

UNPROGRAMMED ONE TIME PROGRAMMABLE ROM

1. OUTLINE

The UNPROGRAMMED OTP ROM IC MEMORY CARD series is made up of One Time Programmable ROM chips. Memory capacity is from 32K Bytes to 1M Bytes. IE series is 8 bit wide data bus.

This card is only used for customer's development.

2. VARIATION

Part Number	Memory Size	Description
BPC032IEC0	32K Byte	32K × 8 bit CMOS UNPROGRAMMED OTP ROM CARD
BPC064IEC0	64K Byte	64K × 8 bit CMOS UNPROGRAMMED OTP ROM CARD
BPC128IEC0	128K Byte	128K × 8 bit CMOS UNPROGRAMMED OTP ROM CARD
BPC256IEC0	256K Byte	256K × 8 bit CMOS UNPROGRAMMED OTP ROM CARD
BPC512IEC0	512K Byte	512K × 8 bit CMOS UNPROGRAMMED OTP ROM CARD
BPC100IEC0	1M Byte	1M × 8 bit CMOS UNPROGRAMMED OTP ROM CARD

3. NOTIFICATION ABOUT 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.

4. SIZE

- (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) Card Type : 40 pin Card Edge

5. FEATURES

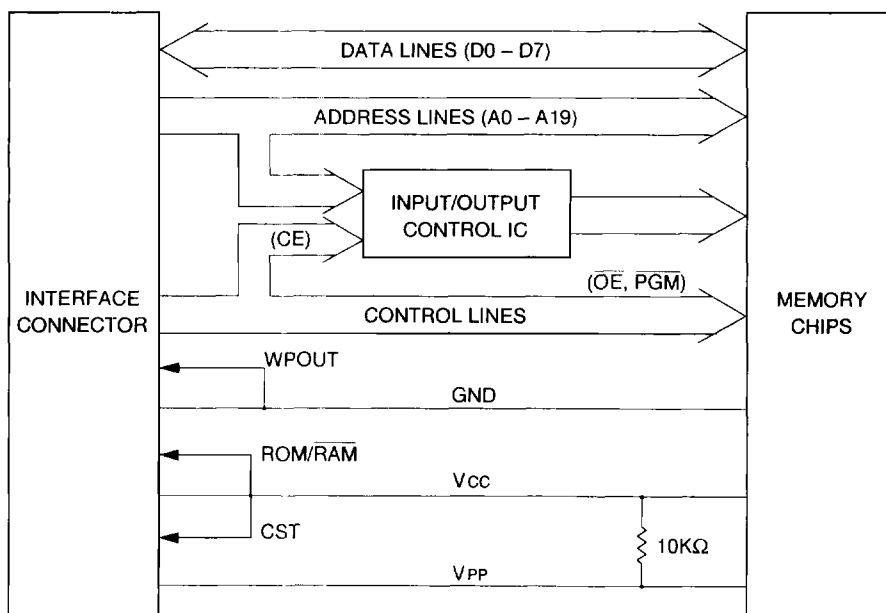
(1) Shutter Mechanism

This mechanism protects the terminals from dirt, static electricity, hand contact, etc. The shutter is opened by tabs on the connector during insertion, and is 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 unit, the connector, and the card from potential damage.

6. BLOCK DIAGRAM



(1) D0 to D7

Data input/output, 8 bit wide

(2) A0 to A19

Address inputs

Unused address lines should be “no connect”.

(3) CE

Card Enable input (Active HIGH)

Memory card operates when CE signal is “HIGH”

(4) \overline{OE}

Output Enable input (Active LOW)

Memory card output data when \overline{OE} is “LOW”

(5) \overline{PGM}

Program Enable input (Active LOW)

Programming data into the card is possible when \overline{PGM} signal is “LOW”

(6) WPOUT*

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

(7) CST*

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

This line is connected to VCC line.

(8) ROM/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

GND level indicates RAM : SRAM (RBC), EEPROM (FEC) (EEC),
FLASH MEMORY

Do never use as Card VCC or GND line.

(9) VPP

Power supply voltage required to program data to the card.

VPP: +12.5 or +12.75 V

Connected to VCC through a 10K ohm resister.

(10) VCC

Power source : +5 V \pm 10%.

(11) GND

Ground

Note: See the recommended interface circuit.

* Do never use as VCC or GND line.

7. ELECTRICAL CHARACTERISTICS

7-1. ABSOLUTE MAXIMUM RATINGS

Symbol	Description	Maximum Rating	Unit
VCC	VCC Power supply	-0.5 to 7.0	V
VPP	VPP power supply	-0.5 to 14.0	V
VIN	Input Voltage (1)	-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 (2)	0 to 95	%
PD	Power dissipation	1	W

Note: (1) VIN should be under 7.0 V.

(2) No dew condition

7-2. CAPACITANCE (Ta = 25°C, f = 1 MHz)

Symbol	Variation	Item	Condition	Min	Typ	Max	Unit
C1	BPC032IEC0	A0 to A14, CE, OE	VIN = 0 V	—	14	20	pF
	BPC064IEC0	A0 to A15, CE		—	14	20	pF
	BPC128IEC0	A0 to A16, CE, OE, PGM		—	14	20	pF
	BPC256IEC0	A0 to A16, OE, PGM A17, CE		—	14	20	pF
	BPC512IEC0	A0 to A16, OE, PGM A17, A18, CE		—	24	32	pF
				—	14	20	pF
BPC100IEC0	A0 to A18, OE A19, CE	—	14	20	pF		
C2	BPC032IEC0	D0 to D7	VIN/VOUT = 0 V	—	10	14	pF
	BPC064IEC0						
	BPC128IEC0						
	BPC256IEC0			—	20	28	pF
	BPC512IEC0			—	40	56	pF
	BPC100IEC0			—	20	28	pF

7-3. DC RECOMMENDED OPERATING CONDITIONS

Symbol	Description	Min	Typ	Max	Unit
VCC	Supply voltage (READ)	4.5	5.0	5.5	V
VCC	Supply voltage (PROGRAM) (1)	5.75	6.0	6.25	V
VCC	Supply voltage (PROGRAM) (2)	6.00	6.25	6.50	V
VPP	Program voltage (READ)	4.75	5.0	5.25	V
VPP	Program voltage (PROGRAM) (3)	12.2	12.5	12.8	V
VPP	Program voltage (PROGRAM) (4)	12.5	12.75	13.0	V
V _{IH}	High level input voltage	$V_{CC} \times 0.8$	—	$V_{CC} + 0.3$	V
V _{IL}	Low level input voltage	-0.3	—	$V_{CC} \times 0.1$	V

- Note: (1) BPC064
 (2) BPC032, BPC128, BPC256, BPC512, BPC100
 (3) BPC064, BPC100
 (4) BPC032, BPC128, BPC256, BPC512

7-4. DC ELECTRICAL CHARACTERISTICS**(Ta = 0 to 60°C, VCC = 5 V ±10%)**

Symbol	Description	Note	Condition	Min	Typ	Max	Unit
VOH	High level output voltage	1	IOH = -400 μ A	2.4	—	—	V
VOL	Low level output voltage	1	IOL = -2.1 mA	—	—	0.4	V
II	Input leakage current	2	VIN = 0 V or VCC	-10	—	10	μ A
ILO	Output leakage current	1	CE = VIL or OE = VIH, VOUT = 0 V or VCC	-10	—	10	μ A
I _{ACT}	Active current	3	CE = VCC -0.4 V OTHER INPUTS = 0.4 V/VCC -0.4 V I _{OUT} = 0 mA BPC032IEC0 BPC064IEC0 BPC128IEC0 BPC256IEC0 BPC512IEC0 BPC100IEC0	—	—	50	mA
I _{STB}	Standby current	3	CE = 0.4 V OTHER INPUTS = 0.4 V/VCC -0.4 V BPC032IEC0 BPC064IEC0 BPC128IEC0 BPC256IEC0 BPC512IEC0 BPC100IEC0	—	—	1	mA

- Notes:
1. D0 to D7
 2. A0 to A19, $\overline{\text{OE}}$, CE, $\overline{\text{PGM}}$
 3. D0 to D7, CST = No Load

7-5. VPP RESISTANCE (Ta = 0 to 60°C)

Symbol	Description	Min	Typ	Max	Unit
RVPP	VPP RESISTANCE	9	10	11	KΩ

7-6. OPERATING MODES

Variation	Mode	CE	OE	PGM	VPP	VCC	D0 to D7	CST
ALL CARDS	READ	H	L	H	5 V	5 V	DATA OUTPUT	HO
	DISABLE	H	H	H	5 V	5 V	HZ	HO
	STANDBY	L	*	*	5 V	5 V	HZ	HO
BPC032IEC0	PROGRAM	H	H	—	12.75 V	6.25 V	DATA INPUT	HO
	PGRM INHIBIT	L	H	—	12.75 V	6.25 V	HZ	HO
	PGRM VERIFY	L	L	—	12.75 V	6.25 V	DATA OUTPUT	HO
BPC064IEC0	PROGRAM	H	12.5	—	—	6 V	DATA INPUT	HO
	PGRM INHIBIT	L	12.5	—	—	6 V	HZ	HO
	PGRM VERIFY	H	L	—	—	6 V	DATA OUTPUT	HO
BPC128IEC0	PROGRAM	H	H	L	12.75 V	6.25 V	DATA INPUT	HO
BPC256IEC0	PGRM INHIBIT	L	H	H	12.75 V	6.25 V	HZ	HO
BPC512IEC0	PGRM VERIFY	H	L	H	12.75 V	6.25 V	DATA OUTPUT	HO
BPC100IEC0	PROGRAM	H	H	—	12.5 V	6.25 V	DATA INPUT	HO
	PGRM INHIBIT	L	H	—	12.5 V	6.25 V	HZ	HO

— : No input exists

* : Does not matter what input is set

HZ : High Impedance

HO : Output VCC level

7-7. JEDEC ELECTRIC SIGNATURE MODE

Variation	Manufacturer Code (A0 = V _{IL})	Device Code (A0 = V _{IH})
	HEX	HEX
BPC032IEC0	98	C4
	10	64
BPC064IEC0	10	25
BPC128IEC0	98	07
	10	86
	10	16
BPC256IEC0	98	07
	10	86
BPC512IEC0	98	07
BPC100IEC0	98	C8

HOW TO READ THE IDENTIFIER CODE:

- (1) A1 to A8 & A10 to A19 = V_{IL} (-0.3 to 0.6 V)
- (2) A9 = 11.5 V to 12.5 V
- (3) A0 = V_{IL} : Manufacturer code is output to D0 to D7
A0 = V_{IH} : Device code is output to D0 to D7
- (4) CE & $\overline{\text{PGM}}$ = V_{IH}, $\overline{\text{OE}}$ = V_{IL}
- (5) V_{CC} = V_{PP} = 5 V ±10%

7-8. AC ELECTRICAL CHARACTERISTICS AT READ (ALL CARD)
 (Ta = 0 to 60°C, VCC = 5 V ±10%)

Symbol	Description	Min	Max	Unit
t _{RC}	Read cycle time	220	—	ns
t _{ACC}	Address access time	—	200*	ns
t _{CE}	CE access time	—	220	ns
t _{OE}	OE access time	—	90	ns
t _{COE}	CE to enable time	10	—	ns
t _{OEE}	OE to enable time	10	—	ns
t _{OD}	CE to disable time	—	80	ns
t _{ODO}	OE to disable time	—	80	ns
t _{OH}	DATA hold time	0**	—	ns

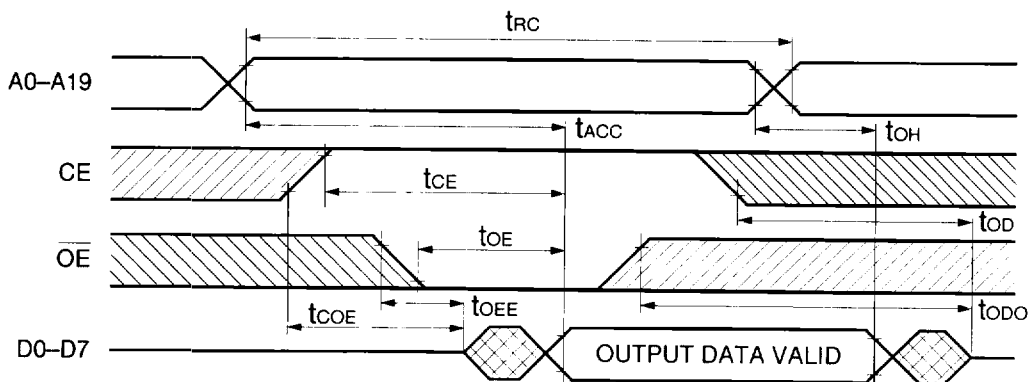
Notes: * 220 ns at BPC256IEC0, BPC512IEC0, BPC100IEC0

** 20 ns at BPC256IEC0, BPC512IEC0, BPC100IEC0

<< AC test conditions >>

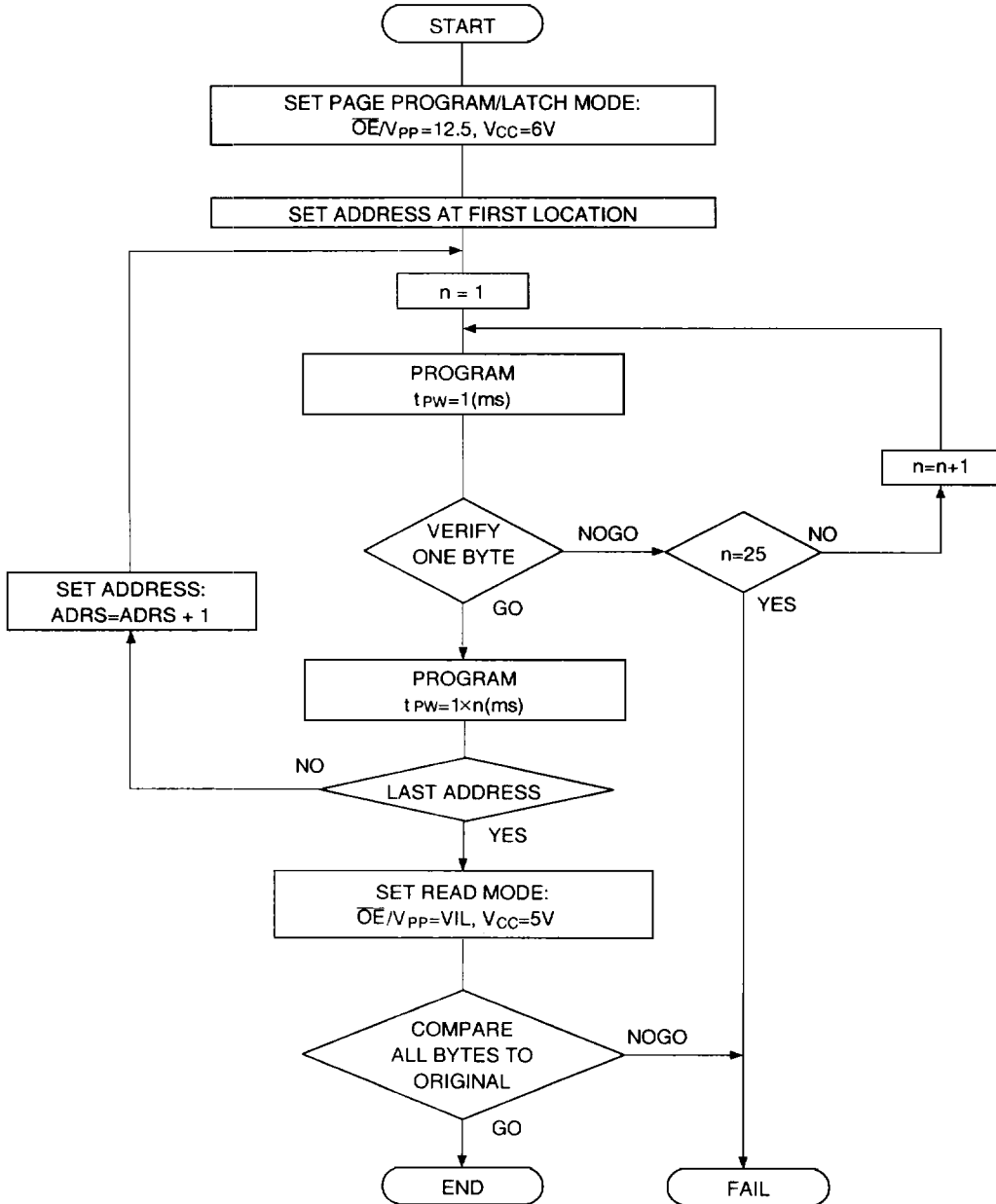
- Output load : 1 TTL gate + 100 pF (include jig)
- Input pulse rise & fall time : 20 ns
- Input pulse level : 0.4 V, 2.4 V
- Timing measurement comparison level : Input : 0.6 V and 2.2 V
 Output : 0.6 V and 2.2 V

READ TIMING



7-9. PROGRAMMING FLOW CHART

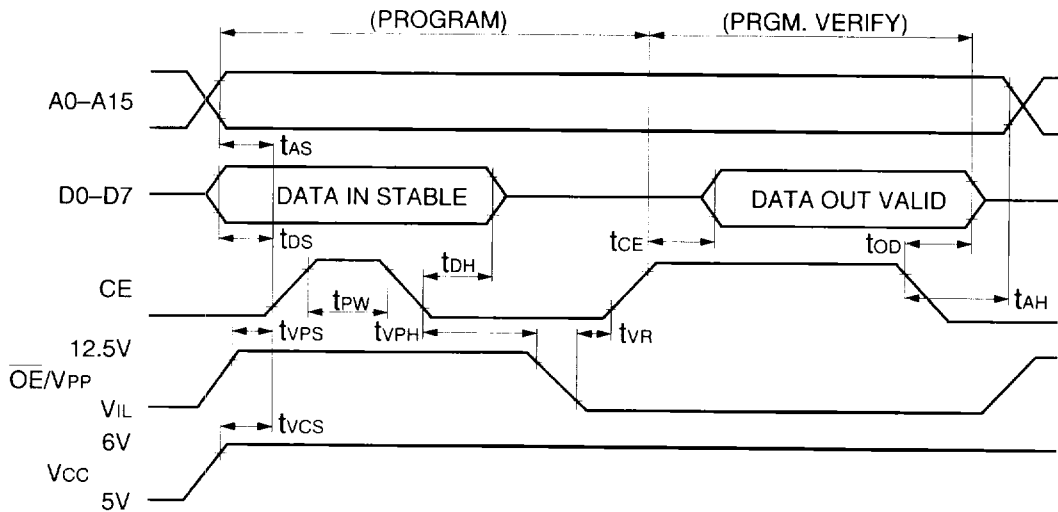
CARD TYPE: BPC064IEC0



7-10. AC ELECTRICAL CHARACTERISTICS AT PROGRAMMING
CARD TYPE: BPC064IEC0
(VCC = 6 ±0.25 V, VPP = 12.5 ±0.3 V, Ta = 25 ±5°C)

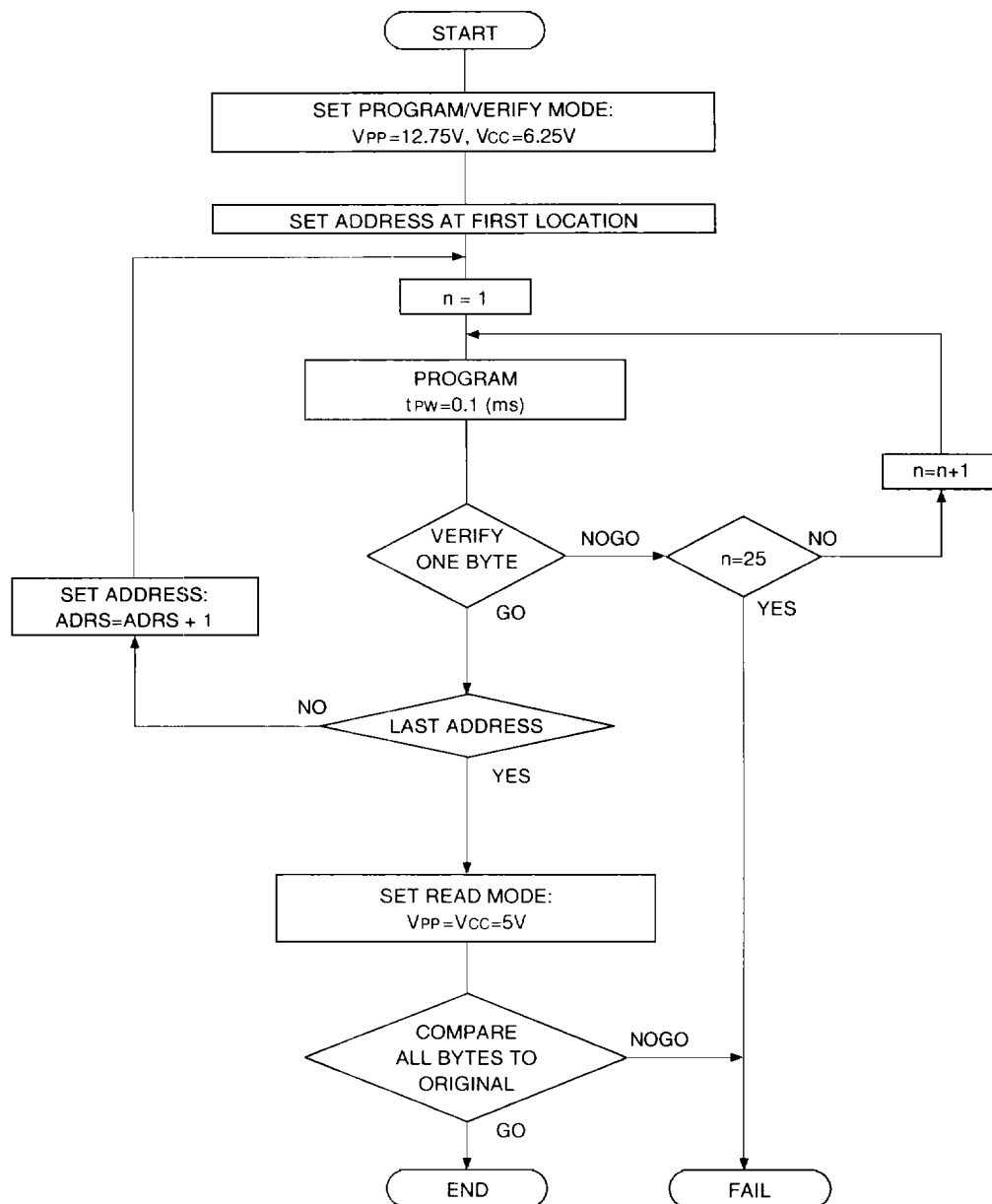
Symbol	Item	Min	Typ	Max	Unit
tAS	Address set up time	2	—	—	μs
tDS	Data set up time	2	—	—	μs
tAH	Address hold time	0	—	—	μs
tDH	Date hold time	2	—	—	μs
tOD	CE to disable time	—	—	150	μs
tVPH	VPP hold time	2	—	—	μs
tVPS	VPP set up time	2	—	—	μs
tVCS	VCC set up time	2	—	—	μs
tpw	Write pulse width	0.95	1.0	1.05	ms
tOPW	CE pulse/over program	2.85	—	78.75	ms
tVR	VPP recovery time	2	—	—	μs
tCE	CE to output enable	—	—	1	μs

TIMING DIAGRAM



7-11. PROGRAMMING FLOW CHART

**CARD TYPE: BPC032IEC0, BPC128IEC0
BPC256IEC0, BPC512IEC0**

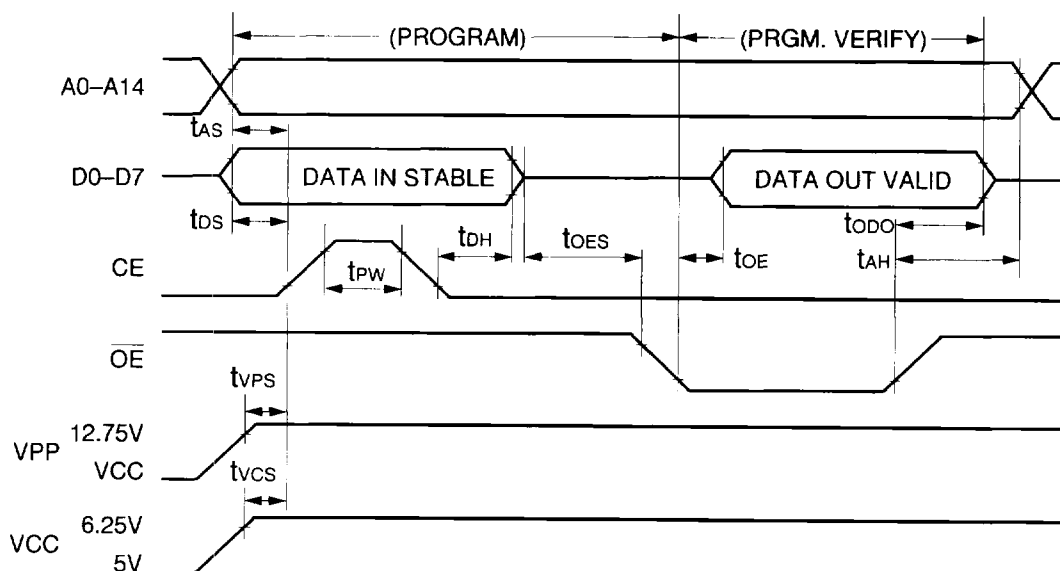


**7-12. AC ELECTRICAL CHARACTERISTICS AT PROGRAMMING
CARD TYPE BPC032IEC0**

($V_{CC} = 6.25 \pm 0.25 \text{ V}$, $V_{PP} = 12.75 \pm 0.25 \text{ V}$, $T_a = 25 \pm 5^\circ\text{C}$)

Symbol	Item	Min	Typ	Max	Unit
t_{AS}	Address set up time	2	—	—	μs
t_{OES}	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_{OE}	OE to output enable	—	—	100	μs
t_{ODO}	OE disable time	—	—	90	μs

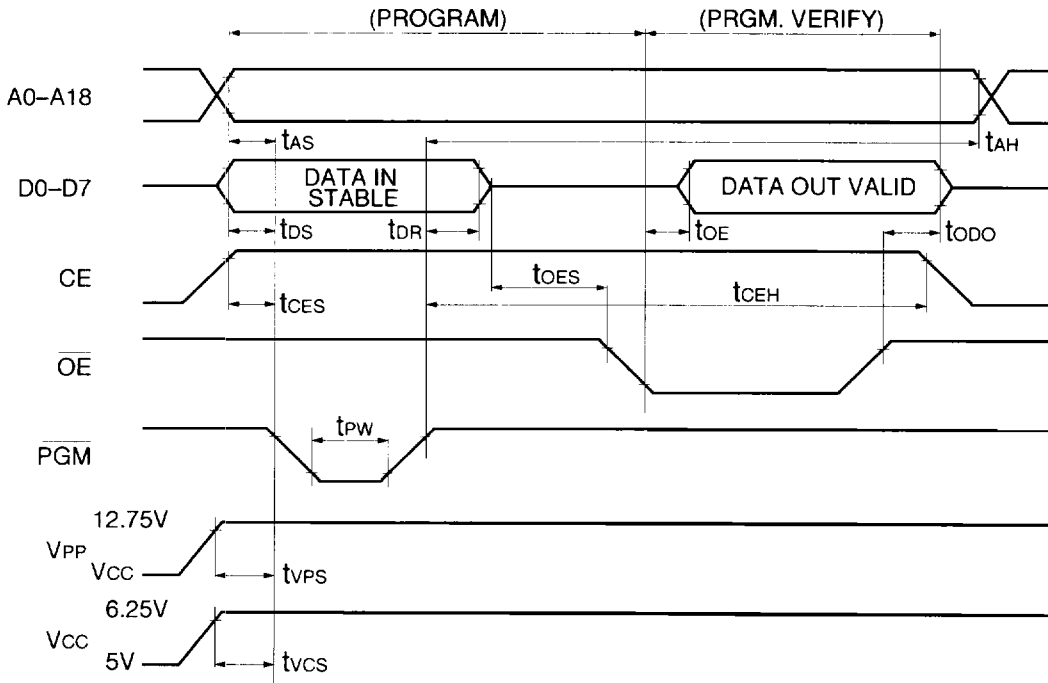
TIMING DIAGRAM



**7-13. AC ELECTRICAL CHARACTERISTICS AT PROGRAMMING
CARD TYPE BPC128IEC0, BPC256IEC0, BPC512IEC0
(VCC = 6.25 ±0.25 V, VPP = 12.75 ±0.25 V, Ta = 25 ±5°C)**

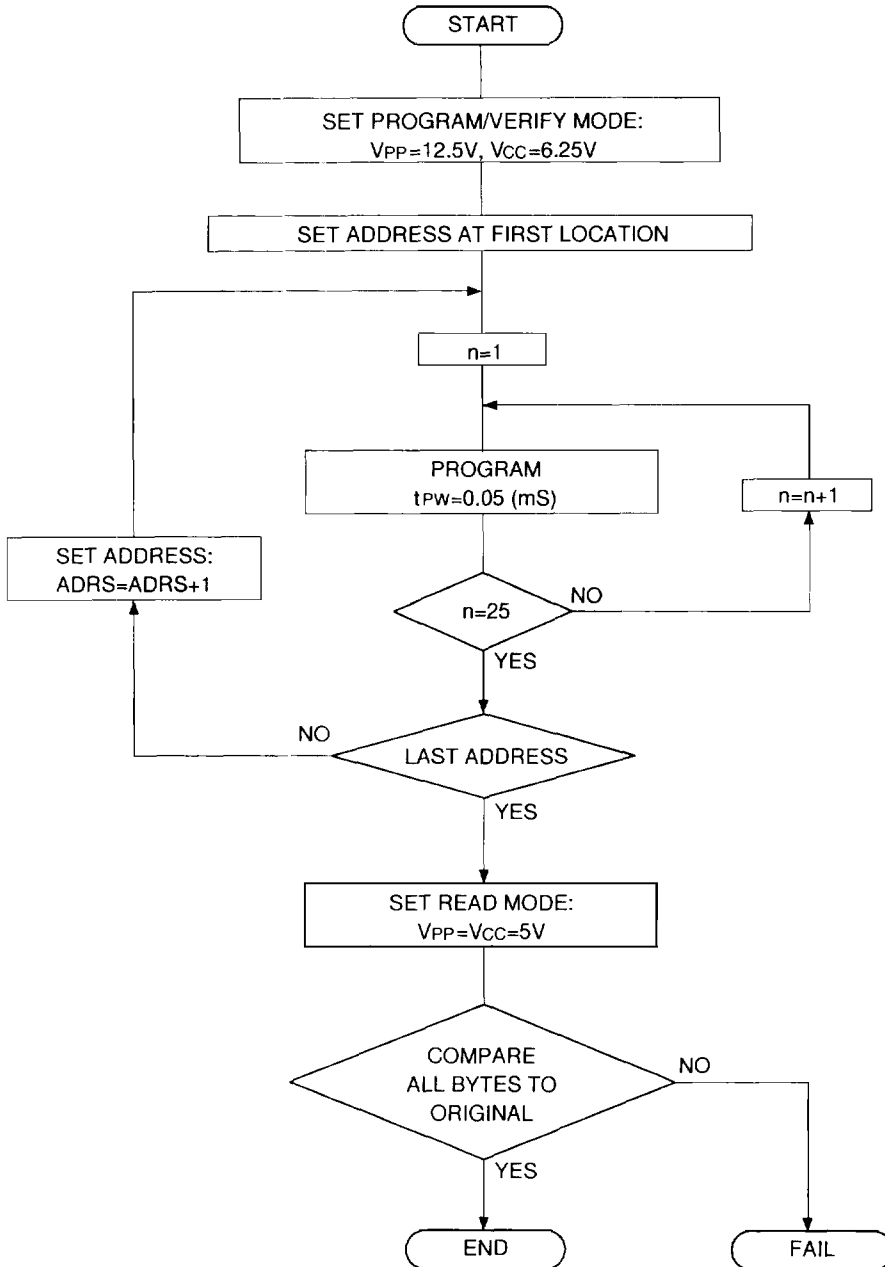
Symbol	Item	Min	Typ	Max	Unit
tAS	Address set up time	2	—	—	μs
toES	OE set up time	2	—	—	μs
tDS	Data set up time	2	—	—	μs
tAH	Address hold time	2	—	—	μs
tDH	Date hold time	2	—	—	μs
tvPS	VPP set up time	2	—	—	μs
tvCS	VCC set up time	2	—	—	μs
tpW	PGM pulse width	0.095	0.1	0.105	ms
tCES	CE set up time	2	—	—	μs
toE	OE to output enable	—	—	100	ns
tODO	Output disable	—	—	90	ns
tCEH	CE hold time	2	—	—	μs

TIMING DIAGRAM



7-14. PROGRAMMING FLOW CHART

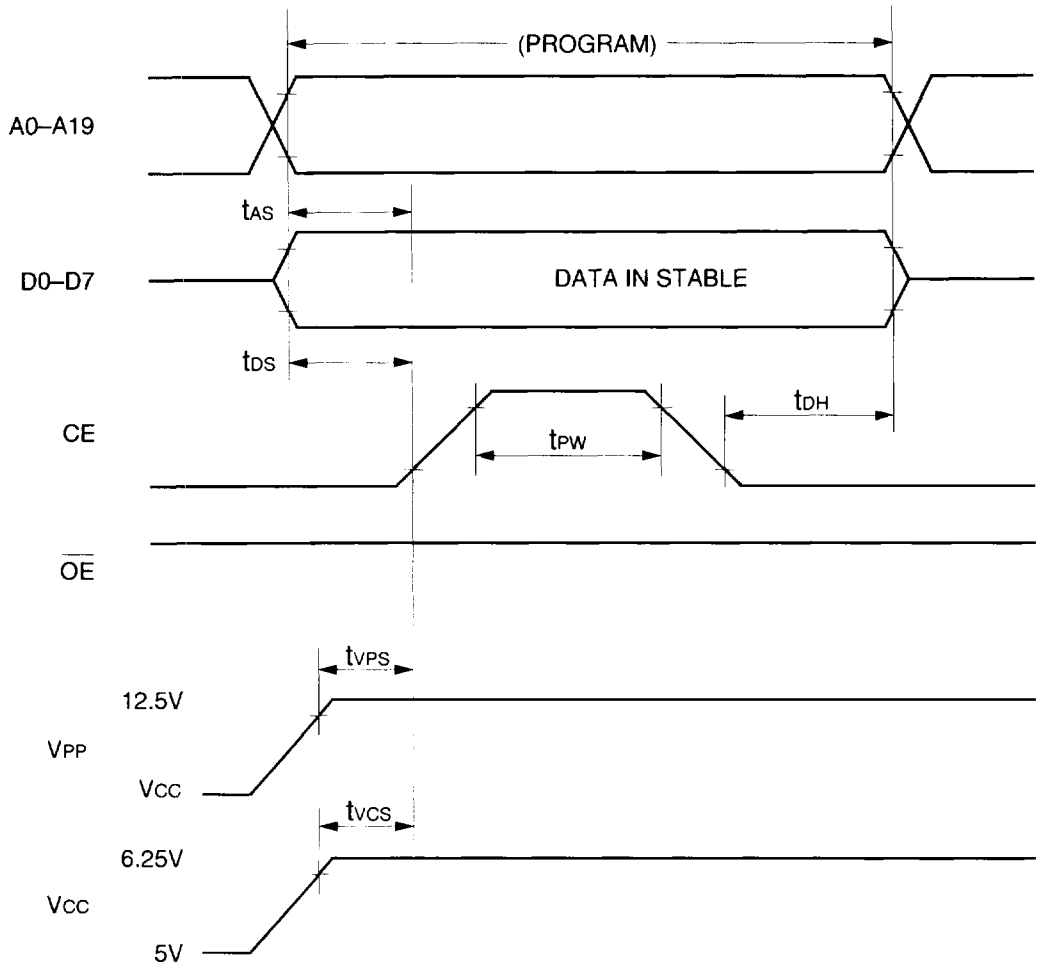
CARD TYPE: BPC100IEC0



**7-15. AC ELECTRICAL CHARACTERISTICS AT PROGRAMMING
CARD TYPE BPC100IEC0****(VCC = 6.25 ±0.25 V, VPP = 12.5 ±0.3 V, Ta = 25 ±5°C)**

Symbol	Item	Min	Typ	Max	Unit
tAS	Address set up time	2	—	—	μs
tDS	Data set up time	2	—	—	μs
tDH	Data hold time	2	—	—	μs
tVPS	VPP set up time	2	—	—	μs
tVCS	VCC set up time	2	—	—	μs
tPW	Write pulse width	45	50	55	μs

TIMING DIAGRAM (7-15. Con't)



7-16. PROGRAMMING REMARKS

- 1) The voltage applied to VPP must be later than or at the same time as VCC is applied. Also, VPP should be removed earlier than or at the same time as VCC.
- 2) The card should never be inserted or extracted when VPP = 12.5 V (or 12.75 V) is applied, or the card could be damaged.
- 3) The voltage level applied to VPP should never be more than maximum ratings.
- 4) The voltage level at VPP should never be changed when CE = VIH.

8. PIN ASSIGNMENT

Pin #	Name	Pin #	Name
1	VCC	21	CE
2	VPP***	22	OE***
3	A0	23	D0
4	A1	24	D1
5	A2	25	D2
6	A3	26	D3
7	A4	27	D4
8	A5	28	D5
9	A6	29	D6
10	A7	30	D7
11	A8	31	A17*
12	A9	32	A18*
13	A10	33	A19*
14	A11	34	N/C
15	A12	35	N/C
16	A13	36	N/C
17	A14*	37	WPOUT**
18	A15*	38	CST**
19	A16*	39	ROM/RAM**
20	PGM***	40	GND

Notes: *A14 : 32KB, 64KB, 128KB, 256KB, 512KB, 1MB

*A15 : 64KB, 128KB, 256KB, 512KB, 1MB

*A16 : 128KB, 256KB, 512KB, 1MB

*A17 : 256KB, 512KB, 1MB

*A18 : 512KB, 1MB

*A19 : 1MB

Unused address lines should be N/C (No Connect).

** : Output signal line. (Connect to VCC or GND inside the card)
Do never use as VCC or GND line.

*** : BPC032 & BPC100 (VPP—>VPP, PGM—>N/C, OE—>OE)
BPC064 (VPP—>N/C, PGM—>N/C, OE—>OE/VPP)
BPC128, BPC256 & BPC512 (VPP—>VPP, PGM—>PGM, OE—>OE)