

THC63LVDM83D

REDUCED SWING LVDS 24Bit COLOR HOST-LCD PANEL INTERFACE

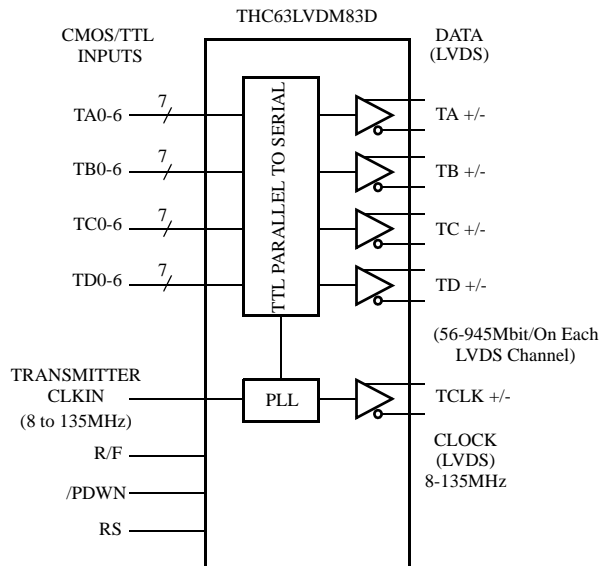
General Description

The THC63LVDM83D transmitter is designed to support pixel data transmission between Host and Flat Panel Display from NTSC up to SXGA+ resolutions. The THC63LVDM83D converts 28bits of CMOS/TTL data into LVDS(Low Voltage Differential Signaling) data stream. The transmitter can be programmed for rising edge or falling edge clocks through a dedicated pin. At a transmit clock frequency of 135MHz, 24bits of RGB data and 4bits of timing and control data (HSYNC, VSYNC, CNTL1, CNTL2) are transmitted at an effective rate of 945Mbps per LVDS channel.

Features

- Wide dot clock range: 8-135MHz suited for NTSC, VGA, SVGA, XGA, SXGA and SXGA+
- PLL requires no external components
- Supports spread spectrum clock generator
- On chip jitter filtering
- Clock edge selectable
- Supports reduced swing LVDS for low EMI
- Power down mode
- Low power single 3.3V CMOS design
- Low profile 56 Lead TSSOP Package
- Pin compatible with THC63LVDM83C/83R(24bits)

Block Diagram



Pin Out

THC63LVDM83D

RS	1	56	TA4
TD1	2	55	TA3
TA5	3	54	TA2
TA6	4	53	GND
GND	5	52	TA1
TB0	6	51	TA0
TB1	7	50	TD0
TD2	8	49	LVDS GND
VCC	9	48	TA-
TD3	10	47	TA+
TB2	11	46	TB-
TB3	12	45	TB+
GND	13	44	LVDS VCC
TB4	14	43	LVDS GND
TB5	15	42	TC-
TD4	16	41	TC+
R/F	17	40	TCLK-
TD5	18	39	TCLK+
TB6	19	38	TD-
TC0	20	37	TD+
GND	21	36	LVDS GND
TC1	22	35	PLL GND
TC2	23	34	PLL VCC
TC3	24	33	PLL GND
TD6	25	32	/PDWN
VCC	26	31	CLK IN
TC4	27	30	TC6
TC5	28	29	GND

Pin Description

Pin Name	Pin #	Type	Description												
TA+, TA-	47, 48	LVDS OUT	LVDS Data Out.												
TB+, TB-	45, 46	LVDS OUT													
TC+, TC-	41, 42	LVDS OUT													
TD+, TD-	37, 38	LVDS OUT													
TCLK+, TCLK-	39, 40	LVDS OUT	LVDS Clock Out.												
TA0 ~ TA6	51, 52, 54, 55, 56, 3, 4	IN	Pixel Data Inputs.												
TB0 ~ TB6	6, 7, 11, 12, 14, 15, 19	IN													
TC0 ~ TC6	20, 22, 23, 24, 27, 28, 30	IN													
TD0 ~ TD6	50, 2, 8, 10, 16, 18, 25	IN													
/PDWN	32	IN	H: Normal operation, L: Power down (all outputs are Hi-Z)												
RS	1	IN	LVDS swing mode, VREF select. <table border="1" data-bbox="959 846 1378 1025" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>RS</th> <th>LVDS Swing</th> <th>Small Swing Input Support</th> </tr> </thead> <tbody> <tr> <td>VCC</td> <td>350mV</td> <td>N/A</td> </tr> <tr> <td>0.6 ~ 1.4V</td> <td>350mV</td> <td>RS=VREF^a</td> </tr> <tr> <td>GND</td> <td>200mV</td> <td>N/A</td> </tr> </tbody> </table> <p>a. VREF is Input Reference Voltage.</p>	RS	LVDS Swing	Small Swing Input Support	VCC	350mV	N/A	0.6 ~ 1.4V	350mV	RS=VREF ^a	GND	200mV	N/A
RS	LVDS Swing	Small Swing Input Support													
VCC	350mV	N/A													
0.6 ~ 1.4V	350mV	RS=VREF ^a													
GND	200mV	N/A													
R/F	17	IN	Input Clock Triggering Edge Select. H: Rising edge, L: Falling edge												
VCC	9, 26	Power	Power Supply Pins for TTL inputs and digital circuitry.												
CLKIN	31	IN	Clock in.												
GND	5, 13, 21, 29, 53	Ground	Ground Pins for TTL inputs and digital circuitry.												
LVDS VCC	44	Power	Power Supply Pins for LVDS Outputs.												
LVDS GND	36, 43, 49	Ground	Ground Pins for LVDS Outputs.												
PLL VCC	34	Power	Power Supply Pin for PLL circuitry.												
PLL GND	33, 35	Ground	Ground Pins for PLL circuitry.												

Absolute Maximum Ratings¹

Supply Voltage (V_{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 Driver Output Voltage	-0.3V ~ ($V_{CC} + 0.3V$)
Output Current	continuous
Junction Temperature	+125°C
Storage Temperature Range	-55°C ~ +150°C
Resistance to soldering heat	+260°C/10sec
Maximum Power Dissipation @+25°C	0.9W

1. “Absolute Maximum Ratings” are those valued 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.

Electrical Characteristics

CMOS/TTL DC Specifications

 $V_{CC} = 3.0V \sim 3.6V, T_a = 0^{\circ}C \sim +70^{\circ}C$

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
V_{IH}	High Level Input Voltage	RS=VCC or GND	2.0		V_{CC}	V
V_{IL}	Low Level Input Voltage	RS=VCC or GND	GND		0.8	V
V_{DDQ}^1	Small Swing Voltage		1.2		2.8	V
V_{REF}	Input Reference Voltage	Small Swing (RS= $V_{DDQ}/2$)		$V_{DDQ}/2$		
V_{SH}^2	Small Swing High Level Input Voltage	$V_{REF} = V_{DDQ}/2$	$V_{DDQ}/2$ +100mV			V
V_{SL}^2	Small Swing Low Level Input Voltage	$V_{REF} = V_{DDQ}/2$			$V_{DDQ}/2$ -100mV	V
I_{INC}	Input Current	$0V \leq V_{IN} \leq V_{CC}$			± 10	μA

Notes: ¹ V_{DDQ} voltage defines max voltage of small swing input. It is not an actual input voltage.

² Small swing signal is applied to TA0-6, TB0-6, TC0-6, TD0-6 and CLKIN.

LVDS Transmitter DC Specifications

 $V_{CC} = 3.0V \sim 3.6V, T_a = 0^{\circ}C \sim +70^{\circ}C$

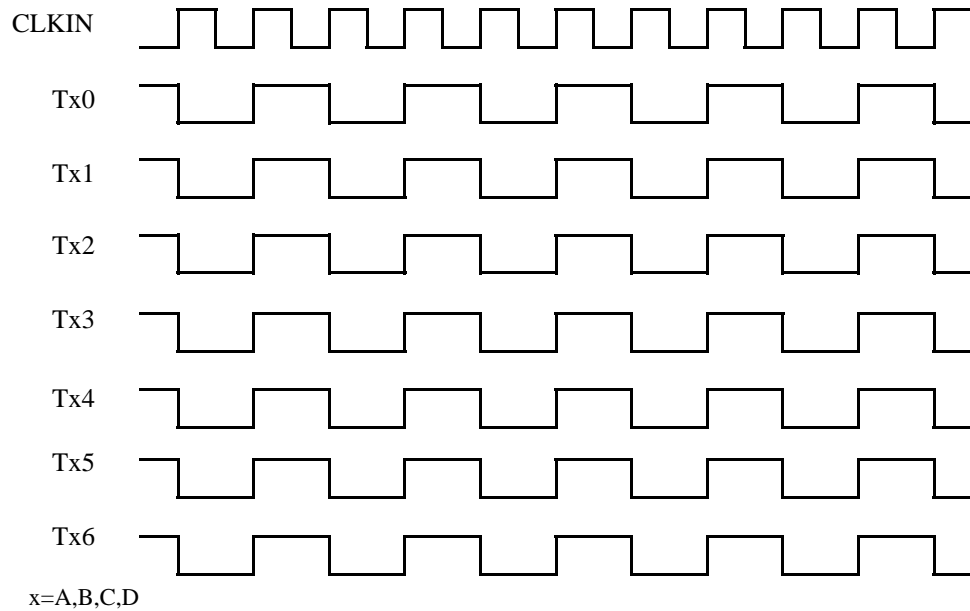
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
VOD	Differential Output Voltage	Normal swing RS= V_{CC}	250	350	450	mV
		Reduced swing RS=GND	100	200	300	mV
ΔVOD	Change in VOD between complementary output states	RL=100 Ω			35	mV
VOC	Common Mode Voltage		1.125	1.25	1.375	V
ΔVOC	Change in VOC between complementary output states				35	mV
I_{OS}	Output Short Circuit Current	VOUT=0V, RL=100 Ω			-24	mA
I_{OZ}	Output TRI-STATE Current	/PDWN=0V, VOUT=0V to V_{CC}			± 10	μA

Supply Current

$V_{CC} = 3.0V \sim 3.6V, T_a = 0^{\circ}C \sim +70^{\circ}C$

Symbol	Parameter	Condition(*)		Typ.	Max.	Units
I_{TCCW}	Transmitter Supply Current	RL=100Ω, CL=5pF V _{CC} =3.3V, RS=V _{CC} Worst Case Pattern	f=85MHz	61	67	mA
			f=135MHz	77	83	mA
		RL=100Ω, CL=5pF V _{CC} =3.3V, RS=GND Worst Case Pattern	f=85MHz	50	56	mA
			f=135MHz	65	71	mA
I_{TCCS}	Transmitter Power Down Supply Current	/PDWN = L, All Inputs = L or H			10	μA

Worst Case Pattern



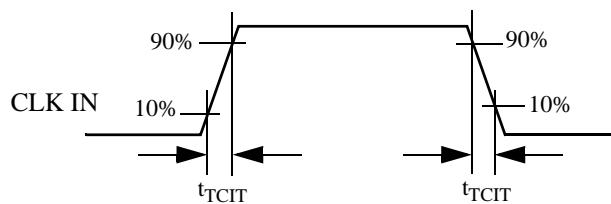
Switching Characteristics

V_{CC} = 3.0V ~ 3.6V, Ta = 0°C ~ +70°C

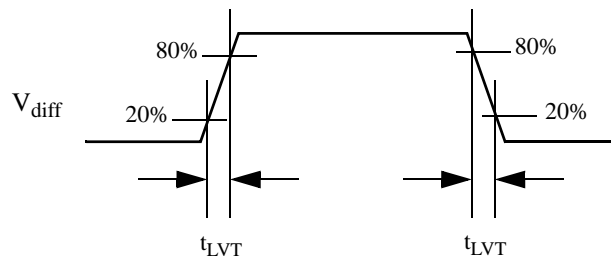
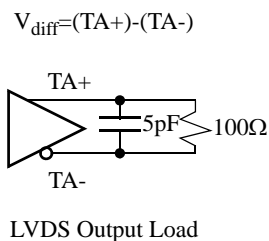
Symbol	Parameter	Min.	Typ.	Max.	Units
t _{TCIT}	CLK IN Transition time			5.0	ns
t _{TCP}	CLK IN Period	7.4	T	125	ns
t _{TCH}	CLK IN High Time	0.35T	0.5T	0.65T	ns
t _{TCL}	CLK IN Low Time	0.35T	0.5T	0.65T	ns
t _{TCD}	CLK IN to TCLK+/- Delay		3T		ns
t _{TS}	TTL Data Setup to CLK IN	2.0			ns
t _{TH}	TTL Data Hold from CLK IN	0.0			ns
t _{LVT}	LVDS Transition Time		0.6	1.5	ns
t _{TOP1}	Output Data Position0 (T=7.4ns)	-0.15	0.0	+0.15	ns
t _{TOP0}	Output Data Position1 (T=7.4ns)	$\frac{T}{7} - 0.15$	$\frac{T}{7}$	$\frac{T}{7} + 0.15$	ns
t _{TOP6}	Output Data Position2 (T=7.4ns)	$2\frac{T}{7} - 0.15$	$2\frac{T}{7}$	$2\frac{T}{7} + 0.15$	ns
t _{TOP5}	Output Data Position3(T=7.4ns)	$3\frac{T}{7} - 0.15$	$3\frac{T}{7}$	$3\frac{T}{7} + 0.15$	ns
t _{TOP4}	Output Data Position4 (T=7.4ns)	$4\frac{T}{7} - 0.15$	$4\frac{T}{7}$	$4\frac{T}{7} + 0.15$	ns
t _{TOP3}	Output Data Position5 (T=7.4ns)	$5\frac{T}{7} - 0.15$	$5\frac{T}{7}$	$5\frac{T}{7} + 0.15$	ns
t _{TOP2}	Output Data Position6 (T=7.4ns)	$6\frac{T}{7} - 0.15$	$6\frac{T}{7}$	$6\frac{T}{7} + 0.15$	ns
t _{TPLL}	Phase Lock Loop Set			10.0	ms

AC Timing Diagrams

TTL Input

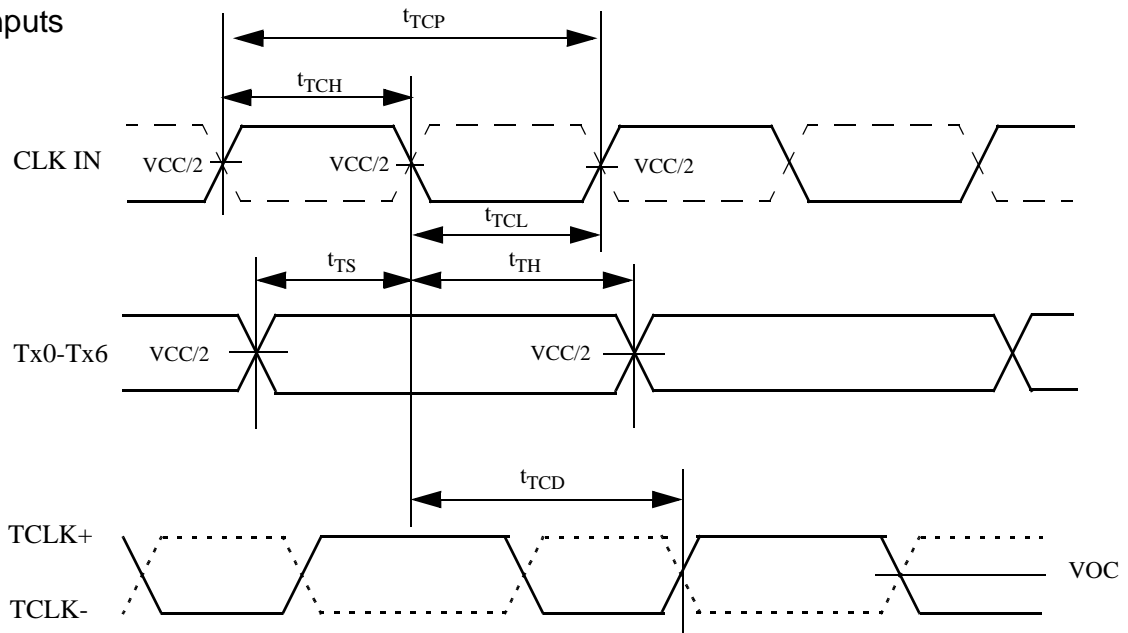


LVDS Output



AC Timing Diagrams

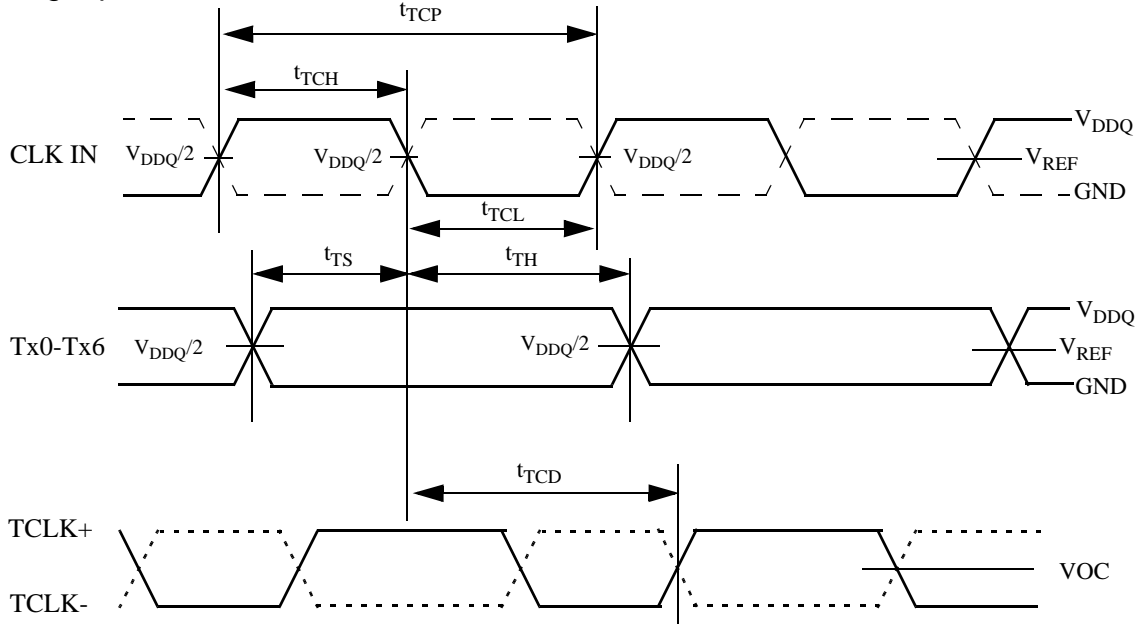
TTL Inputs



Note:

CLK IN: for R/F=GND, denote as solid line,
for R/F=VCC, denote as dashed line

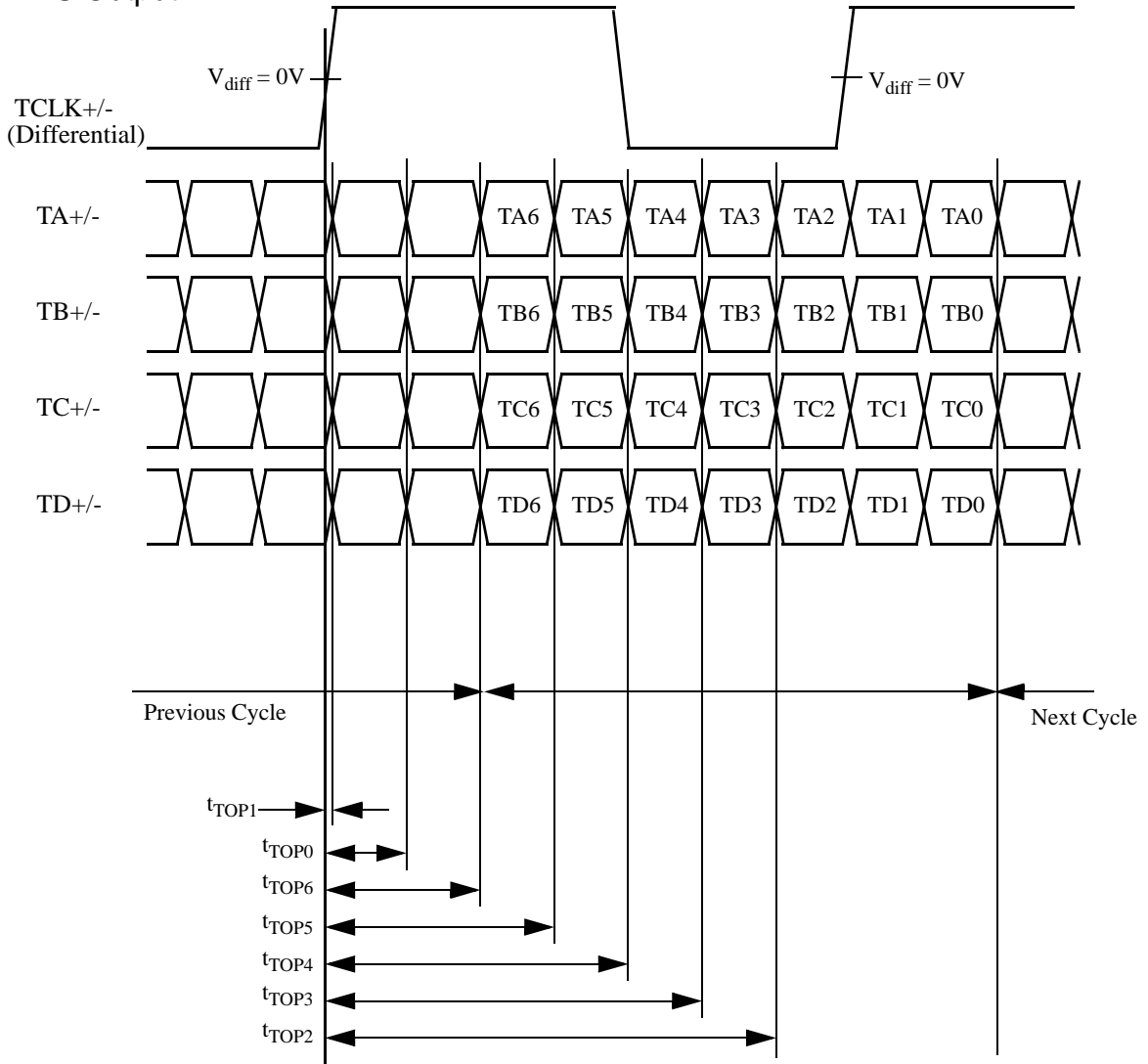
Small Swing Inputs



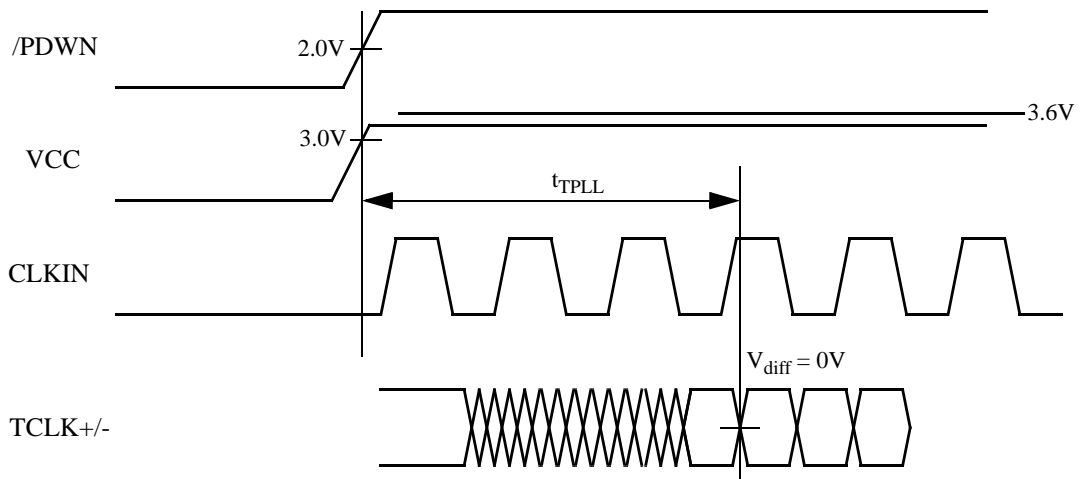
Note:

CLK IN: for R/F=GND, denote as solid line,
for R/F=VCC, denote as dashed line

AC Timing Diagrams
LVDS Output

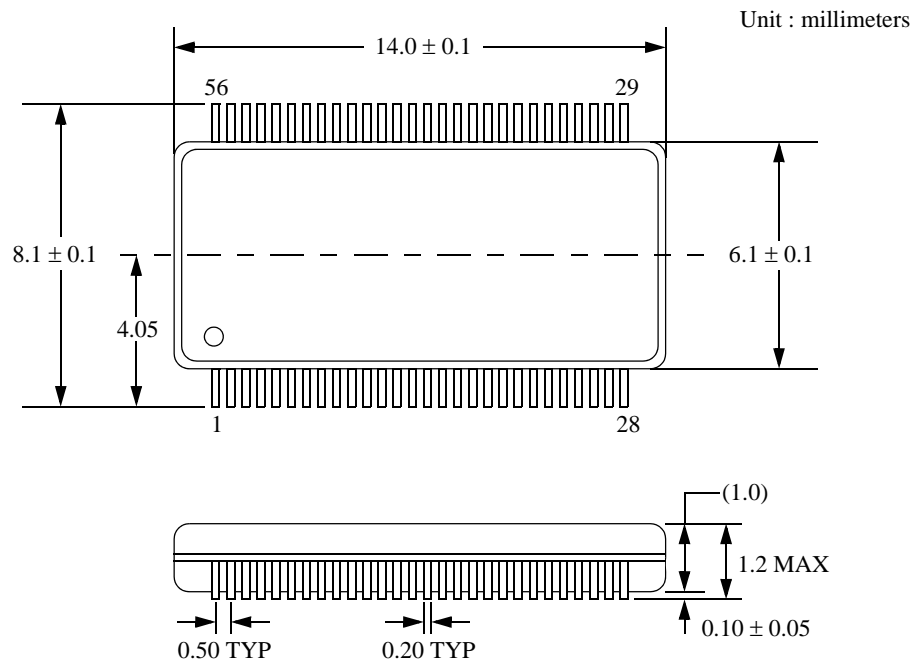


Phase Lock Loop Set Time



Package

56 Lead Molded Thin Shrink Small Outline Package, JEDEC



Notes to Users:

1. The contents of this data sheet are subject to change without prior notice.
2. Circuit diagrams shown in this data sheet are examples of application. Therefore, please pay sufficient attention when designing circuits. Even if there are incorrect descriptions, we are not responsible for any problem due to them. Please note that incorrect descriptions sometimes cannot be corrected immediately if found.
3. Our copyright and know-how are included in this data sheet. Duplication of the data sheet and disclosure to other persons are strictly prohibited without our permission.
4. We are not responsible for any problems of industrial proprietorship occurring during THC63LVDM83D use, except for those directly related to THC63LVDM83D's structure, manufacture or functions. THC63LVDM83D is designed on the premise that it should be used for ordinary electronic devices. Therefore, it shall not be used for applications that require extremely high-reliability (space equipment, nuclear control equipment, medical equipment that affects people's lives, etc.). In addition, when using THC63LVDM83D for traffic signals, safety devices and control/safety units in transportation equipment, etc., appropriate measures should be taken.
5. We are making the utmost effort to improve the quality and reliability of our products. However, there is a very slight possibility of failure in semiconductor devices. To avoid damage to social or official organizations, much care should be taken to provide sufficient redundancy and fail-safe design.
6. No radiation-hardened design is incorporated in THC63LVDM83D.
7. Judgment on whether THC63LVDM83D comes under strategic products prescribed by the Foreign Exchange and Foreign Trade Control Law is the user's responsibility.
8. This technical document was provisionally created during development of THC63LVDM83D, so there is a possibility of differences between it and the product's final specifications. When designing circuits using THC63LVDM83D, be sure to refer to the final technical documents.

THine Electronics, Inc.

Wakamatsu Bldg, 6F
3-3-6, Nihombashi-Honcho,
Chuo-ku, Tokyo, 103-0023 Japan
Tel: 81-3-3270-0880
Fax: 81-3-3270-1771
sales@thine.co.jp