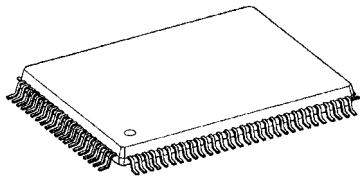
TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

T6A92

COLUMN DRIVER LSI FOR A DOT MATRIX LCD

The T6A92 is a column driver with 80 output channels for a dot matrix LCD.
The T6A92 realizes low power LCD systems using the CMOS Si−Gate process.
The T6A92 has two types of data flow.
(1) $O_1 \rightarrow O_{80}$, (2) $O_{80} \rightarrow O_1$



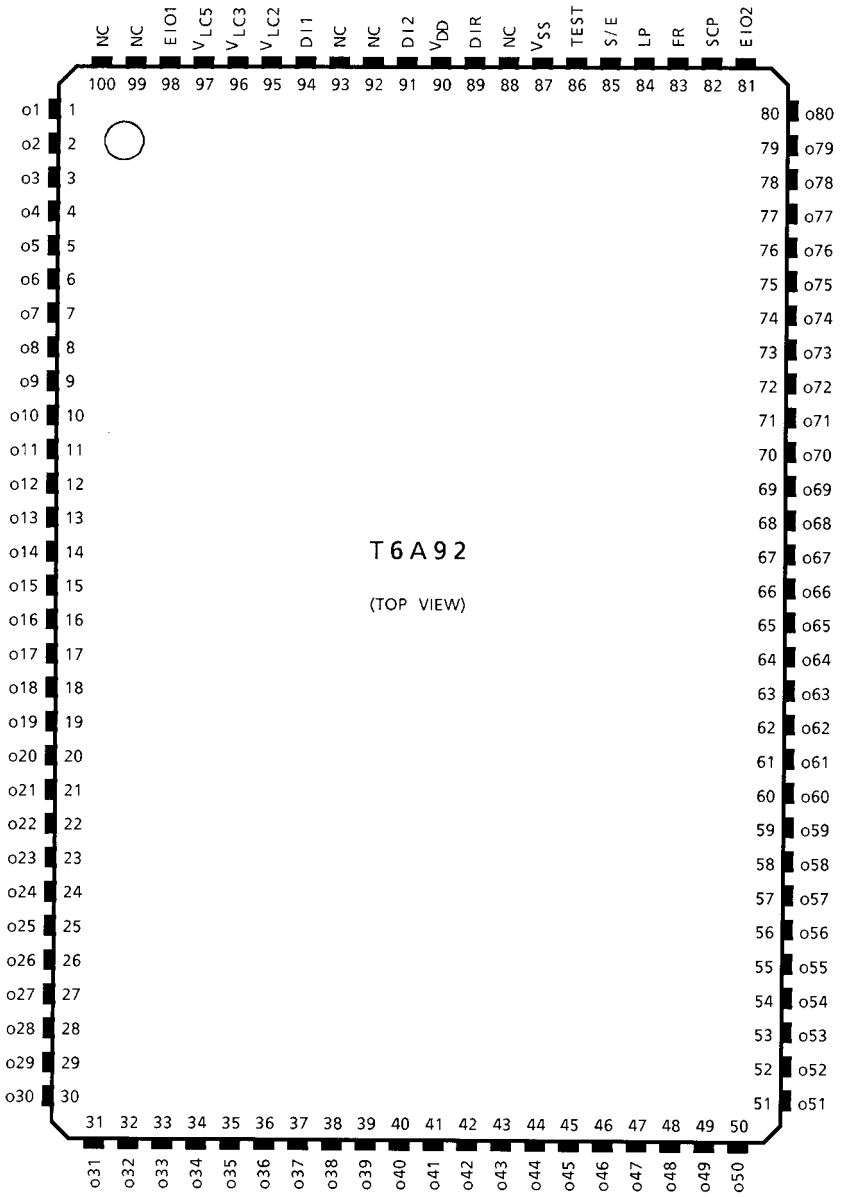
QFP100-P-1420-0.65J

Weight: 1.6 g (typ.)

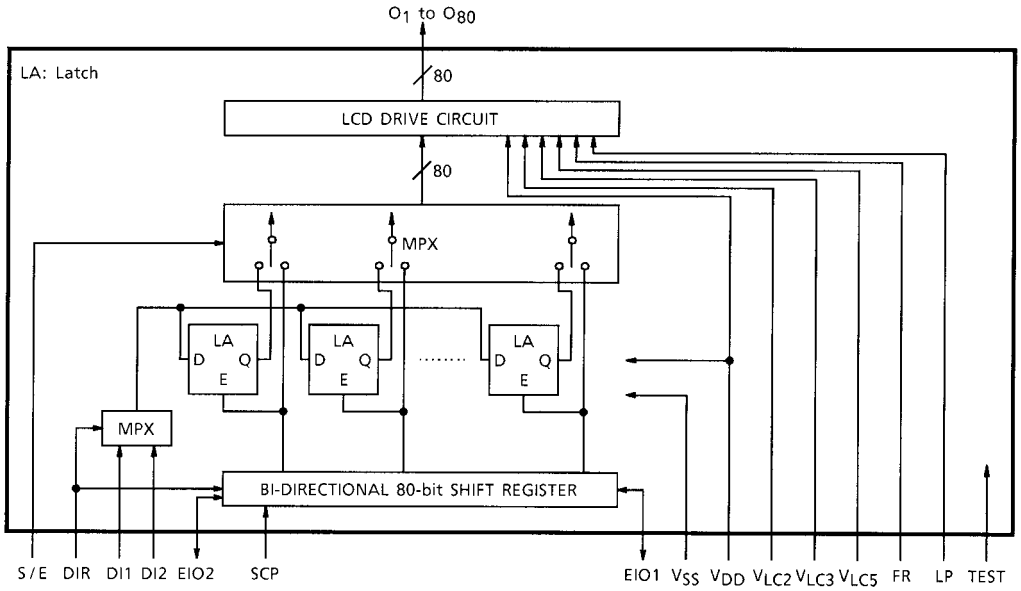
Features

- 80−output column driver
- Data input format : 1−bit (ENABLE mode)
  : 2−bit (SHIFT mode)
- Two types of data flow:
  (1) $O_1 \rightarrow O_{80}$
  (2) $O_{80} \rightarrow O_1$
- Low power consumption
- Power supply : 5 V ± 10%
- 100−pin plastic flat package

Pin Assignment



Block Diagram



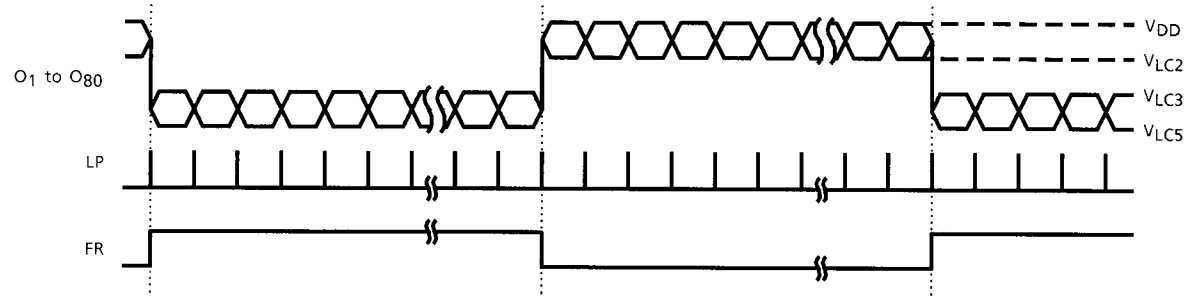
Pin Functions

Pin Name	I / O	Functions	Level
O1 to O80	Output	LCD drive signal output	V_{DD} to V_{LC5}
DI1, DI2	Input	Data signal input	V_{DD} to V_{SS}
EIO1, EIO2	I / O	ENABLE signal input / output When S / E = H, this pin is for input.	
SCP	Input	(Shift Clock Pulse) Shift clock pulse input	
FR	Input	(Frame) Frame signal input	
LP	Input	(Latch Pulse) Latch pulse signal input	
S / E	Input	Input for mode selection	
DIR	Input	Input data flow direction select	
TEST	Input	Test pin: usually connected to V_{SS} (0 V)	
$V_{LC2, 3, 5}$	—	Power supply for LCD drive	—
V_{DD}	—	Power supply (5 V)	
V_{SS}	—	Power supply (0 V)	

Function of Data and Enable Pins

S / E DIR		DI1	DI2	EIO1	EIO2	Data Flow	First Data	Last Data	Mode
L	L	Open	DATA INPUT	ENABLE signal input	ENABLE signal output	$O_{80} \rightarrow O_1$	O_1	O_{80}	ENABLE
L	H	DATA INPUT	Open	ENABLE signal output	ENABLE signal input	$O_1 \rightarrow O_{80}$	O_{80}	O_1	
H	L	Open	Open	DATA INPUT	DATA OUTPUT	$O_1 \rightarrow O_{80}$	O_{80}	O_1	SHIFT
H	H	Open	Open	DATA OUTPUT	DATA INPUT	$O_{80} \rightarrow O_1$	O_1	O_{80}	

Timing Diagram



Absolute Maximum Ratings (Ta = 25°C)

Item	Symbol	Rating	Unit
Supply Voltage (1)	V_{DD} (Note 1)	−0.3 to 7.0	V
Supply Voltage (2)	V_{LC2}, V_{LC3}, V_{LC5} (Note 1, 2)	−0.3 to 7.0	V
Input Voltage	V_{IN} (Note 1)	−0.3 to V_{DD} + 0.3	V
Operating Temperature	T_{opr}	−20 to 75	°C
Storage Temperature	T_{stg}	−55 to 125	°C

Note 1: Referenced to V_{SS} = 0 V

Note 2: Ensure that the following condition is always maintained.

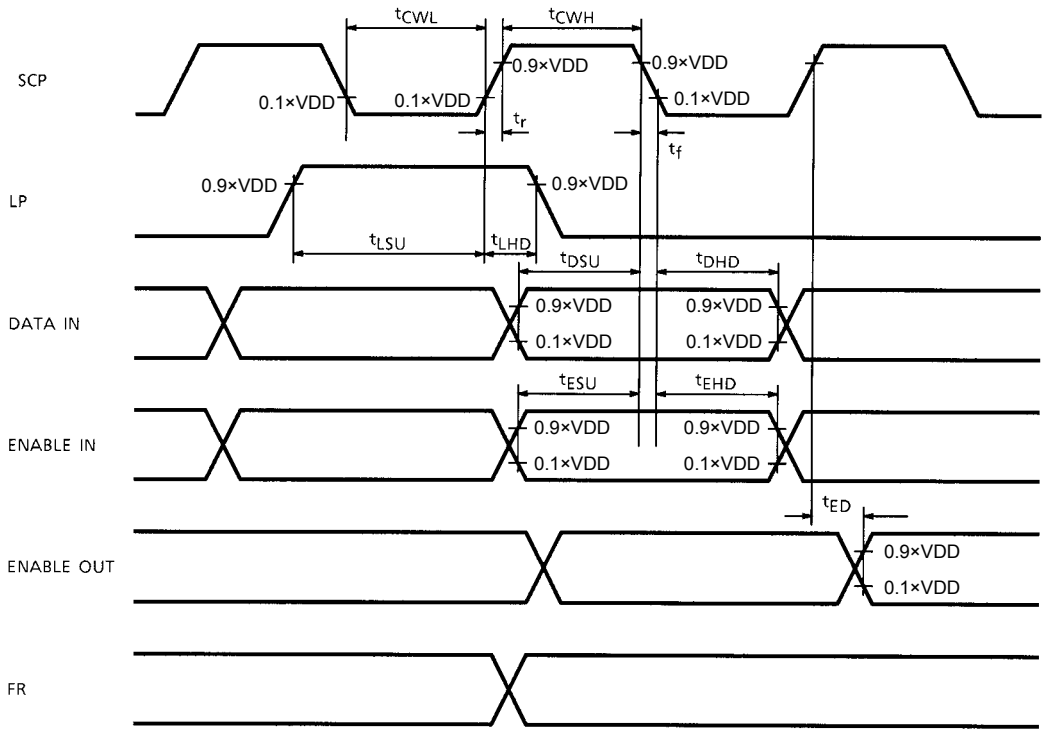
$V_{DD} \geq V_{LC2} \geq V_{LC3} \geq V_{LC5}$

Electrical Characteristics
DC Characteristics
Test Conditions
(Unless Otherwise Noted, V_{SS} = 0 V, V_{DD} = 5.0 V ± 10%, V_{LC5} = 0 V, Ta = −20 to 75°C)

Item		Symbol	Test Circuit	Test Condition		Min	Typ.	Max	Unit	Pin Name
Operating Voltage (1)		V_{DD}	—	—		4.5	5.0	5.5	V	V_{DD}
Operating Voltage (2)		V_{LC5}	—	—		0	—	V_{DD} −3.0	V	V_{LC5}
Input voltage	H Level	V_{IH}	—	—		V_{DD} −1.0	—	V_{DD}	V	(Note)
	L Level	V_{IL}	—	—		0	—	1.0	V	(Note)
Output voltage	H Level	V_{OH}	—	I_{OH} = −0.4 mA		V_{DD} −0.4	—	V_{DD}	V	EIO1, EIO2
	L Level	V_{OL}	—	I_{OH} = 0.4 mA		0	—	0.4	V	EIO1, EIO2
Output Resistance		R_{COL}	—	I_d = ± 50 μA		—	—	30	kΩ	O_1 to O_{80}
Operating Frequency		f_{scp}	—	T_a = −20 to 75°C		—	—	400	kHz	SCP
Current Consumption		I_{SS}	—	V_{DD} = 5.0 V V_{LC2} = 3.0 V V_{LC3} = 2.0 V V_{LC5} = 0.0 V f_{FR} = 39 Hz f_{scp} = 250 kHz O_1 to O_{80} : No Load	Binary Data Input	—	—	1.0	mA	V_{SS}
					Input Data : LOW Constant	—	—	0.4	mA	

Note: SCP, LP, FR, EIO1, EIO2, DI1, DI2, DIR, S / E, TEST

AC Characteristics



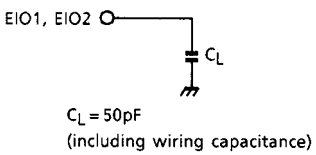
Test Conditions

(Unless Otherwise Noted, V_{SS} = 0 V, V_{DD} = 5 V ± 10%, V_{LC5} = 0 V, Ta = −20 to 75°C)

Item	Symbol	Min	Max	Unit
Operating Frequency	f_{scp}	—	400	kHz
SCP Pulse Width	t_{CWH}, t_{CWL}	800	—	ns
SCP Rise / Fall Time	t_r, t_f	—	200	ns
LP Set−up Time	t_{LSU}	500	—	ns
LP Hold Time	t_{LHD}	—	10	ns
Data Set−up Time	t_{DSU} (Note 1)	300	—	ns
Data Hold Time	t_{DHD} (Note 1)	300	—	ns
Enable Set−up Time	t_{ESU} (Note 2)	300	—	ns
Enable Hold Time	t_{EHD} (Note 2)	300	—	ns
Enable Delay Time	t_{ED} (Note 3)	—	500	ns

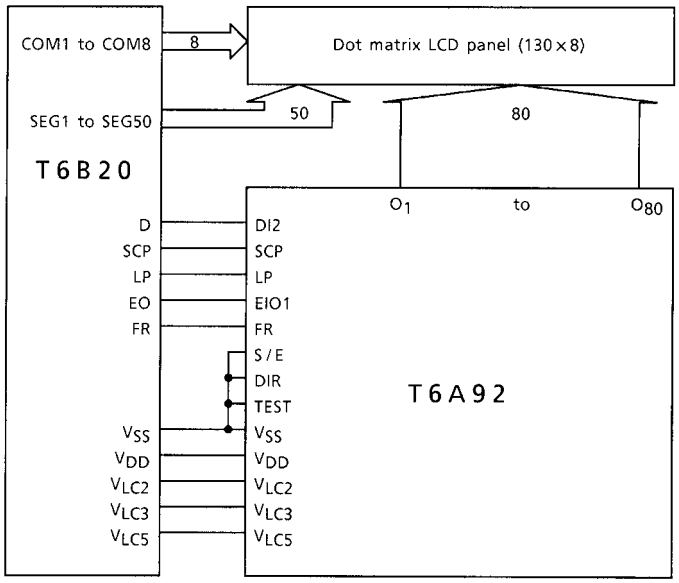
Note 1: Applies to DI1 and DI2
Note 2: Applies to EIO1 and EIO2
Note 3: With load circuit connected

Load Circuit

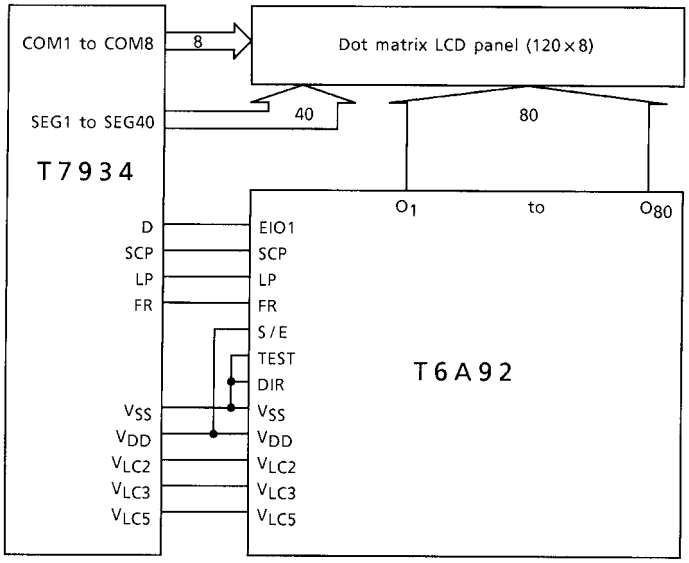


Application Circuit

- **S / E = L (ENABLE mode)**



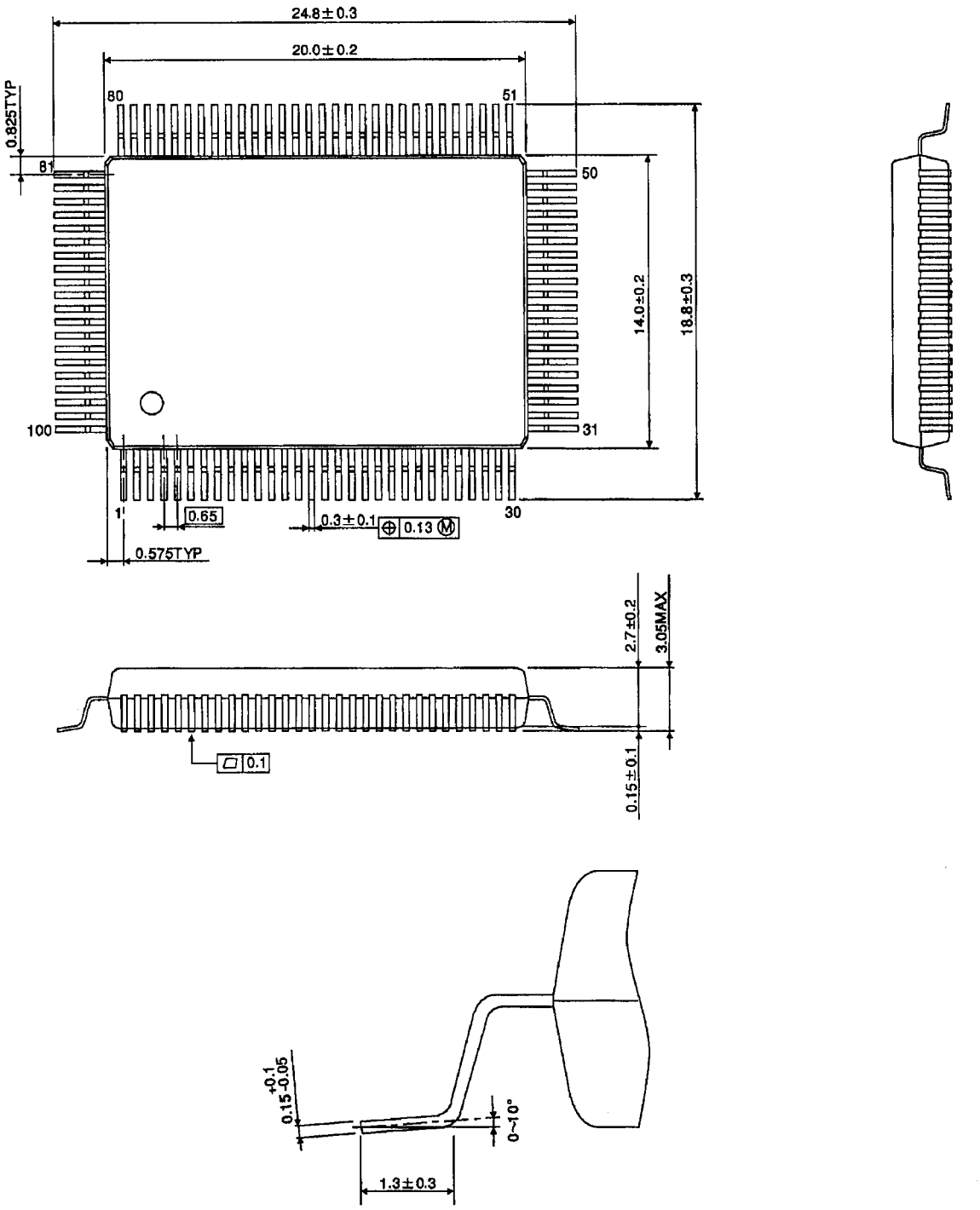
- **S / E = H (SHIFT mode)**



Package Dimensions

QFP100-P-1420-0.65J

Unit : mm



Weight : 1.6g (Typ.)

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