

FAN3852 Microphone Pre-Amp Stereo Evaluation Board User's Manual

Overview

This manual describes the features and operation of the FAN3852 stereo evaluation board (EVB). This board allows functional and performance testing of the FAN3852 analog amplifier with PDM output. The FAN3852 was originally designed as a pre-amplifier for analog electret condenser microphones (ECM); however, this board can easily be used to amplify and digitize other low-amplitude analog signals with a similar bandwidth, such as from pressure, vibration or ambient light sensors. The FAN3852 has a fixed gain of +16 dB.

Required Hardware & Equipment

Use of this board requires the following equipment and hardware:

- DC Voltage Source (1.8 V–3.3 V)
- Banana Plug Cables
- ECM Module or Other Small-Amplitude Analog Signal Source
- PDM Clock Generator
- PDM Data Receiver/Analyzer

Quick Start

The jumper configuration is preset for stereo operation with CLOCK1 and DATA1 lines being used for both input channels. In this configuration, INPUT1 is configured as the LEFT audio input and INPUT2 is the RIGHT audio input.

1. Connect PDM clock source to CLOCK1 input.
2. Connect PDM data receiver to DATA1 output.
3. Connect analog input signal(s) to INPUT1 (INPUT2).

Table 1. FAN3852 RECOMMENDED OPERATING RANGES

Symbol	Parameter	Min	Typ	Max	Unit
T _A	Operating Temperature Range	–40	–	+85	°C
V _{DD}	Supply Voltage Range	1.64	1.80	3.63	V
T _{RF-CLK}	Clock Rise and Fall Time	–	–	10	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.



ON Semiconductor®

www.onsemi.com

EVAL BOARD USER'S MANUAL

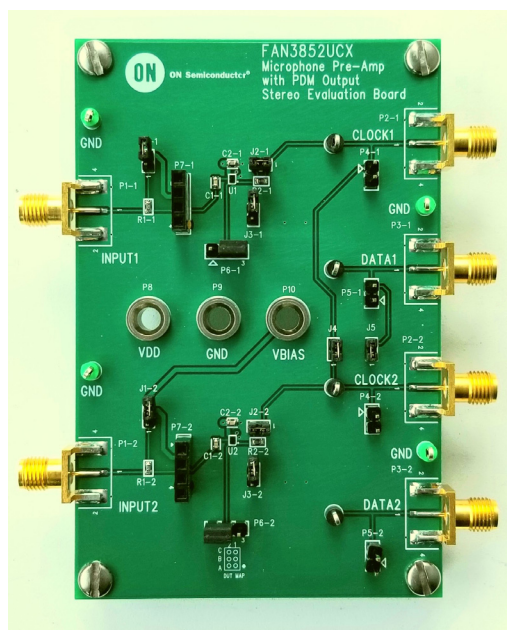


Figure 1. Board Photo

Channel Layout

This evaluation board has two independent FAN3852 signal channels. This board can be configured to operate as a stand-alone single channel, as two independent channels, or in a stereo configuration using a single PDM clock/data path. Figure 2 shows the channel locations.

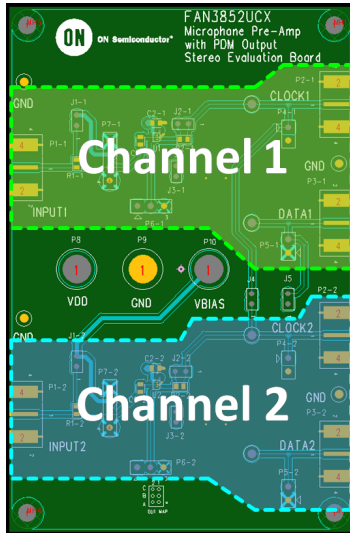


Figure 2. EVB Signal Channels

NOTE: Both channels are powered from the same supply voltage and cannot be powered with different VDD voltages.

Signal Headers

Figure 3 shows header locations on the board. Table 2 lists the headers which are used to connect I/O signals to the EVB. These headers use either SMA end-launch connectors or two-pin 100-mil male header connectors.

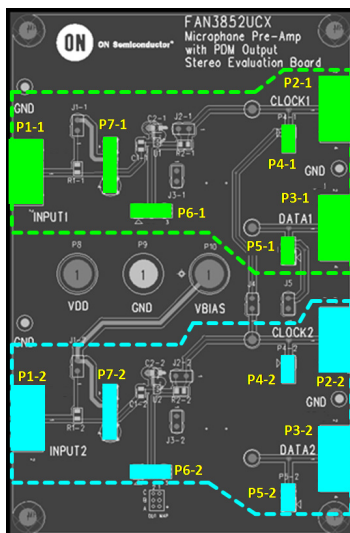


Figure 3. EVB Header Locations

Table 2. EVB Header Descriptions

Header	Description
P1-1	INPUT1 SMA connector
P2-1	CLOCK1 SMA connector
P3-1	DATA1 SMA output connector
P4-1	CLOCK1 100-mil header
P5-1	DATA1 100-mil header
P6-1	SELECT1 configuration header
P7-1	INPUT1 100-mil auxiliary input header
P1-2	INPUT2 SMA connector
P2-2	CLOCK2 SMA connector
P3-2	DATA2 SMA output connector
P4-2	CLOCK2 100-mil header
P5-2	DATA2 100-mil header
P6-2	SELECT2 configuration header
P7-2	INPUT2 100-mil auxiliary input header

Jumpers

Jumpers on this EVB are all two-pin 2 mm male headers with shorting jumpers supplied. Jumpers are used to select different board operation options.

Figure 4 below shows the jumper locations. Table 3 on the next page lists the available configuration jumpers, shows their default positions for stereo operation, and provides descriptions of each jumper's function.

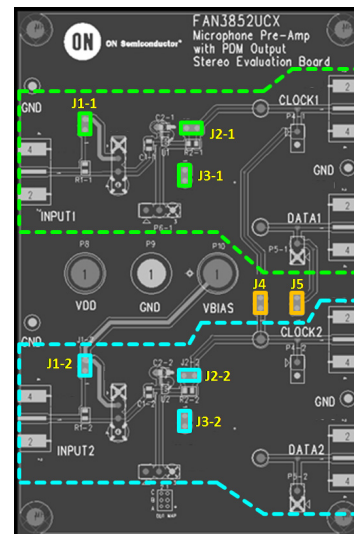


Figure 4. EVB Jumper Locations

Table 3. EVB JUMPER DESCRIPTIONS

Jumper	Default Position	Description
J1-1	Open	Connects INPUT1 to VBIAS through 2.2 k Ω resistor R1-1
J2-1	Short	Bypasses CLOCK1 input 100 Ω series termination resistor R2-1
J3-1	Open	Connects 1 k Ω 47 pF load to ground (R3-1, C3-1) at DATA1 output
J1-2	Open	Connects INPUT2 to VBIAS through 2.2 k Ω resistor R1-2
J2-2	Short	Bypasses CLOCK2 input 100 Ω series termination resistor
J3-2	Open	Connects 1 k Ω 47 pF load to ground (R3-2, C3-2) at DATA2 output
J4	Short	Connects CLOCK1 input to CLOCK2 input
J5	Short	Connects DATA1 output to DATA2 output

Modes of Operation

Single-Channel or Independent Two-Channel Operation

This example uses Channel 1. However, these directions will work for Channel 2 by substituting header numbers 'Pn-1' with 'Pn-2'.

1. Remove J4 & J5.
2. Connect input signal to P1-1 or P7-1.
3. Connect PDM clock source to P2-1 or P4-1.
4. Connect PDM data receiver to P3-1 or P5-1.
5. Apply VDD.
6. Enable PDM clock.

Stereo Two-Channel Operation

This mode is typically used with a stereo (dual-microphone) audio source. In this configuration, the FAN3852 SELECT jumpers are set for left-channel audio on Channel 1 & right-channel audio on Channel 2.

1. Connect J4 & J5.
2. Connect both input signals.
3. Connect PDM clock source to P2-1 or P4-1.
4. Connect PDM data receiver to P3-1 or P5-1.
5. Connect the P6-1 shorting jumper between pins 2-3.
6. Connect the P6-2 shorting jumper between pins 1-2.
7. Apply VDD.
8. Enable PDM clock.

Pin Descriptions

Figure 5 and Table 4 below describe the location and function of each of the FAN3852 device pins.

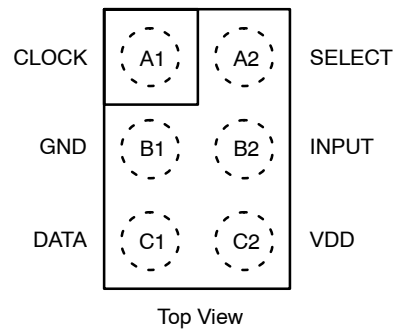


Figure 5. Pin Configuration

Table 4. FAN3852 PIN DESCRIPTIONS

Pin #	Pin Name	Type	Description
A1	CLOCK	Input	Clock Input
B1	GND	Input	Device Ground
C1	DATA	Input	PDM Output (1-bit ADC)
A2	SELECT	Output	Clock Edge Select Low = Rising Edge High = Falling Edge
B2	INPUT	Input	Analog Signal Input
C2	VDD	Input	Device Power

PCB LAYOUT

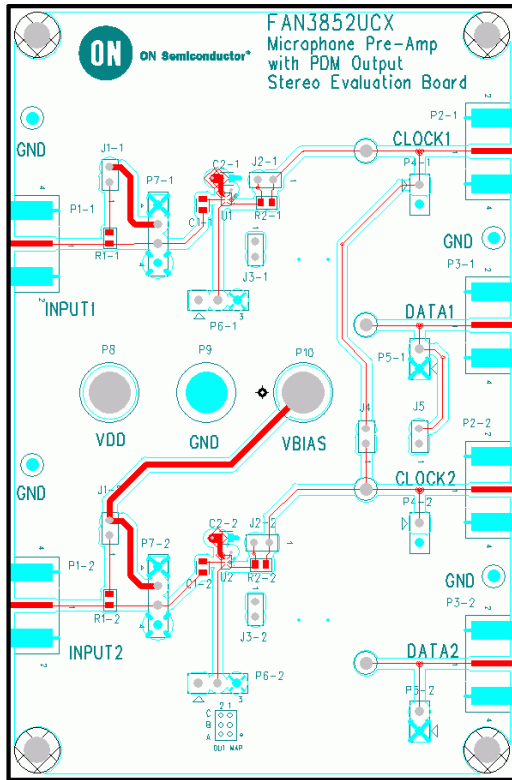


Figure 6. Board Layout (Top)

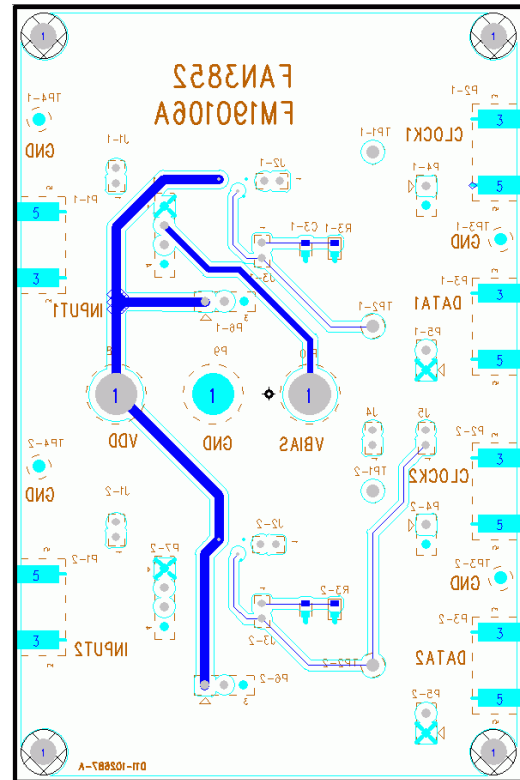


Figure 7. Board Layout (Bottom, Thru-view)

PCB BILL OF MATERIALS

Table 5. PCB EVB BILL OF MATERIALS

Reference	Description	Package	Value	Manufacturer	Manufacturer Part Number
C1-1, C1-2	CAP SMD 1000 pF X7R 50V 0603	0603	1000 pF	Yageo	CC0603KRX7R9BB102
C2-1, C2-2	CAP CER 0.1 F 50 V X7R 0603	0603	0.1 μ F	Samsung Electro-Mechanics	CL10B104KB8NNCC
3-1, C3-2	CAP CER 47 pF 50 V C0G/NP0 0603	0603	47 pF	AVX Corporation	06035A470JAT2A
J1-1, J2-1, J3-1, J4, J5, J1-2, J2-2, J3-2	Connector Header Through Hole 2 position 0.079" (2.00 mm)	Thru-hole	2x1 Male	Sullins Connector Solutions	NRPN021PAEN-RC
P4-1, P4-2, P5-1, P5-2	CONN HEADER VERT 2POS 2.54 mm	Thru-hole	2x1	MaleWurth Electronics, Inc.	61300211121
P1-1, P1-2, P2-1, P2-2, P3-1, P3-2	CONN SMA RCPT STR 50 EDGE MNT	SMA (Tray)	073251-115	Molex, LLC	073251-115
P6-1, P6-2	CONN HEADER VERT 3POS 2.54 mm	Thru-hole	3x1 Male	Wurth Electronics, Inc.	61300311121
P7-1, P7-2	CONN HDR 4POS 0.1 TIN PCB	Thru-hole	4x1 Female	Sullins Connector Solutions	PPTC041LFBN-RC
P10, P8, P9	CONN BANANA JACK SOLDER	Thru-hole	n/a	Keystone Electronics	575-6
R1-1, R1-2	RES SMD 2.2 k Ω 0.1% 1/10W 0603	0603	2.2 k Ω	Panasonic Electronic Components	ERA-3AE222V
R2-1, R2-2	RES SMD 100 Ω 0.1% 1/16W 0603	0603	100 Ω	TE Connectivity Passive Product	CPF0603B100RE1
R3-1, R3-2	RES SMD 1 k Ω 0.5% 1/16W 0603	0603	1 k Ω	Susumu	RR0816P-102-D
TP1-1, TP2-1, TP1-2, TP2-2	PC TEST POINT COMPACT BLACK	Thru	5006	Keystone Electronics	5006
TP3-1, TP4-1, TP3-2, TP4-2	PC TEST POINT COMPACT GREEN	Thru	5121	Keystone Electronics	5121
U1, U2	FAN3852 Microphone Pre-Amplifier	WLCS	2x3	ON Semiconductor	FAN3852UCX

PCB SCHEMATIC

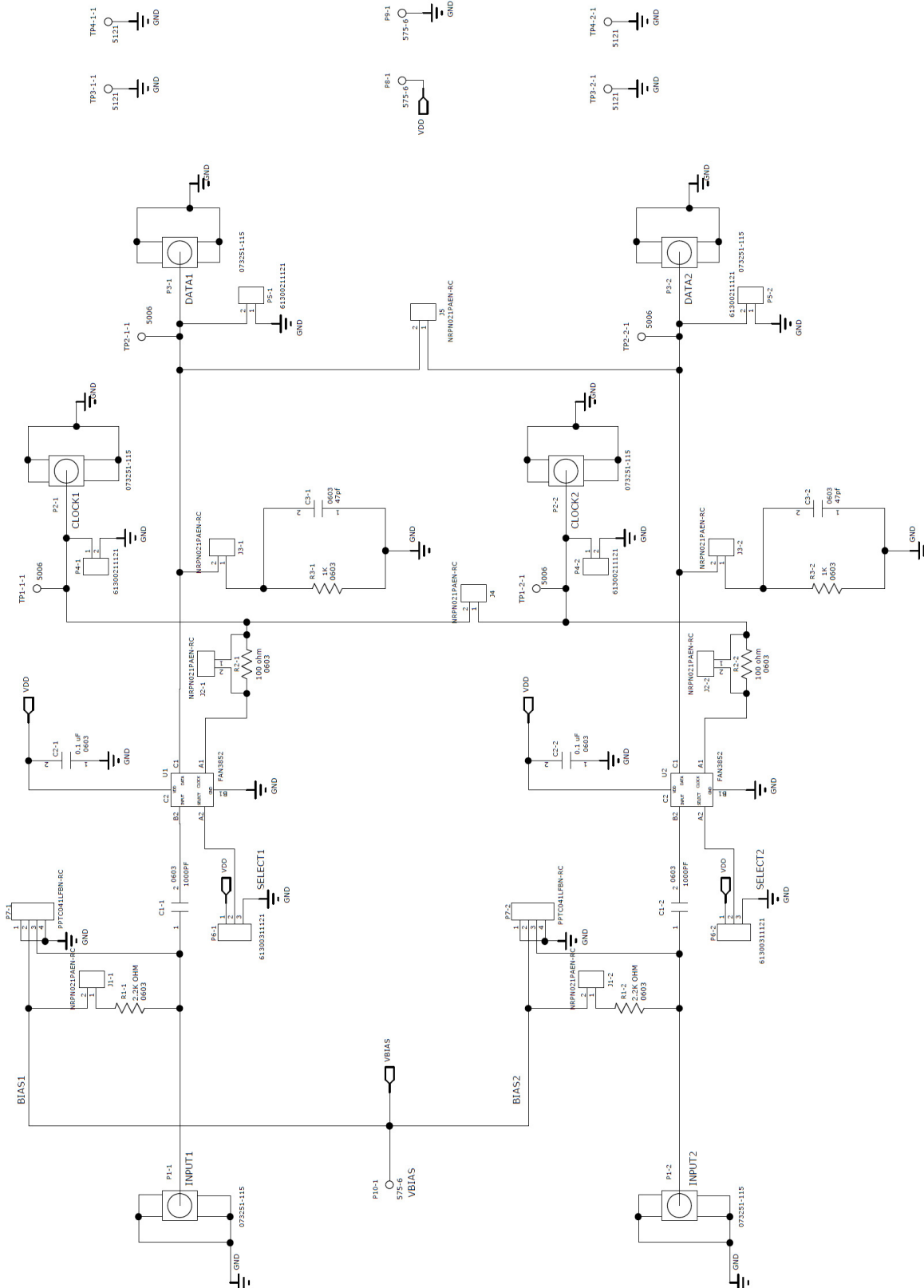


Figure 8. PCB Schematic

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