Features

- Wide Input Voltage Range: Up to 24V
- Low Power Consumption: 2.0uA
- Output Voltage 1.5V~5.0V
- Maximum Output Current: 500mA
- High PSRR: 65dB (Typ.) at 1KHz
- High Accuracy:±2%(Typ.)
- Low Dropout Voltage：200mV @100mA
- Current Limiter
- Short Circuit Protection
- Over Temperature Protection

Application

- Battery-powered equipment
- Audio/Video/Radio equipment
- Laptop，Palmtops and PDAS
- Cameras
- Cellular and Smart phones

Description

The HT78RXX are a group of positive voltage regulators manufactured by CMOS technologies with a wide input voltage range(up to 24V), low power consumption (2.0uA), low dropout linear regulator which is able to provide 500mA output current. They are available with several fixed output voltages ranging from 1.5V to 5.0V. It is suitable for battery powered equipment with longer application life. CMOS technology ensures low voltage drop and low quiescent current. Also, it has built in current limiter, over temperature protection, short circuit protection function. The device is available in SOT-23、SOT-23-3L、SOT-23-5Land SOT-89 package.

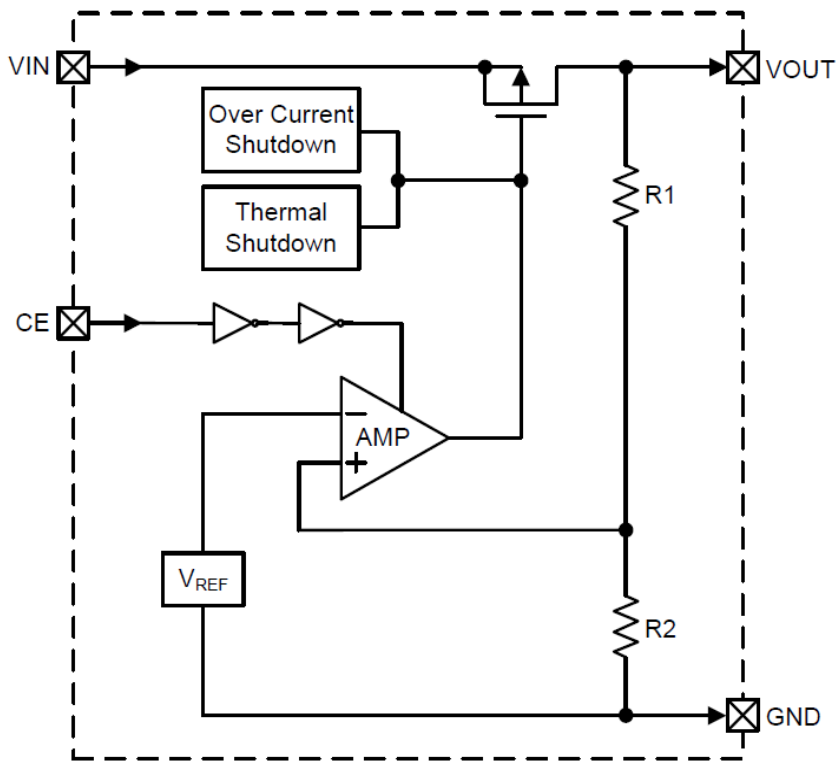
Pb-Free RoHS Halogen-Free

Order Information

Type	Output voltage	Package	Marking
HT78R15	1.5V	SOT-23 SOT-23-3L SOT-23-5L SOT-89	MLXX
HT78R30	3.0V		
HT78R33	3.3V		
HT78R35	3.5V		
HT78R50	5.0V		

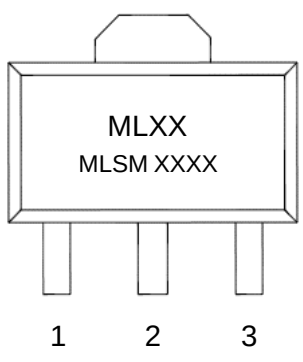
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Functional Block Diagram

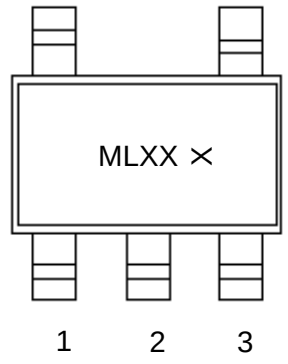


Packages And Pin Assignment

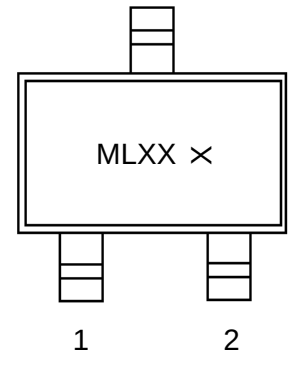
SOT-89



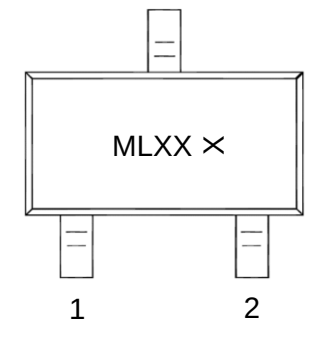
SOT-23-5L



SOT-23-3L



SOT-23



Pin No.				Name	Description
SOT-23	SOT-23-3L	SOT-89	SOT-23-5L		
1	1	1	2	GND	Ground pin
2	2	3	5	VOUT	Regulator Output pin.
3	3	2	1	VIN	Power Supply Voltage input.
-	-	-	3	CE	Enable Input Logic, Active High. When the EN goes to a logic low, the device will be shutdown mode. This pin cannot be left floating to enable the device. The maximum voltage must remain below 6.5 V.
-	-	-	4	NC	No Internal Connection.

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Specifications

Absolute Maximum Ratings

Operating temperature range(25°C) (unless otherwise noted)

ITEM		RATING	UNIT
Input Voltage		-0.3~24	V
Output Voltage		-0.3~6	V
EN Voltage		V_{IN}-0.3~V_{IN}+0.3	V
Max Output Current		500	mA
Power Dissipation	SOT-23	280	mw
	SOT-23-3L	380	mw
	SOT-23-5L	400	mw
	SOT-89	600	mw
$R_{\theta JA}$(Junction to ambient thermal resistance)	SOT-23	360	°C/W
	SOT-23-3L	260	°C/W
	SOT-23-5L	250	°C/W
	SOT-89	165	°C/W
Operating junction temperature, TJ		-40~+85	°C
Storage temperature, Tstg		-55~+150	°C

Electrical Characteristics

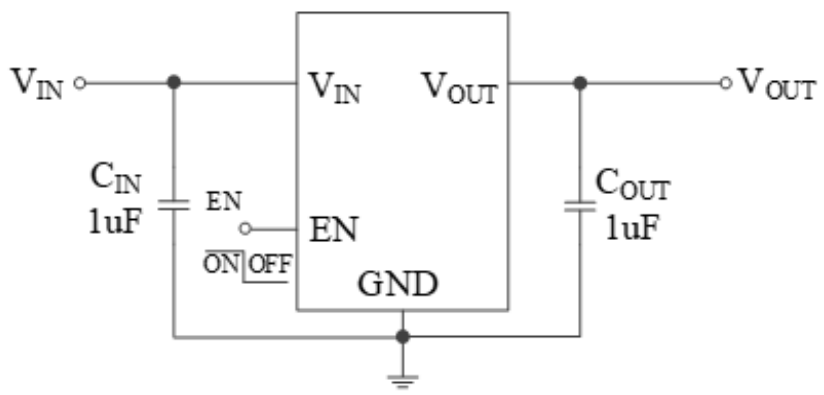
(V_{IN}=V_{OUT}+1V, C_{IN}=C_{OUT}=1μF，CE=V_{IN}，Ta=25°C (unless otherwise specified)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
V_{IN}	Input Voltage	-	3.0	-	24	V
I_{SS}	Quiescent Current	IO=0mA, V_{CE}=V_{IN}	-	2.0	5	μA
$V_{DROPOUT}$	Dropout Voltage	I_{OUT} = 100mA	-	200	-	mV
ΔV_{OUT}	Load Regulation	1mA ≤ I_{OUT} ≤ 100mA	-	10	-	mV
$\frac{\Delta VOUT}{VOUT}$	Line Regulation	I_{OUT} =1mA V_{OUT}+1V ≤ V_{IN} ≤ 20V	-	0.2	0.3	%/V
PSRR	Power Supply Rejection Ratio	f = 100Hz, I_{OUT} = 50mA	-	80	-	dB
		f = 1KHz, I_{OUT} = 50mA	-	65	-	dB
		f = 10KHz, I_{OUT} = 50mA	-	50	-	dB
		f = 100KHz, I_{OUT} = 50mA	-	45	-	dB
I_{SHORT}	Short Current	V_{OUT} =V_{SS}	-	25	-	mA
I_{LIM}	Limit Current	-	-	-	500	mA
T_{SD}	Thermal Shutdown	Rising, I_{OUT}=20mA	-	150	-	°C
V_{IH}	CE high level	-	1.5	-	-	V
V_{IL}	CE low level	-	-	-	0.4	V
Rdis	Output discharge res	Vce<0.4V	-	150	-	Ω

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Application Information

The HT78RXX is a wide input voltage range (up to 24V), low power consumption (2uA), low dropout linear regulator. It's application circuit is very simple, which only needs two outside capacitors. It is designed to work with low-ESR ceramic capacitor, reducing the amount of the PCB. The HT78RXX is composed of the reference voltage, the error amplifier, P-channel MOSFET pass transistor, internal resistor divider and some additional.



Input and Output Capacitor

A 1μF ceramic capacitor is recommended between V_{IN} and GND pins to decouple input power supply glitch and noise. 1μF or greater X7R or X5R ceramic capacitor is selected to get good dynamic performance. This input capacitor must be located as close as possible to the pins to assure input stability and reduce noise.
The output capacitor is required to stabilize and improve the transient response of the LDO. The output decoupling capacitor should be located as close as possible to the V_{OUT} pin. 1μF or greater X7R or X5R ceramic capacitor is selected to get good dynamic performance.

Current Limit Protection

When output current at V_{OUT} pin is higher than current limit threshold, the current limit protection will be triggered and clamp the output current to prevent over-current and to protect the regulator from damage due to overheating.

Short Circuit Protection

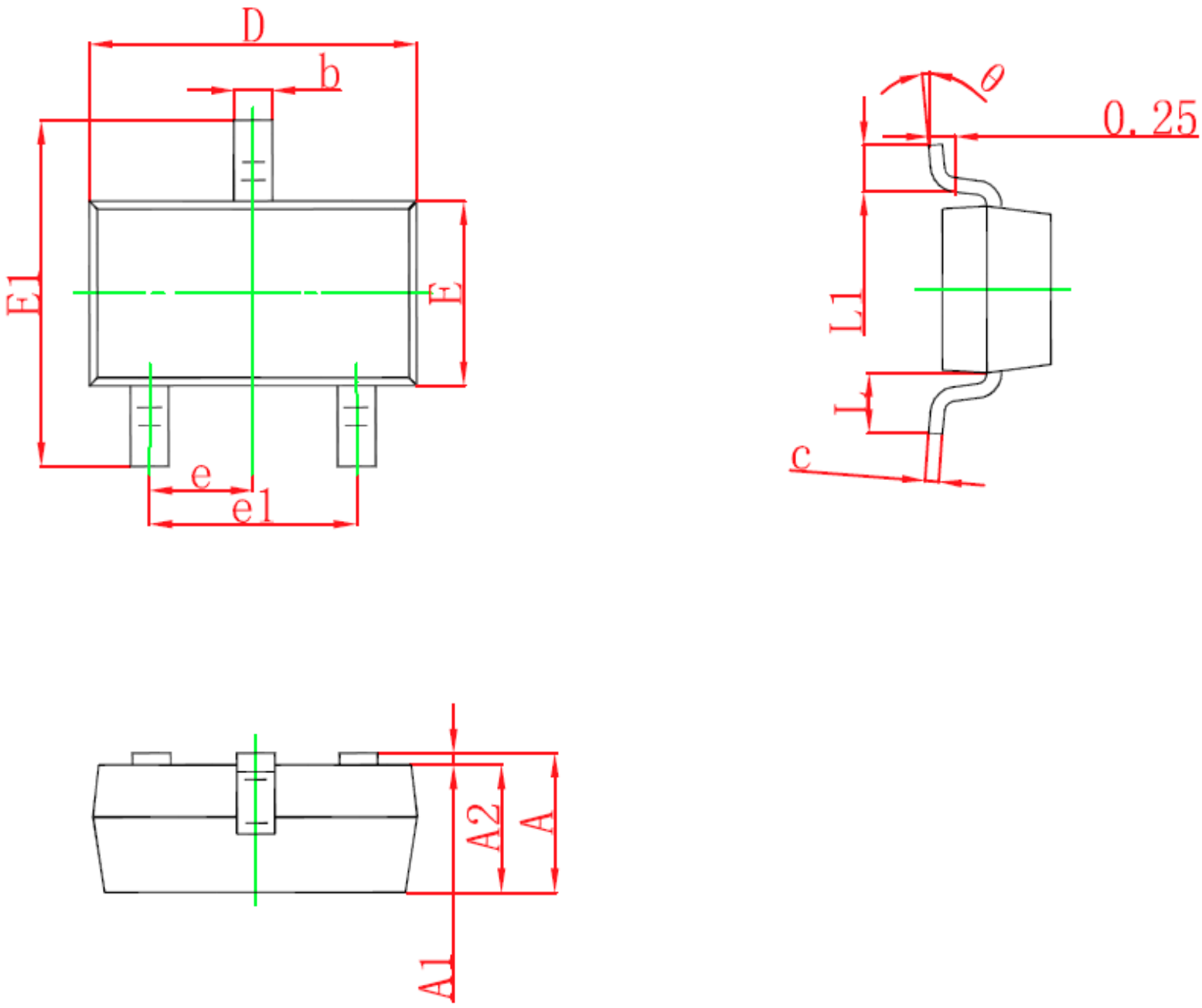
When V_{OUT} pin is short-circuit to GND, short circuit protection will be triggered and clamp the output current to approximately 50mA. This feature protects the regulator from over-current and damage due to overheating.

Over Temperature Protection (OTP)

The device offers over temperature protection. A temperature sensor circuit is integrated and monitors the internal IC temperature. Once the temperature exceeds the preset threshold (typically +145˚C), the IC shuts down immediately. The OTP has a typical hysteresis of +15˚C.

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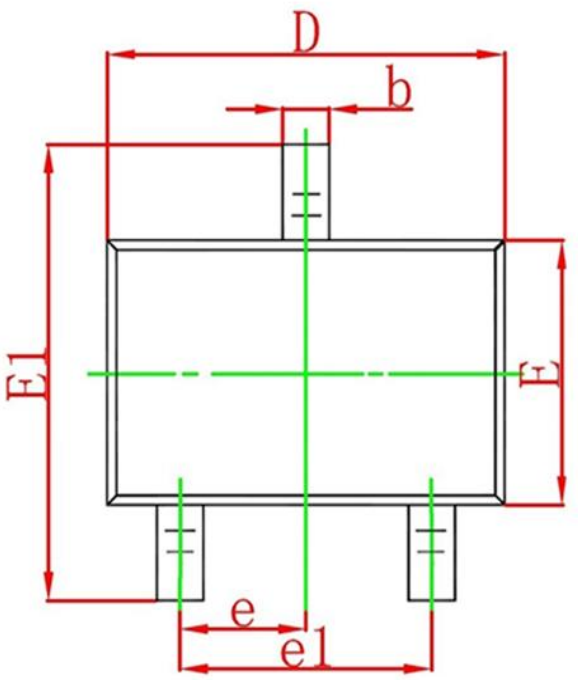
SOT-23 Package Outline Dimensions

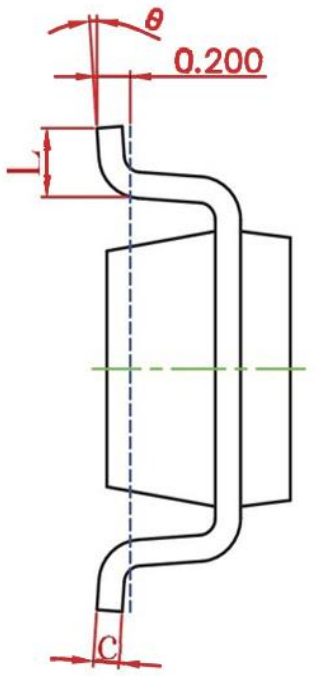


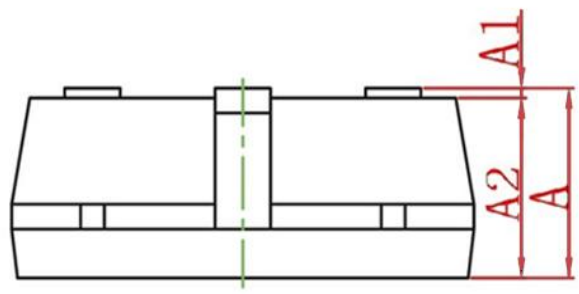
Symbol	Dimensions in Millimeters(mm)		Dimensions In Inches	
	Min	Max	Min	Max
A	0.900	1.150	0.035	0.045
A1	0.000	0.100	0.000	0.004
A2	0.900	1.050	0.035	0.041
b	0.300	0.500	0.012	0.020
c	0.080	0.150	0.003	0.006
D	2.800	3.000	0.110	0.118
E1	2.250	2.550	0.088	0.100
E	1.200	1.400	0.047	0.055
e	0.950TYP		0.037TYP	
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°

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SOT-23-3L Package Outline Dimensions



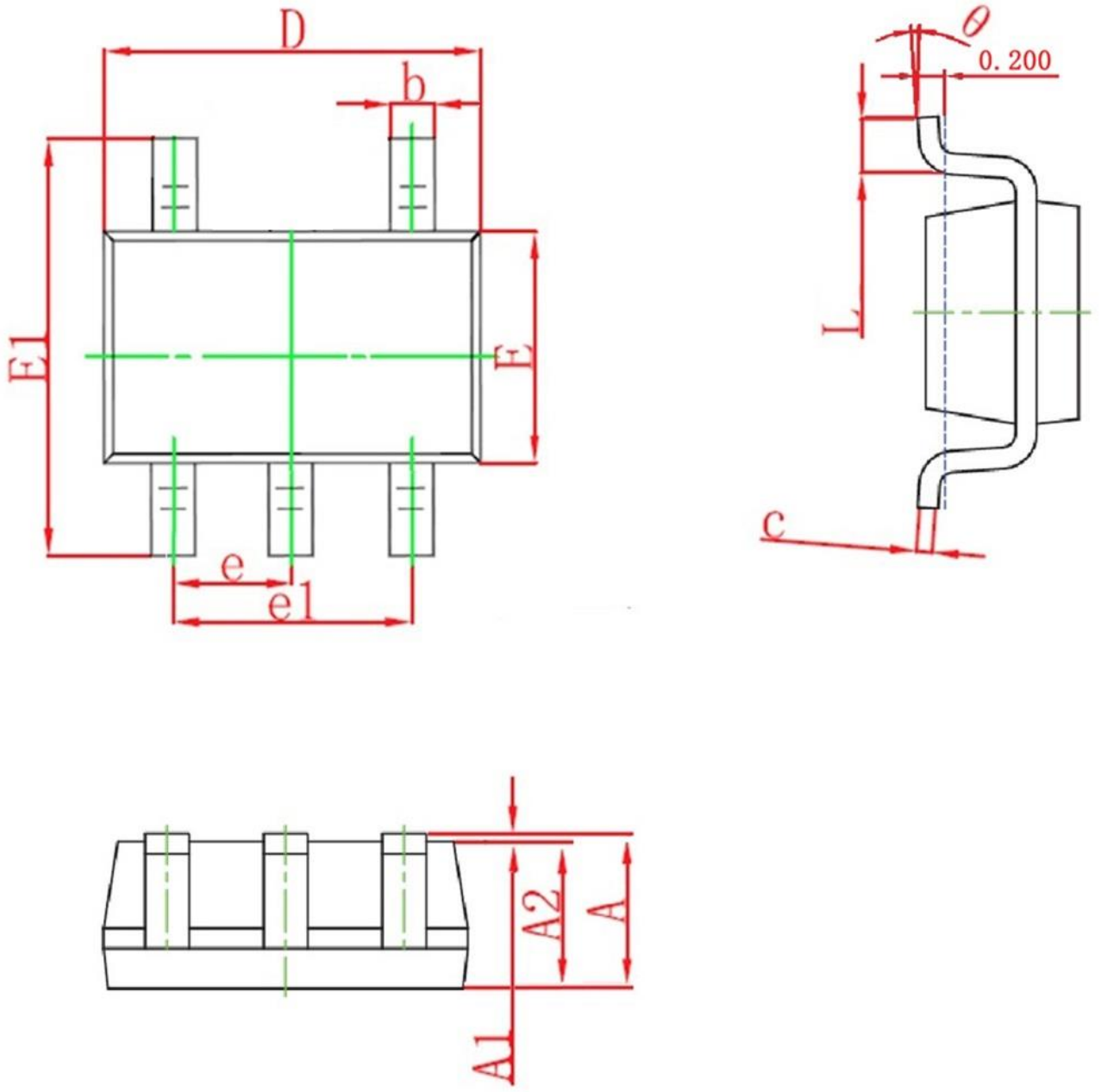




Symbol	Dimensions in Millimeters(mm)		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.042	0.050
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.042	0.046
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.112	0.120
E	1.500	1.700	0.060	0.068
E1	2.650	2.950	0.106	0.118
e	0.950TYP		0.037TYP	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

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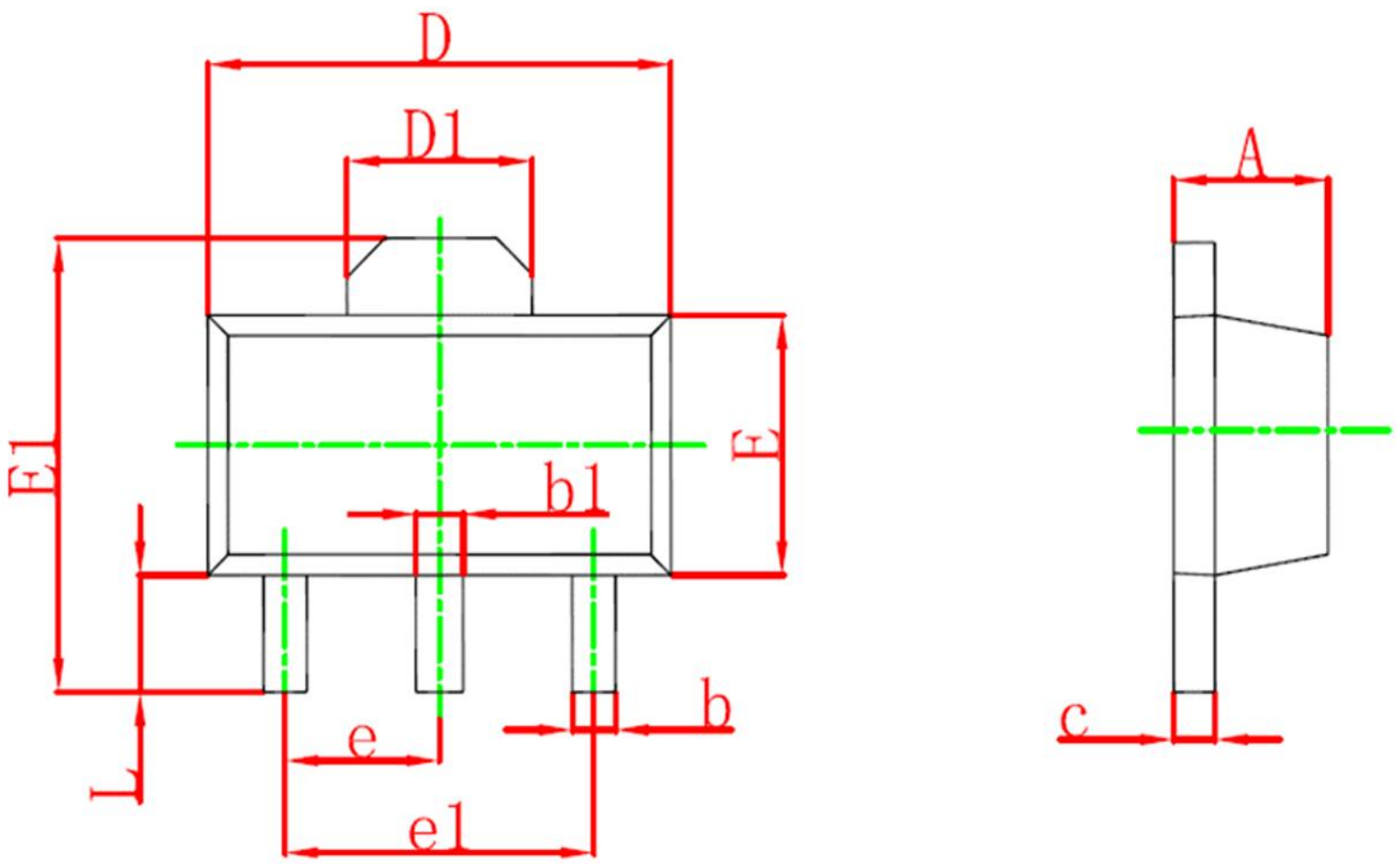
SOT-23-5L Package Outline Dimensions



Symbol	Dimensions in Millimeters(mm)		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	0.950TYP		0.037TYP	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

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SOT-89 Package Outline Dimensions



Symbol	Dimensions in Millimeters(mm)		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

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