

General Description

EST2800X is a higher integrated PWM flyback controller. It provides several features to enhance the efficiency of flyback converters, 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. EST2800X also built-in the leading-edge blanking (LEB) of the current sensing and feedback loop to screen the spike noise form 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, EST2800X also provides various protection, such as, OLP (Over Load Protection) and OVP (Over Voltage Protection) to prevent the circuit damage from the abnormal conditions. EST2800X is available in SOT-23-6 and DIP-8, SOP-8 packages

Features

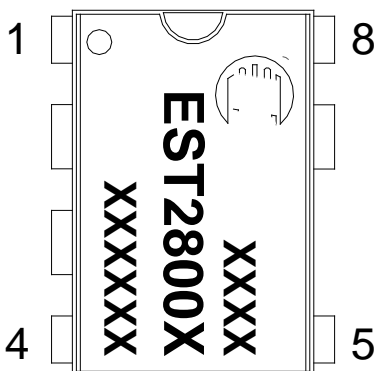
- High voltage CMOS process with excellent ESD protection
- Soft Start Function
- Very low startup current (<20uA)
- Current mode control
- Built-in slope compensation
- LEB (Leading-edge blanking) on CS Pin
- Non-audible-noise Green mode control
- UVLO (Under voltage lockout)
- OVP (Over Voltage Protection)
- OLP (Over load protection)
- BNO (Brownout protection)
- Opto coupler short protection
- Feedback open protection
- High noise immunity
- RoHS compliant and Halogen free

Application

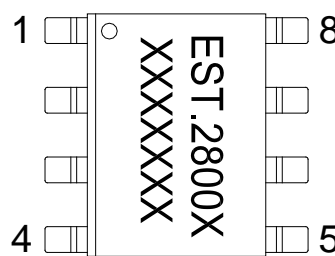
- Switching ac/dc adapter and battery charger
- ATX standby power
- Open frame switching power and CD(R)
- Set-top-boxes(STB) 384XreplacementC

Ordering Information

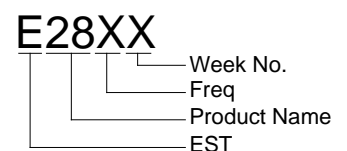
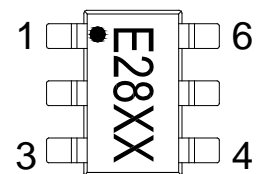
Part Number	Freq.	Protection				
	KHZ	OCP	Vcc _{OVP}	OLP	OTP	BNO
EST2800A	65	Yes	Hiccup	Hiccup	Latch	X
EST2800B	65	Yes	Hiccup	Hiccup	X	Hiccup
EST2800M	100	Yes	Hiccup	Hiccup	Latch	X
EST2800H	135	Yes	Hiccup	Hiccup	Latch	X



DIP-8



SOP-8

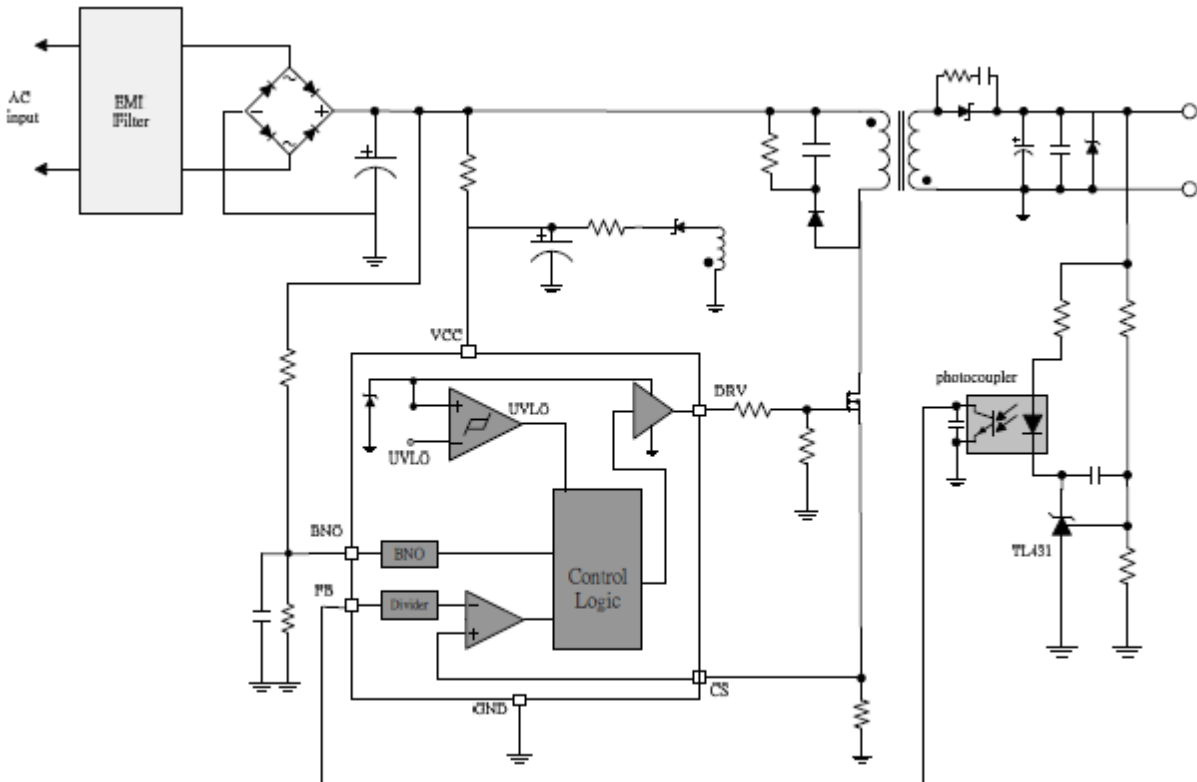


SOT-23-6

Pin Assignments and Package Type

SOT-23-6	DIP-8/SOP-8	NAME Description	Description
1	8	GND	Ground
2	7	FB	Voltage input pin by connecting a photo-coupler
3	5	BNO/OTP	2800A/2800B/2800M/2800H : External Over Temperature Protection, 2800B: Brownout voltage detection
4	4	CS	Current Sense
5	2	VCC	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 Vcc	V _{CC}	-0.3	30	V		
FB,CS, OTP, BNO	V _{FB} , V _{BNO} V _{CS}	-0.3	7	V		
Gate Driver Voltage	V _{DRV}	-0.3	V _{CC} +0.3	V		
Gate Output Current	I _{DRV}		500	mA		
Junction Temperature	T _j	-40	150	°C		
Operation Ambient Temperature	T _{opr}	-40	85	°C		
Storage Temperature	T _{stg}	-55	150	°C		
Package Thermal Resistance	SOT-23-6	θ _{JA}	-	250	°C/W	
	DIP-8		-	100		
	SOP-8		-	160		
Power Dissipation @T _A =85°C	SOT-23-6	P _D	-	0.25	W	
	DIP-8		-	0.2800		
	SOP-8		-	0.85		
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

Recommended Operating Conditions

Parameter Symbol	Symbol	Limit Values		Unit	Remarks
		Min.	Max		
Supply Voltage Vcc	VCC	9.5	25.5	V	
Startup Resistor Value	Rstar	0.6	4	MΩ	
Junction temperature range	T _j	-40	150	°C	
Ambient temperature range	T _{opr}	-40	85	°C	

DC Electrical Characteristics (VCC =15V, Ta=25°C)

Supply Voltage (VCC Pin):

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Startup Current	ICC-ST		8	15	μA	UVLO ON - 0.1V
Operating Current (with 1nF load on DRV pin)	ICC-OP		0.85		mA	VFB=0V
	ICC-OP		2		mA	VFB=2.5V CL=1nF
	ICC-OLP	0.4	0.6		mA	OLP
	ICC-OVP	0.4	0.6		mA	VCC OVP
UVLO (off)	VUVLO-OFF	6.5	7.5	8.5	V	
UVLO (on)	VUVLO-ON	12.5	13.5	14.5	V	
VCC OVP Level	VOVP	26.5	28	29.5	V	
VCC level in Latch off mode (3Meg start-up resistor)	VCC-LHON		6		V	
Latch off mode release voltage	VCC-LHOFF		3.5		V	
Holding current at latch off mode	IDD-LH		20		uA	VCC=5V

Voltage Feedback(FB Pin):

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Short Circuit Current	IZero		0.4		mA	VFB=0V
Open Loop Voltage	VFB-OP		5		V	FB pin open
Green Mode Threshold VFB	VFB-Th		1.55		V	
Burst Mode Hysteresis	VBUR_		0.1		V	

Current Sensing (CS Pin):

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Maximum Input Voltage Threshold	V _{CSH}	0.8	0.85	0.9	V	
Leading Edge Blanking Time	T _{LEB}		220		ns	
Propagation Delay to Output	T _{PD}		100		ns	

Oscillator for Switching Frequency (2800/2800R/2800L/2800B/2800M):

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
PWM Frequency	f _{OSC1}	60	65	70	kHz	
Frequency Jittering Range	f _{jitter}	+/-4	+/-6	+/-8	kHz	
Green Mode frequency	f _{Green}	19	22	25	kHz	
Maximum Duty Cycle	D _{MAX}	70	75	80	%	
Frequency v.s Temp. Stability	f _{DT}		3	5	%	(-40°C ~85°C)
Frequency v.s Voltage Stability	f _{DV}		1	3	%	(VCC=11V-25V)

Oscillator for Switching Frequency (2800H):

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
PWM Frequency	f _{OSC1}	125	135	145	kHz	
Frequency Jittering Range	f _{jitter}	+/-8	+/-12	+/-16	kHz	
Green Mode frequency	f _{Green}	39	46	52	kHz	
Maximum Duty Cycle	D _{MAX}	70	75	80	%	
Frequency v.s Temp. Stability	f _{DT}		3	5	%	(-40°C ~85°C)
Frequency v.s Voltage Stability	f _{DV}		1	3	%	(VCC=11V-25V)

Gate Drive Output (DRV Pin):

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Rising Time	T _R		220		ns	V _{CC} = 15V, C _L = 1nF

Falling Time	T_F		80		ns	$V_{CC} = 15V, C_L = 1nF$
Vclamp	V_{gate}	12	16			$V_{gate} (V_{CC} = 25V)$

OLP (Over Load Protection):

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
OLP Trip Level	V_{FB_OLP}		3.5		V	
OLP Delay Time 1	T_{FB_OLP}		60		ms	2800A/2800R/2800L/2800B/2800M
OLP Delay Time 2	T_{FB_OLP}		30		ms	2800H $F_S = 135kHz$

OTP/BNO Section

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Output current from RTL pin	$I_{OTP/BNO}$	95	100	105	uA	
OTP Turn-off trip leve	V_{OTP}	0.95	1	1.05	V	$T_A = 25^\circ C$
OTP pin de-bounce time 1	T_{DOTP}		100		uS	2800A/2800R/2800L/2800B/2800M
OTP pin de-bounce time 2	T_{DOTP}		48		uS	2800H $F_S = 135kHz$
OTP/BNO pin floating voltage	V_{OTP/BNO_OPEN}	1.8	2.4	3	V	
Brownout Turn-On Trip Level	V_{BNO_ON}	0.95	1	1.05	V	Only for 2800B
Brownout Turn-Off Trip Level	V_{BNO_Off}	0.75	0.8	0.85	V	Only for 2800B
BNO pin de-bounce time	T_{DBNO}		100		uS	Only for 2800B

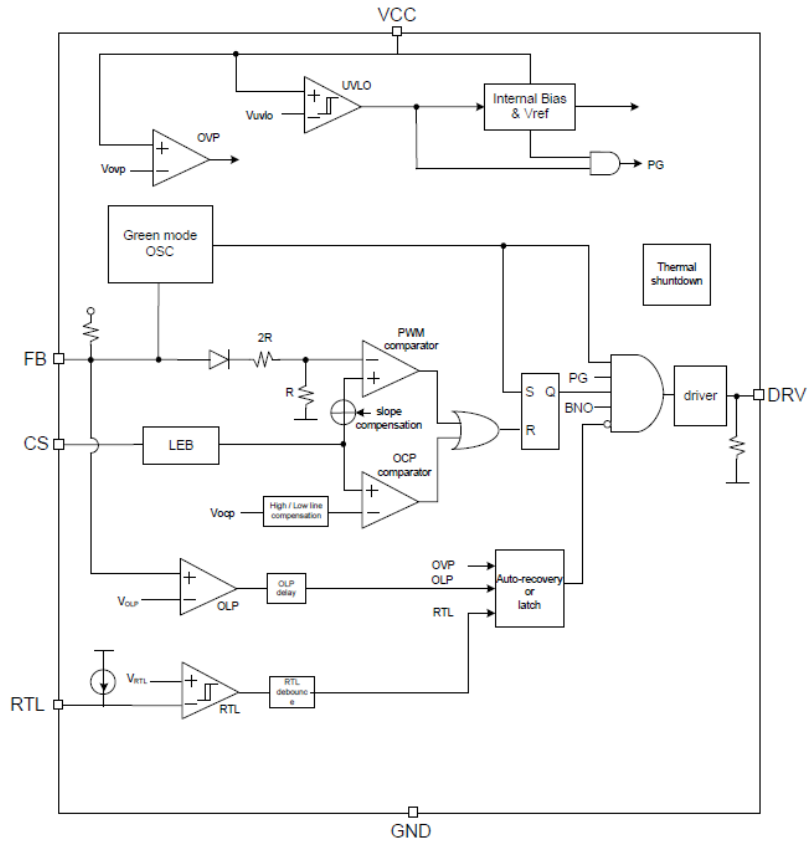
EST2800X

Green-Mode PWM Flyback (SSR) Controller



Block Diagram

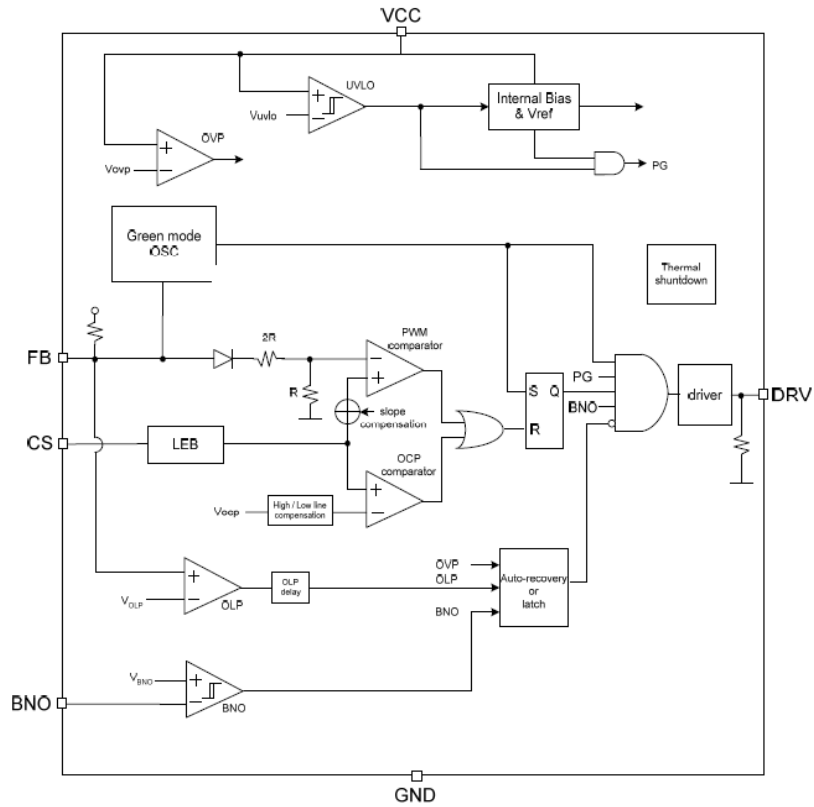
EST2800A/2800M/2800H



EST2800B

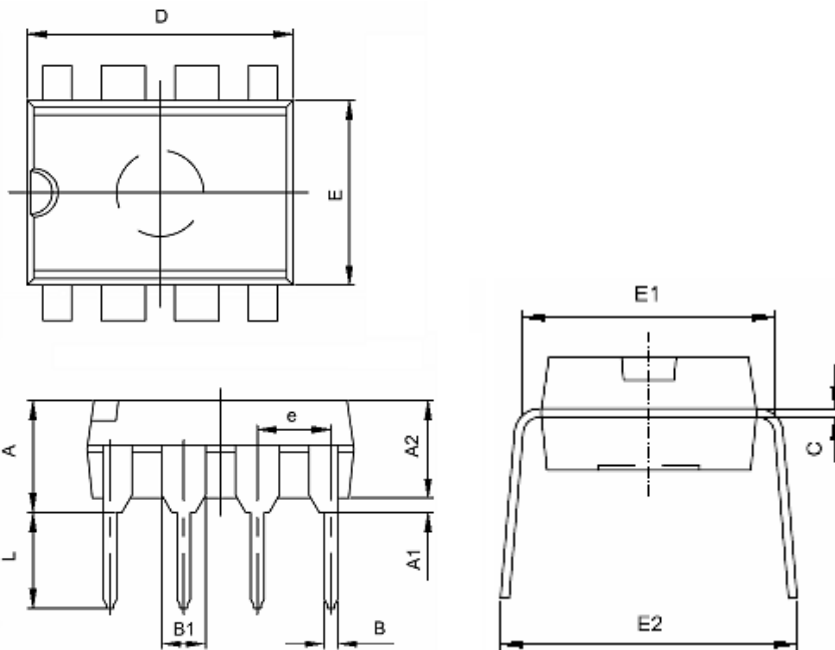
EST2800X

Green-Mode PWM Flyback (SSR) Controller



Package Information

DIP-8 Package



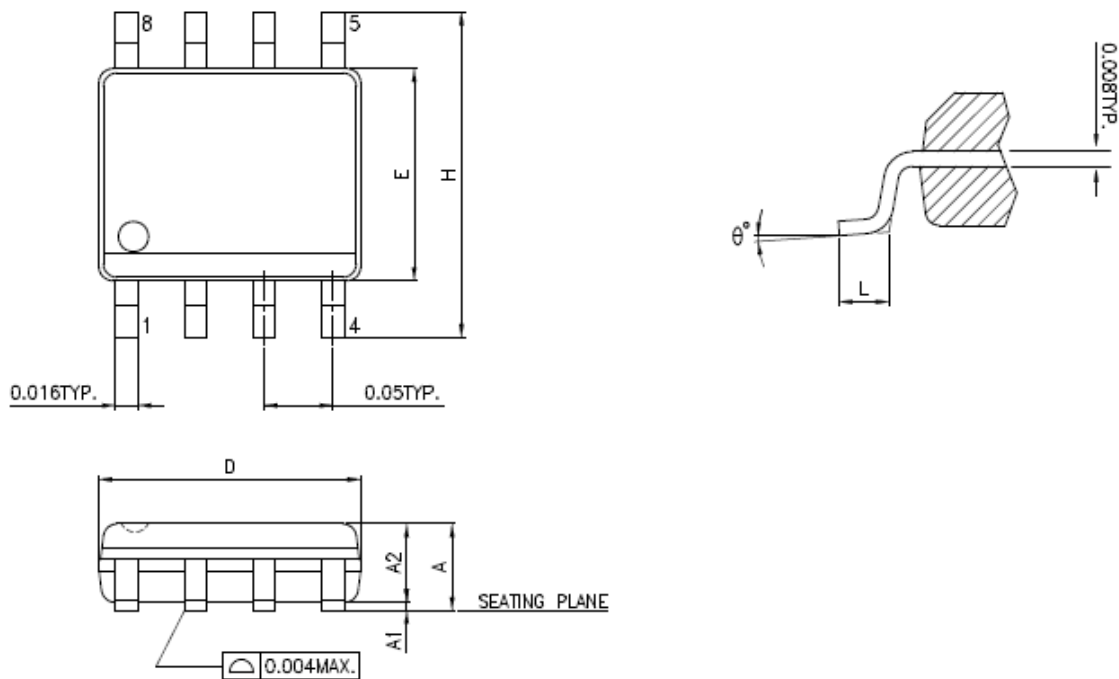
EST2800X

Green-Mode PWM Flyback (SSR) Controller



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)



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°

SOT-23-6L:

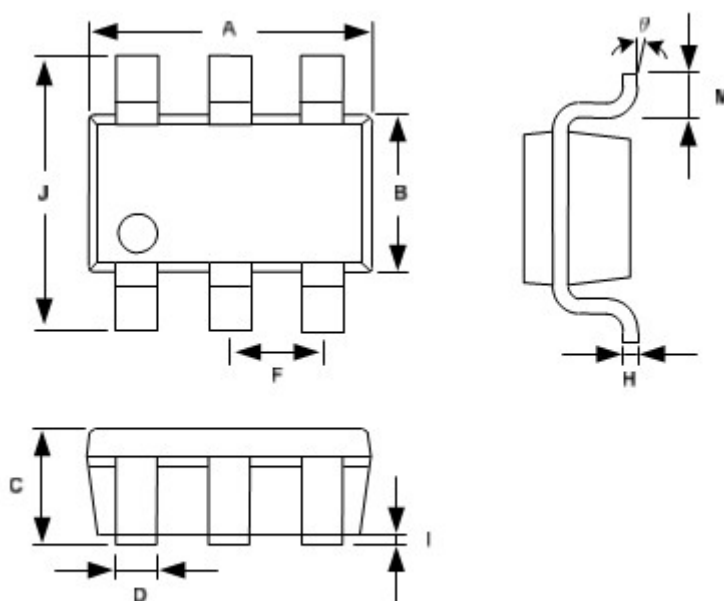


Fig 8

Dimension in mm	Dimension in inch
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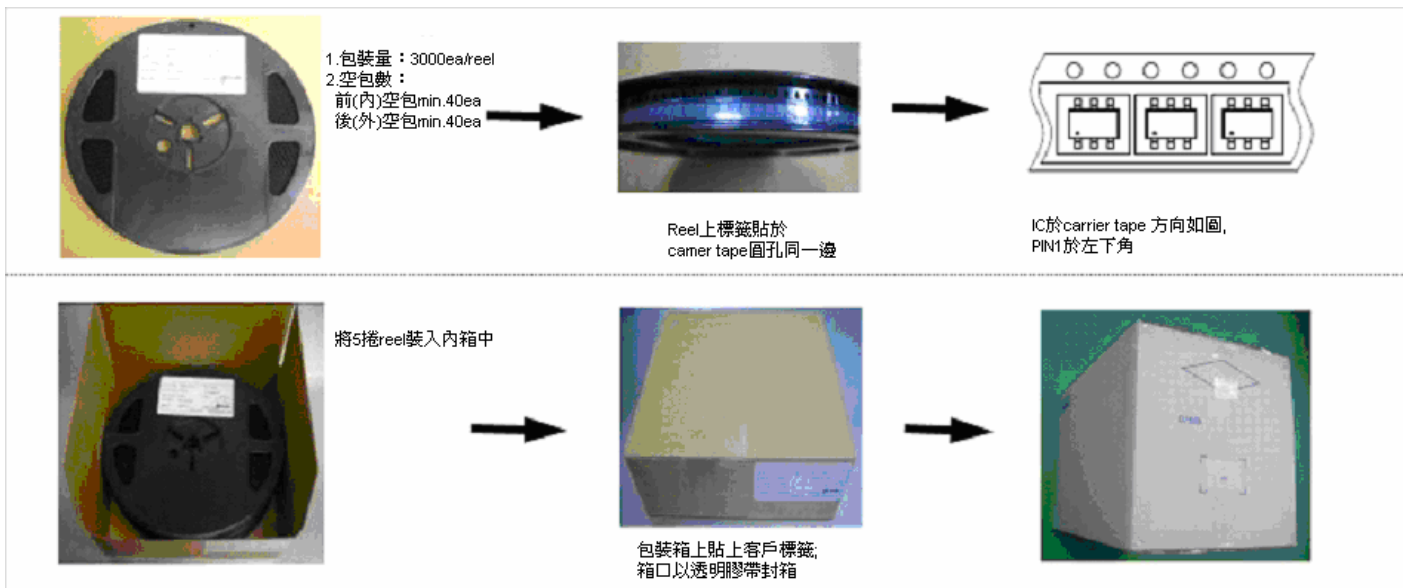
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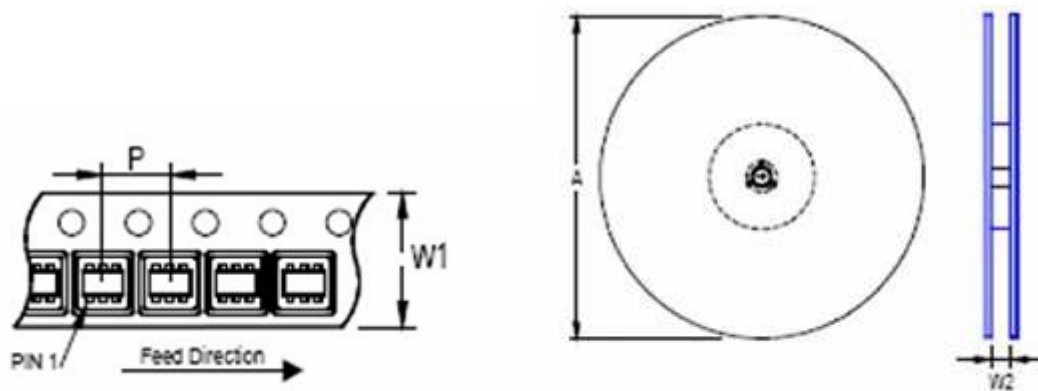


Symbol	MIN.	MAX.	MIN.	MAX.
A	2.692	3.099	0.106	0.122
B	1.397	1.803	0.055	0.071
C	-----	1.450	-----	0.057
D	0.300	0.550	0.012	0.022
F	0.838	1.041	0.033	0.041
H	0.080	0.254	0.003	0.010
I	0.050	0.150	0.002	0.006
J	2.600	3.000	0.102	0.118
M	0.300	0.600	0.012	0.024
θ	0°	10°	0°	10°

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



Update History

Revision	Date	Update
1.00	August 06, 2013	Preliminary version