PVR-0512

1.25V Micropower Precision Voltage Reference

FEATURES

- Precision ±0.08% max initial accuracy
- Temperature coefficient 5 PPM/°C max
- Input voltage range 3.5V to 16V
- Output drive current 7mA
- Output voltage noise 15µVp-p (0.1Hz to 10kHz)
- Humidity and stress resistant ceramic LCC package for -QL and /883 models
- -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
- Supply current 90µA typical @ +125°C
- 8 pin SOIC package (SE, SM)
- Pb-free RoHS compliant

PRODUCT OVERVIEW

The PVR-0512 from DATEL uses a proprietary technology to provide a series of very low drift and low noise precision voltage references offered in either a small 8-pin SOIC or a fully hermetic sealed ceramic LCC package. The hermetic package, offered for the –QL and /883 versions, protects the IC from the effects of moisture making the reference more stable in environments where humidity is a concern. In addition, the LCC package isolates the IC from the stresses on printed circuit boards caused by variations in temperature.

This precision reference operates from a single 3.5V to 16V supply and provides ±0.08% initial voltage accuracy. Boasting a very low voltage drift temperature coefficient (TC), this reference is one in a family of precision voltage references from DATEL that ranges from 1.25 to 5.0 output volts. With a max temperature coefficient of 5 PPM/°C this reference allows a mere 625µV of drift at +125°C. This low TC drift along with the precision initial accuracy of 1.0mV max makes the PVR-0512 the reference of choice for precision data acquisition applications. For low power battery or solar applications, the PVR-0512 offers low supply current and low dropout voltage coupled with precision output voltage specifications.

DATEL offers these precision references qualified and 100% tested over the -40°C to +125°C enhanced and –55°C to +125°C military temperature ranges. Burn-in and environmental screening are also available as well as full temperature range ATE 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

- MIL-STD/883 systems
- Defense/ aerospace applications
- Precision A/D and D/A converters; Digital meters
- Battery and Solar powered management/monitoring
- Portable instruments
- Base stations
- Low voltage signal processing
- Micropower remote sensing

ORDERING INFORMATION

MODEL	TEMP. RANGE	PACKAGE
PVR-0512SE	-40°C to +125°C	SOT23-3
PVR-0512SM	-55°C to +125°C	SOT23-3
PVR-0512-QL	-55°C to +125°C	CLCC
PVR-0512/883	-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 +18	Volts
Vout to GND (10sec.)	-0.5 to Vout +1	Volts
Voltage on "Do Not Connect" pins (3,7,8)	No connection allowed	

FUNCTIONAL SPECIFICATIONS

(Typical Iout = 0mA unless otherwise specified, Ta = +25°C)

INPUT/OUTPUT	MIN.	TYP.	MAX.	UNITS
Vin	3.5	–	16	Volts
Iin (+25°C)	—	80	200	µA
Iin (+125°C)	—	90	220	µA
Line Regulation (4.5V to 16V)	—	50	150	µV/V
Output Voltage	—	10	50	Volts
Output Voltage Accuracy	—	1.250	—	mVolts
Output Voltage Temperature Drift Coefficient	-1	—	+1	ppm/°C
Load Regulation (sourcing: 0mA to 7mA)		3	5	µV/mA
Load Regulation (sinking: 0mA to -7mA)	—	15	60	µV/mA
Output Voltage Noise (0.1Hz to 10Hz)	—	15	100	µVp-p
Output Voltage Noise (10Hz to 1kHz)	—	5	—	µVRMS
Output Ripple Rejection (10kHz)	—	2	—	dB
Short Circuit Current (+25°C)	—	62	—	mA
Turn on Settling Time (±0.1% Vout)	—	10	—	µs
Stability (1000 hours, +25°C)	—	100	—	ppm
Thermal Hysteresis	—	50	—	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	8-pin SOIC			
-QL, /883 Versions	Ceramic Leadless Chip Carrier (CLCC)			
Thermal[5]				
8-pin SOIC	—	115	—	°C/W
Storage Temperature	-65	—	+150	°C

NOTES

1. Unless otherwise specified, all test method are pulsed such that Tj = Tc = Ta
2. Post reflow drift may shift up to 1.0mV based on testing using test sockets and FR4 PC boards. Dropout Voltage is the Vin - Vout differential voltage where Vout drops 1mV from Vin = nominal at +25°C
3. Over the specified temperature range the TC is measured by the change in Vout divided by the temperature range (e.g. -55°C to +125°C = +180°C).
4. 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 measurement 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.
5. θ_j measured on thermally conductive test card in free air

APPLICATION NOTES

Extended Temperature Operation

The PVR-0512 uses a proprietary technology to provide bothlow output voltage drift as well as an optimized biasing technique to achieve the PVR-0512's low noise performance of 15µVpp in the 0.1Hz to 10Hz bandwidth. For high-reliabilty applications requiring precision low noise performance over temperature, this series of PVR-05xx references are also available in a hermetic sealed ceramic LCC package. This package offering resolves environmental issues such as susceptibility to humidity and die stress making this reference an ideal selection for precision, low noise, extended temperature applications .

Noise Performance and Reduction

Output noise in the 0.1 to 10Hz range is measured through a 1-pole high-pass filter with a 3dB frequency of 0.1Hz and a 2-pole low-pass filter with a 3dB frequency of 8Hz. Noise measurements in the 10Hz to 1kHz range are taken using a 1-pole high-pass filter with a 3dB frequency at 1/10 of the center frequency and 1-pole low-pass filter with a 3dB frequency at 10x the center frequency.

Output capacitance up to 1uF can be added to reduce transient response, however when driving capacitance values greater than 0.001µF the noise reduction circuit shown in Fig. 1 is recommended. This circuit reduces noise over the full bandwidth and improves transient response. The 0.1uF capacitor can be increased for improved transient response without affecting stability.

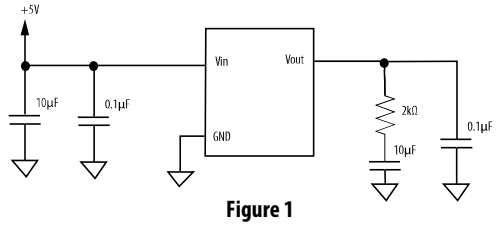


Figure 1

Output Voltage Adjustment

The PVR-0512 offers a ±2.5% adjustable output voltage by creating a voltage divider from Vout to GND with the divider node connected to the high impedance TRIM pin. The TC drift of the voltage applied at the TRIM pin will affect the overall TC of the PVR-0512.

Humidity Susceptibility

Plastic mold compounds that are used to house ICs can absorb moisture. When these devices are exposed to humidity the plastic package can undergo slight changes that can apply pressure to the internal die. 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.

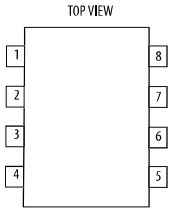
Board Mounting Considerations

For applications requiring the highest accuracy, attention should be paid to the board mounting location of SE and SM devices. These models use a plastic SOIC package that could subject the die to mild stresses when the printed circuit 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 be placed in the center of the PCB or near the edge of the shortest side where stresses due to flexing are reduced. Mounting the device in a cutout also minimizes flex. Mounting the device on an extremely thin PCB or flexprint will increase the potential for loss of accuracy due to stress. The CLCC package offered for -QL and /883 devices eliminates the potential for die stress.

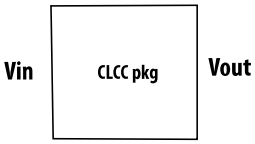
Board Assembly Considerations

Precision 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.

INPUT/OUTPUT CONNECTIONS



SE and SM models

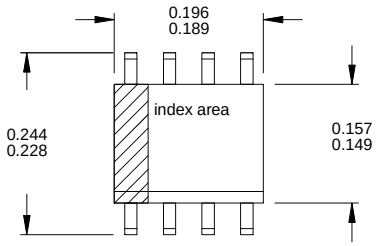


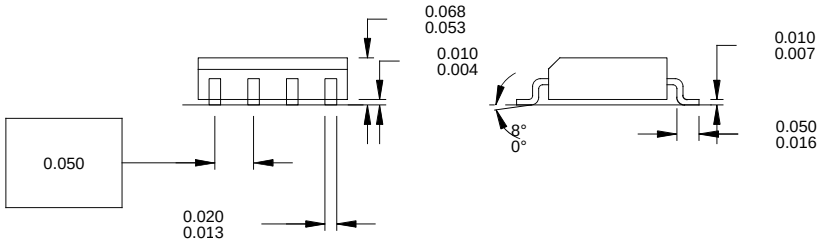
-QL and -883 models

PIN	PIN NAME	FUNCTION
1	GND	Ground
2	Vin	Input Voltage
3	Do Not Connect	Do Not Connect
4	GND	Ground
5	TRIM	Trim Voltage / Do Not Connect
6	Vout	Voltage Reference Output
7	Do Not Connect	Do Not Connect
8	Do Not Connect	Do Not Connect

MECHANICAL DIMENSIONS

8-pin SOIC





Mechanical Dimensions: inches

Dimensions do not include mold flash, gate burrs, or protrusions.

Chamfer on the body is optional. If not present, a visual index feature must be located within the crosshatch ares.

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