

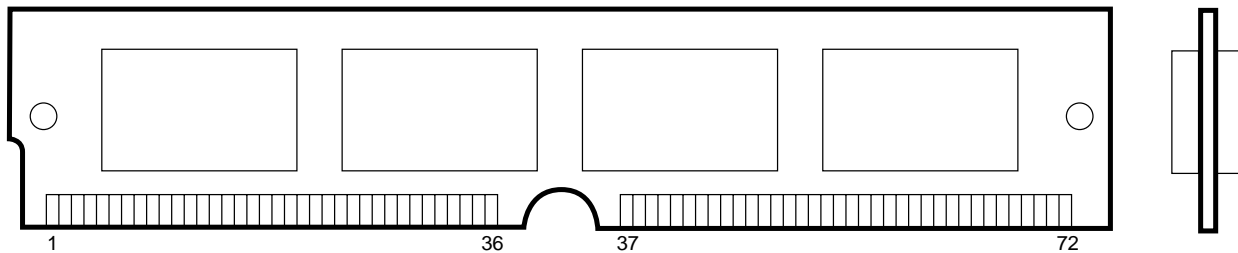
Features

- 2M x 32-bit organization
- V8DJX232BLT EDO
- V8DJ232BLT FPM
- Utilizes High Performance 1M x 8 CMOS DRAMs
- Fast access times: 45, 50, 60 ns
- Low power dissipation
- $\overline{\text{CAS}}$ before $\overline{\text{RAS}}$ refresh, $\overline{\text{RAS}}$ only refresh, and Hidden refresh capability
- Standard 72-lead single-in-line module
- Single 5 V \pm 10% Power Supply
- TTL Interface

Description

The V8DJX232BLT/V8DJ232BLT memory Module is organized as 2,097,152 x 32 bits in a 72-lead single-in-line module. The 2M x 32 memory module uses 8 Mosel-Vitellic 1M x 8 DRAMs. The x32 modules are ideal for use in high performance computer systems where increased memory density and fast access times are required.

V8DJX232BLT/V8DJ232BLT Pin Configuration



1	VSS	19	NC	37	NC	55	I/O12
2	I/O1	20	I/O5	38	NC	56	I/O28
3	I/O17	21	I/O21	39	VSS	57	I/O13
4	I/O2	22	I/O6	40	$\overline{\text{CAS0}}$	58	I/O29
5	I/O18	23	I/O22	41	$\overline{\text{CAS2}}$	59	VCC
6	I/O3	24	I/O7	42	$\overline{\text{CAS3}}$	60	I/O30
7	I/O19	25	I/O23	43	$\overline{\text{CAS1}}$	61	I/O14
8	I/O4	26	I/O8	44	$\overline{\text{RAS0}}$	62	I/O31
9	I/O20	27	I/O24	45	$\overline{\text{RAS1}}$	63	I/O15
10	VCC	28	A7	46	NC	64	I/O32
11	NC	29	NC	47	$\overline{\text{WE}}$	65	I/O16
12	A0	30	VCC	48	NC	66	NC
13	A1	31	A8	49	I/O9	67	PD1*
14	A2	32	A9	50	I/O25	68	PD2*
15	A3	33	$\overline{\text{RAS3}}$	51	I/O10	69	PD3*
16	A4	34	$\overline{\text{RAS2}}$	52	I/O26	70	PD4*
17	A5	35	NC	53	I/O11	71	NC
18	A6	36	NC	54	I/O27	72	VSS

Pin Names

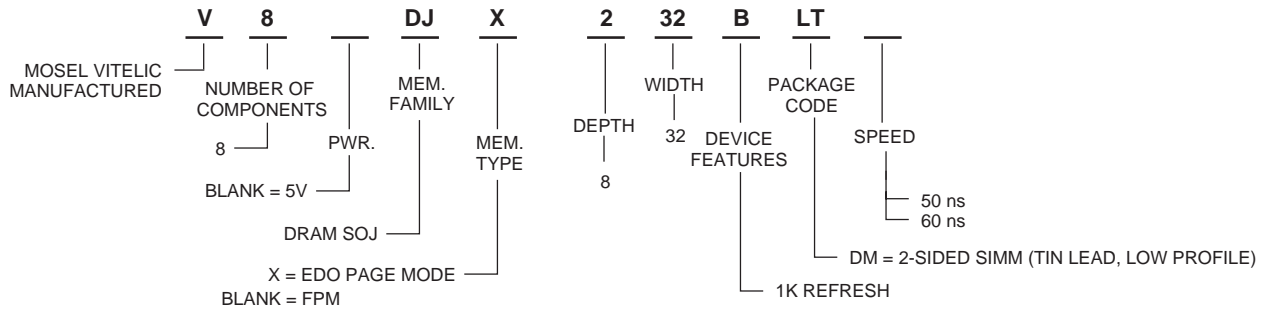
Name	Description
A0–A9	Addresses
I/O1–I/O32	Data Inputs/Outputs
$\overline{\text{RAS0}}$ – $\overline{\text{RAS3}}$	Row Address Strobes
$\overline{\text{CAS0}}$ – $\overline{\text{CAS3}}$	Column Address Strobes
$\overline{\text{WE}}$	Write Enable
PD1–PD4	Presence Detect
V _{CC}	Power Supply (5V)
V _{SS}	Ground
NC	No Connection

* Default Presence Detect is NC, Optional configurations are available.

Device Usage Chart

Operating Temperature Range	Organization	Module Type	Access Time (ns)		Power
	2M x 32	SIMM	50	60	Std
0°C to 70°C	•	•	•	•	•

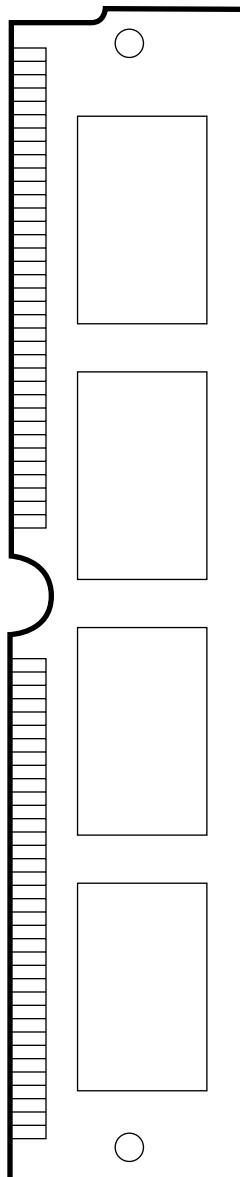
Part Number Information



Edge Connector

Pin Names

- | | | | |
|----|-------|----|-------|
| 1 | VSS | 2 | I/O1 |
| 3 | I/O17 | 4 | I/O2 |
| 5 | I/O18 | 6 | I/O3 |
| 7 | I/O19 | 8 | I/O4 |
| 9 | I/O20 | 10 | VCC |
| 11 | NC | 12 | A0 |
| 13 | A1 | 14 | A2 |
| 15 | A3 | 16 | A4 |
| 17 | A5 | 18 | A6 |
| 19 | NC | 20 | I/O5 |
| 21 | I/O21 | 22 | I/O6 |
| 23 | I/O22 | 24 | I/O7 |
| 25 | I/O23 | 26 | I/O8 |
| 27 | I/O24 | 28 | A7 |
| 29 | NC | 30 | VCC |
| 31 | A8 | 32 | A9 |
| 33 | RAS3 | 34 | RAS2 |
| 35 | NC | 36 | NC |
| | | | |
| 37 | NC | 38 | NC |
| 39 | VSS | 40 | CAS0 |
| 41 | CAS2 | 42 | CAS3 |
| 43 | CAS1 | 44 | RAS0 |
| 45 | RAS1 | 46 | NC |
| 47 | WE | 48 | NC |
| 49 | I/O9 | 50 | I/O25 |
| 51 | I/O10 | 52 | I/O26 |
| 53 | I/O11 | 54 | I/O27 |
| 55 | I/O12 | 56 | I/O28 |
| 57 | I/O13 | 58 | I/O29 |
| 59 | VCC | 60 | I/O30 |
| 61 | I/O14 | 62 | I/O31 |
| 63 | I/O15 | 64 | I/O32 |
| 65 | I/O16 | 66 | NC |
| 67 | PD1 | 68 | PD2 |
| 69 | PD3 | 70 | PD4 |
| 71 | NC | 72 | VSS |



Absolute Maximum Ratings*

- Ambient Temperature
 - Under Bias -10°C to +80°C
 - Storage Temperature (plastic) -55°C to +125°C
- Voltage on any Pin Except V_{CC}
 - Relative to V_{SS} -1.0 V to +7.0 V
- Voltage on V_{CC} Relative to V_{SS} -1.0 V to +7.0 V
- Data Out Current 50 mA
- Power Dissipation
 - V8DJX232BLT 3.5 W
 - V8DJ232BLT 4.5 W

*Note: Operation above Absolute Maximum Ratings can adversely affect device reliability.

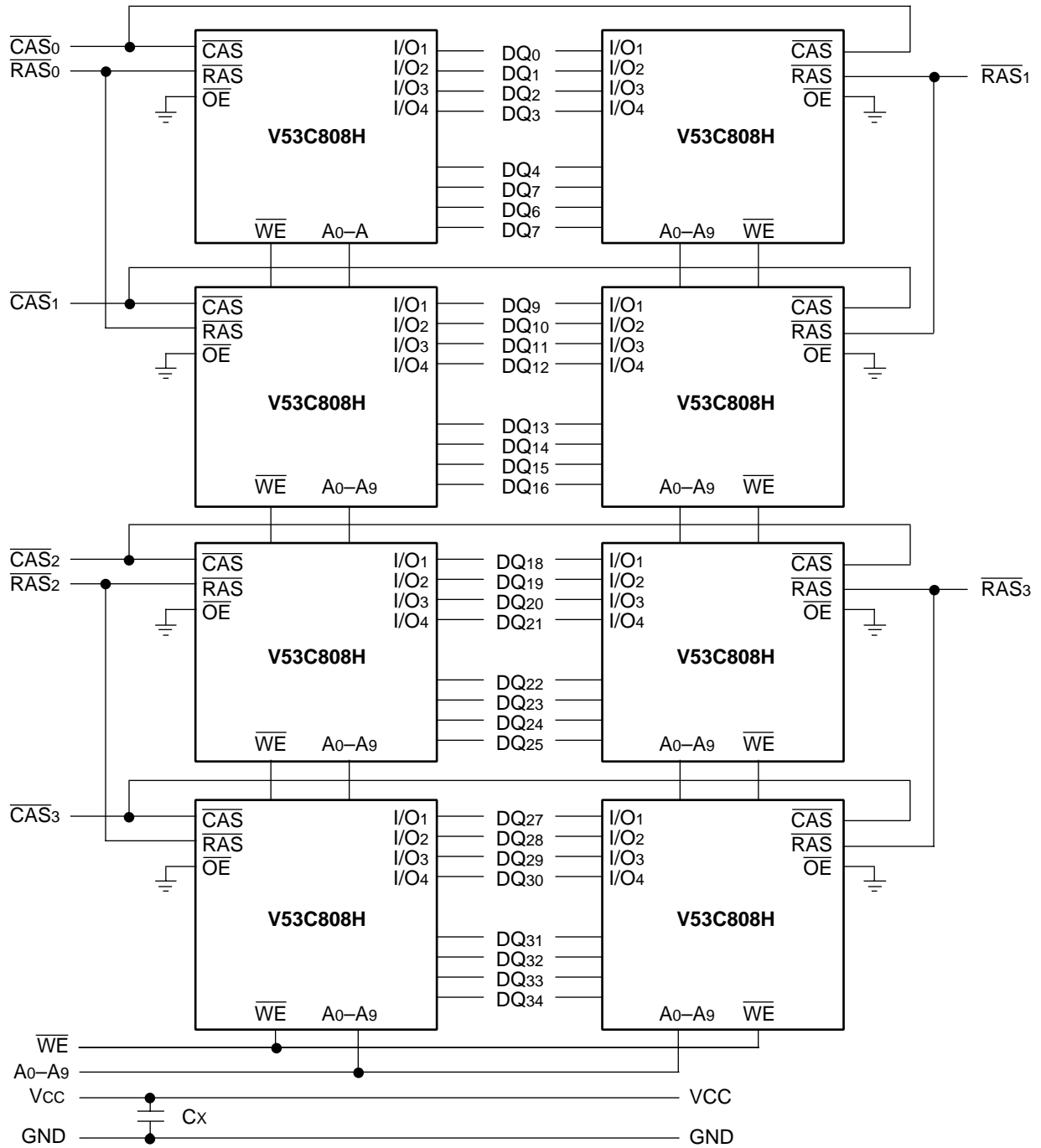
Capacitance*

T_A = 25°C, f = 1.0MHz, V_{CC} = 5 V ± 10%, V_{SS} = 0 V

Symbol	Parameter	Min.	Max.	Unit
C _{IN}	Input Capacitance, Address Inputs		111	pF
C _{IN}	Input Capacitance, \bar{W}		127	pF
C _{I(O)}	Input/Output Capacitance, I/O1-I/O32		17	pF
C _{IN(RAS)}	Input Capacitance, RAS0, RAS2		32	pF
C _{IN(CAS)}	Input Capacitance, CAS0-CAS3		32	pF

*Note: Capacitance is samples and not 100% tested.

V8DJX232BLT/V8DJ232BLT Functional Diagram



DC and Operating Characteristics

$T_A = 0^\circ\text{C}$ to 70°C , $V_{CC} = 5\text{ V} \pm 10\%$, $V_{SS} = 0\text{ V}$, unless otherwise specified.

Symbol	Parameter	Access Time	V8DJX232BLT			Unit	Test Conditions	Notes
			Min.	Typ.	Max.			
I_{LI}	Input Leakage Current (any input pin)		-40		40	μA	$V_{SS} \leq V_{IN} \leq V_{CC}$	
I_{LO}	Output Leakage Current (for High-Z State)		-40		40	μA	$V_{SS} \leq V_{OUT} \leq V_{CC}$ $\overline{\text{RAS}}, \overline{\text{CAS}}$ at V_{IH}	
I_{CC1}	V_{CC} Supply Current, Operating	50			580	mA	$t_{RC} = t_{RC}(\text{min.})$	1, 2
		60			540			
I_{CC2}	V_{CC} Supply Current, TTL Standby				8	mA	$\overline{\text{RAS}}, \overline{\text{CAS}}$ at V_{IH} other inputs $\geq V_{SS}$	
I_{CC3}	V_{CC} Supply Current, $\overline{\text{RAS}}$ -Only Refresh	50			580	mA	$t_{RC} = t_{RC}(\text{min.})$	2
		60			540			
I_{CC4}	V_{CC} Supply Current, EDO Page Mode Operation	50			340	mA	Minimum cycle	1, 2
		60			320			
I_{CC5}	V_{CC} Supply Current, Standby, Output Enabled				8	mA	$\overline{\text{RAS}} = V_{IH}, \overline{\text{CAS}} = V_{IL}$ other inputs $\geq V_{SS}$	1
I_{CC6}	V_{CC} Supply Current, CMOS Standby				8	mA	$\overline{\text{RAS}} \geq V_{CC} - 0.2\text{ V}$, $\overline{\text{CAS}} \geq V_{CC} - 0.2\text{ V}$, All other inputs $\geq V_{SS}$	
I_{CC7}	Self Refresh Current				1.6	mA	CBR Cycle with $t_{RAS} \geq t_{RASS}$ (Min.) and $\overline{\text{CAS}} = V_{IL}$; $\text{WE} = V_{CC} - 0.2\text{ V}$; A0–A8 and $D_{IN} = V_{CC} - 0.2\text{ V}$	
V_{CC}	Supply Voltage		4.5	5.0	5.5	V		
V_{IL}	Input Low Voltage		-1		0.8	V		3
V_{IH}	Input High Voltage		2.4		$V_{CC} + 1$	V		3
V_{OL}	Output Low Voltage				0.4	V	$I_{OL} = 2\text{ mA}$	
V_{OH}	Output High Voltage		2.4			V	$I_{OH} = -2\text{ mA}$	

DC and Operating Characteristics

$T_A = 0^\circ\text{C}$ to 70°C , $V_{CC} = 5\text{ V} \pm 10\%$, $V_{SS} = 0\text{ V}$, unless otherwise specified.

Symbol	Parameter	Access Time	V8DJ232BLT			Unit	Test Conditions	Notes
			Min.	Typ.	Max.			
I_{LI}	Input Leakage Current (any input pin)		-40		40	μA	$V_{SS} \leq V_{IN} \leq V_{CC}$	
I_{LO}	Output Leakage Current (for High-Z State)		-40		40	μA	$V_{SS} \leq V_{OUT} \leq V_{CC}$ RAS, CAS at V_{IH}	
I_{CC1}	V_{CC} Supply Current, Operating	50			840	mA	$t_{RC} = t_{RC}(\text{min.})$	1, 2
		60			800			
I_{CC2}	V_{CC} Supply Current, TTL Standby				16	mA	RAS, CAS at V_{IH} other inputs $\geq V_{SS}$	
I_{CC3}	V_{CC} Supply Current, RAS-Only Refresh	50			840	mA	$t_{RC} = t_{RC}(\text{min.})$	2
		60			800			
I_{CC4}	V_{CC} Supply Current, Fast Page Mode Operation	50			400	mA	Minimum cycle	1, 2
		60			360			
I_{CC5}	V_{CC} Supply Current, Standby, Output Enabled				8	mA	RAS = V_{IH} , CAS = V_{IL} other inputs $\geq V_{SS}$	1
I_{CC6}	V_{CC} Supply Current, CMOS Standby				8	mA	RAS $\geq V_{CC} - 0.2\text{ V}$, CAS $\geq V_{CC} - 0.2\text{ V}$, All other inputs $\geq V_{SS}$	
V_{CC}	Supply Voltage		4.5	5.0	5.5	V		
V_{IL}	Input Low Voltage		-1		0.8	V		3
V_{IH}	Input High Voltage		2.4		$V_{CC} + 1$	V		3
V_{OL}	Output Low Voltage				0.4	V	$I_{OL} = 4.2\text{ mA}$	
V_{OH}	Output High Voltage		2.4			V	$I_{OH} = -5\text{ mA}$	

AC Characteristics

$T_A = 0^\circ\text{C}$ to 70°C , $V_{CC} = 5\text{ V} \pm 10\%$, $V_{SS} = 0\text{V}$ unless otherwise noted
AC Test conditions, input pulse levels 0 to 3V

#	Symbol	Parameter	V8DJ232BLT				Unit	Notes
			50		60			
			Min.	Max.	Min.	Max.		
1	t_{RAS}	\overline{RAS} Pulse Width	50	75K	60	75K	ns	
2	t_{RC}	Read or Write Cycle Time	90		110		ns	
3	t_{RP}	\overline{RAS} Precharge Time	30		40		ns	
4	t_{CSH}	\overline{CAS} Hold Time	50		60		ns	
5	t_{CAS}	\overline{CAS} Pulse Width	14		15		ns	
6	t_{RCD}	\overline{RAS} to \overline{CAS} Delay	19	36	20	43	ns	
7	t_{RCS}	Read Command Setup Time	0		0		ns	4
8	t_{ASR}	Row Address Setup Time	0		0		ns	
9	t_{RAH}	Row Address Hold Time	9		10		ns	
10	t_{ASC}	Column Address Setup Time	0		0		ns	
11	t_{CAH}	Column Address Hold Time	7		10		ns	
12	$t_{RSH(R)}$	\overline{RAS} Hold Time (Read Cycle)	14		15		ns	
13	t_{CRP}	\overline{CAS} to \overline{RAS} Precharge Time	5		5		ns	
14	t_{RCH}	Read Command Hold Time Referenced to \overline{CAS}	0		0		ns	5
15	t_{RRH}	Read Command Hold Time Referenced to \overline{RAS}	0		0		ns	5
16	t_{ROH}	\overline{RAS} Hold Time Referenced to \overline{OE}	10		10		ns	
17	t_{OAC}	Access Time from \overline{OE}		14		17	ns	
18	t_{CAC}	Access Time from \overline{CAS}		14		17	ns	6, 7
19	t_{RAC}	Access Time from \overline{RAS}		50		60	ns	6, 8, 9
20	t_{CAA}	Access Time from Column Address		24		30	ns	6, 7, 10
21	t_{LZ}	\overline{CAS} to Low-Z Output	0		0		ns	16
22	t_{HZ}	Output buffer turn-off delay time	0	8	0	10	ns	16
23	t_{AR}	Column Address Hold Time from \overline{RAS}	40		45		ns	
24	t_{RAD}	\overline{RAS} to Column Address Delay Time	14	26	15	30	ns	11
25	$t_{RSH(W)}$	\overline{RAS} or \overline{CAS} Hold Time in Write Cycle	14		15		ns	
26	t_{CWL}	Write Command to \overline{CAS} Lead Time	14		15		ns	
27	t_{WCS}	Write Command Setup Time	0		0		ns	12, 13
28	t_{WCH}	Write Command Hold Time	7		10		ns	
29	t_{WP}	Write Pulse Width	7		10		ns	

AC Characteristics (cont.)

#	Symbol	Parameter	V8DJ232BLT				Unit	Notes
			50		60			
			Min.	Max.	Min.	Max.		
30	t_{WCR}	Write Command Hold Time from \overline{RAS}	40		45		ns	
31	t_{RWL}	Write Command to \overline{RAS} Lead Time	14		15		ns	
32	t_{DS}	Data in Setup Time	0		0		ns	14
33	t_{DH}	Data in Hold Time	7		10		ns	14
34	t_{WOH}	Write to \overline{OE} Hold Time	8		10		ns	14
35	t_{OED}	\overline{OE} to Data Delay Time	8		10		ns	14
36	t_{RWC}	Read-Modify-Write Cycle Time	130		170		ns	
37	t_{RRW}	Read-Modify-Write Cycle \overline{RAS} Pulse Width	87		105		ns	
38	t_{CWD}	\overline{CAS} to \overline{WE} Delay	34		40		ns	12
39	t_{RWD}	\overline{RAS} to \overline{WE} Delay in Read-Modify-Write Cycle	68		85		ns	12
40	t_{CRW}	\overline{CAS} Pulse Width (RMW)	52		65		ns	
41	t_{AWD}	Col. Address to \overline{WE} Delay	42		58		ns	12
42	t_{PC}	Fast Page Mode Read or Write Cycle Time	28		40		ns	
43	t_{CP}	\overline{CAS} Precharge Time	7		8		ns	
44	t_{CAR}	Column Address to \overline{RAS} Setup Time	24		30		ns	
45	t_{CAP}	Access Time from Column Precharge		27		34	ns	7
46	t_{DHR}	Data in Hold Time Referenced to \overline{RAS}	40		50		ns	
47	t_{CSR}	\overline{CAS} Setup Time \overline{CAS} -before- \overline{RAS} Refresh	10		10		ns	
48	t_{RPC}	\overline{RAS} to \overline{CAS} Precharge Time	0		0		ns	
49	t_{CHR}	\overline{CAS} Hold Time \overline{CAS} -before- \overline{RAS} Refresh	12		15		ns	
50	t_{PCM}	Fast Page Mode Read-Modify-Write Cycle Time	70		85		ns	
51	t_T	Transition Time (Rise and Fall)	3	50	3	50	ns	15
52	t_{REF}	Refresh Interval (1024 Cycles)		16		16	ms	

AC Characteristics

$T_A = 0^\circ\text{C}$ to 70°C , $V_{CC} = 5\text{ V} \pm 10\%$, $V_{SS} = 0\text{V}$ unless otherwise noted
AC Test conditions, input pulse levels 0 to 3V

#	Symbol	Parameter	V8DJX232BLT				Unit	Notes
			50		60			
			Min.	Max.	Min.	Max.		
1	t_{RAS}	\overline{RAS} Pulse Width	50	75K	60	75K	ns	
2	t_{RC}	Read or Write Cycle Time	90		110		ns	
3	t_{RP}	\overline{RAS} Precharge Time	30		40		ns	
4	t_{CSH}	\overline{CAS} Hold Time	50		60		ns	
5	t_{CAS}	\overline{CAS} Pulse Width	9		15		ns	
6	t_{RCD}	\overline{RAS} to \overline{CAS} Delay	19	36	20	45	ns	
7	t_{RCS}	Read Command Setup Time	0		0		ns	4
8	t_{ASR}	Row Address Setup Time	0		0		ns	
9	t_{RAH}	Row Address Hold Time	9		10		ns	
10	t_{ASC}	Column Address Setup Time	0		0		ns	
11	t_{CAH}	Column Address Hold Time	7		10		ns	
12	$t_{RSH (R)}$	\overline{RAS} Hold Time (Read Cycle)	15		15		ns	
13	t_{CRP}	\overline{CAS} to \overline{RAS} Precharge Time	5		5		ns	
14	t_{RCH}	Read Command Hold Time Referenced to \overline{CAS}	0		0		ns	5
15	t_{RRH}	Read Command Hold Time Referenced to \overline{RAS}	0		0		ns	5
16	t_{CAC}	Access Time from \overline{CAS} (EDO)		14		15	ns	6, 7, 14
17	t_{RAC}	Access Time from \overline{RAS}		50		60	ns	6, 8, 9
18	t_{CAA}	Access Time from Column Address		24		30	ns	6, 7, 10
19	t_{LZ}	\overline{CAS} to Low-Z Output	0		0		ns	16
20	t_{HZ}	\overline{CAS} to High-Z Output	0	8	0	10	ns	16
21	t_{AR}	Column Address Hold Time from \overline{RAS}	40		50		ns	
22	t_{RAD}	\overline{RAS} to Column Address Delay Time	14	26	15	30	ns	11
23	$t_{RSH (W)}$	\overline{RAS} or \overline{CAS} Hold Time in Write Cycle	14		15		ns	
24	t_{CWL}	Write Command to \overline{CAS} Lead Time	14		15		ns	
25	t_{WCS}	Write Command Setup Time	0		0		ns	12, 13
26	t_{WCH}	Write Command Hold Time	7		10		ns	
27	t_{WP}	Write Pulse Width	7		10		ns	
28	t_{WCR}	Write Command Hold Time from \overline{RAS}	40		50		ns	
29	t_{RWL}	Write Command to \overline{RAS} Lead Time	14		15		ns	
30	t_{DS}	Data in Setup Time	0		0		ns	14
31	t_{DH}	Data in Hold Time	7		10		ns	14

#	Symbol	Parameter	V8DJX232BLT				Unit	Notes
			50		60			
			Min.	Max.	Min.	Max.		
32	t_{RWC} (RMW)	Read-Modify-Write Cycle Time	130		170		ns	
33	t_{RRW} (RMW)	Read-Modify-Write Cycle \overline{RAS} Pulse Width	87		105		ns	
34	t_{CWD}	\overline{CAS} to \overline{WE} Delay	34		40		ns	12
35	t_{RWD}	\overline{RAS} to \overline{WE} Delay in Read-Modify-Write Cycle	68		85		ns	12
36	t_{CRW}	\overline{CAS} Pulse Width (RMW)	52		65		ns	
37	t_{AWD}	Col. Address to \overline{WE} Delay	42		58		ns	12
38	t_{PC}	EDO Page Mode Read or Write Cycle Time	19		27		ns	
39	t_{CP}	CAS Precharge Time	7		10		ns	
40	t_{CAR}	Column Address to \overline{RAS} Setup Time	24		30		ns	
41	t_{CAP}	Access Time from Column Precharge		27		34	ns	7
42	t_{DHR}	Data in Hold Time Referenced to \overline{RAS}	40		50		ns	
43	t_{CSR}	\overline{CAS} Setup Time \overline{CAS} -before- \overline{RAS} Refresh	10		10		ns	
44	t_{RPC}	\overline{RAS} to \overline{CAS} Precharge Time	0		0		ns	
45	t_{CHR}	\overline{CAS} Hold Time \overline{CAS} -before- \overline{RAS} Refresh	12		15		ns	
46	t_{PCM}	EDO Page Mode Read-Modify-Write Cycle Time	70		85		ns	
47	t_{COH}	Output Hold After \overline{CAS} Low	5		5		ns	
48	t_T	Transition Time (Rise and Fall)	3	50	3	50	ns	15
49	t_{REF}	Refresh Interval (1024 Cycles)		16		16	ms	17

Notes:

1. I_{CC} is dependent on output loading when the device output is selected. Specified I_{CC} (max.) is measured with the output open.
2. I_{CC} is dependent upon the number of address transitions. Specified I_{CC} (max.) is measured with a maximum of two transitions per address cycle in EDO Page Mode.
3. Specified V_{IL} (min.) is steady state operating. During transitions, V_{IL} (min.) may undershoot to -1.0 V for a period not to exceed 20 ns. All AC parameters are measured with V_{IL} (min.) $\geq V_{SS}$ and V_{IH} (max.) $\leq V_{CC}$.
4. t_{RCD} (max.) is specified for reference only. Operation within t_{RCD} (max.) limits insures that t_{RAC} (max.) and t_{CAA} (max.) can be met. If t_{RCD} is greater than the specified t_{RCD} (max.), the access time is controlled by t_{CAA} and t_{CAC} .
5. Either t_{RRH} or t_{RCH} must be satisfied for a Read Cycle to occur.
6. Measured with a load equivalent to one TTL inputs and 100 pF.
7. Access time is determined by the longest of t_{CAA} , t_{CAC} and t_{CAP} .
8. Assumes that $t_{RAD} \leq t_{RAD}$ (max.). If t_{RAD} is greater than t_{RAD} (max.), t_{RAC} will increase by the amount that t_{RAD} exceeds t_{RAD} (max.).
9. Assumes that $t_{RCD} \leq t_{RCD}$ (max.). If t_{RCD} is greater than t_{RCD} (max.), t_{RCD} will increase by the amount that t_{RCD} exceeds t_{RCD} (max.).
10. Assumes that $t_{RAD} \geq t_{RAD}$ (max.).
11. Operation within the t_{RAD} (max.) limit ensures that t_{RAC} (max.) can be met. t_{RAD} (max.) is specified as a reference point only. If t_{RAD} is greater than the specified t_{RAD} (max.) limit, the access time is controlled by t_{CAA} and t_{CAC} .
12. t_{WCS} , t_{RWD} , t_{AWD} and t_{CWD} are not restrictive operating parameters.
13. t_{WCS} (min.) must be satisfied in an Early Write Cycle.
14. t_{DS} and t_{DH} are referenced to the latter occurrence of \overline{CAS} or \overline{WE} .
15. t_T is measured between V_{IH} (min.) and V_{IL} (max.). AC-measurements assume $t_T = 3$ ns.
16. Assumes a three-state test load (5 pF and a 380 Ohm Thevenin equivalent).
17. An initial 200 μ s pause and 8 \overline{RAS} -containing cycles are required when exiting an extended period of bias without clocks. An extended period of time without clocks is defined as one that exceeds the specified Refresh Interval.

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