Ultra-Low IQ 650nA, 400mA Output Current, Low-Dropout Regulator

Features

- **Operating Voltage: 1.6V-7.0V**
- **Ultra-Low Power Consumption: 650nA(Type)**
- **Output Voltage Accuracy: 1%**
- **Output Voltage: 1.0V,1.2V,1.5V,1.8V,2.5V,2.8V,3.0V,3.3V,4.0V,4.2V and 5.0V Optional Fixed**
- **Low Dropout Voltage:450mV@300mA/3.3V**
- **Maximum Output Current: 400mA**
- **Low Temperature Coefficient**
- **Current Limiting Protections**
- **Short Circuit Protections**
- **Stable with 1uF Output Capacitor**
- **Lead Free and Green Device Available (RoHS Compliant), Available in SOT23, SOT23-5L, SOT89-3 and DFN1x1-4L Packages**

Applications

- **Wearables electronics**
- **Battery-Powered Devices**
- **Reference Voltage Sources**
- **Building Security & Video Surveillance Devices**
- **Thermostat, Smoke and heat detectors**

General Description

The LTK63310 is an ultra-low 650nA quiescent current low-dropout linear regulator (LDO) that can source maximum 400mA with good transient performance.

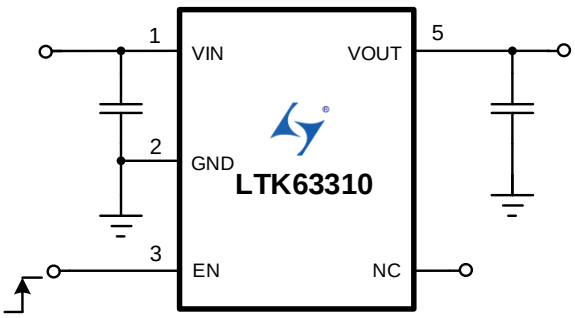
The LTK63310 is designed specifically for applications where very-low quiescent current is a critical parameter. This device maintains low IQ consumption even in dropout mode to further increase the battery life.

The LTK63310 has an output voltage from 1.0V, 1.2V, 1.5V, 1.8V, 2.5V, 2.8V, 3.0V, 3.3V, 3.6V, 4.0V, 4.2V and 5.0V or other voltages applicable as customer specified.

The LTK63310 has the current limiter's fold-back circuit operates as a short circuit protection as well as the output current limiter for the output pins.

The LTK63310 is available in SOT23, SOT23-5, SOT89-3 and DFN1x1-4L packages.

Typical Application Circuit



Note: EN must NOT be floating

Order and Marking Information

LTK63310 □□□□-□□
- Voltage
- Packge Code

Packge Code
S233: SOT23 S235: SOT23-5L
S893: SOT89-3 D114: DFN1X1-4L
Voltage (presented by digit)
10: 1.0V 12: 1.2V 15: 1.5V 25: 2.5V 28: 2.8V
30: 3.0V 33: 3.3V 36: 3.6V 40: 4.0V 42: 4.2V 50: 5.2V

S235: 63310 / ● XXXY
Y - Voltage(alphabet)
X - Data Code

S233: 63XX / ●
X - Voltage(digit)

S893: 63310Y / ● XXXX
Y - Voltage(alphabet)
X - Data Code

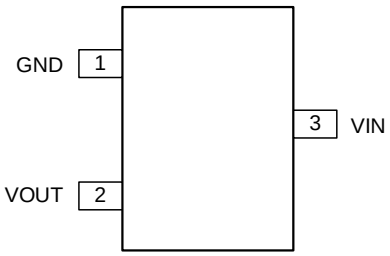
D114: XX / XY
X - Data Code
Y - Voltage(alphabet)

Voltage (presented by alphabet)

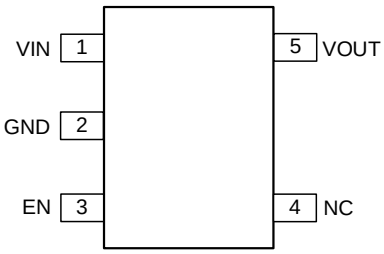
1.0V	1.2V	1.5V	1.8V	2.5V	2.8V	3.0V	3.3V	3.6V	4.0V	4.2V	5.0V
A	B	C	D	G	H	J	L	M	P	Q	S

Note: LTKCHIP lead-free products contain molding compounds/die attach materials and 100% matte tin plate termination finish, which are fully compliant with RoHS and compatible with both SnPb and lead-free soldering operations. LTKCHIP 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.
LTKCHIP reserves the right to make changes to improve reliability or manufacturability without notice and advise customers to obtain the latest version of relevant information to verify before placing orders.

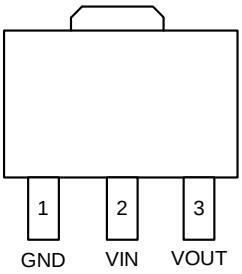
Pin Configuration



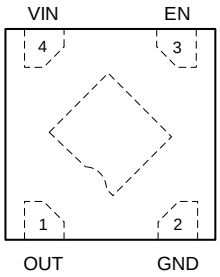
SOT23



SOT23-5L



SOT89-3

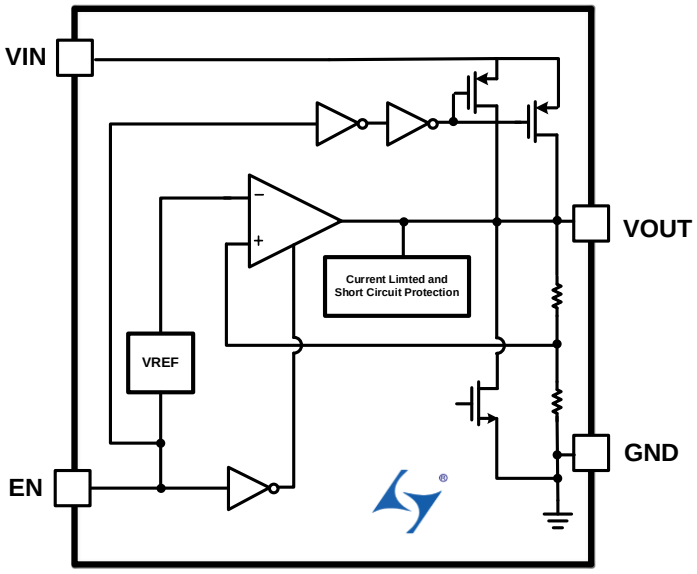


DFN1X1-4L

Pin Function Description

PIN Number				SYMBOL	DESCTRIPTION
SOT23	SOT23-5L	SOT89-3	DFN1X1-4L		
1	1	2	4	VIN	Power Supply Input
12	2	1	2, EP	GND	Ground
--	3	--	3	EN	Chip Enable
--	4	--	--	NC	Not Connected
2	5	3	1	VOUT	Output

Block Diagram



Absolute Maximum Ratings (Note1)

Symbol	Parameter		Rating	Unit
Vin	Supply Voltage (VDD to GND)		-0.3 to 9.0	V
V_{out}	VOUT Pin Voltage		-0.3 to (Vin+0.3)	
P_d	Maximum Power Dissipation	SOT23-5	400	mW
		DFN1X1-4L	450	
		SOT23	350	
		SOT89-3	550	
PTR	Package Thermal Resistance θ_{JA}	SOT23-5	285	°C/W
		DFN1X1-4L	280	
		SOT23	300	
		SOT89-3	175	
T_J	Junction Temperature Range		-40 to +150	°C
T_{STG}	Storage Temperature Range		-40 to +150	
T_{SDR}	Soldering Temperature Range		260	

Note 1. Absolute Maximum Ratings are those values beyond which the life of a device may be impaired. Exposure to absolute maximum rating conditions for extended periods may affect device reliability. Operation above these absolute maximum ratings may cause degradation or permanent damage to the devices. These are stress ratings only and do not necessarily imply functional operation below these limits

Recommended Operating Conditions

Symbol	Items	Value	Unit
Vin	Vin Supply Voltage	1.6 to 7.0	V
T_{OPT}	Operating Temperature	-40 to +85	°C

Electrical Characteristics

V_{IN}= V_{OUT} +1V, V_{OUT} =3.3V, C_{IN}= C_{OUT}=1uF, T_A= 25°C (unless otherwise specified)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
V_{IN}	Input Voltage		1.6		7	V
V_{UVLO}	UVLO threshold			1.2		V
V_{OUT}	Output Accuracy	I_{OUT}=1mA	-1.0		1.0	%
I_{LIM}	Current Limit	V_{IN}=5V	410	530		mA
I_Q	Quiescent Current	V_{IN}=5V, V_{EN}=5V, No Load		0.65	1	μA
I_{SHD}	Shutdown Current	V_{EN}=0V			0.1	μA
V_{DROP}	Dropout Voltage	I_{OUT}=100mA		100		mV
		I_{OUT}=300mA		450		
		I_{OUT}=400mA		850		
S_{LINE}	Line Regulation	V_{IN}= V_{OUT} +0.5V to 5.5V, I_{OUT}=1mA		0.15	0.3	%/V
S_{LOAD}	Load Regulation	V_{IN}= V_{OUT} +1V, 1mA< I_{OUT} >400mA		0.0035	0.006	%/mA
I_{SHORT}	Short Current	V_{OUT}=0V		90		mA
V_{ENH}	EN High Voltage	V_{IN}= V_{OUT} +0.5V to 5.5V, I_{OUT}=1mA	1.5			V
V_{ENL}	EN Low Voltage				0.8	
T_{START}	Startup Time	V_{EN} low to high to V_{OUT} =95%		800		μS
PSRR	Power Supply Rejection Ratio	I_{OUT}=10mA, Freq=217Hz		53		dB
		I_{OUT}=10mA, Freq=1kHz		50		
		I_{OUT}=10mA, Freq=10kHz		48		
V_{NOISE}	Output Noise Voltage	Freq from 10Hz to 100KHz,		100		μV_{RMS}
T_C	Output Voltage Temperature Coefficient	I_{OUT}=10mA, T_A= -40 to 85°C		0.5		mV/°C
T_{SD}	Overheat Protection	Shut down when temperature increasing		150		°C

Characteristic curve test condition (TA=25℃)

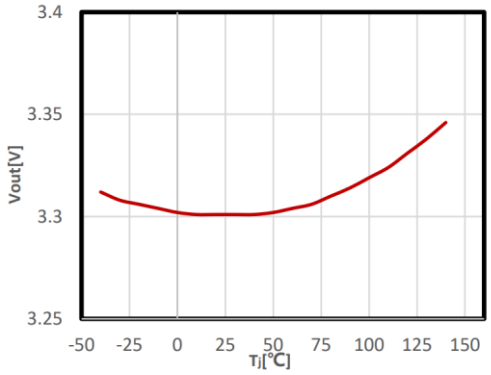


Figure 1. V_{OUT} vs V_{IN}=5V, I_{OUT}=10mA

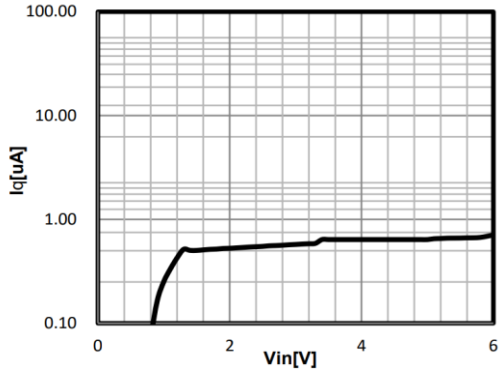


Figure 2. I_Q vs V_{IN}

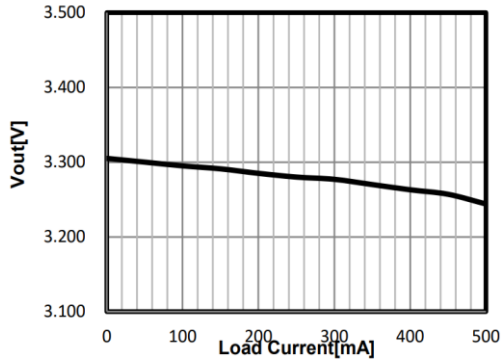


Figure 3. V_{OUT} vs Load Current

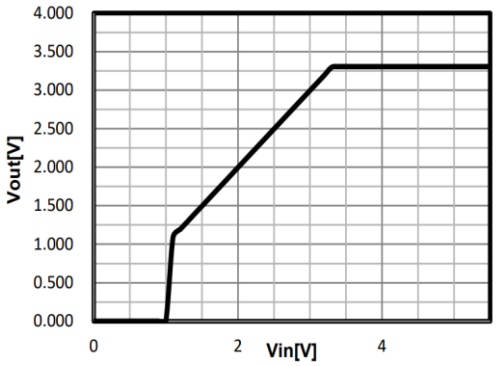


Figure 4. V_{OUT} vs V_{IN}

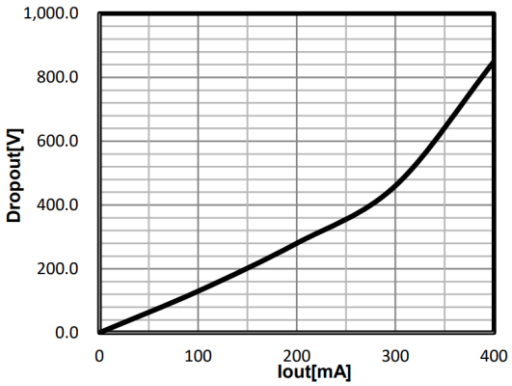


Figure 5. Dropout Voltage vs Load Current

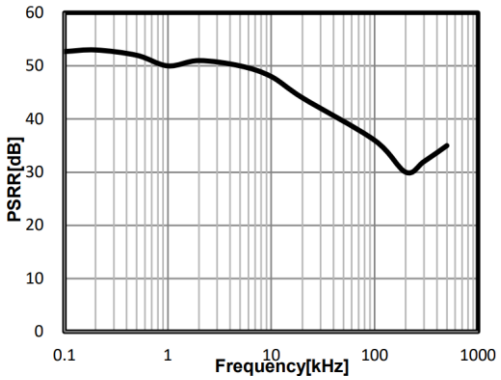


Figure 6. PSRR

Application Information

Input Capacitor Selection

The input capacitors used with the LTK63310 must be carefully selected for regulator stability and performance. Using a capacitor whose value is >1uF one the LTK63310 input and amount of capacitance can be increased without limit. The input capacitor must be located no more than 0.5-inch distance from the input pin of the IC and retured to a clean analog ground. Any good quality ceramic or tantalum can be used for this capacitor. The capacitor with larger value and lower ESR provides better PSRR and line-transient response.

Output Capacitor Selection

The LTK63310 requires surface-mount multi-layer ceramic capacitors. These capacitors are small, inexpensive, and have very low ESR (<15ohm typical). Tantalum capacitors, and aluminum electrolytic capacitors generally are not recommended for use with LTK63310 due to their high ESR compared to ceramic capacitors.

For most applications, ceramic capacitors with an X7R or X5R temperature characteristic are preferred for use with the LTK63310. These capacitors have tight capacitance tolerance(as good as ±10%) and hold their value over temperature (X7R: ±15% over -55°C to 125°C;X5R: ±15% over -55°C to 85°C)

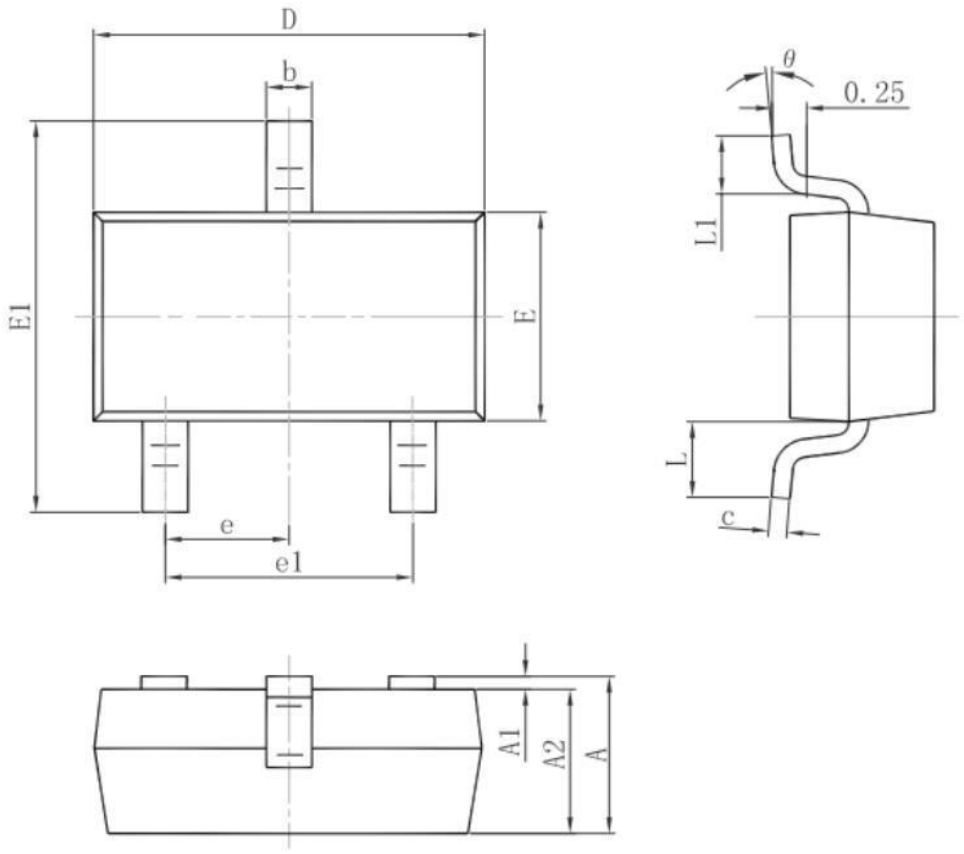
Output capacitor of larger capacitance can reduce noise and improve load transient response, stability, and PSRR. The ouput capacitor should be located no more than 0.5-inch distance from the Vout Pin of the LTK63310 and returned to a clean analog ground.

Layout Considerations

To improve AC performance such as PSRR, output noise, and transient response, it is recommended that the PCB be designed with separate ground planes for Vin and Vout, with each ground plane connected only at the GND pin of the device. A true ground plane and short connections to all capacitors will improve performance and ensure proper regulation under all conditions.

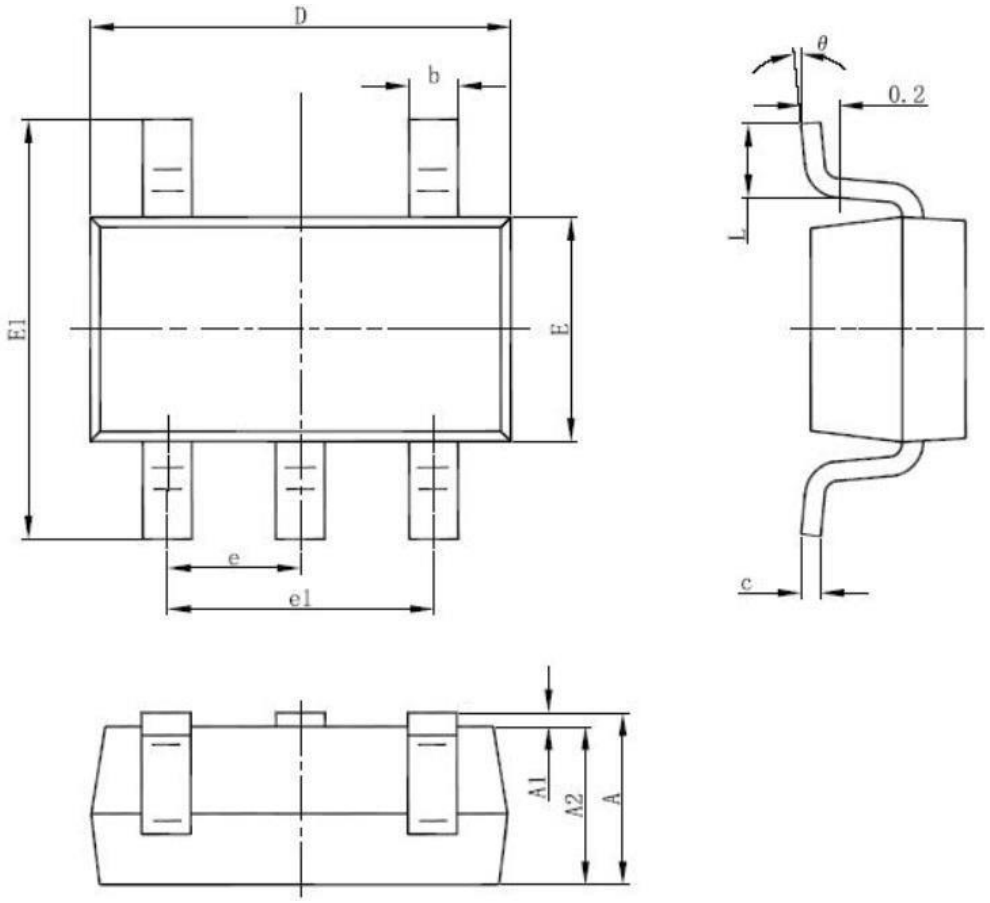
Packaging Information

SOT23



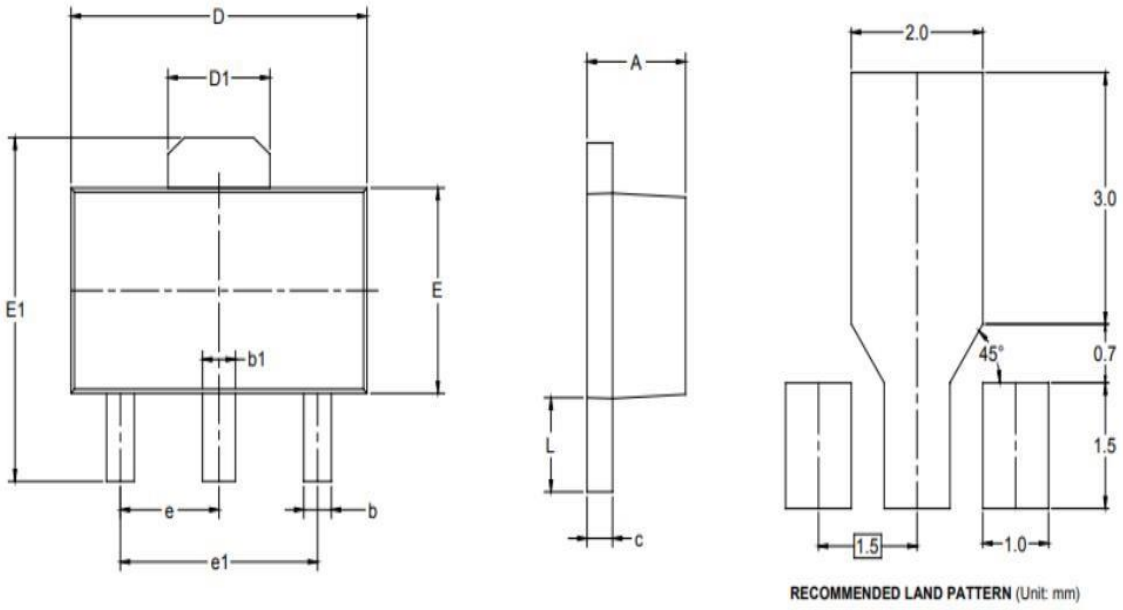
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.900	1.150	0.035	0.045
A1	0.000	0.100	0.000	0.004
A2	0.900	1.050	0.035	0.041
b	0.300	0.500	0.012	0.020
c	0.080	0.150	0.003	0.006
D	2.800	3.000	0.110	0.118
E	1.200	1.400	0.047	0.055
E1	2.250	2.550	0.089	0.100
e	0.950 TYP.		0.037 TYP.	
e1	1.800	2.000	0.071	0.079
L	0.550 REF.		0.022 REF.	
L1	0.300	0.500	0.012	0.020
θ	0°	8°	0°	8°

SOT23-5L



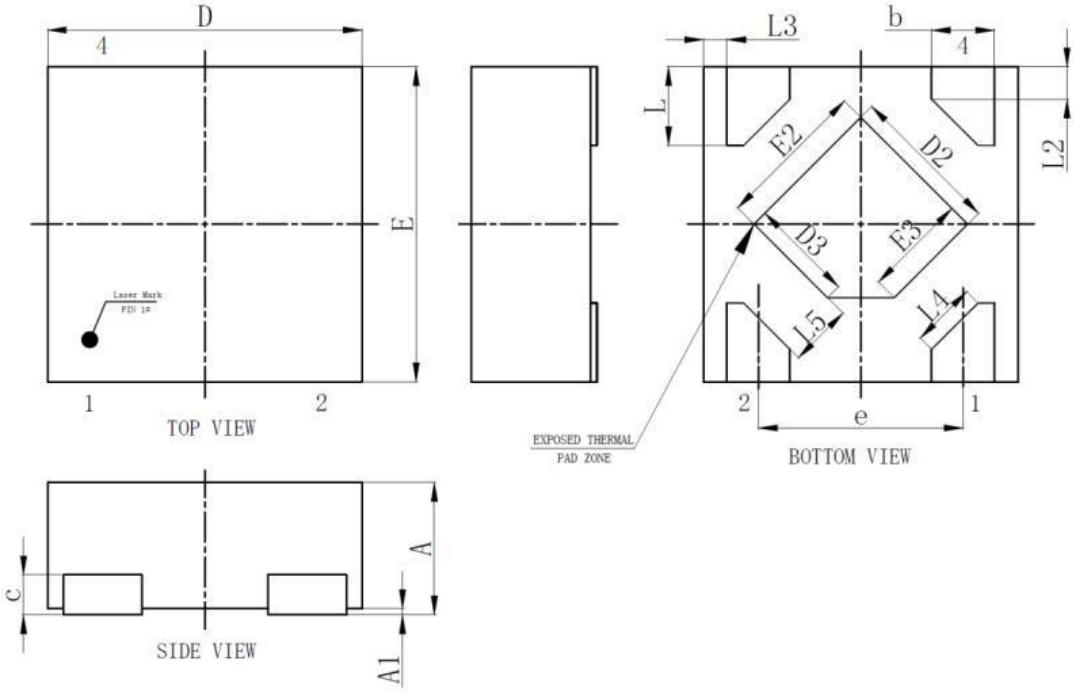
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)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

SOT89-3



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.400	1.600	0.055	0.063
b	0.320	0.520	0.013	0.020
b1	0.400	0.580	0.016	0.023
c	0.350	0.440	0.014	0.017
D	4.400	4.600	0.173	0.181
D1	1.550 REF		0.061 REF	
E	2.300	2.600	0.091	0.102
E1	3.940	4.250	0.155	0.167
e	1.500 TYP		0.060 TYP	
e1	3.000 TYP		0.118 TYP	
L	0.900	1.200	0.035	0.047

DFN1X1-4L



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	0. 35	-	0. 40
A1	0. 00	0.02	0. 05
b	0. 15	0. 20	0. 25
c	0. 127REF		
D	0. 95	1. 00	1. 05
D2	0. 38	0. 48	0. 58
D3	0. 23	0. 33	0. 43
e	0. 65BSC		
E	0. 95	1. 00	1. 05
E2	0. 38	0. 48	0. 58
E3	0. 23	0. 33	0. 43
L	0. 20	0.25	0. 30
L2	0.103REF		
L3	0.075REF		
L4	0.208REF		
L5	0.200REF		