

Data Sheet

Type Description : **Green-Mode PWM Flyback (SSR) Controller**

Product Name : **EST2900X**

Reversion : **V1.0**

Reversion Date : **May, 2016**

Page : **13 Pages**



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LIFE SUPPORT APPLICATIONS

These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify EST for any damages resulting from such improper use or sales.

EST.2900X Green-Mode PWM Flyback (SSR) Controller



General Description

EST2900X is a higher integrated PWM flyback controller. It provides several functions to enhance the efficiency and EMI-improved solution, and also built in complete protection.

Meantime, the low startup current, and the proprietary of green-mode function provides gradually mode of frequency reducing under light-load. For zero-load condition, it also built-in burst mode and several parameters to completely turn off PWM output and minimize the power loss of external resistance.

EST2900X also built-in the leading-edge blanking (LEB) of the current sensing and feedback loop to screen the spike noise from any input signal. The internal slope compensation can limit the constant output over universal AC input range. The sawtooth over frequency function for EMI improved solution.

Meanwhile, EST2900X also provides various protection, such as, OLP (Over Load Protection), VDD OVP (Over Voltage Protection), Output OVP, Brown-in/out protection(BNO) and VDD OVP to prevent the circuit damage from the abnormal conditions.

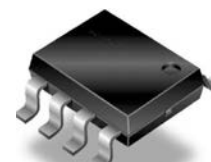
EST2900X is available in SOT23-6 and DIP-8, SOP-8 packages

Features

- High voltage CMOS process with excellent ESD protection
- 10ms Soft-start
- Very low startup current (<6 uA)
- 0.5mA ultra-low operating current at light load
- Adaptive Frequency Shuffling and Slope Compensation @ Fix Frequency CCM Mode
- Current mode control with Cycle-by-Cycle current limit
- Built-in slope and load regulation compensation
- LEB (Leading-edge blanking) on CS Pin
- UVLO (Under voltage lockout)
- VDD OVP (Over Voltage Protection)
- OLP (Over load protection)
- Photo coupler short protection
- Feedback open protection



SOT23-6



SOP-8L

Application

- Switching AC/DC adapter and battery charger
- ATX standby power
- Open frame switching power and CD(R)
- Set-top-boxes(STB) 384XreplacementC



DIP-8L

Function and Protection Options

Protection Options

Part Number	Freq. KHZ	Protection						
		V _{DD} OVP	AUX. OVP	AUX. OVP	OLP	BNI/O	CS Open	SCP
EST2900A	PWM (Max) 65KHz	Hiccup	Hiccup	Hiccup	Hiccup/64ms		Hiccup	Hiccup
EST2900B	PWM (Max) 65KHz	Hiccup	Hiccup	Hiccup	Hiccup/64ms	Hiccup	Hiccup	Hiccup

Ordering Information

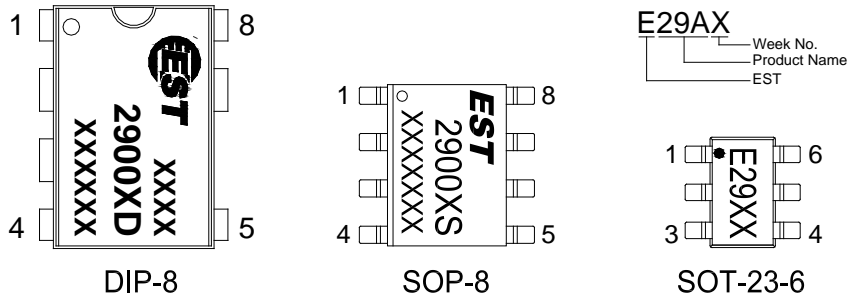
Part Number	Package	Packaging	Note
EST2900A/B	SOT-23-6	Tape & Reel	Green
EST2900AS/BS	SOP-8L	Tape & Reel	Green
EST2900AD/BD	DIP-8L	Tape	Green

Note: EST lead-free products contain molding compounds/die attach materials and 100% matte tin plate termination finish; which are fully compliant with RoHS. EST lead-free products meet or exceed the lead-free requirements of IPC/JEDEC J-STD-020C for MSL classification at lead-free peak reflow temperature. EST defines "Green" to mean lead-free (RoHS compliant) and halogen free (Br or Cl does not exceed 900ppm by weight in homogeneous material and total of Br and Cl does not exceed 1500ppm by weight)

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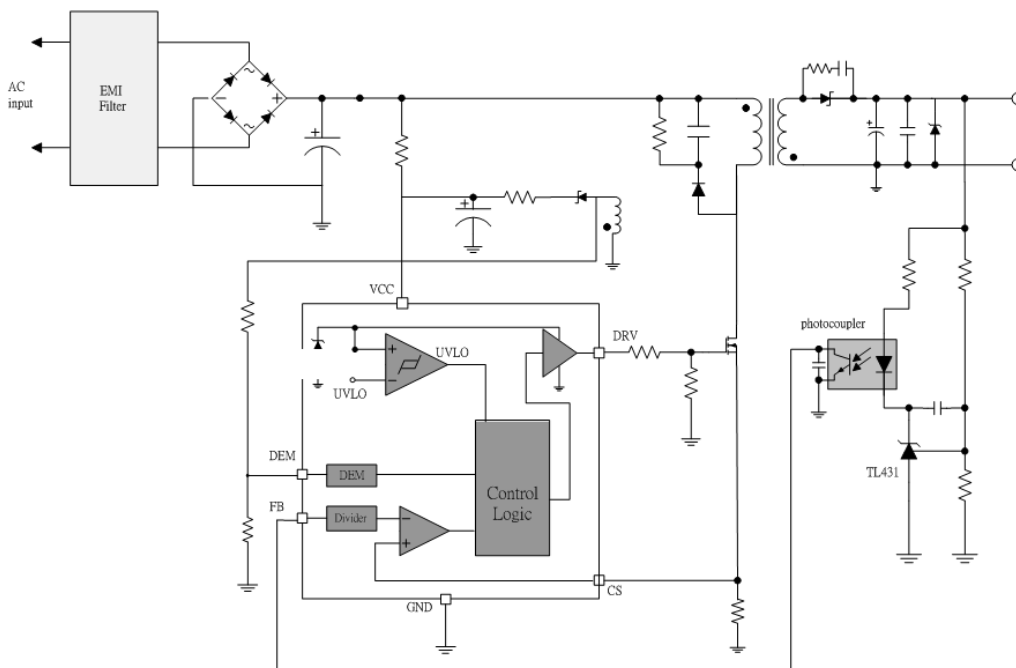


Pin Assignments and Package Type



SOT-23-6	SOP-8L;D IP-8L	NAME Description	Description
1	8	GND	Ground
2	7	FB	Voltage input pin by connecting a photo-coupler
3	5	RTL	This pin also used for output over voltage protection (Output OVP) and AC line brown-out protection (BNO)
4	4	CS	Current Sense input. The current sense resistor between this pin and GND is used for current limit setting.
5	2	V _{DD}	Power supply pin
6	1	DRV	Driver output to driver the external MOSFET
--	3/6	NC	No internal connection

Application Circuit



Absolute Maximum Ratings

Parameter Symbol	Symbol	Limit Values		Unit	Remark
		Min.	Max		
Supply Voltage V_{DD}	V_{DD}	-0.3	40	V	
FB,CS,RTL	V_{FB}, V_{CS}, V_{RTL}	-0.3	7	V	
DRAIN Voltage (off state)	V_{DRV}	-0.3	$V_{DD}+0.3$	V	
Gate Output Current	I_{DRV}		500	mA	
Operation Junction Temperature	T_j	-40	150	°C	
Operation Ambient Temperature	T_A	-25	85	°C	
Storage Temperature	T_{stg}	-55	150	°C	
Power Dissipation @ $T_A=85^{\circ}C$	PD	-	0.3	W	
Junction-to-Ambient Thermal Resistance*	θ_{JA}	$T_a = 25^{\circ}C$	250	°C/W	
Junction-to-Case Thermal Resistance**	θ_{JC}	$T_a = 25^{\circ}C$	115	°C/W	
Lead temperature (Soldering, 10 sec)			-	260	°C
ESD Voltage Protection	HBM	$V_{ESD-HBM}$	-	3.0	KV
	MM	V_{ESD-MM}	-	300	V

Stress beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

*Free standing with no heatsink; without copper clad.(Measurement condition – just before junction temperature T_J enters into OTP)

**Measure on the DRAIN pin close to plastic interface

***Measure on the PKG top surface

Recommended Operating Conditions

Parameter Symbol	Symbol	Limit Values		Unit	Remarks
		Min.	Max		
Supply Voltage V_{DD}	V_{DD}	11	29.5	V	
Startup Resistor Value	R_{star}	1	14	MΩ	
Ambient temperature range	T_{opr}	-40	85	°C	

DC Electrical Characteristics ($V_{CC} = 15V, T_a = 25^{\circ}C$)

Supply Voltage (VCC Pin):

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Startup Current	I_{CC-ST}	2	3.5	5.5	μA	UVLO ON - 0.1V
Operating Current (with 1nF load on DRV pin)	I_{CC-OP}	0.4	0.6	0.8	mA	$V_{FB}=0V$
	I_{CC-OP}	1.5	2	2.5	mA	$V_{FB}=2.5V$ CL=1nF
	I_{CC-OLP}	0.4	0.5	0.6	mA	OLP
UVLO (off)	$V_{UVLO-OFF}$	8	9	10	V	
UVLO (on)	$V_{UVLO-ON}$	14.5	15.5	16.5	V	
V_{DD} OVP Level	V_{OVP}	30.5	32	33.5	V	
OVP Debounce Time	T_{OVP}		100		uS	V_{DD} sweep until no OUT pulse

Voltage Feedback(FB Pin):

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Short Circuit Current	I_{zero}	0.18	0.23	0.28	mA	$V_{FB}=0V$
Open Loop Voltage	V_{FB-OP}	4.5	5	5.5	V	FB pin open
Burst mode start voltage(on)	V_{BUR_ON}	0.9	1.0	1.1	V	
Burst Mode Hysteresis	V_{BUR_HY}	0.05	0.1	0.15	V	
OLP Trip Level		3.8	4.1	4.4	V	
Delay Time of FB pin Open loop protection	t_{Delay_OLP}	54	64	74	ms	Freq=65K
Green Mode Threshold	V_{th_GR}	1.9	2	2.1	V	

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Current Sensing (CS Pin):

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Leading Edge Blanking Time	TLEB	200	300	400	ns	
Maximum CS Reference Voltage	V _{CS}	0.8	0.85	0.9	V	
Propagation Delay to Output	T _{pd}	80	100	120	nS	
Short Circuit Protection Voltage	V _{SCP}	1.25	1.35/1.75	1.45	V	

Resistor Trigger Latch off (RTL Pin):

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Output OVP Trigger Point	V _{TH_OVP}	3.3	3.5	3.7	V	
Output OVP Deglitch Time Constant	T _{OVP_delay}		4		Cycle	
Output UVP Trigger Point	V _{TH_OVP}	0.7	0.8	0.9	V	
Output UVP Deglitch Time Constant	T _{OVP_delay}		4		Cycle	
Threshold Current of Brown-in	I _{BNI}	105	115	125	μA	Only for EST2900B
Current of Brown-out	I _{BNO}	85	95	105	μA	
Brown-out de-bounce time	T _{D_BNO}		130		ms	

Timer Section:

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Internal Soft Startup Time	T _{ss}		8		ms	Freq=65K
Burst Mode Switching Frequency	F _{burst}	20	24	27	KHz	
Frequency at PWM	F _{CCM}	60	65	70	KHz	
Frequency Shuffling Range	F _{jitter}	+/-4	+/-6	+/-8	%	

On-chip Thermal Protection

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Thermal Shut Down Temperature	T _{shutdown}	130	140	150	°C	Guarantee by Design
Thermal Shut Down hysteresis	T _{recovery}		30		°C	

Driver(DRV Pin) :

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Output Low Level	V _{OL}			1	V	V _{DD} = 15V, I _O =20mA
Output High Level	V _{OH}	8			V	V _{DD} = 15V, I _O =20mA
Output Clamp Voltage Level	V _{G_Clamp}	10.5	11.5	12.5	V	V _{DD} = 25V
Rising Time	T _R	200	300	400	nS	V _{DD} = 15V, C _L = 1nF
Falling Time	T _F	50	80	100	nS	V _{DD} = 15V, C _L = 1nF

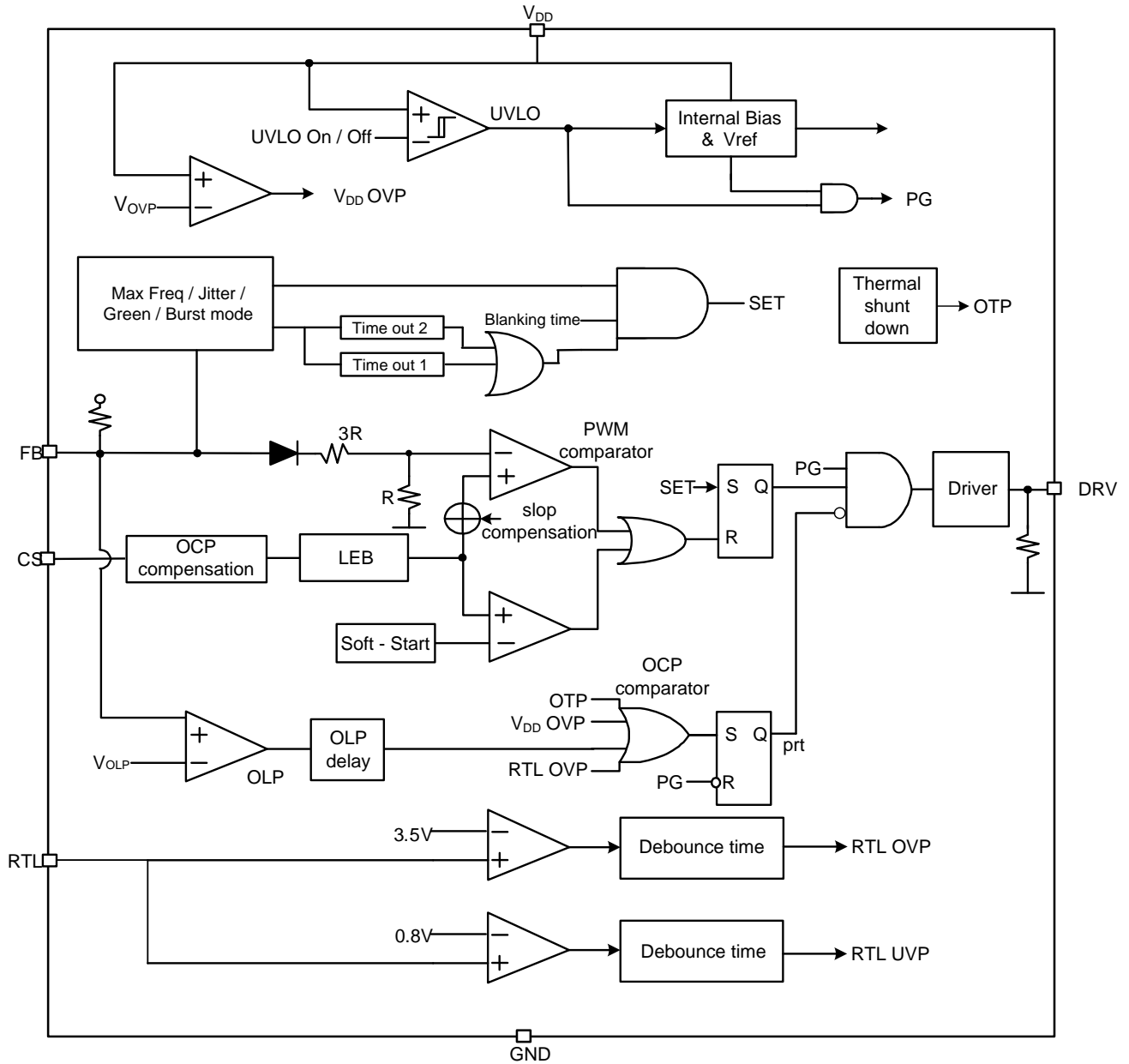
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EST.2900X Green-Mode PWM Flyback (SSR) Controller

Block Diagram

EST2900X

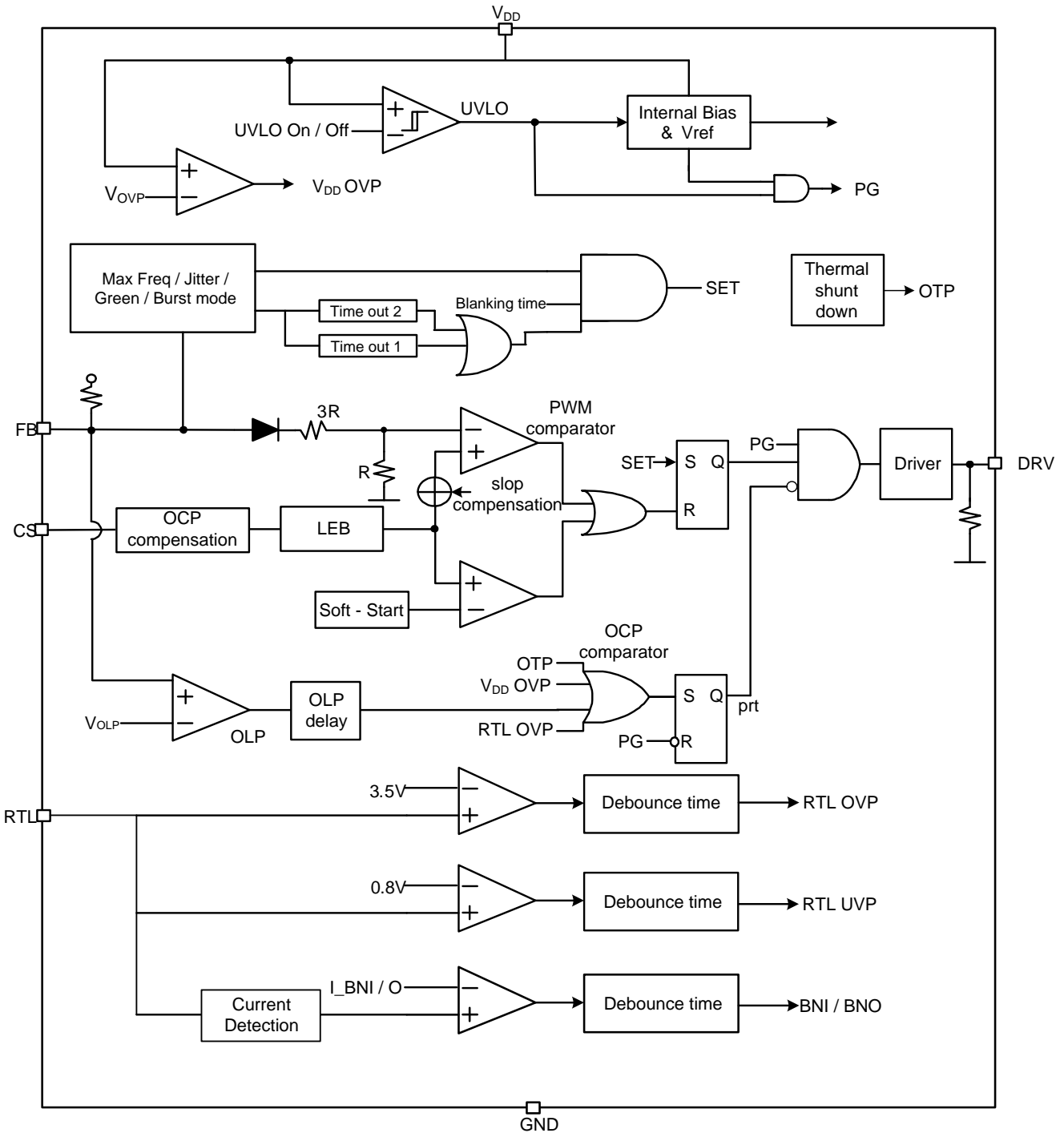


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EST2900X



EST.2900X Green-Mode PWM Flyback (SSR) Controller



Package Information

SOT-23-6L:

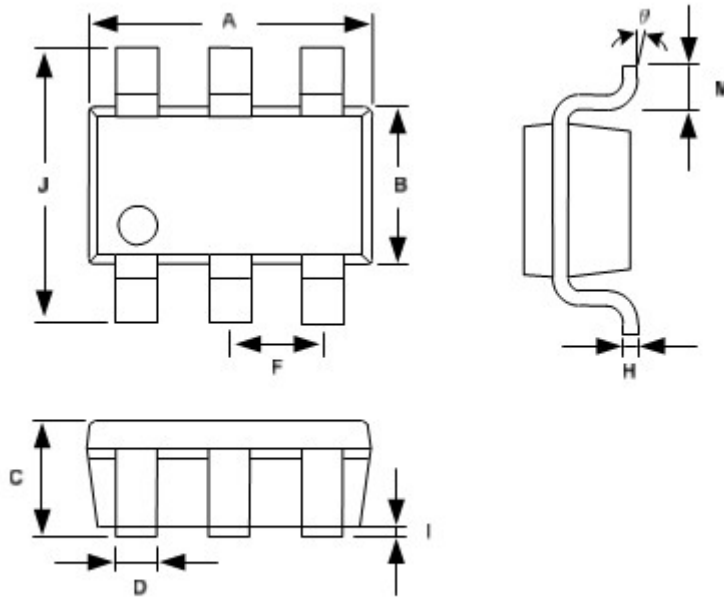


Fig 8

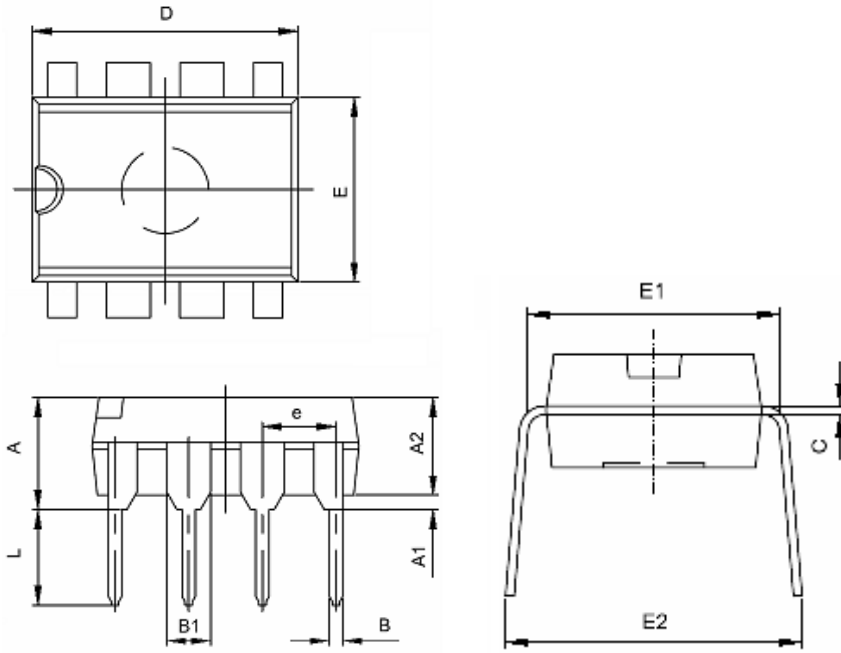
Symbol	Dimension in mm		Dimension in inch	
	MIN.	MAX.	MIN.	MAX.
A	2.692	3.099	0.106	0.122
B	1.397	1.803	0.055	0.071
C	-----	1.450	-----	0.057
D	0.300	0.550	0.012	0.022
F	0.838	1.041	0.033	0.041
H	0.080	0.254	0.003	0.010
I	0.050	0.150	0.002	0.006
J	2.600	3.000	0.102	0.118
M	0.300	0.600	0.012	0.024
θ	0°	10°	0°	10°

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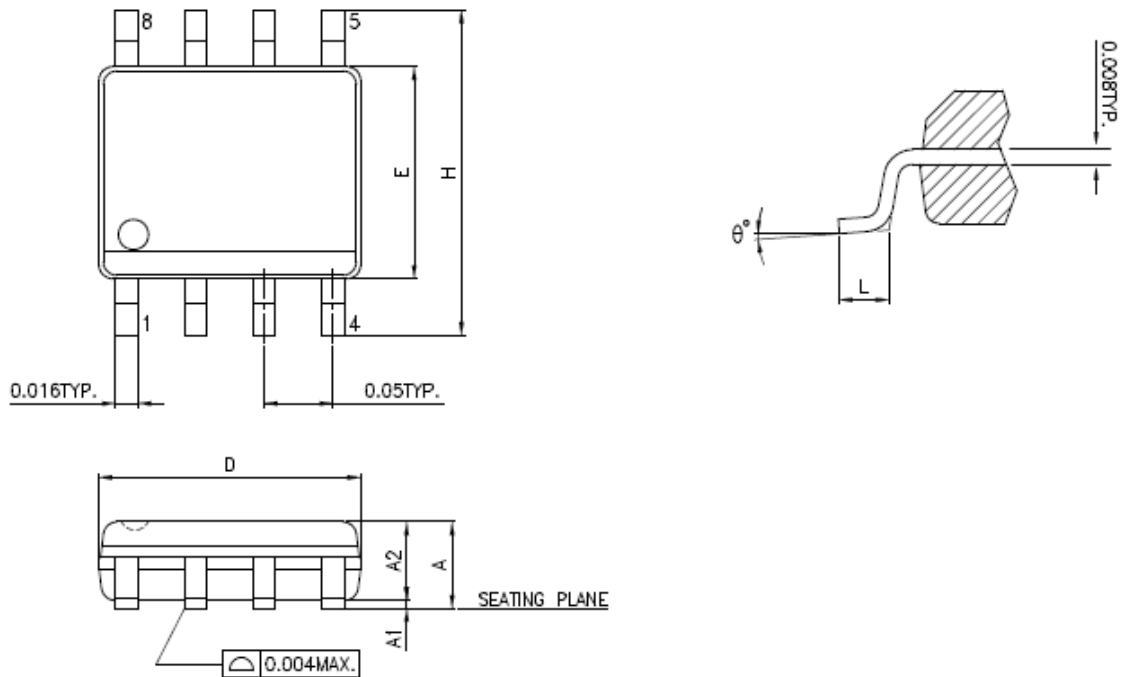
DIP-8 Package



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	0.360	0.560	0.014	0.022
B1	1.524(TYP)		0.060(TYP)	
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	7.620(TYP)		0.300(TYP)	
e	2.540(TYP)		0.100(TYP)	
L	3.000	3.600	0.118	0.142
E2	8.200	9.400	0.323	0.370

SOP-8 Package (mm)

EST.2900X Green-Mode PWM Flyback (SSR) Controller

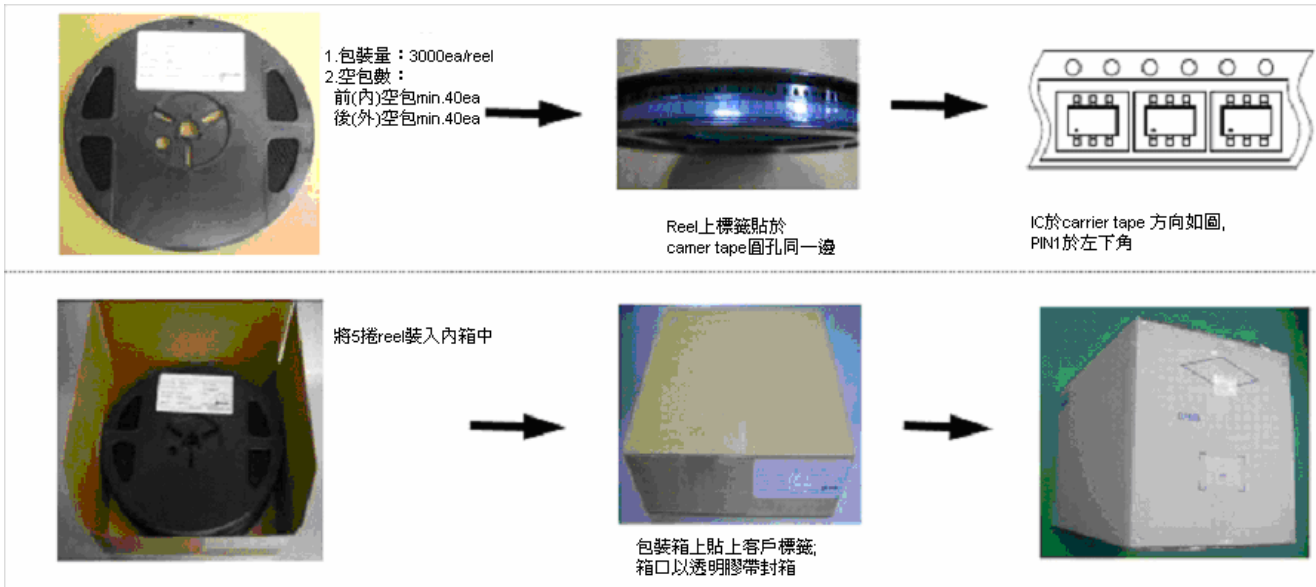


Symbols	Dimensions In Inches			Dimensions In millimeters		
	MIN.	NOR.	MAX.	MIN.	NOR.	MAX.
A	0.050	0.061	0.072	1.270	1.549	1.829
A1	0.000	-----	0.010	0.000	-----	0.254
A2	-----	-----	0.062	-----	-----	1.575
D	0.185	0.193	0.200	4.699	4.902	5.080
E	0.147	0.154	0.160	3.734	3.912	4.064
H	0.225	0.237	0.249	5.715	6.020	6.325
L	0.013	0.033	0.053	0.330	0.838	1.346
θ	0°	4°	8°	0°	4°	8°

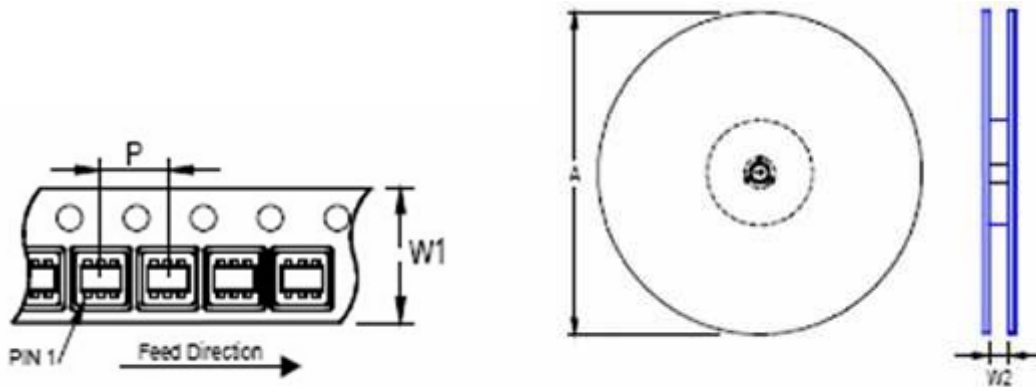
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Shipping packing



Tape Reel Data



Package Type SOT-26	Tape Size (W1) (mm)	Pocket Pitch (P) (mm)	Reel Size (A) (mm)	Reel Width (W2) Min./Max. (mm)	Units Per Reel pcs.
6 Lead	8	4	180	8.4/9.9	3000

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