# 5504FX-EK_Rev1

# Professional Audio

## Evaluation Board for SAM5504

### Overview

5504FX-EK is a high quality and low cost reference board for effects applications based on SAM5504 (AUDIO & MUSIC MULTI-DSP PROCESSOR).
The SAM5504 can be used in 2 different hardware configurations for different applications. On 5504FX-EK board the SAM5504 is running in a hardware configuration well suited for effects processing.
Digital Audio Streaming can be sent and received through an Audio CODEC or USB port. Effect parameter control can be done via USB port (using MIDI protocol), from an external front panel, or from host port. External SPI SRAM can be added when long delay lines are needed. The firmware can be loaded from serial Flash memory or from host. The SAM5504 provides also firmware code encryption for copy protection purpose.

Beside the SAM5504, the 5504FX-EK_Rev1 hardware includes:

- Audio CODEC: AKM AK4556 (24bit | ADC: S/N=103dB, S/N+D=91dB | DAC: S/N=106dB, S/N+D=90dB)
- SPI NOR Flash memory WINBOND W25X20CLSNIG: 2Mbit, for firmware and data storage
- SPI SRAM (APMEMORY APS1604M:16Mbit, optional for top quality reverb and long delay lines)
- USB High Speed, Device mode
- Connection to dedicated Front panel or Host

### Hardware Configuration

This reference design kit also includes a front panel. It offers simple user interface made of:

- 16-position selector (Gray encoder)
- 2 x tact switches
- 2 x LEDs
- 3 x analog potentiometers

### Operating Mode

5504FX-EK operates on two modes:

- Debug mode:
  The board is connected to a PC through the Dream 5000DBG-IF adaptor. The firmware can be downloaded and debugged into internal RAM with Dream SamVS-C development software. With SamVS or ProgSam software tool it is possible to program the firmware in SPI Flash memory for stand-alone mode. The ProgSam tool allows also programming the eFuses in SAM5504 with the encryption key used for code protection.
- Stand-alone mode:
  In this mode the SAM5504 loads the program from the SPI Flash memory or form Host at startup then executes it in its internal RAM.

## Connectors Configuration

| Name | Reference | Type | Description |
|---|---|---|---|
| DEBUG / PROGRAM | J1 | JST PH Series, 1*5 | Serial connection for debug and program, compatible with Dream 5000DBG-IF |
| FX IN | J2 | Mini Jack | Audio stereo input channels (2.3Vpp) |
| | J5 (Optional, n.m.) | 1*3 | Audio stereo input channels (2.3Vpp) |
| FX OUT | J3 | Mini Jack | Audio stereo output channels (2.3Vpp) |
| | J4 (Optional, n.m.) | 1*3 | Audio stereo output channels (2.3Vpp) |
| MULTI-PURPOSE INTERFACE | J6 | FFC 20, 1mm | Can be used as:<br>- Slave // 8-bit port for firmware download and control from host<br>- Serial Slave port for firmware download and control from host<br>- MIDI port for firmware download and control from host<br>- GPIOs + 3-channel ADC for front panel connection |
| USB POWER SUPPLY & USB DEVICE PORT | J7 | Micro USB B | USB connector used to power the board. Can also be used as USB device full or high speed port. |
| POWER SUPPLY | J8 (Optional, n.m.) | 1*2 | Power supply if JD1 open, +5V/0.5A, GND on pin 1 |
| USB DEVICE PORT | J9 (Optional, n.m.) | 1*4 | USB device full or high speed port if J7 is not used. |

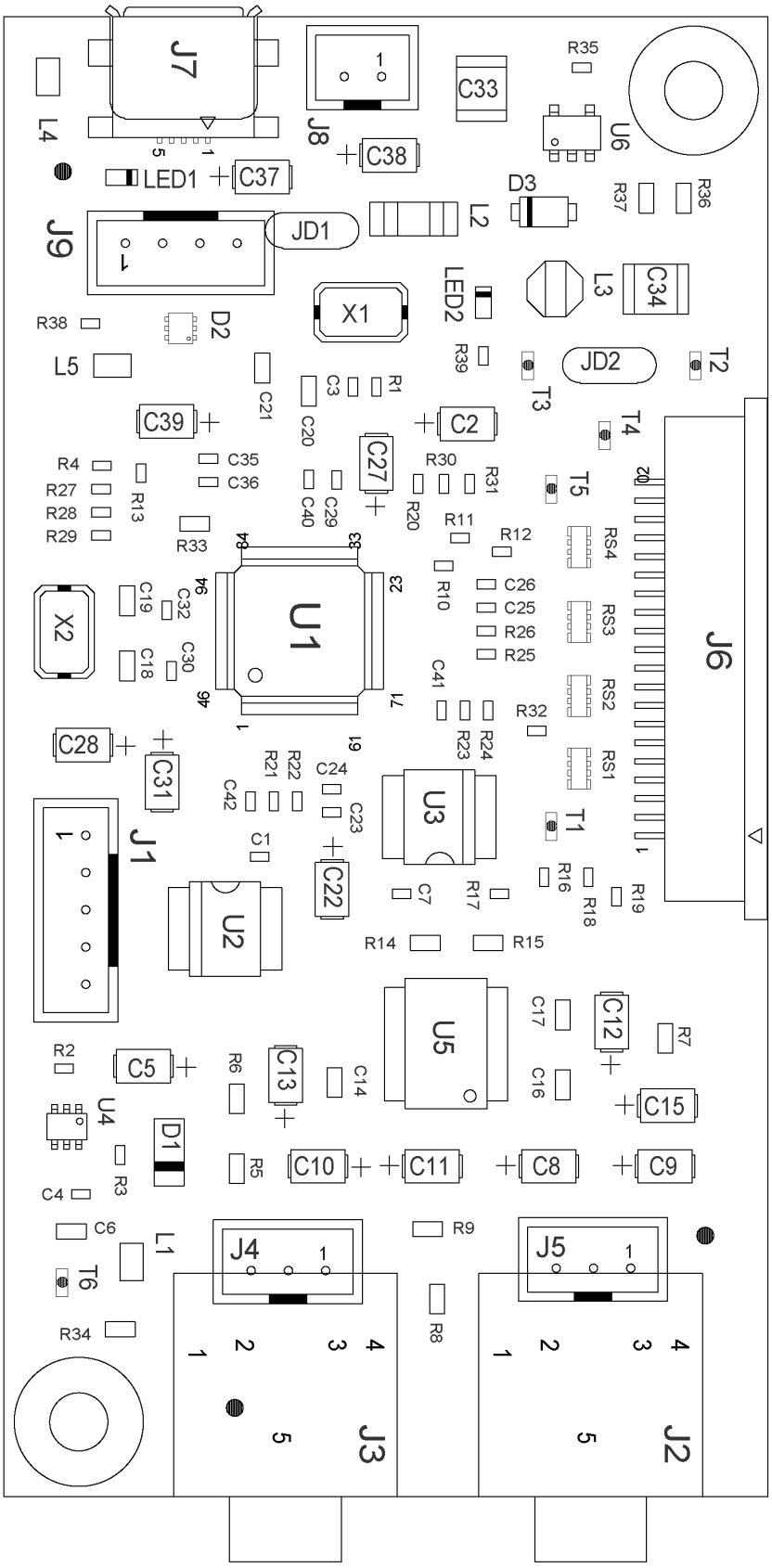
“n.m.” = not mounted

## Jumper Configuration

| Reference | Default Setting | Description |
|---|---|---|
| JD1 | Closed | Power supply source<br>• Closed: Power supply from USB VBUS<br>• Open: Power supply from J8 |
| JD2 | Closed | For test and measurement on 3.3V power supply |

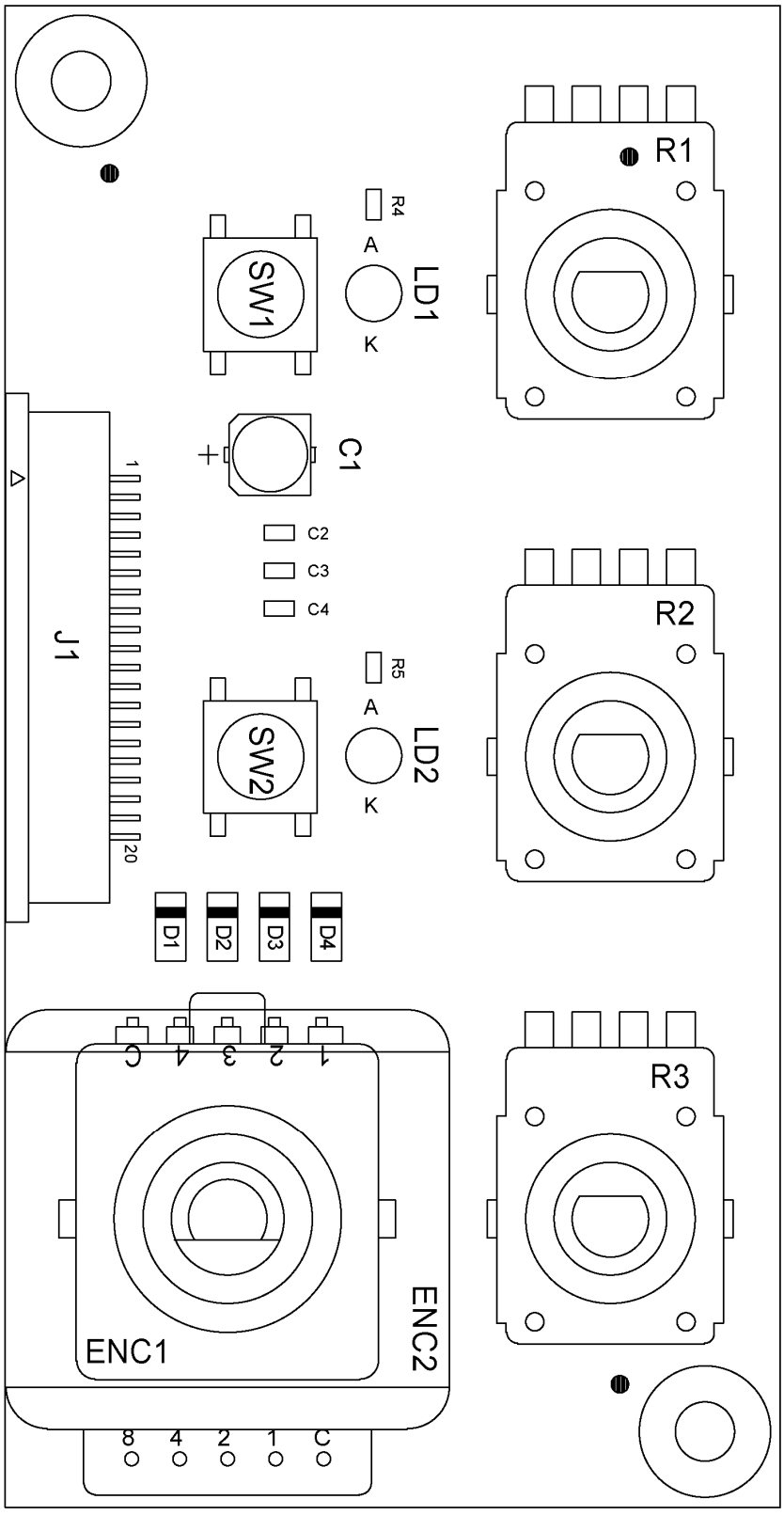
## Layout – Effect Board

Size: 0.37 dm2 (89.50 mm x 41.00 mm)



## Layout – Front Panel

Size: 0.37 dm2 (89.50 mm x 41.00 mm)



## Bill of Material

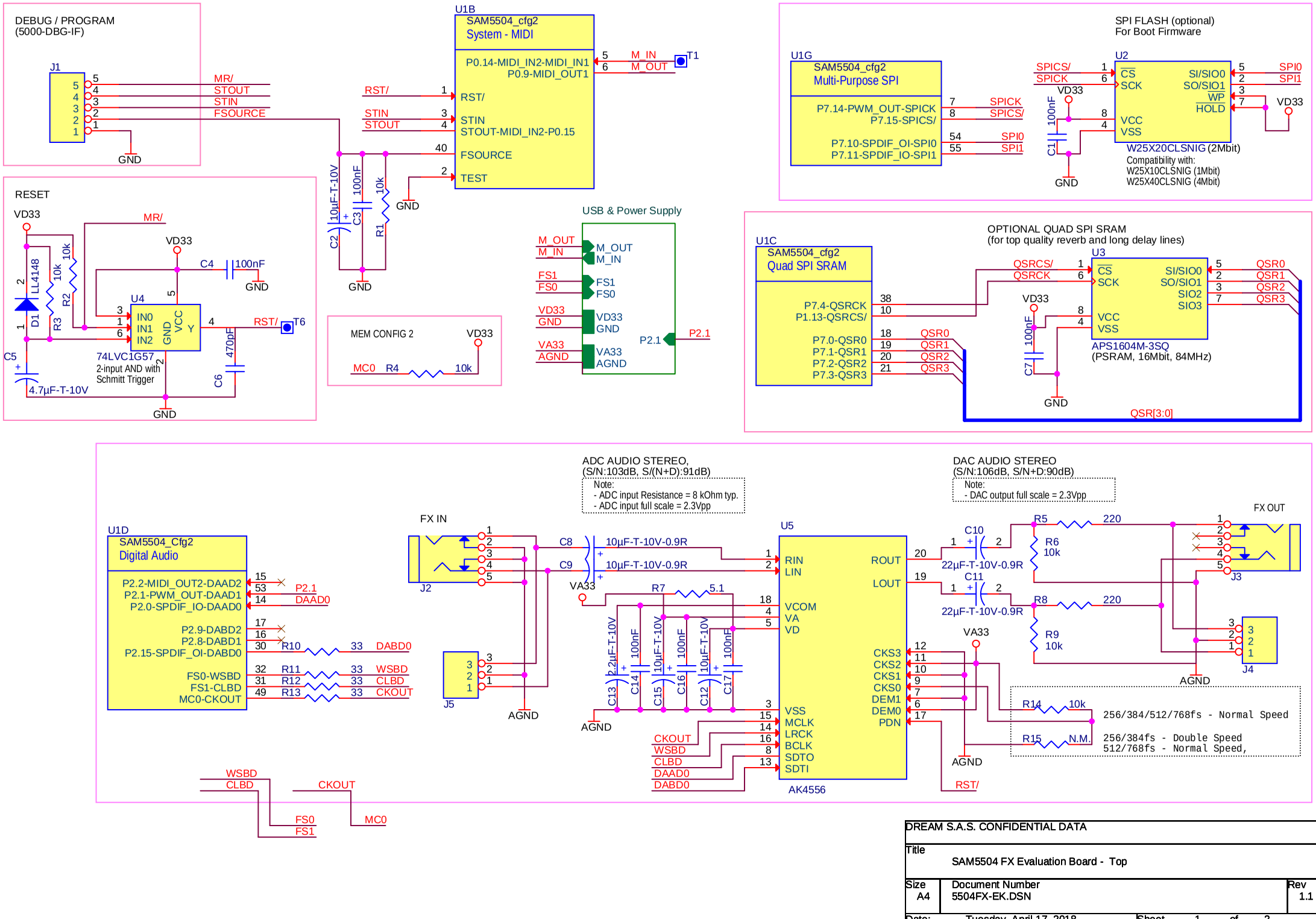
SAM5504 - FX Evaluation Board - Revised: April 17, 2018
5504FX-EK.DSN Revision: 1.1
Page 1

| Item | Quantity | Reference | Part | Manufacturer | Designation |
|---|---|---|---|---|---|
| 1 | 13 | C1, C3, C4, C7, C23, C25, C29, C30, C32, C35, C40, C41, C42 | 100nF | | |
| 2 | 7 | C2, C12, C15, C22, C27, C31, C39 | 10µF-T-10V | | |
| 3 | 2 | C5, C28 | 4.7µF-T-10V | | |
| 4 | 1 | C6 | 470pF | | |
| 5 | 2 | C8, C9 | 10µF-T-10V-0.9R | AVX | TPSA106K010R0900 |
| 6 | 2 | C10, C11 | 22µF-T-10V-0.9R | AVX | TPSA226K010R0900 |
| 7 | 1 | C13 | 2.2µF-T-10V | | |
| 8 | 3 | C14, C16, C17 | 100nF | | |
| 9 | 4 | C18, C19, C20, C21 | 22pF | | |
| 10 | 3 | C24, C26, C36 | 10nF | | |
| 11 | 2 | C33, C34 | 22µF-X5R | | |
| 12 | 2 | C37, C38 | 1µF-T | | |
| 13 | 1 | D1 | LL4148 | VISHAY | LL4148 |
| 14 | 1 | D2 | TPD2E1B06 | TI | TPD2E1B06 |
| 15 | 1 | D3 | CRS08 | TOSHIBA | CRS08 |
| 16 | 2 | JD1, JD2 | Jumper Disk1P | | |
| 17 | 1 | J1 | B5B-PH-K-S | JST | B5B-PH-K-S |
| 18 | 2 | J2, J3 | JACK 3.5 STEREO | 3E | 15.427 |
| 19 | 2 | J4, J5 | N.M. | JST | B3B-PH-K-S |
| 20 | 1 | J6 | AMP- 2-84952-0 | TYCO ELECTRONICS | AMP- 2-84952-0 |
| 21 | 1 | J7 | 47642-0001 | MOLEX | 47642-0001 |
| 22 | 1 | J8 | N.M. | JST | B2B-PH-K-S |
| 23 | 1 | J9 | N.M. | JST | B4B-PH-K-S |
| 24 | 1 | LED1 | TLMG1100-Vishay | VISHAY | TLMG1100 |
| 25 | 1 | LED2 | TLMS1000-Vishay | VISHAY | TLMS1000-GS08 |
| 26 | 3 | L1, L4, L5 | 742792093 | WURTH | 742792093 |
| 27 | 1 | L2 | NFM41PC204F1H3 | MURATA | NFM41PC204F1H3 |
| 28 | 1 | L3 | 744029003 | WURTH | 744029003 |
| 29 | 4 | RS1, RS2, RS3, RS4 | 4x100 | | |
| 30 | 6 | R1, R2, R3, R4, R17, R19 | 10k | | |
| 31 | 2 | R5, R8 | 220 | | |
| 32 | 3 | R6, R9, R14 | 10k | | |
| 33 | 1 | R7 | 5.1 | | |

| Item | Quantity | Reference | Part | Manufacturer | Designation |
|---|---|---|---|---|---|
| 34 | 4 | R10, R11, R12, R13 | 33 | | |
| 35 | 1 | R15 | N.M. | | |
| 36 | 2 | R16, R18 | N.M. | | |
| 37 | 14 | R20, R21, R22, R23, R24, R25, R26, R27, R28, R29, R30, R31, R32, R35 | 100k | | |
| 38 | 1 | R33 | 12k, 1% | | |
| 39 | 1 | R34 | 0 | | |
| 40 | 1 | R36 | 45.3k 1% | | |
| 41 | 1 | R37 | 10k 1% | | |
| 42 | 2 | R38, R39 | 750 | | |
| 43 | 6 | T1, T2, T3, T4, T5, T6 | TestPoint | Vogt | N.M. (985.62 or 1000C.22) |
| 44 | 1 | U1 | SAM5504_cfg2 | DREAM | SAM5504 |
| 45 | 1 | U2 | W25X20CLSNIG | WINBOND | W25X20CLSNIG |
| 46 | 1 | U3 | APS1604M-3SQ | APMEMORY | APS1604M-3SQ |
| 47 | 1 | U4 | 74LVC1G57 | TI | 74LVC1G57DCK |
| 48 | 1 | U5 | AK4556 | AKM | AK4556VT |
| 49 | 1 | U6 | LM2830X | NS | LM2830X |
| 50 | 1 | X1 | 12 MHz | ABRACON | ABM3-12.000MHZ-D2Y-T |
| 51 | 1 | X2 | N.M. | | |

Front Panel - Guitar Effect - Revised: February 11, 2015
5504FXFP-EK.DSN Revision: 0
Page 1

| Item | Quantity | Reference | Part | Manufacturer | Designation |
|---|---|---|---|---|---|
| 1 | 1 | C1 | 10µF-A-16V | | |
| 2 | 3 | C2, C3, C4 | 100nF | | |
| 3 | 4 | D1, D2, D3, D4 | LL4148 | | |
| 4 | 1 | ENC1 | REB161(9x7)PVB20FHGRY1-4-16-PCE | NOBLE | REB161(9x7)PVB20FHGRY1-4-16-PCE |
| 5 | 1 | ENC2 | 25LB22-G | GRAYHILL | 25LB22-G |
| 6 | 1 | J1 | AMP- 2-84952-0 | TYCO ELECTRONICS | AMP- 2-84952-0 |
| 7 | 1 | LD1 | TLHG4400-Vishay | VISHAY | TLHG4400 |
| 8 | 1 | LD2 | TLHR4400-Vishay | VISHAY | TLHR4400 |
| 9 | 3 | R1,R2,R3 | STRK11K07 | ALPS | STRK11K07 |
| 10 | 2 | R4,R5 | 560 | | |
| 11 | 2 | SW1,SW2 | DTSM-6 | APEM | DFTSM-61N |




DREAM S.A.S. CONFIDENTIAL DATA

| | | |
|---|---|---|
| Title | SAM5504 FX Evaluation Board - Top | |
| Size A4 | Document Number 5504FX-EK.DSN | Rev 1.1 |
| Date: Tuesday, April 17, 2018 | Sheet 1 of 2 | |

| Freq (MHz) | FS1 | FS0 |
|---|---|---|
| 12 (Default) | 0 | 0 |
| 9.6 | 0 | 1 |
| 11.2896 | 1 | 0 |
| 12.288 | 1 | 1 |

MULTI-PURPOSE INTERFACE
Can be used as:
- Slave // 8-bit port for firmware download and control from host
- Serial Slave port for firmware download and control from host
- MIDI port for firmware download and control from host
- GPIOs + 3-channel ADC for front panel connection

FREQUENCE SENSE (OSC1)
12MHz

SECONDARY OSCILLATOR
(OPTIONAL)

MAIN OSCILLATOR

USB POWER SUPPLY &
USB DEVICE PORT

5V to 3.3V DC/DC Step-Down DC-DC Regulator

USB ACTIVITY

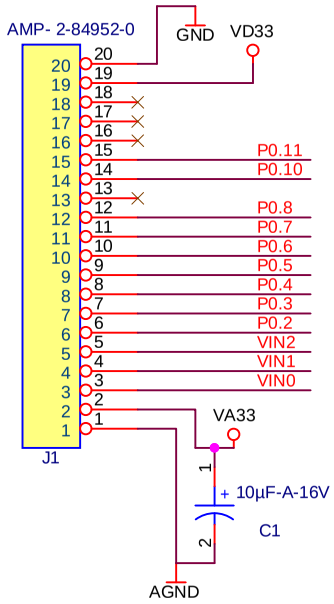
POWER

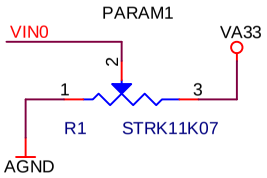
DREAM S.A.S. CONFIDENTIAL DATA

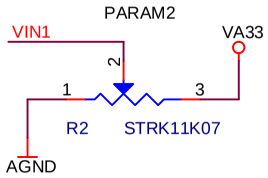
Title: SAM5504 - FX Evaluation Board - USB & Power Supply

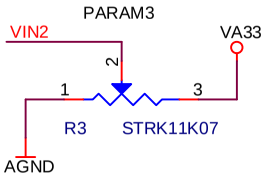
| Size | Document Number | Rev |
|---|---|---|
| A4 | 5504FX-EK.DSN | 1.1 |

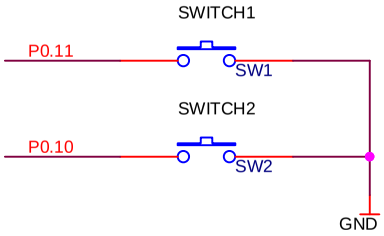
Date: Monday, April 16, 2018 Sheet 2 of 2

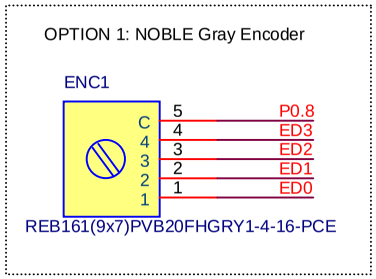


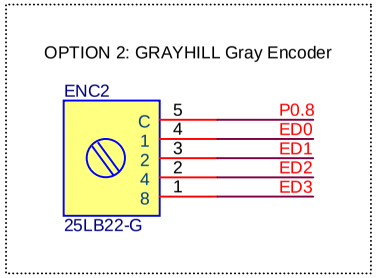



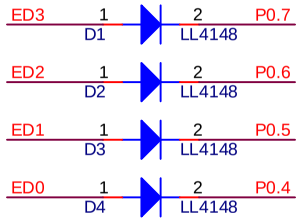



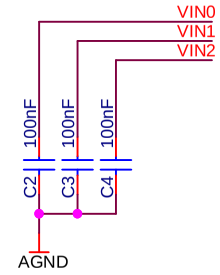



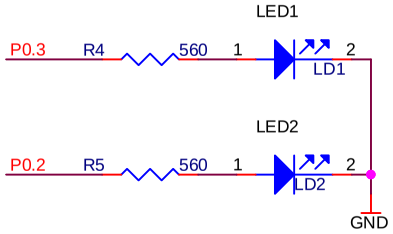




NOTE: Option 1 or option 2 can be
mounted alternatively, depending on availability.




Note:
C2 to C4 should be mounted close to J1




| | | |
|---|---|---|
| DREAM S.A.S. CONFIDENTIAL DATA | | |
| Title: FRONT PANEL - GUITAR EFFECT | | |
| Size: A4 | Document Number: 5504FXFP-EK.DSN | Rev: 0 |
| Date: Wednesday, February 11, 2015 | Sheet 1 of 1 | |

## Dream Contact

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## Website

http://www.dream.fr