

Features

- 1.8 V to 5.5 V single supply
- Low on resistance (2.5 Ω Typ)
- Low on resistance flatness
- -3 dB bandwidth > 200 MHz
- Rail-to-rail operation
- 16-lead TSSOP and SOP packages
- Fast switching times: $t_{ON} = 16$ ns $t_{OFF} = 10$ ns
- Typical power consumption: (< 0.01 μ W)
- TTL/CMOS compatible

Application

- Cell phones
- Video switching
- Communication systems
- Battery-powered systems
- USB 1.1 signal switching circuits
- Mechanical reed relay replacement

Description

The CBMG711, CBMG712, and CBMG713 are monolithic CMOS devices containing four independently selectable switches. These switches are designed on an advanced submicron process that provides low power dissipation yet gives high switching speed, low on resistance, low leakage currents, and high bandwidth.

They are designed to operate from a single 1.8 V to 5.5 V supply, making them ideal for use in battery-powered instruments and with the new generation of DACs and ADCs from Corebai. Fast switching times and high bandwidth make the parts suitable for switching USB 1.1 data signals and video signals.

The CBMG711, CBMG712, and CBMG713 contain four independent single-pole/single-throw (SPST) switches. The CBMG711 and CBMG712 differ only in that the digital control logic is inverted. The CBMG711 switches are turned on with a logic low on the appropriate control input, while a logic high is required to turn on the switches of the CBMG712. The CBMG713 contains two switches whose digital control logic is similar to the CBMG711, while the logic is inverted on the other two switches.

Each switch conducts equally well in both directions when On. The CBMG713 exhibits break-before-make switching action.

The CBMG711/CBMG712/CBMG713 are available in 16-lead TSSOP and 16-lead SOP packages.

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Product Highlights

1. 1.8 V to 5.5 V Single-Supply Operation. The CBMG711, CBMG712, and CBMG713 offer high performance and are fully specified and guaranteed with 3V and 5V supply rails.
2. Very Low R_{ON} (4.5Ω maximum at 5 V, 8Ω maximum at 3V). At supply voltage of 1.8V, R_{ON} is typically 35Ω over the temperature range.
3. Low On Resistance Flatness.
4. -3dB Bandwidth >200 MHz.
5. Low Power Dissipation. CMOS construction ensures low power dissipation.
6. Fast t_{ON}/t_{OFF} .
7. Break-Before-Make Switching. This prevents channel shorting when the switches are configured as a multiplexer (CBMG713 only).
8. 16-Lead TSSOP and 16-Lead SOP Packages.

Pin Configurations

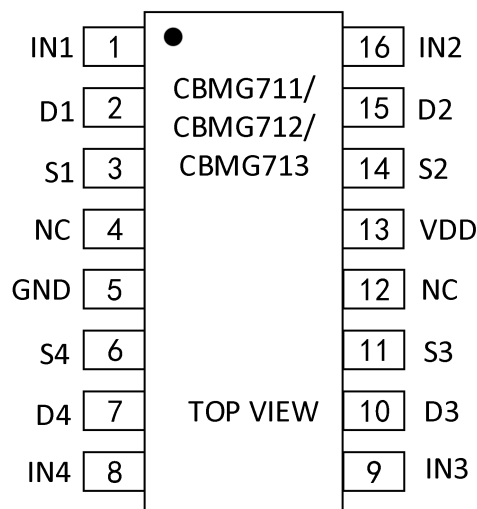


Figure 1. TSSOP16 Pin Configuration

Table 1. Pin description

Pin No.	Pin Name	Description
1	IN1	Digital Control Input. Its logic state controls the status of the Switch S1-D1.

2	D1	Drain Pin. Can be used as input or output.
3	S1	Source Pin. Can be used as input or output.
4	NC	Not internally connected.
5	GND	The most negative power supply pin.
6	S4	Source Pin. Can be used as input or output.
7	D4	Drain Pin. Can be used as input or output.
8	IN4	Digital Control Input. Its logic state controls the status of the Switch S4-D4.
9	IN3	Digital Control Input. Its logic state controls the status of the Switch S3-D3.
10	D3	Drain Pin. Can be used as input or output.
11	S3	Source Pin. Can be used as input or output.
12	NC	Not internally connected.
13	V _{DD}	The most positive power supply pin.
14	S2	Source Pin. Can be used as input or output.
15	D2	Drain Pin. Can be used as input or output.
16	IN2	Digital Control Input. Its logic state controls the status of the Switch S2-D2.

Functional Block diagram

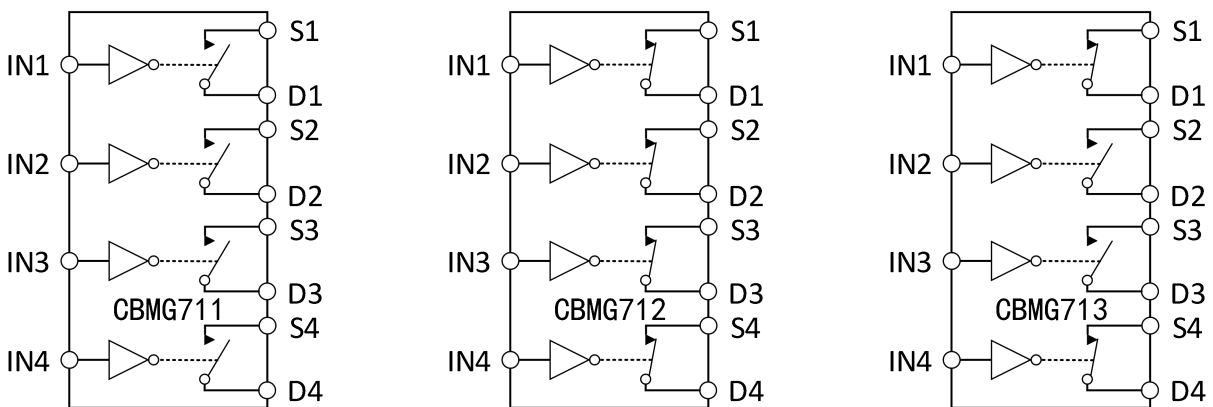


Figure 2. Switches shown for a logic "1" input

Table 2. Truth Table(CBMG711/CBMG712)

CBMG711 In	CBMG712 In	Switch Condition
0	1	ON

1	0	OFF
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Table 3. Truth Table(CBMG713)

Logic	Switch 1, 4	Switch 2, 3
0	OFF	ON
1	ON	OFF

Absolute Maximum Ratings ⁽¹⁾

- V_{DD} to GND : -0.3 V to +6 V
- Analog, Digital Inputs1 : -0.3 V to $V_{DD} + 0.3$ V or 30 mA, whichever occurs first
- Peak Current, S or D : 100 mA(Pulsed at 1 ms, 10% duty cycle maximum)
- 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 : 430mW
- θ_{JA} Thermal Impedance : 150°C/W
- θ_{JC} Thermal Impedance : 27°C/W
- SOP Package, Power Dissipation : 520 mW
- θ_{JA} Thermal Impedance : 125°C/W
- θ_{JC} Thermal Impedance : 42°C/W
- Lead Temperature, Soldering
Vapor Phase(60 sec) : 215°C
Infrared(15 sec) : 220°C
- Soldering (Pb-Free)
Reflow, Peak Temperature : 260(+0/-5)°C
Time at Peak Temperature : 20 to 40 sec
- ESD : 2 kV

Electrical Characteristics

VDD = +5 V±10%, GND = 0 V. All specifications -40°C to +85°C, unless otherwise noted.

Table 4.

PARAMETER	+25°C			-40°C to +85°C			Test Conditions	UNIT
	Min	Typ	Max	Min	Typ	Max		
Analog Switch								
Analog Signal Range				0V to V _{DD}				V
On Resistance (R _{ON})	--	2.5	4	--	--	4.5	V _S =0V to V _{DD} , I _S =-10mA; See Figure 6	Ω
On Resistance Match Between Channels (ΔR _{ON})				--	0.05	0.3	V _S =0 V to V _{DD} , I _S =-10mA	Ω
On Resistance Flatness (R _{FLAT(ON)})	--	0.5	--	--	--	1.0	V _S =0 V to V _{DD} , I _S =-10mA	Ω
Leakage Currents V _{DD} =+5.5V								
Source Off Leakage I _S (Off)	--	±0.01	±0.1	--	--	±0.2	V _S =4.5V/1V, V _D =1V/4.5V; See Figure 7	nA
Drain Off Leakage I _D (Off)	--	±0.01	±0.1	--	--	±0.2	V _S =4.5V/1V, V _D =1V/4.5V; See Figure 7	nA
Channel On Leakage I _D , I _S (On)	--	±0.01	±0.1	--	--	±0.2	V _S =V _D =1V, or 4.5V; See Figure 8	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}	--	0.005	--	--	--	±0.1	V _{IN} =V _{INL} or V _{INH}	μA
Dynamic Characteristics								
t _{ON}	--	11	--	--	--	16	R _L =300Ω, C _L =35pF, V _S =3V	ns
t _{OFF}	--	6	--	--	--	10	R _L =300Ω, C _L =35pF, V _S =3V	ns
Break-Before-Make Time Delay, t _D (CBMG713 Only)	--	6	--	1	--	--	R _L =300Ω, C _L =35pF, V _{S1} =V _{S2} =3V;	ns
Charge Injection	--	3	--				V _S =2V; R _S =0Ω, C _L =1nF;	pC
Off Isolation	--	-58	--				R _L =50Ω, C _L =5pF, f=10MHz	dB
	--	-78	--				R _L =50Ω, C _L =5pF, f=1MHz	dB

Channel-to-Channel Crosstalk	--	-90	--				$R_L=50\Omega, C_L=5pF, f=10MHz;$	dB
Bandwidth -3 dB	--	200	--				$R_L=50\Omega, C_L=5pF;$	MHz
C_S	--	10	--					pF
C_D	--	10	--					pF
C_D, C_S (On)	--	22	--					pF
Power Requirements								
I_{DD}	--	0.001	--	--	--	1.0	$V_{DD}=+5.5V, \text{ Digital inputs}=0V$ or 5V	μA

VDD = +3 V±10%, GND = 0 V. All specifications -40°C to +85°C, unless otherwise noted.

Table 5.

PARAMETER	+25°C			-40°C to +85°C			Test Conditions	UNIT
	Min	Typ	Max	Min	Typ	Max		
Analog Switch								
Analog Signal Range				0V to V_{DD}				V
On Resistance (R_{ON})	--	5	--	--	5.5	8	$V_S=0V \text{ to } V_{DD}, I_S=-10mA;$ See Figure 6	Ω
On Resistance Match Between Channels (ΔR_{ON})	--	0.1	--	--	--	--	$V_S=0V \text{ to } V_{DD}, I_S=-10mA$	Ω
On Resistance Flatness ($R_{FLAT}(ON)$)	--	--	--	--	2.5	--	$V_S=0V \text{ to } V_{DD}, I_S=-10mA$	Ω
Leakage Currents							$V_{DD}=+3.3V$	
Source Off Leakage I_S (Off)	--	±0.01	±0.1	--	--	±0.2	$V_S=3V/1V, V_D=1V/3V;$ See Figure 7	nA
Drain Off Leakage I_D (Off)	--	±0.01	±0.1	--	--	±0.2	$V_S=3V/1V, V_D=1V/3V;$ See Figure 7	nA
Channel On Leakage I_D, I_S (On)	--	±0.01	±0.1	--	--	±0.2	$V_S=V_D=1V, \text{ or } 3V;$ See Figure 8	nA
Digital Inputs								
Input High Voltage, V_{INH}				2.0	--	--		V
Input Low Voltage, V_{INL}				--	--	0.4		V
Input Current I_{INL} or I_{INH}	--	0.005	--	--	--	±0.1	$V_{IN}=V_{INL}$ or V_{INH}	μA
Dynamic Characteristics								
t_{ON}	--	13	--	--	--	20	$R_L=300\Omega, C_L=35pF, V_S=2V$	ns

t_{OFF}	--	7	--	--	--	12	$R_L=300\Omega, C_L=35pF, V_S=2V$	ns
Break-Before-Make Time Delay, t_D (CBMG713 Only)	--	7	--	1	--	--	$R_L=300\Omega, C_L=35pF, V_{S1}=V_{S2}=2V;$	ns
Charge Injection	--	3	--				$V_S=1.5V; R_S=0\Omega, C_L=1nF;$	pC
Off Isolation	--	-58	--				$R_L=50\Omega, C_L=5pF, f=10MHz$	dB
	--	-78	--				$R_L=50\Omega, C_L=5pF, f=1MHz$	dB
Channel-to-Channel Crosstalk	--	-90	--				$R_L=50\Omega, C_L=5pF, f=10MHz;$	dB
Bandwidth -3 dB	--	200	--				$R_L=50\Omega, C_L=5pF;$	MHz
C_S	--	10	--					pF
C_D	--	10	--					pF
C_D, C_S (On)	--	22	--					pF
Power Requirements								
I_{DD}	--	0.001	--	--	--	1.0	$V_{DD}=+3.3V, \text{ Digital inputs}=0V$ or 3V	μA

Typical Characteristics

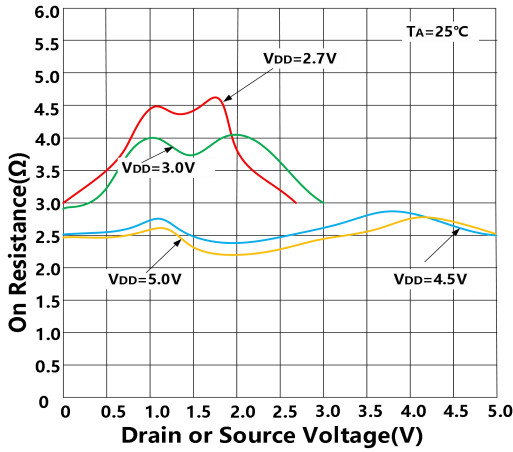


Figure 3. On Resistance vs. V_D (V_S)

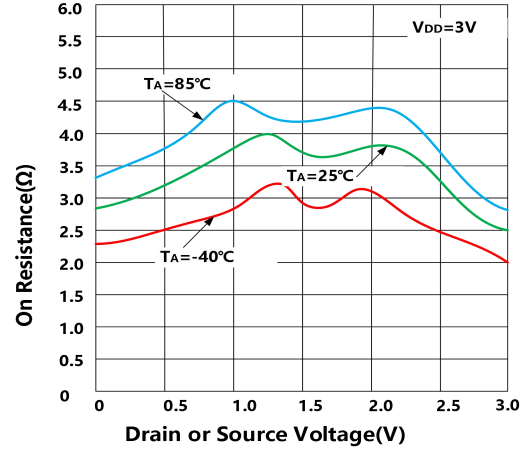


Figure 4. On Resistance as a Function of V_D (V_S) for Different Temperatures, $V_{DD} = 3\text{V}$

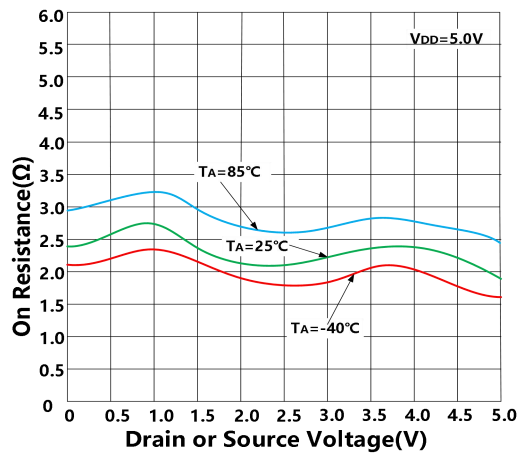


Figure 5. On Resistance as a Function of V_D (V_S) for Different Temperatures, $V_{DD} = 5\text{V}$

Test Circuit

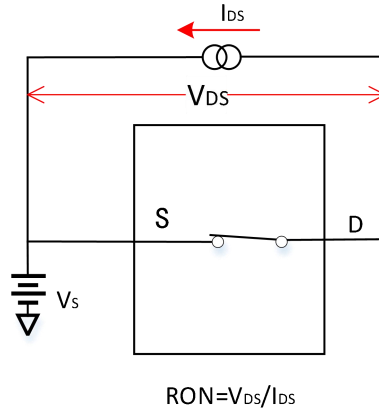


Figure 6. On Resistance

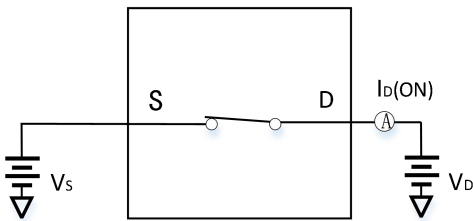


Figure 7. On Leakage

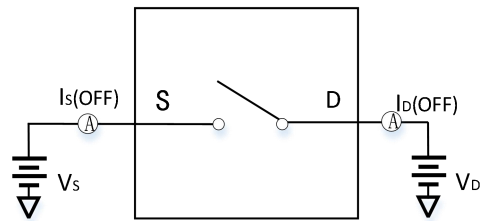


Figure 8. Off Leakage

Package Outline Dimensions

TSSOP-16

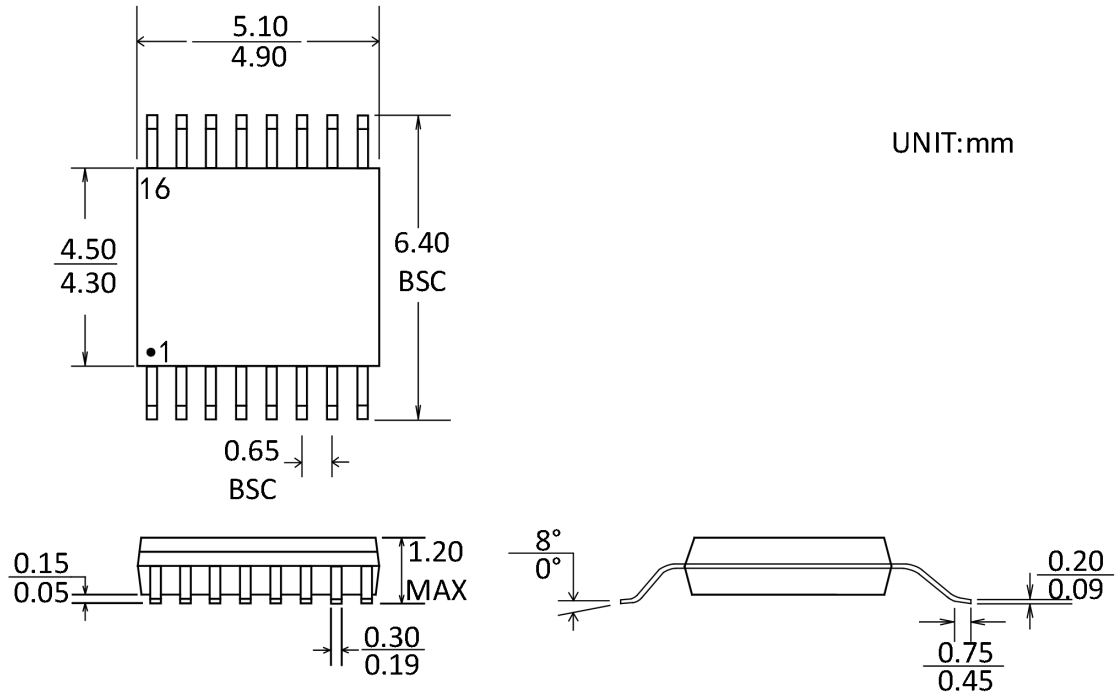


Figure 9. 16-Lead Thin Shrink Small Outline Package [TSSOP]

SOP-16

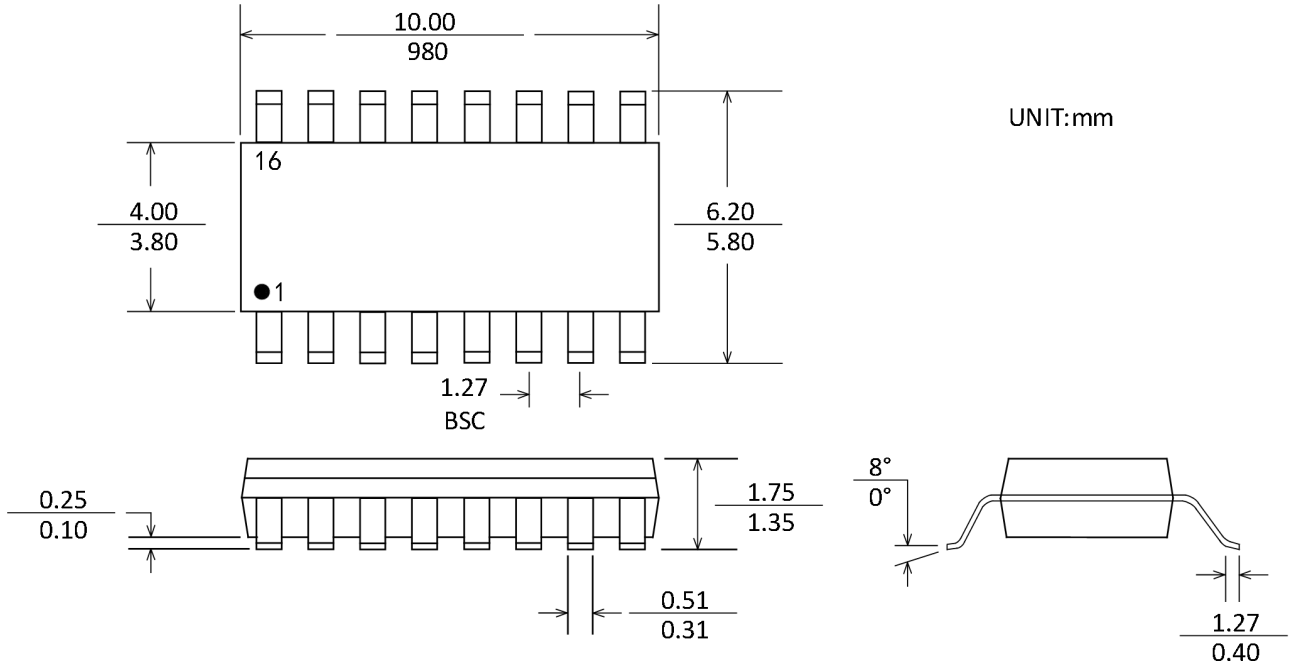


Figure 10. 16-Lead Standard Small Outline Package [SOP]

Package/Ordering Information

PRODUCT TYPE	OPERATING TEMPERATURE	PACKAGE	PACKAGE MARKING	NUMBER OF PACKAGES
CBMG711AS16	-40°C~85°C	SOP-16		Tape and Reel, 2500
CBMG711ATS16	-40°C~85°C	TSSOP-16		Tape and Reel, 2500
CBMG712AS16	-40°C~85°C	SOP-16		Tape and Reel, 2500
CBMG712ATS16	-40°C~85°C	TSSOP-16		Tape and Reel, 2500
CBMG713AS16	-40°C~85°C	SOP-16		Tape and Reel, 2500
CBMG713ATS16	-40°C~85°C	TSSOP-16		Tape and Reel, 2500