TTV-4103 Temperature Sensing Diode Connections

The TTV-4103 Thermal Test Vehicle contains a TTC-1001 Unit Cell 30 X 24 array, 32.2mm X 25.8mm, chip. The chip is mounted on an 81mm by 75mm substrate/board that contains 18 solder lands for accessing up to 67 Temperature Sensing Diodes (TSD) strategically placed on the chip. Individual TSDs can be accessed by connecting to one of the nine solder lands dedicated to Anode lines and one of the nine solder lands dedicated to Cathode lines. Figure 1 shows the physical location of each accessible TSD, and the Anode and Cathode lines associated with each diode.

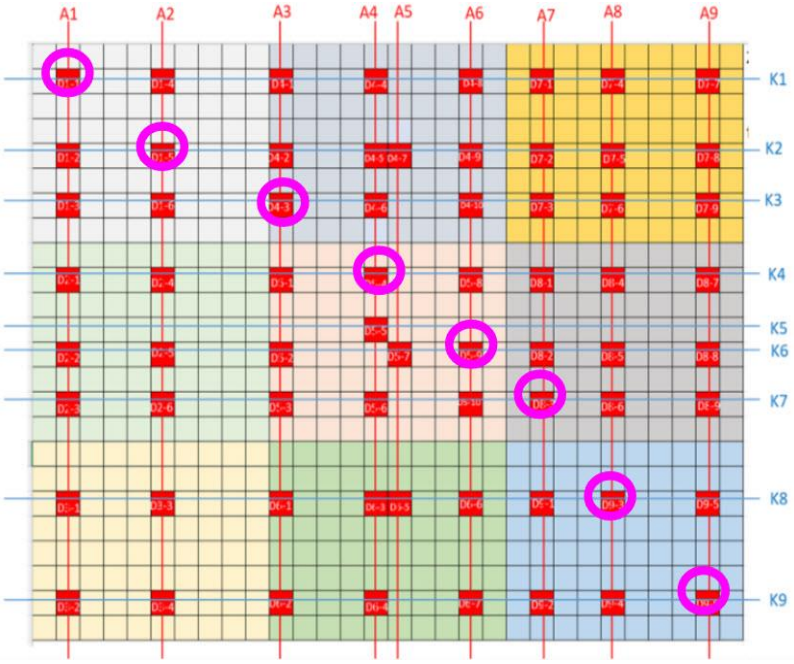

Figure 1. Red squares are the TTC-1001 Unit Cells containing the accessible TSDs. The red (Anode) and blue (Cathode) lines connect the TSDs in a matrix configuration.

Forcing a 1mA current into an Anode line with a return through a Cathode line will turn on a specific TSD, with the voltage across the lines being directly related to the junction temperature of that TSD. For example, using A1 and K1 connections, the temperature of the top left TSD can be determined (see TB-02, Diode Temperature Sensing).

The TMM-100 Temperature Measurement Module is specifically designed to collect data from 8 TSDs, 2 thermocouples, and two 10KΩ NTC thermistors. Figure 2 shows an example of how the TTV-4103's eight diagonal TSDs (from top left to bottom right, circled cells) can be connected to TMM-100 for automated data collection of temperature across the chip. Any other collection of 8 TSDs is possible by connecting to the lines.

To overcome the 8 TSD limitation of the TMM-100, the two rotary switch approach shown in Figure 3 is possible for accessing all 67 TSD manually, while relying on the TMM-100 for the 1mA forward bias current source and the voltage measurement. The Anode switch is marked with positions A1 through A9 and the Cathode switch is marked with positions K1 through K9. Thus, setting each switch to an appropriate position will allow any TSD to be selected. The center wiper of each switch connects to the TMM-100 as shown.

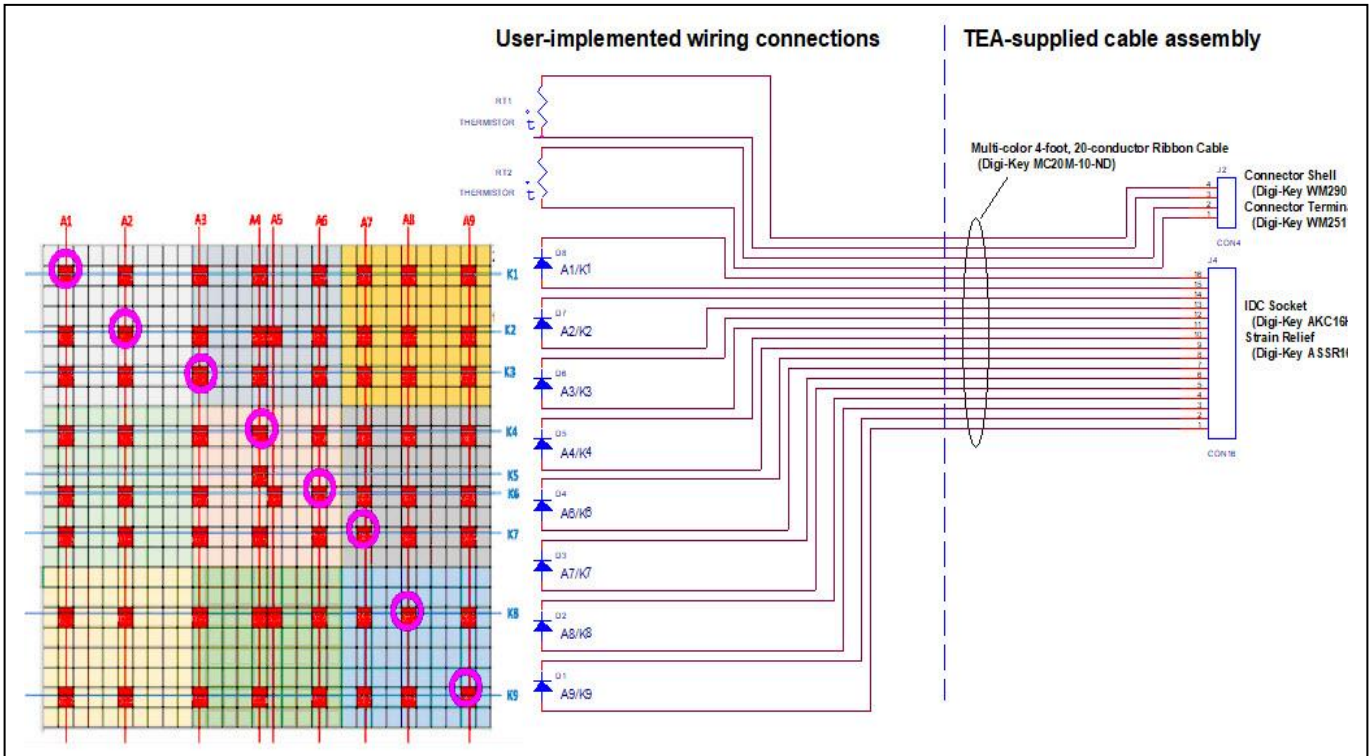

Figure 2. An example of connecting 8 TSDs to the TMM-100 for automated data collection as a function of heating time (t_H) and heating power (P_H).

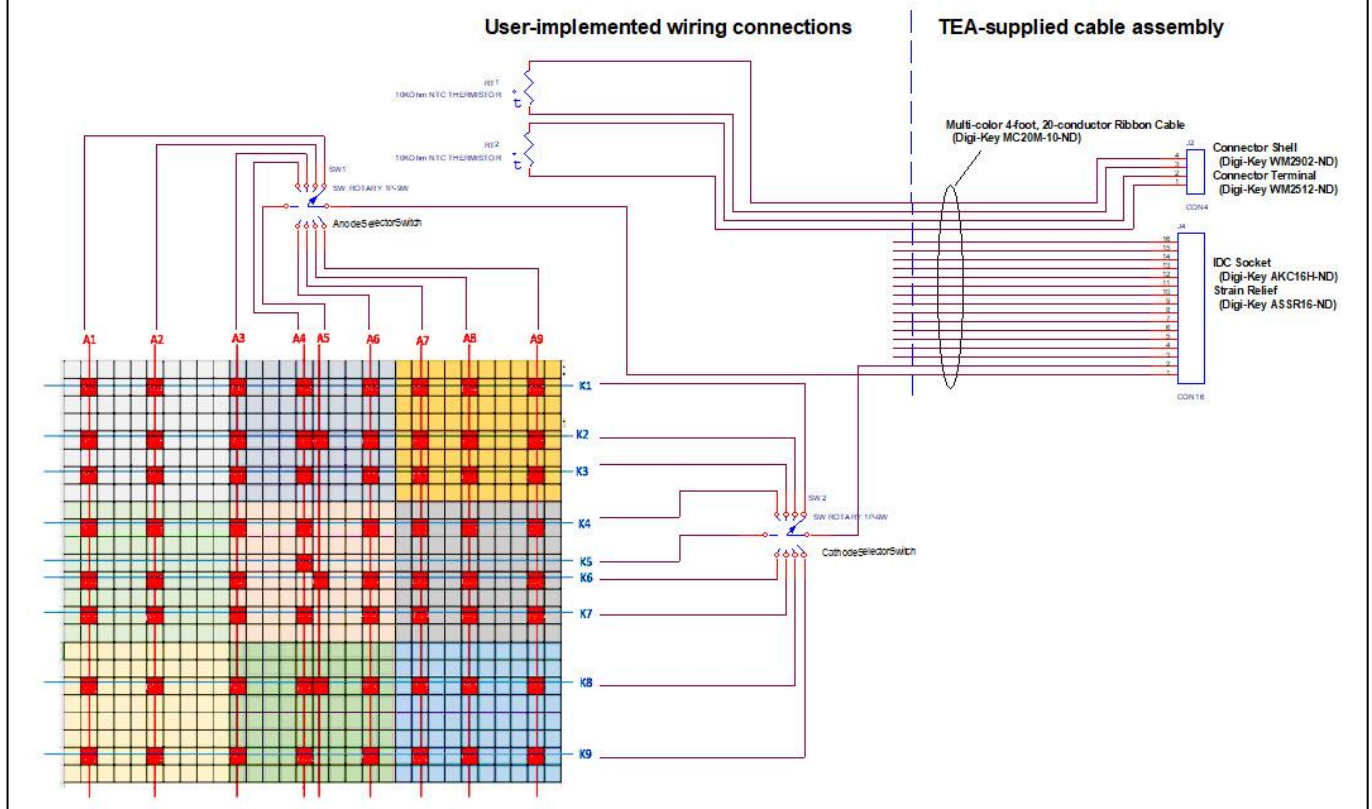

Figure 3. An example of connecting two 9-position rotary switches to access all 67 TSDs using a single TMM-100 channel to provide measurement current (IM) and voltage reading capability