

THC63LVD104C

112MHz 30Bits COLOR LVDS Receiver

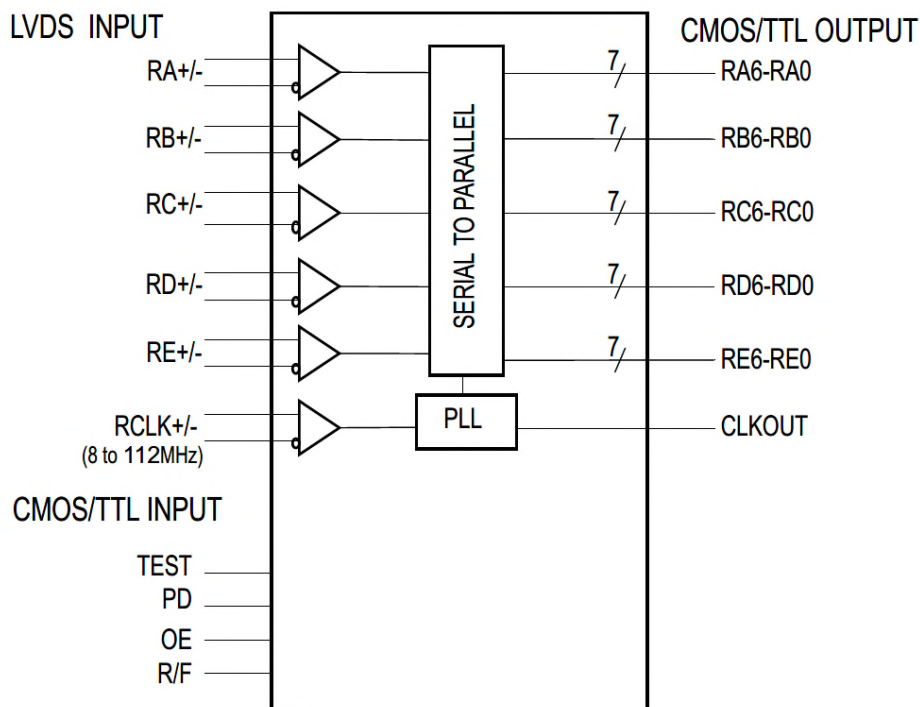
General Description

The THC63LVD104C receiver is designed to support pixel data transmission between Host and Flat Panel Display from NTSC up to SXGA resolutions. The THC63LVD104C converts the LVDS data streams back into 35bits of CMOS/TTL data with the choice of the rising edge or falling edge clock for the convenience 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

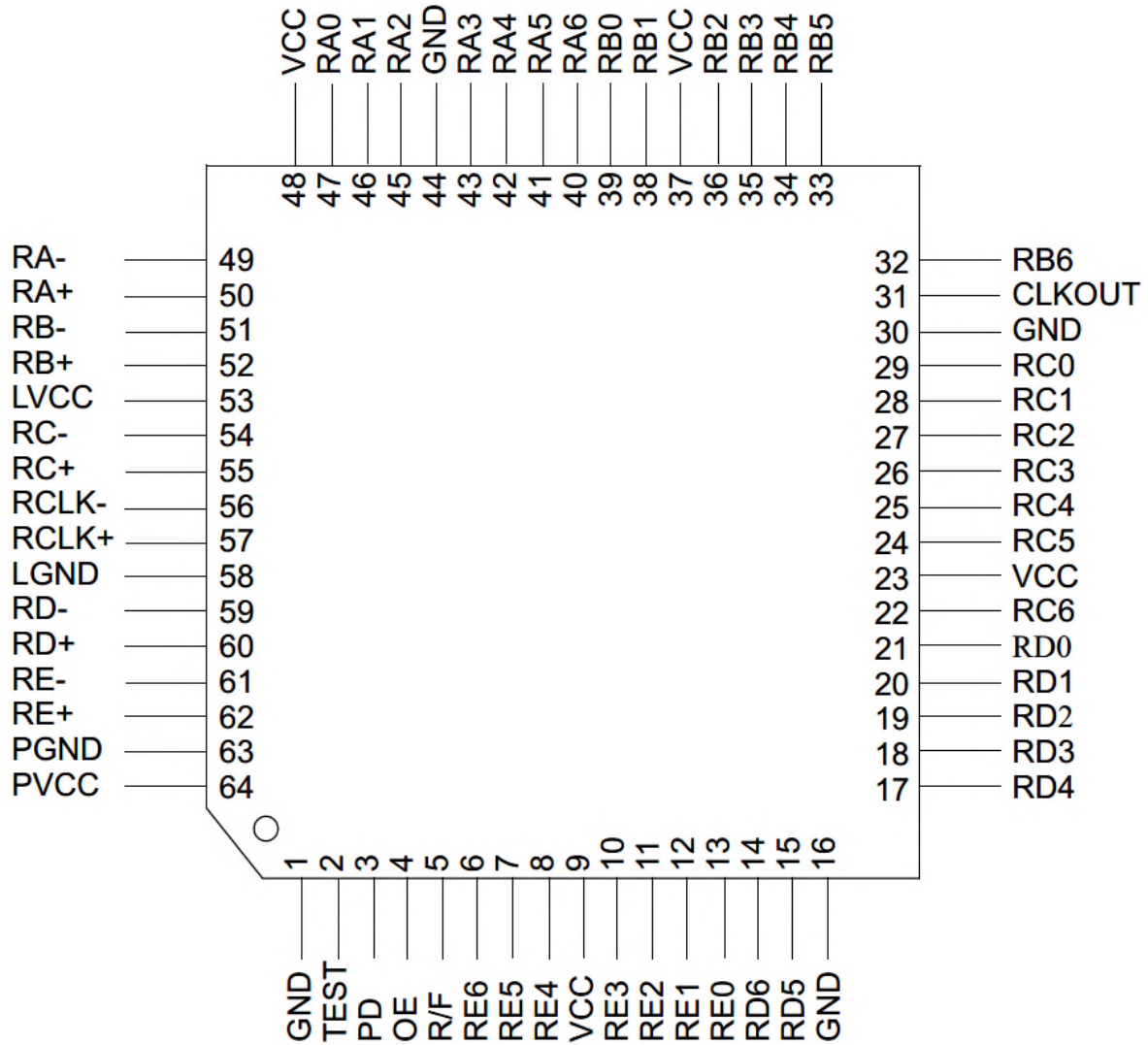
Features

- 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 programmable
- Power down mode
- Low power single 3.3V CMOS design
- 64pin TQFP
- Backward compatible with THC63LVDF64x (18bits) / F84x(24bits)
- Pin compatible with THC63LVD104A
- Fail-safe for Open LVDS Input

Block Diagram



Pin Diagram



Pin Name	Pin #	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	
TEST	2	IN	Test pin, must be "L" for normal operation.
PD	3	IN	H: Normal operation, L: Power down (all outputs are "L")
OE	4	IN	H: Output enable (Normal operation). L: Output disable(all outputs are Hi-Z)
R/F	5	IN	Output Clock Triggering Edge Select. 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.

PD	R/F	OE	Data Outputs (Rxn)	CLKOUT
0	0	0	Hi-Z	Hi-Z
0	0	1	All 0	Fixed Low
0	1	0	Hi-Z	Hi-Z
0	1	1	All 0	Fixed Low
1	0	0	Hi-Z	Hi-Z
1	0	1	Data Out	The falling edge closer to the center of the data eye.
1	1	0	Hi-Z	Hi-Z
1	1	1	Data Out	The rising edge closer to the center of the data eye.

** Rxn

x = A,B,C,D,E

n = 0,1,2,3,4,5,6

Absolute Maximum Ratings *1

Supply Voltage (V _{CC} =V _{CC} =LV _{CC} =PV _{CC})	-0.3V ~ +4.0V
CMOS/TTL Input Voltage	-0.3V ~ (V _{CC} + 0.3V)
CMOS/TTL Output Voltage	-0.3V ~ (V _{CC} + 0.3V)
LVDS Receiver Input Voltage	-0.3V ~ (V _{CC} + 0.3V)
Output Current	-30mA ~ 30mA
Junction Temperature	+125 °C
Storage Temperature Range	-55 °C ~ +150 °C
Reflow Peak Temperature / Time	+260 °C / 10sec.
Maximum Power Dissipation @+25 °C	2.1W

Electrical Characteristics

CMOS/TTL DC Specifications

V_{CC} =LV_{CC}=PV_{CC}= 3.0V ~ 3.6V, Ta = -20° C~ +85°C

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
V _{IH}	High Level Input Voltage	-	2.0	-	V _{CC}	V
V _{IL}	Low Level Input Voltage	-	GND	-	0.8	V
V _{OH}	High Level Output Voltage	I _{OH} = -4mA (data) I _{OH} = -8mA (clock)	2.4	-	-	V
V _{OL}	Low Level Output Voltage	I _{OL} = 4mA (data) I _{OL} = 8mA (clock)	-	-	0.4	V
I _{INC}	Input Current	0V δ V _{IN} δ V _{CC}	-		±10	μA

LVDS Receiver DC Specifications

V_{CC} =LV_{CC}=PV_{CC}= 3.0V ~ 3.6V, Ta = -20° C~ +85°C

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 _{INL}	Input Current	V _{IN} = 2.4V / 0V V _{CC} = 3.6V	-		30	μA

1. “Absolute Maximum Ratings” are those values beyond which the safety of the device can not be guaranteed. They are not meant to imply that the device should be operated at these limits. The tables of “Electrical Characteristics” specify conditions for device operation.

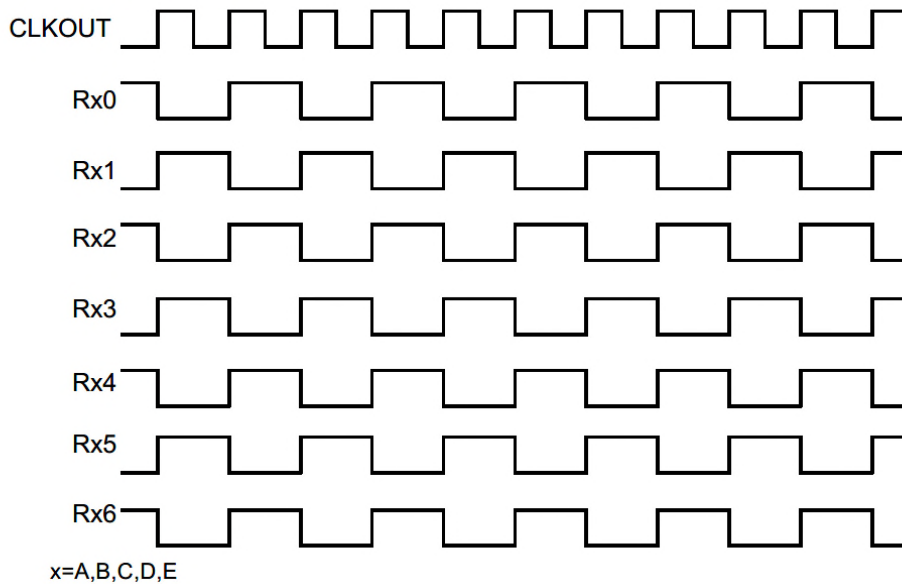
Supply Current

VCC =LVCC=PVCC= 3.0V ~ 3.6V, Ta = -20° C~ +85°C

Symbol	Parameter	Conditions	Typ.	Max.	Units
IRCCW	Receiver Supply Current (LVDS Full Toggle)	fCLKOUT = 75MHz	-	205	mA
		fCLKOUT = 90MHz		236	
		fCLKOUT = 112MHz	-	280	mA
IRCCS	Receiver Power Down Supply Current	PD = L	-	25	μA

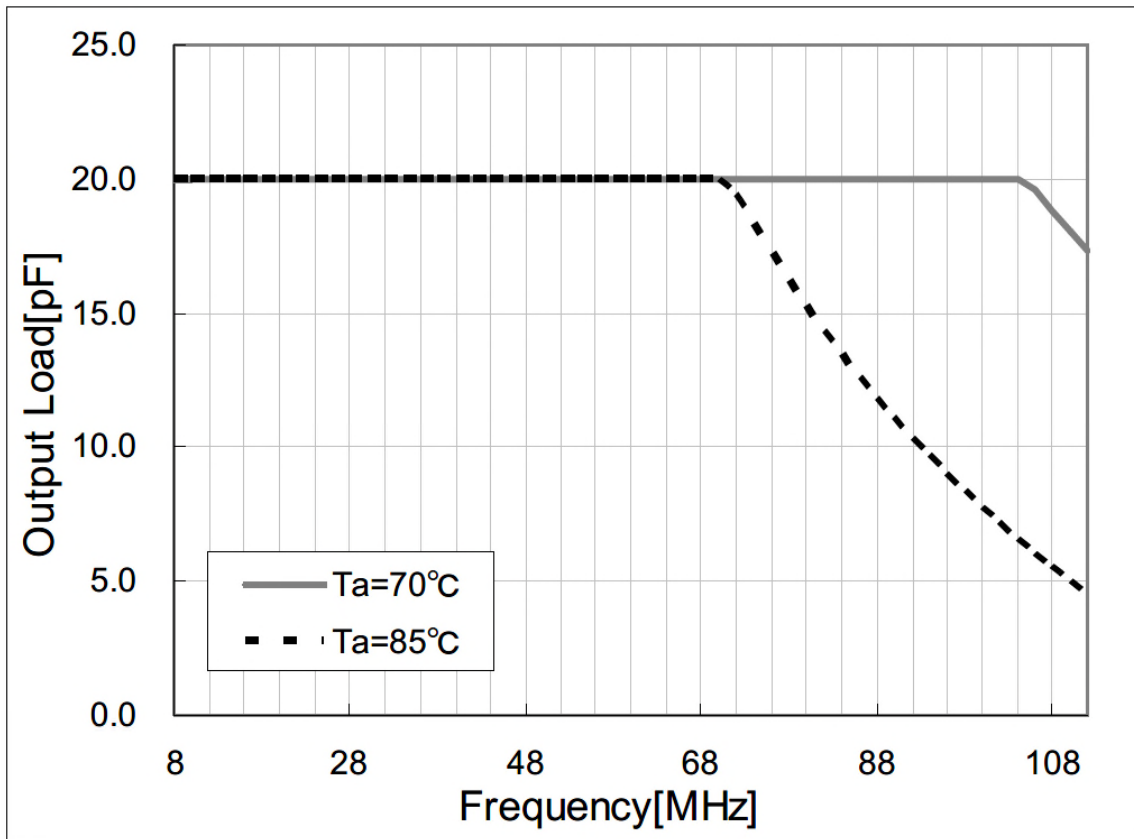
*The trade-off between the output load and the ambient temperature exists so that the junction temperature does not exceed 125°C.

LVDS Full Toggle Pattern



Output load limitation

The output load is limited so that the junction temperature does not exceed 125°C.



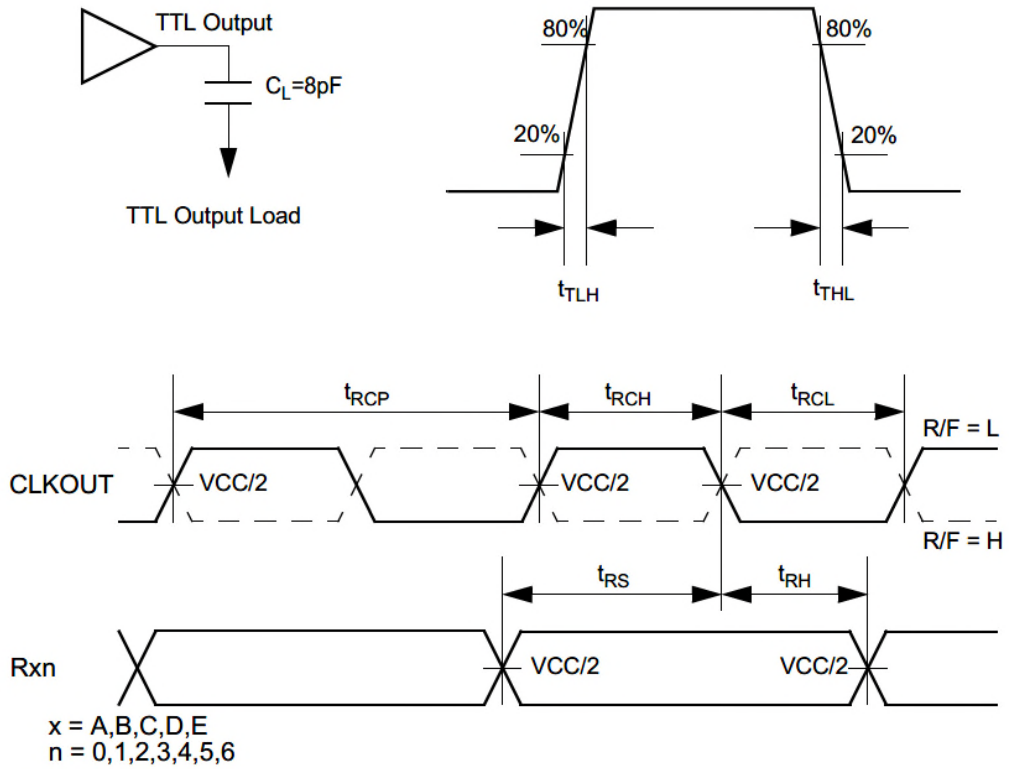
Switching Characteristics

VCC =LVCC=PVCC= 3.0V ~ 3.6V, Ta = -20° C ~+85°C

Symbol	Parameter		Min.	Typ.	Max.	Units
tRCP	CLKOUT Period		8.92	T	125.0	ns
tRCH	CLKOUT High Time		-	T/2	-	ns
tRCL	CLKOUT Low Time		-	T/2	-	ns
tRS	TTL Data Setup to CLKOUT		$4/7t_{RCP}-1$	-	-	ns
tRH	TTL Data Hold from CLKOUT		$3/7t_{RCP}-1$	-	-	ns
tTLH	TTL Low to High Transition Time		-	1.0	3.0	ns
tTHL	TTL High to Low Transition Time		-	1.0	3.0	ns
tSK	Receiver Skew Margin	CLKOUT=50MHz	-1000	0	1000	ps
		CLKOUT=75MHz	-550	0	550	ps
		CLKOUT=90MHz	-400	0	400	ps
		CLKOUT=112MHz	-250	0	250	ps
tRIP1	Input Data Position0		-t _{SK}	0	+t _{SK}	ns
tRIP0	Input Data Position1		T/7-t _{SK}	T/7	T/7+t _{SK}	ns
tRIP6	Input Data Position2		2T/7-t _{SK}	2T/7	2T/7+t _{SK}	ns
tRIP5	Input Data Position3		3T/7-t _{SK}	3T/7	3T/7+t _{SK}	ns
tRIP4	Input Data Position4		4T/7-t _{SK}	4T/7	4T/7+t _{SK}	ns
tRIP3	Input Data Position5		5T/7-t _{SK}	5T/7	5T/7+t _{SK}	ns
tRIP2	Input Data Position6		6T/7-t _{SK}	6T/7	6T/7+t _{SK}	ns
tRPLL	Phase Lock Loop Set		-	-	10.0	ms
tRCD	RCLK +/- to CLKOUT Delay	CLKOUT=75MHz	46.5	-	52.5	ns
tRCIP	CLKIN Period		8.92	-	125.0	ns

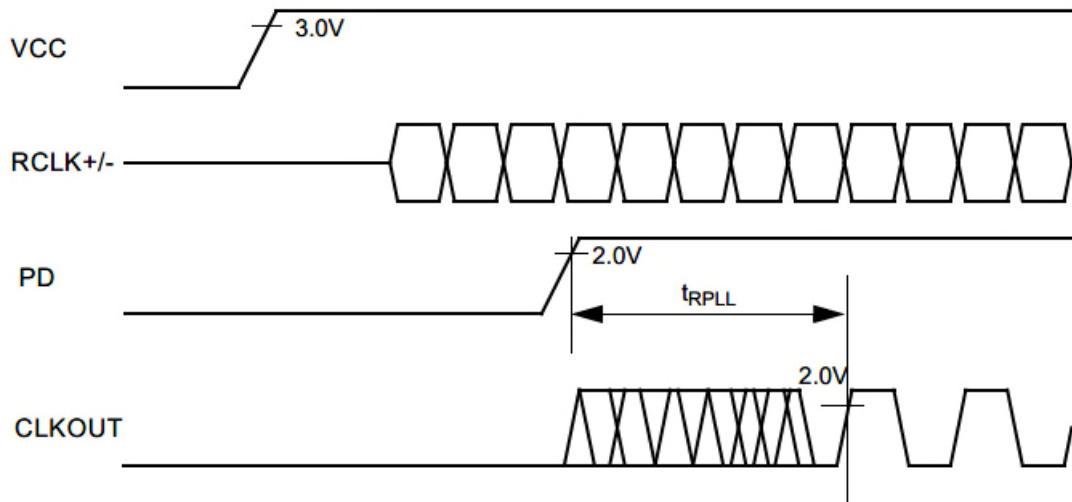
Switching Characteristics

TTL Outputs

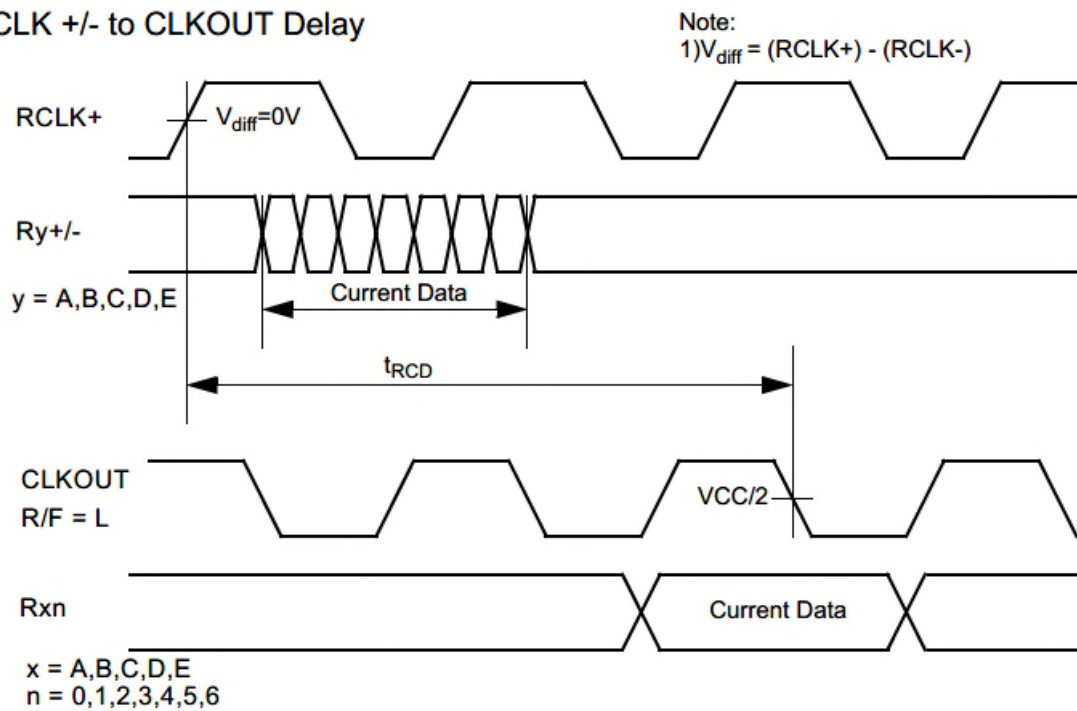


AC Timing Diagram

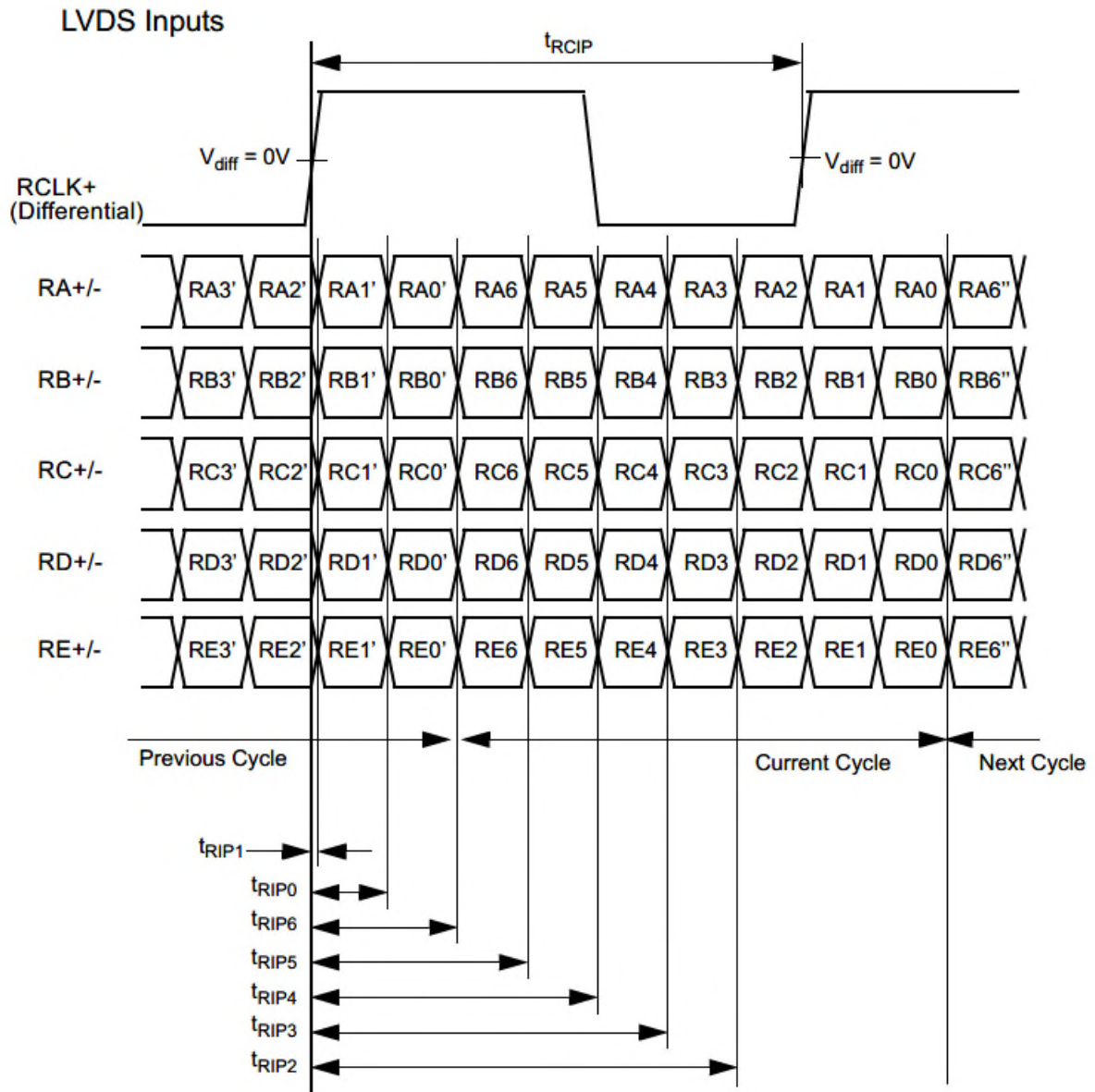
Phase Lock Loop Set Time



RCLK +/- to CLKOUT Delay



AC Timing Diagram



Note

1)Power On Sequence

Power on LVDS-Tx after THC63LVD104C.

2)Cable Connection and Disconnection

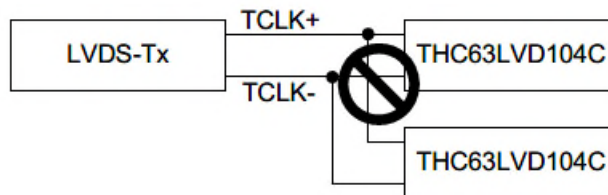
Don't connect and disconnect the LVDS cable, when the power is supplied to the system.

3)GND Connection

Connect the each GND of the PCB which LVDS-Tx and THC63LVD104C on it. It is better for EMI reduction to place GND cable as close to LVDS cable as possible.

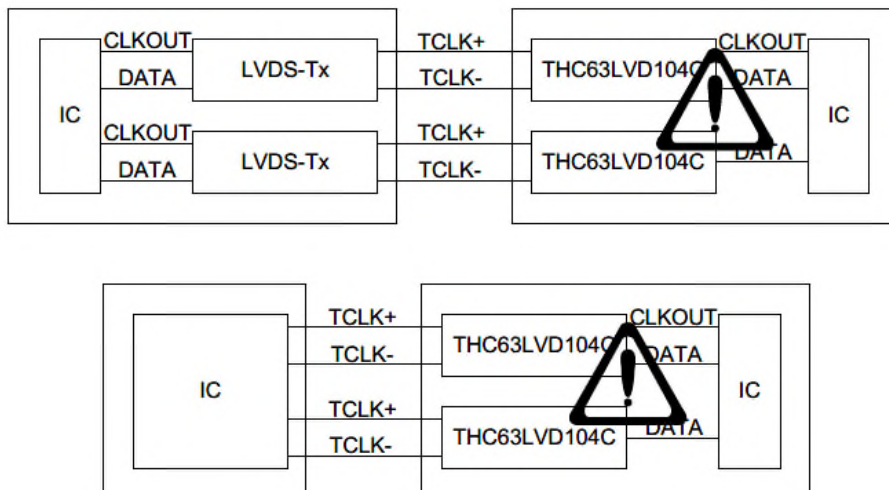
4)Multi Drop Connection

Multi drop connection is not recommended.

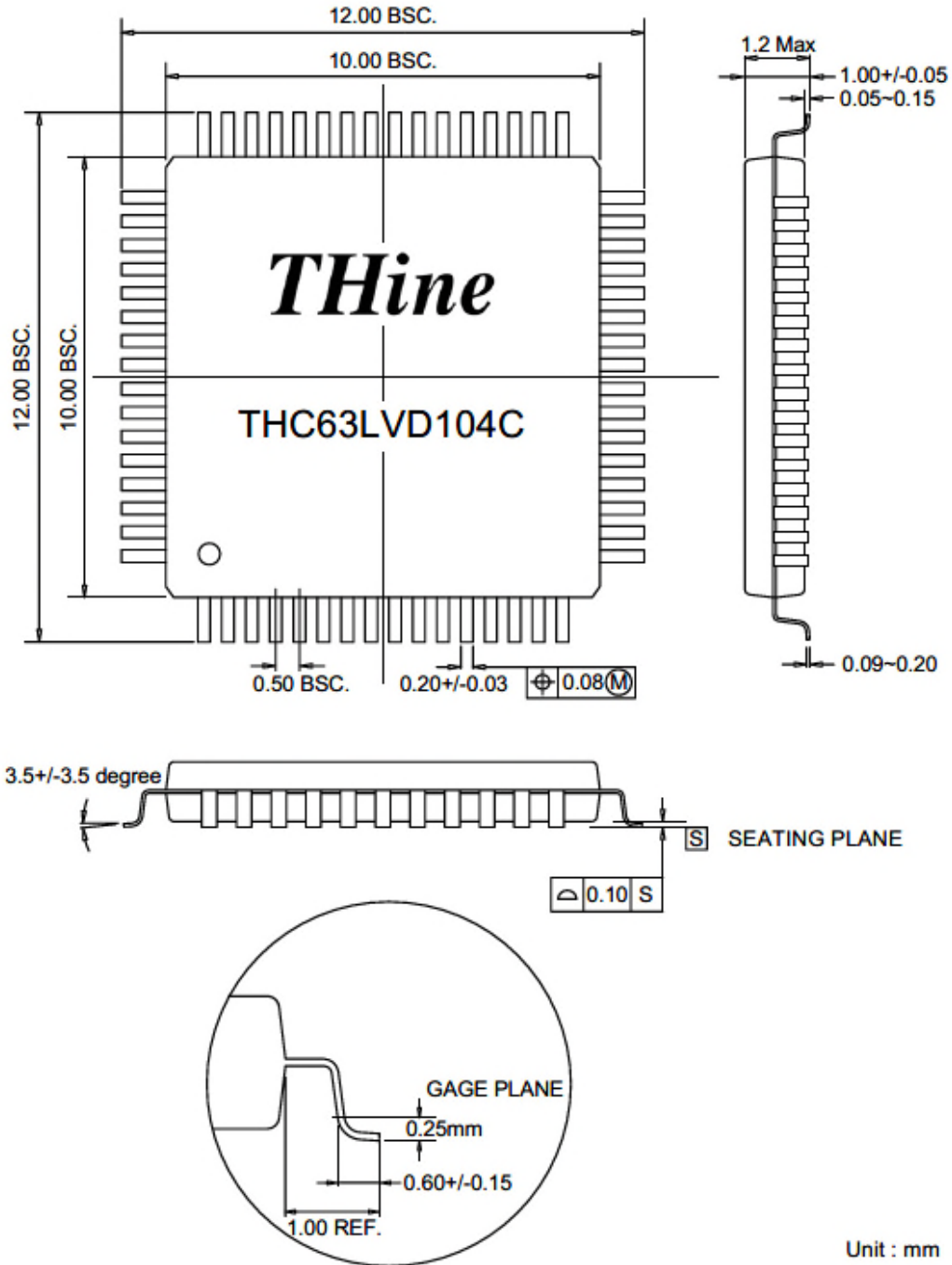


5)Asynchronous use

Asynchronous use such as following systems are not recommended.



Package



Unit : mm

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