

8-bit Data Bus
Static RAM Card

MF3128-MLDAPXX
 MF3256-MLDAPXX
 MF3512-MLDAPXX

Connector Type

Two-piece 60-pin

DESCRIPTION

Mitsubishi's static RAM cards provide large memory capacities on a device approximately the size of a credit card (85.6mm × 54mm × 3.4mm). The cards use an 8-bit data bus. The devices use a replaceable lithium battery to maintain data. Available in 128K byte, 256K byte and 512K byte capacities, Mitsubishi's Static RAM cards are available with a 60-pin, two-piece connector.

- 60-pin connector
- 8-bit data width
- Write protect switch
- Battery voltage pin

FEATURES

- Uses TSOP (Thin Small Outline Package) to achieve very high memory density coupled with high reliability, without enlarging card size
- Electrostatic discharge protection to 25kV
- Buffered interface

APPLICATIONS

- Office automation
- Computers
- Telecommunications
- Data Communications
- Industrial
- Consumer

PRODUCT LIST

Type name	Item	Memory capacity	Data bus width (bits)	Access time (ns)	Connector type	Number of pins	Outline drawing
MF3128-MLDAPXX		128KB	8	200	Two-piece	60	60P-004
MF3256-MLDAPXX		256KB					
MF3512-MLDAPXX		512KB					

STATIC RAM CARDS

PIN ASSIGNMENT

Pin No.	Symbol	Function	Pin No.	Symbol	Function
1	NC	No connection	2	VBATT	Battery voltage
3	NC		4	NC	No connection
5	A12		6	CD 1	Card detect 1 (Note 1)
7	A 7		8	A15	Address input A17 (NC for 128KB types) A18 (NC for 128KB and 256KB types)
9	A 6		10	A16	
11	A 5	12	A17		
13	A 4	14	A18		
15	A 3	Address input	16	NC	No connection
17	A 2		18	NC	
19	A 1		20	NC	
21	A 0		22	NC	
23	D 0		24	NC	
25	D 1	Data I/O	26	NC	Ground
27	D 2		28	NC	
29	GND		30	GND	
31	D 3	Data I/O	32	GND	No connection
33	D 4		34	NC	
35	D 5		36	NC	
37	D 6		38	NC	
39	D 7		40	NC	
41	CE	Card Enable	42	NC	Write protect No connection
43	A10	Address input	44	NC	
45	OE	Output Enable	46	NC	
47	A11	Address input	48	WP	
49	A 9		50	NC	
51	A 8		52	B 0	Memory card type detect (Note 2)
53	A13	54	B 1		
55	A14	56	B 2		
57	WE	Write Enable	58	CD2	Card detect 2 (Note 1)
59	VCC	Power supply	60	VCC	Power supply

Note 1 : Installing the card shorts connector pins 6 and 58, allowing host equipment to detect that the card is installed.

2 : Pins 52, 54 and 56 are either grounded or left open according to the card type (see table), allowing the host equipment to identify the card is installed.

3 : No signal should be applied to any "NC" pin.

	B 0	B 1	B 2
Card Type	52	54	56
RAM	GND	GND	GND
OTP	GND	NC	GND
Mask ROM	NC	GND	GND

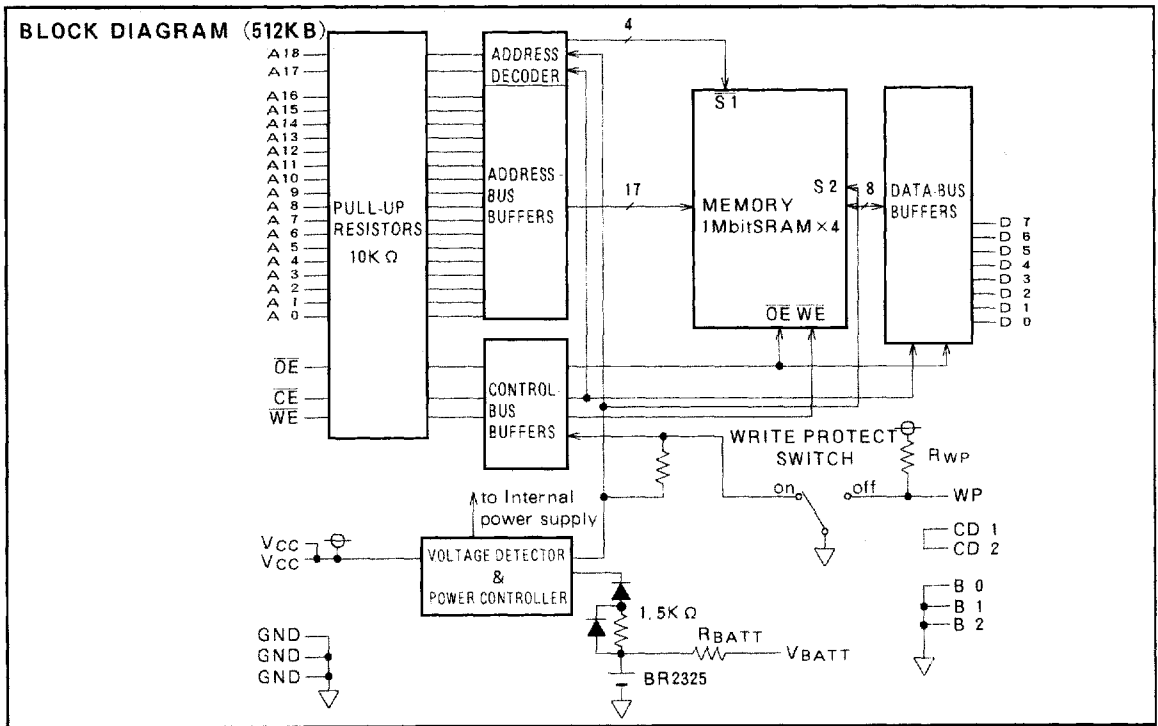
BATTERY VOLTAGE PIN (V_{BATT})

This pin is connected to the battery through a 102kΩ (96kΩ~108kΩ) resistor. If this pin is shorted with GND, the battery will be discharged. Never supply voltage to this pin as the battery cannot be charged.

WRITE PROTECT MODE (WP)

When the write protect switch is switched on, this card goes into a write protect mode that can read but not write data.

In this mode, the WP pin is pulled-up by a 51kΩ (45kΩ~57kΩ) resistor, which is connected to GND in normal mode (when the write protect switch is switched off). The system can easily check whether the card is in the write protect mode or not.



FUNCTION TABLE

Mode	\overline{CE}	WE	OE	D_m	I_{cc}
Deselect	H	X	X	High impedance	Standby
Write	L	L	H	D_{in}	Active
Read	L	H	L	D_{out}	Active
Output disable	L	H	H	High impedance	Active

Note 4 : H = V_{IH} , L = V_{IL} , X = V_{IH} or V_{IL}

STATIC RAM CARDS

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Conditions	Ratings	Unit
V _{CC}	Supply voltage	With respect to GND	-0.3~+7	V
V _I	Input voltage		-0.5~V _{CC} +0.3 (7.0max.)	V
V _O	Output voltage		0~V _{CC}	V
T _{opr}	Operating temperature	Read, Write, Data retention	0~70	°C
T _{stg}	Storage temperature		-30~80	°C

RECOMMENDED OPERATING CONDITIONS (T_a = 0~50°C, unless otherwise noted)

Symbol	Parameter	Limits			Unit
		Min.	Typ.	Max.	
V _{CC}	Supply voltage	4.5	5.0	5.5	V
GND	Supply voltage		0		V
V _{IL}	Low-level input voltage	0		0.8	V
V _{IH}	High-level input voltage	0.7×V _{CC}		V _{CC}	V

ELECTRICAL CHARACTERISTICS (T_a = 0~50°C, V_{CC} = 4.5~5.5V, unless otherwise noted)

Symbol	Parameter	Test conditions	Limits			Unit
			Min.	Typ.	Max.	
V _{OH}	High-level output voltage	I _{OH} = -1 mA	2.4			V
V _{OL}	Low-level output voltage	I _{OL} = 2 mA			0.4	V
I _{IH}	High-level input current	V _I = V _{CC}			25	μA
I _{IL}	Low-level input current	V _I = 0 V	-350		-670	μA
I _{ozh}	Off-state high-level output current	$\overline{CE} = V_{IH}$ or $\overline{OE} = V_{IH}$; V _o = V _{CC}			10	μA
I _{ozl}	Off-state low-level output current	$\overline{CE} = V_{IH}$ or $\overline{OE} = V_{IH}$; V _o = 0 V			-10	μA
I _{CC1-1}	Active supply current (minimum cycle)	$\overline{CE} = V_{IL}$, other inputs = V _{IH} or V _{IL} , Outputs = pulled-up or pulled-down by 1 MΩ resistors			165	mA
I _{CC1-2}	Active supply current (minimum cycle)	$\overline{CE} \leq 0.2V$, other inputs $\leq 0.2V$ or $\geq V_{CC} - 0.2V$, Outputs = pulled-up or pulled-down by 1 MΩ resistors			130	mA
I _{CC2-1}	Standby supply current	$\overline{CE} = V_{IH}$, A _n = $\overline{OE} = \overline{WE} = V_{IH}$, D _m = V _{IL} or V _{IH}			80	mA
I _{CC2-2}	Standby supply current	$\overline{CE} \geq V_{CC} - 0.2V$, A _n = $\overline{OE} = \overline{WE} \geq V_{CC} - 0.2V$, D _m $\leq 0.2V$ or $\geq V_{CC} - 0.2V$			16	mA
R _{BATT}	Battery series resistor		96	102	108	kΩ
R _{WP}	WP pull-up resistor		45	51	57	kΩ

Note 5 : Currents flowing into the card are taken as positive.
 6 : Typical values are measured at V_{CC} = 5 V, T_a = 25°C.

STATIC RAM CARDS

CAPACITANCE

Symbol	Parameter	Test conditions	Limits			Unit
			Min.	Typ.	Max.	
C _I	Input capacitance	V _I =GND, v _i =25mVrms, f= 1 MHz, T _a =25°C			45	pF
C _O	Output capacitance	V _O =GND, v _o =25mVrms, f= 1 MHz, T _a =25°C			30	pF

Note 7 : These parameters are not 100% tested.

SWITCHING CHARACTERISTICS

Read Cycle (T_a= 0 ~50°C, V_{CC}=4.5~5.5V, unless otherwise noted)

Symbol	Parameter	Limits			Unit
		Min.	Typ.	Max.	
t _{CR}	Read cycle time	200			ns
t _{a(A)}	Address access time			200	ns
t _{a(CE)}	Card select access time			200	ns
t _{a(OE)}	Output enable access time			100	ns
t _{dis(CE)}	Output disable time (from CE)			70	ns
t _{dis(OE)}	Output disable time (from OE)			70	ns
t _{en(CE)}	Output enable time (from CE)	5			ns
t _{en(OE)}	Output enable time (from OE)	5			ns
t _{V(A)}	Data valid time (after address)	20			ns

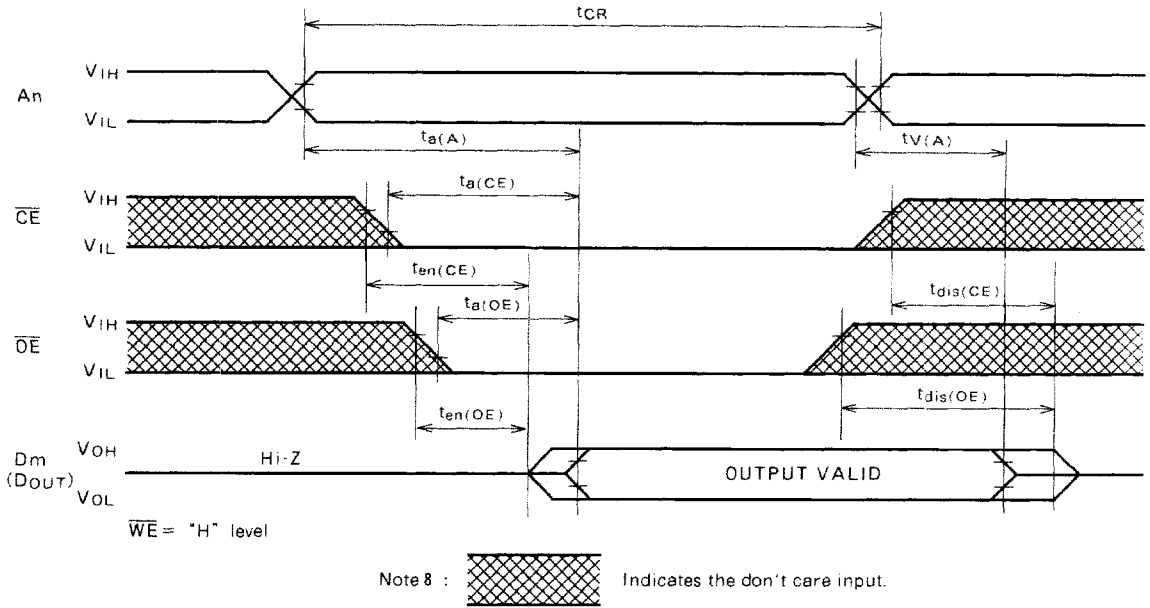
TIMING REQUIREMENTS

Write Cycle (T_a= 0 ~50°C, V_{CC}=4.5~5.5V, unless otherwise noted)

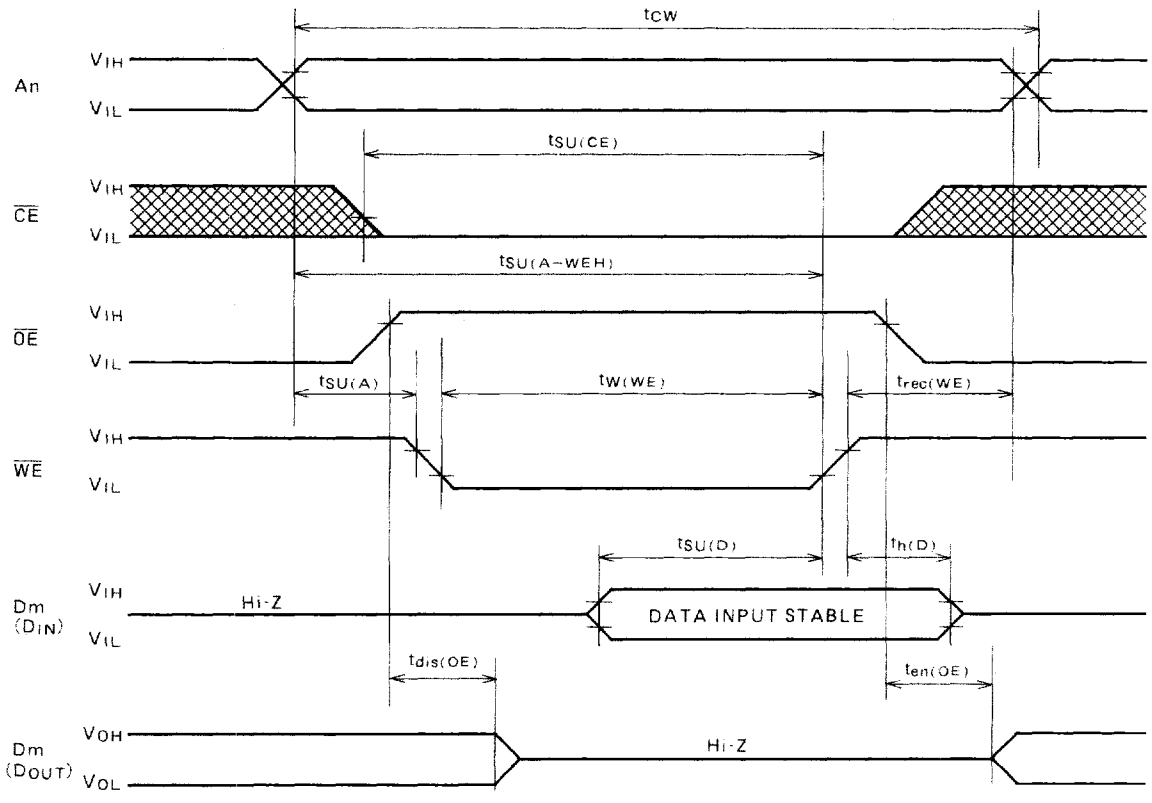
Symbol	Parameter	Limits			Unit
		Min.	Typ.	Max.	
t _{CW}	Write cycle time	200			ns
t _{w(WE)}	Write pulse width	120			ns
t _{SU(A)}	Address setup time	20			ns
t _{SU(A-WEH)}	Address setup time before write pulse rise	140			ns
t _{SU(CE)}	Card select setup time	120			ns
t _{SU(D)}	Data setup time	60			ns
t _{h(D)}	Data hold time	30			ns
t _{rec(WE)}	Write recovery time	30			ns
t _{dis(OE)}	Output disable time (from OE)			70	ns
t _{en(OE)}	Output enable time (from OE)	5			ns

TIMING DIAGRAM

Read Cycle

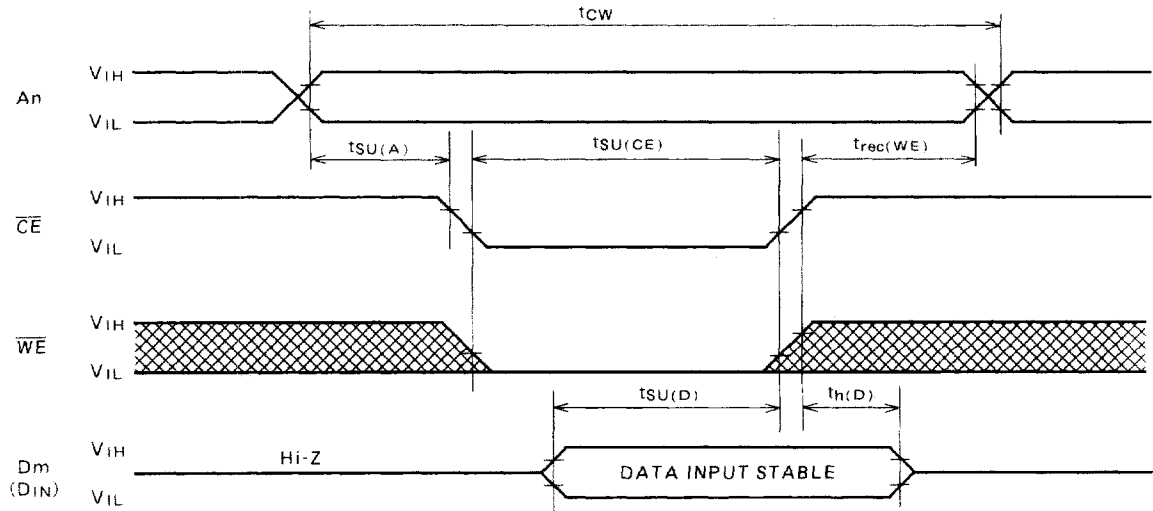


Write Cycle (\overline{WE} control)



TIMING DIAGRAM

Write Cycle (\overline{CE} control)



\overline{OE} = "H" level

Note 9 : Test Conditions

Input pulse levels : $V_{IL} = 0.4V$, $V_{IH} = 0.8 \times V_{CC} V$

Input pulse rise, fall time : $t_r = t_f = 10ns$

Reference voltage

Input : $V_{IL} = 0.8V$, $V_{IH} = 0.7 \times V_{CC} V$

Output : $V_{OL} = 0.8V$, $V_{OH} = 2.0V$

(t_{en} and t_{dis} are measured when output voltage is $\pm 500mV$ from steady state.)

Load : 100pF + 1 TTL gate

5 pF + 1 TTL gate (at t_{en} and t_{dis} measuring)

10 : The data write is performed during the interval when both \overline{CE} and \overline{WE} are low "L" level.

11 : Don't apply inverted phase signal externally when Dm pin is in output mode.

ELECTRICAL CHARACTERISTICS

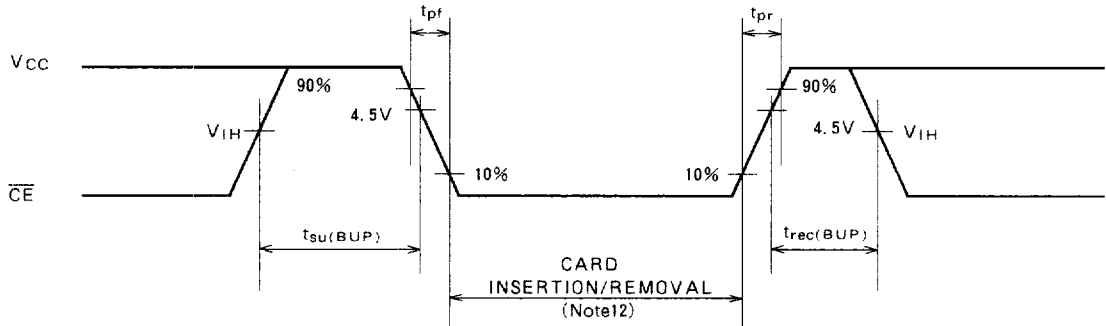
BATTERY BACKUP ($T_a = 0 \sim 50^\circ C$, unless otherwise noted)

Symbol	Parameter	Test conditions	Limits			Unit
			Min.	Typ.	Max.	
V_{batt}	Back up enable battery voltage	All pins open	2.6			V
$I_{CC(BUP)}$	Battery back up supply current	All pins open, $V_{batt} = 3V$, $T_a = 25^\circ C$			2	μA
					3	
					5	

TIMING REQUIREMENTS ($T_a = 0 \sim 50^\circ\text{C}$, unless otherwise noted)

Symbol	Parameter	Limits			Unit
		Min.	Typ.	Max.	
t_{pr}	Power supply rise time			20	ms
t_{pf}	Power supply fall time	1		20	ms
$t_{su(BUP)}$	Battery backup setup time	1			μs
$t_{rec(BUP)}$	Battery backup recovery time	20			ms

TIMING DIAGRAM



Note 12 : When the card is holding valuable data, the battery must not be removed unless V_{CC} is present.

BATTERY SPECIFICATIONS

A replaceable battery (type BR2325) with a capacity of 165mAH is used ;
Estimated battery life.

MF3128-MLDAPXX	7.0years
MF3256-MLDAPXX	5.9years
MF3212-MLDAPXX	3.6years

Note 13 : Conditions Temperature : 25°C
 Humidity : 60%RH