National Semiconductor

MILITARY DATA SHEET

MN54F821-X REV 1A0

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10-BIT D-TYPE FLIP-FLOP

General Description

The F821 is a 10-bit D-type flip-flop with TRI-STATE true outputs arranged in a broadside pinout. The F821 is functionally and pin compatible with the AMDs AM29821.

Industry Part Number

54F821

NS Part Numbers

54F821DMQB
54F821FMQB
54F821LMQB

Prime Die

M821

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

- TRI-STATE Outputs
- Direct replacement for AMD's Am29821

(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	1, 3	INPUTS		20	uA	1, 2, 3
IBVI	Input HIGH Current	VCC=5.5V, VM=7.0V	1, 3	INPUTS		100	uA	1, 2, 3
IIL	Input LOW Current	VCC=5.5V, VM=0.5V	1, 3	INPUTS		-0.6	mA	1, 2, 3
VOL	Output LOW Voltage	VCC=4.5V, VIH=0.8V, IOL=20mA, VIH=2.0V	1, 3	OUTPUTS		0.5	V	1, 2, 3
VOH	Output HIGH Voltage	VCC=4.5V, VIH=2.0V, IOH=-1.0mA, VIL=0.8V	1, 3	OUTPUTS	2.5		V	1, 2, 3
VOH3	Output HIGH Voltage	VCC=4.5V, VIH=2.0V, IOH=-3.0mA, VIL=0.8V	1, 3	OUTPUTS	2.4		V	1, 2, 3
IOS	Short-Circuit Current	VCC=5.5V, VM=0.0V	1, 3	OUTPUTS	-60	-150	mA	1, 2, 3
VCD	Input Clamp Diode Voltage	VCC=4.5V, IM=-18mA	1, 3	INPUTS		-1.2	V	1, 2, 3
ICCZ	Power Supply Current	VCC=5.5V	1, 3	VCC		100	mA	1, 2, 3
ICEX	Output HIGH Leakage Current	VCC=5.5V, VM=5.5V, VINL=0.0V, VINH=5.5V	1, 3	OUTPUTS		250	uA	1, 2, 3
IOZH	Output Leakage Current	VCC=5.5V, VM=2.7V, VIH=2.0V	1, 3	OUTPUTS		50	uA	1, 2, 3
IOZL	Output Leakage Current	VCC=5.5V, VM=0.5V, VIH=2.0V	1, 3	OUTPUTS		-50	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=5.0V @ 25C, VCC=4.5V & 5.5V @ -55/125C	2, 4	CP to Qn	2.0	9.5	ns	9
			2, 4	CP to Qn	2.0	10.5	ns	10, 11
tpHL	Propagation Delay	VCC=5.0V @ 25C, VCC=4.5V & 5.5V @ -55/125C	2, 4	CP to Qn	2.0	9.5	ns	9
			2, 4	CP to Qn	2.0	10.5	ns	10, 11
tpZH	Output Enable Time	VCC=5.0V @ 25C, VCC=4.5V & 5.5V @ -55/125C	2, 4	OUTPUT ENABLE	2.0	10.5	ns	9
			2, 4	OUTPUT ENABLE	2.0	13.0	ns	10, 11
tpZL	Output Enable Time	VCC=5.0V @ 25C, VCC=4.5V & 5.5V @ -55/125C	2, 4	OUTPUT ENABLE	2.0	10.5	ns	9
			2, 4	OUTPUT ENABLE	2.0	13.0	ns	10, 11
tpHZ	Output Disable Time	VCC=5.0V @ 25C, VCC=4.5V & 5.5V @ -55/125C	2, 4	OUTPUT DISABLE	1.5	7.0	ns	9
			2, 4	OUTPUT DISABLE	1.0	7.5	ns	10, 11
tpLZ	Output Disable Time	VCC=5.0V @ 25C, VCC=4.5V & 5.5V @ -55/125C	2, 4	OUTPUT DISABLE	1.5	7.0	ns	9
			2, 4	OUTPUT DISABLE	1.0	7.5	ns	10, 11
ts(H/L)	Setup Time HIGH or LOW	VCC=5.0V @ 25C, VCC=4.5V & 5.5V @ -55/125C	5	Dn to CP	3.0		ns	9
			5	Dn to CP	4.0		ns	10, 11
th(H/L)	Hold Time HIGH or LOW	VCC=5.0V @ 25C, VCC=4.5V & 5.5V @ -55/125C	5	Dn to CP	2.5		ns	9, 10, 11
tw(H/L)	Pulse Width	VCC=5.0V @ 25C, VCC=4.5V & 5.5V @ -55/125C TR/TF=1.0ns	5	CP	5.0		ns	9
			5	CP	6.0		ns	10, 11
Fmax	Maximum CLock Frequency	VCC=5.0V @ 25C, VCC=4.5V & 5.5V @ -55/125C TR/TF=1.0ns	5		100		MHz	9
			5		60		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).