

## Product Datasheet - Technical Specifications



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# ***Specifications***

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## Analog Input Specifications

Table 28 lists the specifications for the A/D subsystem on the DT9832 Series modules.

**Table 28: A/D Subsystem Specifications**

Feature	Specifications
Number of analog input channels DT9832: DT9832A:	4 single-ended, simultaneous 2 single-ended, simultaneous
Resolution	16 bits
Range	$\pm 10$ V
Gain	1
Throughput per channel	See Table 29.
Signal bandwidth (to $-3$ dB point) DT9832: DT9832A:	> 6.25 MHz > 10.0 MHz
Sample-and-hold Aperture uncertainty: Aperture delay: Aperture match: Gain match: Zero match:	200 ps typical 25 ns typical 1 ns / 500 ps typical $\pm 0.015\%$ $\pm 1.5$ mV
System accuracy, to % of FSR	$\pm 0.01\%$
Data encoding	Offset binary
Maximum input voltage (without damage) Power on: Power off:	$\pm 35$ V $\pm 20$ V
Input impedance	100 M $\Omega$ , 10 pF
Input bias current	$\pm 10$ nA
Integral nonlinearity	< 2 LSB
Differential nonlinearity	< 1 LSB
Inherent quantizing error	1/2 LSB
Drift Zero: Gain:	$\pm 20$ $\mu$ V/ $^{\circ}$ C $\pm 20$ ppm of FSR/ $^{\circ}$ C
ESD protection Arc: Contact:	8 kV 4 kV
Effective Number of Bits (ENOBs) @ 10 kHz input	14 bits typical
Spurious Free Dynamic Range (SFDR)	86 dB typical

## A/D Subsystem Throughput

Due to limitations of the USB bus, the maximum achievable sample rate (throughput) of the modules depends upon the number of channels sampled. [Table 29](#) lists the approximate throughput for each module based on the number of channels in the channel list. If you set a rate that is too high, you will receive an overrun error when you begin sampling.

**Table 29: Maximum Achievable Throughput**

Channels	DT9832 <sup>a</sup>	DT9832A <sup>b</sup>
1	1,250,000 Hz	2,000,000 Hz
2	1,250,000 Hz	2,000,000 Hz
3	1,250,000 Hz	1,816,666 Hz
4	1,250,000 Hz	1,362,500 Hz
5	1,090,000 Hz	1,090,000 Hz
6	908,333 Hz	908,333 Hz
7	778,571 Hz	778,571 Hz
8	681,250 Hz	681,250 Hz
9	605,555 Hz	605,555 Hz
10	545,000 Hz	545,000 Hz
11	495,454 Hz	495,454 Hz
12	454,166 Hz	454,166 Hz
13	419,230 Hz	419,230 Hz
14	389,286 Hz	–
15	363,333 Hz	–

- a. If you use all 15 channels of the DT9832 (30 bytes/sample), 1.25 MHz is transferred to the FIFO, but the effective rate is limited to 415 kSamples/s continuous by the USB bus.
- b. If you use all 13 channels of the DT9832A (26 bytes/sample), 1.50 MHz is transferred to the FIFO, but the effective rate is limited to 415 kSamples/s continuous by the USB bus.

## Analog Output Specifications

Table 30 lists the specifications for the D/A subsystem on the DT9832 Series modules.

**Table 30: D/A Subsystem Specifications**

Feature	Specifications
Number of analog output channels	2 Simultaneous
Resolution	16 bits
Settling time to 0.01% of FSR	2.0 $\mu$ s / 1.0 $\mu$ s, 100 mV steps 5.0 $\mu$ s / 2.0 $\mu$ s, 10 V steps
Throughput	500 kSamples/s per channel
Slew rate	10 V/ $\mu$ s
Glitch energy	12 nV-s, typical (essentially glitchless)
Output range	$\pm$ 10 V
Data encoding	Offset binary
Output current	$\pm$ 5 mA maximum load
Output impedance	0.1 $\Omega$ maximum
Capacitive driver capability	0.004 $\mu$ F
Protection	Short circuit to analog ground
Integral nonlinearity	1.0 LSB / 0.5 LSB
Differential nonlinearity	1.0 LSB / 0.5 LSB
Inherent quantizing error	1.0 LSB / 0.5 LSB
Error Zero: Gain:	$\pm$ 0.0003 V $\pm$ 0.0003 V
Drift Zero (bipolar): Gain:	$\pm$ 10 ppm of FSR/ $^{\circ}$ C $\pm$ 30 ppm of FSR/ $^{\circ}$ C
FIFO	128 kSamples, total
Monotonicity	1 LSB / Yes
ESD protection Arc: Contact:	8 kV 4 kV

## Digital I/O Specifications

Table 31 lists the specifications for the DIN/DOUT subsystems on the DT9832 Series modules.

**Table 31: DIN/DOUT Subsystem Specifications**

Feature	Specifications
Number of digital I/O lines	32 (16 in, 16 out)
Number of ports	2 (16 bits each)
Logic family	LVTTL (5 V tolerant)
Logic sense	Positive true
Inputs Input type: Input logic load: High input voltage: Low input voltage: Low input current:	Level-sensitive 1 LVTTL 2.0 V minimum 0.8 V maximum 0.4 mA maximum
Input termination	Inputs tied to +3.3 V through 15 k $\Omega$ pull-up resistors
Outputs High output: Low output:	2.4 V minimum with up to 6 mA 0.4 V maximum with up to 3 mA
Interrupt on change	Yes (on first 8 bits)
Clocked with sample clock	Yes
Software I/O selectable	No

## Counter/Timer and Quadrature Decoder Specifications

Table 32 lists the specifications for the C/T and quadrature decoder subsystems on the DT9832 Series modules.

**Table 32: C/T and Quadrature Decoder Subsystem Specifications**

Feature	Specifications
Number of channels C/T: Quadrature decoder:	2 3
Internal reference clock	48 MHz
Resolution	32 bits per channel
Clock divider Minimum: Maximum:	2 4,294,967,296
Clock output Minimum: Maximum:	0.0112 Hz 24 MHz
Maximum clock or gate input frequency	24 MHz <sup>a</sup>
Minimum pulse width (minimum amount of time it takes a C/T to recognize an input pulse)	21 ns
Maximum input frequency	23.8 MHz
Logic family	LVTTL (5 V tolerant)
Inputs Input logic load: High input voltage: Low input voltage: Low input current:	1 LVTTL 2.0 V minimum 0.8 V maximum –0.4 mA maximum
Outputs High output: Low output:	2.4 V minimum with up to 6 mA 0.4 V maximum with up to 3 mA

a. The integrity of the signal degrades at frequencies greater than 10 MHz.

## External Trigger Specifications

Table 33 lists the specifications for the external A/D and D/A triggers on the DT9832 Series modules.

**Table 33: External A/D and D/A Trigger Specifications**

Feature	Specifications
Trigger sources Internal: External:	Software-initiated Software-selectable
Input type	Edge-sensitive
Logic family	LVTTL (5 V tolerant)
Inputs Input logic load: Input termination: High input voltage: Low input voltage: Low input current:	1 LVTTL 2.2 k $\Omega$ pull-up to +3.3 V 2.0 V minimum 0.8 V maximum -0.25 mA maximum
Minimum pulse width High: Low:	25 ns 25 ns
Triggering modes Single scan: Continuous scan: Triggered scan:	Yes Yes No



## Internal Clock Specifications

Table 34 lists the specifications for the internal A/D and D/A clocks on the DT9832 Series modules.

**Table 34: Internal A/D and D/A Clock Specifications**

Feature	Specifications
Reference frequency	48 MHz
A/D Divisor range	3 to 4,294,967,295
A/D Usable clock frequency range DT9832: DT9832A:	0.00838 Hz to 1.25 MHz 0.00838 Hz to 2.0 MHz
A/D Usable clock period range DT9832: DT9832A:	800 ns to 119.33 s 500 ns to 119.33 s
D/A Usable clock frequency range	0.00838 Hz to 500 kHz
Oscillator accuracy (recording time error)	±50 ppm

## External Clock Specifications

Table 35 lists the specifications for the external A/D and D/A clocks on the DT9832 Series modules.

**Table 35: External A/D and D/A Clock Specifications**

Feature	Specifications
Input type <sup>a</sup> A/D: D/A:	falling edge rising edge
Logic family	LVTTL (5 V tolerant)
Inputs Input logic load: Input termination: High input voltage: Low input voltage:	1 LVTTL 2.2 k $\Omega$ pull-up to +3.3 V 2.0 V 0.8 V
A/D Frequency DT9832: DT9832A:	DC to 1.25 MHz DC to 2.0 MHz
D/A Frequency	DC to 500 kHz
Minimum pulse width High: Low:	25 ns 25 ns

- a. A quiet (glitch-free) stable clock is required for best results and to prevent overclock conditions. In addition, it is recommended that you avoid gating the clock unless gating on and off is synchronous to the clock.

## Power, Physical, and Environmental Specifications

Table 36 lists the power, physical, and environmental specifications for the DT9832 Series modules.

**Table 36: Power, Physical, and Environmental Specifications**

Feature	Specifications
Power, +5 V	±5% @ 2 A maximum plus load on +5 V outputs
Physical Dimensions (OEM): Dimensions (BNC): Weight (OEM):	190 mm x 100 mm 215.9 mm x 105.9 mm x 50 mm 4.6 ounces
Environmental Operating temperature range: Storage temperature range: Relative humidity: Altitude:	0° C to 55° C –25° C to 85° C to 95%, noncondensing to 10,000 feet

## Mating Connector Specifications

Table 37 lists the mating cable connectors for the connectors on the BNC connection box, the OEM version of the DT9832 Series module, and the EP353 and EP356 accessory panels.

**Table 37: Mating Cable Connectors**

Module/Panel	Connector	Part Number on Module (or Equivalent)	Mating Cable Connector
BNC connection box	Analog input	AMP/Tyco AMP 5747375-8	AMP/Tyco 5-747917-2
	Digital I/O	AMP/Tyco 5747301-8	AMP/Tyco 5-747916-2
	C\T, DAC, Clk, Trig	AMP/Tyco 5747301-8	AMP/Tyco 5-747916-2
OEM version	J2	AMP/Tyco 6-104068-8	AMP/Tyco 3-111196-4 <sup>a</sup>
	J3	AMP/Tyco 6-104068-8	AMP/Tyco 3-111196-4 <sup>a</sup>
	TB1 <sup>b</sup>	Phoenix Contact 1707434	Phoenix Contact 1839610
EP353 accessory panel	J1	AMP/Tyco 5102321-6	AMP/Tyco 1658622-6
	J2	AMP/Tyco 5747375-8	AMP/Tyco 5-747917-2
EP356 accessory panel	J1	AMP/Tyco 5747301-8	AMP/Tyco 5-747916-2
	J2	AMP/Tyco 5747301-8	AMP/Tyco 5-747916-2

a. The mating PCB receptacle is AMP/Tyco 6-104078-3.

b. Secondary power connector.

## Regulatory Specifications

The DT9832 Series modules are CE-compliant. [Table 38](#) lists the regulatory specifications for the DT9832 Series modules.

**Table 38: Regulatory Specifications**

Feature	Specifications
Emissions (EMI)	FCC Part 15, Class A EN55011:2007 (Based on CISPR-11, 2003/A2, 2006)
Immunity	EN61326-1:2006 Electrical Equipment for Measurement, Control, and Laboratory Use  <u>EMC Requirements</u> EN61000-4-2:2009 Electrostatic Discharge (ESD) 4 kV contact discharge, 8 kV air discharge, 4 kV horizontal and vertical coupling planes  EN61000-4-3:2006 Radiated electromagnetic fields, 3 V/m, 80 to 1000 MHz; 3 V/m, 1.4 GHz to 2 GHz; 1 V/m, 2 GHz to 2.7 GHz  EN61000-4-4:2004 Electrical Fast Transient/Burst (EFT) 1 kV on data cables  EN61000-4-6:2009 Conducted immunity requirements, 3 Vrms on data cables 150 kHz to 80 MHz
RoHS (EU Directive 2002/95/EG)	Compliant (as of July 1st, 2006)

## External Power Supply Specifications

Table 39 lists the specifications for the EP361 +5 V external power supply that is used with the DT9832 Series modules.

**Table 39: External Power Supply (EP361) Specifications**

Feature	Specifications
Type	Total Power medical power supply (TPES22-050400 or TPEMG24-S050400-7)
Input voltage	Typical 90 - 264 V AC
Input current TPES22-050400	Typical 0.38 A at 115 V AC, 0.15 A at 230 V AC
TPEMG24-S050400-7	Typical 0.347 A at 115 V AC, 0.215 A at 230 V AC
Frequency	47 to 63 Hz
Inrush current TPES22-050400	35 A at 230 V AC typical or less than 30 A by adding thermistor
TPEMG24-S050400-7	6.274 A RMS at 230 V AC
Output voltage	5 V DC
Output current	4.0 A
Output wattage TPES22-050400	Typical 22 - 24 W
TPEMG24-S050400-7	Typical 20 - 24 W
Noise and ripple	1% peak to peak
Regulatory specifications TPES22-050400	UL, N, CE, FCC Class B
TPEMG24-S050400-7	UL, ITE, CE, FCC Class B, Energy Star compliant