



Is Now Part of



**ON Semiconductor®**

To learn more about ON Semiconductor, please visit our website at  
[www.onsemi.com](http://www.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](http://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.

## MM74HC175 Quad D-Type Flip-Flop With Clear

### General Description

The MM74HC175 high speed D-type flip-flop with complementary outputs utilizes advanced silicon-gate CMOS technology to achieve the high noise immunity and low power consumption of standard CMOS integrated circuits, along with the ability to drive 10 LS-TTL loads.

Information at the D inputs of the MM74HC175 is transferred to the Q and  $\bar{Q}$  outputs on the positive going edge of the clock pulse. Both true and complement outputs from each flip flop are externally available. All four flip-flops are controlled by a common clock and a common CLEAR. Clearing is accomplished by a negative pulse at the CLEAR input. All four Q outputs are cleared to a logical "0" and all four  $\bar{Q}$  outputs to a logical "1."

The 74HC logic family is functionally as well as pin-out compatible with the standard 74LS logic family. All inputs are protected from damage due to static discharge by internal diode clamps to  $V_{CC}$  and ground.

### Features

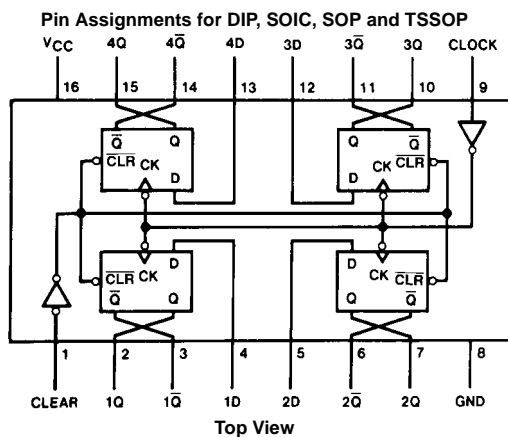
- Typical propagation delay: 15 ns
- Wide operating supply voltage range: 2–6V
- Low input current: 1  $\mu$ A maximum
- Low quiescent supply current: 80  $\mu$ A maximum (74HC)
- High output drive current: 4 mA minimum (74HC)

### Ordering Code:

Order Number	Package Number	Package Description
MM74HC175M	M16A	16-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow
MM74HC175SJ	M16D	16-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
MM74HC175MTC	MTC16	16-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide
MM74HC175N	N16E	16-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide

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

### Connection Diagram



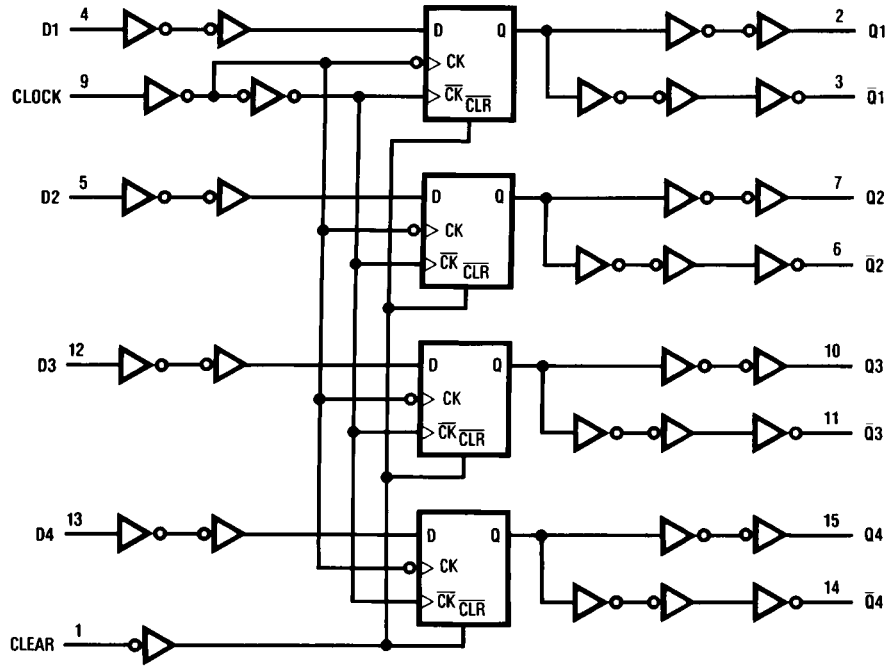
### Truth Table

(Each Flip-Flop)

Clear	Inputs			Outputs	
	Clear	Clock	D	Q	$\bar{Q}$
L	X	X	X	L	H
H	$\uparrow$	H	H	H	L
H	$\uparrow$	L	L	L	H
H	L	X	$Q_0$	$\bar{Q}_0$	

H = HIGH Level (steady state)  
L = LOW Level (steady state)  
X = Irrelevant  
 $\uparrow$  = Transition from LOW-to-HIGH level  
 $Q_0$  = The level of Q before the indicated steady-state input conditions were established

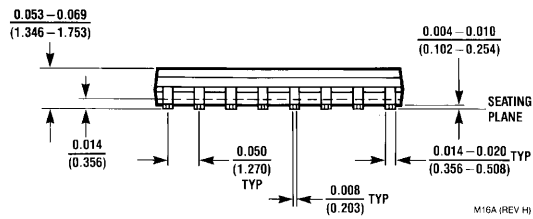
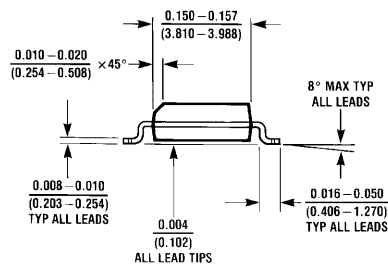
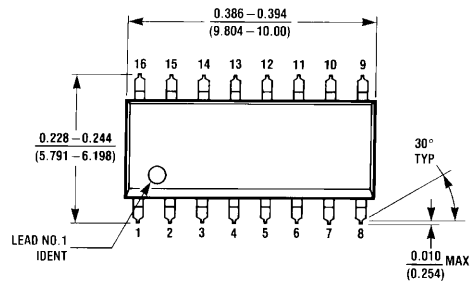
Logic Diagram



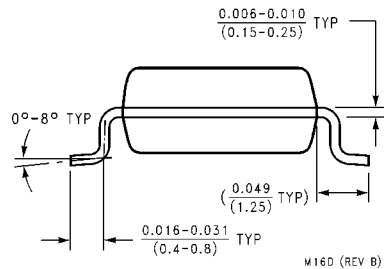
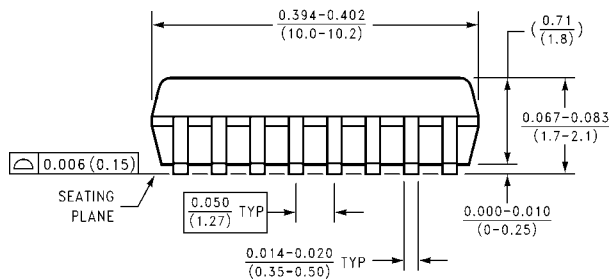
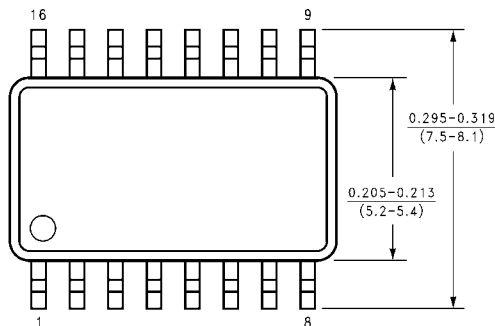
Absolute Maximum Ratings (Note 1)				Recommended Operating Conditions				
(Note 2)								
Supply Voltage ( $V_{CC}$ )		-0.5 to +7.0V		Min	Max	Units		
DC Input Voltage ( $V_{IN}$ )		-1.5 to $V_{CC} + 1.5V$		2	6	V		
DC Output Voltage ( $V_{OUT}$ )		-0.5 to $V_{CC} + 0.5V$						
Clamp Diode Current ( $I_{IK}, I_{OK}$ )		$\pm 20$ mA		0	$V_{CC}$	V		
DC Output Current, per pin ( $I_{OUT}$ )		$\pm 25$ mA		Operating Temperature Range ( $T_A$ )				
DC $V_{CC}$ or GND Current, per pin ( $I_{CC}$ )		$\pm 50$ mA		-40	+85	$^{\circ}C$		
Storage Temperature Range ( $T_{STG}$ )		-65 $^{\circ}C$ to +150 $^{\circ}C$		Input Rise or Fall Times				
Power Dissipation ( $P_D$ )				( $t_r, t_f$ ) $V_{CC} = 2.0V$		1000	ns	
(Note 3)		600 mW		$V_{CC} = 4.5V$		500	ns	
S.O. Package only		500 mW		$V_{CC} = 6.0V$		400	ns	
Lead Temperature ( $T_L$ )				<b>Note 1:</b> Absolute Maximum Ratings are those values beyond which damage to the device may occur.				
(Soldering 10 seconds)		260 $^{\circ}C$		<b>Note 2:</b> Unless otherwise specified all voltages are referenced to ground.				
				<b>Note 3:</b> Power Dissipation temperature derating — plastic "N" package: -12 mW/ $^{\circ}C$ from 65 $^{\circ}C$ to 85 $^{\circ}C$ .				
DC Electrical Characteristics (Note 4)								
Symbol	Parameter	Conditions	$V_{CC}$	$T_A = 25^{\circ}C$			Units	
				Guaranteed Limits				
$V_{IH}$	Minimum HIGH Level Input Voltage		2.0V		1.5	1.5	1.5	V
			4.5V		3.15	3.15	3.15	V
			6.0V		4.2	4.2	4.2	V
$V_{IL}$	Maximum LOW Level Input Voltage		2.0V		0.5	0.5	0.5	V
			4.5V		1.35	1.35	1.35	V
			6.0V		1.8	1.8	1.8	V
$V_{OH}$	Minimum HIGH Level Output Voltage	$V_{IN} = V_{IH}$ or $V_{IL}$ $ I_{OUT}  \leq 20 \mu A$	2.0V	2.0	1.9	1.9	1.9	V
			4.5V	4.5	4.4	4.4	4.4	V
			6.0V	6.0	5.9	5.9	5.9	V
	Maximum LOW Level Output Voltage	$V_{IN} = V_{IH}$ or $V_{IL}$ $ I_{OUT}  \leq 4.0$ mA $ I_{OUT}  \leq 5.2$ mA	4.5V	4.2	3.98	3.84	3.7	V
			6.0V	5.7	5.48	5.34	5.2	V
$V_{OL}$	Maximum LOW Level Output Voltage	$V_{IN} = V_{IH}$ or $V_{IL}$ $ I_{OUT}  \leq 20 \mu A$	2.0V	0	0.1	0.1	0.1	V
			4.5V	0	0.1	0.1	0.1	V
			6.0V	0	0.1	0.1	0.1	V
	Maximum Input Current	$V_{IN} = V_{CC}$ or GND	4.5V	0.2	0.26	0.33	0.4	V
			6.0V	0.2	0.26	0.33	0.4	V
$I_{IN}$	Maximum Input Current	$V_{IN} = V_{CC}$ or GND	6.0V		$\pm 0.1$	$\pm 1.0$	$\pm 1.0$	$\mu A$
$I_{CC}$	Maximum Quiescent Supply Current	$V_{IN} = V_{CC}$ or GND $I_{OUT} = 0 \mu A$	6.0V		8	80	160	$\mu A$
<b>Note 4:</b> For a power supply of 5V $\pm 10\%$ the worst case output voltages ( $V_{OH}$ , and $V_{OL}$ ) occur for HC at 4.5V. Thus the 4.5V values should be used when designing with this supply. Worst case $V_{IH}$ and $V_{IL}$ occur at $V_{CC} = 5.5V$ and 4.5V respectively. (The $V_{IH}$ value at 5.5V is 3.85V.) The worst case leakage current ( $I_{IN}$ , $I_{CC}$ , and $I_{OZ}$ ) occur for CMOS at the higher voltage and so the 6.0V values should be used.								

AC Electrical Characteristics								
$V_{CC} = 5V, T_A = 25^\circ C, C_L = 15 \text{ pF}, t_r = t_f = 6 \text{ ns}$								
Symbol	Parameter	Conditions	Typ	Guaranteed Limit	Units			
$f_{MAX}$	Maximum Operating Frequency		60	35	MHz			
$t_{PHL}, t_{PLH}$	Maximum Propagation Delay, Clock to Q or $\bar{Q}$		15	25	ns			
$t_{PHL}, t_{PLH}$	Maximum Propagation Delay, Reset to Q or $\bar{Q}$		13	21	ns			
$t_{REC}$	Minimum Removal Time, Clear to Clock			20	ns			
$t_S$	Minimum Setup Time, Data to Clock			20	ns			
$t_H$	Minimum Hold Time, Data from Clock			0	ns			
$t_W$	Minimum Pulse Width, Clock or Clear		10	16	ns			
AC Electrical Characteristics								
$V_{CC} = 2.0V \text{ to } 6.0V, C_L = 50 \text{ pF}, t_r = t_f = 6 \text{ ns}$ (unless otherwise specified)								
Symbol	Parameter	Conditions	$V_{CC}$	$T_A = 25^\circ C$		$T_A = -40 \text{ to } 85^\circ C$	$T_A = -55 \text{ to } 125^\circ C$	Units
				Typ	Guaranteed Limits			
$f_{MAX}$	Maximum Operating Frequency		2.0V	12	6	5	4	MHz
			4.5V	60	30	24	20	MHz
			6.0V	70	35	28	24	MHz
$t_{PHL}, t_{PLH}$	Maximum Propagation Delay, Clock to Q or $\bar{Q}$		2.0V	80	150	190	225	ns
			4.5V	15	30	38	45	ns
			6.0V	13	26	32	38	ns
$t_{PHL}, t_{PLH}$	Maximum Propagation Delay, Reset to Q or $\bar{Q}$		2.0V	64	125	158	186	ns
			4.5V	14	25	32	37	ns
			6.0V	12	21	27	32	ns
$t_{REM}$	Minimum Removal Time Clear to Clock		2.0V		100	125	150	ns
			4.5V		20	25	30	ns
			6.0V		17	21	25	ns
$t_S$	Minimum Setup Time Data to Clock		2.0V		100	125	150	ns
			4.5V		20	25	30	ns
			6.0V		17	21	25	ns
$t_H$	Minimum Hold Time Data from Clock		2.0V		0	0	0	ns
			4.5V		0	0	0	ns
			6.0V		0	0	0	ns
$t_W$	Minimum Pulse Width Clear or Clock		2.0V	30	80	100	120	ns
			4.5V	9	16	20	24	ns
			6.0V	8	14	17	20	ns
$t_r, t_f$	Maximum Input Rise and Fall Time		2.0V		1000	1000	1000	ns
			4.5V		500	500	500	ns
			6.0V		400	400	400	ns
$t_{TLH}, t_{THL}$	Maximum Output Rise and Fall Time		2.0V	30	75	95	110	ns
			4.5V	9	15	19	22	ns
			6.0V	8	13	16	19	ns
$C_{PD}$	Power Dissipation Capacitance (Note 5)	(per package)		150				pF
$C_{IN}$	Maximum Input Capacitance			5	10	10	10	pF
<b>Note 5:</b> $C_{PD}$ determines the no load dynamic power consumption, $P_D = C_{PD} V_{CC}^2 f + I_{CC} V_{CC}$ , and the no load dynamic current consumption, $I_S = C_{PD} V_{CC} f + I_{CC}$ .								

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

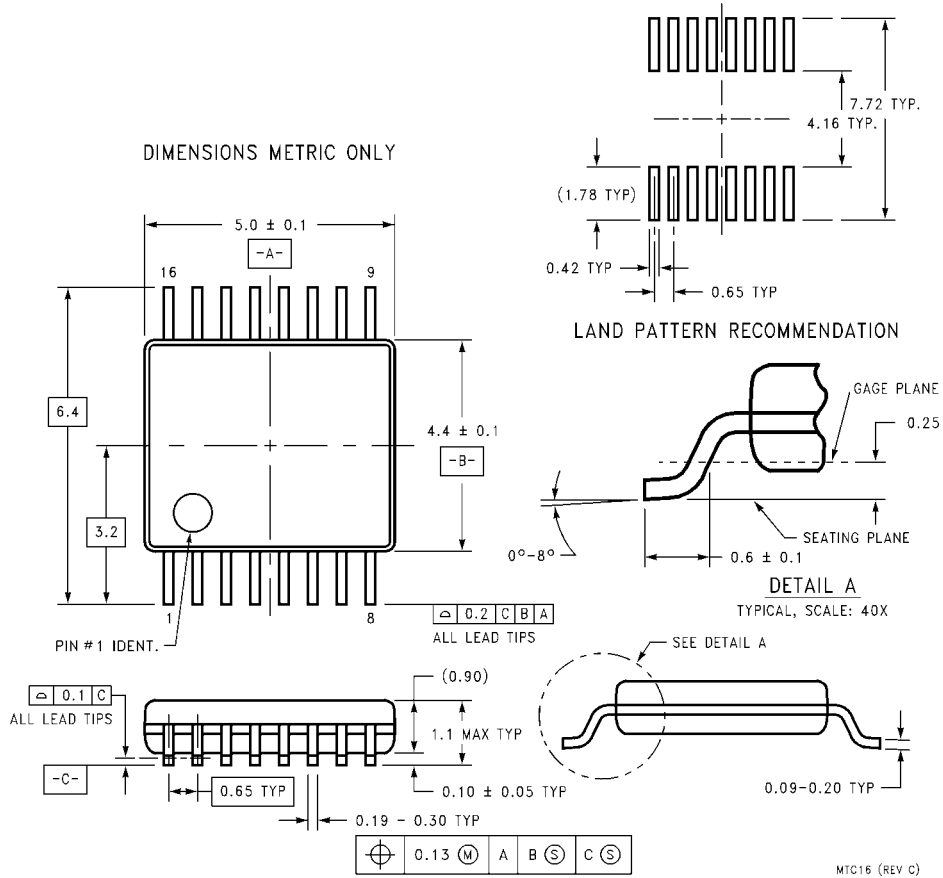


**16-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow  
Package Number M16A**



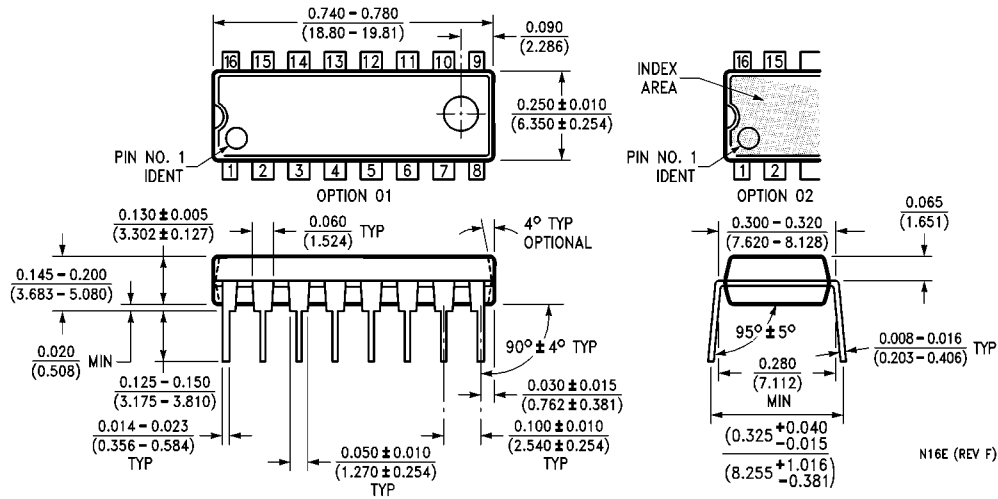
**16-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide  
Package Number M16D**

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



**16-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide  
Package Number MTC16**

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



**16-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide Package Number N16E**

N16E (REV F)

**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](http://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](http://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](mailto: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](http://www.onsemi.com)  
**Order Literature:** <http://www.onsemi.com/orderlit>  
For additional information, please contact your local  
Sales Representative