

Q

High Speed CMOS 1-of-8 Decoders

QS54/74FCT138T
QS54/74FCT238T

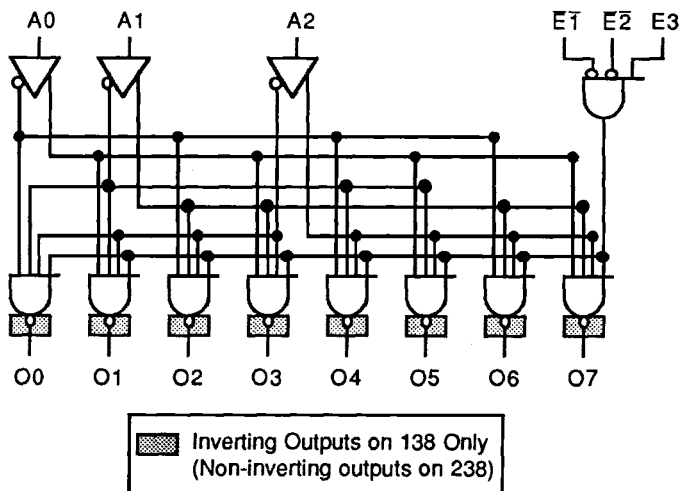
FEATURES/BENEFITS

- QSFCT138A faster than 74F
- $I_{OL}=48$ 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

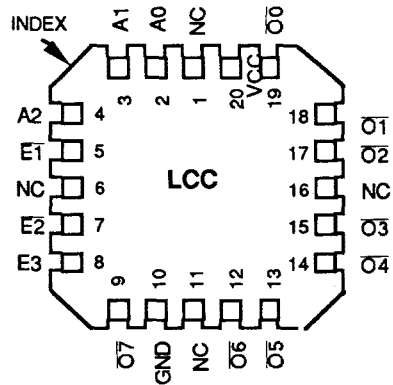
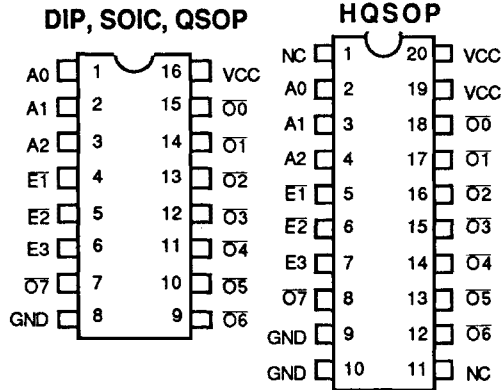
DESCRIPTION

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 I_{OL} and I_{OH} 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 V_{CC} is removed from the device.

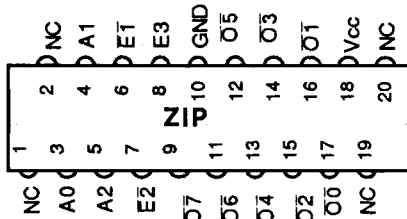
FUNCTIONAL BLOCK DIAGRAM



PIN CONFIGURATIONS



ALL PINS TOP VIEW



Name	I/O	Description
Ai	I	Select Inputs
O _i	O	Decode Outputs
E _i	I	Enable

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

Enable			Select			Output								Function
E _T	E ₂	E ₃	A ₂	A ₁	A ₀	O ₇	O ₆	O ₅	O ₄	O ₃	O ₂	O ₁	O ₀	
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	A ₂ -0 = 0
L	L	H	L	L	H	0	0	0	0	0	0	1	0	A ₂ -0 = 1
L	L	H	L	H	L	0	0	0	0	0	1	0	0	A ₂ -0 = 2
L	L	H	L	H	H	0	0	0	0	1	0	0	0	A ₂ -0 = 3
L	L	H	H	L	L	0	0	0	1	0	0	0	0	A ₂ -0 = 4
L	L	H	H	L	H	0	0	1	0	0	0	0	0	A ₂ -0 = 5
L	L	H	H	H	L	0	1	0	0	0	0	0	0	A ₂ -0 = 6
L	L	H	H	H	H	1	0	0	0	0	0	0	0	A ₂ -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

$T_A = 25^\circ\text{C}$, $f = 1\text{ MHz}$, $V_{in} = 0\text{V}$, $V_{out} = 0\text{V}$

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 $T_A = 0^\circ\text{C}$ to 70°C , $V_{CC} = 5.0\text{V} \pm 5\%$ Military $T_A = -55^\circ\text{C}$ to 125°C , $V_{CC} = 5.0\text{V} \pm 10\%$

Symbol	Parameter	Test Conditions		Min	Typ (1)	Max	Unit
V_{ih}	Input High Voltage	Logic HIGH for All Inputs		2.0	-	-	Volts
V_{il}	Input LOW Voltage	Logic LOW for All Inputs		-	-	0.8	
ΔV_t	Input Hysteresis	$V_{th} - V_{tl}$ for All Inputs		-	0.2	-	
$ I_{ih} $ $ I_{il} $	Input Current Input HIGH or LOW	$V_{CC} = \text{MAX}$	$0 \leq V_{in} < V_{CC}$	-	-	5	μA
$ I_{oz} $	Off State Output Current (Hi-Z)	$V_{CC} = \text{MAX}$, $0 \leq V_{in} \leq V_{CC}$		-	-	5	
I_{os}	Short Circuit Current	$V_{CC} = \text{MAX}$, $V_o = \text{GND}$ (2,3)		-60	-	-225	mA
V_{ic}	Input Clamp Voltage	$V_{CC} = \text{MIN}$, $I_{in} = 18\text{ mA}$ (3)		-	-0.7	-1.2	Volts
V_{oh}	Output HIGH Voltage	$V_{CC} = \text{MIN}$	$I_{oh} = 12\text{ mA}$ (MIL)	2.4	-	-	Volts
			$I_{oh} = 15\text{ mA}$ (COM)	2.4	-	-	
V_{ol}	Output LOW Voltage	$V_{CC} = \text{MIN}$	$I_{ol} = 32\text{ mA}$ (MIL)	-	-	0.50	
			$I_{ol} = 48\text{ mA}$ (COM)	-	-	0.50	

Notes:

1. Typical values indicate $V_{CC} = 5.0\text{V}$ and $T_A = 25^\circ\text{C}$.
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
I _{cc}	Quiescent Power Supply Current	V _{cc} = MAX, freq = 0 0V ≤ V _{in} ≤ 0.2V or V _{cc} - 0.2V ≤ V _{in} ≤ V _{cc}	-	1.5	mA
ΔI _{cc}	Supply Current per Input @ TTL HIGH	V _{cc} = MAX, V _{in} = 3.4 V, freq = 0 (2)	-	2.0	
Q _{ccd}	Supply Current per input per mHz	V _{cc} = MAX, Outputs open and enabled One bit toggling @ 50% duty cycle Other inputs at GND or V _{cc} (3,4)	-	0.25	mA/ MHz

- For conditions shown as MIN or MAX use the appropriate values specified under DC specifications.
- Per TTL driven input (V_i = 3.4V)
- For flipflops Q_{ccd} 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.
- I_c 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, V_{cc} = 5.0V ± 5% Military TA = -55°C to 125° C, V_{cc} = 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	
t _{PHL}	Propagation Delay A _i to O _i	COM	1.5	9	1.5	5.8	1.5	5.0	1.0	4.0	ns
t _{PLH}		MIL	1.5	12	1.5	7.8	1.5	7.0			
t _{PHLE}	Propagation Delay E _i to O _i	COM	1.5	8	1.5	5.9	1.5	5.0	1.0	4.0	
t _{PLHE}		MIL	1.5	12	1.5	8.0	1.5	7.0			

Notes:

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