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74AUP2G241

Low-power dual buffer/line driver; 3-state

Rev. 7 — 11 February 2013 **Product data sheet**

1. General description

The 74AUP2G241 provides a dual non-inverting buffer/line driver with 3-state outputs. The 3-state outputs are controlled by the output enable inputs $1\overline{OE}$ and 2OE. A HIGH level at pin $1\overline{OE}$ causes output 1Y to assume a high-impedance OFF-state. A LOW level at pin 2OE causes output 2Y to assume a high-impedance OFF-state.

Schmitt trigger action at all inputs makes the circuit tolerant to slower input rise and fall times across the entire V_{CC} range from 0.8 V to 3.6 V.

This device ensures a very low static and dynamic power consumption across the entire V_{CC} range from 0.8 V to 3.6 V.

This device is fully specified for partial power-down applications using I_{OFF}.
The I_{OFF} circuitry disables the output, preventing the damaging backflow current through the device when it is powered down.

This device has an input-disable feature, which allows floating input signals. The input 1A is disabled when the output enable input $1\overline{OE}$ is HIGH. The input 2A is disabled when the output enable input 2OE is LOW.

2. Features and benefits

- Wide supply voltage range from 0.8 V to 3.6 V
- High noise immunity
- Complies with JEDEC standards:
  - JESD8-12 (0.8 V to 1.3 V)
  - JESD8-11 (0.9 V to 1.65 V)
  - JESD8-7 (1.2 V to 1.95 V)
  - JESD8-5 (1.8 V to 2.7 V)
  - JESD8-B (2.7 V to 3.6 V)
- ESD protection:
  - HBM JESD22-A114F Class 3A exceeds 5000 V
  - MM JESD22-A115-A exceeds 200 V
  - CDM JESD22-C101E exceeds 1000 V
- Low static power consumption; $I_{CC} = 0.9\ \mu A$ (maximum)
- Latch-up performance exceeds 100 mA per JESD 78 Class II
- Inputs accept voltages up to 3.6 V
- Low noise overshoot and undershoot < 10 % of V_{CC}
- Input-disable feature allows floating input conditions
- I_{OFF} circuitry provides partial Power-down mode operation

- Multiple package options
- Specified from −40 °C to +85 °C and −40 °C to +125 °C

3. Ordering information

Table 1. Ordering information

Type number	Package			
	Temperature range	Name	Description	Version
74AUP2G241DC	−40 °C to +125 °C	VSSOP8	plastic very thin shrink small outline package; 8 leads; body width 2.3 mm	SOT765-1
74AUP2G241GT	−40 °C to +125 °C	XSON8	plastic extremely thin small outline package; no leads; 8 terminals; body 1 × 1.95 × 0.5 mm	SOT833-1
74AUP2G241GF	−40 °C to +125 °C	XSON8	extremely thin small outline package; no leads; 8 terminals; body 1.35 × 1 × 0.5 mm	SOT1089
74AUP2G241GD	−40 °C to +125 °C	XSON8	plastic extremely thin small outline package; no leads; 8 terminals; body 3 × 2 × 0.5 mm	SOT996-2
74AUP2G241GM	−40 °C to +125 °C	XQFN8	plastic, extremely thin quad flat package; no leads; 8 terminals; body 1.6 × 1.6 × 0.5 mm	SOT902-2
74AUP2G241GN	−40 °C to +125 °C	XSON8	extremely thin small outline package; no leads; 8 terminals; body 1.2 × 1.0 × 0.35 mm	SOT1116
74AUP2G241GS	−40 °C to +125 °C	XSON8	extremely thin small outline package; no leads; 8 terminals; body 1.35 × 1.0 × 0.35 mm	SOT1203

4. Marking

Table 2. Marking codes

Type number	Marking code[1]
74AUP2G241DC	p41
74AUP2G241GT	p41
74AUP2G241GF	p1
74AUP2G241GD	p41
74AUP2G241GM	p41
74AUP2G241GN	p1
74AUP2G241GS	p1

[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

5. Functional diagram

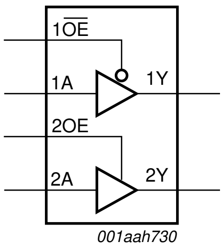


Fig 1. Logic symbol

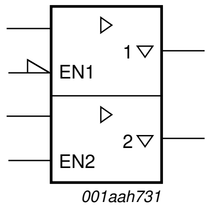


Fig 2. IEC logic symbol

6. Pinning information

6.1 Pinning

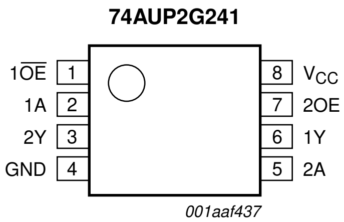


Fig 3. Pin configuration SOT765-1

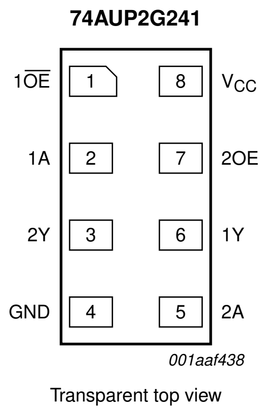


Fig 4. Pin configuration SOT833-1, SOT1089, SOT1116 and SOT1203

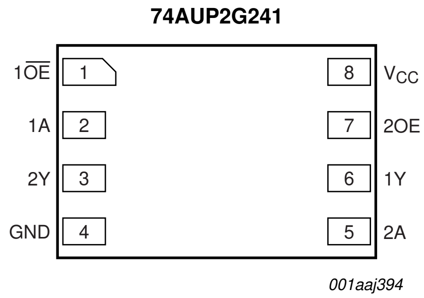


Fig 5. Pin configuration SOT996-2

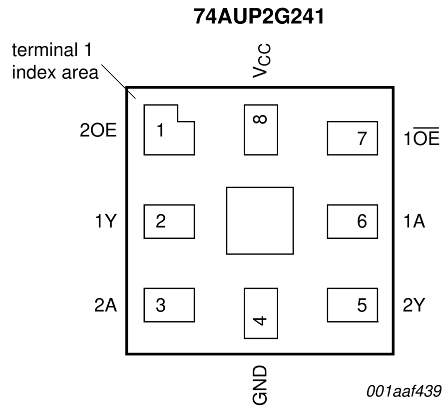


Fig 6. Pin configuration SOT902-2

6.2 Pin description

Table 3. Pin description

Symbol	Pin		Description
	SOT765-1, SOT833-1, SOT1089, SOT996-2, SOT1116 and SOT1203	SOT902-2	
1$\overline{\text{OE}}$	1	7	output enable input 1$\overline{\text{OE}}$ (active LOW)
1A, 2A	2, 5	6, 3	data input
1Y, 2Y	6, 3	2, 5	data output
GND	4	4	ground (0 V)
2OE	7	1	output enable input 2OE (active HIGH)
V_{CC}	8	8	supply voltage

7. Functional description

Table 4. Function table[1]

Input		Output	Input		Output
1$\overline{\text{OE}}$	1A	1Y	2OE	2A	2Y
L	L	L	H	L	L
L	H	H	H	H	H
H	X	Z	L	X	Z

[1] H = HIGH voltage level; L = LOW voltage level; X = don't care; Z = high-impedance OFF-state.

8. Limiting values

Table 5. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134). Voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions		Min	Max	Unit
V_{CC}	supply voltage			–0.5	+4.6	V
I_{IK}	input clamping current	$V_I < 0$ V		–50	-	mA
V_I	input voltage		[1]	–0.5	+4.6	V
I_{OK}	output clamping current	$V_O < 0$ V		–50	-	mA
V_O	output voltage	Active mode and Power-down mode	[1]	–0.5	+4.6	V
I_O	output current	$V_O = 0$ V to V_{CC}		-	±20	mA
I_{CC}	supply current			-	+50	mA
I_{GND}	ground current			–50	-	mA
T_{stg}	storage temperature			–65	+150	°C
P_{tot}	total power dissipation	T_{amb} = –40 °C to +125 °C	[2]	-	250	mW

[1] The minimum input and output voltage ratings may be exceeded if the input and output current ratings are observed.

[2] For VSSOP8 packages: above 110 °C the value of P_{tot} derates linearly with 8.0 mW/K.
For XSON8 and XQFN8 packages: above 118 °C the value of P_{tot} derates linearly with 7.8 mW/K.

9. Recommended operating conditions

Table 6. Operating conditions

Symbol	Parameter	Conditions	Min	Max	Unit
V_{CC}	supply voltage		0.8	3.6	V
V_I	input voltage		0	3.6	V
V_O	output voltage	Active mode	0	V_{CC}	V
		Power-down mode; $V_{CC} = 0$ V	0	3.6	V
T_{amb}	ambient temperature		–40	+125	°C
$\Delta t/\Delta V$	input transition rise and fall rate	V_{CC} = 0.8 V to 3.6 V	0	200	ns/V

10. Static characteristics

Table 7. Static characteristics

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
T_{amb} = 25 °C						
V_{IH}	HIGH-level input voltage	V_{CC} = 0.8 V	0.70 × V_{CC}	-	-	V
		V_{CC} = 0.9 V to 1.95 V	0.65 × V_{CC}	-	-	V
		V_{CC} = 2.3 V to 2.7 V	1.6	-	-	V
		V_{CC} = 3.0 V to 3.6 V	2.0	-	-	V
V_{IL}	LOW-level input voltage	V_{CC} = 0.8 V	-	-	0.30 × V_{CC}	V
		V_{CC} = 0.9 V to 1.95 V	-	-	0.35 × V_{CC}	V
		V_{CC} = 2.3 V to 2.7 V	-	-	0.7	V
		V_{CC} = 3.0 V to 3.6 V	-	-	0.9	V

Table 7. Static characteristics *...continued*
At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{OH}	HIGH-level output voltage	$V_I = V_{IH}$ or V_{IL}					
		$I_O = -20\ \mu A$; $V_{CC} = 0.8$ V to 3.6 V		$V_{CC} - 0.1$	-	-	V
		$I_O = -1.1$ mA; $V_{CC} = 1.1$ V		$0.75 \times V_{CC}$	-	-	V
		$I_O = -1.7$ mA; $V_{CC} = 1.4$ V		1.11	-	-	V
		$I_O = -1.9$ mA; $V_{CC} = 1.65$ V		1.32	-	-	V
		$I_O = -2.3$ mA; $V_{CC} = 2.3$ V		2.05	-	-	V
		$I_O = -3.1$ mA; $V_{CC} = 2.3$ V		1.9	-	-	V
		$I_O = -2.7$ mA; $V_{CC} = 3.0$ V		2.72	-	-	V
		$I_O = -4.0$ mA; $V_{CC} = 3.0$ V		2.6	-	-	V
V_{OL}	LOW-level output voltage	$V_I = V_{IH}$ or V_{IL}					
		$I_O = 20\ \mu A$; $V_{CC} = 0.8$ V to 3.6 V		-	-	0.1	V
		$I_O = 1.1$ mA; $V_{CC} = 1.1$ V		-	-	$0.3 \times V_{CC}$	V
		$I_O = 1.7$ mA; $V_{CC} = 1.4$ V		-	-	0.31	V
		$I_O = 1.9$ mA; $V_{CC} = 1.65$ V		-	-	0.31	V
		$I_O = 2.3$ mA; $V_{CC} = 2.3$ V		-	-	0.31	V
		$I_O = 3.1$ mA; $V_{CC} = 2.3$ V		-	-	0.44	V
		$I_O = 2.7$ mA; $V_{CC} = 3.0$ V		-	-	0.31	V
		$I_O = 4.0$ mA; $V_{CC} = 3.0$ V		-	-	0.44	V
I_I	input leakage current	V_I = GND to 3.6 V; $V_{CC} = 0$ V to 3.6 V		-	-	±0.1	μA
I_{OZ}	OFF-state output current	$V_I = V_{IH}$ or V_{IL}; $V_O = 0$ V to 3.6 V; $V_{CC} = 0$ V to 3.6 V		-	-	±0.1	μA
I_{OFF}	power-off leakage current	V_I or $V_O = 0$ V to 3.6 V; $V_{CC} = 0$ V		-	-	±0.2	μA
ΔI_{OFF}	additional power-off leakage current	V_I or $V_O = 0$ V to 3.6 V; $V_{CC} = 0$ V to 0.2 V		-	-	±0.2	μA
I_{CC}	supply current	V_I = GND or V_{CC}; $I_O = 0$ A; $V_{CC} = 0.8$ V to 3.6 V		-	-	0.5	μA
ΔI_{CC}	additional supply current	data input; $V_I = V_{CC} - 0.6$ V; $I_O = 0$ A; $V_{CC} = 3.3$ V	[1]	-	-	40	μA
		$1\overline{OE}$ and 2OE input; $V_I = V_{CC} - 0.6$ V; $I_O = 0$ A; $V_{CC} = 3.3$ V	[1]	-	-	110	μA
		all inputs; V_I = GND to 3.6 V; $1\overline{OE} = V_{CC}$; 2OE = GND; $V_{CC} = 0.8$ V to 3.6 V	[2]	-	-	1	μA
C_I	input capacitance	$V_{CC} = 0$ V to 3.6 V; V_I = GND or V_{CC}		-	0.6	-	pF
C_O	output capacitance	output enabled; V_O = GND; $V_{CC} = 0$ V		-	1.7	-	pF
		output disabled; $V_{CC} = 0$ V to 3.6 V; V_O = GND or V_{CC}		-	1.5	-	pF
T_{amb} = −40 °C to +85 °C							
V_{IH}	HIGH-level input voltage	$V_{CC} = 0.8$ V		$0.70 \times V_{CC}$	-	-	V
		$V_{CC} = 0.9$ V to 1.95 V		$0.65 \times V_{CC}$	-	-	V
		$V_{CC} = 2.3$ V to 2.7 V		1.6	-	-	V
		$V_{CC} = 3.0$ V to 3.6 V		2.0	-	-	V

Table 7. Static characteristics *...continued*

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{IL}	LOW-level input voltage	V_{CC} = 0.8 V		-	-	0.30 × V_{CC}	V
		V_{CC} = 0.9 V to 1.95 V		-	-	0.35 × V_{CC}	V
		V_{CC} = 2.3 V to 2.7 V		-	-	0.7	V
		V_{CC} = 3.0 V to 3.6 V		-	-	0.9	V
V_{OH}	HIGH-level output voltage	V_I = V_{IH} or V_{IL}					
		I_O = −20 μA; V_{CC} = 0.8 V to 3.6 V		V_{CC} − 0.1	-	-	V
		I_O = −1.1 mA; V_{CC} = 1.1 V		0.7 × V_{CC}	-	-	V
		I_O = −1.7 mA; V_{CC} = 1.4 V		1.03	-	-	V
		I_O = −1.9 mA; V_{CC} = 1.65 V		1.30	-	-	V
		I_O = −2.3 mA; V_{CC} = 2.3 V		1.97	-	-	V
		I_O = −3.1 mA; V_{CC} = 2.3 V		1.85	-	-	V
		I_O = −2.7 mA; V_{CC} = 3.0 V		2.67	-	-	V
		I_O = −4.0 mA; V_{CC} = 3.0 V		2.55	-	-	V
V_{OL}	LOW-level output voltage	V_I = V_{IH} or V_{IL}					
		I_O = 20 μA; V_{CC} = 0.8 V to 3.6 V		-	-	0.1	V
		I_O = 1.1 mA; V_{CC} = 1.1 V		-	-	0.3 × V_{CC}	V
		I_O = 1.7 mA; V_{CC} = 1.4 V		-	-	0.37	V
		I_O = 1.9 mA; V_{CC} = 1.65 V		-	-	0.35	V
		I_O = 2.3 mA; V_{CC} = 2.3 V		-	-	0.33	V
		I_O = 3.1 mA; V_{CC} = 2.3 V		-	-	0.45	V
		I_O = 2.7 mA; V_{CC} = 3.0 V		-	-	0.33	V
		I_O = 4.0 mA; V_{CC} = 3.0 V		-	-	0.45	V
I_I	input leakage current	V_I = GND to 3.6 V; V_{CC} = 0 V to 3.6 V		-	-	±0.5	μA
I_{OFF}	power-off leakage current	V_I or V_O = 0 V to 3.6 V; V_{CC} = 0 V		-	-	±0.5	μA
I_{OZ}	OFF-state output current	V_I = V_{IH} or V_{IL}; V_O = 0 V to 3.6 V; V_{CC} = 0 V to 3.6 V		-	-	±0.5	μA
ΔI_{OFF}	additional power-off leakage current	V_I or V_O = 0 V to 3.6 V; V_{CC} = 0 V to 0.2 V		-	-	±0.6	μA
I_{CC}	supply current	V_I = GND or V_{CC}; I_O = 0 A; V_{CC} = 0.8 V to 3.6 V		-	-	0.9	μA
ΔI_{CC}	additional supply current	data input; V_I = V_{CC} − 0.6 V; I_O = 0 A; V_{CC} = 3.3 V	[1]	-	-	50	μA
		$1\overline{OE}$ and 2OE input; V_I = V_{CC} − 0.6 V; I_O = 0 A; V_{CC} = 3.3 V	[1]	-	-	120	μA
		all inputs; V_I = GND to 3.6 V; $1\overline{OE}$ = V_{CC}; 2OE = GND; V_{CC} = 0.8 V to 3.6 V	[2]	-	-	1	μA
T_{amb} = −40 °C to +125 °C							
V_{IH}	HIGH-level input voltage	V_{CC} = 0.8 V		0.75 × V_{CC}	-	-	V
		V_{CC} = 0.9 V to 1.95 V		0.70 × V_{CC}	-	-	V
		V_{CC} = 2.3 V to 2.7 V		1.6	-	-	V
		V_{CC} = 3.0 V to 3.6 V		2.0	-	-	V

Table 7. Static characteristics *…continued*
At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{IL}	LOW-level input voltage	V_{CC} = 0.8 V		-	-	0.25 × V_{CC}	V
		V_{CC} = 0.9 V to 1.95 V		-	-	0.30 × V_{CC}	V
		V_{CC} = 2.3 V to 2.7 V		-	-	0.7	V
		V_{CC} = 3.0 V to 3.6 V		-	-	0.9	V
V_{OH}	HIGH-level output voltage	V_I = V_{IH} or V_{IL}					
		I_O = −20 µA; V_{CC} = 0.8 V to 3.6 V		V_{CC} − 0.11	-	-	V
		I_O = −1.1 mA; V_{CC} = 1.1 V		0.6 × V_{CC}	-	-	V
		I_O = −1.7 mA; V_{CC} = 1.4 V		0.93	-	-	V
		I_O = −1.9 mA; V_{CC} = 1.65 V		1.17	-	-	V
		I_O = −2.3 mA; V_{CC} = 2.3 V		1.77	-	-	V
		I_O = −3.1 mA; V_{CC} = 2.3 V		1.67	-	-	V
		I_O = −2.7 mA; V_{CC} = 3.0 V		2.40	-	-	V
		I_O = −4.0 mA; V_{CC} = 3.0 V		2.30	-	-	V
V_{OL}	LOW-level output voltage	V_I = V_{IH} or V_{IL}					
		I_O = 20 µA; V_{CC} = 0.8 V to 3.6 V		-	-	0.11	V
		I_O = 1.1 mA; V_{CC} = 1.1 V		-	-	0.33 × V_{CC}	V
		I_O = 1.7 mA; V_{CC} = 1.4 V		-	-	0.41	V
		I_O = 1.9 mA; V_{CC} = 1.65 V		-	-	0.39	V
		I_O = 2.3 mA; V_{CC} = 2.3 V		-	-	0.36	V
		I_O = 3.1 mA; V_{CC} = 2.3 V		-	-	0.50	V
		I_O = 2.7 mA; V_{CC} = 3.0 V		-	-	0.36	V
		I_O = 4.0 mA; V_{CC} = 3.0 V		-	-	0.50	V
I_I	input leakage current	V_I = GND to 3.6 V; V_{CC} = 0 V to 3.6 V		-	-	±0.75	µA
I_{OZ}	OFF-state output current	V_I = V_{IH} or V_{IL}; V_O = 0 V to 3.6 V; V_{CC} = 0 V to 3.6 V		-	-	±0.75	µA
I_{OFF}	power-off leakage current	V_I or V_O = 0 V to 3.6 V; V_{CC} = 0 V		-	-	±0.75	µA
ΔI_{OFF}	additional power-off leakage current	V_I or V_O = 0 V to 3.6 V; V_{CC} = 0 V to 0.2 V		-	-	±0.75	µA
I_{CC}	supply current	V_I = GND or V_{CC}; I_O = 0 A; V_{CC} = 0.8 V to 3.6 V		-	-	1.4	µA
ΔI_{CC}	additional supply current	data input; V_I = V_{CC} − 0.6 V; I_O = 0 A; V_{CC} = 3.3 V	[1]	-	-	75	µA
		$1\overline{OE}$ and 2OE input; V_I = V_{CC} − 0.6 V; I_O = 0 A; V_{CC} = 3.3 V	[1]	-	-	180	µA
		all inputs; V_I = GND to 3.6 V; $1\overline{OE}$ = V_{CC}; 2OE = GND; V_{CC} = 0.8 V to 3.6 V	[2]	-	-	1	µA

[1] One input at V_{CC} − 0.6 V, other input at V_{CC} or GND.

[2] To show I_{CC} remains very low when the input-disable feature is enabled.

11. Dynamic characteristics

Table 8. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V); for test circuit see Figure 10.

Symbol	Parameter	Conditions		25 °C			−40 °C to +125 °C			Unit
				Min	Typ[1]	Max	Min	Max (85 °C)	Max (125 °C)	
C_L = 5 pF										
t_{pd}	propagation delay	nA to nY; see Figure 7	[2]							
		V_{CC} = 0.8 V		-	20.6	-	-	-	-	ns
		V_{CC} = 1.1 V to 1.3 V		2.8	5.5	10.5	2.5	11.7	12.9	ns
		V_{CC} = 1.4 V to 1.6 V		2.2	3.9	6.1	2.0	7.3	8.1	ns
		V_{CC} = 1.65 V to 1.95 V		1.9	3.2	4.8	1.7	6.1	6.7	ns
		V_{CC} = 2.3 V to 2.7 V		1.6	2.6	3.6	1.4	4.3	4.9	ns
		V_{CC} = 3.0 V to 3.6 V		1.4	2.4	3.1	1.2	3.9	4.4	ns
t_{en}	enable time	$1\overline{OE}$ to 1Y; see Figure 8	[3]							
		V_{CC} = 0.8 V		-	69.9	-	-	-	-	ns
		V_{CC} = 1.1 V to 1.3 V		3.1	6.1	11.8	2.9	13.9	15.4	ns
		V_{CC} = 1.4 V to 1.6 V		2.5	4.2	6.6	2.3	7.7	8.3	ns
		V_{CC} = 1.65 V to 1.95 V		2.1	3.4	5.1	2.0	6.2	6.8	ns
		V_{CC} = 2.3 V to 2.7 V		1.8	2.6	3.7	1.7	4.5	5.0	ns
		V_{CC} = 3.0 V to 3.6 V		1.7	2.4	3.1	1.7	3.5	3.9	ns
		2OE to 2Y; see Figure 9	[3]							
		V_{CC} = 0.8 V		-	71.6	-	-	-	-	ns
		V_{CC} = 1.1 V to 1.3 V		2.8	6.2	12.4	2.6	13.6	13.6	ns
		V_{CC} = 1.4 V to 1.6 V		2.3	4.2	6.9	2.2	7.4	7.7	ns
		V_{CC} = 1.65 V to 1.95 V		1.9	3.3	5.3	1.7	5.9	6.2	ns
		V_{CC} = 2.3 V to 2.7 V		1.5	2.4	3.6	1.4	3.8	4.1	ns
		V_{CC} = 3.0 V to 3.6 V		1.3	2.0	2.9	1.2	3.2	3.4	ns
t_{dis}	disable time	$1\overline{OE}$ to 1Y; see Figure 8	[4]							
		V_{CC} = 0.8 V		-	14.3	-	-	-	-	ns
		V_{CC} = 1.1 V to 1.3 V		2.7	4.3	6.5	2.7	7.3	8.2	ns
		V_{CC} = 1.4 V to 1.6 V		2.1	3.2	4.4	2.1	5.1	5.7	ns
		V_{CC} = 1.65 V to 1.95 V		2.0	3.0	4.3	2.0	5.0	5.7	ns
		V_{CC} = 2.3 V to 2.7 V		1.4	2.2	2.9	1.4	3.3	4.1	ns
		V_{CC} = 3.0 V to 3.6 V		1.7	2.5	3.2	1.7	3.4	3.9	ns
		2OE to 2Y; see Figure 9	[4]							
		V_{CC} = 0.8 V		-	10.3	-	-	-	-	ns
		V_{CC} = 1.1 V to 1.3 V		2.6	4.2	6.2	2.9	6.4	6.5	ns
		V_{CC} = 1.4 V to 1.6 V		2.1	3.2	4.4	2.2	4.6	4.7	ns
		V_{CC} = 1.65 V to 1.95 V		2.1	3.1	4.4	1.7	4.6	4.8	ns
		V_{CC} = 2.3 V to 2.7 V		1.7	2.4	3.2	1.4	3.4	3.6	ns
		V_{CC} = 3.0 V to 3.6 V		2.1	2.8	3.6	1.2	3.7	3.8	ns

Table 8. Dynamic characteristics *...continued*

Voltages are referenced to GND (ground = 0 V); for test circuit see Figure 10.

Symbol	Parameter	Conditions		25 °C			−40 °C to +125 °C			Unit
				Min	Typ[1]	Max	Min	Max (85 °C)	Max (125 °C)	
C_L = 10 pF										
t_{pd}	propagation delay	nA to nY; see Figure 7	[2]							
		V_{CC} = 0.8 V		-	24.0	-	-	-	-	ns
		V_{CC} = 1.1 V to 1.3 V		3.2	6.4	12.3	3.0	13.8	15.2	ns
		V_{CC} = 1.4 V to 1.6 V		2.1	4.5	7.3	1.9	8.5	9.4	ns
		V_{CC} = 1.65 V to 1.95 V		1.9	3.8	5.5	1.7	6.8	7.6	ns
		V_{CC} = 2.3 V to 2.7 V		2.1	3.2	4.2	1.6	5.3	5.9	ns
		V_{CC} = 3.0 V to 3.6 V		1.8	3.0	3.8	1.6	4.6	5.2	ns
t_{en}	enable time	$1\overline{OE}$ to 1Y; see Figure 8	[3]							
		V_{CC} = 0.8 V		-	73.7	-	-	-	-	ns
		V_{CC} = 1.1 V to 1.3 V		3.6	6.9	13.5	3.4	15.8	17.5	ns
		V_{CC} = 1.4 V to 1.6 V		2.3	4.8	7.7	2.2	8.6	9.4	ns
		V_{CC} = 1.65 V to 1.95 V		2.0	3.9	5.8	1.9	6.8	7.4	ns
		V_{CC} = 2.3 V to 2.7 V		1.8	3.2	4.3	1.7	5.3	5.9	ns
		V_{CC} = 3.0 V to 3.6 V		1.7	3.0	3.9	1.7	4.3	4.8	ns
		2OE to 2Y; see Figure 9	[3]							
		V_{CC} = 0.8 V		-	75.3	-	-	-	-	ns
		V_{CC} = 1.1 V to 1.3 V		3.2	7.1	14.1	3.0	15.4	15.4	ns
		V_{CC} = 1.4 V to 1.6 V		2.2	4.8	8.0	2.1	8.3	8.6	ns
		V_{CC} = 1.65 V to 1.95 V		1.8	3.9	5.9	1.7	6.5	6.8	ns
		V_{CC} = 2.3 V to 2.7 V		1.5	2.9	4.2	1.4	4.5	4.8	ns
		V_{CC} = 3.0 V to 3.6 V		1.4	2.6	3.6	1.3	3.8	4.0	ns
t_{dis}	disable time	$1\overline{OE}$ to 1Y; see Figure 8	[4]							
		V_{CC} = 0.8 V		-	32.7	-	-	-	-	ns
		V_{CC} = 1.1 V to 1.3 V		3.4	5.4	7.9	3.4	8.8	9.9	ns
		V_{CC} = 1.4 V to 1.6 V		2.2	4.1	5.5	2.2	6.2	7.1	ns
		V_{CC} = 1.65 V to 1.95 V		2.2	4.2	5.6	1.9	6.3	7.1	ns
		V_{CC} = 2.3 V to 2.7 V		1.7	3.0	3.8	1.7	4.5	5.1	ns
		V_{CC} = 3.0 V to 3.6 V		2.1	3.8	4.8	1.7	5.0	5.6	ns
		2OE to 2Y; see Figure 9	[4]							
		V_{CC} = 0.8 V		-	12.2	-	-	-	-	ns
		V_{CC} = 1.1 V to 1.3 V		3.5	5.3	7.6	3.3	7.9	7.9	ns
		V_{CC} = 1.4 V to 1.6 V		2.2	4.1	5.6	2.1	5.7	5.9	ns
		V_{CC} = 1.65 V to 1.95 V		2.4	4.2	5.7	1.7	5.8	6.0	ns
		V_{CC} = 2.3 V to 2.7 V		1.9	3.2	4.1	1.4	4.3	4.5	ns
		V_{CC} = 3.0 V to 3.6 V		2.4	4.1	5.0	1.3	5.2	5.3	ns

Table 8. Dynamic characteristics *...continued*
Voltages are referenced to GND (ground = 0 V); for test circuit see Figure 10.

Symbol	Parameter	Conditions		25 °C			−40 °C to +125 °C			Unit
				Min	Typ[1]	Max	Min	Max (85 °C)	Max (125 °C)	
C_L = 15 pF										
t_{pd}	propagation delay	nA to nY; see Figure 7	[2]							
		V_{CC} = 0.8 V		-	27.4	-	-	-	-	ns
		V_{CC} = 1.1 V to 1.3 V		3.6	7.2	14.1	3.3	15.8	17.5	ns
		V_{CC} = 1.4 V to 1.6 V		3.0	5.1	8.1	2.5	9.8	10.9	ns
		V_{CC} = 1.65 V to 1.95 V		2.2	4.3	6.3	2.0	7.9	8.8	ns
		V_{CC} = 2.3 V to 2.7 V		2.0	3.7	4.9	1.8	6.0	6.7	ns
		V_{CC} = 3.0 V to 3.6 V		2.0	3.5	4.4	1.8	5.4	6.1	ns
t_{en}	enable time	$1\overline{OE}$ to 1Y; see Figure 8	[3]							
		V_{CC} = 0.8 V		-	77.5	-	-	-	-	ns
		V_{CC} = 1.1 V to 1.3 V		4.0	7.7	15.2	3.7	17.6	19.6	ns
		V_{CC} = 1.4 V to 1.6 V		3.0	5.3	8.4	2.5	9.8	10.7	ns
		V_{CC} = 1.65 V to 1.95 V		2.3	4.4	6.5	2.1	7.7	8.5	ns
		V_{CC} = 2.3 V to 2.7 V		2.1	3.6	5.0	2.0	6.1	6.8	ns
		V_{CC} = 3.0 V to 3.6 V		2.0	3.5	4.5	1.9	4.9	5.5	ns
		2OE to 2Y; see Figure 9	[3]							
		V_{CC} = 0.8 V		-	79.2	-	-	-	-	ns
		V_{CC} = 1.1 V to 1.3 V		3.6	7.8	15.8	3.3	17.1	17.1	ns
		V_{CC} = 1.4 V to 1.6 V		3.0	5.4	8.8	2.9	9.4	9.7	ns
		V_{CC} = 1.65 V to 1.95 V		2.1	4.3	6.7	2.0	7.3	7.7	ns
		V_{CC} = 2.3 V to 2.7 V		1.8	3.4	4.8	1.7	5.2	5.6	ns
		V_{CC} = 3.0 V to 3.6 V		1.6	3.1	4.3	1.5	4.5	4.7	ns
t_{dis}	disable time	$1\overline{OE}$ to 1Y; see Figure 8	[4]							
		V_{CC} = 0.8 V		-	60.8	-	-	-	-	ns
		V_{CC} = 1.1 V to 1.3 V		4.3	6.5	9.2	3.7	10.3	11.6	ns
		V_{CC} = 1.4 V to 1.6 V		3.0	5.0	6.5	2.5	7.4	8.4	ns
		V_{CC} = 1.65 V to 1.95 V		3.0	5.3	6.6	2.1	7.4	8.9	ns
		V_{CC} = 2.3 V to 2.7 V		2.1	3.8	4.9	2.0	5.1	6.4	ns
		V_{CC} = 3.0 V to 3.6 V		2.9	5.0	6.2	1.9	6.6	7.4	ns
		2OE to 2Y; see Figure 9	[4]							
		V_{CC} = 0.8 V		-	14.9	-	-	-	-	ns
		V_{CC} = 1.1 V to 1.3 V		4.3	6.4	8.5	3.7	9.3	9.4	ns
		V_{CC} = 1.4 V to 1.6 V		3.0	5.0	6.6	2.5	6.9	7.0	ns
		V_{CC} = 1.65 V to 1.95 V		3.1	5.4	6.6	2.0	7.4	7.5	ns
		V_{CC} = 2.3 V to 2.7 V		2.4	4.0	5.0	1.7	5.1	5.5	ns
		V_{CC} = 3.0 V to 3.6 V		3.2	5.3	6.2	1.5	6.7	6.9	ns

Table 8. Dynamic characteristics *...continued*

Voltages are referenced to GND (ground = 0 V); for test circuit see Figure 10.

Symbol	Parameter	Conditions		25 °C			−40 °C to +125 °C			Unit
				Min	Typ[1]	Max	Min	Max (85 °C)	Max (125 °C)	
C_L = 30 pF										
t_{pd}	propagation delay	nA to nY; see Figure 7	[2]							
		V_{CC} = 0.8 V		-	37.4	-	-	-	-	ns
		V_{CC} = 1.1 V to 1.3 V		4.8	9.5	19.0	4.4	21.6	24.0	ns
		V_{CC} = 1.4 V to 1.6 V		4.0	6.7	10.8	3.0	13.0	14.5	ns
		V_{CC} = 1.65 V to 1.95 V		2.9	5.6	8.4	2.6	10.3	11.5	ns
		V_{CC} = 2.3 V to 2.7 V		2.7	4.8	6.3	2.5	7.8	8.7	ns
		V_{CC} = 3.0 V to 3.6 V		2.7	4.6	5.8	2.5	7.0	8.3	ns
t_{en}	enable time	$1\overline{OE}$ to 1Y; see Figure 8	[3]							
		V_{CC} = 0.8 V		-	88.9	-	-	-	-	ns
		V_{CC} = 1.1 V to 1.3 V		5.2	9.9	19.8	4.8	22.8	25.3	ns
		V_{CC} = 1.4 V to 1.6 V		4.0	6.8	10.8	3.1	12.6	14.1	ns
		V_{CC} = 1.65 V to 1.95 V		3.0	5.6	8.5	2.8	10.2	11.3	ns
		V_{CC} = 2.3 V to 2.7 V		2.7	4.8	6.5	2.6	7.8	8.8	ns
		V_{CC} = 3.0 V to 3.6 V		2.7	4.6	6.0	2.6	6.9	7.7	ns
		2OE to 2Y; see Figure 9	[3]							
		V_{CC} = 0.8 V		-	90.6	-	-	-	-	ns
		V_{CC} = 1.1 V to 1.3 V		4.7	10.0	20.4	4.3	22.0	22.0	ns
		V_{CC} = 1.4 V to 1.6 V		3.0	6.9	11.3	3.7	12.0	12.5	ns
		V_{CC} = 1.65 V to 1.95 V		2.6	5.6	8.6	3.2	9.5	10.1	ns
		V_{CC} = 2.3 V to 2.7 V		2.3	4.5	6.3	2.9	6.8	7.3	ns
		V_{CC} = 3.0 V to 3.6 V		2.2	4.2	5.8	2.7	6.4	6.7	ns
t_{dis}	disable time	$1\overline{OE}$ to 1Y; see Figure 8	[4]							
		V_{CC} = 0.8 V		-	49.9	-	-	-	-	ns
		V_{CC} = 1.1 V to 1.3 V		6.0	9.9	13.3	4.8	14.8	16.5	ns
		V_{CC} = 1.4 V to 1.6 V		4.4	7.7	9.6	3.1	10.7	12.1	ns
		V_{CC} = 1.65 V to 1.95 V		5.1	8.7	11.1	2.8	12.4	13.8	ns
		V_{CC} = 2.3 V to 2.7 V		3.6	6.2	7.4	2.6	8.6	9.6	ns
		V_{CC} = 3.0 V to 3.6 V		5.2	8.7	10.5	2.6	10.8	13.1	ns
		2OE to 2Y; see Figure 9	[4]							
		V_{CC} = 0.8 V		-	51.6	-	-	-	-	ns
		V_{CC} = 1.1 V to 1.3 V		6.0	9.8	13.6	4.7	14.3	14.4	ns
		V_{CC} = 1.4 V to 1.6 V		4.5	7.7	10.5	3.0	10.7	11.0	ns
		V_{CC} = 1.65 V to 1.95 V		5.2	8.8	11.4	2.6	11.5	11.6	ns
		V_{CC} = 2.3 V to 2.7 V		3.9	6.4	7.4	2.3	9.0	10.2	ns
		V_{CC} = 3.0 V to 3.6 V		5.5	9.0	10.7	2.2	10.8	12.0	ns

Table 8. Dynamic characteristics *...continued*
Voltages are referenced to GND (ground = 0 V); for test circuit see Figure 10.

Symbol	Parameter	Conditions		25 °C			−40 °C to +125 °C			Unit
				Min	Typ[1]	Max	Min	Max (85 °C)	Max (125 °C)	
C_L = 5 pF, 10 pF, 15 pF and 30 pF										
C_{PD}	power dissipation capacitance	f = 1 MHz; V_I = GND to V_{CC}	[5]							
		V_{CC} = 0.8 V		-	2.8	-	-	-	-	pF
		V_{CC} = 1.1 V to 1.3 V		-	2.8	-	-	-	-	pF
		V_{CC} = 1.4 V to 1.6 V		-	3.0	-	-	-	-	pF
		V_{CC} = 1.65 V to 1.95 V		-	3.0	-	-	-	-	pF
		V_{CC} = 2.3 V to 2.7 V		-	3.7	-	-	-	-	pF
		V_{CC} = 3.0 V to 3.6 V		-	4.2	-	-	-	-	pF

[1] All typical values are measured at nominal V_{CC}.

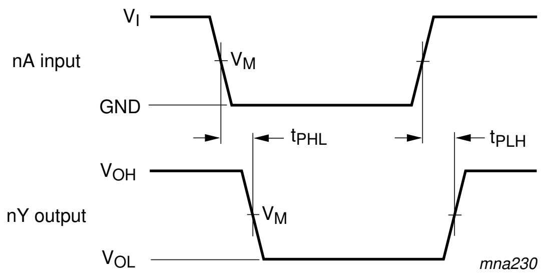
[2] t_{pd} is the same as t_{PLH} and t_{PHL}.

[3] t_{en} is the same as t_{PZH} and t_{PZL}.

[4] t_{dis} is the same as t_{PHZ} and t_{PLZ}.

[5] C_{PD} is used to determine the dynamic power dissipation (P_D in μW).
$P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma(C_L \times V_{CC}^2 \times f_o)$ where:
f_i = input frequency in MHz;
f_o = output frequency in MHz;
C_L = output load capacitance in pF;
V_{CC} = supply voltage in V;
N = number of inputs switching;
$\Sigma(C_L \times V_{CC}^2 \times f_o)$ = sum of the outputs.

12. Waveforms



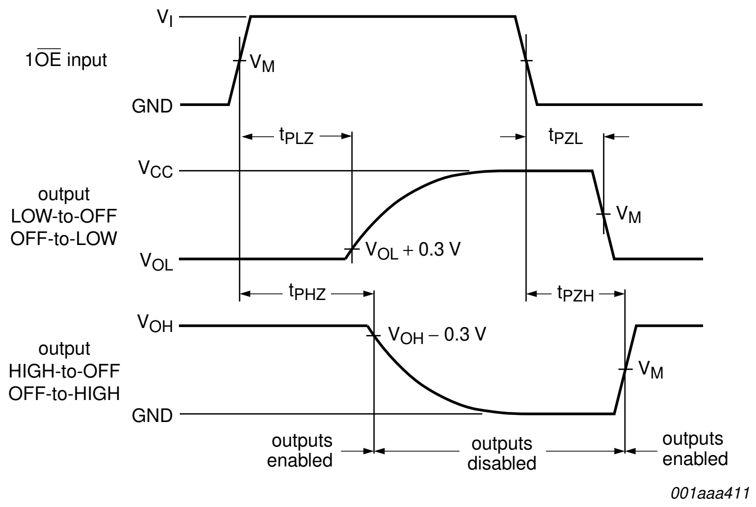
Measurement points are given in Table 9.

Logic levels: V_{OL} and V_{OH} are typical output voltage levels that occur with the output load.

Fig 7. The data input (nA) to output (nY) propagation delays

Table 9. Measurement points

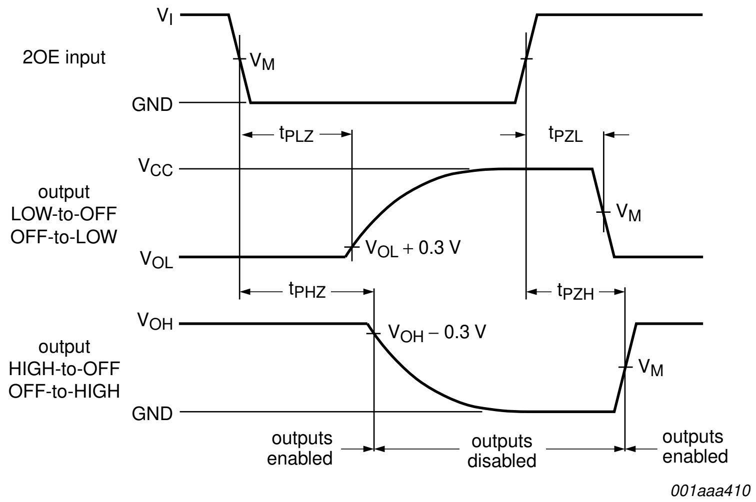
Supply voltage	Output	Input		
V_{CC}	V_M	V_M	V_I	$t_r = t_f$
0.8 V to 3.6 V	0.5 × V_{CC}	0.5 × V_{CC}	V_{CC}	≤ 3.0 ns



Measurement points are given in Table 10.

Logic levels: V_{OL} and V_{OH} are typical output voltage levels that occur with the output load.

Fig 8. 3-state enable and disable times



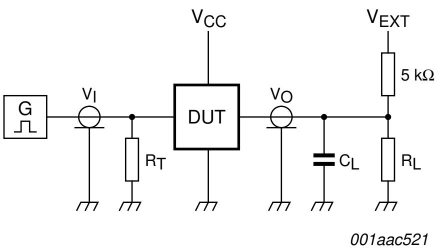
Measurement points are given in Table 10.

Logic levels: V_{OL} and V_{OH} are typical output voltage levels that occur with the output load.

Fig 9. 3-state enable and disable times

Table 10. Measurement points

Supply voltage	Input	Output		
V_{CC}	V_M	V_M	V_X	V_Y
0.8 V to 1.6 V	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$	V_{OL} + 0.1 V	V_{OH} − 0.1 V
1.65 V to 2.7 V	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$	V_{OL} + 0.15 V	V_{OH} − 0.15 V
3.0 V to 3.6 V	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$	V_{OL} + 0.3 V	V_{OH} − 0.3 V



Test data is given in Table 11.

Definitions for test circuit:

R_L = Load resistance.

C_L = Load capacitance including jig and probe capacitance.

R_T = Termination resistance should be equal to the output impedance Z_o of the pulse generator.

V_{EXT} = External voltage for measuring switching times.

Fig 10. Test circuit for measuring switching times

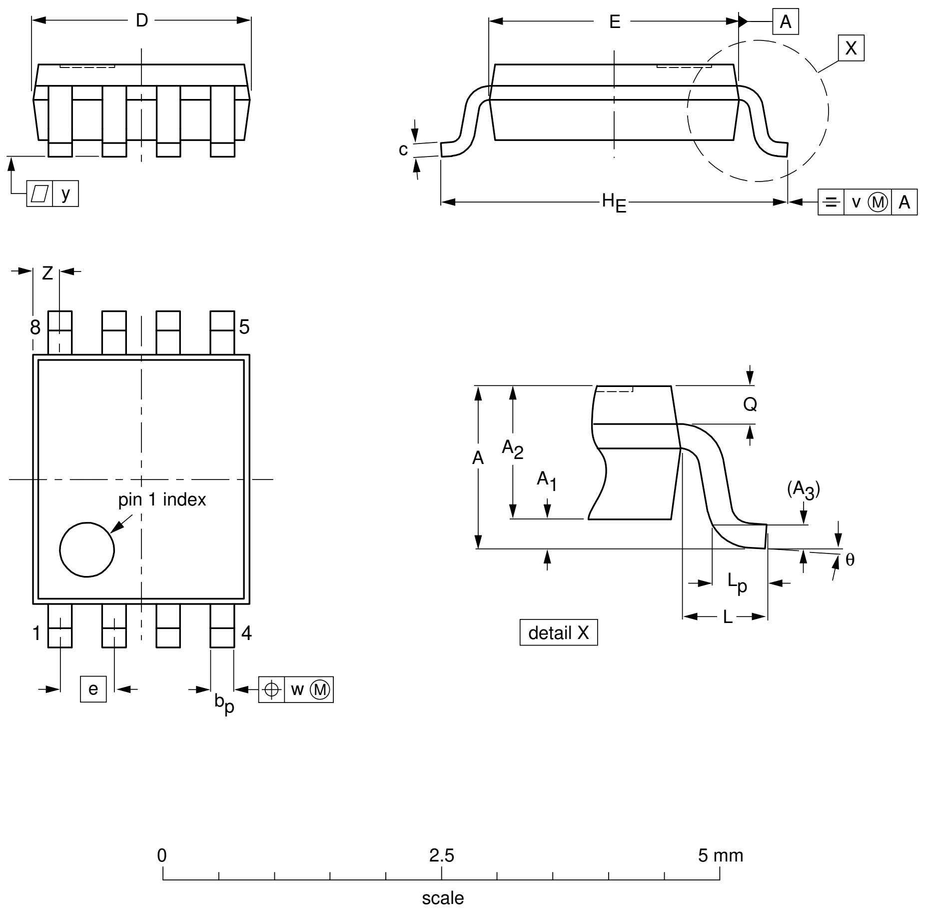
Table 11. Test data

Supply voltage	Load		V_{EXT}		
V_{CC}	C_L	R_L [1]	t_{PLH}, t_{PHL}	t_{PZH}, t_{PHZ}	t_{PZL}, t_{PLZ}
0.8 V to 3.6 V	5 pF, 10 pF, 15 pF and 30 pF	5 kΩ or 1 MΩ	open	GND	2 × V_{CC}

[1] For measuring enable and disable times R_L = 5 kΩ, for measuring propagation delays, setup and hold times and pulse width R_L = 1 MΩ.

13. Package outline

VSSOP8: plastic very thin shrink small outline package; 8 leads; body width 2.3 mm **SOT765-1**



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	0.15 0.00	0.85 0.60	0.12	0.27 0.17	0.23 0.08	2.1 1.9	2.4 2.2	0.5	3.2 3.0	0.4	0.40 0.15	0.21 0.19	0.2	0.13	0.1	0.4 0.1	8° 0°

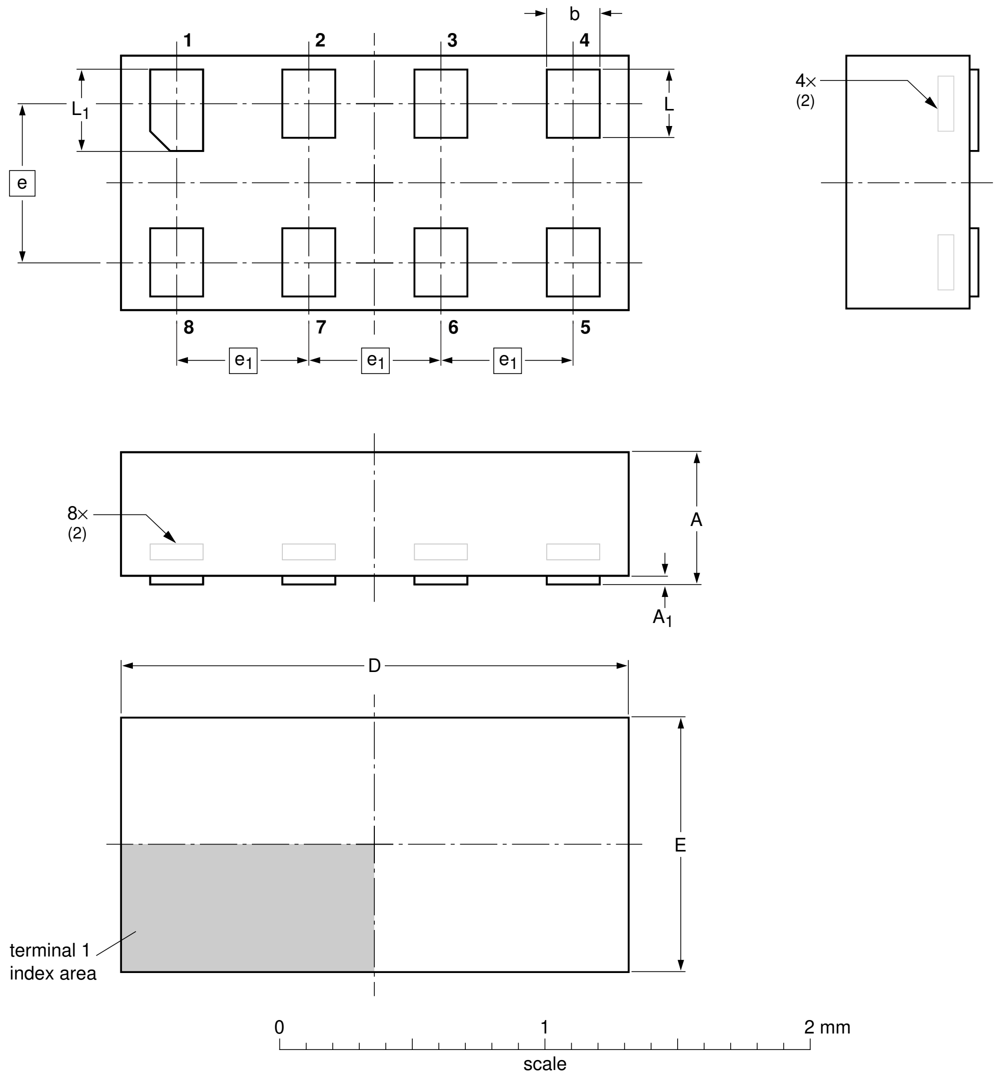
Notes

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

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT765-1		MO-187				02-06-07

Fig 11. Package outline SOT765-1 (VSSOP8)

XSON8: plastic extremely thin small outline package; no leads; 8 terminals; body 1 x 1.95 x 0.5 mm **SOT833-1**



DIMENSIONS (mm are the original dimensions)

UNIT	$A^{(1)}$ max	A_1 max	b	D	E	e	e_1	L	L_1
mm	0.5	0.04	0.25 0.17	2.0 1.9	1.05 0.95	0.6	0.5	0.35 0.27	0.40 0.32

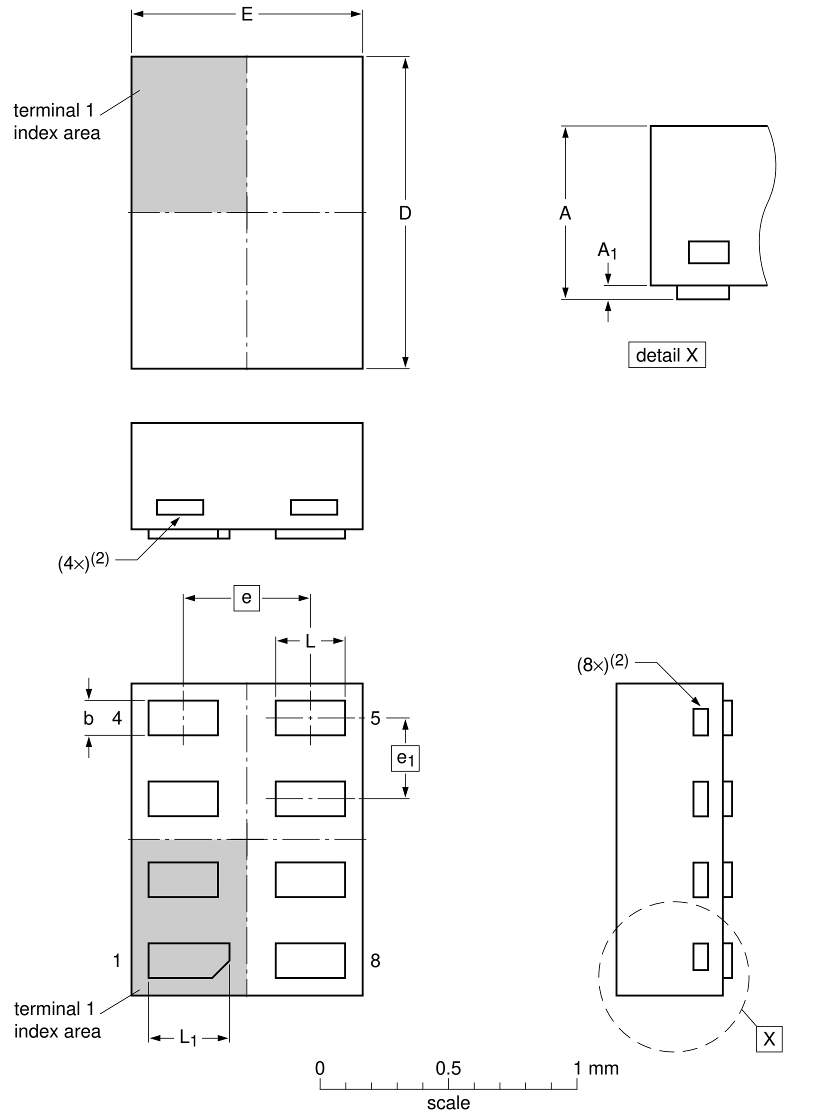
Notes

1. Including plating thickness.
2. Can be visible in some manufacturing processes.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT833-1	- - -	MO-252	- - -			~~07-11-14~~ 07-12-07

Fig 12. Package outline SOT833-1 (XSON8)

XSON8: extremely thin small outline package; no leads; 8 terminals; body 1.35 x 1 x 0.5 mm **SOT1089**



Dimensions

Unit		$A^{(1)}$	A_1	b	D	E	e	e_1	L	L_1
mm	max	0.5	0.04	0.20	1.40	1.05			0.35	0.40
	nom			0.15	1.35	1.00	0.55	0.35	0.30	0.35
	min			0.12	1.30	0.95			0.27	0.32

Note
1. Including plating thickness.
2. Visible depending upon used manufacturing technology.

sot1089_po

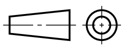
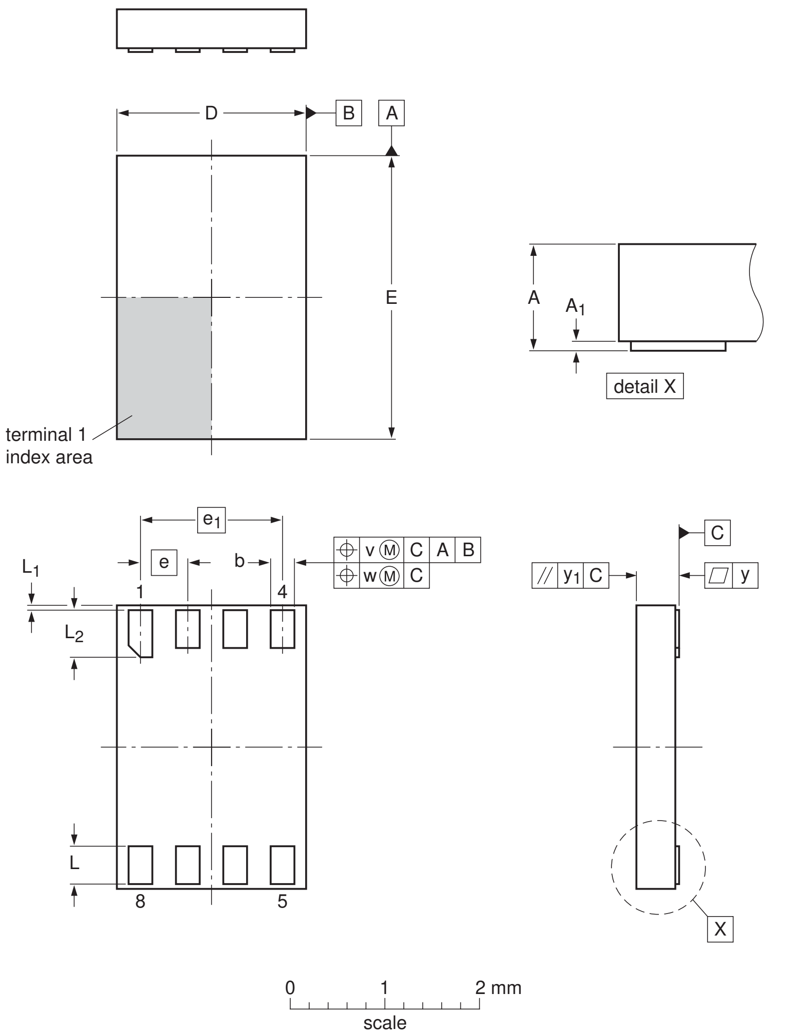
Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOT1089		MO-252				~~10-04-09~~ 10-04-12

Fig 13. Package outline SOT1089 (XSON8)

XSON8: plastic extremely thin small outline package; no leads; 8 terminals; body 3 x 2 x 0.5 mm **SOT996-2**



Dimensions (mm are the original dimensions)

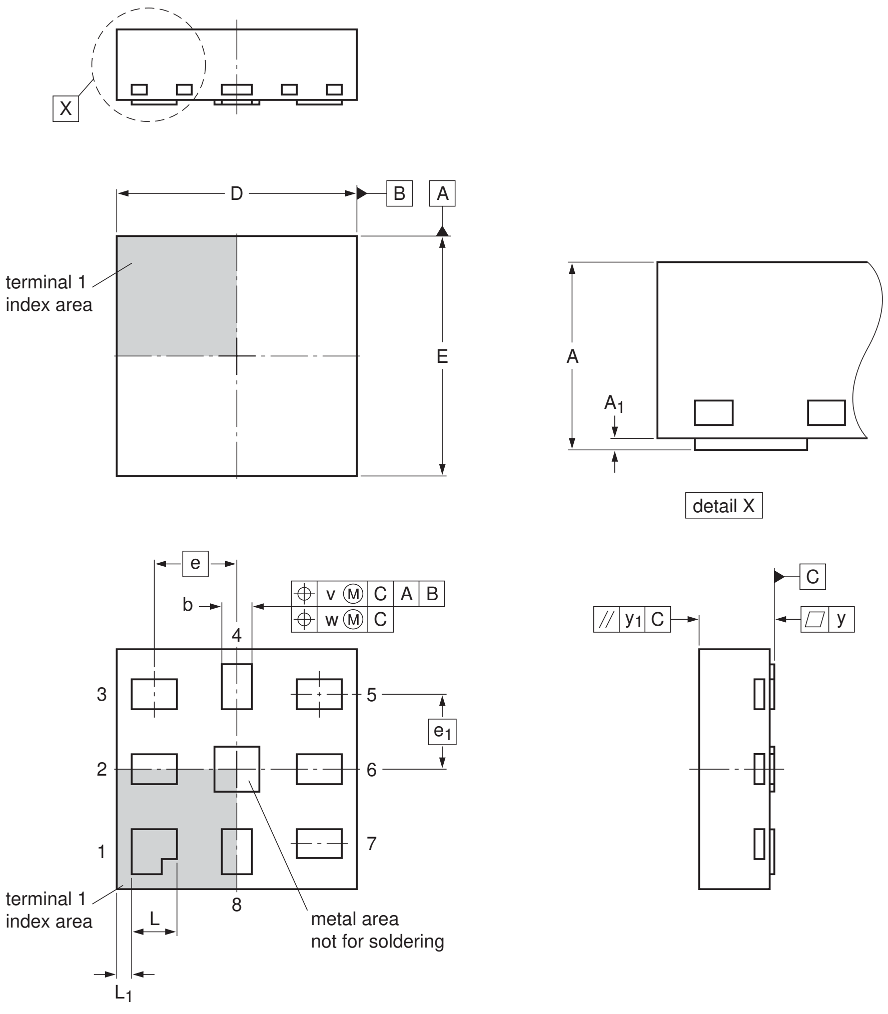
Unit(1)		A	A_1	b	D	E	e	e_1	L	L_1	L_2	v	w	y	y_1
	max		0.05	0.35	2.1	3.1			0.5	0.15	0.6				
mm	nom	0.5					0.5	1.5				0.1	0.05	0.05	0.1
	min		0.00	0.15	1.9	2.9			0.3	0.05	0.4				

sot996-2_po

Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOT996-2						~~07-12-21~~ 12-11-20

Fig 14. Package outline SOT996-2 (XSON8)

XQFN8: plastic, extremely thin quad flat package; no leads; 8 terminals; body 1.6 x 1.6 x 0.5 mm **SOT902-2**



Dimensions

Unit(1)		A	A_1	b	D	E	e	e_1	L	L_1	v	w	y	y_1
	max	0.5	0.05	0.25	1.65	1.65			0.35	0.15				
mm	nom			0.20	1.60	1.60	0.55	0.5	0.30	0.10	0.1	0.05	0.05	0.05
	min		0.00	0.15	1.55	1.55			0.25	0.05				

Note

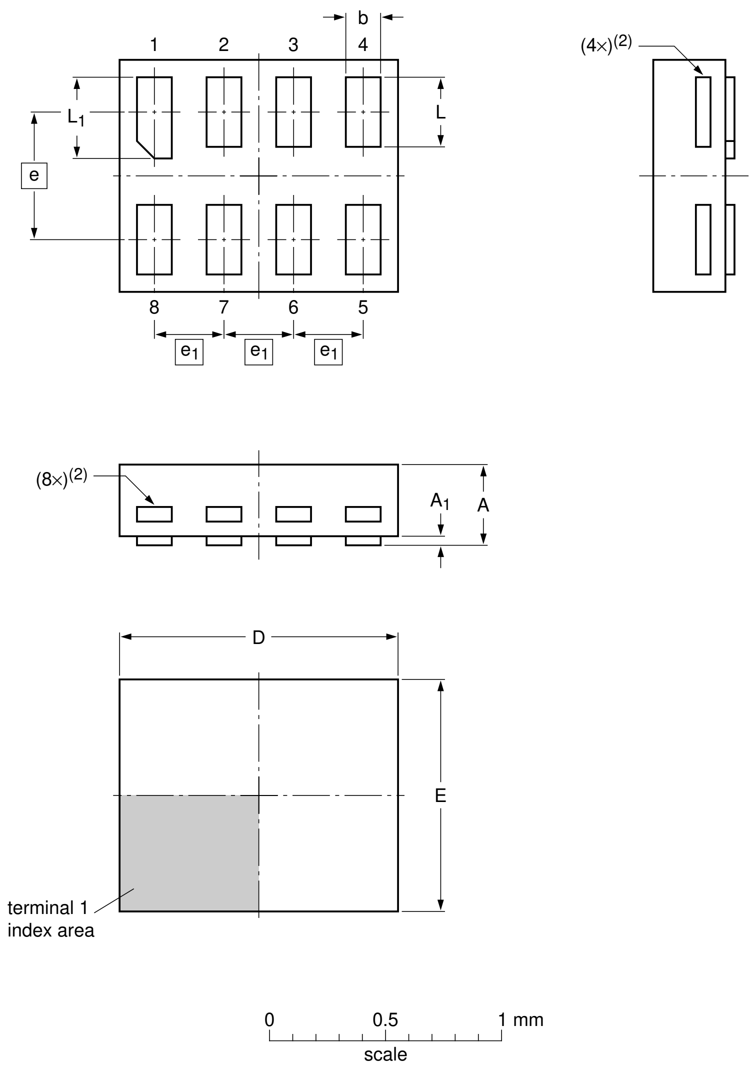
1. Plastic or metal protrusions of 0.075 mm maximum per side are not included.

sot902-2_po

Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOT902-2	- - -	MO-255	- - -			~~10-11-02~~ 11-03-31

Fig 15. Package outline SOT902-2 (XQFN8)

XSON8: extremely thin small outline package; no leads;
8 terminals; body 1.2 x 1.0 x 0.35 mm **SOT1116**



Dimensions

Unit		A(1)	A_1	b	D	E	e	e_1	L	L_1
mm	max	0.35	0.04	0.20	1.25	1.05			0.35	0.40
	nom			0.15	1.20	1.00	0.55	0.3	0.30	0.35
	min			0.12	1.15	0.95			0.27	0.32

Note
1. Including plating thickness.
2. Visible depending upon used manufacturing technology.

sot1116_po

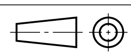
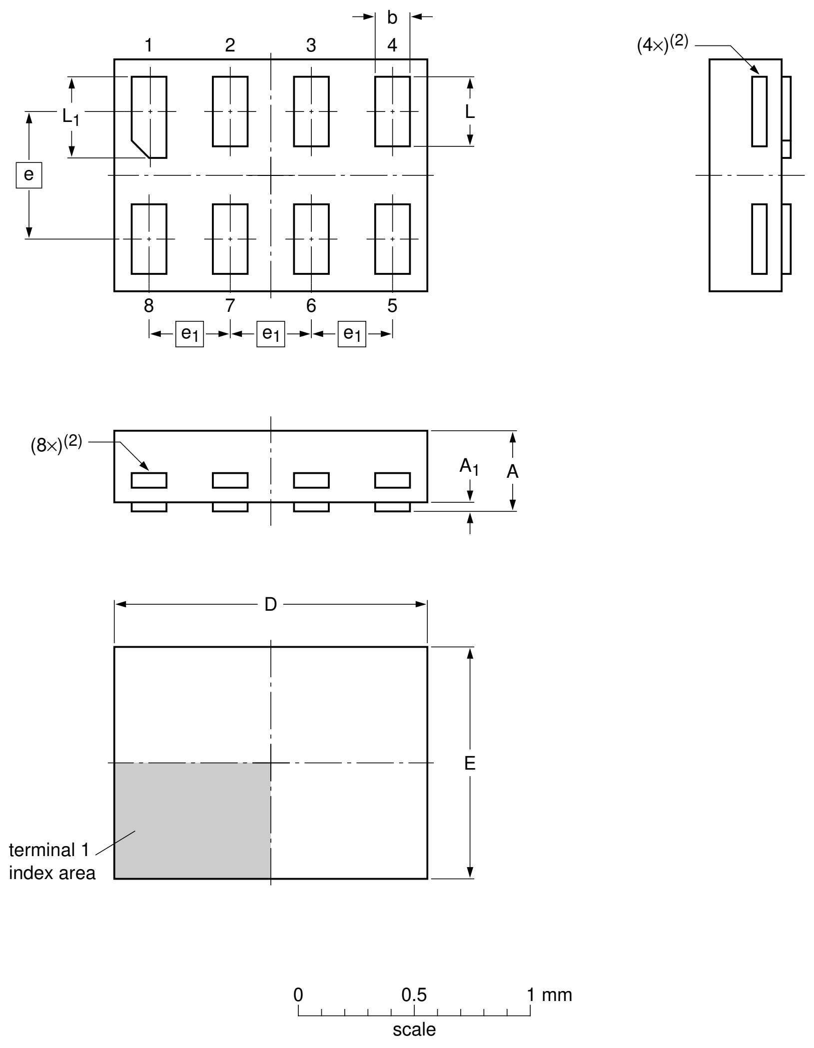
Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOT1116						~~10-04-02~~ 10-04-07

Fig 16. Package outline SOT1116 (XSON8)

XSON8: extremely thin small outline package; no leads; 8 terminals; body 1.35 x 1.0 x 0.35 mm **SOT1203**



Dimensions

Unit		A(1)	A1	b	D	E	e	e1	L	L1
mm	max	0.35	0.04	0.20	1.40	1.05			0.35	0.40
	nom			0.15	1.35	1.00	0.55	0.35	0.30	0.35
	min			0.12	1.30	0.95			0.27	0.32

Note
1. Including plating thickness.
2. Visible depending upon used manufacturing technology.

sot1203_po

Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOT1203						~~10-04-02~~ 10-04-06

Fig 17. Package outline SOT1203 (XSON8)

14. Abbreviations

Table 12. Abbreviations

Acronym	Description
CDM	Charged Device Model
DUT	Device Under Test
ESD	ElectroStatic Discharge
HBM	Human Body Model
MM	Machine Model

15. Revision history

Table 13. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74AUP2G241 v.7	20130211	Product data sheet	-	74AUP2G241 v.6
Modifications:	• For type number 74AUP2G241GD XSON8U has changed to XSON8.			
74AUP2G241 v.6	20120606	Product data sheet	-	74AUP2G241 v.5
74AUP2G241 v.5	20111205	Product data sheet	-	74AUP2G241 v.4
74AUP2G241 v.4	20100913	Product data sheet	-	74AUP2G241 v.3
74AUP2G241 v.3	20090112	Product data sheet	-	74AUP2G241 v.2
74AUP2G241 v.2	20080219	Product data sheet	-	74AUP2G241 v.1
74AUP2G241 v.1	20061012	Product data sheet	-	-

16. Legal information

16.1 Data sheet status

Document status[1][2]	Product status[3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

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

[2] The term 'short data sheet' is explained in section "Definitions".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL http://www.nxp.com.

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