

# NCP370GEVB

## NCP370 Over Voltage Protection Controller with Reverse Charge Control Evaluation Board User's Manual



ON Semiconductor®

<http://onsemi.com>

### Description

The NCP370 is an overvoltage, overcurrent and reverse control device. Two main modes are available by setting logic pins.

First mode is Direct Mode from Wall Adapter to the system. In this mode the system is both positive and negative overvoltage protected up to +28 V and down to -28 V. The wall adapter is disconnected from the system if the input voltage exceeds the overvoltage (OVLO) or undervoltage (UVLO) thresholds. At powerup, the Vout turns on 30 ms after the Vin exceeds the undervoltage threshold.

The second mode, called the Reverse Mode, allows an external accessory to be powered by the system battery or a boost converter. Here, the external accessory would be connected to the device input (bottom connector of system) and the device battery would be at the device output. In this case, overcurrent protection is activated to prevent accessory faults and battery discharge. Thanks to the NCP370 using an internal NMOS, the system cost and the PCB area of the application board are minimized. The NCP370 provides a negative going flag (FLAG(BAR)) output which alerts the system that a fault has occurred. In addition, the device has ESD protected input (15 kV Air) when bypassed with a 1.0  $\mu$ F or larger capacitor.

### EVAL BOARD USER'S MANUAL

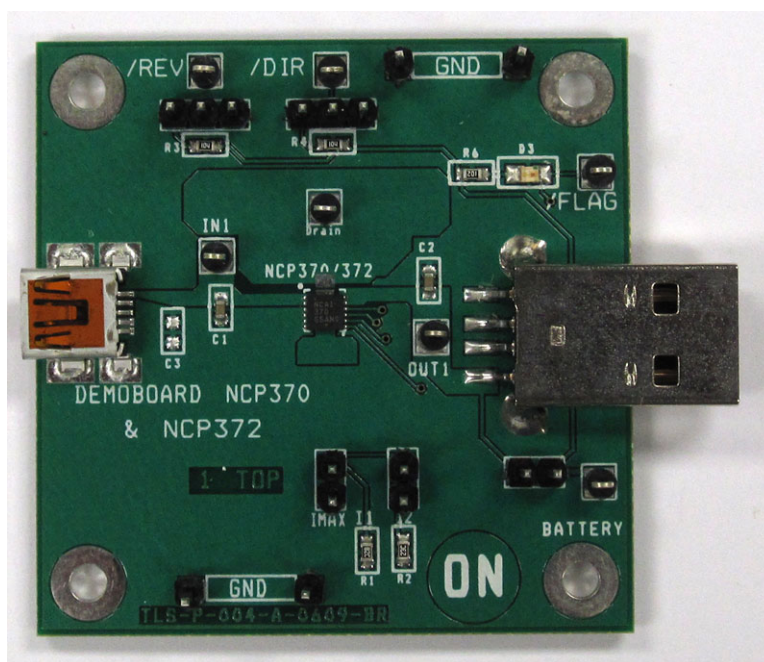
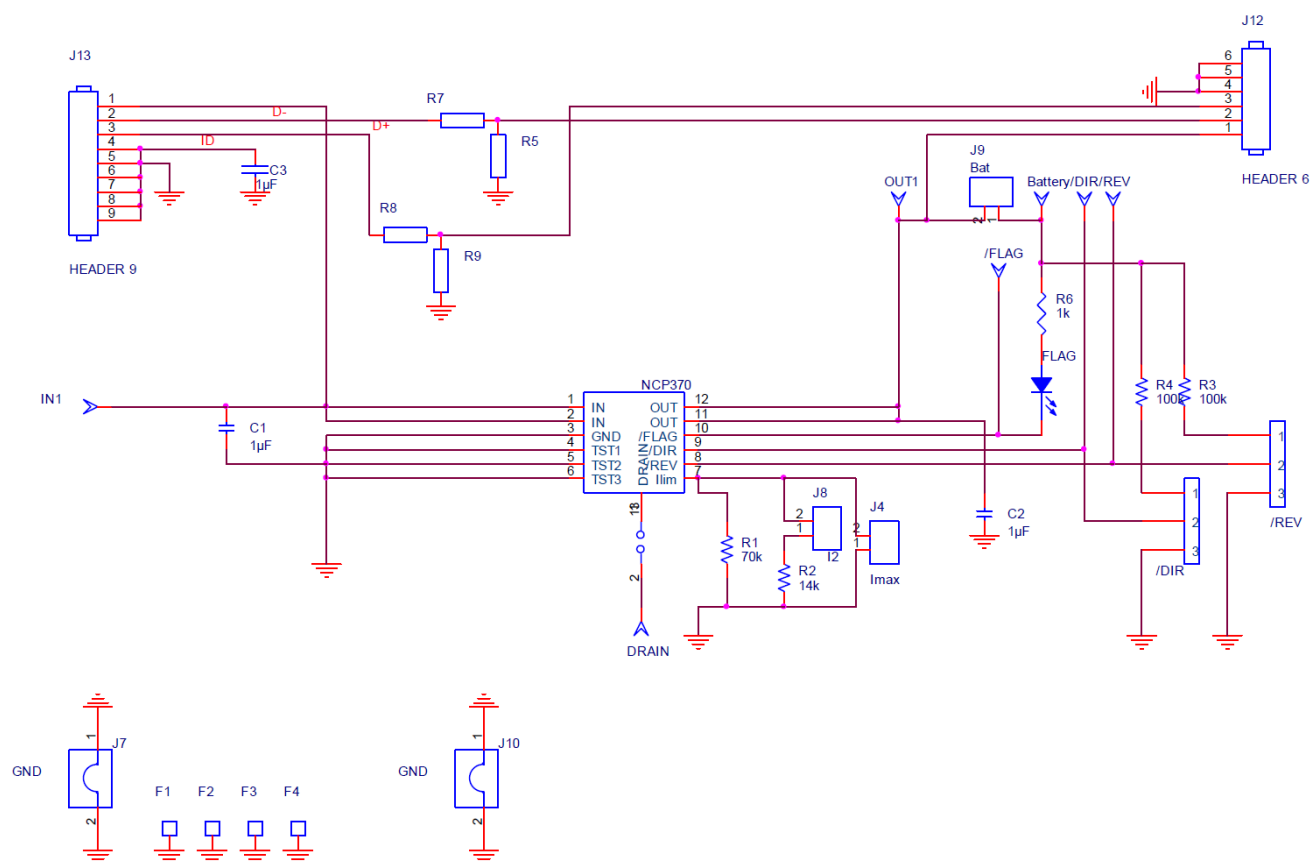


Figure 1. NCP370GEVB Board Picture

**NCP370GEVB**



**Figure 2. NCP370GEVB Board Schematic**

# NCP370GEVB

**Table 1. BILL OF MATERIALS**

| Quantity    | Designation                                           | Manufacturer                | Digi key           | Specifications                   |
|-------------|-------------------------------------------------------|-----------------------------|--------------------|----------------------------------|
| 1           | NCP370 LLGA3x3                                        | ON Semiconductor            |                    | Over voltage protection          |
| 2           | C1 (Cin), C2 (Cout)                                   | Murata – GRM188R61E105KA12D | 490-3897-1-ND      | 1 $\mu$ F 25V X5R CMS0805        |
| 1           | C3 (ID): not mounted                                  |                             |                    |                                  |
| 13          | Test points:IN1, OUT1, BATTERY, FLAG, DRAIN, REV, DIR |                             | 5001K-ND           | Hole diameter: 1.3mm             |
| 1           | J13 (USB IN)                                          | Molex                       | WM17116CT-ND       | 5 pins USB miniB                 |
| 1           | J12. (USB OUT)                                        | Molex                       | WM17118-ND         | 4 pins USB A                     |
| 1           | FLAG                                                  | rohm                        | 511-1287-ND        | Green LED 0805                   |
| 1           | R6                                                    | susumu                      | Rr08p(value)dct-nd | 1 k $\Omega$ . CMS0603 0.5%      |
| 2           | R3, R4                                                | susumu                      | Rr08p(value)dct-nd | 100 k $\Omega$ . CMS0603 0.5%    |
| Not mounted | R5,R7,R8,R9 (USB data)                                |                             |                    |                                  |
| 1           | R1                                                    | susumu                      | Rr08p(value)bct-nd | 69.8k $\Omega$ . CMS0603 0.5%    |
| 1           | R2                                                    | susumu                      | Rr08p(value)bct-nd | 16.9k $\Omega$ . CMS0603 0.5%    |
| 4           | GND jumper: J7, J10                                   |                             | WM8083-ND          | Jumper Ground 1mm pitch 10.16 mm |
| 1x3         | REV                                                   |                             | WM8083-ND          | SMB R 114 665 PCB Plated Gold    |
| 1x3         | DIR                                                   |                             | WM8083-ND          | SMB R 114 665 PCB Plated Gold    |
| 1x2         | lmax                                                  |                             | WM8083-ND          | SMB R 114 665 PCB Plated Gold    |
| 1x2         | l2                                                    |                             | WM8083-ND          | SMB R 114 665 PCB Plated Gold    |
| 1x2         | Battery                                               |                             | WM8083-ND          | SMB R 114 665 PCB Plated Gold    |

# NCP370GEVB

## PCB

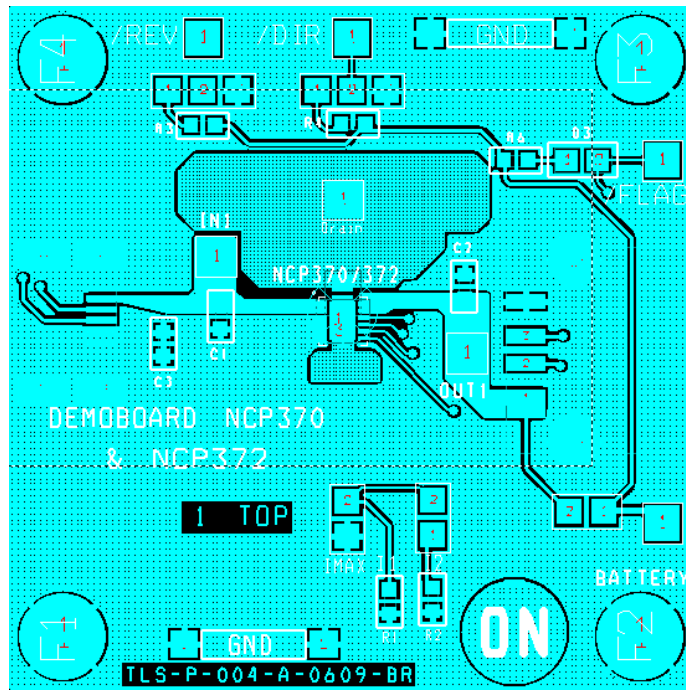


Figure 3. NCP370GEVB Board Layout (Top View)

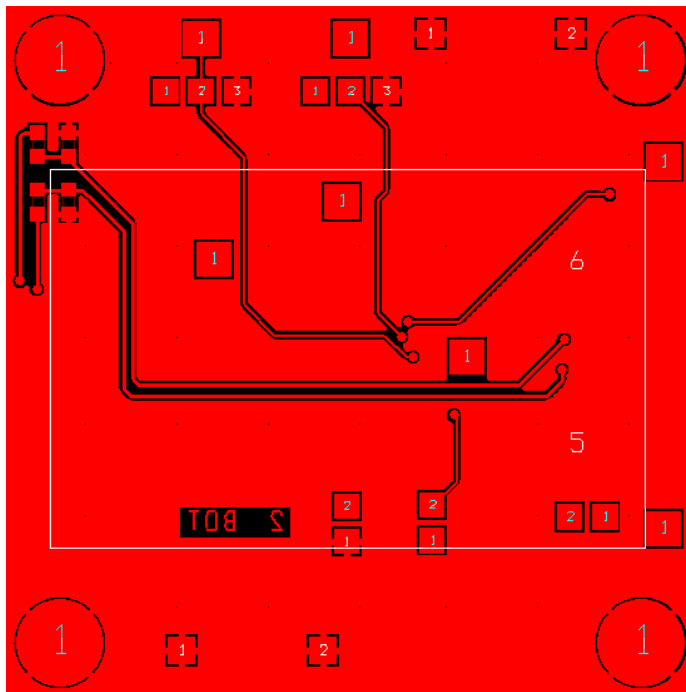
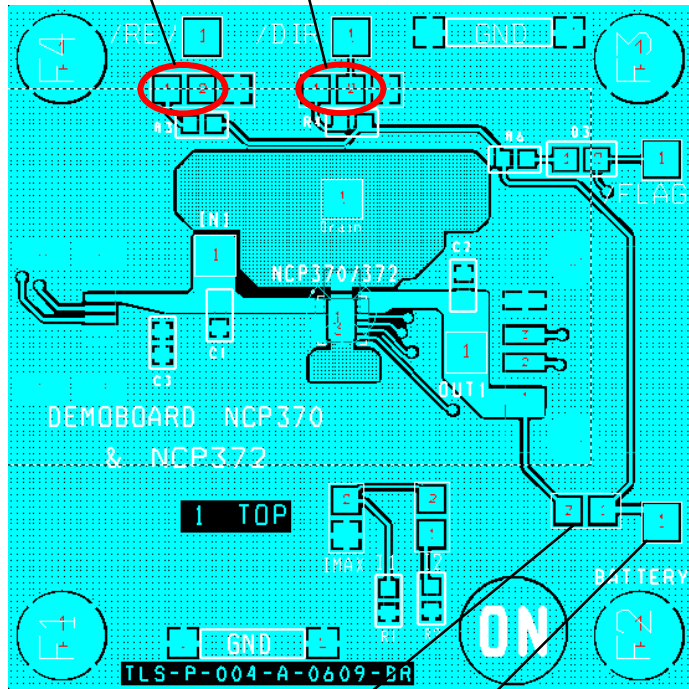


Figure 4. NCP370GEVB Board Layout (Bottom View)

# NCP370GEVB

## CONNECTING PROCESS

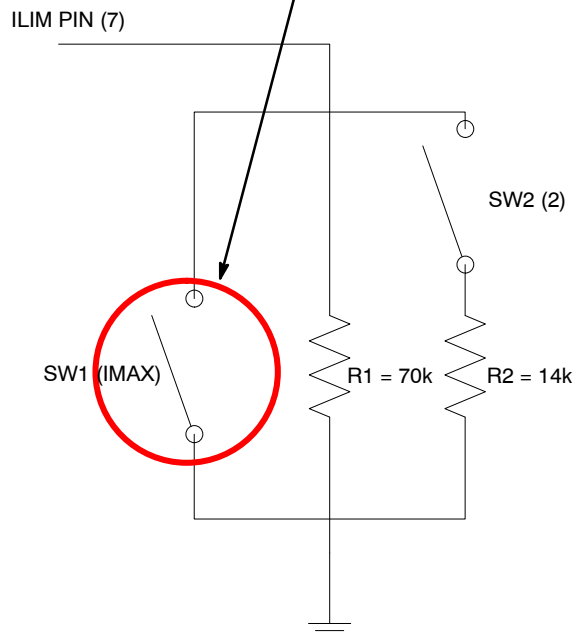
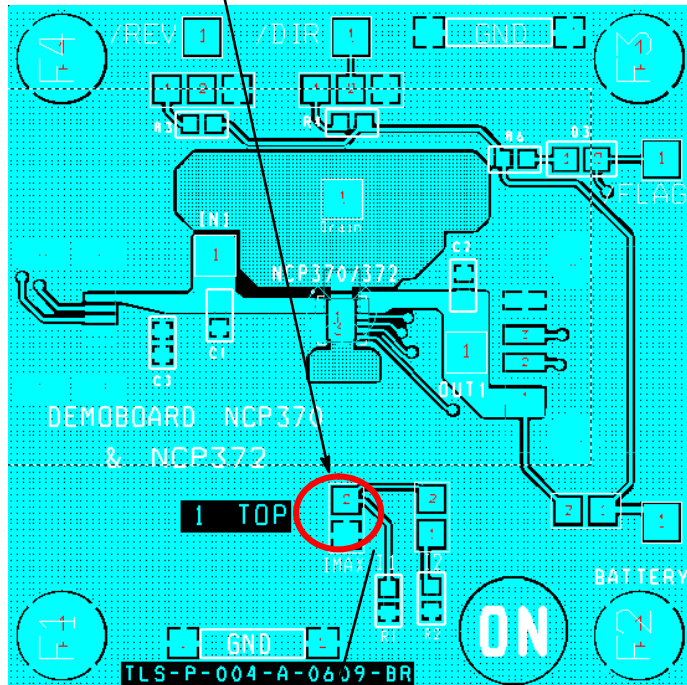
1. Place /REV strap and /DIR strap on left side ("1" logic) (connected to Vbat, through pull up resistor)



2. Let Battery strap opened.
3. Connect a Battery or power supply (4.2 V) on Battery test point (min 2 A capability).

# NCP370GEVB

4. Connect strap on lim.



## NCP370GEVB

5. Select I limit threshold with pull down resistors connected on pin 7:

| SW1 | SW2 | IOCP   |
|-----|-----|--------|
| 0   | 0   | 500 mA |
| 0   | 1   | 1 A    |
| 1   | 0   | 1.5 A  |
| 1   | 1   | 1.5 A  |

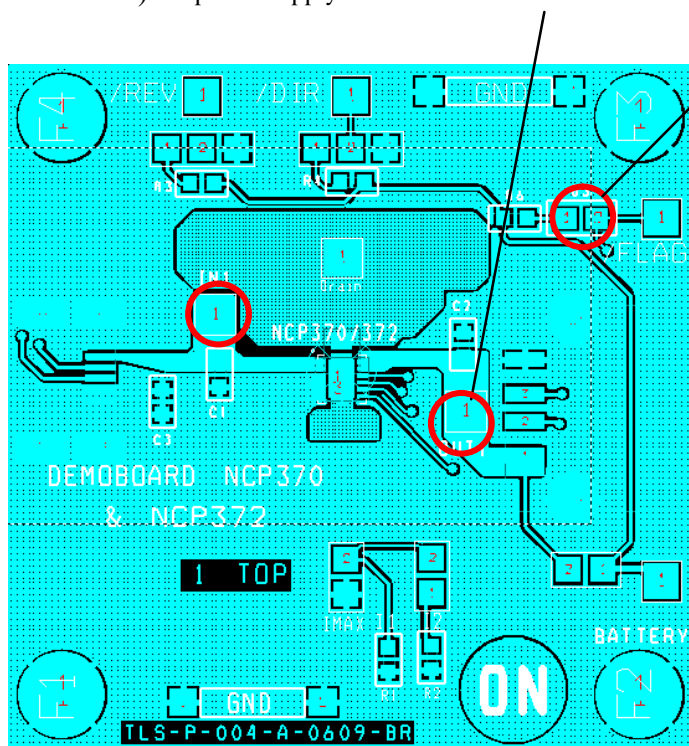
R1 = 70K

R2 = 14K

### Disable Mode:

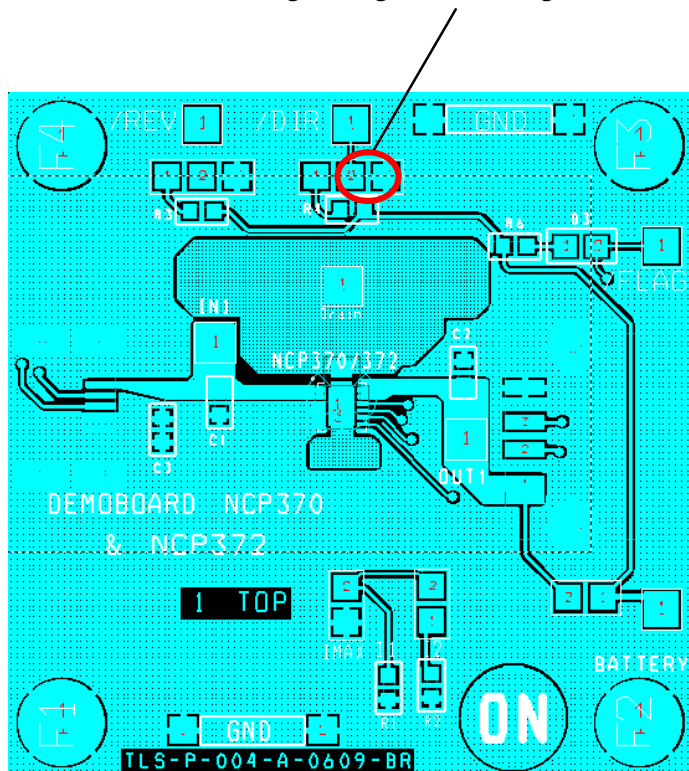
6. Connect 10 V capability Vin Supply on IN1 test point.

a.) Set power supply to 5 V  $\Rightarrow$  Check Vout = 0 V and LED = off

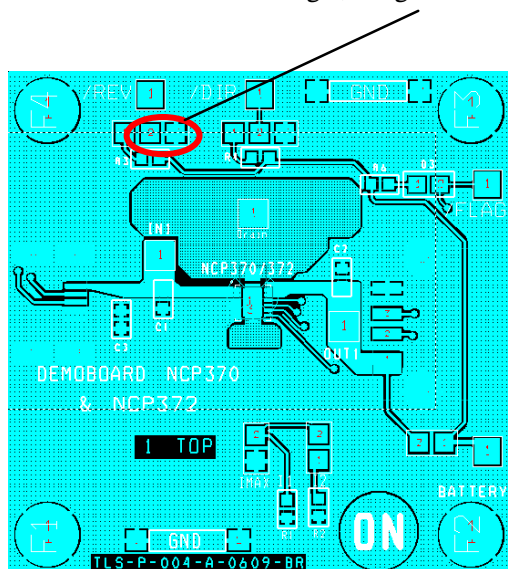


## Direct Mode:

7. Switch /DIR from left to right, 1 logic level to 0 logic level



8. Check  $V_{out} = 5\text{ V}$  and Flag LED is still off
9. Set  $V_{in} = 7\text{ V}$
10. Check Flag LED = on, and  $V_{out}$  is 0 V.
11. Switch /REV from left to right, 1 logic level to 0 logic level



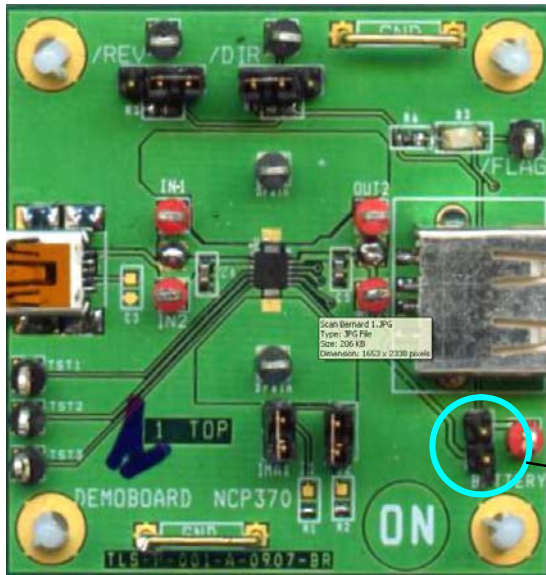
12. Check Flag LED = off, and  $V_{out} = V_{in} = 7\text{ V}$ .  
Disconnect  $V_{in}$  Supply.



## NCP370GEVB

### Reverse Mode:

13. Connect Set /DIR = 1, /REV = 1  
Disconnect Vin Power Supply from IN test points.  
Connect accessory on IN1 or IN2 test points.



Put strap to connect Battery to Vout

14. Set /DIR = 1, /REV = 0:  $V_{out} = V_{in}$

If  $I_{accessory} < I_{limit}$  then  $V_{in} = V_{out} - R_{dson} \times I$

If  $I_{accessory} > I_{limit}$  then  $V_{in} = 0$  (Current regulation)

Power off.

15. Set /DIR = 1, /REV = 1
16. Disconnect accessory
17. Disconnect Battery

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 is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

The evaluation board/kit (research and development board/kit) (hereinafter the "board") is not a finished product and is as such not available for sale to consumers. The board is only intended for research, development, demonstration and evaluation purposes and should as such only be used in laboratory/development areas by persons with an engineering/technical training and familiar with the risks associated with handling electrical/mechanical components, systems and subsystems. This person assumes full responsibility/liability for proper and safe handling. Any other use, resale or redistribution for any other purpose is strictly prohibited.

The board is delivered "AS IS" and without warranty of any kind including, but not limited to, that the board is production-worthy, that the functions contained in the board will meet your requirements, or that the operation of the board will be uninterrupted or error free. ON Semiconductor expressly disclaims all warranties, express, implied or otherwise, including without limitation, warranties of fitness for a particular purpose and non-infringement of intellectual property rights.

ON Semiconductor reserves the right to make changes without further notice to any board.

You are responsible for determining whether the board will be suitable for your intended use or application or will achieve your intended results. Prior to using or distributing any systems that have been evaluated, designed or tested using the board, you agree to test and validate your design to confirm the functionality for your application. Any technical, applications or design information or advice, quality characterization, reliability data or other services provided by ON Semiconductor shall not constitute any representation or warranty by ON Semiconductor, and no additional obligations or liabilities shall arise from ON Semiconductor having provided such information or services.

The boards are not designed, intended, or authorized for use in life support systems, or any FDA Class 3 medical devices or medical devices with a similar or equivalent classification in a foreign jurisdiction, or any devices intended for implantation in the human body. Should you purchase or use the board for any such unintended or unauthorized application, you 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 board.

This evaluation board/kit does not fall within the scope of the European Union directives regarding electromagnetic compatibility, restricted substances (RoHS), recycling (WEEE), FCC, CE or UL, and may not meet the technical requirements of these or other related directives.

**FCC WARNING** – This evaluation board/kit is intended for use for engineering development, demonstration, or evaluation purposes only and is not considered by ON Semiconductor to be a finished end product fit for general consumer use. It may generate, use, or radiate radio frequency energy and has not been tested for compliance with the limits of computing devices pursuant to part 15 of FCC rules, which are designed to provide reasonable protection against radio frequency interference. Operation of this equipment may cause interference with radio communications, in which case the user shall be responsible, at its expense, to take whatever measures may be required to correct this interference.

ON Semiconductor does not convey any license under its patent rights nor the rights of others.

**LIMITATIONS OF LIABILITY:** ON Semiconductor shall not be liable for any special, consequential, incidental, indirect or punitive damages, including, but not limited to the costs of requalification, delay, loss of profits or goodwill, arising out of or in connection with the board, even if ON Semiconductor is advised of the possibility of such damages. In no event shall ON Semiconductor's aggregate liability from any obligation arising out of or in connection with the board, under any theory of liability, exceed the purchase price paid for the board, if any.

For more information and documentation, please visit [www.onsemi.com](http://www.onsemi.com).

## PUBLICATION ORDERING INFORMATION

### LITERATURE FULFILLMENT:

Email Requests to: [orderlit@onsemi.com](mailto:orderlit@onsemi.com)

ON Semiconductor Website: [www.onsemi.com](http://www.onsemi.com)

### TECHNICAL SUPPORT

#### North American Technical Support:

Voice Mail: 1 800-282-9855 Toll Free USA/Canada

Phone: 011 421 33 790 2910

#### Europe, Middle East and Africa Technical Support:

Phone: 00421 33 790 2910

For additional information, please contact your local Sales Representative