

**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> .....	(GND-0.3V) to 44Vdc
Digital Inputs, V <sub>S</sub> , V <sub>D</sub> .....	(V <sup>-</sup> ) -2Vdc to (V <sup>+</sup> ) +2Vdc 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> -55 °C ≤ T <sub>A</sub> ≤ +125 °C Unless otherwise specified		Group A Subgroup	Device type	Limits		Units
						Min	Max	
Drain-to-Source ON Resistance	r <sub>DS(ON)</sub>	V <sub>+</sub> =13.5V V <sub>-</sub> =-13.5V I <sub>S</sub> =-10mA V <sub>D</sub> =±8.5V	V <sub>IN</sub> =0.8V	1,3 2	01	0 0	35 45	Ω
			V <sub>IN</sub> =2.4V	1,3 2	02	0 0	35 45	
			V <sub>IN</sub> =0.8V or 2.4V <u>2/</u>	1,3 2	03	0 0	35 45	
Drain-to-Source ON Resistance	r <sub>DS(ON)</sub>	V <sub>+</sub> =10.8V V <sub>-</sub> =0V I <sub>S</sub> =-10mA V <sub>D</sub> =3.0V and 8.0V	V <sub>IN</sub> =0.8V	1,3 2	01	0 0	80 100	Ω
			V <sub>IN</sub> =2.4V	1,3 2	02	0 0	80 100	
			V <sub>IN</sub> =0.8V or 2.4V <u>2/</u>	1,3 2	03	0 0	80 100	
Source OFF leakage current and Drain OFF leakage current	I <sub>S(OFF)</sub> and I <sub>D(OFF)</sub>	V <sub>+</sub> =16.5V V <sub>-</sub> =-16.5V V <sub>D</sub> =-15.5V V <sub>S</sub> =15.5V	V <sub>IN</sub> =2.4V	1 2,3	01	-0.25 20.0	0.25 20.0	nA
			V <sub>IN</sub> =0.8V	1 2,3	02	-0.25 -20.0	0.25 20.0	
			V <sub>IN</sub> =0.8V or 2.4V <u>2/</u>	1 2,3	03	-0.25 -20.0	0.25 20.0	
Source OFF leakage current and Drain OFF leakage current	I <sub>S(OFF)</sub> and I <sub>D(OFF)</sub>	V <sub>+</sub> =16.5V V <sub>-</sub> =-16.5V V <sub>D</sub> =15.5V V <sub>S</sub> =-15.5V	V <sub>IN</sub> =2.4V	1 2,3	01	-0.25 20.0	0.25 20.0	nA
			V <sub>IN</sub> =0.8V	1 2,3	02	-0.25 -20.0	0.25 20.0	
			V <sub>IN</sub> =0.8V or 2.4V <u>2/</u>	1 2,3	03	-0.25 -20.0	0.25 20.0	
Channel ON leakage current	I <sub>D(ON)</sub> + I <sub>S(ON)</sub>	V <sub>+</sub> =16.5V V <sub>-</sub> =-16.5V V <sub>D</sub> =15.5V V <sub>S</sub> =V <sub>D</sub> =±15.5V	V <sub>IN</sub> =2.4V	1 2,3	01	-0.4 40.0	0.4 40.0	nA
			V <sub>IN</sub> =0.8V	1 2,3	02	-0.4 -40.0	0.4 40.0	
			V <sub>IN</sub> =0.8V or 2.4V <u>2/</u>	1 2,3	03	-0.4 -40.0	0.4 40.0	
Input current with V <sub>IN</sub> low	I <sub>IL</sub>	Input under test=0.8V, all others = 2.4V		1,2,3	All	-0.5	+0.5	μA
Input current with V <sub>IN</sub> high	I <sub>IH</sub>	Input under test=2.4V, all others = 0.8V		1,2,3	All	-0.5	+0.5	μA

TABLE 1 ELECTRICAL TESTS

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

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FIGURE 4:

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

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FIGURE 5:

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

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## 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 per Method 5005, Table 1
Interim Electric Parameters Method 5004	1
Final Electrical Parameters Method 5005	1*, 2, 3, 9, 10, 11
Group A Test Requirements Method 5005	1, 2, 3, 9, 10, 11
Group C and D End-Point Electrical Parameters Method 5005	1

\* PDA applies to Subgroup 1 only.