

## **TAS2560 Evaluation Module**

This user's guide describes the characteristics, operation, and use of the TAS2560 Evaluation Module (EVM). The complete schematic diagrams, printed-circuit board layouts, and bill of materials (BOM) are included in this document.

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## 1 Description

The TAS2560 is an amplifier with an integrated 8.5V boost converter supporting Class-D, Class-G, and Class-H. The device supports up to 5.7W output while using a 4 Ohm driver and includes on-chip voltage and current sensing. Users can utilize this sensing to implement an advanced algorithm to provide real-time speaker protection against overheating and excessive excursion.

The TAS2560 EVM supports evaluation and development with the TAS2560 through the following interfaces:

1. USB interface
  - (a) TAS2560 control through PurePath™ Console 3 GUI, USB-HID
  - (b) USB-class Audio Device, compatible with Microsoft® Windows® 7
2. Digital audio AP/PSIA interface through 100-mil headers
3. TI Learning Board 2 for speaker characterization
4. SPI interface for TAS2560 control
5. I<sup>2</sup>C interface for TAS2560 control

**Table 1. Specifications**

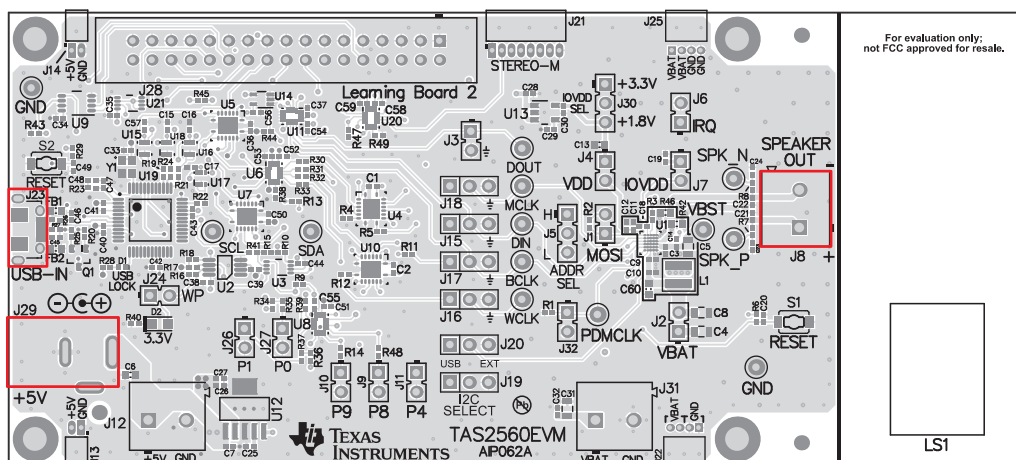
|                                      |                   |
|--------------------------------------|-------------------|
| Amplifier power supply ( $V_{BAT}$ ) | +2.7 V to +5.5 V  |
| EVM power supply                     | +5 V              |
| I/O power supply ( $I/O_{VDD}$ )     | +1.62 V to +3.6 V |
| Output power                         | 4 W               |
| USB, USB class-audio                 | Micro-USB B       |

## 2 Software

The EVM requires PurePath™ Console 3 with the TAS2560 EVM App.

### 3 Mono Setup

- Install PurePath™ Console 3 and the TAS2560 App
- Connect a speaker to J8 on the EVM.
- Attach a +5-V, 2-A power supply to connector J29 (inner = +5 V, outer = GND).
- Connect the EVM to a Windows 7 PC with a micro USB cable (J23). It enumerates as a USB class-audio device (sound card).

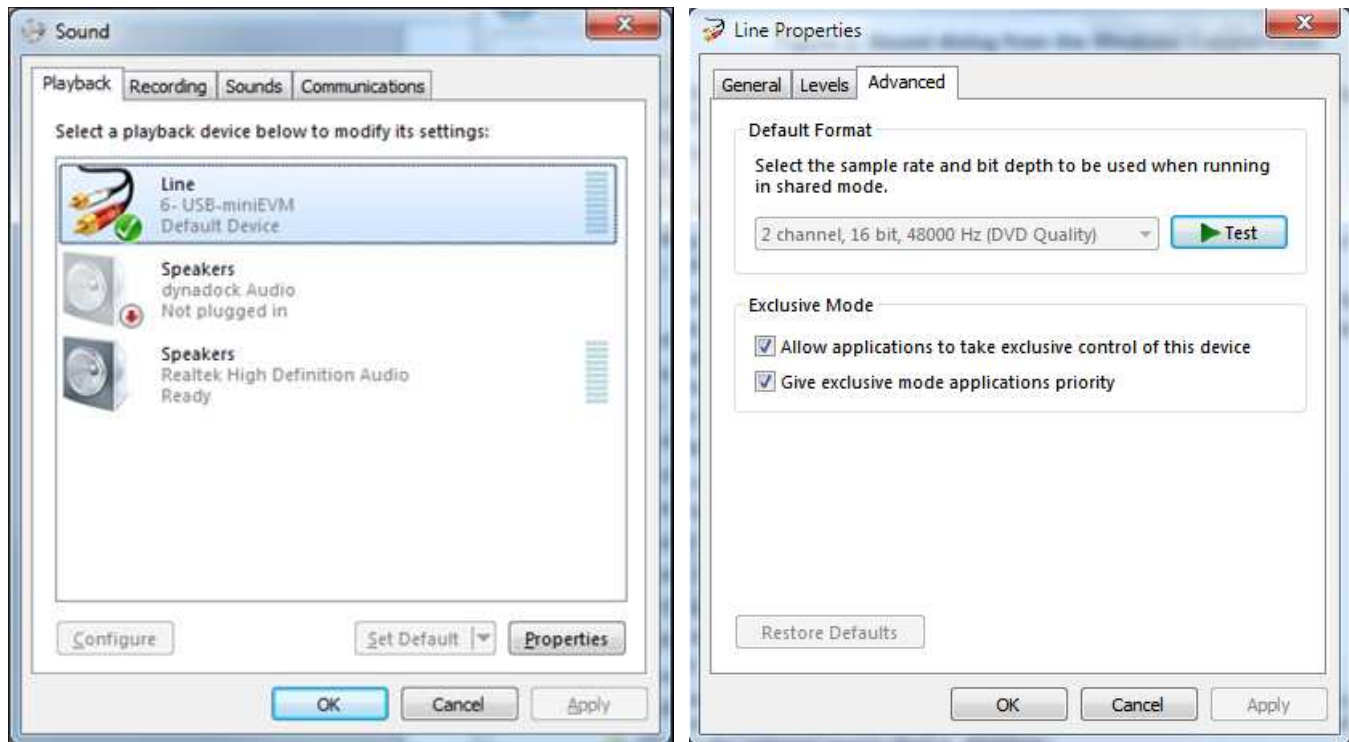


**Figure 1. Sound Card**

Default jumper settings:

- |                                                       |                                            |
|-------------------------------------------------------|--------------------------------------------|
| J1: inserted                                          | J16: inserted left (WCLK = on-board)       |
| J2: inserted ( $V_{BAT}$ = from +5 V)                 | J17: inserted left (BCLK = on-board)       |
| J3: removed (DATA from TAS2560 access header)         | J18: inserted left (MCLK = on-board)       |
| J4: inserted (or wire loop)                           | J19: inserted left (SCL = on-board)        |
| J5: inserted bottom (I2C address = 0x98 (0x4C 7-bit)) | J20: inserted left (SDA = on-board)        |
| J6: inserted                                          | J24: removed (EEPROM write protect = off)  |
| J7: inserted (or wire loop)                           | J26: inserted (select USB audio)           |
| J9: inserted (select USB audio)                       | J27: inserted (select USB audio)           |
| J10: inserted (select USB audio)                      | J30: inserted bottom ( $I_{OVDD}$ = 1.8 V) |
| J11: inserted                                         | J32: removed                               |
| J15: inserted left (DIN = on-board)                   |                                            |

Verify that the EVM is the default playback device (open the Sound dialog from the Windows Control Panel):



**Figure 2. Sound dialog from the Windows Control Panel**

The EVM firmware enumerates as a USB-miniEVM. It supports 48kHz sampling rate by default. Check if the sampling rate matches the Windows setting via Properties->Advanced.

This setting must match the EVM (2 channel, 16 bit, 48000 Hz)

## 4 Digital Audio Interfaces

The various digital audio interfaces on the TAS2560 EVM can be selected through hardware settings and software settings.

Several headers close to the TAS2560 allow access to the following digital audio signals:

- J3: Data Out (DOUT) from the TAS2560 (that is, current and voltage sense data)
- J15: Data In (DIN) to the TAS2560
- J16: Word Clock / Frame Sync (WCLK)
- J17: Bit Clock (BCLK)
- J18: Master Clock (MCLK) – optional if TAS2560 PLL is not used

J3 has two pins:

1. Digital data (that is, I and V sense data) from the TAS2560
2. Ground

J15, J16, J17 and J18 have three pins:

1. Digital audio interface signals from the EVM
2. Digital audio interface signals to the TAS2560
3. Ground

A jumper inserted in position 1-2 connects the TAS2560 to the digital audio signals from the board (e.g. USB or Learning Board 2). Replacing the jumper with a connector from an external source connects the TAS2560 to the external source (that is, AP/PSIA).

The selection between the two on-board digital audio sources (USB or Learning Board 2) is controlled by:

(a) Hardware: J26, J27:

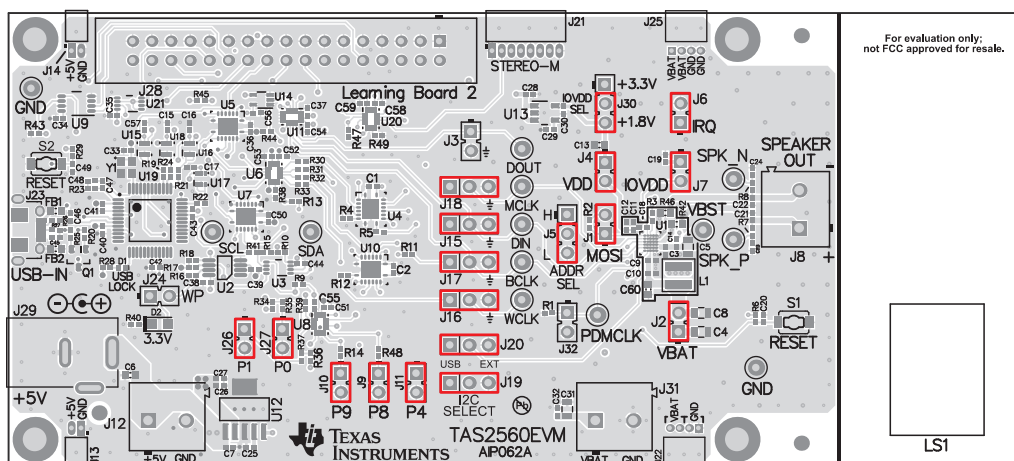
- (a) J26 = inserted, J27 = inserted selects USB
- (b) J26 = inserted, J27 = removed selects Learning Board 2

(b) Software: The PPC3 GUI controls the digital audio routing during speaker characterization. This has priority over the hardware settings from point a.

## 4.1 Digital Audio Interface Selection

### 4.1.1 USB

The TAS2560 EVM contains a microcontroller (TAS1020b) that acts as a USB HID and USB class audio interface. To select USB, insert J26, J27, J9, J10 and insert J15, J16, J17, J18 in the 1-2 position.



**Figure 3. USB Interface**

### 4.1.2 Direct (AP/PSIA)

Remove the jumpers from J15, J16, J17, J18 and connect the external digital audio source (that is, AP/PSIA) to pin 2 of each header. Pin 3 provides a ground connection.

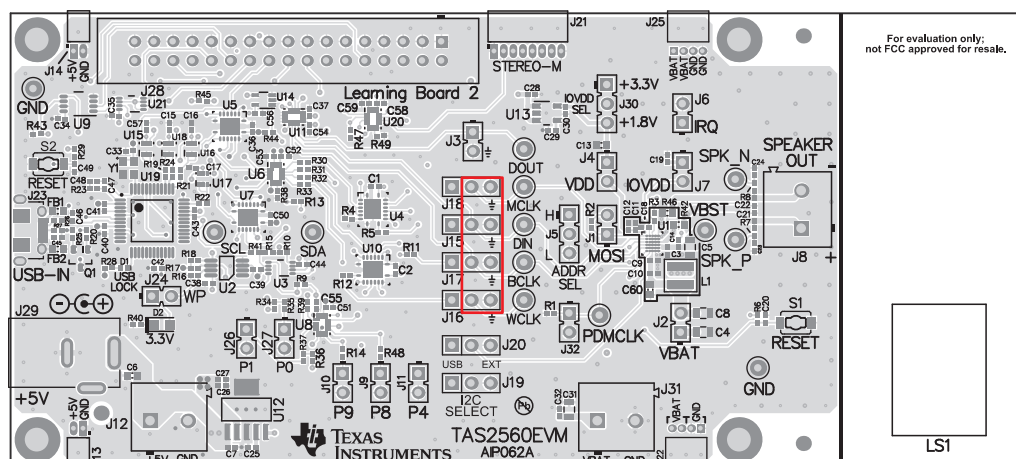


Figure 4. Direct (AP/PSIA)

## 5 PurePath™ Console 3 Software

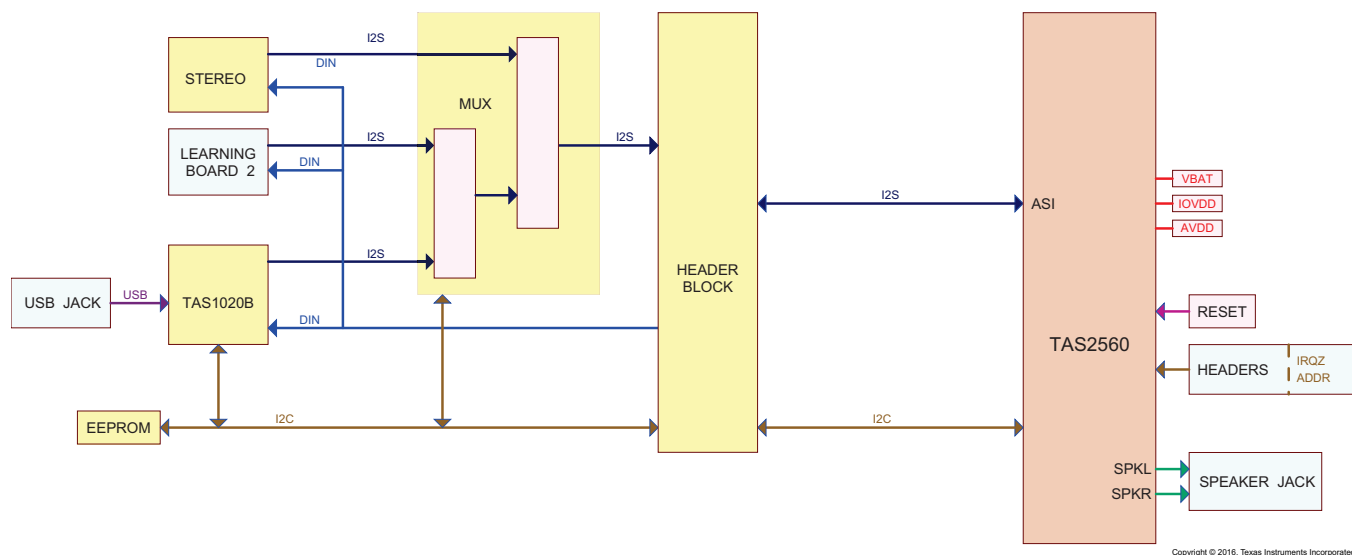
The graphical user interface software, PurePath™ Console 3 with the TAS2560 App, controls the TAS2560 EVM.

**NOTE:** The TAS2560 must be configured using this software. It will not function without configuration.

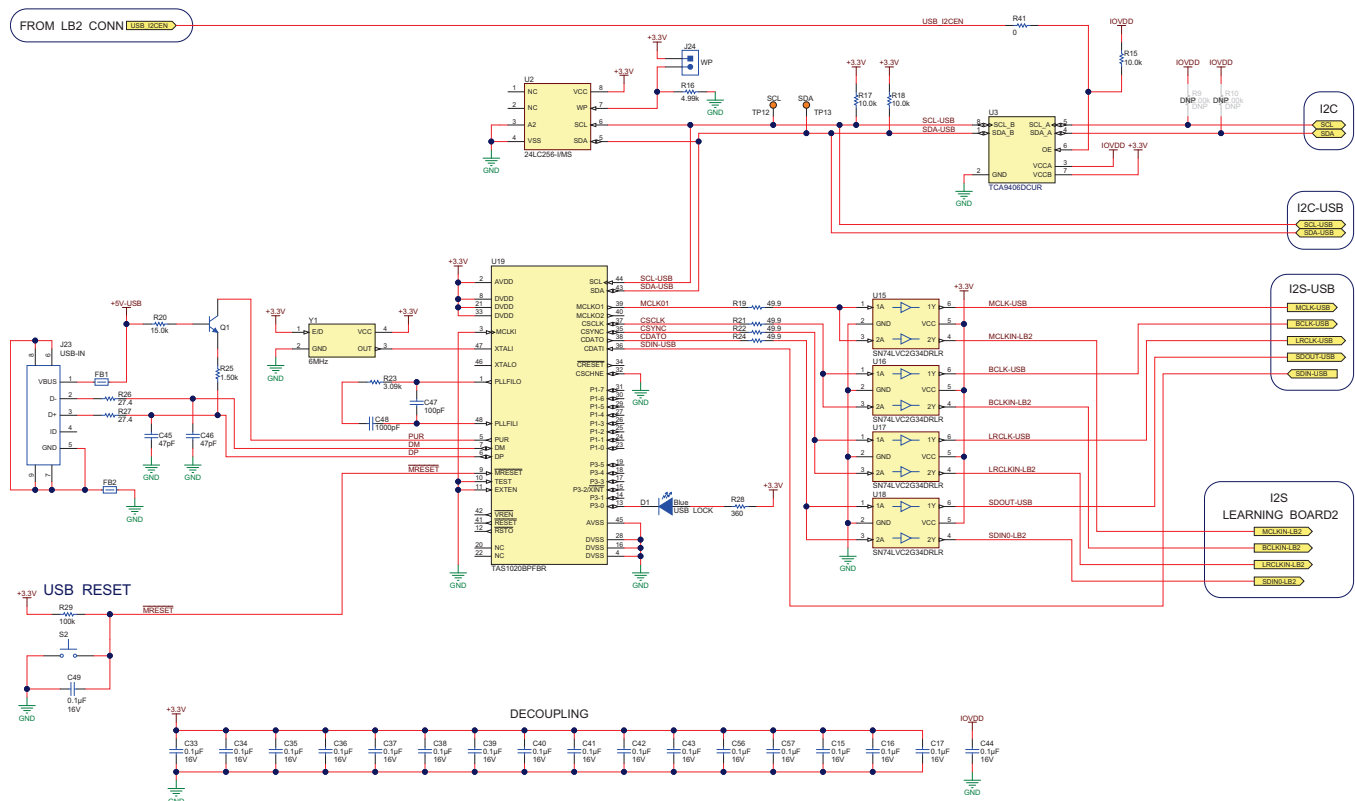
## 6 Schematics, Layout and BOM

### 6.1 Schematic

Figure 5 through Figure 10 illustrate the EVM schematic diagrams.



**Figure 5. Schematic Page 1**



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Figure 6. Schematic Page 2



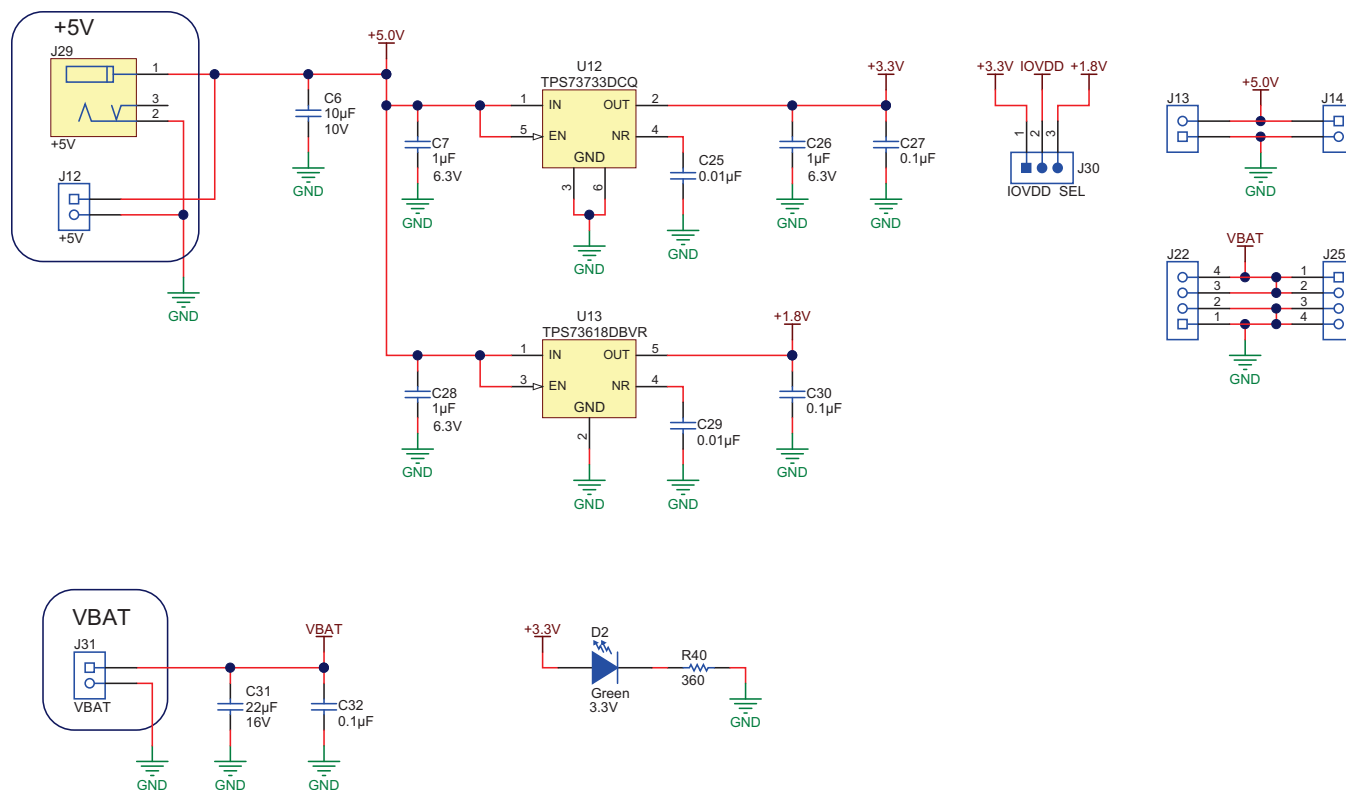
**Figure 7. Schematic Page 3**



**Figure 8. Schematic Page 4**



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Figure 10. Schematic Page 6

## 6.2 PCB Layout

Figure 11 through Figure 22 illustrate the EVM PCB layouts.

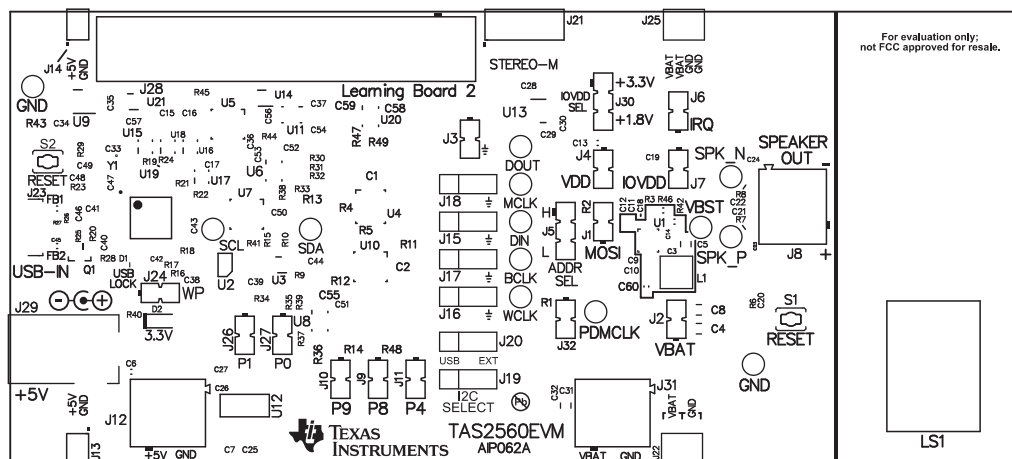


Figure 11. PCB Layer 1

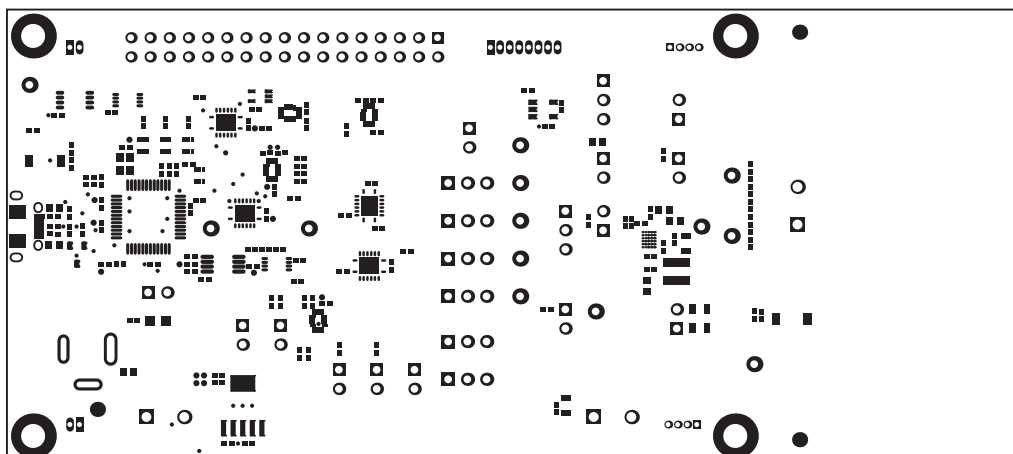


Figure 12. PCB Layer 2

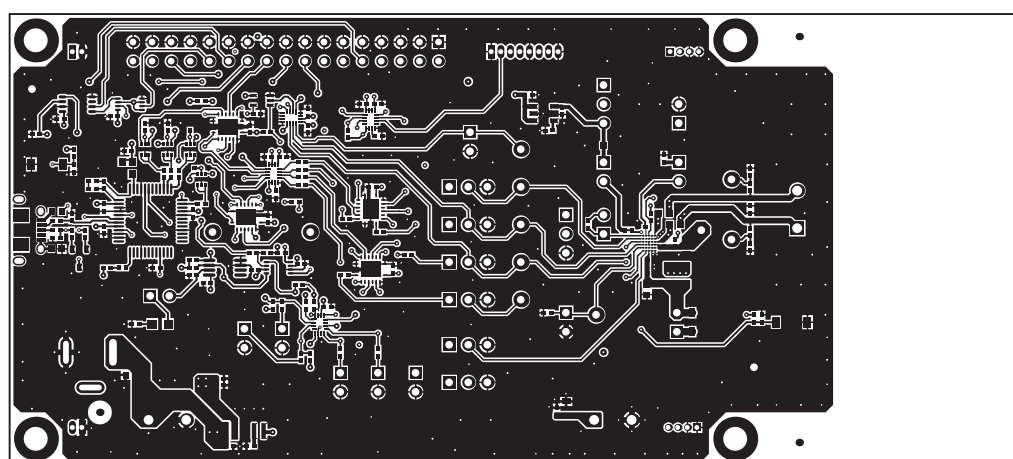


Figure 13. PCB Layer 3

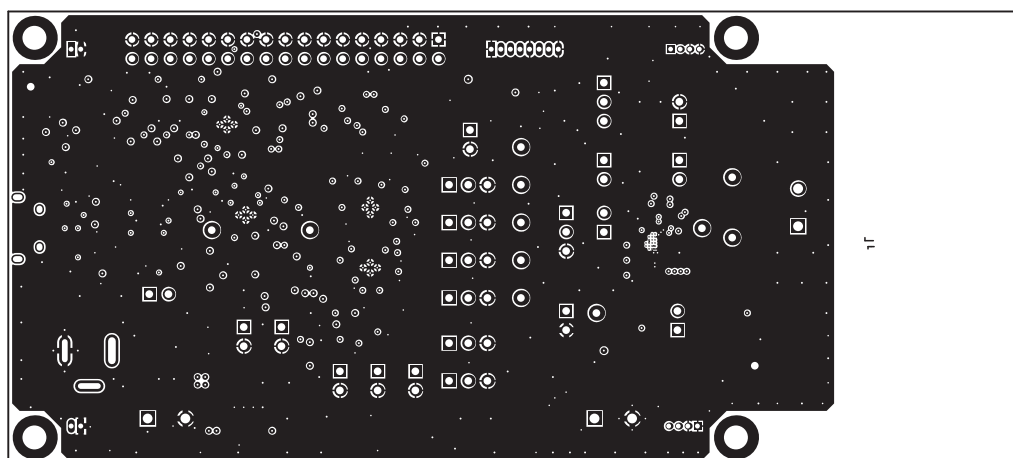
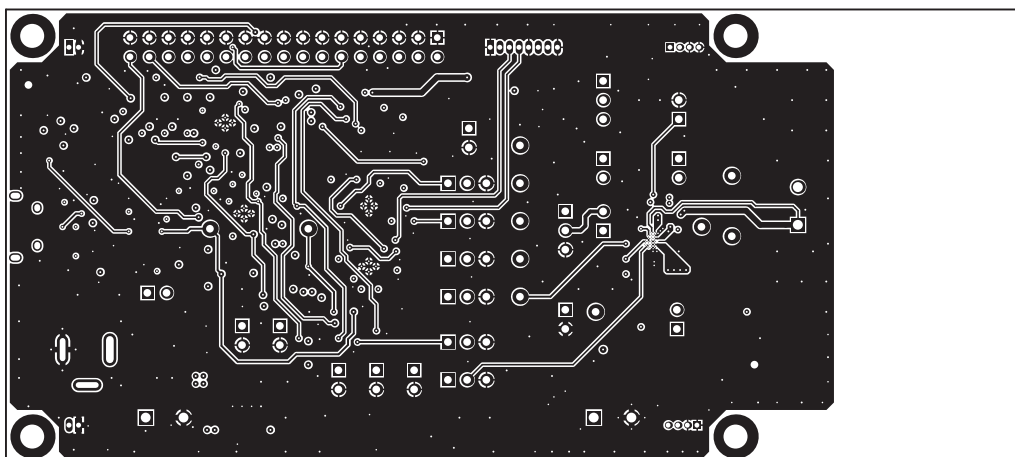
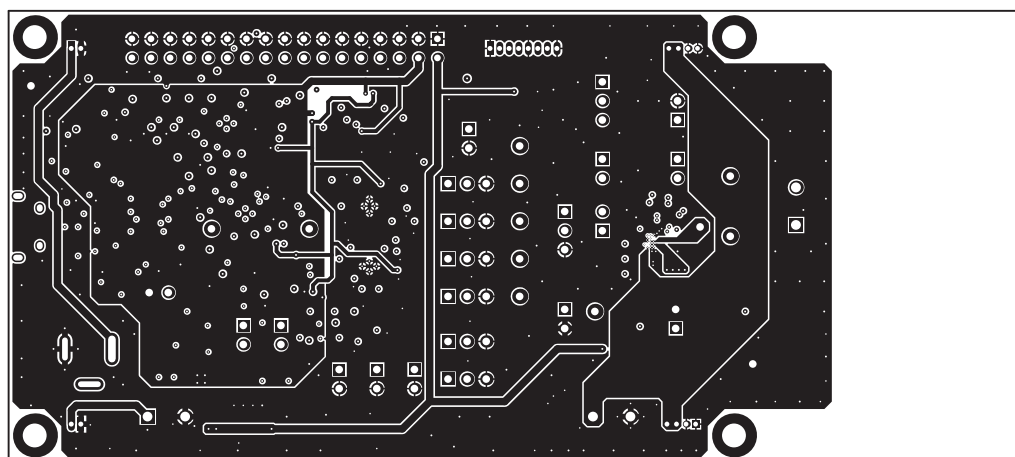


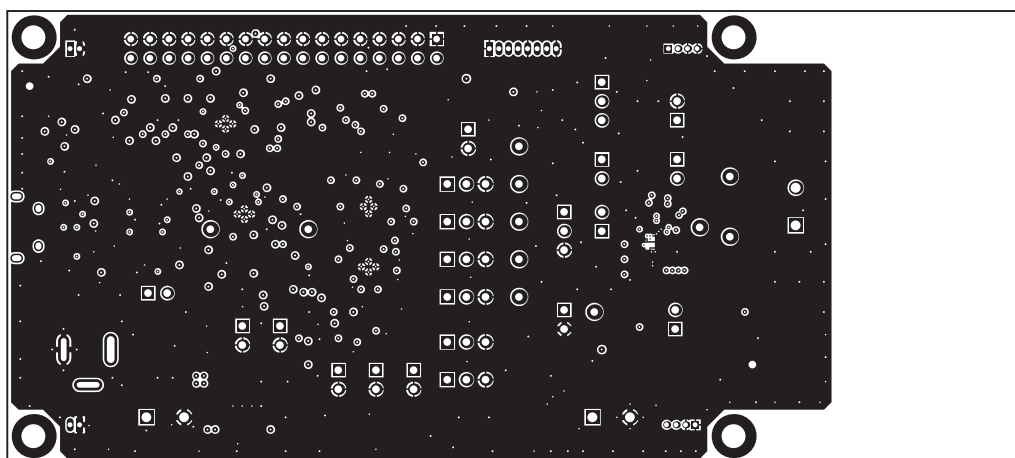
Figure 14. PCB Layer 4



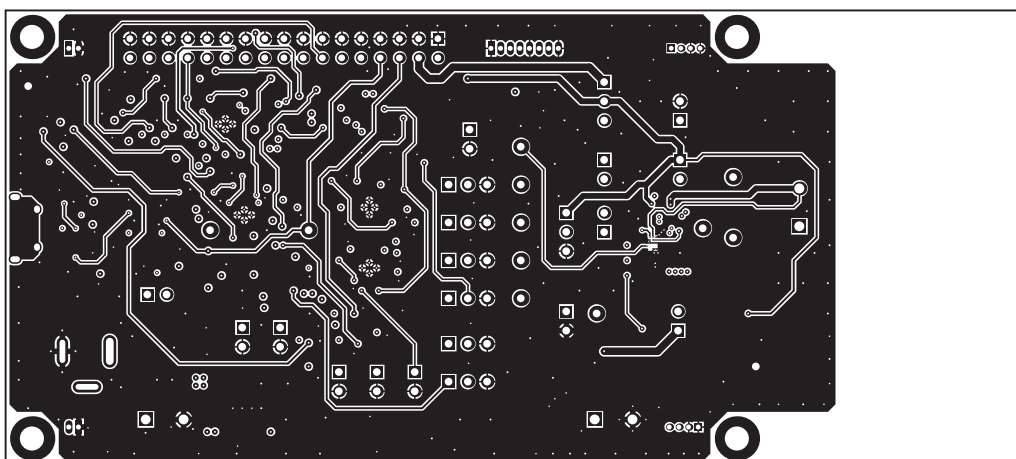
**Figure 15. PCB Layer 5**



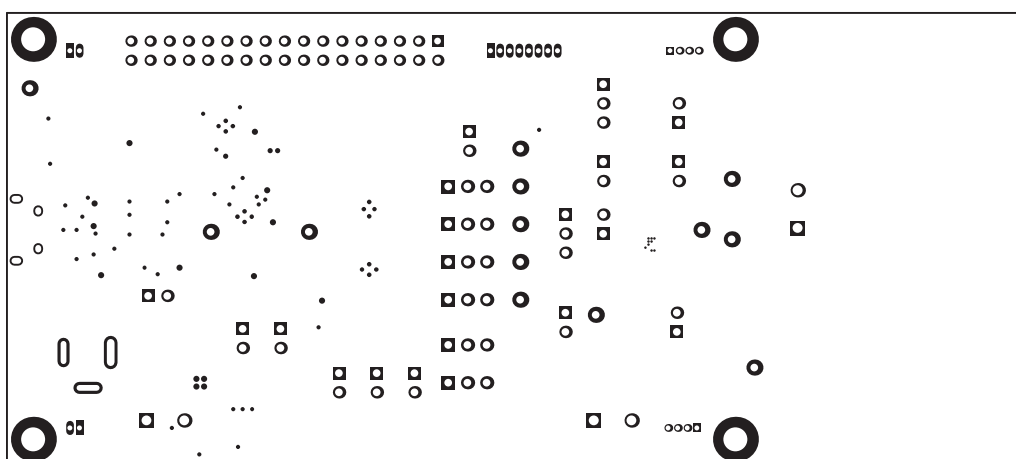
**Figure 16. PCB Layer 6**



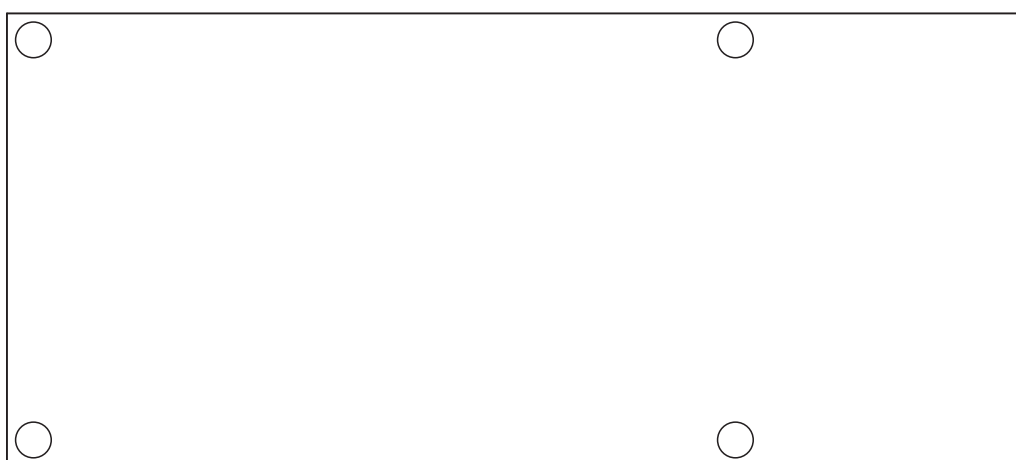
**Figure 17. PCB Layer 7**



**Figure 18. PCB Layer 8**

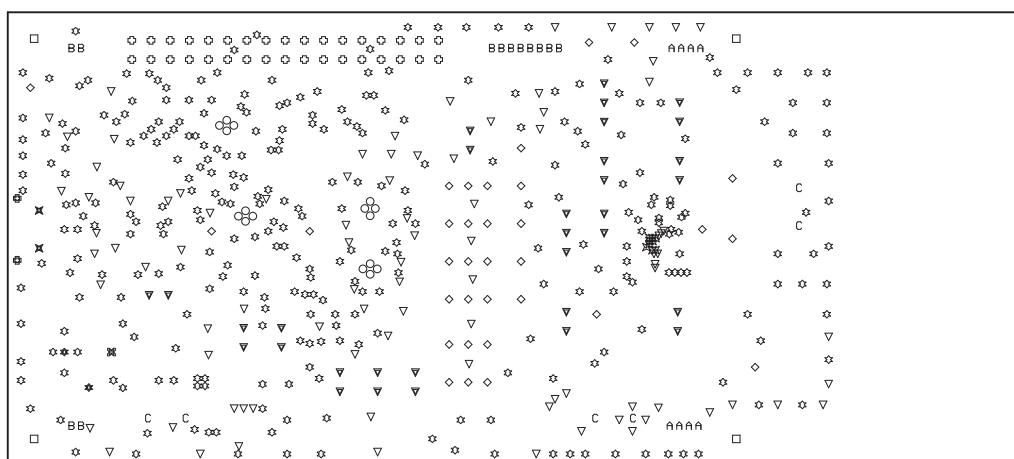


**Figure 19. PCB Layer 9**



**Figure 20. PCB Layer 10**

| Symbol | Hit Count        | Finished Hole Size  | Plated | Hole Type | Physical Length     | Rout Path Length    |
|--------|------------------|---------------------|--------|-----------|---------------------|---------------------|
| ⌘      | 1                | 1.010mm (39.76mil)  | PTH    | Slot      | 3.560mm (140.16mil) | 2.550mm (100.39mil) |
| ✱      | 2                | 0.760mm (29.92mil)  | PTH    | Slot      | 3.050mm (120.08mil) | 2.290mm (90.16mil)  |
| ✕      | 2                | 0.800mm (31.50mil)  | PTH    | Slot      | 1.000mm (39.37mil)  | 0.200mm (7.87mil)   |
| ⊗      | 2                | 0.800mm (31.50mil)  | PTH    | Slot      | 1.300mm (51.18mil)  | 0.500mm (19.69mil)  |
| □      | 4                | 3.175mm (125.00mil) | PTH    | Round     |                     |                     |
| ○      | 6                | 1.300mm (51.18mil)  | PTH    | Round     |                     |                     |
| ⊖      | 8                | 0.650mm (25.59mil)  | PTH    | Round     |                     |                     |
| ⌘      | 9                | 0.150mm (5.91mil)   | PTH    | Round     |                     |                     |
| ⊖      | 12               | 0.660mm (26.00mil)  | PTH    | Round     |                     |                     |
| ○      | 16               | 0.200mm (7.87mil)   | PTH    | Round     |                     |                     |
| ▽      | 32               | 1.020mm (40.16mil)  | PTH    | Round     |                     |                     |
| ◇      | 33               | 1.016mm (40.00mil)  | PTH    | Round     |                     |                     |
| ⊗      | 34               | 0.890mm (35.04mil)  | PTH    | Round     |                     |                     |
| ▽      | 91               | 0.203mm (8.00mil)   | PTH    | Round     |                     |                     |
| ✱      | 309              | 0.254mm (10.00mil)  | PTH    | Round     |                     |                     |
|        | <b>561 Total</b> |                     |        |           |                     |                     |


**Figure 21. PCB Layer 11**

**Figure 22. PCB Layer 12**

### 6.3 Bill of Materials

Table 2 details the EVM BOM.

**Table 2. Bill of Materials**

| Designator                                                                               | Quantity | Value   | Description                                                                         | Package Reference             | Part Number         | Manufacture            | Alternate Part Number <sup>(1)</sup> | Alternate Manufacturer |
|------------------------------------------------------------------------------------------|----------|---------|-------------------------------------------------------------------------------------|-------------------------------|---------------------|------------------------|--------------------------------------|------------------------|
| PCB                                                                                      | 1        |         | Printed Circuit Board                                                               |                               | AAP062              | Any                    |                                      |                        |
| C1, C2, C9, C11, C18, C27, C30, C32, C50, C51, C52, C53, C54, C55, C58, C59              | 16       | 0.1uF   | CAP, CERM, 0.1uF, 10V, +/-10%, X7R, 0402                                            | 0402                          | GRM155R71A104KA01D  | MuRata                 |                                      |                        |
| C3                                                                                       | 1        | 0.1uF   | CAP, CERM, 0.1 uF, 16 V, +/- 10%, X7R, 0402                                         | 0402                          | GRM155R71C104KA88D  | MuRata                 |                                      |                        |
| C5, C8, C31                                                                              | 3        | 22uF    | CAP, CERM, 22 uF, 16 V, +/- 10%, X5R, 0805                                          | 0805                          | C2012X5R1C226K125AC | TDK                    |                                      |                        |
| C6, C13, C60                                                                             | 3        | 10uF    | CAP, CERM, 10 uF, 10 V, +/- 20%, X5R, 0603                                          | 0603                          | C1608X5R1A106M080AC | TDK                    |                                      |                        |
| C7, C10, C12, C19, C26, C28                                                              | 6        | 1uF     | CAP, CERM, 1uF, 6.3V, +/-20%, X5R, 0402                                             | 0402                          | C1005X5R0J105M      | TDK                    |                                      |                        |
| C14, C25, C29                                                                            | 3        | 0.01uF  | CAP, CERM, 0.01uF, 6.3V, +/-10%, X7R, 0402                                          | 0402                          | GRM155R70J103KA01D  | MuRata                 |                                      |                        |
| C15, C16, C17, C33, C34, C35, C36, C37, C38, C39, C40, C41, C42, C43, C44, C49, C56, C57 | 18       | 0.1uF   | CAP, CERM, 0.1uF, 16V, +/-10%, X7R, 0402                                            | 0402                          | GRM155R71C104KA88D  | MuRata                 |                                      |                        |
| C20                                                                                      | 1        | 0.1uF   | CAP, CERM, 0.1 uF, 10 V, +/- 10%, X7R, 0402                                         | 0402                          | GRM155R71A104KA01D  | MuRata                 |                                      |                        |
| C45, C46                                                                                 | 2        | 47pF    | CAP, CERM, 47pF, 25V, +/-5%, C0G/NP0, 0402                                          | 0402                          | GRM1555C1E470JA01D  | MuRata                 |                                      |                        |
| C47                                                                                      | 1        | 100pF   | CAP, CERM, 100pF, 50V, +/-5%, C0G/NP0, 0402                                         | 0402                          | GRM1555C1H101JA01D  | MuRata                 |                                      |                        |
| C48                                                                                      | 1        | 1000pF  | CAP, CERM, 1000pF, 50V, +/-5%, C0G/NP0, 0402                                        | 0402                          | GRM1555C1H102JA01D  | MuRata                 |                                      |                        |
| D1                                                                                       | 1        | Blue    | LED, Blue, SMD                                                                      | Blue LED                      | SMLP12BC7TT86       | Rohm                   |                                      |                        |
| D2                                                                                       | 1        | Green   | LED, Green, SMD                                                                     | LED_0805                      | LTST-C171GKT        | Lite-On                |                                      |                        |
| FB1, FB2                                                                                 | 2        | 220 ohm | 2.2A Ferrite Bead, 220 ohm at 100MHz, SMD                                           | 0603                          | MPZ1608S221A        | TDK                    |                                      |                        |
| H1, H2, H3, H4                                                                           | 4        |         | MACHINE SCREW PAN PHILLIPS 4-40                                                     | Machine Screw, 4-40, 1/4"     | PMSSS 440 0025 PH   | B&F Fastener Supply    |                                      |                        |
| H5, H6, H7, H8                                                                           | 4        |         | ROUND STANDOFF 4-40 ALUM 1/2"                                                       | ROUND STANDOFF 4-40 ALUM 1/2" | 2027                | Keystone               |                                      |                        |
| H9                                                                                       | 1        |         | Custom Cable For Connecting Stereo EVM Boards. IDC34 Ribbon Cable With Offset Pins. | IDC34 Custom Cable            | CBL007              | Any Shop               |                                      |                        |
| J1, J2, J3, J4, J6, J7, J9, J10, J11, J24, J26, J27, J32                                 | 13       |         | Header, 2.54 mm, 2x1, Tin, TH                                                       | Header, 2.54 mm, 2x1, TH      | TSW-102-07-T-S      | Samtec                 |                                      |                        |
| J5, J30                                                                                  | 2        |         | Header, 2.54 mm, 3x1, Tin, TH                                                       | Header, 2.54 mm, 3x1, TH      | TSW-103-07-T-S      | Samtec                 |                                      |                        |
| J8, J12, J31                                                                             | 3        |         | Terminal Block, 5 mm, 2x1, Tin, TH                                                  | Terminal Block, 5 mm, 2x1, TH | 691 101 710 002     | Wurth Elektronik eiSos |                                      |                        |

<sup>(1)</sup> Unless otherwise noted in the Alternate Part Number and/or Alternate Manufacturer columns, all parts may be substituted with equivalents.

**Table 2. Bill of Materials (continued)**

| Designator                                                                                                                                                       | Quantity | Value | Description                                                     | Package Reference                    | Part Number          | Manufacture                 | Alternate Part Number <sup>(1)</sup> | Alternate Manufacturer |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-------|-----------------------------------------------------------------|--------------------------------------|----------------------|-----------------------------|--------------------------------------|------------------------|
| J13, J14                                                                                                                                                         | 2        |       | Receptacle, 50 mil, 2x1, Gold, R/A, TH                          | Receptacle, 2x1, 50mil, R/A          | 851-43-002-20-001000 | Mill-Max                    |                                      |                        |
| J15, J16, J17, J18, J19, J20                                                                                                                                     | 6        | 1x3   | Header, 100mil, 3x1, Gold, TH                                   | PBC03SAAN                            | PBC03SAAN            | Sullins Connector Solutions |                                      |                        |
| J21                                                                                                                                                              | 1        |       | Receptacle, 50 mil, 8x1, Gold, R/A, TH                          | Receptacle, 8x1, 50mil, R/A          | 851-43-008-20-001000 | Mill-Max                    |                                      |                        |
| J22, J25                                                                                                                                                         | 2        |       | SOCKET .050" GRID SIP 4 POS R/A, TH                             | R/A 4x1 receptacle                   | 851-43-004-20-001000 | Mill-Max                    |                                      |                        |
| J23                                                                                                                                                              | 1        |       | Connector, Receptacle, Micro-USB Type AB, R/A, Bottom Mount SMT | Connector, USB Micro AB              | DX4R205JJAR1800      | JAE Electronics             |                                      |                        |
| J28                                                                                                                                                              | 1        |       | Header (shrouded), 2.54 mm, 17x2, Gold, TH                      | Header (shrouded), 2.54 mm, 17x2, TH | N2534-6002-RB        | 3M                          |                                      |                        |
| J29                                                                                                                                                              | 1        |       | Power Jack, mini, 2.5mm OD, R/A, TH                             | Jack, 14.5x11x9mm                    | RAPC712X             | Switchcraft                 |                                      |                        |
| L1                                                                                                                                                               | 1        | 2.2uH | Inductor, Shielded, Composite, 2.2uH, 3.7A, 0.02 ohm, SMD       | 4x2x4mm                              | XFL4020-222MEB       | Coilcraft                   |                                      |                        |
| LS1                                                                                                                                                              | 1        |       | TAS2555 EVM Speaker                                             | Speaker, 20x26mm.                    | DMSP1217P-J-01       | AAC Technologies            |                                      |                        |
| Q1                                                                                                                                                               | 1        | 0.3V  | Transistor, NPN, 40V, 0.15A, SOT-23                             | SOT-23                               | MMBT2222A            | Fairchild Semiconductor     |                                      |                        |
| R1, R3, R6, R15, R38, R39, R43, R44, R49                                                                                                                         | 9        | 10.0k | RES, 10.0k ohm, 1%, 0.063W, 0402                                | 0402                                 | CRCW040210K0FKED     | Vishay-Dale                 |                                      |                        |
| R2                                                                                                                                                               | 1        | 22.0k | RES, 10.0k ohm, 1%, 0.063W, 0402                                | 0402                                 | CRCW040210K0FKED     | Vishay-Dale                 |                                      |                        |
| R4, R5, R11, R12, R30, R31, R32, R33                                                                                                                             | 8        | 0     | RES, 0 ohm, 5%, 0.063W, 0402                                    | 0402                                 | CRCW04020000Z0ED     | Vishay-Dale                 |                                      |                        |
| R13, R34, R36, R47                                                                                                                                               | 4        | 47k   | RES, 47 k, 5%, 0.063 W, 0402                                    | 0402                                 | CRCW040247K0JNED     | Vishay-Dale                 |                                      |                        |
| R14, R35, R37, R48                                                                                                                                               | 4        | 2.2k  | RES, 2.2 k, 5%, 0.063 W, 0402                                   | 0402                                 | CRCW04022K20JNED     | Vishay-Dale                 |                                      |                        |
| R16                                                                                                                                                              | 1        | 4.99k | RES, 4.99k ohm, 1%, 0.063W, 0402                                | 0402                                 | CRCW04024K99FKED     | Vishay-Dale                 |                                      |                        |
| R17, R18                                                                                                                                                         | 2        | 10.0k | RES, 10.0 k, 1%, 0.063 W, 0402                                  | 0402                                 | CRCW040210K0FKED     | Vishay-Dale                 |                                      |                        |
| R19, R21, R22, R24, R45                                                                                                                                          | 5        | 49.9  | RES, 49.9 ohm, 1%, 0.063W, 0402                                 | 0402                                 | CRCW040249R9FKED     | Vishay-Dale                 |                                      |                        |
| R20                                                                                                                                                              | 1        | 15.0k | RES, 15.0k ohm, 1%, 0.063W, 0402                                | 0402                                 | CRCW040215K0FKED     | Vishay-Dale                 |                                      |                        |
| R23                                                                                                                                                              | 1        | 3.09k | RES, 3.09k ohm, 1%, 0.063W, 0402                                | 0402                                 | CRCW04023K09FKED     | Vishay-Dale                 |                                      |                        |
| R25                                                                                                                                                              | 1        | 1.50k | RES, 1.50k ohm, 1%, 0.063W, 0402                                | 0402                                 | CRCW04021K50FKED     | Vishay-Dale                 |                                      |                        |
| R26, R27                                                                                                                                                         | 2        | 27.4  | RES, 27.4 ohm, 1%, 0.063W, 0402                                 | 0402                                 | CRCW040227R4FKED     | Vishay-Dale                 |                                      |                        |
| R28, R40                                                                                                                                                         | 2        | 360   | RES, 360 ohm, 5%, 0.063W, 0402                                  | 0402                                 | CRCW0402360RJNED     | Vishay-Dale                 |                                      |                        |
| R29                                                                                                                                                              | 1        | 100k  | RES, 100k ohm, 1%, 0.063W, 0402                                 | 0402                                 | CRCW0402100KFKED     | Vishay-Dale                 |                                      |                        |
| R41                                                                                                                                                              | 1        | 0     | RES, 0, 5%, 0.063 W, 0402                                       | 0402                                 | CRCW04020000Z0ED     | Vishay-Dale                 |                                      |                        |
| R42, R46                                                                                                                                                         | 2        | 0     | RES, 0, 5%, 0.1 W, 0603                                         | 0603                                 | CRCW06030000Z0EA     | Vishay-Dale                 |                                      |                        |
| S1, S2                                                                                                                                                           | 2        |       | Switch, Tactile, SPST-NO, 0.05A, 12V, SMT                       | Switch, 4.4x2x2.9 mm                 | TL1015AF160QG        | E-Switch                    |                                      |                        |
| SHUNT1, SHUNT2, SHUNT3, SHUNT4, SHUNT5, SHUNT6, SHUNT7, SHUNT8, SHUNT9, SHUNT10, SHUNT11, SHUNT12, SHUNT13, SHUNT14, SHUNT15, SHUNT16, SHUNT17, SHUNT18, SHUNT19 | 19       | 1x2   | Shunt, 100mil, Gold plated, Black                               | Shunt                                | SNT-100-BK-G         | Samtec                      | 969102-0000-DA                       | 3M                     |

**Table 2. Bill of Materials (continued)**

| Designator                                                            | Quantity | Value  | Description                                                                                                                                                               | Package Reference          | Part Number         | Manufacture           | Alternate Part Number <sup>(1)</sup> | Alternate Manufacturer |
|-----------------------------------------------------------------------|----------|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|---------------------|-----------------------|--------------------------------------|------------------------|
| TP1, TP2, TP3, TP4, TP5, TP8, TP9, TP10, TP11, TP12, TP13, TP14, TP15 | 13       | Orange | Test Point, Miniature, Orange, TH                                                                                                                                         | Orange Miniature Testpoint | 5003                | Keystone              |                                      |                        |
| TP6, TP7                                                              | 2        | Black  | Test Point, Miniature, Black, TH                                                                                                                                          | Black Miniature Testpoint  | 5001                | Keystone              |                                      |                        |
| U1                                                                    | 1        |        | WCSP30-YFF                                                                                                                                                                | YFF00030BFBA               | TAS2560YFF          | Texas Instruments     |                                      | Texas Instruments      |
| U2                                                                    | 1        |        | EEPROM, 256KBIT, 400KHZ, MSOP8                                                                                                                                            | MSOP-8                     | 24LC256-I/MS        | Microchip             |                                      |                        |
| U3                                                                    | 1        |        | TCA9406 Dual Bidirectional 1-MHz I2C-BUS and SMBus Voltage Level-Translator, 1.65 to 3.6 V, -40 to 85 degC, 8-pin US8 (DCU), Green (RoHS & no Sb/Br)                      | DCU0008A                   | TCA9406DCUR         | Texas Instruments     | Equivalent                           | Texas Instruments      |
| U4, U5, U7, U10                                                       | 4        |        | Dual 1-of-4 FET Multiplexer / Demultiplexer 2.5-V / 3.3-V Low-Voltage High-Bandwidth Bus Switch, RGY0016A                                                                 | RGY0016A                   | SN74CB3Q3253RGYR    | Texas Instruments     |                                      | Texas Instruments      |
| U6, U11, U20                                                          | 3        |        | 4-BIT DUAL-SUPPLY BUS TRANSCEIVER WITH CONFIGURABLE VOLTAGE TRANSLATION AND 3-STATE OUTPUTS, RSV0016A                                                                     | RSV0016A                   | SN74AVC4T774RSVR    | Texas Instruments     |                                      | None                   |
| U8                                                                    | 1        |        | Low-Voltage 8-Bit I2C and SMBus I/O Expander, 1.65 to 5.5 V, -40 to 85 degC, 16-pin UQFN (RSV), Green (RoHS & no Sb/Br)                                                   | RSV0016A                   | TCA6408ARSVR        | Texas Instruments     | Equivalent                           | None                   |
| U9                                                                    | 1        |        | Single 2-Line to 1-Line Data Selector Multiplexer, DCT0008A                                                                                                               | DCT0008A                   | SN74LVC2G157DCTR    | Texas Instruments     |                                      | None                   |
| U12                                                                   | 1        |        | Single Output LDO, 1 A, Fixed 3.3 V Output, 2.2 to 5.5 V Input, with Reverse Current Protection, 6-pin SOT-223 (DCQ), -40 to 125 degC, Green (RoHS & no Sb/Br)            | DCQ0006A                   | TPS73733DCQ         | Texas Instruments     | Equivalent                           | None                   |
| U13                                                                   | 1        |        | Single Output Low Noise LDO, 400 mA, Fixed 1.8 V Output, 1.7 to 5.5 V Input, with Reverse Current Protection, 5-pin SOT-23 (DBV), -40 to 85 degC, Green (RoHS & no Sb/Br) | DBV0005A                   | TPS73618DBVR        | Texas Instruments     | Equivalent                           | None                   |
| U14                                                                   | 1        |        | Single Bus Buffer Gate With 3-State Output, DCK0005A                                                                                                                      | DCK0005A                   | SN74LVC1G125DCKR    | Texas Instruments     | SN74LVC1G125DCKT                     | Texas Instruments      |
| U15, U16, U17, U18                                                    | 4        |        | DUAL BUFFER GATE, DRL0006A                                                                                                                                                | DRL0006A                   | SN74LVC2G34DRLR     | Texas Instruments     |                                      | None                   |
| U19                                                                   | 1        |        | USB Streaming Controller, PFB0048A, NRND                                                                                                                                  | PFB0048A                   | TAS1020BPFB         | Texas Instruments     | TAS1020BPFB                          | Texas Instruments      |
| U21                                                                   | 1        |        | Triple BUFFER GATE                                                                                                                                                        | DRL0006A                   | SN74LVC3G34DCUR     | Texas Instruments     |                                      | None                   |
| Y1                                                                    | 1        |        | Oscillator, 6MHz, 3.3V, SMD                                                                                                                                               | 2.5x1x2.5mm                | 625L3I006M00000     | CTS Electrocomponents |                                      |                        |
| C4                                                                    | 0        | 22uF   | CAP, CERM, 22 µF, 16 V, +/- 10%, X5R, 0805                                                                                                                                | 0805                       | C2012X5R1C226K125AC | TDK                   |                                      |                        |
| C21, C22                                                              | 0        | 1000pF | CAP, CERM, 1000pF, 50V, +/-5%, COG/NP0, 0402                                                                                                                              | 0402                       | GRM1555C1H102JA01D  | MuRata                |                                      |                        |
| C23, C24                                                              | 0        | 4700pF | CAP, CERM, 4700 pF, 50 V, +/- 10%, X7R, 0402                                                                                                                              | 0402                       | GRM155R71H472KA01D  | MuRata                |                                      |                        |
| FID1, FID2, FID3                                                      | 0        |        | Fiducial mark. There is nothing to buy or mount.                                                                                                                          | Fiducial                   | N/A                 | N/A                   |                                      |                        |
| R7, R8                                                                | 0        | 1.00k  | RES, 1.00 k, 1%, 0.063 W, 0402                                                                                                                                            | 0402                       | CRCW04021K00FKED    | Vishay-Dale           |                                      |                        |
| R9, R10                                                               | 0        | 2.00k  | RES, 2.00 k, 1%, 0.063 W, 0402                                                                                                                                            | 0402                       | CRCW04022K00FKED    | Vishay-Dale           |                                      |                        |

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- 3 *Regulatory Notices:*

- 3.1 *United States*

### 3.1.1 *Notice applicable to EVMs not FCC-Approved:*

This kit is designed to allow product developers to evaluate electronic components, circuitry, or software associated with the kit to determine whether to incorporate such items in a finished product and software developers to write software applications for use with the end product. This kit is not a finished product and when assembled may not be resold or otherwise marketed unless all required FCC equipment authorizations are first obtained. Operation is subject to the condition that this product not cause harmful interference to licensed radio stations and that this product accept harmful interference. Unless the assembled kit is designed to operate under part 15, part 18 or part 95 of this chapter, the operator of the kit must operate under the authority of an FCC license holder or must secure an experimental authorization under part 5 of this chapter.

### 3.1.2 *For EVMs annotated as FCC – FEDERAL COMMUNICATIONS COMMISSION Part 15 Compliant:*

## CAUTION

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

## FCC Interference Statement for Class A EVM devices

*NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.*

## FCC Interference Statement for Class B EVM devices

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- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

### 3.2 Canada

#### 3.2.1 For EVMs issued with an Industry Canada Certificate of Conformance to RSS-210

##### Concerning EVMs Including Radio Transmitters:

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

##### Concernant les EVMs avec appareils radio:

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

##### Concerning EVMs Including Detachable Antennas:

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication. This radio transmitter has been approved by Industry Canada to operate with the antenna types listed in the user guide with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

##### Concernant les EVMs avec antennes détachables

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante. Le présent émetteur radio a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés dans le manuel d'usage et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

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[http://www.tij.co.jp/lstds/ti\\_ja/general/eStore/notice\\_01.page](http://www.tij.co.jp/lstds/ti_ja/general/eStore/notice_01.page)

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2. Use EVMs only after User obtains the license of Test Radio Station as provided in Radio Law of Japan with respect to EVMs, or
3. Use of EVMs only after User obtains the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to EVMs. Also, do not transfer EVMs, unless User gives the same notice above to the transferee. Please note that if User does not follow the instructions above, User will be subject to penalties of Radio Law of Japan.

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