

# THC63LVD104S

## 112MHz 30Bits Color LVDS Receiver

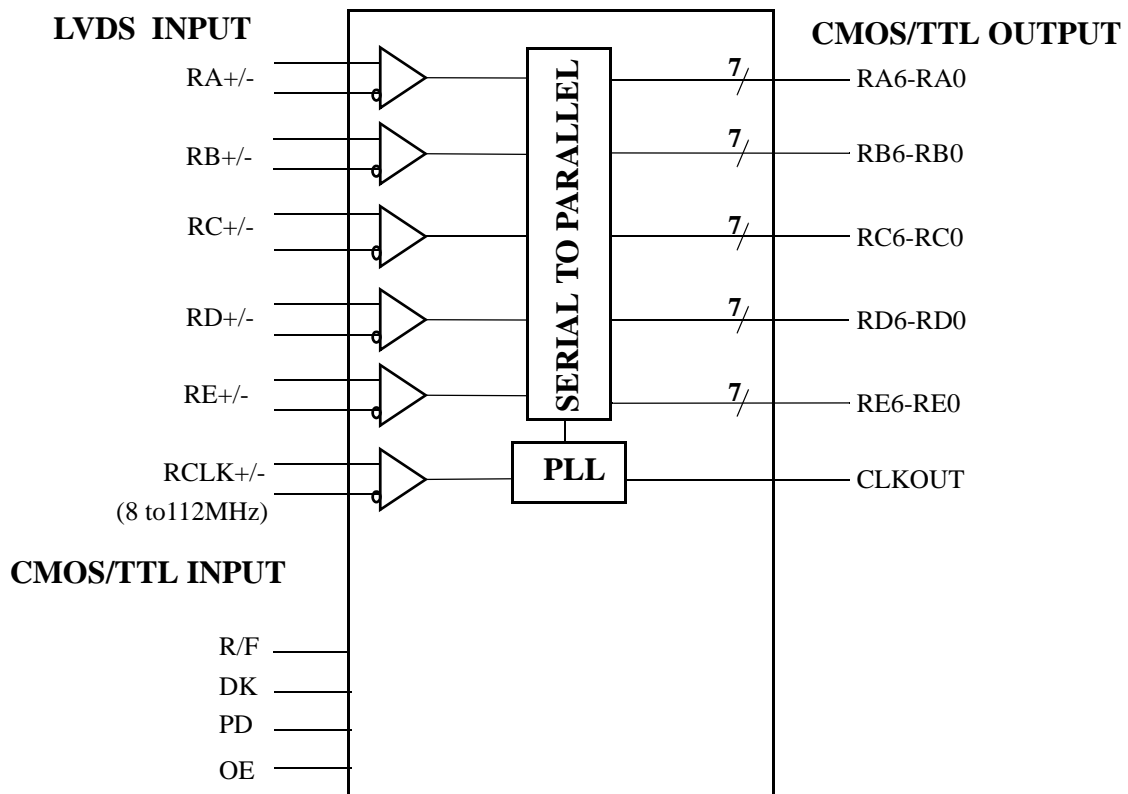
### General Description

The THC63LVD104S receiver is designed to support pixel data transmission between Host and Flat Panel Display from NTSC up to SXGA resolutions. The THC63LVD104S converts the LVDS data streams back into 35bits of CMOS/TTL data with rising edge or falling edge clock for convenient with a variety of LCD panel controllers. At a transmit clock frequency of 112MHz, 30bits of RGB data and 5bits of timing and control data (HSYNC, VSYNC, DE, CNTL1, CNTL2) are transmitted at an effective rate of 784Mbps per LVDS channel. Using a 112MHz clock, the data throughput is 490Mbytes per second.

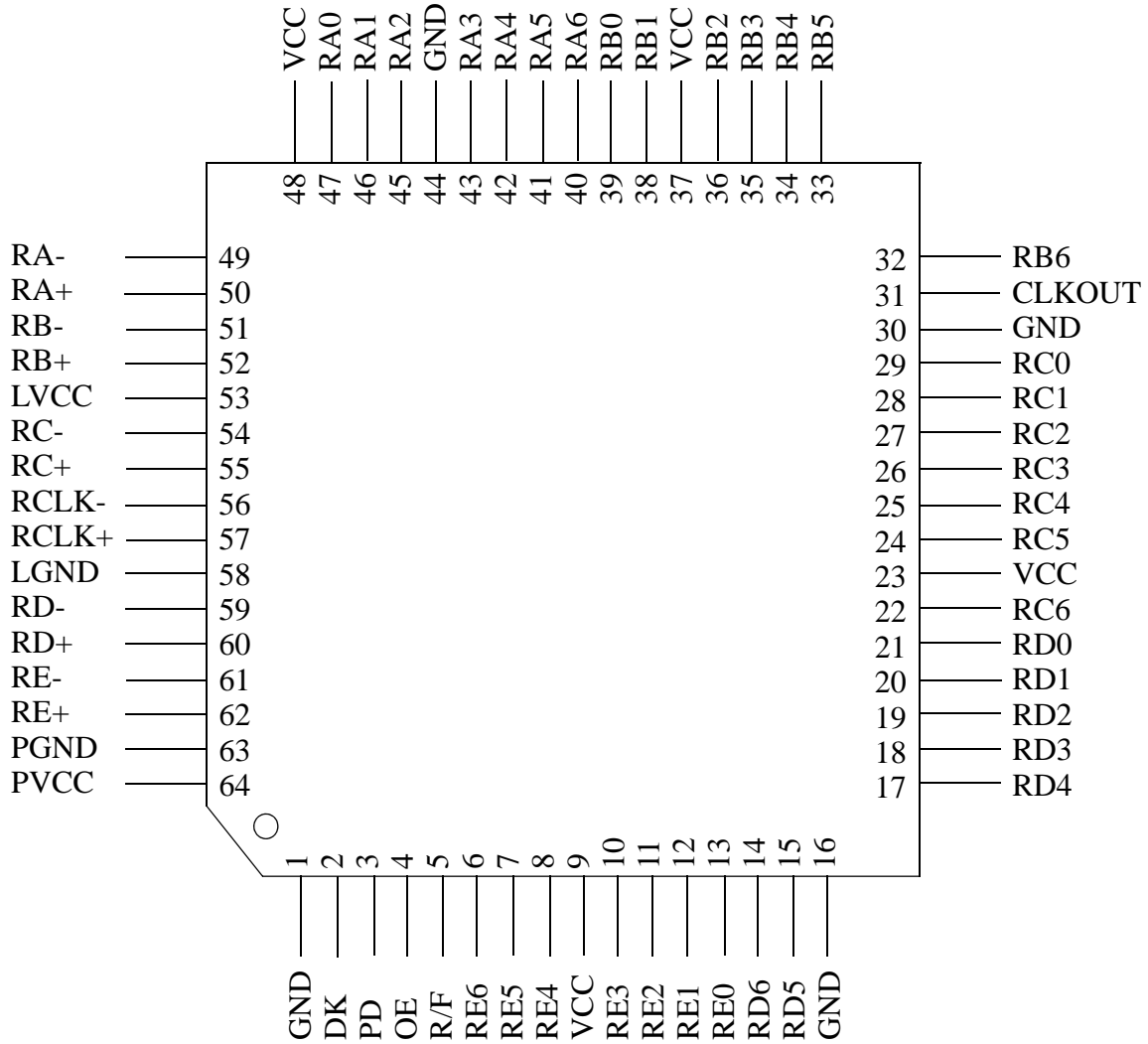
### Features

- Wide dot clock range: 8-112MHz suited for NTSC, VGA, SVGA, XGA, and SXGA
- PLL requires no external components
- 50% output clock duty cycle
- TTL clock edge and position programmable(3 step)
- Power down mode
- Low power single 2.5V CMOS design
- TQFP 64pin
- Pin compatible with THC63LVD104A
- Fail-safe for Open CLK Input

### Block Diagram



Pin Out



## Pin Description

Pin Name	Pin No.	I/O Type	Description
RA+, RA-	50, 49	LVDS IN	LVDS Data In.
RB+, RB-	52, 51	LVDS IN	
RC+, RC-	55, 54	LVDS IN	
RD+, RD-	60, 59	LVDS IN	
RE+, RE-	62, 61	LVDS IN	
RCLK+, RCLK-	57, 56	LVDS IN	LVDS Clock In.
RA6 ~ RA0	40,41,42,43,45,46,47	OUT	CMOS/TTL Data Outputs.
RB6 ~ RB0	32,33,34,35,36,38,39	OUT	
RC6 ~ RC0	22,24,25,26,27,28,29	OUT	
RD6 ~ RD0	14,15,17,18,19,20,21	OUT	
RE6 ~ RE0	6,7,8,10,11,12,13	OUT	
PD	3	IN	Power down and Output Control.(Table1) H: Normal operation L: Power down
OE	4	IN	Output Enable. See Table1. H:Output enable. L:Output disable
DK	2	IN ( 3-Level )	Output Clock Delay Timing Select.(Fig5) $t_{RCP}$ =Output Clock Cycle L: Offset 0[nsec] M: Offset $-3\frac{t_{RCP}}{14}$ (typ) [nsec] H: Offset $+3\frac{t_{RCP}}{14}$ (typ)[nsec]
R/F	5	IN	Output Clock Triggering Edge Select.(Fig5) H: Rising Edge L: Falling Edge
VCC	9,23,37,48	Power	Power Supply Pins for TTL outputs and digital circuitry.
CLKOUT	31	OUT	Clock out.
GND	1,16,30,44	Ground	Ground Pins for TTL outputs and digital circuitry.
LVCC	53	Power	Power Supply Pin for LVDS inputs.
LGND	58	Ground	Ground Pin for LVDS inputs.
PVCC	64	Power	Power Supply Pin for PLL circuitry.
PGND	63	Ground	Ground Pin for PLL circuitry.

Pin Description (Continued)

Table 1. Output Control

PD	OE	Data Outputs (Rxn)	CLKOUT
L	L	Hi-Z	Hi-Z
L	H	All Low	Fixed Low
H	L	Hi-Z	Hi-Z
H	H	Data Out	CLK Out

\*\* Rxn x = A,B,C,D,E n = 0,1,2,3,4,5,6

Absolute Maximum Ratings

Supply Voltage (V <sub>CC</sub> )	-0.3V ~ +3.0V
CMOS/TTL Input Voltage	-0.3V ~ (V <sub>CC</sub> + 0.3V)
CMOS/TTL Output Voltage	-0.3V ~ (V <sub>CC</sub> + 0.3V)
LVDS Receiver Input Voltage	-0.3V ~ (V <sub>CC</sub> + 0.3V)
Output Current	-30mA ~ 30mA
Junction Temperature	+125°C
Storage Temperature Range	-55°C ~ +150°C
Resistance to soldering heat	+260°C /10sec
Maximum Power Dissipation @+25°C	1.4W

Recommended Operating Conditions

Parameter	Min	Typ	Max	Units
All Supply Voltage	2.3	2.5	2.7	V
Operating Ambient Temperature	0		70	°C
Differential CLKIN Frequency	8		112	MHz
Differential CLKIN High Time(t <sub>RCIH</sub> ) (Fig1)	$2 \frac{t_{RCIP}}{7}$		$5 \frac{t_{RCIP}}{7}$	nsec
Differential CLKIN Low Time(t <sub>RCIL</sub> ) (Fig1)	$2 \frac{t_{RCIP}}{7}$		$5 \frac{t_{RCIP}}{7}$	nsec

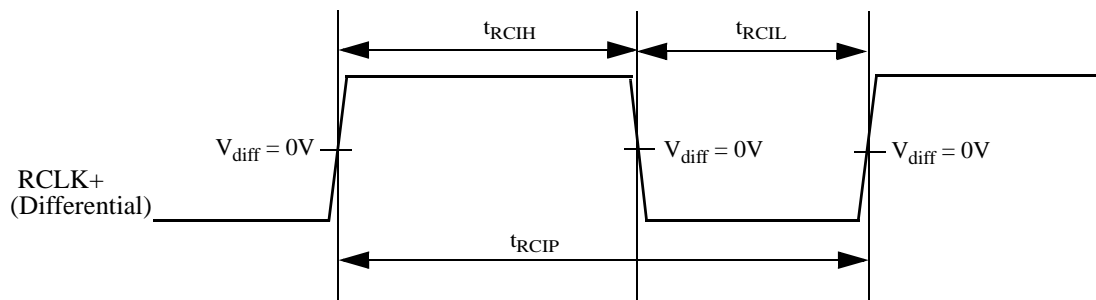


Fig1. Differential CLKIN

## Electrical Characteristics

### CMOS/TTL DC Specifications

 $V_{CC}=V_{CC}=PV_{CC}=LV_{CC}$ 

Symbol	Parameter	Conditions	Min	Typ	Max	Units
$V_{IH}$	High Level Input Voltage	PD, OE,R/F Pin	1.7		$V_{CC}$	V
$V_{IL}$	Low Level Input Voltage		GND		0.7	V
$V_{IH3}$	High Level Input Voltage	3-Level Inputs(DK Pin)	2.1		$V_{CC}$	V
$V_{IM3}$	Middle Level Input Voltage		1.05	1.25	1.45	V
$V_{IL3}$	Low Level Input Voltage		GND		0.4	V
$V_{OH}$	High Level Output Voltage	$I_{OH}= -2mA$	2.1			V
$V_{OL}$	Low Level Output Voltage	$I_{OL}= 2mA$			0.4	V
$I_{IL}$	Input Leakage Current	PD, OE,R/F Pin $0V \leq V_{IN} \leq V_{CC}$			$\pm 10$	$\mu A$
$I_{IL3}$	3-Level Input Leakage Current	3-Level Inputs(DK Pin) $0V \leq V_{IN} \leq V_{CC}$			$\pm 10$	$\mu A$

### LVDS Receiver DC Specifications

 $V_{CC}=V_{CC}=PV_{CC}=LV_{CC}$ 

Symbol	Parameter	Conditions	Min	Typ	Max	Units
$V_{TH}$	Differential Input High Threshold	$V_{IC}= 1.2V$			100	mV
$V_{TL}$	Differential Input Low Threshold	$V_{IC}= 1.2V$	-100			mV
$I_{ILD}$	Differential Input Leakage Current	$V_{IN}= 2.4V / 0V$			$\pm 200$	$\mu A$

### Supply Current

 $V_{CC}=V_{CC}=PV_{CC}=LV_{CC}$ 

Symbol	Parameter	Conditions	Min	Typ	Max	Units
$I_{RCCW}$	Receiver Supply Current Checker Pattern(Worst Case) (Fig 2)	$f_{CLKOUT}=65MHz$	CL=8pF		125	mA
		$f_{CLKOUT}=85MHz$			152	mA
		$f_{CLKOUT}=112MHz$			184	mA
$I_{RCCS}$	Receiver Power Down Supply Current	PD = L, Ta=RT			10	$\mu A$

# Electrical Characteristics (Continued)

## Checker Pattern

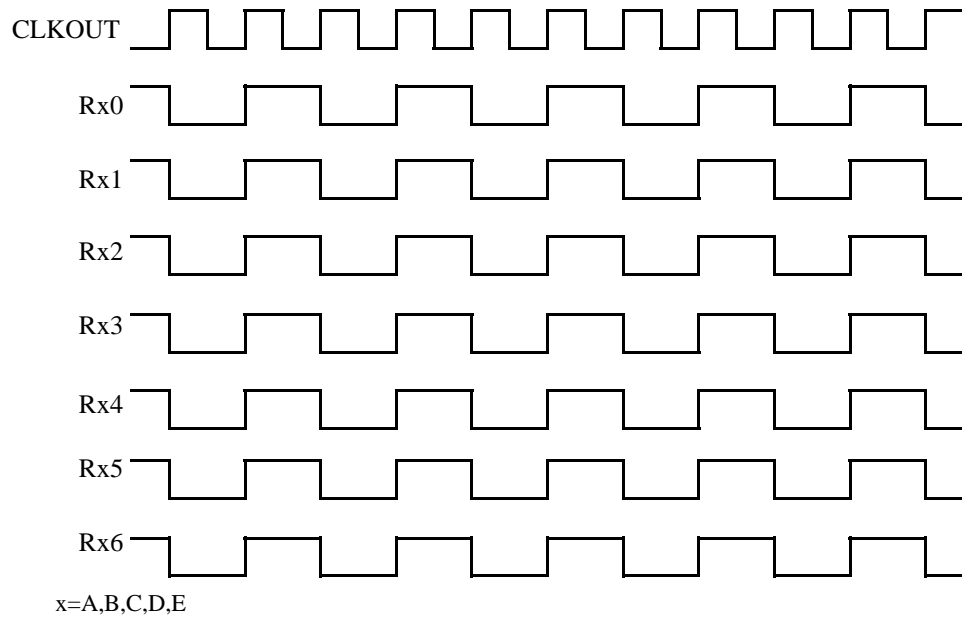


Fig2. Test Pattern

## Switching Characteristics

 $V_{CC}=VCC=PVCC=LVCC$ 

Symbol	Parameter		Min.	Typ.	Max.	Units
$t_{RCP}$	CLKOUT Period (Fig4)		8.93	T	125.0	ns
$t_{RCH}$	CLKOUT High Time (Fig4)			$\frac{T}{2}$		ns
$t_{RCL}$	CLKOUT Low Time (Fig4)			$\frac{T}{2}$		ns
$t_{RS}$	TTL Data Setup to CLKOUT		$0.50t_{RCP}-1.5$			ns
$t_{RH}$	TTL Data Hold to CLKOUT		$0.35t_{RCP}-1.0$			ns
$t_{TLH}$	TTL Low to High Transition Time (Fig 3)			1.3	3.0	ns
$t_{THL}$	TTL High to Low Transition Time (Fig 3)			1.3	3.0	ns
$t_{RCD}$	RCLK +/- to CLK OUT Delay (Fig8)	$1/t_{RCIP}=75\text{MHz}$	45.5		48.5	ns
$t_{RCIP}$	CLKIN Period (Fig6)		8.93		125.0	ns
$t_{SK}$	Receiver Skew Margin (Fig6)	$1/t_{RCIP}=85\text{MHz}$	-0.4	0	0.4	ns
		$1/t_{RCIP}=112\text{MHz}$	-0.35	0	0.35	ns
$t_{RIP1}$	Input Data Position0 (Fig6)		$-t_{SK}$	0	$+t_{SK}$	ns
$t_{RIP0}$	Input Data Position1 (Fig6)		$\frac{t_{RCIP}}{7} - t_{SK}$	$\frac{t_{RCIP}}{7}$	$\frac{t_{RCIP}}{7} + t_{SK}$	ns
$t_{RIP6}$	Input Data Position2 (Fig6)		$2\frac{t_{RCIP}}{7} - t_{SK}$	$2\frac{t_{RCIP}}{7}$	$2\frac{t_{RCIP}}{7} + t_{SK}$	ns
$t_{RIP5}$	Input Data Position3 (Fig6)		$3\frac{t_{RCIP}}{7} - t_{SK}$	$3\frac{t_{RCIP}}{7}$	$3\frac{t_{RCIP}}{7} + t_{SK}$	ns
$t_{RIP4}$	Input Data Position4 (Fig6)		$4\frac{t_{RCIP}}{7} - t_{SK}$	$4\frac{t_{RCIP}}{7}$	$4\frac{t_{RCIP}}{7} + t_{SK}$	ns
$t_{RIP3}$	Input Data Position5 (Fig6)		$5\frac{t_{RCIP}}{7} - t_{SK}$	$5\frac{t_{RCIP}}{7}$	$5\frac{t_{RCIP}}{7} + t_{SK}$	ns
$t_{RIP2}$	Input Data Position6 (Fig6)		$6\frac{t_{RCIP}}{7} - t_{SK}$	$6\frac{t_{RCIP}}{7}$	$6\frac{t_{RCIP}}{7} + t_{SK}$	ns
$t_{RPLL}$	Phase Lock Loop Set (Fig7)				10.0	ms

### AC Timing Diagrams

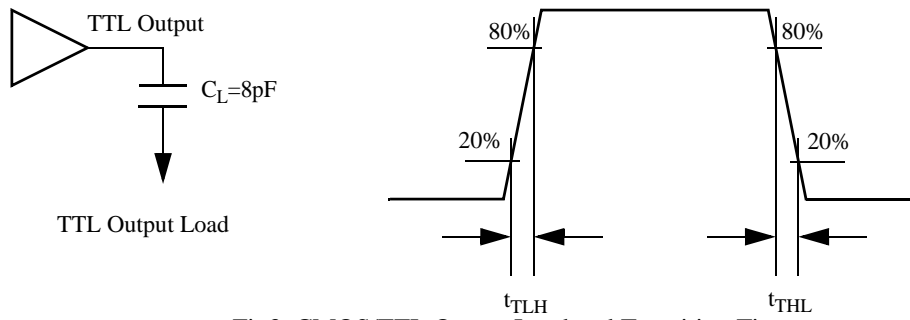


Fig3. CMOS/TTL Output Load and Transition Time

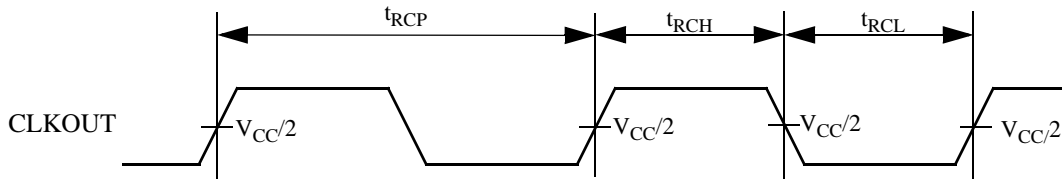


Fig4. CLKOUT Period and High/Low Time

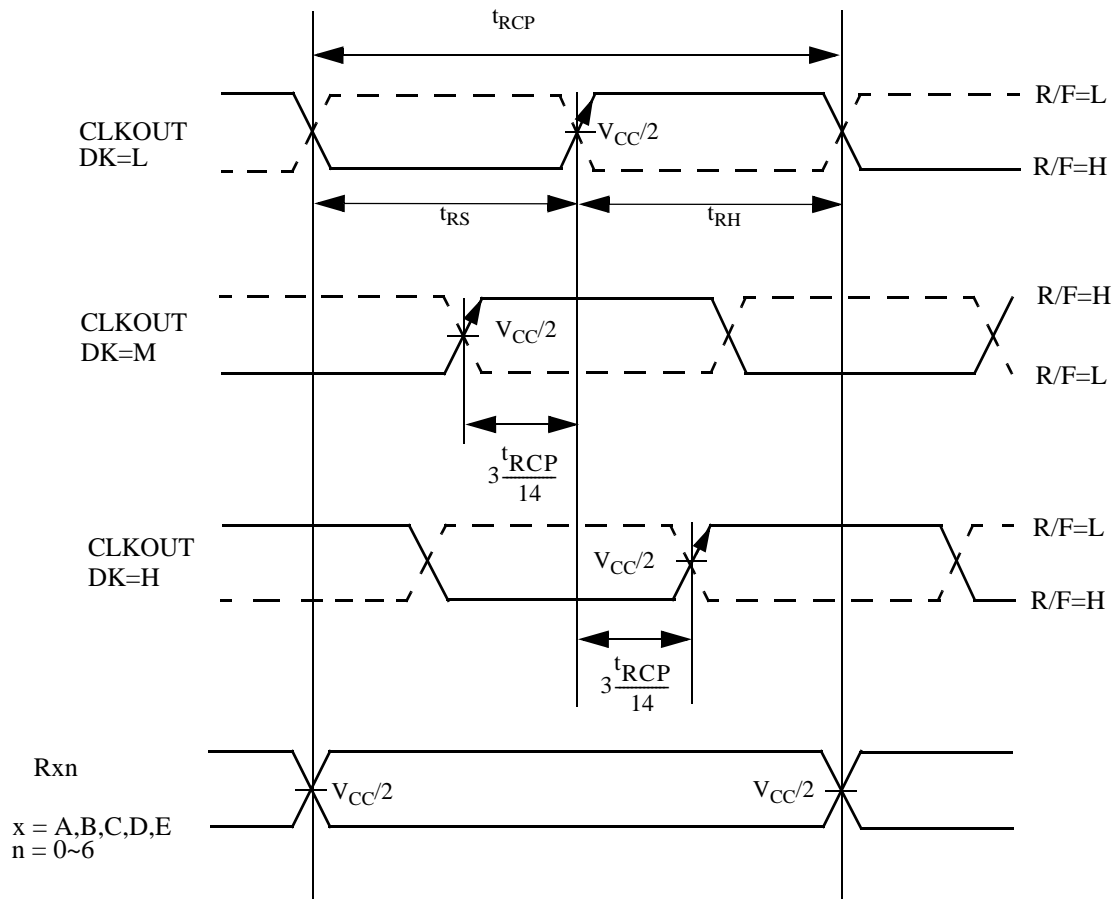


Fig5. CLKOUT Position and Setup/Hold Timing

AC Timing Diagrams (Continued)

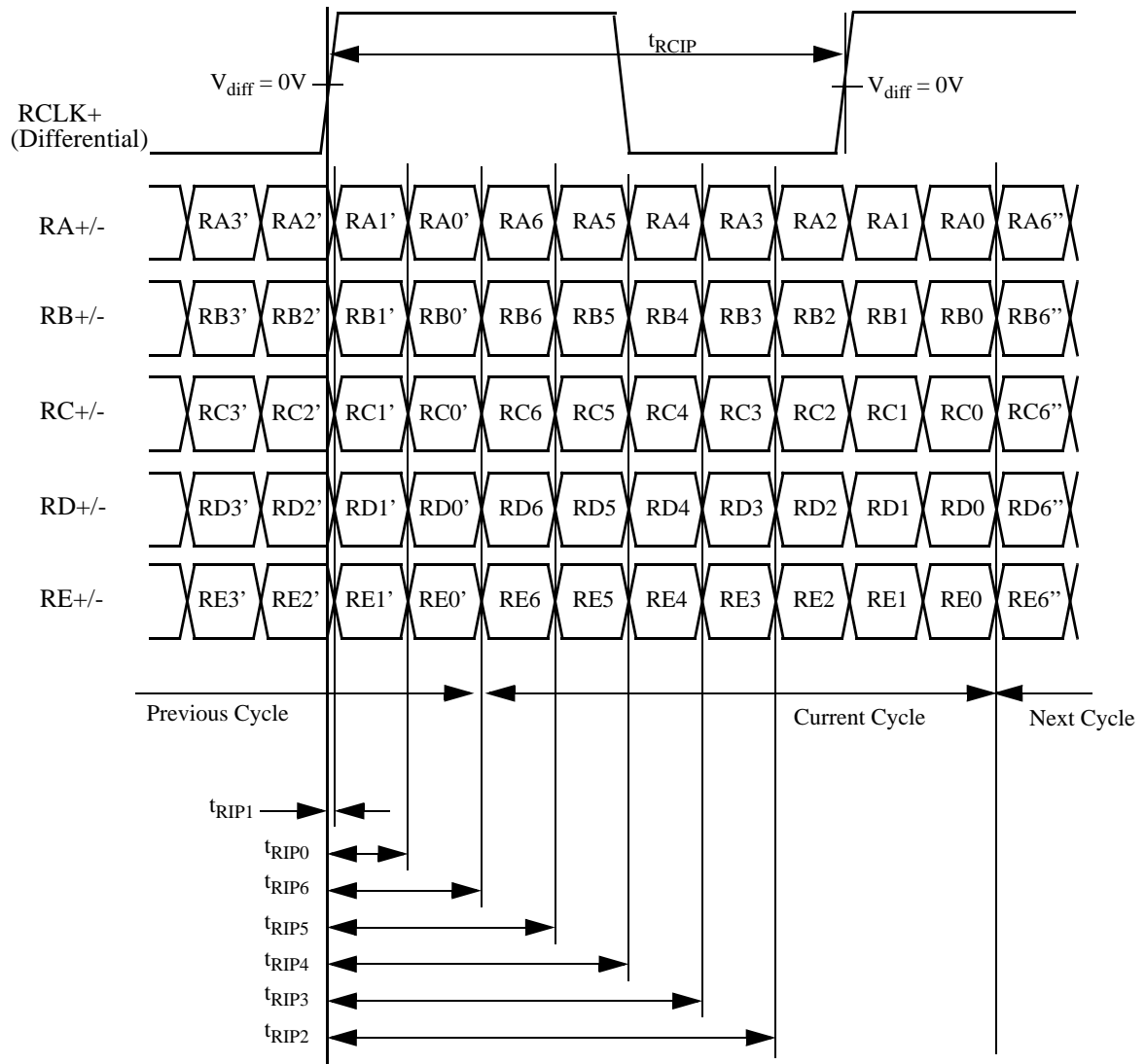


Fig6. LVDS Input Data Position

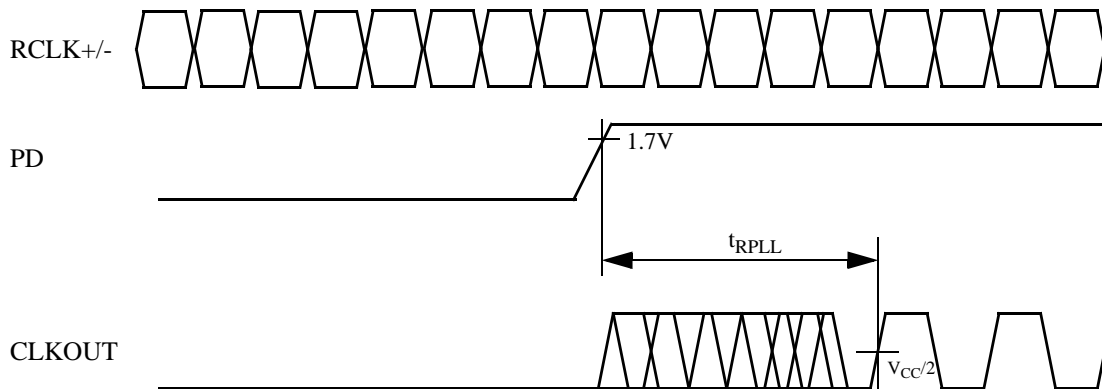


Fig7. PLL Lock Loop Set Time

AC Timing Diagrams (Continued)

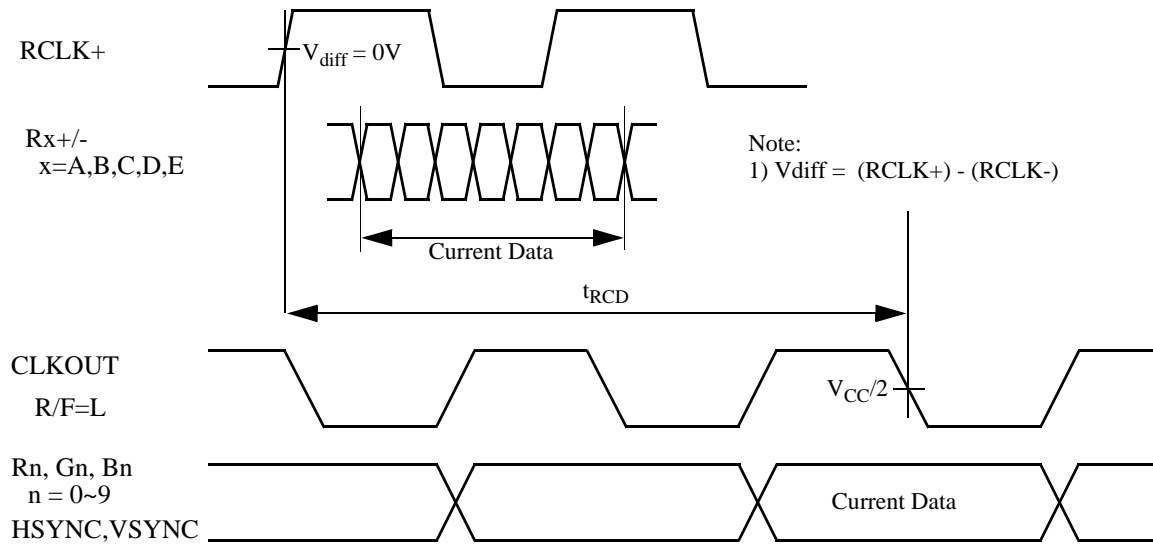


Fig8. RCLK +/- to CLK OUT Delay

Note

1)Power On Sequence

Power on LVDS-Tx after THC63LVD104S. If it is not avoidable, please contact to

mssupport@thine.co.jp (for FAE mailing list)

2)Cable Connection and Disconnection

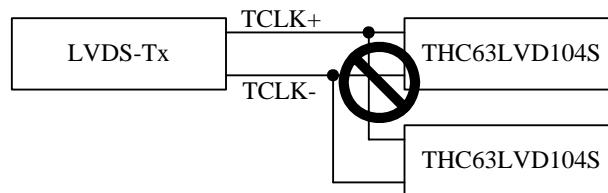
Don't connect and disconnect the LVDS cable , when the power is supplied to the system.

3)GND Connection

Connect the each GND of the PCB which LVDS-Tx and THC63LVD104S on it. It is better for EMI reduction to place GND cable as close to LVDS cable as possible.

4)Multi Drop Connection

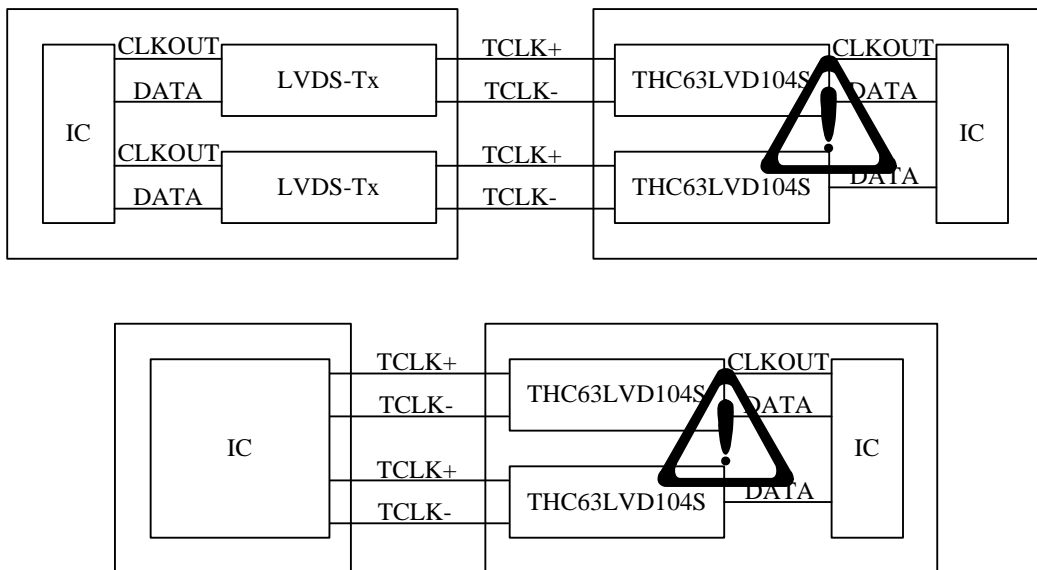
Multi drop connection is not recommended.



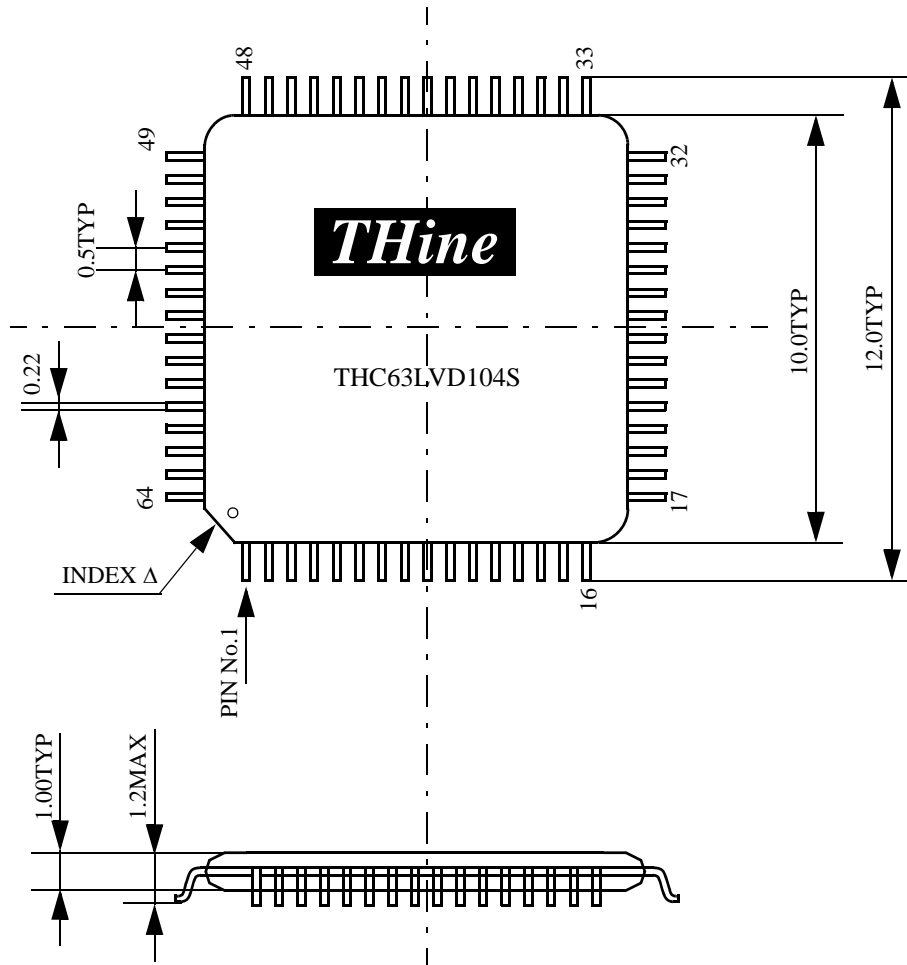
5)Asynchronous use

Asynchronous use such as following system is not recommended. If it is not avoidable, please contact to

mssupport@thine.co.jp (for FAE mailing list)



Package



UNITS: mm

## Notices and Requests

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6. Despite our utmost efforts to improve the quality and reliability of the product, faults will occur with a certain small probability, which is inevitable to a semi-conductor product. Therefore, you are encouraged to have sufficiently redundant or error preventive design applied to the use of the product so as not to have our product cause any social or public damage.
7. Please note that this product is not designed to be radiation-proof.
8. Customers are asked, if required, to judge by themselves if this product falls under the category of strategic goods under the Foreign Exchange and Foreign Trade Control Law.

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