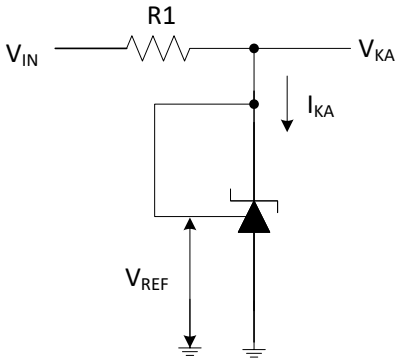
JML431,JML432 Precision Programmable Reference

Features

- Reference voltage tolerance at 25°C
  – 0.4% (A grade)
  – 0.8% (B grade)
- Programmable Precise Output Voltage from 2.5V to 36V
- High Stability under Capacitive Load
- Low Equivalent Full-range Temperature Coefficient with 20PPM/°C Typical
- 0.2-Ω Typical output impedance
- Sink-current Capability: 1 mA to 100 mA
- Low Output Noise
- Extended temperature range: –40°C to 125°C compatibility AECQ-100

Applications

- Secondary side regulation in flyback SMPS
- Zener replacement
- Voltage monitoring
- Comparator with integrated reference
- Adjustable voltage and current referencing



Simplified Schematic

General Description

TheJML431 andJML432 devices are three-terminal adjustable shunt regulators, with specified thermal stability over applicable automotive, commercial, and military temperature ranges. The output voltage can be set to any value between Vref (approximately 2.5 V) and 36 V, with two external resistors. These devices have a typical output impedance of 0.2Ω. Active output circuitry provides a very sharp turn-on characteristic, making these devices excellent replacements for Zener diodes in many applications, such as onboard regulation, adjustable power supplies, and switching power supplies. TheJML432 device has exactly the same functionality and electrical specifications as the XM431 device, but has different pinouts.
Both theJML431 andJML432 devices are offered in two grades, with initial tolerances (at 25°C) of 0.4% and 0.8%, for the A and B grade, respectively. In addition, low output drift versus temperature ensures good stability over the entire temperature range.TheJML431 andJML432 are characterized for operation from –40°C to 125°C.

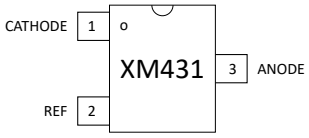
Device Information[1][2]

PART NUMBER	PACKAGE	BODY SIZE(NOM)
JML431	SOT-23-3(3)	2.90 mm × 1.30 mm
JML432	SOT-23-3(3)	2.90 mm × 1.30 mm

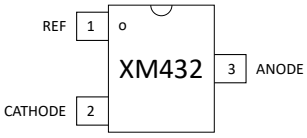
[1] For all available packages,see the orderable addendum at the end of the data sheet.
[2] Package is for preview only.

Pin Configuration and Functions

JML
3-Pin SOT-23
(Top View)



JML
3-Pin SOT-23
(Top View)



PIN			I/O	DESCRIPTION
NAME	**XM431**	**XM432**		
CATHODE	1	2	I/O	Shunt Current/Voltage input
REF	2	1	I	Threshold relative to common anode
ANODE	3	3	O	Common pin, normally connected to ground

Specifications

Absolute Maximum Ratings

Over operating ambient temperature (unless otherwise noted)[1]

		MIN	MAX	UNIT
V_{KA} Cathode voltage with respect to ANODE			40	V
I_{KA} Continuous cathode current range		-100	150	mA
$I_{I(ref)}$ Reference input current range			10	mA
Temperature	Junction, T_J		150	°C
	Storage, T_{stg}	-65	150	

[1] Stresses beyond 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-rated conditions for extended periods may affect device reliability.

ESD Ratings

		VALUE	UNIT
XM43x			
V_{ESD} Electrostatic discharge	Human-body model (HBM), per ANSI/ESDA/JEDEC JS-001[1]	±2000	V
	Charged-device model (CDM), per JEDEC specification JESD22-C101[1]	±1000	

[1] JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process
[2] JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process.

Thermal Information

THERMAL METRIC	SOT23-3	UNIT
$R_{\theta JA}$ Junction-to-ambient thermal resistance	206	°C/W
$R_{\theta JC(top)}$ Junction-to-case (top) thermal resistance	76	

Recommended Operating Conditions

Over operating ambient temperature (unless otherwise noted)

Symbol	Parameter	MIN	MAX	UNIT
V_{KA}	Cathode voltage with respect to ANODE	V_{ref}	40	V
I_{KA}	Continuous cathode current range	1	100	mA
T_A	Specified temperature	–40	125	°C

Electrical Characteristics of JML431 JML432

over recommended operating conditions, T_A = 25°C(unless otherwise noted)

PARAMETER		TEST CONDITIONS	TEST CIRCUIT	MIN	TYP	MAX	UNIT
V_{ref}	Reference voltage	$V_{KA}=V_{ref}, I_{KA}$=10mA (A grade)	Fig.1	2.490	2.500	2.510	V
		$V_{KA}=V_{ref}, I_{KA}$=10mA (B grade)	Fig.1	2.480	2.500	2.520	
$V_{I(dev)}$	Deviation of reference input voltage over full temperature range	$V_{KA}=V_{ref}, I_{KA}$=10mA, T_A = –40°C to 125°C	Fig.1		5	16	mV
$\frac{\Delta V_{ref}}{\Delta V_{KA}}$	Ratio of change in reference voltage to the change in cathode voltage	I_{KA}=10mA, ΔV_{KA}=10V to V_{ref}	Fig.2		-1.4	-2.7	mV/V
		I_{KA}=10mA, ΔV_{KA}=36V to 10V	Fig.2		-0.6	-2.0	
I_{ref}	Reference input current	I_{KA}=10mA, R1=10kΩ, R2=∞	Fig.2		1	4	µA
$I_{I(dev)}$	Deviation of reference input current over full temperature range	I_{KA}=10mA, R1=10kΩ, R2=∞ T_A = –40°C to 125°C	Fig.2		0.8	1.4	µA
I_{min}	Minimum cathode current for regulation	$V_{KA}=V_{ref}$	Fig.1		0.4	1.0	mA
I_{off}	Off-state cathode current	V_{KA}=36V, V_{ref}=0V	Fig.3		0.05	1.0	µA
Z_{KA}	Dynamic impedance	$V_{KA}=V_{ref}$, f ≤ 1.0kHz, I_{KA}=1 to 100mA	Fig.1		0.2	0.5	Ω

Parameter Measurement Information

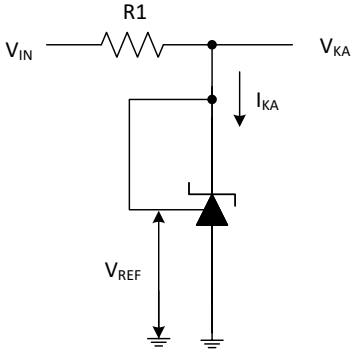


Figure 1: Test Circuit for $V_{KA}=V_{ref}$

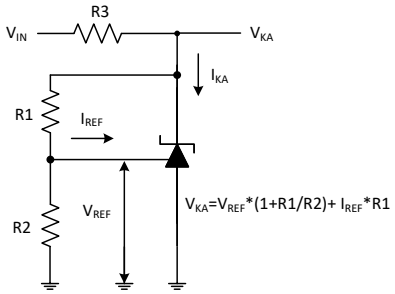


Figure 2: Test Circuit for $V_{KA}>V_{ref}$

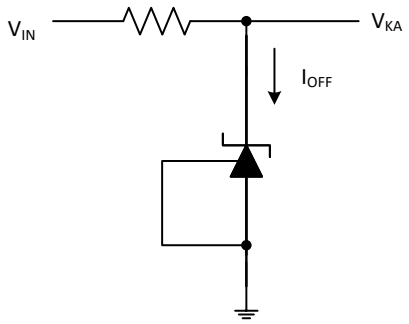


Figure 3: Test Circuit for I_{off}

Typical Characteristics

Data at high and low temperatures are applicable only within the recommended operating free-air temperature ranges of the various devices. (unless otherwise noted)

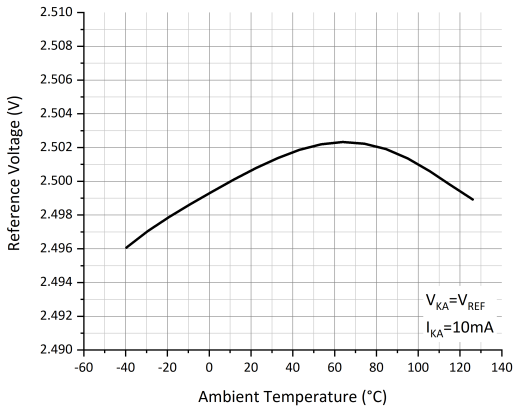


Figure 4: Reference Voltage vs Free-Air Temperature

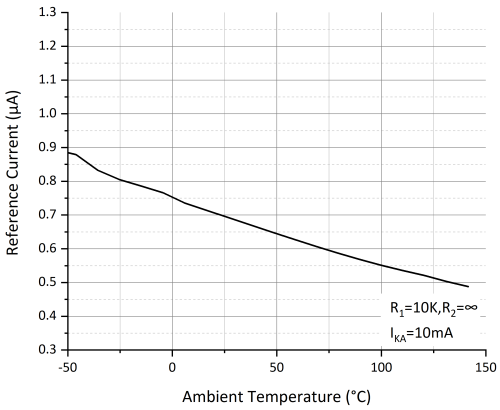


Figure 5: Reference Current vs Free-Air Temperature

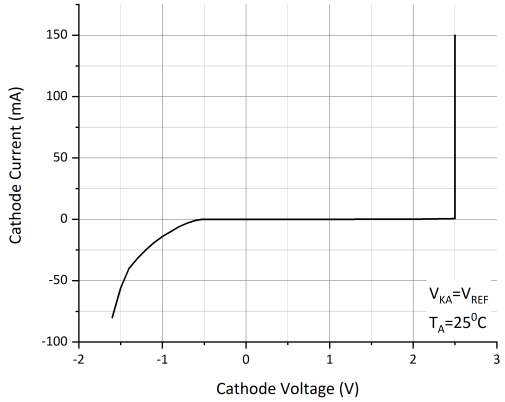


Figure 6: Cathode Current vs Cathode Voltage

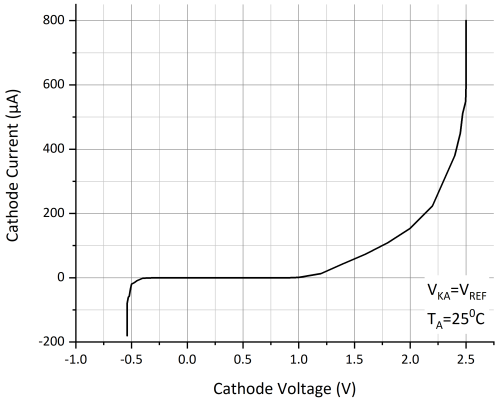


Figure 7: Cathode Current vs. Cathode Voltage

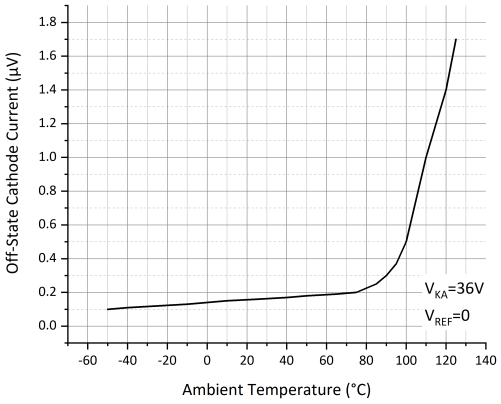


Figure 8: Off-State Cathode Current vs. Ambient Temperature

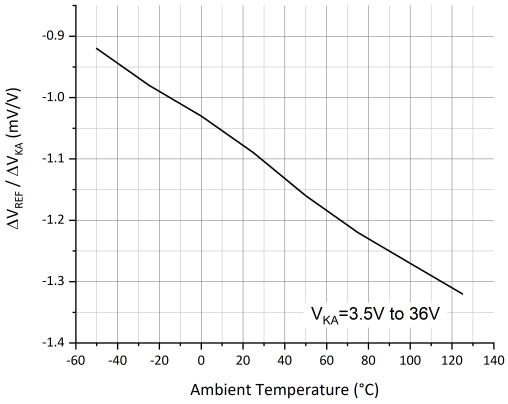


Figure 9: Ratio of Delta Reference Voltage to the Ratio of Delta Cathode Voltage

Typical Characteristics (continued)

Data at high and low temperatures are applicable only within the recommended operating free-air temperature ranges of the various devices. (unless otherwise noted)

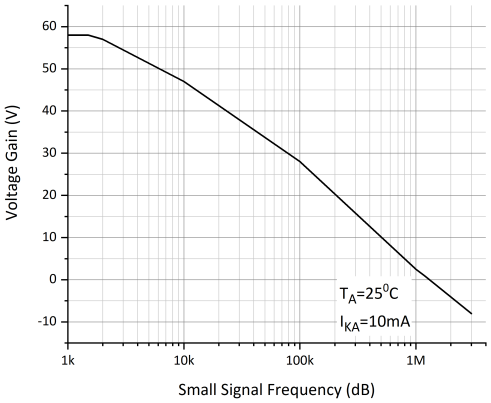


Figure 10: Small-Signal Voltage Amplification vs Frequency

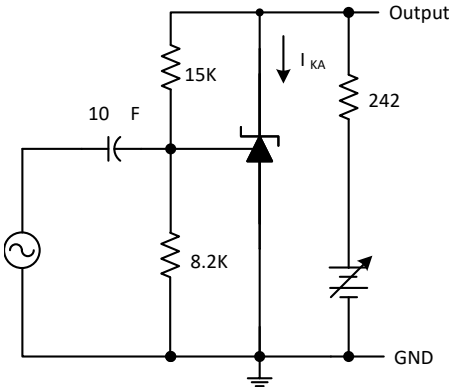


Figure 11: Test Circuit for Voltage Amplification

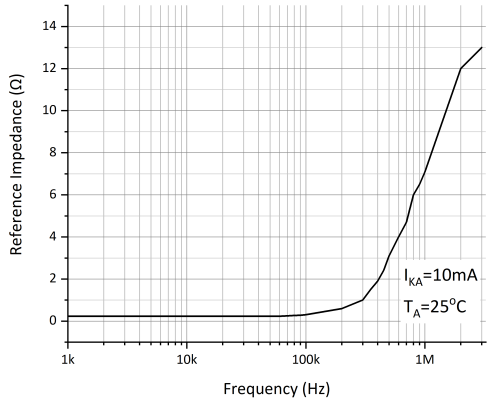


Figure 12: Reference Impedance vs Frequency

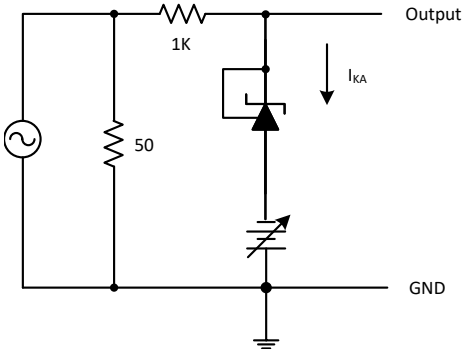


Figure 13: Test Circuit for Reference Impedance

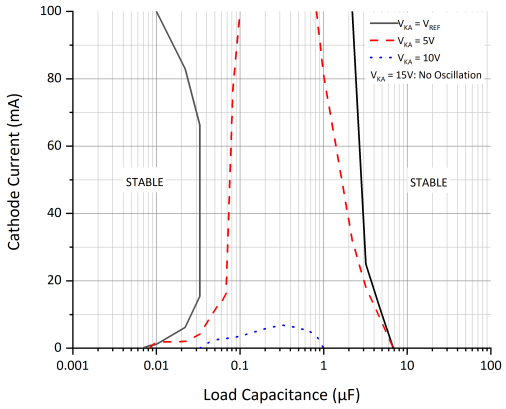


Figure 14: Stability Boundary Conditions vs. Load Capacitance

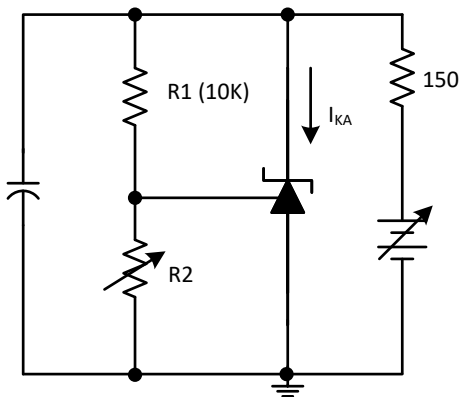


Figure 15: Test Circuits for Stability Boundary Conditions

Typical Characteristics

Data at high and low temperatures are applicable only within the recommended operating free-air temperature ranges of the various devices. (unless otherwise noted)

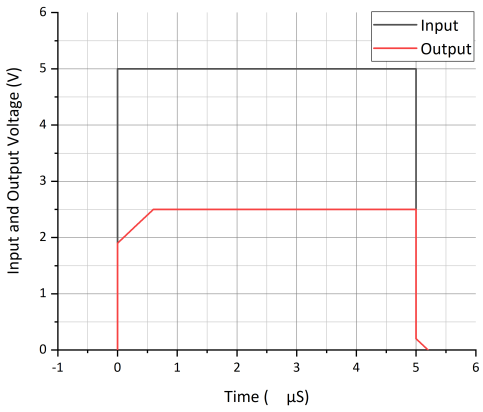


Figure 16: Pulse Response

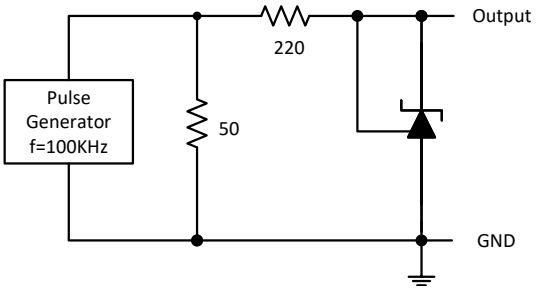


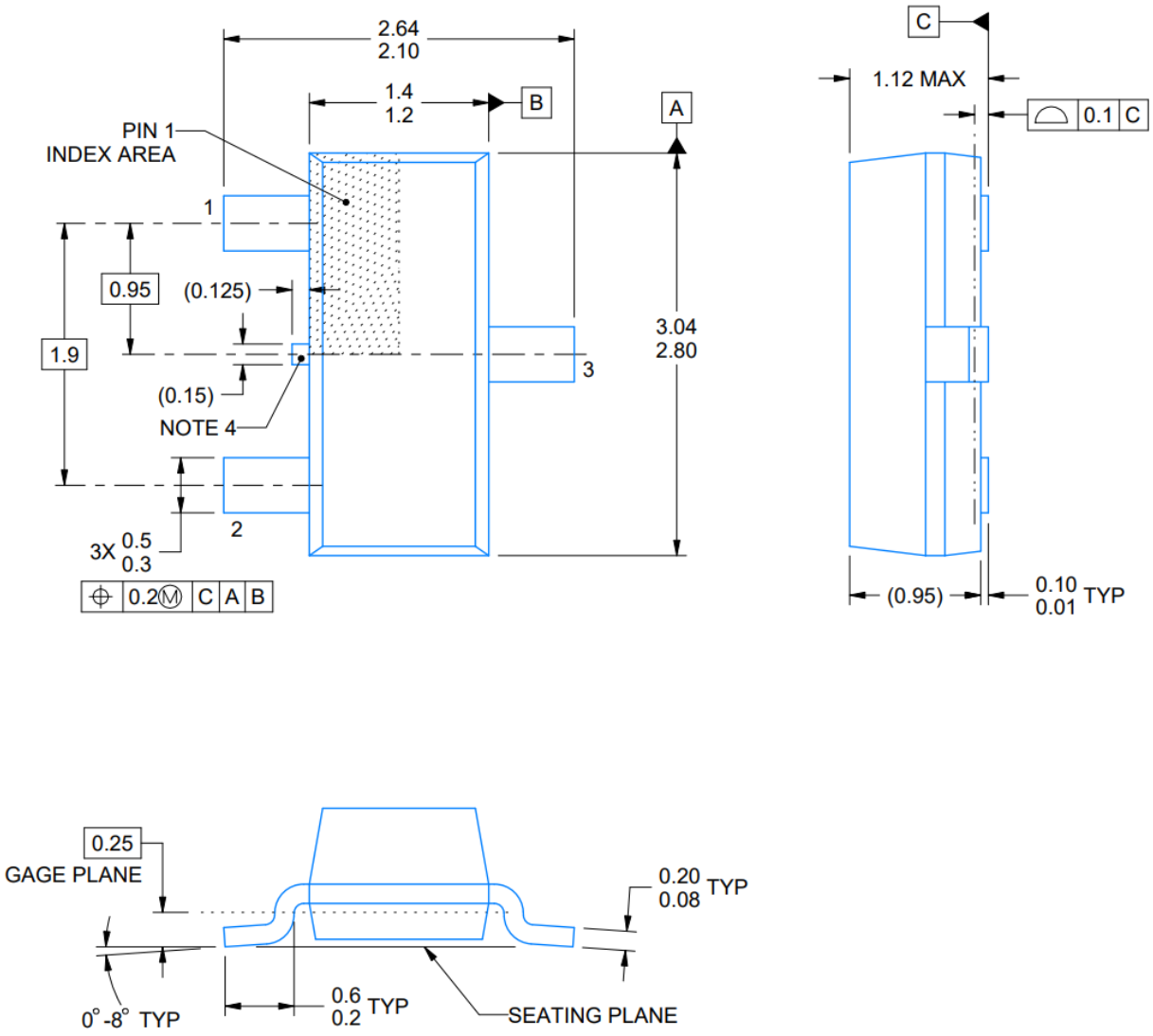
Figure 17: Test Circuit for Pulse Response

Packaging Infromation

Orderable Device	Status	Voltage Tolerance	Package Type	Pins	Package Qty	Eco Plan	Op Temp(°C)	Marking
JMLADBZR	ACTIVE	0.4%	SOT-23	3	4000	RoHS Green	-40 to 125	431A
JMLADBZR	ACTIVE	0.4%	SOT-23	3	4000	RoHS Green	-40 to 125	432A
JMLBDBZR	ACTIVE	0.8%	SOT-23	3	4000	RoHS Green	-40 to 125	431B
JMLBDBZR	ACTIVE	0.8%	SOT-23	3	4000	RoHS Green	-40 to 125	432B

Package Outline Dimension

SOT23-3



NOTE:

1.All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only.

2.This drawing is subject to change without notice.

3.Body dimensions do not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.25 mm per side.

4.Support pin may differ or may not be present.