National Semiconductor

MILITARY DATA SHEET

MN54F676-X REV 1A0

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16-BIT SERIAL/PARALLEL-IN, SERIAL-OUT SHIFT REGISTER

General Description

The F676 contains 16 flip-flops with provision for synchronous parallel or serial entry and serial output. When the Mode (M) input is HIGH, information present on the parallel data (P0-P15) inputs is entered on the falling edge of the Clock Pulse ($\overline{CP}$) input signal. When M is LOW, data is shifted out of the most significant bit position while information present on the Serial (SI) input shifts into the least significant bit position. A HIGH signal on the Chip Select ($\overline{CS}$) input prevents both parallel and serial operations.

Industry Part Number

54F676

NS Part Numbers

54F676DMQB
54F676FMQB
54F676LMQB

Prime Die

M676

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

- 16-bit parallel-to-serial conversion
- 16-bit serial-in, serial-out
- Chip select control
- Slim 24 lead 300 mil package

(Absolute Maximum Ratings)

(Note 1)

Storage Temperature	-65 C to +150 C
Ambient Temperature under Bias	-55 C to +125 C
Junction Temperature under Bias	-55 C to +175 C
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	
Commercial	0 C to +70 C
Military	-55 C to +125 C
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	1, 3	INPUTS		20	uA	1, 2, 3
IBVI	Input HIGH Current	VCC=5.5V, VM=7.0V, VINH=5.5V	1, 3	INPUTS		100	uA	1, 2, 3
IIL	Input LOW Current	VCC=5.5V, VM=0.5V, VINL=0.0V, VINH=5.5V	1, 3	INPUTS		-0.6	mA	1, 2, 3
VOL	Output LOW Voltage	VCC=4.5V, VIH=0.8V, IOL=20mA, VIH=2.0V, VINH=5.5V, VINL=0.0V	1, 3	OUTPUTS		0.5	V	1, 2, 3
VOH	Output HIGH Voltage	VCC=4.5V, VIL=0.8V, IOH=-1.0mA, VINH=5.5V, VIH=2.0V, VINL=0.0V	1, 3	OUTPUTS	2.5		V	1, 2, 3
IOS	Short-Circuit Current	VCC=5.5V, VM=0.0V, VINH=5.5V, 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	Supply Current	VCC=5.5V, VINH=5.5V, VINL=0.0V	1, 3	VCC		72	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

Electrical Characteristics

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

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
tpLH	Propagation Delay	VCC=5.5V @25C, VCC=4.5V & 5.5V @-55/125C	2, 4	$\overline{CP}$ to SO	4.5	11.0	ns	9
			2, 4	$\overline{CP}$ to SO	4.5	17.0	ns	10, 11
tpHL	Propagation Delay	VCC=5.5V @25C, VCC=4.5V & 5.5V @-55/125C	2, 4	$\overline{CP}$ to SO	5.0	12.5	ns	9
			2, 4	$\overline{CP}$ to SO	5.0	14.5	ns	10, 11
ts(H/L)(1)	Setup Time HIGH or LOW	VCC=5.5V @25C, VCC=4.5V & 5.5V @-55/125C	5	SI to $\overline{CP}$	4.0		ns	9, 10, 11
th(H/L)(1)	Hold Time HIGH or LOW	VCC=5.5V @25C, VCC=4.5V & 5.5V @-55/125C	5	SI to $\overline{CP}$	4.0		ns	9, 10, 11
ts(H/L)(2)	Setup Time HIGH or LOW	VCC=5.5V @25C, VCC=4.5V & 5.5V @-55/125C	5	M to $\overline{CP}$	8.0		ns	9, 10, 11
th(H/L)(2)	Hold Time HIGH or LOW	VCC=5.5V @25C, VCC=4.5V & 5.5V @-55/125C	5	M to $\overline{CP}$	2.0		ns	9, 10, 11
ts(H/L)(3)	Setup Time HIGH or LOW	VCC=5.5V @25C, VCC=4.5V & 5.5V @-55/125C	5	Pn to $\overline{CP}$	3.0		ns	9, 10, 11
th(H/L)(3)	Hold Time HIGH or LOW	VCC=5.5V @25C, VCC=4.5V & 5.5V @-55/125C	5	Pn to $\overline{CP}$	4.0		ns	9, 10, 11
ts(L)	Setup Time HIGH or LOW	VCC=5.5V @25C, VCC=4.5V & 5.5V @-55/125C	5	$\overline{CS}$ to $\overline{CP}$	10.0		ns	9
			5	$\overline{CS}$ to $\overline{CP}$	12.0		ns	10, 11
th(L)	Hold Time HIGH or LOW	VCC=5.5V @25C, VCC=4.5V & 5.5V @-55/125C	5	$\overline{CS}$ to $\overline{CP}$	10.0		ns	9, 10, 11
tw(H)	Pulse Width	VCC=5.5V @25C, VCC=4.5V & 5.5V @-55/125C TR/TF=1.0ns	5	$\overline{CP}$	4.0		ns	9
			5	$\overline{CP}$	5.0		ns	10, 11
tw(L)	Pulse Width	VCC=5.5V @25C, VCC=4.5V & 5.5V @-55/125C TR/TF=1.0ns	5	$\overline{CP}$	7.0		ns	9
			5	$\overline{CP}$	9.0		ns	10, 11
fMAX	Maximum Clock Frequency	VCC=5.5V @25C, VCC=4.5V & 5.5V @-55/125C TR/TF=1.0ns	5		90		MHZ	9
			5		45		MHZ	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 +25 C, +125 C or -55 C temperature (DESIGN CHARACTERIZATION DATA).