08-359r0

Validation of the Power Supply Voltage Detection Logic Circuit Proposed in 08-358 (Annex M)

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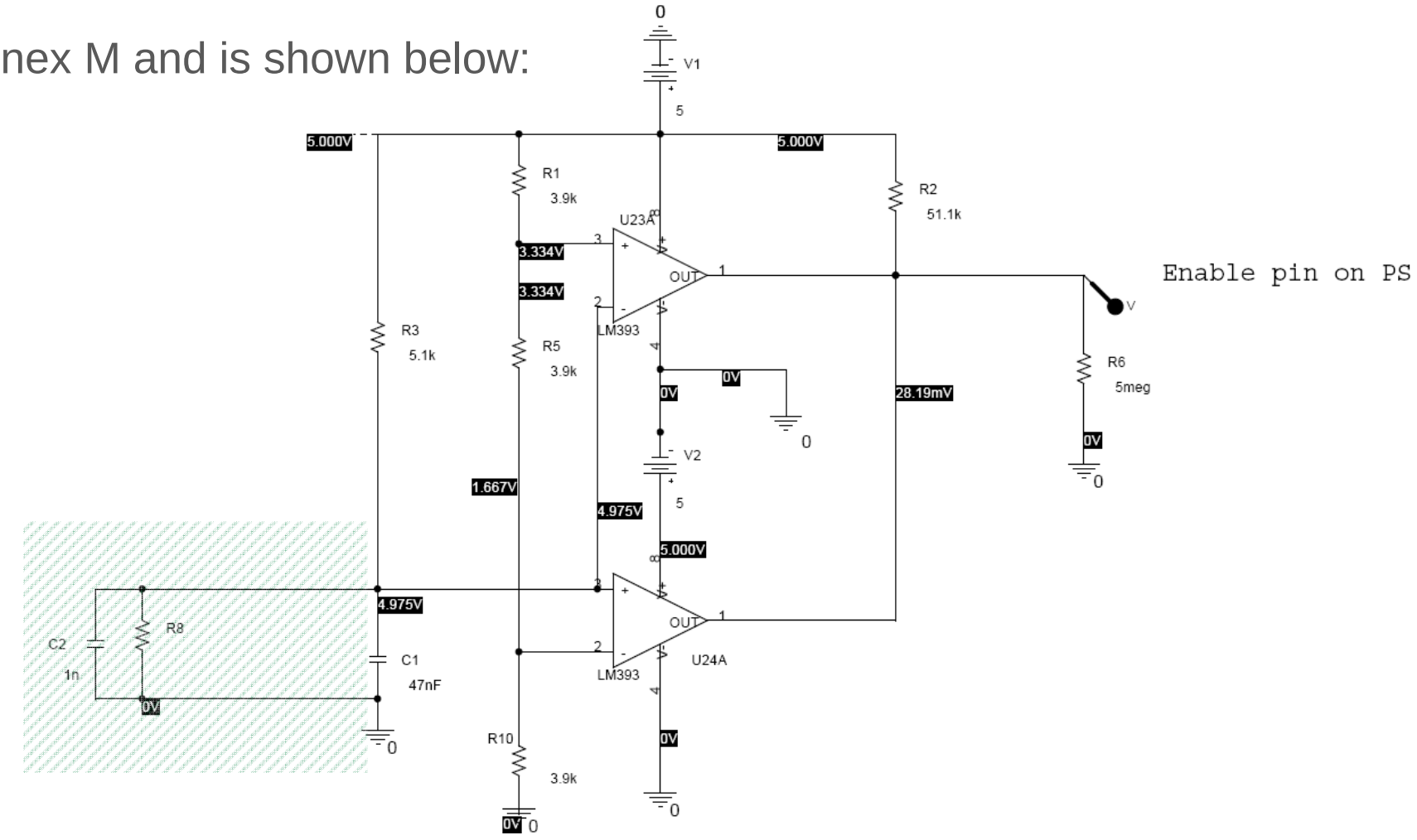
Introduction

- Powered mini-SAS devices supporting Active Cables need to operate with passive cables which have the Vcc pin tied to ground. Hence there needs to be a mechanism that turns on the power to the receptacle only when an active cable is plugged in, to avoid shorting the power supply. A voltage sense pin is proposed for Active Cables in 08-358. A circuit that turns on the power supply only when a Sense resistor of 5k Ohm is detected on the sense pin inside the plug is also proposed as an Informative Annex M.
- These are results of a SPICE simulation to verify the functionality of the proposed circuit.

Simulation Setup

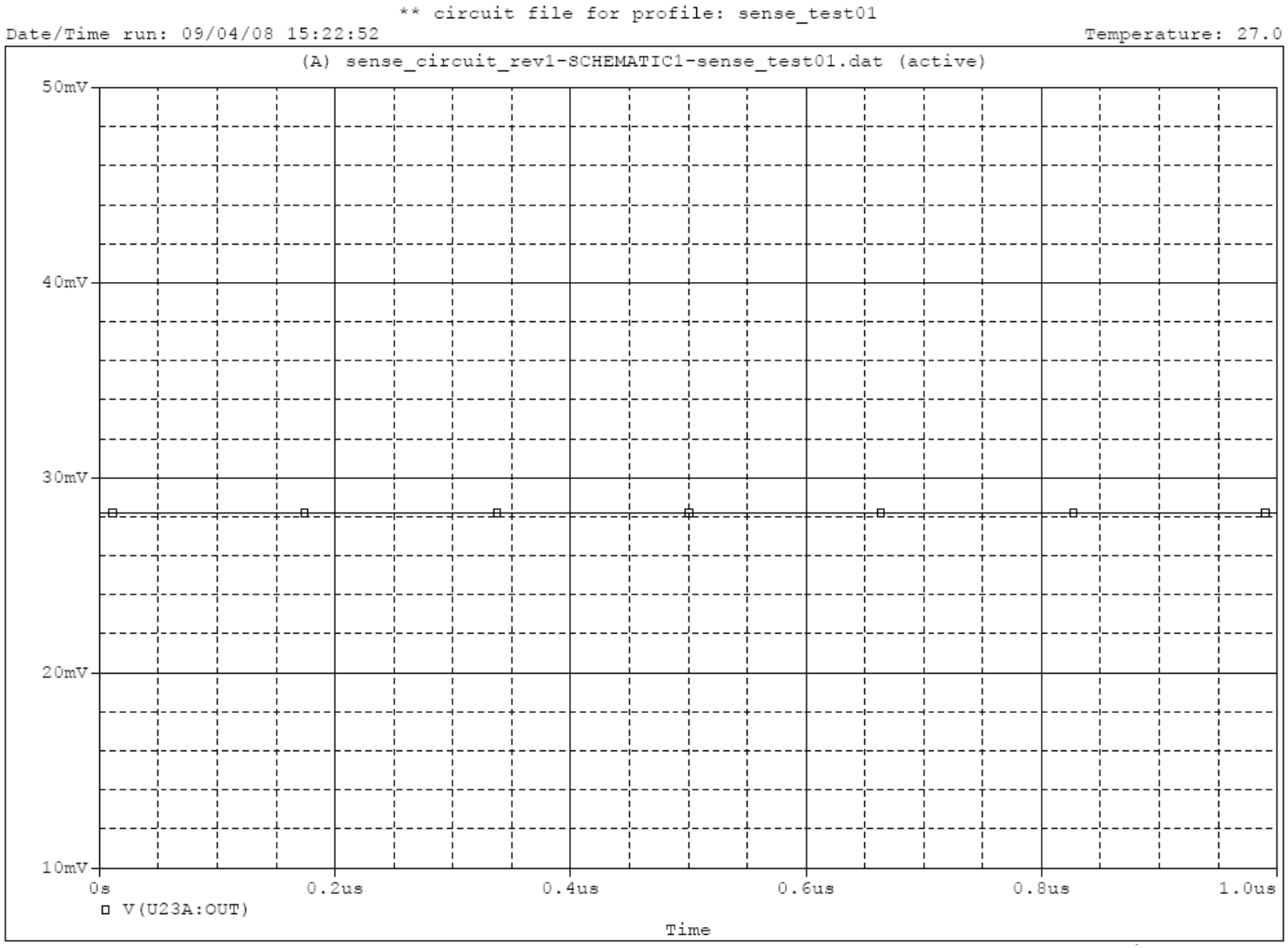
- The circuit for the spice simulation is the one proposed in 08-358, Annex M and is shown below:



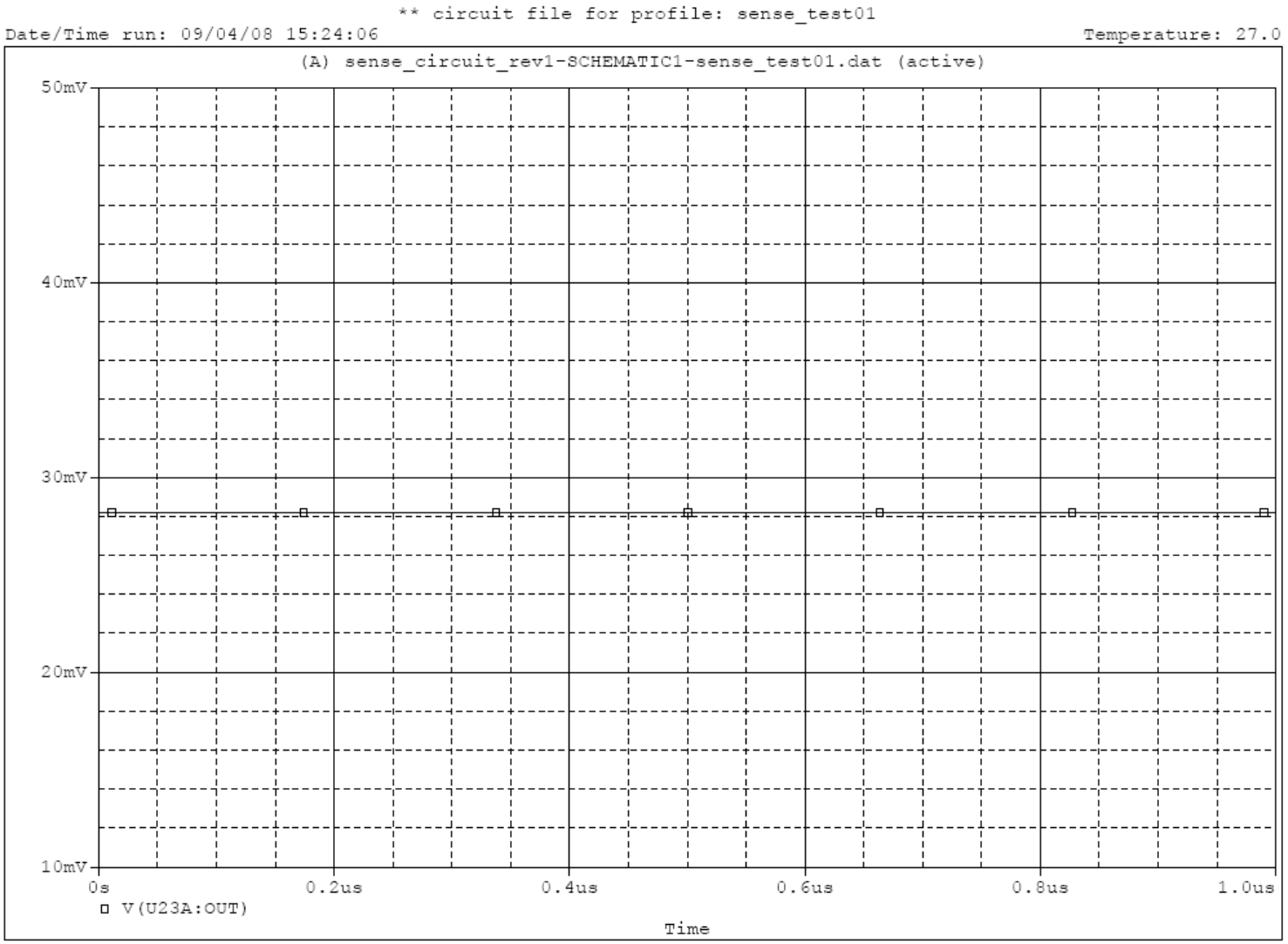
Simulation Setup *(continued)*

- The green shaded area is on the plug connector paddle card, and R8 is the Sense Resistor. The circuit is designed to have ~ 5V voltage on the power supply “Enable” pin when the Sense resistor value is 5k Ohm, and ~ 0V otherwise. ~5V on the “Enable” pin turns on the power supply, and it remains off otherwise.
- The circuit has been simulated in SPICE for various values of R8, and the voltage on the “Enable” pin was determined.
- Example output charts and output results are shown below.

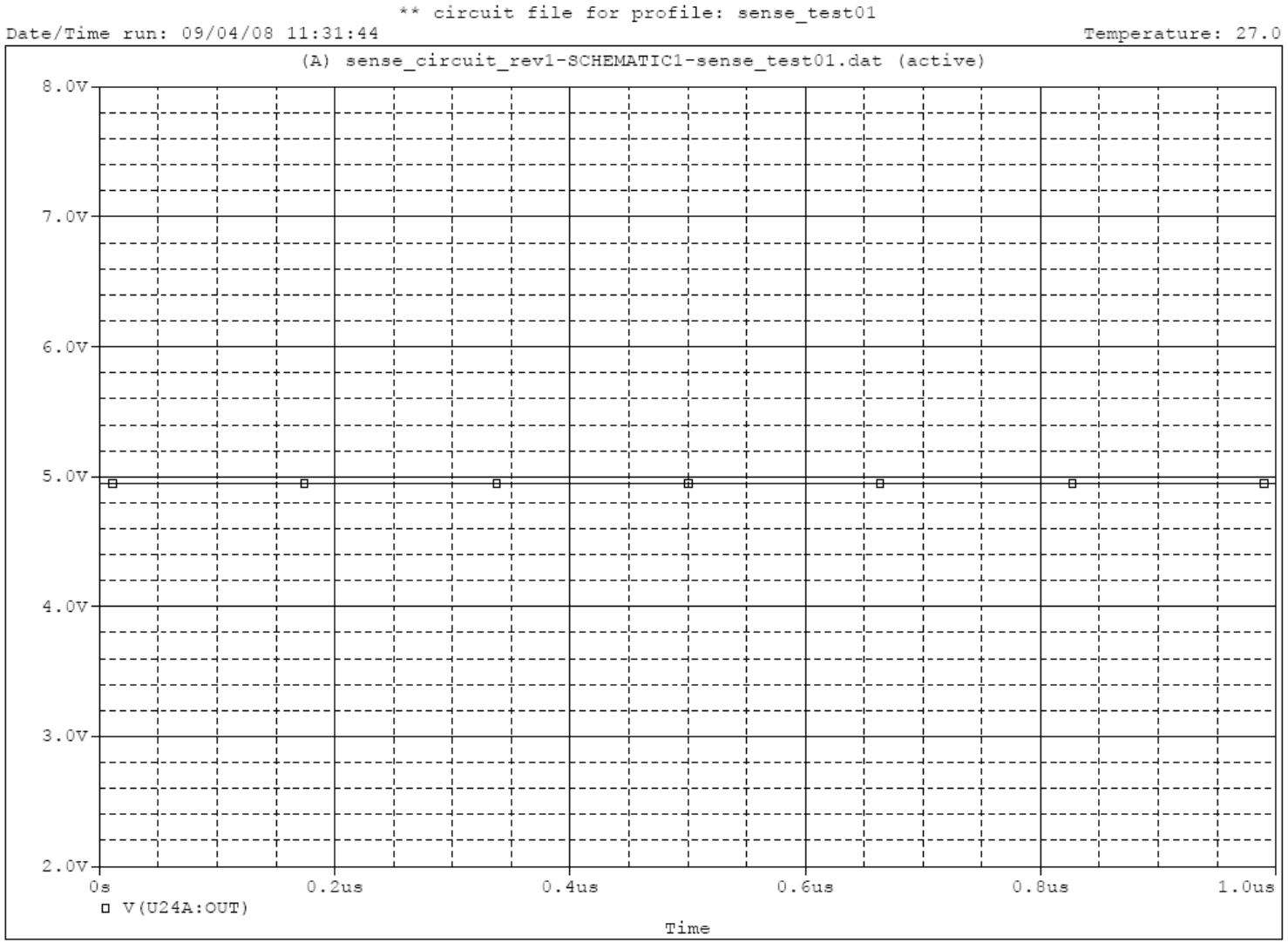
Simulation Results: R8 = 1 uOhm



Simulation Results: R8 = 1 MOhm



Simulation Results: R8 = 5k Ohm



Simulation Results: Summary

Sense Resistor Value	Cable Condition	V_{EN}
1uOhm	Passive	~28 mV
1M Ohm	Open	~28 mV
5k Ohm	Active	~5V

Appendix 1: SPICE Netlist

```
*Libraries:
* Local Libraries :
* From [PSPICE NETLIST] section of pspice91.ini file:
* .lib "nom.lib"
*library file for LM393
.lib "lm393.lib"

*Analysis directives:
.option post probe Accurate=1 ingold=2
.option list node
.TRAN  0 1000ns 0

R_R3        N00726 N00199  5.1k
R_R5        N05249 N00183  3.9k
R_R10         0 N05249  3.9k
X_U23A        N00183 N00726 N00199 0 N11560 LM393
V_V1        N00199 0 5
X_U24A        N00726 N05249 N07003 0 N11560 LM393
V_V2        N07003 0 5
R_R8        0 N00726  1meg
R_R6        0 N11560  5meg
R_R2        N11560 N00199  51.1k
C_C1        0 N00726  47nF
C_C2        0 N00726  1n
R_R1        N00183 N00199  3.9k
.end
```

Appendix 2: Dual Comparator Library File “lm393.lib”

```
* connections:   non-inverting input
*               | inverting input
*               | | positive power supply
*               | | | negative power supply
*               | | | | open collector output
*               | | | | |
.subckt LM393    1 2 3 4 5
*
  f1    9  3 v1 1
  iee   3  7 dc 100.0E-6
  vi1  21  1 dc .75
  vi2  22  2 dc .75
  q1    9 21  7 qin
  q2    8 22  7 qin
  q3    9  8  4 qmo
  q4    8  8  4 qmi
.model qin PNP(Is=800.0E-18 Bf=2.000E3)
.model qmi NPN(Is=800.0E-18 Bf=1002)
.model qmo NPN(Is=800.0E-18 Bf=1000 Cjc=1E-15 Tr=475.4E-9)
  e1   10  4  9  4  1
  v1   10 11 dc 0
  q5    5 11  4 qoc
.model qoc NPN(Is=800.0E-18 Bf=20.69E3 Cjc=1E-15 Tf=3.540E-9 Tr=472.8E-9)
  dp    4  3 dx
  rp    3  4 37.50E3
.model dx  D(Is=800.0E-18 Rs=1)
*
.ends
```