

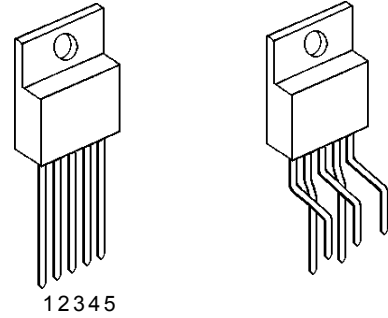
## 5.5A HIGH POWER DC/DC CONVERTER CONTROLLER IC

### ■GENERAL DESCRIPTION

The **NJM2367** is a high power DC/DC converter controller inducing basic function of DC/DC converter controller, which consists precision reference voltage, fixed frequency oscillator, high gain error amplifier, precision output switch, cycle-by-cycle current limit, under voltage lockout, and thermal shutdown circuit.

The **NJM2367** is suitable for step-down converter with few external parts, and realize low power stand-by mode.

### ■PACKAGE OUTLINE



12345  
**NJM2367TA2050 NJM2367TLA2050**

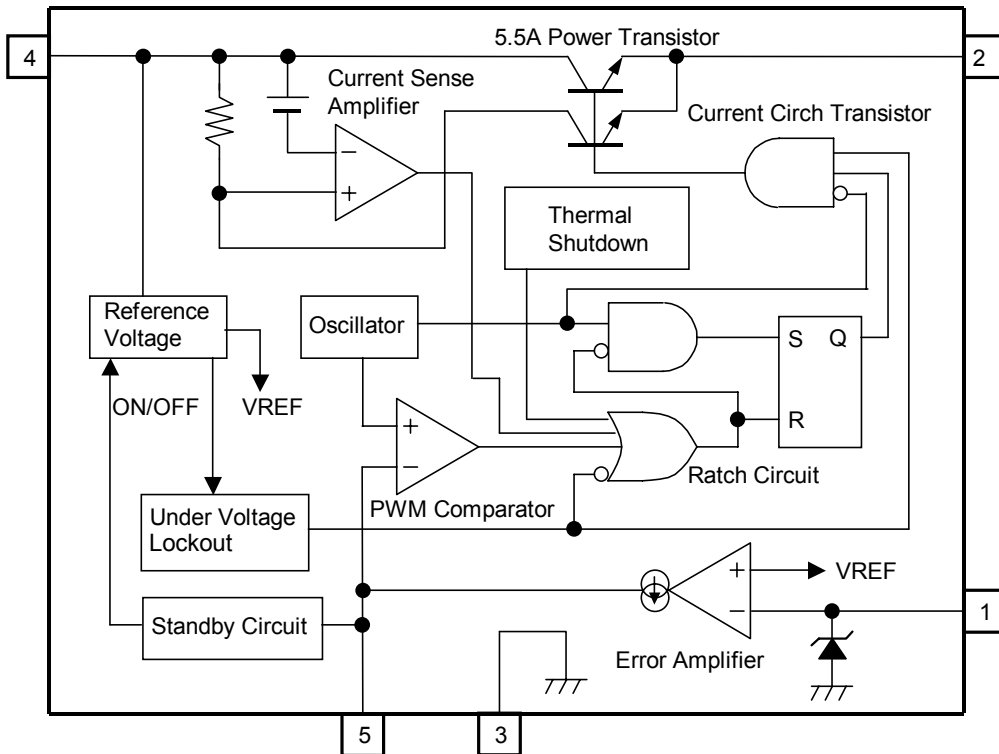
### ■FEATURES

- Operating Voltage (7.5V to 40V)
- PWM form Switching Power Supply Control
- Internal High Power Transistor 5.5A (min.)
- Fixed Frequency Oscillator 72kHz (typ.)
- Internal Current Sense Amplifier
- Internal Under Voltage Lockout
- Internal Thermal Shutdown Circuit
- Bipolar Technology
- Package Outline TO-220(5PIN)

### PIN FUNCTION

- 1:V<sub>FB</sub>
- 2:SW<sub>OUT</sub>
- 3:GND
- 4:V<sup>+</sup>
- 5:STBY (V<sub>COMP</sub>)

### ■BLOCK DIAGRAM



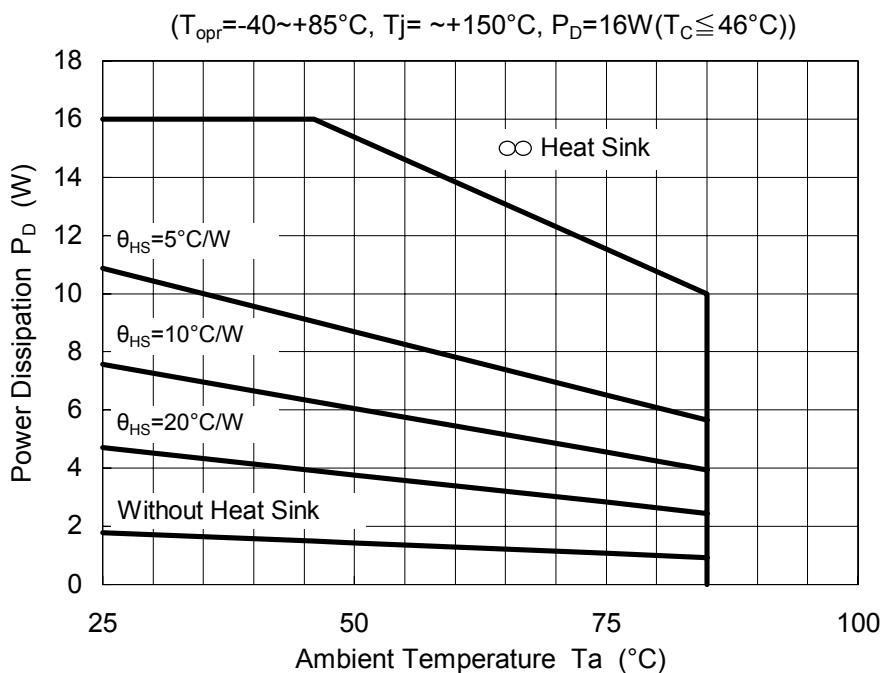
## ■ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

PARAMETER	SYMBOL	RATINGS	UNIT
Maximum Supply Voltage	V <sup>+</sup>	40	V
Switch Output Voltage	V <sub>o</sub> (SWITCH)	-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 CONDITIONS	MIN.	TYP.	MAX.	UNIT
Frequency	fosc	$V^+=7.5V$	65	72	79	kHz

## ERROR AMPLIFIER BLOCK

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

## SWITCH OUTPUT BLOCK

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Output Voltage Saturation	$V_{SAT}$	$V^+=7.5V, I_{source}=5.5A$	–	$V^+-1.5$	$V^+-1.8$	V
OFF-State Leakage	$I_{sw(off)}$	$V^+=40V, SW_{OUT}=0V$	–	0	100	$\mu A$
Current Limit Threshold	$I_{pk(SWITCH)}$	$V^+=7.5V$	5.5	6.5	8.0	A
Switching Times						
Output Voltage Rise Time	$t_r$	$V^+=40V, R_{OUT}=7.7\Omega, V_{FB}=0V$	–	100	–	nS
Output Voltage Fall Time	$t_f$	$V^+=40V, R_{OUT}=7.7\Omega, V_{FB}=0V$	–	50	–	nS

## UNDER VOLTAGE LOCKOUT BLOCK

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Startup Threshold	$V_{TH(UVLO)}$	$V^+$ Increasing	5.9	6.3	6.7	V
Hysteresis	$V_H(UVLO)$	$V^+$ Decreasing	0.6	0.8	1.0	V

## TOTAL DEVICE

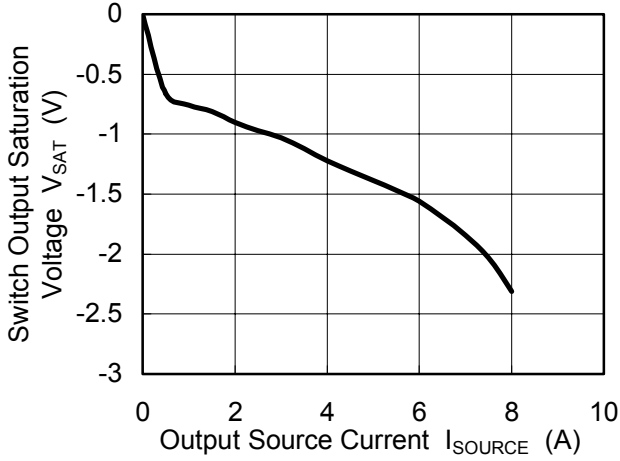
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Standby-State Power Supply Current	$I_{cc(stby)}$	$STBY \leq 0.1V$	–	36	100	$\mu A$
Operating-State Power Supply Current	$I_{cc}$	$V^+=40V, V_{FB}=0V$ duty:cycle=MAX	–	40	53	mA

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

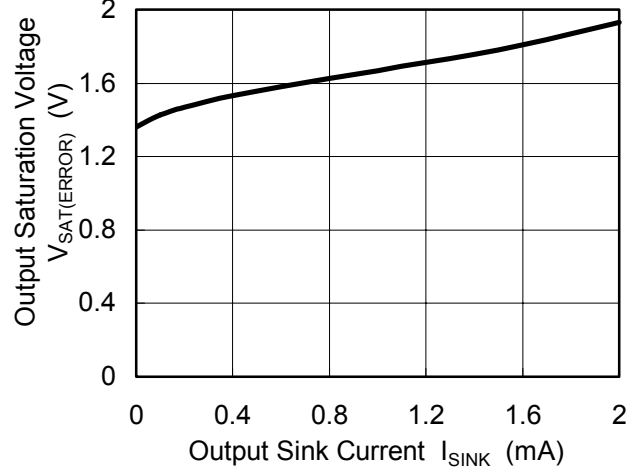
Low duty cycle pulse test is used to close its junction temperature to ambient temperature.

## ■TYPICAL CHARACTERISTICS

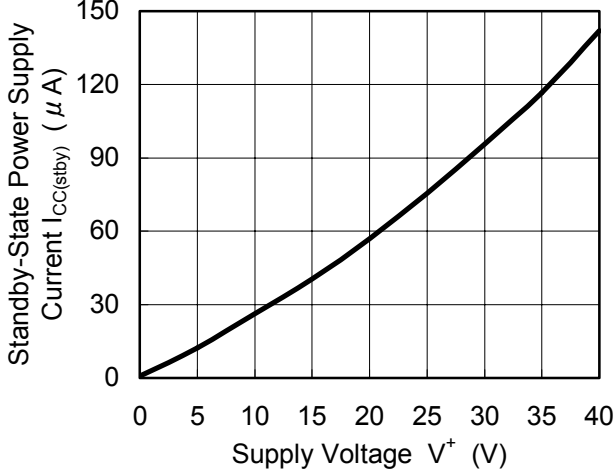
Switch Output Saturation Voltage vs. Output Source Current ( $V^+=7.5V, T_a=25^\circ C$ )



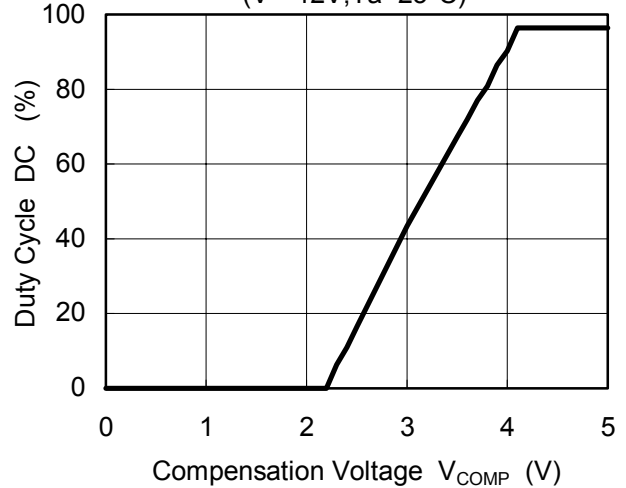
Error AMP Block Output Saturation Voltage vs. Output Sink Current ( $V^+=12V, V_{FB}=5.5V, T_a=25^\circ C$ )



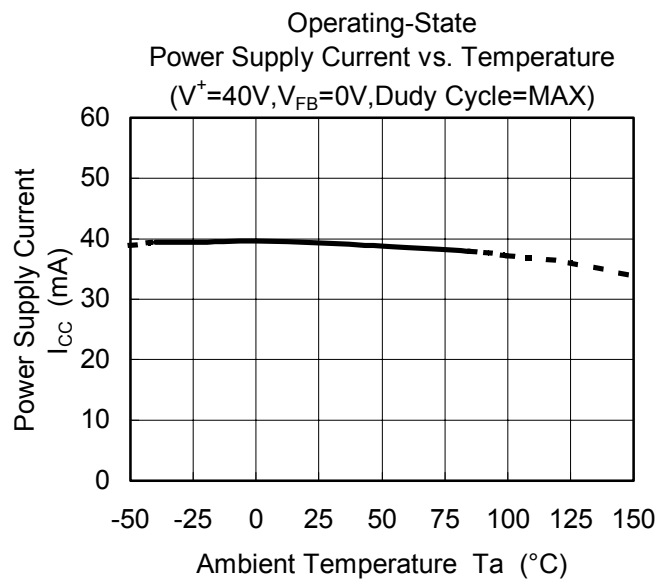
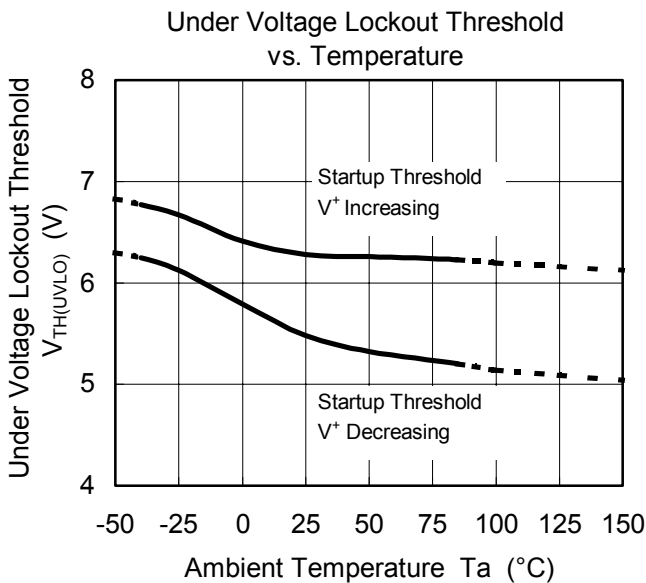
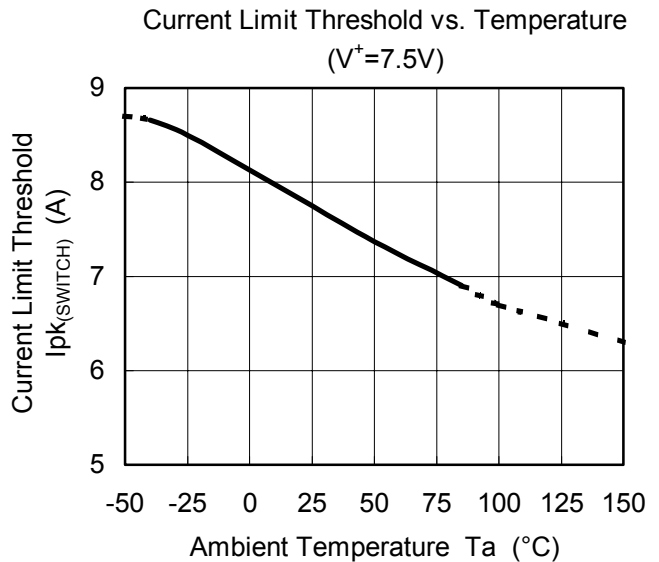
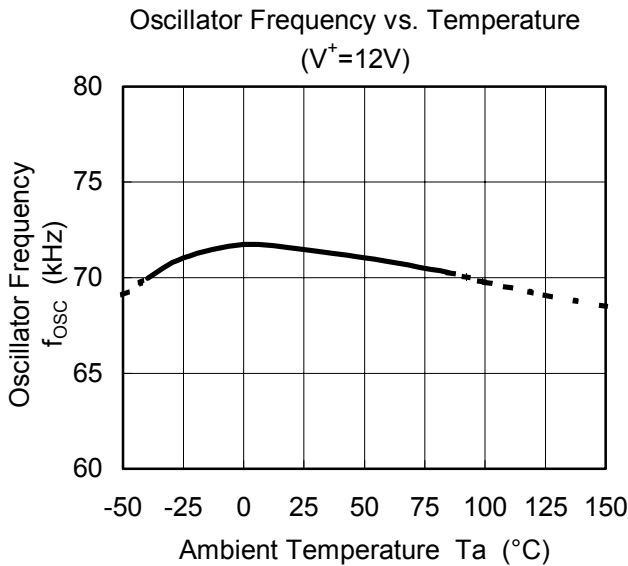
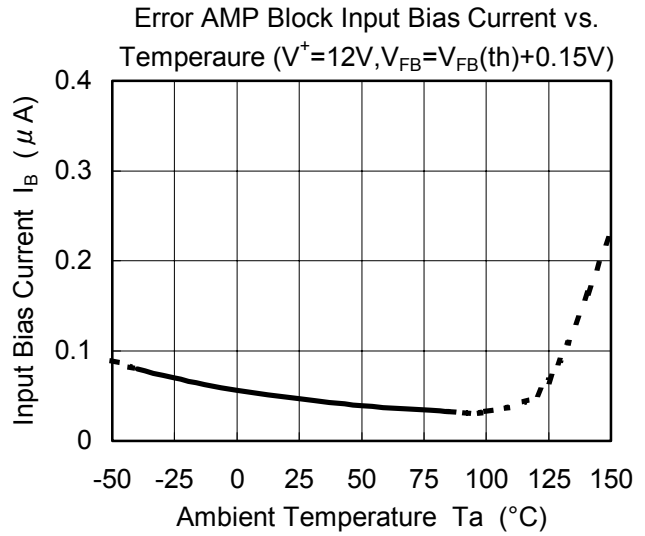
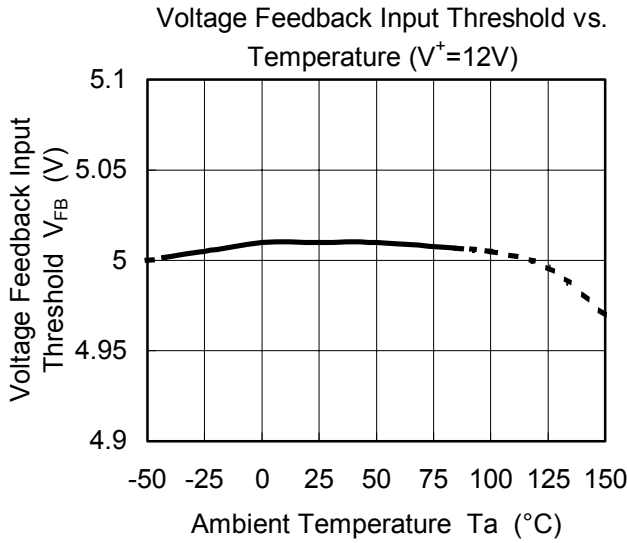
Standby-State Power Supply Current vs. Supply Voltage ( $T_a=25^\circ C$ )



Duty Cycle vs. Compensation Voltage ( $V^+=12V, T_a=25^\circ C$ )



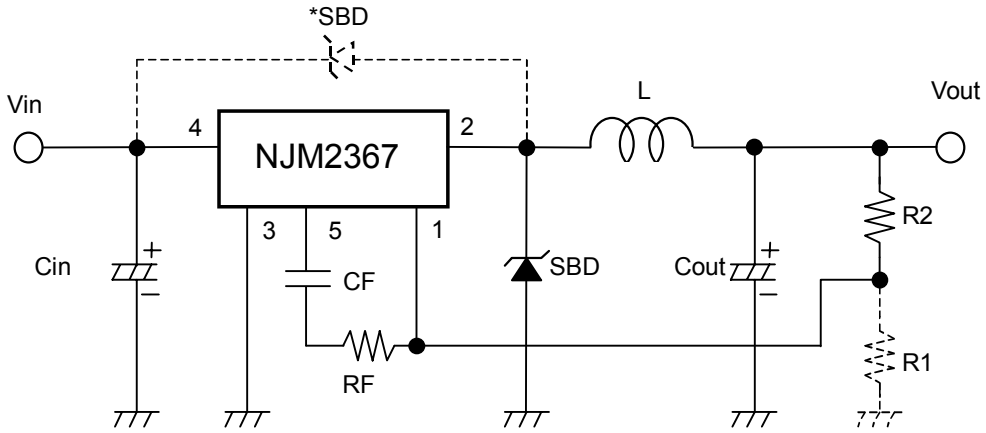
■ TYPICAL CHARACTERISTICS



# NJM2367

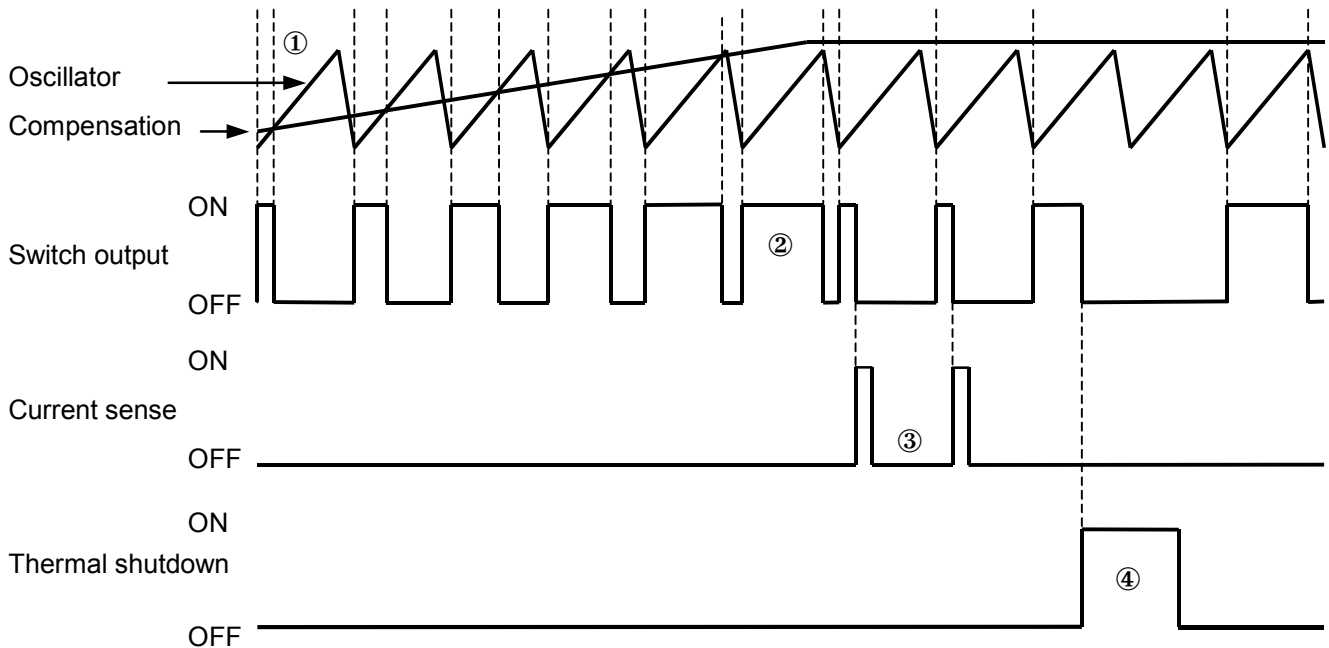
## ■TYPICAL APPLICATIONS

### 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 NJM2367, 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 NJM2367 generate square waves. The PWM comparator generate PWM signals to compare square waves and compensation voltage.
- 2) The switching duty is maximum 95%.
- 3) Over the 6.5A current, the output switch will be OFF to operate current limit protection. The NJM2367 sense the switching current of power transistor.
- 4) Over the 180°C (T<sub>j</sub>), the switching will be OFF to operate thermal shutdown circuit.

## MEMO

**[CAUTION]**

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