ELM95xxx PWM STEP-UP DC/DC CONVERTER

■ GENERAL DESCRIPTION

ELM95xxx Series is a CMOS step-up DC-DC converter. As external parts, a coil, a diode, and a capacitor are used to obtain constant output voltage (2.7V, 3.0V, 3.3V, 5.0V) higher than input voltage. ELM95xxx Series consists of a reference voltage source, an error amplifier, an oscillation circuit, a start-up circuit, a PWM control circuit, a switching transistor, and an output voltage setting resistor. By the new-developed PWM-control circuit, ELM95xxx Series modulates the switching-time very smoothly in a constant frequency and consequently generates a stable output and small ripples.

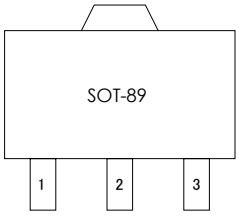
■ FEATURES

- ・Low power operation : 35 μ W (TYP. ELM9530x)
- ・Low voltage operation : Input voltage VIN ≧ 0.98V (RL = 30k Ω)
- ・High efficiency : 85% (TYP.)
- ・High output voltage accuracy : ± 2.5%
- ・Constant output frequency : 55kHz (TYP.)
- ・Small ripples
- ・Compact SOT-89 package

■ APPLICATION

- ・Constant voltage source for battery-operated devices
- ・Constant voltage source for cameras
- ・Portable communications equipment, and videos
- ・Local regulator

■ PIN CONFIGURATION



(TOP VIEW)

Pin No.	Pin Name
1	VSS
2	OUT
3	LX

■ SELECTION GUIDE

Symbol		
a, b	Output Voltage	Ex 27 : VOUT = 2.7V 30 : VOUT = 3.0V 50 : VOUT = 5.0V
c	Product Version	C : Sn/Pb package D : Pb − Free package

ELM95 x x x
a b c

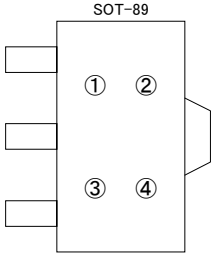
■ SERIES

Model	Output Voltage
ELM9527x-S(N)	2.7V
ELM9530x-S(N)	3.0V
ELM9533x-S(N)	3.3V
ELM9550x-S(N)	5.0V

S type : Standard, N type : Reverse

* Available 2.5V～5.5V output at 0.1V step as semi-custom-made IC.

■ MARKING



① : Represents the integer digit of the Output Voltage

Symbol	Output Voltage
2	2.*V
3	3.*V
5	5.*V

② : Represents the decimal digit of the Output Voltage

Symbol	Output Voltage
0	*.0V
3	*.3V
7	*.7V

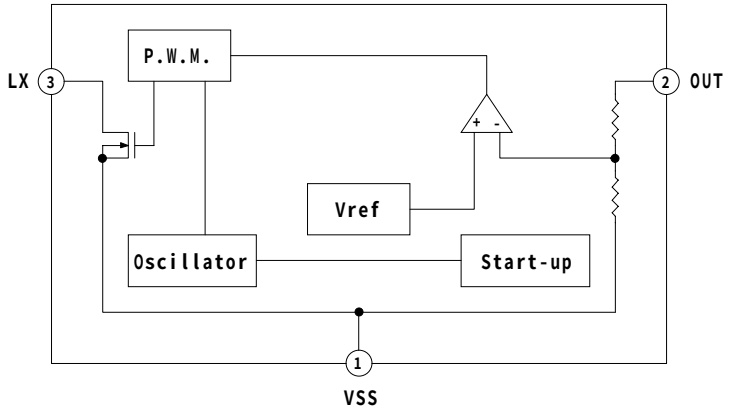
③ : Represents the assembly lot number

A ～ Z repeated (I,O,X excepted)

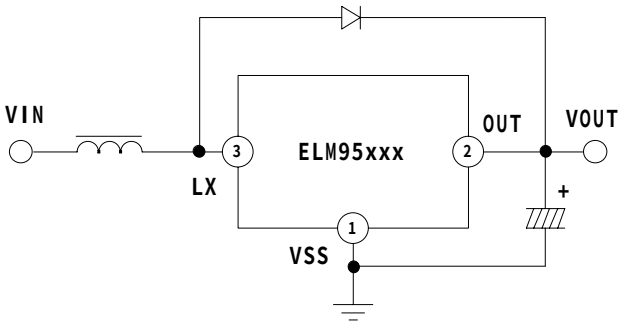
④ : Represents the assembly lot number

0 ～ 9 repeated

■ BLOCK DIAGRAM



■ STANDARD CIRCUIT



■ MAXIMUM ABSOLUTE RATINGS

(VSS=0V)

Parameter	Symbol	Limits	Units
Apply Voltage to Lx pin	VLX	12	V
Apply Voltage to Out pin	VOUT	12	V
Output Current of Lx pin	ILX	200	mA
Power Dissipation	Pd	300	mW
Operating Temperature	Top	−20～+70	℃
Storage Temperature	Tstg	−40～+125	℃

■ ELECTRICAL CHARACTERISTICS

ELM9527x (Top=25℃, VSS=0V)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Input Voltage	VIN				10	V
Starting Voltage	VST	RL=27kΩ			0.98	V
Holding Voltage	Vhold	IOUT=1mA			0.7	V
Self-Current Consumption	ISS	VIN=1.5V		9	18	μA
Output Voltage	VOUT	VIN=1.5V, IOUT=1mA	2.63	2.70	2.77	V
Output Current of Lx pin	ILX	VOUT=2.6V, VLX=0.4V	70			mA
Leakage Current of Lx pin	ILXL	VOUT=VLX=10.0V			1.0	μA
Oscillating Frequency	Fosc	VOUT=2.6V	35	55	75	kHz
Maximum Duty Ratio	Duty	VOUT=2.6V	45	60	75	%

ELM9530x (Top=25℃, VSS=0V)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Input Voltage	VIN				10	V
Starting Voltage	VST	RL=30kΩ			0.98	V
Holding Voltage	Vhold	IOUT=1mA			0.7	V
Self-Current Consumption	ISS	VIN=1.5V		12	20	μA
Output Voltage	VOUT	VIN=1.5V, IOUT=1mA	2.92	3.00	3.08	V
Output Current of Lx pin	ILX	VOUT=2.9V, VLX=0.4V	80			mA
Leakage Current of Lx pin	ILXL	VOUT=VLX=10.0V			1.0	μA
Oscillating Frequency	Fosc	VOUT=2.9V	35	55	75	kHz
Maximum Duty Ratio	Duty	VOUT=2.9V	45	60	75	%

ELM9533x (Top=25℃, VSS=0V)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Input Voltage	VIN				10	V
Starting Voltage	VST	RL=33kΩ			0.98	V
Holding Voltage	Vhold	IOUT=1mA			0.7	V
Self-Current Consumption	ISS	VIN=1.5V		14	23	μA
Output Voltage	VOUT	VIN=1.5V, IOUT=1mA	3.21	3.30	3.39	V
Output Current of Lx pin	ILX	VOUT=3.2V, VLX=0.4V	80			mA
Leakage Current of Lx pin	ILXL	VOUT=VLX=10.0V			1.0	μA
Oscillating Frequency	Fosc	VOUT=3.2V	35	55	75	kHz
Maximum Duty Ratio	Duty	VOUT=3.2V	45	60	75	%

ELM9550x (Top=25℃, VSS=0V)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Input Voltage	VIN				10	V
Starting Voltage	VST	RL=50kΩ			0.98	V
Holding Voltage	Vhold	IOUT=1mA			0.9	V
Self-Current Consumption	ISS	VIN=3.0V		30	45	μA
Output Voltage	VOUT	VIN=3.0V, IOUT=1mA	4.87	5.00	5.13	V
Output Current of Lx pin	ILX	VOUT=4.8V, VLX=0.4V	110			mA
Leakage Current of Lx pin	ILXL	VOUT=VLX=10.0V			1.0	μA
Oscillating Frequency	Fosc	VOUT=4.8V	35	55	75	kHz
Maximum Duty Ratio	Duty	VOUT=4.8V	45	60	75	%

■ NOTE

1) Coil

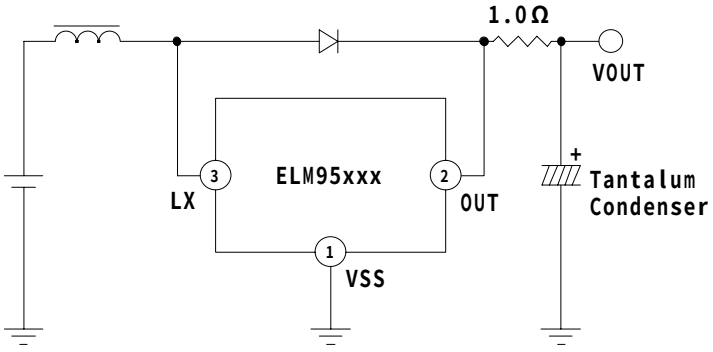
Choke coils shall be used. To select choke coils, consider that the core must not be saturated magnetically, DC resistance must be low, and there must be a sufficient margin of the rated current.
For ELM95xxx, the following coil is recommended.
・CM-5 / CN-5N (Sumida Electric Co., Ltd.)

2) Diode

Schottoky Barrier diodes are suitable. To select schottoky diodes, consider that the forward voltage must be small, there must be a sufficient margin of the rated current, and the switching speed must be quick.

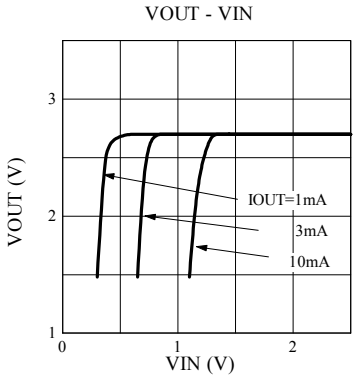
3) Capacitor

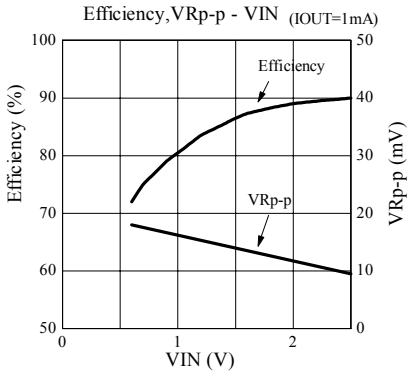
We recommend to use “Aluminum electrolytic condenser”, of which capacity must be comparatively large, and the voltage limit must be larger than three times of the specified output voltage. When you use high quality condenser like “Tantalum condenser” or “Laminated ceramic condenser”, there are some cases that a few hundred hertz waving motion happens in output voltage wave-form. In such cases, we recommend to connect resistance (1.0Ω approx.) to condenser serially as below.



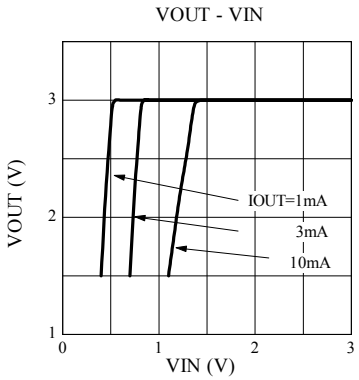
■ TYPICAL CHARACTERISTICS

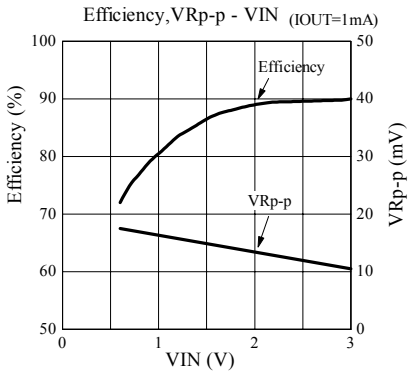
● ELM9527x (Top=25℃, L=220 μ H, D=MA721, C=47 μ F)



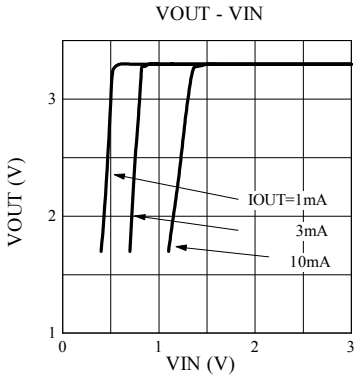


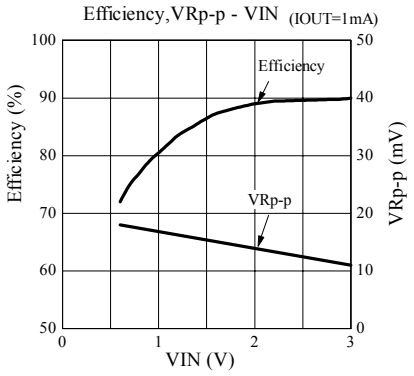
● ELM9530x (Top=25℃, L=220 μ H, D=MA721, C=47 μ F)





● ELM9533x (Top=25℃, L=220 μ H, D=MA721, C=47 μ F)





● ELM9550x (Top=25℃, L=220 μ H, D=MA721, C=47 μ F)