

NCP43080FLYGEVB

NCP43080 Synchronous Rectification Evaluation Board User's Manual

Description

This evaluation board user's manual describes a high efficiency synchronous rectification evaluation board that can easily replace a secondary side rectification diode in an SMPS.

The NCP43080 is used as synchronous rectification controller. The evaluation board has very few external components and illustrates how small and effective such a design can be.

The NCP43080 features a very precise 0 mV turn-off comparator that supports even very low current flowing through the MOSFET even when very low RDSON synchronous MOSFETs is used. NCP43080 can be used in application working in CCM without external synchronization thanks to very low propagation delay and strong driver. Board has also assembled LLD circuit with components with value close to typical 65 kHz flyback application (adjust to used application is needed).

Key Features

- Precise Turn-off Comparator
- Wide Input Voltage Range
- High Operation Frequency
- Strong MOSFET Driver
- High Efficiency
- Adjustable Minimum On and Off Times
- Light Load Detection Feature
- Capable to Operate in Positive and Negative Branch
- Small Size

Table 1.

SMPS Type	Supply Voltage	Reverse Voltage	Effective Resistance
Flyback, QR	5 – 35 V	150 V	10 mΩ



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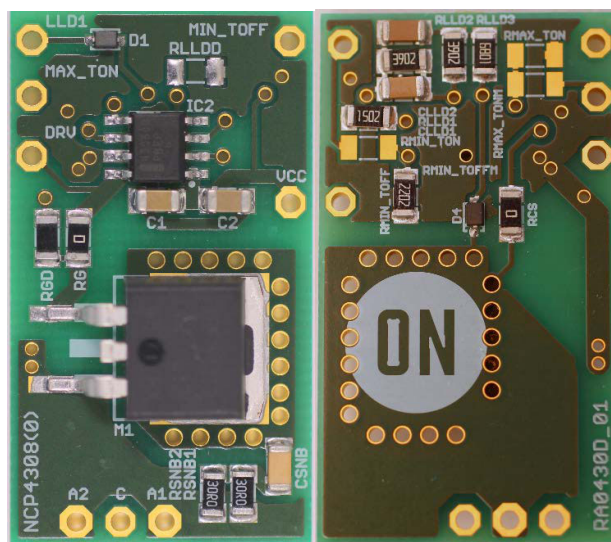


Figure 1. Evaluation Board Photo

CONNECTION DIAGRAM



to use an external power supply (or auxiliary winding with rectification) to provide power to the evaluation board. VCC should be referenced to A1 or A2 points.

NCP43080FLYGEVB

EVALUATION BOARD SCHEMATIC

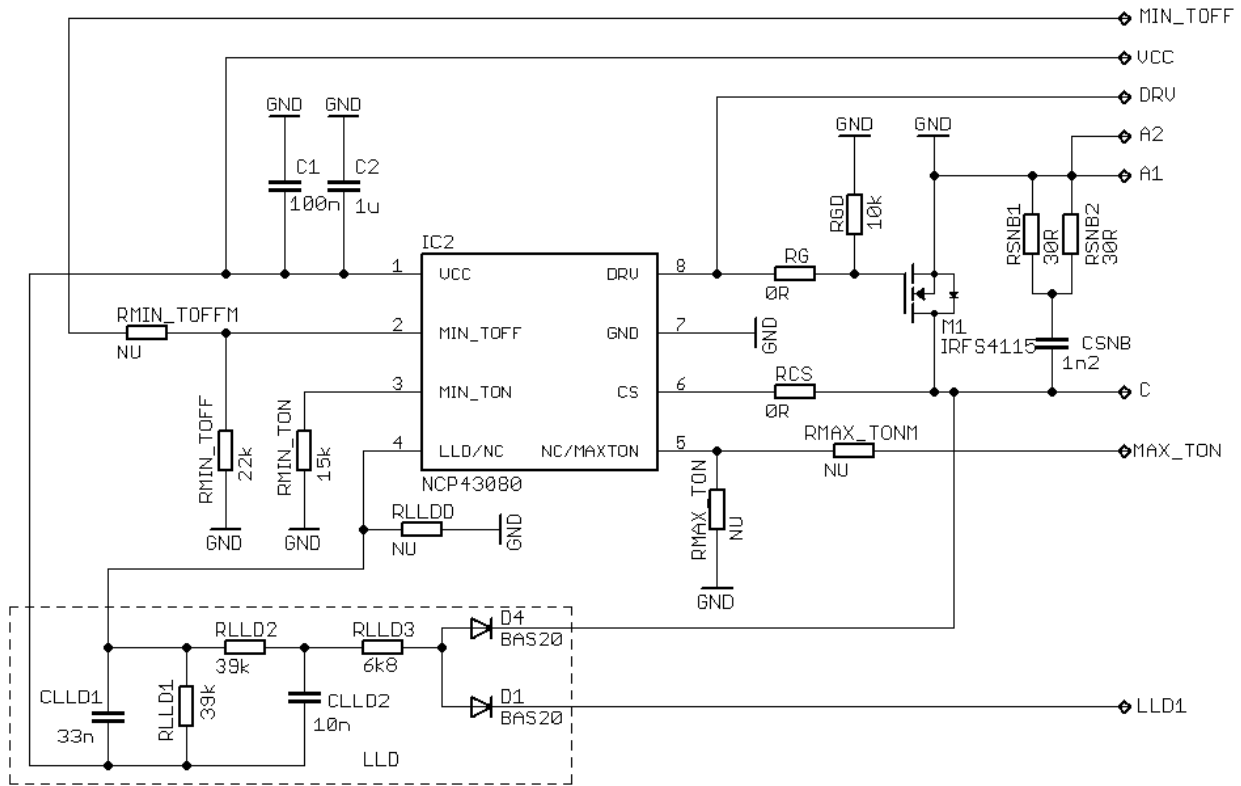


Figure 3. Schematic of the NCP43080

The evaluation board was designed to support a minimal external component count implementation. C1 and C2 are decoupling capacitors. They should be placed as close as possible to the VCC and GND pins. Resistors RMIN_TON and RMIN_TOFF are used to set the protection interval when the synchronous MOSFET is turned on and off. Resistor RMIN_TOFFM is placed there to support a situation when an external circuit provides control for minimum off-time modulation. This is needed only in situations when the minimum-off time cannot be set across the whole range of power supply operation. Resistor RMAX_TON is for Q version, it is used to set maximum on-time (used for QR application) and RMAX_TONM is

only for Q version, it is only for max_ton modulation (if needed). A position for a gate resistor RG is provided in case there is a need to slow down the MOSFET switching process. The turn-off (and also the turn-on) threshold can be lowered when resistor RCS is used, but it is recommended to keep it zero. Components CSNB, RSNB1 and RSNB2 form a snubber circuit.

LLD circuit consists of CLLD1, CLLD2, RLLD1, RLLD2, RLLD3 and D4. Purpose of circuit is to measure conduction duty cycle. When output power is low, conduction time is also low so voltage at CLLD1 is lower. Usually time constant of whole circuitry is low so voltage at LLD pin is smooth also in skip mode.

CIRCUIT LAYOUT

The PCB consists of a 2 layer FR4 board with 35 μm copper cladding. All components are surface mount and most of the components that may require adjustment are on the same side and use 1206 values for easy rework. Critical component such as blocking capacitors C1 and C2 have to be placed carefully near the IC. The synchronous driver path to the MOSFET was done with very low resistance and

parasitic inductance to minimize emissions and minimize turn-on and turn-off times. The same is true for the CS pin. For the CS pin, a kelvin contact was done to be able to sense the voltage directly at the drain. Improper connection of the GND and CS connects can impact the turn-off process especially when a very low $R_{\text{DS(on)}}$ MOSFET is used.

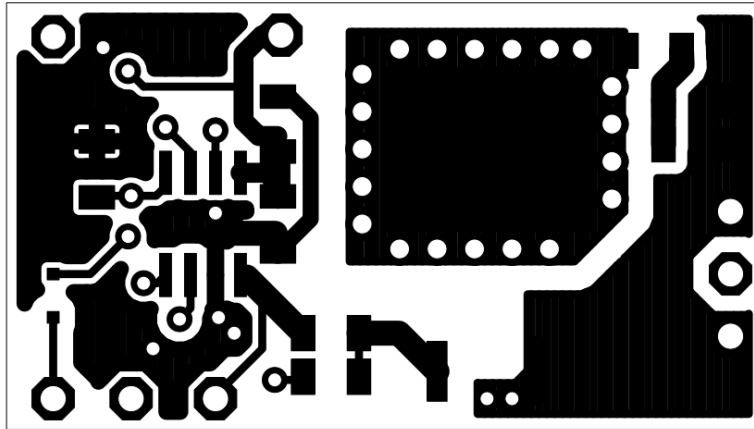


Figure 4. Circuit Layout – Top Layer

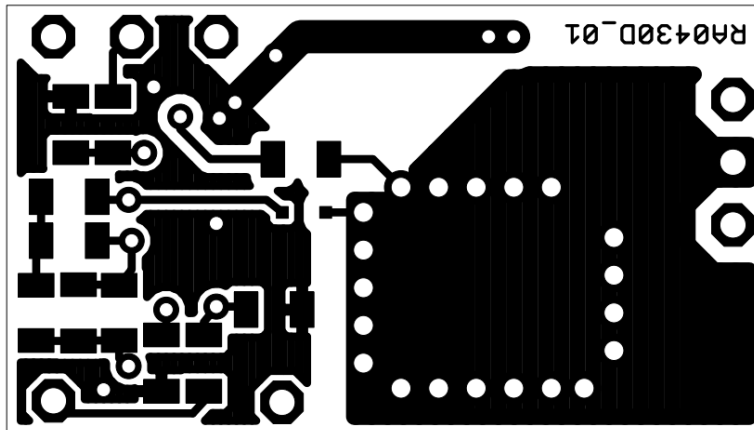


Figure 5. Circuit Layout – Bottom Layer

NCP43080FLYGEVB

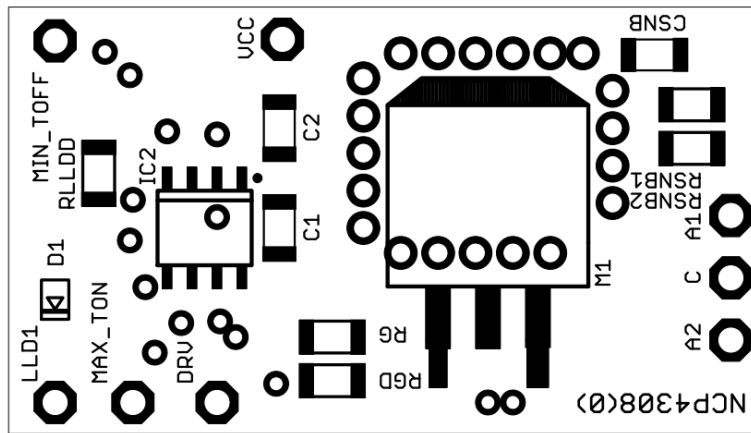


Figure 6. Top Side Components

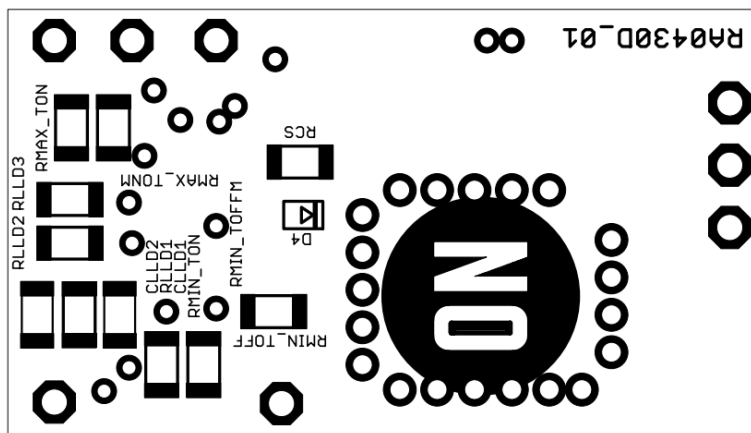


Figure 7. Bottom Side Components

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EVALUATION BOARD

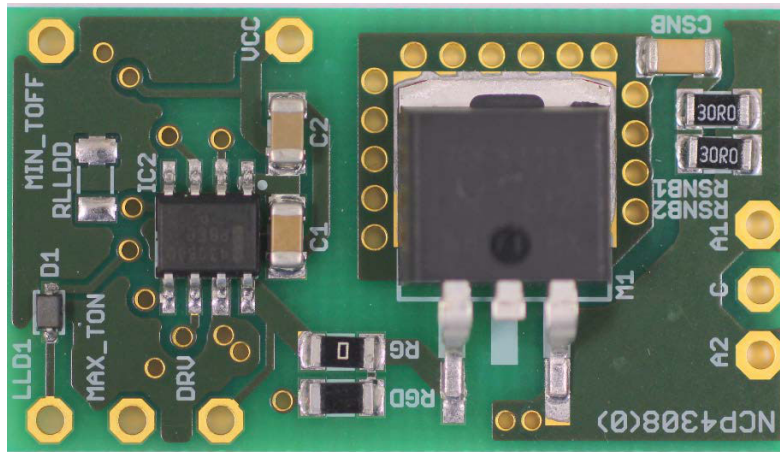


Figure 8. Evaluation Board Photo – Top Side

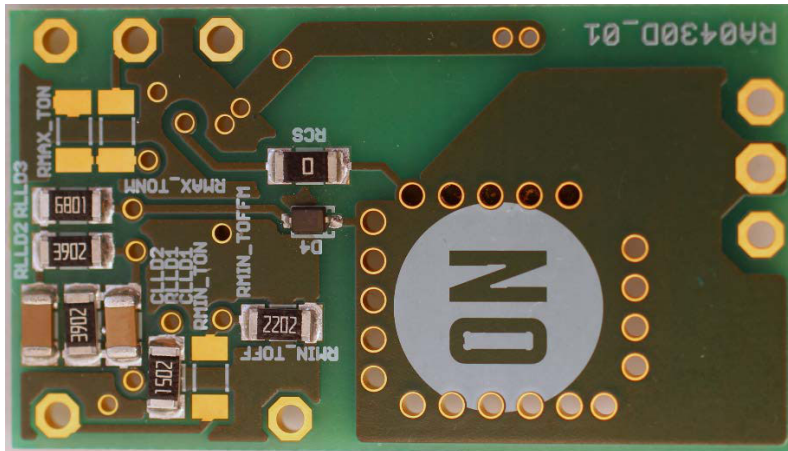


Figure 9. Evaluation Board Photo – Bottom Side

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Table 2. BILL OF MATERIALS FOR THE NCP43080 PUT-IN BOARD D2PAK

Designator	Qty	Description	Value	Tolerance	Footprint	Manufacturer	Manufacturer Part Number	Substitution Allowed
C1	1	Ceramic Capacitor	100 nF	10%	1206	Kemet	C1206X104K5RACTU	Yes
C2	1	Ceramic Capacitor	1 μ F / 50 V	10%	1206	Kemet	C1206X105K5RACTU	Yes
CLLD1	1	Ceramic Capacitor	33 nF	10%	1206	Kemet	C1206X333KBRCTU	Yes
CLLD2	1	Ceramic Capacitor	10 nF	10%	1206	Kemet	C1206X103K5RACTU	Yes
CSNB	1	Ceramic Capacitor	1.2 nF / 1500 V	10%	1206	AVX	1206SC122KAT1A	Yes
D1, D4	2	Switching Diode, High Voltage	BAS20HT1G	–	SOD-323	ON Semiconductor	BAS20HT1G	Yes
IC1	1	Secondary Side Synchronous Rectification Controller	NCP43080D	–	SOIC-08	ON Semiconductor	NCP43080DDR2G	No
M1	1	Power MOSFET N-Channel	IRFS4115	–	D2PAK	International Rectifier	IRFS4115TRL PBF	Yes
RCS, RG	2	Resistor SMD	0.0 Ω	5%	1206	Yageo	RC1206JR-070RL	Yes
RGD	1	Resistor SMD	10 Ω	1%	1206	Yageo	RC1206FR-0710KL	Yes
RLLD1, RLLD2	2	Resistor SMD	39 k Ω	1%	1206	Yageo	RC1206FR-0739KL	Yes
RLLD3	1	Resistor SMD	6.8 k Ω	1%	1206	Yageo	RC1206FR-076K8L	Yes
RLLDD, RMAX_TONM, RMIN_TOFFM, RMAX_TON	4	Resistor SMD	NU	–	1206	–	–	Yes
RMIN_TOFF	1	Resistor SMD	22 k Ω	1%	1206	Yageo	RC1206FR-0722KL	Yes
RMIN_TON	1	Resistor SMD	15 k Ω	1%	1206	Yageo	RC1206FR-0715KL	Yes
RSNB1, RSNB2	2	Resistor	30 Ω	1%	1206	Vishay	CRCW120630R0FKEA	Yes

NOTE All components are lead free.

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