19-0944; Rev 1; 3/99

MAXIM

Low-Voltage Reference

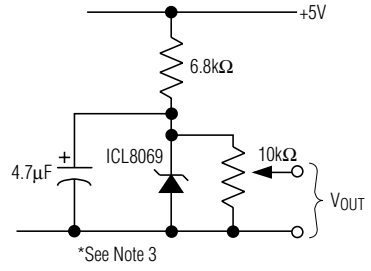
General Description

The ICL8069 is a 1.2V temperature-compensated voltage reference. It uses the bandgap principle to achieve excellent stability and low noise at reverse currents down to 50µA. Maxim's ICL8069 also features excellent stability, freedom from oscillation.

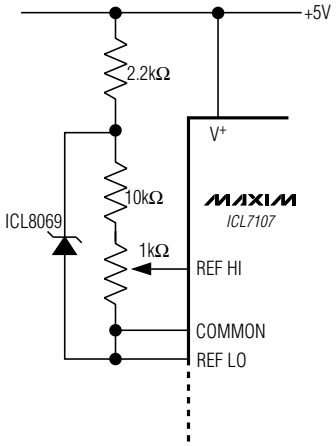
Applications

Analog-to-Digital Converters
Digital-to-Analog Converters
Threshold Detectors
Voltage Regulators
Portable Instruments

Typical Operating Circuit



(a) Simple Reference (1.2V or Less)



(b) Double-Regulated 100mV Reference for ICL7107 One-Chip DPM Circuit

Features

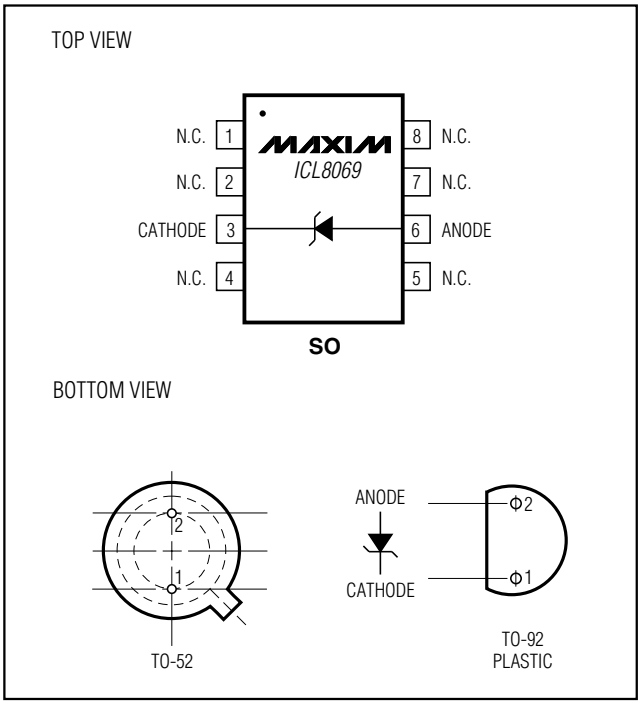
- **Temperature Coefficient Guaranteed to 10ppm/°C max**
- **Low Bias Current: 50µA min**
- **Low Dynamic Impedance**
- **Low Reverse Voltage**
- **Low Cost**

Ordering Information

PART	TEMP. RANGE	PIN-PACKAGE	MAX TEMPCO (ppm/°C)
ICL8069BCSA	0°C to +70°C	8 SO	25
ICL8069CCSA	0°C to +70°C	8 SO	50
ICL8069DCSA	0°C to +70°C	8 SO	100
ICL8069DESA	-40°C to +85°C	8 SO	100
ICL8069CCZQ2	0°C to +70°C	TO-92	50
ICL8069DCZQ2	0°C to +70°C	TO-92	100

Ordering Information continued at end of data sheet.

Pin Configurations



ABSOLUTE MAXIMUM RATINGS

Reverse Voltage .....(Note 1)
Forward Current 10mA
Reverse Current 10mA
Power Dissipation.....Limited by Max Forward/Reverse Current
Storage Temperature Range .....-65°C to +150°C

Operating Temperature Ranges
ICL8069C .....0°C to +70°C
ICL8069E .....-40°C to +85°C
ICL8069M .....-55°C to +125°C
Lead Temperature (soldering, 10sec) .....+300°C

Note 1: 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.

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 in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

ELECTRICAL CHARACTERISTICS

(T_A = +25°C, unless otherwise noted.) (Note 2)

PARAMETER	CONDITIONS		MIN	TYP	MAX	UNITS
Output Voltage	I_R = 500µA		1.20	1.23	1.25	V
Output Voltage Temperature Coefficient	I_R = 500µA, T_A = operating temperature range (Note 3)	ICL8069A			10	ppm/°C
		ICL8069B			25	
		ICL8069C			50	
		ICL8069D			100	
Output Voltage Change	50µA ≤ I_R ≤ 5mA			15	20	mV
Reverse Dynamic Impedance	I_R = 50µA, I_R = 500µA			1	2	Ω
				0.6	2	
Forward Voltage Drop	I_F = 500µA			0.7	1	V
RMS Noise Voltage	10Hz ≤ f ≤ 10kHz, I_R = 500µA			5		µV
Reverse Current Range			0.050		5	mA

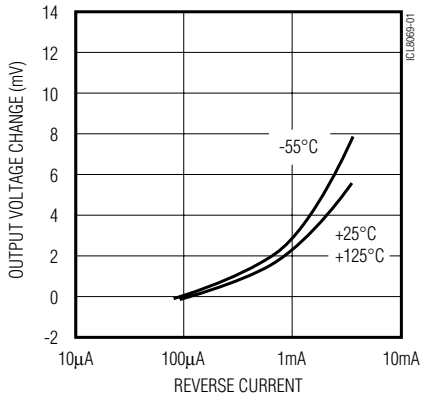
Note 2: If circuit strays in excess of 200pF are anticipated, a 4.7µF shunt capacitor will ensure stability under all operating conditions.

Note 3: For military devices, measurements are made at +25°C, -55°C, and +125°C, while for commercial devices measurements are made at +25°C, 0°C, and +70°C. The units are then classified as a function of the worst-case TC. Sample tested to 0.1% AQL.

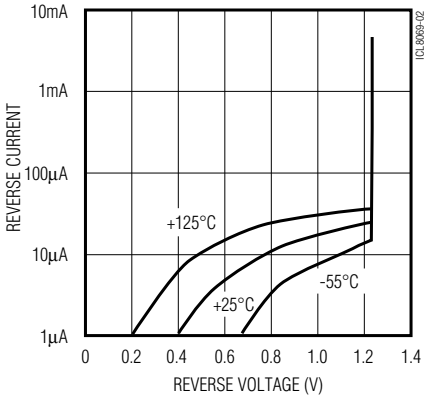
Typical Operating Characteristics

(T_A = +25°C, unless otherwise noted.)

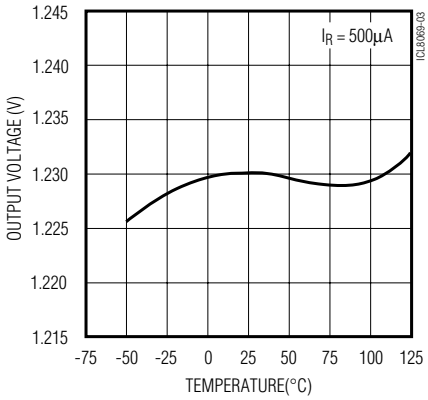
VOLTAGE CHANGE vs. REVERSE CURRENT



REVERSE CURRENT vs. REVERSE VOLTAGE



REVERSE VOLTAGE vs. TEMPERATURE



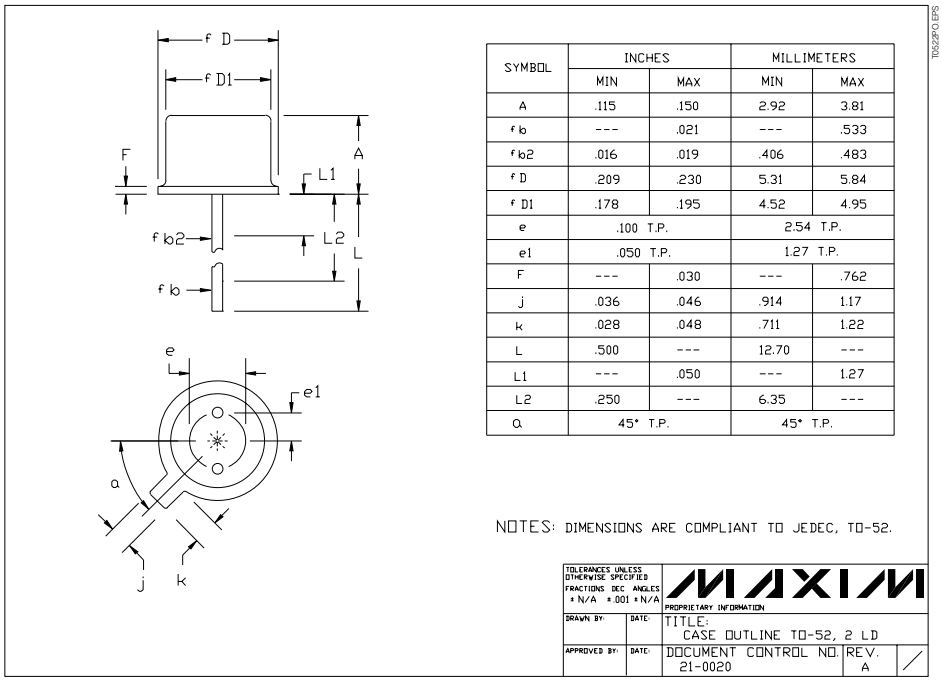
Ordering Information (continued)

PART	TEMP RANGE	PIN-PACKAGE	MAX TEMPCO (ppm/°C)
ICL8069ACSA*	0°C to +70°C	8 SO	10
ICL8069BCZQ2*	0°C to +70°C	TO-92	25
ICL8069ACSQ2*	0°C to +70°C	TO-52	10
ICL8069BCSQ2*	0°C to +70°C	TO-52	25
ICL8069CCSQ2*	0°C to +70°C	TO-52	50
ICL8069DCSQ2*	0°C to +70°C	TO-52	100
ICL8069CMSQ2*	-55°C to +125°C	TO-52	50
ICL8069DMSQ2*	-55°C to +125°C	TO-52	100
ICL8069DC/D*	0°C to +70°C	Dice**	—

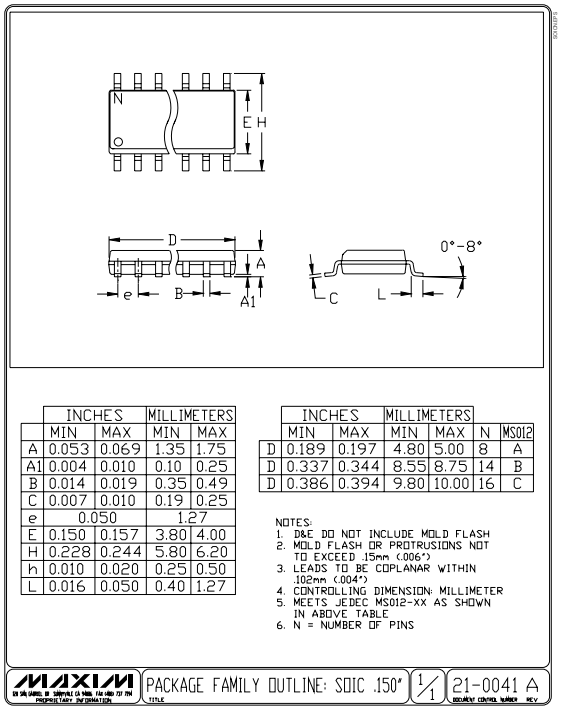
***Dice are specified at TA = +25°C.*

**Contact factory for availability.*

Package Information



SYMBOL	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.115	.150	2.92	3.81
f b	---	.021	---	.533
f b2	.016	.019	.406	.483
f D	.209	.230	5.31	5.84
f D1	.178	.195	4.52	4.95
e	.100 T.P.		2.54 T.P.	
e1	.050 T.P.		1.27 T.P.	
F	---	.030	---	.762
j	.036	.046	.914	1.17
k	.028	.048	.711	1.22
L	.500	---	12.70	---
L1	---	.050	---	1.27
L2	.250	---	6.35	---
a	45° T.P.		45° T.P.	



	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.053	0.069	1.35	1.75
A1	0.004	0.010	0.10	0.25
B	0.014	0.019	0.35	0.49
C	0.007	0.010	0.19	0.25
e	0.050		1.27	
E	0.150	0.157	3.80	4.00
H	0.228	0.244	5.80	6.20
h	0.010	0.020	0.25	0.50
L	0.016	0.050	0.40	1.27

	INCHES		MILLIMETERS			
	MIN	MAX	MIN	MAX	N	MS012
D	0.189	0.197	4.80	5.00	8	A
D	0.337	0.344	8.55	8.75	14	B
D	0.386	0.394	9.80	10.00	16	C

NOTES:
1. D&E DO NOT INCLUDE MOLD FLASH
2. MOLD FLASH OR PROTRUSIONS NOT TO EXCEED .15mm (.006")
3. LEADS TO BE COPLANAR WITHIN .102mm (.004")
4. CONTROLLING DIMENSION: MILLIMETER
5. MEETS JEDEC MS012-xx AS SHOWN IN ABOVE TABLE
6. N = NUMBER OF PINS