SanDisk SDHC, Class 4, 4GB Cards – Initialization Timing Aspects

SD boot issue has been observed for 3 of 10 pieces of this SDHC card while trying to shorten active timeout of the power-on reset IC serving the system host from 200ms to 33ms. Booting from the SDHC card with manual reset works properly.

It has been observed that, while trying to boot from the SDHC card, the clock and command signals coming from the host behave properly, but no activity on the DAT0 line (Figure 1 below), meaning the card is not initialized.
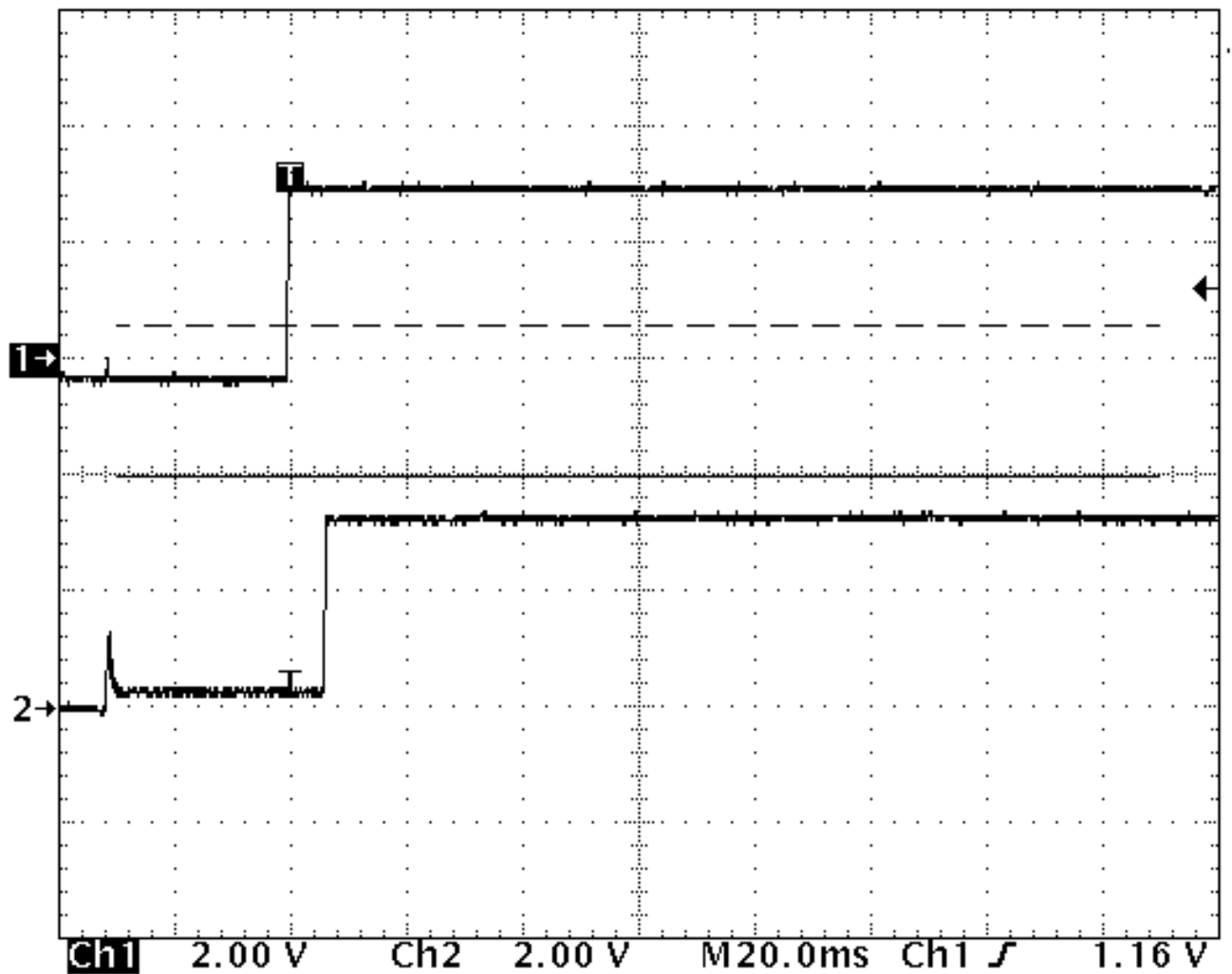

Figure 1. Host's Power-On Reset (upper trace) vs. DAT0 (lower trace):

SDHC card and Host powered up simultaneously

Both the host and SDHC card share the same 3.3V power rail. Its power-up timing (Figure 2 below) meets the "6.4 Power Scheme" section requirements (Figure 3 and Figure 4 below) from the SD interface specification ("SD Specifications", Part 1, Physical Layer Simplified Specification, Version 4.10, 22 January 2013).
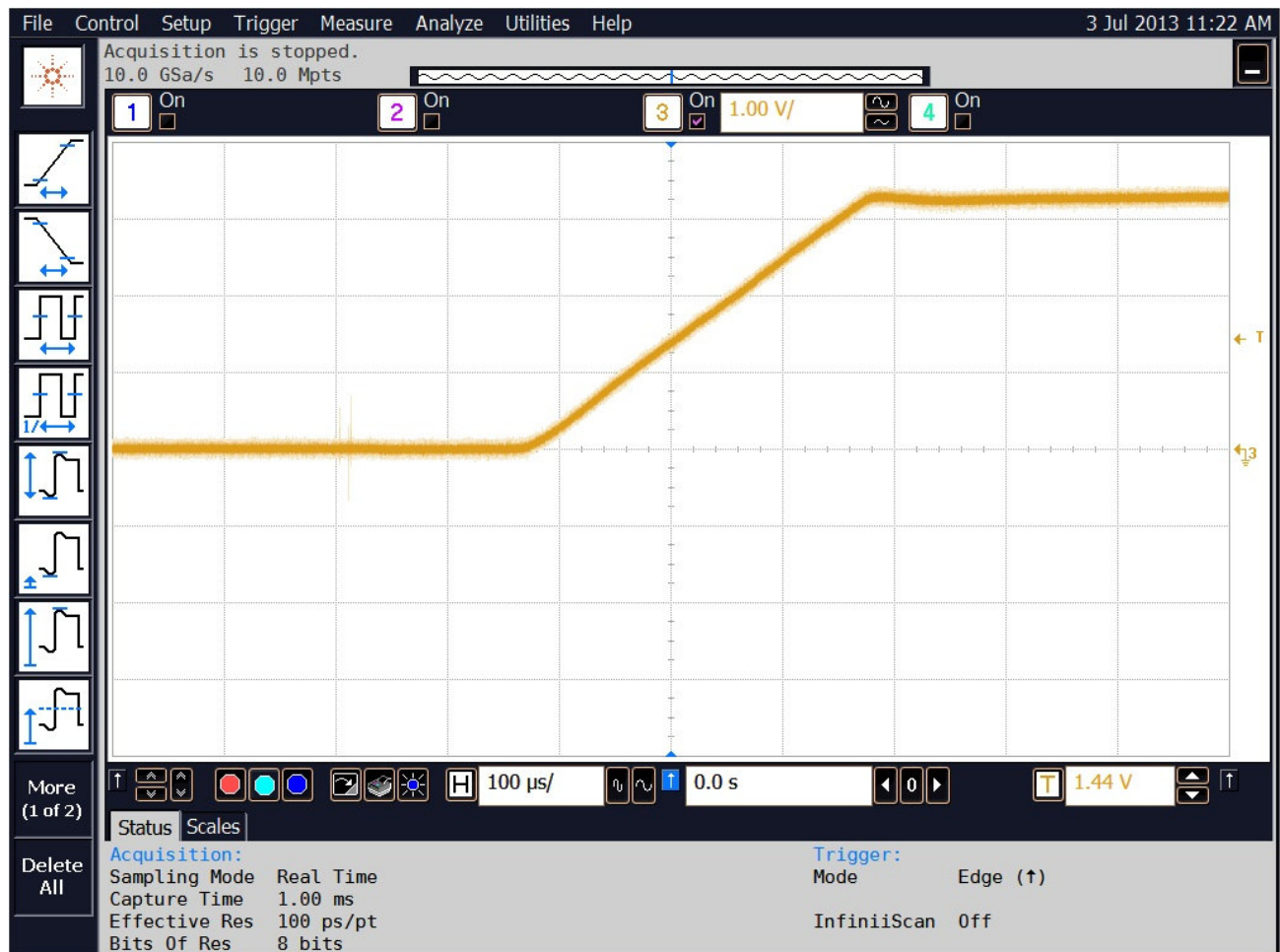

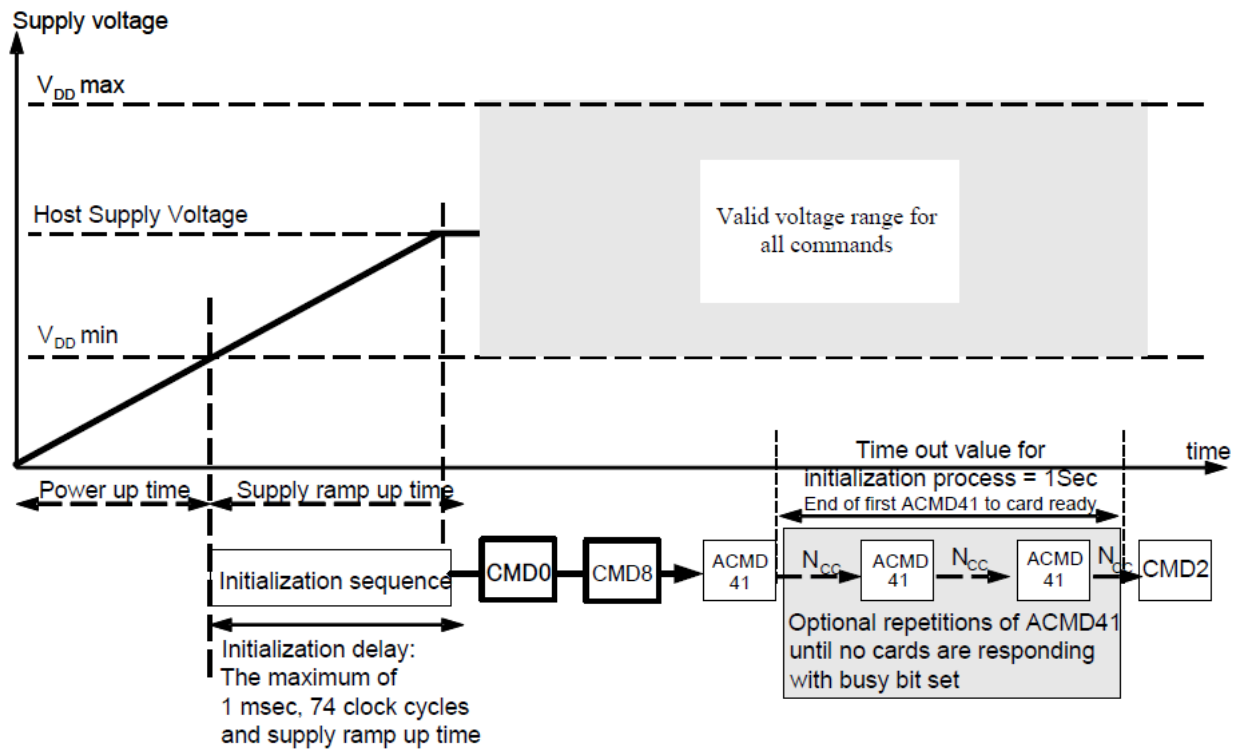**Figure 2. 3.3V rail power-up timing**

Figure 3. SD interface specification: card power-up timing and initialization process
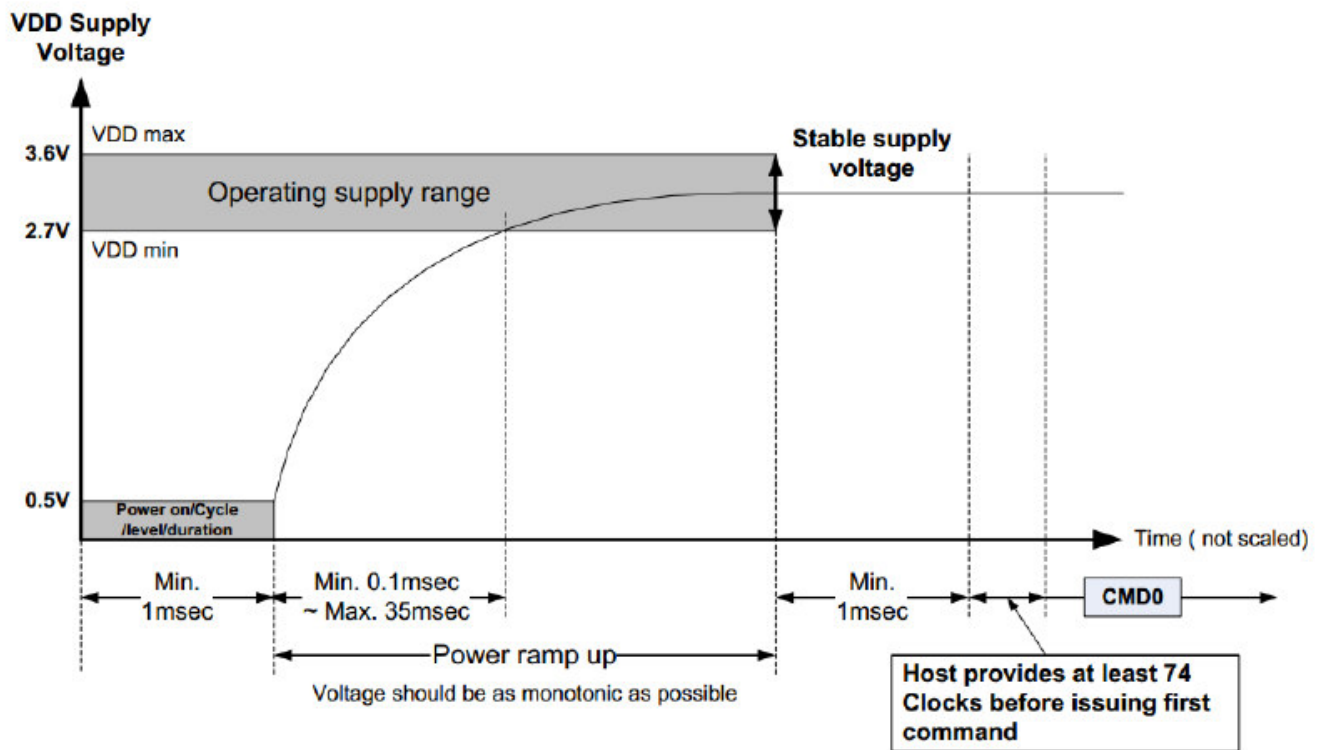

Figure 4. SD interface specification: host power-up timing

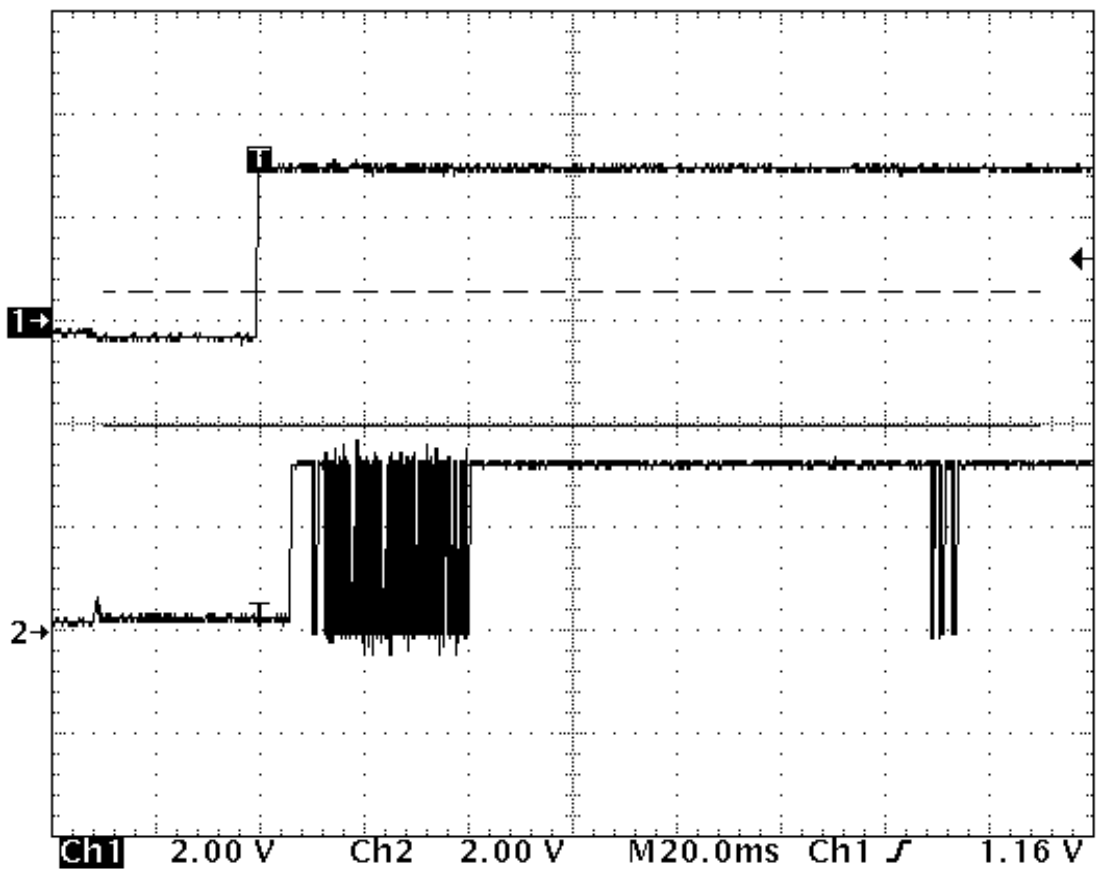When the SDHC card is powered ~1 second prior to the system host, the DAT0 signal is active (Figure 5).

Figure 5. Host's Power-On Reset (upper trace) vs. DAT0 (lower trace):

SDHC card powered ~1 second prior to Host

In addition to the above data, as per SanDisk's documentation ("SanDisk SD Card Product Family", OEM Product Manual, Version 2.2, Document No. 80-36-00497, June 2007), specifically its "Table 2-3 System Performance for SanDisk SD Product Family", their SDHC cards initialize quite slowly - e.g. the maximum value for the "ACMD1 to ready after power-up" parameter equals 500ms (Figure 6 below).

Timing	Maximum Value
ACMD1 to ready after power-up	500 ms

Figure 6. System Performance for SanDisk SD Product Family

Conclusion and Possible Solutions

Some of the SanDisk SDHC cards require quite a long time to initialize, i.e. between the moment it is powered up and the moment it is ready to communicate.

Based on the SD card initialization process details (Figure 3 above), there are 2 possible solutions:
- Lengthening the system host's power-on reset timeout,
- Polling the SD card until it is initialized, e.g. for 1 second.