

**SCOPE: IMPROVED 8-CHANNEL/DUAL 4-CHANNEL  
CMOS ANALOG MULTIPLEXER**

<u>Device Type</u>	<u>Generic Number</u>	<u>Circuit Function</u>
01	DG408A(x)/883B	8-Channel Analog Multiplexer
02	DG409A(x)/883B	Dual 4-Channel Analog Multiplexer

**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-F16	16 LEAD FLATPACK	F16
Z	CQCC1-N20	20-Pin Ceramic LCC	L20

**Absolute Maximum Ratings**

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

V <sup>+</sup> to V <sup>-</sup> .....	-0.3V, 44V
V <sup>-</sup> to GND .....	-0.3V, 25V
Digital Inputs, S, D <u>1</u> / .....	(V <sup>-</sup> ) -2V to (V <sup>+</sup> ) +2V or 30mA whichever occurs first
Continuous Current, Any terminal .....	30mA
Peak Current, S or D (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 FLATPACK (derate 6.1mW/°C above +70°C) .....	485mW
16 lead CERDIP (derate 10.0mW/°C above +70°C) .....	800mW
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 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 20 lead LCC .....	110°C/W

**Recommended Operating Conditions**

Ambient Operating Range (T <sub>A</sub> ) .....	-55°C to +125°C
Positive Supply Voltage (V <sup>+</sup> ) .....	+15V
Negative Supply Voltage (V <sup>-</sup> ) .....	-15V
V <sub>AL</sub> (max) .....	0.8V
V <sub>AH</sub> (min) .....	2.4V

1/ Signals on SX, DX, EN, A0, A1, A2 exceeding V<sup>+</sup> or V<sup>-</sup> will be clamped by internal diodes.  
Limit forward current to the 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: DUAL SUPPLIES**

TEST	Symbol	CONDITIONS		Group A Subgroup	Device type	Limits Min 2/	Limits Max 2/	Units
		-55 °C <=T <sub>A</sub> <= +125°C V <sup>+</sup> =+15V, V <sup>-</sup> =-15V, GND=0V V <sub>AH</sub> =+2.4V, V <sub>AL</sub> =+0.8V Unless otherwise specified						
<b>SWITCH</b>								
Analog-Signal Range	V <sub>ANALOG</sub>		NOTE 3	1,2,3	All	-15	15	V
Drain-Source On Resistance	r <sub>DS(ON)</sub>	I <sub>S</sub> =-1.0mA, V <sub>D</sub> =±10V		1 2,3	All		100 125	Ω
On-resistance Matching between Channels	Δr <sub>DS(ON)</sub>	I <sub>S</sub> =-10mA, V <sub>D</sub> =±10V NOTE 4		1 2,3	All		8 10	Ω
On-resistance Flatness	r <sub>FLAT</sub>	I <sub>S</sub> =-10mA, V <sub>D</sub> =±5V or 0V		1 2,3	All		9 12	Ω
Source- Off Leakage Current	I <sub>S(OFF)</sub>	V <sub>D</sub> =±10V V <sub>S</sub> =±10V, V <sub>EN</sub> =0V		1 2,3	All	-0.5 -50	0.5 50	nA
Drain-Off Leakage Current	I <sub>D(OFF)</sub>	V <sub>S</sub> =±10mA, V <sub>D</sub> =±10V, V <sub>EN</sub> =0V		1 2,3	01	-1.0 -100	1.0 100	nA
				1 2,3	02	-1.0 -50	1.0 50	
Drain-On Leakage Current	I <sub>D(ON)</sub>	V <sub>D</sub> =V <sub>S</sub> =±10V, sequence each switch on		1 2,3	01	-1.0 -100	1.0 100	nA
				1 2,3	02	-1.0 -50	1.0 50	
<b>INPUT</b>								
Input Current/Voltage High	I <sub>AH</sub>	V <sub>IN</sub> = 2.4V, 15V		1,2,3	All	-1.0	1.0	μA
Input Current/Voltage Low	I <sub>AL</sub>	V <sub>EN</sub> =0V, 2.4V; V <sub>A</sub> =0V		1,2,3	All	-1.0	1.0	μA
<b>SUPPLY</b>								
Power Supply Range				1,2,3	All	±4.5	±20	V
Positive Supply Current	I+	V <sub>EN</sub> =V <sub>A</sub> =0V or 4.5V		1 2,3	All		30 75	μA
		V <sub>EN</sub> =2.4V, V <sub>A(ALL)</sub> =0V or 2.4V		1 2,3	All		0.5 2.0	mA
Negative Supply Current	I-	V <sub>EN</sub> =2.4V, V <sub>A(ALL)</sub> =0V or 2.4V		1 2,3	All	-1 -10	1 10	μA
<b>DYNAMIC</b>								
Transition Time	t <sub>TRANS</sub>	Figure 2		9 10,11	All		175 250	ns
Break-Before-Make interval	t <sub>OPEN</sub>	Figure 4		9	All	10		ns

**TABLE 1. ELECTRICAL TESTS: DUAL SUPPLIES**

TEST	Symbol	CONDITIONS	Group A Subgroup	Device type	Limits Min	Limits Max	Units
		-55 °C ≤ T <sub>A</sub> ≤ +125°C V <sup>+</sup> =+15V, V <sup>-</sup> =-15V, GND=0V V <sub>AH</sub> =+2.4V, V <sub>AL</sub> =+0.8V Unless otherwise specified					
Enable Turn-On Time	t <sub>ON(EN)</sub>	Figure 3	9 10,11	All		150 225	ns
Enable Turn-Off Time	t <sub>OFF(EN)</sub>	Figure 3	9 10,11	All		150 300	ns
Charge Injection	Q	Figure 5, NOTE 3	9	ALL		15	pC

**TABLE 1. ELECTRICAL TESTS: SINGLE SUPPLY**

TEST	Symbol	CONDITIONS	Group A Subgroup	Device type	Limits Min	Limits Max	Units
		-55 °C ≤ T <sub>A</sub> ≤ +125°C V <sup>+</sup> =+12V, V <sup>-</sup> =0V, GND=0V V <sub>AH</sub> =+2.4V, V <sub>AL</sub> =+0.8V Unless otherwise specified					
<b>SWITCH</b>							
Analog Signal Range	V <sub>ANALOG</sub>	NOTE 3	1,2,3	All	0	12	V
Drain-Source On-Resistance	r <sub>DS(ON)</sub>	I <sub>S</sub> =-1.0mA, V <sub>D</sub> =3V or 10V	1	All		175	Ω
<b>DYNAMIC</b>							
Transition Time NOTE 3	t <sub>TRANS</sub>	V <sub>S1</sub> =8V, V <sub>S8</sub> =0V, V <sub>A</sub> =0V, Figure 2	9	All		450	ns
Enable Turn-On Time NOTE 3	t <sub>ON(EN)</sub>	V <sub>AL</sub> =0V, V <sub>S1</sub> =5V, Figure 3	9	All		600	ns
Enable Turn-Off Time NOTE 3	t <sub>OFF(EN)</sub>	V <sub>AL</sub> =0V, V <sub>S1</sub> =5V, Figure 3	9	All		300	ns

NOTE 2: The algebraic convention where the most negative value is a minimum and the most positive value a maximum is used in this data sheet.

NOTE 3: Guaranteed by design.

NOTE 4:  $\Delta r_{DS(ON)} = r_{DS(ON)max} - r_{DS(ON)min}$ . On-resistance match between channels and flatness are guaranteed only with specified voltages. Flatness is defined as the difference between the maximum and minimum value of on-resistance as measured at the extremes of the specified analog signal range.

**FIGURE 2: Transition Time Diagrams:** See Commercial Data Sheet

**FIGURE 3: Enable Switching Time Diagrams:** See Commercial Data Sheet

**FIGURE 4: Break-Before-Make Interval Diagrams:** See Commercial Data Sheet

**FIGURE 5: Charge Injection Diagrams:** See Commercial Data Sheet

<b>ORDERING INFORMATION:</b>			
DG408AL/883B	16 FLATPACK	DG409AL/883B	16 FLATPACK
DG408AK/883B	16 CDIP	DG409AK/883B	16 CDIP
DG408AZ/883B	20 LCC	DG409AZ/883B	20 LCC

**TRUTH TABLE**

**TERMINAL CONNECTION**

A2	A1	A0	EN	DG408A ON SWITCH	TERMINAL NUMBER	01 DG408A	01 DG408A	02 DG409A	02 DG409A
X	X	X	0	None		F16 & J16	20LCC	F16 & J16	20LCC
0	0	0	1	1	1	A0	NC	A0	NC
0	0	1	1	2	2	EN	A0	EN	A0
0	1	0	1	3	3	V-	EN	V-	EN
0	1	1	1	4	4	S1	V-	S1a	V-
1	0	0	1	5	5	S2	S1	S2a	S1a
1	0	1	1	6	6	S3	NC	S3a	NC
1	1	0	1	7	7	S4	S2	S4a	S2a
1	1	1	1	8	8	D	S3	Da	S3a
					9	S8	S4	Db	S4a
				<b>DG409</b>	10	S7	D	S4b	Da
	<b>A1</b>	<b>A0</b>	<b>EN</b>	<b>ON SWITCH</b>	11	S6	NC	S3b	NC
	X	X	0	None	12	S5	S8	S2b	Db
	0	0	1	1	13	V+	S7	S1b	S4b
	0	1	1	2	14	GND	S6	V+	S3b
	1	0	1	3	15	A2	S5	GND	S2b
	1	1	1	4	16	A1	NC	A1	NC
					17		V+		S1b
					18		GND		V+
					19		A2		GND
					20		A1		A1

**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 per Method 5005, Table 1
Interim Electric Parameters Method 5004	1
Final Electrical Parameters Method 5005	1*, 2, 3, 9
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.