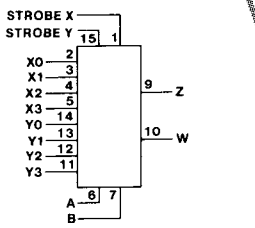
CMOS Dual 4-Channel Analog Data Selector

High-Voltage Types (20-Volt Rating)



FUNCTIONAL DIAGRAM

Features:

- *Wide range of digital and analog signal levels:*
  Digital: 3 to 20 V
  Analog: 0 to 20 V_{p-p}
- *Low ON-state resistance: 120 Ω typ. at 15 V*
- *Break-Before-Make switching eliminates channel overlap*
- *100% tested for quiescent current at 20 V*
- *5-V, 10-V, and 15-V parametric ratings*
- *Maximum input current of 1 μA at 18 V over full package-temperature range; 100 nA at 18 V and 25°C*
- *Noise margin (full package-temperature range) = 1 V at V_{DD}=5 V*
  2 V at V_{DD}=10 V
  2.5 V at V_{DD}=15 V
- *Meets all requirements of JEDEC Standard No. 13B, "Standard Specifications for Description of 'B' Series CMOS Devices"*

■ CD4529B CMOS dual 4-channel analog data selector consists of digitally controlled analog switches having low on-impedance and very low off-leakage current. The CD4529B is bidirectional and can also be used in digital applications. By tying Z and W together the device can be used as a single 8-channel analog data selector.

The CD4529B device is supplied in 16-lead ceramic dual-in-line packages (D and F suffixes), 16-lead plastic dual-in-line package (E suffix), and in chip form (H suffix).

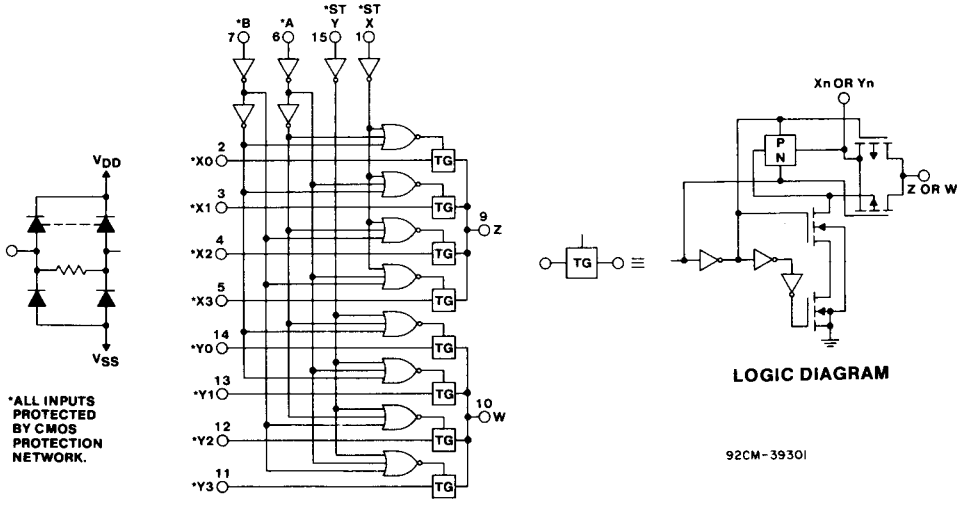


Fig. 1 - Schematic and logic diagram.

MAXIMUM RATINGS, *Absolute-Maximum Values:*

DC SUPPLY-VOLTAGE RANGE, (V_{DD})
(Voltages referenced to V_{SS} Terminal) ..... -0.5V to +20V
INPUT VOLTAGE RANGE, ALL INPUTS ..... -0.5V to V_{DD} +0.5V
DC INPUT CURRENT, ANY ONE INPUT ..... ±10mA
POWER DISSIPATION PER PACKAGE (P_D):
For T_A = -55°C to +100°C 500mW
For T_A = +100°C to +125°C ..... Derate Linearity at 12mW/°C to 200mW
DEVICE DISSIPATION PER OUTPUT TRANSISTOR
FOR T_A = FULL PACKAGE-TEMPERATURE RANGE (All Package Types) 100mW
OPERATING-TEMPERATURE RANGE (T_A) ..... -55°C to +125°C
STORAGE TEMPERATURE RANGE (T_{stg}) ..... -65°C to +150°C
LEAD TEMPERATURE (DURING SOLDERING):
At distance 1/16 ± 1/32 inch (1.59 ± 0.79mm) from case for 10s max ..... +265°C

RECOMMENDED OPERATING CONDITIONS at T_A = 25°C (Unless Otherwise Specified)

For maximum reliability, nominal operating conditions should be selected so that operation is always within the following ranges. Values shown apply to all types except as noted.

CHARACTERISTIC	V_{DD}	Min.	Max.	UNITS
Supply-Voltage Range (T_A = Full Package-Temperature Range)	—	3	18	V
Multiplexer Switch Input Current Capability*	—	—	25	mA
Output Load Resistance	—	100	—	Ω

* In certain applications, the external load-resistor current may include both V_{DD} and signal-line components. To avoid drawing V_{DD} current when switch current flows into the transmission gate inputs, the voltage drop across the bidirectional switch must not exceed 0.8 volt (calculated from R_{ON} values shown in Electrical Characteristics Chart). No V_{DD} current will flow through R_L if the switch current flows into terminals 9 and 10 (Z and W, respectively).

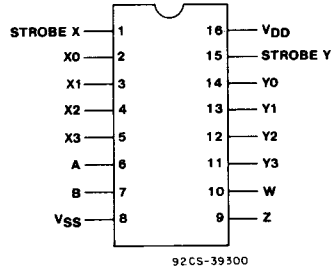
TRUTH TABLE

INPUT				OUTPUT	
STROBE X	STROBE Y	B	A	Z	W
1	1	0	0	X0	Y0
1	1	0	1	X1	Y1
1	1	1	0	X2	Y2
1	1	1	1	X3	Y3
1	0	0	0	X0	
1	0	0	1	X1	
1	0	1	0	X2	
1	0	1	1	X3	
0	1	0	0	Y0	
0	1	0	1	Y1	
0	1	1	0	Y2	
0	1	1	1	Y3	
0	0	*	*	High Impedance	

Dual 4-Channel Mode (2 Outputs)

Single 8-Channel Mode (1 Output: Z and W tied together)

* = Don't Care



TERMINAL ASSIGNMENT

ELECTRICAL CHARACTERISTICS

CHARACTERISTIC	CONDITIONS	V_{SS} (V)	V_{DD} (V)	LIMITS AT INDICATED TEMPERATURES (°C) -55	-40	+85	+125	+25 Min.	+25 Typ.	+25 Max.	UNITS
SIGNAL INPUTS (V_{IN}) AND OUTPUTS (V_{OUT})											
Quiescent Device Current, I_{DD} Max.			5	5	5	150	150	—	0.04	5	μA
			10	10	10	300	300	—	0.04	10	
			15	20	20	600	600	—	0.04	20	
			20	100	100	3000	3000	—	0.08	100	
On-State Resistance $0 \leq V_{IN} \leq V_{DD}$ r_{ON} Max.		-5	5	400	410	560	640	—	240	480	Ω
		-7.5	7.5	240	250	350	400	—	135	270	
		0	5	800	850	1200	1300	—	470	1050	
		0	10	400	410	560	640	—	240	480	
		0	15	250	250	350	400	—	135	270	
Change in On-State Resistance (Between Any Two Channels) Δr_{ON}		0	5	—	—	—	—	—	15	—	Ω
		0	10	—	—	—	—	—	10	—	
		0	15	—	—	—	—	—	5	—	
OFF Channel Leakage Current: Any Channel OFF Max. or All Channels OFF (Common OUT/IN) Max.		0	18	±100*		±1000*		—	±0.01	±100*	nA
Capacitance: Input, C_{IN}		-5	5	—	—	—	—	—	5	—	pF
Output, C_{OUT}				—	—	—	—	—	18	—	
Feedthrough, C_{IOS}				—	—	—	—	—	0.2	—	
Propagation Delay Time (Signal Input to Output) (t_{PHL}, t_{PLH})	V_{SS}=0, R_L=1 kΩ, C_L=50 pF, V_{IN}=V_{DD}-V_{SS} (Square Wave), t_r,t_f=20 ns	0	5	—	—	—	—	—	20	40	ns
			10	—	—	—	—	—	10	20	
			15	—	—	—	—	—	8	15	
CONTROL (ADDRESS OR STROBE) V_C											
Input Low Voltage, V_{ILC} Max.	V_{IN}=V_{DD}, R_L=1 kΩ to V_{SS}		5	1.5				—	—	1.5	V
			10	3				—	—	3	
			15	4				—	—	4	
Input High Voltage, V_{IHC} Min.	$I_{IS} < 2$ μA on all OFF Channels		5	3.5				3.5	—	—	
			10	7				7	—	—	
			15	11				11	—	—	
Input Current, I_{IN} Max.	V_{IN}=0, 18		18	±0.1	±0.1	±1	±1	—	$\pm 10^{-5}$	±0.1	μA
Propagation Delay Time: Control to Signal OUT (t_{PHL}, t_{PLH})	t_r,t_f=20 ns, R_L=1 kΩ, C_L=50 pF, V_{IN}=V_{DD}-V_{SS} (Square Wave)		5	—	—	—	—	—	200	400	ns
			10	—	—	—	—	—	80	160	
			15	—	—	—	—	—	60	120	
Input Capacitance, C_{IN} (Any Address or Strobe Input)				—	—	—	—	—	5	7.5	pF

*Determined by minimum feasible leakage measurement for automatic testing.

ELECTRICAL CHARACTERISTICS (Cont'd) at T_A = 25° C

CHARACTERISTIC	TEST CONDITIONS	V_{DD}	LIMITS Min.	Typ.	Max.	UNITS
Crosstalk Voltage, Control to Output	R_L = 1 kΩ, C_L = 50 pF, R_{OUT} = 10 kΩ	5	—	5	—	mV
		10	—	5	—	
		15	—	5	—	
Maximum Control Input Pulse Frequency	R_L = 1 kΩ, C_L = 50 pF	5	—	5	—	MHz
		10	—	10	—	
		15	—	12	—	
Noise Voltage	f = 100 Hz	5	—	24	—	$\frac{nV}{\sqrt{cycle}}$
		10	—	25	—	
		15	—	30	—	
	f = 100 kHz	5	—	12	—	
		10	—	12	—	
		15	—	15	—	
Sine Wave Distortion	V_{IN} = 1.77 V dc (RMS) centered at 0 V dc, R_L = 10 kΩ, f = 1 kHz, V_{SS} = -5 V	5	—	0.36	—	%
Insertion Loss	V_{IN} = 1.77 V dc (RMS) centered at 0 V dc, f = 1 MHz, V_{SS} = -5 V, $I_{Loss} = 20 \log_{10} \frac{V_{OUT}}{V_{IN}}$					
	R = 1 kΩ	5	—	2	—	dB
	R = 10 kΩ		—	0.8	—	
	R = 100 kΩ		—	0.25	—	
	R = 1 MΩ		—	0.01	—	
Bandwidth (-3 dB)	V_{IN} = 1.77 V dc (RMS) centered at 0 V dc, V_{SS} = -5 V					
	R = 1 kΩ	5	—	35	—	MHz
	R = 10 kΩ		—	28	—	
	R = 100 kΩ		—	27	—	
	R = 1 MΩ		—	26	—	
Feedthrough and Crosstalk	V_{SS} = -5 V, $20 \log_{10} \frac{V_{OUT}}{V_{IN}}$ = -50 dB					
	R = 1 kΩ	5	—	850	—	kHz
	R = 10 kΩ		—	100	—	
	R = 100 kΩ		—	12	—	
	R = 1 MΩ		—	1.5	—	

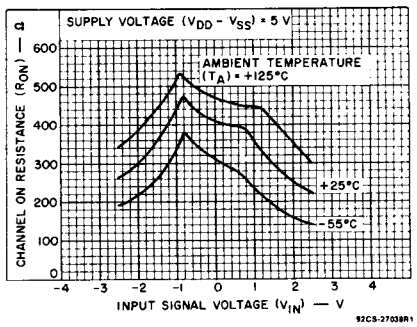


Fig. 2 - Typical channel ON resistance vs. input signal voltage.

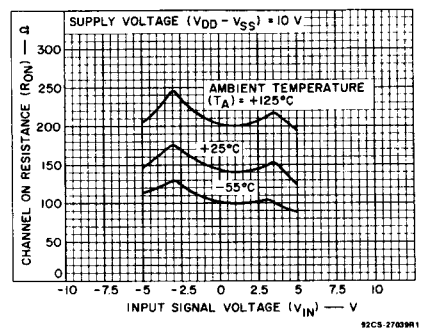


Fig. 3 - Typical channel ON resistance vs., input signal voltage.

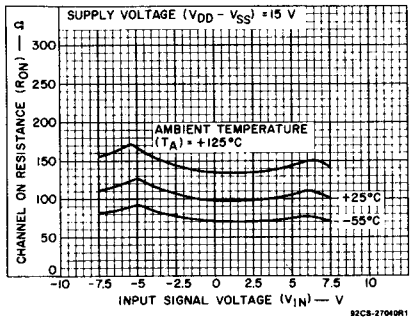


Fig. 4 - Typical channel ON resistance vs. input signal voltage.

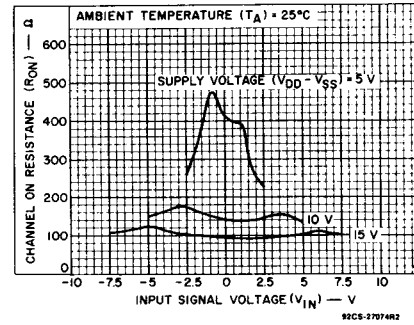


Fig. 5 - Typical channel ON resistance vs. input signal voltage.

TEST CIRCUITS

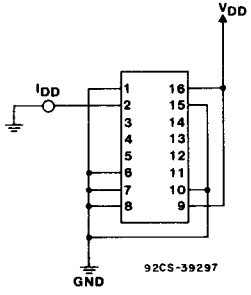


Fig. 6 - OFF channel leakage current- any channel OFF.

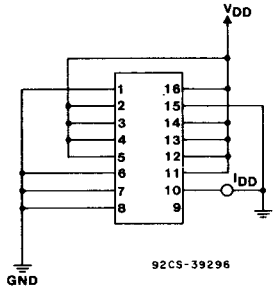


Fig. 7 - OFF channel leakage current, all channels OFF.

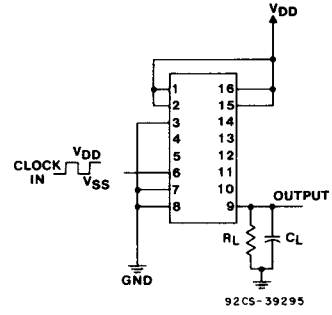


Fig. 8 - Propagation delay address input to signal output.

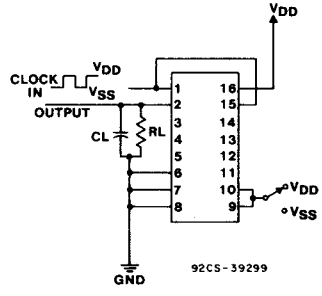


Fig. 9 - Propagation delay-strobe input to signal output.

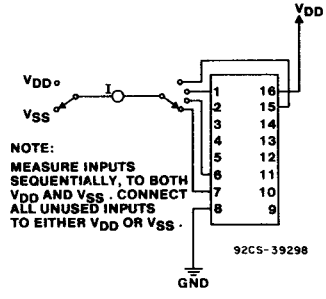


Fig. 10 - Quiescent device current.

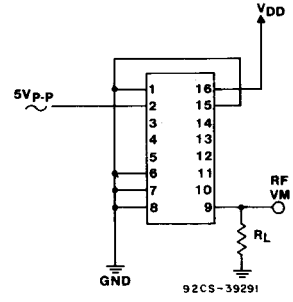


Fig. 11 - Feedthrough.

TEST CIRCUITS (Cont'd)

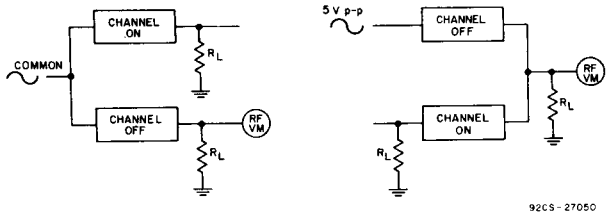


Fig. 12 - Crosstalk between any two channels.

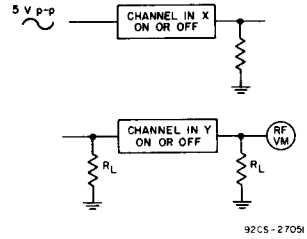


Fig. 13 - Crosstalk between sections.

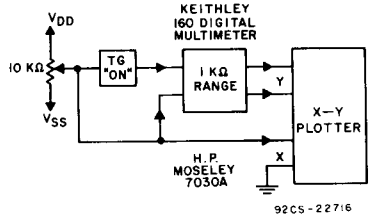
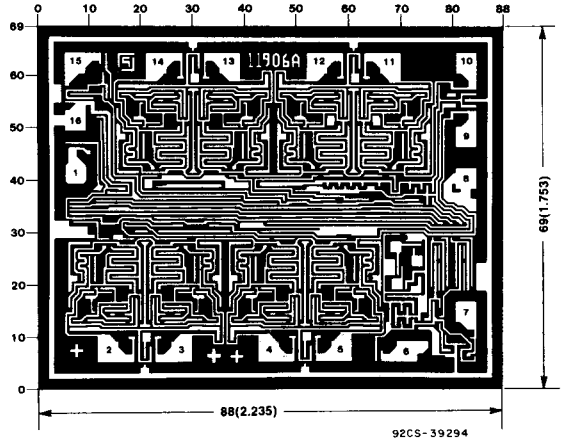


Fig. 14 - Channel ON resistance measurement circuit.



Dimensions and pad layout for CD4529B.

Dimensions in parenthese are in millimeters and are derived from the basic inch dimensions as indicated. Grid graduations are in mills (10^{-3} inch).