

# MATRIX Software For Matrix-256 TTC Diode Scanner System

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## Introduction

With the advent of Thermal Test Chips, which allow the integrated circuit thermal solution to be developed in parallel with the chip itself, the packaging and heat removal may be simulated and tested to be ready when the first articles come from the fab. The Thermal Test Chip is made up of an array of cells, each with 1 or 2 heating resistors and 1 or 4 temperature sensing diodes. The idea is straight forward: heat the chip by powering up the resistors in a manner closely approximating the expected power dissipation of the actual integrated circuit chip and read/display temperature(s) of specific cell(s) in real time as the chip heats up. There are many possible heating configurations put forth to heat the cell resistors, but the temperature sensor scanning scheme of the MATRIX-256 is adaptable to all heating schemes. The Matrix Software program developed by Consultronix provides a very user-friendly interface to setup and use the Matrix-256 TTC Scanner System.

## Description

The MATRIX Software is designed to setup, control and read all of the diodes in a TTC array. The user must specify the number of rows and columns in the chip array when setting up the operation. For a more detailed description of the Matrix-256 hardware, see the Matrix-256 Spec Sheet.

The Matrix Software communicates with the Matrix-256 hardware via a USB connection. During the setup process, the user will specify the number of rows and columns in the array, which diodes will be used as reference diodes which may be displayed in a histogram of the entire test time.

## Features

- Easy and intuitive test setup
- real time display of each cell's temperature
- All control issued through USB interface

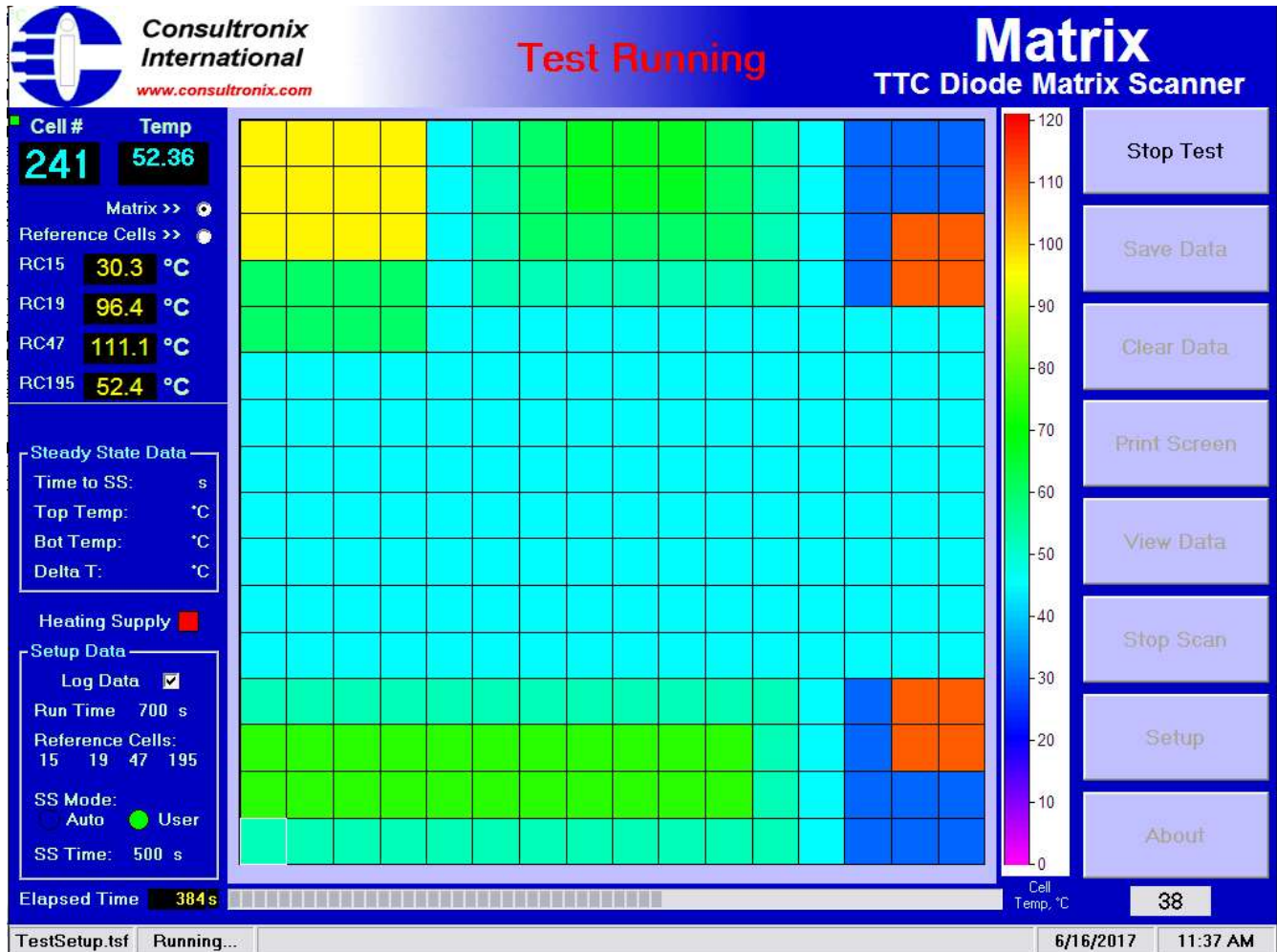
- Easy hook up through 34 pin IDC front panel connector
- Built-in diode K-factor calibration
- Optional high power transient burst response capability (with capable power supply)
- Optional 2-layer TIM analysis capability
- Transient response option

## Operation

**Setup:** The Setup Screen allows the user to define the TTC and the test parameters.

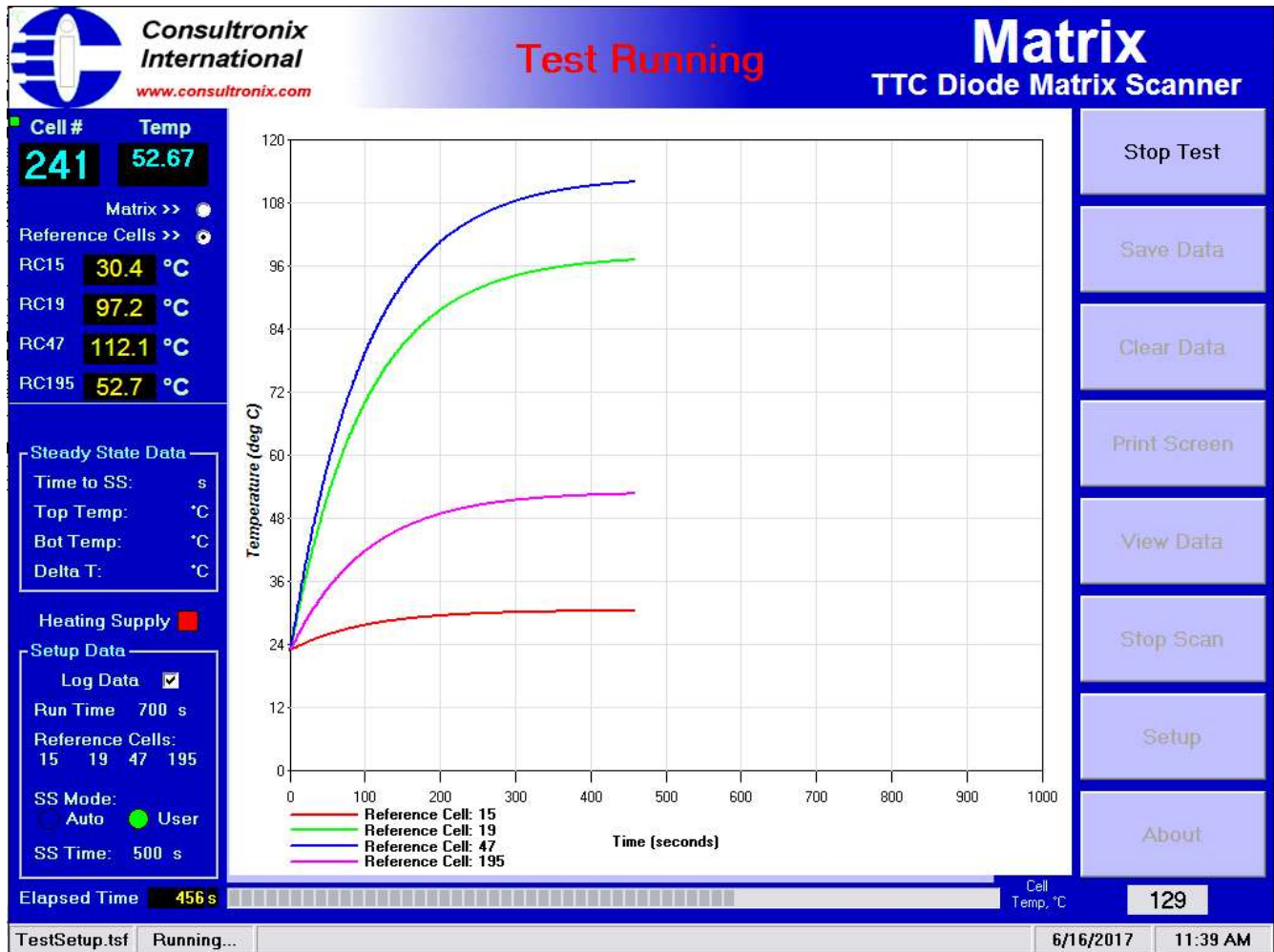
The transient response option will require a power supply system that is capable of generating a short-term high power voltage to a specified zone in the matrix. The response to a selected diode will be taken and displayed over a 1 or 2 second period with a 1 msec time resolution.

**Run Screens:** The entire array may be viewed in the *matrix view*.



During the test, the entire TTC array is seen at once in a color scheme with a color bar at the right showing the temperature of the colors. It gives a real time display of how the chip is heating up and where the hot spots are. The entire test data may be saved to disk and replayed at any later time to review the results over the whole test period.

In the *reference diode* view, the selected diode temperatures are shown in a histogram.



The reference cells are selected by the operator and can be monitored graphically or textually during the test. Any cell may be selected in the matrix view to see its cell number and temperature displayed in the upper left of the data screen. As the cursor is passed over any cell, its cell number is immediately displayed in the lower right corner.

## Calibration:

The Matrix software has the capability to calibrate the k-factor for each diode in the array and to store the reference forward voltage at a specified temperature for each diode.

The screenshot displays the Matrix TTC Diode Matrix Scanner software interface. The top left corner features the Consultronix International logo and website address. The top right corner displays the software title "Matrix TTC Diode Matrix Scanner". The main window is titled "Calibration" and contains a list of instructions for the calibration process. On the left side, there is a sidebar with various controls, including a "Cell # Temp" display showing "241 108.00", a "Reference Cells" list, "Steady State Data" fields, "Setup Data" fields, and "SS Mode" options. On the right side, there is a vertical panel with buttons for "Analog Offset", "K-Factors", and "Exit Calibration". At the bottom, there is a "Calibrate" button, a "Results" button, and "K Factor Calibration" settings for "Low Temp" (20) and "High Temp" (70). The bottom status bar shows "Elapsed Time 0s", "Cell Temp, °C 81", and the date/time "6/16/2017 11:29 AM".

**Consultronix International**  
www.consultronix.com

# Matrix

## TTC Diode Matrix Scanner

### Calibration

**Cell # Temp**  
**241 108.00**

Matrix >>   
Reference Cells >>

RC15  °C  
RC19  °C  
RC47  °C  
RC195  °C

Steady State Data  
Time to SS:  s  
Top Temp:  °C  
Bot Temp:  °C  
Delta T:  °C

Heating Supply

Setup Data  
Log Data   
Run Time 700 s  
Reference Cells:  
15 19 47 195

SS Mode:  
 Auto  User  
SS Time: 500 s

Elapsed Time **0s**

Cell Temp, °C **81**

Instructions

1. Plug connecting cable into TTC array and plug the other end into the front panel connector.
2. Put TTC module into an oven set at 20 degrees centigrade and let it come to equilibrium.
3. When TTC module is at equilibrium, click on the calibrate button below. The initial Vf for each diode in the matrix will be recorded.
4. At the end of data collection, the results indicator will turn yellow.
5. Set oven for 70degrees centigrade. Wait for matrix to come to equilibrium.
6. When matrix is at equilibrium at 70 degrees, click on the calibrate button again.
7. At the end of the test, the results indicator will turn green.

Calibrate Results

K Factor Calibration  
Low Temp  20  
High Temp  70

Analog Offset  
K-Factors  
Exit Calibration

TestSetup.tsf MD16x16 6/16/2017 11:29 AM