



Is Now Part of



ON Semiconductor®

To learn more about ON Semiconductor, please visit our website at
www.onsemi.com

Please note: As part of the Fairchild Semiconductor integration, some of the Fairchild orderable part numbers will need to change in order to meet ON Semiconductor's system requirements. Since the ON Semiconductor product management systems do not have the ability to manage part nomenclature that utilizes an underscore (_), the underscore (_) in the Fairchild part numbers will be changed to a dash (-). This document may contain device numbers with an underscore (_). Please check the ON Semiconductor website to verify the updated device numbers. The most current and up-to-date ordering information can be found at www.onsemi.com. Please email any questions regarding the system integration to Fairchild_questions@onsemi.com.

ON Semiconductor and the ON Semiconductor logo are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of ON Semiconductor's product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using ON Semiconductor products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by ON Semiconductor. "Typical" parameters which may be provided in ON Semiconductor data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. ON Semiconductor does not convey any license under its patent rights nor the rights of others. ON Semiconductor products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use ON Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold ON Semiconductor and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that ON Semiconductor was negligent regarding the design or manufacture of the part. ON Semiconductor is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

74ALVC162839

Low Voltage 20-Bit Selectable Register/Buffer with 3.6V Tolerant Inputs/Outputs and 26Ω Series Resistors in the Outputs

General Description

The ALVC162839 contains twenty non-inverting selectable buffered or registered paths. The device can be configured to operate in a registered, or flow through buffer mode by utilizing the register enable (REGE) and Clock (CLK) signals. The device operates in a 20-bit word wide mode. All outputs can be placed into 3-STATE through use of the OE pin. These devices are ideally suited for buffered or registered 168 pin and 200 pin SDRAM DIMM memory modules.

The 74ALVC162839 is designed for low voltage (1.65V to 3.6V) V_{CC} applications with I/O compatibility up to 3.6V. The 74ALVC162839 is also designed with 26Ω series resistors in the outputs. This design reduces line noise in applications such as memory address drivers, clock drivers, and bus transceivers/transmitters.

The 74ALVC162839 is fabricated with an advanced CMOS technology to achieve high speed operation while maintaining low CMOS power dissipation.

Features

- Compatible with PC100 and PC133 DIMM module specifications
- 1.65V–3.6V V_{CC} supply operation
- 3.6V tolerant inputs and outputs
- 26Ω series resistors in the outputs
- t_{PD} (CLK to O_n)
 - 4.6 ns max for 3.0V to 3.6V V_{CC}
 - 6.3 ns max for 2.3V to 2.7V V_{CC}
 - 9.8 ns max for 1.65V to 1.95V V_{CC}
- Power-off high impedance inputs and outputs
- Supports live insertion and withdrawal (Note 1)
- Uses patented noise/EMI reduction circuitry
- Latchup conforms to JEDEC JED78
- ESD performance:
 - Human body model > 2000V
 - Machine model > 200V

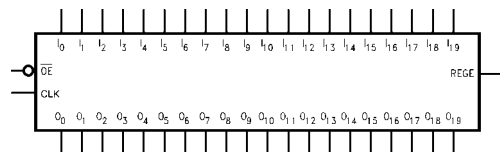
Note 1: To ensure the high-impedance state during power up or power down, OE should be tied to V_{CC} through a pull-up resistor; the minimum value of the resistor is determined by the current-sourcing capability of the driver.

Ordering Code:

Order Number	Package Number	Package Description
74ALVC162839T	MTD56	56-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 6.1mm Wide

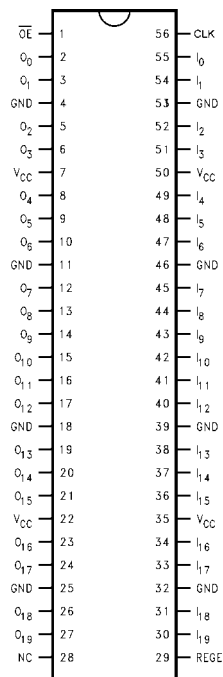
Devices also available in Tape and Reel. Specify by appending suffix letter "X" to the ordering code.

Logic Symbol



Pin Descriptions

Pin Names	Description
\overline{OE}	Output Enable Input (Active LOW)
I_0 – I_{19}	Inputs
O_0 – O_{19}	Outputs
CLK	Clock Input
REGE	Register Enable Input



Truth Table

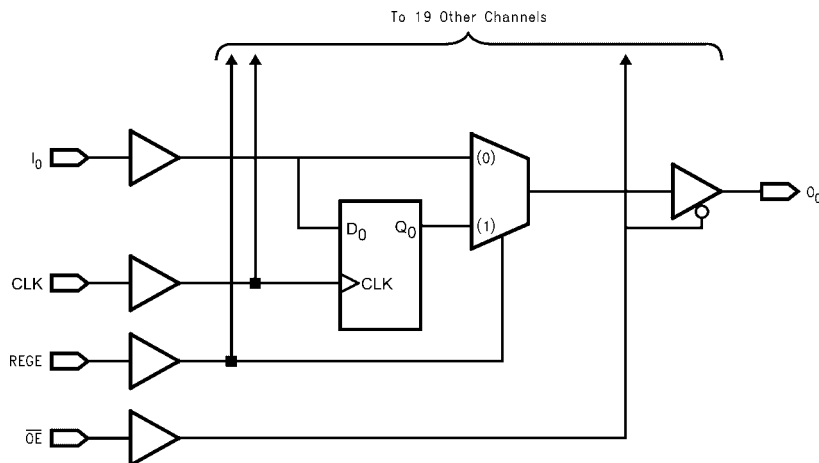
Inputs				Outputs
CLK	REGE	I _n	$\overline{\text{OE}}$	O _n
↑	H	H	L	H
↑	H	L	L	L
X	L	H	L	H
X	L	L	L	L
X	X	X	H	Z

H = Logic HIGH
L = Logic LOW
X = Don't Care, but not floating
Z = High Impedance
↑ = LOW-to-HIGH Clock Transition

Functional Description

The 74ALVC162839 consists of twenty selectable non-inverting buffers or registers with word wide modes. Mode functionality is selected through operation of the CLK and REGE pin as shown by the truth table. When REGE is held at a logic HIGH the device operates as a 20-bit register. Data is transferred from I_n to O_n on the rising edge of the CLK input. When the REGE pin is held at a logic LOW the device operates in a flow through mode and data propagates directly from the I_n to the O_n outputs. All outputs can be 3-stated by holding the \overline{OE} pin at a logic HIGH.

Logic Diagram



Absolute Maximum Ratings(Note 2)

Supply Voltage (V_{CC})	−0.5V to +4.6V
DC Input Voltage (V_I)	−0.5V to 4.6V
Output Voltage (V_O) (Note 3)	−0.5V to V_{CC} +0.5V
DC Input Diode Current (I_{IK})	
$V_I < 0V$	−50 mA
DC Output Diode Current (I_{OK})	
$V_O < 0V$	−50 mA
DC Output Source/Sink Current (I_{OH}/I_{OL})	±50 mA
DC V_{CC} or GND Current per Supply Pin (I_{CC} or GND)	±100 mA
Storage Temperature Range (T_{STG})	−65°C to +150°C

Recommended Operating Conditions (Note 4)

Power Supply	
Operating	1.65V to 3.6V
Input Voltage	0V to V_{CC}
Output Voltage (V_O)	0V to V_{CC}
Free Air Operating Temperature (T_A)	−40°C to +85°C
Minimum Input Edge Rate ($\Delta t/\Delta V$)	
$V_{IN} = 0.8V$ to $2.0V$, $V_{CC} = 3.0V$	10 ns/V

Note 2: The Absolute Maximum Ratings are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the Electrical Characteristics tables are not guaranteed at the Absolute Maximum Ratings. The "Recommended Operating Conditions" table will define the conditions for actual device operation.

Note 3: I_O Absolute Maximum Rating must be observed.

Note 4: Floating or unused control inputs must be held HIGH or LOW.

DC Electrical Characteristics

Symbol	Parameter	Conditions	V_{CC} (V)	Min	Max	Units
V_{IH}	HIGH Level Input Voltage		1.65 - 1.95 2.3 - 2.7 2.7 - 3.6	0.65 x V_{CC} 1.7 2.0		V
V_{IL}	LOW Level Input Voltage		1.65 - 1.95 2.3 - 2.7 2.7 - 3.6		0.35 x V_{CC} 0.7 0.8	V
V_{OH}	HIGH Level Output Voltage	$I_{OH} = -100 \mu A$	1.65 - 3.6	$V_{CC} - 0.2$		V
		$I_{OH} = -2 \text{ mA}$	1.65	1.2		
		$I_{OH} = -4 \text{ mA}$	2.3	1.9		
		$I_{OH} = -6 \text{ mA}$	2.3	1.7		
		$I_{OH} = -8 \text{ mA}$	3.0	2.4		
		$I_{OH} = -12 \text{ mA}$	2.7	2		
V_{OL}	LOW Level Output Voltage	$I_{OL} = 100 \mu A$	1.65 - 3.6		0.2	V
		$I_{OL} = 2 \text{ mA}$	1.65		0.45	
		$I_{OL} = 4 \text{ mA}$	2.3		0.4	
		$I_{OL} = 6 \text{ mA}$	2.3		0.55	
		$I_{OL} = 8 \text{ mA}$	3.0		0.55	
		$I_{OL} = 12 \text{ mA}$	2.7		0.6	
I_I	Input Leakage Current	$0 \leq V_I \leq 3.6V$	1.65 - 3.6		±5.0	μA
I_{OZ}	3-STATE Output Leakage	$0 \leq V_O \leq 3.6V$, $V_I = V_{IH}$ or V_{IL}	1.65 - 3.6		±10	μA
I_{OFF}	Power Off Leakage Current	$0V \leq (V_I, V_O) \leq 3.6V$	0		10	mA
I_{CC}	Quiescent Supply Current	$V_I = V_{CC}$ or GND, $I_O = 0$	3.6		40	μA
ΔI_{CC}	Increase in I_{CC} per Input	$V_{IH} = V_{CC} - 0.6V$	2.7 - 3.6		750	μA

AC Electrical Characteristics

Symbol	Parameter	T _A = -40°C to +85°C, R _L = 500Ω								Units
		C _L = 50 pF				C _L = 30 pF				
		V _{CC} = 3.3V ± 0.3V		V _{CC} = 2.7V		V _{CC} = 2.5 ± 0.2V		V _{CC} = 1.8V ± 0.15V		
		Min	Max	Min	Max	Min	Max	Min	Max	
f _{MAX}	Maximum Clock Frequency	250		200		200		100		MHz
t _{PHL} , t _{PLH}	Propagation Delay Bus-to-Bus (REGE = 0)	1.3	4.0	1.5	5.4	1.0	4.9	1.5	9.8	ns
t _{PHL} , t _{PLH}	Propagation Delay Clock to Bus (REGE = 1)	1.3	4.6	1.5	6.3	1.0	5.8	1.5	9.8	ns
t _{PHL} , t _{PLH}	Propagation Delay REGE to Bus	1.3	5.4	1.5	6.9	1.0	6.4	1.5	9.8	ns
t _{PZL} , t _{PZH}	Output Enable Time	1.3	4.8	1.5	6.6	1.0	6.1	1.5	9.8	ns
t _{PLZ} , t _{PHZ}	Output Disable Time	1.3	4.8	1.5	5.4	1.0	4.9	1.5	8.8	ns
t _S	Setup Time	1.0		1.0		1.0		2.5		ns
t _H	Hold Time	0.7		0.7		0.7		1.0		ns
t _W	Pulse Width	1.5		1.5		1.5		4.0		ns

Capacitance

Symbol	Parameter		Conditions	$T_A = +25^{\circ}\text{C}$		Units
				V_{CC}	Typical	
C_{IN}	Input Capacitance		$V_I = 0V \text{ or } V_{CC}$	3.3	6	pF
C_{OUT}	Output Capacitance		$V_I = 0V \text{ or } V_{CC}$	3.3	7	pF
C_{PD}	Power Dissipation Capacitance	Outputs Enabled	$f = 10 \text{ MHz}, C_L = 0 \text{ pF}$	3.3	20	pF
				2.5	20	

AC Loading and Waveforms

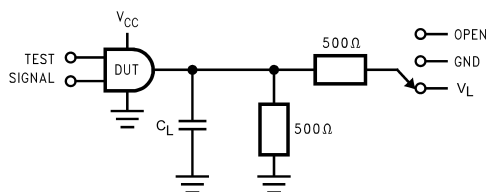


FIGURE 1. AC Test Circuit

TABLE 1. Values for Figure 1

TEST	SWITCH
t_{PLH} , t_{PHL}	Open
t_{PZL} , t_{PLZ}	V_L
t_{PZH} , t_{PHZ}	GND

TABLE 2. Variable Matrix
(Input Characteristics: $f = 1\text{MHz}$; $t_r = t_f = 2\text{ns}$; $Z_0 = 50\Omega$)

Symbol	V_{CC}			
	$3.3\text{V} \pm 0.3\text{V}$	2.7V	$2.5\text{V} \pm 0.2\text{V}$	$1.8\text{V} \pm 0.15\text{V}$
V_{mi}	1.5V	1.5V	$V_{CC}/2$	$V_{CC}/2$
V_{mo}	1.5V	1.5V	$V_{CC}/2$	$V_{CC}/2$
V_X	$V_{OL} + 0.3\text{V}$	$V_{OL} + 0.3\text{V}$	$V_{OL} + 0.15\text{V}$	$V_{OL} + 0.15\text{V}$
V_Y	$V_{OH} - 0.3\text{V}$	$V_{OH} - 0.3\text{V}$	$V_{OH} - 0.15\text{V}$	$V_{OH} - 0.15\text{V}$
V_L	6V	6V	$V_{CC} \times 2$	$V_{CC} \times 2$

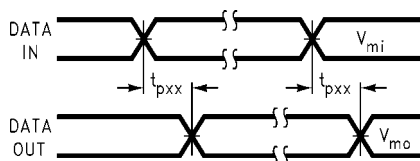


FIGURE 2. Waveform for Inverting and Non-Inverting Functions

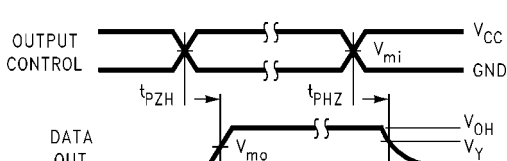


FIGURE 3. 3-STATE Output High Enable and Disable Times for Low Voltage Logic

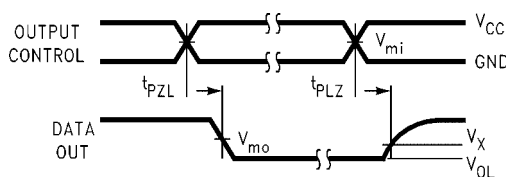


FIGURE 4. 3-STATE Output Low Enable and Disable Times for Low Voltage Logic

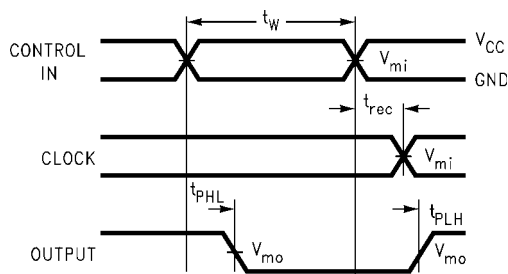


FIGURE 5. Propagation Delay, Pulse Width and t_{rec} Waveforms

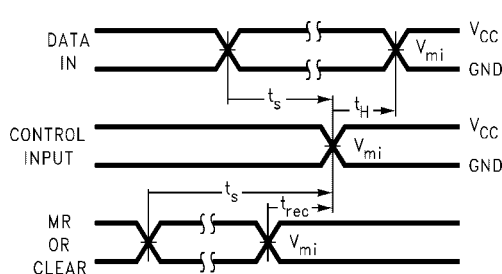


FIGURE 6. Setup Time, Hold Time and Recovery Time for Low Voltage Logic

Top View:

- Overall Width: 14.0 ± 0.1
- Overall Height: 6.1 ± 0.1
- Lead Tip Length (Left): 8.1
- Lead Tip Length (Right): 29
- Hole Position: 4.05 from Left Edge
- Feature Control Frame: $\square 0.2 C B A$ ALL LEAD TIPS

Side View:

- Total Length: 29
- Lead Tip Length: 56

End View:

- Diameter: $\varnothing 0.13(M)$
- Wall Thickness: 0.09-0.20 TYP
- Feature Control Frame: $\oplus 0.13(M) A B S C(S)$

LAND PATTERN RECOMMENDATION:

- Symmetrical about centerline.
- Lead Tip Length: 1.8 TYP
- Lead Tip Spacing: 0.3 TYP
- Lead Tip Width: 0.5 TYP
- Overall Land Width: 9.2 TYP

Detail A:

- GAGE PLANE: 0.25
- SEATING PLANE: 0.60^{+0.15}/_{-0.10}
- Angle: $0^\circ - 8^\circ$

**56-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 6.1mm Wide
Package Number MTD56**

MTD56 (REV B

LIFE SUPPORT POLICY

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

www.fairchildsemi.com

www.fairchildsemi.com

ON Semiconductor and  are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of ON Semiconductor's product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using ON Semiconductor products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by ON Semiconductor. "Typical" parameters which may be provided in ON Semiconductor data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. ON Semiconductor does not convey any license under its patent rights nor the rights of others. ON Semiconductor products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use ON Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold ON Semiconductor and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that ON Semiconductor was negligent regarding the design or manufacture of the part. ON Semiconductor is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:

Literature Distribution Center for ON Semiconductor
19521 E. 32nd Pkwy, Aurora, Colorado 80011 USA
Phone: 303-675-2175 or 800-344-3860 Toll Free USA/Canada
Fax: 303-675-2176 or 800-344-3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800-282-9855 Toll Free
USA/Canada

Europe, Middle East and Africa Technical Support:
Phone: 421 33 790 2910

Japan Customer Focus Center
Phone: 81-3-5817-1050

ON Semiconductor Website: www.onsemi.com

Order Literature: <http://www.onsemi.com/orderlit>

For additional information, please contact your local
Sales Representative