

# Step-up DC-DC Converter IC

## Monolithic IC MM3333XN

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### Outline

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This IC is a step-up DC-DC converter with automatic PWM/PFM switching function.

A step-up DC-DC converter can be configured by using only coil, capacitor, and diode as external components.

It is optimal for applications for mobile equipment that will need high efficiency due to characteristics of small package or low current consumption.

Also with an automatic PWM/PFM switching function, decrease of efficiency by current consumption of IC during low load is prevented.

### Features

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1. Step-up is possible from input voltage of 1.8 V, so operations are possible with only one battery.
2. It has realized high efficiency with low current consumption and PFM operation.
3. Adopted small package.

### Package

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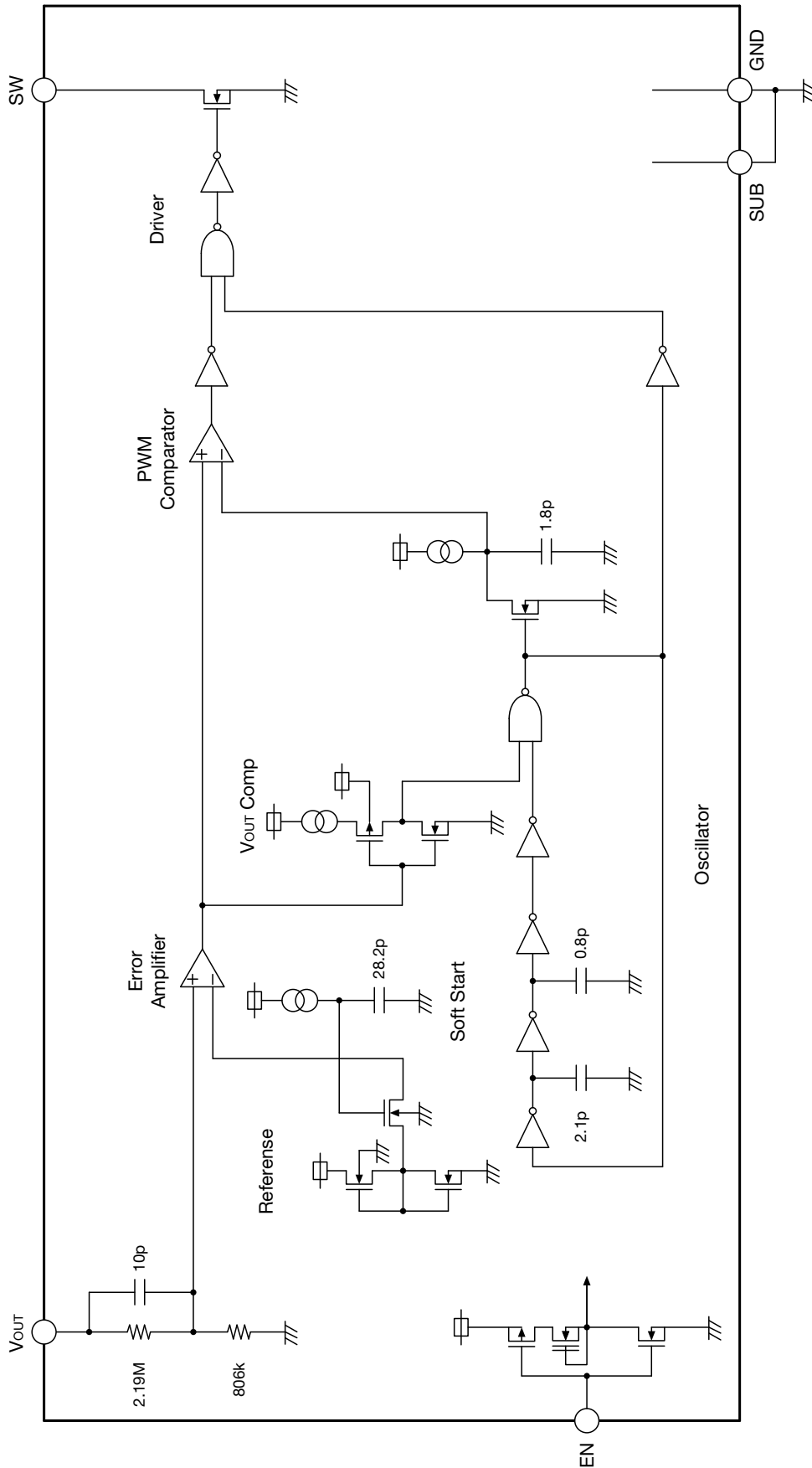
SOT-26B

### Applications

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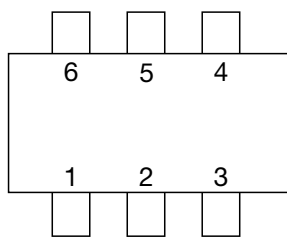
1. Power supply for mobile equipment such as digital still cameras, electronic organizers, PDA, etc.
2. Power supply for audio equipment such as portable CD, MD, etc.
3. Power supply for microprocessor

Block Diagram



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## Pin Assignment



SOT-26B  
(TOP VIEW)

1	EN
2	V <sub>OUT</sub>
3	NC
4	GND
5	SUB
6	SW

## Pin Description

Pin No.	Pin name	I/O	Pin description	Internal equivalent circuit diagram
1	EN	Input	Enable pin for ON/OFF	
2	V <sub>OUT</sub>	Input	Output voltage feedback PIN /V <sub>DD</sub> PIN	
3	NC		No connection	
4	GND	Output	Ground PIN	
5 (Note)	SUB		Substrate PIN	
6	SW		Power switch PIN	

(Note) : The Pin 5 this product is SUB, so connect the pin to Ground.

## Absolute Maximum Ratings (Except where noted otherwise Ta=25°C)

Item	Symbol	Ratings	Units
Storage temperature	T <sub>STG</sub>	-55~+150	°C
Operating temperature	T <sub>OPR</sub>	-40~+85	°C
V <sub>OUT</sub> Voltage	V <sub>OUT</sub>	-0.3~6	V
EN Voltage	V <sub>EN</sub>	-0.3~6	V
SW Voltage	V <sub>SW</sub>	-0.3~6	V
Power dissipation	P <sub>d</sub>	150 (Alone)	mW

## Recommended Operating Conditions (Except where noted otherwise Ta=25°C)

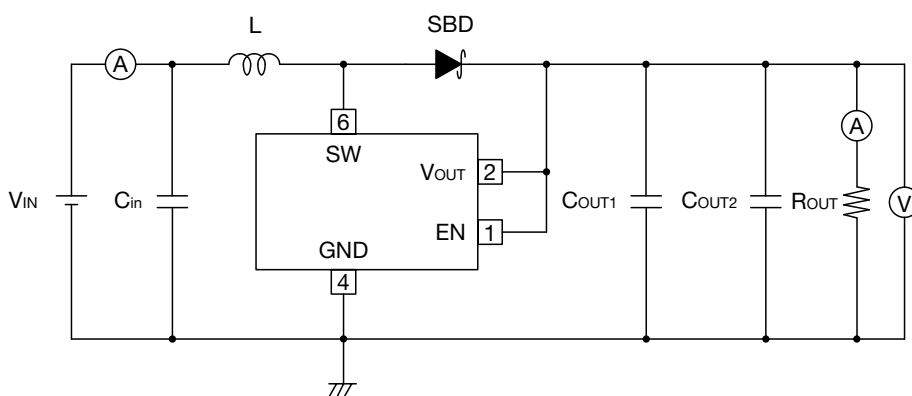
Item	Symbol	Ratings	Units
Operating supply voltage	V <sub>OP</sub>	1.8~5.5	V
Operating temperature	T <sub>OP</sub>	-40~+85	°C

## Electrical Characteristics (Except where noted otherwise V<sub>IN</sub>=2.4V, Ta=25°C)

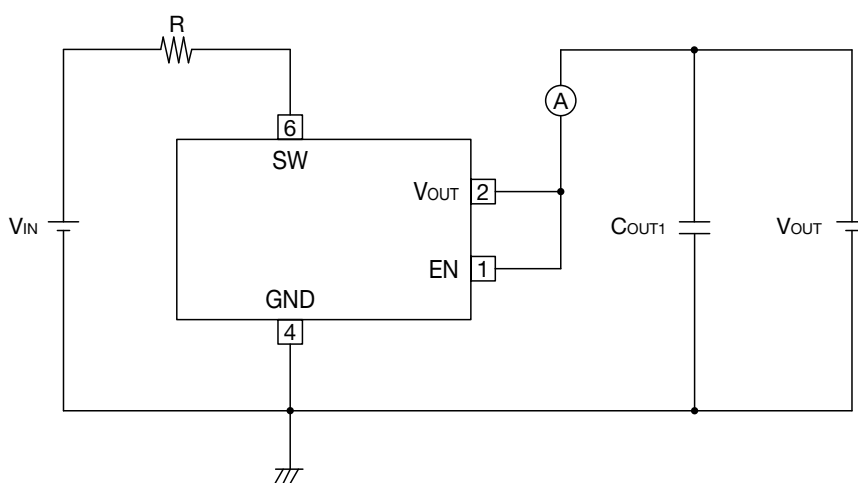
Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Units
Output voltage	V <sub>OUT</sub>	I <sub>OUT</sub> =10mA	3.123	3.200	3.277	V
Starting output voltage	V <sub>ST1</sub>	I <sub>OUT</sub> =1mA			0.9	V
Oscillation start voltage	V <sub>ST2</sub>	No external parts, voltage applied to V <sub>OUT</sub>			0.8	V
Holding output voltage	V <sub>HLD</sub>	I <sub>OUT</sub> =1mA, Judged by decreasing V <sub>IN</sub> voltage gradually	0.7			V
Supply current 1	I <sub>DD1</sub>	V <sub>OUT</sub> =3.0V		74.3	123.8	μA
Supply current 2	I <sub>DD2</sub>	V <sub>OUT</sub> =3.7V		9.5	18.9	μA
Supply current 3	I <sub>DD3</sub>	V <sub>EN</sub> =0V			0.5	μA
Switching current	I <sub>SW</sub>	V <sub>SW</sub> =0.4V	144	231		mA
Switching transistor leak current	I <sub>SWQ</sub>	V <sub>SW</sub> =V <sub>OUT</sub> =5.5V			0.5	μA
Line regulation	ΔV <sub>OUT1</sub>	V <sub>IN</sub> =1.2V~1.8V		30	60	mV
Load regulation	ΔV <sub>OUT2</sub>	I <sub>OUT</sub> =0.01mA~15mA		30	60	mV
Output voltage temperature characteristics	ΔV <sub>O</sub> / ΔT	-40°C ≤ T ≤ 85°C		±50		ppm/°C
Oscillator frequency	f <sub>OSC</sub>	V <sub>OUT</sub> =3.0V	212.5	250	287.5	kHz
Maximum duty cycle	Max Duty	V <sub>OUT</sub> =3.0V	70	78	85	%
EN pin "High" Input voltage	V <sub>ENH</sub>	V <sub>EN</sub> =0→5.5V	0.9			V
EN pin "Low" Input voltage	V <sub>ENL</sub>	V <sub>EN</sub> =5.5→0V			0.3	V
EN pin "High" Input current	I <sub>ENH</sub>	V <sub>EN</sub> =5.5V	-0.1		0.1	μA
EN pin "Low" Input current	I <sub>ENL</sub>	V <sub>EN</sub> =0V	-0.1		0.1	μA
Soft start time	T <sub>SS</sub>		1.8	3.6	7.2	ms
Efficiency	EFFI			85		%

## Measuring Circuit

1.



2.



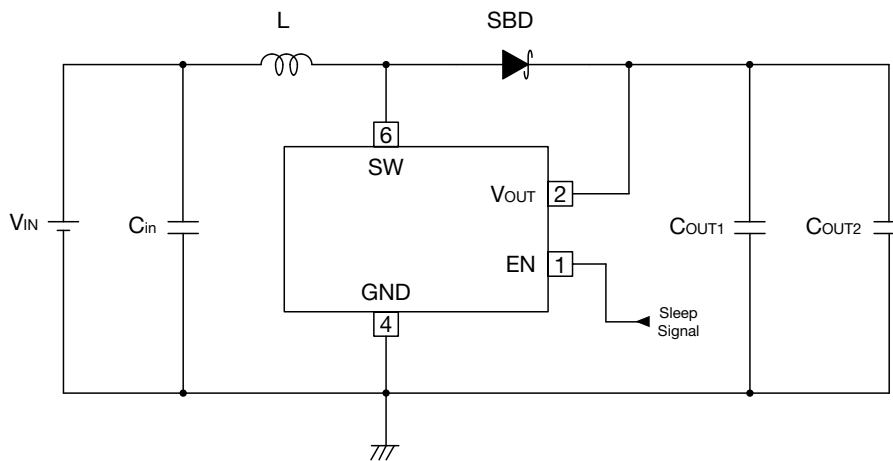
• Used parts when measurement

$C_{in}$	: 10 $\mu$ F (GRM21BR60J106/Murata Manufacturing Co., Ltd.)
$C_{OUT1}$	: 47 $\mu$ F (NOJT476M006/AVX Corporation)
$C_{OUT2}$	: 0.1 $\mu$ F (EMK107BJ104/Taiyo Yuden Co., Ltd.)
L	: 10 $\mu$ H (C4-K1.8R/MITSUMI ELECTRIC Co., LTD)
SBD	: (RSX101VA/ROHM Co., Ltd.)
R	: 300 $\Omega$

Timing Chart



Application Circuit

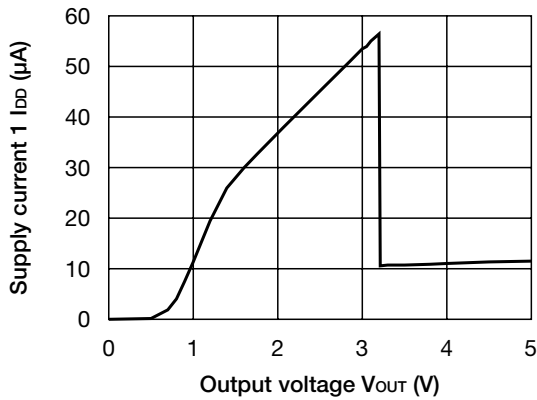


• Recommended parts

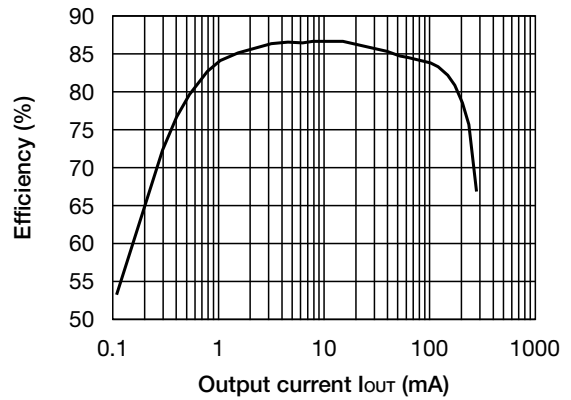
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SBD	: (RSX101VA/ROHM Co., Ltd.)

Characteristics

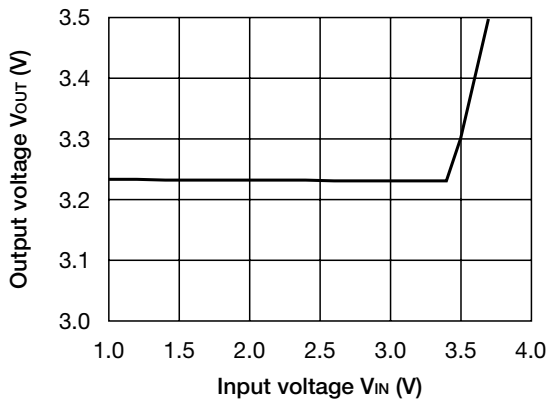
Supply current 1 - Output voltage  
 $V_{OUT}=0 \rightarrow 5.0V$



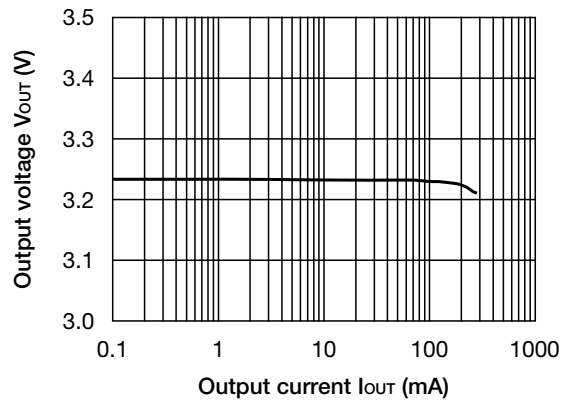
Efficiency - Output current  
 $V_{IN}=2.4V, V_{OUT}=3.2V$



Output voltage - Input voltage  
 $V_{IN}=4.0V \rightarrow 0V, I_{OUT}=10mA$



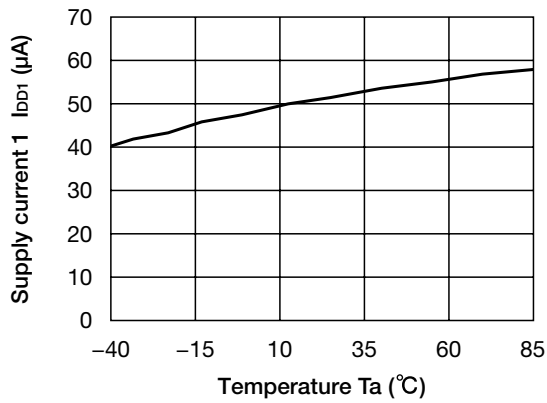
Output voltage - Output current  
 $V_{IN}=2.4V, I_{OUT}=0.1 \rightarrow 300mA$



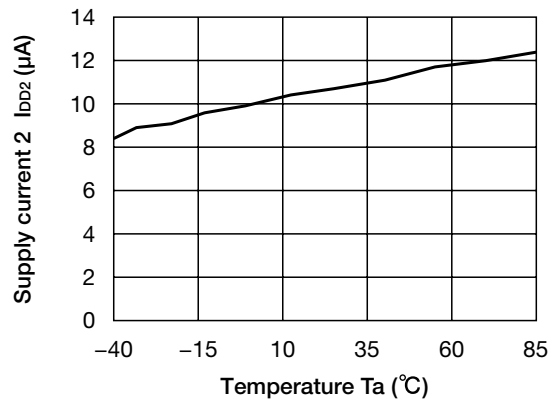
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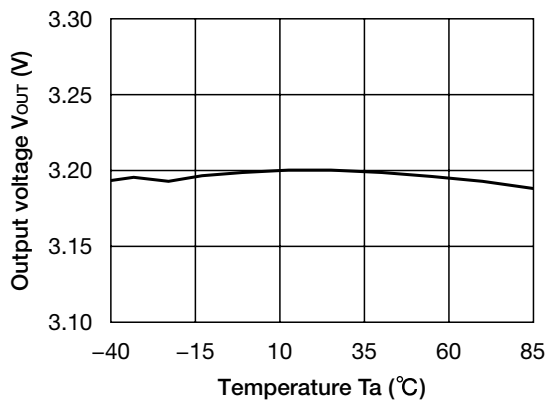
**Supply current 1 - Temperature**  
 $V_{OUT}=3.0V, T_a=-40\sim 85^{\circ}C$



**Supply current 2 - Temperature**  
 $V_{OUT}=3.7V, T_a=-40\sim 85^{\circ}C$



**Output voltage - Temperature**  
 $V_{IN}=2.4V, I_{OUT}=10mA, T_a=-40\sim 85^{\circ}C$



**Oscillator frequency - Temperature**  
 $V_{OUT}=3.0V, T_a=-40\sim 85^{\circ}C$

