SERIES 24 AND 28
STANDARD AND LOW POWER PROGRAMMABLE READ-ONLY MEMORIES

SEPTEMBER 1979—REVISED AUGUST 1984

- **Expanded Family of Standard and Low Power PROMs**

- **Titanium-Tungsten (Ti-W) Fuse Links for Reliable Low-Voltage Full-Family-Compatible Programming**

- **Full Decoding and Fast Chip Select Simplify System Design**

- **P-N-P Inputs for Reduced Loading On System Buffers/Drivers**

- **Each PROM Supplied With a High Logic Level Stored at Each Bit Location**

- **Applications Include:**
  Microprogramming/Firmware Loaders
  Code Converters/Character Generators
  Translators/Emulators
  Address Mapping/Look-Up Tables

description

The 24 and 28 Series of monolithic TTL programmable read-only memories (PROMs) feature an expanded selection of standard and low-power PROMs. This expanded PROM family provides the system designer with considerable flexibility in upgrading existing designs or optimizing new designs. Featuring proven titanium-tungsten (Ti-W) fuse links with low-current MOS-compatible p-n-p inputs, all family members utilize a common programming technique designed to program each link with a 20-microsecond pulse.

The 4096-bit and 8192-bit PROMs are offered in a wide variety of packages ranging from 18-pin 300 mil-wide thru 24 pin 600 mil-wide. The 16,384-bit PROMs provide twice the bit density of the 8192-bit PROMs and are provided in a 24 pin 600 mil-wide package.

All PROMs are supplied with a logic-high output level stored at each bit location. The programming procedure will produce open-circuits in the Ti-W metal links, which reverses the stored logic level at the selected location. The procedure is irreversible; once altered, the output for that bit location is permanently programmed. Outputs that have never been altered may later be programmed to supply the opposite output level. Operation of the unit within the recommended operating conditions will not alter the memory content.

Active level(s) at the chip-select input(s) (S or $\overline{S}$) enables all of the outputs. An inactive level at any chip-select input causes all outputs to be in the three-state, or off condition.

standard PROMs

The standard PROM members of Series 24 and 28 offer high performance for applications which require the uncompromised speed of Schottky technology. The fast chip-select access times allow additional decoding delays to occur without degrading speed performance.

TYPE NUMBER	PACKAGE† AND TEMPERATURE RANGE DESIGNATORS	OUTPUT CONFIGURATION‡	BIT SIZE (ORGANIZATION)	TYPICAL PERFORMANCE		
				ACCESS TIMES		POWER DISSIPATION
				ADDRESS	SELECT	
TBP24S10	MJ, J, N	▽	1024 Bits (256W × 4B)	35 ns	20 ns	375 mW
TBP24SA10	MJ, J, N	⬦				
TBP28S42	MJ, J, N	▽	4096 Bits (512W × 8B)	35 ns	20 ns	500 mW
TBP28SA42	MJ, J, N	⬦				
TBP28S46	MJW, JW, NW	▽				
TBP28SA46	MJW, JW, NW	⬦				
TBP24S41	MJ, J, N	▽	4096 Bits (1024 × 4B)	40 ns	20 ns	475 mW
TBP24SA41	MJ, J, N	⬦				
TBP24S81	MJ, J, N	▽	8192 Bits (2048 × 4B)	45 ns	20 ns	625 mW
TBP24SA81	MJ, J, N	⬦				
TBP28S86A	MJW, JW, NW	▽	8192 Bits (1024 × 8B)	45 ns	20 ns	625 mW
TBP28SA86A	MJW, JW, NW	⬦				
TBP28S2708A	NW	▽				
TBP28S166	NW	▽	16,384 Bits (2048W × 8B)	35 ns	15 ns	650 mW

† MJ and MJW designates full-temperature-range circuits (formerly 54 Family), J, JW, N, and NW designates commercial-temperature-range circuits (formerly 74 Family).
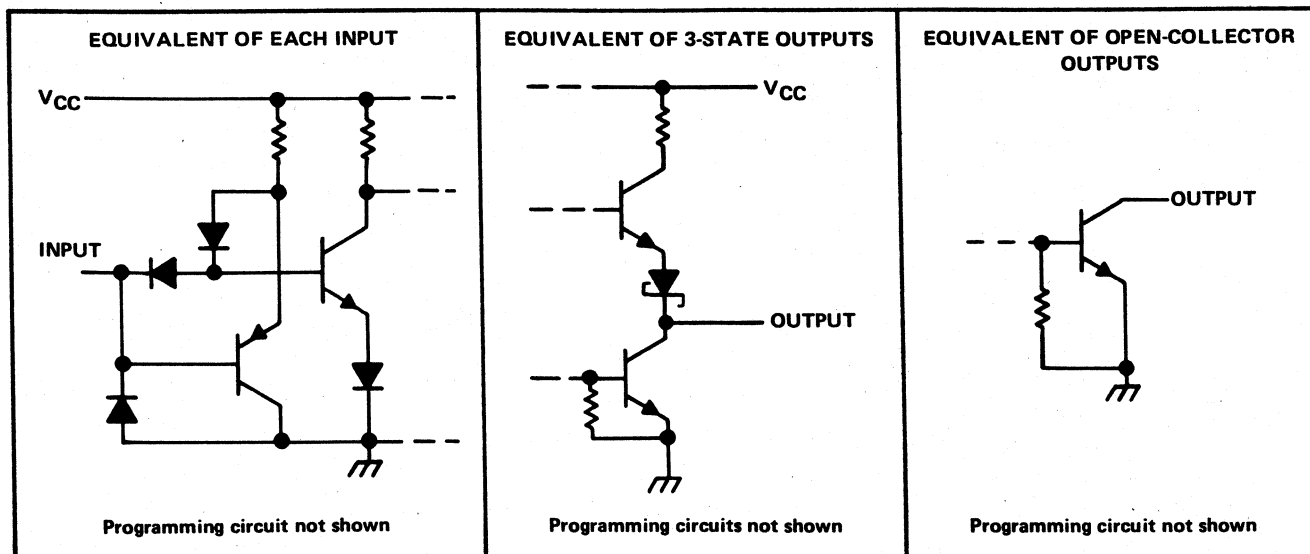‡ ▽ = three state, ⬦ = open collector.

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PROMs

low power PROMs

To upgrade systems utilizing MOS EPROMs or MOS PROMs, or when designing new systems which do not require maximum speed, the low-power PROM family offers the output drive and speed performance of bipolar technology, plus reduced power dissipation.

TYPE NUMBER	PACKAGE† AND TEMPERATURE RANGE DESIGNATORS	OUTPUT CONFIGURATION‡	BIT SIZE (ORGANIZATION)	TYPICAL PERFORMANCE		
				ACCESS TIMES		POWER DISSIPATION
				ADDRESS	SELECT	
TBP28L22	MJ, J,N	▽	2048 Bits (256W × 8B)	45 ns	20 ns	375 mW
TBP28LA22	MJ, J, N	⬦				
TBP28L42	MJ, J, N	▽	4096 Bits (512W × 8B)	60 ns	30 ns	250 mW
TBP28L46	MJW, JW, NW	▽				
TBP28L86A	MJW, JW, NW	▽	8192 Bits (1024W × 8B)	80 ns	35 ns	350 mW
TBP28L166	NW	▽	16,384 Bits (2084W × 8B)	65 ns	30 ns	350 mW

†MJ and MJW designates full-temperature-range circuits (formerly 54 Family), J, JW, N, and NW designates commercial-temperature-range circuits (formerly 74 Family).
‡ ▽ = three state, ⬦ = open collector.

schematics of inputs and outputs

EQUIVALENT OF EACH INPUT	EQUIVALENT OF 3-STATE OUTPUTS	EQUIVALENT OF OPEN-COLLECTOR OUTPUTS
Programming circuit not shown	Programming circuits not shown	Programming circuit not shown

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Supply voltage (see Note 1) . . . . 7 V
Input voltage . . . . 5.5 V
Chip-select peak input voltage (S, S1, S2) (see Note 2) . . . . 11 V
Off-state output voltage . . . . 5.5 V
Off-state peak output voltage (see Note 2) . . . . 16.25 V
Operating free-air temperature range: Full-temperature-range circuits (M suffix) . . −55°C to 125°C
Commercial-temperature-range circuits . . . . 0°C to 70°C
Storage temperature range . . . . −65°C to 150°C

NOTES: 1. Voltage values are with respect to network ground terminal.
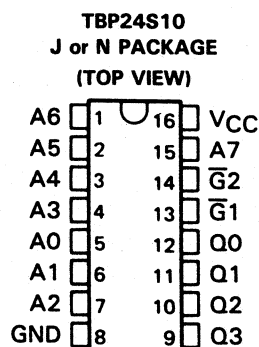2. These ratings apply only under the conditions described in the programming procedure.

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PROMs

logic symbol

TBP24S10

```
        PROM 256 X 4
A0 ─(5)─ 0
A1 ─(6)─
A2 ─(7)─          A ▽ ─(12)─ Q0
A3 ─(4)─    A  0  A ▽ ─(11)─ Q1
A4 ─(3)─      ─── A ▽ ─(10)─ Q2
A5 ─(2)─      255 A ▽ ─(9)── Q3
A6 ─(1)─
A7 ─(15)─ 7
G̅2 ─(14)─ ⊳
G̅1 ─(13)─ ⊳      & │ EN
```

pin assignment

TBP24S10
J or N PACKAGE
(TOP VIEW)

```
       ┌──┬─┬──┐
A6  [ 1 │ ∪ │16] VCC
A5  [ 2       15] A7
A4  [ 3       14] G̅2
A3  [ 4       13] G̅1
A0  [ 5       12] Q0
A1  [ 6       11] Q1
A2  [ 7       10] Q2
GND [ 8        9] Q3
       └─────────┘
```

recommended operating conditions

PARAMETER		MJ			J OR N			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V_{CC}	Supply voltage	4.5	5	5.5	4.75	5	5.25	V
V_{IH}	High-level input voltage	2			2			V
V_{IL}	Low-level input voltage			0.8			0.8	V
I_{OH}	High-level output current			−2			−6.5	mA
I_{OL}	Low-level output current			16			16	mA
T_A	Operating free-air temperature range	−55		125	0		70	°C

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS[†]		MJ			J OR N			UNIT
			MIN	TYP[‡]	MAX	MIN	TYP[‡]	MAX	
V_{IK}	V_{CC} = MIN,	I_I = −18 mA			−1.2			−1.2	V
V_{OH}	V_{CC} = MIN,	I_{OH} = MAX	2.4	3.1		2.4	3.1		V
V_{OL}	V_{CC} = MIN,	I_{OL} = 16 mA			0.5			0.5	V
I_{OZH}	V_{CC} = MAX,	V_O = 2.4 V			50			50	µA
I_{OZL}	V_{CC} = MAX,	V_O = 0.5 V			−50			−50	µA
I_I	V_{CC} = MAX,	V_I = 5.5 V			1			1	mA
I_{IH}	V_{CC} = MAX,	V_I = 2.7 V			25			25	µA
I_{IL}	V_{CC} = MAX,	V_I = 0.5 V			−0.25			−0.25	mA
I_{OS}[§]	V_{CC} = MAX		−30		−100	−30		−100	mA
I_{CC}	V_{CC} = MAX			75	100		75	100	mA

switching characteristics over recommended ranges of T_A and V_{CC} (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MJ			J OR N			UNIT
			MIN	TYP[‡]	MAX	MIN	TYP[‡]	MAX	
$t_{a(A)}$	Access time from address	C_L = 30 pF		35	75		35	55	ns
$t_{a(S)}$	Access time from chip select (enable time)	See Note 3		20	40		20	35	ns
t_{dis}	Disable time	C_L = 5 pF See Note 3		15	40		15	35	ns

[†]For conditions shown as MIN or MAX, use appropriate value specified under recommended operating conditions.
[‡]All typical values are at V_{CC} = 5 V, T_A = 25°C.
[§]Not more than one output should be shorted at a time, and duration of the short circuit should not exceed one second.
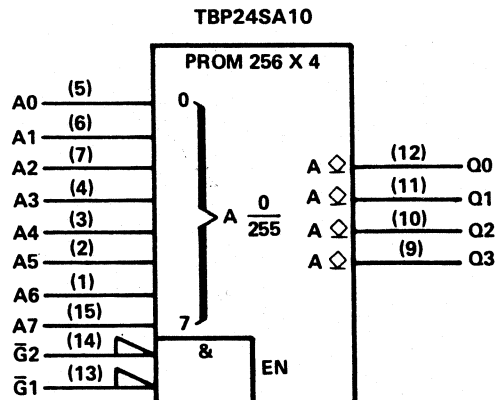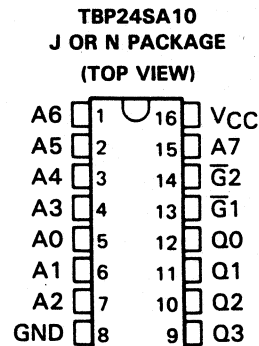NOTE 3: Load circuits and voltage waveforms are shown in Section 1.

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PROMs

1024 BITS (256 WORDS BY 4 BITS)
STANDARD PROGRAMMABLE READ-ONLY MEMORIES WITH OPEN-COLLECTOR OUTPUTS

logic symbol

TBP24SA10

PROM 256 X 4

```
A0 ──(5)──┐ 0
A1 ──(6)──┤
A2 ──(7)──┤                    A ◇ ──(12)── Q0
A3 ──(4)──┤      A  0          A ◇ ──(11)── Q1
A4 ──(3)──┤        ───         A ◇ ──(10)── Q2
A5 ──(2)──┤        255         A ◇ ──(9)─── Q3
A6 ──(1)──┤
A7 ──(15)─┘ 7
Ḡ2 ──(14)──▷┐ &
Ḡ1 ──(13)──▷┘    EN
```

pin assignment

TBP24SA10
J OR N PACKAGE
(TOP VIEW)

```
A6  [ 1      16 ]  VCC
A5  [ 2      15 ]  A7
A4  [ 3      14 ]  Ḡ2
A3  [ 4      13 ]  Ḡ1
A0  [ 5      12 ]  Q0
A1  [ 6      11 ]  Q1
A2  [ 7      10 ]  Q2
GND [ 8       9 ]  Q3
```

recommended operating conditions

	PARAMETER	MJ			J OR N			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V_{CC}	Supply voltage	4.5	5	5.5	4.75	5	5.25	V
V_{IH}	High-level input voltage	2			2			V
V_{IL}	Low-level input voltage			0.8			0.8	V
V_{OH}	High-level output voltage			5.5			5.5	V
I_{OL}	Low-level output current			16			16	mA
T_A	Operating free-air temperature range	−55		125	0		70	°C

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS[†]		MJ			J OR N			UNIT
			MIN	TYP[‡]	MAX	MIN	TYP[‡]	MAX	
V_{IK}	V_{CC} = MIN,	I_I = −18 mA			−1.2			−1.2	V
I_{OH}	V_{CC} = MIN,	V_{OH} = 2.4 V			0.05			0.05	mA
		V_{OH} = 5.5 V			0.1			0.1	
V_{OL}	V_{CC} = MIN,	I_{OL} = 16 mA			0.5			0.45	V
I_I	V_{CC} = MAX,	V_I = 5.5 V			1			1	mA
I_{IH}	V_{CC} = MAX,	V_I = 2.7 V			25			25	μA
I_{IL}	V_{CC} = MAX,	V_I = 0.5 V			−0.25			−0.25	mA
I_{CC}	V_{CC} = MAX			75	100		75	100	mA

switching characteristics over recommended ranges of T_A and V_{CC} (unless otherwise noted)

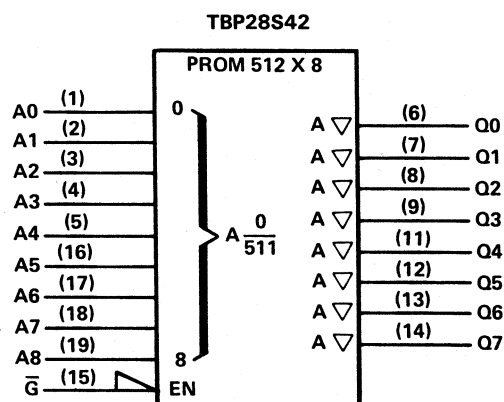| PARAMETER		TEST CONDITIONS	MJ			J OR N			UNIT
			MIN	TYP[‡]	MAX	MIN	TYP[‡]	MAX	
$t_{a(A)}$	Access time from address	C_L = 30 pF		35	75		35	65	ns
$t_{a(S)}$	Access time from chip select (enable time)	R_{L1} = 300 Ω		20	40		20	35	ns
t_{PLH}	Propagation delay time low-to-high-level output from chip select	R_{L2} = 600 Ω See Note 3		15	40		20	35	ns

[†]For conditions shown as MIN or MAX, use appropriate value specified under recommended operating conditions.
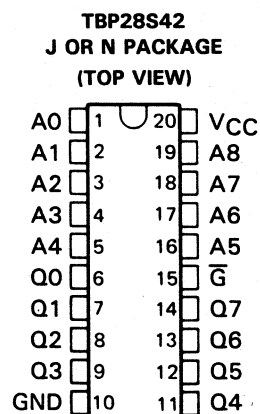[‡]All typical values are at V_{CC} = 5 V, T_A = 25°C.
NOTE 3: Load circuits and voltage waveforms are shown in Section 1.

4096 BITS (512 WORDS BY 8 BITS)
STANDARD PROGRAMMABLE READ-ONLY MEMORIES WITH 3-STATE OUTPUTS

logic symbol

TBP28S42

PROM 512 X 8

A0	(1)	0			
A1	(2)		A ▽	(6)	Q0
A2	(3)		A ▽	(7)	Q1
A3	(4)		A ▽	(8)	Q2
A4	(5)		A ▽	(9)	Q3
A5	(16)	A $\frac{0}{511}$	A ▽	(11)	Q4
A6	(17)		A ▽	(12)	Q5
A7	(18)		A ▽	(13)	Q6
A8	(19)	8	A ▽	(14)	Q7
$\overline{G}$	(15)	EN			

TBP28S42
J OR N PACKAGE
(TOP VIEW)

A0	1		20	V_{CC}
A1	2		19	A8
A2	3		18	A7
A3	4		17	A6
A4	5		16	A5
Q0	6		15	$\overline{G}$
Q1	7		14	Q7
Q2	8		13	Q6
Q3	9		12	Q5
GND	10		11	Q4

recommended operating conditions

PARAMETER		MJ			J OR N			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V_{CC}	Supply voltage	4.5	5	5.5	4.75	5	5.25	V
V_{IH}	High-level input voltage	2			2			V
V_{IL}	Low-level input voltage			0.8			0.8	V
I_{OH}	High-level output current			−2			−6.5	mA
I_{OL}	Low-level output current			16			16	mA
T_A	Operating free-air temperature range	−55		125	0		70	°C

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS[†]		MJ			J OR N			UNIT
			MIN	TYP[‡]	MAX	MIN	TYP[‡]	MAX	
V_{IK}	V_{CC} = MIN,	I_I = −18 mA			−1.2			−1.2	V
V_{OH}	V_{CC} = MIN,	I_{OH} = MAX	2.4	3.1		2.4	3.1		V
V_{OL}	V_{CC} = MIN,	I_{OL} = 16 mA			0.5			0.5	V
I_{OZH}	V_{CC} = MAX,	V_O = 2.4 V			50			50	µA
I_{OZL}	V_{CC} = MAX,	V_O = 0.5 V			−50			−50	µA
I_I	V_{CC} = MAX,	V_I = 5.5 V			1			1	mA
I_{IH}	V_{CC} = MAX,	V_I = 2.7 V			25			25	µA
I_{IL}	V_{CC} = MAX,	V_I = 0.5 V			−0.25			−0.25	mA
I_{OS}[§]	V_{CC} = MAX		−30		−100	−30		−100	mA
I_{CC}	V_{CC} = MAX			100	135		100	135	mA

switching characteristics over recommended ranges of T_A and V_{CC} (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MJ			J OR N			UNIT
			MIN	TYP[‡]	MAX	MIN	TYP[‡]	MAX	
$t_{a(A)}$	Access time from address	C_L = 30 pF		35	70		35	60	ns
$t_{a(S)}$	Access time from chip select (enable time)	See Note 3		20	45		20	45	ns
t_{dis}	Disable time	C_L = 5 pF See Note 3		15	45		15	40	ns

[†]For conditions shown as MIN or MAX, use appropriate value specified under recommended operating conditions.
[‡]All typical values are at V_{CC} = 5 V, T_A = 25°C.
[§]Not more than one output should be shorted at a time, and duration of the short circuit should not exceed one second.
NOTE 3: Load circuits and voltage waveforms are shown in Section 1.
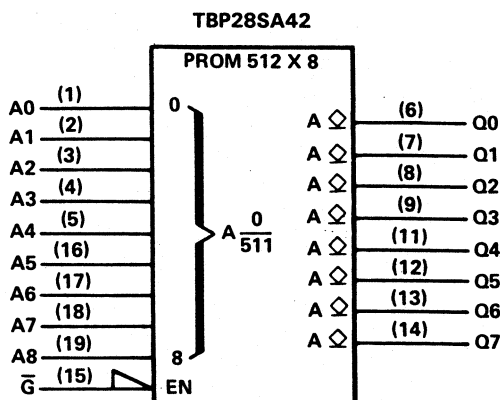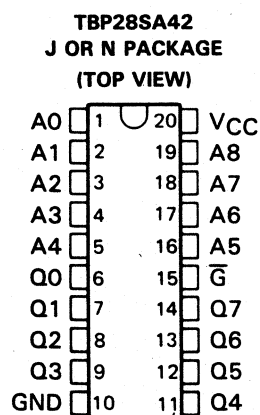
Texas
Instruments

PROMs

4

TBP28SA42
4096 BITS (512 WORDS BY 8 BITS)
STANDARD PROGRAMMABLE READ-ONLY MEMORIES WITH OPEN-COLLECTOR OUTPUTS

logic symbol

TBP28SA42

PROM 512 X 8

```
A0 ──(1)──┐ 0
A1 ──(2)──┤         A ◇ ──(6)── Q0
A2 ──(3)──┤         A ◇ ──(7)── Q1
A3 ──(4)──┤         A ◇ ──(8)── Q2
A4 ──(5)──┤    0    A ◇ ──(9)── Q3
A5 ──(16)─┤  A ───  A ◇ ──(11)── Q4
A6 ──(17)─┤   511   A ◇ ──(12)── Q5
A7 ──(18)─┤         A ◇ ──(13)── Q6
A8 ──(19)─┤ 8       A ◇ ──(14)── Q7
G̅ ──(15)──┤ EN
```

pin assignment

TBP28SA42
J OR N PACKAGE
(TOP VIEW)

```
      ┌────┬─┬────┐
A0  [ 1      20 ] VCC
A1  [ 2      19 ] A8
A2  [ 3      18 ] A7
A3  [ 4      17 ] A6
A4  [ 5      16 ] A5
Q0  [ 6      15 ] G̅
Q1  [ 7      14 ] Q7
Q2  [ 8      13 ] Q6
Q3  [ 9      12 ] Q5
GND [ 10     11 ] Q4
      └─────────┘
```

recommended operating conditions

PARAMETER		MJ MIN	MJ NOM	MJ MAX	J OR N MIN	J OR N NOM	J OR N MAX	UNIT
V_{CC}	Supply voltage	4.5	5	5.5	4.75	5	5.25	V
V_{IH}	High-level input voltage	2			2			V
V_{IL}	Low-level input voltage			0.8			0.8	V
V_{OH}	High-level output voltage			5.5			5.5	V
I_{OL}	Low-level output current			16			16	mA
T_A	Operating free-air temperature range	−55		125	0		70	°C

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS[†]		MJ MIN	MJ TYP[‡]	MJ MAX	J OR N MIN	J OR N TYP[‡]	J OR N MAX	UNIT
V_{IK}	V_{CC} = MIN,	I_I = −18 mA			−1.2			−1.2	V
I_{OH}	V_{CC} = MIN,	V_{OH} = 2.4 V			0.05			0.05	mA
		V_{OH} = 5.5 V			0.1			0.1	
V_{OL}	V_{CC} = MIN,	I_{OL} = 16 mA			0.5			0.5	V
I_I	V_{CC} = MAX,	V_I = 5.5 V			1			1	mA
I_{IH}	V_{CC} = MAX,	V_I = 2.7 V			25			25	µA
I_{IL}	V_{CC} = MAX,	V_I = 0.5 V			−0.25			−0.25	mA
I_{CC}	V_{CC} = MAX			105	135		105	135	mA

switching characteristics over recommended ranges of T_A and V_{CC} (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MJ MIN	MJ TYP[‡]	MJ MAX	J OR N MIN	J OR N TYP[‡]	J OR N MAX	UNIT
$t_{a(A)}$	Access time from address	C_L = 30 pF		35	75		35	65	ns
$t_{a(S)}$	Access time from chip select (enable time)	R_{L1} = 300 Ω		20	45		20	35	ns
t_{PLH}	Propagation delay time low-to-high-level output from chip select	R_{L2} = 600 Ω See Note 3		15	45		15	35	ns

[†]For conditions shown as MIN or MAX, use appropriate value specified under recommended operating conditions.
[‡]All typical values are at V_{CC} = 5 V, T_A = 25°C.
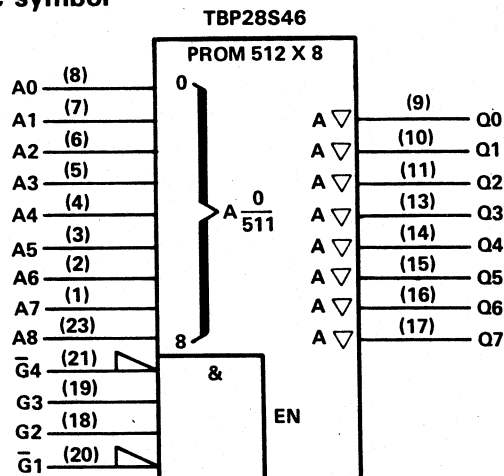NOTE 3: Load circuits and voltage waveforms are shown in Section 1.

Texas Instruments
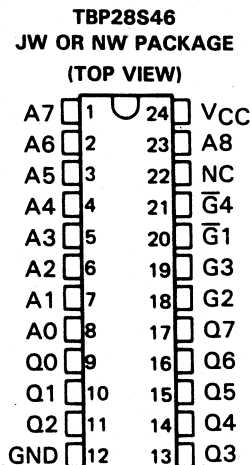
logic symbol

TBP28S46

PROM 512 X 8

Input	Pin		Output	Pin
A0	(8)		Q0	(9)
A1	(7)		Q1	(10)
A2	(6)		Q2	(11)
A3	(5)		Q3	(13)
A4	(4)		Q4	(14)
A5	(3)		Q5	(15)
A6	(2)		Q6	(16)
A7	(1)		Q7	(17)
A8	(23)			
$\overline{G}4$	(21)			
G3	(19)			
G2	(18)			
$\overline{G}1$	(20)			

$A\frac{0}{511}$

& EN

pin assignment

TBP28S46
JW OR NW PACKAGE
(TOP VIEW)

	Pin	Pin	
A7	1	24	V_{CC}
A6	2	23	A8
A5	3	22	NC
A4	4	21	$\overline{G}4$
A3	5	20	$\overline{G}1$
A2	6	19	G3
A1	7	18	G2
A0	8	17	Q7
Q0	9	16	Q6
Q1	10	15	Q5
Q2	11	14	Q4
GND	12	13	Q3

recommended operating conditions

	PARAMETER	MJW			JW OR NW			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V_{CC}	Supply voltage	4.5	5	5.5	4.75	5	5.25	V
V_{IH}	High-level input voltage	2			2			V
V_{IL}	Low-level input voltage			0.8			0.8	V
I_{OH}	High-level output current			−2			−6.5	mA
I_{OL}	Low-level output current			16			16	mA
T_A	Operating free-air temperature range	−55		125	0		70	°C

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS[†]		MJW			JW OR NW			UNIT
			MIN	TYP[‡]	MAX	MIN	TYP[‡]	MAX	
V_{IK}	V_{CC} = MIN,	I_I = −18 mA			−1.2			−1.2	V
V_{OH}	V_{CC} = MIN,	I_{OH} = MAX	2.4	3.1		2.4	3.1		V
V_{OL}	V_{CC} = MIN,	I_{OL} = 16 mA			0.5			0.5	V
I_{OZH}	V_{CC} = MAX,	V_O = 2.4 V			50			50	µA
I_{OZL}	V_{CC} = MAX,	V_O = 0.5 V			−50			−50	µA
I_I	V_{CC} = MAX,	V_I = 5.5 V			1			1	mA
I_{IH}	V_{CC} = MAX,	V_I = 2.7 V			25			25	µA
I_{IL}	V_{CC} = MAX,	V_I = 0.5 V			−0.25			−0.25	mA
I_{OS}[§]	V_{CC} = MAX		−15		−100	−20		−100	mA
I_{CC}	V_{CC} = MAX			100	135		100	135	mA

switching characteristics over recommended ranges of T_A and V_{CC} (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MJW			JW OR NW			UNIT
			MIN	TYP[‡]	MAX	MIN	TYP[‡]	MAX	
$t_{a(A)}$	Access time from address	C_L = 30 pF		35	70		35	60	ns
$t_{a(S)}$	Access time from chip select (enable time)	See Note 3		20	45		20	35	ns
t_{dis}	Disable time	C_L = 5 pF See Note 3		15	40		15	35	ns

[†] For conditions shown as MIN or MAX, use appropriate value specified under recommended operating conditions.
[‡] All typical values are at V_{CC} = 5 V, T_A = 25°C.
[§] Not more than one output should be shorted at a time, and duration of the short circuit should not exceed one second.
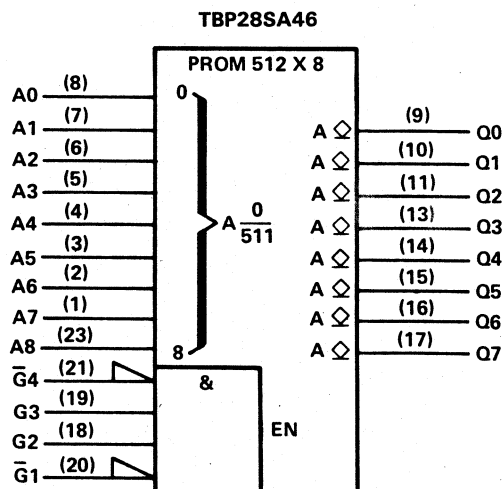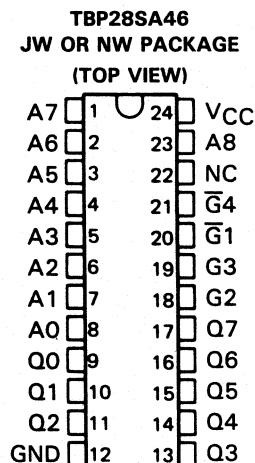NOTE 3: Load circuits and voltage waveforms are shown in Section 1.

PROMs

4

TEXAS

TBP28SA46
4096 BITS (512 WORDS BY 8 BITS)
STANDARD PROGRAMMABLE READ-ONLY MEMORIES WITH OPEN-COLLECTOR OUTPUTS

logic symbol

TBP28SA46

```
           PROM 512 X 8
A0 ──(8)──┐ 0
A1 ──(7)──┤        A ◇ ──(9)──── Q0
A2 ──(6)──┤        A ◇ ──(10)─── Q1
A3 ──(5)──┤        A ◇ ──(11)─── Q2
A4 ──(4)──┤  A  0  A ◇ ──(13)─── Q3
A5 ──(3)──┤    511 A ◇ ──(14)─── Q4
A6 ──(2)──┤        A ◇ ──(15)─── Q5
A7 ──(1)──┤        A ◇ ──(16)─── Q6
A8 ──(23)─┘ 8      A ◇ ──(17)─── Q7
G̅4 ──(21)──▷┐
G3 ──(19)──┤  &
G2 ──(18)──┤
G̅1 ──(20)──▷┘  EN
```

pin assignment

TBP28SA46
JW OR NW PACKAGE
(TOP VIEW)

```
         ┌──┴──┐
A7  [ 1  U  24 ]  VCC
A6  [ 2     23 ]  A8
A5  [ 3     22 ]  NC
A4  [ 4     21 ]  G̅4
A3  [ 5     20 ]  G̅1
A2  [ 6     19 ]  G3
A1  [ 7     18 ]  G2
A0  [ 8     17 ]  Q7
Q0  [ 9     16 ]  Q6
Q1  [ 10    15 ]  Q5
Q2  [ 11    14 ]  Q4
GND [ 12    13 ]  Q3
         └─────┘
```

recommended operating conditions

PARAMETER		MJW MIN	MJW NOM	MJW MAX	JW OR NW MIN	JW OR NW NOM	JW OR NW MAX	UNIT
V_{CC}	Supply voltage	4.5	5	5.5	4.75	5	5.25	V
V_{IH}	High-level input voltage	2			2			V
V_{IL}	Low-level input voltage			0.8			0.8	V
V_{OH}	High-level output voltage			5.5			5.5	V
I_{OL}	Low-level output current			16			16	mA
T_A	Operating free-air temperature range	−55		125	0		70	°C

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS†		MJW MIN	MJW TYP‡	MJW MAX	JW OR NW MIN	JW OR NW TYP‡	JW OR NW MAX	UNIT
V_{IK}	V_{CC} = MIN,	I_I = −18 mA			−1.2			−1.2	V
I_{OH}	V_{CC} = MIN,	V_{OH} = 2.4 V			0.05			0.05	mA
		V_{OH} = 5.5 V			0.1			0.1	
V_{OL}	V_{CC} = MIN,	I_{OL} = 16 mA			0.5			0.5	V
I_I	V_{CC} = MAX,	V_I = 5.5 V			1			1	mA
I_{IH}	V_{CC} = MAX,	V_I = 2.7 V			25			25	μA
I_{IL}	V_{CC} = MAX,	V_I = 0.5 V			−0.25			−0.25	mA
I_{CC}	V_{CC} = MAX			100	135		100	135	mA

switching characteristics over recommended ranges of T_A and V_{CC} (unless otherwise noted)

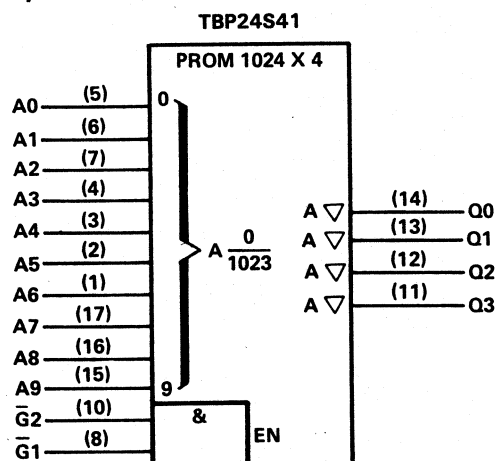| PARAMETER		TEST CONDITIONS	MJW MIN	MJW TYP‡	MJW MAX	JW OR NW MIN	JW OR NW TYP‡	JW OR NW MAX	UNIT
$t_{a(A)}$	Access time from address	C_L = 30 pF		35	75		35	65	ns
$t_{a(S)}$	Access time from chip select (enable time)	R_{L1} = 300 Ω		20	45		20	35	ns
t_{PLH}	Propagation delay time low-to-high-level output from chip select	R_{L2} = 600 Ω See Note 3		15	40		15	35	ns

†For conditions shown as MIN or MAX, use appropriate value specified under recommended operating conditions.
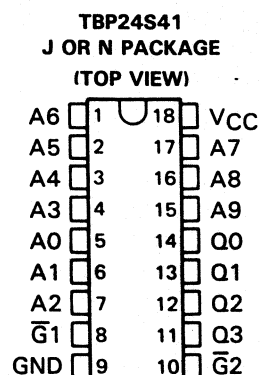‡All typical values are at V_{CC} = 5 V, T_A = 25°C.
NOTE 3: Load circuits and voltage waveforms are shown in Section 1.

4

PROMS

Texas

logic symbol

pin assignment

recommended operating conditions

	PARAMETER	MJ			J OR N			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V_{CC}	Supply voltage	4.5	5	5.5	4.75	5	5.25	V
V_{IH}	High-level input voltage	2			2			V
V_{IL}	Low-level input voltage			0.8			0.8	V
I_{OH}	High-level output current			−2			−3.2	mA
I_{OL}	Low-level output current			16			16	mA
T_A	Operating free-air temperature range	−55		125	0		70	°C

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS[†]		MJ			J OR N			UNIT
			MIN	TYP[‡]	MAX	MIN	TYP[‡]	MAX	
V_{IK}	V_{CC} = MIN,	I_I = −18 mA			−1.2			−1.2	V
V_{OH}	V_{CC} = MIN,	I_{OH} = MAX	2.4	3.1		2.4	3.1		V
V_{OL}	V_{CC} = MIN,	I_{OL} = 16 mA			0.5			0.5	V
I_{OZH}	V_{CC} = MAX,	V_O = 2.4 V			50			50	µA
I_{OZL}	V_{CC} = MAX,	V_O = 0.5 V			−50			−50	µA
I_I	V_{CC} = MAX,	V_I = 5.5 V			1			1	mA
I_{IH}	V_{CC} = MAX,	V_I = 2.7 V			25			25	µA
I_{IL}	V_{CC} = MAX,	V_I = 0.5 V			−0.25			−0.25	mA
I_{OS}[§]	V_{CC} = MAX		−15		−100	−20		−100	mA
I_{CC}	V_{CC} = MAX			95	140		95	140	mA

switching characteristics over recommended ranges of T_A and V_{CC} (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MJ			J OR N			UNIT
			MIN	TYP[‡]	MAX	MIN	TYP[‡]	MAX	
$t_{a(A)}$	Access time from address	C_L = 30 pF See Note 3		40	75		40	60	ns
$t_{a(S)}$	Access time from chip select (enable time)			20	40		20	30	ns
t_{dis}	Disable time	C_L = 5 pF See Note 3		20	40		20	30	ns

[†]For conditions shown as MIN or MAX, use appropriate value specified under recommended operating conditions.
[‡]All typical values are at V_{CC} = 5 V, T_A = 25°C.
[§]Not more than one output should be shorted at a time, and duration of the short circuit should not exceed one second.
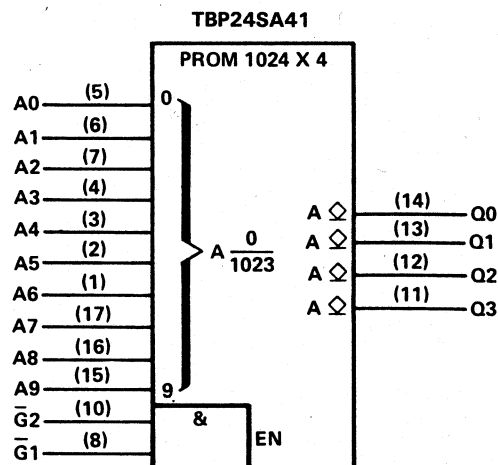NOTE 3: Load circuits and voltage waveforms are shown in Section 1.

logic symbol

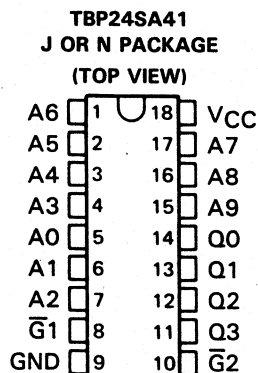**TBP24SA41**

PROM 1024 X 4

A0 — (5) — 0		
A1 — (6)		A ◇ (14) — Q0
A2 — (7)		A ◇ (13) — Q1
A3 — (4)	A $\frac{0}{1023}$	A ◇ (12) — Q2
A4 — (3)		A ◇ (11) — Q3
A5 — (2)		
A6 — (1)		
A7 — (17)		
A8 — (16)		
A9 — (15) — 9		
$\overline{G2}$ — (10)	& EN	
$\overline{G1}$ — (8)		

pin assignment

TBP24SA41
J OR N PACKAGE
(TOP VIEW)

A6	1		18	V_{CC}
A5	2		17	A7
A4	3		16	A8
A3	4		15	A9
A0	5		14	Q0
A1	6		13	Q1
A2	7		12	Q2
$\overline{G1}$	8		11	Q3
GND	9		10	$\overline{G2}$

recommended operating conditions

PARAMETER		MJ			J OR N			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V_{CC}	Supply voltage	4.5	5	5.5	4.75	5	5.25	V
V_{IH}	High-level input voltage	2			2			V
V_{IL}	Low-level input voltage			0.8			0.8	V
V_{OH}	High-level output voltage			5.5			5.5	V
I_{OL}	Low-level output current			16			16	mA
T_A	Operating free-air temperature range	-55		125	0		70	°C

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS†		MJ			J OR N			UNIT
			MIN	TYP‡	MAX	MIN	TYP‡	MAX	
V_{IK}	V_{CC} = MIN,	I_I = -18 mA			-1.2			-1.2	V
I_{OH}	V_{CC} = MIN,	V_{OH} = 2.4 V			0.05			0.05	mA
		V_{OH} = 5.5 V			0.1			0.1	
V_{OL}	V_{CC} = MIN,	I_{OL} = 16 mA			0.5			0.5	V
I_I	V_{CC} = MAX,	V_I = 5.5 V			1			1	mA
I_{IH}	V_{CC} = MAX,	V_I = 2.7 V			25			25	µA
I_{IL}	V_{CC} = MAX,	V_I = 0.5 V			-0.25			-0.25	mA
I_{CC}	V_{CC} = MAX			95	140		95	140	mA

switching characteristics over recommended ranges of T_A and V_{CC} (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MJ			J OR N			UNIT
			MIN	TYP‡	MAX	MIN	TYP‡	MAX	
$t_{a(A)}$	Access time from address	C_L = 30 pF		40	75		40	60	ns
$t_{a(S)}$	Access time from chip select (enable time)	R_{L1} = 300 Ω		20	40		20	30	ns
t_{PLH}	Propagation delay time low-to-high-level output from chip select	R_{L2} = 600 Ω See Note 3		20	40		20	30	ns

†For conditions shown as MIN or MAX, use appropriate value specified under recommended operating conditions.
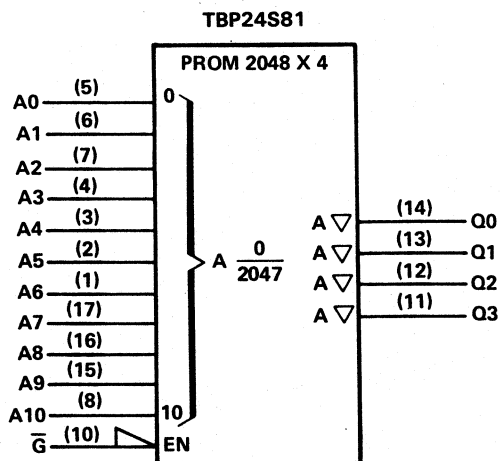‡All typical values are at V_{CC} = 5 V, T_A = 25°C.
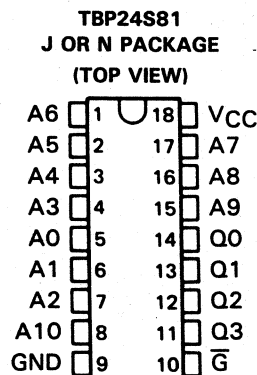NOTE 3: Load circuits and voltage waveforms are shown in Section 1.

4 PROMS

TEXAS

logic symbol

TBP24S81

PROM 2048 X 4

A0 — (5) — 0
A1 — (6)
A2 — (7)
A3 — (4)
A4 — (3)
A5 — (2) — A — 0 / 2047
A6 — (1)
A7 — (17)
A8 — (16)
A9 — (15)
A10 — (8) — 10
G̅ — (10) — EN

A ▽ — (14) — Q0
A ▽ — (13) — Q1
A ▽ — (12) — Q2
A ▽ — (11) — Q3

pin assignment

TBP24S81
J OR N PACKAGE
(TOP VIEW)

A6	1	18	V_{CC}
A5	2	17	A7
A4	3	16	A8
A3	4	15	A9
A0	5	14	Q0
A1	6	13	Q1
A2	7	12	Q2
A10	8	11	Q3
GND	9	10	G̅

recommended operating conditions

PARAMETER		MJ			J OR N			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V_{CC}	Supply voltage	4.5	5	5.5	4.75	5	5.25	V
V_{IH}	High-level input voltage	2			2			V
V_{IL}	Low-level input voltage			0.8			0.8	V
I_{OH}	High-level output current			−2			−3.2	mA
I_{OL}	Low-level output current			16			16	mA
T_A	Operating free-air temperature range	−55		125	0		70	°C

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS[†]		MJ			J OR N			UNIT
			MIN	TYP[‡]	MAX	MIN	TYP[‡]	MAX	
V_{IK}	V_{CC} = MIN,	I_I = −18 mA			−1.2			−1.2	V
V_{OH}	V_{CC} = MIN,	I_{OH} = MAX	2.4	3.1		2.4	3.1		V
V_{OL}	V_{CC} = MIN,	I_{OL} = 16 mA			0.5			0.5	V
I_{OZH}	V_{CC} = MAX,	V_O = 2.4 V			50			50	μA
I_{OZL}	V_{CC} = MAX,	V_O = 0.5 V			−50			−50	μA
I_I	V_{CC} = MAX,	V_I = 5.5 V			1			1	mA
I_{IH}	V_{CC} = MAX,	V_I = 2.7 V			25			25	μA
I_{IL}	V_{CC} = MAX,	V_I = 0.5 V			−0.25			−0.25	mA
I_{OS}[§]	V_{CC} = MAX		−15		−100	−20		−100	mA
I_{CC}	V_{CC} = MAX			125	175		125	175	mA

switching characteristics over recommended ranges of T_A and V_{CC} (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MJ			J OR N			UNIT
			MIN	TYP[‡]	MAX	MIN	TYP[‡]	MAX	
$t_{a(A)}$	Access time from address	C_L = 30 pF		45	85		45	70	ns
$t_{a(S)}$	Access time from chip select (enable time)	See Note 3		20	50		20	40	ns
t_{dis}	Disable time	C_L = 5 pF See Note 3		20	50		20	40	ns

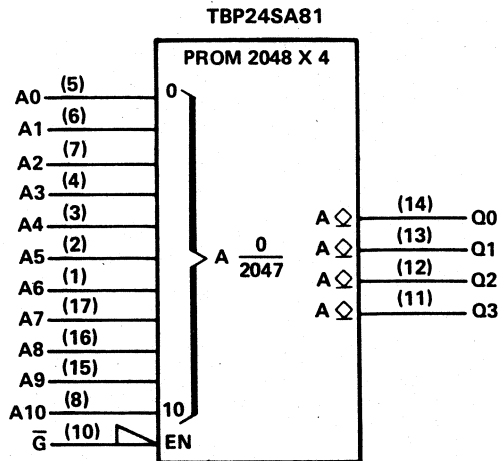[†]For conditions shown as MIN or MAX, use appropriate value specified under recommended operating conditions.
[‡]All typical values are at V_{CC} = 5 V, T_A = 25°C.
[§]Not more than one output should be shorted at a time, and duration of the short circuit should not exceed one second.
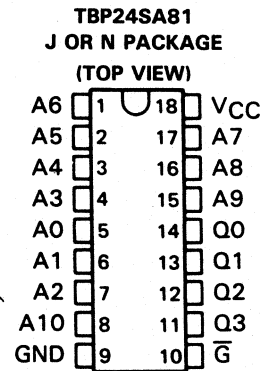NOTE 3: Load circuits and voltage waveforms are shown in Section 1.

4

PROMs

TEXAS INSTRUMENTS

TBP24SA81
8192 BITS (2048 WORDS BY 4 BITS)
STANDARD PROGRAMMABLE READ-ONLY MEMORIES WITH OPEN-COLLECTOR OUTPUTS

logic symbol

TBP24SA81

PROM 2048 X 4

A0 —(5)— 0
A1 —(6)—
A2 —(7)—
A3 —(4)—
A4 —(3)—
A5 —(2)—
A6 —(1)—
A7 —(17)—
A8 —(16)—
A9 —(15)—
A10 —(8)— 10
$\overline{G}$ —(10)— EN

A $\frac{0}{2047}$

A ◇ —(14)— Q0
A ◇ —(13)— Q1
A ◇ —(12)— Q2
A ◇ —(11)— Q3

pin assignment

TBP24SA81
J OR N PACKAGE
(TOP VIEW)

A6	1	18	V_{CC}
A5	2	17	A7
A4	3	16	A8
A3	4	15	A9
A0	5	14	Q0
A1	6	13	Q1
A2	7	12	Q2
A10	8	11	Q3
GND	9	10	$\overline{G}$

recommended operating conditions

PARAMETER		MJ			J OR N			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V_{CC}	Supply voltage	4.5	5	5.5	4.75	5	5.25	V
V_{IH}	High-level input voltage	2			2			V
V_{IL}	Low-level input voltage			0.8			0.8	V
V_{OH}	High-level output voltage			5.5			5.5	V
I_{OL}	Low-level output current			16			16	mA
T_A	Operating free-air temperature range	−55		125	0		70	°C

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS†		MJ			J OR N			UNIT
			MIN	TYP‡	MAX	MIN	TYP‡	MAX	
V_{IK}	V_{CC} = MIN,	I_I = −18 mA			−1.2			−1.2	V
I_{OH}	V_{CC} = MIN,	V_{OH} = 2.4 V			0.05			0.05	VmA
		V_{OH} = 5.5 V			0.1			0.1	
V_{OL}	V_{CC} = MIN,	I_{OL} = 16 mA			0.5			0.5	V
I_I	V_{CC} = MAX,	V_I = 5.5 V			1			1	mA
I_{IH}	V_{CC} = MAX,	V_I = 2.7 V			25			25	μA
I_{IL}	V_{CC} = MAX,	V_I = 0.5 V			−0.25			−0.25	mA
I_{CC}	V_{CC} = MAX			125	175		125	175	mA

switching characteristics over recommended ranges of T_A and V_{CC} (unless otherwise noted)

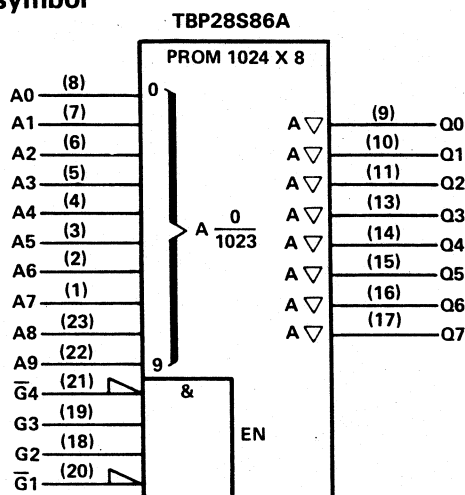| PARAMETER		TEST CONDITIONS	MJ			J OR N			UNIT
			MIN	TYP‡	MAX	MIN	TYP‡	MAX	
$t_{a(A)}$	Access time from address	C_L = 30 pF		45	95		45	70	ns
$t_{a(S)}$	Access time from chip select (enable time)	R_{L1} = 300 Ω		20	50		20	40	ns
t_{PLH}	Propagation delay time low-to-high-level output from chip select	R_{L2} = 600 Ω See Note 3		20	50		20	40	ns

†For conditions shown as MIN or MAX, use appropriate value specified under recommended operating conditions.
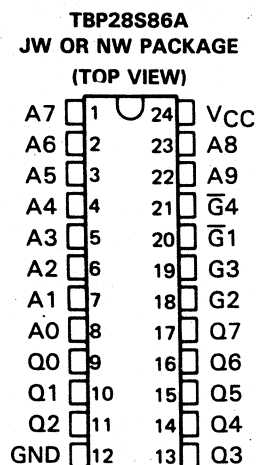‡All typical values are at V_{CC} = 5 V, T_A = 25°C.
NOTE 3: Load circuits and voltage waveforms are shown in Section 1.

TEXAS

logic symbol

TBP28S86A

PROM 1024 X 8

A0 — (8) — 0
A1 — (7)
A2 — (6)
A3 — (5)
A4 — (4)
A5 — (3) — A $\frac{0}{1023}$
A6 — (2)
A7 — (1)
A8 — (23)
A9 — (22) — 9
$\overline{G4}$ — (21) — &
G3 — (19)
G2 — (18) — EN
$\overline{G1}$ — (20)

A▽ (9) — Q0
A▽ (10) — Q1
A▽ (11) — Q2
A▽ (13) — Q3
A▽ (14) — Q4
A▽ (15) — Q5
A▽ (16) — Q6
A▽ (17) — Q7

pin assignment

TBP28S86A
JW OR NW PACKAGE
(TOP VIEW)

A7	1	24	V$_{CC}$
A6	2	23	A8
A5	3	22	A9
A4	4	21	$\overline{G4}$
A3	5	20	$\overline{G1}$
A2	6	19	G3
A1	7	18	G2
A0	8	17	Q7
Q0	9	16	Q6
Q1	10	15	Q5
Q2	11	14	Q4
GND	12	13	Q3

4

PROMs

recommended operating conditions

PARAMETER		MJW			JW OR NW			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V$_{CC}$	Supply voltage	4.5	5	5.5	4.75	5	5.25	V
V$_{IH}$	High-level input voltage	2			2			V
V$_{IL}$	Low-level input voltage			0.8			0.8	V
I$_{OH}$	High-level output current			−2			−3.2	mA
I$_{OL}$	Low-level output current			12			12	mA
T$_A$	Operating free-air temperature range	−55		125	0		70	°C

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS[†]		MJW			JW OR NW			UNIT
			MIN	TYP[‡]	MAX	MIN	TYP[‡]	MAX	
V$_{IK}$	V$_{CC}$ = MIN,	I$_I$ = −18 mA			−1.2			−1.2	V
V$_{OH}$	V$_{CC}$ = MIN,	I$_{OH}$ = MAX	2.4	3.1		2.4	3.1		V
V$_{OL}$	V$_{CC}$ = MIN,	I$_{OL}$ = 12 mA			0.5			0.5	V
I$_{OZH}$	V$_{CC}$ = MAX,	V$_O$ = 2.4 V			50			50	μA
I$_{OZL}$	V$_{CC}$ = MAX,	V$_O$ = 0.5 V			−50			−50	μA
I$_I$	V$_{CC}$ = MAX,	V$_I$ = 5.5 V			1			1	mA
I$_{IH}$	V$_{CC}$ = MAX,	V$_I$ = 2.7 V			25			25	μA
I$_{IL}$	V$_{CC}$ = MAX,	V$_I$ = 0.5 V			−0.25			−0.25	mA
I$_{OS}$[§]	V$_{CC}$ = MAX		−15		−100	−20		−100	mA
I$_{CC}$	V$_{CC}$ = MAX			110	170		110	165	mA

switching characteristics over recommended ranges of T$_A$ and V$_{CC}$ (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MJW			JW OR NW			UNIT
			MIN	TYP[‡]	MAX	MIN	TYP[‡]	MAX	
t$_{a(A)}$	Access time from address	C$_L$ = 30 pF		35	80		35	65	ns
t$_{a(S)}$	Access time from chip select (enable time)	See Note 3		20	50		20	40	ns
t$_{dis}$	Disable time	C$_L$ = 5 pF See Note 3		15	40		15	35	ns

[†]For conditions shown as MIN or MAX, use appropriate value specified under recommended operating conditions.
[‡]All typical values are at V$_{CC}$ = 5 V, T$_A$ = 25°C.
[§]Not more than one output should be shorted at a time, and duration of the short circuit should not exceed one second.
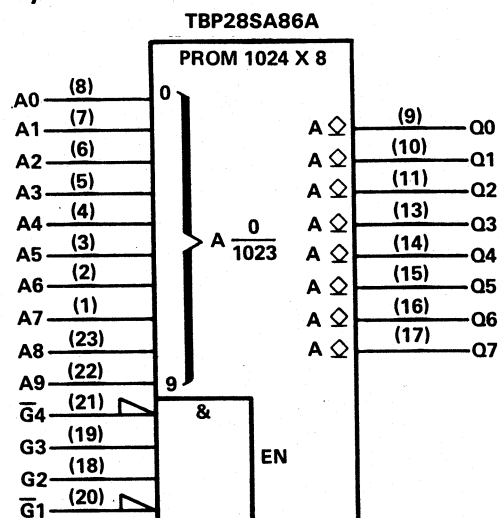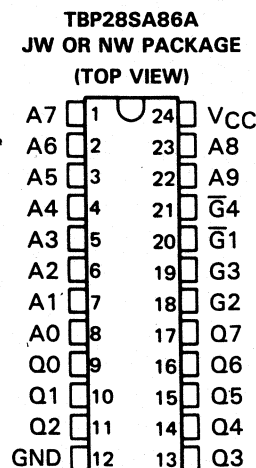NOTE 3: Load circuits and voltage waveforms are shown in Section 1.

Texas

logic symbol

TBP28SA86A
PROM 1024 X 8

A0 (8) — 0		
A1 (7)	A ◇ (9)	Q0
A2 (6)	A ◇ (10)	Q1
A3 (5)	A ◇ (11)	Q2
A4 (4)	A ◇ (13)	Q3
A5 (3)	A $\frac{0}{1023}$ ◇ (14)	Q4
A6 (2)	A ◇ (15)	Q5
A7 (1)	A ◇ (16)	Q6
A8 (23)	A ◇ (17)	Q7
A9 (22) — 9		
$\overline{G}$4 (21) &		
G3 (19)		
G2 (18) EN		
$\overline{G}$1 (20)		

pin assignment

TBP28SA86A
JW OR NW PACKAGE
(TOP VIEW)

A7	1	24	VCC
A6	2	23	A8
A5	3	22	A9
A4	4	21	$\overline{G}$4
A3	5	20	$\overline{G}$1
A2	6	19	G3
A1	7	18	G2
A0	8	17	Q7
Q0	9	16	Q6
Q1	10	15	Q5
Q2	11	14	Q4
GND	12	13	Q3

recommended operating conditions

PARAMETER		MJW MIN	MJW NOM	MJW MAX	JW OR NW MIN	JW OR NW NOM	JW OR NW MAX	UNIT
V_{CC}	Supply voltage	4.5	5	5.5	4.75	5	5.25	V
V_{IH}	High-level input voltage	2			2			V
V_{IL}	Low-level input voltage			0.8			0.8	V
V_{OH}	High-level output voltage			5.5			5.5	V
I_{OL}	Low-level output current			12			12	mA
T_A	Operating free-air temperature range	−55		125	0		70	°C

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS†		MJW MIN	MJW TYP‡	MJW MAX	JW OR NW MIN	JW OR NW TYP‡	JW OR NW MAX	UNIT
V_{IK}	V_{CC} = MIN,	I_I = −18 mA			−1.2			−1.2	V
I_{OH}	V_{CC} = MIN,	V_{OH} = 2.4 V			0.05			0.05	mA
		V_{OH} = 5.5 V			0.1			0.1	
V_{OL}	V_{CC} = MIN,	I_{OL} = 12 mA			0.5			0.5	V
I_I	V_{CC} = MAX,	V_I = 5.5 V			1			1	mA
I_{IH}	V_{CC} = MAX,	V_I = 2.7 V			25			25	μA
I_{IL}	V_{CC} = MAX,	V_I = 0.5 V			−0.25			−0.25	mA
I_{CC}	V_{CC} = MAX			125	175		125	175	mA

switching characteristics over recommended ranges of T_A and V_{CC} (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MJW MIN	MJW TYP‡	MJW MAX	JW OR NW MIN	JW OR NW TYP‡	JW OR NW MAX	UNIT
$t_{a(A)}$	Access time from address	C_L = 30 pF		35	80		35	70	ns
$t_{a(S)}$	Access time from chip select (enable time)	R_{L1} = 300 Ω		20	50		20	40	ns
t_{PLH}	Propagation delay time low-to-high-level output from chip select	R_{L2} = 600 Ω See Note 3		15	40		15	35	ns

†For conditions shown as MIN or MAX, use appropriate value specified under recommended operating conditions.
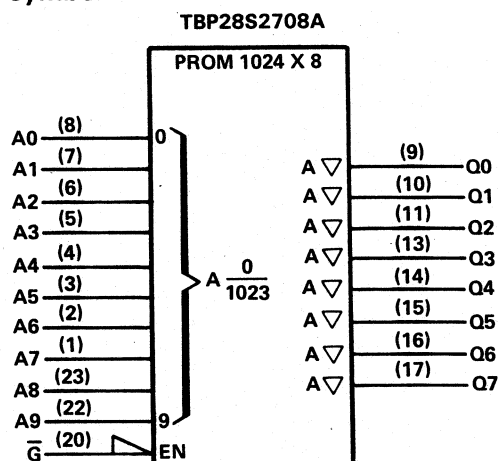‡All typical values are at V_{CC} = 5 V, T_A = 25°C.
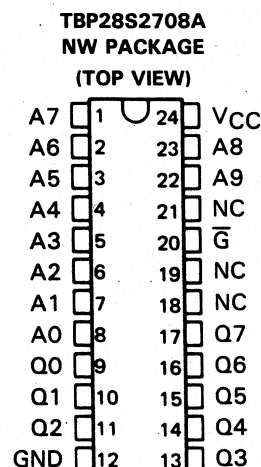NOTE 3: Load circuits and voltage waveforms are shown in Section 1.

logic symbol

TBP28S2708A

PROM 1024 X 8

A0 (8) 0
A1 (7)
A2 (6)
A3 (5)
A4 (4)
A5 (3)
A6 (2)
A7 (1)
A8 (23)
A9 (22) 9
$\overline{G}$ (20) EN

$A \dfrac{0}{1023}$

A▽ (9) Q0
A▽ (10) Q1
A▽ (11) Q2
A▽ (13) Q3
A▽ (14) Q4
A▽ (15) Q5
A▽ (16) Q6
A▽ (17) Q7

pin assignment

TBP28S2708A
NW PACKAGE
(TOP VIEW)

A7	1	24	V_{CC}
A6	2	23	A8
A5	3	22	A9
A4	4	21	NC
A3	5	20	$\overline{G}$
A2	6	19	NC
A1	7	18	NC
A0	8	17	Q7
Q0	9	16	Q6
Q1	10	15	Q5
Q2	11	14	Q4
GND	12	13	Q3

recommended operating conditions

PARAMETER		NW			UNIT
		MIN	NOM	MAX	
V_{CC}	Supply voltage	4.75	5	5.25	V
V_{IH}	High-level input voltage	2			V
V_{IL}	Low-level input voltage			0.8	V
I_{OH}	High-level output current			−3.2	mA
I_{OL}	Low-level output current			12	mA
T_A	Operating free-air temperature range	0		70	°C

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS		NW			UNIT
			MIN	TYP[†]	MAX	
V_{IK}	$V_{CC} = 4.75$,	$I_I = -18$ mA			−1.2	V
V_{OH}	$V_{CC} = 4.75$,	$I_{OH} = -3.2$ mA	2.4	3.1		V
V_{OL}	$V_{CC} = 4.75$,	$I_{OL} = 12$ mA			0.5	V
I_{OZH}	$V_{CC} = 5.25$,	$V_O = 2.4$ V			50	μA
I_{OZL}	$V_{CC} = 5.25$,	$V_O = 0.5$ V			−50	μA
I_I	$V_{CC} = 5.25$,	$V_I = 5.5$ V			1	mA
I_{IH}	$V_{CC} = 5.25$,	$V_I = 2.7$ V			25	μA
I_{IL}	$V_{CC} = 5.25$,	$V_I = 0.5$ V			−0.25	mA
I_{OS}[‡]	$V_{CC} = 5.25$		−20		−100	mA
I_{CC}	$V_{CC} = 5.25$			110	165	mA

switching characteristics over recommended ranges of T_A and V_{CC} (unless otherwise noted)

PARAMETER		TEST CONDITIONS	NW			UNIT
			MIN	TYP[†]	MAX	
$t_{a(A)}$	Access time from address	$C_L = 30$ pF		45	70	ns
$t_{a(S)}$	Access time from chip select (enable time)	See Note 3		20	40	ns
t_{dis}	Disable time	$C_L = 5$ pF See Note 3		20	40	ns

[†]All typical values are at $V_{CC} = 5$ V, $T_A = 25$°C.
[‡]Not more than one output should be shorted at a time, and duration of the short circuit should not exceed one second.
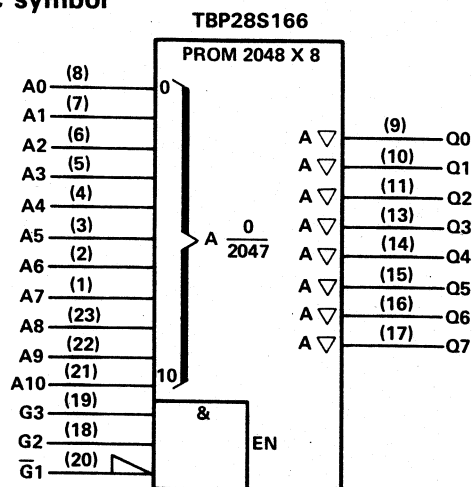NOTE 3: Load circuits and voltage waveforms are shown in Section 1.

4

PROMs

Texas

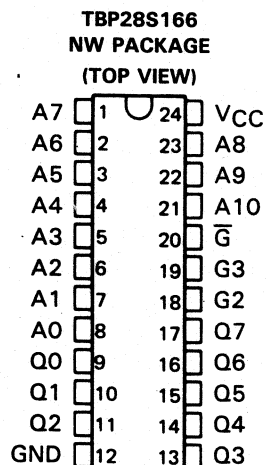## TBP28S166
16,384 BITS (2084 WORDS BY 8 BITS)
STANDARD PROGRAMMABLE READ-ONLY MEMORIES WITH 3-STATE OUTPUTS

logic symbol

TBP28S166

PROM 2048 X 8

Signal	Pin
A0	(8)
A1	(7)
A2	(6)
A3	(5)
A4	(4)
A5	(3)
A6	(2)
A7	(1)
A8	(23)
A9	(22)
A10	(21)
G3	(19)
G2	(18)
$\overline{G1}$	(20)

Signal	Pin
Q0	(9)
Q1	(10)
Q2	(11)
Q3	(13)
Q4	(14)
Q5	(15)
Q6	(16)
Q7	(17)

$A \frac{0}{2047}$

& EN

pin assignment

TBP28S166
NW PACKAGE
(TOP VIEW)

A7	1	24	V_{CC}
A6	2	23	A8
A5	3	22	A9
A4	4	21	A10
A3	5	20	$\overline{G}$
A2	6	19	G3
A1	7	18	G2
A0	8	17	Q7
Q0	9	16	Q6
Q1	10	15	Q5
Q2	11	14	Q4
GND	12	13	Q3

recommended operating conditions

	PARAMETER	NW MIN	NW NOM	NW MAX	UNIT
V_{CC}	Supply voltage	4.75	5	5.25	V
V_{IH}	High-level input voltage	2			V
V_{IL}	Low-level input voltage			0.8	V
I_{OH}	High-level output current			−3.2	mA
I_{OL}	Low-level output current			16	mA
T_A	Operating free-air temperature range	0		70	°C

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS		NW MIN	NW TYP†	NW MAX	UNIT
V_{IK}	$V_{CC} = 4.75$,	$I_I = −18$ mA			−1.2	V
V_{OH}	$V_{CC} = 4.75$,	$I_{OH} = −3.2$ mA	2.4	3.1		V
V_{OL}	$V_{CC} = 4.75$,	$I_{OL} = 16$ mA			0.5	V
I_{OZH}	$V_{CC} = 5.25$,	$V_O = 2.4$ V			50	μA
I_{OZL}	$V_{CC} = 5.25$,	$V_O = 0.5$ V			−50	μA
I_I	$V_{CC} = 5.25$,	$V_I = 5.5$ V			1	mA
I_{IH}	$V_{CC} = 5.25$,	$V_I = 2.7$ V			25	μA
I_{IL}	$V_{CC} = 5.25$,	$V_I = 0.5$ V			−0.25	mA
I_{OS}‡	$V_{CC} = 5.25$		−20		−100	mA
I_{CC}	$V_{CC} = 5.25$			130	175	mA

switching characteristics over recommended ranges of T_A and V_{CC} (unless otherwise noted)

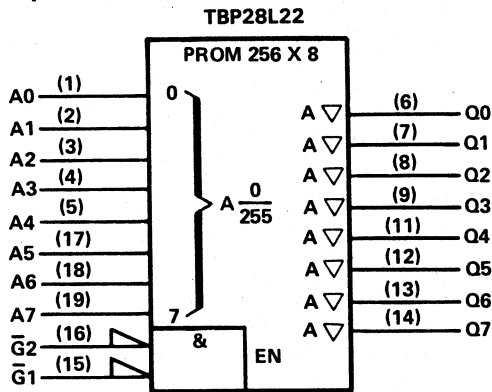| PARAMETER		TEST CONDITIONS	NW MIN	NW TYP†	NW MAX	UNIT
$t_{a(A)}$	Access time from address	$C_L = 30$ pF		35	75	ns
$t_{a(S)}$	Access time from chip select (enable time)	See Note 3		15	40	ns
t_{dis}	Disable time	$C_L = 5$ pF See Note 3		15	40	ns

†All typical values are at $V_{CC} = 5$ V, $T_A = 25°C$.
‡Not more than one output should be shorted at a time, and duration of the short circuit should not exceed one second.
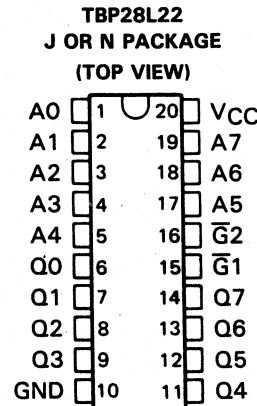NOTE 3: Load circuits and voltage waveforms are shown in Section 1.

TEXAS

logic symbol

TBP28L22

PROM 256 X 8

A0 (1)	0
A1 (2)	
A2 (3)	
A3 (4)	A▽ (6) Q0
A4 (17)	A▽ (7) Q1
A5 (18)	A $\frac{0}{255}$ A▽ (8) Q2
A6 (19)	A▽ (9) Q3
A7 (16)	A▽ (11) Q4
$\overline{G2}$ (16)	A▽ (12) Q5
$\overline{G1}$ (15)	7 A▽ (13) Q6
	& A▽ (14) Q7
	EN

pin assignment

TBP28L22
J OR N PACKAGE
(TOP VIEW)

A0	1 20	V_{CC}
A1	2 19	A7
A2	3 18	A6
A3	4 17	A5
A4	5 16	$\overline{G2}$
Q0	6 15	$\overline{G1}$
Q1	7 14	Q7
Q2	8 13	Q6
Q3	9 12	Q5
GND	10 11	Q4

recommended operating conditions

PARAMETER		MJ			J OR N			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V_{CC}	Supply voltage	4.5	5	5.5	4.75	5	5.25	V
V_{IH}	High-level input voltage	2			2			V
V_{IL}	Low-level input voltage			0.8			0.8	V
I_{OH}	High-level output current			−2			−6.5	mA
I_{OL}	Low-level output current			16			16	mA
T_A	Operating free-air temperature range	−55		125	0		70	°C

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS[†]		MJ			J OR N			UNIT
			MIN	TYP[‡]	MAX	MIN	TYP[‡]	MAX	
V_{IK}	V_{CC} = MIN,	I_I = −18 mA			−1.2			−1.2	V
V_{OH}	V_{CC} = MIN,	I_{OH} = MAX	2.4	3.1		2.4	3.1		V
V_{OL}	V_{CC} = MIN,	I_{OL} = 16 mA			0.5			0.5	V
I_{OZH}	V_{CC} = MAX,	V_O = 2.4 V			50			50	μA
I_{OZL}	V_{CC} = MAX,	V_O = 0.5 V			−50			−50	μA
I_I	V_{CC} = MAX,	V_I = 5.5 V			1			1	mA
I_{IH}	V_{CC} = MAX,	V_I = 2.7 V			25			25	μA
I_{IL}	V_{CC} = MAX,	V_I = 0.5 V			−0.25			−0.25	mA
I_{OS}[§]	V_{CC} = MAX		−25		−100	−30		−100	mA
I_{CC}	V_{CC} = MAX			75	100		75	100	mA

switching characteristics over recommended ranges of T_A and V_{CC} (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MJ			J OR N			UNIT
			MIN	TYP[‡]	MAX	MIN	TYP[‡]	MAX	
$t_{a(A)}$	Access time from address	C_L = 30 pF		45	75		45	70	ns
$t_{a(S)}$	Access time from chip select (enable time)	See Note 3		20	40		20	35	ns
t_{dis}	Disable time	C_L = 5 pF See Note 3		15	35		15	30	ns

[†]For conditions shown as MIN or MAX, use appropriate value specified under recommended operating conditions.
[‡]All typical values are at V_{CC} = 5 V, T_A = 25°C.
[§]Not more than one output should be shorted at a time, and duration of the short circuit should not exceed one second.
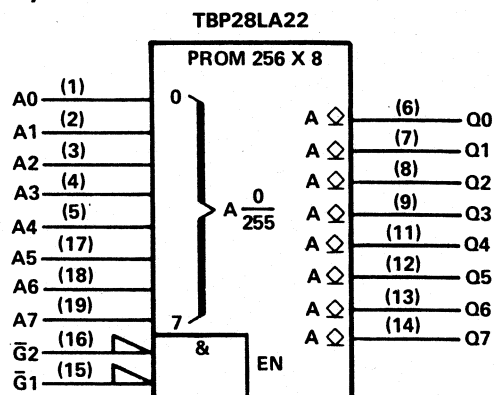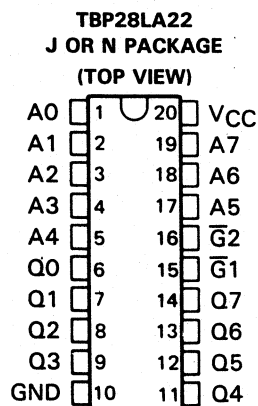NOTE 3: Load circuits and voltage waveforms are shown in Section 1.

4

PROMs

Texas

TBP28LA22
2048 BITS (256 WORDS BY 8 BITS)
LOW-POWER PROGRAMMABLE READ-ONLY MEMORIES WITH OPEN-COLLECTOR OUTPUTS

logic symbol

TBP28LA22

PROM 256 X 8

```
A0 —(1)—— 0           A ◇ —(6)—— Q0
A1 —(2)——             A ◇ —(7)—— Q1
A2 —(3)——             A ◇ —(8)—— Q2
A3 —(4)——    A  0     A ◇ —(9)—— Q3
A4 —(5)——      255    A ◇ —(11)— Q4
A5 —(17)—             A ◇ —(12)— Q5
A6 —(18)—             A ◇ —(13)— Q6
A7 —(19)— 7           A ◇ —(14)— Q7
G̅2 —(16)—  &      EN
G̅1 —(15)—
```

pin assignment

TBP28LA22
J OR N PACKAGE
(TOP VIEW)

```
 A0 [ 1    20 ] VCC
 A1 [ 2    19 ] A7
 A2 [ 3    18 ] A6
 A3 [ 4    17 ] A5
 A4 [ 5    16 ] G̅2
 Q0 [ 6    15 ] G̅1
 Q1 [ 7    14 ] Q7
 Q2 [ 8    13 ] Q6
 Q3 [ 9    12 ] Q5
GND [ 10   11 ] Q4
```

recommended operating conditions

PARAMETER		MJ			J OR N			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V_{CC}	Supply voltage	4.5	5	5.5	4.75	5	5.25	V
V_{IH}	High-level input voltage	2			2			V
V_{IL}	Low-level input voltage			0.8			0.8	V
V_{OH}	High-level output voltage			5.5			5.5	V
I_{OL}	Low-level output current			16			16	mA
T_A	Operating free-air temperature range	−55		125	0		70	°C

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS[†]		MJ			J OR N			UNIT
			MIN	TYP[‡]	MAX	MIN	TYP[‡]	MAX	
V_{IK}	V_{CC} = MIN,	I_I = −18 mA			−1.2			−1.2	V
I_{OH}	V_{CC} = MIN,	V_{OH} = 2.4 V			0.05			0.05	mA
		V_{OH} = 5.5 V			0.1			0.1	
V_{OL}	V_{CC} = MIN,	I_{OL} = 16 mA			0.5			0.5	V
I_I	V_{CC} = MAX,	V_I = 5.5 V			1			1	mA
I_{IH}	V_{CC} = MAX,	V_I = 2.7 V			25			25	μA
I_{IL}	V_{CC} = MAX,	V_I = 0.5 V			−0.25			−0.25	mA
I_{CC}	V_{CC} = MAX			75	100		75	100	mA

switching characteristics over recommended ranges of T_A and V_{CC} (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MJ			J OR N			UNIT
			MIN	TYP[‡]	MAX	MIN	TYP[‡]	MAX	
$t_{a(A)}$	Access time from address	C_L = 30 pF		40	80		45	75	ns
$t_{a(S)}$	Access time from chip select (enable time)	R_{L1} = 300 Ω		20	40		20	35	ns
t_{PLH}	Propagation delay time low-to-high-level output from chip select	R_{L2} = 600 Ω See Note 3		15	35		15	30	ns

[†]For conditions shown as MIN or MAX, use appropriate value specified under recommended operating conditions.
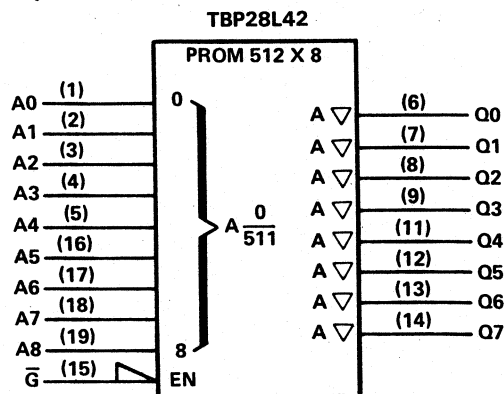[‡]All typical values are at V_{CC} = 5 V, T_A = 25°C.
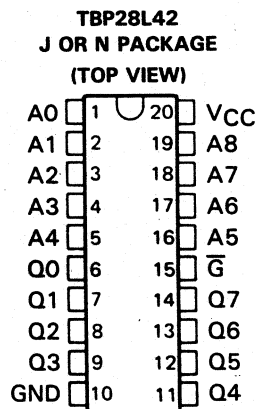NOTE 3: Load circuits and voltage waveforms are shown in Section 1.

logic symbol

TBP28L42

PROM 512 X 8

A0 — (1) — 0
A1 — (2)
A2 — (3)
A3 — (4)
A4 — (5)
A5 — (16) $A\frac{0}{511}$
A6 — (17)
A7 — (18)
A8 — (19)
$\overline{G}$ — (15) — EN
8

A ▽ — (6) — Q0
A ▽ — (7) — Q1
A ▽ — (8) — Q2
A ▽ — (9) — Q3
A ▽ — (11) — Q4
A ▽ — (12) — Q5
A ▽ — (13) — Q6
A ▽ — (14) — Q7

pin assignment

TBP28L42
J OR N PACKAGE
(TOP VIEW)

A0	1	20	V$_{CC}$
A1	2	19	A8
A2	3	18	A7
A3	4	17	A6
A4	5	16	A5
Q0	6	15	$\overline{G}$
Q1	7	14	Q7
Q2	8	13	Q6
Q3	9	12	Q5
GND	10	11	Q4

recommended operating conditions

PARAMETER		MJ			J OR N			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V$_{CC}$	Supply voltage	4.5	5	5.5	4.75	5	5.25	V
V$_{IH}$	High-level input voltage	2			2			V
V$_{IL}$	Low-level input voltage			0.8			0.8	V
I$_{OH}$	High-level output current			−1			−1.6	mA
I$_{OL}$	Low-level output current			8			8	mA
T$_A$	Operating free-air temperature range	−55		125	0		70	°C

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS[†]		MJ			J OR N			UNIT
			MIN	TYP[‡]	MAX	MIN	TYP[‡]	MAX	
V$_{IK}$	V$_{CC}$ = MIN,	I$_I$ = −18 mA			−1.2			−1.2	V
V$_{OH}$	V$_{CC}$ = MIN,	I$_{OH}$ = MAX	2.4	3.1		2.4	3.1		V
V$_{OL}$	V$_{CC}$ = MIN,	I$_{OL}$ = 8 mA			0.5			0.5	V
I$_{OZH}$	V$_{CC}$ = MAX,	V$_O$ = 2.4 V			50			50	µA
I$_{OZL}$	V$_{CC}$ = MAX,	V$_O$ = 0.5 V			−50			−50	µA
I$_I$	V$_{CC}$ = MAX,	V$_I$ = 5.5 V			1			1	mA
I$_{IH}$	V$_{CC}$ = MAX,	V$_I$ = 2.7 V			25			25	µA
I$_{IL}$	V$_{CC}$ = MAX,	V$_I$ = 0.5 V			−0.25			−0.25	mA
I$_{OS}$[§]	V$_{CC}$ = MAX		−10		−100	−10		−100	mA
I$_{CC}$	V$_{CC}$ = MAX			50	85		50	85	mA

switching characteristics over recommended ranges of T$_A$ and V$_{CC}$ (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MJ			J OR N			UNIT
			MIN	TYP[‡]	MAX	MIN	TYP[‡]	MAX	
t$_{a(A)}$	Access time from address	C$_L$ = 30 pF		55	110		55	95	ns
t$_{a(S)}$	Access time from chip select (enable time)	See Note 3		25	60		25	60	ns
t$_{dis}$	Disable time	C$_L$ = 5 pF See Note 3		25	50		25	40	ns

[†]For conditions shown as MIN or MAX, use appropriate value specified under recommended operating conditions.
[‡]All typical values are at V$_{CC}$ = 5 V, T$_A$ = 25°C.
[§]Not more than one output should be shorted at a time, and duration of the short circuit should not exceed one second.
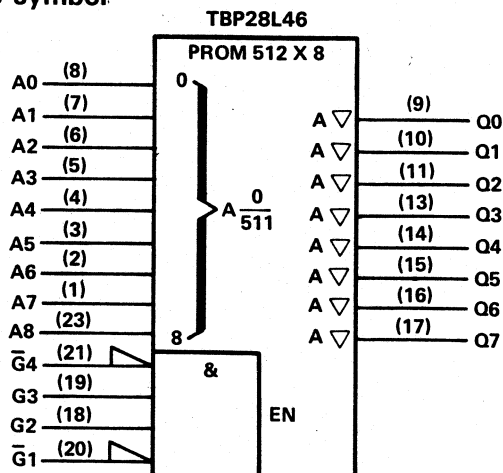NOTE 3: Load circuits and voltage waveforms are shown in Section 1.

4

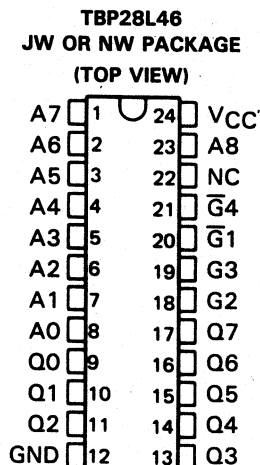**PROMs**

TEXAS

TBP28L46
4096 BITS (512 WORDS BY 8 BITS)
LOW-POWER PROGRAMMABLE READ-ONLY MEMORIES WITH 3-STATE OUTPUTS

logic symbol

TBP28L46
PROM 512 X 8

A0 (8)		
A1 (7)		(9) Q0
A2 (6)	A▽	(10) Q1
A3 (5)	A▽	(11) Q2
A4 (4)	A▽	(13) Q3
A5 (3)	A 0/511 ▽	(14) Q4
A6 (2)	A▽	(15) Q5
A7 (1)	A▽	(16) Q6
A8 (23)	A▽	(17) Q7
$\overline{G}4$ (21)	8	
G3 (19)	&	
G2 (18)		
$\overline{G}1$ (20)	EN	

pin assignment

TBP28L46
JW OR NW PACKAGE
(TOP VIEW)

A7	1		24	VCC
A6	2		23	A8
A5	3		22	NC
A4	4		21	$\overline{G}4$
A3	5		20	$\overline{G}1$
A2	6		19	G3
A1	7		18	G2
A0	8		17	Q7
Q0	9		16	Q6
Q1	10		15	Q5
Q2	11		14	Q4
GND	12		13	Q3

recommended operating conditions

PARAMETER		MJW			JW OR NW			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V_{CC}	Supply voltage	4.5	5	5.5	4.75	5	5.25	V
V_{IH}	High-level input voltage	2			2			V
V_{IL}	Low-level input voltage			0.8			0.8	V
I_{OH}	High-level output current			−1			−1.6	mA
I_{OL}	Low-level output current			8			8	mA
T_A	Operating free-air temperature range	−55		125	0		70	°C

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS[†]		MJW			JW OR NW			UNIT
			MIN	TYP[‡]	MAX	MIN	TYP[‡]	MAX	
V_{IK}	V_{CC} = MIN,	I_I = −18 mA			−1.2			−1.2	V
V_{OH}	V_{CC} = MIN,	I_{OH} = MAX	2.4	3.1		2.4	3.1		V
V_{OL}	V_{CC} = MIN,	I_{OL} = 8 mA			0.5			0.5	V
I_{OZH}	V_{CC} = MAX,	V_O = 2.4 V			50			50	μA
I_{OZL}	V_{CC} = MAX,	V_O = 0.5 V			−50			−50	μA
I_I	V_{CC} = MAX,	V_I = 5.5 V			1			1	mA
I_{IH}	V_{CC} = MAX,	V_I = 2.7 V			25			25	μA
I_{IL}	V_{CC} = MAX,	V_I = 0.5 V			−0.25			−0.25	mA
I_{OS}[§]	V_{CC} = MAX		−10		−100	−10		−100	mA
I_{CC}	V_{CC} = MAX			50	85		50	85	mA

switching characteristics over recommended ranges of T_A and V_{CC} (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MJW			JW OR NW			UNIT
			MIN	TYP[‡]	MAX	MIN	TYP[‡]	MAX	
$t_{a(A)}$	Access time from address	C_L = 30 pF		55	110		55	95	ns
$t_{a(S)}$	Access time from chip select (enable time)	See Note 3		25	60		25	60	ns
t_{dis}	Disable time	C_L = 5 pF See Note 3		25	50		25	40	ns

[†]For conditions shown as MIN or MAX, use appropriate value specified under recommended operating conditions.
[‡]All typical values are at V_{CC} = 5 V, T_A = 25°C.
[§]Not more than one output should be shorted at a time, and duration of the short circuit should not exceed one second.
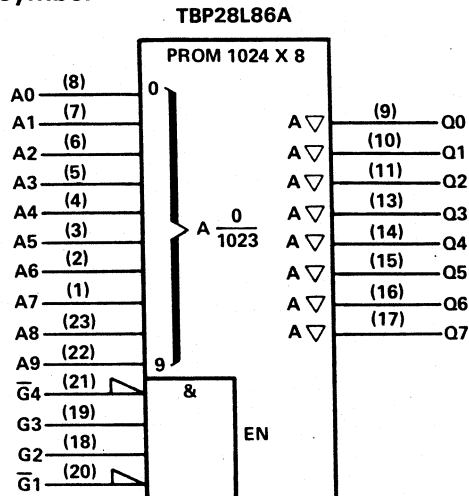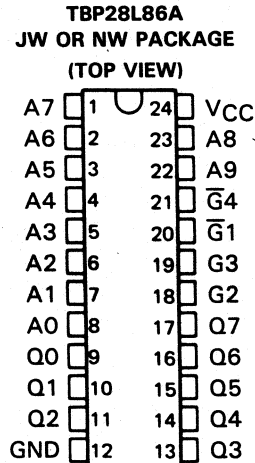NOTE 3: Load circuits and voltage waveforms are shown in Section 1.

TEXAS

logic symbol

TBP28L86A

```
        PROM 1024 X 8
A0 ──(8)──┐ 0
A1 ──(7)──┤         A▽ ──(9)──── Q0
A2 ──(6)──┤         A▽ ──(10)─── Q1
A3 ──(5)──┤         A▽ ──(11)─── Q2
A4 ──(4)──┤  A  0   A▽ ──(13)─── Q3
A5 ──(3)──┤  ──────  A▽ ──(14)─── Q4
A6 ──(2)──┤    1023 A▽ ──(15)─── Q5
A7 ──(1)──┤         A▽ ──(16)─── Q6
A8 ──(23)─┤         A▽ ──(17)─── Q7
A9 ──(22)─┘ 9
G̅4 ──(21)──▷┐ &
G3 ──(19)──┤
G2 ──(18)──┤    EN
G̅1 ──(20)──▷┘
```

pin assignment

TBP28L86A
JW OR NW PACKAGE
(TOP VIEW)

```
    A7 [ 1      24 ] VCC
    A6 [ 2      23 ] A8
    A5 [ 3      22 ] A9
    A4 [ 4      21 ] G̅4
    A3 [ 5      20 ] G̅1
    A2 [ 6      19 ] G3
    A1 [ 7      18 ] G2
    A0 [ 8      17 ] Q7
    Q0 [ 9      16 ] Q6
    Q1 [ 10     15 ] Q5
    Q2 [ 11     14 ] Q4
   GND [ 12     13 ] Q3
```

recommended operating conditions

	PARAMETER	MJW			JW OR NW			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V_{CC}	Supply voltage	4.5	5	5.5	4.75	5	5.25	V
V_{IH}	High-level input voltage	2			2			V
V_{IL}	Low-level input voltage			0.8			0.8	V
I_{OH}	High-level output current			−1			−1.6	mA
I_{OL}	Low-level output current			8			8	mA
T_A	Operating free-air temperature range	−55		125	0		70	°C

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS[†]		MJW			JW OR NW			UNIT
			MIN	TYP[‡]	MAX	MIN	TYP[‡]	MAX	
V_{IK}	V_{CC} = MIN,	I_I = −18 mA			−1.2			−1.2	V
V_{OH}	V_{CC} = MIN,	I_{OH} = MAX	2.4	3.1		2.4	3.1		V
V_{OL}	V_{CC} = MIN,	I_{OL} = 8 mA			0.5			0.5	V
I_{OZH}	V_{CC} = MAX,	V_O = 2.4 V			50			50	µA
I_{OZL}	V_{CC} = MAX,	V_O = 0.5 V			−50			−50	µA
I_I	V_{CC} = MAX,	V_I = 5.5 V			1			1	mA
I_{IH}	V_{CC} = MAX,	V_I = 2.7 V			25			25	µA
I_{IL}	V_{CC} = MAX,	V_I = 0.5 V			−0.25			−0.25	mA
I_{OS}[§]	V_{CC} = MAX		−10		−100	−10		−100	mA
I_{CC}	V_{CC} = MAX			55	95		55	80	mA

switching characteristics over recommended ranges of T_A and V_{CC} (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MJW			JW OR NW			UNIT
			MIN	TYP[‡]	MAX	MIN	TYP[‡]	MAX	
$t_{a(A)}$	Access time from address	C_L = 30 pF See Note 3		65	200		65	110	ns
$t_{a(S)}$	Access time from chip select (enable time)			40	125		40	80	ns
t_{dis}	Disable time	C_L = 5 pF See Note 3		25	100		25	60	ns

[†]For conditions shown as MIN or MAX, use appropriate value specified under recommended operating conditions.
[‡]All typical values are at V_{CC} = 5 V, T_A = 25°C.
[§]Not more than one output should be shorted at a time, and duration of the short circuit should not exceed one second.
NOTE 3: Load circuits and voltage waveforms are shown in Section 1.
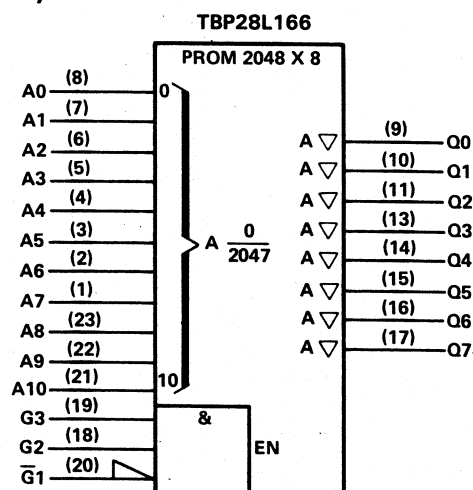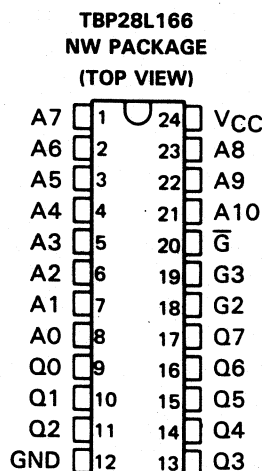
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PROMS

TEXAS INSTRUMENTS

TBP28L166
16,384 BITS (2084 WORDS BY 8 BITS)
LOW-POWER PROGRAMMABLE READ-ONLY MEMORIES WITH 3-STATE OUTPUTS

logic symbol

TBP28L166

PROM 2048 X 8

```
A0  (8)  0
A1  (7)
A2  (6)          A ▽  (9)   Q0
A3  (5)          A ▽  (10)  Q1
A4  (4)          A ▽  (11)  Q2
A5  (3)     0    A ▽  (13)  Q3
A6  (2)   A──── A ▽  (14)  Q4
A7  (1)   2047   A ▽  (15)  Q5
A8  (23)         A ▽  (16)  Q6
A9  (22)         A ▽  (17)  Q7
A10 (21) 10
G3  (19)
G2  (18)    &
G̅1  (20)         EN
```

pin assignment

TBP28L166
NW PACKAGE
(TOP VIEW)

```
A7  ┌1  ∪ 24┐ VCC
A6  □2    23□ A8
A5  □3    22□ A9
A4  □4    21□ A10
A3  □5    20□ G̅
A2  □6    19□ G3
A1  □7    18□ G2
A0  □8    17□ Q7
Q0  □9    16□ Q6
Q1  □10   15□ Q5
Q2  □11   14□ Q4
GND □12   13□ Q3
```

recommended operating conditions

PARAMETER		NW			UNIT
		MIN	NOM	MAX	
V_{CC}	Supply voltage	4.75	5	5.25	V
V_{IH}	High-level input voltage	2			V
V_{IL}	Low-level input voltage			0.8	V
I_{OH}	High-level output current			−1.6	mA
I_{OL}	Low-level output current			8	mA
T_A	Operating free-air temperature range	0		70	°C

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS		NW			UNIT
			MIN	TYP[†]	MAX	
V_{IK}	V_{CC} = 4.75,	I_I = −18 mA			−1.2	V
V_{OH}	V_{CC} = 4.75,	I_{OH} = −1.6 mA	2.4	3.1		V
V_{OL}	V_{CC} = 4.75,	I_{OL} = 8 mA			0.5	V
I_{OZH}	V_{CC} = 5.25,	V_O = 2.4 V			50	μA
I_{OZL}	V_{CC} = 5.25,	V_O = 0.5 V			−50	μA
I_I	V_{CC} = 5.25,	V_I = 5.5 V			1	mA
I_{IH}	V_{CC} = 5.25,	V_I = 2.7 V			25	μA
I_{IL}	V_{CC} = 5.25,	V_I = 0.5 V			−0.25	mA
I_{OS}[‡]	V_{CC} = 5.25		−10		−100	mA
I_{CC}	V_{CC} = 5.25			75	110	mA

switching characteristics over recommended ranges of T_A and V_{CC} (unless otherwise noted)

PARAMETER		TEST CONDITIONS	NW			UNIT
			MIN	TYP[†]	MAX	
$t_{a(A)}$	Access time from address	C_L = 30 pF		80	125	ns
$t_{a(S)}$	Access time from chip select (enable time)	See Note 3		40	65	ns
t_{dis}	Disable time	C_L = 5 pF See Note 3		30	65	ns

[†]All typical values are at V_{CC} = 5 V, T_A = 25°C.
[‡]Not more than one output should be shorted at a time, and duration of the short circuit should not exceed one second.
NOTE 3: Load circuits and voltage waveforms are shown in Section 1.

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PROMs

TEXAS

recommended operating conditions for programming (see Figure 1)

|		MIN	NOM	MAX	UNIT
Steady-state supply voltage	V_{CC}	4.75	5	5.25	V
Input voltage	V_{IH}	3	4	5	V
	V_{IL}	0	0	0.5	
Voltage at all outputs except the one to be programmed		0	0	0.5	V
Supply voltage level to program a bit	$V_{CC(pr)}$	5.75	6	6.25	V
Select or enable level to program a bit	$V_{S(pr)}$	9.75	10	11	V
Output level during interval t_5	$V_{O(pr)}$	15.75	16	16.25	V
Supply voltage during verification (see step 14)	Low	4.4	4.5	4.6	V
	High	5.4	5.5	5.6	
Time from V_{CC} to settle and to verify need to program	t_1	0	5	10	μs
Time from $V_{CC} = 6$ V until chip select (enable) is at 10 V	t_2	5	5	10	μs
Time from chip select (enable) high to start of program ramp	t_3	0.1	5	10	μs
Ramp time, output program pulse	t_4	10	15	20	μs
Duration of output program pulse	t_5	15	20	20	μs
Time from end of program pulse to chip select (enable) low	t_6	5	5	10	μs
Time from chip select (enable) $V_{CC} = 0$ V	t_7	0.1	5	5	μs
Time for cooling between bits	t_8	30	50	100	μs
Time for cooling between words	t_9	30	50		μs
Free-air temperature	T_A	20	25	30	°C

step-by-step programming instruction (see Figure 1)

1. Address the word to be programmed, apply 5 volts to V_{CC} and active levels to all chip select (S and $\bar{S}$) or chip enable (E and $\bar{E}$) inputs.

2. Verify the status of a bit location by checking the output level.

3. Decreass V_{CC} to 0 volts.

4. For bit locations that do not require programming, skip steps 5 through 11.

5. Increase V_{CC} to $V_{CC(pr)}$ with a minimum current capability of 250 milliamperes.

6. Apply $V_{S(pr)}$ to all the $\bar{S}$, $\bar{E}$ or $\bar{G}$ inputs. $I_I \leq 25$ milliamperes. Active-high enables may be left high.

7. Connect all outputs, except the one to be programmed, to V_{IL}. Only one bit is to be programmed at a time.

8. Apply the output programming pulse for 20 microseconds. Minimum current capability of the programming supply should be 250 milliamperes.

9. After terminating the output pulse, disconnect all outputs from V_{IL} conditions.

10. Reduce the voltage at $\bar{S}$, $\bar{E}$, or $\bar{G}$ inputs to V_{II}.

11. Decrease V_{CC} to 0 volts.

12. Return to step 4 until all outputs in the word have been programmed.

13. Repeat steps 2 through 11 for each word in memory.

14. Verify programming of every word after all words have been programmed using V_{CC} values of 4.5 and 5.5 volts.

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PROMs
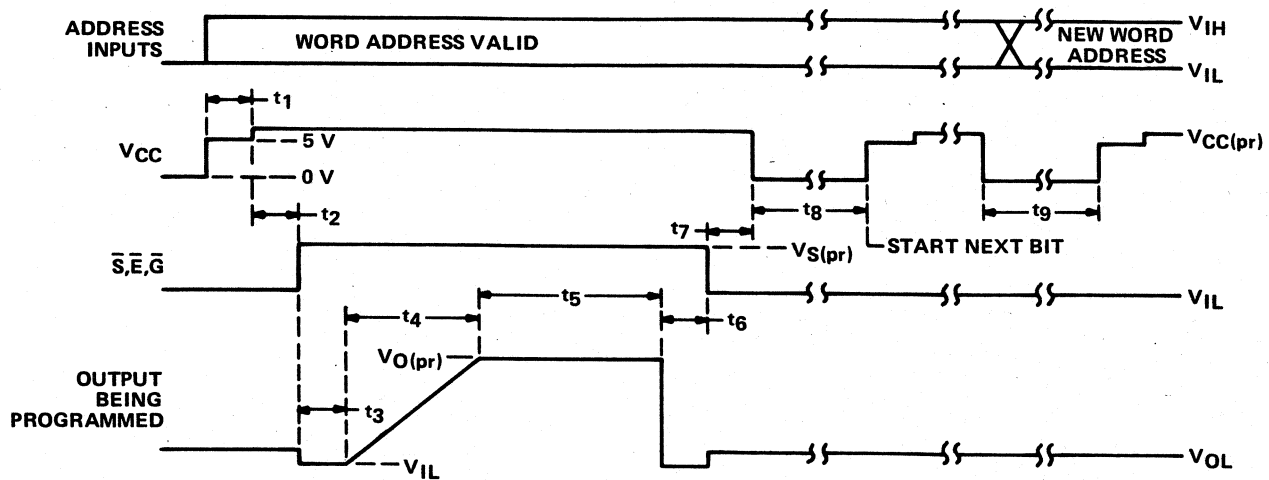
NOTE 4: Rise and fall times should be ≤ 1 μs.

FIGURE 1. TIMING DIAGRAM AND VOLTAGE WAVEFORMS FOR PROGRAMMING SEQUENCE

TEXAS

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