

74AC157 • 74ACT157 Quad 2-Input Multiplexer

General Description

The AC/ACT157 is a high-speed quad 2-input multiplexer. Four bits of data from two sources can be selected using the common Select and Enable inputs. The four outputs present the selected data in the true (noninverted) form. The AC/ACT157 can also be used as a function generator.

Features

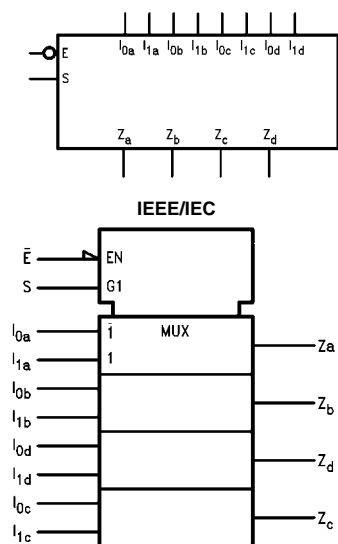
- I_{CC} and I_{OZ} reduced by 50%
- Outputs source/sink 24 mA
- ACT157 has TTL-compatible inputs

Ordering Code:

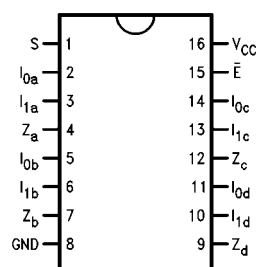
Order Number	Package Number	Package Description
74AC157SC	M16A	16-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow Body
74AC157SJ	M16D	16-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
74AC157MTC	MTC16	16-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide
74AC157PC	N16E	16-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide
74ACT157SC	M16A	16-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow Body
74ACT157SJ	M16D	16-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
74ACT157MTC	MTC16	16-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide
74ACT157PC	N16E	16-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide

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

Logic Symbols



Connection Diagram



Pin Descriptions

Pin Names	Description
I_{0a} – I_{0d}	Source 0 Data Inputs
I_{1a} – I_{1d}	Source 1 Data Inputs
\bar{E}	Enable Input
S	Select Input
Z_a – Z_d	Outputs

FACT™ is a trademark of Fairchild Semiconductor Corporation.

Functional Description

The AC/ACT157 is a quad 2-input multiplexer. It selects four bits of data from two sources under the control of a common Select input (S). The Enable input (\bar{E}) is active-LOW. When \bar{E} is HIGH, all of the outputs (Z) are forced LOW regardless of all other inputs. The AC/ACT157 is the logic implementation of a 4-pole, 2-position switch where the position of the switch is determined by the logic levels supplied to the Select input. The logic equations for the outputs are shown below:

$$Z_a = \bar{E} \cdot (I_{1a} \cdot S + I_{0a} \cdot \bar{S})$$

$$Z_b = \bar{E} \cdot (I_{1b} \cdot S + I_{0b} \cdot \bar{S})$$

$$Z_c = \bar{E} \cdot (I_{1c} \cdot S + I_{0c} \cdot \bar{S})$$

$$Z_d = \bar{E} \cdot (I_{1d} \cdot S + I_{0d} \cdot \bar{S})$$

A common use of the AC/ACT157 is the moving of data from two groups of registers to four common output buses. The particular register from which the data comes is determined by the state of the Select input. A less obvious use is as a function generator. The AC/ACT157 can generate any four of the sixteen different functions of two variables with one variable common. This is useful for implementing gating functions.

Truth Table

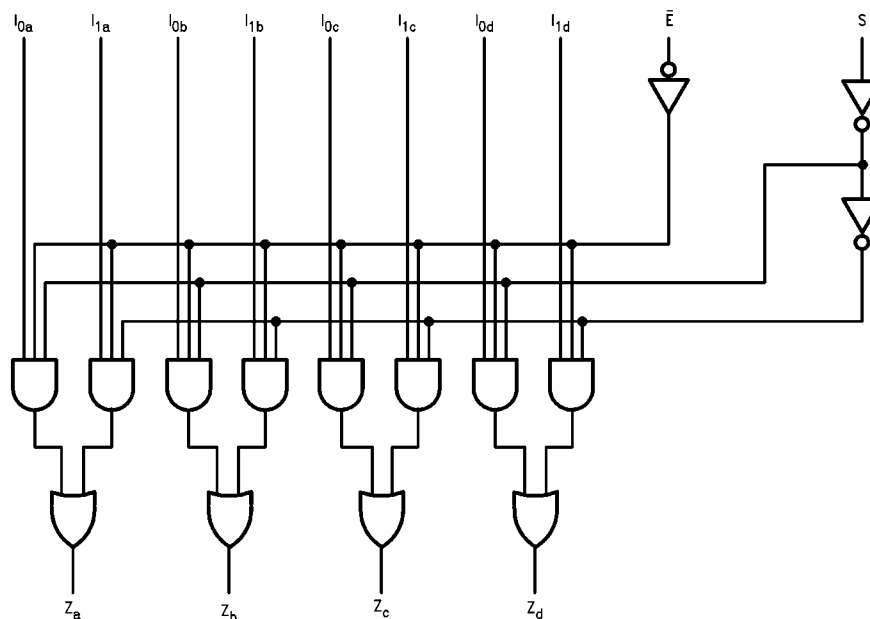
Inputs				Outputs
\bar{E}	S	I_0	I_1	Z
H	X	X	X	L
L	H	X	L	L
L	H	X	H	H
L	L	L	X	L
L	L	L	H	H

H = HIGH Voltage Level

L = LOW Voltage Level

X = Immaterial

Logic Diagram



Please note that this diagram is provided only for the understanding of logic operations and should not be used to estimate propagation delays.

Absolute Maximum Ratings(Note 1)

Supply Voltage (V_{CC})	-0.5V to +7.0V
DC Input Diode Current (I_{IK})	
$V_I = -0.5V$	-20 mA
$V_I = V_{CC} + 0.5V$	+20 mA
DC Input Voltage (V_I)	-0.5V to $V_{CC} + 0.5V$
DC Output Diode Current (I_{OK})	
$V_O = -0.5V$	-20 mA
$V_O = V_{CC} + 0.5V$	+20 mA
DC Output Voltage (V_O)	-0.5V to $V_{CC} + 0.5V$
DC Output Source	
or Sink Current (I_O)	± 50 mA
DC V_{CC} or Ground Current	
per Output Pin (I_{CC} or I_{GND})	± 50 mA
Storage Temperature (T_{STG})	-65°C to +150°C
Junction Temperature (T_J)	
PDIP	140°C

Recommended Operating Conditions

Supply Voltage (V_{CC})	
AC	2.0V to 6.0V
ACT	4.5V to 5.5V
Input Voltage (V_I)	0V to V_{CC}
Output Voltage (V_O)	0V to V_{CC}
Operating Temperature (T_A)	-40°C to +85°C
Minimum Input Edge Rate ($\Delta V/\Delta t$)	
AC Devices	
V_{IN} from 30% to 70% of V_{CC}	
V_{CC} @ 3.3V, 4.5V, 5.5V	125 mV/ns
Minimum Input Edge Rate ($\Delta V/\Delta t$)	
ACT Devices	
V_{IN} from 0.8V to 2.0V	
V_{CC} @ 4.5V, 5.5V	125 mV/ns

Note 1: Absolute maximum ratings are those values beyond which damage to the device may occur. The databook specifications should be met, without exception, to ensure that the system design is reliable over its power supply, temperature, and output/input loading variables. Fairchild does not recommend operation of FACT™ circuits outside databook specifications.

DC Electrical Characteristics for AC

Symbol	Parameter	V _{CC} (V)	T _A = +25°C		T _A = -40°C to +85°C	Units	Conditions
			Typ	Guaranteed Limits			
V _{IH}	Minimum HIGH Level Input Voltage	3.0	1.5	2.1	2.1	V	V _{OUT} = 0.1V or V _{CC} - 0.1V
		4.5	2.25	3.15	3.15		
		5.5	2.75	3.85	3.85		
V _{IL}	Maximum LOW Level Input Voltage	3.0	1.5	0.9	0.9	V	V _{OUT} = 0.1V or V _{CC} - 0.1V
		4.5	2.25	1.35	1.35		
		5.5	2.75	1.65	1.65		
V _{OH}	Minimum HIGH Level Output Voltage	3.0	2.99	2.9	2.9	V	I _{OUT} = -50 μA
		4.5	4.49	4.4	4.4		
		5.5	5.49	5.4	5.4		
		3.0		2.56	2.46	V	V _{IN} = V _{IL} or V _{IH} I _{OH} = -12 mA I _{OH} = -24 mA I _{OH} = -24 mA (Note 2)
		4.5		3.86	3.76		
		5.5		4.86	4.76		
V _{OL}	Maximum LOW Level Output Voltage	3.0	0.002	0.1	0.1	V	I _{OUT} = 50 μA
		4.5	0.001	0.1	0.1		
		5.5	0.001	0.1	0.1		
		3.0		0.36	0.44	V	V _{IN} = V _{IL} or V _{IH} I _{OL} = 12 mA I _{OL} = 24 mA I _{OL} = 24 mA (Note 2)
		4.5		0.36	0.44		
		5.5		0.36	0.44		
I _{IN} (Note 4)	Maximum Input Leakage Current	5.5		±0.1	±1.0	μA	V _I = V _{CC} , GND
I _{OLD}	Minimum Dynamic	5.5			75	mA	V _{OLD} = 1.65V Max
I _{OHD}	Output Current (Note 3)	5.5			-75	mA	V _{OHD} = 3.85V Min
I _{CC} (Note 4)	Maximum Quiescent Supply Current	5.5		4.0	40.0	μA	V _{IN} = V _{CC} or GND

Note 2: All outputs loaded; thresholds on input associated with output under test.

Note 3: Maximum test duration 2.0 ms, one output loaded at a time.

Note 4: I_{IN} and I_{CC} @ 3.0V are guaranteed to be less than or equal to the respective limit @ 5.5V V_{CC} .

DC Characteristics for ACT

Symbol	Parameter	V _{CC} (V)	T _A = +25°C		T _A = -40°C to +85°C	Units	Conditions
			Typ	Guaranteed Limits			
V _{IH}	Minimum HIGH Level Input Voltage	4.5	1.5	2.0	2.0	V	V _{OUT} = 0.1V
		5.5	1.5	2.0	2.0		or V _{CC} - 0.1V
V _{IL}	Maximum LOW Level Input Voltage	4.5	1.5	0.8	0.8	V	V _{OUT} = 0.1V
		5.5	1.5	0.8	0.8		or V _{CC} - 0.1V
V _{OH}	Minimum HIGH Level Output Voltage	4.5	4.49	4.4	4.4	V	I _{OUT} = -50 μA
		5.5	5.49	5.4	5.4		
		4.5		3.86	3.76	V	V _{IN} = V _{IL} or V _{IH}
		5.5		4.86	4.76		I _{OH} = -24 mA
V _{OL}	Maximum LOW Level Output Voltage	4.5	0.001	0.1	0.1	V	I _{OH} = -24 mA (Note 5)
		5.5	0.001	0.1	0.1		I _{OUT} = 50 μA
		4.5		0.36	0.44	V	V _{IN} = V _{IL} or V _{IH}
		5.5		0.36	0.44		I _{OL} = 24 mA
I _{IN}	Maximum Input Leakage Current	5.5		±0.1	±1.0	μA	V _I = V _{CC} , GND
I _{CCT}	Maximum I _{CC} /Input	5.5	0.6		1.5	mA	V _I = V _{CC} - 2.1V
I _{OLD}	Minimum Dynamic	5.5			75	mA	V _{OLD} = 1.65V Max
I _{OHD}	Output Current (Note 6)	5.5			-75	mA	V _{OHD} = 3.85V Min
I _{CC}	Maximum Quiescent Supply Current	5.5		4.0	40.0	μA	V _{IN} = V _{CC} or GND

Note 5: All outputs loaded; thresholds on input associated with output under test.

Note 6: Maximum test duration 2.0 ms, one output loaded at a time.

AC Electrical Characteristics for AC

Symbol	Parameter	V _{CC} (V) (Note 7)	T _A = +25°C C _L = 50 pF			T _A = -40°C to +85°C C _L = 50 pF		Units
			Min	Typ	Max	Min	Max	
t _{PLH}	Propagation Delay S to Z _n	3.3	1.5	7.0	11.5	1.5	13.0	ns
		5.0	1.5	5.5	9.0	1.5	10.0	
t _{PHL}	Propagation Delay S to Z _n	3.3	1.5	6.5	11.0	1.5	12.0	ns
		5.0	1.5	5.0	8.5	1.0	9.5	
t _{PLH}	Propagation Delay E to Z _n	3.3	1.5	7.0	11.5	1.5	13.0	ns
		5.0	1.5	5.5	9.0	1.5	10.0	
t _{PHL}	Propagation Delay E to Z _n	3.3	1.5	6.5	11.0	1.5	12.0	ns
		5.0	1.5	5.5	9.0	1.0	9.5	
t _{PLH}	Propagation Delay I _n to Z _n	3.3	1.5	5.0	8.5	1.0	9.0	ns
		5.0	1.5	4.0	6.5	1.0	7.0	
t _{PHL}	Propagation Delay I _n to Z _n	3.3	1.5	5.0	8.0	1.0	9.0	ns
		5.0	1.5	4.0	6.5	1.0	7.0	

Note 7: Voltage Range 3.3 is 3.3V ± 0.3V

Voltage Range 5.0 is 5.0V ± 0.5V

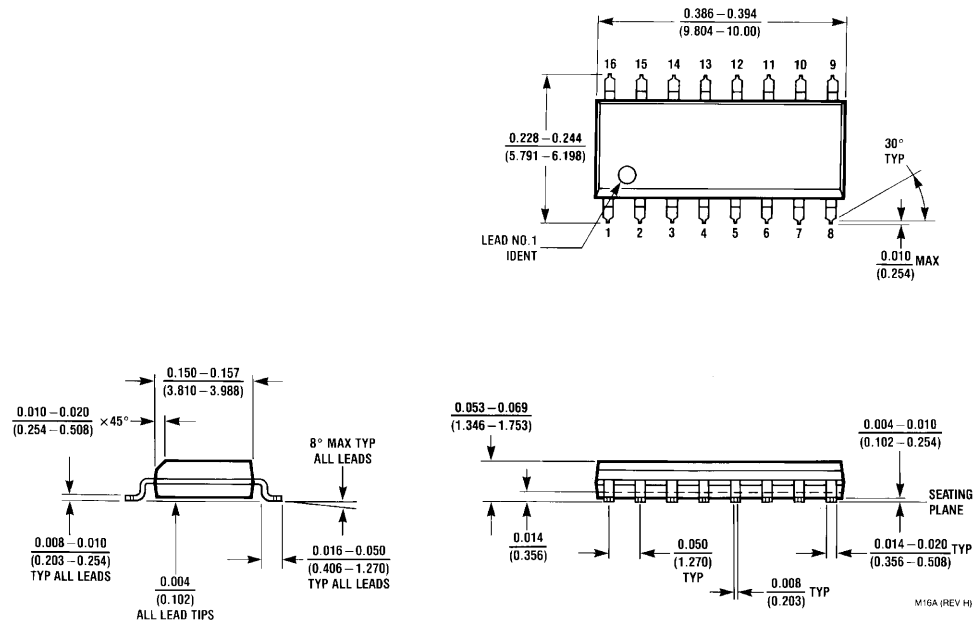
AC Electrical Characteristics for ACT

Symbol	Parameter	V _{CC} (V) (Note 8)	T _A = +25°C C _L = 50 pF			T _A = -40°C to +85°C C _L = 50 pF		Units
			Min	Typ	Max	Min	Max	
t _{PLH}	Propagation Delay S to Z _n	5.0	2.0	5.5	9.0	1.5	10.0	ns
t _{PHL}	Propagation Delay S to Z _n	5.0	2.0	5.5	9.5	2.0	10.5	ns
t _{PLH}	Propagation Delay \bar{E} to Z _n	5.0	1.5	6.0	10.0	1.5	11.5	ns
t _{PHL}	Propagation Delay \bar{E} to Z _n	5.0	1.5	5.0	8.5	1.0	9.0	ns
t _{PLH}	Propagation Delay I _n to Z _n	5.0	1.5	4.0	7.0	1.0	8.5	ns
t _{PHL}	Propagation Delay I _n to Z _n	5.0	1.5	4.5	7.5	1.0	8.5	ns

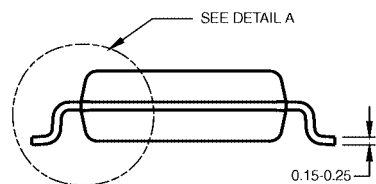
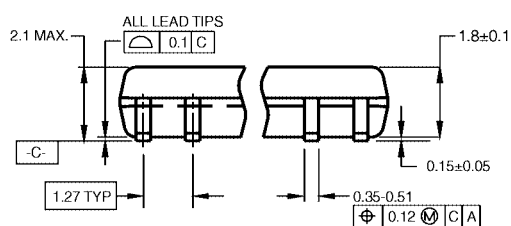
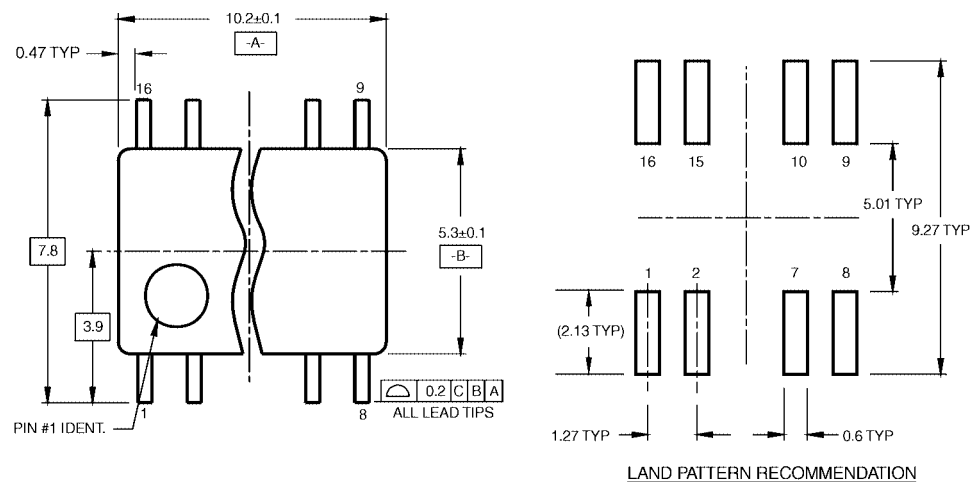
Note 8: Voltage Range 5.0 is 5.0V ± 0.5V**Capacitance**

Symbol	Parameter	Typ	Units	Conditions
C _{IN}	Input Capacitance	4.5	pF	V _{CC} = OPEN
C _{PD}	Power Dissipation Capacitance	50.0	pF	V _{CC} = 5.0V

Physical Dimensions inches (millimeters) unless otherwise noted

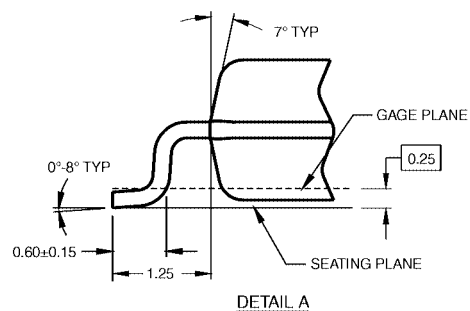


16-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow Body
Package Number M16A

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)

NOTES:

- CONFORMS TO EIAJ EDR-7320 REGISTRATION, ESTABLISHED IN DECEMBER, 1998.
- DIMENSIONS ARE IN MILLIMETERS.
- DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.

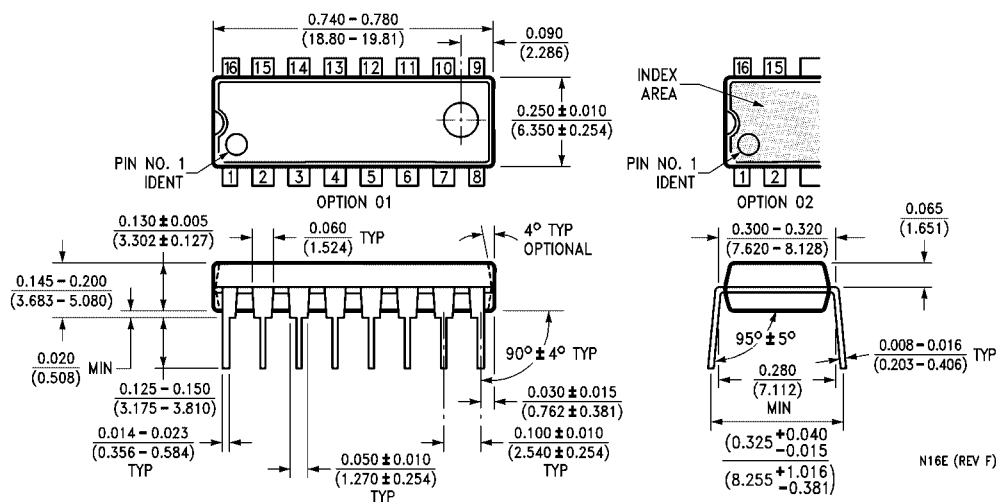
M16DRevB1



**16-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
Package Number M16D**



Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



Fairchild does not assume any responsibility for use of any circuitry described, no circuit patent licenses are implied and Fairchild reserves the right at any time without notice to change said circuitry and specifications.

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT OF FAIRCHILD SEMICONDUCTOR CORPORATION. As used herein:

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

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