TAS3208EVM-LC

Low-Cost (LC) Evaluation Module (EVM) for TAS3208 Digital Audio Processor

User's Guide

Literature Number: SLEU097
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Contents

Preface **5**

1 Overview **7**

1.1 TAS3208EVM-LC Features 8

1.2 TAS3208EVM-LC Block Diagram 9

1.3 TAS3208EVM-LC PCB Component Mapping 10

2 Quick Setup Guide **11**

2.1 Unpacking the EVM 12

2.2 Power Supply Setup 12

2.3 PurePath GDE Software Installation 12

2.4 Developing the Process Flow on the EVM 13

2.4.1 Default Configuration 13

2.4.2 Configuring the EVM 13

2.4.3 Master/Slave Mode Operation 14

2.4.4 Loading the Process Flow 14

2.4.5 Running the Process Flow 15

3 System Interfaces **17**

3.1 Digital Audio Interface 18

3.1.1 Digital Input Header 18

3.1.2 Digital Output Header 18

3.2 Analog Audio Interface 19

3.2.1 Analog Output Header 19

3.2.2 Analog Input Header 19

3.3 Control Interface 20

Important Notices **21**

List of Figures

1-1 Block Diagram 9
1-2 Component Mapping 10
1-3 Printed Circuit Assembly 10
2-1 PurePath Studio I^{2}C Command File Window 14

List of Tables

1 Related TI Documentation 5
3-1 Digital Audio Input Interface (J1) 18
3-2 Digital Audio Output Interface (J3) 18
3-3 Analog Output Interface (J5) 19
3-4 Analog Input Interface (J4) 19
3-5 Control Interface (J6) 20

Read This First

About This Manual

This manual describes the operation of the TAS3208 low-cost (LC) evaluation module (EVM) from Texas Instruments.

How to Use This Manual

This document contains the following chapters:

- Chapter 1 – Overview
- Chapter 2 – Quick Setup Guide
- Chapter 3 – System Interfaces

Information About Cautions and Warnings

This manual may contain cautions and warnings.

CAUTION

This is an example of a caution statement.

A caution statement describes a situation that could potentially damage your software or equipment.

WARNING

This is an example of a warning statement.

A warning statement describes a situation that could potentially cause harm to you.

The information in a caution or a warning is provided for your protection. Please read each caution and warning carefully.

Related Documentation From Texas Instruments

Table 1 contains a list of data manuals that have detailed descriptions of the integrated circuits used in the design of the TAS3208EVM-LC. The data manuals can be obtained at www.ti.com.

Table 1. Related TI Documentation

DEVICE	LITERATURE NUMBER
TAS3208	SLES201B
TUSB3210	SLLS466
TPA6610A2	SLOS314
TPS3808	SBVS050
SN74LVC1G08	SCES217
TPS79533	SLVS350

Additional Documentation

- PurePath Studio™ Graphical Development Environment (GDE) tool for TAS3208
- General application notes
- TAS3108 Audio DSP Instruction Set Reference Guide (SLEU067)

Important Software Updates

The TAS3208 is shipped with the latest version of PurePath Studio GDE at the time of the initial EVM release.

Before starting any new design, verify that you are using the latest version of PurePath Studio GDE available by requesting access to the Texas Instruments Mixed Signal Audio & Video extranet via http://www-k.ext.ti.com/sc/technical-support/email-tech-support.asp?DSP. Once access is granted, any new build of the software can simply be downloaded via an internet connection.

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Overview

The PurePath Digital™ TAS3208EVM-LC demonstrates the TAS3208 Digital Audio Processor from Texas Instruments (TI).

The TAS3208 is a fully programmable high-performance system on chip (SoC) digital audio processor. It uses an efficient, custom, multi-instruction programming environment optimized for digital audio processing algorithms. The TAS3208 architecture provides high-quality audio processing by using a 48-bit data path, 28-bit filter coefficients, and a single-cycle 28 x 48-bit multiplier with a 76-bit accumulator. An custom embedded 8051 microprocessor provides algorithm and data control. The TAS3208 is the commercial version intended for home audio and other commercial applications.

The TAS3208 is well-suited for inclusion in digital televisions, home theater systems, mini-component audio systems, and pro-audio systems.

Topic **Page**

1.1 TAS3208EVM-LC Features 8
1.2 TAS3208EVM-LC Block Diagram..... 9
1.3 TAS3208EVM-LC PCB Component Mapping 10

1.1 TAS3208EVM-LC Features

- Three serial digital stereo inputs (S/PDIF, I^2S, left- or right-justified)
- Two serial digital stereo outputs (S/PDIF, I^2S, left- or right-justified)
- Three analog stereo inputs multiplexed to one analog-to-digital converter
- One analog stereo digital-to-analog output
- One analog stereo line output
- One 24-mW, 3.5-mm headphone output jack
- One 3.5-mm stereo line input jack
- USB interface for I^2C control via PurePath Studio GDE
- Double-sided plated-through PCB layout
- Three LED status indicators for reset, I^2C, and USB link

The primary usage mode of the EVM is to provide a software development platform that receives the control and signal processing flow descriptions from a host PC running the PurePath™ Studio Graphical Environment (GDE) or Integrated Development Environment (IDE) through a Universal Serial Bus (USB) interface. In this mode of operation, the user develops a signal processing flow and custom components using PurePath™ Studio. The resulting process flows can be loaded into the EVM EEPROM via the USB. The TAS3208 then loads the EEPROM contents and executes the signal processing flows. During execution, many of the TAS3208 signal processing flow parameters can be dynamically changed using the PurePath™ Studio Graphical Development Environment, allowing the user to customize the process flow without resetting the device.

The TAS3208EVM-LC contains hardware logic, which can be utilized to reset the TAS3208 Digital Audio Processor without disconnecting and re-enumerating the USB Controller. A red LED indicates the period in which the reset is active. Additional on-board LEDs indicate that the board is powered, Active I^2C transactions from either a host controller or the EEPROM, and that the USB link to the host PC is established.

Further information on using the EVM with the PurePath Studio GDE is included in subsequent sections of this document and through additional PurePath Studio documentation.

1.2 TAS3208EVM-LC Block Diagram

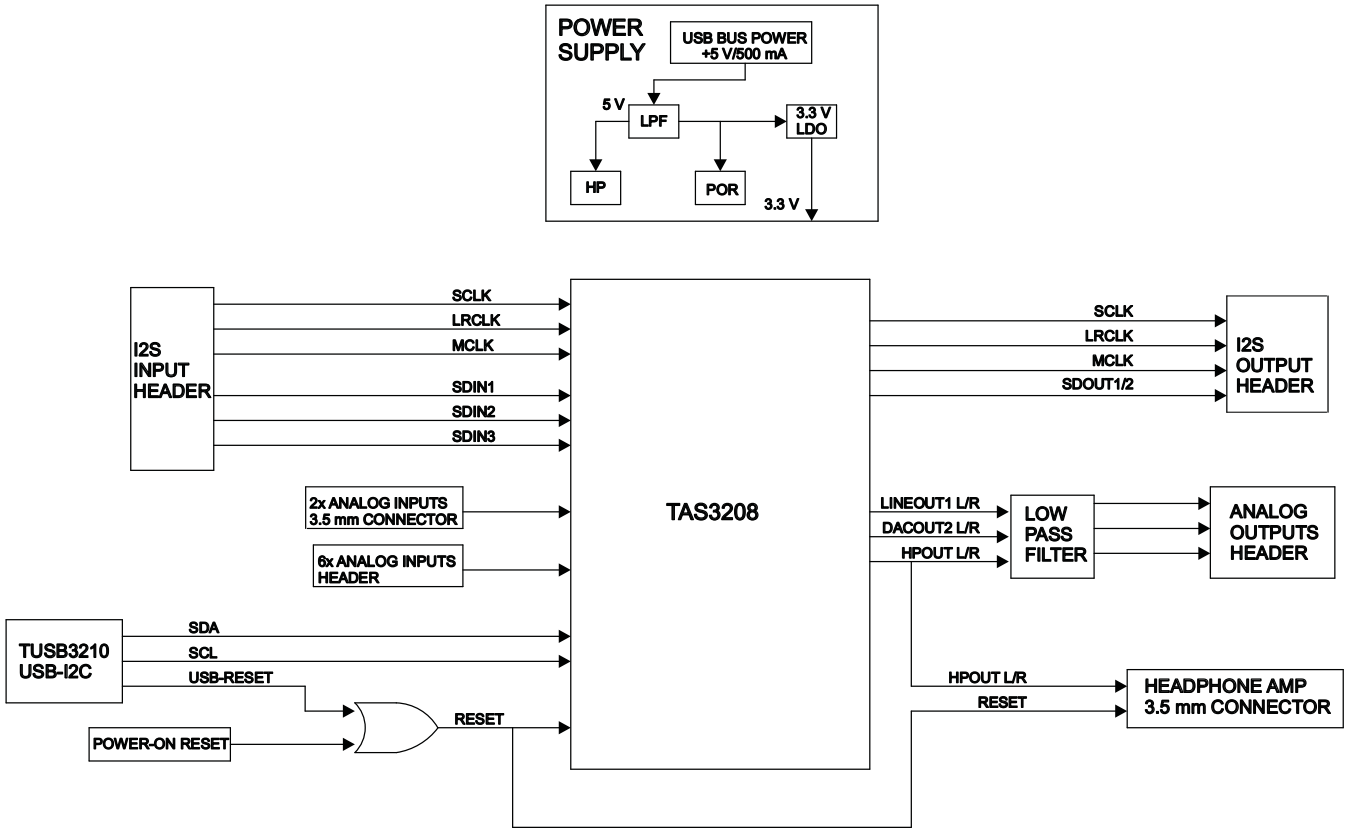

Figure 1-1. Block Diagram

1.3 TAS3208EVM-LC PCB Component Mapping

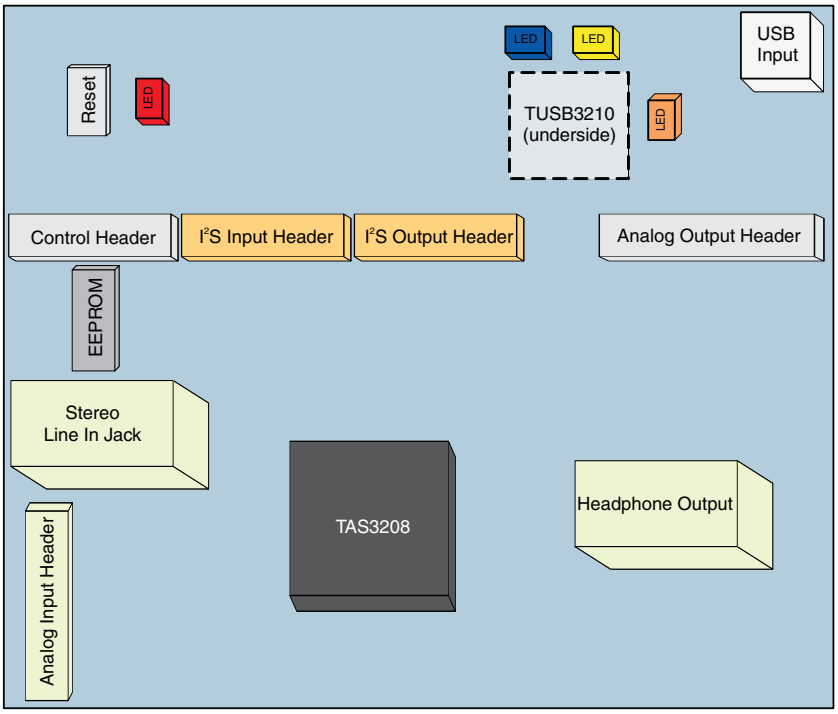

Figure 1-2. Component Mapping

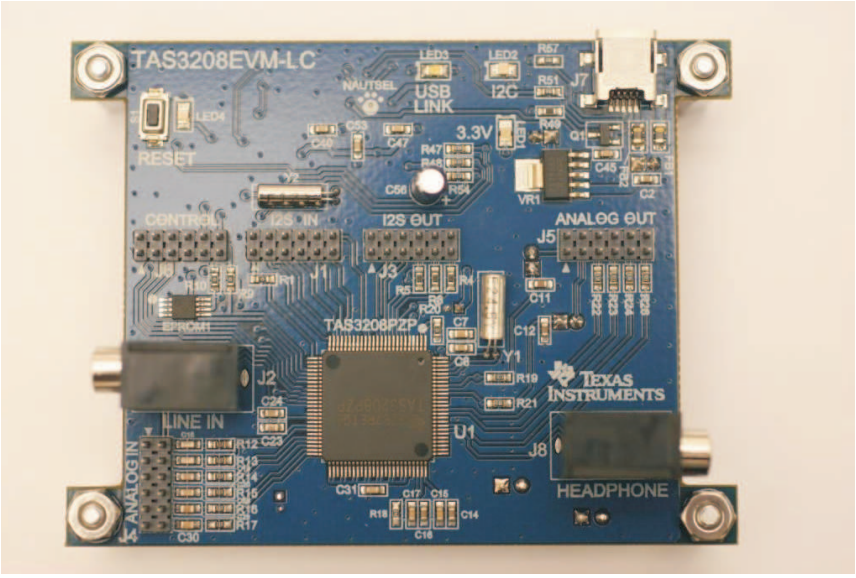

Figure 1-3. Printed Circuit Assembly

Quick Setup Guide

This chapter provides a step-by-step guide to configuring the TAS3208EVM-LC for device evaluation.

This chapter describes the TAS3208EVM-LC board in regard to power supply requirements and system interfaces. The chapter provides information regarding handling, unpacking, and absolute operating conditions.

Topic **Page**

2.1	Unpacking the EVM	12
2.2	Power Supply Setup	12
2.3	PurePath GDE Software Installation	12
2.4	Developing the Process Flow on the EVM	13

Electrostatic Discharge Warning

Many of the components on the TAS3208EVM-LC are susceptible to damage by electrostatic discharge (ESD). Customers are advised to observe proper ESD handling precautions when unpacking and handling the EVM, including the use of a grounded wrist strap at an approved ESD workstation.

CAUTION

Failure to observe ESD handling procedures may result in damage to EVM components.

2.1 Unpacking the EVM

Upon opening the TAS3208EVM-LC package, please check to make sure that the following items are included:

- One TAS3208EVM-LC board using one TAS3208PZP
- One CD-ROM containing GDE software, application reports, user guides, schematics, board Gerber files, and PC software tools
- One USB-type A-to-mini cable.

Note: If any of these items are missing, please contact the Texas Instruments Product Information Center nearest you to inquire about a replacement.

2.2 Power Supply Setup

The TAS3208EVM-LC is powered via the universal serial bus (USB) connection from the host PC. No additional power supplies are needed to evaluate the device.

2.3 PurePath GDE Software Installation

The TAS3208 is programmed and configured using Texas Instruments PurePath Studio. PurePath Studio is composed of the graphical development environment (GDE), the integrated development environment (IDE), and the component publisher.

- The GDE permits the user to program TAS3208 using predefined signal processing components that are placed and connected graphically in the GDE pallet. PurePath Studio runs on a Windows XP computer.
- The IDE is software development environment that permits the user to construct and test the code for a new GDE component.
- The component publisher is used to create the component, define the component's control interface and the ways in which the component can be used.

The PurePath Studio software is supplied on the TAS3208EVM-LC Software CD-ROM. The latest version of the PurePath Studio is available on the Texas Instruments extranet for registered users.

There are two types of licenses:

- Evaluation license – The evaluation license is available for users who are interested only in evaluating the PurePath Studio Tool suite
- Production license – The production license is available for users who are interested in product development using the PurePath Studio tools. This is the software license that is needed to support the EVM.

Once registered, access to the extranet is available by using a browser to access my.ti.com and selecting extranets. The PurePath Studio software is contained under the link TAS3208 PurePath Studio.

- To load PurePath Studio software suite
  - From CD-ROM
    - Insert the TAS3208 Software CD-ROM
    - Open the TAS3208GDE directory and run setup_PurePath_Studio_vx.xx.exe
    - Follow the instructions to compete the installation.
      The CD-ROM also contains initialization files for master and slave EVM initialization and a simple process flow that can be used to verify the TAS3208EVM-LC operation. After the PurePath Studio installation is complete, copy the contents of the CD-ROM TAS3208_Config directory to C:\Program Files\Texas Instruments Inc\PurePath Studio\MyProcessFlows.
  - From download
    - Save the installation file to temporary directory
    - Go to the temporary directory and run setup_PurePath_Studio_vx.xx.exe
    - Follow the instructions to compete the installation.

2.4 Developing the Process Flow on the EVM

2.4.1 Default Configuration

The TAS3208 is placed into the default configuration upon receiving a reset. The reset signal comes from one of the two following methods.

- Pressing the reset button
- Sending a reset signal through the USB interface via the GDE

Note: Following the receipt of the reset, the TAS3208 loads the contents of the EEPROM and configures the SAP clock for master mode operation.

2.4.2 Configuring the EVM

After completing the software installation, connect the USB cable to J7 on the TAS3208EVM-LC board. This connection powers the EVM and automatically enumerates the TUSB3210 USB Serial Controller required for communication between the host PC and the TAS3208 Digital Audio Processor.

Start PurePath Studio using the Start Menu. The program takes a few seconds to load on the host PC. The TAS3208 requires a configuration file to be loaded after a device reset. This file configures the TAS3208 for operation.

Note: Always verify that a configuration file is specified in the Execute I^2C command file window before attempting to execute a process flow. An unspecified I^2C configuration file upon execution may result in unspecified device behavior.

The configuration tool is available under the Tools menu in the GDE.

Tools >> I^2C Command Tool

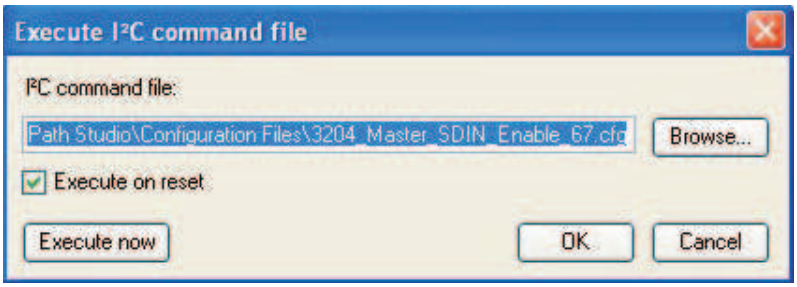

Figure 2-1. PurePath Studio I²C Command File Window

2.4.3 Master/Slave Mode Operation

The TAS3208 can be configured for both master and slave modes via the SAP/Clock register. By default, the TAS3208 is configured for master mode. The TAS3208 can be changed to operate in slave mode by loading the correct SAP/Clock registers settings via the configuration file.

Example master and slave configuration scripts can be found on the CD-ROM included with the TAS3208LC Evaluation Module.

Note: Make sure to verify check the 'Execute on reset' box before closing the Configuration Tool.

2.4.3.1 TAS3208EVM-LC Operation in Master Mode

In master mode, the MCLK, SCLK, and LRCLK for the system are internally generated by the external crystal. Serial Digital Audio is input in to the TAS3208EVM-LC via the Serial Digital Input header (J1). Analog signals are input via the analog input header (J4), or the line in jack (J2).

2.4.3.2 TAS3208EVM-LC Operation in Slave Mode

In slave mode, MCLK, SCLK, and LRCLK for the system must be externally provided by the user's system controller on the serial digital input header (J1). The DSP, MCU and I²C clocks are still internally derived from the external crystal. Serial Digital Audio is input in to the TAS3208EVM-LC via the Serial Digital Input header (J1). Analog signals are input via the analog input header (J4), or the line in jack (J2).

Note: Audio performance in slave mode depends on the quality of the I²S clocks. The clocks should be buffered before the TAS3208. The lowest sampling frequency for acceptable audio performance is slave mode is 44.1 kHz.

2.4.4 Loading the Process Flow

The process flow can be built using the TAS3208 application framework, TAS3208 I/O components, and audio processing components.

Note: The TAS3208 application framework must be loaded into the pallet before any other components can be added.

The CD-ROM included with the TAS3208EVM-LC comes with a sample process flow that allows the device to stream analog audio from input to output. This process flow can be loaded from the file menu.

File >> Open

Browse to the TAS3208.pfw using Windows Explorer and open the process flow. The TAS3208.pfw is designed to stream an analog signal from input to output.

2.4.5 Running the Process Flow

To run the process flow, use the build menu and select run.

Build >> Run

The GDE generates and assembles the code for the process flow, downloads it to the EVM, then resets the TAS3208EVM-LC board. At this point the GDE switches from Edit Mode to Run Mode, and streams audio from input to output.

For more advanced use of the GDE please refer to the GDE online help, Release Notes, and the TAS3108/TAS3108A Audio DSP Instruction Set Reference, literature number SLEU067. These materials are available via www.ti.com.

System Interfaces

This chapter describes the TAS3208EVM-LC board in regard to system interfaces.

Topic **Page**

3.1 Digital Audio Interface 18
3.2 Analog Audio Interface 19
3.3 Control Interface 20

3.1 Digital Audio Interface

The digital audio interface contains the digital I^2S clocks and data. Please refer to the TAS3208 Data Manual for signal timing an overview of the I^2S protocol.

3.1.1 Digital Input Header

Table 3-1. Digital Audio Input Interface (J1)

SIGNAL NAME	SCHEMATIC NET NAME	HEADER PIN ASSIGNMENT
Master clock input	MCLKIN	1
Digital ground	GND	2
Serial clock input	SCLKIN	3
Digital ground	GND	4
Left/right clock input	LRCLKIN	5
Digital ground	GND	6
Serial data 1 input	SDIN1	7
Digital ground	GND	8
Serial data 2 input	SDIN2	9
Digital ground	GND	10
Serial data 3 input	SDIN3	11
Sony/Philips digital interface format input	SPDIF_IN	12

3.1.2 Digital Output Header

Table 3-2. Digital Audio Output Interface (J3)

SIGNAL NAME	SCHEMATIC NET NAME	HEADER PIN ASSIGNMENT
Not connected	NC	1
Not connected	NC	2
Serial data 2 output	SDOUT2	3
Digital ground	GND	4
Serial data 1 output	SDOUT1	5
Digital ground	GND	6
Serial clock output	SCLKOUT	7
Digital ground	GND	8
Left/right clock output	LRCLKOUT	9
Digital ground	GND	10
Master clock output	MCLKOUT	11
Digital ground	GND	12

3.2 Analog Audio Interface

3.2.1 Analog Output Header

Table 3-3. Analog Output Interface (J5)

SIGNAL NAME	SCHEMATIC NET NAME	HEADER PIN ASSIGNMENT
Right headphone amp output	HPR	1
Analog ground	GND	2
Left headphone amp output	HPL	3
Analog ground	GND	4
Digital-to-analog 2 right output	DAC2R	5
Analog ground	GND	6
Digital-to-analog 2 left output	DAC2L	7
Analog ground	GND	8
Lineout 1 right output	LINE1R	9
Analog ground	GND	10
Lineout 1 left output	LINE1L	11
Analog ground	GND	12

3.2.2 Analog Input Header

Table 3-4. Analog Input Interface (J4)

SIGNAL NAME	SCHEMATIC NET NAME	HEADER PIN ASSIGNMENT
Analog ground	GND	1
Line 1 left input	LINEIN1L	2
Analog ground	GND	3
Line 1 right input	LINEIN1R	4
Analog ground	GND	5
Line 2 left input	LINEIN2L	6
Analog ground	GND	7
Line 2 right input	LINEIN2R	8
Analog ground	GND	9
Line 3 left input	LINEIN3L	10
Analog ground	GND	11
Line 3 right input	LINEIN3R	12

3.3 Control Interface

This interface connects the TAS3208 to an external controller. This is a general purpose interface.

Table 3-5. Control Interface (J6)

SIGNAL NAME	SCHEMATIC NET NAME	HEADER PIN ASSIGNMENT
Ground	GND	1
Not connected	NC	2
Mute	GND	3
General purpose input/output 2	GPIO2	4
General purpose input/output 1	GPIO1	5
General purpose input/output 3	GPIO3	6
General purpose input/output 4	GPIO4	7
Ground	GND	8
Ground	GND	9
Serial clock 1	SCL1	10
Ground	GND	11
Serial data 1	SDA1	12

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EVM WARNINGS AND RESTRICTIONS

It is important to operate this EVM within the input voltage range of 0 V to 3.3 V and the output voltage range of 0 V to 3.3 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 75°C. The EVM is designed to operate properly with certain components above 75°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.

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