National Semiconductor

MILITARY DATA SHEET

MN54F410-X REV 1A0

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REGISTER STACK-16 X 4 RAM TRI-STATE OUTPUT REGISTER

General Description

The F410 is a register-oriented high-speed 64-bit Read/Write Memory organized as 16-words by 4-bits. An edge-triggered 4-bit output register allows new input data to be written while previous data is held. TRI-STATE outputs are provided for maximum versatility. The F410 is fully compatible with all TTL families.

Industry Part Number

54F410

NS Part Numbers

54F410DMQB
54F410FMQB
54F410LMQB

Prime Die

M410

Processing

MIL-STD-883, Method 5004

Quality Conformance Inspection

MIL-STD-883, Method 5005

Subgrp	Description	Temp (^{o}C)
1	Static tests at	+25
2	Static tests at	+125
3	Static tests at	-55
4	Dynamic tests at	+25
5	Dynamic tests at	+125
6	Dynamic tests at	-55
7	Functional tests at	+25
8A	Functional tests at	+125
8B	Functional tests at	-55
9	Switching tests at	+25
10	Switching tests at	+125
11	Switching tests at	-55

Features

- Edge-triggered output register
- Typical access time of 35 ns
- TRI-STATE outputs
- Optimized for register stack operation
- 18-Pin package
- 9410 replacement

(Absolute Maximum Ratings)
(Note 1)

Storage Temperature	-65 C to +150 C
Ambient Temperature under Bias	-55C to +125C
Junction Temperature under Bias	-55 to +175C
Vcc Pin Potential to Ground Pin	-0.5V to +7.0V
Input Voltage (Note 2)	-0.5V to +7.0V
Input Current (Note 2)	-30mA to +5.0mA
Voltage Applied to Output in HIGH State (with Vcc=0V)	
Standard Output	-0.5V to Vcc
TRI-STATE Output	-0.5V to +5.5V
Current APplied to Output in LOW State (Max)	twice the rated Iol(mA)

Note 1: Absolute maximum ratings are values beyond which the device may be damaged or have its useful life impaired. Functional operation under these conditions is not implied.
Note 2: Either voltage limit or current limit is sufficient to protect inputs.

Recommended Operating Conditions

Free Air Ambient Temperature	
Military	-55C to +125C
Commercial	0C to +70C
Supply Voltage	
Military	+4.5V to +5.5V
Commercial	+4.5V to +5.5V

Electrical Characteristics

DC PARAMETERS

(The following conditions apply to all the following parameters, unless otherwise specified.)
DC: VCC 4.5V to 5.5V, Temp range:-55C to 125C

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
IIH	Input High Current	VCC=5.5V, VM=2.7V, VINH=5.5V, VINL=0.0V	1, 3	INPUTS		20	uA	1, 2, 3
IBVI	Input High Current	VCC=5.5V, VM=7.0V, VINH=5.5V, VINL=0.0V	1, 3	INPUTS		100	uA	1, 2, 3
IIL (1)	Input LOW Current	VCC=5.5V, VM=0.5V, VINH=5.5V, VINL=0.0V	1, 3	IN EXCEPT $\overline{CS}$, CP		-0.6	mA	1, 2, 3
IIL (2)	Input LOW Current	VCC=5.5V, VM=0.5V, VINH=5.5V, VINL=0.0V	1, 3	INPUTS $\overline{CS}$, CP		-1.2	mA	1, 2, 3
VOL	Output LOW Voltage	VCC=4.5V, IOL=20mA, VIH=2.0V, VIL=0.8V, VINH=5.5V, VINL=0.0V	1, 3	OUTPUTS		0.5	V	1, 2, 3
VOH	Output HIGH Voltage	VCC=4.5V, IOH=-1.0mA, VIH=2.0V, VIL=0.8V, VINH=5.5V, VINL=0.0V	1, 3	OUTPUTS	2.5		V	1, 2, 3
VOH3	Output HIGH Voltage	VCC=4.5V, IOH3=-3.0mA, VIH=2.0V, VIL=0.8V, VINH=5.5V VINL=0.0V	1, 3	OUTPUTS	2.4		V	1, 2, 3
IOS	Short-Circuit Current	VCC=5.5V, VINH=5.5V, VM=0.0V, VINL=0.0V	1, 3	OUTPUTS	-60	-150	mA	1, 2, 3
VCD	Input Clamp Diode Voltage	VCC=4.5V, IM=-18mA, VINH=5.5V	1, 3	INPUTS		-1.2	V	1, 2, 3
ICC	Power Supply Current	VCC=5.5V, VINH=5.5V, VINL=0.0V	1, 3	VCC		70	mA	1, 2, 3
ICEX	Output HIGH Leakage Current	VCC=5.5V, VINH=5.5V, VINL=0.0V, VM=5.5V	1, 3	OUTPUTS		250	uA	1, 2, 3
IOZH	Output Leakage Current	VCC=5.5V, VOZH=2.7V, VIH=2.0V, VIL=0.8V, VINH=5.5V, VINL=0.0V	1, 3	OUTPUTS		50	uA	1, 2, 3
IOZL	Output Leakage Current	VCC=5.5V, VOZL=0.5V, VIH=2.0V, VIL=0.8V, VINH=5.5V, VINL=0.0V	1, 3	OUTPUTS		-50	uA	1, 2, 3

AC PARAMETERS

(The following conditions apply to all the following parameters, unless otherwise specified.)
AC: CL=50pf, RL=500 OHMS, TR=2.5ns, TF=2.5ns SEE AC FIGS

tpLH	Propagation Delay	VCC=5.0V @25C, 4.5V & 5.5V @ -55C & 125C	2, 4	CP to Qn	3.0	8.5	ns	9
			2, 4	CP to Qn	2.5	11.0	ns	10, 11
tpHL	Propagation Delay	VCC=5.0V @25C, 4.5V & 5.5V @ -55C & 125C	2, 4	CP to Qn	3.5	9.0	ns	9
			2, 4	CP to Qn	3.0	12.0	ns	10, 11

Electrical Characteristics

AC PARAMETERS(Continued)

(The following conditions apply to all the following parameters, unless otherwise specified.)
AC: CL=50pf, RL=500 OHMS, TR=2.5ns, TF=2.5ns SEE AC FIGS

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
tpZH	Enable Time	VCC=5.0V @25C, 4.5V & 5.5V @ -55C & 125C	2, 4	$\overline{OE}$ to Qn	3.0	8.0	ns	9
			2, 4	$\overline{OE}$ to Qn	2.5	10.5	ns	10, 11
tpZL	Enable Time	VCC=5.0V @25C, 4.5V & 5.5V @ -55C & 125C	2, 4	$\overline{OE}$ to Qn	3.5	9.0	ns	9
			2, 4	$\overline{OE}$ to Qn	3.0	13.0	ns	10, 11
tpHZ	Enable Time	VCC=5.0V @25C, 4.5V & 5.5V @ -55C & 125C	2, 4	$\overline{OE}$ to Qn	2.5	6.5	ns	9
			2, 4	$\overline{OE}$ to Qn	2.0	8.5	ns	10, 11
tpLZ	Enable Time	VCC=5.0V @25C, 4.5V & 5.5V @ -55C & 125C	2, 4	$\overline{OE}$ to Qn	2.5	7.0	ns	9
			2, 4	$\overline{OE}$ to Qn	2.0	9.5	ns	10, 11
ts(H/L)(1)	Setup Time HIGH or LOW	VCC=5.0V @25C, (READ MODE) 4.5V & 5.5V @ -55C & 125C	5	An to CP	15.0		ns	9
			5	An to CP	23.0		ns	10, 11
th(H/L)(1)	Setup Time	VCC=5.0V @25C, (READ MODE) 4.5V & 5.5V @ -55C & 125C	5	An to CP	0		ns	9, 10, 11
ts(H/L)(2)	Setup Time HIGH or LOW	VCC=5.0V @25C, (WRITE MODE) 4.5V & 5.5V @ -55C & 125C	5	An to $\overline{WE}$	0		ns	9, 10, 11
th(H/L)(2)	Hold Time HIGH or LOW	VCC=5.0V @25C, (WRITE MODE) 4.5V & 5.5V @ -55C & 125C	5	An to $\overline{WE}$	0		ns	9, 10, 11
ts(H/L)(3)	Setup Time HIGH or LOW	VCC=5.0V @25C, (WRITE MODE) 4.5V & 5.5V @ -55C & 125C	5	Dn to $\overline{WE}$	5.0		ns	9
			5	Dn to $\overline{WE}$	8.5		ns	10, 11
th(H/L)(3)	Hold Time HIGH or LOW	VCC=5.0V @25C, (WRITE MODE) 4.5V & 5.5V @ -55C & 125C	5	Dn to $\overline{WE}$	0		ns	9
			5	Dn to $\overline{WE}$	2.5		ns	10, 11
tw (1)	Pulse Width	VCC=5.0V @25C, TR/TF=1.0ns 4.5V & 5.5V @ -55C & 125C	5	$\overline{WE}$	7.5		ns	9
			5	$\overline{WE}$	9.5		ns	10, 11
tw (2)	Pulse Width	VCC=5.0V @25C, TR/TF=1.0ns 4.5V & 5.5V @ -55C & 125C	5	$\overline{CS}$	7.5		ns	9
			5	$\overline{CS}$	9.5		ns	10, 11

Electrical Characteristics

AC PARAMETERS(Continued)

(The following conditions apply to all the following parameters, unless otherwise specified.)
AC: CL=50pf, RL=500 OHMS, TR=2.5ns, TF=2.5ns SEE AC FIGS

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
tw (3)	Pulse Width (Read Mode only)	VCC=5.0V @25C, TR/TF=1.0ns 4.5V & 5.5V @ -55C & 125C	5	$\overline{CP}$	7.5		ns	9
			5	$\overline{CP}$	9.5		ns	10, 11
tw (4)	Pulse Width (Read/Write Mode)	VCC=5.0V @25C, TR=TF=1.0ns 4.5V & 5.5V @ -55C & 125C	5	$\overline{CP}$	18.5		ns	9, 10, 11

Note 1: Screen tested 100% on each device at -55 C, +25 C & +125 C temperature, Subgroups A1, 2, 3, 7 & 8.
Note 2: Screen tested 100% on each device at +25 C temperature only, Subgroup A9.
Note 3: Sample tested (Method 5005, Table 1) on each MFG. lot at +25 C, +125 C & -55 C temp., Subgroups A1, 2, 3, 7 & 8.
Note 4: Sample Tested (Method 5005, Table 1) on each MFG. lot at +25 C Subgroup A9, & periodically at +125 C & -55 C temp., Subgroups 10 & 11.
Note 5: Not tested at +25C, +125C, or -55C Temperature. (DESIGN CHARACTERIZATION DATA).
Note 6: * = Barred Input/Output Pins.

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