transient

dac one datasheet and application information

research by listening

The Dac One is a modern high precision dac replacement for old dacs very often used in "non oversampled" systems like the old TDA 1543 and TDA 1541. It is not a pin compatible replacement but a way to build up an converter system which can meet the best systems today in terms of sound quality.

Architecture
The Dac One is build up around a fast 16 bits and very precise R2R ladder network. To match this ladder network to real audio formats, fast glue logic is added and makes the dac compatible with RJ16, RJ24 and I2S standards. The Dac One is physically split up in two sections . The digital section is running on 5 Volt DC while the analog section is running on a symmetrical +/- 6 Volts. Both positive or negative reference voltages can be used and gives a fully symmetrical voltage or current swing. Like one bit dacs the Dac One can handle 24 bit formats due to forward control techniques as realized with our FPGA based "Forward Correction Module"

Versions available
The ladder network is designed as a current output device so to get a voltage out an I/V converter is needed. Depending on designers needs the Dac One is available in two versions:

Current output version (Dac one - C)
The current output coming from the R2R ladder is directly available on one of the output pins.

Maximum load is 33 Ohm with 10 VDC reference voltage

Output voltage (10 Volt ref)		2nd harmonic	3rd harmonic
100 Ohms	50 mV	0.02%	0.0009%
50 Ohms	25 mV	0.007%	0.0002%
33 Ohms	16 mV	0.002%	0.0001%

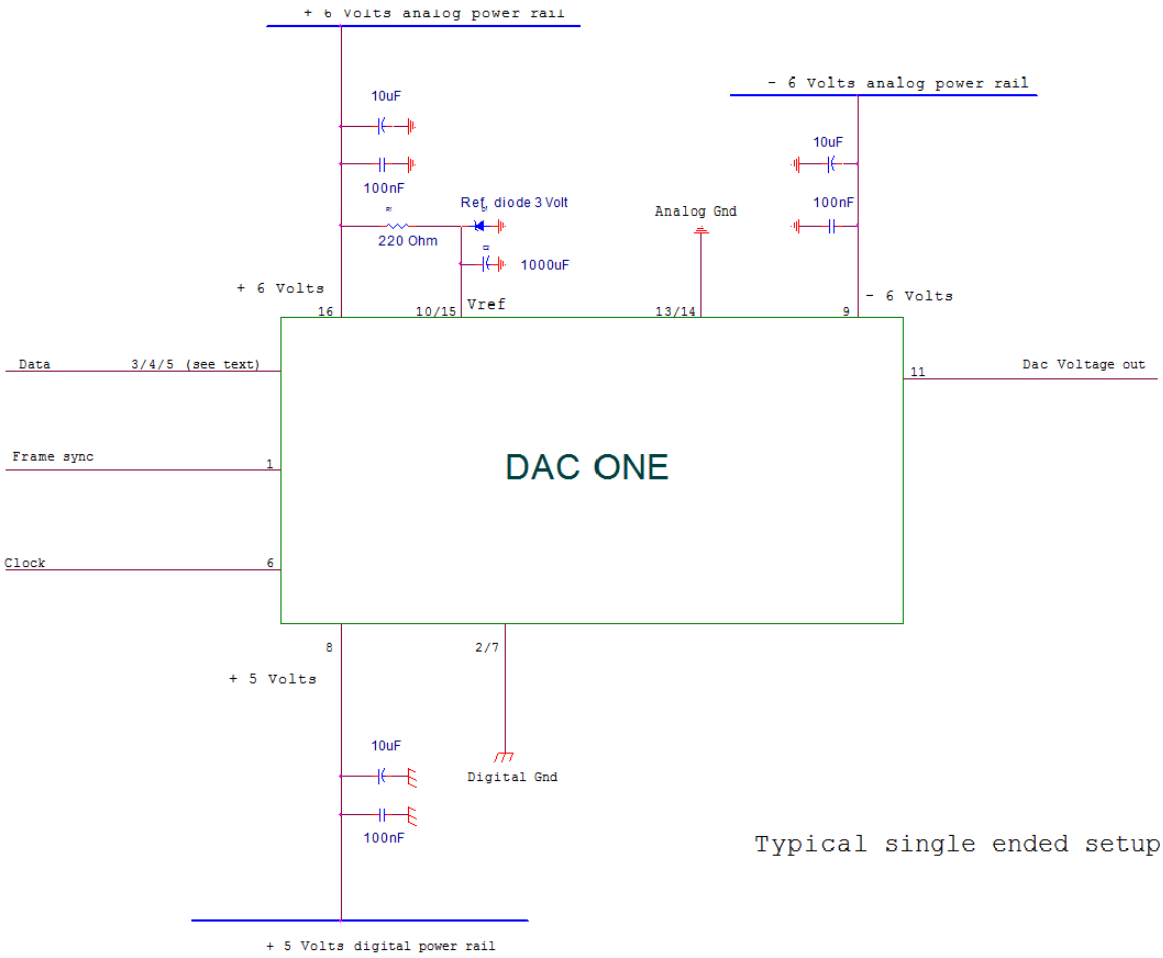
Voltage output version (Dac One - V)
In this version the ladder is connected to an I/V converter having an extremely fast (1500 V/µSec) slew rate and a bandwidth of 500 MHz . This approach gives a very open and detailed sound without the restrictions of very often used silicon.

Low pass filter
In case of the voltage output version, a passive first order network is added to the I/V converter and has its -3dB point at 70 kHz.

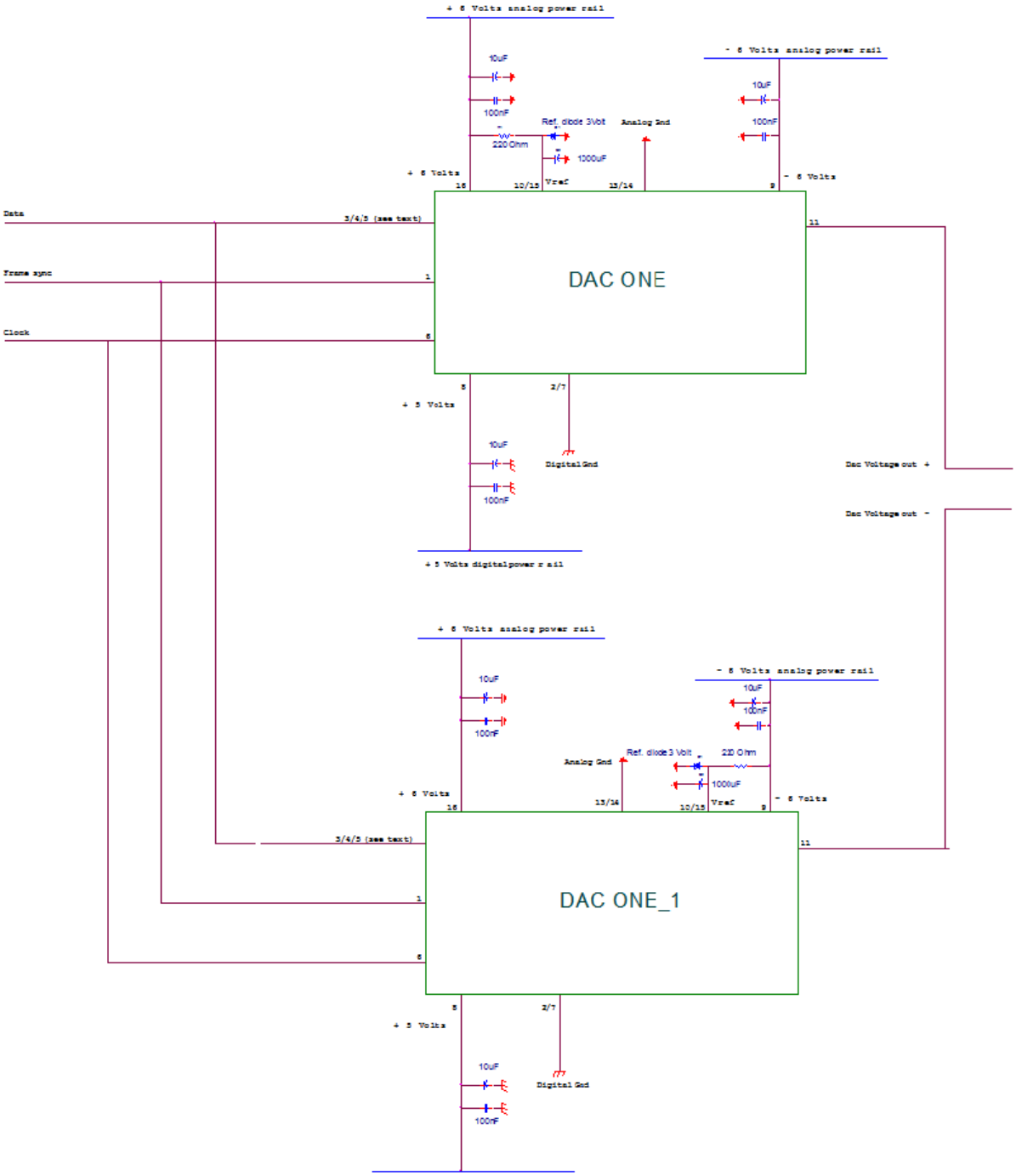
Absolute maximum ratings ratings

Analog Power Supply ±6.5 VDC	Current version ±12 VDC
Digital Power Supply 5.5 VDC	Current version 5.5 VDC
Storage Temperature Range: D, DBV –65 to +125 °C	
Junction Temperature (TJ) +175 °C	
Human Body Model (HBM) 2000 V	
ESD Ratings Charge Device Model (CDM) 1500 V	
Stresses above these ratings may cause permanent damage.	
Reference voltage ±3VDC	Current version ±10 VDC

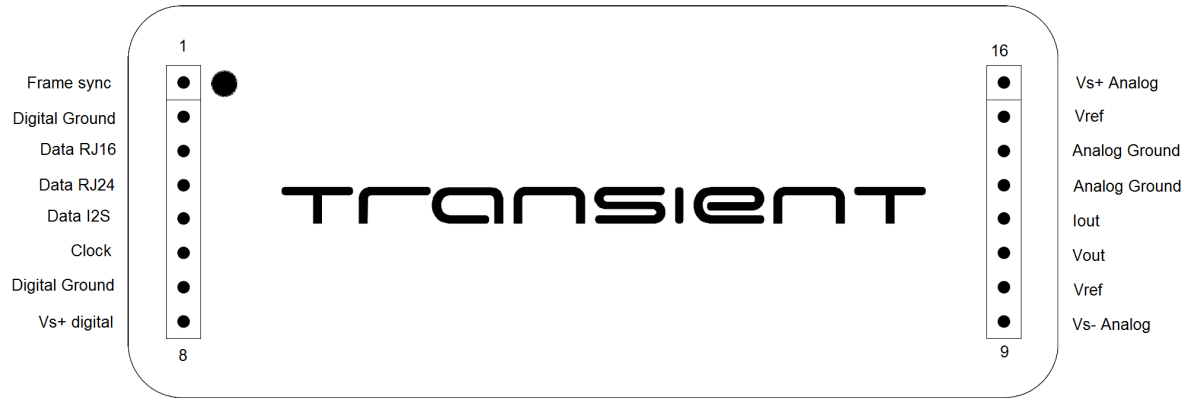
Applications



Simple "Single ended " voltage out design for one channel.



Balanced design for one channel. Only reference voltages has different polarities.



Shown from top side of dac module

Pin configuration

Pin 1 Frame sync/ Write control digital input Active low

Pin 2 Digital Ground

Pin 3 Input data format Right Justified 16 (when in use, leave other input pins open)

Pin 4 Input data format Right Justified 24 (when in use, leave other input pins open)

Pin 5 Input data format I2S (when in use, leave other input pins open)

Pin 6 Clock input

Pin 7 Digital Ground

Pin 8 Digital power supply + 5 Volt

Pin 9 Analog negative power supply -6 Volt Current version -12 Volt

Pin 10 Vref, Typical +3VDC or -3VDC for 2Volts RMS output. (voltage output version) tied with pin 15. In case of Current version max . +10 VDC or -10 VDC

Pin 11 Vout, Output of the I/V converter including the 70kHz first order low pass filter.

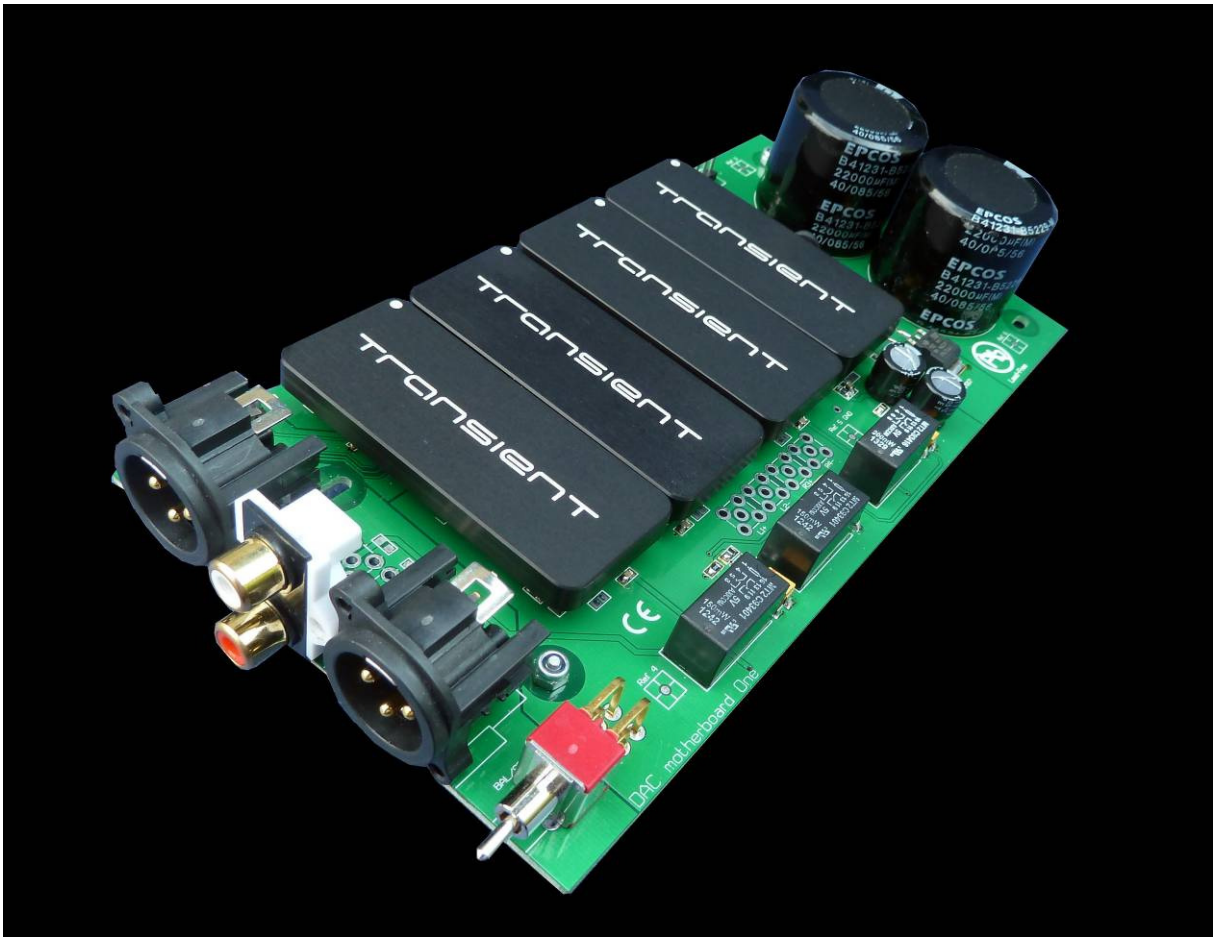
Pin 12 I out, Current output directly from the ladder network. (current output version)

Pin 13 Analog Ground

Pin 14 Analog Ground

Pin 15 Vref, Typical +3VDC or -3VDC for 2Volts RMS output. (voltage output version) tied with pin 10. In case of Current version max . +10 VDC or -10 VDC

Pin16 Analog positive power supply +6 Volt Current version +12 Volt

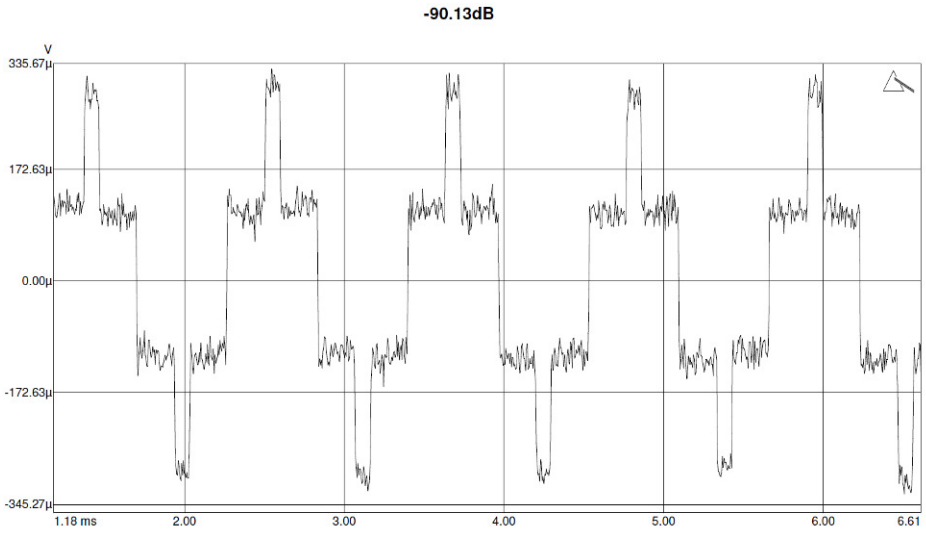


The DAC ONE used in a balanced stereo configuration. By switching the reference voltages the dac can be converted to a single ended output version.

Pin position is based on standard grid of 0.1 Inch (2.54 mm)

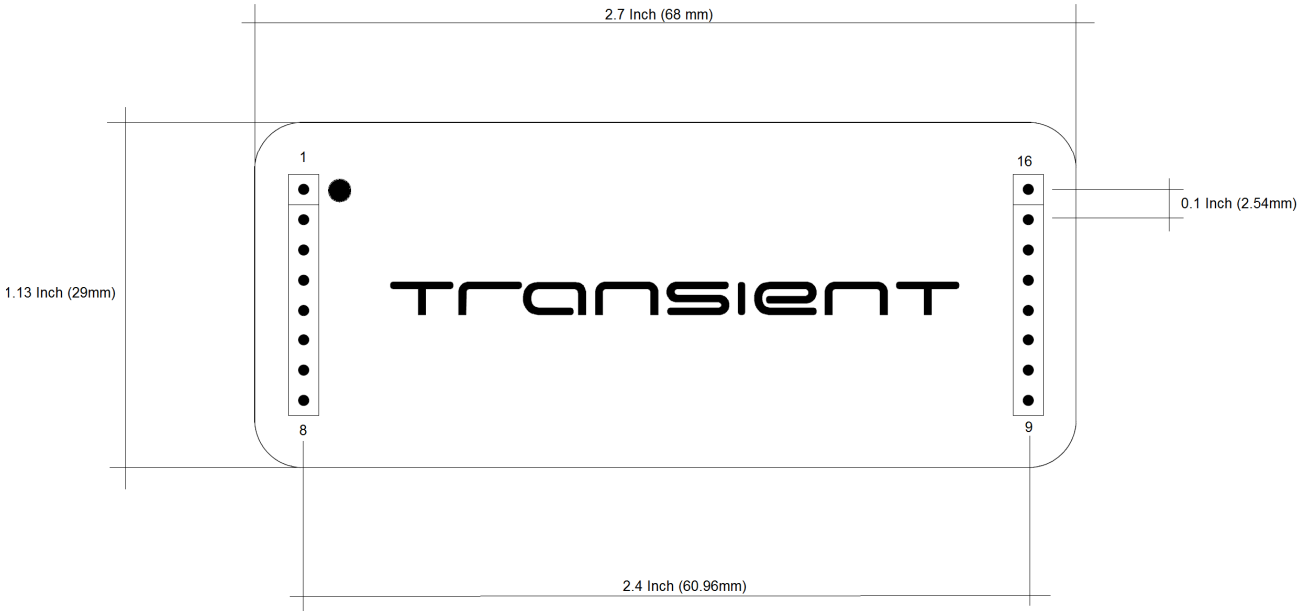
Technical specs

Resolution	16 bits
Accuracy	1LSB
Differential non linearity	0.5 LSB
Output current (current output version)	max. 1.5 mA
Max reference voltage for 2 Volts RMS output (voltage output version)	+/- 3Volts
(current version)	+/-10 Volts
Noise related to 2 Volts RMS output (FFFF digital input data)	-125dB
Noise related to 2 Volts RMS output (0000 digital input data)	-140dB
Output impedance (voltage output version)	100 Ohm
Max offset voltage (voltage output version)	1 mV
THD (44.1kHz sampling) (voltage output version)	0.008 %
Total power consumption	92 milliWatt
Digital part	5 Volt 3.5 mA
Analog part (voltage output version)	+/- 6 Volt 7.5 mA
(current version)	+/- 12 Volt 12 mA



Sine produced on -90.13dB undithered

Dimensions



Distance of pins is based on standard grid of 0.1 Inch or 2.54 mm.

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