

## SCOPE: MONOLITHIC CMOS, ANALOG MULTIPLEXER

| <u>Device Type</u> | <u>Generic Number</u> |
|--------------------|-----------------------|
| 01                 | DG508AA(x)/883B       |
| 02                 | DG509AA(x)/883B       |

**Case Outline(s).** The case outlines shall be designated in Mil-Std-1835 and as follows:

| <u>Outline Letter</u> | <u>Mil-Std-1835</u>    | <u>Case Outline</u> | <u>Package Code</u> |
|-----------------------|------------------------|---------------------|---------------------|
| K                     | GDIP1-T16 or CDIP2-T16 | 16 LEAD Cerdip      | J16                 |
| L                     | CDFP4-16               | 16 LEAD FLATPACK    | F16                 |
| P                     | GDIP1-T16 or CDIP2-T16 | 16 LEAD Sidebrazed  | R16                 |
| Z                     | CQCC1-N20              | 20-Pin Ceramic LCC  | L20                 |

### **Absolute Maximum Ratings**

Voltage Referenced to V<sup>-</sup>

|                                                        |                                                                 |
|--------------------------------------------------------|-----------------------------------------------------------------|
| V <sup>+</sup> to V <sup>-</sup> .....                 | 44V                                                             |
| V <sup>+</sup> to GND .....                            | 25V                                                             |
| Digital Inputs, Overvoltage Range $\frac{1}{2}$ .....  | -2V to (V <sup>+</sup> +2V)<br>or 20mA (whichever occurs first) |
| Continuous Current, Any terminal except S or D .....   | 30mA                                                            |
| Continuous Current, S or D .....                       | 20mA                                                            |
| Peak Current (Pulsed at 1ms, 10% duty cycle max) ..... | 40mA                                                            |
| Lead Temperature (soldering, 10 seconds) .....         | +300°C                                                          |
| Storage Temperature .....                              | -65°C to +150°C                                                 |

|                                                          |                       |
|----------------------------------------------------------|-----------------------|
| Continuous Power Dissipation .....                       | T <sub>A</sub> =+70°C |
| 16 lead FLATPACK (derate 6.1mW/°C above +70°C) .....     | 485mW                 |
| 16 lead Cerdip(derate 10.0mW/°C above +70°C) .....       | 800mW                 |
| 16 lead Side Braze(derate 10.5mW/°C above +70°C) .....   | 842mW                 |
| 20 lead LCC (derate 9.1mW/°C above +70°C) .....          | 727mW                 |
| Junction Temperature T <sub>J</sub> .....                | +150°C                |
| Thermal Resistance, Junction to Case, $\theta_{JC}$ :    |                       |
| Case Outline 16 lead FLATPACK .....                      | 65°C/W                |
| Case Outline 16 lead Cerdip.....                         | 50°C/W                |
| Case Outline 16 lead Side Braze.....                     | 45°C/W                |
| Case Outline 20 lead LCC .....                           | 20°C/W                |
| Thermal Resistance, Junction to Ambient, $\theta_{JA}$ : |                       |
| Case Outline 16 lead FLATPACK .....                      | 165°C/W               |
| Case Outline 16 lead Cerdip.....                         | 100°C/W               |
| Case Outline 16 lead Side Braze.....                     | 95°C/W                |
| Case Outline 20 lead LCC .....                           | 110°C/W               |

### **Recommended Operating Conditions.**

|                                                 |                 |
|-------------------------------------------------|-----------------|
| Ambient Operating Range (T <sub>A</sub> ) ..... | -55°C to +125°C |
|-------------------------------------------------|-----------------|

NOTE 1: Signals on S, D, IN exceeding V<sup>+</sup> or V<sup>-</sup> will be clamped by internal diodes. Limit forward diode current to maximum current ratings.

Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

TABLE 1. ELECTRICAL TESTS

| TEST                                           | Symbol              | CONDITIONS<br>-55 °C ≤ T <sub>A</sub> ≤ +125 °C<br>V <sub>S</sub> =+15V, V <sub>D</sub> =-15V, GND=0V<br>V <sub>AH</sub> =2.4V, V <sub>AL</sub> =0.8V<br>Unless otherwise specified | Group A<br>Subgroup | Device<br>type | Limits<br>Min | Limits<br>Max | Units |
|------------------------------------------------|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|----------------|---------------|---------------|-------|
| <b>SWITCH</b>                                  |                     |                                                                                                                                                                                     |                     |                |               |               |       |
| Analog-Signal Range                            | V <sub>ANALOG</sub> | V <sub>S</sub> =±15V                                                                                                                                                                | 1,2,3               | All            | -15           | 15            | V     |
| Drain-Source ON Resistance <u>3/</u>           | r <sub>DS(ON)</sub> | I <sub>S</sub> = -200μA, V <sub>D</sub> =±10V, V <sub>AL</sub> =0.8V, V <sub>AH</sub> =2.4V, Sequence each switch on                                                                | 1<br>2,3            | All            |               | 300<br>400    | Ω     |
| Source-OFF Leakage Current                     | I <sub>S(OFF)</sub> | V <sub>S</sub> =10V, V <sub>D</sub> =-10V, V <sub>EN</sub> =0V                                                                                                                      | 1<br>2,3            | All            |               | 0.5<br>50     | nA    |
| Source-OFF Leakage Current                     | I <sub>S(OFF)</sub> | V <sub>S</sub> =-10V, V <sub>D</sub> =10V, V <sub>EN</sub> =0V                                                                                                                      | 1<br>2,3            | All            | -0.5<br>-50   |               | nA    |
| Drain-OFF Leakage Current                      | I <sub>D(OFF)</sub> | V <sub>S</sub> =10V, V <sub>D</sub> =-10V, V <sub>EN</sub> =0V                                                                                                                      | 1<br>2,3            | 01             | -2<br>-200    |               | nA    |
| Drain-OFF Leakage Current                      | I <sub>D(OFF)</sub> | V <sub>S</sub> =-10V, V <sub>D</sub> =10V, V <sub>EN</sub> =0V                                                                                                                      | 1<br>2,3            | 01             |               | 2<br>200      | nA    |
| Drain-OFF Leakage Current                      | I <sub>D(OFF)</sub> | V <sub>S</sub> =10V, V <sub>D</sub> =-10V, V <sub>EN</sub> =0V                                                                                                                      | 1<br>2,3            | 02             | -2<br>-100    |               | nA    |
| Drain-OFF Leakage Current                      | I <sub>D(OFF)</sub> | V <sub>S</sub> =-10V, V <sub>D</sub> =10V, V <sub>IN</sub> =0V                                                                                                                      | 1<br>2,3            | 02             |               | 2<br>100      | nA    |
| Drain-ON Leakage Current NOTE 2                | I <sub>D(ON)</sub>  | V <sub>S(ALL)</sub> =V <sub>D</sub> =10V, V <sub>AL</sub> =0.8V, V <sub>AH</sub> =2.4V<br>Sequence each channel on                                                                  | 1<br>2,3            | 01             |               | 2<br>200      | nA    |
| Drain-ON Leakage Current NOTE 2                | I <sub>D(ON)</sub>  | V <sub>S(ALL)</sub> =V <sub>D</sub> =-10V, V <sub>AL</sub> =0.8, V <sub>AH</sub> =2.4V<br>Sequence each channel on                                                                  | 1<br>2,3            | 01             | -2<br>-200    |               | nA    |
| Drain-ON Leakage Current NOTE 2                | I <sub>D(ON)</sub>  | V <sub>S(ALL)</sub> =V <sub>D</sub> =10V, V <sub>AL</sub> =0.8V, V <sub>AH</sub> =2.4V<br>Sequence each channel on                                                                  | 1<br>2,3            | 02             |               | 2<br>100      | nA    |
| Drain-ON Leakage Current NOTE 2                | I <sub>D(ON)</sub>  | V <sub>S(ALL)</sub> =V <sub>D</sub> =-10V, V <sub>AL</sub> =0.8V, V <sub>AH</sub> =2.4V<br>Sequence each channel on                                                                 | 1<br>2,3            | 02             | -2<br>-100    |               | nA    |
| <b>INPUT</b>                                   |                     |                                                                                                                                                                                     |                     |                |               |               |       |
| Input Current/Voltage High                     | I <sub>AH</sub>     | V <sub>A</sub> = 2.4V                                                                                                                                                               | 1<br>2,3            | All            | -10<br>-30    |               | μA    |
|                                                |                     | V <sub>A</sub> =15V                                                                                                                                                                 | 1<br>2,3            | All            |               | 10<br>30      |       |
| Input Current/Voltage Low                      | I <sub>AL</sub>     | V <sub>EN</sub> =0V or 2.4V; All V <sub>A</sub> =0V                                                                                                                                 | 1<br>2,3            | All            | -10<br>-30    |               | μA    |
| <b>SUPPLY</b>                                  |                     |                                                                                                                                                                                     |                     |                |               |               |       |
| Positive Supply Range for Continuous Operation | V-, V+              | NOTES 3, 4                                                                                                                                                                          | 1                   | All            | ±4.5          | ±18           | V     |
| Positive Supply Current                        | I+                  | V <sub>EN</sub> =2.4V, All V <sub>A</sub> =0V or 2.4V                                                                                                                               | 1                   | All            |               | 0.2           | mA    |

**TABLE 1. ELECTRICAL TESTS**

| TEST                               | Symbol               | CONDITIONS                                                                                                                                                           | Group A Subgroup | Device type | Limits Min | Limits Max | Units |
|------------------------------------|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-------------|------------|------------|-------|
|                                    |                      | -55 °C ≤ T <sub>A</sub> ≤ +125°C<br>V <sub>+</sub> =+15V, V <sub>-</sub> =-15V, GND=0V<br>V <sub>AH</sub> =2.4V, V <sub>AL</sub> =0.8V<br>Unless otherwise specified |                  |             |            |            |       |
| Negative Supply Current            | I <sub>-</sub>       | V <sub>EN</sub> =2.4V, All V <sub>A</sub> =0V or 2.4V                                                                                                                | 1                | All         | -0.1       |            | mA    |
| Positive Supply Current in Standby | I <sub>+</sub>       | V <sub>EN</sub> =0V, all V <sub>A</sub> =0V or 2.4V                                                                                                                  | 1                | All         |            | 0.2        | mA    |
| Negative Supply Current in Standby | I <sub>-</sub>       | V <sub>EN</sub> =0V, all V <sub>A</sub> =0V or 2.4V                                                                                                                  | 1                | All         | -0.1       |            | mA    |
| <b>DYNAMIC</b>                     |                      |                                                                                                                                                                      |                  |             |            |            |       |
| Transition Time                    | t <sub>TRANS</sub>   | Figure 1                                                                                                                                                             | 9<br>10,11       | All         |            | 1.0<br>1.5 | μs    |
| Break Before Make Time             | t <sub>OPEN</sub>    | Figure 3                                                                                                                                                             | 9                | All         | 5          |            | ns    |
| Enable Turn-On Time                | t <sub>ON(EN)</sub>  | Figure 2                                                                                                                                                             | 9<br>10,11       | All         |            | 1.0<br>2.0 | μs    |
| Enable Turn-Off Time               | t <sub>OFF(EN)</sub> | Figure 2                                                                                                                                                             | 9<br>10,11       | All         |            | 0.7<br>2.0 | μs    |

NOTE 2: I<sub>D(ON)</sub> is leakage from driver into “on” switch.

NOTE 3: Electrical Characteristics (such as on resistance) will change when power supplies other than ±15V are used.

NOTE 4: For designs requiring single 5V or dual ±5V operation, refer to Maxim’s improved MAX338 and MAX339. Minimum operating voltage for DG508ADY and DG509ADY is ±9V.

**FIGURE 1: SWITCHING TIME TEST CIRCUIT:** See Commercial Data Sheet

**FIGURE 2: ENABLE TIME TEST CIRCUIT:** See Commercial Data Sheet

**FIGURE 3: BREAK-BEFORE-MAKE TEST CIRCUIT:** See Commercial Data Sheet

**TRUTH TABLE**
**TERMINAL CONNECTION**

| A2 | A1 | A0 | EN | DG508A<br>ON SWITCH | TERMINAL<br>NUMBER | 01<br>DG508A   | 02<br>DG509A   | 01<br>DG508A | 02<br>DG509A |
|----|----|----|----|---------------------|--------------------|----------------|----------------|--------------|--------------|
| X  | X  | X  | 0  | None                |                    | J16, R16 & F16 | J16, R16 & F16 | L20          | L20          |
| 0  | 0  | 0  | 1  | 1                   | 1                  | A0             | A0             | NC           | NC           |
| 0  | 0  | 1  | 1  | 2                   | 2                  | EN             | EN             | A0           | A0           |
| 0  | 1  | 0  | 1  | 3                   | 3                  | V-             | V-             | EN           | EN           |
| 0  | 1  | 1  | 1  | 4                   | 4                  | S1             | S1A            | V-           | V-           |
| 1  | 0  | 0  | 1  | 5                   | 5                  | S2             | S2A            | S1           | S1A          |
| 1  | 0  | 1  | 1  | 6                   | 6                  | S3             | S3A            | NC           | NC           |
| 1  | 1  | 0  | 1  | 7                   | 7                  | S4             | S4A            | S2           | S2A          |
| 1  | 1  | 1  | 1  | 8                   | 8                  | D              | DA             | S3           | S3A          |
|    |    |    |    |                     | 9                  | S8             | DB             | S4           | S4A          |
|    |    |    |    | DG509A              | 10                 | S7             | S4B            | D            | DA           |
|    | A1 | A0 | EN | ON SWITCH           | 11                 | S6             | S3B            | NC           | NC           |
|    | X  | X  | 0  | None                | 12                 | S5             | S2B            | S8           | DB           |
|    | 0  | 0  | 1  | 1                   | 13                 | V+             | S1B            | S7           | S4B          |
|    | 0  | 1  | 1  | 2                   | 14                 | GND            | V+             | S6           | S3B          |
|    | 1  | 0  | 1  | 3                   | 15                 | A2             | GND            | S5           | S2B          |
|    | 1  | 1  | 1  | 4                   | 16                 | A1             | A1             | NC           | NC           |
|    |    |    |    |                     | 17                 |                |                | V+           | S1B          |
|    |    |    |    |                     | 18                 |                |                | GND          | V+           |
|    |    |    |    |                     | 19                 |                |                | A2           | GND          |
|    |    |    |    |                     | 20                 |                |                | A1           | A1           |

| <b>ORDERING INFORMATION:</b> |               |               |               |
|------------------------------|---------------|---------------|---------------|
| DG508AAK/883B                | 16 CDIP       | DG509AAK/883B | 16 CDIP       |
| DG508AAL/883B                | 16 FLATPACK   | DG509AAL/883B | 16 FLATPACK   |
| DG508AAP/883B                | 16 SIDE BRAZE | DG509AAP/883B | 16 SIDE BRAZE |
| DG508AAZ/883B                | 20 LCC        | DG509AAZ/883B | 20 LCC        |

## QUALITY ASSURANCE

Sampling and inspection procedures shall be in accordance with MIL-Prf-38535, Appendix A as specified in Mil-Std-883.

Screening shall be in accordance with Method 5004 of Mil-Std-883. Burn-in test Method 1015:

1. Test Condition, A, B, C, or D.
2. TA = +125°C minimum.
3. Interim and final electrical test requirements shall be specified in Table 2.

Quality conformance inspection shall be in accordance with Method 5005 of Mil-Std-883, including Groups A, B, C, and D inspection.

Group A inspection:

1. Tests as specified in Table 2.
2. Selected subgroups in Table 1, Method 5005 of Mil-Std-883 shall be omitted.

Group C and D inspections:

- a. End-point electrical parameters shall be specified in Table 1.
- b. Steady-state life test, Method 1005 of Mil-Std-883:
  1. Test condition A, B, C, D.
  2. TA = +125°C, minimum.
  3. Test duration, 1000 hours, except as permitted by Method 1005 of Mil-Std-883.

**TABLE 2. ELECTRICAL TEST REQUIREMENTS**

| Mil-Std-883 Test Requirements                                | Subgroups<br>per Method 5005, Table 1 |
|--------------------------------------------------------------|---------------------------------------|
| Interim Electric Parameters<br>Method 5004                   | 1                                     |
| Final Electrical Parameters<br>Method 5005                   | 1*, 2, 3, 9                           |
| Group A Test Requirements<br>Method 5005                     | 1, 2, 3, 9, 10, 11                    |
| Group C and D End-Point Electrical Parameters<br>Method 5005 | 1                                     |

\* PDA applies to Subgroup 1 only.