



ChinaTM

Virtual Event

November 1 – 4, 2022

Virtual Event

www.testconx.org

POWER SEQUENCE MEASUREMENT VIA AUTOMATED CLOUD POWER-ON-RESET TOOL

Angie Ng See Tien, Mohd Bahar Amyrul Azuan, Tan Yean Shim,
Lee Eng Kwong, Saifullah Nasrullah
Intel Corporation



Virtual ▪ November 1-4, 2022



Contents

- What is Power Sequencing Measurement
- Why is Power Sequencing Measurement
- Problem Statement
- Objectives
- Solution Overview
- Impact of Cloud Power Sequencing
- Summary
- Acknowledgement



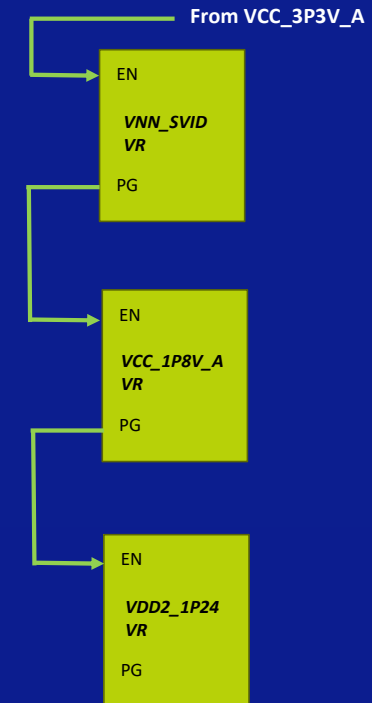
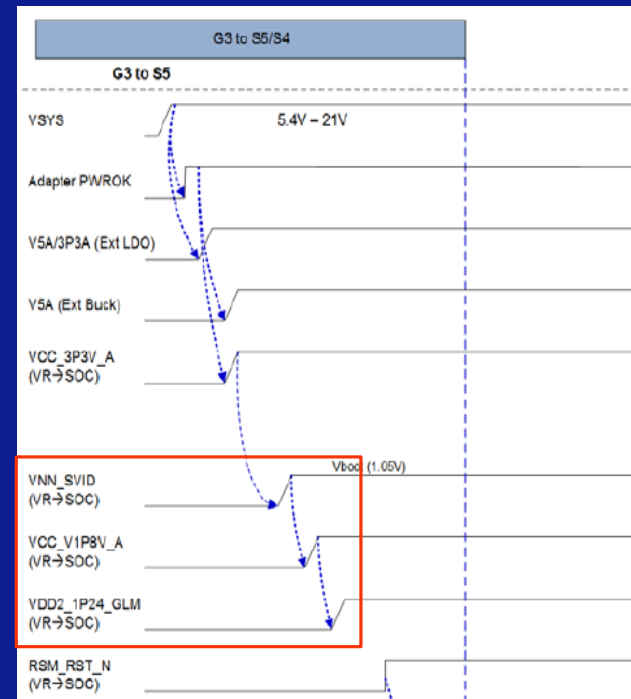
Power On Sequence Measurement using Automated Cloud Controlled Power-On-Reset Tool

2022

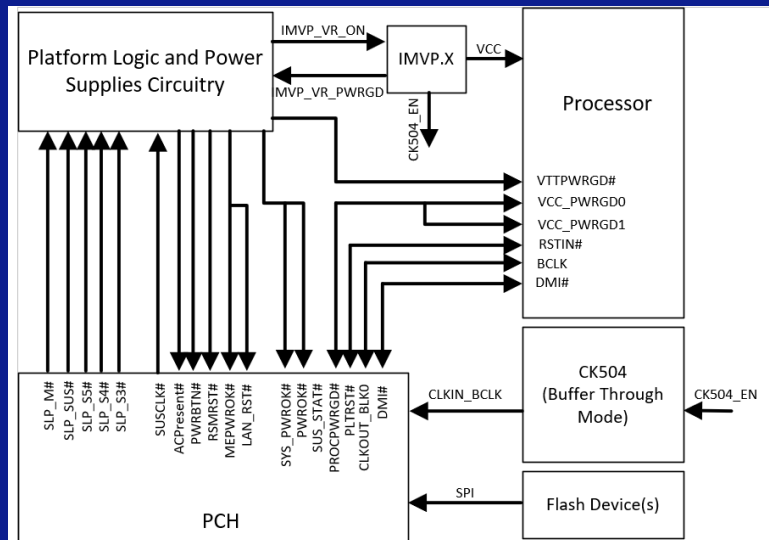
2

What is Power Sequencing Measurement?

- The sequence in which power is applied and shut down
- Includes specification of the time intervals between steps in the sequence
- Start up and shut down in the right sequence and at correct rates to avoid latch up, functional anomalies or even damage

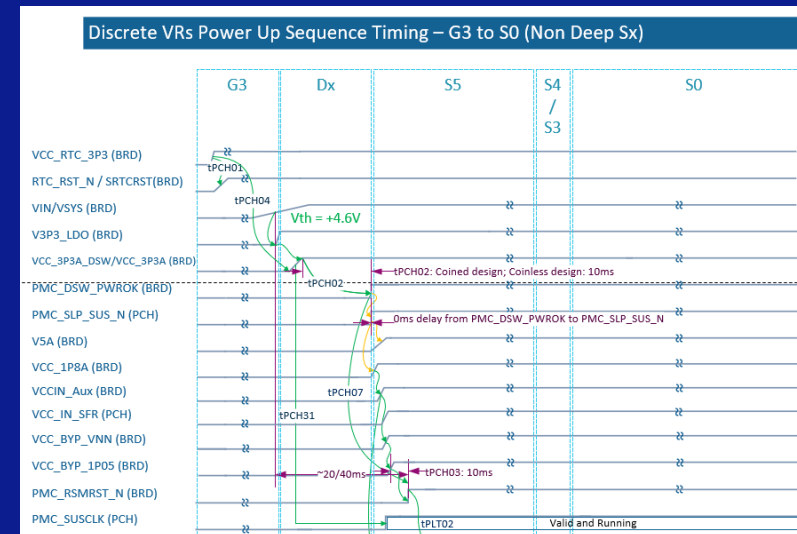


Why Power Sequencing Measurement?



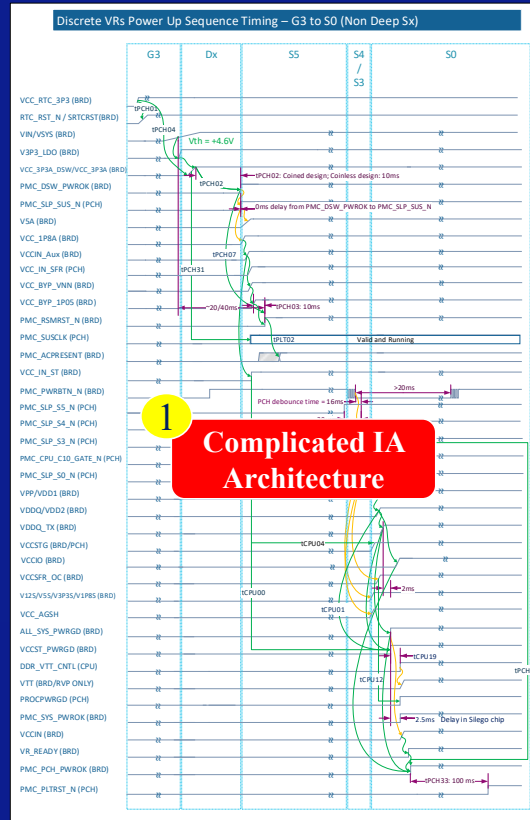
Example of Platform Power Logic and Signal Block Diagram

- Collect and timestamp electrical activities across several signals over a specific period
- Critical to ensure products functionality and stability



Power On Timing Sequences

Problem Statement



1 Complicated IA Architecture



Power On Debug
(~2 weeks)



Factory Test
(~2 weeks)

1st Build

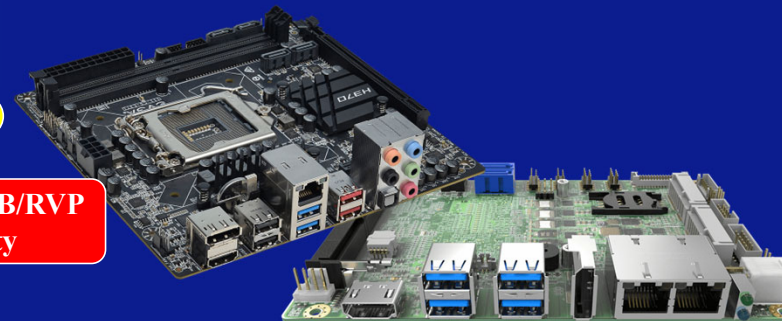
Typical 7-10 weeks in total

Time consuming

Product shipped

4

Limited CRB/RVP quantity

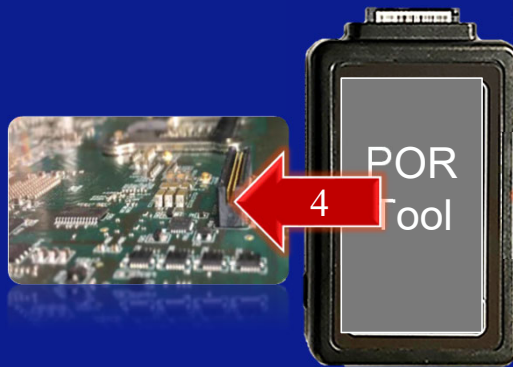


Solution Overview

Power-On-Reset (POR) Tool Overview

POR is a device that emulates a 32-channel mixed signal oscilloscope and logic analyzer with integrated and automated rule-checking

Reduces debug work from **days** to hours
Reduces validation work from **weeks** to days



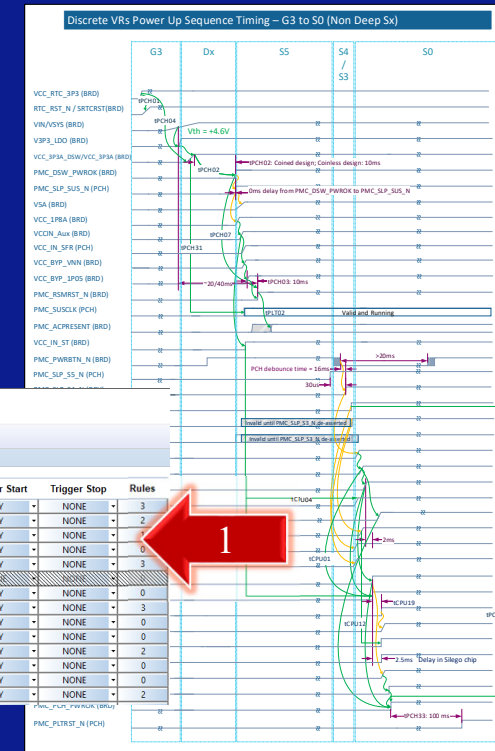
```
platform.json - Notepad
File Edit Format View Help
{
  "firmwareVersion": "0.0-0",
  "libVersion": "0.3.0",
  "name": "EHL",
  "numCaptureDevices": 1,
  "ruleset": {
    "sequenceOrder": [
      {
        "enabled": true,
        "firstSignal": "+V3.3A_RTC",
        "firstTransition": "rise",
        "id": "DSQ01",
        "maxDelay": null,
        "minDelay": "9ms",
        "secondSignal": "RTC_RST_N",
        "secondTransition": "rise"
      },
      {
        "enabled": true,
        "firstSignal": "+V3.3A_RTC",
        "firstTransition": "rise",
        "id": "DSQ01",
        "maxDelay": null,
        "minDelay": "9ms",
        "secondSignal": "RTC_RST_N",
        "secondTransition": "rise"
      }
    ]
  }
}
```

ug & Validation Tool (DDV Tool)

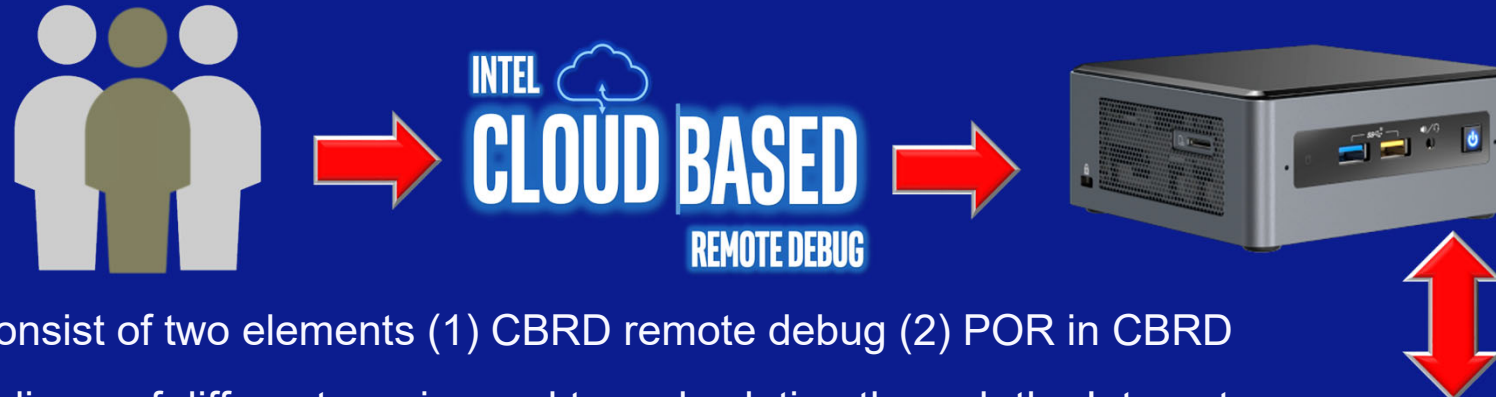
Help Search Analyze...

EH1_Train VCD Timeline: test.vcd test.vcd ytryr

Pin	Signal Name	Voltage	Analog Sampling	Digital Sampling	Trigger Start	Trigger Stop	Rules
1	+V3.3A_RTC	3.0	OFF	ON	ANY	NONE	3
2	RTC_RST_N	3.0	OFF	ON	ANY	NONE	2
3	SRTC_RST_N	3.0	OFF	ON	ANY	NONE	7
4	-VREG3.3	3.3	OFF	ON	ANY	NONE	0
5	+V3.3A_DSW/+V3.3A	3.3	OFF	ON	ANY	NONE	3
7	GPD_3_PAWRTH_N	3.3	OFF	ON	ANY	NONE	0
8	PCH_DPWRTH_N	3.3	OFF	ON	ANY	NONE	3
9	SLP_SUS_N	3.3	OFF	ON	ANY	NONE	0
10	PM_SLP_S0_N	3.3	OFF	ON	ANY	NONE	0
11	+V1.8A	1.8	OFF	ON	ANY	NONE	2
12	+VCCIN_AUX	1.8	OFF	ON	ANY	NONE	0
13	+VCCST_CPU	1.0	OFF	ON	ANY	NONE	0
14	+VCC_VNNEXT_IP05_SOC	1.05	OFF	ON	ANY	NONE	2



Solution Overview



- ✓ This solution consist of two elements (1) CBRD remote debug (2) POR in CBRD
- ✓ CBRD is the delivery of different service end to end solution through the Internet . It help to enable remote access to Intel customer reference and validation boards possible during Pandemic time.
- ✓ Measure power sequencing remotely through cloud services.
- ✓ POR helps to save time (~ 70% time reduced) and more convenient for debug
- ✓ Covered most of the power up/down sequence rails and signals



Power On Sequence Measurement using Automated Cloud Controlled Power-On-Reset Tool

2022

7

Overall system solution architecture

1

2

3

Pin	Signal Name	Voltage	Analog Sampling	Start	Trigger Stop	Rules
8	PCH_S0PWRCK	3.3	OFF	ON	NONE	3
9	SBP_S0PWRCK	3.3	OFF	ON	NONE	0
10	PM_S0PWRCK	3.3	OFF	ON	NONE	0
11	HTP_S0PWRCK	3.3	OFF	ON	NONE	2
12	WCCPWRCK	1.8	OFF	ON	NONE	0
13	WCCPWRCK	1.8	OFF	ON	NONE	0
14	WCCPWRCK	1.8	OFF	ON	NONE	2
15	WCCPWRCK	1.8	OFF	ON	NONE	0
16	WCCPWRCK	1.8	OFF	ON	NONE	0
17	PM_S0PWRCK	3.3	OFF	ON	NONE	2
18	PM_S0PWRCK	3.3	OFF	ON	NONE	0
19	PM_S0PWRCK	3.3	OFF	ON	NONE	1
20	PM_S0PWRCK	3.3	OFF	ON	NONE	0
21	WCCPWRCK	3.3	OFF	ON	NONE	0
22	WCCPWRCK	3.3	OFF	ON	NONE	0
23	WCCPWRCK	3.3	OFF	ON	NONE	0
24	WCCPWRCK	3.3	OFF	ON	NONE	0
25	WCCPWRCK	3.3	OFF	ON	NONE	1
26	WCCPWRCK	3.3	OFF	ON	NONE	0
27	WCCPWRCK	3.3	OFF	ON	NONE	0
28	WCCPWRCK	3.3	OFF	ON	NONE	0
29	WCCPWRCK	3.3	OFF	ON	NONE	0
30	WCCPWRCK	3.3	OFF	ON	NONE	0
31	WCCPWRCK	3.3	OFF	ON	NONE	2
32	WCCPWRCK	3.3	OFF	ON	NONE	0
33	WCCPWRCK	3.3	OFF	ON	NONE	0
34	WCCPWRCK	3.3	OFF	ON	NONE	0
35	WCCPWRCK	3.3	OFF	ON	NONE	1
36	WCCPWRCK	3.3	OFF	ON	NONE	0
37	WCCPWRCK	3.3	OFF	ON	NONE	0

Comparison between Conventional method vs POR Tool + CBRD

Components	Today	POR Tool + CBRD
Equipment	>\$20K (uses probes)	<\$2K (uses header)
Requirements	Paper Spec (Pdf)	Smart Spec (RuleKit)
Test Method	Manual Interpretation	Fully Automated
Test Skills	Highly Specialized	Minimal Experience
Test Plans	Weeks (Create new)	Days (reuse RuleKit)
Test Execution	Months (Variable)	Days (Predictable)
Test Environment	Onsite	Remotely
Manpower	2-3 Engineers	1 Engineer

Conclusion & Future Plans

- Proposed a new architecture of power on reset tool solution based on FPGA
- Combines the FPGA based POR tool with Cloud Based Remote Debug (CBRD) infrastructure to introduce the remote element to the test environment during pandemic outbreak
- Enhance POR tool to be multi-tool scaling to enable rule-check across 256 signals
- Optimize test capability on AC Transient analysis measurement
- Scale POR tool support across Intel product roadmap



Power On Sequence Measurement using Automated Cloud Controlled Power-On-Reset Tool

2022

10

Acknowledgements

- Eric Chan - VP in Intel IoTG (Internet of Thing Group)
- Board of Directors in Intel Malaysia Design Center (MDC)
- Ng, Hooi Ching – IT Malaysia Hub Manager
- Goh, Kean Hean – Engineering Lab Manager



Power On Sequence Measurement using Automated Cloud Controlled Power-On-Reset Tool

2022

11

With Thanks to Our Sponsors!

Honored



金东唐科技

Distinguished

smiths
interconnect

TERADYNE

FELDMAN
ENGINEERING

自动化&智能化的综合方案供应商
Automation & intelligent integrated solution supplier



is sponsored by

smiths interconnect

Your Global Partner for Innovative
Semiconductor Test Solutions

Enabling the Next Generation of Technology Through Advanced Test Solutions

[TERADYNE.COM](https://www.teradyne.com)

COPYRIGHT NOTICE

The presentation(s)/poster(s) in this publication comprise the proceedings of the TestConX China 2022 virtual event. The content reflects the opinion of the authors and their respective companies. They are reproduced here as they were presented at TestConX China. The inclusion of the presentations/posters in this publication does not constitute an endorsement by TestConX or the workshop's sponsors.

There is NO copyright protection claimed on the presentation/poster content by TestConX. However, each presentation/poster is the work of the authors and their respective companies: as such, it is strongly encouraged that any use reflect proper acknowledgement to the appropriate source. Any questions regarding the use of any materials presented should be directed to the author(s) or their companies.

TestConX, TestConX China, the TestConX logo, and the TestConX China logo are trademarks of TestConX. All rights reserved.