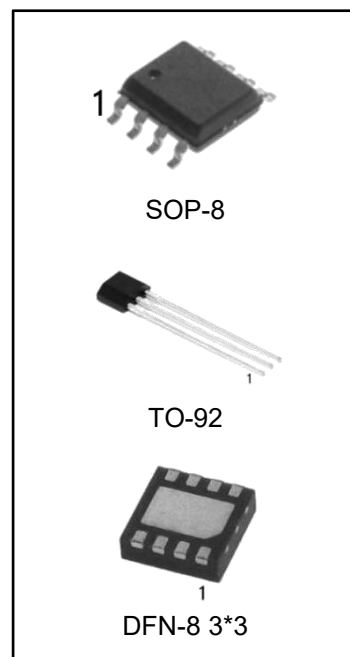


## Description

The LM236 and LM336 are precision 5.0V regulator diodes. These voltage reference monolithic ICs operate like 5.0V zener diodes with a low temperature coefficient and a dynamic impedance of  $0.6\ \Omega$ . A third pin enables adjusting the reference voltage and the temperature coefficient.

## Features

- Adjustable 4V to 6V
- Low temperature coefficient
- Wide operating current of 600  $\mu$ A to 10 mA
- $0.6\ \Omega$  dynamic impedance
- $\pm 1\%$  initial tolerance available
- Guaranteed temperature stability
- Easily trimmed for minimum temperature drift
- Fast turn-on
- Three lead transistor package

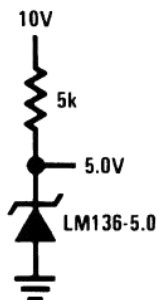


## Ordering Information

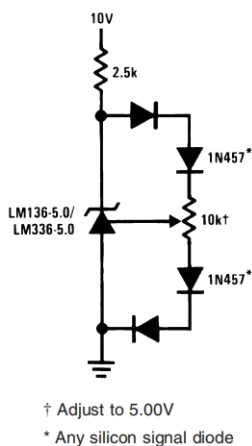
DEVICE	Package Type	MARKING	Packing	Packing Qty
LM236D-5.0RG	SOP-8	236-5.0	REEL	2500pcs/reel
LM236D-5.0RG4	SOP-8	236-5.0	REEL	4000pcs/reel
LM336D-5.0RG	SOP-8	336-5.0	REEL	2500pcs/reel
LM336D-5.0RG4	SOP-8	336-5.0	REEL	4000pcs/reel
LM236LP-5.0G	TO-92	LM236-5.0	BAG	1000pcs/box
LM336LP-5.0G	TO-92	LM336-5.0	BAG	1000pcs/box
LM236DQ-5.0RG	DFN-8 3*3	236-5.0	REEL	2500pcs/reel
LM336DQ-5.0RG	DFN-8 3*3	336-5.0	REEL	2500pcs/reel

## Typical Applications

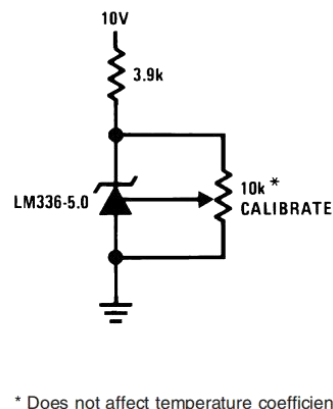
### 5.0V Reference



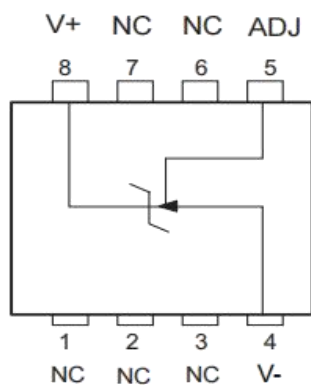
### 5.0V Reference with Minimum Temperature Coefficient



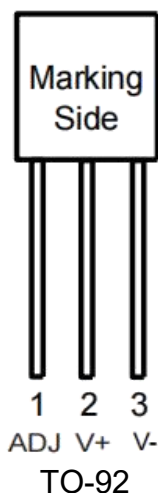
### Trimmed 4V to 6V Reference with Temperature Coefficient Independent of Breakdown Voltage



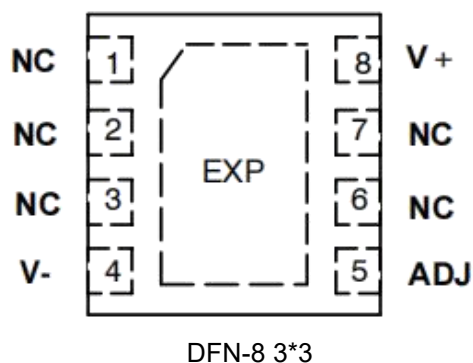
## Pin Connections



SOP-8



TO-92



DFN-8 3\*3

## Absolute Maximum Ratings

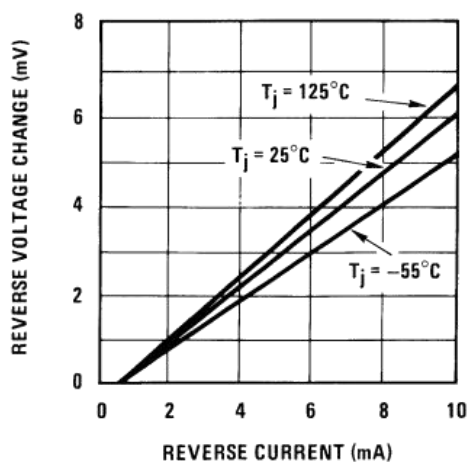
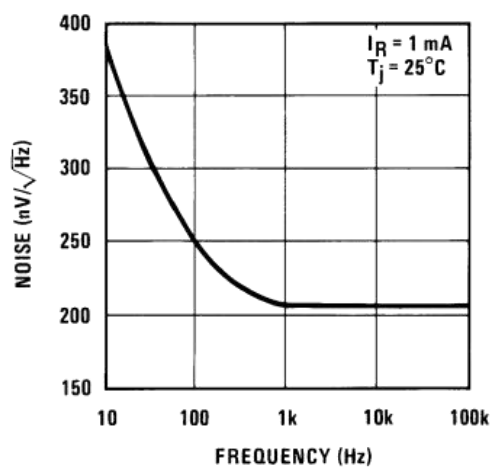
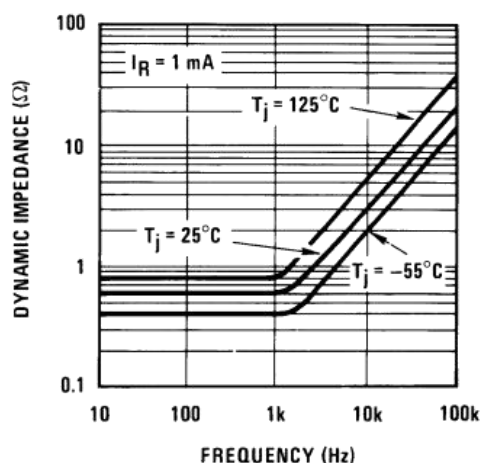
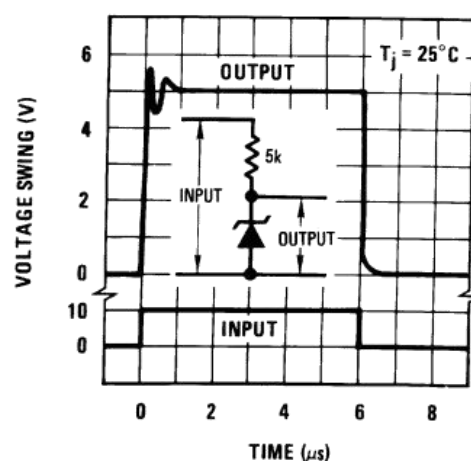
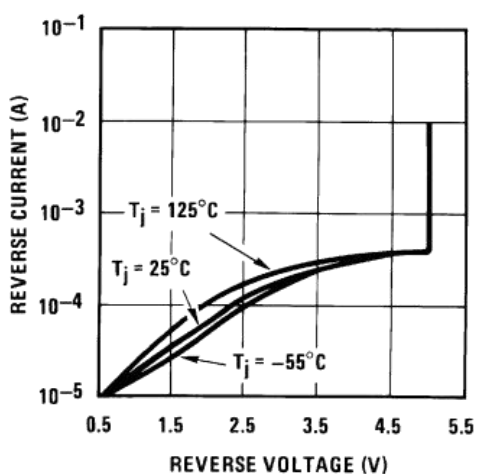
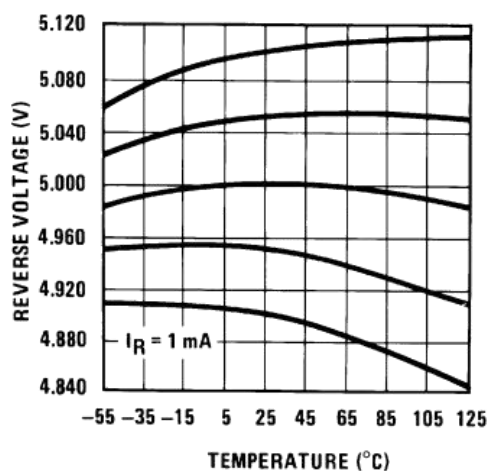
Symbol	Parameter	LM336	Unit
$I_{RF}$	Current Reverse Forward	15 10	mA
$T_{oper}$	Operating Free-air Temperature Range	LM336-5.0: 0 to +70 LM236-5.0: -40 to +85	°C °C
$T_{Stg}$	Storage Temperature Range	-65 to +150	°C
$T_L$	Lead Temperature (Soldering, 10 seconds)	245	°C

**Note:** Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Operating Ratings indicate conditions for which the device is intended to be functional, but specific performance is not ensured.

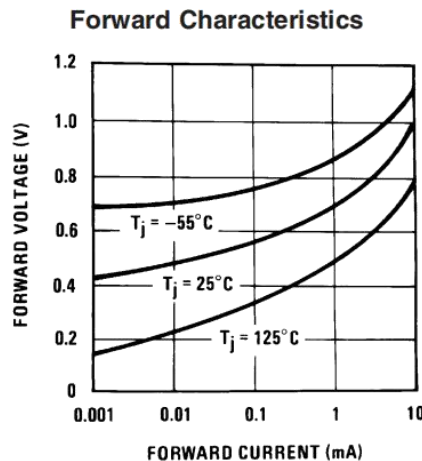
## Electrical Characteristics

Symbol	Parameter	LM236/LM336			Unit
		Min.	Typ.	Max.	
$V_R$	Reference Breakdown Voltage $T_{amb} = +25^{\circ}C, I_R = 1mA$	4.9	5.0	5.1	V
$\Delta V_R$	Reverse Breakdown Voltage Change with Current $600\mu A \leq I_R \leq 10mA$ $T_{amb} = +25^{\circ}C$ $T_{min.} \leq T_{amb} \leq T_{max.}$	-	6	20	mV
$Z_D$	Reverse Dynamic Impedance ( $I_R = 1mA$ ) $T_{amb} = +25^{\circ}C, f=100Hz$ $T_{min.} \leq T_{amb} \leq T_{max.}$	-	0.6	2.0	
$K_{VT}$	Temperature Stability ( $V_R = 5.0V, I_R = 1mA$ )	-	4	12	mV
$K_{VH}$	Long Term Stability ( $T_{amb} = +25^{\circ}C \pm 0.1^{\circ}C, I_R = 1mA$ )	-	20	-	ppm

## Typical Performance Characteristics

**Reverse Voltage Change**

**Zener Noise Voltage**

**Dynamic Impedance**

**Response Time**

**Reverse Characteristics**

**Temperature Drift**


## Typical Performance Characteristics (Continued)



## Application Hints

The LMx36-5.0 series voltage references are much easier to use than ordinary zener diodes. Their low impedance and wide operating current range simplify biasing in almost any circuit. Further, either the breakdown voltage or the temperature coefficient can be adjusted to optimize circuit performance.

Figure 1 shows an LM336-5.0 with a 10k potentiometer for adjusting the reverse breakdown voltage. With the addition of R1 the breakdown voltage can be adjusted without affecting the temperature coefficient of the device. The adjustment range is usually sufficient to adjust for both the initial device tolerance and inaccuracies in buffer circuitry.

If minimum temperature coefficient is desired, four diodes can be added in series with the adjustment potentiometer as shown in Figure 2. When the device is adjusted to 5.00V the temperature coefficient is minimized. Almost any silicon signal diode can be used for this purpose such as a 1N914, 1N4148 or a 1N457. For proper temperature compensation the diodes should be in the same thermal environment as the LM336-5.0. It is usually sufficient to mount the diodes near the LM336-5.0 on the printed circuit board. The absolute resistance of the network is not critical and any value from 2k to 20k will work. Because of the wide adjustment range, fixed resistors should be connected in series with the pot to make pot setting less critical.

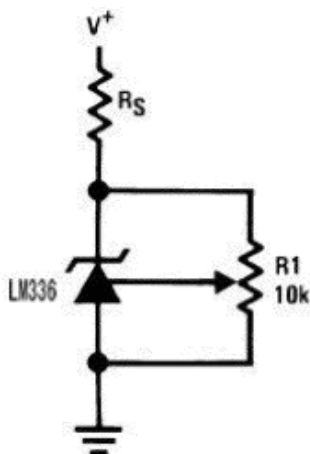


FIGURE 1. LM336-5.0 with Pot for Adjustment of Breakdown Voltage (Trim Range =  $\pm 1.0\text{V}$  Typical)

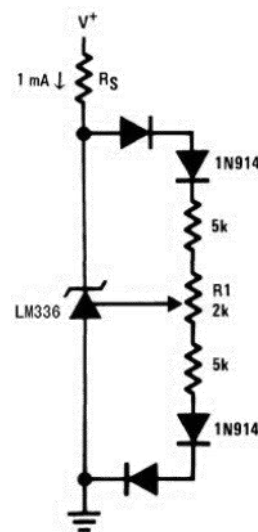
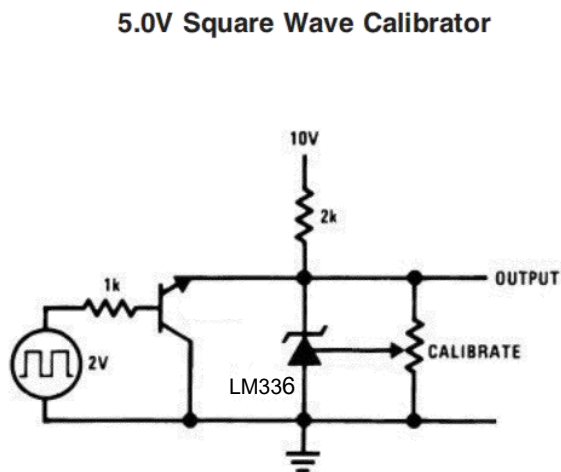
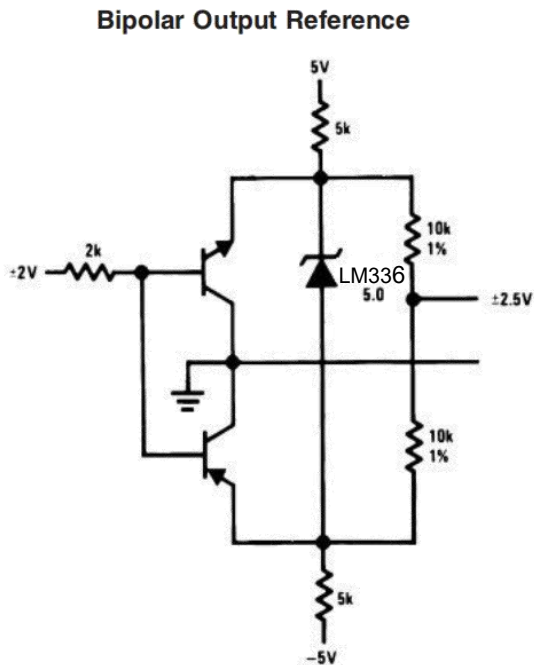
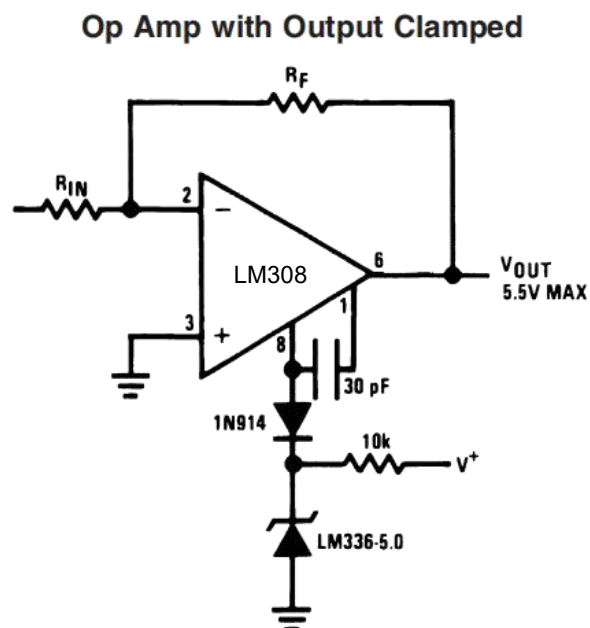
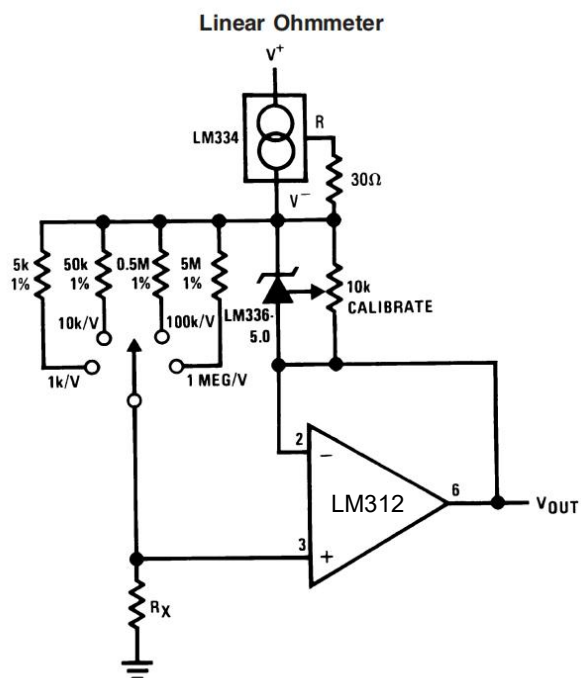


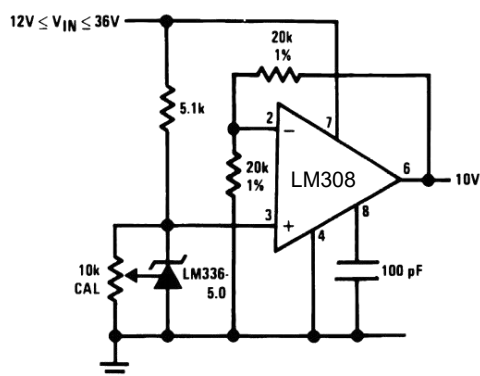
FIGURE 2. Temperature Coefficient Adjustment (Trim Range =  $\pm 0.5\text{V}$  Typical)



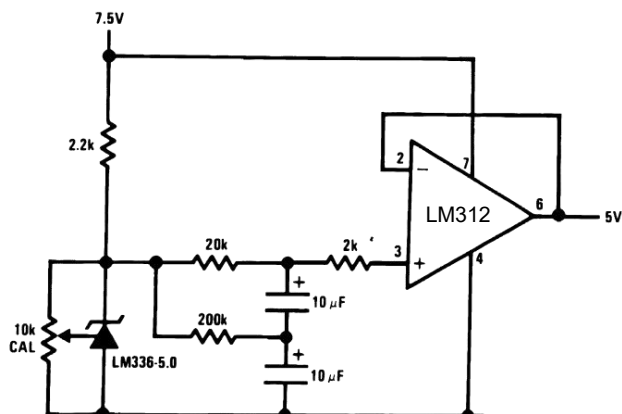
**Typical Applications (Continued)**


## Typical Applications (Continued)

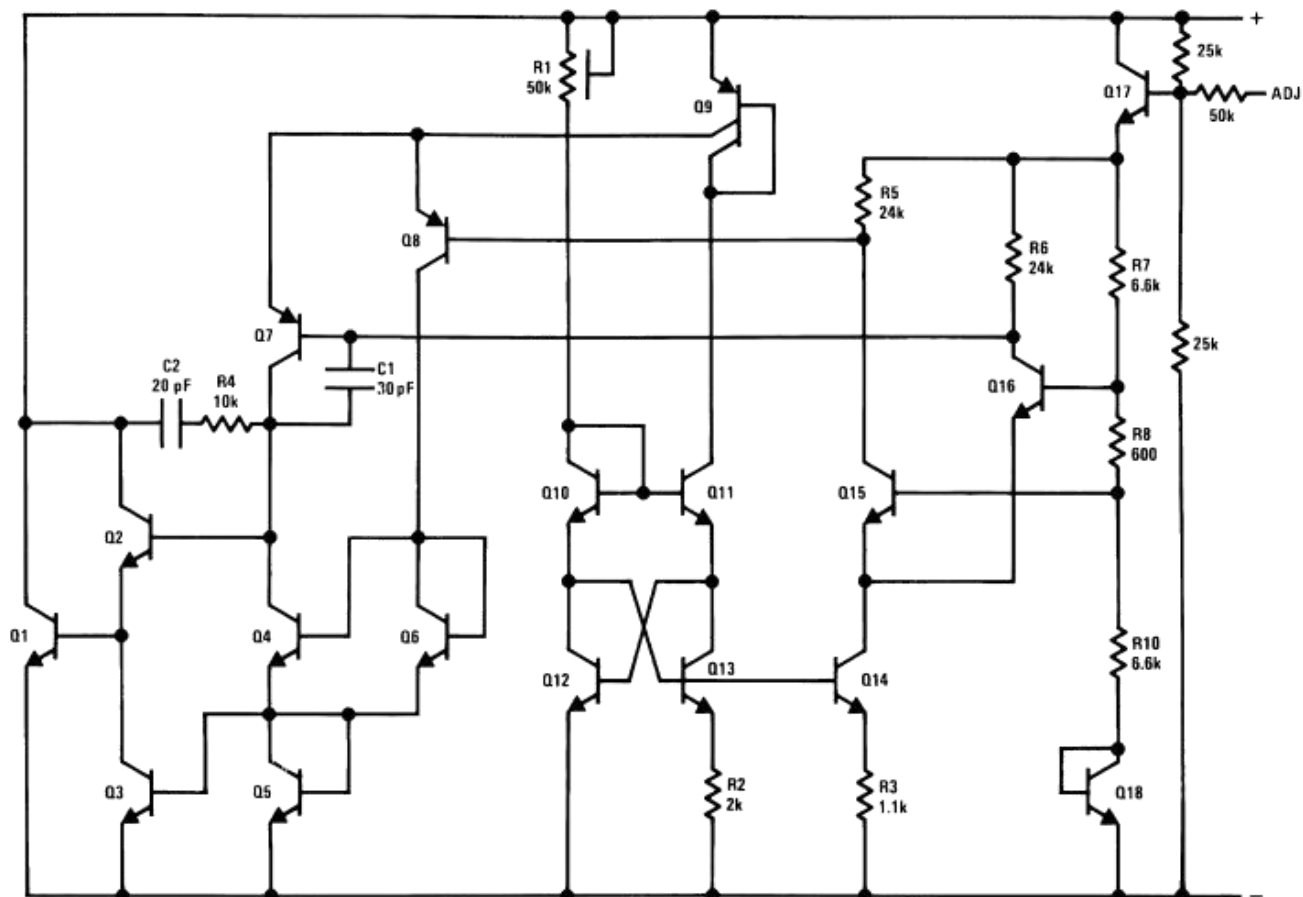
10V Buffered Reference



Low Noise Buffered Reference

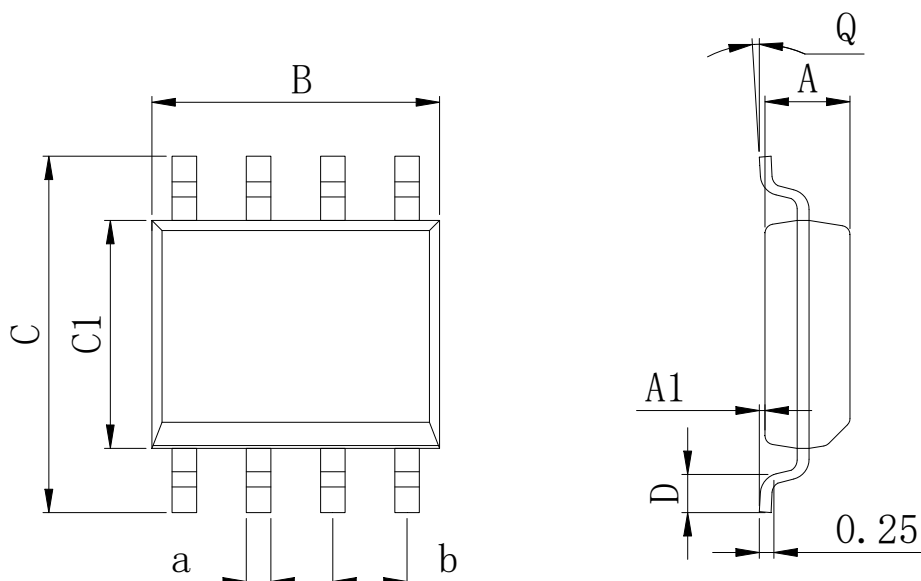


## Schematic Diagram



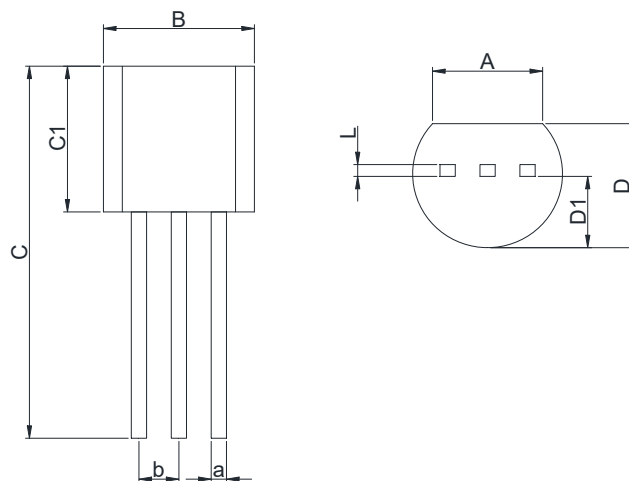
## Physical Dimensions

### SOP-8



Dimensions In Millimeters(SOP-8)									
Symbol:	A	A1	B	C	C1	D	Q	a	b
Min:	1.35	0.05	4.90	5.80	3.80	0.40	0°	0.35	1.27 BSC
Max:	1.55	0.20	5.10	6.20	4.00	0.80	8°	0.45	

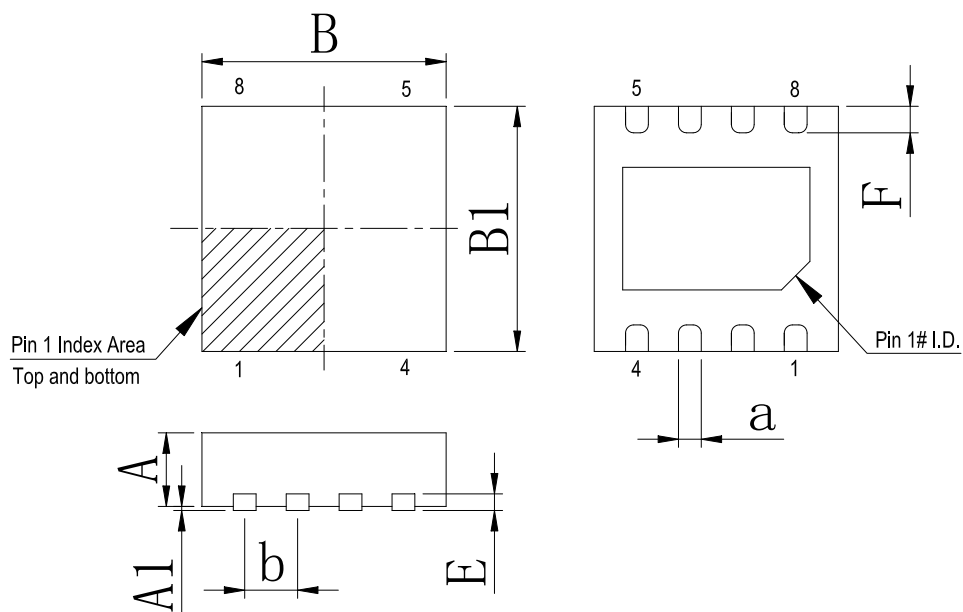
### TO-92



Dimensions In Millimeters(TO-92)									
Symbol:	A	B	C	C1	D	D1	L	a	b
Min:	3.43	4.44	11.2	4.32	3.17	2.03	0.33	0.40	1.27BSC
Max:	3.83	5.21	12.7	5.34	4.19	2.67	0.42	0.52	

## Physical Dimensions

DFN-8 3\*3



Dimensions In Millimeters(DFN-8 3*3)								
Symbol:	A	A1	B	B1	E	F	a	b
Min:	0.85	0.00	2.90	2.90	0.20	0.30	0.20	0.65 BSC
Max:	0.95	0.05	3.10	3.10	0.25	0.50	0.34	

## Revision History

REVISION NUMBER	DATE	REVISION	PAGE
V1.0	2018-9	New	1-11
V1.1	2023-9	Update Lead Temperature、Add annotation for Maximum Ratings.	2

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