WM8816-MICRO- EV1M

WM8816 Micro-Controller Board User Handbook

INTRODUCTION

The WM8816 Micro-Controller Board is a user-friendly interface for the WM8816 Stereo Volume Control Evaluation Platform.

By connecting the WM8816 Micro-Controller Board directly to the 10 pin header of the WM8816 evaluation board users can quickly and easily generate the digital signals required to demonstrate the volume, balance and peak level detection features of the WM8816 volume control chip.

The latest revision of the datasheet offers device functionality information as well as timing and data format requirements.

GETTING STARTED

PACKING LIST

The WM8816 Micro-Controller Board Kit contains:

- 1 WM8816_MICRO_EV1B Micro-Controller Board

- This manual -1 WM8816_MICRO_EV1M

- 10 Pin Ribbon Cable For Connection To The WM8816_EV1B Board

CUSTOMER REQUIREMENTS

Minimum customer requirements are:

- A 9 Volt D.C. Bench Top Power Supply.

- A WM8816_EV1B Board
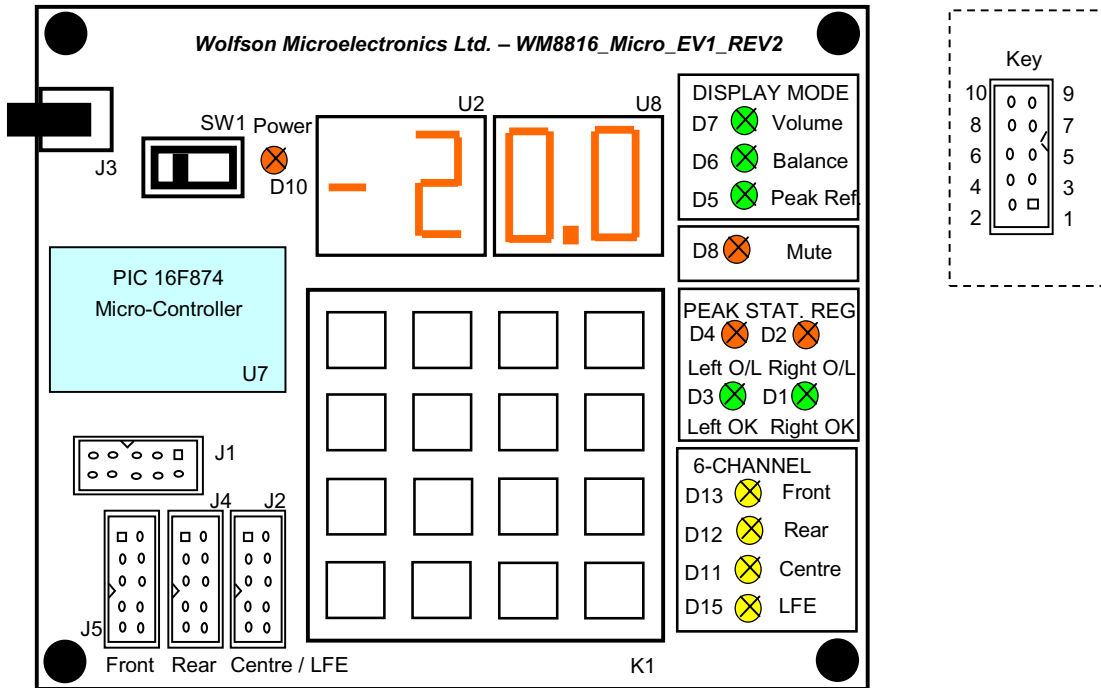
BLOCK DIAGRAM

Figure 1 WM8816 Micro-Controller Board Block Diagram

POWER SUPPLIES

A 9 Volt power supply, with a positive centre pin miniature power jack, should be connected to the power input connector (J3). This 9 Volt supply is regulated onboard to the 5 Volt supply required by the PIC Micro-Controller (U7).

For normal operation the power on/off switch (SW1) should be in the right hand (on) position, illuminating the "Power On" LED (D10).

BOARD FUNCTIONALITY

Header J5 of the WM8816 Micro-Controller Board should be connected directly to the 10-pin header of the WM8816 Evaluation Board using the ribbon cable provided.

The keypad (K1) allows for the input of Volume, Balance, and Peak Level information which is then sent, via the ribbon cable, to the Evaluation Board. A PIC Micro-Controller is used to convert user inputs, from the keypad, into the appropriate digital format (as described in the WM8816 data sheet).

Components U2 & U8 form a four-digit display, which is used to display the current Volume, Balance, and Peak Reference Register settings. LED's D5, D6 and D7 indicate which of the three display modes is being currently displayed.
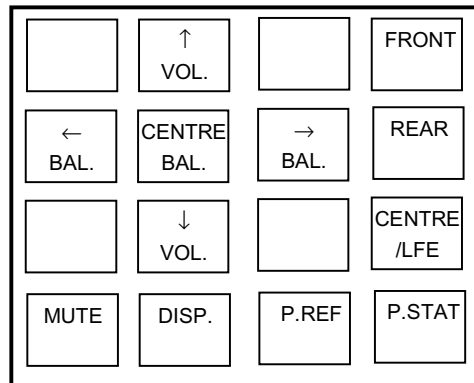
KEYPAD LAYOUT

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	↑ VOL.		FRONT
← BAL.	CENTRE BAL.	→ BAL.	REAR
	↓ VOL.		CENTRE /LFE
MUTE	DISP.	P.REF	P.STAT

Figure 2 Keypad Layout

The following sections describe the function of each of these keys.

SETTING THE VOLUME

The volume is set using the up and down arrow keys marked "Vol.". The up arrow increments the volume in 0.5dB steps whilst the down arrow decrements the volume in 0.5dB steps. The applied gain can be varied between +15.5dB and –111.5dB. Holding down the keys causes the output volume level to be changed faster.

When either of the "Vol." keys are pressed, LED (D7) is illuminated, and the output display (U2 & U8) is updated to show the latest volume, in dB.

ADJUSTING THE BALANCE SETTING

The left and right arrow keys, marked "Bal.", are used to adjust the relative loudness of each channel. Attenuating the opposite channel makes one channel (apparently) louder.

The left arrow shifts the balance towards the left channel in 0.5 dB steps. Similarly the right arrow key shifts the balance towards the right channel in 0.5dB steps. Pressing the "Centre Bal." key equalises the volume emitting from both channels.

When any of the balance keys is pressed LED (D6) is illuminated and the output display (U2 & U8) is updated to indicate the latest setting. Balance settings are displayed as a 3 digit number preceded by an 'L' or 'R'. The letter 'L' indicates that the left channel is the loudest channel, whilst the letter 'R' indicates that the right channel is the loudest channel. The following number indicates how many dB's the opposite channel has been attenuated to achieve the balance effect. For example a display of R45.5 indicates that the balance is currently set towards the right channel – and that to achieve this the left channel has been attenuated by 45.5dB.

Holding down either of the left / right balance keys causes the settings to change much faster. The maximum volume difference that can be set between channels, in the current board implementation, is 63.5 dB.

MUTE

Pressing the key marked MUTE causes the mute option to be toggled between on and off. LED (D8) is illuminated when the WM8816 is muted.

The WM8816 Micro-Controller Board initiates what the data sheet calls a "Software Mute" - since it is achieved by writing the code for –112dB to the digital serial interface of the WM8816 chip.

It is still possible to adjust the volume, balance and peak level detection settings whilst the device is muted. However it should be noted that these settings will only come into effect once the device is un-muted.

USING THE PEAK LEVEL DETECTOR

The WM8816 Datasheet describes the full functionality of the peak level detector.

Pressing the key marked "P.REF." cycles through, on the output display (U2 & U8), all the values which can be written to the Peak Reference Register (0,1,2….255). Once 255 is reached the display wraps back round to zero. These values are written instantaneously to the Peak Reference Register. When the output display (U2 & U8) is showing peak reference information the first letter of the output display will be a 'P' (i.e. P102) and the LED (D5) will be illuminated.

In order to read the information stored in the Peak Status Register the user should press the key marked "P.STAT". If the left channel output has exceeded the value held in the Peak Reference register then the LED (D4) will be illuminated. If the right channel output has exceeded the value held in the Peak Reference Register then the LED (D2) will be illuminated. If the left or right channel outputs have not exceeded the value held in the Peak Reference Register then the LED's (D3 & D1) are illuminated as appropriate.

Users should be aware that once the output level has exceeded the reference level that the Peak Status Register will remain set until read (i.e. when the "P.STAT" key is pressed).

Pressing any key, other than "P.STAT" switches off all the Peak Status output LED's (D1…D4).

TOGGLING THE DISPLAY MODE

Users can toggle between the Volume, Balance, and Peak Reference display modes by pressing the key marked "DISP.". This key cycles through the three output display options, without making any adjustments to the current settings.

The three LED's in the top right hand corner of the board (D5, D6, and D7) indicate the current display mode. This can also be deduced from the first letter of the four digit display (U2 & U8).

Volume displays are preceded by either a '-' sign or blank digit, depending on whether attenuation or gain is being applied. An 'L' or 'R' precedes Balance displays' depending on which channel is currently louder. Peak Reference displays are preceded by a 'P'.

SETTING UP A 6 CHANNEL VOLUME CONTROL

It is possible to use more than one WM8816_EV1B board to accommodate a multi-channel system. The same DATA, and CCLK signals can be used for many WM8816's with different CSB lines used to select which chip is currently active.

Figure 6 shows how three WM8816's can be used with a single Micro-Controller to create a 6 channel volume control.

The three WM8816_EV1B's should be set up and connected to a ±25V power supply as described in the "WM8816_EV1BM" user manual. For correct operation it is vital the links on each board are set up as described in table 1.

The WM8816_EV1B Evaluation Board that is being used to control the front stereo pair of speakers should have a 10 pin ribbon cable from its serial interface to header J5 on the Micro-controller board, marked "front".

Similarly the WM8816_EV1B Evaluation Board that is being used to control the Rear stereo pair of speakers should have a 10 pin ribbon cable from its serial interface to header J4 on the Micro-controller board marked "Rear".

Finally the WM8816_EV1B Evaluation Board that is controlling the Centre & LFE speakers should have ribbon connection from the serial interface to header J2 on the Micro-Controller board – marked "Centre / LFE". This third WM8816_EV1B is slightly different in that it uses its left channel to control the gain applied to the Centre speaker and its right channel to control the gain applied to the LFE.

Input to the three evaluation boards can come from any 6 channel analogue source; say a DVD player or the WM8770 Codec.
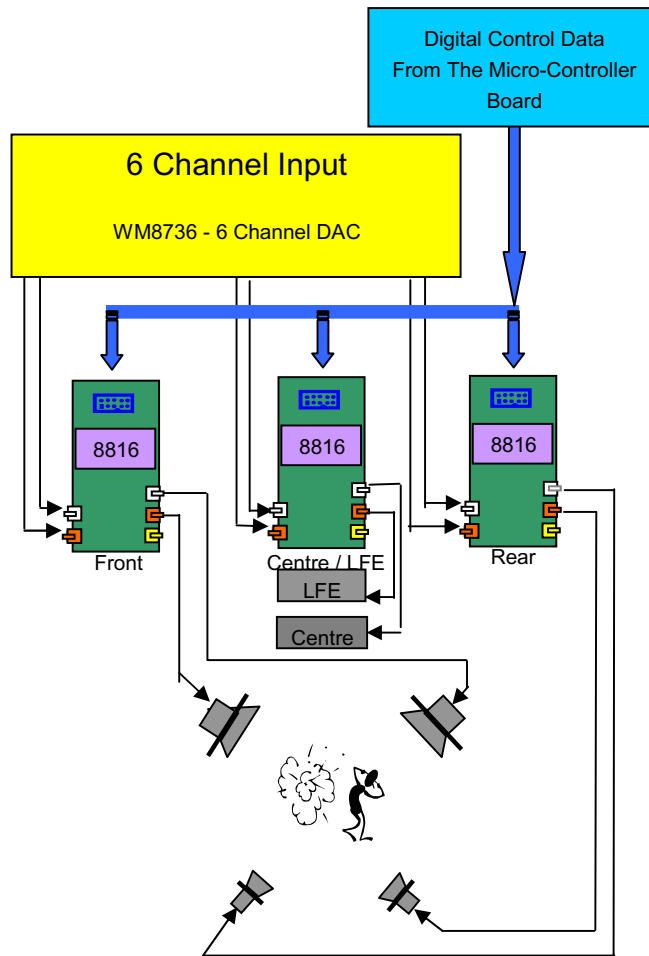
Figure 3 Using Three WM8816_EV1B Boards to Create a Six Channel Volume Control

WM8816_EV1B	LNK1	LNK2	LNK3
Front	Closed	Open	Open
Rear	Open	Closed	Open
Centre / LFE	Open	Open	Closed

Table 1 Link Positions For 6 Channel Operation

USING THE 6 CHANNEL VOLUME CONTROL

The keys marked "Front", "Rear" and "Centre / LFE" select which of the three WM8816_EV1B is currently active.

When the "Front" key is pressed then the WM8816_EV1B that is controlling the Front Stereo Pair of speakers is made active. Any user inputs to the keypad will be applied to this Evaluation Board only. This is indicated by LED D13 being illuminated.

If the "Rear" key is pressed then the second WM8816_EV1B, which controls the Rear Stereo Pair of speakers, is made active. Any user inputs to the keypad will now be applied to this Evaluation Board only. LED D12 will be illuminated

If the "Centre / LFE" key is pressed then the third WM8816_EV1B, which controls the centre and LFE speakers is made active. This third WM8816_EV1B differs from the others since the left channel controls the Centre speaker and the right channel controls the LFE speaker. It is not a stereo pair of speakers like the front and rear.

Pressing the "Centre / LFE" key once allows variable gain to be applied to the Centre speaker. When the centre speaker is under control of the Micro-Controller board then LED D11 is illuminated.

Pressing the "Centre / LFE" key once more allows the Micro-Controller board to vary the volume of the LFE speaker. When the LFE speaker is currently selected LED D15 will be illuminated.

Because the Centre and LFE are mono signals balance information can not be written to this third WM8816_EV1B Evaluation Board. If a user attempts to use any of the balance keys when Centre or LFE is selected then "------" is output to the four digit display (U2 & U8).

In 6 Channel Mode the peak reference keys operate as before – except for the fact that data is written to or read from the WM8816_EV1B which is currently active, as indicated by LEDS D13, D12, D11, D15.

Pressing the Mute key will mute all 6-output speakers. Pressing the key again will un-mute all the channels and restore them to their original state.

KEY FUNCTION SUMMARY

KEY	FUNCTION
↑ VOL.	Increments the output gain in 0.5 dB steps
↓ VOL.	Decrements the output gain in 0.5dB steps
← BAL.	Shifts the Balance towards the left channel in 0.5 dB steps.
→ BAL.	Shifts the Balance towards the right channel in 0.5 dB steps.
CENTRE BAL.	Makes the output gain from each channel equal.
MUTE	Mutes the output of the WM8816 Volume Control Chip. Pressing again un-mutes the device.
DISP.	Cycles through the three output display modes Volume, Balance and Peak Reference.
P.REF	Sets the Peak Reference Register
P.STAT	Reads the Peak Status Register. LED's D1,D2,D3, & D4 used to display the result
FRONT	Selects the Front speakers as those currently under control of the Micro-Controller board. (6 Channel Mode Only).
REAR	Selects the Rear speakers as those currently under control of the Micro-Controller board. (6 Channel Mode Only).
CENTRE / LFE	Selects the Centre & LFE speakers as those currently under control of the Micro-Controller board (6 Channel Mode Only).

Table 2 Key Function Summary

HEADERS/CONNECTORS/SWITCHES

	FUNCTION
SW1	Power On / Off Switch
J3	9 Volt Power Input
J1	PIC Micro-Controller Programming Socket
J2	For use with a 6-channel system only (see "Setting Up A 6 Channel Volume Control)
J4	For use with a 6-channel system only

Table 3 Miscellaneous Functions

J5	FUNCTION
1	Chip Select 1
2	GND
3	Chip Select 2
4	GND
5	Chip Select 3
6	GND
7	Data
8	GND
9	Cclk
10	GND

Table 4 Digital Serial Interface

WM8816_MICRO_EV1_REV1 SCHEMATIC
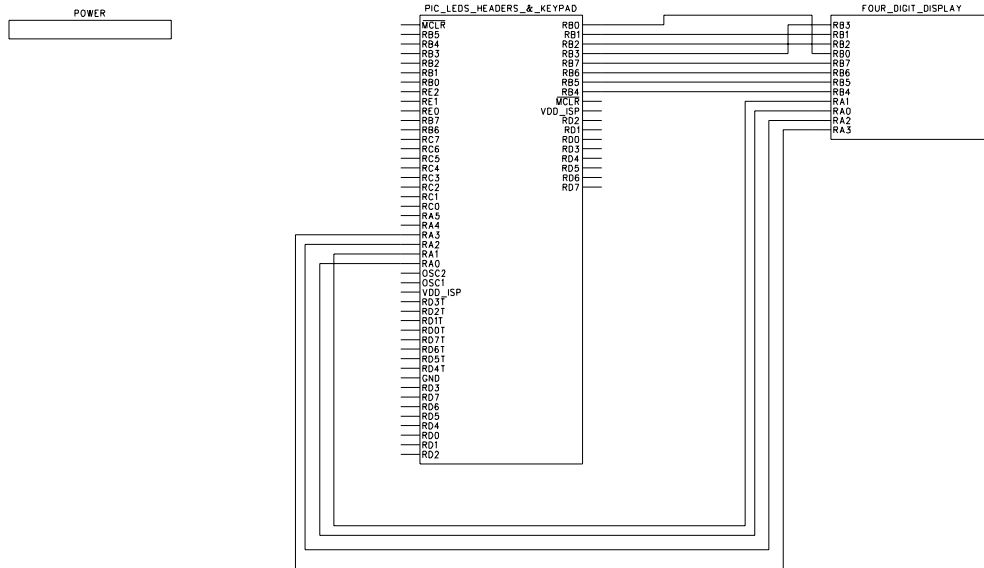
Figure 4 Top Level View
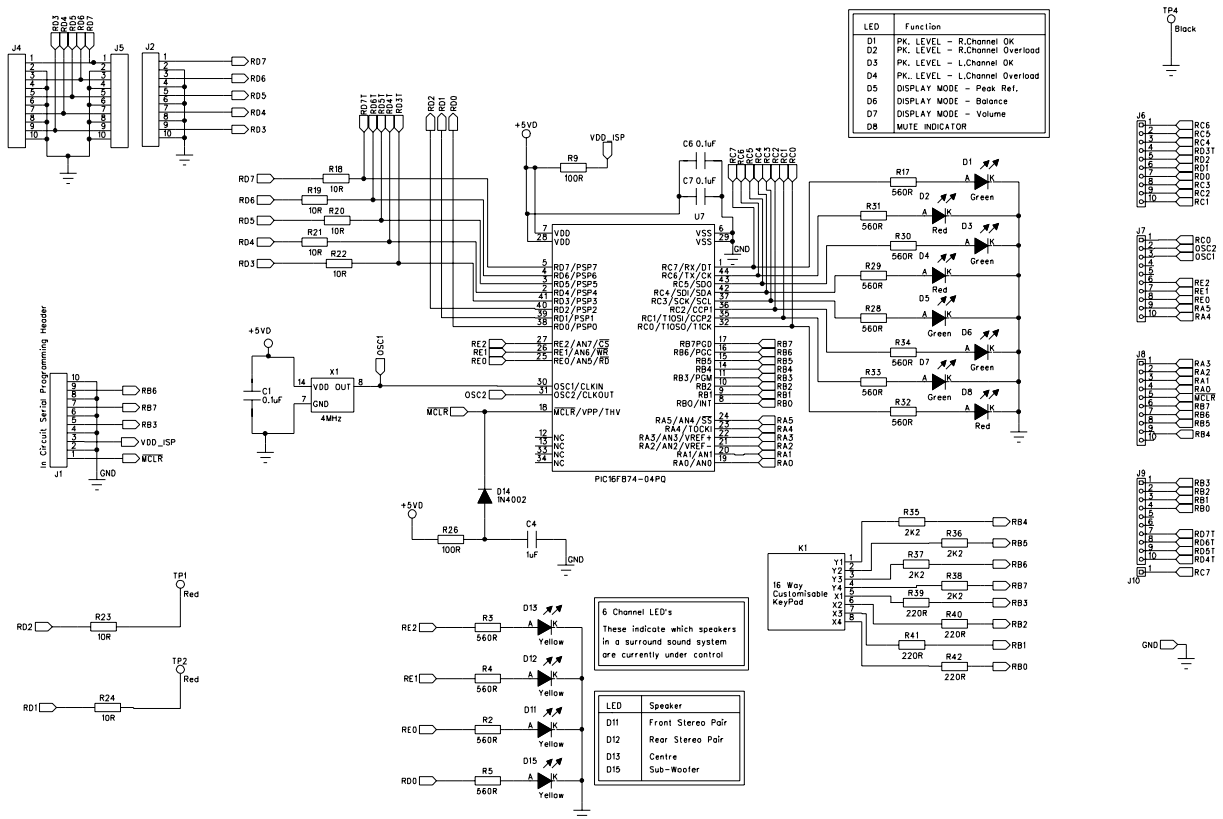
Figure 5 PIC Micro-Controller, LED's, Header + Keypad
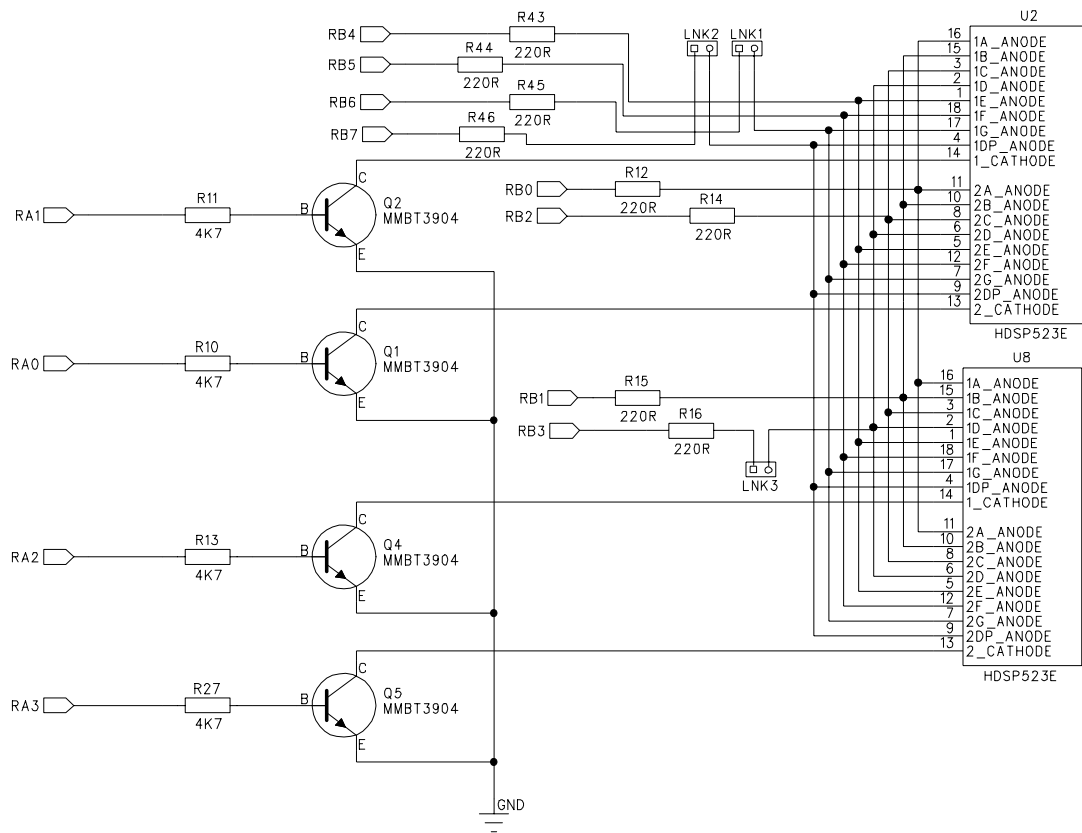
Figure 6 Four Digit Display
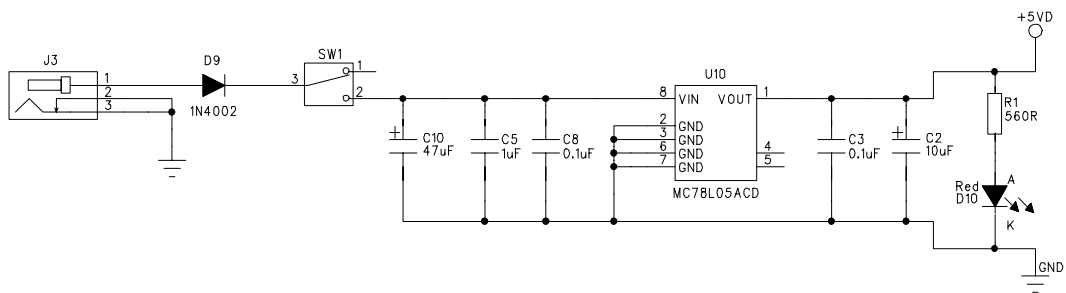
Figure 7 Power

MICRO_CONTROLLER

A PIC16F874 Micro-Controller was used for the WM8816_MICRO_EV1B board. Code was compiled and programmed using MPASM V5.0. Further details on PIC Micro-Controllers can be found at:

www.microchip.com.

The Micro-Controller code is available on request.

EVALUATION SUPPORT

The aim of this evaluation kit is to enable you to become familiar with the functionality and performance of the WM8816_EV1B Micro-Controller Board.

If you require further information or require technical support please contact Wolfson Microelectronics Applications group through the following channels:

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Mail: Applications Department at address on last page.

Or contact your local Wolfson representative.

Additional information may be made available from time to time on our web site at:

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IMPORTANT NOTICE

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