X3T9.2/90-154

TO: X3T9.2 Committee Members, Liason and Observers

ROM: Chuck Micalizzi Emulex
(714) 662-5600 ext 3166
c_micalizzi@emulex.com

DATE: Oct. 4 1990

SUBJECT: Low Power Differential SCSI Working Group

On Sept. 26 1990 a special working group met at the Newport Beach, Ca. Sheraton to discuss creating a Low Power Differential Interface for SCSI-3. I would like to thank everyone who attended. The level of participation was excellent. Included in this mailing is a list of attendees (mailing addresses), preliminary specification, and a list of action items

M E E T I N G N O T I C E

There will be a second Low Power Differential SCSI working group meeting to be held Oct. 29 1990 in Austin Texas. The meeting will begin at 2:30pm to 5:00pm. This meeting will follow the Cable Working Group meeting which will be from 1:00 to 2:30.

The meeting will be held at the Stoufer Austin Hotel 9721 Arboretum Blvd. Austin Texas, reservation can be made by calling 512-343-2626. (see the November Working Group Meeting Notice from the October Mailing X3T9.2/90-135 page 309 for details).

See you in Austin,

Chuck

Alternative-Differential Specification : PRELIMINARY

Author: E. Jessen
Date: 9-26-90

1. REQUIREMENTS

a. At least 8 devices per system.
b. 16-bit data bus.
c. Each SCSI device must be capable of being implemented in a single device using a digital CMOS process. This implies a max. power dissipation of 1.0 to 1.5W per SCSI device.
d. Data error rates lower than single-ended.
e. At least 10MT/s (mega-transfers per second).
f. Minimum cable length of 6m.
g. lower power consumption than present differential.

2. GOALS

a. Develop an overal specification suitable for a workstation or in-cabinet environment.
c. Higher data rates. 20 mega-transfers very much desired.
d. 25m cable length.
e. 16 devices per system.
f. clearly specify system considerations previously ignored:
   - "hot-plugging" effects and design requirements.
   - cable specification
   - common-mode ranges

TRANSCIEVER REQUIREMENTS

	min	max	abs. min	abs. max	units	notes
Iil	-50	+50			uA	(1)
Iih	-50	+50			uA	(1)
Vinput	0.0	+5.0	-0.5	5.5	V	(2)
| Vid |	200				mV	(3)
input hysteresis	35				mV	
input impedance	12				k-ohm	(4)
input capacitance		25			pF	
| Vod |	0.5				V	(5)
Ioh (Voh = 2.7V)	-55				mA	(6)
Iol (Vol = 2.2V)	+55				mA	(6)
Ios1		??			mA	(7)
Ios2		??			mA	(8)

(1) Iil and Iih include leakage current of tristated outputs and of input receivers.
(2) Voltage at connection to SCSI bus, when outputs are tristate, measured relative to local ground.
(3) Vid = Va - Va-, where A and A- are the differential inputs to the device. Va and Va- must be separated by at least 200mV for a valid signal level to be recognized.
(4) This needs further specification:
    - some max and min | Z | over some frequency range
(5) Vod = Va - Va-, where A and A- are the differential outputs of the device.
(6) As Voh nears VDD, or Vol nears GND, Ioh and Iol values may drop below this minimum.
(7) Shorted to 5V.
(8) Shorted to 0V.

Values exceeding min and max levels may cause the device not to function properly. Values exceeding absolute min and max levels may cause permanent damage to the device.

4. Termination

There are two termination schemes under consideration: The first is the traditional three-resistor termination. The new, preferred method is a single series resistor between A and A-, with bias circuitry contained within each SCSI device.

4A. Original Method.

R1 is the resistor connected between the two differential signals.
R2 is the resistor connected from the power lines to the differential signals.
Resistor values are subject to change.

	min	nom	max.	units	notes
Vterm	4.0	4.5	5.25	V	
R1	123	125	127	ohms	(1)
R2	544	550	556	ohms	(1)
eff. impedance		100		ohms	
current from Vterm		4		mA	
current to ground		5		mA	

(1) Five percent tolerance.

Termination should be designed so that, when no devices are driving a signal, at least 500mV of bias voltage exists between A and A-. There are two sub-methods: one using symmetric differential, and the other using asymmetric differential.

4B. New Method.

A series resistor, in the 120 ohm range, is connected at each end of the cable between each pair of differential lines. There is no TERMPOWER line in the design, and TERMPOWER lines in the cable will be marked as RESERVED, and left open, to prevent device damage should a new SCSI device be plugged into an old SCSI system. Each input receiver on each SCSI device will have internal bias circuitry. A schematic of this circuitry is under development.

Termination resistor tolerance of 5% should be sufficient.

5. Notes

A. It may be necessary to specify varying values of termination, as a function of number of devices on the cable.

B. This system is not compatible with present differential.

To: c_micalizzi@emulex.com
Subject: here is A-cable pinout; let me know what you think...

differential cable pinouts - preliminary
Author: E. Jessen EMAIL dasun!jessen@sunkist.west.sun.com
Date: October 1, 1990

Signal Name	Connector Contact Number Set 2	Connector Contact Number Set 1	Cable Conductor Number		Connector Contact Number Set 2	Connector Contact Number Set 1	Signal Name
GROUND	1	1	1	2	2	26	GROUND
+DB(0)	2	3	3	4	4	27	-DB(0)
+DB(1)	3	5	5	6	6	28	-DB(1)
+DB(2)	4	7	7	8	8	29	-DB(2)
+DB(3)	5	9	9	10	10	30	-DB(3)
+DB(4)	6	11	11	12	12	31	-DB(4)
+DB(5)	7	13	13	14	14	32	-DB(5)
+DB(6)	8	15	15	16	16	33	-DB(6)
+DB(7)	9	17	17	18	18	34	-DB(7)
+DB(P)	10	19	19	20	20	35	-DB(P)
GROUND	11	21	21	22	22	36	GROUND
RESERVED	12	23	23	24	24	37	RESERVED
GROUND	13	25	25	26	26	38	GROUND
RESERVED	14	27	27	28	28	39	RESERVED
+ATN	15	29	29	30	30	40	-ATN
GROUND	16	31	31	32	32	41	GROUND
+BSY	17	33	33	34	34	42	-BSY
+ACK	18	35	35	36	36	43	-ACK
+RST	19	37	37	38	38	44	-RST
+MSG	20	39	39	40	40	45	-MSG
+SEL	21	41	41	42	42	46	-SEL
C/D	22	43	43	44	44	47	-C/D
+REQ	23	45	45	46	46	48	-REQ
+I/O	24	47	47	48	48	49	-I/O
GROUND	25	49	49	50	50	50	GROUND

Changes:
* DIFFSENSE became ground. This will make sure that old and new systems are not compatible.
* TERMPOWER became ground. This does not harm anything, because DIFFSENSE is grounded.

Recommendations:
* Convert more reserved lines to GROUND, to reduce common-mode swing and to provide better noise shielding of clock lines. This increases the ground lines from 10 to 14.
* Identify a single connector type that this specification will work with. SCSI has too many variants as is.
* specify signal to color assignments for round cable, to ensure that noise is as low as possible.
* generate a P-cable specification

AGENDA FOR OCT 29 MEETING
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a. Review TI's SPICE results for max. power dissipation.
b. Determine appropriate termination scheme.
c. Determine packaging feasibility.
d. Review TI's SPICE results for max. transfer rate.
e. Review IBM's hot-plugging considerations.
f. Collect a list of internet addresses of attendees

ACTION ITEMS
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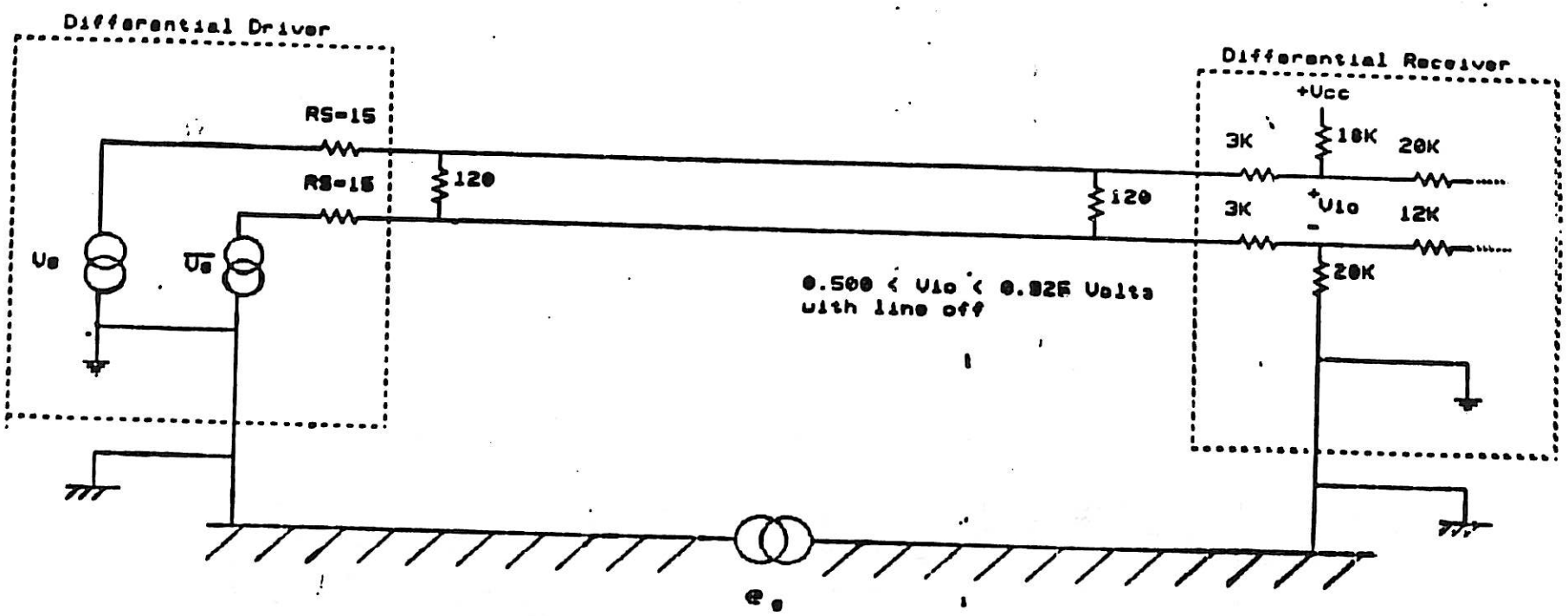
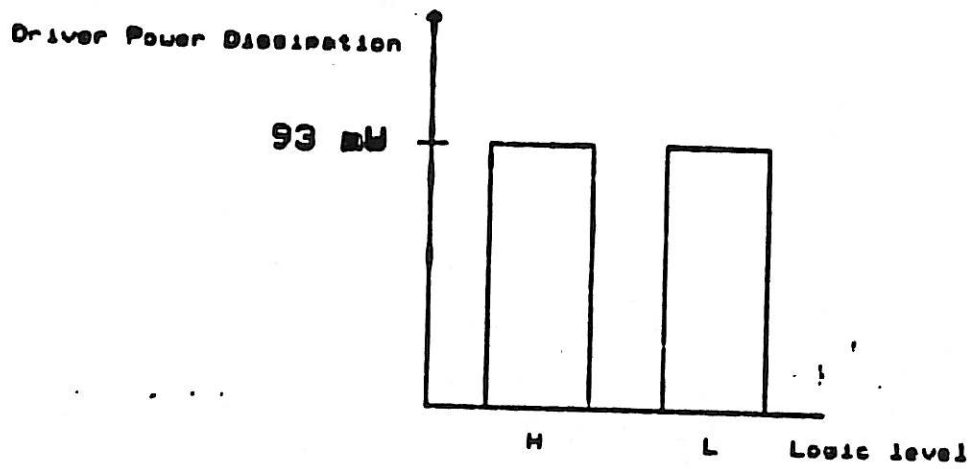
a. Hot-plugging IBM-Rochester
   - definition of terms
   - effects of hot-plugging and active-plugging
   - design requirements to minimize adverse effects.
b. Power-supply effects on common-mode noise
   - all attendees are generally urged to research the issue.
c. Define specific packages for 8-bit and 16-bit versions.
   This will be used in analyzing feasibility of integrating into a single device.
d. Define max. power dissipation
e. SPICE power dissipation for new termination TI
f. SPICE to see if new termination will run up to 20MT/s. TI
g. Generate new SCSI signal pin assignment.

Differential SCSI equivalent circuit with internal Vio





Meeting Attendees and Mailing Addresses

Marc Friedmann
AMCC
6195 Lusk Blvd.
San Diego, Ca. 92121
(619) 535-6516
FAX (619) 450-9885

Tim Thompson
AMCC
6195 Lusk Blvd.
San Diego, Ca. 92121
(619) 535-6516
FAX (619) 450-9885

Doug Makishima
Adaptec
691 S. Milpitas Blvd.
Milpitas, Ca. 95035
(408) 945-8600 ext. 2162
FAX (408) ???-????

Boyd Pett
Cirrus Logic, Inc.
1463 Centre Pointe Dr.
Milpitas, Ca. 95035
(408) 945-8300
FAX (408) 263-5682

Jim Shaffner
Emulex Micro Devices
3545 Harbor Blvd.
Costa Mesa, Ca. 92626
(714) 668-5365
FAX (714) 754-0731

Chuck Micalizzi
Emulex Micro Devices
3545 Harbor Blvd.
Costa Mesa, Ca. 92626
(714) 668-5600 ext. 3166
FAX (714) 754-0731
Email C_Micalizzi@Emulex.com

Ken Post
Future Domain
2801 Mcgaw Ave.
Irvine, Ca. 92714
(714) 253-0495
FAX (714) 253-0913

Carrie Claflin
Hewlett-Packard
P.O. Box 39
MS 216
Boise, ID 83704
(208) 323-4182
FAX (208) 323-2251
Email Carrie@HPDML64

Roger Dimmick
IBM
Hwy 52 & 37st
Rochester, Mn
(507) 253-2027
FAX (507) 253-5319

David Steele
NCR
1635 Aeroplaza
Colorado Springs, Co. 80916
(719) 596-5795
FAX (719) 570-8225

Ted Mlynar
NCR
1635 Aeroplaza
Colorado Springs, Co. 80916
(719) 596-5795
FAX (719) 570-8225

Luke A. Perkins
NCR
1635 Aeroplaza
Colorado Springs, Co. 80916
(719) 596-5795
FAX (719) 570-8225

Ed Shurig
Texas Instruments
M/S 8206
8360 LBJ Freeway
Dallas, Tx 75265
(214) 997-3384
FAX (214) ???-????

Mike Bartlett
Texas Instruments
M/S 8206
8360 LBJ Freeway
Dallas, Tx 75265
(214) 997-3308
FAX (214) ???-????

Meeting Attendees and Mailing Addresses

Kevin Gingerich
Texas Instruments
M/S 8206
8360 LBJ Freeway
Dallas, Tx 75265
(214) 997-3165
FAX (214) ???-????

Andrew Jue
National Semiconductor
2900 Semiconductor Dr.
P.O. Box 58090
Santa Clara, Ca. 95052-8090
M/S D-3969
(408) 721-7795
FAX (408) 739-6204

Don Chin
National Semiconductor
2900 Semiconductor Dr.
P.O. Box 58090
Santa Clara, Ca. 95052-8090
M/S E200
(408) 721-7916
FAX (408) 739-6204

Gary Murdock
National Semiconductor
2900 Semiconductor Dr.
P.O. Box 58090
Santa Clara, Ca. 95052-8090
M/S D-3969
(408) 721-7269
FAX (408) 739-6204

Ken Erickson
Micropolis
21211 Nordhoff
Chatsworth, Ca. 91311
(818) 718-5113
FAX (818) 709-3497

Eric Jessen
Western Digital
8105 Irvine Center Drive
Irvine, Ca. 92718
(714) 932-6612
Email dasun!Jessen@Sunkist.west.sun.com