THC63LVDM83D

REDUCED SWING LVDS 24Bit COLOR HOST-LCD PANEL INTERFACE

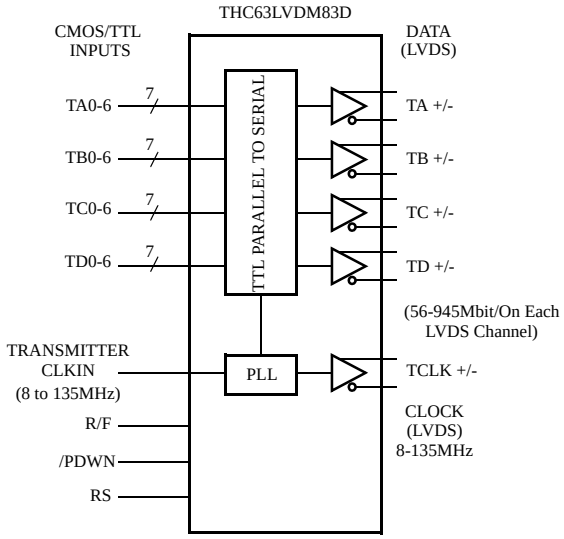
General Description

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.

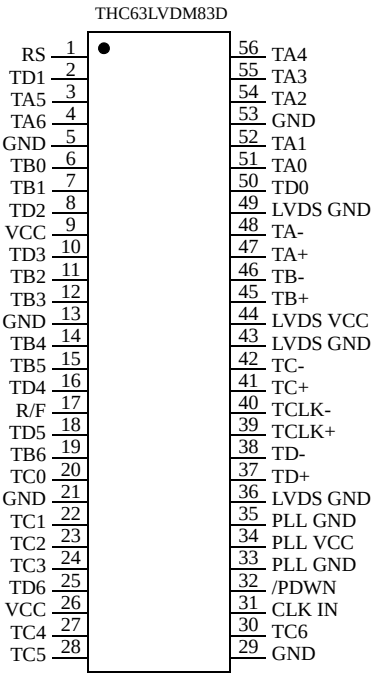
Features

- 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



Pin Description

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

Absolute Maximum Ratings [1]

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 ~ 3.6V, Ta = 0°C ~ +70°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	$0V \le V_{IN} \le V_{CC}$			±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 ~ 3.6V, Ta = 0°C ~ +70°C

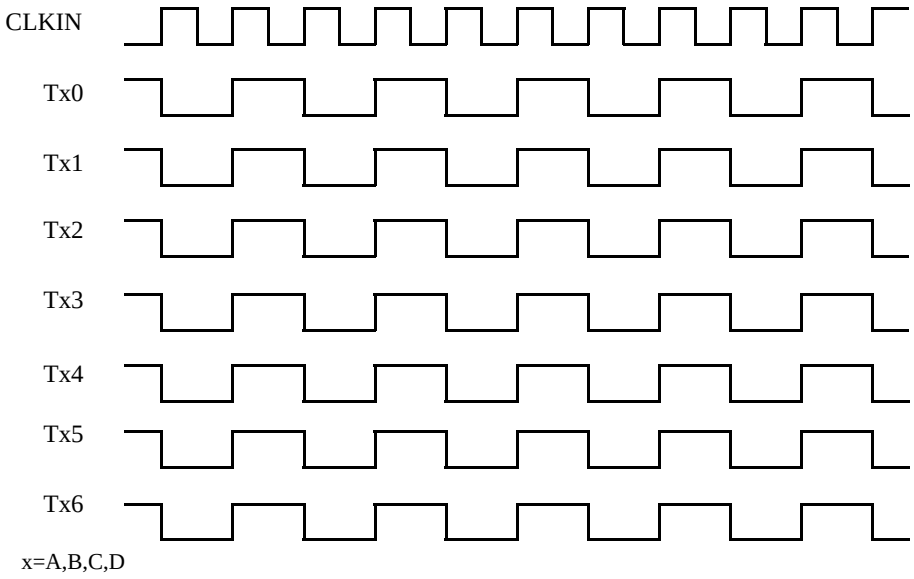
Symbol	Parameter	Conditions		Min.	Typ.	Max.	Units
VOD	Differential Output Voltage	RL=100Ω	Normal swing RS=V_{CC}	250	350	450	mV
			Reduced swing RS=GND	100	200	300	mV
ΔVOD	Change in VOD between complementary output states	RL=100Ω				35	mV
VOC	Common Mode Voltage			1.125	1.25	1.375	V
ΔVOC	Change in VOC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

Supply Current

V_{CC} = 3.0V ~ 3.6V, Ta = 0°C ~ +70°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



x=A,B,C,D

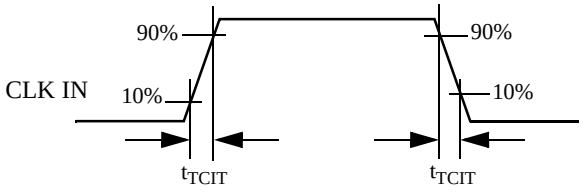
Switching Characteristics

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

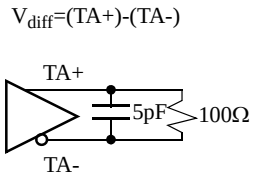
Symbol	Parameter	Min.	Typ.	Max.	Units
t_{TCIT}	CLK IN Transition time			5.0	ns
t_{TCP}	CLK IN Period	7.4	T	125	ns
t_{TCH}	CLK IN High Time	0.35T	0.5T	0.65T	ns
t_{TCL}	CLK IN Low Time	0.35T	0.5T	0.65T	ns
t_{TCD}	CLK IN to TCLK+/- Delay		3T		ns
t_{TS}	TTL Data Setup to CLK IN	2.0			ns
t_{TH}	TTL Data Hold 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

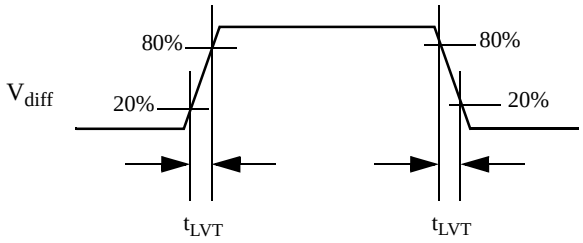
TTL Input



LVDS Output

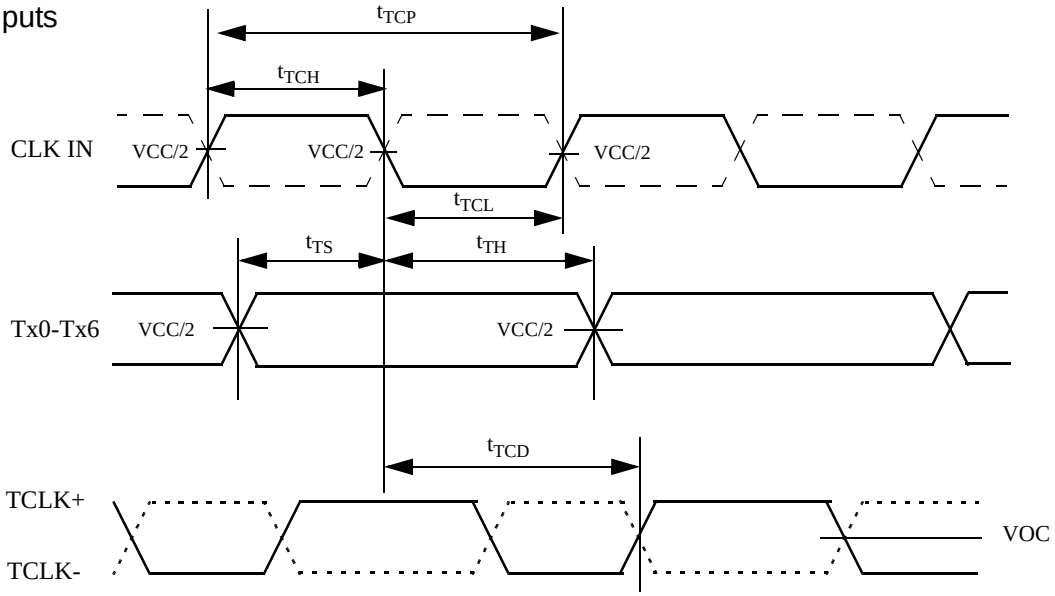


LVDS Output Load



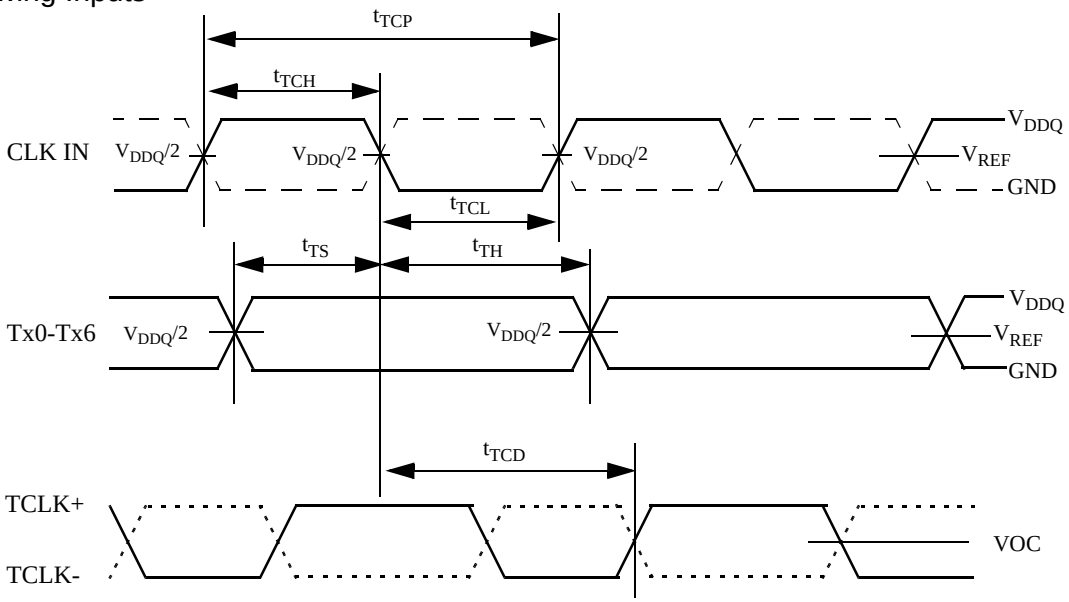
AC Timing Diagrams

TTL Inputs



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

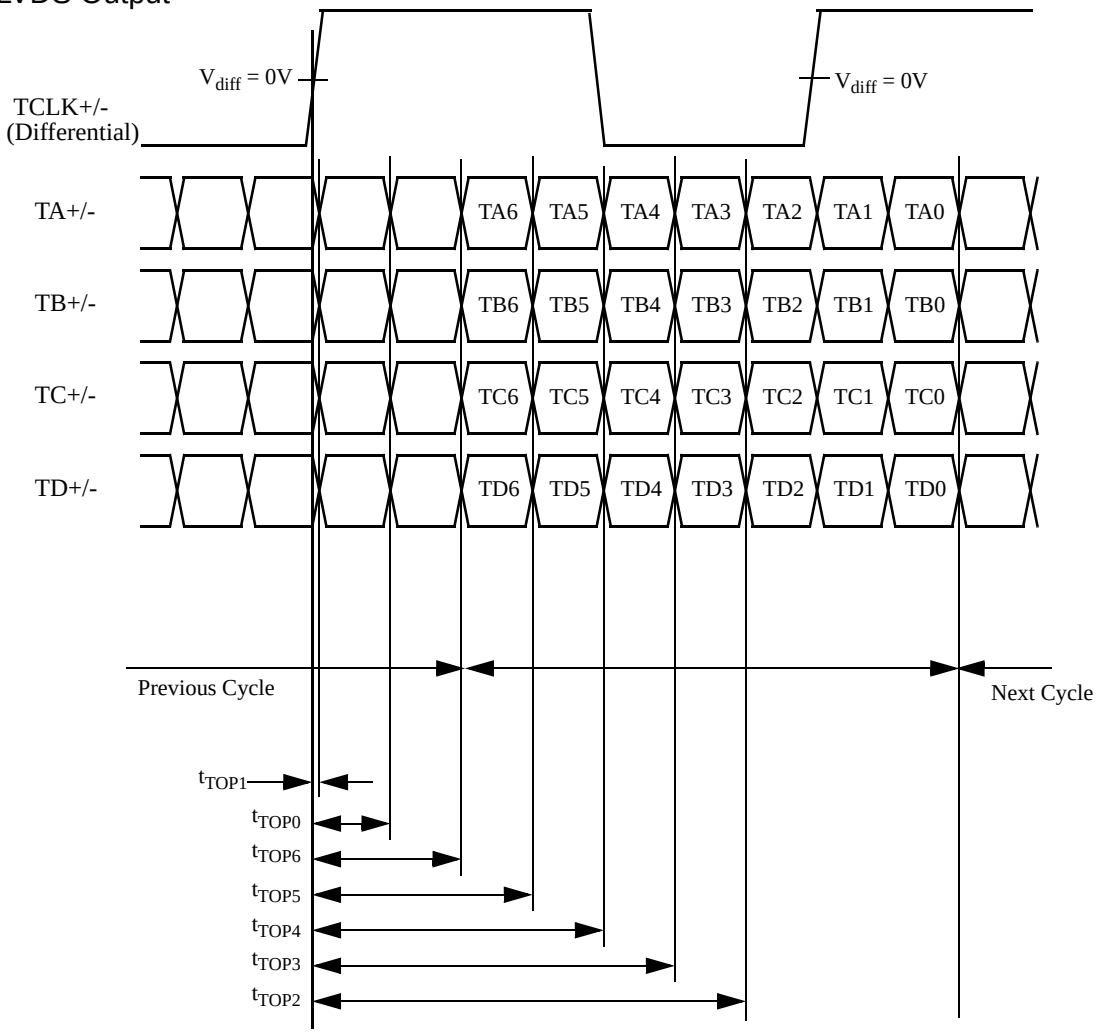
Small Swing Inputs



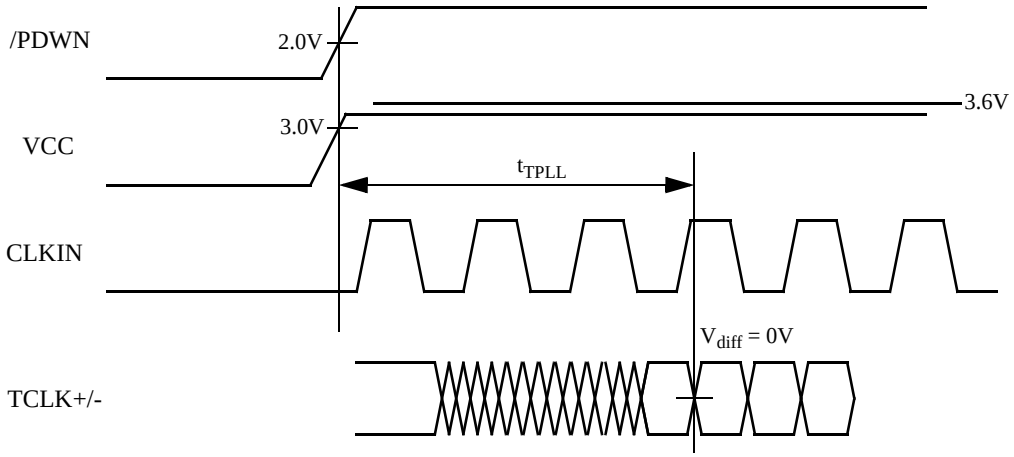
Note:
CLK IN: for R/F=GND, denote as solid line,
for R/F=VCC, denote as dashed line

AC Timing Diagrams

LVDS Output

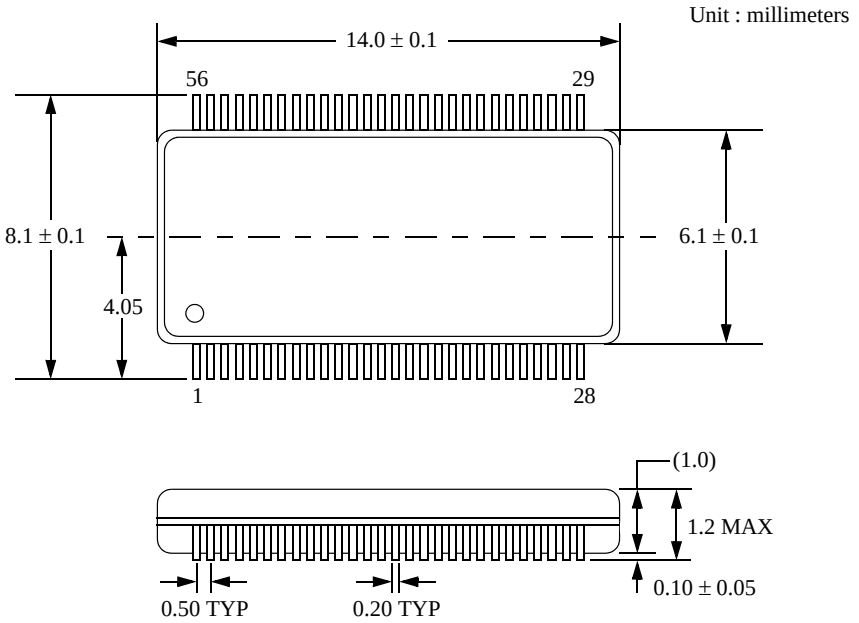


Phase Lock Loop Set Time



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