UNPROGRAMMED ONE TIME PROGRAMMABLE ROM

OUTLINE

The UNPROGRAMMED 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 only used for customer's development.

VARIATION

Part Number	Memory Size	Description
BPC065HEC0	64K Bytes	32K × 16 bits CMOS UNPROGRAMMED OTP ROM CARD
BPC129HEC0	128K Bytes	64K × 16 bits CMOS UNPROGRAMMED OTP ROM CARD
BPC257HEC0	256K Bytes	128K × 16 bits CMOS UNPROGRAMMED OTP ROM CARD
BPC513HEC0	512K Bytes	256K × 16 bits CMOS UNPROGRAMMED OTP ROM CARD
BPC101HEC0	1M Bytes	512K × 16 bits CMOS UNPROGRAMMED 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

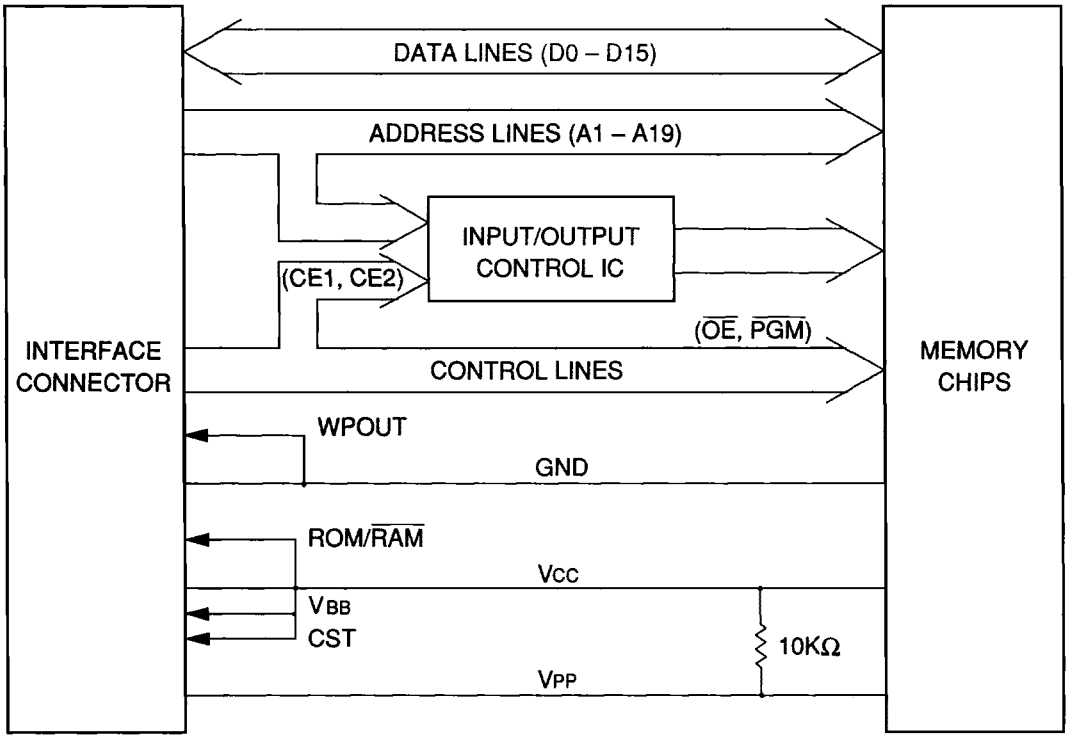
(1) Shutter Mechanism

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)
Programming data into the card is possible when $\overline{PGM}$ signal is "LOW"

(7) WPOUT*

This card can be programmed only one time, but WPOUT is connected to GND line.

(8) CST*

Output line to indicate that the card is accessible or not.
This line is connected to VCC line.

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

This line is connected VCC or GND line.
Output line to indicate the card type.
VCC 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 VCC or GND line.

(10) VPP

Power supply voltage required to write(program) data to the card.
VPP: +12.5 or +12.75 V
Connected to VCC through a 10K ohm resister.

(11) VCC

Power source : + 5 V ±10%.

(12) GND

Ground

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

ABSOLUTE MAXIMUM RATINGS

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: VIN should be under 7.0 V.

CAPACITANCE (Ta = 25°C, f = 1 MHz)

Card	Item	Condition	Min	Typ	Max	Unit
BPC65HEC0	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
BPC129HEC0	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
BPC257HEC0	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
BPC513HEC0	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
BPC101HEC0	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
VCC	Supply at (WRITE)	5.75	6.0	6.25	V
VCC	Supply at (WRITE)	6.00	6.25	6.50	V
VPP	Supply at (READ)	4.5	5.00	5.5	V
VPP	Supply at (WRITE)	12.2	12.5	12.8	V
VPP	Supply at (WRITE)	12.5	12.75	13.0	V

DC ELECTRICAL CHARACTERISTICS

READ (Ta = 0 to 60°C, V_{CC} = 5 V ±0.25 V, V_{PP} = V_{CC})

WRITE (Ta = 20 to 30°C, V_{CC} = 6 V ±0.25 V, V_{PP} = 12.5 ±0.3 V)

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_{IH} or $\overline{OE}$ = V_{IL} V_{OUT} = 0 to V_{CC}	–10	—	10	µA
V_{OH}	High Output	2	I_{OH} = –400 uA	2.4	—	—	V
V_{OL}	Low Output	2	I_{OL} = 2.1 mA	—	—	0.4	V
I_{CC1}	Active Cur. (READ)	3	CE = V_{IH}				
			BPC065HEC0	—	—	100	mA
			BPC129HEC0	—	—	100	mA
			BPC257HEC0	—	—	100	mA
			BPC513HEC0	—	—	100	mA
			BPC101HEC0	—	—	100	mA
I_{CC2}	Active Cur. (WRITE)	3	CE = V_{IH}				
			BPC065HEC0	—	—	100	mA
			BPC129HEC0	—	—	100	mA
			BPC257HEC0	—	—	100	mA
			BPC513HEC0	—	—	100	mA
			BPC101HEC0	—	—	100	mA
I_{PP}	Program Cur. (WRITE)	3	CE = V_{IH}				
			BPC065HEC0	—	—	100	mA
			BPC129HEC0	—	—	100	mA
			BPC257HEC0	—	—	100	mA
			BPC513HEC0	—	—	100	mA
			BPC101HEC0	—	—	100	mA
I_{SB}	Standby Cur.	3	CE1, CE2 = V_{IL}				
			BPC065HEC0	—	—	1	mA
			BPC129HEC0	—	—	1	mA
			BPC257HEC0	—	—	1	mA
			BPC513HEC0	—	—	1	mA
			BPC101HEC0	—	—	1	mA

Notes:
1. A1 to A19, $\overline{OE}$, PGM
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	V_{PP} RESISTANCE	—	9	10	11	KΩ

OPERATING MODES

Model	Mode	CE	$\overline{OE}$	PGM	V_{PP}	V_{CC}	D0 – D15	CST
ALL MODELS	READ	V_{IH}	V_{IL}	V_{IH}	V1	V1	OUTPUT	HO
	DISABLE	V_{IH}	V_{IH}	V_{IH}	V1	V1	HZ	HO
	STANDBY	V_{IL}	*	*	V1	V1	HZ	HO
BPC065HEC0	PROGRAM	V_{IH}	V_{IH}	—	12.75 V	6.25 V	INPUT	HO
	PGRM INHIBIT	V_{IL}	V_{IH}	—	12.75 V	6.25 V	HZ	HO
	PGRM VERIFY	V_{IH}	V_{IL}	—	12.75 V	6.25 V	OUTPUT	HO
BPC129HEC0	PROGRAM	V_{IH}	12.5 V	—	—	6 V	INPUT	HO
	PGRM INHIBIT	V_{IH}	12.5 V	—	—	6 V	HZ	HO
	PGRM VERIFY	V_{IH}	V_{IL}	—	—	6 V	OUTPUT	HO
BPC257HEC0 BPC513HEC0	PROGRAM	V_{IH}	V_{IH}	V_{IL}	12.75 V	6.25 V	INPUT	HO
	PGRM INHIBIT	V_{IL}	V_{IH}	V_{IH}	12.75 V	6.25 V	HZ	HO
	PGRM VERIFY	V_{IH}	V_{IL}	V_{IH}	12.75 V	6.25 V	OUTPUT	HO
BPC101HEC0	PROGRAM	V_{IH}	V_{IH}	—	12.5 V	6.25 V	INPUT	HO
	PGRM INHIBIT	V_{IL}	V_{IH}	—	12.5 V	6.25 V	HZ	HO
	PGRM VERIFY	V_{IH}	V_{IL}	—	12.5 V	6.25 V	OUTPUT	HO

— : No input exists
* : Input is V_{IH} or V_{IL}
HZ : High Impedance
HO : Output V_{CC} level
V1 : 4.5 to 5.5 V

ELECTRIC SIGNATURE MODE

Model	Manufacturer Code (A1 = V_{IL})	Device Code (A1 = V_{IH})
	HEX	HEX
BPC065HEC0	98	C4
	10	64
BPC129HEC0	10	25
BPC257HEC0	98	07
	10	16
	10	86
BPC513HEC0	98	07
BPC101HEC0	98	8C

HOW TO READ THE IDENTIFIER CODE:

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

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

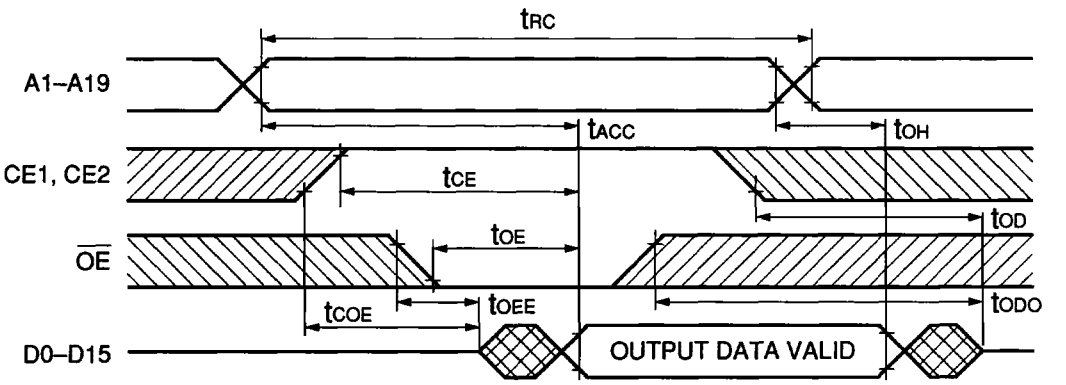
Symbol	Item	Min	Max	Unit
t_{RC}	Read Cycle	220	—	ns
t_{ACC}	Read Access	—	200*	ns
t_{CE}	$\overline{CE}$ Access	—	220	ns
t_{OE}	$\overline{OE}$ Access	—	90	ns
t_{COE}	$\overline{CE}$ to Enable	10	—	ns
t_{OEE}	$\overline{OE}$ to Enable	10	—	ns
t_{OD}	$\overline{CE}$ to Disable	—	80	ns
t_{ODO}	$\overline{OE}$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

* : 220 ns at EPC513HEC0
** : 20 ns at EPC513HEC0

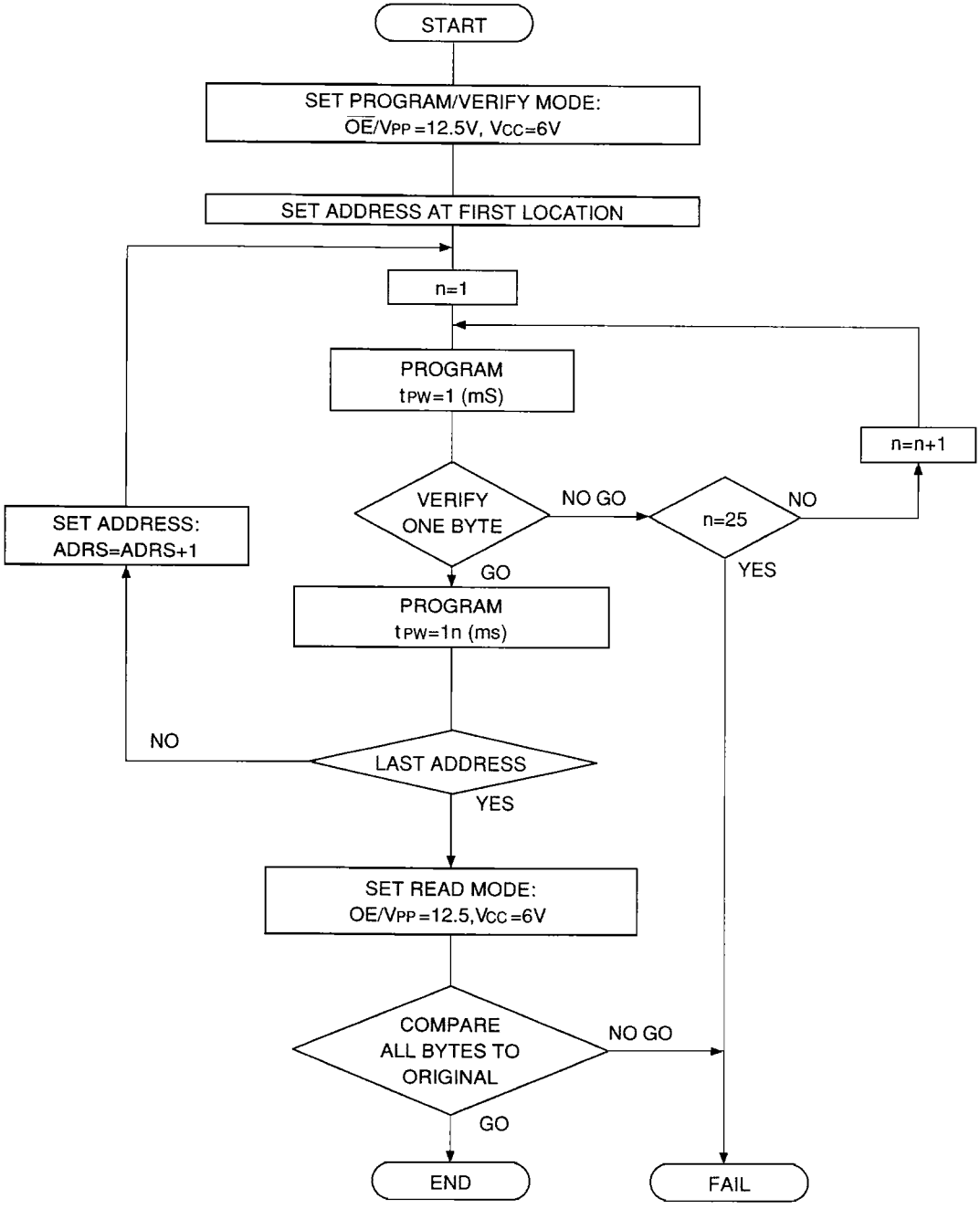
<< AC test conditions >>

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, 2.2 V Output: 0.6 V, 2.2 V
Input rise and fall	: 20 ns

READ TIMING



PROGRAMMING FLOW CHART
CARD TYPE : BPC129HEC0



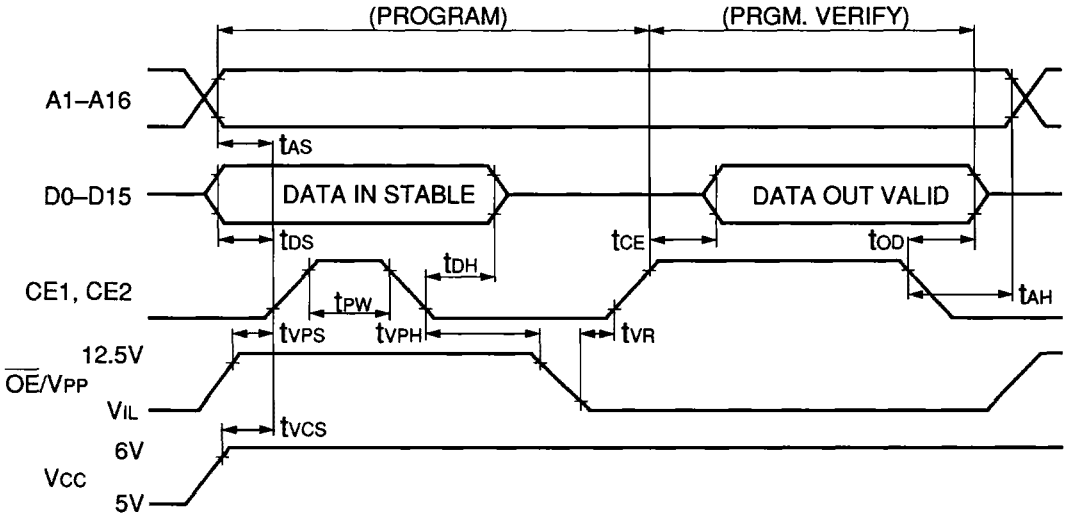
AC ELECTRICAL CHARACTERISTICS AT WRITE

CARD TYPE : BPC129IBC0

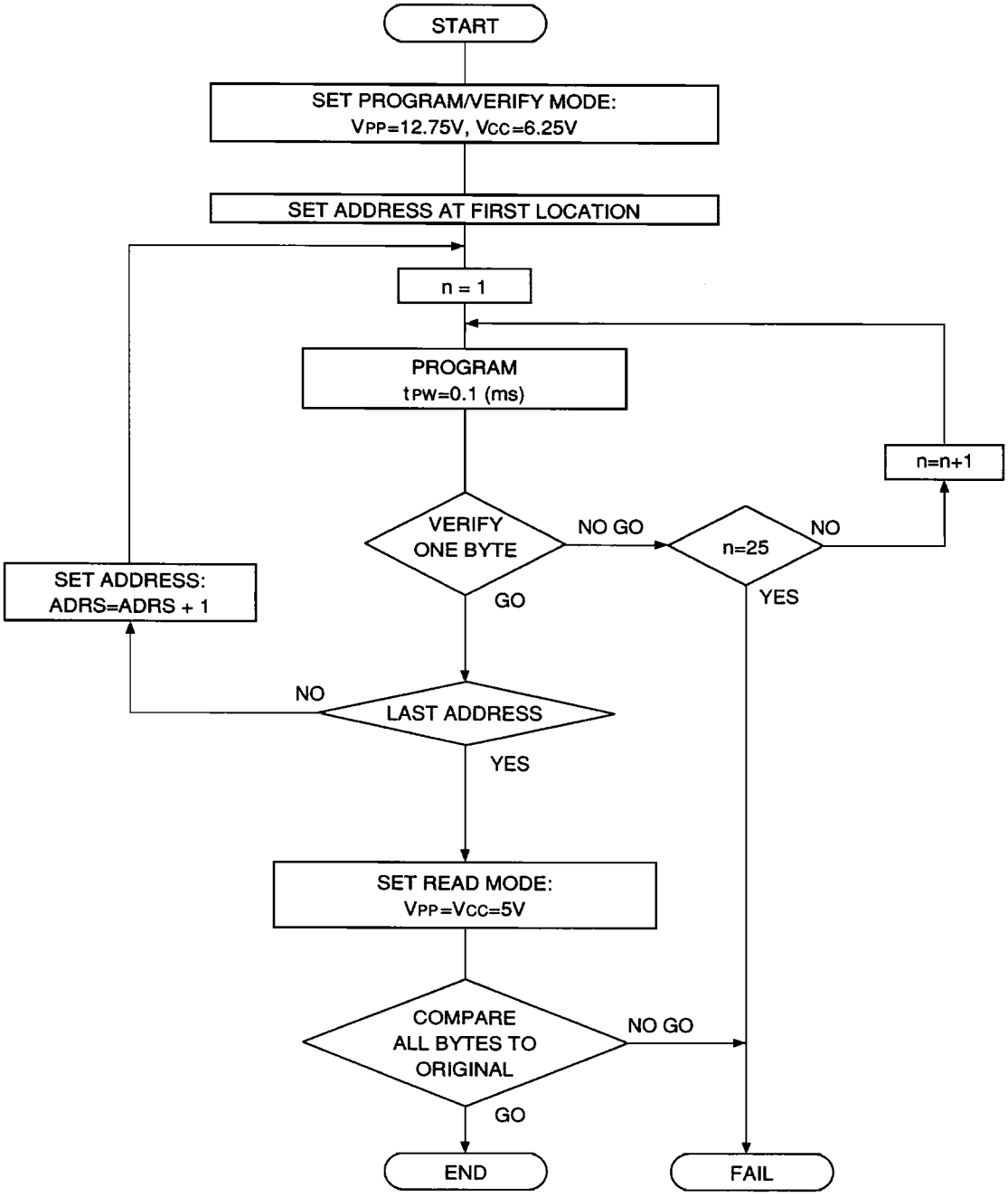
(V_{CC} = 6 ±0.25 V, V_{PP} = 12.5 ±0.3 V, Ta = 25°C)

Symbol	Item	Min	Typ	Max	Unit
t_{AS}	Address set up time	2	—	—	µs
t_{DS}	Data set up time	2	—	—	µs
t_{AH}	Address hold time	0	—	—	µs
t_{DH}	Data hold time	2	—	—	µs
t_{OD}	CE disable time	—	—	150	ns
t_{VPH}	V_{PP} hold time	2	—	—	µs
t_{VPS}	V_{PP} set up time	2	—	—	µs
t_{VCS}	V_{CC} set up time	2	—	—	µs
t_{PW}	Initial program pulse width	0.95	1	1.05	ms
t_{OPW}	Overprorram puls width	2.85	—	78.75	ms
t_{VR}	V_{PP} recovery time	2	—	—	µs
t_{CE}	CE to output enable	—	—	1	µs

TIMING DIAGRAM



PROGRAMMING FLOW CHART
CARD TYPE : BPC065HEC0, BPC267HEC0, BPC513HEC0



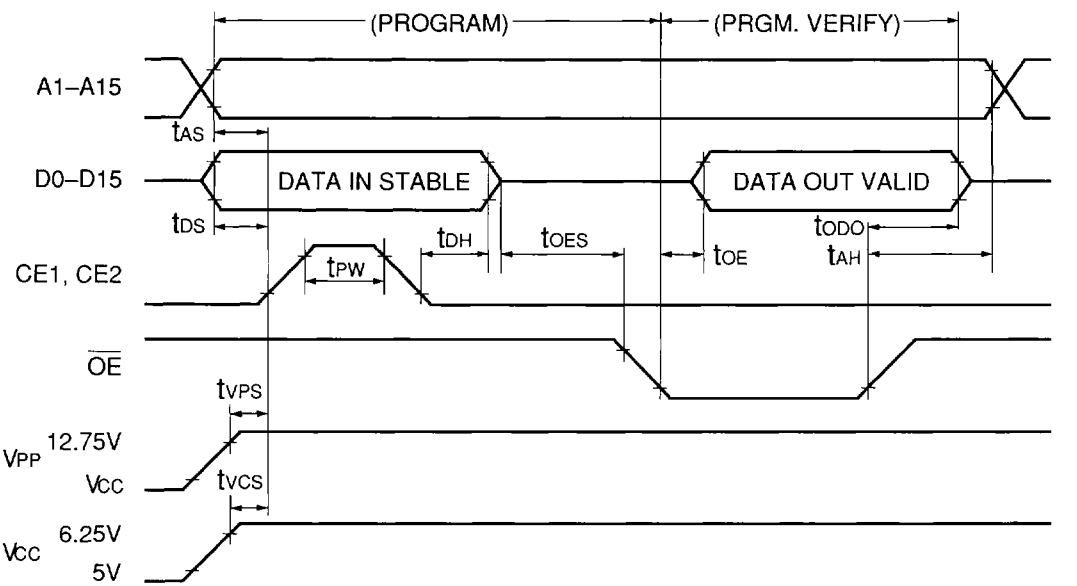
AC ELECTRICAL CHARACTERICSTICS AT WRITE

CARD TYPE : BPC065HEC0

(V_{CC} = 6.25 ±0.25 V, V_{PP} = 12.75 ±0.25 V, Ta = 25 ±5°C)

Symbol	Item	Min	Typ	Max	Unit
t_{AS}	Address set up time	2	—	—	µs
t_{OES}	$\overline{OE}$ set up time	2	—	—	µs
t_{DS}	Data set up time	2	—	—	µs
t_{AH}	Address hold time	2	—	—	µs
t_{DH}	Date hold time	2	—	—	µs
t_{VPS}	V_{PP} set up time	2	—	—	µs
t_{VCS}	V_{CC} set up time	2	—	—	µs
t_{PW}	Write pulse width	0.095	0.1	0.105	ms
t_{CES}	$\overline{CE}$ set up time	2	—	—	µs
t_{OE}	$\overline{OE}$ to output enable	—	—	100	ns
t_{ODO}	$\overline{OE}$ disable time	—	—	90	ns

TIMING DIAGRAM



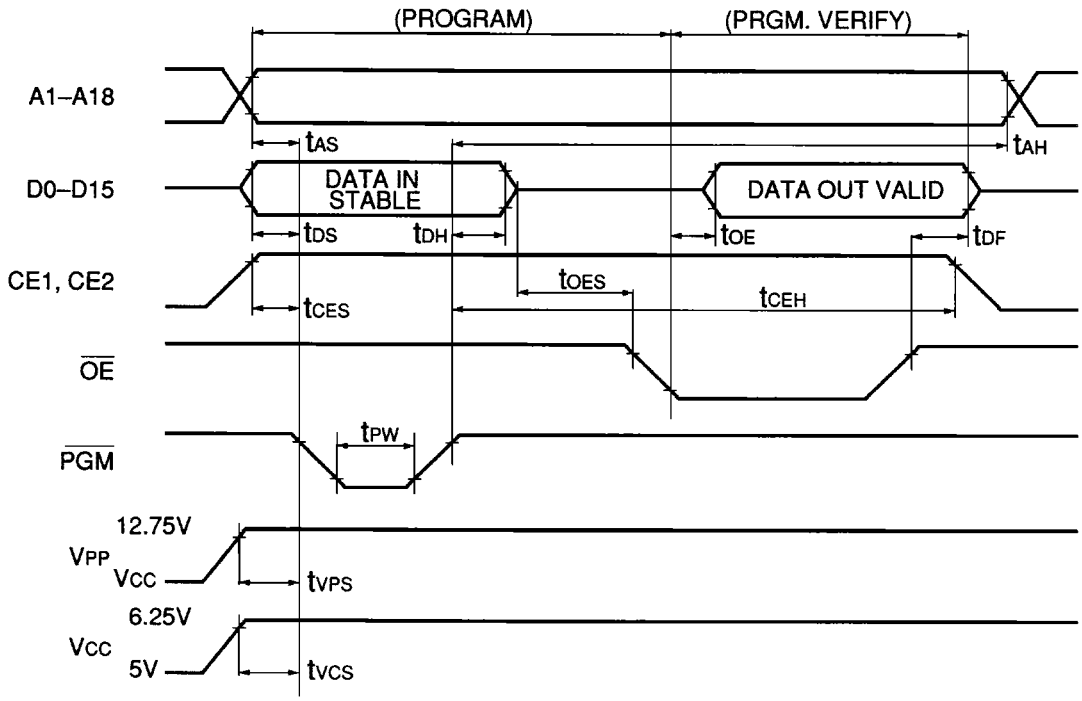
AC ELECTRICAL CHARACTERICSTICS AT WRITE

CARD TYPE : BPC257HEC0, BPC513HEC0

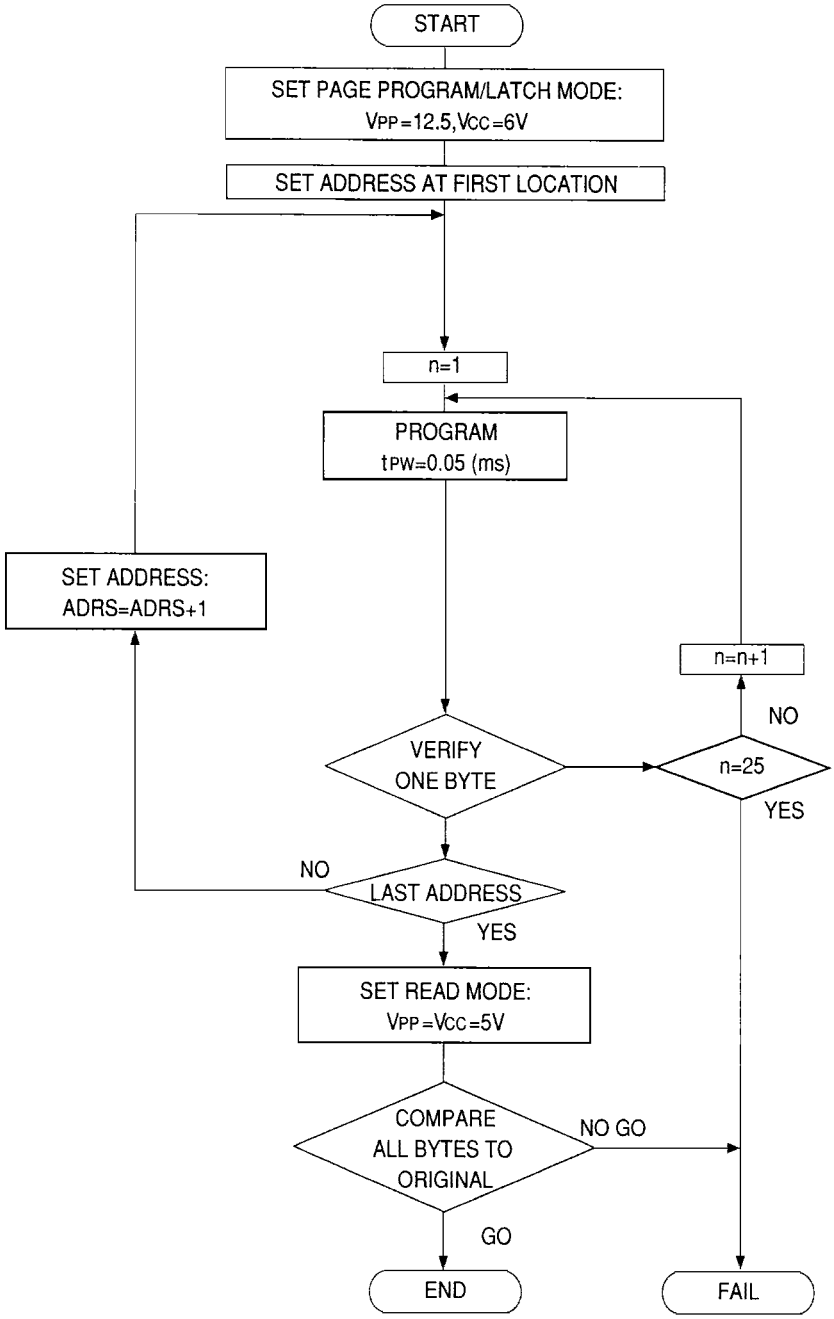
(V_{CC} = 6.25 ±0.25 V, V_{PP} = 12.75 ±0.25 V, Ta = 25 ±5°C)

Symbol	Item	Min	Typ	Max	Unit
t_{AS}	Address set up time	2	—	—	µs
t_{OES}	$\overline{OE}$ set up time	2	—	—	µs
t_{DS}	Data set up time	2	—	—	µs
t_{AH}	Address hold time	2	—	—	µs
t_{DH}	Date hold time	2	—	—	µs
t_{VPS}	V_{PP} set up time	2	—	—	µs
t_{VCS}	V_{CC} set up time	2	—	—	µs
t_{PW}	PGM pulse width	0.095	0.1	0.105	ms
t_{CES}	CE set up time	2	—	—	µs
t_{OE}	$\overline{OE}$ to output enable	—	—	100	ns
t_{ODO}	Output disable	—	—	90	ns
t_{CEH}	CE hold time	2	—	—	µs

TIMING DIAGRAM



PROGRAMMING FLOW CHART
CARD TYPE : BPC101HEC0



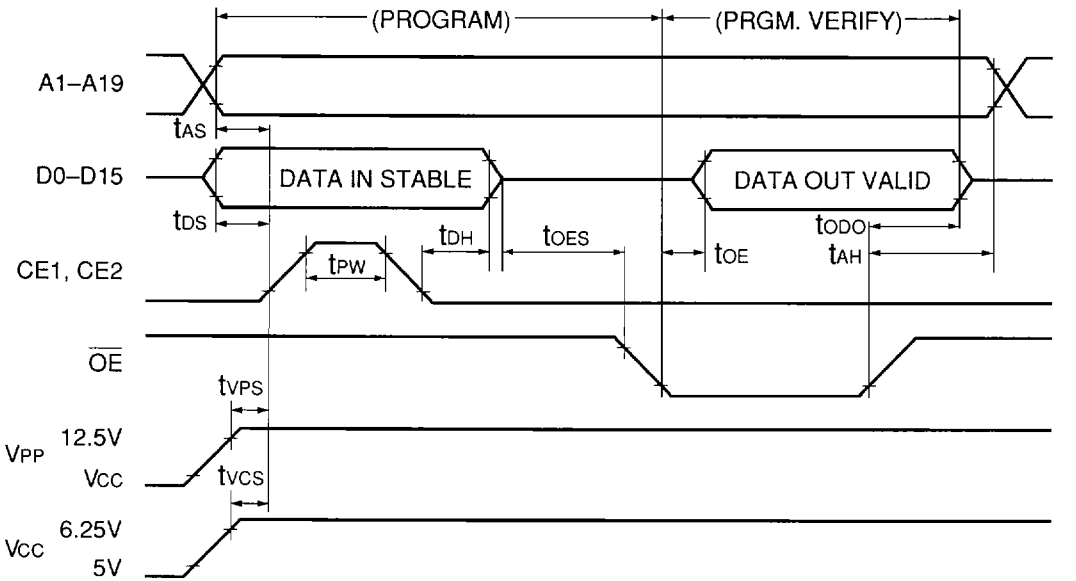
AC ELECTRICAL CHARACTERICSTICS AT WRITE

CARD TYPE : BPC101HEC0

(V_{CC} = 6.25 ±0.25 V, V_{PP} = 12.5 ±0.3 V, Ta = 25 ±5°C)

Symbol	Item	Min	Typ	Max	Unit
t_{AS}	Address set up time	2	—	—	µs
t_{OES}	$\overline{OE}$ set up time	2	—	—	µs
t_{DS}	Data set up time	2	—	—	µs
t_{AH}	Address hold time	2	—	—	µs
t_{DH}	Date hold time	2	—	—	µs
t_{VPS}	V_{PP} set up time	2	—	—	µs
t_{VCS}	V_{CC} set up time	2	—	—	µs
t_{PW}	Write pulse width	45	50	55	µs
t_{OE}	$\overline{OE}$ to output enable	—	—	100	ns
t_{ODO}	$\overline{OE}$ disable time	—	—	90	ns

TIMING DIAGRAM



WRITE CHARACTERISTIC NOTES

<< 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, 2.2 V Output: 0.6 V, 2.2 V
Input rise & fall time	:	20 ns

POWER SUPPLY RATINGS

V_{CC} = 6.0 ±0.25 V
V_{CC} = 6.25 ±0.25 V
V_{PP} = 12.5 ±0.3 V
V_{PP} = 12.75 ±0.25 V

PROGRAMMING REMARKS

(1) The voltage applied to V_{PP} must be later than or at the same time as V_{CC} is applied. Also, V_{PP} should be removed earlier than or at the same time as V_{CC}.

(2) The card should never be inserted or extracted when V_{PP} = 12.5 V (or 12.75 V) is applied, or the card could be damaged.

(3) The voltage level applied to V_{PP} should never be more than maximum ratings.

(4) The voltage level at V_{PP} should never be changed when CE = V_{IH}.

PROGRAMMING AND PROGRAMMED DATA

This card isn't inspected about programming and programmed data, so the card isn't guaranteed against programming and programmed data.

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 : BPC065, BPC129, BPC257, BPC513, BPC101
*A16 : BPC129, BPC257, BPC513, BPC101
*A17 : BPC257, BPC513, BPC101
*A18 : BPC513, BPC101
*A19 : BPC101
(Unused address lines should be N/C.)
** : BPC065 & BPC101 ($\overline{OE} \rightarrow \overline{OE}$, $\overline{PGM} \rightarrow$ N/C, $V_{PP} \rightarrow V_{PP}$)
BPC129 ($\overline{OE} \rightarrow \overline{OE}/V_{PP}$, $\overline{PGM} \rightarrow$ N/C, $V_{PP} \rightarrow$ N/C)
BPC257 & BPC513 ($\overline{OE} \rightarrow \overline{OE}$, $\overline{PGM} \rightarrow \overline{PGM}$, $V_{PP} \rightarrow V_{PP}$)