

**SCOPE: IMPROVED, QUAD, SPST ANALOG SWITCHES**

| <u>Device Type</u> | <u>Generic Number</u> |
|--------------------|-----------------------|
| 01                 | DG411A(x)/883B        |
| 02                 | DG412A(x)/883B        |
| 03                 | DG413A(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> |
|-----------------------|---------------------|------------------------|---------------------|
| <b>MAXIM</b>          | <b>SMD</b>          |                        |                     |
| K                     | E                   | GDIP1-T16 or CDIP2-T16 | J16                 |
| L                     | X                   | CDFP4-F16              | F16                 |
| Z                     | 2                   | CQCC1-N20              | L20                 |

**Absolute Maximum Ratings**

|   |   |
|---|---|
| V <sup>+</sup> to V <sup>-</sup> .....                            | 44V   |
| GND to V <sup>-</sup> .....                                       | 25V   |
| Logic Supply Voltage (V <sub>L</sub> ) to V <sup>-</sup> 2/ ..... | (GND-0.3V) to 44Vdc   |
| Digital Inputs, V <sub>S</sub> , V <sub>D</sub> 2/ .....          | (V <sup>-</sup> ) -2Vdc to (V <sup>+</sup> ) +2Vdc<br>or 30mA whichever occurs first. |
| Continuous Current, Any terminal .....                            | 30mA  |
| Source or drain Current (Pulsed at 1ms, 10% duty cycle max) ..... | 100mA   |
| 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 CERDIP(derate 10.0mW/°C above +70°C) .....                | 800mW   |
| 16 lead FLATPACK(derate 6.1mW/°C above +70°C) .....               | 485mW   |
| 20 lead LCC (derate 9.1 mW/°C above +70°C) .....                  | 727mW   |
| Junction Temperature T <sub>J</sub> .....                         | +150°C  |
| Thermal Resistance, Junction to Case, Θ <sub>JC</sub> :           |   |
| Case Outline 16 lead CERDIP .....                                 | 50°C/W  |
| Case Outline 16 lead FLATPACK .....                               | 65°C/W  |
| Case Outline 20 lead LCC .....                                    | 20°C/W  |
| Thermal Resistance, Junction to Ambient, Θ <sub>JA</sub> :        |   |
| Case Outline 16 lead CERDIP .....                                 | 100°C/W   |
| Case Outline 16 lead FLATPACK .....                               | 165°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 |
| Unipolar Supply Voltage (V <sup>+</sup> ) ..... | 12V             |
| (V <sup>-</sup> ) .....                         | 0V              |
| Bipolar Supply Voltage (V <sup>+</sup> ) .....  | 15V             |
| (V <sup>-</sup> ) .....                         | 15V             |
| Logic Supply Voltage (V <sub>L</sub> ) .....    | +5.25V          |

NOTE 1: 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.

NOTE 2: Signals on SX, DX or INX exceeding V<sup>+</sup> or V<sup>-</sup> are clamped by internal diodes. Limit forward current to maximum current ratings.

TABLE 1 ELECTRICAL TESTS

| TEST   | Symbol  | CONDITIONS <u>1/</u><br>-55 °C ≤ T <sub>A</sub> ≤ +125 °C<br>Unless otherwise specified                            |  | Group A<br>Subgroup | Device<br>type | Limits         |              | Units |
|--|---|--|--|---------------------|----------------|----------------|--------------|-------|
|  |   |  |  |                     |                | Min            | Max          |       |
| Drain-to-Source<br>ON Resistance                                     | r <sub>DS(ON)</sub>                               | V <sub>+</sub> =13.5V<br>V <sub>-</sub> =-13.5V<br>I <sub>S</sub> =-10mA<br>V <sub>D</sub> =±8.5V                  | V <sub>IN</sub> =0.8V                      | 1,3<br>2            | 01             | 0<br>0         | 35<br>45     | Ω     |
|  |   |  | V <sub>IN</sub> =2.4V                      | 1,3<br>2            | 02             | 0<br>0         | 35<br>45     |       |
|  |   |  | V <sub>IN</sub> =0.8V or<br>2.4V <u>2/</u> | 1,3<br>2            | 03             | 0<br>0         | 35<br>45     |       |
| Drain-to-Source<br>ON Resistance                                     | r <sub>DS(ON)</sub>                               | V <sub>+</sub> =10.8V<br>V <sub>-</sub> =0V<br>I <sub>S</sub> =-10mA<br>V <sub>D</sub> =3.0V<br>and 8.0V           | V <sub>IN</sub> =0.8V                      | 1,3<br>2            | 01             | 0<br>0         | 80<br>100    | Ω     |
|  |   |  | V <sub>IN</sub> =2.4V                      | 1,3<br>2            | 02             | 0<br>0         | 80<br>100    |       |
|  |   |  | V <sub>IN</sub> =0.8V or<br>2.4V <u>2/</u> | 1,3<br>2            | 03             | 0<br>0         | 80<br>100    |       |
| Source OFF<br>leakage current<br>and<br>Drain OFF<br>leakage current | I <sub>S(OFF)</sub><br>and<br>I <sub>D(OFF)</sub> | V <sub>+</sub> =16.5V<br>V <sub>-</sub> =-16.5V<br>V <sub>D</sub> =-15.5V<br>V <sub>S</sub> =15.5V                 | V <sub>IN</sub> =2.4V                      | 1<br>2,3            | 01             | -0.25<br>20.0  | 0.25<br>20.0 | nA    |
|  |   |  | V <sub>IN</sub> =0.8V                      | 1<br>2,3            | 02             | -0.25<br>-20.0 | 0.25<br>20.0 |       |
|  |   |  | V <sub>IN</sub> =0.8V or<br>2.4V <u>2/</u> | 1<br>2,3            | 03             | -0.25<br>-20.0 | 0.25<br>20.0 |       |
| Source OFF<br>leakage current<br>and<br>Drain OFF<br>leakage current | I <sub>S(OFF)</sub><br>and<br>I <sub>D(OFF)</sub> | V <sub>+</sub> =16.5V<br>V <sub>-</sub> =-16.5V<br>V <sub>D</sub> =15.5V<br>V <sub>S</sub> =-15.5V                 | V <sub>IN</sub> =2.4V                      | 1<br>2,3            | 01             | -0.25<br>20.0  | 0.25<br>20.0 | nA    |
|  |   |  | V <sub>IN</sub> =0.8V                      | 1<br>2,3            | 02             | -0.25<br>-20.0 | 0.25<br>20.0 |       |
|  |   |  | V <sub>IN</sub> =0.8V or<br>2.4V <u>2/</u> | 1<br>2,3            | 03             | -0.25<br>-20.0 | 0.25<br>20.0 |       |
| Channel ON<br>leakage current  | I <sub>D(ON)</sub><br>+<br>I <sub>S(ON)</sub>     | V <sub>+</sub> =16.5V<br>V <sub>-</sub> =-16.5V<br>V <sub>D</sub> =15.5V<br>V <sub>S</sub> =V <sub>D</sub> =±15.5V | V <sub>IN</sub> =2.4V                      | 1<br>2,3            | 01             | -0.4<br>40.0   | 0.4<br>40.0  | nA    |
|  |   |  | V <sub>IN</sub> =0.8V                      | 1<br>2,3            | 02             | -0.4<br>-40.0  | 0.4<br>40.0  |       |
|  |   |  | V <sub>IN</sub> =0.8V or<br>2.4V <u>2/</u> | 1<br>2,3            | 03             | -0.4<br>-40.0  | 0.4<br>40.0  |       |
| Input current<br>with V <sub>IN</sub> low                            | I <sub>IL</sub>                                   | Input under test=0.8V,<br>all others = 2.4V  |  | 1,2,3               | All            | -0.5           | +0.5         | μA    |
| Input current<br>with V <sub>IN</sub> high                           | I <sub>IH</sub>                                   | Input under test=2.4V,<br>all others = 0.8V  |  | 1,2,3               | All            | -0.5           | +0.5         | μA    |

TABLE 1 ELECTRICAL TESTS

| TEST                    | Symbol    | CONDITIONS $\underline{1/}$<br>-55 °C $\leq T_A \leq$ +125°C<br>Unless otherwise specified | Group A<br>Subgroup | Device<br>type | Limits       |              | Units   |
|-------------------------|-----------|--|---------------------|----------------|--------------|--------------|---------|
|                         |           |  |                     |                | Min          | Max          |         |
| Turn ON time            | $t_{ON}$  | See Figure 4,<br>$C_L=35pF, V_S=\pm 10V, R_L=300\Omega$                                    | 9,11<br>10          | All            | 0<br>0       | 175<br>240   | nS      |
|                         |           | See Figure 4, $V_+=12V, V_-=0V,$<br>$V_S=\pm 8V, C_L=35pF, R_L=300\Omega$                  | 9,11<br>10          | All            | 0<br>0       | 250<br>400   |         |
| Turn OFF time           | $t_{OFF}$ | See Figure 4,<br>$C_L=35pF, V_S=\pm 10V, R_L=300\Omega$                                    | 9,11<br>10          | All            | 0<br>0       | 145<br>160   | nS      |
|                         |           | See Figure 4, $V_+=12V, V_-=0V,$<br>$V_S=\pm 8V, C_L=35pF, R_L=300\Omega$                  | 9,11<br>10          | All            | 0<br>0       | 125<br>140   |         |
| Charge Injection        | Q         | See Figure 5, $V_{GEN}=0V, R_{GEN}=0\Omega,$<br>$C_L=10nF$                                 | 9                   | All            | -100         | +100         | pC      |
|                         |           | See Figure 5, $V_{GEN}=6.0V,$<br>$R_{GEN}=0\Omega, C_L=10nF,$<br>$V_+=12V, V_-=0V$         |                     |                | -100         | +100         |         |
| Positive Supply Current | $I_+$     | $V_+=16.5V, V_-=-16.5V,$<br>$V_{IN}=0V$ or 5.0V  | 1<br>2,3            | All            |              | +1.0<br>+5.0 | $\mu A$ |
|                         |           | $V_+=13.2V, V_-=0V, V_{IN}=0V$ or 5V,<br>$V_L=5.25V$                                       | 1<br>2,3            |                | +1.0<br>+5.0 |              |         |
| Negative Supply Current | $I_-$     | $V_+=16.5V, V_-=-16.5V,$<br>$V_{IN}=0V$ or 5.0V  | 1<br>2,3            | All            | -1.0<br>-5.0 |              | $\mu A$ |
|                         |           | $V_+=13.2V, V_-=0V, V_{IN}=0V$ or 5V,<br>$V_L=5.25V$                                       | 1<br>2,3            |                | -1.0<br>-5.0 |              |         |
| Logic Supply Current    | $I_L$     | $V_+=16.5V, V_-=-16.5V,$<br>$V_{IN}=0V$ or 5.0V  | 1<br>2,3            | All            |              | +1.0<br>+5.0 | $\mu A$ |
|                         |           | $V_+=13.2V, V_-=0V, V_{IN}=0V$ or 5V,<br>$V_L=5.25V$                                       | 1<br>2,3            |                | +1.0<br>+5.0 |              |         |
| Ground Current          | $I_{GND}$ | $V_+=16.5V, V_-=-16.5V,$<br>$V_{IN}=0V$ or 5.0V  | 1<br>2,3            | All            | -1.0<br>-5.0 |              | $\mu A$ |
|                         |           | $V_+=13.2V, V_-=0V, V_{IN}=0V$ or 5V,<br>$V_L=5.25V$                                       | 1<br>2,3            |                | -1.0<br>-5.0 |              |         |

NOTE 1:  $V_+=15V, V_-=-15V, V_L=5V$  and GND = 0V, unless otherwise specified.

NOTE 2:  $V_{IN}$ =input voltage to perform proper function.

| Ordering Information. |              | SMD #           | PKG.Code |
|-----------------------|--------------|-----------------|----------|
| 01                    | DG411AK/883B | 5962-9073101MEA | J16      |
| 01                    | DG411AL/883B | 5962-9073101MXC | F16      |
| 01                    | DG411AZ/883B | 5962-9073101M2A | L20      |
| 02                    | DG412AK/883B | 5962-9073102MEA | J16      |
| 02                    | DG412AL/883B | 5962-9073102MXC | F16      |
| 02                    | DG412AZ/883B | 5962-9073102M2A | L20      |
| 03                    | DG413AK/883B | 5962-9073103MEA | J16      |
| 03                    | DG413AL/883B | 5962-9073103MXC | F16      |
| 03                    | DG413AZ/883B | 5962-9073103M2A | L20      |

FIGURE 1 TERMINAL CONNECTIONS  
DEVICE TYPES 01, 02, 03

| CASE OUTLINES   | SMD=E OR X<br>MAXIM= K OR L |     | SMD = 2<br>MAXIM = Z |     |
|-----------------|-----------------------------|-----|----------------------|-----|
| TERMINAL NUMBER | TERMINAL SYMBOL             |     | TERMINAL SYMBOL      |     |
| 1               | INPUT 1                     | IN1 | NC                   |     |
| 2               | DRAIN 1                     | D1  | INPUT 1              | IN1 |
| 3               | SOURCE 1                    | S1  | DRAIN 1              | D1  |
| 4               | V-                          |     | SOURCE 1             | S1  |
| 5               | GROUND                      | GND | V-                   |     |
| 6               | SOURCE 4                    | S4  | NC                   |     |
| 7               | DRAIN 4                     | D4  | GROUND               | GND |
| 8               | INPUT 4                     | IN4 | SOURCE 4             | S4  |
| 9               | INPUT 3                     | IN3 | DRAIN 4              | D4  |
| 10              | DRAIN 3                     | D3  | INPUT 4              | IN4 |
| 11              | SOURCE 3                    | S3  | NC                   |     |
| 12              | V <sub>L</sub>              |     | INPUT 3              | IN3 |
| 13              | V+                          |     | DRAIN 3              | D3  |
| 14              | SOURCE 2                    | S2  | SOURCE 3             | S3  |
| 15              | DRAIN 2                     | D2  | V <sub>L</sub>       |     |
| 16              | INPUT2                      | IN2 | NC                   |     |
| 17              |                             |     | V+                   |     |
| 18              |                             |     | SOURCE 2             | S2  |
| 19              |                             |     | DRAIN 2              | D2  |
| 20              |                             |     | INPUT 2              | IN2 |

FIGURE 2. TRUTH TABLES

|        | DG411   | DG412   | DG413 | DG413 |
|--------|---------|---------|-------|-------|
| SWITCH | 1,2,3,4 | 1,2,3,4 | 1,4   | 2,3   |
| LOGIC  |         |         |       |       |
| 0      | ON      | OFF     | OFF   | ON    |
| 1      | OFF     | ON      | ON    | OFF   |

FIGURE 3:

Block Diagrams: See commercial datasheet or SMD 5962-90731

|       |   |       |                      |              |
|-------|---|-------|----------------------|--------------|
| ----- | Electrical Characteristics of DG411A/412A/413A/883B<br>for SMD 5962-90731 | ----- | 19-0338<br>Page 6 of | Rev. B<br>10 |
|-------|---|-------|----------------------|--------------|

FIGURE 4:

TEST CIRCUITS: Switching Times. See commercial datasheet or SMD 5962-90731

|       |   |       |                      |              |
|-------|---|-------|----------------------|--------------|
| ----- | Electrical Characteristics of DG411A/412A/413A/883B<br>for SMD 5962-90731 | ----- | 19-0338<br>Page 7 of | Rev. B<br>10 |
|-------|---|-------|----------------------|--------------|

FIGURE 5:

Charge Injection test circuit and waveforms. See Commercial datasheet or SMD 5962-90731

|       |   |       |                      |              |
|-------|---|-------|----------------------|--------------|
| ----- | Electrical Characteristics of DG411A/412A/413A/883B<br>for SMD 5962-90731 | ----- | 19-0338<br>Page 8 of | Rev. B<br>10 |
|-------|---|-------|----------------------|--------------|

## 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 = +125C 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 = +125C, 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, 10, 11                   |
| 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.

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