2.495V Programmable Shunt Voltage Reference

DESCRIPTION

TS431 integrated circuits are three-terminal programmable These shunt regulator diodes. monolithic IC voltage references operate as a low temperature coefficient zener which is programmable from V_{REF} to 36V with two external resistors. These devices exhibit a wide operating current range to 250mA with a typical dynamic impedance of 0.2Ω . The characteristics of these references make them excellent replacements for zener diodes in many applications such as digital voltmeters, power supplies, and op amp circuitry. The 2.495V reference makes it convenient to obtain a stable reference from 5.0V logic supplies, and since The TS431 operates as a shunt regulator, it can be used as either a positive or negative stage reference.

FEATURES

- Programmable Output Voltage up to 36V
 - TS431A V_{REF} 2.495V ±1% tolerance
 - TS431B V_{REF} 2.495V ±0.5% tolerance
- Fast Turn-On Response
- Sink Current Capability: 120mA
- Low Dynamic Output Impedance: 0.2Ω (Typ.)
- Min. Operating Cathode Current: 0.2mA (Typ.)
- Compliant to RoHS Directive 2011/65/EU and in accordance to WEEE 2002/96/EC
- Halogen-free according to IEC 61249-2-21

APPLICATION

- SMPS
- Lighting
- Telecommunication
- Home appliance





Pin Definition:

- 1. Cathode
- 2. Reference 3. Anode

Notes: MSL 3 (Moisture Sensitivity Level) per J-STD-020

SIMPLIFIED SCHEMATIC



TS431xRIX-Z Taiwan Semiconductor



ABSOLUTE MAXIMUM RATINGS (T _A = 25°C unless otherwise noted)				
PARAMETER	SYMBOL	LIMIT	UNIT	
Cathode Voltage	V _{KA}	36	V	
Continuous Cathode Current	Ι _κ	120	mA	
Reference Input Current	I _{REF}	10	mA	
Power Dissipation	PD	0.25	W	
Operating Temperature Range	T _{OPER}	-40 ~ +125	°C	
Junction Temperature	TJ	+150	°C	
Storage Temperature Range	T _{STG}	-40 ~ +150	°C	

THERMAL PERFORMANCE					
SYMBOL	LIMIT	UNIT			
R _{eJC}	110	°C/W			
R _{θJA}	350	°C/W			
-	SYMBOL R _{ejc} R _{ejA}	SYMBOL LIMIT R _{ΘJC} 110 R _{ΘJA} 350			

Note: Consider measured with the PCB copper area of approximately 1 in² (Multi-Layer)

ELECTRICAL SPECIFICATIONS (T _A =+25°C, unless otherwise specified)								
PARAMETER	SYMBOL	CONDITIONS		MIN	ТҮР	MAX	UNIT	
Deference veltere	M	$V_{KA} = V_{REF}, I_{K}$ =10mA (Figure 1) TS43		TS431A	2.470	2.495	2.520	V
Reference voltage	V _{REF}			TS431B	2.483		2.507	
Deviation of reference input voltage	ΔV_{REF}	$V_{KA} = V_{REF}, I_{K} = 10 \text{mA}^{(Figure 1)}$ $T_{A} = -20 \sim 85^{\circ} \text{C}$			25	35	mV	
Radio of change in Vref to	ΔV_{REF}	I _{KA} =10mA,	V _{KA} = 1	0V to V _{REF}		-1.2	-2.0	····
change in cathode Voltage	$/\Delta V_{KA}$	(Figure 2)	V _{KA} = 3	6V to 10V		-1.0	-2.0	mv/v
Reference Input current	I _{REF}	R1=10kΩ, R2= ∞ I _{KA} =10mA ^(Figure 2)			1.5	3.5	μA	
Deviation of reference input current, over temp.	ΔI_{REF}	R1=10kΩ, R2= ∞ , I _{KA} =10mA T _A =-20~85°C ^(Figure 2)			0.4	1.2	μA	
Off-state Cathode Current	I _{KA} (off)	V_{REF} =0V ^(Figure 3) , V_{KA} =36V			0.1	1.0	μA	
Dynamic Output Impedance	Z _{ka}	f<1kHz, $V_{KA} = V_{REF}$ ^(Figure 1)			0.2	0.5	Ω	
Minimum operating cathode current	I _{KA} (min)	$V_{KA} = V_{REF}$ (Figure 1)			0.2	0.5	mA	

Note: The deviation parameters ΔV_{REF} and ΔI_{REF} are defined as difference between the maximum value and minimum value obtained over the full operating ambient temperature range that applied.

ORDERING INFORMATION

PART NO.	PACKAGE	PACKING
TS431ARIX-Z RFG	SOT-23	3,000pcs / 7" Reel
TS431BRIX-Z RFG	SOT-23	3,000pcs / 7" Reel



CHARACTERISTICS CURVES

(T_c = 25°C unless otherwise noted)



Figure 1. V_{REF} vs. Ambient Temperature



Figure 3. Cathode Current vs. Cathode Voltage



Figure 5. Off-State Cathode current vs. Ambient Temperature



Figure 2. IREF vs. Ambient Temperature



Figure 4. Cathode Current vs. Cathode Voltage







TYPICAL PERFORMANCE CHARACTERISTICS

Small-Signal Voltage Gain and Phase Shift vs. Frequency





Test Circuit For Voltage Amplification

Reference Impedance vs. Frequency





Test Circuit For Reference Impedance

Pulse Response







TYPICAL PERFORMANCE CHARACTERISTICS

Stability Boundary Condition





PACKAGE OUTLINE DIMENSIONS (Unit: Millimeters)





SUGGESTED PAD LAYOUT (Unit: Millimeters)



MARKING DIAGRAM





Taiwan Semiconductor

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