

# MOSTEK®

## MILITARY/HIGH-REL PRODUCTS

Extended Temperature, Extended Burn-in Industrial Processing

# 2048 x 8-Bit UV Erasable PROM

## MKI2716(J)-77/78

### FEATURES

- 44 hr. min., 125°C burn-in plus Industrial screening for greater reliability (see Figure 3 for processing description)
- Extended operating temperature ( $-40^{\circ}\text{C} \leq T_A \leq 85^{\circ}\text{C}$ )
- Pin compatible with Mostek's BYTEWYDE™ memory family
- Single +5 volt power supply during read operation
- Fast 450ns access time in read mode
- Low power dissipation: 633 mW max active
- Power down mode: 165 mW max standby

- Three state output OR-tie capability
- Five modes of operation for greater system flexibility (see Table)
- Single programming requirement: single location programming with one 50 msec pulse
- Military MKB version available ( $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ )
- TTL compatible in all operating modes
- Standard 24 pin DIP with transparent lid

### DESCRIPTION

The MKI2716 is a 2048 x 8 bit electrically programmable/ultraviolet erasable read only memory. The circuit is fabricated with Mostek's advanced N-channel silicon gate technology for the highest performance and reliability. The MKI2716 offers significant advances over hardwired logic cost, system flexibility, turnaround time and performance.

The MKI2716 has many useful system oriented features including a standby mode of operation which lowers the device power from 633mW maximum active power to 165mW maximum for an overall savings of 75%.

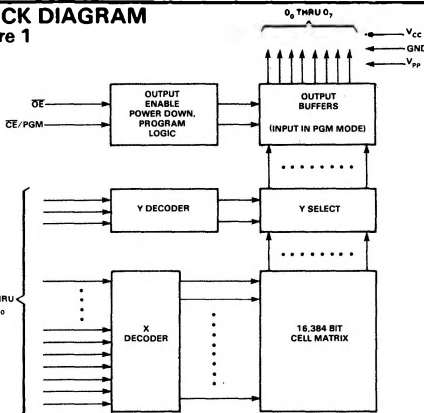
### MODE SELECTION

Pin	CE/PGM (18)	OE (20)	V <sub>PP</sub> (21)	Output
Read	V <sub>IL</sub>	V <sub>IL</sub>	+5	Valid Out
Standby	V <sub>IH</sub>	Don't Care	+5	Open
Program	Pulsed V <sub>IL</sub> to V <sub>IH</sub>	V <sub>IH</sub>	+25	Input
Program Verify	V <sub>IL</sub>	V <sub>IL</sub>	+25	Valid Out
Program Inhibit	V <sub>IL</sub>	V <sub>IH</sub>	+25	Open

V<sub>CC(24)</sub> = 5V all modes

### BLOCK DIAGRAM

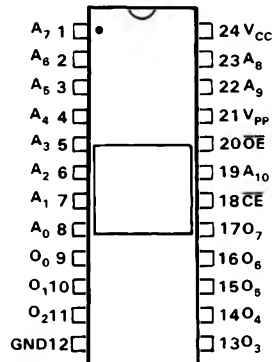
Figure 1



NOTE: Pin 18 and 20 have been renamed for compatibility with presently available 16K, 32K and 64K ROMs and future generation 32K and 64K EPROMs. All other specifications for this device remain unaffected by this change.

### PIN CONNECTIONS

Figure 2



### PIN NAMES

A0 - A10	Addresses	OE	Output Enable
CE/PGM	Chip Enable/ Program	O <sub>0</sub> - O <sub>7</sub>	Outputs

### ABSOLUTE MAXIMUM RATINGS\*

Voltage on any pin relative to $V_{SS}$ (Except $V_{PP}$ )	-0.3 V to +6 V
Voltage on $V_{PP}$ supply pin relative to $V_{SS}$	-0.3 V to +28 V
Operating Temperature $T_A$ (Ambient)	$-40^{\circ}\text{C} \leq T_A \leq 85^{\circ}\text{C}$
Storage Temperature (Ambient)	$-65^{\circ}\text{C} \leq T_A \leq +125^{\circ}\text{C}$
Power Dissipation	1 Watt
Short Circuit Output Current	50 mA

\*Stresses greater than those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operating sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

### READ OPERATION

#### RECOMMENDED DC OPERATING CONDITIONS

$(-40^{\circ}\text{C} \leq T_A \leq 85^{\circ}\text{C})$

SYM	PARAMETER	MIN	TYP	MAX	UNITS	NOTES
$V_{IH}$	Input High Voltage	2.0		$V_{CC}+1$	V	
$V_{IL}$	Input Low Voltage	-0.1		0.8	V	

#### DC ELECTRICAL CHARACTERISTICS<sup>1,2,4,8</sup>

$(-40^{\circ}\text{C} \leq T_A \leq 85^{\circ}\text{C}) (V_{CC} = +5\text{ V} \pm 5\%, V_{PP} = V_{CC})^2$

SYM	PARAMETER	MIN	TYP	MAX	UNITS	NOTES
$I_{CC1}$	$V_{CC}$ Standby Power Supply Current ( $\overline{OE} = \overline{V_{IL}}$ ; $CE = V_{IH}$ )		10	30	mA	2
$I_{CC2}$	$V_{CC}$ Active Power Supply Current ( $\overline{OE} = \overline{CE} = \overline{V_{IL}}$ )		57	115	mA	2
$I_{PP1}$	$V_{PP}$ Current ( $V_{PP} = 5.25\text{ V}$ )			10	mA	2
$V_{OH}$	Output High Voltage ( $I_{OH} = -400\ \mu\text{A}$ )	2.4			V	
$V_{OL}$	Output Low Voltage ( $I_{OL} = 2.1\text{ mA}$ )			.45	V	
$I_{IL}$	Input Leakage Current ( $V_{IN} = 5.25\text{ V}$ )			10	$\mu\text{A}$	
$I_{OL}$	Output Leakage Current ( $V_{OUT} = 5.25\text{ V}$ )			10	$\mu\text{A}$	

#### AC ELECTRICAL CHARACTERISTICS<sup>1,2,5</sup>

$(-40^{\circ}\text{C} \leq T_A \leq 85^{\circ}\text{C}) (V_{CC} = +5\text{ V} \pm 5\%, V_{PP} = V_{CC})^2$

SYM	PARAMETER	-77		-78		UNITS	NOTES
		MIN	MAX	MIN	MAX		
$t_{ACC}$	Address to Output Delay ( $\overline{CE} = \overline{OE} = \overline{V_{IL}}$ )		390		450	ns	
$t_{CE}$	CE to Output Delay ( $\overline{OE} = \overline{V_{IL}}$ )		390		450	ns	5
$t_{OE}$	Output Enable to Output Delay ( $\overline{CE} = \overline{V_{IL}}$ )		150		150	ns	9
$t_{DF}$	Chip Deselect to Output Float ( $\overline{CE} = \overline{V_{IL}}$ )	0	130	0	130	ns	8
$t_{OH}$	Address to Output Hold ( $CE = \overline{OE} = \overline{V_{IL}}$ )	0		0		ns	

## RECOMMENDED AC OPERATING CONDITIONS AND ELECTRICAL CHARACTERISTICS<sup>1,2,6,7</sup>

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

SYM	PARAMETER	MIN	TYP	MAX	UNITS	NOTES
$t_{AS}$	Address Setup Time	2			$\mu\text{S}$	
$t_{OES}$	$\overline{\text{OE}}$ Setup Time	2			$\mu\text{S}$	
$t_{DS}$	Data Setup Time	2			$\mu\text{S}$	
$t_{AH}$	Address Hold Time	2			$\mu\text{S}$	
$t_{OE H}$	$\overline{\text{OE}}$ Hold Time	2			$\mu\text{S}$	
$t_{DH}$	Data Hold Time	2			$\mu\text{S}$	
$t_{DF}$	Output Enable to Output Float	0		130	ns	4
$t_{OE}$	Output Enable to Output Delay			120	ns	4
$t_{PW}$	Program Pulse Width	45	50	55	ms	
$t_{PRT}$	Program Pulse Rise Time	5			ns	
$t_{PFT}$	Program Pulse Fall Time	5			ns	

### PROGRAM OPERATION NOTES:

- $V_{CC}$  must be applied at the same time or before  $V_{pp}$  and removed after or at the same time as  $V_{pp}$ . To prevent damage to the device it must not be inserted into a board with  $V_{pp}$  at 25V.
- Care must be taken to prevent overshoot of the  $V_{pp}$  supply when switching to -25V.
- $0.45\text{V} \leq V_{IN} \leq 5.25\text{V}$
- $\overline{\text{CE}}/\text{PGM} - V_{IL}$
- $\overline{\text{CE}}/\text{PGM} - V_{IH}$
- $t_T = 20\text{nsec}$
- 1V or 2V for inputs and 8V or 2V for outputs are used as timing reference levels.
- Although speed selections are made for read operation all programming specifications are the same for all dash numbers.

## MKI INDUSTRIAL HI-REL SCREENING

Figure 3

	Screen	MIL-STD 883 Method	Reqmt.
Package Assembly	Die Inspect Pre-Seal Inspect	75X Mostek Spec. 30X-60X Mostek Spec.	100% 100%
Environmental	Temperature Cycle Centrifuge Fine Leak Gross Leak	1010 Cond. C, 5 Cycles 2001 Cond. D, 20Kg $Y_j$ 1014 Cond. B, $1 \times 10^{-7}$ atm cc/sec Mostek Spec.	100% 100% 100% 100%
Electrical	Electrical Screens	5005 Grp. A electrical sub-groups, testing conditions and limits which guarantee ac, dc and functional performance over the full temperature range.	100%
Voltage Stress (DRAMs only)		1015 Cond. D, 10 hrs. min., 125°C	100%
Burn-in		1015 Cond. D, 44 hrs. min., 125°C	100%
QA Acceptance	Hermeticity Electrical Tests  Visual/Mechanical  Solderability Pre-shipment Inspect	Fine and gross leak samples 5005 Grp. A sample testing to guarantee performance to data sheet over full temp. range. Visual tests to guarantee marking, construction and mechanical integrity	.25% AQL 4% AQL  65% AQL  LTPD 10 65% AQL

## CAPACITANCE

( $T_A = 25^\circ\text{C}$ )<sup>8</sup>

SYM	PARAMETER	TYP	MAX	UNITS	NOTES
$C_{IN}$	Input Capacitance	4	6	pF	6
$C_{OUT}$	Output Capacitance	8	12	pF	6

### READ OPERATION NOTES:

- $V_{CC}$  must be applied on or before  $V_{PP}$  and removed after or at the same time as  $V_{PP}$ .
- $V_{PP}$  and  $V_{CC}$  may be connected together except during programming, in which case the supply current is the sum of  $I_{CC}$  and  $I_{PP1}$ .
- All voltages with respect to  $V_{SS}$ .
- Load conditions =  $t_{TL}$  load and 100pF.,  $t_r = t_f = 20\text{ns}$ , reference levels are 1V and 2V for inputs and .8V and 2V for outputs.
- $t_{OE}$  is referenced to  $\overline{CE}$  or the addresses, whichever occurs last.
- Effective Capacitance calculated from the equation  $C = \frac{\Delta Q}{\Delta V}$  where  $\Delta V = 3V$ .
- Typical numbers are for  $T_A = 25^\circ\text{C}$  and  $V_{CC} = 5.0V$ .
- $t_{DF}$  is applicable to both  $\overline{CE}$  and  $\overline{OE}$ , whichever occurs first.
- $\overline{OE}$  may follow up to  $t_{ACC} - t_{OE}$  after the falling edge of  $\overline{CE}$  without effecting  $t_{ACC}$ .

## PROGRAM OPERATION<sup>8</sup>

### RECOMMENDED DC OPERATING CONDITIONS<sup>8</sup>

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

SYM	PARAMETER	MIN	MAX	UNITS	NOTES
$V_{IL}$	Input Low Level	-0.1	0.8	V	
$V_{IH}$	Input High Level	2.0	$V_{CC} + 1$	V	

## DC ELECTRICAL CHARACTERISTICS

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

SYM	PARAMETER	MIN	MAX	UNITS	NOTES
$I_{IL}$	Input Leakage Current		10	$\mu\text{A}$	3
$I_{CC}$	$V_{CC}$ Power Supply Current		100	mA	
$I_{PP1}$	$V_{PP}$ Supply Current		10	mA	4
$I_{PP2}$	$V_{PP}$ Supply Current during Programming Pulse		30	mA	5