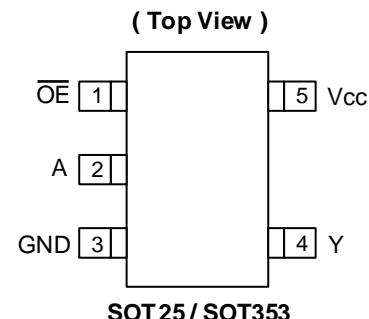


## Description

The 74AHCT1G125Q is an automotive compliant, single non-inverting buffer/bus driver with a 3-state output. The output enters a high impedance state when a HIGH-level is applied to the output enable ( $\overline{OE}$ ) pin. The device is designed for operation with a power supply range of 4.5V to 5.5V.

## Pin Assignments



## Features

- Grade 1 Ambient Temperature Operation: -40°C to +125°C
- Supply Voltage Range from 4.5V to 5.5V
- $\pm 8\text{mA}$  Output Drive at 4.5V
- 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 Vcc
- 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 74AHCT1G125Q 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

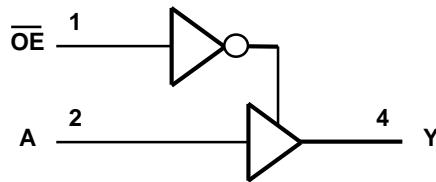
Notes:

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
$\overline{OE}$	Output Enable
A	Data Input
GND	Ground
Y	Data Output
V <sub>cc</sub>	Supply Voltage

## Logic Diagram



## Function Table

Inputs		Output
$\overline{OE}$	A	Y
L	H	H
L	L	L
H	X	Z

## 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>	75	mA
I <sub>GND</sub>	Continuous Current Through GND	-75	mA
T <sub>J</sub>	Operating Junction Temperature	-40 to +150	°C
T <sub>TSG</sub>	Storage Temperature	-65 to +150	°C
P <sub>D</sub>	Total Power Dissipation (Note 6)	250	mW

Notes:

- Stresses beyond the absolute maximum can result in immediate failure or reduced reliability. These are stress values and device operation should be within recommended 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.
- 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			2.0	—	V
V <sub>IL</sub>	Low-Level Input Voltage			—	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			—	-8	mA
I <sub>OL</sub>	Low-Level Output Current			—	8	mA
Δt/ΔV	Input Transition Rise or Fall Rate			—	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>OZ</sub>	Z State Leakage Current	V <sub>I</sub> = 5.5V or GND V <sub>O</sub> = 0 to 5.5V	5.5V	—	—	0.25	—	2.5	—	10	μA
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  $V_{CC} = 5V$ .)

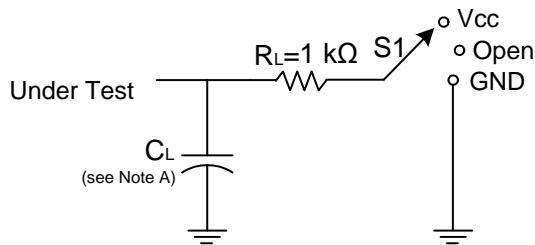
Parameter	From (Input)	To (Output)	Test Conditions	+25°C			-40°C to +85°C		-40°C to +125°C		Unit
				Min	Typ	Max	Min	Max	Min	Max	
$t_{PD}$	A	Y	$C_L = 15pF$	1.0	3.4	5.5	1.0	6.5	1.0	7.0	ns
			$C_L = 50pF$	1.0	4.8	7.5	1.0	8.5	1.0	9.5	ns
$t_{EN}$	$\overline{OE}$	Y	$C_L = 15pF$	1.0	3.9	5.1	1.0	6.0	1.0	6.5	ns
			$C_L = 50pF$	1.0	5.1	7.5	1.0	8.5	1.0	9.5	ns
$t_{DIS}$	$\overline{OE}$	Y	$C_L = 15pF$	1.0	4.5	6.8	1.0	8.0	1.0	8.5	ns
			$C_L = 50pF$	1.0	6.1	8.8	1.0	10.0	1.0	11.0	ns

## Operating Characteristics

$T_A = +25^\circ C$

Parameter		Test Conditions	Typ	Unit
CPD	Power Dissipation Capacitance	$V_{CC} = 5.0V, f = 1MHz$ $C_L = 50pF$ $V_I = GND$ to $V_{CC}$	11	pF

## Measurement Information



Test	S1
$t_{PLH}/t_{PHL}$	Open
$t_{PLZ}/t_{PZL}$	$V_{LOAD}$
$t_{PHZ}/t_{PZH}$	GND

$V_{CC}$	Inputs		$V_M$	$V_{LOAD}$	$C_L$	$R_L$	$V_{\Delta}$
	$V_I$	$t_R/t_F$					
$5V \pm 0.5V$	GND to 3V	$\leq 2.5ns$	1.5V	$V_{CC}$	15pF	$1k\Omega$	0.3V
$5V \pm 0.5V$	GND to 3V	$\leq 2.5ns$	1.5V	$V_{CC}$	50pF	$1k\Omega$	0.3V

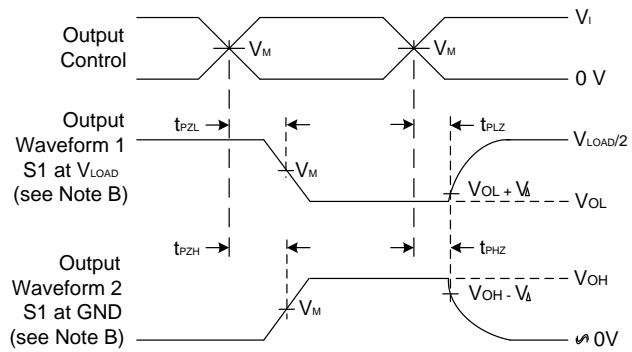
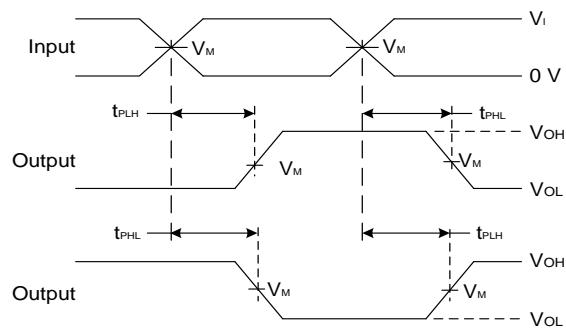
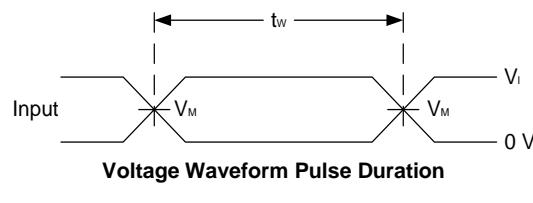


Figure 1. Load Circuit and Voltage Waveforms

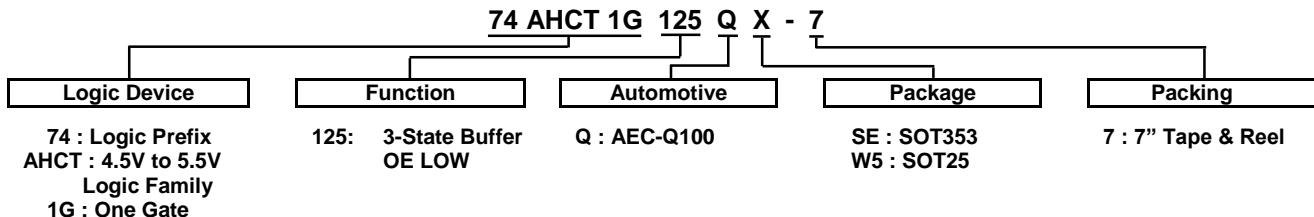
Notes:

- 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.  $t_{PLZ}$  and  $t_{PHZ}$  are the same as  $t_{DIS}$ .
- E.  $t_{PZL}$  and  $t_{PZH}$  are the same as  $t_{EN}$ .
- F.  $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{PD}$ .

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**Ordering Information** (Note 9)
 

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Part Number	Package Code	Package (Notes 10 & 11)	Package Size	7" Tape and Reel	
				Quantity	Part Number Suffix
74AHCT1G125QSE-7	SE	SOT353	2.15mm × 2.1mm × 1.1mm 0.65mm lead pitch	3000/Tape & Reel	-7
74AHCT1G125QW5-7	W5	SOT25	3.0mm × 2.8mm × 1.2mm 0.95mm lead pitch	3000/Tape & Reel	-7

Notes:

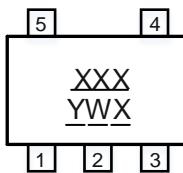
9. For packaging details, go to our website at <https://www.diodes.com/design/support/packaging/diodes-packaging/>.
10. Pad layout as shown in Diodes Incorporated's package outline PDFs, which can be found on our website at <http://www.diodes.com/package-outlines.html>.
11. The taping orientation is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

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**Marking Information**


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(Top View)



SOT25 / SOT353

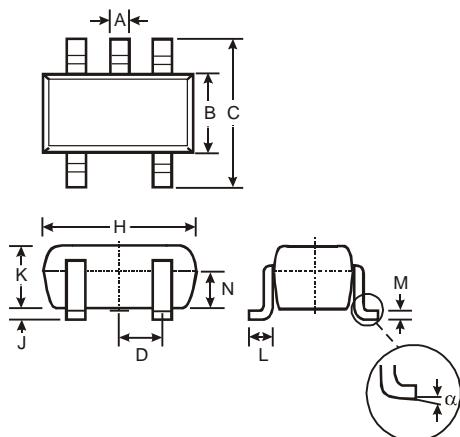
XXX : Identification Code  
 Y : Year 0~9  
 W : Week: A~Z 1~26 week  
       a~z 27~52 week  
       z represents week 52 and 53  
 X : A~Z : Internal Code

Part Number	Package	Identification Code
74AHCT1G125QW5-7	SOT25	ZYQ
74AHCT1G125QSE-7	SOT353	ZYQ

## Package Outline Dimensions

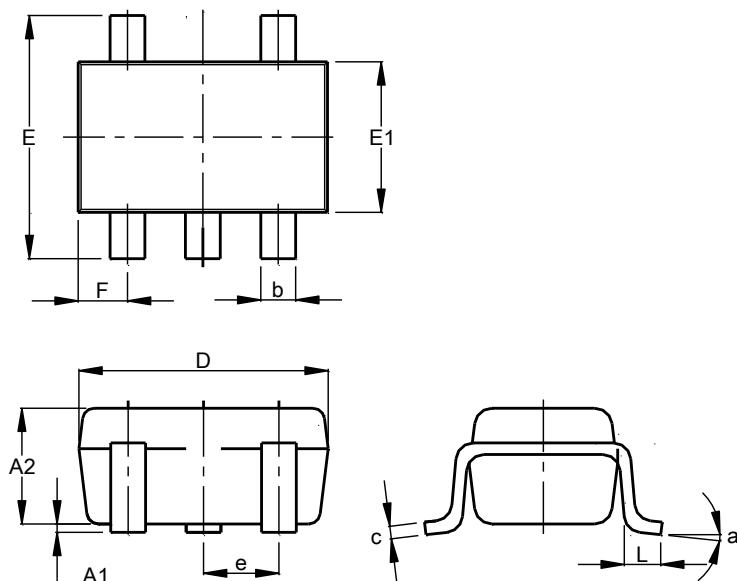
Please see <http://www.diodes.com/package-outlines.html> for the latest version.

### (1) Package Type: SOT25



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

### (2) Package Type: SOT353

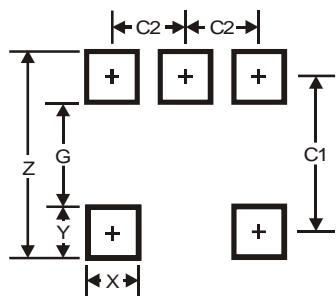


SOT353			
Dim	Min	Max	Typ
<b>A1</b>	0.00	0.10	0.05
<b>A2</b>	0.90	1.00	0.95
<b>b</b>	0.10	0.30	0.25
<b>c</b>	0.10	0.22	0.11
<b>D</b>	1.80	2.20	2.15
<b>E</b>	2.00	2.20	2.10
<b>E1</b>	1.15	1.35	1.30
<b>e</b>	0.650 BSC		
<b>F</b>	0.40	0.45	0.425
<b>L</b>	0.25	0.40	0.30
<b>a</b>	0°	8°	--
All Dimensions in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

## Suggested Pad Layout

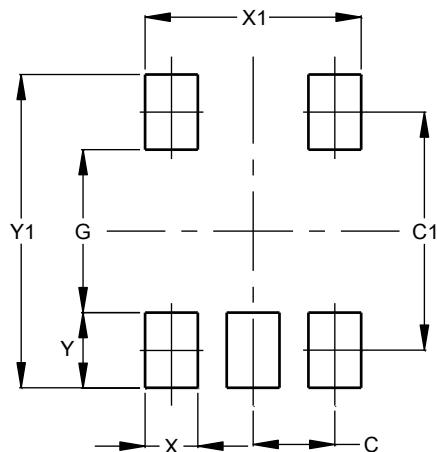
Please see <http://www.diodes.com/package-outlines.html> for the latest version.

### (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<sup>(e3)</sup>
- 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<sup>(e3)</sup>
- Weight: 0.0064 grams (Approximate)

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