



CDG708_CDG709

4/8 Channel Multiplexers

Version: Rev 1.0.0 Date: 2025-6-18

Features ■■

- 1.8 V to 5.5 V single supply
- ± 2.5 V dual supply
- $3\ \Omega$ on resistance
- $0.75\ \Omega$ on resistance flatness
- 100 pA leakage currents
- 14 ns switching times
- Single 8-to-1 multiplexer CDG708
- Differential 4-to-1 multiplexer CDG709
- 16-lead TSSOP package
- Low power consumption
- Qualified for automotive applications
- TTL-/CMOS-compatible inputs

Description ■■

The CDG708/CDG709 are low voltage, CMOS analog multiplexers comprising eight single channels and four differential channels, respectively. The CDG708 switches one of eight inputs (S1 to S8) to a common output, D, as determined by the 3-bit binary address lines A0, A1, and A2. The CDG709 switches one of four differential inputs to a common differential output as determined by the 2-bit binary address lines A0 and A1. An EN input on both devices is used to enable or disable the device. When disabled, all channels are switched off.

Low power consumption and an operating supply range of 1.8 V to 5.5 V make the CDG708/CDG709 ideal for battery-powered, portable instruments. All channels exhibit break-before-make switching action preventing momentary shorting when switching channels. These switches are designed on an enhanced sub micron process that provides low power dissipation yet gives high switching speed, very low on resistance, and leakage currents.

On resistance is in the region of a few ohms and is closely matched between switches and very flat over the full signal range. These parts can operate equally well as either multiplexers or demultiplexers and have an input signal range that extends to the supplies.

The CDG708/CDG709 are available in a 16-lead TSSOP.

Application ■■

- Data acquisition systems
- Communication systems
- Relay replacement
- Audio and video switching
- Battery-powered systems

Contents

Features.....

- 1 -

Application.....

- 1 -

Description.....

- 1 -

Pin Configurations.....

- 3 -

Functional Block diagram.....

- 5 -

Absolute Maximum Ratings.....

- 6 -

Electrical Characteristics.....

- 6 -

Typical Characteristics.....

- 8 -

Test Circuit.....

- 9 -

Package Outline Dimensions.....

- 10 -

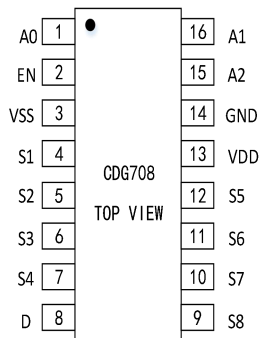
Package/Ordering Information.....

- 11 -

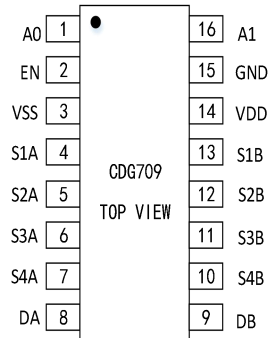
Revision Log.....

- 12 -

Pin Configurations



CDG708 Pin Configuration



CDG709 Pin Configuration

CDG708 Pin Description

Pin NO.	Pin Name	Description
1	A0	Digital Input. Channel selection control line A0
2	EN	Digital Input. Switch enable control line
3	V _{SS}	Negative Power Supply Pin in Dual-Supply Applications. For single-supply applications, it should be tied to GND.
4	S1	Source Terminal. Can be an input or output.
5	S2	Source Terminal. Can be an input or output.
6	S3	Source Terminal. Can be an input or output.
7	S4	Source Terminal. Can be an input or output.
8	D	Drain Terminal. Can be an input or output.
9	S8	Source Terminal. Can be an input or output.
10	S7	Source Terminal. Can be an input or output.
11	S6	Source Terminal. Can be an input or output.
12	S5	Source Terminal. Can be an input or output.
13	V _{DD}	Positive Power Supply Pin.
14	GND	Ground Reference.
15	A2	Digital Input. Channel selection control line A1
16	A1	Digital Input. Channel selection control line A2

CDG709 Pin Description

Pin NO.	Pin Name	Description
1	A0	Digital Input. Channel selection control line A0
2	EN	Digital Input. Switch enable control line
3	V _{SS}	Negative Power Supply Pin in Dual-Supply Applications. For single-supply applications, it should be tied to GND.
4	S1A	Source Terminal. Can be an input or output.
5	S2A	Source Terminal. Can be an input or output.
6	S3A	Source Terminal. Can be an input or output.
7	S4A	Source Terminal. Can be an input or output.
8	DA	Drain Terminal. Can be an input or output.
9	DB	Drain Terminal. Can be an input or output.
10	S4B	Source Terminal. Can be an input or output.
11	S3B	Source Terminal. Can be an input or output.
12	S2B	Source Terminal. Can be an input or output.
13	S1B	Source Terminal. Can be an input or output.
14	V _{DD}	Positive Power Supply Pin.
15	GND	Ground Reference.
16	A1	Digital Input. Channel selection control line A1

CDG708 Truth Table

A2	A1	A0	EN	Switch Condition
X	X	X	0	None
0	0	0	1	1
0	0	1	1	2
0	1	0	1	3
0	1	1	1	4
1	0	0	1	5
1	0	1	1	6
1	1	0	1	7
1	1	1	1	8

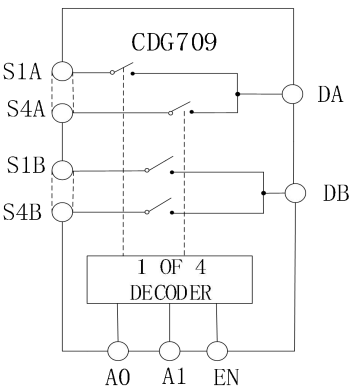
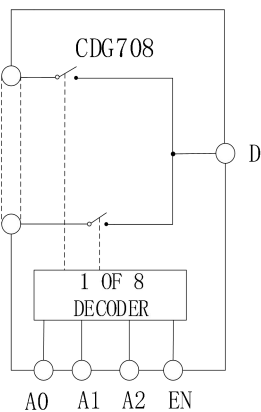
X=Don not care

CDG709 Truth Table

A1	A0	EN	Switch Condition
X	X	0	None
0	0	1	1
0	1	1	2
1	0	1	3
1	1	1	4

X=Don not care

Functional Block diagram



Functional Block Diagrams

CDG706 Truth Table

A3	A2	A1	A0	EN	ON Switch
X	X	X	X	0	None
0	0	0	0	1	1
0	0	0	1	1	2
0	0	1	0	1	3
0	0	1	1	1	4
0	1	0	0	1	5
0	1	0	1	1	6
0	1	1	0	1	7
0	1	1	1	1	8
1	0	0	0	1	9
1	0	0	1	1	10
1	0	1	0	1	11
1	0	1	1	1	12
1	1	0	0	1	13
1	1	0	1	1	14
1	1	1	0	1	15
1	1	1	1	1	16

CDG707 Truth Table

A2	A1	A0	EN	ON Switch Pair
X	X	X	0	None
0	0	0	1	1
0	0	1	1	2
0	1	0	1	3

0	1	1	1	4
1	0	0	1	5
1	0	1	1	6
1	1	0	1	7
1	1	1	1	8

X=Don not care

Absolute Maximum Ratings

Parameter	Rating
V _{DD} to GND	−0.3 V to +7 V
Analog, Digital Inputs ¹	−0.3 V to V _{DD} + 0.3 V or 30 mA, whichever occurs first
Peak Current, S or D	100 mA
Continuous Current, S or D	30mA
Operating Temperature Range	−40°C to +85°C
Storage Temperature Range	−65°C to +150°C
Junction Temperature	150°C
TSSOP Package, Power Dissipation	432mW
θ _{JA} Thermal Impedance	150.4°C/W
θ _{JC} Thermal Impedance	27.6°C/W
Lead Temperature, Soldering Vapor Phase(60 sec)	215°C
IR Reflow, Peak Temperature (<20sec)	220°C

Electrical Characteristics

(V_{DD} = 5 V ± 10%, V_{SS} = 0 V, GND = 0 V, +25°C, unless otherwise noted.)

PARAMETER	COND IT ION	CDG708, CDG709			
		MIN	TYP	MAX	UNIT
Analog Switch					
Analog Signal Range		0		V _{DD}	V
On Resistance (Ron)	S = 0 V to V _{DD} , I _{DS} = 10 mA;		3	4.5	Ω
On Resistance Match Between Channels (Δ Ron)	S = 0 V to V _{DD} , I _{DS} = 10 mA;		0.4		Ω
On Resistance Flatness(R _{FLAT} (ON))			0.75		Ω
Leakage Currents					
Source Off Leakage, I _S (Off)	V _{DD} =5.5V, V _D = 4.5 V/1 V, V _S = 1 V/4.5 V		±0.01	±0.1	nA

Drain Off Leakage, I_D (Off)	$V_D = 4.5\text{ V}/1\text{ V}, V_S = 1\text{ V}/4.5\text{ V}$		± 0.01	± 0.1	nA
Channel On Leakage, I_D, I_S (On)	$V_D = 4.5\text{ V}/1\text{ V}, V_S = 1\text{ V}/4.5\text{ V}$		± 0.01	± 0.1	nA
Digital Inputs					
Input High Voltage, V_{INH}		2.4			V
Input Low Voltage, V_{INL}				0.8	V
Input Current I_{INL} or I_{INH}			0.05		μA
Digital Input Capacitance, C_{IN}			2		pF
Dynamic Characteristics					
$t_{\text{TRANSITION}}$	$R_L=300\Omega, C_L=35\text{pF}, V_{S1}=3\text{V}/0\text{V}, V_{S8}=0\text{V}/3\text{V}$		14		ns
Break-Before-Make Time Delay, t_{OPEN}	$R_L=300\Omega, C_L=35\text{pF}$		8		ns
t_{ON} (EN)	$R_L=300\Omega, C_L=35\text{pF}, V_S=3\text{V}$		14		ns
t_{OFF} (EN)	$R_L=300\Omega, C_L=35\text{pF}, V_S=3\text{V}$		7		ns
Charge Injection	$V_S=2.5\text{V}, R_S=0\Omega, C_L=1\text{nF}$		± 3		pC
Off Isolation	$R_L=50\Omega, C_L=5\text{pF}, f=10\text{MHz}$		-60		dB
Power Requirements					
I_{DD}	$V_{DD}=5.5\text{V}, \text{Digital inputs}=0\text{V or }5.5\text{V}$		0.001	1.0	μA

($V_{DD} = 3\text{ V} \pm 10\%$, $V_{SS} = 0\text{ V}$, $\text{GND} = 0\text{ V}$, $+25^\circ\text{C}$, unless otherwise noted.)

PARAMETER	CONDIT ION	CDG708, CDG709			
		MIN	TYP	MAX	UNIT
Analog Switch					
Analog Signal Range		0		V _{DD}	V
On Resistance (Ron)	S = 0 V to V _{DD} , I _{DS} = 10 mA;		8	14	Ω
On Resistance Match Between Channels (ΔRon)	S = 0 V to V _{DD} , I _{DS} = 10 mA;		0.4		Ω
On Resistance Flatness(RFLAT (ON))			0.75		Ω
Leakage Currents					
Source Off Leakage, I _S (Off)	V _{DD} =3.3V,V _D = 1V/3 V, V _S = 3 V/1 V		±0.01	±0.1	nA
Drain Off Leakage, I _D (Off)	V _D = 1 V/3 V, V _S = 3 V/1 V		±0.01	±0.1	nA
Channel On Leakage, I _D , I _S (On)	V _D = V _S = 1 V or 3 V		±0.01	±0.1	nA
Digital Inputs					
Input High Voltage, VINH		2.0			V
Input Low Voltage, VINL				0.8	V
Input Current IINL or IINH			0.05		μA
Digital Input Capacitance, CIN			2		pF
Dynamic Characteristics					
t _{TRANSITION}	R _L =300 Ω,C _L =35pF,V _{S1} =2V/0V,V _{S8} =0V/2V		18		ns

Break-Before-Make Time Delay, t_{OPEN}	$R_L=300\Omega, C_L=35\text{pF}$	8		ns
$t_{\text{ON}}(\text{EN})$	$R_L=300\Omega, C_L=35\text{pF}, V_S=2\text{V}$	18		ns
$t_{\text{OFF}}(\text{EN})$	$R_L=300\Omega, C_L=35\text{pF}, V_S=2\text{V}$	8		ns
Charge Injection	$V_S=1.5\text{V}, R_S=0\Omega, C_L=1\text{nF}$	± 3		pC
Off Isolation	$R_L=50\Omega, C_L=5\text{pF}, f=10\text{MHz}$	-60		dB
Power Requirements				
I_{DD}	$V_{\text{DD}}=3.3\text{V}, \text{Digital inputs}=0\text{V or } 3.3\text{V}$	0.001	1.0	μA

Typical Characteristics

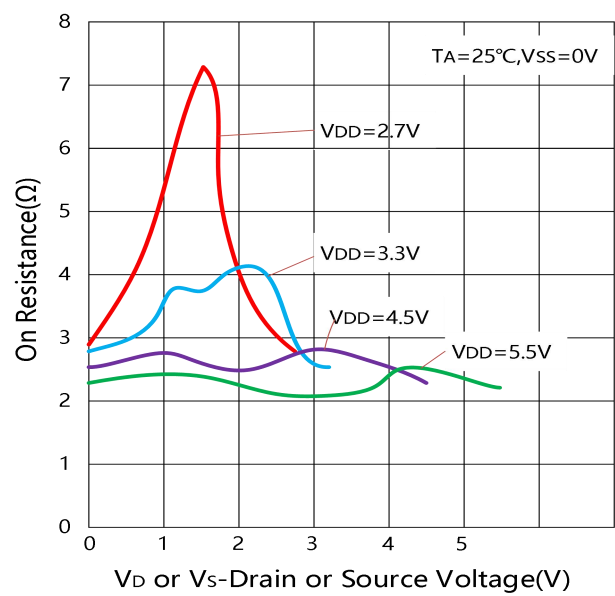


Figure 1. On Resistance as a Function of VD
Different Temperatures,

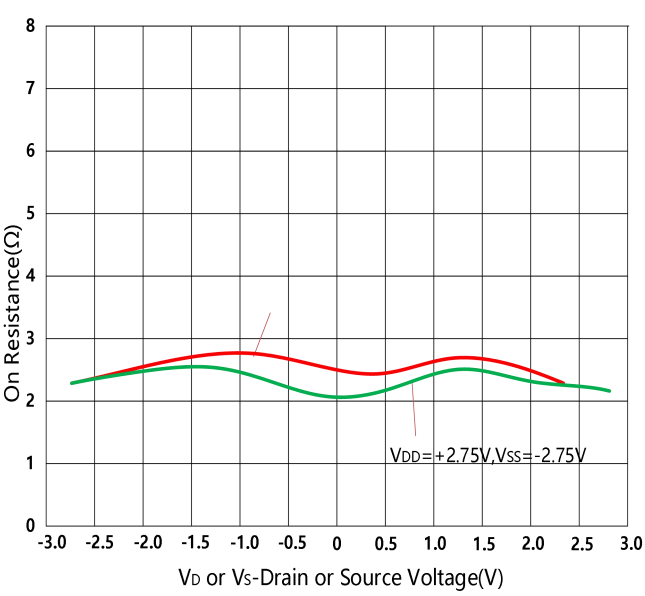


Figure 2. On Resistance as a Function of VD
(VS) for Dual Supply

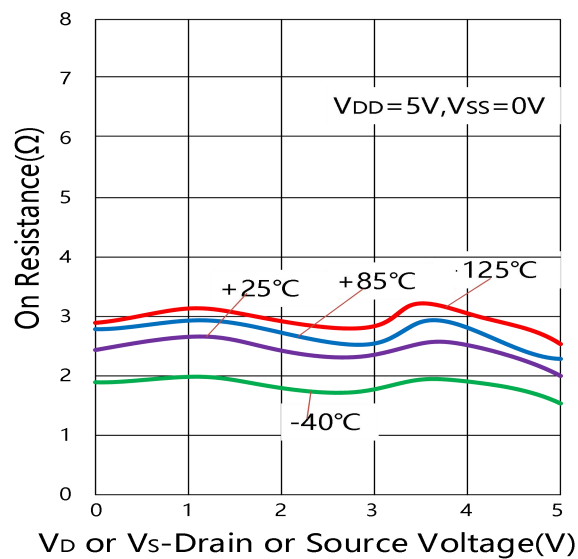


Figure 3. On Resistance as a Function of VD (VS) for Single Supply

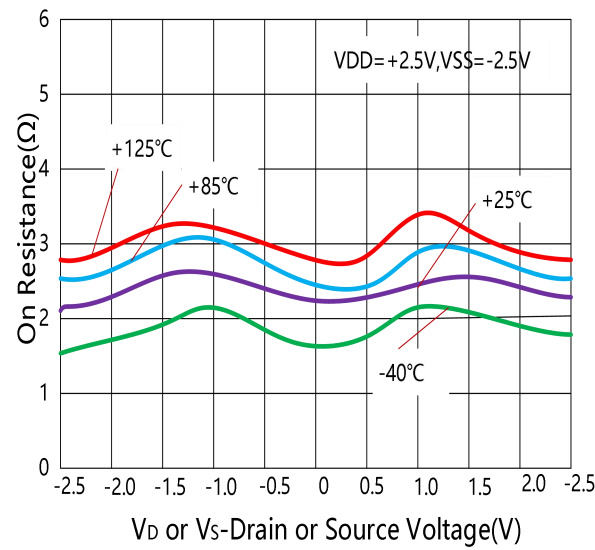


Figure 4. On Resistance as a Function of VD (VS) for Different Temperatures, Dual Supply

Test Circuit

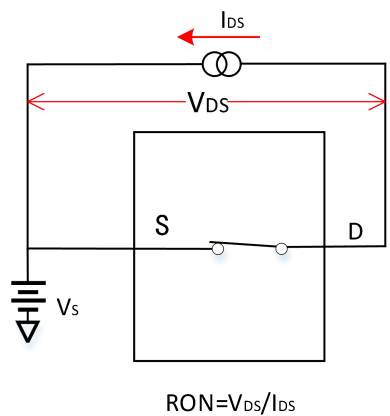


Figure 5. On Resistance

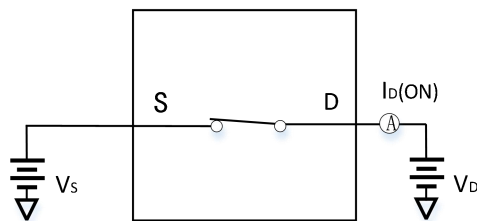


Figure 6. On Leakage

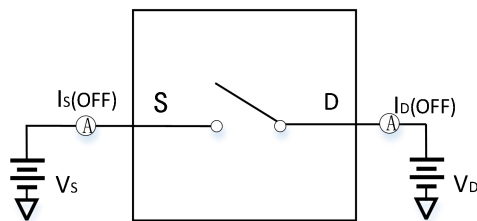
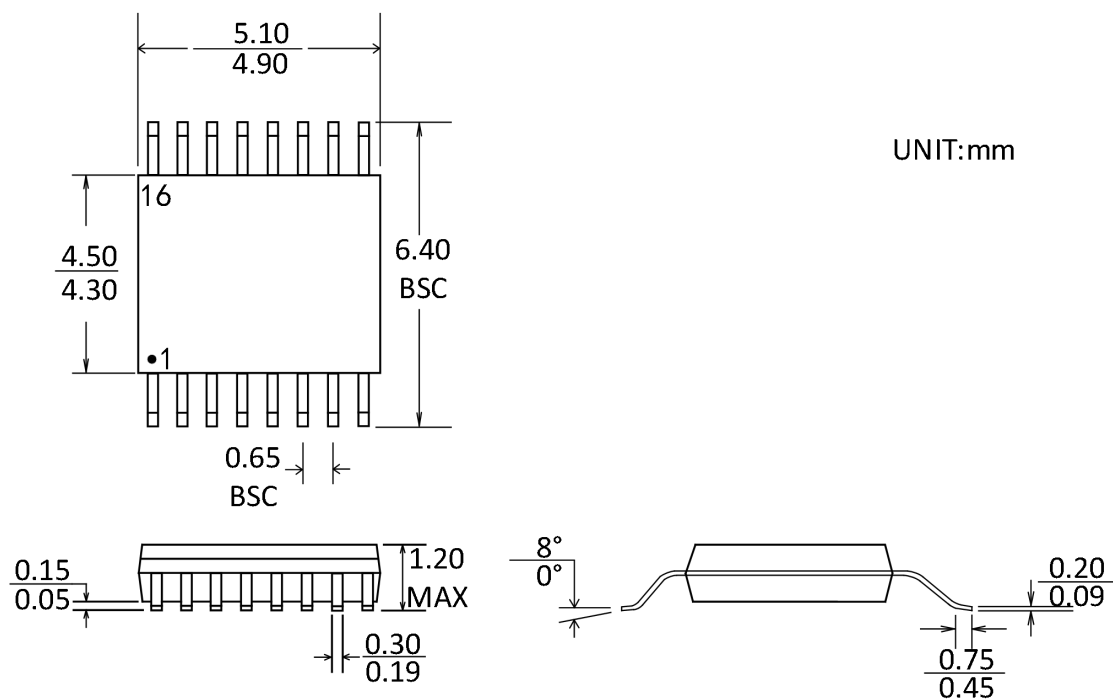


Figure 7. Off Leakage

TSSOP-16

Package/Ordering Information

MODEL	TEMPERATURE	PACKAGE DESCRIPTION	PACKAGE OPTION
CDG708ATS16	-40°C~125°C	TSSOP-16	Tape and Reel, 2500
CDG708ATS16-RL	-40°C~125°C	TSSOP-16	Tape and Reel, 3000
CDG708ATS16-REEL	-40°C~125°C	TSSOP-16	Tape and Reel, 4000
CDG709ATS16	-40°C~125°C	TSSOP-16	Tape and Reel, 2500
CDG709ATS16-RL	-40°C~125°C	TSSOP-16	Tape and Reel, 3000
CDG709ATS16-REEL	-40°C~125°C	TSSOP-16	Tape and Reel, 4000

Revision Log

Version	Revision date	Change content	Reason for Change	Modified by	Reviewed By	Note
V1.0	2025.6.18	Initial version	Regular update	WW	LYL	