Data Sheet | September 12, 2007 | FN6327.6

High Voltage Input Precision, Low Noise FGA™ Voltage References

The ISL21009 FGA™ voltage references are extremely low power, high precision, and low noise voltage references fabricated on Intersil's proprietary Floating Gate Analog technology. The ISL21009 features very low noise ($4.5\mu V_{P-P}$ for 0.1Hz to 10Hz), low operating current (180µA, Max), and 3ppm/°C of temperature drift. In addition, the ISL21009 family features guaranteed initial accuracy as low as ±0.5mV.

This combination of high initial accuracy, low power and low output noise performance of the ISL21009 enables versatile high performance control and data acquisition applications with low power consumption.

Available Options

PART NUMBER	V_{OUT} OPTION (V)	INITIAL ACCURACY (mV)	TEMPCO. (ppm/°C)
ISL21009BFB812Z	1.250	±0.5	3
ISL21009CFB812Z	1.250	±1.0	5
ISL21009DFB812Z	1.250	±2.0	10
ISL21009BFB825Z	2.500	±0.5	3
ISL21009CFB825Z	2.500	±1.0	5
ISL21009DFB825Z	2.500	±2.0	10
ISL21009BFB841Z	4.096	±0.5	3
ISL21009CFB841Z	4.096	±1.0	5
ISL21009DFB841Z	4.096	±2.0	10
ISL21009BFB850Z	5.000	±0.5	3
ISL21009CFB850Z	5.000	±1.0	5
ISL21009DFB850Z	5.000	±2.0	10

Features

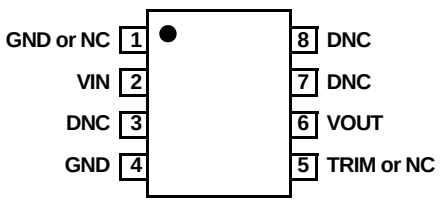
- Output Voltages 1.250V, 2.500V, 4.096V, 5.000V
- Initial Accuracy . . . . . .±0.5mV, ±1.0mV, ±2.0mV
- Input Voltage Range. . . . . 3.5V to 16.5V
- Output Voltage Noise . . . . . .$4.5\mu V_{P-P}$ (0.1Hz to 10Hz)
- Supply Current . . . . . .180µA (Max)
- Temperature Coefficient . . . 3ppm/°C, 5ppm/°C, 10ppm/°C
- Output Current Capability. . . . . Up to ±7.0mA
- Operating Temperature Range. . . . . .-40°C to +125°C
- Package . . . . . 8 Ld SOIC
- Pb-free available (RoHS compliant)

Applications

- High Resolution A/Ds and D/As
- Digital Meters
- Bar Code Scanners
- Basestations
- Battery Management/Monitoring
- Industrial/Instrumentation Equipment

Pinout

ISL21009
(8 LD SOIC)
TOP VIEW



Pin Descriptions

PIN NUMBER	PIN NAME	DESCRIPTION
1	GND or NC	Can be either Ground or No Connect
2	VIN	Power Supply Input Connection
4	GND	Ground Connection
5	TRIM	Allows user trim typically ±2.5%. Leave Unconnected when unused.
6	VOUT	Voltage Reference Output Connection
3, 7, 8	DNC	Do Not Connect; Internal Connection – Must Be Left Floating

Ordering Information

PART NUMBER (Notes 1, 2)	PART MARKING	V_{OUT} OPTION (V)	GRADE	TEMP. RANGE (°C)	PACKAGE (Pb-Free)	PKG. DWG. #
ISL21009BFB812Z	21009BF Z12	1.250	±0.5mV, 3ppm/°C	-40 to +125	8 Ld SOIC	M8.15
ISL21009CFB812Z	21009CF Z12	1.250	±1.0mV, 5ppm/°C	-40 to +125	8 Ld SOIC	M8.15
ISL21009DFB812Z	21009DF Z12	1.250	±2.0mV, 10ppm/°C	-40 to +125	8 Ld SOIC	M8.15
ISL21009BFB825Z	21009BF Z25	2.500	±0.5mV, 3ppm/°C	-40 to +125	8 Ld SOIC	M8.15
ISL21009CFB825Z	21009CF Z25	2.500	±1.0mV, 5ppm/°C	-40 to +125	8 Ld SOIC	M8.15
ISL21009DFB825Z	21009DF Z25	2.500	±2.0mV, 10ppm/°C	-40 to +125	8 Ld SOIC	M8.15
ISL21009BFB841Z	21009BF Z41	4.096	±0.5mV, 3ppm/°C	-40 to +125	8 Ld SOIC	M8.15
ISL21009CFB841Z	21009CF Z41	4.096	±1.0mV, 5ppm/°C	-40 to +125	8 Ld SOIC	M8.15
ISL21009DFB841Z	21009DF Z41	4.096	±2.0mV, 10ppm/°C	-40 to +125	8 Ld SOIC	M8.15
ISL21009BFB850Z	21009BF Z50	5.000	±0.5mV, 3ppm/°C	-40 to +125	8 Ld SOIC	M8.15
ISL21009CFB850Z	21009CF Z50	5.000	±1.0mV, 5ppm/°C	-40 to +125	8 Ld SOIC	M8.15
ISL21009DFB850Z	21009DF Z50	5.000	±2.0mV, 10ppm/°C	-40 to +125	8 Ld SOIC	M8.15

NOTES:

1. These Intersil Pb-free plastic packaged products employ special Pb-free material sets; molding compounds/die attach materials and 100% matte tin plate PLUS ANNEAL - e3 termination finish, which is RoHS compliant and compatible with both SnPb and Pb-free soldering operations. Intersil Pb-free products are MSL classified at Pb-free peak reflow temperatures that meet or exceed the Pb-free requirements of IPC/JEDEC J STD-020.
2. Add “-TK” suffix for tape and reel. Please refer to TB347 for details on reel specifications.

Absolute Voltage Ratings

Storage Temperature Range . . . . . .-65°C to +150°C
Max Voltage V_{IN} to GND . . . . . .-0.5V to +18V
Max Voltage V_{OUT} to GND (10s) . . . . . -0.5V to V_{OUT} +1V
Voltage on “DNC” pins . . . . No connections permitted to these pins.
ESD Ratings
Human Body Model 6kV
Charged Device Model. 2kV

Recommended Operating Conditions

Temperature Range (Industrial) . . . . . -40°C to +125°C

Thermal Information

Continuous Power Dissipation (Note 3) . . . . . T_A = +70°C
8 Ld SOIC derate 5.88mW/°C above +70°C. 471mW
Pb-free reflow profile. . . . . see link below

CAUTION: Do not operate at or near the maximum ratings listed for extended periods of time. Exposure to such conditions may adversely impact product reliability and result in failures not covered by warranty.

IMPORTANT NOTE: All parameters having Min/Max specifications are guaranteed. Typ values are for information purposes only. Unless otherwise noted, all tests are at the specified temperature and are pulsed tests, therefore: $T_J = T_C = T_A$

NOTE:

3. θ_{JA} is measured with the component mounted on a high effective thermal conductivity test board in free air. See Tech Brief TB379 for details.

Common Electrical Specifications (ISL21009-12, -25, -41, -50)

T_A = -40°C to +125°C, I_{OUT} = 0, unless otherwise specified.

PARAMETER	DESCRIPTION	CONDITIONS	MIN	TYP	MAX	UNIT
V_{OA}	V_{OUT} Accuracy @ T_A = +25°C	ISL21009B	-0.5		+0.5	mV
		ISL21009C	-1.0		+1.0	mV
		ISL21009D	-2.0		+2.0	mV
TC V_{OUT}	Output Voltage Temperature Coefficient (Note 4)	ISL21009B			3	ppm/°C
		ISL21009C			5	ppm/°C
		ISL21009D			10	ppm/°C
I_{IN}	Supply Current			95	180	µA
$\Delta V_{OUT} / V_{OUT}$	Trim Range		±2.0	±2.5		%
I_{SC}	Short Circuit Current	T_A = +25°C, V_{OUT} tied to GND		10		mA
t_R	Turn-on Settling Time	V_{OUT} = ±0.1%		100		µs
	Ripple Rejection	f = 10kHz		60		dB
e_N	Output Voltage Noise	0.1Hz ≤ f ≤ 10Hz		4.5		μV_{P-P}
V_N	Broadband Voltage Noise	10Hz ≤ f ≤ 1kHz		2.2		μV_{RMS}

Electrical Specifications (ISL21009-12, V_{OUT} = 1.250V)

V_{IN} = 5.0V, T_A = -40°C to +125°C, I_{OUT} = 0, unless otherwise specified.

PARAMETER	DESCRIPTION	CONDITIONS	MIN	TYP	MAX	UNIT
V_{OUT}	Output Voltage			1.250		V
V_{IN}	Input Voltage Range		3.5		16.5	V
$\Delta V_{OUT}/\Delta V_{IN}$	Line Regulation	3.5V ≤ V_{IN} ≤ 5.5V		50	150	µV/V
		5.5V ≤ V_{IN} ≤ 16.5V		10	50	µV/V
$\Delta V_{OUT}/\Delta I_{OUT}$	Load Regulation	Sourcing: 0mA ≤ I_{OUT} ≤ 7mA		10	50	µV/mA
		Sinking: -7mA ≤ I_{OUT} ≤ 0mA		20	100	µV/mA
$\Delta V_{OUT}/\Delta T_A$	Thermal Hysteresis (Note 5)	ΔT_A = +165°C		50		ppm
$\Delta V_{OUT}/\Delta t$	Long Term Stability (Note 6)	T_A = +25°C		50		ppm

Electrical Specifications (ISL21009-25, V_{OUT} = 2.50V) V_{IN} = 5.0V, T_A = -40°C to +125°C, I_{OUT} = 0, unless otherwise specified.

PARAMETER	DESCRIPTION	CONDITIONS	MIN	TYP	MAX	UNIT
V_{OUT}	Output Voltage			2.500		V
V_{IN}	Input Voltage Range		3.5		16.5	V
$\Delta V_{OUT}/\Delta V_{IN}$	Line Regulation	$3.5V \leq V_{IN} \leq 5.5V$		50	150	µV/V
		$5.5V \leq V_{IN} \leq 16.5V$		10	50	µV/V
$\Delta V_{OUT}/\Delta I_{OUT}$	Load Regulation	Sourcing: $0mA \leq I_{OUT} \leq 7mA$		10	50	µV/mA
		Sinking: $-7mA \leq I_{OUT} \leq 0mA$		20	100	µV/mA
$\Delta V_{OUT}/\Delta T_A$	Thermal Hysteresis (Note 5)	ΔT_A = +165°C		50		ppm
$\Delta V_{OUT}/\Delta t$	Long Term Stability (Note 6)	T_A = +25°C		50		ppm

Electrical Specifications (ISL21009-41, V_{OUT} = 4.096V) V_{IN} = 5.0V, T_A = -40°C to +125°C, I_{OUT} = 0 unless otherwise specified.

PARAMETER	DESCRIPTION	CONDITIONS	MIN	TYP	MAX	UNIT
V_{OUT}	Output Voltage			4.096		V
V_{IN}	Input Voltage Range		4.5		16.5	V
$\Delta V_{OUT}/\Delta V_{IN}$	Line Regulation	$4.5V \leq V_{IN} \leq 16.5V$		50	200	µV/V
$\Delta V_{OUT}/\Delta I_{OUT}$	Load Regulation	Sourcing: $0mA \leq I_{OUT} \leq 5mA$		20	100	µV/mA
		Sinking: $-5mA \leq I_{OUT} \leq 0mA$		20	150	µV/mA
$\Delta V_{OUT}/\Delta T_A$	Thermal Hysteresis (Note 5)	ΔT_A = +165°C		50		ppm
$\Delta V_{OUT}/\Delta t$	Long Term Stability (Note 6)	T_A = +25°C		50		ppm

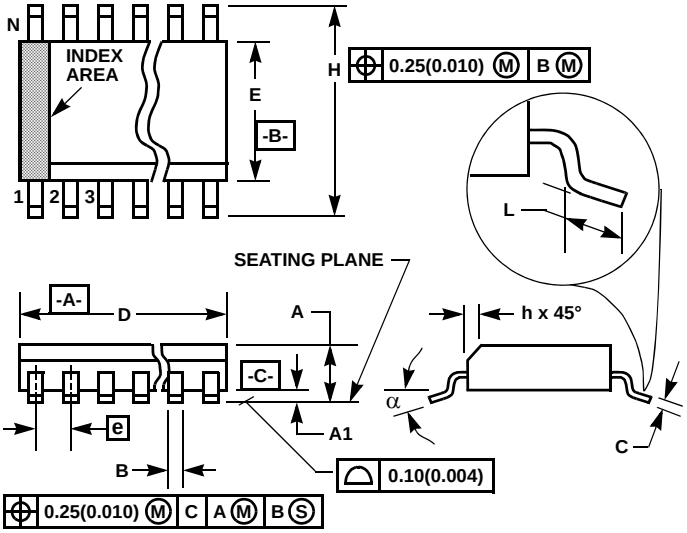
Electrical Specifications (ISL21009-50, V_{OUT} = 5.0V) V_{IN} = 10.0V, T_A = -40°C to +125°C, I_{OUT} = 0 unless otherwise specified.

PARAMETER	DESCRIPTION	CONDITIONS	MIN	TYP	MAX	UNIT
V_{OUT}	Output Voltage			5.000		V
V_{IN}	Input Voltage Range		5.5		16.5	V
$\Delta V_{OUT}/\Delta V_{IN}$	Line Regulation	$5.5V \leq V_{IN} \leq 16.5V$		20	90	µV/V
$\Delta V_{OUT}/\Delta I_{OUT}$	Load Regulation	Sourcing: $0mA \leq I_{OUT} \leq 7mA$		10	100	µV/mA
		Sinking: $-7mA \leq I_{OUT} \leq 0mA$		20	150	µV/mA
$\Delta V_{OUT}/\Delta T_A$	Thermal Hysteresis (Note 5)	ΔT_A = +165°C		50		ppm
$\Delta V_{OUT}/\Delta t$	Long Term Stability (Note 6)	T_A = +25°C		50		ppm

NOTES:

4. Over the specified temperature range. Temperature coefficient is measured by the box method whereby the change in V_{OUT} is divided by the temperature range; in this case, -40°C to +125°C = +165°C.
5. Thermal Hysteresis is the change of V_{OUT} measured @ T_A = +25°C after temperature cycling over a specified range, ΔT_A. V_{OUT} is read initially at T_A = +25°C for the device under test. The device is temperature cycled and a second V_{OUT} measurement is taken at +25°C. The difference between the initial V_{OUT} reading and the second V_{OUT} reading is then expressed in ppm. For ΔT_A = +165°C, the device under test is cycled from +25°C to +125°C to -40°C to +25°C.
6. Long term drift is logarithmic in nature and diminishes over time. Drift after the first 1000 hours will be approximately 10ppm/sqrt(1kHrs).

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.
3. 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.
4. 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

SYMBOL	INCHES		MILLIMETERS		NOTES
	MIN	MAX	MIN	MAX	
A	0.0532	0.0688	1.35	1.75	-
A1	0.0040	0.0098	0.10	0.25	-
B	0.013	0.020	0.33	0.51	9
C	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
e	0.050 BSC		1.27 BSC		-
H	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
a	0°	8°	0°	8°	-