54VCXH162244

LOW VOLTAGE CMOS 16-BIT BUS BUFFER (3-STATE INV.) WITH 3.6V TOLERANT INPUTS AND OUTPUTS

- 3.6V TOLERANT INPUTS AND OUTPUTS
- HIGH SPEED :
  t_{PD} = 3.4 ns (MAX.) at V_{CC} = 3.0 to 3.6V
  t_{PD} = 3.8 ns (MAX.) at V_{CC} = 2.3 to 2.7V
- POWER DOWN PROTECTION ON INPUTS AND OUTPUTS
- SYMMETRICAL OUTPUT IMPEDANCE:
  $|I_{OH}| = I_{OL}$ = 12mA (MIN) at V_{CC} = 3.0V
  $|I_{OH}| = I_{OL}$ = 8mA (MIN) at V_{CC} = 2.3V
- 26Ω SERIE RESISTORS IN OUTPUTS
- OPERATING VOLTAGE RANGE:
  V_{CC}(OPR) = 2.3V to 3.6V
- PIN AND FUNCTION COMPATIBLE WITH 54 SERIES H162244
- BUS HOLD PROVIDED ON DATA INPUTS
- LATCH-UP PERFORMANCE EXCEEDS 300mA (JESD 17)
- ESD PERFORMANCE:
  HBM > 2000V (MIL STD 883 method 3015);
  MM > 200V
- 100 Krad mil. 1019.6 (RHA QUAL) CONDITION A
- NO SEL, NO SEU UNDER 72 Mev/cm^2/mg LET HEAVY IONS IRRADIATION
- QML QUALIFIED PRODUCT
- SMD 5962-05210

DESCRIPTION

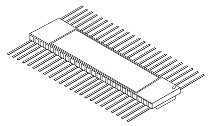
The 54VCXH162244 is a low voltage CMOS 16 BIT BUS BUFFER (NON INVERTED) fabricated with sub-micron silicon gate and five-layer metal wiring C^{2}MOS technology. It is ideal for low power and very high speed 2.3 to 3.6V applications; it can be interfaced to 3.6V signal environment for both inputs and outputs.

Any n$\overline{G}$ output control governs four BUS BUFFERS. Output Enable input (n$\overline{G}$) tied together gives full 16-bit operation.

When n$\overline{G}$ is LOW, the outputs are on. When n$\overline{G}$ is HIGH, the output are in high impedance state.

This device is designed to be used with 3 state memory address drivers, etc. Bus hold on data inputs is provided in order to eliminate the need for external pull-up or pull-down resistor.

The device circuits is including 26Ω series resistance in the outputs. These resistors permit to reduce line noise in high speed applications.



FLAT-48

All inputs and outputs are equipped with protection circuits against static discharge, giving them 2KV ESD immunity and transient excess voltage.

Figure 1: Pin Connection

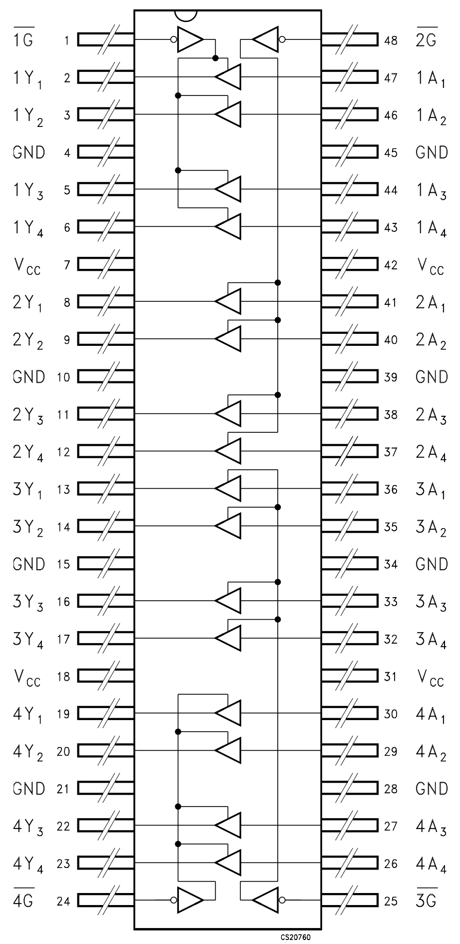


Table 1: Order Codes

PACKAGE	SOLDER DIPPING	FLYING MODEL		ENGINEERING MODEL
		QML-V	QML-Q	
FLAT-48	GOLD	RHRXH162244K01V	RHRXH162244K01Q	RHRXH162244K1 RHRXH162244K2 (*)
FLAT-48	SOLDER	RHRXH162244K02V	RHRXH162244K02Q	

(*) EM with 48 hours Burn-In

Figure 2: Input And Output Equivalent Circuit

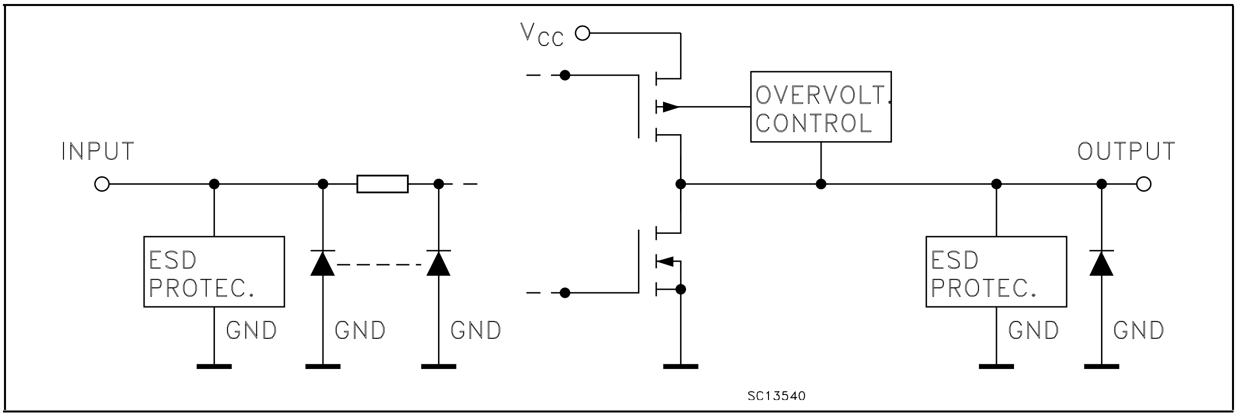


Table 2: Pin Description

PIN N°	SYMBOL	NAME AND FUNCTION
1	$1\overline{G}$	Output Enable Input
2, 3, 5, 6	1Y1 to 1Y4	Data Outputs
8, 9, 11, 12	2Y1 to 2Y4	Data Outputs
13, 14, 16, 17	3Y1 to 3Y4	Data Outputs
19, 20, 22, 23	4Y1 to 4Y4	Data Outputs
24	$4\overline{G}$	Output Enable Input
25	$3\overline{G}$	Output Enable Input
30, 29, 27, 26	4A1 to 4A4	Data Outputs
36, 35, 33, 32	3A1 to 3A4	Data Outputs
41, 40, 38, 37	2A1 to 2A4	Data Outputs
47, 46, 44, 43	1A1 to 1A4	Data Outputs
48	$2\overline{G}$	Output Enable Input
4, 10, 15, 21, 28, 34, 39, 45	GND	Ground (0V)
7, 18, 31, 42	V_{CC}	Positive Supply Voltage

Table 3: Truth Table

INPUTS		OUTPUT
$\overline{G}$	An	Yn
L	L	L
L	H	H
H	X	Z

X : Don‘t Care
Z : High Impedance

Figure 3: IEC Logic Symbols

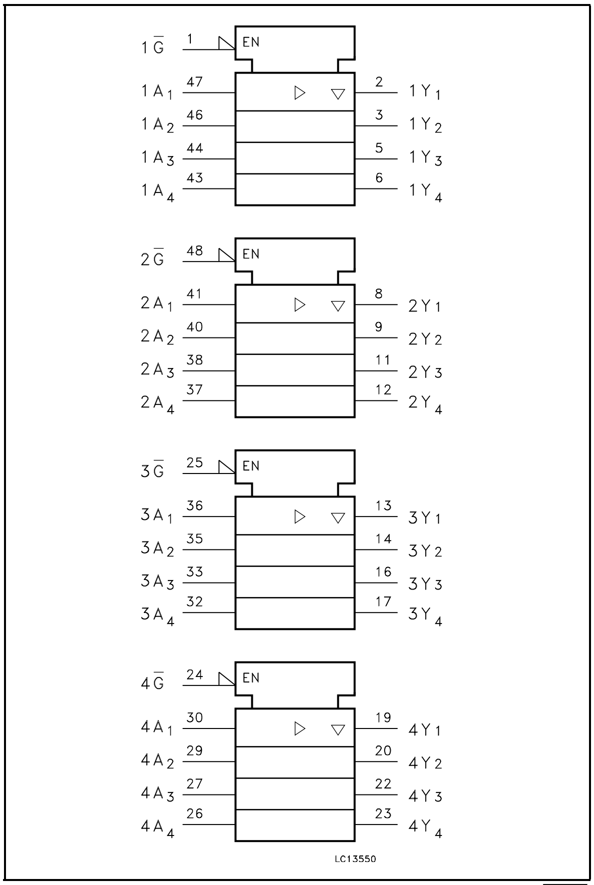


Table 4: Absolute Maximum Ratings

Symbol	Parameter	Value	Unit
V_{CC}	Supply Voltage	-0.5 to +4.6	V
V_I	DC Input Voltage	-0.5 to +4.6	V
V_O	DC Output Voltage (OFF State)	-0.5 to +4.6	V
V_O	DC Output Voltage (High or Low State) (note 1)	-0.5 to V_{CC} + 0.5	V
I_{IK}	DC Input Diode Current	- 50	mA
I_{OK}	DC Output Diode Current (note 2)	- 50	mA
I_O	DC Output Current	± 50	mA
I_{CC} or I_{GND}	DC V_{CC} or Ground Current per Supply Pin	± 100	mA
P_D	Power Dissipation	400	mW
T_{stg}	Storage Temperature	-65 to +150	°C
T_L	Lead Temperature (10 sec)	260	°C

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these conditions is not implied
1) I_O absolute maximum rating must be observed
2) V_O < GND, V_O > V_{CC}

Table 5: Recommended Operating Conditions

Symbol	Parameter	Value	Unit
V_{CC}	Supply Voltage	2.3 to 3.6	V
V_I	Input Voltage	-0.3 to 3.6	V
V_O	Output Voltage (OFF State)	0 to 3.6	V
V_O	Output Voltage (High or Low State)	0 to V_{CC}	V
I_{OH}, I_{OL}	High or Low Level Output Current (V_{CC} = 3.0 to 3.6V)	± 12	mA
I_{OH}, I_{OL}	High or Low Level Output Current (V_{CC} = 2.3 to 2.7V)	± 8	mA
T_{op}	Operating Temperature	-55 to 125	°C
dt/dv	Input Rise and Fall Time (note 1)	0 to 10	ns/V

1) V_{IN} from 0.8V to 2V at V_{CC} = 3.0V

Table 6: DC Specifications (2.7V < V_{CC} ≤ 3.6V unless otherwise specified)

Symbol	Parameter	Test Condition		Value		Unit
		V_{CC} (V)		-55 to 125 °C		
				Min.	Max.	
V_{IH}	High Level Input Voltage	2.7 to 3.6		2.0		V
V_{IL}	Low Level Input Voltage				0.8	
V_{OH}	High Level Output Voltage	2.7 to 3.6	I_O=-100 µA	V_{CC}-0.2		V
		2.7	I_O=-6 mA	2.2		
		3.0	I_O=-8 mA	2.4		
			I_O=-12 mA	2.2		
V_{OL}	Low Level Output Voltage	2.7 to 3.6	I_O=100 µA		0.2	V
		2.7	I_O=6 mA		0.4	
		3.0	I_O=8 mA		0.5	
			I_O=12 mA		0.8	
I_I	Input Leakage Current	2.7 to 3.6	V_I = V_{CC} or GND		± 5	µA
$I_{I(HOLD)}$	Input Hold Current	3.0	V_I = 0.8V	75		µA
			V_I = 2V	-75		
		3.6	V_I = 0 to 3.6V		± 500	
I_{off}	Power Off Leakage Current	0	V_I or V_O = 0 to 3.6V		10	µA
I_{OZ}	High Impedance Output Leakage Current	2.7 to 3.6	V_I = V_{IH} or V_{IL} V_O = 0 to 3.6V		± 10	µA
I_{CC}	Quiescent Supply Current	2.7 to 3.6	V_I = V_{CC} or GND		20	µA
			V_I or V_O = V_{CC} to 3.6V		± 20	
ΔI_{CC}	I_{CC} incr. per Input	2.7 to 3.6	V_{IH} = V_{CC} - 0.6V		750	µA

Table 7: DC Specifications (2.3V < V_{CC} ≤ 2.7V unless otherwise specified)

Symbol	Parameter	Test Condition		Value		Unit
		V_{CC} (V)		-55 to 125 °C		
				Min.	Max.	
V_{IH}	High Level Input Voltage	2.3 to 2.7		1.6		V
V_{IL}	Low Level Input Voltage				0.7	
V_{OH}	High Level Output Voltage	2.3 to 2.7	I_O=-100 µA	V_{CC}-0.2		V
		2.3	I_O=-4 mA	2.0		
			I_O=-6 mA	1.8		
			I_O=-8 mA	1.7		
V_{OL}	Low Level Output Voltage	2.3 to 2.7	I_O=100 µA		0.2	V
		2.3	I_O=6 mA		0.4	
			I_O=8 mA		0.6	
I_I	Input Leakage Current	2.3 to 2.7	V_I = V_{CC} or GND		± 5	µA
$I_{I(HOLD)}$	Input Hold Current	2.3	V_I = 0.7V	45		µA
			V_I = 1.7V	-45		
I_{off}	Power Off Leakage Current	0	V_I or V_O = 0 to 3.6V		10	µA
I_{OZ}	High Impedance Output Leakage Current	2.3 to 2.7	V_I = V_{IH} or V_{IL} V_O = 0 to 3.6V		± 10	µA
I_{CC}	Quiescent Supply Current	2.3 to 2.7	V_I = V_{CC} or GND		20	µA
			V_I or V_O = V_{CC} to 3.6V		± 20	

Table 8: Dynamic Switching Characteristics (T_a = 25°C, Input t_r = t_f = 2.0ns, C_L = 30pF, R_L = 500Ω)

Symbol	Parameter	Test Condition		Value			Unit
		V_{CC} (V)		T_A = 25 °C			
				Min.	Typ.	Max.	
V_{OLP}	Dynamic Low Voltage Quiet Output (note 1, 3)	2.5	V_{IL} = 0V V_{IH} = V_{CC}		0.25		V
		3.3			0.35		
V_{OLV}	Dynamic Low Voltage Quiet Output (note 1, 3)	2.5	V_{IL} = 0V V_{IH} = V_{CC}		-0.25		V
		3.3			-0.35		
V_{OHV}	Dynamic High Voltage Quiet Output (note 2, 3)	2.5	V_{IL} = 0V V_{IH} = V_{CC}		2.05		V
		3.3			2.65		

1) Number of outputs defined as "n". Measured with "n-1" outputs switching from HIGH to LOW or LOW to HIGH. The remaining output is measured in the LOW state.
2) Number of outputs defined as "n". Measured with "n-1" outputs switching from HIGH to LOW or LOW to HIGH. The remaining output is measured in the HIGH state.
3) Parameters guaranteed by design.

Table 9: AC Electrical Characteristics (C_L = 30pF, R_L = 500Ω, Input t_r = t_f = 2.0ns)

Symbol	Parameter	Test Condition		Value		Unit
		V_{CC} (V)		-55 to 125 °C		
				Min.	Max.	
t_{PLH} t_{PHL}	Propagation Delay Time	2.3 to 2.7		1.0	5.2	ns
		3.0 to 3.6		0.8	5.0	
t_{PZL} t_{PZH}	Output Enable Time	2.3 to 2.7		1.0	5.8	ns
		3.0 to 3.6		0.8	4.2	
t_{PLZ} t_{PHZ}	Output Disable Time	2.3 to 2.7		1.0	4.5	ns
		3.0 to 3.6		0.8	4.0	
t_{OSLH} t_{OSHL}	Output To Output Skew Time (note1, 2)	2.3 to 2.7			0.5	ns
		3.0 to 3.6			0.5	

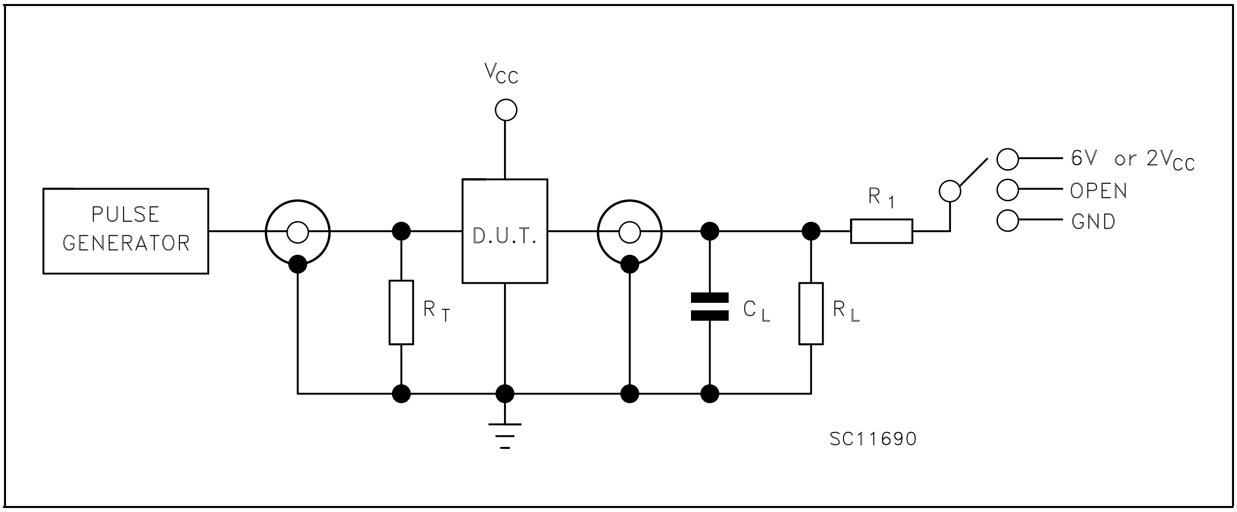
1) Skew is defined as the absolute value of the difference between the actual propagation delay for any two outputs of the same device switching in the same direction, either HIGH or LOW (t_{OSLH} = | t_{PLHm} - t_{PLHn}|, t_{OSHL} = | t_{PHLm} - t_{PHLn}|)
2) Parameter guaranteed by design

Table 10: Capacitive Characteristics

Symbol	Parameter	Test Condition		Value			Unit
		V_{CC} (V)		T_A = 25 °C			
				Min.	Typ.	Max.	
C_{IN}	Input Capacitance	2.5 or 3.3	V_{IN} = 0 or V_{CC}		6		pF
C_{OUT}	Output Capacitance	2.5 or 3.3	V_{IN} = 0 or V_{CC}		7		pF
C_{PD}	Power Dissipation Capacitance (note 1)	2.5 or 3.3	f_{IN} = 10MHz V_{IN} = 0 or V_{CC}		20		pF

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} x V_{CC} x f_{IN} + I_{CC}/16 (per circuit)

Figure 4: Test Circuit



TEST	SWITCH
t_{PLH}, t_{PHL}	Open
t_{PZL}, t_{PLZ} (V_{CC} = 3.0 to 3.6V)	6V
t_{PZL}, t_{PLZ} (V_{CC} = 2.3 to 2.7V)	$2V_{CC}$
t_{PZH}, t_{PHZ}	GND

C_L = 30 pF or equivalent (includes jig and probe capacitance)
R_L = R1 = 500Ω or equivalent
R_T = Z_{OUT} of pulse generator (typically 50Ω)

Table 11: Waveform Symbol Values

Symbol	V_{CC}	
	3.0 to3.6V	**2.3 to 2.7V**
V_{IH}	2.7V	V_{CC}
V_M	1.5V	$V_{CC}/2$
V_X	V_{OL} + 0.3V	V_{OL} + 0.15V
V_Y	V_{OH} - 0.3V	V_{OH} - 0.15V

Figure 5: Waveform - Propagation Delays (f=1MHz; 50% duty cycle)

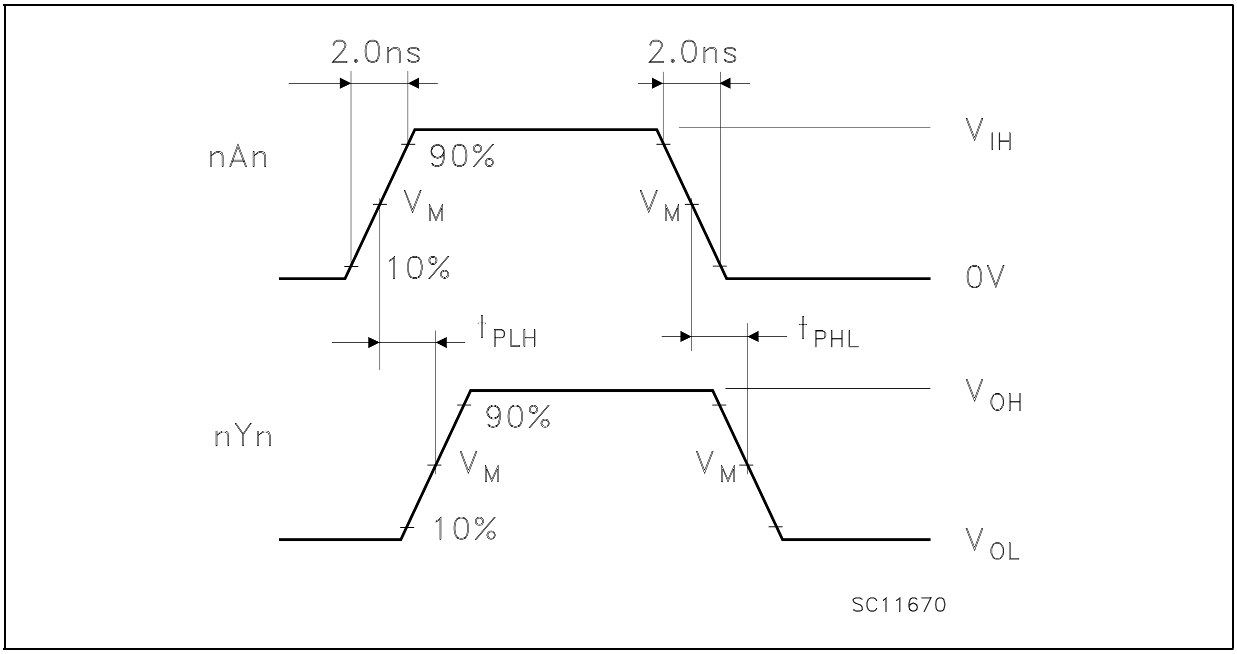
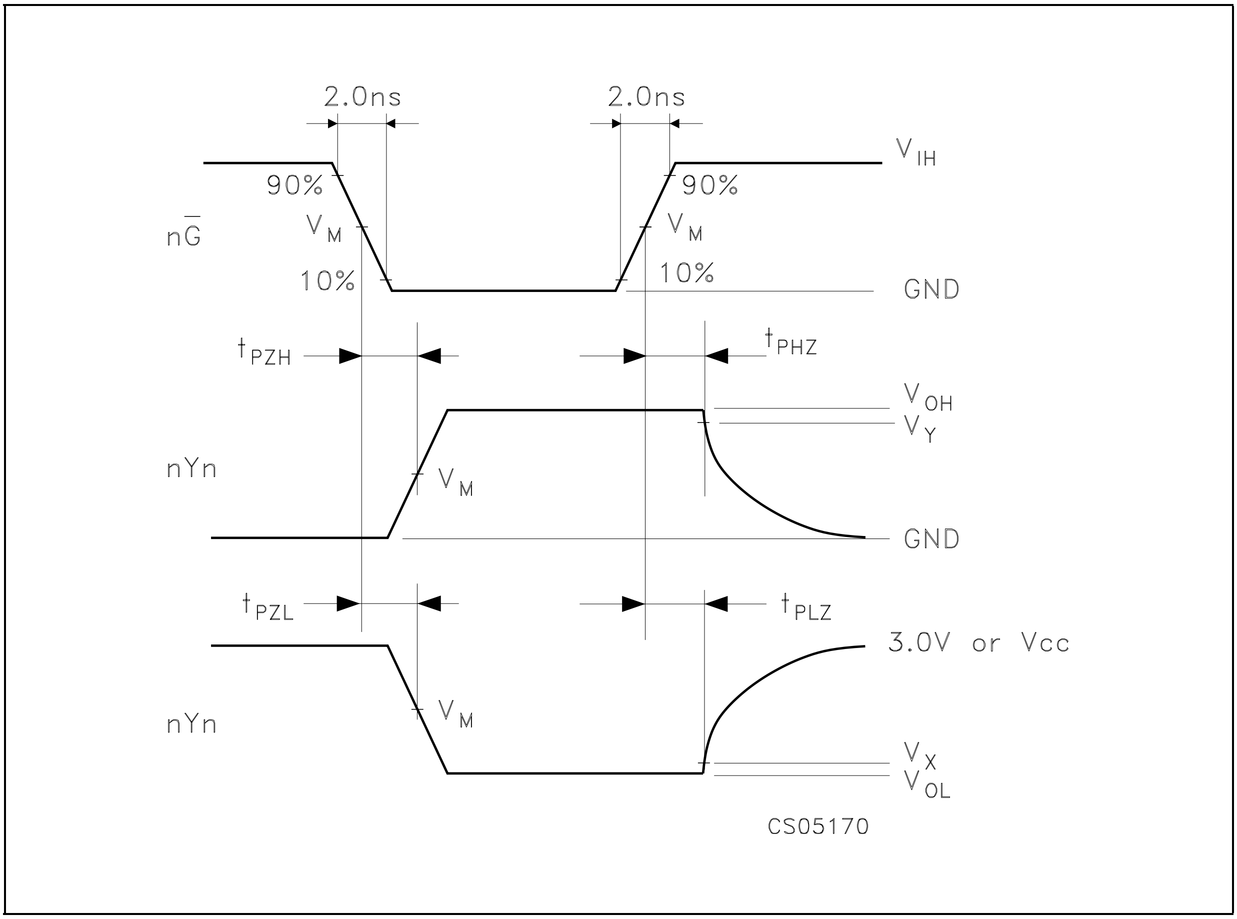


Figure 6: Waveform - Output Enable And Disable Time (f=1MHz; 50% duty cycle)



FLAT-48 (MIL-STD-1835) MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	2.18		2.72	0.086		0.107
b		0.254			0.010	
c		0.15			0.006	
D		15.75			0.620	
E		9.65			0.380	
E2		6.35			0.250	
e		0.635			0.025	
L		8.38			0.330	
Q	0.66		1.14	0.026		0.045
S1		0.13			0.005	

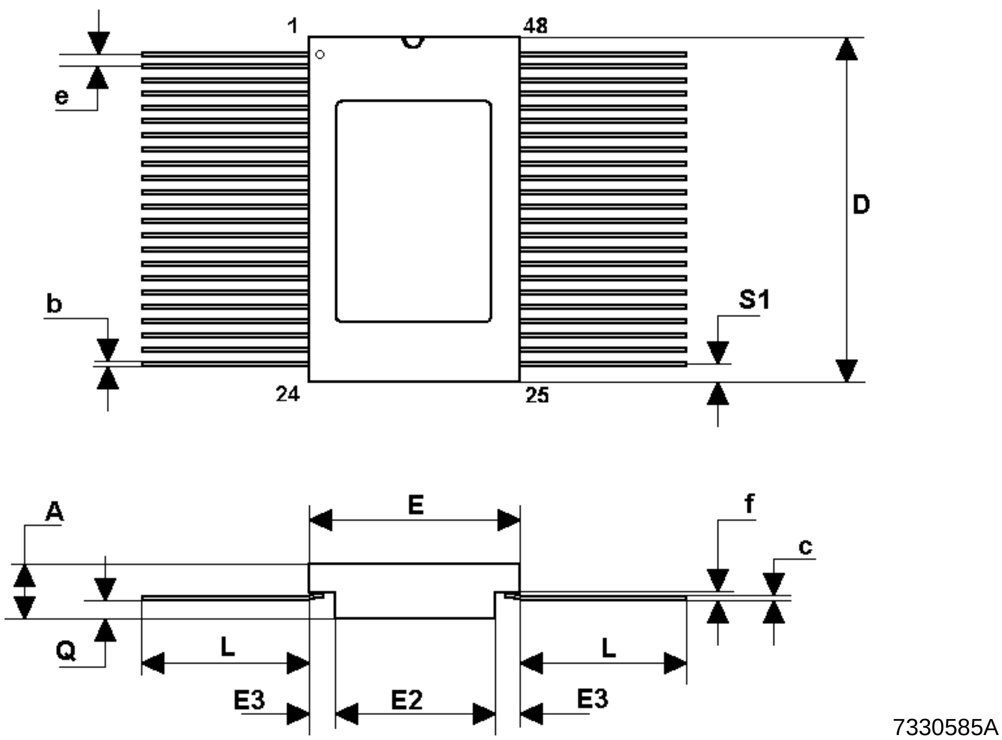


Table 12: Revision History

Date	Revision	Description of Changes
09-Jul-2004	1	First Release
17-May-2005	2	SMD Qualified.