DIVADESAM TECHNOLOGIES®

nimēṣa REAL TIME SYSTEM CONTROLLER SPECIFICATIONS

nimēṣa REAL TIME SYSTEM CONTROLLER SPECIFICATIONS

nimēṣa REAL TIME SYSTEM CONTROLLER v3.0

Model: NRTS2416

nimēṣa RTS is advance controller for the rapid prototyping of the real world application. RTS controller work in plug and play manner and comes with advance hardware which fulfils the modern control requirements. RTS controller is compatible to work with any system i.e. any external power electronics hardware, actuators, signals, waveforms generators, emulators etc.

GENERAL SPECIFICATIONS

NOMINAL RATINGS			
Physical Dimensions	**Length**	**Width**	**Height**
	20 cm	20 cm	8 cm
Device I/Os	**Analogue Input**	**Analogue Output**	
	16 Bit ADC	16 Bit DAC	
GPIO Connection	24 bit Bidirectional ports at 1.27mm Pitch		
Number of Channels	**ADC**	**DAC**	
	16	16	
Additional Port*	32 bit additional Port for External Modules		
Type of Connectors	SMA Connectors		

Device Connectivity	Wi-Fi/Ethernet support with multiple user access
PWM Port	Dual 8 port SPWM at 1.27mm Pitch
External Connectivity	nimēṣa Microgrid, Power Electronics Devices, Drives, Sensors, Emulators
Function Generator	MATLAB Controlled Function Generator
Software Requirement	MATLAB Simulink® 2018 or above
System Requirement	MS Windows 8.1 or above

*Subject to external device interface.

DETAIL SPECIFICATIONS

Parameter		Specifications
FPGA/Processor	FPGA Type	Xilinx -FPGA & 7th Series
	Processor	667 MHz ARM 7th GEN
	Cache	2 x 16KB, on-chip
Operating System		Proprietary real time.
Memory	Flash Memory	16 MB
	Storage	Up to 64GB SD card
	RAM	1GB
Timer	4 general-purpose timers	32-bit down counter Reload by hardware 50-ns resolution
	1 sampling rate dimer (decrementer)	32-bit down counter Reload by hardware 25-ns resolution
A/D Converter	Channels	8 multiplexed channels equipped with one sample & hold A/D converter (1x16-bit) Dual ADC Note: 2 A/D converter channels 16 Bit x 8 Channels each can be sampled simultaneously
	Resolution	Multiplexed channels: 16 bit
	Input Voltage Range	±10 V
	Conversion Time	Multiplexed channels: 5 µs)** Single channels: 2 µs)
	Offset error	±5 mV
	Gain error	Multiplexed channels: ±0.5%

		Parallel channels: ±0.5%
	SNR	92 db
	THD	-102db
	DNL	±0.5 LSB
	INL	±0.75 LSB
	Bipolar Input	±10.24V, ±5.12V, ±2.56V
	Unipolar Input	10.24V, 5.12V
	5V Analog Supply	1.65V to 5 V I/O Supply
	Constant Resistive Input Impedance	1MΩ
	Input Overvoltage Protection	Up to ±12V
	Total Throughput Sampling	500-k SPS
	Industrial Temperature Range	-40° C to 125° C
D/A Converter	**Channels**	16 channels
	Resolution	16-bit
	Output range	±10 V
	Settling time	Max. 15 µs (full-scale, accuracy ½ LSB)
	Offset error	±2 mV
	Gain error	±0.2%
	Offset drift	130 µV/K
	Gain drift	25 ppm/K
	SNR	>80 dB
	Imax	±10 mA
	Bipolar Output	±2V to ±16.5V

	Unipolar Output	0V to +33V
	Low Power	14.4 mW/Ch(Bipolar Supply)
	Relative Accuracy	4LSB max
	Low Glitch	4nV-s
	Programmable Gain	X4/x6
Digital I/O	**Channels**	24-bit parallel I/O 34 bits optional for external proprietary Hardware Single bit selectable for input or output
	Voltage range	CMOS input/output levels
	I_{out}, max	±50 mA
Serial Interface	**Configuration**	Single UART (universal asynchronous receiver and transmitter) with FIFO RS232/RS422/RS485 compatibility
	Baud rate	Up to 115.2 kBd (RS232)
Slave Processor	**Type**	Cortex A9
	Clock rate	667 MHz
	Memory	64Kx16 external code memory 28Kx16 external data memory 4Kx16 dual-port memory for communication 32KB flash memory
	I/O channels	8x2 PWM outputs 4 capture inputs 1 serial peripheral interface
	Input Voltage Range	CMOS input/output level

		A/D converter inputs: 0 … 16 V(Max)
	Output current	Max. ±10 mA
Physical Characteristics	**Physical size**	20cm x 20 cm x 8 cm
	Ambient Temperature	0 … 55 ºC (32 … 131 ºF)
	Cooling	Active cooling by fan/ Not applicable in the current model
	Power Consumption	10 W
	Power supply (External)	+5 V ±5%, 2 A
	Power supply (Internal)	+12 V ±5%, 0.3 A 12 V ±5%, 0.2 A

** Speed and timing specifications describe the capabilities of the hardware components and circuits of our products. Depending on the software complexity, the attainable overall performance figures can deviate significantly from the hardware specifications.

Note: The exact number of I/O channels depends on your configuration.

Hardware Ports Description

Salient Features:

1. Quick MATLAB integration
2. Supports wireless programming
3. Integrated high-speed FPGA
4. No additional software licensing required
5. Improved time synchronization
6. Faster build process
7. Precision PWM Signal generation with symmetric dead-band frequency adjusted PWM.
8. Low cost

Hardware Resources:

1. 24 General-purpose digital Input-outputs
2. 16 channel,16-bit Analog Output
3. 16 channel,16-bit Analog Input
4. Dedicated USB ports for HIL, Daisy Chain support and Multi model connections.

Additional Ports for Robotics:

1. 8 channels for Digital Servo motor drive
2. 2A, 8 Channels for Stepper Motor analogue drive

Fig.1. Front Isometric View

Fig.2. Back-Side View

Fig.3. Back-Panel View

GPIO-1/2

GND	GND	11	9	GND	7	5	5V	3	1
5V	5V	10	8	5V	6	4	GND	2	0

GPIO-2/2

GND	7	5	3	1	5V	7	5	3	1
GND	6	4	2	0	GND	6	4	2	0

PWM-1
PWM-2

GND	GND	11	9	GND	7	5	5V	3	1
5V	5V	10	8	5V	6	4	GND	2	0

Fig.4. GPIO & PWM Pin Description

AD15	AD11	AD7	AD3	Fig- 5 ADC/ DAC Pin Description	DA15	DA11	DA7	DA3
AD14	AD10	AD6	AD2		DA14	DA10	DA6	DA2
AD13	AD9	AD5	AD1		DA13	DA9	DA5	DA1
AD12	AD8	AD4	AD0		DA12	DA8	DA4	DA0

GND	GND	GND	GND	GND	GND	GND	GND	GND	5V
1	2	3	4	5	6	7	8	9	5V

Fig-6 RBT – Pin Description

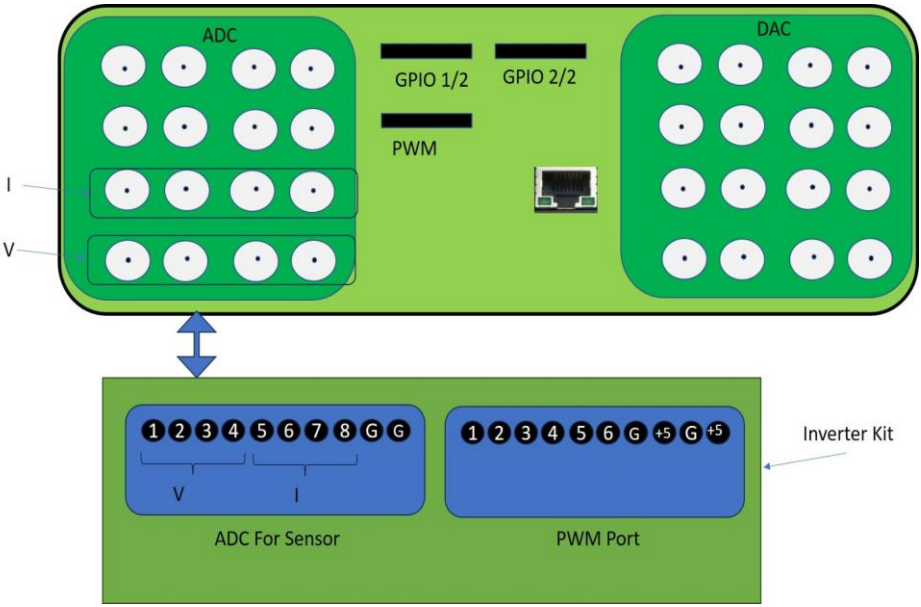

Fig 7. RTS Connections to Inverter ports

RTS APPLICATIONS

RTS can be used for following experiments and research application along with additional requirement as given below:

S. No	Experiments	Additional Package Requirement
RTS application in Power Electronic Lab		
1	All Type of DC-DC Converters	Converter Kit and Sensors
2	Bidirectional converters	Converter Kit and Sensors
3	PWM control of inverters and rectifiers	Converter Kit and Sensors
4	Thyristor control rectifiers	Converter Kit and Sensors
5	Switching control of MOSFET / SiC and IGBTs	Converter Kit and Sensors
6	All other related experiments	Additional kits may be required
RTS application in Machine and Electric Drive Lab		
7	Variable frequency drives	Converter kit + Sensors
8	BLDC drives and Controllers	Motor + Sensors
9	Vector control of induction motors	Motor + Sensors
10	DC motor controlled	Motor + Sensors
11	Field oriented control of motors	Motor + Sensors
12	All other related experiments	Additional kits may be required
RTS application in sensors, actuators and IoT		
13	Data acquisition from wide range of sensors including voltage, current and temperature sensors	May be required if not available
14	Data recording in MATLAB workspace	MATLAB 2018 and above
15	Post processing and analysis of data with MATLAB	MATLAB 2018 and above
16	Post processing and analysis of data with MATLAB	Setup may be required

17	Control of various type of pneumatic, hydraulic or electromagnetic actuators	Setup may be required
18	Ethernet interface for remote control	Setup may be required
19	WiFi based control	
RTS application in Robotics		
20	Control of stepper and servo motors	Setup may be required
21	CNC and Delta robot control	Setup may be required
22	Robotic arm control	Setup may be required
RTS application in Power System		
23	Design and prototyping of numerical relays	Customized Setup
24	Data acquisition using current and voltage sensors with real time analysis	Setup may be required
25	LV grid protection schemes	Customized Setup
RTS application in Renewable Energy		
26	Multi quadrant control of converters for PV application	Complete Experimental Setup
27	Advanced MPPT algorithm for PV, Wind and fuel cell.	Complete Experimental Setup
28	Grid tie applications of inverters and converters	Customized Setup
29	Microgrid inverters control	Kits + sensors
30	Bidirectional converter control for unipolar and bipolar dc Microgrid	Kits + sensors
31	Controlled power electronics loads	Kits + sensors
32	All other related areas	Kits + sensors

**Most of the experiments can be performed in the already existing converter kits in the Lab. In some experiments, additional package may be required.*