

## UTMC PRODUCT ADVISORY

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### **RADPAL™ Power-On-Reset Performance at Cold Temperatures**

UTMC has identified the following anomaly in the power up behavior of the UT22VP10 RADPAL™.

#### **Anomaly:**

The anomaly was observed for power-up applications where the voltage applied to the  $V_{DD}$  pin(s) of the RADPAL™ was within the specified voltage tolerance of  $5V \pm 10\%$ , yet, was not sufficient to turn off the internal reset pulse at cold temperature. Consequently, all programmed macro-cells would remain in reset until the power supply reached a minimum voltage.

UTMC has characterized this anomaly through HSPICE simulation, and laboratory testing. The characterization data shows that the minimum power-up voltage dependency on temperature fits a linear curve. Additionally, UTMC has identified distinct wafer lots that contain die with better cold temperature performance than the original supply of die. The wafer characterization is performed in the following manner:

- 1) Each wafer is evaluated for the transistor threshold voltages.
- 2) Each wafer showing satisfactory threshold voltages is then mapped to find die that have a high probability of representing the typical threshold voltage found across the wafer.
- 3) These selected die are then packaged, programmed, and characterized.
- 4) The test process ramps the voltage on the  $V_{DD}$  pin(s) of the RADPAL™ and measures the minimum voltage required for the reset signal to turn off.
- 5) These voltage measurements are taken in five degree increments in temperature through  $-55^{\circ}\text{C}$ .
- 6) The characterization data is then plotted to verify that the samples fit the specified  $V_{DD}$  to temperature curve.

As a result of the characterization performed, UTMC has developed the following equations that UT22VP10 RADPAL™ device types will satisfy:

- 1) SMD device types 01, 02, 03, 04 (CMOS and TTL) satisfy

$$V_{DD} = 4.61V - 0.0090 * (\text{Temperature } ^{\circ}\text{C})$$

- 2) SMD device types 05, 06 (CMOS only) satisfy

$$V_{DD} = 4.41V - 0.0090 * (\text{Temperature } ^{\circ}\text{C})$$

**Solution:**

To insure that the UT22VP10 RADPAL™ will power up in a usable mode, the following conditions must be met:

- 1) The voltage supplied to the  $V_{DD}$  pin(s) must be equal to 0V prior to the intended power-up sequence.
- 2) The voltage on  $V_{DD}$  must rise from 0V to 1V at a rate of 0.1V/s or faster.
- 3) The  $V_{DD}$  rise must be continuously increasing with respect to time, through 3V, and monotonic thereafter.
- 4) Following reset, the clock input must not be driven from LOW to HIGH until all applicable input and feedback setup times are met.
- 5) The power-up voltage must meet the minimum  $V_{DD}$  requirements described by the above device dependent equations. The customer can procure the specific device types meeting the respective equation via the SMD#5962-94754.

**NOTE: The minimum  $V_{DD}$  requirement above is not applicable if the UT22VP10 application is purely combinatorial (i.e. no outputs are registered)**