

# Selection Guide

- Buck Switching Regulator ICs
- Liner Regulator (LDO) ICs
- Peripheral Diodes

All information in this guide is as of the date of publication.  
Please make sure that you are using the latest version of the guide.  
If you need more product information, please refer to our data sheets.

<https://www.sanken-ele.co.jp/en>

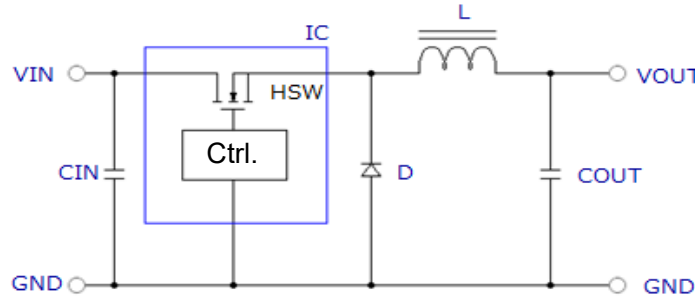
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Sanken's buck regulators include high-efficiency switching regulators and low-noise linear regulators. Our regulator ICs incorporate power transistors, enabling smaller PCB designs.

## ◆ Buck Switching Regulator

**Asynchronous  
Switching Regulator**

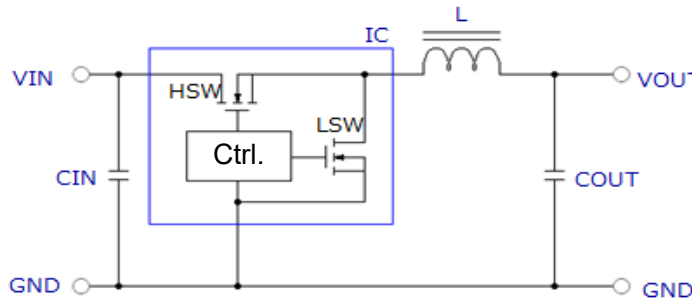
→ [p.5](#)



- ✓ Basic buck switching regulator
- ✓ Simplified control
- ✓ Freewheel diode required (see [p. 36](#))

**Synchronous  
Switching Regulator**

→ [p.6](#)

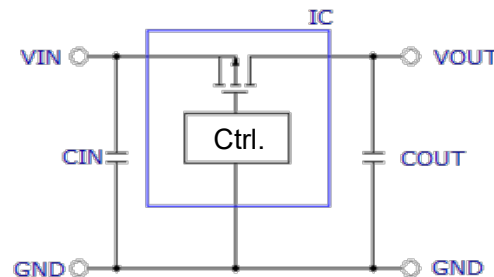


- ✓ No freewheel diode required
- ✓ High-efficiency
- ✓ Higher frequencies than asynchronous switching regulators

## ◆ Linear Regulator

**LDO**

→ [p.7](#)



- ✓ Suitable for switching-noise-sensitive applications
- ✓ Fewer external components (fixed output voltage)
- ✓ Lower input-to-output voltage difference (LDO: Low Dropout)

Through-hole Mounting

Single Output

Adjustable Output Voltage

Asynchronous

SI-8010GL, NR111D

Surface Mounting

Single Output

Fixed Output Voltage

Asynchronous

SI-80xxJD/SD

Synchronous

NR263S

Adjustable Output Voltage

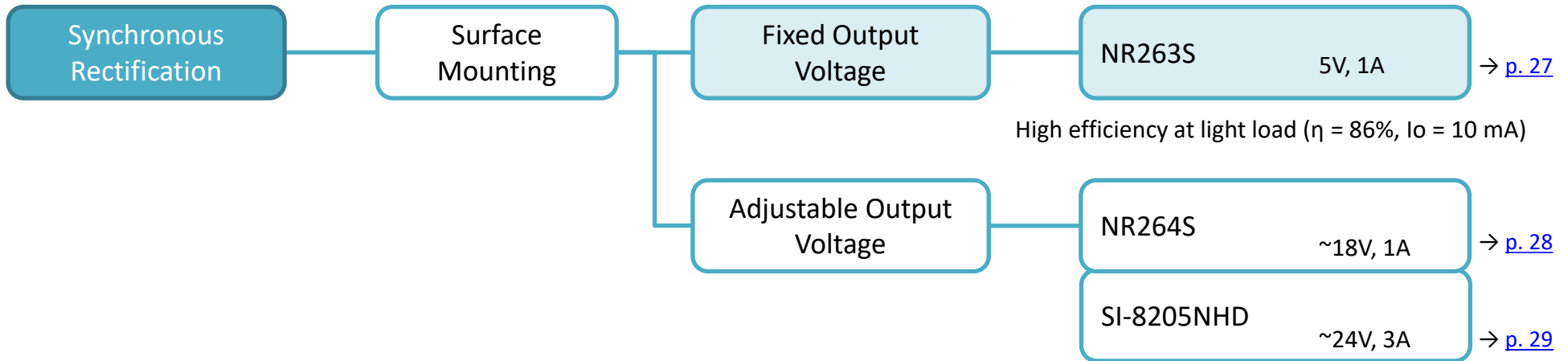
Asynchronous

NR11xE/K, NR131x,  
SI-8008TM/TMX/HD

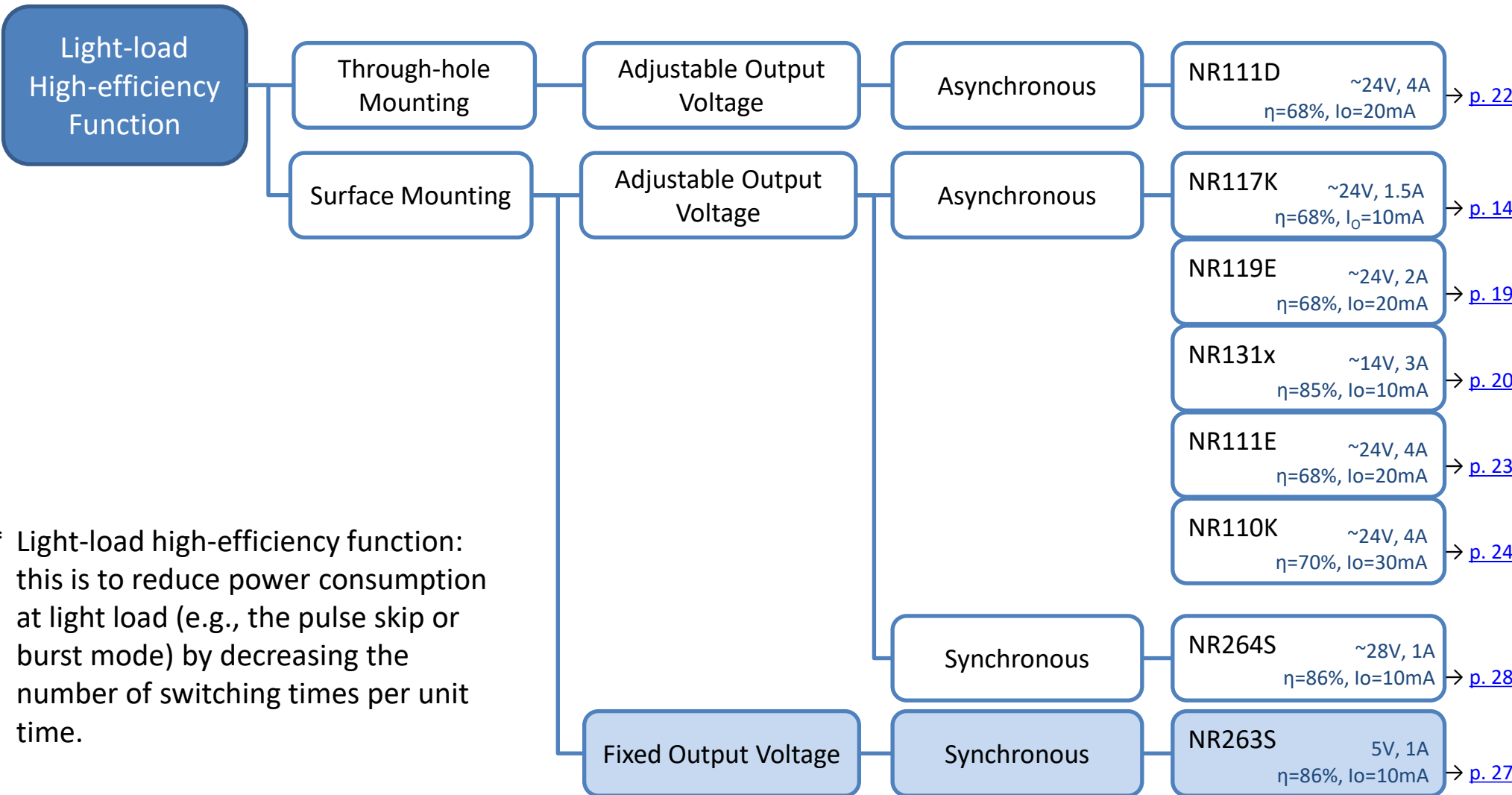
Synchronous

NR264S, SI-8205NHD

A synchronous topology enables high-efficiency and high-frequency operations compared to an asynchronous topology. This helps your application use small inductors, resulting in a reduction in PCB size.



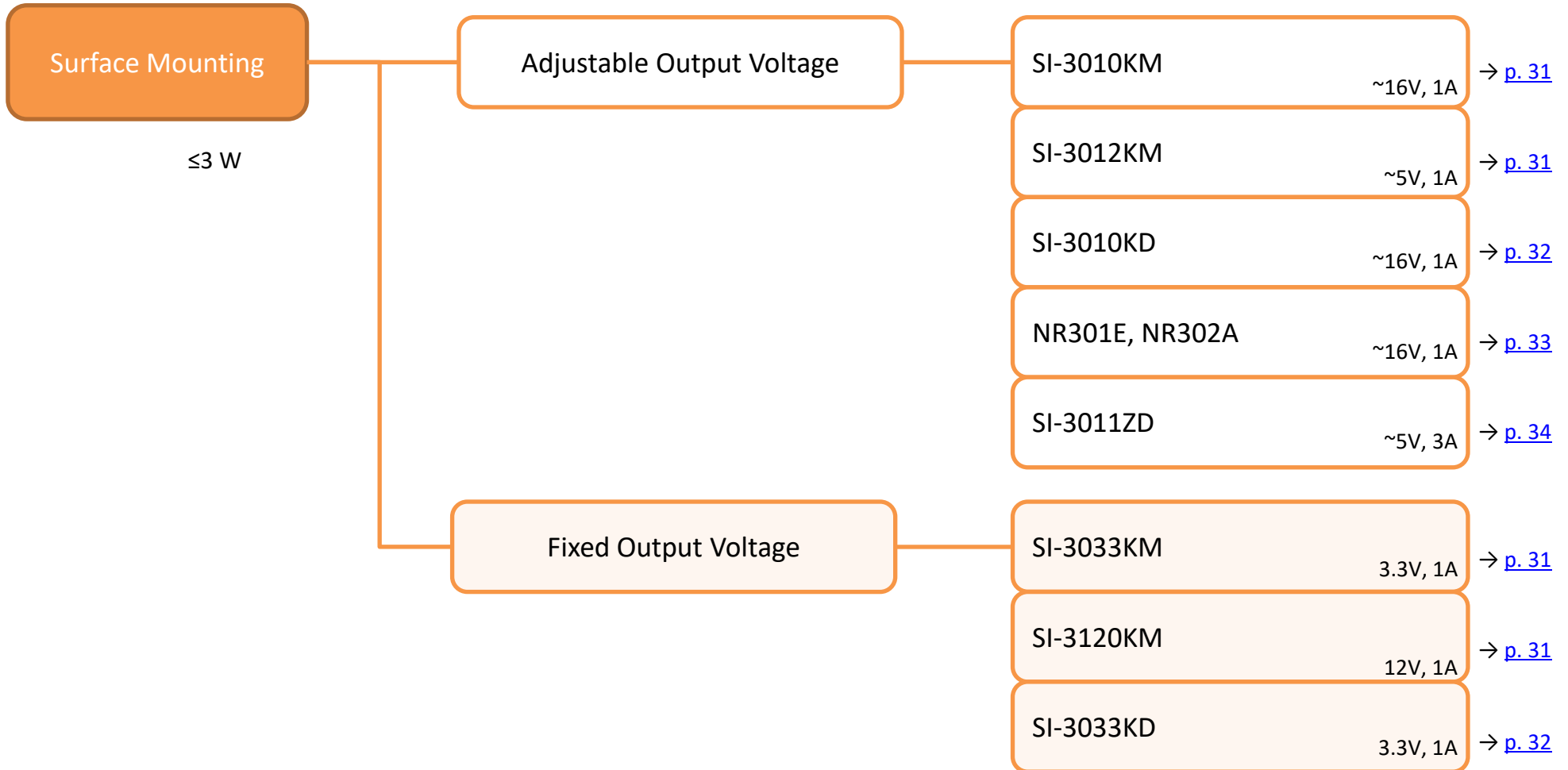
Our buck switching regulators enhance efficiency at light load. The products with the light-load high-efficiency function can achieve a light-load efficiency of  $\eta = 68\%$  to  $85\%$ . (Products without this function:  $\eta = 40\%$  to  $50\%$ )



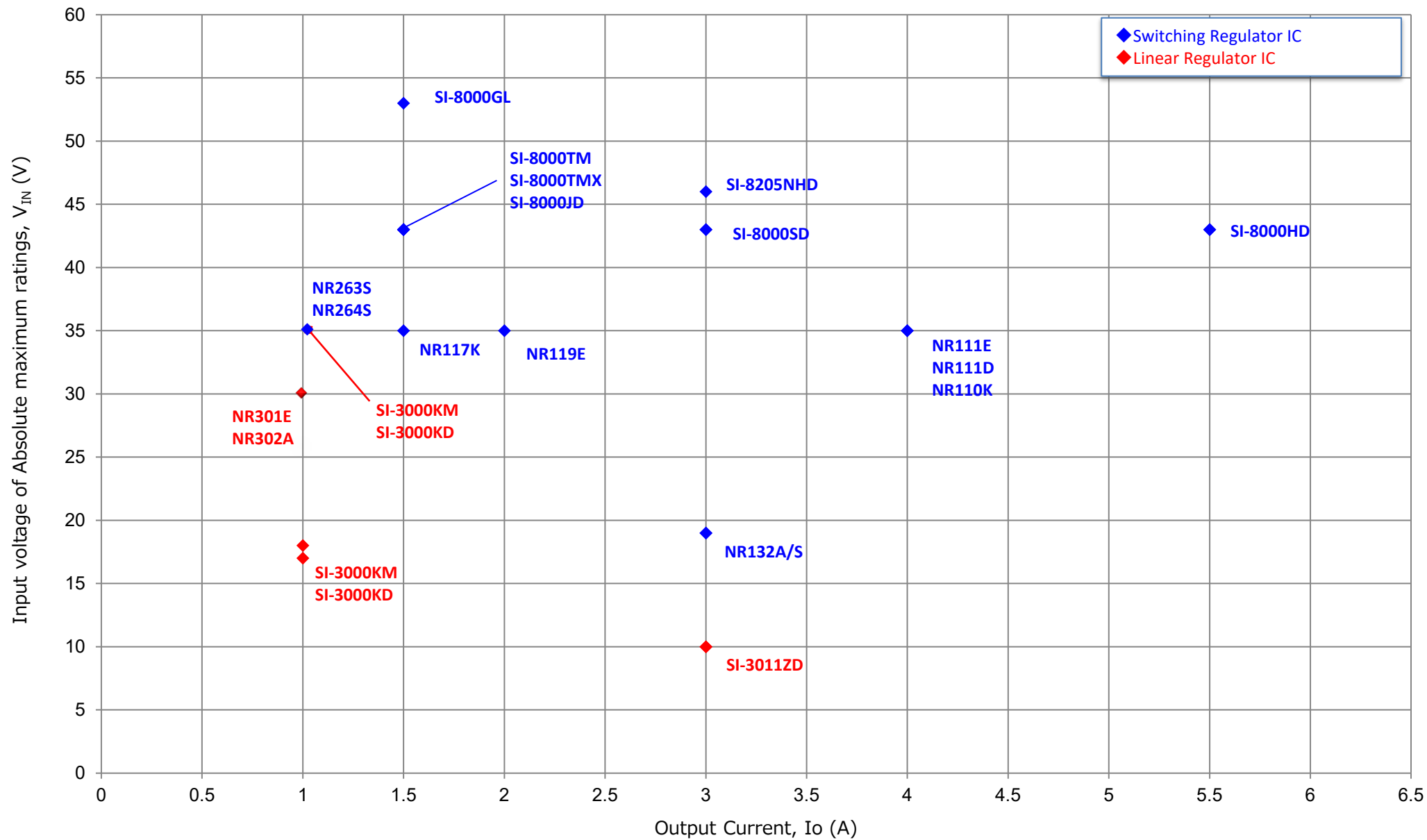
\* Light-load high-efficiency function: this is to reduce power consumption at light load (e.g., the pulse skip or burst mode) by decreasing the number of switching times per unit time.

The efficiency ( $\eta$ ) is measured at  $V_{IN} = 12\text{ V}$ ,  $V_o = 5\text{ V}$ .

We offer a wide selection of linear regulators with  $I_O = 0.25\text{ A to }3\text{ A}$  and  $P_D = 0.75\text{ W to }3\text{ W}$ . You will find the LDO linear regulator that best suits your application.



# Product Map: Buck Switching Regulators ( $V_{IN}$ vs. $I_O$ )





I <sub>o</sub>	Part Number	V <sub>IN</sub> (V)		V <sub>O</sub> (V)		Frequencies (kHz)		High Efficiency at Light Load	Phase Compensation	C <sub>OUT</sub> Ceramic Capacitor	Package	Page
		Min.	Max.	Fixed	Adjustable	Fixed	Adjustable					
1.5 A	NR117K	8	35	—	0.8 – 24	30	—	✓	Internal	✓	HSOP8	<a href="#">p. 14</a>
	SI-8033JD	6.3	43	3.3	—	125	—	—	Internal	—	TO-263 -5L	<a href="#">p. 15</a>
	SI-8050JD	8	43	5.0	—	125	—	—	Internal	—		
	SI-8090JD	12	43	9.0	—	125	—	—	Internal	—		
	SI-8120JD	15	43	12.0	—	125	—	—	Internal	—		
	SI-8008TM	4.5	43	—	0.8 – 24	300	—	—	Internal	—	TO-252 -5L	<a href="#">p. 16</a>
	SI-8008TMX	4.5	43	—	0.8 – 24	300	—	I <sub>q</sub> (OFF) = 1μA	Internal	—		<a href="#">p. 17</a>
	SI-8010GL	8	53	—	1 – 14	250	—	—	External	—	DIP8	<a href="#">p. 18</a>
2 A	NR119E	6.5	35	—	0.8 – 24	364	—	✓	Internal	✓	eSOIC8	<a href="#">p. 19</a>

I <sub>o</sub>	Part Number	V <sub>IN</sub> (V)		V <sub>O</sub> (V)		Frequencies (kHz)		High Efficiency at Light Load	Phase Compensation	C <sub>OUT</sub> Ceramic Capacitor	Package	Page
		Min.	Max.	Fixed	Adjustable	Fixed	Adjustable					
3 A	NR131A	4.5	19	—	0.8 – 14	350	—	✓	Internal	✓	eSOIC8	<a href="#">p. 20</a>
	NR131S	4.5	19	—	0.8 – 14	350	—	✓	Internal	✓	SOIC8	
	SI-8033SD	5.5	43	3.3	—	60	—	—	Internal	—	TO-263-5L	<a href="#">p. 21</a>
	SI-8050SD	7	43	5.0	—	60	—	—	Internal	—		
4 A	NR111D	8	35	—	0.8 – 24	350	—	✓	Internal	✓	DIP8	<a href="#">p. 22</a>
	NR111E	6.5	35	—	0.8 – 24	350	—	✓	Internal	✓	eSOIC8	<a href="#">p. 23</a>
	NR110K	8	35	—	0.8 – 24	350	—	✓	Internal	✓	HSOP8	<a href="#">p. 24</a>
5.5 A	SI-8008HD	4.5	43	—	0.8 – 24	150	—	—	Internal	—	TO-263-5L	<a href="#">p. 25</a>

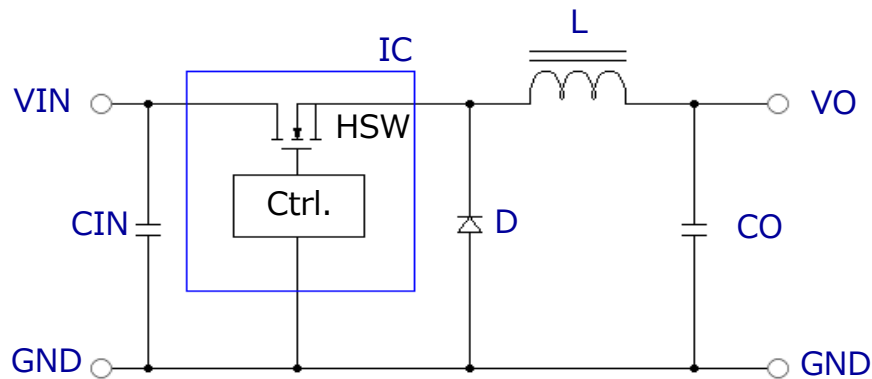
I <sub>o</sub>	Part Number	V <sub>IN</sub> (V)		V <sub>O</sub> (V)		Frequencies (kHz)		High Efficiency at Light Load	Phase Compensation	C <sub>OUT</sub> Ceramic Capacitor	Package	Page
		Min.	Max.	Fixed	Adjustable	Fixed	Adjustable					
1A	NR263S	8	31	5.0	—	500	—	✓	Internal	✓	SOP8	<a href="#">p. 27</a>
	NR264S	8	31	—	3 – 18	500	—	✓	Internal	✓	SOP8	<a href="#">p. 28</a>
3 A	SI-8205NHD	8	46	—	0.5 – 24	—	200 – 1000	—	External	✓	HSOP8	<a href="#">p. 29</a>

Io	Part Number	VIN (V)		Vo (V)		VIN-Vo Minimum Differential Voltage (V)	OCP Operation	ON/OFF by External Signal	Pd (W)	Cout Ceramic Capacitor	Package	Page
		Min.	Max.	Fixed	Adjustable							
1 A	SI-3033KM	3.9	17	3.3	—	0.6	Drooping	✓	1	✓	TO-252 -5L	<a href="#">p. 31</a>
	SI-3012KM	2.4	17	—	1.28 – 5	0.6	Drooping	✓	1	✓		
	SI-3120KM	12.6	35	12.0	—	0.6	Fold back	✓	1	✓		
	SI-3010KM	2.4	35	—	1.1 – 16	0.6	Fold back	✓	1	✓		
	SI-3033KD	3.9	17	3.3	—	0.6	Drooping	✓	3	—	TO-263 -5L	<a href="#">p. 32</a>
	SI-3010KD	2.4	35	—	1.1 – 16	0.6	Fold back	✓	3	—	TO-263 -5L	
	NR301E	2.7	30	—	1.1 – 16	0.6	Fold back	✓	1.4	✓	eSOIC8	<a href="#">p. 33</a>
	NR302A	2.7	30	—	1.1 – 16	0.6	Fold back	✓	1.4	✓	HSOP8	
3 A	SI-3011ZD	2.4	10	—	1.2 – 5	0.6	Fold back	✓	3	—	TO-263 -5L	<a href="#">p. 34</a>

# Asynchronous Buck Switching Regulator ICs

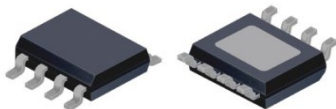
## Product Information

- ✓ Simplified Control
- ✓ Integrated Power MOSFET or Bipolar Transistor for Hsw
- ✓ External Freewheel Diode Required (See [p. 35](#))



# NR117K

HSOP8



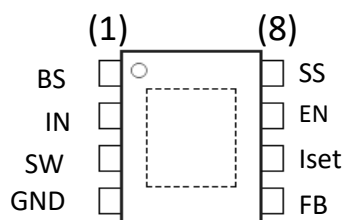
## Features

- $I_O = 1.5 \text{ A}$
- $f_{SW} = 30 \text{ kHz}$
- Adjustable Output Voltage
- High Efficiency by Pulse Skip Operation at Light Load  
Light-load Efficiency:  $\eta = 68\% \text{ max.}$  ( $I_O = 10 \text{ mA}$ ,  $V_{IN} = 12 \text{ V}$ ,  $V_O = 5 \text{ V}$ )
- Current Mode Control
- Stable with Ceramic Output Capacitors
- Soft-start Function
- Output On/Off Function
- Protections (OCP, TSD, UVLO)
- Component Count Reduced by Internal Phase Compensation

## Specifications

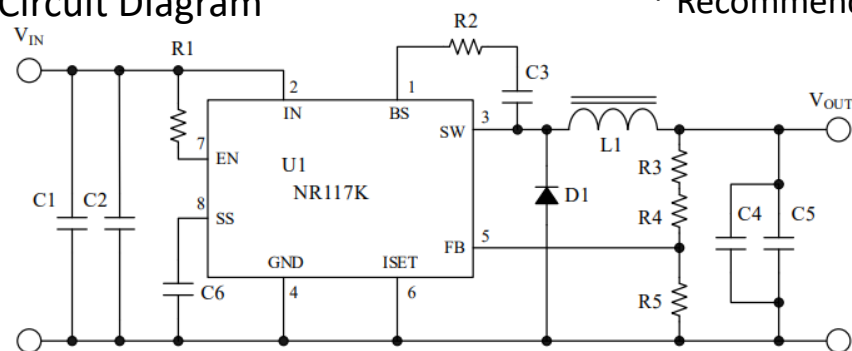
Part Number	$I_O$	Frequencies		Ref. Voltage	$V_O$	$V_{IN}^*$	Efficiency	Protection Functions	
		Light Load	Full Load					OCP	TSD
NR117K	1.5 A	Pulse skip	30 kHz	0.8 V	0.8 to 24 V	8 to 31 V	87%	Drooping	Auto-restart

## Pin Assignment



- (1) BS : Supply Voltage for Gate Drive
- (2) IN : Voltage Input
- (3) SW : Switching Output
- (4) GND : Ground
- (5) FB : Feedback Signal Input
- (6) Iset : External OCP Adjustment
- (7) EN : Vo ON/OFF Control
- (8) SS : Soft-start

## Circuit Diagram



\* Recommended value

$$I_O = 1.5 \text{ A}, V_{IN} = 43 \text{ V}$$

# Asynchronous Buck Switching Regulator ICs

## SI-8000JD Series

TO-263-5L



### Features

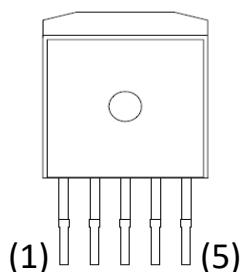
- $I_O = 1.5 \text{ A}$
- $f_{OSC} = 125 \text{ kHz}$
- Fixed Output Voltage
- Requires Only Four Discrete Components
- Output On/Off Function
- Protections (OCP, TSD)

### Specifications

\* Recommended value

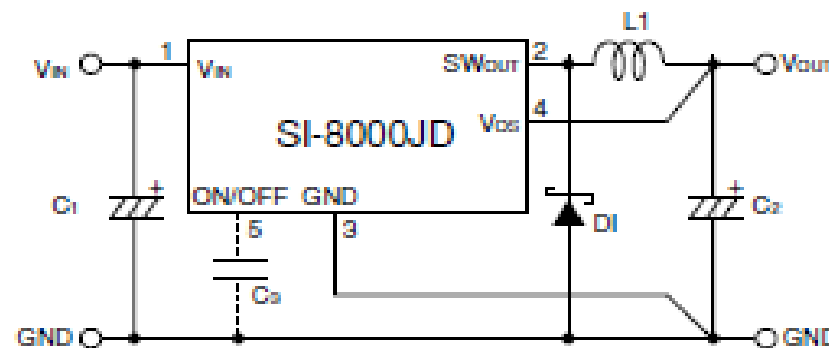
Part Number	$I_O$	Frequencies		Ref. Voltage	$V_O$	$V_{IN}^*$	Efficiency	Protection Functions	
		Light Load	Full Load					OCP	TSD
SI-8033JD	1.5 A	—	125 kHz	—	3.30 V	5.3 to 40 V	77%	Fold back	Auto-restart
SI-8050JD				—	5.00 V	7 to 40 V	82%		
SI-8090JD				—	9.00 V	11 to 40 V	86%		
SI-8120JD				—	12.00 V	14 to 40 V	88%		

### Pin Assignment



- (1)  $V_{IN}$  : Voltage Input
- (2)  $SW_{OUT}$  : Switching Output
- (3) GND : Ground
- (4)  $V_{OS}$  : Output Voltage Detection
- (5) ON/OFF :  $V_O$  ON/OFF Control

### Circuit Diagram



$$I_O = 1.5 \text{ A}, V_{IN} = 43 \text{ V}$$

# Asynchronous Buck Switching Regulator IC

## SI-8008TM

TO-252-5L



### Features

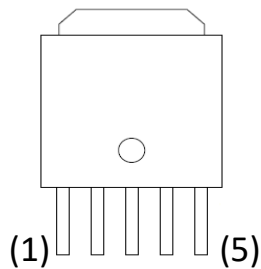
- $I_O = 1.5 \text{ A}$
- $f_{OSC} = 300 \text{ kHz}$
- Adjustable Output Voltage
- Soft-start Function
- Output On/Off Function
- Protections (OCP, TSD)

### Specifications

\* Recommended value

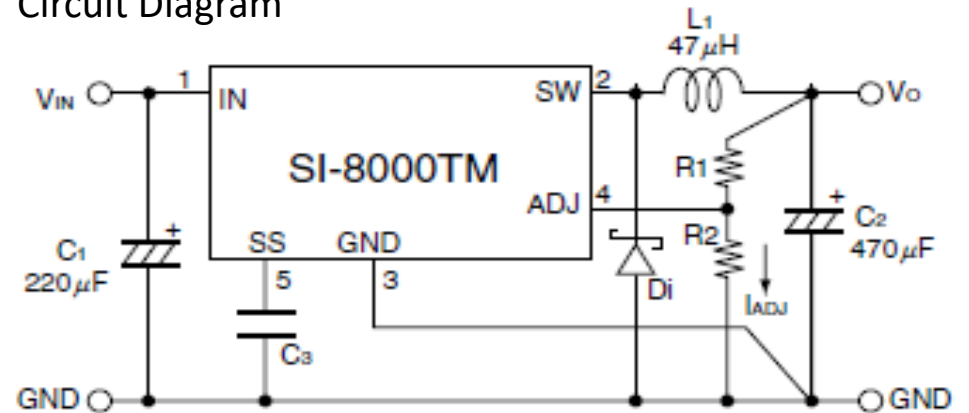
Part Number	$I_O$	Frequencies		Ref. Voltage	$V_O$	$V_{IN}^*$	Efficiency	Protection Functions	
		Light Load	Full Load					OCP	TSD
SI-8008TM	1.5 A	—	300 kHz	0.8 V	0.8 to 24 V	$V_O+3$ or 4.5 to 40 V	81%	Drooping	Auto-restart

### Pin Assignment



- (1) IN : Voltage Input
- (2) SW : Switching Output
- (3) GND : Ground
- (4) ADJ : Feedback Signal Input
- (5) SS : Soft-start and  $V_O$  ON/OFF Control

### Circuit Diagram





$$I_O = 1.5 \text{ A}, V_{IN} = 43 \text{ V}$$

# Asynchronous Buck Switching Regulator IC

## SI-8008TMX

TO-252-5L



### Features

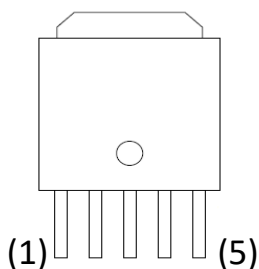
- $I_O = 1.5 \text{ A}$
- $f_{OSC} = 300 \text{ kHz}$
- Adjustable Output Voltage
- Output On/Off Function ( $I_{q(OFF)} = 1 \mu\text{A}$ )
- Protections (OCP, TSD)

### Specifications

\* Recommended value

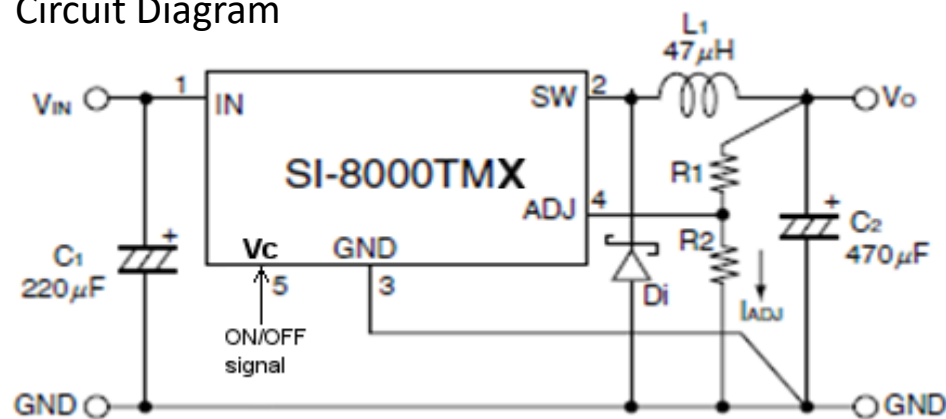
Part Number	$I_O$	Frequencies		Ref. Voltage	$V_O$	$V_{IN}^*$	Efficiency	Protection Functions	
		Light Load	Full Load					OCP	TSD
SI-8008TMX	1.5 A	—	300 kHz	0.8 V	0.8 to 24 V	$V_O + 3$ or 4.5 to 40 V	81%	Drooping	Auto-restart

### Pin Assignment



- (1) IN : Voltage Input
- (2) SW : Switching Output
- (3) GND : Ground
- (4) ADJ : Feedback Signal Input
- (5) Vc :  $V_O$  ON/OFF Control

### Circuit Diagram

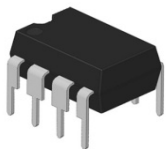


$$I_O = 1.5 \text{ A}, V_{IN} = 53 \text{ V}$$

# Asynchronous Buck Switching Regulator IC

## SI-8010GL

DIP8



### Features

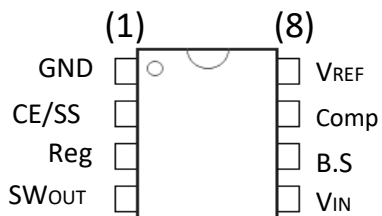
- $V_{IN} = 53 \text{ V}$  (max.)
- $I_O = 20 \text{ mA}$  to  $1.5 \text{ A}$
- $f_{OSC} = 250 \text{ kHz}$
- Adjustable Output Voltage
- Soft-start Function
- Output On/Off Function
- Protections (OCP, TSD)

### Specifications

\* Recommended value

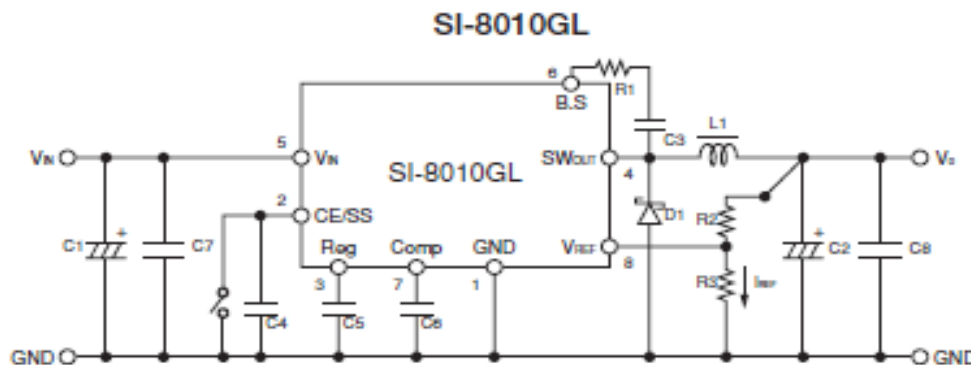
Part Number	$I_O$	Frequencies		Ref. Voltage	$V_O$	$V_{IN}^*$	Efficiency	Protection Functions	
		Light Load	Full Load					OCP	TSD
SI-8010GL	20 mA to 1.5 A	—	250 kHz	1.00 V	1.0 to 14 V	$V_O+3$ or 8 to 50 V	86%	Drooping	Auto-restart

### Pin Assignment



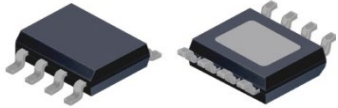
- (1) GND : Ground
- (2) CE/SS : Vo ON/OFF and Soft-start
- (3) Reg : Internal Regulator Output
- (4) SWOUT : Switching Output
- (5)  $V_{IN}$  : Voltage Input
- (6) B.S : Supply Voltage for Gate Drive
- (7) Comp : External Phase Compensation
- (8)  $V_{REF}$  : Feedback Signal Input

### Circuit Diagram



# NR119E

eSOIC8



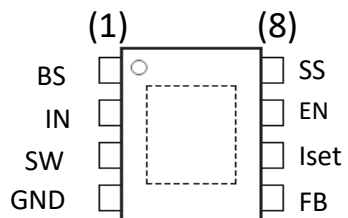
## Features

- $I_O = 2\text{ A}$
- $f_{sw} = 364\text{ kHz}$
- Adjustable Output Voltage
- High Efficiency by Pulse Skip Operation at Light Load  
Light-load Efficiency:  $\eta = 68\% \text{ max.}$  ( $I_O = 20\text{ mA}$ ,  $V_{IN} = 12\text{ V}$ ,  $V_O = 5\text{ V}$ )
- Current Mode Control
- Stable with Ceramic Output Capacitors
- Soft-start Function
- Output On/Off Function
- Protections (OCP, TSD, UVLO)
- Component Count Reduced by Internal Phase Compensation

## Specifications

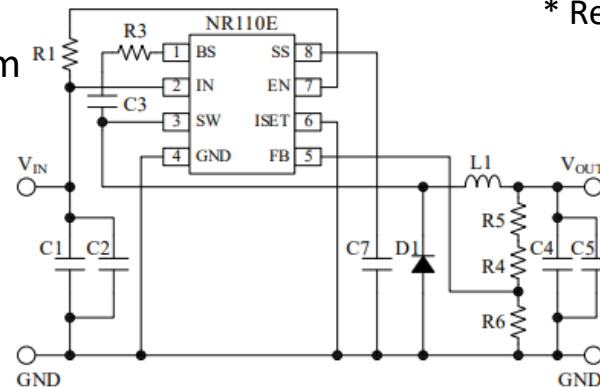
Part Number	$I_O$	Frequencies		Ref. Voltage	$V_O$	$V_{IN}^*$	Efficiency	Protection Functions	
		Light Load	Full Load					OCP	TSD
NR119E	2 A	Pulse skip	364 kHz	0.8 V	0.8 to 24 V	6.5 to 31 V	94%	Drooping	Auto-restart

## Pin Assignment



- (1) BS : Supply Voltage for Gate Drive
- (2) IN : Voltage Input
- (3) SW : Switching Output
- (4) GND : Ground
- (5) FB : Feedback Signal Input
- (6) Iset : External OCP Adjustment
- (7) EN :  $V_O$  ON/OFF
- (8) SS : Soft-start

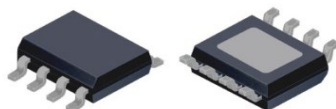
## Circuit Diagram



\* Recommended value

## NR131x Series

**NR131A**  
eSOIC8



**NR131S**  
SOIC8



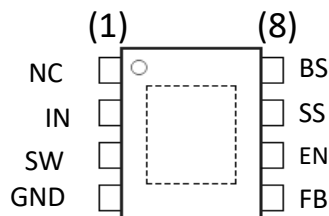
### Features

- $I_O = 3\text{ A}$
- $f_{SW} = 350\text{ kHz}$
- Adjustable Output Voltage
- High Efficiency by Pulse Skip Operation at Light Load  
Light-load Efficiency:  $\eta = 85\%$  max. ( $I_O = 10\text{ mA}$ ,  $V_{IN} = 12\text{ V}$ ,  $V_O = 5\text{ V}$ )
- Current Mode Control
- Stable with Ceramic Output Capacitors
- Soft-start Function
- Output On/Off Function
- Protections (OCP, TSD, UVLO)
- Component Count Reduced by Internal Phase Compensation

### Specifications

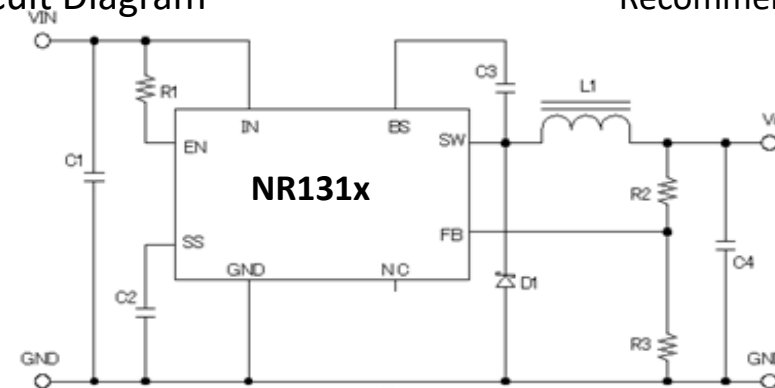
Part Number	$I_O$	Frequencies		Ref. Voltage	$V_O$	$V_{IN}^*$	Efficiency	Protection Functions	
		Light Load	Full Load					OCP	TSD
NR131A	3 A	Pulse skip	350 kHz	0.8 V	0.8 to 14 V	4.5 to 17 V	95%	Drooping	Auto-restart
NR131S									

### Pin Assignment



- (1) NC : No Connection
- (2) IN : Voltage Input
- (3) SW : Switching Output
- (4) GND : Ground
- (5) FB : Feedback Signal Input
- (6) EN :  $V_O$  ON/OFF Control
- (7) SS : Soft-start
- (8) BS : Supply Voltage for Gate Drive

### Circuit Diagram



\* Recommended value

$I_O = 3\text{ A}$ ,  $V_{IN} = 43\text{ V}$

# Asynchronous Buck Switching Regulator ICs

## SI-8000SD Series

TO-263-5L



### Features

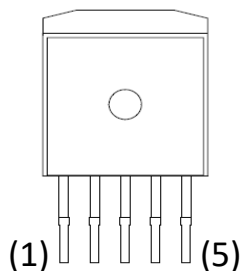
- $I_O = 3\text{ A}$
- $f_{OSC} = 60\text{ kHz}$
- Fixed Output Voltage
- Requires Only Four Discrete Components
- Soft-start Function
- Output On/Off Function
- Protections (OCP, TSD)

### Specifications

\* Recommended value

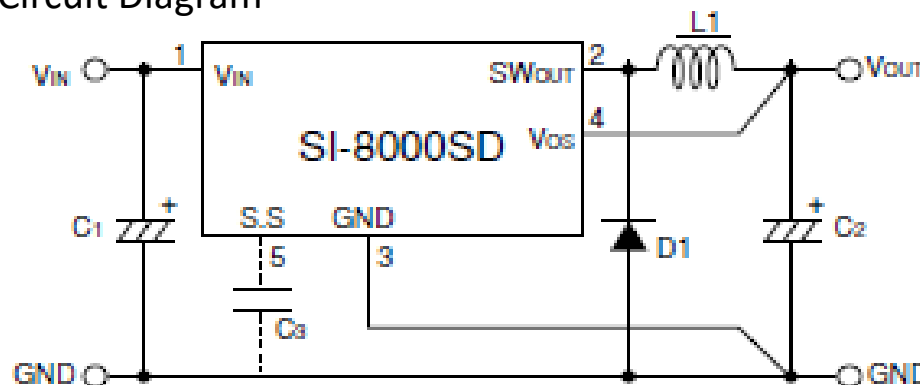
Part Number	$I_O$	Frequencies		Ref. Voltage	$V_O$	$V_{IN}^*$	Efficiency	Protection Functions	
		Light Load	Full Load					OCP	TSD
SI-8033SD	3 A	—	60 kHz	—	3.30 V	5.5 to 28 V	77%	Drooping	Auto-restart
SI-8050SD					5.00 V	7 to 40 V	82%		

### Pin Assignment



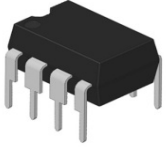
- (1)  $V_{IN}$  : Voltage Input
- (2)  $SW_{OUT}$  : Switching Output
- (3) GND : Ground
- (4)  $V_{OS}$  : Output Voltage Detection
- (5) S.S :  $V_O$  ON/OFF Control and Soft-start

### Circuit Diagram



# NR111D

DIP8



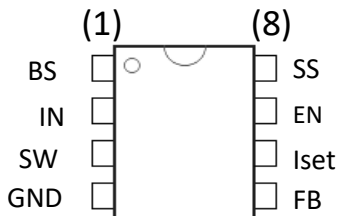
## Features

- $I_O = 4\text{ A}$
- $f_{SW} = 350\text{ kHz}$
- Adjustable Output Voltage
- High Efficiency by Pulse Skip Operation at Light Load  
Light-load Efficiency:  $\eta = 68\%$  max. ( $I_O = 20\text{ mA}$ ,  $V_{IN} = 12\text{ V}$ ,  $V_O = 5\text{ V}$ )
- Current Mode Control
- Stable with Ceramic Output Capacitors
- Soft-start Function
- Output On/Off Function
- Protections (OCP, TSD, UVLO)
- Component Count Reduced by Internal Phase Compensation

## Specifications

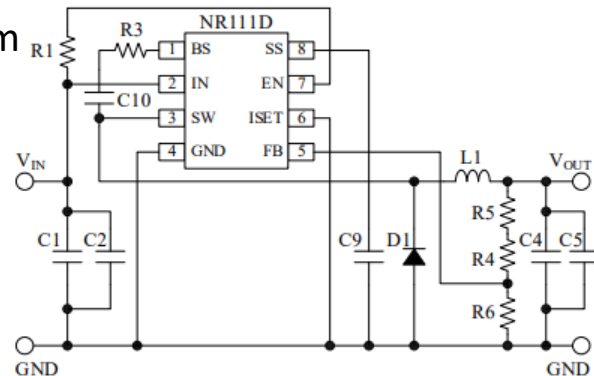
Part Number	$I_O$	Frequencies		Ref. Voltage	$V_O$	$V_{IN}^*$	Efficiency	Protection Functions	
		Light Load	Full Load					OCP	TSD
NR111D	4 A	Pulse skip	350 kHz	0.8 V	0.8 to 24 V	6.5 to 31 V	94%	Drooping	Auto-restart

## Pin Assignment



- (1) BS: Supply Voltage for Gate Drive
- (2) IN: Voltage Input
- (3) SW: Switching Output
- (4) GND: Ground
- (5) FB: Feedback Signal Input
- (6) Iset: External OCP Adjustment
- (7) EN: Vo ON/OFF Control
- (8) SS: Soft-start

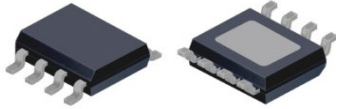
## Circuit Diagram



\* Recommended value

# NR111E

eSOIC8



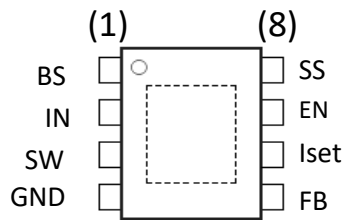
## Features

- $I_O = 4\text{ A}$
- $f_{SW} = 350\text{ kHz}$
- Adjustable Output Voltage
- High Efficiency by Pulse Skip Operation at Light Load  
Light-load Efficiency:  $\eta = 68\% \text{ max.}$  ( $I_O = 20\text{ mA}$ ,  $V_{IN} = 12\text{ V}$ ,  $V_O = 5\text{ V}$ )
- Current Mode Control
- Stable with Ceramic Output Capacitors
- Soft-start Function
- Output On/Off Function
- Protections (OCP, TSD, UVLO)
- Component Count Reduced by Internal Phase Compensation

## Specifications

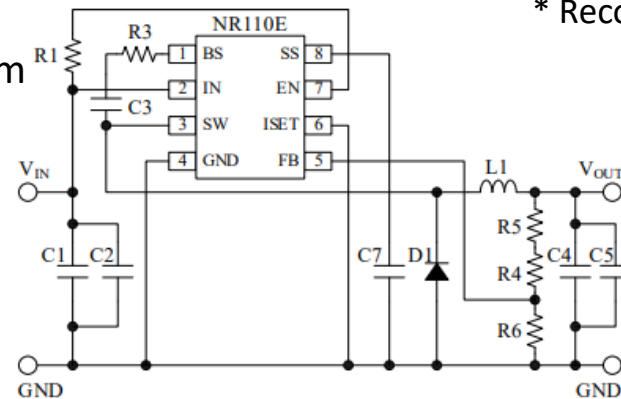
Part Number	$I_O$	Frequencies		Ref. Voltage	$V_O$	$V_{IN}^*$	Efficiency	Protection Functions	
		Light Load	Full Load					OCP	TSD
NR111E	4 A	Pulse skip	350 kHz	0.8 V	0.8 to 24 V	6.5 to 31 V	94%	Drooping	Auto-restart

## Pin Assignment



- (1) BS : Supply Voltage for Gate Drive
- (2) IN : Voltage Input
- (3) SW : Switching Output
- (4) GND : Ground
- (5) FB : Feedback Signal Input
- (6) Iset : External OCP Adjustment
- (7) EN : Vo ON/OFF
- (8) SS : Soft-start

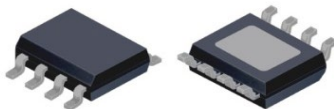
## Circuit Diagram



\* Recommended value

# NR110K

HSOP8



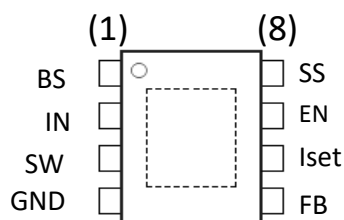
## Features

- $I_O = 4\text{ A}$
- $f_{SW} = 350\text{ kHz}$
- Adjustable Output Voltage
- High Efficiency by Pulse Skip Operation at Light Load  
Light-load Efficiency:  $\eta = 70\%$  max. ( $I_O = 30\text{ mA}$ ,  $V_{IN} = 12\text{ V}$ ,  $V_O = 5\text{ V}$ )
- Current Mode Control
- Stable with Ceramic Output Capacitors
- Soft-start Function
- Output On/Off Function
- Protections (OCP, TSD, UVLO)
- Component Count Reduced by Internal Phase Compensation

## Specifications

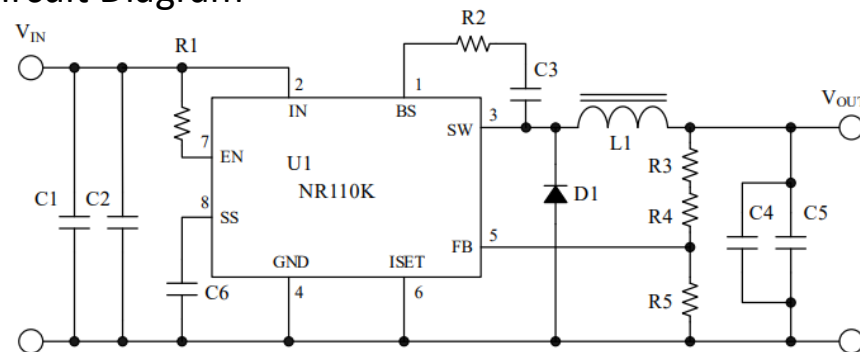
Part Number	$I_O$	Frequencies		Ref. Voltage	$V_O$	$V_{IN}^*$	Efficiency	Protection Functions	
		Light Load	Full Load					OCP	TSD
NR110K	4 A	Pulse skip	350 kHz	0.8 V	0.8 to 24 V	8 to 31 V	94%	Drooping	Auto-restart

## Pin Assignment



- (1) BS : Supply Voltage for Gate Drive
- (2) IN : Voltage Input
- (3) SW : Switching Output
- (4) GND : Ground
- (5) FB : Feedback Signal Input
- (6) Iset : External OCP Adjustment
- (7) EN : Vo ON/OFF
- (8) SS : Soft-start

## Circuit Diagram



\* Recommended value



$$I_O = 5.5 \text{ A}, V_{IN} = 43 \text{ V}$$

# Asynchronous Buck Switching Regulator IC

## SI-8008HD

TO-263-5L



### Features

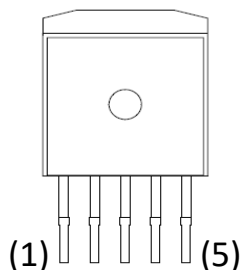
- $I_O = 5.5 \text{ A}$
- $f_{OSC} = 150 \text{ kHz}$
- Adjustable Output Voltage
- Soft-start Function
- Output On/Off Function
- Protections (OCP, TSD)

### Specifications

\* Recommended value

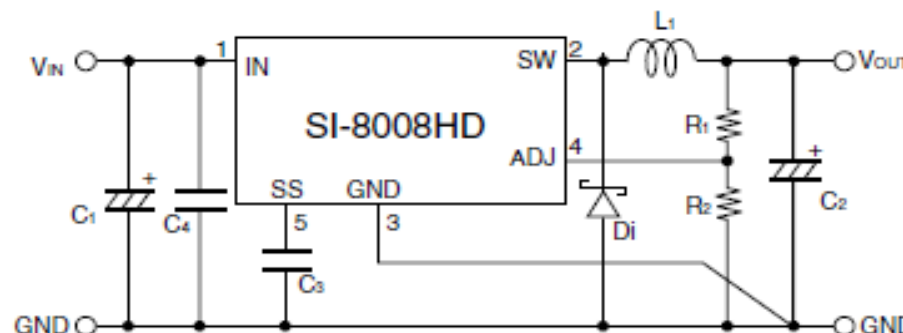
Part Number	$I_O$	Frequencies		Ref. Voltage	$V_O$	$V_{IN}^*$	Efficiency	Protection Functions	
		Light Load	Full Load					OCP	TSD
SI-8008HD	5.5 A	—	150 kHz	0.8 V	0.8 to 24 V	$V_O+3$ or 4.5 to 40 V	83%	Drooping	Auto-restart

### Pin Assignment



- (1) IN : Voltage Input
- (2) SW : Switching Output
- (3) GND : Ground
- (4) ADJ : Feedback Signal Input
- (5) SS : Soft-start and  $V_O$  ON/OFF Control

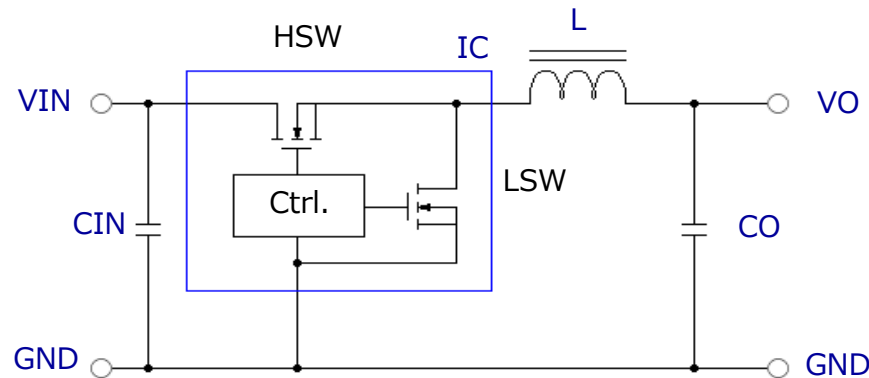
### Circuit Diagram



# Synchronous Buck Switching Regulator ICs

## Product Information

- ✓ Higher Efficiency by Synchronous Rectification
- ✓ No External Freewheel Diode Required
- ✓ Integrated Power MOSFETs for Hsw and Lsw
- ✓ Space-saving (PCB Size Reduction)
- ✓ Smaller Inductors for Higher Frequencies



$I_O = 1\text{ A}$ ,  $V_{IN} = 35\text{ V}$

# Synchronous Buck Switching Regulator IC

## NR263S

SOP8



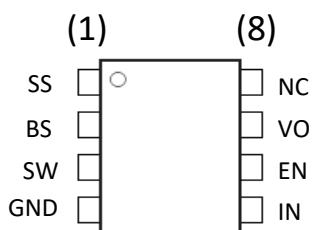
### Features

- $I_O = 1\text{ A}$
- $f_{SW} = 500\text{ kHz}$
- Fixed Output Voltage
- High Efficiency by Pulse Skip Operation at Light Load  
Light-load Efficiency:  $\eta = 86\%$  max. ( $I_O = 10\text{ mA}$ ,  $V_{IN} = 12\text{ V}$ ,  $V_O = 5\text{ V}$ )
- Synchronous Rectification
- Current Mode Control
- Stable with Ceramic Output Capacitors
- Soft-start Function
- Output On/Off Function
- Protections (OCP, TSD)
- Component Count Reduced by Internal Phase Compensation

### Specifications

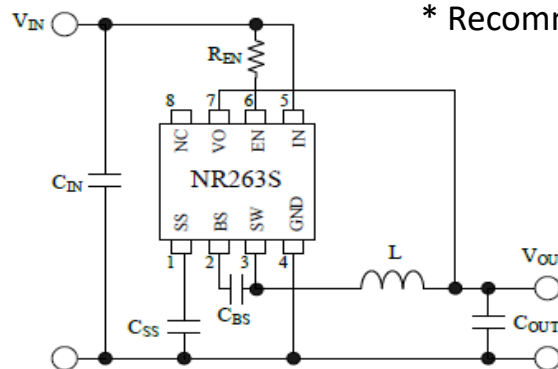
Part Number	$I_O$	Frequencies		Ref. Voltage	$V_O$	$V_{IN}^*$	Efficiency	Protection Functions	
		Light Load	Full Load					OCP	TSD
NR263S	1 A	Pulse skip	500 kHz	—	5.0 V	8 to 31 V	92%	Drooping	Auto-restart

### Pin Assignment



- (1) SS : Soft-start
- (2) BS : Supply Voltage for Gate Drive
- (3) SW : Switching Output
- (4) GND : Ground
- (5) IN : Voltage Input
- (6) EN : Vo ON/OFF Control
- (7) FB : Feedback Signal Input
- (8) NC : No Connection

### Circuit Diagram



\* Recommended value

$I_O = 1\text{ A}$ ,  $V_{IN} = 35\text{ V}$

# Synchronous Buck Switching Regulator IC



## NR264S

SOP8



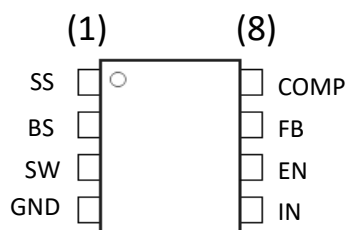
### Features

- $I_O = 1\text{ A}$
- $f_{SW} = 500\text{ kHz}$
- Adjustable Output Voltage
- High Efficiency by Pulse Skip Operation at Light Load  
Light-load Efficiency:  $\eta = 86\%$  max. ( $I_O = 10\text{ mA}$ ,  $V_{IN} = 12\text{ V}$ ,  $V_O = 5\text{ V}$ )
- Synchronous Rectification
- Current Mode Control
- Stable with Ceramic Output Capacitors
- Soft-start Function
- Output On/Off Function
- Protections (OCP, TSD)

### Specifications

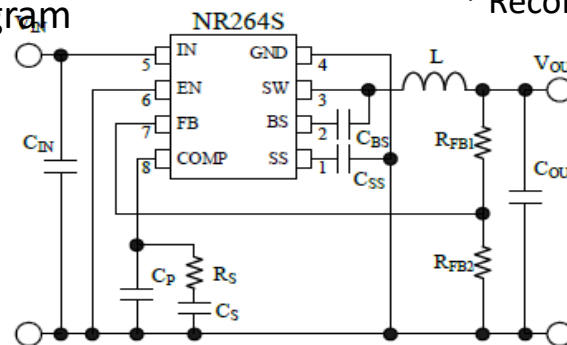
Part Number	$I_O$	Frequencies		Ref. Voltage	$V_O$	$V_{IN}^*$	Efficiency	Protection Functions	
		Light Load	Full Load					OCP	TSD
NR264S	1 A	Pulse Skip	500 kHz	0.8 V	3 to 18 V	8 to 31 V	94%	Drooping	Auto-restart

### Pin Assignment



- (1) SS : Soft-start
- (2) BS : Supply Voltage for Gate Drive
- (3) SW : Switching Output
- (4) GND : Ground
- (5) IN : Voltage Input
- (6) EN : Vo ON/OFF Control
- (7) FB : Feedback Signal Input
- (8) COMP : External Phase Compensation

### Circuit Diagram



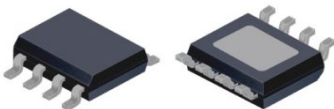
\* Recommended value

$$I_O = 3 \text{ A}, V_{IN} = 46 \text{ V}$$

# Synchronous Buck Switching Regulator IC

## SI-8205NHD

HSOP8



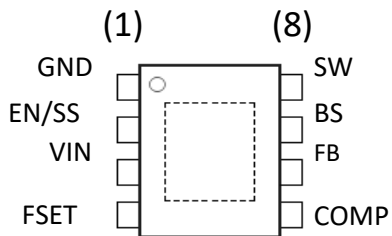
### Features

- $I_O = 3 \text{ A}$
- Adjustable Switching Frequency:  $f_{OSC} = 200 \text{ kHz to } 1\text{MHz}$
- Adjustable Output Voltage
- Synchronous Rectification
- Current Mode Control
- Stable with Ceramic Output Capacitors
- Soft-start Function
- Output On/Off Function
- Protections (OCP, TSD, UVLO)

### Specifications

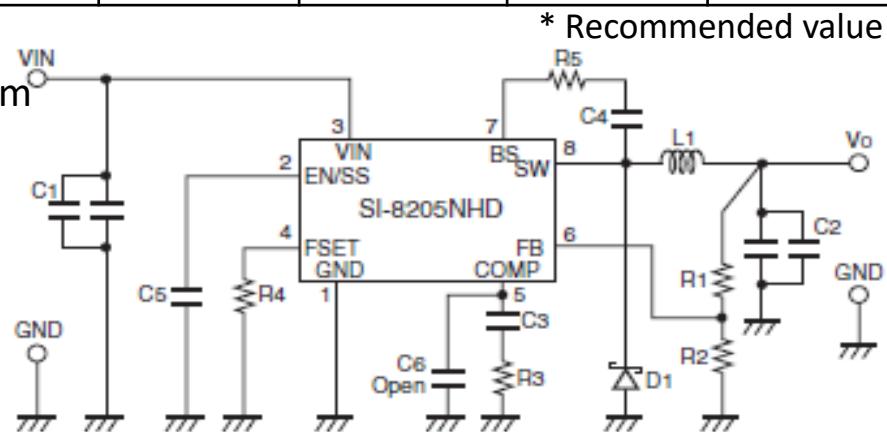
Part Number	$I_O$	Frequencies		Ref. Voltage	$V_O$	$V_{IN}^*$	Efficiency	Protection Functions	
		Light Load	Full Load					OCP	TSD
SI-8205NHD	3 A	—	200 kHz to 1MHz, Adjustable	0.8 V $\pm 1\%$	0.5 to 24 V	$V_O+3$ or 8 to 43 V	90%	Drooping	Auto-restart

### Pin Assignment



- (1) GND : Ground
- (2) EN/SS : Vo ON/OFF Control and Soft-start
- (3) VIN : Voltage Input
- (4) FSET : Frequency Adjustment
- (5) COMP : External Phase Compensation
- (6) FB : Feedback Signal Input
- (7) BS : Supply Voltage for Gate Drive
- (8) SW : Switching Output

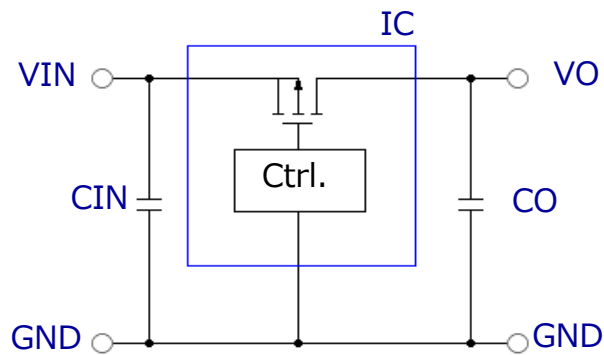
### Circuit Diagram



# LDO Linear Regulator ICs

## Product Information

- Suitable for Switching-noise-sensitive Applications
- Fewer External Components
- Integrated Power MOSFET or Bipolar Transistor for Series Pass Switch
- Low-dropout (Lower Input-to-Output Voltage Difference)



## SI-3000KM Series

TO-252-5L



### Features

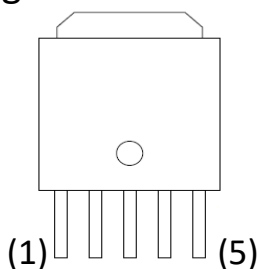
- $I_O = 1\text{ A}$
- $V_{DIF} (= V_{IN} - V_O) \leq 0.6\text{ V}$  ( $I_O = 1\text{ A}$ )
- Output On/Off Function ( $I_{q(OFF)} \leq 1\text{ }\mu\text{A}$ )
- Protections (OCP, TSD)

### Specifications

\* Recommended value

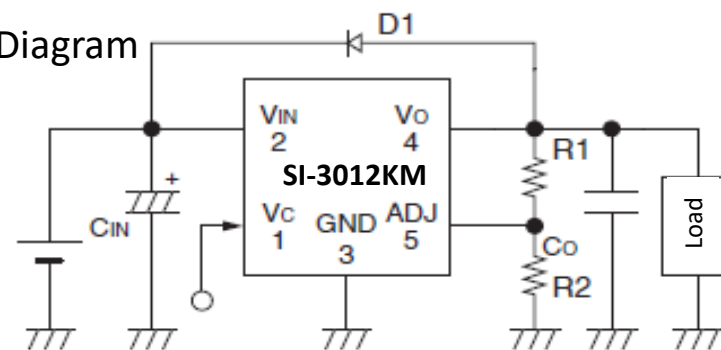
Part Number	$I_O$	$V_{DIF}$ ( $I_O \leq 1\text{ A}$ )	Ref. Voltage	$V_O$	$V_{IN}$ (Maximum rating)	$V_{IN}^*$	$C_{OUT}$ Ceramic Capacitor	Protection Functions	
								OCP	TSD
SI-3033KM	1 A	0.6 V	—	3.3 V	17 V	$V_O + 1\text{ V}$	✓	Drooping	Auto-Restart
SI-3012KM			1.28 V	1.28 to 5 V		2.4 to $V_O + 1\text{ V}$			
SI-3120KM	1 A	0.6 V	—	12 V	35 V	$\leq 15\text{ V}$	—	Fold back	Auto-restart
SI-3010KM			1.1 V	1.1 to 16 V		2.4 to 27 V			

### Pin Assignment



- (1)  $V_C$  :  $V_O$  ON/OFF Control
- (2)  $V_{IN}$  : Voltage Input
- (3) GND : Ground
- (4)  $V_O$  : Output
- (5) Sense(ADJ) : Output Voltage Detection/  
Feedback Signal Input

### Circuit Diagram



## SI-3000KD Series

TO-263-5L



### Features

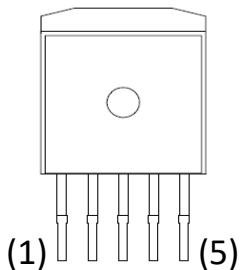
- $I_O = 1 \text{ A}$
- $V_{DIF} (= V_{IN} - V_O) \leq 0.6 \text{ V}$  ( $I_O = 1 \text{ A}$ )
- Stable with Ceramic Output Capacitors
- Output On/Off Function ( $I_{q(OFF)} \leq 1 \mu\text{A}$ )
- Protections (OCP, TSD)

### Specifications

\* Recommended value

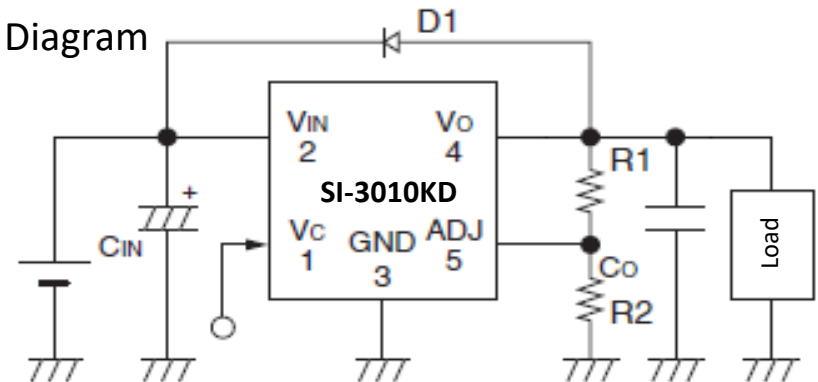
Part Number	$I_O$	$V_{DIF}$ ( $I_O \leq 1 \text{ A}$ )	Ref. Voltage	$V_O$	$V_{IN}$ (Maximum Rating)	$V_{IN}^*$	$C_{OUT}$ Ceramic Capacitor	Protection Functions	
								OCP	TSD
SI-3033KD	1 A	0.6 V	—	3.3 V	17 V	$V_O + 1 \text{ V}$	✓	Drooping	Auto-Restart
SI-3010KD	1 A	0.6 V	1.0 V	1.1 to 16 V	35 V	2.4 to 27 V	—	Fold back	Auto-restart

### Pin Assignment



- (1)  $V_C$  :  $V_O$  ON/OFF Control
- (2)  $V_{IN}$  : Voltage Input
- (3) GND : Ground
- (4)  $V_O$  : Output
- (5) Sense(ADJ) : Output Voltage Detection/  
Feedback Signal Input

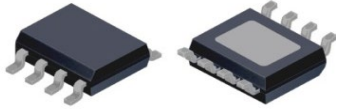
### Circuit Diagram





# NR301E, NR302A

NR301E: eSOIC8  
NR302A: HSOP8



## Features

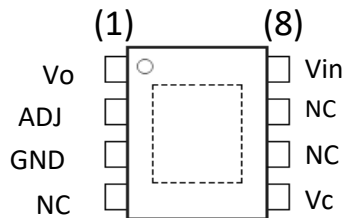
- $I_O = 1\text{ A}$
- $V_{DIF} (= V_{IN} - V_O) \leq 0.6\text{ V}$  ( $I_O = 1\text{ A}$ )
- Adjustable Output Voltage
- Stable with Ceramic Output Capacitors
- Output On/Off Function
- Protections (OCP, TSD, UVLO)

## Specifications

\* Recommended value

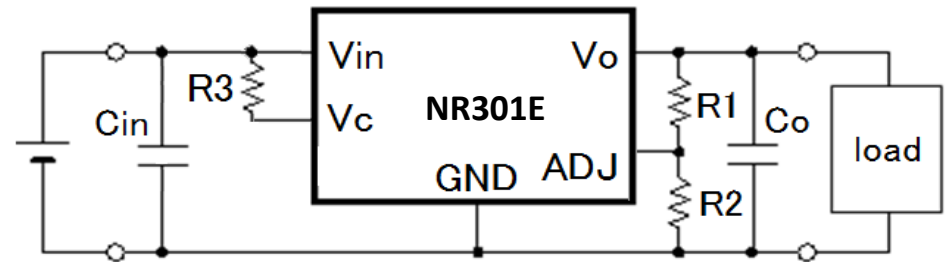
Part Number	$I_O$	$V_{DIF}$ ( $I_O \leq 1\text{ A}$ )	Ref. Voltage	$V_O$	$V_{IN}$ (Maximum rating)	$V_{IN}^*$	$C_{OUT}$ Ceramic Capacitor	Protection Functions	
								OCP	TSD
NR301E	1 A	0.6 V	1.0 V	2.5 to 15 V	30 V	$\leq 27\text{ V}$	✓	Fold Back	Auto-restart
NR302A									

## Pin Assignment



- (1)  $V_O$  : Output
- (2) ADJ : Feedback Signal Input
- (3) GND : Ground
- (4) NC : No Connection
- (5)  $V_C$  :  $V_O$  ON/OFF Control
- (6) NC : No Connection
- (7) NC : No Connection
- (8)  $V_{IN}$  : Voltage Input

## Circuit Diagram



# SI-3011ZD

TO-263-5L



## Features

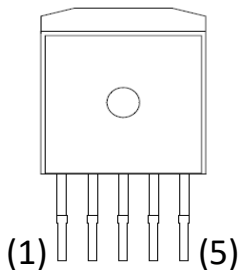
- $I_O = 3\text{ A}$
- $V_{DIF} (= V_{IN} - V_O) \leq 0.6\text{ V}$  ( $I_O = 3\text{ A}$ )
- Output On/Off Function ( $I_{q(OFF)} \leq 1\text{ }\mu\text{A}$ )
- Protections (OCP, TSD)

## Specifications

\* Recommended value

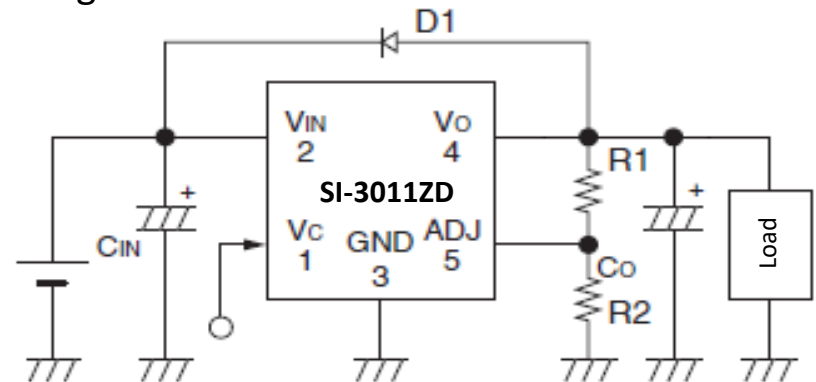
Part Number	$I_O$	$V_{DIF}$ ( $I_O \leq 3\text{ A}$ )	Ref. Voltage	$V_O$	$V_{IN}$ (Maximum rating)	$V_{IN}^*$	$C_{OUT}$ Ceramic Capacitor	Protection Functions	
								OCP	TSD
SI-3011ZD	3 A	0.6 V	1.1 V	1.2 to 5 V	10 V	2.4 to 6 V	—	Drooping	Auto-restart

## Pin Assignment

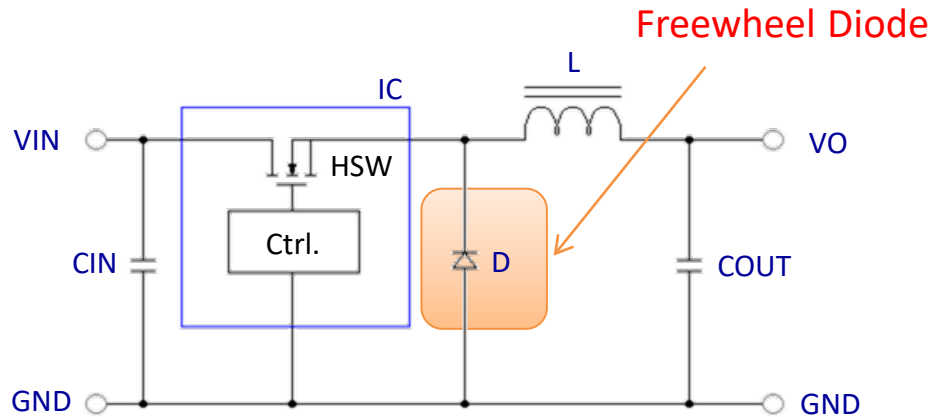


- (1)  $V_C$  :  $V_O$  ON/OFF Control
- (2)  $V_{IN}$  : Voltage Input
- (3) GND : Ground
- (4)  $V_O$  : Output
- (5) Sense(ADJ) : Output Voltage Detection/  
Feedback Signal Input

## Circuit Diagram

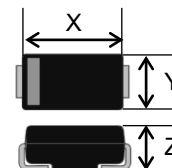


# Freewheel Diodes for Buck Switching Regulator ICs



- Schlocky Diodes
- $V_{RM} = 40\text{ V to }60\text{ V}$
- $I_F = 1\text{ A to }5\text{ A}$

Package: SJP





X / Y / Z = 4.5 : 2.6 : 2.15 (mm)

Part Number	$V_{RM}$	$I_F$	$V_F$
SJPB-D4	40 V	1.0 A	0.55 V
SJPB-H4		2.0 A	0.55 V
SJPE-H4			0.60 V
SJPB-L4		3.0 A	0.55 V
SJPW-T4		5.0 A	0.55 V
SJPB-D6	60 V	1.0 A	0.68 V
SJPB-H6		2.0 A	0.69 V
SJPB-L6		3.0 A	0.70 V

Our power supply design examples for DC/DC converters are available on our website. You can also apply for an evaluation board from our online form.

## DC/DCコンバータ 評価基板

搭載IC	評価基板	概要・主な特徴	ドキュメント
<a href="#">NR111E</a> データシート	 DEJ0015	$V_{OUT} = 5V$ 、 $I_{OUT(MAX)} = 4A$ <ul style="list-style-type: none"><li>位相補償回路内蔵</li><li>低ESRコンデンサ対応</li></ul>	<a href="#">5V, 4A 設計例</a>
<a href="#">NR263S</a> データシート	 DEJ0016	$V_{OUT} = 5V$ 、 $I_{OUT(MAX)} = 1A$ <ul style="list-style-type: none"><li>位相補償回路内蔵</li><li>低ESRコンデンサ対応</li><li>軽負荷時パルススキップ動作</li></ul>	<a href="#">5V, 1A 設計例</a>

[Power Supply Design Examples  
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