

Am10415

1024 x 1 IMOX™ ECL Bipolar RAM

Am10415

DISTINCTIVE CHARACTERISTICS

- Fast access time (8 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 Am10415 is a fully decoded 1024-bit ECL RAM organized 1024 words by one bit. Bit selection is achieved by means of a 10-bit address, A_0 through A_9 . Easy memory expansion is provided by an active-LOW chip select (\overline{CS}) input and an unterminated OR-tieable emitter follower output.

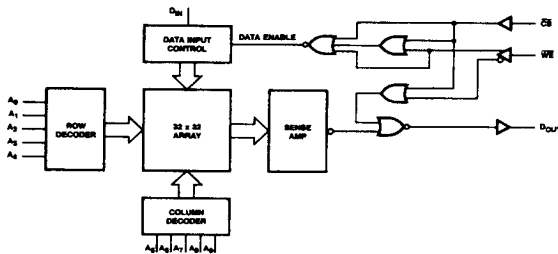
An active-LOW write line (\overline{WE}) controls the write/read operation of the memory. When the chip select and write lines are LOW, the data input (D_{IN}) is written into the addressed memory word simultaneously preconditioning

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



BD000640

MODE SELECT TABLE

\overline{CS}	Input		Output		Mode
	\overline{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 $\cong -0.9$ V

L = LOW $\cong -1.7$ V

X = Don't Care

PRODUCT SELECTOR GUIDE

Highlights of Key Performance Parameters

Part Number	Am10415 - 10	Am10415SA	Am10415A	Am10415 - 15	Am10415SA	Am10415A
Temperature Range	C	C	C	M	M	M
Address Access Time (t_{AA})	10 ns	15 ns	20 ns	15 ns	20 ns	25 ns
Write Pulse Width (t_W)	10 ns	10 ns	12 ns	11 ns	13 ns	16 ns
Write Recovery (t_{WR})	10 ns	12 ns	15 ns	10 ns	12 ns	15 ns
Chip Select Access/Recovery (t_{ACS}/t_{RCS})	8 ns	8 ns	8 ns	10 ns	10 ns	12 ns
Write Disable (t_{WD})	10 ns	10 ns	10 ns	10 ns	10 ns	10 ns
Power Supply (I_{EE})	-150 mA	-150 mA	-150 mA	-165 mA	-165 mA	-165 mA

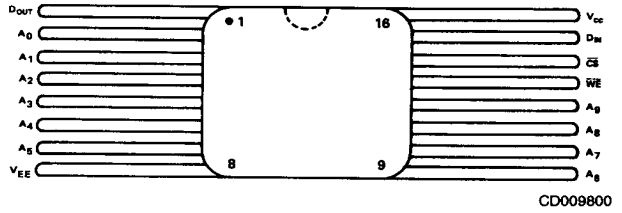
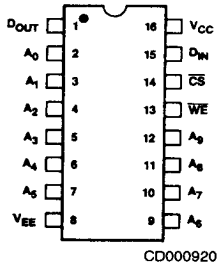
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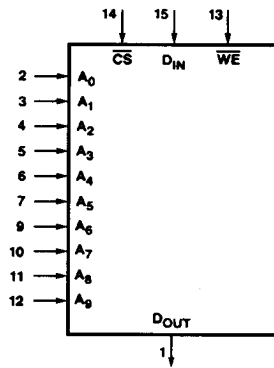
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CONNECTION DIAGRAMS Top View



Note: Pin 1 is marked for orientation.

LOGIC SYMBOL



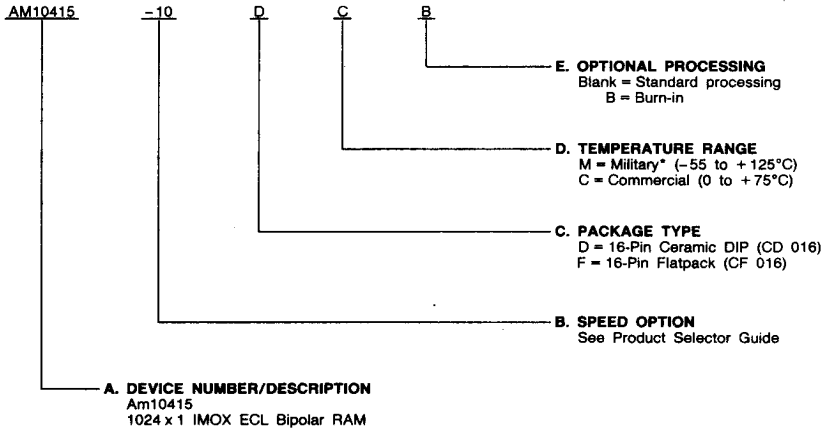
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V_{CC} = Pin 16
V_{EE} = Pin 8

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**



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

Valid Combinations	
AM10415-10	DC, DCB, FC, FCB
AM10415-15	DMB, FMB
AM10415SA	DC, DCB, FC,
AM10415A	FCB, DMB, FMB

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 valid 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		
				T = +25°C	-960	-810			
				T = +75°C	-900	-720			
V _{OL}	Output Voltage LOW			T = 0°C	-1870	-1665	mV		
				T = +25°C	-1850	-1650			
				T = +75°C	-1830	-1625			
V _{OHC}	Output Voltage HIGH	V _{IN} = V _{IHB} or V _{ILA}	Loading is 50 Ω to -2.0 V	T = 0°C	-1020		mV		
				T = +25°C	-980				
				T = +75°C	-920				
V _{OLC}	Output Voltage LOW			T = 0°C			-1645	mV	
				T = +25°C			-1630		
				T = +75°C			-1605		
V _{IH}	Input Voltage HIGH	Guaranteed Input Voltage HIGH for All Inputs (Note 4)	Loading is 50 Ω to -2.0 V	T = 0°C	-1145	-840	mV		
				T = +25°C	-1105	-810			
				T = +75°C	-1045	-720			
V _{IL}	Input Voltage LOW			Guaranteed Input Voltage LOW for All Inputs (Note 4)	Loading is 50 Ω to -2.0 V	T = 0°C	-1870	-1490	mV
						T = +25°C	-1850	-1475	
						T = +75°C	-1830	-1450	
I _{IH}	Input Current HIGH	V _{IN} = V _{IHA}	T = 0 to +75°C				220	μA	
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 8)	All Inputs and Outputs Open	Loading is 50 Ω to -2.0 V			T = 0°C	-150	-105	mA
				T = +75°C		-90			

- Notes: 1. Typical values are at V_{EE} = -5.2 V, T = 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°C/W (approximately)

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

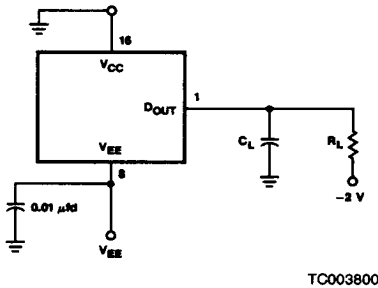
DC CHARACTERISTICS (Military)* $V_{EE} = -5.2 \text{ V}$, $V_{CC} = \text{GND}$ (Note 5)

Parameter Symbol	Parameter Description	Test Conditions		B (Note 3)	Typ. (Note 1)	A (Note 3)	Units	
V _{OH}	Output Voltage HIGH	V _{IN} = V _{IHA} or V _{ILB}	Loading is 50 Ω to -2.0 V	T = -55°C	-1140	-870	mV	
				T = +25°C	-1000	-840		
				T = +125°C	-880	-685		
V _{OL}	Output Voltage LOW			T = -55°C	-1910	-1700		
				T = +25°C	-1870	-1665		
				T = +125°C	-1815	-1600		
V _{OHC}	Output Voltage HIGH	V _{IN} = V _{IHB} or V _{ILA}	Loading is 50 Ω to -2.0 V	T = -55°C	-1160		mV	
				T = +25°C	-1020			
				T = +125°C	-900			
V _{OLC}	Output Voltage LOW			T = -55°C		-1680		mV
				T = +25°C		-1645		
				T = +125°C		-1580		
V _{IH}	Input Voltage HIGH	Guaranteed Input Voltage HIGH for All Inputs (Note 4)		T = -55°C	-1285	-870	mV	
				T = +25°C	-1145	-840		
				T = +125°C	-1025	-685		
V _{IL}	Input Voltage LOW	Guaranteed Input Voltage LOW for All Inputs (Note 4)		T = -55°C	-1910	-1525	mV	
				T = +25°C	-1870	-1490		
				T = +125°C	-1815	-1420		
I _{IH}	Input Current HIGH	V _{IN} = V _{IHA}		T = -55°C		220	μA	
I _{IL}	Input Current LOW Chip Select (CS) All Other Inputs	V _{IN} = V _{ILB}		T = 55°C	0.5	170	μA	
					-50			
I _{EE}	Power Supply Current (Pin 8)	All Inputs and Outputs Open		T = -55°C	-165	-115	mA	
				T = +125°C		-80		

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

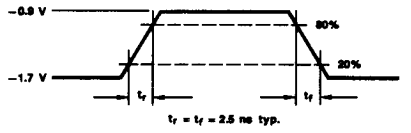
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SWITCHING TEST CIRCUIT



$R_L = 50 \Omega$ termination of measurement system
 $C_L = 30 \text{ pF}$ (including stray jig capacitance)

SWITCHING TEST WAVEFORM



KEY TO SWITCHING TEST WAVEFORM

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

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

No.	Parameter Symbol	Parameter Description	Test Conditions	Am10415-10			Am10415SA			Am10415A			Units
				Min.	Typ. (Note 1)	Max.	Min.	Typ. (Note 1)	Max.	Min.	Typ. (Note 1)	Max.	
READ MODE													
1	t_{ACS}	Chip Select Access Time	Measured at 50% of input to 50% of output		6	8		6	8		6	8	ns
2	t_{RCS}	Chip Select Recovery Time			5	8		5	8		5	8	ns
3	t_{AA}	Address Access Time			8	10		10	15		13	20	ns
WRITE MODE													
4	t_W	Write Pulse Width (to Guarantee Writing)	$t_{WSA} = t_{WSA}(\text{Min.})$	10	6		10	9		12	9		ns
5	t_{WSD}	Data Setup Time Prior to Write		1	0		2	0		4	0		ns
6	t_{WHD}	Data Hold Time After Write		1	0		2	0		4	0		ns
7	t_{WSA}	Address Setup Time Prior to Write	$t_W = t_W(\text{Min.})$	1	0		3	3		5	3		ns
8	t_{WHA}	Address Hold Time After Write		1	0		2	0		3	1		ns
9	t_{WSCS}	Chip Select Setup Time Prior to Write	Measured at 50% of input to 50% of output	1	0		2	0		4	0		ns
10	t_{WHCS}	Chip Select Hold Time After Write		1	0		2	0		4	0		ns
11	t_{WS}	Write Disable Time			5	10		5	10		5	10	ns
10	t_{WR}	Write Recovery Time		6	10		6	12		10	15	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		
CAPACITANCE													
	C_{IN}	Input Pin Capacitance	Measure with a Pulse Technique		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.

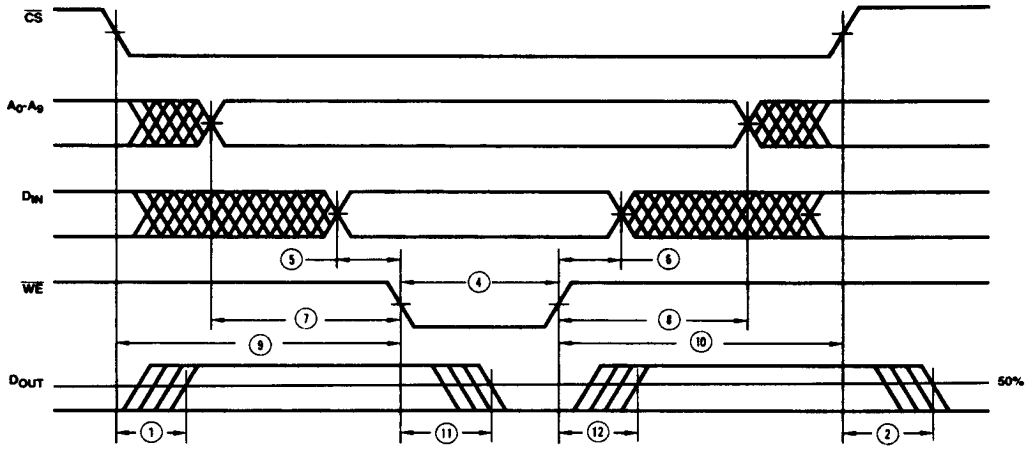
SWITCHING CHARACTERISTICS (Military)* $V_{EE} = -5.72$ to -4.68 V (Note 5)

No.	Parameter Symbol	Parameter Description	Test Conditions	Am10415-15			Am10415SA			Am10415A			Units
				Min.	Typ. (Note 1)	Max.	Min.	Typ. (Note 1)	Max.	Min.	Typ. (Note 1)	Max.	
READ MODE													
1	t _{ACS}	Chip Select Access Time	Measured at 50% of input to 50% of output		6	10		6	10		6	12	ns
2	t _{RCS}	Chip Select Recovery Time			5	10		5	10		5	12	ns
3	t _{AA}	Address Access Time			10	15		10	20		13	25	ns
WRITE MODE													
4	t _W	Write Pulse Width (to Guarantee Writing)	t _{WSA} = t _{WSA} (Min.)	11	6		16	6		16	9		ns
5	t _{WSD}	Data Setup Time Prior to Write		2	0		4	0		4	0		ns
6	t _{WHD}	Data Hold Time After Write		2	0		4	0		4	0		ns
7	t _{WSA}	Address Setup Time	t _W = t _W (Min.)	2	0		5	3		5	3		ns
8	t _{WHA}	Address Hold Time After Write		2	0		4	0		4	0		ns
9	t _{WSCS}	Chip Select Setup Time Prior to Write	Measured at 50% of input to 50% of output	2	0		4	0		4	0		ns
10	t _{WHCS}	Chip Select Hold Time After Write		2	0		4	0		4	0		ns
11	t _{WS}	Write Disable Time			5	10		5	10		5	10	ns
12	t _{WR}	Write Recovery Time		6	10		6	12		10	15	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		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.

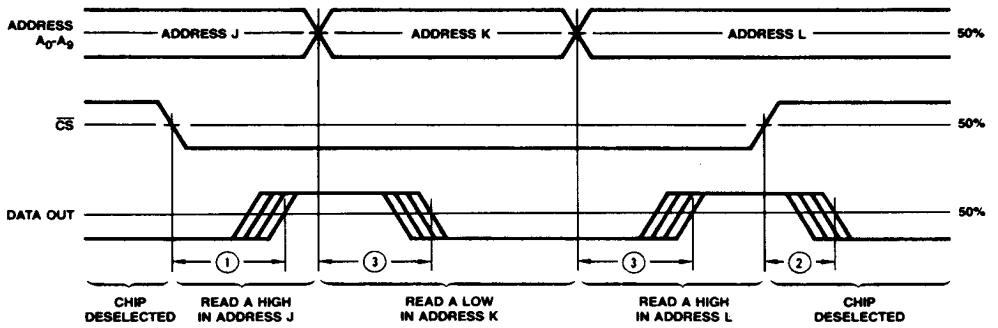
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SWITCHING WAVEFORMS



WF001163

Write Mode



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.

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