ADJUSTABLE PRECISION SHUNT REGULATOR

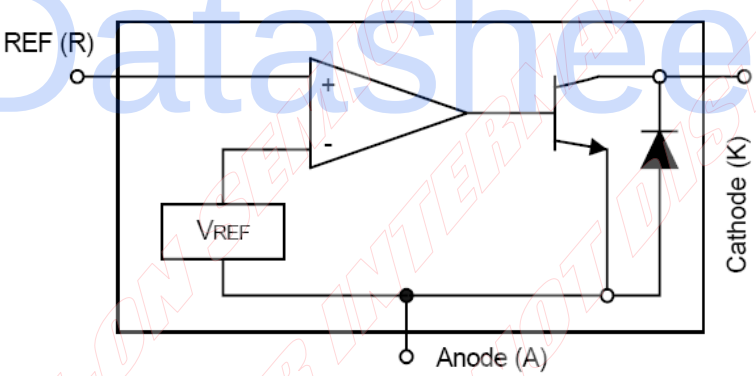
FEATURES

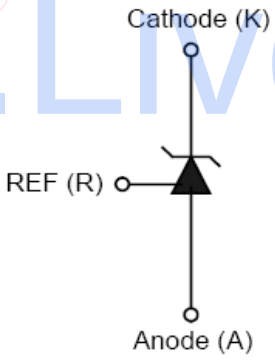
- Precision reference voltage :
  LT431O : 2.495V±0.4%
  LT431N : 2.495V±1.0%
- Adjustable output voltage is VREF to 36V
- Sink current capability is 200mA
- Low dynamic output impedance is 0.2Ω (typ.)
- Minimum Cathode current for regulation is 0.2mA (typ.)
- Plastic material has UL flammability classification 94V-0

GENERAL DESCRIPTION

The LT431 is a low voltage three terminal adjustable shunt regulator with a guaranteed thermal stability over applicable temperature ranges. The output voltage can be set to any value between 2.495V (VREF) to 36V with two external resistors (see application circuit). The high precise Reference voltage tolerance is ±0.4% and ±1.0% by LT431. This device has a typical output impedance of 0.2Ω. Active output circuitry provides a very sharp turn on characteristic, making this device excel lent replacement for Zener diodes in many applications.

Block Diagram & Symbol





Absolute Maximum Ratings

(at T_A=25°C)

Characteristics		Symbol	Rating	Unit
Cathode Voltage		V_{KA}	40	V
Continuous Cathode Current		I_{KA}	250	mA
Reference Input Current		I_{REF}	10	mA
Junction Temperature		T_J	160	°C
Storage Temperature		T_{STG}	-40~150	°C
Power Dissipation (Note1)	TO-92	PD	0.68	W
	SOT-23		0.25	W

Note1 : Ratings apply to ambient temperature at 25°C

Recommended Operating Conditions

Characteristics	Symbol	Min	Max	Unit
Cathode Voltage	V_{KA}	V_{REF}	36	V
Cathode Current	I_{KA}	0.5	200	mA
Operating Temperature (Operating free-air temperature)	T_A	-20	85	°C

Electrical Characteristics

(T_A=25°C, unless otherwise specified)

Characteristics	Symbol	Conditions		Min	Typ	Max	Unit
Reference Voltage	V_{REF}	V_{KA} = V_{REF}, I_{KA} = 10mA (Fig.1)	0.4 %	2.485	2.495	2.505	V
			1.0 %	2.470		2.520	
Deviation of Reference Input Voltage over full temperature range	$V_{REF(DEV)}$	V_{KA} = V_{REF}, I_{KA} = 10mA, T_A = -20~85°C (Fig.1)			6.0	20	mV
Reference Input Current	I_{REF}	R1 = 10KΩ,R2 = ∞ I_{KA}= 10mA (Fig.2)			1.5	3.5	uA
Deviation of Reference Input Current over Temperature	$I_{REF(DEV)}$	R1 = 10KΩ,R2 = ∞ I_{KA} = 10mA T_A = -20~85°C (Fig.2)			0.4	1.2	uA
Ratio of the Change in Reference V_{KA} = 10V ~V_{REF} - -1.2 -2.0 Voltage to the Change in Cathode Voltage	$\frac{\Delta V_{REF}}{\Delta V_{KA}}$	I_{KA} = 10mA (Fig.2)	V_{KA} = 10V ~V_{REF}		-1.2	-2.0	mV/V
			V_{KA}= 36V ~10V		-1	-2.0	
Minimum Cathode Current for Regulation	$I_{KA(min)}$	V_{KA} = V_{REF} (Fig.1)			0.2	0.5	mA
Off-state Cathode Current	$I_{KA(OFF)}$	V_{KA} = 36V, V_{REF} = 0V (Fig.3)			0.1	1	uA
Dynamic Output Impedance	Z_{KA}	V_{KA} = V_{REF} Frequency ≤ 1KHz (Fig.1)			0.2	0.5	Ω

Application Circuit

Fig1: $V_{KA}=V_{REF}$

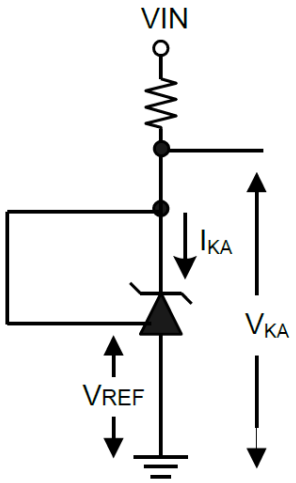
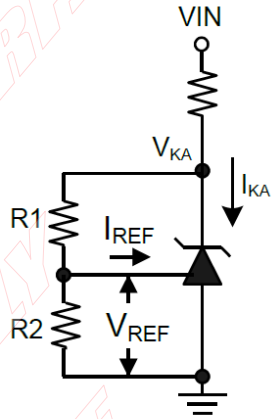
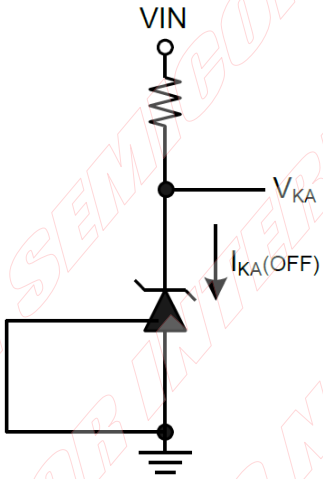


Fig2: $V_{KA}>V_{REF}$

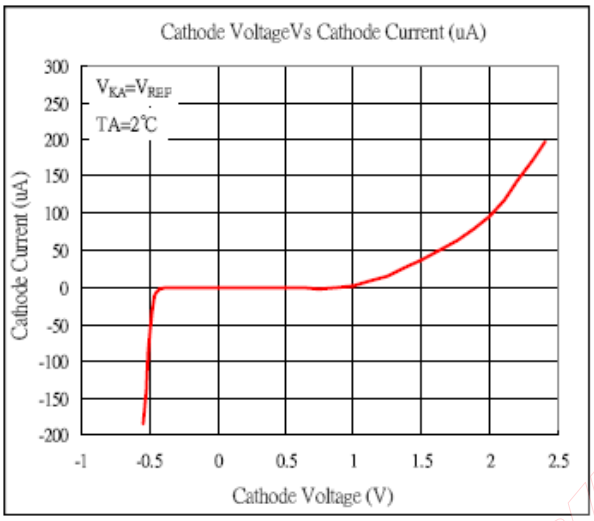


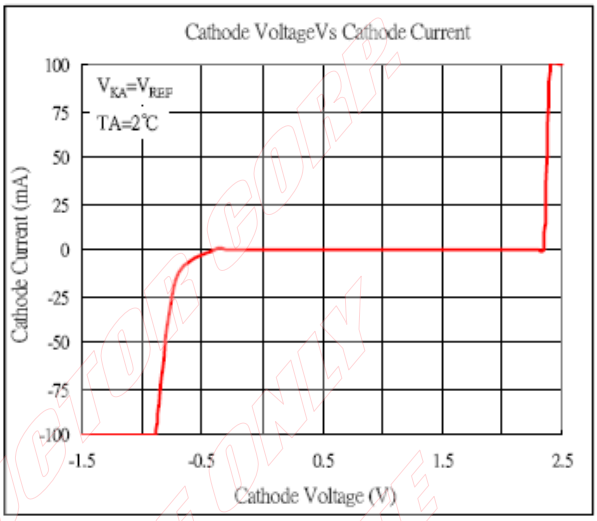
$VKA=V_{REF}(1+R1/R2)+I_{REF}*R1$

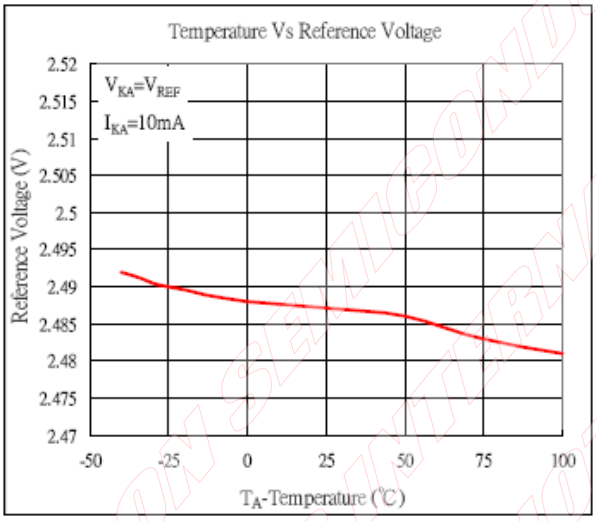
Fig3: Off state current

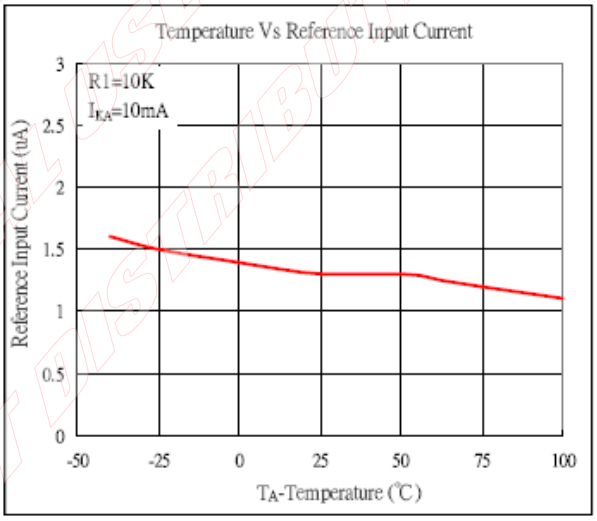


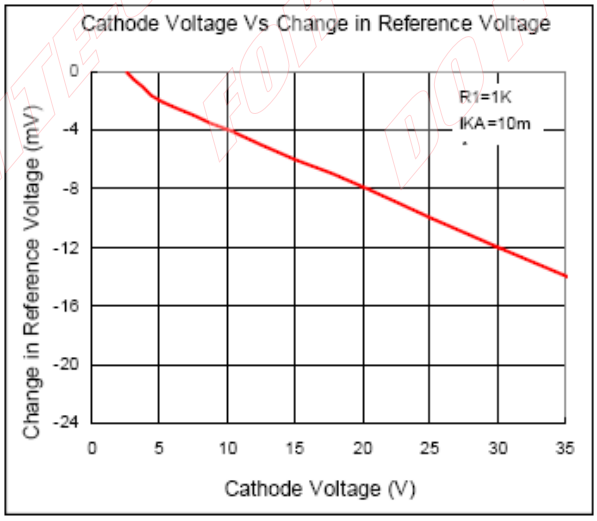
Typical Characteristics





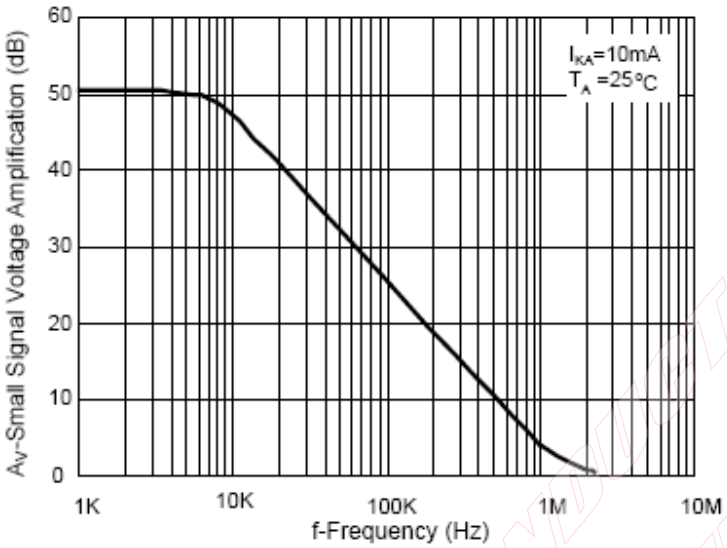


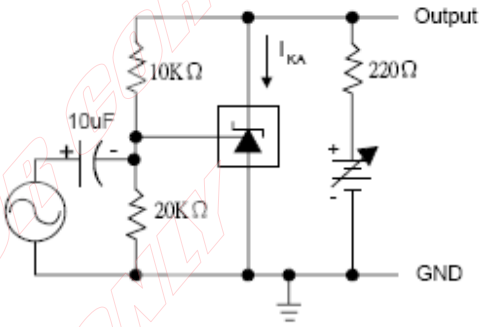




Typical Characteristics (Continued)

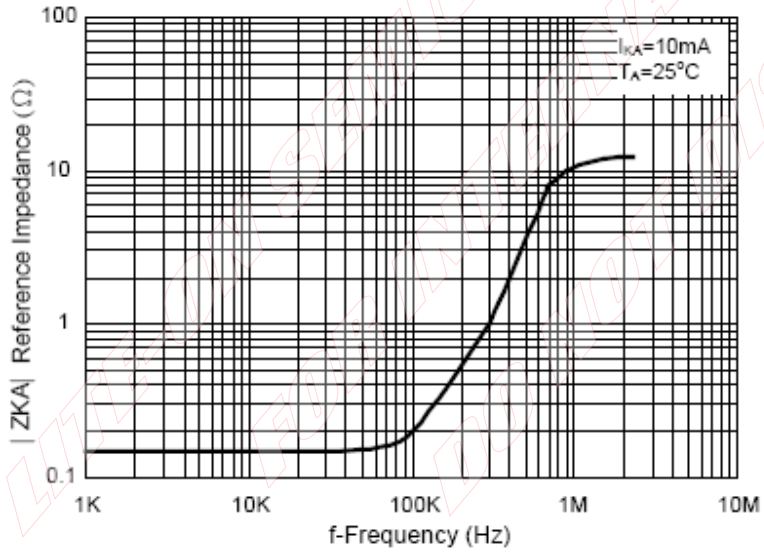
(1) Small Signal Voltage Amplification Vs Frequency

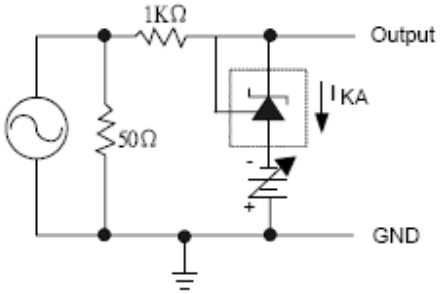




TEST CIRCUIT FOR VOLTAGE AMPLIFICATION

(2) Reference Impedance VS Frequency

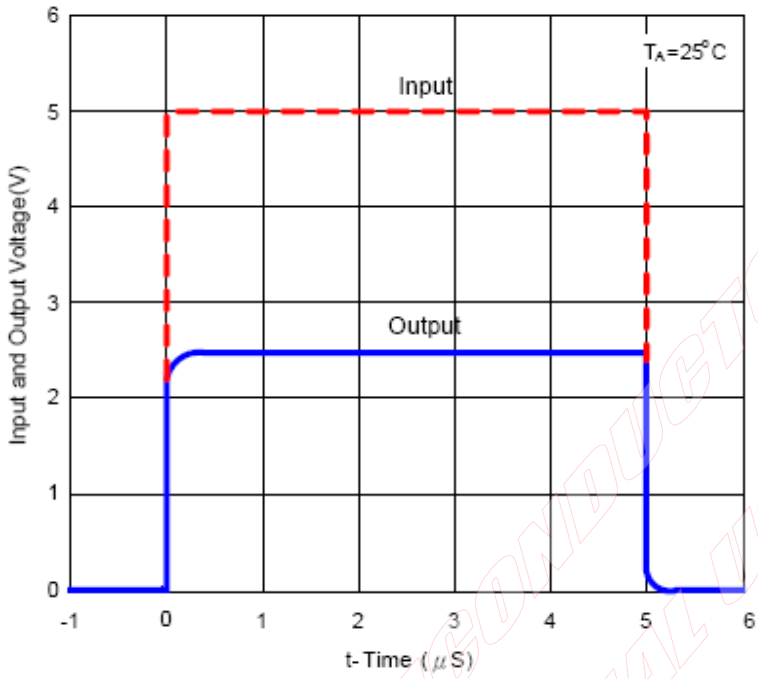


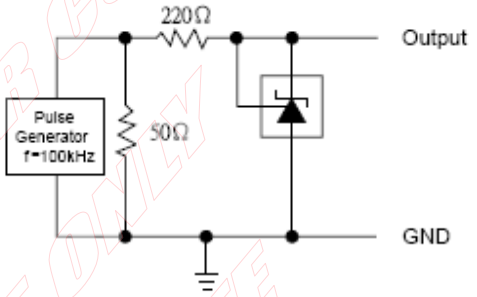


TEST CIRCUIT FOR REFERENCE IMPEDANCE

Typical Characteristics (Continued)

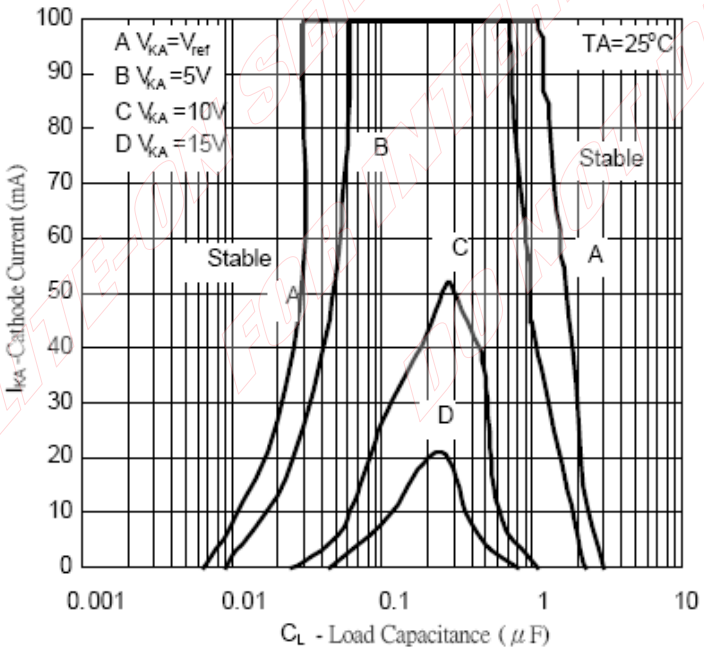
(3) Pulse Response

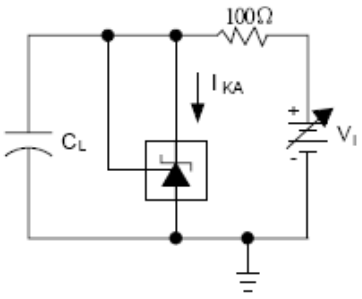




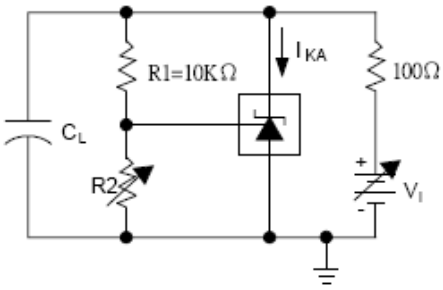
TEST CIRCUIT FOR PULSE RESPONSE

(4) Stability boundary conditions





TEST CIRCUIT FOR CURVE A



TEST CIRCUIT FOR CURVE B , C , AND D

The areas under the curves represent conditions that may cause the device to oscillate For curves B,C , and D, R2 and V_I were adjusted to establish the initial V_{KA} and I_{KA} conditions with C_L=0 . V_{BATT} and C_L were then adjusted to determine the ranges of stability.

Ordering Information

LT431 X X X X

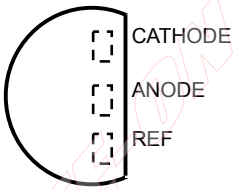
Reference Voltage	Package	Lead Free	Packing
Tolerance O : +/- 0.4% N : +/- 1.0%	H : TO-92 CA : SOT-23 CR : SOT-23R	P : Green	A : Tape & Reel

Product Number	Output Voltage Tolerance	Package	Lead Free	Packing
LT431OHPA	0.4 %	TO-92	Green	Taping & Reel
LT431NHPA	1.0 %	TO-92	Green	Taping & Reel
LT431OCAPA	0.4 %	SOT-23	Green	Taping & Reel
LT431NCAPA	1.0 %	SOT-23	Green	Taping & Reel
LT431OCRPA	0.4 %	SOT-23R	Green	Taping & Reel
LT431NCRPA	1.0 %	SOT-23R	Green	Taping & Reel

Pin Assignment

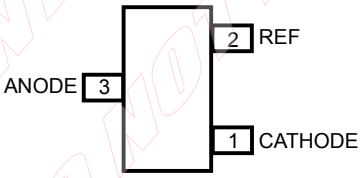
(1) TO-92

(Top View)



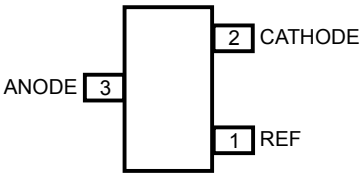
(2) SOT-23

(Top View)



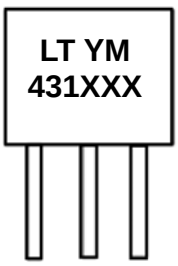
(3) SOT-23R

(Top View)



Marking Information

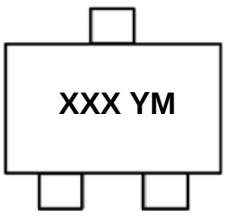
(1) TO-92



1) YM = Date Code,
Y: Year, M: Month

2) 431xxx = Product Number
LT431OHPA: 431OHP
LT431NHPA: 431NHP

(2) SOT-23 & SOT-23R

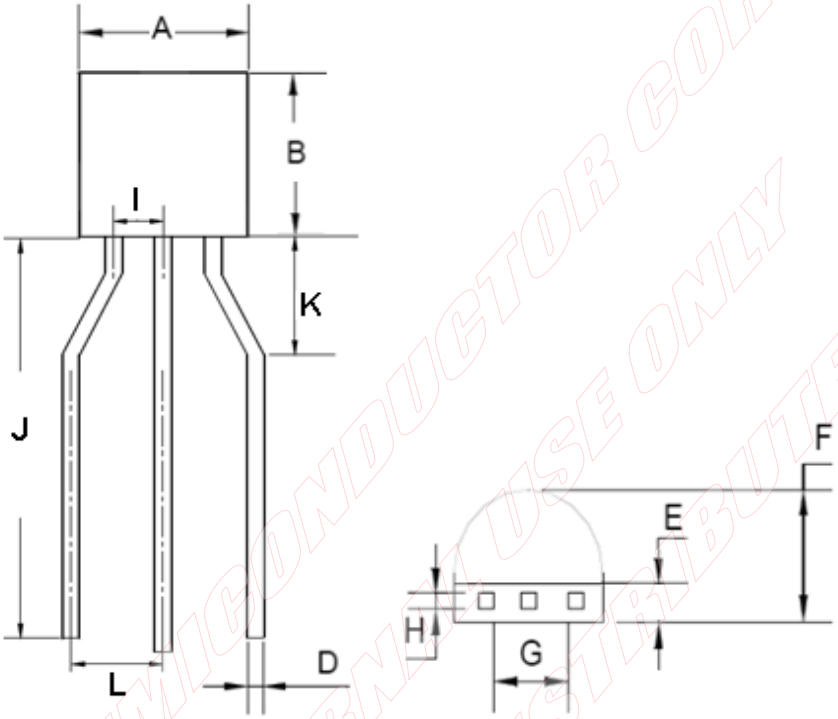


1) YM = Date Code,
Y: Year, M: Month

2) xxx = Product Number
LT431OCAPA: OCA
LT431NCAPA: NCA
LT431OCRPA: OCR
LT431NCRPA: NCR

Mechanical Information

(1) Package type: TO-92

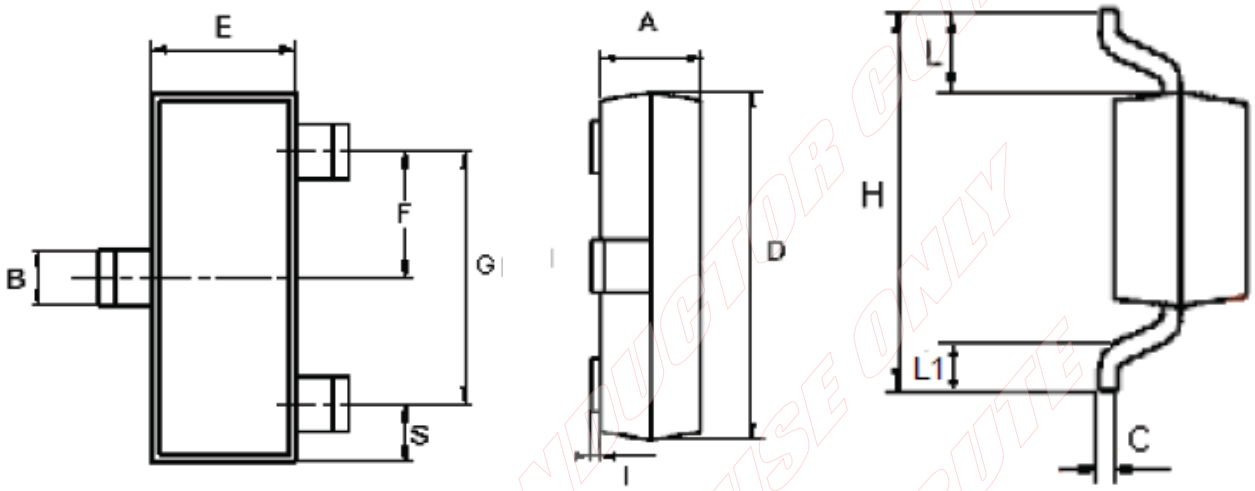


Unit: mm

DIM.	MIN.	MAX.
A	4.30	4.70
B	4.30	4.70
D	0.38	0.55
E	1.10	1.40
F	3.30	3.70
G	2.44	2.64
H	0.36	0.51
I	1.27 TYP.	
J	13.00	14.00
K	3.50	4.50
L	2.20	2.80

Mechanical Information (Continued)

(1) Package type: SOT-23 & SOT-23R



Unit: mm

DIM.	MIN.	MAX.
A	0.89	1.15
B	0.3.	0.51
C	0.08	0.18
D	2.75	3.04
E	1.2	1.4
F	0.95 TYP.	
G	1.70	2.10
H	2.10	2.75
I	0.0	0.1
L	0.55 Typ.	
L1	0.30	0.50

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