CMOS Static RAM 1 Meg (256K x 4-Bit)

IDT71028

Features

- **256K x 4 advanced high-speed CMOS static RAM**
- **Equal access and cycle times**
  - *— Commercial and Industrial: 12/15/20ns*
- **One Chip Select plus one Output Enable pin**
- **Bidirectional data inputs and outputs directly TTL-compatible**
- **Low power consumption via chip deselect**
- **Available in 400 mil Plastic SOJ package.**

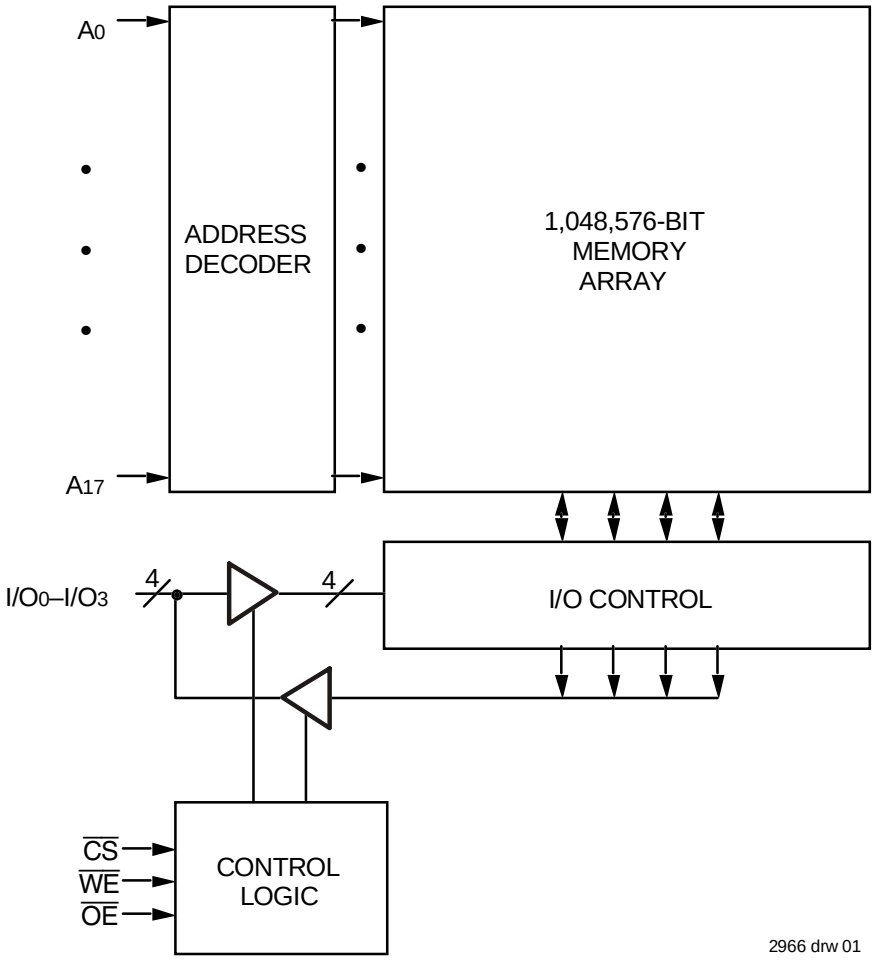
Description

The IDT71028 is a 1,048,576-bit high-speed static RAM organized as 256K x 4. It is fabricated using IDT's high-perfomance, high-reliability CMOS technology. This state-of-the-art technology, combined with innovative circuit design techniques, provides a cost-effective solution for high-speed memory needs.

The IDT71028 has an output enable pin which operates as fast as 6ns, with address access times as fast as 12ns. All bidirectional inputs and outputs of the IDT71028 are TTL-compatible and operation is from a single 5V supply. Fully static asynchronous circuitry is used, requiring no clocks or refresh for operation.

The IDT71028 is packaged in a 28-pin 400 mil Plastic SOJ.

Functional Block Diagram



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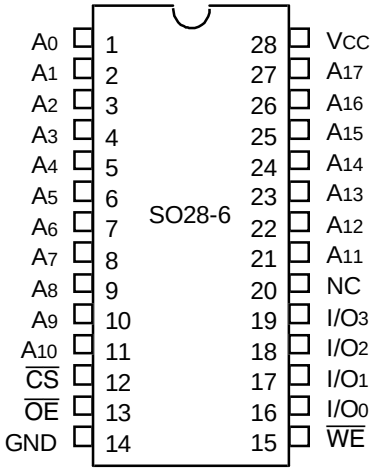
Pin Configuration



2966 drw 02

SOJ
Top View

Truth Table(1,2)

$\overline{CS}$	$\overline{OE}$	$\overline{WE}$	I/O	Function
L	L	H	$DATA_{OUT}$	Read Data
L	X	L	$DATA_{IN}$	Write Data
L	H	H	High-Z	Output Disabled
H	X	X	High-Z	Deselected – Standby (I_{SB})
V_{HC}(3)	X	X	High-Z	Deselected – Standby (I_{SB1})

2966 tbl 01

NOTES:
1. H = V_{IH}, L = V_{IL}, x = Don't care.
2. V_{LC} = 0.2V, V_{HC} = V_{CC} -0.2V.
3. Other inputs ≥V_{HC} or ≤V_{LC}.

Recommended Operating Temperature and Supply Voltage

Grade	Temperature	Vss	Vss
Commercial	0°C to +70°C	0V	5.0V ± 10%
Industrial	–40°C to +85°C	0V	5.0V ± 10%

2966 tbl 05

Absolute Maximum Ratings(1)

Symbol	Rating	Value	Unit
V_{TERM}(2)	Terminal Voltage with Respect to GND	–0.5 to +7.0	V
T_A	Operating Temperature	0 to +70	°C
T_{BIAS}	Temperature Under Bias	–55 to +125	°C
T_{STG}	Storage Temperature	–55 to +125	°C
P_T	Power Dissipation	1.25	W
I_{OUT}	DC Output Current	50	mA

2966 tbl 02

NOTES:
1. 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.
2. V_{TERM} must not exceed V_{CC} + 0.5V.

Capacitance

(T_A = +25°C, f = 1.0MHz, SOJ package)

Symbol	Parameter(1)	Conditions	Max.	Unit
C_{IN}	Input Capacitance	V_{IN} = 3dV	8	pF
$C_{I/O}$	I/O Capacitance	V_{OUT} = 3dV	8	pF

2966 tbl 03

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

Recommended DC Operating Conditions

Symbol	Parameter	Min.	Typ.	Max.	Unit
V_{CC}	Supply Voltage	4.5	5.0	5.5	V
GND	Ground	0	0	0	V
V_{IH}	Input High Voltage	2.2	—	V_{CC}+0.5	V
V_{IL}	Input Low Voltage	–0.5(1)	—	0.8	V

2966 tbl 04

NOTE:
1. V_{IL} (min.) = –1.5V for pulse width less than 10ns, once per cycle.

DC Electrical Characteristics

(V_{CC} = 5.0V ± 10%, Commercial and Industrial Temperature Ranges)

Symbol	Parameter	Test Condition	IDT71028		Unit
			Min.	Max.	
$\|I_{LI}\|$	Input Leakage Current	V_{CC} = Max., V_{IN} = GND to V_{CC}	—	5	µA
$\|I_{LO}\|$	Output Leakage Current	V_{CC} = Max., $\overline{CS}$ = V_{IH}, V_{OUT} = GND to V_{CC}	—	5	µA
V_{OL}	Output Low Voltage	I_{OL} = 8mA, V_{CC} = Min.	—	0.4	V
V_{OH}	Output High Voltage	I_{OH} = –4mA, V_{CC} = Min.	2.4	—	V

2966 tbl 06

DC Electrical Characteristics(1)

(V_{CC} = 5.0V ± 10%, V_{LC} = 0.2V, V_{HC} = V_{CC} – 0.2V)

Symbol	Parameters	71028S12		71028S15		71028S20		Unit
		Com'l.	Ind.	Com'l.	Ind.	Com'l.	Ind.	
I_{CC}	Dynamic Operating Current, $\overline{CS} \le V_{IL}$, Outputs Open, V_{CC} = Max., f = f_{MAX}(2)	155	170	150	165	145	160	mA
I_{SB}	Standby Power Supply Current (TTL Level) $\overline{CS} \ge V_{IH}$, Outputs Open, V_{CC} = Max., f=f_{MAX}(2)	40	40	40	40	40	40	mA
I_{SB1}	Full Standby Power Supply Current (CMOS Level), $\overline{CS} \ge V_{HC}$, Outputs Open, V_{CC} = Max., f = 0(2), $V_{IN} \le V_{LC}$ or $V_{IN} \ge V_{HC}$	10	10	10	10	10	10	mA

NOTES:

2966 tbl 07

1. All values are maximum guaranteed values.
2. f_{MAX} = 1/t_{RC} (all address inputs are cycling at f_{MAX}); f = 0 means no address input lines are changing.

AC Test Conditions

Input Pulse Levels	GND to 3.0V
Input Rise/Fall Times	3ns
Input Timing Reference Levels	1.5V
Output Reference Levels	1.5V
AC Test Load	See Figures 1 and 2

2966 tbl 08

AC Test Loads

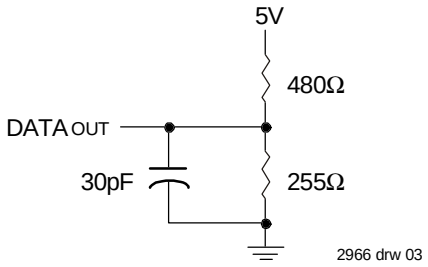
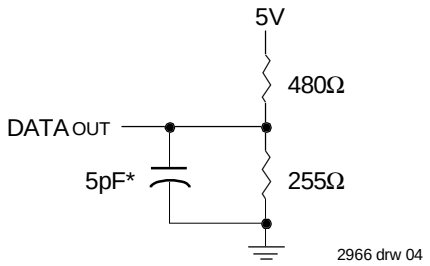


Figure 1. AC Test Load



*Including jig and scope capacitance.

Figure 2. AC Test Load
(for t_{CLZ}, t_{OLZ}, t_{CHZ}, t_{OHZ}, t_{OW}, and t_{WHZ})

AC Electrical Characteristics

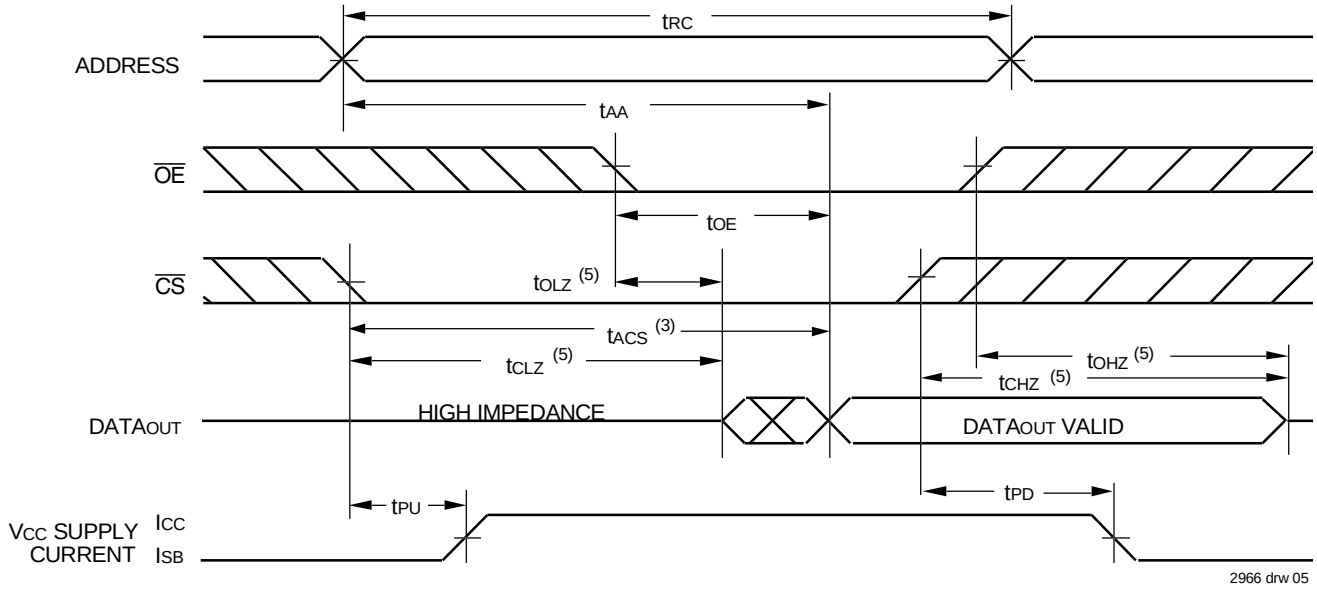
(V_{CC} = 5.0V ± 10%, Commercial and Industrial Temperature Ranges)

Symbol	Parameter	71028S12		71028S15		71028S20		Unit
		Min.	Max.	Min.	Max.	Min.	Max.	
Read Cycle								
t_{RC}	Read Cycle Time	12	—	15	—	20	—	ns
t_{AA}	Address Access Time	—	12	—	15	—	20	ns
t_{ACS}	Chip Select Access Time	—	12	—	15	—	20	ns
t_{CLZ}(1)	Chip Select to Output in Low-Z	3	—	3	—	3	—	ns
t_{CHZ}(1)	Chip Deselect to Output in High-Z	0	6	0	7	0	8	ns
t_{OE}	Output Enable to Output Valid	—	6	—	7	—	8	ns
t_{OLZ}(1)	Output Enable to Output in Low-Z	0	—	0	—	0	—	ns
t_{OHZ}(1)	Output Disable to Output in High-Z	0	5	0	5	0	7	ns
t_{OH}	Output Hold from Address Change	4	—	4	—	4	—	ns
t_{PU}(1)	Chip Select to Power-Up Time	0	—	0	—	0	—	ns
t_{PD}(1)	Chip Deselect to Power-Down Time	—	12	—	15	—	20	ns
Write Cycle								
t_{WC}	Write Cycle Time	12	—	15	—	20	—	ns
t_{AW}	Address Valid to End-of-Write	10	—	12	—	15	—	ns
t_{CW}	Chip Select to End-of-Write	10	—	12	—	15	—	ns
t_{AS}	Address Set-Up Time	0	—	0	—	0	—	ns
t_{WP}	Write Pulse Width	10	—	12	—	15	—	ns
t_{WR}	Write Recovery Time	0	—	0	—	0	—	ns
t_{DW}	Data Valid to End-of-Write	7	—	8	—	9	—	ns
t_{DH}	Data Hold Time	0	—	0	—	0	—	ns
t_{OW}(1)	Output Active from End-of-Write	3	—	3	—	4	—	ns
t_{WHZ}(1)	Write Enable to Output in High-Z	0	5	0	5	0	8	ns

2966 tbl 09

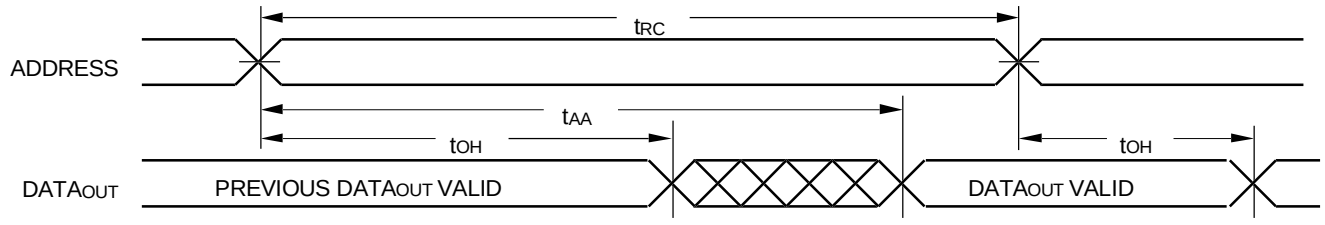
NOTE:
1. This parameter guaranteed with the AC load (Figure 2) by device characterization, but is not production tested.

Timing Waveform of Read Cycle No. 1(1)



2966 drw 05

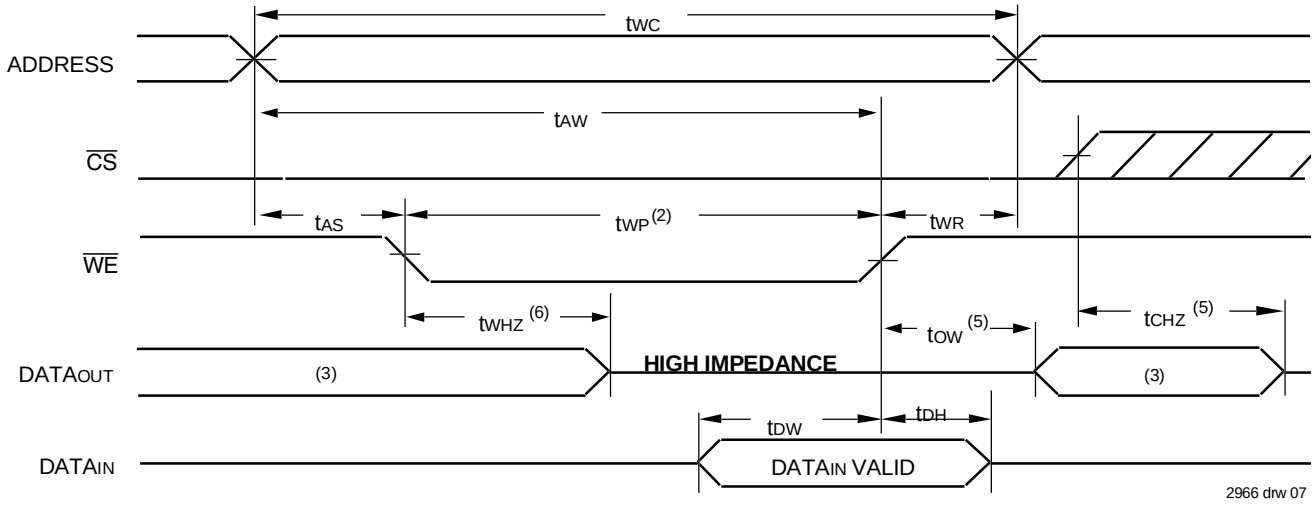
Timing Waveform of Read Cycle No. 2(1,2,4)



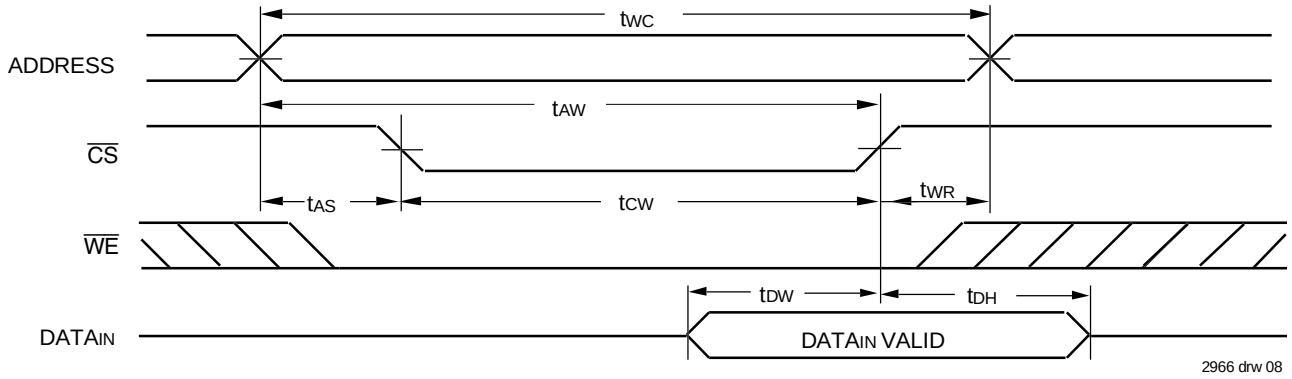
2966 drw 06

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

Timing Waveform of Write Cycle No. 1 ($\overline{WE}$ Controlled Timing)(1,2,4)

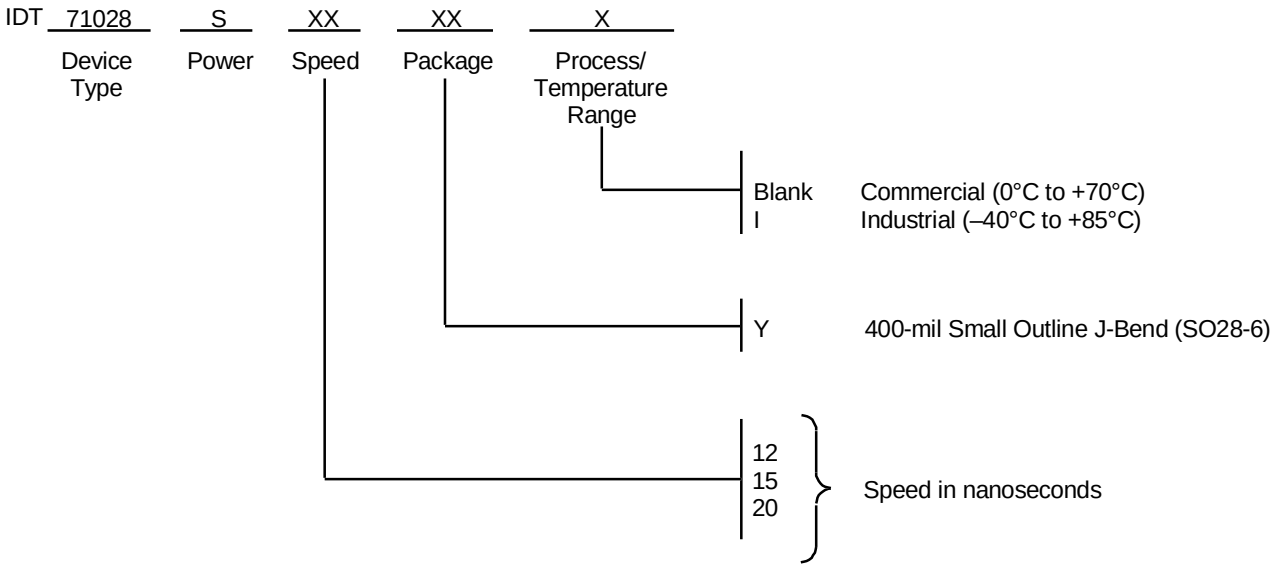


Timing Waveform of Write Cycle No. 2 ($\overline{CS}$ Controlled Timing)(1,4)



NOTES:
1. A write occurs during the overlap of a LOW $\overline{CS}$ and a LOW $\overline{WE}$.
2. $\overline{OE}$ 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}.
3. During this period, I/O pins are in the output state, and input signals must not be applied.
4. If the $\overline{CS}$ LOW transition occurs simultaneously with or after the $\overline{WE}$ LOW transition, the outputs remain in a high-impedance state.
5. Transition is measured ±200mV from steady state.

Ordering Information



2966 drw 09

Datasheet Document History

09/23/99:		Updated to new format
	Pg. 1–4, 7	Added industrial temperature range offerings
	Pg. 1, 3, 4, 7	Removed 17ns speed grade
	Pg. 6	Revised notes and footnotes on Write Cycle No. 1 and No. 2 diagrams
	Pg. 8	Added Datasheet Document History
03/14/00	Pg. 3	Revised I_{SB} to accomidate speed functionality
08/09/00		Not recommended for new designs
02/01/01		Removed "Not recommended for new designs"

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