D.Module.ADDA12MUX Technical Data Sheet

D.SignT
Digital Signalprocessing Technology

Revision 1.0

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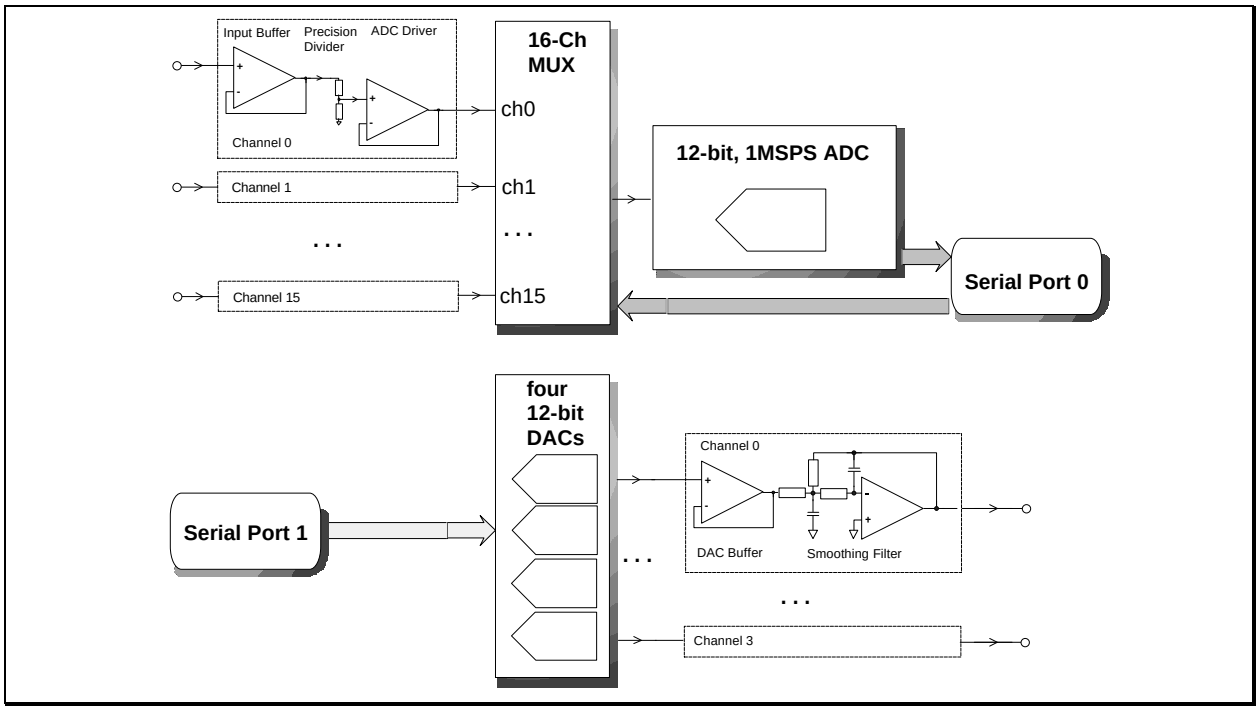
SUMMARY

- **16-channels multiplexed analog input with sequencer**
- **4-channel analog output**
- **12 bit resolution**
- **1 MSPS total throughput**
- **+/- 10V single-ended inputs and outputs**
- **interfaces to DSP via serial ports**
- **+/-15 V analog power supply 3.3V digital power supply**
- **Small Size: only 85 x 59 mm**
- **industrial temperature grade -40..+85°C**



The D.Module.ADDA12MUX is particularly suited for industrial process control and robotics. It's multiplexer and sequencer allow to convert up to 16 input channels with a maximum total throughput of 1 MSPS. Two schemes of conversion sequencencing are supported: a fixed sequence (channel 0 to channel N repetitively), or a free programmable sequence, which allows to convert one or more channels at a higher sampling frequency than the other channels

The inputs are single-ended with +/-10V input range. The four analog outputs, single-ended, with +/-10 V output range, are followed by a smoothing filter and default to 0V on power-up.

Input Stage

Each analog input has it's own buffer amplifier and level shifter. Input impedance is 1 MOhms. A 2.048V reference output is provided for ratiometric input configurations.

Multiplexer and ADC

The heart of the D.Module.ADDA12Mux is the Analog Devices AD7490 Analog-to-Digital Converter, a 12-bit successive approximation converter with a built-in 16-channel multiplexer.

A conversion is initiated by sending a conversion-start command via the serial port. Depending on the configuration, either the AD7490 built-in sequencer is used, or the conversion sequence is determined by the sequence of commands written to the ADC. The latter provides maximum flexibility because it allows to convert one or more channels at higher sampling frequencies. Since almost all DSPs provide a DMA controller, the conversion sequence can by transmitted by DMA without loading the CPU. A typical DSP-provided conversion sequence may be 0-1-2-3-4-5-0-1-6-7-8-9-0-1-10-11-12-13. etc. This will convert channel 0 and channel 1 at three times the sampling frequency of the other channels.

The sampling frequency is determined by the serial port clock, which is programmable by the DSP. It is not possible to synchronize the ADDA12Mux to an external clock, nor use an external clock as the sampling frequency source .

DAC

The D.Module.ADDA12Mux uses the Texas Instruments DAC7615, a four-channel digital-to-analog converter with a serial interface. The four DACs can be written independently. Two operation modes are supported: each analog output is updated immediately after a new value has been written to it, or all four outputs update simultaneously. Simultaneous update will preserve correct phase alignment between the analog outputs.

On power-up, the outputs default to 0V. The DAC settling time is less than 10 µsecs for a full-scale step, allowing to output full-range signals up to 100kHz.

Output Stage

Each DAC output is followed by a second-order Butterworth smoothing filter and an amplifier stage to provide +/-10V output range.

DSP Interface

The D.Module.ADDA12MUX interfaces via the DSP's synchronous serial ports, called McBSPs on Texas Instruments DSPs, or SPORTs on Analog Devices DSPs. Serial Port 0 uses the transmitter to write conversion start commands to the ADC. The receiver is used to read the data from the ADC. Serial Port 1 uses the transmitter to write data to the DACs. The receiver is not used except for the receive frame sync signal, which can be used to initiate a synchronous update of all four DAC channels.

The maximum supported serial clock frequencies are 16MHz for the ADC (resulting in 1 MSPS throughput), and 10 MHz for the DAC.

Power Supply

The D.Module.ADDA12Mux requires a +/-15V power supply for the analog input and output stage. The digital part operates at 3.3V, which is directly connected to the DSP module power supply.

SIGNAL DESCRIPTION

DSP SERIAL PORT INTERFACE

Signal	Pin	Type	Description
DAT_RX0	A26	O	serial data from ADC to DSP
CLK_RX0	A27	I	serial port clock for ADC, determines sampling frequency
FX_RX0	A28	I	ADC chip select
DAT_TX0	A29	I	serial conversion command from DSP to ADC
CLK_TX0	A30	I	connected to CLK_RX0
FS_TX0	A31	I	connected to FS_RX0
FS_RX1	B28	I	not used or driven low: immediate update of each DAC after a write pulsed low: simultaneous update of all four DACs
DAT_TX1	B29	I	serial data from DSP to DAC
CLK_TX1	B30	I	serial port clock for DAC
FS_TX1	B31	I	DAC chip select

POWER SUPPLY

Signal	Pin	Type	Description
+AVCC	C17	PWR	positive analog power supply, +15V
AGND	C16	PWR	analog ground, 0V
-AVCC	C15	PWR	negative analog power supply, -15V
VCC	B32	PWR	digital power supply, +3.3V
GND	A32	PWR	digital ground, 0V

Analog Inputs

Signal	Pin	Type	Description
AGND	F1, F2, O1, O2	PWR	analog ground, 0V
IN0	G1	I	analog input channel 0
IN1	H1	I	analog input channel 1
IN2	I1	I	analog input channel 2
IN3	J1	I	analog input channel 3
IN4	K1	I	analog input channel 4
IN5	L1	I	analog input channel 5
IN6	M1	I	analog input channel 6
IN7	N1	I	analog input channel 7
IN8	G2	I	analog input channel 8
IN9	H2	I	analog input channel 9
IN10	I2	I	analog input channel 10
IN11	J2	I	analog input channel 11
IN12	K2	I	analog input channel 12
IN13	L2	I	analog input channel 13
IN14	M2	I	analog input channel 14
IN15	N2	I	analog input channel 15
REFOUT	P1	O	buffered reference voltage output, 2.048V

Analog Outputs

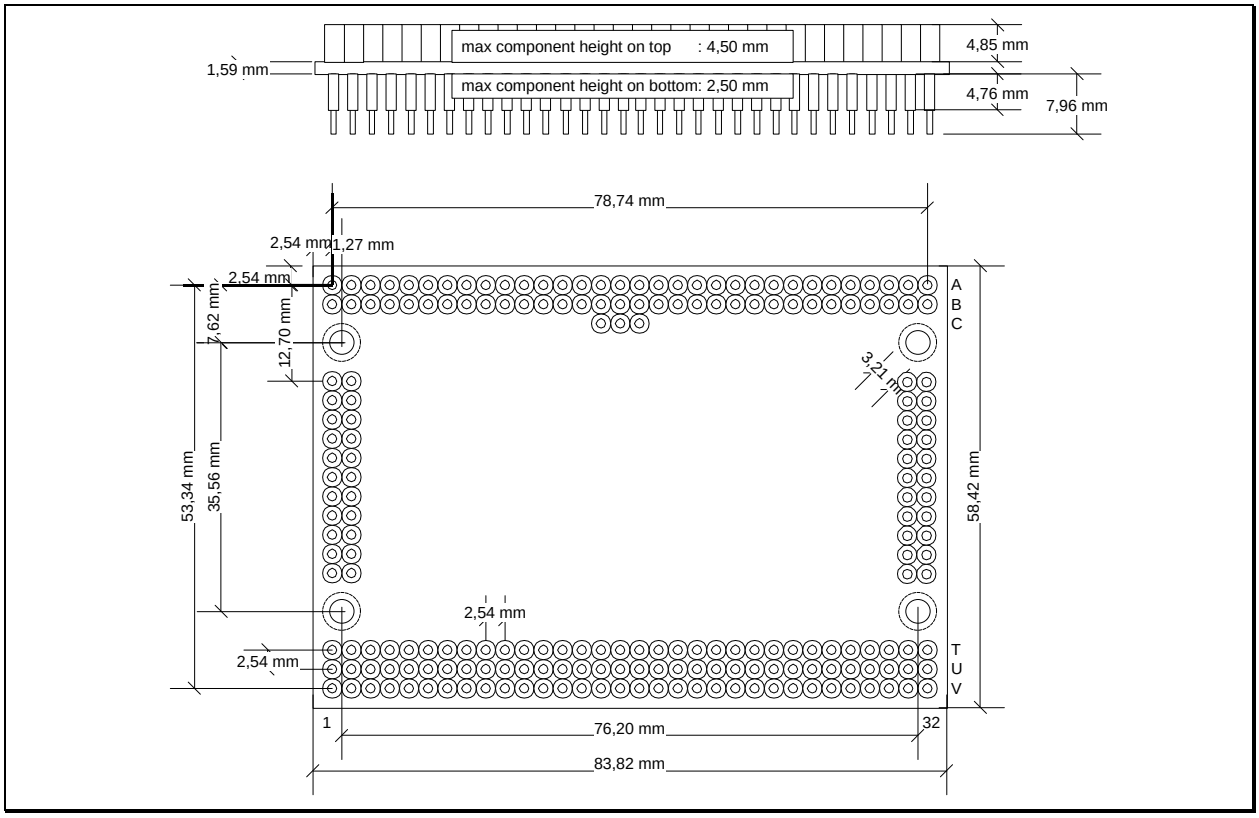
Signal	Pin	Type	Description
AGND	F31, H31, J31, L31, N31, O31, F32..N32	PWR	analog ground, 0V
OUT0	G31	O	analog output channel 0
OUT1	I31	O	analog output channel 1
OUT2	K31	O	analog output channel 2
OUT3	M31	O	analog output channel 3
REFOUT	P31	O	buffered reference voltage output, 2.048V

PINOUT

Pin	A	B	C	T	U	V
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15			-AVCC			
16			AGND			
17			+AVCC			
18						
19						
20						
21						
22						
23						
24						
25						
26	DAT_RX0	DAT_RX1				
27	CLK_RX0	CLK_RX1				
28	FS_RX0	FS_RX1				
29	DAT_TX0	DAT_TX1				
30	CLK_TX0	CLK_TX1				
31	FS_TX0	FS_TX1				
32	GND	VCC (3.3V)				

Pin	1	2	31	32
F	AGND	AGND	AGND	AGND
G	ADC channel 0 IN	ADC channel 8 IN	DAC channel 0 OUT	AGND
H	ADC channel 1 IN	ADC channel 9 IN	AGND	AGND
I	ADC channel 2 IN	ADC channel 10 IN	DAC channel 0 OUT	AGND
J	ADC channel 3 IN	ADC channel 11 IN	AGND	AGND
K	ADC channel 4 IN	ADC channel 12 IN	DAC channel 0 OUT	AGND
L	ADC channel 5 IN	ADC channel 13 IN	AGND	AGND
M	ADC channel 6 IN	ADC channel 14 IN	DAC channel 0 OUT	AGND
N	ADC channel 7 IN	ADC channel 15 IN	AGND	AGND
O	AGND	AGND	AGND	rsvd
P	REFOUT	rsvd	REFOUT	rsvd

MECHANICAL DIMENSIONS



Size: max. 85 x 59 x 15 mm

ELECTRICAL CHARACTERISTICS

OPERATING CONDITIONS, DC PARAMETERS

Supply Voltage	digital: 3.3V +/- 5%
	analog: +/-15V +/-10%
Power Consumption	digital: 10 mA typ.
	analog: 80 mA typ.
Operating Temperature	-40..+85°C
High Level Input Voltage	min. 2V, max. VCC+0.2V
Low Level Input Voltage	min. -0.2V, max. 0.8V

ANALOG INPUTS

Channels	16 , single-ended
Input Voltage Range	+/-10V
Input Impedance	1 MOhms
Input Offset Voltage	TBD

ANALOG OUTPUTS

Channels	4, single-ended
Output Voltage Range	+/-10V, outputs default to 0V after power-on
Output Offset Voltage	TBD
Smoothing Filter	Butterworth, 2^{nd} order, fc=200kHz
Load	> 2 K Ohms

ANALOG-TO-DIGITAL CONVERTER

Type	successive approximation with built-in multiplexer
Resolution	12 bit
Acquisition Time	300 nsecs
Conversion Time	800 nsecs
Sampling Frequency	max. 1 MHz (1 channel), max. 62.5 kHz (16 channels), determined by serial clock frequency
Signal-to-Noise Ratio	TBD
SINAD	TBD

DIGITAL-TO-ANALOG CONVERTER

Type	four independent R2R ladder
Resolution	12 bit
Monotonicity	12 bit
Settling Time	< 10 µsecs full-scale step to 1/2 LSB
Sampling Frequency	max 500 kHz (1 channel), max. 125 kHz (4 channels), determined by serial clock frequency
Signal-to-Noise Ratio	TBD
SINAD	TBD

ORDERING INFORMATION

D.Module.ADDA12MUX-16-4-V10	standard module

ADDITIONAL OPTIONS ON VOLUME PURCHASE

For volume purchase D.SignT offers customer-specific modifications of the hardware either to reduce costs through reduced functionality or to increase functionality to meet the customers application requirements. Extensive experience in custom designs and the powerful engineering tools of our development department bring your application and our DSP know how together for your solution. Please contact D.SignT directly.

TECHNICAL SUPPORT

Our products include free of charge technical support. You can reach the technical support by e-mail (support@dsignt.de) phone or fax.

PRICING

Please ask for our current price list and volume discounts.

AVAILABLITY

Our standard D.Modules are available typically ex-stock. For special modifications or non-standard D.Modules please consult our sales department.

WARRANTY

All D.Modules come with a warranty of 12 month.

For additional information contact your local distributor who will also support you after your purchase or contact D.SignT directly.

Distributed and supported locally by

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