

16-CHANNEL ANALOGUE MULTIPLEXER/DEMULTIPLEXER



The HEF4067B is a 16-channel analogue multiplexer/demultiplexer with four address inputs (A_0 to A_3), an active LOW enable input ($\bar{E}$), sixteen independent inputs/outputs (Y_0 to Y_{15}) and a common input/output (Z).

The device contains sixteen bidirectional analogue switches, each with one side connected to an independent input/output (Y_0 to Y_{15}) and the other side connected to the common input/output (Z).

With $\bar{E}$ LOW, one of the sixteen switches is selected (low impedance ON-state) by A_0 to A_3 . All unselected switches are in the high impedance OFF-state. With $\bar{E}$ HIGH all switches are in the high impedance OFF-state, independent of A_0 to A_3 .

The analogue inputs/outputs (Y_0 to Y_{15} and Z) can swing between V_{DD} as a positive limit and V_{SS} as a negative limit. V_{DD} to V_{SS} may not exceed 15 V.

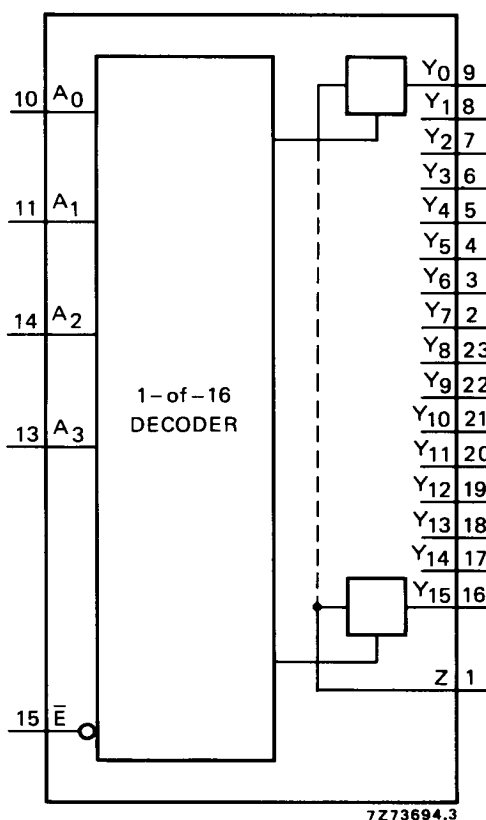


Fig. 1 Functional diagram.

FAMILY DATA

I_{DD} LIMITS category MSI
see Family Specifications

HEF4067B

MSI

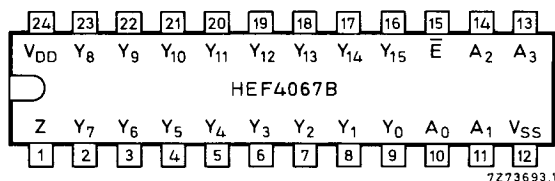


Fig. 2 Pinning diagram.

HEF4067BP : 24-lead DIL; plastic (SOT-101A).

HEF4067BD: 24-lead DIL; ceramic (cerdip) (SOT-94).

HEF4067BT: 24-lead mini-pack; plastic (SO-24; SOT-137A).

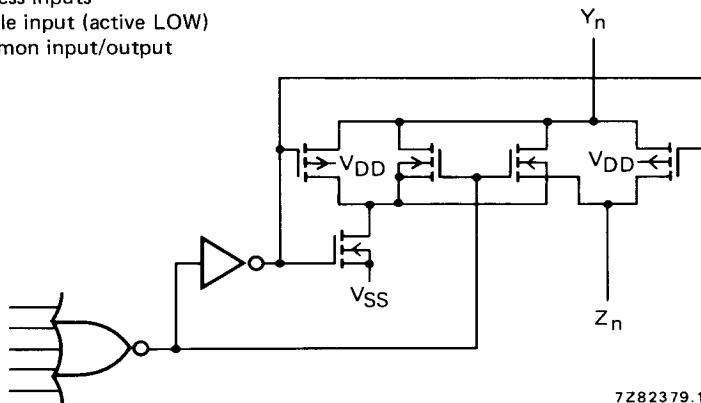
PINNING

Y_0 to Y_{15} independent inputs/outputs

A_0 to A_3 address inputs

$\bar{E}$ enable input (active LOW)

Z common input/output



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Fig. 3 Schematic diagram (one switch).

FUNCTION TABLE

$\bar{E}$	inputs				channel ON
	A_3	A_2	A_1	A_0	
L	L	L	L	L	$Y_0 - Z$
L	L	L	L	H	$Y_1 - Z$
L	L	L	H	L	$Y_2 - Z$
L	L	L	H	H	$Y_3 - Z$
L	L	H	L	L	$Y_4 - Z$
L	L	H	L	H	$Y_5 - Z$
L	L	H	H	L	$Y_6 - Z$
L	L	H	H	H	$Y_7 - Z$
L	H	L	L	L	$Y_8 - Z$
L	H	L	L	H	$Y_9 - Z$
L	H	L	H	L	$Y_{10} - Z$
L	H	L	H	H	$Y_{11} - Z$
L	H	H	L	L	$Y_{12} - Z$
L	H	H	L	H	$Y_{13} - Z$
L	H	H	H	L	$Y_{14} - Z$
L	H	H	H	H	$Y_{15} - Z$
H	X	X	X	X	none

H = HIGH state (the more positive voltage)

L = LOW state (the less positive voltage)

X = state is immaterial

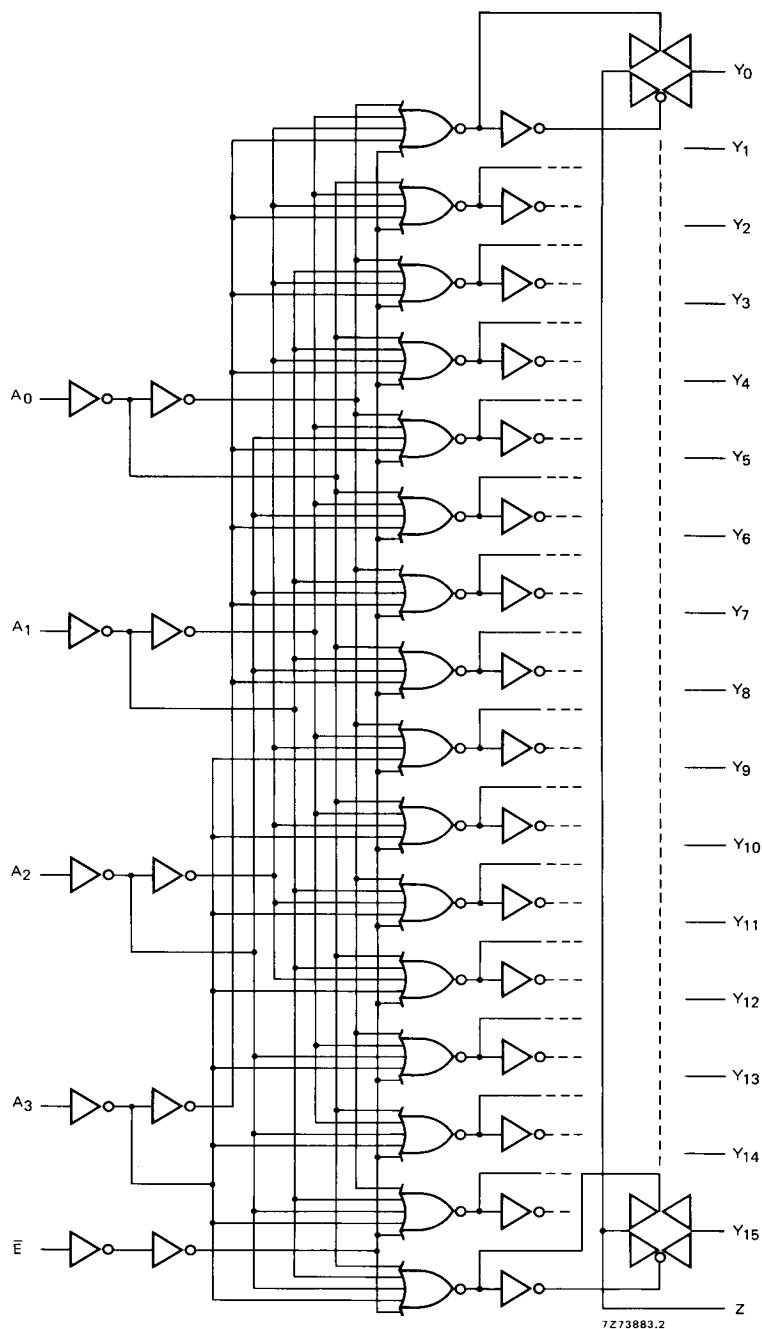
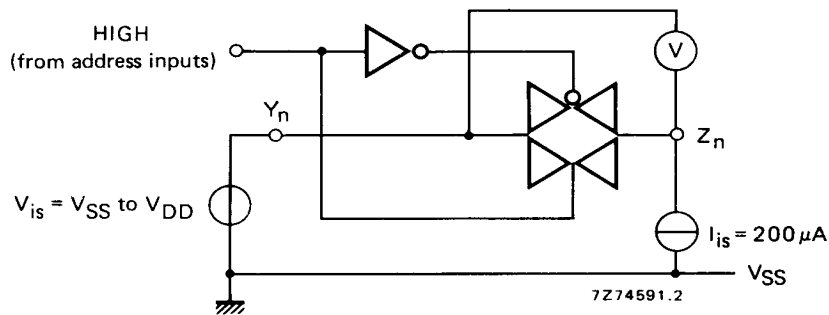
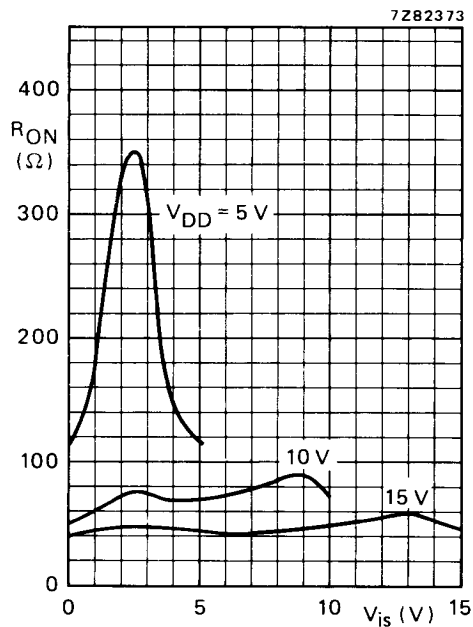


Fig. 4 Logic diagram.

D.C. CHARACTERISTICS

 $T_{amb} = 25^{\circ}\text{C}$

	V_{DD} V	symbol	typ.	max.	conditions
ON resistance	5	R_{ON}	350	2500 Ω	} $V_{is} = V_{SS}$ to V_{DD} see Fig. 5
	10		80	245 Ω	
	15		60	175 Ω	
ON resistance	5	R_{ON}	115	340 Ω	} $V_{is} = V_{SS}$ see Fig. 5
	10		50	160 Ω	
	15		40	115 Ω	
ON resistance	5	R_{ON}	120	365 Ω	} $V_{is} = V_{DD}$ see Fig. 5
	10		65	200 Ω	
	15		50	155 Ω	
' Δ ' ON resistance between any two channels	5	ΔR_{ON}	25	— Ω	} $V_{is} = V_{SS}$ to V_{DD} see Fig. 5
	10		10	— Ω	
	15		5	— Ω	
OFF-state leakage current, all channels OFF	5	I_{OZZ}	—	— nA	} $\bar{E}$ at V_{DD}
	10		—	— nA	
	15		—	1000 nA	
OFF-state leakage current, any channel	5	I_{OZY}	—	— nA	} $\bar{E}$ at V_{SS}
	10		—	— nA	
	15		—	200 nA	

Fig. 5 Test set-up for measuring R_{ON} .Fig. 6 Typical R_{ON} as a function of input voltage. $I_{is} = 200 \mu A$ $V_{SS} = 0 V$ **NOTE**

To avoid drawing V_{DD} current out of terminal Z, when switch current flows into terminals Y, the voltage drop across the bidirectional switch must not exceed 0,4 V. If the switch current flows into terminal Z, no V_{DD} current will flow out of terminals Y, in this case there is no limit for the voltage drop across the switch, but the voltages at Y and Z may not exceed V_{DD} or V_{SS} .

A.C. CHARACTERISTICS

 $V_{SS} = 0\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$; input transition times $\leq 20\text{ ns}$

	V_{DD} V	typical formula for P (μW)	where f_i = input freq. (MHz) f_o = output freq. (MHz) C_L = load capacitance (pF) $\Sigma(f_o C_L)$ = sum of outputs V_{DD} = supply voltage (V)
Dynamic power dissipation per package (P)	5	$1\,100 f_i + \Sigma(f_o C_L) \times V_{DD}^2$	
	10	$5\,000 f_i + \Sigma(f_o C_L) \times V_{DD}^2$	
	15	$13\,300 f_i + \Sigma(f_o C_L) \times V_{DD}^2$	

A.C. CHARACTERISTICS

 $V_{SS} = 0\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$; input transition times $\leq 20\text{ ns}$

	V_{DD} V	symbol	typ.	max.	
Propagation delays $V_{is} \rightarrow V_{os}$ HIGH to LOW	5	t_{PHL}	30	60	ns } note 1
	10		15	25	
	15		10	20	
LOW to HIGH	5	t_{PLH}	25	50	ns } note 1
	10		10	20	
	15		10	20	
$A_n \rightarrow V_{os}$ HIGH to LOW	5	t_{PHL}	190	380	ns } note 2
	10		70	145	
	15		50	100	
LOW to HIGH	5	t_{PLH}	175	345	ns } note 2
	10		70	140	
	15		50	100	
Output disable times $\bar{E} \rightarrow V_{os}$ HIGH	5	t_{PHZ}	195	385	ns } note 3
	10		140	280	
	15		130	260	
LOW	5	t_{PLZ}	215	435	ns } note 3
	10		180	355	
	15		170	340	
Output enable times $\bar{E} \rightarrow V_{os}$ HIGH	5	t_{PZH}	155	315	ns } note 3
	10		70	135	
	15		50	100	
LOW	5	t_{PZL}	170	340	ns } note 3
	10		70	140	
	15		50	100	

A.C. CHARACTERISTICS

$V_{SS} = 0\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$; input transition times $\leq 20\text{ ns}$

	V_{DD} V	symbol	typ.	max.	
Distortion, sine-wave response	5		0,25	%	} note 4
	10		0,04	%	
	15		0,04	%	
Crosstalk between any two channels	5		—	MHz	} note 5
	10		1	MHz	
	15		—	MHz	
Crosstalk; enable or address input to output	5		—	mV	} note 6
	10		50	mV	
	15		—	mV	
OFF-state feed-through	5		—	MHz	} note 7
	10		1	MHz	
	15		—	MHz	
ON-state frequency response	5		13	MHz	} note 8
	10		40	MHz	
	15		70	MHz	

NOTES

V_{is} is the input voltage at a Y or Z terminal, whichever is assigned as input.

V_{os} is the output voltage at a Y or Z terminal, whichever is assigned as output.

- $R_L = 10\text{ k}\Omega$ to V_{SS} ; $C_L = 50\text{ pF}$ to V_{SS} ; $\bar{E} = V_{SS}$; $V_{is} = V_{DD}$ (square-wave); see Fig. 7.
- $R_L = 10\text{ k}\Omega$; $C_L = 50\text{ pF}$ to V_{SS} ; $\bar{E} = V_{SS}$; $A_n = V_{DD}$ (square-wave); $V_{is} = V_{DD}$ and R_L to V_{SS} for t_{PLH} ; $V_{is} = V_{SS}$ and R_L to V_{DD} for t_{PHL} ; see Fig. 7.
- $R_L = 10\text{ k}\Omega$; $C_L = 50\text{ pF}$ to V_{SS} ; $\bar{E} = V_{DD}$ (square-wave);
 $V_{is} = V_{DD}$ and R_L to V_{SS} for t_{PHZ} and t_{PZH} ;
 $V_{is} = V_{SS}$ and R_L to V_{DD} for t_{PLZ} and t_{PZL} ; see Fig. 7.
- $R_L = 10\text{ k}\Omega$; $C_L = 15\text{ pF}$; channel ON; $V_{is} = \frac{1}{2} V_{DD(p-p)}$ (sine-wave, symmetrical about $\frac{1}{2} V_{DD}$); $f_{is} = 1\text{ kHz}$; see Fig. 8.
- $R_L = 1\text{ k}\Omega$; $V_{is} = \frac{1}{2} V_{DD(p-p)}$ (sine-wave, symmetrical about $\frac{1}{2} V_{DD}$);
 $20 \log \frac{V_{os}}{V_{is}} = -50\text{ dB}$; see Fig. 9.
- $R_L = 10\text{ k}\Omega$ to V_{SS} ; $C_L = 15\text{ pF}$ to V_{SS} ; $\bar{E}$ or $A_n = V_{DD}$ (square-wave); crosstalk is $|V_{os}|$ (peak value); see Fig. 7.
- $R_L = 1\text{ k}\Omega$; $C_L = 5\text{ pF}$; channel OFF; $V_{is} = \frac{1}{2} V_{DD(p-p)}$ (sine-wave, symmetrical about $\frac{1}{2} V_{DD}$);
 $20 \log \frac{V_{os}}{V_{is}} = -50\text{ dB}$; see Fig. 8.
- $R_L = 1\text{ k}\Omega$; $C_L = 5\text{ pF}$; channel ON; $V_{is} = \frac{1}{2} V_{DD(p-p)}$ (sine-wave, symmetrical about $\frac{1}{2} V_{DD}$);
 $20 \log \frac{V_{os}}{V_{is}} = -3\text{ dB}$; see Fig. 8.

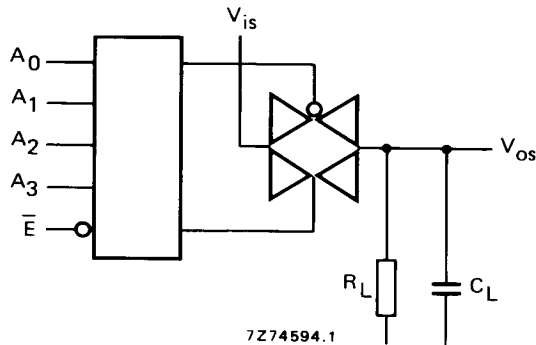


Fig. 7.

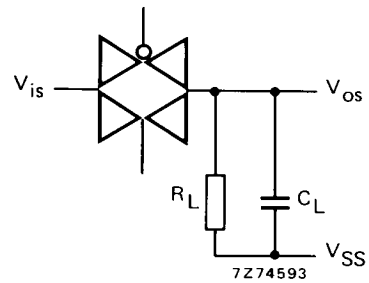


Fig. 8.

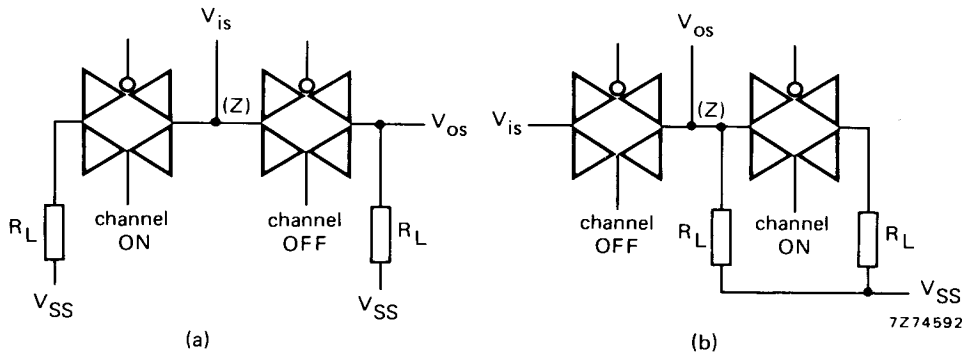


Fig. 9.

APPLICATION INFORMATION

Some examples of applications for the HEF4067B are:

- Analogue multiplexing and demultiplexing.
- Digital multiplexing and demultiplexing.
- Signal gating.

NOTE

If break before make is needed, then it is necessary to use the enable input.