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April 1st, 2010
Renesas Electronics Corporation

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M5M5256DFP,VP -70G,-70GI,-70XG

262144-BIT (32768-WORD BY 8-BIT) CMOS STATIC RAM

DESCRIPTION

The M5M5256DFP,VP is 262,144-bit CMOS static RAMs organized as 32,768-words by 8-bits which is fabricated using high-performance 3 poly silicon CMOS technology. The use of resistive load NMOS cells and CMOS periphery results in a high density and low power static RAM. Stand-by current is small enough for battery back-up application. It is ideal for the memory systems which require simple interface.

Especially the M5M5256DVP are packaged in a 28-pin thin small outline package.

FEATURE

Type	Access time (max)	Operating Temperature	Power supply current	
			Active (max)	Stand-by (max)
M5M5256DFP,VP -70G	70ns	0~70°C	45mA (V _{cc} =5.5V)	20µA (V _{cc} =5.5V)
M5M5256DFP,VP -70GI	70ns	-40~85°C		40µA (V _{cc} =5.5V)
M5M5256DFP,VP -70XG	70ns	0~70°C	25mA (V _{cc} =3.6V)	24µA (V _{cc} =3.6V)
				5µA (V _{cc} =5.5V)
				2.4µA (V _{cc} =3.6V)
				0.05µA (V _{cc} =3.0V Typical)

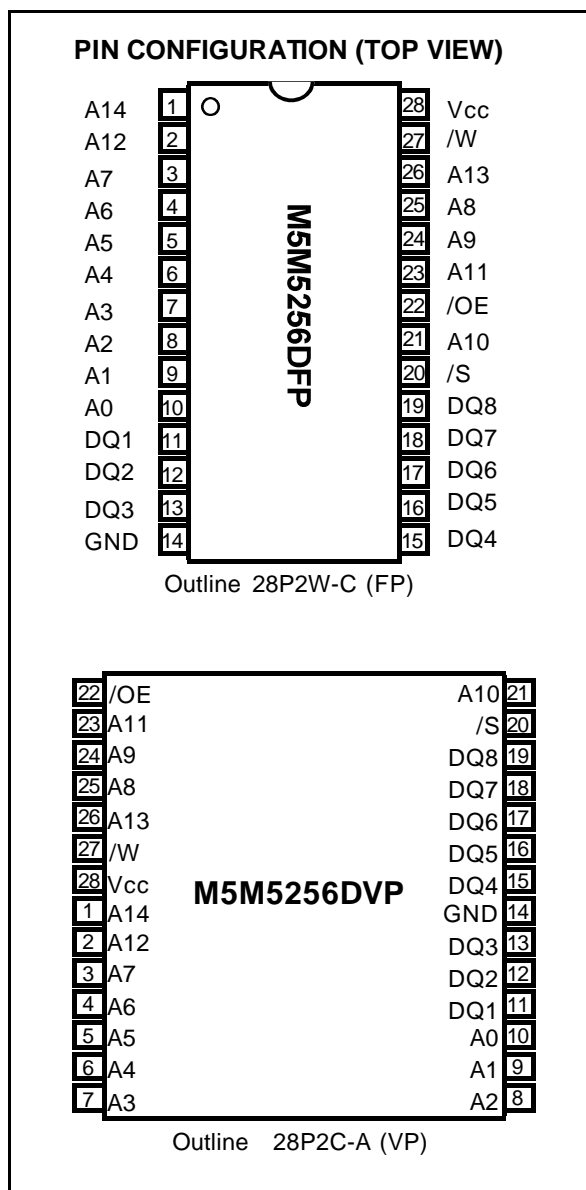
- Single 3.0~5.5V power supply
- No clocks, no refresh
- Data-Hold on +2.0V power supply
- Directly TTL compatible : all inputs and outputs
- Three-state outputs : OR-tie capability
- /OE prevents data contention in the I/O bus
- Common Data I/O
- Battery backup capability
- Low stand-by current 0.05µA(typ.)

PACKAGE

- M5M5256DFP : 28 pin 450 mil SOP
- M5M5256DVP : 28pin 8 X 13.4 mm² TSOP

APPLICATION

Small capacity memory units



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FUNCTION

The operation mode of the M5M5256DFP,VP is determined by a combination of the device control inputs /S, /W and /OE. Each mode is summarized in the function table.

A write cycle is executed whenever the low level /W overlaps with the low level /S. The address must be set up before the write cycle and must be stable during the entire cycle. The data is latched into a cell on the trailing edge of /W, /S, whichever occurs first, requiring the set-up and hold time relative to these edge to be maintained. The output enable /OE directly controls the output stage. Setting the /OE at a high level, the output stage is in a high-impedance state, and the data bus contention problem in the write cycle is eliminated.

A read cycle is executed by setting /W at a high level and /OE at a low level while /S are in an active state.

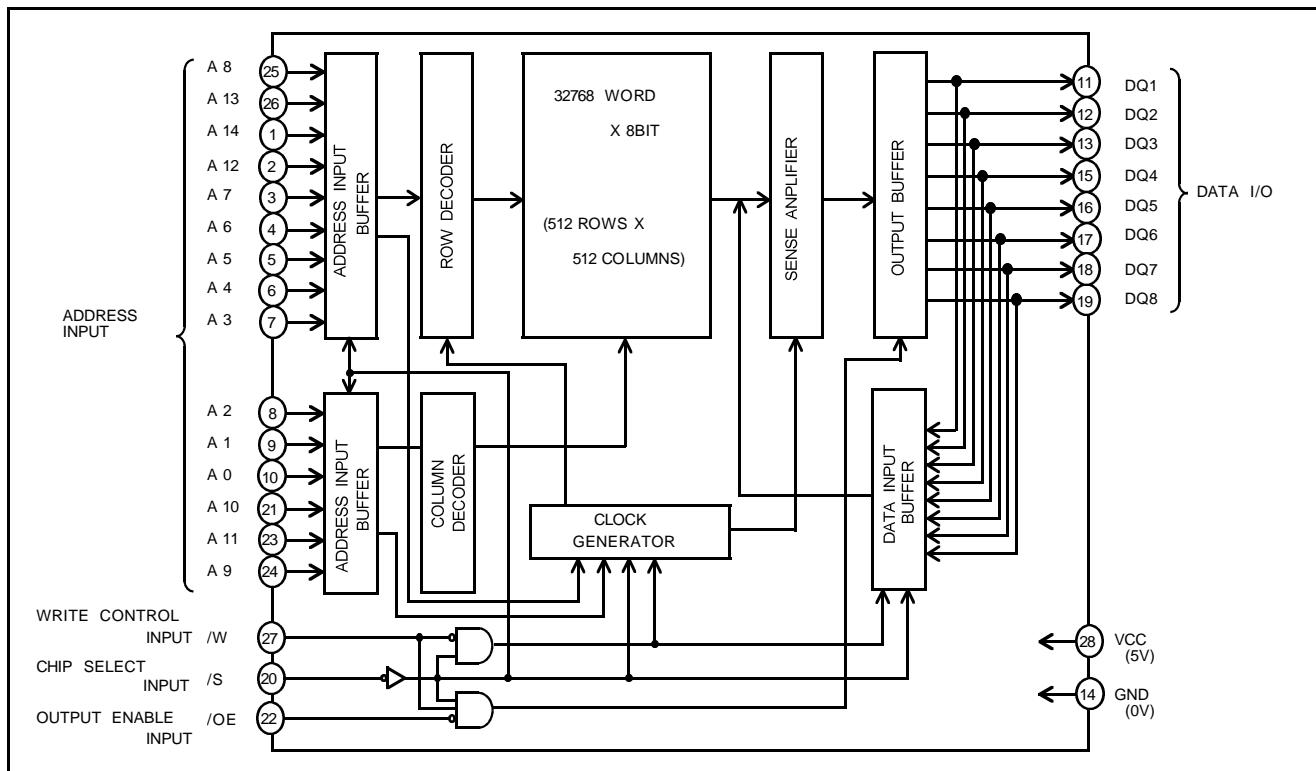
When setting /S at a high level, the chip is in a non-selectable mode in which both reading and writing are disabled. In this mode, the output stage is in a high-impedance state, allowing OR-tie with other chips and memory expansion by /S. The power supply current is reduced as low as the stand-by current which is specified as Icc3 or Icc4, and the memory data can be held at +2V power supply, enabling battery back-up operation during power failure or power-down operation in the non-selected mode.

FUNCTION TABLE

/S	/W	/OE	Mode	DQ	Icc
H	X	X	Non selection	High-impedance	Stand-by
L	L	X	Write	D _{IN}	Active
L	H	L	Read	D _{OUT}	Active
L	H	H		High-impedance	Active

Note • "H" and "L" in this table mean VIH and VIL, respectively.
 • "X" in this table should be "H" or "L".

BLOCK DIAGRAM



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ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Conditions	Ratings	Unit
V _{CC}	Supply voltage	With respect to GND	-0.3*~7.0	V
V _I	Input voltage		-0.3*~V _{CC} +0.3 (Max 7.0)	V
V _O	Output voltage		0~V _{CC}	V
P _d	Power dissipation	T _a =25°C	700	mW
T _{opr}	Operating temperature	-G,-XG	0~70	°C
		-GI	-40~85	
T _{stg}	Storage temperature		-65~150	°C

* -3.0V in case of AC (Pulse width < 30ns)

DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Test conditions	Limits1 (V _{CC} =3.3±0.3V)			Limits2 (V _{CC} =5.0±0.5V)			Unit
			Min	Typ	Max	Min	Typ	Max	
V _{IH}	High-level input voltage		2.0		V _{CC} +0.3	2.2		V _{CC} +0.3	V
V _{IL}	Low-level input voltage		-0.3*		0.6	-0.3*		0.8	V
V _{OH1}	High-level output voltage 1	I _{OH} =-1mA (V _{CC} =5.0±0.5V) I _{OH} =-0.5mA (V _{CC} =3.3±0.3V)	2.4			2.4			V
V _{OH2}	High-level output voltage 2	I _{OH} =-0.1mA (V _{CC} =5.0±0.5V) I _{OH} =-0.05mA (V _{CC} =3.3±0.3V)	V _{CC} -0.5			V _{CC} -0.5			V
V _{OL}	Low-level output voltage	I _{OL} =2mA (V _{CC} =5.0±0.5V) I _{OL} =1mA (V _{CC} =3.3±0.3V)			0.4			0.4	V
I _I	Input current	V _I =0~V _{CC}			±1			±1	µA
I _O	Output current in off-state	/S=V _{IH} or or /OE=V _{IH} , V _{I/O} =0~V _{CC}			±1			±1	µA
I _{CC1}	Active supply current (AC, MOS level)	/S<0.2V, Output-open Other inputs<0.2V or >V _{CC} -0.2V	70ns 1MHz	13 1.5	25 3	25 2	40 4		mA
I _{CC2}	Active supply current (AC, TTL level)	/S=V _{IL} , Output-open other inputs=V _{IH} or V _{IL}	70ns 1MHz	14 1.5	25 3	25 4	45 8		mA
I _{CC3}	Stand-by current	/S>V _{CC} -0.2V, other inputs =0~V _{CC}	~25°C ~40°C ~70°C ~85°C	-G,-GI -XG -G,-GI -XG -GI	1.2 0.05 0.3 0.8 2.4 24		2 0.1 0.4 1.2 5 40		µA
I _{CC4}	Stand-by current	/S=V _{IH} , other inputs=0~V _{CC}			0.33		3		mA

* -3.0V in case of AC (Pulse width < 30ns)

CAPACITANCE

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
C _I	Input capacitance	V _I =GND, V _I =25mVrms, f=1MHz			6	pF
C _O	Output capacitance	V _O =GND, V _O =25mVrms, f=1MHz			8	pF

Note 0: Direction for current flowing into an IC is positive (no mark).

1: Typical value is one at T_a = 25°C.2: C_I, C_O are periodically sampled and are not 100% tested.

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AC ELECTRICAL CHARACTERISTICS**(1) READ CYCLE**

Symbol	Parameter	Limits1 V _{CC} =3.3±0.3V		Limits2 V _{CC} =5.0±0.5V		Unit
		Min	Max	Min	Max	
t _{CR}	Read cycle time	70		70		ns
t _{a(A)}	Address access time		70		70	ns
t _{a(S)}	Chip select access time		70		70	ns
t _{a(OE)}	Output enable access time		35		35	ns
t _{dis(S)}	Output disable time after /S high		25		25	ns
t _{dis(OE)}	Output disable time after /OE high		25		25	ns
t _{en(S)}	Output enable time after /S low	5		5		ns
t _{en(OE)}	Output enable time after /OE low	5		5		ns
t _{v(A)}	Data valid time after address	10		10		ns

(2) WRITE CYCLE

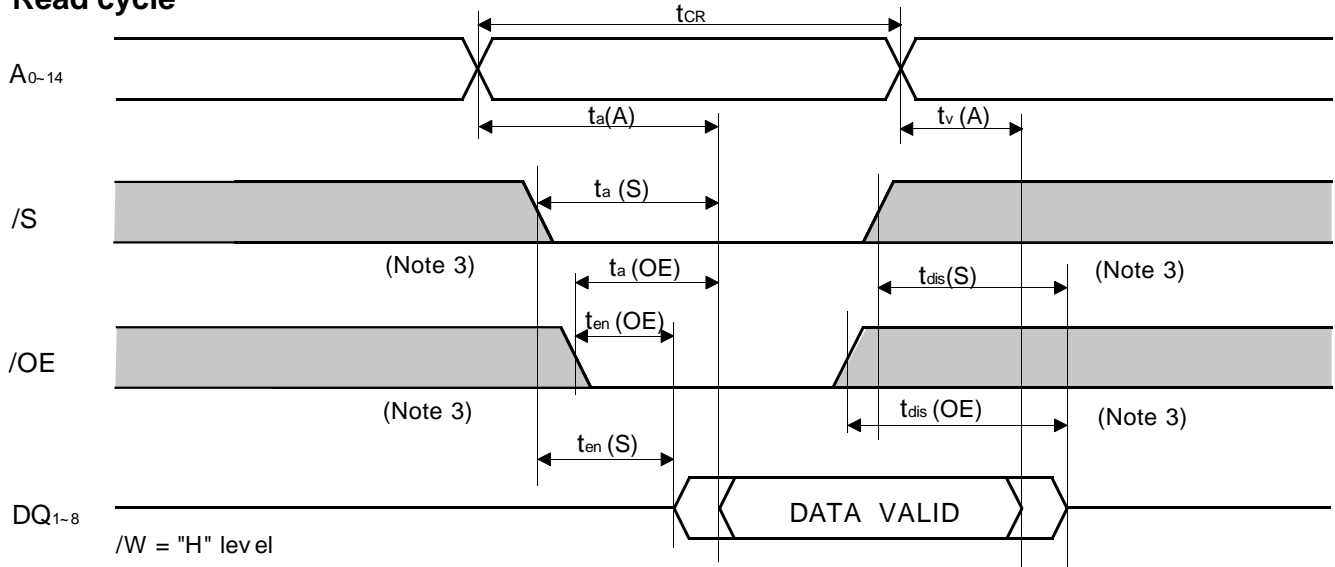
Symbol	Parameter	Limits1 V _{CC} =3.3±0.3V		Limits2 V _{CC} =5.0±0.5V		Unit
		Min	Max	Min	Max	
t _{cw}	Write cycle time	70		70		ns
t _{w(W)}	Write pulse width	55		50		ns
t _{su(A)}	Address setup time	0		0		ns
t _{su(A-WH)}	Address setup time with respect to /W high	65		65		ns
t _{su(S)}	Chip select setup time	65		65		ns
t _{su(D)}	Data setup time	30		30		ns
t _{h(D)}	Data hold time	0		0		ns
t _{rec(W)}	Write recovery time	0		0		ns
t _{dis(W)}	Output disable time from /W low		25		25	ns
t _{dis(OE)}	Output disable time from /OE high		25		25	ns
t _{en(W)}	Output enable time from /W high	5		5		ns
t _{en(OE)}	Output enable time from /OE low	5		5		ns

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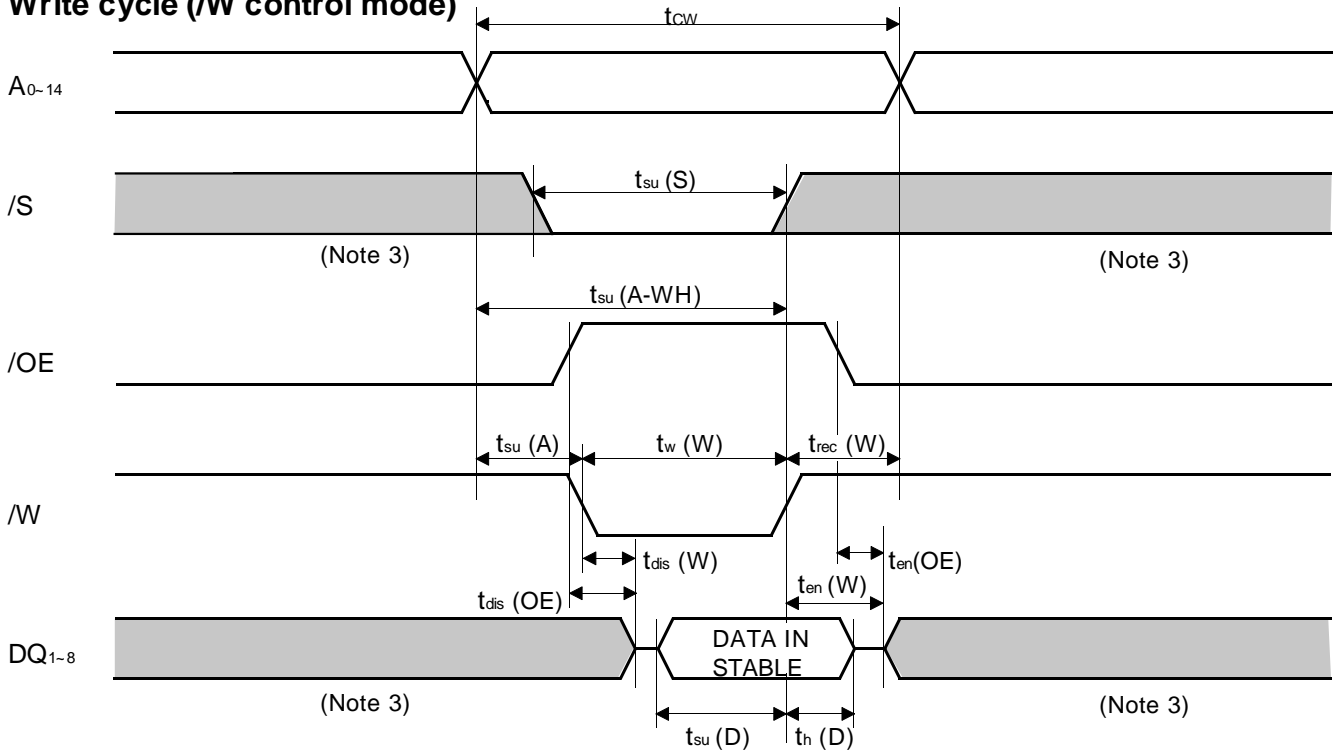
262144-BIT (32768-WORD BY 8-BIT) CMOS STATIC RAM

(3) TIMING DIAGRAMS

Read cycle



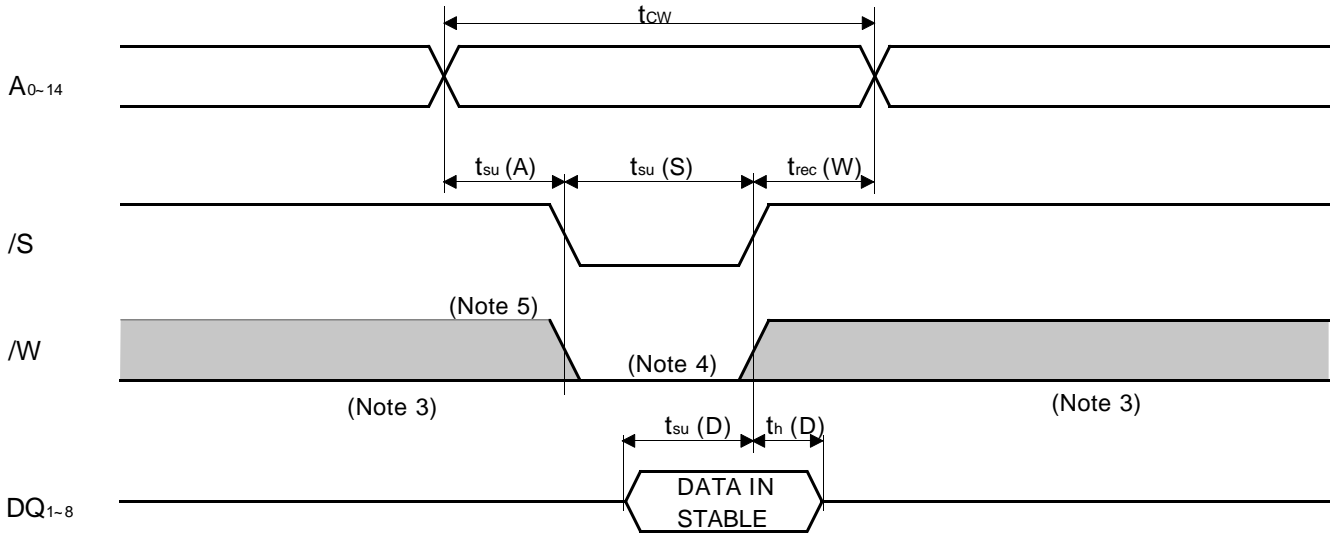
Write cycle (/W control mode)



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Write cycle (/S control mode)



(4) MEASUREMENT CONDITIONS

Limits1: Vcc=3.3±0.3V

Input pulse level V_{IH}=2.4V, V_{IL}=0.4V

Input rise and fall time 5ns

Reference level V_{OH}=V_{OL}=1.5V

Output load Fig.1, CL=30pF

CL=5pF (for t_{en}, t_{dis})

Transition is measured ±500mV from steady state voltage. (for t_{en}, t_{dis})

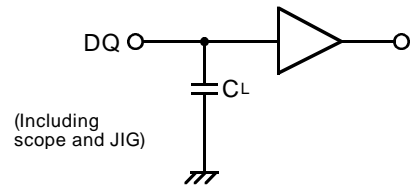


Fig.1 Output load

Limits2: Vcc=5.0±0.5V

Input pulse level V_{IH}=2.4V, V_{IL}=0.6V

Input rise and fall time 5ns

Reference level V_{OH}=V_{OL}=1.5V

Output load Fig.2, CL=100pF

CL=5pF (for t_{en}, t_{dis})

Transition is measured ±500mV from steady state voltage. (for t_{en}, t_{dis})

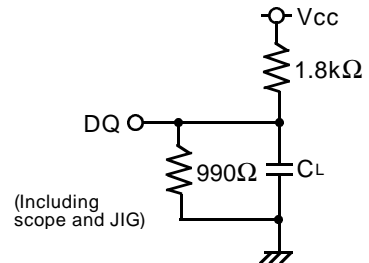


Fig.2 Output load

Note 3 : Hatching indicates the state is "don't care".

4 : Writing is executed in overlap of /S and /W low.

5 : If /W goes low simultaneously with or prior to /S, the outputs remain in the high impedance state.

6 : Don't apply inverted phase signal externally when DQ pin is output mode.

7 : t_{en}, t_{dis} are periodically sampled and are not 100% tested.

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POWER DOWN CHARACTERISTICS

(1) ELECTRICAL CHARACTERISTICS

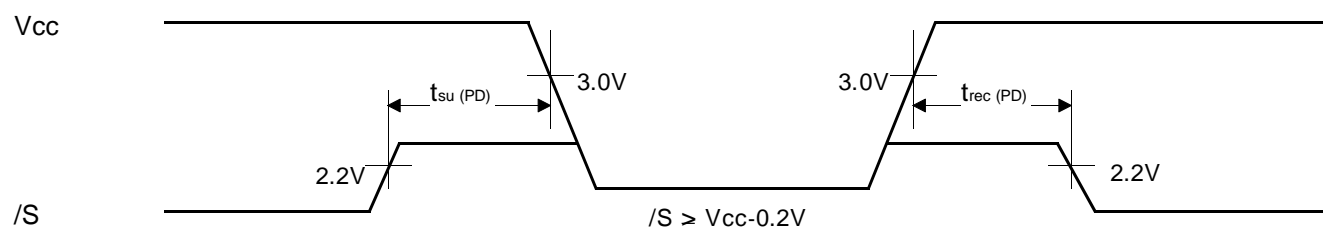
Symbol	Parameter	Test conditions	Limits			Unit	
			Min	Typ	Max		
$V_{CC(PD)}$	Power down supply voltage		2			V	
$V_I (/S)$	Chip select input /S	$2.2V \leq V_{CC(PD)}$	2.2			V	
		$2V \leq V_{CC(PD)} \leq 2.2V$		$V_{CC(PD)}$		V	
$I_{CC(PD)}$	Power down supply current	$V_{CC} = 3V, /S \geq V_{CC}-0.2V,$ Other inputs=0~ V_{CC}	~25°C	-G,-GI		1	μA
				-XG	0.05	0.2	
			~40°C	-G,-GI		3	
				-XG		0.6	
			~70°C	-G,-GI		10	
				-XG		2	
~85°C	-GI		20				

(2) TIMING REQUIREMENTS

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
$t_{su(PD)}$	Power down set up time		0			ns
$t_{rec(PD)}$	Power down recovery time		tCR			ns

(3) POWER DOWN CHARACTERISTICS

/S control mode



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