

Features

- Operate from 1.6V to 5.5V
- Low Power Current: $I_{CC}=10\mu A$ (Max.)
- $\pm 8mA$ Output Drive ($V_{CC}=5.0V$)
- Power Down Protection
- ESD Protection Exceeds JESD 22
 - 2000-V Human-Body Model (A114-A)
 - 200-V Machine Model (A115-A)
 - 1000-V Charged-Device Model (C101)

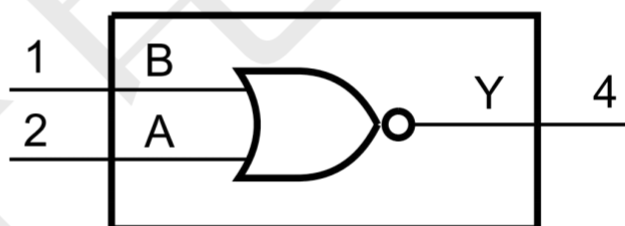
General Description

The is a single, level translating 2-input NOR gate. The low threshold inputs support 1.8 V input logic at $V_{CC} = 3.3 V$ and can be used in 1.8 V to 3.3 V level up translation. In addition, the 5 V tolerant input pins enable level down translation (3.3 V to 2.5 V output at $V_{CC} = 2.5 V$). The output level is referenced to the supply voltage and supports 1.8 V, 2.5 V, 3.3 V and 5.0 V CMOS levels.

Applications

- AV Receiver
- Audio Dock: Portable
- Blu-ray Player and Home Theater
- Embedded PC
- Personal Digital Assistant(PDA)
- Power: Telecom/Server AC/DC Supply: Single Controller: Analog and Digital
- Solid State Drive(SSD): Client and Enterprise
- Wireless Headset, Keyboard, and Mouse

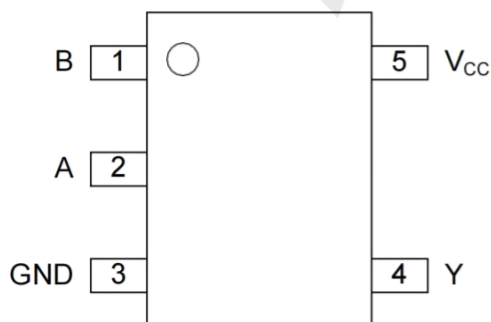
Logic Diagram



Ordering Information

ORDER NUMBER	PACKAGE DESCRIPTION	PACKAGE OPTION
SN74LV1T02DBVR-TP	SOT23-5	Tape and Reel, 3000
SN74LV1T02DCKR-TP	SOT353	Tape and Reel, 3000

Pin Configuratio



SOT23-5 / SOT353

Function Table

Input		Output
A	B	Y
L	L	H
L	H	L
H	L	L
H	H	L

Note: H: HIGH voltage level; L: LOW voltage level.

Absolute Maximum Ratings

PARAMETER	SYMBOL	TEST CONDITIONS	RATINGS	UNIT
Supply Voltage	V_{CC}		-0.5 ~ 7	V
Input Voltage (Note 2)	V_{IN}		-0.5 ~ 7	V
Output Voltage (Note 2)	V_{OUT}	Output in the high-impedance or power-off state	-0.5 ~ 4.6	V
		Output in the high or low state	-0.5 ~ $V_{CC}+0.5$	V
Continuous Output Current	I_{OUT}		± 25	mA
Continuous current through		V_{CC} or GND	± 50	mA
Input Clamp Current	I_{IK}	$V_{IN} < 0$	-20	mA
Output Clamp Current	I_{OK}	$V_{OUT} < 0$ or $V_{OUT} > V_{CC}$	± 20	mA
Storage Temperature Range	T_{STG}		-65 ~ +150	°C

Notes:

1. Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.
2. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

Recommended Operating Conditions

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Supply Voltage	V_{CC}	Operating	1.6	--	5.5	V
Input Voltage	V_{IN}		0	--	5.5	V
Output Voltage	V_{OUT}		0	--	V_{CC}	V
Operating Temperature	T_A		-40	--	+125	°C
Input transition rise and fall rate	$\Delta t/\Delta V$	$V_{CC} = 1.8 \text{ V to } 5.0 \text{ V}$	--	--	20	ns/V

STATIC CHARACTERISTICS ($T_A=25^\circ\text{C}$, unless otherwise specified)

Symbol	Parameter	Conditions	Min	TYP	Max	Unit
V_{IH}	HIGH-level input voltage	$V_{CC} = 1.65\text{ V to }1.8\text{ V}$	0.94	--	--	V
		$V_{CC} = 2.0\text{ V}$	0.99	--	--	V
		$V_{CC} = 2.25\text{ V to }2.5\text{ V}$	1.135	--	--	V
		$V_{CC} = 2.75\text{ V}$	1.21	--	--	V
		$V_{CC} = 3.0\text{ V to }3.3\text{ V}$	1.35	--	--	V
		$V_{CC} = 3.6\text{ V}$	1.47	--	--	V
		$V_{CC} = 4.5\text{ V to }5.0\text{ V}$	2.02	--	--	V
		$V_{CC} = 5.5\text{ V}$	2.25	--	--	V
V_{IL}	LOW-level input voltage	$V_{CC} = 1.65\text{ V to }2.0\text{ V}$	--	--	0.58	V
		$V_{CC} = 2.25\text{ V to }2.75\text{ V}$	--	--	0.75	V
		$V_{CC} = 3.0\text{ V to }3.6\text{ V}$	--	--	0.80	V
		$V_{CC} = 4.5\text{ V to }5.5\text{ V}$	--	--	0.80	V
V_{OH}	HIGH-level output voltage	$V_I = V_{IH}\text{ or }V_{IL}$				
		$V_{CC} = 1.65\text{ V to }5.5\text{ V}; I_O = -20\text{ }\mu\text{A}$	$V_{CC} - 0.1$	--	--	V
		$V_{CC} = 1.65\text{ V}; I_O = -2\text{ mA}$	1.28	--	--	V
		$V_{CC} = 1.8\text{ V}; I_O = -2\text{ mA}$	1.5	--	--	V
		$V_{CC} = 2.3\text{ V}; I_O = -2.3\text{ mA}$	2.0	--	--	V
		$V_{CC} = 2.3\text{ V}; I_O = -3\text{ mA}$	2.0	--	--	V
		$V_{CC} = 2.5\text{ V}; I_O = -3\text{ mA}$	2.25	--	--	V
		$V_{CC} = 3.0\text{ V}; I_O = -3\text{ mA}$	2.78	--	--	V
		$V_{CC} = 3.0\text{ V}; I_O = -5.5\text{ mA}$	2.6	--	--	V
		$V_{CC} = 3.3\text{ V}; I_O = -5.5\text{ mA}$	2.9	--	--	V
		$V_{CC} = 4.5\text{ V}; I_O = -4\text{ mA}$	4.2	--	--	V
		$V_{CC} = 4.5\text{ V}; I_O = -8\text{ mA}$	4.1	--	--	V
		$V_{CC} = 5.0\text{ V}; I_O = -8\text{ mA}$	4.6	--	--	V
V_{OL}	LOW-level output voltage	$V_I = V_{IH}\text{ or }V_{IL}$				
		$V_{CC} = 1.65\text{ V to }5.5\text{ V}; I_O = 20\text{ }\mu\text{A}$	--	--	0.1	V
		$V_{CC} = 1.65\text{ V}; I_O = 2\text{ mA}$	--	--	0.2	V
		$V_{CC} = 2.3\text{ V}; I_O = 2.3\text{ mA}$	--	--	0.1	V
		$V_{CC} = 2.3\text{ V}; I_O = 3\text{ mA}$	--	--	0.15	V
		$V_{CC} = 3.0\text{ V}; I_O = 3\text{ mA}$	--	--	0.1	V
		$V_{CC} = 3.0\text{ V}; I_O = 5.5\text{ mA}$	--	--	0.2	V
		$V_{CC} = 4.5\text{ V}; I_O = 4\text{ mA}$	--	--	0.15	V
		$V_{CC} = 4.5\text{ V}; I_O = 8\text{ mA}$	--	--	0.3	V

STATIC CHARACTERISTICS (Cont.)

Symbol	Parameter	Conditions	Min	TYP	Max	Unit
I_I	input leakage current	$V_I = V_{CC}$ or GND; $V_{CC} = 0$ V to 5.5 V	--	--	± 0.1	μA
I_{CC}	supply current	$V_I = V_{CC}$ or GND; $I_O = 0$ A; $V_{CC} = 1.8$ V, 2.5 V, 3.3 V, 5.0 V	--	--	1	μA
ΔI_{CC}	additional supply current	per input pin; $V_{CC} = 1.8$ V; $V_I = 0.3$ V or 1.1 V; $I_O = 0$ A; other pins at V_{CC} or GND	--	--	10	μA
		per input pin; $V_{CC} = 5.5$ V; $V_I = 0.3$ V or 3.4 V; $I_O = 0$ A; other pins at V_{CC} or GND	--	--	1.35	mA

DYNAMIC CHARACTERISTICS ($T_A = 25^\circ C$, unless otherwise specified)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
t_{pd}	propagation delay	A, B to Y; see				
		$V_{CC} = 1.8$ V; $C_L = 15$ pF	--	6.6	10.1	ns
		$V_{CC} = 1.8$ V; $C_L = 30$ pF	--	7.6	11.9	ns
		$V_{CC} = 2.5$ V; $C_L = 15$ pF	--	4.6	6.8	ns
		$V_{CC} = 2.5$ V; $C_L = 30$ pF	--	5.3	8.0	ns
		$V_{CC} = 3.3$ V; $C_L = 15$ pF	--	3.7	5.6	ns
		$V_{CC} = 3.3$ V; $C_L = 30$ pF	--	4.3	6.4	ns
		$V_{CC} = 5.0$ V; $C_L = 15$ pF	--	3.1	4.2	ns
		$V_{CC} = 5.0$ V; $C_L = 30$ pF	--	3.7	4.7	ns
C_I	input capacitance	$V_I = V_{CC}$ or GND; $V_{CC} = 3.3$ V	--	1.5	10	pF
C_O	output capacitance	$V_O = V_{CC}$ or GND; $V_{CC} = 3.3$ V	--	2.5	--	pF
C_{PD}	power dissipation capacitance	per buffer; $V_I =$ GND to V_{CC} ; $C_L = 30$ pF; $f = 10$ MHz				
		$V_{CC} = 1.8$ V	--	4.2	--	pF
		$V_{CC} = 2.5$ V	--	5.7	--	pF
		$V_{CC} = 3.3$ V	--	7.7	--	pF
		$V_{CC} = 5.0$ V	--	12	--	pF

t_{pd} is the same as t_{PLH} and t_{PHL} .

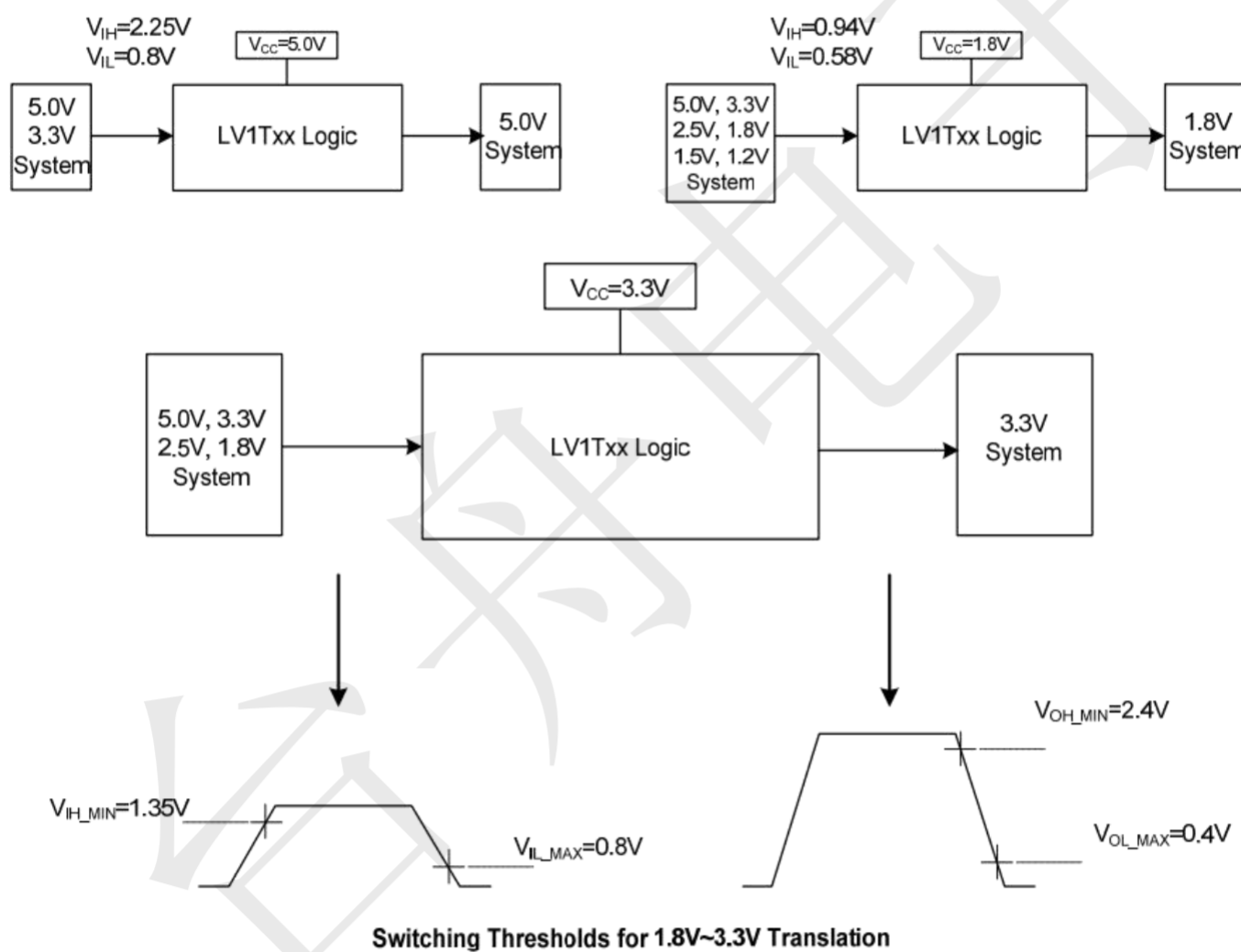
C_{PD} is used to determine the dynamic power dissipation (PD in μW). $PD =$

$f_i =$ input frequency in MHz; $f_o =$ output frequency in MHz;

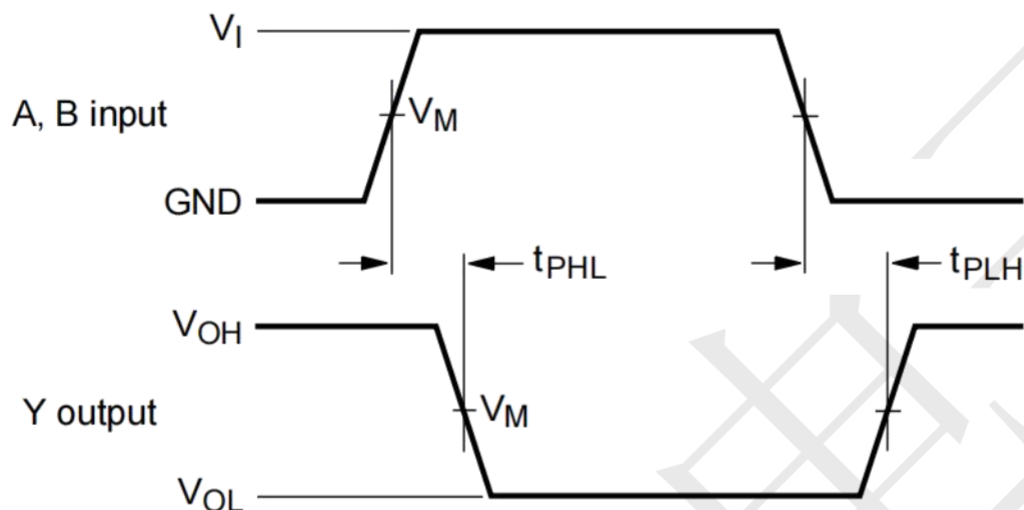
$C_L =$ output load capacitance in pF; $V_{CC} =$ supply voltage in V;

$N =$ number of inputs switching; $\sum (C_L \times V_{CC} \times 2 \times f_o) =$ sum of the outputs.

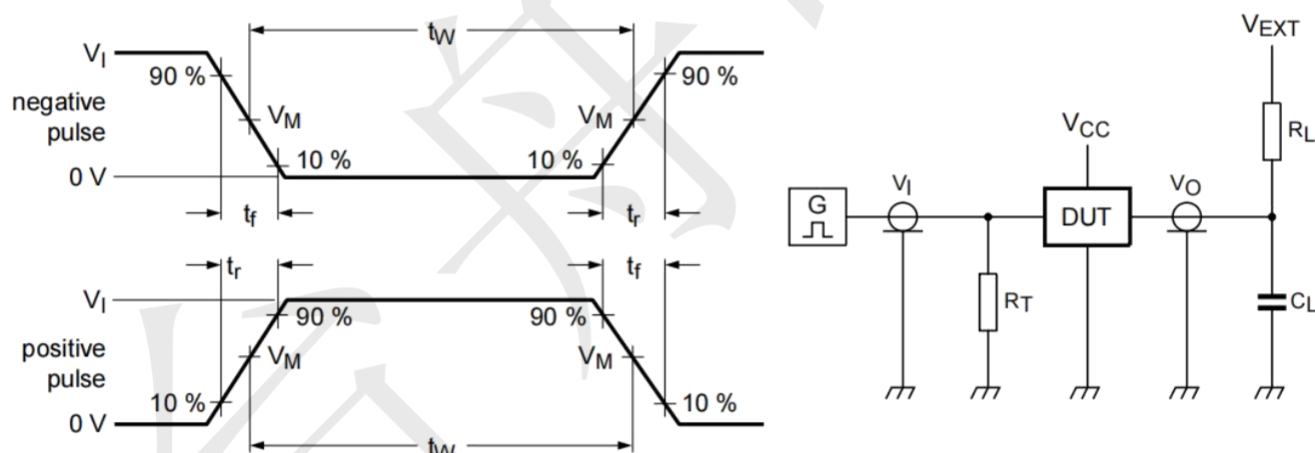
TYPICAL DESIGN EXAMPLES



TEST CIRCUIT AND WAVEFORMS



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



Definitions test circuit:

R_T = Termination resistance should be equal to output impedance Z_o of the pulse generator; C_L = Load capacitance including jig and probe capacitance;

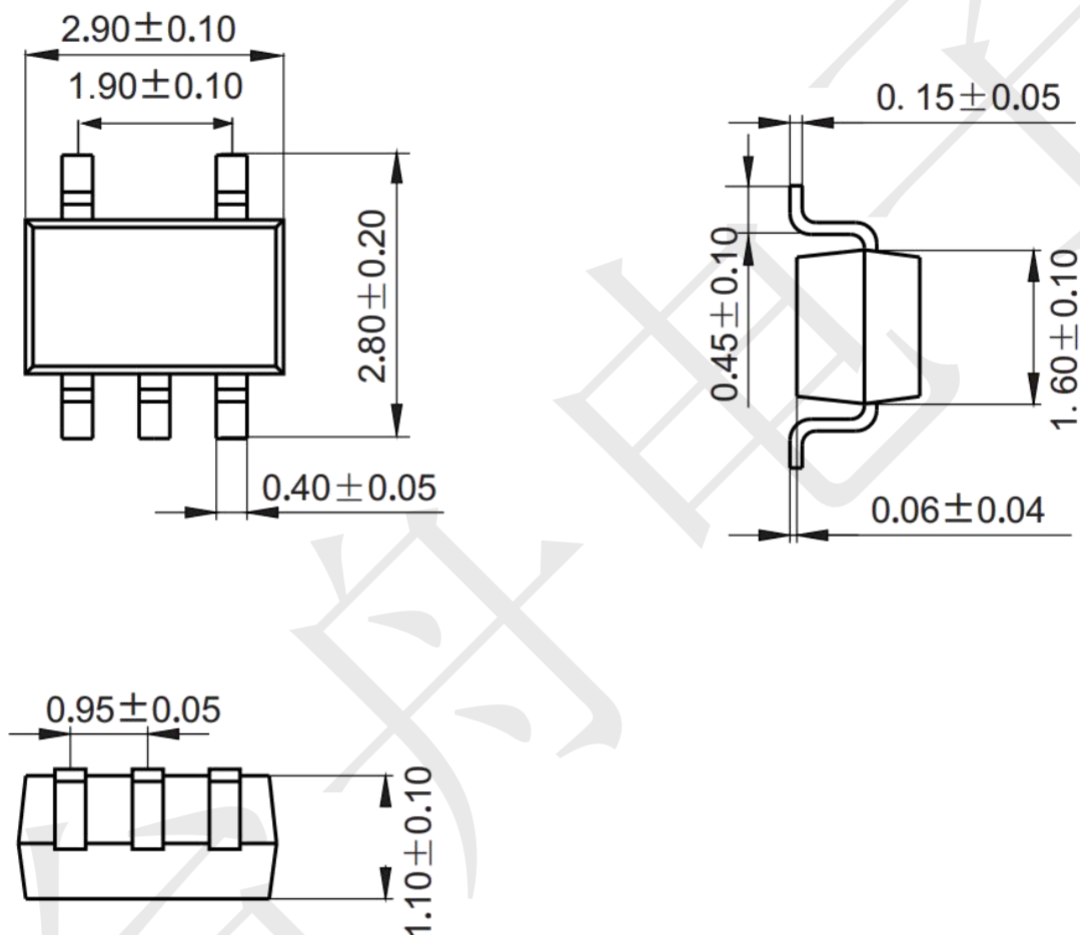
R_L = Load resistance;

V_{EXT} = External voltage for measuring switching times.

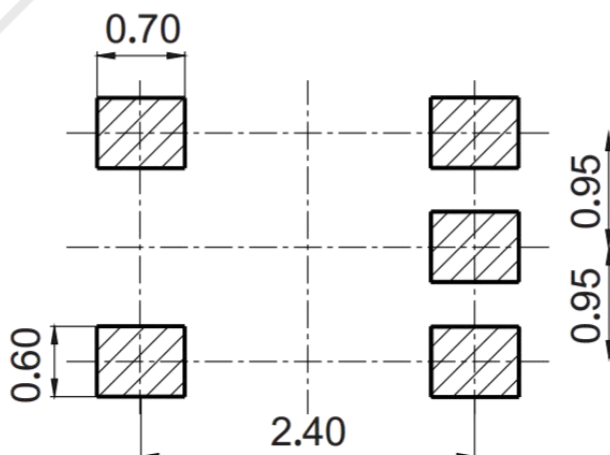
Supply voltage	Input			Load		V_{EXT}		
V_{CC}	V_I	$\Delta t/\Delta V$	f_{max}	C_L	R_L	t_{PLH}, t_{PHL}	t_{PZH}, t_{PHZ}	t_{PZL}, t_{PLZ}
1.8 V	V_{CC}	$\leq 1.0 \text{ ns/V}$	15 MHz	15 pF, 30 pF	1M Ω	GND	GND	V_{CC}
2.5 V	V_{CC}	$\leq 1.0 \text{ ns/V}$	25 MHz	15 pF, 30 pF	1M Ω	GND	GND	V_{CC}
3.3 V	3 V	$\leq 1.0 \text{ ns/V}$	50 MHz	15 pF, 30 pF	1M Ω	GND	GND	V_{CC}
5.0 V	3 V	$\leq 1.0 \text{ ns/V}$	50 MHz	15 pF, 30 pF	1M Ω	GND	GND	V_{CC}

Package information (Unit: mm)

SOT23-5

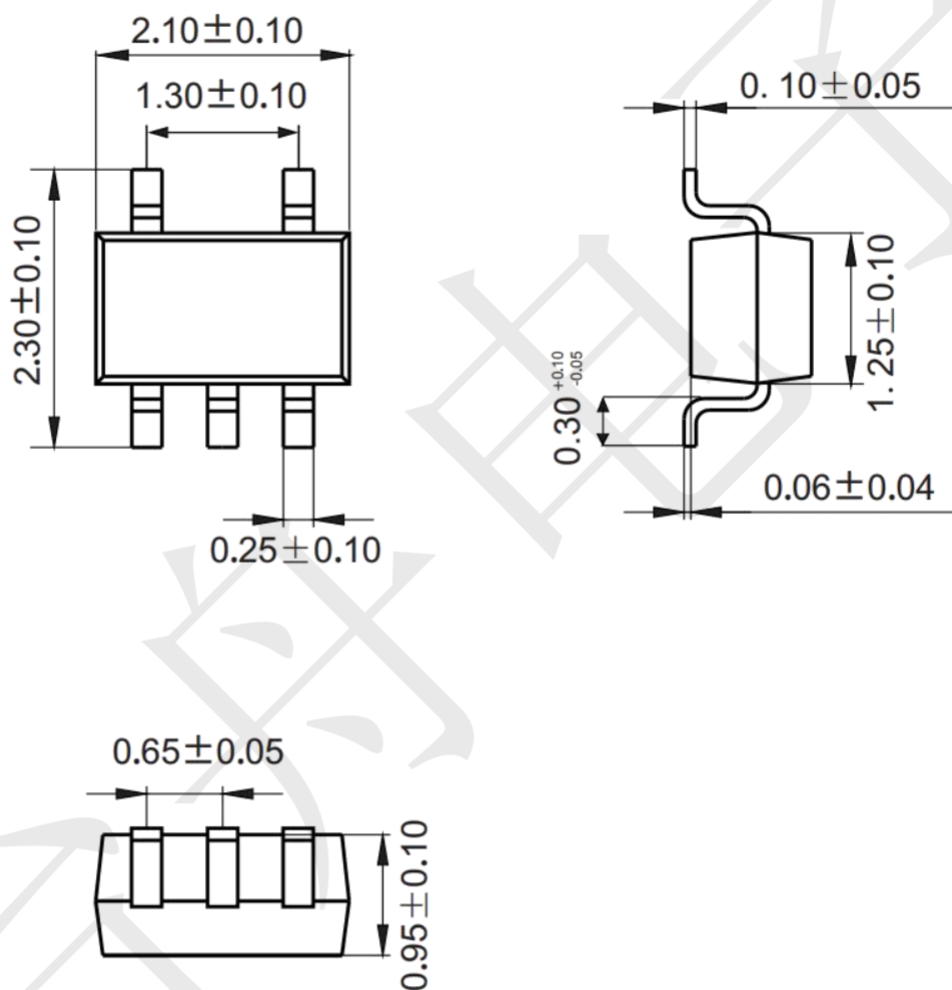


Mounting Pad Layout (unit: mm)



Package information (Unit: mm)

SOT353



Mounting Pad Layout (unit: mm)

