

T6A39

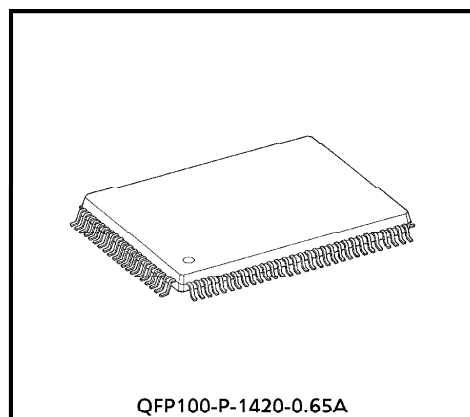
COLUMN DRIVER FOR A DOT MATRIX LCD

The T6A39 is an 80-channel-output column driver for an STN dot matrix LCD.

The T6A39 features a 28-V LCD drive voltage and a 4-MHz maximum operating frequency. The T6A39 is able to drive LCD panels with a duty ratio of up to 1/240. It is recommended for use with the T6A40.

FEATURES

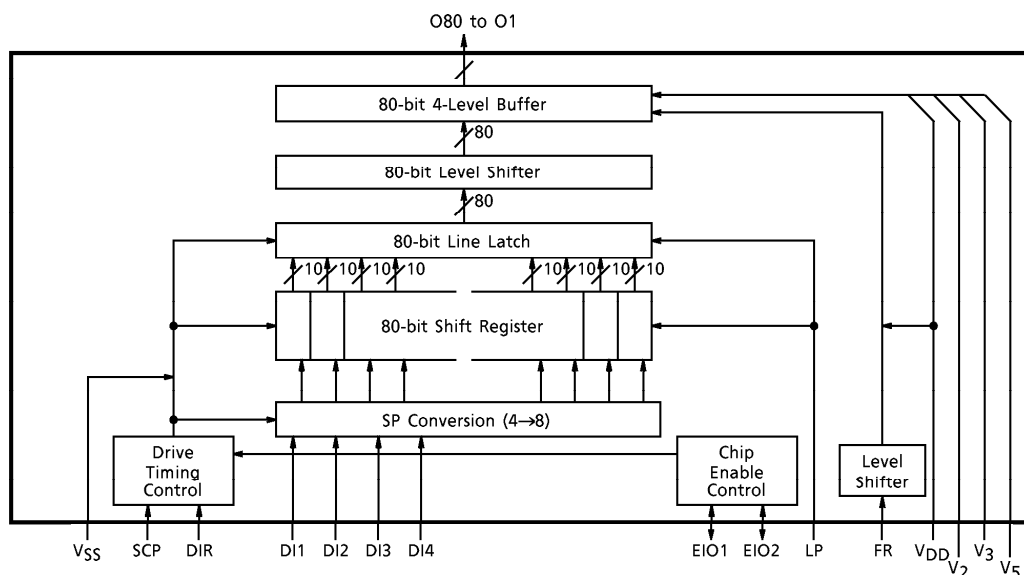
- Display duty application : to 1/240
- LCD drive signal : 80
- Data transfer : 1, 2, 4-bit bidirectional
- Operating frequency : 4 MHz
- LCD drive voltage : 8 to 28V (max 30V)
- Power supply voltage : 4.5 to 5.5V
- Operating temperature : -20 to 75°C
- LCD drive output resistance : 1.5k Ω (max) (12.8V, 1/9 bias)
- Low power consumption : Cascade connection and auto enable transfer functions are available.



QFP100-P-1420-0.65A

Weight : 1.60g (typ.)

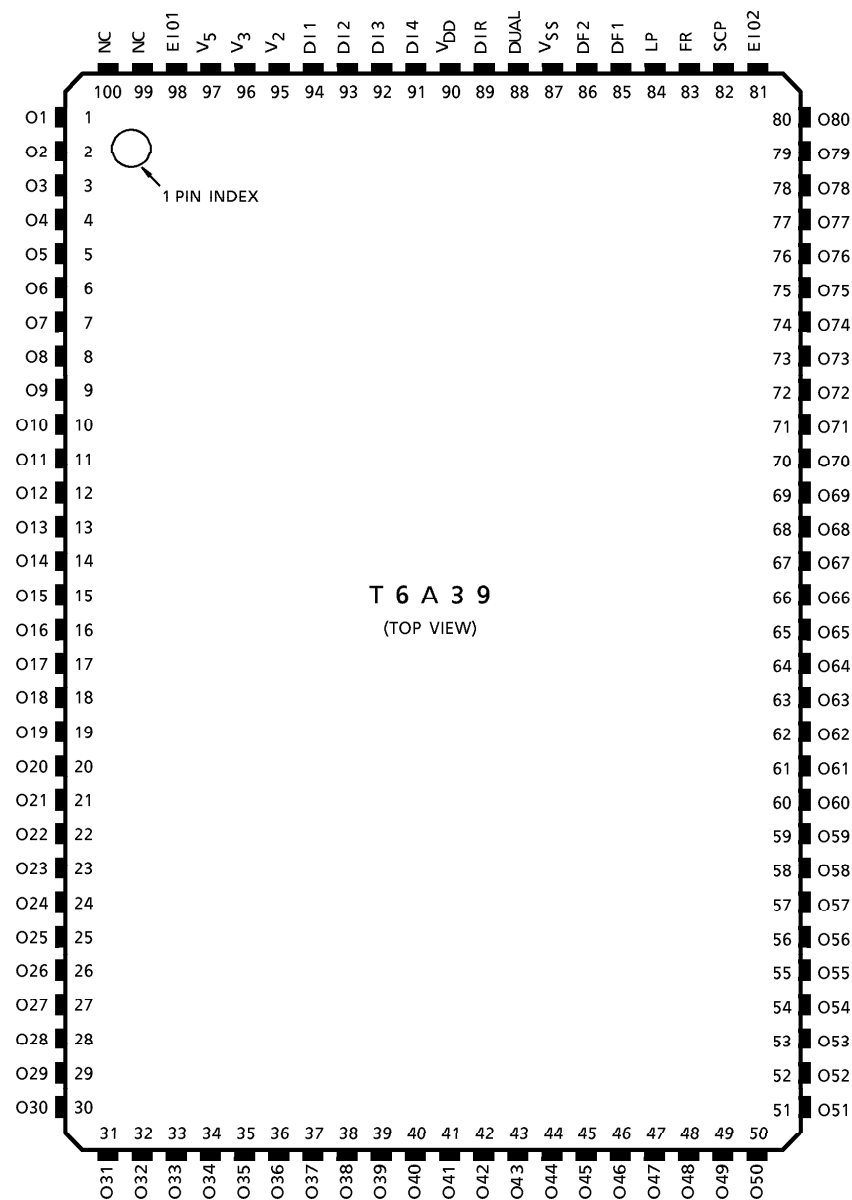
BLOCK DIAGRAM



961001EBA2

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PIN ASSIGNMENT



PIN FUNCTIONS

PIN NAME	I/O	FUNCTIONS	LEVEL																			
O1 to O80	Output	Output for LCD drive signal	V_{DD} to V5																			
DI1 to DI4	Input	Input for shift data	V_{DD} to V_{SS}																			
SCP	Input	(Shift Clock Pulse) Input for shift clock pulse																				
FR	Input	(Frame) Input for frame signal																				
LP	Input	(Latch Pulse) Input for shift clock pulse																				
DUAL	Input	(Dual Mode) Terminal for dual input mode or single input mode select																				
DIR	Input	(Direction) Input for data flow direction select																				
DF1, DF2	Input	(Data Format) Input for selection data format (1-bit, 2-bit, 4-bit)																				
EIO1, EIO2	I/O	Input/output for ENABLE signal <table border="1"> <tr> <th>DUAL</th><th>DIR</th><th>EIO2</th><th>EIO1</th></tr> <tr> <td>L</td><td>L</td><td>OUT</td><td>IN</td></tr> <tr> <td>L</td><td>H</td><td>IN</td><td>OUT</td></tr> <tr> <td>H</td><td>L</td><td>OUT</td><td>IN</td></tr> <tr> <td>H</td><td>H</td><td>OUT</td><td>IN</td></tr> </table>		DUAL	DIR	EIO2	EIO1	L	L	OUT	IN	L	H	IN	OUT	H	L	OUT	IN	H	H	OUT
DUAL	DIR	EIO2	EIO1																			
L	L	OUT	IN																			
L	H	IN	OUT																			
H	L	OUT	IN																			
H	H	OUT	IN																			
V_{DD}	—	Power supply for internal logic (+5V)	—																			
V_{SS}	—	Power supply for internal logic (0V)																				
V2	—	Power supply for LCD drive circuit																				
V3	—	Power supply for LCD drive circuit																				
V5	—	Power supply for LCD drive circuit																				

RELATION BETWEEN FR, DATA INPUT AND OUTPUT LEVEL

FR	DATA INPUT (DI1 to DI4)	OUTPUT LEVEL
L	L	V2
L	H	V_{DD}
H	L	V3
H	H	V5

DATA INPUT FORMAT

DF1	DF2	DUAL	DIR	bits	DATA INPUT				DATA FORMAT										
					D11	D12	D13	D14	Ⓛ	Ⓢ	Ⓛ	Ⓢ	D12	Ⓛ	Ⓢ	D13	Ⓢ	Ⓛ	D14
L	L	L	L	1-bit	*	*	*	IN		—							O80, O79...O2, O1	Ⓢ	
L	L	L	H		IN	*	*	*	O1, O2...O79, O80										
L	L	H	L		*	*	*	IN		—							O80, O79...O42, O41		
L	L	H	H		IN	*	*	IN	O1, O2...O39, O40								O80, O79...O42, O41		
H	L	L	L	2-bit	*	*	IN	IN		—					O79, O77...O3, O1	O80, O78...O4, O2			
H	L	L	H		IN	IN	*	*	O1, O3...O77, O79		O2, O4...O78, O80						—		
H	L	H	L		*	*	IN	IN		—					O79, O77...O43, O41	O80, O78...O44, O42			
H	L	H	H		IN	IN	IN	IN	O1, O3...O37, O39		O2, O4...O38, O40		O79, O77...O43, O41		O79, O77...O43, O41	O80, O78...O44, O42			
*	H	L	L	4-bit	IN	IN	IN	IN	O77, O73...O5, O1		O78, O74...O6, O2		O79, O75...O7, O3		O79, O75...O7, O3	O80, O76...O8, O4			
*	H	L	H		IN	IN	IN	IN	O1, O5...O73, O77		O2, O6...O74, O78		O3, O7...O75, O79		O3, O7...O75, O79	O4, O8...O76, O80			
*	H	H	L		IN	IN	IN	IN	O77, O73...O45, O41		O78, O74...O46, O42		O79, O75...O47, O43		O79, O75...O47, O43	O80, O76...O48, O44			
*	H	H	H																

DON'T USE

DON'T USE

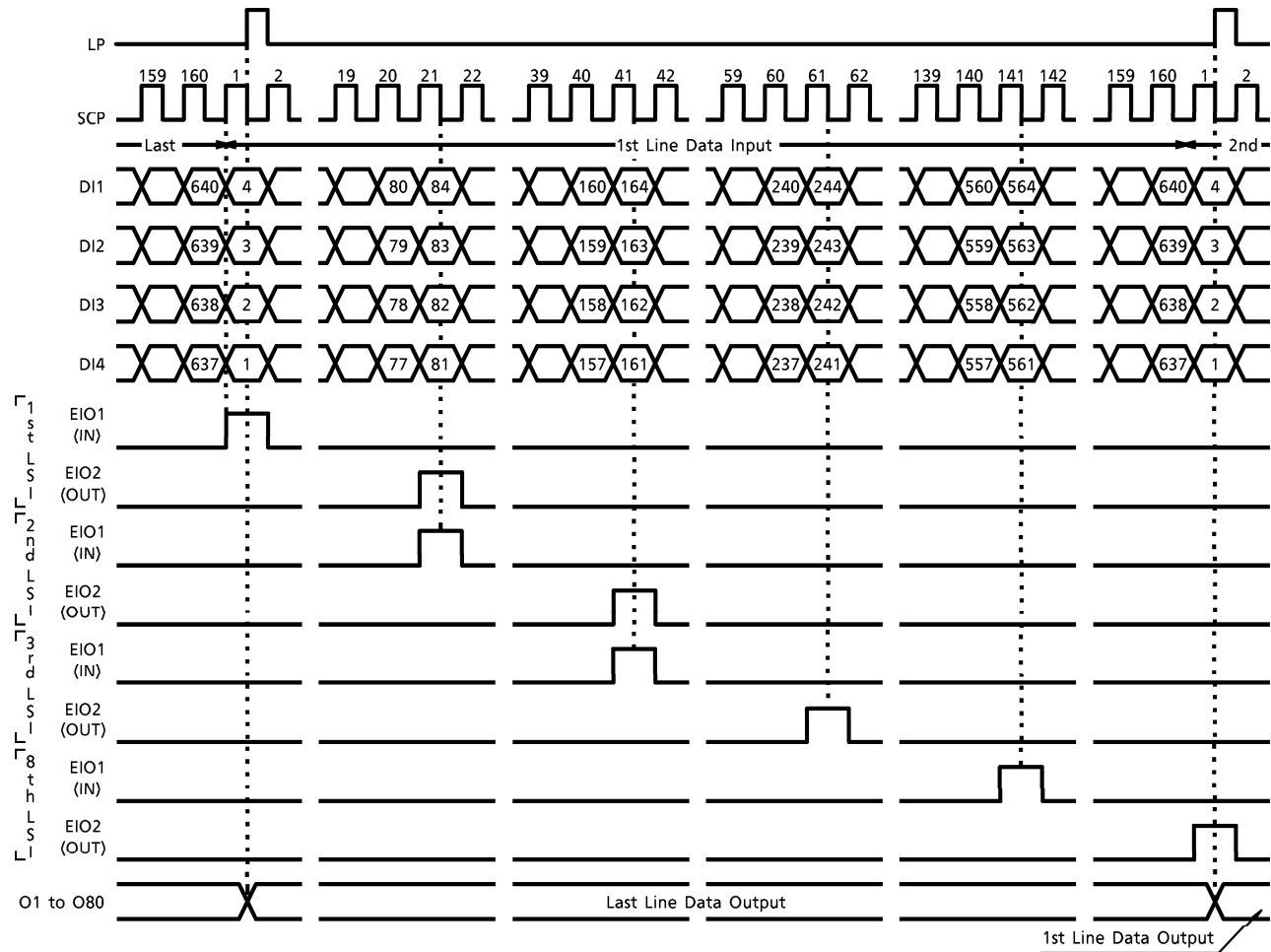
* Don't Care

Ⓛ→LAST DATA

Ⓢ→FIRST DATA

TIMING DIAGRAM

DIR = L



ABSOLUTE MAXIMUM RATINGS

(Ensure that the following conditions are maintained, $V_{CC} \geq V_0 \geq V_2 \geq V_3 \geq V_5 \geq V_{SS}$, $V_{SS} = 0V$)

ITEM	SYMBOL	PIN NAME	RATING	UNIT
Supply Voltage 1	V_{DD}	V_{DD}	- 0.3 to 7.0	V
Supply Voltage 2	V2	V2	$V_{DD} - 30$ to $V_{DD} + 0.3$	V
Supply Voltage 3	V3	V3	$V_{DD} - 30$ to $V_{DD} + 0.3$	V
Supply Voltage 4	V5	V5	$V_{DD} - 30$ to $V_{DD} + 0.3$	V
Input Voltage	V_{IN}	(*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

(*1) SCP, FR, LP, DIR, DF1, DF2, DUAL, DI1 to DI4

ELECTRICAL CHARACTERISTICS

DC CHARACTERISTICS

TEST CONDITIONS (Unless otherwise noted, $V_{SS}=0V$, $V_{DD}=4.5$ to $5.5V$,
 $V_5=(V_{DD}-23)V \pm 10\%$, $T_a = -20$ to $75^\circ C$)

ITEM	SYMBOL	TEST CIR- CUIT	TEST CONDITION	MIN	TYP.	MAX	UNIT	PIN NAME
Supply Voltage 1	—	—	—	4.5	5.0	5.5	V	V_{DD}
Supply Voltage 2	V_5	—	—	$V_{DD}-28$	$V_{DD}-23$	$V_{DD}-8.0$	V	V_5
Input Voltage	H Level	V_{IH}	$T_{opr} = -10$ to $75^\circ C$ (*2)	$V_{DD}-0.8$ (*3)	—	V_{DD}	V	SCP, FR, LP, DIR, EIO1, EIO2, DI1 to DI4, DF1, DF2, DUAL
	L Level	V_{IL}	$T_{opr} = -10$ to $75^\circ C$ (*2)	0	—	0.8 (*4)		
Output Voltage	H Level	V_{OH}	—	$V_{DD}-0.3$	—	V_{DD}	V	EIO1, EIO2
	L Level	V_{OL}	—	0	—	0.3		
Output Resistance (1)	H Level	R_{OH}	$V_{OUT} = V_{DD} - 0.5V$	—	—	1.0	k Ω	EIO1, EIO2
	L Level	R_{OL}	$V_{OUT} = V_{SS} + 0.5V$	—	—	1.0		
Output Resistance (2)	H Level	R_{OH}	$V_{OUT} = V_{DD} - 0.5V$ (*5)	—	—	1.5	k Ω	O1 to O80
	M Level	R_{OM}	$V_{OUT} = V_2 \pm 0.5V$ (*5)	—	—	1.5		
		R_{OM}	$V_{OUT} = V_3 \pm 0.5V$ (*5)	—	—	1.5		
	L Level	R_{OL}	$V_{OUT} = V_5 + 0.5V$ (*5)	—	—	1.5		
Current Consumption (1) (*5)	I_{SS}	—	$V_{DD} = 5.5V$ $V_5 = -22.5V$ $f_{FR} = 35Hz$ $f_{SCP} = 2.5MHz$ O1 to O80 : No Load (*7)	Input Data: every bit inverted	—	1050	μA	V_{SS}
				Input Data: low	—	770		
Current Consumption (2) (*6)	I_{SS}	—	As mentioned above (*7)	Input Data: every bit inverted	—	260	μA	V_{SS}

(*2) $R_L = 3k\Omega$, $C_L = 500pF$

(*3) $V_{DD} - 0.7$ ($T_{opr} = -20$ to $-10^\circ C$)

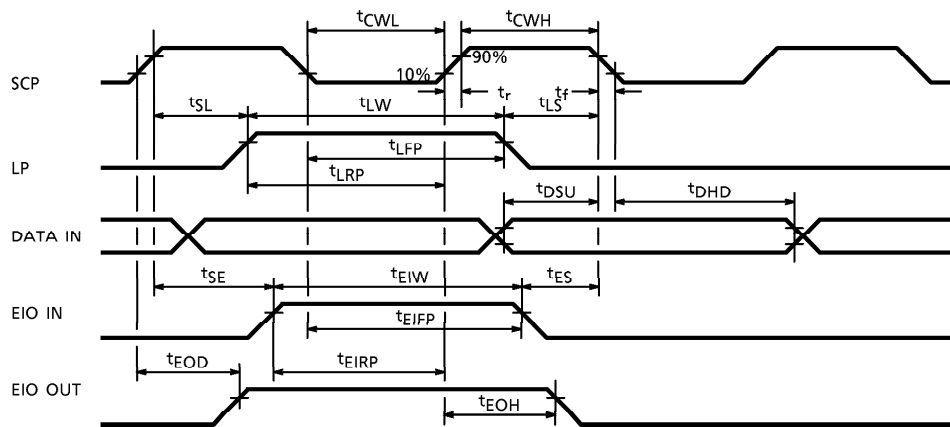
(*4) 0.7 ($T_{opr} = -20$ to $-10^\circ C$)

(*5) Internal data receiver operating

(*6) Internal data receiver sleeping

(*7) $V_{DD} = 5.0V$, $V_5 = -7.8V$, $V_2 = V_{DD} - 2/9 (V_{DD} - V_5)$, $V_3 = V_{DD} - 7/9 (V_{DD} - V_5)$

AC CHARACTERISTICS



TEST CONDITIONS ($V_{SS} = 0V$, $V_{DD} = 4.5$ to $5.5V$, $V_0 = V_{DD}$, $V_5 = (V_{DD} - 23) V \pm 10\%$, $T_a = -20$ to $75^\circ C$)

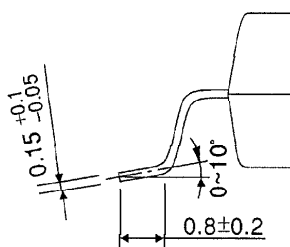
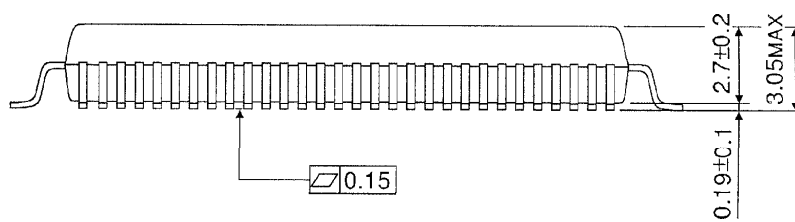
ITEM	SYMBOL	TEST CONDITION	MIN	MAX	UNIT
Operating Frequency	t_{SCP}	—	—	4.0	MHz
SCP Pulse Width	t_{CWH}	—	95	—	ns
SCP Pulse Width	t_{CWL}	—	95	—	
Data Set-up Time	t_{DSU}	—	20	—	
Data Hold Time	t_{DHD}	—	40	—	
SCP Rise / Fall Time	t_r, t_f	—	—	30	
LP Set-up Time	t_{LRP}	—	20	—	
LP Hold Time	t_{LFP}	—	40	—	
LP Pulse Width	t_{LW}	—	40	—	
SCP-Rise-to-LP-Rise Time	t_{SL}	—	10	—	
LP-Fall-to-SCP-Fall Time	t_{LS}	—	10	—	
EIO IN Set-up Time	t_{EIRP}	—	20	—	
EIO IN Hold Time	t_{EIFP}	—	40	—	
EIO IN Pulse Width	t_{EIW}	—	40	—	
SCP-Rise-to-EIO-Rise Time	t_{SE}	(*8)	10	—	
EIO-Fall-to-SCP-Fall Time	t_{ES}	(*8)	10	—	
EIO OUT Data Delay Time	t_{EOD}	—	—	100	
EIO OUT Hold Time	t_{EOH}	—	—	95	

(*8) $C_L = 10pF$

QFP100-P-1420-0.65A

The drawing shows a rectangular component with the following dimensions and tolerances:

- Overall width: 23.8 ± 0.3
- Overall height: 17.8 ± 0.3
- Inner width: 20.0 ± 0.2
- Inner height: 14.0 ± 0.2
- Top-left corner radius: $R0.825$ (TYP)
- Top-right corner radius: $R0.51$
- Bottom-left corner radius: $R0.81$
- Bottom-right corner radius: $R0.31$
- Left side feature: A series of rectangular protrusions with a width of 0.81 and a height of 0.825 (TYP).
- Right side feature: A series of rectangular protrusions with a width of 0.31 and a height of 0.51 .
- Bottom feature: A series of rectangular protrusions with a width of 0.31 and a height of 0.31 .
- Bottom-left feature: A circular feature with a diameter of 0.1 .
- Bottom-right feature: A circular feature with a diameter of 0.13 (M).
- Bottom center feature: A rectangular feature with a width of 0.65 and a height of 0.3 ± 0.1 .



1997-04-07 8/8