

Dual 2-to-4 line decoder/demultiplexer

74LVC139

FEATURES

- Wide supply voltage range from 1.2 V to 3.6 V
- Inputs accept voltages up to 5.5 V
- CMOS low power consumption
- Direct interface with TTL levels
- Demultiplexing capability
- Two independent 2-to-4 decoders
- Multifunction capability
- Active LOW mutually exclusive outputs
- Output drive capability 50 Ω transmission lines at 125 °C
- In accordance with JEDEC standard no. 8-1A
- ESD protection:
HBM EIA/JESD22-A114-A exceeds 2000 V
MM EIA/JESD22-A115-A exceeds 200 V.

DESCRIPTION

The 74LVC139 is a high-performance, low-voltage and low-power Si-gate CMOS device, superior to most advanced CMOS compatible TTL families.

The 74LVC139 is a dual 2-to-4 line decoder/demultiplexer. This device has two independent decoders, each accepting two binary weighted inputs ($nA0$ and $nA1$) and providing four mutually exclusive active LOW outputs ($n\bar{Y}0$ to $n\bar{Y}3$). Each decoder has an active LOW input ($n\bar{E}$).

When $n\bar{E}$ is HIGH, every output is forced HIGH. The enable input can be used as the data input for a 1-to-4 demultiplexer application.

QUICK REFERENCE DATA

GND = 0 V; $T_{amb} = 25\text{ }^{\circ}\text{C}$; $t_r = t_f \leq 2.5\text{ ns}$.

SYMBOL	PARAMETER	CONDITIONS	TYPICAL	UNIT
t_{PHL}/t_{PLH}	propagation delay nA to $n\bar{Y}n$ $n\bar{E}$ to $n\bar{Y}n$	$C_L = 50\text{ pF}$; $V_{CC} = 3.3\text{ V}$	2.9 2.7	ns ns
C_I	input capacitance		5.0	pF
C_{PD}	power dissipation capacitance per multiplexer	$V_{CC} = 3.3\text{ V}$; notes 1 and 2	17	pF

Notes

1. C_{PD} is used to determine the dynamic power dissipation (P_D in μW).

$$P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma(C_L \times V_{CC}^2 \times f_o) \text{ where:}$$

f_i = input frequency in MHz;

f_o = output frequency in MHz;

C_L = output load capacitance in pF;

V_{CC} = supply voltage in Volts;

N = total load switching outputs;

$\Sigma(C_L \times V_{CC}^2 \times f_o)$ = sum of the outputs.

2. The condition is $V_I = \text{GND}$ to V_{CC} .

Dual 2-to-4 line decoder/demultiplexer

74LVC139

FUNCTION TABLE

See note 1

INPUT			OUTPUT			
$n\bar{E}$	nA0	nA1	$n\bar{Y}0$	$n\bar{Y}1$	$n\bar{Y}2$	$n\bar{Y}3$
H	X	X	H	H	H	H
L	L	L	L	H	H	H
L	H	L	H	L	H	H
L	L	H	H	H	L	H
L	H	H	H	H	H	L

Note

1. H = HIGH voltage level;
L = LOW voltage level;
X = don't care.

ORDERING INFORMATION

TYPE NUMBER	PACKAGE				
	TEMPERATURE RANGE	PINS	PACKAGE	MATERIAL	CODE
74LVC139D	-40 °C to +125 °C	16	SO16	plastic	SOT109-1
74LVC139DB	-40 °C to +125 °C	16	SSOP16	plastic	SOT338-1
74LVC139PW	-40 °C to +125 °C	16	TSSOP16	plastic	SOT403-1
74LVC139BQ	-40 °C to +125 °C	16	DHVQFN16	plastic	SOT763-1

Dual 2-to-4 line decoder/demultiplexer

74LVC139

RECOMMENDED OPERATING CONDITIONS

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CC}	supply voltage	for maximum speed performance	2.7	3.6	V
		for low-voltage applications	1.2	3.6	V
V_I	input voltage		0	5.5	V
V_O	output voltage		0	V_{CC}	V
T_{amb}	operating ambient temperature	in free air	-40	+125	°C
t_r, t_f	input rise and fall times	$V_{CC} = 1.2\text{ V to }2.7\text{ V}$	0	20	ns/V
		$V_{CC} = 2.7\text{ V to }3.6\text{ V}$	0	10	ns/V

LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 60134); voltages are referenced to GND (ground = 0 V).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CC}	supply voltage		-0.5	+6.5	V
I_{IK}	input diode current	$V_I < 0$	-	-50	mA
V_I	input voltage	note 1	-0.5	+6.5	V
I_{OK}	output diode current	$V_O > V_{CC}$ or $V_O < 0\text{ V}$	-	±50	mA
V_O	output voltage	note 1	-0.5	$V_{CC} + 0.5$	V
I_O	output source or sink current	$V_O = 0\text{ V to }V_{CC}$	-	±50	mA
I_{CC}, I_{GND}	V_{CC} or GND current		-	±100	mA
T_{stg}	storage temperature		-65	+150	°C
P_{tot}	power dissipation	$T_{amb} = -40\text{ °C to }+125\text{ °C}$; note 2	-	500	mW

Notes

- The input and output voltage ratings may be exceeded if the input and output current ratings are observed.
- For SO16 packages: above 70 °C derate linearly with 8 mW/K.
For SSOP16 and TSSOP16 packages: above 60 °C derate linearly with 5.5 mW/K.
For DHVQFN16 packages: above 60 °C derate linearly with 4.5 mW/K.

Dual 2-to-4 line decoder/demultiplexer

74LVC139

DC CHARACTERISTICS

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

SYMBOL	PARAMETER	TEST CONDITIONS		MIN.	TYP. ⁽¹⁾	MAX.	UNIT
		OTHER	V _{CC} (V)				
T_{amb} = -40 °C to +85 °C							
V _{IH}	HIGH-level input voltage		1.2	V _{CC}	-	-	V
			2.7 to 3.6	2.0	-	-	V
V _{IL}	LOW-level input voltage		1.2	-	-	GND	V
			2.7 to 3.6	-	-	0.8	V
V _{OH}	HIGH-level output voltage	V _I = V _{IH} or V _{IL} I _O = -100 μA	2.7 to 3.6	V _{CC} - 0.2	-	-	V
		I _O = -12 mA	2.7	V _{CC} - 0.5	-	-	V
		I _O = -18 mA	3.0	V _{CC} - 0.6	-	-	V
		I _O = -24 mA	3.0	V _{CC} - 0.8	-	-	V
V _{OL}	LOW-level output voltage	V _I = V _{IH} or V _{IL} I _O = 100 μA	2.7 to 3.6	-	-	0.2	V
		I _O = 12 mA	2.7	-	-	0.4	V
		I _O = 24 mA	3.0	-	-	0.55	V
I _{LI}	input leakage current	V _I = 5.5 V or GND	3.6	-	±0.1	±5	μA
I _{CC}	quiescent supply current	V _I = V _{CC} or GND; I _O = 0 A	3.6	-	0.1	10	μA
ΔI _{CC}	additional quiescent supply current per input pin	V _I = V _{CC} - 0.6 V; I _O = 0 A	2.7 to 3.6	-	5	500	μA

Dual 2-to-4 line decoder/demultiplexer

74LVC139

SYMBOL	PARAMETER	TEST CONDITIONS		MIN.	TYP. ⁽¹⁾	MAX.	UNIT
		OTHER	V _{CC} (V)				
T_{amb} = -40 °C to +125 °C							
V _{IH}	HIGH-level input voltage		1.2	V _{CC}	–	–	V
			2.7 to 3.6	2.0	–	–	V
V _{IL}	LOW-level input voltage		1.2	–	–	GND	V
			2.7 to 3.6	–	–	0.8	V
V _{OH}	HIGH-level output voltage	V _I = V _{IH} or V _{IL} I _O = -100 μA	2.7 to 3.6	V _{CC} - 0.3	–	–	V
		I _O = -12 mA	2.7	V _{CC} - 0.65	–	–	V
		I _O = -18 mA	3.0	V _{CC} - 0.75	–	–	V
		I _O = -24 mA	3.0	V _{CC} - 1	–	–	V
V _{OL}	LOW-level output voltage	V _I = V _{IH} or V _{IL} I _O = 100 μA	2.7 to 3.6	–	–	0.3	V
		I _O = 12 mA	2.7	–	–	0.6	V
		I _O = 24 mA	3.0	–	–	0.8	V
I _{LI}	input leakage current	V _I = 5.5 V or GND	3.6	–	–	±20	μA
I _{CC}	quiescent supply current	V _I = V _{CC} or GND; I _O = 0 A	3.6	–	–	40	μA
ΔI _{CC}	additional quiescent supply current per input pin	V _I = V _{CC} - 0.6 V; I _O = 0 A	2.7 to 3.6	–	–	5000	μA

Note

1. Typical values are measured at V_{CC} = 3.3 V and T_{amb} = 25 °C.

Dual 2-to-4 line decoder/demultiplexer

74LVC139

AC CHARACTERISTICS

GND = 0 V; $t_r = t_f \leq 2.5$ ns; $C_L = 50$ pF; $R_L = 500$ Ω .

SYMBOL	PARAMETER	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
		WAVEFORMS	V _{CC} (V)				
T_{amb} = -40 °C to +85 °C; note 1							
t _{PHL} /t _{PLH}	propagation delay nAn to \bar{Y}_n	see Figs 6 and 8	1.2	–	14	–	ns
			2.7	1.0	3.5	6.3	ns
			3.0 to 3.6	1.0	2.9 ⁽²⁾	5.3	ns
t _{PHL} /t _{PLH}	propagation delay n \bar{E} to \bar{Y}_n	see Figs 7 and 8	1.2	–	14	–	ns
			2.7	1.0	3.1	5.4	ns
			3.0 to 3.6	1.0	2.7 ⁽²⁾	5.0	ns
t _{sk(0)}	skew	note 3	3.0 to 3.6	–	–	1.0	ns
T_{amb} = -40 °C to +125 °C							
t _{PHL} /t _{PLH}	propagation delay nAn to \bar{Y}_n	see Figs 6 and 8	1.2	–	–	–	ns
			2.7	1.0	–	8.0	ns
			3.0 to 3.6	1.0	–	7.0	ns
t _{PHL} /t _{PLH}	propagation delay n \bar{E} to \bar{Y}_n	see Figs 7 and 8	1.2	–	–	–	ns
			2.7	1.0	–	7.0	ns
			3.0 to 3.6	1.0	–	6.5	ns
t _{sk(0)}	skew	note 3	3.0 to 3.6	–	–	1.5	ns

Notes

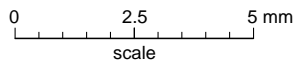
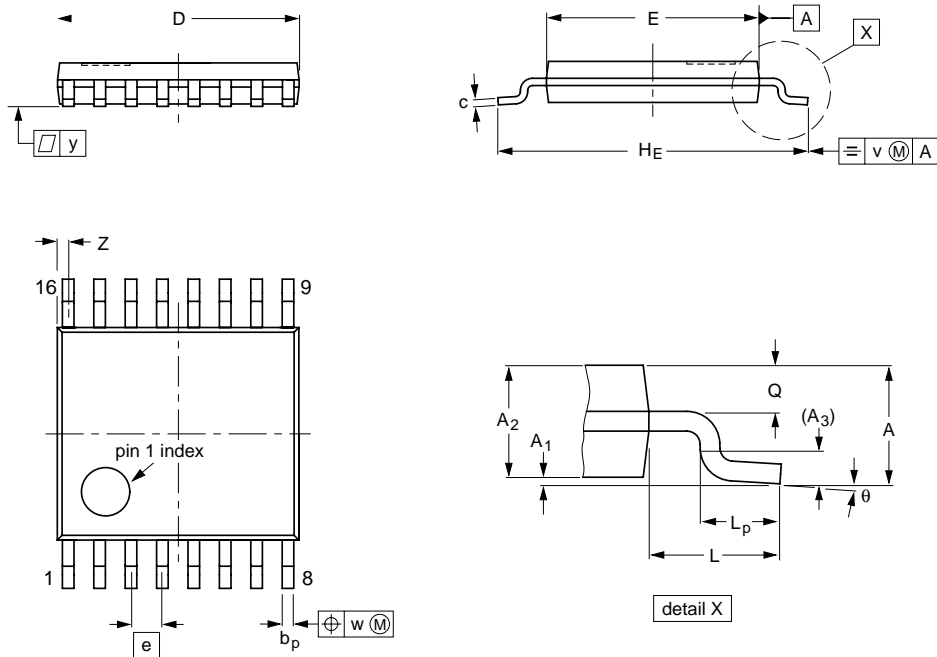
1. All typical values are measured at T_{amb} = 25 °C.
2. This typical value is measured at V_{CC} = 3.3 V and T_{amb} = 25 °C.
3. Skew between any two outputs of the same package switching in the same direction. This parameter is guaranteed by design.

Dual 2-to-4 line decoder/demultiplexer

74LVC139

TSSOP16: plastic thin shrink small outline package; 16 leads; body width 4.4 mm

SOT403-1



DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A ₁	A ₂	A ₃	b _p	c	D ⁽¹⁾	E ⁽²⁾	e	H _E	L	L _p	Q	v	w	y	z ⁽¹⁾	θ
mm	1.1	0.15 0.05	0.95 0.80	0.25	0.30 0.19	0.2 0.1	5.1 4.9	4.5 4.3	0.65	6.6 6.2	1	0.75 0.50	0.4 0.3	0.2	0.13	0.1	0.40 0.06	8° 0°

Notes

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
2. Plastic interlead protrusions of 0.25 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES			EUROPEAN PROJECTION
	IEC	JEDEC	JEITA	
SOT403-1		MO-153		