Low-Noise Precision Operational Amplifier

OP27

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:

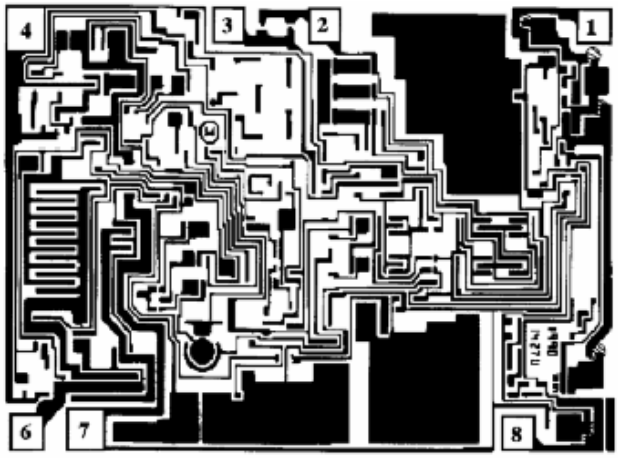
Part Number	Description
OP27-000C	Low-Noise Precision Operational Amplifier
OP27R000C	Radiation Tested Low-Noise Precision Operational Amplifier

3.0 Die Information

3.1 Die Dimensions

Die Size	Die Thickness	Bond Pad Metalization
66 mil x 95 mil	**19 mil ± 2 mil**	**Al/Cu**

3.2 Die Picture



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

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3.3 Absolute Maximum Ratings 1/

Supply Voltage (V_S)	±22V
Input Voltage 2/	±22V
Output Short Circuit Duration	Indefinite
Differential Input Voltage 3/	±0.7V
Differential Input Current 3/	±25mA
Storage Temperature Range	-65°C to +150°C
Operating Temperature Range.....	-55°C to +125°C
Junction Temperature (T_J)……....	150°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 ±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 ±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 1/	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 = ±4.5V to ±18V		10	µV/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} = ±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 = ±11V	114		dB
Large Signal Voltage Gain	A_{VO}	V_{OUT} = ±10V, $R_L \geq 2k\Omega$	1000		V/mV

Table I Notes:

1/ V_S = ±15V, T_A = 25°C, unless otherwise specified.

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

Table II Notes:

1/ V_S = ±15V, R_S = 50Ω, 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	5-Jun-091
B	Delete post burn-in temp limit from Table III; Add Document Number and Absolute Max Ratings	265-Jun-091
C	Delete VOS adjust from Table I and II, Delete 600ohm gain, change PSRR range from ±4V to ±18V to ±4.5V to ±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