



MOTOROLA

MC14529B

DUAL 4-CHANNEL ANALOG DATA SELECTOR

The MC14529B analog data selector is a dual 4-channel or single 8-channel device depending on the input coding. The device is suitable for digital as well as analog application, including various one-of-four and one-of-eight data selector functions. Since the device has bidirectional analog characteristics it can also be used as a dual binary to 1-of-4 or a binary to 1-of-8 decoder.

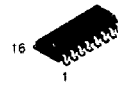
- Data Paths Are Bidirectional
- 3-State Outputs
- Linear "On" Resistance
- Supply Voltage Range = 3.0 Vdc to 18 Vdc
- Capable of Driving Two Low-power TTL Loads or One Low-power Schottky TTL Load over the Rated Temperature Range.



L SUFFIX
CERAMIC
CASE 620



P SUFFIX
PLASTIC
CASE 648



D SUFFIX
SOIC
CASE 751B

MAXIMUM RATINGS* (Voltages Referenced to V_{SS})

| Symbol | Parameter | Value | Unit |
|-------------------|--|------------------------|------|
| V_{DD} | DC Supply Voltage | -0.5 to +18.0 | V |
| V_{in}, V_{out} | Input or Output Voltage (DC or Transient) | -0.5 to $V_{DD} + 0.5$ | V |
| I_{in}, I_{out} | Input or Output Current (DC or Transient), per Pin | ± 10 | mA |
| P_D | Power Dissipation, per Package† | 500 | mW |
| T_{stg} | Storage Temperature | -65 to +150 | °C |
| T_L | Lead Temperature (8-Second Soldering) | 260 | °C |

*Maximum Ratings are those values beyond which damage to the device may occur.
†Temperature Derating: Plastic "P and D/DW" Packages: -7.0 mW/°C From 65°C To 125°C
Ceramic "L" Packages: -12 mW/°C From 100°C To 125°C

ORDERING INFORMATION

MC14XXXBCP Plastic
MC14XXXBCL Ceramic
MC14XXXBD SOIC

$T_A = -55^\circ$ to 125°C for all packages.

TRUTH TABLE

| ST _X | ST _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 | X | X | High Impedance | |

Dual 4-Channel Mode
2 Outputs

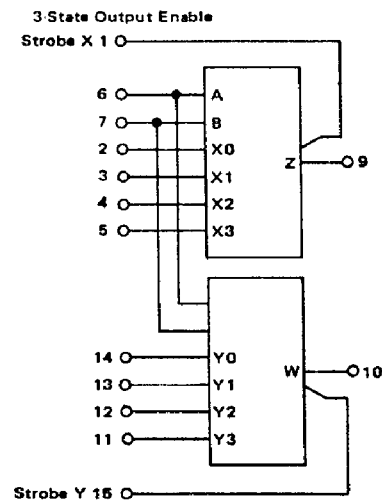
Single 8-Channel Mode
1 Output
(Z and W tied together)

X = Don't Care

This device contains protection circuitry to guard against damage due to high static voltages or electric fields. However, precautions must be taken to avoid applications of any voltage higher than maximum rated voltages to this high-impedance circuit. For proper operation, V_{in} and V_{out} should be constrained to the range $V_{SS} \leq (V_{in} \text{ or } V_{out}) \leq V_{DD}$.

Unused inputs must always be tied to an appropriate logic voltage level (e.g., either V_{SS} or V_{DD}). Unused outputs must be left open.

BLOCK DIAGRAM



V_{DD} = Pin 16
 V_{SS} = Pin 8

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ELECTRICAL CHARACTERISTICS

| Characteristic | Symbol | V _{DD} | Test Conditions | -55°C | | 25°C | | | 125°C | | Unit |
|----------------|--------|-----------------|-----------------|-------|-----|------|-------|-----|-------|-----|------|
| | | | | Min | Max | Min | Typ # | Max | Min | Max | |

SUPPLY REQUIREMENTS (Voltages Referenced to V_{EE})

| | | | | | | | | | | | |
|--|--------------------|-----------------|---|--|-------------------|-----|-------------------------|-------------------|-----|-----------------|----|
| Power Supply Voltage Range | V _{DD} | — | V _{DD} - 3.0 ≥ V _{SS} ≥ V _{EE} | 3.0 | 18 | 3.0 | — | 18 | 3.0 | 18 | V |
| Quiescent Current Per Package | I _{DD} | 5.0 10 15 | Control Inputs: V _{in} = V _{SS} or V _{DD} , Switch I/O: V _{SS} ≤ V _{I/O} ≤ V _{DD} , and ΔV _{switch} ≤ 500 mV** | — | 1.0 1.0 2.0 | — | 0.005 0.010 0.015 | 1.0 1.0 2.0 | — | 60 60 120 | μA |
| Total Supply Current (Dynamic Plus Quiescent, Per Package) | I _{D(AV)} | 5.0 10 15 | T _A = 25°C only (The channel component, (V _{in} - V _{out})/R _{on} , is not included.) | Typical (0.07 μA/kHz)f + I _{DD} (0.20 μA/kHz)f + I _{DD} (0.36 μA/kHz)f + I _{DD} | | | | | | | μA |

CONTROL INPUTS — INHIBIT, A, B (Voltages Referenced to V_{SS})

| | | | | | | | | | | | |
|--------------------------|-----------------|-----------------|--|------------------|-------------------|------------------|----------------------|-------------------|------------------|-------------------|----|
| Low-Level Input Voltage | V _{IL} | 5.0 10 15 | R _{on} = per spec, I _{off} = per spec | — | 1.5 3.0 4.0 | — | 2.25 4.50 6.75 | 1.5 3.0 4.0 | — | 1.5 3.0 4.0 | V |
| High-Level Input Voltage | V _{IH} | 5.0 10 15 | R _{on} = per spec, I _{off} = per spec | 3.5 7.0 11 | — | 3.5 7.0 11 | 2.75 5.50 8.25 | — | 3.5 7.0 11 | — | V |
| Input Leakage Current | I _{in} | 15 | V _{in} = 0 or V _{DD} | — | ±0.1 | — | ±0.00001 | ±0.1 | — | ±1.0 | μA |
| Input Capacitance | C _{in} | — | — | — | — | — | 5.0 | 7.5 | — | — | pF |

SWITCHES IN/OUT AND COMMONS OUT/IN — W, Z (Voltages Referenced to V_{EE})

| | | | | | | | | | | | |
|--|----------------------|----------|---|---|-----------------|---|--------------|-----------------|---|-----------------|------------------|
| Recommended Peak-to-Peak Voltage Into or Out of the Switch | V _{I/O} | — | Channel On or Off | 0 | V _{DD} | 0 | — | V _{DD} | 0 | V _{DD} | V _{p-p} |
| Recommended Static or Dynamic Voltage Across the Switch** (Figure 5) | ΔV _{switch} | — | Channel On | 0 | 600 | 0 | — | 600 | 0 | 300 | mV |
| Output Offset Voltage | V _{OO} | — | V _{in} = 0 V, No Load | — | — | — | 10 | — | — | — | μV |
| ON Resistance | R _{on} | 10 15 | ΔV _{switch} ≤ 500 mV**, V _{in} = V _{IL} or V _{IH} (Control), and V _{in} = 0 to V _{DD} (Switch) | — | 400 240 | — | 120 80 | 480 270 | — | 560 350 | Ω |
| ΔON Resistance Between Any Two Channels in the Same Package | ΔR _{on} | 10 15 | — | — | — | — | 15 10 | — | — | — | Ω |
| Off-Channel Leakage Current (Figure 10) | I _{off} | 15 | V _{in} = V _{IL} or V _{IH} (Control) Channel to Channel or Any One Channel | — | ±100 | — | ±0.05 | ±100 | — | ±1000 | nA |
| Capacitance, Switch I/O | C _{I/O} | — | Inhibit = V _{DD} | — | — | — | 8.0 | — | — | — | pF |
| Capacitance, Common O/I | C _{O/I} | — | Inhibit = V _{DD} | — | — | — | 20 | — | — | — | pF |
| Capacitance, Feedthrough (Channel Off) | C _{I/O} | — | Pins Not Adjacent Pins Adjacent | — | — | — | 0.15 0.47 | — | — | — | pF |

#Data labeled "Typ" is not to be used for design purposes, but is intended as an indication of the IC's potential performance.

**For voltage drops across the switch (ΔV_{switch}) > 600 mV (>300 mV at high temperature), excessive V_{DD} current may be drawn; i.e. the current out of the switch may contain both V_{DD} and switch input components. The reliability of the device will be unaffected unless the Maximum Ratings are exceeded. (See first page of this data sheet.)

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SWITCHING CHARACTERISTICS (T_A = 25°C)

| Characteristic | Figure | Symbol | V _{SS} | V _{DD} | Min | Typ # | Max | Unit |
|--|--------|--|------------------------------|--|--------------------------------|--|--------------------------------|----------------------------------|
| V _{in} to V _{out} Propagation Delay Time (C _L = 50 pF, R _L = 1.0 kΩ) | 7 | t _{PLH} , t _{PHL} | 0.0 | 5.0 10 15 | — — — | 20 10 8.0 | 40 20 15 | ns |
| Propagation Delay Time, Control to Output, V _{in} = V _{DD} or V _{SS} (C _L = 50 pF, R _L = 1.0 kΩ) | 8 | t _{PLZ} , t _{PZL} , t _{PHZ} , t _{PZH} | 0.0 | 5.0 10 15 | — — — | 140 70 50 | 400 160 120 | ns |
| Crosstalk, Control to Output (C _L = 50 pF, R _L = 1.0 kΩ R _{out} = 10 kΩ) | 9 | — | 0.0 | 5.0 10 15 | — — — | 5.0 5.0 5.0 | — — — | mV |
| Control Input Pulse Frequency (C _L = 50 pF, R _L = 1.0 kΩ) | 10 | f _{in} | 0.0 | 5.0 10 15 | — — — | 5.0 10 12 | 2.5 6.2 8.3 | MHz |
| Noise Voltage (f = 100 Hz) | 11,12 | — | 0.0 | 5.0 10 15 5.0 10 15 | — — — — — — | 24 25 30 12 12 15 | — — — — — — | $\frac{nV}{\sqrt{\text{cycle}}}$ |
| Sine Wave Distortion (V _{in} = 1.77 Vdc RMS Centered @ 0.0 Vdc, R _L = 10 kΩ, f = 1.0 kHz) | — | — | -5.0 | 5.0 | — | 0.36 | — | % |
| Off-Channel Leakage Current (V _{in} = +5.0 Vdc, V _{out} = -5.0 Vdc) (V _{in} = -5.0 Vdc, V _{out} = +5.0 Vdc) (V _{in} = +7.5 Vdc, V _{out} = -7.5 Vdc) (V _{in} = -7.5 Vdc, V _{out} = +7.5 Vdc) | — | I _{off} | -5.0 -5.0 -7.5 -7.5 | 5.0 5.0 7.5 7.5 | — — — — | ±0.001 ±0.001 ±0.0015 ±0.0015 | ±125 ±125 ±250 ±250 | nA |
| Insertion Loss (V _{in} = 1.77 Vdc RMS centered @ 0.0 Vdc, f = 1.0 MHz) I _{loss} = 20 Log ₁₀ $\frac{V_{out}}{V_{in}}$ (R _L = 1.0 kΩ) (R _L = 10 kΩ) (R _L = 100 kΩ) (R _L = 1.0 MΩ) | 13 | — | -5.0 | 5.0 | — — — — | 2.0 0.8 0.25 0.01 | — — — — | dB |
| Bandwidth (-3 dB) (V _{in} = 1.77 Vdc RMS centered @ 0.0 Vdc) (R _L = 1.0 kΩ) (R _L = 10 kΩ) (R _L = 100 kΩ) (R _L = 1.0 MΩ) | — | BW | -5.0 | 5.0 | — — — — | 35 28 27 26 | — — — — | MHz |
| Feedthrough and Crosstalk 20 Log ₁₀ $\frac{V_{out}}{V_{in}}$ = -50 dB (R _L = 1.0 kΩ) (R _L = 10 kΩ) (R _L = 100 kΩ) (R _L = 1.0 MΩ) | — | — | -5.0 | 5.0 | — — — — | 850 100 12 1.5 | — — — — | MHz |

#Data labelled "Typ" is not to be used for design purposes but is intended as an indication of the IC's potential performance.

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FIGURE 1 - OUTPUT VOLTAGE TEST CIRCUIT

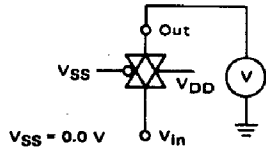
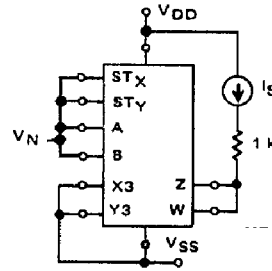


FIGURE 2 - NOISE IMMUNITY TEST CIRCUIT

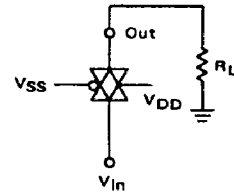
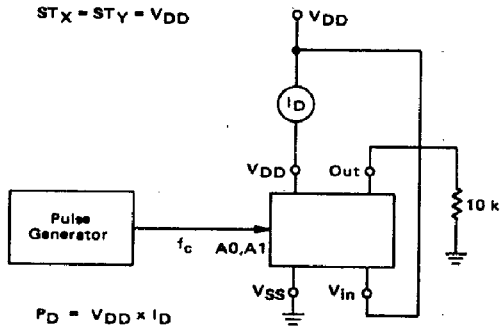


Pins 2, 3, 4, 12, 13 and 14 are left open.
 V_{IL}: V_C is raised from V_{SS} until V_C = V_{IL}.
 at V_C = V_{IL}: I_S = +10 μA with V_{in} = V_{SS}, V_{out} = V_{DD} or
 V_{in} = V_{DD}, V_{out} = V_{SS}.

V_{IH}: When V_C = V_{IH} to V_{DD}, the switch is ON and the R_{ON} specifications are met.

FIGURE 4 - R_{ON} CHARACTERISTICS TEST CIRCUIT

FIGURE 3 - QUIESCENT POWER DISSIPATION TEST CIRCUIT



TYPICAL R_{ON} versus INPUT VOLTAGE

FIGURE 5

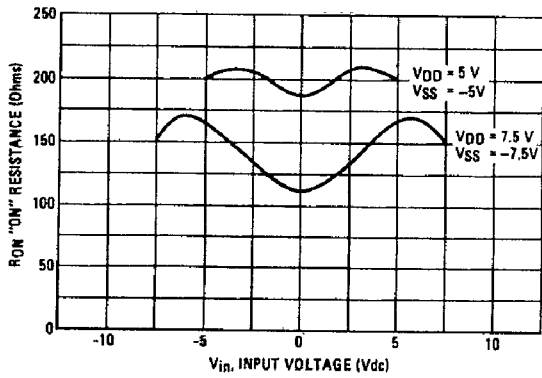
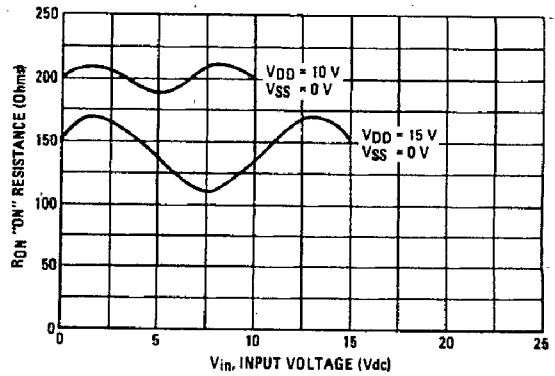


FIGURE 6



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FIGURE 7 – PROPAGATION DELAY TEST CIRCUIT AND WAVEFORMS

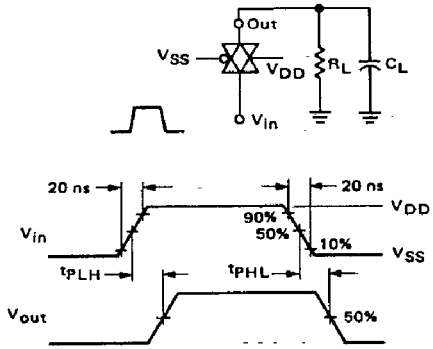


FIGURE 9 – CROSSTALK TEST CIRCUIT

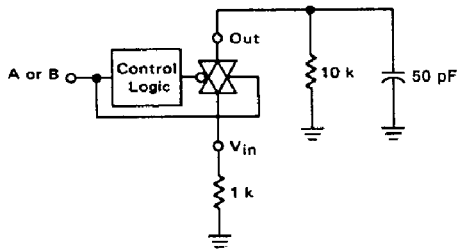


FIGURE 11 – NOISE VOLTAGE TEST CIRCUIT

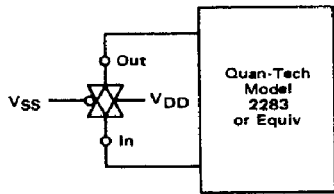


FIGURE 8 – TURN-ON DELAY TIME TEST CIRCUIT AND WAVEFORMS

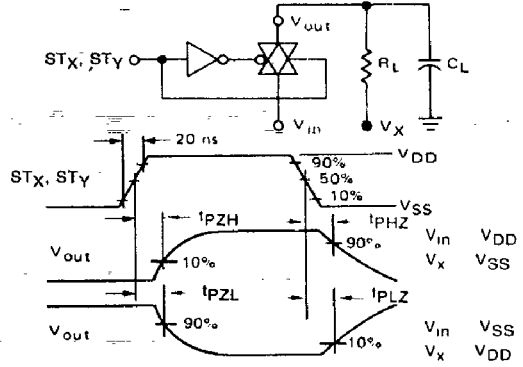


FIGURE 10 – FREQUENCY RESPONSE TEST CIRCUIT

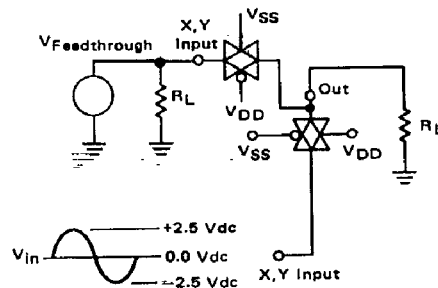
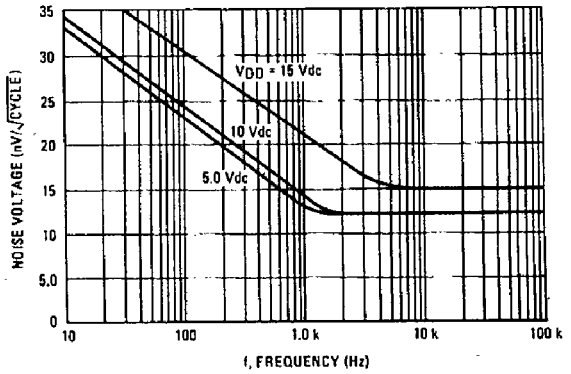
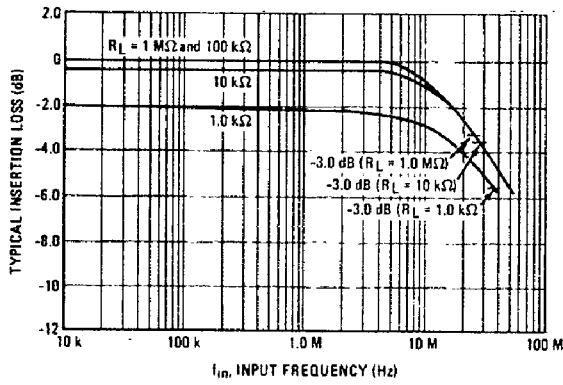


FIGURE 12 – TYPICAL NOISE CHARACTERISTICS

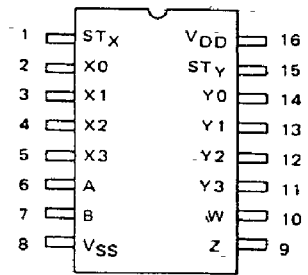


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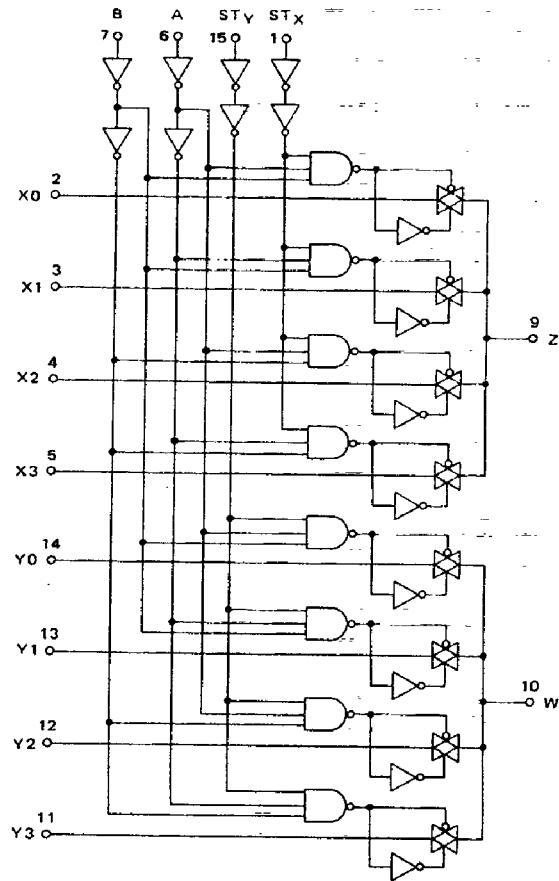
FIGURE 13 – TYPICAL INSERTION LOSS/BANDWIDTH CHARACTERISTICS



PIN ASSIGNMENT



LOGIC DIAGRAM



V_{DD} = Pin 16
V_{SS} = Pin 8