PROPOSAL #2

LONG DISTANCE, SMALL SWING DIFFERENTIAL SCSI

ADVANTAGES:

- o VERY HIGH DATA RATES (FASTER THAN FAST SCSI) - ALL TRANSCEIVERS ON SAME SILICON.
- o LOW POWER - INTEGRATION ONTO PROTOCOL CONTROLLER A POSSIBILITY.
- o TWO VOLT GROUND SHIFT ALLOWED.
- o BACKWARD COMPATIBLE WITH SHORT DISTANCE DIFFERENTIAL.

107

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PROPOSAL #2

LONG DISTANCE, SMALL SWING DIFFERENTIAL SCSI

DISADVANTAGES:

- o TRANSCEIVER DESIGN MORE COMPLICATED. YIELD OF PROTOCOL PLUS DIFF. TRANSCEIVERS BIGGEST PROBLEM.
- o PROCESS REQUIRED COMPATABLE WITH PROTOCOL PROCESS?

108

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PROPOSAL #2

LONG DISTANCE, SMALL SWING DIFFERENTIAL SCSI

TRANSCEIVER FEATURES:

o SMALL SWING DRIVER - 0.7V OR 0.4V

o TIGHT THRESHOLD RECEIVER - 100 mV OR 50mV

o HIGH VOL (>2V) TO ALLOW FOR GROUND SHIFT.

o SAME TRANSCEIVER ON ALL LINES TO AVOID GROUND SHIFT PROBLEMS.

Note:

- Precedent for small swing - SMD-E uses ECL (0.7V), SMD uses Current-mode (0.3V) at lengths to 15 meters.
- ECL receiver Vcm (+/- 1V) limit SMD-E distance?

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109

PROPOSAL #2

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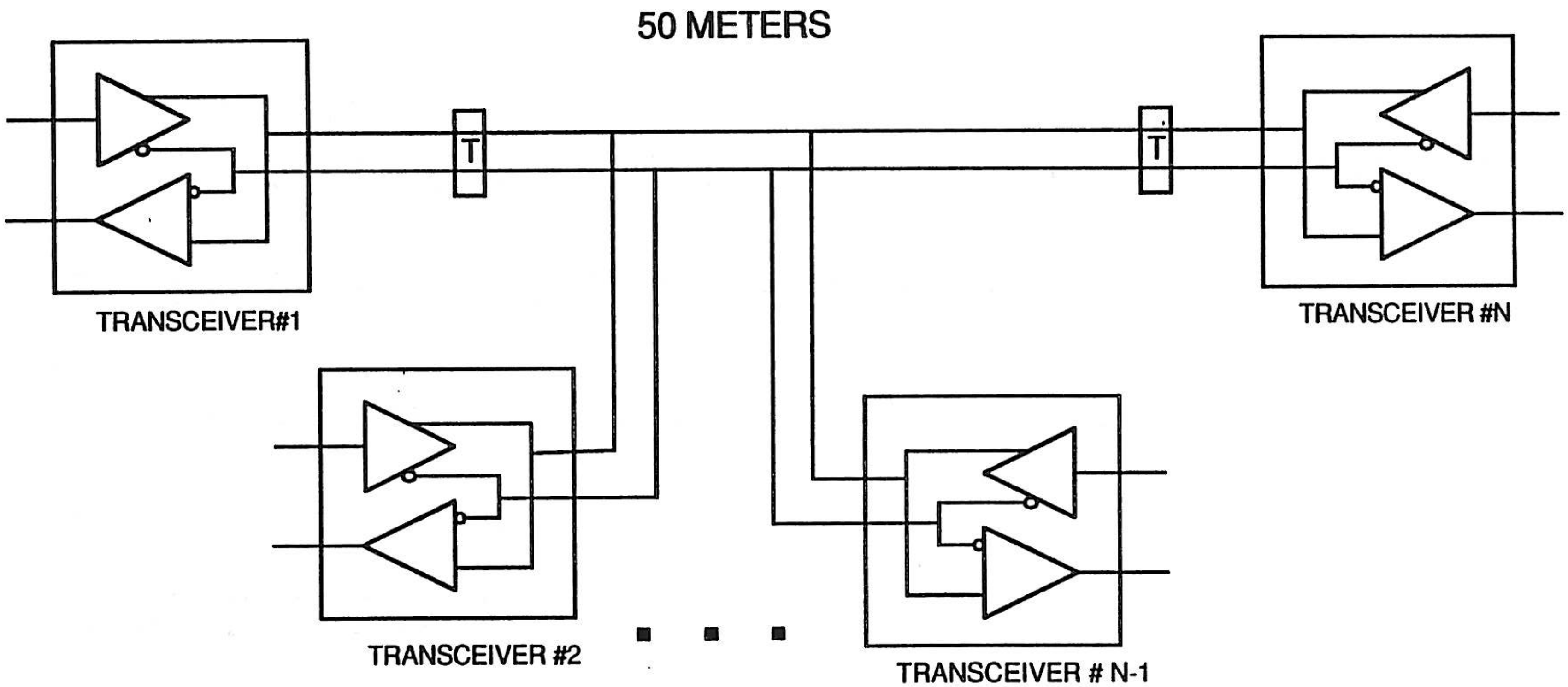
CIRCUIT DIAGRAM - ONE CHANNEL (ALL 18 THE SAME):



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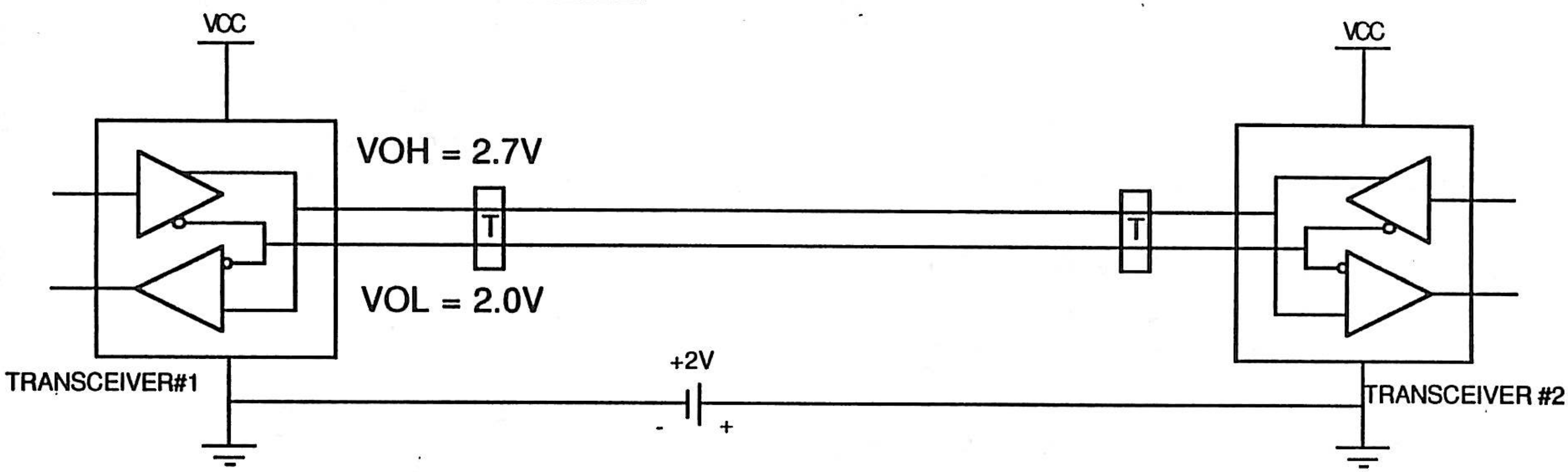
GROUND SHIFT TOLERANCE:



0 GROUND OF #2 IS 2V HIGHER THAN #1 (WORST CASE DIRECTION OF GROUND SHIFT)

o VOL OF #1 LOOKS KIKE GROUND TO #2.

o A SIMPLE TOTEM POLE OUTPUT DOES NOT STAY IN TRI-STATE WHEN ITS OUTPUT GOES BELOW ITS GROUND.

o SINCE VOL IS NOT BELOW DRIVER #2 GROUND, DRIVER #2 STAYS IN TRI-STATE.

o 2 VOLT VOL GIVES GROUND SHIFT PROTECTION OF 2V, WORST CASE.

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PROPOSAL #2

LONG DISTANCE, SMALL SWING DIFFERENTIAL SCSI

CALCULATION OF 18 CHANNEL POWER DISSIPATION:

MINIMUM CABLE IMPEDANCE

LOADED CABLE IMPEDANCE IS GIVEN BY:

$$Z_L = \frac{Z_O}{\sqrt{1 + C_L / C_O}}$$

WHERE : Zo = Unloaded cable characteristic impedance.
Zl = Loaded cable characteristic impedance.
Co = Unloaded cable capacitance per foot.
Cl = Loaded cable capacitance per foot.

Assume: Zo = 120 ohm (differential)
Co = 15 pF/ft
Cl = 15 pF/ft

Therefore: $Z_L = \frac{120}{\sqrt{1 + 15/15}} = 85$ ohms

Assume min loaded impedance of 80 ohms.

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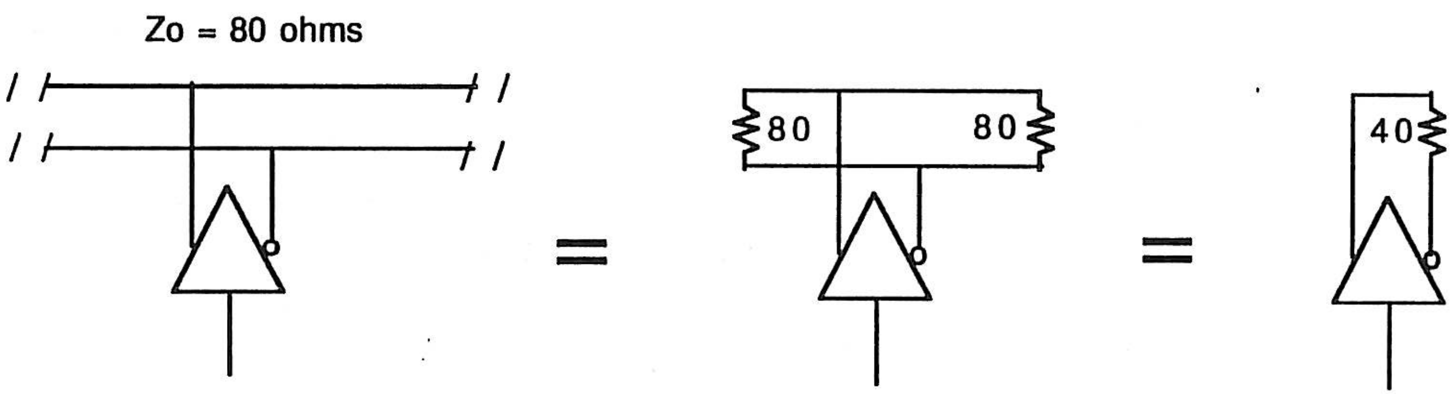
112

PROPOSAL #2

LONG DISTANCE, SMALL SWING DIFFERENTIAL SCSI

CALCULATION OF 18 CHANNEL POWER DISSIPATION:

MAXIMUM DRIVER LOAD CURRENT



0.7V SWING:

$$I\ load = \frac{0.7V}{40\ ohms} = 17.5\ mA$$

0.4V SWING:

$$I\ load = \frac{0.4V}{40\ ohms} = 10\ mA$$

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1/3

PROPOSAL #2

LONG DISTANCE, SMALL SWING DIFFERENTIAL SCSI

CALCULATION OF 18 CHANNEL POWER DISSIPATION:

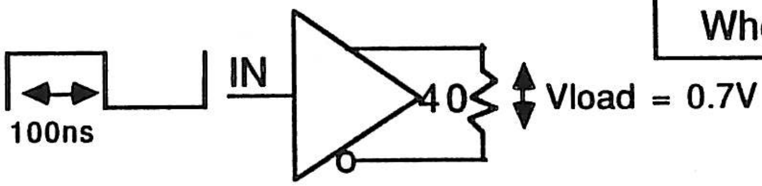
DRIVER POWER DISSIPATION AT FAST SCSI DATA RATE

$$Pd = (Vcc - Vload) * Iload + Cpd * Vcc*Vcc * f$$

Where: f = frequency (fast SCSI data channel= 5Mhz)
Cpd = Power dissipation capacitance (est. 50 pF for output and load)

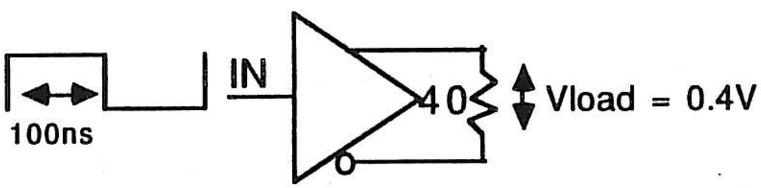
Note: Assumed zero quiesent current (CMOS process). Assumed control line constant switching.

0.7V SWING



Pd = (5-.7)*17.5 mA + 50pF*25V*5Mhz
= 82 mW/driver
18 channel Pd = 82 mW/driver * 18 drivers = 1.48 Watts

0.4V SWING



Pd = (5-.4)*10mA + 50pF*25V* 5Mhz
= 53 mW/driver
18 channel Pd = 53mW/driver * 18 drivers = 0.95 Watts

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114

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CALCULATION OF 18 CHANNEL POWER DISSIPATION:

TOTAL TRANSCEIVER POWER DISSIPATION

o RECEIVER POWER DISSIPATION:
Assume receiver Icc = 5 mA/receiver

Pd = Icc * Vcc * 18 Receivers
= 5 mA * 5V * 18
= 0.45 Watts

115

o TOTAL 18 CHANNEL TRANSCEIVER POWER DISSIPATION:

0.7V SWING
Pd total = Pd drivers + Pd receivers
= 1.48 W + 0.45W
= 1.93 Watts

0.4V SWING
Pd total = 0.95 W + 0.45 W
= 1.4 Watts

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PROPOSAL #2

LONG DISTANCE, SMALL SWING DIFFERENTIAL SCSI

SUMMARY

o POWER DISSIPATION APPEARS TO BE LOW ENOUGH TO ALLOW INTEGRATION ONTO A PROTOCOL CHIP.

o HOWEVER, SOME CONCERNS:

1) TRANSCEIVER DESIGN IS MORE COMPLEX THAN CURRENT SINGLE-ENDED DESIGNS

2) TRANSCEIVER PROCESS COMPATIBILE WITH PROTOCOL PROCESS?

3) YIELDS OF ADVANCED PROTOCOL + ADVANCED TRANSCEIVERS?

o IS THERE A MARKET FOR AN OUTBOARD, SMALL SWING, 18 CHANNEL TRANSCEIVER?

1) MARKET LIFE?

2) PACKAGE SIZE?

3) HOW MUCH $?

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116