Green-Mode PWM Controller

■ General Description

The LN2532 is a low cost , low startup current , current mode PWM controller with green-mode power-saving operation. The integrated functions include the leading-edge blanking of the current sensing, internal slope compensation. It would provide the users a superior AC/DC power application of higher efficiency, low external component counts, and lower cost solution for applications. The LN2532 features more protections or functions for the following characteristics : Add OLP (Over Load Protection) function to provide better protection performance for fault conditions like short circuit or over load. Modify the OVP (Over Voltage Protection) mechanism from the cycle-by-cycle mode to the hiccup mode.

LN2532 is available by SOT-23-6L 、 DIP-8P 、 SOP-8 packages.

■ Applications

● AC/DC Switching Power Adaptor
● Battery Charger
● PC 5V Standby Power
● Open-Frame Switching Power Supply

■ Features

● High-Voltage BiCMOS Process
● Very Low Startup Current (<20µA)
● Under Voltage Lockout (UVLO)
● Current Mode Control
● Non-audible-noise Green Mode Control
● Current Limiting
● LEB (Leading-Edge Blanking) on CS Pin
● OLP (Over Load Protection)
● OVP (Over Voltage Protection) on Vcc Pin
● Leading-Edge Blanking
● Programmable Switching Frequency
● Internal Slope Compensation
● Green-Mode Control for Power Saving
● 300mA Driving Capability

■ Package

● SOT-23-6
● DIP-8
● SOP-8

■ Ordering Information

LN2532①②

Designator	Symbol	Description
①		Package
	R	DIP-8
	M	SOT-23-6
	S	SOP-8
②		Device Orientation
	R	Embossed Tape: Standard Feed
	L	Embossed Tape: Reverse Feed

■ Pin Configuration
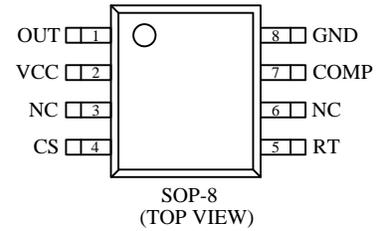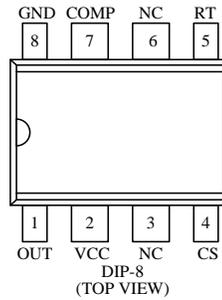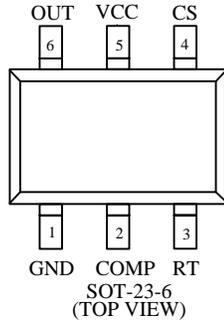
■ Pin Assignment

Pin Mumber		Pin Name	Function
SOT-23-6	DIP-8		
1	8	GND	Ground
2	7	COMP	Voltage feedback.the pin provides the output voltage regulation signal, It provides feedback to the internal PWM comparator ,so that the PWM comparator can control the duty cycle.
3	5	RT	This current is used to charge an internal capacitor, to determine the Switching frequency.
4	4	CS	Current sense .This pin senses the voltage across a resistor, to control PWM output. This pin also provides current amplitude information for current-mode control.
5	2	VCC	Supply power.
6	1	OUT	Gate driver output to drive the external MOSFET
—	3,6	NC	Not Connect.

■ Typical Application Circuit
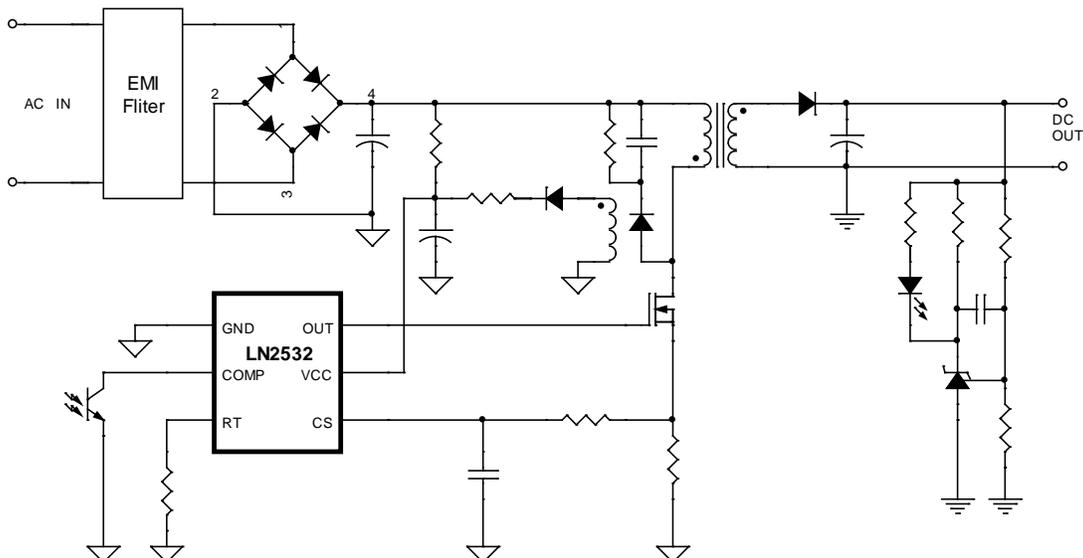
■ Block Diagram
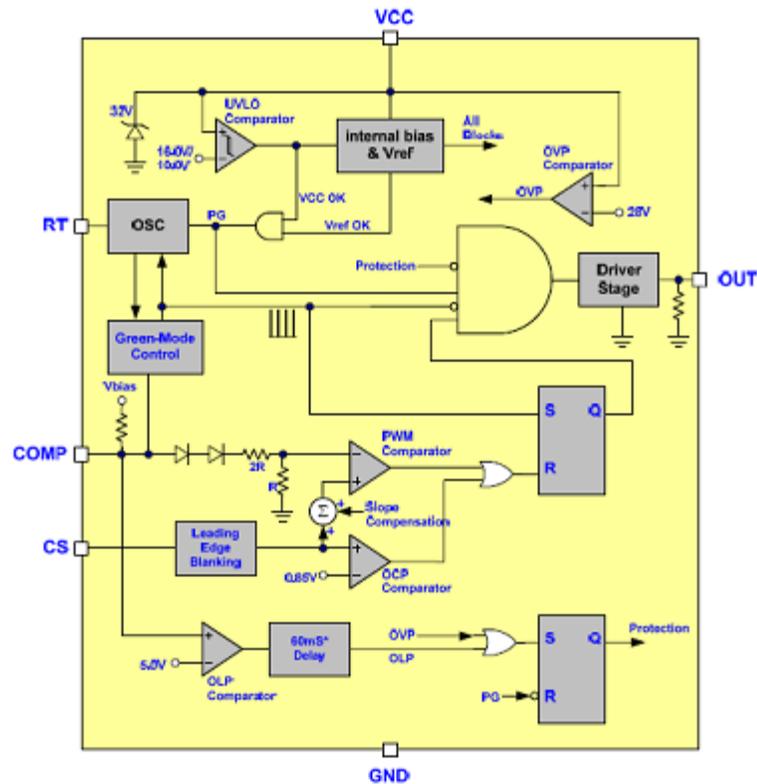
■ Absolute Maximum Ratings

Parameter		Symbol	Maximum Rating	Unit
DC supply voltage		V_{CC}	36	V
$C_{COMP/RT/CS}$ Voltage		$V_{COMP/RT/CS}$	-0.3—7.0	V
Power Dissipation@Ta=85℃		P_D	0.3	W
Operating ambient temperature		T_{OPE}	-40—85	℃
Operating junction temperature		T_J	-40—150	℃
Pb-free lead soldering temperature for 5 sec.		T_{LEAD}	260	℃
Storage temperature range		T_{STG}	-40—150	℃
Thermal resistance junction-case(*)	SOT-23-6	$R_{\theta JC}$	200	℃/W
	DIP-8		90	
	SOP-8		150	

■ Electrical Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
Supply Voltage(VCC Pin)						
Istt	Start current			10	20	μA
Iop	Operating Current	VCOMP=0V		2.7	4	mA
		VCOMP=3V		2.4		mA
		Protection tripped (OLP,OVP)		1.0		mA
UVLO(off)	Min. Operating Voltage		9.0	10.0	11.0	V
UVLO(on)	Start Threshold Voltage		15.0	16.0	17.0	V
OVP Level	Over Voltage Protection		24	26	29.5	V
Voltage Feedback(Comp Pin)						
Isc	Short Circuit Current			1.25	2.2	mA
Vop	Open Loop Voltage			6		V
VTH(GM)	Green Mode Threshold VCOMP			2.35		V
Oscillator(RT Pin)						
FOSC	Frequency	RT=100K	60.0	68.0	75.0	KHz
FOSC(GM)	Green Mode Frequency	Fs=65.0KHz		22		KHz
Fdt	Frequency Variation versus Temp. Deviation	(-40℃—105℃)			3	%
Fdv	Frequency Variation versus VCC Deviation	(VCC=11V—25V)			1	%
Current Sensing(CS Pin)						
Vcs(off)	Maximum Input Voltage		0.8	0.85	0.9	V
TLEDD	Leading Edge Blanking Time			280		nS
Zcs	Input impedance		1			MΩ
TPD	Delay to Output			100		nS
Gate Driver Output(OUT Pin)						
DC(Max)	Maximum Duty Cycle		70	75	80	%
DC(Min)	Minimum Duty Cycle			0		%
VOL	Output Low Level	VCC=15V,Io=20mA			1	V
VOH	Output High Level	VCC=15V,Io=20mA	8			V
Tr	Rising Time	Load Cap=1000pF		50	200	nS
Tf	Falling Time	Load Cap=1000pF		30	120	nS
OLP (Over Load Protection)						
TLolp	OLP Trip Level			5.0		V
TDolp	OLP Delay Time(note)			60		mS

## ■ Typical Performance Characteristics
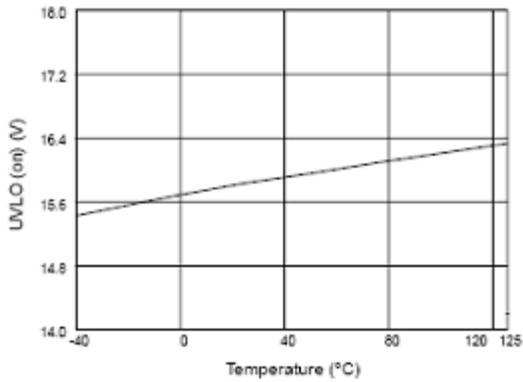
Fig. 1   UVLO (on) vs. Temperature
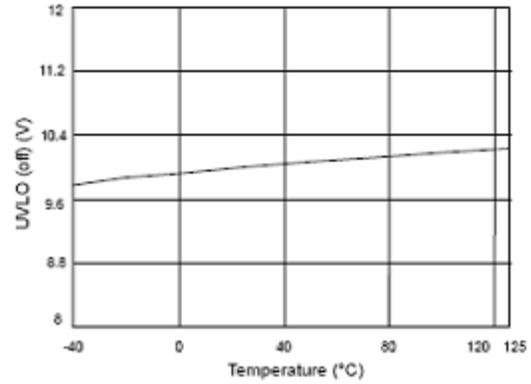

Fig. 2   UVLO (off) vs. Temperature
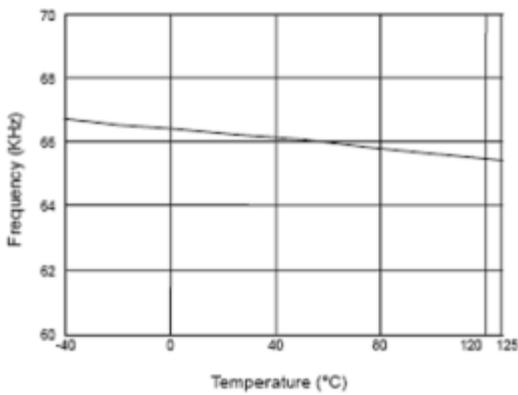
Fig. 3   Frequency vs. Temperature
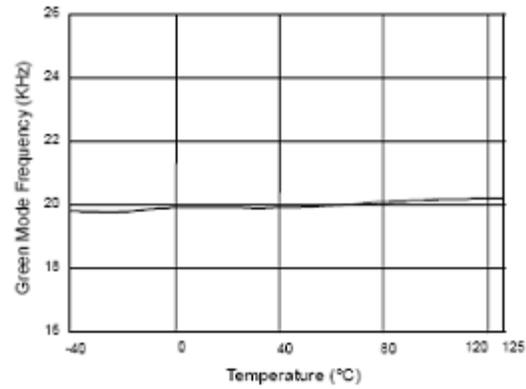
Fig. 4   Green Mode Frequency vs. Temperature
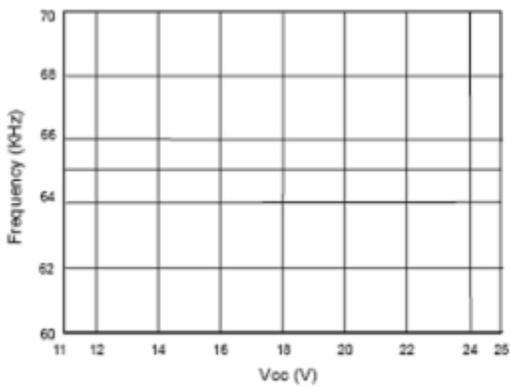

Fig. 5   Frequency vs. Vcc
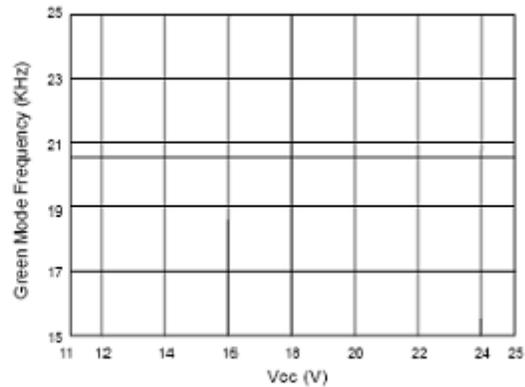

Fig. 6   Green Mode Frequency vs. Vcc
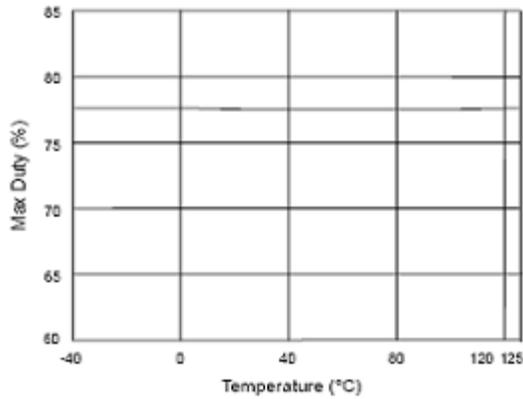
Fig. 7   Max Duty vs. Temperature
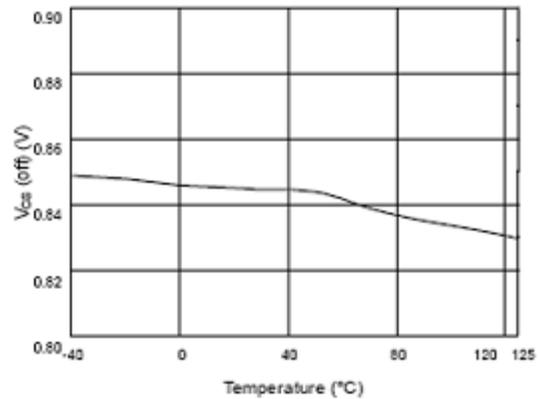
Fig. 8 V_{CS} (off) vs. Temperature
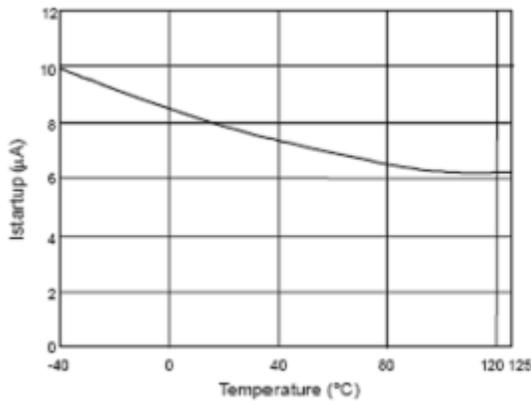
Fig. 9   Startup Current (Istartup) vs. Temperature
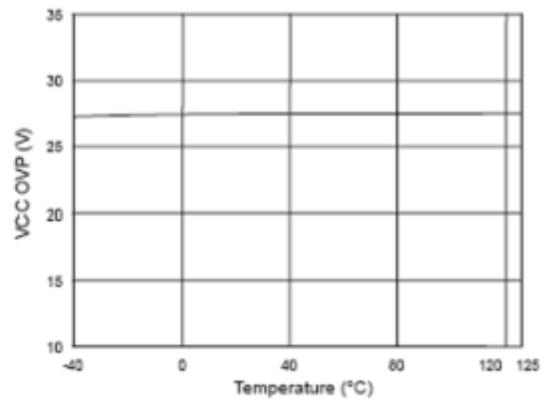
Fig. 10   VCC OVP vs. Temperature
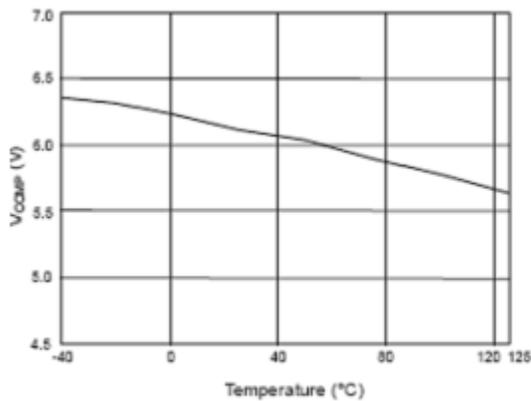
Fig. 11 V_{COMP} open loop voltage vs. Temperature
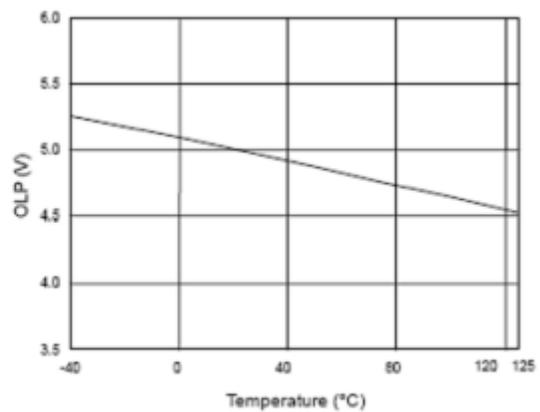
Fig. 12   OLP-Trip Level vs. Temperature

Tek Stop 10.0MS/s   341 Acqs

Δ: 400mV
Δ: 10.6µs
@: 12.4 V
C2 Freq
68.900kHz
Min 68.64k
Max 68.97k

C2 +Duty
73.8 %
Min 73.4
Max 74.4

C2 Rise
90ns
Min 80n
Max 170n

C2 Fall
80ns
Min 80n
Max 160n

Ch2 5.00 V   M 5.00µs Ch1   1.6mV   6 Aug 2008
06:56:58

Max Duty Cycle

Tek Stop 2.50MS/s   481 Acqs

Δ: 12.5 V
Δ: 42.4µs
@: −100mV
C2 Freq
21.185kHz
Min 21.01k
Max 21.19k

C2 +Duty
5.9 %
Min 5.8
Max 6.4

C2 Rise
320ns
Min 310n
Max 640n

C2 Fall
320ns
Min 310n
Max 650n

Ch2 5.00 V   M 20.0µs Ch2   7.5 V   6 Aug 2008
07:04:44

Min Duty Cycle

Tek Stop 10.0MS/s   180 Acqs

Δ: 11.2 V
Δ: 10.6µs
@: 12.4 V
C2 Freq
68.047kHz
Min 67.57k
Max 68.48k

C2 −Duty
74.1 %
Min 74.0
Max 74.7

C2 Rise
90ns
Min 80n
Max 170n

C2 Fall
90ns
Min 80n
Max 160n

Ch2 5.00 V   M 5.00µs Ch1   1.6mV   6 Aug 2008
06:57:40

Max Duty Cycle

Tek Stop 2.50MS/s   2718 Acqs

Δ: 12.3 V
Δ: 42.4µs
@: −100mV
C2 Freq
22.148kHz
Min 21.01k
Max 1.250M

C2 +Duty
6.5 %
Min 1.4
Max 75.7

C2 Rise
330ns
Min 160n
Max 650n

C2 Fall
320ns
Min 160n
Max 650n

Ch2 5.00 V   M 20.0µs Ch2   7.5 V   6 Aug 2008
07:06:51

Min Duty Cycle

Tek Stop 10.0MS/s   590 Acqs

Δ: 12.5 V
Δ: 10.6µs
@: 12.4 V
C2 Freq
68.493kHz
Min 68.09k
Max 68.97k

C2 +Duty
74.0 %
Min 73.5
Max 74.3

C2 Rise
80ns
Min 70n
Max 170n

C2 Fall
80ns
Min 40n
Max 160n

Ch2 5.00 V   M 5.00µs Ch2   7.5 V   6 Aug 2008
07:01:50

Max Duty Cycle

Tek Stop 2.50MS/s   579 Acqs

Δ: 200mV
Δ: 42.4µs
@: −100mV
C2 Freq
21.739kHz
Min 21.74k
Max 21.93k

C2 +Duty
6.1 %
Min 5.7
Max 7.9

C2 Rise
320ns
Min 300n
Max 640n

C2 Fall
320ns
Min 170n
Max 640n

Ch2 5.00 V   M 20.0µs Ch2   7.5 V   6 Aug 2008
07:10:31

Min Duty Cycle

Rising Time Load
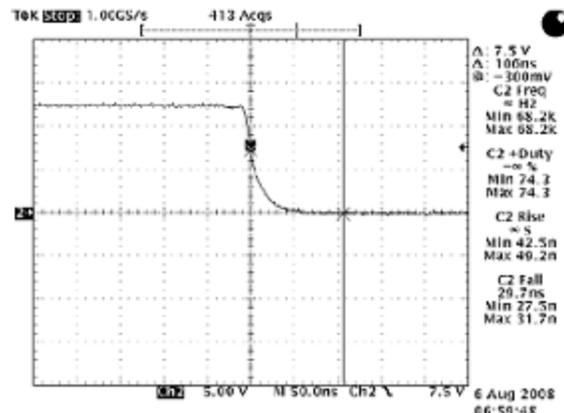
Falling Time Load

Rising Time Load

Falling Time Load

Rising Time Load

Falling Time Load

Leading Edge Blanking Time

OLP Delay Time

Leading Edge Blanking Time

OLP Delay Time

Leading Edge Blanking Time

OLP Delay Time
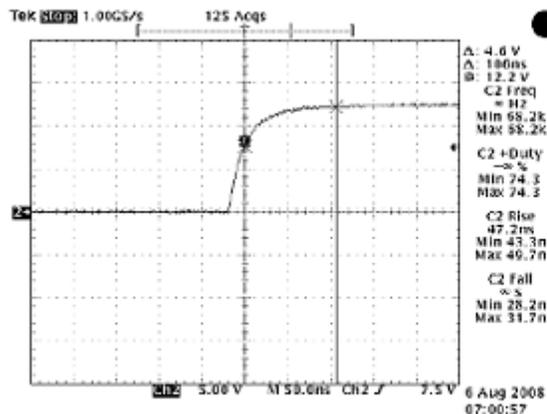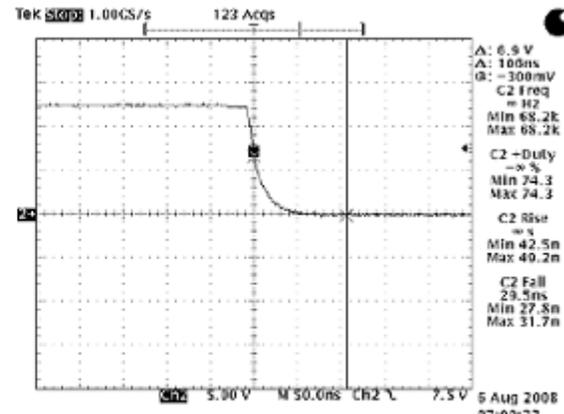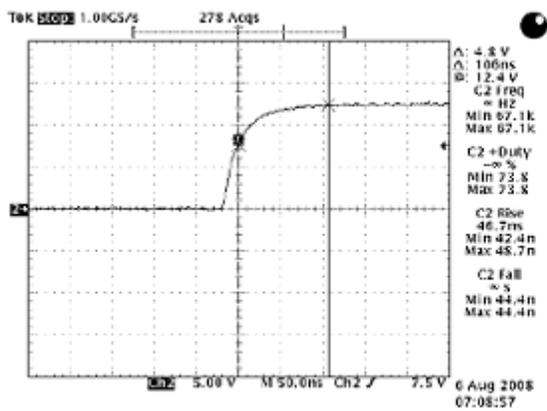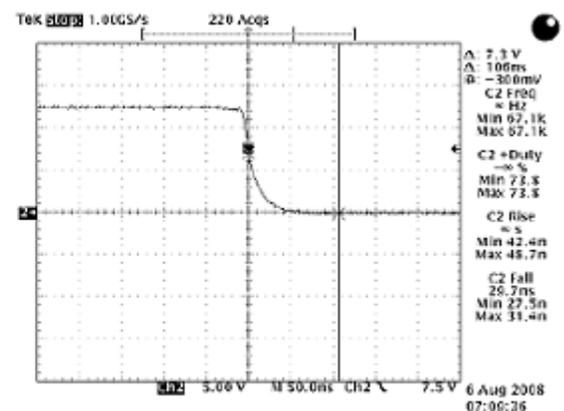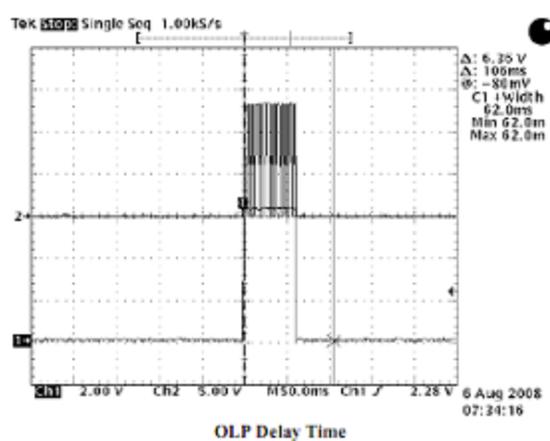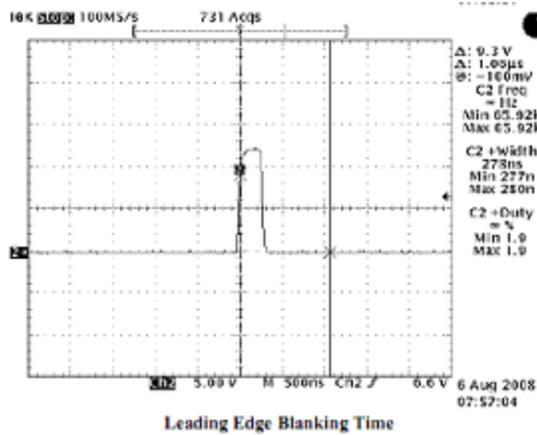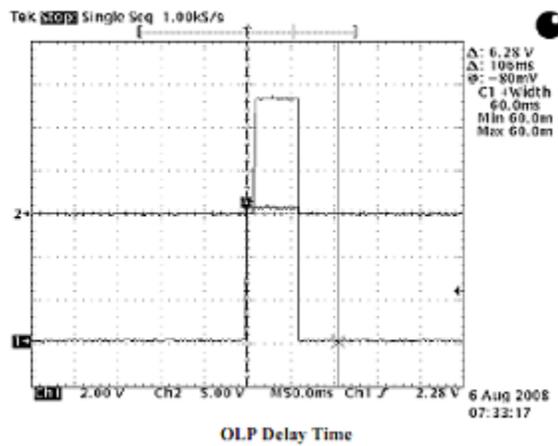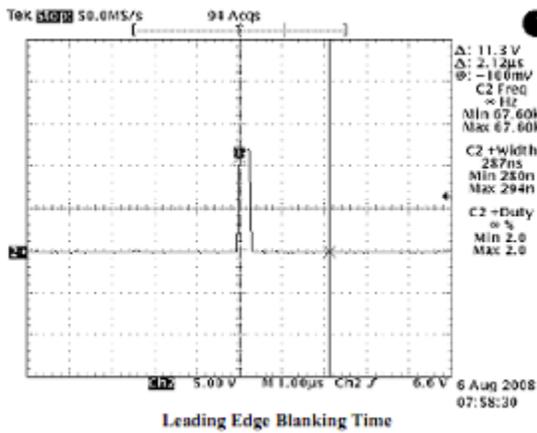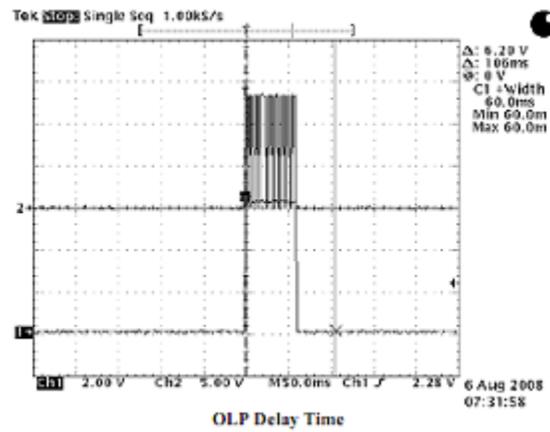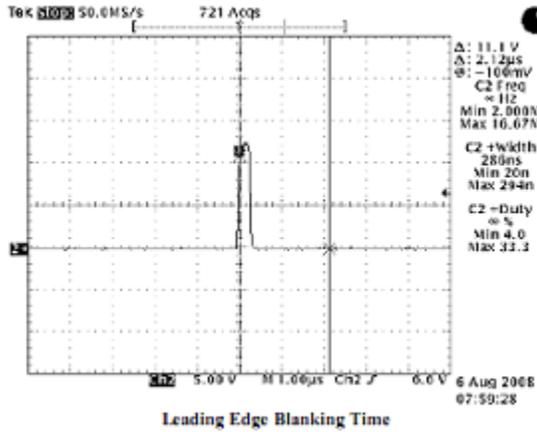
■ Package Information

● **SOT-23-6L**
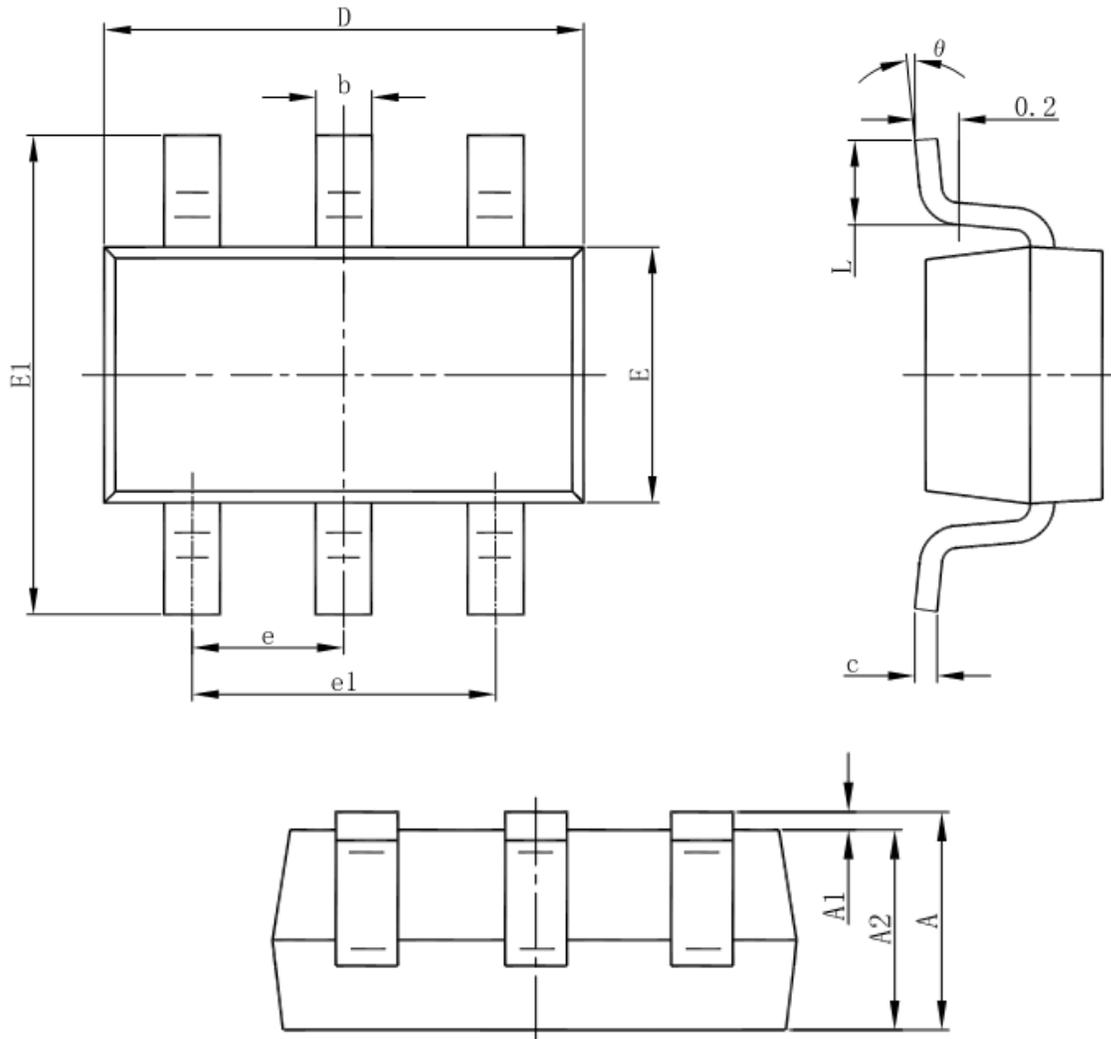
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

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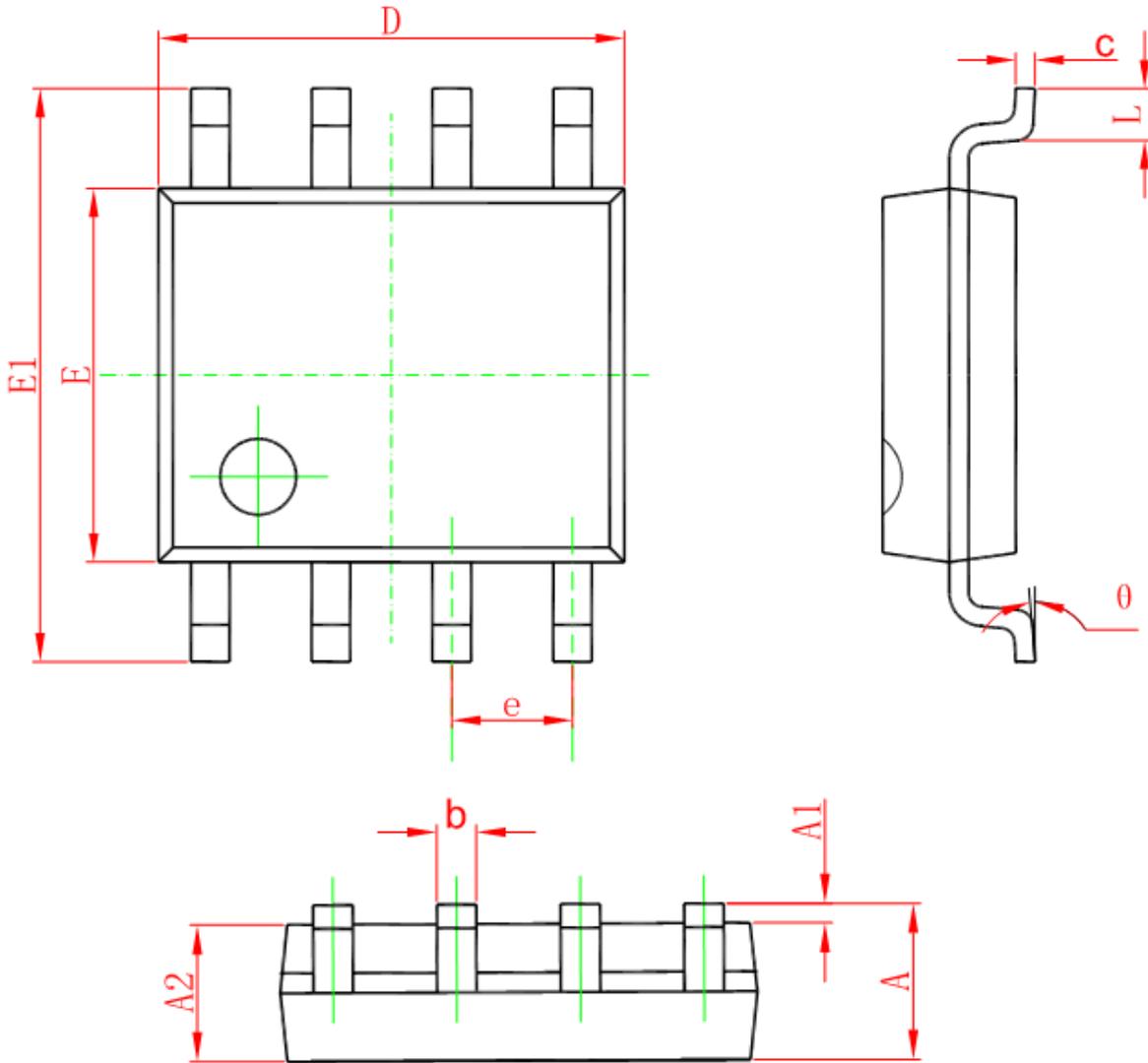
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270 (BSC)		0.050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

● **DIP-8**
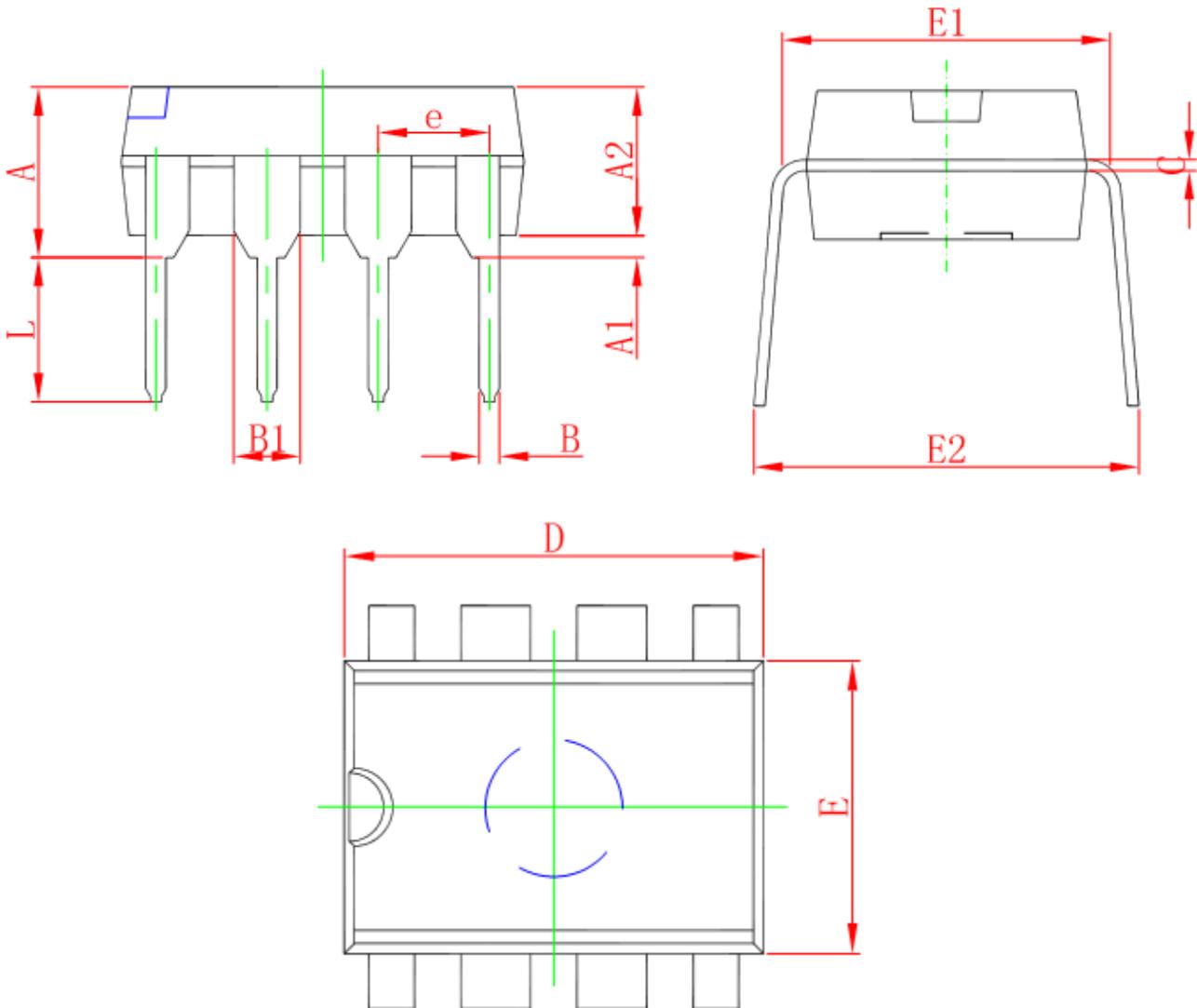
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	3.710	4.310	0.146	0.170
A1	0.510		0.020	
A2	3.200	3.600	0.126	0.142
B	0.380	0.570	0.015	0.022
B1	1.524 (BSC)		0.060 (BSC)	
C	0.204	0.360	0.008	0.014
D	9.000	9.400	0.354	0.370
E	6.200	6.600	0.244	0.260
E1	7.320	7.920	0.288	0.312
e	2.540 (BSC)		0.100 (BSC)	
L	3.000	3.600	0.118	0.142
E2	8.400	9.000	0.331	0.354