# ONE TIME PROGRAMMABLE ROM

## OUTLINE

The OTP ROM IC MEMORY CARD series is made up of One Time Programable ROM chips. Memory capacity is from 64K Bytes to 1M Bytes.
HE series is 16 bit wide data bus.
This card is programmed by manufacturer.

## VARIATION

| Part Number | Memory Size | Description |
|---|---|---|
| EPC065HEC0 | 64K Bytes | 32K × 16 bits CMOS OTP ROM CARD |
| EPC129HEC0 | 128K Bytes | 64K × 16 bits CMOS OTP ROM CARD |
| EPC257HEC0 | 256K Bytes | 128K × 16 bits CMOS OTP ROM CARD |
| EPC513HEC0 | 512K Bytes | 256K × 16 bits CMOS OTP ROM CARD |
| EPC101HEC0 | 1M Bytes | 512K × 16 bits CMOS OTP ROM CARD |

## SIZE AND WEIGHT

(1) Size: 54.0 ±0.1 mm wide by 86.0 ±0.2 mm long by 2.4 ±0.15 mm thick
(2) Thickness at the contacts : 1.80 ±0.15 mm
(3) Weight : approx. 23 grams
(4) Card type : 50 pin Card Edge type

## FEATURES

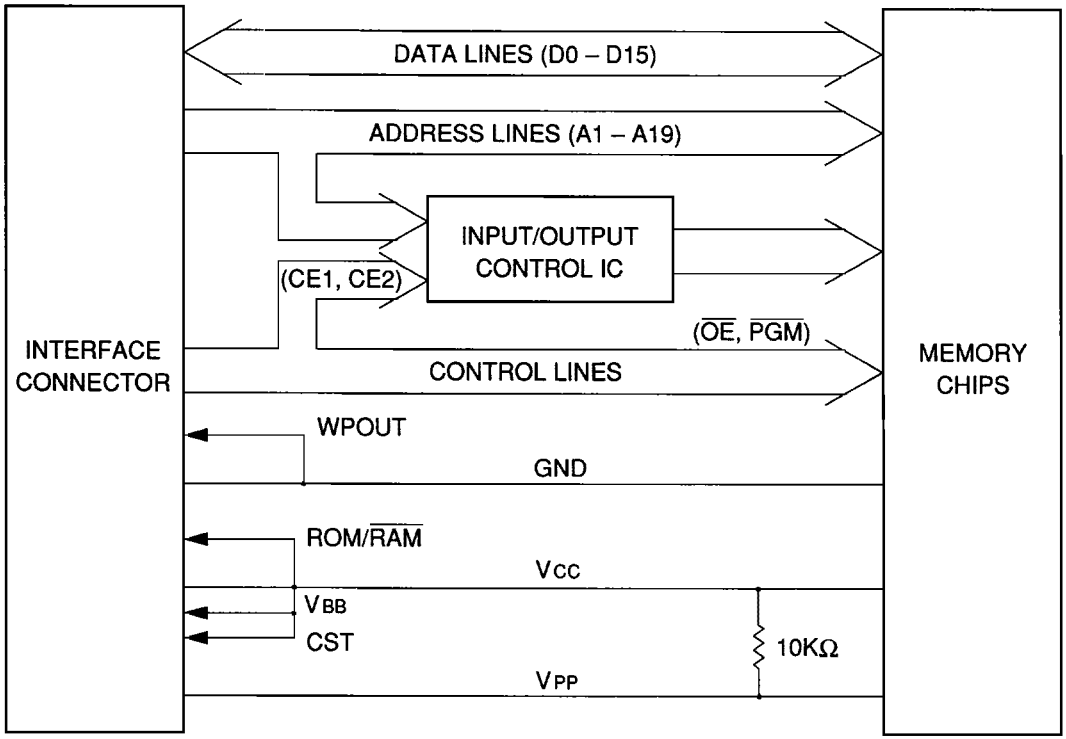
(1) Shutter Mechanism

This mechanism protects the terminal from dirt, static electricity, hand contact, etc. The shutter is opened by tabs on the connector during insertion, and it closed by built in springs when the card is removed from the connector.
(Our connector is required to operate this feature.)

2) Polarization of the connector to the card

The IC card and our connector have a mechanism to safeguard against incorrect insertion. This mechanism protects the circuits of the Read/Write unit, the connector, and the card from potential damage.

## INTERFACE SIGNAL DIRECTION




(1) D0 to D15

Data input/output, 16 bit wide
D0 to D7 : lower data
D8 to D15 : upper data

(2) A1 to A19

Address inputs
Unused address lines should be "no connect".

(3) CE1

Card Enable input (Active HIGH)
Controls D0 to D7

(4) CE2

Card Enable input (Active HIGH)
Controls D8 to D15

(5) $\overline{OE}$

Output Enable input (Active LOW)
Memory card output data when $\overline{OE}$ is "LOW"

(6) $\overline{PGM}$

Program Enable input (Active LOW)
This card is programmed, so this line should be $V_{IH}$ state.

(7) WPOUT*

This card can not be programmed, so WPOUT connected to GND line.

(8) CST*

Output line to indicate that the card is accessible or not.
This line is connected to $V_{CC}$ line.

(9) ROM/$\overline{RAM}$*

This line is connected $V_{CC}$ or GND line.
Output line to indicate the card type.
$V_{CC}$ level indicates ROM : OTP (EPC, BPC), MASKROM (MRC), FLASH MEMORY (FPC)
GND level indicates RAM : SRAM (RBC), EEPROM (EEC), FLASH MEMORY (FEC)
Do never use as card $V_{CC}$ or GND line.

(10) VPP

Power supply voltage required to program data to the card.
Connected to VCC through a 10K ohm resister.
This card is programmed, so this line should be VCC or floating state.

(11) VCC

Power source : +5 V ±10%.

(12) GND

Ground

Notes: See the recommended interface circuit.
* Do never use as VCC or GND line.

## ABSOLUTE MAXIMUM RATING

| Symbol | Description | Maximum Rating | Unit |
|---|---|---|---|
| VCC | Power supply voltage | –0.5 to 7.0 | V |
| VPP | VPP power supply | –0.5 to 14.0 | V |
| VIN | Input Voltage | –0.5 to VCC +0.5 | V |
| VOUT | Output Voltage | –0.5 to VCC | V |
| TOP | Operating Temperature | 0 to 60 | °C |
| TSTG | Storage Temperature | –20 to 60 | °C |
| HSTG | Storage Humidity | 0 to 65 | % |
| PD | Power Dissipation | 2 | W |

Note: VIH should be under 7.0 V.

## CAPACITANCE (Ta = 25°C, f = 1 MHz)

| Card | Item | Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| EPC065HEC0 | A1 – A15, $\overline{OE}$ | Vin = 0 V | — | 14 | 18 | pF |
| | CE1, CE2 | Vin = 0 V | — | 6 | 8 | pF |
| | D0 – D15 | Vin/Vout = 0 V | — | 10 | 14 | pF |
| EPC129HEC0 | A1 – A16 | Vin =0 V | — | 14 | 18 | pF |
| | $\overline{OE}$/VPP | Vin = 0 V | — | 15 | 20 | pF |
| | CE1, CE2 | Vin = 0 V | — | 6 | 8 | pF |
| | D0 – D15 | Vin/Vout = 0 V | — | 10 | 14 | pF |
| EPC257HEC0 | A1 – A17, $\overline{OE}$, $\overline{PGM}$ | Vin = 0 V | — | 14 | 18 | pF |
| | CE1, CE2 | Vin = 0 V | — | 6 | 8 | pF |
| | D0 – D15 | Vin/Vout = 0 V | — | 10 | 14 | pF |
| EPC513HEC0 | A1 – A17, $\overline{OE}$, $\overline{PGM}$ | Vin = 0 V | — | 24 | 32 | pF |
| | A18, CE1, CE2 | Vin = 0 V | — | 6 | 8 | pF |
| | D0 – D15 | Vin/Vout = 0 V | — | 20 | 28 | pF |
| EPC101HEC0 | A1 – A19, $\overline{OE}$ | Vin = 0 V | — | 14 | 18 | pF |
| | CE1, CE2 | Vin = 0 V | — | 6 | 8 | pF |
| | D0 – D15 | Vin/Vout = 0 V | — | 10 | 14 | pF |

Note: The above figures are reference only.

## DC RECOMMENDED OPERATING CONDITIONS

| Symbol | Item | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| VIH | High Input Level | 2.2 | — | VCC + 0.3 | V |
| VIL | Low Input Level | –0.3 | — | 0.6 | V |
| VCC | Supply at (READ) | 4.5 | 5.0 | 5.5 | V |
| VPP | Supply at (READ) | 4.5 | 5.0 | 5.5 | V |

## DC CHARACTERISTICS ( Ta = 0 to 60°C, $V_{CC}$ = 5 V +/–5% )

| Symbol | Item | Note | Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $I_{LI}$ | Low Input Cur. | 1 | $V_{IN}$ = 0 to $V_{CC}$ | –10 | — | 10 | µA |
| $I_{LO}$ | Leakage Cur. | 2 | CE = $V_{IL}$ or $\overline{OE}$ = $V_{IH}$<br>$V_{OUT}$ = 0 to $V_{CC}$ | –10 | — | 10 | µA |
| $V_{OH}$ | High Output | 2 | $I_{OH}$ = –400 uA | 2.4 | — | — | V |
| $V_{OL}$ | LowOutput | 2 | $I_{OL}$ = 2.1 mA | — | — | 0.4 | V |
| $I_{CC}$ | Active Cur. | 3 | CE1, CE2 = $V_{IH}$ | | | | |
| | | | EPC065HEC0 | — | — | 100 | mA |
| | | | EPC129HEC0 | — | — | 100 | mA |
| | | | EPC257HEC0 | — | — | 100 | mA |
| | | | EPC513HEC0 | — | — | 100 | mA |
| | | | EPC101HEC0 | — | — | 100 | mA |
| $I_{SB1}$ | Standby Cur. | 3 | CE1,CE2 = $V_{IL}$ | | | | |
| | | | EPC065HEC0 | — | — | 1 | mA |
| | | | EPC129HEC0 | — | — | 1 | mA |
| | | | EPC257HEC0 | — | — | 1 | mA |
| | | | EPC513HEC0 | — | — | 1 | mA |
| | | | EPC101HEC0 | — | — | 1 | mA |

Notes:
1. A1 to A19, $\overline{OE}$, $\overline{PGM}$, CE1, CE2
2. D0 to D15
3. D0 to D15,CST = No Load//other inputs = $V_{IH}$ or $V_{IL}$

## $V_{PP}$ RESISTANCE ( Ta = 0 to 60°C )

| Symbol | Item | Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| RVPP | VPP RESISTANCE | — | 9 | 10 | 11 | Kohm |

## OPERATING MODES

| Mode | CE | $\overline{OE}$ | $\overline{PGM}$ | VPP | VCC | D0 – D15 | CST |
|---|---|---|---|---|---|---|---|
| READ | VIH | VIL | VIL | V1 | V1 | OUTPUT | HO |
| DISABLE | VIH | VIH | VIH | V1 | V1 | HZ | HO |
| STANDBY | VIL | * | * | V1 | V1 | HZ | HO |

HO: Output VCC level.
* : Input is VIH or VIL.
HZ: High Impedance
V1 : 4.5 to 5.5 V

## ELECTRIC SIGNATURE MODE

| Model | Manufacturer Code (A1 = VIL) | Device Code (A1 = VIH) |
|---|---|---|
| | HEX | HEX |
| EPC065HEC0 | 98 | C4 |
| or | 10 | 64 |
| EPC129HEC0 | 10 | 25 |
| EPC257HEC0 | 98 | 07 |
| or | 10 | 16 |
| or | 10 | 86 |
| EPC513HEC0 | 98 | 07 |
| EPC101HEC0 | 98 | 8C |

HOW TO READ THE IDENTIFIER CODE:

(1) A2 to A9 & A11 to A19 = VIL ( –0.3 to 0.8 V)
(2) A10 = 11.5 V to 12.5 V
(3) A1 = VIL : Manufacturer code is output to D0 to D7 & D8 to D15
A1 = VIH : Device code is output to D0 to D7 & D8 to D15
(4) CE & $\overline{PGM}$ = VIH, $\overline{OE}$ = VIL
(5) VCC = VPP = 5 V ±10%

## AC ELECTRICAL CHARACTERICTICS AT READ
## (Ta = 0 to 60°C, $V_{CC}$ = 5 V ±10%)

| Symbol | Item | Min | Max | Unit |
|---|---|---|---|---|
| $t_{RC}$ | Read Cycle | 220 | — | ns |
| $t_{ACC}$ | Read Access | — | 200* | ns |
| $t_{CE}$ | CE Access | — | 220 | ns |
| $t_{OE}$ | OE Access | — | 90 | ns |
| $t_{COE}$ | CE to Enable | 10 | — | ns |
| $t_{OEE}$ | OE to Enable | 10 | — | ns |
| $t_{OD}$ | CE to Disable | — | 80 | ns |
| $t_{ODO}$ | OE to Disable | — | 80 | ns |
| $t_{OH}$ | Data Hold | 0** | — | ns |

* : 220 ns at EPC513HEC0

** : 20 ns at EPC513HEC0

<< AC test conditions >>

Output load : 1 TTL gate + 100 pF (include jig)

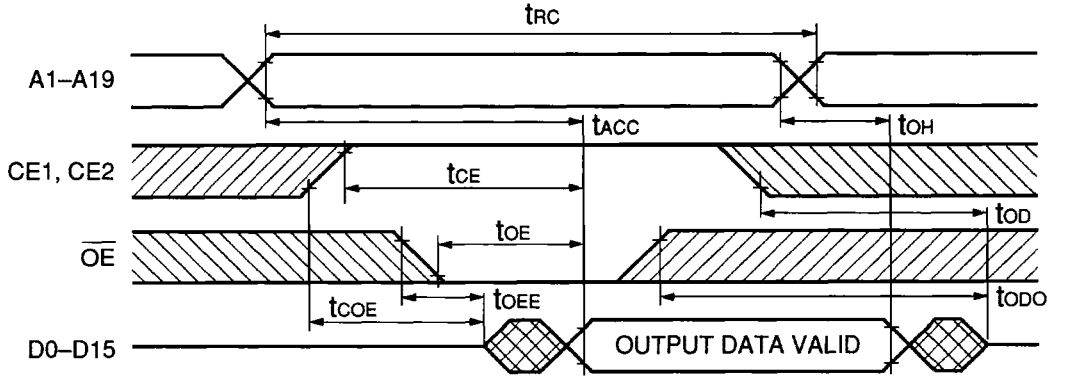
Input pulse level : 0.4 V, 2.4 V

Timing measurement comparison level : Input : 0.6 V and 2.2 V

Output : 0.6 V and 2.2 V

Input rise & fall : 20 ns

## READ TIMING



## PIN ASSIGNMENT

| Pin # | Name | Len |
|---|---|---|
| 1 | GND | L |
| 2 | A1 | M |
| 3 | A2 | M |
| 4 | A3 | M |
| 5 | A4 | M |
| 6 | A5 | M |
| 7 | A6 | M |
| 8 | A7 | M |
| 9 | A8 | M |
| 10 | A9 | M |
| 11 | A10 | M |
| 12 | A11 | M |
| 13 | A12 | M |
| 14 | A13 | M |
| 15 | A14 | M |
| 16 | A15* | M |
| 17 | A16* | M |

| Pin # | Name | Len |
|---|---|---|
| 18 | A17* | M |
| 19 | A18* | M |
| 20 | A19* | M |
| 21 | N/C | M |
| 22 | N/C | M |
| 23 | $\overline{PGM}$** | M |
| 24 | ROM/$\overline{RAM}$ | M |
| 25 | CE1 | M |
| 26 | CE2 | M |
| 27 | WPOUT | M |
| 28 | $\overline{OE}$** | M |
| 29 | CST | S |
| 30 | $V_{BB}$ | M |
| 31 | $V_{CC}$ | L |
| 32 | $V_{CC}$ | L |
| 33 | $V_{PP}$** | M |
| 34 | D0 | M |

| Pin# | Name | Len |
|---|---|---|
| 35 | D1 | M |
| 36 | D2 | M |
| 37 | D3 | M |
| 38 | D4 | M |
| 39 | D5 | M |
| 40 | D6 | M |
| 41 | D7 | M |
| 42 | D8 | M |
| 43 | D9 | M |
| 44 | D10 | M |
| 45 | D11 | M |
| 46 | D12 | M |
| 47 | D13 | M |
| 48 | D14 | M |
| 49 | D15 | M |
| 50 | GND | L |

<NOTES>

Len = Terminal length

L: Long length M: Middle length S: Short length

* A15: EPC065,EPC129,EPC257,EPC513,EPC101
* A16: EPC129,EPC257,EPC513,EPC101
* A17: EPC257,EPC513,EPC101
* A18: EPC513,EPC101
* A19: EPC101

(Unused address lines should be N/C.)

** : EPC065 & EPC101 ($\overline{OE}$ — >$\overline{OE}$,$\overline{PGM}$ — >N/C,$V_{PP}$ — >$V_{PP}$)
EPC129 ($\overline{OE}$ — >$\overline{OE}$/$V_{PP}$,$\overline{PGM}$ — >N/C,$V_{PP}$ — >N/C)
EPC257 & EPC513 ($\overline{OE}$ — >$\overline{OE}$,$\overline{PGM}$ — >$\overline{PGM}$,$V_{PP}$ — >$V_{PP}$)