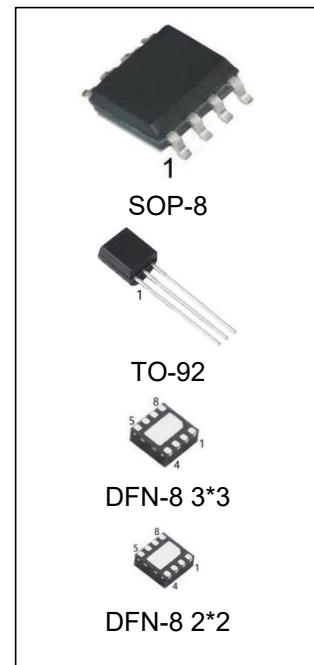


Description

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 0.6Ω . A third pin enables adjusting the reference voltage and the temperature coefficient.

Features

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

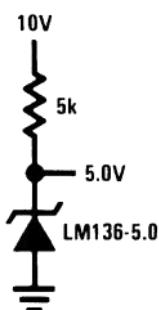


Ordering Information

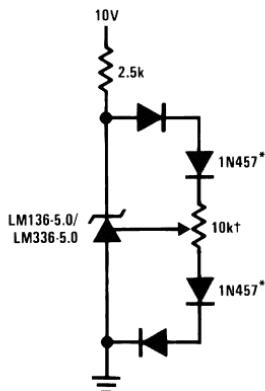
DEVICE	PACKAGE TYPE	MARKING	PACKING	PACKING QTY
LM236AM-5.0/TR	SOP-8	236A-5.0	REEL	2500pcs/reel
LM236M-5.0/TR	SOP-8	236-5.0	REEL	2500pcs/reel
LM336BM-5.0/TR	SOP-8	336B-5.0	REEL	2500pcs/reel
LM336M-5.0/TR	SOP-8	336-5.0	REEL	2500pcs/reel
LM236AZ-5.0	TO-92	LM236A-5.0	BAG	1000pcs/box
LM236Z-5.0	TO-92	LM236-5.0	BAG	1000pcs/box
LM336BZ-5.0	TO-92	LM336B-5.0	BAG	1000pcs/box
LM336Z-5.0	TO-92	LM336-5.0	BAG	1000pcs/box
LM236ADQ3-5.0/TR	DFN-8 3*3	236A-5.0	REEL	5000pcs/reel
LM236DQ3-5.0/TR	DFN-8 3*3	236-5.0	REEL	5000pcs/reel
LM336BDQ3-5.0/TR	DFN-8 3*3	336B-5.0	REEL	5000pcs/reel
LM336DQ3-5.0/TR	DFN-8 3*3	336-5.0	REEL	5000pcs/reel
LM236ADQ2-5.0/TR	DFN-8 2*2	236A-5.0	REEL	4000pcs/reel
LM236DQ2-5.0/TR	DFN-8 2*2	236-5.0	REEL	4000pcs/reel
LM336BDQ2-5.0/TR	DFN-8 2*2	336B-5.0	REEL	4000pcs/reel
LM336DQ2-5.0/TR	DFN-8 2*2	336-5.0	REEL	4000pcs/reel

Typical Applications

5.0V Reference



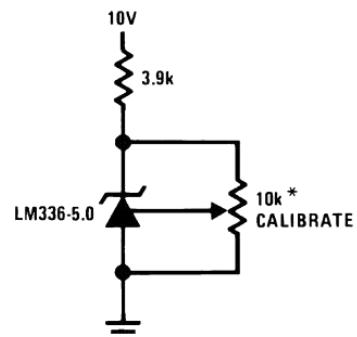
5.0V Reference with Minimum Temperature Coefficient



† Adjust to 5.00V

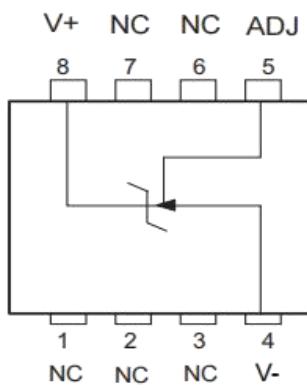
* Any silicon signal diode

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

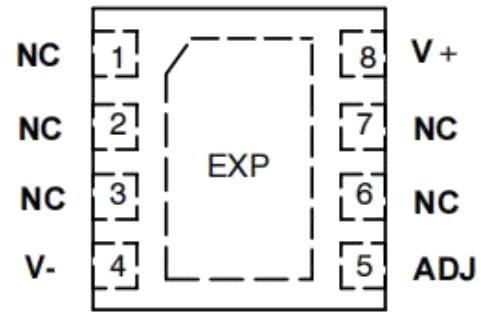
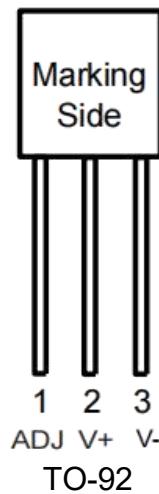


* Does not affect temperature coefficient

Pin Connections



SOP-8



DFN-8 2*2/DFN-8 3*3

Absolute Maximum Ratings

Symbol	Parameter	LM336	Unit
I _{RIF}	Current Reverse Forward	15 10	mA
T _{oper}	Operating Free-air Temperature Range	LM336-5.0: 0 to +70	°C
		LM236-5.0: -40 to +85	°C
T _{Stg}	Storage Temperature Range	-65 to +150	°C
T _L	Lead Temperature (Soldering, 10 seconds)	260	°C

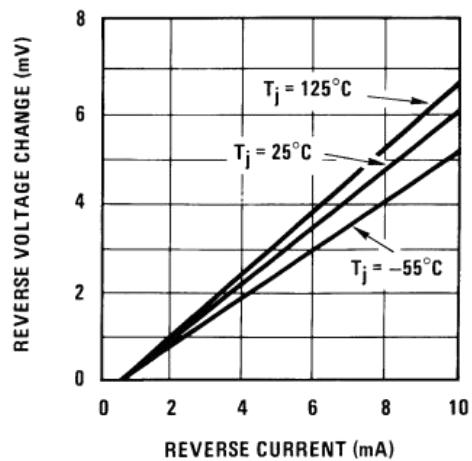
Note: Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Operating Ratings indicate conditions for which the device is intended to be functional, but specific performance is not ensured.

Electrical Characteristics

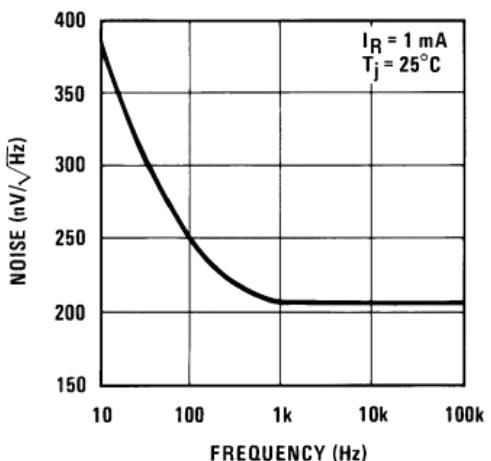
Symbol	Parameter	LM236/LM336			Unit
		Min.	Typ.	Max.	
V _R	Reference Breakdown Voltage T _{amb} = +25°C, I _R = 1mA	LM236A-5.0	4.95	5.0	5.05
		LM236-5.0/LM336B-5.0	4.90	5.0	5.10
		LM336-5.0	4.98	5.0	5.20
ΔV _R	Reverse Breakdown Voltage Change with Current 600μA ≤ I _R ≤ 10mA T _{amb} = +25°C T _{min.} ≤ T _{amb} ≤ T _{max.}	-	6	20	mV
Z _D	Reverse Dynamic Impedance (I _R = 1mA) T _{amb} = +25°C f=100Hz T _{min.} ≤ T _{amb} ≤ 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°C ±0.1°C, I _R = 1mA)	-	20	-	ppm

Typical Performance Characteristics

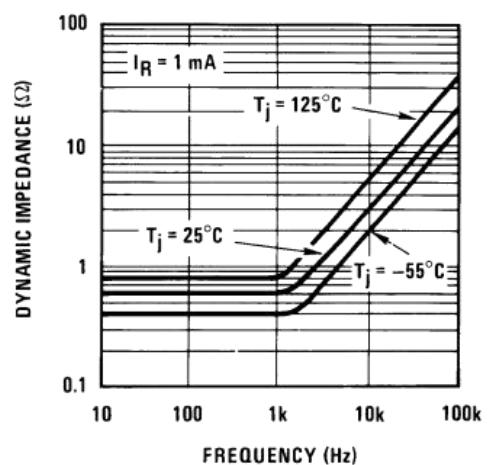
Reverse Voltage Change



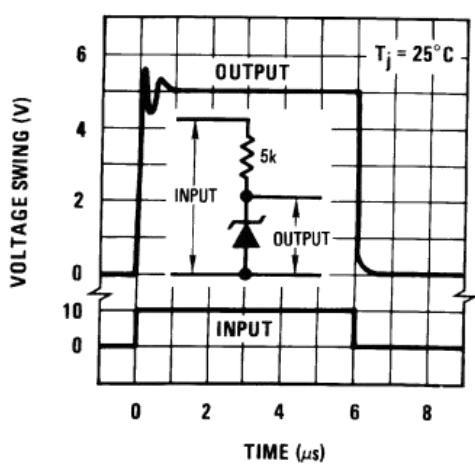
Zener Noise Voltage



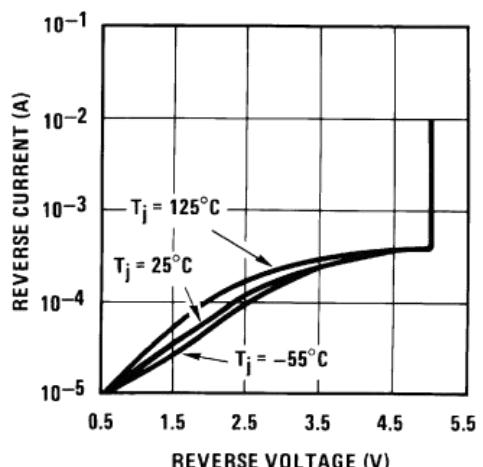
Dynamic Impedance



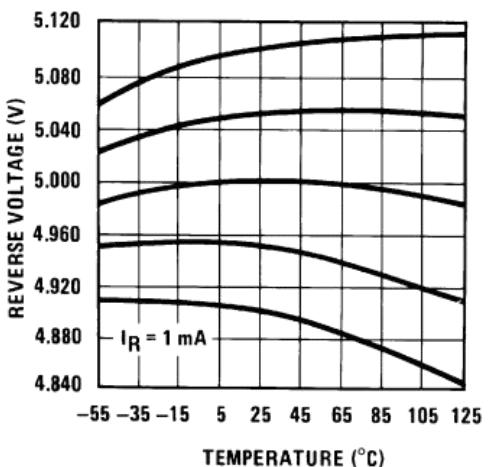
Response Time



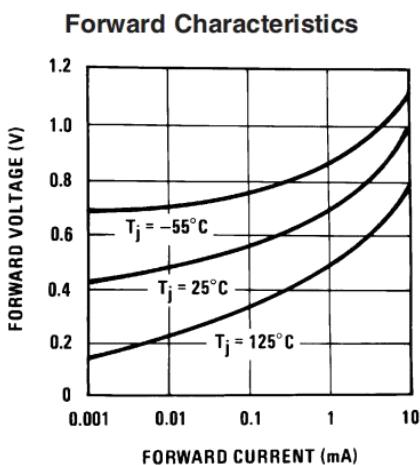
Reverse Characteristics



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.

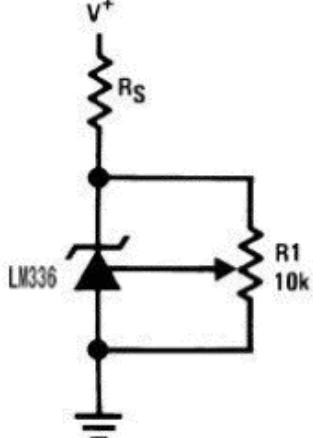


FIGURE 1. LM336-5.0 with Pot for Adjustment of Breakdown Voltage (Trim Range = $\pm 1.0\text{V}$ Typical)

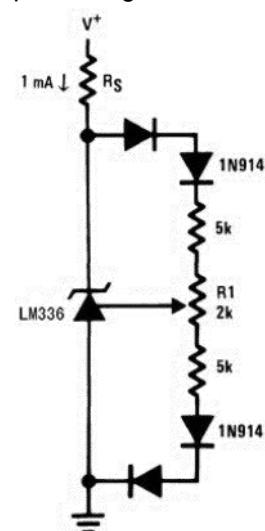
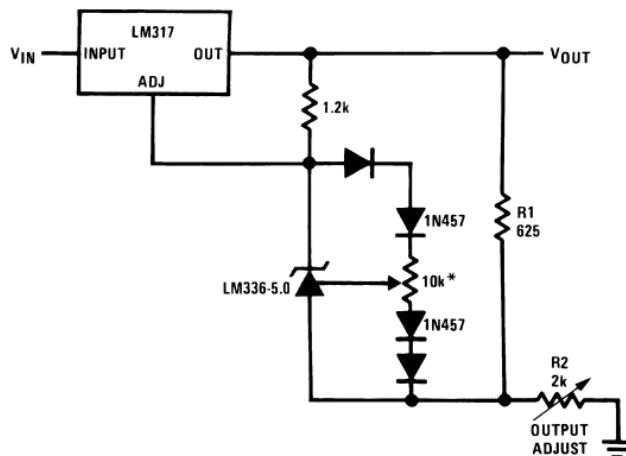
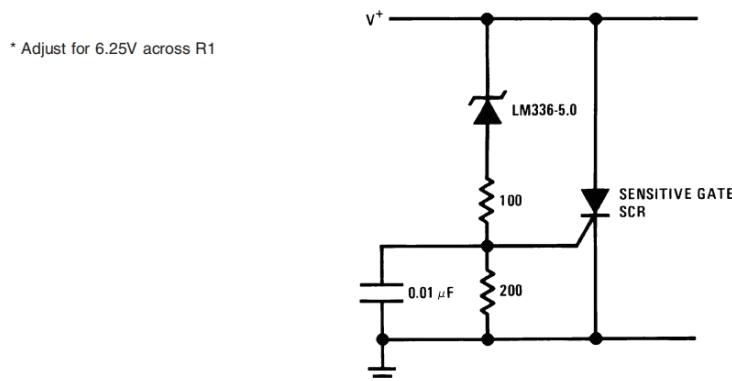


FIGURE 2. Temperature Coefficient Adjustment (Trim Range = $\pm 0.5\text{V}$ Typical)

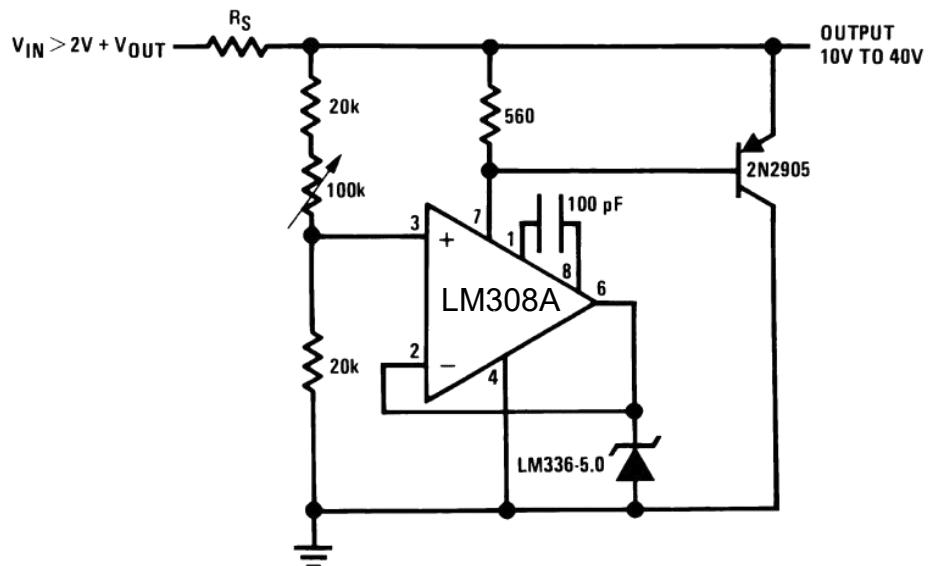
Typical Applications



Precision Power Regulator with Low Temperature Coefficient

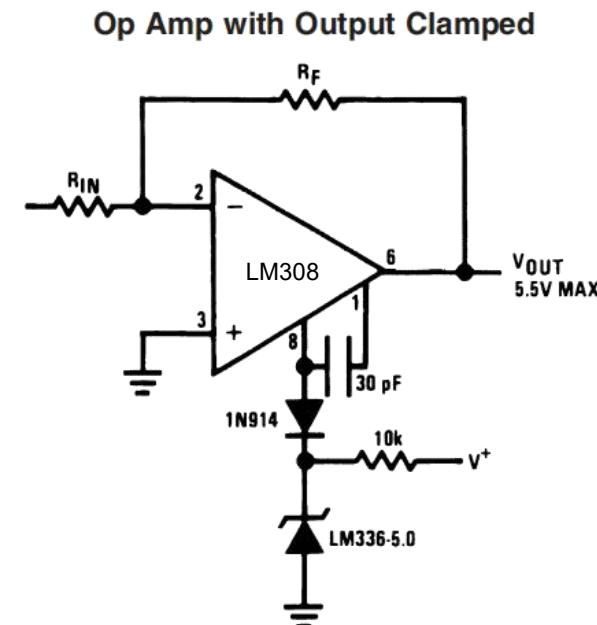
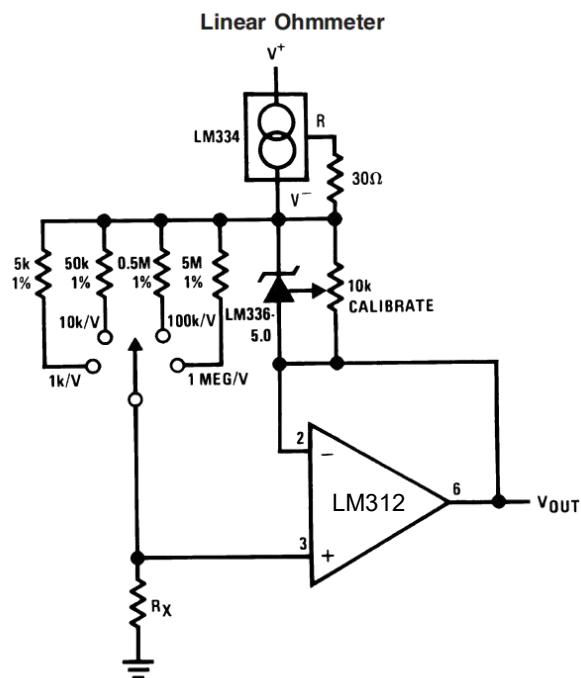


5V Crowbar

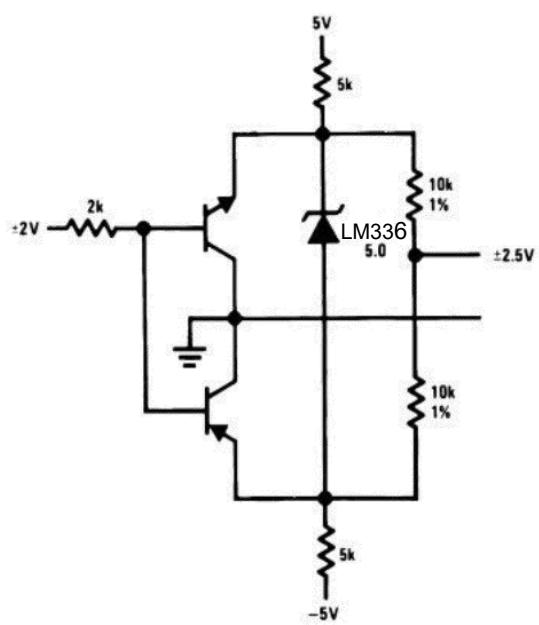


Adjustable Shunt Regulator

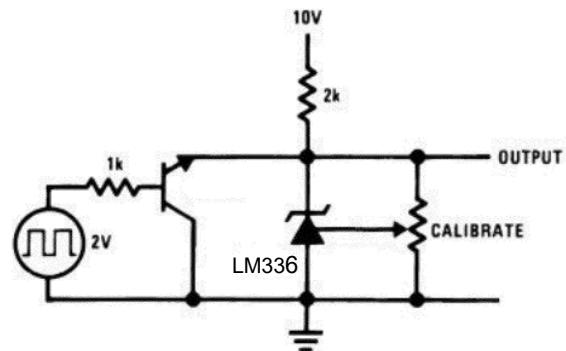
Typical Applications (Continued)



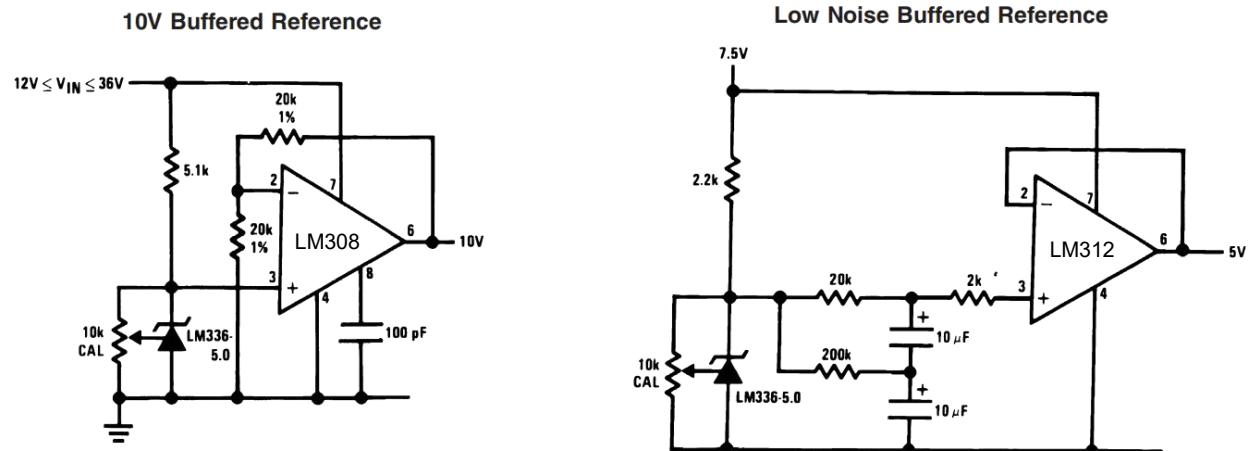
Bipolar Output Reference



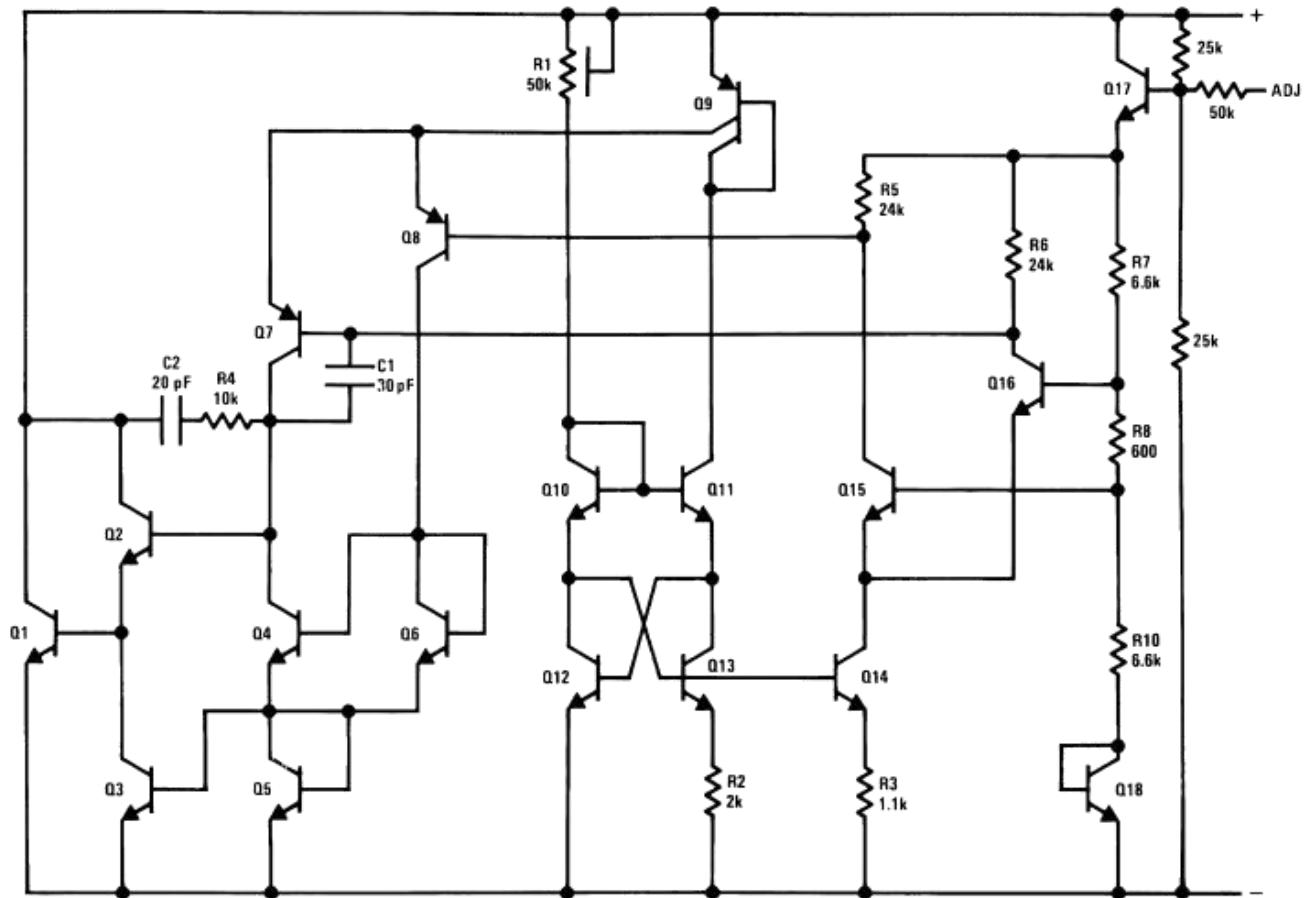
5.0V Square Wave Calibrator



Typical Applications (Continued)

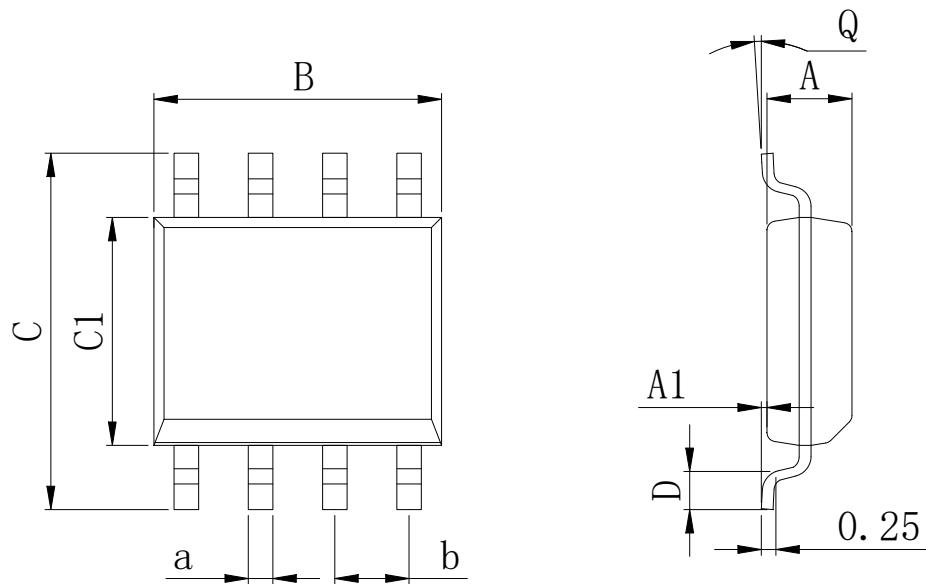


Schematic Diagram



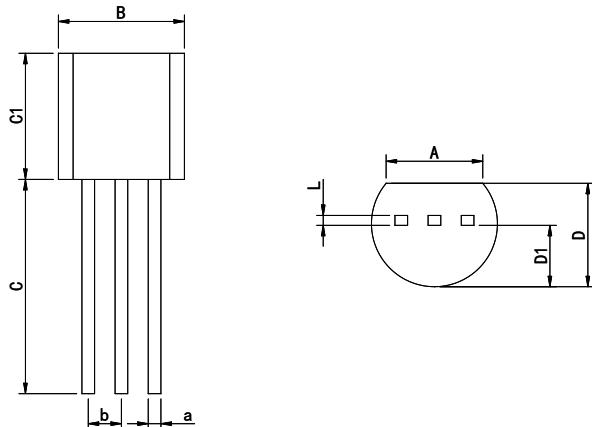
Physical Dimensions

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	

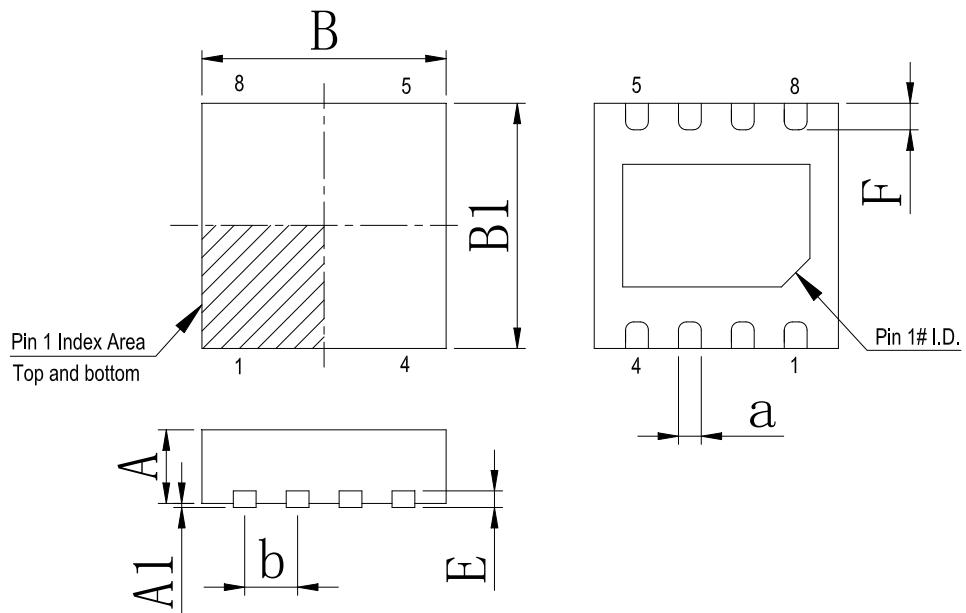
TO-92



Dimensions In Millimeters(TO-92)									
Symbol:	A	B	C	C1	D	D1	L	a	b
Min:	3.43	4.44	13.5	4.32	3.17	2.03	0.33	0.40	1.27BSC
Max:	4.13	5.21	15.3	5.34	4.19	2.67	0.42	0.52	

Physical Dimensions

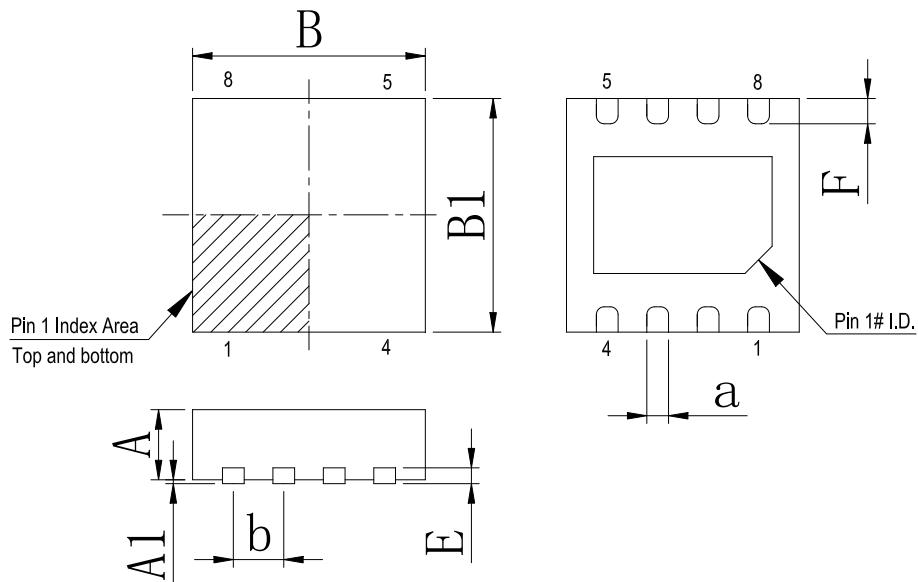
DFN-8 3*3



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	

DFN-8 2*2



Dimensions In Millimeters(DFN-8 2*2)

Symbol:	A	A1	B	B1	E	F	a	b
Min:	0.85	0	1.90	1.90	0.15	0.25	0.18	0.50TYP
Max:	0.95	0.05	2.10	2.10	0.25	0.45	0.30	

Revision History

REVISION NUMBER	DATE	REVISION	PAGE
V1.0	2015-9	New	1-11
V1.1	2017-9	Add annotation for Maximum Ratings.	2
V1.2	2024-11	Update TO-92 Physical Dimensions、Update Lead Temperature	2、8
V1.3	2025-3	Add DFN-8 package model	1
V1.4	2025-4	Add tiered models	1

IMPORTANT STATEMENT:

Huaguan Semiconductor reserves the right to change its products and services without notice. Before ordering, the customer shall obtain the latest relevant information and verify whether the information is up to date and complete. Huaguan Semiconductor does not assume any responsibility or obligation for the altered documents.

Customers are responsible for complying with safety standards and taking safety measures when using Huaguan Semiconductor products for system design and machine manufacturing. You will bear all the following responsibilities: Select the appropriate Huaguan Semiconductor products for your application; Design, validate and test your application; Ensure that your application meets the appropriate standards and any other safety, security or other requirements. To avoid the occurrence of potential risks that may lead to personal injury or property loss.

Huaguan Semiconductor products have not been approved for applications in life support, military, aerospace and other fields, and Huaguan Semiconductor will not bear the consequences caused by the application of products in these fields. All problems, responsibilities and losses arising from the user's use beyond the applicable area of the product shall be borne by the user and have nothing to do with Huaguan Semiconductor, and the user shall not claim any compensation liability against Huaguan Semiconductor by the terms of this Agreement.

The technical and reliability data (including data sheets), design resources (including reference designs), application or other design suggestions, network tools, safety information and other resources provided for the performance of semiconductor products produced by Huaguan Semiconductor are not guaranteed to be free from defects and no warranty, express or implied, is made. The use of testing and other quality control technologies is limited to the quality assurance scope of Huaguan Semiconductor. Not all parameters of each device need to be tested.

The documentation of Huaguan Semiconductor authorizes you to use these resources only for developing the application of the product described in this document. You have no right to use any other Huaguan Semiconductor intellectual property rights or any third party intellectual property rights. It is strictly forbidden to make other copies or displays of these resources. You should fully compensate Huaguan Semiconductor and its agents for any claims, damages, costs, losses and debts caused by the use of these resources. Huaguan Semiconductor accepts no liability for any loss or damage caused by infringement.