Connection Diagram

Pin			Pin
$\overline{OE}$	1	56	CLK
O_0	2	55	I_0
O_1	3	54	I_1
GND	4	53	GND
O_2	5	52	I_2
O_3	6	51	I_3
V_{CC}	7	50	V_{CC}
O_4	8	49	I_4
O_5	9	48	I_5
O_6	10	47	I_6
GND	11	46	GND
O_7	12	45	I_7
O_8	13	44	I_8
O_9	14	43	I_9
O_{10}	15	42	I_{10}
O_{11}	16	41	I_{11}
O_{12}	17	40	I_{12}
GND	18	39	GND
O_{13}	19	38	I_{13}
O_{14}	20	37	I_{14}
O_{15}	21	36	I_{15}
V_{CC}	22	35	V_{CC}
O_{16}	23	34	I_{16}
O_{17}	24	33	I_{17}
GND	25	32	GND
O_{18}	26	31	I_{18}
O_{19}	27	30	I_{19}
NC	28	29	REGE

Truth Table

Inputs				Outputs
CLK	REGE	I_n	$\overline{OE}$	O_n
↑	H	H	L	H
↑	H	L	L	L
X	L	H	L	H
X	L	L	L	L
X	X	X	H	Z

H = Logic HIGH
L = Logic LOW
X = Don't Care, but not floating
Z = High Impedance
↑ = LOW-to-HIGH Clock Transition

Functional Description

The 74VCX16839 consists of twenty selectable non-inverting buffers or registers with word wide modes. Mode functionality is selected through operation of the CLK and REGE pin as shown by the truth table. When REGE is held at a logic HIGH the device operates as a 20-bit register. Data is transferred from I_n to O_n on the rising edge of the CLK input. When the REGE pin is held at a logic LOW the device operates in a flow through mode and data propagates directly from the I_n to the O_n outputs. All outputs can be 3-stated by holding the $\overline{OE}$ pin at a logic HIGH.

Logic Diagram

To 19 Other Channels
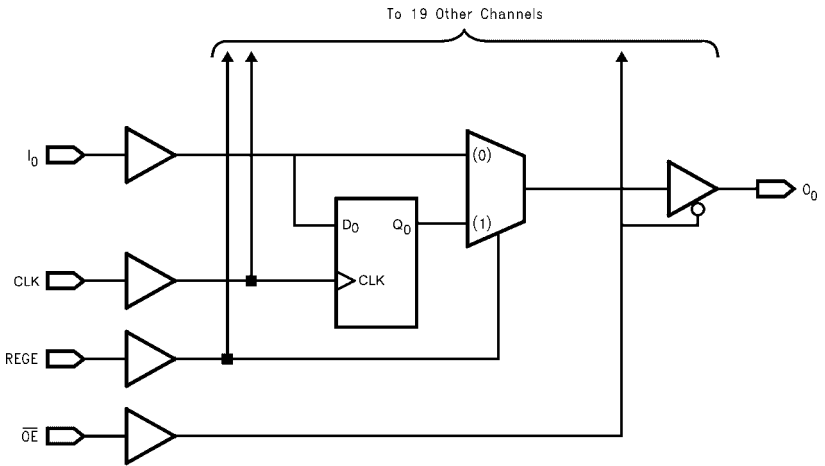
Absolute Maximum Ratings(Note 2)

Supply Voltage (V_{CC})	−0.5V to +4.6V
DC Input Voltage (V_I)	−0.5V to +4.6V
Output Voltage (V_O)	
Outputs 3-STATE	−0.5V to +4.6V
Outputs Active (Note 3)	−0.5V to V_{CC} +0.5V
DC Input Diode Current (I_{IK}) $V_I <$ 0V	−50 mA
DC Output Diode Current (I_{OK})	
$V_O <$ 0V	−50 mA
$V_O > V_{CC}$	+50 mA
DC Output Source/Sink Current	
(I_{OH}/I_{OL})	±50 mA
DC V_{CC} or GND Current per	
Supply Pin (I_{CC} or GND)	±100 mA
Storage Temperature Range (T_{STG})	−65°C to +150°C

Recommended Operating Conditions (Note 4)

Power Supply	
Operating	1.65V to 3.6V
Data Retention Only	1.2V to 3.6V
Input Voltage	−0.3V to +3.6V
Output Voltage (V_O)	
Output in Active States	0V to V_{CC}
Output in "OFF" State	0V to 3.6V
Output Current in I_{OH}/I_{OL}	
V_{CC} = 3.0V to 3.6V	±24 mA
V_{CC} = 2.3V to 2.7V	±18 mA
V_{CC} = 1.65V to 2.3V	±6 mA
Free Air Operating Temperature (T_A)	−40°C to +85°C
Minimum Input Edge Rate (Δt/ΔV)	
V_{IN} = 0.8V to 2.0V, V_{CC} = 3.0V	10 ns/V

Note 2: The Absolute Maximum Ratings are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the Electrical Characteristics tables are not guaranteed at the Absolute Maximum Ratings. The "Recommended Operating Conditions" table will define the conditions for actual device operation.

Note 3: I_O Absolute Maximum Rating must be observed.

Note 4: Floating or unused inputs must be held HIGH or LOW.

DC Electrical Characteristics (2.7V < V_{CC} ≤ 3.6V)

Symbol	Parameter	Conditions	V_{CC} (V)	Min	Max	Units
V_{IH}	HIGH Level Input Voltage		2.7 – 3.6	2.0		V
V_{IL}	LOW Level Input Voltage		2.7 – 3.6		0.8	V
V_{OH}	HIGH Level Output Voltage	I_{OH} = −100 μA	2.7 – 3.6	V_{CC} − 0.2		V
		I_{OH} = −12 mA	2.7	2.2		
		I_{OH} = −18 mA	3.0	2.4		
		I_{OH} = −24 mA	3.0	2.2		
V_{OL}	LOW Level Output Voltage	I_{OL} = 100 μA	2.7 – 3.6		0.2	V
		I_{OL} = 12 mA	2.7		0.4	
		I_{OL} = 18 mA	3.0		0.4	
		I_{OL} = 24 mA	3.0		0.55	
I_I	Input Leakage Current	0V ≤ V_I ≤ 3.6V	2.7 – 3.6		±5.0	μA
I_{OZ}	3-STATE Output Leakage	0V ≤ V_O ≤ 3.6V $V_I = V_{IH}$ or V_{IL}	2.7 – 3.6		±10	μA
I_{OFF}	Power-OFF Leakage Current	0V ≤ (V_I, V_O) ≤ 3.6V	0		10	μA
I_{CC}	Quiescent Supply Current	$V_I = V_{CC}$ or GND	2.7 – 3.6		20	μA
		V_{CC} ≤ (V_I, V_O) ≤ 3.6V (Note 5)			±20	
ΔI_{CC}	Increase in I_{CC} per Input	$V_{IH} = V_{CC}$ −0.6V	2.7 – 3.6		750	μA

Note 5: Outputs disabled or 3-STATE only.

DC Electrical Characteristics (2.3V ≤ V$_{CC}$ ≤ 2.7V)

Symbol	Parameter	Conditions	V$_{CC}$ (V)	Min	Max	Units
V$_{IH}$	HIGH Level Input Voltage		2.3 – 2.7	1.6		V
V$_{IL}$	LOW Level Input Voltage		2.3 – 2.7		0.7	V
V$_{OH}$	HIGH Level Output Voltage	I$_{OH}$ = −100 μA	2.3 – 2.7	V$_{CC}$ − 0.2		V
		I$_{OH}$ = −6 mA	2.3	2.0		
		I$_{OH}$ = −12 mA	2.3	1.8		
		I$_{OH}$ = −18 mA	2.3	1.7		
V$_{OL}$	LOW Level Output Voltage	I$_{OL}$ = 100 μA	2.3 – 2.7		0.2	V
		I$_{OL}$ = 12 mA	2.3		0.4	
		I$_{OL}$ = 18 mA	2.3		0.6	
I$_I$	Input Leakage Current	0V ≤ V$_I$ ≤ 3.6V	2.3 – 2.7		±5.0	μA
I$_{OZ}$	3-STATE Output Leakage	0V ≤ V$_O$ ≤ 3.6V V$_I$ = V$_{IH}$ or V$_{IL}$	2.3 – 2.7		±10	μA
I$_{OFF}$	Power-OFF Leakage Current	0V ≤ (V$_I$, V$_O$) ≤ 3.6V	0		10	μA
I$_{CC}$	Quiescent Supply Current	V$_I$ = V$_{CC}$ or GND	2.3 – 2.7		20	μA
		V$_{CC}$ ≤ (V$_I$, V$_O$) ≤ 3.6V (Note 6)			±20	

Note 6: Outputs disabled or 3-STATE only.

DC Electrical Characteristics (1.65V ≤ V$_{CC}$ < 2.3V)

Symbol	Parameter	Conditions	V$_{CC}$ (V)	Min	Max	Units
V$_{IH}$	HIGH Level Input Voltage		1.65 - 2.3	0.65 × V$_{CC}$		V
V$_{IL}$	LOW Level Input Voltage		1.65 - 2.3		0.35 × V$_{CC}$	V
V$_{OH}$	HIGH Level Output Voltage	I$_{OH}$ = −100 μA	1.65 - 2.3	V$_{CC}$ − 0.2		V
		I$_{OH}$ = −6 mA	1.65	1.4		
V$_{OL}$	LOW Level Output Voltage	I$_{OL}$ = 100 μA	1.65 - 2.3		0.2	V
		I$_{OL}$ = 6 mA	1.65		0.3	
I$_I$	Input Leakage Current	0V ≤ V$_I$ ≤ 3.6V	1.65 - 2.3		±5.0	μA
I$_{OZ}$	3-STATE Output Leakage	0V ≤ V$_O$ ≤ 3.6V V$_I$ = V$_{IH}$ or V$_{IL}$	1.65 - 2.3		±10	μA
I$_{OFF}$	Power-OFF Leakage Current	0V ≤ (V$_I$, V$_O$) ≤ 3.6V	0		10	μA
I$_{CC}$	Quiescent Supply Current	V$_I$ = V$_{CC}$ or GND	1.65 - 2.3		20	μA
		V$_{CC}$ ≤ (V$_I$, V$_O$) ≤ 3.6V (Note 7)			±20	

Note 7: Outputs disabled or 3-STATE only.

AC Electrical Characteristics VCX16839 (Note 8)

Symbol	Parameter	$T_A = -40°C$ to $+85°C$, $C_L = 30$ pF, $R_L = 500\Omega$						Units
		$V_{CC} = 3.3V \pm 0.3V$		$V_{CC} = 2.5V \pm 0.2V$		$V_{CC} = 1.8V \pm 0.15V$		
		Min	Max	Min	Max	Min	Max	
f_{MAX}	Maximum Clock Frequency	250		200		100		MHz
t_{PHL} t_{PLH}	Propagation Delay I_n to O_n (REGE = 0)	0.8	2.5	1.0	3.5	1.5	7.0	ns
t_{PHL} t_{PLH}	Propagation Delay CLK to O_n (REGE = 1)	0.8	3.2	1.0	4.4	1.5	8.8	ns
t_{PHL}, t_{PLH}	Propagation Delay REGE to O_n	0.8	4.0	1.0	5.0	1.5	9.8	ns
t_{PZL}, t_{PZH}	Output Enable Time	0.8	3.8	1.0	4.9	1.5	9.8	ns
t_{PLZ}, t_{PHZ}	Output Disable Time	0.8	3.7	1.0	4.2	1.5	7.6	ns
t_S	Setup Time	1.0		1.0		2.5		ns
t_H	Hold Time	0.7		0.7		1.0		ns
t_W	Pulse Width	1.5		1.5		4.0		ns
t_{OSHL} t_{OSLH}	Output to Output Skew (Note 9)		0.5		0.5		0.75	ns

Note 8: For $C_L = 50$ pF, add approximately 300 ps to the AC maximum specification.

Note 9: Skew is defined as the absolute value of the difference between the actual propagation delay for any two separate outputs of the same device. The specification applies to any outputs switching in the same direction, either HIGH-to-LOW (t_{OSHL}) or LOW-to-HIGH (t_{OSLH}).

Extended AC Electrical Characteristics (Note 10)

Symbol	Parameter	$T_A = -0°C$ to $+85°C$, $R_L = 500\Omega$ $V_{CC} = 3.3V \pm 0.3V$		Units
		$C_L = 50$ pF		
		Min	Max	
t_{PHL}, t_{PLH}	Propagation Delay I_n to O_n (REGE = 0)	1.0	2.8	ns
t_{PHL}, t_{PLH}	Propagation Delay CLK to O_n (REGE = 1)	1.4	3.5	ns
t_{PHL}, t_{PLH}	Propagation Delay REGE to O_n	1.0	4.3	ns
t_{PZL}, t_{PZH}	Output Enable Time	1.0	4.1	ns
t_{PLZ}, t_{PHZ}	Output Disable Time	1.0	4.0	ns
t_S	Setup Time	1.0		ns
t_H	Hold Time	0.7		ns

Note 10: This parameter is guaranteed by characterization but not tested.

Dynamic Switching Characteristics

Symbol	Parameter	Conditions	V_{CC} (V)	$T_A = +25°C$ Typical	Units
V_{OLP}	Quiet Output Dynamic Peak V_{OL}	$C_L = 30$ pF, $V_{IH} = V_{CC}$, $V_{IL} = 0V$	1.8	0.25	V
			2.5	0.6	
			3.3	0.8	
V_{OLV}	Quiet Output Dynamic Valley V_{OL}	$C_L = 30$ pF, $V_{IH} = V_{CC}$, $V_{IL} = 0V$	1.8	−0.25	V
			2.5	−0.6	
			3.3	−0.8	
V_{OHV}	Quiet Output Dynamic Valley V_{OH}	$C_L = 30$ pF, $V_{IH} = V_{CC}$, $V_{IL} = 0V$	1.8	1.5	V
			2.5	1.9	
			3.3	2.2	

Capacitance

Symbol	Parameter	Conditions	$T_A = +25°C$ Typical	Units
C_{IN}	Input Capacitance	$V_{CC} = 1.8V$, 2.5V or 3.3V, $V_I = 0V$ or V_{CC}	6	pF
C_{OUT}	Output Capacitance	$V_I = 0V$ or V_{CC}, $V_{CC} = 1.8V$, 2.5V or 3.3V	7	pF
C_{PD}	Power Dissipation Capacitance	$V_I = 0V$ or V_{CC}, f = 10 MHz, $V_{CC} = 1.8V$, 2.5V or 3.3V	20	pF

AC Loading and Waveforms
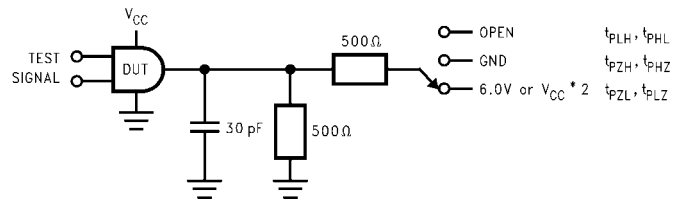
TEST	SWITCH
t_{PLH}, t_{PHL}	Open
t_{PZL}, t_{PLZ}	6V at V_{CC} = 3.3 ± 0.3V; V_{CC} x 2 at V_{CC} = 2.5 ± 0.2V; 1.8V ± 0.15V
t_{PZH}, t_{PHZ}	GND

FIGURE 1. AC Test Circuit

FIGURE 2. Waveform for Inverting and Non-Inverting Functions

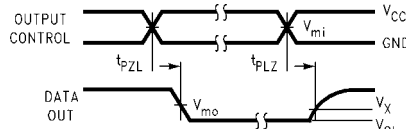**FIGURE 3. 3-STATE Output High Enable and Disable Times for Low Voltage Logic**

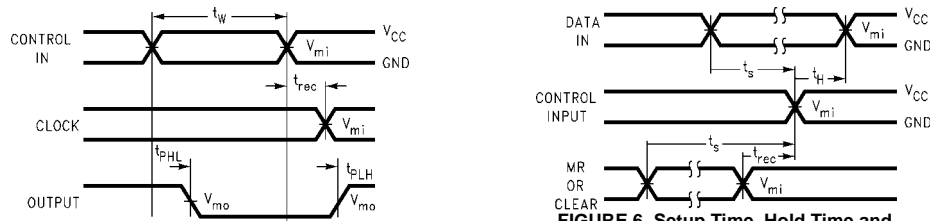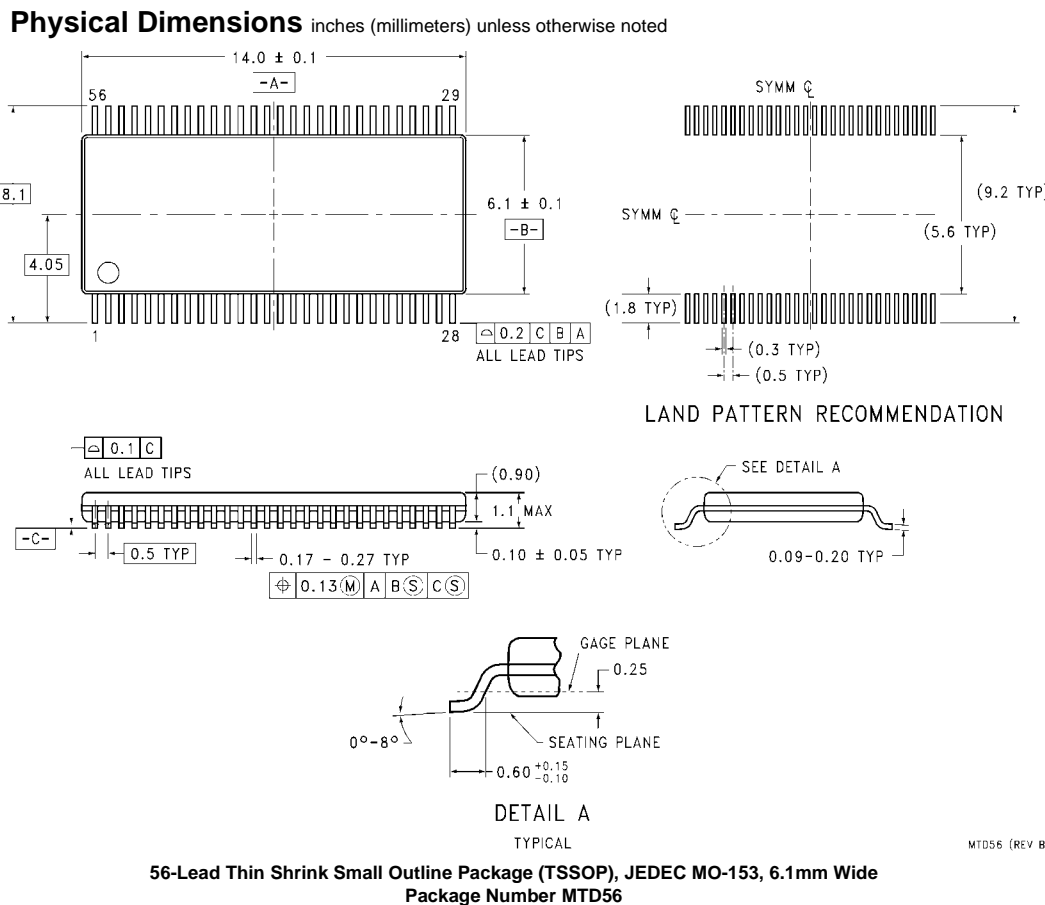**FIGURE 4. 3-STATE Output Low Enable and Disable Times for Low Voltage Logic**

FIGURE 5. Propagation Delay, Pulse Width and t_{rec} Waveforms

FIGURE 6. Setup Time, Hold Time and Recovery Time for Low Voltage Logic

Symbol	V_{CC}		
	3.3V ± 0.3V	2.5V ± 0.2V	1.8V ± 0.15V
V_{mi}	1.5V	V_{CC}/2	V_{CC}/2
V_{mo}	1.5V	V_{CC}/2	V_{CC}/2
V_X	V_{OL} +0.3V	V_{OL} +0.15V	V_{OL} +0.15V
V_Y	V_{OH} −0.3V	V_{OH} −0.15V	V_{OH} −0.15V

Physical Dimensions inches (millimeters) unless otherwise noted

LAND PATTERN RECOMMENDATION

DETAIL A
TYPICAL

MTD56 (REV B)

56-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 6.1mm Wide
Package Number MTD56

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