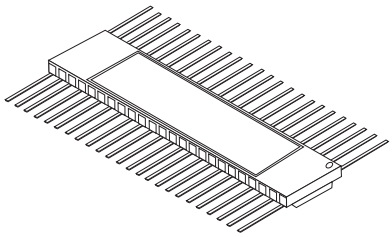
54VCXH162244

Low voltage CMOS 16-bit bus buffer (3-state non inverter) with 3.6 V tolerant inputs and outputs

Features

- 1.65 to 3.6 V inputs and outputs
- High speed:
  - t_{PD} = 3.4 ns at V_{CC} = 3.0 to 3.6 V
  - t_{PD} = 3.8 ns at V_{CC} = 2.3 to 2.7 V
- Power down protection on inputs and outputs
- Symmetrical output impedance:
  - $|I_{OH}| = I_{OL}$ = 12 mA (Min.) at V_{CC} = 3.0 V
  - $|I_{OH}| = I_{OL}$ = 8 mA (Min.) at V_{CC} = 2.3 V
- 26 Ω serie resistors in outputs
- Operating voltage range:
  - V_{CC}(Opr) = 1.65 V to 3.6 V
- Pin and function compatible with 54 series H162244
- Bus hold provided on data inputs
- Cold spare function
- Latch-up performance exceeds 300 mA (JESD 17)
- ESD performance:
  - HBM > 2000 V (Mil Std 883 Method 3015); MM > 200 V
- 300 krad Mil1019.6 condition A, (RHA QML qualification extension undergone)
- No SEL, no SEU and no SET under 110 Mev/cm2/mg LET heavy ions irradiation
- QML qualified product
- SMD 5962-05210
- 100 mV typical input hysteresis



Flat-48

The upper metallic lid is not electrically connected to any pins, nor to the IC die inside the package.

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 C²MOS technology. It is ideal for low power and very high speed 1.65 to 3.6 V applications; it can be interfaced to 3.6 V 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 26 Ω series resistance in the outputs. These resistors permit to reduce line noise in high speed applications. All inputs and outputs are equipped with protection circuits against static discharge, giving them 2 kV ESD immunity and transient excess voltage.

Contents

1 Logic symbols and I/O equivalent circuit

Figure 1. IEC logic symbols

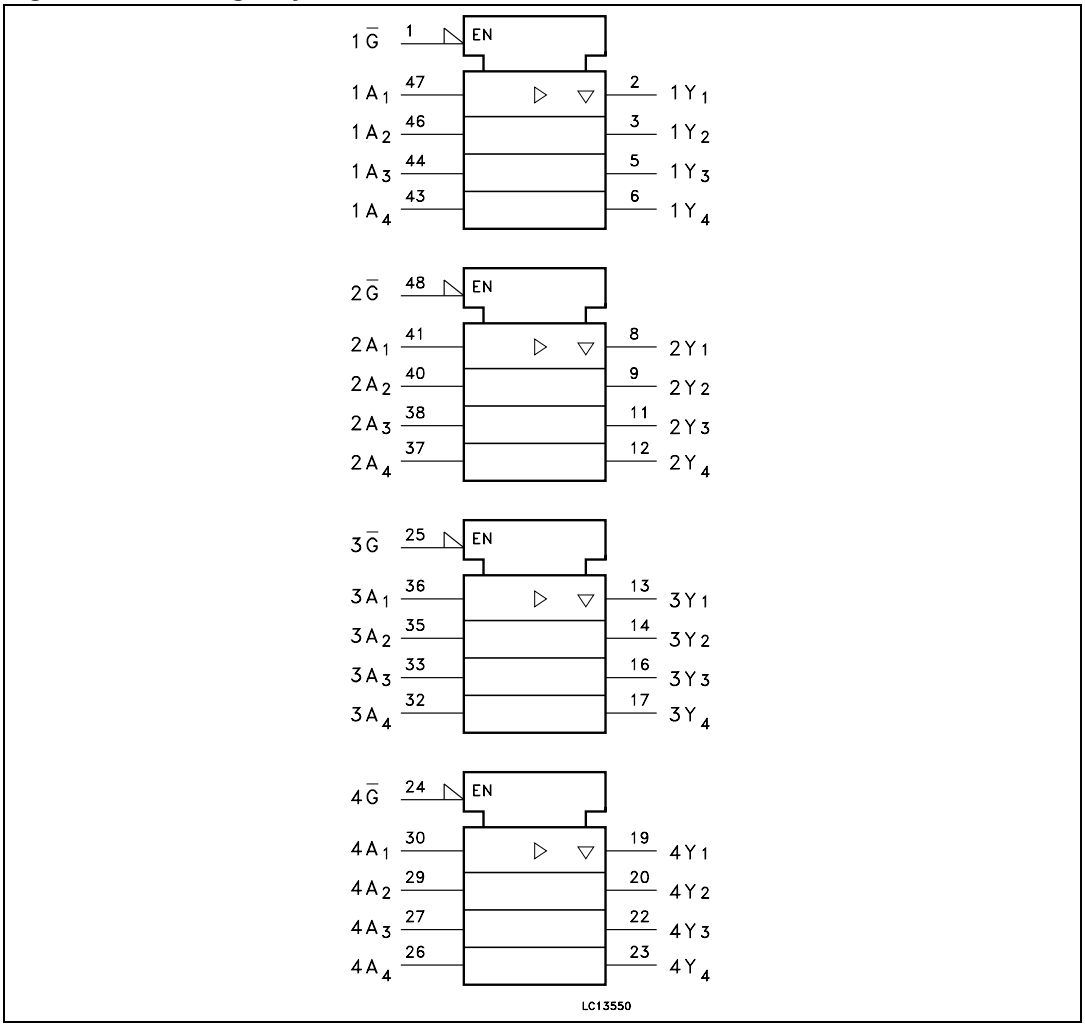
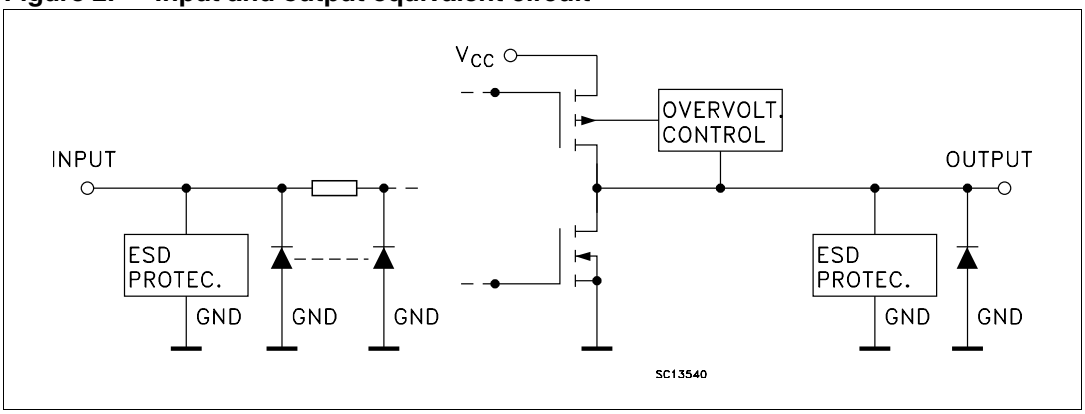


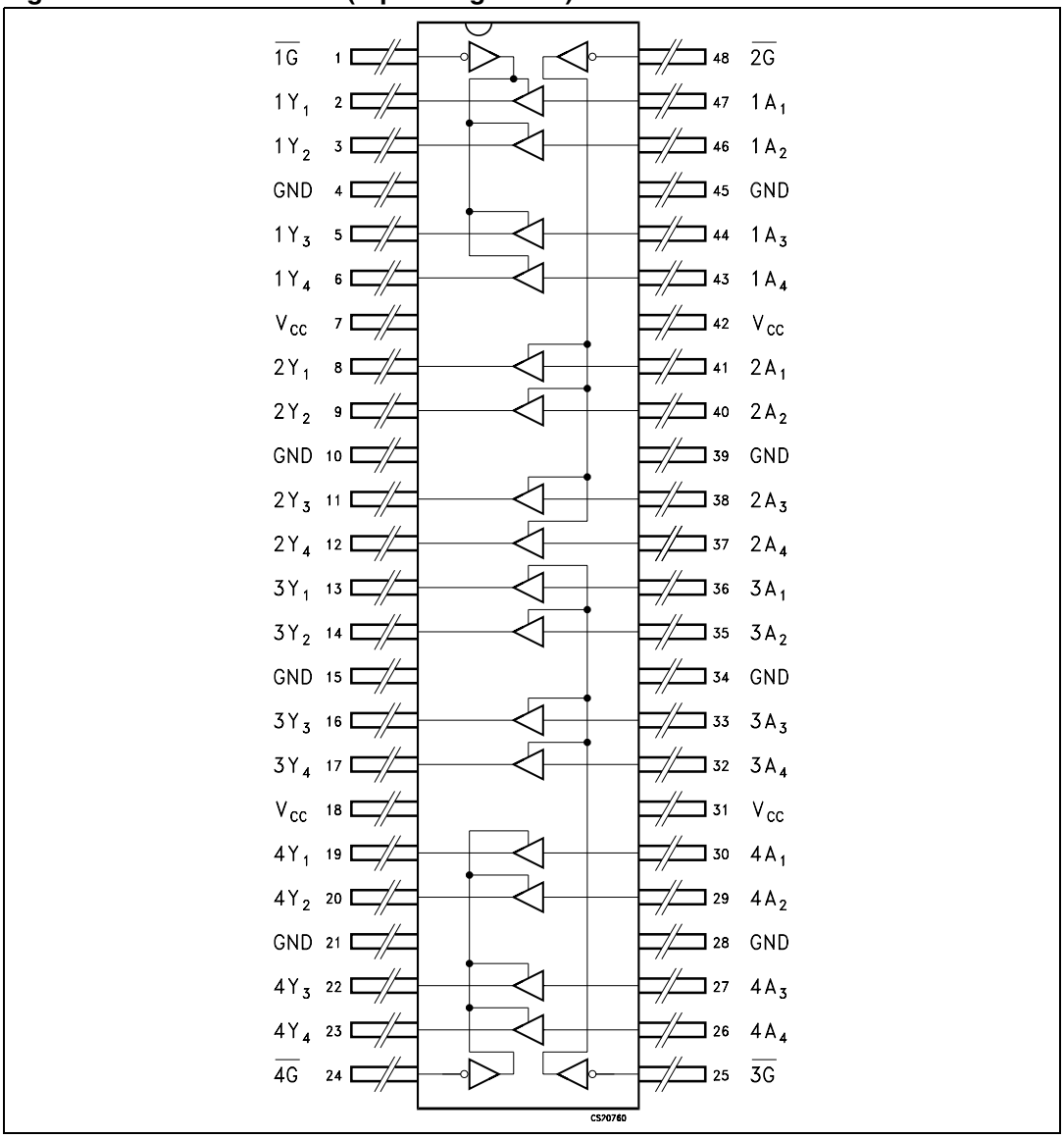
Figure 2. Input and output equivalent circuit



2 Pin settings

2.1 Pin connection

Figure 3. Pin connection (top through view)



2.2 Pin description

Table 1. 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 (0 V)
7, 18, 31, 42	V_{CC}	Positive supply voltage

2.3 Truth table

Table 2. Truth table

Inputs		Output
G	**An**	**Yn**
L	L	L
L	H	H
H	X	Z

Note: X = Do not care; Z = High impedance

3 Maximum rating

Stressing the device above the rating listed in the “absolute maximum ratings” table may cause permanent damage to the device. These are stress ratings only and operation of the device at these or any other conditions above those indicated in the operating sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Table 3. 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) (1)	-0.5 to V_{CC} + 0.5	V
I_{IK}	DC input diode current	- 50	mA
I_{OK}	DC output diode current (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

1. I_O absolute maximum rating must be observed
2. $V_O < GND$, $V_O > V_{CC}$

3.1 Recommended operating conditions

Table 4. Recommended operating conditions

Symbol	Parameter	Value	Unit
V_{CC}	Supply voltage	1.8 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 3.6 V)	± 12	mA
I_{OH}, I_{OL}	High or low level output current (V_{CC} = 2.3 to 2.7 V)	± 8	mA
T_{op}	Operating temperature	-55 to 125	°C
dt/dv	Input rise and fall time (1)	0 to 10	ns/V

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

4 Electrical characteristics

2.7 V < V_{CC} < 3.6 V unless otherwise specified

Table 5. DC specifications

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 = 0.8 V	75		µA
			V_I = 2 V	-75		
		3.6	V_I = 0 to 3.6 V		± 500	
I_{off}	Power off leakage current	0	V_I or V_O = 0 to 3.6 V		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 3.6 V		± 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 3.6 V		± 20	
ΔI_{CC}	I_{CC} incr. per input	2.7 to 3.6	V_{IH} = V_{CC} - 0.6 V		750	µA

2.3 V < V_{CC} < 2.7 V unless otherwise specified

Table 6. DC specifications

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 = 0.7 V	45		µA
			V_I = 1.7 V	-45		
I_{off}	Power off leakage current	0	V_I or V_O = 0 to 3.6 V		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 3.6 V		± 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 3.6 V		± 20	

T_A = 25 °C, Input $t_r = t_f$ = 2.0 ns, C_L = 30 pF, R_L = 500 Ω

Table 7. Dynamic switching characteristics

Symbol	Parameter	Test condition		Value	Unit
		V_{CC} (V)		T_A = 25 °C	
V_{OLP}	Dynamic low voltage quiet output (1) (2)	2.5	V_{IL} = 0V V_{IH} = V_{CC}	0.25	V
		3.3		0.35	
V_{OLV}	Dynamic low voltage quiet output (1) (2)	2.5	V_{IL} = 0V V_{IH} = V_{CC}	-0.25	V
		3.3		-0.35	
V_{OHV}	Dynamic high voltage quiet output (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. Parameters guaranteed by design.
3. 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.

C_L = 30 pF, R_L = 500 Ω, Input $t_r = t_f$ = 2.0 ns

Table 8. AC electrical characteristics

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 (1) (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 9. Capacitive characteristics

Symbol	Parameter	Test condition		Value	Unit
		V_{CC} (V)		T_A = 25 °C	
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 (1)	2.5 or 3.3	f_{IN} = 10 MHz 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. $I_{CC(opr)} = C_{PD} \times V_{CC} \times f_{IN} + I_{CC}/16$ (per circuit)

5 Test circuit

Figure 4. Application circuit

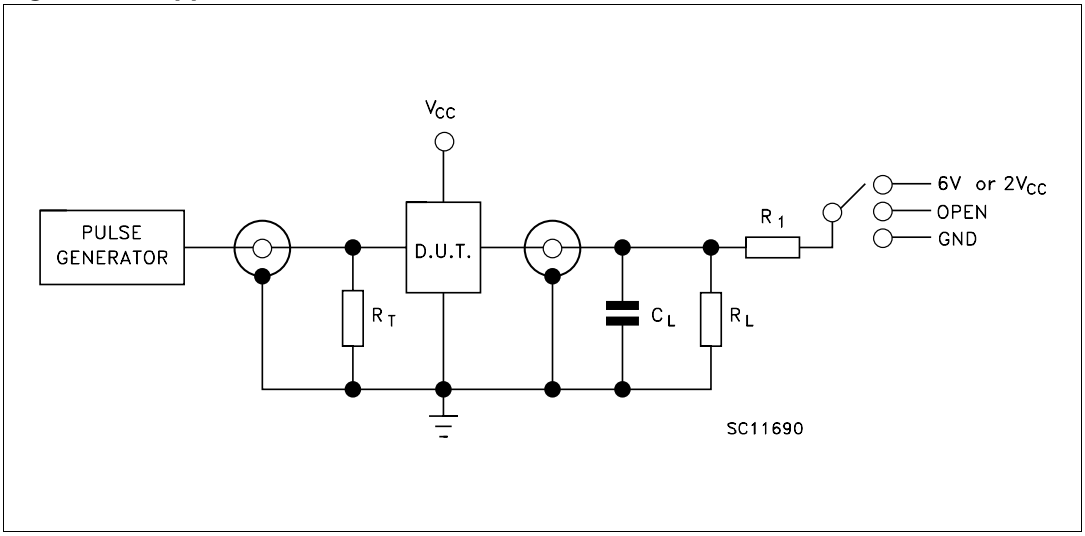


Table 10. Test circuit

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

C_L = 10/30 pF or equivalent (includes jig and probe capacitance)

R_L = R_1 = 500 Ω or equivalent

R_T = Z_{OUT} of pulse generator (typically 50 Ω)

6 Waveforms

Table 11. Waveform symbol value

Symbol	V_{CC}	
	3.0 to 3.6 V	2.3 to 2.7 V
V_{IH}	2.7 V	V_{CC}
V_M	1.5 V	$V_{CC}/2$
V_X	V_{OL} +0.3 V	V_{OL} +0.15 V
V_Y	V_{OH} -0.3 V	V_{OH} -0.15 V

Figure 5. Waveform - propagation delay (f = 1 MHz; 50% duty cycle)

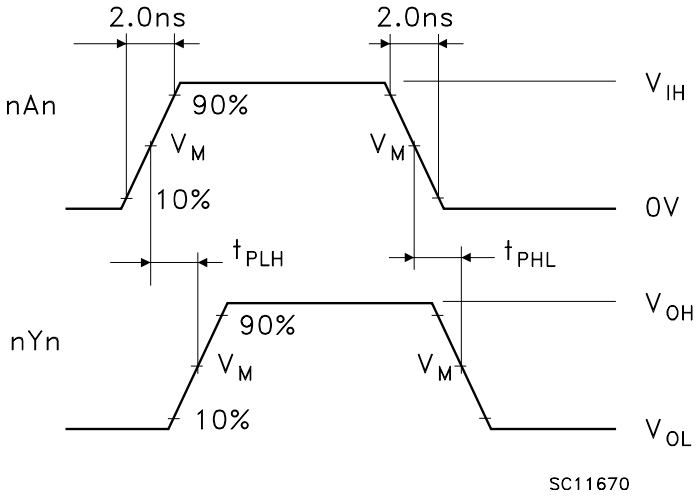
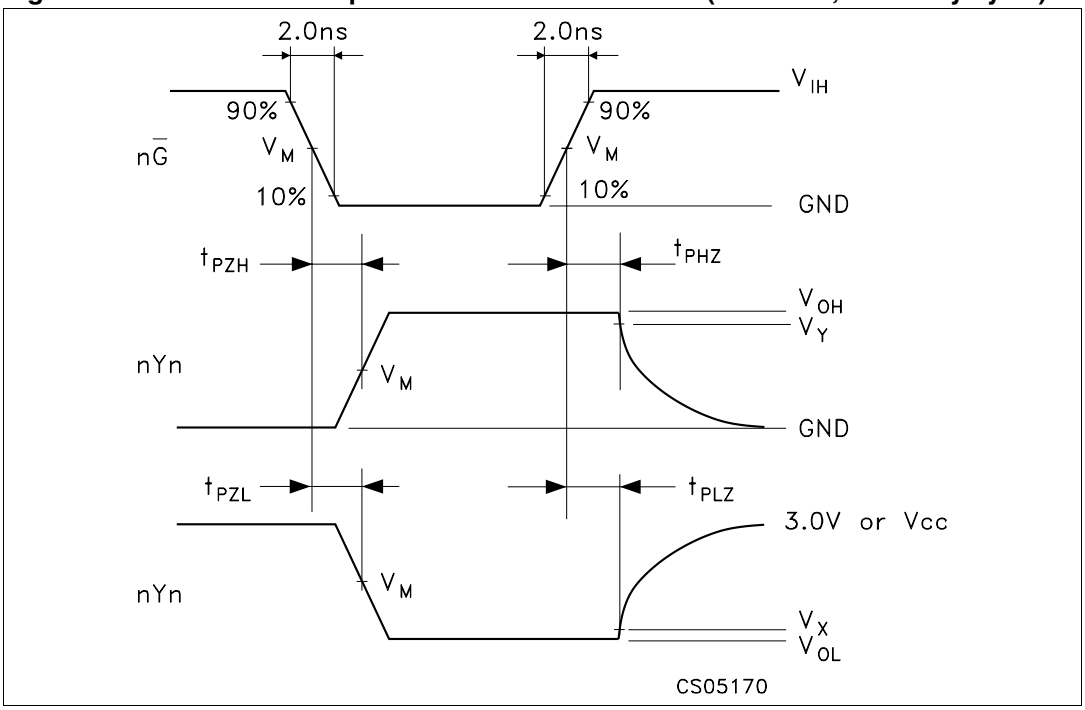


Figure 6. Waveform - output enable and disable time (f = 1 MHz; 50% duty cycle)



7 Package mechanical data

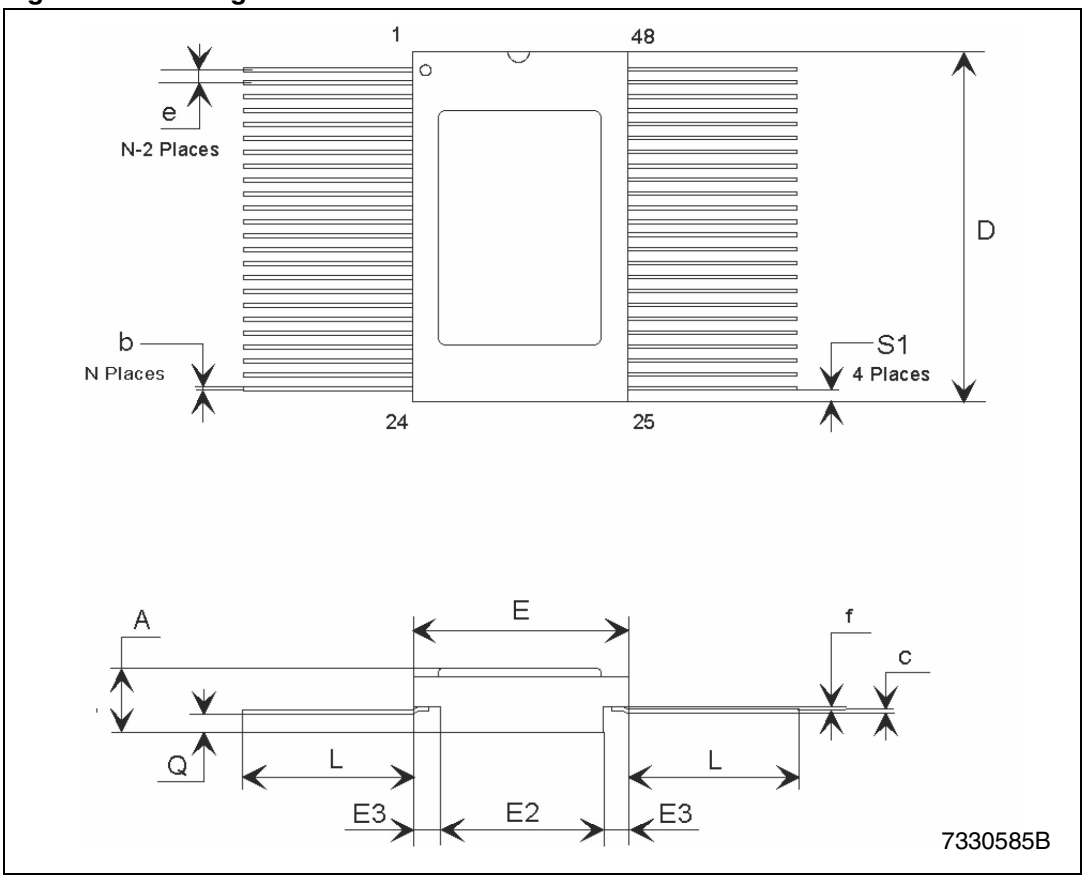
54VCXH162245 products are supplied into ceramic body / metal lid hermetic Flat 48-pin space package

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: *www.st.com*. ECOPACK® is an ST trademark.

Table 12. Flat-48 (MIL-STD-1835) mechanical data

Dim.	mm			inch		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	2.18	2.47	2.72	0.086	0.097	0.107
b	0.20	0.254	0.30	0.008	0.010	0.012
c	0.12	0.15	0.18	0.005	0.006	0.007
D	15.57	15.75	15.92	0.613	0.620	0.627
E	9.52	9.65	9.78	0.375	0.380	0.385
E2	6.22	6.35	6.48	0.245	0.250	0.255
E3	1.52	1.65	1.78	0.060	0.065	0.070
e		0.635			0.025	
f		0.20			0.008	
L	6.85	8.38	9.40	0.270	0.330	0.370
Q	0.66	0.79	0.92	0.026	0.031	0.036
S1	0.25	0.43	0.61	0.010	0.017	0.024

Figure 7. Package dimension



Note: The upper metallic lid is not electrically connected to any pins, nor to the IC die inside the package. Connecting unused pins or metal lid to ground or to the power supply will not affect the electrical characteristics.

8 Order codes

Table 13. Ordering information

Package	Min op. voltage	Lead finish	Radiation level	Flight models	Engineering model	Packing
				QML-V		
48-pin flat	1.8V	gold plated	300 krad	RHFXH162244K03V	RHRXH162244K1	Conductive strip pack
Die	3.6V to 1.8V	-	100 krad	RXH162244DIE2V		

9 Revision history

Table 14. Document revision history

Date	Revision	Changes
09-Jul-2004	1	First release
17-May-2005	2	SMD qualified
19-Jun-2006	3	300 krad bullet updated, new template, mechanical data updated
11-Apr-2007	4	Updated cover page features
30-Jul-2007	5	Typo in *Table 12 on page 14*
17-Sep-2008	6	Updated cover page
09-Jan-2009	7	Updated cover page
23-Sep-2009	8	Updated *Table 13 on page 16*
29-Jul-2011	9	Added *Note: on page 15* and in the "Pin connections" diagram on the coverpage

Please Read Carefully:

Information in this document is provided solely in connection with ST products. STMicroelectronics NV and its subsidiaries (“ST”) reserve the right to make changes, corrections, modifications or improvements, to this document, and the products and services described herein at any time, without notice.

All ST products are sold pursuant to ST’s terms and conditions of sale.

Purchasers are solely responsible for the choice, selection and use of the ST products and services described herein, and ST assumes no liability whatsoever relating to the choice, selection or use of the ST products and services described herein.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted under this document. If any part of this document refers to any third party products or services it shall not be deemed a license grant by ST for the use of such third party products or services, or any intellectual property contained therein or considered as a warranty covering the use in any manner whatsoever of such third party products or services or any intellectual property contained therein.

UNLESS OTHERWISE SET FORTH IN ST’S TERMS AND CONDITIONS OF SALE ST DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY WITH RESPECT TO THE USE AND/OR SALE OF ST PRODUCTS INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION), OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT.

UNLESS EXPRESSLY APPROVED IN WRITING BY TWO AUTHORIZED ST REPRESENTATIVES, ST PRODUCTS ARE NOT RECOMMENDED, AUTHORIZED OR WARRANTED FOR USE IN MILITARY, AIR CRAFT, SPACE, LIFE SAVING, OR LIFE SUSTAINING APPLICATIONS, NOR IN PRODUCTS OR SYSTEMS WHERE FAILURE OR MALFUNCTION MAY RESULT IN PERSONAL INJURY, DEATH, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE. ST PRODUCTS WHICH ARE NOT SPECIFIED AS "AUTOMOTIVE GRADE" MAY ONLY BE USED IN AUTOMOTIVE APPLICATIONS AT USER’S OWN RISK.

Resale of ST products with provisions different from the statements and/or technical features set forth in this document shall immediately void any warranty granted by ST for the ST product or service described herein and shall not create or extend in any manner whatsoever, any liability of ST.

ST and the ST logo are trademarks or registered trademarks of ST in various countries.

Information in this document supersedes and replaces all information previously supplied.

The ST logo is a registered trademark of STMicroelectronics. All other names are the property of their respective owners.

STMicroelectronics group of companies

Australia - Belgium - Brazil - Canada - China - Czech Republic - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan - Malaysia - Malta - Morocco - Philippines - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States of America

www.st.com

X-ON Electronics

Largest Supplier of Electrical and Electronic Components

Click to view similar products for Buffers & Line Drivers ***category:***

Click to view products by STMicroelectronics ***manufacturer:***

Other Similar products are found below :

5962-9217601MSA 634810D 875140G HEF4022BP HEF4043BP NL17SG125DFT2G NL17SZ126P5T5G NLU1GT126CMUTCG NLU3G16AMX1TCG NLV27WZ125USG MC74HCT365ADTR2G BCM6306KMLG 54FCT240CTDB Le87401NQC Le87402MQC 028192B 042140C 051117G 070519XB 065312DB 091056E 098456D NL17SG07DFT2G NL17SG17DFT2G NL17SG34DFT2G NL17SZ07P5T5G NL17SZ125P5T5G NLU1GT126AMUTCG NLV27WZ16DFT2G 5962-8982101PA 5962-9052201PA 74LVC07ADR2G MC74VHC1G125DFT1G NL17SH17P5T5G NL17SZ125CMUTCG NLV17SZ07DFT2G NLV37WZ17USG NLVHCT244ADTR2G NC7WZ17FHX 74HCT126T14-13 NL17SH125P5T5G NLV14049UBDTR2G NLV37WZ07USG 74VHC541FT(BE) RHFAC244K1 74LVC1G17FW4-7 74LVC1G126FZ4-7 BCM6302KMLG 74LVC1G07FZ4-7 74LVC1G125FW4-7