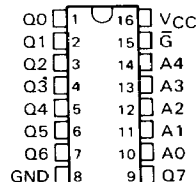


- Titanium-Tungsten (Ti-W) Fuse Link for Reliable Low-Voltage Full Family Compatible Programming
- Full Decoding and Fast Chip Select Simplify System Design
- P-N-P Inputs for Reduced Loading on System Buffers/Drivers
- Applications Include:  
 Microprogramming/Firmware Loaders  
 Code Converters/Character Generators  
 Translators/Emulators  
 Address Mapping/Look-Up Tables
- Choice of 3-State or Open-Collector Outputs

TBP18SA030, TBP18S030 . . . J OR N PACKAGE  
 (TOP VIEW)



### description

These monolithic TTL programmable read-only memories (PROMs) feature titanium-tungsten (Ti-W) fuse links with each link designed to program in 20 microseconds. The Schottky-clamped versions of these PROMs offer considerable flexibility for upgrading existing designs or improving new designs as they feature full Schottky clamping for improved performance, low-current MOS-compatible p-n-p inputs, choice of bus-driving three-state or open-collector outputs, and improved chip-select access times.

Data can be electronically programmed, as desired, at any bit location in accordance with the programming procedure specified. All PROMs are supplied with a low-logic level output condition stored at each bit location. The programming procedure open-circuits Ti-W metal links, which reverses the stored logic level at selected locations. 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.

A low level at the chip-select input(s) enables each PROM. The opposite level at any chip-select input causes the outputs to be off.

The three-state output offers the convenience of an open-collector with the speed of a totem-pole output; it can be bus-connected to other similar outputs yet it retains the fast rise time characteristic of the TTL totem-pole output. The open-collector output offers the capability of direct interface with a data line having a passive pull up.

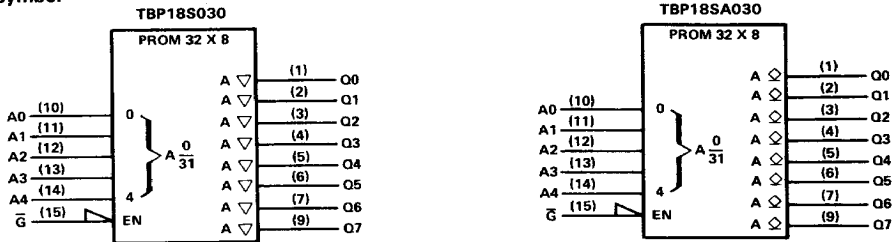
A MJ suffix designates full-temperature circuits (formerly 54 Family) and are characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . A J or N suffix designates commercial-temperature circuits (formerly 74 Family) and are characterized for operation from  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ .

**4**

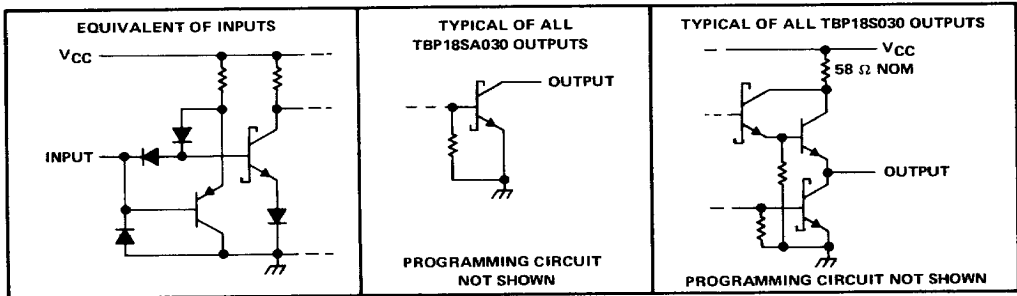
**PROMs**

**TBP18S030, TBP18SA030**  
**256 BITS (32 WORDS BY 8 BITS)**  
**PROGRAMMABLE READ-ONLY MEMORIES**

logic symbol



schematics of inputs and outputs



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

Supply voltage (see Note 1)	7V
Input voltage	5.5V
Off-state output voltage	5.5V
Operating free-air temperature range: Full-temperature-range circuits	-55°C to 125°C
Commercial-temperature-range circuits	0°C to 70°C
Storage temperature range	-65°C to 150°C

recommended conditions for programming TBP18S', TBP18SA PROMs

		MIN	NOM	MAX	UNIT
Supply voltage, V <sub>CC</sub> (see Note 1)	Steady state	4.75	5	5.25	V
	Program pulse	9	9.25	9.5	
Input voltage	High level, V <sub>IH</sub>	2.4		5	V
	Low level, V <sub>IL</sub>	0		0.5	
Termination of all outputs except the one to be programmed		See load circuit (Figure 1)			
Voltage applied to output to be programmed, V <sub>O(pr)</sub> (see Note 2)		0	0.25	0.3	V
Duration of V <sub>CC</sub> programming pulse X (see Figure 2 and Note 3)		15	25	100	μs
Programming duty cycle for Y pulse			25	35	%
Free-air temperature		20	25	30	°C

- NOTES: 1. Voltage values are with respect to network ground terminal. The supply voltage rating does not apply during programming.
2. The TBP18S030, TBP18SA030 are supplied with all bit locations containing a low logic level, and programming a bit changes the output of the bit to high logic level.
3. Programming is guaranteed if the pulse applied is 98 μs in duration.

### programming procedure

1. Apply steady-state supply voltage ( $V_{CC} = 5\text{ V}$ ) and address the word to be programmed.
2. Verify that the bit location needs to be programmed. If not, proceed to the next bit.
3. If the bit requires programming, disable the outputs by applying a high-logic level voltage to the chip-select input(s).
4. Only one bit location is programmed at a time. Connect each output not being programmed to 5 V through 3.9 k $\Omega$  and apply the voltage specified in the table to the output to be programmed. Maximum current into the programmer output is 150 mA.
5. Step  $V_{CC}$  to 9.25 nominal. Maximum supply current required during programming is 750 mA.
6. Apply a low-logic-level voltage to the chip-select input(s). This should occur between 1  $\mu\text{s}$  and 1 ms after  $V_{CC}$  has reached its 9.25 level. See programming sequence of Figure 2.
7. After the X pulse time is reached, a high logic level is applied to the chip-select inputs to disable the outputs.
8. Within the range of 1  $\mu\text{s}$  to 1 ms after the chip-select input(s) reach a high logic level,  $V_{CC}$  should be stepped down to 5 V at which level verification can be accomplished.
9. The chip-select input(s) may be taken to a low logic level (to permit program verification) 1  $\mu\text{s}$  or more after  $V_{CC}$  reaches its steady-state value of 5 V.
10. At a Y pulse duty cycle of 35% or less, repeat steps 1 through 8 for each output where it is desired to program a bit.
11. Verify accurate programming of every word after all words have been programmed using  $V_{CC}$  values of 4.5 and 5.5 volts.

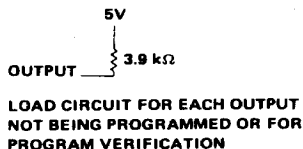
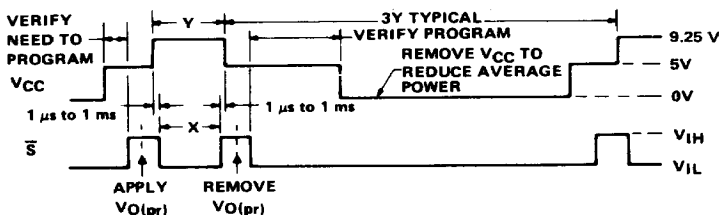


FIGURE 1 – LOAD CIRCUIT



4

PROMS

**TBP18S030**  
**256 BITS (32 WORDS BY 8 BITS)**  
**PROGRAMMABLE READ-ONLY MEMORIES WITH 3-STATE OUTPUTS**

recommended operating conditions (see Note 4)

PARAMETER		TBP18S030			UNIT
		MIN	NOM	MAX	
Supply voltage, $V_{CC}$	MJ	4.5	5	5.5	V
	J, N	4.75	5	5.25	
High-level output current, $I_{OH}$	MJ			-2	mA
	J, N			-6.5	
Low-level output current, $I_{OL}$	MJ			20	mA
	J, N			20	
Operating free-air temperature, $T_A$	MJ	-55		125	°C
	J, N	0		70	

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)  
(see Note 4)

PARAMETER		FULL TEMP (MJ)			COMM. TEMP (J, N)			UNIT
		MIN	TYP <sup>‡</sup>	MAX	MIN	TYP <sup>‡</sup>	MAX	
$V_{IH}$	High-level input voltage	2			2			V
$V_{IL}$	Low-level input voltage			0.8			0.8	V
$V_{IK}$	Input clamp voltage			-1.2			-1.2	V
$V_{OH}$	High-level output voltage	$V_{CC} = \text{MIN},$ $V_{IL} = 0.8\text{V},$ $I_{OH} = \text{MAX}$	2.4	3.4	$V_{CC} = \text{MIN},$ $V_{IL} = 0.8\text{V},$ $I_{OH} = \text{MAX}$	2.4	3.2	V
$V_{OL}$	Low-level output voltage	$V_{CC} = \text{MIN},$ $V_{IL} = 0.8\text{V},$ $I_{OL} = \text{MAX}$		0.5	$V_{CC} = \text{MIN},$ $V_{IL} = 0.8\text{V},$ $I_{OL} = \text{MAX}$		0.5	V
$I_{OZH}$	Off-state output current, high-level voltage applied	$V_{CC} = \text{MAX},$ $V_{IH} = 2\text{V},$ $V_O = 2.4\text{V}$		50	$V_{CC} = \text{MAX},$ $V_{IH} = 2\text{V},$ $V_O = 2.4\text{V}$		50	µA
$I_{OZL}$	Off-state output current, low-level voltage applied	$V_{CC} = \text{MAX},$ $V_{IH} = 2\text{V},$ $V_O = 0.5\text{V}$		-50	$V_{CC} = \text{MAX},$ $V_{IH} = 2\text{V},$ $V_O = 0.5\text{V}$		-50	µA
$I_I$	Input current at maximum input voltage	$V_{CC} = \text{MAX},$ $V_I = 5.5\text{V}$		1	$V_{CC} = \text{MAX},$ $V_I = 5.5\text{V}$		1	mA
$I_{IH}$	High-level input current	$V_{CC} = \text{MAX},$ $V_I = 2.7\text{V}$		25	$V_{CC} = \text{MAX},$ $V_I = 2.7\text{V}$		25	µA
$I_{IL}$	Low-level input current	$V_{CC} = \text{MAX},$ $V_I = 0.5\text{V}$		-0.25	$V_{CC} = \text{MAX},$ $V_I = 0.5\text{V}$		-0.25	mA
$I_{OS}$	Short-circuit output current <sup>§</sup>	$V_{CC} = \text{MAX},$ Outputs open, See Note 5	-30	-100	$V_{CC} = \text{MAX},$ Outputs open, See Note 5	-30	-100	mA
$I_{CC}$	Supply current	$V_{CC} = \text{MAX},$ Chip select(s) at 0 V, Outputs open, See Note 5	80	110	$V_{CC} = \text{MAX},$ Chip select(s) at 0 V, Outputs open, See Note 5	80	110	mA

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

TYPE	TEST CONDITIONS	$t_a(A)$ ACCESS TIME FROM ADDRESS			$t_a(S)$ ACCESS TIME FROM CHIP SELECT (ENABLE TIME)			$t_{dis}$ DISABLE TIME FROM HIGH OR LOW LEVEL			UNIT
		MIN	TYP <sup>‡</sup>	MAX	MIN	TYP <sup>‡</sup>	MAX	MIN	TYP <sup>‡</sup>	MAX	
TBP18S030MJ	$C_L = 30\text{ pF}$ for $t_a(A)$ and $t_a(S)$ , 5 pF for $t_{dis}$ , See Note 6	25		50	12		30	8		30	ns
TBP18S030		25		40	12		25	8		20	ns

<sup>‡</sup>For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

<sup>‡</sup>All typical values are at  $V_{CC} = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$ .

<sup>§</sup>Not more than one output should be shorted at a time and duration of the short circuit should not exceed one second.

NOTES: 4. MJ designates full-temperature circuits (formerly 54 Family), J and N designate commercial-temperature circuits (formerly 74 Family).

5. The typical values of  $I_{CC}$  are with all outputs low.

6. Load circuits and voltage waveforms are shown in Section 1.

**TBP18SA030**  
**256 BITS (32 WORDS BY 8 BITS)**  
**PROGRAMMABLE READ-ONLY MEMORIES WITH OPEN-COLLECTOR OUTPUTS**

recommended operating conditions (see Note 4)

PARAMETER		TBP18SA030			UNIT
		MIN	NOM	MAX	
Supply voltage, $V_{CC}$	MJ	4.5	5	5.5	V
	J, N	4.75	5	5.25	
High-level output voltage, $V_{OH}$				5.5	V
Low-level output current, $I_{OL}$				20	mA
Operating free-air temperature, $T_A$	MJ	-55		125	°C
	J, N	0		70	

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

PARAMETER	TEST CONDITIONS†	MIN	TYP‡	MAX	UNIT
$V_{IH}$ High-level input voltage		2			V
$V_{IL}$ Low-level input voltage				0.8	V
$V_{IK}$ Input clamp voltage	$V_{CC} = \text{MIN.}$ , $I_I = -18\text{mA}$			-1.2	V
$I_{OH}$ High-level output current	$V_{CC} = \text{MIN.}$ , $V_{IH} = 2\text{ V}$ , $V_{IL} = 0.8\text{ V}$			50	$\mu\text{A}$
	$V_{OH} = 2.4\text{ V}$ , $V_{OH} = 5.5\text{ V}$			100	
$V_{OL}$ Low-level output voltage	$V_{CC} = \text{MIN.}$ , $V_{IH} = 2\text{ V}$ , $V_{IL} = 0.8\text{ V}$ , $I_{OL} = \text{MAX}$			0.5	V
$I_I$ Input current at maximum input voltage	$V_{CC} = \text{MAX.}$ , $V_I = 5.5\text{ V}$			1	mA
$I_{IH}$ High-level input current	$V_{CC} = \text{MAX.}$ , $V_I = 2.7\text{ V}$			25	$\mu\text{A}$
$I_{IL}$ Low-level input current	$V_{CC} = \text{MAX.}$ , $V_I = 0.5\text{ V}$			-0.25	mA
$I_{CC}$ Supply current	$V_{CC} = \text{MAX.}$ , Chip select(s) at 0 V, Outputs open, See Note 5		80	110	mA

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

TYPE	TEST CONDITIONS	$t(A)$ ACCESS TIME FROM ADDRESS			$t_a(S)$ ACCESS TIME FROM CHIP SELECT (ENABLE TIME)			$t_{PLH}$ PROPAGATION DELAY TIME, LOW-TO-HIGH-LEVEL OUTPUT FROM CHIP SELECT (DISABLE TIME)			UNIT
		MIN	TYP‡	MAX	MIN	TYP‡	MAX	MIN	TYP‡	MAX	
TBP18SA030MJ	$C_L = 30\text{pF}$ , $R_{L1} = 300\ \Omega$ ,		25	50		12	30		12	30	ns
TBP18SA030	$R_{L2} = 600\ \Omega$ , See Note 6		25	40		12	25		12	25	ns

†For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

‡All typical values are at  $V_{CC} = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$ .

NOTES: 4. MJ designates full-temperature circuits (formerly 54 Family), J and N designate commercial-temperature circuits (formerly 74 Family).

5. The typical values of  $I_{CC}$  are with all outputs low.

6. Load circuits and voltage waveforms are shown in Section 1.

4

PROMs