



Integrated Device Technology, Inc.

LOW POWER 2V CMOS SRAM 1 MEG (128K x 8-BIT)

ADVANCE
INFORMATION
IDT71T024

FEATURES:

- 128K x 8 Organization
- Wide Operating Voltage Range: 1.8V to 2.7V
- Speed Grades: 150ns, 200ns
- Low Operating Power: 11mA (max)
- Low Standby Power: 5µA (max)
- Low-Voltage Data Retention: 1.5V (min)
- Available in 32-pin, 13.4mm x 8mm Type I TSOP package

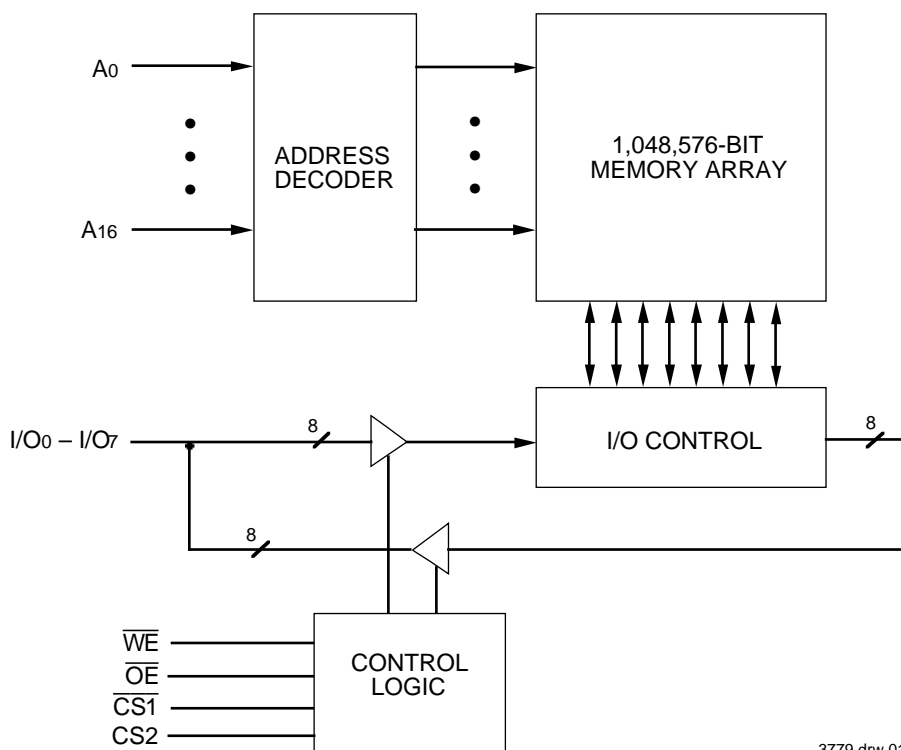
DESCRIPTION:

The IDT71T024 is a 1,048,576-bit very low-power Static RAM organized as 128K x 8. It is fabricated using IDT's high-reliability CMOS technology. This state-of-the-art technology, combined with innovative circuit design techniques, provides a cost-effective solution for low-power memory needs. It uses a 6-transistor memory cell.

Operation is from a single extended-range 2.5V supply. This extended supply range makes the device ideally suited for unregulated battery-powered applications. Fully static asynchronous circuitry is used, requiring no clocks or refresh for operation.

The IDT71T024 is packaged in a JEDEC standard 32-pin TSOP Type I.

FUNCTIONAL BLOCK DIAGRAM

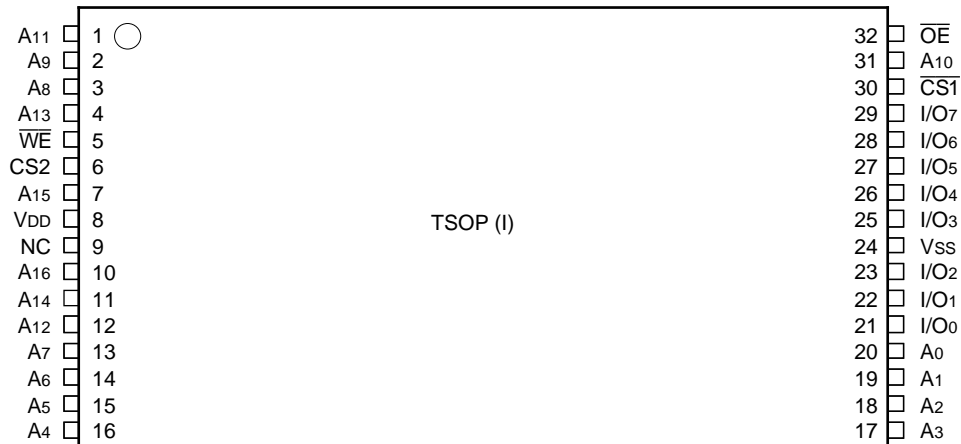


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INDUSTRIAL AND COMMERCIAL TEMPERATURE RANGES

MAY 1997

PIN CONFIGURATIONS



3779 drw 02

**TSOP
 TOP VIEW**

TRUTH TABLE⁽¹⁾

$\overline{CS1}$	CS2	\overline{OE}	\overline{WE}	I/O ₀ -I/O ₇	Function
H	X	X	X	High-Z	Deselected - Standby
X	L	X	X	High-Z	Deselected - Standby
L	H	L	H	DATAOUT	Read
L	H	X	L	DATAIN	Write
L	H	H	H	High-Z	Outputs Disabled

NOTE: 3779 tbl 02
 1.H = V_{IH}, L = V_{IL}, X = Don't care.

PIN DESCRIPTIONS

A ₀ – A ₁₆	Address Inputs	Input
$\overline{CS1}$	Chip Select	Input
CS2	Chip Select	Input
\overline{WE}	Write Enable	Input
\overline{OE}	Output Enable	Input
I/O ₀ - I/O ₇	Data Input/Output	I/O
V _{DD}	Power	Pwr
V _{SS}	Ground	Gnd

3779 tbl 01

CAPACITANCE

(T_A = +25°C, f = 1.0MHz)

Symbol	Parameter ⁽¹⁾	Conditions	Max.	Unit
C _{IN}	Input Capacitance	V _{IN} = 1dV	6	pF
C _{I/O}	I/O Capacitance	V _{OUT} = 1dV	7	pF

NOTE: 3779 tbl 06
 1. This parameter is guaranteed by device characterization, but not production tested.

ABSOLUTE MAXIMUM RATINGS⁽¹⁾

Symbol	Rating	Com'l. and Ind'l.	Unit
V _{TERM} ⁽²⁾	Terminal Voltage with Respect to VSS	-0.5 to +3.6	V
V _{TERM} ⁽³⁾	Terminal Voltage with Respect to VSS	-0.5 to V _{DD} +0.5V	V
T _{BIAS}	Temperature Under Bias	-55 to +125	°C
T _{STG}	Storage Temperature	-55 to +125	°C
P _T	Power Dissipation	1.0	W
I _{OUT}	DC Output Current	20	mA

NOTES:

3779 tbl 03

- Stresses greater than those listed under ABSOLUTE MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.
- V_{DD} terminals only.
- Input, Output, and I/O terminals; 3.6V maximum.

RECOMMENDED OPERATING TEMPERATURE AND SUPPLY VOLTAGE

Grade	Temperature	V _{SS}	V _{DD}
Commercial	0°C to +70°C	0V	1.8V to 2.7V
Industrial	-40°C to +85°C	0V	1.8V to 2.7V

3779 tbl 04

RECOMMENDED DC OPERATING CONDITIONS

Symbol	Parameter	Min.	Max.	Unit
V _{DD}	Supply Voltage	1.8	2.7	V
V _{SS}	Ground	0	0	V
V _{IH}	Input High Voltage	V _{DD} x 0.7	V _{DD} + 0.3 ⁽¹⁾	V
V _{IL}	Input Low Voltage	-0.3 ⁽²⁾	V _{DD} x 0.3	V

NOTE:

3779 tbl 05

- V_{IH} (max.) = V_{DD} + 1.5V for pulse width less than 5ns, once per cycle.
- V_{IL} (min.) = -1.5V for pulse width less than 5ns, once per cycle.

DC ELECTRICAL CHARACTERISTICS

V_{DD} = 1.8V to 2.7V, Commercial and Industrial Temperature Ranges

Symbol	Parameter	Test Conditions	Min.	Max.	Unit
I _{LI}	Input Leakage Current	V _{DD} = Max., V _{IN} = V _{SS} to V _{DD}	—	1	μA
I _{LO}	Output Leakage Current	V _{DD} = Max., \overline{CS} = V _{IH} , V _{OUT} = V _{SS} to V _{DD}	—	1	μA
V _{OH}	Output High Voltage	V _{DD} = 1.8 to 2.7V I _{OH} = -0.3mA	V _{DD} - 0.2	—	V
		V _{DD} = 2.3 to 2.7V I _{OH} = -2mA	1.7	—	
V _{OL}	Output Low Voltage	V _{DD} = 1.8 to 2.7V I _{OL} = 0.3mA	—	0.2	V
		V _{DD} = 2.3 to 2.7V I _{OL} = 2mA	—	0.4	

3779 tbl 07

DC ELECTRICAL CHARACTERISTICS^(1, 2)

V_{DD} = 1.8 to 2.7V, V_{LC} = 0.2V, V_{HC} = V_{DD}-0.2V, Commercial and Industrial Temperature Ranges

Symbol	Parameter	Test Conditions	Typ. ⁽⁵⁾	Max.	Unit	
I _{CC2}	Dynamic Operating Current	$\overline{CS1}$ = V _{LC} , CS ₂ = V _{HC} , Outputs Open, V _{DD} = 2.7V, f = f _{MAX} ⁽³⁾	-70 ns	—	11	mA
			-100 ns	—	9	
I _{CC}	Static Operating Current	$\overline{CS1}$ = V _{LC} , CS ₂ = V _{HC} , Outputs Open, \overline{WE} = V _{HC} , V _{DD} = 2.7V, f = 0 ⁽⁴⁾	—	4	mA	
I _{SB1}	Standby Supply Current	$\overline{CS1}$ and CS ₂ = V _{HC} , or CS ₂ = V _{LC} , Outputs Open, V _{DD} = 2.7V	-40 to 85°C	—	10	μA
			0 to 70°C	—	5	
			40°C	—	2	
			25°C	—	1	

NOTES:

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- All values are maximum guaranteed values.
- Input low and high voltage levels are 0.2V and V_{DD}-0.2V respectively for all tests.
- f_{MAX} = 1/trc (all address inputs are cycling at f_{MAX}).
- f = 0 means no address input lines are changing.
- Typical conditions are V_{DD} = 2.0V and specified temperature.

DATA RETENTION CHARACTERISTICS OVER ALL TEMPERATURE RANGES

($V_{LC} = 0.2V$, $V_{HC} = V_{DD} - 0.2V$)

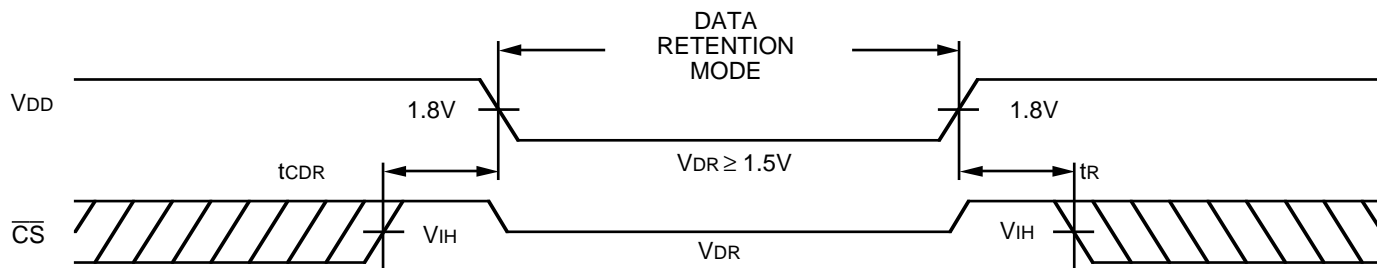
Symbol	Parameter	Test Condition	Min.	Typ. ⁽¹⁾	Max.	Unit
V_{DR}	VCC for Data Retention	—	1.5	—	—	V
I_{CCDR}	Data Retention Current	1) $\overline{CS1} \geq V_{HC}$ and $CS2 \geq V_{HC}$	—	<1	5	μA
$t_{CDR}^{(3)}$	Chip Deselect to Data Retention Time	or 2) $CS2 \leq V_{LC}$	0	—	—	ns
$t_R^{(3)}$	Operation Recovery Time		$t_{RC}^{(2)}$	—	—	ns

NOTES:

- $T_A = +25^\circ C$.
- t_{RC} = Read Cycle Time.
- This parameter is guaranteed by device characterization, but is not production tested.

3779 tbl 09

LOW V_{DD} DATA RETENTION WAVEFORM



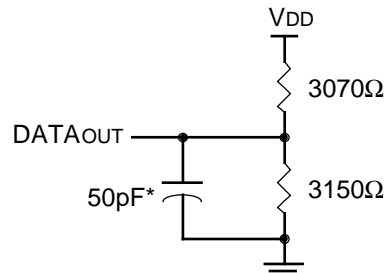
3779 drw 05

AC TEST CONDITIONS

Input Pulse Levels	GND to V_{DD}
Input Rise/Fall Times	3ns
Input Timing Reference Levels	$V_{DD} \times 0.5$
Output Reference Levels	$V_{DD} \times 0.5$
AC Test Load	See Figure 1

3779 tbl 10

AC TEST LOAD



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*Including jig and scope capacitance.

Figure 1. AC Test Load

AC ELECTRICAL CHARACTERISTICS ($V_{DD} = 1.8$ to $2.7V$, All Temperature Ranges)

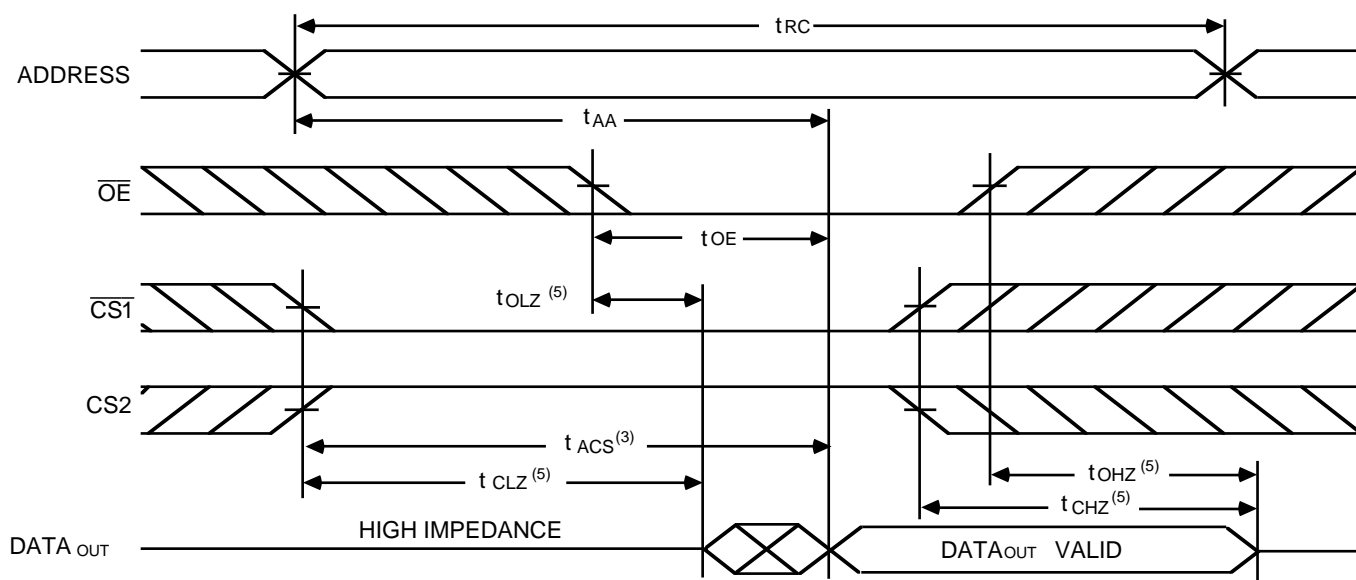
Symbol	Parameter	71T024L150		71T024L200		Units
		Min.	Max.	Min.	Max.	
Read Cycle						
t _{RC}	Read Cycle Time	150	—	200	—	ns
t _{AA}	Address Access Time	—	150	—	200	ns
t _{ACS}	Chip Select Access Time	—	150	—	200	ns
t _{CLZ} ⁽¹⁾	Chip Select Low to Output in Low-Z	20	—	20	—	ns
t _{CHZ} ⁽¹⁾	Chip Select High to Output in High-Z	—	30	—	40	ns
t _{OE}	Output Enable Low to Output Valid	—	75	—	100	ns
t _{OLZ} ⁽¹⁾	Output Enable Low to Output in Low-Z	20	—	20	—	ns
t _{OHZ} ⁽¹⁾	Output Enable High to Output in High-Z	—	30	—	40	ns
t _{OH}	Output Hold from Address Change	15	—	15	—	ns
Write Cycle						
t _{WC}	Write Cycle Time	150	—	200	—	ns
t _{AW}	Address Valid to End of Write	120	—	160	—	ns
t _{CW}	Chip Select Low to End of Write	120	—	160	—	ns
t _{AS}	Address Set-up Time	0	—	0	—	ns
t _{WR}	Address Hold from End of Write	0	—	0	—	ns
t _{WP}	Write Pulse Width	100	—	140	—	ns
t _{DW}	Data Valid to End of Write	60	—	80	—	ns
t _{DH}	Data Hold Time	0	—	0	—	ns
t _{OW} ⁽¹⁾	Write Enable High to Output in Low-Z	5	—	5	—	ns
t _{WHZ} ⁽¹⁾	Write Enable Low to Output in High-Z	—	40	—	50	ns

NOTE:

1. This parameter is guaranteed by device characterization, but is not production tested.

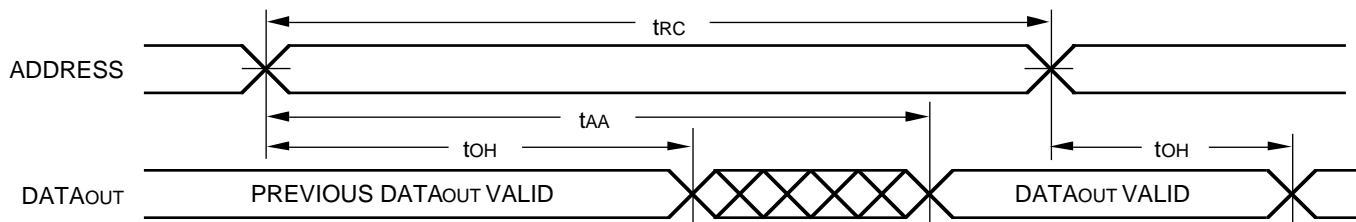
3779 tbl 11

TIMING WAVEFORM OF READ CYCLE NO. 1⁽¹⁾



3779 drw 06

TIMING WAVEFORM OF READ CYCLE NO. 2^(1, 2, 4)

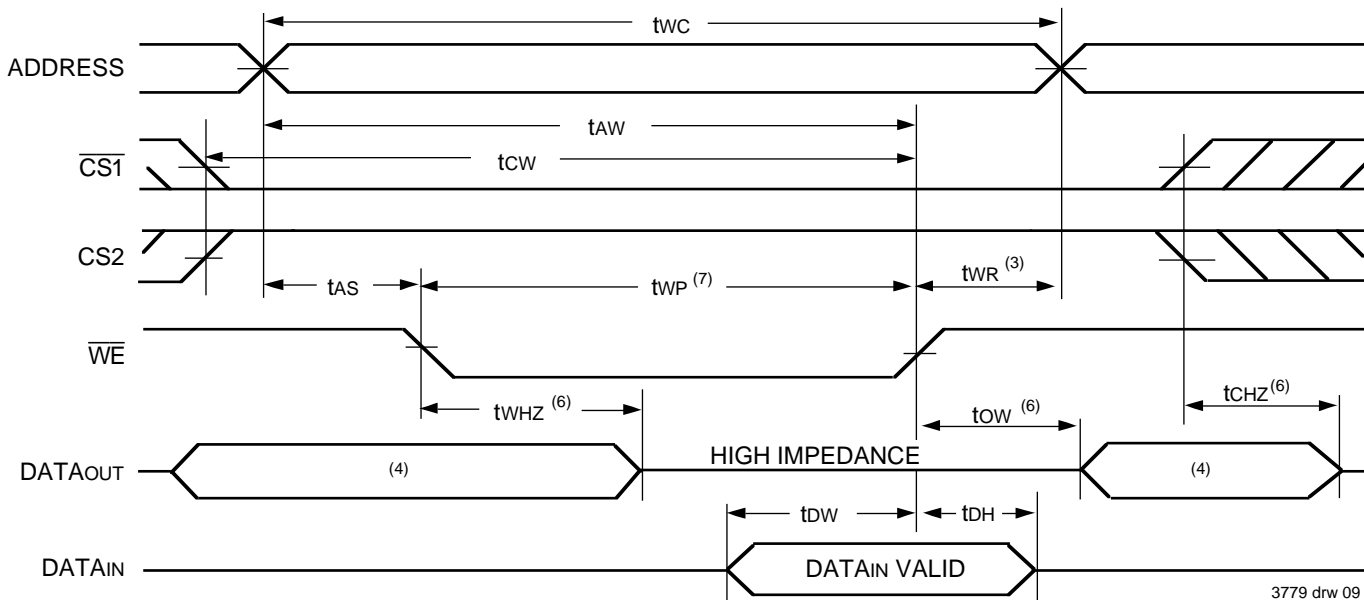


3779 drw 07

NOTES:

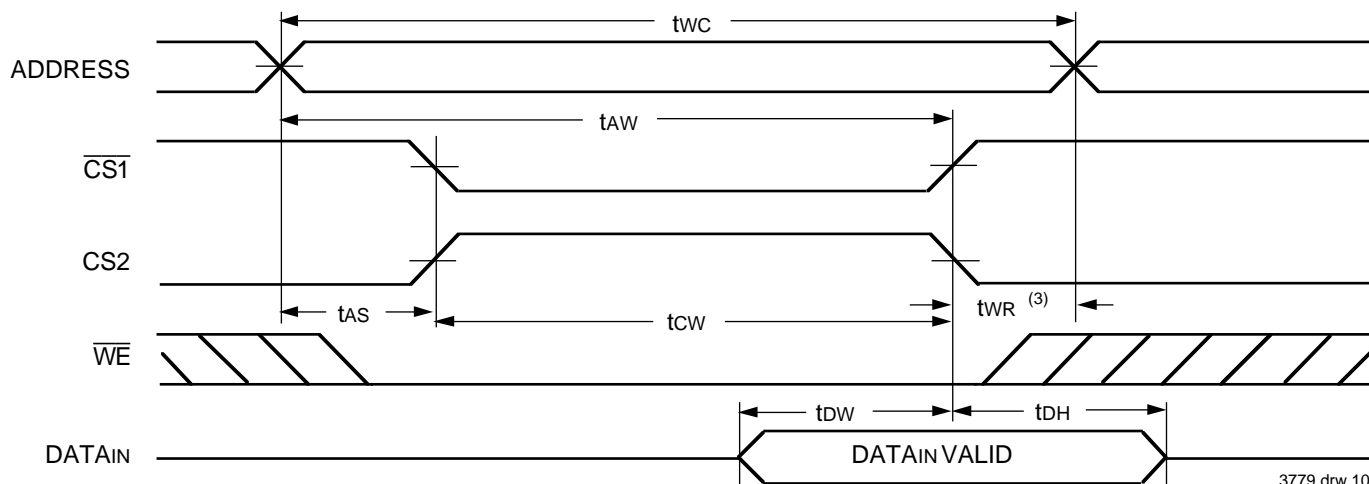
1. \overline{WE} is HIGH for Read Cycle.
2. Device is continuously selected; $\overline{CS1}$ is LOW and $\overline{CS2}$ is HIGH.
3. Address must be valid prior to or coincident with the later of $\overline{CS1}$ transition LOW and $\overline{CS2}$ transition HIGH; otherwise t_{AA} is the limiting parameter.
4. \overline{OE} is LOW.
5. Transition is measured $\pm 200\text{mV}$ from steady state.

TIMING WAVEFORM OF WRITE CYCLE NO. 1 (\overline{WE} CONTROLLED TIMING)^(1, 2, 5)



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TIMING WAVEFORM OF WRITE CYCLE NO. 2 ($\overline{CS1}$ AND CS2 CONTROLLED TIMING)^(1,2,5)

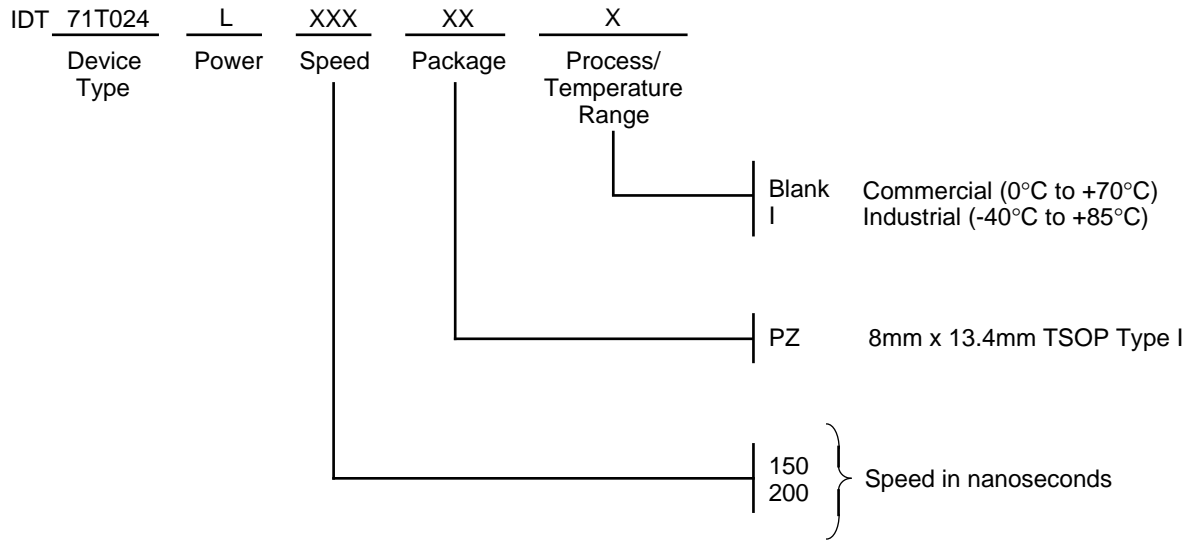


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NOTES:

1. \overline{WE} or $\overline{CS1}$ must be HIGH, or CS2 must be LOW during all address transitions.
2. A write occurs during the overlap of a LOW $\overline{CS1}$, HIGH CS2, and a LOW \overline{WE} .
3. t_{WR} is measured from the earlier of either $\overline{CS1}$ or \overline{WE} going HIGH or CS2 going LOW to the end of the write cycle.
4. During this period, I/O pins are in the output state, and input signals must not be applied.
5. If the $\overline{CS1}$ LOW transition or CS2 HIGH transition occurs simultaneously with or after the \overline{WE} LOW transition, the outputs remain in a high-impedance state.
6. Transition is measured $\pm 200\text{mV}$ from steady state.
7. \overline{OE} is continuously HIGH. If during a \overline{WE} controlled write cycle \overline{OE} is LOW, t_{WP} must be greater than or equal to $t_{WHZ} + t_{DW}$ to allow the I/O drivers to turn off and data to be placed on the bus for the required t_{DW} . If \overline{OE} is HIGH during a \overline{WE} controlled write cycle, this requirement does not apply and the minimum write pulse is as short as the specified t_{WP} .

ORDERING INFORMATION



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