ALSA Driver for MX31

Freescale Semiconductor

Linux BSP

1 Hardware Operation

The MC13783 chip contains a stereo DAC and voice CODEC which can be operated simultaneously. Voice recording at sample rates of 8000 kHz and 16000 kHz are supported. The stereo DAC supports playback rates of 8000, 11025, 16000, 22050, 24000, 32000, 44100 in both mono and stereo. Detailed hardware operation of the MC13783 stereo DAC and the voice CODEC is contained in the hardware documentation.

2 Software Operation

The MX31 MC13783 sound driver sits beneath the ALSA (Advanced Linux Sound Architecture) layer of the Linux kernel (see the figure below). The driver handles the details of the MC13783 audio hardware, while the ALSA layer understands and executes the ALSA and OSS sound interfaces. Although the Linux kernel supports the ALSA interface natively, it also provides an OSS-compatibility interface for backwards compatibility with older programs. For ALSA, the MC13783 sound hardware is exposed to the application in user space by the /dev/snd/* device nodes as well as the /proc/asound/* pseudo-files to provide sound hardware enumeration and capabilities information. The OSS-compatibility mode is accessible using the /dev/sound/* device nodes.

3 Source Code Structure Configuration

Table 3.1 lists the source files found in the following directory:

`linux/sound/arm/`

Table 3.1. MC13783 ALSA Driver File List

File	***Description***
mxc-alsa-mc13783.h	MC13783 sound driver header file
mxc-alsa-mc13783.c	MC13783 sound driver source code
mxc-alsa-mixer.h	MC13783 mixer header file
mxc-alsa-mixer.c	MC13783 mixer source code

4 Linux Menu Configuration Options

Enable these kernel configuration options as either built-in to the kernel (Y) which is the preferred method, or as modules (M).

These options are all under "Device Drivers ---> Sound":

```
Enable “Sound card support”

Under “Advanced Linux Sound Architecture”:
      Enable “Advanced Linux Sound Architecture”
      Enable “OSS Mixer API” if you require OSS emulation
      Enable “OSS PCM (digital audio) API” if you need OSS emulation

Under “ALSA ARM devices”:
      Enable “MXC sound system”
      Disable “Open Sound System”
```

You may enable or disable other ALSA-related configuration options as needed.

You may wish to enable the following packages which provide sound support:

- alsa-lib (library and header files for user-space ALSA APIs)
- alsa-utils (ALSA play, record, and mixer utilities)
- libmad (MPEG audio decoder library)
- madplay (command-line MPEG audio decoder and player)

5 Board Configuration Options

With the power off, set the following switches on the MC13783 board:

Set SW7:1-6 to OFF, OFF, OFF, OFF, ON, ON
Set SW8:1-6 to ON, OFF, OFF, ON, OFF, OFF

Connect amplified speakers or headphones to J8 of the MC13783 board.

6 Programming Interface

The application interface to the sound driver is using the standard ALSA and OSS interfaces, using open, close, read, write, and ioctl function calls.

7 Usage Example

1. After building the kernel with the proper sound configurations and deploying, boot the target.

2. Copy a .wav file or an .mp3 file to your target’s root filesystem.

3. For a .wav file, run the command: `aplay file.wav`

4. For a .mp3 file, run the command: `madplay file.mp3`

Volume control

```
amixer -c 0 cset iface=MIXER,name='PCM Playback Volume',index=0 arg1
```

arg1 is the new volume value to be set and it ranges in value from 0(min) to 100(max)
-c 0 --> soundcard 0
cset --> command to set simple controls
iface --> The interface used (mixer interface in this case)
name --> name of a particular control (In this case its Playback volume of PCM)
index --> Index distinguishes multiple devices of same kind (2 codecs will have the same name but different indices)

Balance control

```
amixer -c 0 cset iface=MIXER,name='PCM Playback Balance',index=0 arg1,arg2
```

arg1 is the balance attenuation and it ranges from 0 (no atten) to 7 (-21 dB atten) in -3dB steps
arg2 is the channel for attenuation. Its either 0 (Left channel) or 1(Right channel)

Output Switch

```
amixer -c 0 cset iface=MIXER,name='Mixer Output Switch',index=0 arg1,arg2
```

arg1 is the identification of the output device and it ranges in value from 0 to 3
0 --> Earpiece
1 --> Hfree
2 --> Stereo Headset (Jack J8)
3 --> RxOUT (Jack J2)
arg2 is the flag that's either 0(disable o/p indicated by arg1) or 1(enable arg1)

You may use standard Linux utilities (like “cat”) to display the sound configuration and capabilities files contained in the /proc/asound/ subdirectory.