

Am10470

4096 x 1 IMOX™ ECL Bipolar RAM

Am10470

DISTINCTIVE CHARACTERISTICS

- Fast access time (12 ns typ.) — improves system cycle speeds
- Fully compatible with standard voltage compensated 10K series ECL — no board changes required
- Internally voltage compensated providing flat AC performance
- Outputs preconditioned during write cycle eliminating write recovery glitch
- Emitter follower outputs — easy wire-ORing
- Power dissipation decreases with increasing temperature

GENERAL DESCRIPTION

The Am10470 is a fully decoded 4096-bit ECL RAM organized 4096 words by one bit. Bit selection is achieved by means of a 12-bit address, A₀ through A₁₁. Easy memory expansion is provided by an active-LOW chip select ($\overline{CS}$) input and an unterminated OR-tieable emitter follower output.

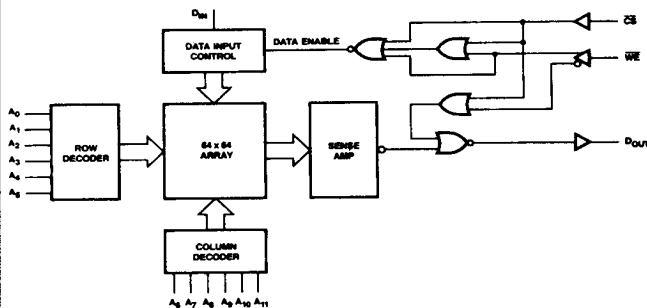
An active-LOW write line ($\overline{WE}$) controls the write/read operation of the memory. When the chip select and write lines are LOW, the data input (D_{IN}) is written into the addressed memory word simultaneously preconditioning

the output so true data is present when the write cycle is complete. This preconditioning operation insures minimum write recovery times by eliminating the "write recovery glitch."

Reading is performed with the chip select line LOW and the write line HIGH. The information stored in the addressed word is read out on the noninverting output (D_{OUT}).

During the writing operation or when the chip select line is HIGH, the output of the memory goes to a LOW state.

BLOCK DIAGRAM



MODE SELECT TABLE

Input			Output		Mode
CS	WE	D _{IN}	D _{OUT}		
H	X	X	L		Not Selected
L	L	L	L		Write "0"
L	L	H	L		Write "1"
L	H	X	D _{OUT}		Read

H = HIGH = -0.9 V

L = LOW = -1.7 V

X = Don't Care

BD000660

PRODUCT SELECTOR GUIDE

Highlights of Key Performance Parameters

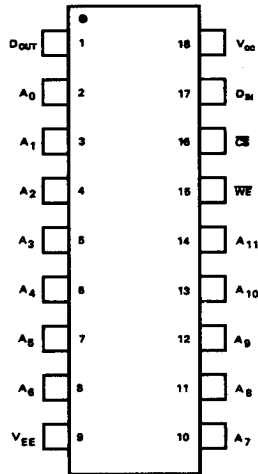
Part Number	Am10470SA	Am10470-15	Am10470SA	Am10470A	Am10470A
Temperature Range	C	M	M	C	M
Address Access Time (t _{AA})	15 ns	15 ns	20 ns	25 ns	30 ns
Write Pulse Width (t _w)	15 ns	15 ns	18 ns	20 ns	22 ns
Write Recovery (t _{wr})	8 ns	10 ns	10 ns	10 ns	12 ns
Chip Select Access/Recovery (t _{ACS} /t _{RCS})	8 ns	10 ns	10 ns	10 ns	15 ns
Write Disable (t _{ws})	8 ns	10 ns	10 ns	10 ns	12 ns
Power Supply (I _{EE})	230 mA	255 mA	255 mA	200 mA	220 mA

IMOX is a trademark of Advanced Micro Devices, Inc.

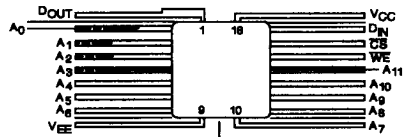
3-29

Publication # 03224
Rev. C
Issue Date: May 1986
Amendment /0

CONNECTION DIAGRAMS Top View



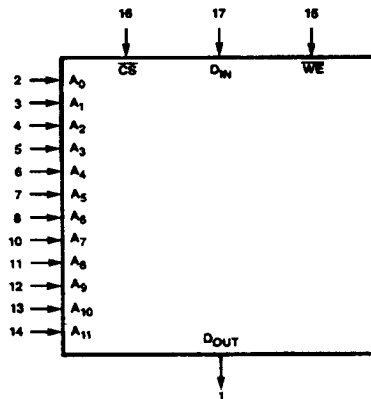
CD009810



CD009790

Note: Pin 1 is marked for orientation.

LOGIC SYMBOL



LS000271

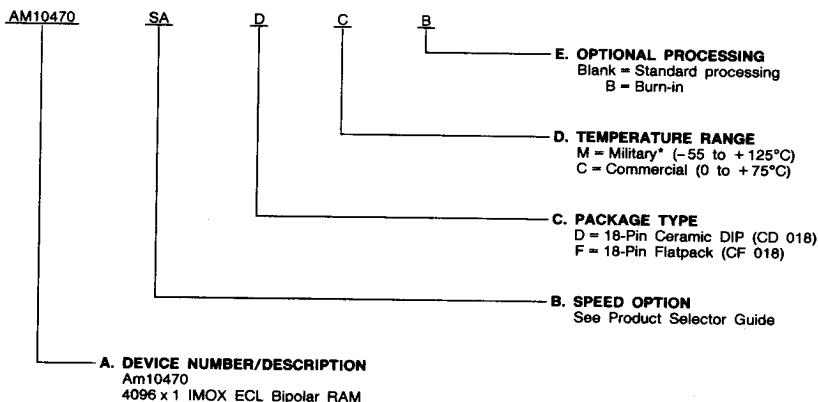
VCC = Pin 18
VEE = Pin 9

ORDERING INFORMATION

Standard Products

AMD standard products are available in several packages and operating ranges. The order number (Valid Combination) is formed by a combination of:

- A. Device Number**
- B. Speed Option** (if applicable)
- C. Package Type**
- D. Temperature Range**
- E. Optional Processing**



Valid Combinations	
AM10470SA	DC, DCB, DMB
AM10470A	FC, FCB, FMB
AM10470-15	DMB, FMB

*Military or Limited Military temperature range products are "NPL" (Non-Compliant Products List) or Non-MIL-STD-883C Compliant products only.

Valid Combinations

Valid Combinations list configurations planned to be supported in volume for this device. Consult the local AMD sales office to confirm availability of specific valid combinations, to check on newly released combinations, and to obtain additional data on AMD's standard military grade products.

ABSOLUTE MAXIMUM RATINGS

Storage Temperature - 65 to 150°C
 Case Temperature with
 Power Applied - 55 to +125°C
 V_{EE} Pin Potential to GND Pin - 7.0 V to +0.5 V
 Input Voltage (DC) V_{EE} to +0.5 V
 Output Current (DC Output HIGH) ... - 30 mA to +0.1 mA

Stresses above those listed under **ABSOLUTE MAXIMUM RATINGS** may cause permanent device failure. Functionality at or above these limits is not implied. Exposure to absolute maximum ratings for extended periods may affect device reliability.

OPERATING RANGES

Commercial (C) Devices

Temperature 0 to +75°C
 Supply Voltage - 5.46 V to - 4.94 V

Military (M) Devices

Temperature - 55 to +125°C
 Supply Voltage - 5.72 V to - 4.68 V

Operating ranges define those limits between which the functionality of the device is guaranteed.

DC CHARACTERISTICS (Commercial)* V_{EE} = - 5.2 V, V_{CC}=GND (Note 2)

Parameter Symbol	Parameter Description	Test Conditions			B (Note 3)	Typ. (Note 1)	A (Note 3)	Units
V _{OH}	Output Voltage HIGH	V _{IN} = V _{IHA} or V _{ILB}	Loading is 50 Ω to -2.0 V	T = 0°C	-1000		-840	mV
V _{OL}	Output Voltage LOW			T = +25°C	-960		-810	mV
				T = +75°C	-900		-720	
		T = 0°C		-1870		-1665		
V _{OHC}	Output Voltage HIGH	V _{IN} = V _{IHB} or V _{ILA}		T = +25°C	-1850		-1650	mV
				T = +75°C	-1830		-1625	
				T = 0°C	-1020			
V _{OLC}	Output Voltage LOW	T = +25°C		-980			mV	
		T = +75°C		-920				
		T = 0°C				-1645		mV
V _{IH}	Input Voltage HIGH	Guaranteed Input Voltage HIGH for All Input (Note 4)	T = +25°C			-1630	mV	
			T = +75°C			-1605		
			T = 0°C	-1145		-840		mV
V _{IL}	Input Voltage LOW	Guaranteed Input Voltage Low for All Inputs (Note 4)	T = +25°C	-1105		-810	mV	
			T = +75°C	-1045		-720		
			T = 0°C	-1870		-1490		mV
I _{IH}	Input Current HIGH	V _{IN} = V _{IHA}	T = +25°C	-1850		-1475	mV	
			T = +75°C	-1830		-1450		
			I _{IH}	Input Current HIGH	V _{IN} = V _{IHA}	T = 0°C to +75°C		
I _{IL}	Input Current LOW Chip Select (CS) All Other Inputs	V _{IN} = V _{ILB}	T = +25°C	0.5 -50		170	μA	
I _{EE}	Power Supply Current (Pin 9)	All Inputs and Outputs Open	Am10470A and Am10470	T = 0°C	-200	-160		mA
			Am10470SA	T = +75°C		-145		
				T = 0°C	-230	-180		

Notes: 1. Typical values are at V_{EE} = -5.2 V, T_A = 25°C and maximum loading.

2. Output Load = 50 Ω and 30 pF to -2.0 V

T = T_A = 0 to +75°C for Commercial DIPs. Guaranteed with transverse air flow exceeding 400 linear F.P.M. and 2-minute warm-up period. Approximate thermal resistance values of the package are:

θ_{JA} (Junction to Ambient) = 90°C/Watt (still air)

θ_{JA} (Junction to Ambient) = 50°C/Watt (at 400 F.P.M. air flow)

T = T_C = 0 to +75°C for Flatpacks and Leadless Chip Carriers.

θ_{JC} (Junction to Case) = 25°C/Watt

3. Definition of symbols and terms used in this product specification: The relative values of the specified conditions and limits will be referenced to an algebraic scale. The extremities of the scale are: "A" the value closest to positive infinity, "B" the value closest to negative infinity.

4. These are absolute voltages with respect to device ground pin and include all overshoots due to system and/or tester noise. Do not attempt to test these values without suitable equipment.

5. Operating specification with adequate time for temperature stabilization and transverse air flow exceeding 400 linear feet per minute. Conformance testing performed instantaneously where T = T_C.
 θ_{JC} ≈ 25° 9w (approximately).

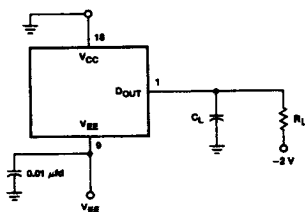
*See the last page of this spec for Group A Subgroup Testing information.

DC CHARACTERISTICS (Military)* $V_{EE} = -5.2\text{ V}$, $V_{CC} = \text{GND}$ (Note 5)

Parameter Symbol	Parameter Description	Test Conditions		B (Note 3)	Typ. (Note 1)	A (Note 3)	Units
VOH	Output Voltage HIGH	VIN = VIHA or VILB	Loading is 50 Ω to -2.0 V	TA = -55°C	-1140	-870	mV
VOL	Output Voltage LOW			TA = +25°C	-1000	-840	
				TA = +125°C	-880	-685	
				TA = -55°C	-1910	-1700	
				TA = +25°C	-1870	-1665	
				TA = +125°C	-1815	-1600	
VOHC	Output Voltage HIGH	VIN = VIHB or VILA	Loading is 50 Ω to -2.0 V	TA = -55°C	-1160		mV
VOLC	Output Voltage LOW			TA = +25°C	-1020		
				TA = +125°C	-900		
				TA = -55°C		-1680	mV
				TA = +25°C		-1645	
				TA = +125°C		-1580	
VIH	Input Voltage HIGH	Guaranteed Input Voltage HIGH for All Inputs (Note 4)		TA = -55°C	-1285	-870	mV
VIL	Input Voltage LOW	Guaranteed Input Voltage LOW for All Inputs (Note 4)	TA = +25°C	-1145	-840		
			TA = +125°C	-1025	-685		
			TA = -55°C	-1910	-1525	mV	
IIL	Input Current LOW Chip Select (CS) All Other Inputs	VIN = VILB	TA = +25°C	-1870	-1490		
			TA = +125°C	-1815	-1420		
			TA = -55°C		220	μA	
IEE	Power Supply Current (Pin 9)	All Inputs and Outputs Open	Am10470A	TA = -55°C	-220	-175	mA
Am10470SA Am10470-15	TA = +125°C			-160			
	TA = -55°C		-255	-200			

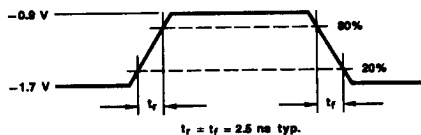
*See the last page of this spec for Group A Subgroup Testing information.

SWITCHING TEST CIRCUIT



TC000231

SWITCHING TEST WAVEFORM



TW000310

KEY TO SWITCHING WAVEFORMS

WAVEFORM	INPUTS	OUTPUTS
	MUST BE STEADY	WILL BE STEADY
	MAY CHANGE FROM H TO L	WILL BE CHANGING FROM H TO L
	MAY CHANGE FROM L TO H	WILL BE CHANGING FROM L TO H
	DON'T CARE; ANY CHANGE PERMITTED	CHANGING; STATE UNKNOWN
	DOES NOT APPLY	CENTER LINE IS HIGH IMPEDANCE "OFF" STATE

KS000010

$R_L = 50 \Omega$ termination of measurement system

$C_L = 30$ pF (including stray jig capacitance)

SWITCHING CHARACTERISTICS (Commercial)* $V_{EE} = -5.46$ to -4.94 V (Note 2)

No.	Parameter Symbol	Parameter Description	Test Conditions	Am10470SA			Am10470A			Units
				Min.	Typ. (Note 1)	Max.	Min.	Typ. (Note 1)	Max.	
READ MODE										
1	tACS	Chip Select Access Time	Measured at 50% of input to 50% of output		6	8		8	10	ns
2	tRCS	Chip Select Recovery Time			6	8		8	10	ns
3	tAA	Address Access Time			12	15		18	25	ns
WRITE MODE										
4	tW	Write Pulse Width (to Guarantee Writing)	tWSA = tWSA (Min.)	15	8		20	10		ns
5	tWSD	Data Setup Time Prior to Write		2	0		2	0		ns
6	tWHD	Data Hold Time After Write		2	0		2	0		ns
7	tWSA	Address Setup Time Prior to Write	tW = tW (Min.)	2	0		2	0		ns
8	tWHA	Address Hold Time After Write		2	0		2	0		ns
9	tWSCS	Chip Select Setup Time Prior to Write	Measured at 50% of input to 50% of output	2			2	0		ns
10	tWHCS	Chip Select Hold Time After Write		2	0		2	0		ns
11	tWS	Write Disable Time			6	8		8	10	ns
12	tWR	Write Recovery Time			6	8		8	10	ns
RISE TIME AND FALL TIME										
	t _r	Output Rise Time	Measured between 20% and 80% points		2.5			2.5		ns
	t _f	Output Fall Time			2.5			2.5		ns
CAPACITANCE										
	C _{IN}	Input Pin Capacitance	Measure with a Pulse Technique on a Sample Basis.		4	5		4	5	pF
	C _{OUT}	Output Pin Capacitance			7	8		7	8	

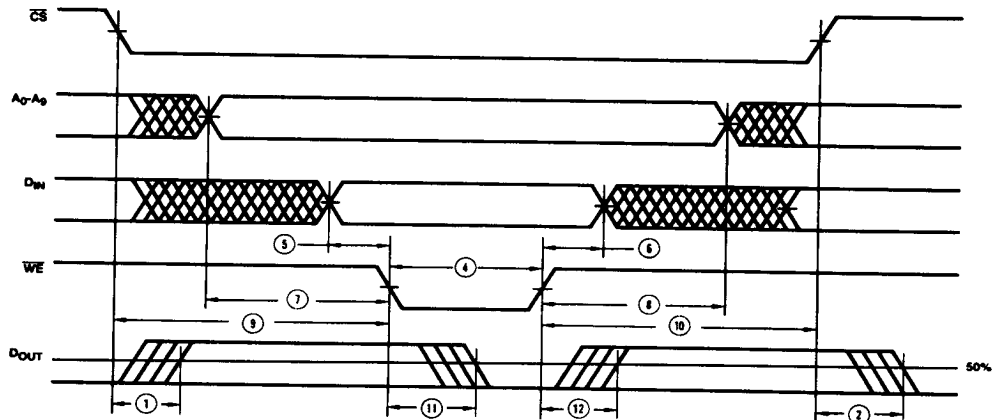
*See the last page of this spec for Group A Subgroup Testing information.

SWITCHING CHARACTERISTICS (Military)*

No.	Parameter Symbol	Parameter Description	Test Conditions	Am10470-15			Am10470SA			Am10470A			Units
				Min.	Typ. (Note 1)	Max.	Min.	Typ. (Note 1)	Max.	Min.	Typ. (Note 1)	Max.	
READ MODE													
1	tACS	Chip Select Access Time	Measured at 50% of input to 50% of output		8	10		8	10		10	15	ns
2	tRCS	Chip Select Recovery Time			8	10		8	10		10	15	ns
3	tAA	Address Access Time			12	15		17	20		20	30	ns
WRITE MODE													
4	tW	Write Pulse Width	tWSA = tWSA (Min.)	15	10		18	14		22	17		ns
5	tWSD	Data Setup Time Prior to Write		3	0		3	0		5	2		ns
6	tWHD	Data Hold Time After Write		3	0		3	0		5	2		ns
7	tWSA	Address Setup Time Prior to Write	tW = tW (Min.)	3	0		3	0		5	2		ns
8	tWHA	Address Hold Time	Measured at 50% of input to 50% of output	3	0		3	0		5	2		ns
9	tWSCS	Chip Select Setup Time Prior to Write		3	0		3	0		5	2		ns
10	tWHCS	Chip Select Hold Time After Write		3	0		3	0		5	2		ns
11	tWS	Write Disable Time			8	10		8	10		10	12	ns
12	tWR	Write Recovery Time			8	10		8	10		10	12	ns
RISE TIME AND FALL TIME													
	t _r	Output Rise Time	Measured between 20% and 80% points		2.5			2.5			2.5		ns
	t _f	Output Fall Time			2.5			2.5			2.5		ns
CAPACITANCE													
	C _{IN}	Input Pin Capacitance	Measure with a Pulse Technique on a Sample Basis.		4	5		4	5		4	5	pF
	C _{OUT}	Output Pin Capacitance			7	8		7	8		7	8	

*See the last page of this spec for Group A Subgroup Testing information.

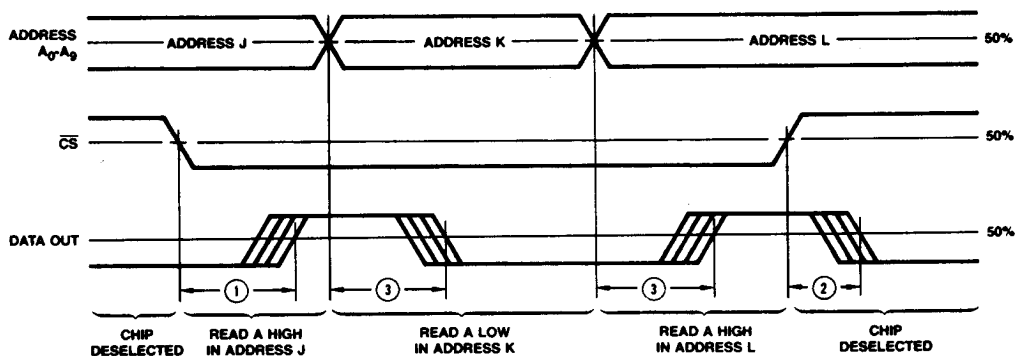
SWITCHING WAVEFORMS (Cont'd.)



Write Mode

WF001163

SWITCHING WAVEFORMS



WF001173

Read Mode

GROUP A SUBGROUP TESTING

DC CHARACTERISTICS

Parameter Symbol	Subgroups
V _{OH}	1, 2, 3
V _{OL}	1, 2, 3
V _{OHC}	1, 2, 3
V _{OLC}	1, 2, 3
V _{IH}	1, 2, 3
V _{IL}	1, 2, 3
I _{IH}	1, 2, 3
I _{IL}	1, 2, 3
I _{EE}	1, 2, 3

SWITCHING CHARACTERISTICS

No.	Parameter Symbol	Subgroups	No.	Parameter Symbol	Subgroups
1	t _{ACS}	9, 10, 11	7	t _{WSA}	9, 10, 11
2	t _{RCS}	9, 10, 11	8	t _{WHA}	9, 10, 11
3	t _{AA}	9, 10, 11	9	t _{WSCS}	9, 10, 11
4	t _W	9, 10, 11	10	t _{WHCS}	9, 10, 11
5	t _{WSD}	9, 10, 11	11	t _{WS}	9, 10, 11
6	t _{WHD}	9, 10, 11	12	t _{WR}	9, 10, 11

MILITARY BURN-IN

Military burn-in is in accordance with the current revision of MIL-STD-883, Test Method 1015, Conditions A through E. Test conditions are selected at AMD's option.