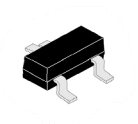
SOT-23 Adjustable Precision Shunt Regulators

CMTL431AR



SOT-23

SOT-23
SMD Package
RoHS compliant

FEATURES:

1. Low output impedance
2. Narrow tolerance band
3. Compliant to RoHS, REACH, Conflict Minerals
4. Operating Free Air temperature T_A: -40°C to 85°C
5. Marking code = **431AR**

ABSOLUTE MAXIMUM RATING-Q1 (Ta = 25 ℃ Unless otherwise specified)

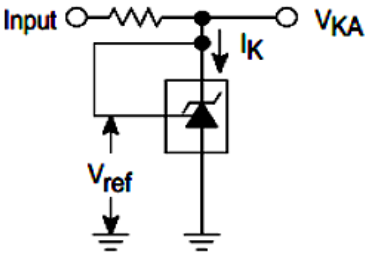
PARAMETER	SYMBOL	VALUE	UNIT
Cathode Voltage	V_{KA}	37	V
Cathode Current Range (Continuous)	I_{KA}	-100 to +150	mA
Reference Input Current Range	Iref	-0.05 to +10	mA
Power Dissipation	P_D	300	mW
Thermal Resistance from Junction to Ambient	$R_{\theta JA}$	417	°C/W
Operating Junction Temperature	T_j	-40 to +125	°C
Storage temperature Range	T_{stg}	-55 to +150	°C

ELECTRICAL CHARACTERISTICS at - Q1 NMOS(Ta = 25 ℃ Unless otherwise specified)

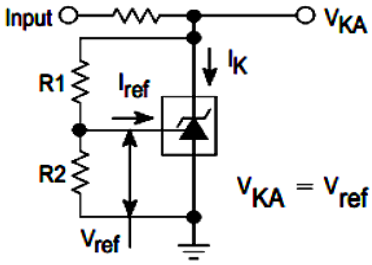
PARAMETER	SYMBOL	TEST CONDITION		MIN	TYP	MAX	UNIT
Reference input voltage	V_{ref}	$V_{KA} = V_{REF}$, I_{KA} = 10mA		2.470	2.495	2.52	V
Temperature drift of Vref ---	$\triangle V_{ref}$	$V_{KA} = V_{REF}$, I_{KA} = 10mA T_j = -25°C ~ +85°C		--	4.5	17	mV
Temperature drift von Vref		T_j = -40°C ~ +125°C		--	6	34	
Ratio of change in reference input voltage to the change in cathode voltage	$\triangle V_{ref}$ /$\triangle V_{KA}$	I_{KA} = 10mA	ΔV_{KA} = 10V~V_{REF}	--	-1	-1.7	mV/V
			ΔV_{KA} = 36V~10V	--	-0.5	-2	mV/V
Reference Input Current	I_{ref}	I_{KA}=10mA, R_1=10kΩR2 = ∞		--	1.5	4	μA
Deviation of reference current over full temperature range	$\triangle I_{ref}$	I_{KA} = 10mA, R_1 = 10kΩ R_2 = ∞, T_j = -25°C to +85°C		--	0.4	1.2	μA
		T_j = -40°C to +125°C		--	0.8	2.5	
Minimum cathode current for regulation	$I_{KA(min)}$	$V_{KA} = V_{REF}$		--	0.4	0.7	mA
Off-state cathode Current	$I_{KA(OFF)}$	V_{KA} = 36V, V_{REF} = 0		--	0.05	1	μA
Dynamic impedance	Z_{KA}	$V_{KA} = V_{REF}$, f ≤ 1.0kHz I_{KA} = 1 to 100mA		--	0.15	0.5	Ω

TEST CIRCUIT AND DIAGRAMS

Test Circuit for $V_{KA} = V_{ref}$

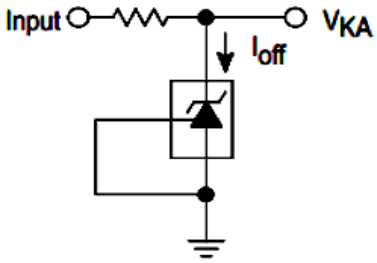


Test Circuit for $V_{KA} > V_{ref}$



$$V_{KA} = V_{ref}\left(1 + \frac{R1}{R2}\right) + I_{ref} \bullet R1$$

Test Circuit for I_{off}



Application Notes

Fig. 1 Test circuit for characteristics/ Shunt regulator/ Voltage Reference

$V_O = (1 + R_1/R_2)\, V_{REF} + I_R \times R_1$

Stability criteria see „Recommended operating area".

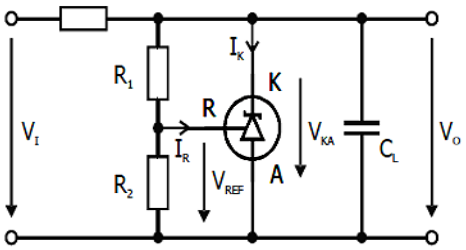


Fig. 2 Replacement of low voltage Zener diodes

Comparison between a BZT52C3V3 and the CMTL431AR adjusted to 3.3V according to Fig. 1: The shunt regulator shows a better linearity with very tight tolerance band and low temperature drift.

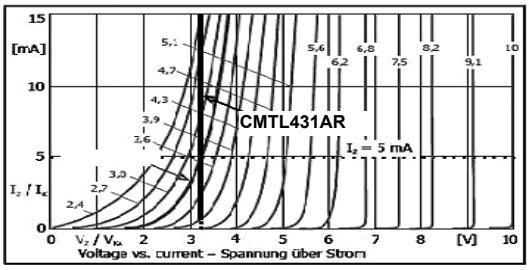


Fig. 3 Low device-count power supply for microcontrollers and other circuits with low current need

The current limiting diode CL10MD provides a contant current over a wide input voltage range (~3 V ... 90 V). For dimensioning, refer to the data sheet of the CL10MD.

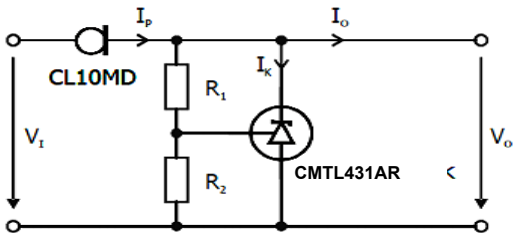


Fig. 4 Precision voltage regulator

$V_O = (1 + R_1/R_2)\, V_{REF}$

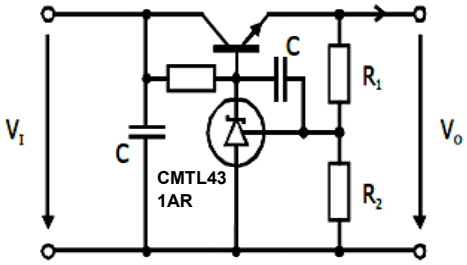
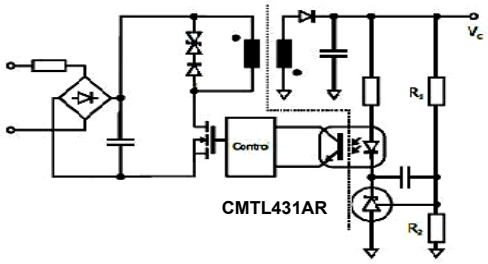


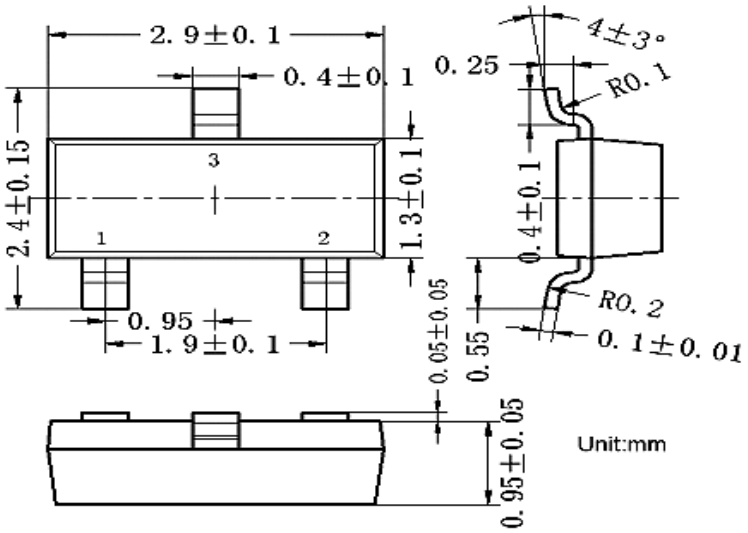
Fig. 5 Secondary side regulation of a flyback converter

The CMTL431AR provides a reference voltage and is used as error amplifier.



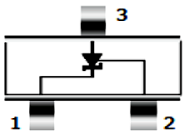
PACKAGE DETAILS

SOT-23 Package

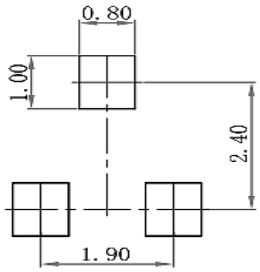


PIN CONFIGURATION

1. Cathode
2. Reference
3. Anode



SOT-23 Suggested Pad Layout



Note

1. Controlling Dimensions: in Millimeters.
2. General Tolerance:±0.05mm
3. The Pad Layout is For Reference Purposes Only.

Recommended Reflow Solder Profiles

The recommended reflow solder profiles for Pb and Pb-free devices are shown below.

Figure 1 shows the recommended solder profile for devices that have Pb-free terminal plating, and where a Pb-free solder is used.

Figure 2 shows the recommended solder profile for devices with Pb-free terminal plating used with leaded solder, or for devices with leaded terminal plating used with a leaded solder.

Figure 1

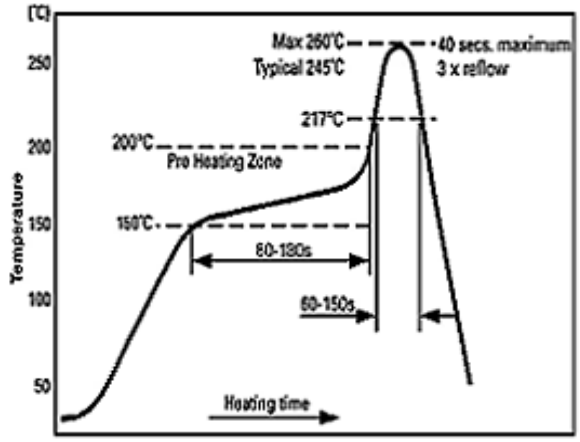
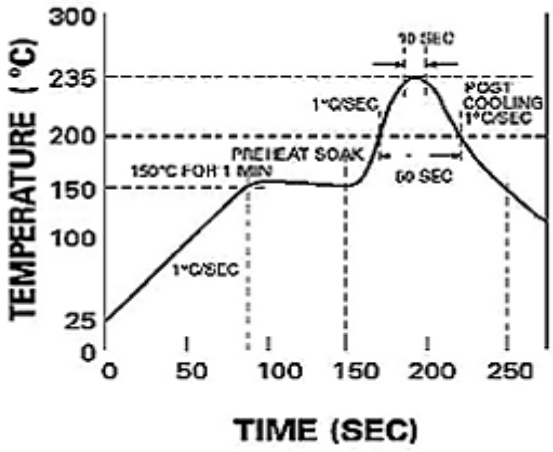


Figure 2

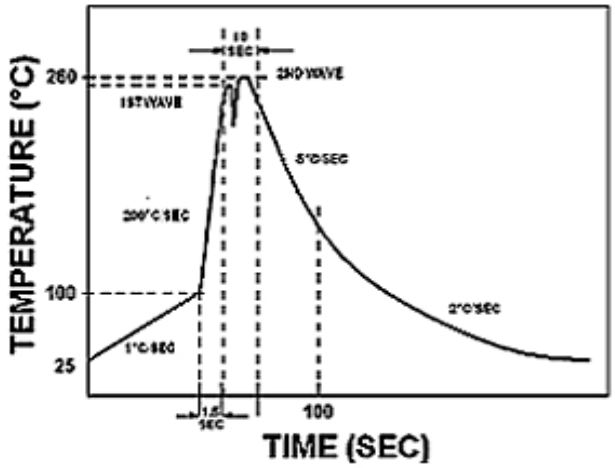


Reflow profiles in tabular form

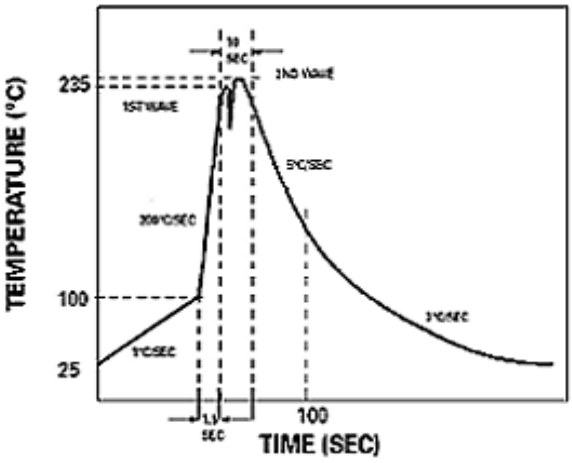
Profile Feature	Sn-Pb System	Pb-Free System
Average Ramp-Up Rate	~3°C/second	~3°C/second
Preheat – Temperature Range – Time	 150-170°C 60-180 seconds	 150-200°C 60-180 seconds
Time maintained above: – Temperature – Time	 200°C 30-50 seconds	 217°C 60-150 seconds
Peak Temperature	235°C	260°C max.
Time within +0 -5°C of actual Peak	10 seconds	40 seconds
Ramp-Down Rate	3°C/second max.	6°C/second max.

Recommended Wave Solder Profiles

The Recommended solder Profile For Devices with Pb-free terminal plating where a Pb-free solder is used



The Recommended solder Profile For Devices with Pb-free terminal plating used with leaded solder, or for devices with leaded terminal plating used with leaded solder



Wave Profiles in Tabular Form

Profile Feature	Sn-Pb System	Sn-Pb System
Average Ramp-Up Rate	~200°C/second	~200°C/second
Heating rate during preheat	Typical 1-2, Max 4°C/sec	Typical 1-2, Max 4°C/Sec
Final preheat Temperature	Within 125°C of Solder Temp	Within 125°C of Solder Temp
Peak Temperature	235°C	260°C max.
Time within +0 -5°C of actual Peak	10 seconds	10 seconds
Ramp-Down Rate	5°C/second max.	5°C/second max

Recommended Product Storage Environment for Discrete Semiconductor Devices

This storage environment assumes that the Diodes and transistors are packed properly inside the original packing supplied by CDIL.

- Temperature 5 °C to 30 °C
- Humidity between 40 to 70 %RH
- Air should be clean.
- Avoid harmful gas or dust.
- Avoid outdoor exposure or storage in areas subject to rain or water spraying .
- Avoid storage in areas subject to corrosive gas or dust. Product shall not be stored in areas exposed to direct sunlight.
- Avoid rapid change of temperature.
- Avoid condensation.
- Mechanical stress such as vibration and impact shall be avoided.
- The product shall not be placed directly on the floor.
- The product shall be stored on a plane area. They should not be turned upside down. They should not be placed against the wall.

Shelf Life of CDIL Products

The shelf life of products is the period from product manufacture to shipment to customers. The product can be unconditionally shipped within this period. The period is defined as 2 years.
If products are stored longer than the shelf life of 2 years the products shall be subjected to quality check as per CDIL quality procedure.
The products are further warranted for another one year after the date of shipment subject to the above conditions in CDIL original packing.

Floor Life of CDIL Products and MSL Level

When the products are opened from the original packing, the floor life will start.
For this, the following JEDEC table may be referred:

JEDEC MSL Level		
Level	**Time**	**Condition**
1	Unlimited	≤30 °C / 85% RH
2	1 Year	≤30 °C / 60% RH
2a	4 Weeks	≤30 °C / 60% RH
3	168 Hours	≤30 °C / 60% RH
4	72 Hours	≤30 °C / 60% RH
5	48 Hours	≤30 °C / 60% RH
5a	24 Hours	≤30 °C / 60% RH
6	Time on Label(TOL)	≤30 °C / 60% RH

Customer Notes

Component Disposal Instructions

1. CDIL Semiconductor Devices are RoHS compliant, customers are requested to please dispose as per prevailing Environmental Legislation of their Country.
2. In Europe, please dispose as per EU Directive 2002/96/EC on Waste Electrical and Electronic Equipment (WEEE).

Disclaimer

The product information and the selection guides facilitate selection of the CDIL's Semiconductor Device(s) best suited for application in your product(s) as per your requirement. It is recommended that you completely review our Data Sheet(s) so as to confirm that the Device(s) meet functionality parameters for your application. The information furnished in the Data Sheet and on the CDIL Web Site/CD are believed to be accurate and reliable. CDIL however, does not assume responsibility for inaccuracies or incomplete information. Furthermore, CDIL does not assume liability whatsoever, arising out of the application or use of any CDIL product; neither does it convey any license under its patent rights nor rights of others. These products are not designed for use in life saving/support appliances or systems. CDIL customers selling these products (either as individual Semiconductor Devices or incorporated in their end products), in any life saving/support appliances or systems or applications do so at their own risk and CDIL will not be responsible for any damages resulting from such sale(s).
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