COS/MOS INTEGRATED CIRCUIT

HCC/HCF 4066B

41C 08847 D T-57-11

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

- 15V DIGITAL OR ±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: 65 dB TYP. @ f_{is} = 10 kHz, R_L = 10 kΩ
- HIGH DEGREE OF LINEARITY: < 0.5% DISTORTION TYP. @ f_{is} = 1 kHz, V_{is} = 5 Vp-p, V_{DD}-V_{SS} ≥ 10V, R_L = 10 kΩ
- EXTREMELY LOW OFF SWITCH LEAKAGE RESULTING IN VERY LOW OFFSET CURRENT AND HIGH EFFECTIVE OFF RESISTANCE; 10 pA TYP. @ V_{DD}-V_{SS} = 10V, T_A = 25°C
- EXTREMELY HIGH CONTROL INPUT IMPEDANCE (CONTROL CIRCUIT ISOLATED FROM SIGNAL CIRCUIT): 10^{12} Ω TYP.
- LOW CROSSTALK BETWEEN SWITCHES: -50 dB TYP. @ f_{is} = 0.9 MHz, R_L = 1 kΩ
- MATCHED CONTROL-INPUT TO SIGNAL-OUTPUT CAPACITANCE: REDUCES OUTPUT SIGNAL TRANSIENTS
- FREQUENCY RESPONSE, SWITCH ON = 40 MHz (TYP.)
- QUIESCENT CURRENT SPECIFIED TO 20V FOR HCC DEVICE
- 5V, 10V, AND 15V PARAMETRIC RATINGS
- INPUT CURRENT OF 100 nA AT 18V AND 25°C FOR HCC DEVICE
- 100% TESTED FOR QUIESCENT CURRENT
- MEETS ALL REQUIREMENTS OF JEDEC TENTATIVE STANDARD No. 13A, "STANDARD SPECIFICATIONS FOR DESCRIPTION OF "B" SERIES CMOS DEVICES"

The **HCC 4066B** (extended temperature range) and **HCF 4066B** (intermediate temperature range) are monolithic integrated circuits, available in 14-lead dual in-line plastic or ceramic package, ceramic flat package and plastic micropackage. The **HCC/HCF 4066B** is a quad bilateral switch intended for the transmission or multiplexing of analog or digital signals. It is pin-for-pin compatible with **HCC/HCF 4016B**, but exhibits a much lower ON resistance. In addition, the ON resistance is relatively constant over the full input-signal range. The **HCC/HCF 4066B** 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/HCF 4016B** is recommended.

ABSOLUTE MAXIMUM RATINGS

V_{DD}*	Supply voltage: **HCC** types	-0.5 to 20	V
	HCF types	-0.5 to 18	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)	200	mW
	Dissipation per output transistor for T_{op} = full package-temperature range	100	mW
T_{op}	Operating temperature: **HCC** types	-55 to 125	°C
	HCF types	-40 to 85	°C
T_{stg}	Storage temperature	-65 to 150	°C

* All voltage values are referred to V_{SS} pin voltage

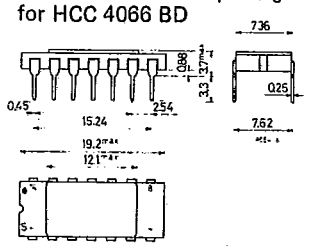
ORDERING NUMBERS:

HCC 4066 BD for dual in-line ceramic package
HCC 4066 BF for dual in-line ceramic package, frit seal
HCC 4066 BK for ceramic flat package
HCF 4066 BE for dual in-line plastic package
HCF 4066 BF for dual in-line ceramic package, frit seal
HCF 4066 BM for plastic micropackage

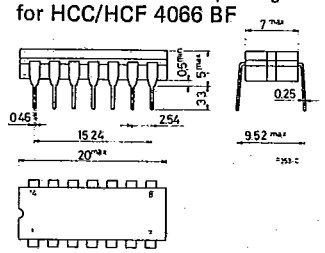
HCC/HCF 4066B

MECHANICAL DATA (dimensions in mm)

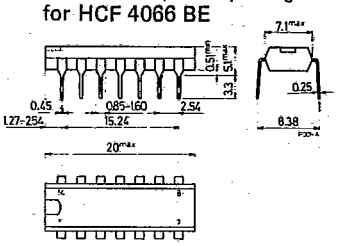
Dual in-line ceramic package for HCC 4066 BD



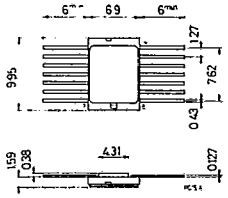
Dual in-line ceramic package for HCC/HCF 4066 BF



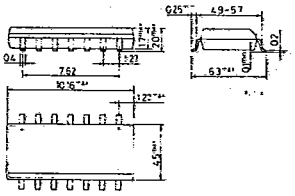
Dual in-line plastic package for HCF 4066 BE



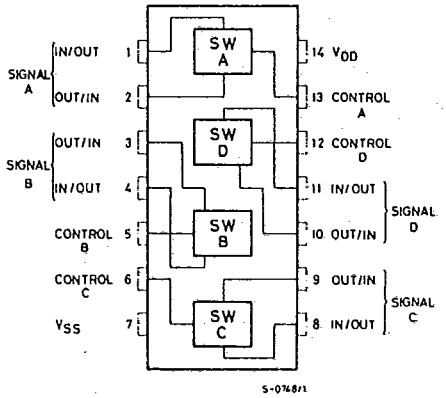
Ceramic flat package for HCC 4066 BK



Plastic micropackage for HCF 4066 BM



FUNCTIONAL DIAGRAM



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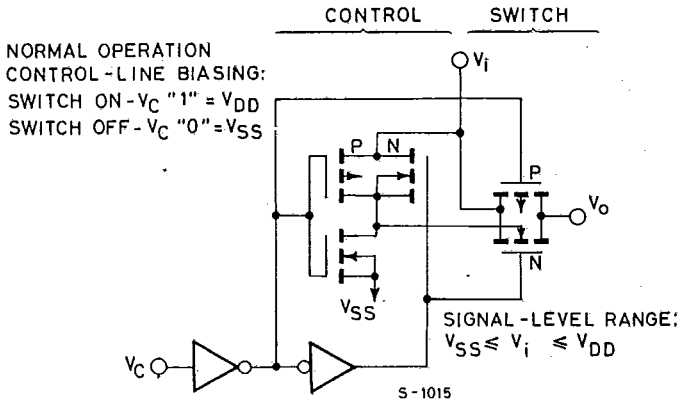
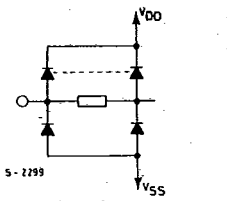
RECOMMENDED OPERATING CONDITIONS

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

SCHEMATIC DIAGRAM

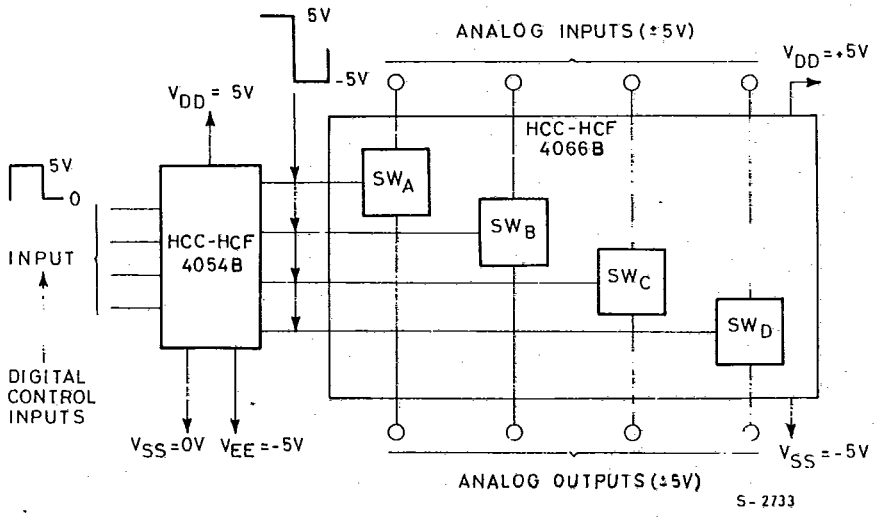
1 of 4 identical switches and its associated control circuitry





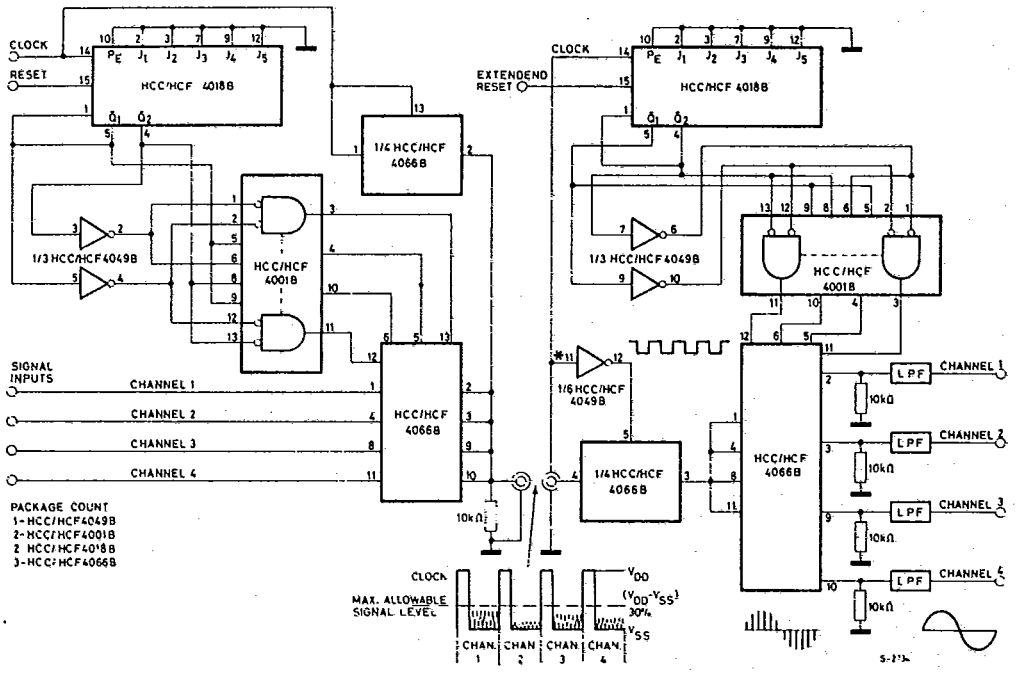
TYPICAL APPLICATIONS

Bidirectional signal transmission via digital control logic



TYPICAL APPLICATIONS (continued)

4-channel PAM multiplex system diagram



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

Parameter			Test conditions V_I (V)	Test conditions V_{DD} (V)	Values T_{Low}* Min.	Values T_{Low}* Max.	Values 25°C Min.	Values 25°C Typ.	Values 25°C Max.	Values T_{High}* Min.	Values T_{High}* Max.	Unit
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	
			0/20	20		5		0.02	5		150	
		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= 10 KΩ 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		V_C= V_{DD}= 5V, V_{SS}= -5V, V_{is} (p-p)= 5V (Sine wave centered in 0V) R_L= 10 kΩ, f_{is} = 1 KHz sine wave					0.4				%
-3dB	Cutoff Frequency (switch on)		V_C=V_{DD}= 5V, V_{SS}= -5V, V_{is} (p-p)= 5V (Sine wave centered on 0V) R_L= 1 kΩ					40				MHz
-50 dB	Feedthrough Frequency (switch off)		V_C=V_{SS}= -5V, V_{is}(p-p)= 5V (Sine wave centered 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)= 5 Vp-p, 50Ω source R_L= 1 kΩ					8				MHz
t_{pd}	Propagation delay (Signal Input to Signal output)		R_L= 200 kΩ V_C=V_{DD}, V_{SS}= GND, C_L= 50 pF, V_{is}= 10V (Square wave centered on 5V) t_r, t_f = 20 ns	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	

ELECTRICAL CHARACTERISTICS (continued)

Parameter		Test conditions	V_{DD} (V)	Values							Unit
				T_{Low}*		25°C			T_{High}*		
				Min.	Max.	Min.	Typ.	Max.	Min.	Max.	
CONTROL (V_C)											
V_{ILC}	Control input Low voltage	$\|I_{is}\| < 10\ \mu A$ $V_{is} = V_{SS}$, $V_{os} = V_{DD}$ 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 $V_{is} \leq V_{DD}$ $V_{DD}-V_{SS} = 18V$	18		±0.1		$\pm 10^{-5}$	±0.1		± 1	μA
		HCF types $V_{DD}-V_{SS} = 15V$ $V_{CC} \leq V_{DD}-V_{SS}$	15		±0.3		$\pm 10^{-5}$	±0.3		± 1	
Crosstalk (control input to signal output)		$V_C = 10V$ (Sq. wave) $t_r, t_f = 20$ ns $R_L = 10$ kΩ	10				50				mW
Turn-On propagation delay		$V_{IN} = V_{DD}$ $t_r, t_f = 20$ ns $C_L = 50$ pF $R_L = 1$ kΩ	5				35	70			ns
			10				20	40			
			15				15	30			
Control input Repetition rate		$V_{is} = V_{DD}$, V_{SS}=GND $R_L = 1$ kΩ to gnd $C_L = 50$ pF $V_C = 10V$ (Square wave centered on 5V) $t_r, t_f = 20$ ns $V_{os} = ½ V_{os}$ @ 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