Mark signal higher than -45dBm	V.21 980Hz Mark signal higher than -45dBm
1	3	V.21 1650Hz signal higher than wide signal without 1800Hz	V.21 980Hz signal higher than wide signal without 2100Hz
1	4	CCITT 2100Hz Answer tone higher than -45dBm	V.32bis AA signal (1800Hz) higher than -45dBm
1	5	CCITT signal higher than wide signal without 1800Hz	V.32bis AA signal higher than wide signal without 2100Hz
1	6	Bell 2225 or Unscrambled Mark higher than -45dBm	Bell 103 1270Hz Mark signal higher than -45dBm
1	7	Bell signal higher than wide signal without 1800Hz	Bell 103 1270Hz signal higher than wide signal without 2100Hz

4 - APPENDIX

Figure 1

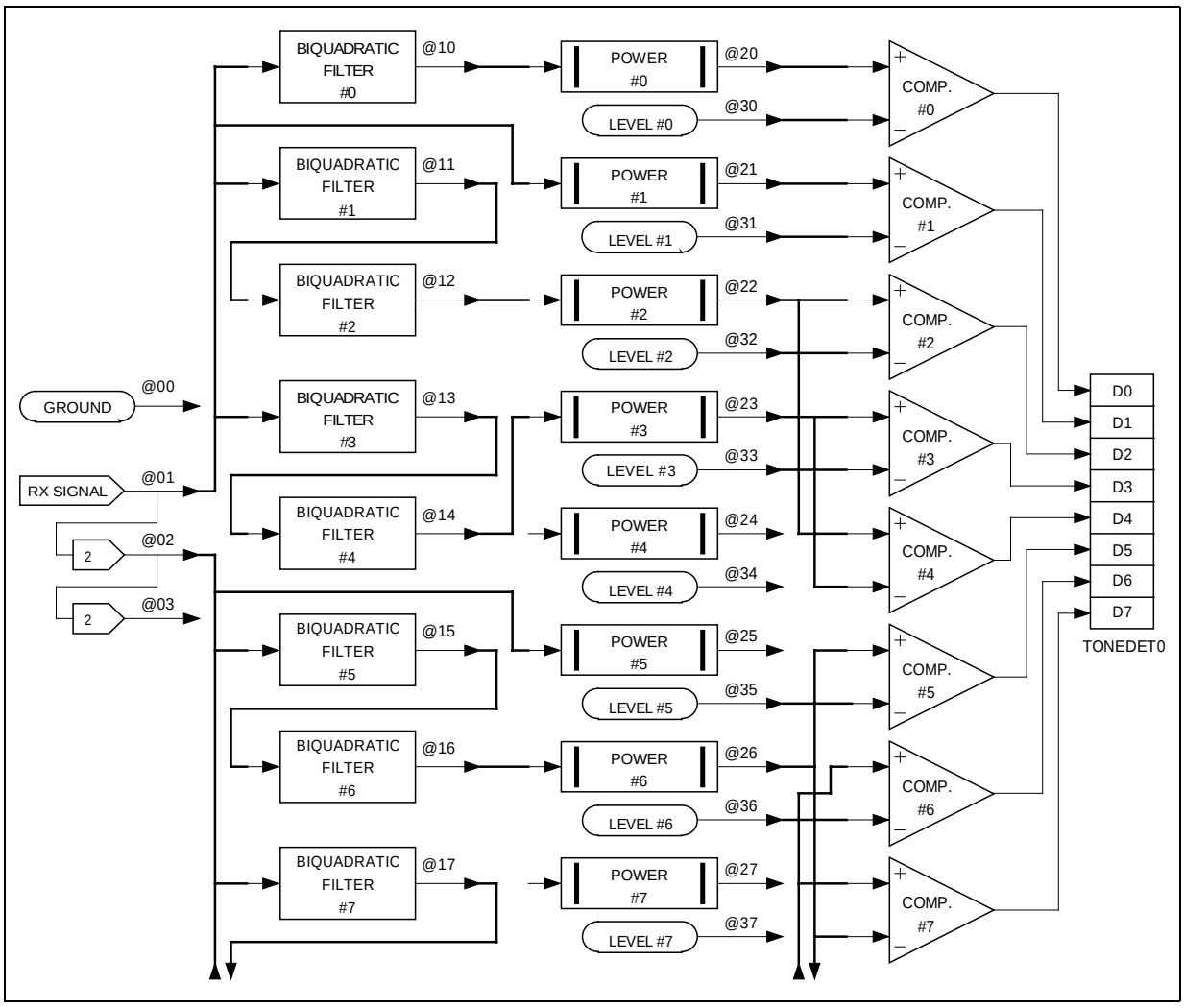

Figure 2