



# LC378100QM, QT

## 8 MEG (1048576 words × 8 bits) Mask ROM Internal Clocked Silicon Gate

### Preliminary

### Overview

The LC378100QM and LC378100QT are 1,048,576-word × 8-bit organization (8,388,608-bit) mask programmable read only memories. They feature a wide operating voltage range (2.6 to 5.5 V), a 100-ns access time ( $t_{CA}$ ) at  $V_{CC} = 4.5$  to 5.5 V, and a 200-ns access time at  $V_{CC} = 2.6$  to 3.3 V. Thus these LSIs can be used in a wide range of systems, from 5-V systems that require high-speed access to 3-V systems that use batteries.

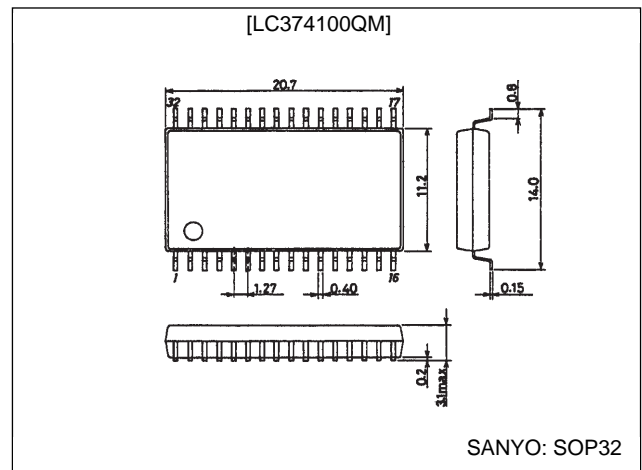
### Features

- 1048576 words × 8 bits organization
- Supply voltage range: 2.6 to 5.5
- Fast access time ( $t_{AA}$ ): 120 ns (max.)  $V_{CC} = 4.5$  to 5.5 V  
( $t_{CA}$ ): 100 ns (max.)  $V_{CC} = 4.5$  to 5.5 V  
200 ns (max.)  $V_{CC} = 2.6$  to 5.5 V
- Operating current 55 mA (max.)
- Standby current 30  $\mu$ A (max.)
- Full static operation (internal clocked type)
- 3 state outputs
- JEDEC standard pin configuration
- Package type  
LC378100QM: SOP32 (525 mil)  
LC378100QT: TSOP32 (8 mm × 20 mm)

### Package Dimensions

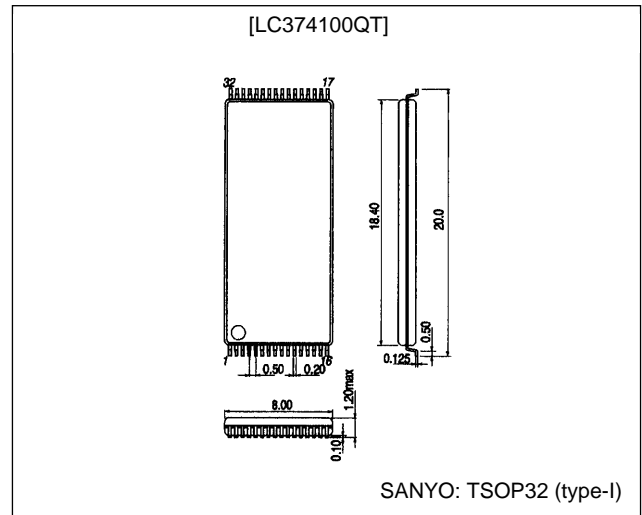
unit: mm

#### 3205-SOP32



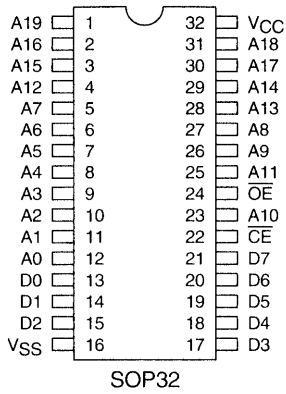
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#### 3224-TSOP32



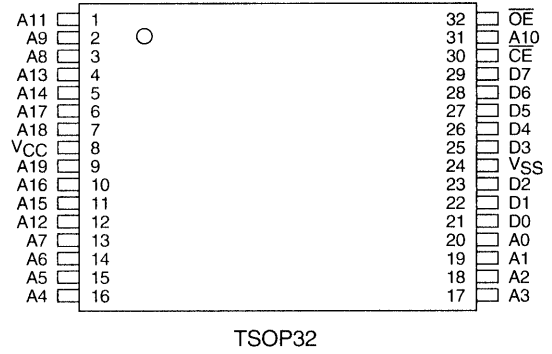
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## Pin Assignments

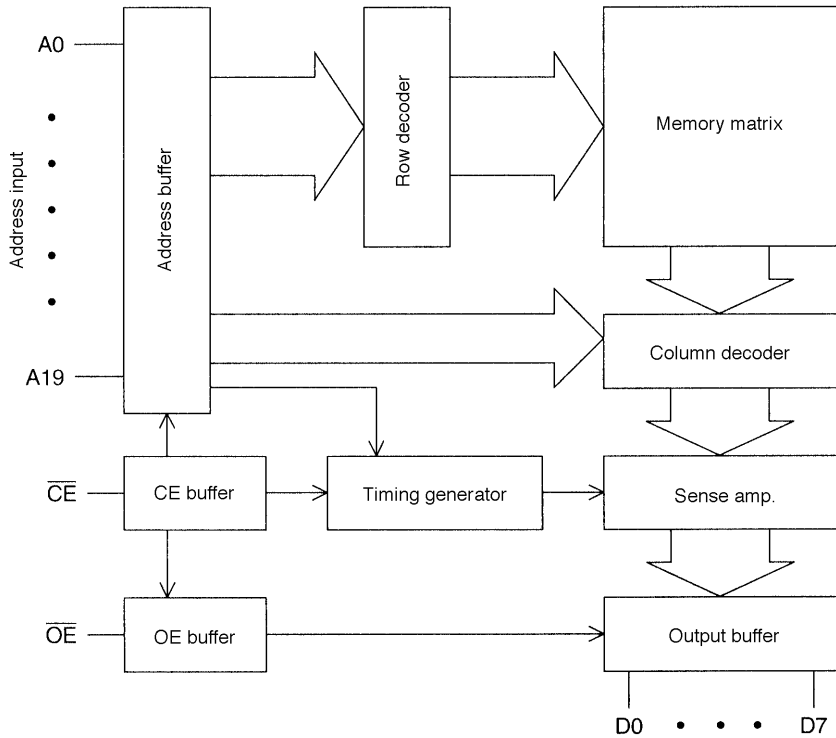


## Pin Functions

A0 to A16	Address input
D0 to D7	Data output
$\overline{CE}$	Chip enable input
$\overline{OE}$	Output enable input
VCC	Power supply
VSS	Ground



## Block Diagram



## Truth Table

$\overline{CE}$	$\overline{OE}$	Output	Current drain
H	X	High-impedance	Standby mode
L	H	High-impedance	Operating mode
L	L	DOUT	Operating mode

X: H or L level should be offered.

## Specifications

### Absolute Maximum Ratings \*1

Parameter	Symbol	Conditions	Ratings	Unit
Supply voltage	$V_{CC}$		-0.3 to +7.0	V
Supply input voltage	$V_{IN}$		-0.3*2 to $V_{CC} + 0.3$	V
Supply output voltage	$V_{OUT}$		-0.3 to $V_{CC} + 0.3$	V
Allowable power dissipation	$P_{d\ max}$	$T_a = 25^\circ\text{C}$ ; Reference values for the SANYO DIP package	1.0	W
Operating temperature	$T_{opr}$		-10 to +70	$^\circ\text{C}$
Storage temperature	$T_{stg}$		-55 to +125	$^\circ\text{C}$

Note: 1. Permanent device damage may occur if Absolute Maximum Ratings are exceeded. Functional operation should be restricted to Recommended Operating Conditions.  
 2.  $V_{IN}$  (min) = -3.0 V (pulse width  $\leq$  30 ns)

### Input/Output Capacitance\* at $T_a = 25^\circ\text{C}$ , $f = 1.0\ \text{MHz}$

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Input capacitance	$C_{IN}$	$V_{IN} = 0\ \text{V}$ ; Reference values for the SANYO DIP package			8	pF
Output capacitance	$C_{OUT}$	$V_{OUT} = 0\ \text{V}$ ; Reference values for the SANYO DIP package			10	pF

Note: \* This parameter is periodically sampled and not 100% tested.

### DC Recommended Operating Ranges at $T_a = -10\ \text{to}\ +70^\circ\text{C}$ , $V_{CC} = 2.6\ \text{to}\ 5.5\ \text{V}$

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Supply voltage	$V_{CC}$		2.6	5.0	5.5	V
Input high level voltage	$V_{IH}$		2.2		$V_{CC} + 0.3$	V
Input low level voltage	$V_{IL}$		-0.3		+0.6	V

### DC Electrical Characteristics at $T_a = -10\ \text{to}\ +70^\circ\text{C}$ , $V_{CC} = 2.6\ \text{to}\ 5.5\ \text{V}$

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Operating supply current	$I_{CCA1}$	$\overline{CE} = 0.2\ \text{V}$ , $V_I = V_{CC} - 0.2\ \text{V}/0.2\ \text{V}$			30	mA
	$I_{CCA2}$	$\overline{CE} = V_{IL}$ , $I_O = 0\ \text{mA}$ , $V_I = V_{IH}/V_{IL}$ , $f = 10\ \text{MHz}$			55	mA
Standby supply current	$I_{CCS1}$	$\overline{CE} = V_{CC} - 0.2\ \text{V}$			30 (1.0)	$\mu\text{A}$
	$I_{CCS2}$	$\overline{CE} = V_{IH}$			1.0 (300)	mA( $\mu\text{A}$ )
Input leakage current	$I_{LI}$	$V_{IN} = 0\ \text{to}\ V_{CC}$			$\pm 1.0$	$\mu\text{A}$
Output leakage current	$I_{LO}$	$\overline{CE}$ or $\overline{OE} = V_{IH}$ , $V_{OUT} = 0\ \text{to}\ V_{CC}$			$\pm 1.0$	$\mu\text{A}$
Output high level voltage	$V_{OH}$	$I_{OH} = -0.5\ \text{mA}$	0.8 $V_{CC}$			V
Output low level voltage	$V_{OL}$	$I_{OL} = 0.5\ \text{mA}$			0.2	V

Note: \* Guaranteed at  $T_a = 25^\circ\text{C}$

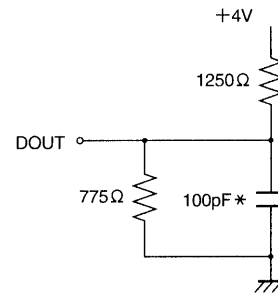
### AC Characteristics at $T_a = -10\ \text{to}\ +70^\circ\text{C}$ , $V_{CC} = 2.6\ \text{to}\ 5.5\ \text{V}$

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Cycle time	$t_{CYC}$		200 (120)			ns
Address access time	$t_{AA}$				200 (120)	ns
$\overline{CE}$ access time	$t_{CA}$				200 (100)	ns
$\overline{OE}$ access time	$t_{OA}$				80 (40)	ns
Output hold time	$t_{OH}$		20			ns
Output disable time*1	$t_{OD}^{*1}$				100	ns

Note: 1.  $t_{OD}$  is measured from the earlier edge of the  $\overline{CE}$  or  $\overline{OE}$ 's going high impedance.  
 This parameter is periodically sampled and not 100% tested.  
 2. Guaranteed at  $V_{CC} = 4.5\ \text{to}\ 5.5\ \text{V}$

**AC Test Conditions**

Input pulse levels	0.4 to 2.8 V
Input rise/fall time	5 ns
Input timing level	1.5 V
Output timing level	1.5 V
Output load	See Figure 1

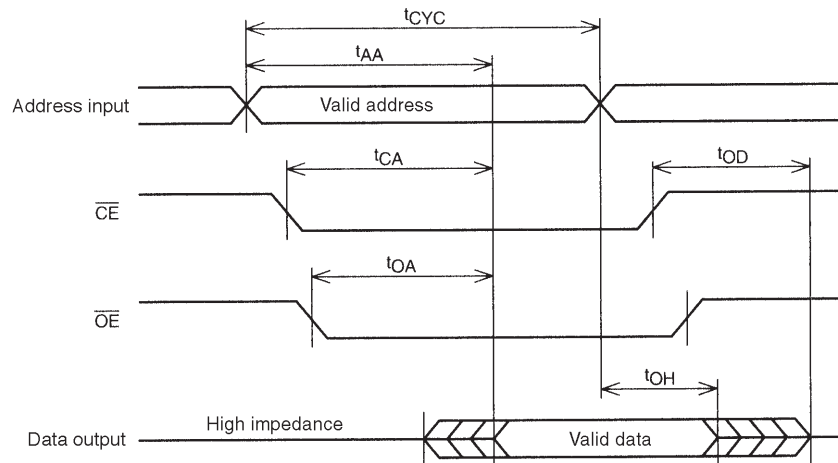


\* Including scope and jig

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**Figure 1 Output Load**

**Timing Chart**



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**System Design Notes**

These LSIs adopt the ATD technique, in which operation starts when a change in either the  $\overline{CE}$  or address inputs is detected. This means that the output data immediately after power is applied is invalid. When using these LSIs as program memory for Z80 and similar microprocessors, applications must take into account the fact that valid data will not be output after power is first applied unless the value of either the  $\overline{CE}$  or at least one of the address lines is changed after the power supply has stabilized.

Another point due to the use of the ATD technique is that these LSIs are sensitive to input noise. Do not apply voltages outside the allowable DC input levels for extended periods and do not apply input voltages with large noise components.

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