

BRITISH STANDARDS INSTITUTION
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BS CECC 90 202 - 003
ISSUE 1 DECEMBER 1987



Page 1 Total number of Pages: 16

Specification available from: CECC 00 200, PD 9002 and:
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ELECTRONIC COMPONENTS OF ASSESSED QUALITY
IN ACCORDANCE WITH

BS CECC 90 000: 1985
BS CECC 90 200: 1987

MANUFACTURER'S TYPE NUMBER

OPA 111 A

OPA 111 B

OPA 111 S

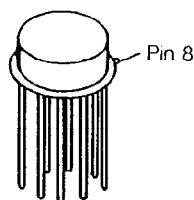
See PD 9002 and CECC 00 200
For ordering information see clause 1

SILICON MONOLITHIC
INTEGRATED CIRCUIT
LOW NOISE PRECISION
DIFET OPERATIONAL
AMPLIFIER

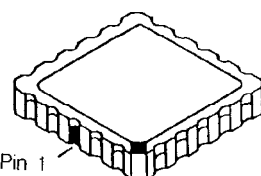
TYPICAL CONSTRUCTION:
HERMETICALLY SEALED,
METAL CAN PACKAGE AND
LEADLESS CHIP CARRIER

ASSESSMENT LEVELS Y AND L

Outlines not to scale: Isometric Projection



TO - 99(metal can) package



Leadless Chip Carrier package

For detail dimensions see Appendix D
of this Specification.

1. TYPE DESCRIPTION

1.1

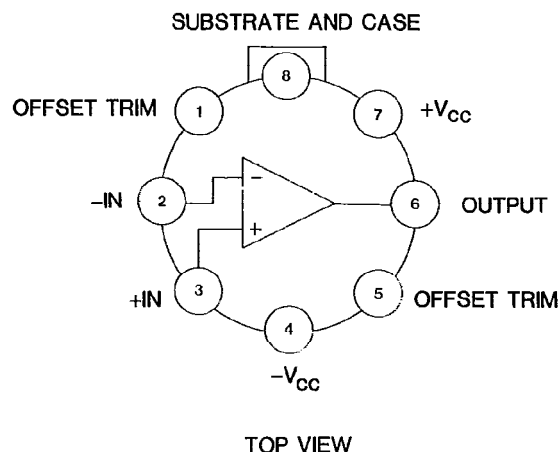
- Low Noise: $8\text{nV}/\sqrt{\text{Hz}}$ max at 10kHz
- Low Bias Current: 1pA max
- Low Offset: $250\mu\text{V}$ max
- Low Drift: $1\mu\text{V}/^\circ\text{C}$ max
- High Open Loop Gain: 120dB min
- High Common-Mode Rejection: 100dB min

Refer to Qualified Products List PD9002 and/or CECC 00 200
for details of Manufacturers approved to this Specification.



Documents

Document Sharing Hub

1.2 TERMINAL IDENTIFICATION, TYPE DESIGNATION AND MARKING**1.2.1 TERMINAL IDENTIFICATION****1.2.2 TYPE DESIGNATION**

TEMPERATURE RANGE	PACKAGE	
	TO-99 METAL CAN	LEADLESS CHIP CARRIER
-25 +85	OPA 111 AM OPA 111 BM	OPA 111 AL OPA 111 BL
-55 +125	OPA 111 SM	OPA 111 SL

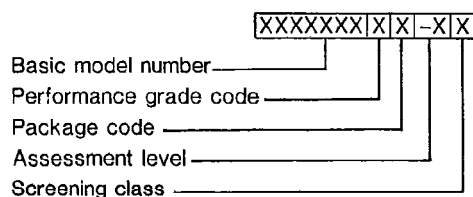
1.2.3 MARKING

- (1) Each integrated circuit shall bear the following markings:
- Terminal identification.
 - The manufacturer's type number and package material type.
 - Quality assessment level applied.
 - Screening class applied.
 - Date code.
 - CECC mark of conformity.
 - The factory logo.
- (2) Each primary package containing one or more of these circuits shall bear the markings (b), (c), (d) and (e) above, and in addition:
- The BS CECC detail specification number.

1.3 ORDERING INFORMATION

Orders for components to this specification shall contain the following minimum information:

- Manufacturer's type number (including required suffix e.g. M), see clause 1.3.1.
- Quantity.
- The BS CECC specification number, issue and date, package style, assessment level and screening class.

1.3.1 INTERPRETATION OF MANUFACTURER'S TYPE NUMBER**KEY:**

Basic model number - OPA 111
 Performance grade code - A, B or S
 Package code - M (TO-99 METAL CAN)
 L (LEADLESS CHIP CARRIER)

1.3.2 ASSESSMENT LEVELS

(With optional screening classes)

Assessment level Y
with screening class B and E.

Assessment level L
with screening class B and E.

Example:

OPA111AM-YB is a device type OPA111, performance grade level A, package TO-99 (metal can) with CECC assessment and application category YB. (For details of screening procedures see Appendix A)

2.0**RATINGS (LIMITING VALUES)** (Not for inspection purposes.)

CLAUSE NO.	CHARACTERISTIC	SYMBOL	LIMIT
2.1	Voltages on any terminal referred to $-V_{CC}$ shall not exceed the range of 0 to $+V_{CC}$	-	-
2.2	Maximum continuous positive supply voltage. Maximum continuous negative supply voltage	V_{CC} $-V_{CC}$	+18V -18V
2.3	Output current (continuous)	I_{LO}	$\pm 10\text{mA}$
2.4	Internal Power Dissipation (See Note 3)	P_D	500mW
2.5	Maximum common mode input voltage (See Note 1)	V_I	$\pm 18\text{V}$
2.6	Maximum differential input voltage (See Note 1)	V_{ID}	36V
2.7	Ambient operating temperature range for A, B versions Ambient operating temperature range for S version	T_{amb} T_{amb}	-25°C to +85°C -55°C to +125°C
2.8	Storage temperature range	T_{stg}	-65°C to +150°C
2.9	Shock Vibration Acceleration steady state		14,700m/s ² 196m/s ² 294,000m/s ²
2.11	Max value of output short-circuit current (See Note 2)	I_{OS}	60mA continuous

Note 1: For supply voltage less than $\pm 18\text{VDC}$ the absolute maximum input voltage is equal to the supply voltage.

Note 2: Short circuit may be to power supply common only. Rating applies to +25°C ambient. Observe dissipation limit and T_{VJ} .

Note 3: Package must be derated on $\theta_{JC}=150^\circ\text{C/W}$ or $\theta_{JA}=200^\circ\text{C/W}$ for TO-99 package, max.junction temp. $T_{VJ}=175^\circ\text{C}$

RECOMMENDED CONDITIONS OF USE AND ASSOCIATED CHARACTERISTICS

(Not for inspection purposes).

 $T_{amb} = 25^{\circ}\text{C}$, $V = \pm 15\text{V}$ unless otherwise stated.

For Pin connection Diagrams and Function Block Diagram see APPENDIX B and C.

CLAUSE	DESCRIPTION	SYMBOL	VERSIONS	VALUE		UNITS	IEC METHOD
				MIN	MAX		
3.1	Input Voltage	V_I	A, B, S	-18	+18	V	-
3.3	Output Current ($R_L = 2\text{k}\Omega$)	I_O	A, B, S	± 5	-	mA	-
3.4	Supply Current ($I_O = 0\text{mA}$)	I_S	A, B, S	-	3.5	mA	A-01
3.5	Input Impedance	Z_{IN}	A, B, S	10^8	-	Ω	A-02
3.6	Output Impedance D.C. Open Loop	Z_O	A, B, S	-	300	Ω	A-03
3.7	Input Offset Voltage ($V_{CM} = 0\text{VDC}$)	V_{IO}	B A, S	- -	250 500	μV μV	A-04
3.9	Input Offset Current ($V_{CM} = 0\text{VDC}$)	I_{IO}	B A, S	- -	± 0.75 ± 1.5	pA pA	A-05
3.10	Input Bias Current ($V_{CM} = 0\text{VDC}$)	I_B	B A, S	- -	± 1 ± 2	pA pA	A-06
3.14	Open Loop Voltage Gain ($R_L \geq 2\text{k}\Omega$)	A_{VD}	B A, S	120 114	- -	dB dB	A-09
3.16	Common Mode Rejection ($V_{IN} = \pm 10\text{VDC}$) Common Mode Input Range	CMR	B, A, S A, B, S	100 90 ± 10	- - -	dB dB V	A-11
3.17	Power Supply Rejection Ratio	PSRR	B A, S	100 90	- -	dB dB	A-12
3.18	Output Voltage Range ($R_L \geq 2\text{k}\Omega$)	V_O	A, B, S	± 11	-	V	A-13
3.19	Total Response Time ($V_{IN} = 20\text{Vp-p}$) ($R_L = 2\text{k}\Omega$)	T_{OT}	A, B, S	16	-	kHz	A-14
3.20	Input Voltage Noise $F_O = 10\text{Hz}$ $F_O = 100\text{Hz}$ $F_O = 1\text{kHz}$ $F_O = 10\text{kHz}$ $F_B = 10\text{Hz to } 10\text{kHz}$ $F_B = 0.1\text{Hz to } 10\text{Hz}$	V_N	B A, S B A, S B A, S B A, S B A, S	- - - - - - - - - -	60 80 30 40 12 15 8 1.0 1.2 2.5 3.3	nV/ $\sqrt{\text{Hz}}$ nV/ $\sqrt{\text{Hz}}$ nV/ $\sqrt{\text{Hz}}$ nV/ $\sqrt{\text{Hz}}$ nV/ $\sqrt{\text{Hz}}$ nV/ $\sqrt{\text{Hz}}$ μVrms μVrms $\mu\text{Vp-p}$ $\mu\text{Vp-p}$	A-15
3.20	Input Current Noise $F_B = 0.1\text{Hz to } 10\text{kHz}$ $F_O = 0.1\text{Hz through } 20\text{kHz}$	I_N	B A, S B A, S	- - - -	12 15 0.6 0.8	fA,p-p fA,p-p fA/ $\sqrt{\text{Hz}}$ fA/ $\sqrt{\text{Hz}}$	A-15
3.21	SLEW RATE ($V_O = \pm 10\text{V}$, $R_L = 2\text{k}\Omega$)	S_{VOAV}	A, B, S	1	-	V/ μs	A-16

3.1
cont'd)

CLAUSE	DESCRIPTION	SYMBOL	VERSIONS	VALUE		UNITS	IEC METHOD
				MIN	MAX		
3.22	GAIN BANDWIDTH	GW _R	A, B, S	1	—	MHz	A-17
3.24	Short Circuit Current	I _{SC}	A, B, S	10	—	mA	—
—	Supply Operating Voltages	+V _{CC} -V _{EE}	A, B, S	5	18	V	—

3.2

ASSOCIATED CHARACTERISTICS OVER TEMPERATURE RANGEfor A, B VERSIONS. T_{max} = 85°C, T_{min} = -25°Cfor S VERSION. T_{max} = 125°C, T_{min} = -55°C

CLAUSE	DESCRIPTION	SYMBOL	VERSIONS	VALUE		UNITS	IEC METHOD
				MIN	MAX		
3.3	Output Current	I _O	A, B, S	±5	—	mA	—
3.4	Power Supply Current (I _O = 0mA)	I _S	A, B, S	—	3.5	mA	A-01
3.7	Input Offset Voltage (V _{CM} = OVDC) Average Drift	V _{IO}	A	—	±1000	μV	A-04
			B	—	±500	μV	
			S	—	±1500	μV	
			B	—	±1	μV/°C	
			A, S	—	±5	μV/°C	
3.9	Input Offset Current (V _{CM} = OVDC)	I _{IO}	B	—	±100	pA	A-05
			A	—	±200	pA	
			S	—	±3.1	nA	
3.10	Input Bias Current (V _{CM} = OVDC)	I _B	B	—	±130	pA	A-06
			A	—	±250	pA	
			S	—	±4.1	nA	
3.13	Open Loop Voltage Gain (R _L ≥ 2KΩ)	A _{VD}	B	114	—	dB	A-09
			A, S	110	—	dB	
3.16	Common Mode Rejection (V _{IN} = ±10 VDC)	CMR	B	90	—	dB	A-11
			A, S	86	—	dB	
3.17	Power Supply Rejection Ratio	PSRR	B	90	—	dB	A-12
			A, S	86	—	dB	
3.18	Output Voltage Range (R _L ≥ 2KΩ)	V _O	B, S	±11	—	V	A-13
			A	±10.5	—	V	
3.19	Total Response Time (V _{IN} = 20V _{P-P}) (R _I = 2kΩ)	T _{TOT}	A, B, S	—	30	μS	A-14
3.20	Input Voltage Noise (R _L = 2KΩ) (R ₁ = 100Ω) (R ₂ = 50kΩ) F _O = 10Hz F _O = 100Hz F _O = 1kHz	E _N					A-15
			B	—	70	nV/√Hz	
			A	—	90	nV/√Hz	
			S	—	100	nV/√Hz	
			B	—	40	nV/√Hz	
			A	—	50	nV/√Hz	
			S	—	60	nV/√Hz	
			B	—	15	nV/√Hz	
			A,	—	18	nV/√Hz	
			S	—	21	nV/√Hz	
3.21	SLEW RATE (V _O = ±10V, R _L = 2KΩ)	S _{VOAV}	A, B, S	0.7	—	V/μs	A-16
3.22	GAIN BANDWIDTH		A, B S	0.9 0.8	—	MHz	A-17
3.24	Short Circuit Current	I _{SC}	A, B, S	10	—	mA	—