Low–Input-Current Operational Amplifier

PM108

1.0 SCOPE

This specification documents the detailed requirements for Analog Devices space qualified die including die qualification as described for Class K in MIL-PRF-38534, Appendix C, Table C-II except as modified herein.

The manufacturing flow described in the STANDARD DIE PRODUCTS PROGRAM brochure at http://www.analog.com/marketSolutions/militaryAerospace/pdf/Die_Broc.pdf is to be considered a part of this specification.

This data sheet specifically details the space grade version of this product. A more detailed operational description and a complete data sheet for commercial product grades can be found at www.analog.com/PM108

2.0 Part Number.

The complete part number(s) of this specification follow:

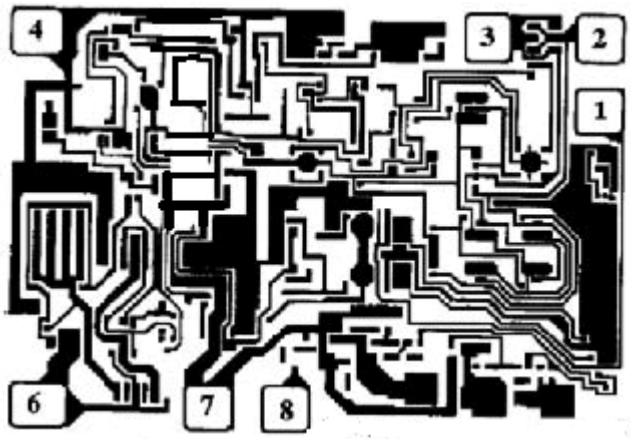
Part Number	Description
PM108-000C	Low-Input-Current Operational Amplifier
PM108R000C	Radiation tested Low-Input-Current Operational Amplifier

3.0 Die Information

3.1 Die Dimensions

Die Size	Die Thickness	Bond Pad Metalization
54 mil x 74 mil	19 mil ± 2 mil	Al/Cu

3.2 Die Picture



1. COMP
2. -IN
3. +IN
4. V-
5. NC
6. OUT
7. V+
8. COMP

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3.3 Absolute Maximum Ratings 1/

Supply Voltage (V_{CC})..... ±22 V
Input Voltage (V_{IN}) 2/..... ±15 V
Differential Input Current 3/..... ±10 mA
Output Short-Circuit Duration..... Indefinite
Storage Temperature Range ..... -65 °C to +150 °C
Junction Temperature (T_J)…… +175 °C
Ambient Temperature Range ..... -55 °C to +125 °C

Absolute Maximum Ratings Notes:

1/ Stresses above the absolute maximum rating may cause permanent damage to the device. Extended operation at the maximum levels may degrade performance and affect reliability.

2/ For supply voltages less than ±15 V, the absolute maximum input voltage is equal to the supply voltage.

3/ The inputs are shunted with back-to-back diodes for overvoltage protection. Therefore, if a differential input voltage in excess of 1 V is applied between the inputs, excessive current will flow, unless some limiting resistance is provided.

4.0 Die Qualification

In accordance with class-K version of MIL-PRF-38534, Appendix C, Table C-II, except as modified herein.
(a) Qual Sample Size and Qual Acceptance Criteria – 10/0
(b) Qual Sample Package – DIP
(c) Pre-screen electrical test over temperature performed post-assembly prior to die qualification.

Table I Notes:

Table I - Dice Electrical Characteristics

Parameter	Symbol	Conditions 1/	Limit Min	Limit Max	Units
Input Offset Voltage	V_{IO}		-0.5	0.5	mV
Input Offset Current	I_{IO}		-0.2	0.2	nA
Input Bias Current	$\pm I_{IB}$		-0.1	2	nA
Power Supply Rejection Ratio	+PSRR	$+V_{CC}$ = +10 V to +20 V, $-V_{CC}$ = -20 V	-16	16	µV/V
	-PSRR	$+V_{CC}$ = +20 V, $-V_{CC}$ = -10 V to -20 V	-16	16	
Input Voltage Range	IVR		±15		V
Input Voltage Common Mode Rejection	CMR	V_{CM} = IVR	96		dB
Supply Current	I_{CC}	$\pm V_{CC}$ = ±15 V		0.6	mA
Output Voltage Swing	$\pm V_{OP}$	$\pm V_{CC}$ = ±20 V, R_L = 10 kΩ	±16		V
Open Loop Voltage Gain	A_{VS}	$\pm V_{CC}$ = ±15 V, R_L = 10 kΩ, V_{OUT} = ±10 V	80		V/mV

Table I Notes:

1/ V_{CC} = ±20 V, R_S = 50 Ω, V_{CM} = 0 V, and T_A = 25 °C, unless otherwise specified.

Table II - Electrical Characteristics for Qual Samples

Parameter	Symbol	Conditions 1/ 3/		Sub-groups	Limit Min	Limit Max	Units
Input Offset Voltage 3/	V_{IO}			1	-0.5	0.5	mV
				2, 3	-1	1	
			M, D, L, R	1	-2	2	
Input Offset Current 3/	I_{IO}			1	-0.2	0.2	nA
				2, 3	-0.4	0.4	
			M, D, L, R	1	-1	1	
Input Bias Current 3/	$\pm I_{IB}$			1	-0.1	2	
				2, 3	-0.4	0.4	
			M, D, L, R	1	-25	25	
Input Offset Voltage Temperature Sensitivity 2/	$\Delta V_{IO} / \Delta T$			2, 3	-5	5	µV/°C
Open Loop Voltage Gain 3/	V_{VS}	$\pm V_{CC} = \pm 15$ V, $R_L = 10$ KΩ, $V_{OUT} = \pm 10$ V		4	80		V/mV
				5, 6	40		
			M, D, L, R	4	10		
Power Supply Rejection Ratio 2/	+PSRR	$+V_{CC} = +10$ V to $+20$ V, $-V_{CC} = -20$ V		1, 2, 3	-16	16	µV/V
	-PSRR	$+V_{CC} = +20$ V, $-V_{CC} = -10$ V to -20 V		1, 2, 3	-16	16	
Input Voltage Range 2/	IVR			1, 2, 3	±15		V
Supply Current 2/	I_{CC}	$V_{CC} = \pm 15$ V		1, 2		0.6	mA
				3		0.8	
Input Voltage Common Mode Rejection Ratio 2/	CMRR	V_{CM} = IVR		1, 2, 3	96		dB
Output Short-Circuit Current 2/	$I_{OS(+)}$	$\pm V_{CC} = \pm 15$ V, t ≤ 25 mS		1	-15		mA
	$I_{OS(-)}$					15	
Output Voltage Swing 2/	$\pm V_{OP}$	$\pm V_{CC} = \pm 20$ V, $R_L = 10$ KΩ		4, 5, 6	±16		V

Table II Notes:
1/ $V_{CC} = \pm 20$ V, $R_S = 50$ Ω, and $V_{CM} = 0$ V, unless otherwise specified.
2/ Not tested post-irradiation
3/ Irradiated at dose rate = 50 - 300 rads (Si)/s in accordance with MIL-STD-883, method 1019, condition A, and is guaranteed to a maximum total dose specified of 100 krad (Si). The effective dose rate after extended room temperature anneal = 1.15 rad (Si)/s per MIL-STD-883, method 1019, condition A, section 3.11.2. The total dose specification for this device only applies to the specified effective dose rate, or lower, environment.

Table III - Life Test Endpoint and Delta Parameter
(Product is tested in accordance with Table II with the following exceptions)

Parameter	Symbol	Sub-groups	Post Burn-in Limit		Post Life Test Limit		Life Test Delta	Units
			Min	Max	Min	Max		
Input Offset Voltage	V_{IO}	1		±0.75		±1	±0.25	mV
		2, 3				±1.5		
Input Bias Current	$\pm I_{IB}$	1	-0.1	2.5	-0.1	±3	±0.5	nA
		2			-1	±3		
		3			-0.1	±4		
Input Offset Current	I_{IO}	1		±0.3		±0.3		nA
		2, 3				±0.5		

5.0 Life Test/Burn-In Information

5.1 HTRB is not applicable for this drawing.
5.2 Burn-in is per MIL-STD-883 Method 1015 test condition B or C.
5.3 Steady state life test is per MIL-STD-883 Method 1005.

Rev	Description of Change	Date
A	Initiate	7-Feb-02
B	Add radiation test limits. Update web address.	9-Jan-03
C	Make correction file names (see OP215)	9-Jan-03
D	Update 1.0 Scope description.	09-Jul-07
E	Update header/footer & add to 1.0 scope description.	19-Feb-08
F	Add Junction Temperature(T_J).....175°C to 3.3 Absolute Maximum Ratings	March 31, 2008
G	Updated Section 4.0c note to indicate pre-screen temp testing being performed.	6-JUN-2009
H	Update fonts and sizes to ADI standard	3-Oct-2011
I	Add dose rate environment at Table II Notes.	08-Jun-21

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