



3.3V CMOS Static RAM 1 Meg (64K x 16-Bit)

IDT71V016

Features

- ♦ 64K x 16 advanced high-speed CMOS Static RAM
- ♦ Commercial (0° to +70°C) and Industrial (-40°C to +85°C)
- ♦ Equal access and cycle times
— Commercial and Industrial: 15/20ns
- ♦ One Chip Select plus one Output Enable pin
- ♦ Bidirectional data inputs and outputs directly LVTTTL-compatible
- ♦ Low power consumption via chip deselect
- ♦ Upper and Lower Byte Enable Pins
- ♦ Single 3.3V ($\pm 0.3V$) power supply
- ♦ Available in 44-pin Plastic SOJ and 44-pin TSOP package.

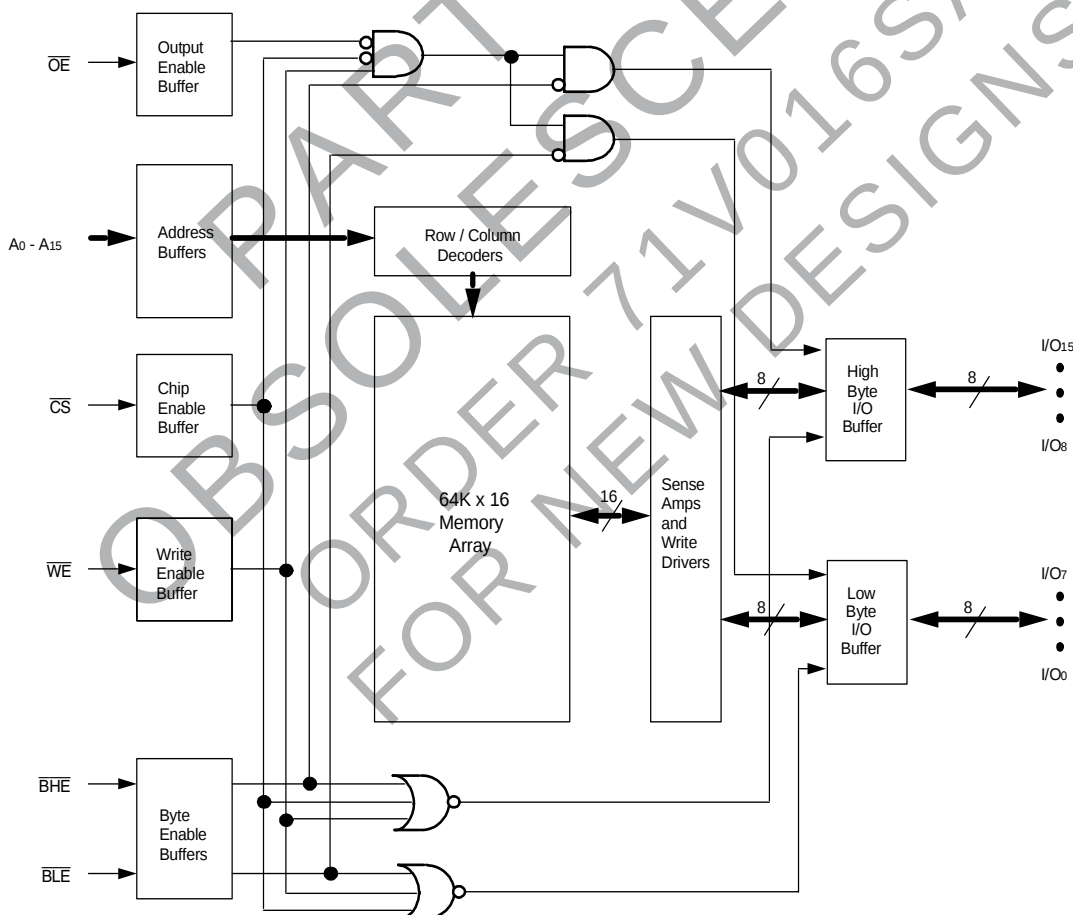
Description

The IDT71V016 is a 1,048,576-bit high-speed Static RAM organized as 64K x 16. It is fabricated using IDT's high-performance, 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 IDT71V016 has an output enable pin which operates as fast as 7ns, with address access times as fast as 12ns. All bidirectional inputs and outputs of the IDT71V016 are LVTTTL-compatible and operation is from a single 3.3V supply. Fully static asynchronous circuitry is used, requiring no clocks or refresh for operation.

The IDT71V016 is packaged in a JEDEC standard 44-pin Plastic SOJ and 44-pin TSOP Type II.

Functional Block Diagram

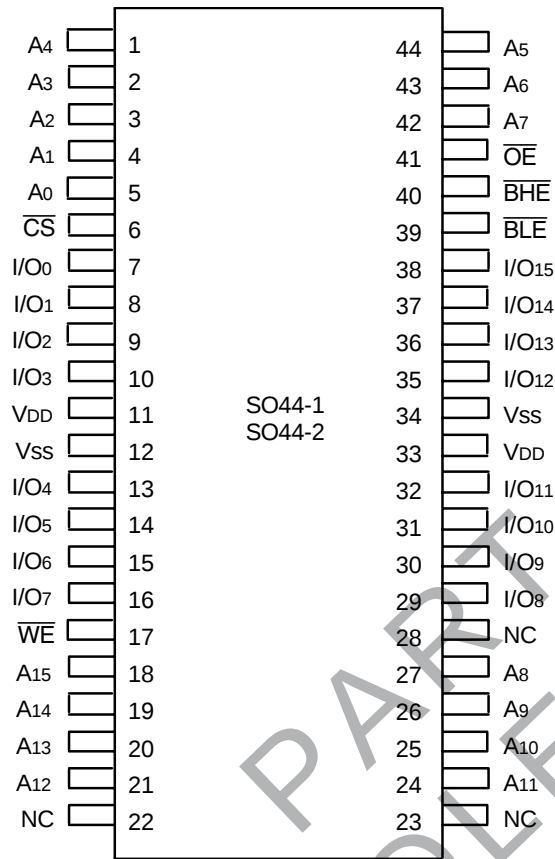


3211 drw 01

AUGUST 2000

Pin Configuration

Pin Description



SOJ/TSOP
Top View

3211 drw 02

Truth Table⁽¹⁾

$\overline{CS}$	$\overline{OE}$	$\overline{WE}$	$\overline{BLE}$	$\overline{BHE}$	I/O0-I/O7	I/O8-I/O15	Function
H	X	X	X	X	High-Z	High-Z	Deselected – Standby
L	L	H	L	H	DATAOUT	High-Z	Low Byte Read
L	L	H	H	L	High-Z	DATAOUT	High Byte Read
L	L	H	L	L	DATAOUT	DATAOUT	Word Read
L	X	L	L	L	DATAIN	DATAIN	Word Write
L	X	L	L	H	DATAIN	High-Z	Low Byte Write
L	X	L	H	L	High-Z	DATAIN	High Byte Write
L	H	H	X	X	High-Z	High-Z	Outputs Disabled
L	X	X	H	H	High-Z	High-Z	Outputs Disabled

NOTE:

1. H = V_{IH} , L = V_{IL} , X = Don't care.

3211 tbl 02

Absolute Maximum Ratings⁽¹⁾

Symbol	Rating	Value	Unit
V _{TERM} ⁽²⁾	Terminal Voltage with Respect to GND	-0.5 to +4.6	V
V _{TERM} ⁽³⁾	Terminal Voltage with Respect to GND	-0.5 to V _{CC} +0.5	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	1.0	W
I _{OUT}	DC Output Current	50	mA

3211 tbl 03

NOTES:

- 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; 4.6V maximum.

Recommended Operating Temperature and Supply Voltage

Grade	Temperature	GND	V _{DD}
Commercial	0°C to +70°C	0V	3.3V ± 0.3V
Industrial	-40°C to +85°C	0V	3.3V ± 0.3V

3211 tbl 04

Recommended DC Operating Conditions

Symbol	Parameter	Min.	Typ.	Max.	Unit
V _{DD}	Supply Voltage	3.0	3.3	3.6	V
GND	Supply Voltage	0	0	0	V
V _{IH}	Input High Voltage – Inputs	2.0	—	4.6	V
V _{IH}	Input High Voltage – I/O	2.0	—	V _{DD} +0.3	V
V _{IL}	Input Low Voltage	-0.5 ⁽¹⁾	—	0.8	V

NOTE:

- V_{IL} (min.) = -1.5V for pulse width less than t_{RC}/2, once per cycle.

3211 tbl 05

Capacitance

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

Symbol	Parameter ⁽¹⁾	Conditions	Max.	Unit
C _{IN}	Input Capacitance	V _{IN} = 3dV	6	pF
C _{I/O}	I/O Capacitance	V _{OUT} = 3dV	7	pF

NOTE:

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

3211 tbl 06

DC Electrical Characteristics

(V_{DD} = 3.3V ± 0.3V, Commercial and Industrial Temperature Ranges)

Symbol	Parameter	Test Condition	IDT71V016		Unit
			Min.	Max.	
I _{IL}	Input Leakage Current	V _{DD} = Max., V _{IN} = GND to V _{DD}	—	5	μA
I _{LO}	Output Leakage Current	V _{DD} = Max., CS = V _{IH} , V _{OUT} = GND to V _{DD}	—	5	μA
V _{OL}	Output Low Voltage	I _{OL} = 8mA, V _{DD} = Min.	—	0.4	V
V _{OH}	Output High Voltage	I _{OH} = -4mA, V _{DD} = Min.	2.4	—	V

3211 tbl 07

DC Electrical Characteristics⁽¹⁾

(V_{DD} = 3.3V ± 0.3V, V_{LC} = 0.2V, V_{HC} = V_{DD}-0.2V)

Symbol	Parameter	71V016S15		71V016S20		Unit
		Com'l	Ind.	Com'l	Ind.	
I _{CC}	Dynamic Operating Current CS ≤ V _{IL} , Outputs Open, V _{DD} = Max., f = f _{MAX} ⁽²⁾	130	130	120	120	mA
I _{SB}	Standby Power Supply Current (TTL Level) CS ≥ V _{IH} , Outputs Open, V _{DD} = Max., f = f _{MAX} ⁽²⁾	35	35	30	30	mA
I _{SB1}	Standby Power Supply Current (CMOS Level) CS ≥ V _{HC} , Outputs Open, V _{DD} = Max., f = 0 ⁽²⁾ V _{IN} ≤ V _{LC} or V _{IN} ≥ V _{HC}	5	7	5	7	mA

NOTES:

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

3211 tbl 08

AC Test Conditions

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

3211 tbl 09

AC Test Loads

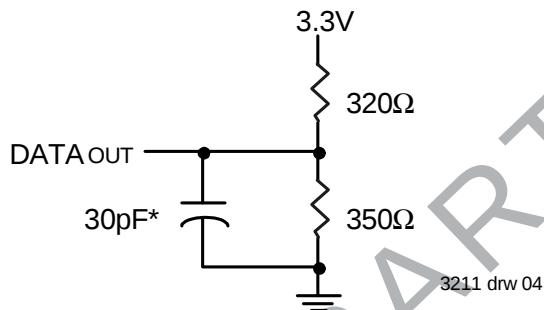


Figure 1. AC Test Load

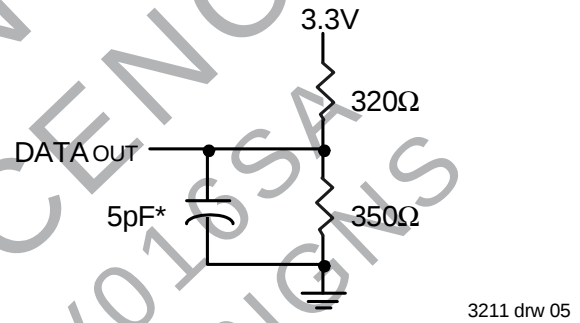


Figure 2. AC Test Load
(for tCLZ, tOLZ, tCHZ, tOHZ, tOW, and tWHZ)

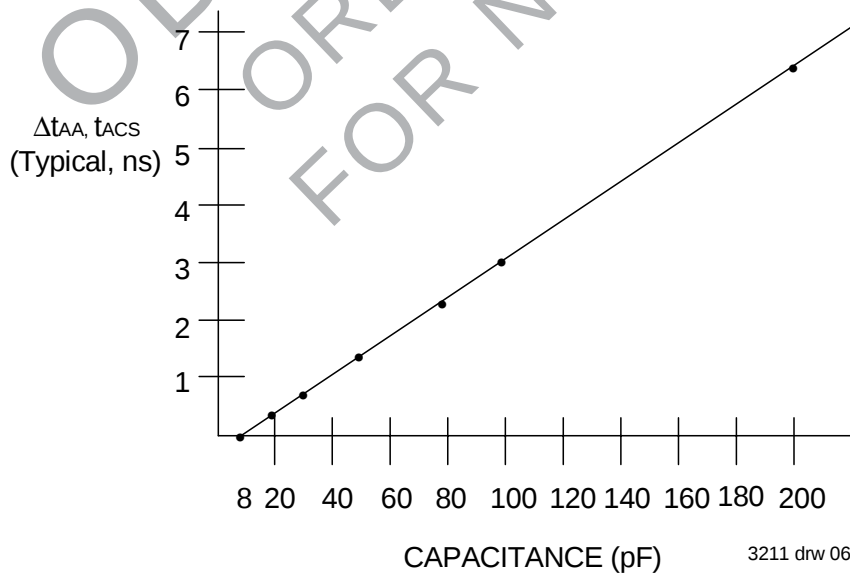


Figure 3. Output Capacitive Derating

AC Electrical Characteristics ($V_{DD} = 3.3V \pm 0.3V$, Commercial and Industrial Temperature Ranges)

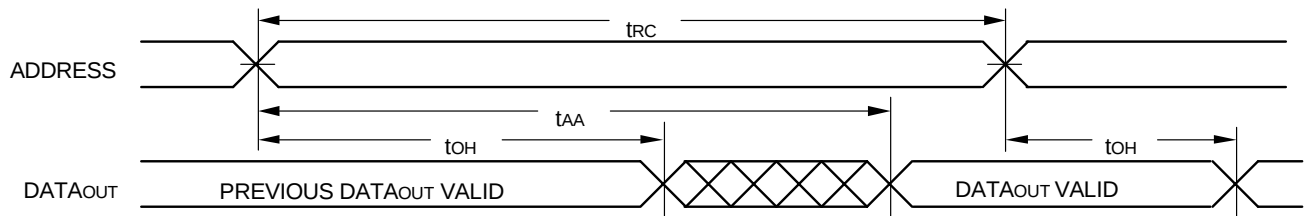
Symbol	Parameter	71V016S15		71V016S20		Unit
		Min.	Max.	Min.	Max.	
READ CYCLE						
tRC	Read Cycle Time	15	—	20	—	ns
tAA	Address Access Time	—	15	—	20	ns
tACS	Chip Select Access Time	—	15	—	20	ns
tCLZ ⁽¹⁾	Chip Select Low to Output in Low-Z	5	—	5	—	ns
tCHZ ⁽¹⁾	Chip Select High to Output in High-Z	—	6	—	8	ns
tOE	Output Enable Low to Output Valid	—	8	—	10	ns
tOLZ ⁽¹⁾	Output Enable Low to Output in Low-Z	0	—	0	—	ns
tOHZ ⁽¹⁾	Output Enable High to Output in High-Z	—	6	—	8	ns
tOH	Output Hold from Address Change	4	—	5	—	ns
tBE	Byte Enable Low to Output Valid	—	8	—	10	ns
tBLZ ⁽¹⁾	Byte Enable Low to Output in Low-Z	0	—	0	—	ns
tBHZ ⁽¹⁾	Byte Enable High to Output in High-Z	—	6	—	8	ns
WRITE CYCLE						
tWC	Write Cycle Time	15	—	20	—	ns
tAW	Address Valid to End of Write	10	—	12	—	ns
tCW	Chip Select Low to End of Write	10	—	12	—	ns
tBW	Byte Enable Low to End of Write	10	—	12	—	ns
tAS	Address Set-up Time	0	—	0	—	ns
tWR	Address Hold from End of Write	0	—	0	—	ns
tWP	Write Pulse Width	10	—	12	—	ns
tDW	Data Valid to End of Write	8	—	10	—	ns
tDH	Data Hold Time	0	—	0	—	ns
tOW ⁽¹⁾	Write Enable High to Output in Low-Z	1	—	1	—	ns
tWHZ ⁽¹⁾	Write Enable Low to Output in High-Z	—	6	—	8	ns

3211 tbl 10

NOTE:

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

Timing Waveform of Read Cycle No. 1^(1,2,3)



NOTES:

1. $\overline{WE}$ is HIGH for Read Cycle.
2. Device is continuously selected, $\overline{CS}$ is LOW.
3. $\overline{OE}$, $\overline{BHE}$, and $\overline{BLE}$ are LOW.

3211 drw 07

1. WE is HIGH for Read Cycle.
2. Address must be valid prior to or coincident with the later of $\overline{\text{CS}}$, $\overline{\text{BHE}}$, or $\overline{\text{BLE}}$ transition LOW; otherwise t_{AA} is the limiting parameter.
3. Transition is measured $\pm 200\text{mV}$ from steady state.

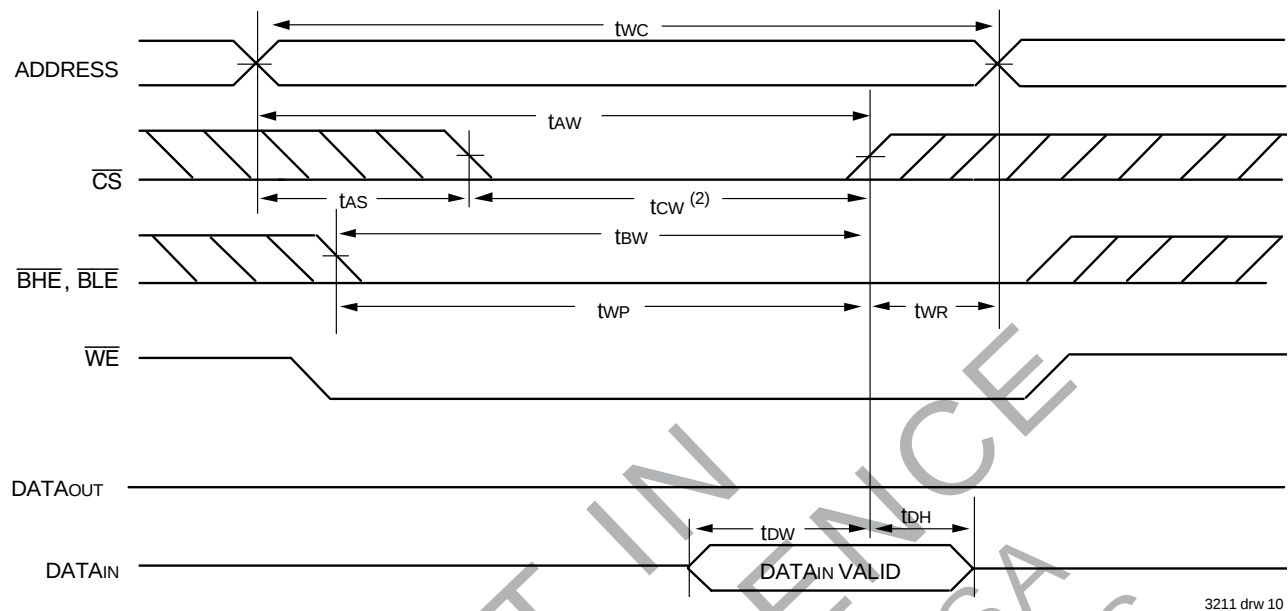
The timing diagram illustrates the signal transitions and timing parameters for the 74VHC04-100. The signals shown are ADDRESS, $\overline{CS}$, BHE, BLE, WE, DATAOUT, and DATAIN. The diagram includes the following timing parameters:

- t_{WC} : Address setup time before $\overline{CS}$ falls.
- t_{AW} : Address hold time after $\overline{CS}$ rises.
- $t_{CW}^{(2)}$: $\overline{CS}$ setup time before WE falls.
- t_{BW} : $\overline{CS}$ hold time after WE rises.
- t_{WP} : WE setup time before DATAOUT becomes valid.
- t_{WR} : WE hold time after DATAOUT becomes invalid.
- t_{AS} : WE setup time before DATAIN becomes valid.
- $t_{WHZ}^{(5)}$: WE hold time after DATAIN becomes invalid.
- $t_{OW}^{(5)}$: DATAOUT setup time before DATAIN becomes valid.
- $t_{CHZ}^{(5)}$: $\overline{CS}$ setup time before DATAIN becomes valid.
- $t_{BHZ}^{(5)}$: $\overline{CS}$ hold time after DATAIN becomes invalid.
- t_{DW} : DATAIN setup time before DATAOUT becomes valid.
- t_{DH} : DATAIN hold time after DATAOUT becomes invalid.

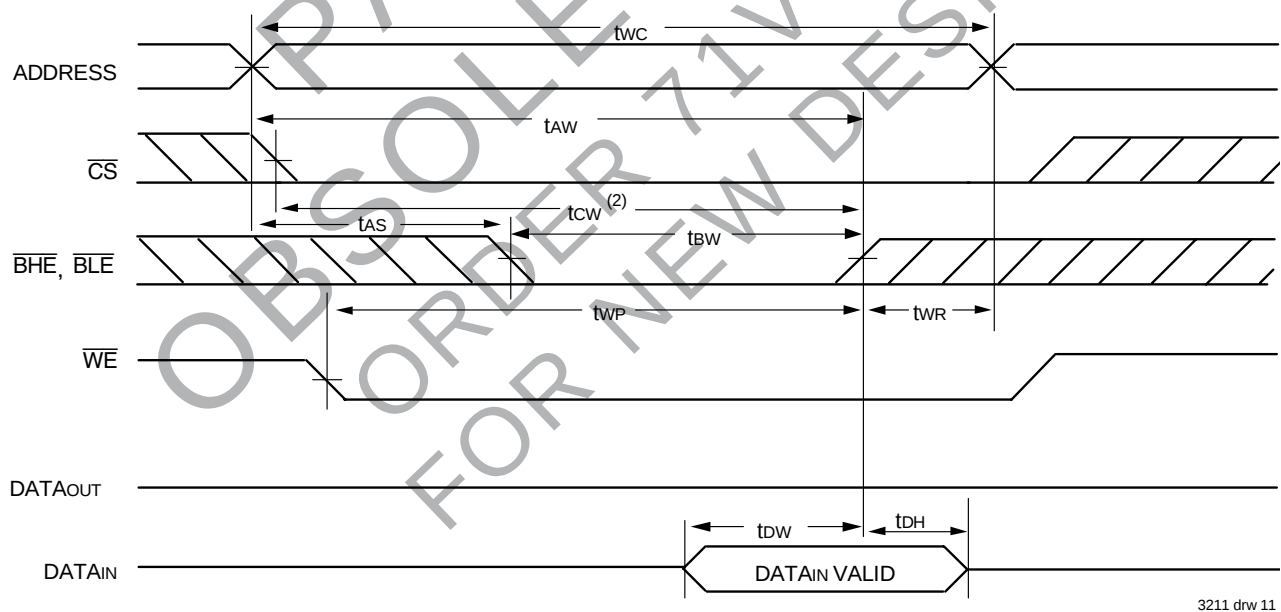
The diagram also shows the states of DATAOUT and DATAIN: "PREVIOUS DATA VALID" (3) and "DATA VALID" for DATAOUT, and "DATAIN VALID" for DATAIN.

1. A write occurs during the overlap of a LOW $\overline{CS}$, LOW $\overline{BHE}$ or $\overline{BLE}$, 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 $t_{WHZ} + t_{OW}$ to allow the I/O drivers to turn off and data to be placed on the bus for the required t_{W} . 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 or $\overline{BHE}$ and $\overline{BLE}$ LOW transition occurs simultaneously with or after the $\overline{WE}$ LOW transition, the outputs remain in a high-impedance state.
5. Transition is measured $\pm 200\text{mV}$ from steady state.

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



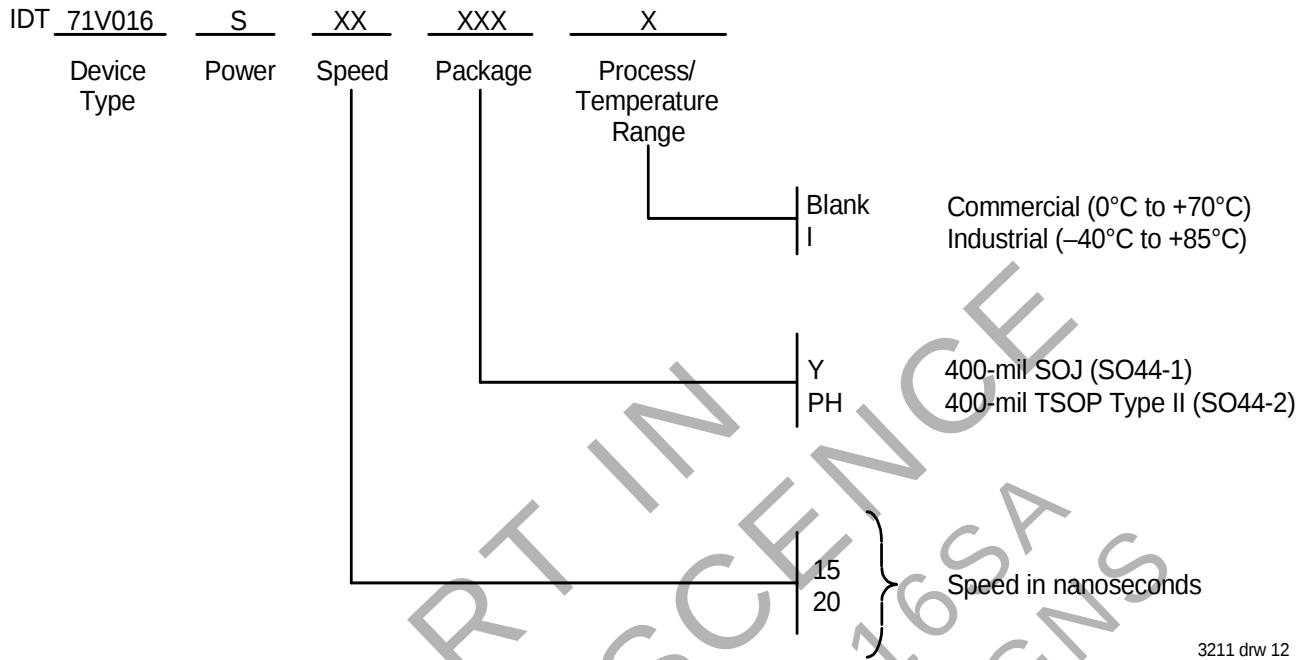
Timing Waveform of Write Cycle No. 3 ($\overline{\text{BHE}}$, $\overline{\text{BLE}}$ Controlled Timing)^(1,4)



NOTES:

1. A write occurs during the overlap of a LOW $\overline{\text{CS}}$, LOW $\overline{\text{BHE}}$ or $\overline{\text{BLE}}$, and a LOW $\overline{\text{WE}}$.
2. $\overline{\text{OE}}$ is continuously HIGH. If during a $\overline{\text{WE}}$ controlled write cycle $\overline{\text{OE}}$ 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 $\overline{\text{OE}}$ is HIGH during a $\overline{\text{WE}}$ 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 $\overline{\text{CS}}$ LOW or $\overline{\text{BHE}}$ and $\overline{\text{BLE}}$ LOW transition occurs simultaneously with or after the $\overline{\text{WE}}$ LOW transition, the outputs remain in a high-impedance state.
5. Transition is measured $\pm 200\text{mV}$ from steady state.

Ordering Information



3211 dw 12

Datasheet Document History

11/1/99		Updated to new format
	Pg. 3	Expressed commercial and industrial ranges on DC Electrical table
	Pg. 5	Expressed commercial and industrial ranges on AC Electrical table
	Pg. 6	Revised footnotes on Write Cycle No. 1 diagram
	Pg. 7	Revised footnotes on Write Cycle No. 2 and No. 3 diagrams
	Pg. 9	Added Datasheet Document History
08/30/00		Part in obsolescence, order part 71V016SA. See PDN# S-0003

PART IN
OBSCURITY
ORDER 71V016SA
FOR NEW DESIGNS



CORPORATE HEADQUARTERS
2975 Stender Way
Santa Clara, CA 95054

for SALES:
800-345-7015 or 408-727-6116
fax: 408-492-8674
www.idt.com

for Tech Support:
sramhelp@idt.com
800-544-7726, x4033

The IDT logo is a registered trademark of Integrated Device Technology, Inc.