300mA, Low Noise, Ultra-Fast CMOS LDO Regulator

REV: 02

General Description

The LD6911 is a micropower linear regulator, featuring low-noise, low-dropout and high ripple rejection ratio. The precision of feedback reference voltage is within ±2% and output current is up to 300mA. As well, the LD6911 can be stable with a 1μF output capacitor, which will reduce the board space and cost.

The LD6911 is available in a space saving SOT23-5, SC70-6 or WDFN-6L package.

+Patented

Features

- Shutdown current <1μA
- Ultra-Fast Response in Load Transient
- High PSRR@70dB@1KHz
- Thermal Shutdown and Current Limiting Protection
- V_{OUT} Discharge Function
- Stable with 1μF Output Capacitor
- Soft Start Operation
- Output Voltage: 1.8V to 3.3V (step 0.1V)

Applications

- Battery-Powered Equipment
- Hand-Held Instruments

Typical Application

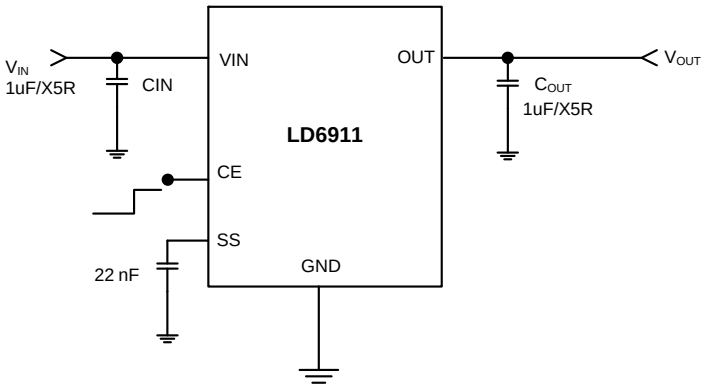
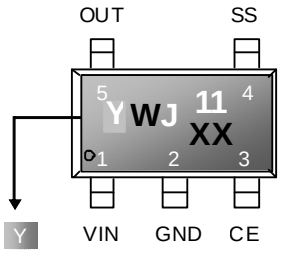


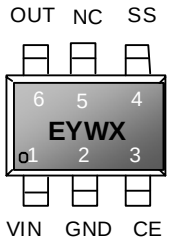
Fig.1 Typical Application Circuit

Pin Configuration

SOT-25 (TOP VIEW)



SC-70-6 (TOP VIEW)

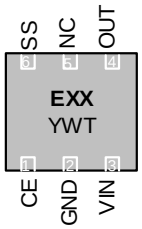


The PB-free package is identified in embossed font

YY, Y : Year code (E: 2005, F: 2006…..)
WW, W: Week code
J11: LD6911 (Product family code)
XX: Output Voltage

E: LD6911
Y: Year code (E: 2005, F: 2006…..)
W: Week code
X: Output Voltage (4~9: 1.8V~2.3V, a~j: 2.4V~3.3V)

WDFN-6L (1.6x1.6)



Y: Year code (D: 2004, E: 2005…..)
W: Week code
E : LD6911
XX: Voltage code

T: Thickness
V: 0.85~0.9mm
W: 0.75mm (normal)
U: 0.55mm
X: 0.4mm

Ordering Information

Part number	Package		TOP MARK	Shipping
LD6911 GL-XX	SOT-25	Green Package	YWJ/11XX	3000 /tape & reel
LD6911 GU-XX	SC70-6	Green Package	EYWX	3000 /tape & reel
LD6911 GDAW-XX	WDFN-6L 1.6 x 1.6	Green Package	EXX	3000 /tape & reel

Note 1: The LD6911 is ROHS compliant/ Green Package.

Note 2: Part number XX: Output voltage, ex: 18:1.8V, …. 33:3.3V (step 0.1V)

Pin Descriptions

SOT23-5

PIN	NAME	FUNCTION
1	VIN	Input Voltage
2	GND	IC GND
3	CE	Chip Enable, High=Enable, Low=Disable
4	SS	This pin combines noise reduction and soft start function. Connect a capacitor to GND to adjust soft start time. Css>1nF is recommended.
5	OUT	Regulator output

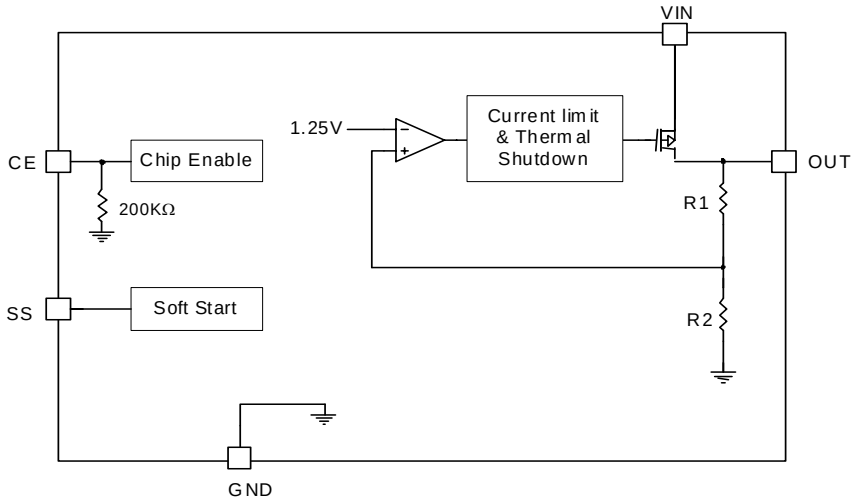
SC70-6

PIN	NAME	FUNCTION
1	VIN	Input Voltage
2	GND	IC GND
3	CE	Chip Enable, High=Enable, Low=Disable
4	SS	This pin combines noise reduction and soft start function. Connect a capacitor to GND to adjust soft start time. Css>1nF is recommended.
5	NC	No connection
6	OUT	Regulator output

WDFN-6L 1.6 x 1.6

PIN	NAME	FUNCTION
1	CE	Chip Enable, High=Enable, Low=Disable
2	GND	IC GND
3	VIN	Input Voltage
4	OUT	Regulator output
5	NC	No connection
6	SS	This pin combines noise reduction and soft start function. Connect a capacitor to GND to adjust soft start time. Css>1nF is recommended.
EP	GND	Exposed pad should be connected to GND plane to provide efficient heat path soldered directly to the PCB.

Block Diagram



Absolute Maximum Ratings

VIN, VOUT Pin	-0.3V~6V
SS, CE Pin	-0.3V~(VIN+0.3)V
Power dissipation SOT23-5@Ta=25°C	400mW
Power dissipation SC70-6@Ta=25°C	300mW
Power dissipation WDFN-6L 1.6×1.6 @TA=25°C	571mW
Operating Temperature Range	-30°C to 85°C
Package Thermal Resistance SOT23-5	250°C/W
Package Thermal Resistance SC70-6	333°C/W
Package Thermal Resistance WDFN-6L 1.6 x 1.6	175°C/W
Storage Temperature Range	-55°C to 125°C
Lead temperature (Soldering, 10sec)	260°C
ESD Level (Human Body Model)	2KV
ESD Level (Machine Model)	200V

Caution:

Stresses beyond the ratings specified in “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

Electrical Characteristics

(T_A = +25°C unless otherwise stated, V_{IN}=V_{OUT}+1V, C_{IN}=C_{OUT}=1μF, Css=22nF)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
INPUT POWER					
Input Voltage		2.8	-	5.5	V
Quiescent Current	V_{IN}>1.2V, I_{OUT}=0mA	-	140	200	μA
Shutdown Supply Current	CE=GND	-		1	μA
Dropt Voltage					
Dropt Voltage	I_{OUT}=200mA, V_{OUT}>2.8V		170	200	mV
	I_{OUT}=300mA, V_{OUT}>2.8V		220	300	mV
Soft Start					
Soft Start Current		-	7.5	-	μA
OUTPUT					
Output Current Limit	R_{LOAD}=1Ω	330	420	-	mA
Output Voltage Accuracy	I_{OUT}=1mA	-2		+2	%
Line Regulation	V_{IN}=Vout+1V, to 5.5V, I_{OUT}=1mA	-	0.05	0.2	%/V
Load Regulation	1mA<I_{OUT}<300mA	-		0.6	%
Ripple Rejection	F=120Hz, EIN=1Vrms, I_{OUT}=10mA	-	70	-	dB
	F=10KHz, EIN=1Vrms, I_{OUT}=10mA	-	60	-	dB
Output Noise Voltage	V_{OUT}=3.1V,100Hz~100KHz I_{OUT}=0mA	-	40	-	μVrms
Discharge Current	CE=High to Low	-	30	-	mA
CE					
Impedance to GND			200		KΩ
CE Input Level	Enable	1.5	-	-	V
	Disable	-	-	0.6	V
THERMAL PROTECTION					
Thermal Shutdown	V_{OUT} short to GND		145		°C
Hysteresis			30		°C

Typical Performance Characteristics

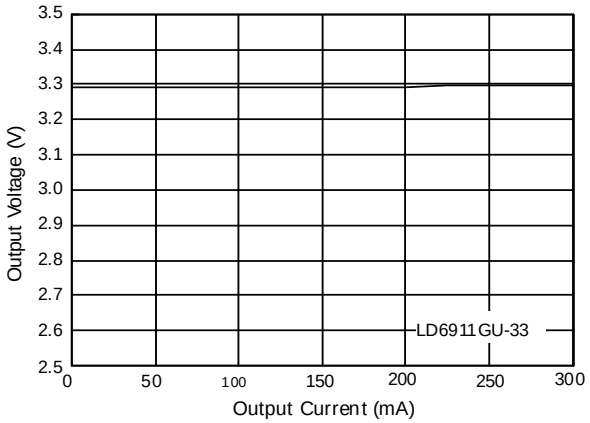


Fig.2 Output Voltage vs. Output Current

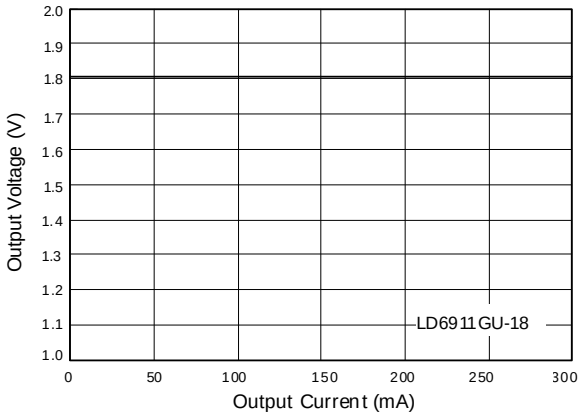


Fig.3 Output Voltage vs. Output Current

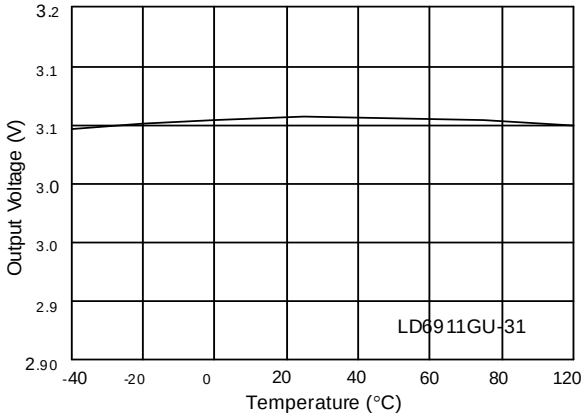


Fig.4 Output Voltage vs. Temperature

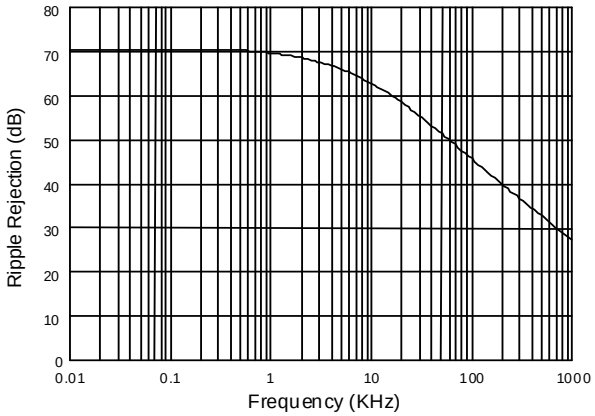


Fig.5 Ripple Rejection vs. Frequency

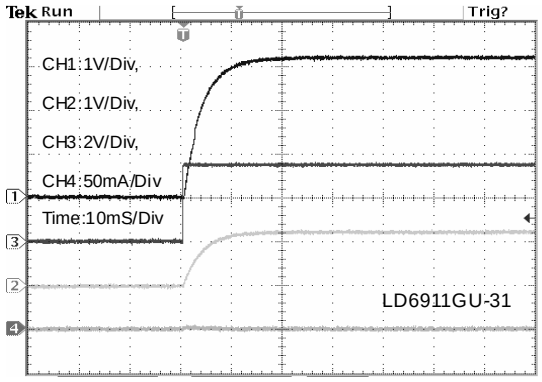


Fig.6 Start Up Waveform Css=22nF

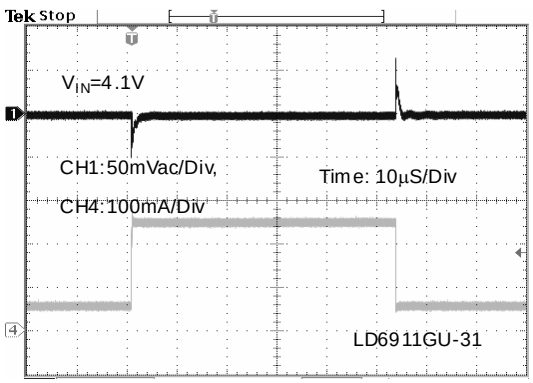


Fig.7 Load Transient Response

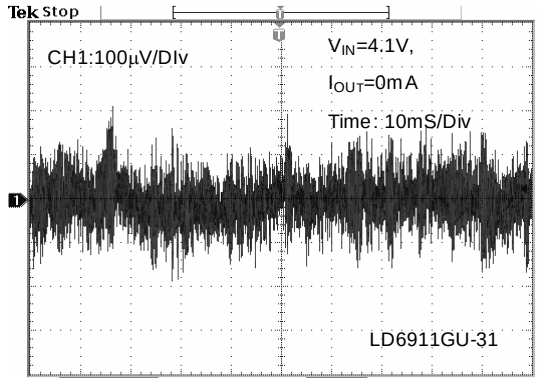


Fig.8 Output Noise

Application Information

Operation Overview

An input capacitor is necessary to place between the input and GND to stabilize V_{IN}. The input capacitor should be larger than 1μF to obtain beneficial effect. Besides, the input capacitor should be located in the distance of 5mm from the VIN pin.

For stable operation, the output capacitor should be larger than 1μF with ESR >25 mΩ. The figure 1 shows the curves of the allowable ESR range as a function of load current for C_{OUT}=1μF.

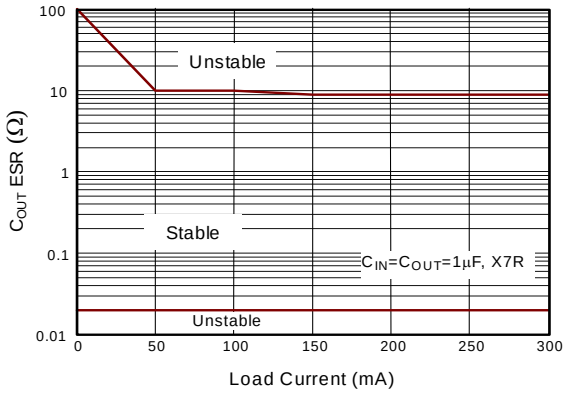


Fig. 7 Region of Stable C_{OUT} ESR vs. Load Current

Output capacitor of larger capacitance can suppress noise and improve load transient response, stability and PSRR. The output capacitor should be located in the distance of 5mm from the OUT pin.

X5R or X7R types of capacitors are recommended for the input and output capacitors.

Current Limit

Output current is limited to 420mA (typical). When current limit engages, the output voltage scales back linearly until the overcurrent condition come to an end. Take care not to exceed the power dispassion ratings of the package.

Thermal Consideration

The thermal sensor would disable the pass transistor as soon as it detects the junction temperature over the limit of 145°C. It remains disable until it's cooled down to about 30°C (typ.). For continuous operation, it's not recommended to operate while the maximum junction temperature is above 125°C. The maximum power dissipation is determined according to the following equation.

$$P_{D(MAX)} = \frac{(T_{J(MAX)} - T_A)}{\theta_{JA}}$$

θ_{JA}: Package Thermal Resistance

The maximum power dispassion at Ta=25°C can be obtained by above formula.

P_{DMAX}=(125°C-25°C)/250=400mW

……(SOT23/ SOT25 package)

P_{DMAX}=(125°C-25°C)/333=300mW

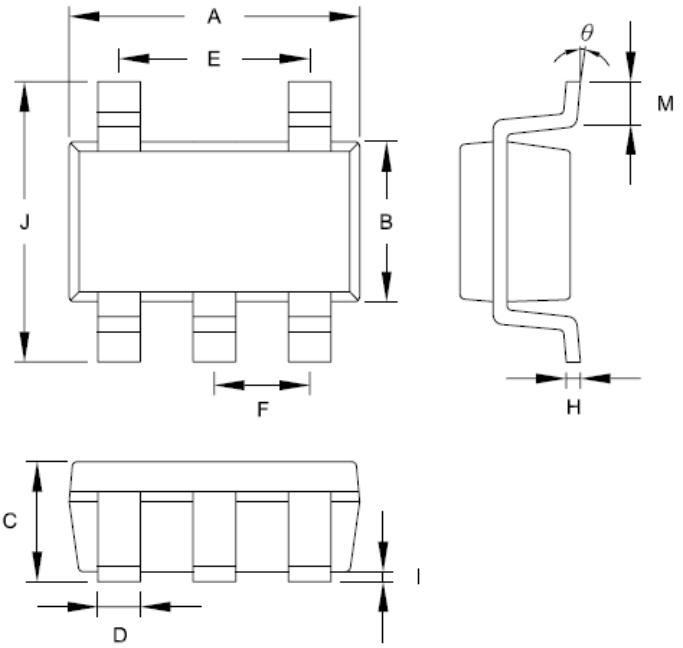
……..(SC70-3/ SC70-6 package)

P_{DMAX}=(125°C-25°C)/175=571mW

……..(WDFN-6L 1.6x1.6 package)

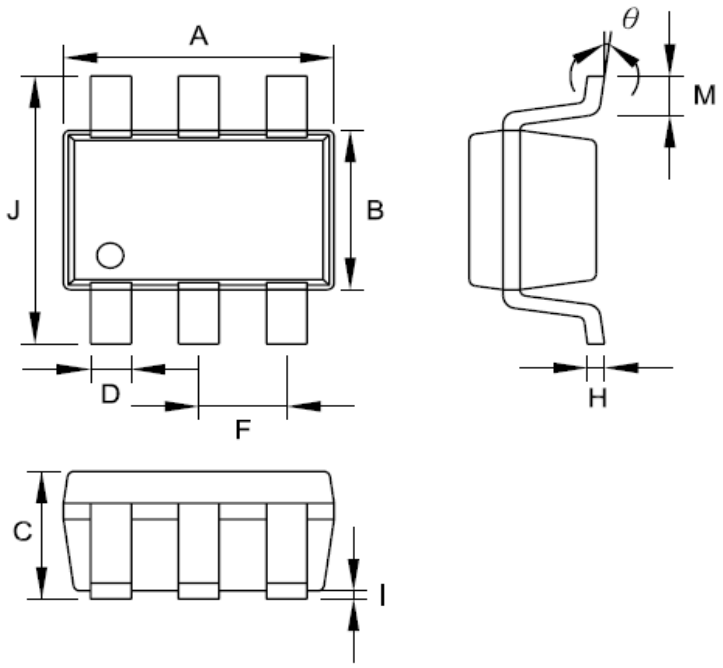
Package Information

SOT-25



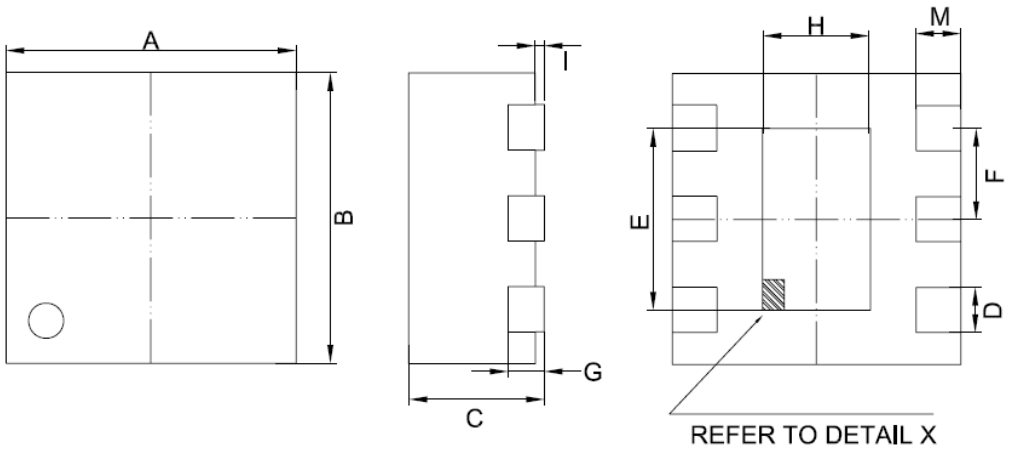
Symbol	Dimension in Millimeters		Dimensions in Inches	
	Min	Max	Min	Max
A	2.692	3.099	0.106	0.122
B	1.397	1.803	0.055	0.071
C	---	1.450	---	0.057
D	0.300	0.500	0.012	0.020
E	1.90 TYP		0.074 TYP	
F	0.95 TYP		0.037 TYP	
H	0.080	0.254	0.003	0.010
I	0.050	0.150	0.002	0.006
J	2.600	3.000	0.102	0.118
M	0.300	0.600	0.012	0.024
θ	0°	10°	0°	10°

SC70-6



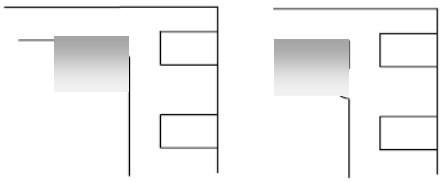
Symbol	Dimension in Millimeters		Dimensions in Inches	
	Min	Max	Min	Max
A	1.800	2.200	0.071	0.087
B	1.150	1.350	0.045	0.053
C	0.800	1.100	0.031	0.043
D	0.150	0.400	0.006	0.016
F	0.65 TYP		0.026 TYP	
H	0.080	0.250	0.003	0.010
I	0.000	0.100	0.000	0.004
J	1.800	2.400	0.071	0.094
M	0.100	0.460	0.004	0.018
θ	0°	8°	0°	8°

WDFN-6L (1.6x1.6)



DETAIL X

THE CONFIGURATION OF THE PIN 1 IDENTIFIER IS OPTIONAL AS SHOWN HERE.

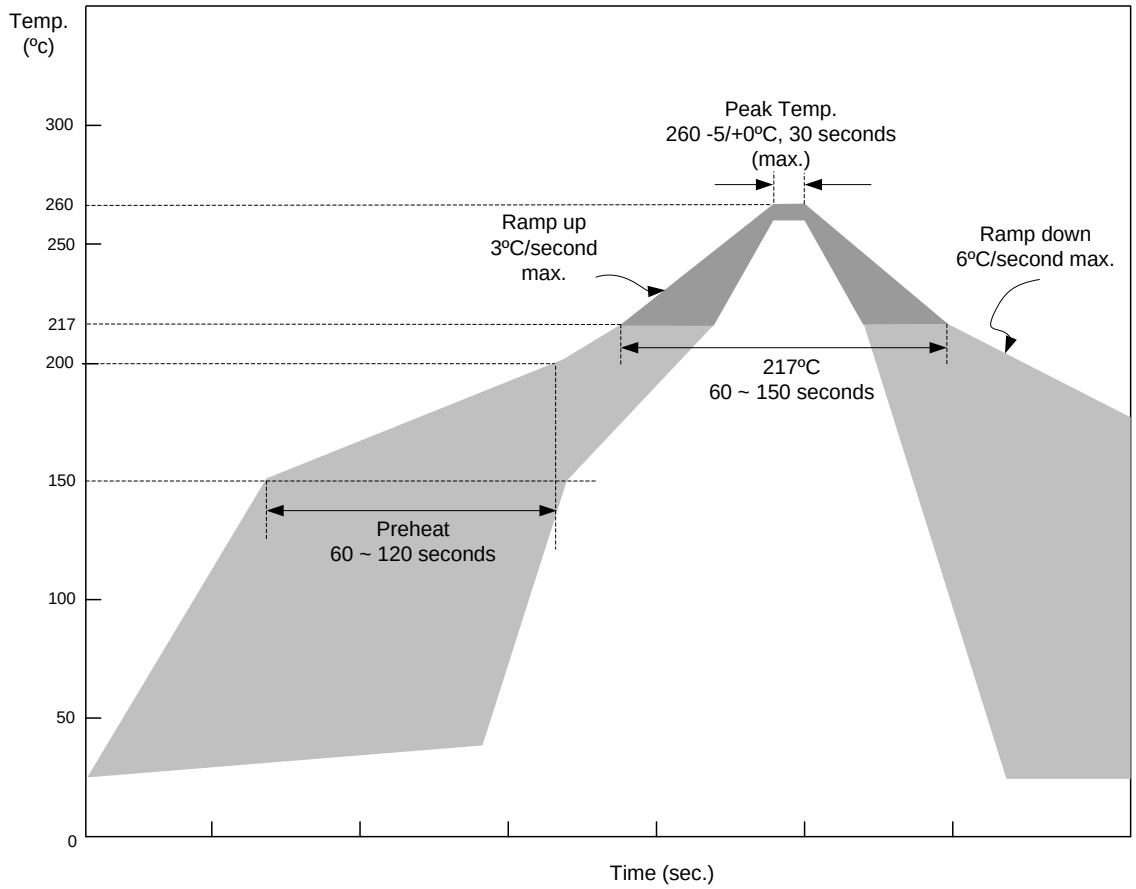


Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min.	Max.	Min.	Max.
A	1.500	1.700	0.059	0.067
B	1.500	1.700	0.059	0.067
C	0.700	0.800	0.028	0.031
D	0.200	0.300	0.008	0.012
E	0.900	1.100	0.035	0.043
F	0.500 TYP		0.019 TYP	
G	0.203 REF		0.008 REF	
H	0.500	0.700	0.020	0.028
I	0.000	0.050	0.000	0.002
M	0.200	0.300	0.008	0.012

Important Notice

Leadtrend Technology Corp. reserves the right to make changes or corrections to its products at any time without notice. Customers should verify the datasheets are current and complete before placing order.

IR Profile for SMD Devices



Item	Average Ramp-up Rate	Pre-heat (150 ~ 200°C)	Time Maintained Above 217°C	Peak Temp.	Ramp-down Rate
Required	3°C(max) /sec	60~120 sec	60~150 seconds	260 +0/-5°C 30 seconds	6°C (max) /sec

Revision History

Rev.	Date	Change Notice
00	1/1/2007	Original Specification.
00a	10/8/2007	Marking
01	11/19/2008	Package option: WDFN-6L
02	6/3/2009	Additional waveforms for “output voltage vs. output current.”