

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/aerospace> 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/OP27

2.0 Part Number. The complete part number(s) of this specification follow:

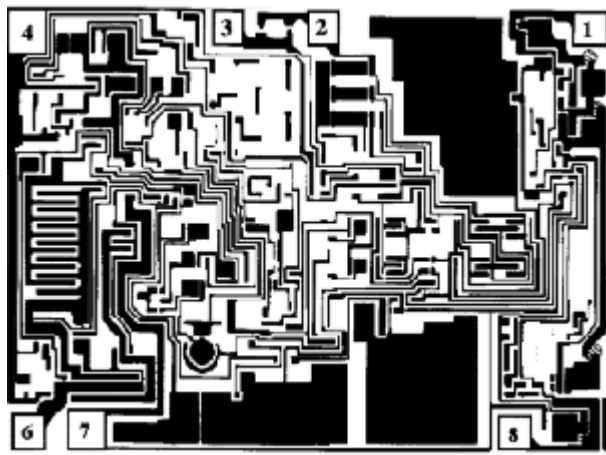
<u>Part Number</u>	<u>Description</u>
OP27-000C	Low-Noise Precision Operational Amplifier
OP27R000C	Radiation Tested Low-Noise Precision Operational Amplifier

3.0 Die Information

3.1 Die Dimensions

Die Size	Die Thickness	Bond Pad Metalization
66 mil x 95 mil	19 mil $\pm$ 2 mil	Al/Cu

3.2 Die Picture



1. BALANCE
2. -INPUT
3. +INPUT
4. -Vs
5. NC
6. OUT
7. +Vs
8. BALANCE

3.3 Absolute Maximum Ratings ^{1/}

Supply Voltage (V_S)	$\pm 22V$
Input Voltage ^{2/}	$\pm 22V$
Output Short Circuit Duration	Indefinite
Differential Input Voltage ^{3/}	$\pm 0.7V$
Differential Input Current ^{3/}	$\pm 25mA$
Storage Temperature Range	$-65^{\circ}C$ to $+150^{\circ}C$
Operating Temperature Range	$-55^{\circ}C$ to $+125^{\circ}C$
Junction Temperature (T_J).....	$150^{\circ}C$

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 $\pm 22V$, the absolute maximum input voltage is equal to the supply voltages.
- ^{3/} The device inputs are protected by back-to-back diodes. Current limiting resistors are not used in order to achieve low noise. If differential input voltage exceeds $\pm 0.7V$, the input current should be limited to 25mA.

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 - Dice Electrical Characteristics

Parameter	Symbol	Conditions <u>1/</u>	Limit Min	Limit Max	Units
Input Offset Voltage	V_{OS}		-25	25	μV
Input Offset Current	I_{OS}		-35	+35	nA
Average Input Bias Current	I_{IB}		-40	+40	nA
Input Voltage Range	IVR		± 11		V
Power Supply Rejection Ratio	PSRR	$V_S = \pm 4.5V$ to $\pm 18V$		10	$\mu V/V$
Output Voltage Swing	V_{OUT}	$R_L \geq 2k\Omega$	± 12		V
		$R_L \geq 600\Omega$	± 10		
Supply Current	I_S	No Load		4.67	mA
Power Dissipation	P_D	No Load		140	mW
Output Short-Circuit Current	$+I_{SC}$			+70	mA
	$-I_{SC}$		-70		
Slew Rate	SR	$V_{OUT} = \pm 5V$, $R_L \geq 2k\Omega$, $C_L = 100pF$, measured at -2.5V to +2.5V	1.7		V/ μs
Gain Bandwidth	GBW		5		MHz
Common Mode Rejection Ratio	CMRR	$V_{CM} = IVR = \pm 11V$	114		dB
Large Signal Voltage Gain	A_{VO}	$V_{OUT} = \pm 10V$, $R_L \geq 2k\Omega$	1000		V/mV

Table I Notes:

1/ $V_S = \pm 15V$, $T_A = 25^\circ C$, unless otherwise specified.

Table II - Electrical Characteristics for Qual Samples

Parameter	Symbol	Conditions <u>1/</u>	Sub- groups	Limit Min	Limit Max	Units
Input Offset Voltage	V_{OS}	M, D, L, R <u>3/</u>	4	-25	25	μV
			5, 6	-60	60	
			4	-100	100	
Average Input Offset Voltage <u>2/</u>	TCV_{OS}		5, 6	-0.6	0.6	$\mu V/^{\circ}C$
Input Offset Current	I_{OS}	M, D, L, R <u>3/</u>	1	-35	+35	nA
			2, 3	-50	+50	
			1	-100	100	
Average Input Bias Current	I_{IB}	M, D, L, R <u>3/</u>	1	-40	+40	
			2, 3	-60	+60	
			1	-1000	1000	
Input Voltage Range <u>2/</u>	IVR		1	± 11		V
			2, 3	± 10.3		
Power Supply Rejection Ratio <u>2/</u>	PSRR	$V_S = \pm 4.5V$ to $\pm 18V$	1		10	$\mu V/V$
			2, 3		16	
Output Voltage Swing <u>2/</u>	V_{OUT}	$R_L \geq 2k\Omega$	1	± 12		V
		$R_L \geq 600\Omega$		± 10		
		$R_L \geq 2k\Omega$	2, 3	± 11.5		
Supply Current	I_S	No Load	1		4.67	mA
		M, D, L, R <u>3/</u>	1		4.7	
Power Dissipation <u>2/</u>	P_D	No Load	1		140	mW
Output Short-Circuit Current <u>2/</u>	$+I_{SC}$		1		+70	mA
	$-I_{SC}$			-70		
Slew Rate <u>2/</u>	SR	$V_{OUT} = \pm 5V$, $R_L \geq 2k\Omega$, $C_L = 100pF$, measured at -2.5V to +2.5V	4	1.7		$V/\mu s$
Gain Bandwidth <u>2/</u>	GBW		4	5		MHz
Common Mode Rejection Ratio <u>2/</u>	CMRR	$V_{CM} = IVR = \pm 11V$	4	114		dB
		$V_{CM} = IVR = \pm 10.3V$	5, 6	108		
Large Signal Voltage Gain	A_{VO}	$V_{OUT} = \pm 10V$, $R_L \geq 2k\Omega$	4	1000		V/mV
			5, 6	600		
		M, D, L, R <u>3/</u>	4	100		

Table II Notes:

1/ $V_S = \pm 15V$, $R_S = 50\Omega$, unless otherwise specified.

2/ This parameter not tested post irradiation.

3/ Devices tested at 100Krad irradiation.

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 _{OS}	4	-60	60	-135	135	±75	μV
		5, 6			-170	170		
Input Bias Current	I _{IB}	1	-55	55	-65	65	±10	nA
		2, 3			-85	85		

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	3-Nov-111
B	Delete post burn-in temp limit from Table III; Add Document Number and Absolute Max Ratings	263-Nov-111
C	Delete VOS adjust from Table I and II, Delete 600ohm gain, change PSRR range from $\pm 4V$ to $\pm 18V$ to $\pm 4.5V$ to $\pm 18V$. Update web address.	20-Dec-01
D	Update web address	Aug. 5, 2003
E	Add radiation limits and part number for rad guarantee.	Sept. 30, 2003
F	Update header/footer and add to 1.0 Scope description.	Feb. 26, 2008
G	Add Junction Temperature(TJ)... 150°C to 3.3 Absolute Max Ratings	March 27, 2008
H	Updated Section 4.0c note to indicated pre-screen temp testing being performed.	June 6, 2009
I	Updated fonts and sizes to ADI standard	Oct 3, 2011