



SRAM MODULE 8Mbyte(4M x 16-Bit) 80-Pin SMM 5V
Part No. HMS4M16F16G

GENERAL DESCRIPTION

The HMS4M16F16G is a high-speed static random access memory (SRAM) module containing 4,194,304 words organized in a x16-bit configuration. The module consists of sixteen 1M x 4 SRAMs in TSOP package is mounted on a 80-pin, double-sided, FR4-printed circuit board. The HMS4M16F16 is a SMM(Stackable Memory Module) designed and is intended for mounting into two 40-pin connector sockets.

Two decoders are used to select chips and used to enable the module's 4 bytes independently. Output enable (/OE) and write enable (/WE) can set the memory input and output. Data is written into the SRAM memory when write enable (/WE) and chip enable (/CE) inputs are both LOW. Reading is accomplished when /WE remains HIGH and /CE and output enable (/OE) are LOW.

For reliability, this SRAM module is designed as multiple power and ground pin. All module components may be powered from a single +5V DC power supply and all inputs and outputs are fully TTL-compatible.

FEATURES

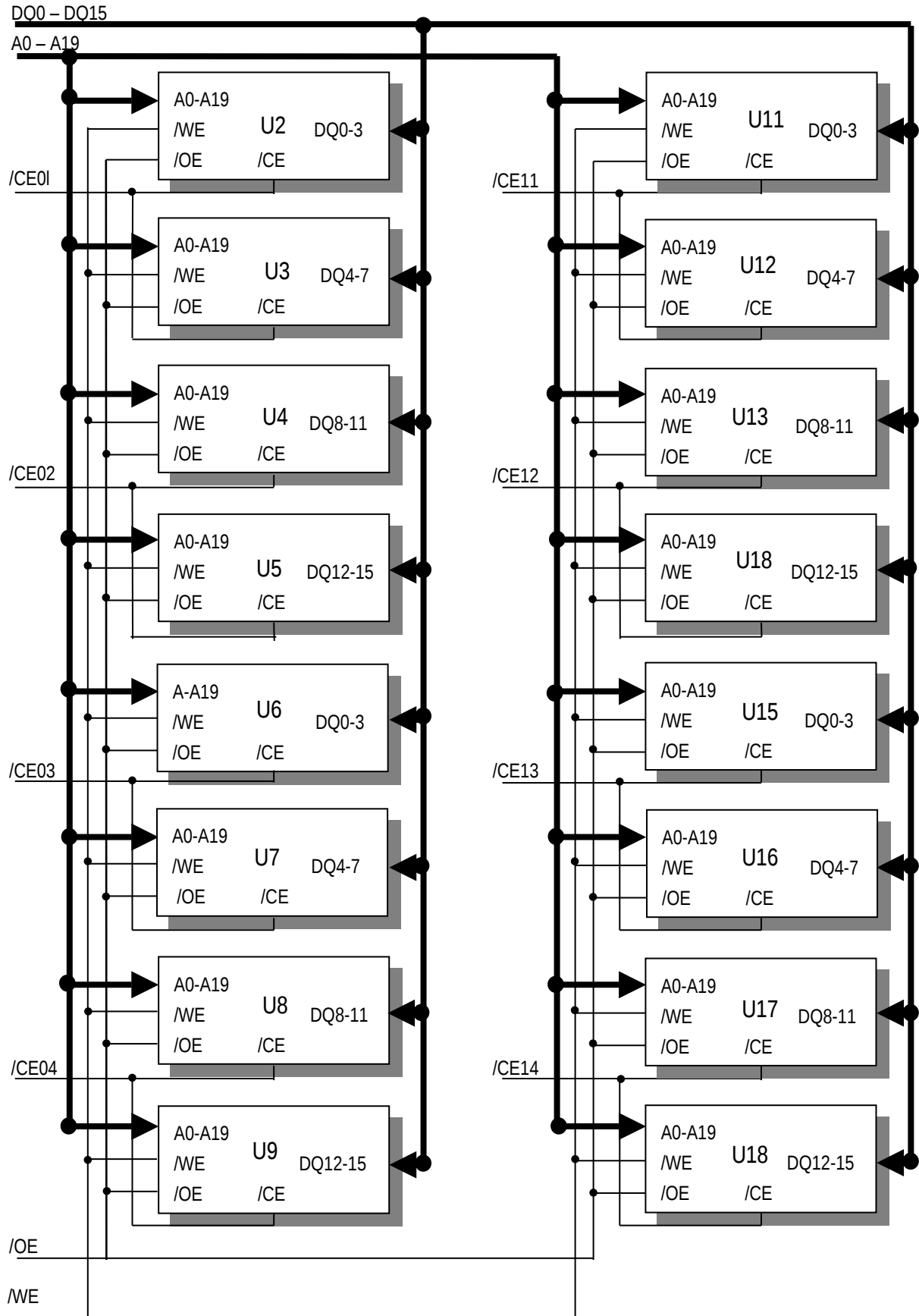
- w Access times : 10, 12, 15, 17 and 20ns
- w High-density 8MByte design
- w High-reliability, high-speed design
- w Single + 5V $\pm 10\%$ power supply
- w Easy memory expansion /CE and /OE functions
- w All inputs and outputs are TTL-compatible
- w Fully Static Operation -- No Clock or Refresh required
- w Industry-standard pinout
- w FR4-PCB design

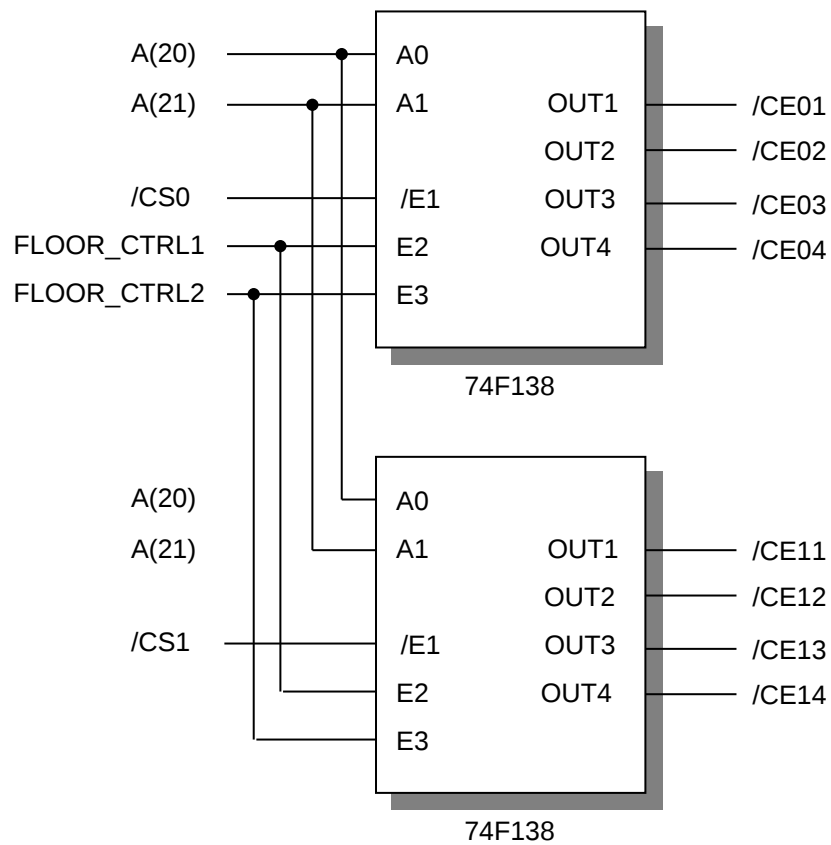
PIN ASSIGNMENT

40-PIN P1 Connector				40-PIN P2 Connector			
PIN	SYMBOL	PIN	SYMBOL	PIN	SYMBOL	PIN	SYMBOL
1	Vcc	21	Vcc	1	Vcc	21	Vcc
2	A0	22	A16	2	DQ0	22	NC
3	A1	23	A17	3	DQ1	23	NC
4	A2	24	A18	4	DQ2	24	NC
5	A3	25	A19	5	DQ3	25	NC
6	A4	26	A20	6	DQ4	26	NC
7	Vss	27	Vss	7	Vss	27	Vss
8	A5	28	A21	8	DQ5	28	NC
9	A6	29	FLOOR CTRL3	9	DQ6	29	NC
10	A7	30	FLOOR CTRL1	10	DQ7	30	NC
11	A8	31	NC	11	DQ8	31	NC
12	A9	32	FLOOR CTRL2	12	DQ9	32	NC
13	A10	33	/CS0	13	DQ10	33	NC
14	Vss	34	/CS1	14	Vss	34	Vss
15	A11	35	/OE	15	DQ11	35	NC
16	A12	36	/WE0	16	DQ12	36	NC
17	A13	37	/WE1	17	DQ13	37	NC
18	A14	38	NC	18	DQ14	38	NC
19	A15	39	NC	19	DQ15	39	NC
20	Vcc	40	Vcc	20	Vcc	40	Vcc

SMM TOP VIEW

FUNCTIONAL BLOCK DIAGRAM





TRUTH TABLE

MODE	/OE	/CE	/WE	OUTPUT	POWER
STANDBY	X	H	X	HIGH-Z	STANDBY
NOT SELECTED	H	L	H	HIGH-Z	ACTIVE
READ	L	L	H	D _{OUT}	ACTIVE
WRITE	X	L	L	D _{IN}	ACTIVE

ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	RATING
Voltage on Any Pin Relative to V _{SS}	V _{IN,OUT}	-0.5V to +7.0V
Voltage on V _{CC} Supply Relative to V _{SS}	V _{CC}	-0.5V to +7.0V
Power Dissipation	P _D	16W
Storage Temperature	T _{STG}	-65°C to +150°C
Operating Temperature	T _A	0°C to +70°C

w 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 operating section of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

RECOMMENDED DC OPERATING CONDITIONS (T_A=0 to 70 °C)

PARAMETER	SYMBOL	MIN	TYP.	MAX
Supply Voltage	V _{CC}	4.5V	5.0V	5.5V
Ground	V _{SS}	0	0	0
Input High Voltage	V _{IH}	2.2	-	V _{CC} +0.5V**
Input Low Voltage	V _{IL}	-0.5*	-	0.8V

* V_{IL}(Min.) = -2.0V ac (Pulse Width ≤ 10ns) for I ≤ 20 mA

** V_{IH}(Min.) = V_{CC}+2.0V ac (Pulse Width ≤ 10ns) for I ≤ 20 mA

DC AND OPERATING CHARACTERISTICS (1)(0°C ≤ T_A ≤ 70 °C ; V_{CC} = 5V ± 0.5V)

PARAMETER	TEST CONDITIONS	SYMBOL	MIN	MAX	UNITS
Input Leakage Current	V _{IN} = V _{SS} to V _{CC}	IL _I	-32	32	μA
Output Leakage Current	/CE=V _{IH} or /OE =V _{IH} or /WE=V _{IL} V _{OUT} =V _{SS} to V _{CC}	IL _O	-32	32	μA
Output High Voltage	I _{OH} = -4.0Ma	V _{OH}	2.4		V
Output Low Voltage	I _{OL} = 8.0Ma	V _{OL}		0.4	V

* V_{CC}=5.0V, Temp=25 °C

DC AND OPERATING CHARACTERISTICS (2)

DESCRIPTION	TEST CONDITIONS	SYMBOL	MAX			UNIT
			-10	-12	-15	
Power Supply Current: Operating	Min. Cycle, 100% Duty /CE= V_{IL} , $V_{IN}=V_{IH}$ or V_{IL} , $I_{OUT}=0mA$	I_{CC}	2560	2400	2240	mA
Power Supply Current :Standby	Min. Cycle, /CE= V_{IH}	I_{SB}	960	960	960	mA
	f=0MHZ, /CE $\geq V_{CC}-0.2V$, $V_{IN} \geq V_{CC}-0.2V$ or $V_{IN} \leq 0.2V$	I_{SB1}	160	160	160	mA

CAPACITANCE

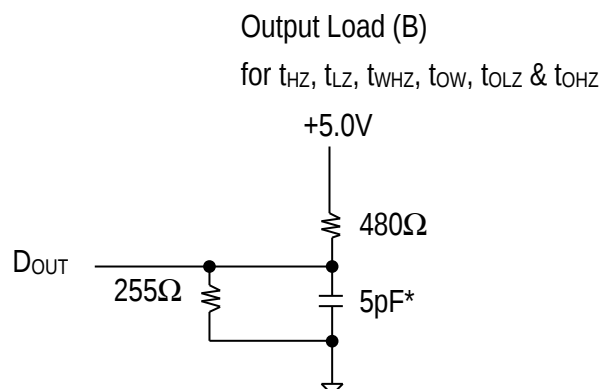
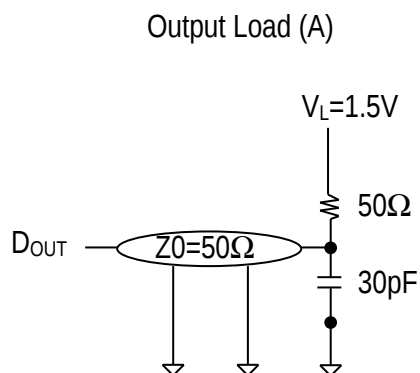
DESCRIPTION	TEST CONDITIONS	SYMBOL	MAX	UNIT
Input /Output Capacitance	$V_{I/O}=0V$	$C_{I/O}$	128	pF
Input Capacitance	$V_{IN}=0V$	C_{IN}	112	pF

* **NOTE** : Capacitance is sampled and not 100% tested

AC CHARACTERISTICS ($0^{\circ}C \leq T_A \leq 70^{\circ}C$; $V_{CC} = 5V \pm 0.5V$, unless otherwise specified)

TEST CONDITIONS

PARAMETER	VALUE
Input Pulse Level	0 to 3V
Input Rise and Fall Time	3ns
Input and Output Timing Reference Levels	1.5V
Output Load	See below



READ CYCLE

PARAMETER	SYMBOL	-10		-12		-15		UNIT
		MIN	MAX	MIN	MAX	MIN	MAX	
Read Cycle Time	t_{RC}	10	-	12	-	15	-	ns
Address Access Time	t_{AA}	-	10	-	12	-	15	ns
Chip Select to Output	t_{CO}	-	10	-	12	-	15	ns
Output Enable to Output	t_{OE}	-	5	-	6	-	7	ns
Chip Enable to Low-Z Output	t_{LZ}	3	-	3	-	3	-	ns
Output Enable to Low-Z Output	t_{OLZ}	0	-	0	-	0	-	ns
Output Disable to High-Z Output	t_{OHZ}	0	5	0	6	0	7	ns
Chip Disable to High-Z Output	t_{HZ}	0	5	0	6	0	7	ns
Output Hold from Address Change	t_{OH}	3	-	3	-	3	-	ns
Chip Select to Power Up Time	t_{PU}	0	-	0	-	0	-	ns
Chip Select to Power Down Time	t_{PD}	-	10		12	-	15	ns

WRITE CYCLE

PARAMETER	SYMBOL	-10		-12		-15		UNIT
		MIN	MAX	MIN	MAX	MIN	MAX	
Write Cycle Time	t_{WC}	10	-	12	-	15	-	ns
Chip Select to End of Write	t_{CW}	7	-	8	-	10	-	ns
Address Set-up Time	t_{AS}	0	-	0	-	0	-	ns
Address Valid to End of Write	t_{AW}	7	-	8	-	10	-	ns
Write Pulse Width (/OE High)	t_{WP}	7	-	8	-	10	-	ns
Write Recovery Time	t_{WR}	0	-	0	-	0	-	ns
Write to Output High-Z	t_{WHZ}	0	5	0	6	0	7	ns
Data to Write Time Overlap	t_{DW}	5	-	6	-	7	-	ns
Data Hold from Write Time	t_{DH}	0	-	0	-	0	-	ns
End of Write to Output Low-Z	t_{OW}	3	-	3	-	3	-	ns

TIMING DIAGRAMS

Please refer to timing diagram chart(II)

FUNCTIONAL DESCRIPTION

/CE	/WE	/OE	MODE	I/O PIN	SUPPLY CURRENT
H	X*	X	Not Select	High-Z	I_{SB}, I_{SB1}
L	H	H	Output Disable	High-Z	I_{CC}
L	H	L	Read	D_{OUT}	I_{CC}
L	L	X	Write	D_{IN}	I_{CC}

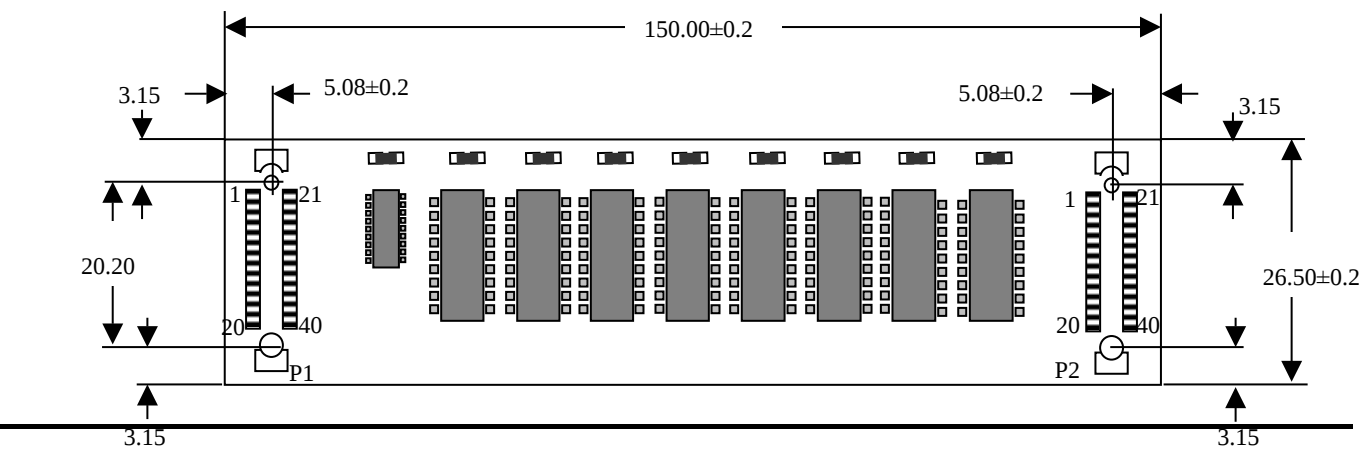
Note: X means Don't Care

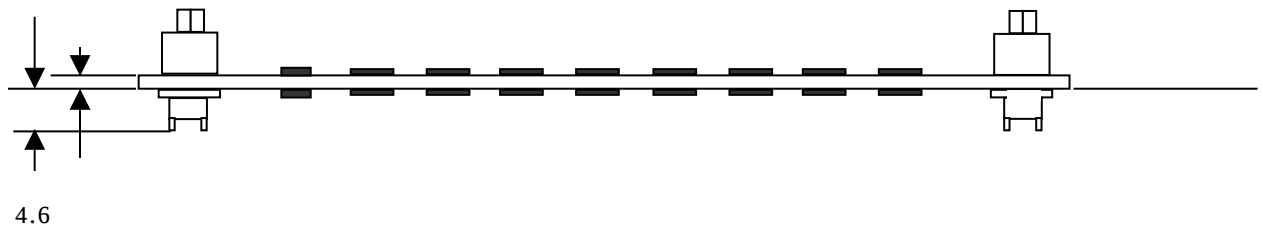
ORDERING INFORMATION

Part Number	Density	Org.	Package	Component Number	Vcc	SPEED
HMS4M16F16G-10	8MByte	4M×16bit	80Pin-SMM	16EA	5.0V	10ns
HMS4M16F16G-12	8MByte	4M×16bit	80Pin-SMM	16EA	5.0V	12ns
HMS4M16F16G-15	8MByte	4M×16bit	80Pin-SMM	16EA	5.0V	15ns
HMS4M16F16G-17	8MByte	4M×16bit	80Pin-SMM	16EA	5.0V	17ns
HMS4M16F16G-20	8MByte	4M×16bit	80Pin-SMM	16EA	5.0V	20ns

PACKAGE DIMENSIONS

Unit : mm



**Connector Configuration**

- Module PCB Bottom: 177985-1(AMP), 0.8mm Free Height Plugs, 40pins
- Board top: 177986-1'(AMP), 0.8mm Free Height Receptacles ,40pins