

### 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](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/PM139](http://www.analog.com/PM139)

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

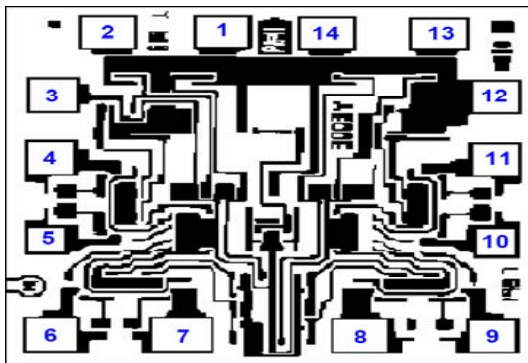
<u>Part Number</u>	<u>Description</u>
PM139-000C	Quad Low-Power Voltage Comparator
PM139R000C	Quad Low-Power Voltage Comparator with Radiation Guarantee

### 3.0 Die Information

#### 3.1 Die Dimensions

Die Size	Die Thickness	Bond Pad Metalization
51 mil x 48 mil	19 mil ± 2 mil	Al/Cu

#### 3.2 Die Picture



- |          |           |
|----------|-----------|
| 1. OUT 2 | 8. IN 3-  |
| 2. OUT 1 | 9. IN 3+  |
| 3. V+    | 10. IN 4- |
| 4. IN 1- | 11. IN 4+ |
| 5. IN 1+ | 12. GND   |
| 6. IN 2- | 13. OUT 4 |
| 7. IN 2+ | 14. OUT 3 |

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Rev. H

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**3.3 Absolute Maximum Ratings** <sup>1/</sup>

Supply Voltage Range .....	36V dc or ±18V dc
Input Voltage Range .....	-0.3V dc to 36V dc
Input Current ( $V_{IN} < -0.3V$ ) .....	50mA
Sink Current .....	20mA approximately
Storage Temperature .....	-65°C to +150°C
Ambient Operating Temperature Range .....	-55°C to +125°C
Junction Temperature ( $T_J$ ).....	150°C

Absolute Maximum Ratings Notes:

- <sup>1/</sup> 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 Samples Size and Qual Acceptance Criteria – 25/2
- (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 <sup>1/</sup>	Limit Min	Limit Max	Units
Input Offset Voltage	$V_{IO}$			±2	mV
Input Offset Current	$I_{IO}$	$I_{IN+} - I_{IN-}$ with output in the linear range		25	nA
Input Bias Current	$I_{IB}$	$I_{IN+} - I_{IN-}$ with output in the linear range		100	nA
Output Sink Current	$I_{SINK}$	$V_{IN-} \geq 1V, V_{IN+} = 0V,$ $V_O \leq 1.5V$	6		mA
Saturation Voltage	$V_{SAT}$	$V_{IN-} \geq 1V, V_{IN+} = 0V,$ $I_{SINK} \leq 4mA$		400	mV
Output Leakage Current	$I_{LEAK}$	$V_{IN-} = 0V, V_{IN+} \geq 1V$ dc $V_O = 30V$		0.5	µA
Supply Current	$I_{CC}$	$R_L = \infty, V+ = 30V$		3	mA
Input Voltage Common Mode Rejection Ratio	CMRR	$V+ = 15V, V_{CM} = 0V$ to $13.5V, R_L \geq 15k\Omega$	60.5		dB

Table I Notes:

<sup>1/</sup>  $V+ = +5V, V- = 0V, V_O = 1.4V, V_{IN} = 0V,$  and  $T_A = 25^\circ C,$  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	$V_{IO}$		1		$\pm 2$	mV
			2, 3		$\pm 4$	
			<u>2/</u>	1	3	
Input Offset Current	$I_{IO}$	$I_{IN+} - I_{IN-}$ with output in the linear range	1		$\pm 25$	nA
			2, 3		$\pm 100$	
			<u>2/</u>	1	$\pm 25$	
Input Bias Current	$I_{IB}$	$I_{IN+} - I_{IN-}$ with output in the linear range	1		$\pm 100$	
			2, 3		$\pm 300$	
			<u>2/</u>	1	$\pm 100$	
Output Sink Current	$I_{SINK}$	$V_{IN-} \geq 1V, V_{IN+} = 0V,$ $V_O \leq 1.5V$ <u>3/</u>	1	6		mA
Saturation Voltage	$V_{SAT}$	$V_{IN-} \geq 1V, V_{IN+} = 0V,$ $I_{SINK} \leq 4mA$	1		400	mV
			2, 3		700	
			<u>2/</u>	1	400	
Output Leakage Current	$I_{LEAK}$	$V_{IN-} = 0V, V_{IN+} \geq 1V$ dc, $V_O = 30V$	1		0.5	$\mu A$
			2, 3		1	
			<u>2/</u>		0.5	
Supply Current	$I_{CC}$	$R_L = \infty, V_+ = 30V$	1, 2, 3		3	mA
			<u>2/</u>	1	2	
Input Voltage Common Mode Rejection Ratio	CMRR	$V_+ = 15V,$ $R_L \geq 15k\Omega$ <u>3/</u>	$V_{CM} = 0V$ to 13.5V	1	60.5	dB
			$V_{CM} = 0V$ to 13V	2, 3		

Table II Notes:

1/  $V_+ = +5V, V_- = 0V, V_O = 1.4V,$  and  $V_{IN} = 0V,$  unless otherwise specified.2/ Post 100Krad limit3/ Not tested post irradiation.

<b>Table III - Life Test Endpoint and Delta Parameter</b> (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		±3.5		±5	±1.5	mV
		2, 3				±7		
Input Bias Current	$I_{IB}$	1		±115		±130	±15	nA
		2, 3				±330		
Input Offset Current	$I_{IO}$	1		±30		±35		nA
		2, 3				±100		

**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	07-Feb-02
B	Add CMVR for temperature different than subgroup 1. (0V to 13V)	10-Apr-02
C	Add 100Krad irradiation limits to table II. Update web address.	6-Jan-03
D	Correct die picture. Changed from LCC die picture to DIP die picture.	17-Feb-05
E	Update the 1.0 Scope Description	13-Jul-07
F	Update header/footer and add to 1.0 scope description.	Feb. 13,2008
G	Added Junction Temperature (T <sub>J</sub> ) 150°C to 3.3- Absolute Maximum Ratings	March 31, 2008
H	Updated Section 4.0c note to indicate pre-screen temp testing being performed.	6-JUN-2009

