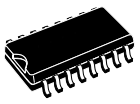
M74HC365

Hex bus buffer with 3-state outputs (non-inverting)

Datasheet - production data



SO16

TSSOP16

Features

- High-speed:
  t_{PD} = 10 ns (typ.) at V_{CC} = 6 V
- Low power dissipation:
  I_{CC} = 4 µA (max.) at T_A = 25 °C
- High noise immunity:
  $V_{NIH} = V_{NIL}$ = 28 % V_{CC} (min)
- Symmetrical output impedance:
  $|I_{OH}| = I_{OL}$ = 6 mA (min.)
- Balanced propagation delays:
  $t_{PLH} \cong t_{PHL}$
- Wide operating voltage range:
  V_{CC} (opr) = 2 V to 6 V
- Pin and function compatible with 74 series 365
- ESD performance
  - HBM: 2 kV
  - MM: 200 V
  - CDM: 1 kV

Description

The M74HC365 is an advanced high-speed CMOS hex bus buffer (3-state) fabricated with silicon gate C^2MOS technology.

All six buffers are controlled by the combination of two enable inputs ($\overline{G1}$ and $\overline{G2}$). All outputs of these buffers are enabled only when both $\overline{G1}$ and $\overline{G2}$ inputs are held low. Under all other conditions these outputs are disabled in a high-impedance state.

The M74HC365 has non-inverting outputs.

All inputs are equipped with protection circuits against static discharge and transient excess voltage.

Table 1. Device summary

Order code	Temp. range	Package	Packing	Marking
M74HC365RM13TR	-55 °C to 125 °C	S016	Tape and reel	74HC365
M74HC365YRM13TR(1)	-40 °C to 125 °C	SO16 (automotive grade)		74HC365Y
M74HC365TTR	-55 °C to 125 °C	TSSOP16		HC365
M74HC365YTTR(1)	-40 °C to 125 °C	TSSOP16 (automotive grade)		HC365Y

1. Qualification and characterization according to AEC Q100 and Q003 or equivalent, advanced screening according to AEC Q001 and Q002 or equivalent.

Contents

1 Pin information

Figure 1. Pin connection and IED logic symbols

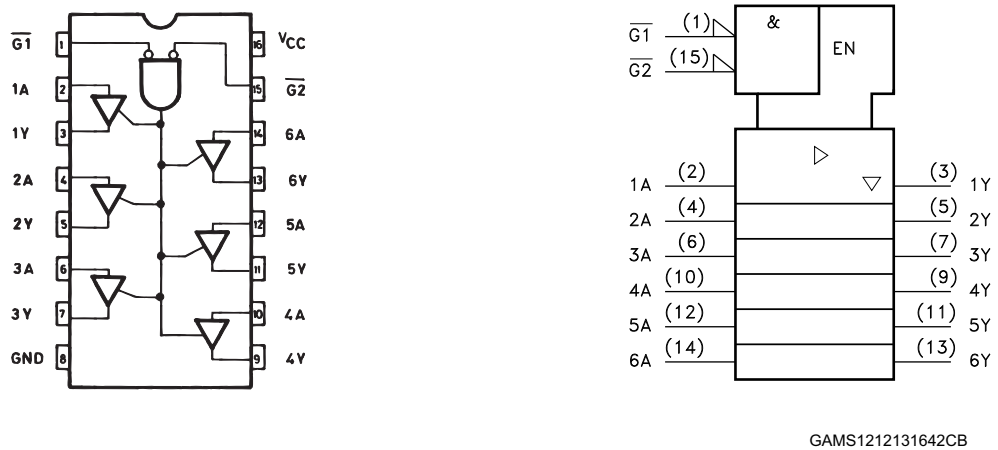


Table 2. Pin description

Pin no	Symbol	Name and function
1, 15	$\overline{G1}$, $\overline{G2}$	Output enable inputs
2, 4, 6, 10, 12, 14	1A to 6A	Data inputs
3, 5, 7, 9, 11, 13	1Y to 6Y	Data outputs
8	GND	Ground (0 V)
16	V_{CC}	Positive supply voltage

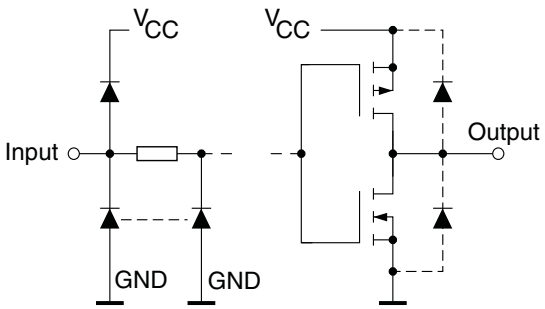
2 Functional description

Table 3. Truth table

Inputs			Outputs
$\overline{G1}$	$\overline{G2}$	An	Y
L	L	L	L
L	L	H	H
H	X(2)	X(2)	Z(1)
X(2)	H	X(2)	Z(1)

1. Z = high impedance
2. X = don't care

Figure 2. Input and output equivalent circuit



3 Electrical characteristics

"Absolute maximum ratings" are those values beyond which damage to the device may occur. Functional operation under these conditions is not implied.

Table 4. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{CC}	Supply voltage	-0.5 to +7	V
V_I	DC input voltage	-0.5 to V_{CC} + 0.5	
V_O	DC output voltage		
I_{IK}	DC input diode current	±20	mA
I_{OK}	DC output diode current		
I_O	DC output current	±35	
I_{CC} or I_{GND}	DC V_{CC} or ground current	±70	
P_D	Power dissipation	500(1)	mW
T_{stg}	Storage temperature	-65 to +150	°C
T_L	Lead temperature (10 sec)	300	

1. 500 mW at 65 °C; derate to 300 mW by 10 mW/°C from 65 °C to 85 °C

Table 5. Recommended operating conditions

Symbol	Parameter		Value	Unit
V_{CC}	Supply voltage		2 to 6	V
V_I	Input voltage		0 to V_{CC}	
V_O	Output voltage			
T_{op}	Operating temperature		-55 to 125	°C
t_r, t_f	Input rise and fall time	V_{CC} = 2.0 V	0 to 1000	ns
		V_{CC} = 4.5V	0 to 500	
		V_{CC} = 6.0 V	0 to 400	

Table 6. DC specifications

Symbol	Parameter	Test condition		Value							Unit
		V_{CC} (V)		T_A = 25 °C			-40 to 85 °C		-55 to 125 °C		
				Min.	Typ.	Max.	Min.	Max.	Min.	Max.	
V_{IH}	High level input voltage	2.0		1.5			1.5		1.5		V
		4.5		3.15			3.15		3.15		
		6.0		4.2			4.2		4.2		
V_{IL}	Low level input voltage	2.0				0.5		0.5		0.5	V
		4.5				1.35		1.35		1.35	
		6.0				1.8		1.8		1.8	
V_{OH}	High level output voltage	2.0	I_O = -20 µA	1.9	2.0		1.9		1.9		V
		4.5	I_O = -20 µA	4.4	4.5		4.4		4.4		
		6.0	I_O = -20 µA	5.9	6.0		5.9		5.9		
		4.5	I_O = -6.0 mA	4.18	4.31		4.13		4.10		
		6.0	I_O = -7.8 mA	5.68	5.8		5.63		5.60		
V_{OL}	Low level output voltage	2.0	I_O = 20 µA		0.0	0.1		0.1		0.1	V
		4.5	I_O = 20 µA		0.0	0.1		0.1		0.1	
		6.0	I_O = 20 µA		0.0	0.1		0.1		0.1	
		4.5	I_O = 6.0 mA		0.17	0.26		0.33		0.40	
		6.0	I_O = 7.8 mA		0.18	0.26		0.33		0.40	
I_I	Input leakage current	6.0	V_I = V_{CC} or GND			±0.1		±1		±1	µA
I_{OZ}	High impedance output leakage current	6.0	V_I = V_{IH} or V_{IL} V_O = V_{CC} or GND			±0.5		±5		±10	µA
I_{CC}	Quiescent supply current	6.0	V_I = V_{CC} or GND			4		40		80	µA

Table 7. AC electrical characteristics
(C_L = 50 pF, Input t_r = t_f = 6 ns)

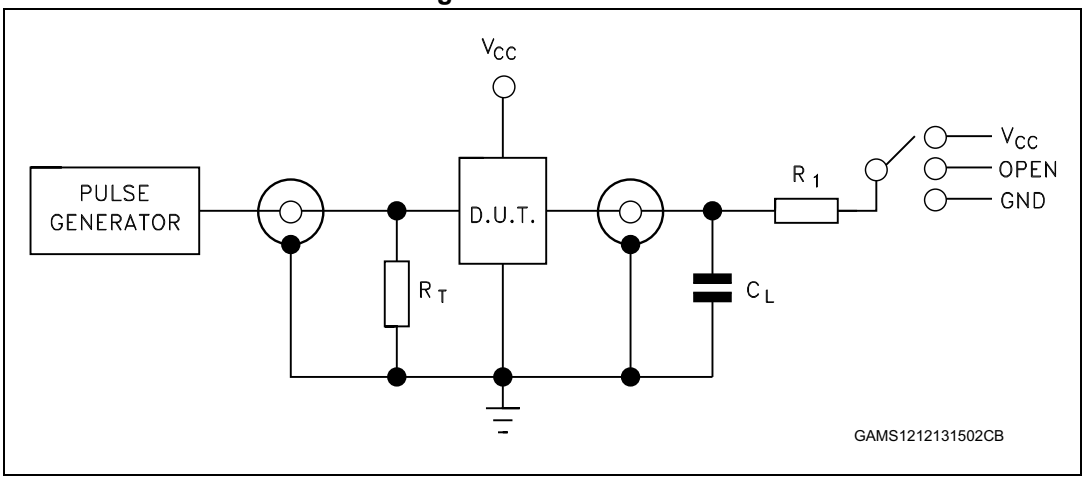
Symbol	Parameter	Test condition			Value							Unit
		V_{CC} (V)	C_L (pF)		T_A = 25 °C			-40 to 85 °C		-55 to 125 °C		
					Min.	Typ.	Max.	Min.	Max.	Min.	Max.	
t_{TLH}, t_{THL}	Output transition time	2.0	50			25	60		75		90	ns
		4.5				7	12		19		18	
		6.0				6	10		13		15	
t_{PLH}, t_{PHL}	Propagation delay time	2.0	50			38	90		115		135	ns
		4.5				12	18		23		27	
		6.0				10	15		20		23	
		2.0	150			51	130		165		195	ns
		4.5				17	26		33		39	
		6.0				14	22		28		33	
t_{PZL}, t_{PZH}	High impedance output enable time	2.0	50	R_L = 1 kΩ	-	64	130	-	165	-	195	ns
		4.5				16	26		33		39	
		6.0				14	22		28		33	
		2.0	150			76	150		190		225	ns
		4.5				19	30		38		45	
		6.0				16	26		32		38	
t_{PLZ}, t_{PHZ}	High impedance output disable time	2.0	50	R_L = 1 kΩ		42	130		165		195	ns
		4.5				18	26		33		39	
		6.0				15	22		28		33	

Table 8. Capacitive characteristics

Sym	Parameter	Test condition	Value							Unit
		V_{CC} (V)	T_A = 25 °C			-40 to 85 °C		-55 to 125 °C		
			Min	Typ	Max	Min	Max	Min	Max	
C_{IN}	Input capacitance	5.0	-	5	10	-	10	-	10	pF
C_{PD}	Power dissipation capacitance(1)			27						

1. C_{PD} is defined as the value of the IC's internal equivalent capacitance which is calculated from the operating current consumption without load (refer to test circuit). Average operating current can be obtained by the following equation: $I_{CC(opr)} = C_{PD} \times V_{CC} \times f_{IN} + I_{CC}/6$(per gate).

Figure 3. Test circuit



1. Legend:
   C_L = 50 pF/150 pF or equivalent (includes jig and probe capacitance).
   R_1 = 1 kΩor equivalent.
   R_T = Z_{OUT} of pulse generator (typically 50 Ω).

Table 9. Propagation delay time configuration

Test	Switch
t_{PLH}, t_{PHL}	Open
t_{PZL}, t_{PLZ}	V_{CC}
t_{PZH}, t_{PHZ}	GND

Figure 4. Waveform 1: propagation delay times (f = 1 MHz; 50 % duty cycle)

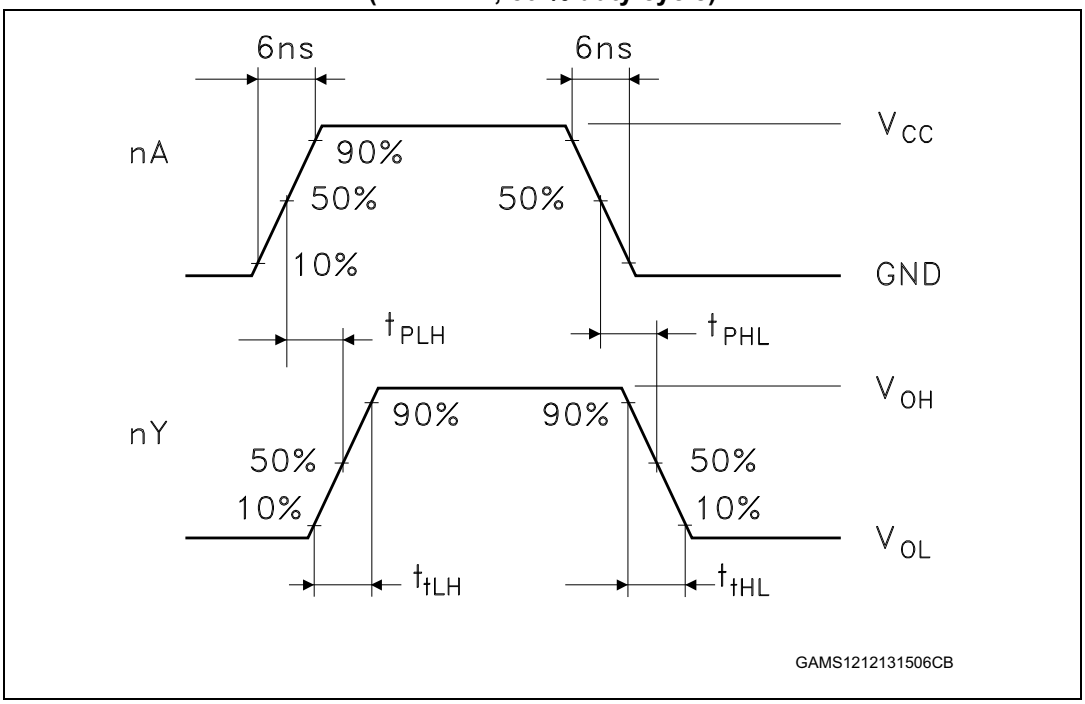
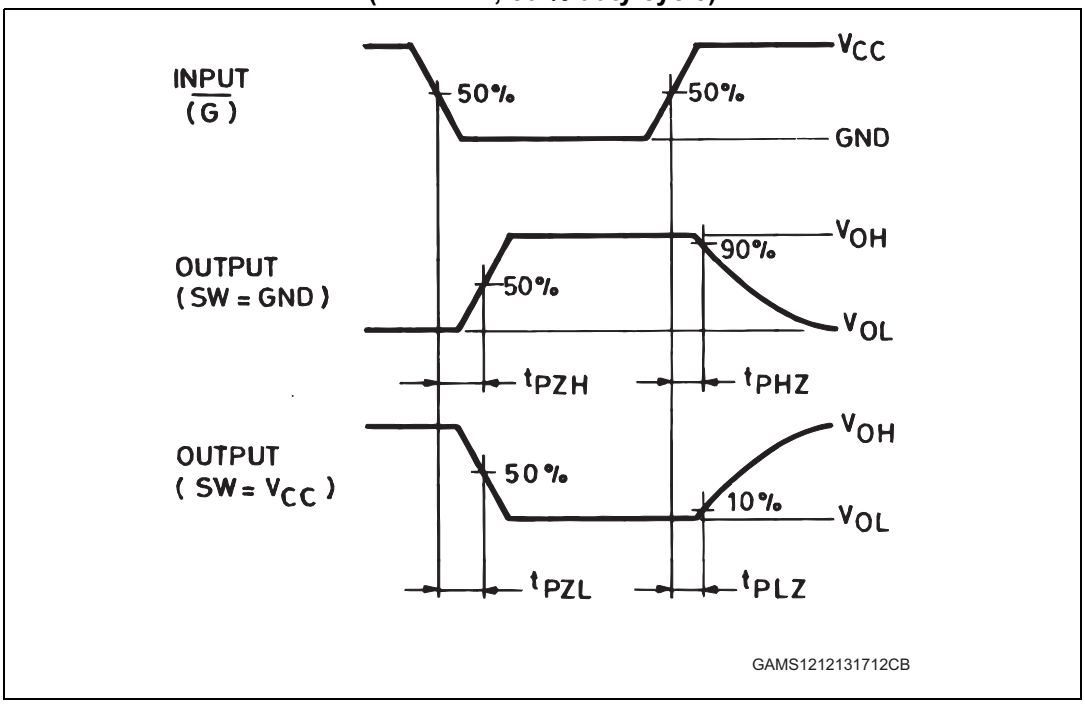


Figure 5. Waveform 2: Output enable and disable times (f = 1 MHz; 50 % duty cycle)



4 Package information

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4.1 SO16 package information

Figure 6. SO16 package mechanical drawing

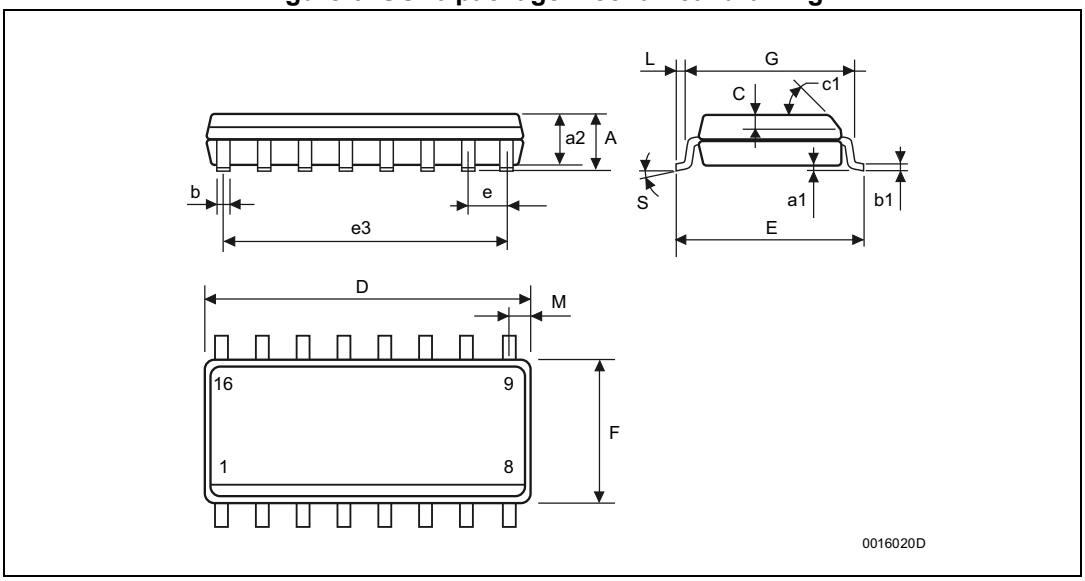

Table 10. SO16 package mechanical data

Symbol	Dimensions					
	mm			inch		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			1.75			0.068
a1	0.1		0.2	0.003		0.008
a2			1.65			0.064
b	0.35		0.46	0.013		0.018
b1	0.19		0.25	0.007		0.010
C		0.5			0.019	
c1	45° (typ.)					
D	9.8		10	0.385		0.393
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		8.89			0.350	
F	3.8		4.0	0.149		0.157
G	4.6		5.3	0.181		0.208
L	0.5		1.27	0.019		0.050
M			0.62			0.024
S	8° (max.)					

4.2 TSSOP16 package information

Figure 7. TSSOP16 package mechanical drawing

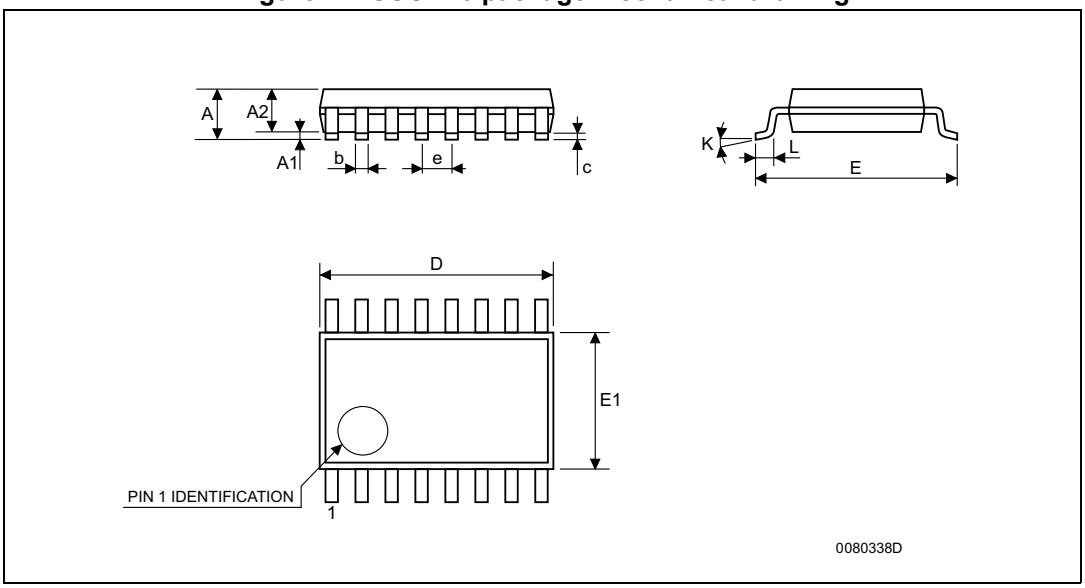

Table 11. TSSOP16 package mechanical data

Symbol	Dimensions					
	mm			inch		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			1.2			0.047
A1	0.05		0.15	0.002	0.004	0.006
A2	0.8	1	1.05	0.031	0.039	0.041
b	0.19		0.30	0.007		0.012
c	0.09		0.20	0.004		0.0089
D	4.9	5	5.1	0.193	0.197	0.201
E	6.2	6.4	6.6	0.244	0.252	0.260
E1	4.3	4.4	4.48	0.169	0.173	0.176
e		0.65			0.0256	
K	0 °		8 °	0 °		8 °
L	0.45	0.60	0.75	0.018	0.024	0.030

5 Ordering information

Table 12. Order codes

Order code	Temp. range	Package	Packing	Marking
M74HC365RM13TR	-55 °C to 125 °C	S016	Tape and reel	74HC365
M74HC365YRM13TR(1)	-40 °C to 125 °C	SO16 (automotive grade)		74HC365Y
M74HC365TTR	-55 °C to 125 °C	TSSOP16		HC365
M74HC365YTTR(1)	-40 °C to 125 °C	TSSOP16 (automotive grade)		HC365Y

1. Qualification and characterization according to AEC Q100 and Q003 or equivalent, advanced screening according to AEC Q001 and Q002 or equivalent.

6 Revision history

Table 13. Document revision history

Date	Revision	Changes
Aug-2001	1	Initial release.
13-Dec-2013	2	Removed DIP16 package *Table 1: Device summary*: updated order codes, added automotive grade order codes, added temperature range and marking details. Added *Section 5: Ordering information*.
13-Jan-2014	3	Added ESD data to *Features*

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