

Q

High Speed CMOS Dual Binary 1-of-4 Decoders

QS54/74FCT139T
QS54/74FCT239T

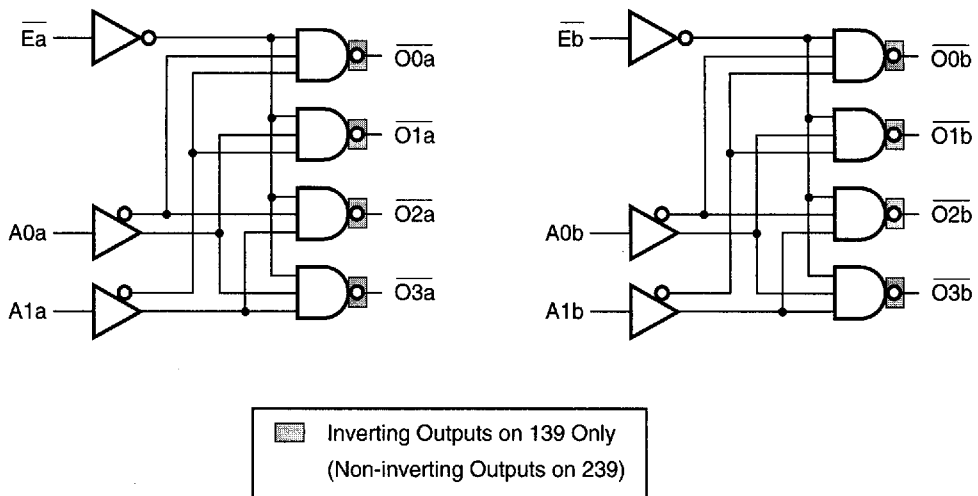
FEATURES/BENEFITS

- QSFCT139D with 4.0 ns propagation delay
- $I_{OL} = 48 \text{ mA COM}, 32 \text{ mA MIL}$
- TTL-compatible input and output levels
- Mil product compliant with MIL-STD 883, Class B
- QSFCT239T has positive active outputs
- CMOS power levels $< 7.5 \text{ mW static}$
- Available in DIP, SOIC, QSOP, HQSOP, ZIP
- JEDEC standard pinouts

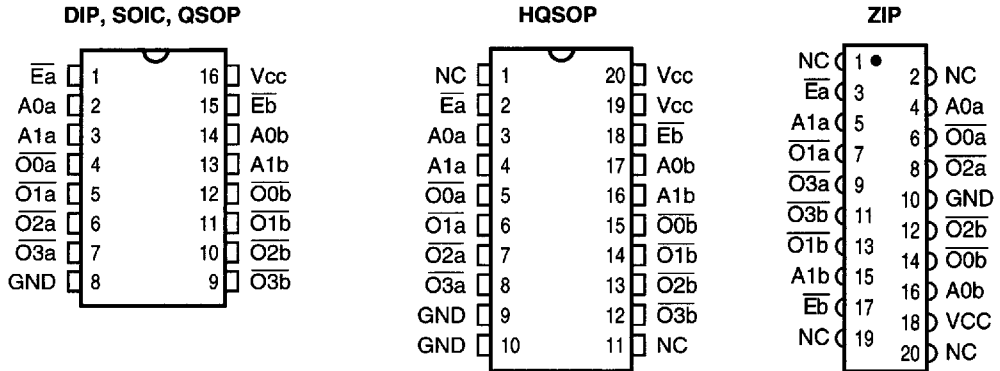
DESCRIPTION

The QSFCT139T and QSFCT239T are high-speed CMOS TTL-compatible high-speed binary decoders. The QSFCT139T has negative active outputs, and the QSFCT239T 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)



Note: Available in both 150 mil wide SOIC (package code S1) and 300 mil SOIC (package code SO).

PIN DESCRIPTION

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

FUNCTION TABLE

Enable Ea, Eb	Select A1 A0		FCT139 Output O3 O2 O1 O0				FCT239 Output O3 O2 O1 O0				Note
	A1	A0	O3	O2	O1	O0	O3	O2	O1	O0	
H	X	X	H	H	H	H	L	L	L	L	Disable Decode
L	L	L	H	H	H	L	L	L	L	H	A1-0 = 0
L	L	H	H	H	L	H	L	L	H	L	A1-0 = 1
L	H	L	H	L	H	H	L	H	L	L	A1-0 = 2
L	H	H	L	H	H	H	H	L	L	L	A1-0 = 3

ABSOLUTE MAXIMUM RATINGS

Supply Voltage to Ground	-0.5V to +7.0V
DC Output Voltage V_{OUT}	-0.5V to +7.0V
DC Input Voltage V_{IN}	-0.5V to +7.0V
AC Input Voltage (for a pulse width ≤ 20 ns)	-3.0V
DC Input Diode Current with $V_{IN} < 0$	-20 mA
DC Output Diode Current with $V_{OUT} < 0$	-50 mA
DC Output Current Max. Sink Current/Pin	120 mA
Maximum Power Dissipation	0.5 watts
T_{STG} Storage Temperature	-65° to +150°C

Note: Stresses greater than those listed under ABSOLUTE MAXIMUM RATINGS may cause permanent damage to this device resulting in functional or reliability type failures.

CAPACITANCE

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

Pins	SOIC	QSOP	PDIP	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.

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	—	—	V
V_{IL}	Input LOW Voltage	Logic LOW for All Inputs	—	—	0.8	V
ΔV_T	Input Hysteresis	$V_{TLH} - V_{THL}$ for All Inputs	—	0.2	—	V
I_{IH} I_{IL}	Input Current Input HIGH or LOW	$V_{CC} = \text{Max.}$, $0 \leq V_{IN} < V_{CC}$	—	—	5	μA
I_{OS}	Short Circuit Current	$V_{CC} = \text{Max.}$, $V_{OUT} = \text{GND}^{(2,3)}$	-60	—	—	mA
V_{IC}	Input Clamp Voltage	$V_{CC} = \text{Min.}$, $I_{IN} = -18$ mA, $T_A = 25^\circ\text{C}^{(3)}$	—	-0.7	-1.2	V
V_{OH}	Output HIGH Voltage	$V_{CC} = \text{Min.}$, $I_{OH} = -12$ mA (MIL) $I_{OH} = -15$ mA (COM)	2.4 2.4	— —	— —	V
V_{OL}	Output LOW Voltage	$V_{CC} = \text{Min.}$, $I_{OL} = 32$ mA (MIL) $I_{OL} = 48$ mA (COM)	— —	— —	0.50 0.50	V

Notes:

- Typical values indicate $V_{CC} = 5.0\text{V}$ and $T_A = 25^\circ\text{C}$.
- Not more than one output should be shorted and the duration is ≤ 1 second.
- 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} = 3.4V, freq = 0 ⁽²⁾	—	2.0	mA
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

Notes:

- For conditions shown as Min. or Max., use the appropriate values specified under DC specifications.
- Per TTL driven input (V_{IN} = 3.4V).
- For flip-flops, 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 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%

C_{LOAD} = 50 pF, R_{LOAD} = 500Ω unless otherwise noted.

Symbol	Description ⁽¹⁾		139 239		139A 239A		139C 239C		139D 239D		Unit
			Min	Max	Min	Max	Min	Max	Min	Max	
t _{PHL}	Propagation Delay	Com	1.5	9	1.5	5.8	1.5	5.0	1.0	4.0	ns
t _{PLH}	A _i to $\overline{O}_i$	Mil	1.5	12	1.5	7.8	1.5	7.0	—	—	
t _{PHLE}	Propagation Delay	Com	1.5	9	1.5	5.9	1.5	5.0	1.0	4.0	ns
t _{PLHE}	$\overline{E}_i$ to $\overline{O}_i$	Mil	1.5	12	1.5	8.0	1.5	7.0	—	—	

Notes:

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