This document describes how to use and configure the SN65DSI83, SN65DSI84, or SN65DSI85 EVM. Hereafter in this document, the SN65DSI83, SN65DSI84, and SN65DSI85 devices may be referred to as SN65DSI8X.

Contents
1 Overview ...................................................................................................................... 2
  1.1 What are the SN65DSI83, SN65DSI84, and SN65DSI85? .................................... 2
  1.2 What is the SN65DSI8X EVM? ........................................................................... 2
  1.3 What is Included in the SN65DSI8X EVM? .......................................................... 3
  1.4 What Does This EVM Look Like? ....................................................................... 3
2 Hardware Description .................................................................................................... 4
  2.1 Connectors for DSI8X Input Ports ................................................................. 4
  2.2 Connectors for DSI85 Output Ports ............................................................. 4
  2.3 I2C ......................................................................................................................... 5
  2.4 Enable or Reset ..................................................................................................... 5
  2.5 Power ....................................................................................................................... 5
  2.6 Backlight Driver ...................................................................................................... 5
  2.7 Reference CLK Programmability ........................................................................ 6
  2.8 DIP Switch Configuration ...................................................................................... 6
3 Quick Start Guide .......................................................................................................... 6
4 References .................................................................................................................. 7
5 EVM Schematics .......................................................................................................... 8

List of Figures
1 SN65DSI8XEVM ........................................................................................................ 3
2 SN65DSI8X EVM Block Diagram ........................................................................ 4
3 DSI EVM Example Setup ..................................................................................... 7
4 SN65DSI8X Schematic 1 ......................................................................................... 8
5 SN65DSI8X Schematic 2 ......................................................................................... 9
6 SN65DSI8X Schematic 3 ......................................................................................... 10
7 SN65DSI8X Schematic 4 ......................................................................................... 11

List of Tables
1 SN65DSI8X Features Summary ............................................................................ 2
2 DIP Switch Setting .................................................................................................... 6
1 Overview

1.1 What are the SN65DSI83, SN65DSI84, and SN65DSI85?

The SN65DSI8X is a MIPI DSI-to-LVDS bridge device that supports video modes in the forward direction. The SN65DSI8X is primarily targeted for portable applications such as tablets and smart phones that utilize the MIPI DSI video format. Use the SN65DSI8X between a GPU with DSI output and a video panel with LVDS inputs.

All three devices share the same pin out and package.

Table 1 is a summary of the feature sets on these devices:

<table>
<thead>
<tr>
<th>Part Name</th>
<th>Description</th>
<th>Max Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>SN65DSI83</td>
<td>Single-channel DSI to single-link LVDS</td>
<td>Suitable 1366x768/1280x60 fps at 24 bpp/18 bpp</td>
</tr>
<tr>
<td>SN65DSI84</td>
<td>Single-channel DSI to two single-link LVDS</td>
<td>1920x1200 60 fps at 24 bpp/18 bpp</td>
</tr>
<tr>
<td>SN65DSI85</td>
<td>Dual-channel DSI to two single-link LVDS</td>
<td>2560x1600 60 fps, 1920x1080p 120 fps at 24 bpp /18 bpp</td>
</tr>
</tbody>
</table>

NOTE: Each DSI channel has 4 DSI data lanes + 1 CLK lane. Each LVDS link has 4 data lanes + 1 CLK lane.

1.2 What is the SN65DSI8X EVM?

The SN65DSI8X EVM is a PCB created to help customers implementing SN65DSI83, SN65DSI84, and SN65DSI85 in system hardware. This EVM can be used as a hardware reference design for any implementation using the SN65DSI8X. The SN65DSI8X EVM is designed for use across all three versions of the DSI bridge devices - SN65DSI83, SN65DSI84, and SN65DSI85. PCB design and layout files are provided upon request to aid PCB design with a SN65DSI8X component. The layout files are used as a guideline to implant the SN65DSI8X with illustrations of the routing and placement rules. Please note that the EVM design includes test components to evaluate the SN65DSI8X which may not applicable for production.

This EVM includes on-board connectors for DSI input and LVDS output signals. These connectors connect MIPI DPHY-compliant DSI source and LVDS panels to the EVM. Refer to Section 2.1 and Section 2.2 for more information on the connectors.

CAUTION

A custom translator cable or card is required if this EVM is to be utilized for the evaluation of an implementation from the customer. Any other method of connecting to any DSI source or LVDS panel is not supported by this EVM. TI is not responsible for any issues or problems that may occur as a result of using connection methods other than what is recommended in this document.

NOTE: Some portions and components in the EVM or in this document may include the references to SN65DSI85 instead of addressing all three part numbers. The SN65DSI85 is replaceable with SN65DSI83 or SN65DSI84.
1.3 What is Included in the SN65DSI8X EVM?

The major components of the EVM follow:
- SN65DSI83, SN65DSI84, or SN65DSI85
- Backlight driver via J2 and J5
- Samtec QSH-type connectors on DSI and LVDS interfaces
- Hirose-type connector on DSI Ch A interface
- IPEX-type connectors on LVDS interfaces
- I²C programming interface for external I²C host connection

1.4 What Does This EVM Look Like?

Figure 1 illustrates the EVM.
2 Hardware Description

Figure 2 shows the EVM block diagram.

2.1 Connectors for DSI8X Input Ports

The EVM has two input options for DSI video. If a custom breakout board is to be designed using these options, a schematic and an allegro PCB symbol for either connector is provided by TI upon request.

(A) J4 - Samtec QSH-type connector (P/N QSH-020-01-H-D- DP-A)

J4 is a Samtec QSH-type connector that can be mated with a matching QTH-type connector on the top. It provides DSI input connections to both DSI Ch A and Ch B signals. It also provides access to \(i^2C\) and other miscellaneous signals such as IRQ. XC connections are open vias just in case there is a need for connection to other signals. The mating connector part number is QTH-020-01-H-D-DP-A. For an SMA-type connection, use the Samtec HDR-128291-XX breakout board. The HDR-128291-XX is a breakout board with a mating connector to J4 and standard SMA male connectors via cables. More information on this breakout board is provided upon request.

(B) J1 – Hirose FX-type connector (P/N FX6A-40S-0.8SV2)

J1 is a Hirose FX-type connector that can be mated with a matching FX plug on the top. The part number for the mating connector is FX6A-40P-0.8SV2. J1 provides DSI input connection only to the DSI Ch A signals. It also provides access to \(i^2C\) and other miscellaneous signals such as IRQ.

2.2 Connectors for DSI85 Output Ports

There are two output port options available on the EVM for the LVDS output signals. If a custom breakout board is to be designed using these options, a schematic and an allegro PCB symbol for either connector can be provided by TI.

(A) J6 - Samtec QSH-type connector (P/N QSH-020-01-H-D- DP-A)

J6 is a Samtec QSH-type connector that can be mated with a matching QTH-type connector on the top. It provides DSI input connections to both LVDS Ch A and Ch B signals. It also provides access to...
the backlight power and its related signals. XC connections are open vias, in case there is a need to connect to other signals. The mating connector part number is QTH-020-01-H-D-DP-A. For an SMA-type connection, use the Samtec HDR-128291-XX breakout board. The HDR-128291-XX is a breakout board with a mating connector to J6 and standard SMA male connectors via cables. More information on this breakout board is provided upon request.

(B) **J2 and J5 – I-PEX-type connectors (P/N 20455-040E-12)**

J2 and J5 are I-PEX connectors widely used in LCD video panels with LVDS receivers. Connect J2 and J5 via an SGC-type cable with one-to-one pin mapping to a panel using the I-PEX20455-040E-12 connectors. J2 connects to the LVDS CH A signals while J5 connects to the LVDS CHB signals.

### 2.3 **I<sup>C</sup>C**

Access to I<sup>C</sup>C signals are provided via DSI input connectors J1 and J4 (as mentioned in Section 2.1) or J10. Note that I<sup>C</sup>C signal levels should be at 1.8 V when the I<sup>C</sup>C interface is accessed through connectors J1 or J4. A 3.3-V to 1.8-V voltage translation is provided when an I<sup>C</sup>C host is connected through J10.

A stand-alone external I<sup>C</sup>C host can be connected via J10 to debug.

### 2.4 **Enable or Reset**

There are three device enable or reset options to use with the EVM:

(A) **Supervisor circuitry option**

This is a default configuration. The enable (EN) signal is held low until the power good (PG) from the 1.8-V voltage regulator reaches a stable high voltage level, then it is released high.

(B) **RC timing option**

The C10 external capacitor and internal resistor are used to control the EN ramp time after the device is powered on. C10 is a DNI (Do Not Install option), by default. C10 needs to be installed and R52 needs to be uninstalled to enable this option.

(C) **External control option**

A push button (SW1) or a DIP switch (SW2.3) is available for the manual control of the EN signal. Install R64 to enable the DIP switch option.

### 2.5 **Power**

A 5- to 6-V power supply will operate the SN65DSI8X EVM. A plug to accept a 5- to 6-V wall power adapter is provided on the EVM (J13). The jumper on position 1-2 of J15 should be placed while J14 is left open. This should be the default configuration when the board is shipped.

The EVM is designed to accommodate up to maximum of 1.5 A current. The current consumption of the board without backlight driver enabled is about 70 mA + SN65DSI85 device power. The SN65DSI85 consumes about 50 mA at power on, approximately 80 mA to approximately 200 mA, depending on the system configuration. The total power consumption of the board could vary depending on LCD panels when the on-board backlight driver is used. When an LCD panel consumes more current than 1.5 A minus 70 mA + SN65DSI85 device power, an external backlight source should be used.

**NOTE:** Do not plug in any power source higher than the configured voltage (5 V or 6 V).

### 2.6 **Backlight Driver**

The SN65DSI8X EVM incorporates the LED backlight driver circuitry using the TI backlight driver device TPS61181A enabling use of the on-board backlight driver source. The default configuration of the EVM enables the on-board backlight driver.

If the external backlight driver is used, a connection is available via J3. Uninstall FB6 if external backlight driver is used.
2.7 Reference CLK Programmability

The SN65DSI8X EVM incorporates a programmable CLK circuitry using a TI-programmable device, CDCEL913. The output of the CDCEL913 is connected to the reference CLK of the SN65DSI8X. The default frequency of the reference CLK is 27 MHz. The CLK can be programmed via I²C signals brought out to on-board connectors J9, J12, or J10. When J10 is used, place jumpers on J9 and J12. The reference CLK can be pre-programmed to a desired value, if requested prior to shipping.

2.8 DIP Switch Configuration

A DIP switch is provided to operate the device or EVM in different configurations. When the switch is in an open position, the corresponding signal is tied high. When the switch is in the ON (closed) position, the corresponding signal is tied to GND.

The signals in the greyed out region are not enabled unless a corresponding resistor is installed.

### Table 2. DIP Switch Setting

<table>
<thead>
<tr>
<th>DIP SW No</th>
<th>Signal Name</th>
<th>Description</th>
<th>Default Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>SW2-1</td>
<td>DIP1 – Dimming CTRL or LED_BKLT_EN</td>
<td>Controls LED backlight driver enable in default configuration. Installing R100 and uninstalling R63 enables control on dimming control of the backlight driver. Always switch back to closed (ON) position prior to unplug or plug operation of the panel.</td>
<td>x</td>
</tr>
<tr>
<td>SW2-2</td>
<td>I2C_3V3EN</td>
<td>Enables 3.3-V voltage translator for the I²C signals</td>
<td>x</td>
</tr>
<tr>
<td>SW2-3</td>
<td>BRD_RSTN</td>
<td>Controls the EN/RESET signal of the SN65DSI8X high or low</td>
<td>x</td>
</tr>
<tr>
<td>SW2-4</td>
<td>RSVD1</td>
<td>Reserved</td>
<td>x</td>
</tr>
<tr>
<td>SW2-5</td>
<td>RSVD2</td>
<td>Reserved</td>
<td>x</td>
</tr>
<tr>
<td>SW2-6</td>
<td>ADDR</td>
<td>Controls the ADDR signal of the SN65DSI8X high or low</td>
<td>x</td>
</tr>
<tr>
<td>SW2-7</td>
<td>PWMIN</td>
<td>Controls the PWMIN of J6 high or low</td>
<td>x</td>
</tr>
<tr>
<td>SW2-8</td>
<td>LED_EN</td>
<td>Controls the LED_EN of J2 or J5 high or low. This switch should be toggled high to enable the LED of the connected panel. Always switch back to closed (ON) position prior to unplug or plug operation of the panel.</td>
<td>x</td>
</tr>
</tbody>
</table>

3 Quick Start Guide

Quick-start instructions are provided in the following list:

1. Plug in a DSI source to J4
2. Plug in a LVDS video sink device on J2, J5 or J6
3. Plug in an I²C host on J10 if an external I²C host is used.
4. Make sure the DIP switch setting is in a correct configuration.
5. Apply power to the EVM. The following LEDs should light up: D3, D6, and D7. D1 may light up depending on the configuration.
6. Start video streaming on the DSI input
7. Configure the device for the desired mode of operation via I²C. Video output should be observed after configuration is complete.
Figure 3 depicts the setup using an external I\textsuperscript{2}C host, Samtec-to-SMA breakout board (HDR-128291-XX) for DSI ChA input and a 1024×600 video panel over an I-PEX connector.

![Figure 3. DSI EVM Example Setup](image)

### 4 References

1. SN65DSI8X Datasheets (SN65DSI83 SLLSEC1), (SN65DSI84 SLLSEC2), (SN65DSI85 SLLSEB9)
The number of capacitors and their values may vary depending on the system implementation.

Reset Implementation

Reset (EN) can be implemented with passive components as shown or active circuitry. In the case of using passive components, the values of the RC circuitry need to be adjusted to make sure the transition occurs after the Vcc supply has adjusted to make sure the low to high transition occurs after the Vcc supply has adjusted. Recommended to use active circuitry for better control of the RESETHO timing.

ADDR = 0, Slave Addr = 0x2C
ADDR = 1, Slave Addr = 0x2D

Reset Implementation Guide

Figure 4 through Figure 7 illustrate the EVM schematics.

Figure 4. SN65DSI8X Schematic 1
**Figure 5. SN65DSI8X Schematic 2**
Figure 6. SN65DSI8X Schematic 3
Figure 7. SN65DSI8X Schematic 4
STANDARD TERMS AND CONDITIONS FOR EVALUATION MODULES

1. Delivery: TI delivers TI evaluation boards, kits, or modules, including demonstration software, components, and/or documentation which may be provided together or separately (collectively, an “EVM” or “EVMs”) to the User (“User”) in accordance with the terms and conditions set forth herein. Acceptance of the EVM is expressly subject to the following terms and conditions.

1.1 EVMs are intended solely for product or software developers for use in a research and development setting to facilitate feasibility evaluation, experimentation, or scientific analysis of TI semiconductors products. EVMs have no direct function and are not finished products. EVMs shall not be directly or indirectly assembled as a part or subassembly in any finished product. For clarification, any software or software tools provided with the EVM (“Software”) shall not be subject to the terms and conditions set forth herein but rather shall be subject to the applicable terms and conditions that accompany such Software.

1.2 EVMs are not intended for consumer or household use. EVMs may not be sold, sublicensed, leased, rented, loaned, assigned, or otherwise distributed for commercial purposes by Users, in whole or in part, or used in any finished product or production system.

2 Limited Warranty and Related Remedies/Disclaimers:

2.1 These terms and conditions do not apply to Software. The warranty, if any, for Software is covered in the applicable Software License Agreement.

2.2 TI warrants that the TI EVM will conform to TI's published specifications for ninety (90) days after the date TI delivers such EVM to User. Notwithstanding the foregoing, TI shall not be liable for any defects that are caused by neglect, misuse or mistreatment by an entity other than TI, including improper installation or testing, or for any EVMs that have been altered or modified in any way by an entity other than TI. Moreover, TI shall not be liable for any defects that result from User's design, specifications or instructions for such EVMs. Testing and other quality control techniques are used to the extent TI deems necessary or as mandated by government requirements. TI does not test all parameters of each EVM.

2.3 If any EVM fails to conform to the warranty set forth above, TI's sole liability shall be at its option to repair or replace such EVM, or credit User's account for such EVM. TI's liability under this warranty shall be limited to EVMs that are returned during the warranty period to the address designated by TI and that are determined by TI not to conform to such warranty. If TI elects to repair or replace such EVM, TI shall have a reasonable time to repair such EVM or provide replacements. Repaired EVMs shall be warranted for the remainder of the original warranty period. Replaced EVMs shall be warranted for a new full ninety (90) day warranty period.

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

NOTE: 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.

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.

3.3 Japan

3.3.1 Notice for EVMs delivered in Japan: Please see http://www.tij.co.jp/sds/ti_ja/general/eStore/notice_01.page 日本国内に輸入される評価用キット、ボードについては、次のところをご覧ください。

http://www.tij.co.jp/sds/ti_ja/general/eStore/notice_01.page

3.3.2 Notice for Users of EVMs Considered “Radio Frequency Products” in Japan: EVMs entering Japan may not be certified by TI as conforming to Technical Regulations of Radio Law of Japan.

If User uses EVMs in Japan, not certified to Technical Regulations of Radio Law of Japan, User is required by Radio Law of Japan to follow the instructions below with respect to EVMs:

1. Use EVMs 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 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.
【無線電波を送信する製品の開発キットをお使いになる際の注意事項】
開発キットの中には技術基準適合証明を受けていないものがあります。技術基準適合証明を受けていないものご使用に際しては、電波法遵守のため、以下のいずれかの措置を取っていただく必要がありますのでご注意ください。
1. 電波法施行規則第6条第1項第1号に基づく平成18年3月28日総務省告示第173号で定められた電波暗室等の試験設備でご使用いただく。
2. 実験局の免許を取得後ご使用いただく。
3. 技術基準適合証明を取得後ご使用いただく。
なお、本製品は、上記の「ご使用にあたっての注意」を譲渡先、移転先に通知しない限り、譲渡、移転できないものとします。
上記を遵守頂けない場合は、電波法の罰則が適用される可能性があることをご留意ください。
日本テキサス・インスツルメンツ株式会社
東京都新宿区西新宿6丁目2・4番1号
西新宿三井ビル
3.3.3 Notice for EVMs for Power Line Communication: Please see http://www.tij.co.jp/lsds/ti_ja/general/eStore/notice_02.page
電力線搬送波通信についての開発キットをお使いになる際の注意事項については、次のところをご覧ください。http://www.tij.co.jp/lsds/ti_ja/general/eStore/notice_02.page

4 EVM Use Restrictions and Warnings:
4.1 EVMs ARE NOT FOR USE IN FUNCTIONAL SAFETY AND/OR SAFETY CRITICAL EVALUATIONS, INCLUDING BUT NOT LIMITED TO EVALUATIONS OF LIFE SUPPORT APPLICATIONS.
4.2 User must read and apply the user guide and other available documentation provided by TI regarding the EVM prior to handling or using the EVM, including without limitation any warning or restriction notices. The notices contain important safety information related to, for example, temperatures and voltages.
4.3 Safety-Related Warnings and Restrictions:
4.3.1 User shall operate the EVM within TI's recommended specifications and environmental considerations stated in the user guide, other available documentation provided by TI, and any other applicable requirements and employ reasonable and customary safeguards. Exceeding the specified performance ratings and specifications (including but not limited to input and output voltage, current, power, and environmental ranges) for the EVM may cause personal injury or death, or property damage. If there are questions concerning performance ratings and specifications, User should 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 also result in unintended and/or inaccurate operation and/or possible permanent damage to the EVM and/or interface electronics. Please consult the EVM user 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, even with the inputs and outputs kept within the specified allowable ranges, some circuit components may have elevated case temperatures. These components include but are not limited to linear regulators, switching transistors, pass transistors, current sense resistors, and heat sinks, which can be identified using the information in the associated documentation. When working with the EVM, please be aware that the EVM may become very warm.
4.3.2 EVMs are intended solely for use by technically qualified, professional electronics experts who are familiar with the dangers and application risks associated with handling electrical mechanical components, systems, and subsystems. User assumes all responsibility and liability for proper and safe handling and use of the EVM by User or its employees, affiliates, contractors or designees. User assumes all responsibility and liability to ensure 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. User assumes all responsibility and liability for any improper or unsafe handling or use of the EVM by User or its employees, affiliates, contractors or designees.
4.4 User assumes all responsibility and liability to determine whether the EVM is subject to any applicable international, federal, state, or local laws and regulations related to User's handling and use of the EVM and, if applicable, User assumes all responsibility and liability for compliance in all respects with such laws and regulations. User assumes all responsibility and liability for proper disposal and recycling of the EVM consistent with all applicable international, federal, state, and local requirements.

5. Accuracy of Information: To the extent TI provides information on the availability and function of EVMs, TI attempts to be as accurate as possible. However, TI does not warrant the accuracy of EVM descriptions, EVM availability or other information on its websites as accurate, complete, reliable, current, or error-free.
6. **Disclaimers:**

6.1 EXCEPT AS SET FORTH ABOVE, EVMS AND ANY WRITTEN DESIGN MATERIALS PROVIDED WITH THE EVM (AND THE DESIGN OF THE EVM ITSELF) ARE PROVIDED “AS IS” AND “WITH ALL FAULTS.” TI DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, REGARDING SUCH ITEMS, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF ANY THIRD PARTY PATENTS, COPYRIGHTS, TRADE SECRETS OR OTHER INTELLECTUAL PROPERTY RIGHTS.

6.2 EXCEPT FOR THE LIMITED RIGHT TO USE THE EVM SET FORTH HEREIN, NOTHING IN THESE TERMS AND CONDITIONS SHALL BE CONSTRUED AS GRANTING OR CONFESSIONING ANY RIGHTS BY LICENSE, PATENT, OR ANY OTHER INDUSTRIAL OR INTELLECTUAL PROPERTY RIGHT OF TI, ITS SUPPLIERS/LICENSES OR ANY OTHER THIRD PARTY, TO USE THE EVM IN ANY FINISHED END-USER OR READY-TO-USE FINAL PRODUCT, OR FOR ANY INVENTION, DISCOVERY OR IMPROVEMENT MADE, CONCEIVED OR ACQUIRED PRIOR TO OR AFTER DELIVERY OF THE EVM.

7. **USER’S INDEMNITY OBLIGATIONS AND REPRESENTATIONS.** USER WILL DEFEND, INDEMNIFY AND HOLD TI, ITS LICENSORS AND THEIR REPRESENTATIVES HARMLESS FROM AND AGAINST ANY AND ALL CLAIMS, DAMAGES, LOSSES, EXPENSES, COSTS AND LIABILITIES (COLLECTIVELY, “CLAIMS”) ARISING OUT OF OR IN CONNECTION WITH ANY HANDLING OR USE OF THE EVM THAT IS NOT IN ACCORDANCE WITH THESE TERMS AND CONDITIONS. THIS OBLIGATION SHALL APPLY WHETHER CLAIMS ARISE UNDER STATUTE, REGULATION, OR THE LAW OF TORT, CONTRACT OR ANY OTHER LEGAL THEORY, AND EVEN IF THE EVM FAILS TO PERFORM AS DESCRIBED OR EXPECTED.

8. **Limitations on Damages and Liability:**

8.1 **General Limitations.** IN NO EVENT SHALL TI BE LIABLE FOR ANY SPECIAL, COLLATERAL, INDIRECT, PUNITIVE, INCIDENTAL, CONSEQUENTIAL, OR EXEMPLARY DAMAGES IN CONNECTION WITH OR ARISING OUT OF THESE TERMS AND CONDITIONS OR THE USE OF THE EVMS PROVIDED HEREUNDER, REGARDLESS OF WHETHER TI HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. EXCLUDED DAMAGES INCLUDE, BUT ARE NOT LIMITED TO, COST OF REMOVAL OR REINSTALLATION, ANCILLARY COSTS TO THE PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES, RETESTING, OUTSIDE COMPUTER TIME, LABOR COSTS, LOSS OF GOODWILL, LOSS OF PROFITS, LOSS OF SAVINGS, LOSS OF USE, LOSS OF DATA, OR BUSINESS INTERRUPTION. NO CLAIM, SUIT OR ACTION SHALL BE BROUGHT AGAINST TI MORE THAN ONE YEAR AFTER THE RELATED CAUSE OF ACTION HAS OCCURRED.

8.2 **Specific Limitations.** IN NO EVENT SHALL TI’S AGGREGATE LIABILITY FROM ANY WARRANTY OR OTHER OBLIGATION ARISING OUT OF OR IN CONNECTION WITH THESE TERMS AND CONDITIONS, OR ANY USE OF ANY TI EVM PROVIDED HEREUNDER, EXCEED THE TOTAL AMOUNT PAID TO TI FOR THE PARTICULAR UNITS SOLD UNDER THESE TERMS AND CONDITIONS WITH RESPECT TO WHICH LOSSES OR DAMAGES ARE CLAIMED. THE EXISTENCE OF MORE THAN ONE CLAIM AGAINST THE PARTICULAR UNITS SOLD TO USER UNDER THESE TERMS AND CONDITIONS SHALL NOT ENLARGE OR EXTEND THIS LIMIT.

9. **Return Policy.** Except as otherwise provided, TI does not offer any refunds, returns, or exchanges. Furthermore, no return of EVM(s) will be accepted if the package has been opened and no return of the EVM(s) will be accepted if they are damaged or otherwise not in a resalable condition. If User feels it has been incorrectly charged for the EVM(s) it ordered or that delivery violates the applicable order, User should contact TI. All refunds will be made in full within thirty (30) working days from the return of the components(s), excluding any postage or packaging costs.

10. **Governing Law:** These terms and conditions shall be governed by and interpreted in accordance with the laws of the State of Texas, without reference to conflict-of-laws principles. User agrees that non-exclusive jurisdiction for any dispute arising out of or relating to these terms and conditions lies within courts located in the State of Texas and consents to venue in Dallas County, Texas. Notwithstanding the foregoing, any judgment may be enforced in any United States or foreign court, and TI may seek injunctive relief in any United States or foreign court.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2016, Texas Instruments Incorporated
IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, enhancements, improvements and other changes to its semiconductor products and services per JESD46, latest issue, and to discontinue any product or service per JESD48, latest issue. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All semiconductor products (also referred to herein as “components”) are sold subject to TI’s terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its components to the specifications applicable at the time of sale, in accordance with the warranty in TI’s terms and conditions of sale of semiconductor products. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by applicable law, testing of all parameters of each component is not necessarily performed.

TI assumes no liability for applications assistance or the design of Buyers’ products. Buyers are responsible for their products and applications using TI components. To minimize the risks associated with Buyers’ products and applications, Buyers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which TI components or services are used. Information published by TI regarding third-party products or services does not constitute a license to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of significant portions of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. TI is not responsible or liable for such altered documentation. Information from third parties may be subject to additional restrictions.

Resale of TI components or services with statements different from or beyond the parameters stated by TI for that component or service voids all express and any implied warranties for the associated TI component or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Buyer acknowledges and agrees that it is solely responsible for compliance with all legal, regulatory and safety-related requirements concerning its products, and any use of TI components in its applications, notwithstanding any applications-related information or support that may be provided by TI. Buyer represents and agrees that it has all the necessary expertise to create and implement safeguards which anticipate dangerous consequences of failures, monitor failures and their consequences, lessen the likelihood of failures that might cause harm and take appropriate remedial actions. Buyer will fully indemnify TI and its representatives against any damages arising out of the use of any TI components in safety-critical applications.

In some cases, TI components may be promoted specifically to facilitate safety-related applications. With such components, TI’s goal is to help enable customers to design and create their own end-product solutions that meet applicable functional safety standards and requirements. Nonetheless, such components are subject to these terms.

No TI components are authorized for use in FDA Class III (or similar life-critical medical equipment) unless authorized officers of the parties have executed a special agreement specifically governing such use.

Only those TI components which TI has specifically designated as military grade or “enhanced plastic” are designed and intended for use in military/aerospace applications or environments. Buyer acknowledges and agrees that any military or aerospace use of TI components which have not been so designated is solely at the Buyer’s risk, and that Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI has specifically designated certain components as meeting ISO/TS16949 requirements, mainly for automotive use. In any case of use of non-designated products, TI will not be responsible for any failure to meet ISO/TS16949.