Abstract
This document provides an overview of common device features and controls available for TAS2563 in Device Controls panel of Purepath Console 3 (PPC3). Features that are not listed in the Device Control panel may be accessed directly via I2C commands.

Table of Contents
Abstract ...................................................................................................................................................................................... 1
1 TAS2563 Device Features and Controls ............................................................................................................................... 2
  1.1 Brown-Out Protection and Limiter .............................................................................................................................. 4
  1.2 Playback............................................................................................................................................................................. 4
  1.3 Retry and Class-D Controls ............................................................................................................................................... 5
  1.4 IRQZ ................................................................................................................................................................................... 6
  1.5 Idel Channel Detection ....................................................................................................................................................... 6
  1.6 PCM and TDM .................................................................................................................................................................... 6
  1.7 Current and Voltage Sense (IV Sense) .............................................................................................................................. 8
  1.8 Thermal Foldback .............................................................................................................................................................. 8
  1.9 Channel Gain ..................................................................................................................................................................... 9
2 Summary ............................................................................................................................................................................... 11

Trademarks
All other trademarks are the property of their respective owners.
1 TAS2563 Device Features and Controls

TAS2563 offers a wide range of advanced configurations to suit various audio system requirements. Some of the most used features include, but are not limited to, Brown-Out Protection, Limiter, Boost control, and Thermal Foldback. Especially with TAS2563’s integrated DSP, these functions can be easily and finely adjusted in PPC3. This section will provide an overview of some of the protections and amplifier settings PPC3 can configure. For detailed explanation of each configuration and its functions, please refer to other application report listed on the TAS2563 Product Page.

Please note that in order to initialize the EVMs after every power on/power off, the EVM requires reload of the tuning files by simply selecting "Tuning and Audio Processing" panel of the Device Home Page.

The features that are available to be configured for TAS2563 in the “Device Control” are listed in the following table:

<table>
<thead>
<tr>
<th>Device Configurations</th>
<th>Reference Document</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limiter</td>
<td>More Info, Datasheet</td>
</tr>
<tr>
<td>Brown-Out Protection</td>
<td>More Info, Datasheet</td>
</tr>
<tr>
<td>Playback</td>
<td>Datasheet</td>
</tr>
<tr>
<td>PCM &amp; TDM</td>
<td>Datasheet PCM, Datasheet TDM</td>
</tr>
<tr>
<td>Faults Retry</td>
<td>Datasheet</td>
</tr>
<tr>
<td>IRQZ</td>
<td>Datasheet</td>
</tr>
<tr>
<td>Idle Channel Detection</td>
<td>Datasheet</td>
</tr>
<tr>
<td>IV Sense</td>
<td>Datasheet More Info</td>
</tr>
<tr>
<td>Thermal Foldback</td>
<td>More Info Datasheet</td>
</tr>
<tr>
<td>Channel Gain Control</td>
<td>More Info</td>
</tr>
</tbody>
</table>
Amplifier configuration page can be found under “Device Control” in the PPC3 device home page shown in Figure 1-1.

Users can enter “Advance” mode by selecting the corresponding button on the top of the page. For device control configuration to take effect, please select “Apply” in the upper right corner.

Figure 1-2. Device Control Panel
1.1 Brown-Out Protection and Limiter

The BOP and Limiter features utilize the information from the internal VBAT tracking and adjusts the output power accordingly to the configured setting. Since VBAT normally depletes after prolonged usage, it is necessary to implement such mitigating features. They serve as protections to system level collapse that may impact resources outside of the audio amplifier. Limiter can be enabled to adjust the output power above the BOP threshold. Typically, users would like to adjust the output power linearly with decrease in VBAT before it reaches the critical voltage threshold. BOP gives the user more control over how the amplifier can response in case of under-voltage. When VBAT drops bellows the threshold, there are two ways of which BOP can respond. Either attacks till max attenuation, or mute and shutdown the device. Attack Rate, Attack Step Size, Hold Time, Max Attenuation, Release Rate, and Release Step size are different parameters user can define to specify the manner in which BOP response. For more details each parameter, please refer to Battery Voltage Tracking Limiter and Brown-Out Protection and the Datasheet.

![Figure 1-3. Brown-Out Protection (BOP)](image)

1.2 Playback

The playback panel of the Device Control provides the option to change the default digital volume control from 0 dB to -100 dB (shown in Figure 26). It also offers other parameters such as Volume Ramp Rate, Sample Rate, Sample Ramp Rate, and etc. The Volume Ramp Rate is defined as how long it takes for the playback to adjust...
to the new volume whenever there is a change in volume control. For more details, please refer to TAS2563 datasheet.

Figure 1-4. Playback Control

1.3 Retry and Class-D Controls

In case of die over-temperature fault or output load over-current fault, user can specify whether the device should resume previous state or enter software shutdown. The retry feature give users the flexibility in fault responses. In addition, TAS2563 offers Class-D synchronization mode and Low EMI Spread Spectrum mode at the output. These modes enable user to synchronize output switching to audio sample rate and reduce output EMI in some systems, respectively. For more details regarding retry criteria, Class D synchronization mode and low EMI mode, please refer to TAS2563 datasheet.

Figure 1-5. Miscellaneous
1.4 IRQZ
For software shutdown error reporting on IRQZ pin, this panel provides a simplified way to unmask fault interrupt register. By selecting “Fault Interrupt Mask”, user can check which error to report in case of shutdown. For more information fault interrupt, please refer to Fault and Status section of TAS2563 datasheet.

![ IRQZ Panel ]

**Figure 1-6. IRQZ Panel**

1.5 Idle Channel Detection
Idle channel detection can be used to trigger auto-mute. If the input audio drops below the programmable idle channel threshold, the device will stop playing audio automatically. To disable auto-mute, threshold can be kept at very low level or disable idle channel detection in the idle channel detection tile of the Device Control page.

![ Idle Channel Detection ]

**Figure 1-7. Idle Channel Detection**

1.6 PCM and TDM
Depending on the specification of the application, parameters such as PCM HF Corner frequency, TDM justification, and edge trigger polarity can be defined (shown in Figure 28). These two panels give the users the option to tailor their system requirement needs for data communication. Users can customize the receiving TDM format and configure the transmit TDM slots for critical application data such as IV sense level, VBAT level, temperature, and etc.

For more details regarding PCM and TDM, please refer to TDM section of TAS2563 datasheet.
Note

More options and parameter may be available for customization once the user enters "Advanced" mode of the Device Control.

Figure 1-8. PCM and TDM Settings (Advance)
1.7 Current and Voltage Sense (IV Sense)

TAS2563's Smart Amp algorithm can provide advance speaker protection based on speaker characterization models and accurate output Current and Voltage Sense (IV Sense) tracking. By utilizing IV Sense, TAS2563 can constantly monitor the output power deliver to the speaker, and analyze the health of the speaker, in terms of temperature and excursion limits. Users can enable IV Sense in the register map by writing 0x0 to ISNS_PD and VSNS_PD of register 0x02. Thermal and excursion data can be read externally through TDM/I2S by assigning the TDM slots in the Transmit tab of TDM in "Advance" mode as shown in the Figure 1-9.

IV Sense data can also be configured in TDM tab to be read externally when the device is in ROM mode. Since ROM mode bypasses internal processing and protection algorithm for testing purposes, it is advised to avoid from playing pure tone to prevent any speaker damages. For users who would like to read TDM data from the device via USB to PC, make sure to assign the correct slot for each channel for USB communication (e.g. Slot 0 for I sensing and slot 4 for V sensing in 32 bits channel).

For more information about IV Sense and/or verify the accuracy of IV Sense, please refer to the datasheet and Current and Voltage Sensing Accuracy.

![Figure 1-9. TDM Transmit IV Sense Data](image)

1.8 Thermal Foldback

To protect the device from over-heating, thermal sensor is placed near the die to constatnly measure the die temperature. The sensor will trigger Thermal Foldback when the die temperature exceeds the programmable threshold. During Thermal Foldback event, the output power will attenuate relatively to the over-temperature until it reaches programmable Thermal Max Attenuation. This feature will release the attenuation automatically after the die temperature is below the threshold again and Hold Time period has passed. Combing with the over-temperature fault, these two features can provide a comprehensive thermal protection mechanism. For
more detailed explanation about Thermal Foldback, please refer to TAS2562, TAS2563 Thermal Foldback Feature on SmartAmps and the datasheet.

![Thermal Foldback](image)

**Figure 1-10. Thermal Foldback**

### 1.9 Channel Gain

The 6.1-W boost feature of TAS2563 is based on the internal Class-H gain controller. In the Channel Gain panel of the Device Control page, user can configure the specification of the internal boost according to the system requirements. Depending on the application, there are four boost modes available. Class H boost, or multilevel boost, is used for the highest power efficiency but demands greater input current from the battery for fast switching. Class G boost, or two levels boost, is used for lower input current demand from the battery, but is less efficient than the Class H boost. Always on boost is used to boost all signals, and always off boost is used for the external boost option. In order to properly configure the internal boost feature, it is important to verify that the Boost Inductor Range and Boost Capacitance at 0 V match the component values in the layout design.

In the Channel Gain tile, users are also allowed to limit the max power output by defining the Max Boost Voltage and Peak Current Limit. This provides a safety consideration for each system and application. For more details about Channel Gain, please refer to [Benefits of Class-G and Class-H Boost in Audio Amplifiers](#).

Note

Amplifier Level cannot be changed in Smart Amp/Tuning Mode. In order to change it, user must enter ROM mode in Test and Measurement panel in the Device Home page.
Note

More parameter controls are available when user is in the "Advanced" mode

Figure 1-11. Channel Gain
2 Summary

Once the amplifier is configured to the system requirements, you are now ready to proceed to the next step of the development, Tuning and Audio Processing, in PPC3. The Device Control page of PPC3 offers some of the commonly used features and does not include all of the features listed in the TAS2563 datasheet. Features that cannot be accessed through PPC3 Device Control may be accessed via Direct I2C commands.

For questions about each feature, please refer to Figure 1-1 or visit our E2E forum.
IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATASHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES “AS IS” AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for skilled developers designing with TI products. You are solely responsible for (1) selecting the appropriate TI products for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, or other requirements. These resources are subject to change without notice. TI grants you permission to use these resources only for development of an application that uses the TI products described in the resource. Other reproduction and display of these resources is prohibited. No license is granted to any other TI intellectual property right or to any third party intellectual property right. TI disclaims responsibility for, and you will fully indemnify TI and its representatives against, any claims, damages, costs, losses, and liabilities arising out of your use of these resources.

TI's products are provided subject to TI's Terms of Sale (www.ti.com/legal/termsofsale.html) or other applicable terms available either on ti.com or provided in conjunction with such TI products. TI's provision of these resources does not expand or otherwise alter TI's applicable warranties or warranty disclaimers for TI products.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2020, Texas Instruments Incorporated