FUJITSU

ECL 4096-BIT BIPOLAR RANDOM ACCESS MEMORY

MBM 10470A-10
MBM 10470A-15
MBM 10470A-20

July 1984
Edition 2.0

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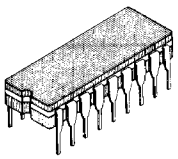
4096-BIT BIPOLAR ECL RANDOM ACCESS MEMORY

The Fujitsu MBM 10470A is fully decoded 4096-bit ECL read/write random access memory designed for high-speed scratch pad, control and buffer storage applications. This device is organized as 4096 words by one bit, and it features on-chip voltage compensation for improved noise margin.

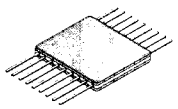
The MBM 10470A offers extremely small cell and chip size, realized through the use of Fujitsu's patented DOPOS (Doped Polysilicon), as well as IOP-II (Isolation by Oxide and Polysilicon) processing. As a result, very fast access time with high yields and outstanding device reliability are achieved in volume production.

Operation for the MBM 10470A is specified over a temperature range of from 0° to 75°C (T_A for DIP, T_C for Flat Package and LCC). It also features 18-pin Ceramic DIP, Flat Package, or LCC. It is fully compatible with industry-standard 10K-series ECL families.

- 4096 words x 1 bit organization
- On-chip voltage compensation for improved noise margin
- Fully compatible with industry-standard 10K-series ECL families
- Address access time: 10 nsec. max. (MBM 10470A-10)
  15 nsec. max. (MBM 10470A-15)
  20 nsec. max. (MBM 10470A-20)
- Chip select access time: 6 nsec. max. (MBM 10470A-10)
  8 nsec. max. (MBM 10470A-15)
  15 nsec max. (MBM 10470A-20)
- Open emitter output for ease of memory expansion
- Low power dissipation: 0.22mW/bit
- DOPOS and IOP-II processing
- Pin compatible with the F10470



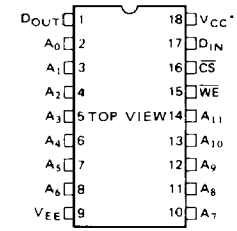
CERAMIC PACKAGE
DIP-18C-C01

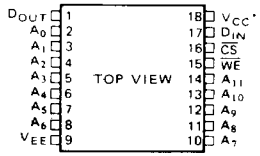


CERAMIC PACKAGE
FPT-18C-C01

LCC-18C-F01 : See Page 10

PIN ASSIGNMENT





*VCC grounded

LCC PAD CONFIGURATION : See Page 10

ABSOLUTE MAXIMUM RATINGS (See NOTE)

Parameter	Symbol	Value	Unit
V_{EE} Pin Potential to Ground Pin	V_{EE}	+0.5 to -7.0	V
Input Voltage	V_{IN}	+0.5 to V_{EE}	V
Output Current (DC, Output High)	I_{OUT}	-30	mA
Temperature Under Bias	T_A for DIP	-55 to +125	°C
	T_C for Flat Package and LCC	-55 to +125	
Storage Temperature	T_{STG}	-65 to +150	°C

NOTE: Permanent device damage may occur if ABSOLUTE MAXIMUM RATINGS are exceeded. Functional operation should be restricted to the conditions as detailed in the operational sections of this data sheet.

Small geometry bipolar integrated circuits are occasionally susceptible to damage from static voltages or electric fields. It is therefore advised that normal precautions be taken to avoid application of any voltage higher than maximum rated voltages to this device.

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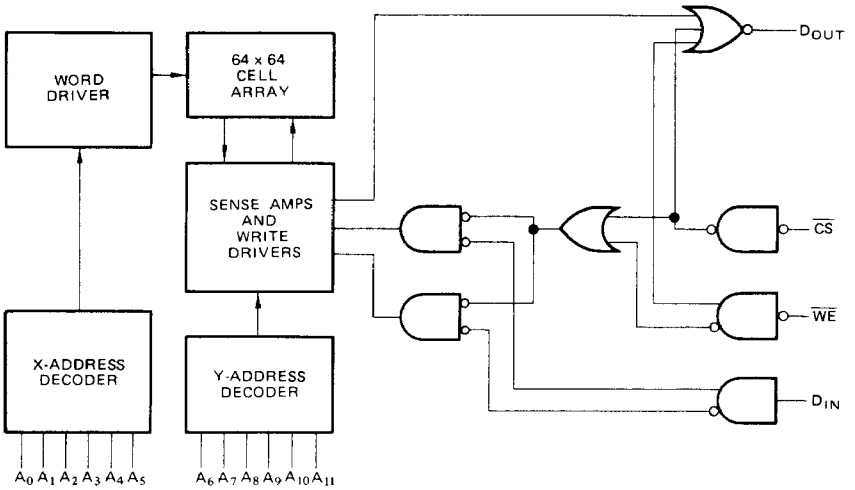
Fig. 1 – MBM 10470A BLOCK DIAGRAM



TRUTH TABLE

INPUT			OUTPUT	MODE
$\overline{CS}$	$\overline{WE}$	D_{IN}		
H	X	X	L	DISABLED
L	L	H	L	WRITE "H"
L	L	L	L	WRITE "L"
L	H	X	D_{OUT}	READ

H = High Voltage Level
L = Low Voltage Level
X = Don't care

FUNCTIONAL DESCRIPTION

The Fujitsu MBM 10470A is fully decoded 4096-bit read/write random access memory organized as 4096 words by one bit. Memory cell selection is achieved by means of a 12-bit address designated A_0 through A_{11}. The active low Chip Select ($\overline{CS}$) input is provided for memory expansion. The read and write operations are controlled by the state of the active low Write Enable ($\overline{WE}$) input. With $\overline{WE}$ and $\overline{CS}$ held low, the data at D_{IN} is written into the addressed location. To read, $\overline{WE}$ is held high, while $\overline{CS}$ is held low. Data at the addressed location is then transferred to D_{OUT} and read out non-inverted. Open emitter outputs are provided to allow for maximum flexibility in output wired-OR connection.

GUARANTEED OPERATING CONDITIONS

(Referenced to V_{CC})

Parameter	Symbol	Min	Typ	Max	Unit	Ambient Temperature for DIP, Case Temperature for Flat Package and LCC
Supply Voltage	V_{EE}	-5.46	-5.2	-4.94	V	0°C to 75°C

DC CHARACTERISTICS

(V_{CC} = 0V, V_{EE} = -5.2V, Output Load = 50Ω and 30pF to -2.0V, T_A = 0°C to 75°C for DIP, Airflow≧2.5m/s, T_C = 0°C to 75°C for Flat Package and LCC unless otherwise noted.)

Parameter	Symbol	Min	Typ	Max	Unit	T_A/T_C
Output High Voltage (V_{IN} = $V_{IH\ max}$ or $V_{IL\ min}$)	V_{OH}	-1000 -960 -900		-840 -810 -720	mV	0°C 25°C 75°C
Output Low Voltage (V_{IN} = $V_{IH\ max}$ or $V_{IL\ min}$)	V_{OL}	-1870 -1850 -1830		-1665 -1650 -1625	mV	0°C 25°C 75°C
Output High Voltage (V_{IN} = $V_{IH\ min}$ or $V_{IL\ max}$)	V_{OHC}	-1020 -980 -920			mV	0°C 25°C 75°C
Output Low Voltage (V_{IN} = $V_{IH\ min}$ or $V_{IL\ max}$)	V_{OLC}			-1645 -1630 -1605	mV	0°C 25°C 75°C
Input High Voltage (Guaranteed Input Voltage High for All Inputs)	V_{IH}	-1145 -1105 -1045		-840 -810 -720	mV	0°C 25°C 75°C
Input Low Voltage (Guaranteed Input Voltage Low for All Inputs)	V_{IL}	-1870 -1850 -1830		-1490 -1475 -1450	mV	0°C 25°C 75°C
Input High Current (V_{IN} = $V_{IH\ max}$)	I_{IH}			-220	μA	0°C to 75°C
Input Low Current (V_{IN} = $V_{IL\ min}$)	I_{IL}	-50			μA	0°C to 75°C
$\overline{CS}$ Input Low Current (V_{IN} = $V_{IL\ min}$)	I_{IL}	0.5		170	μA	0°C to 75°C
Power Supply Current (All Inputs and Output Open)	I_{EE}	-200			mA	0°C to 75°C

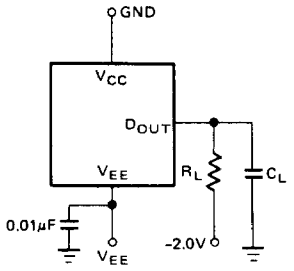
CAPACITANCE

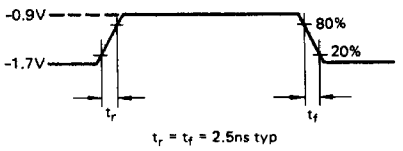
Parameter	Symbol	Min	Typ	Max	Unit
Input Pin Capacitance	C_{IN}		4		pF
Output Pin Capacitance	C_{OUT}		6		pF

AC CHARACTERISTICS

(V_{CC} = 0V, V_{EE} = -5.2V ± 5%, Output Load = 50Ω to -2.0V and 30pF to GND, T_A = 0°C to 75°C for DIP, Airflow ≧ 2.5m/s, T_C = 0°C to 75°C for Flat Package and LCC, unless otherwise noted.)

Fig. 2 – AC TEST CONDITIONS





$t_r = t_f$ = 2.5ns typ

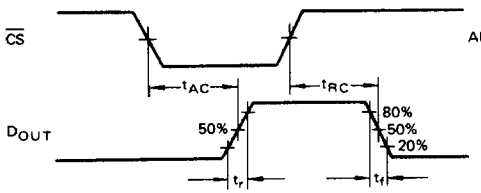
Output Load: R_L = 50Ω
C_L = 30pF
(including jig and stray capacitance)

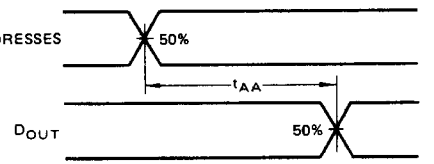
NOTE: All timing measurements referenced to 50% input levels.

READ CYCLE

Parameter	Symbol	MBM 10470A-10			MBM 10470A-15			MBM 10470A-20			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
Address Access Time	t_{AA}			10			15			20	ns
Chip Select Access Time	t_{AC}			6			8			15	ns
Chip Select Recovery Time	t_{RC}			6			8			15	ns

READ CYCLE TIMING DIAGRAMS

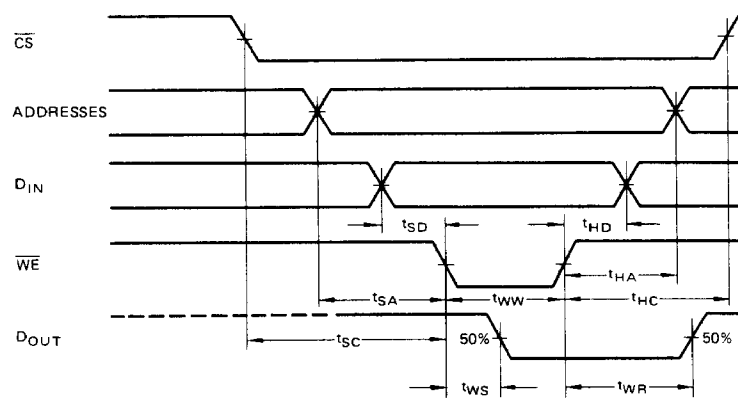




WRITE CYCLE

Parameter	Symbol	MBM 10470A-10			MBM 10470A-15			MBM 10470A-20			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
Write Pulse Width	t_{WW}	12			15			15			ns
Write Disable Time	t_{WS}			6			8			15	ns
Write Recovery Time	t_{WR}			10			10			15	ns
Address Set Up Time	t_{SA}	1			1			3			ns
Chip Select Set Up Time	t_{SC}	1			1			2			ns
Data Set Up Time	t_{SD}	1			1			2			ns
Address Hold Time	t_{HA}	2			2			2			ns
Chip Select Hold Time	t_{HC}	2			2			2			ns
Data Hold Time	t_{HD}	2			2			2			ns

WRITE CYCLE TIMING DIAGRAM



RISE TIME and FALL TIME

Parameter	Symbol	MBM 10470A-10			MBM 10470A-15			MBM 10470A-20			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
Output Rise Time	t_r		1.5			1.5			1.5		ns
Output Fall Time	t_f		1.5			1.5			1.5		ns

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TYPICAL CHARACTERISTICS CURVES

Fig. 3 – OUTPUT HIGH VOLTAGE vs AMBIENT TEMPERATURE

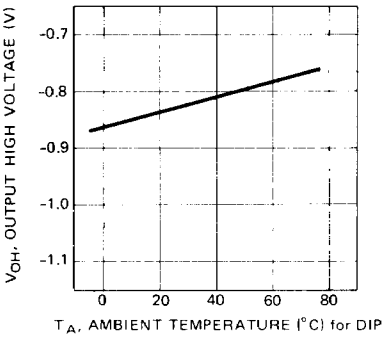


Fig. 4 – OUTPUT LOW VOLTAGE vs AMBIENT TEMPERATURE

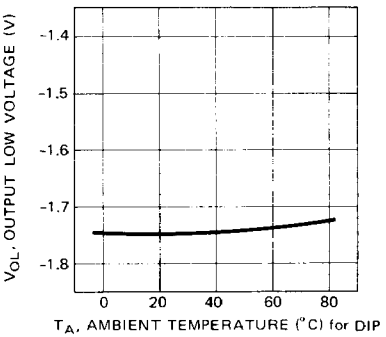


Fig. 5 – OUTPUT HIGH VOLTAGE vs SUPPLY VOLTAGE

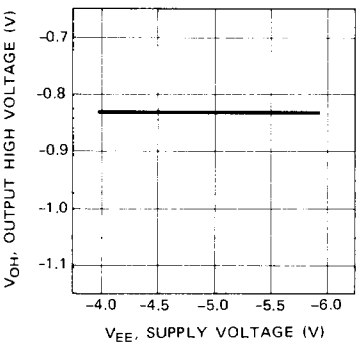


Fig. 6 – OUTPUT LOW VOLTAGE vs SUPPLY VOLTAGE

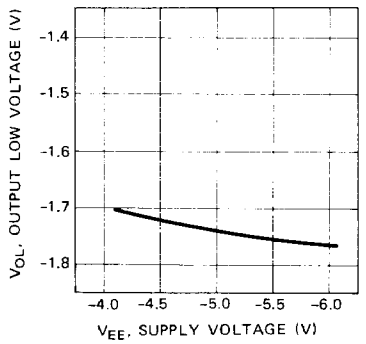


Fig. 7 – SUPPLY CURRENT vs AMBIENT TEMPERATURE

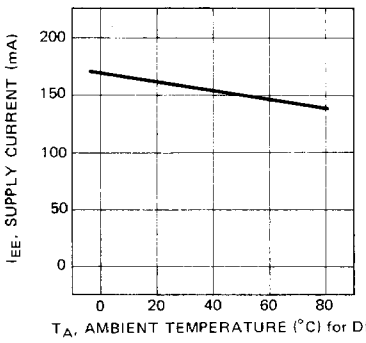


Fig. 8 – ADDRESS ACCESS TIME vs SUPPLY VOLTAGE

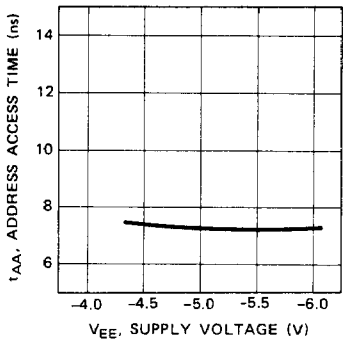


Fig. 9 – ADDRESS ACCESS TIME vs AMBIENT TEMPERATURE

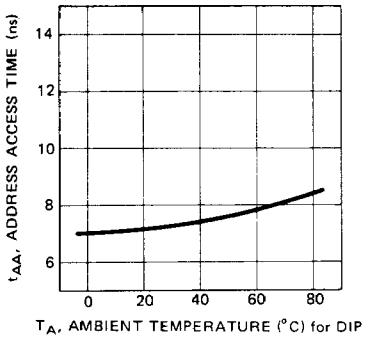


Fig. 10 – WRITE PULSE WIDTH vs SUPPLY VOLTAGE

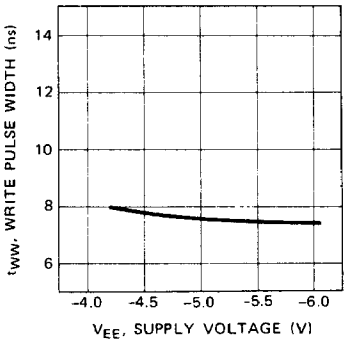
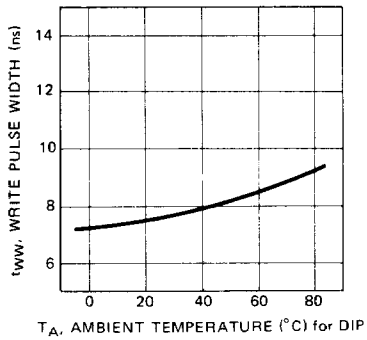


Fig. 11 – WRITE PULSE WIDTH vs AMBIENT TEMPERATURE



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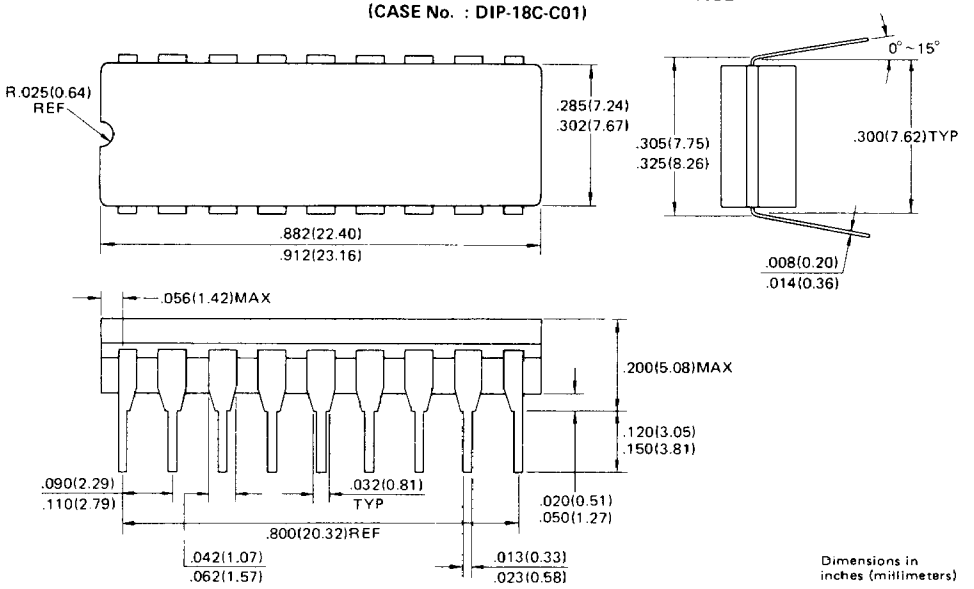
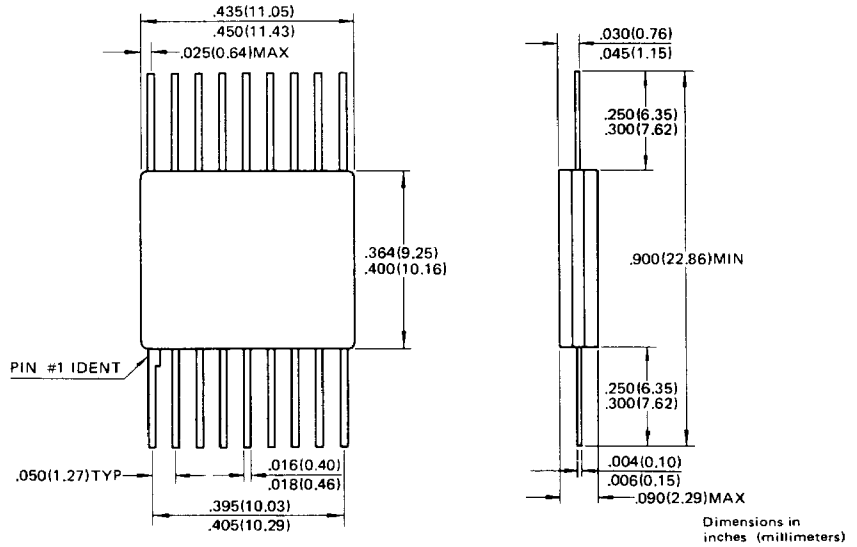
PACKAGE DIMENSIONS

18-LEAD CERAMIC (CERDIP) DUAL IN-LINE PACKAGE
(CASE No. : DIP-18C-C01)



PACKAGE DIMENSIONS

18-LEAD CERAMIC (CERDIP) FLAT PACKAGE
(CASE No. : FPT-18C-C01)



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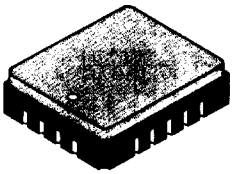
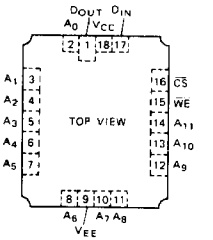
PACKAGE DIMENSIONS

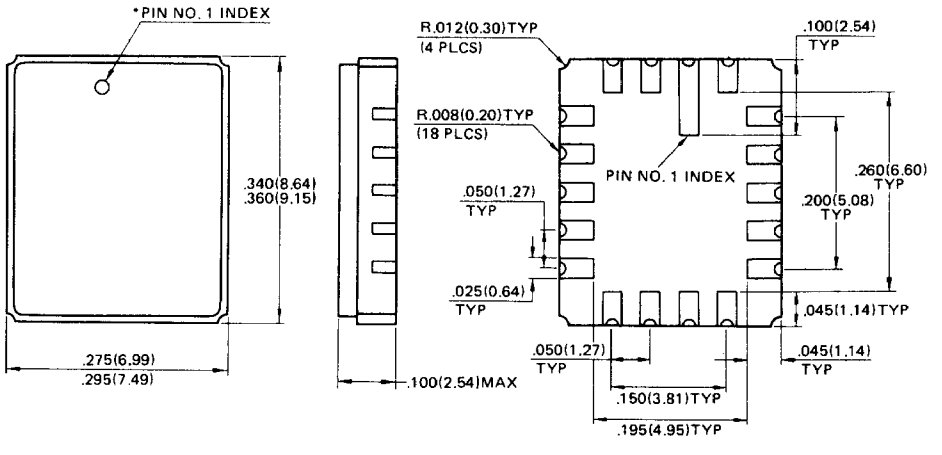


LCC-18C-F01

PAD ASSIGNMENT



18-PAD CERAMIC (FRIT SEAL) LEADLESS CHIP CARRIER
(CASE NO.: LCC-18C-F01)



*Shape of Pin 1 index: Subject to change without notice

Dimensions in inches
(millimeters)