## Hex Inverter <br> MM74HCT04

## General Description

The MM74HCT04 is a logic function fabricated by using advanced silicon-gate CMOS technology which provides the inherent benefits of CMOS-low quiescent power and wide power supply range. This device is input and output characteristic as well as pin-out compatible with standard 74LS logic families. The MM74HCT04, triple buffered, hex inverters, features low power dissipation and fast switching times. All inputs are protected from static discharge by internal diodes to $\mathrm{V}_{\mathrm{CC}}$ and ground.

MM74HCT devices are intended to interface between TTL and NMOS components and standard CMOS devices. These parts are also plug-in replacements for LS-TTL devices and can be used to reduce power consumption in existing designs.

## Features

- TTL, LS Pin-out and Threshold Compatible
- Fast Switching: $\mathrm{t}_{\mathrm{PLH}}, \mathrm{t}_{\mathrm{PHL}}=10 \mathrm{~ns}$ (typ.)
- Low Power: $10 \mu \mathrm{~W}$ at DC, 3.7 mW at 5 MHz
- High Fan Out: $\geq 10$ LS Loads
- Inverting, Triple Buffered
- These Devices are $\mathrm{Pb}-$ Free, Halide Free and are RoHS Compliant


## Connection Diagram



Figure 1. Pin Assignments for SOIC and TSSOP


TSSOP-14 CASE 948G-01

## MARKING DIAGRAM



> HCT04A = Specific Device Code
> A = Assembly Location
> WL, L = Wafer Lot
> Y = Year
> WW, W = Work Week

## ORDERING INFORMATION

See detailed ordering and shipping information on
page NO TAG of this data sheet.

## MM74HCT04

ABSOLUTE MAXIMUM RATINGS (Note 1)

| Symbol | Parameter | Rating |
| :---: | :--- | :---: |
| $\mathrm{V}_{\mathrm{CC}}$ | Supply Voltage | -0.5 to +7.0 V |
| $\mathrm{~V}_{\text {IN }}$ | DC Input Voltage | -0.5 to $\mathrm{V}_{\mathrm{CC}}+0.5 \mathrm{~V}$ |
| $\mathrm{~V}_{\mathrm{OUT}}$ | DC Output Voltage | -0.5 to $\mathrm{V}_{\mathrm{CC}}+0.5 \mathrm{~V}$ |
| $\mathrm{I}_{\mathrm{IK}}, \mathrm{I}_{\mathrm{OK}}$ | Clamp Diode Current | $\pm 20 \mathrm{~mA}$ |
| $\mathrm{I}_{\mathrm{OUT}}$ | DC Output Current, per Pin | $\pm 25 \mathrm{~mA}$ |
| $\mathrm{I}_{\mathrm{CC}}$ | DC $\mathrm{V}_{\mathrm{CC}}$ or GND Current, per Pin | $\pm 50 \mathrm{~mA}$ |
| $\mathrm{~T}_{\mathrm{STG}}$ | Storage Temperature Range | $-65^{\circ} \mathrm{C}$ to $+150^{\circ} \mathrm{C}$ |
| $\mathrm{P}_{\mathrm{D}}$ | Power Dissipation | S.O. Package Only |
| $\mathrm{T}_{\mathrm{L}}$ | Lead Temperature (Soldering 10 Seconds) | 500 mW |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Unless otherwise specified all voltages are referenced to ground.

RECOMMENDED OPERATING CONDITIONS

| Symbol | Parameter | Min | Max | Unit |
| :---: | :--- | :---: | :---: | :---: |
| $\mathrm{V}_{\mathrm{CC}}$ | Supply Voltage | 4.5 | 5.5 | V |
| $\mathrm{~V}_{\mathrm{IN}}, \mathrm{V}_{\text {OUT }}$ | DC Input or Output Voltage | 0 | $\mathrm{~V}_{\mathrm{CC}}$ | V |
| $\mathrm{T}_{\mathrm{A}}$ | Operating Temperature Range | -55 | +125 | ${ }^{\circ} \mathrm{C}$ |
| $\mathrm{t}_{\mathrm{r}}, \mathrm{t}_{\mathrm{f}}$ | Input Rise or Fall Times | - | 500 | ns |

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

DC ELECTRICAL CHARACTERISTICS ( $\mathrm{V}_{\mathrm{CC}}=5 \mathrm{~V} \pm 10 \%$ (unless otherwise specified))

| Symbol | Parameter | Conditions | $\mathrm{T}_{\mathrm{A}}=25^{\circ} \mathrm{C}$ |  | $\begin{gathered} \mathrm{T}_{\mathrm{A}}=-40^{\circ} \mathrm{C} \\ \text { to } 85^{\circ} \mathrm{C} \end{gathered}$ | $\begin{gathered} \mathrm{T}_{\mathrm{A}}=-55^{\circ} \mathrm{C} \\ \text { to } 125^{\circ} \mathrm{C} \end{gathered}$ | Unit |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | Typ. | Guaranteed Limits |  |  |  |
| $\mathrm{V}_{\mathrm{IH}}$ | Minimum HIGH Level Input Voltage |  | - | 2.0 | 2.0 | 2.0 | V |
| $\mathrm{V}_{\mathrm{IL}}$ | Maximum LOW Level Input Voltage |  | - | 0.8 | 0.8 | 0.8 | V |
| $\mathrm{V}_{\mathrm{OH}}$ | Minimum HIGH Level Output Voltage | $\begin{aligned} & V_{I N}=V_{I H} \text { or } V_{I L}, \\ & \left\|{ }_{\text {loUT }}\right\|=20 \mu \mathrm{~A} \end{aligned}$ | $\mathrm{V}_{\mathrm{CC}}$ | $\mathrm{V}_{\text {CC }}-0.1$ | $\mathrm{V}_{\mathrm{CC}}-0.1$ | $\mathrm{V}_{\mathrm{CC}}-0.1$ | V |
|  |  | $\begin{aligned} & \mathrm{V}_{\mathrm{IN}}=\mathrm{V}_{\mathrm{IH}} \text { or } \mathrm{V}_{\mathrm{IL}}, \\ & \mathrm{I}_{\mathrm{OUT}} \mid=4.0 \mathrm{~mA}, \\ & \mathrm{~V}_{\mathrm{CC}}=4.5 \mathrm{~V} \end{aligned}$ | 4.2 | 3.98 | 3.84 | 3.7 |  |
|  |  | $\begin{aligned} & \mathrm{V}_{\mathrm{IN}}=\mathrm{V}_{\mathrm{IH}} \text { or } \mathrm{V}_{\mathrm{IL}} \\ & \left\|\mathrm{I}_{\mathrm{OUT}}\right\|=4.8 \mathrm{~mA}, \\ & \mathrm{~V}_{\mathrm{CC}}=5.5 \mathrm{~V} \end{aligned}$ | 5.2 | 4.98 | 4.84 | 4.7 |  |
| $\mathrm{V}_{\text {OL }}$ | Maximum LOW Level Voltage | $\begin{aligned} & V_{I N}=V_{I H} \\ & \mid \text { IOUT } \mid=20 \mu \mathrm{~A} \end{aligned}$ | 0 | 0.1 | 0.1 | 0.1 | V |
|  |  | $\begin{aligned} & \mathrm{V}_{\mathrm{IN}}=\mathrm{V}_{\mathrm{IH}} \\ & \left\|I_{\text {OUT }}\right\|=4.0 \mathrm{~mA} \\ & \mathrm{~V}_{\mathrm{CC}}=4.5 \mathrm{~V} \end{aligned}$ | 0.2 | 0.26 | 0.33 | 0.4 |  |
|  |  | $\begin{aligned} & \mathrm{V}_{\mathrm{IN}}=\mathrm{V}_{\mathrm{IH}} \\ & \left\|\left.\right\|_{\mathrm{OUT}}\right\|=4.8 \mathrm{~mA} \\ & \mathrm{~V}_{\mathrm{CC}}=5.5 \mathrm{~V} \end{aligned}$ | 0.2 | 0.26 | 0.33 | 0.4 |  |
| IN | Maximum Input Current | $\begin{aligned} & V_{\text {IN }}=V_{C C} \text { or } G N D, \\ & V_{I H} \text { or } V_{I L} \end{aligned}$ | - | $\pm 0.1$ | $\pm 1.0$ | $\pm 1.0$ | $\mu \mathrm{A}$ |
| $\mathrm{I}_{\mathrm{CC}}$ | Maximum Quiescent Supply Current | $\begin{aligned} & \mathrm{V}_{\mathrm{IN}}=\mathrm{V}_{\mathrm{CC}} \text { or } \mathrm{GND}, \\ & \mathrm{I}_{\text {OUT }}=0 \mu \mathrm{~A} \end{aligned}$ | - | 2.0 | 20 | 40 | $\mu \mathrm{A}$ |
|  |  | $\begin{aligned} & \hline \mathrm{V}_{\mathrm{IN}}=2.4 \mathrm{~V} \text { or } 0.5 \mathrm{~V} \\ & \text { (Note 2) } \end{aligned}$ | - | 0.3 | 0.4 | 0.5 | mA |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.
2. This is measured per input with all other inputs held at $\mathrm{V}_{\mathrm{CC}}$ or ground.

## MM74HCT04

## AC ELECTRICAL CHARACTERISTICS

( $\mathrm{V}_{\mathrm{CC}}=5.0 \mathrm{~V}, \mathrm{t}_{\mathrm{r}}=\mathrm{t}_{\mathrm{f}}=6 \mathrm{~ns}, \mathrm{C}_{\mathrm{L}}=15 \mathrm{pF}, \mathrm{T}_{\mathrm{A}}=25^{\circ} \mathrm{C}$ (unless otherwise specified))

| Symbol | Parameter | Conditions | Typ. | Guaranteed Limit | Unit |
| :---: | :---: | :---: | :---: | :---: | :---: |
| $\mathrm{t}_{\text {PLH }}, \mathrm{t}_{\text {PHL }}$ | Maximum Propagation Delay |  | 10 | 18 | ns |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

## AC ELECTRICAL CHARACTERISTICS

( $\mathrm{V}_{\mathrm{CC}}=5.0 \mathrm{~V} \pm 10 \%, \mathrm{t}_{\mathrm{r}}=\mathrm{t}_{\mathrm{f}}=6 \mathrm{~ns}, \mathrm{C}_{\mathrm{L}}=50 \mathrm{pF}$ (unless otherwise specified))

| Symbol | Parameter | Conditions | $\mathrm{T}_{\mathrm{A}}=25^{\circ} \mathrm{C}$ |  | $\mathrm{T}_{\mathrm{A}}=-40^{\circ} \mathrm{C}$ | $\mathrm{T}_{\mathrm{A}}=-55^{\circ} \mathrm{C}$ | Unit |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | Typ. | Guaranteed Limits |  |  |  |
| tpLH, tPHL | Maximum Propagation Delay |  | 14 | 20 | 25 | 30 | ns |
| ${ }_{\text {t }}^{\text {THL }}$, $\mathrm{t}_{\text {TLL }}$ | Maximum Output Rise and Fall Time |  | 8 | 15 | 19 | 22 | ns |
| $\mathrm{CPD}^{\text {P }}$ | Power Dissipation Capacitance | (Note 3) | 20 | - | - | - | pF |
| $\mathrm{C}_{\text {IN }}$ | Input Capacitance |  | 5 | 10 | 10 | 10 | pF |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.
3. $C_{P D}$ determines the no load dynamic power consumption, $P_{D}=C_{P D} V_{C C}{ }^{2} f+I_{C C} V_{C C}$, and the no load dynamic current consumption, $I_{S}=C_{P D} V_{C C} f+I_{C C}$.

## ORDERING INFORMATION

| Device | Package | Shipping $^{\dagger}$ |
| :--- | :---: | :---: |
| MM74HCT04M | SOIC-14, Case 751A-03 <br> (Pb-Free and Halide Free) | 55 Units / Tube |
| MM74HCT04MX | SOIC-14, Case 751EF <br> (Pb-Free and Halide Free) | 2500 Units / Tape \& Reel |
| MM74HCT04MTCX | TSSOP-14, Case 948G-01 <br> (Pb-Free and Halide Free) | 2500 Units / Tape \& Reel |

$\dagger$ For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.
NOTE: All packages are lead free per JEDEC: J-STD-020B standard.


SOIC-14 NB
CASE 751A-03
ISSUE L
SCALE 1:1


NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b DOES NOT INCLUDE DAMBAR

PROTRUSION. ALLOWABLE PROTRUSION
SHALL BE 0.13 TOTAL IN EXCESS OF AT MAXIMUM MATERIAL CONDITION
4. DIMENSIONS D AND E DO NOT INCLUDE

MOLD PROTRUSIONS.
5. MAXIMUM MOLD PROTRUSION 0.15 PER SIDE.

| DIM | MILLIMETERS |  |  | INCHES |  |
| :---: | ---: | :---: | ---: | ---: | :---: |
|  | MIN | MAX | MIN | MAX |  |
|  | 1.35 | 1.75 | 0.054 | 0.068 |  |
| A1 | 0.10 | 0.25 | 0.004 | 0.010 |  |
| A3 | 0.19 | 0.25 | 0.008 | 0.010 |  |
| b | 0.35 | 0.49 | 0.014 | 0.019 |  |
| D | 8.55 | 8.75 | 0.337 | 0.344 |  |
| E | 3.80 | 4.00 | 0.150 | 0.157 |  |
| e | 1.27 BSC | 0.050 | BSC |  |  |
| H | 5.80 | 6.20 | 0.228 | 0.244 |  |
| h | 0.25 | 0.50 | 0.010 | 0.019 |  |
| L | 0.40 | 1.25 | 0.016 | 0.049 |  |
| M | 0 | $7^{\circ}$ | $7^{\circ}$ | $0^{\circ}$ |  |



SOLDERING FOOTPRINT*


For additional information on our $\mathrm{Pb}-$ Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

## STYLES ON PAGE 2

| DOCUMENT NUMBER: | 98ASB42565B | Electronic versions are uncontrolled except when accessed directly from the Document Repository. <br> Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red. |
| ---: | :--- | :--- | :--- |
| DESCRIPTION: | SOIC-14 NB | PAGE 1 OF 2 |

[^0] special, consequential or incidental damages. onsemi does not convey any license under its patent rights nor the rights of others.

STYLE 1:
PIN 1. COMMON CATHODE
2. ANODE/CATHODE
3. ANODE/CATHODE
4. NO CONNECTION
5. ANODE/CATHODE
6. NO CONNECTION
7. ANODE/CATHODE
8. ANODE/CATHODE
9. ANODE/CATHODE
10. NO CONNECTION
11. ANODE/CATHODE
12. ANODE/CATHODE
13. NO CONNECTION
4. COMMON ANODE

STYLE 5
PIN 1. COMMON CATHODE
2. ANODE/CATHODE
3. ANODE/CATHOD
4. ANODE/CATHOD
4. ANODE/CATHODE
5. ANODE/CATHODE
6. NO CONNECTION
7. COMMON ANODE
8. COMMON CATHOD
9. ANODE/CATHODE
10. ANODE/CATHODE
11. ANODE/CATHODE
12. ANODE/CATHODE
13. NO CONNECTION
14. COMMON ANODE

STYLE 2 :
CANCELLED

STYLE 3:
PIN 1. NO CONNECTION 2. ANODE 3. ANODE
4. NO CONNECTION 5. ANODE
6. NO CONNECTION
7. ANODE
8. ANODE
9. ANODE
10. NO CONNECTION
11. ANODE
12. ANODE
13. NO CONNECTION
14. COMMON CATHODE

## STYLE 6

PIN 1. CATHODE
2. CATHODE
3. CATHODE
4. CATHODE
5. CATHODE
5. CATHODE
6. CATHODE
7. CATHOD
8. ANODE
9. ANODE
10. ANODE
11. ANODE
12. ANODE
13. ANODE
14. ANODE

STYLE 7:
PIN 1. ANODE/CATHODE
2. COMMON ANODE
3. COMMON CATHODE
4. ANODE/CATHODE
4. ANODE/CATHODE
5. ANODE/CATHODE
6. ANODE/CATHODE
7. ANODE/CATHODE
8. ANODE/CATHODE
9. ANODE/CATHODE
10. ANODE/CATHODE
11. COMMON CATHODE
11. COMMON CATHOD
13. ANODE/CATHODE
14. ANODE/CATHODE

STYLE 4:
PIN 1. NO CONNECTION 2. CATHODE
3. CATHODE
4. NO CONNECTION
5. CATHODE
6. NO CONNECTION
7. CATHODE
. CATHODE
9. CATHODE
10. NO CONNECTION
11. CATHODE
12. CATHODE
13. NO CONNECTION
14. COMMON ANODE

STYLE 8:
PIN 1. COMMON CATHODE
2. ANODE/CATHODE
3. ANODE/CATHODE
4. NO CONNECTION
4. NO CONNECTION
5. ANODE/CATHODE
6. ANODE/CATHODE
7. COMMON ANODE
8. COMMON ANODE
9. ANODE/CATHODE
10. ANODE/CATHODE
11. NO CONNECTION
11. NO CONNECTION
12. ANODE/CATHODE
12. ANODE/CATHODE
13. ANODE/CATHODE
13. ANODE/CATHODE
14. COMMON CATHODE

| DOCUMENT NUMBER: | 98ASB42565B | Electronic versions are uncontrolled except when accessed directly from the Document Repository Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red. |
| :---: | :---: | :---: |
| DESCRIPTION: | SOIC-14 NB |  |

onsemi and OnSemi. are trademarks of Semiconductor Components Industries, LLC dba onsemi or its subsidiaries in the United States and/or other countries. onsemi reserves the right to make changes without further notice to any products herein. onsemi makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does onsemi 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. onsemi does not convey any license under its patent rights nor the rights of others.

SOIC14
CASE 751EF ISSUE O


LAND PATTERN RECOMMENDATION


NOTES:
A. CONFORMS TO JEDEC MS-012, VARIATION AB, ISSUE C
B. ALL DIMENSIONS ARE IN MILLIMETERS
C. DIMENSIONS DO NOT INCLUDE MOLD FLASH OR BURRS
D. LAND PATTERN STANDARD: SOIC127P600X145-14M
E. CONFORMS TO ASME Y14.5M, 2009

DETAILA
SCALE 16: 1

| DOCUMENT NUMBER: | 98AON13739G | Electronic versions are uncontrolled except when accessed directly from the Document Repository. <br> Printed versions are uncontroled except when stamped "CONTROLLED COPY" in red. |
| ---: | :--- | :--- | :--- |
| DESCRIPTION: | SOIC14 | PAGE 1 OF 1 |

ON Semiconductor and (iN) are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. 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. ON Semiconductor does not convey any license under its patent rights nor the disclaims any and
rights of others.


TSSOP-14 WB
CASE 948G
ISSUE C
DATE 17 FEB 2016


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS MOLD FLASH OR GATE BURRS SHALL NOT MOLD FLASH OR GATE BURRS
EXCEED $0.15(0.006)$ PER SIDE.
4. DIMENSION B DOES NOT INCLUDE

INTERLEAD FLASH OR PROTRUSION.
INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 (0.010) PER SIDE.
5. DIMENSION K DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR
PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE K DIMENSION AT MAXIMUM MATERIAL CONDITION.
6. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
7. DIMENSION A AND B ARE TO BE DETERMINED AT DATUM PLANE -W-.

| DIM | MILLIMETERS |  | INCHES |  |
| :---: | :---: | :---: | :---: | :---: |
|  | MIN | MAX | MIN | MAX |
| A | 4.90 | 5.10 | 0.193 | 0.200 |
| B | 4.30 | 4.50 | 0.169 | 0.177 |
| C | --- | 1.20 | --- | 0.047 |
| D | 0.05 | 0.15 | 0.002 | 0.006 |
| F | 0.50 | 0.75 | 0.020 | 0.030 |
| G | 0.65 | BSC | 0.026 |  |
| BSC |  |  |  |  |
| H | 0.50 | 0.60 | 0.020 | 0.024 |
| J | 0.09 | 0.20 | 0.004 | 0.008 |
| J1 | 0.09 | 0.16 | 0.004 | 0.006 |
| K | 0.19 | 0.30 | 0.007 | 0.012 |
| K1 | 0.19 | 0.25 | 0.007 | 0.010 |
| L | 6.40 BSC | 0.252 | BSC |  |
| M | $00^{\circ}$ | $8^{\circ}$ | $0^{\circ}$ | $8^{\circ}$ |

GENERIC MARKING DIAGRAM*

SOLDERING FOOTPRINT


|  |
| :---: |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |


| A | $=$ Assembly Location |
| :--- | :--- |
| L | $=$ Wafer Lot |
| Y | $=$ Year |
| W | $=$ Work Week |
| - | $=$ Pb-Free Package |

(Note: Microdot may be in either location)
*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "•", may or may not be present. Some products may not follow the Generic Marking.

| DOCUMENT NUMBER: | 98ASH70246A | Electronic versions are uncontrolled except when accessed directly from the Document Repository. <br> Printed versions are uncontroled except when stamped "CONTROLLED COPY' in red. |
| ---: | :--- | :--- | :--- |
| DESCRIPTION: | TSSOP-14 WB | PAGE 1 OF 1 |

[^1]onsemi, OnSeMi., and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "onsemi" or its affiliates and/or subsidiaries in the United States and/or other countries. onsemi owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of onsemi's product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. onsemi reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as-is" and onsemi makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does onsemi 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 onsemi products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by onsemi. "Typical" parameters which may be provided in onsemi 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. onsemi does not convey any license under any of its intellectual property rights nor the rights of others. onsemi 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 onsemi products for any such unintended or unauthorized application, Buyer shall indemnify and hold onsemi 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 onsemi was negligent regarding the design or manufacture of the part. onsemi is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner

## ADDITIONAL INFORMATION

TECHNICAL PUBLICATIONS:
Technical Library: www.onsemi.com/design/resources/technical-documentation onsemi Website: www.onsemi.com

ONLINE SUPPORT: www.onsemi.com/support
For additional information, please contact your local Sales Representative at www.onsemi.com/support/sales


[^0]:    onsemi and OnSEMi are trademarks of Semiconductor Components Industries, LLC dba onsemi or its subsidiaries in the United States and/or other countries. onsemi reserves the right to make changes without further notice to any products herein. onsemi makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does onsemi 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

[^1]:    onsemi and OnSemi. are trademarks of Semiconductor Components Industries, LLC dba onsemi or its subsidiaries in the United States and/or other countries. onsemi reserves the right to make changes without further notice to any products herein. onsemi makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does onsemi 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. onsemi does not convey any license under its patent rights nor the rights of others.

