Application Report

TAS2563 Device Features and Controls Overview

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Abstract

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

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1 TAS2563 Device Features and Controls

TAS2563 offers a wide range advance configurations to suit various audio system requirements. Some of the most used features include, but 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 follwing table:

Device Configurations	Reference Document
Limiter	More Info, Datasheet
Brown-Out Protection	More Info, Datasheet
Playback	Datasheet
PCM & TDM	Datasheet PCM, Datasheet TDM
Faults Retry	Datasheet
IRQZ	Datasheet
Idle Channel Detection	Datasheet
IV Sense	Datasheet More Info
Thermal Foldback	More Info Datasheet
Channel Gain Control	More Info

Amplifier configuration page can be found under “Device Control” in the PPC3 device home page shown in Figure 1-1.

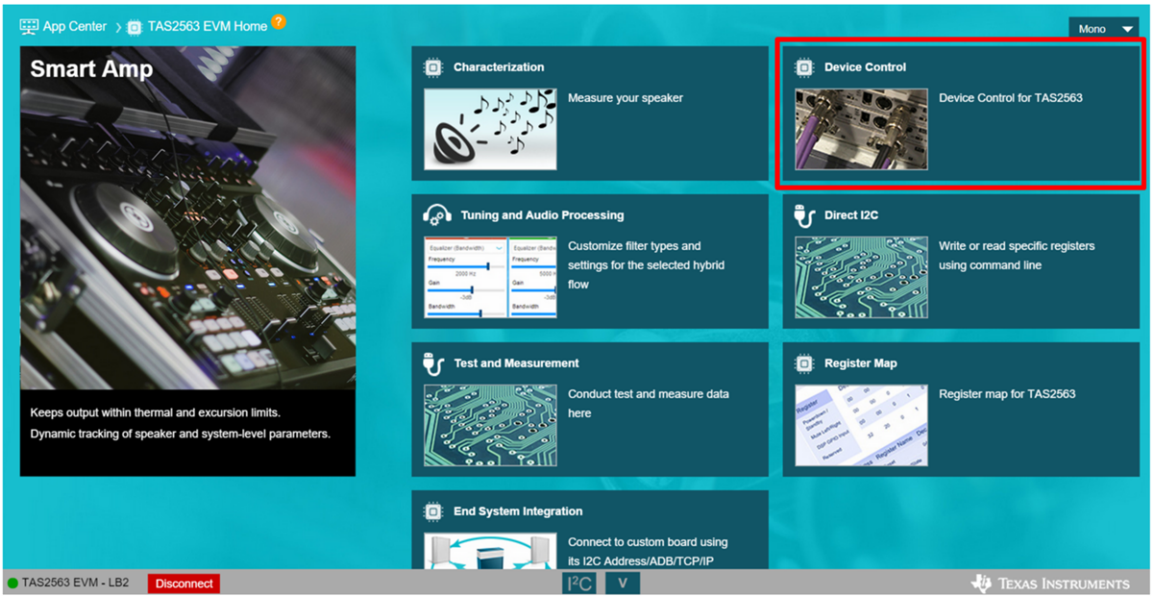

Figure 1-1. PPC3 Device Home

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.

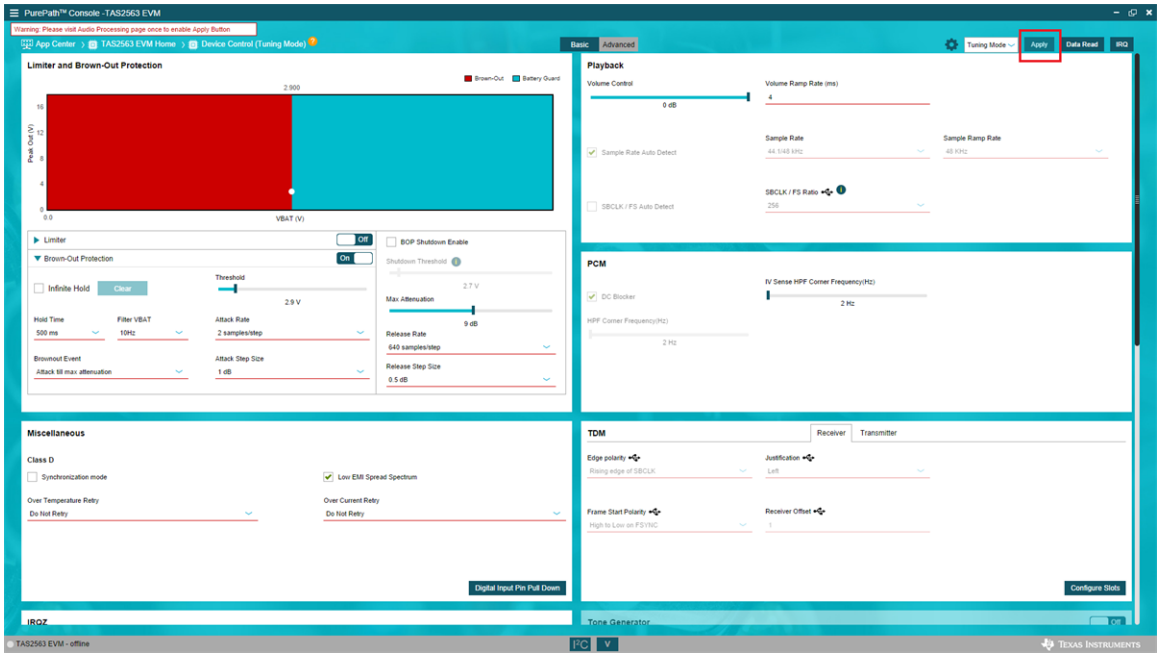

Figure 1-2. Device Control Panel

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.

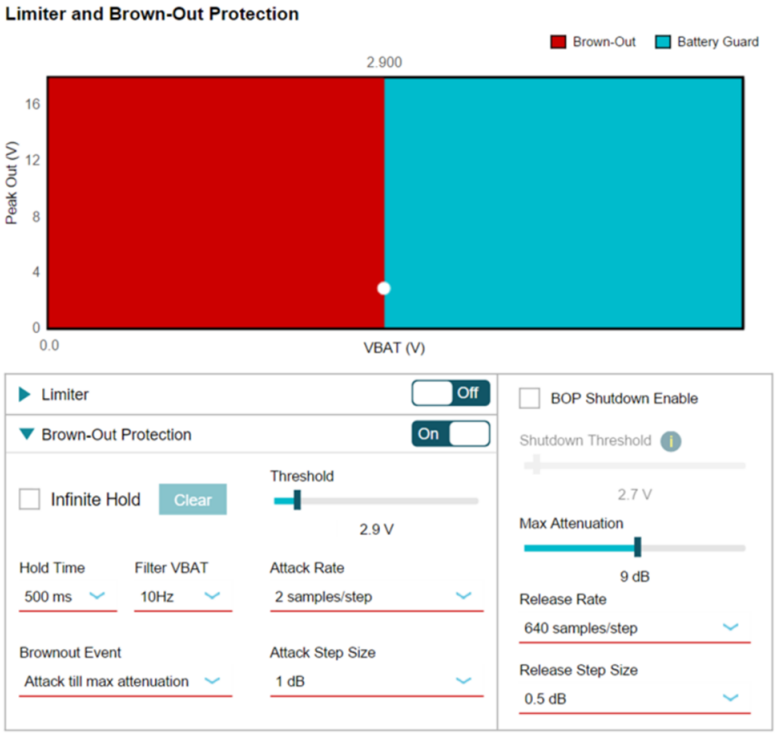

Figure 1-3. Brown-Out Protection (BOP)

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 synchonization mode and Low EMI Spread Spectrum mode at the output. These modes enable user to synchonize output switching to audio sample rate and reduce output EMI is some systems, respectively. For more details regarding retry criteria, Class D synchronization mode and low EMI mode, please refer to TAS2563 datasheet.

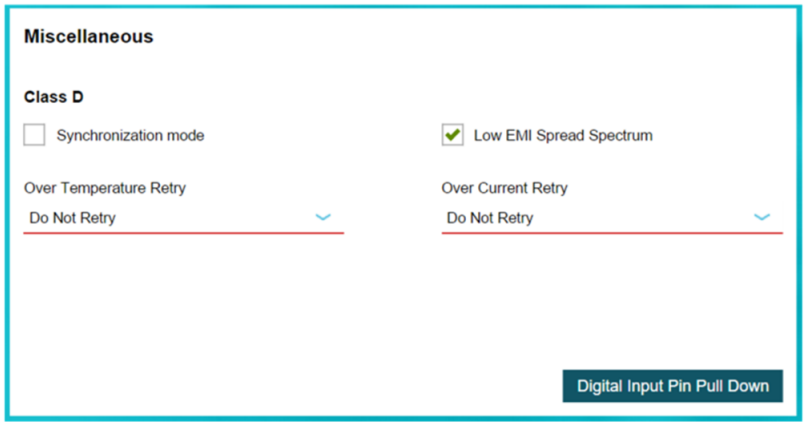

Figure 1-5. Miscellaneous

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 .

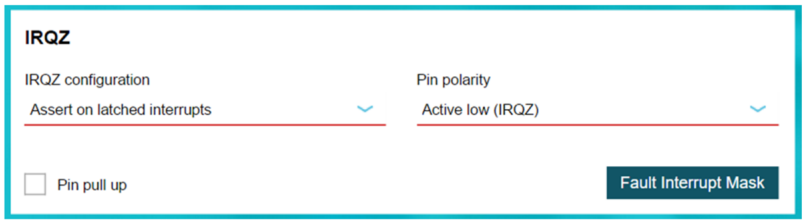

Figure 1-6. IRQZ Panel

1.5 Idel Channel Detection

Idel 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 idel channel detection tile of the Device Control page.

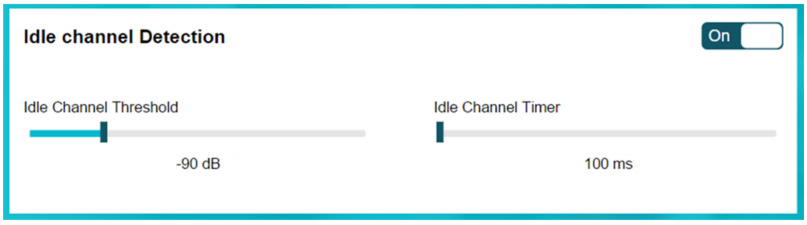

Figure 1-7. Idle Channel Detection

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.

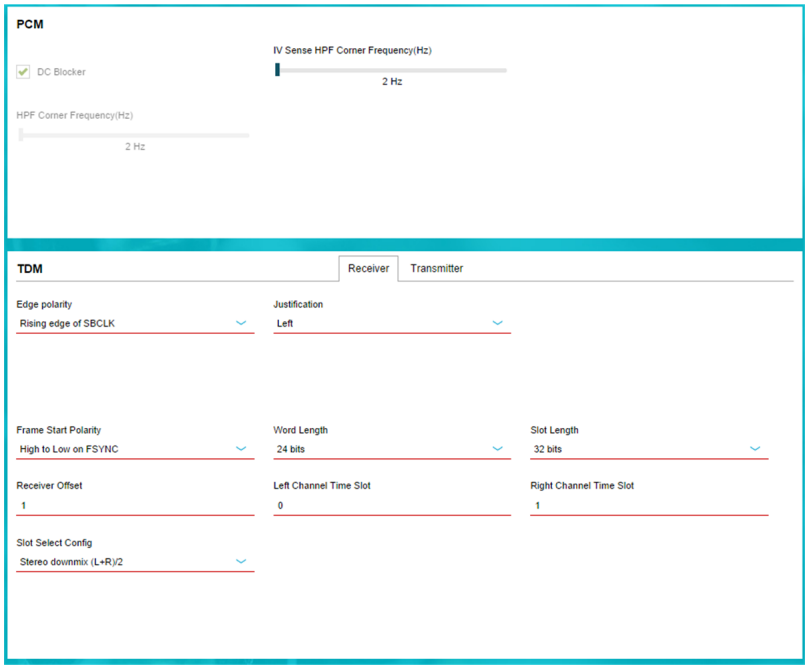

Figure 1-8. PCM and TDM Settings (Advance)

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 deliever 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/I^2S 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

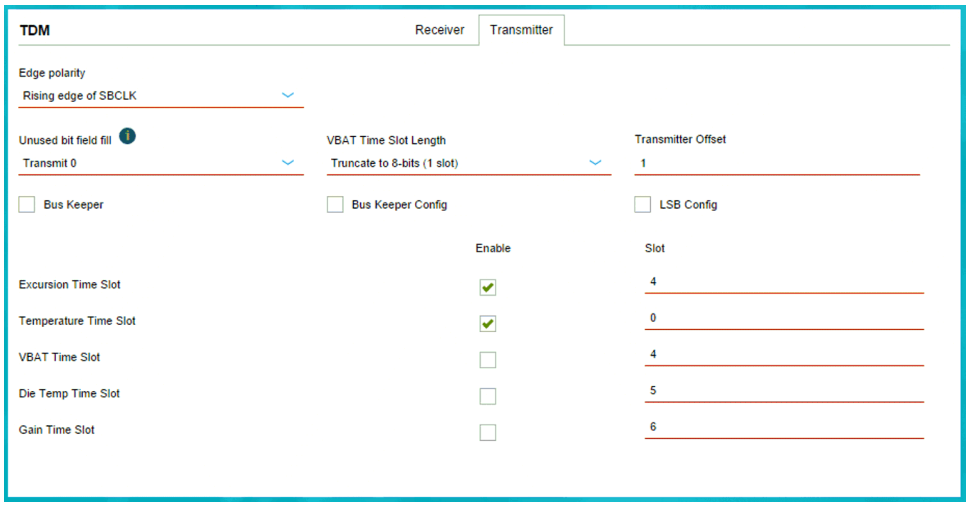

Figure 1-9. TDM Transmit IV Sense Data

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 attenutate relatively to the over-temperature until it reaches programmable Thermal Max Attenuation. This feature will release the attentuation automatically after the die temperature is below the threshold again and Hold Time period has passed. Combinig 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.

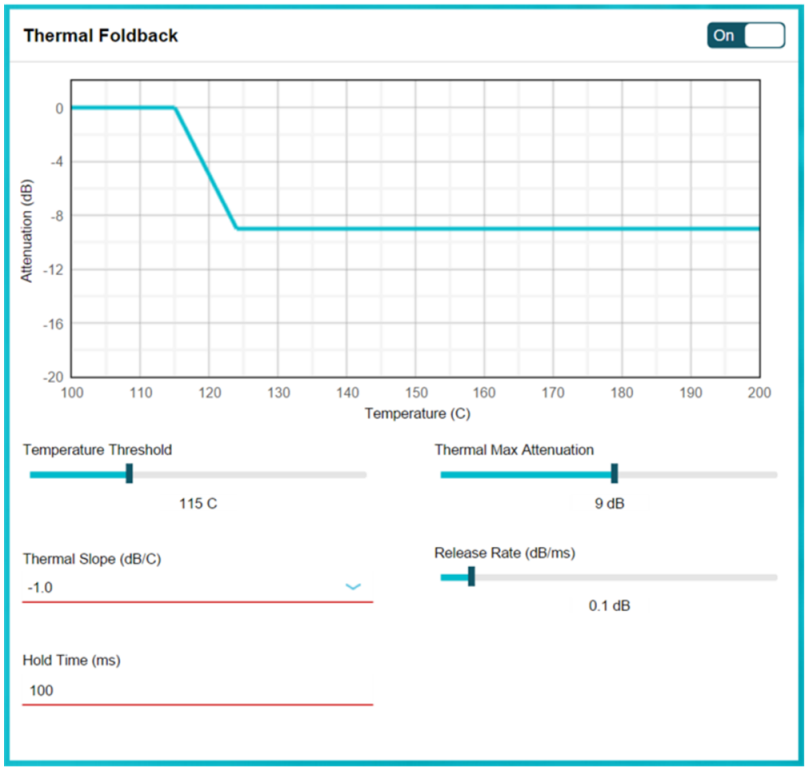

Figure 1-10. Thermal Foldback

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. Depeding 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 deisgn.

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 avaible when user is in the “Advanced” mode

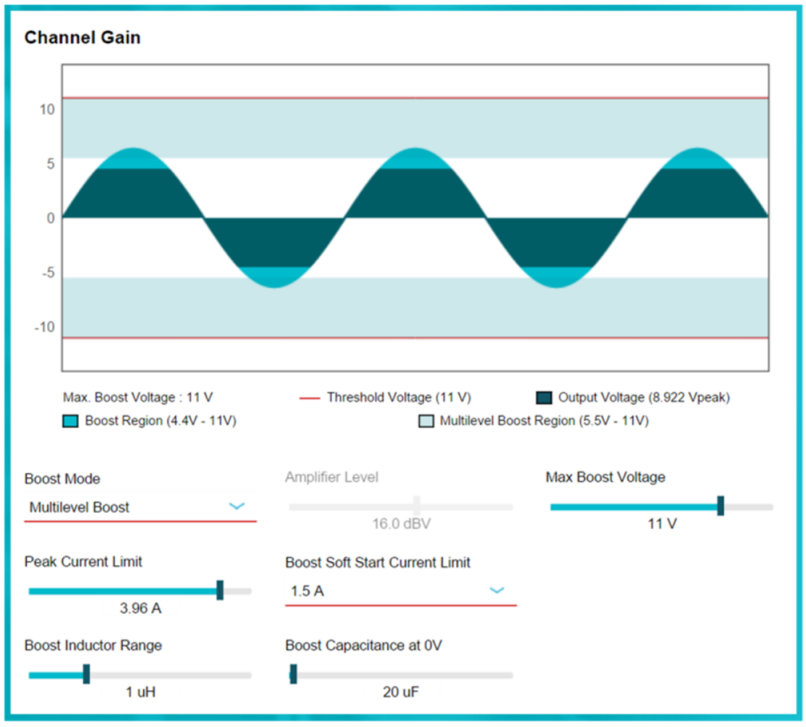

Figure 1-11. Channel Gain

2 Summary

Once the 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 features please refer to Figure 1-1 or visit our E2E forum.

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