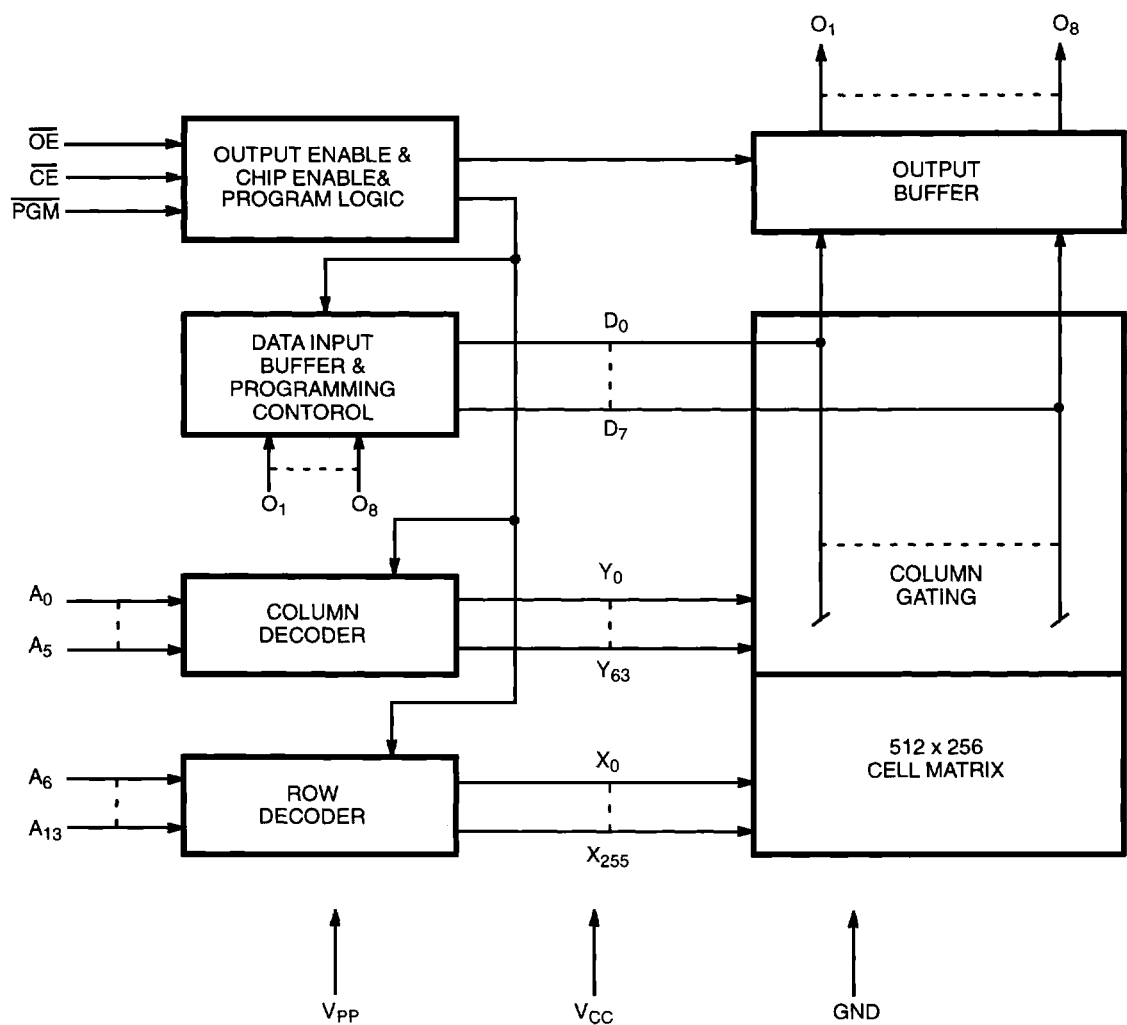


Fig. 1 – MBM27C128 BLOCK DIAGRAM



CAPACITANCE ($T_A = 25^\circ\text{C}$, $f = 1\text{MHz}$)

Parameter	Symbol	Min	Typ	Max	Unit
Input Capacitance ($V_{IN} = 0V$)	C_{IN}	–	4	6	pF
Output Capacitance ($V_{OUT} = 0V$)	C_{OUT}	–	8	12	pF

FUNCTIONS AND PIN CONNECTIONS

Function (Pin No.) Mode	Address Input	Data I/O	\overline{CE}	\overline{OE}	\overline{PGM}	V_{CC}	V_{PP}	GND
Read	A_{IN}	D_{OUT}	V_{IL}	V_{IL}	V_{IH}	V_{CC}	V_{CC}	GND
Output Disable	A_{IN}	High-Z	V_{IL}	V_{IH}	Don't Care	V_{CC}	V_{CC}	GND
				Don't Care	V_{IL}			
Standby	Don't Care	High-Z	V_{IH}	Don't Care	Don't Care	V_{CC}	V_{CC}	GND
Program	A_{IN}	D_{IN}	V_{IL}	V_{IH}	V_{IL}	V_{CC}	V_{PP}	GND
Program Verify	A_{IN}	D_{OUT}	V_{IL}	V_{IL}	V_{IH}	V_{CC}	V_{PP}	GND
Program Inhibit	Don't Care	High-Z	V_{IH}	Don't Care	Don't Care	V_{CC}	V_{PP}	GND

RECOMMENDED OPERATING CONDITIONS

(Referenced to GND)

Parameter	Symbol	Min	Typ	Max	Unit
V_{CC} Supply Voltage*1	V_{CC}	4.5	5.0	5.5	V
V_{PP} Supply Voltage	V_{PP}	$V_{CC} - 0.6$	V_{CC}	$V_{CC} + 0.6$	V
Operating Temperature	T_A	0	—	70	°C

Note: *1 V_{CC} must be applied either before or coincident with V_{PP} and removed either after or coincident with V_{PP} .

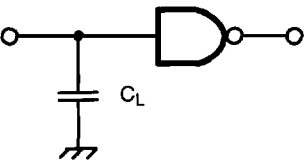
DC CHARACTERISTICS

(Recommended operating conditions unless otherwise noted)

Parameter	Symbol	Min	Typ	Max	Unit
Input Load Current ($V_{IN} = 5.5V$)	$ I_{LI} $			10	μA
Output Leakage Current ($V_{OUT} = 5.5V$)	$ I_{LO} $			10	μA
V_{PP} Supply Current ($V_{PP}: V_{CC} \pm 0.6V$)	I_{PP1}		1	100	μA
V_{CC} Standby Current ($\overline{CE} = V_{IH}$)	I_{SB1}			1	mA
V_{CC} Standby Current ($\overline{CE} = V_{CC} \pm 0.3V, I_{OUT} = 0mA$)	I_{SB2}		1	100	μA
V_{CC} Active Current ($\overline{CE} = V_{IL}, I_{OUT} = 0mA$)	I_{CC1}		2	30	mA
V_{CC} Operation Current ($f = 4MHz, I_{OUT} = 0mA$)	I_{CC2}		4	30	mA
Input High Voltage	V_{IH}	2.0		$V_{CC} + 0.3$	V
Input Low Voltage	V_{IL}	-0.1		0.8	V
Output Low Voltage ($I_{OL} = 2.1mA$)	V_{OL}			0.45	V
Output High Voltage ($I_{OH} = -400\mu A$)	V_{OH1}	2.4			V
Output High Voltage ($I_{OH} = -100\mu A$)	V_{OH2}	$V_{CC} - 0.7$			V

Fig. 2 – AC TEST CONDITIONS (INCLUDING PROGRAMMING)

Input Pulse Levels: 0.8V to 2.2V
Input Rise/Fall Time: $\leq 20\text{ns}$
Timing Measurement Reference Levels: 1.0V and 2.0V for inputs
0.8V and 2.0V for outputs
Output Load: 1 TTL gate and $C_L = 100\text{pF}$



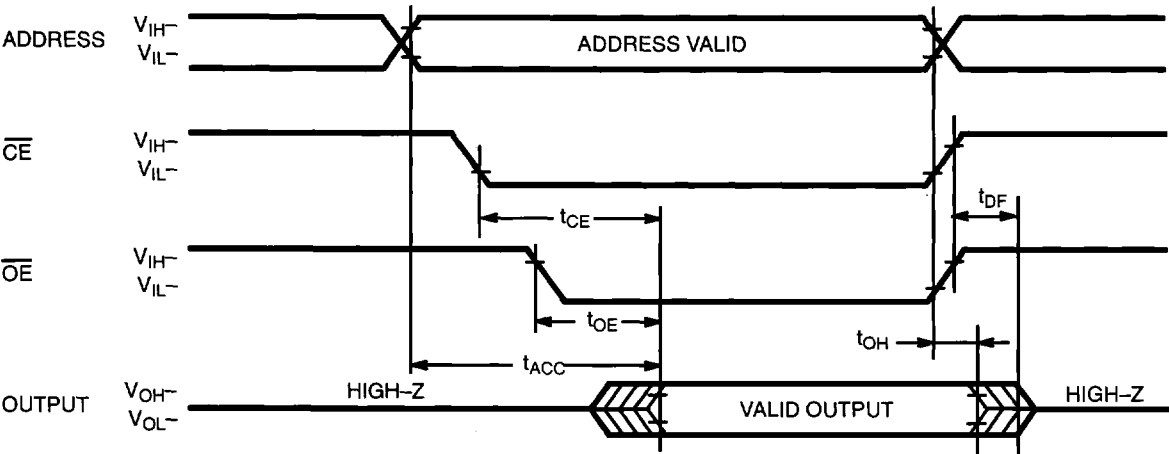
AC CHARACTERISTICS

(Recommended operating conditions unless otherwise noted)

Parameter	Symbol	MBM27C128-20			MBM27C128-25			Unit
		Min	Typ	Max	Min	Typ	Max	
Address Access Time*1	t_{ACC}			200			250	ns
\overline{CE} to Output Delay	t_{CE}			200			250	ns
\overline{OE} to Output Delay*1	t_{OE}			70			100	ns
Address to Output Hold	t_{OH}	0			0			ns
Output Enable High to Output Float*2	t_{DF}	0		60	0		60	ns

Notes: (1) \overline{OE} may be delayed up to $t_{ACC} - t_{OE}$ after the falling edge of \overline{CE} without impact on t_{ACC} .
(2) t_{DF} is specified from \overline{OE} or \overline{CE} , whichever occurs first. Output Float is defined as the point where data is no longer driven.

OPERATION TIMING DIAGRAM



PROGRAMMING/ERASING INFORMATION

PROGRAMMING

Upon delivery from Fujitsu, or after each erasure (see Erasure section), the MBM27C128 has all 131,072 bits in the "1" **Standard Programming**

The programming mode is entered when +21V is applied to the V_{PP} pin and \overline{CE} and \overline{PGM} are both at V_{IL} . During programming, \overline{CE} is kept at V_{IL} . A 0.1 μ F capacitor between V_{PP} and GND is needed to prevent excessive voltage transients, which could damage the device. The address to be programmed is applied to the proper

, or high, state. "0's" are loaded into the MBM27C128 through the procedure of programming.

address pins. 8 bit patterns are placed on the respective data output pins. The voltage levels should be standard TTL levels. When both the address and data are stable, a 50 msec, TTL Low-level pulse is applied to the PGM input to accomplish the programming. The procedure can be done manually, address by address, randomly,

or automatically via the proper circuitry. All that is required is that one 50 msec program pulse be applied at each address to be programmed. It is necessary that this program pulse width not exceed 55 msec. Therefore, applying a DC level to the PGM input is prohibited when programming.

Quick Programming

In addition to the standard 50 msec pulse width programming procedure, the MBM27C128 can be programmed with a fast programming algorithm designed by Fujitsu called quick programming. The algorithm utilizes a sequence of a 1ms pulse to program each location.

The programming mode is entered when +21V and +6V are applied to the V_{PP} pin and V_{CC} pin respectively, and \overline{PGM} and \overline{OE} are V_{IH} . During programming, \overline{CE} is kept at V_{IL} . A 0.1 μ F capacitor between V_{PP} and GND is needed to prevent excessive voltage transients which could damage the device. The address to be programmed is applied to the proper address pins. The 8 bit pattern are placed on the respective data output pins. The voltage levels should be standard TTL levels. When both the address and data are stable, a sequence of a 1 msec, TTL low-level pulse is applied to the \overline{PGM} pin and after that additional pulse

is applied to the \overline{PGM} pin to accomplish the programming.

Procedure of quick programming (Refer to the attached flow chart.)

- 1) Input the start address (Address = G)
- 2) Set the $V_{CC} = 6V$ and $V_{PP} = 21V$
- 3) Input data.
- 4) Compare the input data with FF. If data are FF, go to the step 11). If not, proceed the next step.
- 5) Clear the counter ($X \leftarrow 0$).
- 6) Apply ONE programming pulse to \overline{PGM} pin ($t_{PW} = 1$ ms Typ.).
- 7) Increment the counter ($X \leftarrow X+1$).
- 8) Compare the counter value with 20. If $X = 20$, go to the step 10). If $X < 20$, proceed the next step.
- 9) Verify the data. If the programmed data are the same as the input data, proceed the next step. If not, go back to the step 6).

- 10) Apply the additional programming pulse to the \overline{PGM} pin (1 ms x X or X ms x 1).

- 11) Compare the address with the end address. If the programmed address is the end address, proceed the next step. If not, go back to the step 3) for next address ($G \leftarrow G+1$).

- 12) Verify the data. If the programmed data are not the same as the input data, the part is failed. If the programmed data the same as the input data, programming is at an end.

All that is required is that initial 1 msec program pulse and additional program pulse (21 msec Max.) be applied at each address to be programmed. It is necessary that one program pulse width does not exceed 21 msec. Therefore, applying a DC level to the \overline{PGM} input is prohibited when programming.

ERASURE

In order to clear all locations of their programmed contents, it is necessary to expose the MBM27C128 to an ultra-violet light source. A dosage of 15W-seconds/cm² is required to completely erase an MBM27C128. This dosage can be obtained by exposure to an ultraviolet lamp (wavelength of 2537 Angstroms (Å)) with intensity of 12000 μ W/cm² for 15 to 21 min-

utes. The MBM27C128 should be about one inch from the source and all filters should be removed from the UV light source prior to erasure.

It is important to note that the MBM27C128 and similar devices, will erase with light sources having wavelengths shorter than 4000Å. Although erasure time will be much

longer than with an UV sources at 2537Å, nevertheless the exposure to fluorescent light and sunlight will eventually erase the MBM27C128, and exposure to the device should be prevented to realize maximum system reliability. If used in light environment, the package windows should be covered by an opaque label or substance.

PROGRAMMING/ERASING INFORMATION (Continued)

ELECTRONIC SIGNATURE

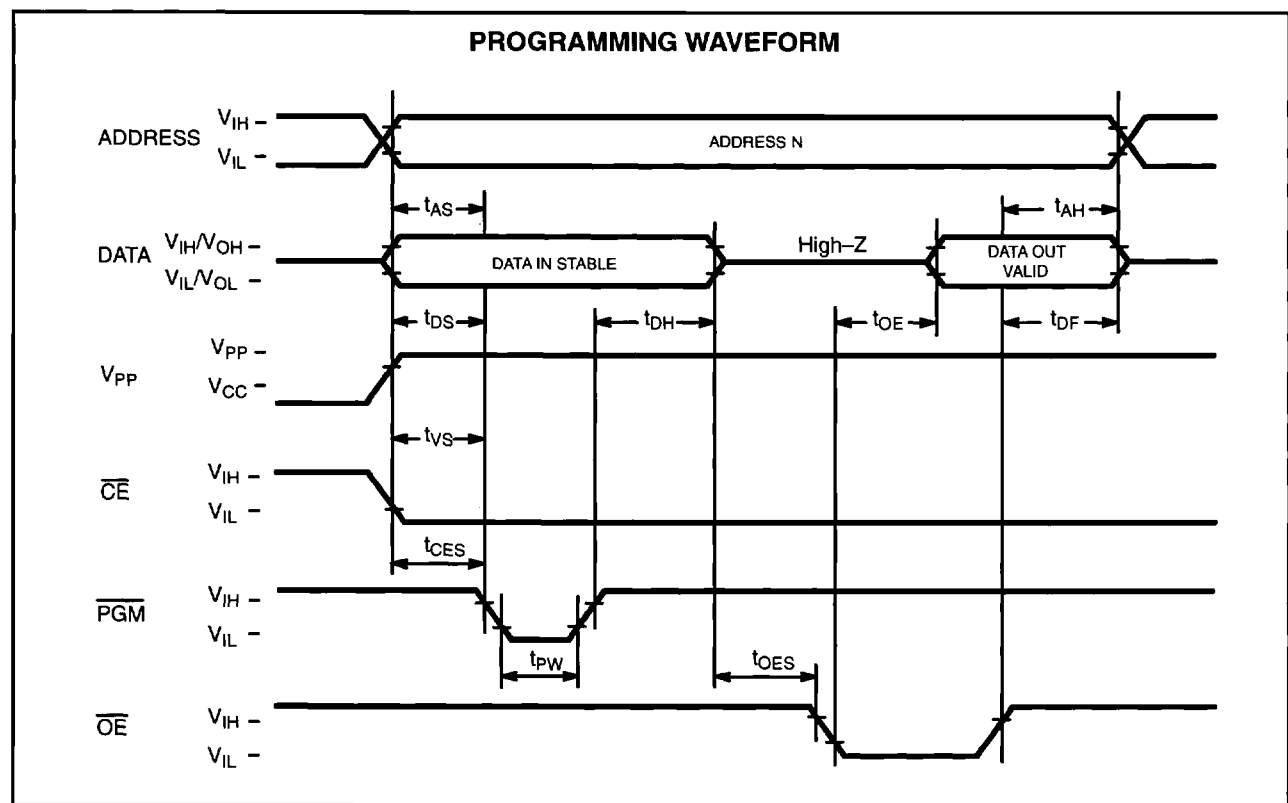
The MBM27C128 has an electronic signature mode which can be intended for use by programming equipment for the purpose of automatically matching the device to be programmed with its corresponding program-

ming algorithm. The electronic signature is activated when +12V is applied to the address line A₉ (pin 24) of the MBM27C128. Two identifier bytes are read out from the outputs by toggling

address line A₀ (pin 10) from V_{IL} to V_{IH}. The address lines from A₁ through A₁₃ must be hold at V_{IL} during the electronic signature mode. See the table below.

A ₀	O ₁	O ₂	O ₃	O ₄	O ₅	O ₆	O ₇	O ₈	
V _{IL}	0	0	1	0	0	0	0	0	Manufacture
V _{IH}	1	1	0	0	0	1	0	1	Device

Note: A₉ = 12V ±0.5V
A₁ thru A₈ = A₁₀ thru A₁₃ = $\overline{CE} = \overline{OE} = V_{IL}$.



1. Standard Programming

DC CHARACTERISTICS

($T_A = 25 \pm 5^\circ\text{C}$, $V_{CC}^{*1} = 5V \pm 5\%$, $V_{PP}^{*2} = 21 \pm 0.5V$)

Parameter	Symbol	Min	Typ	Max	Unit
Input Leakage Current ($V_{IN} = 5.25V/0.45V$)	$ I_{LI} $			10	μA
V_{PP} Supply Current During Programming Pulse ($\overline{CE} = \overline{PGM} = V_{IL}$)	I_{PP2}			40	mA
V_{CC} Supply Current	I_{CC3}			30	mA
Input Low Level	V_{IL}	-0.1		0.8	V
Input High Level	V_{IH}	2.0		$V_{CC} + 0.3$	V
Output Low Voltage During Verify ($I_{OL} = 2.1 \text{ mA}$)	V_{OL}			0.45	V
Output High Voltage During Verify ($I_{OH} = -400\mu\text{A}$)	V_{OH}	2.4			V

Note: *1 V_{CC} must be applied either coincidently or before V_{PP} and removed either coincidently or after V_{PP} .

*2 V_{PP} must not be 22 volts or more including overshoot. Permanent device damage may occur if the device is taken out or put into socket remaining $V_{PP} = 21$ volts. Also, during $\overline{CE} = \overline{PGM} = V_{IL}$, V_{PP} must be switched from 5 to 21 volts or vise-versa.

AC CHARACTERISTICS

($T_A = 25 \pm 5^\circ\text{C}$, $V_{CC} = 5V \pm 5\%$, $V_{PP} = 21 \pm 0.5V$)

Parameter	Symbol	Min	Typ	Max	Unit
Address Setup Time	t_{AS}	2			μs
Chip Enable Setup Time	t_{CES}	2			μs
Output Enable Setup Time	t_{OES}	2			μs
Data Setup Time	t_{DS}	2			μs
V_{PP} Setup Time	t_{VS}	2			μs
Address Hold Time	t_{AH}	0			μs
Data Hold Time	t_{DH}	2			ns
Output Enable to Output Float Delay	t_{DF}	0		130	ns
Data Valid from Output Enable	t_{OE}			150	μs
\overline{PGM} Pulse Width	t_{PW}	25	50	55	ms

PROGRAMMING/ERASING INFORMATION (Continued)

2. Quick Programming

DC CHARACTERISTICS

($T_A = 25 \pm 5^\circ\text{C}$, $V_{CC}^{*1} = 6V \pm 0.25V$, $V_{PP}^{*2} = 21V \pm 0.5V$)

Parameter	Symbol	Min	Typ	Max	Unit
Input Leakage Current ($V_{IN} = 6.25V/0.45V$)	$ I_{LI} $			10	μA
V_{PP} Supply Current During Programming Pulse ($\overline{CE} = \overline{PGM} = V_{IL}$)	I_{PP2}			40	mA
V_{CC} Supply Current	I_{CC3}			30	mA
Input Low Level	V_{IL}	-0.1		0.8	V
Input High Level	V_{IH}	2.0		$V_{CC} + 0.3$	V
Output Low Voltage During Verify ($I_{OL} = 2.1 \text{ mA}$)	V_{OL}			0.45	V
Output High Voltage During Verify ($I_{OH} = -400\mu\text{A}$)	V_{OH}	2.4			V

Note: *1 V_{CC} must be applied either coincidently or before V_{PP} and removed either coincidently or after V_{PP} .

*2 V_{PP} must not be 22 volts or more including overshoot. Permanent device damage may occur if the device is taken out or put into socket remaining $V_{PP} = 21$ volts. Also, during $\overline{CE} = \overline{PGM} = V_{IL}$, V_{PP} must be switched from 6 to 21 volts or vice-versa.

AC CHARACTERISTICS

($T_A = 25 \pm 5^\circ\text{C}$, $V_{CC} = 6V \pm 0.25V$, $V_{PP} = 21V \pm 0.5V$)

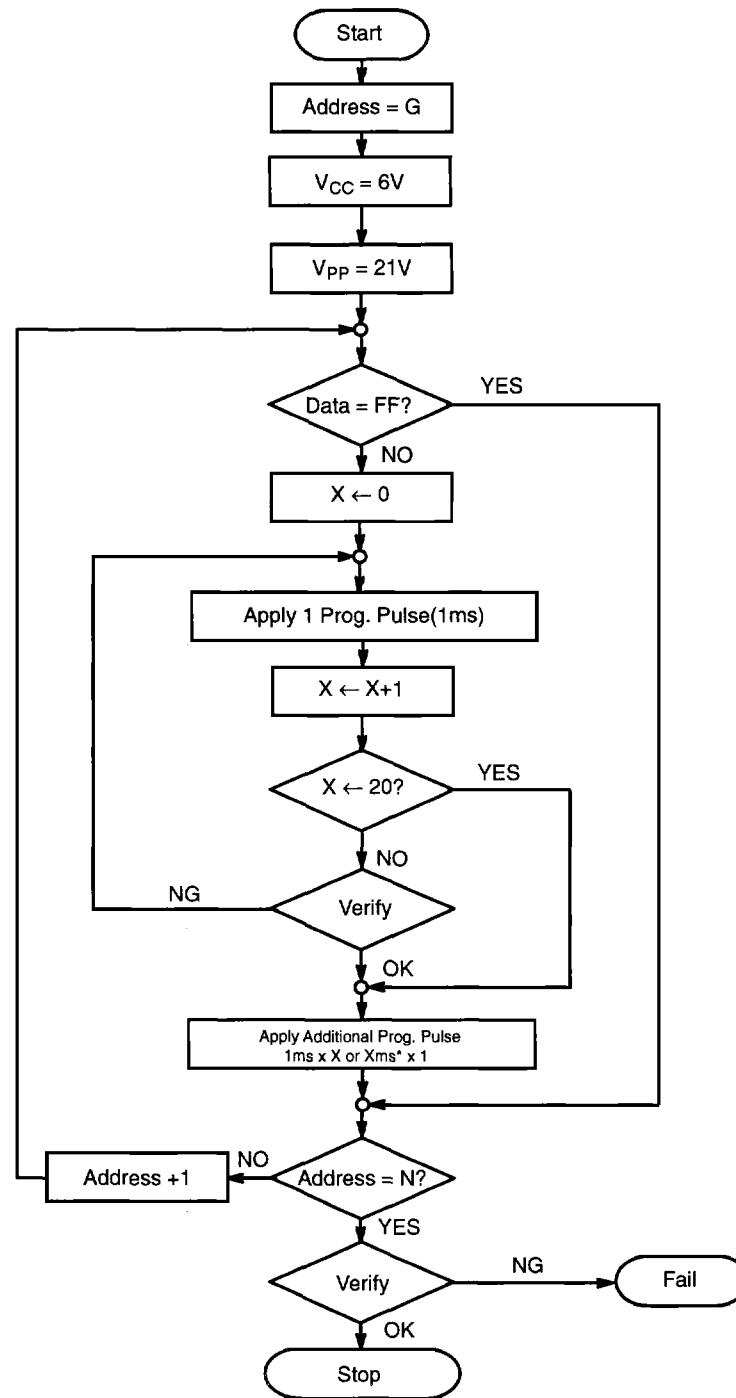
Parameter	Symbol	Min	Typ	Max	Unit
Address Setup Time	t_{AS}	2			μs
Chip Enable Setup Time	t_{CES}	2			μs
Output Enable Setup Time	t_{OES}	2			μs
Data Setup Time	t_{DS}	2			μs
V_{PP} Setup Time	t_{VS}	2			μs
Address Hold Time	t_{AH}	0			μs
Data Hold Time	t_{DH}	2			μs
Output Enable to Output Float Delay	t_{DF}	0		130	ns
Data Valid from Output Enable	t_{OE}			150	μns
\overline{PGM} Pulse Width	t_{PW}	0.95	1	1.05	ms

Fig. 17 –QUICK PROGRAMMING FLOW CHART

$V_{CC} = 6V \pm 0.25V$
 $V_{PP} = 21V \pm 0.5V$

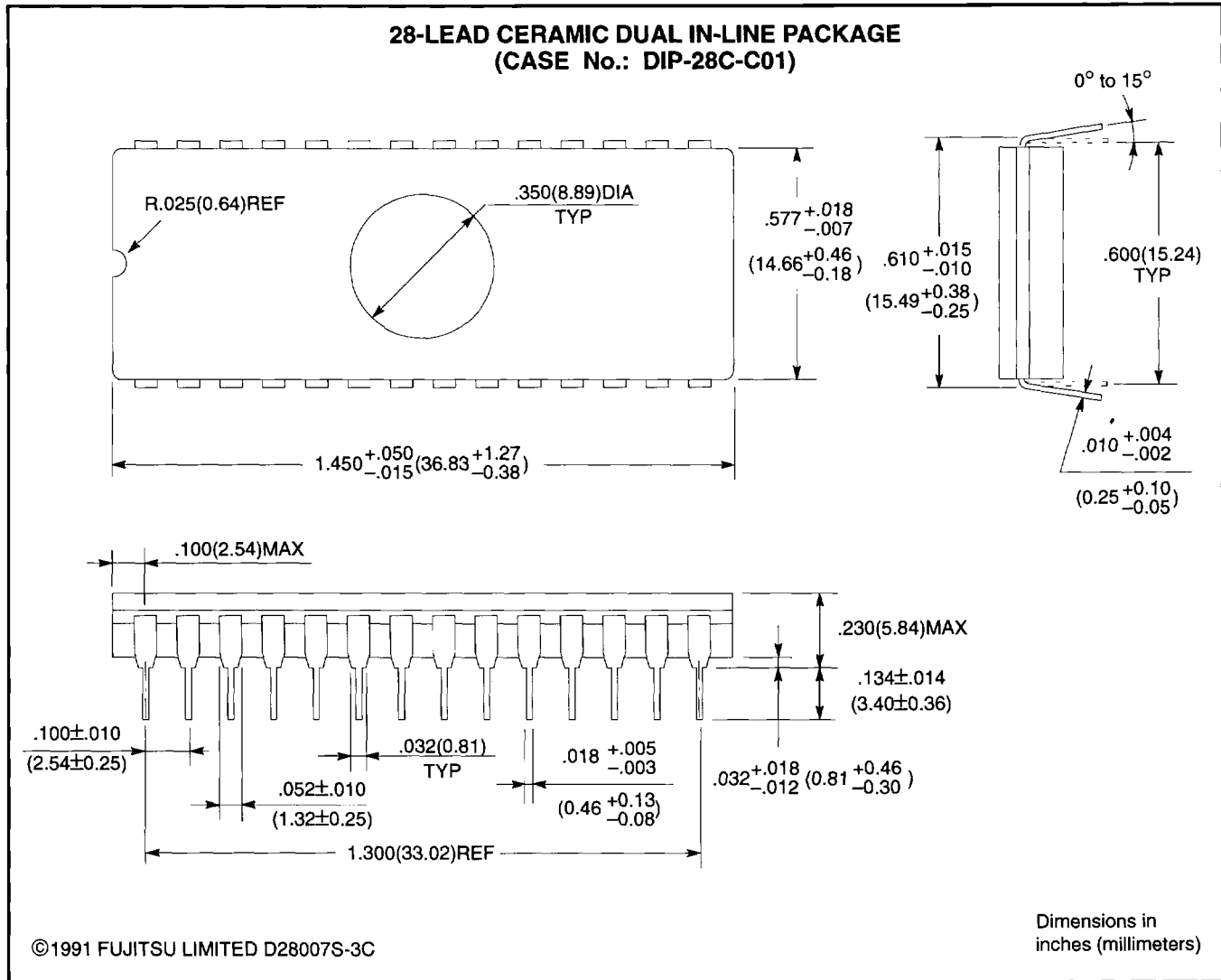
$T_{PW} = 1ms \pm 50\mu s$
(* = $Xms \pm 5\%$)

G: Start Address
N: Stop Address
X: Counter Value
Maximum 42ms/Byte
Minimum 1.9ms/Byte



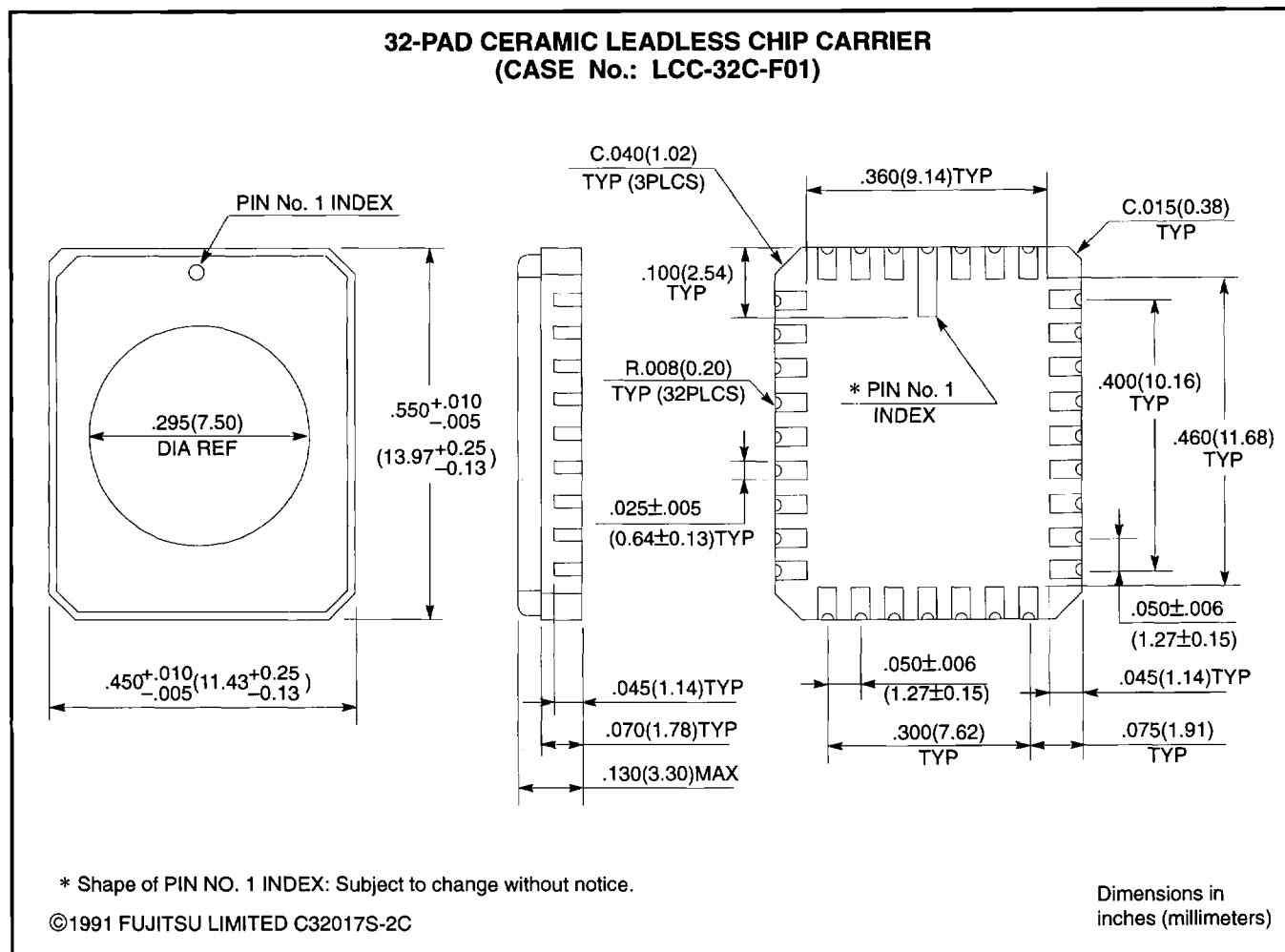
PACKAGE DIMENSIONS

Standard 28-pin Ceramic DIP (Suffix: -Z)



PACKAGE DIMENSIONS (Continued)

Standard 32-pad Ceramic LCC (Suffix: -TV)



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