

TOTEM

TOTEM Experiment

REPEATER SPECIFICATION

*TOTEM Project Document No.:***REPEATER***Institute Document No.**Created: 16/01/2006**Page:**Modified:**Rev. No.:*

TOTEM REPEATER CHIP SPECIFICATION

Abstract

This document provides the full specification of the TOTEM repeater chip. This chip restores the LVDS levels for 16 parallel signals transmitted over a long electrical cable.

Totem needs to transmit the trigger signals from the Roman Pots to the counting room over electrical cable which presents a delay of about 4.2 ns/m compared to 5 ns/m for optical fiber. This increase in transmission speed allows TOTEM to present the Roman Pot trigger signals in time to the CMS global trigger.

*Prepared by:***P. Chalmet
W. Snoeys***Checked by:***W. Snoeys***Approved by:***W. Snoeys PH-MIC**

Distribution List

Table of Contents

TABLE OF CONTENTS 2

1. INTRODUCTION 3

2. FLOORPLAN 3

3. LIST OF THE PADS..... 4

4. CONCLUSIONS: BENEFITS FOR THE EXPERIMENT 4

1. Introduction

The LVDS repeater regenerates 16 LVDS signals in parallel (see Fig. 1). To do this every of the 16 signals is applied to an LVDS receiver block which converts the signal to CMOS and sends it to an LVDS driver block which converts the signal back to LVDS. An important problem is the length of the electrical cable. The chip consumes about 10mW per channel, so 160 mW in total. Since the chip will be connected to very long cables, the protection diodes were resized for the chip to be more robust.

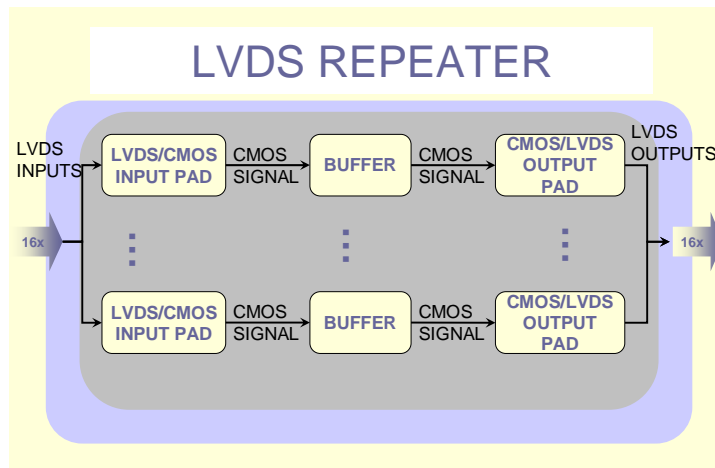


Fig. 1. General LVDS Repeater architecture

2. Floorplan

Fig. 3 illustrates the overall floorplan of the chip. The chip dimensions are indicated as well.

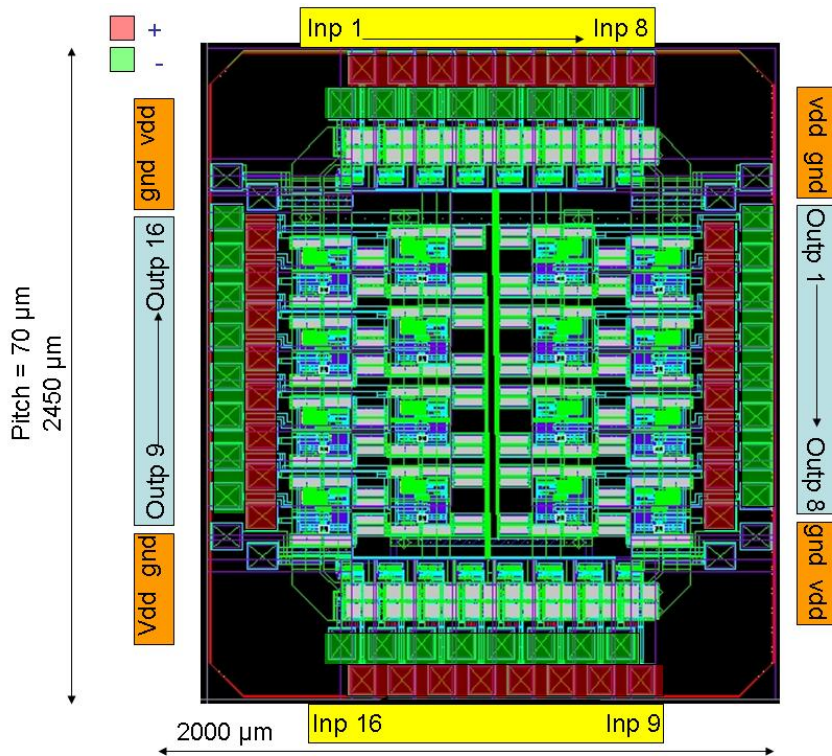


Fig. 2. Geometrical organization of the pads.

REPEATER

3. List of the Pads

The following table contains a detailed list of pads.

PAD	FUNCTION			X	Y	PAD	FUNCTION			X	Y
		lvds						lvds			
1	IN	1	-	475	2057,84	37	IN	9	+	1525	69,28
2	IN	1	+	545	2182,84	38	IN	9	-	1455	194,28
3	IN	2	-	615	2057,84	39	IN	10	+	1385	69,28
4	IN	2	+	685	2182,84	40	IN	10	-	1315	194,28
5	IN	3	-	755	2057,84	41	IN	11	+	1245	69,28
6	IN	3	+	825	2182,84	42	IN	11	-	1175	194,28
7	IN	4	-	895	2057,84	43	IN	12	+	1105	69,28
8	IN	4	+	965	2182,84	44	IN	12	-	1035	194,28
9	IN	5	-	1035	2057,84	45	IN	13	+	965	69,28
10	IN	5	+	1105	2182,84	46	IN	13	-	895	194,28
11	IN	6	-	1175	2057,84	47	IN	14	+	825	69,28
12	IN	6	+	1245	2182,84	48	IN	14	-	755	194,28
13	IN	7	-	1315	2057,84	49	IN	15	+	685	69,28
14	IN	7	+	1385	2182,84	50	IN	15	-	615	194,28
15	IN	8	-	1455	2057,84	51	IN	16	+	545	69,28
16	IN	8	+	1525	2182,84	52	IN	16	-	475	194,28
PAD	FUNCTION			X	Y	PAD	FUNCTION			X	Y
17	VDD	in		1930,72	1816,06	53	VDD	in		194,28	486,06
18	GND	in		1805,72	1746,06	54	GND	in		69,28	556,06
		lvds						lvds			
19	OUT	1	-	1930,72	1676,06	55	OUT	9	+	194,28	626,06
20	OUT	1	+	1805,72	1606,06	56	OUT	9	-	69,28	696,06
21	OUT	2	-	1930,72	1536,06	57	OUT	10	+	194,28	766,06
22	OUT	2	+	1805,72	1466,06	58	OUT	10	-	69,28	836,06
23	OUT	3	-	1930,72	1396,06	59	OUT	11	+	194,28	906,06
24	OUT	3	+	1805,72	1326,06	60	OUT	11	-	69,28	976,06
25	OUT	4	-	1930,72	1256,06	61	OUT	12	+	194,28	1046,06
26	OUT	4	+	1805,72	1186,06	62	OUT	12	-	69,28	1116,06
27	OUT	5	-	1930,72	1116,06	63	OUT	13	+	194,28	1186,06
28	OUT	5	+	1805,72	1046,06	64	OUT	13	-	69,28	1256,06
29	OUT	6	-	1930,72	976,06	65	OUT	14	+	194,28	1326,06
30	OUT	6	+	1805,72	906,06	66	OUT	14	-	69,28	1396,06
31	OUT	7	-	1930,72	836,06	67	OUT	15	+	194,28	1466,06
32	OUT	7	+	1805,72	766,06	68	OUT	15	-	69,28	1536,06
33	OUT	8	-	1930,72	696,06	69	OUT	16	+	194,28	1606,06
34	OUT	8	+	1805,72	626,06	70	OUT	16	-	69,28	1676,06
35	GND	in		1930,72	556,06	71	GND	in		194,28	1746,06
36	VDD	in		1805,72	486,06	72	VDD	in		69,28	1816,06

Table 1. Definition of the pads of the LVDS Repeater.

4. Conclusions: benefits for the experiment

The LVDS Repeater chip is required for the TOTEM experiment to conserve signal integrity for the trigger signals sent from the Roman Pots. Latency requirements for the moment preclude optical transmission, and therefore electrical transmission using LVDS was required. For a cable length of about 270 m a few repeater stages will be required to conserve signal integrity. The chip had to be designed to be radiation tolerant, and this determined the decision to submit a full-custom chip.