REF29xxAIDBZR-TP Series

Precision Low Power Series Voltage Reference

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Features

- Low Dropout 1 mV
- High Accuracy 2%
- High Output Current 25 mA
- Low IQ Maximum of 50 μA
- Low Temperature Drift: Maximum of 100 ppm/°C
- Package appearance SOT-23

Applications

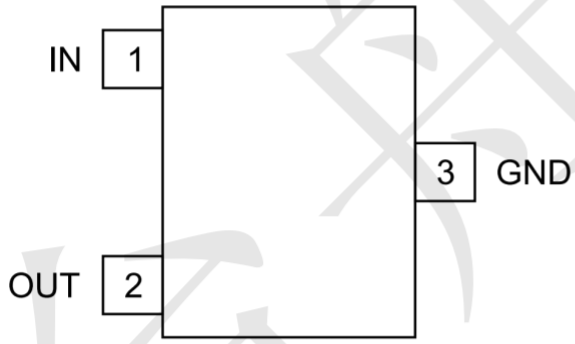
- Battery-Powered Equipment
- Data Acquisition Systems
- Precision Audio Components
- Instrumentation
- Process Control

General Description

The is a precision, low-power, low-voltage dropout voltage reference family available in a tiny 3-pin SOT-23 package.
The small size and low power consumption (50 μA maximum) of the make it ideal for portable and battery-powered applications.
The does not require a load capacitor, but it is stable with any capacitive load.
Unloaded, the can be operated with supplies within 1 mV of output voltage. All models are specified for the wide temperature range, -40°C to 125°C.

Pin Configuration

SOT-23



Functions

NO.	NAME	DESCRIPTION
1	IN	Input supply voltage
2	OUT	Reference output voltage
3	GND	Ground

Device Comparison Table

PRODUCT	VOLTAGE (V)
REF2912AIDBZR-TP	1.25V
REF2920AIDBZR-TP	2.048V
REF2925AIDBZR-TP	2.5V
REF2930AIDBZR-TP	3.0V
REF2933AIDBZR-TP	3.3V
REF2940AIDBZR-TP	4.096V

Absolute Maximum Ratings

over operating free-air temperature range (unless otherwise noted)

	MIN	MAX	UNIT
Supply voltage, V+ to V–	--	7	V
Output short circuit(2)	Continuous		°C
Lead temperature (soldering, 10 s)	--	300	°C
Operating temperature	-40	125	°C
Junction temperature	--	150	°C
Storage temperature, T_{stg}	-65	150	°C

Note 1，Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. These are stress ratings only, which do not imply functional operation of the device at these or any other conditions beyond those indicated under Recommended Operating Conditions. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
Note 2，Short-circuit to ground.

ESD Ratings

		VALUE	UNIT
$V_{(ESD)}$ Electrostatic discharge	Human-body model (HBM)	±4000	V
	Charged-device model (CDM)	±1500	

Recommended Operating Conditions

over operating free-air temperature range (unless otherwise noted)

		MIN	MAX	UNIT
V_{IN}	Input voltage	1.8	5.5	V
I_{LOAD}	Load current	--	25	mA
T_A	Operating temperature	-40	125	°C
$R_{\theta JA}$	Junction-to-ambient thermal resistance	297.3		°C/W
$R_{\theta JB}$	Junction-to-board thermal resistance	91.7		°C/W
$R_{\theta JC}$	Junction-to-case (top) thermal resistance	128.5		°C/W

Electrical Characteristics

(At T_A = 25°C, I_{LOAD} = 0 mA, V_{IN} = 5 V, unless otherwise noted.)

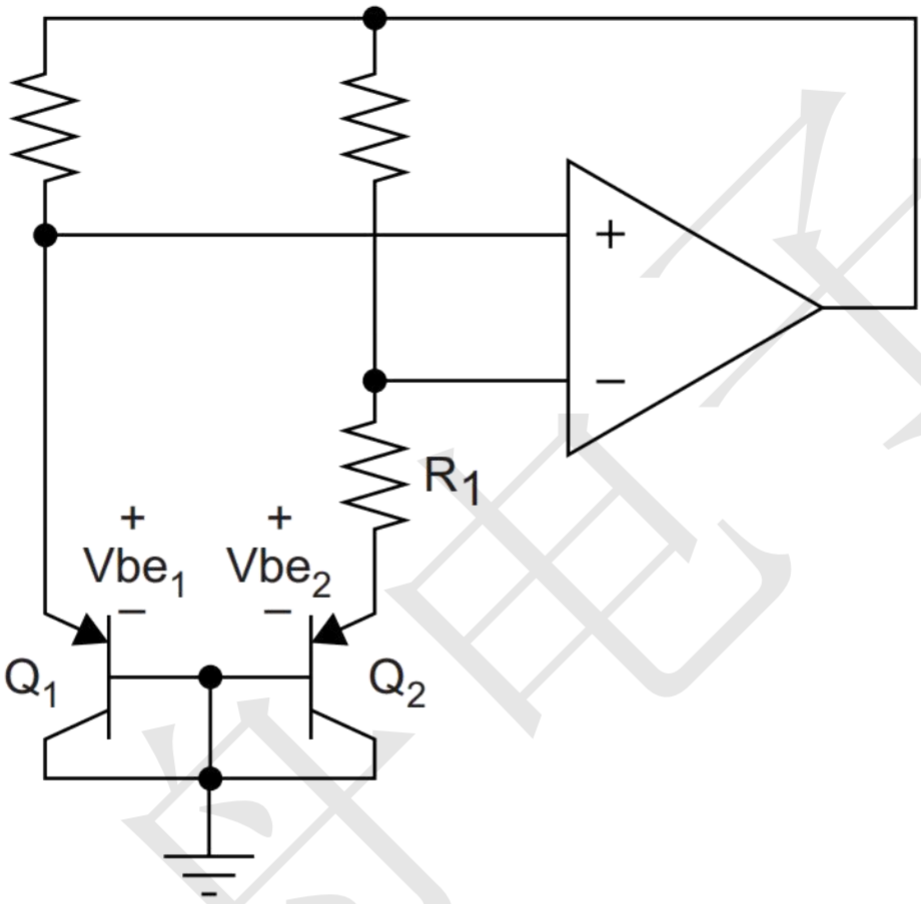
PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
REF2912AIDBZR-TP						
V_{OUT}	Output voltage		1.225	1.25	1.275	V
Initial accuracy				2%		
Output voltage noise		f = 0.1 Hz to 10 Hz,		14		μV_{PP}
Voltage noise		f = 10 Hz to 10 kHz		42		μVrms
Line regulation		1.8 V ≤ V_{IN} ≤ 5.5 V	--	60	190	μV/V
REF2920AIDBZR-TP						
V_{OUT}	Output voltage		2.007	2.048	2.089	V
Initial accuracy				2%		
Output voltage noise		f = 0.1 Hz to 10 Hz,		23		μV_{PP}
Voltage noise		f = 10 Hz to 10 kHz		65		μVrms
Line regulation		V_{REF} + 50 mV ≤ V_{IN} ≤ 5.5 V	--	110	290	μV/V
REF2925AIDBZR-TP						
V_{OUT}	Output voltage		2.45	2.5	2.55	V
Initial accuracy				2%		
Output voltage noise		f = 0.1 Hz to 10 Hz		28		μV_{PP}
Voltage noise		f = 10 Hz to 10 kHz		80		μVrms
Line regulation		V_{REF} + 50 mV ≤ V_{IN} ≤ 5.5 V	--	120	325	μV/V
REF2930AIDBZR-TP						
V_{OUT}	Output voltage		2.94	3	3.06	V
Initial accuracy				2%		
Output voltage noise		f = 0.1 Hz to 10 Hz,		33		μV_{PP}
Voltage noise		f = 10 Hz to 10 kHz		94		μVrms
Line regulation		V_{REF} + 50 mV ≤ V_{IN} ≤ 5.5 V	--	120	375	μV/V
REF2933AIDBZR-TP						
V_{OUT}	Output voltage		3.234	3.3	3.366	V
Initial accuracy				2%		
Output voltage noise		f = 0.1 Hz to 10 Hz,		36		μV_{PP}
Voltage noise		f = 10 Hz to 10 kHz		105		μVrms
Line regulation		V_{REF} + 50 mV ≤ V_{IN} ≤ 5.5 V	--	130	400	μV/V

Electrical Characteristics (continued)

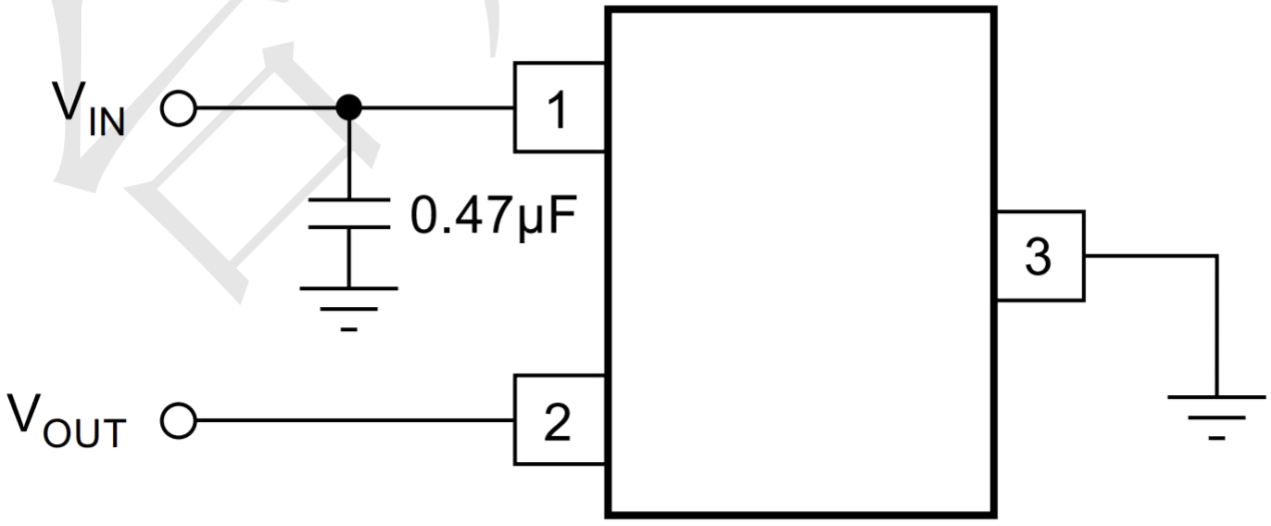
(At T_A = 25°C, I_{LOAD} = 0 mA, V_{IN} = 5 V, unless otherwise noted.)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
REF2940AIDBZR-TP						
V_{OUT}	Output voltage		4.014	4.096	4.178	V
Initial accuracy				2%		
Output voltage noise		f = 0.1 Hz to 10 Hz,		45		μV_{PP}
Voltage noise		f = 10 Hz to 10 kHz		128		μVrms
Line regulation		V_{REF} + 50 mV ≤ V_{IN} ≤ 5.5 V	--	160	410	μV/V
REF2912AIDBZR-TP，REF2920AIDBZR-TP，REF2925AIDBZR-TP，REF2930AIDBZR-TP，TREF2933AIDBZR-TP，REF2940AIDBZR-TP						
dV_{OUT}/dT	Output voltage temperature drift	-40°C ≤ T_A ≤ 125°C	--	35	100	ppm/°C
I_{LOAD}	Output current			25		mA
Long-term stability		0 to 1000H		24		ppm
		1000 to 2000H		15		ppm
dV_{OUT}/dI_{LOAD} Load regulation		0 mA < I_{LOAD} < 25 mA, V_{IN} = V_{REF} + 500 mV(3)	--	3	100	μV/mA
dT	Thermal Hysteresis		--	25	100	ppm
$V_{IN} - V_{OUT}$	Dropout voltage		--	1	50	mV
I_{SC}	Short-circuit current			45		mA
Turnon settling time		to 0.1% at V_{IN} = 5 V with C_L = 0		120		μs
POWER SUPPLY						
V_S	Voltage	I_L = 0	V_{REF} + 0.001	--	5.5	V
	Voltage over temperature	–40°C ≤ T_A ≤ 125°C	V_{REF} + 0.05	--	5.5	
I_Q	Quiescent current		--	42	50	μA
	Quiescent current over temperature	–40°C ≤ T_A ≤ 125°C		59		
TEMPERATURE RANGE						
Specified range			-40	--	125	°C
Operating range			-40	--	125	°C
Storage range			-65	--	150	°C

Functional Block Diagram



Typical Connections for Operating



Typical Operating Characteristics

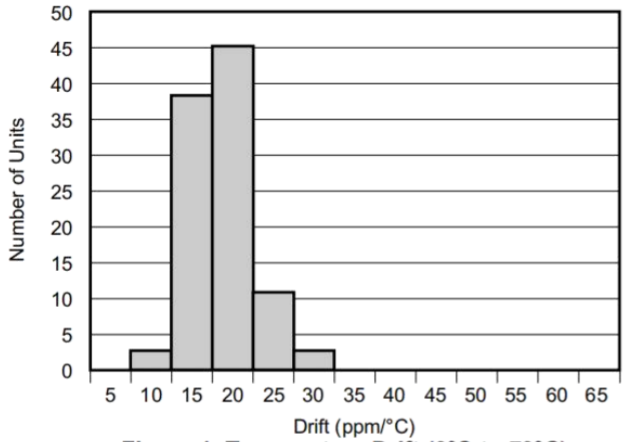


Figure 1. Temperature Drift (0°C to 70°C)

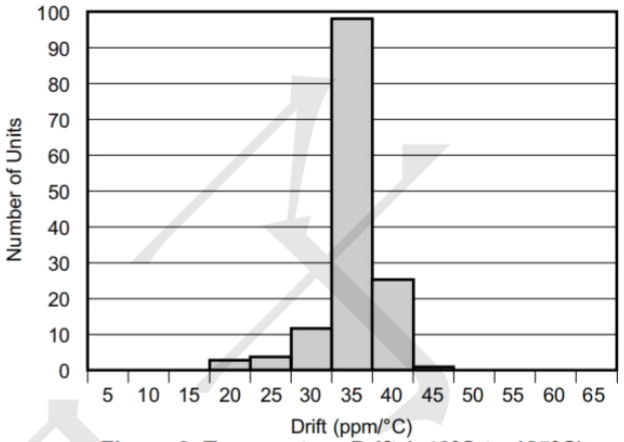


Figure 2. Temperature Drift (–40°C to 125°C)

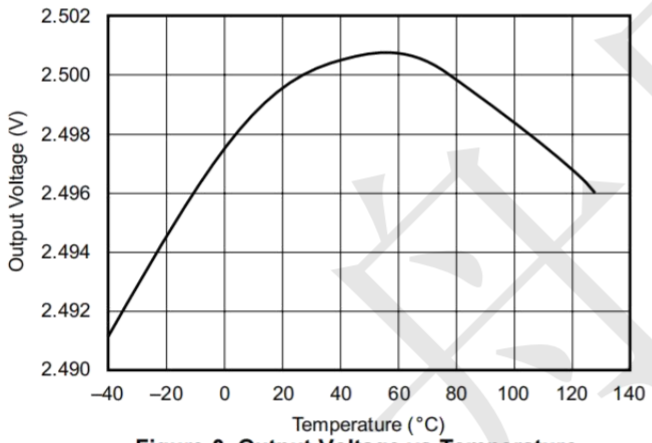


Figure 3. Output Voltage vs Temperature

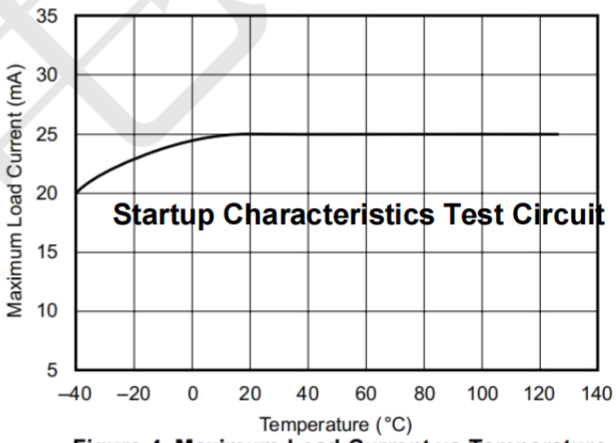


Figure 4. Maximum Load Current vs Temperature

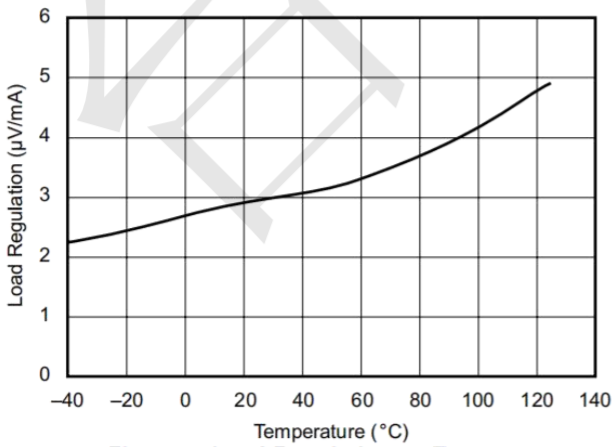


Figure 5. Load Regulation vs Temperature

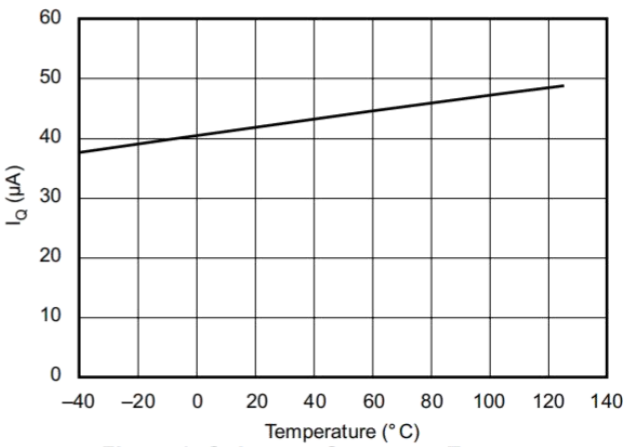


Figure 6. Quiescent Current vs Temperature

Typical Operating Characteristics

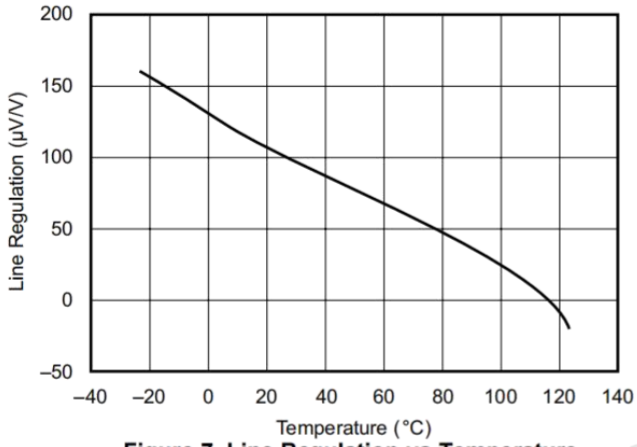


Figure 7. Line Regulation vs Temperature

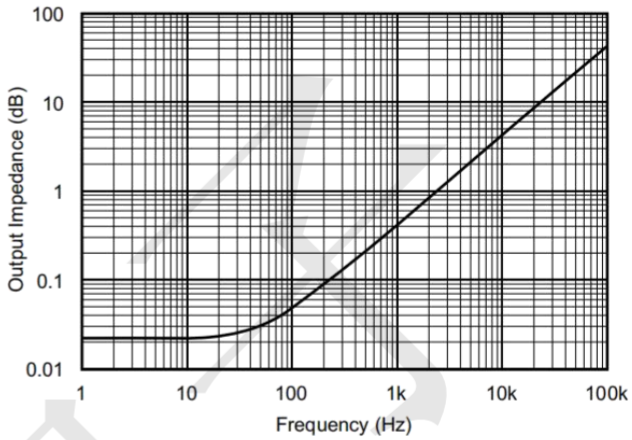


Figure 8. Output Impedance vs Frequency

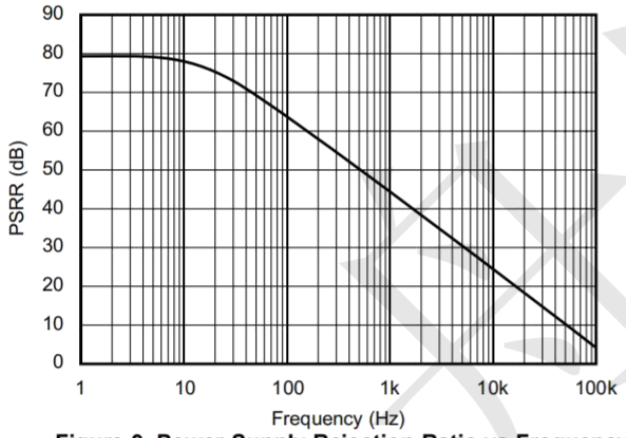


Figure 9. Power-Supply Rejection Ratio vs Frequency

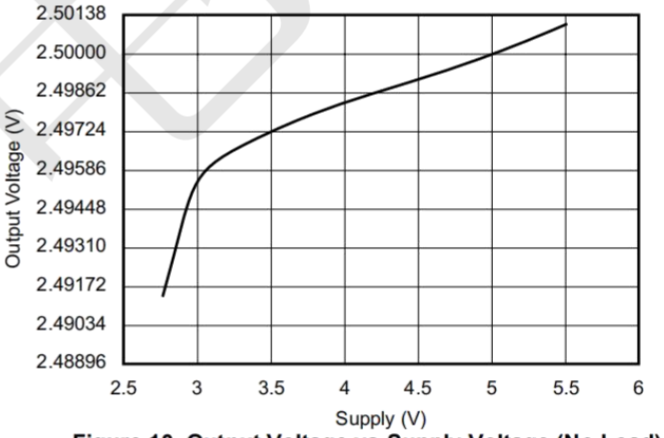


Figure 10. Output Voltage vs Supply Voltage (No Load)

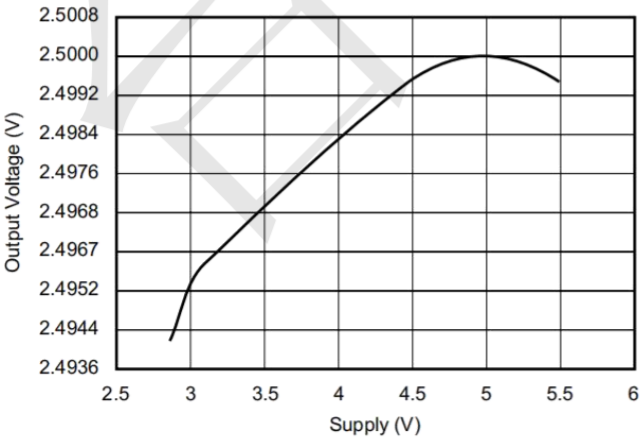


Figure 11. Output Voltage vs Supply Voltage (I_{LOAD} = 25 mA)

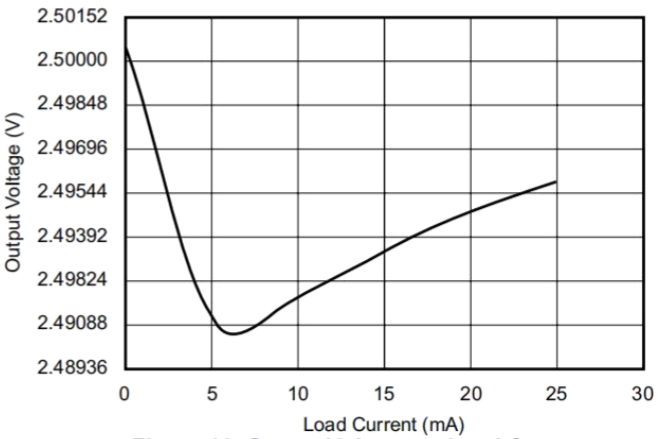


Figure 12. Output Voltage vs Load Current

Typical Operating Characteristics

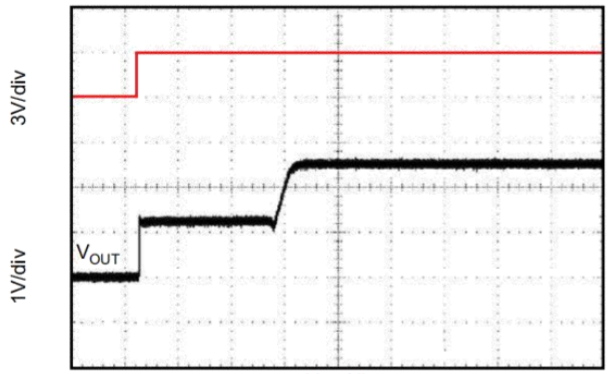


Figure 13. Step Response, C_L = 0, 3-V Start-Up

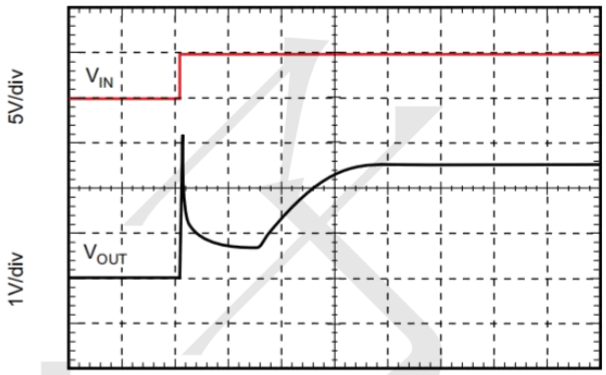


Figure 14. Step Response, C_L = 0, 5-V Start-Up

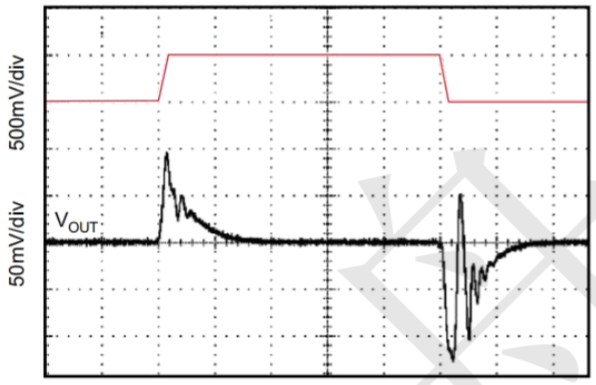


Figure 15. Line Transient Response

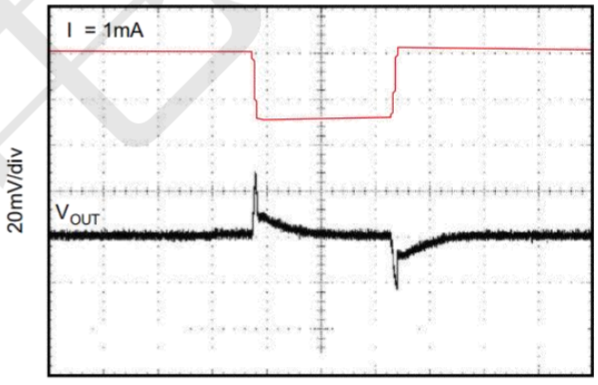


Figure 16. 0 to 1-mA Load Transient (C_L = 0)

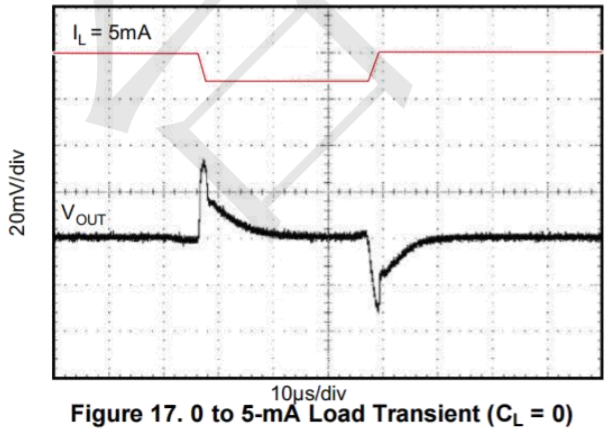


Figure 17. 0 to 5-mA Load Transient (C_L = 0)

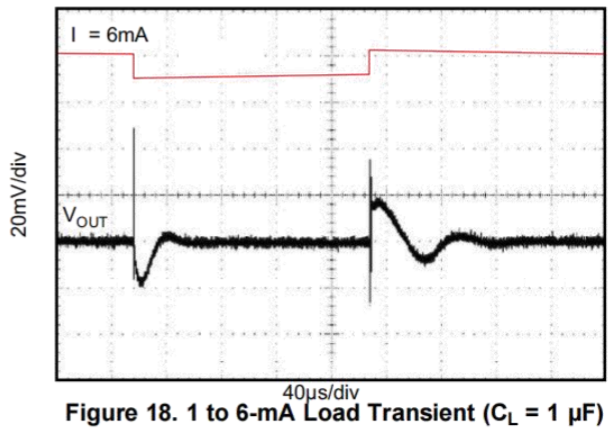
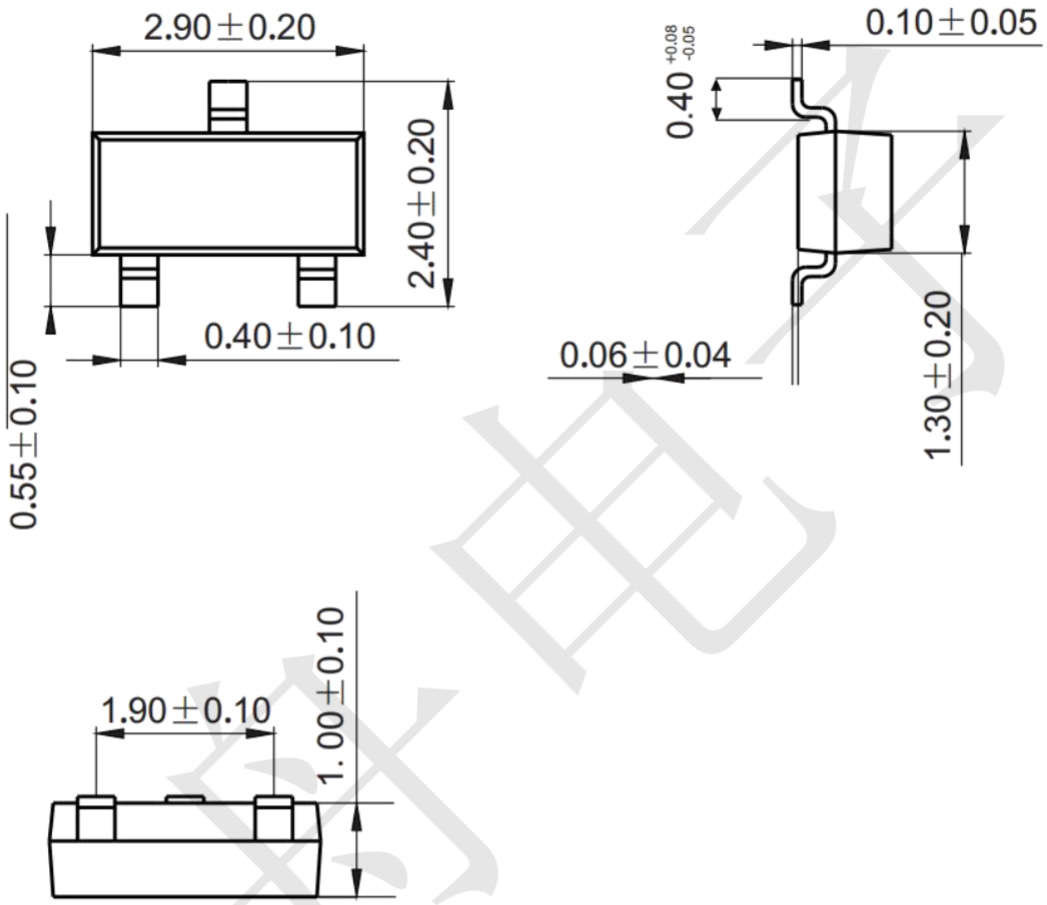


Figure 18. 1 to 6-mA Load Transient (C_L = 1 µF)

Package Outline Dimensions (unit: mm)

SOT-23



Mounting Pad Layout (unit: mm)