SIEMENS

HYB 514171 BJ/BJL -60/-70

256k x 16 - Bit Dynamic RAM

INFORMATION NOTE NO.4

256kx16 WORDWIDE DYNAMIC MEMORIES
(Hypershrink Version)

CHARACTERISATION DATA

This information note is intended to provide technical information on the SIEMENS 256kx16 DYNAMIC ACCESS MEMORIES (Hypershrink-Version) HYB 514171BJ/BJL.

CHARACTERISTICS OF DC - PARAMETERS

The SIEMENS HYB 514171BJ/BJL 256kx16 wordwide DRAM device ("Hypershrink Version") is guarantied to meet certain DC parametric limits over the temperature range 0^{o} to 70^{o}C. This information note shows the actual performance levels that can typically be expected from devices. Samples out of three different production lots have been randomly selected and characterised.

Typical values of operation and standby currents as a function of temperature, voltage and cycle time are shown in fig.1 through fig 10.

In fig.11 and 12 the typical behaviour of V_{IHmin} (minimum TTL-level input high voltage) , V_{ILmax} (maximum TTL-level input low voltage), V_{OH}/V_{OL} (output high and low voltage) as a function of supply voltage is shown.

CHARACTERISTICS OF AC - PARAMETERS

Supply voltage and temperature dependence of row (trac), column (tcac), address (taa) and output enable (toea) access times are the topics of fig.13 and fig. 16.

All other AC - parameters measured at two voltages (VCC = 4.5 V and 5.5 V) and two temperatures (+85^{o}C and - 10^{o}C) are put together in tables 1 & 2.

All measurements shown in this information note have been performed on an ADVANTEST 3333 dedicated memory test system.

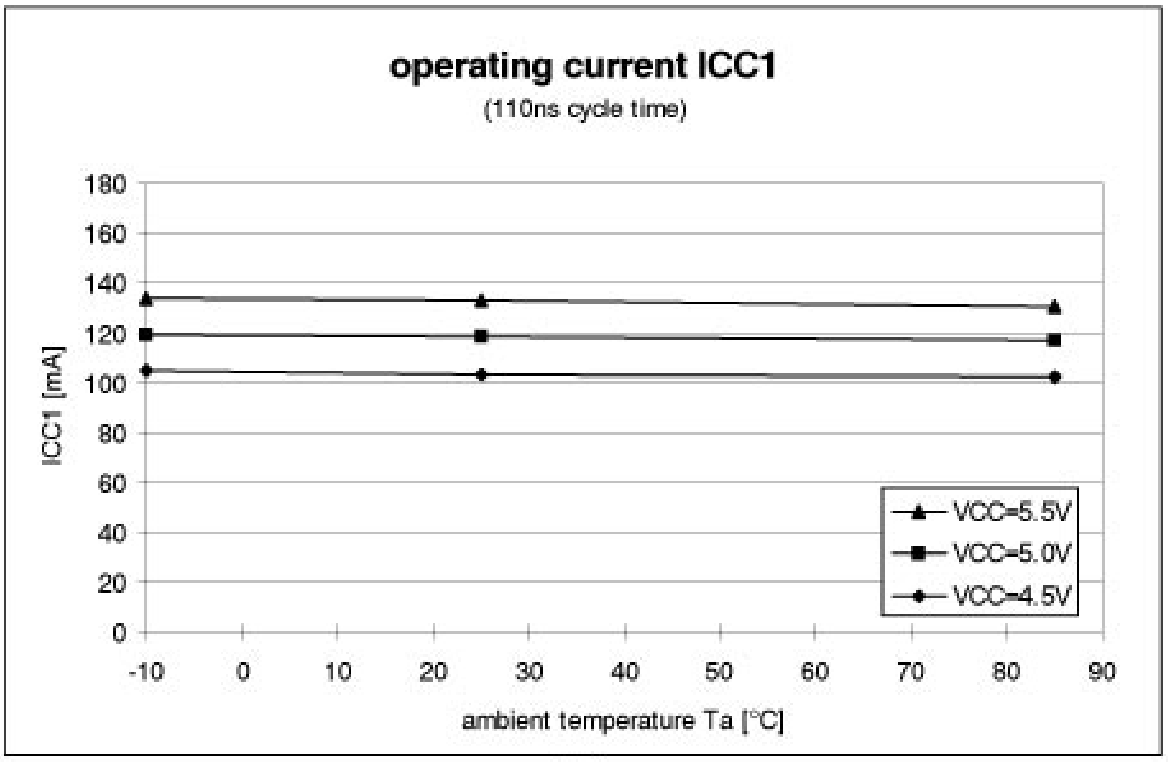
operating current ICC1
(110ns cycle time)
ICC1 [mA]
180
160
140
120
100
80
60
40
20
0
-10
0
10
20
30
40
50
60
70
80
90
ambient temperature Ta [°C]
VCC=5.5V
VCC=5.0V
VCC=4.5V

fig.1

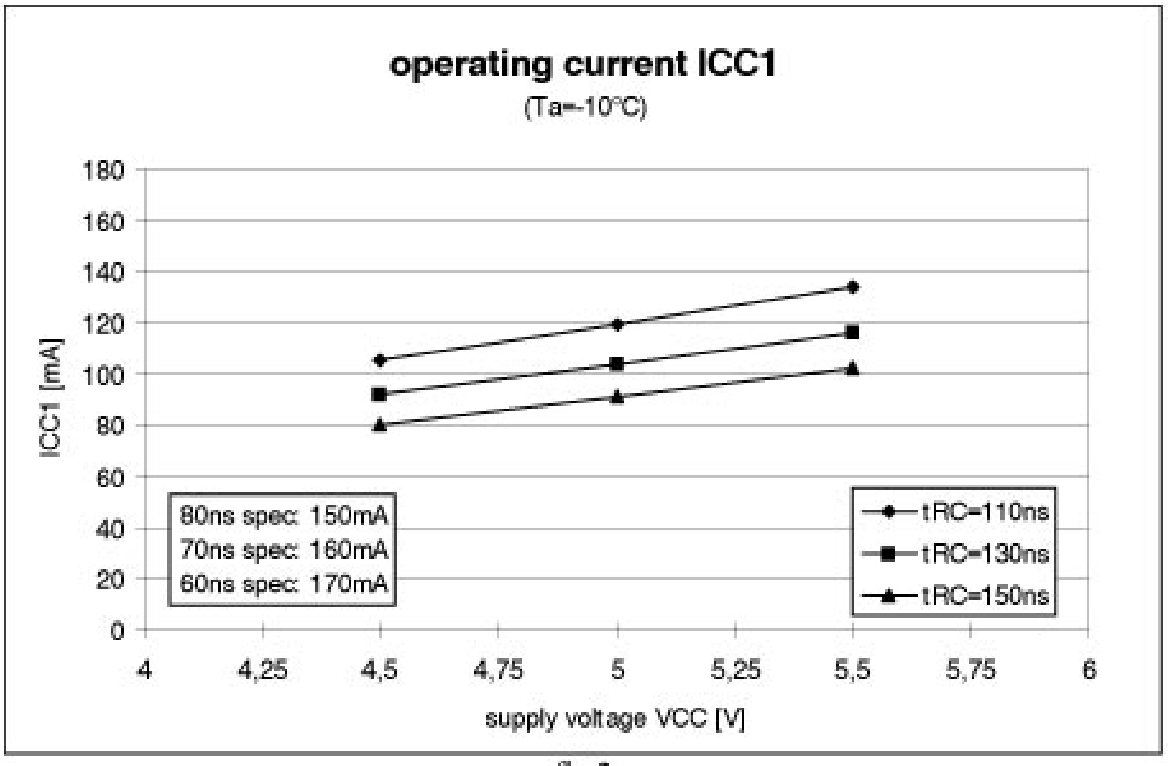
operating current ICC1
(Ta=-10°C)
ICC1 [mA]
180
160
140
120
100
80
60
40
20
0
4
4,25
4,5
4,75
5
5,25
5,5
5,75
6
supply voltage VCC [V]
80ns spec: 150mA
70ns spec: 160mA
60ns spec: 170mA
tRC=110ns
tRC=130ns
tRC=150ns

fig.2

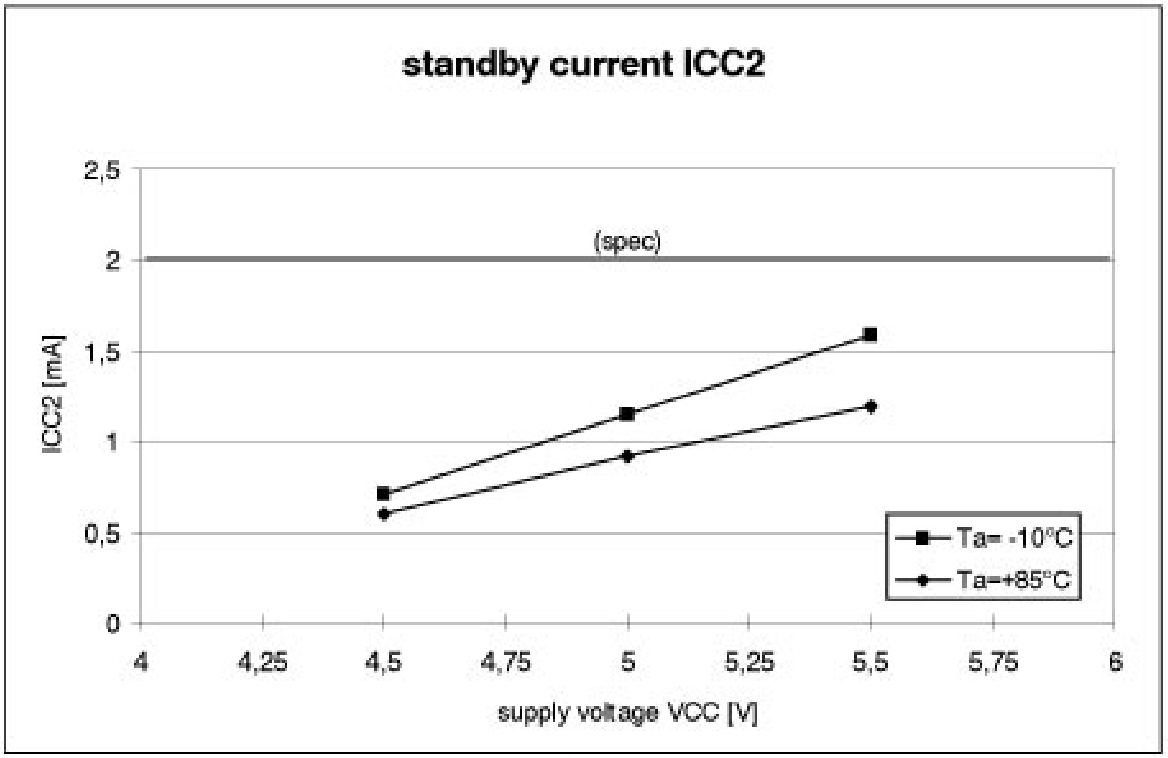
standby current ICC2
2,5
2
1,5
1
0,5
0
ICC2 [mA]
(spec)
Ta= -10°C
Ta=+85°C
4
4,25
4,5
4,75
5
5,25
5,5
5,75
6
supply voltage VCC [V]

fig.3

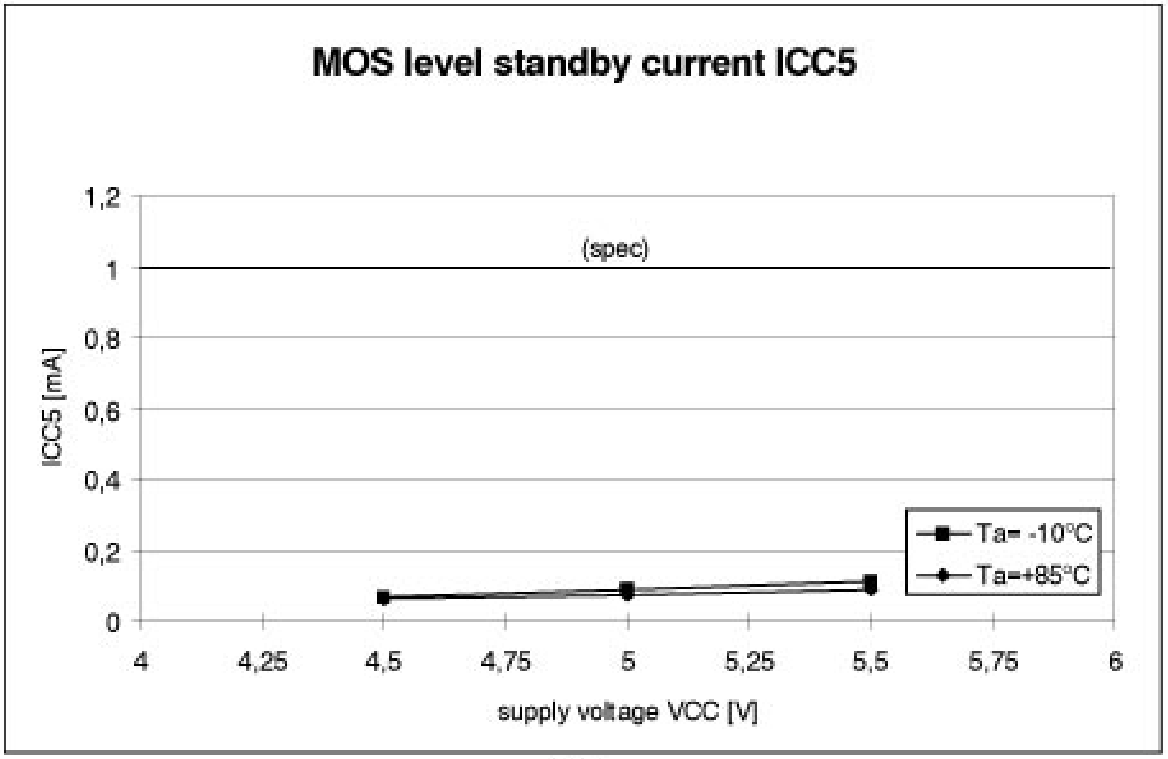
MOS level standby current ICC5
1,2
1
0,8
0,6
0,4
0,2
0
ICC5 [mA]
(spec)
Ta= -10°C
Ta=+85°C
4
4,25
4,5
4,75
5
5,25
5,5
5,75
6
supply voltage VCC [V]

fig.4

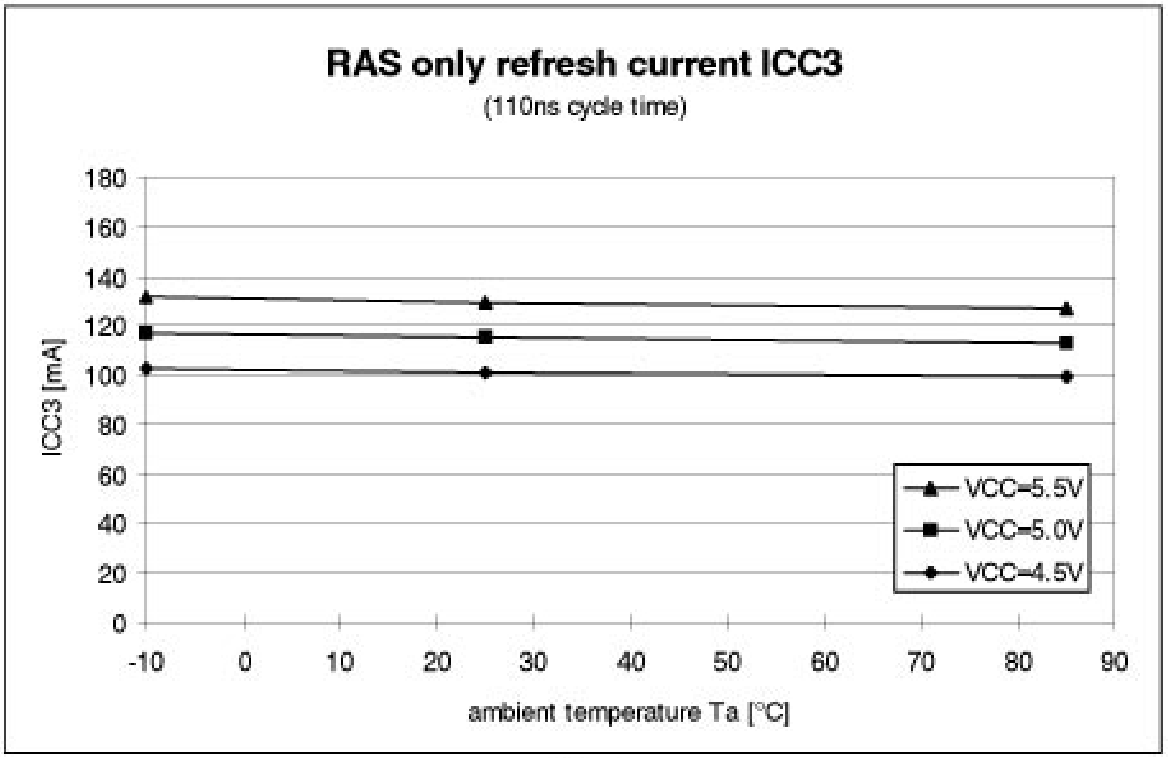
RAS only refresh current ICC3
(110ns cycle time)
ICC3 [mA]
180
160
140
120
100
80
60
40
20
0
-10
0
10
20
30
40
50
60
70
80
90
ambient temperature Ta [°C]
VCC=5.5V
VCC=5.0V
VCC=4.5V

fig.5

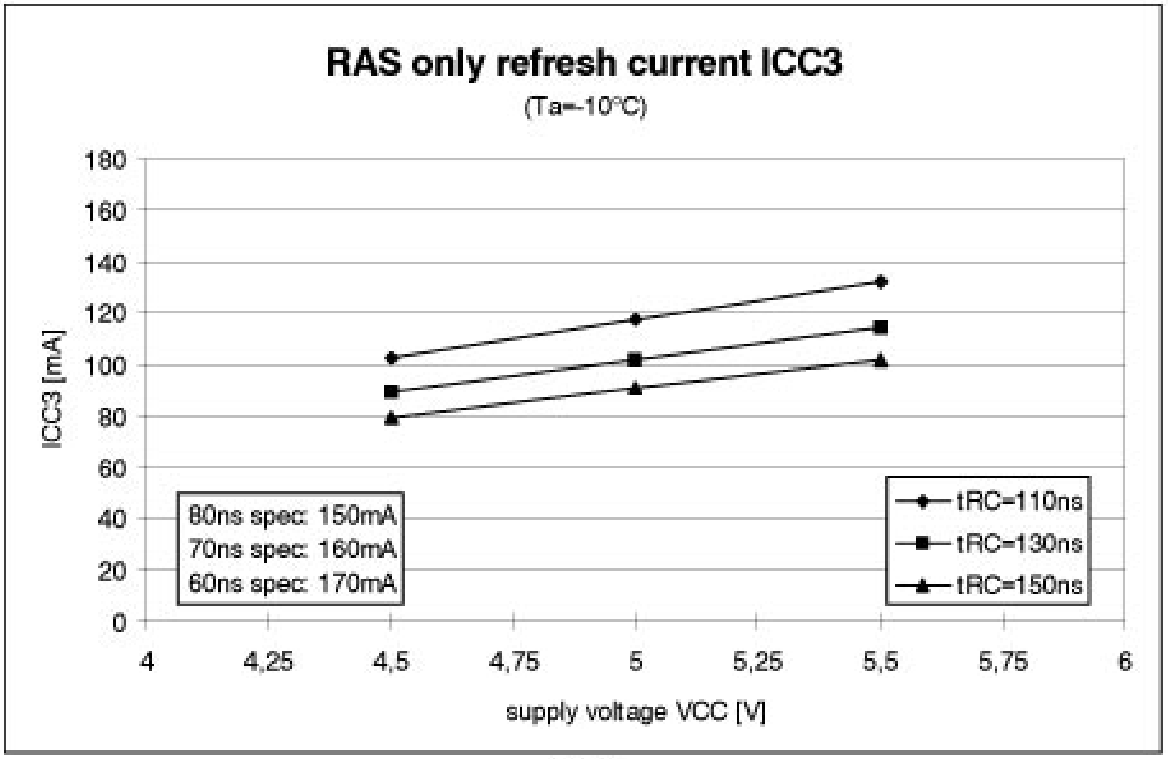
RAS only refresh current ICC3
(Ta=-10°C)
ICC3 [mA]
180
160
140
120
100
80
60
40
20
0
4
4,25
4,5
4,75
5
5,25
5,5
5,75
6
supply voltage VCC [V]
80ns spec: 150mA
70ns spec: 160mA
60ns spec: 170mA
tRC=110ns
tRC=130ns
tRC=150ns

fig.6

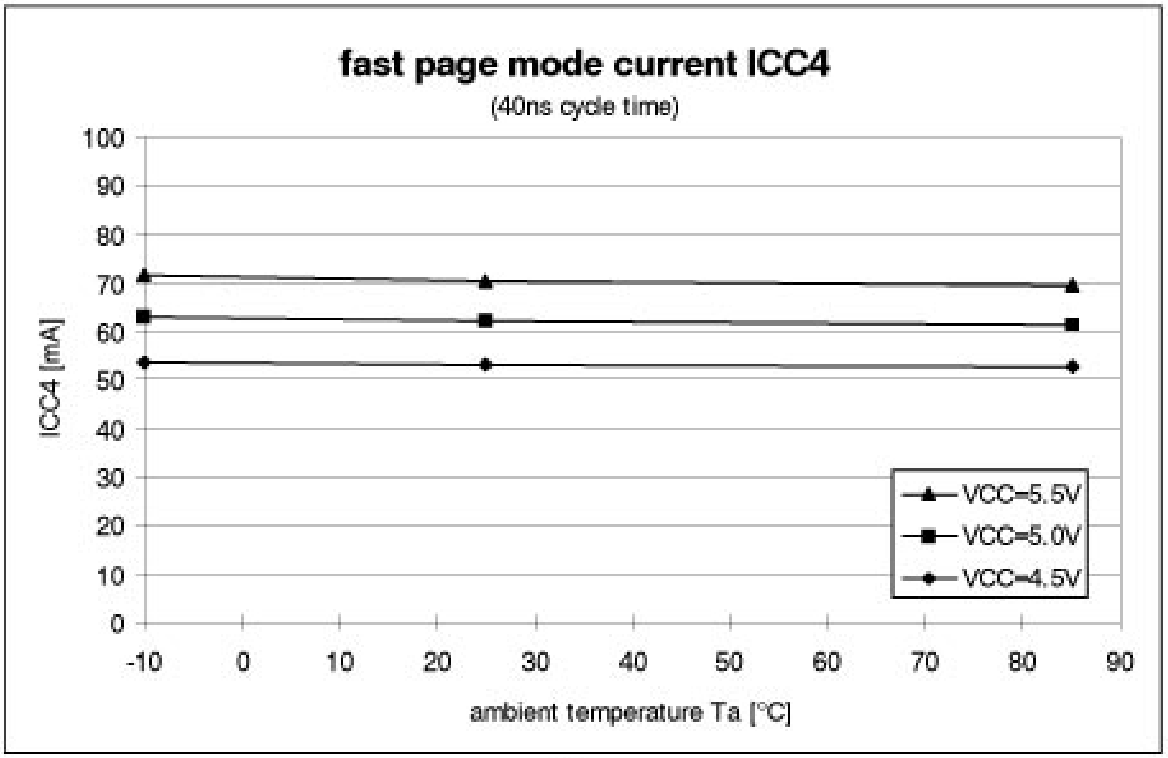
fast page mode current ICC4
(40ns cycle time)
ICC4 [mA]
100
90
80
70
60
50
40
30
20
10
0
-10
0
10
20
30
40
50
60
70
80
90
ambient temperature Ta [°C]
VCC=5.5V
VCC=5.0V
VCC=4.5V

fig.7

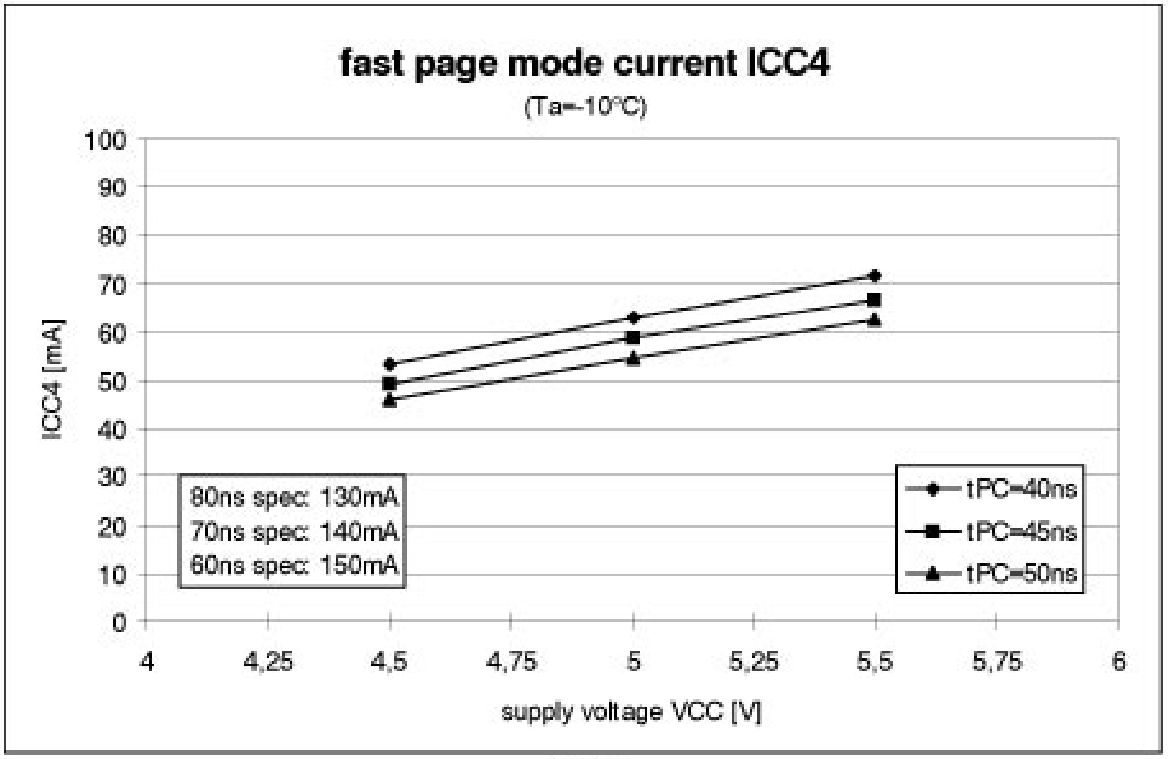
fast page mode current ICC4
(Ta=-10°C)
ICC4 [mA]
100
90
80
70
60
50
40
30
20
10
0
4
4,25
4,5
4,75
5
5,25
5,5
5,75
6
supply voltage VCC [V]
80ns spec: 130mA
70ns spec: 140mA
60ns spec: 150mA
tPC=40ns
tPC=45ns
tPC=50ns

fig.8

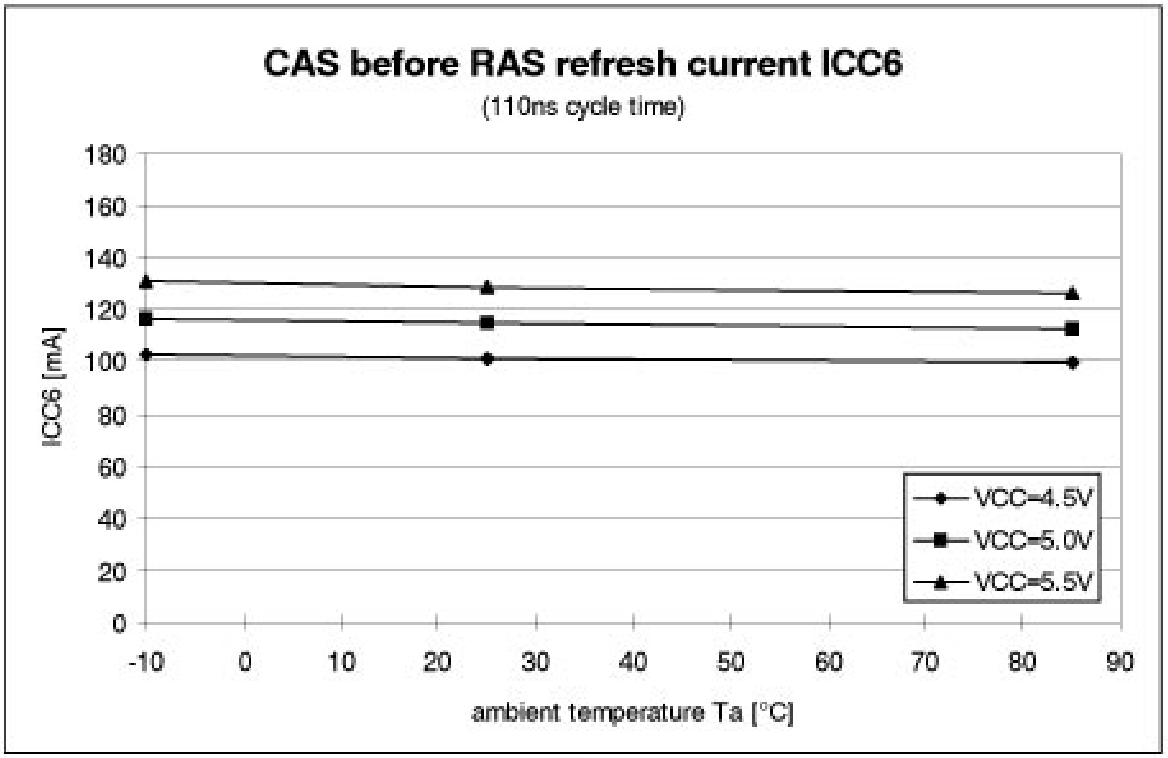
CAS before RAS refresh current ICC6
(110ns cycle time)
ICC6 [mA]
180
160
140
120
100
80
60
40
20
0
-10
0
10
20
30
40
50
60
70
80
90
ambient temperature Ta [°C]
VCC=4.5V
VCC=5.0V
VCC=5.5V

fig.9

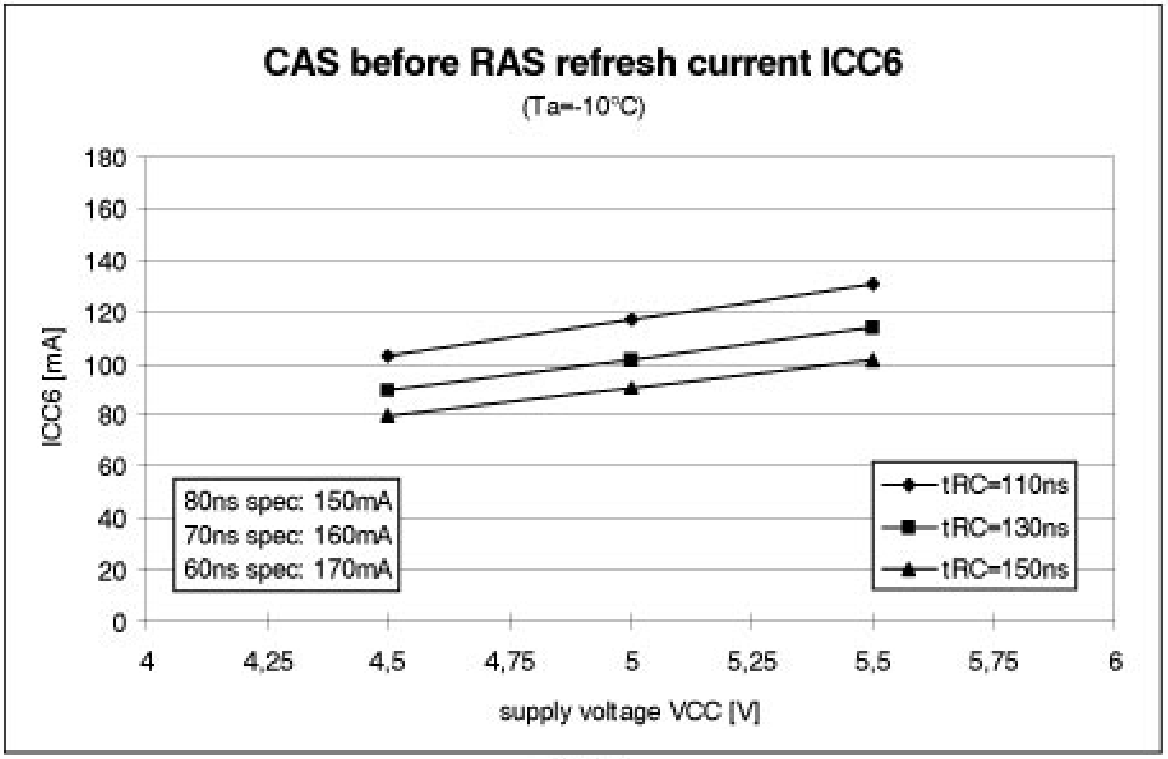
CAS before RAS refresh current ICC6
(Ta=-10°C)
ICC6 [mA]
180
160
140
120
100
80
60
40
20
0
4
4,25
4,5
4,75
5
5,25
5,5
5,75
6
supply voltage VCC [V]
80ns spec: 150mA
70ns spec: 160mA
60ns spec: 170mA
tRC=110ns
tRC=130ns
tRC=150ns

fig.10

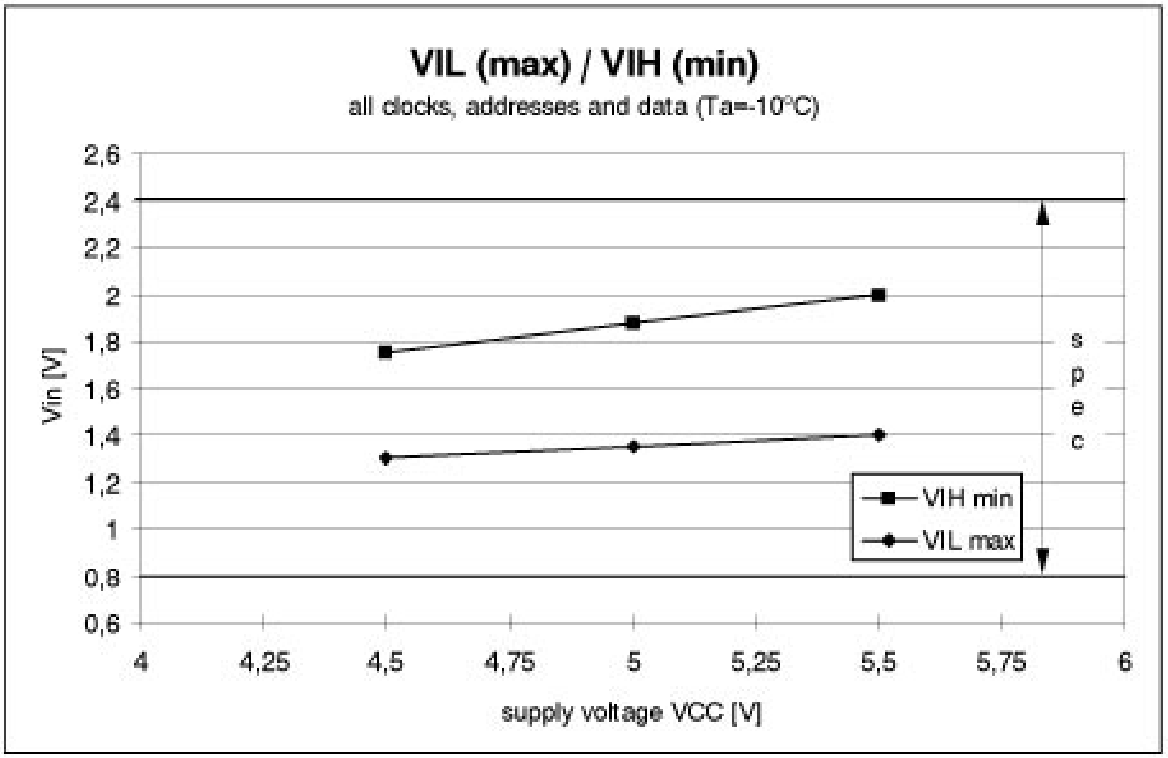
VIL (max) / VIH (min)
all clocks, addresses and data (Ta=-10°C)
Vin [V]
2,6
2,4
2,2
2
1,8
1,6
1,4
1,2
1
0,8
0,6
4
4,25
4,5
4,75
5
5,25
5,5
5,75
6
supply voltage VCC [V]
VIH min
VIL max
spec

fig.11

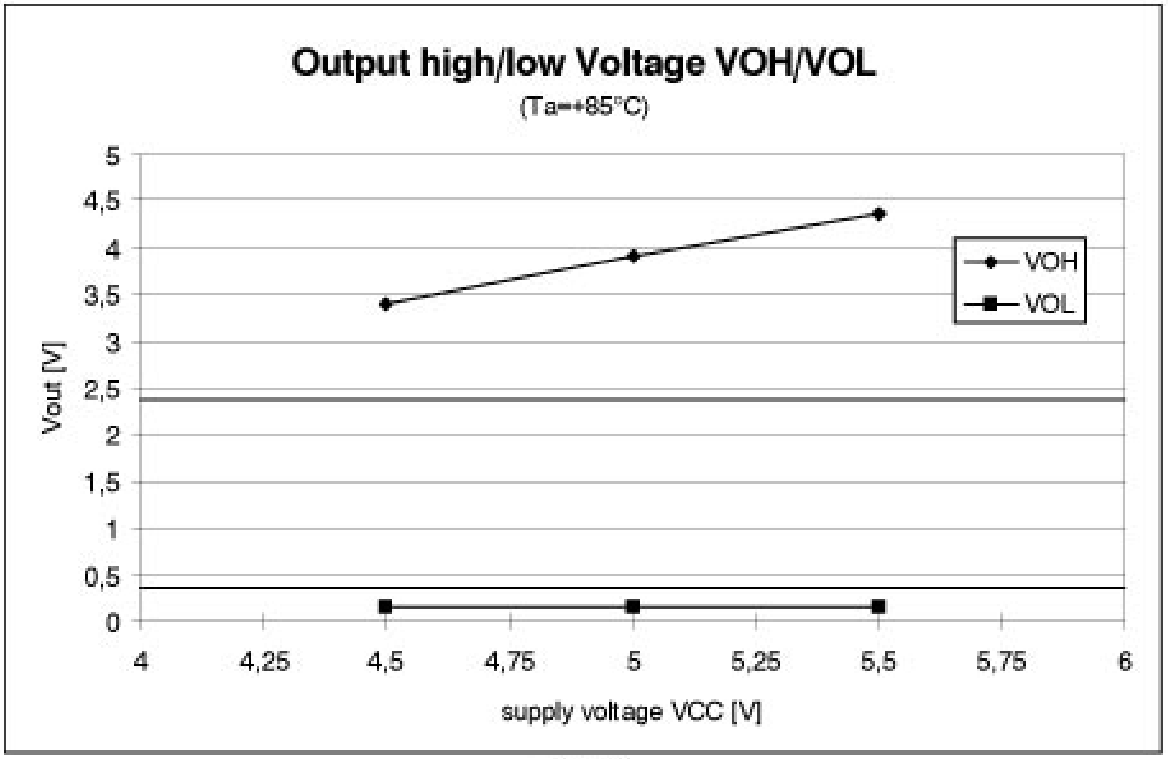
Output high/low Voltage VOH/VOL
(Ta=+85°C)
Vout [V]
5
4,5
4
3,5
3
2,5
2
1,5
1
0,5
0
4
4,25
4,5
4,75
5
5,25
5,5
5,75
6
supply voltage VCC [V]
VOH
VOL

fig.12

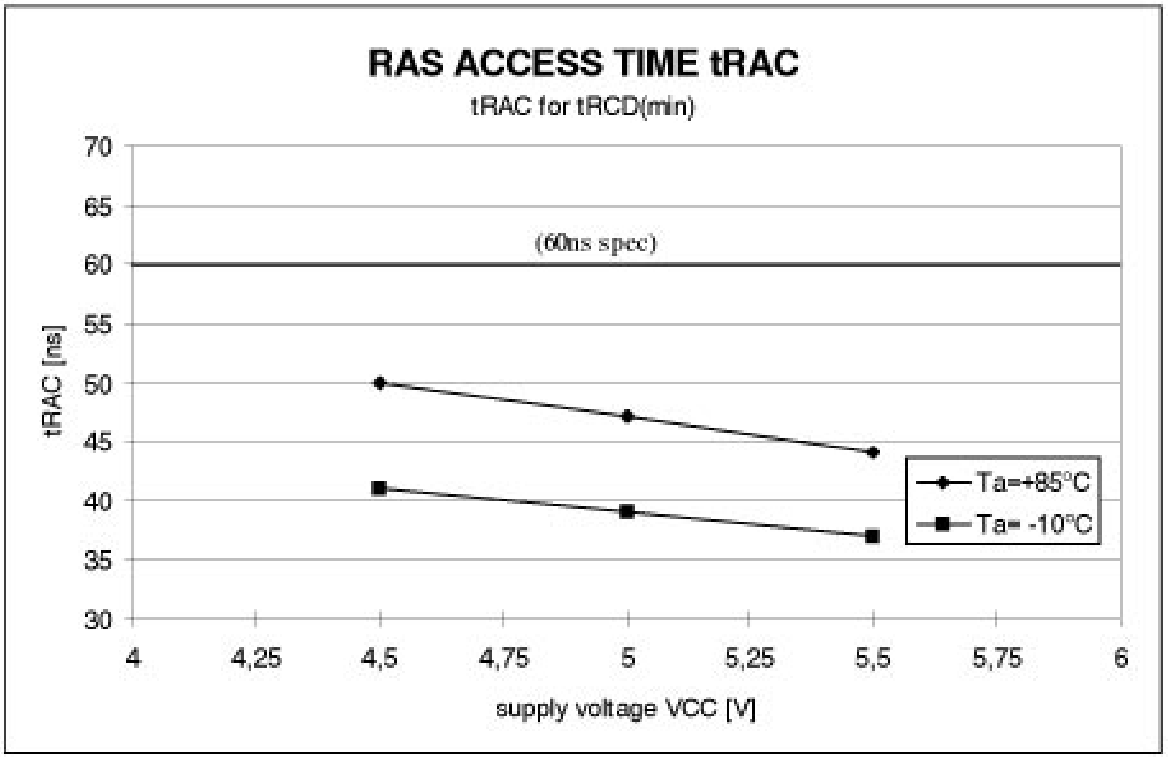
RAS ACCESS TIME tRAC
tRAC for tRCD(min)
70
65
60
55
50
45
40
35
30
(60ns spec)
tRAC [ns]
Ta=+85°C
Ta= -10°C
4
4,25
4,5
4,75
5
5,25
5,5
5,75
6
supply voltage VCC [V]

fig.13

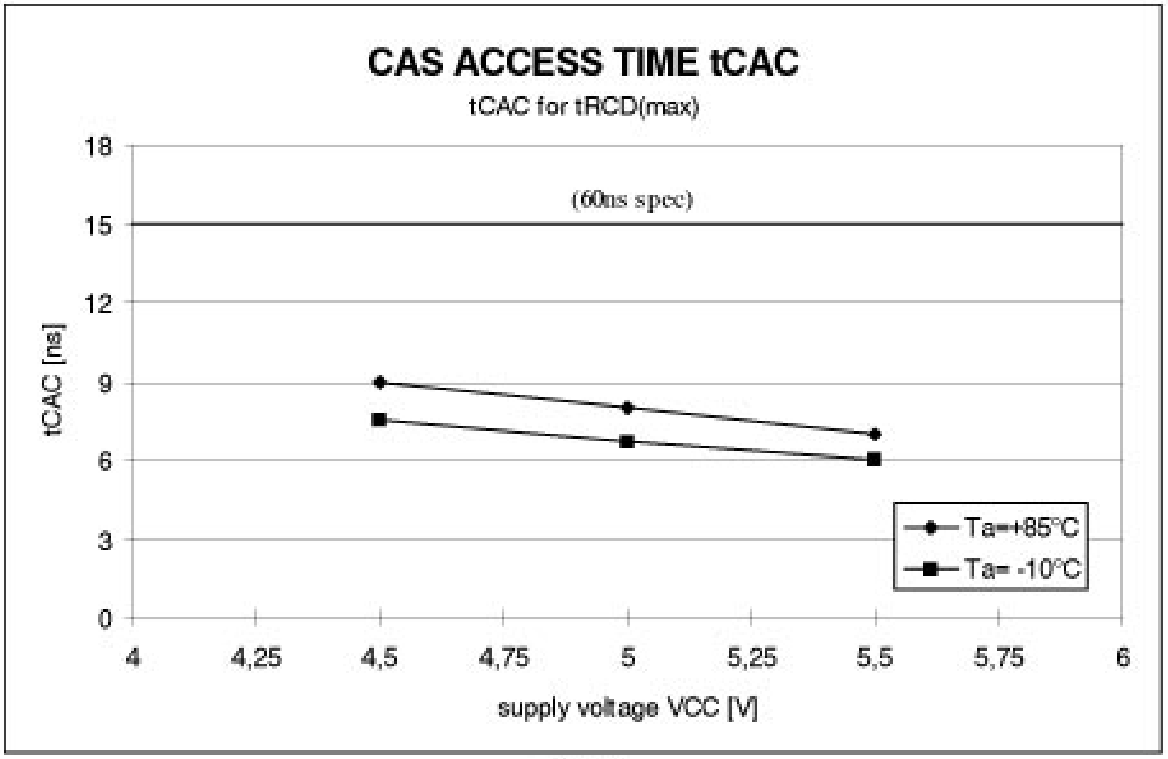
CAS ACCESS TIME tCAC
tCAC for tRCD(max)
18
15
12
9
6
3
0
(60ns spec)
tCAC [ns]
Ta=+85°C
Ta= -10°C
4
4,25
4,5
4,75
5
5,25
5,5
5,75
6
supply voltage VCC [V]

fig.14

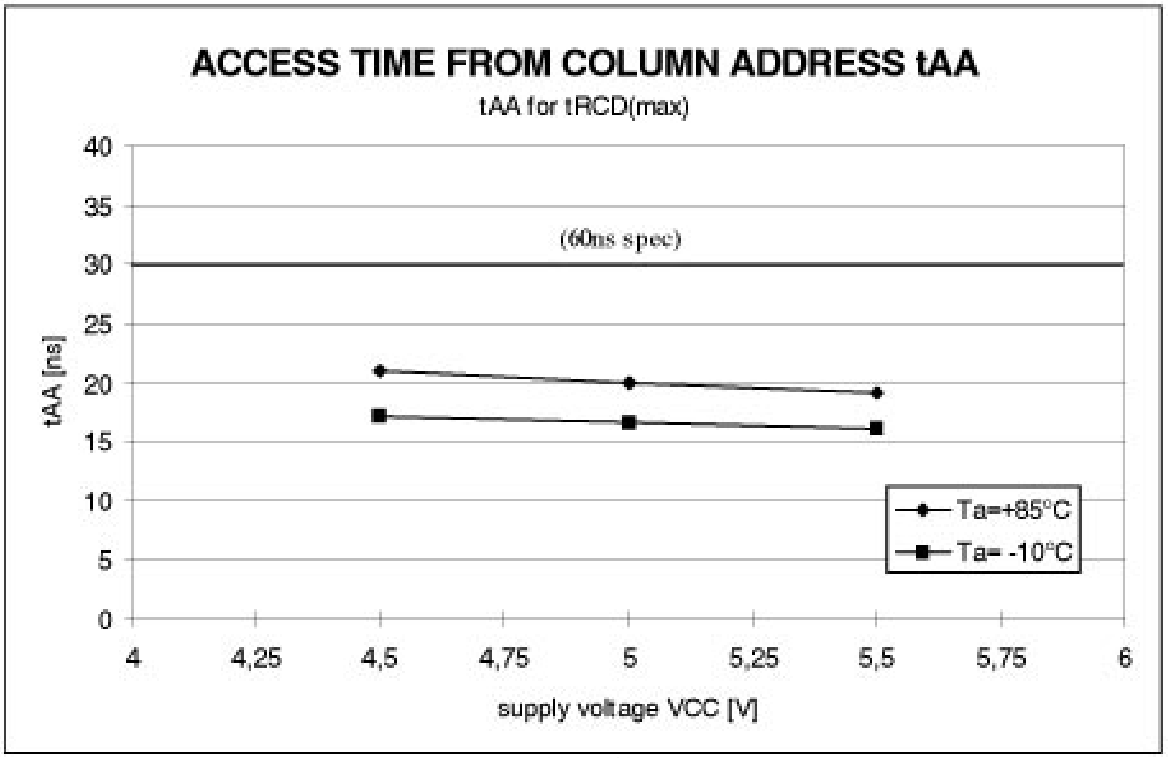
ACCESS TIME FROM COLUMN ADDRESS tAA
tAA for tRCD(max)
(60ns spec)
tAA [ns]
40
35
30
25
20
15
10
5
0
4
4,25
4,5
4,75
5
5,25
5,5
5,75
6
supply voltage VCC [V]
Ta=+85°C
Ta= -10°C

fig.15

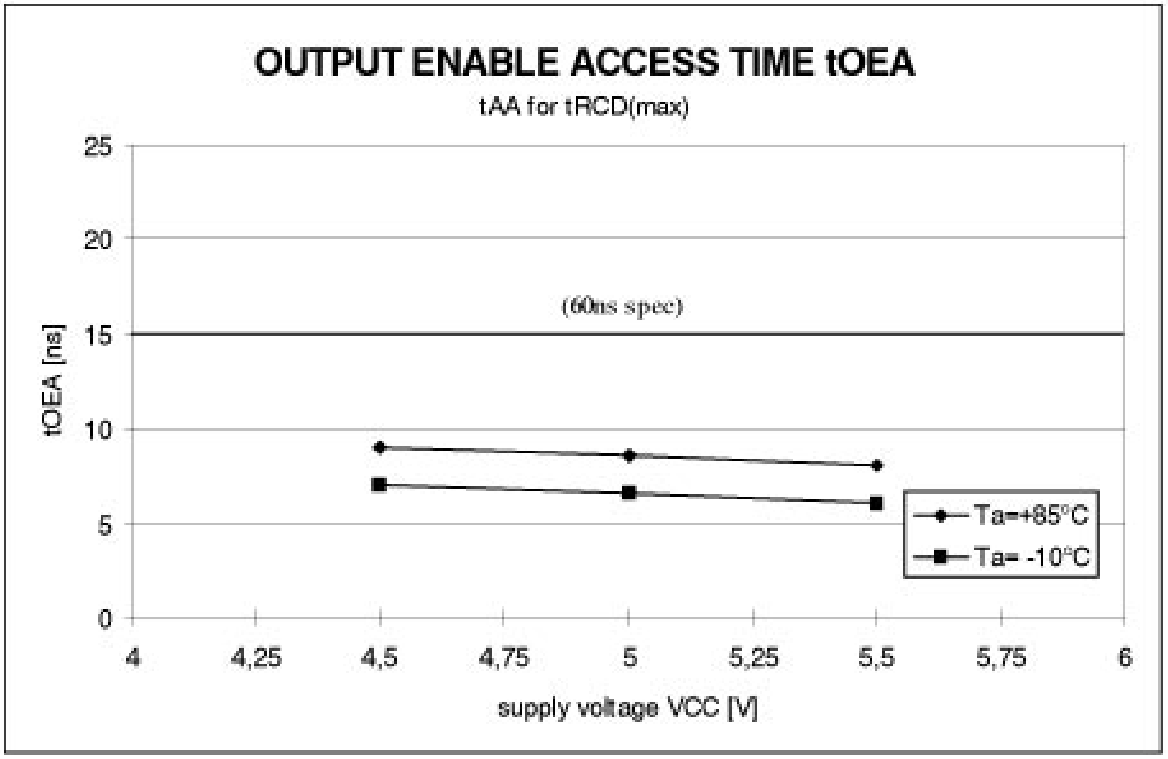
OUTPUT ENABLE ACCESS TIME tOEA
tAA for tRCD(max)
(60ns spec)
tOEA [ns]
25
20
15
10
5
0
4
4,25
4,5
4,75
5
5,25
5,5
5,75
6
supply voltage VCC [V]
Ta=+85°C
Ta= -10°C

fig.16

AC CHARACTERISTICS
Device: 256K X 16 DRAM 60ns

COMMON PARAMETERS

Parameter	Spec -60ns	Measurement (tT = 5ns)

	Unit [ns]		Ta = -10°C		Ta = +85°C		note
	min.	max.	Vcc = 4.5V	Vcc = 5.5V	Vcc = 4.5V	Vcc = 5.5V	1)
trc	110	-	74	70	86	78	
trp	40	-	15	12	21	17	
tras	60	10000	23	19	29	24	2)
tcas	15	10000	2	0	4	2	3)
tasr	0	-	-7	-6	-9	-8	
trah	10	-	-1	-1	1	0	
tasc	0	-	-9	-8	-10	-9	
tcah	15	-	2	1	3	2	
tar	55	-	<=25	<=25	26	<=25	
trcd (min)	20		2	3	4	4	
trcd (max)	-	45	34	31	41	37	4)
trad	15	30	4	4	6	5	
trsh	15	-	0	0	1	1	
tcsh	50	-	36	32	45	39	
tcrp	5	-	-4	-4	-5	-4	
troh	10	-	-6	-6	-6	-6	
toez	0	20	5	5	7	6	

READ CYCLE

	Unit [ns]		Ta = -10°C		Ta = +85°C	
	min.	max.	Vcc = 4.5V	Vcc = 5.5V	Vcc = 4.5V	Vcc = 5.5V
trac	-	60	41	37	50	44
tcac	-	15	7	6	9	7
taa	-	30	17	16	21	19
toea	-	15	7	6	9	8
trcs	0	-	-7	-7	-8	-7
trch	0	-	-8	-7	-9	-8
trrh	0	-	-6	-6	-7	-6
tral	30	-	6	<=5	7	6
toff	0	20	4	3	5	4

WRITE CYCLE

	Unit [ns]		Ta = -10°C		Ta = +85°C	
	min.	max.	Vcc = 4.5V	Vcc = 5.5V	Vcc = 4.5V	Vcc = 5.5V
twcs	0	-	-5	-5	-5	-5
twch	10	-	-1	-2	0	-1
twp	10	-	-2	-2	-1	-2
trwl	15	-	-1	-1	0	0
tcwl	15	-	2	1	4	3
tds	0	-	-9	-8	10	-9
tdh	15	-	2	1	4	3
twcr	50	-	19	18	20	19
tdhr	50	-	22	21	24	23

tab. 1

READ-MODIFY-WRITE CYCLE

	Unit [ns]		Ta = -10°C		Ta = +85°C		note
	min.	max.	Vcc = 4.5V	Vcc = 5.5V	Vcc = 4.5V	Vcc = 5.5V	
trwc	160	-	97	91	110	101	
trwd	90	-	47	42	53	49	
tcwd	45	-	12	12	13	12	
tawd	60	-	22	22	24	24	

REFRESH CYCLE
CAS-BEFORE-RAS CYCLE

	Unit [ns]		Ta = -10°C		Ta = +85°C	
	min.	max.	Vcc = 4.5V	Vcc = 5.5V	Vcc = 4.5V	Vcc = 5.5V
tcsr	5	-	-4	-4	-4	-4
tchr	10	-	-4	-4	-3	-4
trpc	0	-	-8	-7	-9	-7
tcpn	10	-	1	1	1	1

FAST PAGE MODE CYCLE

	Unit [ns]		Ta = -10°C		Ta = +85°C		
	min.	max.	Vcc = 4.5V	Vcc = 5.5V	Vcc = 4.5V	Vcc = 5.5V	
tpc	40	-	<=32	<=32	<=32	<=32	
tcp	10	-	-4	-4	-4	-4	
trasp	60	200000	23	19	29	24	2)
tcpa	-	35	21	19	24	22	
tprwc	90	-	44	42	49	45	

CAS-BEFORE-RAS COUNTER TEST CYCLE

	Unit [ns]		Ta = -10°C		Ta = +85°C	
	min.	max.	Vcc = 4.5V	Vcc = 5.5V	Vcc = 4.5V	Vcc = 5.5V
tcpt	30	-	-1	-1	-1	-1

Notes:

1) all AC-parameters are measured with 0.85V/2.35V levels on clocks and addresses

2) the "min."-value is shown

3) tcas(min)-value in a write cycle is shown

4) trod(max.) is the reference point where the access time is controlled by tcac