

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/AD667

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

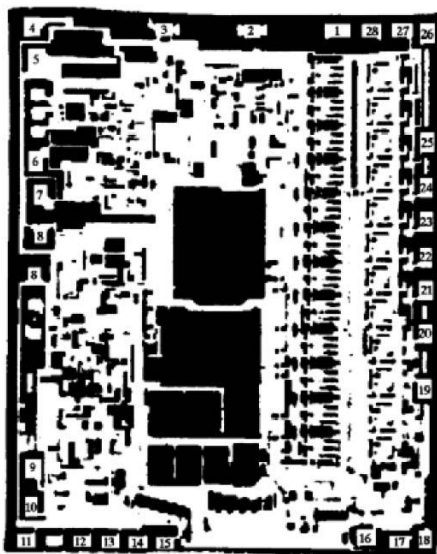
Part Number	Description
AD667-000C	Microprocessor-Compatible 12- Bit D/A Converter

3.0 Die Information

3.1 Die Dimensions

Die Size	Die Thickness	Bond Pad Metalization
142 mil x 184 mil	19 mil ± 2 mil	Al/Cu

3.2 Die Picture



- | | |
|------------------|----------------|
| 1. 20V SPAN | 15. DB11 (MSB) |
| 2. 10V SPAN | 16. DB10 |
| 3. SUM JCT. | 17. DB9 |
| 4. BIP OFF | 18. DB8 |
| 5. AGND | 19. DB7 |
| 6. V_{REF} OUT | 20. DB6 |
| 7. V_{REF} IN | 21. DB5 |
| 8. $+V_{CC}$ | 22. DB4 |
| 9. V_{OUT} | 23. DB3 |
| 10. $-V_{EE}$ | 24. DB2 |
| 11. CS* | 25. DB1 |
| 12. A3 | 26. DB0(LSB) |
| 13. A2 | 27. POWER GND |
| 14. A1 | 28. A0 |

*Active Low Input

ASD0013003

Rev. F

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3.3 **Absolute Maximum Ratings** 1/

V_{CC} to power ground range0V dc to +18V dc
V_{EE} to power ground range0V dc to -18V dc
Digital inputs (pins 11-15, 17-28) to power ground range	...±0.3V dc
Reference in to reference ground±12V dc
Bipolar offset to reference ground±12V dc
10V span R to reference ground±12V dc
20V span R to reference ground±24V dc
Reference out, V_{OUT} (pins 6 and 9)continuous short to power ground, momentary short to V_{CC}
Storage Temperature Range -65°C to +150°C
Junction Temperature (T_J)+150°C
Ambient Operating 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.

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
Resolution	RES		12		Bits
Relative Accuracy	RA	All bits with positive errors on & All bits with negative error on.		±0.5	LSB
Differential Nonlinearity	DNL	Major carry errors		±0.75	LSB
Gain Error <u>2/</u>	A _E	All bits on; All bits high		.20	%FSR
Unipolar Offset Error	V _{OS}	All bits off; All bits low		±2	LSB
Bipolar Zero Error	B _{PZE}	MSB on, all other bits off		±0.1	%FSR
Reference Output Voltage <u>3/</u>	V _{REF}	Bipolar mode, V _S = ±11.4V, 0.1 mA external load	9.9	10.1	V
Power Supply Rejection Ratio	PSRR	All bits on; +11.4V ≤ VCC ≤ +16.5V		10	ppm of FSR/%
		All bits on; -11.4V ≥ VEE ≥ -16.5V		10	
Power Supply Current	I _{CC}	V _S = ±16.5 V, All bits on		12	mA
	I _{EE}			25	
Digital Input High Voltage	V _{IH}		2		V
Digital Input Low Voltage	V _{IL}			0.8	V
Digital Input High Current	I _{IH}	V _{IH} = 5.5 V		10	μA
Digital Input Low Current	I _{IL}	V _{IL} = 0V		5	μA

Table I Notes:

- 1/ V_{CC} = +15V, V_{EE} = -15V, 50Ω resistor pin 6 to pin 7 A₀, A₁, A₂, A₃, CS = Logic "0", V_{IH} = 2V, V_{IL} = 0.8V, Unipolar configuration unless otherwise specified. Unipolar configuration – Pins 1 and 2 to Pin 9, Pin 4 to Pin 5. Bipolar configuration – Pin 1 to Pin 9, 50Ω resistor Pin 4 to Pin 6.
- 2/ Adjustable to 0.
- 3/ In subgroup 1, the reference output is loaded with 0.5mA nominal reference current, 1.0 mA bipolar offset current and 0.1 mA additional current.

Table II - Electrical Characteristics for Qual Samples

Parameter	Symbol	Conditions <u>1/</u>	Sub-groups	Limit Min	Limit Max	Units
Resolution	RES			12		Bits
Relative Accuracy	RA	All bits with positive errors on & All bits with negative error on.	1		±0.5	LSB
			2, 3		±0.75	
Differential Nonlinearity	DNL	Major carry errors	1		±0.75	LSB
			2, 3		±1	
Gain Error <u>2/</u>	A _E	All bits on; All bits high	1		0.2	%FSR
Gain Temperature Coefficient	TCA _E		2, 3		30	ppm/°C
Unipolar Offset Error	V _{OS}	All bits off; All bits low	1		±2	LSB
Unipolar Offset Temperature Coefficient	TCV _{OS}		2, 3		±3	ppm/°C
Bipolar Zero Error <u>2/</u>	B _{PZE}	MSB on, all other bits off	1		±0.14	%FSR
B _{PZE} Temperature Coefficient	TCB _{PZE}		2, 3		±12	ppm/°C
Reference Output Voltage <u>3/</u>	V _{REF}	Bipolar mode, V _S = ±11.4V, 0.1 mA external load	1, 2, 3	9.9	10.1	V
Power Supply Rejection Ratio	PSRR	All bits on; +11.4V ≤ V _{CC} ≤ +16.5V	1		10	ppm of FSR/%
		All bits on; -11.4V ≥ V _{EE} ≥ -16.5V	1		10	
Power Supply Current	I _{CC}	V _S = ±16.5 V, All bits on	1		12	mA
	I _{EE}		1		25	
Digital Input High Voltage	V _{IH}		1, 2, 3	2		V
Digital Input High Voltage	V _{IL}		1		0.8	V
			2, 3		0.7	
Digital Input High Voltage	I _{IH}	V _{IH} = 5.5 V	1		10	μA
Digital Input High Voltage	I _{IL}	V _{IL} = 0V	1		5	

Table II Notes:

1/ V_{CC} = +15V, V_{EE} = -15V, 50Ω resistor pin 6 to pin 7 A_O, A₁, A₂, A₃, CS = Logic "0", V_{IH} = 2.0V, V_{IL} = 0.8V, Unipolar configuration unless otherwise specified. Unipolar configuration - Pins 1 and 2 to Pin 9, Pin 4 to Pin 5. Bipolar configuration - Pin 1 to Pin 9, 50Ω resistor Pin 4 to Pin 6.

2/ Adjustable to 0.

3/ In subgroup 1, the reference output is loaded with 0.5mA nominal reference current, 1.0 mA bipolar offset current and 0.1 mA additional current. In subgroups 2 and 3, only the 0.5 mA reference input current is applied. The reference must be buffered to supply external loads at elevated temperatures.

Table III - Delta Parameter Table

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}	1		±3		±4	±1	LSB
Bipolar Zero Error	B _{PZE}	1		±0.19		±0.24	±0.05	%FS
Power Supply Current	I _{CC}	1		13.2		14.4	1.2	mA
Power Supply Current	I _{EE}	1		27.5		30	2.5	mA

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.

AD667

Rev	Description of Change	Date
A	Initiate	9-Apr-02
B	Update 1.0 Scope description.	1 Aug. 2007
C	Update header/footer & add to 1.0 Scope description	Mar. 3, 2008
D	Add Junction Temperature (T_j)+150°C to 3.3 Absolute Max. Ratings	April 2, 2008
E	Updated Section 4.0c note to indicate pre-screen temp testing being performed	5-JUN-2009
F	Update Fonts and sizes to ADI standard	22-Sept-2011