amanero technologies

COMBO384 USB TO I2S DSD CONVERTER

Preliminary Datasheet
version 4/09/2013 Rev F

FEATURES

- **Core**
  ARM® Cortex®-M3 ATSAM3U
  CPLD XILINX® XC2C64A

- **OSCILLATORSG**
  TCXO 24.5760 Mhz Low phase noise
  TCXO 22.5792 Mhz Low phase noise

- **USB**
  USB 2.0 High Speed dedicated 12Mhz crystal
  Class 2 compatible
  No drivers for Mac OSX® 10.6+
  No drivers for Linux with UAC2 Kernel compliant
  WDM Kernel Streaming/WasaPI/DS MS Windows® XP/Vista/Win7 32bit/64Bit tested with Win 8 preview.

- **AUDIO**

  PCM over USB sample rates 44.1Khz 48Khz, 88,2Khz,96Khz,192Khz 352.8Khz, 384Khz I2S output

  DSD over USB freq. 2.822 Mhz, 3.072 Mhz, 5.644 Mhz, 6.144 Mhz. PCM token FA05

- **OUTPUT**
  LVCMOS33

- **Powered by USB 5V bus. Power Consumption is 605 mW at max speed.**
  The module mounts an ultra low noise LDO ADP-151-3.3V

- **ROHS and CE certified**

DESCRIPTION

The combo384 is an USB audio device adapter for OEM applications.
USB PCM audio data (2 Channels) accepted in input are converted in an I2S stream or DSD native stream. The PCM sample rates supported are 44.1 Khz, 48 Khz, 88,2 Khz, 96 Khz, 176,4 Khz, 192 Khz, 352,8 Khz, 384 Khz.

The DSD over USB format is detected when PCM sample with an alternate sequence of 32 FA05 token in the MSB part is received. The DSD managed frequencies are 2.822 Mhz, 3.072 Mhz, 5.644 Mhz, 6.144 Mhz. With ASIO Driver http://www.amanero.com/asio it's possible to play native DSD extending the range to DSD256 and DSD512.

An incoming DSD stream is indicated by an asserted signal in a specific DSD ON pin of the output comb connector and the I2S DATA and I2S FSCLK pins become the DSD Left/Right output pins.

The module works in Master Mode Only. The embedded oscillators can be replaced with an external oscillator enabling the Pin 6 to work as MCLK INPUT.

Output connector

header 10x2 raw 2.54 pitch

1	Cable Plugged	-	It's "1" When the usb cable is plugged
2	Reserved	-	
3	I2S DATA/DSD1	Out	Data stream LVCMOS 3.3V 47ohm
4	I2S CLK/DSD CLK	Out	Clock LVCMOS 3.3V 47ohm
5	I2S FSCLK/DSD2	Out	Frame sync LVCMOS 3.3V 47ohm
6	MCLK	Out	Actual Master Clock 24.576Mhz or 22.5792Mhz
7	DSD ON	Out	This line is "1" when a DSD stream is detected. (FA05 in the PCM envelope MSB) LVCMOS 3.3V
8	GND	Power	Ground Terminal
9	3.3V output (max 50mA)	Power Out	This output can be used to power an isolator or it can be used to detect when the usb is connected to the PC.
10			
11	MUTE	Out	This line is "1" during a sample rate change or when the DSD mode is changing.
12	Reserved	-	
13	GND	Power	Ground Terminal
14	GND	Power	Ground Terminal
15	GND	Power	Ground Terminal
16	DSD64_128	Out	0=DSD64 1=DSD128 -open drain-
17	F0	Out	Sample rate indicator see table below
18	F1	Out	Sample rate indicator see table below
19	F2	Out	Sample rate indicator see table below
20	F3	Out	Sample rate indicator see table below

Output Connector pinout

[11] **Mute**	[12] **SDA**	[13]**GND**	[14]**GND**	[15]**GND**	[16]**DSD**	[17]**F0**	[18]**F1**	[19]**F2**	[20]**F3**
[1] **Plug**	[2] **SCL**	[3] **DATA**	[4] **CLK**	[5]**FSCLK**	[6] **MCLK**	[7]**DSDON**	[8]**GND**	[9]**3.3V**	[10]**3.3V**

Windows Drivers can be downloaded at http://www.amanero.com/drivers.htm

ELECTRICAL CHARACTERISTICS

ABSOLUTE RATINGS*

Storage Temperature.....-40°C to + 85°C
Maximum Operating Voltage .....5.5V USB supply

***NOTICE: Stresses beyond those listed under "Absolute Maximum**
Ratings" may cause permanent damage to the device.
This is a stress rating only and functional operation of the
device at these or other conditions beyond those indicated
in the operational sections of this specification is
not implied. **Exposure to absolute maximum rating conditions for extended periods may affect device reliability**

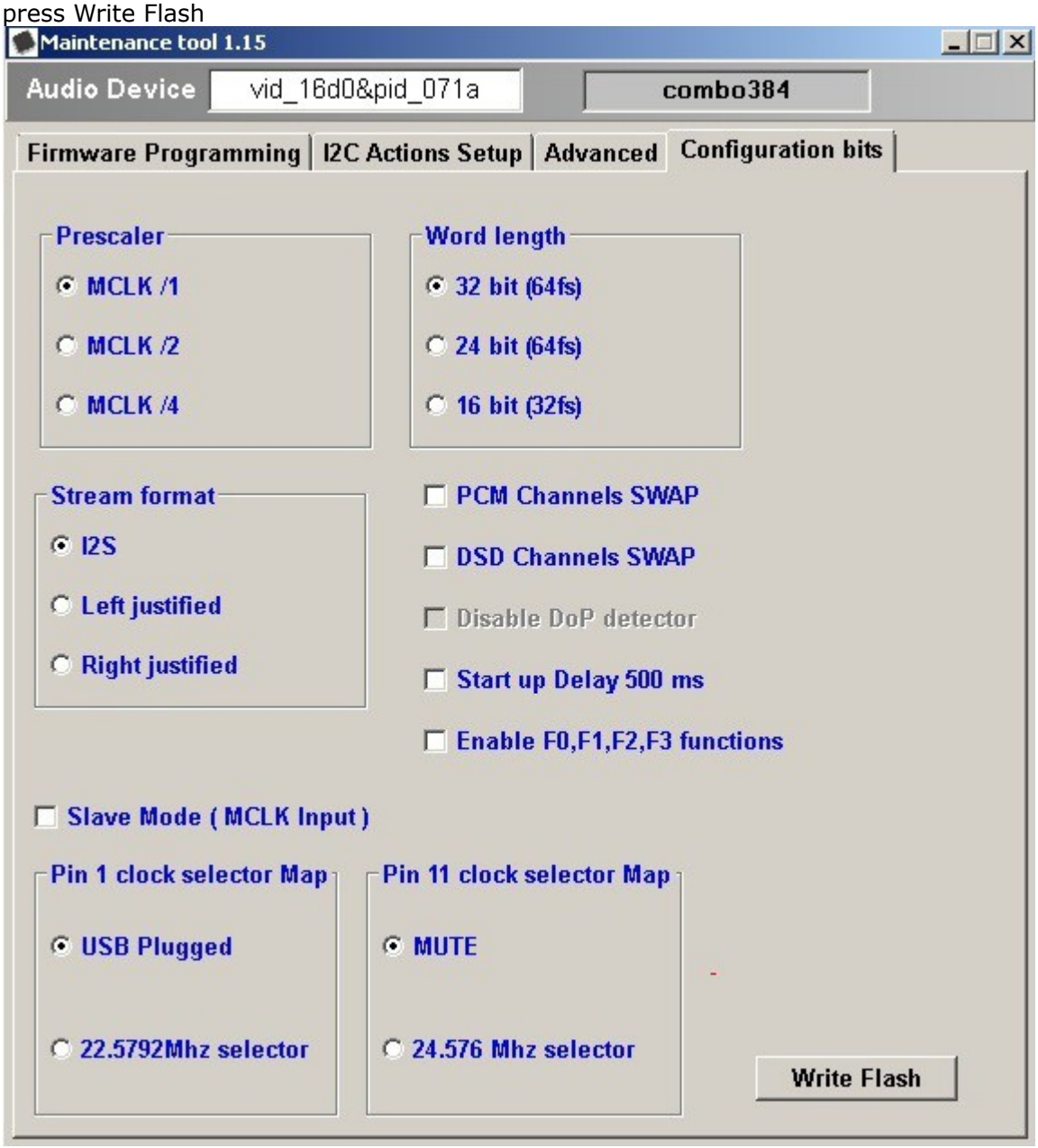
For more info please read http://www.amanero.com/drivers/combo384-D.pdf

Sample Rate Indicators

0 (F3), 0 (F2), 0(F1), 0(F0) -> 32kHz
0 (F3), 0 (F2), 0(F1), 1(F0) -> 44.1kHz
0 (F3), 0 (F2), 1(F1), 0(F0) -> 48kHz
0 (F3), 0 (F2), 1(F1), 1(F0) -> 88.2kHz
0 (F3), 1 (F2), 0(F1), 0(F0) -> 96kHz
0 (F3), 1 (F2), 0(F1), 1(F0) -> 176.4kHz
0 (F3), 1 (F2), 1(F1), 0(F0) -> 192kHz
0 (F3), 1 (F2), 1(F1), 1(F0) -> 352.8kHz
1 (F3), 0 (F2), 0(F1), 0(F0) -> 384kHz

To enable the sample rate indicators download www.amanero.com/oemtool115.zip

Plug the board, run the ConfigTool.exe and on Configuration Bit Panel enable F0... functions then press Write Flash



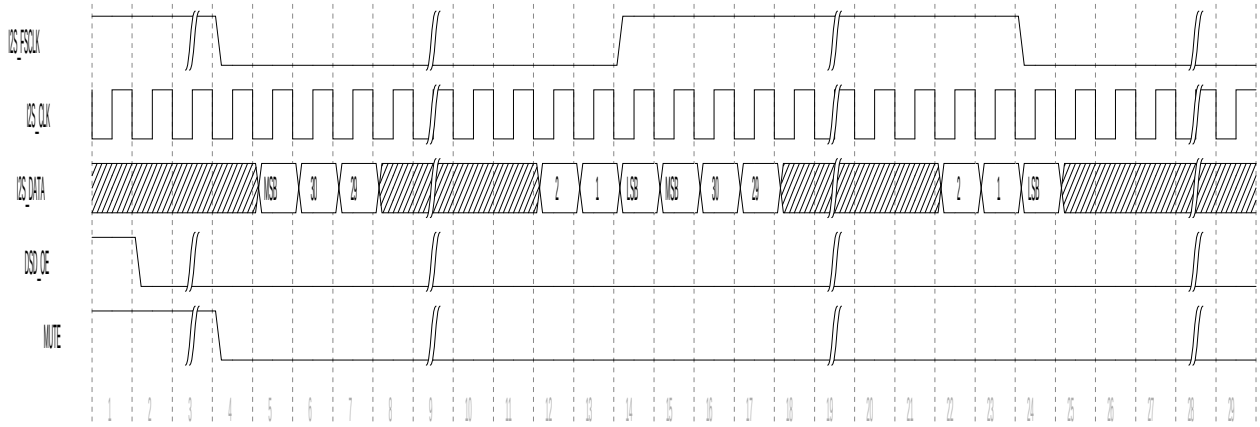
DC Characteristics

VCCIO 3.3V

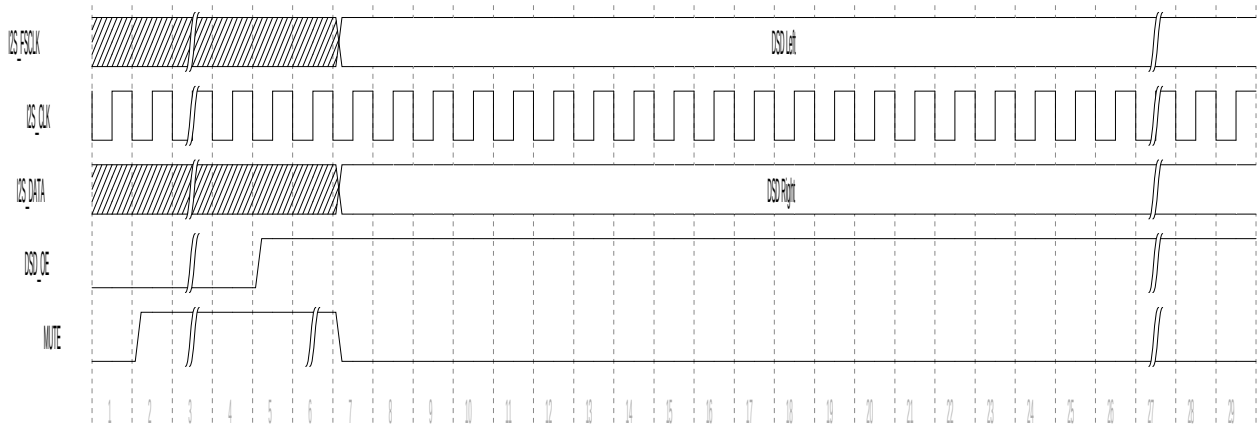
Symbol	Parameter	Min	Max
VOH	High level output voltage	VCCIO – 0.4V (Ioh=-8mA)	-
VOL	Low level output voltage	_	0.4 V (Iol=8mA)
Pdc	Power consumption at 32/384Khz		605mW

Timing Diagrams

I2S Mode



DSD Mode



In DSD Mode the I2S_CLK becomes the DSD clock signal, the I2S_FSCLK becomes the output data line DSD1 and I2S_Data becomes the DSD2 Line.

Application Note

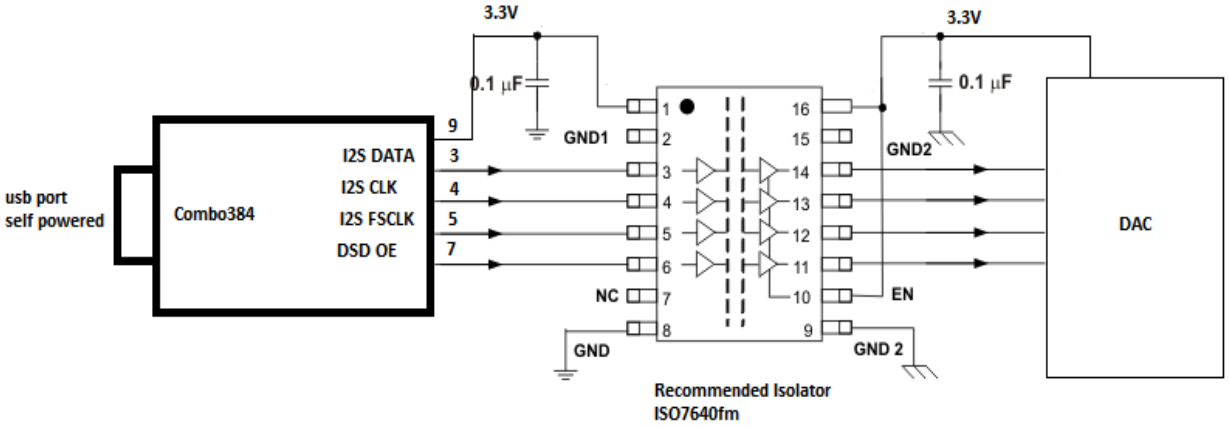


Fig.1 - Isolator between the module and the DAC.

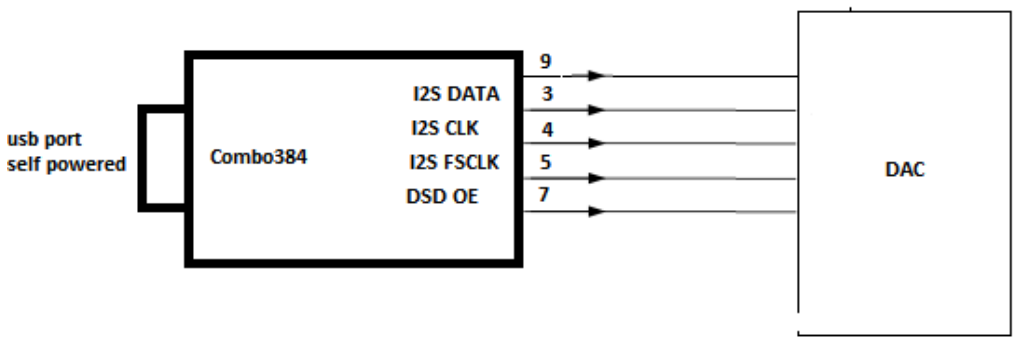
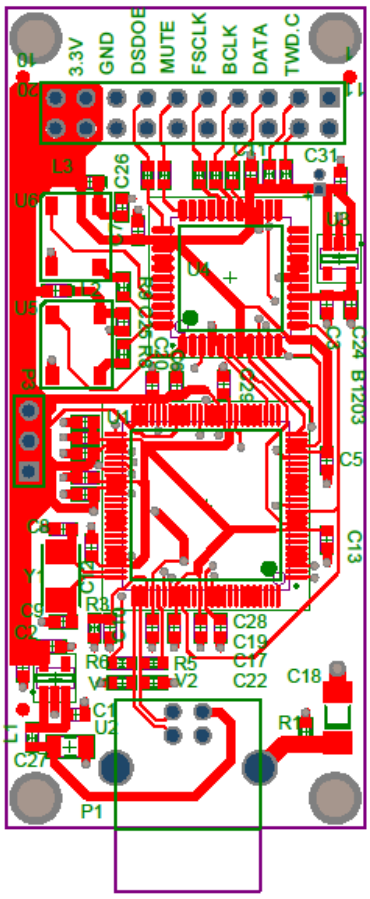


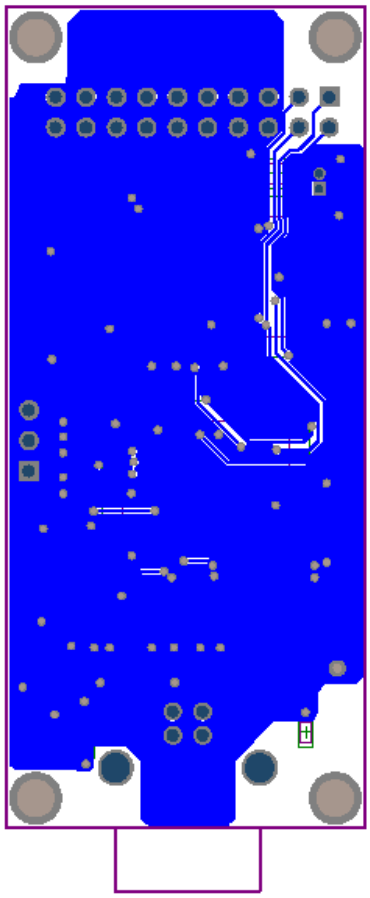
Fig. 2 - Without isolator.

The pin 9 3.3V can be used to detect when the usb is plugged and the module powered.

GERBER TOP

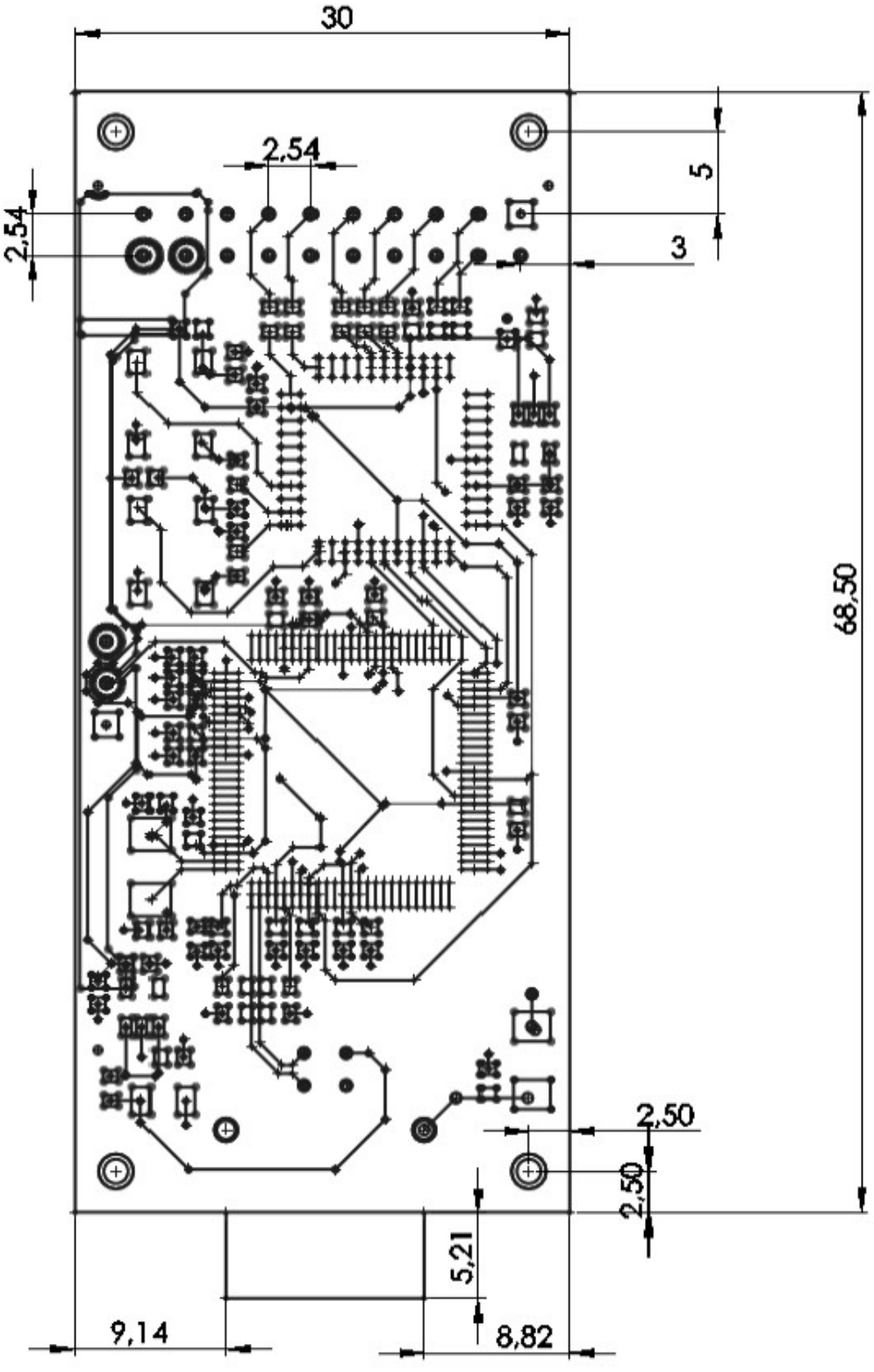


GERBER BOTTOM



MECHANICAL CHARACTERISTIC

distances are in mm



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NOTICE

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This is a preliminary datasheet and is not complete.