LDO ICs

Micro-Power consumption 40V, 200mA, Low Low-Dropout Voltage Linear Regulator

AS9132

General Description

The AS9132 is a CMOS low dropout, low noise, low power consumption, low quiescent current positive linear regulator with wide input voltage range. The AS9132 can deliver a guaranteed 200mA load current with a low dropout voltage. Quiescent current of only 2.0uA makes these devices ideal for powering the battery-powered, always-on systems that require very little idle-state power dissipation to a longer service life. There is an option of shutdown function by selecting the parts with the EN pin and pulling it low. The off state of AS9132 that consumes less than 0.1uA during shutdown mode.

The device is suitable for portable application such as cellular handsets or PDA. The AS9132 is designed and optimized to work with low cost ceramic capacitors 1.0uF, which consumes less than 0.1μA during shutdown mode. Besides, its current limit protection and on-chip thermal shutdown function provide protection against any combination of over-load or ambient temperature which could cause junction temperature exceeding maximum rating. The AS9132 includes a reference bypass pin in order to reduce output noise and a logic control shut-down input.

The space-saving tiny SOT23-5L, SOT23-3L, SOT89-3L, SOT223 and DFN1010-4L packages are attractive for hand-held applications. The device is specified over an ambient temperature range of -40˚C to 125˚C.

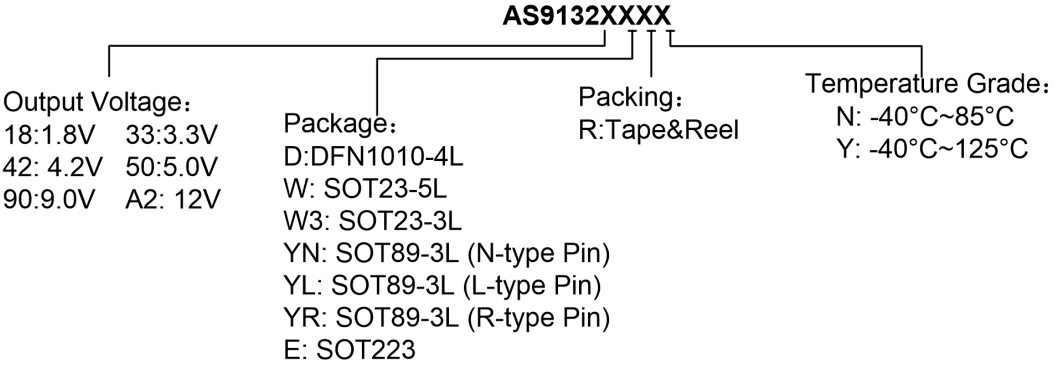
Features

- Output Current Up to 200mA
- Wide Voltage V_{IN} Range: 2.0V to 40V
- Very Low Quiescent Current at 2.0uA
- Low Dropout voltage of 450mV at 100mA/V_{IN}=5V
- Output Voltage Accuracy at ±2.0%
- Support Fixed Output Voltage: 1.8V, 3.3V, 4.2V, 5V, 9V, 12V.
- PSRR 70dB at 100Hz
- Needs Only 1.0uF Capacitor for Stability
- Current Limit Protection
- Without EMI and Switch Noise
- Stable with Ceramic Capacitor or Tantalum Capacitor
- RoHS and Green Compliant
- DFN1010-4L, SOT23-3L, SOT89-3L, SOT223 and SOT23-5L Packages
- -40℃ to +125 ℃ Temperature Range

Applications

- Portable, Battery Powered Equipment
- Low Power Microcontrollers
- Laptop, Palmtops & PDAs
- Audio/Video Equipment
- Car Navigation Systems
- Industrial Control
- Weighting Scales
- Meters/Home Automation

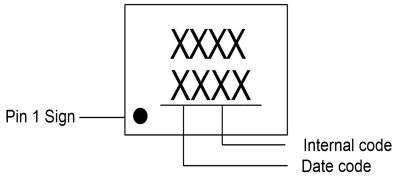
Ordering Information

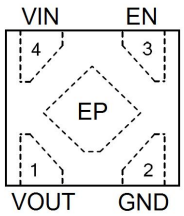


Part Number	Driver Capability	Package Type	Package Qty	Temperature	Eco Plan
AS9132-XXDRN	200mA	DFN1010-4L	7-in reel 10000pcs/reel	-40～85℃	RoHS
AS9132-XXWRN	200mA	SOT23-5L	7-in reel 3000pcs/reel	-40～85℃	RoHS
AS9132-XXW3RN	200mA	SOT23-3L	7-in reel 3000pcs/reel	-40～85℃	RoHS
AS9132-XXYNRN	200mA	SOT89-3L	7-in reel 1000pcs/reel	-40～85℃	RoHS
AS9132-XXYLRN	200mA	SOT89-3L	7-in reel 1000pcs/reel	-40～85℃	RoHS
AS9132-XXYRRN	200mA	SOT89-3L	7-in reel 1000pcs/reel	-40～85℃	RoHS
AS9132-XXERN	200mA	SOT223	7-in reel 1000pcs/reel	-40～85℃	RoHS
AS9132-XXDRY	200mA	DFN1010-4L	7-in reel 10000pcs/reel	-40～125℃	RoHS
AS9132-XXWRY	200mA	SOT23-5L	7-in reel 3000pcs/reel	-40～125℃	RoHS
AS9132-XXW3RY	200mA	SOT23-3L	7-in reel 3000pcs/reel	-40～125℃	RoHS
AS9132-XXYNRY	200mA	SOT89-3L	7-in reel 1000pcs/reel	-40～125℃	RoHS
AS9132-XXYLRY	200mA	SOT89-3L	7-in reel 1000pcs/reel	-40～125℃	RoHS
AS9132-XXYRRY	200mA	SOT89-3L	7-in reel 1000pcs/reel	-40～125℃	RoHS
AS9132-XXERY	200mA	SOT223	7-in reel 1000pcs/reel	-40～125℃	RoHS

Marking Information & Pin Assignment

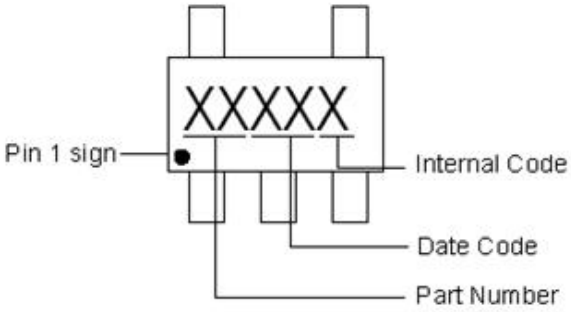
DFN1010-4L

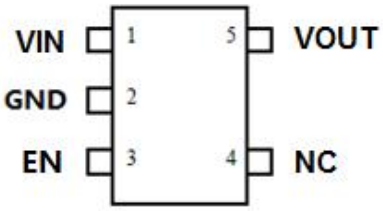




Pin Name	Pin No. DFN1010-4L	I/O	Pin Function
VOUT	1	O	Output Pin
GND	2	P	Ground
EN	3	I	Pull this pin high to enable IC, pull this pin low to shutdown IC.
VIN	4	P	Input Power Supply
EP	-	-	Please Connected to GND.

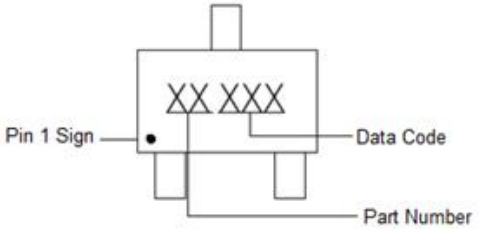
SOT23-5L

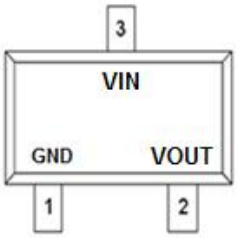




Pin Name	Pin No. SOT23-5L	I/O	Pin Function
VIN	1	P	Input Power Supply
GND	2	P	Ground
EN	3	I	Pull this pin high to enable IC, pull this pin low to shutdown IC.
NC	4	-	Not Connected.
VOUT	5	O	Output Pin

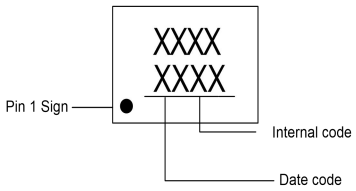
SOT23-3L:

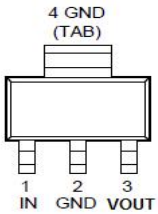




Pin Name	Pin No. SOT23-3L	I/O	Pin Function
VOUT	2	O	Output Pin
GND	1	P	Ground
VIN	3	P	Input Power Supply

SOT89-3L (N-type Pin):





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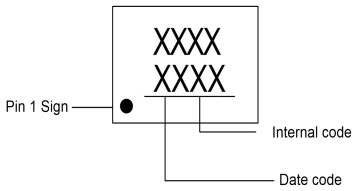
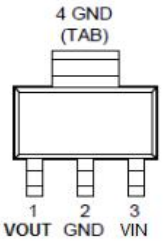
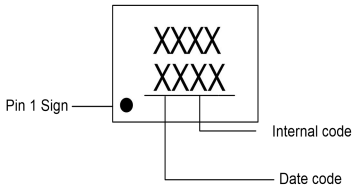
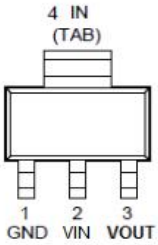




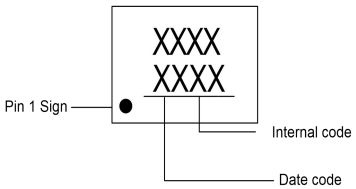
SOT89-3L (R-type Pin):

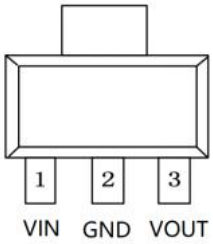




Pin Name	Pin No.			I/O	Pin Function
	SOT89-3L (N-type Pin)	SOT89-3L (L-type Pin)	SOT89-3L (R-type Pin)		
VOUT	3	1	3	O	Output Pin
GND	2	2	1	P	Ground
VIN	1	3	2	P	Input Power Supply
TAB	4	4	-	P	Please Connected to GND.
TAB	-	-	4	P	Please Connected to VIN.

SOT223:





Pin Name	Pin No.	I/O	Pin Function
	SOT223		
VIN	1	P	Input Power Supply
GND	2	P	Ground
VOUT	3	O	Output Pin
TAB	4	P	Please Connected to GND.

Typical Application Circuit

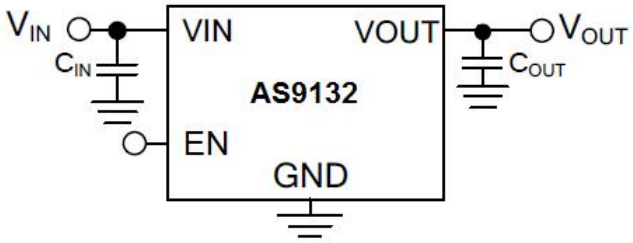


Figure 1, Typical Application Circuit of AS9132 Fixed Output Voltage

Block Diagram

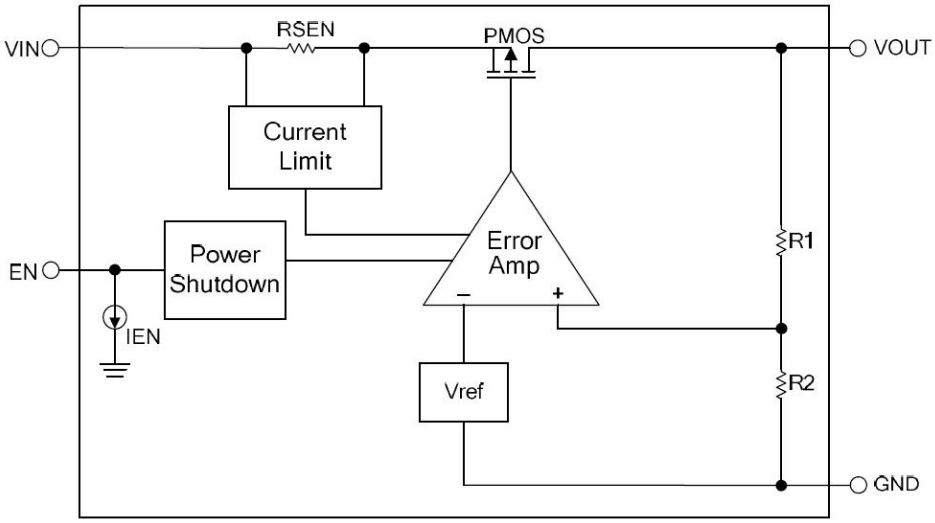


Figure 2, Block Diagram of AS9132

Absolute Maximum Ratings[1] (T_A=25°C, unless otherwise noted)

Parameter		Symbol	Rating	Unit
V_{IN}, EN Pin to GND		V_*	-0.3 to +45	V
Output Pin to GND	V_{OUT}=12V/9V	V_{OUT}	-0.3 to +14	V
	V_{OUT}=1.8V/3.3V/5.0V	V_{OUT}	-0.3 to +6.0	
Storage Temperature Range		T_S	-55 to +150	℃
Operating Junction Temperature Range		T_J	-40 to +150	℃
Maximum Soldering Temperature (at leads, 10 sec)		T_{LEAD}	260	℃

Recommended Operating Conditions[2]

Parameter		Symbol	Rating	Unit
V_{IN} Pin Voltage to GND		V_{IN}	+2.0 to +40	V
Output Current		I_{OUT}	Up to 200	mA
Operating Temperature Range		T_{OP}	-40 to +125	℃
Maximum Thermal Resistance	DFN1010-4L	Θ_{JA}	130	℃/W
	SOT23-5L/SOT23-3L	Θ_{JA}	200	℃/W
	SOT223	Θ_{JA}	150	℃/W
	SOT89-3L	Θ_{JA}	120	℃/W
Maximum Power Dissipation	T_A<25°C	P_D	0.50	W

Note: 1: Stresses above those listed in absolute maximum ratings may cause permanent damage to the device. Functional operation at conditions other than the operating conditions specified is not implied. Only one absolute maximum rating should be applied at any one time.

2: The device is not guaranteed to function outside of its operating conditions.

● Electrical Characteristics

(T_A = -40 to +125℃ unless otherwise noted. Typical values are at T_A = +25℃, V_{IN} =15V, V_{EN}=5.0V, C_{IN}=1.0uF=C_{OUT})

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
Supply						
V_{IN}	Input Voltage		2.0	-	40	V
I_Q	Ground Current	I_O=0mA, V_{OUT}≤5.0V	-	2.0	-	uA
		Only SOT23-3L	-	3.5	-	
		I_O=0mA, 5.0V≤V_{OUT}≤12V,	-	4.0	-	
		Only SOT23-3L	-	5.5	-	
I_{SHDN}	Supply Current Shutdown	V_{EN} = 0V	-	0.01	0.5	μA
Output Current						
△V_{OUT}	Output Voltage Accuracy	I_O=0.1m, T_A= +25℃	-	1.0	-	%
		I_O=0.1m, -40 to +125℃	-2.0	-	2.0	%
I_{OUT}	Output Current		-	200	-	mA
I_{LIMIT}	Output Current Limit		210	300	-	mA
I_{SHDNLK}	Shutdown Leakage Current	V_{EN} = 0V	-	0.01	0.5	μA
V_{DROP}	Dropout Voltage (I_O=100mA)	V_{OUT}≥5.0V	-	450	-	mV
		V_{OUT}=3.3V	-	450	-	mV
		V_{OUT}=1.8V	-	800	-	mV
△V_{LOAD}	Load Regulation	I_O=1mA to 200mA	-	0.1	-	%
△V_{LINE}	Line Regulation	I_O=1mA, V_{IN}=5.0V to 40V	-	0.3	-	%
PSRR	Ripple Rejection (I_O=1mA)	V_{IN}=12V, V_O=5V, f_R=100Hz	-	70	-	dB
Enable (/SHDN)						
V_{ENL}	EN OFF Threshold	V_{EN} Falling	0	-	0.6	V
V_{ENH}	EN ON Threshold	V_{EN} Rising	2.0	-	V_{IN}	V
I_{EN}	EN Pin Bias Current		-	0.01	0.1	μA
Thermal Shut-Down						
TSD	Shut-Down Temperature	Rising	-	160	-	℃
△TSD	Temperature Hystersis	Falling	-	15	-	℃

Note 3: Guarantee by designed.

Application Information

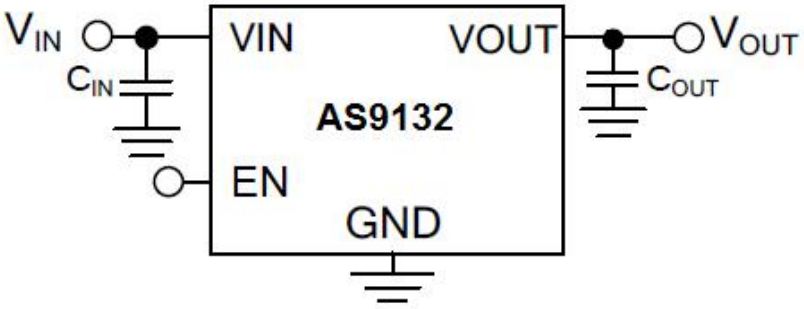


Figure 3, Typical Application Circuit of AS9132

The AS9132 series are low dropout linear regulators that could provide 200mA output current at low input voltage. Besides, current limit and on chip thermal shutdown features provide protection against any combination of over-load or ambient temperature which could cause junction temperature exceeding maximum rating.

Output and Input Capacitor

The AS9132 regulator is designed to be stable with a wide range of output capacitors. The ESR of the output capacitor affects stability. Larger value of the output capacitor decreases the peak deviations and improves transition response for larger current changes.

The external input and output capacitors of AS9132 series must be properly selected for stability and performance. Use a 1μF or larger input capacitor and place it close to the IC's VIN and GND pins. Any output capacitor meeting the minimum 1mΩ ESR (Equivalent Series Resistance) and effective capacitance between 1μF and 22μF requirement may be used. Place the output capacitor close to the IC's VOUT and GND pins. Increasing capacitance and decreasing ESR can improve the circuit's PSRR and line transient response.

Current Limit

The AS9132 series contain the current limiter of output power transistor, which monitors and controls the transistor, limiting the output current to 600mA (typical). The output can be shorted to ground indefinitely without damaging the part.

Active / Shutdown Input Operation

The AS9132 is turned off by pulling the EN pin low and turned on by pulling it high. If this feature is not used, the EN pin should be connected to V_{IN} to keep the regulator output available all the time.

Drop Out Voltage

The AS9132 series use a PMOS pass transistor to achieve low dropout. When (V_{IN} – V_{OUT}) is less than the dropout voltage (V_{DROP}), the PMOS pass device is in the linear region of operation and the input-to-output resistance is the $R_{DS(ON)}$ of the PMOS pass element. V_{DROP} scales approximately with the output current because the PMOS device behaves as a resistor in dropout condition.

As any linear regulator, PSRR and transient response are degraded as (V_{IN} – V_{OUT}) approaches dropout condition.

Thermal Consideration

In order to prevent overloading or thermal condition from damaging the device, AS9132 regulator has internal thermal and current limit functions designed to protect the device. It will rapidly shut off PMOS pass element during over-loading or over-temperature condition.

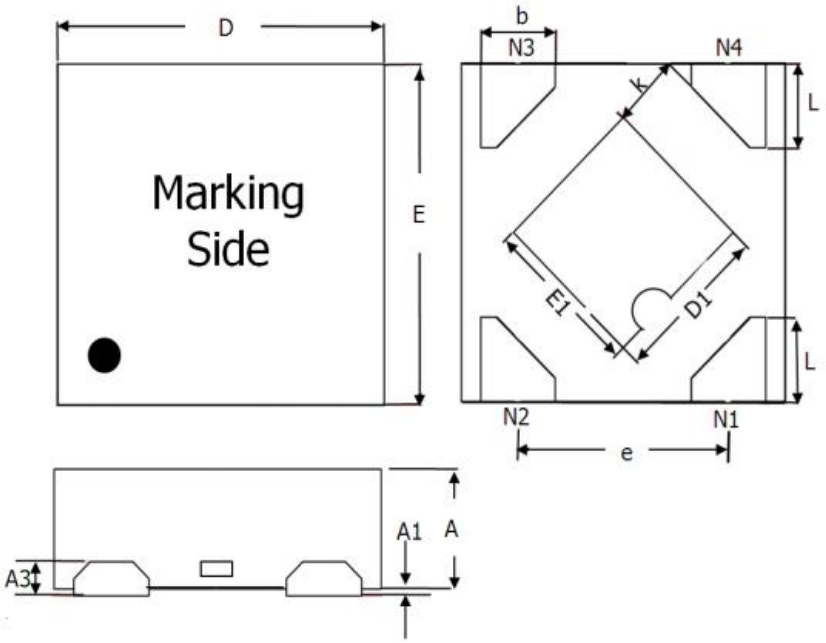
The power handling capability of the device will be limited by allowable operation junction temperature (125℃). The power dissipated by the device will be estimated by $P_D = I_{OUT}(V_{IN}-V_{OUT})$. The power dissipation should be lower than the maximum power dissipation listed in “Absolute Maximum Ratings” section.

Layout Consideration

By placing input and output capacitors on the same side of the PCB as the LDO, and placing them as close as is practical to the package can achieve the best performance. The ground connections for input and output capacitors must be back to the AS9132 ground pin using as wide and as short of a copper trace as is practical. Connections using long trace lengths, narrow trace widths, and/or connections through via must be avoided. These add parasitic inductances and resistance that results in worse performance especially during transient conditions.

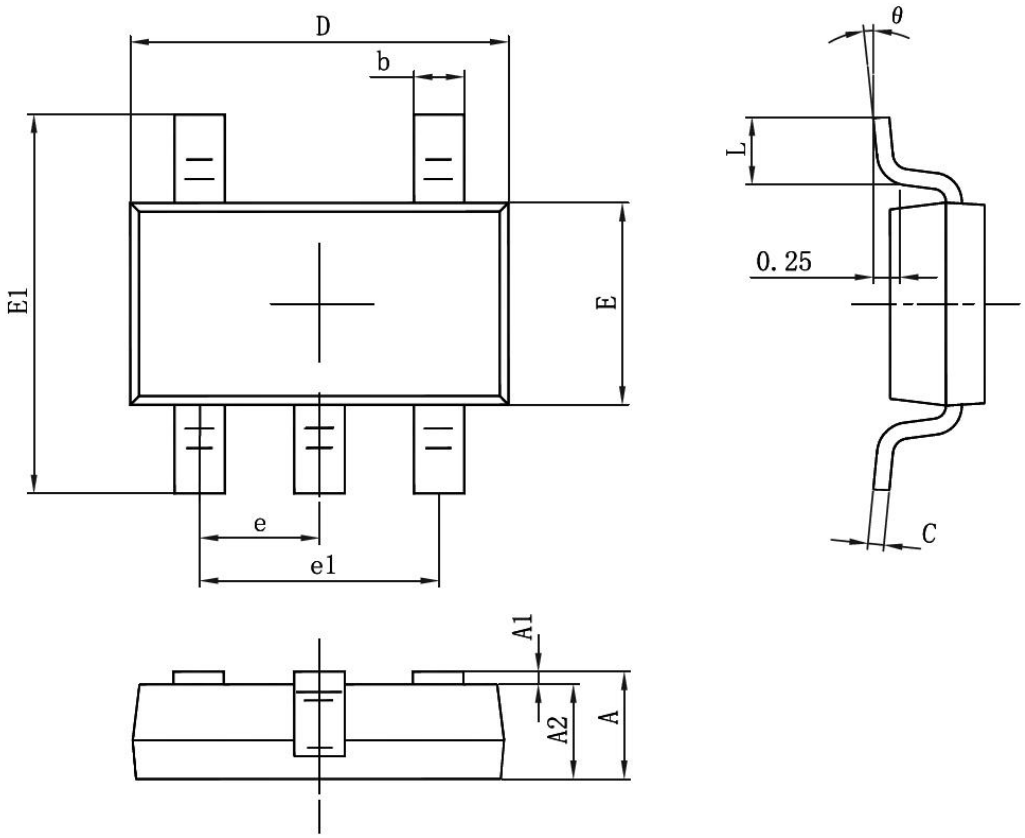
Package Information

DFN1010-4L:



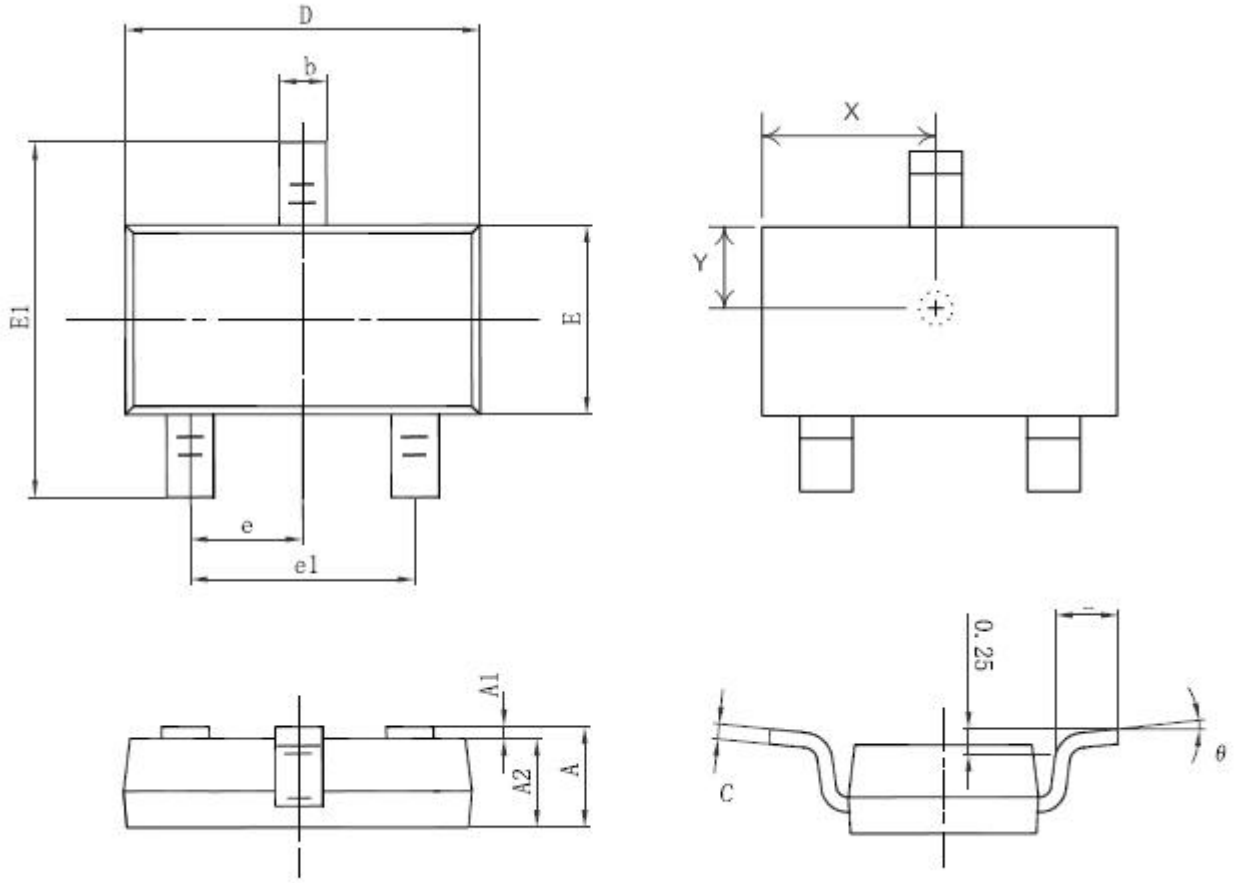
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.340	0.400	0.014	0.016
A1	0.000	0.050	0.000	0.002
A3	0.152 BSC		0.006 BSC	
D	0.950	1.050	0.038	0.042
E	0.950	1.050	0.038	0.042
D1	0.450	0.550	0.018	0.022
E1	0.450	0.550	0.018	0.022
k	0.211 BSC		0.008 BSC	
b	0.180	0.280	0.0072	0.0112
e	0.625 BSC		0.025 BSC	
L	0.200	0.300	0.008	0.012

SOT23-5L:



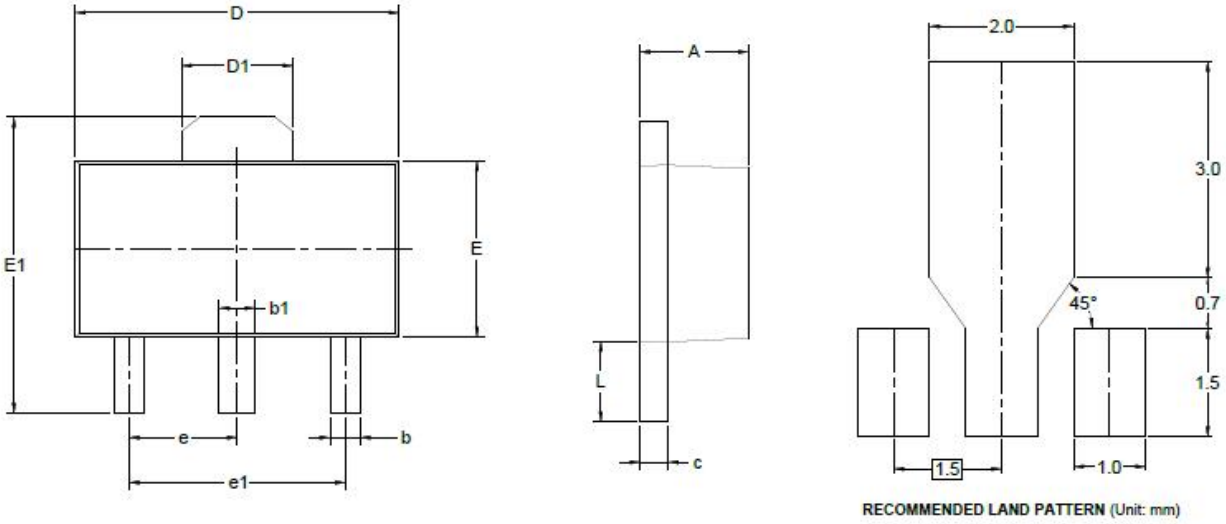
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.900	1.450	0.036	0.058
A1	0.000	0.150	0.000	0.006
A2	0.900	1.300	0.036	0.052
b	0.300	0.500	0.012	0.020
C	0.080	0.200	0.003	0,008
D	2.800	3.000	0.112	0.120
E	1.500	1.700	0.060	0.068
E1	2.600	3.000	0.104	0.120
e	0.95(BSC)		0.037(BSC)	
e1	1.90(BSC)		0.075(BSC)	
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

SOT23-3L:



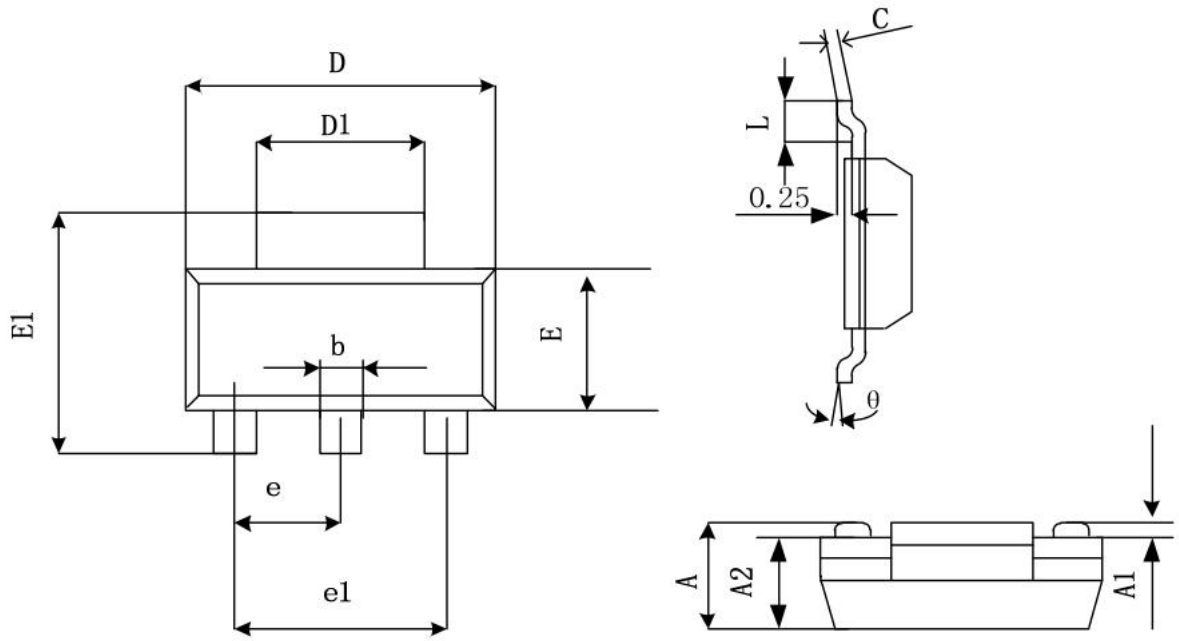
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.900(BSC)		0.075(BSC)	
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

SOT89-3L:



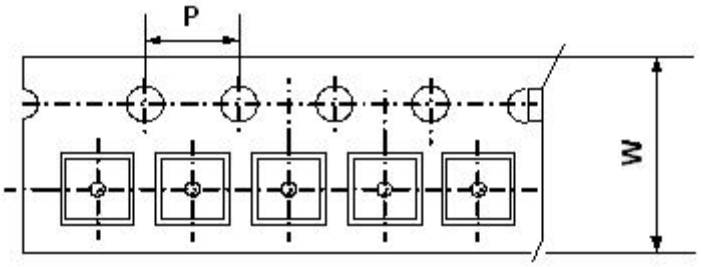
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.400	1.600	0.055	0.063
b	0.320	0.520	0.013	0.020
b1	0.400	0.580	0.016	0.023
c	0.350	0.440	0.014	0.017
D	4.400	4.600	0.173	0.181
D1	1.550 REF		0.061 REF	
E	2.300	2.600	0.091	0.102
E1	3.940	4.250	0.155	0.167
e	1.500 TYP		0.060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

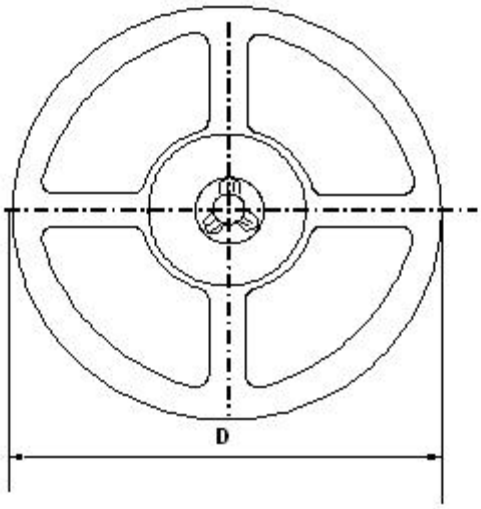
SOT223:



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.520	1.800	0.060	0.071
A1	0.020	0.130	0.001	0.005
A2	1.500	1.700	0.059	0.067
b	0.660	0.840	0.026	0.033
c	0.230	0.350	0.009	0.014
D	6.450	6.850	0.254	0.270
D1	2.900	3.000	0.114	0.122
E	3.450	3.850	0.136	0.152
E1	6.830	7.070	0.269	0.278
e	2.300 (BSC)		0.091 (BSC)	
e1	1.900(BSC)		0.075(BSC)	
e1	4.500	4.700	0.177	0.185
L	0.900	1.150	0.035	0.045
θ	0°	10°	0°	10°

■ Packing Information





Package Type	Carrier Width(W)	Pitch(P)	Reel Size(D)	Packing Minimum
DFN1010-4L	8.0±0.1 mm	2.0±0.1 mm	180±1 mm	10000pcs
SOT23-5L	8.0±0.1 mm	4.0±0.1 mm	180±1 mm	3000pcs
SOT23-3L	8.0±0.1 mm	4.0±0.1 mm	180±1 mm	3000pcs
SOT89-3L	8.0±0.1 mm	4.0±0.1 mm	180±1 mm	1000pcs
SOT223	8.0±0.1 mm	4.0±0.1 mm	180±1 mm	1000pcs

Note: Carrier Tape Dimension, Reel Size and Packing Minimum