National Semiconductor

MILITARY DATA SHEET

MN100351-X REV 1A0

Original Creation Date: 10/30/95
Last Update Date: 08/28/96
Last Major Revision Date: 08/21/96

LOW POWER HEX D FLIP-FLOP

General Description

The F100351 contains six D-type, edge-triggered master/slave flip-flops with true and complement outputs, a pair of common clock inputs (CPa and CPb) and common Master Reset (MR) input. Data enters a master when both CPa and CPb are LOW and transfers to the slave when CPa and CPb (or both) go HIGH. The MR input overrides all other inputs and makes the Q outputs LOW. All inputs have 50K ohm pull-down resistors.

Industry Part Number

100351

Prime Die

F351

NS Part Numbers

100351DMQB
100351FMQB
100351J-QMLV
100351W-QMLV

Processing

MIL-STD-883, Method 5004

Quality Conformance Inspection

MIL-STD-883, Method 5005

Subgrp	Description	Temp (°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

- 40% Power Reduction of the 100151
- 2000V ESD Protection
- Pin/function compatible with 100151
- Voltage compensated operating range: -4.2V to -5.7V
- Available to industrial grade temperature range

(Absolute Maximum Ratings)

(Note 1)

Storage Temperature (Tstg)	−65C to +150C
Maximum Junction Temperature (Tj)	
Ceramic	+175C
Plastic	+150C
Vee Pin Potential to Ground Pin	−7.0V to +0.5V
Input Voltage (DC)	Vee to +0.5V
Output Current (DC Output HIGH)	−50 mA
ESD (Note 2)	≥2000V

Note 1: Absolute maximum ratings are those values beyond which the device may be damaged or have its useful life impaired. Functional operation under these conditions is not implied.

Note 2: ESD testing conforms to MIL-STD-883, Method 3015.

Recommended Operating Conditions

Case Temperature (Tc)	
Commercial	0 C to +85 C
Industrial	−40 C to +85C
Military	−55C to +125C
Supply Voltage (Vee)	−5.7V to −4.2V

Electrical Characteristics

DC PARAMETERS

(The following conditions apply to all the following parameters, unless otherwise specified.)
DC: Vee Range: -4.2V to -5.7V, Tc= -55C to +125C, VCC=VCCA=GND

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
IIH	Input HIGH Current	VEE=-5.7V, VM=-0.87V	1, 3	Dn		240	uA	1, 2
			1, 3	Dn		340	uA	3
		VEE =-5.7V, VM =-0.87V	1, 3	MR, CPn		350	uA	1, 2
			1, 3	MR, CPn		500	uA	3
IIL	Input Low Current	VEE=-4.2V, VM=-1.83V	1, 3	INPUTS	0.5		uA	1, 2, 3
VOH	Output HIGH Voltage	VEE=-4.2V/-5.7V, VIH=-0.87V, VIL=-1.83V, LOADING:50 Ohms to -2.0V	1, 3	OUTPUTS	-1025	-870	mV	1, 2
			1, 3	OUTPUTS	-1085	-870	mV	3
VOL	Output LOW Voltage	Vee=-4.2V/-5.7V, VIH=-0.87V, VIL=-1.83V, LOADING:50 Ohms to -2.0V	1, 3	OUTPUTS	-1830	-1620	mV	1, 2
			1, 3	OUTPUTS	-1830	-1555	mV	3
VOHC	Output HIGH Voltage Corner Point High	Vee=-4.2V/-5.7V, VIH=-1.165V, VIL=-1.475V, Loading:50 Ohms to -2.0V	1, 3	OUTPUTS	-1035		mV	1, 2
			1, 3	OUTPUTS	-1085		mV	3
VOLC	Output LOW Voltage Corner Point High	Vee=-4.2V/-5.7V, VIH=-1.165V, VIL=-1.475V, Loading:50 Ohms to -2.0V	1, 3	OUTPUTS		-1610	mV	1, 2
			1, 3	OUTPUTS		-1555	mV	3
VIH	Input HIGH Voltage		1, 3, 7	INPUTS	-1165	-870	mV	1, 2, 3
VIL	Input LOW Voltage		1, 3, 7	INPUTS	-1830	-1475	mV	1, 2, 3
IEE	Power Supply Current	VEE=-4.2/-5.7V	1, 3	VEE	-135	-50	mA	1, 2, 3

Electrical Characteristics

AC PARAMETERS

(The following conditions apply to all the following parameters, unless otherwise specified.)
AC: VEE Range: -4.2V to -5.7V, LOADING: 50 Ohms to -2.0V, VCC=VCCA=GND

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
tpLH/tpHL(1)	Propagation Delay	VEE=-4.2/-5.7V	2, 4	CPn to Qn/$\overline{Qn}$	0.5	2.2	ns	9
			2, 4	CPn to Qn/$\overline{Qn}$	0.5	2.6	ns	10
			2, 4	CPn to Qn/$\overline{Qn}$	0.4	2.4	ns	11
tpLH/tpHL(2)	Propagation Delay	VEE=-4.2/-5.7V	2, 4	MR to Qn/$\overline{Qn}$	0.7	2.6	ns	9
			2, 4	MR to Qn/$\overline{Qn}$	0.8	2.9	ns	10
			2, 4	MR to Qn/$\overline{Qn}$	0.6	2.7	ns	11
tTLH/tTHL	Transistion Time	VEE=-4.2/-5.7V	6	Qn/$\overline{Qn}$	0.2	1.6	ns	9, 10, 11
tS	Setup Time	VEE=-4.2/-5.7V	6	Dn to CPn	0.8		ns	9
			6	Dn to CPn	0.9		ns	10, 11
tH	Hold Time	VEE=-4.2/-5.7V	6	Dn to CPn	1.4		ns	9
			6	Dn to CPn	1.6		ns	10
			6	Dn to CPn	1.5		ns	11
tREL		VEE= -4.2/-5.7V	6	MR	1.8		ns	9
			6	MR	2.6		ns	10
			6	MR	1.6		ns	11
tPW(H)	Pulse Width	VEE= -4.2/-5.7V	6	CPn/MR	2.0		ns	9, 10, 11
fMAX	Maximum Clock Frequency	VEE= -4.2/-5.7V	6	CPn	375		MHz	9, 10, 11

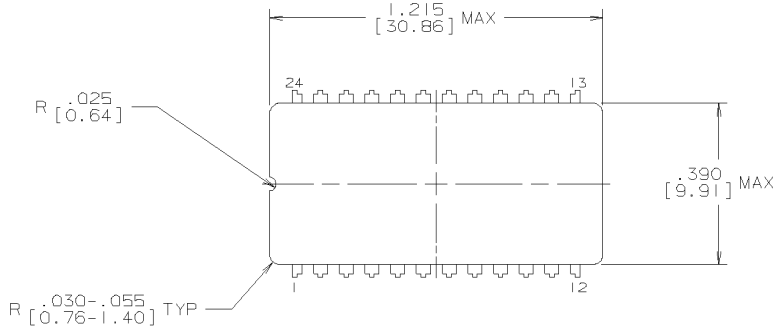
Note 1: Screen tested 100% on each device at -55 C, +25 C and +125 C temp., subgroups 1, 2, 3, 7 & 8.
Note 2: For QB devices, screen tested 100% on each device at +25C temperature only, subgroup A9. For QMLV devices, screen tested 100% on each device at +25C, +125C & -55C temperature, subgroups A9, 10 & 11.
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, and at +125 C & -55 C temp., subgroups A10 & 11.
Note 5: Sample tested (Method 5005, Table 1) on each MFG. lot at +25 C temp. only, subgroup A9.
Note 6: Not tested at +25 C, +125 C & -55 C temp. (DESIGN CHARACTERIZATION DATA).
Note 7: Guaranteed by applying specified input condition and testing VOH/VOL.

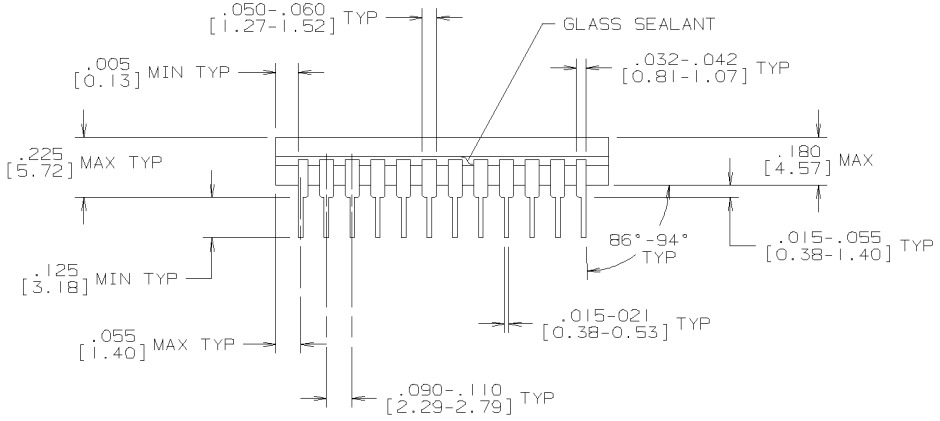
Graphics and Diagrams

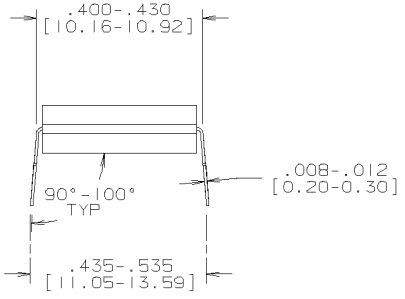
GRAPHICS#	DESCRIPTION
J24ERJ	CERDIP(J), 24LD .400 CENTERS (P/P DWG)
P000078A	CERDIP (J), 24LD .400 CENTERS (PIN OUT)
P000079A	CERPAC, QUAD, 24 LEAD (PIN OUT)
W24BRE	CERPAC, QUAD, 24 LEAD (P/P DWG)

See attached graphics following this page.

REVISIONS				
LTR	DESCRIPTION	E.C.N.	DATE	BY/APP'D
J	REVISE AND REDRAW	09044	03/05/92	DEG/







NOTES: UNLESS OTHERWISE SPECIFIED

1. LEAD FINISH: SOLDER DIPPED WITH Sn60 OR Sn63 SOLDER CONFORMING TO MIL-M-38510 TO A MINIMUM THICKNESS OF 200 MICROINCHES/5.08 MICROMETERS. SOLDER MAY BE APPLIED OVER LEAD BASIS METAL OR Sn PLATE.
2. LEAD THICKNESS MAY BE INCREASED BY .003 [0.08] MAXIMUM AFTER LEAD FINISH APPLIED.
3. BUMPERS ARE AVAILABLE ON CERTAIN PRODUCTS. BUMPERS WILL ADD .040 [1.02] MAX TO THE LENGTH OF THE PACKAGE.
4. NO JEDEC REGISTRATION AS OF 2/17/92.

MIL/AERO CONFIGURATION CONTROL

MIL-M-38510 CONFIGURATION CONTROL

CONTROLLING DIMENSION: INCH

APPROVALS	DATE
DRAWN D.E.GRADY	03/05/92
DFTG. CHK.	
ENGR. CHK.	
APPROVAL	

NATIONAL SEMICONDUCTOR CORPORATION
2900 Semiconductor Drive, Santa Clara, CA 95052-8090

CERDIP (J), 24 LEAD, .400 CENTERS

PROJECTION INCH MM

SCALE	SIZE	DRAWING NUMBER	REV
N/A	C	MKT-J24E	J

FORMERLY: N/A SHEET 1 OF 1