Shift Registers

NATIONAL

MM4006A/MM5006A dual 100-bit shift register
MM4007/MM5007 dual 100-bit mask programmable shift register
MM4019/MM5019 dual 256-bit mask programmable shift register

general description

The MM4007/MM5007 and MM4019/MM5019 are monolithic dual 100-bit and dual 256-bit dynamic shift registers utilizing P-channel enhancement mode technology to achieve bipolar compatibility. The length of the registers may be varied at manufacture by the altering of the metal mask providing custom length of both registers. Additional connection between registers may be accomplished at the metal mask to provide single shift register lengths of up to 200 or 512-bits, with or without an appropriate tap provided at the juncture. The MM5006A is an MM5007 programmed as a dual 100-bit shift register.

For the MM4007/MM5007 N = 20 to 100 bits
For the MM4019/MM5019 N = 40 to 256 bits

STANDARD LENGTHS:

MM4006A	Dual 100-bit
MM4007/AA	Dual 80-bit
MM4019	Dual 256-bit

CUSTOM LENGTHS:

The programmed shift registers are assigned a letter code for each option. These are designated by a pair of letters after the number code but before the package designation such as

MM5007/AA/H

which is a 0°C to +70°C dual 80-bit dynamic shift register in the TO-99 package. Pattern codes are assigned by National upon initial order entry. See MOS Brief 14 for a more detailed description of the custom mask.

features

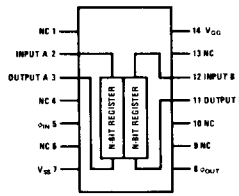
- Bipolar compatibility — Standard +5V, −12V power supplies
- Mask programmable length
  - MM4007/MM5007 — dual 20-100 bits
  - MM4019/MM5019 — dual 40-256 bits
- Low clock capacitance
  - MM4007/MM5007 — 65 pF max
  - MM4019/MM5019 — 125 pF max
- Standard clock frequency — 250 Hz min — typical at 25°C; 2.5 MHz max — guaranteed over temp
- Full temperature range
  - MM4007,MM4019 — −55°C to +125°C
  - MM5007,MM5019 — 0°C to +70°C

applications

- Custom shift registers
- CRT recirculate display

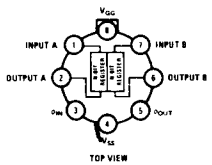
connection diagrams

Dual-In-Line Package



TOP VIEW

Note: Pin 7 connected to case.

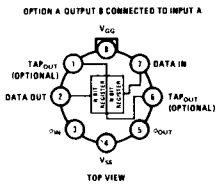


TOP VIEW

Note: Pin 4 connected to case.

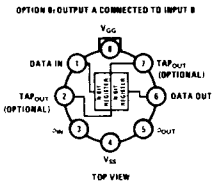
Standard Connection

Metal Can Packages



TOP VIEW

Note: Pin 4 connected to case.



TOP VIEW

Note: Pin 4 connected to case.

Optional Connections

ordering information

DUAL 80-BIT	DUAL 100-BIT	DUAL 100-BIT	DUAL 256-BIT	PROGRAMMABLE 20 to 100 Bits	PROGRAMMABLE 40 to 256 Bits	SEE PACKAGE
MM4007AA/D	MM4006AD	MM4007D	MM4019D	MM4007XX/D	MM4019XX/D	2
MM4007AA/H	MM4006AH	MM4007H	MM4019H	MM4007XX/H	MM4019XX/H	23
MM5007AA/D	MM5006AD	MM5007D	MM5019D	MM5007XX/D	MM5019XX/D	2
MM5007AA/H	MM5006AH	MM5007H	MM5019H	MM5007XX/H	MM5019XX/H	23

absolute maximum ratings

Voltage at Any Pin	V_{SS} + 0.3V to V_{SS} − 22V
Operating Temperature Range	
MM4006A,MM4007,MM4019	−55°C to +125°C
MM5006A,MM5007,MM5019	0°C to +70°C
Storage Temperature Range	−65°C to +150°C

electrical characteristics

T_A within operating temperature range, V_{SS} = 5.0V ±5%, V_{GG} = −12.0V ±10%, unless otherwise noted.

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Data Input Levels					
Logical HIGH Level (V_{IH})		V_{SS} − 2.0		V_{SS} + 0.3	V
Logical LOW Level (V_{IL})		V_{SS} − 18.5		V_{SS} − 4.2	V
Data Input Leakage	V_{IN} = −20V, T_A = 25°C, All Other Pins GND		0.01	0.5	μA
Data Input Capacitance	V_{IN} = 0.0V, f = 1 MHz, All Other Pins GND (Note 1)		3.0	5.0	pF
Clock Input Levels					
Logical HIGH Level ($V_{\phi H}$)		V_{SS} − 1.5		V_{SS} + 0.3	V
Logical LOW Level ($V_{\phi L}$)		V_{SS} − 18.5		V_{SS} − 14.5	V
Clock Input Leakage	V_ϕ = −2.0V, T_A = 25°C, All Other Pins GND		0.05	1.0	μA
Clock Input Capacitance	V_ϕ = 0.0V, f = 1 MHz, All Other Pins GND (Note 1)				
MM4006A/MM5006A & MM4007/MM5007			50	65	pF
MM4019/MM5019			95	125	pF
Data Output Levels					
Logical HIGH Level (V_{OH})	I_{SOURCE} = −0.5 mA	2.4		V_{SS}	V
Logical LOW Level (V_{OL})	I_{SINK} = 1.6 mA			0.4	V
Power Supply Current I_{GG}	T_A = 25°C, V_{GG} = −12V, ϕ_{PW} = 150 ns, V_{SS} = 5.0V, $V_{\phi L}$ = −12V, Data = 0-1-0-1				
MM4006A/MM5006A & MM4007/MM5007	0.01 MHz ≤ ϕ_f ≤ 0.1 MHz		2.0	3.0	mA
MM4019/MM5019			2.5	3.5	mA
MM4006A/MM5006A & MM4007/MM5007	ϕ_f = 1.0 MHz		4.0	6.0	mA
MM4019/MM5019			5.0	7.0	mA
MM4006A/MM5006A & MM4007/MM5007	ϕ_f = 2.5 MHz		6.0	9.0	mA
MM4019/MM5019			9.0	12.0	mA
Clock Frequency (ϕ_f)	$\phi t_r = \phi t_f$ = 20 ns	.01	3.3	2.5	MHz
Clock Pulsewidth (ϕ_{PW})	$\phi t_r + \phi_{PW} + \phi t_f \leq 10.5\ \mu s$	0.15		10	μs
Clock Phase Delay Times (ϕ_d, $\bar{\phi}_d$)	(Note 2)	10			ns
Clock Transition Times (ϕt_r, ϕt_f)	$\phi t_f + \phi_{PW} + \phi t_r \leq 10.5\ \mu s$			1.0	μs
Partial Bit Times (T)	(Note 2)				
Input Partial Bit Time (T_{IN})		0.20		100	μs
Output Partial Bit Time (T_{OUT})		0.20		100	μs
Data Input Setup Time (t_{ds})		80	30		ns
Data Input Hold Time (t_{dh})		20	0		ns
Data Output Propagation Delay from ϕ_{OUT}	(See ac test circuit)				
Delay to High Level (t_{pdH})			150	200	ns
Delay to Low Level (t_{pdL})			150	200	ns

Note 1: Capacitance is guaranteed by periodic testing.

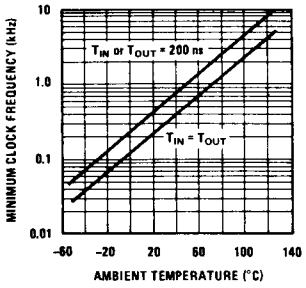
Note 2: Minimum clock frequency is a function of temperature and partial bit times (T_{IN} and T_{OUT}) as shown by the ϕ_f versus temperature and T_{IN}, T_{OUT} versus temperature curves. The lowest guaranteed clock frequency for any temperature can be attained by making T_{IN} equal to T_{OUT}. The minimum guaranteed clock frequency is:

$$\phi_{f(min)} = \frac{1}{T_{IN} + T_{OUT}}$$, where T_{IN} and T_{OUT} do not exceed the guaranteed maximums.

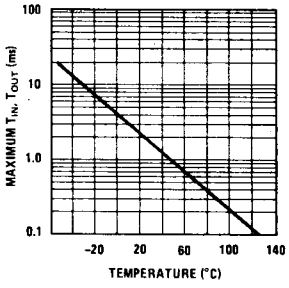
Note 3: Minimum clock frequency and partial bit time curves are guaranteed by testing at a high temperature point.

performance characteristics

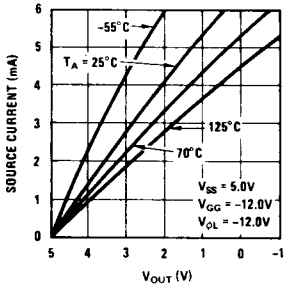
Guaranteed Minimum Clock Frequency vs Temperature (Note 2)



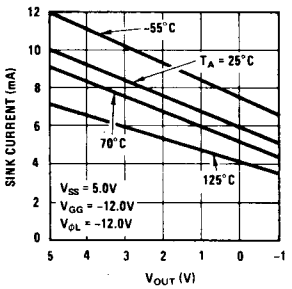
Guaranteed Maximum T_{IN} and T_{OUT} vs Temperature (Note 2)



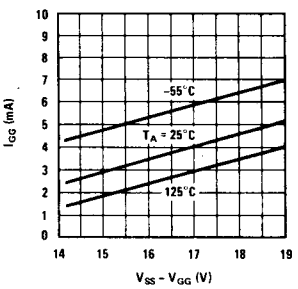
Typical Data Output Source Current vs Voltage



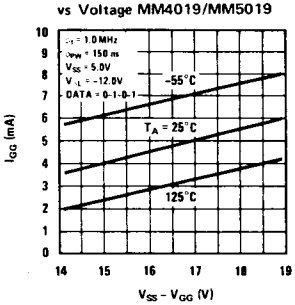
Typical Data Output Sink Current vs Voltage



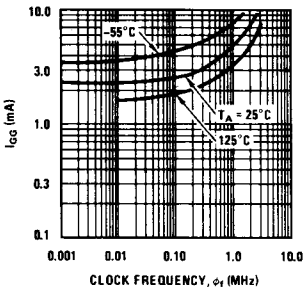
Typical Power Supply Current vs Voltage MM4006A/MM5006A MM4007/MM5007



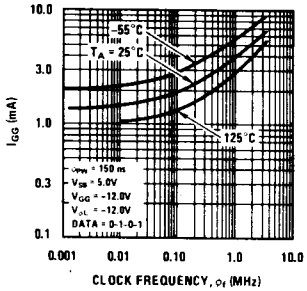
Typical Power Supply Current vs Voltage MM4019/MM5019



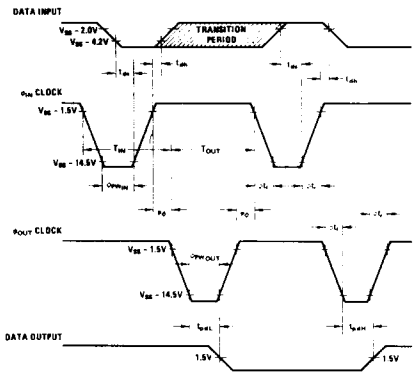
Typical Power Supply Current vs Clock Frequency MM4019/MM5019



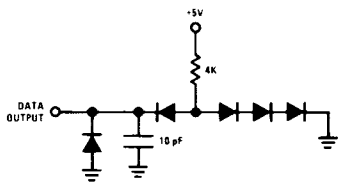
Typical Power Supply Current vs Clock Frequency MM4006A/MM5006A/ MM4007/MM5007



switching waveforms



ac test circuit



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