

TAS5414B and TAS5424B Evaluation Module (EVM)

User's Guide



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1	Quick-Start Guide	5
1.1	Overview	5
1.2	Software Installation	6
1.3	Connections	6
1.4	Initial Power Up	6
1.5	Basic Graphical User Interface Controls	7
2	EVM Description	7
2.1	Description of Inputs	7
2.2	Description of Outputs	7
2.3	Controls	8
2.4	Indicator Description	9
3	Graphical User Interface	9
3.1	Introduction	9
3.2	Software Installation	9
3.3	Hardware Installation	9
3.4	Using the GUI	9
4	TAS5414/TAS5424B EVM Schematics	11
5	Board Layouts	15
6	Bill of Materials	23
7	Related Documentation from Texas Instruments	25

List of Figures

1	EVM to I ² C Device Connections	5
2	Connections for Input, Speaker Loads, Power, and I ² C	6
3	End Panel for I ² C Connections	6
4	Main Window	7
5	Wiring Harness for Power and Speaker Connections.....	8
6	Power and Speaker Connections to the EVM.....	8
7	TAS5414BPHD Top Layer	15
8	TAS5414BPHD Mid Layer Level 1	15
9	TAS5414BPHD Mid Layer Level 2	16
10	TAS5414BPHD Bottom Layer	16
11	TAS5414BPHD Top Silkscreen Overlay	17
12	TAS5414BPHD Bottom Silkscreen Overlay.....	17
13	TAS5414BDKD Top Layer	18
14	TAS5414BDKD Mid Layer Level 1	18
15	TAS5414BDKD Mid Layer Level 2	19
16	TAS5414BDKD Bottom Layer	19
17	TAS5414BDKD Top Silkscreen Overlay	20
18	TAS5414BDKD Bottom Silkscreen Overlay.....	20
19	TAS5424BDKD Top Layer	21
20	TAS5424BDKD Mid Layer Level 1	21
21	TAS5424BDKD Mid Layer Level 2	22
22	TAS5424BDKD Bottom Layer	22
23	TAS5424BDKD Top Silkscreen Overlay	23

List of Tables

1	Bill of Materials for TAS5414BPHD	23
2	Bill of Materials for TAS5414BDKD	24
3	Bill of Materials for TAS5424BDKD	25

TAS5414B and TAS5424B Evaluation Module (EVM) User's Guide

The TAS5414B/TAS5424B evaluation module (EVM) is intended to be used to demonstrate the capabilities of the device. All the device features can be accessed through the hardware and the software graphical user interface (GUI) supplied. This user's guide contains a description of the EVM and the GUI. Included are the EVM schematics, bill of materials, and the board layout.

1 Quick-Start Guide

This section provides a guide to set up and power up the EVM without the details of its operation. For a more-detailed description, read the complete user's guide.

1.1 Overview

The EVM consists of a single printed circuit board (PCB) mounted inside a metal chassis for EMC testing. The EVM must have an external I²C controller board to function. The USB-to-I²C controller board connects to a personal computer (PC) through a USB cable. The EVM connects to the I²C controller through a supplied 6-pin DIN cable. The PC needs the graphical user interface (GUI) software to control the EVM. See [Figure 1](#) for the device connections.

Software is available on the enclosed CDrom and provides the GUI, this document, and any other necessary documents. Hardware provided in the EVM modules consists of the EVM, an I²C controller board, a USB cable, a 6-pin DIN cable, and speaker cables.

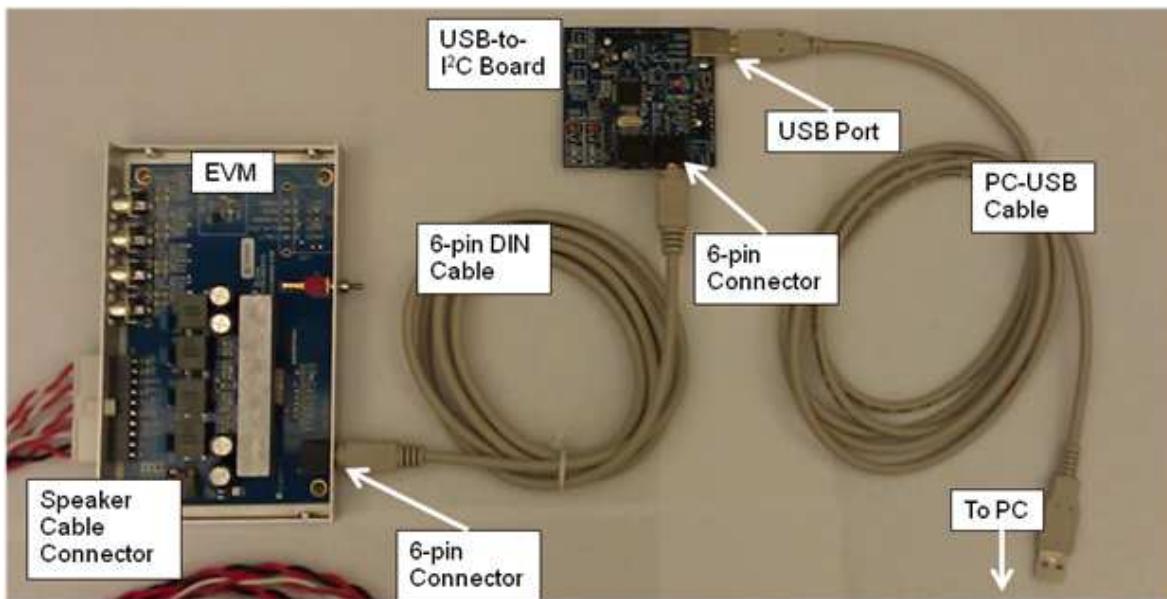


Figure 1. EVM to I²C Device Connections

1.2 Software Installation

The software is provided on the TI Web site. Run the setup.exe program to install the GUI. For more details, see [Section 1.5, Basic Graphical User Interface Controls](#).

1.3 Connections

The connections are for an analog signal for the input, speaker loads, power, and I²C. The audio inputs are made through the four RCA connectors. The power connectors and speaker connectors are made using the 10-pin connector.

The I²C connections are made through a 6-pin DIN connector. The provided adapter PCB and cable connect the EVM to the PC. The adapter PCB is an I²C-to-USB converter, which is a human-interface device (HID) and is automatically recognized by the PC when connected. Therefore, no drivers are needed.

The basic connections are: PVDD or power is connected to the EVM through the supplied 10-pin connector with the twisted red and black wires. The speakers or loads are also connected through the same 10-pin connector with the twisted red and white wires. The 6-pin DIN is connected to the I²C-to-USB adapter board. See [Figure 2](#) for EVM input details.

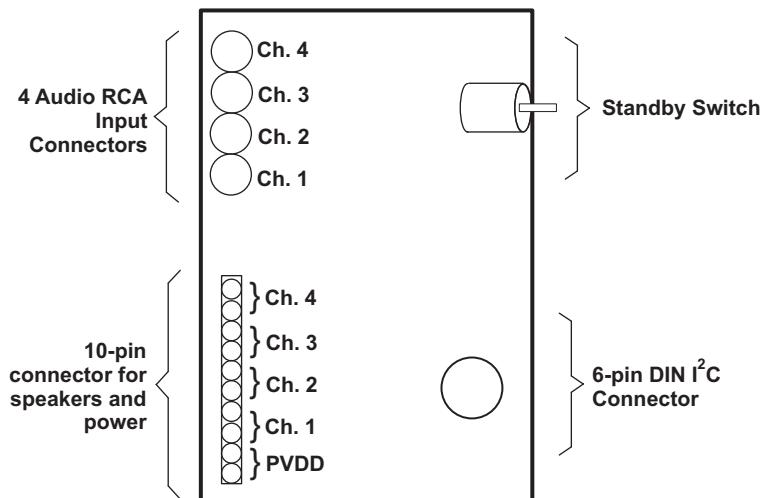


Figure 2. Connections for Input, Speaker Loads, Power, and I²C

1.4 Initial Power Up

Before applying power, check to make sure the standby control switch is in the Standby OFF position, as shown in [Figure 3](#). If the switch is in the Standby ON position, then at power up the I²C LED indicator on the GUI is red (see [Section 3.4.3](#) for more details).

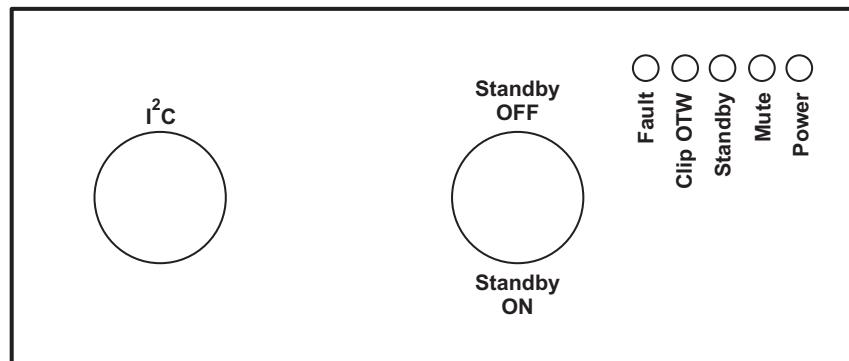


Figure 3. End Panel for I²C Connections

Apply power: the Standby, Mute, and Power LEDs should be on. The Fault LED may also be on, but not necessarily. This indicates that the unit is powered, and the TAS5414B or TAS5424B is in Standby Mode and Mute Mode. The fault indicated is an undervoltage fault during power up. This is normal and is cleared by reading I²C Register 0x00 (the Read Faults button) twice. Reading the faults once clears the faults, and the second read is to ensure that all the faults have been cleared.

1.5 Basic Graphical User Interface Controls

The default state for the device is mute. To unmute, click the Play All button at the top left of the window. To mute, click the Mute All button. The main EVM window is shown in [Figure 4](#).



Figure 4. Main Window

2 EVM Description

2.1 Description of Inputs

2.1.1 Analog Inputs

The TAS5424B EVM provides balanced input and the TAS5414B EVM provides unbalanced (single-ended) inputs. The four RCA jacks on either EVM are provided for the audio input. The unbalanced inputs have the shield of the RCA connected to ground. The balanced inputs have the plus (+) input on the center pin of the RCA and the minus (-) input on the shield. The balanced ground can be connected to the chassis or Power- (GND).

2.1.2 Power

The EVM requires one dc power connection. The connection is made through a 10-pin supplied connector. The black wire is ground and the red wire is connected to PVDD, which can range from 6 to 24 Vdc.

2.2 Description of Outputs

2.2.1 Speaker and Power Connections

The 10-pin connector on the EVM and the wiring harness provide the power connections and the speaker connections. The power connection consists of a pair of red and black twisted wires, which correspond to the plus (+) output and minus (-) output, respectively. This pair of wires must be attached to a power supply.

The speaker connections consist of the remaining four pairs of red and white twisted wire. Each pair of red and white wires corresponds with a channel. The red wire corresponds to the plus (+) output, and the white wire corresponds to the minus (−) output. These wires must be terminated to a speaker load or resistive load.

See [Figure 2](#) for more details on the 10-pin connector on the EVM, [Figure 5](#) for more details about the speaker cables, and [Figure 6](#) for the speaker cables connection to the EVM.

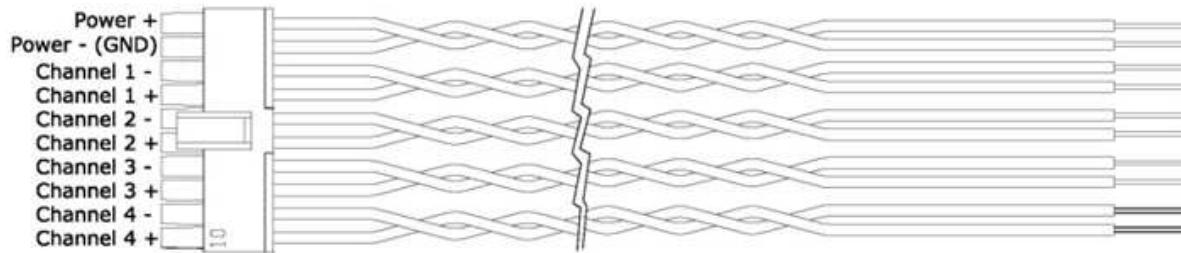


Figure 5. Wiring Harness for Power and Speaker Connections

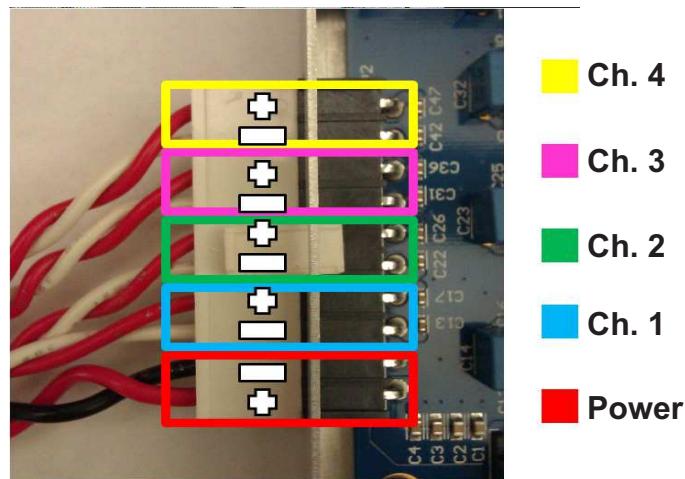


Figure 6. Power and Speaker Connections to the EVM

NOTE: Do not connect any of the speaker outputs to ground. The TAS5414B and TAS5424B have full bridged outputs; connecting to ground triggers a fault.

The outputs can be paralleled by connecting the plus (+) of one channel to the plus (+) of the other channel. The minus (−) connection of one channel and the minus (−) connection of the other channel must be connected also. See the data sheet for more details on parallel outputs (PBTL).

2.3 Controls

2.3.1 Standby

The standby switch is located next to the 6-pin DIN I²C input connector. Having the toggle in the Standby ON position forces the TAS5414B or TAS5424B into the standby mode. This is the same as a power-on reset (POR). POR shuts down the device, and I²C is not functional.

Setting the switch to the Standby OFF position puts the device in the EVM into its default power up mode. The I²C registers are set to their defaults. The amplifier output is in Hi-Z mode.

2.4 Indicator Description

There are five LED indicators on the chassis next to the standby switch. The LED farthest away from the standby switch is for the 3.3 Vdc supply. The 3.3 V supply is needed for the LEDs and the standby circuit. The other four LEDs indicate the four non-I²C output pins: FAULT, CLIP_OTW, STANDBY, and MUTE. The FAULT and CLIP_OTW signals are also routed to the 6-pin DIN for the GUI. In normal play mode, these four LEDs should not light.

3 Graphical User Interface

3.1 Introduction

The TAS5414B/TAS5424B GUI software is designed to demonstrate the features of the TAS5414B and TAS5424B. It is also able to assist the applications programmer in generating and saving the desired operating characteristics.

The TAS5414B/TAS5424B GUI has a feature by which it can log the I²C data being sent to the device. This can be helpful to the programmer in understanding the I²C commands needed for proper function.

3.2 Software Installation

The GUI software is available on the CDrom provided with the EVM. Run the setup.exe program on a personal computer (PC) with the Windows OS to install the GUI.

The software is currently supported up to Windows XP and is not supported by Windows 7.

The PC may need to connect to the internet to download the Microsoft .Net 2.0 environment, if it is not already on the PC.

3.3 Hardware Installation

In the EVM package is a small PCB labeled USB2IIC2 on the PCB. This is the USB-to-I²C converter to communicate from the PC to the EVM. Connect the USB cable to the PC and the PCB. Connect the 6-pin cable to the connector labeled I²C on the converter PCB to the 6-pin connector on the EVM. The USB connection provides power for this card. The PC should automatically connect to the USB-connected PCB. See [Figure 1, EVM to I²C Device Connections](#), for more details.

3.4 Using the GUI

3.4.1 The Main Window

3.4.1.1 TAS5414 Control Panel

The control panel consists of six buttons that perform basic functions on all four channels.

Reset: This button sends a software reset to the device via I²C. It is equivalent to sending 0x9F to register 0x0C. All the I²C defaults are restored.

Read Faults: This button reads the two fault registers 0x00 and 0x01 and reports the data to the Device Status Panel

Load Diag: This button runs a script to perform the built-in load diagnostics and reports any faults to the Device Status Panel. The details are displayed for each channel.

Play All: This button uses I²C to write 0x00 to register 0x0C which places all four channels into play mode.

Mute All: This button uses I²C to set all channels to mute mode by writing 0x10 to register 0x0C. All channels switch at 50% duty cycle, and no signal will pass from the input to the output.

Hi-Z All: This button places all four channel outputs into a high-impedance state by writing 0x1F to register 0x0C. The device is first placed in mute. The Low-Low state is then invoked. Lastly, the outputs are placed in Hi-Z.

3.4.2 Device Status Panel

Device Panel Title: The title at the top of the Device Status Panel shows which device the GUI is set to communicate. The four options are: Master, Slave1, Slave 2, and Slave 3. This is changed in the menu item Device Select.

Global: This provides fault feedback from the device. If a fault occurs a red Fault is indicated. Read the fault detail in the register 0x00 and 0x01.

Temperature: This shows the temperature of the device. When the device is below 125°C, the color is green. At Level 1 OTW, the color is yellow. At Level 2 OTW, the color is orange. At Level 3 OTW, the color is red.

Channel 1-4: These four items provide individual channel output states: Hi-Z, Mute, Low-Low, and Play. The gain setting will be displayed with the play indication.

Fsw: This item provides the switching frequency of the outputs.

3.4.3 Connection Status Panel

There are two LED indicators to provide connection status.

USB: This indicator is gray when there is no USB connection to the USB2I2C PCB. The I²C LED is off. The indicator is green when a connection is good.

I²C: This indicator is red when there is a USB connection, but no I²C connection. A green indicator shows that I²C communication is functioning properly. If the LED is off, then there is no USB connection.

3.4.4 I²C Log Panel

All the I²C commands that are sent or received by the TAS5414B and TAS5424B are shown in this panel except for I²C polling information. The displayed data can be copied to the clipboard for a programming aid.

This type of information can be controlled by the I²C Log menu item. An R indicates a value read from the device and a W indicates a value sent to the device. Valuable comments are also provided. Polling I²C reads are not shown to prevent over-running the panel with background reads. See [Section 3.4.7](#) for further details on each tab.

3.4.5 Register Overview Panel

This panel provides the hexadecimal (hex) data for each I²C register. The hex data in the control registers can be directly changed here and sent to the device with the Apply button. Any changes made to the data are cleared by clicking the Cancel button. The Register Detail panel is changed either by changing the hex value of the register directly or by clicking on the register and changing the specific bit in the Register Detail panel. (See [Section 3.4.6](#))

3.4.6 Register Detail Panel

This panel provides a detailed view of each register. By clicking on a register in the Register Overview panel, the details of that register are shown. Each bit has its description and its value shown by the checkbox. A checkbox with a check mark indicates a logical 1 and an unchecked checkbox indicates a logical 0. Changes to each bit can be made by clicking on the checkbox. The changes are sent to the device by clicking on the Apply button in the Register Overview panel.

3.4.7 Menu

File: In this menu, the Exit function can be found at the bottom of the drop-down menu.

Device Select: The I²C device select value can be changed in the Menu. For the EVM, use the default value, which is Master.

Macros: In this menu, macros can be used. Macros are currently not being implemented at this time.

Custom Macros: This allows the users to create then save their own macros for later use.

Preloaded Macros: This menu item provides a list of built-in macros to perform typical I²C routines.

Read: The Read panel controls are located in this menu

Fault Registers: When selected, the values of the fault registers are displayed in the I²C log. Note that reading fault registers is different from reading faults. The data in a fault register is cleared on read. The actual value displayed may show the fault, but the value in the device register will be cleared. A second read of the fault registers will show a cleared fault register.

Load Diagnostic Registers: When selected, the values of the load diagnostic registers are read.

Status Registers: When selected, the values of the status registers are read.

Control Registers: When selected, the values of the control registers are read.

All Registers: When selected, the values of all the registers are read.

Options: The Options panel controls are located in this menu

Crosstalk Compensation Enabled: When selected, Crosstalk is optimized. When this option is disabled, the standard operation optimizes PSRR.

180 Phase Difference: When selected, the channels switch at 180° phase difference

Switching Frequency: When selected, the switching-frequency setting for AM avoidance can be changed to 357 kHz or 500 kHz.

All Channels Gain: When selected, the gain on all the channels can be changed to 12 dB, 20 dB, or 32 dB.

I²C Log: The I²C Log panel controls are located in this menu.

Enabled: When selected, this menu option shows the I²C Log panel. When disabled, the I²C Log panel is hidden.

Show I²C Reads: When selected, this menu option shows the values read from the device. These are indicated with a R.

Show I²C Writes: When selected, this menu option shows the values that are sent to the device. These are indicated with a W.

Show Comments: When selected, this menu option shows the comments. The comments are not shown when this item is not selected.

Clear: This menu item clears the log data. The data is lost.

I²C Polling: The I²C Polling panel controls are located in this menu

Enabled: When selected, the I²C actively samples the status registers specifically. When I²C Polling is disabled, there is no guarantee that the register readings are valid.

Rate: When selected, the poll rate can be changed (in ms). The default setting is 250 ms.

Help: This menu item provides four items:

About: This provides the revision level of the software.

User Guide: This opens the User Guide in the AdobeTM AcrobatTM ReaderTM. Acrobat Reader needs to be available on the PC.

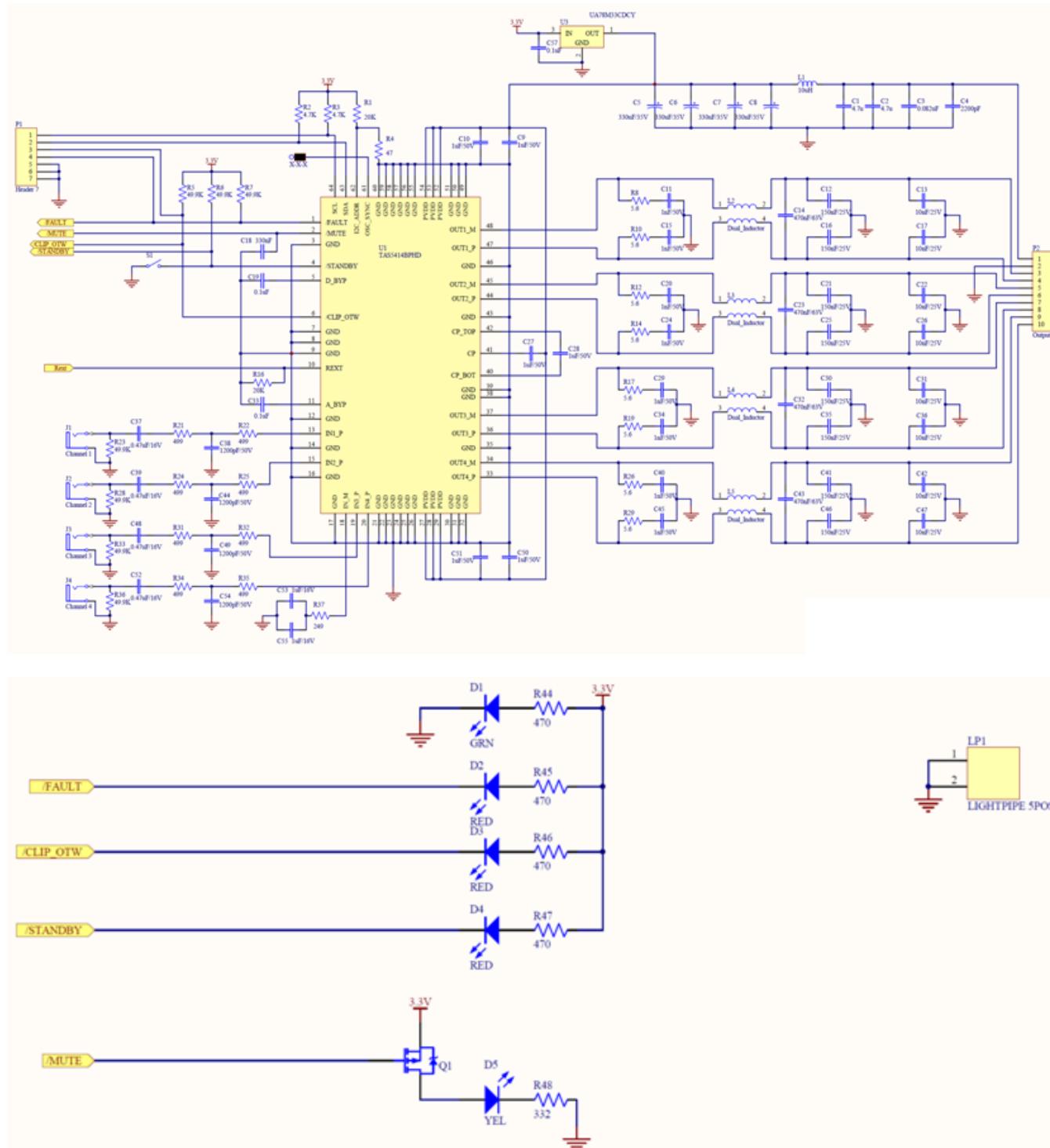
Device Webpage: This opens the TAS5414B/TAS5424B web page at the Texas Instruments Web site in the default browser. The most-current data sheets, application reports, and GUI software is available for downloading.

Check for EVM Updates: This checks to see if any new updates of the GUI are available.

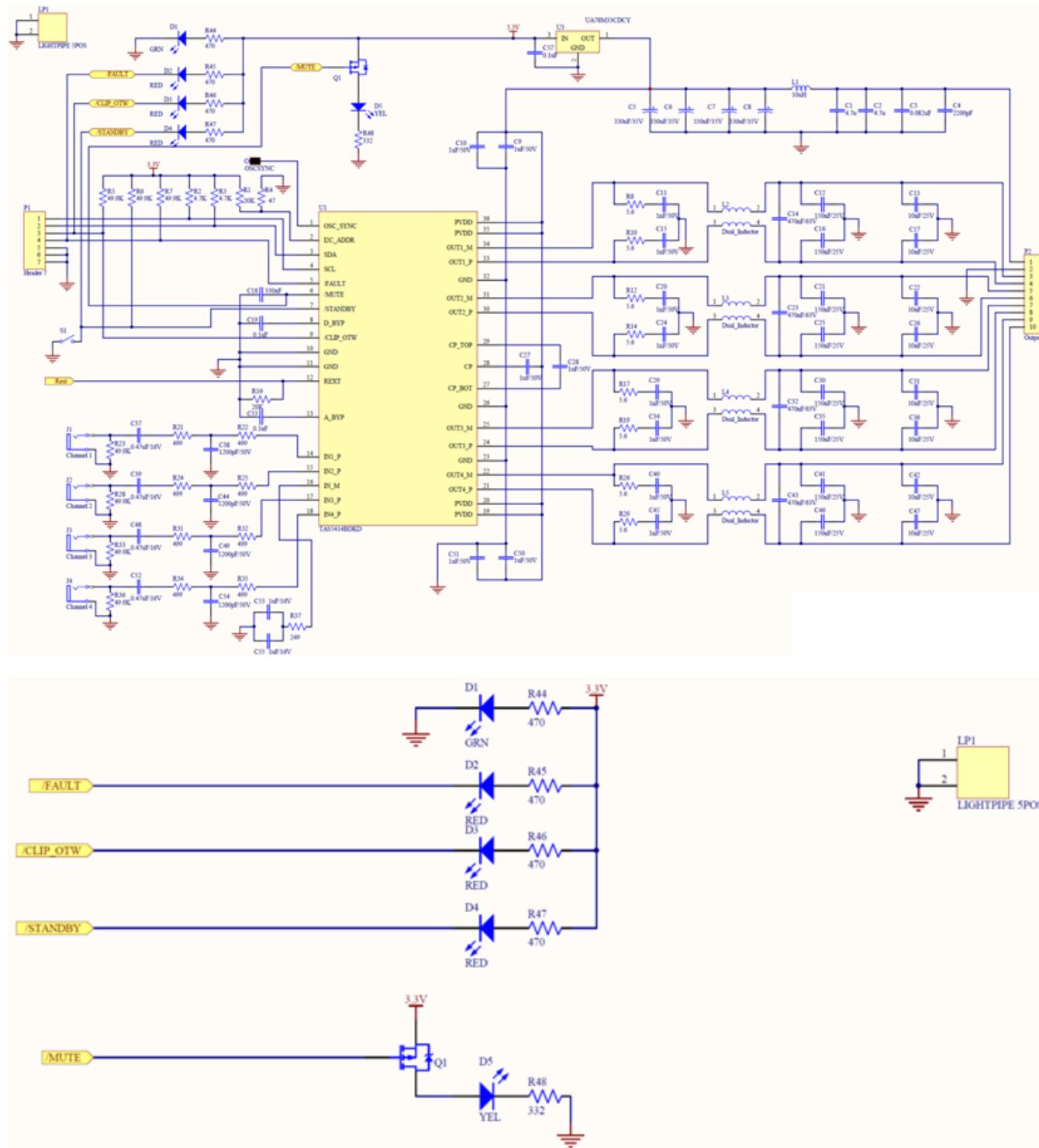
4 TAS5414/TAS5424B EVM Schematics

The schematics for the TAS5414BPHD, TAS5414BDKD, and TAS5424BDKD are shown on the following pages.

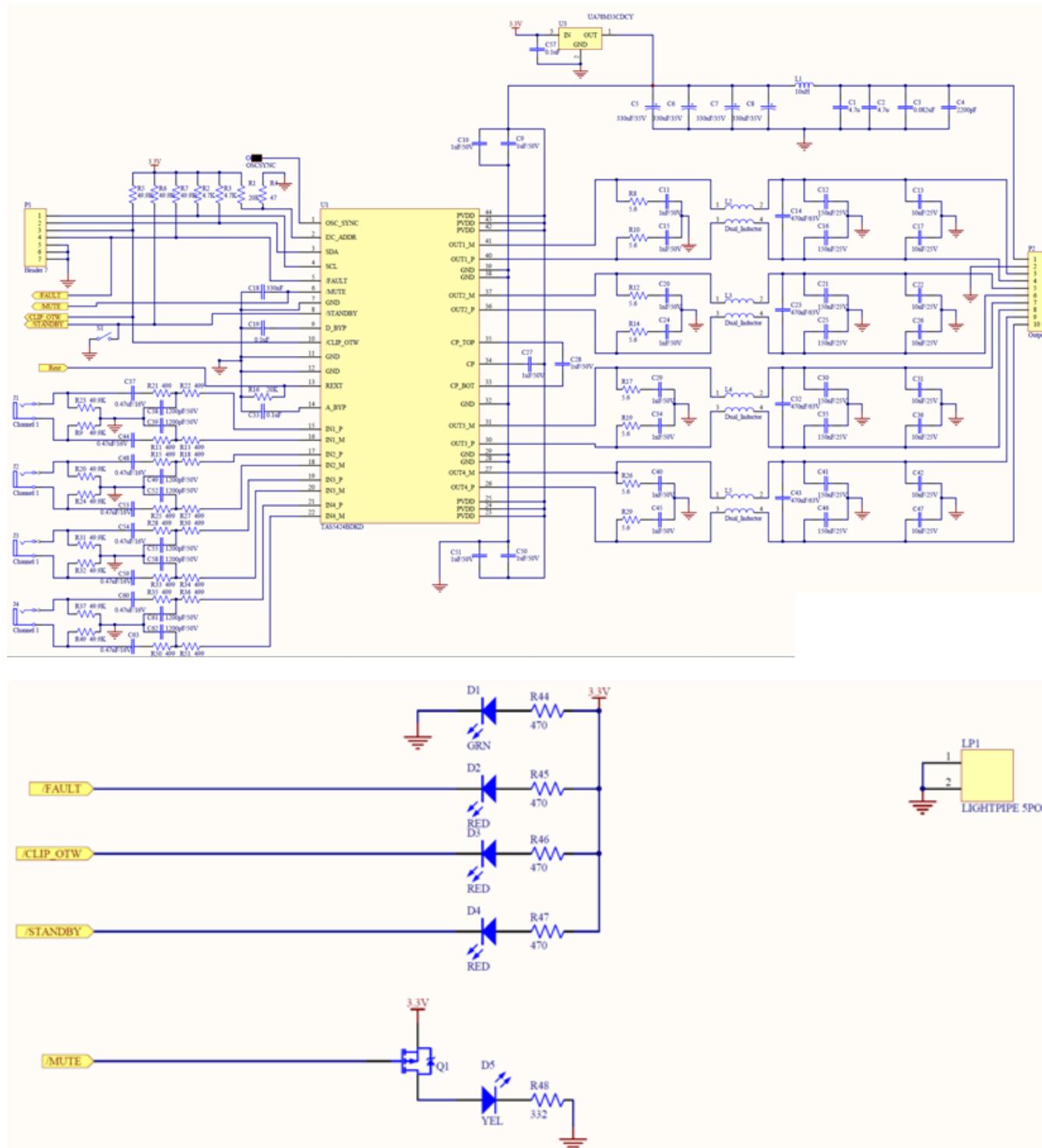
TAS5414BPHD EVM Schematics



TAS5414BDKD EVM Schematics



TAS5424BDKD EVM Schematics



5 Board Layouts

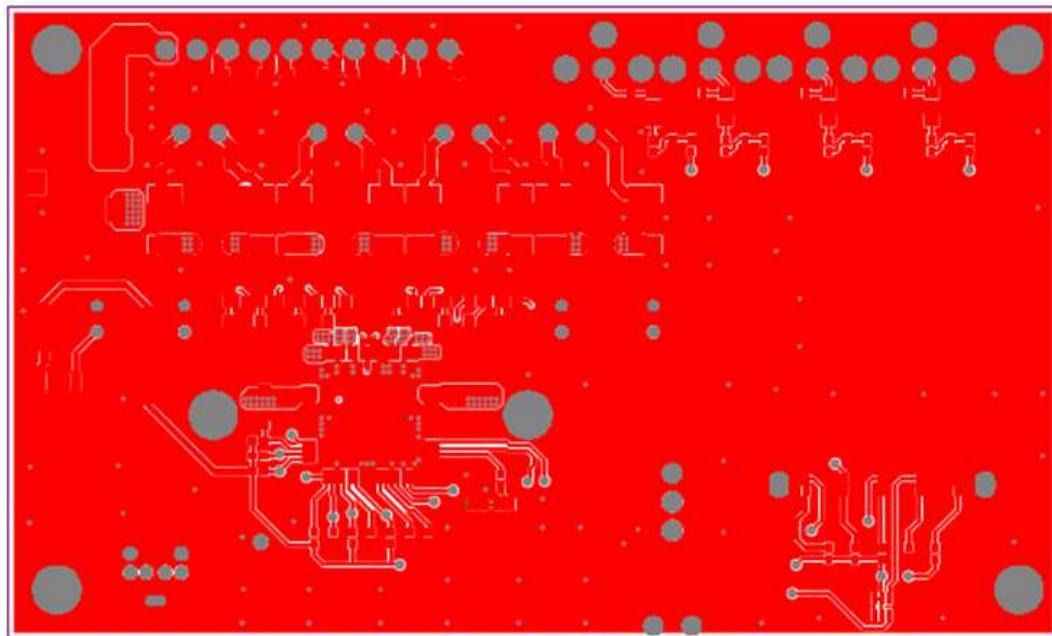


Figure 7. TAS5414BPHD Top Layer

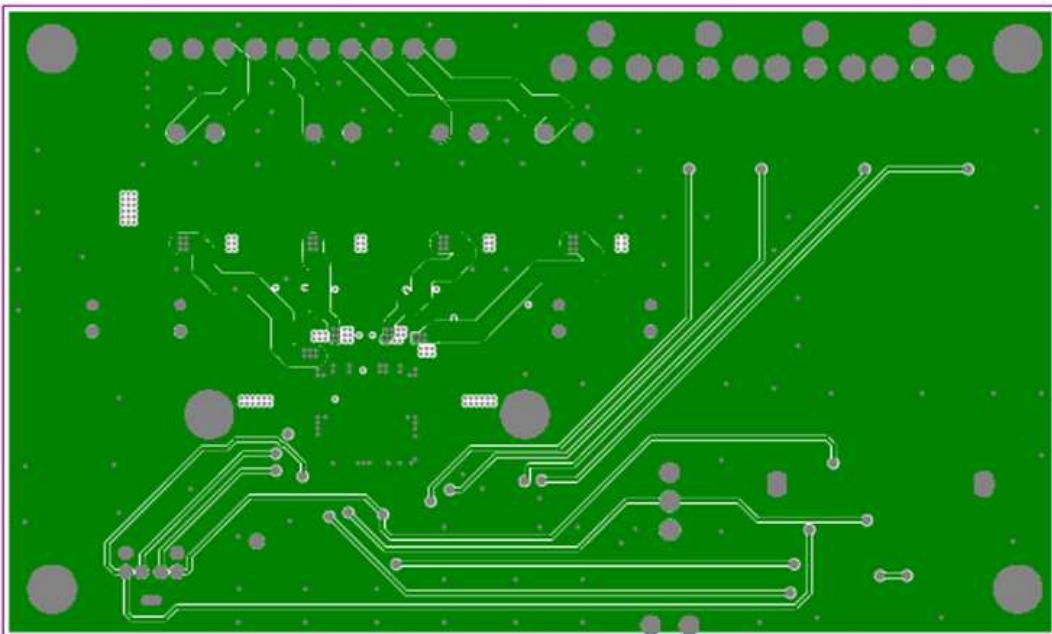


Figure 8. TAS5414BPHD Mid Layer Level 1

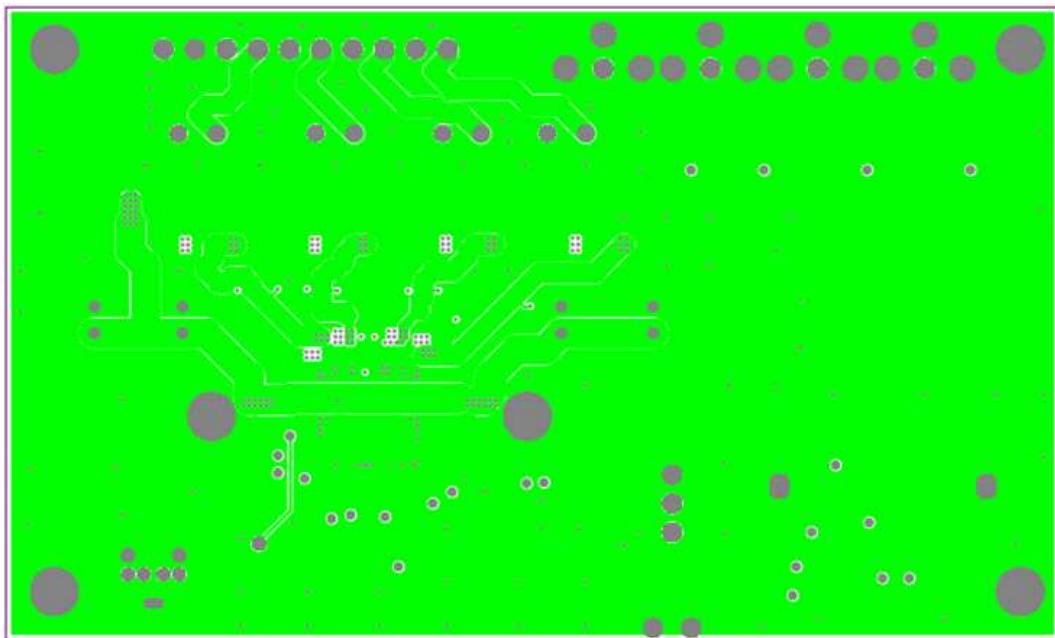


Figure 9. TAS5414BPHD Mid Layer Level 2

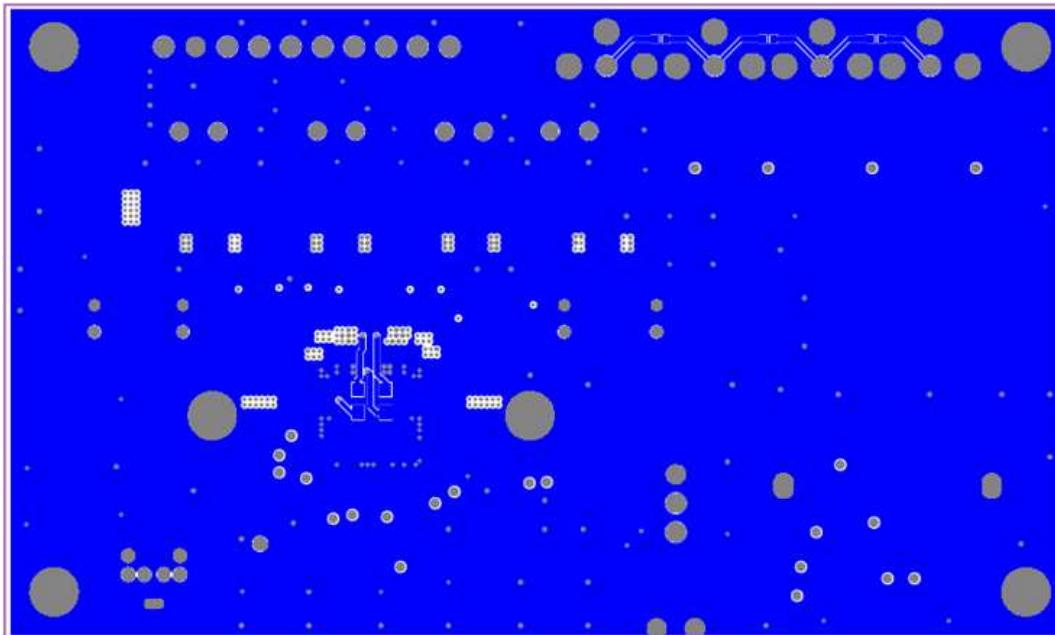


Figure 10. TAS5414BPHD Bottom Layer

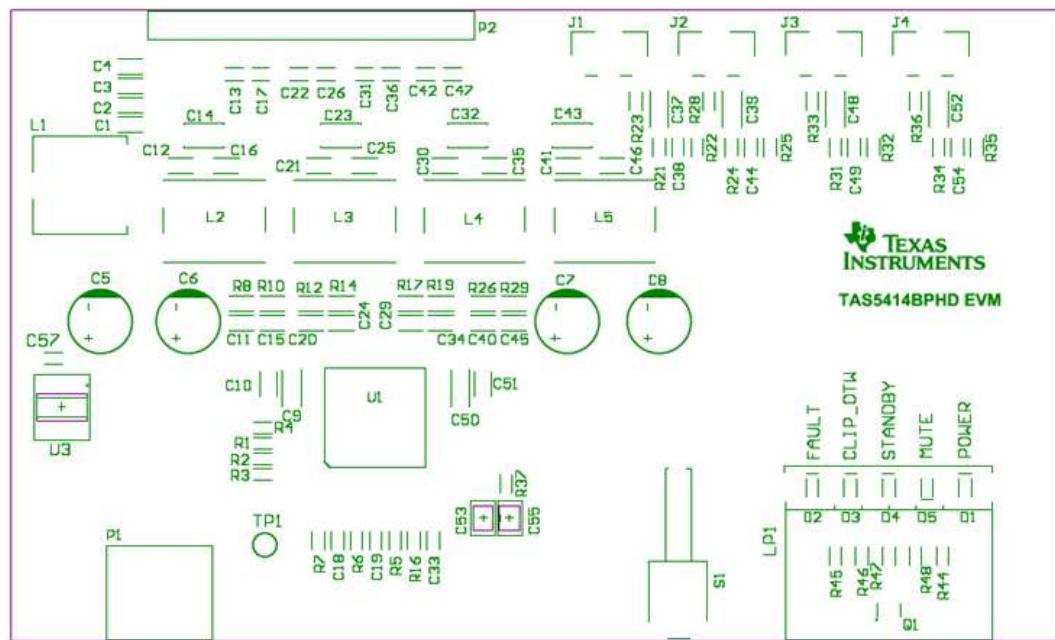


Figure 11. TAS5414BPHD Top Silkscreen Overlay

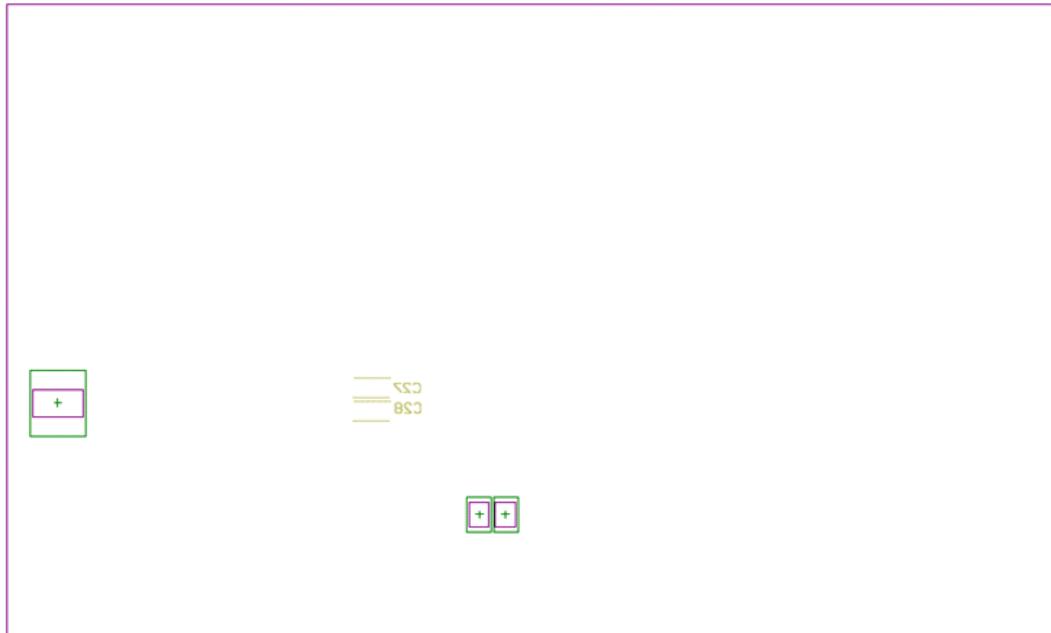


Figure 12. TAS5414BPHD Bottom Silkscreen Overlay

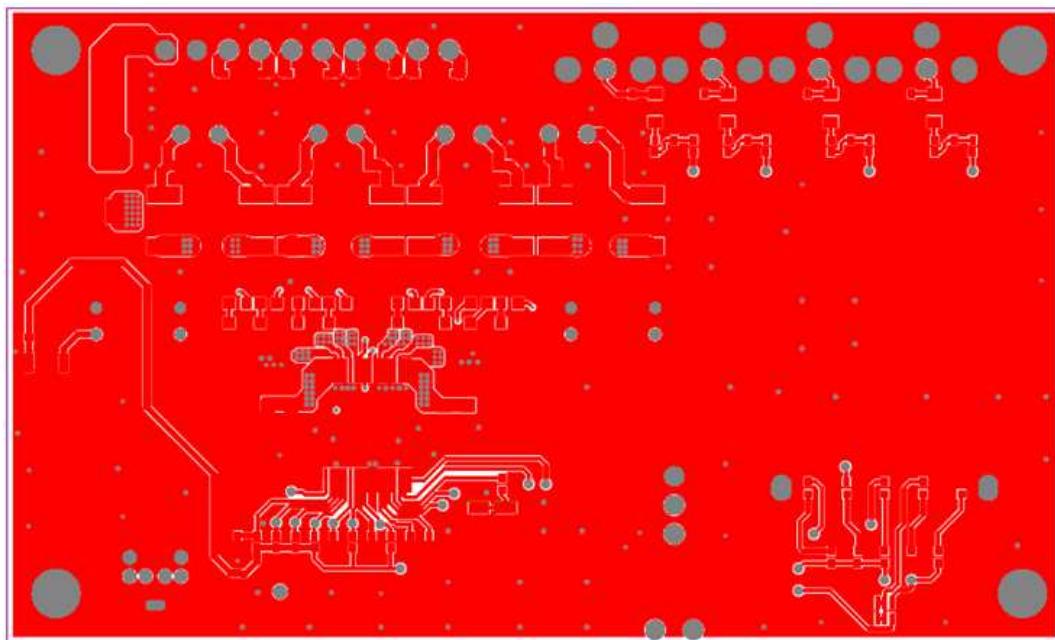


Figure 13. TAS5414BDKD Top Layer

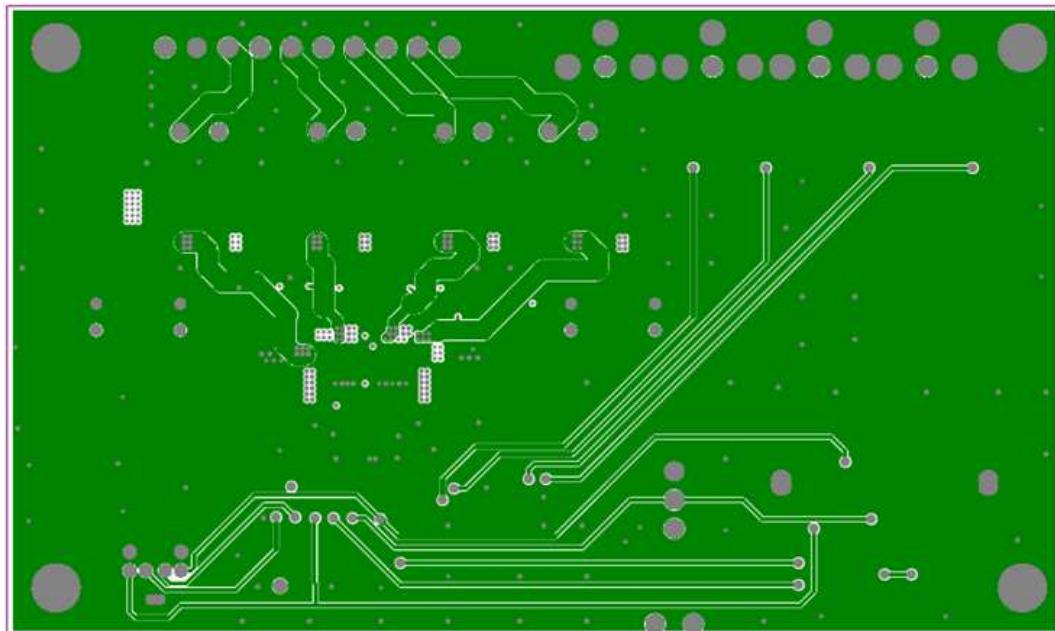


Figure 14. TAS5414BDKD Mid Layer Level 1

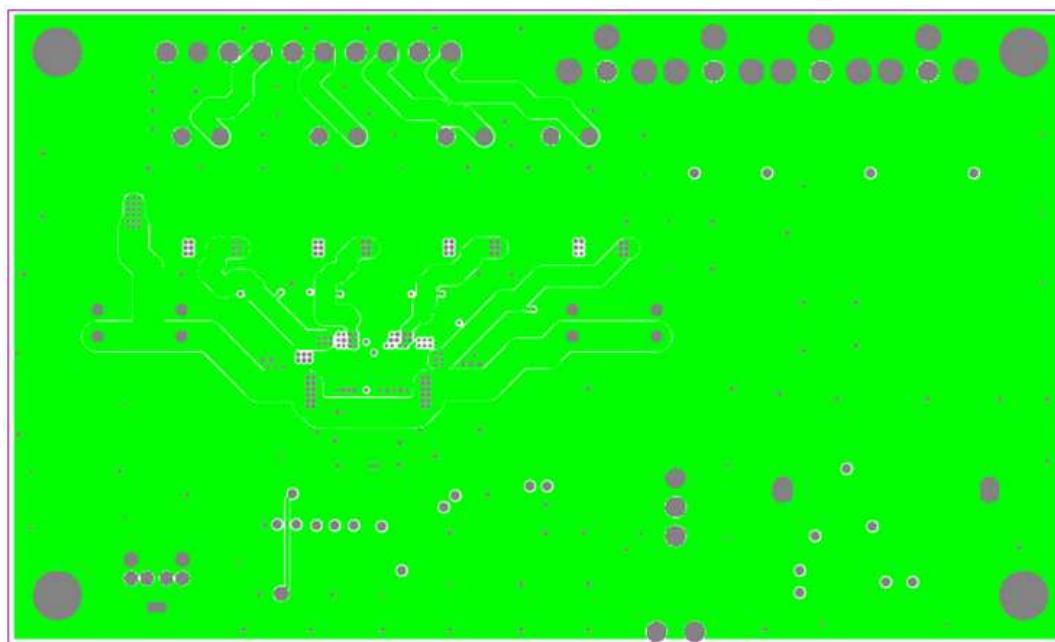


Figure 15. TAS5414BDKD Mid Layer Level 2

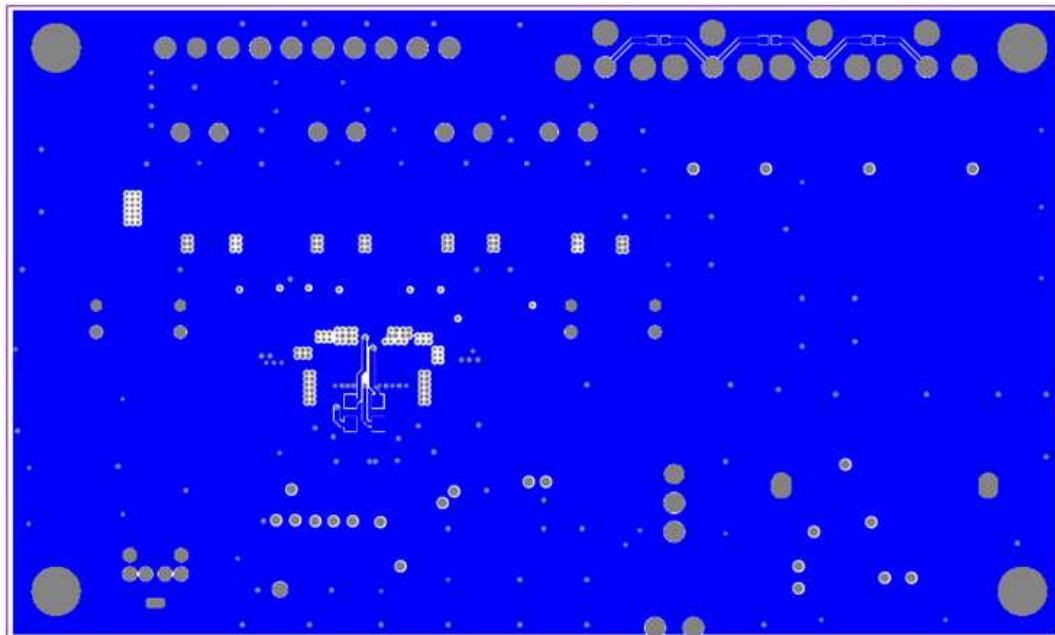


Figure 16. TAS5414BDKD Bottom Layer

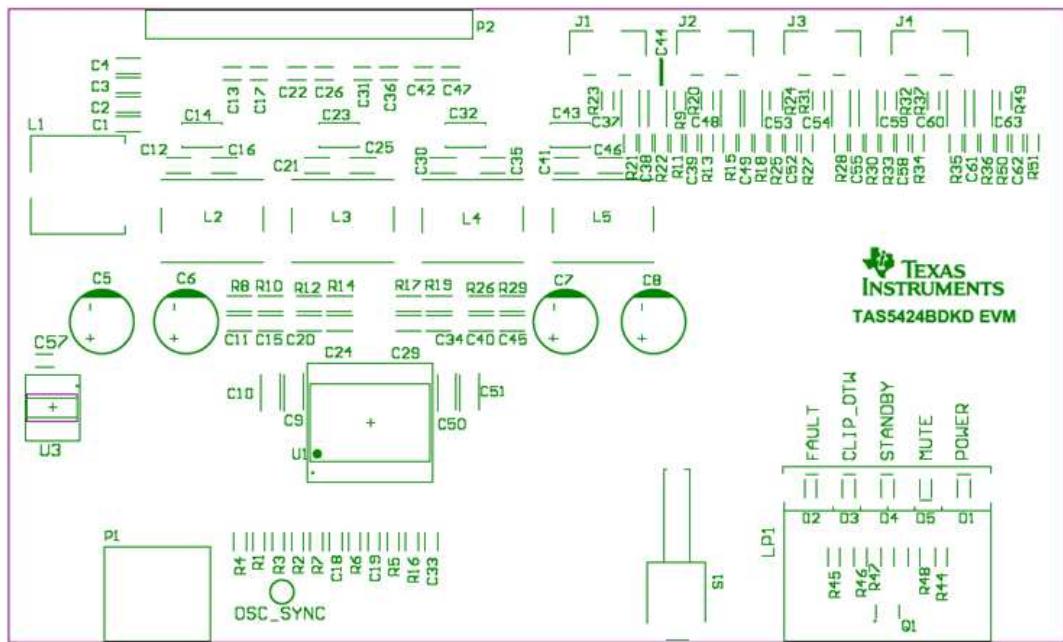


Figure 17. TAS5414BDKD Top Silkscreen Overlay

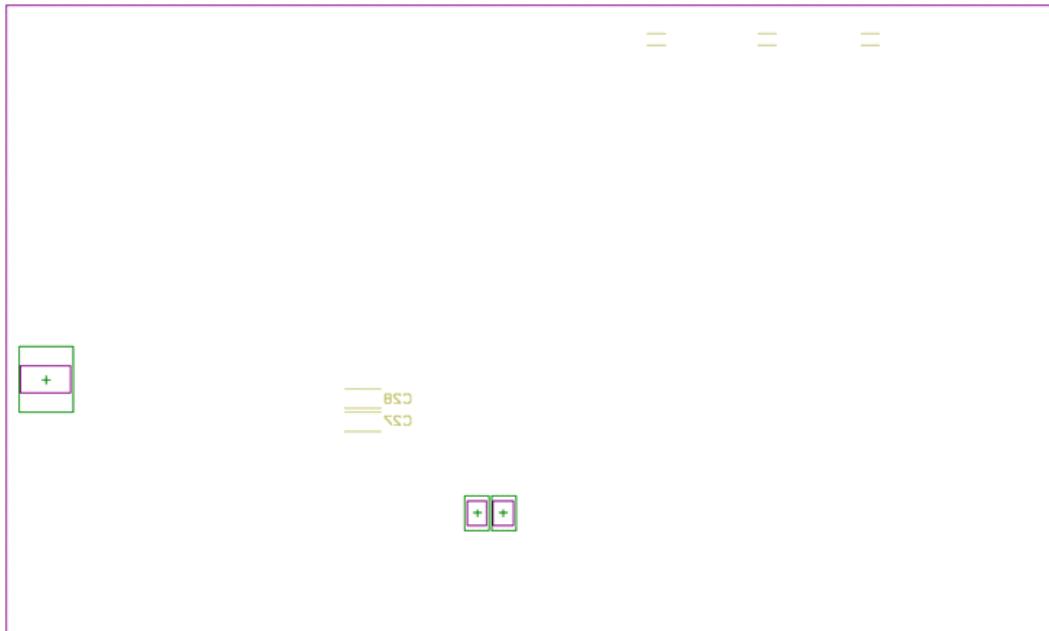


Figure 18. TAS5414BDKD Bottom Silkscreen Overlay

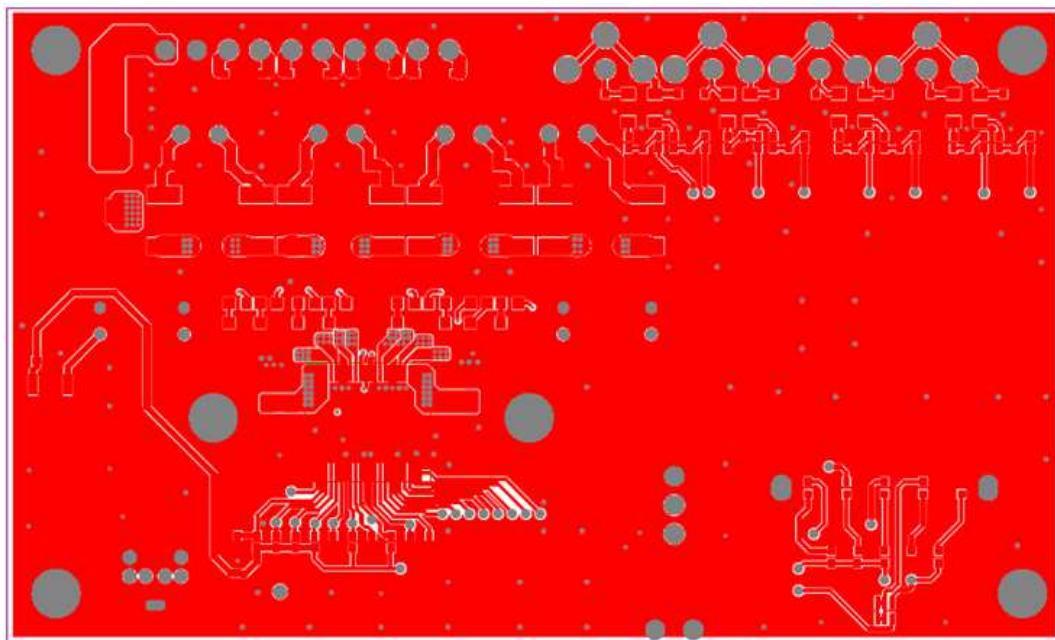


Figure 19. TAS5424BDKD Top Layer

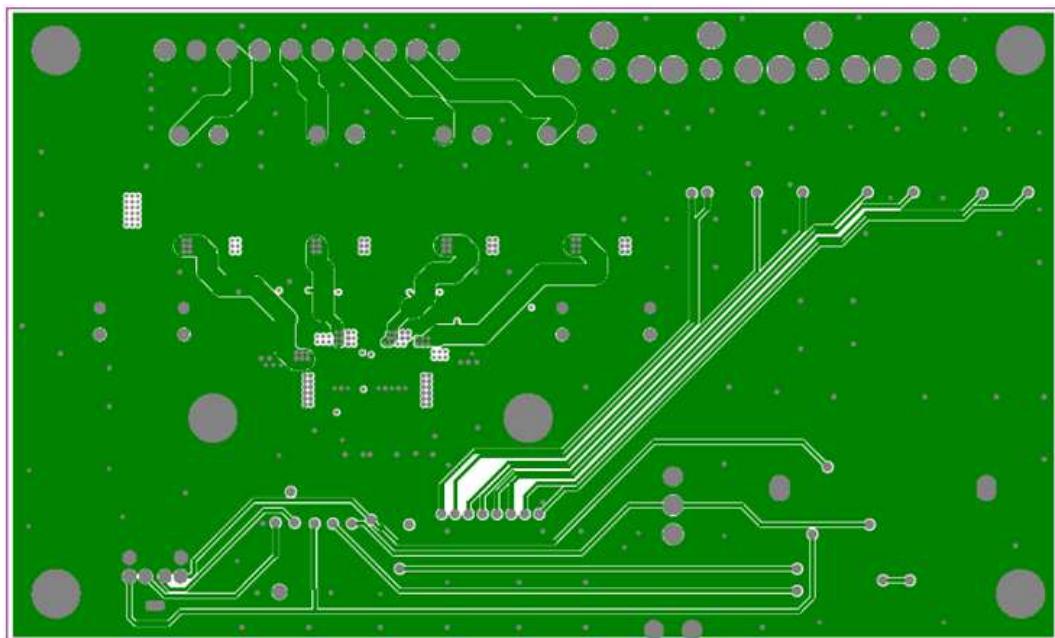


Figure 20. TAS5424BDKD Mid Layer Level 1

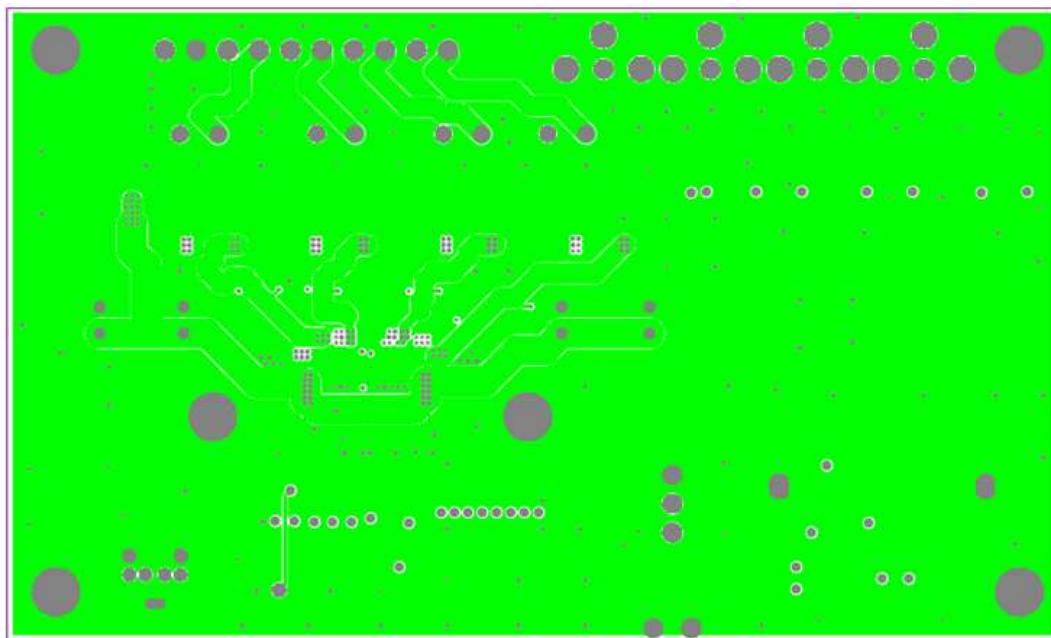


Figure 21. TAS5424BDKD Mid Layer Level 2

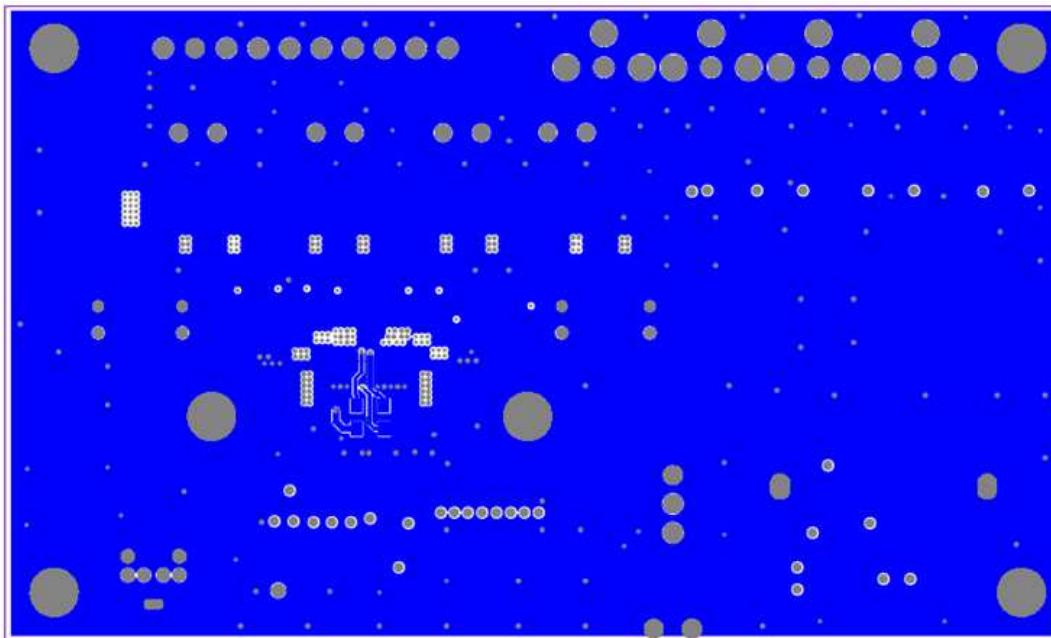


Figure 22. TAS5424BDKD Bottom Layer

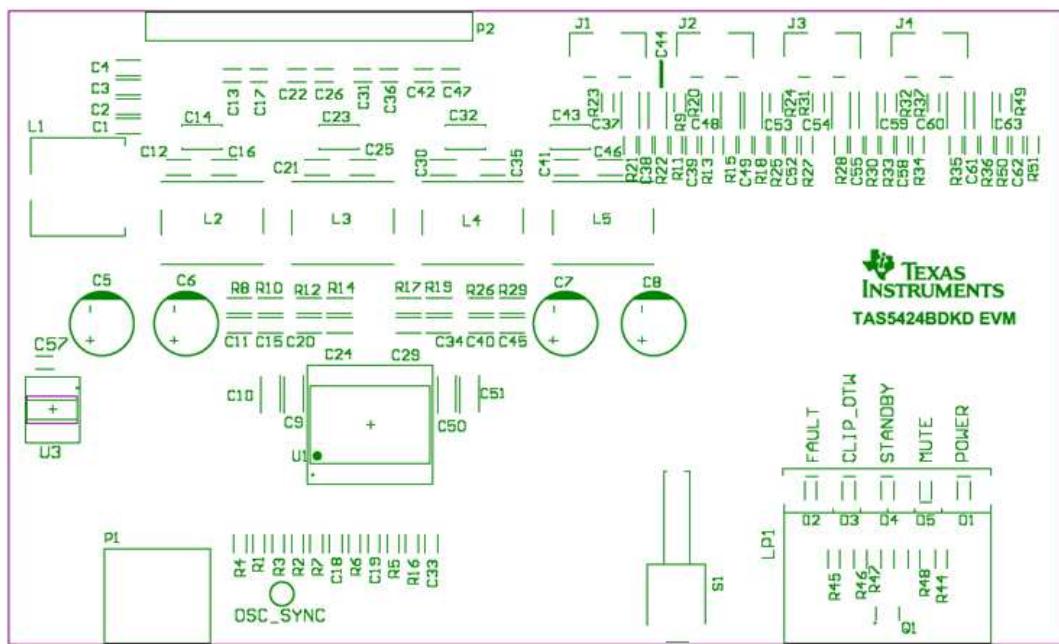


Figure 23. TAS5424BDKD Top Silkscreen Overlay

6 Bill of Materials

[Table 1](#), [Table 2](#), and [Table 3](#) present the bill of materials for TAS5414BPHD, TAS5414BDKD, and TAS5424BDKD respectively.

Table 1. Bill of Materials for TAS5414BPHD

VALUE	DESCRIPTION	DESIGNATOR	P/N	P/N (DIGIKEY)	QUANTITY
4.7 μ F	Capacitor, ceramic	C1, C2	C2012X5R1E475K	445-4116-1-ND	2
0.082 μ F	Capacitor, ceramic	C3	ECJ-2YB1H823K	PCC1839CT	1
2200 pF	Capacitor, ceramic	C4	ECJ-2VB1H222K	PCC222BNCT-ND	1
330 μ F/35 V	Capacitor, electrolytic	C5, C6, C7, C8	UVR1V331MPD	493-1083-ND	4
1 μ F/50 V	Capacitor, ceramic	C9, C10, C27, C28, C50, C51	C3216X7R1H105K	445-1423-1-ND	6
1 nF/50 V	Capacitor, ceramic	C11, C15, C20, C24, C29, C34, C40, C45	ECJ-2VB1H102K	PCC102BNCT-ND	8
150 nF/25 V	Capacitor, ceramic	C12, C16, C21, C25, C30, C35, C41, C46	C2012X7R1E474K	445-1353-1-ND	8
10 nF/25 V	Capacitor, ceramic	C13, C17, C22, C26, C31, C36, C42, C47	ECJ-1VB1E103K	PCC1763CT-ND	8
470 nF/63 V	Capacitor, ceramic	C14, C23, C32, C43	B32529C474J	495-1110-ND	4
220 nF	Capacitor, ceramic	C18	C0603C334K4RACTU	399-4916-1-ND	1
0.1 μ F	Capacitor, ceramic	C19, C33, C57	ECJ-1VB1C104K	PCC1762CT-ND	3
0.47 μ F/16 V	Capacitor, film	C37, C39, C48, C52	ECP-U1C474MA5	PCF1130CT-ND	4
1200 pF/50 V	Capacitor, ceramic	C38, C44, C49, C54	ECJ-1VB1H122K	PCC1773CT-ND	4
1 μ F/16 V	Capacitor, film	C53, C55	ECP-U1C105MA5	PCF1132CT-ND	2
GRN	Typical GREEN GaAs LED	D1	SML-LX0603GW-TR	67-1549-1-ND	1
RED	Typical RED GaAs LED	D2, D3, D4	SML-LX0603SRW-TR	67-1551-1-ND	3
YEL	Typical YELLOW GaAs LED	D5	SML-LX0603YW-TR	67-1550-1-ND	1
Channel 1, 2, 3, 4, input	RCA phono jack, right angle, thru-hole, snap-in	J1	RCJ-011	CP-1400-ND	4
10 μ H	10- μ H inductor, SMT	L1	Coilcraft SER1360H-103L		1
Dual_inductor	Dual inductor	L2, L3, L4, L5	Toko HEAW		4
LIGHTPIPE 5POS		LP1	LPF-C051303S		1
Header 7	Header, 7-pin	P1	MD-60S	CP-2460	1
Output	Header, 10-pin, right	P2	Samtech IPBT-110-H1-T-S-RA		1

Table 1. Bill of Materials for TAS5414BPHD (continued)

VALUE	DESCRIPTION	DESIGNATOR	P/N	P/N (DIGIKEY)	QUANTITY
N MOS	FET - P W/DIODE	Q1	IRLMS5703TRPBF	IRLMS5703PBFCT-ND	1
20 kΩ	Resistor, SMT	R1, R16	ERJ-3EKF2002V	P20.0KHCT-ND	2
4.7 kΩ	Resistor, SMT	R2, R3	ERJ-3EKF4701V	P4.70KHCT-ND	2
47 Ω	Resistor, SMT	R4	ERJ-3EKF47R0V	P47.0HCT-ND	1
49.9 kΩ	Resistor, SMT	R5, R6, R7, R23, R28, R33, R36	ERJ-3EKF4992V	P49.9KHCT-ND	7
5.6 Ω	Resistor, SMT	R8, R10, R12, R14, R17, R19, R26, R29	RL1220S-5R6-F	RL12S5.6FCT-ND	8
499 Ω	Resistor, SMT	R21, R22, R24, R25, R31, R32, R34, R35	ERJ-3EKF4990V	P499HCT-ND	8
249 Ω	Resistor, SMT	R37	ERJ-3EKF2490V	P249HCT-ND	1
470 Ω	Resistor, SMT	R44, R45, R46, R47	ERJ-3GEYJ471V	P470GCT-ND	4
332 Ω	Resistor, SMT	R48	ERJ-3EKF3320V	P332HCT-ND	1
S1	E-switch, SPDT, right-angle	S1	100SP1T2B4M7RE	EG2364-ND	1
TAS5414BPHD	4-channel class-D amplifier	U1	TAS5414BTPHDRV1	TAS5414BTPHDRV1-ND	1
UA78M33CDCY	Positive-voltage regulator	U3	UA78M33CDCYR	296-13424-1-ND	1

Table 2. Bill of Materials for TAS5414BDKD

VALUE	DESCRIPTION	DESIGNATOR	P/N	P/N (DIGIKEY)	QUANTITY
4.7 μF	Capacitor, ceramic	C1, C2	C2012X5R1E475K	445-4116-1-ND	2
0.082 μF	Capacitor, ceramic	C3	ECJ-2YB1H823K	PCC1839CT	1
2200 pF	Capacitor, ceramic	C4	ECJ-2VB1H222K	PCC222BNCT-ND	1
330 μF/35 V	Capacitor, electrolytic	C5, C6, C7, C8	UVR1V331MPD	493-1083-ND	4
1 μF/50 V	Capacitor, ceramic	C9, C10, C27, C28, C50, C51	C3216X7R1H105K	445-1423-1-ND	6
1 nF/50 V	Capacitor, ceramic	C11, C15, C20, C24, C29, C34, C40, C45	ECJ-2VB1H102K	PCC102BNCT-ND	8
150 nF/25 V	Capacitor, ceramic	C12, C16, C21, C25, C30, C35, C41, C46	C2012X7R1E474K	445-1353-1-ND	8
10 nF/25 V	Capacitor, ceramic	C13, C17, C22, C26, C31, C36, C42, C47	ECJ-1VB1E103K	PCC1763CT-ND	8
470 nF/63 V	Capacitor, ceramic	C14, C23, C32, C43	B32529C474J	495-1110-ND	4
220 nF	Capacitor, ceramic	C18	C0603C334K4RACTU	399-4916-1-ND	1
0.1 μF	Capacitor, ceramic	C19, C33, C57	ECJ-1VB1C104K	PCC1762CT-ND	3
0.47 μF/16 V	Capacitor, film	C37, C39, C48, C52	ECP-U1C474MA5	PCF1130CT-ND	4
1200 pF/50 V	Capacitor, ceramic	C38, C44, C49, C54	ECJ-1VB1H122K	PCC1773CT-ND	4
1 μF/16 V	Capacitor, film	C53, C55	ECP-U1C105MA5	PCF1132CT-ND	2
GRN	Typical GREEN GaAs LED	D1	SML-LX0603GW-TR	67-1549-1-ND	1
RED	Typical RED GaAs LED	D2, D3, D4	SML-LX0603SRW-TR	67-1551-1-ND	3
YEL	Typical YELLOW GaAs LED	D5	SML-LX0603YW-TR	67-1550-1-ND	1
Channel 1, 2, 3, 4, input	RCA phono jack, right angle, thru-hole, snap-in	J1	RCJ-011	CP-1400-ND	4
10uH	10-μH Inductor, SMT	L1	Coilcraft SER1360H-103L		1
Dual_inductor	Dual inductor	L2, L3, L4, L5	Toko HEAW		4
LIGHTPIPE 5POS		LP1	LPF-C051303S		1
Header 7	Header, 7-pin	P1	MD-60S	CP-2460	1
Output	Header, 10-pin, right	P2	Samtech IPBT-110-H1-T-S-RA		1
N MOS	FET - P W/DIODE	Q1	IRLMS5703TRPBF	IRLMS5703PBFCT-ND	1
20 kΩ	Resistor, SMT	R1, R16	ERJ-3EKF2002V	P20.0KHCT-ND	2
4.7 kΩ	Resistor, SMT	R2, R3	ERJ-3EKF4701V	P4.70KHCT-ND	2
47 Ω	Resistor, SMT	R4	ERJ-3EKF47R0V	P47.0HCT-ND	1
49.9 kΩ	Resistor, SMT	R5, R6, R7, R23, R28, R33, R36	ERJ-3EKF4992V	P49.9KHCT-ND	7
5.6 Ω	Resistor, SMT	R8, R10, R12, R14, R17, R19, R26, R29	RL1220S-5R6-F	RL12S5.6FCT-ND	8
499 Ω	Resistor, SMT	R21, R22, R24, R25, R31, R32, R34, R35	ERJ-3EKF4990V	P499HCT-ND	8
249 Ω	Resistor, SMT	R37	ERJ-3EKF2490V	P249HCT-ND	1
470 Ω	Resistor, SMT	R44, R45, R46, R47	ERJ-3GEYJ471V	P470GCT-ND	4

Table 2. Bill of Materials for TAS5414BDKD (continued)

VALUE	DESCRIPTION	DESIGNATOR	P/N	P/N (DIGIKEY)	QUANTITY
332 Ω	Resistor, SMT	R48	ERJ-3EKF3320V	P332HCT-ND	1
S1	E-switch, SPDT, right-angle	S1	100SP1T2B4M7RE	EG2364-ND	1
TAS5414BDKD	4-channel class-D amplifier	U1	TAS5414BTDKDRQ1	TAS5414BTDKDRQ1-ND	1
UA78M33CDCY	Positive-voltage regulator	U3	UA78M33CDCYR	296-13424-1-ND	1

Table 3. Bill of Materials for TAS5424BDKD

VALUE	DESCRIPTION	DESIGNATOR	P/N	P/N (DIGIKEY)	QUANTITY
4.7 μF	Capacitor, ceramic	C1, C2	C2012X5R1E475K	445-4116-1-ND	2
0.082 μF	Capacitor, ceramic	C3	ECJ-2YB1H823K	PCC1839CT	1
2200 pF	Capacitor, ceramic	C4	ECJ-2VB1H222K	PCC222BNCT-ND	1
330 μF/35 V	Capacitor, electrolytic	C5, C6, C7, C8	UVR1V331MPD	493-1083-ND	4
1 μF/50 V	Capacitor, ceramic	C9, C10, C27, C28, C50, C51	C3216X7R1H105K	445-1423-1-ND	6
1 nF/50 V	Capacitor, ceramic	C11, C15, C20, C24, C29, C34, C40, C45	ECJ-2VB1H102K	PCC102BNCT-ND	8
150 nF/25 V	Capacitor, ceramic	C12, C16, C21, C25, C30, C35, C41, C46	C2012X7R1E474K	445-1353-1-ND	8
10 nF/25 V	Capacitor, ceramic	C13, C17, C22, C26, C31, C36, C42, C47	ECJ-1VB1E103K	PCC1763CT-ND	8
470 nF/63 V	Capacitor, ceramic	C14, C23, C32, C43	B32529C474J	495-1110-ND	4
22 nF	Capacitor, ceramic	C18	C0603C334K4RACTU	399-4916-1-ND	1
0.1 μF	Capacitor, ceramic	C19, C33, C57	ECJ-1VB1C104K	PCC1762CT-ND	3
0.47uF/16V	Capacitor, film	C37, C44, C48, C53, C54, C59, C60, C63	ECP-U1C474MA5	PCF1130CT-ND	8
1200 pF/50 V	Capacitor, ceramic	C38, C39, C49, C52, C55, C58, C61, C62	ECJ-1VB1H122K	PCC1773CT-ND	8
GRN	Typical GREEN GaAs LED	D1	SML-LX0603GW-TR	67-1549-1-ND	1
RED	Typical RED GaAs LED	D2, D3, D4	SML-LX0603SRW-TR	67-1551-1-ND	3
YEL	Typical YELLOW GaAs LED	D5	SML-LX0603YW-TR	67-1550-1-ND	1
Channel 1, 2, 3, 4, input	RCA phono jack, right angle, thru-hole, snap-in	J1	RCJ-011	CP-1400-ND	4
10 μH	10-μH inductor, SMT	L1	Coilcraft SER1360H-103L		1
Dual_inductor	Dual inductor	L2, L3, L4, L5	Toko HEAW		4
LIGHTPIPE 5POS		LP1	LPF-C051303S		1
Header 7	Header, 7-pin	P1	MD-60S	CP-2460	1
Output	Header, 10-pin, right	P2	Samtech IPBT-110-H1-T-S-RA		1
N MOS	FET - P W/DIODE	Q1	IRLMS5703TRPBF	IRLMS5703PBFCT-ND	1
20 kΩ	Resistor, SMT	R1, R16	ERJ-3EKF2002V	P20.0KHCT-ND	2
4.7 kΩ	Resistor, SMT	R2, R3	ERJ-3EKF4701V	P4.70KHCT-ND	2
47 Ω	Resistor, SMT	R4	ERJ-3EKF47R0V	P47.0HCT-ND	1
49.9 kΩ	Resistor, SMT	R5, R6, R7, R23, R9, R20, R24, R31, R32, R37, R49	ERJ-3EKF4992V	P49.9KHCT-ND	11
5.6 Ω	Resistor, SMT	R8, R10, R12, R14, R17, R19, R26, R29	RL1220S-5R6-F	RL12S5.6FCT-ND	8
499 Ω	Resistor, SMT	R21, R22, R11, R13, R15, R18, R25, R27, R28, R30, R33, R34, R35, R36, R50, R51	ERJ-3EKF4990V	P499HCT-ND	16
470 Ω	Resistor, SMT	R44, R45, R46, R47	ERJ-3GEYJ471V	P470GCT-ND	4
332 Ω	Resistor, SMT	R48	ERJ-3EKF3320V	P332HCT-ND	1
S1	E-switch, SPDT, right-angle	S1	100SP1T2B4M7RE	EG2364-ND	1
TAS5424BDKD	4-channel class-D amplifier	U2	TAS5424BTDKDRQ1	TAS5424BTDKDRQ1-ND	1
UA78M33CDCY	Positive-voltage regulator	U3	UA78M33CDCYR	296-13424-1-ND	1

7 Related Documentation from Texas Instruments

The TAS5414B, TAS5424B, Four-Channel Automotive Digital Amplifiers data sheet can be found online at www.ti.com.

Evaluation Board/Kit Important Notice

Texas Instruments (TI) provides the enclosed product(s) under the following conditions:

This evaluation board/kit is intended for use for **ENGINEERING DEVELOPMENT, DEMONSTRATION, OR EVALUATION PURPOSES ONLY** and is not considered by TI to be a finished end-product fit for general consumer use. Persons handling the product(s) must have electronics training and observe good engineering practice standards. As such, the goods being provided are not intended to be complete in terms of required design-, marketing-, and/or manufacturing-related protective considerations, including product safety and environmental measures typically found in end products that incorporate such semiconductor components or circuit boards. This evaluation board/kit does not fall within the scope of the European Union directives regarding electromagnetic compatibility, restricted substances (RoHS), recycling (WEEE), FCC, CE or UL, and therefore may not meet the technical requirements of these directives or other related directives.

Should this evaluation board/kit not meet the specifications indicated in the User's Guide, the board/kit may be returned within 30 days from the date of delivery for a full refund. **THE FOREGOING WARRANTY IS THE EXCLUSIVE WARRANTY MADE BY SELLER TO BUYER AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED, OR STATUTORY, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE.**

The user assumes all responsibility and liability for proper and safe handling of the goods. Further, the user indemnifies TI from all claims arising from the handling or use of the goods. Due to the open construction of the product, it is the user's responsibility to take any and all appropriate precautions with regard to electrostatic discharge.

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EVM Warnings and Restrictions

It is important to operate this EVM within the input voltage range of -0.3 V to 48 V and the output voltage range of 0.9 V to 18 V.

Exceeding the specified input range may cause unexpected operation and/or irreversible damage to the EVM. If there are questions concerning the input range, please contact a TI field representative prior to connecting the input power.

Applying loads outside of the specified output range may result in unintended operation and/or possible permanent damage to the EVM. Please consult the EVM User's Guide prior to connecting any load to the EVM output. If there is uncertainty as to the load specification, please contact a TI field representative.

During normal operation, some circuit components may have case temperatures greater than 85°C. The EVM is designed to operate properly with certain components above 60°C as long as the input and output ranges are maintained. These components include but are not limited to linear regulators, switching transistors, pass transistors, and current sense resistors. These types of devices can be identified using the EVM schematic located in the EVM User's Guide. When placing measurement probes near these devices during operation, please be aware that these devices may be very warm to the touch.

EVALUATION BOARD/KIT/MODULE (EVM) ADDITIONAL TERMS

Texas Instruments (TI) provides the enclosed Evaluation Board/Kit/Module (EVM) under the following conditions:

The user assumes all responsibility and liability for proper and safe handling of the goods. Further, the user indemnifies TI from all claims arising from the handling or use of the goods.

Should this evaluation board/kit not meet the specifications indicated in the User's Guide, the board/kit may be returned within 30 days from the date of delivery for a full refund. THE FOREGOING LIMITED WARRANTY IS THE EXCLUSIVE WARRANTY MADE BY SELLER TO BUYER AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED, OR STATUTORY, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. EXCEPT TO THE EXTENT OF THE INDEMNITY SET FORTH ABOVE, NEITHER PARTY SHALL BE LIABLE TO THE OTHER FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES.

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REGULATORY COMPLIANCE INFORMATION

As noted in the EVM User's Guide and/or EVM itself, this EVM and/or accompanying hardware may or may not be subject to the Federal Communications Commission (FCC) and Industry Canada (IC) rules.

For EVMs **not** subject to the above rules, this evaluation board/kit/module is intended for use for ENGINEERING DEVELOPMENT, DEMONSTRATION OR EVALUATION PURPOSES ONLY and is not considered by TI to be a finished end product fit for general consumer use. It generates, uses, and can radiate radio frequency energy and has not been tested for compliance with the limits of computing devices pursuant to part 15 of FCC or ICES-003 rules, which are designed to provide reasonable protection against radio frequency interference. Operation of the equipment may cause interference with radio communications, in which case the user at his own expense will be required to take whatever measures may be required to correct this interference.

General Statement for EVMs including a radio

User Power/Frequency Use Obligations: This radio is intended for development/professional use only in legally allocated frequency and power limits. Any use of radio frequencies and/or power availability of this EVM and its development application(s) must comply with local laws governing radio spectrum allocation and power limits for this evaluation module. It is the user's sole responsibility to only operate this radio in legally acceptable frequency space and within legally mandated power limitations. Any exceptions to this are strictly prohibited and unauthorized by Texas Instruments unless user has obtained appropriate experimental/development licenses from local regulatory authorities, which is responsibility of user including its acceptable authorization.

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

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

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- 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.

For EVMs annotated as IC – INDUSTRY CANADA Compliant

This Class A or B digital apparatus complies with Canadian ICES-003.

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

Concerning EVMs including radio transmitters

This device complies with Industry Canada licence-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.

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.

Cet appareil numérique de la classe A ou B est conforme à la norme NMB-003 du Canada.

Les changements ou les modifications pas expressément approuvés par la partie responsable de la conformité ont pu vider l'autorité de l'utilisateur pour actionner l'équipement.

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.

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 isotope 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.

【Important Notice for Users of this Product in Japan】

This development kit is NOT certified as Confirming to Technical Regulations of Radio Law of Japan

If you use this product in Japan, you are required by Radio Law of Japan to follow the instructions below with respect to this product:

1. Use this product in a shielded room or any other test facility as defined in the notification #173 issued by Ministry of Internal Affairs and Communications on March 28, 2006, based on Sub-section 1.1 of Article 6 of the Ministry's Rule for Enforcement of Radio Law of Japan,
2. Use this product only after you obtained the license of Test Radio Station as provided in Radio Law of Japan with respect to this product, or
3. Use of this product only after you obtained the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to this product. Also, please do not transfer this product, unless you give the same notice above to the transferee. Please note that if you could not follow the instructions above, you will be subject to penalties of Radio Law of Japan.

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2. 実験局の免許を取得後ご使用いただく。
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EVALUATION BOARD/KIT/MODULE (EVM) WARNINGS, RESTRICTIONS AND DISCLAIMERS

For Feasibility Evaluation Only, in Laboratory/Development Environments. Unless otherwise indicated, this EVM is not a finished electrical equipment and not intended for consumer use. It is intended solely for use for preliminary feasibility evaluation in laboratory/development environments by technically qualified electronics experts who are familiar with the dangers and application risks associated with handling electrical mechanical components, systems and subsystems. It should not be used as all or part of a finished end product.

Your Sole Responsibility and Risk. You acknowledge, represent and agree that:

1. You have unique knowledge concerning Federal, State and local regulatory requirements (including but not limited to Food and Drug Administration regulations, if applicable) which relate to your products and which relate to your use (and/or that of your employees, affiliates, contractors or designees) of the EVM for evaluation, testing and other purposes.
2. You have full and exclusive responsibility to assure the safety and compliance of your products with all such laws and other applicable regulatory requirements, and also to assure the safety of any activities to be conducted by you and/or your employees, affiliates, contractors or designees, using the EVM. Further, you are responsible to assure that any interfaces (electronic and/or mechanical) between the EVM and any human body are designed with suitable isolation and means to safely limit accessible leakage currents to minimize the risk of electrical shock hazard.
3. You will employ reasonable safeguards to ensure that your use of the EVM will not result in any property damage, injury or death, even if the EVM should fail to perform as described or expected.
4. You will take care of proper disposal and recycling of the EVM's electronic components and packing materials.

Certain Instructions. It is important to operate this EVM within TI's recommended specifications and environmental considerations per the user guidelines. Exceeding the specified EVM ratings (including but not limited to input and output voltage, current, power, and environmental ranges) may cause property damage, personal injury or death. If there are questions concerning these ratings please contact a TI field representative prior to connecting interface electronics including input power and intended loads. Any loads applied outside of the specified output range may result in unintended and/or inaccurate operation and/or possible permanent damage to the EVM and/or interface electronics. Please consult the EVM User's Guide prior to connecting any load to the EVM output. If there is uncertainty as to the load specification, please contact a TI field representative. During normal operation, some circuit components may have case temperatures greater than 60°C as long as the input and output are maintained at a normal ambient operating temperature. These components include but are not limited to linear regulators, switching transistors, pass transistors, and current sense resistors which can be identified using the EVM schematic located in the EVM User's Guide. When placing measurement probes near these devices during normal operation, please be aware that these devices may be very warm to the touch. As with all electronic evaluation tools, only qualified personnel knowledgeable in electronic measurement and diagnostics normally found in development environments should use these EVMs.

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