

NCP6360EVB

NCP6360 WLCSP6 Evaluation Board User's Manual



ON Semiconductor®

<http://onsemi.com>

EVAL BOARD USER'S MANUAL

Introduction

This document gives a detailed description of the NCP6360 Evaluation Board (WLCSP6) with the Bill Of Material (BOM), board schematic and layout. The appropriate laboratory test setups are also provided. The NCP6360 Evaluation Board has been designed to help for a quick evaluation of the NCP6360 buck converter.

This document has to be used together with the NCP6360 datasheet. The datasheet contains full technical details regarding the NCP6360 specifications and operation. The board (FR4 material) is implemented in 4 metal layers. The top and bottom layers have thicknesses of 35 μm (1 oz). The PCB thickness is 1.6 mm with dimensions of 77 mm by 55 mm (see Figure 1).



Figure 1. Evaluation Board Picture

EQUIPMENT

Table 1. RECOMMENDED EXAMPLE OF EQUIPMENT

Description	Main Features	Example of Equipment (Note 1)	Qty.
Regulated Power Supply	1.5 A DC Current capability	Tektronix PS2520G G ^W INSTEK PPT3615	1
Multimeter		Keitley 2000 or 2001	2
Sourcemeter	3 A DC Current capability	Keitley 2420	2
Oscilloscope	500 MHz Bandwidth, four channel scope, min 1 Mbit memory per channel (Note 2)	Tecktronix TDS744, 754 or 784 / TDS5054 series or Lecroy WR5060 TDS5104B, 1 GHz, 5 GS/s	1
Voltage probe	3 probes 500 MHz Bandwidth	Tektronix P6139A / P5050	3
Current probe	1 probe	Tektronix TCP 202	
Waveform generator	Arbitrary/Function generator	Tektronix AFG 3102 Dual channel, 100 MHz	1
SMB Cable		Load transient control or VCON	1

1. Equipment used in the context of this Evaluation Board User's Manual
2. Greater Scope memory per channel offers better resolution

QUICK TEST PROCEDURE

(see Figure 2)

Initial Setup:

The initial setup given here is recommended before starting measurements on the evaluation board.

- Jumper Configuration: initial / default setup
 - ♦ LTR1 not connected
 - ♦ LTR2 connected – Can be used for visualizing the current in the inductor (ILX) using an oscilloscope current probe
 - ♦ LTR3 connected – Connect FB pin to Vout
 - ♦ S1: Enable pin; default with jumper connected to VBAT (Logic Level High), device is activated by default
- Connect Vin (VBAT) with VBAT tuned at 3.7 V for example
- Connect VCON with VCON tuned at 0.8 V for example $\Rightarrow V_{out} = 0.8 \text{ V} \times 2.5 = 2 \text{ V}$
- Connect load (8Ω or 10Ω respectively 250 mA or 200 mA considering $V_{out} = 2 \text{ V}$) or connect a current source tuned with 100 mA (as initial load value)
- Connect voltage probe or multi-meter on Vout test point
- Other test points can be eventually checked: VCON (TP9), FB, VBAT, EN, FSEL and BPEN

- SW test point is available as well
- Apply VBAT = 3.7 V first then VCON = 0.8 V and finally IOUT (100 mA) if current source connected
- Check Vout = 2 V
- VBAT can vary from 2.5 V to 5.5 V according to datasheet
- VCON can vary from 0.24 V to 1.36 V with a corresponding respective Vout of 0.6 V typical and 3.4 V typical
- Output current can vary from 0 to 800 mA in PWM mode and up to 1.2 A in By Pass mode

Operating Modes:

- 4 operating modes are available: they can be checked by sweeping VCON according to datasheet specification and below rough guide lines:
 - ♦ Sleep Mode with VCON below about 0.125 V
 - ♦ PFM Mode with VCON above 0.125 V
 - ♦ PWM Mode when Iout above about 200 mA
 - ♦ By Pass Mode when Vout close to Vin such as $V_{in} - V_{out}$ below about 200 mV or by forcing bypass mode with pin BPEN

BOARD DESCRIPTION



BOARD SCHEMATIC



NCP6360EVB

Table 2. BILL OF MATERIAL – NCP6360 EVALUATION BOARD

Designator	Qty	Description	Value	Tol	Footprint	Manufacturer	Manufacturer Part Number	Lead Free
C1	1	CAP CER 100UF 6.3V 20% X5R 1210	100 μ F	20%	1210			Yes
C2	1	0805	DNP	–	0805		DNP	Yes
C3, C8	2	CAP CER 10UF 16V 10% X5R 0603	10 μ F	10%	0603			Yes
C5	1	CAP CER 1UF 16V X7R 10% 0603	1 μ F	10%	0603			Yes
C6	1	CAP CER 4.7UF 16V X7R 0603	4.7 μ F	5%	0603			Yes
C7	1	0402	DNP		0402		DNP	
R1	1	STRAP	DNP	–			Engineering, DNP	Yes
R2	1	0603 SMD	50, DNP	–	0603			Yes
L1	1	2016, inductor 0.47 μ H (1 μ H)	0.47 μ H (1 μ H)		2016	TDK TOKO	TFM201610A–R47M–T00 DFE201612R–H–R47N	Yes
TP1, TP2, TP5, TP7, TP9	5	VBAT, VOUT, FB, EN, VCON Clip Test Point, Hole Diameter 1.6 mm (0.063 mil)	–	–	TP_1.6MMHOLE _KEYSTONE _5010	Keystone	5010	Yes
TP6	1	SW, Contact Test Point	–	–	NA	NA	NA	Yes
TP8	1	Load Transient Gen, Clip Test Point, Hole Diameter 1.6 mm (0.063 mil)	–	–	TP_1.6MMHOLE _KEYSTONE _5010	Keystone	5010	Yes
J1, J2	2	VBAT, VOUT, 2-Pins Male Connector, 5.08 mm Step	–	–	CON2	Phoenix Contact	MSTBA2.52G5.08	Yes
J3, J4	2	Ground Strap, Brass, Diameter 1.0 mm, Pitch 10.16 mm, Height 9.9 mm	–	–	GND_STRP	HARWIN	D3082–46	Yes
J5, J6, J7, J8	4	VBAT, VOUT banana connectors, DC 60 V 16 A. (Ø 4 mm nickel-plated brass socket)	–		BANANA JACK	Hirschmann	BO 10	Yes
J9, J10, J11	3	SMB connectors	Populate J9 only		SMB/V	IMS	111510001	Yes
LTR1, LTR2, LTR3	3	Breakable Single Row Header (2 Pins)	–	–	CON2–2.54	TYCO Amp	5–826629–0	Yes
S1	3	EN Breakable Single Row Header (3 Pins)	–	–	CON3–2.54	TYCO Amp	5–826629–0	Yes
U1	1	NCP6360	–	–	WLCSP6	ON Semiconductor	NCP6360	Yes
Q1	1	NTD3055L104	DNP		DPACK–1234	ON Semiconductor	Engineering, DNP	Yes
H1, H2, H3, H4	4	Standoff nut & Standoff screw	–	–	STANDOFF HOLE	Keystone Electronics	1903C & 4814K–ND	Yes

NOTE DNP = Do Not Populate

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** 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 not available for sale to consumers. The board is only intended for research, development, demonstration and evaluation purposes and will 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 PROVIDED BY ONSEMI TO YOU "AS IS" AND WITHOUT ANY REPRESENTATIONS OR WARRANTIES WHATSOEVER. WITHOUT LIMITING THE FOREGOING, ONSEMI (AND ITS LICENSORS/SUPPLIERS) HEREBY DISCLAIMS ANY AND ALL REPRESENTATIONS AND WARRANTIES IN RELATION TO THE BOARD, ANY MODIFICATIONS, OR THIS AGREEMENT, WHETHER EXPRESS, IMPLIED, STATUTORY OR OTHERWISE, INCLUDING WITHOUT LIMITATION ANY AND ALL REPRESENTATIONS AND WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, TITLE, NON-INFRINGEMENT, AND THOSE ARISING FROM A COURSE OF DEALING, TRADE USAGE, TRADE CUSTOM OR TRADE PRACTICE.

onsemi 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 **onsemi** shall not constitute any representation or warranty by **onsemi**, and no additional obligations or liabilities shall arise from **onsemi** having provided such information or services.

onsemi products including 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. You agree to indemnify, defend and hold harmless **onsemi**, its directors, officers, employees, representatives, agents, subsidiaries, affiliates, distributors, and assigns, against any and all liabilities, losses, costs, damages, judgments, and expenses, arising out of any claim, demand, investigation, lawsuit, regulatory action or cause of action arising out of or associated with any unauthorized use, even if such claim alleges that **onsemi** was negligent regarding the design or manufacture of any products and/or 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 **onsemi** 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.

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

LIMITATIONS OF LIABILITY: **onsemi** 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 **onsemi** is advised of the possibility of such damages. In no event shall **onsemi**'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.

The board is provided to you subject to the license and other terms per **onsemi**'s standard terms and conditions of sale. For more information and documentation, please visit www.onsemi.com.

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