

Features

- Wide supply voltage range:
VCC(A): 1.2 V to 3.6 V and
VCC(B): 1.65 V to 5.5 V
- IOFF circuitry provides partial
Power-down mode operation
- Inputs accept voltages up to 5.5 V
- ESD protection:
A port :
2000V Human Discharge Model (A114-B)
250V machine model (A115-A)
1500V charger component model (C101)
B port :
15KV Human Discharge Model (A114-B)
250V machine model (A115-A)
1500V charger component model (C101)
- package: SOT-363

Applications

- tablet
- smartphone
- Desktop computer
- Handheld Terminal

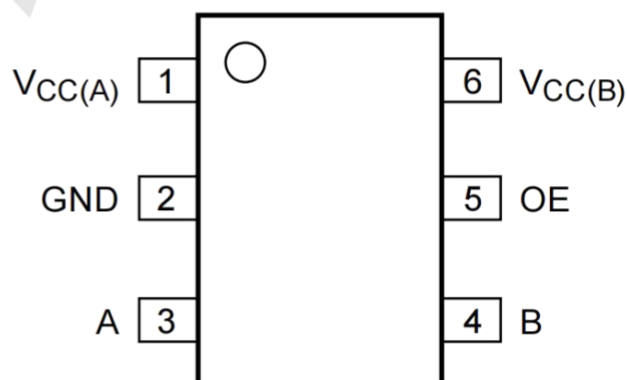
Pin Configurations

Pin Number	Pin Name	Pin Function
1	VCC(A)	supply voltage A
2	GND	ground pin.
3	A	data input or output (referenced to VCC(A))
4	B	data input or output (referenced to VCC(B))
5	OE	output enable input (active HIGH; referenced to VCC(A))
6	VCC(B)	supply voltage B

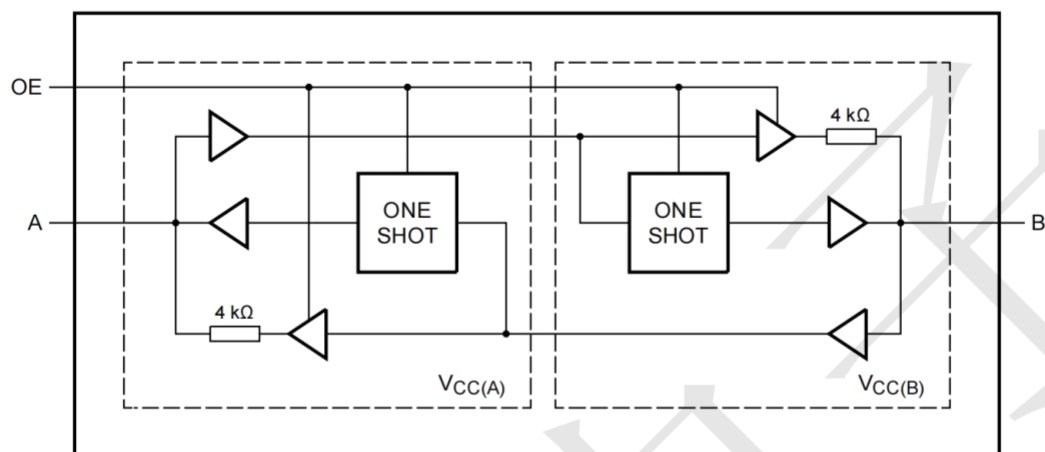
General Description

The is a 1-bit, dual supply translating transceiver with auto direction sensing, that enables bidirectional voltage level translation. It features two 1-bit input-output ports (A and B), one output enable input (OE) and two supply pins (VCC(A) and VCC(B)). VCC(A) can be supplied at any voltage between 1.2 V and 3.6 V and VCC(B) can be supplied at any voltage between 1.65 V and 5.5 V, making the device suitable for translating between any of the low voltage nodes (1.2 V, 1.5 V, 1.8 V, 2.5 V, 3.3 V and 5.0 V). Pin A and OE are referenced to VCC(A) and pins B is referenced to VCC(B). A LOW level at pin OE causes the outputs to assume a high-impedance OFF-state.

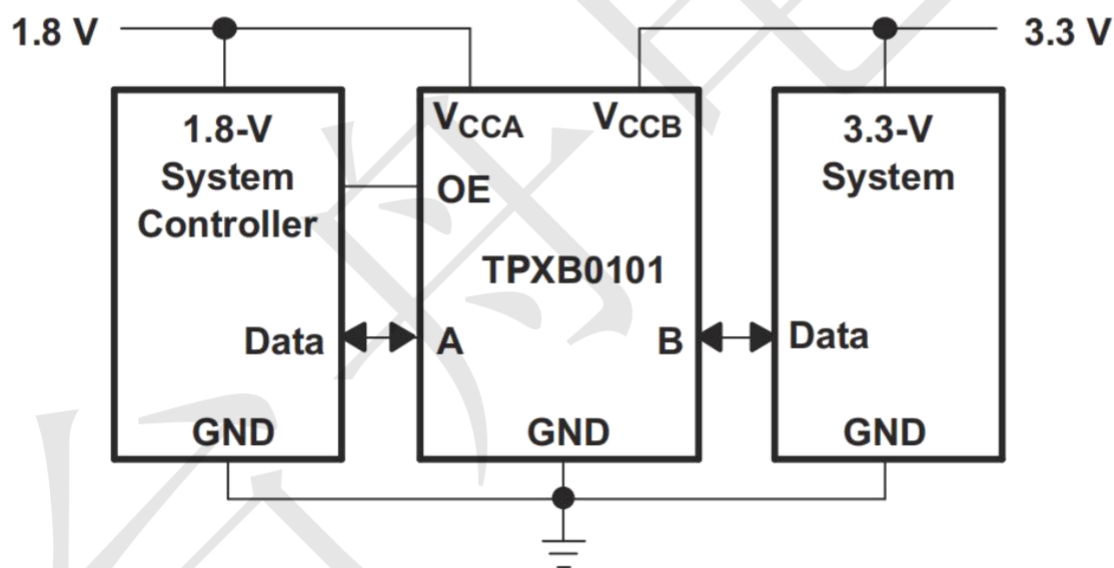
Pinout (top view)



BLOCK DIAGRAM



Typical working circuit



Functional description

H = HIGH voltage level; L = LOW voltage level; X = don't care; Z = high-impedance OFF-state.

Supply voltage		Input	Input/output	
V _{CC(A)} (1)	V _{CC(B)}	OE	A	B
1.2 V to 3.6 V	1.65 V to 5.5 V	L	Z	Z
1.2 V to 3.6 V	1.65 V to 5.5 V	H	input or output	output or input
GND	1.65 V to 5.5 V	X	Z	Z
1.2 V to 3.6 V	GND	X	Z	Z

Note: (1) V_{CC(A)} must be less than or equal to V_{CC(B)}.

Absolute Maximum Ratings

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{CC(A)}$	supply voltage A		-0.5	+6.5	V
$V_{CC(B)}$	supply voltage B		-0.5	+6.5	V
V_I	input voltage	OE (1)	-0.5	+6.5	V
		Power-down or 3-state mode			
		An, Bn (1)	-0.5	+6.5	V
		Active mode			
		An, Bn (1)(2)(3)	-0.5	$V_{CCI} + 0.5$	V
V_O	output voltage	Power-down or 3-state mode			
		A, B (1)	-0.5	+6.5	V
		Active mode			
		A, B (1)(3)(4)	-0.5	$V_{CCO} + 0.5$	V
I_{IK}	input clamping current	$V_I < 0$ V	-50	--	mA
I_{OK}	output clamping current	$V_O < 0$ V	-50	--	mA
I_O	output current	$V_O = 0$ V to V_{CCO} (4)	--	± 50	mA
I_{CC}	supply current	$I_{CC(A)}$ or $I_{CC(B)}$	--	100	mA
I_{GND}	ground current		-100	--	mA
T_{stg}	storage temperature		-65	+150	°C
P_{tot}	total power dissipation	$T_{amb} = -40$ °C to $+125$ °C (5)	--	250	mW

Note:

(1) The minimum input and minimum output voltage ratings may be exceeded if the input and output current ratings are observed.

(2) V_{CCI} is the supply voltage associated with the input.

(3) $V_{CCI} + 0.5$ V or $V_{CCO} + 0.5$ V should not exceed 6.5 V.

(4) V_{CCO} is the supply voltage associated with the output.

(5) For SOT363 package: P_{tot} derates linearly with 3.7 mW/K above 83 °C.

ESD Level

		Value	Unit
A port			
V _(ESD)	(HBM) · ANSI/ESDA/JEDEC JS-001	±2000	V
	(CDM) · JEDEC JESD22-C101	±1500	
B port			
V _(ESD)	(HBM) · ANSI/ESDA/JEDEC JS-001	±15	kV
	(CDM) · JEDEC JESD22-C101	±1500	V

Recommended operating conditions

parameter		test conditions	V _{CCA}	V _{CCB}	T _A = 25°C			-40°C ~ 85°C			Unit
					Min.	Typ.	Max.	Min.	Typ.	Max.	
V _{OHA}		I _{OH} = -20μA	1.2V		1.1			V _{CCA} - 0.4			V
			1.4V~3.6V								
V _{OLA}		I _{OL} = 20μA	1.2V		0.9			0.4			V
			1.4V~3.6V								
V _{OHB}		I _{OH} = -20μA		1.65V~5.5V				V _{CCB} - 0.4			V
V _{OLB}		I _{OL} = 20μA		1.65V~5.5V				0.4			V
I _I	OE		1.2V~3.6V	1.65V~5.5V	±1			±2			μA
I _{off}	A port		0V	0V~5.5V	±1			±2			μA
	B port		0V~3.6V	0V	±1			±2			
I _{OZ}	A port&B port	OE = GND	1.2V~3.6V	1.65V~5.5V	±1			±2			μA
I _{CCA}		V _I = V _{CCI} GND · I _O = 0	1.2V	1.65V~5.5V	0.2			3			μA
			1.4V~3.6V	1.65V~5.5V							
			3.6V	0V	2						
			0V	5.5V	-2						
I _{CCB}		V _I = V _{CCI} GND · I _O = 0	1.2V	1.65V~5.5V	3.4			5			μA
			1.4V~3.6V	1.65V~5.5V							
			3.6V	0V	-2						
			0V	5.5V	2						
I _{CCA} + I _{CCB}		V _I = V _{CCI} GND · I _O = 0	1.2V	1.65V~5.5V	3.5			8			μA
			1.4V~3.6V	1.65V~5.5V							
I _{CCZA}		V _I = V _{CCI} GND · I _O = 0 · OE = GND	1.2V	1.65V~5.5V	0.2			3			μA
			1.4V~3.6V	1.65V~5.5V							
I _{CCZB}		V _I = V _{CCI} GND · I _O = 0 · OE = GND	1.2V	1.65V~5.5V	3.3			5			μA
			1.4V~3.6V	1.65V~5.5V							
C _i	OE		1.2V~3.6V	1.65V~5.5V	2.5			3			pF
C _{io}	A port		1.2V~3.6V	1.65V~5.5V	5			6			pF
	B port				11			14.5			

Dynamic characteristics (T_{amb} = 25 °C)

Symbol	Parameter	Conditions	V _{CC(B)}				Unit
			1.8 V	2.5 V	3.3 V	5.0 V	
V _{CC(A)} = 1.2 V; T _{amb} = 25 °C							
t _{pd}	propagation delay	A to B	7.5	6.0	5.5	5.2	ns
		B to A	6.6	5.6	5.1	4.9	ns
t _{en}	enable time	OE to A, B	0.5	0.5	0.5	0.5	μs
t _{dis}	disable time	OE to A; no external load	8.3	8.3	8.3	8.3	ns
		OE to B; no external load	10.4	9.4	9.3	8.8	ns
		OE to A	81	69	83	68	ns
		OE to B	81	69	83	68	ns
t _t	transition time	A port	4.3	4.3	4.3	4.4	ns
		B port	2.7	2.1	1.8	1.5	ns
t _w	pulse width	data inputs	15	13	13	13	ns
f _{data}	data rate		70	80	80	80	Mbps

Dynamic characteristics for temperature range (-40 °C to +85 °C)

Symbol	Parameter	Conditions	V _{CC(B)}								Unit
			1.8 V ± 0.15 V		2.5 V ± 0.2 V		3.3 V ± 0.3 V		5.0 V ± 0.5 V		
			Min	Max	Min	Max	Min	Max	Min	Max	
V _{CC(A)} = 1.5 V ± 0.1 V											
t _{pd}	propagation delay	A to B	1.4	12.9	1.2	10.1	1.1	10.0	0.8	9.9	ns
		B to A	0.9	14.2	0.7	12.0	0.4	11.7	0.3	13.7	ns
t _{en}	enable time	OE to A, B	--	1.0	--	1.0	--	1.0	--	1.0	μs
t _{dis}	disable time	OE to A; no external load	1.0	17.9	1.0	17.9	1.0	17.9	1.0	17.9	ns
		OE to B; no external load	1.0	21.0	1.0	16.6	1.0	15.1	1.0	14.4	ns
		OE to A	--	100	--	100	--	100	--	100	ns
		OE to B	--	150	--	105	--	150	--	105	ns
t _t	transition time	A port	0.9	5.1	0.9	5.1	0.9	5.1	0.9	5.1	ns
		B port	0.9	4.7	0.6	3.2	0.5	2.5	0.4	2.7	ns
t _w	pulse width	data inputs	25	--	25	--	25	--	25	--	ns
f _{data}	data rate		--	40	--	40	--	40	--	40	Mbps

Dynamic characteristics for temperature range (−40 °C to +85 °C)

Symbol	Parameter	Conditions	V _{CC(B)}								Unit
			1.8 V ± 0.15 V		2.5 V ± 0.2 V		3.3 V ± 0.3 V		5.0 V ± 0.5 V		
			Min	Max	Min	Max	Min	Max	Min	Max	
V _{CC(A)} = 1.8 V ± 0.15 V											
t _{pd}	propagation delay	A to B	1.6	11.0	1.4	7.7	1.3	6.8	1.2	6.5	ns
		B to A	1.5	12.0	1.3	8.4	1.0	7.6	0.9	7.1	ns
t _{en}	enable time	OE to A, B	--	1.0	--	1.0	--	1.0	--	1.0	μs
t _{dis}	disable time	OE to A; no external load	1.0	14.7	1.0	14.7	1.0	14.7	1.0	14.7	ns
		OE to B; no external load	1.0	18.2	1.0	14.5	1.0	13.7	1.0	12.7	ns
		OE to A	--	120	--	120	--	120	--	120	ns
		OE to B	--	150	--	105	--	150	--	105	ns
t _t	transition time	A port	0.8	4.1	0.8	4.1	0.8	4.1	0.8	4.1	ns
		B port	0.9	4.7	0.6	3.2	0.5	2.5	0.4	2.7	ns
t _w	pulse width	data inputs	20	--	17	--	17	--	17	--	ns
f _{data}	data rate		--	49	--	60	--	60	--	60	Mbps
V _{CC(A)} = 2.5 V ± 0.2 V											
t _{pd}	propagation delay	A to B	--	--	1.1	6.3	1.0	5.2	0.9	4.7	ns
		B to A	--	--	1.2	6.6	1.1	5.1	0.9	4.4	ns
t _{en}	enable time	OE to A, B	--	--	--	1.0	--	1.0	--	1.0	μs
t _{dis}	disable time	OE to A; no external load	--	--	1.0	9.7	1.0	9.7	1.0	9.7	ns
		OE to B; no external load	--	--	1.0	12.9	1.0	12.0	1.0	11.0	ns
		OE to A	--	--	--	85	--	85	--	85	ns
		OE to B	--	--	--	105	--	150	--	100	ns
t _t	transition time	A port	--	--	0.7	3.0	0.7	3.0	0.7	3.0	ns
		B port	--	--	0.7	3.2	0.5	2.5	0.4	2.7	ns
t _w	pulse width	data inputs	--	--	12	--	10	--	10	--	ns
f _{data}	data rate		--	--	--	85	--	100	--	100	Mbps

Dynamic characteristics for temperature range (-40 °C to +85 °C)

Symbol	Parameter	Conditions	V _{CC(B)}								Unit
			1.8 V ± 0.15 V		2.5 V ± 0.2 V		3.3 V ± 0.3 V		5.0 V ± 0.5 V		
			Min	Max	Min	Max	Min	Max	Min	Max	
V _{CC(A)} = 3.3 V ± 0.3 V											
t _{pd}	propagation delay	A to B	--	--	--	--	0.9	4.7	0.8	4.0	ns
		B to A	--	--	--	--	1.0	4.9	0.9	3.8	ns
t _{en}	enable time	OE to A, B	--	--	--	--	--	1.0	--	1.0	μs
t _{dis}	disable time	OE to A; no external load	--	--	--	--	1.0	9.4	1.0	9.4	ns
		OE to B; no external load	--	--	--	--	1.0	11.3	1.0	10.4	ns
		OE to A	--	--	--	--	--	125	--	125	ns
		OE to B	--	--	--	--	--	150	--	100	ns
t _t	transition time	A port	--	--	--	--	0.7	2.5	0.7	2.5	ns
		B port	--	--	--	--	0.5	2.5	0.4	2.7	ns
t _w	pulse width	data inputs	--	--	--	--	10	--	10	--	ns
f _{data}	data rate		--	--	--	--	--	100	--	100	Mbps

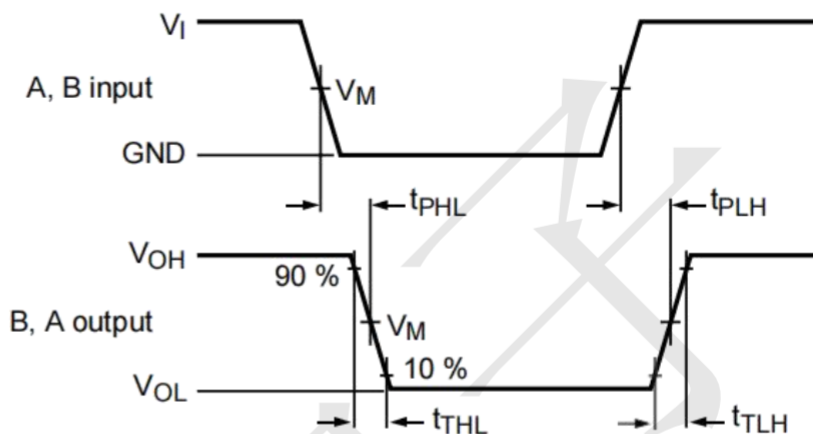
[1] t_{pd} is the same as t_{PLH} and t_{PHL} ; t_{en} is the same as t_{PZL} and t_{PZH} ; t_{dis} is the same as t_{PLZ} and t_{PHZ} ; t_t is the same as t_{THL} and t_{TLH}

[2] Delay between OE going LOW and when the outputs are actually disabled.

Typical power dissipation capacitance

Symbol	Parameter	Conditions	V _{CC(A)}							Unit
			1.2 V	1.2 V	1.5 V	1.8 V	2.5 V	2.5 V	3.3 V	
			V _{CC(B)}							
			1.8 V	5.0 V	1.8 V	1.8 V	2.5 V	5.0 V	3.3 V to 5.0 V	
T _{amb} = 25 °C										
C _{PD}	power dissipation capacitance	outputs enabled; OE = V _{CC(A)}								
		A port: (direction A to B)	6	5	6	6	6	5	5	pF
		A port: (direction B to A)	8	8	8	8	8	8	8	pF
		B port: (direction A to B)	26	30	26	26	27	30	30	pF
		B port: (direction B to A)	23	28	22	22	22	26	26	pF
		outputs disabled; OE = GND								
		A port: (direction A to B)	0.05	0.05	0.05	0.09	0.08	0.08	0.06	pF
		A port: (direction B to A)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	pF
		B port: (direction A to B)	0.00	0.02	0.00	0.00	0.00	0.00	0.00	pF
		B port: (direction B to A)	0.06	0.09	0.06	0.06	0.06	0.07	0.07	pF

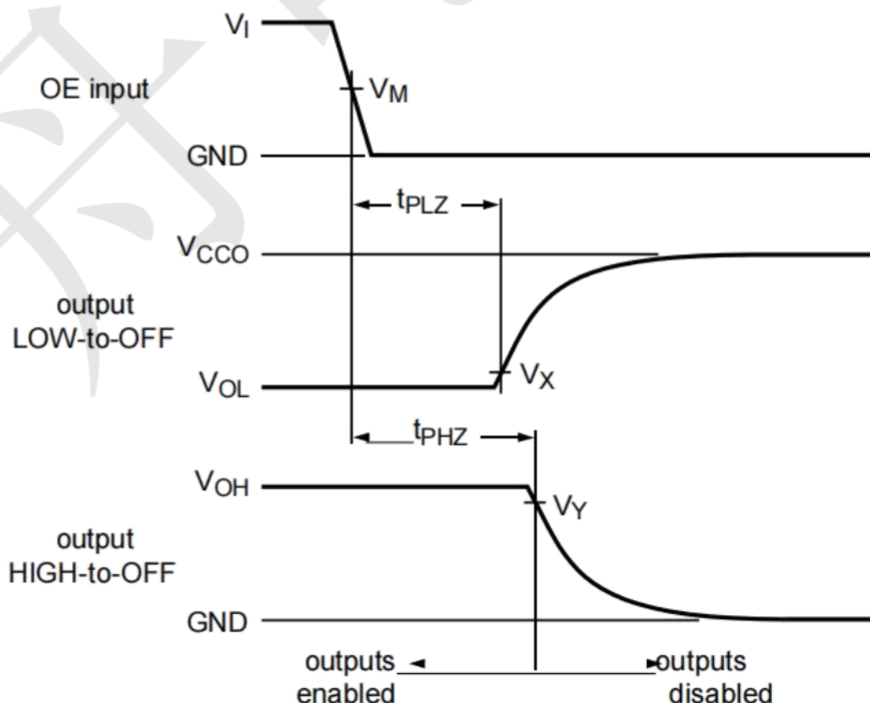
Waveforms and test circuit



Measurement points are given in

V_{OL} and V_{OH} are typical output voltage levels that occur with the output load.

The data input (An, Bn) to data output (Bn, An) propagation delay times



Measurement points are given in

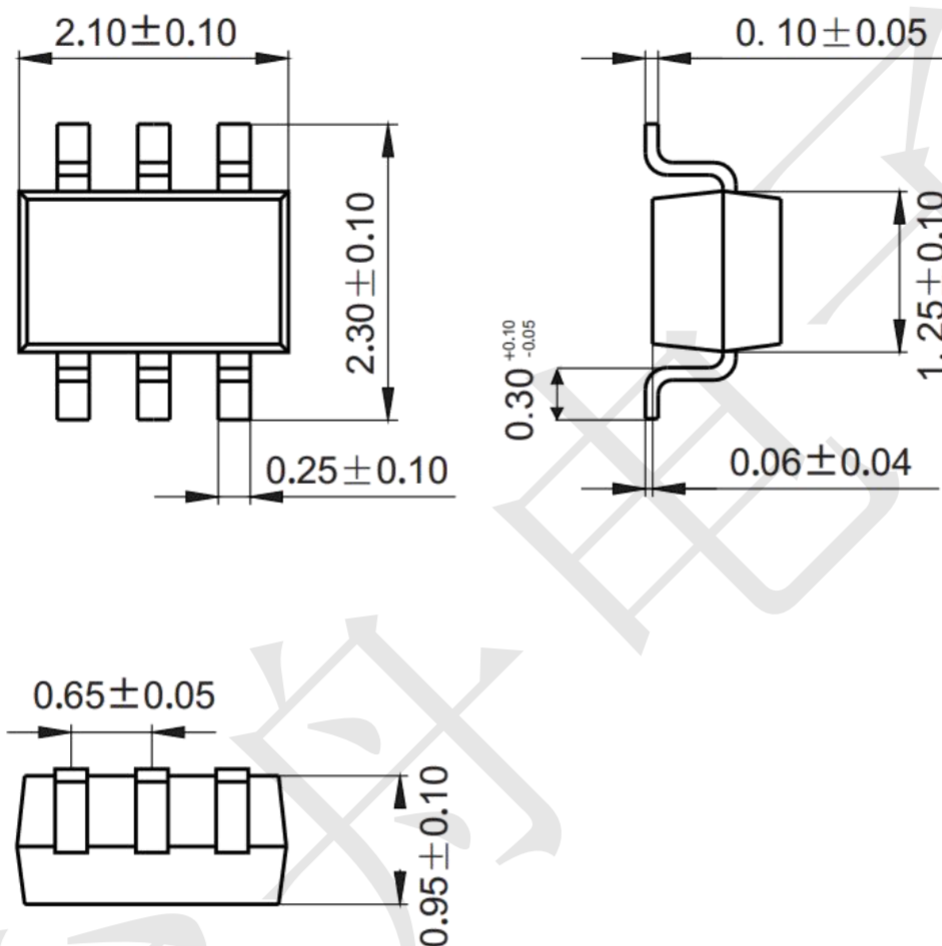
V_{OL} and V_{OH} are typical output voltage levels that occur with the output load.

V_{CCO} is the supply voltage associated with the output.

Disable times

Package information

SO-T363 (Unit: mm)



Mounting Pad Layout (unit: mm)

