

AN-1785 LM3881 Power Sequencer Evaluation Board

1 Introduction

The LM3881 evaluation board has been designed to permit the designer to connect it directly to the Enable or Remote ON/OFF pins of power supply devices of an existing system to facilitate system sequencing. The block diagram of a typical system application is given in [Figure 1](#).

Upon enabling the device, the three open drain output flags will rise in sequential order, 1-2-3. Once the part is disabled, the shutdown sequence will occur in reverse order 3-2-1. Therefore the last power supply that started up will be the first to shutdown.

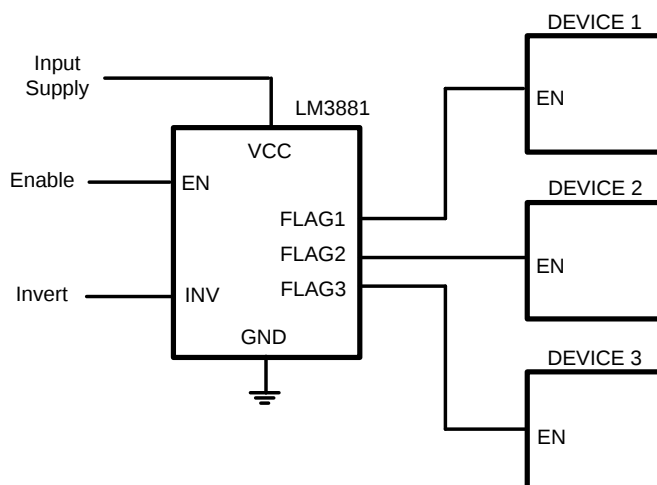


Figure 1. Typical System Application Using LM3881 Sequencer

2 Timing Sequence

Figure 2 and Figure 3 present the power up and power down timing sequence of the output flags with the INV at logic level low and high, respectively. The waveform labeled TADJ refers to the voltage on the timer adjust pin of the LM3881.

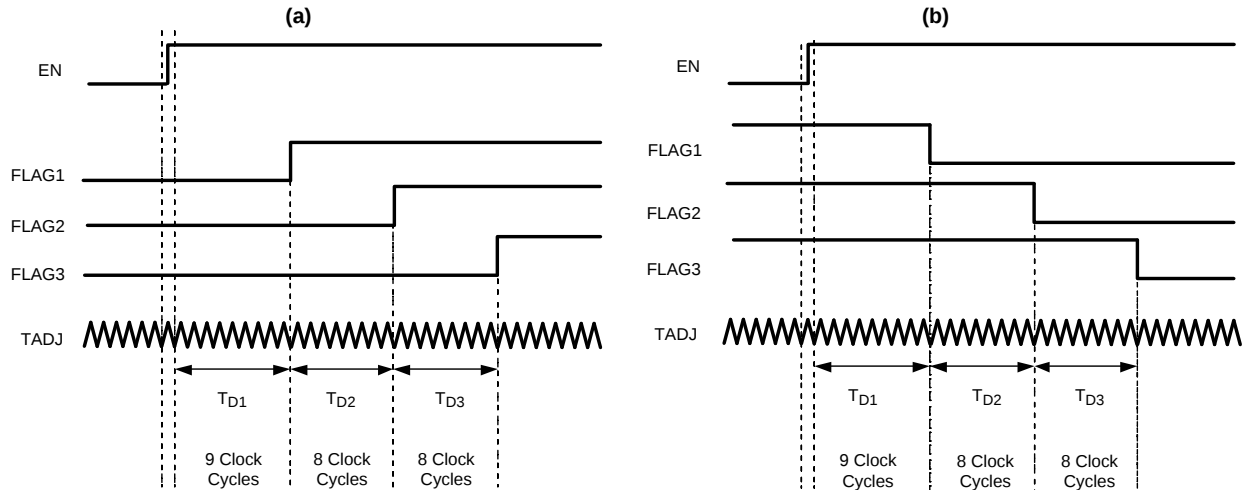


Figure 2. Power Up Sequence (a) INV Low, (b) INV High

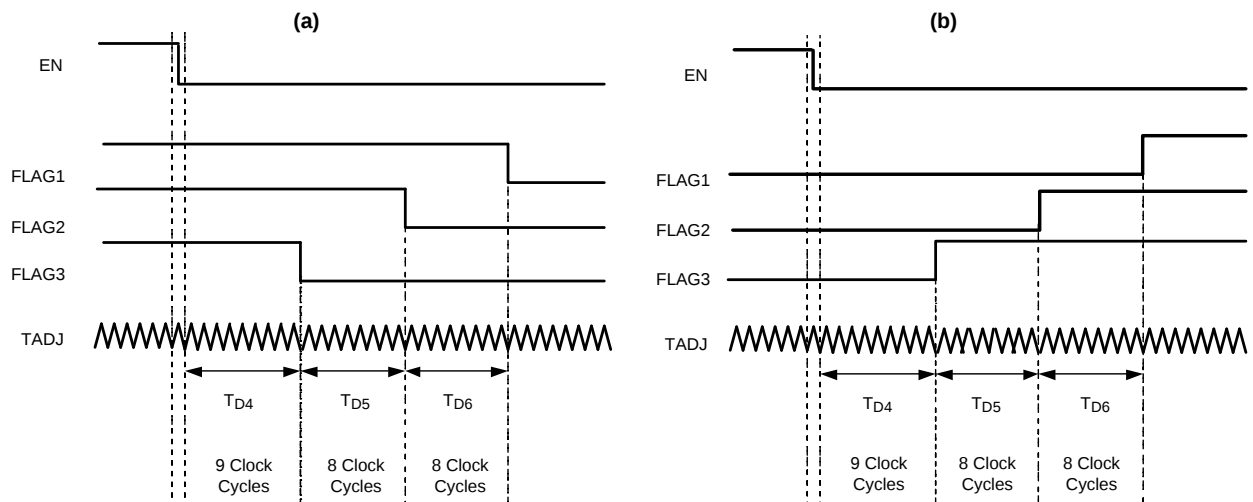


Figure 3. Power Down Sequence (a) INV Low, (b) INV High

3 LM3881 Circuit Schematic

The evaluation board schematic is given in Figure 4. The board contains the LM3881MFX device which has a timing capacitor, C_{ADJ} , of 10 nF so that each time delay between flags will be approximately 10 ms. The pull-up resistors of the flag outputs (R1, R2, R3) are each 100 k Ω .

The LM3881 has an enable pin that is pulled up by an internal 7 μ A current source. Thus, the associated PCB terminal, labeled EN, can be left open circuit if desired. In this case, the flags will release when the LM3881 V_{CC} supply exceeds its UVLO level. Finally, the LM3881 has an invert pin that sets the polarity of the flags. The associated PCB terminal, labeled INV, needs to be connected to V_{CC} or GND.

The evaluation board bill of materials, LM3881 pin-out and pin description are given in Table 1, Figure 5 and Table 2 respectively.

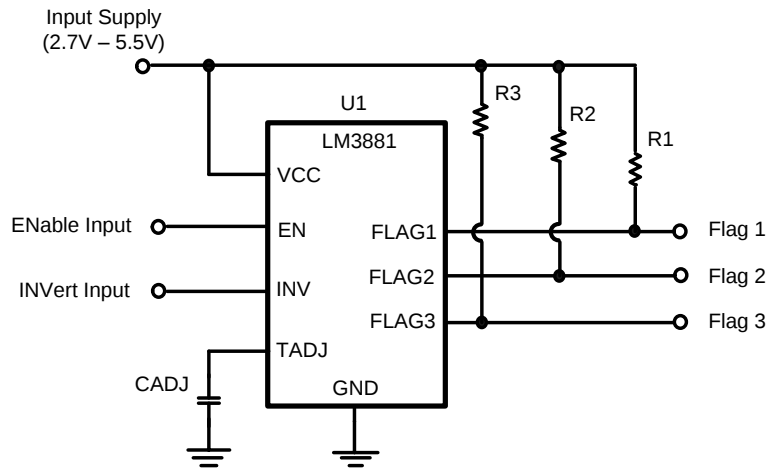


Figure 4. LM3881 Schematic

4 LM3881 Evaluation Board Bill of Materials (BOM)

Table 1. Evaluation Board Bill of Materials

Ref Des	Description	Case Size	Manufacturer	Manufacturer P/N
U1	LM3881 Sequencer	MSOP-8	Texas Instruments	LM388
R1	100 k Ω	0603	Vishay Dale	CRCW06031003F-e3
R2	100 k Ω	0603	Vishay Dale	CRCW06031003F-e3
R3	100 k Ω	0603	Vishay Dale	CRCW06031003F-e3
CADJ	10 nF $\pm$ 10% X7R 16 V	0603	Murata	GRM188R71C103KA01

5 LM3881 Pin-Out

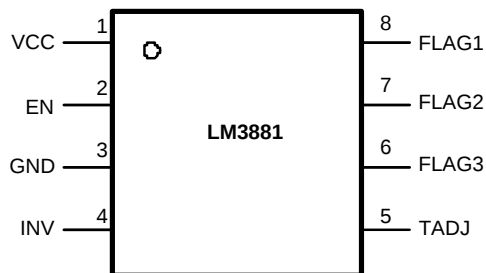


Figure 5. LM3881 Pin-Out

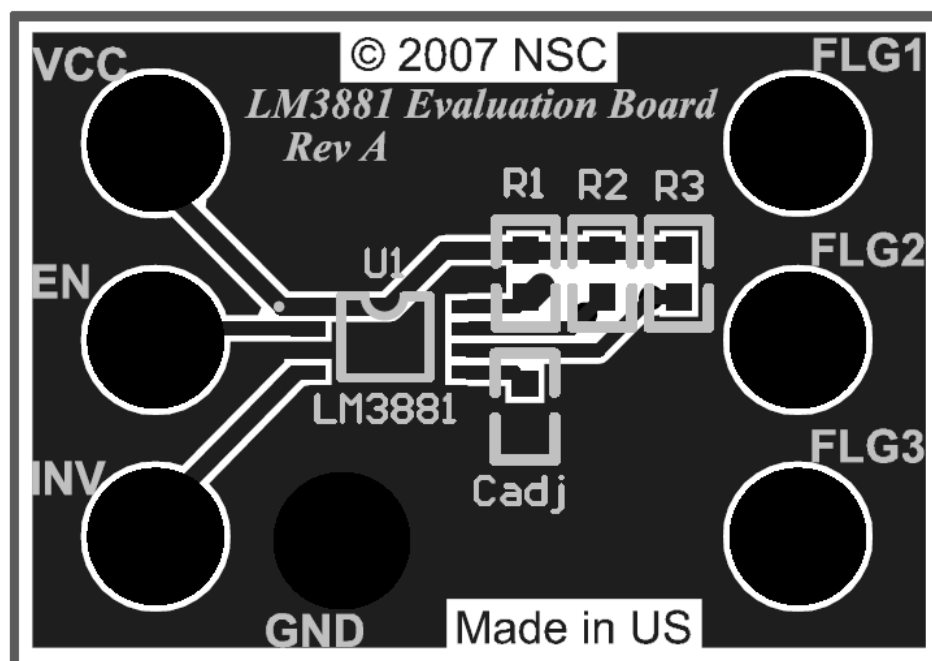
6 LM3881 Pin Descriptions

Table 2. Pin Descriptions

Pin No	Name	Function
1	V _{CC}	Input Supply
2	EN	Precision Enable
3	GND	Ground
4	INV	Output Logic Invert
5	TADJ	Timer Adjust
6	FLAG3	Open Drain Output #3
7	FLAG2	Open Drain Output #2
8	FLAG1	Open Drain Output #1

7 PC Board Layout

The evaluation board is based on a small 1.09" x 0.76" FR4 PCB with two layers of copper. The actual layout can be seen in [Figure 6](#) and [Figure 7](#). When looking at the top layer, pin 1 of the LM3881 is on the upper left. An optional component, assigned reference designator R4, is placed on the bottom side of the PCB to facilitate connection of INV to GND.


Figure 6. Top Side PCB Layout

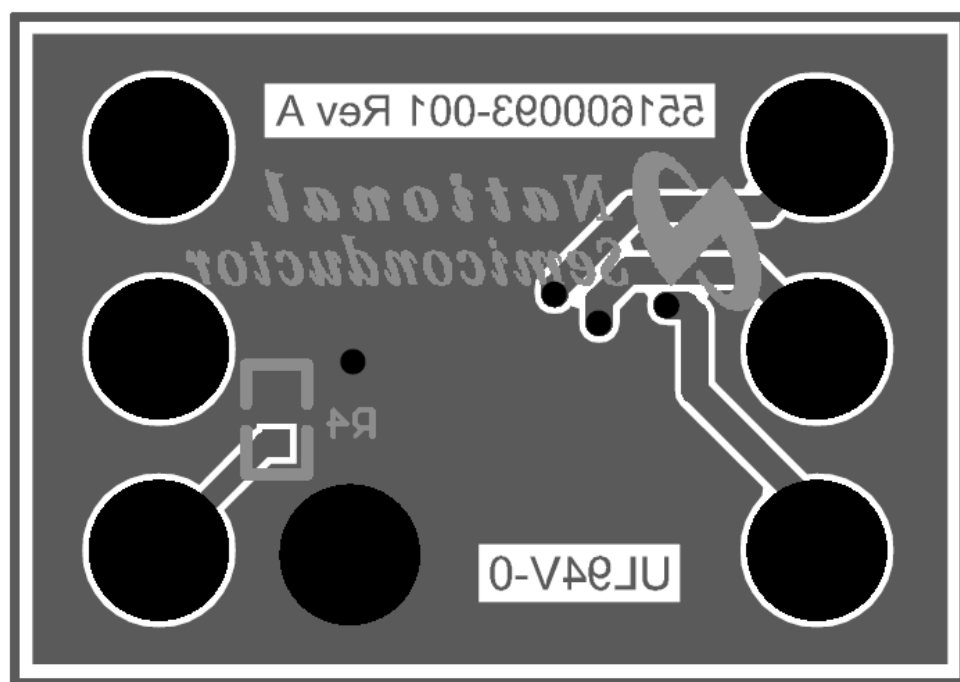


Figure 7. Bottom Side PCB Layout

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, enhancements, improvements and other changes to its semiconductor products and services per JESD46, latest issue, and to discontinue any product or service per JESD48, latest issue. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All semiconductor products (also referred to herein as "components") are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its components to the specifications applicable at the time of sale, in accordance with the warranty in TI's terms and conditions of sale of semiconductor products. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by applicable law, testing of all parameters of each component is not necessarily performed.

TI assumes no liability for applications assistance or the design of Buyers' products. Buyers are responsible for their products and applications using TI components. To minimize the risks associated with Buyers' products and applications, Buyers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which TI components or services are used. Information published by TI regarding third-party products or services does not constitute a license to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of significant portions of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI components or services with statements different from or beyond the parameters stated by TI for that component or service voids all express and any implied warranties for the associated TI component or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Buyer acknowledges and agrees that it is solely responsible for compliance with all legal, regulatory and safety-related requirements concerning its products, and any use of TI components in its applications, notwithstanding any applications-related information or support that may be provided by TI. Buyer represents and agrees that it has all the necessary expertise to create and implement safeguards which anticipate dangerous consequences of failures, monitor failures and their consequences, lessen the likelihood of failures that might cause harm and take appropriate remedial actions. Buyer will fully indemnify TI and its representatives against any damages arising out of the use of any TI components in safety-critical applications.

In some cases, TI components may be promoted specifically to facilitate safety-related applications. With such components, TI's goal is to help enable customers to design and create their own end-product solutions that meet applicable functional safety standards and requirements. Nonetheless, such components are subject to these terms.

No TI components are authorized for use in FDA Class III (or similar life-critical medical equipment) unless authorized officers of the parties have executed a special agreement specifically governing such use.

Only those TI components which TI has specifically designated as military grade or "enhanced plastic" are designed and intended for use in military/aerospace applications or environments. Buyer acknowledges and agrees that any military or aerospace use of TI components which have **not** been so designated is solely at the Buyer's risk, and that Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI has specifically designated certain components as meeting ISO/TS16949 requirements, mainly for automotive use. In any case of use of non-designated products, TI will not be responsible for any failure to meet ISO/TS16949.

Products

Audio	www.ti.com/audio
Amplifiers	amplifier.ti.com
Data Converters	dataconverter.ti.com
DLP® Products	www.dlp.com
DSP	dsp.ti.com
Clocks and Timers	www.ti.com/clocks
Interface	interface.ti.com
Logic	logic.ti.com
Power Mgmt	power.ti.com
Microcontrollers	microcontroller.ti.com
RFID	www.ti-rfid.com
OMAP Applications Processors	www.ti.com/omap
Wireless Connectivity	www.ti.com/wirelessconnectivity

Applications

Automotive and Transportation	www.ti.com/automotive
Communications and Telecom	www.ti.com/communications
Computers and Peripherals	www.ti.com/computers
Consumer Electronics	www.ti.com/consumer-apps
Energy and Lighting	www.ti.com/energy
Industrial	www.ti.com/industrial
Medical	www.ti.com/medical
Security	www.ti.com/security
Space, Avionics and Defense	www.ti.com/space-avionics-defense
Video and Imaging	www.ti.com/video

TI E2E Community

e2e.ti.com