

DM54/74S188 (32 x 8) 256-Bit TTL PROM

General Description

This Schottky memory is organized in the popular 32 words by 8 bits configuration. A memory enable input is provided to control the output states. When the device is enabled, the outputs represent the contents of the selected word. When disabled, the 8 outputs go to the "OFF" or high impedance state.

PROMs are shipped from the factory with lows in all locations. A high may be programmed into any selected location by following the programming instructions.

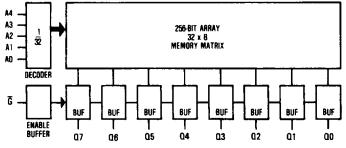
Features

- Advanced titanium-tungsten (Ti-W) fuses
- Schottky-clamped for high speed Address access down to-25 ns max Enable access-20 ns max Enable recovery-20 ns max
- PNP inputs for reduced input loading
- All DC and AC parameters guaranteed over temperature

A0-A4

- Low voltage TRI-SAFE™ programming
- Open-collector outputs

Block Diagram



Output Enabl
O

Addresses

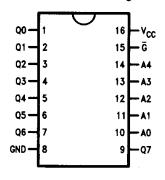
Output Enable
Ground
Outputs
Power Supply

Pin Names

TL/D/9187-1

Connection Diagrams

Dual-In-Line Package

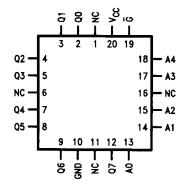


TL/D/9187-2

Order Number DM54/74S188J, 188AJ, DM74S188N or 188AN See NS Package Number J16A or N16A

Top View

Plastic Leaded Chip Carrier (PLCC)



TL/D/9187-3

Top View
Order Number DM74S188V or 188AV
See NS Package Number V20A

Ordering Information

Commercial Temp Range (0°C to +70°C)

Parameter/Order Number	Max Access Time (ns)
DM74S188N	35
DM74S188J	35
DM74S188V	35
DM74S188AN	25
DM74S188AJ	25
DM74S188AV	25

Military Temp Range (-55°C to +125°C)

Parameter/Order Number	Max Access Time (ns)
DM54S188J	45
DM54S188AJ	35

Absolute Maximun Ratings (Note 1)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Supply Voltage (Note 2)	-0.5V to $+7.0V$
Input Voltage (Note 2)	-1.2V to $+5.5V$
Output Voltage (Note 2)	-0.5V to $+5.5V$
Storage Temperature	-65°C to +150°C
Lead Temp. (Soldering, 10 seconds)	300°C
ESD to be determined	

, po. a	Min	Max	Units
Supply Voltage (V _{CC})			
Military	4.50	5.50	٧
Commercial	4.75	5.25	٧
Ambient Temperature (T _A)			
Military	-55	+ 125	°C
Commercial	0	+70	°C
Logical "0" Input Voltage	0	0.8	٧

2.0

5.5

Operating Conditions

Logical "1" Input Voltage

DC Electrical Characteristics (Note 3)

Symbol	Parameter	Conditions		DM54S188			DM74S188		
Зушьог	raiailletei			Тур	Max	Min	Тур	Max	Units
I _{IL}	Input Load Current	$V_{CC} = Max, V_{IN} = 0.45V$		-80	-250		-80	-250	μΑ
liH	Input Leakage Current	$V_{CC} = Max, V_{IN} = 2.7V$			25			25	μΑ
		$V_{CC} = Max, V_{IN} = 5.5V$			1.0			1.0	mA
V _{OL}	Low Level Output Voltage	V _{CC} = Min, I _{OL} = 16 mA		0.35	0.50		0.35	0.45	v
V _{IL} (Note 4)	Low Level Input Voltage				0.80			0.80	٧
V _{IH} (Note 4)	High Level Input Voltage		2.0			2.0			٧
loz	Output Leakage Current	V _{CC} = Max, V _{CEX} = 2.4V			50			50	μΑ
	(Open-Collector Only)	V _{CC} = Max, V _{CEX} = 5.5V			100			100	μА
V _C	Input Clamp Voltage	$V_{CC} = Min, I_{IN} = -18 \text{ mA}$		-0.8	-1.2		-0.8	-1.2	V
Cl	Input Capacitance	$V_{CC} = 5.0V, V_{IN} = 2.0V$ $T_A = 25^{\circ}C, 1 \text{ MHz}$		4.0			4.0		pF
Co	Output Capacitance	$V_{CC} = 5.0V$, $V_{O} = 2.0V$ $T_{A} = 25^{\circ}$ C, 1 MHz, Outputs Off		6.0			6.0		pF
lcc	Power Supply Current	V _{CC} = Max, Input Grounded All Outputs Open		70	110		70	110	mA

Note 1: Absolute Maximum Ratings are those values beyond which the device may be permanently damaged. They do not mean that the device may be operated at these values.

AC Electrical Characteristics with Standard Load and Operating Conditions

COMMERCIAL TEMP RANGE (0°C to +70°C)

Symbol JEDEC Symbol	Parameter	Parameter DM74S188			Units				
	raiametei	Min	Тур	Max	Min	Тур	Max		
TAA	TAVQV	Address Access Time		22	35		17	25	ns
TEA	TEVQV	Enable Access Time		15	20	-	15	20	ns
TER	TEXQX	Enable Recovery Time		15	25		15	20	ns
TZX	TEVQX	Output Enable Time		15	20		15	20	ns
TXZ	TEXQZ	Output Disable Time		15	25		15	20	ns

Note 2: These limits do not apply during programming. For the programming ratings, refer to the programming instructions.

Note 3: These limits apply over the entire operating range unless stated otherwise. All typical values are for V_{CC} = 5.0V and T_A = 25°C.

Note 4: These are absolute voltages with respect to pin 8 on the device and include all overshoots due to system and/or tester noise. Do not attempt to test these values without suitable equipment.

MILITARY TEMP RANGE (-55°C to +125°C)

Symbol JEDEC Symbol		JEDEC Parameter	DM54S188			DM54S188A			Units
	raiailletei	Min	Тур	Max	Min	Тур	Max	Units	
TAA	TAVQV	Address Access Time		22	45		17	35	ns
TEA	TEVQV	Enable Access Time		15	30		15	30	ns
TER	TEXQX	Enable Recovery Time		15	35		15	30	ns
TZX	TEVQX	Output Enable Time		15	30		15	30	ns
TXZ	TEXQZ	Output Disable Time		15	35		15	30	ns

Functional Description

TESTABILITY

The Schottky PROM die includes extra rows and columns of fusable links for testing the programmability of each chip. These test fuses are placed at the worst-case chip locations to provide the highest possible confidence in the programming tests in the final product. A ROM pattern is also permanently fixed in the additional circuitry and coded to provide a parity check of input address levels. These and other test circuits are used to test for correct operation of the row and column-select circuits and functionality of input and enable gates. All test circuits are available at both wafer and assembled device levels to allow 100% functional and parametric testing at every stage of the test flow.

RELIABILITY

As with all National products, the Ti-W PROMs are subjected to an on-going reliability evaluation by the Reliability Assurance Department. These evaluations employ accelerated life tests, including dynamic high-temperature operating life, temperature-humidity life, temperature cycling, and thermal shock. To date, nearly 7.4 million Schottky Ti-W PROM device hours have been logged, with samples in Epoxy B molded DIP (N-package), PLCC (V-package) and CERDIP (J-package). Device performance in all package configurations is excellent.

TITANIUM-TUNGSTEN FUSES

National's Programmable Read-Only Memories (PROMs) feature titanium-tungsten (Ti-W) fuse links designed to program efficiently with only 10.5V applied. The high performance and reliability of these PROMs are the result of fabrication by a Schottky bipolar process, of which the titanium-tungsten metallization is an integral part, and the use of an on-chip programming circuit.

A major advantage of the titanium-tungsten fuse technology is the low programming voltage of the fuse links. At 10.5V, this virtually eliminates the need for guard-ring devices and wide spacings required for other fuse technologies. Care is taken, however, to minimize voltage drops across the die and to reduce parasitics. The device is designed to ensure that worst-case fuse operating current is low enough for reliable long-term operation. The Darlington programming circuit is liberally designed to insure adequate power density for blowing the fuse links. The complete circuit design is optimized to provide high performance over the entire operating ranges of $V_{\rm CC}$ and temperature.