To our customers,

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April 1st, 2010
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (http://www.renesas.com)

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M5M5256DFP,VP-55LL,-70LL,-70LLI, -55XL,-70XL

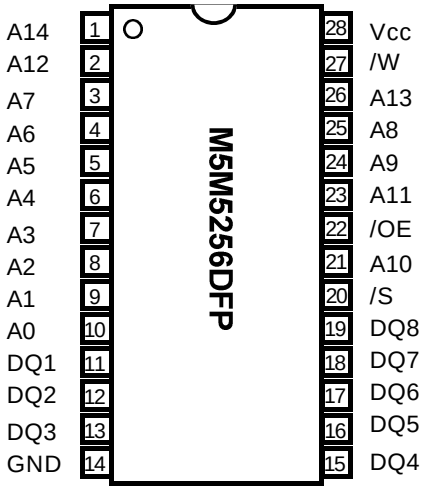
262144-BIT (32768-WORD BY 8-BIT) CMOS STATIC RAM

DESCRIPTION

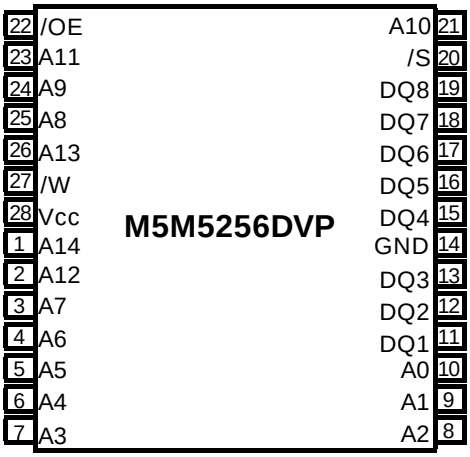
The M5M5256DFP,VP is 262,144-bit CMOS static RAMs organized as 32,768-words by 8-bits which is fabricated using high-performance 3 polysilicon CMOS technology. The use of resistive load NMOS cells and CMOS periphery results in a high density and low power static RAM. Stand-by current is small enough 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.

PIN CONFIGURATION (TOP VIEW)



Outline 28P2W-C (FP)



Outline 28P2C-A (VP)

FEATURE

Type	Access time (max)	Oprating Temperature	Power supply current	
			Active (max)	Stand-by (max)
M5M5256DFP,VP-55LL	55ns	0~70°C	50mA (Vcc=5.5V)	20µA (Vcc=5.5V)
M5M5256DFP,VP-70LL	70ns			
M5M5256DFP,VP-70LLI	70ns	-40~85°C		40µA (Vcc=5.5V)
M5M5256DFP,VP-55XL	55ns	0~70°C		5µA (Vcc=5.5V)
M5M5256DFP,VP-70XL	70ns			0.05µA (Vcc=3.0V, Typical)

- Single +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 mm^2 TSOP

APPLICATION

Small capacity memory units

M5M5256DFP,VP-55LL,-70LL,-70LLI, -55XL,-70XL

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

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.

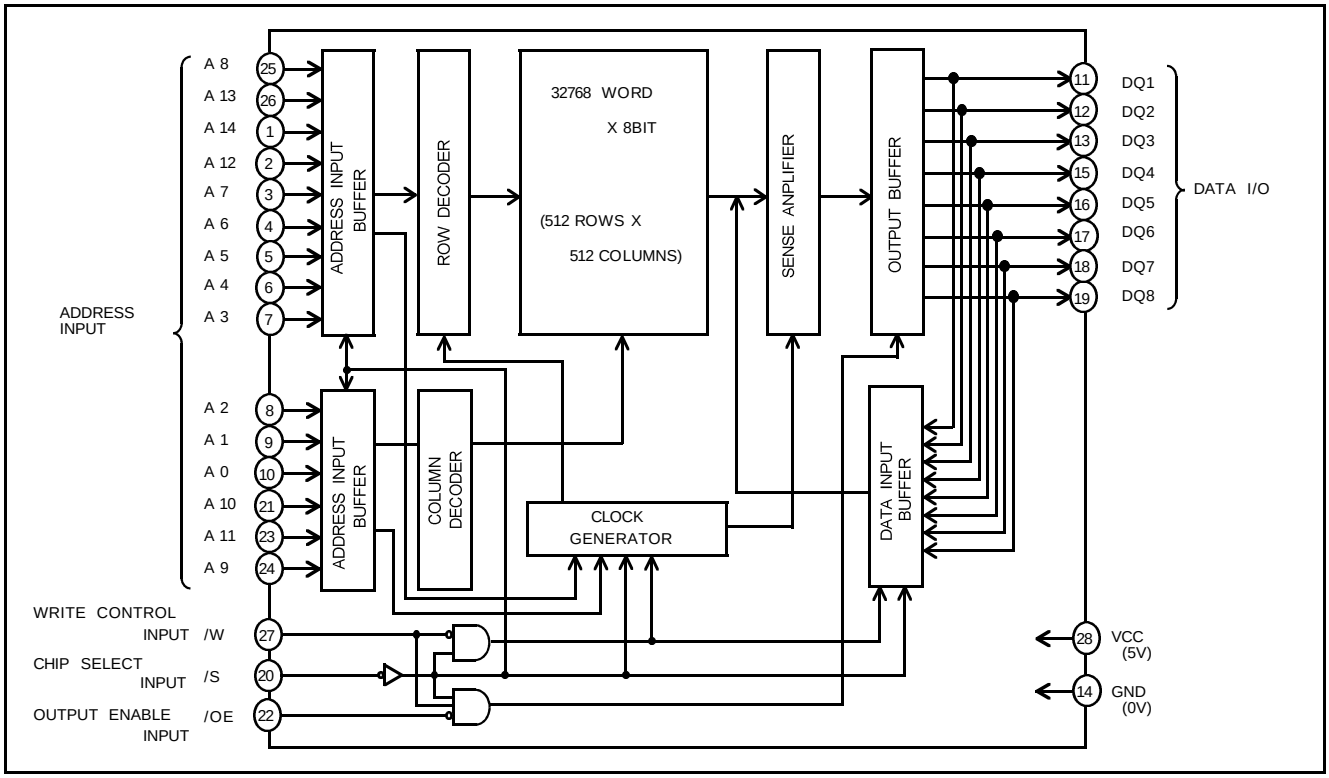
When setting /S at a high level, the chip is in a non-selectable mode in which both reading and writing are disabled. In this mode, the output stage is in a high-impedance state, allowing OR-tie with other chips and memory expansion by /S. The power supply current is reduced as low as the stand-by current 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



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Conditions	Ratings	Unit
Vcc	Supply voltage	With respect to GND	-0.3*~7.0	V
V_I	Input voltage		-0.3*~Vcc+0.3 (Max 7.0)	V
V_O	Output voltage		0~Vcc	V
P_d	Power dissipation	Ta=25°C	700	mW
T_{opr}	Operating temperature	-LL,-XL	0~70	°C
		-LLI	-40~85	
T_{stg}	Storage temperature		-65~150	°C

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

DC ELECTRICAL CHARACTERISTICS (Vcc=5V±10%, unless otherwise noted)

Symbol	Parameter	Test conditions			Limits Min	Limits Typ	Limits Max	Unit
V_{IH}	High-level input voltage				2.2		Vcc +0.3	V
V_{IL}	Low-level input voltage				-0.3*		0.8	V
V_{OH1}	High-level output voltage 1	I_{OH}=-1mA			2.4			V
V_{OH2}	High-level output voltage 2	I_{OH}=-0.1mA			Vcc -0.5			V
V_{OL}	Low-level output voltage	I_{OL}=2mA					0.4	V
I_I	Input current	V_I=0~Vcc					±1	µA
I_O	Output current in off-state	/S=V_{IH} or or /OE=V_{IH}, $V_{I/O}$=0~Vcc					±1	µA
Icc1	Active supply current (AC, MOS level)	/S≤0.2V, Other inputs<0.2V or >Vcc-0.2V Output-open		55ns		30	45	mA
				70ns		25	40	
				1MHz		2	4	
Icc2	Active supply current (AC, TTL level)	/S=V_{IL}, other inputs=V_{IH} or V_{IL} Output-open		55ns		30	50	mA
				70ns		25	45	
				1MHz		4	8	
Icc3	Stand-by current	/S≥Vcc-0.2V, other inputs=0~Vcc	~25°C	-LL,-LLI			2	µA
				-XL		0.1	0.4	
			~40°C	-LL,-LLI			6	
				-XL			1.2	
			~70°C	-LL,-LLI			20	
				-XL			5	
			~85°C	-LLI			40	
Icc4	Stand-by current	/S=V_{IH},other inputs=0~Vcc					3	mA

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

CAPACITANCE (Vcc=5V±10%, unless otherwise noted)

Symbol	Parameter	Test conditions	Limits Min	Limits Typ	Limits Max	Unit
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 Ta = 25°C.

2: C_I, C_O are periodically sampled and are not 100% tested.

AC ELECTRICAL CHARACTERISTICS (Vcc=5V±10%, unless otherwise noted)

(1) READ CYCLE

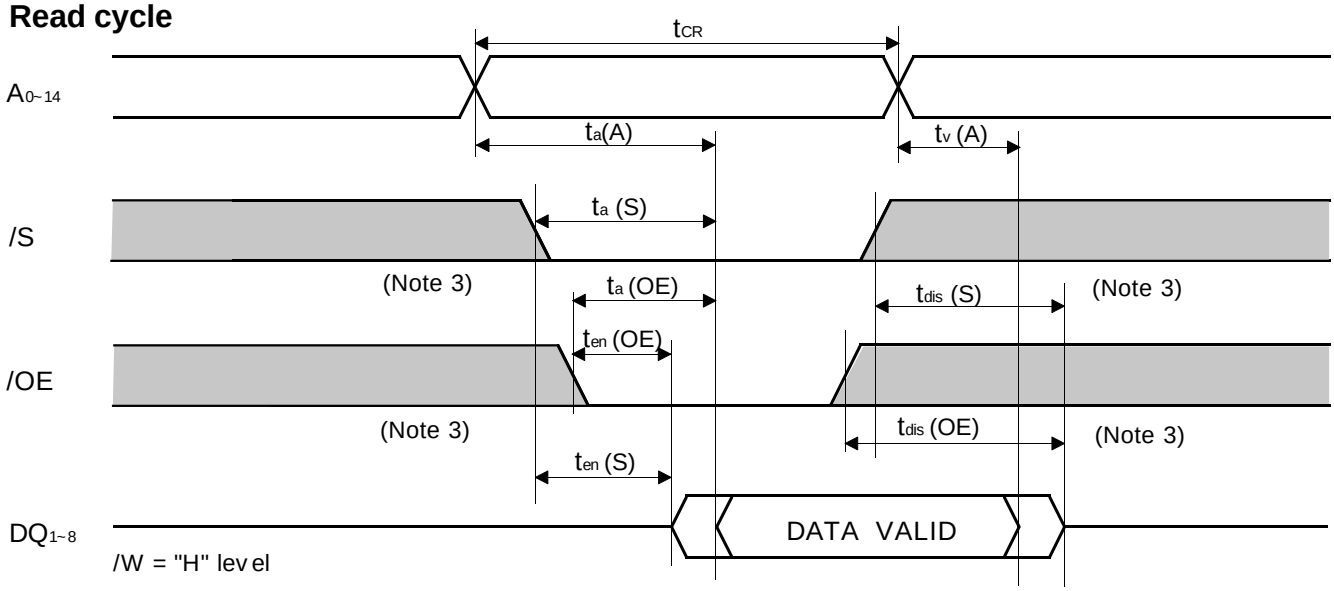
Symbol	Parameter	Limits				Unit
		-55LL, 55XL		-70LL,-70LLI, -70 XL		
		Min	Max	Min	Max	
t_{CR}	Read cycle time	55		70		ns
t_a(A)	Address access time		55		70	ns
t_a(S)	Chip select access time		55		70	ns
t_a(OE)	Output enable access time		30		35	ns
t_{dis}(S)	Output disable time after /S high		20		25	ns
t_{dis}(OE)	Output disable time after /OE high		20		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

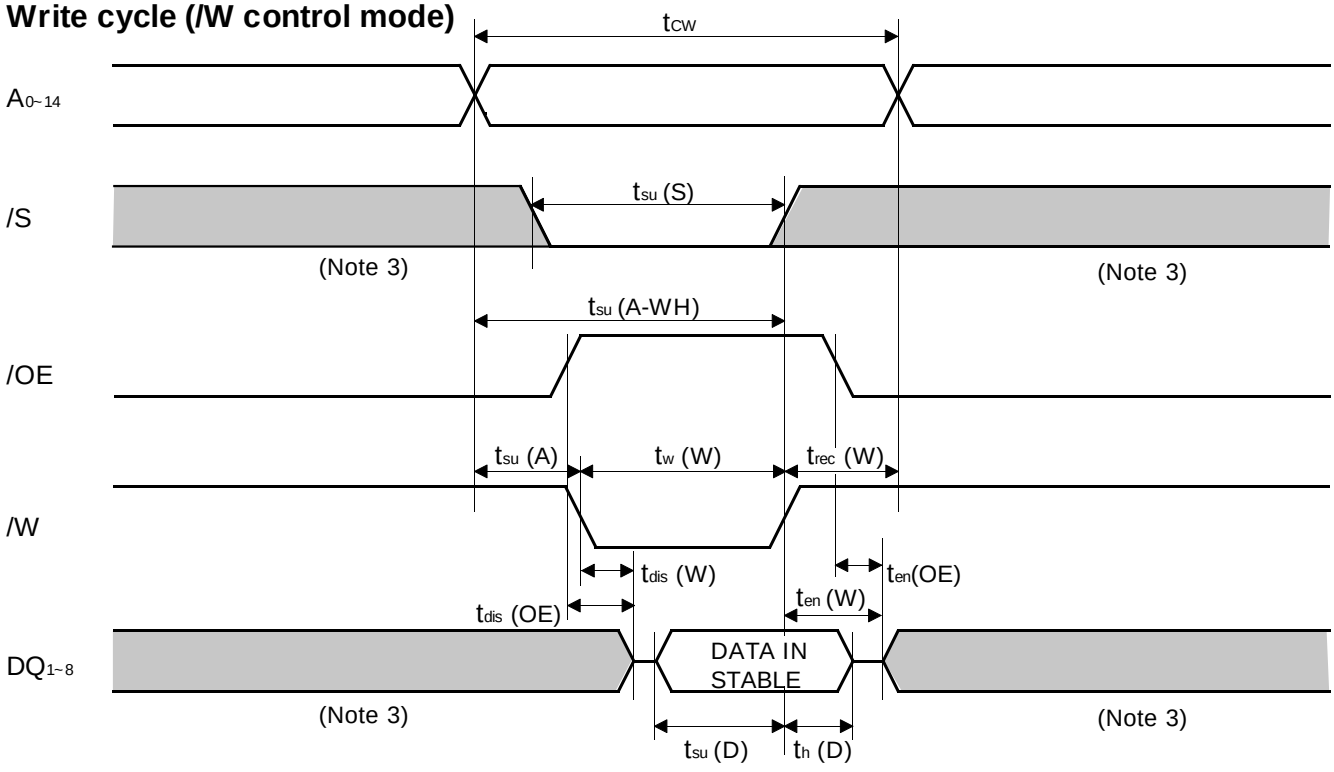
Symbol	Parameter	Limits				Unit
		-55LL, -55XL		-70LL,-70LLI, -70 XL		
		Min	Max	Min	Max	
t_{CW}	Write cycle time	55		70		ns
t_w(W)	Write pulse width	40		50		ns
t_{su}(A)	Address setup time	0		0		ns
t_{su}(A-WH)	Address setup time with respect to /W high	50		65		ns
t_{su}(S)	Chip select setup time	50		65		ns
t_{su}(D)	Data setup time	25		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		20		25	ns
t_{dis}(OE)	Output disable time from /OE high		20		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

(3) TIMING DIAGRAMS

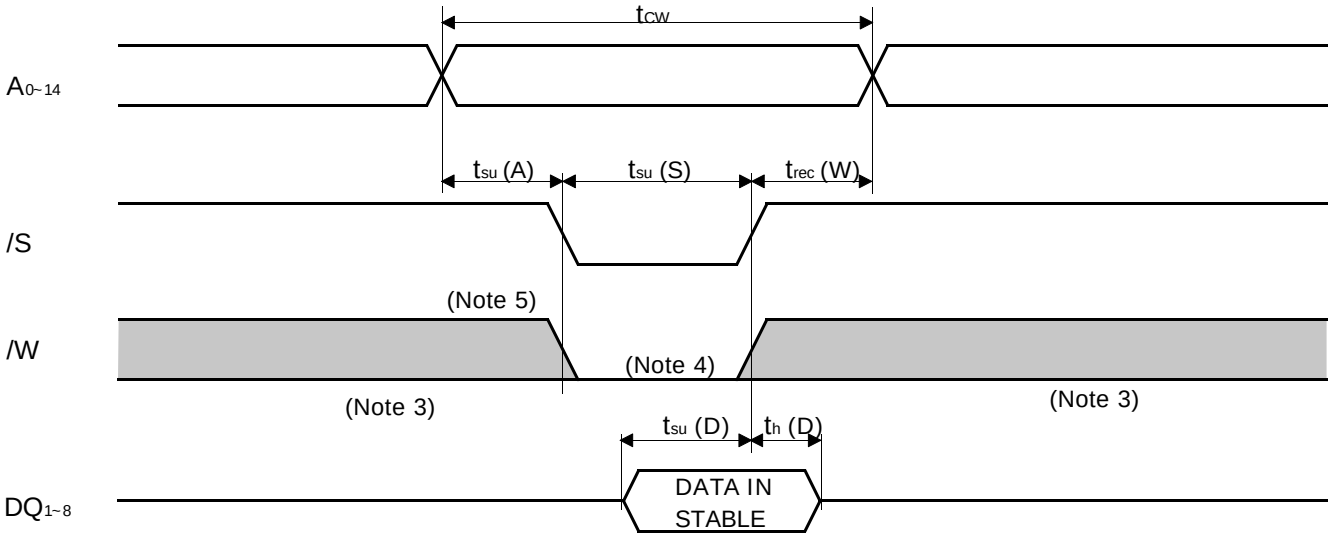
Read cycle



Write cycle (/W control mode)



Write cycle (/S control mode)



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 : ten, tdis are periodically sampled and are not 100% tested.

(4) MEASUREMENT CONDITIONS

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.1 CL=50pF (-55LL,-55XL)
CL=100pF (-70LL,-70LLI,-70XL)
CL=5pF (for ten,tdis)
Transition is measured ±500mV from steady state voltage. (for ten,tdis)

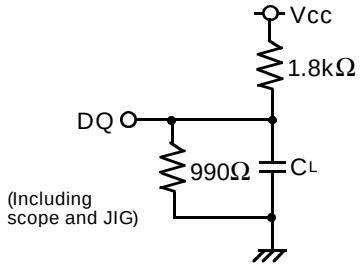


Fig.1 Output load

POWER DOWN CHARACTERISTICS

(1) ELECTRICAL CHARACTERISTICS (Vcc=5V±10%, unless otherwise noted)

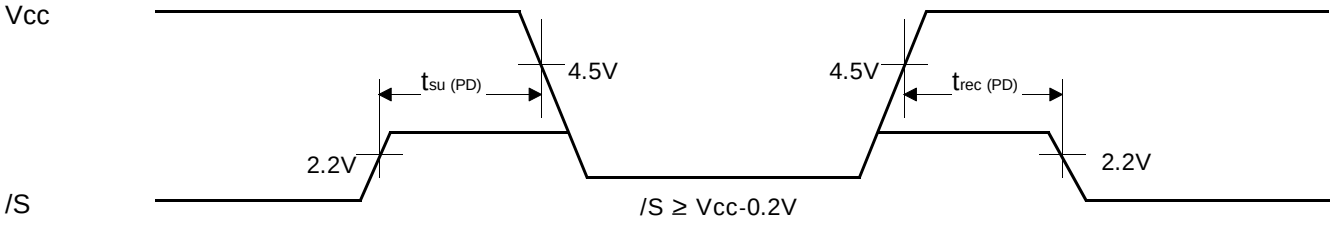
Symbol	Parameter	Test conditions			Limits			Unit
					Min	Typ	Max	
$V_{CC\ (PD)}$	Power down supply voltage				2			V
$V_{I\ (/S)}$	Chip select input /S	2.2V ≤ $V_{CC(PD)}$			2.2			V
		2V≤ $V_{CC(PD)}$ ≤ 2.2V				$V_{CC(PD)}$		V
$I_{CC\ (PD)}$	Power down supply current	Vcc = 3V,/S ≥ Vcc-0.2V, Other inputs=0~Vcc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

(2) TIMING REQUIREMENTS (Vcc=5V±10%, unless otherwise noted)

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



RENESAS LSIs

M5M5256DFP,VP-55LL,-70LL,-70LLI, -55XL,-70XL

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

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