

Features

- ☐ Dynamic random access memory 262144 x 1 bit manufactured using a CMOS technology
- ☐ RAS access times 70 ns, 80 ns
- ☐ TTL-compatible
- ☐ Three-state output
- ☐ 256 refresh cycles
4 ms refresh cycle time
- ☐ FAST PAGE MODE
- ☐ Operating modes: Read, Write, Read - Write, $\overline{\text{RAS}}$ only Refresh, Hidden Refresh with address transfer
- ☐ Power Supply Voltage 5 V
- ☐ Packages PDIP16 (300 mil) SOJ20/26 (300 mil)
- ☐ Operating temperature range 0 to 70 °C
- ☐ Quality assessment according to CECC 90000, CECC 90100 and CECC 90112

Description

Addressing

The UD61256 is a dynamic Write-Read-memory with random access. FPM facilitates faster data operation with predefined row address. Via 9 address inputs the 18 address bits are transmitted into the internal address memories in a time-multiplex operation. The falling $\overline{\text{RAS}}$ -edge takes over the row address. During $\overline{\text{RAS}}$ Low, the column address together with the $\overline{\text{CAS}}$ signal are taken over. The selection of one or more memory circuits can be made by activation of the $\overline{\text{RAS}}$ input.

Read-Write-Control

The choice between Read or Write cycle is made at the $\overline{\text{W}}$ input. HIGH at the $\overline{\text{W}}$ input causes a Read cycle, meanwhile LOW leads to a Write cycle. Both $\overline{\text{CAS}}$ -controlled and $\overline{\text{W}}$ -controlled Write cycles are possible with activated $\overline{\text{RAS}}$ signal.

Data Output Control

The usual state of the data output is the High-Z state. Whenever $\overline{\text{CAS}}$ is inactive (HIGH), Q will float (High-Z). Thus, $\overline{\text{CAS}}$ functions as data output control.

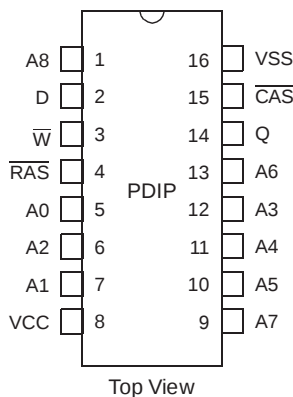
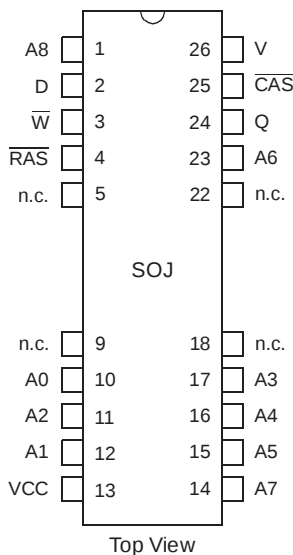
After access time, in case of a Read cycle, the output is activated, and it contains the logic „0“ or „1“.

Q is then valid until $\overline{\text{CAS}}$ returns into to inactive state (HIGH).

The memory cycle being a Read, Read-Write or a Write cycle ($\overline{\text{W}}$ -controlled), Q changes from High-Z state to the active state („0“ or „1“). After the access time the contents of the selected cell is available, except for the Write cycle.

The output remains active until $\overline{\text{CAS}}$ becomes inactive, irrespective of $\overline{\text{RAS}}$ becoming inactive or not. The memory cycle being a Write cycle ($\overline{\text{CAS}}$ -controlled), the data output keeps its High-Z state throughout the whole cycle. This configuration makes Q fully controllable by the user merely through the timing of $\overline{\text{W}}$. The output storing the data, they remain valid from the end of access time until the start of another cycle.

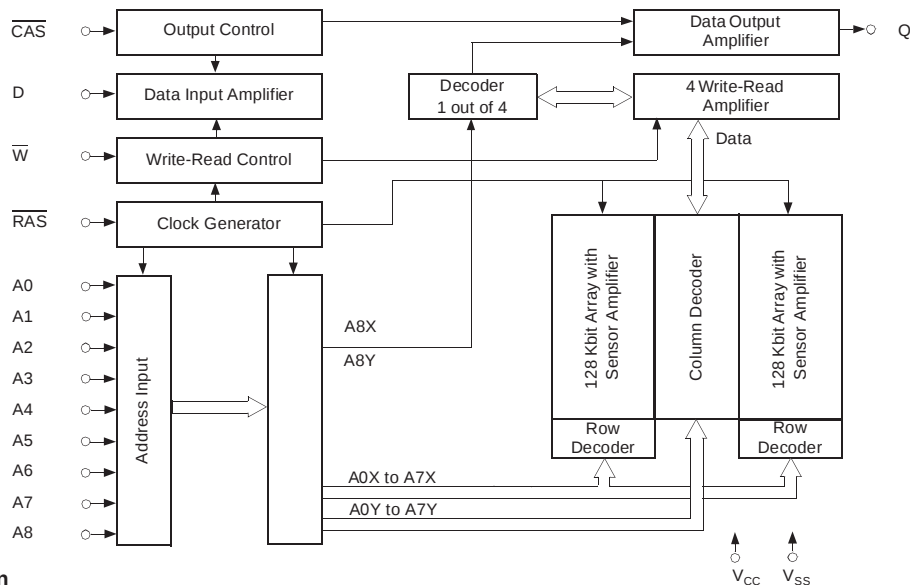
Pin Configuration



Pin Description

Signal Name	Signal Description
A0 - A8	Address Inputs
D	Data Input
$\overline{\text{W}}$	Read, Write Control
$\overline{\text{RAS}}$	Row Address Strobe
UCC	Power Supply Voltage
USS	Ground
$\overline{\text{CAS}}$	Column Address Strobe
Q	Data Output
n.c.	no connected

Block Diagram



Operation

Function		$\overline{\text{RAS}}$	$\overline{\text{CAS}}$	$\overline{\text{W}}$	Address		Data	
					R	C	D	Q
Stand-by		H	X	X	X	X	X	High-Z
Read		L	L	H	Row	Column	X	Output Data
Write		L	L	L	Row	Column	Input Data	High-Z
Read-Write		L	L	H $\rightarrow$ L	Row	Column	Input Data	Output Data
FPM Read	1st cycle	L	H $\rightarrow$ L	H	Row	Column	X	Output Data
	2nd cycle	L	H $\rightarrow$ L	H		Column	X	Output Data
FPM Write	1st cycle	L	H $\rightarrow$ L	L	Row	Column	Input Data	High-Z
	2nd cycle	L	H $\rightarrow$ L	L		Column	Input Data	High-Z
FPM Read-Write	1st cycle	L	H $\rightarrow$ L	H $\rightarrow$ L	Row	Column	Input Data	Output Data
	2nd cycle	L	H $\rightarrow$ L	H $\rightarrow$ L		Column	Input Data	Output Data
RAS only Refresh		L	H	X	Row		X	High-Z
HIDDEN Refresh*)	Read	L $\rightarrow$ H $\rightarrow$ L	L	H	Row	Column	X	Output Data
	Write	L $\rightarrow$ H $\rightarrow$ L	L	L	Row	Column	Input Data	High-Z

*) Transfer of Refresh Address required

Characteristics

All voltages are referenced to $V_{SS} = 0$ V (ground).

All characteristics are valid in the power supply voltage range and operating temperature range indicated below.

Absolute Maximum Ratings	Symbol	Min.	Max.	Unit
Power Supply Voltage	V_{CC}	-0.5	7.0	V
Input Voltage ¹⁾	V_I	-1.0	7.0	V
Output Voltage ¹⁾	V_O	-1.0	7.0	V
Output Current	I_O	-50	50	mA
Power Dissipation	P_D		1	W
Operating Temperature	T_a	0	70	°C
Storage Temperature	T_{stg}	-55	125	°C

Remarks: see page 7

Recommended Operating Conditions	Symbol	Min.	Max.	Unit
Power Supply Voltage	V_{CC}	4.5	5.5	V
Input Low Voltage ¹⁾	V_{IL}	-1.0	0.8	V
Input High Voltage	V_{IH}	2.4	5.5	V

Remark: see page 7

Capacitances	Conditions	Symbol	Min.	Max.	Unit
Input Capacitance A0 to A8, D	$V_{CC} = 5.0$ V $V_I = V_{SS}$ $f = 1$ MHz $T_a = 25$ °C	C_{I1}		6	pF
Input Capacitance RAS, CAS, W		C_{I2}		7	pF
Output Capacitance		C_O		7	pF

All pins not under test must be connected with ground by capacitors.

Static Characteristics	Conditions	Symbol	Min.		Max.		Unit
			07	08	07	08	
Power Supply Current (average value of $\overline{\text{RAS}}$ - $\overline{\text{CAS}}$ cycles) ²⁾	$t_{cW} = t_{cWmin}$ $t_{cR} = t_{cRmin}$	I_{CC1}			70	60	mA
Refresh Current ²⁾ (average value of $\overline{\text{RAS}}$ cycles)	$t_{cW} = t_{cWmin}$ $t_{cR} = t_{cRmin}$ $\overline{\text{CAS}} = V_{IH}$	I_{CC2}			70	60	mA
FPM Current ²⁾ (average value of FPM cycles)	$t_{cPG} = t_{cPGmin}$ $\overline{\text{RAS}} = V_{IL}$	I_{CC3}			50	40	mA
Stand-by Current (TTL Level)	$\overline{\text{RAS}} = \overline{\text{CAS}}$ $= V_{IH}$	I_{CC4}			2	2	mA
Stand-by Current (CMOS Level)	$\overline{\text{RAS}} = \overline{\text{CAS}}$ $= V_{CC} - 0.2 \text{ V}$	I_{CC5}			1	1	mA
Output High Voltage	$I_{OH} = -5 \text{ mA}$	V_{OH}	2.4	2.4			V
Output Low Voltage	$I_{OL} = 4.2 \text{ mA}$	V_{OL}			0.4	0.4	V
Input Leakage Current at any input, all other pins = 0 V	$V_I = 0 \text{ V to } 5.5 \text{ V}$	I_I	-10	-10	10	10	μA
Output Leakage Current Q = High-Z	$V_O = 0 \text{ V to } 5.5 \text{ V}$ $\overline{\text{RAS}} = \overline{\text{CAS}}$ $= V_{IH}$	I_O	-10	-10	10	10	μA

Remarks: see page 7

Dynamic Characteristics ³⁾	Symbol		Min.		Max.		Unit
	Alt.	IEC	07	08	07	08	
☐ ALL CYCLES							
Transition Time (Rise and Fall) ⁴⁾	t _T	t _t	3	3	50	50	ns
$\overline{\text{RAS}}$ Precharge Time	t _{RP}	t _{W(RASH)}	50	60			ns
CAS Precharge Time	t _{CP}	t _{W(CASH)}	10	10			ns
Row Address Set-up Time	t _{ASR}	t _{SU(RA-RAS)}	0	0			ns
Column Address Set-up Time	t _{ASC}	t _{SU(CA-CAS)}	0	0			ns
Row Address Hold Time	t _{RAH}	t _{H(RAS-RA)}	10	10			ns
Column Address Hold Time	t _{CAH}	t _{H(CAS-CA)}	15	15			ns
Column Address Hold Time ref. to $\overline{\text{RAS}}$	t _{AR}	t _{H(RAS-CA)}	55	60			ns
Output Buffer Turn-off Delay ⁵⁾	t _{OFF}	t _{V(CAS)}	0	0	20	20	ns
$\overline{\text{CAS}}$ to $\overline{\text{RAS}}$ Precharge Time	t _{CRP}	t _{CASH-RASL}	5	5			ns
$\overline{\text{RAS}}$ to Column Address Delay Time	t _{RAD}	t _{RAS-CA}	15	15	35	40	ns
Column Address to $\overline{\text{RAS}}$ Lead Time	t _{RAL}	t _{CA-RASH}	35	40			ns
CAS to Output in Low-Z	t _{CLZ}	t _{CASL-QX}	0	0			ns
Refresh Period	t _{REF}	t _{rf}			4	4	ms
☐ READ							
Random Read Cycle Time ¹²⁾	t _{RC}	t _{cR}	130	150			ns
Access Time from $\overline{\text{RAS}}$ ^{7), 8)}	t _{RAC}	t _{a(RAS)}			70	80	ns
Access Time from Column Address ^{7), 8)}	t _{AA}	t _{a(CA)}			35	40	ns
Access Time from $\overline{\text{CAS}}$ ^{7), 8)}	t _{CAC}	t _{a(CAS)}			20	20	ns
$\overline{\text{RAS}}$ Pulse Width	t _{RAS}	t _{W(RASL)}	70	80	10000	10000	ns
$\overline{\text{CAS}}$ Pulse Width	t _{CAS}	t _{W(CASL)}	20	20	10000	10000	ns
Read Command Set-up Time	t _{RCS}	t _{SU(R-CAS)}	0	0			ns
Read Command Hold Time ref. to $\overline{\text{RAS}}$ ⁹⁾	t _{RRH}	t _{H(RAS-R)}	0	0			ns
Read Command Hold Time ⁹⁾	t _{RCH}	t _{H(CAS-R)}	0	0			ns
$\overline{\text{RAS}}$ to $\overline{\text{CAS}}$ Delay Time ⁶⁾	t _{RCD}	t _{RASL-CASL}	20	20	50	60	ns
CAS Hold Time	t _{CSH}	t _{RASL-CASH}	70	80			ns
$\overline{\text{RAS}}$ Hold Time	t _{RSH}	t _{CASL-RASH}	20	20			ns
☐ WRITE							
Random Write Cycle Time ¹²⁾	t _{RC}	t _{cW}	130	150			ns
$\overline{\text{RAS}}$ Pulse Width	t _{RAS}	t _{W(RASL)}	70	80	10000	10000	ns
$\overline{\text{CAS}}$ Pulse Width	t _{CAS}	t _{W(CASL)}	20	20	10000	10000	ns
Write Command Pulse Width	t _{WP}	t _{W(W)}	15	15			ns

Remarks: see page 7

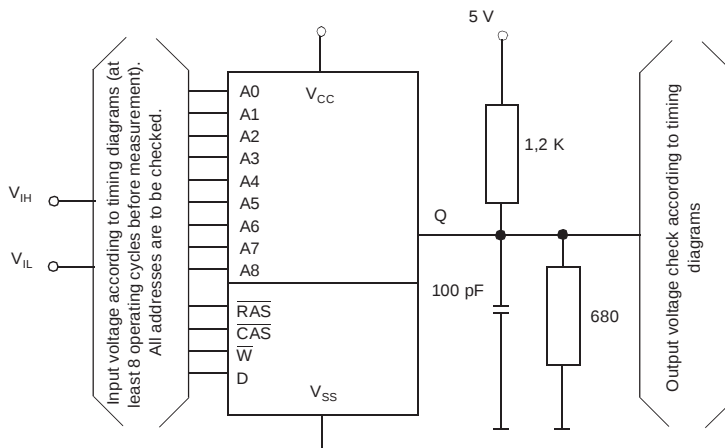
Dynamic Characteristics ³⁾	Symbol		Min.		Max.		Unit
	Alt.	IEC	07	08	07	08	
☐ WRITE (continuation)							
Write Command Set-up Time ¹⁰⁾	t_{WCS}	$t_{su(W-CAS)}$	0	0			ns
Data Set-up Time ref. to $\overline{CAS}$ ¹¹⁾	t_{DS}	$t_{su(D-CAS)}$	0	0			ns
Data Set-up Time ref. to $\overline{W}$ ¹¹⁾	t_{DS}	$t_{su(D-W)}$	0	0			ns
Write Command Hold Time	t_{WCH}	$t_{h(CAS-W)}$	15	15			ns
Write Command to RAS Lead Time	t_{RWL}	$t_{h(W-RAS)}$	20	20			ns
Write Command to CAS Lead Time	t_{CWL}	$t_{h(W-CAS)}$	20	20			ns
Data Hold Time ref. to RAS	t_{DHR}	$t_{h(RAS-D)}$	55	60			ns
Data Hold Time ref. to CAS	t_{DH}	$t_{h(CAS-D)}$	15	15			ns
Data Hold Time ref. to $\overline{W}$	t_{DH}	$t_{h(W-D)}$	15	15			ns
$\overline{RAS}$ to $\overline{CAS}$ Delay Time ⁶⁾	t_{RCD}	$t_{RASL-CASL}$	20	20	50	60	ns
$\overline{CAS}$ Hold Time	t_{CSH}	$t_{RASL-CASH}$	70	80			ns
$\overline{RAS}$ Hold Time	t_{RSH}	$t_{CASL-RASH}$	20	20			ns
☐ READ-WRITE							
Read-Write Cycle Time ¹²⁾	t_{RWC}	t_{cRW}	155	175			ns
$\overline{RAS}$ Pulse Width	t_{RAS}	$t_{w(RASL)RW}$	95	105	10000	10000	ns
$\overline{CAS}$ Pulse Width	t_{CAS}	$t_{w(CASL)RW}$	45	45	10000	10000	ns
$\overline{CAS}$ Hold Time	t_{CSH}	$t_{(RASL-CASH)RW}$	95	105			ns
$\overline{RAS}$ to $\overline{WRITE}$ Delay Time ¹⁰⁾	t_{RWD}	t_{RAS-W}	70	80			ns
$\overline{CAS}$ to $\overline{WRITE}$ Delay Time ¹⁰⁾	t_{CWD}	t_{CAS-W}	20	20			ns
Column to $\overline{WRITE}$ Delay Time ¹⁰⁾	t_{AWD}	$t_{(CA-W)RW}$	35	40			ns
☐ FPM							
Fast Page Mode Cycle Time ¹²⁾	t_{PC}	t_{cPG}	50	50			ns
RAS Pulse Width	t_{RASP}	$t_{w(RASL)}$	70	80	100000	100000	ns
Access Time from $\overline{CAS}$ Precharge	t_{CPA}	$t_{a(CASH)}$	35	40			ns
☐ HIDDEN-REFRESH							
$\overline{CAS}$ Hold Time ($\overline{CAS}$ before $\overline{RAS}$ Cycle)	t_{CHR}	$t_{RASL-CASH}$	15	15			ns

Remarks: see page 7

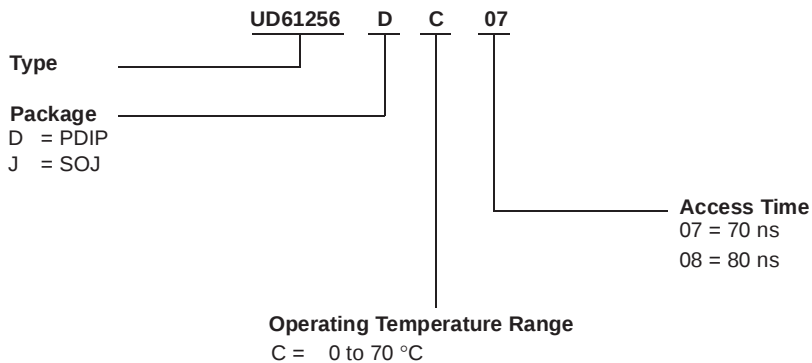
Remarks:

- 1) The Input Low Voltage must not drop below -0.3 V for more than 40 ns.
- 2) The current is inversely proportional to the cycle time; the max. current is measured in the short test cycle time.
- 3) For test conditions see test configuration for functional test and timing diagrams.
- 4) V_{IHmin} and V_{ILmax} are reference levels for time measurement of the input signals; transition times are measured between V_{IH} and V_{IL} .
- 5) $t_{V(CAS)}$ and $t_{V(RAS)}$ define the time at which the data output goes to High-Z; this time is not related to any level.
- 6) $t_{RASL-CASLmax}$ and t_{RAS-CA} are given as reference points only; they do not represent restrictive conditions.
- 7) The access time is determined by the three times $t_{a(RAS)}$, $t_{a(CAS)}$ and $t_{a(CA)}$:
 - if $t_{RASL-CASL} < t_{RASL-CASLmax}$ and $t_{RAS-CA} < t_{RAS-CAmax}$ $t_{a(RAS)}$ is valid,
 - if $t_{RASL-CASL} > t_{RASL-CASLmax}$ and $t_{su(CA-CAS)} < (t_{a(CA)max} - t_{a(CAS)max})$ $t_{a(CA)}$ is valid,
 - if $t_{RASL-CASL} > t_{RASL-CASLmax}$ and $t_{su(CA-CAS)} > (t_{a(CA)max} - t_{a(CAS)max})$ $t_{a(CAS)}$ is valid.
- 8) Measured with a load equivalent to 2 TTL loads.
- 9) In a READ cycle either $t_{h(RAS-R)}$ or $t_{h(CAS-R)}$ must be kept.
- 10) $t_{su(W-CAS)}$, t_{RAS-W} , t_{CAS-W} and $t_{su(A)}$ do not represent restrictive parameters:
 - if $t_{su(W-CAS)} \geq t_{su(W-CAS)min}$, the cycle is a WRITE cycle ($\overline{CAS}$ -controlled) and the data output remains in High-Z throughout the whole $\overline{CAS}$ cycle,
 - if $t_{CAS-W} > t_{CAS-Wmin}$, $t_{RAS-W} > t_{RAS-Wmin}$ and $t_{su(CA-W)RW} > t_{su(CA-W)RWmin}$, the cycle is a READ-WRITE cycle and the content of the cell is available at the data output,
 - if none of these conditions is satisfied, the condition of the data output (at access time) is indeterminate, since a WRITE cycle ($\overline{W}$ -controlled) is carried out.
- 11) These parameters refer to $\overline{CAS}$ in the WRITE cycle ($\overline{CAS}$ -controlled) and to $\overline{W}$ during WRITE ($\overline{W}$ -controlled) or to $\overline{W}$ in the READ-WRITE cycle, resp.
- 12) The values of t_{cmin} are used for indication of the particular cycle time in which full function is guaranteed in the temperature range from 0 to 70 °C. Values below the one shown above may cause permanent damage to the component.

Test Configuration for Functional Check

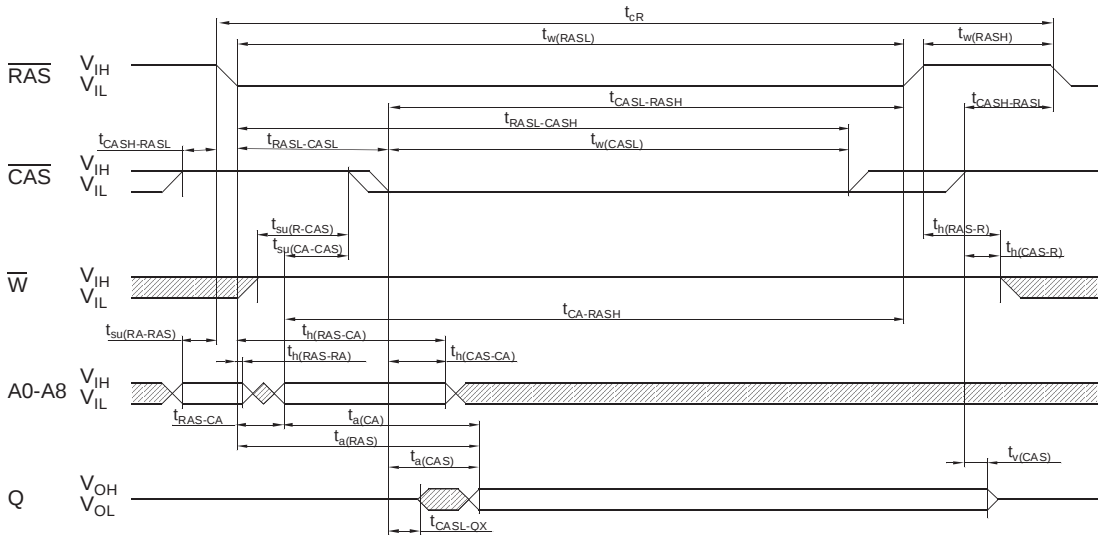
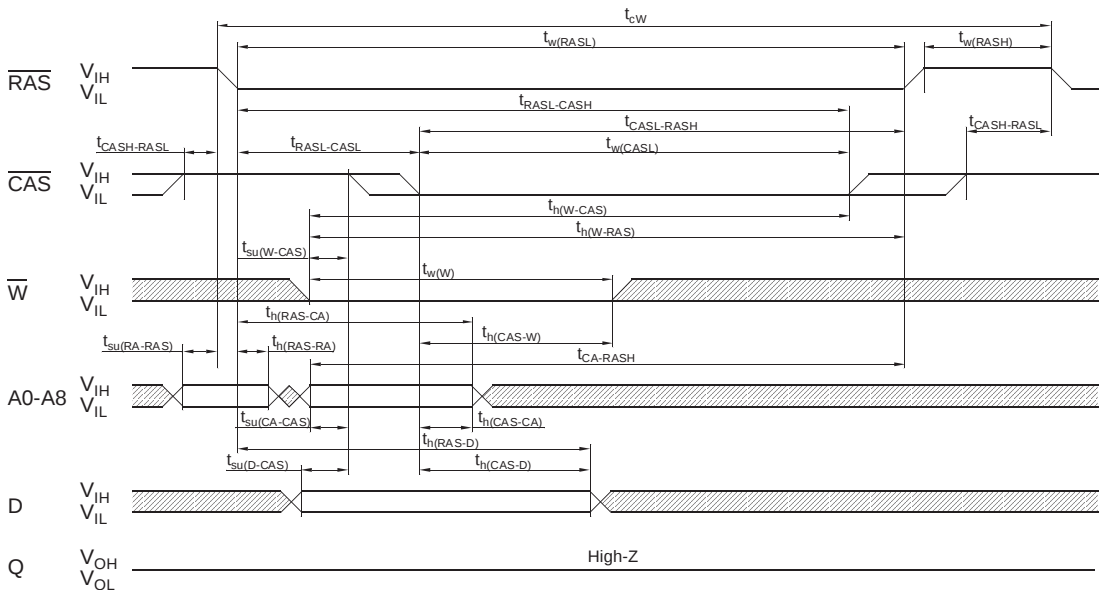


IC Code Numbers

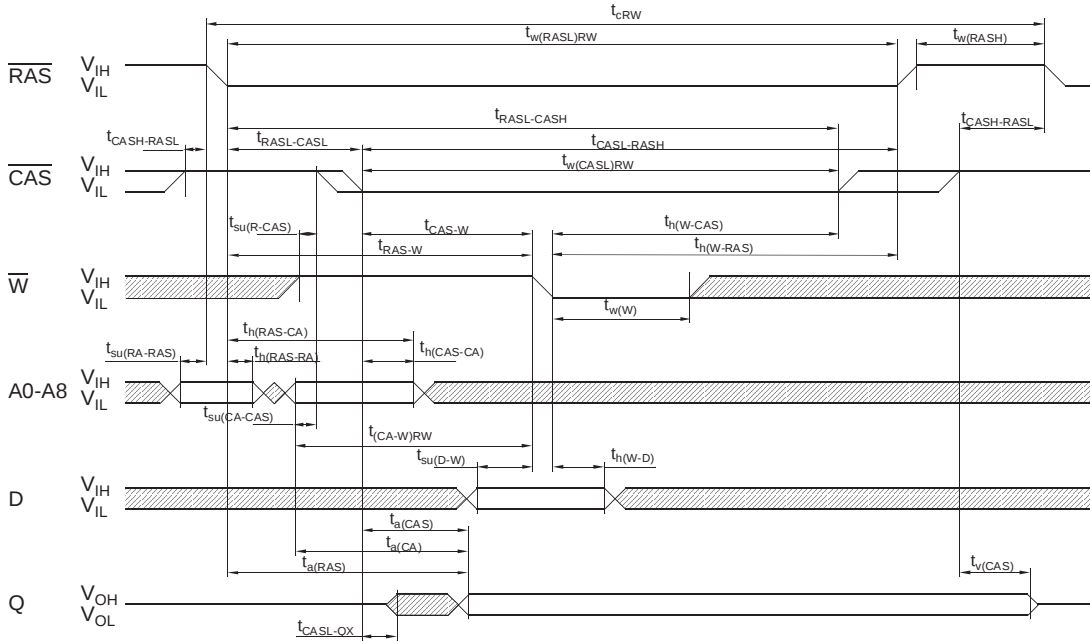


The date of manufacture is given by the 4 last digits of the mark, the 2 first digits indicating the year, and the last 2 digits the calendar week.

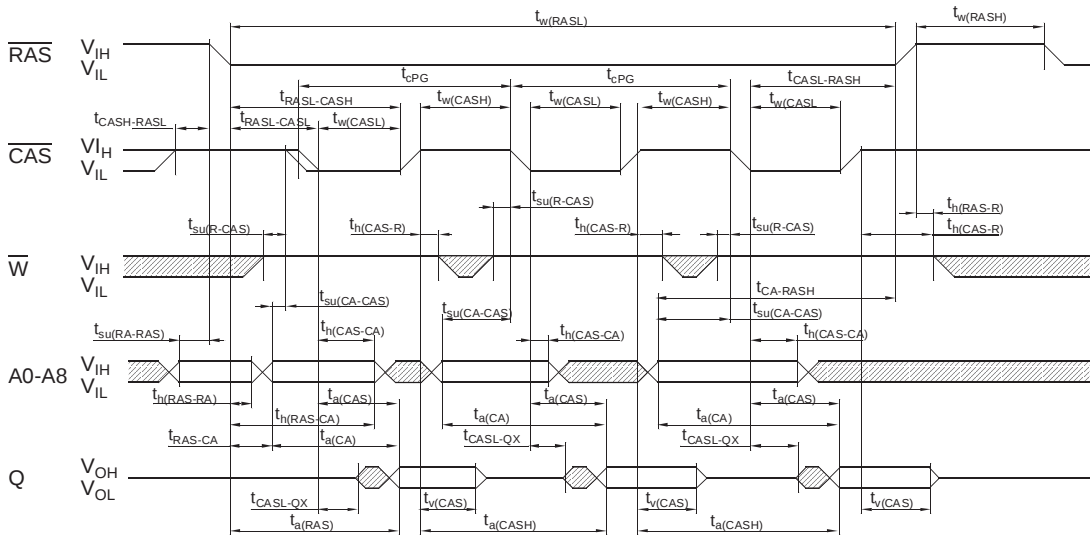
Read

Write ($\overline{\text{CAS}}$ -controlled)

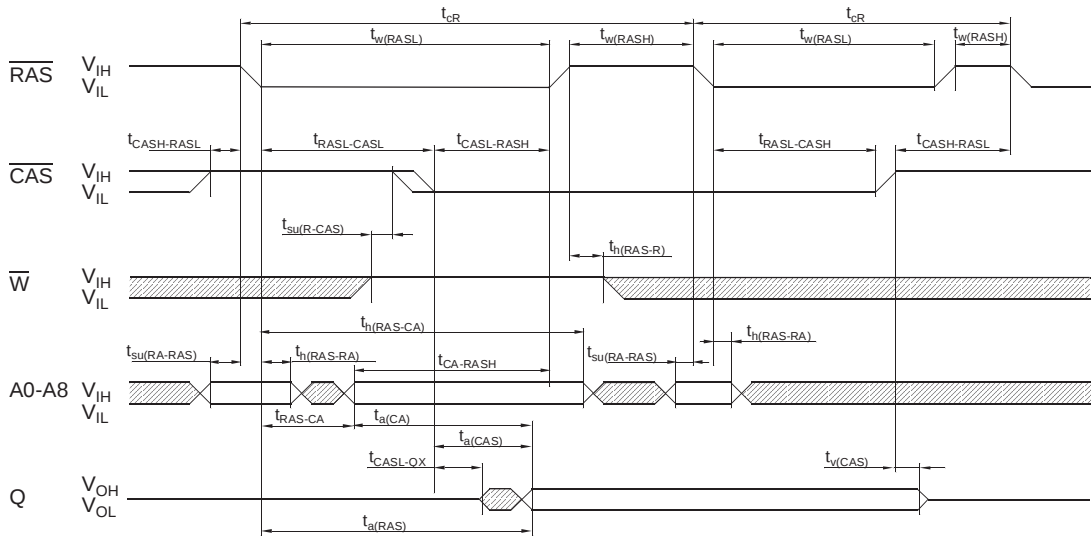
Read-Write



FPM Read



HIDDEN-Refresh with address transfer





Zentrum Mikroelektronik Dresden

Memory Products 1998

256K x 1 DRAM UD61256

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The information describes the type of component and shall not be considered as assured characteristics.

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