

### 1.0 SCOPE

This specification covers the detail requirements for a quad low-power voltage comparator.

It is highly recommended that this data sheet be used as a baseline for new military or aerospace spec control drawings.

### 1.2 Part Number. The complete part numbers per Table I of this specification follow:

| <u>Device</u> | <u>Part Number</u> | <u>Package</u> |
|---------------|--------------------|----------------|
| A             | PM-139AY/883       | Y              |
| X             | PM-139Y/883        | Y              |
| A             | PM-139ARC/883      | RC             |

### 1.2.3 Case Outline.

| <u>Letter</u> | <u>Case Outline (Lead finish per MIL-M-38510)</u> |
|---------------|---------------------------------------------------|
| Y             | 14-pin ceramic dual-in-line package (CERDIP)      |
| RC            | 20-contact hermetic leadless chip carrier (LCC)   |

### 1.3 Absolute Maximum Ratings. ( $T_A = 25^\circ\text{C}$ , unless otherwise noted)

|                                                |                                             |
|------------------------------------------------|---------------------------------------------|
| Supply Voltage, $V_+$ .....                    | 36V or $\pm 18\text{V}$                     |
| Power Dissipation Hermetic DIP .....           | 500mW                                       |
| Derate Above $100^\circ\text{C}$ .....         | 10mW/ $^\circ\text{C}$                      |
| Differential Input Voltage.....                | 36V                                         |
| Input Voltage .....                            | -0.3V to +36V                               |
| Output Short-Circuit to Ground .....           | Continuous                                  |
| Storage Temperature Range.....                 | $-65^\circ\text{C}$ to $+150^\circ\text{C}$ |
| Operating Temperature Range .....              | $-55^\circ\text{C}$ to $+125^\circ\text{C}$ |
| Lead Temperature (Soldering, 60 sec).....      | $+300^\circ\text{C}$                        |
| Input Current ( $V_{IN} < -0.3\text{V}$ )..... | 50mA                                        |

### 1.5 Thermal Characteristics:

Thermal Resistance, CERDIP (Y) package:

Junction-to-Case ( $\theta_{JC}$ ) =  $29^\circ\text{C/W MAX}$

Junction-to Ambient ( $\theta_{JA}$ ) =  $100^\circ\text{C/W MAX}$

Thermal Resistance, LCC (RC) package:

Junction-to-Case ( $\theta_{JC}$ ) =  $35^\circ\text{C/W MAX}$

Junction-to Ambient ( $\theta_{JA}$ ) =  $110^\circ\text{C/W MAX}$

**TABLE 1**

$V_+ = 5V$ ,  $V_- = 0V$ ;  $T_A = 25^\circ C$  unless otherwise specified.

| PM-139/883                            |                   |                                                                      |          |      |          |      |       |
|---------------------------------------|-------------------|----------------------------------------------------------------------|----------|------|----------|------|-------|
| Characteristics                       | Symbol            | Special Conditions                                                   | LIMITS A |      | LIMITS X |      | Units |
|                                       |                   |                                                                      | Min      | Max  | Min      | Max  |       |
| Supply Current<br>(All 4 Comparators) | I <sub>SY</sub>   | V <sub>+</sub> = 30V, R <sub>L</sub> = ∞                             | —        | 2.0  | —        | 2.0  | mA    |
|                                       |                   | -55°C ≤ T <sub>A</sub> ≤ +125°C                                      | —        | 3.0  | —        | 3.0  | mA    |
| Input Offset<br>Voltage               | V <sub>OS</sub>   | R <sub>S</sub> = 0n, V <sub>O</sub> = 1.4V                           | —        | 2.0  | —        | 5.0  | mV    |
|                                       |                   | -55°C ≤ T <sub>A</sub> ≤ +125°C                                      | —        | 4.0  | —        | 9.0  | mV    |
| Input Offset<br>Current               | I <sub>OS</sub>   | I <sub>IN</sub> (+) - I <sub>IN</sub> (-)                            | —        | 25   | —        | 25   | nA    |
|                                       |                   | -55°C ≤ T <sub>A</sub> ≤ +125°C                                      | —        | 100  | —        | 100  | nA    |
| Input Bias<br>Current                 | I <sub>B</sub>    | I <sub>IN</sub> (+) or I <sub>IN</sub> (-)                           | —        | ±100 | —        | ±100 | nA    |
|                                       |                   | -55°C ≤ T <sub>A</sub> ≤ +125°C                                      | —        | ±300 | —        | ±300 | nA    |
| Common-Mode<br>Rejection              | CMR               | R <sub>L</sub> ≥ 15kn, V <sub>+</sub> = 15V                          | 60.5     | —    | 60.5     | —    | dB    |
|                                       |                   | V <sub>CM</sub> = 1.5V to 13.5V                                      |          |      |          |      |       |
|                                       |                   | R <sub>L</sub> ≥ 15kn, V <sub>+</sub> = 15V                          | 60.5     | —    | 60.5     | —    | dB    |
|                                       |                   | V <sub>CM</sub> = 1.5V to 13.0V                                      |          |      |          |      |       |
| Power Supply<br>Rejection             | PSR               | -55°C ≤ T <sub>A</sub> ≤ +125°C                                      |          |      |          |      |       |
|                                       |                   | V <sub>S</sub> = +5V to +18V                                         | 60.5     | —    | 60.5     | —    | dB    |
|                                       |                   | V <sub>S</sub> = +5V to +18V                                         | 60.5     | —    | 60.5     | —    | dB    |
| Output Sink<br>Current                | I <sub>SINK</sub> | V <sub>IN</sub> <sup>+</sup> = 0V, V <sub>IN</sub> <sup>-</sup> ≥ 1V | 6.0      | —    | 6.0      | —    | mA    |
|                                       |                   | V <sub>O</sub> ≤ 1.5V                                                |          |      |          |      |       |
|                                       |                   | V <sub>IN</sub> <sup>+</sup> = 0V, V <sub>IN</sub> <sup>-</sup> ≥ 1V | 5.0      | —    | 5.0      | —    | mA    |
|                                       |                   | V <sub>O</sub> ≤ 1.5V                                                |          |      |          |      |       |
| Saturation<br>Voltage                 | V <sub>OL</sub>   | -55°C ≤ T <sub>A</sub> ≤ +125°C                                      |          |      |          |      |       |
|                                       |                   | V <sub>IN</sub> <sup>+</sup> = 0V, V <sub>IN</sub> <sup>-</sup> ≥ 1V | —        | 400  | —        | 400  | mV    |
|                                       |                   | I <sub>SINK</sub> ≤ 4mA                                              |          |      |          |      |       |
|                                       |                   | V <sub>IN</sub> <sup>+</sup> = 0V, V <sub>IN</sub> <sup>-</sup> ≥ 1V | —        | 700  | —        | 700  | mV    |
| Output Sink<br>Current                | I <sub>SINK</sub> | V <sub>IN</sub> <sup>+</sup> = 0V, V <sub>IN</sub> <sup>-</sup> ≥ 1V |          |      |          |      |       |
|                                       |                   | V <sub>O</sub> ≤ 1.5V                                                |          |      |          |      |       |
| Saturation<br>Voltage                 | V <sub>OL</sub>   | -55°C ≤ T <sub>A</sub> ≤ +125°C                                      |          |      |          |      |       |
|                                       |                   | V <sub>IN</sub> <sup>+</sup> = 0V, V <sub>IN</sub> <sup>-</sup> ≥ 1V |          |      |          |      |       |

TABLE 1 (Continued)

$V^+ = 5V$ ,  $V^- = 0V$ ;  $T_A = 25^\circ C$  unless otherwise specified.

| PM-139/883                          |                                |                                                                                                                                 |           |      |           |      |       |
|-------------------------------------|--------------------------------|---------------------------------------------------------------------------------------------------------------------------------|-----------|------|-----------|------|-------|
| Characteristics                     | Symbol                         | Special Conditions                                                                                                              | LIMITS A  |      | LIMITS X  |      | Units |
|                                     |                                |                                                                                                                                 | Min       | Max  | Min       | Max  |       |
| Output Leakage Current              | I <sub>LEAK</sub>              | V <sub>IN</sub> <sup>+</sup> ≥ 1V, V <sub>IN</sub> <sup>-</sup> = 0V<br>V <sub>O</sub> = 30V                                    | —         | 500  | —         | 500  | nA    |
|                                     |                                | V <sub>IN</sub> <sup>+</sup> ≥ 1V, V <sub>IN</sub> <sup>-</sup> = 0V<br>V <sub>O</sub> = 30V<br>-55°C ≤ T <sub>A</sub> ≤ +125°C | —         | 1000 | —         | 1000 | nA    |
| Large Signal Response Time (Note 2) | t <sub>r</sub><br>Large Signal | V <sub>IN</sub> = 0V to 5V<br>V <sub>REF</sub> = 1.4V, V <sub>RL</sub> = 5V<br>R <sub>L</sub> = 5.1kΩ                           | —         | 700  | —         | 700  | ns    |
| Small Signal Response Time (Note 2) | t <sub>r</sub><br>Small Signal | Low to High Transition<br>V <sub>RL</sub> = 5V, R <sub>L</sub> = 5.1kΩ<br>100mV Input Step, 5mV Overdrive                       | —         | 5.0  | —         | 5.0  | μs    |
|                                     |                                | High to Low Transition<br>V <sub>RL</sub> = 5V, R <sub>L</sub> = 5.1kΩ<br>100mV Input Step, 5mV Overdrive                       | —         | 2.5  | —         | 2.5  | μs    |
| Common-Mode Voltage Range (Note 1)  | CMVR                           | V <sub>+</sub> = 15V                                                                                                            | 0 to 13.5 | —    | 0 to 13.5 | —    | V     |
|                                     |                                | V <sub>+</sub> = 15V<br>-55°C ≤ T <sub>A</sub> ≤ +125°C                                                                         | 0 to 13.0 | —    | 0 to 13.0 | —    | V     |

## NOTES:

- CMVR is guaranteed by  $V_{OS}$  and CMR conditions. The input common-mode voltage, or either input signal voltage should not be allowed to go negative by more than 0.3V. The upper end of the common-mode voltage range is  $V(+)$  -1.5V, but either or both inputs can go to +30V without damage.
- Sample tested.

**TABLE 2****PM-139/883****Electrical Test Requirements  
For Class B Devices**

|                                                |                         |
|------------------------------------------------|-------------------------|
| MIL-STD-883<br>Test Requirements               | Subgroups (see Table 3) |
| Interim Electrical<br>Parameters (pre Burn-In) | 1                       |
| Final Electrical Test<br>Parameters            | 1*, 2, 3                |
| Group A Test Requirements                      | 1, 2, 3, 9              |

\* PDA applies to Subgroup 1 only.  
No other Subgroups are included in PDA.

**TABLE 3****Group A Inspection** $V_+ = 5V$ ,  $V_- = 0V$  unless otherwise specified.

| PM-139/883                                |                   |                                                                                                 |          |      |          |      |       |
|-------------------------------------------|-------------------|-------------------------------------------------------------------------------------------------|----------|------|----------|------|-------|
| Subgroup                                  | Symbol            | Special Conditions                                                                              | LIMITS A |      | LIMITS X |      | Units |
|                                           |                   |                                                                                                 | Min      | Max  | Min      | Max  |       |
| Subgroup 1<br><br>T <sub>A</sub> = +25°C  | I <sub>SY</sub>   | V <sub>+</sub> = 30V, R <sub>L</sub> = ∞ (Note 1)                                               | –        | 2.0  | –        | 2.0  | mA    |
|                                           | V <sub>OS</sub>   | R <sub>S</sub> = 0Ω, V <sub>O</sub> = 1.4V                                                      | –        | 2.0  | –        | 5.0  | mV    |
|                                           | I <sub>OS</sub>   |                                                                                                 | –        | 25   | –        | 25   | nA    |
|                                           | I <sub>B</sub>    |                                                                                                 | –        | ±100 | –        | ±100 | nA    |
|                                           | CMR               | V <sub>+</sub> = 15V, R <sub>L</sub> = 15kΩ<br>V <sub>CM</sub> = 1.5V, 13.5V                    | 60.5     | –    | 60.5     | –    | dB    |
|                                           | PSR               | V <sub>+</sub> = +5V, +18V                                                                      | 60.5     | –    | 60.5     | –    | dB    |
|                                           | I <sub>SINK</sub> | V <sub>IN</sub> <sup>+</sup> = 0V, V <sub>IN</sub> <sup>–</sup> = 1V<br>V <sub>O</sub> = 1.5V   | 6.0      | –    | 6.0      | –    | mA    |
|                                           | V <sub>OL</sub>   | I <sub>SINK</sub> = 4mA<br>V <sub>IN</sub> <sup>+</sup> = 0V, V <sub>IN</sub> <sup>–</sup> = 1V | –        | 400  | –        | 400  | mV    |
|                                           | I <sub>LEAK</sub> | V <sub>IN</sub> <sup>+</sup> = 1V, V <sub>IN</sub> <sup>–</sup> = 0V<br>V <sub>O</sub> = 30V    | –        | 500  | –        | 500  | nA    |
| Subgroup 2<br><br>T <sub>A</sub> = +125°C | I <sub>SY</sub>   | V <sub>+</sub> = 30V, R <sub>L</sub> = ∞ (Note 1)                                               | –        | 3.0  | –        | 3.0  | mA    |
|                                           | V <sub>OS</sub>   | R <sub>S</sub> = 0Ω, V <sub>O</sub> = 1.4V                                                      | –        | 4.0  | –        | 9.0  | mV    |
|                                           | I <sub>OS</sub>   |                                                                                                 | –        | 100  | –        | 100  | nA    |
|                                           | I <sub>B</sub>    |                                                                                                 | –        | ±300 | –        | ±300 | nA    |

**TABLE 3**

**Group A Inspection (Continued)**

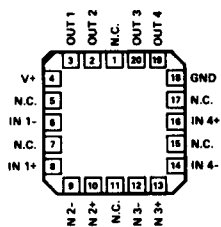
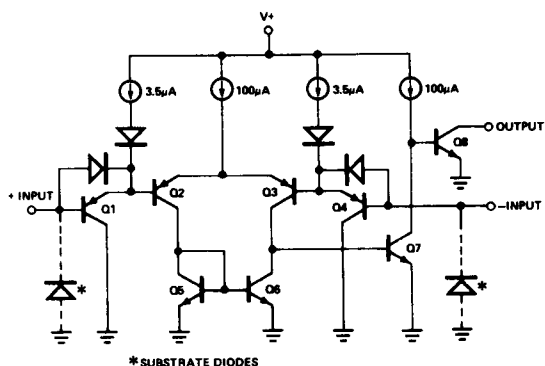
V+ = 5V, V- = 0V unless otherwise specified.

| PM-139/883               |                                                                  |                                                                                                             |          |      |          |      |       |
|--------------------------|------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|----------|------|----------|------|-------|
| Subgroup                 | Symbol                                                           | Special Conditions                                                                                          | LIMITS A |      | LIMITS X |      | Units |
|                          |                                                                  |                                                                                                             | Min      | Max  | Min      | Max  |       |
| Subgroup 2               | CMR                                                              | V+ = 15V, R <sub>L</sub> = 15kΩ<br>V <sub>CM</sub> = 1.5V, 13V                                              | 60.5     | —    | 60.5     | —    | dB    |
| T <sub>A</sub> = +125 °C | PSR                                                              | V+ = +5V, +18V                                                                                              | 60.5     | —    | 60.5     | —    | dB    |
| (Continued)              | I <sub>SINK</sub>                                                | V <sub>IN</sub> <sup>+</sup> = 0V, V <sub>IN</sub> <sup>-</sup> = 1V<br>V <sub>O</sub> = 1.5V               | 5        | —    | 5        | —    | mA    |
|                          | V <sub>OL</sub>                                                  | I <sub>SINK</sub> = 4mA<br>V <sub>IN</sub> <sup>+</sup> = 0V, V <sub>IN</sub> <sup>-</sup> = 1V             | —        | 700  | —        | 700  | mV    |
|                          | I <sub>LEAK</sub>                                                | V <sub>IN</sub> <sup>+</sup> = 0V, V <sub>IN</sub> <sup>-</sup> = 0V<br>V <sub>O</sub> = 30V                | —        | 1000 | —        | 1000 | nA    |
| Subgroup 3               | All Tests, Limits and Conditions are the same as for Subgroup 2. |                                                                                                             |          |      |          |      |       |
| T <sub>A</sub> = -55 °C  |                                                                  |                                                                                                             |          |      |          |      |       |
| Subgroup 9               | t <sub>r</sub>                                                   | V <sub>IN</sub> = 0V, 5V                                                                                    | —        | 700  | —        | 700  | ns    |
| T <sub>A</sub> = +25 °C  | Large Signal                                                     | V <sub>REF</sub> = 1.4V, V <sub>RL</sub> = 5V<br>R <sub>L</sub> = 5.1kΩ                                     |          |      |          |      |       |
|                          |                                                                  | Low to High Transition<br>V <sub>RL</sub> = 5V, R <sub>L</sub> = 5.1kΩ<br>100mV Input Step<br>5mV Overdrive | —        | 5.0  | —        | 5.0  | μs    |
|                          | t <sub>r</sub>                                                   | High to Low Transition<br>V <sub>RL</sub> = 5V, R <sub>L</sub> = 5.1kΩ<br>100mV Input Step<br>5mV Overdrive | —        | 2.5  | —        | 2.5  | μs    |

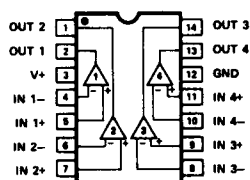
**NOTES:**

1. Total all four comparators.

### 3.2.1 Simplified Schematic and Pin Connections. (ONE COMPARATOR)



**PM-139ARC/883**  
**LCC-PACKAGE**  
(RC-Suffix)



**14-PIN HERMETIC DIP**  
(Y-Suffix)

**3.2.4 Microcircuit Group Assignment.** This microcircuit is covered by microcircuit group 50.

### 4.2 Life Test/Burn-In Circuit.

