

DATA SHEET

CBT16210

20-bit bus switch with 10-bit output enables

Product specification
Supersedes data of 2000 Sep 25

2000 Oct 12

20-bit bus switch with 10-bit output enables

CBT16210

FEATURES

- 5Ω switch connection between two ports
- TTL compatible control input levels
- Package options include shrink small outline (SSOP) and thin shrink small outline (TSSOP)
- ESD exceeds: CDM 1000 V; HBM 2000 V

DESCRIPTION

The CBT16210 provides 20 bits of high-speed TTL-compatible bus switching. The low on-state resistance of the switch allows connections to be made with minimal propagation delay.

The device is organized as a dual 10-bit bus switch with separate output-enable (\overline{OE}) inputs. It can be used as two 10-bit bus switches or as one 20-bit bus switch. When \overline{OE} is low, the associated 10-bit bus switch is on, and port A is connected to port B. When \overline{OE} is high, the switch is open, and a high-impedance state exists between the ports.

The CBT16210 is characterized for operation from -40°C to $+85^{\circ}\text{C}$.

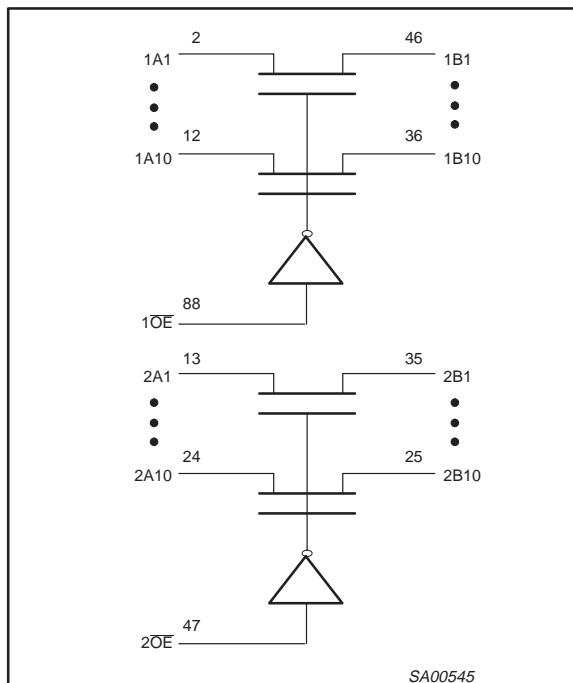
QUICK REFERENCE DATA

| SYMBOL | PARAMETER | CONDITIONS $T_{\text{amb}} = 25^{\circ}\text{C}$; $\text{GND} = 0\text{V}$ | TYPICAL | UNIT |
|--------------------------------------|----------------------------------|--|---------|---------------|
| t_{PLH} t_{PHL} | Propagation delay An to Y_n | $C_L = 50\text{pF}$; $V_{\text{CC}} = 5\text{V}$ | 0.25 | ns |
| C_{IN} | Input capacitance | $V_I = 0\text{V}$ or V_{CC} | 4.3 | pF |
| C_{OUT} | Output capacitance | Outputs disabled; $V_O = 0\text{V}$ or V_{CC} | 6.9 | pF |
| I_{CCZ} | Total supply current | Outputs disabled; $V_{\text{CC}} = 5.5\text{V}$ | 4.0 | μA |

ORDERING INFORMATION

| PACKAGES | TEMPERATURE RANGE | ORDER CODE | DWG NUMBER |
|------------------------------|--|--------------|------------|
| 48-Pin Plastic SSOP Type III | -40°C to $+85^{\circ}\text{C}$ | CBT16210 DL | SOT370-1 |
| 48-Pin Plastic TSSOP Type II | -40°C to $+85^{\circ}\text{C}$ | CBT16210 DGG | SOT362-1 |

LOGIC SYMBOL



FUNCTION TABLE

| INPUTS | | OUTPUTS | |
|------------------|------------------|---------|---------|
| $1\overline{OE}$ | $2\overline{OE}$ | 1A, 1B | 2A, 2B |
| L | L | 1A = 1B | 2A = 2B |
| L | H | 1A = 1B | Z |
| H | L | Z | 2A = 2B |
| H | H | Z | Z |

H = High voltage level

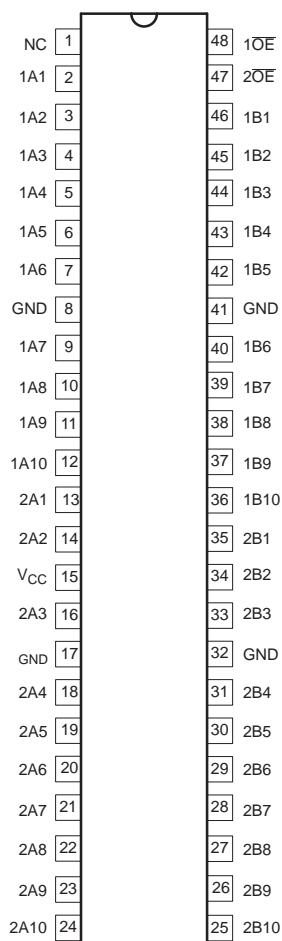
L = Low voltage level

Z = High impedance "off" state

20-bit bus switch with 10-bit output enables

CBT16210

PIN CONFIGURATION



PIN DESCRIPTION

| PIN NUMBER | SYMBOL | NAME AND FUNCTION |
|--|----------|-------------------------|
| 1 | NC | No internal connection |
| 48, 47 | 1OE, 2OE | Output enables |
| 2, 3, 4, 5, 6, 7, 9, 10, 11, 12 | 1A1-1A10 | Inputs |
| 46, 45, 44, 43, 42, 40, 39, 38, 37, 36 | 1B1-1B10 | Outputs |
| 13, 14, 16, 18, 19, 20, 21, 22, 23, 24 | 2A1-2A10 | Inputs |
| 35, 34, 33, 31, 30, 29, 28, 27, 26, 25 | 2B1-2B10 | Outputs |
| 8, 17, 32, 41 | GND | Ground (0V) |
| 15 | VCC | Positive supply voltage |

20-bit bus switch with 10-bit output enables

CBT16210

ABSOLUTE MAXIMUM RATINGS^{1, 2}

| SYMBOL | PARAMETER | CONDITIONS | RATING | UNIT |
|-----------|--------------------------------|-----------------------------|--------------|------|
| V_{CC} | DC supply voltage | | -0.5 to +7.0 | V |
| I_{IK} | DC input diode current | $V_I < 0$ | -50 | mA |
| V_I | DC input voltage ³ | | -0.5 to +7.0 | V |
| V_{OUT} | DC output voltage ³ | output in Off or High state | -0.5 to +5.5 | V |
| I_{OUT} | DC output current | output in Low state | 128 | mA |
| T_{stg} | Storage temperature range | | -65 to 150 | °C |

NOTES:

1. Stresses beyond those listed 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 performance capability of a high-performance integrated circuit in conjunction with its thermal environment can create junction temperatures which are detrimental to reliability. The maximum junction temperature of this integrated circuit should not exceed 150°C.
3. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

RECOMMENDED OPERATING CONDITIONS

| SYMBOL | PARAMETER | LIMITS | | UNIT |
|-----------|--------------------------------------|--------|-----|------|
| | | Min | Max | |
| V_{CC} | DC supply voltage | 4.5 | 5.5 | V |
| V_{IH} | High-level input voltage | 2.0 | | V |
| V_{IL} | Low-level Input voltage | | 0.8 | V |
| T_{amb} | Operating free-air temperature range | -40 | +85 | °C |

DC ELECTRICAL CHARACTERISTICS

| SYMBOL | PARAMETER | TEST CONDITIONS | LIMITS | | | UNIT | |
|-----------------|--|--|--|------------------|---------|---------------|--|
| | | | $T_{amb} = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ | | | | |
| | | | Min | Typ ¹ | Max | | |
| V_{IK} | Input clamp voltage | $V_{CC} = 4.5 \text{ V}$; $I_I = -18 \text{ mA}$ | | | -1.2 | V | |
| V_P | Output high pass voltage | $V_{in} - V_{CC} = 5.0 \text{ V}$, $I_{OUT} = -100 \mu\text{A}$ | 3.4 | 3.6 | 3.9 | V | |
| I_I | Input leakage current | $V_{CC} = 0 \text{ V}$; $V_I = 5.5 \text{ V}$ | | | 10 | μA | |
| | | $V_{CC} = 5.5 \text{ V}$; $V_I = \text{GND}$ or 5.5 V | | | ± 1 | | |
| I_{CC} | Quiescent supply current ² | $V_{CC} = 5.5 \text{ V}$; $I_O = 0$, $V_I = V_{CC}$ or GND ; $\overline{OE} = \text{GND}$ | | | 20 | μA | |
| ΔI_{CC} | Additional supply current per input pin ² | $V_{CC} = 5.5 \text{ V}$, one input at 3.4 V , other inputs at V_{CC} or GND | | | 2.5 | mA | |
| C_I | Control pins | $V_I = 3 \text{ V}$ or 0 | | 4.5 | | pF | |
| $C_{IO(OFF)}$ | Port capacitance in off state | $V_O = 3 \text{ V}$ or 0 , $\overline{OE} = V_{CC}$ | | 6.9 | | pF | |
| r_{on}^3 | | $V_{CC} = 4.5 \text{ V}$; $V_I = 0 \text{ V}$; $I_I = 64 \text{ mA}$ | | 5 | 7 | Ω | |
| | | $V_{CC} = 4.5 \text{ V}$; $V_I = 0 \text{ V}$; $I_I = 30 \text{ mA}$ | | 5 | 7 | | |
| | | $V_{CC} = 4.5 \text{ V}$; $V_I = 2.4 \text{ V}$; $I_I = -15 \text{ mA}$ | | 10 | 15 | | |

NOTES:

1. All typical values are at $V_{CC} = 5 \text{ V}$, $T_{amb} = 25^{\circ}\text{C}$
2. This is the increase in supply current for each input that is at the specified TTL voltage level rather than V_{CC} or GND
3. Measured by the voltage drop between the A and the B terminals at the indicated current through the switch.
On-state resistance is determined by the lowest voltage of the two (A or B) terminals.

20-bit bus switch with 10-bit output enables

CBT16210

AC CHARACTERISTICS

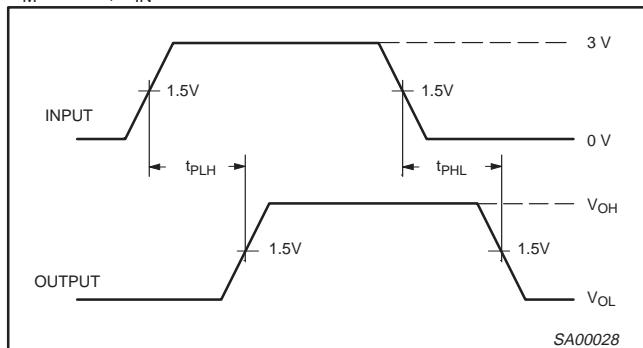
 $GND = 0 \text{ V}$; t_R ; $C_L = 50 \text{ pF}$

| SYMBOL | PARAMETER DESCRIPTION | LIMITS | | | UNITS |
|-----------|-------------------------------------|--------|------|-----|-------|
| | | Min | Mean | Max | |
| t_{pd} | Propagation delay ¹ | | | 250 | ps |
| t_{PZH} | Output enable time to HIGH level | 1.5 | 3.3 | 5.0 | ns |
| t_{PHZ} | Output disable time from HIGH level | 1.0 | 2.4 | 4.5 | ns |
| t_{PZL} | Output enable time to LOW level | 1.5 | 4.0 | 6.5 | ns |
| t_{PLZ} | Output disable time from LOW level | 1.5 | 3.8 | 6.0 | ns |

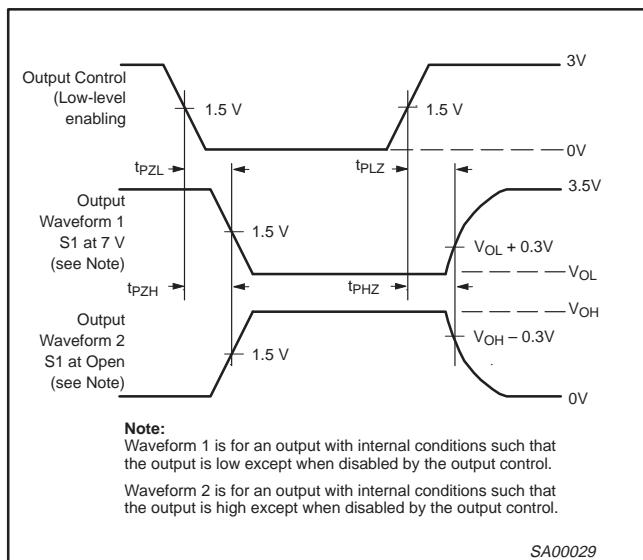
NOTES:

1. This parameter is warranted but not production tested. The propagation delay is based on the RC time constant of the typical on-state resistance of the switch and a load capacitance of 50 pF, when driven by an ideal voltage source (zero output impedance).

AC WAVEFORMS

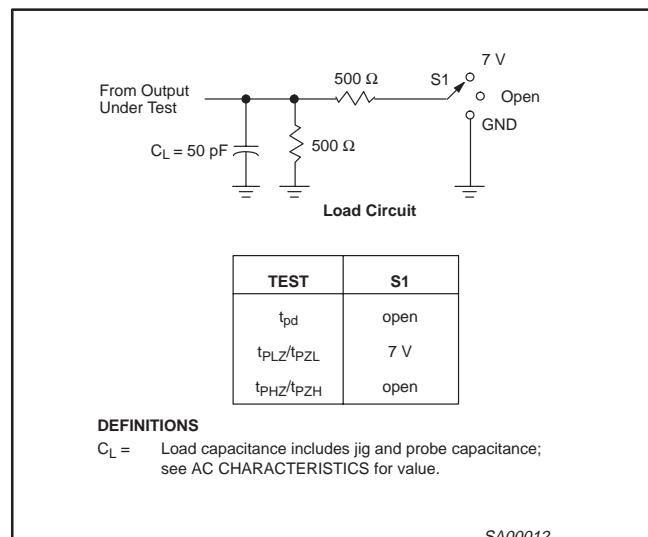
 $V_M = 1.5 \text{ V}$, $V_{IN} = \text{GND to } 3.0 \text{ V}$ 

Waveform 1. Input (An) to Output (Yn) Propagation Delays



Waveform 2. 3-State Output Enable and Disable Times

TEST CIRCUIT AND WAVEFORMS



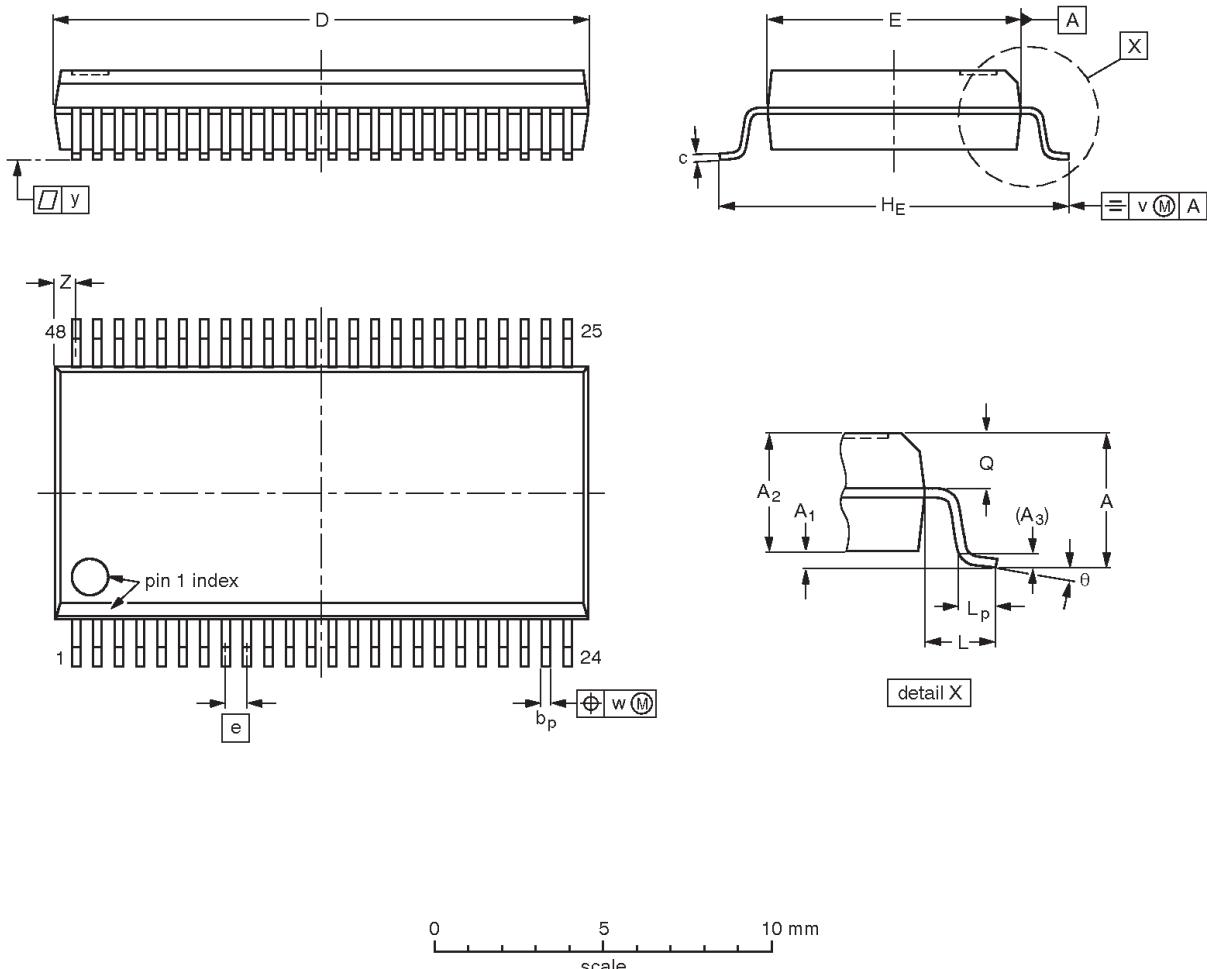
SA00012

20-bit bus switch with 10-bit output enables

CBT16210

SSOP48: plastic shrink small outline package; 48 leads; body width 7.5 mm

SOT370-1



DIMENSIONS (mm are the original dimensions)

| DIMENSIONS (mm are the original dimensions) | | | | | | | | | | | | | | | | | | |
|---|-------------------|----------------|----------------|----------------|----------------|--------------|------------------|------------------|-------|----------------|-----|----------------|------------|------|------|-----|------------------|----------|
| UNIT | A _{max.} | A ₁ | A ₂ | A ₃ | b _p | c | D ⁽¹⁾ | E ⁽¹⁾ | e | H _E | L | L _p | Q | v | w | y | Z ⁽¹⁾ | θ |
| mm | 2.8 | 0.4 0.2 | 2.35 2.20 | 0.25 | 0.3 0.2 | 0.22 0.13 | 16.00 15.75 | 7.6 7.4 | 0.635 | 10.4 10.1 | 1.4 | 1.0 0.6 | 1.2 1.0 | 0.25 | 0.18 | 0.1 | 0.85 0.40 | 8° 0° |

Note

1. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

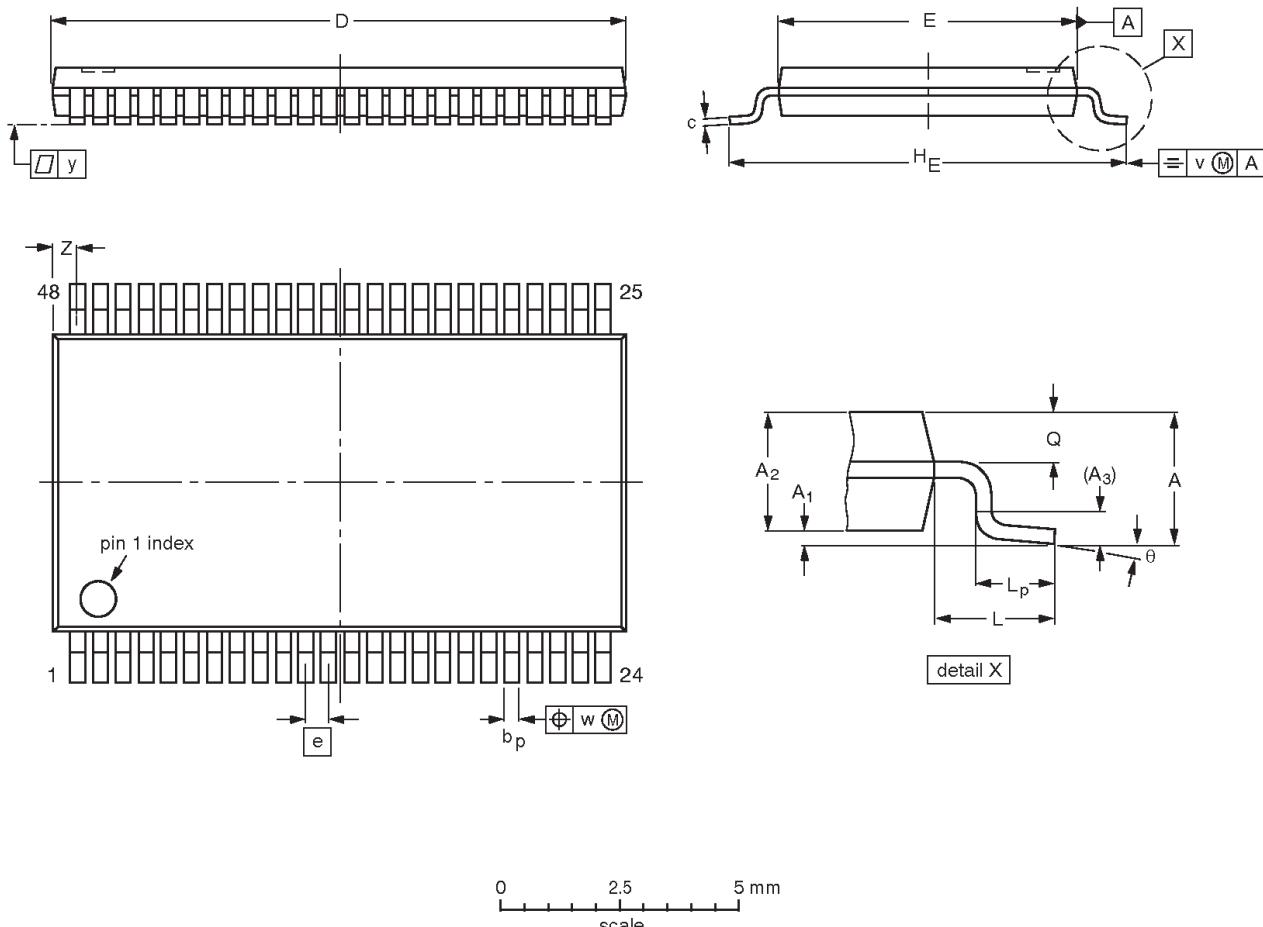
| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|--------|------|--|---|----------------------|
| | IEC | JEDEC | EIAJ | | | |
| SOT370-1 | | MO-118 | | |   | 95-02-04 99-12-27 |

20-bit bus switch with 10-bit output enables

CBT16210

TSSOP48: plastic thin shrink small outline package; 48 leads; body width 6.1 mm

SOT362-1



DIMENSIONS (mm are the original dimensions).

| UNIT | A max. | A ₁ | A ₂ | A ₃ | b _p | c | D ⁽¹⁾ | E ⁽²⁾ | e | H _E | L | L _p | Q | v | w | y | z | theta |
|------|-------------|----------------|----------------|----------------|----------------|------------|------------------|------------------|-----|----------------|---|----------------|--------------|------|------|-----|------------|----------|
| mm | 1.2 0.05 | 0.15 0.85 | 1.05 | 0.25 | 0.28 0.17 | 0.2 0.1 | 12.6 12.4 | 6.2 6.0 | 0.5 | 8.3 7.9 | 1 | 0.8 0.4 | 0.50 0.35 | 0.25 | 0.08 | 0.1 | 0.8 0.4 | 8° 0° |

Notes

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
2. Plastic interlead protrusions of 0.25 mm maximum per side are not included.

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|--------------------|------------|--------|------|--|------------------------|-----------------------|
| | IEC | JEDEC | EIAJ | | | |
| SOT362-1 | | MO-153 | | | | -95-02-10 99-12-27 |

Data sheet status

| Data sheet status | Product status | Definition [1] |
|---------------------------|----------------|--|
| Objective specification | Development | This data sheet contains the design target or goal specifications for product development. Specification may change in any manner without notice. |
| Preliminary specification | Qualification | This data sheet contains preliminary data, and supplementary data will be published at a later date. Philips Semiconductors reserves the right to make changes at any time without notice in order to improve design and supply the best possible product. |
| Product specification | Production | This data sheet contains final specifications. Philips Semiconductors reserves the right to make changes at any time without notice in order to improve design and supply the best possible product. |

[1] Please consult the most recently issued datasheet before initiating or completing a design.

Definitions

Short-form specification — The data in a short-form specification is extracted from a full data sheet with the same type number and title. For detailed information see the relevant data sheet or data handbook.

Limiting values definition — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

Application information — Applications that are described herein for any of these products are for illustrative purposes only. Philips Semiconductors make no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

Disclaimers

Life support — These products are not designed for use in life support appliances, devices or systems where malfunction of these products can reasonably be expected to result in personal injury. Philips Semiconductors customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Philips Semiconductors for any damages resulting from such application.

Right to make changes — Philips Semiconductors reserves the right to make changes, without notice, in the products, including circuits, standard cells, and/or software, described or contained herein in order to improve design and/or performance. Philips Semiconductors assumes no responsibility or liability for the use of any of these products, conveys no license or title under any patent, copyright, or mask work right to these products, and makes no representations or warranties that these products are free from patent, copyright, or mask work right infringement, unless otherwise specified.

Philips Semiconductors
811 East Arques Avenue
P.O. Box 3409
Sunnyvale, California 94088-3409
Telephone 800-234-7381

© Copyright Philips Electronics North America Corporation 2000
All rights reserved. Printed in U.S.A.

Date of release: 10-00
Document order number: 9397 750 07693

Let's make things better.

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

[NXP](#):

[CBT16210DL](#) [CBT16210DL-T](#)