



MICROCIRCUIT DATA SHEET

MN54ABT374-X REV 0B0

Original Creation Date: 09/06/94
Last Update Date: 09/14/98
Last Major Revision Date: 03/19/94

OCTAL D-TYPE FLIP-FLOP WITH 3-STATE OUTPUTS

General Description

The ABT374 is a high-speed, low power octal D-type flip-flop featuring separate D-type inputs for each flip-flop and 3-state outputs for bus-oriented applications. A buffered Clock (CP) and Output Enable (\overline{OE}) are common to all flip-flops.

Industry Part Number

54ABT374

NS Part Numbers

54ABT374E-QML *
54ABT374J-QML **
54ABT374W-QML ***

Prime Die

NB374

Controlling Document

See Features Page

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

- Edge-triggered D-type inputs
- Buffered positive edge-triggered clock
- TRI-STATE outputs for bus-oriented applications
- Output sink capability of 48mA, source capability of 24 mA
- Guaranteed latchup protection
- High impedance glitch free bus loading during entire power up and power down cycle.
- Non-Destructive hot insertion capability.
- SMD : 5962-9314901Q2A*, QRA**, QSA***

(Absolute Maximum Ratings)

(Note 1)

Vcc Pin Potential to Ground Potential	-0.5V to +7.0V
Input Voltage (Note 2)	-0.5V to +7.0V
Input Current (Note 2)	-30mA to +5.0mA
Voltage Applies To Any Output In the Disabled or Power-Off State In The High State	-0.5V to 5.5V -0.5V to Vcc
Current Applies To Output In The Low State (Max)	96mA
Junction Temperature (Tj) Ceramic	+175C
Thermal Resistance Junction-To-Case (Theta JC)	See Mil-Std 1835
Storage Temperature	-65C to +150C
Lead Temperature (Soldering, 10 seconds)	+300C
ESD Classification	Class 2
Maximum Power Dissipation	500 mW

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

Supply Voltage (Vcc)	4.5V to 5.5V
Operating Temperature	-55C to +125C
Minimum Input Edge Rate (dV/dt) Data Input Enable Input	50 mV/ns 20 mV/ns
Maximum Output Current High Level (Ioh) Low Level (Iol)	-24 mA 48 mA

Electrical Characteristics

DC PARAMETERS

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

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
ICCH	Supply Current	VCC=5.5V, VINH=5.5V, VINL=0.0V	1, 4	VCC		250.0	uA	1, 2, 3
ICCL	Supply Current	VCC=5.5V, VINH=5.5V, VINL=0.0V	1, 4	VCC		30.0	mA	1, 2, 3
IC CZ	Supply Current	VCC=5.5V, VINH=5.5V, VINL=0.0V	1, 4	VCC		250.0	uA	1, 2, 3
ICCT	Supply Current	VCC=5.5V, OE=0.0V Input under test=3.4V Other inputs=5.5V or 0.0V	1, 4	VCC		2.5	mA	1, 2, 3
		VCC=5.5V, OE=3.4V Other inputs=5.5V or 0.0V	1, 4	VCC		2.5	mA	1, 2, 3
IIH	High Level Input Current	VCC=5.5V, VINH=5.5V	1, 4	IN		2.0	uA	1, 2, 3
IIL	Low Level Input Current	VCC=5.5V, VINL=0.0V	1, 4	IN		-2.0	uA	1, 2, 3
IOZH	Maximum TRI-STATE Leakage Current HIGH	VCC=5.5V, VOUT=2.7V VINL=0.0V, VIH (OE)=2.0V	1, 4	OUT		10.0	uA	1, 2, 3
IOZL	Maximum TRI-STATE Leakage Current LOW	VCC=5.5V, VOUT=0.5V VINH=5.5V, VIH (OE)=2.0V	1, 4	OUT		-10.0	uA	1, 2, 3
ICEX	Output High Leakage Current	VCC=5.5V, VOUT=5.5V VINH=5.5V	1, 4	OUT		50.0	uA	1, 2, 3
IOS	Output Short Circuit Current	VCC=5.5V, VOUT=0.0V VINH=5.5V	1, 4, 10	OUT	-100	-275	mA	1, 2, 3
IOS1	Output High Circuit Current	VCC=5.5V, VOUT=2.5V VINH=5.5V	1, 4, 10	OUT	-50	-180	mA	1, 2, 3
IBVI	Input High Current Breakdown test	VCC=5.5V, VINH=7.0V	1, 4	OUT		7.0	uA	1, 2, 3
IZZ	Bus Drainage test	VCC=0.0V, VOUT=4.5V, VINL=0.0V	1, 4	IN	-100	100	uA	1, 2, 3
VOL	Low Level Output Voltage	VCC=4.5V, IOL=48.0mA, VINH=4.5V, VINL=0.0V, VIH=2.0V, VIL=0.8V	1, 4	OUT		0.55	V	1, 2, 3
VOH	High Level Output Voltage	VCC=4.5V, IOH=-24.0mA, VINH=4.5V, VINL=0.0V, VIH=2.0V, VIL=0.8V	1, 4	OUT	2.0		V	1, 2, 3
		VCC=4.5V, IOH=-3mA, VINH=4.5V, VINL=0.0V, VIH=2.0V, VIL=0.8V	1, 4	OUT	2.5		V	1, 2, 3
		VCC=5.0V, IOH=-3mA, VINH=5.0V, VINL=0.0V, VIH=2.0V, VIL=0.8V	1, 4	OUT	3.0		V	1, 2, 3

Electrical Characteristics

DC PARAMETERS (Continued)

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

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
VID	Input Leakage test	VCC=0.0V, IID=1.9uA, VINL=0.0V	1, 4	IN	4.75		V	1, 2, 3
VCD	Input Clamp Diode Voltage	VCC=4.5V, IKL=-18mA, VINH=4.5V, VINL=0.0V	1, 4	IN		-1.2	V	1, 2, 3
VOLP	Low Level Ground Bounce	VCC=5.0V, LOAD : 50pF / 500 OHMS	7, 8	IN		0.8	V	4
VOLV	Low Level Ground Bounce	VCC=5.0V, LOAD : 50pF / 500 OHMS	7, 8	IN		-1.5	V	4
VOHP	High Level VCC Bounce	VCC=5.0V, LOAD : 50pF / 500 OHMS	7, 8	IN		1.6	V	4
VOHV	High Level VCC Bounce	VCC=5.0V, LOAD : 50pF / 500 OHMS	7, 8	IN		-1.0	V	4
CIN	Input Capacitance	VCC=0.0V	7	IN		11.0	pF	4
COUT	Output Capacitance	VCC=5.5V	7	OUT		16.0	pF	4

Electrical Characteristics

AC PARAMETERS

(The following conditions apply to all the following parameters, unless otherwise specified.)
 AC: CL=50pF RL=500 OHMS TRISE/TFALL = 3.0nS

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
tpLH	Propagation Delay	VCC=5.0V @25C, VCC=4.5V & 5.5V @-55C/125C	2, 5	CP to On	1.5	5.7	ns	9
			2, 5	CP to On	1.4	6.6	ns	10, 11
tpHL	Propagation Delay	VCC=5.0V @25C, VCC=4.5V & 5.5V @-55C/125C	2, 5	CP to On	2.0	6.6	ns	9
			2, 5	CP to On	2.0	7.6	ns	10, 11
tpZL	Output Enable Time	VCC=5.0V @25C, VCC=4.5V & 5.5V @-55C/125C	2, 5	OE to On	2.3	6.2	ns	9
			2, 5	OE to On	1.5	7.2	ns	10, 11
tpZH	Output Enable Time	VCC=5.0V @25C, VCC=4.5V & 5.5V @-55C/125C	2, 5	OE to On	1.2	5.0	ns	9
			2, 5	OE to On	0.8	5.7	ns	10, 11
tpHZ	Output Disable Time	VCC=5.0V @25C, VCC=4.5V & 5.5V @-55C/125C	2, 5	OE to On	2.3	6.1	ns	9
			2, 5	OE to On	1.3	7.2	ns	10, 11
tpLZ	Output Disable Time	VCC=5.0V @25C, VCC=4.5V & 5.5V @-55C/125C	2, 5	OE to On	1.4	6.0	ns	9
			2, 5	OE to On	1.0	7.0	ns	10, 11
ts(H/L)	Setup Time HIGH or LOW	VCC=5.0V @25C, VCC=4.5V & 5.5V @-55C/125C	7	Dn - CP	2.0		ns	9
			7	Dn - CP	2.5		ns	10, 11
th(H/L)	Hold Time HIGH or LOW	VCC=5.0V @25C, VCC=4.5V & 5.5V @-55C/125C	7	Dn - CP	2.0		ns	9
			7	Dn - CP	2.5		ns	10, 11
tw(H/L)	Pulse Width	VCC=5.0V @25C, VCC=4.5V & 5.5V @-55C/125C	7	CP	3.3		ns	9, 10, 11
Fmax	Maximum Input Frequency	VCC=5.0V @25C, VCC=4.5V & 5.5V @-55C/125C	7		150		MHz	9, 10, 11

Note 1: SCREEN TESTED 100% ON EACH DEVICE AT -55C, +125C & +25C TEMP., SUBGROUPS 1,2,3,7 & 8.

Note 2: SCREEN TESTED 100% ON EACH DEVICE AT -55C, +125C & +25C TEMP., SUBGROUPS A9, A10 & A11.

Note 3: SCREEN TESTED 100% ON EACH DEVICE AT +25C TEMP. ONLY, SUBGROUP 9.

Note 4: SAMPLE TESTED (METHOD 5005, TABLE 1) ON EACH MFG. LOT AT +25C, +125C & -55C TEMP., SUBGROUPS A1, 2, 3, 7 & 8.

Note 5: SAMPLE TESTED (METHOD 5005, TABLE 1) ON MFG. LOT AT +25C, +125C & -55C TEMP., SUBGROUPS A9, 10 & 11.

Note 6: SAMPLE TESTED (METHOD 5005, TABLE 1) ON EACH MFG. LOT AT +25C TEMP. ONLY, SUBGROUP A9.

(Continued)

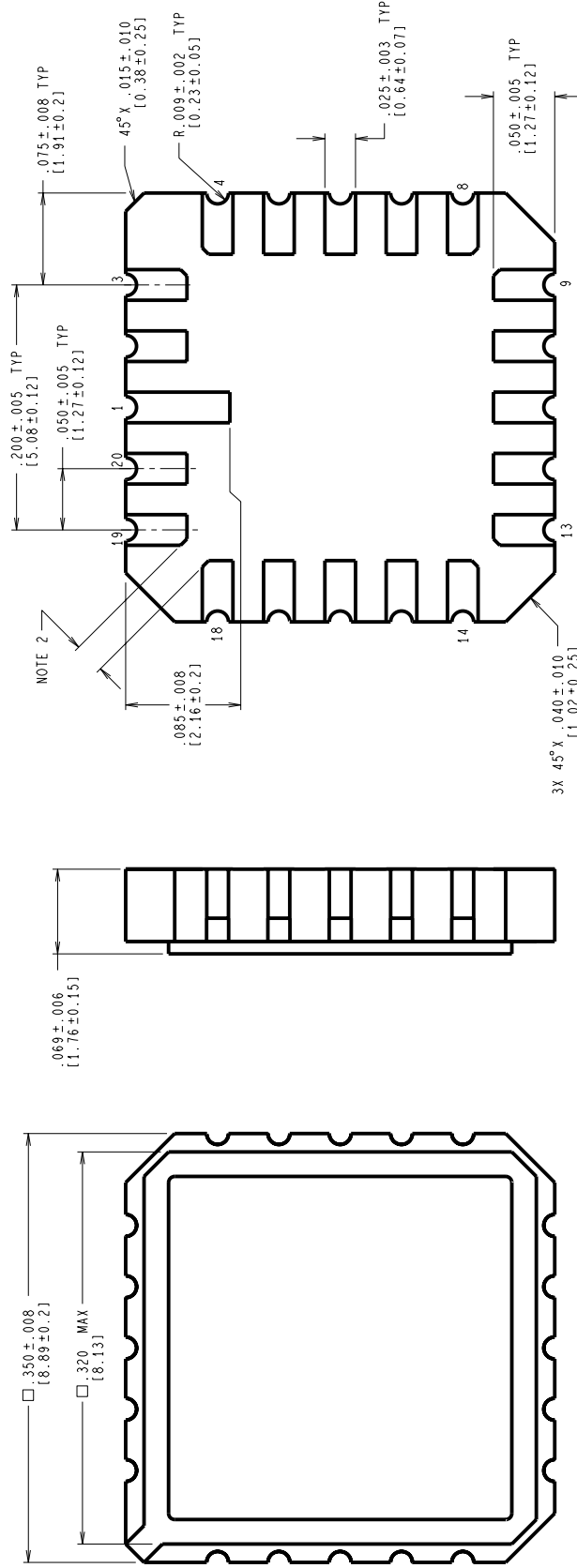
- Note 7: NOT TESTED (GUARANTEED BY DESIGN CHARACTERIZATION DATA).
- Note 8: MAX NUMBER OF OUTPUTS DEFINED AS (N). N-1 DATA INPUTS ARE DRIVEN 0V TO 3.0V. ONE OUTPUT @ VOL OR @ VOH.
- Note 9: MAX NUMBER OF DATA INPUTS (N) SWITCHING. (N-1) INPUTS SWITCHING 0V TO 3.0V. INPUT-UNDERTEST SWITCHING: 3V TO THRESHOLD (VILD), 0V TO THRESHOLD (VIHD), FREQ.= 1 MHZ.
- Note 10: MAXIMUM TEST DURATION NOT TO EXCEED ONE SECOND, NOT MORE THAN ONE OUTPUT SHORTED AT ONE TIME.

Graphics and Diagrams

GRAPHICS#	DESCRIPTION
E20ARE	LCC (E), TYPE C, 20 TERMINAL(P/P DWG)
J20ARM	CERDIP (J), 20 LEAD (P/P DWG)
P000064A	(new)
P000065A	(new)
W20ARF	CERPACK (W), 20 LEAD (P/P DWG)

See attached graphics following this page.

REVISIONS			
LTR	DESCRIPTION	E.C.N.	DATE
E	REVISE AND REDRAW	10005	02/10/94
			DEG/



CONTROLLING DIMENSION IS INCH
VALUES IN [] ARE MILLIMETERS

NOTES: UNLESS OTHERWISE SPECIFIED.

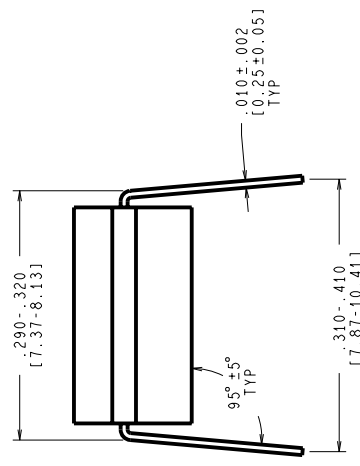
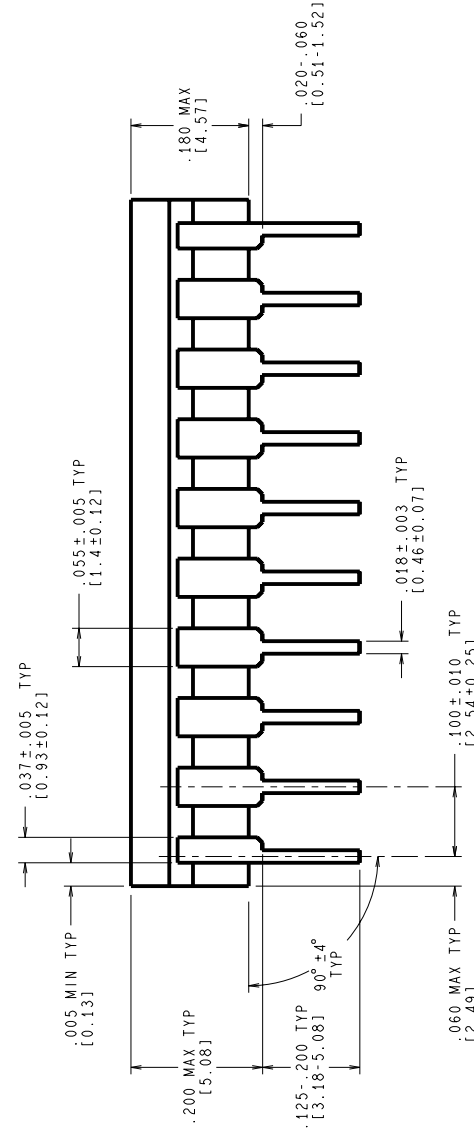
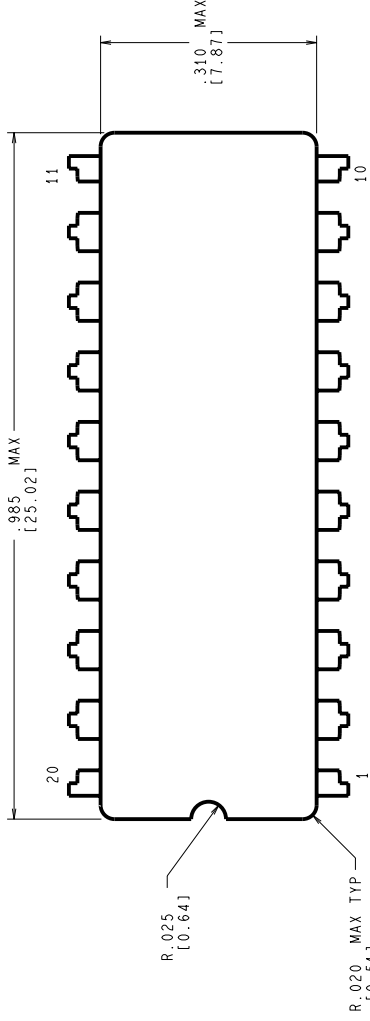
- LEAD FINISH TO BE ONE OF THE FOLLOWING:
 - 50 MICRONS/12.7 MICROMETERS MINIMUM GOLD PLATING OVER 50-350 MICRONS/1.27-8.89 MICROMETERS NICKEL.
 - SOLDER DIP.
 - SOLDER THICKNESS PER LATEST REVISION OF MIL-STD-1835.
- CORNER PADS MAY HAVE A $45^\circ \times 0.20 \text{ IN} / 0.51 \text{ mm}$ MAXIMUM CHAMFER TO ACCOMPLISH THE $.015 \text{ IN} / 0.38 \text{ mm}$ DIMENSION.
- REFERENCE JEDEC REGISTRATION MS-004, VARIATION CB, DATED 7/90.

MIL/AERO
CONFIGURATION CONTROL

APPROVALS		DATE
DRN	Design	02/10/94
CHK	Grady	
CHK		
CHK		
APPROVAL		

		NATIONAL SEMICONDUCTOR CORPORATION 2300 Semiconductor Drive, Santa Clara, CA 95052-8000	
LEADLESS CHIP CARRIER, TYPE C, 20 TERMINAL			
SCALE	SIZE	DRAWING NUMBER	REV
N/A	C	MKT-E20A	E
DO NOT SCALE DRAWING			SHEET 1 of 1

REVISIONS			
LTR	DESCRIPTION	E.C.N.	DATE
N	REVISE AND REDRAW PER CURRENT STANDARD: UPDATE TITLE & MIL/AERO STAMP.	11696	03/27/1997 MS/



CONTROLLING DIMENSION IS INCH
VALUES IN [] ARE MILLIMETERS

NOTES: UNLESS OTHERWISE SPECIFIED

- LEAD FINISH TO BE ONE OF THE FOLLOWING:
 - 200 MICROMETERS/ 5.08 MICROMETERS MINIMUM SOLDER MEASURED AT THE CREST OF THE MAJOR FLATS.
 - 200 TO 800 MICROMETERS/ 5.08 TO 20.32 MICROMETERS TIN PLATE OVER 50 TO 300 MICROMETERS/ 1.27 TO 7.62 MICROMETERS NICKEL UNDERPLATE OR BASIS METAL.
 - 50 TO 100 MICROMETERS/ 1.27 TO 2.54 MICROMETERS GOLD OVER 50 TO 350 MICROMETERS/ 1.27 TO 8.89 MICROMETERS NICKEL UNDERPLATE.
- NO JEDEC REGISTRATION AS OF 03/27/1997.

MIL-PRF-38535
CONFIGURATION CONTROL

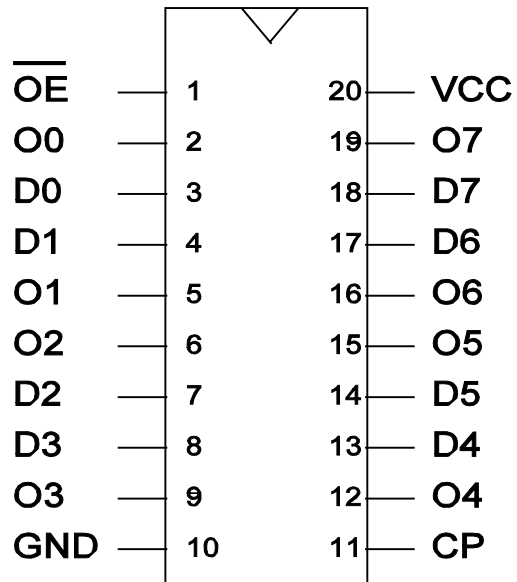
APPROVALS	DATE
DRW: MARYA SUCHY	03/27/1997
DTG: CHK.	
ENGR: CHK.	

PROJECTION		SCALE		SIZE		DRAWING NUMBER		REV	
[Symbol]		N/A		C		(SC)MKT-J20A		N	

National Semiconductor	
2800 Semiconductor dr., Santa Clara, CA 95052-8090	
CERDIP, 20 LEAD, .300 CENTERS	

CONNECTION DIAGRAM

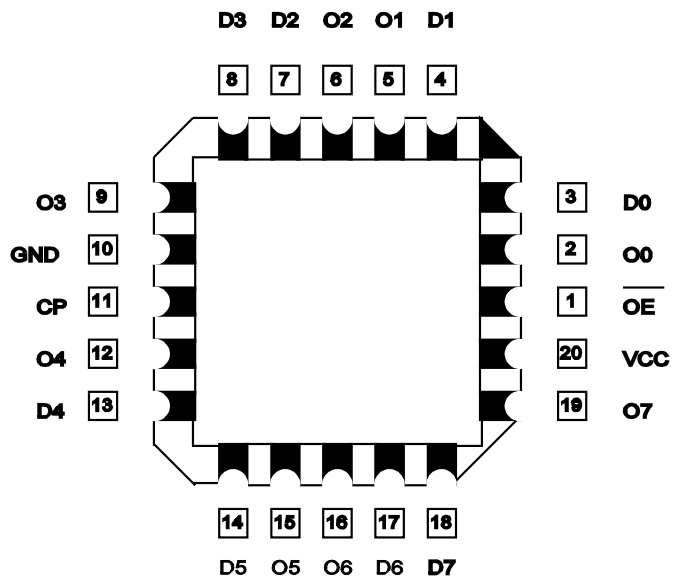
54ABT374



CDIP & FLATPACK PINOUT
(DWG # P000064A)

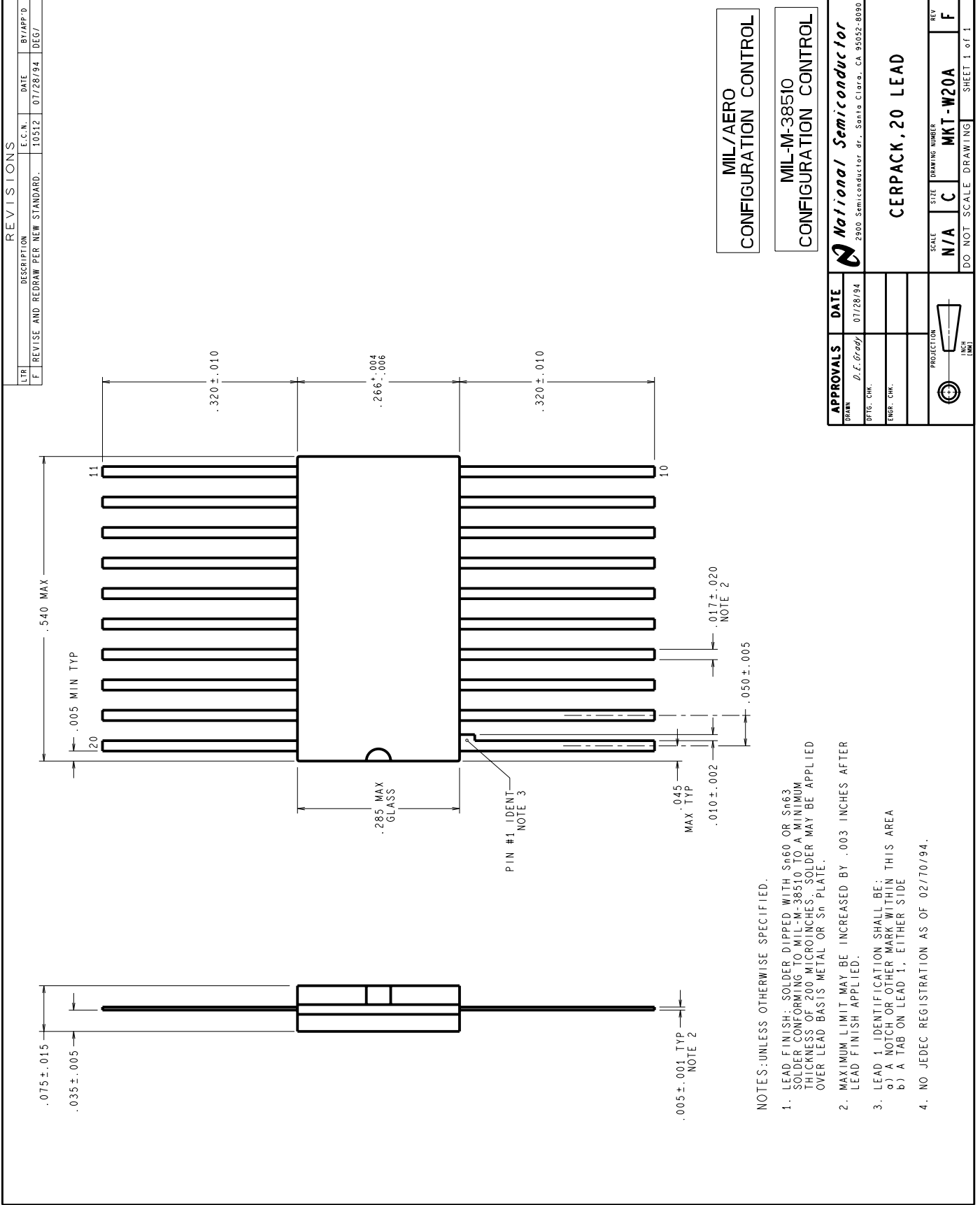
CONNECTION DIAGRAM

54ABT374



CERAMIC LEADLESS PINOUT

(DWG # P000065A)



Revision History

Rev	ECN #	Rel Date	Originator	Changes
0B0	M0001568	09/14/98	Bill Petcher	Changed MDS MN54ABT374-X REV 0A0 to MN54ABT374-X REV 0B0