National Semiconductor

MICROCIRCUIT DATA SHEET

MN54ACT138-X REV 1B0

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1-of-8 Decoder/Demultiplexer

General Description

The ACT138 is a high-speed 1-of-8 decoder / demultiplexer. This device is ideally suited for high-speed bipolar memory chip select address decoding. The multiple input enables allow parallel expansion to a 1-of-24 decoder using just three ACT138 devices or a 1-of-32 decoder using four ACT138 devices and one inverter.

Industry Part Number

54ACT138

NS Part Numbers

54ACT138DMQB
54ACT138FMQB
54ACT138LMQB

Prime Die

J138

Processing

MIL-STD-883, Method 5004

Quality Conformance Inspection

MIL-STD-883, Method 5005

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

Features

- Icc reduced by 50%
- Demultiplexing capability
- Multiple input enable for easy expansion
- Active LOW mutually exclusive outputs
- Outputs source/sink 24 mA
- ACT138 has TTL-compatible inputs
- Standard Military Drawing (SMD)
  - ACT138: 5962-87554

(Absolute Maximum Ratings)

(Note 1)

Supply Voltage (Vcc)	-0.5V to +7.0V
DC Input Diode Current (Iik)	
Vi = -0.5V	-20 mA
Vi = Vcc +0.5V	+20 mA
DC Input Voltage (Vi)	-0.5V to Vcc +0.5V
DC Output Diode Current (Iok)	
Vo = -0.5V	-20 mA
Vo = Vcc +0.5V	+20 mA
DC Output Voltage (Vo)	-0.5V to Vcc +0.5V
DC Output Source or Sink Current (Io)	±50 mA
DC Vcc or Ground Current per Output Pin (Icc or Ignd)	±50 mA
Storage Temperature (Tstg)	-65 C to +150 C
Junction Temperature (Tj)	
CDIP	175 C

Note 1: Absolute maximum ratings are those values beyond which damage to the device may occur. The databook specifications should be met, without exception, to ensure that the system design is reliable over its power supply, temperature, and output/input loading variables. National does not recommend operation of FACT TM circuits outside databook specifications.

Recommended Operating Conditions

Supply Voltage (Vcc)	4.5V to 5.5V
Input Voltage (Vi)	0V to Vcc
Output Voltage (Vo)	0V to Vcc
Operating Temperature(Ta)	-55 C to +125 C
Minimum Input Edge Rate (Delta V/ Delta t)	
ACT Devices	
Vin from 0.8V to 2.0V	
Vcc @ 4.5V, 5.5V	125 mV/ns

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. NOTE: -55C TEMPERATURE, SUBGROUP 3 IS GUARANTEED BUT NOT TESTED.

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
IIH	High level input Current	VCC=5.5V, VM=5.5V, VINH=5.5V	1, 2	INPUT		0.1	uA	1
			1, 2	INPUT		1.0	uA	2, 3
IIL	Low level input Current	VCC=5.5V, VM=0.0V, VINL=0.0V	1, 2	INPUT		-0.1	uA	1
			1, 2	INPUT		-1.0	uA	2, 3
VOL	Low level output Voltage	VCC=4.5V, VIH=2.0V, VIL=0.8V, IOL=24.0mA	1, 2	OUTPUT		.36	V	1
			1, 2	OUTPUT		.50	V	2, 3
		VCC=5.5V, VIH=2.0V, VIL=0.8V, IOL=24.0mA	1, 2	OUTPUT		.36	V	1
			1, 2	OUTPUT		.50	V	2, 3
		VCC=4.5V, VIH=2.0V, VIL=0.8V, IOL=50.0uA	1, 2	OUTPUT		.10	V	1, 2, 3
		VCC=5.5V, VIH=2.0V, VIL=0.8V, IOL=50.0uA	1, 2	OUTPUT		.10	V	1, 2, 3
VIOL	Low level Output Current	VCC=5.5V, VIH=2.0V, VIL=0.8V, IOL=50.0mA	1, 2, 5	OUTPUT		1.65	V	1, 2, 3
VOH	High Level Output Voltage	VCC=4.5V, VIH=2.0V, VIL=0.8V, IOH=-24.0mA, VINH=4.5V, VINL=0.0V	1, 2	OUTPUT	3.86		V	1
			1, 2	OUTPUT	3.70		V	2, 3
		VCC=5.5V, VIH=2.0V, VIL=0.8V, IOH=-24.0mA, VINH=5.5V, VINL=0.0V	1, 2	OUTPUT	4.86		V	1
			1, 2	OUTPUT	4.70		V	2, 3
		VCC=4.5V, VIH=2.0V, VIL=0.8V, IOH=-50.0uA, VINH=4.5V, VINL=0.0V	1, 2	OUTPUT	4.40		V	1, 2, 3
		VCC=5.5V, VIH=2.0V, VIL=0.8V, IOH=-50.0uA, VINH=5.5V, VINL=0.0V	1, 2	OUTPUT	5.40		V	1, 2, 3
VIOH	Dynamic Output Current	VCC=5.5V, VIH=2.0V, VIL=0.8V, IOH=-50.0mA	1, 2, 5	OUTPUT	3.85		V	1, 2, 3
ICCH	Supply Current Outputs HIGH	VCC=5.5V, VINH=5.5V	1, 2	VCC		4.0	uA	1
			1, 2	VCC		80	uA	2, 3
ICCL	Supply Current Outputs LOW	VCC=5.5V, VINH=5.5V, VINL=0.0V	1, 2	VCC		4.0	uA	1
			1, 2	VCC		80	uA	2, 3
ICCT	Supply Current per Input	VCC=5.5V, VIHT=VCC-2.1	1, 2	VCC		1.0	mA	1
			1, 2	VCC		1.6	mA	2, 3

Electrical Characteristics

AC PARAMETERS

(The following conditions apply to all the following parameters, unless otherwise specified.)
AC: CL=50pf, RL=500 OHMS, TRISE=3.0ns, TFALL=3.0ns, Temp Range: -55C to 125C. NOTE: -55C TEMPERATURE, SUBGROUP 11 IS GUARANTEED BUT NOT TESTED.

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
tpLH(1)	Propagation Delay	VCC=4.5V	3, 4, 6	An to $\overline{On}$	1.5	11.0	ns	9
			3, 4, 6	An to $\overline{On}$	1.5	12.5	ns	10, 11
tpHL(1)	Propagation Delay	VCC=4.5V	3, 4, 6	An to $\overline{On}$	1.5	11.0	ns	9
			3, 4, 6	An to $\overline{On}$	1.5	12.5	ns	10, 11
tpLH(2)	Propagation Delay	VCC=4.5V	3, 4, 6	$\overline{E1}$ or $\overline{E2}$ to $\overline{On}$	1.5	12.0	ns	9
			3, 4, 6	$\overline{E1}$ or $\overline{E2}$ to $\overline{On}$	1.5	13.5	ns	10, 11
tpHL(2)	Propagation Delay	VCC=4.5V	3, 4, 6	$\overline{E1}$ or $\overline{E2}$ to $\overline{On}$	1.5	11.5	ns	9
			3, 4, 6	$\overline{E1}$ or $\overline{E2}$ to $\overline{On}$	1.5	12.5	ns	10, 11
tpLH(3)	Propagation Delay	VCC=4.5V	3, 4, 6	$\overline{E3}$ to $\overline{On}$	1.5	12.5	ns	9
			3, 4, 6	$\overline{E3}$ to $\overline{On}$	1.5	14.0	ns	10, 11
tpHL(3)	Propagation Delay	VCC=4.5V	3, 4, 6	$\overline{E3}$ to $\overline{On}$	1.5	10.5	ns	9
			3, 4, 6	$\overline{E3}$ to $\overline{On}$	1.5	12.0	ns	10, 11

Note 1: SCREEN TESTED 100% ON EACH DEVICE AT +25C & +125C TEMPERATURE, SUBGROUPS 1, 2, 7, & 8.
Note 2: SAMPLE TESTED (METHOD 5005, TABLE 1) ON EACH MFG. LOT AT +25C & +125C TEMPERATURE, SUBGROUPS A1, 2, 7 & 8.
Note 3: SCREEN TESTED 100% ON EACH DEVICE AT +25C TEMPERATURE ONLY, SUBGROUP A9.
Note 4: SAMPLE TESTED (METHOD 5005, TABLE 1) ON EACH MFG. LOT AT +25C & +125C TEMPERATURE, SUBGROUPS A9 & 10.
Note 5: TRANSMISSION LINE DRIVING TEST, GUARDBAND LIMITS SET FOR +25C, 2 MSEC DURATION MAX.
Note 6: +25C & +125C MIN LIMITS GUARANTEED FOR 5.5V BY GUARDBANDING 4.5V MIN. LIMITS.