THCV2712

V-by-One® HS Distributor

General Description

The THCV2712 is a high performance 1:2 signal distributor for V-by-One® HS with data rates up to 4Gbps and integrated 2:1 and 1:2 signal switcher support bi-directional communication.

The THCV2712 features the distribution function which duplicates a V-by-One® HS signal and the switch function which changes the path of signals. All configurations are supported by external pins.

All driver outputs and receiver inputs are internally terminated which no require external components.

Features

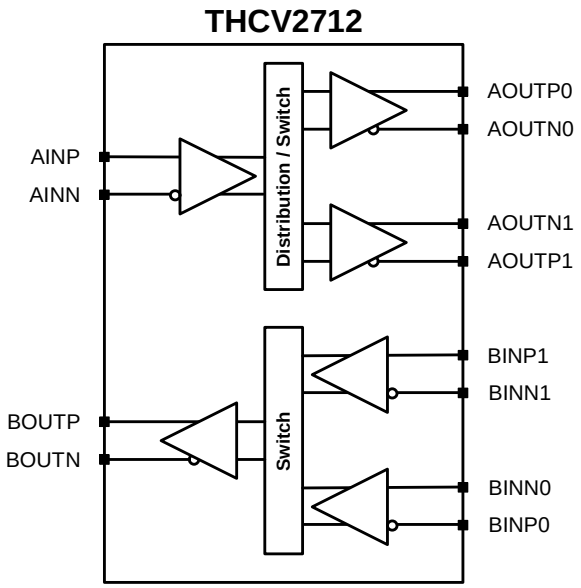
- Unidirectional Distribution
- Bi-directional Switch (1:2 and 2:1)
- Transmit VOD Control : 600 to 1300 mVp-p
- Available in single supply voltage 3.3V with integrated LDO
- ESD: HBM ±4kV
- QFN40 (5.0mm x 5.0mm)

Applications

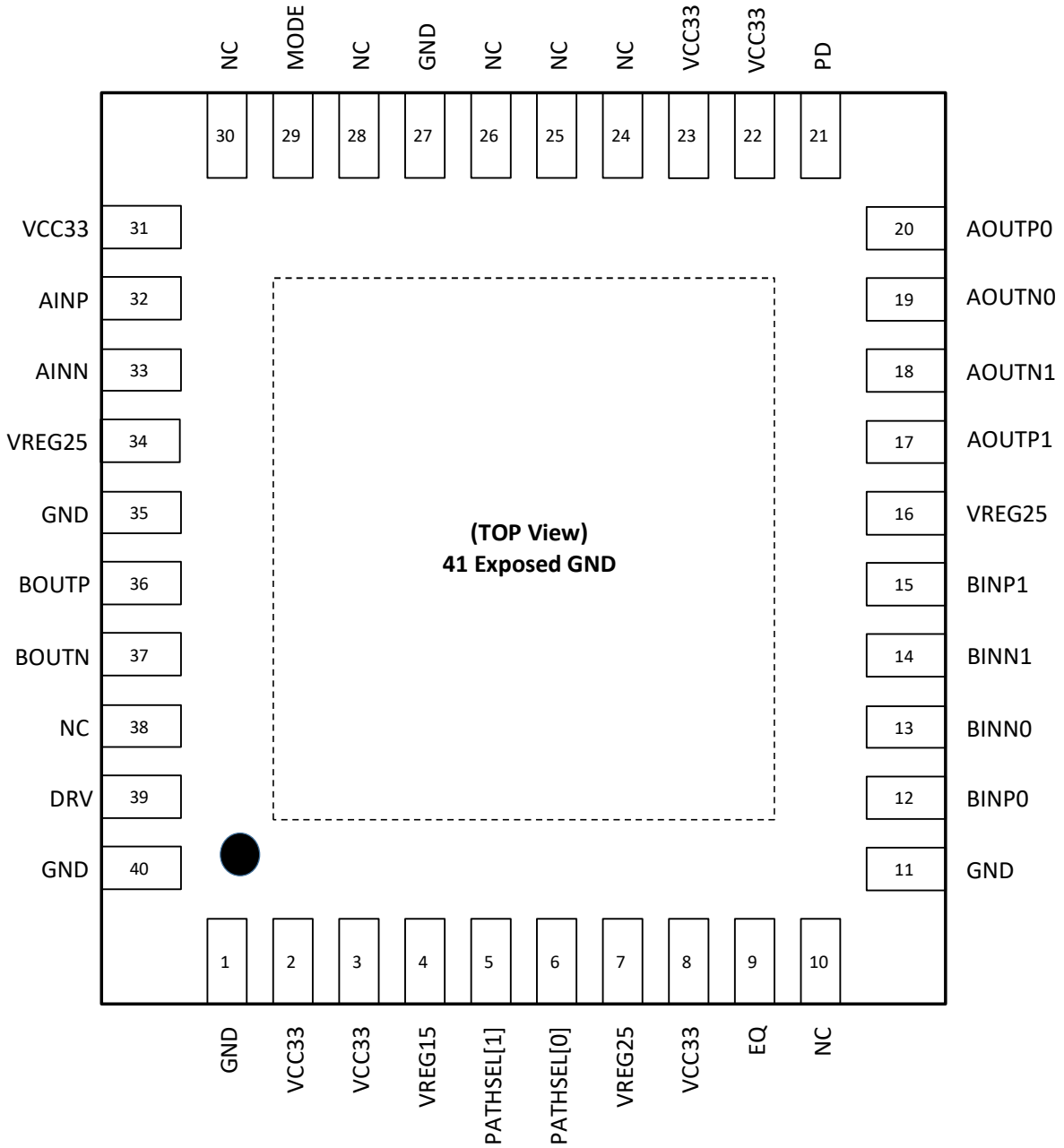
All V-by-One® HS applications such as

- Digital Signage
- Digital Blackboard
- Multi-Function Printer
- Production Printer
- Medical Imaging
- Machine Vision
- Image Sensor
- Camera

Block Diagram



Pin Configuration



Pin Description

Pin Name	Pin No	Type	Description
AINP	32	CI	High-Speed CML Channel A (CHA) Signal Input
AINN	33	CI	High-Speed CML Channel A (CHA) Signal Input
BOUTP	36	CO	High-Speed CML Channel B (CHB) Signal Output
BOUTN	37	CO	High-Speed CML Channel B (CHB) Signal Output
AOUTP1	17	CO	High-Speed CML Port 1 of CHA Signal Output
AOUTN1	18	CO	High-Speed CML Port 1 of CHA Signal Output
AOUTP0	20	CO	High-Speed CML Port 0 of CHA Signal Output
AOUTN0	19	CO	High-Speed CML Port 0 of CHA Signal Output
BINP1	15	CI	High-Speed CML Port 1 of CHB Signal Input
BINN1	14	CI	High-Speed CML Port 1 of CHB Signal Input
BINP0	12	CI	High-Speed CML Port 0 of CHB Signal Input
BINN0	13	CI	High-Speed CML Port 0 of CHB Signal Input
PD	21	I	Power Down 0: Operation 1: Chip Power Down
MODE	29	I	Mode select 0 : Distribution 1 : Switch
PATHSEL[1:0]	5,6	I	Select Switch Input / Output
EQ	9	3LI	Rx equalizer setting.
DRV	39	3LI	Tx output swing control
VREG15	4	PWR	Decoupling Capacitor Pin for On-chip Regulator.
VREG25	7,16,34	PWR	Decoupling Capacitor Pin, 2.5V output.
VCC33	2,3,8,22, 23,31	PWR	Power supply pin for on-chip regulator.
GND	1,11,27, 35,40,41	GND	Ground. Must be tied to the PCB ground plane through an array of vias. Pin#41 is exposed pad ground.
NC	10,24,25, 26,28,30, 38	NC	Non-connection pin. Must be open.

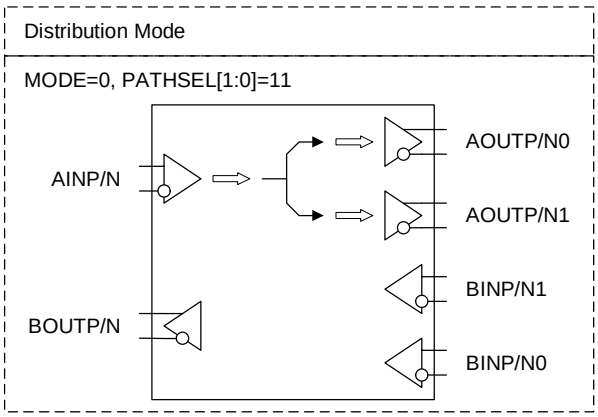
CI: CML Input buffer, CO: CML Output buffer
I: LVCMOS Input buffer, 3LI: 3-Level LVCMOS Input buffer,
PWR: Power supply, GND: Ground, NC: Non-connection pin

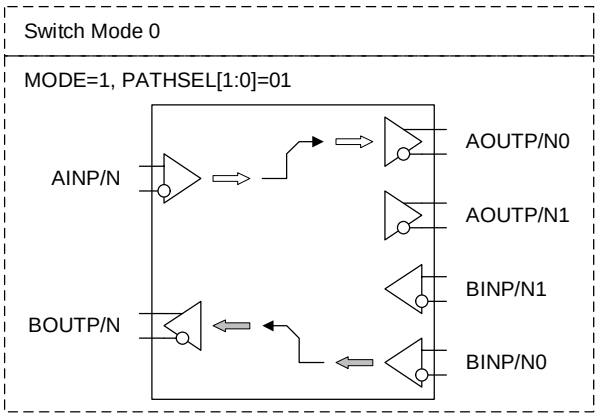
Operation Mode Settings

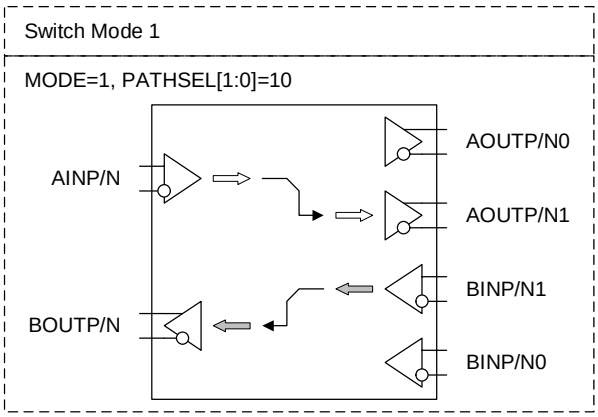
Table1 shows the operation mode setting.

Table 1. Operation Mode Setting

Pin Settings			Operation Mode
PD	**MODE**	**PATHSEL[1:0]**	
0	0	11	Distribution Mode
	1	01	Switch Mode Port 0 Enable
		10	Switch Mode Port 1 Enable
1	Ignore	Ignore	Chip Power Down.







LOCKN/HTPDN signals are not be distributed and switched. The signals should be bypassed THCV2712.

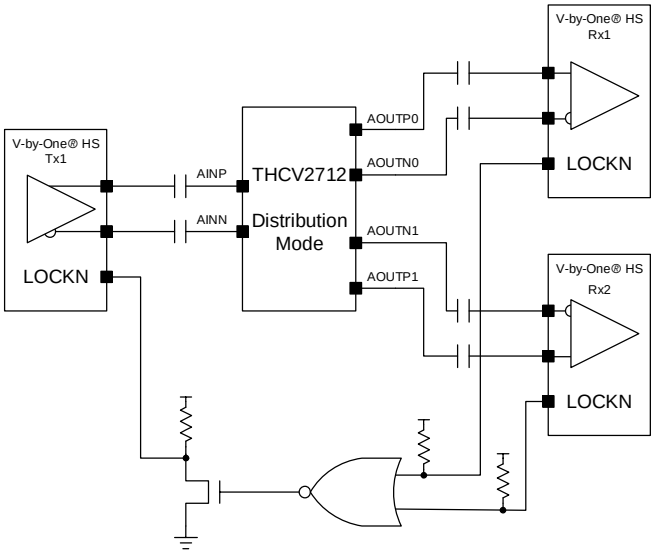
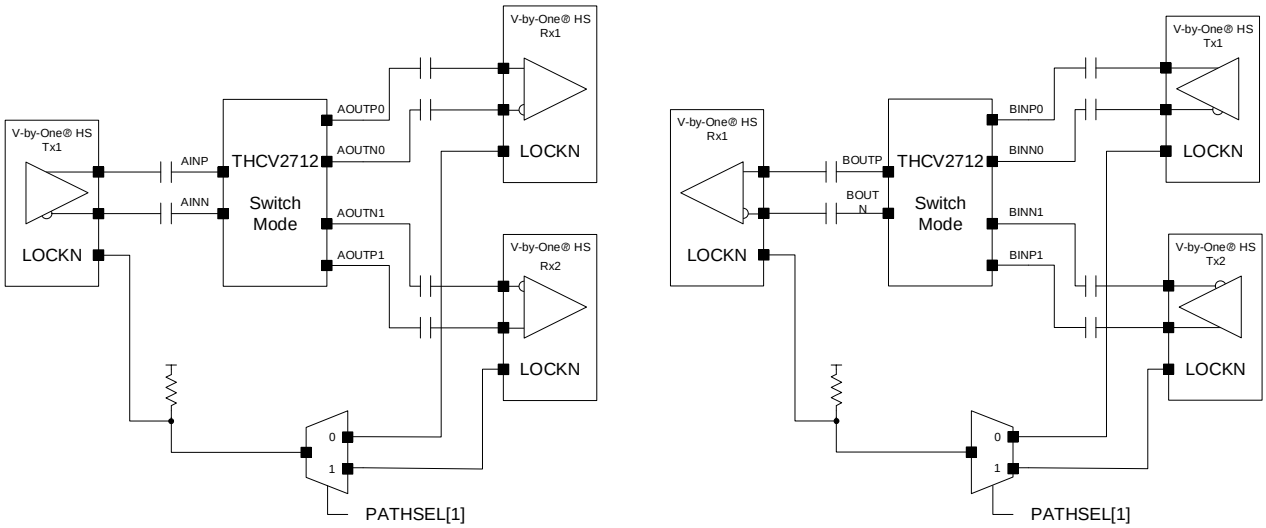


Figure 1. LOCKN circuits in Distribution Mode



(a) 1:2 Switch Function (b) 2:1 Switch Function

Figure 2. LOCKN circuits in Switch Mode

Absolute Maximum Ratings

Table 2. Absolute Maximum Ratings

Parameter		Min	Typ	Max	Unit
Supply Voltage(VCC33)		-0.3	-	4.0	V
LVCMOS Input Voltage		-0.3	-	VCC33+0.3	V
Level Control LVCMOS Input Voltage		-0.3	-	VCC33+2.5	V
3-Level LVCMOS Input Voltage		-0.3	-	VCC33+0.3	V
CML Receiver Input Voltage		-0.3	-	3.0	V
CML Transmitter Output Voltage		-0.3	-	3.0	V
ESD Rating	HBM	-	-	±4	kV
	CDM	-	-	±500	V
Storage Temperature		-55	-	125	°C
Junction Temperature		-	-	125	°C
Reflow Peak Temperature/Time		-	-	260/10	°C/sec

Recommended Operating Conditions

Table 3. Recommended Operating Condition

Parameter	Min	Typ	Max	Unit
Supply Voltage(VCC33)	3.0	3.3	3.6	V
Supply Ramp Requirement	0.1	-	50	ms
Operating Temperature	-40	-	85	°C

Electrical Specification

LVCMOS DC Specification

Table 4. LVCMOS DC Specification

Over recommended operating supply and temperature range unless otherwise specified

Symbol	Parameter	Condition	Min	Typ	Max	Unit
VIH	High Level Input Voltage	-	2.0	-	VCC33	V
VIL	Low Level Input Voltage	-	0	-	0.7	V
VOH	High Level Output Voltage	I_{oh}=-2mA	2.4	-	VCC33	V
VOL	Low Level Output Voltage	I_{ol}=8mA	0	-	0.4	V
IOZH	Output Leak Current High in Hi-Z State	-	-15	-	15	uA
IOZL	Output Leak Current Low in Hi-Z State	-	-15	-	15	uA

3-Level LVCMOS DC Specification

Table 5. 3-Level LVCMOS DC Specification

Over recommended operating supply and temperature range unless otherwise specified

Symbol	Parameter	Condition	Min	Typ	Max	Unit
V_{THL}	Low-Level Threshold Voltage	*	0.42	0.83	1.25	V
V_{THH}	High-Level Threshold Voltage	*	1.25	1.67	2.08	V
I_{IH_3L}	High Level Input Leak Current	VIN=VCC33	-100	-	100	uA
I_{IL_3L}	Low Level Input Leak Current	VIN=GND	-100	-	100	uA

*Must be tied for setting each level

Low: Tie 1kΩ ±5% to GND

Float: Leave pin open

High: Tie 1kΩ ±5% to VCC33

Supply Current

Table 6. Supply Current

Over recommended operating supply and temperature range unless otherwise specified

Symbol	Parameter	Condition	Min	Typ	Max	Unit
ICCW	Active Mode Supply Current	PD=0,MODE=1 EQ=High DRV=High	-	-	170	mA
		PD=0,MODE=1 EQ=Low DRV=Low	-	90	-	mA
		PD=0,MODE=0	-	-	250	mA
ICCS	Power Down Supply Current	PD=1	-	1.0	2.0	mA

Receiver DC/AC Specification

Table 7. Receiver DC/AC Specification

Over recommended operating supply and temperature range unless otherwise specified

Symbol	Parameter	Condition	Min	Typ	Max	Unit
V_{RX-TH}	CML Differential Input High Threshold		-	-	50	mV
V_{RX-TL}	CML Differential Input Low Threshold		-50	-	-	mV
V_{RX-RIN}	CML Differential Input Resistance		80	100	120	Ω
$V_{RX-EQ-LOW}$	Input Equalization@2GHz	EQ=Low	-	3.2	-	dB
$V_{RX-EQ-FLOAT}$	Input Equalization@2GHz	EQ=Float	-	4.6	-	dB
$V_{RX-EQ-HIGH}$	Input Equalization@2GHz	EQ=High	-	7.6	-	dB

Transmitter DC / AC specifications

Table 8. Transmitter DC / AC specification

Over recommended operating supply and temperature range unless otherwise specified

Symbol	Parameter	Condition	Min	Typ	Max	Unit
$V_{TX-DIFF-PP-LOW}$	Differential p-p Tx Voltage Swing	DRV=Low	0.4	0.6	0.8	V
$V_{TX-DIFF-PP-FLOQT}$	Differential p-p Tx Voltage Swing	DRV=Float	0.8	1.0	1.2	
$V_{TX-DIFF-PP-HIGH}$	Differential p-p Tx Voltage Swing	DRV=High	1.0	1.3	1.6	
$R_{TX-DIFF-DC}$	DC Differential Impedance	-	80	100	120	Ω
$V_{TX-DC-CM}$	Transmitter DC Common-mode Voltage	-	-	1.9	-	V
$I_{TX-SHORT}$	Transmitter Short-circuit Current Limit	-	-	20	60	mA
T_{ACTIVE}	PD Low to CML Output Delay				200	ns
$T_{POWERDOWN}$	PD High to CML Output High Fix Delay				10	ns
T_{SKEW}	CML Output Inter-pair skew				25	ps
$T_{PROPAGATION}$	Differential Propagation Delay	-	-	150	-	ps
$\Delta T_{PROPAGATION}$	Delta Propagation Delay		-	-	90	ps
T_{SWITCH}	Switching Time	-	-	-	10	ns

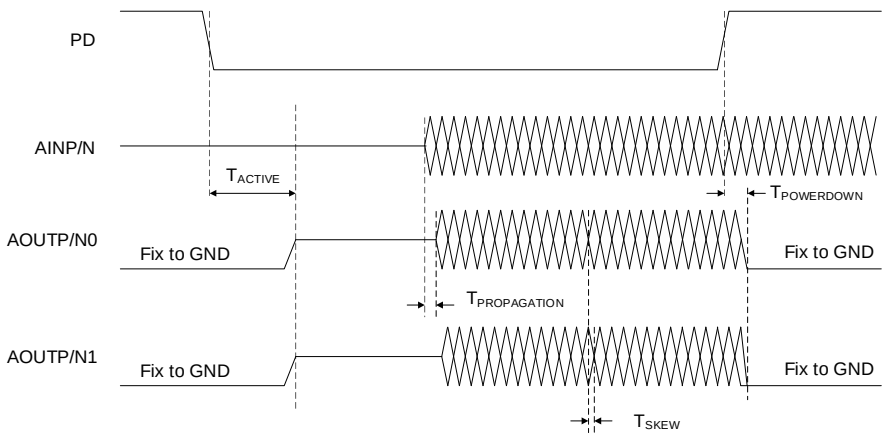


Figure 3 Power on Sequence (Distribution Mode)

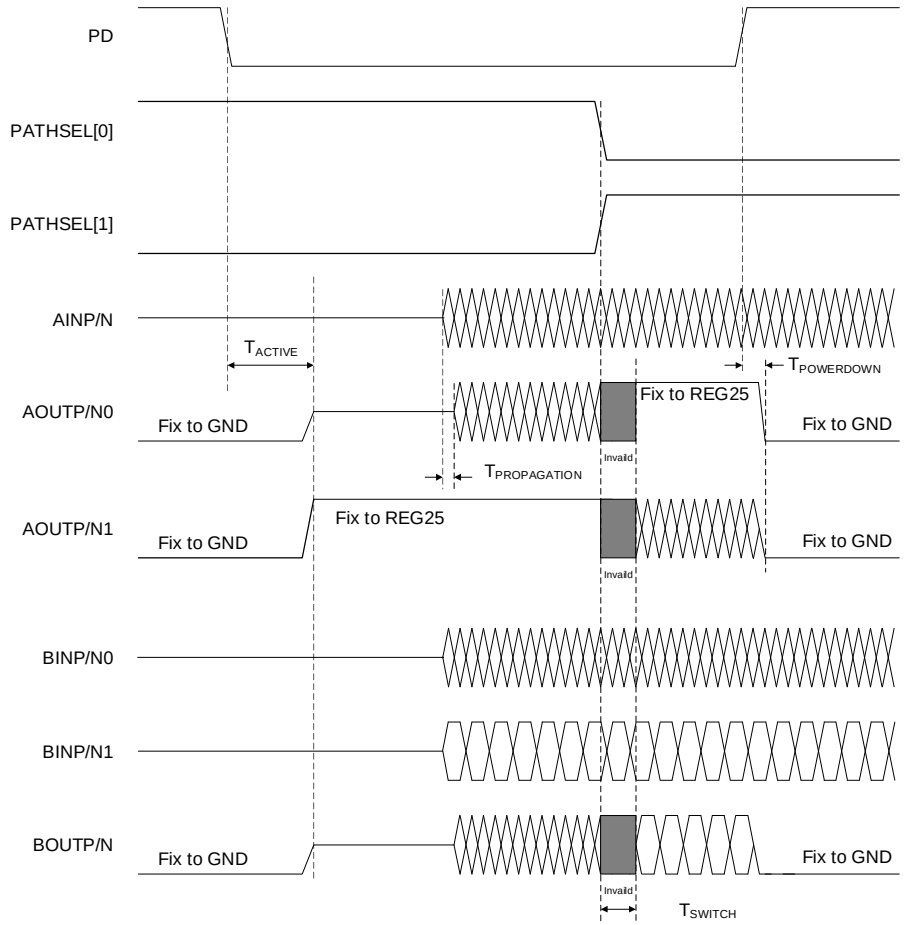


Figure 4. Power on Sequence (Switch Mode)

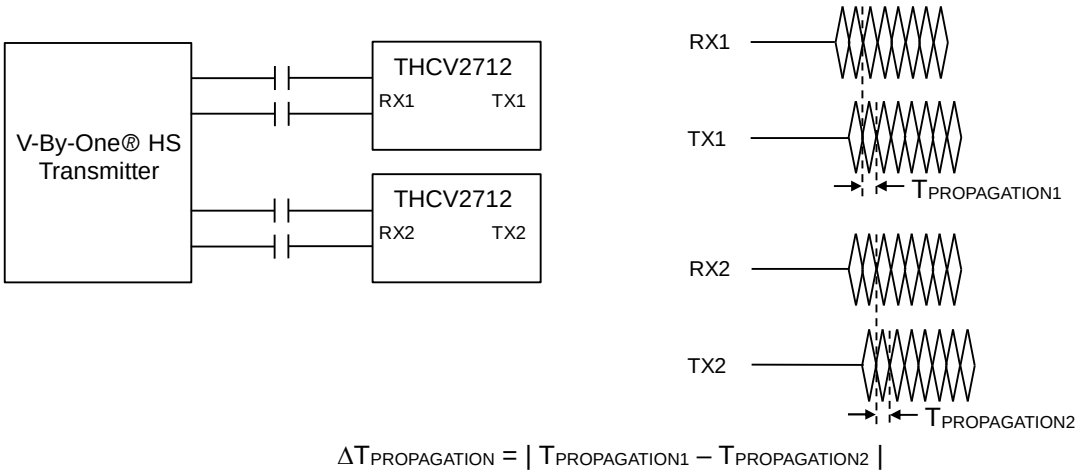
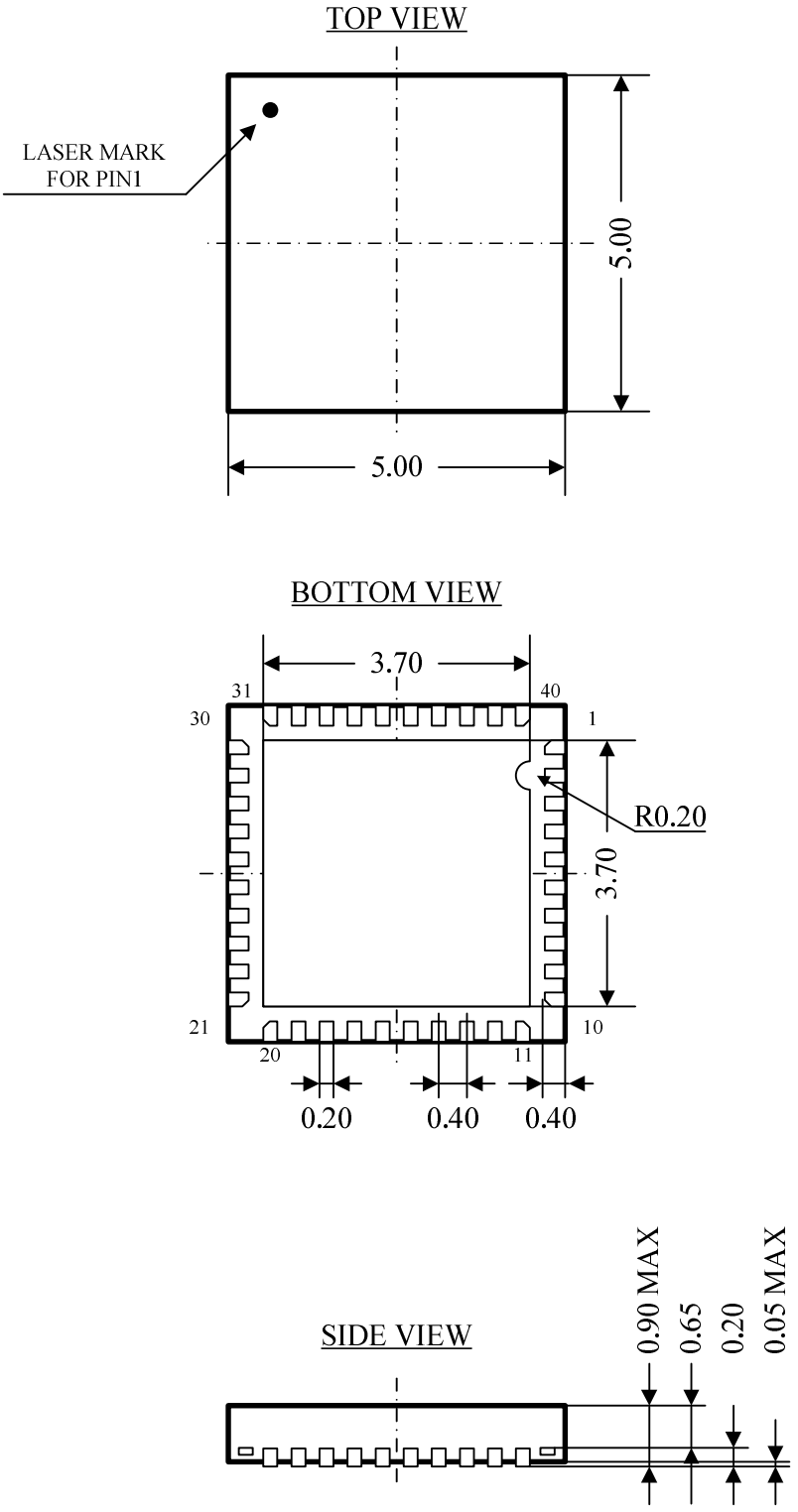


Figure 5. CML Propagation Delay Timing

Package



Unit : mm

Figure 6. 40-pin QFN package physical dimension

Notices and Requests

1. The product specifications described in this material are subject to change without prior notice.

2. The circuit diagrams described in this material are examples of the application which may not always apply to the customer's design. THine Electronics, Inc. (“THine”) is not responsible for possible errors and omissions in this material. Please note even if errors or omissions should be found in this material, THine may not be able to correct them immediately.

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4. Note that even if infringement of any third party's industrial ownership should occur by using this product, THine will be exempted from the responsibility unless it directly relates to the production process or functions of the product.

5. Product Application

5.1 Application of this product is intended for and limited to the following applications: audio-video device, office automation device, communication device, consumer electronics, smartphone, feature phone, and amusement machine device. This product must not be used for applications that require extremely high-reliability/safety such as aerospace device, traffic device, transportation device, nuclear power control device, combustion chamber device, medical device related to critical care, or any kind of safety device.

5.2 This product is not intended to be used as an automotive part, unless the product is specified as a product conforming to the demands and specifications of IATF16949 ("the Specified Product") in this data sheet. THine accepts no liability whatsoever for any product other than the Specified Product for it not conforming to the aforementioned demands and specifications.

5.3 THine accepts liability for demands and specifications of the Specified Product only to the extent that the user and THine have been previously and explicitly agreed to each other.

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. Testing and other quality control techniques are used to this product to the extent THine deems necessary to support warranty for performance of this product. Except where mandated by applicable law or deemed necessary by THine based on the user’s request, testing of all functions and performance of the product is not necessarily performed.

9. 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 Act.

10. The product or peripheral parts may be damaged by a surge in voltage over the absolute maximum ratings or malfunction, if pins of the product are shorted by such as foreign substance. The damages may cause a smoking and ignition. Therefore, you are encouraged to implement safety measures by adding protection devices, such as fuses.

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