NC2600ZA000A180-EV

2A Low Quiescent Current PWM/PFM Step-down Switching Regulator Evaluation Board

No.EEV-ZA000A180-250422

NC2600ZA000A180-EV is the evaluation board for NC2600 which has the below features, benefits and specifications.

GENERAL DESCRIPTION

The NC2600 is a low quiescent current PWM / PFM 2A step-down switching regulator IC using CMOS-based. The NC2600 is available in WLCSP-8-P11 and DFN2020-8-GT, and it is suitable for use in wearable and IoT devices that require miniaturization and long-lifetime of battery.

FEATURES

- Input Voltage Range (Maximum Rating) : 2.3 V to 5.5 V (6.5 V)
- Operating Temperature Range : −40 °C to 85 °C
- Output Voltage : 1.8 V
- Feedback Voltage Accuracy : ±9 mV
- Quiescent Current : Typ. 17 μA
- Switching Frequency : Typ.4.0 MHz (VSET = 1.8 V)
- UVLO Detection Voltage : Typ.2.0 V
- Soft-Start Time : Typ. 0.15 ms When CSS is open.
- Thermal Shutdown Function : Detection Temperature Typ. 150 °C
  Release Temperature Typ. 120 °C
- Auto Discharge Function
- Latch Protection Function
- For more details on NC2600 IC, please refer to
  https://www.nisshinbo-microdevices.co.jp/en/products/dc-dc-switching-regulator/spec/?product=nc2600

PART NUMBER INFORMATION

Product Name	Package
NC2600ZA000A180	WLCSP-8-P11

Description of configuration

	Item	Description
000	Output Voltage	Adjustable Output Voltage Type

Version

	Latch Protection Function	Auto Discharge Function
A	Yes	Yes

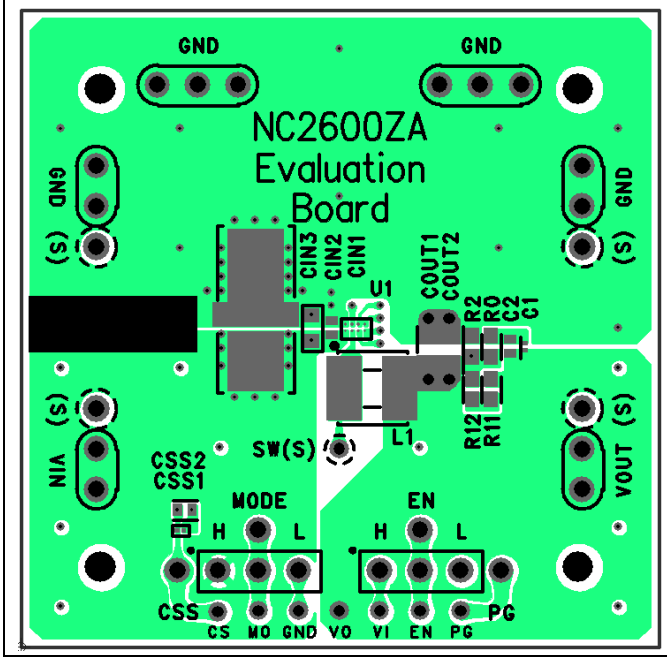
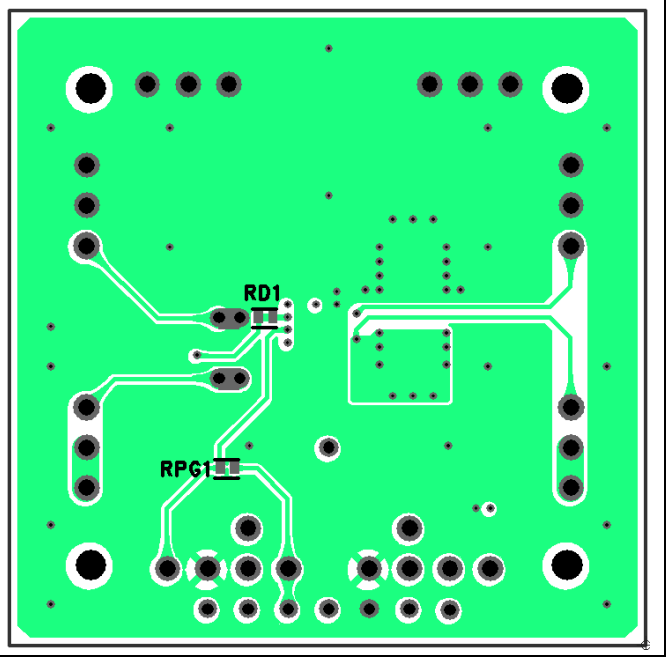
Grade

	Applications	Operating Temperature Range	Test Temperature
S	Consumer	−40 °C to 85 °C	25 °C

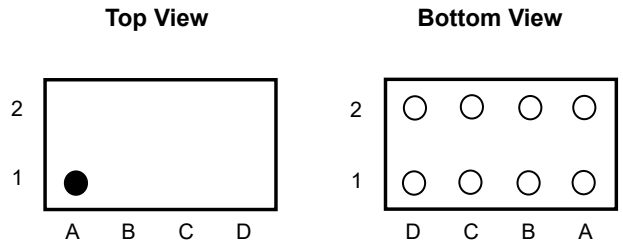
180 : 1.8 V, Output Voltage

PCB LAYOUT

Evaluation board of NC2600ZA (Package: WLCSP-8-P11)

TOP VIEW	BOTTOM VIEW
	

PIN DESCRIPTIONS



WLCSP-8-P11 Pin Configuration

NC2600ZA (WLCSP-8-P11) Pin Descriptions

Pin No.	Pin Name	I/O	Description
A1	VIN	Power	Power Supply Input Pin
B1	SW	O	Switching Output Pin Internal MOSFET Drain Connect the inductor between the VOUT node and the SW pin.
C1	EN	I	Enable Pin Can set the active state with the "High" input and the shutdown state with the "Low" input.
D1	PG	O	Power-good Output Pin NMOS open drain output. In normal operation, "High" (pull-up voltage) is output.
A2	GND	-	Ground Pin
B2	CSS	I	Soft-Start Adjustment Pin Soft-Start time can be adjusted by connecting a capacitor between the CSS pin and GND.
C2	MODE	I	Mode Control Pin High: Forced PWM Control, Low: PWM/PFM Auto Switching Control.
D2	FB	I	Feedback Pin When using NC2600xx000x (adjustable output voltage type), connect an external resistor as the feedback input pin for the error amplifier and set the output voltage. When using the internal fixed output voltage type, connect it to the VOUT node as an output voltage feedback pin.

For details, refer to " *Typical Application Circuit* " and " *THEORY OF OPERATION* ".

ABSOLUTE MAXIMUM RATINGS

Absolute Maximum Ratings

Parameter	Symbol	Ratings	Unit
Input Voltage	V_{IN}	−0.3 to 6.5	V
SW pin voltage	V_{SW}	−0.3 to V_{IN} + 0.3	V
EN pin voltage	V_{EN}	−0.3 to 6.5	V
CSS pin voltage	V_{CSS}	−0.3 to 6.5	V
PG pin voltage	V_{PG}	−0.3 to 6.5	V
MODE pin voltage	V_{MODE}	−0.3 to 6.5	V
FB pin voltage	V_{FB}	−0.3 to 6.5	V
Junction Temperature Range [*1]	Tj	−40 to 125	°C
Storage Temperature Range	Tstg	−55 to 125	°C

ABSOLUTE MAXIMUM RATINGS

Electronic and mechanical stress momentarily exceeded absolute maximum ratings may cause permanent damage and may degrade the lifetime and safety for both device and system using the device in the field. The functional operation at or over these absolute maximum ratings is not assured.

[*1] Calculate the power consumption of the IC from the operating conditions, and calculate the junction temperature with the thermal resistance.

Please refer to "*THERMAL CHARACTERISTICS*" for the thermal resistance under our measurement board conditions

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Ratings	Unit
Input Voltage	V_{IN}	2.3 to 5.5	V
Operating Temperature Range	Ta	−40 to 85	°C

RECOMMENDED OPERATING CONDITIONS

All of electronic equipment should be designed that the mounted semiconductor devices operate within the recommended operating conditions. The semiconductor devices cannot operate normally over the recommended operating conditions, even if when they are used over such conditions by momentary electronic noise or surge. And the semiconductor devices may receive serious damage when they continue to operate over the recommended operating conditions.

ELECTRICAL CHARACTERISTICS

NC2600xx000x （Adjustable Output Voltage Type）

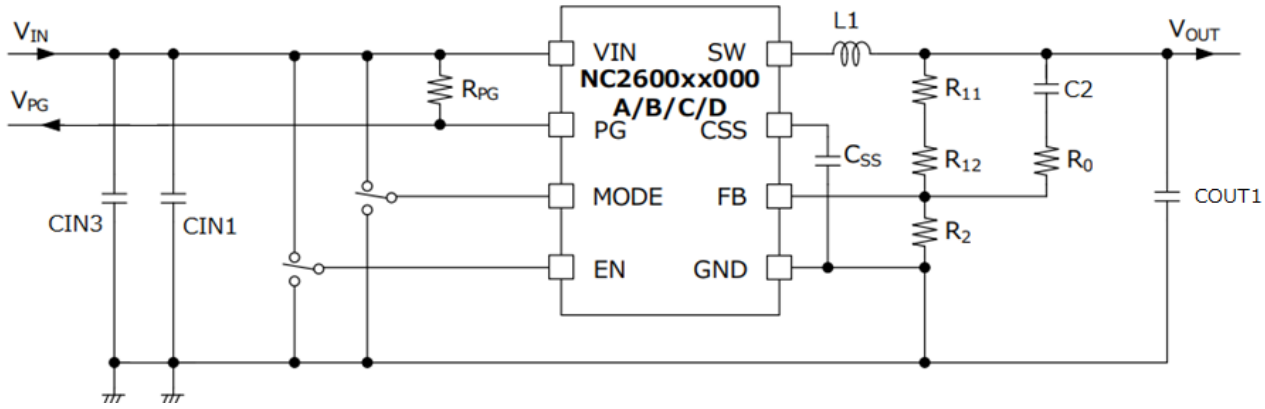
V_{IN} = 3.6V unless otherwise specified.
For parameter that do not describe the temperature condition, the MIN / MAX value under the condition of −40 °C ≤ T_a ≤ 85 °C is described.

Parameter	Symbol	Conditions		MIN	TYP	MAX	Unit
Feedback voltage	V_{FB}	Ta = 25 °C		0.591	0.600	0.609	V
Switching Frequency	f_{OSC}	V_{MODE} =3.6 V		-	4.0	-	MHz
Quiescent Current	I_Q	V_{FB} = 0.63 V, V_{MODE} = 0 V, no switching		-	17	25	μA
Shutdown current	I_{SD}	V_{IN} = 5.5 V, V_{EN} = 0 V		-	0	5	μA
EN "H" Input Current	I_{ENH}	V_{IN} = V_{EN} = 5.5 V		−1	0	1	μA
EN "L" Input Current	I_{ENL}	V_{IN} = 5.5 V, V_{EN} = 0 V		−1	0	1	μA
MODE "H" Input Current	I_{MODEH}	V_{IN} = V_{MODE} = 5.5 V		−1	0	1	μA
MODE "L" Input Current	I_{MODEL}	V_{IN} = 5.5 V, V_{MODE} = 0 V		−1	0	1	μA
FB "H" Input Current	I_{FBH}	V_{IN} = V_{FB} = 5.5 V, V_{EN} = 0 V		−1	0	1	μA
FB "L" Input Current	I_{FBL}	V_{IN} = 5.5 V, V_{EN} = V_{FB} = 0 V		−1	0	1	μA
On-resistance for Discharger	R_{ONDIS}	NC2600xx000A/C		-	60	-	Ω
EN pin "H" Input Voltage	V_{ENH}	V_{IN} = 5.5 V		1.0	-	-	V
EN pin "L" Input Voltage	V_{ENL}	V_{IN} = 2.3 V		-	-	0.4	V
MODE "H" Input Voltage	V_{MODEH}	V_{IN} = 5.5 V		1.0	-	-	V
MODE "L" Input Voltage	V_{MODEL}	V_{IN} = 2.3 V		-	-	0.4	V
On-resistance of High Side MOSFET	R_{ONH}	I_{SW} = 100 mA	NC2600ZA	-	0.13	-	Ω
On-resistance of Low Side MOSFET	R_{ONL}	I_{SW} = 100 mA	NC2600ZA	-	0.09	-	Ω
Soft-Start Time 1	t_{START1}	CSS = OPEN		-	150	300	μs
Soft-Start Time 2	t_{START2}	CSS = 0.1 μF		15	30	45	ms
SW Current Limit	I_{SWLIM}			2.3	-	4.7	A
Protection Delay Time	t_{PROT}	NC2600xx000A/B		10	20	40	μs
UVLO Detection Voltage *1	$V_{UVLODET}$	V_{IN} = Falling		1.85	2.00	2.20	V
UVLO Release Voltage *1	$V_{UVLOREL}$	V_{IN} = Rising		1.90	2.05	2.25	V
On resistance at PG "L" Output	R_{ONPG}	V_{FB} = 0 V		-	45	-	Ω
OV Detection Voltage	V_{OVD}	V_{FB} = Rising		0.66	0.72	-	V
UV Detection Voltage	V_{UVD}	V_{FB} = Falling		-	0.48	0.54	V
Thermal Shutdown Detection Temperature	T_{SDDET}	T_j = Rising		-	150	-	°C
Thermal Shutdown Release Temperature	T_{SDREL}	T_j = Falling		-	120	-	°C

All electrical characteristic parameters that specify the minimum and maximum specifications are tested under the condition of $T_j \approx T_a$ = 25 °C

*1 Due to the circuit configuration, $V_{UVLODET} \geq V_{UVLOREL}$ does not hold. The hysteresis is Typ.0.05 V.

TYPICAL APPLICATION CIRCUIT



NC2600xx Typical Application Circuit

Recommended Values for components

Symbol	Value
CIN3	22 µF * 2set
CIN1	4.7 µF
COUT1	10 µF
L1	1.0 µH
R0	1.0 kΩ
R11	220 kΩ
R12	220 kΩ
R2	220 kΩ
RPG	OPEN
CSS	OPEN
C2	10 pF

TECHNICAL NOTES

The performance of a power source circuit using this device is highly dependent on a peripheral circuit. A peripheral component or the device mounted on PCB should not exceed a rated voltage, a rated current or a rated power. When designing a peripheral circuit, please be fully aware of the following points.

- External components must be connected as close as possible to the ICs and make wiring as short as possible and on the same side of the IC. Especially, the capacitor connected in between VIN pin and GND pin must be wiring the shortest.

- The VIN line, the GND line, and SW pin should make special considerations for the large switching current flows. If their impedance is high, internal voltage of the IC may shift by the switching current, and the operating may be unstable. Make the power supply and GND lines as wide and short as possible. The wiring from the SW pin to the inductor becomes a noise source, so ensure that the current capacity is secured and that the wiring is not wider or longer than necessary so that the noise does not increase.

- Connect COUT to the wiring between the FB pin and the inductor(L), or between the output voltage setting resistor (R1) and L. Also, keep them as far away as possible from noise sources such as inductors to prevent noise from being mixed in.

- The thermal shutdown function prevents the IC from fuming and ignition but does not ensure the IC's reliability or keep the IC below the absolute maximum ratings. The thermal shutdown function does not operate on the heat generated by other than the normal IC operation such as latch-up and overvoltage application. The thermal shutdown function operates in a state over the absolute maximum ratings, therefore the thermal shutdown function should not be used for a system design.

- The tab on the bottom side of the DFN-Package is recommended to be connected to GND. It will work even if it is open, but please note that the heat dissipation and mounting strength will decrease.

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