National Semiconductor

DM54/74S387
(256 x 4) 1024-Bit TTL PROM

General Description

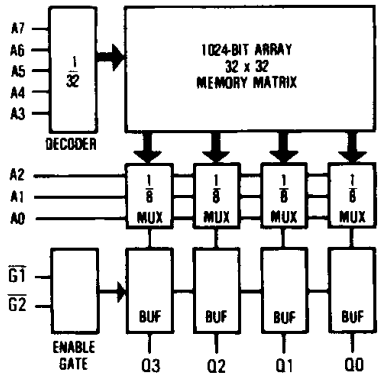
This Schottky memory is organized in the popular 256 words by 4 bits configuration. Memory enable inputs are provided to control the output states. When the device is enabled, the outputs represent the contents of the selected word. When disabled, the 4 outputs go to the "OFF" or high impedance state.

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 30 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
- Low voltage TRI-SAFE™ programming
- Open-collector outputs

Block Diagram



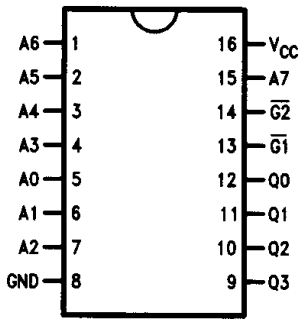
TL/D/9188–1

Pin Names

A0–A7	Addresses
$\overline{G1}$–$\overline{G2}$	Output Enables
GND	Ground
Q0–Q3	Outputs
V_{CC}	Power Supply

Connection Diagrams

Dual-In-Line Package

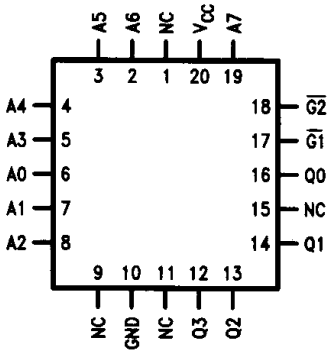


TL/D/9188–2

Top View

Order Number DM54/74S387J, 387AJ, DM74S387N, 387AN
See NS Package Number J16A or N16A

Plastic Leaded Chip Carrier (PLCC)



TL/D/9188–3

Top View

Order Number DM74S387V, 387AV
See NS Package Number V20A

Ordering Information

Commercial Temp Range (0°C to +70°C)

Parameter/Order Number	Max Access Time (ns)
DM74S387AJ	30
DM74S387J	50
DM74S387AN	30
DM74S387N	50
DM74S387AV	30
DM74S387V	50

Military Temp Range (−55°C to +125°C)

Parameter/Order Number	Max Access Time (ns)
DM54S387AJ	40
DM54S387J	60

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Absolute Maximum 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	>2000V

Operating Conditions

	Min	Max	Units
Supply Voltage (V_{CC})			
Military	4.50	5.50	V
Commercial	4.75	5.25	V
Ambient Temperature (T_A)			
Military	−55	+125	°C
Commercial	0	70	°C
Logical "0" Input Voltage	0	0.8	V
Logical "1" Input Voltage	2.0	5.5	V

DC Electrical Characteristics (Note 3)

Symbol	Parameter	Conditions	DM54S387			DM74S387			Units
			Min	Typ	Max	Min	Typ	Max	
I_{IL}	Input Load Current	V_{CC} = Max, V_{IN} = 0.45V		−80	−250		−80	−250	μA
I_{IH}	Input Leakage Current	V_{CC} = Max, V_{IN} = 2.7V			25			25	μA
		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	V
V_{IH} (Note 4)	High Level Input Voltage		2.0			2.0			V
I_{OZ}	Output Leakage Current (Open-Collector Only)	V_{CC} = Max, V_{CEX} = 2.4V			50			50	μA
		V_{CC} = Max, V_{CEX} = 5.5V			100			100	μA
V_C	Input Clamp Voltage	V_{CC} = Min, I_{IN} = −18 mA		−0.8	−1.2		−0.8	−1.2	V
C_I	Input Capacitance	V_{CC} = 5.0V, V_{IN} = 2.0V T_A = 25°C, 1 MHz		4.0			4.0		pF
C_O	Output Capacitance	V_{CC} = 5.0V, V_O = 2.0V T_A = 25°C, 1 MHz, Outputs Off		6.0			6.0		pF
I_{CC}	Power Supply Current	V_{CC} = Max, Inputs Grounded All Outputs Open		80	130		80	130	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.

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.

AC Electrical Characteristics with Standard Load and Operating Conditions

COMMERCIAL TEMP RANGE (0°C to +70°C)

Symbol	Parameter	JEDEC Symbol	DM74S387			DM74S387A			Units
			Min	Typ	Max	Min	Typ	Max	
TAA	Address Access Time	TAVQV		35	50		20	30	ns
TEA	Enable Access Time	TEVQV		15	25		15	20	ns
TER	Enable Recovery Time	TEXQX		15	25		15	20	ns
TZX	Output Enable Time	TEVQX		15	25		15	20	ns
TXZ	Output Disable Time	TEXQZ		15	25		15	20	ns

MILITARY TEMP RANGE (−55°C to +125°C)

Symbol	Parameter	JEDEC Symbol	DM54S387			DM54S387A			Units
			Min	Typ	Max	Min	Typ	Max	
TAA	Address Access Time	TAVQV		35	60		20	40	ns
TEA	Enable Access Time	TEVQV		15	30		15	30	ns
TER	Enable Recovery Time	TEXQX		15	30		15	30	ns
TZX	Output Enable Time	TEVQX		15	30		15	30	ns
TXZ	Output Disable Time	TEXQZ		15	30		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_{CC} and temperature.