

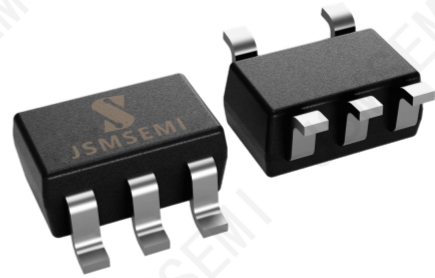
Description

The MC74VHC1GT32 device is a single 2-input positive-OR gate. The device performs the Boolean function $Y = A + B$ or $Y = \overline{A} \cdot \overline{B}$ in positive logic.

The device is fully specified for partial-power-down applications using Ioff.

The Ioff circuitry disables the outputs, preventing damaging current backflow through the device when it is powered down.

The MC74VHC1GT32 is available in Green SOT23-5 and SOT-353 packages. It operates over an ambient temperature range of -40°C to +125°C.



Features

- Operating Range of 4.5 V to 5.5 V
- Typ t_{pd} of 2.8ns at 5 V
- Low Power Consumption, 1μA Max I_{CC}
- ±32mA Output Drive at 5 V
- Inputs are TTL-Voltage Compatible
- Ioff Supports Partial-Power-Down Mode Operation
- Operating Temperature Range: -40°C to +125°C
- Packages: SOT23-5, SOT-353(SC70-5)
- RoSH compatible

INPUTS		OUTPUT
A	B	Y
H	H	H
L	H	H
H	L	H
L	L	L

$Y=A+B$ H=High Voltage Level L=Low Voltage Level

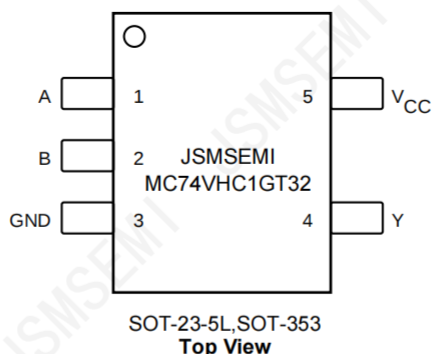
Applications

- I/O Modules; Analog PLC/DCS Inputs
- Server Motherboards
- Automotive Clusters
- Motor Drives and Controls
- DLP Front Projection Systems
- TVs
- Set-top-boxes
- Audio

Ordering Information

Order number	Package	Marking	Operation Temperature Range	MSL Grade	Ship,Quantity	Green
MC74VHC1GT32DTT1G-JSM	SOT-23-5L	B32S	-40 to 125°C	3	TR&3000	Rohs
MC74VHC1GT32DFT1G-JSM	SOT-353	BG3	-40 to 125°C	3	TR&3000	Rohs

Pin Configuration and Functions



Pin Functions

PIN		I/O	DESCRIPTION
NAME	NO.		
A	1	I	Input A
B	2	I	Input B
GND	3	—	Ground Pin
V _{CC}	5	—	Supply Pin
Y	4	O	Output

Specifications

Absolute Maximum Ratings

over operating free-air temperature range (unless otherwise noted)⁽¹⁾

		MIN	MAX	UNIT
V _{CC}	Supply voltage range	−0.5	6.5	V
V _I	Input voltage range ⁽²⁾	−0.5	6.5	V
V _O	Output voltage range ⁽²⁾	−0.5	V _{CC} + 0.5	V
I _{IK}	Input clamp current V _I < 0		−50	mA
I _{OK}	Output clamp current V _O < 0 or V _O > V _{CC}		±50	mA
I _O	Continuous output current V _O = 0 to V _{CC}		±50	mA
	Continuous current through V _{CC} or GND		±100	mA
T _{stg}	Storage temperature range	−65	150	°C

(1) Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under Recommended Operating Conditions is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

(2) The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

ESD Ratings

		VALUE	UNIT
V _(ESD)	Electrostatic discharge	Human body model (HBM)	2000
		Charged device model (CDM)	1000

Recommended Operating Conditions

over operating free-air temperature range (unless otherwise noted)⁽¹⁾

		MIN	MAX	UNIT
V _{CC}	Supply voltage	4.5	5.5	V
V _{IH}	High-level input voltage	2		V
V _{IL}	Low-level input voltage		0.8	V
V _I	Input voltage	0	5.5	V
V _O	Output voltage	0	V _{CC}	V
I _{OH}	High-level output current		-8	mA
I _{OL}	Low-level output current		8	mA
Δt/Δv	Input transition rise or fall rate		20	ns/V
T _A	Operating free-air temperature	-40	125	°C

(1) All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation.

Thermal Information

THERMAL METRIC		MC74VHC1GT32		UNIT
		DBV	DCK	
		5 PINS		
R _{θJA}	Junction-to-ambient thermal resistance	230	280	°C/W
R _{θJC(top)}	Junction-to-case (top) thermal resistance	119.9	97.7	

Electrical Characteristics

over recommended operating free-air temperature range (TYP values are at T_A = +25°C, Full=-40°C to 125°C, unless otherwise noted.)

PARAMETER	TEST CONDITIONS	V _{CC}	TEMP	MIN ⁽²⁾	TYP ⁽³⁾	MAX ⁽²⁾	UNIT
V _{OH}	I _{OH} = -100μA	2.0V to 5.5V	Full	V _{CC} -0.1			V
	I _{OH} = -8mA	2.0		1.6			
	I _{OH} = -24mA	3.3		2.5			
	I _{OH} = -32mA	4.5V		3.8			
		5V		4.2			
		5.5V		4.8			
V _{OL}	I _{OL} = 100μA	2.0V to 5.5V	Full			0.1	V
	I _{OH} = 8mA	2.0				0.45	
	I _{OH} = 24mA	3.3				0.55	
	I _{OL} = 32mA	4.5V				0.55	
		5V				0.5	
		5.5V				0.45	
I _I	A or B inputs	V _I =5.5V or GND	0V to 5.5V	+25°C	±0.1	±1	μA
				Full		±5	
I _{off}	V _I or V _O =5.5V	0V		+25°C	±0.1	±1	μA
				Full		±10	
I _{CC}	V _I =5.5V or GND, I _O =0	2.0V to 5.5V		+25°C	0.1	1	μA
				Full		10	
I _{CCT}	One input at 3.4V, Other inputs at V _{CC} or GND	5.5V	Full			500	μA
C _i (Input Capacitance)	V _{CC} =0V, f=10MHz	0V	+25°C		6		pF

(1) All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation.

(2) Limits are 100% production tested at 25°C. Limits over the operating temperature range are ensured through correlations using statistical quality control (SQC) method.

(3) Typical values represent the most likely parametric norm as determined at the time of characterization. Actual typical values may vary over time and will also depend on the application and configuration.

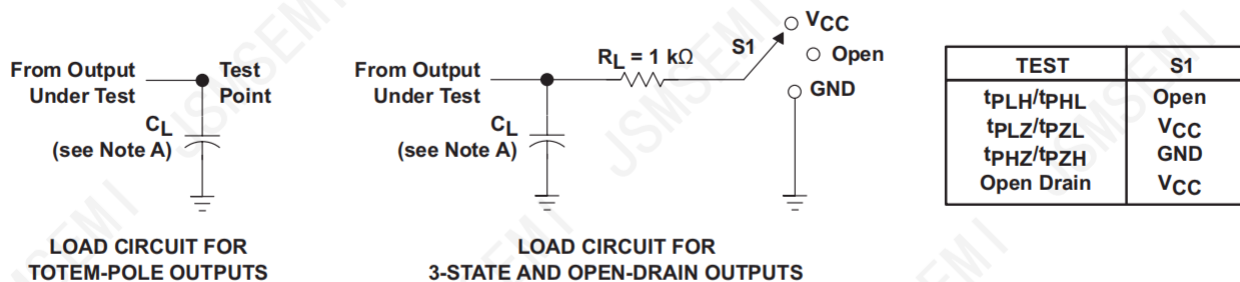
PARAMETER	SYMBOL	TEST CONDITIONS		MIN ⁽²⁾	TYP ⁽³⁾	MAX ⁽²⁾	UNIT
Propagation Delay	t_{pd}	$V_{CC}=2.0V\pm0.2V$	$C_L=30pF, R_L=500\Omega$		3.8		ns
		$V_{CC}=3.3V\pm0.3V$	$C_L=50pF, R_L=500\Omega$		2.6		
		$V_{CC}=5V\pm0.5V$	$C_L=50pF, R_L=500\Omega$		2.8		
Power dissipation capacitance	C_{pd}	$V_{CC}=5V$	$f=10MHz$		25		pF

(1) All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation.

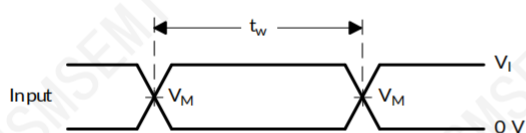
(2) This parameter is ensured by design and/or characterization and is not tested in production.

(3) Typical values represent the most likely parametric norm as determined at the time of characterization. Actual typical values may vary over time and will also depend on the application and configuration.

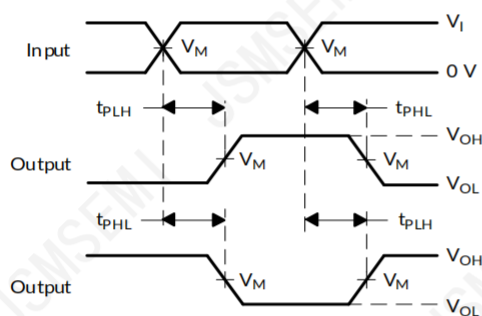
Parameter Measurement Information



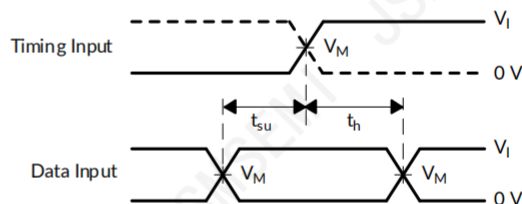
V_{CC}	INPUTS		V_M	V_{LOAD}	C_L	R_L	V_{Δ}
	V_I	t_r/t_f					
$2.0V \pm 0.2V$	V_{CC}	$\leq 2ns$	$V_{CC}/2$	$2 \times V_{CC}$	30pF	500Ω	0.15V
$3.3V \pm 0.3V$	3V	$\leq 2.5ns$	1.5V	6V	50pF	500Ω	0.3V
$5V \pm 0.5V$	V_{CC}	$\leq 2.5ns$	$V_{CC}/2$	$2 \times V_{CC}$	50pF	500Ω	0.3V



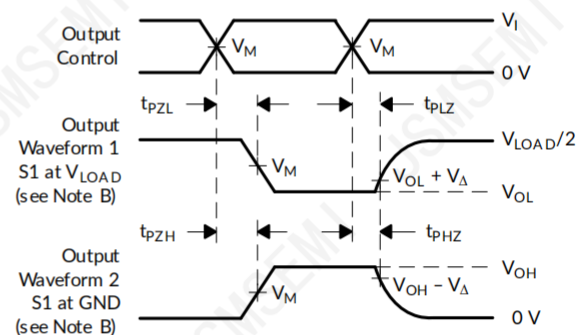
VOLTAGE WAVEFORMS
PULSE DURATION



VOLTAGE WAVEFORMS
PROPAGATION DELAY TIMES
INVERTING AND NONINVERTING OUTPUTS



VOLTAGE WAVEFORMS
SETUP AND HOLD TIMES



VOLTAGE WAVEFORMS
ENABLE AND DISABLE TIMES
LOW- AND HIGH-LEVEL ENABLING

NOTES:

- CL includes probe and jig capacitance.
- Waveform 1 is for an output with internal conditions such that the output is low, except when disabled by the output control.
Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the output control.
- All input pulses are supplied by generators having the following characteristics: PRR ≤ 10 MHz, ZO = 50Ω.
- The outputs are measured one at a time, with one transition per measurement.
- tPLZ and tPHZ are the same as tdis.
- tPZL and tPZH are the same as ten.
- tPLH and tPHL are the same as tpd.
- All parameters and waveforms are not applicable to all devices.

Figure1. Load Circuit and Voltage Waveforms

Detailed Description

Overview

The MC74VHC1GT32 device is a single 2-input positive-OR gate.

$Y = A + B$ or $Y = A \cdot B$ in positive logic.
 The device performs the Boolean function

The device has TTL inputs that allow up translation from 3.3 V to 5 V. The inputs are high impedance when $V_{CC} = 0$ V.

Functional Block Diagram



Figure 2. Logic Diagram (Positive Logic)

Feature Description

- Slow rise and fall time on outputs allow for low noise outputs.
- TTL inputs
 - Allows up translation from 3.3 V to 5 V

Device Functional Modes

Table 1. Function Table

INPUTS		OUTPUT
A	B	Y
H	H	H
L	H	H
H	L	H
L	L	L

$Y = A + B$ H=High Voltage Level L=Low Voltage Level

Application Information

MC74VHC1GT32 is a low-drive CMOS device that can be used for a multitude of bus interface type applications where output ringing is a concern. The low drive and slow edge rates will minimize overshoot and undershoot on the outputs. The TTL inputs can accept voltages down to 3.3 V and translate up to 5 V.

Typical Application

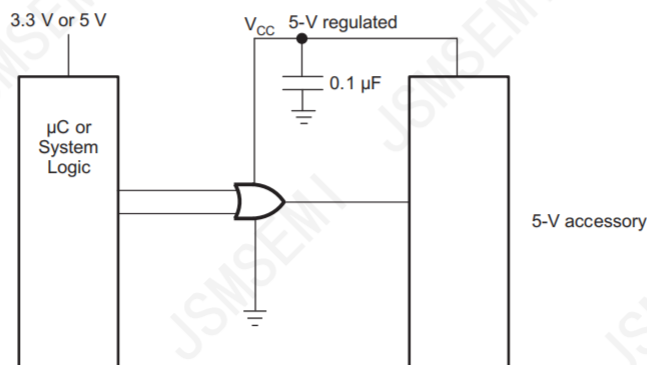


Figure 3. Typical Application Schematic

Design Requirements

This device uses CMOS technology and has balanced output drive. Take care to avoid bus contention because it can drive currents that would exceed maximum limits. The high drive also creates fast edges into light loads, so routing and load conditions must be considered to prevent ringing.

Power Supply Recommendations

The power supply can be any voltage between the minimum and maximum supply voltage rating located in Recommended Operating Conditions.

Each V_{CC} pin must have a good bypass capacitor to prevent power disturbance. Recommends a $0.1\mu\text{F}$ capacitor for devices with a single supply; and a $0.01\mu\text{F}$ or $0.022\mu\text{F}$ capacitor for each power pin if there are multiple V_{CC} pins. It is ok to parallel multiple bypass capacitors to reject different frequencies of noise. $0.1\mu\text{F}$ and $1\mu\text{F}$ capacitors are commonly used in parallel. The bypass capacitor must be installed as close to the power pin as possible for best results.

Layout

Layout Guidelines

When using multiple bit logic devices inputs must not ever float. In many cases, functions or parts of functions of digital logic devices are unused; for example, when only two inputs of a triple-input AND gate are used or only 3 of the 4 buffer gates are used. Such input pins must not be left unconnected because the undefined voltages at the outside connections result in undefined operational states. Observe the following rules under all circumstances.

- All unused inputs of digital logic devices must be connected to a high or low bias to prevent them from floating.
- The logic level that must be applied to any particular unused input depends on the function of the device. Generally they will be tied to GND or V_{CC} , whichever make more sense or is more convenient.

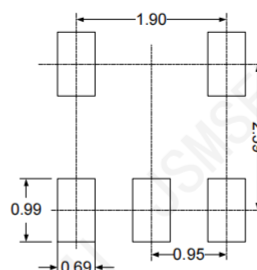
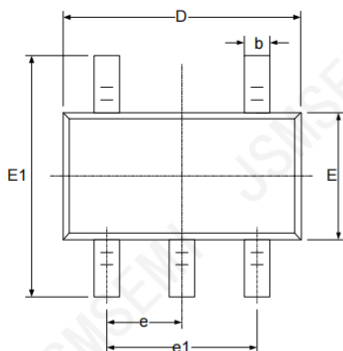
Layout Example



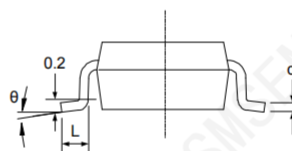
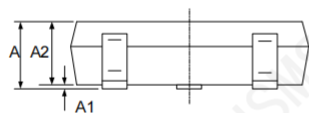
Figure 4. Layout Diagram

Package Information

SOT-23-5L



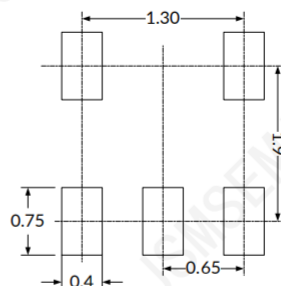
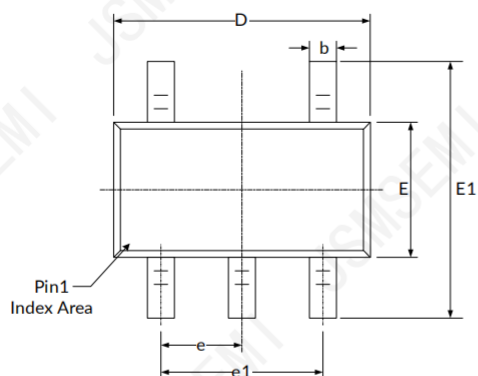
RECOMMENDED LAND PATTERN (Unit: mm)



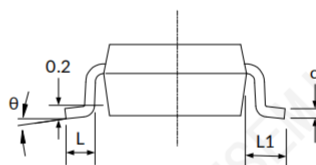
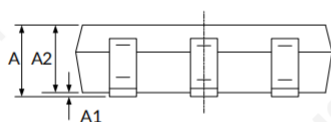
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

Package Information

SOT-353(SC70-5)



RECOMMENDED LAND PATTERN (Unit: mm)



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.900	1.100	0.035	0.043
A1	0.000	0.100	0.000	0.004
A2	0.900	1.000	0.035	0.039
b	0.150	0.350	0.006	0.014
c	0.080	0.150	0.003	0.006
D ⁽¹⁾	2.000	2.200	0.079	0.087
E ⁽¹⁾	1.150	1.350	0.045	0.053
E1	2.150	2.450	0.085	0.096
e	0.650(BSC)		0.026(BSC)	
e1	1.300(BSC)		0.051(BSC)	
L	0.260	0.460	0.010	0.018
L1	0.525		0.021	
θ	0°	8°	0°	8°

Revision History

Rev.	Change	Date
V1.0	Initial version	3/17/2023

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