93-165 RD

LOCAL BUS PHYSICAL INTERFACE SIMULATION RESULTS

Dean Wallace
Linfinity Microelectronics
(714) 898-8121

The circuit used for the simulations is shown in figure one. This is the circuit as agreed upon in the last meeting. The termination on the host side is a 51 ohm series resistor while the termination on the hard drive side is 2.6k//4k (Vth=3V, Rth=1575 ohm). The capacitors C1,C2, and C3 were varied in the simulations (15pF, 20pF, 25pF) to help determine what a maximum node capacitance could be. The cable length used was 4 inches so that td was 0.5nS for T1 and T2 (Zo=75 ohms). With the cable that short the transmission lines had no effect in the simulations. The simulations were run with a wired or driver and with a negation driver with an ouput current of 10mA. The frequencies used were 11MHz (90nS period 50% duty cycle) and 22MHz (45nS period 50% duty). The following table summarizes the results;

PERIOD(50% DUTY)	CAP(C1,C2,C3)	Vda(NEGATION 10mA)	Vda(WIRED OR)
90nS	15pF	3.6V	1.7V
90nS	20pF	3.2V	1.55V
90nS	25pF	2.75V	1.4V
45nS	15pF	2.5V	1.15V
45nS	20pF	2.25V	1V
45nS	25pF	2.2V	0.9V

The graphical outputs on pages 1 thru 12 correlate to the above numbers and show the voltage at node 6 (corresponding to node 6 figure 1) and the driver current (including negation current where appropriate). Simulation results show that with the setup in figure one that a wired or driver can't be used if a 2V step is needed. The negation driver was adequate in all cases (depending on Vih of the receiver).

In this meeting I think the following questions need to be answered (and agreed on):

1) receiver characteristics
2) maximum allowed node capacitance (what is reasonable in practice)
3) maximum cable length (is 4 inches acceptable)
4) will wired or drivers be used
5) what should the driver current be

When the receiver characteristics, maximum node capacitance, and the maximum cable length are defined then the driver characteristics and termination can be defined.

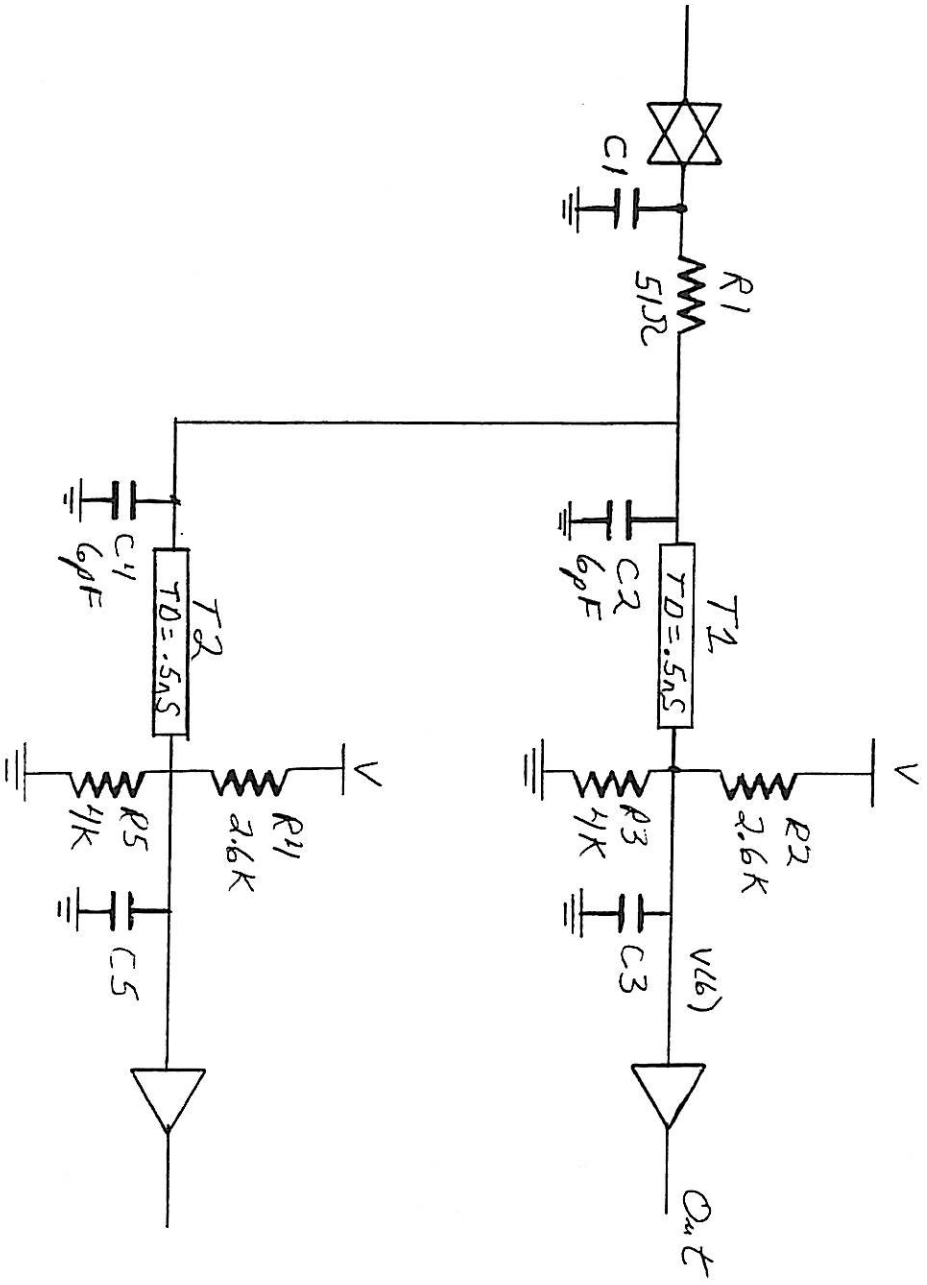
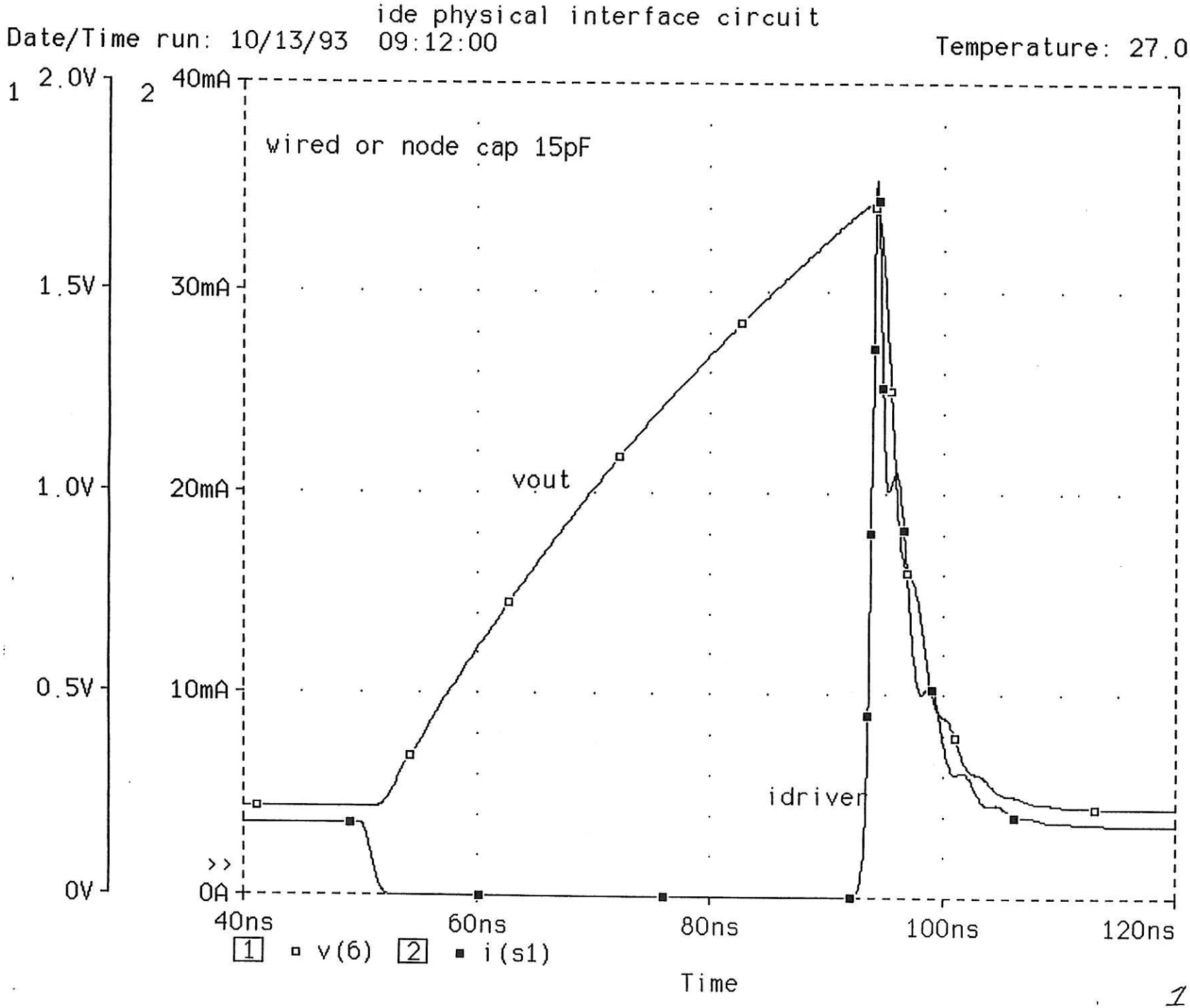
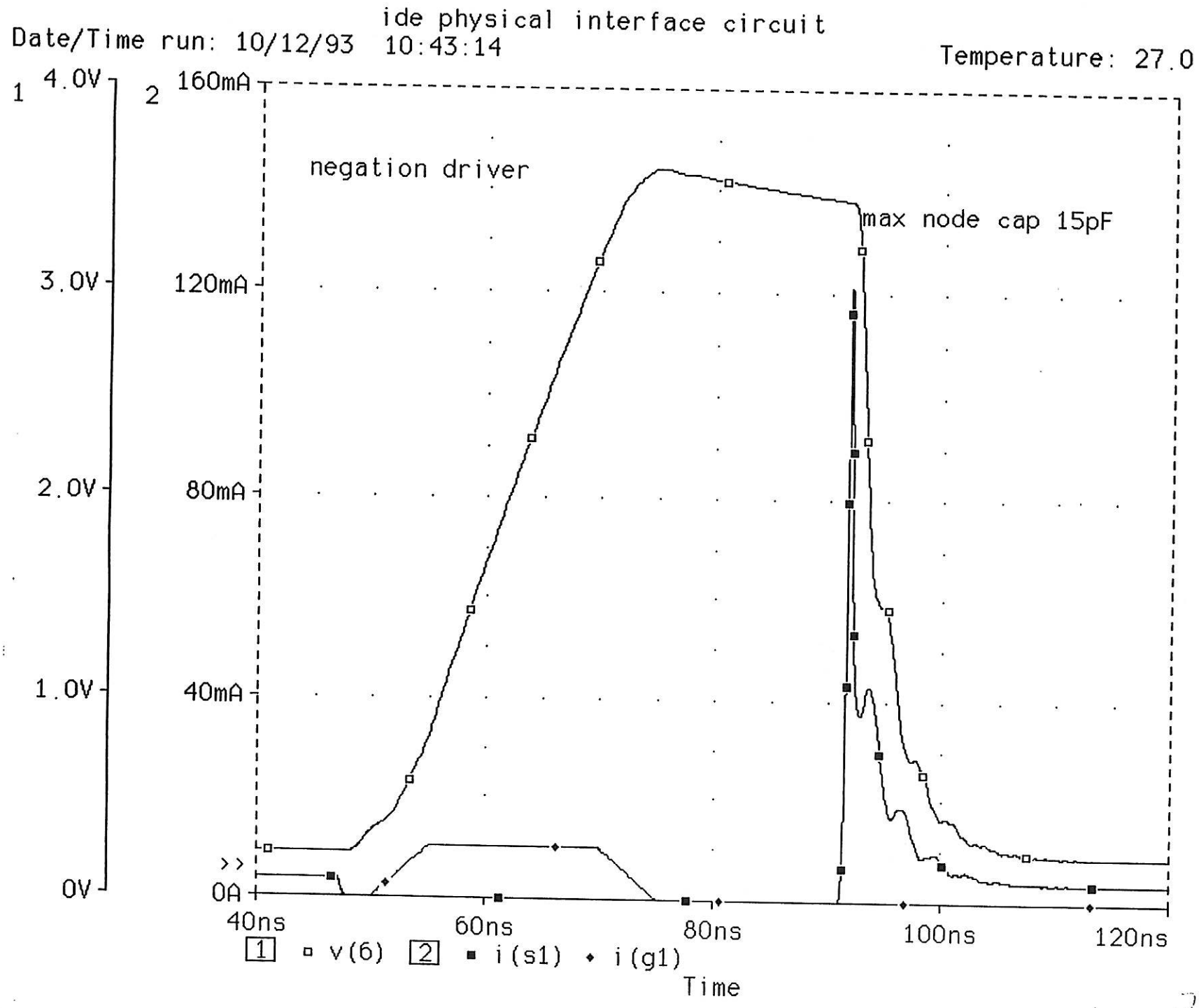
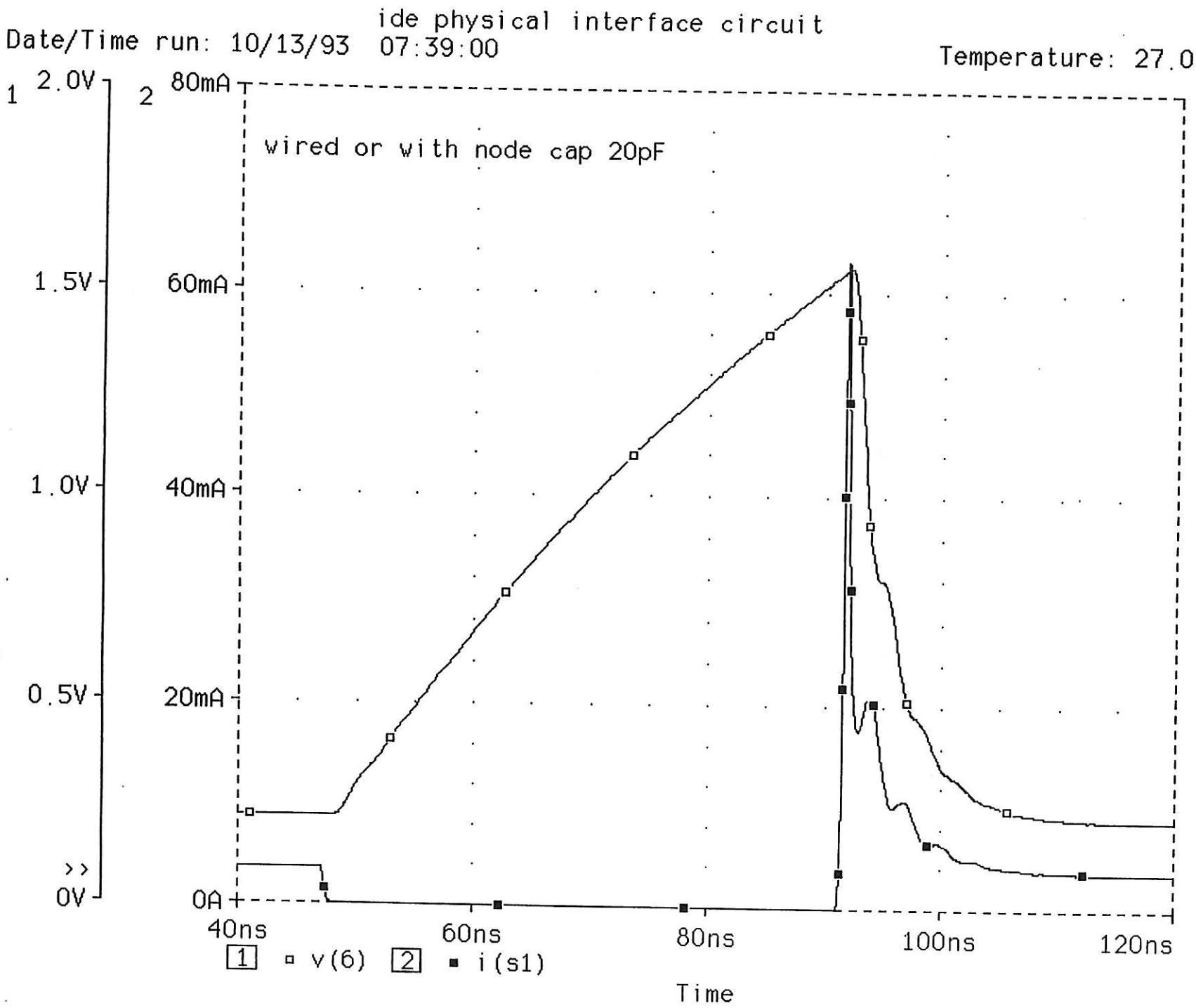
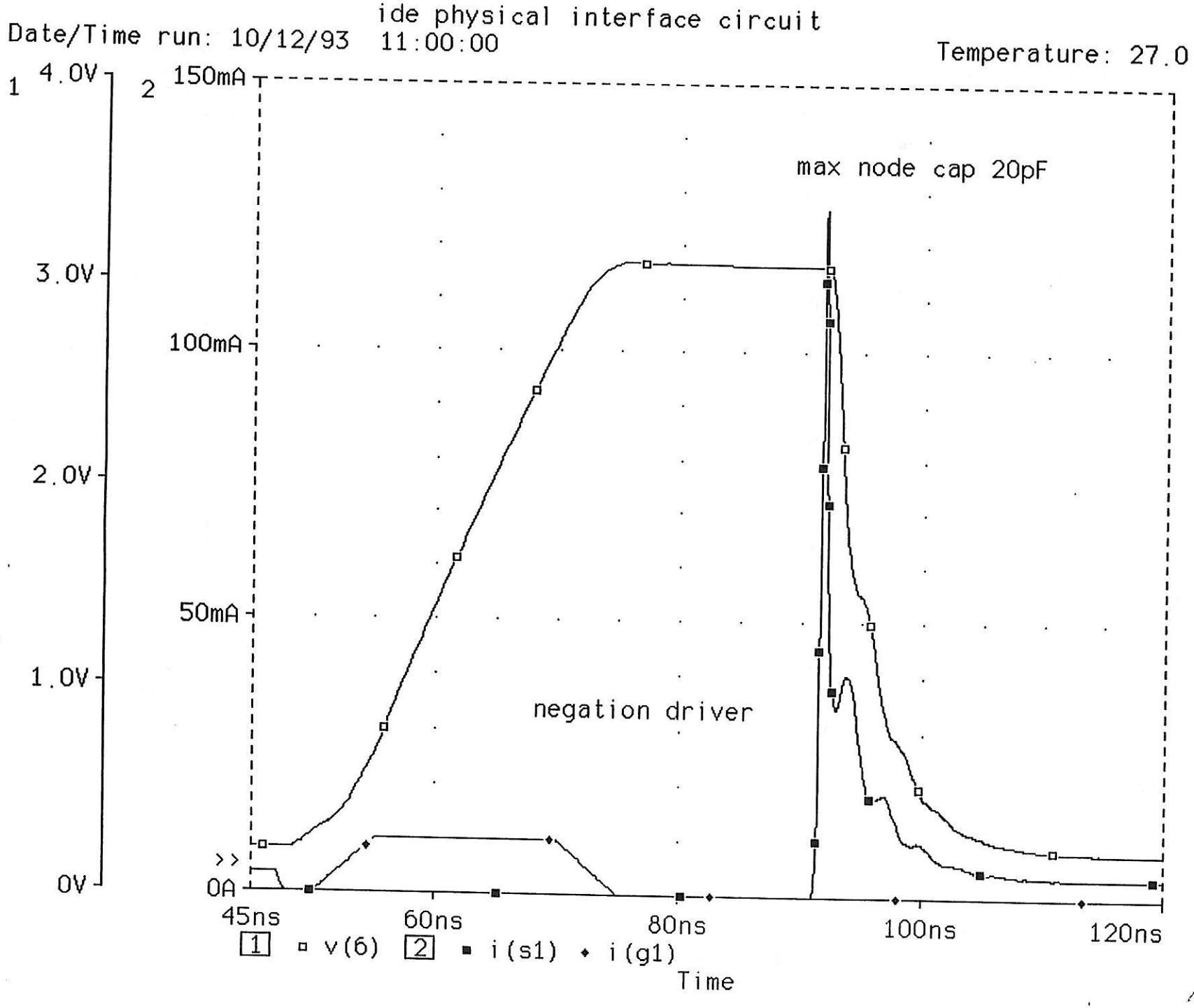

C1
R1
51Ω
C2
6pF
T1
TD=.5nS
R3
1K
R2
2.6K
V
C3
V(6)
Out
C4
6pF
T2
TD=.5nS
R5
1K
R4
2.6K
V
C5

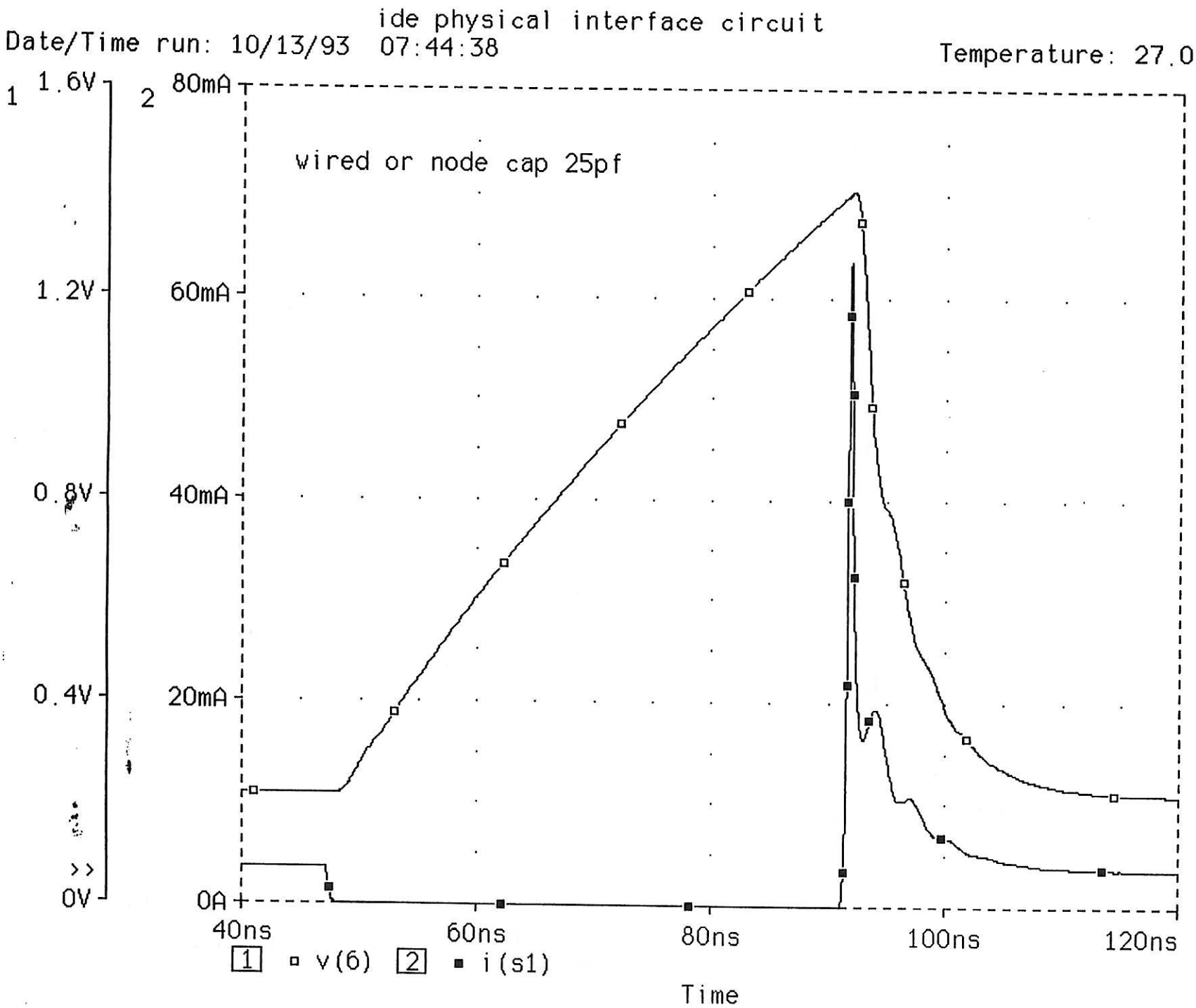
fig 1


ide physical interface circuit
Date/Time run: 10/13/93 09:12:00
Temperature: 27.0
1
2
2.0V
1.5V
1.0V
0.5V
0V
40mA
30mA
20mA
10mA
0A
wired or node cap 15pF
vout
idriver
40ns
60ns
80ns
100ns
120ns
1 v(6) 2 i(s1)
Time

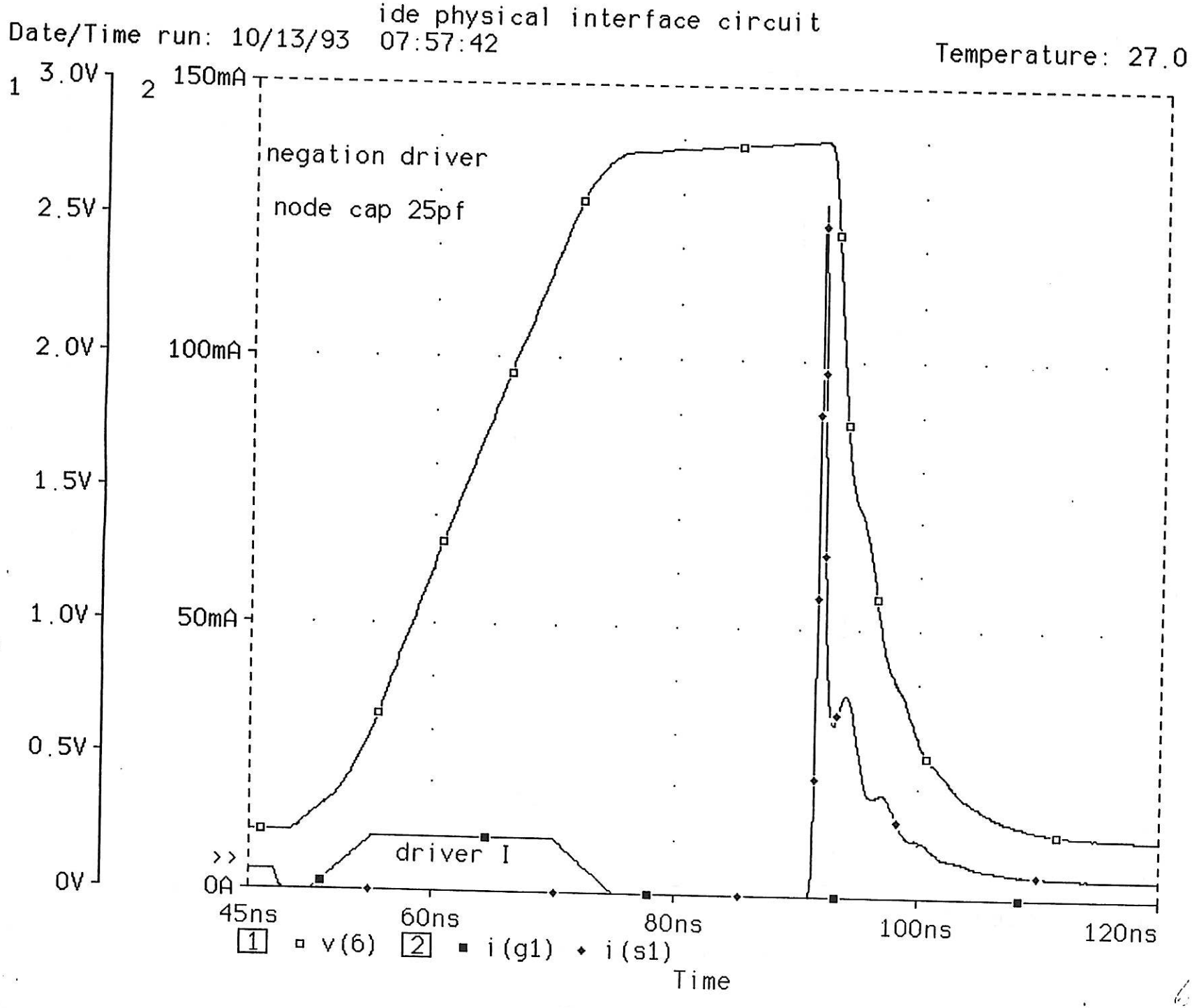

ide physical interface circuit
Date/Time run: 10/12/93 10:43:14
Temperature: 27.0
1
4.0V
3.0V
2.0V
1.0V
0V
2
160mA
120mA
80mA
40mA
0A
negation driver
max node cap 15pF
40ns
60ns
80ns
100ns
120ns
1 v(6) 2 i(s1) i(g1)
Time


ide physical interface circuit
Date/Time run: 10/13/93 07:39:00
Temperature: 27.0
1
2
2.0V
80mA
wired or with node cap 20pF
1.5V
60mA
1.0V
40mA
0.5V
20mA
>>
0V
0A
40ns
60ns
80ns
100ns
120ns
1 v(6) 2 i(s1)
Time

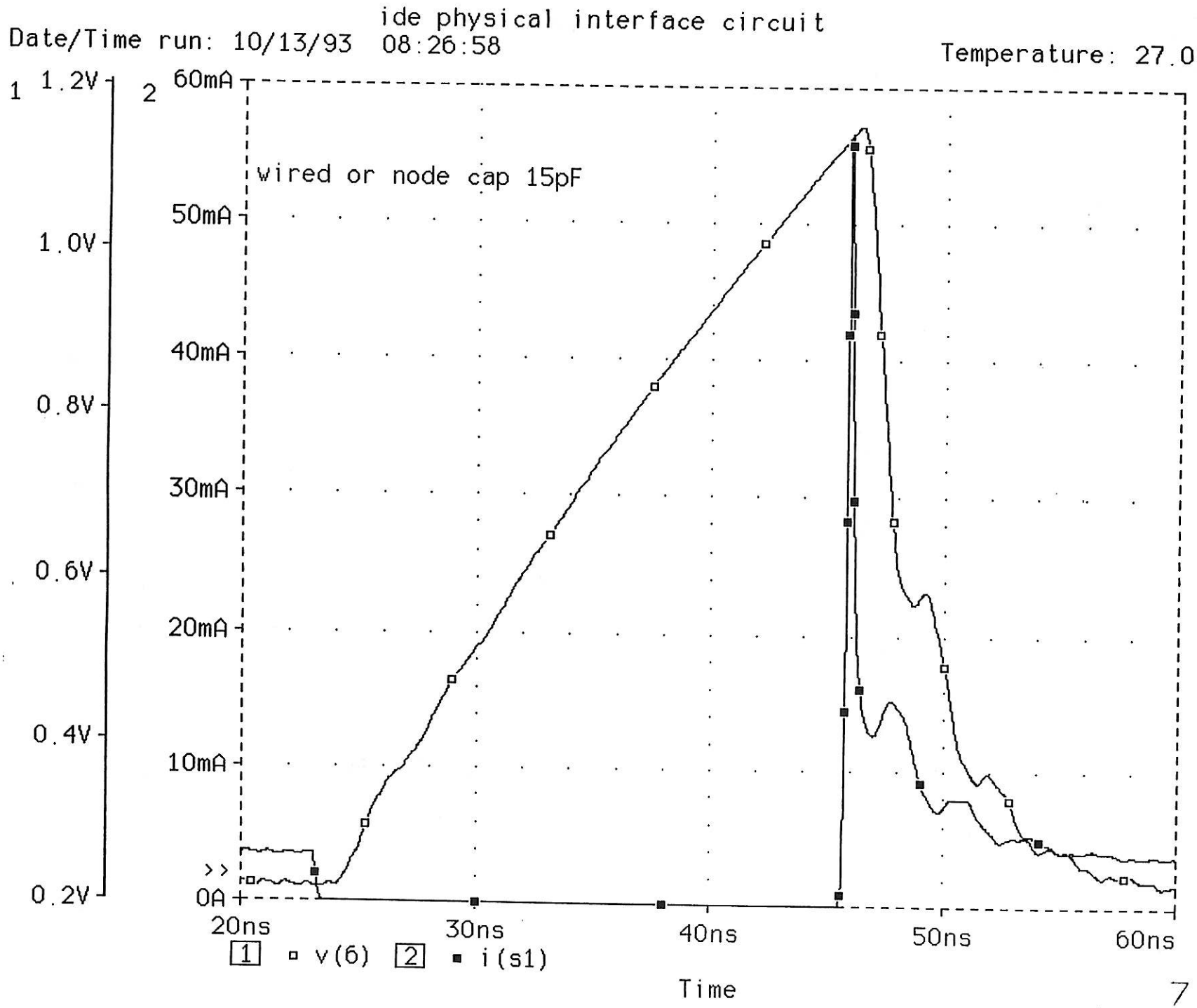

ide physical interface circuit
Date/Time run: 10/12/93 11:00:00
Temperature: 27.0
1
4.0V
3.0V
2.0V
1.0V
0V
2
150mA
100mA
50mA
>>
0A
max node cap 20pF
negation driver
45ns
60ns
80ns
100ns
120ns
1 v(6) 2 i(s1) i(g1)
Time


ide physical interface circuit
Date/Time run: 10/13/93 07:44:38
Temperature: 27.0
1
1.6V
1.2V
0.8V
0.4V
>>
0V
2
80mA
60mA
40mA
20mA
0A
wired or node cap 25pf
40ns
60ns
80ns
100ns
120ns
1 v(6) 2 i(s1)
Time

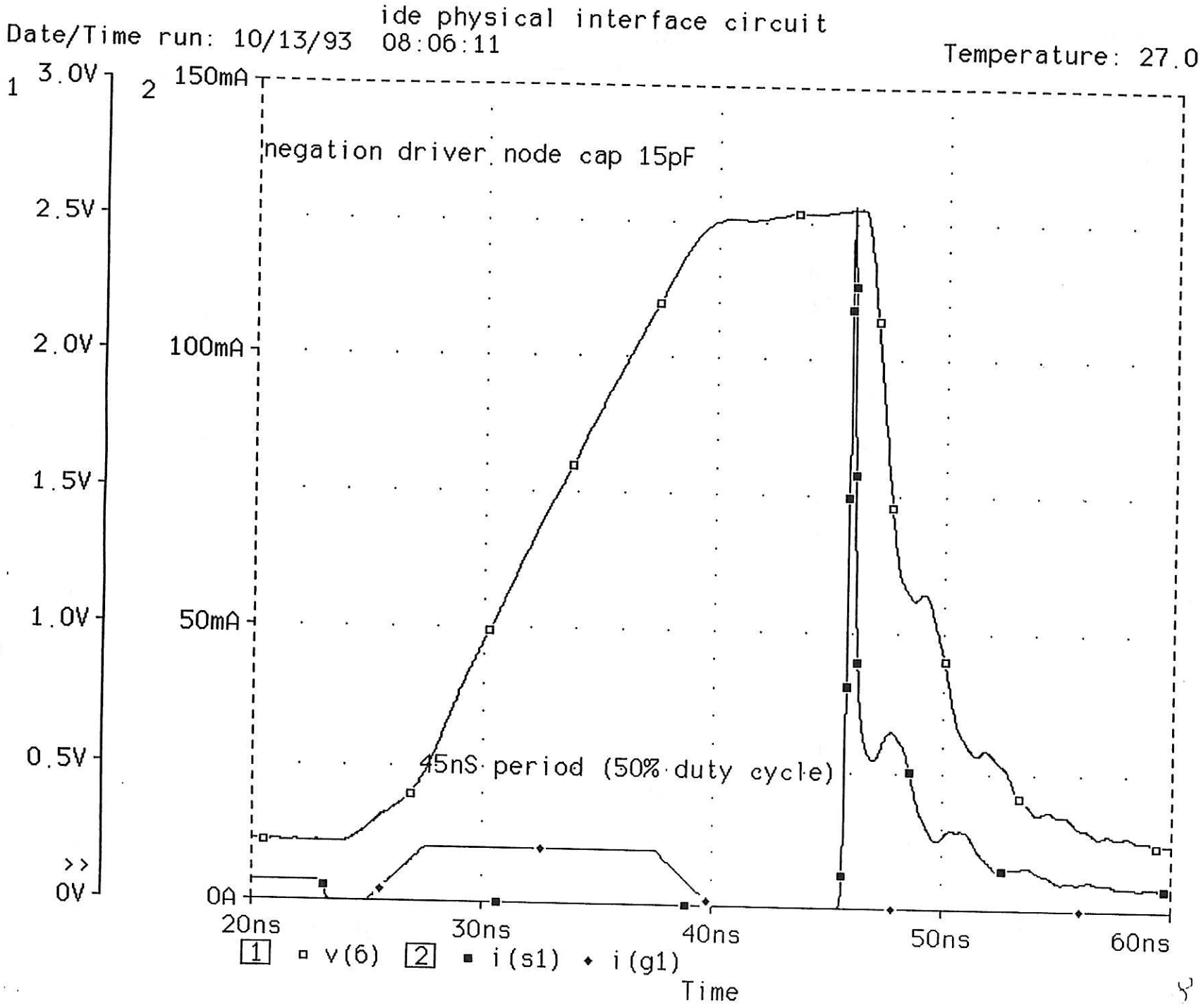
120


ide physical interface circuit
Date/Time run: 10/13/93 07:57:42
Temperature: 27.0
1
2
3.0V
2.5V
2.0V
1.5V
1.0V
0.5V
0V
150mA
100mA
50mA
0A
negation driver
node cap 25pf
driver I
45ns
60ns
80ns
100ns
120ns
1 v(6) 2 i(g1) i(s1)
Time

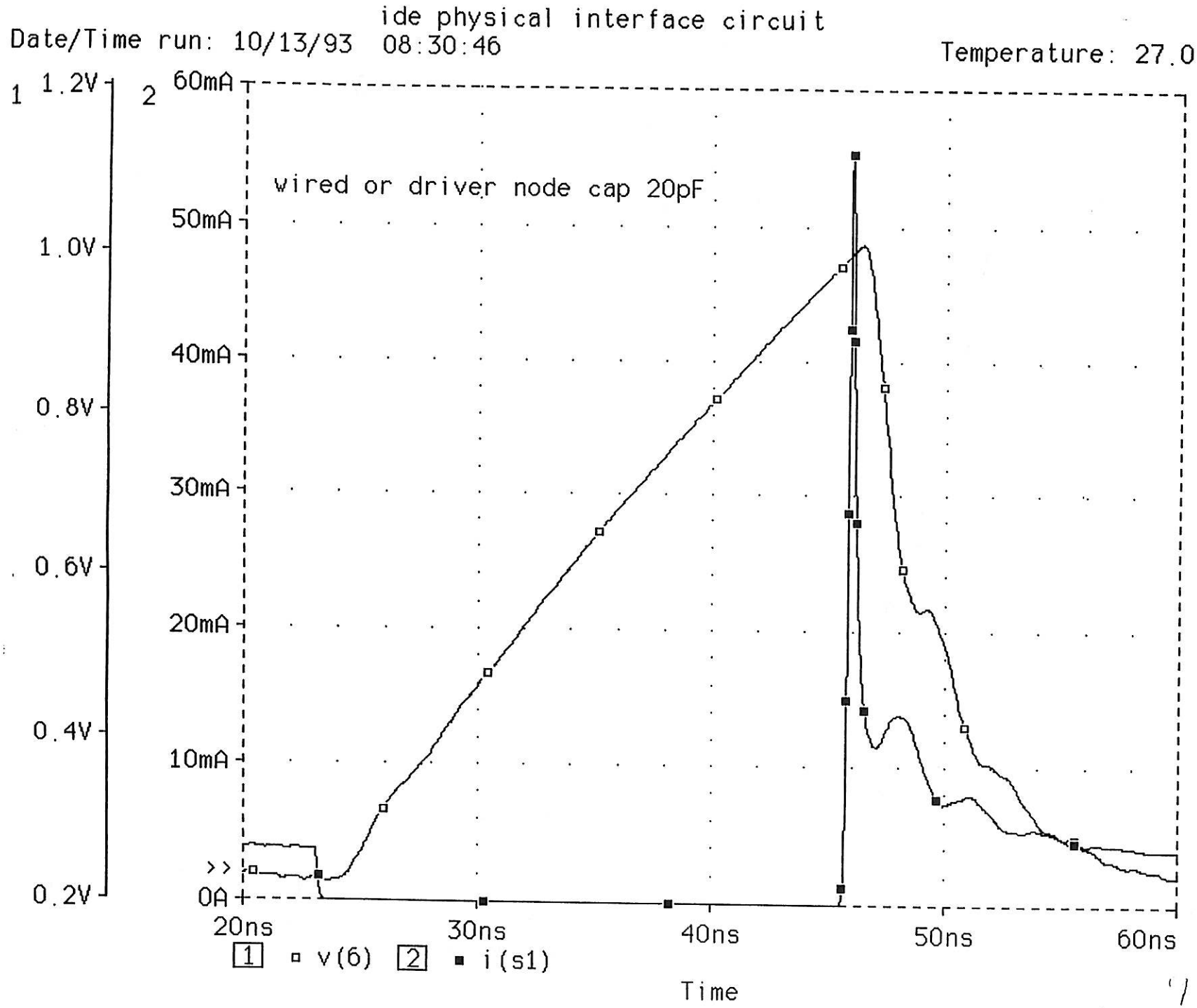
121

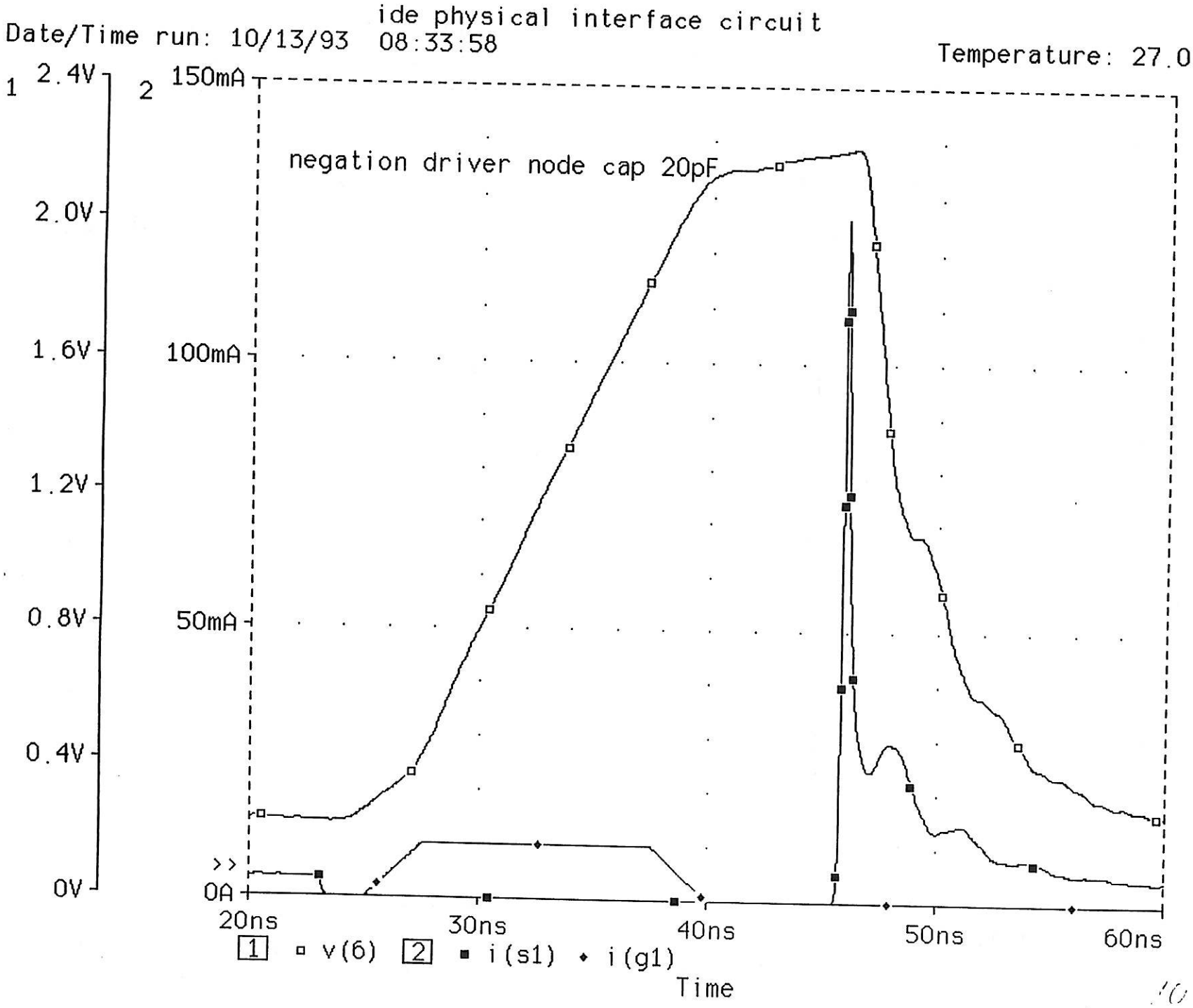

ide physical interface circuit
Date/Time run: 10/13/93 08:26:58
Temperature: 27.0
1 1.2V
2 60mA
wired or node cap 15pF
50mA
1.0V
40mA
0.8V
30mA
0.6V
20mA
0.4V
10mA
0.2V
>>
0A
20ns
30ns
40ns
50ns
60ns
1 v(6) 2 i(s1)
Time

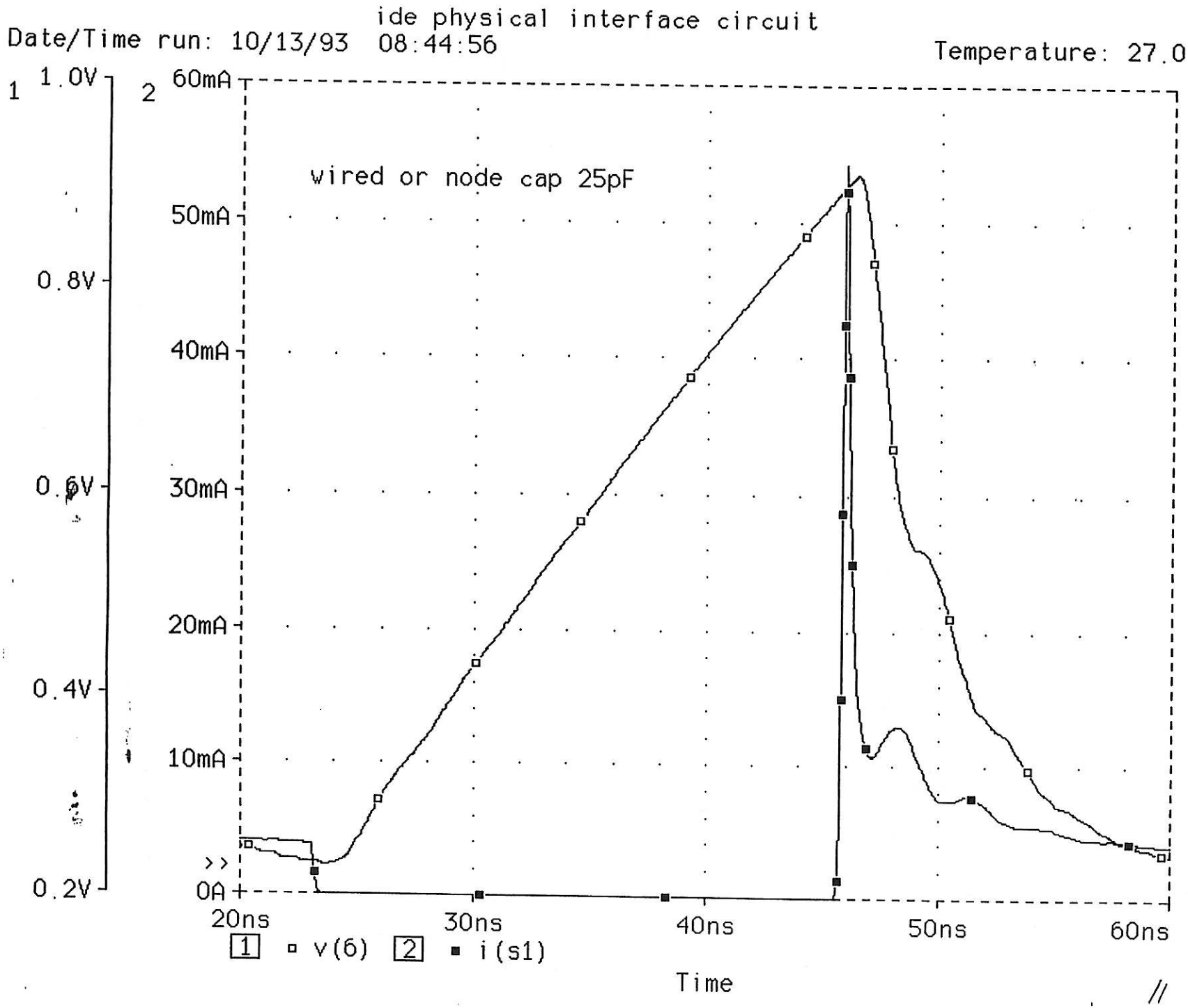
122


ide physical interface circuit
Date/Time run: 10/13/93 08:06:11
Temperature: 27.0
1
2
3.0V
2.5V
2.0V
1.5V
1.0V
0.5V
>>
0V
150mA
100mA
50mA
0A
negation driver node cap 15pF
45nS period (50% duty cycle)
20ns
30ns
40ns
50ns
60ns
1 v(6) 2 i(s1) i(g1)
Time

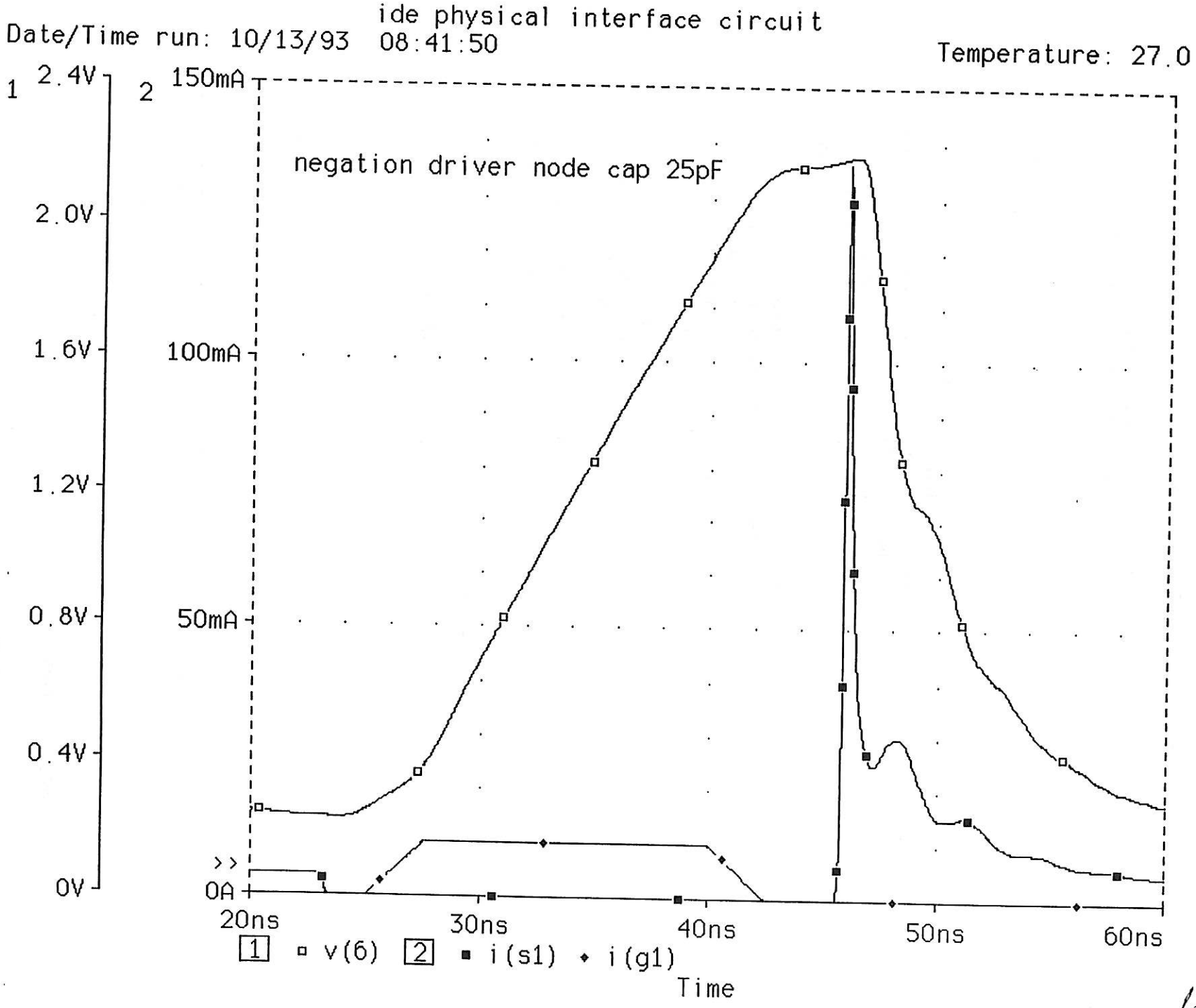
123


ide physical interface circuit
Date/Time run: 10/13/93 08:30:46
Temperature: 27.0
1
2
1.2V
1.0V
0.8V
0.6V
0.4V
0.2V
60mA
50mA
40mA
30mA
20mA
10mA
0A
wired or driver node cap 20pF
20ns
30ns
40ns
50ns
60ns
1 v(6) 2 i(s1)
Time


ide physical interface circuit
Date/Time run: 10/13/93 08:33:58
Temperature: 27.0
1
2
2.4V
2.0V
1.6V
1.2V
0.8V
0.4V
0V
150mA
100mA
50mA
0A
negation driver node cap 20pF
20ns
30ns
40ns
50ns
60ns
1 v(6) 2 i(s1) i(g1)
Time


ide physical interface circuit
Date/Time run: 10/13/93 08:44:56
Temperature: 27.0
1
1.0V
0.8V
0.6V
0.4V
0.2V
2
60mA
50mA
40mA
30mA
20mA
10mA
0A
wired or node cap 25pF
20ns
30ns
40ns
50ns
60ns
1 v(6) 2 i(s1)
Time

126


ide physical interface circuit
Date/Time run: 10/13/93 08:41:50
Temperature: 27.0
1
2.4V
2.0V
1.6V
1.2V
0.8V
0.4V
0V
2
150mA
100mA
50mA
0A
negation driver node cap 25pF
20ns
30ns
40ns
50ns
60ns
1 v(6) 2 i(s1) i(g1)
Time

12