

Description

The 74LVC1G86Q is an automotive-compliant, single 2-input positive EXCLUSIVE OR gate with a standard push-pull output. The device is designed for operation with a power supply range of 1.65V to 5.5V. The inputs are tolerant to 5.5V allowing this device to be used in a mixed voltage environment. The device is fully specified for partial power down applications using I_{OFF}. The I_{OFF} circuitry disables the output preventing damaging current backflow when the device is powered down.

The gate performs the positive Boolean function:

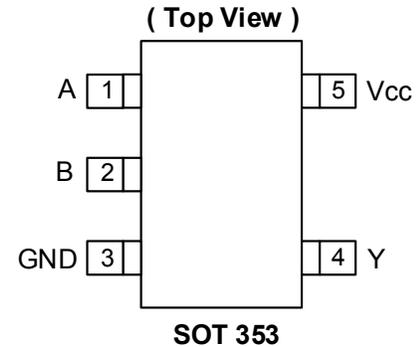
$$Y = A \oplus B \text{ or } Y = \overline{A}B + A\overline{B}$$

Features

- Grade 1 Ambient Temperature Operation: -40°C to 125°C
- Wide Supply Voltage Range from 1.65V to 5.5V
- ±24mA Output Drive at 3.3V
- CMOS Low Power Consumption
- I_{OFF} Supports Partial Power Down Mode Operation
- Inputs Accept up to 5.5V
- ESD Protection Tested per AEC-Q100
 - Exceeds 2000V Human Body Model (AEC Q100-002)
 - Exceeds 1000V Charged Device Model (AEC Q100-011)
- Latch-Up Exceeds 100mA (AEC Q100-004)
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **The 74LVC1G86Q is suitable for automotive applications requiring specific change control and is AEC-Q100 qualified, has a grade 1 -40°C to 125°C temperature rating, is PPAP capable, and is manufactured in IATF16949:2016 certified facilities.**

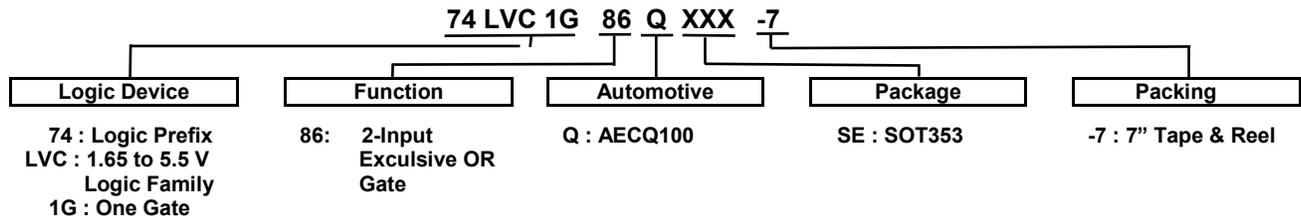
- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
 2. See <https://www.diodes.com/quality/lead-free/> for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
 3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.

Pin Assignments



Applications

- Voltage Level Shifting
- General Purpose Logic
- Power Down Signal Isolation
- Wide Array of Products such as:
 - Automotive Applications Within Grade 1 Temperature Range
 - Industrial Computing/Controls/Automation
 - High Reliability Networking/Communications
 - Industrial/Agricultural Equipment

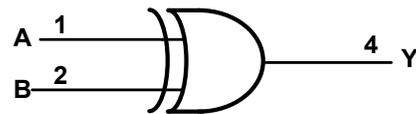
Ordering Information (Note 4)


Part Number	Package Code	Package (Notes 6 & 7)	Package Size	7" Tape and Reel	
				Quantity	Part Number Suffix
74LVC1G86QSE-7	SE	SOT353	2.0mm × 2.0mm × 1.1mm 0.65mm lead pitch	3000/Tape & Reel	-7

Notes: 4. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.
 5. Pad layout as shown in Diodes Inc. suggested pad layouts, which can be found on our website at see <http://www.diodes.com/package-outlines.html>.
 6. The taping orientation is located on our website at <http://www.diodes.com/datasheets/ap02007.pdf>.

Pin Descriptions

Pin Name	Description
A	Data Input
B	Data Input
GND	Ground
Y	Data Output
V _{CC}	Supply Voltage

Logic Diagram

Function Table

Inputs		Output
A	B	Y
H	H	L
L	H	H
H	L	H
L	L	L

Absolute Maximum Ratings (Notes 7 & 8)

Symbol	Description	Rating	Unit
ESD HBM	Human Body Model ESD Protection	2	kV
ESD CDM	Charged Device Model ESD Protection	1	kV
V _{CC}	Supply Voltage Range	-0.5 to 6.5	V
V _I	Input Voltage Range	-0.5 to 6.5	V
V _O	Voltage Applied to Output in High Impedance or I _{OFF} State	-0.5 to 6.5	V
V _O	Voltage Applied to Output in High or Low State	-0.5 to V _{CC} +0.5	V
I _{IK}	Input Clamp Current V _I <0	-50	mA
I _{OK}	Output Clamp Current	-50	mA
I _O	Continuous Output Current	±50	mA
I _{CC} , I _{GND}	Continuous Current Through V _{CC} or GND	±100	mA
T _J	Operating Junction Temperature	-40 to +150	°C
T _{STG}	Storage Temperature	-65 to +150	°C

- Notes:
- Stresses beyond the absolute maximum may result in immediate failure or reduced reliability. These are stress values and device operation should be within recommend values.
 - Forcing the maximum allowed voltage could cause a condition exceeding the maximum current or conversely forcing the maximum current could cause a condition exceeding the maximum voltage. The ratings of both current and voltage must be maintained within the controlled range.

Recommended Operating Conditions (Note 9)

Symbol	Parameter	Min	Max	Unit	
V _{CC}	Operating Voltage	Operating	1.65	5.5	V
		Data Retention Only	1.5	—	V
V _{IH}	High-Level Input Voltage	V _{CC} = 1.65V to 1.95V	0.65 × V _{CC}	—	V
		V _{CC} = 2.3V to 2.7V	1.7	—	
		V _{CC} = 3V to 3.6V	2	—	
		V _{CC} = 4.5V to 5.5V	0.7 × V _{CC}	—	
V _{IL}	Low-Level Input Voltage	V _{CC} = 1.65V to 1.95V	—	0.35 × V _{CC}	V
		V _{CC} = 2.3V to 2.7V	—	0.7	
		V _{CC} = 3V to 3.6V	—	0.8	
		V _{CC} = 4.5V to 5.5V	—	0.3 × V _{CC}	
V _I	Input Voltage	0	5.5	V	
V _O	Output Voltage	0	V _{CC}	V	
I _{OH}	High-Level Output Current	V _{CC} = 1.65V	—	-4	mA
		V _{CC} = 2.3V	—	-8	
		V _{CC} = 2.7V	—	-12	
		V _{CC} = 3V	—	-16	
		V _{CC} = 4.5V	—	-24	
		V _{CC} = 4.5V	—	-32	
I _{OL}	Low-Level Output Current	V _{CC} = 1.65V	—	4	mA
		V _{CC} = 2.3V	—	8	
		V _{CC} = 2.7V	—	12	
		V _{CC} = 3V	—	16	
		V _{CC} = 4.5V	—	24	
Δt/ΔV	Input Transition Rise or Fall Rate	V _{CC} = 1.8V ± 0.15V, 2.5V ± 0.2V	—	20	ns/V
		V _{CC} = 3.3V ± 0.3V	—	10	
		V _{CC} = 5V ± 0.5V	—	5	
T _A	Operating Free-Air Temperature	—	-40	+125	°C

- Note: 9. Unused inputs should be held at V_{CC} or Ground.

Electrical Characteristics (All typical values are at $V_{CC} = 3.3V$, $T_A = +25^\circ C$)

Symbol	Parameter	Test Conditions	V_{CC}	-40°C to +125°C			Unit	
				Min	Typ	Max		
V_{OH}	High Level Output Voltage	$V_I = V_{IH}$ or V_{IL}	$I_{OH} = -100\mu A$	1.65V to 5.5V	$V_{CC} - 0.1$	—	—	V
			$I_{OH} = -4mA$	1.65V	0.95	—	—	
			$I_{OH} = -8mA$	2.3V	1.7	—	—	
			$I_{OH} = -12mA$	2.7V	1.9	—	—	
			$I_{OH} = -24mA$	3V	2.0	—	—	
			$I_{OH} = -32mA$	4.5V	3.4	—	—	
V_{OL}	Low Level Output Voltage	$V_I = V_{IH}$ or V_{IL}	$I_{OL} = 100\mu A$	1.65V to 5.5V	—	—	0.10	V
			$I_{OL} = 4mA$	1.65V	—	—	0.70	
			$I_{OL} = 8mA$	2.3V	—	—	0.45	
			$I_{OL} = 12mA$	2.7V	—	—	0.60	
			$I_{OL} = 24mA$	3V	—	—	0.80	
			$I_{OL} = 32mA$	4.5V	—	—	0.80	
I_I	Input Current	$V_I = 5.5V$ or GND	0 to 5.5V	—	± 0.1	± 1	μA	
I_{OFF}	Power Down Leakage Current	V_I or $V_O = 5.5V$	0V	—	—	± 2	μA	
I_{CC}	Supply Current	$V_I = 5.5V$ or GND $I_O = 0$	5.5V	—	0.1	4	μA	
ΔI_{CC}	Additional Supply Current	One input at $V_{CC} - 0.6V$ Other inputs at V_{CC} or GND	3V to 5.5V	—	—	500	μA	
C_I	Input Capacitance	$V_I = GND$ to V_{CC}	3.3V	—	5.0	—	pF	

Package Characteristics

Symbol	Parameter	Test Conditions	V_{CC}	Min	Typ.	Max	Unit
θ_{JA}	Thermal Resistance Junction-to-Ambient	SOT353	Note 10	—	371	—	$^\circ C/W$
θ_{JC}	Thermal Resistance Junction-to-Case	SOT353	Note 10	—	143	—	$^\circ C/W$

Note: 10. Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.

Switching Characteristics

Figure 1 Typical Values at $T_A = +25^\circ C$ and nominal voltages 1.8V, 2.5V, 2.7V, 3.3V, and 5.0V.

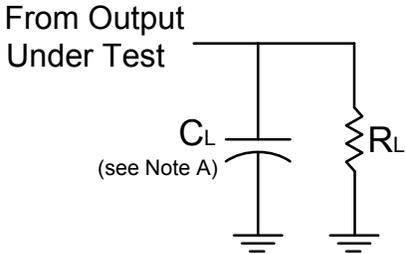
Parameter	From Input	To Output	V_{CC}	$T_A = -40^\circ C$ to $125^\circ C$			Unit
				Min	Typ	Max	
t_{PD}	A or B	Y	1.8V \pm 0.15V	1.0	3.7	13.0	ns
			2.5V \pm 0.2V	0.5	2.5	7.0	
			2.7V	0.5	2.8	7.5	
			3.3V \pm 0.3V	0.5	2.3	6.5	
			5.0V \pm 0.5V	0.5	1.9	5.5	

Operating Characteristics

$T_A = +25^\circ C$

Parameter	Test Conditions	$V_{CC} = 1.8V$	$V_{CC} = 2.5V$	$V_{CC} = 3.3V$	$V_{CC} = 5V$	Unit	
		Typ	Typ	Typ	Typ		
C_{pd}	Power Dissipation Capacitance	f = 10 MHz	18	18	18	18	pF

Measurement Information



V _{CC}	Inputs		V _M	C _L	R _L
	V _I	t _r /t _f			
1.8V ± 0.15V	V _{CC}	≤2ns	V _{CC} /2	30pF	1KΩ
2.5V ± 0.2V	V _{CC}	≤2ns	V _{CC} /2	30pF	500Ω
2.7V	V _{CC}	≤2.5ns	1.5V	50pF	500Ω
3.3V ± 0.3V	3.0V	≤2.5ns	1.5V	50pF	500Ω
5.0V ± 0.5V	V _{CC}	≤2.5ns	V _{CC} /2	50pF	500Ω

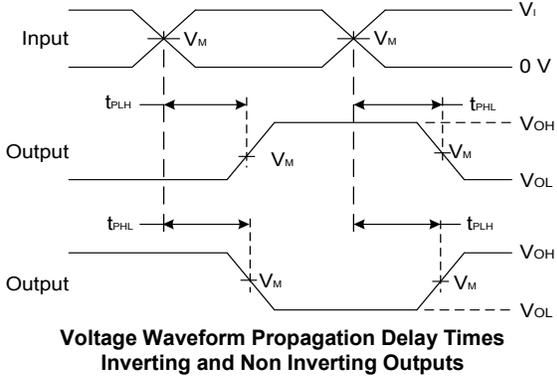
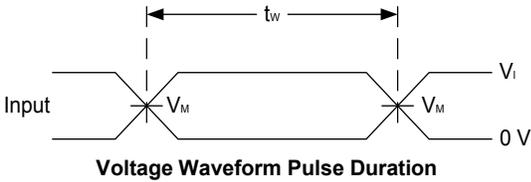
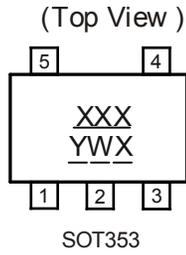


Figure 1 Load Circuit and Voltage Waveforms

- Notes:
- A. Includes test lead and test apparatus capacitance.
 - B. All pulses are supplied at pulse repetition rate ≤ 10 MHz.
 - C. Inputs are measured separately one transition per measurement.
 - D. t_{PLH} and t_{PHL} are the same as t_{PD}.

Marking Information

SOT353



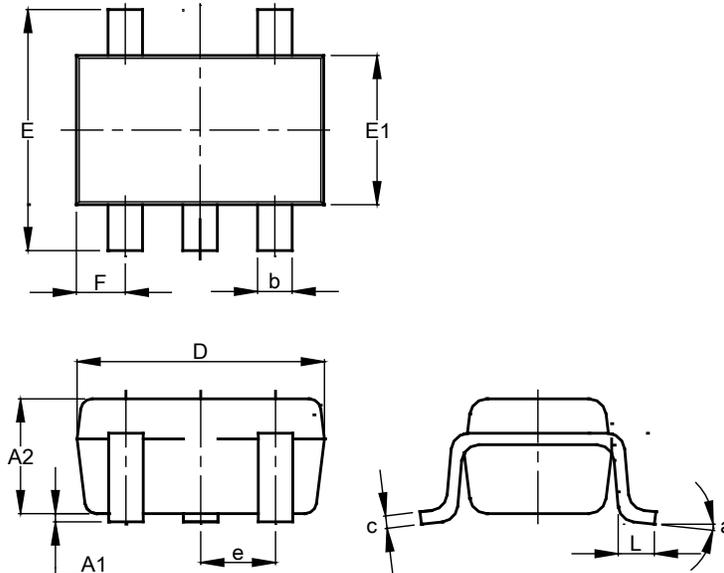
XXX : Identification Code
Y : Year 0~9
W : Week: A~Z 1~26 week
 a~z 27~52 week
 z represents week 52 and 53
 : A~ Z: Internal Code

Part Number	Package	Identification Code
74LVC1G86QSE-7	SOT353	UXQ

Package Outline Dimensions

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

SOT353

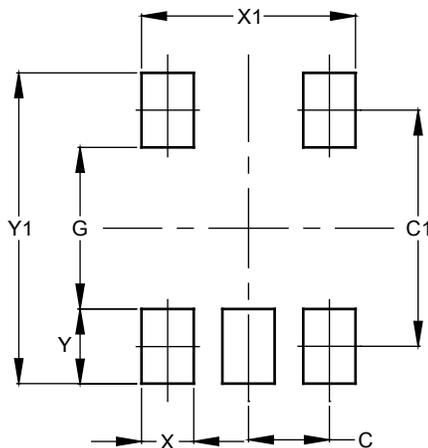


SOT353			
Dim	Min	Max	Typ
A1	0.00	0.10	0.05
A2	0.90	1.00	0.95
b	0.10	0.30	0.25
c	0.10	0.22	0.11
D	1.80	2.20	2.15
E	2.00	2.20	2.10
E1	1.15	1.35	1.30
e	0.650 BSC		
F	0.40	0.45	0.425
L	0.25	0.40	0.30
a	0°	8°	--
All Dimensions in mm			

Suggested Pad Layout

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

SOT353



Dimensions	Value (in mm)
C	0.650
C1	1.900
G	1.300
X	0.420
X1	1.720
Y	0.600
Y1	2.500

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