INSTRUMENTATION AMPLIFIER

(SC1406-0)

DATA SHEET

Version 1.0, May' 2017

Semi–Conductor Laboratory
Government of India
S.A.S. Nagar, Punjab-160071
www.scl.gov.in

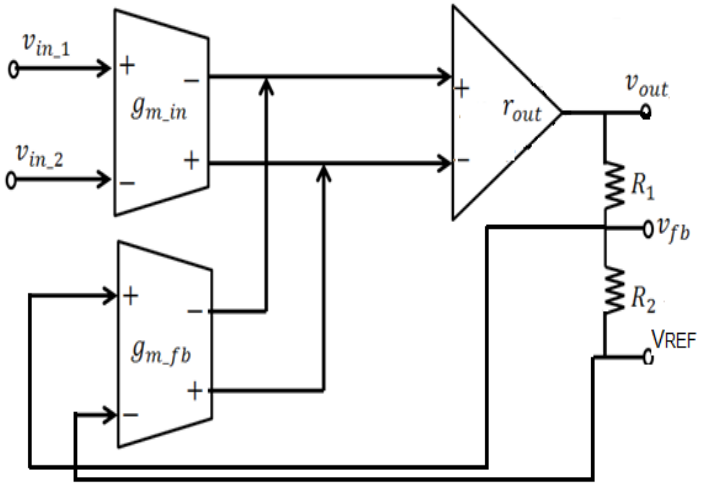
PRODUCT DESCRIPTION:

Programmable Current feedback instrumentation amplifier (SC1406-0) is an IP based solution for high CMRR applications of the order of 80db and above. The output voltage swing is completely independent of input common mode voltage. It has six independent closed loop gain options which can be selected through two control lines. It offers Single supply operation and consumes low power.

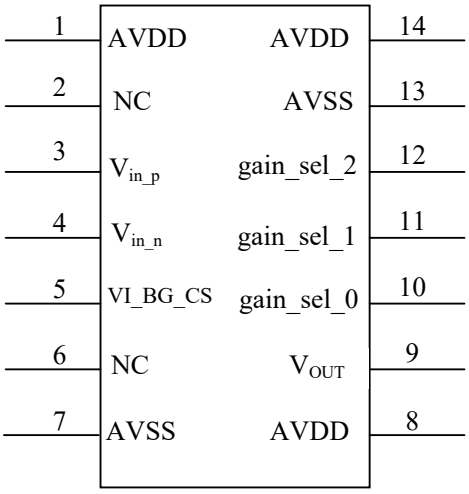
FEATURES:

- **Power Supply Voltage 3.3V ± 0.3V**
- **CMOS logic input levels for digital I/O**
- **Low power dissipation (< 2mW@3.3Vstatic)**
- **Minimum CMRR: 87.6dB (DC)**
- **Minimum CMRR: 66dB at 10KHz**
- **Minimum PSRR: 63.20 dB**
- **Minimum PSRR: 54.58 dB at 1KHz**
- **High Input Impedance**
- **Bandwidth (G=1): 1.13MHz**
- **Six programmable gain option**
- **High output swing**
- **Operating Temperature: -55ºC to 125ºC.**
- **Hermetic sealed 14 pin DIP package**
- **SCL's 180nm CMOS Technology**

FUNCTIONAL BLOCK DIAGRAM:



DEVICE PIN DIAGRAM:



PIN CONFIGURATION:

Pin No.	Pin Name	Description
1	AVDD	Analog Power Supply (3.3V)
2	NC	NC
3	V_{in_p}	Positive input terminal
4	V_{in_n}	Negative input terminal
5	VI_BG_CS	Reference Current Terminal (30µA)
6	NC	NC
7	AVSS	Analog Ground
8	AVDD	Analog Power Supply(3.3V)
9	V_{OUT}	INAMP Output
10	gain_sel_0	Gain Select Lines (inputs)
11	gain_sel_1	Gain Select Lines (inputs)
12	gain_sel_2	Gain Select Lines (inputs)
13	AVSS	Analog Ground
14	AVDD	Analog Power Supply (3.3V)

GAIN SELECTION TABLE:

S. No.	Select Lines (Digital)	Gain
1	000	1
2	001	2
3	010	5
4	011	10
5	100	15
6	101	30
7	110	Reserved
8	111	Reserved

RECOMMENDED OPERATING CONDITIONS:

Symbol	Parameter	Min.	Typ.	Max.	Unit
V_{DD}	Supply voltage	-	3.3	3.6	V
V_{DIFF_IN}	Differential input voltage	-350	-	350	mV
V_{CM}	Common mode input voltage range	0	-	2	V
T_A	Operating Temperature	-55	-	+125	ºC

Recommended Operating Conditions

ABSOLUTE MAXIMUM RATINGS (1):

Over operating free-air temperature range (unless otherwise noted),

PARAMETER	UNIT
V_{DD} , Supply voltage range (2)	–0.5 V to 4.3V
V_{I} , , Input voltage range	–0.5 V to V_{DD} + 0.5 V
T_J , Max. Junction Temperature	150°C
T_{stg} , Storage temperature range	–65°C to 150°C

Absolute Maximum Rating

(1) 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 under *recommended operating conditions* is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

(2) All voltages, except differential I/O bus voltages, are with respect to the network ground terminal.

DC ELECTRICAL SPECIFICATIONS:

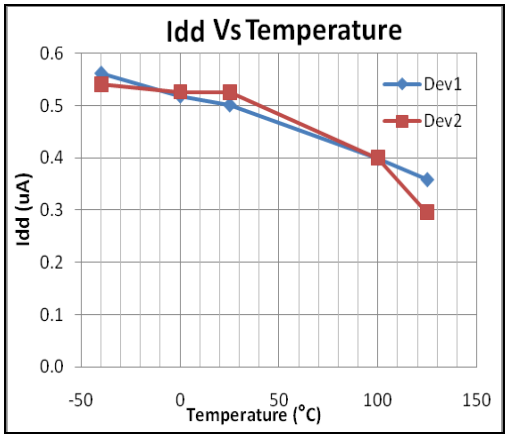
Test condition: V_{DD} =3.3V±0.3V, C_L=10pf, R_L=100K, T_{AMB} = 23±2 °C
VI_BG_CS =30µA ±10%, V_{IN_CM} =1V unless otherwise mentioned

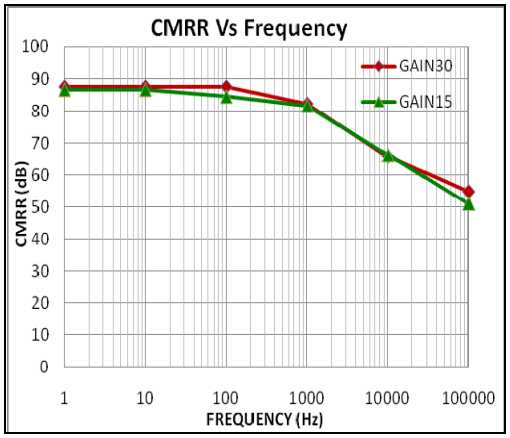
PARAMETER	SPECIFICATION			UNITS	TESTCONDITION/COMMENTS
	Min.	Typ.	Max.		
Common Mode Rejection Ratio. CMRR DC to 60Hz CMRR at 10KHz	-	 87.60 65.84	-	 dB dB	For gain 30
Power Supply Rejection Ratio PSRR DC to 60Hz PSRR at 10KHz	-	 63.2 38.9	-	 dB dB	For gain 30
Gain, G	1	-	30		Verified
Small signal -3 dB Bandwidth G=1 G=2 G=5 G=10 G=15 G=30	-	 1130 810 255 148 76 44	-	 KHz KHz KHz KHz KHz KHz	Vdiff_in = 100mV V_{CM} = 1.65V
Settling Time ±5% G=1 G=2 G=5 G=10 G=15 G=30	-	 1.42 3.06 5.28 6.63 11.8 16.18	-	 µsec µsec µsec µsec µsec µsec	Vdiff_in = 100mV V_{CM} = 1.65V
Slew rate	-	1.42	-	*V/µS*	Vdiff_in = 700mV V_{CM} = 1.65V
Quiescent Supply Current	572	624	870	uA	T_A= -40°C to 125°C and V_{DDA}=3.3
Supply Voltage	3.3	-	3.6	V	
Gain Error (Max)	-6.35	-	5.07	%	Vdiff_in = ±350mV, V_{CM} = 1.65V For all gains
Gain Drift	-	-	60	ppm/°C	T_A= -40°C to 125°C For Lower gains 1,2,5
Offset voltage	-	-	-5	mV	
Offset voltage drift	-	-	2.83	uV/°C	T_A= -40°C to 125°C
Gain Non Linearity	-0.24	-	0.25	%	Vdiff_in (max.) = ±250mV, V_{CM} = 1.65V For All gains
Output voltage Swing High/Low	0.03	-	3.3	V	For gain 5,10,15,30
Input Impedance	-	22	-	MOhms	For gain 1
Output Impedance	-	340	-	KOhms	

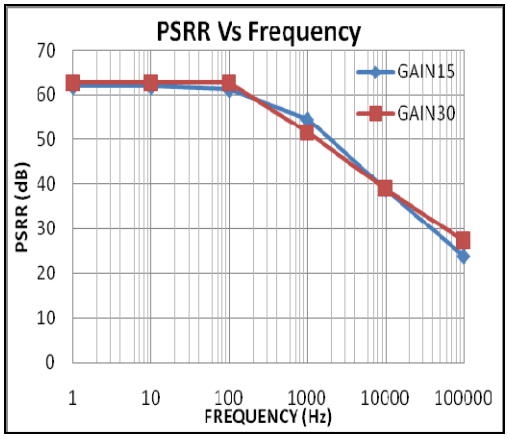
DC Electrical characteristics

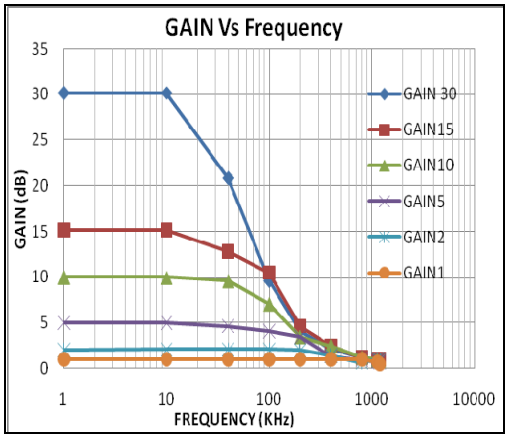
DEVICE CHARACTERISTICS:

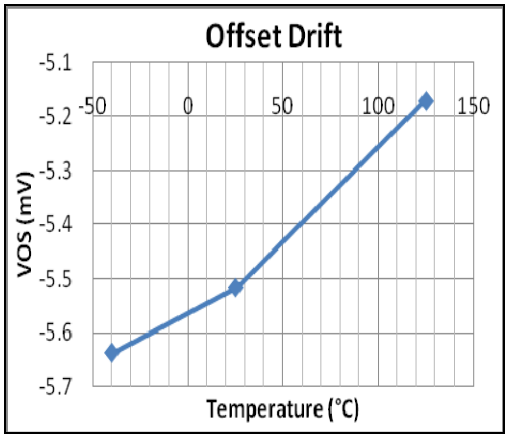
V_{DD} =3.3V±0.3V, C_L=10pf, R_L=100K, VI_BG_CS =30µA ±10%, V_{IN_CM} =1V

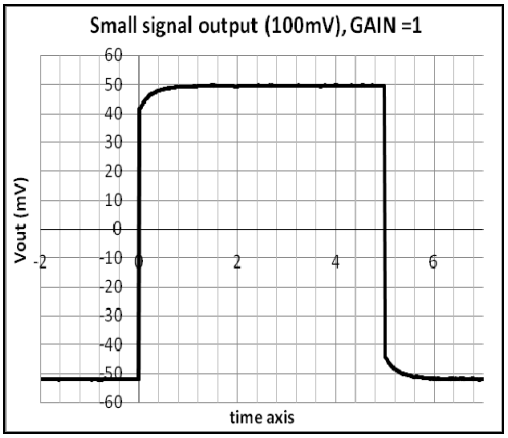






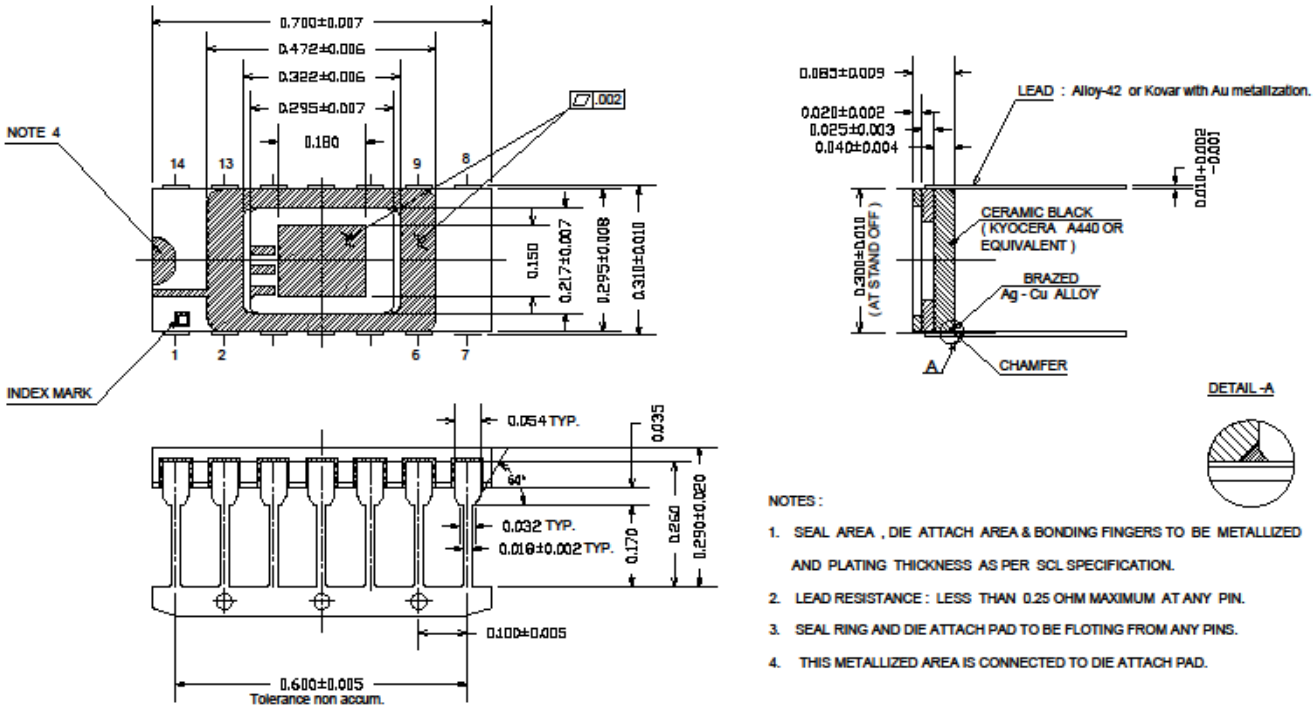






PACKAGE DRAWING (CERAMIC-14PIN-DIP):

NOTE: All linear dimensions are in inches (mm.)



NOTES :

1. SEAL AREA , DIE ATTACH AREA & BONDING FINGERS TO BE METALLIZED AND PLATING THICKNESS AS PER SCL SPECIFICATION.
2. LEAD RESISTANCE : LESS THAN 0.25 OHM MAXIMUM AT ANY PIN.
3. SEAL RING AND DIE ATTACH PAD TO BE FLOTING FROM ANY PINS.
4. THIS METALLIZED AREA IS CONNECTED TO DIE ATTACH PAD.