vodasat@gmail.com 13510327305

4.3V to 23V Input, 2.3-A Synchronous Step-Down Converter with Fast Transient Response

For details, check for samples: INN9182

Features

- W-mode™® Gm Curvature Enables Fast Transient Response
- 2.3-A Output Current
- High Efficient Integrated FETs Optimized for portable application:
  95mΩ (High side) and 90mΩ (Low side)
- High Efficiency
  Up to 96% Efficiency @ 5V Input, 3.3V Output
  Up to 94% efficiency @ 12V Input, 3.3V Output
- Wide Input Voltage Range: 4.3V to 23V @ 2.3-A loading
- Wide Output Voltage Range: 0.923V to 18V @ 2.3-A loading (36Watt output @max)
- Low Output Ripple and Allows Ceramic Output Capacitor
- Thermal Shutdown Protection
- 340-KHz Switching Frequency(fsw)
- Cycle By Cycle Over Current Limit
- +/-1.5% High Accuracy Feedback Voltage

Applications

- Wide Range of Applications for Low Voltage System
- Digital TV Power Supply
- High Definition Blu-ray Disc Players
- Networking Home Terminal
- Digital STB
- Ideal for Portable Applications

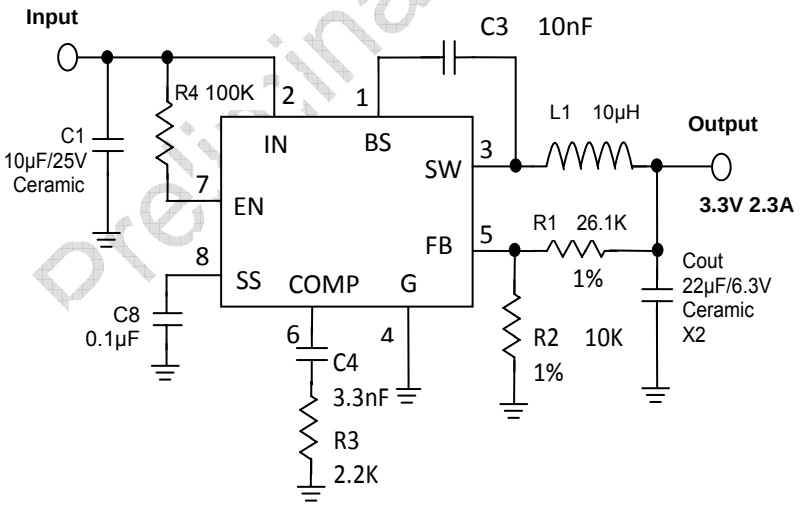
Descriptions

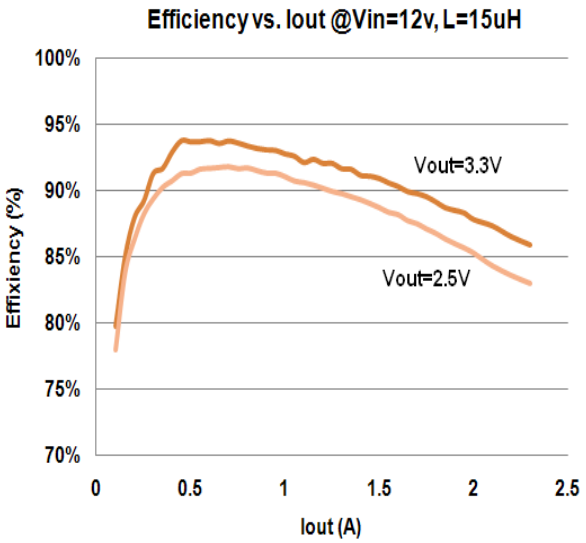
The INN9182 is a current mode synchronous buck converter, and has a proprietary W-mode™® Gm curvature circuit that enables fast transient response, enables the device to adopt to both low ESR output capacitors, such as POSCAP or SP-CAP, and ultra-low ESR ceramic capacitors.

The INN9182 operates from 4.3-V to 23-V Vin input, and the output voltage can be programmed between 0.923v to 18v with 2.3A output current, and +/-1.5% high accuracy output voltage.

Due to 95mΩ (High side) and 90mΩ (Low side) integrated FETs, the INN9182 works in high efficiency (up to 94% @12v Input, 3.3v output) .

Typical Application





ORDERING INFORMATION

TA	PACKAGE	ORDERING PART NUMBER	PIN	TRANSPORT MEDIA, QUANTITY	ECO PLAN
-40℃ to 85℃	SOP8	INN9182XXX	8	Tube	Green (RoHS & no Sb/Br)
		INN9182XXXX	8	Tape and Reel, 2500	

ABOSOLUTE MAXIMUM RATINGS

Over operating free-air temperature range (unless otherwise noted)

ITEMS	NAME	VALUE	UNIT
Voltage Range	IN	-0.3 to 24	V
	BS	-0.3 to 29	V
	SW	-2 to 24	V
	SW (10 ns transient)	-2.5 to 25	V
	FB,SS,COMP	-0.3 to 5.5	V
	EN	-0.3 to 8	V
TJ	Operation Junction	-40 to +150	℃
Tstg	Storage temperature	-55 to +150	℃

DISSIPATION RATINGS

(2oz. trace and copper pad)

PACKAGE	θ**JA**	θ**JC**	UNIT
SOP8	90	45	℃/W

RECOMMENDED OPERATING CONDITIONS

Over operating free-air temperature range(unless otherwise noted)

		MIN	MAX	UNIT
Voltage	Supply input voltage range	4.3	23	V
	VBS	-0.1	28	V
	SS, FB, COMP	-0.1	5	V
	EN	-0.1	7.5	V
	G	-0.1	+0.1	V
TA	Operating free-air temperature	-40	85	℃
TJ	Operating junction temperature	-40	125	℃

ELECTRICAL CHARACTERISTICS

Over operating free-air temperature range(unless otherwise noted)

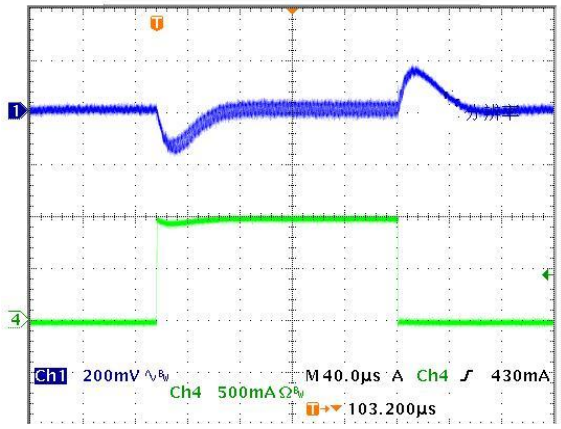
VIN=12V, TA=25℃

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
Supply Current						
Iin	Operating-non-switching supply current	VIN current, TA=25℃, EN=1.8V, VFB=1.0V		1.3	2.0	mA
ISDN	Shut Down Supply Current	VEN=0V		2	4	μA
VFB	Feedback Voltage	4.3V ≤VIN≤23V	0.900	0.913	0.926	V
OVP	Feedback Overvoltage Threshold			1.1		V
Aea	Error Amplifier Voltage Gain			1000		V/V
Gea	Error Amplifier Transconductance	△IC=+/-10μA		900		μA/V
RDS(on)_1	High Side Switch ON Resistance			95		mΩ
RDS(on)_2	Low Side Switch ON Resistance			90		mΩ
Ileakgae	High Side Switch Leakage Current	VEN=0V, VSW=0V			10	μA
ILM_H	High Side Switch Current Limit	Minimum Duty Cycle	2.8	3.5		A
ILM_L	Low Side Switch Current Limit	From Drain to Source		1.0		A
Gcs	COMP Voltage to Current Sense Transconductance			3.5		A/V
Fsw_1	Switching Frequency			340		KHz
Fsw_2	Short Circuit Switching Frequency	VFB=0V		100		KHz
Dmax	Maximum Duty Cycle	VFB=1.0V		90		%
TON_min	Minimum ON Time			220		ns
VEN_1	EN Threshold Voltage	VEN Rising	1.1	1.5	2.0	V
VHys_1	EN Threshold voltage's Hysteresis			100		mV
VEN_2	EN Lockout Threshold Voltage		1.8	2.0	2.2	V
VHys_2	EN Lockout Hysteresis			210		mV
VUVLO	Input Under Voltage Lockout Threshold	VIN Rising	2.4	3.3	4.2	V
VHys_3	Input Under Voltage Lockout Threshold Hysteresis			150		mV
Iss	Soft-Start Current	Vss=0V		6		μA
Tss	Soft-Start Period	Css=0.1μF		15		ms
TSD	Thermal Shutdown			160		℃

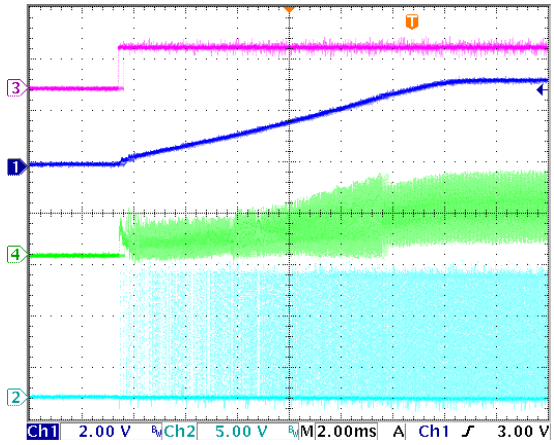
TYPICAL PERFORMANCE CHARACTERISTICS

Vin=12V,Vout=3.3V, L=10μH, Cin=10μF, Cout=22μF, TA=+25℃

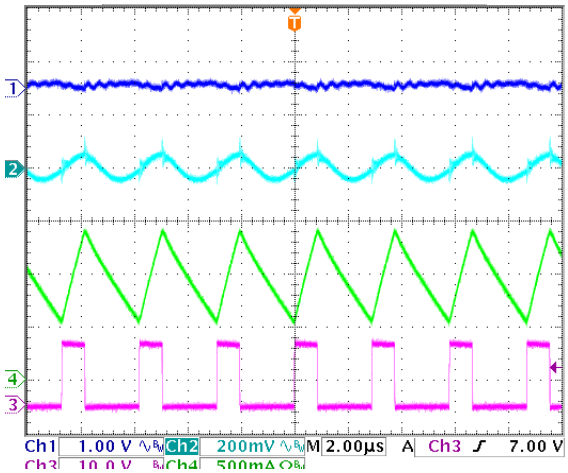
Fast Transient Response (20A/μs)



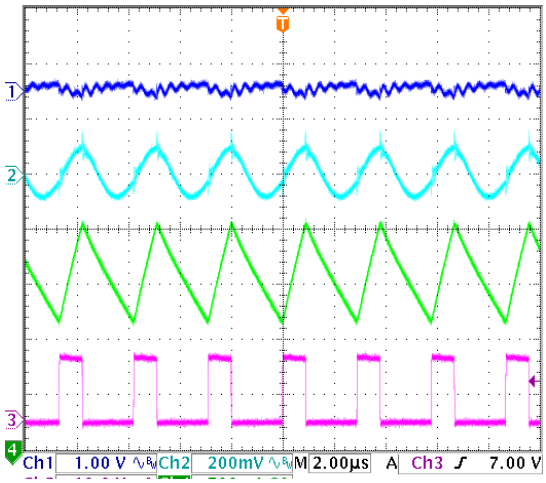
Startup through Enable



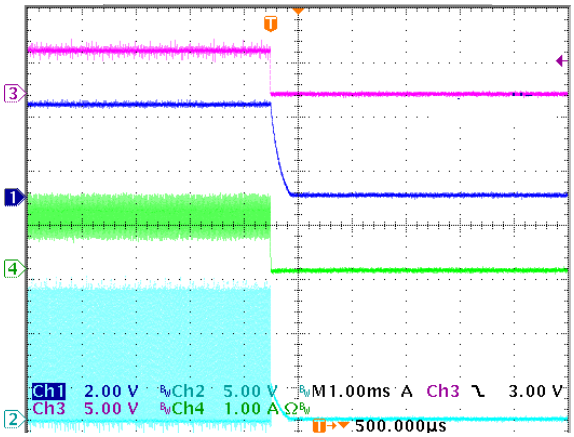
1A Load Operation



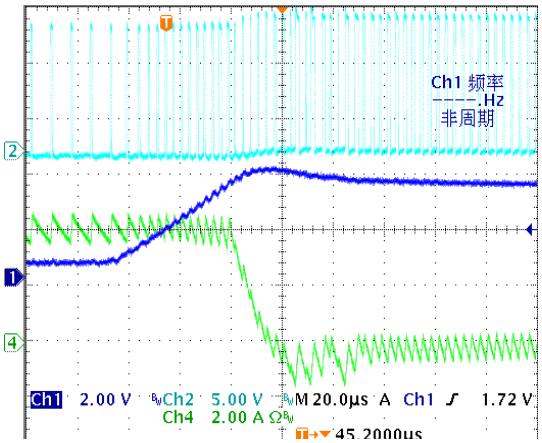
2A Load Operation



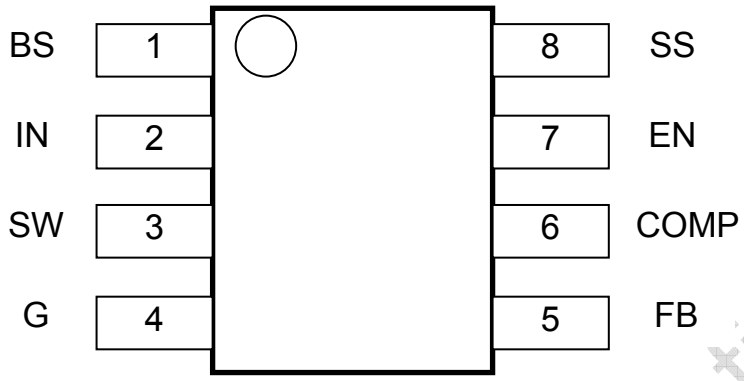
Shutdown through Enable



Short Circuit Recovery



PIN ARRANGEMENT



PIN FUNCTIONS

PIN		Description
NAME	NO.	Deatails
BS	1	Supply input for high-side NFET gate driver (boost terminal). Connect capacitor from this pin to SW pin. An internal PN diode is connected between VREG to BS pin.
IN	2	Power input and connected to high side NFET drain
SW	3	Switch node connection between high-side NFET and low-side NFET. Also serve as inputs to current comparators.
G	4	Signal ground pin, also serve as ground returns for low-side NFET.
FB	5	Converter feedback input. Connect with feedback resistor divider.
COMP	6	Compensation Node. Used to compensate control loop. Connect a series RC network from COMP to G. In some cases, an additional capacitor is required
EN	7	Enable control input
SS	8	Soft-start control. A external capacitor should be connected to G.

APPLICATION SCHEMATIC

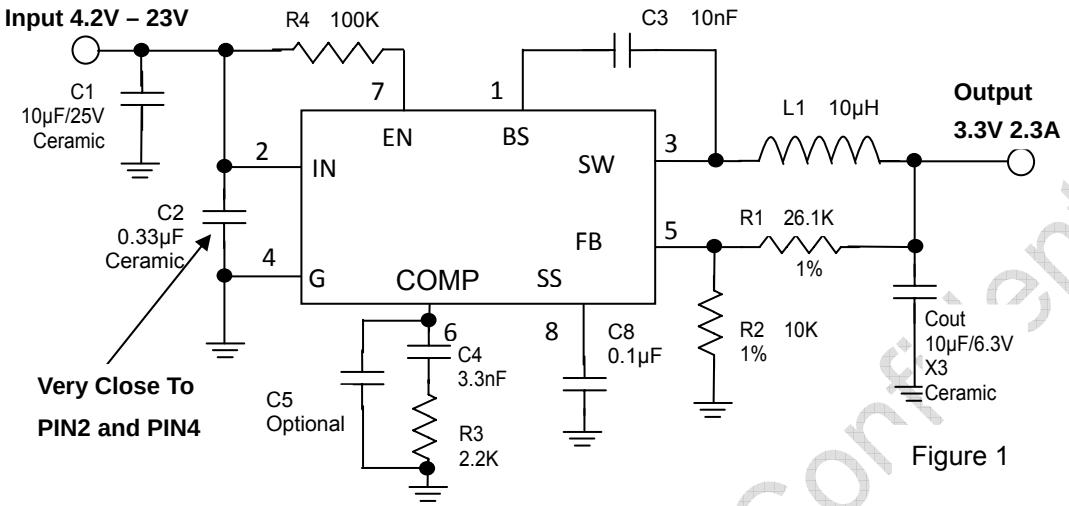


Figure 1

RECOMMENDED COMPONENT SELECTION

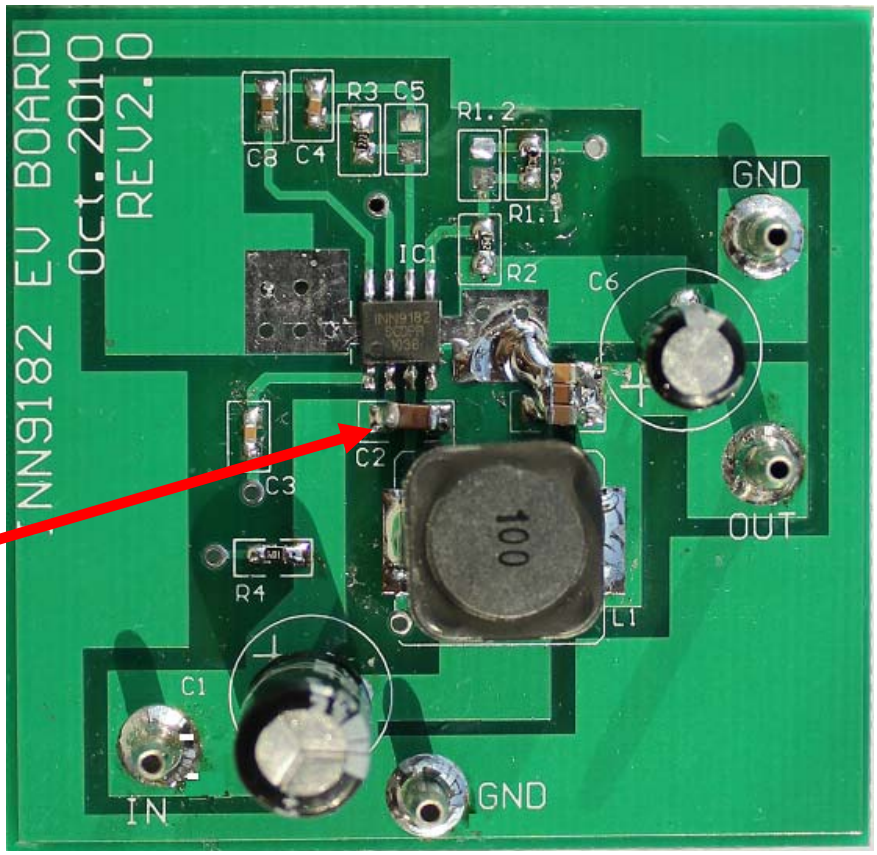
Vout	Cout	R1	R2	R3 (comp)	C4 (comp)	C5 (optional)	L(inductor)
1.0V	22µF Ceramic X2	1.0K	10K	50 Ω	10nF	OPEN	3.3µH
1.2V	22µF Ceramic X2	4.7K	15K	100 Ω	10nF	OPEN	3.3µH
1.8V	22µF Ceramic X2	9.7K	10K	300 Ω	3.3nF	OPEN	4.7µH
2.5V	22µF Ceramic X2	12.0K	6.8K	1.5K Ω	3.3nF	OPEN	6.8µH
3.3V	22µF Ceramic X2	26.1K	10K	2.2K Ω	3.3nF	OPEN	10µH
5.0V	22µF Ceramic X2	30.0K	6.8K	2.7K Ω	3.3nF	OPEN	22µH
1.0V	47µF SP Cap	1.0K	10K	50 Ω	10nF	OPEN	3.3µH
1.2V	47µF SP Cap	4.7K	15K	100 Ω	10nF	OPEN	3.3µH
1.8V	47µF SP Cap	9.7K	10K	300 Ω	3.3nF	OPEN	4.7µH
2.5V	47µF SP Cap	12.0K	6.8K	1.5K Ω	3.3nF	OPEN	6.8µH
3.3V	47µF SP Cap	26.1K	10K	2.2K Ω	3.3nF	OPEN	10µH
5.0V	47µF SP Cap	30.0K	6.8K	2.7K Ω	3.3nF	OPEN	22µH
1.0V	470µF/6.3V/Electrolytic	1.0K	10K	50 Ω	10nF	150pF	3.3µH
1.2V	470µF/6.3V/Electrolytic	4.7K	15K	100 Ω	10nF	150pF	3.3µH
1.8V	470µF/6.3V/Electrolytic	9.7K	10K	300 Ω	3.3nF	150pF	4.7µH
2.5V	470µF/6.3V/Electrolytic	12.0K	6.8K	1.5K Ω	3.3nF	150pF	6.8µH
3.3V	470µF/6.3V/Electrolytic	26.1K	10K	2.2K Ω	3.3nF	150pF	10µH
5.0V	470µF/10V/Electrolytic	30.0K	6.8K	2.7K Ω	3.3nF	150pF	22µH
12V	470µF/25V/Electrolytic	62.0K	5.1K	3.3K Ω	3.3nF	150pF	47µH

APPLICATION NOTES

See Evaluated board:

Notes: (Very important)

1) **C2 has to be added in**
2) C2 has to be very close to PIN2 and PIN4.
3) C2 capacitance has to be 0.33μF or above, and 1206 package



设计注意事项

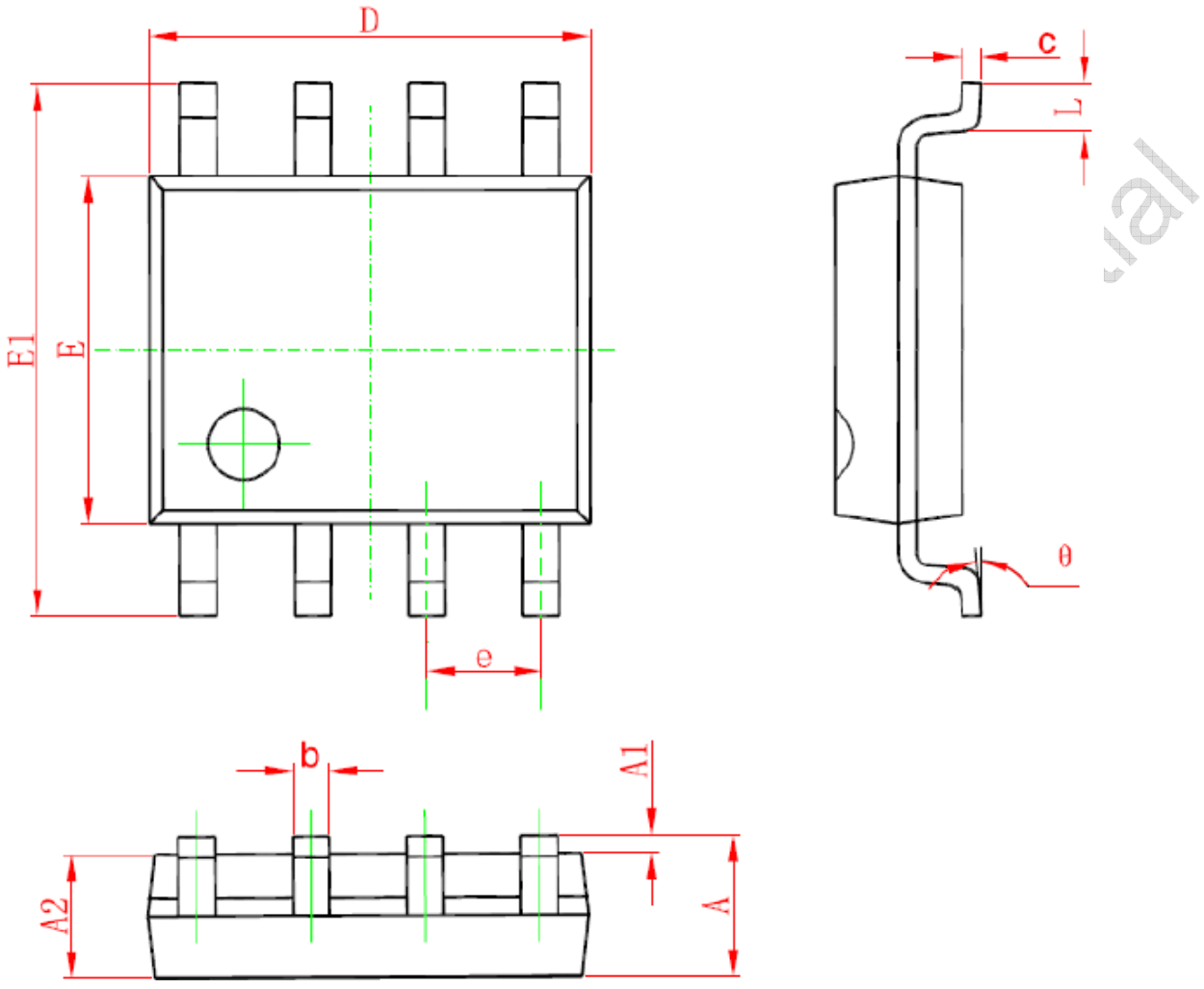
a) **如上图所示：**
   i. **C2 须紧贴芯片的** PIN2 和 PIN4 放置；(此点务必注意，很重要！)
   ii. 若使用电解电容做输入电容，**C2 必须加入**，且须用 0.47μF 或以上容值的瓷片电容。此电容容值越大越好。

b) 使用 47μH 电感时，由于每次 switching 传输的能量大，输出需要更大的电容，以使大信号的反馈环路稳定。
   i. 使用 47μH 电感时，输出须用大于或等于 330μF 的电解电容作能量 Bulk。

c) 大电流路径尽量短，且尽量与芯片在同一 PCB 层次。
   i. 避免大电流路径打过孔跨层连接。

d) 若成本可行，在高效率设计中，应尽量使用瓷片电容或较小 ESR (如：30mohm) 的电解电容，效率可有效提升 1%.

PACKAGE INFORMATION



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270 (BSC)		0.050 (BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°