

Features

- Programmable Precise Output Voltage from 2.5V to 36V
- High Stability under Capacitive Load
- Low Temperature Deviation: 5mV Typical
- Sink Current Capacity from 150uA to 100mA
- Low Output Noise
- Wide Operating Range of -25°C to +125°C

Applications

- Charger
- Voltage Adapter
- Switching Power Supply
- Graphic Card
- Precision Voltage Reference

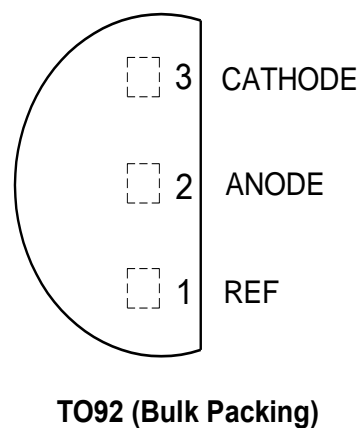
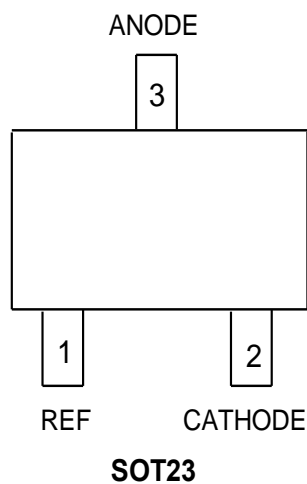
Description

The ASPL431A is a three-terminal adjustable shunt regulator with guaranteed thermal stability over a full operation range. It features sharp turn-on characteristics, low temperature coefficient and low output impedance, which make it ideal substitute for Zener diode in applications such as switching power supply, charger and other adjustable regulators.

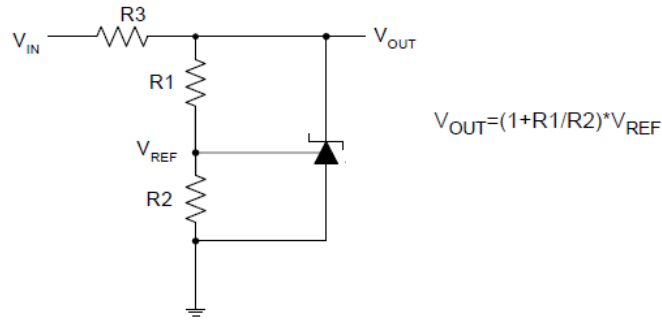
The output voltage of ASPL431A can be set to any value between VREF (2.5V) and the corresponding maximum cathode voltage (36V).

The ASPL431A precision reference is offered in two voltage tolerance: 0.4% and 0.8%.

This IC is available in 3 packages: TO92 (Bulk or Ammo Packing), SOT23 .

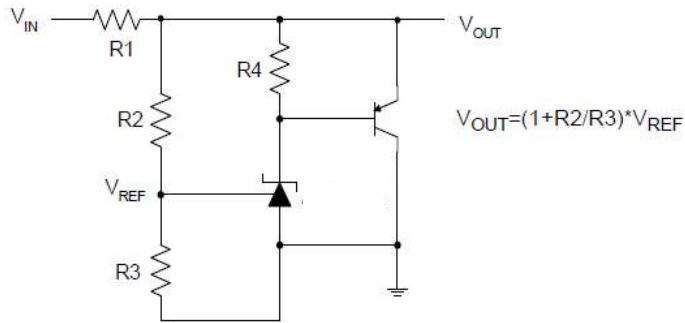


Typical Applications Circuit



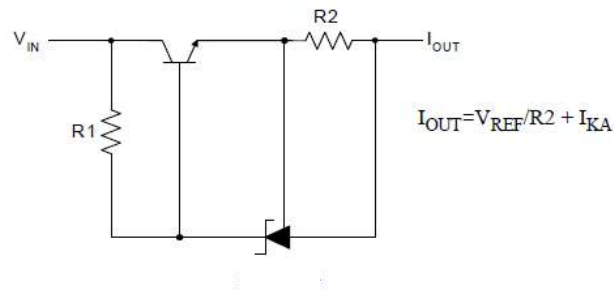
$$V_{OUT} = (1 + R1/R2) * V_{REF}$$

Shunt Regulator



$$V_{OUT} = (1 + R2/R3) * V_{REF}$$

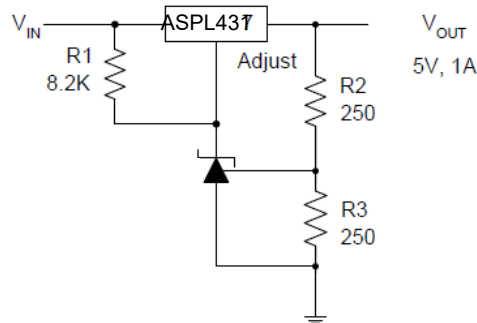
High Current Shunt Regulator



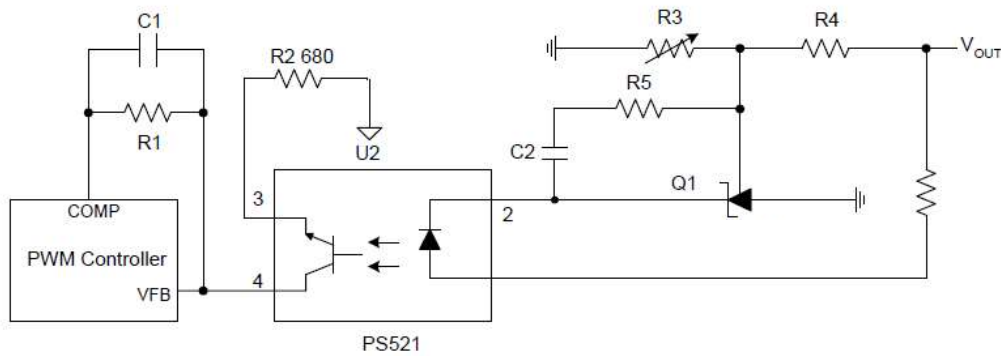
$$I_{OUT} = V_{REF}/R2 + I_{KA}$$

Current Source or Current Limit

Typical Applications Circuit (Cont.)

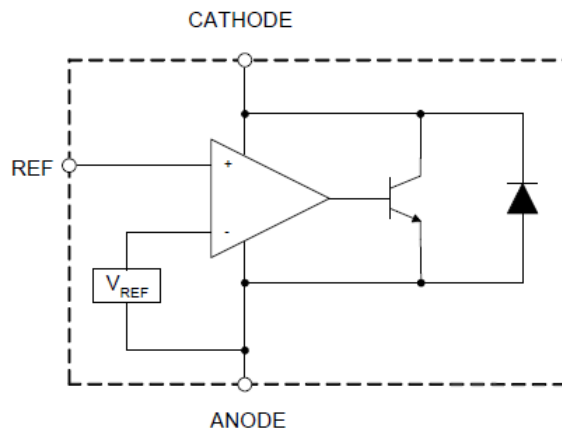


Precision 5V 1A Regulator



PWM Converter with Reference

Functional Block Diagram



Absolute Maximum Ratings (Note 4)

Symbol	Parameter		Rating	Unit
V_{KA}	Cathode Voltage		40	V
I_{KA}	Cathode Current Range (Continuous)		-100 to 150	mA
I_{REF}	Reference Input Current Range		10	mA
P_D	Power Dissipation		Z, R Package: 770	mW
			N Package: 370	
θ_{JA}	Thermal Resistance (Junction to Ambient)	SOT23	380	°C/W
		TO92	165	
T_J	Junction Temperature		+150	°C
T_{STG}	Storage Temperature Range		-65 to +150	°C
ESD	ESD (Human Body Model)		3500	V

Note 4: Stresses greater than those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "Recommended Operating Conditions" is not implied. Exposure to "Absolute Maximum Ratings" for extended periods may affect device reliability.

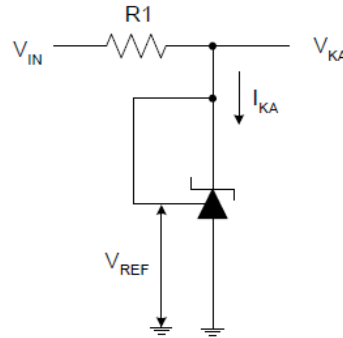
Recommended Operating Conditions

Symbol	Parameter	Min	Max	Unit
V_{KA}	Cathode Voltage	V_{REF}	36	V
I_{KA}	Cathode Current	0.2	100	mA
T_A	Operating Ambient Temperature Range	-25	+125	°C

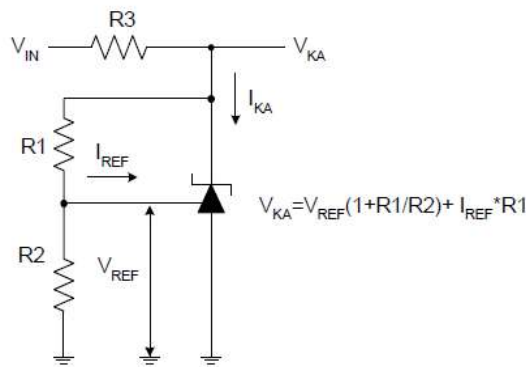
Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)

Symbol	Test Circuit	Parameter	Conditions	Min	Typ	Max	Unit
V _{REF}	4	Reference Voltage	0.5% V _{KA} = V _{REF} , I _{KA} = 10mA	2.480	2.500	2.520	V
ΔV _{REF}	4	Deviation of Reference Voltage Over Full Temperature Range	V _{KA} = V _{REF} I _{KA} = 10mA -20 to +110°C	—	-5	-20	mV
$\frac{\Delta V_{REF}}{\Delta V_{KA}}$	5	Ratio of Change in Reference Voltage to the Change in Cathode Voltage	I _{KA} = 10mA ΔV _{KA} = 10V to V _{REF} ΔV _{KA} = 36V to 10V	—	-1.87	—	mV/V
I _{REF}	5	Reference Current	I _{KA} = 10mA, R1 = 10kΩ, R2 = ∞	—	0.3	0.6	μA
ΔI _{REF}	5	Deviation of Reference Current Over Full Temperature Range	I _{KA} = 10mA, R1 = 10kΩ R2 = ∞, T _A = -40 to +125°C	—	0.2	0.3	μA
I _{KA} (Min)	4	Minimum Cathode Current for Regulation	V _{KA} = V _{REF}	—	0.15	0.4	mA
I _{KA} (Off)	6	Off-state Cathode Current	V _{KA} = 36V, V _{REF} = 0	—	0.01	1.0	μA
Z _{KA}	4	Dynamic Impedance	V _{KA} = V _{REF} , I _{KA} = 1 to 100mA, f ≤ 1.0kHz	—	0.10	0.5	Ω
θ _{JC}	—	Thermal Resistance	SOT23	—	113	—	°C/W
	—		TO92	—	68	—	
	—						

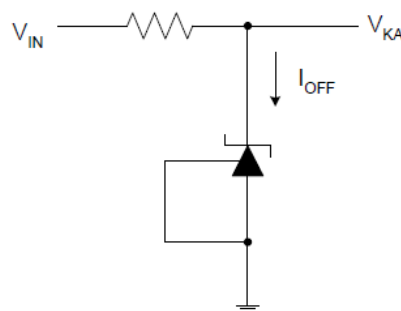
Electrical Characteristics (Cont.)



Test Circuit 4 for $V_{KA} = V_{REF}$

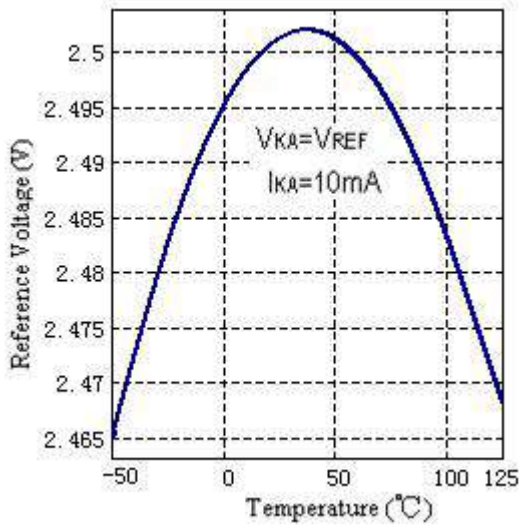


Test Circuit 5 for $V_{KA} > V_{REF}$

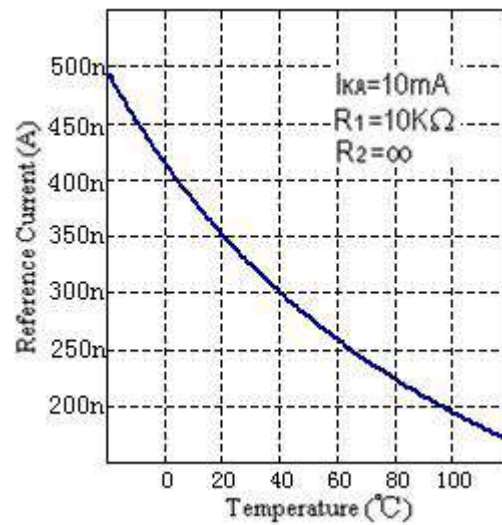


Test Circuit 6 for I_{OFF}

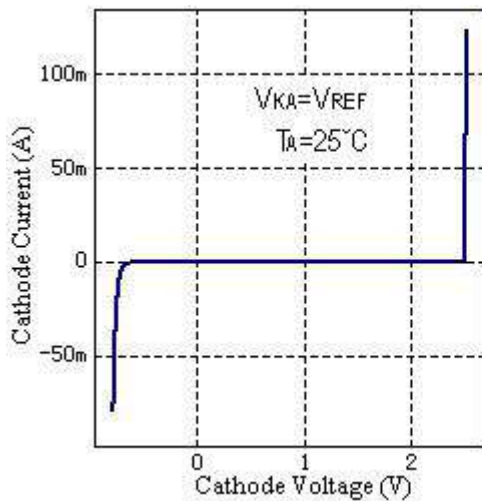
Performance Characteristics



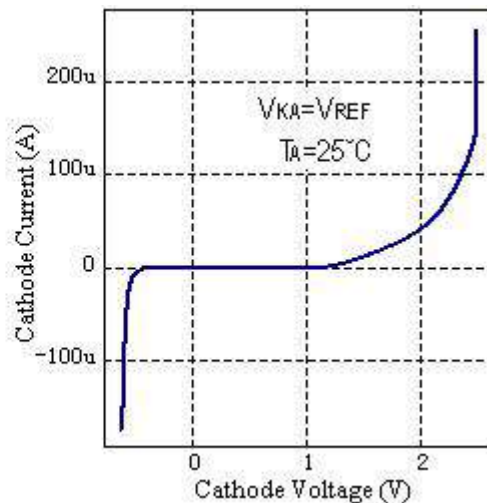
Reference Voltage vs. Ambient Temperature



Reference Current vs. Ambient Temperature

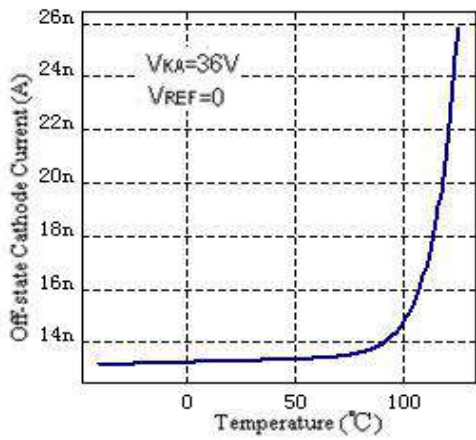


Cathode Current vs. Cathode Voltage

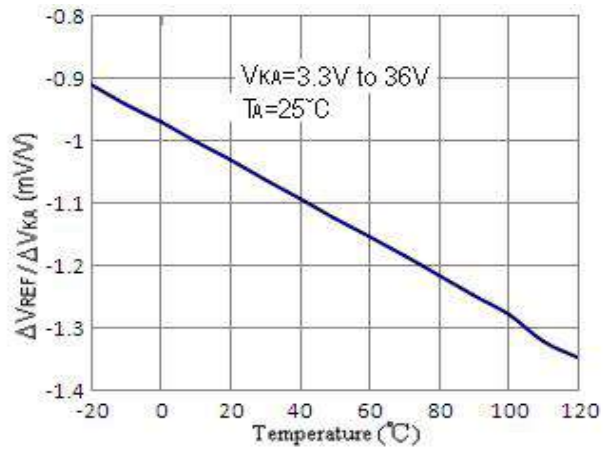


Cathode Current vs. Cathode Voltage

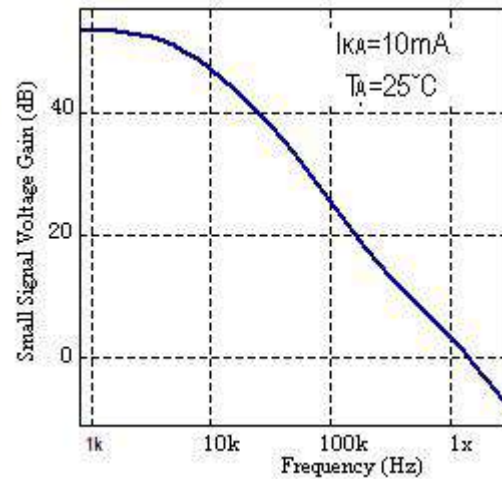
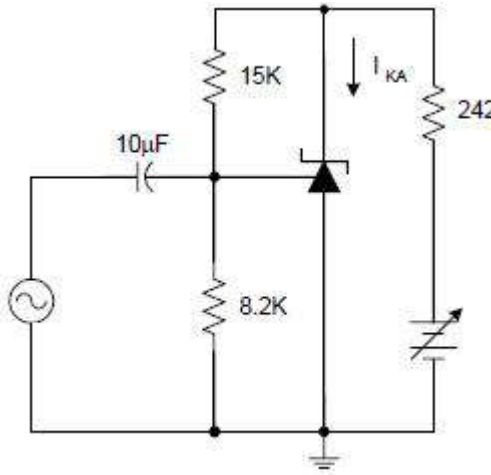
Performance Characteristics (Cont.)



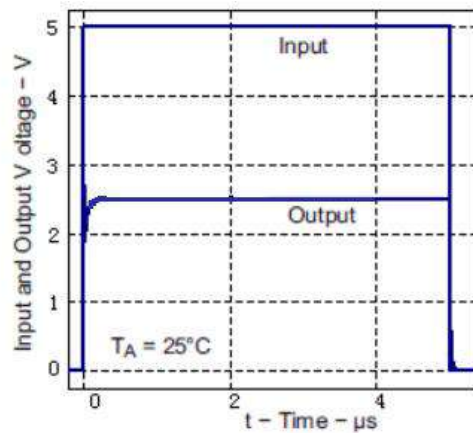
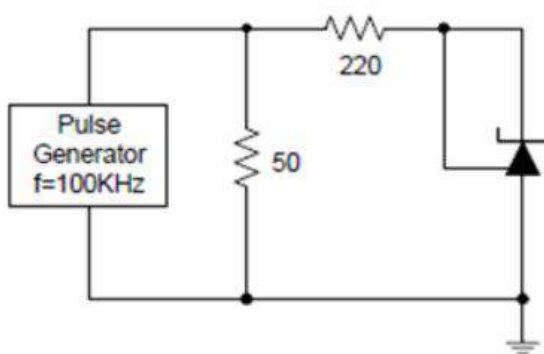
Off-state Cathode Current vs. Ambient Temperature



Ratio of Delta Reference Voltage to the Ratio of Delta Cathode Voltage

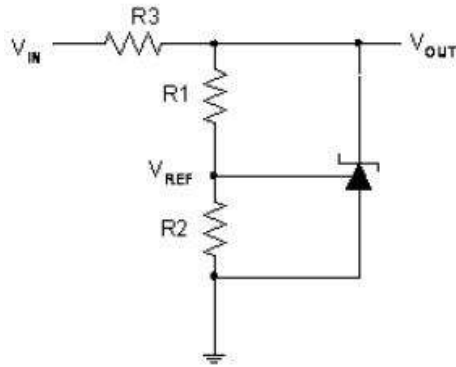


Small Signal Voltage Gain vs. Frequency

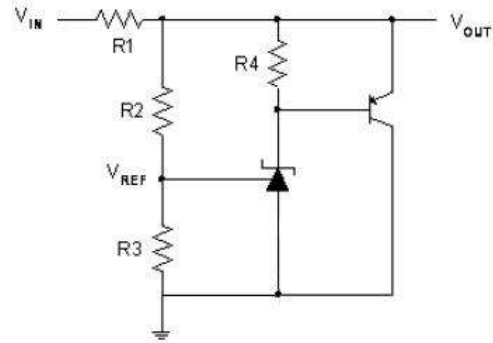


Pulse Response of Input and Output Voltage

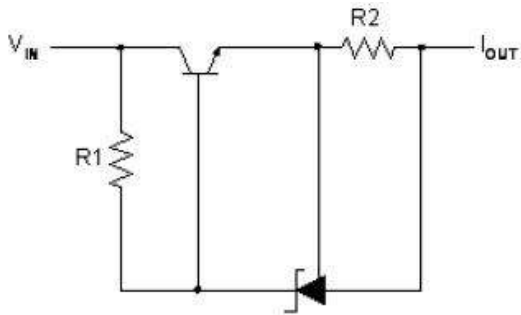
Performance Characteristics (Cont.)



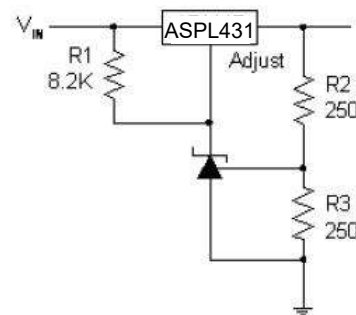
Shunt Regulator



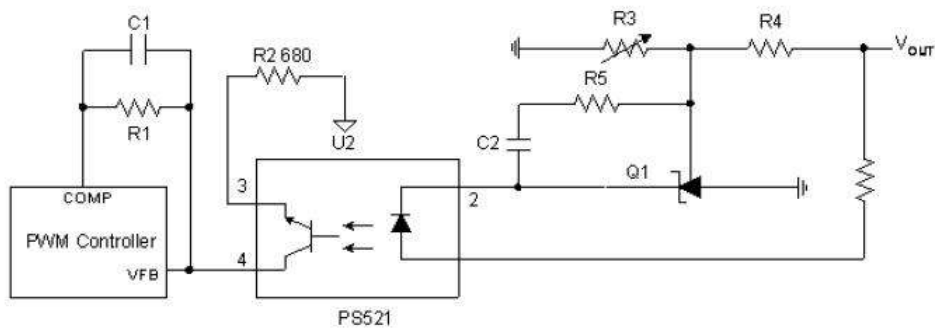
High Current Shunt Regulator



Current Source or Current Limit



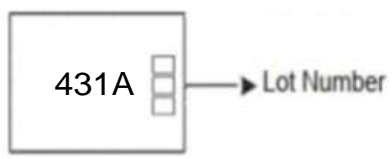
Precision 5V 1A Regulator

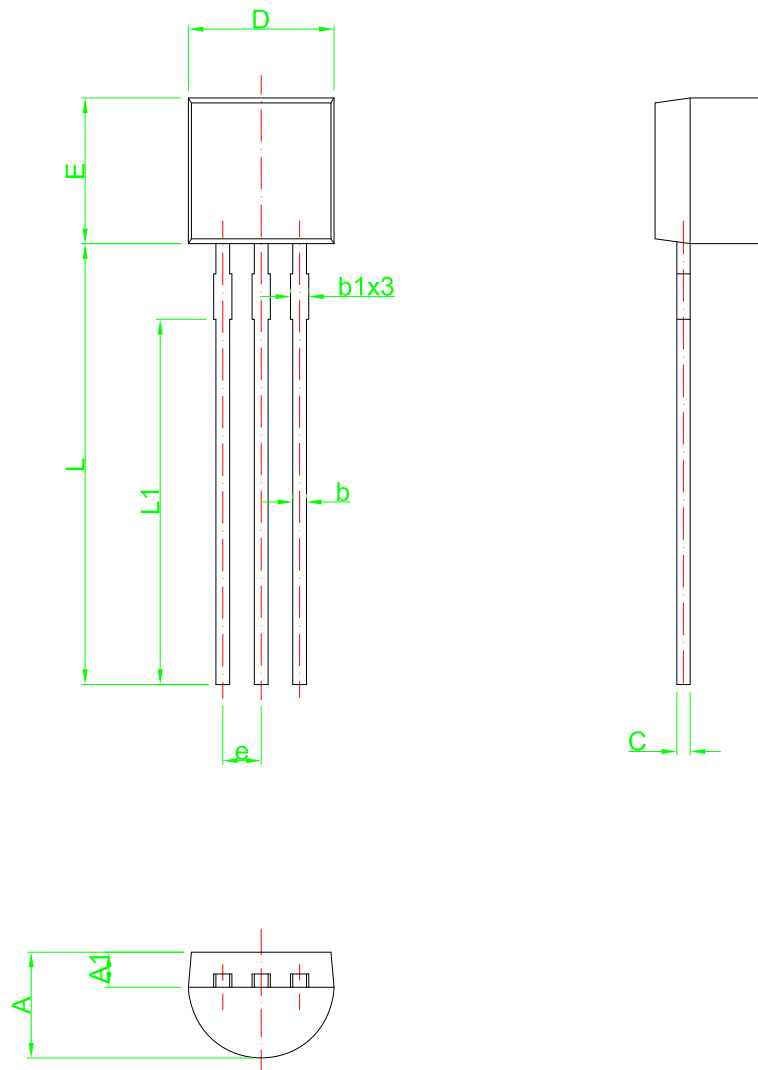


PWM Converter with Reference

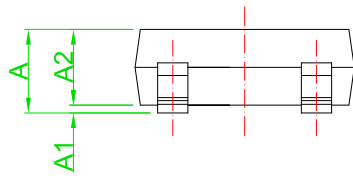
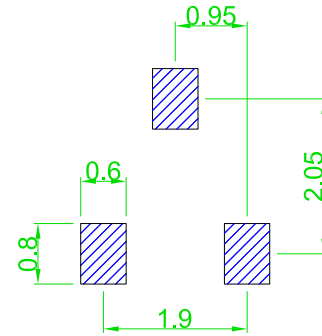
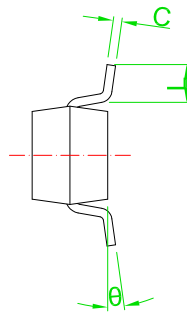
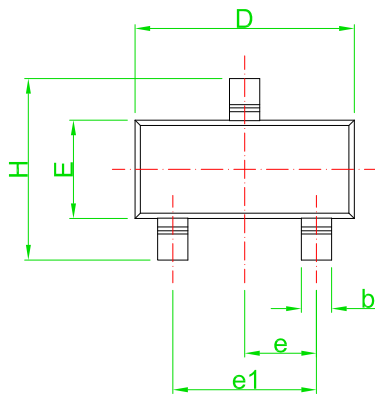
Ordering Information

Ordering Device No	Marking	Package	Packing	Quantity
ASPL431AZA-R	431A/XXX	SOT23	Tape&Reel	3000/Reel

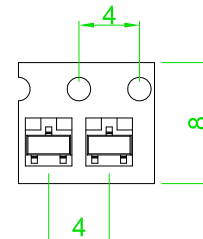
PACKAGE	MARKING
SOT23	



Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min	Max	Min	Max
A	3.30	3.70	0.130	0.146
A1	1.10	1.40	0.043	0.055
b	0.34	0.55	0.013	0.022
b1	0.50	0.70	0.020	0.028
C	0.34	0.54	0.013	0.021
D	4.33	4.83	0.170	0.190
E	4.33	4.83	0.170	0.190
e	1.27 TYP		0.05 TYP	
L	14.07	14.87	0.554	0.585
L1	12.47 TYP		0.491 TYP	



Recommended Land Pattern



Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min	Max	Min	Max
A	0.90	1.15	0.035	0.045
A1	0.00	0.10	0.000	0.004
A2	0.90	1.05	0.035	0.041
b	0.30	0.55	0.012	0.022
C	0.08	0.15	0.003	0.006
D	2.80	3.00	0.110	0.118
E	1.20	1.40	0.047	0.055
e	0.95 TYP		0.037 TYP	
e1	1.80	2.00	0.071	0.079
H	2.25	2.55	0.089	0.100
L	0.30	0.50	0.012	0.020
θ	0°	8°	0°	8°

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