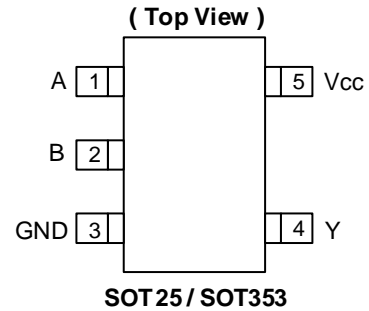


## Description

The 74AHCT1G86Q is an automotive compliant single, two-input positive Exclusive-OR gate with a standard push-pull output. The device is designed for operation with a power supply range of 4.5V to 5.5V. The gate performs the positive Boolean function:

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

## Pin Assignments



## Features

- Grade 1 Ambient Temperature Operation: -40°C to +125°C
- Supply Voltage Range from 4.5V to 5.5V
- ±8mA Output Drive at 5.0V
- CMOS Low-Power Consumption
- Schmitt Trigger Action at All Inputs Make the Circuit Tolerant for Slower Input Rise and Fall Time
- Inputs Not Limited by V<sub>cc</sub>
- Balanced Propagation Delays
- Balanced Drive Capability
- ESD Protection Tested per AEC-Q100
- Exceeds 2000-V Human Body Model (AEC-Q100-002)
- Exceeds 1000-V 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 74AHCT1G86Q is suitable for automotive applications requiring specific change control; this part is AEC-Q100 qualified, PPAP capable, and manufactured in IATF 16949 certified facilities.**

<https://www.diodes.com/quality/product-definitions/>

## Applications

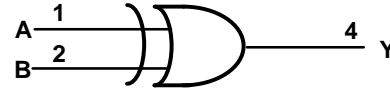
- General Purpose Logic
- Wide Array of Products, such as:
  - Automotive Applications within Grade 1 Temperature Range
  - Industrial Computing/Controls/Automation
  - High Reliability Networking/Communications
  - Industrial/Agricultural Equipment

- 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 Descriptions**

Pin Name	Description
A	Data Input
B	Data Input
GND	Ground
Y	Data Output
Vcc	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 4 & 5)

Symbol	Description	Rating	Unit
ESD HBM	Human Body Model ESD Protection	2	kV
ESD CDM	Charged Device Model ESD Protection	1	kV
V <sub>CC</sub>	Supply Voltage Range	-0.5 to 6.5	V
V <sub>I</sub>	Input Voltage Range	-0.5 to 6.5	V
V <sub>O</sub>	Voltage Applied to Output in High or Low State	-0.5 to V <sub>CC</sub> + 0.5	V
I <sub>IK</sub>	Input Clamp Current V <sub>I</sub> < 0	-20	mA
I <sub>OK</sub>	Output Clamp Current (V <sub>O</sub> < 0 or V <sub>O</sub> > V <sub>CC</sub> )	±20	mA
I <sub>O</sub>	Continuous Output Current (V <sub>O</sub> = 0 to V <sub>CC</sub> )	±25	mA
I <sub>CC</sub>	Continuous Current Through V <sub>CC</sub>	50	mA
I <sub>GND</sub>	Continuous Current Through GND	-50	mA
T <sub>J</sub>	Operating Junction Temperature	-40 to +150	°C
T <sub>STG</sub>	Storage Temperature	-65 to +150	°C
P <sub>D</sub>	Total Power Dissipation (Note 6)	250	mW

- Notes:
4. Stresses beyond the absolute maximum can result in immediate failure or reduced reliability. These are stress values and device operation should be within recommend values.
  5. 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.
  6. This will need to be derated at higher operating temperatures to prevent exceeding maximum T<sub>J</sub>. Refer to package thermal characteristics section.

**Recommended Operating Conditions** (Note 7)

Symbol	Parameter		Min	Max	Unit
V <sub>CC</sub>	Operating Voltage	—	4.5	5.5	V
V <sub>IH</sub>	High-Level Input Voltage	V <sub>CC</sub> = 5V ± 0.5V	2.0	—	V
V <sub>IL</sub>	Low-Level Input Voltage	V <sub>CC</sub> = 5V ± 0.5V	—	0.8	V
V <sub>I</sub>	Input Voltage		0	5.5	V
V <sub>O</sub>	Output Voltage		0	V <sub>CC</sub>	V
I <sub>OH</sub>	High-Level Output Current	V <sub>CC</sub> = 5V ± 0.5V	—	-8	mA
I <sub>OL</sub>	Low-Level Output Current	V <sub>CC</sub> = 5V ± 0.5V	—	8	mA
Δt/ΔV	Input Transition Rise or Fall Rate	V <sub>CC</sub> = 5V ± 0.5V	—	20	ns/V
T <sub>A</sub>	Ambient Temperature	—	-40	+125	°C

Note: 7. Unused inputs should be held at V<sub>CC</sub> or Ground.

**Electrical Characteristics** (All typical values are at V<sub>CC</sub> = 5V, T<sub>A</sub> = +25°C.)

Symbol	Parameter	Test Conditions	V <sub>CC</sub>	+25°C			-40°C to +85°C		-40°C to +125°C		Unit
				Min	Typ	Max	Min	Max	Min	Max	
V <sub>OH</sub>	High Level Output Voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> I <sub>OH</sub> = -50μA	4.5V	4.4	4.5	—	4.4	—	4.4	—	V
		V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> I <sub>OH</sub> = -8mA	4.5V	3.94	—	—	3.8	—	3.70	—	V
V <sub>OL</sub>	Low Level Output Voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> I <sub>OL</sub> = 50μA	4.5V	—	0	0.1	—	0.1	—	0.1	V
		V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> I <sub>OL</sub> = 8mA	4.5V	—	—	0.36	—	0.44	—	0.55	V
I <sub>I</sub>	Input Current	V <sub>I</sub> = 5.5V or GND	0 to 5.5V	—	—	±0.1	—	±1	—	±2	μA
ΔI <sub>CC</sub>	Additional Supply Current	Per input pin; V <sub>I</sub> = 3.4V; other inputs at V <sub>CC</sub> or GND; I <sub>O</sub> = 0	5.5V	—	—	1.35	—	1.5	—	1.5	mA
I <sub>CC</sub>	Supply Current	V <sub>I</sub> = 5.5V or GND I <sub>O</sub> = 0	5.5V	—	—	1	—	10	—	40	μA
C <sub>I</sub>	Input Capacitance	V <sub>I</sub> = V <sub>CC</sub> or GND	5.5V	—	1.5	10	—	10	—	10	pF

## Package Characteristics

Symbol	Parameter	Package	Test Conditions	Min	Typ	Max	Unit
$\theta_{JA}$	Thermal Resistance Junction-to-Ambient	SOT25	Note 8	—	184	—	°C/W
		SOT353		—	385	—	
$\theta_{JC}$	Thermal Resistance Junction-to-Case	SOT25	Note 8	—	62	—	°C/W
		SOT353		—	164	—	

Note: 8. Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.

## Switching Characteristics

$V_{CC} = 5V \pm 0.5V$  (See Figure 1, Typical values at  $V_{CC} = 5V$ .)

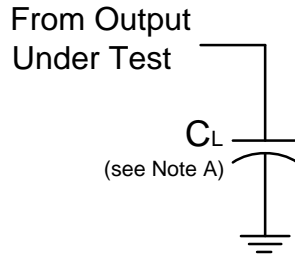
Parameter	From (Input)	To (Output)	Test Conditions	+25°C			-40°C to +85°C		-40°C to +125°C		Unit
				Min	Typ	Max	Min	Max	Min	Max	
$t_{PD}$	A or B	Y	$C_L = 15pF$	1.0	3.5	6.9	1.0	8.0	1.0	9.0	ns
			$C_L = 50pF$	1.0	5.0	7.9	1.0	9.0	1.0	10.5	ns

## Operating Characteristics

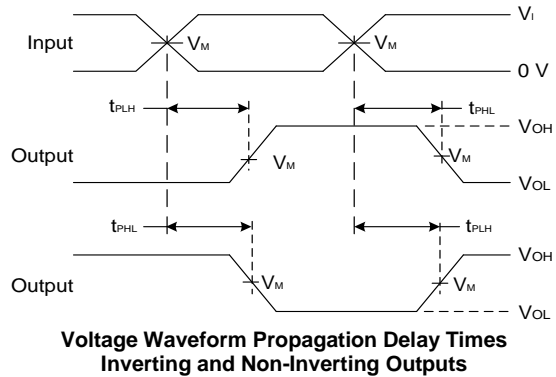
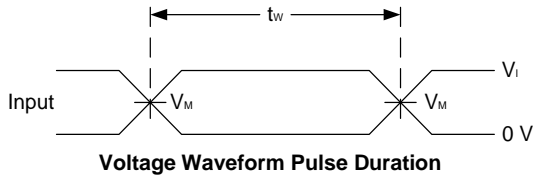
$T_A = +25^\circ C$

Parameter	Test Conditions	$V_{CC} = 5V$		Unit
		Typ		
$C_{PD}$	f = 1MHz No Load	10		pF

**Measurement Information**



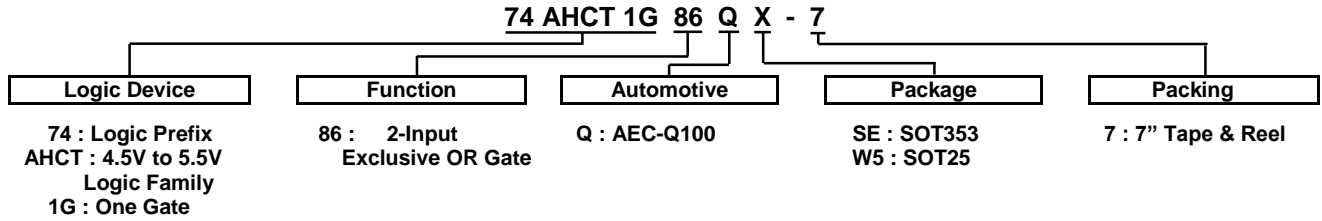
$V_{CC}$	Inputs			Output	$C_L$
	$V_I$	$t_R/t_F$	$V_M$	$V_M$	
$5V \pm 0.5V$	GND to $V_{CC}$	$\leq 3ns$	1.5V	$V_{CC}/2$	15pF
$5V \pm 0.5V$	GND to $V_{CC}$	$\leq 3ns$	1.5V	$V_{CC}/2$	50pF



**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  $\leq 1MHz$ .
  - C. Inputs are measured separately one transition per measurement.
  - D.  $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{PD}$ .

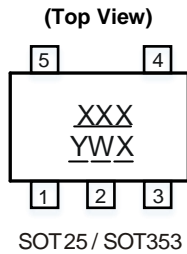
**Ordering Information** (Note 9)



Part Number	Package Code	Package (Notes 10 & 11)	Package Size	7" Tape and Reel	
				Quantity	Part Number Suffix
74AHCT1G86QSE-7	SE	SOT353	2.15mm × 2.1mm × 1.1mm 0.65mm lead pitch	3000/Tape & Reel	-7
74AHCT1G86QW5-7	W5	SOT25	3.0mm × 2.8mm × 1.2mm 0.95mm lead pitch	3000/Tape & Reel	-7

Notes: 9. For packaging details, go to our website at <https://www.diodes.com/design/support/packaging/diodes-packaging/>.  
 10. Pad layout as shown in Diodes Incorporated's package outline PDFs, which can be found on our website at <http://www.diodes.com/package-outlines.html>.  
 11. The taping orientation is located on our website at <https://www.diodes.com/assets/Packaging-Support-Docs/ap02007.pdf>.

**Marking Information**



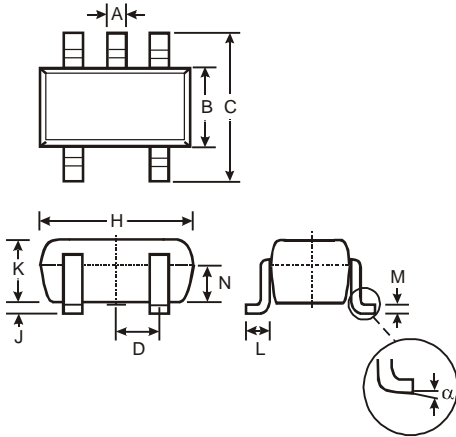
XXX : Identification Code  
 Y : Year 0~9  
 W : Week: A~Z 1~26 week  
       a~z 27~52 week  
       z represents week 52 and 53  
 X : A~ Z: Internal Code

Part Number	Package	Identification Code
74AHCT1G86QW5-7	SOT25	ZXQ
74AHCT1G86QSE-7	SOT353	ZXQ

## Package Outline Dimensions

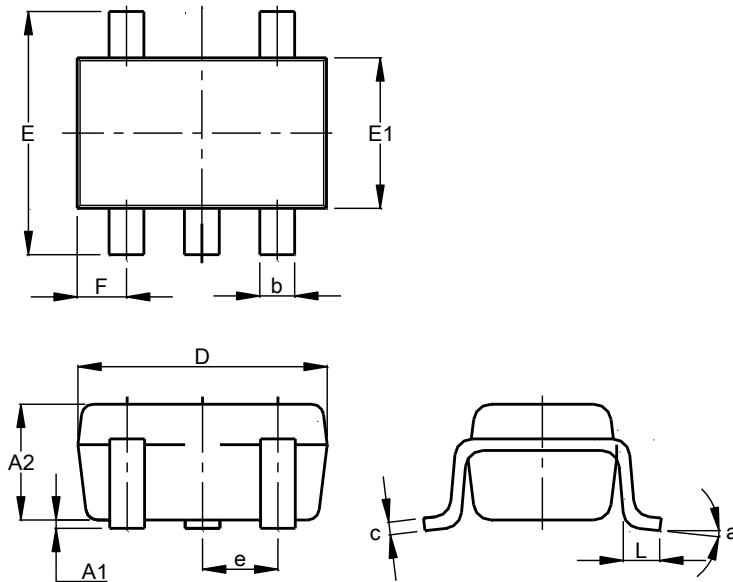
Please see <http://www.diodes.com/package-outlines.html> for the latest version.

### (1) Package Type: SOT25



SOT25			
Dim	Min	Max	Typ
A	0.35	0.50	0.38
B	1.50	1.70	1.60
C	2.70	3.00	2.80
D	-	-	0.95
H	2.90	3.10	3.00
J	0.013	0.10	0.05
K	1.00	1.30	1.10
L	0.35	0.55	0.40
M	0.10	0.20	0.15
N	0.70	0.80	0.75
α	0°	8°	-
All Dimensions in mm			

### (2) Package Type: SOT353

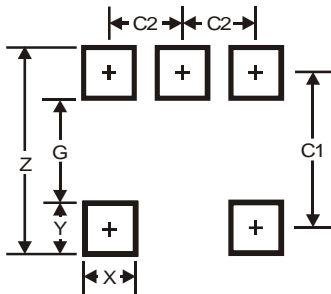


SOT353			
Dim	Min	Max	Typ
A1	0.00	0.10	0.05
A2	0.90	1.00	0.95
b	0.10	0.30	0.25
c	0.10	0.22	0.11
D	1.80	2.20	2.15
E	2.00	2.20	2.10
E1	1.15	1.35	1.30
e	0.650 BSC		
F	0.40	0.45	0.425
L	0.25	0.40	0.30
a	0°	8°	--
All Dimensions in mm			

## Suggested Pad Layout

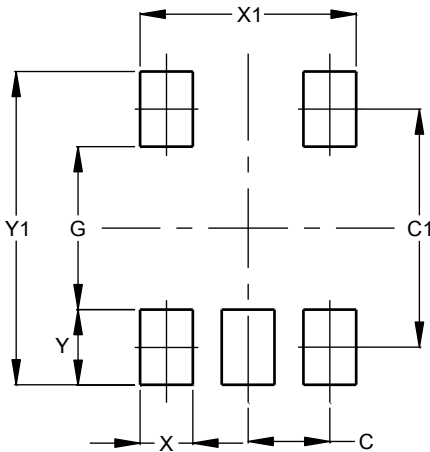
Please see <http://www.diodes.com/package-outlines.html> for the latest version.

### (1) Package Type: SOT25



Dimensions	Value
Z	3.20
G	1.60
X	0.55
Y	0.80
C1	2.40
C2	0.95

### (2) Package Type: 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

## Mechanical Data

### SOT25

- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – Matte Tin Plated Leads, Solderable per MIL-STD-202, Method 208@3
- Weight: 0.0158 grams (Approximate)

### SOT353

- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – Matte Tin Plated Leads, Solderable per MIL-STD-202, Method 208@3
- Weight: 0.0064 grams (Approximate)



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