REVISIONS

Letter	ECO No.	Description	Checked	Approved	Date
A	36-109	INITIAL RELEASE	GG	EAB	10/20/94
B	36-140	ADD VENDOR NAME, PINOUTS, AND PACKAGE OUTLINE	G.G.	EAB	3-9-95

NAME	DATE
Drawn: BRIAN KLATT	9/30/94
Checked: G. GONG	10/20/94
Approved: ED BOUGHAN	10/20/94
Released: K. TIBBETTS	10/20/94

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
CENTER FOR SPACE RESEARCH

MICROCIRCUIT, LINEAR, OPERATIONAL AMPLIFIER, TRANSCONDUCTANCE, MONOLITHIC, SILICON

Size	Code Identification No.	Drawing No.	Rev.
T	80230	36-02305	B

Scale: NONE

1.0 SCOPE

1.1 Introduction This drawing describes device requirements for an Operational Transconductance Amplifier (OTA) used in flight hardware for a space experiment on the AXAF CCD Imaging Spectrometer (ACIS) Instrument. The part described herein is a Harris Semiconductor die, part type CA3080A, packaged in a ten (10) lead ceramic flat pack.

1.2 Part Number The complete MIT part number shall be 36-02305

1.3 Absolute maximum ratings Absolute maximum ratings are in accordance with page 2-74 of Harris 1993-1994 Data Book DB500B.

1.4 Recommended operating conditions Recommended operating conditions are in accordance with page 2-74 of Harris 1993-1994 Data Book DB500B.

2.0 APPLICABLE DRAWINGS

2.1 Government Specifications and Standards Unless otherwise specified, the following specifications and standards, of the latest released issue, form a part of this drawing, to the extent specified herein.

SPECIFICATIONS

MILITARY

MIL-M-38510	Microcircuits, General Specification for

STANDARDS

MIL-STD-883	Test Methods and Procedures for Microelectronics

INDUSTRY

Harris Semiconductor	1993-1994 Data Book DB500B

NOTE: Pages 2-73 through 2-76 of Harris Semiconductor 1993-1994 Data Book DB500B are included herein for convenience.

2.2 Order of precedence In the event of conflict between the text of this drawing and the references cited herein, the text of this drawing shall govern.

3.0 REQUIREMENTS

3.1 General Requirements

3.1.1 Item Requirements The microcircuits described herein shall, in all respects, meet all the requirements of this specification and the intent of MIL-M-38510 for a class B microcircuit. These microcircuits shall be fabricated and tested using production and test facilities and a Reliability and Quality Assurance program adequate to assure successful compliance with this specification and the intent of MIL-M-38510, as modified herein.

3.1.2 Procuring Activity For the purposes of this specification and documents referenced herein, the procuring activity is the Massachusetts Institute of Technology (MIT), Center for Space Research (CSR).

3.1.3 Product Changes The supplier shall notify MIT of proposed changes to Microcircuits, including changes in design, materials, fabrication methods, or processes, and changes which may affect the quality or intended end use.

3.2 Part marking Microcircuit marking shall meet the intent of paragraph 3.6 of MIL-M-38510.

3.2.1 Part Identification Number (PIN) Microcircuits shall be marked with the MIT part number; 36-02305.

3.3 Electrical performance characteristics Unless otherwise specified, the electrical performance characteristics are as specified in Harris Semiconductor 1993-1994 Data Book DB500B, electrical specifications for CA3080A, pages 2-75 and 2-76, and apply over the full operating temperature range.

3.4 Design and Construction Requirements

3.4.1 Package The package shall be a ten (10) lead, hermetically sealed, ceramic flat pack. See figure 1 herein. Leads shall be formed, after final electrical test, for surface mounting on a printed circuit board. Device hermeticity shall be tested after lead forming.

3.4.2. Lead Finish The lead finish shall be "A" per MIL-H-38510.

3.4.3 Terminal connections The terminal connections shall be the same as that for a dual in line package per Harris Semiconductor 1993-1994 Data Book DB500B, page 2-73. Also see table 1 herein.

4.0 QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection Unless otherwise specified herein, the supplier is responsible for the performance of all examinations and tests as specified herein.

4.2 Screening All Microcircuits (100%) shall be subjected to and pass the screen tests and examinations defined in paragraph 4.6 of MIL-M-38510, for a class B device.

4.2.1 Xray All Microcircuits (100%) shall be subjected to and pass radiographic examination per MIL-STD-883, method 2012.

4.2.2 Particle Impact Noise Detection (PIND) All Microcircuits (100%) shall be subjected to and pass PIND examination per MIL-STD-883, method 2020, condition B.

4.3 Quality Conformance Inspection (QCI) Quality conformance inspection shall be in accordance with paragraph 4.5 of MIL-M-38510, for a class B device.

4.4 Destructive Physical Analysis (DPA) An internal destructive examination shall be performed in accordance with paragraph 3.5, of MIL-STD-883, method 5009. Sample size shall be two (2) for lot sizes greater than 200, and one (1) sample for lot sizes of 200 or less.

HARRIS SEMICONDUCTOR

CA3080

Operational Transconductance Amplifier (OTA)

April 1993

Features

- Slew Rate (Unity Gain, Compensated)........50V/ms
- Adjustable Power Consumption.......10µW to 30µW
- Flexible Supply Voltage Range .... ±2V to ±15V
- Fully Adjustable Gain ....0 to gmR_L Limit
- Tight g_M Spread:
  - CA3080 .... 2:1
  - CA3080A 1.6:1
- Extended g_M Linearity.................. 3 Decades

Applications

- Sample and Hold
- Multiplexer
- Voltage Follower
- Multiplier
- Comparator

Ordering Information

PART NUMBER	TEMP. RANGE	PACKAGE
CA3080	0°C to +70°C	8 Pin Can
CA3080A	-55°C to +125°C	8 Pin Can
CA3080AE	-55°C to +125°C	8 Lead Plastic DIP
CA3080AM	-55°C to +125°C	8 Lead SOIC
CA3080AM96	-55°C to +125°C	8 Lead SOIC*
CA3080E	0°C to +70°C	8 Pin Can
CA3080M	0°C to +70°C	8 Lead SOIC
CA3080M96	0°C to +70°C	8 Lead SOIC*

* Denotes Tape and Reel

Description

The CA3080 and CA3080A types are Gatable-Gain Blocks which utilize the unique operational-transconductance-amplifier (OTA) concept described in Application Note ICAN-6668, "Applications of the CA3080 and CA3080A High-Performance Operational Transconductance Amplifiers".

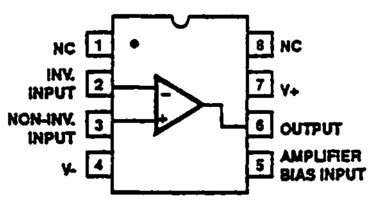
The CA3080 and CA3080A types have differential input and a single-ended, push-pull, class A output. In addition, these types have an amplifier bias input which may be used either for gating or for linear gain control. These types also have a high output impedance and their transconductance (g_M) is directly proportional to the amplifier bias current (I_{ABC}).

The CA3080 and CA3080A types are notable for their excellent slew rate (50V/µs), which makes them especially useful for multiplexer and fast unity-gain voltage followers. These types are especially applicable for multiplexer applications because power is consumed only when the devices are in the "ON" channel state.

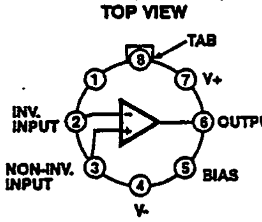
The CA3080A is rated for operation over the full military-temperature range (-55°C to +125°C) and its characteristics are specifically controlled for applications such as sample-hold, gain-control, multiplex, etc. Operational transconductance amplifiers are also useful in programmable power-switch applications, e.g., as described in Application Note AN6048, "Some Applications of a Programmable Power Switch/Amplifier" (CA3094, CA3094A, CA3094B).

Pinouts

CA3080 (PDIP, SOIC)
TOP VIEW

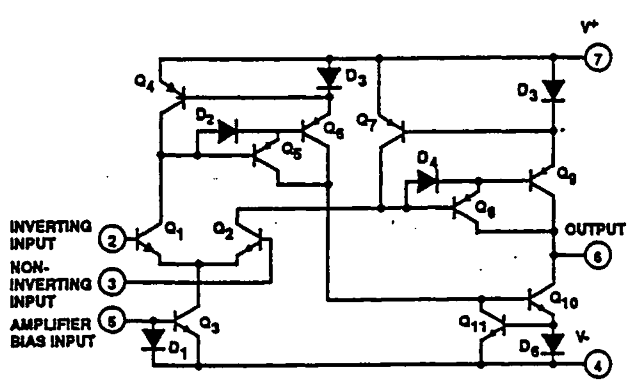


CA3080 (TO-5 CAN)
TOP VIEW



NOTE: Pin 4 is connected to case.

Schematic Diagram



CAUTION: These devices are sensitive to electrostatic discharge. Users should follow proper I.C. Handling Procedures.

File Number 475.2

Specifications CA3080, CA3080A

Absolute Maximum Ratings

Supply Voltage (Between V+ and V- Terminal) 36V
Differential Input Voltage 5V
Input Voltage .... V+ to V-
Input Signal Current 1mA
Amplifier Bias Current (I_{ABC}) 2mA
Power Dissipation 125mW
Output Short Circuit Duration (Note 1) .... No Limitation
Junction Temperature .... +175°C
Junction Temperature (Plastic Package) .... +150°C
Lead Temperature (Soldering 10 Sec.) .... +300°C

Operating Conditions

Operating Temperature Range
CA3080 .... 0°C to +70°C
CA3080A .... -55°C to +125°C
Storage Temperature Range .... -65°C to +150°C

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.

Electrical Specifications For Equipment Design, T_A = +25°C, Unless Otherwise Specified

PARAMETERS	SYMBOL	TEST CONDITIONS V+ = 15V, V- = -15V, I_{ABC} = 500μA	CA3080 LIMITS MIN	TYP	MAX	UNITS
Input Offset Voltage	V_{IO}		-	0.4	5	mV
		T_A = 0 to +70°C	-	-	6	mV
Input Offset Current	I_{IO}		-	0.12	0.6	μA
Input Bias Current	I_I		-	2	5	μA
		T_A = 0 to +70°C	-	-	7	μA
Forward Transconductance (Large Signal)	g_M		6700	9600	13000	μmho
		T_A = 0 to +70°C	5400	-	-	μmho
Peak Output Current	I_{OM}	R_L = 0Ω	350	500	650	μA
		R_L = 0Ω, T_A = 0 to +70°C	300	-	-	μA
Peak Output Voltage: Positive	$V+_{OM}$	R_L = ∞	12	13.5	-	V
Negative	$V-_{OM}$	R_L = ∞	-12	-14.4	-	V
Amplifier Supply Current	I_A		0.8	1	1.2	mA
Device Dissipation	P_D		24	30	36	mW
Input Offset Voltage Sensitivity: Positive	$\Delta V_{IO}/\Delta V+$		-	-	150	μV/V
Negative	$\Delta V_{IO}/\Delta V-$		-	-	150	μV/V
Common-Mode Rejection Ratio	CMRR		80	110	-	dB
Common-Mode Input-Voltage	V_{ICR}		12 to -12	13.6 to -14.6	-	V
Input Resistance	R_I		10	26	-	kΩ

NOTE:

1. Short circuit may be applied to ground or to either supply.

Harris Semiconductor 1993-1994 Data Book DB500B, page 2-75

Specifications CA3080, CA3080A

Electrical Specifications Typical Values Intended Only for Design Guidance, T_A = +25°C, Unless Otherwise Specified

PARAMETERS	SYMBOL	TEST CONDITIONS V+ = 15V, V- = -15V I_{ABC} = 500µA	CA3080 TYP	UNITS
Input Offset Voltage	V_{IO}	I_{ABC} = 5µA	0.3	mV
Input Offset Voltage Change	ΔV_{IO}	I_{ABC} = 500µA to I_{ABC} = 5µA	0.2	mV
Peak Output Current	I_{OM}	I_{ABC} = 5µA	5	µA
Peak Output Voltage:		I_{ABC} = 5µA		
Positive	$V+_{OM}$		13.8	V
Negative	$V-_{OM}$		-14.5	V
Magnitude of Leakage Current		I_{ABC} = 0, V_{TP} = 0	0.08	nA
		I_{ABC} = 0, V_{TP} = 36V	0.3	nA
Differential Input Current		I_{ABC} = 0, V_{DIFF} = 4V	0.008	nA
Amplifier Bias Voltage	V_{ABC}		0.71	V
Slew Rate:	SR			
Maximum (Uncompensated)			75	V/µs
Unity Gain (Compensated)			50	V/µs
Open-Loop Bandwidth	BW_{OL}		2	MHz
Input Capacitance	C_I	f = 1 MHz	3.6	pF
Output Capacitance	C_O	f = 1 MHz	5.6	pF
Output Resistance	R_O		15	MΩ
Input-to-Output Capacitance	C_{I-O}	f = 1 MHz	0.024	pF
Propagation Delay	t_{PHL}, t_{PLH}	I_{ABC} = 500µA	45	ns

Electrical Specifications For Equipment Design, T_A = +25°C, Unless Otherwise Indicated

PARAMETERS	SYMBOL	TEST CONDITIONS V+ = 15V, V- = -15V I_{ABC} = 500µA	CA3080A LIMITS MIN	TYP	MAX	UNITS
Input Offset Voltage	V_{IO}	I_{ABC} = 5µA	-	0.3	2	mV
			-	0.4	2	mV
		T_A = -55 to +125°C	-	-	5	mV
Input Offset Voltage Change	ΔV_{IO}	I_{ABC} = 500µA to I_{ABC} = 5µA	-	0.1	3	mV
Input Offset Current	I_{IO}		-	0.12	0.6	µA
Input Bias Current	I_I		-	2	5	µA
		T_A = -55°C to +125°C	-	-	15	µA
Forward Transconductance (Large Signal)	g_M		7700	9600	12000	µmho
		T_A = -55°C to +125°C	4000	-	-	µmho
Peak Output Current	I_{OM}	I_{ABC} = 5µA, R_L = 0Ω	3	5	7	µA
		R_L = 0Ω	350	500	650	µA
		R_L = 0Ω, T_A = -55°C to +125°C	300	-	-	µA

Specifications CA3080, CA3080A

Electrical Specifications For Equipment Design, T_A = +25°C, Unless Otherwise Indicated (Continued)

PARAMETERS	SYMBOL	TEST CONDITIONS V+ = 15V, V- = -15V I_{ABC} = 500µA	CA3080A LIMITS MIN	TYP	MAX	UNITS
Peak Output Voltage:		I_{ABC} = 5µA, R_L = ∞				
Positive	$V+_{OM}$		12	13.8	-	V
Negative	$V-_{OM}$		-12	-14.5	-	V
Positive	$V+_{OM}$	R_L = ∞	12	13.5	-	V
Negative	$V-_{OM}$		-12	-14.4	-	V
Amplifier Supply Current	I_A		0.8	1	1.2	mA
Device Dissipation	P_D		24	30	36	mW
Input Offset Voltage Sensitivity:						
Positive	$\Delta V_{IO}/\Delta V^+$		-	-	150	µV/V
Negative	$\Delta V_{IO}/\Delta V^-$		-	-	150	µV/V
Magnitude of Leakage Current		I_{ABC} = 0, V_{TP} = 0	-	0.08	5	nA
		I_{ABC} = 0, V_{TP} = 36V	-	0.3	5	nA
Differential Input Current		I_{ABC} = 0, V_{DIFF} = 4V	-	0.008	5	nA
Common-Mode Rejection Ratio	CMRR		80	110	-	dB
Common-Mode Input-Voltage Range	V_{ICR}		12 to -12	13.6 to -14.6	-	V
Input Resistance	R_I		10	26	-	kΩ

Electrical Specifications Typical Values Intended Only for Design Guidance, T_A = +25°C, Unless Otherwise Specified

PARAMETERS	SYMBOL	TEST CONDITIONS V+ = 15V, V- = -15V I_{ABC} = 500µA	CA3080A TYP	UNITS
Amplifier Bias Voltage	V_{ABC}		0.71	V
Slew Rate:				
Maximum (Uncompensated)	SR		75	V/µs
Unity Gain (Compensated)			50	V/µs
Open-Loop Bandwidth	BW_{OL}		2	MHz
Input Capacitance	C_I	f = 1 MHz	3.6	pF
Output Capacitance	C_O	f = 1 MHz	5.6	pF
Output Resistance	R_O		15	MΩ
Input-to-Output Capacitance	C_{I-O}	f = 1 MHz	0.024	pF
Input Offset Voltage Temperature Drift	$\Delta V_{IO}/\Delta T$	I_{ABC} = 100µA, T_A = -55°C to +125°C	3.0	µV/°C
Propagation Delay	t_{PHL}, t_{PLH}	I_{ABC} = 500µA	45	ns

4.5 Inspection and Test Records The supplier shall maintain inspection and test records for 36 months after hardware delivery to MIT. Test data for all electrical tests, screening, DPA, and QCI inspections shall be submitted to MIT with the delivery of flight parts.

4.6 Source Inspection

4.6.1 Government Source Inspection (GSI) The government has the right to inspect any or all of the work included in this order at the supplier's plant. In the event that Government Source Inspection (GSI) is imposed, the Government quality representative who has been delegated NASA quality assurance functions for this procurement shall be notified immediately upon receipt of this order. The Government representative shall also be notified 48 hours in advance of the time that parts are ready for inspection or test.

4.6.2 MIT Source Inspection MIT Performance Assurance will impose mandatory inspection points (MIPs) at wire bonding (precap visual examination) and final test, and must be notified 2 weeks before parts are ready for MIT Inspection. (call area code 617, phone 253-7555).

5.0 PACKAGING

5.1 Packaging requirements Packaging shall be in accordance with paragraph 5.1 of MIL-M-38510.

6.0 NOTES

6.1 Approved Source of Supply

Chip Supply
7725 N. Orange Blossom Trail
Orlando, Florida 32810-2696

Cage Code: 57300

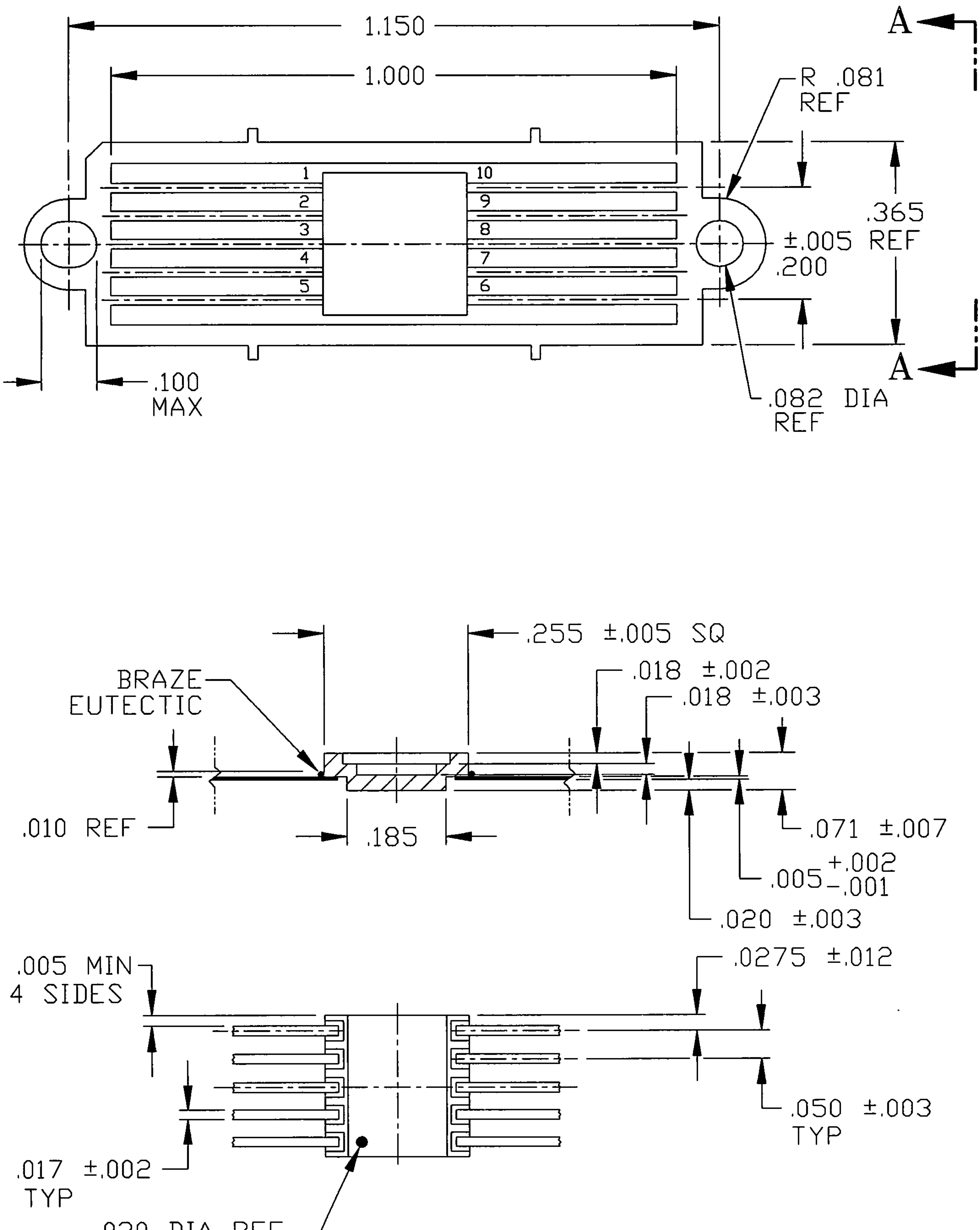
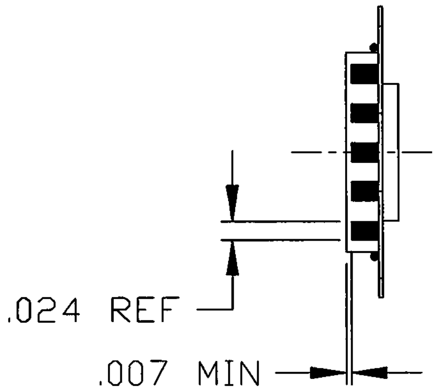


FIGURE I

SIZE	FSCM NO.	DWG. NO.	REV.
A	80230	36-02305	
SCALE 4:1		SHEET 9	



VIEW A-A

PINOUT INFORMATION		
DIE	PACKAGE	FUNCTION
1	1	NC
2	2	INV INPUT
	3	NC
3	4	NON-INV-INPUT
4	5	V-
5	6	AMPLIFIER BIAS INPUT
6	8	OUTPUT
7	9	V+
	10	NC

TABLE I

SIZE	FSCM NO.	DWG. NO.	REV.
A	80230	36-02305	
SCALE 4:1		SHEET 10	