PVR-1520

2.0V Micropower Voltage Reference

FEATURES

- Precision ±0.2% max initial accuracy
- Input voltage range 2.2V to 5.5V
- Dropout voltage 150mV max
- Output drive current 25mA
- Output voltage noise 60µVp-p (0.1Hz to 10kHz)
- -40°C to +125°C and -55°C to +125°C operating temperature ranges
- 100% testing over temperature
- High-Rel process flow, burn-in, environmental, lot and ATE traceability
- Temperature coefficient 15 PPM/°C
- Supply current 46µA typical
- Humidity resistant CLCC package (-QL, /883)
- Tiny SOT-23 package (SE,SM)
- Pb-free RoHS compliant

PRODUCT OVERVIEW

The PVR-1520 from DATEL is a low dropout micropower bandgap voltage reference offered in either a tiny SOT-23-3 or a hermetic sealed ceramic LCC package. The fully hermetic package offered for the –QL and /883 versions are not affected by humidity, and are therefore more stable in environments where humidity is a concern.This precision reference operates from a single 2.2V to 5.5V supply and provides ±0.2% initial voltage accuracy. The PVR-1520 sources up to 25mA output current with a low 150mV maximum dropout voltage.

This reference is one in a family of precision voltage references from DATEL that ranges from 1.024 to 5.0 volts. With a temperature coefficient of 15 PPM/°C this reference allows a mere 3mV of drift at +125°C. This low TC drift along with the precision initial accuracy of 4mV makes the PVR-1520 the reference of choice for precision data acquisition applications. Applications requiring a tighter TC over temperature may require the PVR-05xx series. For low power battery or solar applications, the PVR-1520 offers low supply current and low dropout voltage coupled with precision output voltage specifications.

DATEL offers these precision references as Enhanced Products that are qualified and 100% tested over the -40°C to +125°C and –55°C to +125°C military temperature range. Burn-in and environmental screening are also available as well as full temperature range test results recorded and stored by serial number.

Products are offered in military temperature grades as well as fully screened High-Reliability -QL and /883 models.

APPLICATIONS

- Precision A/D and D/A converters
- Battery and Solar powered management/monitoring
- MIL-STD/883 systems
- Defense/ aerospace applications
- Portable instruments
- Low power industrial/ High-Rel instrumentation
- Low voltage signal processing
- Micropower remote sensing

ORDERING INFORMATION

MODEL	TEMP. RANGE	PACKAGE
PVR-1520SE	-40°C to +125°C	SOT23-3
PVR-1520SM	-55°C to +125°C	SOT23-3
PVR-1520-QL	-55°C to +125°C	CLCC
PVR-1520/883	-55°C to +125°C	CLCC

COMPLETE PRODUCT OFFERING

Output Voltage	Vout Initial Accuracy	Temp Coefficient	Output Current	Minimum Supply Voltage	Maximum Supply Voltage	Maximum Supply Current	LTD Stability	Output Noise (Typ)	Package Type	Model Number
Volts	% Vout	ppm/°C	mA	Volts	Volts	µA	PPM	µVPP		
1.024	0.2	15	25	2.2	5.5	80	110	14	SOT23-3	PVR-1510SE
1.25	0.08	5	7	3.5	16.5	180	50	4.5	SOIC8	PVR-0512SE
	0.2	15	25	2.2	5.5	80	110	17	SOT23-3	PVR-1512SE
1.5	0.2	15	25	2.2	5.5	80	110	20	SOT23-3	PVR-1515SE
2.048	0.2	15	25	2.2	5.5	100	50	58	SOT23-3	PVR-1520SE
2.5	0.04	5	7	3.5	16.5	180	50	4.5	SOIC8	PVR-0525SE
2.5	0.2	15	25	2.6	5.5	80	110	37	SOT23-3	PVR-1525SE
3	0.2	15	25	3.1	5.5	100	110	86	SOT23-3	PVR-1530SE
3.3	0.2	15	25	3.4	5.5	100	50	95	SOT23-3	PVR-1533SE
4.096	0.02	5	7	4.5	16.5	180	50	4.5	SOIC8	PVR-0540SE
	0.2	15	25	4.2	5.5	80	110	56	SOT23-3	PVR-1540SE
5.0	0.02	5	7	5.5	16.5	180	50	4.5	SOIC8	PVR-0550SE

ABSOLUTE MAXIMUM RATINGS		
PARAMETERS	**LIMITS**	**UNITS**
Vin to GND	-0.5 to +6.5	Volts
Vout to GND	-0.5 to Vin +0.5	Volts
Input voltage slew rate	1	V/ µs
Continuous power dissipation	99	mW
Storage Temperature	–65 to +150	°C

FUNCTIONAL SPECIFICATIONS

(Typical at GND=0V, Vin = 3.0V, Iout = 0mA unless otherwise specified, Ta = +25°C)

INPUT/OUTPUT	MIN.	TYP.	MAX.	UNITS
Vin	2.2	–	5.5	Volts
Iin +25°C	—	45	82	µA
Iin +125°C	—	—	105	µA
Line Regulation (2.6V to 5.5V)	—	40	140	µV/V
Dropout Voltage[1] (I_{OUT} = 10mA)	—	50	150	mVolts
Output Voltage	—	2.0480	—	Volts
Output Voltage Accuracy[2]	-0.2	—	0.2	%
Output Voltage Temperature Coefficient[3]		12	50	ppm/°C
Load Regulation (sourcing: 0mA to 25mA)	—	20	120	µV/mA
Load Regulation (sinking: 0mA to -1mA)	—	10	—	µV/mA
Output Voltage Noise (0.1Hz to 10Hz)	—	60	—	µVp-p
Output Voltage Noise (10Hz to 1kHz)	—	30	—	µVRMS
Output Ripple Rejection (120Hz)	—	65	—	dB
Short Circuit Current[4] (+25°C)	—	120	—	mA
Turn on Settling Time[5] (±0.1% Vout)	—	300	—	µs
Stability (1000 hours, +25°C)	—	50	_	ppm
Thermal Hysteresis[6]	—	100	_	ppm
Operating Temp. Range:				
SE Versions	–40	—	+125	°C
SM Versions	–55	—	+125	°C
-QL Versions	–55	—	+125	°C
/883 Versions	–55	—	+125	°C
Storage Temp. Range	–65	—	+150	°C
Package Type				
SE, SM Versions	3-pin SOT-23-3			
-QL, /883 Versions	Ceramic Leadless Chip Carrier (CLCC)			

APPLICATION NOTES

Micropower Operation

The PVR-1520 consumes very little power due to its proprietary bandgap technology. Low noise performance is achieved using optimized biasing techniques. Supply current is typically 45µA and noise in the 0.1Hz to 10Hz bandwidth is typically 60µVpp lending this device to precision, low noise portable applications such as handheld meters and instruments.
Data Converters can utilize the PVR-1520 as a precision, low drift reference. Low power A/Ds and D/As will maximize their noise performance due to the PVR-1520's low-noise specification.

Noise Performance and Reduction

The recommended capacitive load range for the PVR-1520 is from 0.1µF to 10.0µF to ensure stability and best transient performance. Parallel 0.1µF and 10µF capacitors can be used to optimize performance as well. The noise specification stated in the Functional Specification tables is for 0.1µF capacitive load, and larger values will reduce the output noise level.

Humidity Susceptibility

Plastic mold compounds that are used to house ICs can absorb moisture. When these ICs are exposed to humidity the plastic package can undergo slight changes that will apply pressure to the internal die. These stresses placed on a precision reference can cause changes in its output voltage in the order of 100ppm. The fully hermetic package offered for the –QL and /883 versions are not affected by humidity, and are therefore more stable in environments where humidity is a concern.

Board Assembly Considerations

Bandgap references provide high accuracy and low temperature drift but some PC board assembly precautions are necessary. Normal output voltage shifts of 100µV to 4mV can be expected with Pb-free reflow profiles or wave solder on multilayer FR4 PC boards. Precautions should be taken to avoid excessive heat or extended exposure to high reflow or wave solder temperatures, this may reduce device initial accuracy.

Board Mounting Considerations

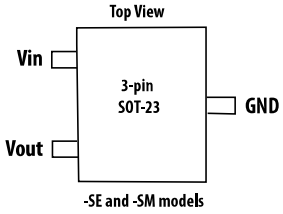
For applications requiring the highest accuracy, attention should be paid to the board mounting location of SE and SM devices. Theses models use a plastic SOIC package, which will subject the die to mild stresses when the Printed Circuit (PC) board is cooled or heated. Placing the device in areas subject to slight twisting may cause die stresses and consequently degradation of the reference voltage accuracy. It is preferred that the device near the edge of the shortest side as the axis of bending or in the center of the PCB where stresses due to flexing are reduced. Mounting the device in a cutout also minimizes flex. Mounting the device on flexprint or extremely thin PC material will likewise cause loss of reference accuracy.

NOTES

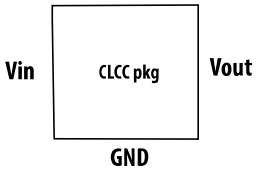
1. Post reflow drift may shift up to 4.0mV following the +260°C peak temperature reflow.
2. Dropout Voltage is the Vin - Vout differential voltage where Vout drops 1mV from Vin = nominal at +25°C
3. Over the specified temperature range. TC is measured by the change in Vout divided by the temperature range (e.g. -55°C to +125°C = +180°C).
4. Vout to GND.
5. Cout = 1uF
6. Thermal Hysteresis is the change of Vout measured at Ta = +25°C after the temperature has been cycled over its specified range (ΔTa). To calculate Thermal Hysteresis, an initial measurment is taken at Ta = +25°C. The temperature is then cycled and a second Vout measurement is taken at +25°C. Thermal Hysteresis is the difference between the initial Vout measurement and the second Vout measurement expressed in ppm. For ΔTa = +180°C, the device under test is cycled from +25°C to -55°C then to +125°C and finally back to +25°C.

INPUT/OUTPUT CONNECTIONS

PIN	PIN NAME	FUNCTION
1	Vin	Input Voltage
2	Vout	Voltage Reference Output
3	GND	Ground



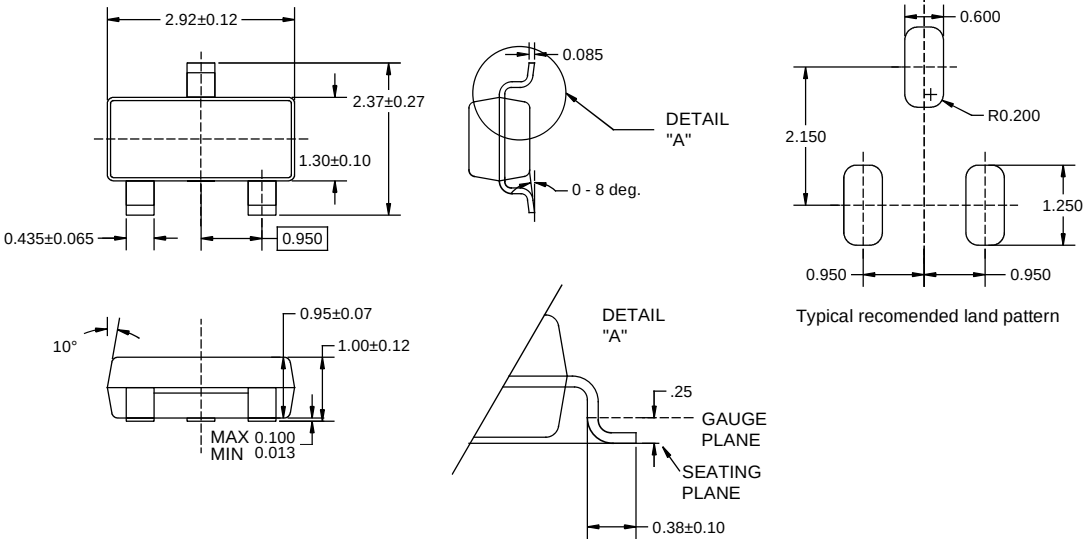
-SE and -SM models



-QL and -883 models

MECHANICAL DIMENSIONS

SOT23-3



Typical recomended land pattern

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