

DoP Decoder board User's Guide

By Ian Jin and Greg Stewart, June 18, 2017 Ver. 2.0b

A. Description

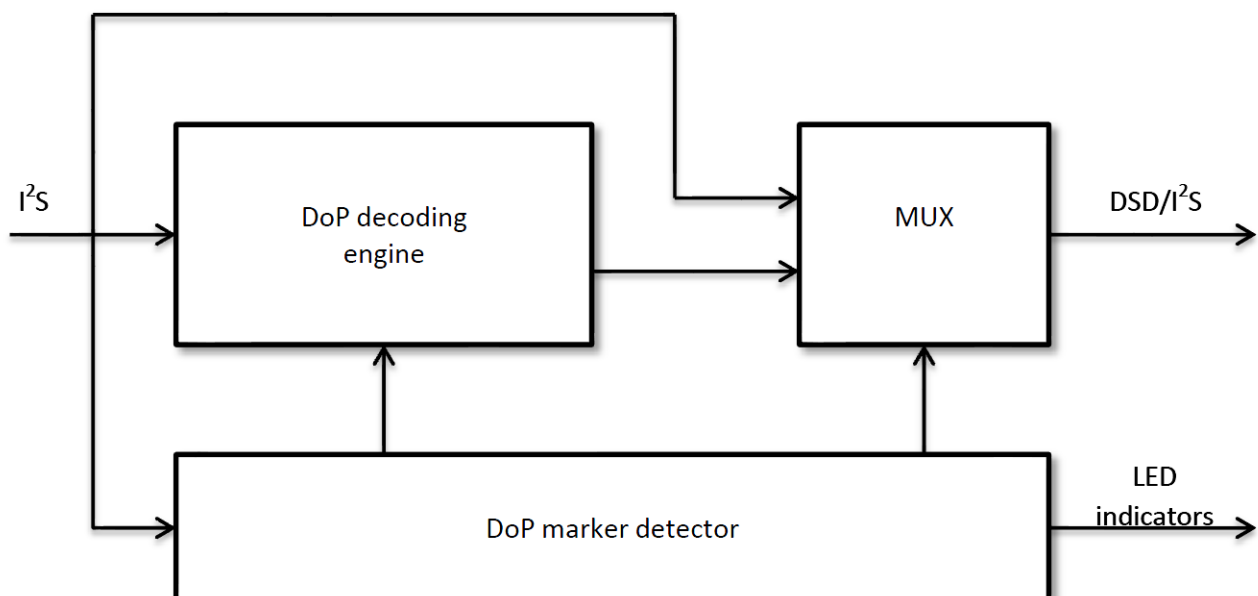
DoP is a protocol to transfer native DSD data within the 24bit PCM (I²S) protocol. By using DoP, DSD data can be sent using existing I²S or S/PDIF connections. DoP is a bit perfect protocol and converts back into native DSD with no losses. There are NO differences between the original native DSD stream and one re-generated back into DSD format from a DoP stream. Many of the common software packages used to playback music on RaspberryPi's or PC are beginning to offer DoP output of DSD data as a means to output DSD via the I2S pins on the expansion header.

To convert DoP back to DSD, a DoP decoder is required. Many DSD-capable music playback systems use a software-based DoP decoder that is part of the systems' firmware or software. Many DSD-capable DACs that are not part of a full music playback system use a hardware-based DoP decoder.

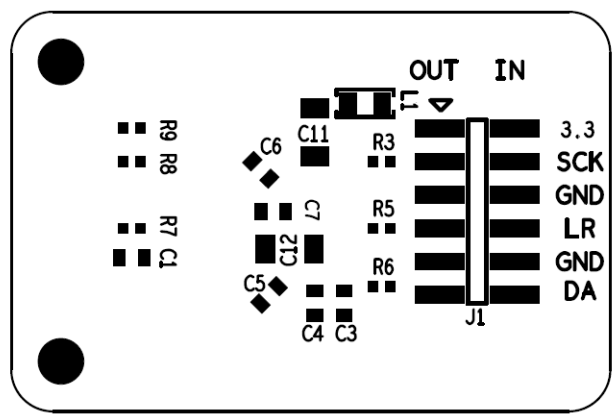
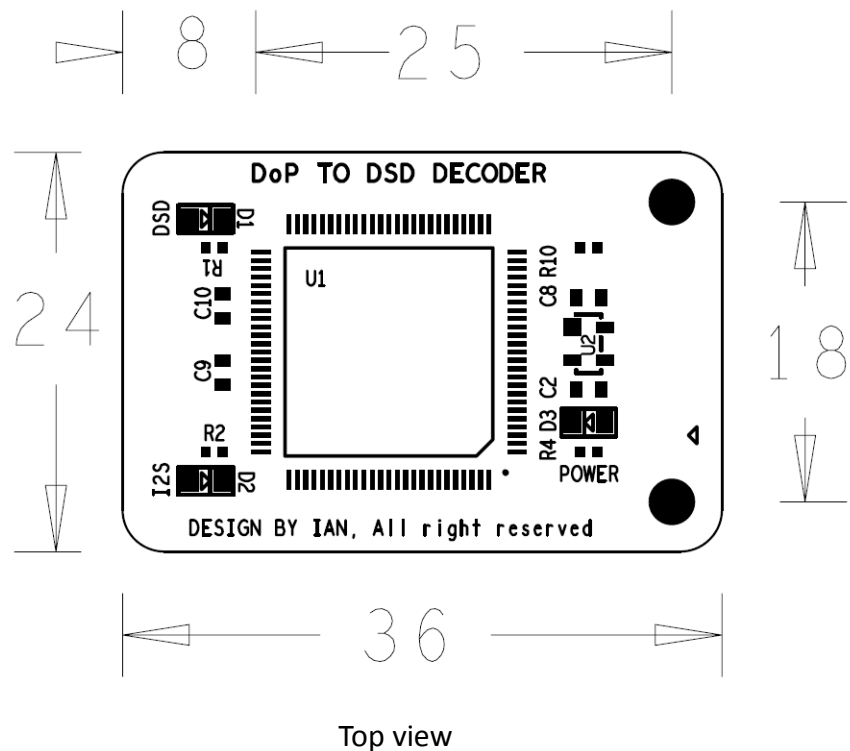
While some DSD-capable DACs can handle DoP data, not all do. Some suggest that a DAC that can handle either DoP or native DSD MAY benefit sonically when feeding native DSD to these DACs, due to the lower processing required by eliminating the on-board conversion.

This DoP Decoder board is an FPGA hardware-based daughter board that works with the IsolatorPi. It converts a DSD64 to DSD512 DoP stream back into native DSD. Native PCM (I²S) and DSD data streams pass-through with no changes. The DoP Decoder board makes it very easy to integrate any I²S/DSD or pure DSD-capable RaspberryPi DAC HATS using the IsolatorPi. All you have to do is plug the DoP Decoder board into the dedicated socket on the IsolatorPi. The DoP Decoder board can also be used separately with external DSD-capable DACs.

B. Block diagram



C. Layout and Dimensions (in mm)



Bottom view

D. Connector

J1: 6*2 PIN 2.0mm female board to board header connector (Note that all signal lines are 3.3V logic level)

Description	Signal	Pin numbers		Signal	Description
3.3V 100mA DC power input	3.3V	1	2	3.3V	3.3V 100mA DC power input
I ² S/DSD SCK output signal	SCK output	3	4	SCK input	I ² S SCK input signal
Ground	GND	5	6	GND	Ground
I ² S LRCK/DSD DL signal	LRCK/DL output	7	8	LRCK input	I ² S LRCK input signal
Ground	GND	9	10	GND	Ground
I ² S DATA/DSD DR signal	DATA/DR output	11	12	DATA	I ² S DATA signal

E. LED indicators

LED	Descriptions	Notes
D1	DSD input status	'On' indicates a DoP input signal is received and being converted to native DSD signal.
D2	I ² S input status	'On' indicates a PCM (I ² S) or other non-DoP input signal is being output UNCHANGED. (Note: Both D1 and D2 'Off' means no input signal. Also either D1 or D2 will be 'On', never both at the same time.)
D3	Power indicator	'On' when board is powered.

F. Application Notes

1. To use with the IsolatorPi:

IsolatorPi includes a DoP Decoder socket. Please see the IsolatorPi manual for details on which jumpers to remove and how to install the DoP Decoder. Once you have done that, your RaspberryPi is ready to output native DSD signal.

2. To integrate with a DAC or other digital audio device:

Insert the DoP decoder into the PCM (I2S)/DSD data stream signal path via J1 as detailed in section D.

You must:

- a. Connect the input and output data streams (SCK, LRCK/DL, & DATA/DR).
- b. Connect 3.3V and ground.

G. DoP decoder daughter board pictures



DoP decoder daughter board



Work with IsolatorPi

© 2017 Ian Jin. The firmware code embedded in the DoP decoder board is the property of Ian Jin. You are granted a non-exclusive, non-transferable, non-sublicenseable, royalty-free right to use the DoP decoder board solely for your own, non-commercial purposes. You may not distribute, sell, lease, transfer, modify, adapt, translate, reverse engineer, prepare derivative works of, decompile, or disassemble the software provided. All rights reserved.