3.6.3 2x20 GPIO Expansion Headers

The board has two 40-pin expansion headers. Each header has 36 user pins connected directly to the Cyclone V SoC FPGA. It also comes with DC +5V (VCC5), DC +3.3V (VCC3P3), and two GND pins. The maximum power consumption allowed for a daughter card connected to one or two GPIO ports is shown in Table 3-10.

Table 3-10 Voltage and Max. Current Limit of Expansion Header(s)

Supplied Voltage	Max. Current Limit
5V	1A
3.3V	1.5A

Each pin on the expansion headers is connected to two diodes and a resistor for protection against high or low voltage level. Figure 3-18 shows the protection circuitry applied to all 2x36 data pins. Table 3-11 shows the pin assignment of two GPIO headers.
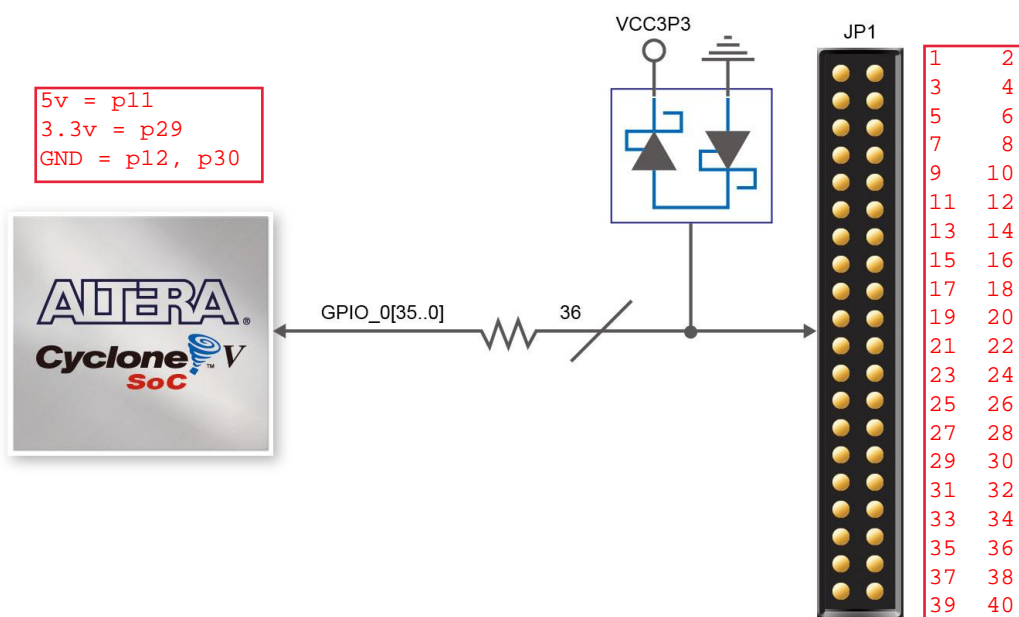

Figure 3-18 Connections between the GPIO header and Cyclone V SoC FPGA

Table 3-11 Pin Assignment of Expansion Headers

Signal Name	FPGA Pin No.	Description	I/O Standard	Hdr Pin
GPIO_0[0]	PIN_AC18	GPIO Connection 0[0]	3.3V	Pin 1
GPIO_0 [1]	PIN_Y17	GPIO Connection 0[1]	3.3V	Pin 2
GPIO_0 [2]	PIN_AD17	GPIO Connection 0[2]	3.3V	Pin 3
GPIO_0 [3]	PIN_Y18	GPIO Connection 0[3]	3.3V	Pin 4

GPIO_0 [4]	PIN_AK16	GPIO Connection 0[4]	3.3V	Pin 5
GPIO_0 [5]	PIN_AK18	GPIO Connection 0[5]	3.3V	Pin 6
GPIO_0 [6]	PIN_AK19	GPIO Connection 0[6]	3.3V	Pin 7
GPIO_0 [7]	PIN_AJ19	GPIO Connection 0[7]	3.3V	Pin 8
GPIO_0 [8]	PIN_AJ17	GPIO Connection 0[8]	3.3V	Pin 9
GPIO_0 [9]	PIN_AJ16	GPIO Connection 0[9]	3.3V	Pin 10
GPIO_0 [10]	PIN_AH18	GPIO Connection 0[10]	3.3V	Pin 13
GPIO_0 [11]	PIN_AH17	GPIO Connection 0[11]	3.3V	Pin 14
GPIO_0 [12]	PIN_AG16	GPIO Connection 0[12]	3.3V	Pin 15
GPIO_0 [13]	PIN_AE16	GPIO Connection 0[13]	3.3V	Pin 16
GPIO_0 [14]	PIN_AF16	GPIO Connection 0[14]	3.3V	Pin 17
GPIO_0 [15]	PIN_AG17	GPIO Connection 0[15]	3.3V	Pin 18
GPIO_0 [16]	PIN_AA18	GPIO Connection 0[16]	3.3V	Pin 19
GPIO_0 [17]	PIN_AA19	GPIO Connection 0[17]	3.3V	Pin 20
GPIO_0 [18]	PIN_AE17	GPIO Connection 0[18]	3.3V	Pin 21
GPIO_0 [19]	PIN_AC20	GPIO Connection 0[19]	3.3V	Pin 22
GPIO_0 [20]	PIN_AH19	GPIO Connection 0[20]	3.3V	Pin 23
GPIO_0 [21]	PIN_AJ20	GPIO Connection 0[21]	3.3V	Pin 24
GPIO_0 [22]	PIN_AH20	GPIO Connection 0[22]	3.3V	Pin 25
GPIO_0 [23]	PIN_AK21	GPIO Connection 0[23]	3.3V	Pin 26
GPIO_0 [24]	PIN_AD19	GPIO Connection 0[24]	3.3V	Pin 27
GPIO_0 [25]	PIN_AD20	GPIO Connection 0[25]	3.3V	Pin 28
GPIO_0 [26]	PIN_AE18	GPIO Connection 0[26]	3.3V	Pin 31
GPIO_0 [27]	PIN_AE19	GPIO Connection 0[27]	3.3V	Pin 32
GPIO_0 [28]	PIN_AF20	GPIO Connection 0[28]	3.3V	Pin 33
GPIO_0 [29]	PIN_AF21	GPIO Connection 0[29]	3.3V	Pin 34
GPIO_0 [30]	PIN_AF19	GPIO Connection 0[30]	3.3V	Pin 35
GPIO_0 [31]	PIN_AG21	GPIO Connection 0[31]	3.3V	Pin 36
GPIO_0 [32]	PIN_AF18	GPIO Connection 0[32]	3.3V	Pin 37
GPIO_0 [33]	PIN_AG20	GPIO Connection 0[33]	3.3V	Pin 38
GPIO_0 [34]	PIN_AG18	GPIO Connection 0[34]	3.3V	Pin 39
GPIO_0 [35]	PIN_AJ21	GPIO Connection 0[35]	3.3V	Pin 40
GPIO_1[0]	PIN_AB17	GPIO Connection 1[0]	3.3V	Pin 1
GPIO_1[1]	PIN_AA21	GPIO Connection 1[1]	3.3V	Pin 2
GPIO_1 [2]	PIN_AB21	GPIO Connection 1[2]	3.3V	Pin 3
GPIO_1 [3]	PIN_AC23	GPIO Connection 1[3]	3.3V	Pin 4
GPIO_1 [4]	PIN_AD24	GPIO Connection 1[4]	3.3V	Pin 5
GPIO_1 [5]	PIN_AE23	GPIO Connection 1[5]	3.3V	Pin 6
GPIO_1 [6]	PIN_AE24	GPIO Connection 1[6]	3.3V	Pin 7
GPIO_1 [7]	PIN_AF25	GPIO Connection 1[7]	3.3V	Pin 8
GPIO_1 [8]	PIN_AF26	GPIO Connection 1[8]	3.3V	Pin 9
GPIO_1 [9]	PIN_AG25	GPIO Connection 1[9]	3.3V	Pin 10
GPIO_1[10]	PIN_AG26	GPIO Connection 1[10]	3.3V	Pin 13
GPIO_1 [11]	PIN_AH24	GPIO Connection 1[11]	3.3V	Pin 14

GPIO_1 [12]	PIN_AH27	GPIO Connection 1[12]	3.3V	Pin 15
GPIO_1 [13]	PIN_AJ27	GPIO Connection 1[13]	3.3V	Pin 16
GPIO_1 [14]	PIN_AK29	GPIO Connection 1[14]	3.3V	Pin 17
GPIO_1 [15]	PIN_AK28	GPIO Connection 1[15]	3.3V	Pin 18
GPIO_1 [16]	PIN_AK27	GPIO Connection 1[16]	3.3V	Pin 19
GPIO_1 [17]	PIN_AJ26	GPIO Connection 1[17]	3.3V	Pin 20
GPIO_1 [18]	PIN_AK26	GPIO Connection 1[18]	3.3V	Pin 21
GPIO_1 [19]	PIN_AH25	GPIO Connection 1[19]	3.3V	Pin 22
GPIO_1 [20]	PIN_AJ25	GPIO Connection 1[20]	3.3V	Pin 23
GPIO_1 [21]	PIN_AJ24	GPIO Connection 1[21]	3.3V	Pin 24
GPIO_1 [22]	PIN_AK24	GPIO Connection 1[22]	3.3V	Pin 25
GPIO_1 [23]	PIN_AG23	GPIO Connection 1[23]	3.3V	Pin 26
GPIO_1 [24]	PIN_AK23	GPIO Connection 1[24]	3.3V	Pin 27
GPIO_1 [25]	PIN_AH23	GPIO Connection 1[25]	3.3V	Pin 28
GPIO_1 [26]	PIN_AK22	GPIO Connection 1[26]	3.3V	Pin 31
GPIO_1 [27]	PIN_AJ22	GPIO Connection 1[27]	3.3V	Pin 32
GPIO_1 [28]	PIN_AH22	GPIO Connection 1[28]	3.3V	Pin 33
GPIO_1 [29]	PIN_AG22	GPIO Connection 1[29]	3.3V	Pin 34
GPIO_1 [30]	PIN_AF24	GPIO Connection 1[30]	3.3V	Pin 35
GPIO_1 [31]	PIN_AF23	GPIO Connection 1[31]	3.3V	Pin 36
GPIO_1 [32]	PIN_AE22	GPIO Connection 1[32]	3.3V	Pin 37
GPIO_1 [33]	PIN_AD21	GPIO Connection 1[33]	3.3V	Pin 38
GPIO_1 [34]	PIN_AA20	GPIO Connection 1[34]	3.3V	Pin 39
GPIO_1 [35]	PIN_AC22	GPIO Connection 1[35]	3.3V	Pin 40

3.6.4 24-bit Audio CODEC

The DE1-SoC board offers high-quality 24-bit audio via the Wolfson WM8731 audio CODEC (Encoder/Decoder). This chip supports microphone-in, line-in, and line-out ports, with adjustable sample rate from 8 kHz to 96 kHz. The WM8731 is controlled via serial I2C bus, which is connected to HPS or Cyclone V SoC FPGA through an I2C multiplexer. The connection of the audio circuitry to the FPGA is shown in Figure 3-19, and the associated pin assignment to the FPGA is listed in Table 3-12. More information about the WM8731 codec is available in its datasheet, which can be found on the manufacturer's website, or in the directory \DE1_SOC_datasheets\Audio CODEC of DE1-SoC System CD.