WM8750 Headphone Detect Switch-Over Delay

INTRODUCTION

WM8750 contains a headphone detect feature. This application note explains the purpose and characteristics of the output switch-over delay in the headphone detect.

HEADPHONE DETECT

The headphone detect can be used to automatically disable the speaker output and enable the headphone output, when a headphone plug is inserted into a headphone connector. The RINPUT3/HPDETECT pin can be used as HPDETECT. The threshold levels are 0.3 x AVDD (low) and 0.7 x AVDD (high). Figure 1 presents an example of headphone detection circuitry. Because of the internal connections of WM8750 a 33kΩ pull-up resistor is needed to ensure the correct operation of headphone detect circuitry. The 33kΩ pull-up resistor causes slightly higher current consumption than normally used 47kΩ.

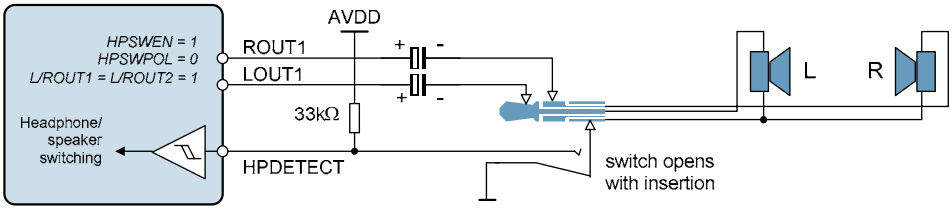

Figure 1 Headphone Detect with Ground Switch

The headphone detect is controlled with two WM8750 register bits: HPSWEN and HPSWPOL. HPSWEN enables the feature (HPDETECT in use) and HPSWPOL changes the HPDETECT polarity. Table 1 explains the headphone detect configuration.

HPSWEN	HPSWPOL	HPDETECT (PIN23)	L/ROUT1 (reg. 26)	L/ROUT2 (reg. 26)	Headphone enabled	Speaker enabled
0	X	X	0	0	no	no
0	X	X	0	1	no	yes
0	X	X	1	0	yes	no
0	X	X	1	1	yes	yes
1	0	0	X	0	no	no
1	0	0	X	1	no	yes
1	0	1	0	X	no	no
1	0	1	1	X	yes	no
1	1	0	0	X	no	no
1	1	0	1	X	yes	no
1	1	1	X	0	no	no
1	1	1	X	1	no	yes

Table 2 Headphone Detect Configuration

SWITCH-OVER DELAY

When a headphone plug is inserted into the headphone connector as shown in Figure 1, the HPDETECT voltage is unstable for some time. The instability, or bounce, is caused by the spring contacts of the headphone connector and variability of insertion time. If the CODEC changed the output every time HPDETECT met the threshold levels, the output would be changed several times during one insertion. This is unacceptable.

To prevent the bounce effect hysteresis is needed. This is achieved by adding a delay before switching output. The switch-over delay (SD) is implemented with a digital counter. The counter starts, when HPDETECT initially meets the threshold limit and stops after a defined time. Figure 2 shows the HPDETECT voltage bounce and the switch-over delay after headphone insertion.

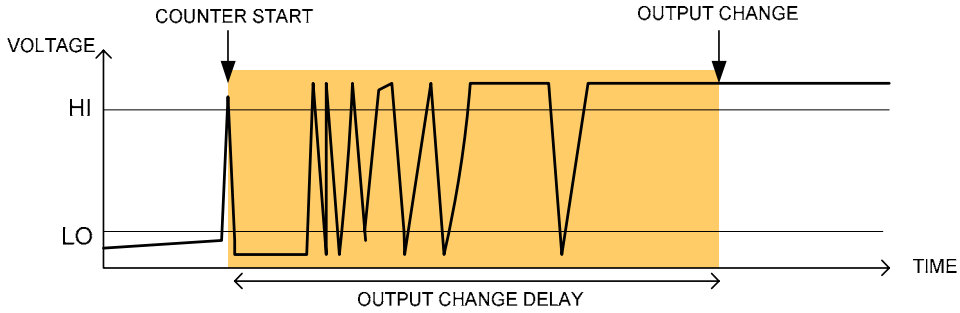

Figure 2 HPDETECT Voltage Bounce and Switch-over Delay after Headphone Insertion

The switch-over delay counter is clocked by MCLK. The switch-over delay therefore depends on MCLK frequency. Note: If MCLK input is not provided WM8750 headphone detect cannot be used.

The switch-over delay can be calculated with the following formulas:

Minimum Switch-over Delay (s): $SD_{MIN} = 2 \times (2^{21} \div f_{MCLK})$

Maximum Switch-over Delay (s): $SD_{MAX} = 3 \times (2^{21} \div f_{MCLK})$

The switch-over delays with commonly used MCLK frequencies are listed in Table 2.

MCLK	SD_{MIN}	SD_{MAX}
2.048MHz	2.05s	3.07s
4.096MHz	1.02s	1.54s
8.192MHz	0.51s	0.77s
11.2896MHz	0.37s	0.56s
12.288MHz	0.34s	0.51s

Table 2 Switch-over Delays with Different MCLK Frequencies

CONCLUSION

The switch-over delay ensures correct operation of the headphone detect circuit and it is always enabled when the headphone detection is used. The length of switch-over delay depends on the MCLK frequency.

APPLICATION SUPPORT

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