Integrated Device Technology, Inc.

CMOS STATIC RAM 256K (32K x 8-BIT)

IDT71256S
IDT71256L

FEATURES:

- High-speed address/chip select time
  - — Military: 25/30/35/45/55/70/85/100/120/150ns (max.)
  - — Commercial: 20/25/35/45ns (max.) Low Power only.
- Low-power operation
- Battery Backup operation — 2V data retention
- Produced with advanced high-performance CMOS technology
- Input and output directly TTL-compatible
- Available in standard 28-pin (300 or 600 mil) ceramic DIP, 28-pin (600 mil) plastic DIP, 28-pin (300 mil) SOJ and 32-pin LCC
- Military product compliant to MIL-STD-883, Class B

DESCRIPTION:

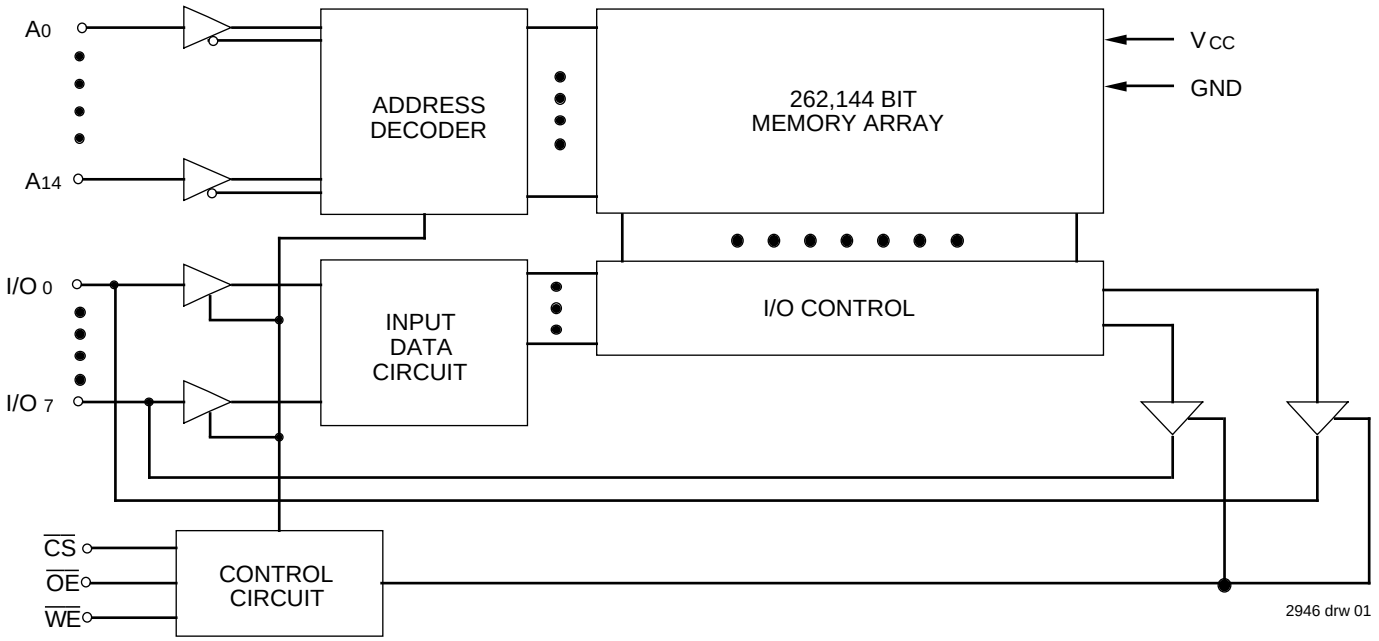
The IDT71256 is a 262,144-bit high-speed static RAM organized as 32K x 8. It is fabricated using IDT's high-performance, high-reliability CMOS technology.

Address access times as fast as 20ns are available with power consumption of only 350mW (typ.). The circuit also offers a reduced power standby mode. When $\overline{CS}$ goes HIGH, the circuit will automatically go to, and remain in, a low-power standby mode as long as $\overline{CS}$ remains HIGH. In the full standby mode, the low-power device consumes less than 15µW, typically. This capability provides significant system level power and cooling savings. The low-power (L) version also offers a battery backup data retention capability where the circuit typically consumes only 5µW when operating off a 2V battery.

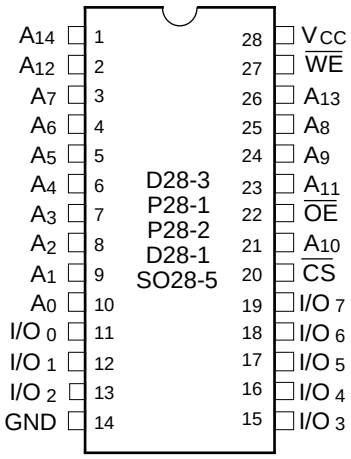
The IDT71256 is packaged in a 28-pin (300 or 600 mil) ceramic DIP, a 28-pin 300 mil J-bend SOIC, and a 28-pin (600 mil) plastic DIP, and 32-pin LCC providing high board-level packing densities.

The IDT71256 military RAM is manufactured in compliance with the latest revision of MIL-STD-883, Class B, making it ideally suited to military temperature applications demanding the highest level of performance and reliability.

FUNCTIONAL BLOCK DIAGRAM

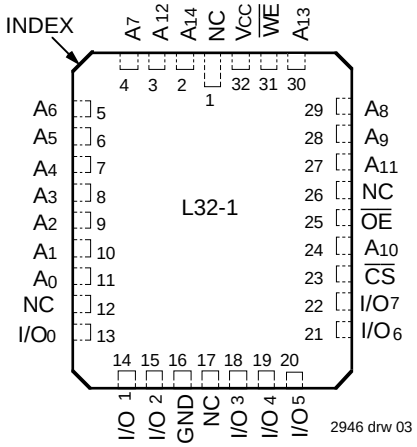


PIN CONFIGURATIONS



2946 drw 02

DIP/SOJ
TOP VIEW



2946 drw 03

32-Pin LCC
TOP VIEW

TRUTH TABLE(1)

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

NOTE: 2946 tbl 02
1. H = V_{IH}, L = V_{IL}, X = Don't Care

ABSOLUTE MAXIMUM RATINGS(1)

Symbol	Rating	Com'l.	Mil.	Unit
V_{TERM}	Terminal Voltage with Respect to GND	–0.5 to +7.0	–0.5 to +7.0	V
T_A	Operating Temperature	0 to +70	–55 to +125	°C
T_{BIAS}	Temperature Under Bias	–55 to +125	–65 to +135	°C
T_{STG}	Storage Temperature	–55 to +125	–65 to +150	°C
P_T	Power Dissipation	1.0	1.0	W
I_{OUT}	DC Output Current	50	50	mA

NOTE: 2946 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.

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
VCC	Power

2946 tbl 01

CAPACITANCE (T_A = +25°C, f = 1.0MHz)

Symbol	Parameter(1)	Conditions	Max.	Unit
C_{IN}	Input Capacitance	V_{IN} = 0V	11	pF
$C_{I/O}$	I/O Capacitance	V_{OUT} = 0V	11	pF

NOTE: 2946 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
Military	–55°C to +125°C	0V	5.0V ± 10%
Commercial	0°C to +70°C	0V	5.0V ± 10%

2946 tbl 05

RECOMMENDED DC OPERATING CONDITIONS

Symbol	Parameter	Min.	Typ.	Max.	Unit
V_{CC}	Supply Voltage	4.5	5.0	5.5	V
GND	Supply Voltage	0	0	0	V
V_{IH}	Input High Voltage	2.2	—	6.0	V
V_{IL}	Input Low Voltage	–0.5(1)	—	0.8	V

NOTE:
1. V_{IL} (min.) = –3.0V for pulse width less than 20ns, once per cycle.

2946 tbl 06

DC ELECTRICAL CHARACTERISTICS(1, 2)

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

Symbol	Parameter	Power	71256S/L20		71256S/L25		71256S/L30		71256S/L35		Unit
			Com'l.	Mil.	Com'l.	Mil.	Com'l.	Mil.	Com'l.	Mil.	
I_{CC}	Dynamic Operating Current $\overline{CS} \le V_{IL}$, Outputs Open V_{CC} = Max., f = f_{MAX}(2)	S	—	—	—	150	—	145	—	140	mA
		L	135	—	115	130	—	125	105	120	
I_{SB}	Standby Power Supply Current (TTL Level) $\overline{CS} \ge V_{IH}$, V_{CC} = Max., Outputs Open, f = f_{MAX}(2)	S	—	—	—	20	—	20	—	20	mA
		L	3	—	3	3	—	3	3	3	
I_{SB1}	Full Standby Power Supply Current (CMOS Level) $\overline{CS} \ge V_{HC}$, V_{CC} = Max., f = 0	S	—	—	—	20	—	20	—	20	mA
		L	0.4	—	0.4	1.5	—	1.5	0.4	1.5	

Symbol	Parameter	Power	71256S/L45		71256S/L55		71256S/L70		71256S/L85(3)		71256S/L100(3)		Unit
			Com'l.	Mil.	Com'l.	Mil.	Com'l.	Mil.	Com'l.	Mil.	Com'l.	Mil.	
I_{CC}	Dynamic Operating Current $\overline{CS} \le V_{IL}$, Outputs Open V_{CC} = Max., f = f_{MAX}(2)	S	—	135	—	135	—	135	—	135	—	135	mA
		L	100	115	—	115	—	115	—	115	—	115	
I_{SB}	Standby Power Supply Current (TTL Level) $\overline{CS} \ge V_{IH}$, V_{CC} = Max., Outputs Open, f = f_{MAX}(2)	S	—	20	—	20	—	20	—	20	—	20	mA
		L	3	3	—	3	—	3	—	3	—	3	
I_{SB1}	Full Standby Power Supply Current (CMOS Level) $\overline{CS} \ge V_{HC}$, V_{CC} = Max., f = 0	S	—	20	—	20	—	20	—	20	—	20	mA
		L	0.4	1.5	—	1.5	—	1.5	—	1.5	—	1.5	

NOTES:
1. All values are maximum guaranteed values.
2. f_{MAX} = 1/t_{RC}, all address inputs cycling at f_{MAX}; f = 0 means no address pins are cycling.
3. Also available: 120 and 150 ns military devices.

2946 tbl 07

AC TEST CONDITIONS

Input Pulse Levels	GND to 3.0V
Input Rise/Fall Times	5ns
Input Timing Reference Levels	1.5V
Output Reference Levels	1.5V
AC Test Load	See Figures 1 and 2

2946 tbl 08

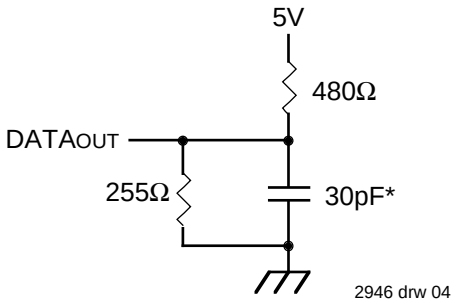


Figure 1. AC Test Load

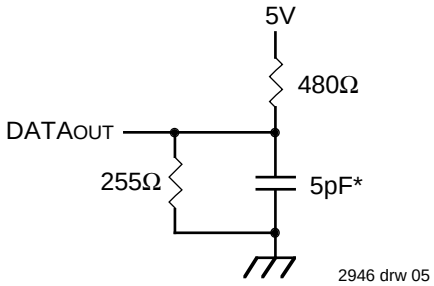


Figure 2. AC Test Load (for t_{CLZ}, t_{OLZ}, t_{CHZ}, t_{OHZ}, t_{OW}, t_{WHZ})

*Includes scope and jig capacitances

DC ELECTRICAL CHARACTERISTICS

V_{CC} = 5.0V ± 10%

Symbol	Parameter	Test Condition		IDT71256S Min.	IDT71256S Typ.	IDT71256S Max.	IDT71256L Min.	IDT71256L Typ.	IDT71256L Max.	Unit
$\|I_{LI}\|$	Input Leakage Current	V_{CC} = Max., V_{IN} = GND to V_{CC}	MIL. COM'L.	— —	— —	10 5	— —	— —	5 2	µA
$\|I_{LO}\|$	Output Leakage Current	V_{CC} = Max., $\overline{CS}$ = V_{IH}, V_{OUT} = GND to V_{CC}	MIL. COM'L.	— —	— —	10 5	— —	— —	5 2	µA
V_{OL}	Output Low Voltage	I_{OL} = 8mA, V_{CC} = Min.			—	0.4	—	—	0.4	V
		I_{OL} = 10mA, V_{CC} = Min.		—	—	0.5	—	—	0.5	
V_{OH}	Output High Voltage	I_{OH} = –4mA, V_{CC} = Min.		2.4	—	—	2.4	—	—	V

2946 tbl 09

DATA RETENTION CHARACTERISTICS OVER ALL TEMPERATURE RANGES

(L Version Only) V_{LC} = 0.2V, V_{HC} = V_{CC} – 0.2V

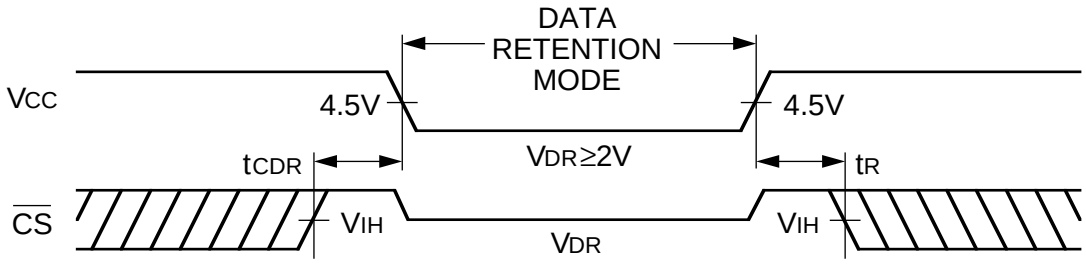
Symbol	Parameter	Test Condition		Min.	Typ. (1) Vcc @ 2.0v	Typ. (1) Vcc @ 3.0V	Max. Vcc @ 2.0V	Max. Vcc @ 3.0V	Unit
V_{DR}	V_{CC} for Data Retention	—		2.0	—	—	—	—	V
I_{CCDR}	Data Retention Current		MIL. COM'L.	— —	— —	— —	500 120	800 200	µA
t_{CDR}	Chip Deselect to Data Retention Time	$\overline{CS} \geq V_{HC}$		0	—	—	—	—	ns
t_R(3)	Operation Recovery Time			t_{RC}(2)	—	—	—	—	ns

NOTES:

2946 tbl 10

1. T_A = +25°C.
2. t_{RC} = Read Cycle Time.
3. This parameter is guaranteed, but not tested.

LOW Vcc DATA RETENTION WAVEFORM



2946 drw 06

AC ELECTRICAL CHARACTERISTICS (VCC = 5.0V ± 10%, All Temperature Ranges)

Symbol	Parameter	71256L20(1)		71256S25 71256L25		71256S30(3) 71256L30(3)		71256S35 71256L35		71256S45 71256L45		Unit
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
Read Cycle												
tRC	Read Cycle Time	20	—	25	—	30	—	35	—	45	—	ns
tAA	Address Access Time	—	20	—	25	—	30	—	35	—	45	ns
tACS	Chip Select Access Time	—	20	—	25	—	30	—	35	—	45	ns
tCLZ(2)	Chip Select to Output in Low-Z	5	—	5	—	5	—	5	—	5	—	ns
tCHZ(2)	Chip Deselect to Output in High-Z	—	10	—	11	—	15	—	15	—	20	ns
tOE	Output Enable to Output Valid	—	10	—	11	—	13	—	15	—	20	ns
tOLZ(2)	Output Enable to Output in Low-Z	2	—	2	—	2	—	2	—	0	—	ns
tOHZ(2)	Output Disable to Output in High-Z	2	8	2	10	2	12	2	15	—	20	ns
tOH	Output Hold from Address Change	5	—	5	—	5	—	5	—	5	—	ns
Write Cycle												
tWC	Write Cycle Time	20	—	25	—	30	—	35	—	45	—	ns
tCW	Chip Select to End-of-Write	15	—	20	—	25	—	30	—	40	—	ns
tAW	Address Valid to End-of-Write	15	—	20	—	25	—	30	—	40	—	ns
tAS	Address Set-up Time	0	—	0	—	0	—	0	—	0	—	ns
tWP	Write Pulse Width	15	—	20	—	25	—	30	—	35	—	ns
tWR	Write Recovery Time	0	—	0	—	0	—	0	—	0	—	ns
tDW	Data to Write Time Overlap	11	—	13	—	14	—	15	—	20	—	ns
tWHZ(2)	Write Enable to Output in High-Z	—	10	—	11	—	15	—	15	—	20	ns
tDH	Data Hold from Write Time	0	—	0	—	0	—	0	—	0	—	ns
tOW(2)	Output Active from End-of-Write	5	—	5	—	5	—	5	—	5	—	ns

NOTES:

2946 tbl 11

1. 0° to +70°C temperature range only.
2. This parameter guaranteed by device characterization, but is not production tested.
3. –55° to +125°C temperature range only.

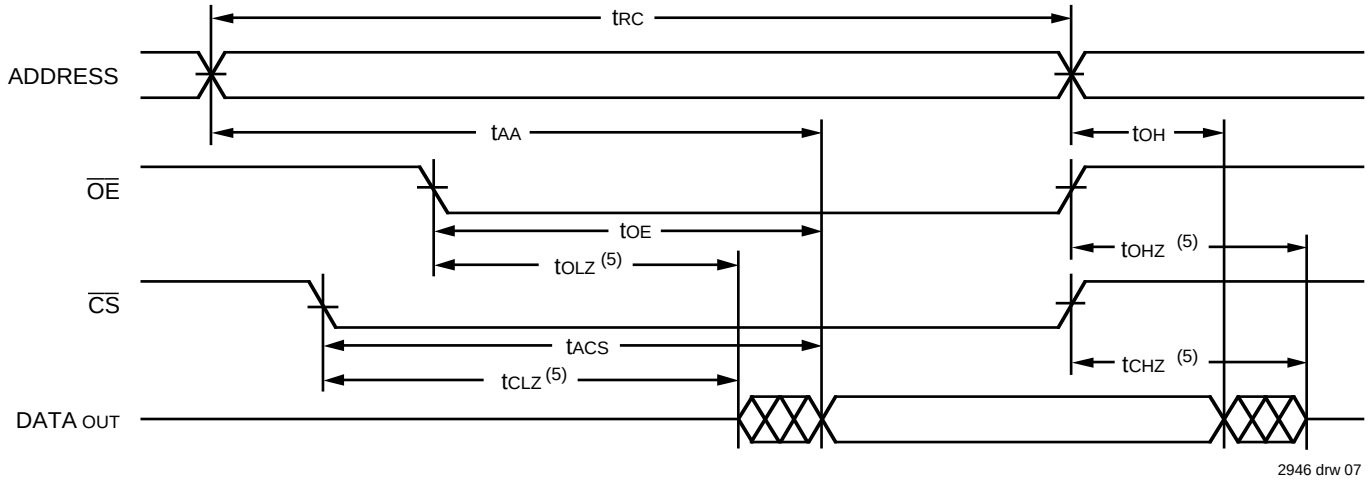
AC ELECTRICAL CHARACTERISTICS (V_{CC} = 5.0V ± 10%, All Temperature Ranges)

Symbol	Parameter	71256S55[1] 71256L55[1]		71256S70[1] 71256L70[1]		71256S85[1] 71256L85[1]		71256S100[1,3] 71256L100[1,3]		Unit
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
Read Cycle										
t_{RC}	Read Cycle Time	55	—	70	—	85	—	100	—	ns
t_{AA}	Address Access Time	—	55	—	70	—	85	—	100	ns
t_{ACS}	Chip Select Access Time	—	55	—	70	—	85	—	100	ns
t_{CLZ}[2]	Chip Deselect to Output in Low-Z	5	—	5	—	5	—	5	—	ns
t_{CHZ}[2]	Output Enable to Output in Low-Z	—	25	—	30	—	35	—	40	ns
t_{OE}	Output Enable to Output Valid	—	25	—	30	—	35	—	40	ns
t_{OLZ}[2]	Output Enable to Output in Low-Z	0	—	0	—	0	—	0	—	ns
t_{OHZ}[2]	Output Disable to Output in High-Z	0	25	0	30	—	35	—	40	ns
t_{OH}	Output Hold from Address Change	5	—	5	—	5	—	5	—	ns
Write Cycle										
t_{WC}	Write Cycle Time	55	—	70	—	85	—	100	—	ns
t_{CW}	Chip Select to End-of-Write	50	—	60	—	70	—	80	—	ns
t_{AW}	Address Valid to End-of-Write	50	—	60	—	70	—	80	—	ns
t_{AS}	Address Set-up Time	0	—	0	—	0	—	0	—	ns
t_{WP}	Write Pulse Width	40	—	45	—	50	—	55	—	ns
t_{WR}	Write Recovery Time	0	—	0	—	0	—	0	—	ns
t_{DW}	Data to Write Time Overlap	25	—	30	—	35	—	40	—	ns
t_{DH}	Data Hold from Write Time ($\overline{WE}$)	0	—	0	—	0	—	0	—	ns
t_{WHZ}[2]	Write Enable to Output in High-Z	—	25	—	30	—	35	—	40	ns
t_{OW}[2]	Output Active from End-of-Write	5	—	5	—	5	—	5	—	ns

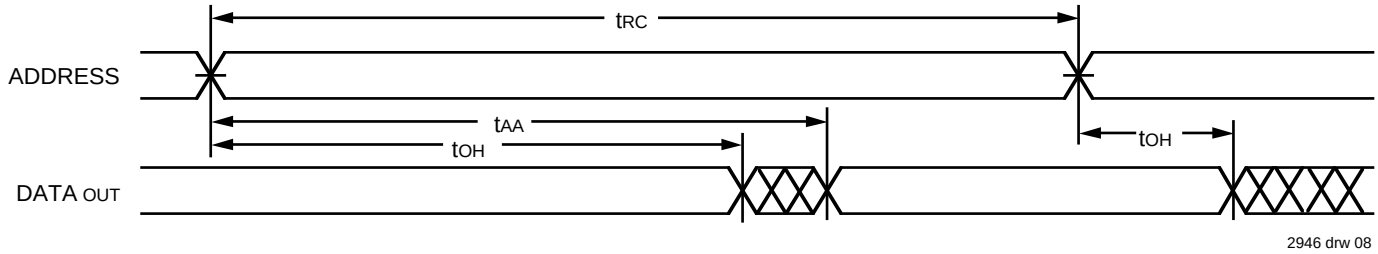
NOTES:
2946 tbl 11

1. –55°C to +125°C temperature range only.
2. This parameter guaranteed by device characterization, but is not production tested.
3. Also available: 120 and 150 ns military devices.

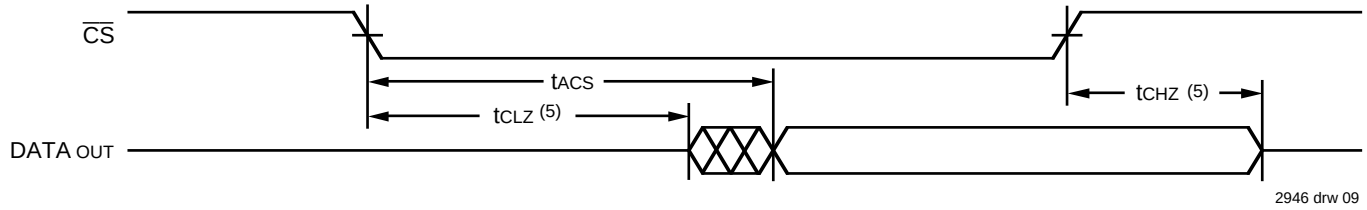
TIMING WAVEFORM OF READ CYCLE NO. 1(1)



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

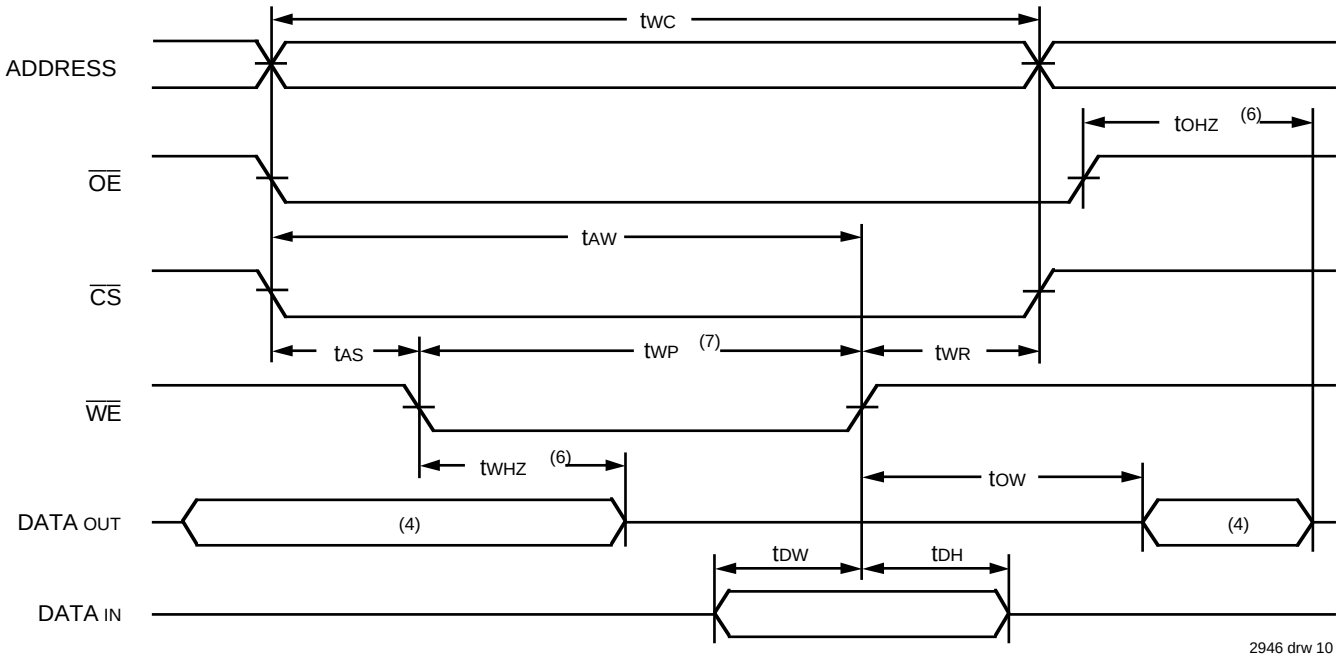


TIMING WAVEFORM OF READ CYCLE NO. 3(1, 3, 4)

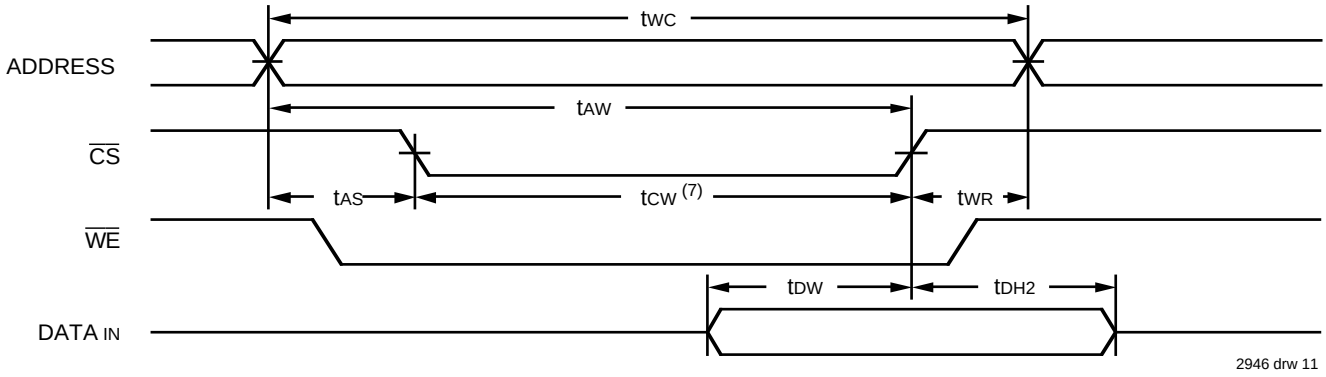


NOTES:
1. $\overline{WE}$ is HIGH for Read cycle.
2. Device is continuously selected, $\overline{CS}$ is LOW.
3. Address valid prior to or coincident with $\overline{CS}$ transition LOW.
4. $\overline{OE}$ is LOW.
5. Transition is measured ±200mV from steady state.

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

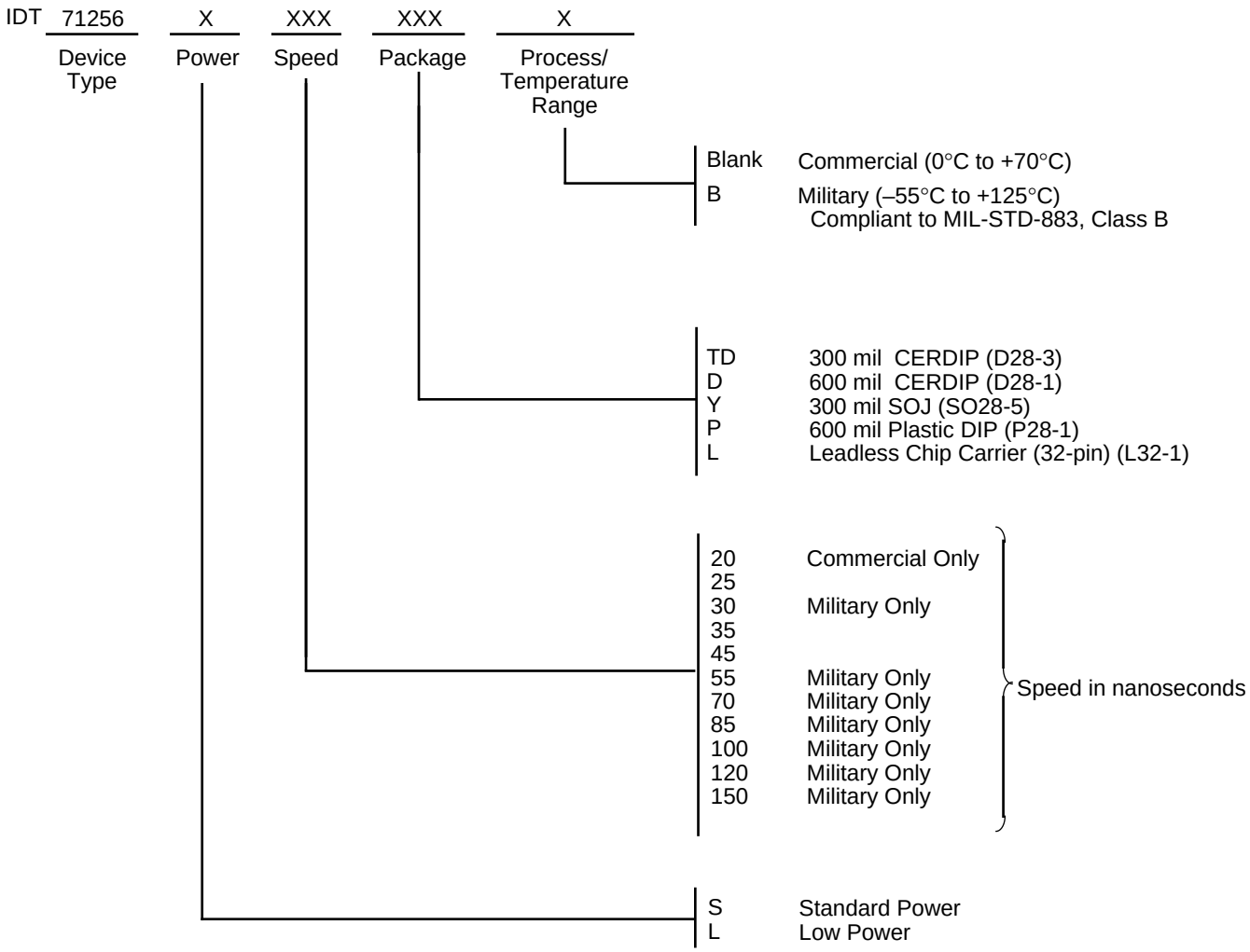


TIMING WAVEFORM OF WRITE CYCLE NO. 2 ($\overline{CS}$ CONTROLLED TIMING)(1, 2, 3, 5)



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}. For a $\overline{CS}$ controlled write cycle, $\overline{OE}$ may be LOW with no degradation to t_{CW}.

ORDERING INFORMATION



2946 drw 12