Integrated Device Technology, Inc.

3.3V CMOS FAST SRAM WITH 2.5V COMPATIBLE INPUTS 256K (32K x 8-BIT)

IDT71V256SB

FEATURES

- Ideal for high-performance processor secondary cache
- Fast access times:
  — 12/15/20ns
- Inputs are 2.5V and LVTTL compatible: V_{IH} = 1.8V
- Outputs are LVTTL compatible
- Low standby current (maximum):
  — 2mA full standby
- Small packages for space-efficient layouts:
  — 28-pin 300 mil SOJ
  — 28-pin TSOP Type I
- Produced with advanced high-performance CMOS technology
- Single 3.3V(±0.3V) power supply

DESCRIPTION

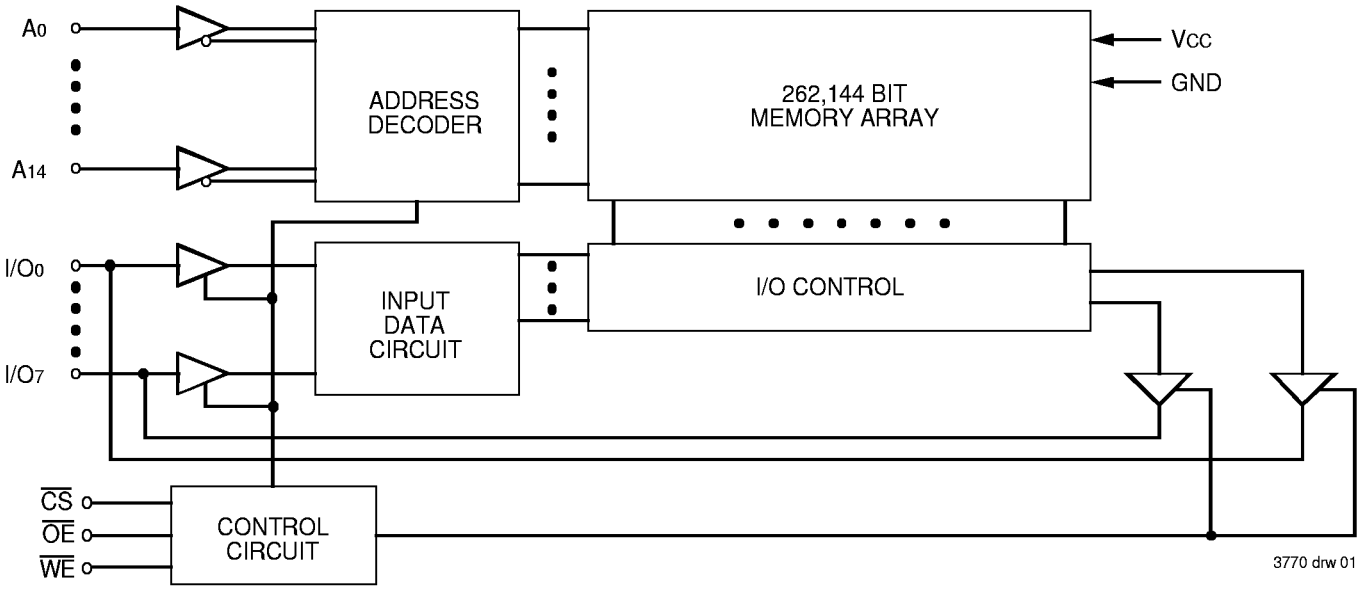
The IDT71V256SB is a 262,144-bit high-speed static RAM organized as 32K x 8. The improved V_{IH} (1.8V) makes the inputs compatible with 2.5V logic levels. The IDT71V256SB is otherwise identical to the IDT71V256SA.

The IDT71V256SB has outstanding low power characteristics while at the same time maintaining very high performance. Address access times of as fast as12 ns are ideal for tag SRAM in secondary cache designs.

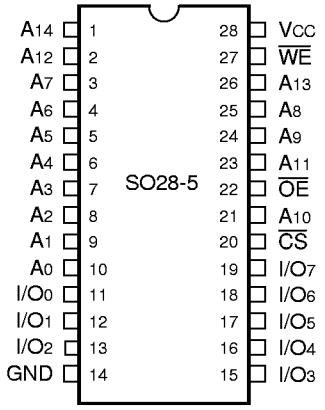
When power management logic puts the IDT71V256SB in standby mode, its very low power characteristics contribute to extended battery life. By taking $\overline{CS}$ HIGH, the SRAM will automatically go to a low power standby mode and will remain in standby as long as $\overline{CS}$ remains HIGH. Furthermore, under full standby mode ($\overline{CS}$ at CMOS level, f=0), power consumption is guaranteed to always be less than 6.6mW and typically will be much smaller.

The IDT71V256SB is packaged in 28-pin 300 mil SOJ and 28-pin300 mil TSOP Type I packaging.

FUNCTIONAL BLOCK DIAGRAM

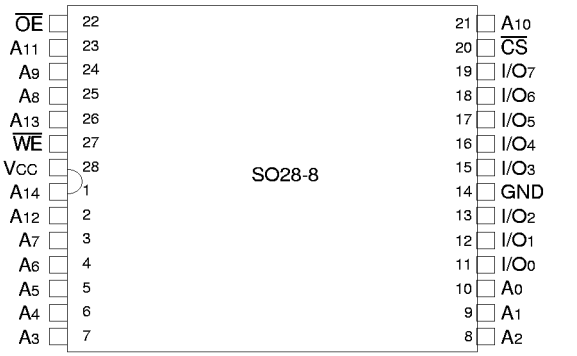


PIN CONFIGURATIONS



SOJ
TOP VIEW

3770 drw 02



3770 drw 03

TSOP
TOP VIEW

PIN DESCRIPTIONS

Name	Description
A_0–A_{14}	Addresses
I/O_0–I/O_7	Data Input/Output
$\overline{CS}$	Chip Select
$\overline{WE}$	Write Enable
$\overline{OE}$	Output Enable
GND	Ground
V_{CC}	Power

3770 tbl 01

TRUTH TABLE(1)

$\overline{WE}$	$\overline{CS}$	$\overline{OE}$	I/O	Function
X	H	X	High-Z	Standby (ISB)
X	V_{HC}	X	High-Z	Standby (ISB1)
H	L	H	High-Z	Output Disable
H	L	L	D_{OUT}	Read
L	L	X	D_{IN}	Write

NOTE: 3770 tbl 02
1. H = V_{IH}, L = V_{IL}, X = Don't Care

ABSOLUTE MAXIMUM RATINGS(1)

Symbol	Rating	Com'l.	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 VCC+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

NOTES: 3770 tbl 03
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. Vcc terminals only.
3. Input, Output, and I/O terminals; 4.6V maximum.

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_{OUT}	Output Capacitance	V_{OUT} = 3dV	7	pF

NOTE: 3770 tbl 04
1. This parameter is determined by device characterization, but is not production tested.

RECOMMENDED OPERATING TEMPERATURE AND SUPPLY VOLTAGE

Grade	Temperature	GND	Vcc
Commercial	0°C to +70°C	0V	3.3V ± 0.3V

3770 tbl 05

RECOMMENDED DC OPERATING CONDITIONS

Symbol	Parameter	Min.	Typ.	Max.	Unit
V_{CC}	Supply Voltage	3.0	3.3	3.6	V
GND	Supply Voltage	0	0	0	V
V_{IH}	Input High Voltage - Inputs	1.8	—	5.0	V
V_{IH}	Input High Voltage - I/O	1.8	—	Vcc+0.3	V
V_{IL}	Input Low Voltage	–0.5(1)	—	0.8	V

NOTE: 3770 tbl 06
1. V_{IL} (min.) = –1.0V for pulse width less than 5ns, once per cycle.

DC ELECTRICAL CHARACTERISTICS(1, 2)

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

Symbol	Parameter	71V256SB12 Com'l	71V256SB15 Com'l.	71V256SB20 Com'l.	Unit
I_{CC}	Dynamic Operating Current $\overline{CS} \leq V_{IL}$, Outputs Open, V_{CC} = Max., f = f_{MAX}(2)	90	85	85	mA
I_{SB}	Standby Power Supply Current (TTL Level) $\overline{CS} = V_{IH}$, V_{CC} = Max., Outputs Open, f = f_{MAX}(2)	20	20	20	mA
I_{SB1}	Full Standby Power Supply Current (CMOS Level) $\overline{CS} \geq V_{HC}$, V_{CC} = Max., Outputs Open, f = 0(2), $V_{IN} \leq V_{LC}$ or $V_{IN} \geq V_{HC}$	2	2	2	mA

NOTES:
1. All values are maximum guaranteed values.
2. f_{MAX} = 1/t_{RC}, only address inputs cycling at fmax; f = 0 means that no inputs are cycling.

3770 tbl 07

DC ELECTRICAL CHARACTERISTICS

V_{CC} = 3.3V± 0.3V

Symbol	Parameter	Test Condition	IDT71V256SB Min.	Typ.	Max.	Unit
$\|I_{LI}\|$	Input Leakage Current	V_{CC} = Max., V_{IN} = GND to V_{CC}	—	—	2	µA
$\|I_{LO}\|$	Output Leakage Current	V_{CC} = Max., $\overline{CS}$ = V_{IH}, V_{OUT} = GND to V_{CC}	—	—	2	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

3770 tbl 08

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

3770 tbl 09

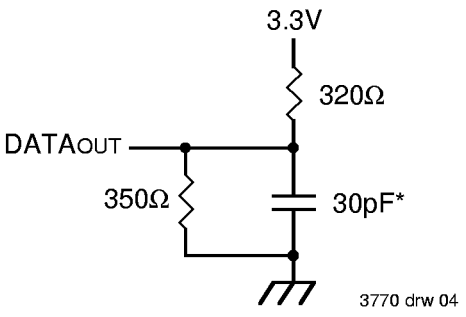


Figure 1. AC Test Load

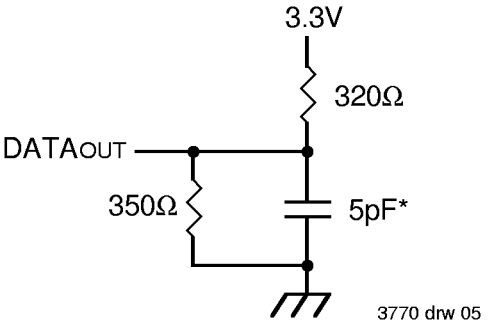


Figure 2. AC Test Load
(for t_{CLZ}, t_{OLZ}, t_{CHZ}, t_{OHZ}, t_{OW}, t_{WHZ})

*Includes scope and jig capacitances

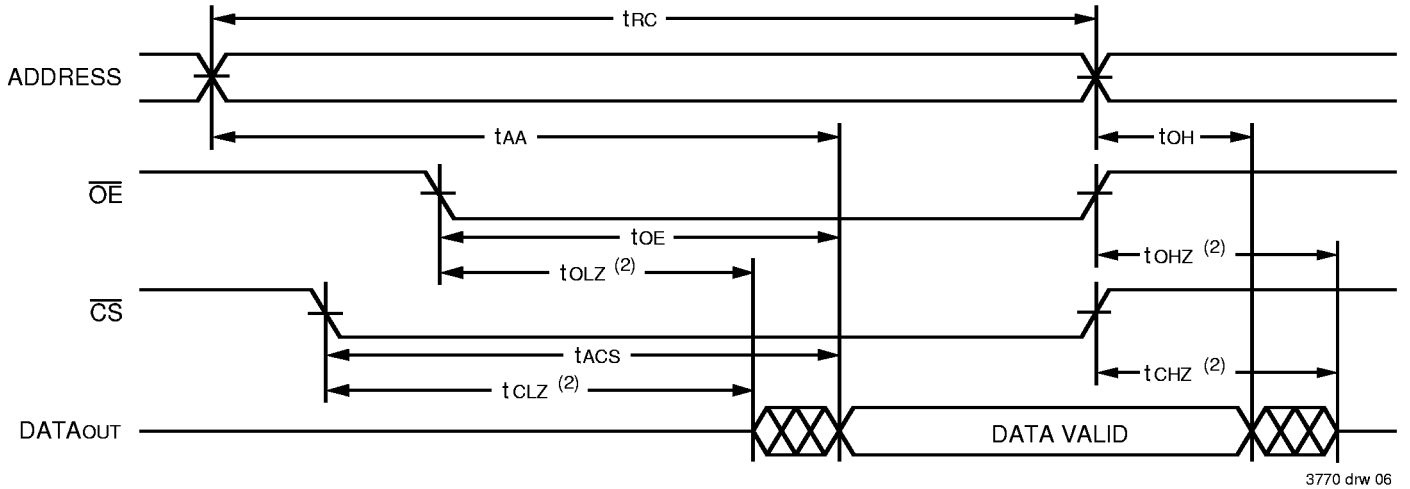
AC ELECTRICAL CHARACTERISTICS (Vcc = 3.3V ± 0.3V, Commercial Temperature Range)

Symbol	Parameter	71V256SA12		71V256SA15		71V256SA20		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	5	—	5	—	5	—	ns
t_{CHZ}(1)	Chip Select to Output in High-Z	0	8	0	9	0	10	ns
t_{OE}	Output Enable to Output Valid	—	6	—	7	—	8	ns
t_{OLZ}(1)	Output Enable to Output in Low-Z	3	—	0	—	0	—	ns
t_{OHZ}(1)	Output Disable to Output in High-Z	2	6	0	7	0	8	ns
t_{OH}	Output Hold from Address Change	3	—	3	—	3	—	ns
Write Cycle								
t_{WC}	Write Cycle Time	12	—	15	—	20	—	ns
t_{AW}	Address Valid to End-of-Write	9	—	10	—	15	—	ns
t_{CW}	Chip Select to End-of-Write	9	—	10	—	15	—	ns
t_{AS}	Address Set-up Time	0	—	0	—	0	—	ns
t_{WP}	Write Pulse Width	9	—	10	—	15	—	ns
t_{WR}	Write Recovery Time	0	—	0	—	0	—	ns
t_{DW}	Data to Write Time Overlap	6	—	7	—	8	—	ns
t_{DH}	Data Hold from Write Time	0	—	0	—	0	—	ns
t_{OW}(1)	Output Active from End-of-Write	4	—	4	—	4	—	ns
t_{WHZ}(1)	Write Enable to Output in High-Z	1	8	1	9	1	10	ns

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

3770 tbl 10

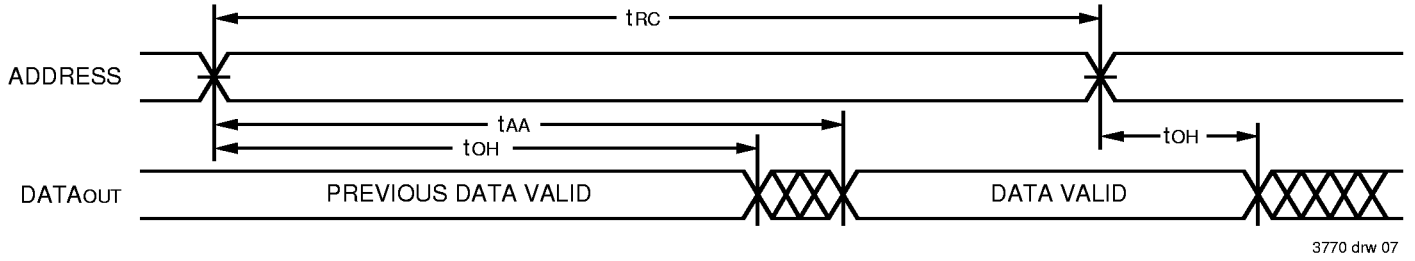
TIMING WAVEFORM OF READ CYCLE NO. 1(1)



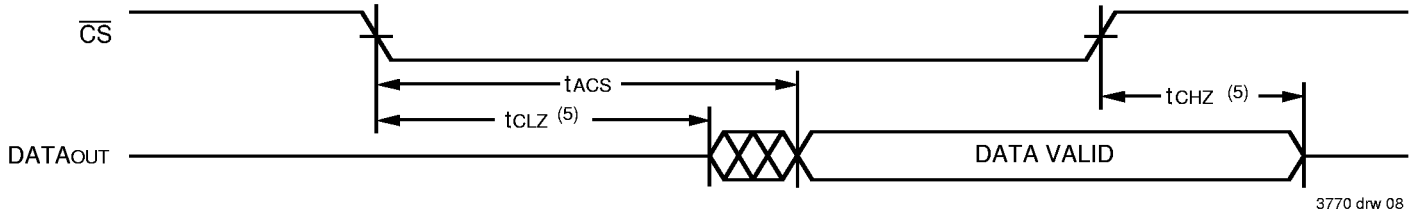
3770 drw 06

NOTES:
1. $\overline{WE}$ is HIGH for Read cycle.
2. Transition is measured ±200mV from steady state.

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

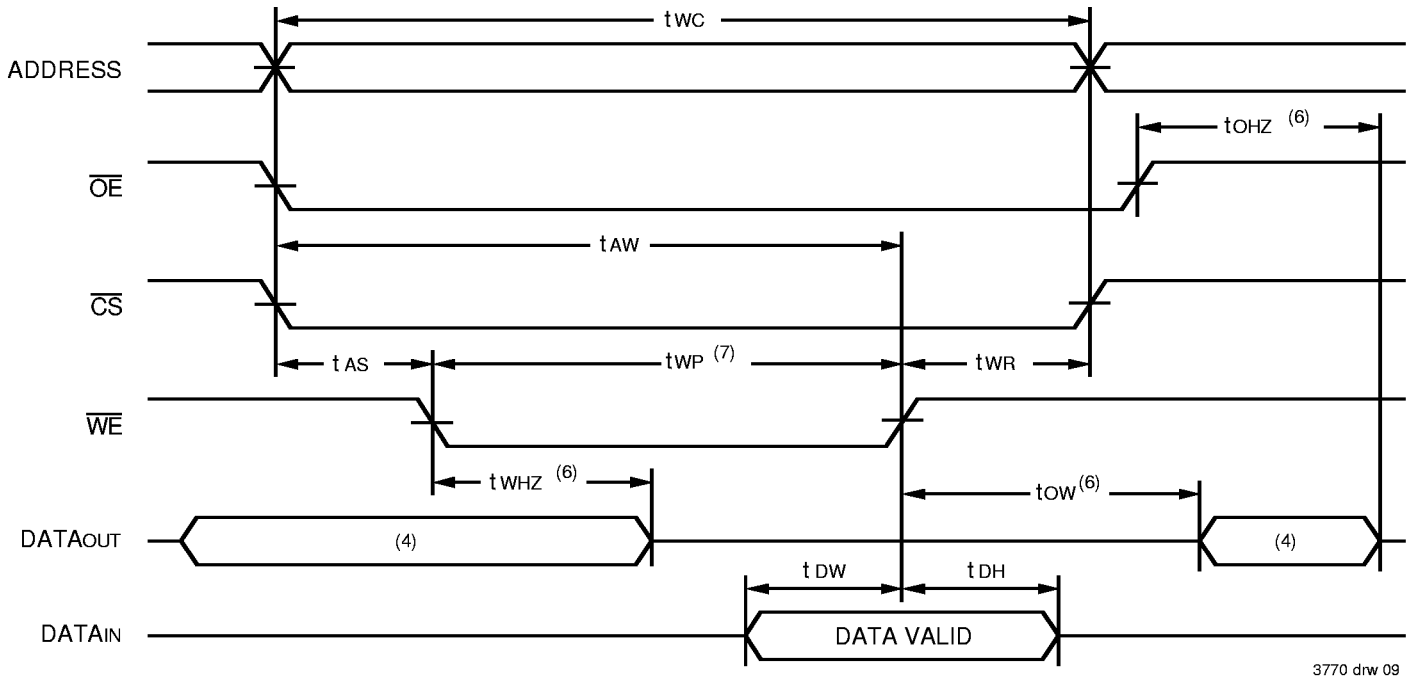


TIMING WAVEFORM OF READ CYCLE NO. 3(1, 3, 4)



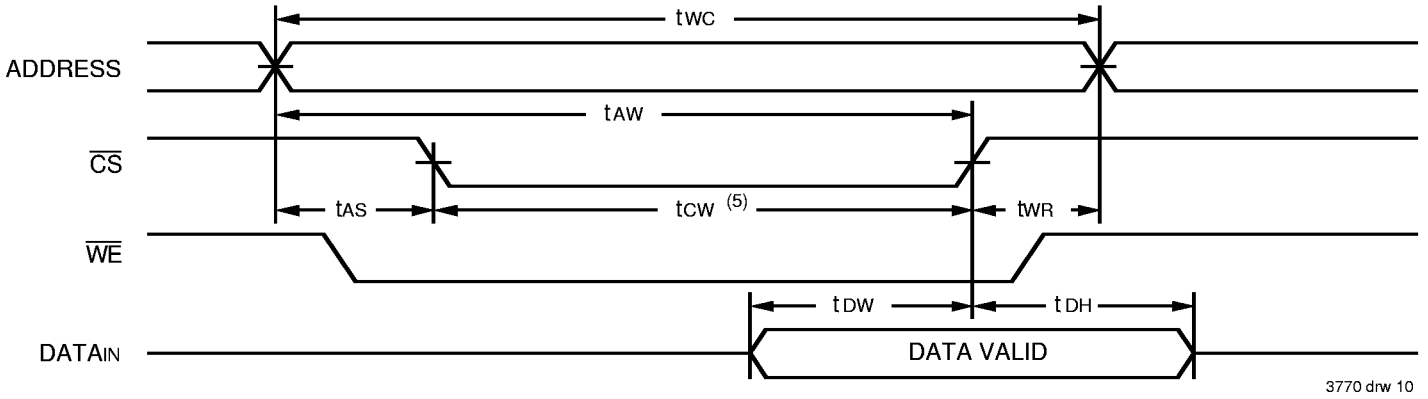
NOTES:
1. $\overline{WE}$ is HIGH for Read cycle.
2. Device is continuously selected, $\overline{CS}$ is LOW.
3. Address valid prior to or coincident with $\overline{CS}$ transition LOW.
4. $\overline{OE}$ is LOW.
5. Transition is measured ±200mV from steady state.

TIMING WAVEFORM OF WRITE CYCLE NO. 1 ($\overline{WE}$ CONTROLLED TIMING)(1, 2, 3, 5, 7)



NOTES:
1. $\overline{WE}$ or $\overline{CS}$ must be HIGH during all address transitions.
2. A write occurs during the overlap of a LOW $\overline{CS}$ and a LOW $\overline{WE}$.
3. t_{WR} is measured from the earlier of $\overline{CS}$ or $\overline{WE}$ going HIGH to the end of the write cycle.
4. During this period, I/O pins are in the output state so that the input signals must not be applied.
5. If the $\overline{CS}$ LOW transition occurs simultaneously with or after the $\overline{WE}$ LOW transition, the outputs remain in a high-impedance state.
6. Transition is measured ±200mV from steady state.
7. If $\overline{OE}$ is LOW during a $\overline{WE}$ controlled write cycle, the write pulse width must be the larger of t_{WP} or (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 write pulse can be as short as the specified t_{WP}.

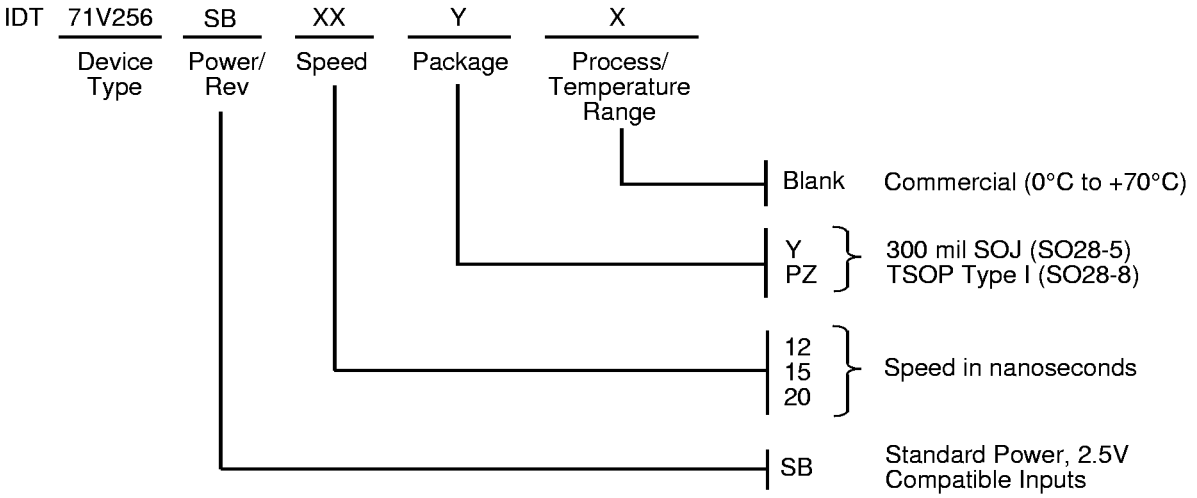
TIMING WAVEFORM OF WRITE CYCLE NO. 2 ($\overline{CS}$ CONTROLLED TIMING)(1, 2, 3, 4)



3770 drw 10

NOTES:
1. $\overline{WE}$ or $\overline{CS}$ must be HIGH during all address transitions.
2. A write occurs during the overlap of a LOW $\overline{CS}$ and a LOW $\overline{WE}$.
3. t_{WR} is measured from the earlier of $\overline{CS}$ or $\overline{WE}$ going HIGH to the end of the write cycle.
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. If $\overline{OE}$ is LOW during a $\overline{WE}$ controlled write cycle, the write pulse width must be the larger of t_{WP} or (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 write pulse can be as short as the spectified t_{WP}.

ORDERING INFORMATION

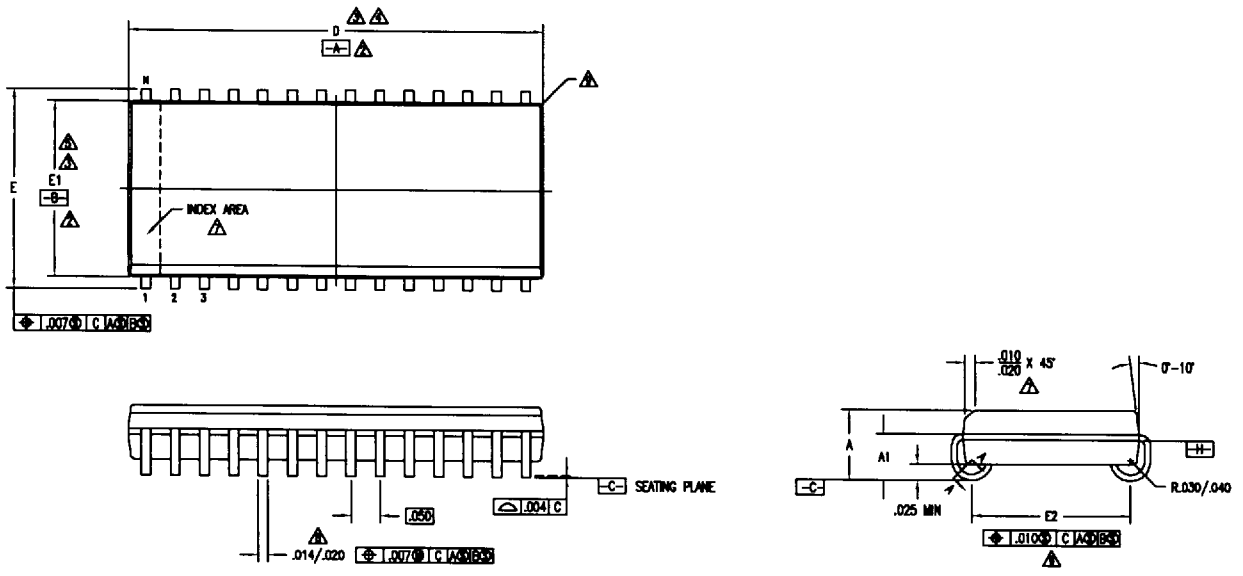


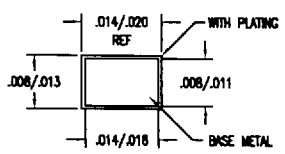
3770 drw 11

PACKAGE DIAGRAM OUTLINES

SOJ

REVISIONS				
DCN	REV	DESCRIPTION	DATE	APPROVED
27644	03	REDRAW TO JEDEC FORMAT	03/15/95	





SECTION A-A

TOLERANCES UNLESS SPECIFIED	
DECIMAL	ANGULAR
XX±	±
XXX±	
XXXX±	

Integrated Device Technology, Inc.
2975 Stender Way, Santa Clara, CA 95054
PHONE: (408) 727-6116
FAX: (408) 492-8674 TWX: 910-338-2070

APPROVALS	DATE
DRAWN Ad	03/15/95
CHECKED	

TITLE: PJ 20 & 28 PACKAGE OUTLINE
.300" BODY WIDTH SOJ
.050" PITCH

SIZE	DRAWING No.	REV
C	PSC-4024	03

DO NOT SCALE DRAWING

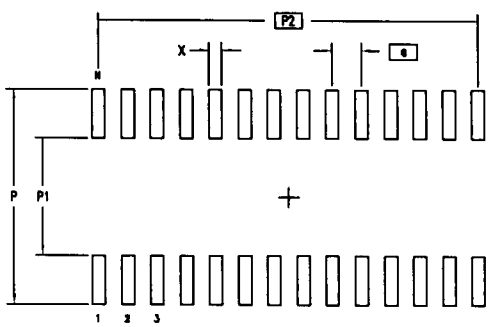
99

SOJ (Continued)

REVISIONS				
DCN	REV	DESCRIPTION	DATE	APPROVED
27644	03	REDRAW TO JEDEC FORMAT	03/15/95	

DWG #		SO20-1			DWG #		SO28-5		
SYMBOL	JEDEC VARIATION AD			NOTE	JEDEC VARIATION AF			NOTE
	MIN	NOM	MAX		MIN	NOM	MAX	
A	.120	.130	.140		.120	.130	.140	
A1	.078	.086	.095		.078	.086	.095	
D	.500	.506	.512	3,4	.700	.706	.712	3,4
E	.335	.340	.347		.335	.340	.347	
E1	.292	.296	.300	3,5	.292	.296	.300	3,5
E2	.262	.267	.272	6	.262	.267	.272	6
N	20				28			

LAND PATTERN DIMENSIONS



	MIN	MAX	MIN	MAX
P	.362	.370	.362	.370
P1	.196	.204	.196	.204
P2	.450 BSC		.650 BSC	
X	.018	.026	.018	.026
e	.050 BSC		.050 BSC	
N	20		28	

NOTES:

1. ALL DIMENSIONING AND TOLERANCING CONFORM TO ANSI Y14.5M-1982
2. DATUMS -A- AND -B- TO BE DETERMINED AT DATUM PLANE -H-
3. DIMENSIONS D AND E1 ARE TO BE DETERMINED AT DATUM PLANE -H-
4. DIMENSION D DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH, PROTRUSIONS AND GATE BURRS SHALL NOT EXCEED .006 PER SIDE
5. DIMENSION E1 DO NOT INCLUDE INTERLEAD FLASH OR PROTRUSIONS. INTERLEAD FLASH OR PROTRUSIONS SHALL NOT EXCEED .006 PER SIDE
6. DIMENSION E2 TO BE DETERMINED AT SEATING PLANE -C- CONTACT POINT
7. THE CHAMFER ON THE PACKAGE BODY IS OPTIONAL. IF IT IS NOT PRESENT, A VISUAL INDEX FEATURE MUST BE LOCATED WITHIN THE ZONE INDICATED
8. LEAD WIDTH DIMENSION DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION IS .004 IN EXCESS OF THE LEAD WIDTH DIMENSION AT MAXIMUM MATERIAL CONDITION
9. EXACT SHAPE OF EACH CORNER IS OPTIONAL
10. ALL DIMENSIONS ARE IN INCHES
11. THIS OUTLINE CONFORMS TO JEDEC PUBLICATION 95 REGISTRATION MO-088, VARIATION AD & AF

TOLERANCES UNLESS SPECIFIED	
DECIMAL	ANGULAR
.XX±	±
.XXX±	
.XXXX±	

APPROVALS	DATE
DRAWN AA	03/15/95
CHECKED	

Integrated Device Technology, Inc.
2975 Stender Way, Santa Clara, CA 95054
PHONE: (408) 727-6116
FAX: (408) 492-8674 TWX: 910-338-2070

TITLE: PJ 20 & 28 PACKAGE OUTLINE .300" BODY WIDTH SOJ .050" PITCH

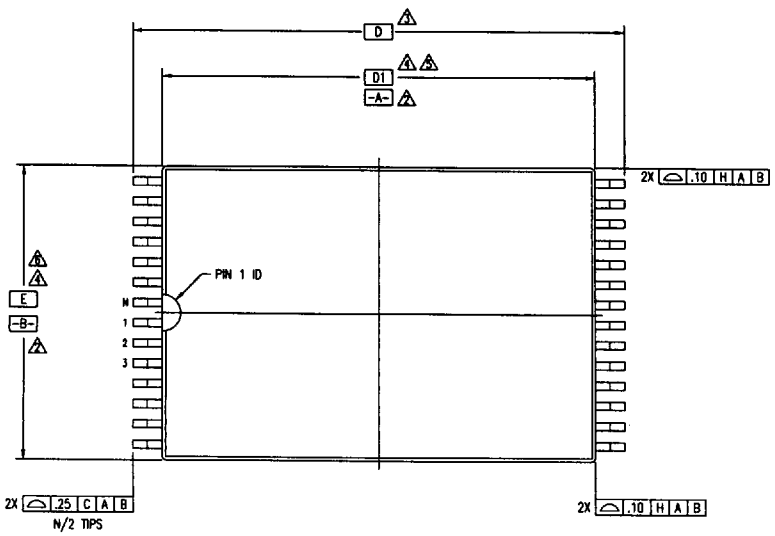
SIZE	DRAWING No.	REV
C	PSC-4024	03

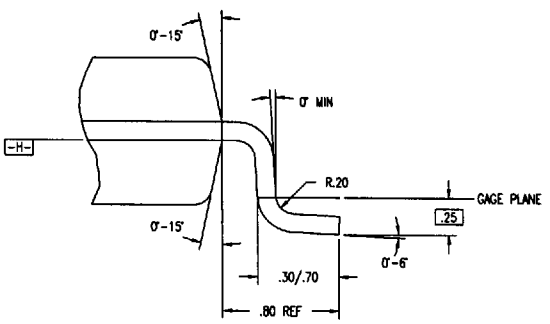
DO NOT SCALE DRAWING

PACKAGE DIAGRAM OUTLINES

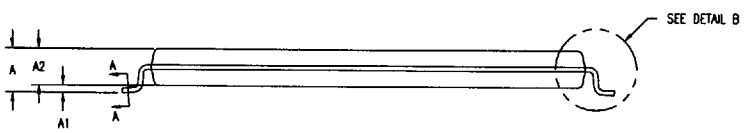
TSOP

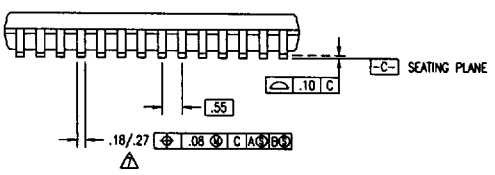
REVISIONS				
DCN	REV	DESCRIPTION	DATE	APPROVED
26041	00	INITIAL RELEASE	04/29/94	DG
27650	01	REDRAW TO ANSI Y14.5M-1982	03/15/95	

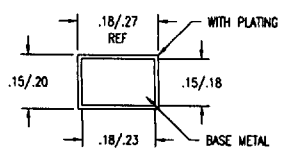




DETAIL B







SECTION A-A

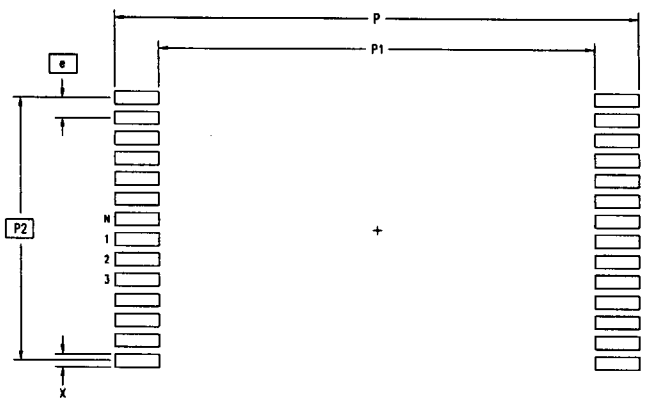
TOLERANCES UNLESS SPECIFIED		Integrated Device Technology, Inc. 2975 Stender Way, Santa Clara, CA 95054 PHONE: (408) 727-6116 FAX: (408) 492-8674 TWX: 910-338-2070		
DECIMAL XX± XXX± XXXX±	ANGULAR ±			
APPROVALS	DATE	TITLE	PZ PACKAGE OUTLINE 8.0 X 13.4 X 1.0 mm TSOP TYPE I .55 mm PITCH	
DRAWN dd	04/15/94			
CHECKED		SIZE C	DRAWING No. PSC-4044	REV 01
		DO NOT SCALE DRAWING		

TSOP (Continued)

REVISIONS				
DCN	REV	DESCRIPTION	DATE	APPROVED
28041	00	INITIAL RELEASE	04/29/94	DG
27850	01	REDRAW TO ANSI Y14.5M-1982	03/15/95	

DWG #		SO28-8	
SYMBOL	JEDEC VARIATION NOT REGISTERED		NOTE
	MIN	NOM	MAX	
A	1.00	–	1.20	
A1	.05	–	.20	
A2	.91	1.00	1.02	
D	13.40 BSC			3
D1	11.80 BSC			4,5
E	8.00 BSC			4,6
N	28			

LAND PATTERN DIMENSIONS



	MIN	MAX
P	14.20	14.40
P1	11.60	11.80
P2	7.15 BSC	
X	.30	.40
e	.55 BSC	
N	28	

NOTES:

1. ALL DIMENSIONING AND TOLERANCING CONFORM TO ANSI Y14.5M-1982
2. DATUMS -A- AND -B- TO BE DETERMINED AT DATUM PLANE -H-
3. DIMENSION D TO BE DETERMINED AT SEATING PLANE -C-
4. DIMENSIONS D1 AND E ARE TO BE DETERMINED AT DATUM PLANE -H-
5. DIMENSION D1 DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSIONS. INTERLEAD FLASH OR PROTRUSIONS SHALL NOT EXCEED .13 mm PER SIDE
6. DIMENSION E DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH , PROTRUSIONS OR GATE BURRS SHALL NOT EXCEED .13 mm PER SIDE
7. LEAD WIDTH DIMENSION DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION IS .08 mm IN EXCESS OF THE LEAD WIDTH DIMENSION AT MAXIMUM MATERIAL CONDITION. DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OR THE FOOT
8. THESE DIMENSIONS APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN .10 AND .25 mm FROM THE LEAD TIP
9. ALL DIMENSIONS ARE IN MILLIMETERS

TOLERANCES UNLESS SPECIFIED		
DECIMAL	ANGULAR	
XX±	±	
XXX±		
XXXX±		
APPROVALS	DATE	
DRAWN dd	04/15/94	
CHECKED		

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TITLE: P2 PACKAGE OUTLINE
8.0 X 13.4 X 1.0 mm TSOP TYPE I
.55 mm PITCH

SIZE	DRAWING No.	REV
C	PSC-4044	01

DO NOT SCALE DRAWING