

## 7.5A High Power DC/DC Converter Controller IC

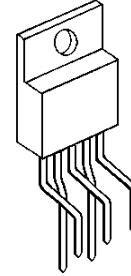
### ■GENERAL DESCRIPTION

The **NJM2811** is a high power step down DC/DC converter IC.

It incorporates 7.5A power transistor,  $\pm 2\%$  accuracy precision voltage reference, fixed frequency PWM controller with cycle-by-cycle current limit and low power consumption stand by function.

The **NJM2811** realizes a high power step down application with minimal external components.

### ■PACKAGE OUTLINE



#### PIN FUNCTION

- 1:  $V_{FB}$
- 2:  $SW_{OUT}$
- 3: GND
- 4:  $V^+$
- 5: STBY ( $V_{COMP}$ )

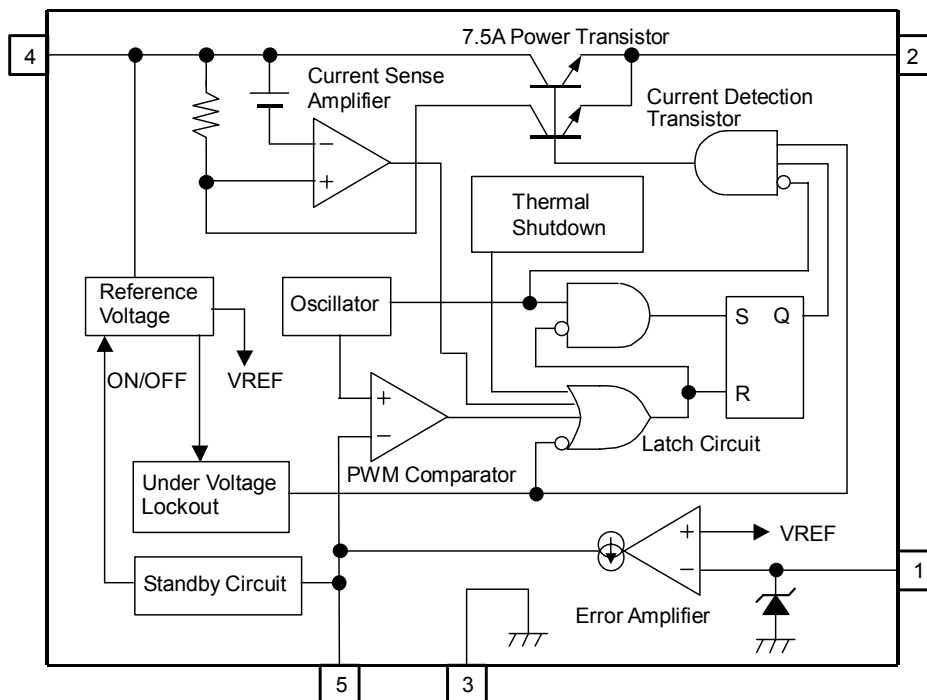
### ■FEATURES

- Adjustable output voltage more than 5V
- Operating Voltage 7.5V to 40V
- PWM form Switching Power Supply Control
- Internal High Power Transistor 7.5A (min.)
- Fixed Frequency Oscillator 72kHz (typ.)
- Current Sense Amplifier
- Under Voltage Lockout
- Thermal Shutdown Circuit
- Bipolar Technology
- Package Outline TO-220(5PIN)

### NJM2811TLA2050

Pin 1 locates on the left side of the package drawing (top front view).

### ■BLOCK DIAGRAM



# NJM2811

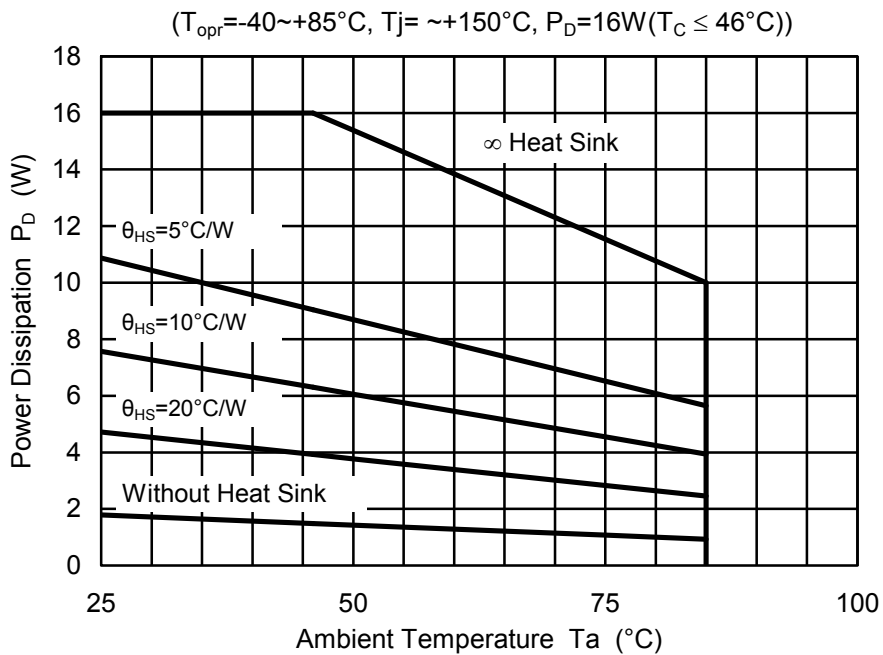
## ■ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

PARAMETER	SYMBOL	MAXIMUM RATINGS	UNIT
Maximum Supply Voltage	V <sup>+</sup>	40	V
Switch Output Voltage	V <sub>O (SWITCH)</sub>	-0.5 ~ +V <sub>in</sub>	V
Voltage Feedback and Compensation Input Voltage Range	V <sub>FB</sub> , V <sub>COMP</sub>	-0.3 ~ +7.0	V
Power Dissipation	P <sub>D</sub>	TO-220 (5PIN) 16(T <sub>C</sub> ≤ 46°C)	W
Operating Junction Temperature	T <sub>j</sub>	-40 ~ +150	°C
Operating Temperature Range	T <sub>opr</sub>	-40 ~ +85	°C
Storage Temperature Range	T <sub>stg</sub>	-50 ~ +150	°C

## ■THERMAL CHARACTERISTICS

Thermal Resistance	Junction-to-Ambient Temperature	θ <sub>ja</sub>	70	°C/W
	Junction-to-Case	θ <sub>jc</sub>	6.5	

## ■POWER DISSIPATION vs. AMBIENT TEMPERATURE



## ■ELECTRICAL CHARACTERISTICS ( $V^+=12V$ , $T_a=25^\circ C$ )

### Oscillator Block

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Frequency	fosc	$V^+=7.5V$	65	72	79	kHz

### Error Amplifier Block

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Voltage Feedback Input Threshold	$V_{FB(th)}$		4.9	5.0	5.1	V
Line Regulation	REG-Line	$V^+=7.5 \sim 40V$	–	0.03	0.08	%/V
Input Bias Current	$I_B$	$V_{FB}=V_{FB(th)}+0.15V$	–	0.15	1.0	$\mu A$
Ripple Rejection	PSRR	$V^+=10 \sim 20V$	–	80	–	dB
Output Voltage Swing	$V_{OH}$	$I_{source}=75\mu A, V_{FB}=4.7V$	4.2	4.9	–	V
	$V_{OL}$	$I_{sink}=0.4mA, V_{FB}=5.3V$	–	1.6	1.9	V

### PWM comparator Block

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Duty Cycle	$DC_{(MAX)}$ $DC_{(MIN)}$	$V_{FB}=0V$	–	95	–	%
		$V_{FB}=5.3V$	0	0	0	%

### Switch Output Block

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Output Voltage Saturation	$V_{SAT}$	$V^+=15V, I_{source}=7.5A$	–	$V^+-2.2$	$V^+-2.5$	V
OFF-State Leakage	$I_{sw(off)}$	$V^+=40V, SW_{OUT}=0V$	–	0	100	$\mu A$
Current Limit Threshold	$I_{pk(SWITCH)}$	$V^+=15V$	7.5	8.5	10	A
Switching Times						
Output Voltage Rise Time	tr	$V^+=40V, R_{OUT}=7.7\Omega, V_{FB}=0V$	–	100	–	ns
Output Voltage Fall Time	tf	$V^+=40V, R_{OUT}=7.7\Omega, V_{FB}=0V$	–	50	–	ns

### Under Voltage Lockout Block

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Startup Threshold	$V_{TH(UVLO)}$	$V^+$ Increasing	6.4	6.8	7.2	V
Hysteresis	$V_H(UVLO)$	$V^+$ Decreasing	0.3	0.5	0.7	V

### Total Device

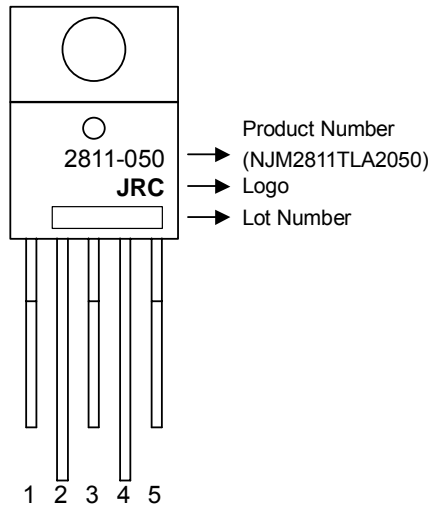
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Standby-State Power Supply Current	$I_{CC(stby)}$	$STBY \leq 0.1V$	–	36	100	$\mu A$
Operating-State Power Supply Current	$I_{CC}$	$V^+=40V, V_{FB}=0V$ duty.cycle=MAX	–	40	53	mA

Keep the limit of maximum power dissipation not to operate thermal shutdown.

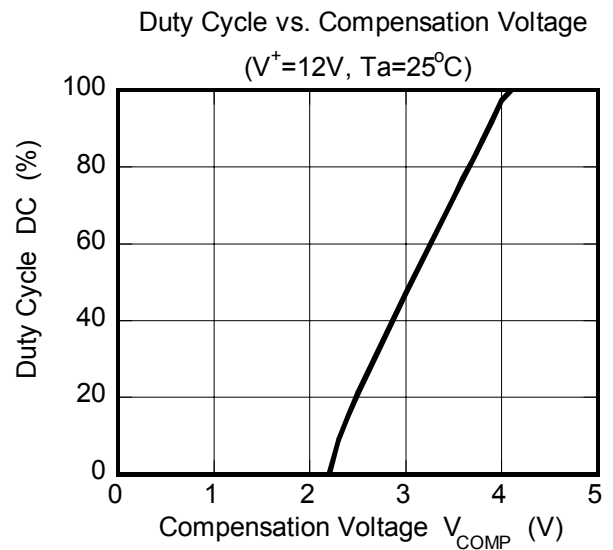
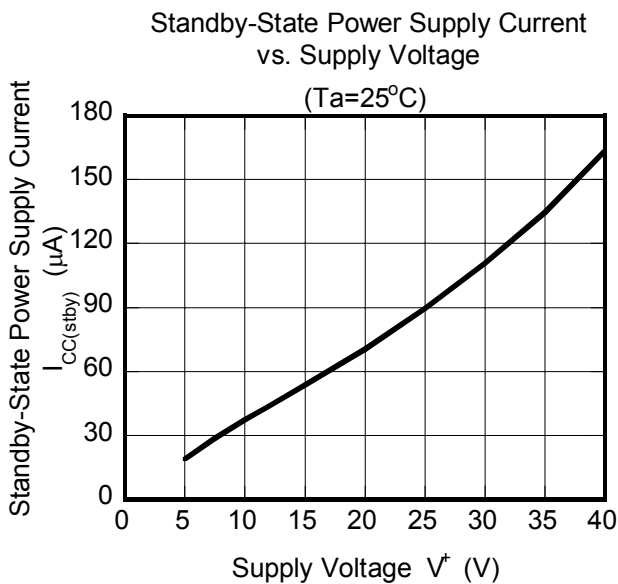
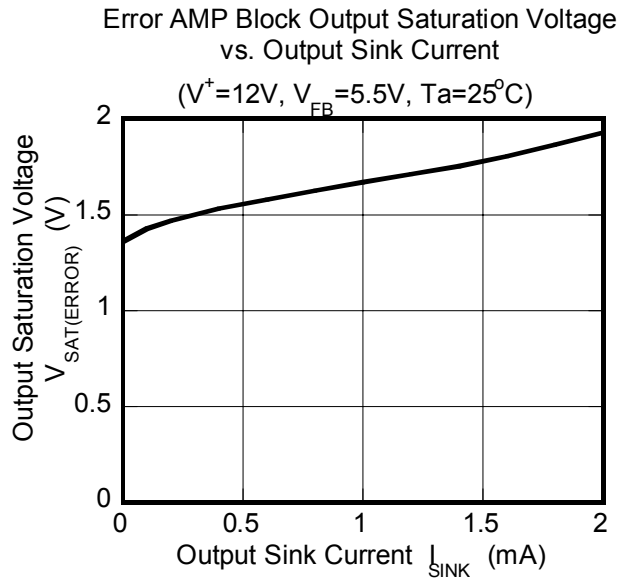
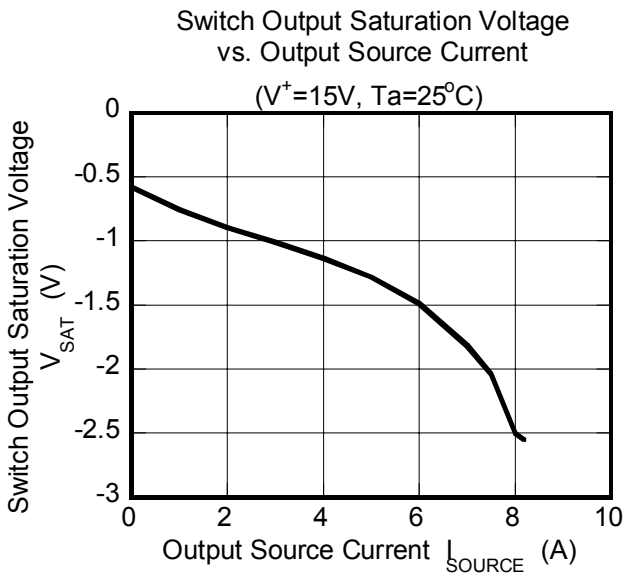
Low duty cycle pulse test is used to close its junction temperature to ambient temperature.

# NJM2811

## MARKING



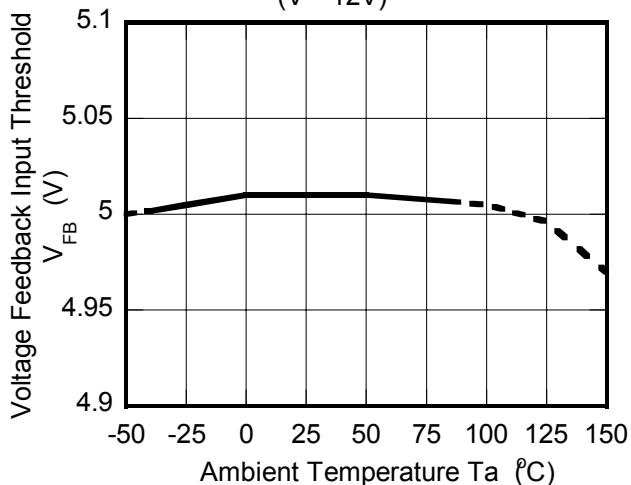
## TYPICAL CHARACTERISTICS



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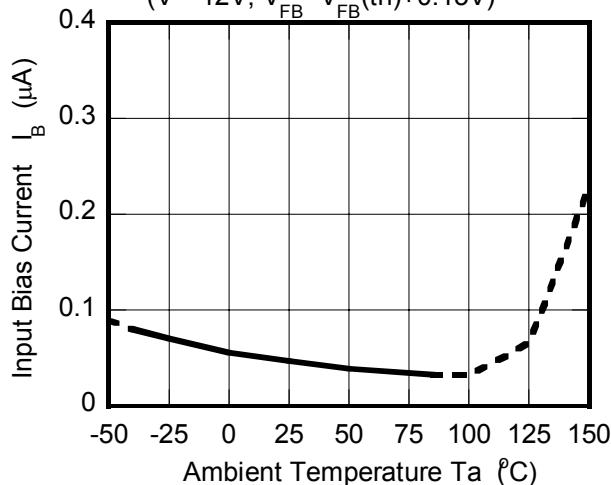
Voltage Feedback Input Threshold vs. Temperature

( $V^+ = 12V$ )



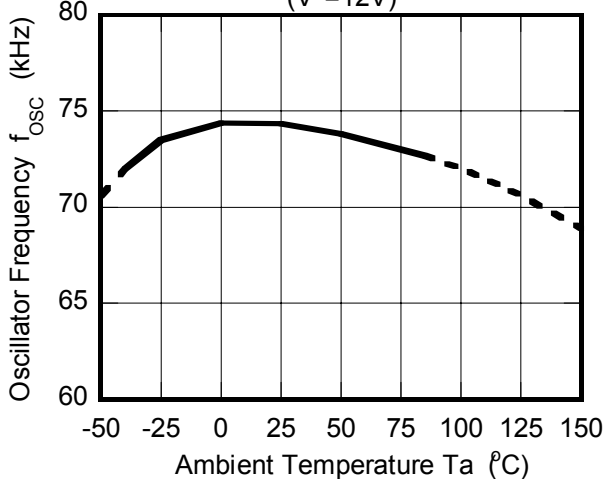
Error AMP Block Input Bias Current vs. Temperature

( $V^+ = 12V, V_{FB} = V_{FB(th)} + 0.15V$ )



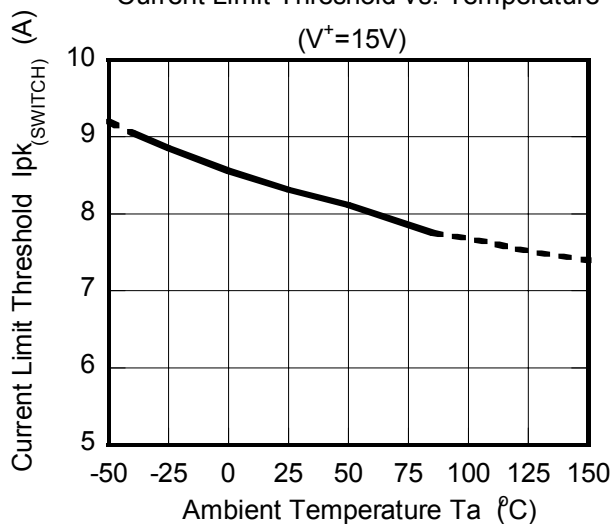
Oscillator Frequency vs. Temperature

( $V^+ = 12V$ )

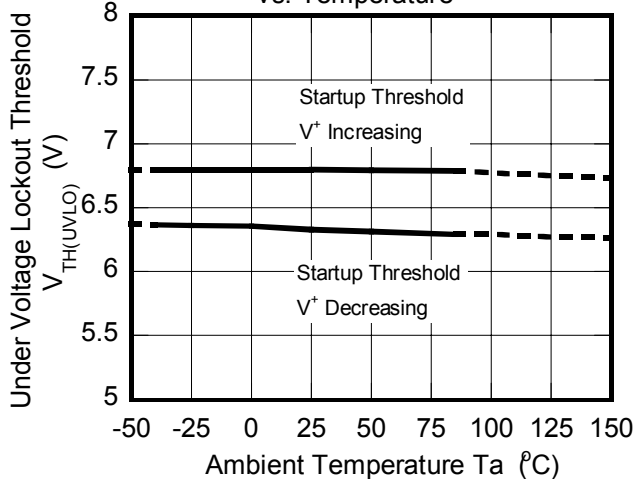


Current Limit Threshold vs. Temperature

( $V^+ = 15V$ )

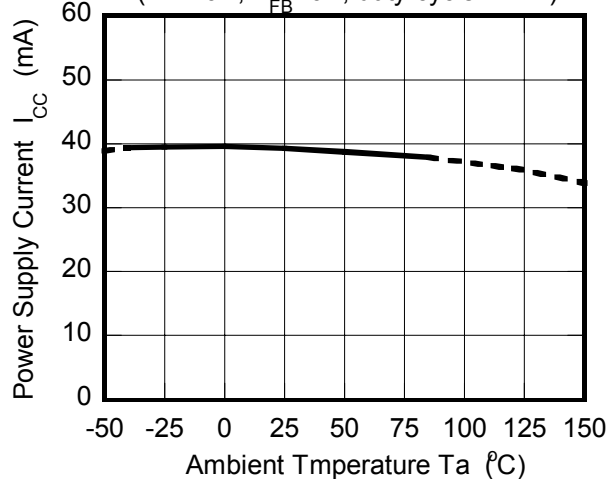


Under Voltage Lockout Threshold vs. Temperature



Operating-State Power Supply Current vs. Temperature

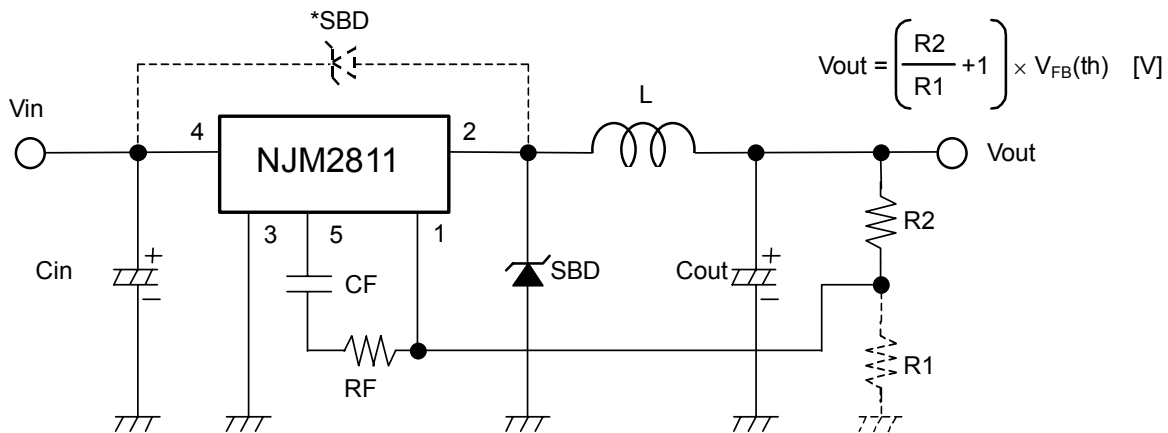
( $V^+ = 40V, V_{FB} = 0V, \text{duty cycle} = \text{MAX}$ )



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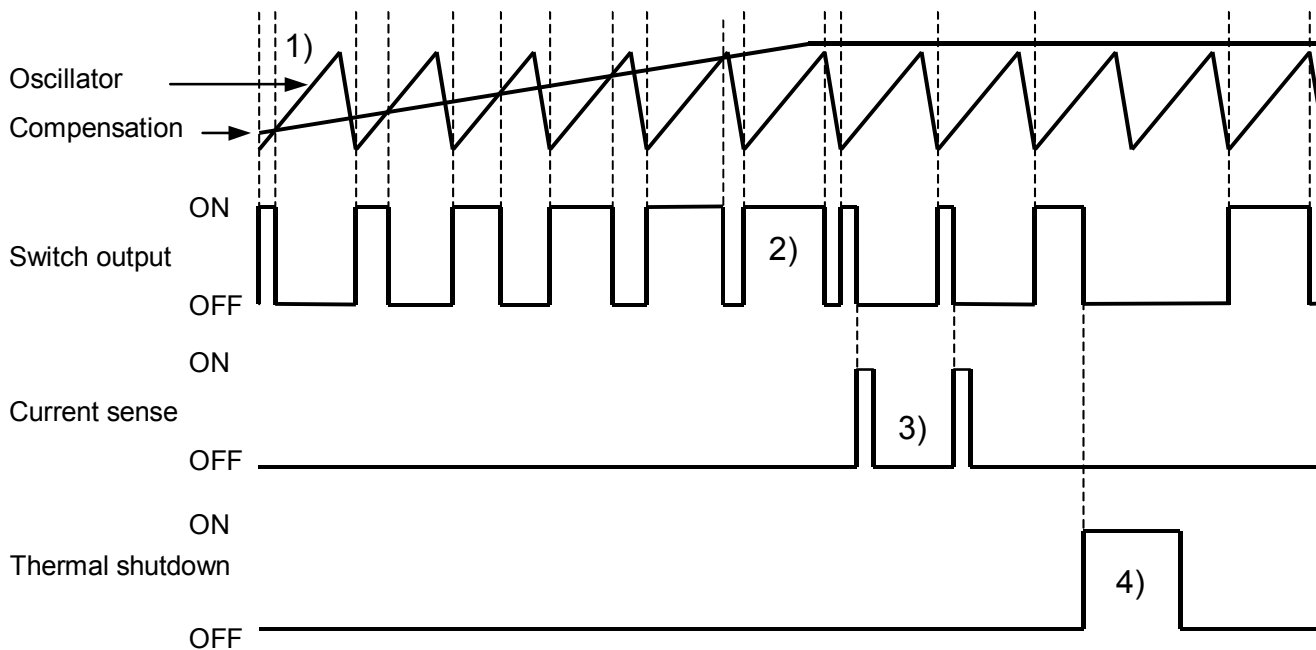
## ■ TYPICAL APPLICATIONS

### Step-Down Converter



- 1) 5V and higher converter, the application must be connected R1 resistor according to above figure.
- 2) High current converter, the application must be placed Cin capacitor next to NJM2811, which avoid the power-line fluctuation.
- 3) The sharp fluctuation of output load cause reverse voltage for inductance and over the supply-voltage for SW<sub>OUT</sub> terminal. To avoid this problem, the application must be placed SBD between terminal 2 and 4.

## ■ TIMING CHART



- 1) The NJM2811 generate square waves. The PWM comparator generate PWM signals to compare square waves and compensation voltage.
- 2) The switching duty is maximum 95%(typ.).
- 3) Over the 8.5A(typ.) current, the output switch will be OFF to operate current limit protection. The NJM2811 sense the switching current of power transistor.
- 4) Over the T<sub>j</sub>=180°C(typ.), the switching will be OFF to operate thermal shutdown circuit.

## MEMO

**[CAUTION]**

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