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## LAB 1 : Exploration and Use of the TI 28335 Board

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Introduction to Technical Specifications and Buying Guide on RS Components

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## 1 Introduction

The **TI 28335 board**, equipped with the **TMS320F28335 processor** from Texas Instruments, is a central element in the arsenal of developers working on high-performance embedded solutions. This board is recognized for its powerful **150 MHz processing unit** that can handle complex tasks in digital control and signal processing. Thanks to its extensive capabilities for direct memory access (DMA) across six channels, it allows for efficient manipulation of high-speed (data without overloading the central CPU).

### Importance and Typical Use in Industrial and Educational Applications

#### Industrial Applications

The TI 28335 finds its place in various industrial sectors where precision and responsiveness are crucial. Frequently used in motor control systems, automation management, and signal processing, it supports complex applications such as *voltage regulation systems* and *frequency converters*. Its ability to simultaneously process information through multiple interfaces, such as the *12-bit 16-channel ADC* and the *I2C bus*, makes it a preferred choice for engineers looking to develop robust and multifunctional embedded systems.

#### Educational Applications

In the educational domain, the TI 28335 board often serves as an advanced teaching tool in *electrical engineering* and *mechatronics* curricula. It allows students to apply theories of digital control, robotics, and electronics thanks to its easy integration with various sensors and actuators. Students can thus develop and test real-time control algorithms, study the effects of different peripheral configurations, and gain a better understanding of the interactions between hardware and software.

The TI 28335 is essential in both demanding industrial contexts and in research laboratories and classrooms, where it helps to train future engineers by providing them with the necessary tools to explore and innovate in the field of electronics and digital control.

## 2 Technical Specifications of the Board

The **TI 28335 board** is designed to deliver exceptional performance in digital control and signal processing applications. Here are the technical specifications that characterize this board:

- **Processor:** The heart of the TI 28335 board is a **TMS320F28335 microcontroller** from Texas Instruments, equipped with a 32-bit digital signal processor (DSP) clocked at 150 MHz. This high-performance DSP is optimized for control operations, capable of efficiently handling complex algorithms.
- **Six-Channel DMA Controller:** The board features a robust six-channel DMA (Direct Memory Access) controller. This controller facilitates the automatic transfer of data between memory and peripherals without the intervention of the main processor, improving resource management and overall system efficiency.
- **External Interface:** The external interface can be configured in 16-bit or 32-bit, allowing great flexibility in applications that require extensive data exchanges or the connection of additional external memories.
- **I2C Bus:** The presence of an integrated I2C bus makes the board compatible with a multitude of digital devices, facilitating the integration of additional sensors, displays, or other communication modules.
- **12-Bit, 16-Channel ADC:** One of the major assets of this board is its 12-bit analog-to-digital converter (ADC) offering up to 16 channels. This allows for precise and rapid reading of multiple analog signals, essential for monitoring and measurement applications.
- **Communication Interfaces:** In addition to the I2C bus, the board also supports communications via UART, SPI, and CAN, thus providing multiple options for connecting to other systems or networks.
- **ePWM:** The board has advanced PWM (Pulse Width Modulation) modules which are essential for precise power control in motor control applications or power conversion.
- **Memory Capabilities:** It is equipped with integrated flash memory and SRAM, sufficient for most embedded control and processing applications.

These specifications make the TI 28335 a highly versatile and powerful platform, suitable for a wide range of industrial and educational applications where performance, precision, and flexibility are critical.

Feature	Description
Processor	TMS320F28335, 32-bit DSP, 150 MHz
DMA Controller	6 channels, efficient data management without overloading the CPU
External Interface	Configurable in 16 or 32 bits
I2C Bus	Allows integration of additional sensors and communication modules
ADC	12 bits, 16 channels, rapid reading of analog signals
Communication Interfaces	UART, SPI, CAN
ePWM	Precise power control for motor command and power conversion
Memory Capabilities	Integrated flash memory and SRAM

### 3 Description of the Pins on the TI 28335 Board

The TI 28335 board is equipped with a variety of pins that offer extended capabilities for control applications and signal processing. The layout of these pins, as per the provided table, is essential for understanding their functionality and usage. Here is a detailed description of the pins on the board:

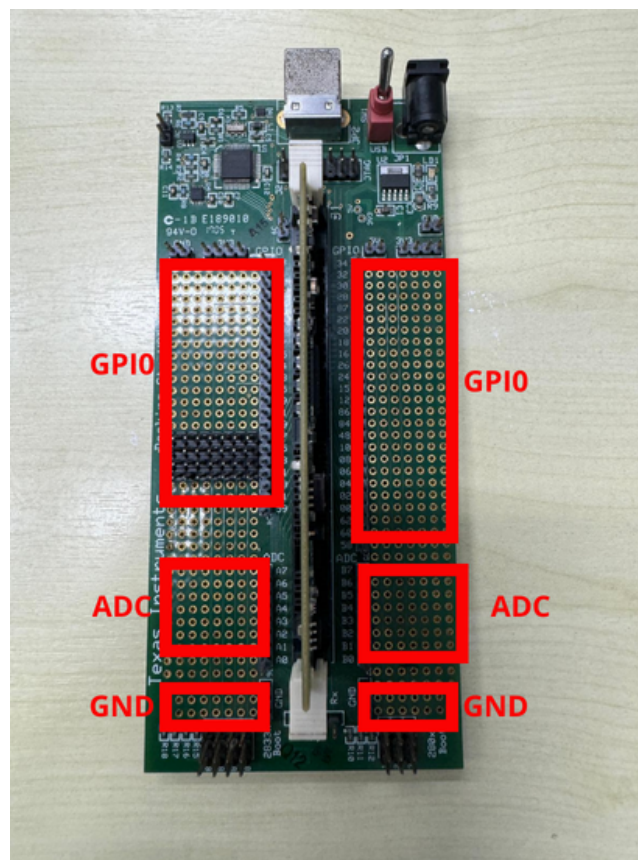


Figure 1: Layout of the main pins on the TI 28335 board

#### Power and Ground

- **+5V in (Pins 77, 82, 87, 92, 96):** These pins provide the necessary voltage to power the board.
- **GND / GND\_ISO (Pins 6, 8, 10, 12, 14, 27, 37, 47):** Ground points used to stabilize and secure the electrical operations on the board.

#### Serial Communication

- **RS232 (ISO-RX-RS232 Pin 2, ISO-TX-RS232 Pin 52):** Pins for RS232 communication, often used to connect computer or telecommunication devices.
- **CAN (CANRX-A Pin 44, CANTX-A Pin 94):** Pins for CAN communication, used in automotive and industrial applications for reliable and robust communications.

### SPI Interface

- **SPI (SPISIMO-A Pin 38, SPISOMI-A Pin 88, SPICLK-A Pin 39, SPISTE-A Pin 89):** These pins are dedicated to the SPI interface for fast communication with devices such as displays or memory modules.

### I2C Interface

- **I2C (I2CSDA Pin 45, I2CSCL Pin 95):** Pins for I2C communication, essential for connecting low-speed sensors and devices.

### Analog-to-Digital Converters (ADC)

- **ADCIN-A0 to ADCIN-A7 (Pins 57 to 71) and ADCIN-B0 to ADCIN-B7 (Pins 7 to 21):** Input pins for the analog-to-digital converter, allowing for the measurement of analog signals from multiple sources.

### Pulse Width Modulation (PWM) and Enhanced Capture (ECAP)

- **EPWM (EPWM-1A to EPWM-6B Pins 23 to 79):** These pins generate PWM signals for motor control or other devices requiring precise power regulation.
- **ECAP (ECAP1 to ECAP6 Pins 34 to 80):** Used to capture external PWM signals, measuring the frequency or period of incoming signals.

### GPIO and Special Functions

- **GPIO (various Pins, e.g., GPIO-00 to GPIO-87):** Offer great flexibility by being configurable for various functions as digital inputs or outputs, useful for control or interface signals.

### Configuration and Debugging

- **JTAG (TDI Pin 97, TDO Pin 98, TCK Pin 48, TMS Pin 49, TRSTn Pin 99):** Provide the necessary functionalities for programming, debugging, and testing integrated circuits on the board.
- **EMU (EMU0 Pin 100, EMU1 Pin 50):** Emulation pins for connecting to debugging tools, facilitating diagnostics and real-time program modifications.

## 4 Package Configuration for TI C2000

For those interested in acquiring the TI 28335 board, here is a detailed procedure to guide the purchase on RS Components, one of the reliable suppliers of electronic components.

### Steps to Order the TI 28335 Board on RS Components

#### 1. Access the Website:

- Start by navigating to the RS Components website at <http://www.rs-components.com>. This distributor is known for its wide range of electronic products and quality customer service.

#### 2. Search for the Board:

- Use the search bar at the top of the homepage. Enter “TI 28335” or the specific model number if you know it. Press Enter or click on the search icon to view the results.

#### 3. Select the Product:

- Browse through the list of search results. You will typically find several versions of the TI 28335 board, possibly including starter kits or individual boards. Select the one that best suits your needs by clicking on the product title to go to its detail page.

#### 4. Verify Specifications:

- Once on the product page, check the specifications to ensure they match what you are looking for. Take the time to read the descriptions, available configurations, and compatibility information.

**5. Add to Cart:**

- If the product meets your expectations, click the “Add to Cart” button. You can then either continue shopping or proceed to checkout.

**6. Checkout Process:**

- To finalize your purchase, go to your cart by clicking on the corresponding icon, then click on “Proceed to Checkout”. If you do not have an account, you will probably need to create one at this stage.
- Follow the instructions to enter your shipping and payment information.

**7. Confirmation and Tracking:**

- After completing the payment, you will receive an order confirmation email with the details of your purchase and tracking information once the order is shipped.

**8. Customer Support:**

- If you have any questions or need assistance during the ordering process, do not hesitate to contact RS Components’ customer service. They can provide additional advice and help resolve any issues you may encounter.

By following these steps, you can easily and safely acquire the TI 28335 board, ensuring you get reliable equipment for your electronic or educational projects.