

INSTRUMENTATION AMPLIFIER

(SC1406-0)



DATA SHEET

Version 1.0, May' 2017



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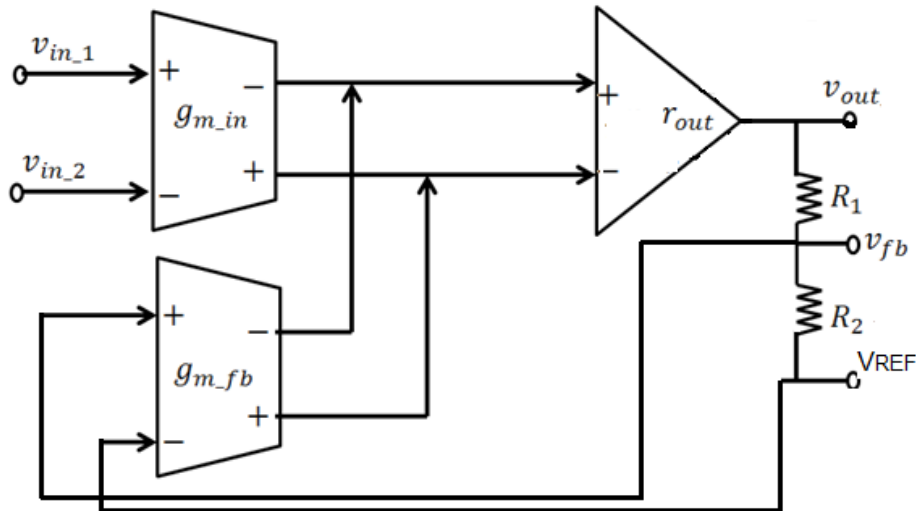
PRODUCT DESCRIPTION:

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 $3.3V \pm 0.3V$
- CMOS logic input levels for digital I/O
- Low power dissipation ($< 2mW @ 3.3V_{static}$)
- 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: $-55^{\circ}C$ to $125^{\circ}C$.
- Hermetic sealed 14 pin DIP package
- SCL's 180nm CMOS Technology

FUNCTIONAL BLOCK DIAGRAM:





PIN CONFIGURATION:

| Pin No. | Pin Name | Description |
|---------|-------------------|-----------------------------------|
| 1 | AVDD | Analog Power Supply (3.3V) |
| 2 | --- | NC |
| 3 | V _{in,n} | Negative input terminal |
| 4 | V _{in,p} | Positive input terminal |
| 5 | VI_BG_CS | Reference Current Terminal (30μA) |
| 6 | --- | 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 | °C |

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.



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DC ELECTRICAL SPECIFICATIONS:

Test condition: $V_{DD}=3.3V\pm 0.3V$, $C_L=10\text{pf}$, $R_L=100\text{K}$, $T_{AMB} = 23\pm 2^\circ\text{C}$

$V_{I_BG_CS}=30\mu\text{A} \pm 10\%$, $V_{INCM}=1\text{V}$ unless otherwise mentioned

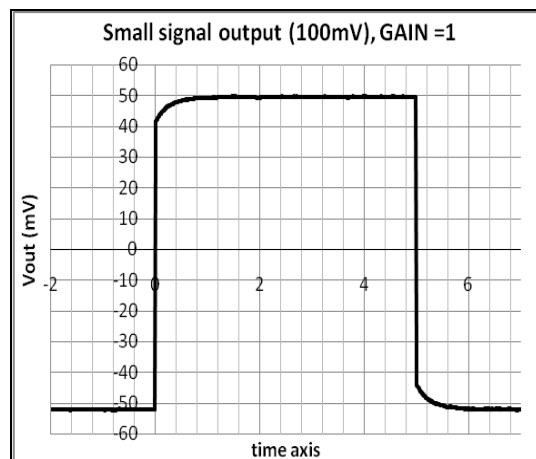
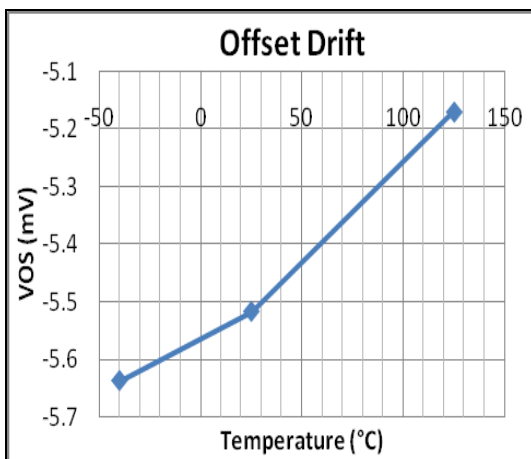
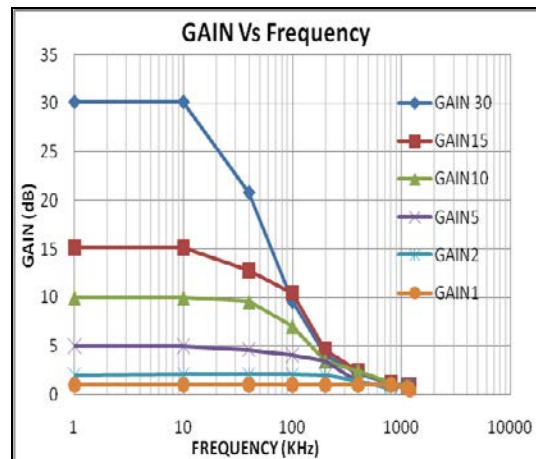
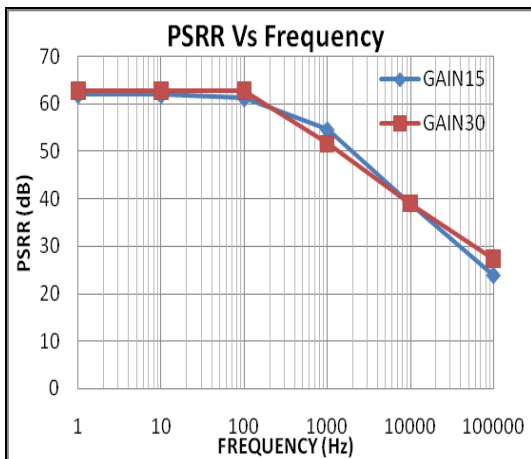
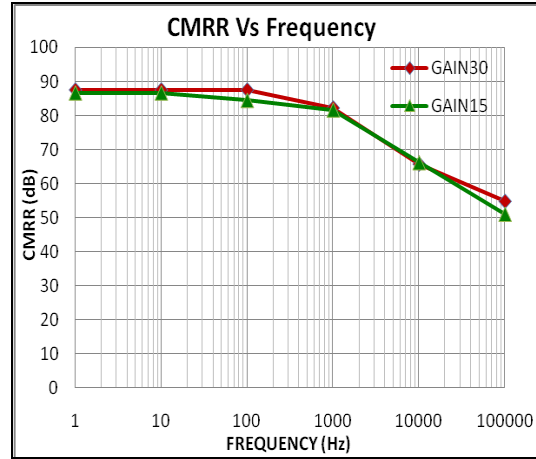
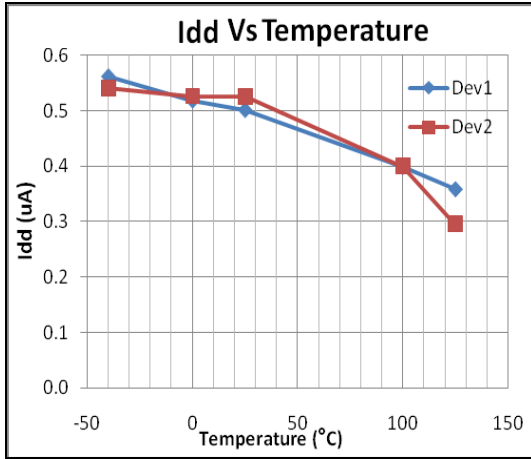
| PARAMETER | SPECIFICATION | | | UNITS | TESTCONDITION/COMMENTS |
|---|---------------|---|------|--|---|
| | Min | Typ. | Max | | |
| Common Mode Rejection Ratio. CMRR DC to 60Hz CMRR at 10KHz | - | 87.60 65.84 | - | dB dB | For gain 30 |
| Power Supply Rejection Ratio PSRR DC to 60Hz PSRR at 10KHz | - | 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 | $V_{diff_in} = 100\text{mV}$ $V_{CM} = 1.65\text{V}$ |
| Settling Time $\pm 5\%$ 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 | $V_{diff_in} = 100\text{mV}$ $V_{CM} = 1.65\text{V}$ |
| Slew rate | - | 1.42 | - | $V/\mu\text{S}$ | $V_{diff_in} = 700\text{mV}$ $V_{CM} = 1.65\text{V}$ |
| Quiescent Supply Current | 572 | 624 | 870 | μA | $T_A = -40^\circ\text{C}$ to 125°C and $V_{DDA}=3.3$ |
| Supply Voltage | 3.3 | - | 3.6 | V | |
| Gain Error (Max) | -6.35 | - | 5.07 | % | $V_{diff_in} = \pm 350\text{mV}$, $V_{CM} = 1.65\text{V}$ For all gains |
| Gain Drift | - | - | 60 | $\text{ppm}/^\circ\text{C}$ | $T_A = -40^\circ\text{C}$ to 125°C For Lower gains 1,2,5 |
| Offset voltage | - | - | -5 | mV | |
| Offset voltage drift | - | - | 2.83 | $\mu\text{V}/^\circ\text{C}$ | $T_A = -40^\circ\text{C}$ to 125°C |
| Gain Non Linearity | -0.24 | - | 0.25 | % | $V_{diff_in} (\text{max.}) = \pm 250\text{mV}$, $V_{CM} = 1.65\text{V}$ 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:

$V_{DD}=3.3V\pm 0.3V$, $C_L=10\text{pf}$, $R_L=100\text{K}$, $V_{I_BG_CS}=30\mu\text{A} \pm 10\%$, $V_{INCM}=1\text{V}$

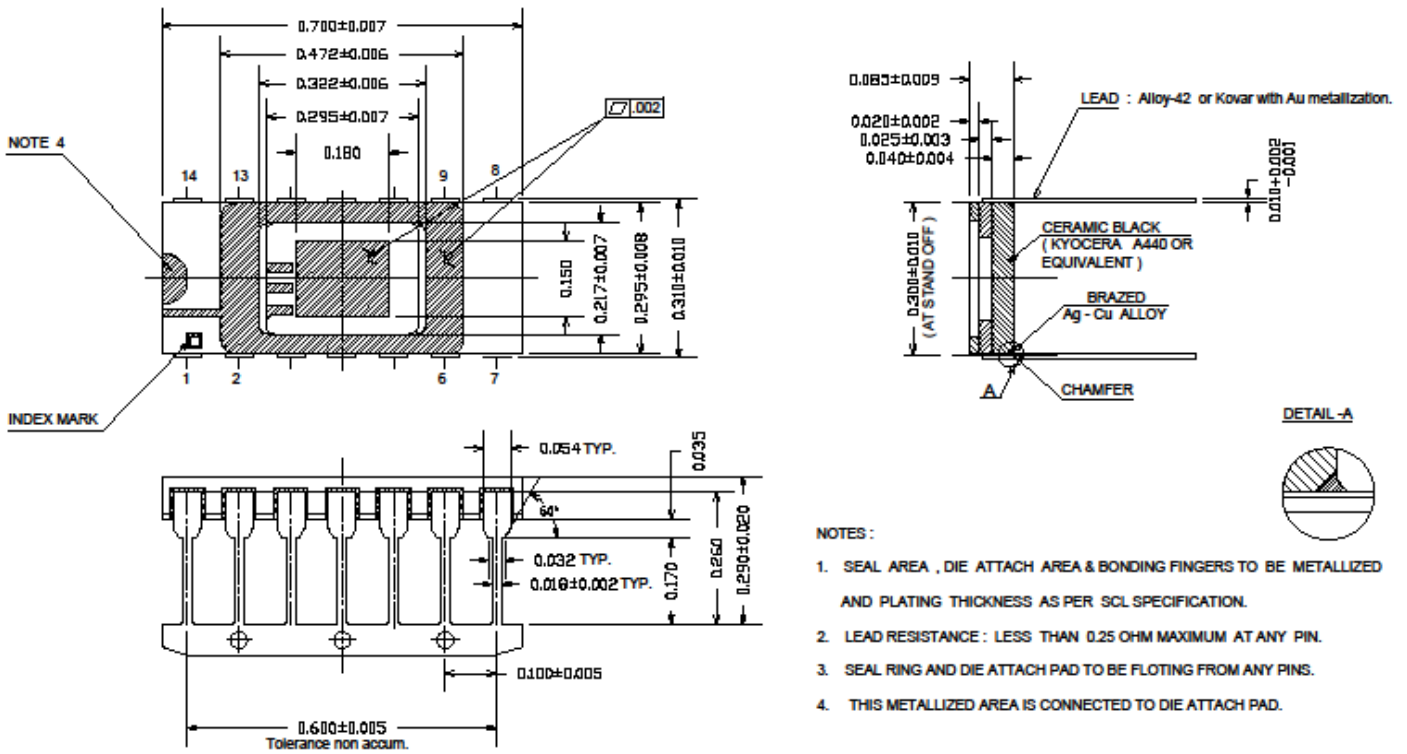




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PACKAGE DRAWING (CERAMIC-14PIN-DIP):

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



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