

# ICL8069

Data Sheet

#### January 2004

#### FN3172.3

# Low Voltage Reference

The ICL8069 is a 1.2V temperature-compensated voltage reference. It uses the band-gap principle to achieve excellent stability and low noise at reverse currents down to  $50\mu$ A. Applications include analog-to-digital converters, digital-to-analog converters, threshold detectors, and voltage regulators. Its low power consumption makes it especially suitable for battery operated equipment.

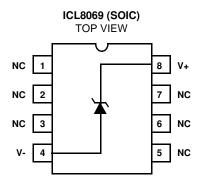
# **Ordering Information**

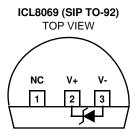
PART NUMBER	MAXIMUM TEMPCO	TEMP. RANGE ( <sup>o</sup> C)	PACKAGE	PKG. DWG. #
ICL8069CCZR	0.005%/ <sup>0</sup> C	0 to 70	SIP Package (TO-92)	Z3.05
ICL8069DCZR	0.01%/ <sup>0</sup> C	0 to 70	SIP Package (TO-92)	Z3.05
ICL8069CCBA	0.005%/ <sup>0</sup> C	0 to 70	8 Ld SOIC	M8.15

#### Features

- Low Bias Current (Min) ......50μA
- Low Dynamic Impedance
- Low Reverse Voltage
- Low Cost

### Pinouts



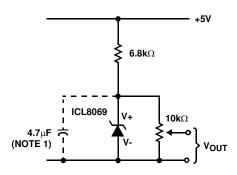


#### CAUTION: These devices are sensitive to electrostatic discharge; follow proper IC Handling Procedures. 1-888-INTERSIL or 321-724-7143 | Intersil (and design) is a registered trademark of Intersil Americas Inc. Copyright © Intersil Americas Inc. 2004. All Rights Reserved All other trademarks mentioned are the property of their respective owners.

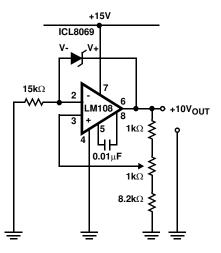
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# Functional Block Diagrams

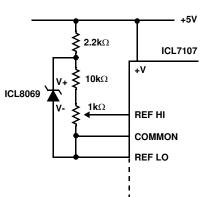
SIMPLE REFERENCE (1.2V OR LESS)



#### **BUFFERED 10V REFERENCE USING A SINGLE SUPPLY**



DOUBLE REGULATED 100mV REFERENCE FOR ICL7107 ONE-CHIP DPM CIRCUIT



#### Absolute Maximum Ratings

Reverse VoltageSee Note	<del>)</del> 3
Forward Current	nA
Reverse Current	nA

#### **Operating Conditions**

Temperature Ranges	
ICL8069C	 $\dots \dots 0^{0}$ C to $70^{0}$ C

#### **Thermal Information**

Thermal Resistance (Typical, Note 1)	θ <sub>JA</sub> ( <sup>o</sup> C/W)	θ <sub>JC</sub> ( <sup>o</sup> C/W)				
SOIC Package	170	N/A				
SIP (TO-92) Package	200	N/A				
Power Dissipation Limited by MAX Forwar	rd/Reverse C	urrent				
Maximum Junction Temperature (SOIC Package)150°C						
Maximum Storage Temperature Range	65	5°C to 150°C				
Maximum Lead Temperature (Soldering 1	0s)	300 <sup>0</sup> C				
(SOIC - Lead Tips Only)						

CAUTION: Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

#### NOTE:

1.  $\theta_{JA}$  is measured with the component mounted on an evaluation PC board in free air.

### **Electrical Specifications** $T_A = 25^{\circ}C$ Unless Otherwise Specified

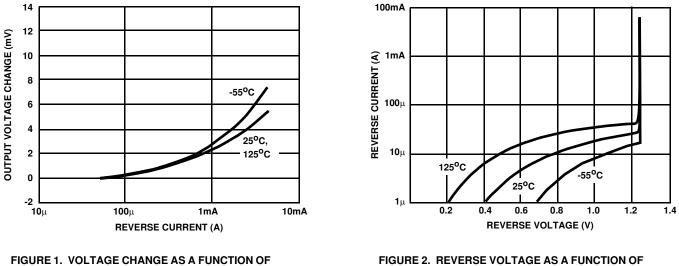
PARAMETER	TEST CONDITIONS	MIN	ТҮР	MAX 1.25	UNITS V
Reverse Breakdown Voltage	I <sub>R</sub> = 500μA	1.20	1.23		
Reverse Breakdown Voltage Change	$50\mu A \le I_R \le 5mA$	-	15	20	mV
Reverse Dynamic Impedance	I <sub>R</sub> = 50μA	-	1	2	Ω
	I <sub>R</sub> = 500μA	-	1	2	Ω
Forward Voltage Drop	I <sub>F</sub> = 500μA	-	0.7	1	V
RMS Noise Voltage	$10Hz \le F \le 10kHz$ , $I_R = 500\mu A$	-	5	-	μV
Long Term Stability	I <sub>R</sub> = 4.75mA, T <sub>A</sub> = 25 <sup>o</sup> C	-	1	-	ppm/kHR
Breakdown Voltage Temperature Coefficient ICL8069C	$I_R = 500 \mu A$ , $T_A = Operating$ Temperature Range	-	-	0.005	%/ <sup>0</sup> C
ICL8069D		-	-	0.01	%/ <sup>o</sup> C
Reverse Current Range	1.18V to 1.27V	0.050	-	5	mA

NOTES:

2. If circuit strays in excess of 200pF are anticipated, a 4.7µF shunt capacitor will ensure stability under all operating conditions.

3. In normal use, the reverse voltage cannot exceed the reference voltage. However when plugging units into a powered-up test fixture, an instantaneous voltage equal to the compliance of the test circuit will be seen. This should not exceed 20V.

# **Typical Performance Curves**



REVERSE CURRENT



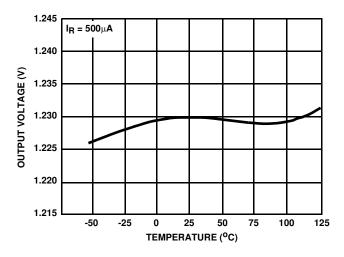
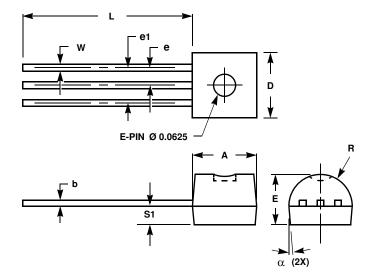


FIGURE 3. REVERSE VOLTAGE AS A FUNCTION OF TEMPERATURE

# Single-In-Line Plastic Packages (SIP)



#### NOTES:

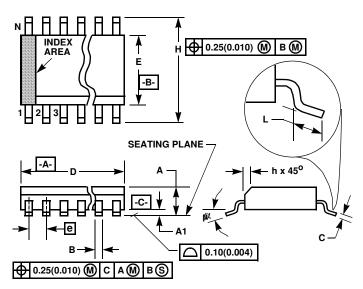
- 1. Package body dimensions do not include any mold flash or protrusions.
- 2. Package outline dimensions do not include burrs.
- 3. Controlling dimension: INCH.

#### Z3.05 (JEDEC STYLE TO-92 MODIFIED) 3 LEAD PLASTIC SINGLE-IN-LINE PACKAGE

	INCHES		MILLIN		
SYMBOL	MIN	MAX	MIN	MAX	NOTES
А	0.170	0.195	4.32	4.95	1
b	0.014	0.020	0.36	0.51	2
E	0.130	0.155	3.30	3.94	1
е	0.045	0.055	1.14	1.40	-
e1	0.095	0.105	2.41	2.67	-
L	0.500	0.610	12.70	15.49	-
R	0.085	0.095	2.16	2.41	-
S1	0.045	0.060	1.14	1.52	-
W	0.016	0.022	0.41	0.56	2
D	0.175	0.195	4.45	4.95	1
α	4 <sup>0</sup>	6 <sup>0</sup>	4 <sup>0</sup>	6 <sup>0</sup>	-

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# Small Outline Plastic Packages (SOIC)



#### NOTES:

- 1. Symbols are defined in the "MO Series Symbol List" in Section 2.2 of Publication Number 95.
- 2. Dimensioning and tolerancing per ANSI Y14.5M-1982.
- Dimension "D" does not include mold flash, protrusions or gate burrs. Mold flash, protrusion and gate burrs shall not exceed 0.15mm (0.006 inch) per side.
- Dimension "E" does not include interlead flash or protrusions. Interlead flash and protrusions shall not exceed 0.25mm (0.010 inch) per side.
- 5. The chamfer on the body is optional. If it is not present, a visual index feature must be located within the crosshatched area.
- 6. "L" is the length of terminal for soldering to a substrate.
- 7. "N" is the number of terminal positions.
- 8. Terminal numbers are shown for reference only.
- 9. The lead width "B", as measured 0.36mm (0.014 inch) or greater above the seating plane, shall not exceed a maximum value of 0.61mm (0.024 inch).
- 10. Controlling dimension: MILLIMETER. Converted inch dimensions are not necessarily exact.

#### **M8.15** (JEDEC MS-012-AA ISSUE C) 8 LEAD NARROW BODY SMALL OUTLINE PLASTIC PACKAGE

	INCHES		MILLIMETERS		
SYMBOL	MIN	MAX	MIN	MAX	NOTES
A	0.0532	0.0688	1.35	1.75	-
A1	0.0040	0.0098	0.10	0.25	-
В	0.013	0.020	0.33	0.51	9
С	0.0075	0.0098	0.19	0.25	-
D	0.1890	0.1968	4.80	5.00	3
E	0.1497	0.1574	3.80	4.00	4
е	0.050 BSC		1.27 BSC		-
Н	0.2284	0.2440	5.80	6.20	-
h	0.0099	0.0196	0.25	0.50	5
L	0.016	0.050	0.40	1.27	6
N	8			8	7
α	0 <sup>0</sup>	8 <sup>0</sup>	0 <sup>0</sup>	8 <sup>0</sup>	-

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