

DATA SHEET

MB2244

16-bit buffer/line driver (3-State)

Product specification
Supersedes data of 1993 Aug 24
IC23 Data Handbook

1998 Jan 16

16-bit buffer/line driver (3-State)

MB2244

FEATURES

- 16-bit bus interface
- Multiple V_{CC} and GND pins minimize switching noise
- Power-up 3-State
- 3-State buffers
- Output capability: +64 mA/-32mA
- Latch-up protection exceeds 500mA per Jedec Std 17
- ESD protection exceeds 2000 V per MIL STD 883 Method 3015 and 200 V per Machine Model
- Inputs are disabled during 3-State mode

DESCRIPTION

The MB2244 high-performance BiCMOS device combines low static and dynamic power dissipation with high speed and high output drive.

The MB2244 device is an 16-bit buffer that is ideal for driving bus lines. The device features four Output Enables ($1\overline{OE}$, $2\overline{OE}$, $3\overline{OE}$, $4\overline{OE}$), each controlling four of the 3-State outputs.

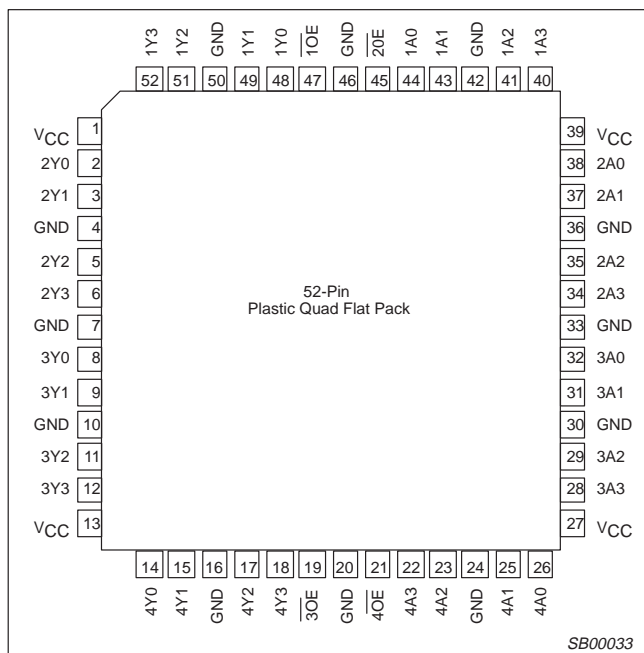
QUICK REFERENCE DATA

| SYMBOL | PARAMETER | CONDITIONS $T_{amb} = 25^{\circ}C$; GND = 0V | TYPICAL | UNIT |
|------------------------|---------------------------------|--|------------|---------|
| t_{PLH} t_{PHL} | Propagation delay nAx to nYx | $C_L = 50pF$; $V_{CC} = 5V$ | 3.2 3.1 | ns |
| C_{IN} | Input capacitance | $V_I = 0V$ or V_{CC} | 4 | pF |
| C_{OUT} | Output capacitance | $V_O = 0V$ or V_{CC} ; 3-State | 7 | pF |
| I_{CCZ} | Total supply current | Outputs disabled; $V_{CC} = 5.5V$ | 50 | μA |

ORDERING INFORMATION

| PACKAGES | TEMPERATURE RANGE | OUTSIDE NORTH AMERICA | NORTH AMERICA | DWG NUMBER |
|-------------------------------|-------------------|-----------------------|---------------|------------|
| 52-pin plastic Quad Flat Pack | -40°C to +85°C | MB2244 BB | MB2244 BB | SOT379-1 |

PIN CONFIGURATION



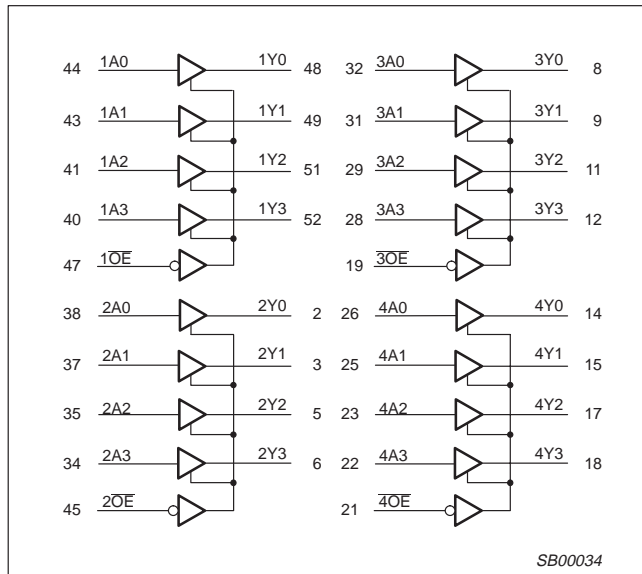
PIN DESCRIPTION

| PIN NUMBER | SYMBOL | NAME AND FUNCTION |
|---|--|-------------------------|
| 44, 43, 41, 40, 38, 37, 35, 34, 32, 31, 29, 28, 26, 25, 23, 22 | 1A0 – 1A3, 2A0 – 2A3, 3A0 – 3A3, 4A0 – 4A3 | Data inputs |
| 48, 49, 51, 52, 2, 3, 5, 6, 8, 9, 11, 12, 14, 15, 17, 18 | 1Y0 – 1Y3, 2Y0 – 2Y3, 3Y0 – 3Y3, 4Y0 – 4Y3 | Data outputs |
| 47, 45, 19, 21 | $1\overline{OE}$, $2\overline{OE}$, $3\overline{OE}$, $4\overline{OE}$ | Output enables |
| 4, 7, 10, 16, 20, 24, 30, 33, 36, 42, 46, 50 | GND | Ground (0V) |
| 1, 13, 27, 39 | V_{CC} | Positive supply voltage |

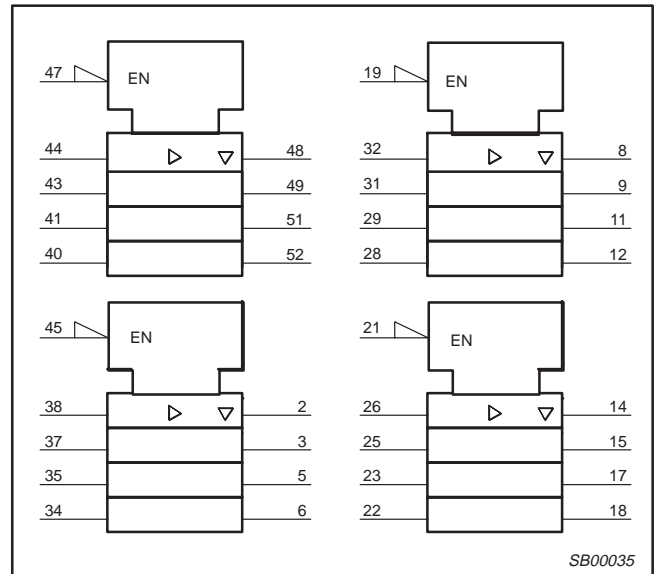
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LOGIC SYMBOL



LOGIC SYMBOL (IEEE/IEC)



FUNCTION TABLE

| INPUTS | | OUTPUTS |
|------------------|-------|---------|
| $n\overline{OE}$ | nAx | nYx |
| L | L | L |
| L | H | H |
| H | X | Z |

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 | $V_I < 0$ | -18 | mA |
| V_I | DC input voltage ³ | | -1.2 to +7.0 | V |
| I_{OK} | DC output diode current | $V_O < 0$ | -50 | mA |
| 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:

- 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.
- 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.
- The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

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RECOMMENDED OPERATING CONDITIONS

| SYMBOL | PARAMETER | LIMITS | | UNIT |
|---------------------|--------------------------------------|--------|----------|------|
| | | Min | Max | |
| V_{CC} | DC supply voltage | 4.5 | 5.5 | V |
| V_I | Input voltage | 0 | V_{CC} | V |
| V_{IH} | High-level input voltage | 2.0 | | V |
| V_{IL} | Low-level input voltage | | 0.8 | V |
| I_{OH} | High-level output current | | -32 | mA |
| I_{OL} | Low-level output current | | 64 | mA |
| $\Delta t/\Delta v$ | Input transition rise or fall rate | 0 | 10 | ns/V |
| T_{amb} | Operating free-air temperature range | -40 | +85 | °C |

DC ELECTRICAL CHARACTERISTICS

| SYMBOL | PARAMETER | TEST CONDITIONS | LIMITS | | | | | UNIT |
|-----------------|--|---|---------------------------------|------------|-----------|---|-----------|---------------|
| | | | $T_{amb} = +25^{\circ}\text{C}$ | | | $T_{amb} = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ | | |
| | | | Min | Typ | Max | Min | Max | |
| V_{IK} | Input clamp voltage | $V_{CC} = 4.5\text{V}; I_{IK} = -18\text{mA}$ | | -0.9 | -1.2 | | -1.2 | V |
| V_{OH} | High-level output voltage | $V_{CC} = 4.5\text{V}; I_{OH} = -3\text{mA}; V_I = V_{IL}$ or V_{IH} | 2.5 | 2.9 | | 2.5 | | V |
| | | $V_{CC} = 5.0\text{V}; I_{OH} = -3\text{mA}; V_I = V_{IL}$ or V_{IH} | 3.0 | 3.4 | | 3.0 | | V |
| | | $V_{CC} = 4.5\text{V}; I_{OH} = -32\text{mA}; V_I = V_{IL}$ or V_{IH} | 2.0 | 2.4 | | 2.0 | | V |
| V_{OL} | Low-level output voltage | $V_{CC} = 4.5\text{V}; I_{OL} = 64\text{mA}; V_I = V_{IL}$ or V_{IH} | | 0.42 | 0.55 | | 0.55 | V |
| I_I | Input leakage current | $V_{CC} = 5.5\text{V}; V_I = \text{GND}$ or 5.5V | | ± 0.01 | ± 1.0 | | ± 1.0 | μA |
| I_{OFF} | Power-off leakage current | $V_{CC} = 0.0\text{V}; V_O$ or $V_I \leq 4.5\text{V}$ | | ± 5.0 | ± 100 | | ± 100 | μA |
| $I_{PU/PD}$ | Power-up/down 3-State output current | $V_{CC} = 2.0\text{V}; V_O = 0.5\text{V}; V_I = \text{GND}$ or $V_{CC}; V_{OE} = V_{CC}$ | | ± 5.0 | ± 50 | | ± 50 | μA |
| I_{OZH} | 3-State output High current | $V_{CC} = 5.5\text{V}; V_O = 2.7\text{V}; V_I = V_{IL}$ or V_{IH} | | 5.0 | 50 | | 50 | μA |
| I_{OZL} | 3-State output Low current | $V_{CC} = 5.5\text{V}; V_O = 0.5\text{V}; V_I = V_{IL}$ or V_{IH} | | -5.0 | -50 | | -50 | μA |
| I_{CEX} | Output High leakage current | $V_{CC} = 5.5\text{V}; V_O = 5.5\text{V}; V_I = \text{GND}$ or V_{CC} | | 5.0 | 50 | | 50 | μA |
| I_O | Output current ¹ | $V_{CC} = 5.5\text{V}; V_O = 2.5\text{V}$ | -50 | -100 | -180 | -50 | -180 | mA |
| I_{CCH} | Quiescent supply current | $V_{CC} = 5.5\text{V};$ Outputs High, $V_I = \text{GND}$ or V_{CC} | | 50 | 100 | | 100 | μA |
| I_{CCL} | | $V_{CC} = 5.5\text{V};$ Outputs Low, $V_I = \text{GND}$ or V_{CC} | | 48 | 60 | | 60 | mA |
| I_{CCZ} | | $V_{CC} = 5.5\text{V};$ Outputs 3-State; $V_I = \text{GND}$ or V_{CC} | | 50 | 100 | | 100 | μA |
| ΔI_{CC} | Additional supply current per input pin ² | Outputs enabled, one input at 3.4V, other inputs at V_{CC} or GND; $V_{CC} = 5.5\text{V}$ | | 0.5 | 1.5 | | 1.5 | mA |

NOTES:

- Not more than one output should be tested at a time, and the duration of the test should not exceed one second.
- This is the increase in supply current for each input at 3.4V.

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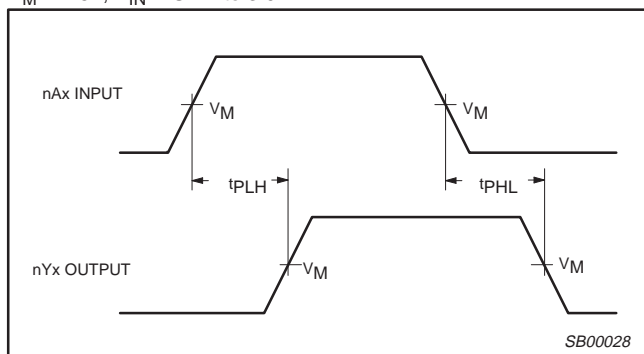
AC CHARACTERISTICS

GND = 0V; $t_R = t_F = 2.5\text{ns}$; $C_L = 50\text{pF}$, $R_L = 500\Omega$

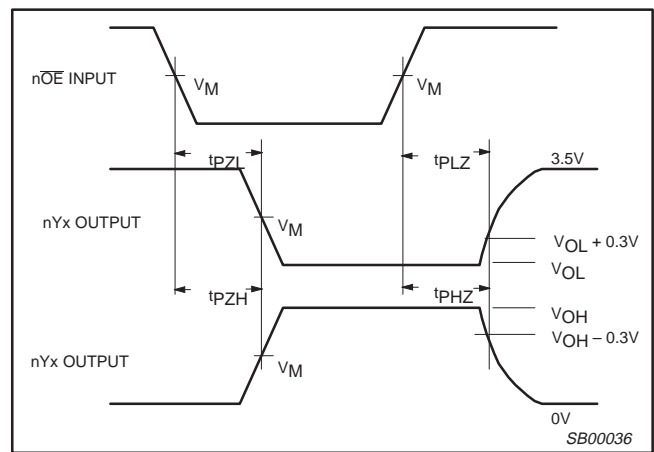
| SYMBOL | PARAMETER | WAVEFORM | LIMITS | | | | | UNIT |
|--------------------------------------|--|----------|--|------------|------------|--|------------|------|
| | | | $T_{\text{amb}} = +25^\circ\text{C}$ $V_{\text{CC}} = +5.0\text{V}$ | | | $T_{\text{amb}} = -40^\circ\text{C to } +85^\circ\text{C}$ $V_{\text{CC}} = +5.0\text{V} \pm 0.5\text{V}$ | | |
| | | | Min | Typ | Max | Min | Max | |
| t_{PLH} t_{PHL} | Propagation delay nAx to nYx | 1 | 1.2 1.2 | 3.2 3.1 | 4.5 4.5 | 1.2 1.2 | 5.1 5.1 | ns |
| t_{PZH} t_{PZL} | Output enable time to High and Low level | 2 | 1.1 1.8 | 3.0 4.0 | 4.4 5.4 | 1.1 1.8 | 5.1 6.4 | ns |
| t_{PHZ} t_{PLZ} | Output disable time from High and Low level | 2 | 1.6 1.7 | 4.0 3.4 | 5.6 5.0 | 1.6 1.7 | 6.2 5.6 | ns |

AC WAVEFORMS

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



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

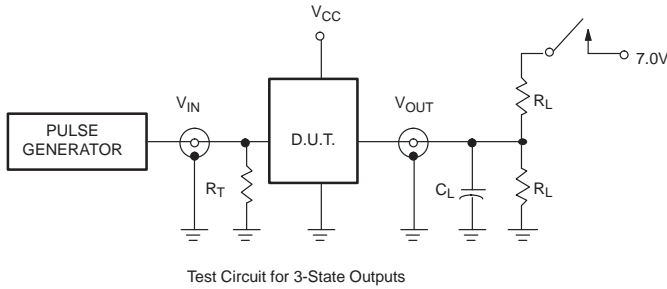


Waveform 2. 3-State Output Enable and Disable Times

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TEST CIRCUIT AND WAVEFORMS



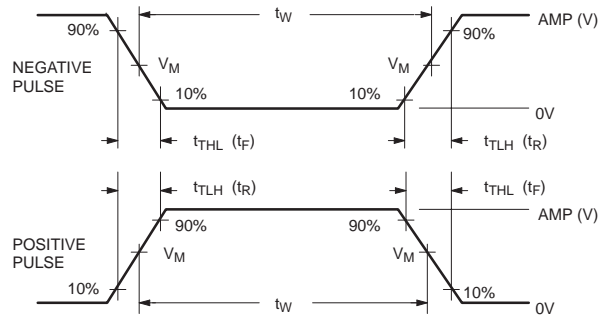
Test Circuit for 3-State Outputs

SWITCH POSITION

| TEST | SWITCH |
|-----------|--------|
| t_{PLZ} | closed |
| t_{pZL} | closed |
| All other | open |

DEFINITIONS

- R_L = Load resistor; see AC CHARACTERISTICS for value.
- C_L = Load capacitance includes jig and probe capacitance; see AC CHARACTERISTICS for value.
- R_T = Termination resistance should be equal to Z_{OUT} of pulse generators.



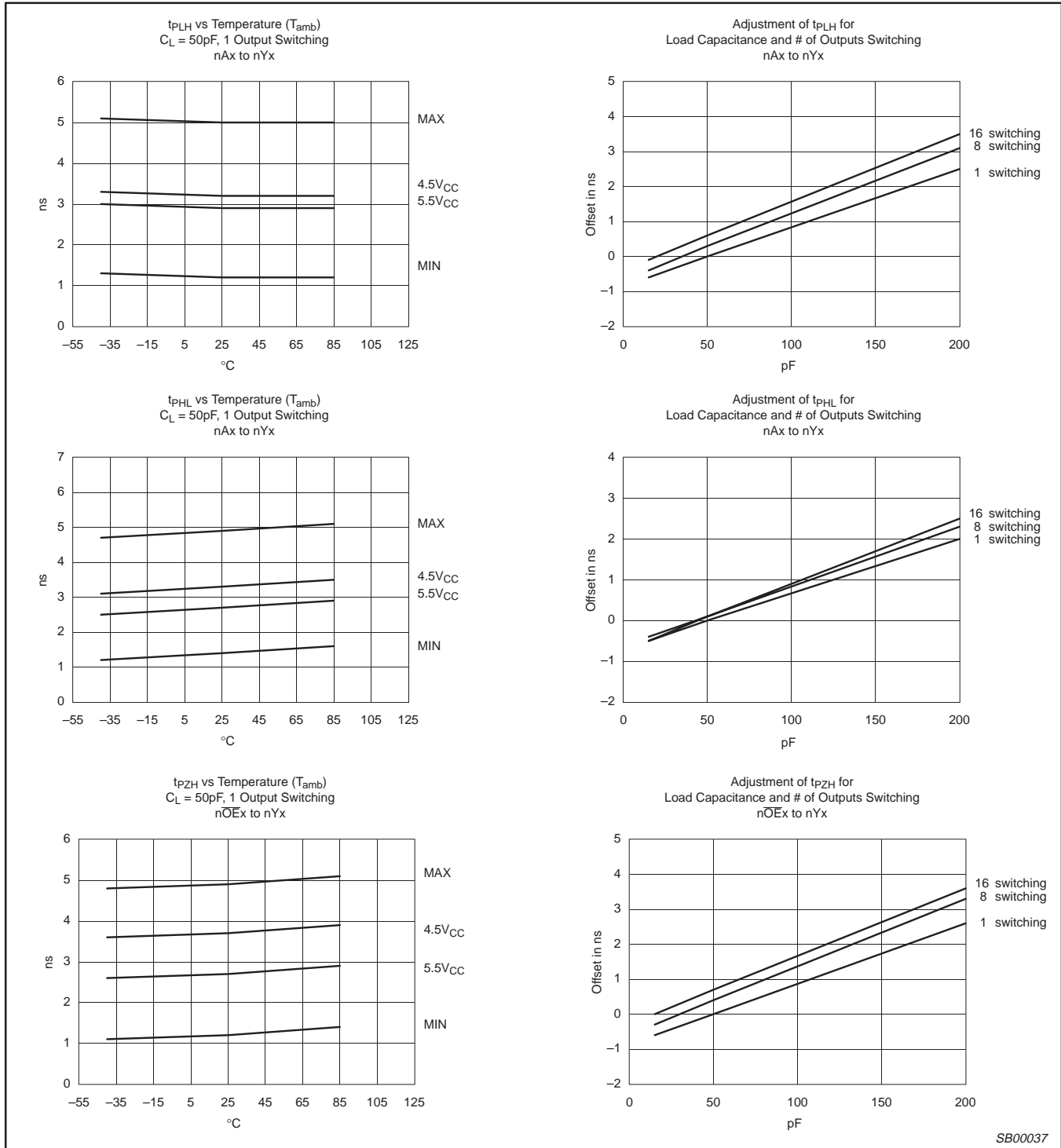
$V_M = 1.5V$
Input Pulse Definition

| FAMILY | INPUT PULSE REQUIREMENTS | | | | |
|--------|--------------------------|-----------|-------|-------|-------|
| | Amplitude | Rep. Rate | t_w | t_r | t_f |
| MB | 3.0V | 1MHz | 500ns | 2.5ns | 2.5ns |

SB00010

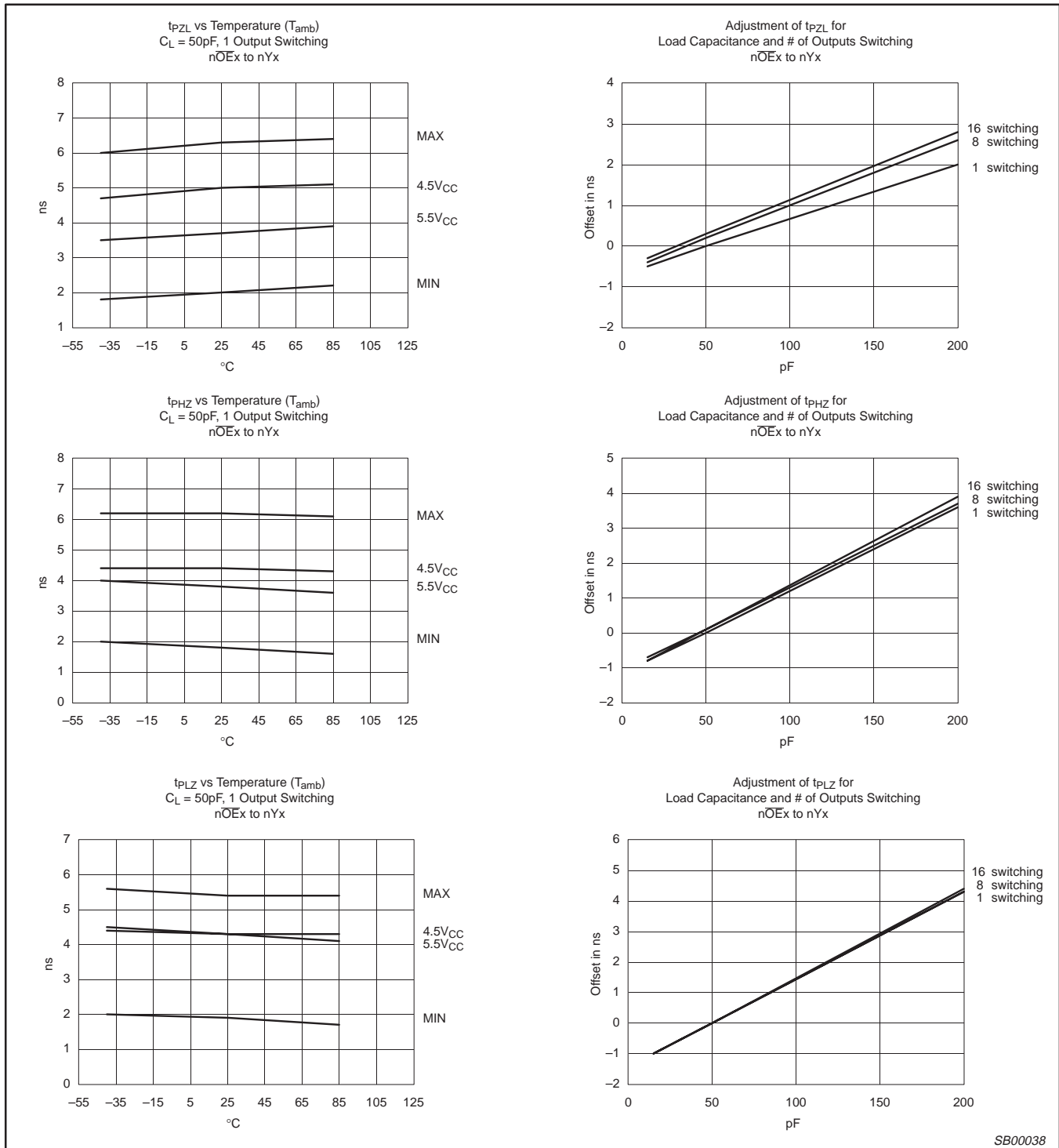
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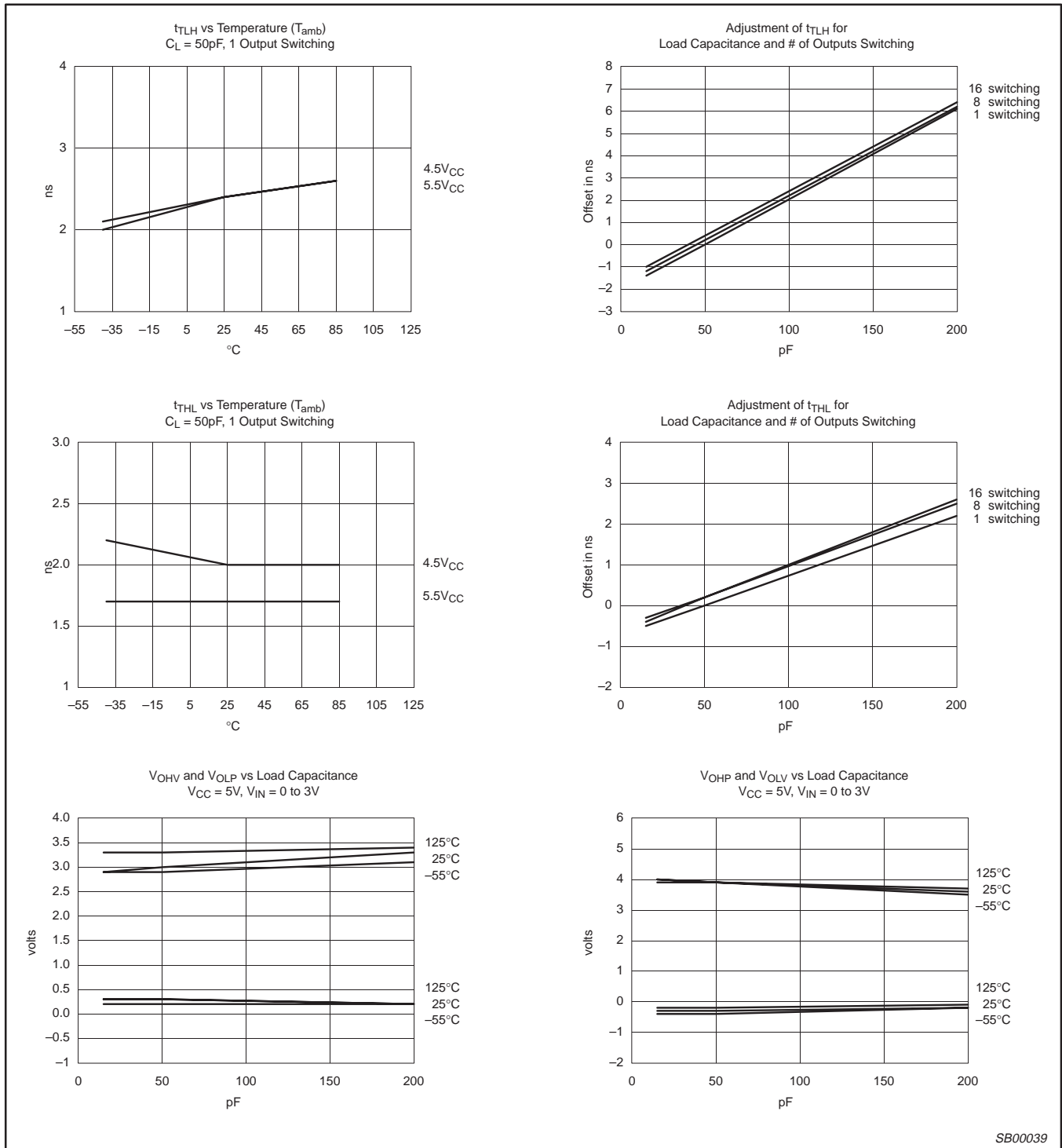
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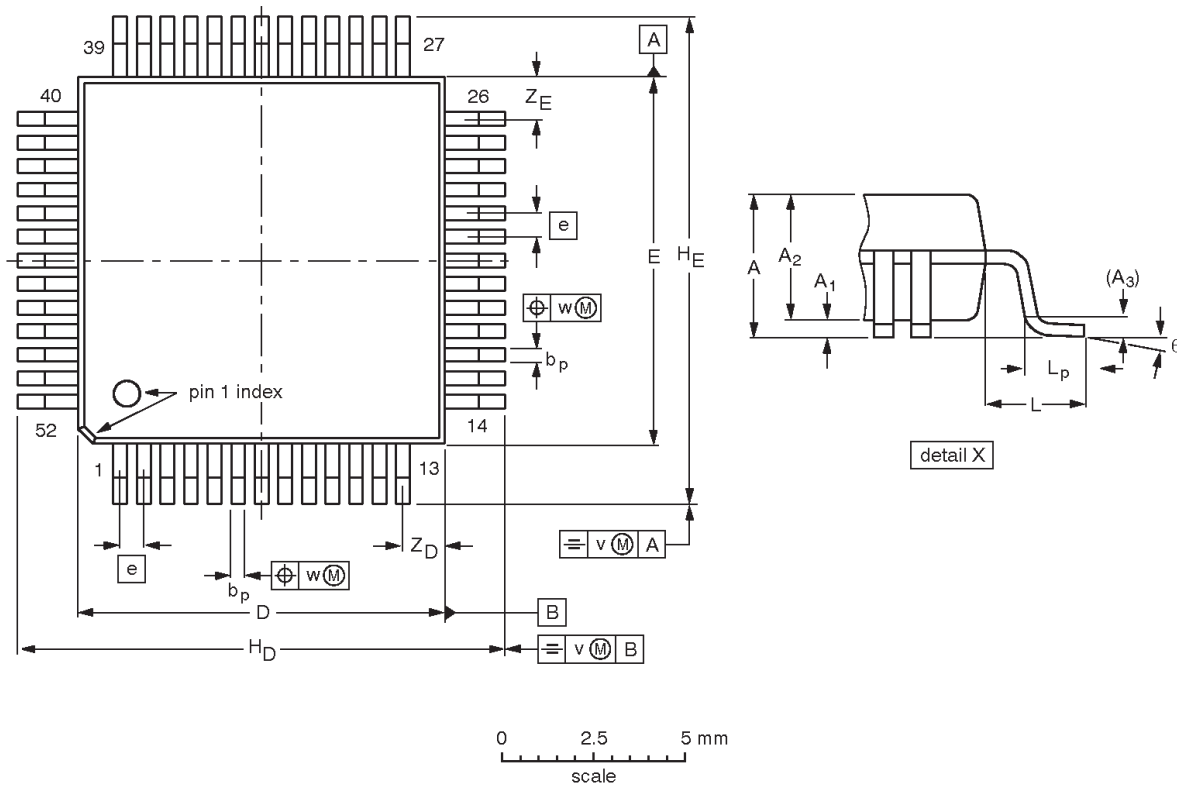
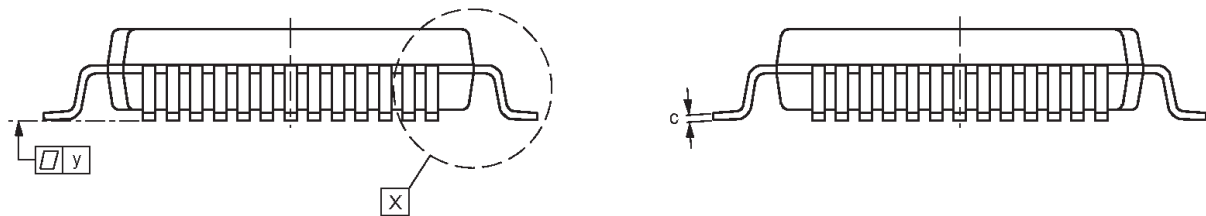
SB00039

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QFP52: plastic quad flat package; 52 leads (lead length 1.6 mm); body 10 x 10 x 2.0 mm

SOT379-1



DIMENSIONS (mm are the original dimensions)

| UNIT | A max. | A ₁ | A ₂ | A ₃ | b _p | c | D ⁽¹⁾ | E ⁽¹⁾ | e | H _D | H _E | L | L _p | v | w | y | Z _D ⁽¹⁾ | Z _E ⁽¹⁾ | θ |
|------|--------|----------------|----------------|----------------|----------------|--------------|------------------|------------------|------|----------------|----------------|------|----------------|------|------|------|-------------------------------|-------------------------------|----------|
| mm | 2.45 | 0.45 0.25 | 2.10 1.95 | 0.25 | 0.38 0.22 | 0.23 0.13 | 10.1 9.9 | 10.1 9.9 | 0.65 | 13.45 12.95 | 13.45 12.95 | 1.60 | 0.95 0.65 | 0.20 | 0.12 | 0.10 | 1.24 0.95 | 1.24 0.95 | 7° 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 | | |
| SOT379-1 | | MO-108 | | | -95-02-04 97-08-04 |

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NOTES

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

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print code

Date of release: 05-96

Document order number:

9397-750-03509

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