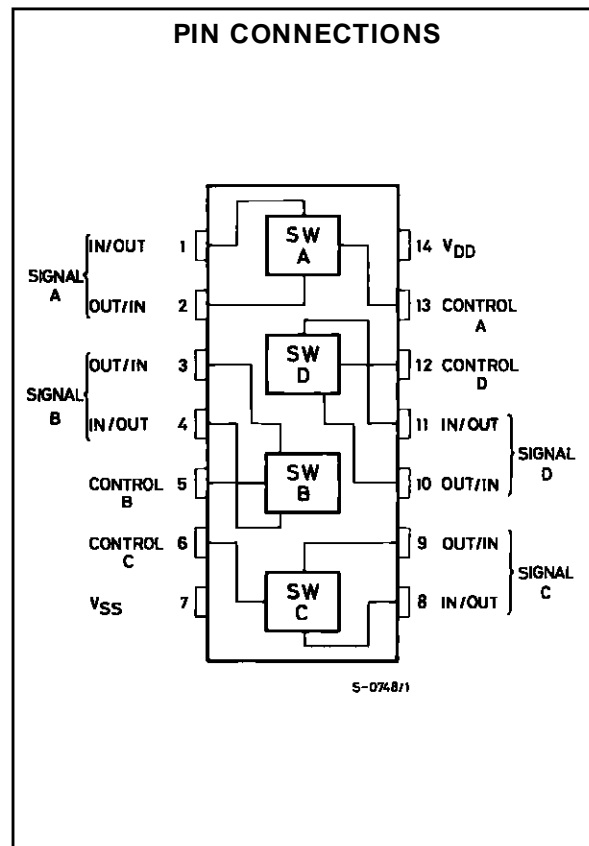
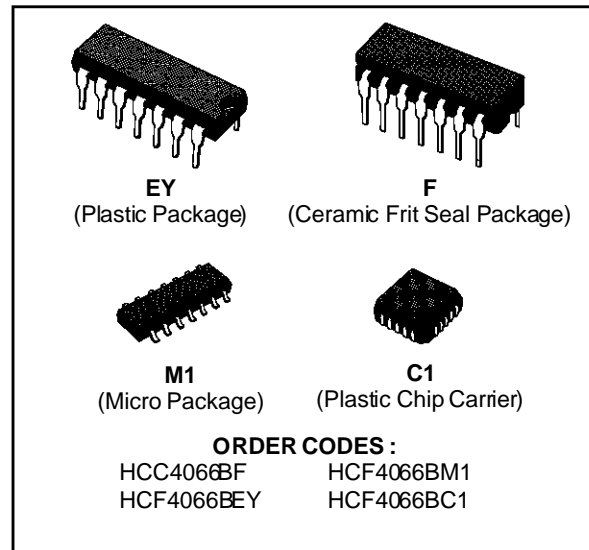


**QUAD BILATERAL SWITCH FOR TRANSMISSION
OR MULTIPLEXING OF ANALOG OR DIGITAL SIGNALS**

- 15V DIGITAL OR $\pm 7.5V$ PEAK-TO-PEAK SWITCHING
- 80Ω TYPICAL ON RESISTANCE FOR 15V OPERATION
- SWITCH ON RESISTANCE MATCHED TO WITHIN 5Ω OVER 15V SIGNAL-INPUT RANGE
- ON RESISTANCE FLAT OVER FULL PEAK-TO-PEAK SIGNAL RANGE
- HIGH ON/OFF OUTPUT-VOLTAGE RATIO : 65dB TYP. @ $f_{is} = 10kHz, R_L = 10k\Omega$
- HIGH DEGREE OF LINEARITY : $< 0.5\%$ DISTORTION TYP. @ $f_{is} = 1kHz, V_{is} = 5 V_{p-p}, V_{DD} - V_{SS} \geq 10V, R_L = 10k\Omega$
- EXTREMELY LOW OFF SWITCH LEAKAGE RESULTING IN VERY LOW OFFSET CURRENT AND HIGH EFFECTIVE OFF RESISTANCE ; $10pA$ TYP. @ $V_{DD} - V_{SS} = 10V, T_A = 25^\circ C$
- EXTREMELY HIGH CONTROL INPUT IMPEDANCE (control circuit isolated from signal circuit) : $10^{12} \Omega$ TYP.
- LOW CROSSTALK BETWEEN SWITCHES : $-50dB$ TYP. @ $f_{is} = 0.9MHz, R_L = 1k\Omega$
- MATCHED CONTROL-INPUT TO SIGNAL-OUTPUT CAPACITANCE : REDUCES OUTPUT SIGNAL TRANSIENTS
- FREQUENCY RESPONSE, SWITCH ON = 40MHz (typ.)
- QUIESCENT CURRENT SPECIFIED TO 20V FOR HCC DEVICE
- 5V, 10V, AND 15V PARAMETRIC RATINGS
- INPUT CURRENT OF 100nA AT 18V AND $25^\circ C$ FOR HCC DEVICE
- 100% TESTED FOR QUIESCENT CURRENT
- MEETS ALL REQUIREMENTS OF JEDEC TENTATIVE STANDARD N^o. 13A, "STANDARD SPECIFICATIONS FOR DESCRIPTION OF "B" SERIES CMOS DEVICES"

DESCRIPTION

The **HCC4066B** (extended temperature range) and **HCF4066B** (intermediate temperature range) are monolithic integrated circuits, available in 14-lead dual in-line plastic or ceramic package and plastic micropackage. The **HCC/HCF4066B** is a quad bilateral switch intended for the transmission or multiplexing of analog or digital signals. It is pin-for-



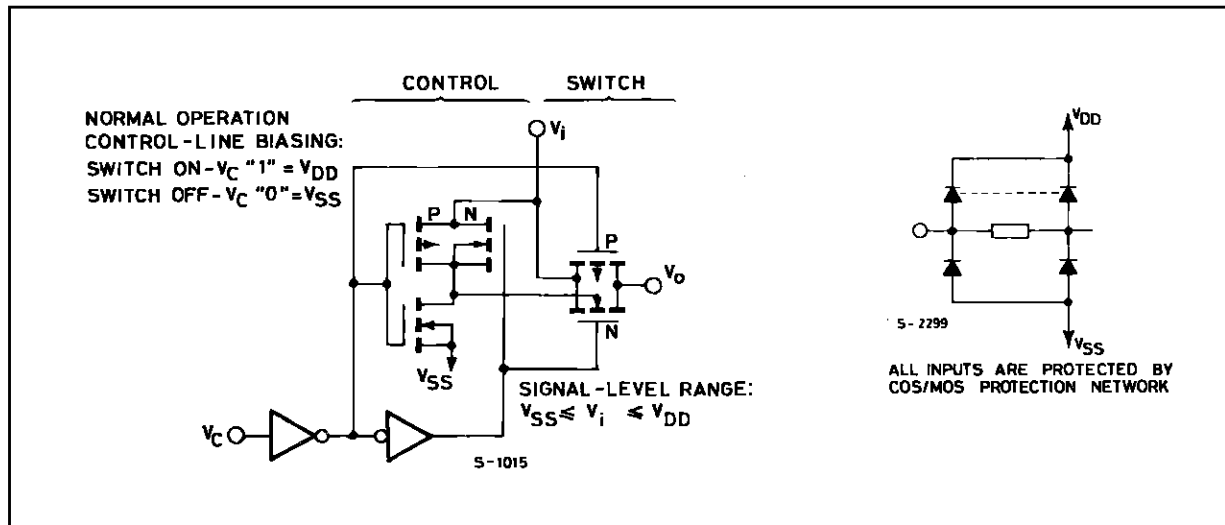
HCC/HCF4066B

pin compatible with **HCC/HCF4016B**, but exhibits a much lower ON resistance. In addition, the ON resistance is relatively constant over the full input-signal range. The **HCC/HCF4066B** consists of four independent bilateral switches. A single control signal is required per switch. Both the p and the n device in a given switch are biased ON or OFF simultaneously by the control signal. As shown in schematic diagram, the well of the n-channel device on each switch is either tied to the input when the switch is ON or to V_{SS} when the switch is OFF. This

configuration eliminates the variation of the switch-transistor threshold voltage with input signal, and thus keeps the ON resistance low over the full operating-signal range. The advantages over single-channel switches include peak input signal voltage swings equal to the full supply voltage, and more constant ON impedance over the input-signal range. For sample-and-hold applications, however, the **HCC/HCF4016B** is recommended.

SCHEMATIC DIAGRAM

1 OF 4 IDENTICAL SWITCHES AND ITS ASSOCIATED CONTROL CIRCUITRY.



ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Value | Unit |
|------------|---|--------------------------------|------------------------------|
| V_{DD}^* | Supply Voltage : HCC Types HCF Types | - 0.5 to + 20 - 0.5 to + 18 | V V |
| V_i | Input Voltage | - 0.5 to $V_{DD} + 0.5$ | V |
| I_i | DC Input Current (any one input) | ± 10 | mA |
| P_{tot} | Total Power Dissipation (per package) Dissipation per Output Transistor for T_{op} = Full Package-temperature Range | 200 100 | mW mW |
| T_{op} | Operating Temperature : HCC Types HCF Types | - 55 to + 125 - 40 to + 85 | $^{\circ}$ C $^{\circ}$ C |
| T_{stg} | Storage Temperature | - 65 to + 150 | $^{\circ}$ C |

Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for external periods may affect device reliability.
* All voltage values are referred to V_{SS} pin voltage.

RECOMMENDED OPERATING CONDITIONS

| Symbol | Parameter | Value | Unit |
|-----------------|-----------------------------------|----------------------|------|
| V _{DD} | Supply Voltage : HCC Types | 3 to 18 | V |
| | HCF Types | 3 to 15 | V |
| V _I | Input Voltage | 0 to V _{DD} | V |
| T _{op} | Operating Temperature : HCC Types | - 55 to + 125 | °C |
| | HCF Types | - 40 to + 85 | °C |

ELECTRICAL CHARACTERISTICS

(T_{amb} = 25°C, typical temperature coefficient for all V_{DD} values is 0,3%/°C)

| Symbol | Parameter | Test Conditions | | | | Value | | | | | | Unit |
|--|--|-----------------|--|------------------------|--------------------|-------|------|------|------|---------------------|------|------|
| | | | V _I (V) | V _{DD} (V) | T _{Low} * | | 25°C | | | T _{High} * | | |
| | | | | | Min. | Max. | Min. | Typ. | Max. | Min. | Max. | |
| I _L | Quiescent Device Current (all switches ON or all switches OFF) | HCC Types | 0/ 5 | 5 | | 0.25 | | 0.01 | 0.25 | | 7.5 | µA |
| | | | 0/10 | 10 | | 0.5 | | 0.01 | 0.5 | | 15 | |
| | | | 0/15 | 15 | | 1 | | 0.01 | 1 | | 30 | |
| | | HCF Types | 0/ 5 | 5 | | 1 | | 0.01 | 1 | | 7.5 | |
| | | | 0/10 | 10 | | 2 | | 0.01 | 2 | | 15 | |
| | | | 0/15 | 15 | | 4 | | 0.01 | 4 | | 30 | |
| SIGNAL INPUTS (V_{is}) and Outputs (V_{os}) | | | | | | | | | | | | |
| R _{ON} | On Resistance | HCC Types | V _C = V _{DD} R _L = 10kΩ Return to $\frac{V_{DD} - V_{SS}}{2}$ V _{is} = V _{SS} to V _{DD} | 5 | | 800 | | 470 | 1050 | | 1300 | Ω |
| | | | | 10 | | 310 | | 180 | 400 | | 550 | |
| | | | | 15 | | 200 | | 125 | 240 | | 320 | |
| | | HCF Types | | 5 | | 850 | | 470 | 1050 | | 1200 | |
| | | | | 10 | | 330 | | 180 | 400 | | 500 | |
| | | | | 15 | | 210 | | 125 | 240 | | 300 | |
| ΔON | Resistance between any 2 Switches, ΔR _{ON} | | R _L 10kΩ, V _C = V _{DD} | 5 | | | | 15 | | | | Ω |
| | | | | 10 | | | | 10 | | | | |
| | | | | 15 | | | | 5 | | | | |
| TDH | Total Harmonic Distorsion | | | | | | | 0.4 | | | | % |
| | - 3 dB Cutoff Frequency (switch on) | | | | | | | 40 | | | | MHz |
| | | | | | | | | | | | | |

* T_{Low} = - 55°C for HCC device : - 40°C for HCF device.* T_{High} = + 125°C for HCC device : + 85°C for HCF device.The Noise Margin for both "1" and "0" level is : 1V min. with V_{DD} = 5V, 2V min. with V_{DD} = 10V, 2.5V min. with V_{DD} = 15V.

ELECTRICAL CHARACTERISTICS (continued)

| Symbol | Parameter | Test Conditions | | Value | | | | | | Unit | | |
|---------------------------------|--|---|---|--------------------|------|-------|-------------------|-------|---------------------|------|------|---|
| | | | V _{DD} (V) | T _{Low} * | | 25°C | | | T _{High} * | | | |
| | | | | Min. | Max. | Min. | Typ. | Max. | Min. | | Max. | |
| | - 50 dB Feedthrough Frequency (switch off) | V _C = V _{SS} = - 5V, V _{is} (p-p) = 5V (sine wave centured on 0V) R _L = 1 kΩ | | | | | 1 | | | | MHz | |
| | - 50 dB Crosstalk Frequency | V _C (A) = V _{DD} = + 5V V _C (B) = V _{SS} = - 5V V _{is} (A) = 5Vp-p, 50Ω source R _L = 1 kΩ | | | | | 8 | | | | MHz | |
| t _{pd} | Propagati on Delay (signal input to signal output) | R _L = 200kΩ V _C = V _{DD} , V _{SS} = GND, C _L = 50pF, V _{is} = 10V (square wave centured on 5V) t _r , t _f = 20ns | | 5 | | | 20 | 40 | | | ns | |
| | | | | 10 | | | 10 | 20 | | | | |
| | | | | 15 | | | 7 | 15 | | | | |
| C _{is} | Input Capacitance | V _{DD} = + 5V V _C = V _{SS} = - 5V | | | | | 8 | | | pF | | |
| C _{os} | Output Capacitance | | | | | | 8 | | | | | |
| C _{ios} | Feedthrough | | | | | | 0.5 | | | | | |
| | Input/Output Leakage Current Switch OFF | HCC Types | V _C = 0V V _{is} = 18V ; V _{os} = 0V V _{is} = 0V ; V _{os} = 18V | 18 | | ± 0.1 | ±10 ⁻³ | ± 0.1 | | ± 1 | μA | |
| | | HCF Types | V _C = 0V V _{is} = 15V ; V _{os} = 0V V _{is} = 0V ; V _{os} = 15V | 15 | | ± 0.3 | ±10 ⁻³ | ± 0.3 | | ± 1 | | |
| CONTROL (V_C) | | | | | | | | | | | | |
| V _{ILC} | Control Input Low Voltage | I _{is} < 10μA V _{is} = V _{SS} , V _{os} = V _{DD} and V _{is} = V _{DD} , V _{os} = V _{SS} | | 5 | | 1 | | | 1 | | 1 | V |
| | | | | 10 | | 2 | | | 2 | | 2 | |
| | | | | 15 | | 2 | | | 2 | | 2 | |
| V _{IHC} | Control Input High Voltage | | | 5 | 3.5 | | 3.5 | | | 3.5 | | V |
| | | | | 10 | 7 | | 7 | | | 7 | | |
| | | | | 15 | 11 | | 11 | | | 11 | | |
| I _{IH} I _{IL} | Input Leakage Current | HCC Types | V _{is} ≤ V _{DD} V _{DD} - V _{SS} = 18V | 18 | | ± 0.1 | ±10 ⁻⁵ | ± 0.1 | | ± 1 | μA | |
| | | HCF Types | V _{DD} - V _{SS} = 15V V _{CC} ≤ V _{DD} - V _{SS} | 15 | | ± 0.3 | ±10 ⁻⁵ | ± 0.3 | | ± 1 | | |

* T_{Low} = - 55°C for HCC device : - 40°C for HCF device.

* T_{High} = + 125°C for HCC device : + 85°C for HCF device.

The Noise Margin for both "1" and "0" level is : 1V min. with V_{DD} = 5V, 2V min. with V_{DD} = 10V, 2.5V min. with V_{DD} = 15V.

ELECTRICAL CHARACTERISTICS (continued)

| Symbol | Parameter | Test Conditions | V _{DD} (V) | Value | | | | | | Unit | |
|----------------|--|--|------------------------|--------------------|------|------|------|------|---------------------|------|------|
| | | | | T _{Low} * | | 25°C | | | T _{High} * | | |
| | | | | Min. | Max. | Min. | Typ. | Max. | Min. | | Max. |
| | Crosstalk (control input to signal output) | V _C = 10V (sq. wave) t _r , t _f = 20ns R _L = 10kΩ | 10 | | | | 50 | | | | mV |
| | Turn-on Propagation Delay | V _{IN} = V _{DD} t _r , t _f = 20ns C _L = 50pF R _L = 1kΩ | 5 | | | | 35 | 70 | | | ns |
| 10 | | | | | | 20 | 40 | | | | |
| 15 | | | | | | 15 | 30 | | | | |
| | Control Input Repetition Rate | V _{is} = V _{DD} , V _{SS} = GND R _L = 1kΩ to gnd C _L = 50pF V _C = 10V (square wave centred on 5V) t _r , t _f = 20ns V _{os} = 1/2V _{os} @ 1kHz | 5 | | | | 6 | | | | MHz |
| 10 | | | | | | 9 | | | | | |
| 15 | | | | | | 9.5 | | | | | |
| C _I | Input Capacitance | Any Input | | | | | 5 | 7.5 | | | pF |

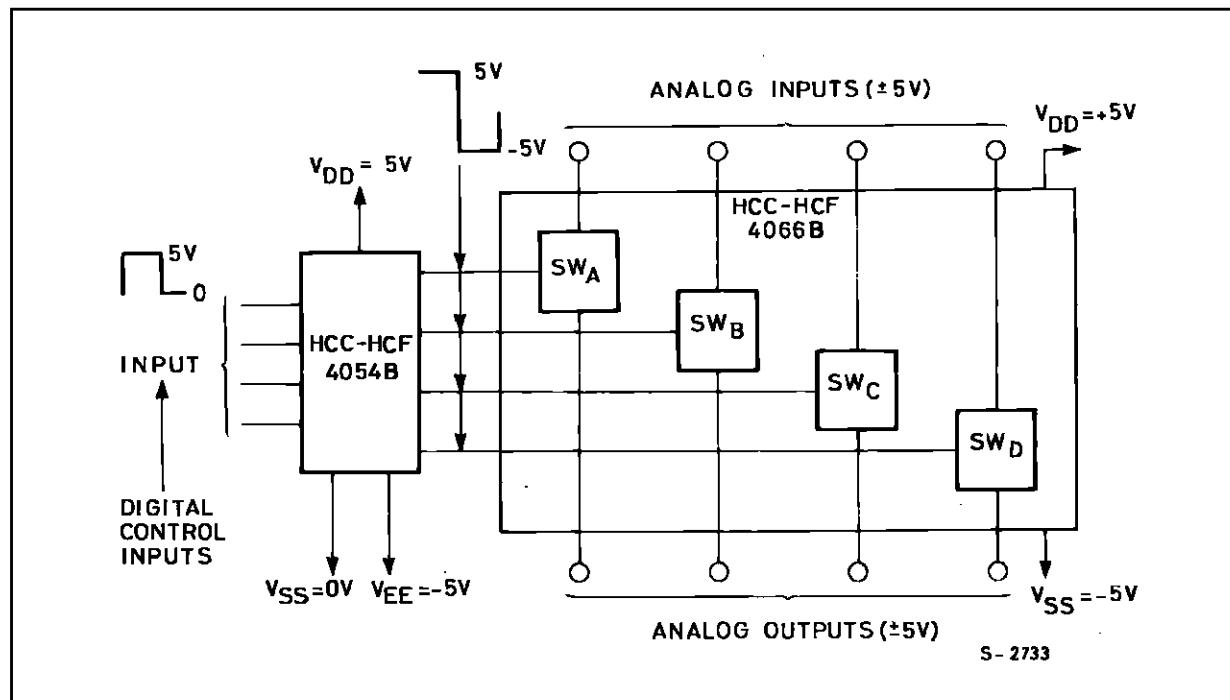
* T_{Low} = - 55°C for HCC device : - 40°C for HCF device.

* T_{High} = + 125°C for HCC device : + 85°C for HCF device.

The Noise Margin for both "1" and "0" level is : 1V min. with V_{DD} = 5V, 2V min. with V_{DD} = 10V, 2.5V min. with V_{DD} = 15V.

TYPICAL APPLICATIONS

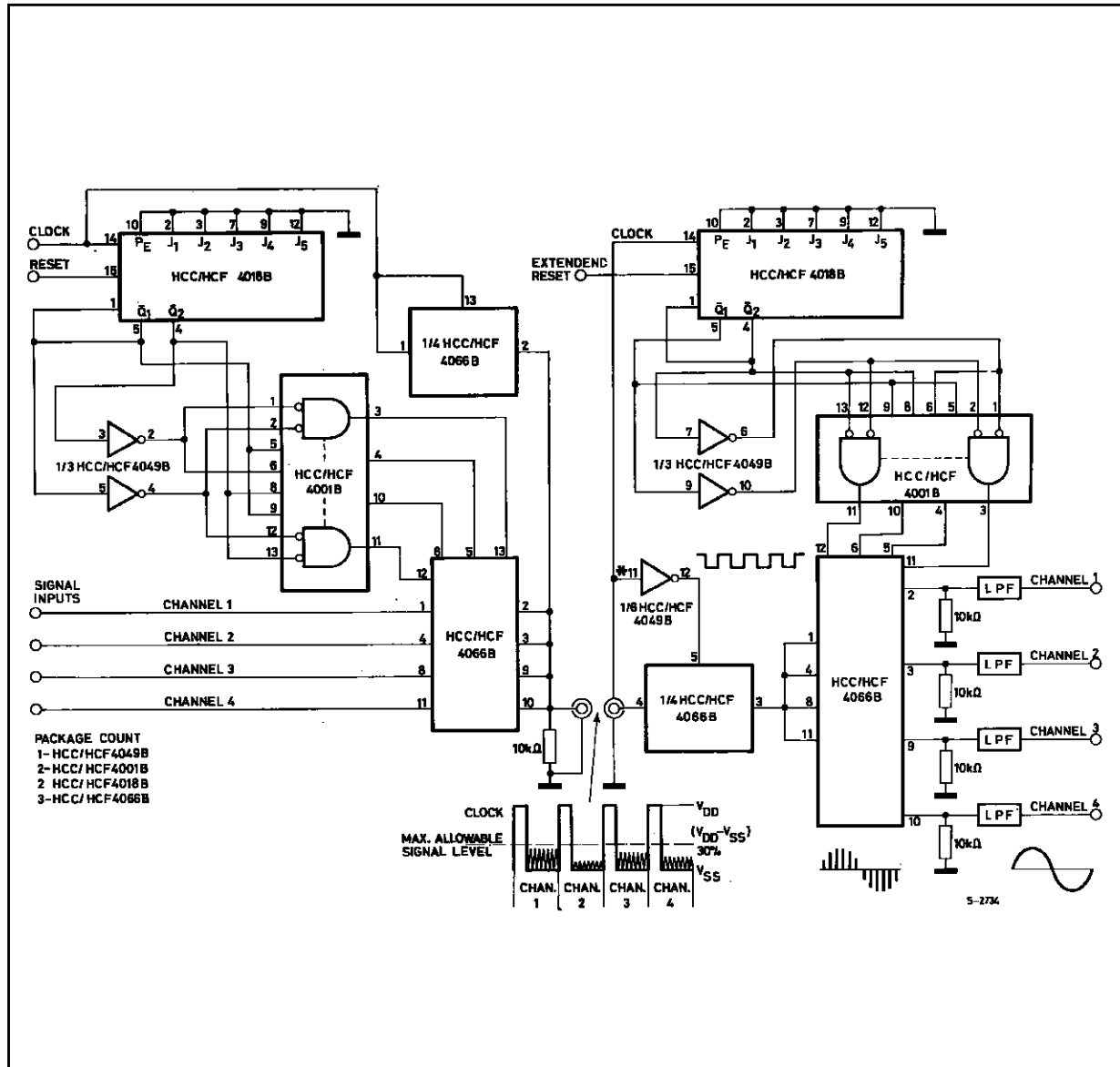
BIDIRECTIONAL SIGNAL TRANSMISSION VIA DIGITAL CONTROL LOGIC



HCC/HCF4066B

TYPICAL APPLICATIONS (continued)

4-CHANNEL PAM MULTIPLEX SYSTEM DIAGRAM.



Plastic DIP14 MECHANICAL DATA

| DIM. | mm | | | inch | | |
|------|------|-------|------|-------|-------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| a1 | 0.51 | | | 0.020 | | |
| B | 1.39 | | 1.65 | 0.055 | | 0.065 |
| b | | 0.5 | | | 0.020 | |
| b1 | | 0.25 | | | 0.010 | |
| D | | | 20 | | | 0.787 |
| E | | 8.5 | | | 0.335 | |
| e | | 2.54 | | | 0.100 | |
| e3 | | 15.24 | | | 0.600 | |
| F | | | 7.1 | | | 0.280 |
| I | | | 5.1 | | | 0.201 |
| L | | 3.3 | | | 0.130 | |
| Z | 1.27 | | 2.54 | 0.050 | | 0.100 |



Ceramic DIP14/1 MECHANICAL DATA

| DIM. | mm | | | inch | | |
|------|------|-------|------|-------|-------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | | | 20 | | | 0.787 |
| B | | | 7.0 | | | 0.276 |
| D | | 3.3 | | | 0.130 | |
| E | 0.38 | | | 0.015 | | |
| e3 | | 15.24 | | | 0.600 | |
| F | 2.29 | | 2.79 | 0.090 | | 0.110 |
| G | 0.4 | | 0.55 | 0.016 | | 0.022 |
| H | 1.17 | | 1.52 | 0.046 | | 0.060 |
| L | 0.22 | | 0.31 | 0.009 | | 0.012 |
| M | 1.52 | | 2.54 | 0.060 | | 0.100 |
| N | | | 10.3 | | | 0.406 |
| P | 7.8 | | 8.05 | 0.307 | | 0.317 |
| Q | | | 5.08 | | | 0.200 |



P053C

SO14 MECHANICAL DATA

| DIM. | mm | | | inch | | |
|------|------------|------|------|-------|-------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | | | 1.75 | | | 0.068 |
| a1 | 0.1 | | 0.2 | 0.003 | | 0.007 |
| a2 | | | 1.65 | | | 0.064 |
| b | 0.35 | | 0.46 | 0.013 | | 0.018 |
| b1 | 0.19 | | 0.25 | 0.007 | | 0.010 |
| C | | 0.5 | | | 0.019 | |
| c1 | 45° (typ.) | | | | | |
| D | 8.55 | | 8.75 | 0.336 | | 0.344 |
| E | 5.8 | | 6.2 | 0.228 | | 0.244 |
| e | | 1.27 | | | 0.050 | |
| e3 | | 7.62 | | | 0.300 | |
| F | 3.8 | | 4.0 | 0.149 | | 0.157 |
| G | 4.6 | | 5.3 | 0.181 | | 0.208 |
| L | 0.5 | | 1.27 | 0.019 | | 0.050 |
| M | | | 0.68 | | | 0.026 |
| S | 8° (max.) | | | | | |



PLCC20 MECHANICAL DATA

| DIM. | mm | | | inch | | |
|------|------|------|-------|-------|-------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | 9.78 | | 10.03 | 0.385 | | 0.395 |
| B | 8.89 | | 9.04 | 0.350 | | 0.356 |
| D | 4.2 | | 4.57 | 0.165 | | 0.180 |
| d1 | | 2.54 | | | 0.100 | |
| d2 | | 0.56 | | | 0.022 | |
| E | 7.37 | | 8.38 | 0.290 | | 0.330 |
| e | | 1.27 | | | 0.050 | |
| e3 | | 5.08 | | | 0.200 | |
| F | | 0.38 | | | 0.015 | |
| G | | | 0.101 | | | 0.004 |
| M | | 1.27 | | | 0.050 | |
| M1 | | 1.14 | | | 0.045 | |



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