High Speed CMOS 1-of-8 Decoders

QS54/74FCT138T
QS54/74FCT238T

FEATURES/BENEFITS

- QSFCT138A faster than 74F
- Iol=48 mA COM, 32 mA MIL
- TTL-compatible input and output levels
- Mil product compliant with MIL-STD 883, Class B
- QSFCT238T has positive active outputs
- CMOS power levels < 7.5 mW static
- Available in DIP, ZIP, SOIC, QSOP, LCC
- JEDEC standard pinouts

DESCRIPTION

The QSFCT138T and QSFCT238T are high speed CMOS TTL-compatible high speed binary decoders. The QSFCT138T has negative active outputs, and the QSFCT238T has positive active outputs. The high output current Iol and Ioh drive high capacitance loads. All inputs have clamp diodes for undershoot noise suppression. All outputs have ground bounce suppression (see QSI Application Note AN-001), and outputs will not load an active bus when Vcc is removed from the device.

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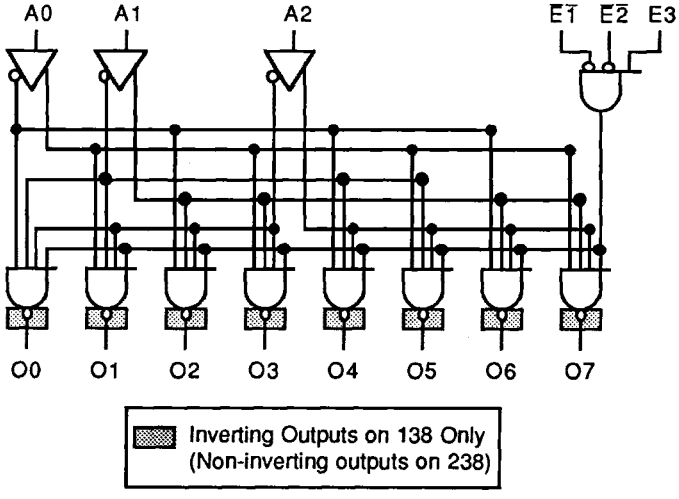
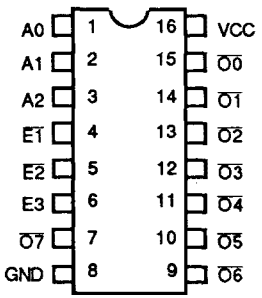
FUNCTIONAL BLOCK DIAGRAM

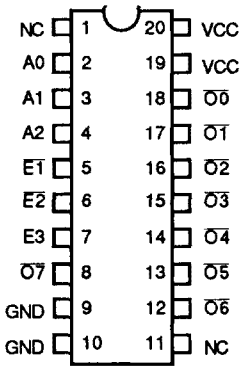


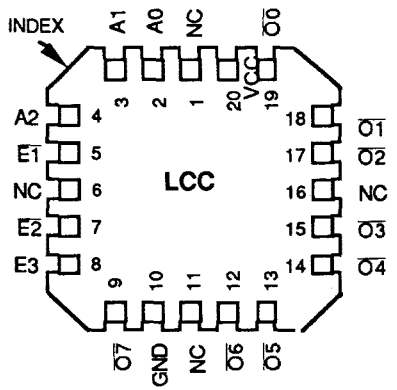
PIN CONFIGURATIONS

DIP, SOIC, QSOP

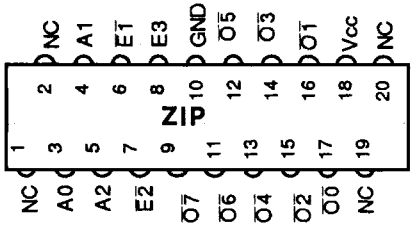


HQSOP





ALL PINS TOP VIEW



Name	I/O	Description
Ai	I	Select Inputs
Oi	O	Decode Outputs
Ei	I	Enable

Output State	Output Level	
	138	238
0	H	L
1	L	H

Enable			Select			Output								Function
E1	E2	E3	A2	A1	A0	O7	O6	O5	O4	O3	O2	O1	O0	
H	X	X	X	X	X	0	0	0	0	0	0	0	0	Disable
X	H	X	X	X	X	0	0	0	0	0	0	0	0	Disable
X	X	L	X	X	X	0	0	0	0	0	0	0	0	Disable
L	L	H	L	L	L	0	0	0	0	0	0	0	1	A2-0 = 0
L	L	H	L	L	H	0	0	0	0	0	0	1	0	A2-0 = 1
L	L	H	L	H	L	0	0	0	0	0	1	0	0	A2-0 = 2
L	L	H	L	H	H	0	0	0	0	1	0	0	0	A2-0 = 3
L	L	H	H	L	L	0	0	0	1	0	0	0	0	A2-0 = 4
L	L	H	H	L	H	0	0	1	0	0	0	0	0	A2-0 = 5
L	L	H	H	H	L	0	1	0	0	0	0	0	0	A2-0 = 6
L	L	H	H	H	H	1	0	0	0	0	0	0	0	A2-0 = 7

ABSOLUTE MAXIMUM RATINGS

Supply Voltage to Ground..... -0.5V to +7.0V
DC Output Voltage V_O ..... -0.5V to 7.0V
DC Input Voltage V_I ..... -0.5V to 7.0V
AC Input Voltage (for a pulse width ≤20 ns)..... -3.0V
DC Input Diode Current with V_I<0.....-20 mA
DC Output Diode Current with V_O <0..... -50 mA
DC Output Current Max. sink current/pin..... 120 mA
Maximum Power Dissipation.....0.5 watts
T_{STG}Storage Temperature..... -65° to +165°C

CAPACITANCE

TA = 25 °C, f = 1 MHz, Vin = 0V, Vout = 0 V

Pins	SOIC	QSOP	PDIP,LCC	ZIP	Unit
1-3	4	4	5	7	pF
7,9-12	6	6	7	9	pF
4-6,13-15	8	8	9	10	pF

Note: Capacitance is characterized but not tested

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DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Commercial T_A=0°C to 70°C, V_{CC}=5.0V±5% Military T_A=-55°C to 125°C, V_{CC}=5.0V±10%

Symbol	Parameter	Test Conditions		Min	Typ (1)	Max	Unit
Vih	Input High Voltage	Logic HIGH for All Inputs		2.0	-	-	Volts
Vil	Input LOW Voltage	Logic LOW for All Inputs		-	-	0.8	
ΔVt	Input Hysterisis	Vtlh - Vthl for All Inputs		-	0.2	-	
| Iih | | Iil |	Input Current Input HIGH or LOW	Vcc = MAX	0 ≤ Vin < Vcc	-	-	5	µA
| Ioz |	Off State Output Current (Hi-Z)	Vcc = MAX, 0 ≤ Vin ≤ Vcc		-	-	5	
Ios	Short Circuit Current	Vcc = MAX, Vo = GND (2,3)		-60	-	-225	mA
Vic	Input Clamp Voltage	Vcc = MIN, Iin = 18 mA (3)		-	-0.7	-1.2	Volts
Voh	Output HIGH Voltage	Vcc = MIN	Ioh = 12 mA (MIL)	2.4	-	-	Volts
			Ioh = 15 mA (COM)	2.4	-	-	
Vol	Output LOW Voltage	Vcc = MIN	Iol = 32 mA (MIL)	-	-	0.50	
			Iol = 48 mA (COM)	-	-	0.50	

Notes:
1. Typical values indicate V_{CC}=5.0V and T_A=25°C.
2. Not more than one output should be shorted and the duration is ≤1 second.
3. These parameters are guaranteed by design but not tested.

POWER SUPPLY CHARACTERISTICS

Symbol	Parameter	Test Conditions (1)	Min	Max	Unit
Icc	Quiescent Power Supply Current	Vcc = MAX, freq = 0 0V≤Vin≤0.2V or Vcc-0.2V≤Vin≤Vcc	-	1.5	mA
ΔIcc	Supply Current per Input @ TTL HIGH	Vcc = MAX, Vin =3.4 V, freq = 0 (2)	-	2.0	
Qccd	Supply Current per input per mHz	Vcc = MAX, Outputs open and enabled One bit toggling @ 50% duty cycle Other inputs at GND or Vcc (3,4)	-	0.25	mA/ MHz

1. For conditions shown as MIN or MAX use the appropriate values specified under DC specifications.
2. Per TTL driven input (Vi=3.4V)
3. For flipflops Qccd is measured by switching one of the data input pins so that the output changes every clock cycle. This is a measurement of device power consumption only and does not include power to drive load capacitance or tester capacitance. This parameter is guaranteed by design but not tested.
4. Ic can be computed using the above parameters as explained in the Technical Overview section.

SWITCHING CHARACTERISTICS OVER OPERATING RANGE

Commercial TA = 0° C to 70°C, Vcc = 5.0V±5% Military TA = -55°C to 125° C, Vcc = 5.0V±10%
Cload = 50 pF, Rload = 500Ω unless otherwise noted

Symbol	Description		Notes (1)	138, 238		138A 238A		138C 238C		138D 238D		Unit
				Min	Max	Min	Max	Min	Max	Min	Max	ns
t PHL t PLH	Propagation Delay Ai to Oi	COM		1.5	9	1.5	5.8	1.5	5.0	1.0	4.0	
		MIL		1.5	12	1.5	7.8	1.5	7.0			
t PHLE t PLHE	Propagation Delay Ei to Oi	COM		1.5	8	1.5	5.9	1.5	5.0	1.0	4.0	
		MIL		1.5	12	1.5	8.0	1.5	7.0			

Notes:
1) Minimums guaranteed but not tested. See Test Circuit and Waveforms.