

## Introduction

The MAXREFDES1295 is a reference design that shows the MAX32630FTHR and MAX11300, as well as several other Maxim products, that demonstrates a small, low-cost, portable electronic load (E-load) for testing the power converters and Power Management Integrated Circuits (PMICs). The MAX32630FTHR is an ARM®-core-based, low-power microcontroller board whose main purpose is to facilitate communication between the PC's graphical user interface (GUI) software and the E-load. The MAX11300 20-port programmable mixed-signal input/output (I/O) (PIXI™) with 12-bit analog-to-digital converter (ADC), 12-bit digital-to-analog converter (DAC), analog switches, and general-purpose input/output (GPIO) is used to control the load currents and measure various parameters of the E-load.

## Hardware Specification

The MAXREFDES1295 features one power input and on-board linear regulator plus three other load channels, one static and dynamic channel and two static channels. This reference design includes the following primary components: a microcontroller, PIXI, operational amplifiers (Op-amps), and power converters. The microcontroller provides the interface between the PC and the PIXI, and the PIXI controls the analog front end (AFE). Table 1 shows an overview of the design specification.

**Table 1. Design Specification**

PARAMETER	SYMBOL	MIN	MAX
Input Voltage	$V_{IN}$	0	10V
Current range for each channel	$I_{LR}$	0	1A
Ramp-Up Range	$T_{R_{UP}}$	10us	—
Ramp-down Low Range	$T_{R_{DOWN}}$	10us	—
Power per channel	P	0	10W

## Designed–Built–Tested

This document describes the hardware shown in Figure 1. It provides a detailed, systematic technical guide to use the small, low-cost, portable E-load and run the accompanying PC software. The design is built and tested, and details are shown in this document.

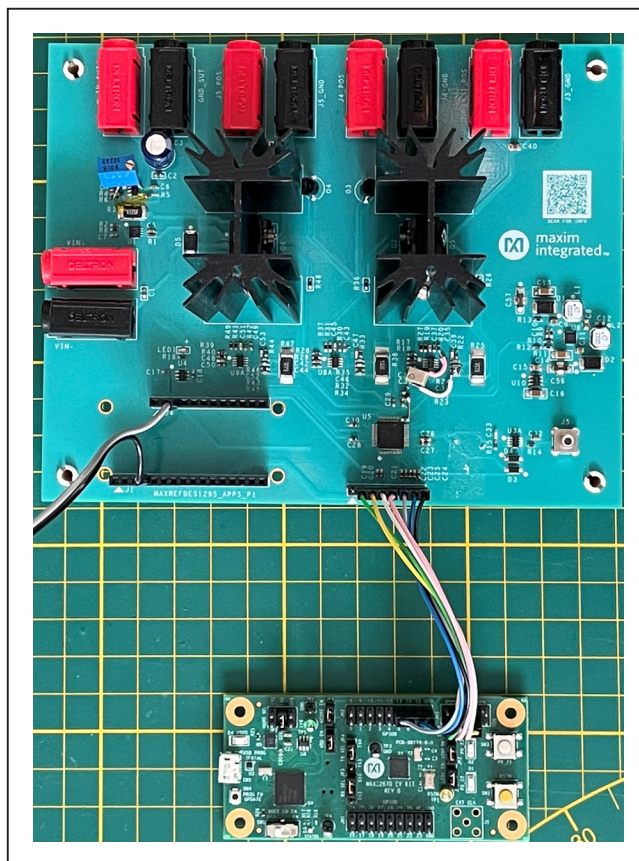


Figure 1. MAXREFDES1295 hardware.

Arm is a registered trademark of Arm Limited.  
PIXI is a trademark of Maxim Integrated Products, Inc.

## Required Equipment

- MAXREFDES1295
- 0 to 12V, 2A DC Input Power Supply
- Digital Voltmeter (DVM)
- Connecting Cables
- One universal serial bus (USB) Standard-A to Micro-B Cable
- Five sets of Connecting Cables: Red and Black with Banana Jacks

## Procedure

This reference design is fully assembled and tested. Follow the steps to verify the board operation:

- 1) The MAXREFDES1295 is USB powered; therefore, connect one side of the USB cable to the PC and the other side to the MAX32630FTHR. LED1 on the MAXREFDES1295 turns on and confirms that the board is functional.
- 2) Set the power supply at a voltage between 0 and 12V, then disable the power supply.
- 3) Connect the positive terminal of the power supply to  $V_{IN+}$  and the negative terminal to  $V_{IN-}$ .

## Warning

The maximum power consumption of the board is only 10W per channel, so make sure that the applied voltage multiplied by the current should not exceed from 10W.

## Detailed Description of Firmware

The firmware is designed using ARM® Mbed™ compiler, and the source code can be found on the MAXREFDES1295 [Design Resources](#) page. The firmware comes preprogrammed, but if the reprogramming of the device is required, then the programming procedure is given as follows:

- 1) Connect the MAX32630FTHR (FTHR) to the MAXREFDES1295, as shown in [Figure 1](#). The MAX32630FTHR board is powered by the USB connection.

- 2) Connect the PICO board (programming board) to the FTHR board with the ribbon cable, then connect both the FTHR and PICO boards to the PC using USB cables.
- 3) Copy the file “maxrefdes1295.bin” to the DAPLINK folder, and this should program the FTHR board.

## Detailed Description of controlling the MAXREFDES1295 through the Terminal Program

- 1) Download any terminal program, this document talks about the Tera Term. To install the Tera Term, refer to the <https://osdn.net/projects/ttssh2/releases/>.
- 2) Open the Tera Term and select the **Serial Port** as shown in [Figure 2](#).
- 3) Select the correct COM part and click **OK**, the data appears continuously as shown in [Figure 3](#).
- 4) As mentioned earlier, this design has the following channels:
  - Voltage and current from Linear regulator.
  - Voltage and current from Load channel 1, this channel can be set to both Static (constant current) and Dynamic modes, only the static voltage and currents are shown on the terminal.
  - Voltage and current of Load channels 2 and 3, which are static channels.

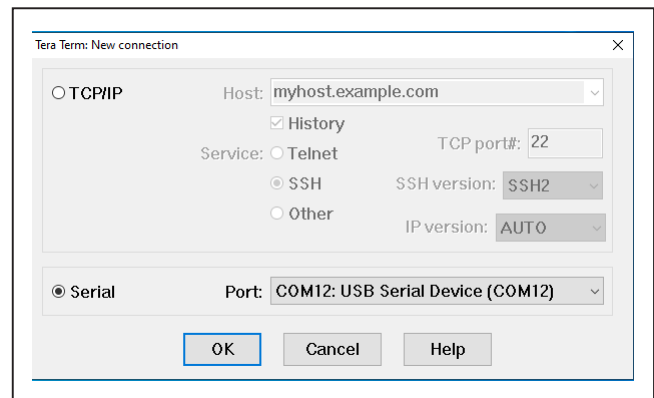


Figure 2. Serial Connection.

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- 7) Setting Load channel 1 in Dynamic mode: The Load channel can be set in Dynamic mode using the following commands shown in [Table 4](#).

**Table 4. Dynamic Mode Commands**

D1	VALLEY CURRENT 16-BIT VALUE RANGE		PEAK CURRENT 16-BIT VALUE RANGE		RAMP UP 16-BIT VALUE (NEGATIVE VALUE) RANGE		RAMP DOWN 16-BIT VALUE (POSITIVE VALUE) RANGE	
	Hex							
Hex	0x0000	0x0FFF	0x0000	0x0FFF	0x0000	0x07FF	0x0000	0x07FF
Analog Range	0	1A	0	1A	0	0.15A/us	0	0.15A/us

Example: **D10200080004000300**, the first two characters represent Dynamic channel and the following characters set the load channel DAC values of the valley, peak, Ramp up and Ramp down respectively. This is equivalent to 125mA of valley current, 500mA of peak current, of 75mA/us Ramp up value and of 57mA/us Ramp down value. Paste the commands on the terminal using “Alt+r”.

### Warning

Make sure that the peak current is higher than the valley current. Avoid very low range values for Ramp up and Ramp down. As a rule of thumb stay above 0x000A.

### Design Resources

Download the complete set of [Design Resources](#) including the schematics, bill of materials, PCB layout, and test files.

## Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	10/21	Initial release	—

