STISO621

Datasheet

Dual channel digital isolator

SO8N

SO8W

Product status link
STISO621
STISO621W

Product label
SUSTAINABLE TECHNOLOGY

Features

- Dual channel, digital isolator with 1 – 1 channel directionality
- High data rate up to 100 Mbps
- Wide t_{amb} range operation: - 40ºC to 125ºC
- High common-mode transient: >50k V/µs
- From 3 V to 5.5 V, supply levels
- 3.3 V and 5 V level translation
- Low-power consumption
- Pulse width distortions < 3 ns
- 6k V galvanic isolation in SO8W package
- SO8 narrow and wide package options
- Safety and regulatory approvals
  - UL1577 certified, file number: E362869
  - IEC 60747-17 certified in SO8W package, File number: 5022192-4880-0002/300335
  - V_{IORM} (Maximum repetitive isolation voltage) up to 1.5k V_{PEAK}
  - V_{IOTM} (Maximum transient isolation voltage) up to 5k V_{PEAK}
  - V_{IOSM} (Maximum surge isolation voltage) up to 6k V_{PEAK}
  - V_{ISO} (Isolation withstand voltage) up to 3.5k V_{RMS}

Applications

- Optocoupler replacement in industrial application
- Industrial field bus isolation
- Battery monitor and motor drive
- Size-critical multichannel isolation

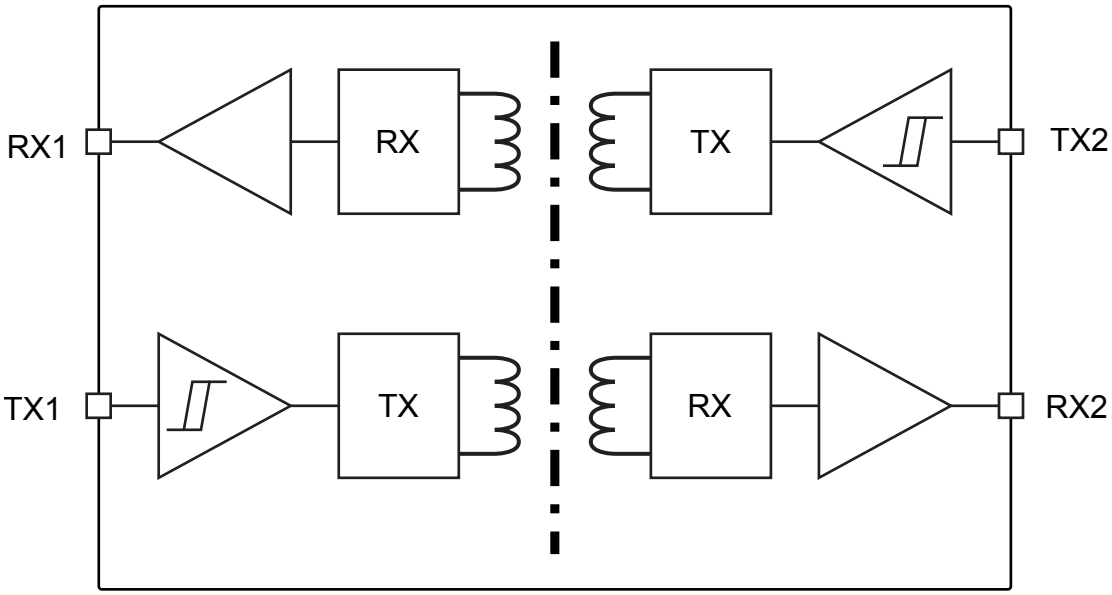
Description

The STISO621 /STISO621W are dual-channel digital isolators based on the ST thick oxide galvanic isolation technology.

The devices provide two independent channels in the opposite direction with Schmitt trigger input, providing robustness to noise and high speed input/output switching time.

1 Block diagram

Figure 1. **Block diagram**



2 Electrical data

2.1 Absolute maximum ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DDX}	Supply voltage (each side)	-0.3 to 7	V
V_{IN}	Logic input voltage	-0.3 to 7	V
I_O	Output current	5	mA
T_j	Junction temperature	-40 to 150	°C

2.2 Electrical sensitivity

Table 2. ESD protection ratings

Symbol	Parameter	Test condition	Class	Value	Unit
HBM	Human Body Model	Conforming to ANSI/ESDA/JEDEC JS-001-2014	H2	+/- 2	kV
CDM	Charge Device Model	All pins Conforming to ANSI/ESDA/JEDEC JS-002-2014	C2B	+/- 750	V
MM	Machine Model	Conforming to EIA/JESD22-A115-C	NC	+/- 200	V

2.3 Recommended operating conditions

Table 3. Recommended operating conditions

Symbol	Parameter	Min	Typ	Max	Unit
V_{DDX}	Supply voltage (each side)	3		5.5	V
V_{IN}	Logic input voltage	0		5	V
T_{amb}	Ambient temperature	-40		125	°C

2.4 Electrical characteristics

Table 4. Electrical characteristics at VDD1 = VDD2 = 5 V

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
V_{DDXon}	V_{DDX} on threshold	V_{DDX} rising from 0 V			2.8	V
$V_{DDXhyst}$	V_{DDX} off hysteresis	V_{DDX} falling from 5 V			0.1	V
IDDX	Supply current	DC		1.65	2	mA
		10 Mbps, C_L = 20 pF		3.65	5	mA
		100 Mbps, C_L = 20 pF		18	20	mA
V_{IHL}	Low-level Schmitt trigger threshold	Logic input falling Full supply range	0.8			V
V_{ILH}	High-level Schmitt trigger threshold	Logic input rising Full supply range			2	V
VI_{Hyst}	Schmitt trigger input hysteresis				0.5	V
V_{OL}	Low-level output voltage	I_{OH} = 4 mA			0.4	V
V_{OH}	High-level output voltage	I_{OL} = 4 mA	V_{DDX} – 0.3			V
Z_O	Output impedance		-40%	50	+40%	Ω
f_{MAX}	Maximum data rate	V_{IH} = 5 V	100			Mbps
t_r	Output rise time	C_L = 15 pF		2	4	ns
t_f	Output fall time	C_L = 15 pF		2	4	ns
t_{DHL}	Propagation delay H to L	See Figure 5		25	42	ns
t_{DLH}	Propagation delay L to H	See Figure 5		25	42	ns
t_{POWUP}	Power-up time				30	µs
$t_{REFRESH}$	Refresh time(1)			1	2	µs
t_{WD}	Watchdog timeout		2		6	µs
PWD	Pulse width distortion |tDHL–tDLH|	Full temperature range (2)			3	ns
CMTI	Common-mode transient immunity	(3)	50	65		kV/µs

1. *A refresh function ensures the persistence of the transmitted data across the isolation. The state of TX is periodically transmitted every $t_{REFRESH}$*
2. *Not tested in production. A characterization on a limited number of samples, representing the worst case of production flow, evaluates the limit.*
3. *Not tested in production. A characterization on a limited number of samples and simulations, evaluates the limit.*

Note: ***Testing conditions: Typical values are defined at t_{amb} = 25°C and VDD1 = VDD2 = 5 V, minimum and maximum limits applies to the full temperature range (Tested in production at t_{amb} = 25°C. A characterization on a limited quantity of samples, evaluates the limit in the full temperature range), unless otherwise specified.***

Table 5. Electrical characteristics at VDD1 = VDD2 = 3 V

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
V_{DDXon}	V_{DDX} on threshold	V_{DDX} rising from 0 V			2.8	V
$V_{DDXhyst}$	V_{DDX} off hysteresis	V_{DDX} falling from 5 V			0.1	V
I_{DDX}	Supply current	DC		1.5	2	mA
		10 Mbps, C_L = 20 pF		3	5	mA
		100 Mbps, C_L = 20 pF		11	20	mA
V_{IHL}	Low-level Schmitt trigger threshold	Logic input falling Full supply range	0.8			V
V_{ILH}	High-level Schmitt trigger threshold	Logic input rising Full supply range			2	V
V_{IHyst}	Schmitt trigger input hysteresis				0.5	V
V_{OL}	Low-level output voltage	I_{OH} = 4 mA			0.4	V
V_{OH}	High-level output voltage	I_{OL} = 4 mA	VDDX – 0.3			V
Z_O	Output impedance		-40%	50	+40%	Ω
f_{MAX}	Maximum data rate	V_{IH} = 3.3 V	100			Mbps
t_r	Output rise time	C_L = 15 pF		1.5	4	ns
t_f	Output fall time	C_L = 15 pF		1.5	4	ns
t_{DHL}	Propagation delay H to L	See Figure 5		25	42	ns
t_{DLH}	Propagation delay L to H	See Figure 5		25	42	ns
t_{POWUP}	Power-up time				30	µs
$t_{REFRESH}$	Refresh time(1)			1	2	µs
t_{WD}	Watchdog timeout		2		6	µs
PWD	Pulse width distortion $\lvert t_{DHL}–t_{DLH}\rvert$	Full temperature range (2)			3	ns
CMTI	Common-mode transient immunity	(3)	50	65		kV/µs

1. *A refresh function ensures the persistence of the transmitted data across the isolation. The state of TX is periodically transmitted every $t_{REFRESH}$*
2. *Not tested in production. A characterization on a limited number of samples, representing the worst case of production flow, evaluates the limit*
3. *Not tested in production. A characterization on a limited number of samples and simulations, evaluates the limit.*

Note: ***Testing conditions: Typical values are defined at tamb = 25°C and VDD1 = VDD2 = 3 V, minimum and maximum limits applies to the full temperature range (Tested in production at t_{amb} = 25°C. A characterization on a limited quantity of samples, evaluates the limit in the full temperature range), unless otherwise specified.***

3 Thermal data

Table 6. Thermal data

Symbol	Parameter	Max. value	Unit
$R_{th\ j\text{-}\ amb}$	Thermal resistance, junction to ambient (1)	97(2)	°C/W
$R_{th\ jc\text{-}\ top}$	Thermal resistance, junction to top case (3)	47	°C/W

1. *As per JESD51-7*
2. *Maximum power dissipation = 670mW (@T_{amb} = 85°C, T_J < 150°C)*
3. *As per JESD51-3*

4 Isolation characteristics

Table 7. Isolation and safety specification (SO8N package)

Symbol	Parameter	Test conditions	Value	Unit
General				
CLR	Clearance (minimum external air gap)	Measured from input terminals to output terminals, shortest distance trough air	4	mm
CPG	Creepage (minimum external tracking)	Measured from input terminals to output terminals, shortest distance path along body	4	mm
CTI	Comparative tracking index (tracking resistance)	IEC 60112	≥ 400	V
-	Material group	According to IEC 60664-1	II	-
-	Overvoltage category per IEC 60664-1	Rated mains voltages ≤ 150 V_{RMS}	I - IV	-
		Rated mains voltages ≤ 300 V_{RMS}	I - III	-
		Rated mains voltages ≤ 600 V_{RMS}	I - II	-
		Rated mains voltages ≤ 1000 V_{RMS}	I	-
DIN EN IEC 60747-17 (VDE 0884-17)				
V_{IORM}	Maximum repetitive isolation voltage	AC voltage	1200	V_{PEAK}
V_{IOWM}	Maximum working isolation voltage	AC voltage (sine wave)	849	V_{RMS}
		DC voltage	1200	V_{PEAK}
V_{PR}	Partial discharge test voltage	Method a, type and sample test t_m= 10 s Partial discharge < 5 pC	1920	V_{PEAK}
		Method b1, 100% production test t_m = 1 s Partial discharge < 5 pC	2250	V_{PEAK}
V_{IOTM}	Maximum transient isolation voltage	Method a, type and sample test, t_{ini} = 60 s	4000	V_{PEAK}
$V_{IOTM,test}$	Transient isolation voltage test	Method b1, 100% production test $V_{IOTM,test} = V_{IOTM} \times 1.2$, t_{ini} = 1 s	4800	V_{PEAK}
V_{IMP}	Maximum impulse voltage	Type test; tested in air 1.2/50 µs waveform per IEC 62368-1	4000	V_{PEAK}
V_{IOSM}	Maximum surge isolation voltage	Type test; tested in oil 1.2/50 µs waveform per IEC 62368-1 $V_{IOSM} \geq V_{IMP} \times 1.3$	5200	V_{PEAK}
R_{IO}	Isolation resistance	Type test V_{IO} = 500 V; T_{amb} = 25°C	> 10^{12}	Ω
		Type test V_{IO} = 500 V; $T_{amb,max}$= 125°C	> 10^{11}	
		Type test V_{IO} = 500 V; $T_{amb} = T_S$ = 150°C	> 10^{9}	
Parameter definitions and test conditions in accordance to IEC 60747-17				

Symbol	Parameter	Test conditions	Value	Unit
UL 1577				
V_{ISO}	Isolation withstand voltage	60 s; type test	2828 / 4000	V_{RMS}/V_{PEAK}
$V_{ISO,test}$	Isolation voltage test	1 s; 100% production	3394 / 4800	V_{RMS}/V_{PEAK}
Recognized under the UL 1577 component recognition program. File number E362869				

Note: ***For three-phase systems the values in the tables Table 7 and Table 8, refer to the line-to-neutral voltage.***

Table 8. Isolation and safety specification (SO8W package)

Symbol	Parameter	Test conditions	Value	Unit
General				
CLR	Clearance (minimum external air gap)	Measured from input terminals to output terminals, shortest distance trough air	8	mm
CPG	Creepage (minimum external tracking)	Measured from input terminals to output terminals, shortest distance path along body	8	mm
CTI	Comparative tracking index (tracking resistance)	IEC 60112	≥ 400	V
-	Material group	According to IEC 60664-1	II	-
-	Overvoltage category per IEC 60664-1	Rated mains voltages ≤ 150 V_{RMS}	I - IV	-
		Rated mains voltages ≤ 300 V_{RMS}	I - III	-
		Rated mains voltages ≤ 600 V_{RMS}	I - II	-
		Rated mains voltages ≤ 1000 V_{RMS}	I	-
DIN EN IEC 60747-17 (VDE 0884-17)				
V_{IORM}	Maximum repetitive isolation voltage	AC voltage	1500	V_{PEAK}
V_{IOWM}	Maximum working isolation voltage	AC voltage (sine wave)	1060	V_{RMS}
		DC voltage	1500	V_{PEAK}
V_{PR}	Partial discharge test voltage	Method a, type and sample test t_m= 10 s Partial discharge < 5 pC	2400	V_{PEAK}
		Method b1, 100% production test t_m = 1 s Partial discharge < 5 pC	2812	V_{PEAK}
V_{IOTM}	Maximum transient isolation voltage	Method a, type and sample test, t_{ini} = 60 s	5000	V_{PEAK}
$V_{IOTM,test}$	Transient isolation voltage test	Method b1, 100% production test $V_{IOTM,test} = V_{IOTM} \times 1.2$, t_{ini} = 1 s	6000	V_{PEAK}
V_{IMP}	Maximum impulse voltage	Type test; tested in air 1.2/50 µs waveform per IEC 62368-1	4600	V_{PEAK}
V_{IOSM}	Maximum surge isolation voltage	Type test; tested in oil 1.2/50 µs waveform per IEC 62368-1 $V_{IOSM} \geq V_{IMP} \times 1.3$	6000	V_{PEAK}
R_{IO}	Isolation resistance	Type and sample test V_{IO} = 500 V; T_{amb} = 25°C	> 10^{12}	Ω
		Type and sample test V_{IO} = 500 V; $T_{amb,max}$ = 125°C	> 10^{11}	
		Type and sample test V_{IO} = 500 V; T_{amb} = T_S = 150°C	> 10^{9}	
Certified according to IEC 60747-17. Certificate number: 5022192-4880-0002/300335				

Symbol	Parameter	Test conditions	Value	Unit
UL 1577				
V_{ISO}	Isolation withstand voltage	60 s; type test	3540 / 5000	V_{RMS}/V_{PEAK}
$V_{ISO,test}$	Isolation voltage test	1 s; 100% production	4240 / 6000	V_{RMS}/V_{PEAK}
Recognized under the UL 1577 component recognition program. File number E362869				

Table 9. Safety limits

Symbol	Parameter	Test condition	Max	Unit
I_S	Safety input, output, or supply current	R_{thja} [(1)]= 115 °C/W, Vi = 5.5 V, t_j = 150°C, t_{amb} = 25°C	197.6	mA
		R_{thja} [(1)]= 115 °C/W, Vi = 3.6 V, t_j = 150°C, t_{amb} = 25°C	301.9	
P_S	Safety input, output, or total power	R_{thja} [(1)]= 115 °C/W, t_j = 150°C, t_{amb} = 25°C	1087	mW
T_S	Maximum safety temperature		150	°C

1. *Evaluated on 2 s board in natural convection @ t_{amb} = 25°C*

Note: ***Safety limitings are aimed at minimizing potential damage to the isolation barrier upon failure of input or output circuitry. Without current limiting, excessive power dissipation might damage the die and the isolation barrier consequently. The maximum limits of P_S and I_S should not be exceeded. These limits vary with the ambient temperature T_A, according to the related derating curves***

Figure 2. Thermal derating curve for current safety limiting

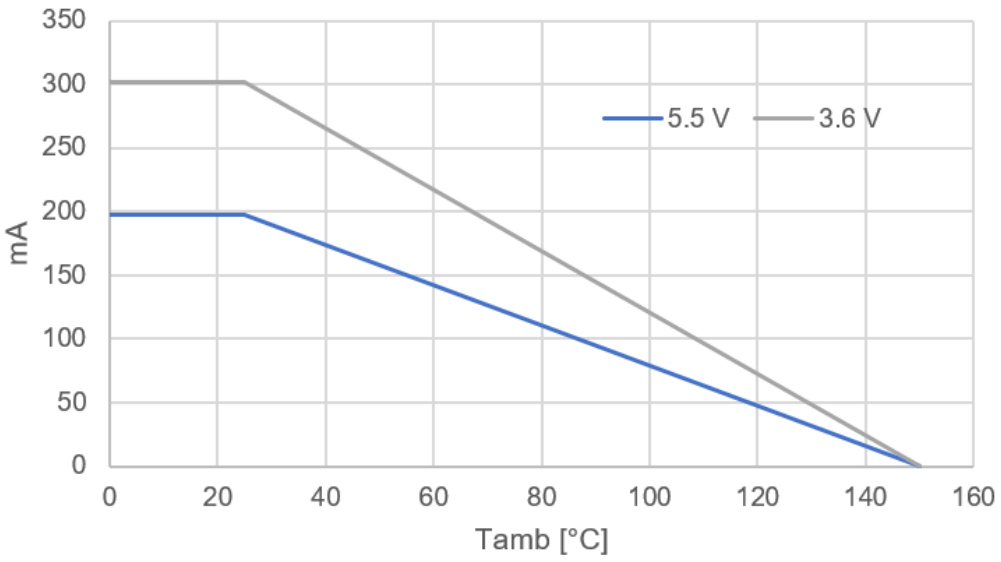
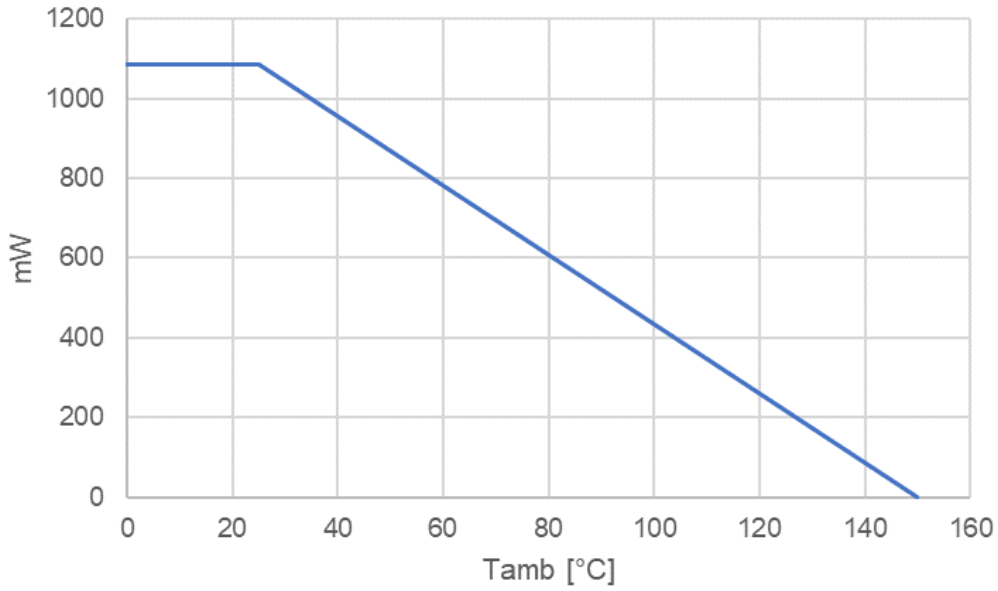
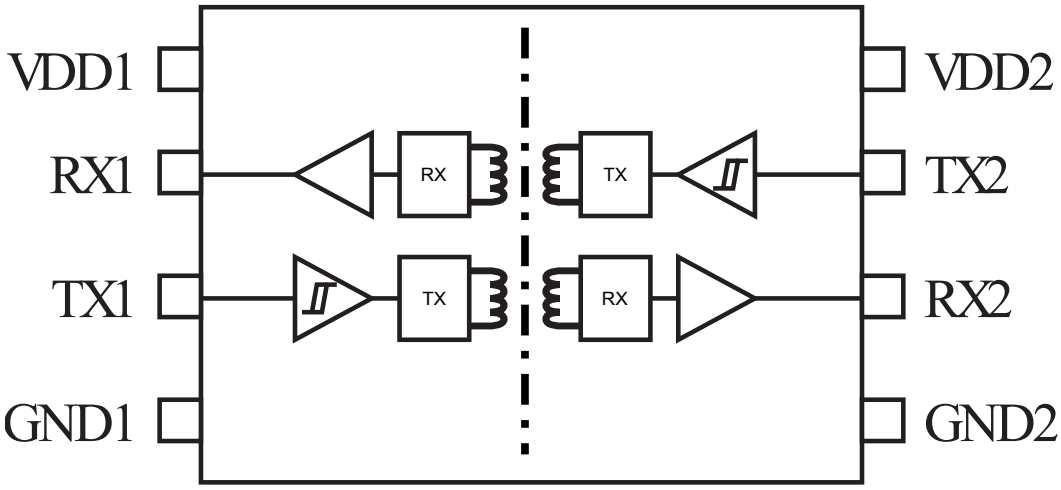


Figure 3. **Thermal derating curve for power safety limiting**



5 Pin connection

Figure 4. **Pin connection (top view)**



6 Pin list

Table 10. **Pin description**

N.	Name	Type	Function
1	VDD1	Supply	Supply voltage side 1
2	RX1	Logic output	Receive data side 1
3	TX1	Logic input	Transmit data side 1
4	GND1	Ground	Ground side 1
5	GND2	Ground	Ground side 2
6	RX2	Logic output	Receive data side 2
7	TX2	Logic input	Transmit data side 2
8	VDD2	Supply	Supply voltage side 2

7 Device description

The STISO621 is a dual high-speed isolated communication channel. It integrates one channel for each communication direction and provides low levels of pulse width distortion in the full operation range.

7.1 Device operation

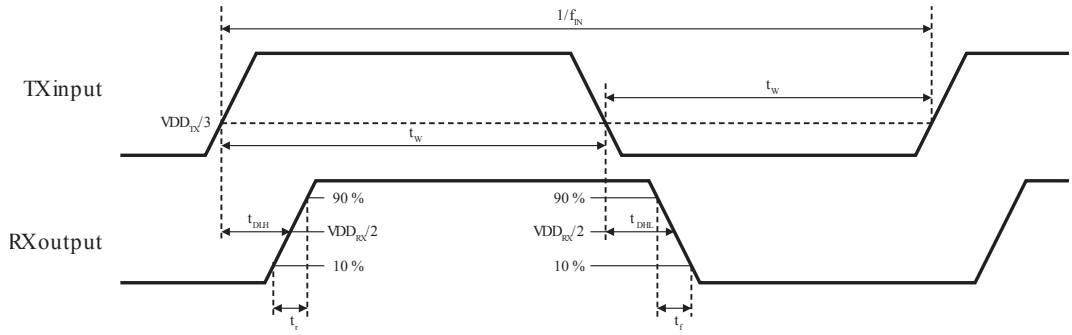
The device operation is described in the following table:

Table 11. Device operation table

VDD1	VDD2	TX1	RX2	TX2	RX1
Above UVLO	Above UVLO	H	H	H	H
		L	L	H	H
		H	H	L	L
		L	L	L	L
Below UVLO	Above UVLO	X	L(1)	X	Unknown
Above UVLO	Below UVLO	X	Unknown	X	L(1)
Below UVLO	Below UVLO	X	Unknown	X	Unknown

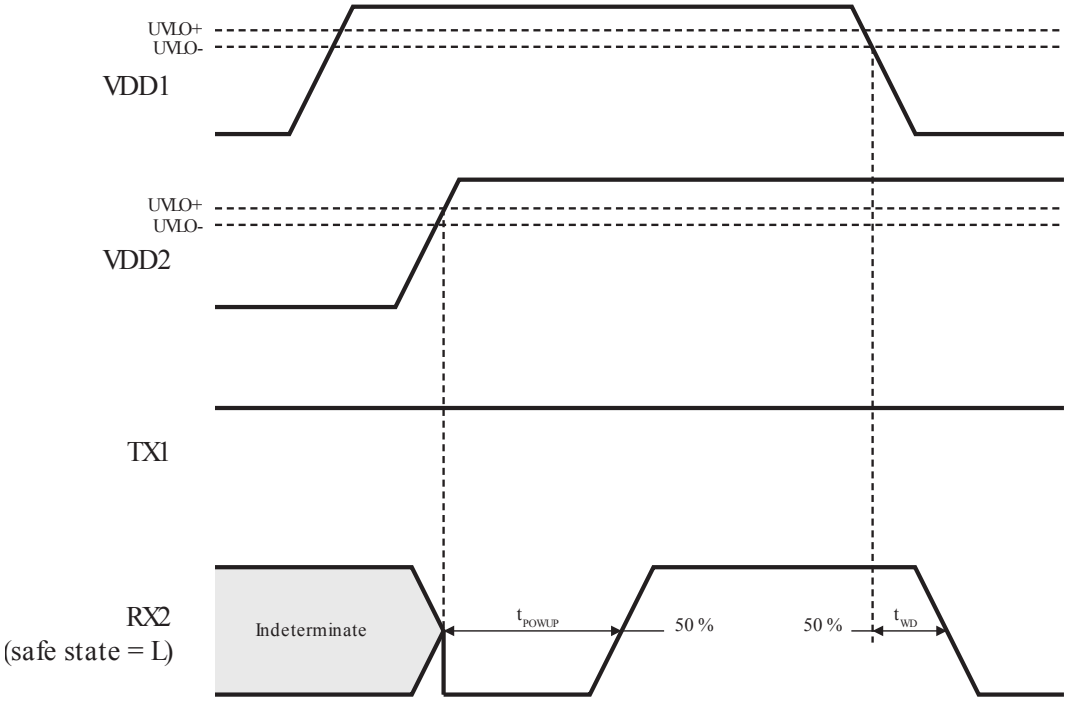
1. *A safe state is imposed by default after the watchdog timeout.*

Figure 5. Timing diagram



In Figure 5, t_W is the minimum pulse width of the TX pulse, so that the internal logic circuitry doesn't filter the pulse itself. According to the f_{MAX} in Table 4 and Table 5, this value is $t_{W,min} \geq 10ns$.

Figure 6. **Timing diagram–power up and power down**

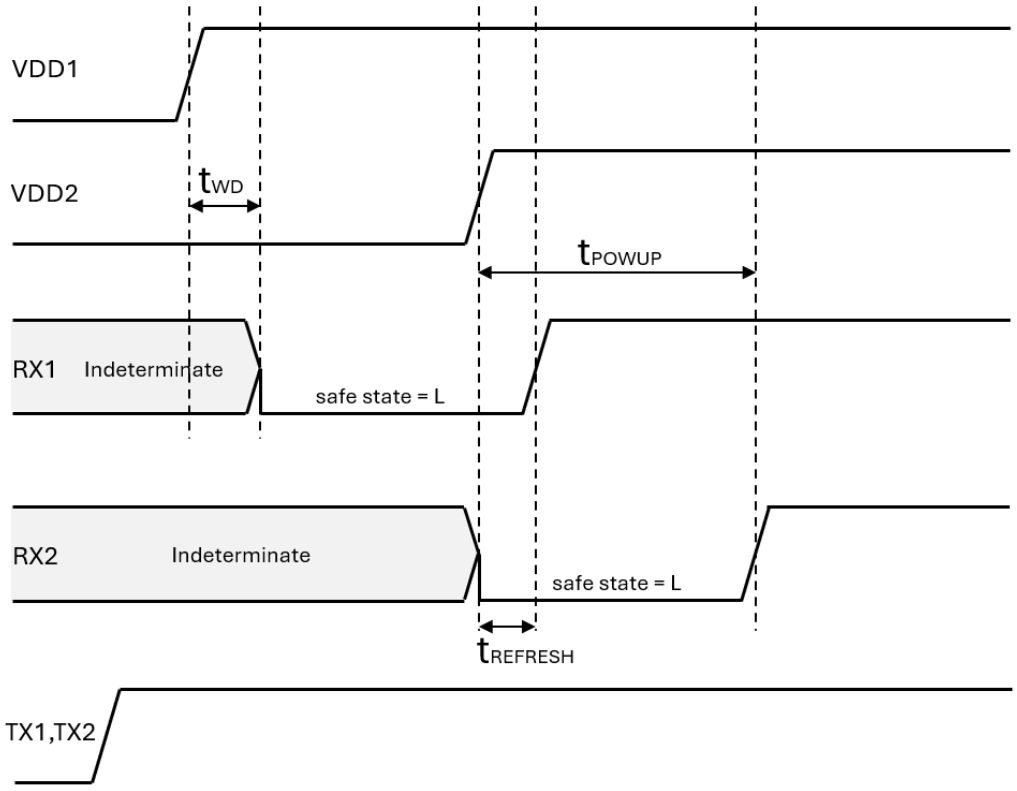


In Figure 6, t_{POWUP} is the power-up time after that the device is operative as reported in Table 11 when VDD1 and VDD2 are both above the UVLO (normal operation).

7.2 Watchdog and safe state

A watchdog function is present to set the output in a safe state if no data are received from one side to another for a time longer than t_{WD}. A typical application of this function is at the start-up of STISO621. If the supply of one side rises slower than the other one, the output of the faster side is set to the safe state until the other side is in off state. A logic level low is forced as safe state: see Figure 7. Another condition is when the supply of one side is suddenly missing.

Figure 7. Watchdog



8 Package mechanical data

Table 12. **SO8 wide package dimensions**

Symbol	Min.	Nom.	Max.	Note
A	2.34		2.64	
A1	0.10		0.30	
b	0.30		0.51	
c	0.20		0.33	
D	5.64		6.05	
e		1.27 BSC		
E1	7.39		7.59	
E	10.11		10.52	
L	0.61		0.91	
h	0.25		0.76	
θ	0°		8°	
aaa		0.25		
bbb		0.25		
ccc		0.10		

Figure 8. **SO8 wide package drawings**

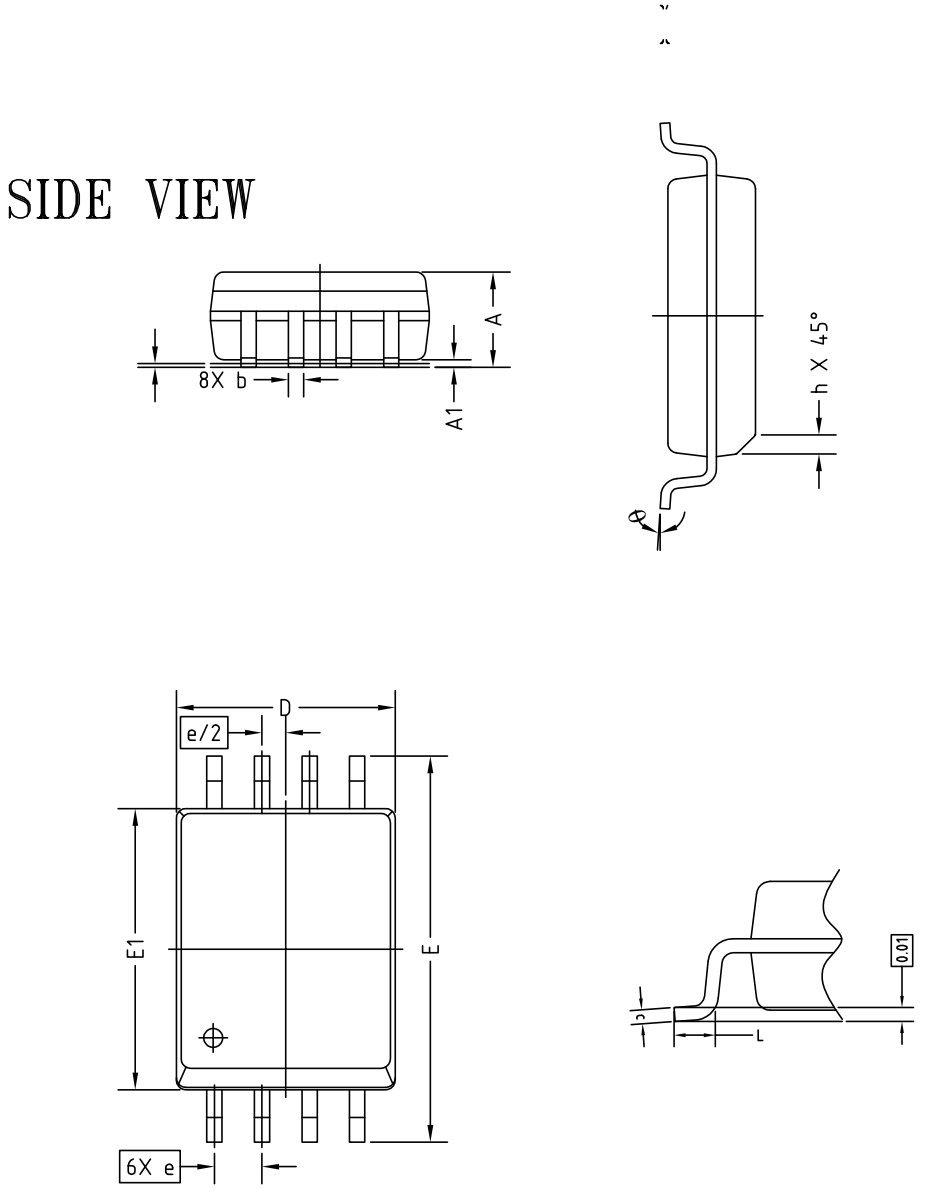


Figure 9. **SO8 wide package recommended footprint**

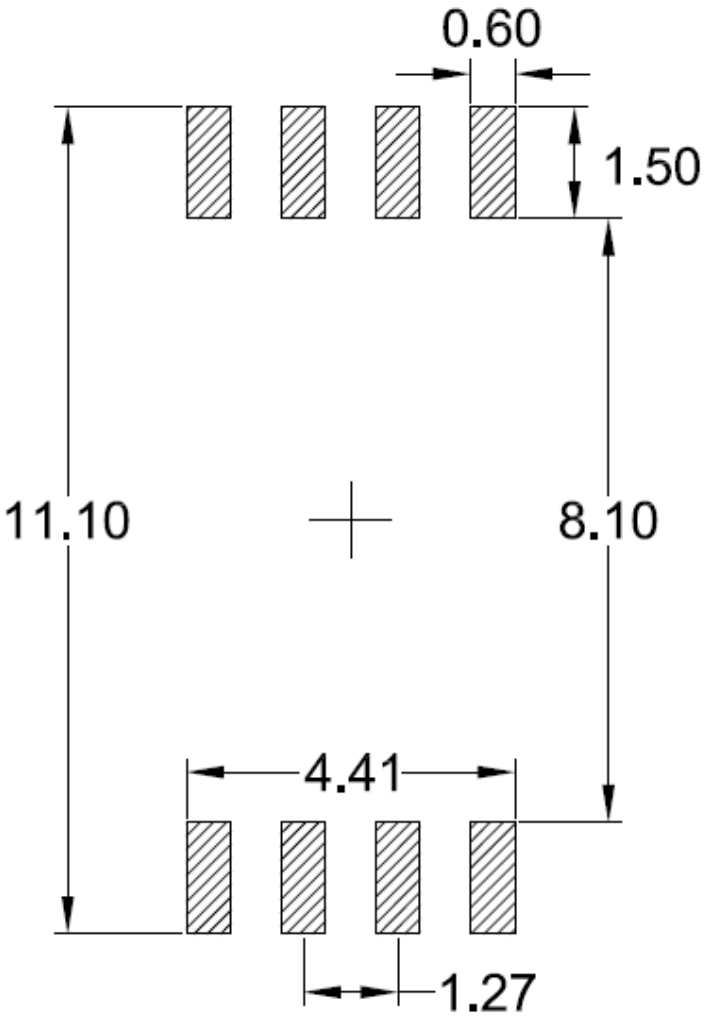


Table 13. **SO8 narrow package dimensions**

Symbol	Min.	Nom.	Max.
A	1.35		1.75
A1	0.10		0.25
b	0.35		0.49
c	0.19		0.25
D	4.80		5.00
e		1.27BSC	
E1	3.80		4.00
E	5.80		6.20
L	0.40		1.25
h	0.25		0.50
θ	0°		7°
Θ1	2°		12°
aaa		0.25	
bbb		0.25	
ccc		0.10	

Figure 10. **SO8 narrow package drawings**

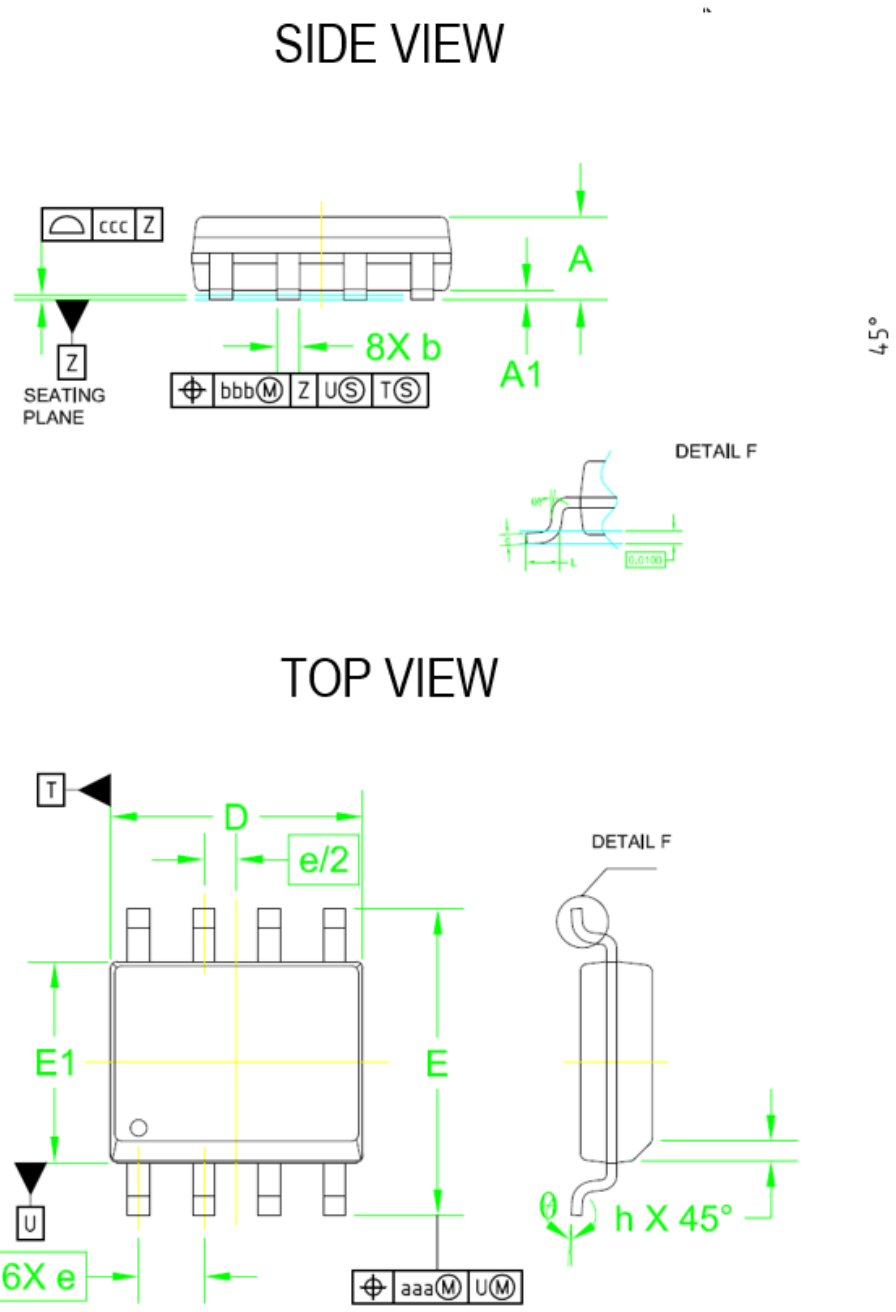
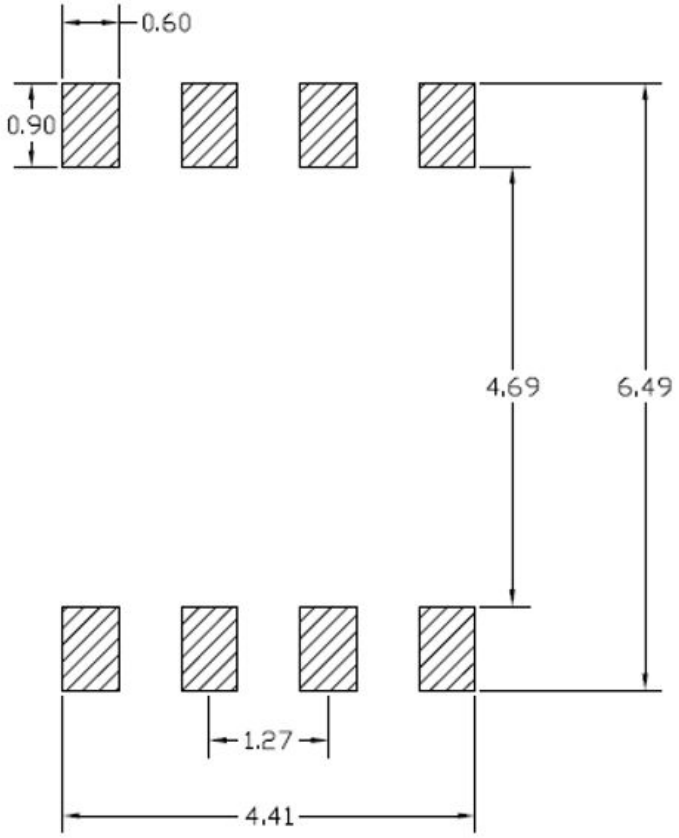


Figure 11. **SO8 narrow package recommended footprint**



9 Order information

Table 14. **Order information**

Order code	Package	Packing
STISO621W	S08 wide body	Tube
STISO621WTR	S08 wide body	Tape & reel
STISO621	S08 narrow body	Tube
STISO621TR	S08 narrow body	Tape & reel

Revision history

Table 15. **Document revision history**

Date	Version	Changes
03-Aug-2020	1	Initial release.
23-Mar-2020	2	SO8 narrow body package option added.
09-May-2022	3	Updated Figure 1 and Figure 4
19-Oct-2022	4	Added UL certification; changed cover image; added STISO621W link.
13-Jan-2025	5	Front page: added reference to IEC 60747-17 certification and isolation ratings values; formatting changes for Table 4 and Table 5; in these tables added also a footnote regarding $t_{REFRESH}$ parameter. Added Table 6 with package thermal data. In section 4 Table 7 and Table 8 replaced with new tables each referred to the package version. Added Table 9 with safety limits reported and also Figure 2 , Figure 3 as derating curves. In section 7.1 added a description of parameters t_W in Figure 5 and t_{POWUP} in Figure 6. Added section 7.2 with Figure 7. Formatting changes for Table 10 , Table 11 , Table 12 , Table 13 , Table 14.

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