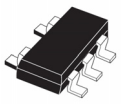
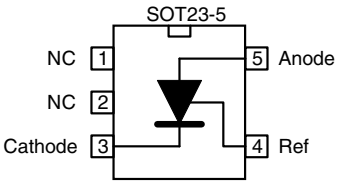
TL431AIDBVR
Programmable voltage reference

Features

- Adjustable output voltage: 2.5 to 36 V
- Sink current capability: 1 to 100 mA
- Typical output impedance: 0.22 Ω
- 1% and 2% voltage precision
- Automotive temp. range - 40 °C to +125 °C



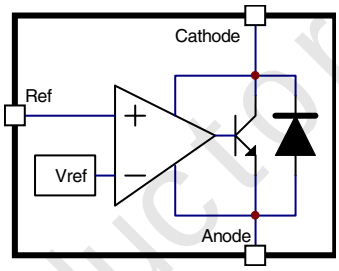
SOT23-5



SOT23-5 pin connections (top view)

Applications

- Power supply
- Industrial
- Automotive



TL431AIDBVR block diagram

Description

The TL431AIDBVR are programmable shunt voltage references with guaranteed temperature stability over the entire operating temperature range. The device temperature range is extended for the automotive version from -40 °C up to +125 °C. The output voltage can be set to any value between 2.5 and 36 V with two external resistors. The TL431AIDBVR operate with a wide current range from 1 to 100 mA with a typical dynamic impedance of 0.22 Ω.

Absolute maximum ratings and operating conditions

Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{KA}	Cathode to anode voltage	37	V
I_k	Continuous cathode current range	-100 to +150	mA
I_{ref}	Reference input current range	-0.05 to +10	mA
R_{thja}	SOT23-5	157	°C/W
R_{thjc}	SOT23-5	67	°C/W
T_{stg}	Storage temperature range	-65 to +150	°C
T_J	Junction temperature	150	°C
ESD	TL431AIDBVR: HBM (human body model)	3000	V

Operating conditions

Symbol	Parameter	Value	Unit
V_{KA}	Cathode to anode voltage	V_{ref} to 36	V
I_k	Cathode current	1 to 100	mA
T_{oper}	TL431AIDBVR	-40 to +125	°C

Electrical characteristics

Tamb = 25°C unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit
V_{ref}	Reference input voltage $V_{KA} = V_{ref}$, I_k = 10 mA $T_{min} \le T_{amb} \le T_{max}$	2.47 2.44	2.495	2.52 2.55	V
ΔV_{ref}	Reference input voltage deviation over temperature range (1) $V_{KA} = V_{ref}$, I_k = 10 mA, $T_{min} \le T_{amb} \le T_{max}$		7	30	mV
$\frac{\Delta Vref}{\Delta Vka}$	Ratio of change in reference input voltage to change in cathode to anode voltage I_k = 10 mA, ΔV_{KA} = 10 V to V_{ref} I_k = 10 mA, ΔV_{KA} = 36 V to 10 V	 -2.7 -2	 -1.4 -1		mV/V
I_{ref}	Reference input current I_k = 10 mA, R1 = 10 kΩ, R2 = ∞ $T_{min} \le T_{amb} \le T_{max}$		1.8	4 6.5	µA
ΔI_{ref}	Reference input current deviation over temperature range I_k = 10 mA, R1 = 10 kΩ, R2 = ∞, $T_{min} \le T_{amb} \le T_{max}$		0.8	1.2	µA
I_{min}	Minimum cathode current for regulation $V_{KA} = V_{ref}$		0.5	0.6	mA
I_{off}	Off-state cathode current $T_{min} \le T_{amb} \le T_{max}$		2.6	1000 3000	nA
$\lvert ZKA \rvert$	Dynamic impedance (2) $V_{KA} = V_{ref}$, ΔI_k = 1 to 100 mA, F ≤ 1 kHz		0.22	0.5	Ω

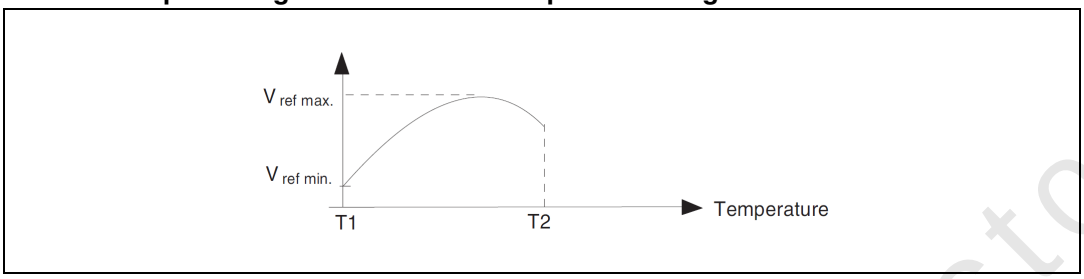
The dynamic impedance is defined as $\lvert ZKA \rvert = \frac{\Delta V_{KA}}{\Delta I_k}$

Reference input voltage deviation over temperature range

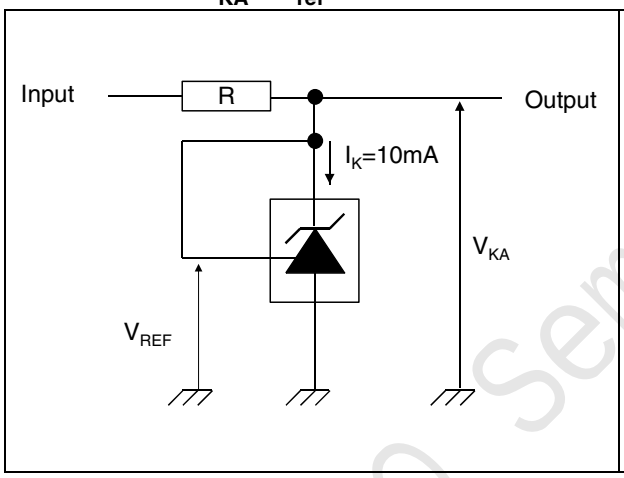
ΔV_{ref} is defined as the difference between the maximum and minimum values obtained over the full temperature range.

$$\Delta V_{ref} = V_{ref\ max} - V_{ref\ min}$$

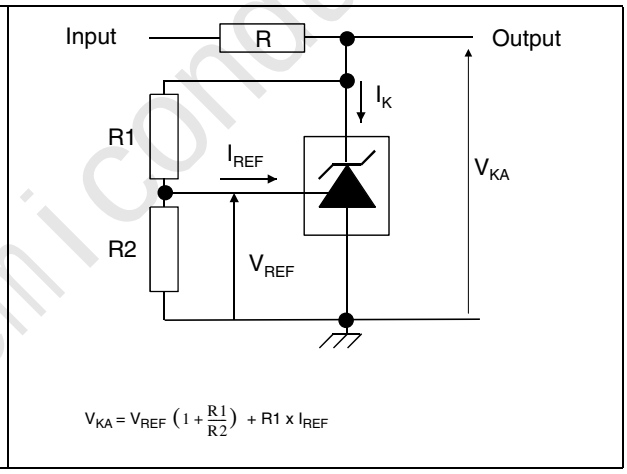
Reference input voltage deviation over temperature range



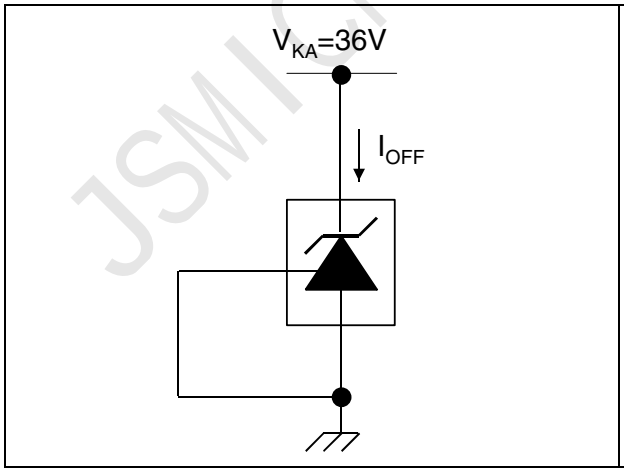
Test circuit for $V_{KA} = V_{ref}$



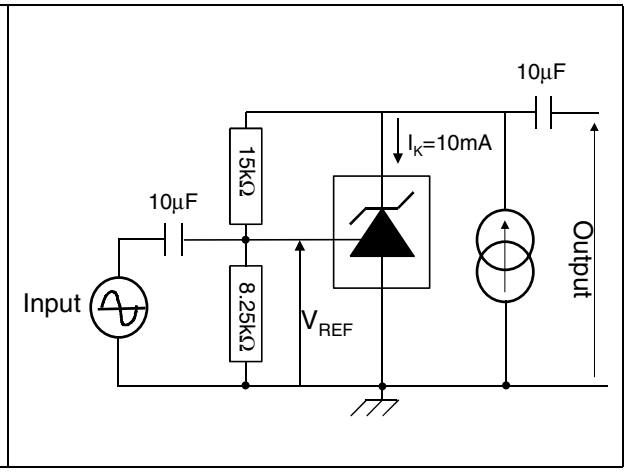
Test circuit for programming mode



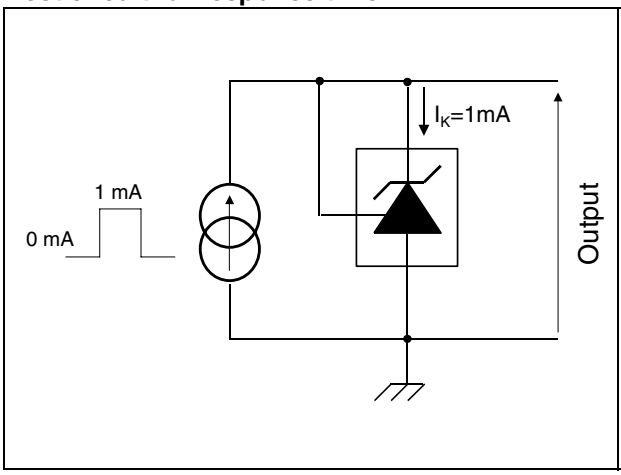
Test circuit for I_{off}



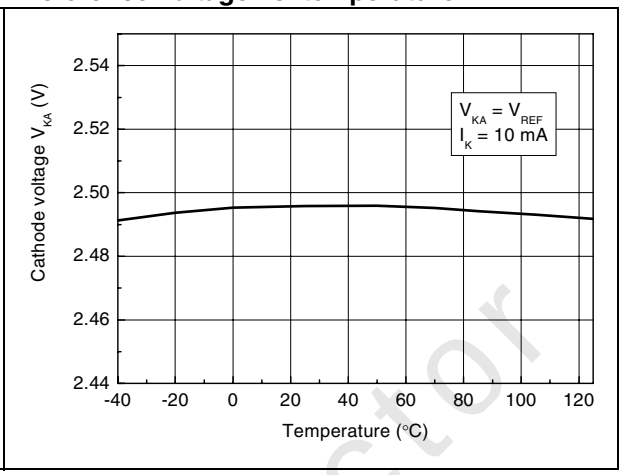
Test circuit for phase margin and voltage gain



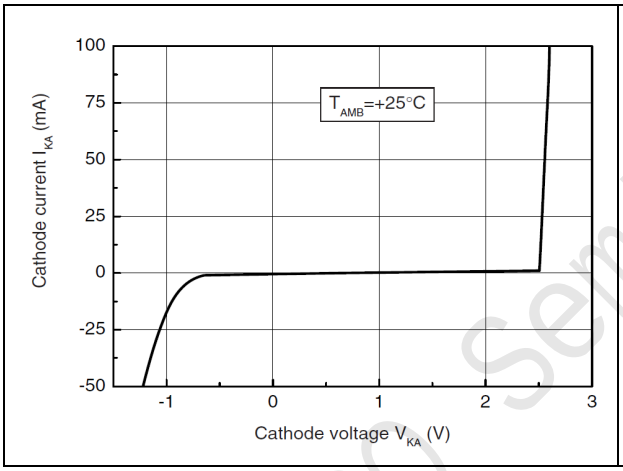
Test circuit for response time



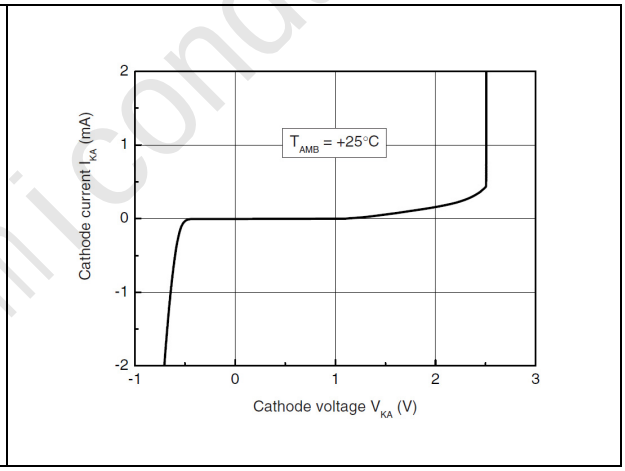
Reference voltage vs. temperature



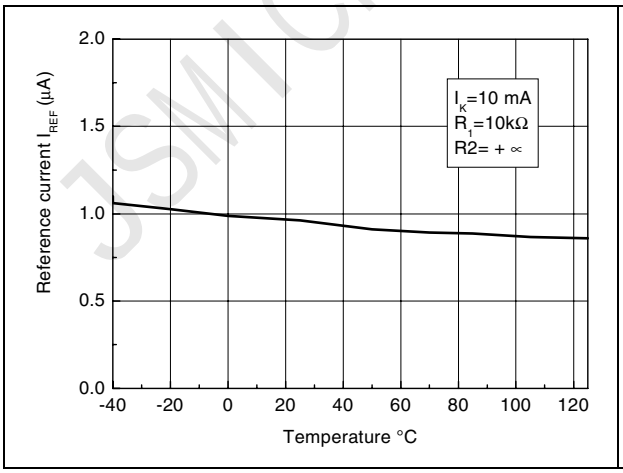
Reference voltage vs. cathode current



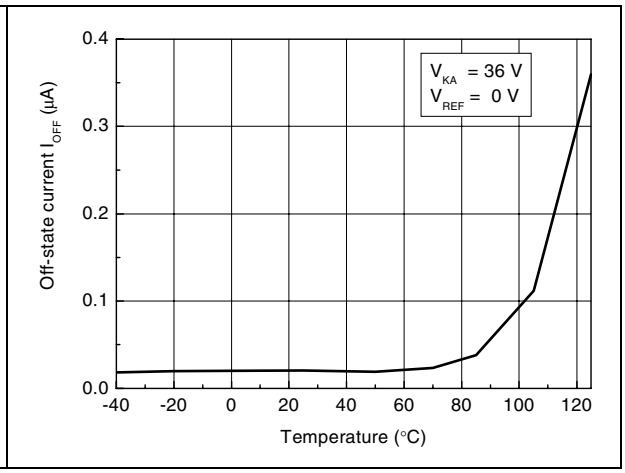
Zoom on reference voltage vs. cathode current



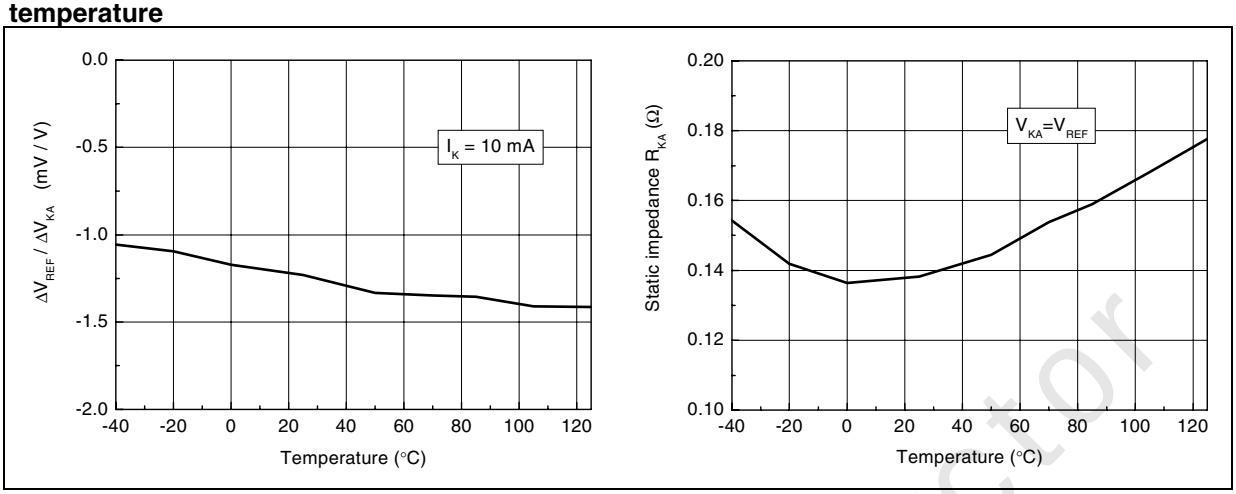
Reference current vs. temperature



Off-state cathode current vs. temperature

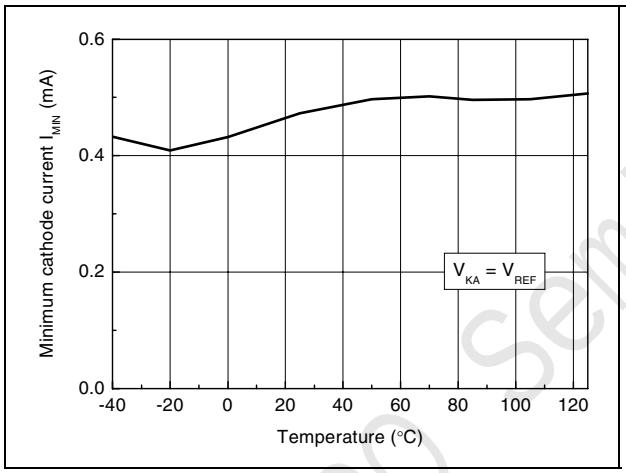


Ratio of change in V_{ref} to change in VKA vs. temperature

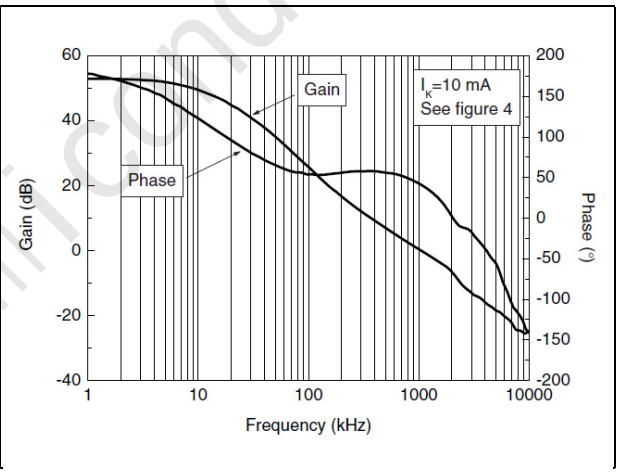


Static impedance R_{KA} vs. temperature

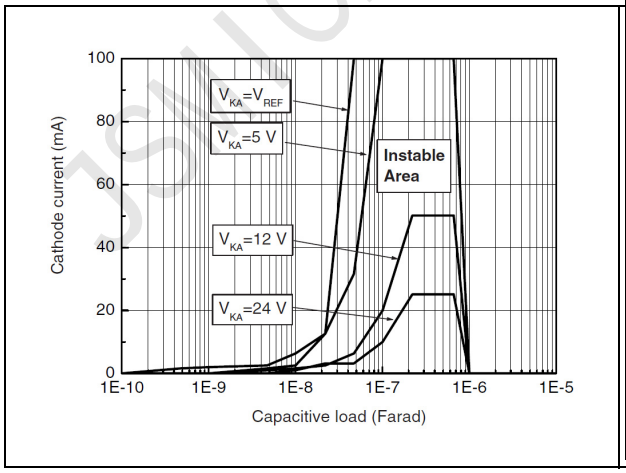
Minimum operating current vs. temperature



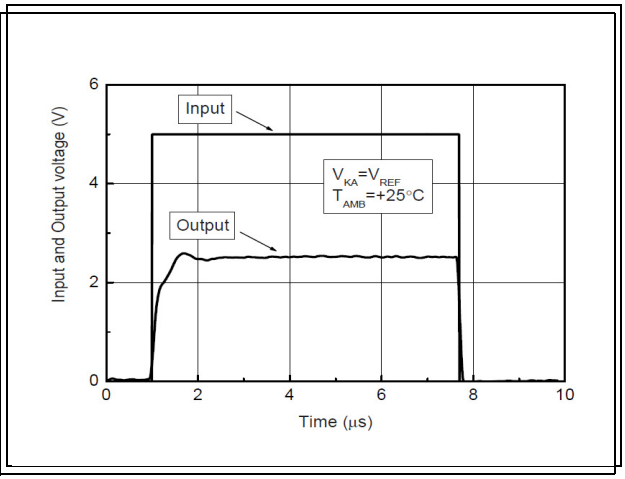
Gain and phase vs. frequency



Stability behavior with capacitive loads

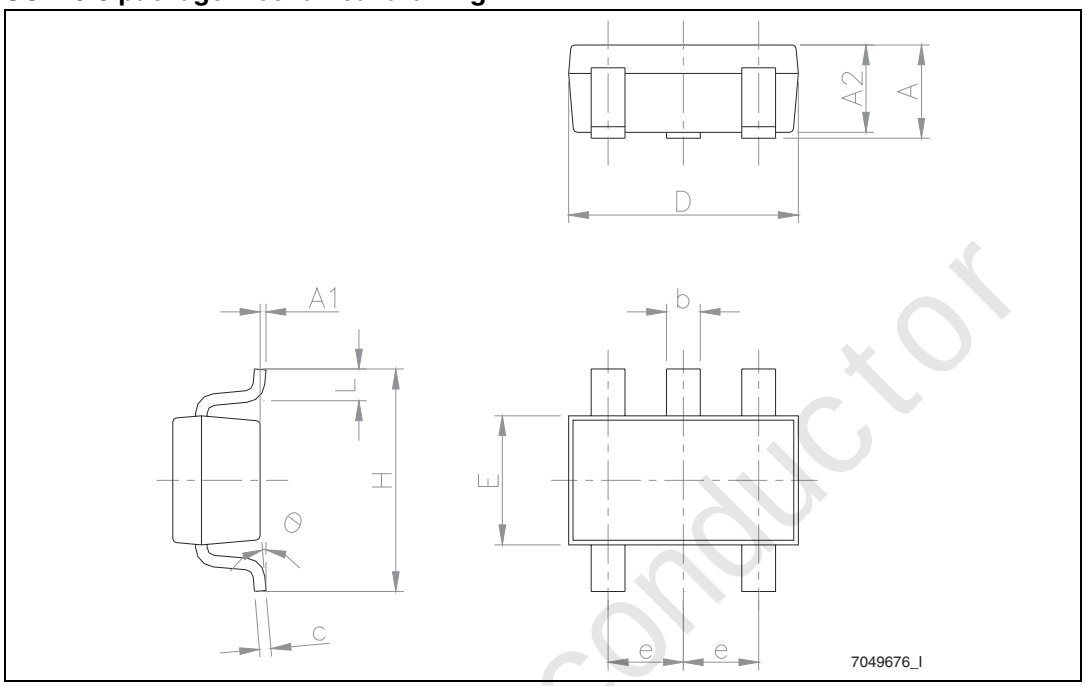


Pulse response for I_k = 1 mA



SOT23-5 package information

SOT23-5 package mechanical drawing



SOT23-5 package mechanical data

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	0.90		1.45	0.035		0.057
A1			0.15			0.006
A2	0.90		1.30	0.035		0.051
b	0.35		0.50	0.014		0.020
c	0.09		0.20	0.004		0.008
D	2.80		3.05	0.110		0.120
E	1.50		1.75	0.059		0.069
e		0.95			0.037	
H	2.60		3.00	0.102		0.118
L	0.10		0.60	0.004		0.024
θ	0 degrees		10 degrees			

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