

3.3V Octal transceiver with 30Ω termination resistors (3-State)

74LVT2245

FEATURES

- 30Ω output termination resistors
- Octal bidirectional bus interface
- 3-State buffers
- Output capability: +12mA/-12mA
- TTL input and output switching levels
- Input and output interface capability to systems at 5V supply
- Bus-hold data inputs eliminate the need for external pull-up resistors to hold unused inputs
- Live insertion/extraction permitted
- Power-up 3-State
- No bus current loading when output is tied to 5V bus
- Latch-up protection exceeds 500mA per JEDEC Std 17
- ESD protection exceeds 2000V per MIL STD 883 Method 3015 and 200V per Machine Model

DESCRIPTION

The LVT2245 is a high-performance BiCMOS product designed for V_{CC} operation at 3.3V.

This device is an octal transceiver featuring non-inverting 3-State bus compatible outputs in both send and receive directions. The control function implementation minimizes external timing requirements. The device features an Output Enable (OE) input for easy cascading and a Direction (DIR) input for direction control.

The 74LVT2245 is designed with 30Ω series resistance in both the High and Low states of the output. This design reduces line noise in applications such as memory address drivers, clock drivers, and bus transceivers/transmitters.

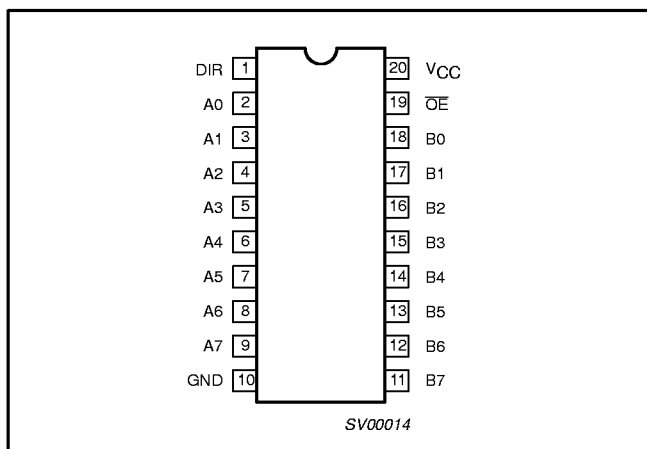
QUICK REFERENCE DATA

| SYMBOL | PARAMETER | CONDITIONS T _{amb} = 25°C; GND = 0V | TYPICAL | UNIT |
|--------------------------------------|---|--|------------|------|
| t _{PLH} t _{PHL} | Propagation delay An to Bn or Bn to An | C _L = 50pF; V _{CC} = 3.3V | 3.2 3.1 | ns |
| C _{IN} | Input capacitance DIR, OE | V _I = 0V or 3.0V | 4 | pF |
| C _{I/O} | I/O pin capacitance | Outputs disabled; V _{I/O} = 0V or 3.0V | 10 | pF |
| I _{CCZ} | Total supply current | Outputs disabled; V _{CC} = 3.6V | 0.13 | mA |

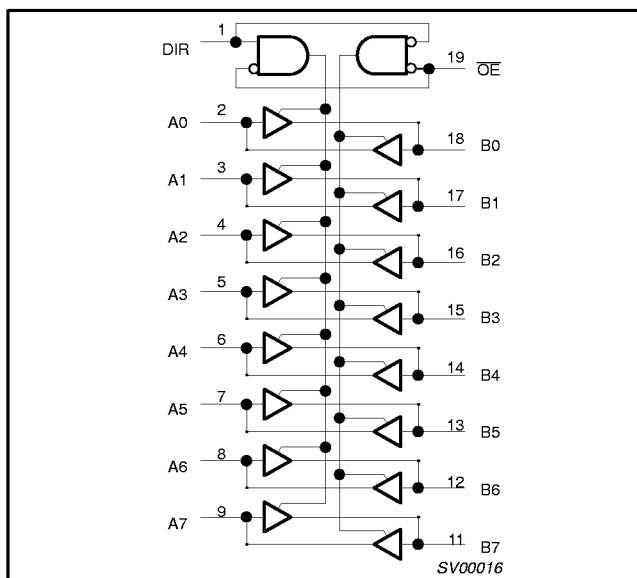
ORDERING INFORMATION

| PACKAGES | TEMPERATURE RANGE | OUTSIDE NORTH AMERICA | NORTH AMERICA | DWG NUMBER |
|----------------------|-------------------|-----------------------|---------------|------------|
| 20-Pin Plastic SO | -40°C to +85°C | 74LVT2245 D | 74LVT2245 D | SOT163-1 |
| 20-Pin Plastic SSOP | -40°C to +85°C | 74LVT2245 DB | 74LVT2245 DB | SOT339-1 |
| 20-Pin Plastic TSSOP | -40°C to +85°C | 74LVT2245 PW | 7LVT2245PW DH | SOT360-1 |

PIN CONFIGURATION



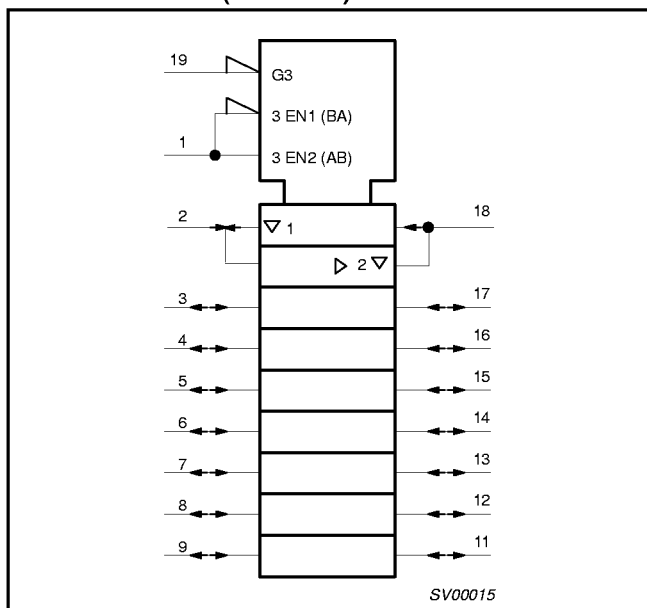
LOGIC SYMBOL



3.3V Octal transceiver with 30Ω termination resistors (3-State)

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LOGIC SYMBOL (IEEE/IEC)

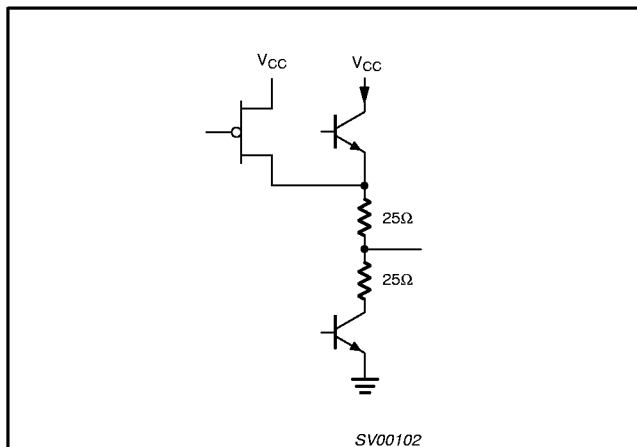


FUNCTION TABLE

| INPUTS | | INPUTS/OUTPUTS | |
|------------------|-----|----------------|--------|
| \overline{OEn} | DIR | An | Bn |
| L | L | An= Bn | Inputs |
| L | H | Inputs | Bn =An |
| H | X | Z | Z |

H = High voltage level
 L = Low voltage level
 X = Don't care
 Z = High impedance "Off" state

SCHEMATIC OF EACH OUTPUT



PIN DESCRIPTION

| PIN NUMBER | SYMBOL | NAME AND FUNCTION |
|--------------------------------|-----------------|----------------------------------|
| 1 | DIR | Direction control input |
| 2, 3, 4, 5, 6, 7, 8, 9 | A0 – A7 | Data inputs/outputs (A side) |
| 18, 17, 16, 15, 14, 13, 12, 11 | B0 – B7 | Data inputs/outputs (B side) |
| 19 | \overline{OE} | Output enable input (active–Low) |
| 10 | GND | Ground (0V) |
| 20 | V _{CC} | Positive supply voltage |

ABSOLUTE MAXIMUM RATINGS^{1,2}

| SYMBOL | PARAMETER | CONDITIONS | RATING | UNIT |
|------------------|--------------------------------|-----------------------------|--------------|------|
| V _{CC} | DC supply voltage | | –0.5 to +4.6 | V |
| I _{IK} | DC input diode current | V _I < 0 | –50 | mA |
| V _I | DC input voltage ³ | | –0.5 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 +7.0 | V |
| I _{OUT} | DC output current | Output in Low state | 128 | mA |
| | | Output in High state | –64 | |
| 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 negative voltage ratings may be exceeded if the input and output clamp current ratings are observed.

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RECOMMENDED OPERATING CONDITIONS

| SYMBOL | PARAMETER | LIMITS | | UNIT |
|------------------|---|--------|-----|------|
| | | MIN | MAX | |
| V _{CC} | DC supply voltage | 2.7 | 3.6 | V |
| V _I | Input voltage | 0 | 5.5 | V |
| V _{IH} | High-level input voltage | 2.0 | | V |
| V _{IL} | Input voltage | | 0.8 | V |
| I _{OH} | High-level output current | | -12 | mA |
| I _{OL} | Low-level output current | | 12 | mA |
| Δt/Δv | Input transition rise or fall rate; Outputs enabled | | 10 | ns/V |
| T _{amb} | Operating free-air temperature range | -40 | +85 | °C |

DC ELECTRICAL CHARACTERISTICS

| SYMBOL | PARAMETER | TEST CONDITIONS | LIMITS | | | UNIT |
|--------------------|--|---|----------------------------|------------------|------|------|
| | | | Temp = -40°C to +85°C | | | |
| | | | MIN | TYP ¹ | MAX | |
| V _{IK} | Input clamp voltage | V _{CC} = 2.7V; I _{IK} = -18mA | | -0.9 | -1.2 | V |
| V _{OH} | High-level output voltage | V _{CC} = 3.0V; I _{OH} = -12mA | 2.0 | 2.2 | | V |
| V _{OL} | Low-level output voltage | V _{CC} = 3.0V; I _{OL} = 12mA | | | 0.8 | V |
| I _I | Input leakage current | V _{CC} = 0 or 3.6V; V _I = 5.5V | Control pins | 1 | 10 | μA |
| | | V _{CC} = 3.6V; V _I = V _{CC} or GND | | ±0.1 | ±1 | |
| | | V _{CC} = 3.6V; V _I = 5.5V | I/O Data pins ⁴ | 1 | 20 | |
| | | V _{CC} = 3.6V; V _I = V _{CC} | | 0.1 | 1 | |
| | | V _{CC} = 3.6V; V _I = 0 | | -1 | -5 | |
| I _{OFF} | Output off current | V _{CC} = 0V; V _I or V _O = 0 to 4.5V | | 1 | ±100 | μA |
| I _{HOLD} | Bus Hold current A inputs ⁶ | V _{CC} = 3V; V _I = 0.8V | 75 | 150 | μA | |
| | | V _{CC} = 3V; V _I = 2.0V | -75 | -150 | | |
| | | V _{CC} = 0V to 3.6V; V _{CC} = 3.6V | ±500 | | | |
| I _{EX} | Current into an output in the High state when V _O > V _{CC} | V _O = 5.5V; V _{CC} = 3.0V | | 60 | 125 | μA |
| I _{PU/PD} | Power up/down 3-State output current ³ | V _{CC} ≤ 1.2V; V _O = 0.5V to V _{CC} ; V _I = GND or V _{CC} ; OE/OE = Don't care | | 15 | ±100 | μA |
| I _{CCH} | Quiescent supply current | V _{CC} = 3.6V; Outputs High, V _I = GND or V _{CC} , I _O = 0 | | 0.13 | 0.19 | mA |
| I _{CCL} | | V _{CC} = 3.6V; Outputs Low, V _I = GND or V _{CC} , I _O = 0 | | 3 | 12 | |
| I _{CCZ} | | V _{CC} = 3.6V; Outputs Disabled; V _I = GND or V _{CC} , I _O = 0 ⁵ | | 0.13 | 0.19 | |
| ΔI _{CC} | Additional supply current per input pin ³ | V _{CC} = 3V to 3.6V; One input at V _{CC} -0.6V, Other inputs at V _{CC} or GND | | 0.1 | 0.2 | mA |

NOTES:

1. All typical values are at V_{CC} = 3.3V and T_{amb} = 25°C.
2. This is the increase in supply current for each input at the specified voltage level other than V_{CC} or GND
3. This parameter is valid for any V_{CC} between 0V and 1.2V with a transition time of up to 10msec. From V_{CC} = 1.2V to V_{CC} = 3.3V ± 0.3V a transition time of 100μsec is permitted. This parameter is valid for T_{amb} = +25°C only.
4. Unused pins at V_{CC} or GND.
5. I_{CCZ} is measured with outputs pulled up to V_{CC} or down to GND
6. This is the bus hold overdrive current required to force the input to the opposite logic state.

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AC CHARACTERISTICS

GND = 0V; $t_R = t_F = 2.5\text{ns}$; $C_L = 50\text{pF}$; $R_L = 500\Omega$; $T_{\text{amb}} = -40^\circ\text{C}$ to $+85^\circ\text{C}$.

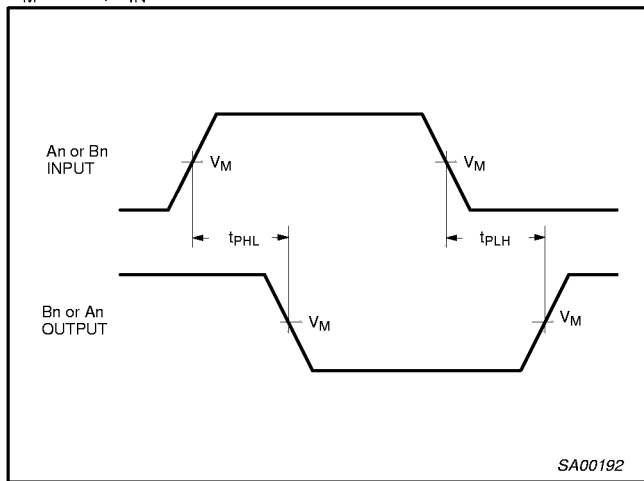
| SYMBOL | PARAMETER | WAVEFORM | LIMITS | | | | UNIT |
|------------------------|--|----------|--------------------------------------|------------|------------|------------------------|------|
| | | | $V_{CC} = 3.3\text{V} + 0.3\text{V}$ | | | $V_{CC} = 2.7\text{V}$ | |
| | | | MIN | TYP | MAX | MAX | |
| t_{PLH} t_{PHL} | Propagation delay An to Bn or Bn to An | 1 | 1.0 1.0 | 3.2 3.1 | 4.6 4.5 | 5.3 4.9 | ns |
| t_{PZH} t_{PZL} | Output enable time to High and Low level | 2 | 1.1 1.5 | 4.5 4.3 | 7.0 6.5 | 9.1 7.6 | ns |
| t_{PHZ} t_{PLZ} | Output disable time from High and Low Level | 2 | 2.2 2.0 | 3.7 3.6 | 5.2 5.0 | 5.6 5.0 | ns |

NOTE:

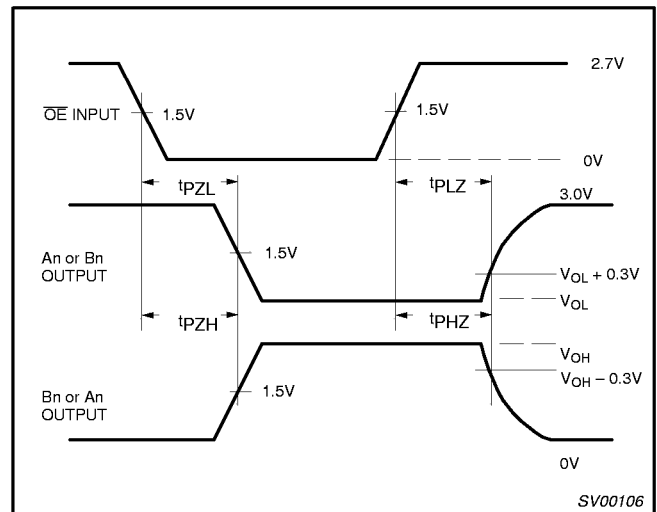
1. All typical values are at $V_{CC} = 3.3\text{V}$ and $T_{\text{amb}} = 25^\circ\text{C}$.

AC WAVEFORMS

$V_M = 1.5\text{V}$; $V_{IN} = \text{GND}$ to 2.7V



Waveform 1. Input (An or Bn) to Output (Bn or An) Propagation Delays

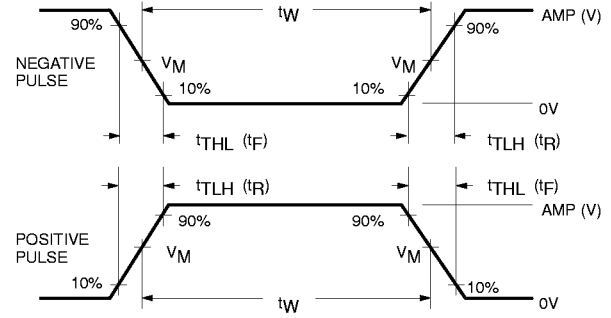
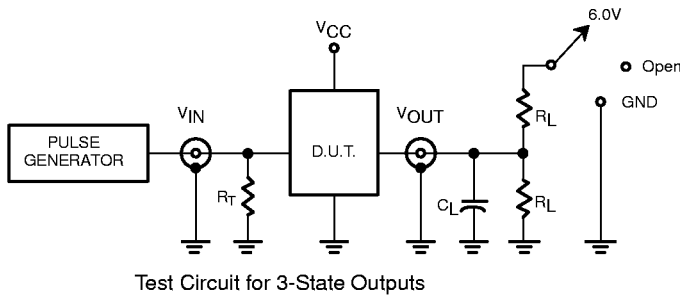


Waveform 2. 3-State Output Enable and Disable Times

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TEST CIRCUIT AND WAVEFORMS



$V_M = 1.5V$
Input Pulse Definition

SWITCH POSITION

| TEST | SWITCH |
|-------------------|--------|
| t_{PLH}/t_{PHL} | Open |
| t_{PLZ}/t_{PZL} | 6V |
| t_{PHZ}/t_{PZH} | GND |

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.

| FAMILY | INPUT PULSE REQUIREMENTS | | | | |
|--------|--------------------------|-----------|-------|---------|---------|
| | Amplitude | Rep. Rate | t_W | t_R | t_F |
| 74LVT | 2.7V | ≤ 10MHz | 500ns | ≤ 2.5ns | ≤ 2.5ns |

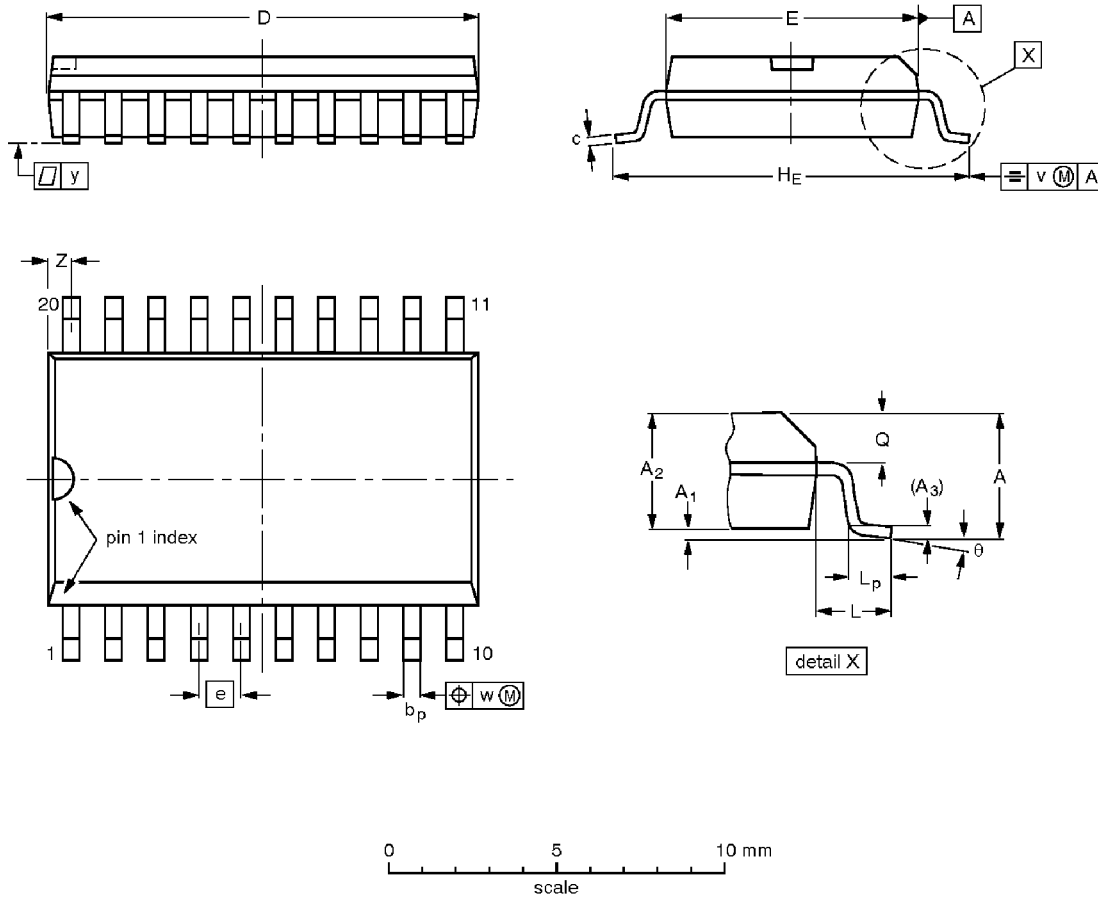
SV00092

3.3V Octal transceiver with 30Ω termination resistors (3-State)

74LVT2245

SO20: plastic small outline package; 20 leads; body width 7.5 mm

SOT163-1



DIMENSIONS (inch dimensions are derived from the original mm 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 | 2.65 | 0.30 0.10 | 2.45 2.25 | 0.25 | 0.49 0.36 | 0.32 0.23 | 13.0 12.6 | 7.6 7.4 | 1.27 | 10.65 10.00 | 1.4 | 1.1 0.4 | 1.1 1.0 | 0.25 | 0.25 | 0.1 | 0.9 0.4 | 8° 0° |
| inches | 0.10 | 0.012 0.004 | 0.096 0.089 | 0.01 | 0.019 0.014 | 0.013 0.009 | 0.51 0.49 | 0.30 0.29 | 0.050 | 0.42 0.39 | 0.055 | 0.043 0.016 | 0.043 0.039 | 0.01 | 0.01 | 0.004 | 0.035 0.016 | |

Note

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

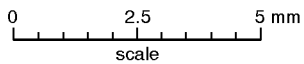
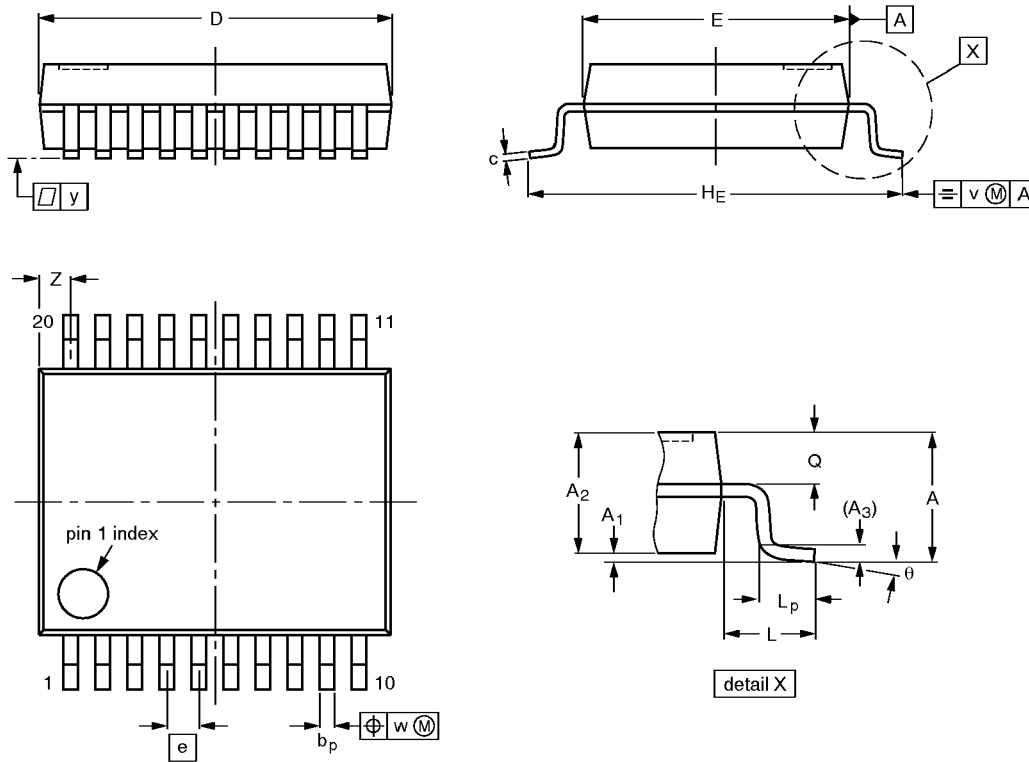
| OUTLINE VERSION | REFERENCES | | | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|----------|------|---------------------|----------------------|
| | IEC | JEDEC | EIAJ | | |
| SOT163-1 | 075E04 | MS-013AC | | | 92-11-17 95-01-24 |

3.3V Octal transceiver with 30Ω termination resistors (3-State)

74LVT2245

SSOP20: plastic shrink small outline package; 20 leads; body width 5.3 mm

SOT339-1



DIMENSIONS (mm are the original dimensions)

| UNIT | A max. | A ₁ | A ₂ | A ₃ | b _p | c | D ⁽¹⁾ | E ⁽¹⁾ | e | H _E | L | L _p | Q | v | w | y | Z ⁽¹⁾ | θ |
|------|--------|----------------|----------------|----------------|----------------|--------------|------------------|------------------|------|----------------|------|----------------|------------|-----|------|-----|------------------|----------|
| mm | 2.0 | 0.21 0.05 | 1.80 1.65 | 0.25 | 0.38 0.25 | 0.20 0.09 | 7.4 7.0 | 5.4 5.2 | 0.65 | 7.9 7.6 | 1.25 | 1.03 0.63 | 0.9 0.7 | 0.2 | 0.13 | 0.1 | 0.9 0.5 | 8° 0° |

Note

1. Plastic or metal protrusions of 0.20 mm maximum per side are not included.

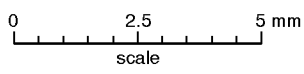
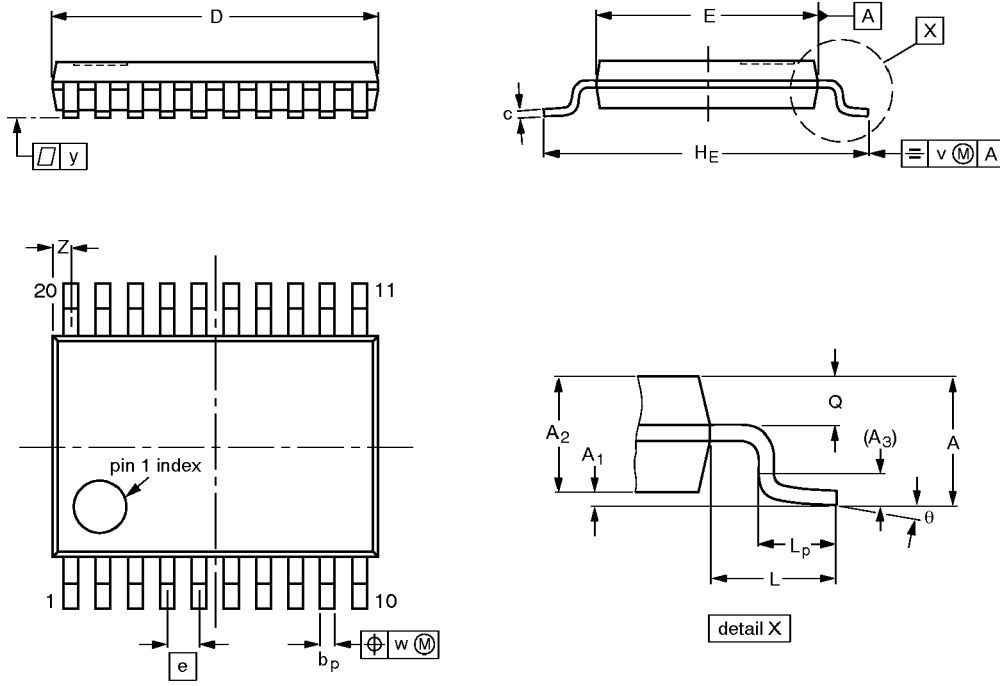
| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|----------|------|--|---------------------|----------------------|
| | IEC | JEDEC | EIAJ | | | |
| SOT339-1 | | MO-150AE | | | | 93-09-08 95-02-04 |

3.3V Octal transceiver with 30Ω termination resistors (3-State)

74LVT2245

TSSOP20: plastic thin shrink small outline package; 20 leads; body width 4.4 mm

SOT360-1



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 ⁽¹⁾ | θ |
|------|--------|----------------|----------------|----------------|----------------|------------|------------------|------------------|------|----------------|-----|----------------|------------|-----|------|-----|------------------|----------|
| mm | 1.10 | 0.15 0.05 | 0.95 0.80 | 0.25 | 0.30 0.19 | 0.2 0.1 | 6.6 6.4 | 4.5 4.3 | 0.65 | 6.6 6.2 | 1.0 | 0.75 0.50 | 0.4 0.3 | 0.2 | 0.13 | 0.1 | 0.5 0.2 | 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 | | |
| SOT360-1 | | MO-153AC | | | -93-06-16- 95-02-04 |