LC9600Series, 97000Series

T-42-11-09

CMOS LSI

Standard Cell

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Overview

The LC9600, 97000 Series CMOS Standard Cells offer the flexibility and simplicity of semi-custom design using standard cells, together with the convenience of function cell and I/O cell compatibility with Sanyo LC9100 and LC92000 Series CMOS Gate Arrays.

Fabricated using Sanyo's silicon-gate CMOS process, these new LSIs allow cell densities of up to 10,000 (LC9600 Series) or 15,000 (LC97000 Series) gates and have an excellent cost/performance ratio. Low power operation makes them ideal for applications in which the power supply is critical.

A full range of CAD support is available, including automatic cell placement and circuit layout, and circuit simulation. Design center support is also available.

Migration from gate arrays to standard cells is facilitated by fully compatible electrical specifications, including internal gate propagation delays, between the LC9600 and LC97000 Series and the LC9100 and LC92000 Series, respectively.

Features

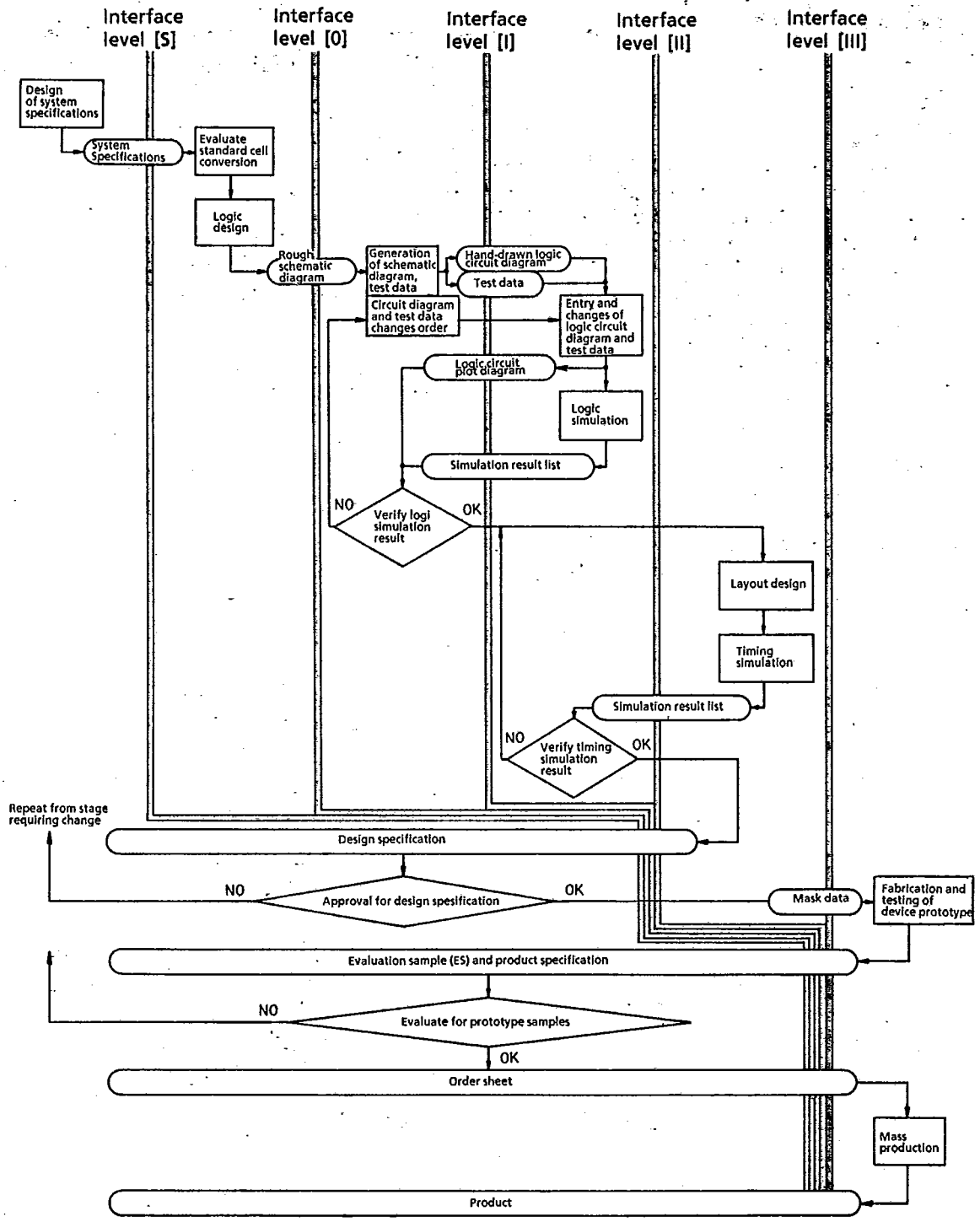
- High gate densities
- Low power dissipation
- Gate array-compatible design and development procedures
  - Library of over 300 function cells and 30 I/O cells
  - CAD system support
  - Flexible user interface
  - Design center support
- Special-purpose circuits

  Multipliers, A/D converters, D/A converters, EPROMs, RAMs, ROMs and large-current drivers difficult to implement in gate arrays can be developed. Large-scale cells such as parallel I/O, serial interface, counter, timer can be also developed.

Item \ Type No.		LC9600 Series	LC97000 Series
Max. Gate Accounts		1000	1500
Package	DIP	16, 18, 20, 24, 28, 40, 42	16, 18, 20, 24, 28, 40, 42
	Shrink DIP	30, 42, 64	30, 42, 64
	Flat	48, 64, 80, 100, 128, 160	48, 64, 80, 100, 128, 160
	Mini-flat	20, 24, 28	20, 24, 28
	PLCC	68	68
Internal Gate Propagation Delay		1.7ns (2-input NAND F/O=2mm L=2mm typ)	1.2ns (2-input NAND F/O=2mm L=2mm typ)
Power Supply		3 to 5.5V	3 to 5.5V
I/O Level		TTL/CMOS compatible	
Process		Double layer metallization · Silicon CMOS	

* Package implementation depends upon the device design and the number of gates used.

Development Procedure and User Interface



In accordance with customer requirements, gate arrays can be developed from circuit data in any format. The above flowchart shows five levels of customer interface. The right of each interface shown as the vertical double lines are Sanyo's job and the left is user's job. Blocks shown with rounded ends ⬭ indicate materials to be provided by the customer or Sanyo. Blocks shown with squared ends ▭ indicates jobs to be done.

<LC9600> Series

Absolute Maximum Ratings at $V_{SS}=0V$, $Ta=25°C$

Parameter	Symbol	Ratings	unit
Maximum Supply Voltage	V_{DD} max	−0.3 to +7.0	V
Input/Output Voltage	V_I, V_O	−0.3 to V_{DD}+0.3	V
Operating Temperature	Topg	−30 to +70	°C
Storage Temperature	Tstg	−55 to +125	°C

Allowable Operating Conditions at $Ta=-30$ to $+70°C$, $V_{SS}=0V$

Parameter	Symbol	min	typ	max	unit
Supply Voltage	V_{DD}	3.0	5.0	5.5	V
Input Voltage Range	V_{IH}	0		V_{DD}	V

DC Characteristics

Input/Output Level at $V_{SS}=0V$, $V_{DD}=4.5$ to $5.5V$, $Ta=-30$ to $+70°C$ (B Series only)

Item	Symbol	Condition	min	typ	max	Condition	min	typ	max	Condition	min	typ	max	unit
'H'-Level Input Voltage	V_{IH}	TTL compatible	2.2			TTL compatible	2.2			TTL compatible	2.2			V
		CMOS compatible	0.7 V_{DD}			CMOS compatible	0.7 V_{DD}			CMOS compatible	0.7 V_{DD}			V
'L'-Level Input Voltage	V_{IL}	TTL compatible			0.8	TTL compatible			0.8	TTL compatible			0.8	V
		CMOS compatible			0.3 V_{DD}	CMOS compatible			0.3 V_{DD}	CMOS compatible			0.3 V_{DD}	V
'H'-Level Output Voltage	V_{OH}	$I_{OH}=-3mA$	2.4			$I_{OH}=-8mA$	2.4			$I_{OH}=-12mA$	2.4			V
		$I_{OH}=-1\mu A$	$V_{DD}-0.05$			$I_{OH}=-4\mu A$	$V_{DD}-0.05$			$I_{OH}=-6\mu A$	$V_{DD}-0.05$			V
'L'-Level Output Voltage	V_{OL}	$I_{OL}=3mA$			0.4	$I_{OL}=8mA$			0.4	$I_{OL}=12mA$			0.4	V
		$I_{OL}=1\mu A$			$V_{DD}+0.05$	$I_{OL}=4\mu A$			$V_{DD}+0.05$	$I_{OL}=6\mu A$			$V_{DD}+0.05$	V
Input Leakage Current	I_L	$V_I=V_{SS}$, V_{DD}	−10		+10	$V_I=V_{SS}$, V_{DD}	−10		+10	$V_I=V_{SS}$, V_{DD}	−10		+10	μA

Note : The buffer with a large-current output is also available.

<LC97000> Series

Absolute Maximum Ratings at V_{SS}=0V,Ta=25°C

Parameter	Symbol	Ratings	unit
Maximum Supply Voltage	V_{DD} max	−0.3 to +7.0	V
Input/Output Voltage	V_I, V_O	−0.3 to V_{DD}+0.3	V
Operating Temperature	Topg	−30 to +70	°C
Storage Temperature	Tstg	−55 to +125	°C

Allowable Operating Conditions at Ta=−30 to +70°C,V_{SS}=0V

Parameter	Symbol	min	typ	max	unit
Supply Voltage	V_{DD}	4.5	5.0	5.5	V
Input Voltage Range	V_{IH}	0		V_{DD}	V

DC Characteristics

Input/Output Level at V_{SS}=0V,V_{DD}=4.5 to 5.5V,Ta=−30 to +70°C (B Series only)

Item	Symbol	Condition	min	typ	max	Condition	min	typ	max	Condition	min	typ	max	unit
'H'-Level Input Voltage	V_{IH}	TTL compatible	2.2			TTL compatible	2.2			TTL compatible	2.2			V
		CMOS compatible	0.7 V_{DD}			CMOS compatible	0.7 V_{DD}			CMOS compatible	0.7 V_{DD}			V
'L'-Level Input Voltage	V_{IL}	TTL compatible			0.8	TTL compatible			0.8	TTL compatible			0.8	V
		CMOS compatible			0.3 V_{DD}	CMOS compatible			0.3 V_{DD}	CMOS compatible			0.3 V_{DD}	V
'H'-Level Output Voltage	V_{OH}	I_{OH}= −3mA	2.4			I_{OH}= −6mA	2.4			I_{OH}= −12mA	2.4			V
		I_{OH}= −1μA	V_{DD} −0.05			I_{OH}= −2μA	V_{DD} −0.05			I_{OH}= −4μA	V_{DD} −0.05			V
'L'-Level Output Voltage	V_{OL}	I_{OL}= 3mA			0.4	I_{OL}= 6mA			0.4	I_{OL}= 12mA			0.4	V
		I_{OL}= 1μA			V_{DD} +0.05	I_{OL}= 2μA			V_{DD} +0.05	I_{OL}= 4μA			V_{DD} +0.05	V
Input Leakage Current	I_L	V_I=V_{SS}, V_{DD}	−10		+10	V_I=V_{SS}, V_{DD}	−10		+10	V_I=V_{SS}, V_{DD}	−10		+10	μA

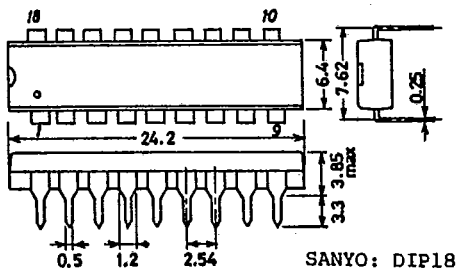
Note : The cell series with I_{OL}=4mA is also available as standard. The buffer with a large-current output is also available.

T-90-20

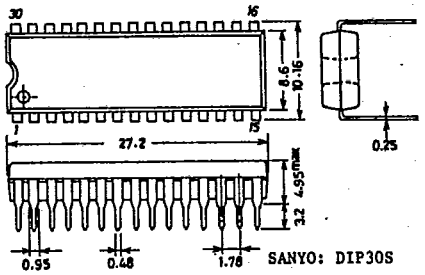
CASE OUTLINES OF 8/4-BIT MICROCOMPUTERS, GATE ARRAYS

- All of Sanyo microcomputer case outlines are illustrated below.
- All dimensions are in mm, and dimensions which are not followed by min. or max. are represented by typical values.
- No marking is indicated.

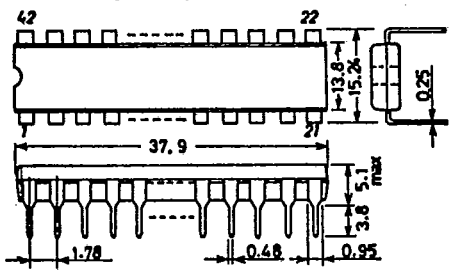
Case Outline—[3007A] unit: mm



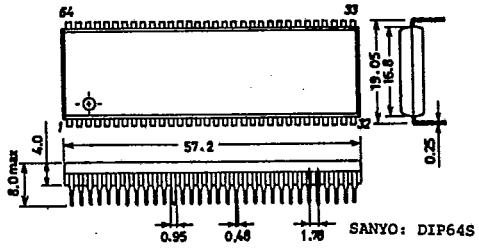
Case Outline—[3061] unit: mm



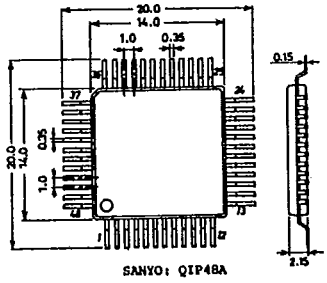
Case Outline—[3025B] unit: mm



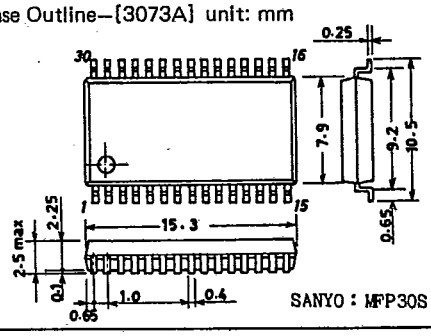
Case Outline—[3071] unit: mm



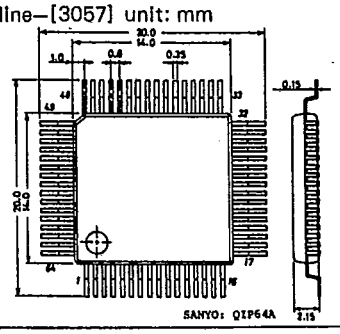
Case Outline—[3052A] unit: mm



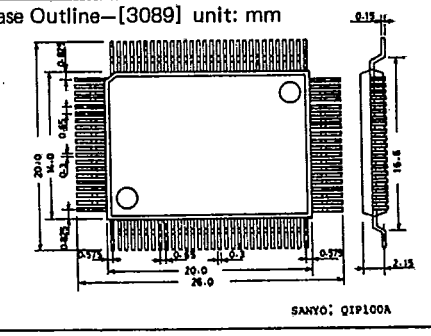
Case Outline—[3073A] unit: mm



Case Outline—[3057] unit: mm

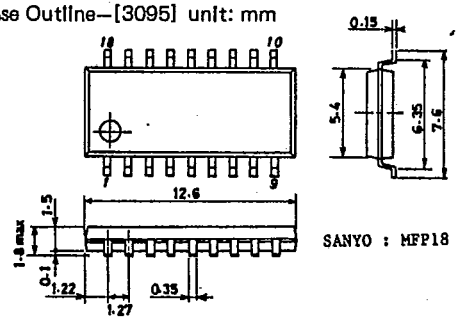


Case Outline—[3089] unit: mm



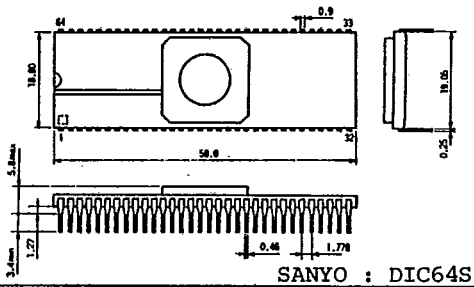
T-90-20

Case Outline—[3095] unit: mm



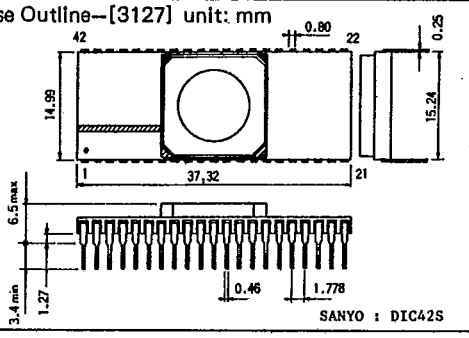
SANYO : MFP18

Case Outline—[3126] unit: mm



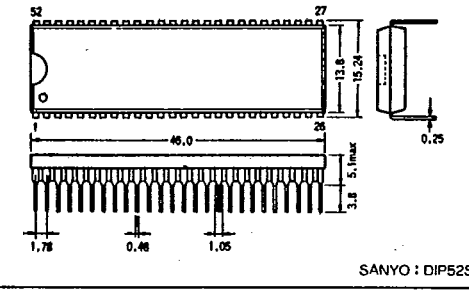
SANYO : DIC64S

Case Outline—[3127] unit: mm



SANYO : DIC42S

Case Outline—[3128] unit: mm



SANYO : DIP52S