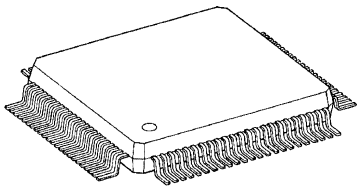
TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

T6A41

COLUMN DRIVER LSI FOR A DOT MATRIX LCD

The T6A41 is a column driver with 64−output channels for a medium−or small−scale dot matrix LCD.
The T6A41 realizes low power LCD systems using the CMOS Si−Gate process.
The T6A41 has two bi−directional data Input / Output pins and three types of data flow (pin program):
(1) $O_1 \rightarrow O_{64}$, (2) $O_{64} \rightarrow O_1$, (3) $O_1 \rightarrow O_{32}$, $O_{64} \rightarrow O_{33}$.



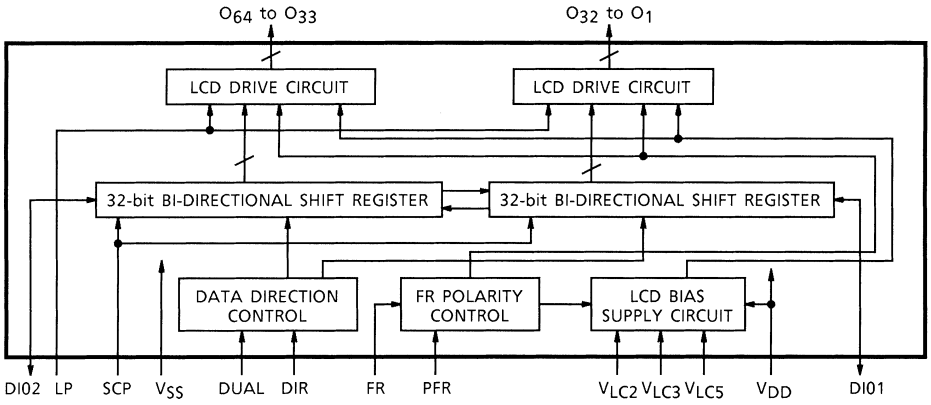
QFP92-P-1818-0.70A

Weight: 1.4 g (typ.)

Features

- 64−output column driver
- Three types of data flow (bi−directional);
  (1) $O_1 \rightarrow O_{64}$
  (2) $O_{64} \rightarrow O_1$
  (3) $O_1 \rightarrow O_{32}$, $O_{64} \rightarrow O_{33}$
- High speed operation
- Low power consumption
- Power supply: 5 V ± 10%
- 92−pin plastic flat package

Block Diagram



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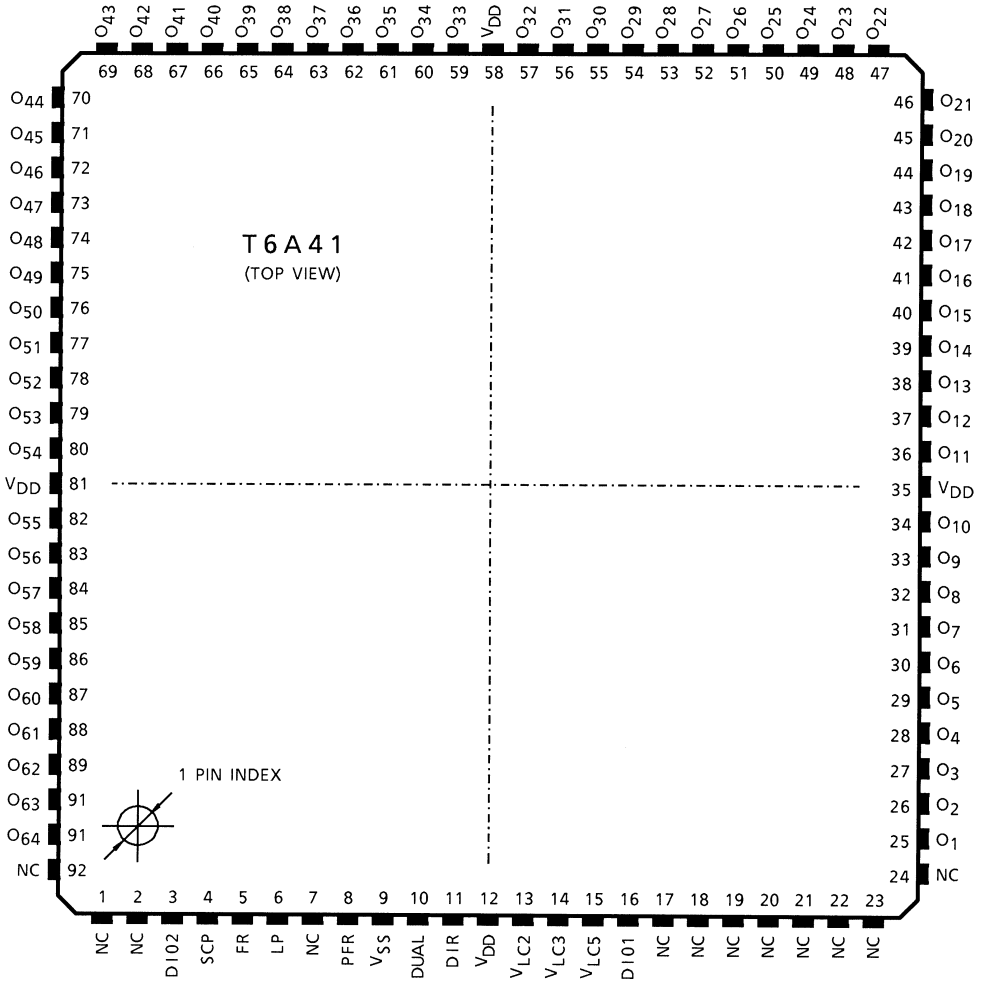
Pin Assignment



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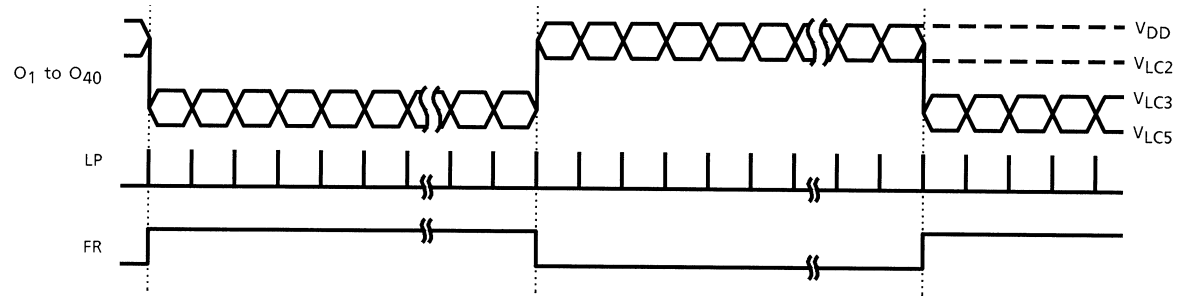
Pin Functions

<table>
<tr><th>Pin Name</th><th>I / O</th><th>Functions</th><th>Level</th></tr>
<tr><td>O_1 to O_{64}</td><td>Output</td><td>LCD drive signal output</td><td>V_{DD} to V_{LC5}</td></tr>
<tr><td>DIO1 , DIO2</td><td>I / O</td><td>Bi−directional data input and output</td><td rowspan="9">V_{DD} to V_{SS}</td></tr>
<tr><td>SCP</td><td>Input</td><td>(Shift Clock Pulse)
Shift clock pulse input</td></tr>
<tr><td>FR</td><td>Input</td><td>(Frame)
Frame signal input</td></tr>
<tr><td>LP</td><td>Input</td><td>(Latch Pulse)
Latch pulse signal input</td></tr>
<tr><td>DUAL</td><td>Input</td><td>(Dual Mode)
Selects dual mode or single mode data flow.
<table>
<tr><th>DUAL</th><th>DIR</th><th>DI01</th><th>DI021</th><th>Data Direction</th></tr>
<tr><td>L</td><td>L</td><td>OUT</td><td>IN</td><td>O64 → O1</td></tr>
<tr><td>L</td><td>H</td><td>IN</td><td>OUT</td><td>O1 → O64</td></tr>
<tr><td>H</td><td>L</td><td>—</td><td>—</td><td>Do not use</td></tr>
<tr><td>H</td><td>H</td><td>IN</td><td>IN</td><td>O1 → O32,
O64 → O33</td></tr>
</table></td></tr>
<tr><td>DIR</td><td>Input</td><td>(Direction)
Selects input data flow direction.</td></tr>
<tr><td>PFR</td><td>Input</td><td>(Polarity of Flame)
Usually connected to V_{SS}</td></tr>
<tr><td>V_{LC2}</td><td>—</td><td>Power supply for LCD drive</td><td rowspan="5">—</td></tr>
<tr><td>V_{LC3}</td><td>—</td><td>Power supply for LCD drive</td></tr>
<tr><td>V_{LC5}</td><td>—</td><td>Power supply for LCD drive</td></tr>
<tr><td>V_{DD}</td><td>—</td><td>Power supply (5 V)</td></tr>
<tr><td>V_{SS}</td><td>—</td><td>Power supply (0 V)</td></tr>
</table>

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} (Note1, 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

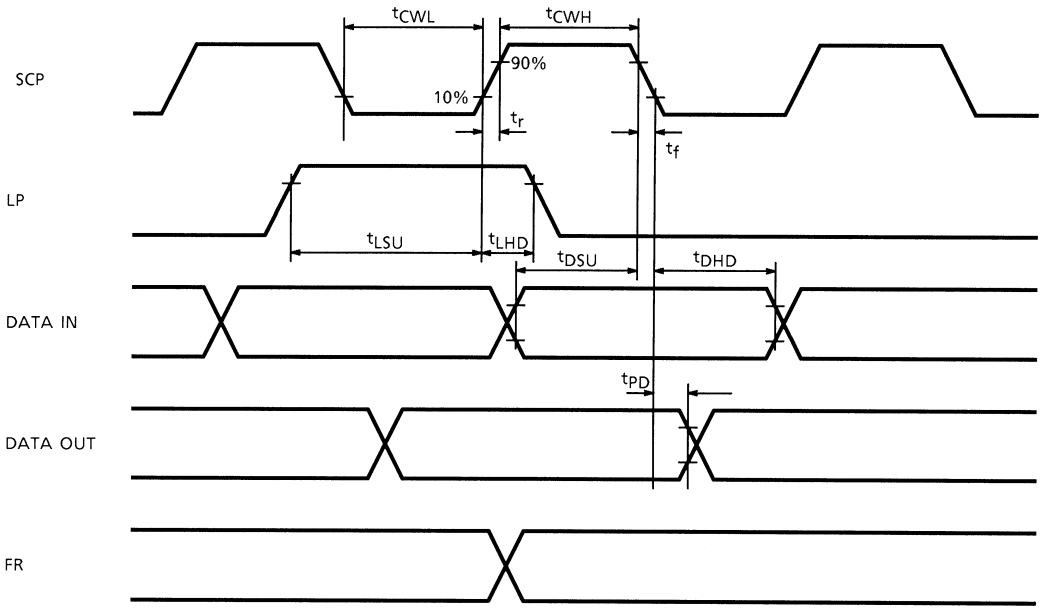
DC Characteristics

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 Conditions		Min	Typ.	Max	Unit	Pin Name
Operating Voltage (1)		—	—	—		4.5	5.0	5.5	V	V_{DD}
Operating Voltage (2)		—	—	—		0	—	V_{DD} −3.0	V	V_{LC5}
Input Voltage	H Level	V_{IH}	—	—		V_{DD} −1.0	—	V_{DD}	V	(*)
	L Level	V_{IL}	—	—		0	—	1.0	V	(*)
Output Voltage	H Level	V_{OH}	—	I_{OH} = −0.4 mA		V_{DD} −0.4	—	V_{DD}	V	DIO1, DIO2
	L Level	V_{OL}	—	I_{Oh} = 0.4 mA		0	—	0.4	V	DIO1, DIO2
Output Resistance		R_{COL}	—	I_d = ±50 μA		—	—	30	kΩ	O_1 to O_{64}
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	

*: DIO1, DIO2, SCP, FR, LP, PFR, DUAL, DIR

AC Characteristics



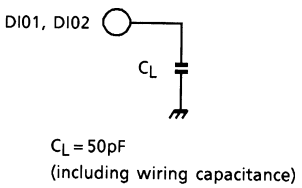
Test Conditions

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

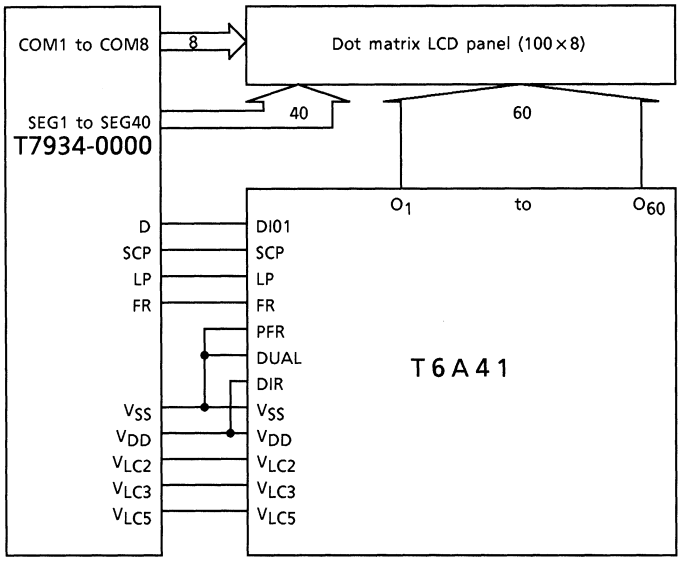
Item	Symbol	Min	Max	Unit
Operating Frequency	f_{SCP}	—	400	kHz
SCP Pulse Width	t_{CWH}, t_{CWL}	800	—	ns
SCP Rise / Fall Time	t_r, t_f	—	200	ns
LP Set−up Time	t_{LSU}	500	—	ns
LP Hold Time	t_{LHD}	—	10	ns
Data Set−up Time	t_{DSU}	300	—	ns
Data Hold Time	t_{DHD}	300	—	ns
Output Data Delay Time	t_{PD}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

Note: With load circuit connected

Load Circuit

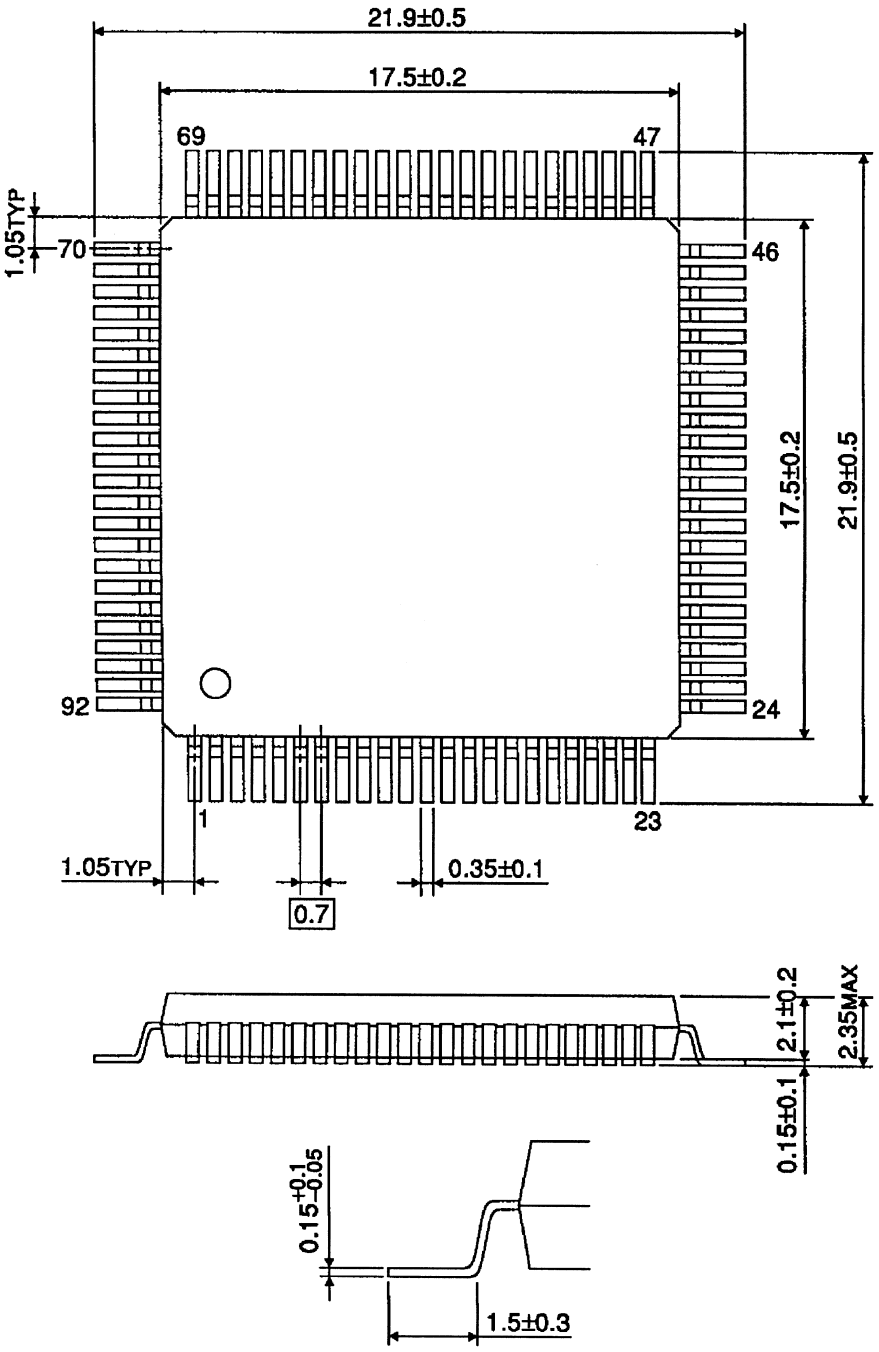


Application Circuit



Package Dimensions

QFP92-P-1818-0.70A Unit : mm



Weight : 1.4g (Typ.)