

#### **DESCRIPTION**

The SP6853 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 SP6853 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.

SP6853 is available by SOT-23-6L / DIP-8P packages.

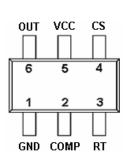
# APPLICATIONSAC/DC Switch

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

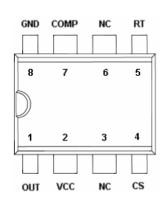
#### **FEATURES**

- 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

# PIN CONFIGURATION SOT-23-6L

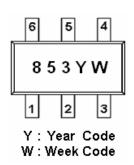


#### DIP-8P



# PART MARKING SOT-23-6L

DIP-8P



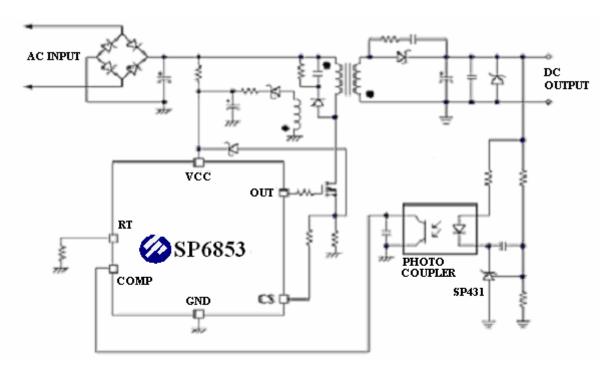
8 7 6 5
SP6853I
AAAAAAA
BBBBBBBB

1 2 3 4
A: Lot Code

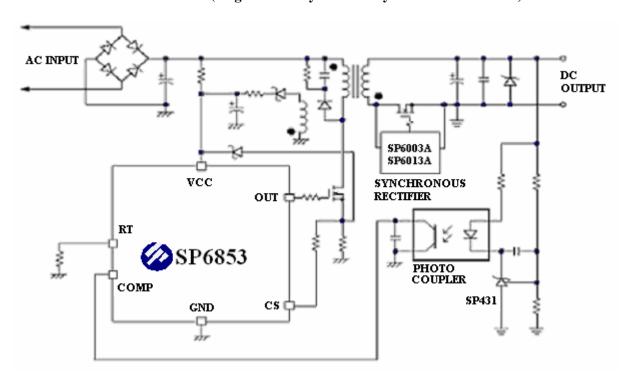
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# TYPICAL APPLCATION CIRCUIT



# TYPICAL APPLCATION CIRCUIT (High Efficiency SMPS + Synchronous Rectifier)



# **PIN DESCRIPTION**

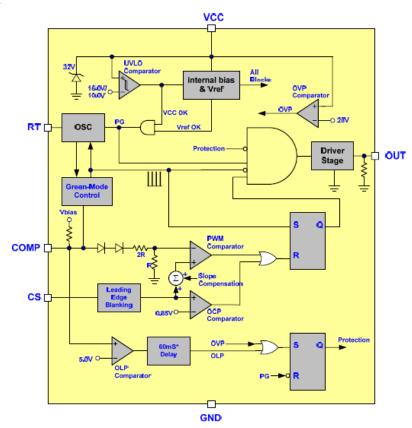
# **SP6853D8TG**

Pin	Symbol	Description			
1	OUT	Gate driver output to drive the external MOSFET			
2	VCC	Supply Voltage in			
3	NC	Unconnected pin			
4	CS	Current sense. This pin senses the voltage across a resistor, to control PWM output. This pin			
4		also provides current amplitude information for current-mode control.			
5	RT	This current is used to charge an internal capacitor, to determine the switching frequency.			
6	NC	Unconnected pin			
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.			
8	GND	Ground			

# **SP6853S26RG**

Pin	Symbol	Description			
1	GND	Ground			
2	COMP	Voltage feedback. The pin provides the output voltage regulation signal., it provides feedback			
	COMP	to the internal PWM comparator, so that the PWM comparator can control the duty cycle			
3	RT	This current is used to charge an internal capacitor, to determine the switching frequency.			
4	CS	Current sense. This pin senses the voltage across a resistor, to control PWM output. This pin			
4		also provides current amplitude information for current-mode control			
5	VCC	Supply Voltage in			
6	OUT	Gate driver output to drive the external MOSFET			

# **BLOCK DIAGRAM**



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#### **ORDERING INFORMATION**

Part Number	Package	Part Marking	
SP6853D8TGB	DIP-8P	SP6853 <b>I</b>	
SP6853S26RGB	SOT-23-6L	853YW	

※ SP6853D8TG : Tube; Pb − Free; Halogen-Free

※ SP6853S26RG : Tape Reel; Pb − Free; Halogen-Free

# **ABSOULTE MAXIMUM RATINGS** ( $T_A$ =25 $^{\circ}$ C, unless otherwise specified.)

The following ratings designate persistent limits beyond which damage to the device may occur.

Symbol	Parameter	Value	Unit	
$V_{CC}$	DC Supply Voltage	36	V	
$V_{COMP/RT/CS}$	COMP / RT / CS Voltage		<b>-</b> 0.3 ~ 7.0	V
$P_{\mathrm{D}}$	Power Dissipation @ T <sub>A</sub> =85°C (*)		0.3	W
ESD	Human Body Model		4	KV
ESD	Machine Model		300	V
$T_{ope}$	Operating Ambient Temperature		<b>-</b> 40 ∼ 85	$^{\circ}$ C
$T_{J}$	Operating Junction Temperature Range		<b>-4</b> 0 ~ 150	$^{\circ}$ C
$T_{STG}$	Storage Temperature Range		<b>-</b> 40 ∼ 150	$^{\circ}$ C
$T_{LEAD}$	Pb-Free Lead Soldering Temperature for 5 sec.		260	$^{\circ}\! C$
$R_{\Theta JC}$	Thermal Resistance Junction – Case (*)	SOT-23-6L	210	°C/W
	Thermal Resistance Junction – Case (*)	DIP-8P	95	C/W

<sup>(\*)</sup> The power dissipation and thermal resistance are evaluated under copper board mounted with free air conditions.

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# **ELECTRICAL CHARACTERISTICS**

 $(T_A=25^{\circ}C, V_{CC}=15V, unless otherwise specified.)$ 

Supply Voltage ( Vcc Pin )   Istt   Startup   Current	Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit	
Iop   Operating Current   VCOMP = 0V   2.7   4   mA   VCOMP = 3V   2.4   mA   MA   VCOMP								
Top	Istt	Startup Current			10	20	uA	
Vol. O (off)   Min. Operating Voltage   9.0   10.0   11.0   V			$V_{COMP} = 0V$		2.7	4	mA	
VIVLO (off)   Min. Operating Voltage   9.0   10.0   11.0   V   VIVLO (on)   Start Threshold Voltage   15.0   16.0   17.0   V   VIVLO (on)   Start Threshold Voltage   15.0   16.0   17.0   V   VIVLO (on)   Start Threshold Voltage   15.0   16.0   17.0   V   VIVLO (on)   Start Threshold Voltage Protection   24   26   29.5   V   VIVLO (on)   Start Threshold Voltage Protection   24   26   29.5   V   VIVLO (on)   Start Threshold Voltage   VIVLO (on)   Start Threshold Voltage   VIVLO (on)   Start Threshold Voltage   Short Circuit Current   1.25   2.2   mA   Vop   Open Loop Voltage   6   V   VIVLO (on)   V   V   VIVLO (on)   V   V   V   V   V   V   V   V   V	Ion	Operating Current	$V_{COMP} = 3V$		2.4		mA	
UVLO (on )   Start Threshold Voltage   15.0   16.0   17.0   V	ТОР	operating current			1.0		mA	
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 )         Frequency RT Fin )           Fosc         Frequency         RT=100KΩ         60.0         68.0         75.0         KHz           Fosc(GM)         Green Mode Frequency         Fs=65.0KHz         22         KHz           Fdt         Frequency Variation versus Temp. Deviation (-40°C ~105°C)         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         Ω           TPD         Delay to Output         0         nS           Gate Driver Output ( OUT Pin )         0         70         7	UVLO (off)	Min. Operating Voltage		9.0	10.0	11.0	V	
Voltage Feedback ( Comp Pin )   Isc   Short Circuit Current   Short Circuit Current Sensor   Stephen   Short Circuit Current Sensor   Stephen   Short Circuit Current Sensor   Short Circuit Current Sensor   Short Curr	UVLO (on )	Start Threshold Voltage		15.0	16.0	17.0	V	
Sc   Short Circuit Current   1.25   2.2   mA	OVP Level	Over Voltage Protection		24	26	29.5	V	
Vop	Voltage Feed	lback ( Comp Pin )						
VTH(GM)   Green Mode Threshold VCOMP   2.35   V	Isc	Short Circuit Current			1.25	2.2	mA	
Socillator (RT Pin   Fosc   Frequency	Vop	Open Loop Voltage			6		V	
Fosc Frequency         RT=100KΩ         60.0         68.0         75.0         KHz           Fosc(GM)         Green Mode Frequency         Fs=65.0KHz         22         KHz           Fdt         Frequency Variation versus Temp. Deviation $(-40^{\circ}\text{C} \sim 105^{\circ}\text{C})$ 3         %           Fdv         Frequency Variation versus Vcc Deviation $(\text{Vcc}=11\text{V}-25\text{V})$ 1         %           Current Sensing ( CS Pin )         Vcs(off)         Maximum Input Voltage         0.8         0.85         0.9         V           TLEDD         Leading Edge Blanking Time         280         nS         Zes         nS         Zes         Input impedance         1         MΩ         MΩ         TPD         Delay to Output         100         nS         Sete Diver Output ( OUT Pin )         NS         Gate Driver Output ( OUT Pin )         VCCCID (Max)         Maximum Duty Cycle         70         75         80         %         DC (Min)         Minimum Duty Cycle         0         %         VCCCID (Min)	VTH(GM)	Green Mode Threshold VCOMP			2.35		V	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Oscillator (	RT Pin )						
Fdt         Frequency Variation versus Temp. Deviation         (-40°C ~105°C)         3         %           Fdv         Frequency Variation versus Vcc Deviation         (Vcc=11V-25V)         1         %           Current Sensing ( CS Pin )           Ves(off)         Maximum Input Voltage         0.8         0.85         0.9         V           TLEDD         Leading Edge Blanking Time         280         nS           Zcs         Input impedance         1         MΩ         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, lo=20mA         1         V           VOH         Output High Level         Vcc=15V, lo=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)         5.0         V </td <td>Fosc</td> <td>Frequency</td> <td><math>R_T=100K\Omega</math></td> <td>60.0</td> <td>68.0</td> <td>75.0</td> <td>KHz</td>	Fosc	Frequency	$R_T=100K\Omega$	60.0	68.0	75.0	KHz	
Fdv   Frequency Variation versus Vcc Deviation   (Vcc=11V-25V)   1	Fosc(gm)	Green Mode Frequency	Fs=65.0KHz		22		KHz	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Fdt	Frequency Variation versus Temp. Deviation	(-40°C ~105°C)			3	%	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Fdv	Frequency Variation versus VCC Deviation	(Vcc=11V-25V)			1	%	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	<b>Current Sen</b>	sing ( CS Pin )						
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Vcs(off)	Maximum Input Voltage		0.8	0.85	0.9	V	
TPD	TLEDD	Leading Edge Blanking Time			280		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         DLP Trip Level         5.0         V	Zcs	Input impedance		1			$M\Omega$	
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         5.0         V	TPD	Delay to Output			100		nS	
DC (Min)   Minimum Duty Cycle   0	<b>Gate Driver</b>	Output ( OUT Pin )	1		•	•		
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         DLP Trip Level         5.0         V	DC (Max)	Maximum Duty Cycle		70	75	80	%	
VOL         Output Low Level         Io=20mA         I         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	DC (Min)	Minimum Duty Cycle			0		%	
Voh         Output High Level         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	Vol	Output Low Level				1	V	
Tf         Falling Time         Load Cap=1000pF         30         120         nS           OLP ( Over Load Protection )         TLOLP         OLP Trip Level         5.0         V	Voh	Output High Level		8			V	
OLP ( Over Load Protection )         5.0         V	Tr	Rising Time	Load Cap=1000pF		50	200	nS	
OLP ( Over Load Protection )         5.0         V	Tf	Falling Time	Load Cap=1000pF		30	120	nS	
TLOLP OLP Trip Level 5.0 V								
TDOLP OLP Delay Time (note) 60 mS					5.0		V	
	TDOLP				60		mS	

Note: The OLP delay time is proportional to the period of switching cycle. So that, the lower RT value will set the higher switching frequency and the shorter OLP delay time.

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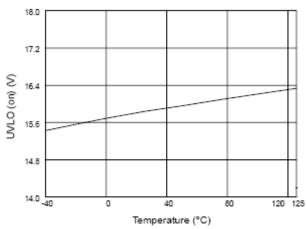


Fig. 1 UVLO (on) vs. Temperature

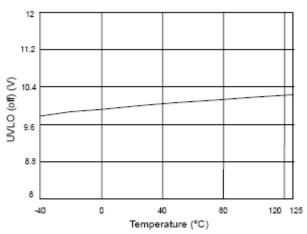


Fig. 2 UVLO (off ) vs. Temperature

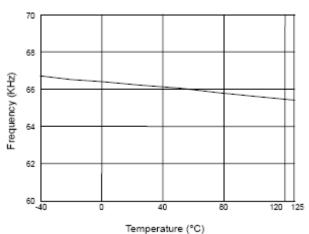


Fig. 3 Frequency vs. Temperature

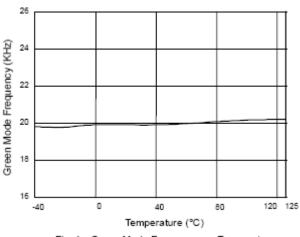


Fig. 4 Green Mode Frequency vs. Temperature

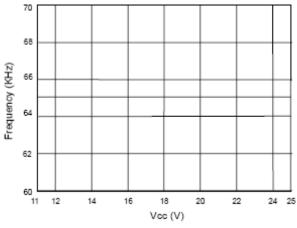


Fig. 5 Frequency vs. Vcc

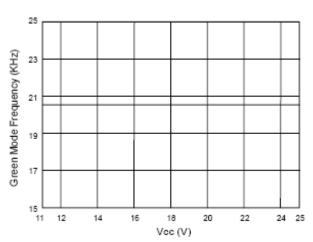


Fig. 6 Green Mode Frequency vs. Vcc

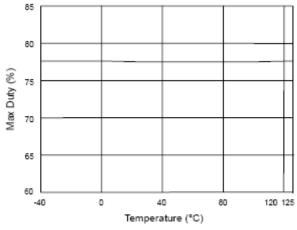


Fig. 7 Max Duty vs. Temperature

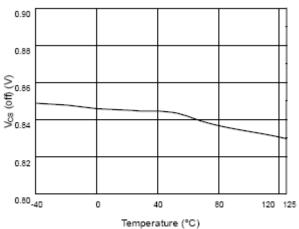


Fig. 8 V<sub>CS</sub> (off) vs. Temperature

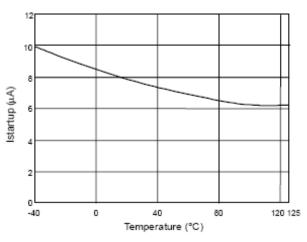


Fig. 9 Startup Current (Istartup) vs. Temperature

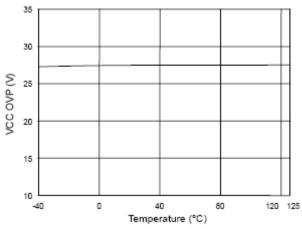


Fig. 10 VCC OVP vs. Temperature

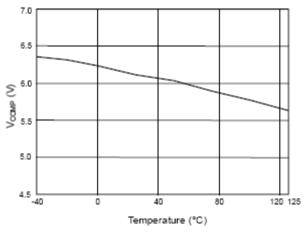


Fig. 11 V<sub>COMP</sub> open loop voltage vs. Temperature

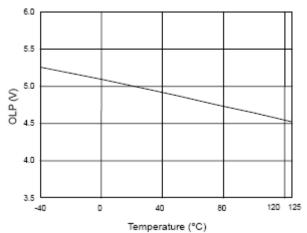
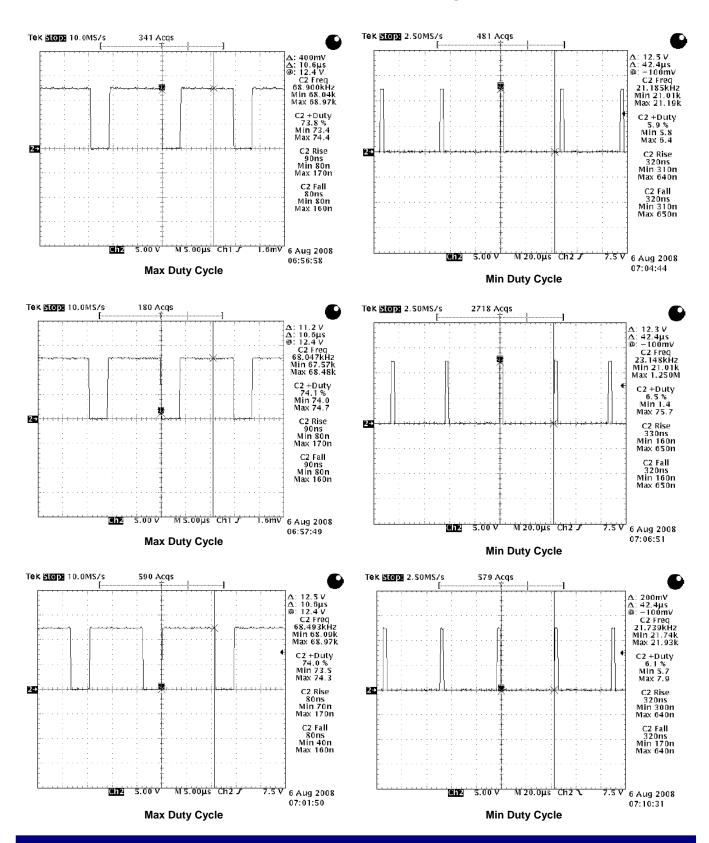
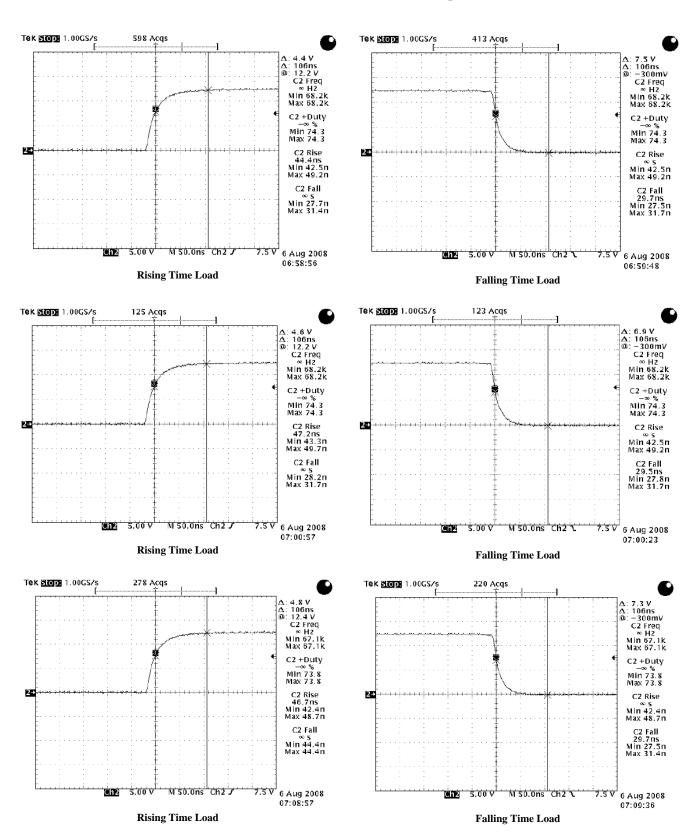


Fig. 12 OLP-Trip Level vs. Temperature

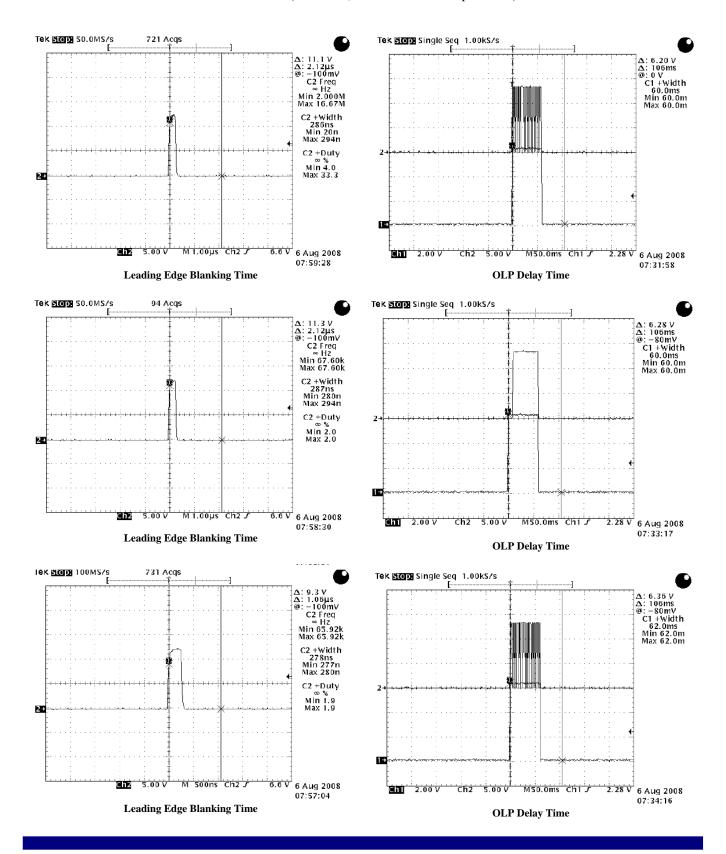






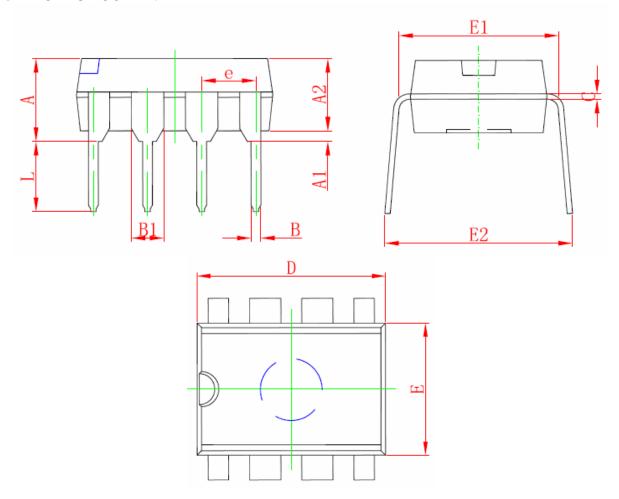








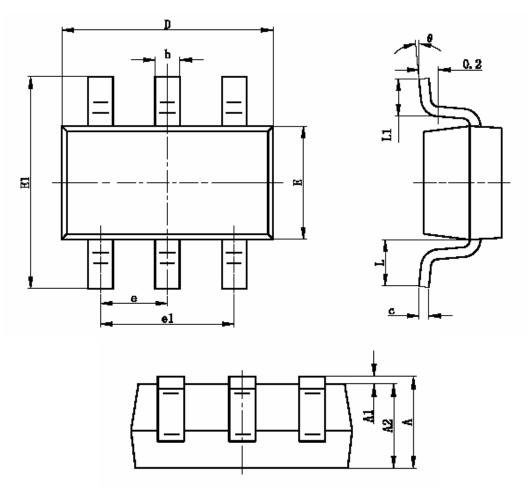
# **DIP- 8P PACKAGE OUTLINE**



	Dimensions In Millimeters		Dimensions In Inches	
Symbol	Min	Max	Min	Max
Α	3. 710	4. 310	0. 146	0. 170
A1	0. 510		0. 020	
A2	3. 200	3. 600	0. 126	0. 142
В	0. 380	0. 570	0. 015	0. 022
B1	1. 524	1. 524 (BSC)		(BSC)
С	0. 204	0. 360	0.008	0. 014
D	9. 000	9. 400	0. 354	0. 370
Е	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



# SOT-23-6L PACKAGE OUTLINE



Symbol	Dimensions In Millimeters		Dimensions In Inches		
Symbol	Min	Max	Min	Max	
А	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	0.400	0.012	0.016	
С	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	
е	0.950TYP		0.037TYP		
e1	1.800	2.000	0.071	0.079	
L	0.700	0.700REF		BREF	
L1	0.300	0.600	0.012	0.024	
θ	0°	8°	0°	8°	

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