

General Description

This single 2-input positive-NAND gate is designed for 1.65-V to 5.5-V V_{CC} operation.

The SN74LVC1G00DCKR performs the Boolean function.

$Y = \overline{A \times B}$ or $Y = \overline{A} + \overline{B}$ in positive logic. The CMOS device has high output drive while maintaining low static power dissipation over a broad V_{CC} operating range.

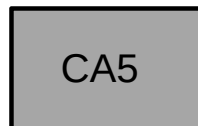
This device is fully specified for partial-power-down applications using I_{off} . The I_{off} circuitry disables the outputs, preventing damaging current backflow through the device when it is powered down.

Features

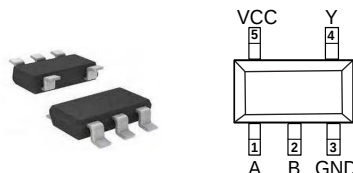
- Supports 5V V_{CC} operation
- Inputs accept voltages to 5.5 V
- Provides down translation to V_{CC}
- Low power consumption, 10- μ A Max I_{CC}
- ± 24 -mA output drive at 3.3 V
- I_{off} supports live insertion, partial-power-down mode, and back drive protection

Applications

- AC receiver
- Audio dock: portable
- Blu-ray players and home theaters
- Embedded PC
- MP3 player/recorder (portable audio)
- Personal digital assistant (PDA)



SOT-353



Functional Block Diagram



Pin Functions

Pin		Type	Description
Name	SOT-353		
A	1	I	Data Input
B	2	I	Data Input
GND	3	-	Ground
Y	4	O	Data Output
V_{CC}	5	-	Supply Voltage

Absolute Maximum Ratings

Parameters			Min	Max.	Unit
V _{CC}	Supply voltage range		-0.5	6.5	V
V _I	Input voltage range		-0.5	6.5	V
V _O	Voltage range applied to any output in the high-impedance or power-off state		-0.5	6.5	V
V _O	Voltage range applied to any output in the high or low state		-0.5	V _{CC} +0.5	V
I _{IK}	Input clamp current	V _I <0		-50	mA
I _{OK}	Output clamp current	V _O <0		-50	mA
I _O	Continuous output current			±50	mA
Continuous current through V _{CC} or GND				±100	mA
T _J	Junction temperature under bias			150	°C
T _{stg}	Storage temperature range		-65	150	°C

(1) Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under Recommended Operating Conditions is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

(2) The input negative-voltage and output voltage ratings may be exceeded if the input and output current ratings are observed.

ESD Ratings

ESD			Value	Unit
V(ESD)	Electrostatic Discharge	Human-Body Model (HBM) ⁽¹⁾	8 K	V
		Charged-Device Model (CDM) ⁽²⁾	2 K	V

(1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.

(2) JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process.

Thermal Information

Package Type	θ_{JA}	θ_{JC}	Unit
SOT-353	400	150	°C/W

Recommended Operating Conditions

Over operating free-air temperature range (unless otherwise noted)

Symbol	Parameter		Min	Max	Unit
V _{CC}	Supply Voltage		1.65	5.5	V
V _H	High-Level Input Voltage	VCC=1.65V to 1.95V	0.65×VCC		V
		VCC=2.3V to 2.7V	1.7		
		VCC=3V to 3.6V	2		
		VCC=4.5V to 5.5V	0.7×VCC		
V _L	Low-Level Input Voltage	VCC=1.65V to 1.95V		0.35×VCC	V
		VCC=2.3V to 2.7V		0.7	
		VCC=3V to 3.6V		0.8	
		VCC=4.5V to 5.5V		0.3×VCC	
V _I	Input Voltage		0	5.5	V
V _O	Output Voltage		0	VCC	V
I _{OH}	High-Level Output Current	VCC=1.65V		-4	mA
		VCC=2.3V		-8	
		VCC=3V		-16	
				-24	
		VCC=4.5V		-32	
I _{OL}	Low-Level Output Current	VCC=1.65V		4	mA
		VCC=2.3V		8	
		VCC=3V		16	
				24	
		VCC=4.5V		32	
Δt/Δv	Input Transition Rise or Fall Rate	VCC=1.8V±0.15V, 2.5V±0.2V		20	ns/V
		VCC=3.3V±0.3V		10	
		VCC=5V±0.5V		5	
TA	Operating Free-Air Temperature		-40	125	°C

Electrical Characteristics (T_J=25°C unless otherwise specified)

V_{CC}=1.65V to 5.5V, FULL=−40°C to +125°C. Typical values are at TA=+25°C (unless otherwise noted)

Parameter	Test Conditions	V _{CC}	−40°C to 85°C			−40°C to 125°C			Unit
			Min	Typ	Max	Min	Typ	Max	
V _{OH}	I _{OH} =−100 μA	1.65 V to 5.5 V	V _{CC} −0.1			V _{CC} −0.1			V
	I _{OH} =−4 mA	1.65 V	1.2			1.2			
	I _{OH} =−8 mA	2.3 V	1.9			1.9			
	I _{OH} =−16 mA	3 V	2.4			2.4			
	I _{OH} =−24 mA		2.3			2.3			
	I _{OH} =−32 mA	4.5 V	3.8			3.8			
V _{OL}	I _{OL} =100 μA	1.65 V to 5.5 V			0.1			0.1	V
	I _{OL} =4 mA	1.65 V			0.45			0.45	
	I _{OL} =8 mA	2.3 V			0.3			0.3	
	I _{OL} =16 mA	3 V			0.4			0.4	
	I _{OL} =24 mA				0.55			0.55	
	I _{OL} =32 mA	4.5 V			0.55			0.55	
I _I	A or B Inputs	V _I =5.5 V or GND	0 to 5.5 V		±5			±5	μA
I _{off}	V _I or V _O =5.5 V	0			±10			±10	μA
I _{CC}	V _I =5.5 V or GND, I _O =0	1.65 V to 5.5 V			10			10	μA
ΔI _{CC}	One Input at V _{CC} − 0.6 V, Other Inputs at V _{CC} or GND	3 V to 5.5 V			10			10	μA
C _i	V _I =V _{CC} or GND	3.3 V		5			5		pF

(1) All unused digital inputs of the device must be held at V_{CC} or GND to ensure proper device operation

Switching Characteristics, CL=15pF

Over recommended operating free-air temperature range (unless otherwise noted)

Parameter	From (Input)	To (Output)	−40°C to 85°C								Unit
			V _{CC} =1.8 V ± 0.15 V		V _{CC} =2.5 V ± 0.2 V		V _{CC} =3.3 V ± 0.3 V		V _{CC} =5 V ± 0.5 V		
			Min	Max	Min	Max	Min	Max	Min	Max	
tpd	A or B	Y	1.5	7.2	0.7	4.4	0.8	3.6	0.8	3.4	ns

Over recommended operating free-air temperature range, CL=30 pF or 50 pF (unless otherwise noted)

Parameter	From (Input)	To (Output)	−40°C to 85°C								Unit
			V _{CC} =1.8 V ± 0.15 V		V _{CC} =2.5 V ± 0.2 V		V _{CC} =3.3 V ± 0.3 V		V _{CC} =5 V ± 0.5 V		
			Min	Max	Min	Max	Min	Max	Min	Max	
tpd	A or B	Y	2.4	8	1.1	5.5	1	4.5	1	4	ns

Over recommended operating free-air temperature range, CL=30 pF or 50 pF (unless otherwise noted)

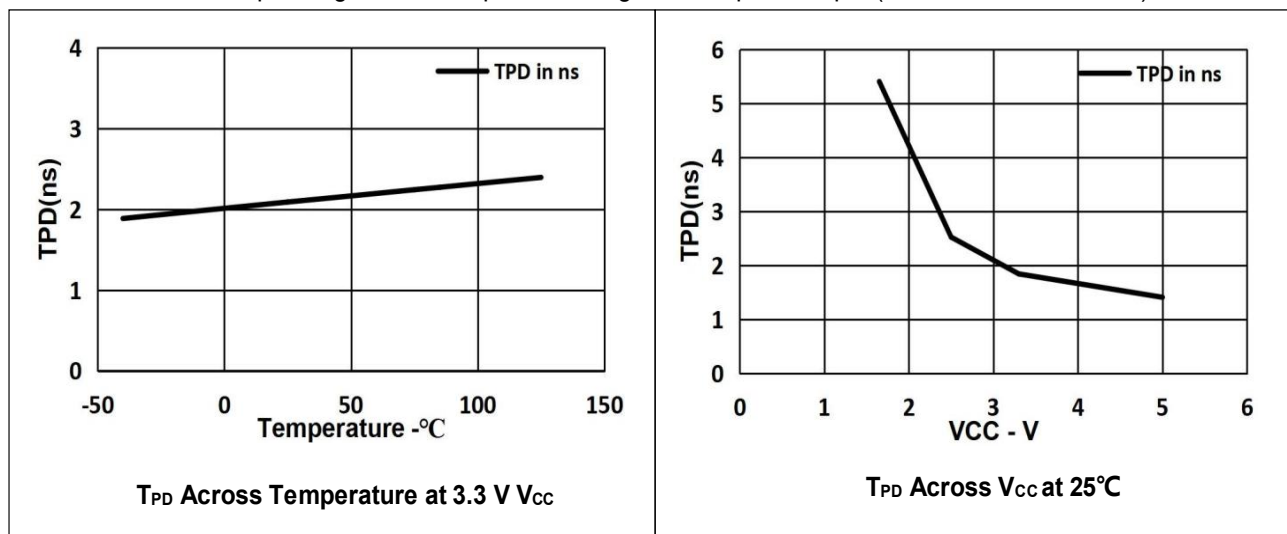
Parameter	From (Input)	TO (Output)	−40°C to 125°C								Unit
			V _{CC} =1.8 V ± 0.15 V		V _{CC} =2.5 V ± 0.2 V		V _{CC} =3.3 V ± 0.3 V		V _{CC} =5 V ± 0.5 V		
			Min	Max	Min	Max	Min	Max	Min	Max	
tpd	A or B	Y	2.4	10	1.1	7	1	6	1	5	ns

Operating Characteristics

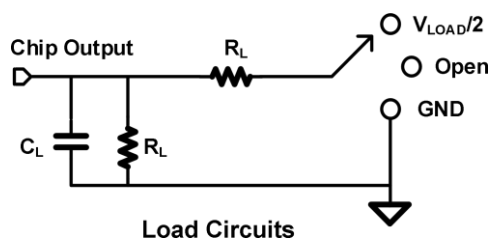
	Parameter	Test Conditions	V _{CC} =1.8 V	V _{CC} =2.5 V	V _{CC} =3.3 V	V _{CC} =5 V	Unit
			Typ	Typ	Typ	Typ	
C _{pd}	Power Dissipation Capacitance	f=10 MHz	16	18	19	20	pF

RATING AND CHARACTERISTIC CURVES

Over recommended operating free-air temperature range, $C_L=30\text{ pF}$ or 50 pF (unless otherwise noted).



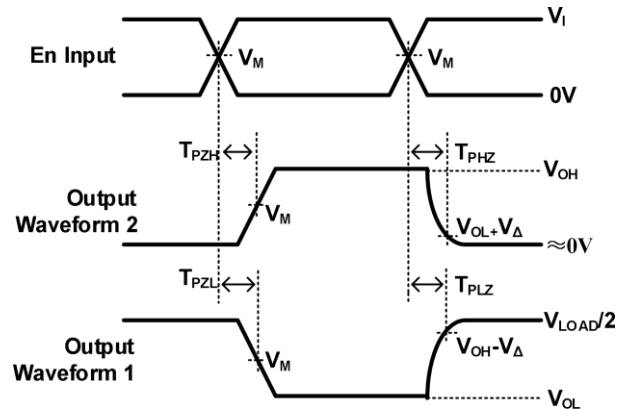
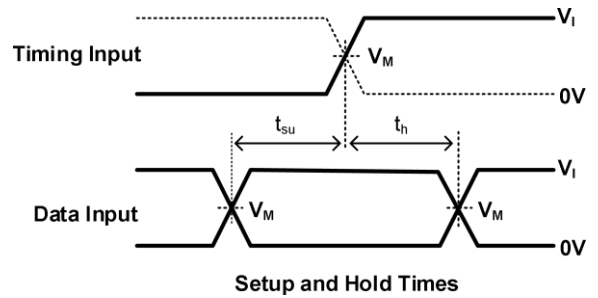
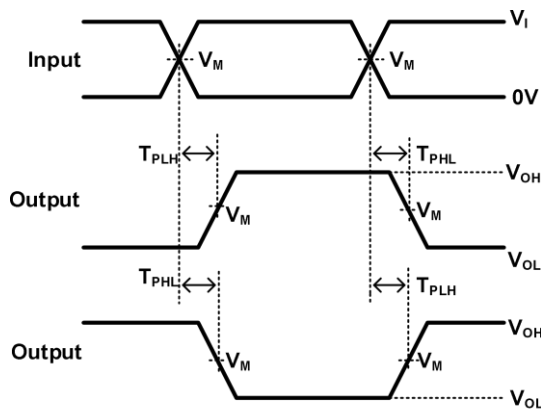
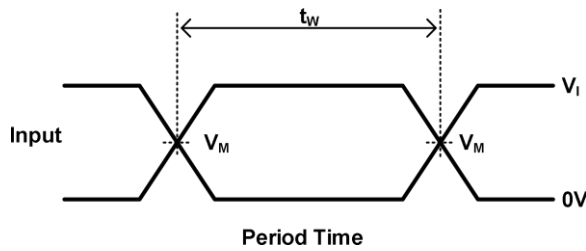
Parameter Measurement Information



TEST	S1
T_{PHL}/T_{PLH}	OPEN
T_{PLZ}/T_{PZL}	V_{LOAD}
T_{PHZ}/T_{PZH}	GND

V_{CC}	INPUTS		V_M	V_{LOAD}	C_L	R_L	V_{Δ}
	V_I	T_r/T_f					
$1.8V \pm 0.15V$	V_{CC}	$\leq 2ns$	$V_{CC}/2$	$2 \times V_{CC}$	15pF	1MΩ	0.15V
$2.5V \pm 0.15V$	V_{CC}	$\leq 2ns$	$V_{CC}/2$	$2 \times V_{CC}$	15pF	1MΩ	0.15V
$3.3V \pm 0.15V$	3V	$\leq 2.5ns$	1.5V	6V	15pF	1MΩ	0.3V
$5V \pm 0.15V$	V_{CC}	$\leq 2.5ns$	$V_{CC}/2$	$2 \times V_{CC}$	15pF	1MΩ	0.3V

Parameter Measurement Information



Notes: A. C_L includes probe and jig capacitance.

B. Waveform 1 is for an output with internal conditions such that the output is low, except when disabled by the output control.

Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the output control.

C. All input pulses are supplied by generators having the following characteristics: PRR 10 MHz, $Z = 50$.

D. The outputs are measured one at a time, with one transition per measurement.

E. t_{PLZ} and t_{PHZ} are the same as t_{dis} .

F. t_{PZL} and t_{PZH} are the same as t_{en} .

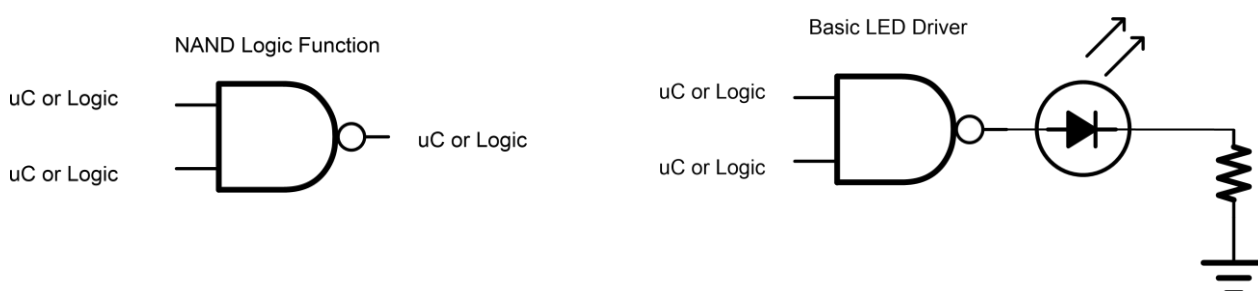
G. t_{PLH} and t_{PHL} are the same as t_{pd} .

H. All parameters and waveforms are not applicable to all device.

Application Note

The SN74LVC1G00DCKR is a high drive CMOS device that can be used for implementing NAND logic with high output drive, such as an LED application. It can produce 24 mA of drive current at 3.3 V making it ideal for driving multiple outputs and good for high speed applications up to 100 MHz. The inputs are 5.5V tolerant allowing it to translate down to V_{CC} .

Typical Application

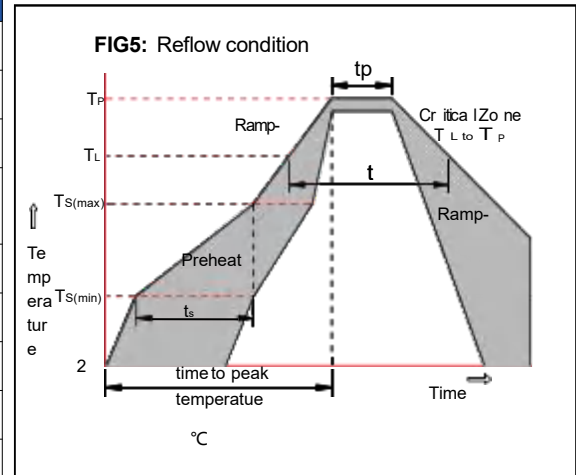


Device Functional Modes

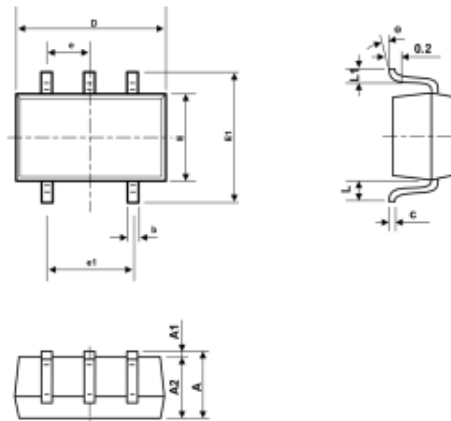
Input A		Output Y
A	B	Y
H	H	L
L	X	H
X	L	H

Soldering parameters

Reflow Condition		Pb-Free assembly (see as below)
Pre Heat	-Temperature Min ($T_{s(min)}$)	+150°C
	-Temperature Max($T_{s(max)}$)	+200°C
	-Time (Min to Max) (ts)	60-180 secs.
Average ramp up rate (Liquid us Temp (T_L) to peak)		3°C/sec. Max
$T_{s(max)}$ to T_L - Ramp-up Rate		3°C/sec. Max
Reflow	-Temperature(T_L)(Liquid us)	+217°C
	-Temperature(t_L)	60-150 secs.
Peak Temp (T_P)		+260(+0/-5)°C
Time within 5°C of actual Peak Temp (t_P)		30 secs. Max
Ramp-down Rate		6°C/sec. Max
Time 25°C to Peak Temp (T_P)		8 min. Max
Do not exceed		+260°C



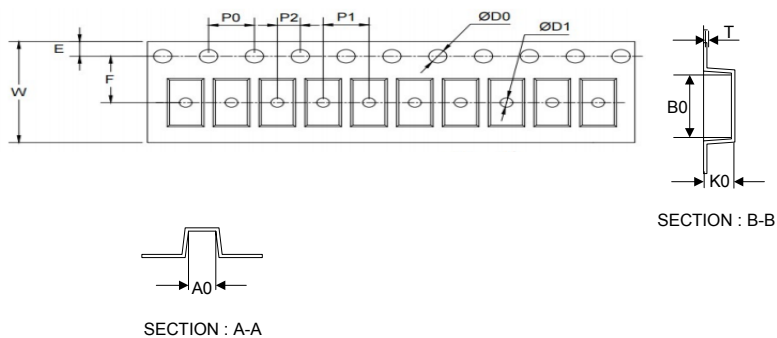
Package Dimensions & Suggested Pad Layout



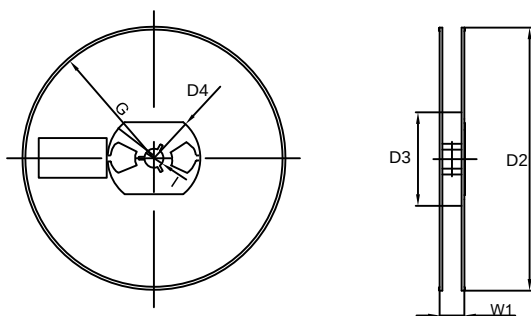
symbol	Dimension In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.900	1.100	0.035	0.043
A1	0.000	0.100	0.000	0.004
A2	0.900	1.000	0.035	0.039
B	0.180	0.380	0.008	0.014
C	0.110	0.175	0.004	0.007
D	2.000	2.200	0.079	0.087
E	1.150	1.350	0.045	0.053
E1	2.150	2.450	0.085	0.098
e	0.850TYP		0.028TYP	
e1	1.200	1.400	0.047	0.055
L	0.528REF		0.021REF	
L1	0.280	0.480	0.010	0.018
s	0"	8"	0"	8"

Tape & reel specification

Tape



7" Reel



Symbol	Dimension (mm)
P0	4.00±0.20
P1	4.00±0.20
P2	2.00±0.20
D0	1.55±0.20
D1	1.00±0.20
E	1.55±0.25
F	3.60±0.20
W	8.00±0.20
A0	2.70±0.20
B0	2.90±0.20
K0	1.35±0.20
T	0.20±0.20
D2	177.0±5.0
D3	55Min.
D4	R24.6±2.0
G	R82.0±2.0
I	13.0±2.0
W1	10.20±3.0

Quantity: 3000PCS