DATA SHEET

NEC
ELECTRON DEVICE

MOS INTEGRATED CIRCUIT

μPD16422

GATE DRIVER FOR TFT LIQUID CRYSTAL PANEL (120-OUTPUT VERTICAL DRIVER)

The μPD16422 is a vertical (gate) driver for TFT liquid crystal panel.

The μPD16422 is an LSI which can drive the vertical direction of the TFT liquid crystal panel, and turn ON/OFF gates of the transistors contained in TFT liquid crystal element.

When used in conjunction with the μPD16421 horizontal (source) driver, a TFT panel for OA application can be configured.

FEATURES

- Number of output pins : 120
- Gate drive voltage (V_{DD}–V_{EE}) : 25 V
- Can be connected in cascade
- Control signal voltage : V_{EE} to V_{DD}
- Architecture : CMOS (Low power consumption)

ORDERING INFORMATION

Order Name	Shipping form
μPD16422N-XXX	35 mm TCP (reel)
μPD16422W(2)	Wafer with bump
μPD16422P(2)	Chip with bump
μPD16422W	Wafer

For delivering in other than in a form of TCP, note regarding the IC wafer delivering specifications and quality assurance, and agreement regarding sales must be separately signed.

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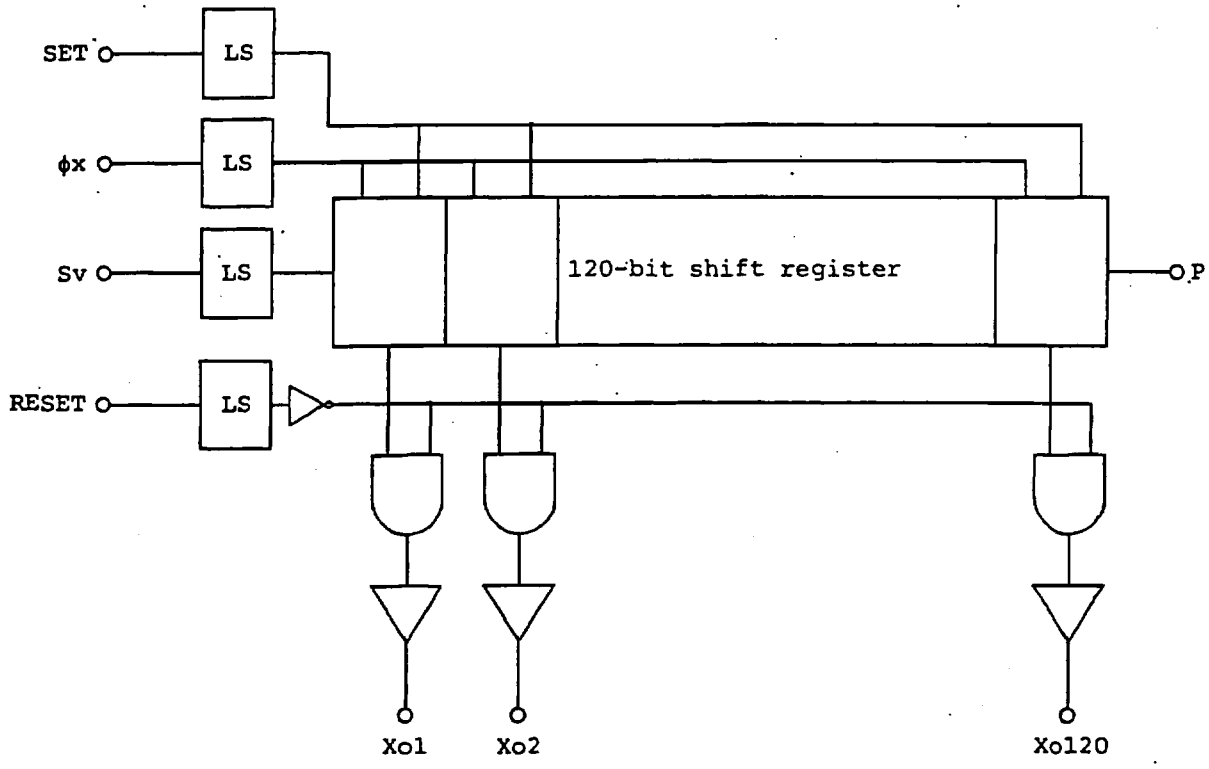
(O.D.No. IC-)
Date Published December 1990P

BLOCK DIAGRAM



LS: V_{SS}–V_{DD} → V_{EE}–V_{DD}

PIN FUNCTIONS

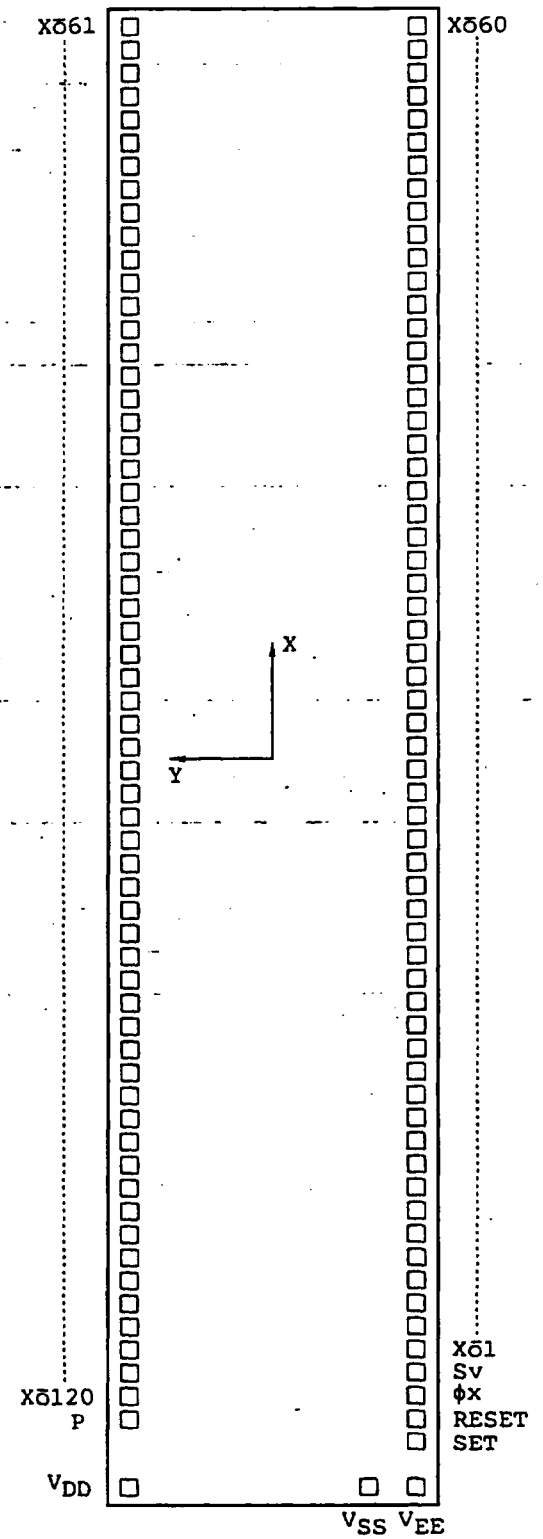
Pin Name	Pin Function	Contents
Xo1 ~ Xo120	Vertical drive output pin	These pins output scan signal for scanning X (vertical) direction of TFT LCD panel. Active high signal is output in synchronization with the rising edge of the shift clock ϕx. Output level: V_{EE} to V_{DD}
Sv	Vertical start pulse input pin	This pin inputs the start pulse for the internal shift register. Input pulse is read in at the rising edge of shift clock ϕx, and the first output of Xo1 is output at the rising edge of the second clock from the clock at which the input pulse is read in. Input level: 0 to 5 V or V_{EE} to V_{DD}
P	Start pulse output pin for driving next vertical driver	This pin outputs the start pulse for the next stage vertical driver when used in cascade connection. The output pulse is output at the falling edge of the 120th clock of the shift clock ϕx. Output level: V_{EE} to V_{DD}
ϕx	Shift clock input pin	This pin is the internal shift register shift clock input pin. Drive outputs Xo1 to Xo120 change in synchronization with the rising edge of ϕx. Input level: 0 to 5 V or V_{EE} to V_{DD}
V_{SS}	GND	Connect to System GND.
V_{DD}	Positive power supply pin	Apply standard operating voltage of 10 to 20 V.
V_{EE}	Negative power supply pin	Apply standard operating voltage of −15 to −5 V.
RESET	Output reset input pin	When RESET=H, outputs are reset to 0. However, the internal logic circuit operates even during reset.
SET	Shift register set input pin	When SET is set to H, all bits of shift register are set to 0.

TRUTH TABLE

Sv	ϕx	RESET	SET	Xo1	Xo2	·····	Xo120	P
X	X	X	H	H	H		H	L
X	X	H	L	L	L		L	X
H	↑	L	L	H	X		X	X
L	↑	L	L	L	X		X	X
X	↓	L	L	X	X		H	H
X	↓	L	L	X	X		L	L

PAD ASSIGNMENT

Chip size 10.31 x 1.84 mm²



Pad size 120 μm□ (Al size)

PAD COORDINATES

SET	X=	-4705.00	Y=	-681.50	Xo54	X=	3845.00	Y=	-681.50
RES	X=	-4555.00	Y=	-681.50	Xo55	X=	3995.00	Y=	-681.50
FAIX	X=	-4405.00	Y=	-681.50	Xo56	X=	4145.00	Y=	-681.50
SV	X=	-4255.00	Y=	-681.50	Xo57	X=	4295.00	Y=	-681.50
Xo1	X=	-4105.00	Y=	-681.50	Xo58	X=	4445.00	Y=	-681.50
Xo2	X=	-3955.00	Y=	-681.50	Xo59	X=	4595.00	Y=	-681.50
Xo3	X=	-3805.00	Y=	-681.50	Xo60	X=	4745.00	Y=	-681.50
Xo4	X=	-3655.00	Y=	-681.50	Xo61	X=	4765.00	Y=	681.50
Xo5	X=	-3505.00	Y=	-681.50	Xo62	X=	4615.00	Y=	681.50
Xo6	X=	-3355.00	Y=	-681.50	Xo63	X=	4465.00	Y=	681.50
Xo7	X=	-3205.00	Y=	-681.50	Xo64	X=	4315.00	Y=	681.50
Xo8	X=	-3055.00	Y=	-681.50	Xo65	X=	4165.00	Y=	681.50
Xo9	X=	-2905.00	Y=	-681.50	Xo66	X=	4015.00	Y=	681.50
Xo10	X=	-2755.00	Y=	-681.50	Xo67	X=	3865.00	Y=	681.50
Xo11	X=	-2605.00	Y=	-681.50	Xo68	X=	3715.00	Y=	681.50
Xo12	X=	-2455.00	Y=	-681.50	Xo69	X=	3565.00	Y=	681.50
Xo13	X=	-2305.00	Y=	-681.50	Xo70	X=	3415.00	Y=	681.50
Xo14	X=	-2155.00	Y=	-681.50	Xo71	X=	3265.00	Y=	681.50
Xo15	X=	-2005.00	Y=	-681.50	Xo72	X=	3115.00	Y=	681.50
Xo16	X=	-1855.00	Y=	-681.50	Xo73	X=	2965.00	Y=	681.50
Xo17	X=	-1705.00	Y=	-681.50	Xo74	X=	2815.00	Y=	681.50
Xo18	X=	-1555.00	Y=	-681.50	Xo75	X=	2665.00	Y=	681.50
Xo19	X=	-1405.00	Y=	-681.50	Xo76	X=	2515.00	Y=	681.50
Xo20	X=	-1255.00	Y=	-681.50	Xo77	X=	2365.00	Y=	681.50
Xo21	X=	-1105.00	Y=	-681.50	Xo78	X=	2215.00	Y=	681.50
Xo22	X=	-955.00	Y=	-681.50	Xo79	X=	2065.00	Y=	681.50
Xo23	X=	-805.00	Y=	-681.50	Xo80	X=	1915.00	Y=	681.50
Xo24	X=	-655.00	Y=	-681.50	Xo81	X=	1765.00	Y=	681.50
Xo25	X=	-505.00	Y=	-681.50	Xo82	X=	1615.00	Y=	681.50
Xo26	X=	-355.00	Y=	-681.50	Xo83	X=	1465.00	Y=	681.50
Xo27	X=	-205.00	Y=	-681.50	Xo84	X=	1315.00	Y=	681.50
Xo28	X=	-55.00	Y=	-681.50	Xo85	X=	1165.00	Y=	681.50
Xo29	X=	95.00	Y=	-681.50	Xo86	X=	1015.00	Y=	681.50
Xo30	X=	245.00	Y=	-681.50	Xo87	X=	865.00	Y=	681.50
Xo31	X=	395.00	Y=	-681.50	Xo88	X=	715.00	Y=	681.50
Xo32	X=	545.00	Y=	-681.50	Xo89	X=	565.00	Y=	681.50
Xo33	X=	695.00	Y=	-681.50	Xo90	X=	415.00	Y=	681.50
Xo34	X=	845.00	Y=	-681.50	Xo91	X=	265.00	Y=	681.50
Xo35	X=	995.00	Y=	-681.50	Xo92	X=	115.00	Y=	681.50
Xo36	X=	1145.00	Y=	-681.50	Xo93	X=	-35.00	Y=	681.50
Xo37	X=	1295.00	Y=	-681.50	Xo94	X=	-185.00	Y=	681.50
Xo38	X=	1445.00	Y=	-681.50	Xo95	X=	-335.00	Y=	681.50
Xo39	X=	1595.00	Y=	-681.50	Xo96	X=	-485.00	Y=	681.50
Xo40	X=	1745.00	Y=	-681.50	Xo97	X=	-635.00	Y=	681.50
Xo41	X=	1895.00	Y=	-681.50	Xo98	X=	-785.00	Y=	681.50
Xo42	X=	2045.00	Y=	-681.50	Xo99	X=	-935.00	Y=	681.50
Xo43	X=	2195.00	Y=	-681.50	Xo100	X=	-1085.00	Y=	681.50
Xo44	X=	2345.00	Y=	-681.50	Xo101	X=	-1235.00	Y=	681.50
Xo45	X=	2495.00	Y=	-681.50	Xo102	X=	-1385.00	Y=	681.50
Xo46	X=	2645.00	Y=	-681.50	Xo103	X=	-1535.00	Y=	681.50
Xo47	X=	2795.00	Y=	-681.50	Xo104	X=	-1685.00	Y=	681.50
Xo48	X=	2945.00	Y=	-681.50	Xo105	X=	-1835.00	Y=	681.50
Xo49	X=	3095.00	Y=	-681.50	Xo106	X=	-1985.00	Y=	681.50
Xo50	X=	3245.00	Y=	-681.50	Xo107	X=	-2135.00	Y=	681.50
Xo51	X=	3395.00	Y=	-681.50	Xo108	X=	-2285.00	Y=	681.50
Xo52	X=	3545.00	Y=	-681.50	Xo109	X=	-2435.00	Y=	681.50
Xo53	X=	3695.00	Y=	-681.50	Xo110	X=	-2585.00	Y=	681.50
					Xo111	X=	-2735.00	Y=	681.50

Xol12	:	X= -2885.00	Y=	681.50
Xol13	:	X= -3035.00	Y=	681.50
Xol14	:	X= -3185.00	Y=	681.50
Xol15	:	X= -3335.00	Y=	681.50
Xol16	:	X= -3485.00	Y=	681.50
Xol17	:	X= -3635.00	Y=	681.50
Xol18	:	X= -3785.00	Y=	681.50
Xol19	:	X= -3935.00	Y=	681.50
Xol20	:	X= -4085.00	Y=	681.50
P	:	X= -4235.00	Y=	681.50
VDD	:	X= -4950.00	Y=	714.00
VSS	:	X= -4950.00	Y=	-538.00
VEE	:	X= -4950.00	Y=	-714.00

ABSOLUTE MAXIMUM RATINGS (T_a=25 +/−2 °C, Vss=0 V)

Item	Symbol	Conditions	Ratings	Unit
Supply voltage	V_{DD}		−0.5 ~ +22	V
Supply current	V_{DD} − V_{EE}		−0.5 ~ +28	V
Supply voltage	V_{EE}		−17 ~ +0.5	V
Input pin voltage	V_I		V_{EE}−0.5 ~ V_{DD}+0.5	V
Input current	I_I		±10	mA
Output current	I_O		±10	mA
Operating junction temperature range	$T_{j(opt)}$		−20 ~ +90	°C
Storage temperature range	T_{stg}		−55 ~ +125	°C

RECOMMENDED OPERATING CONDITIONS

Item	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Supply voltage	V_{DD}		10		20	V
Supply voltage	V_{EE}		−15		−5	V
Supply voltage	V_{DD}−V_{EE}		15		25	V
Operating junction temeperature	$T_{j(opt)}$		0		70	°C

ELECTRICAL CHARACTERISTICS (T_a=0 to 70 °C, V_{DD}=13 V, V_{EE}=−7 V, V_{SS}=0 V)

Item	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Input voltage high	V_{IH}		3.5		V_{DD}	V
Input voltage low	V_{IL}		V_{EE}		1.5	V
Output voltage high (Pin P)	V_{OH}	Load open	V_{DD}−0.05		V_{DD}	V
Output voltage low (Pin P)	V_{OL}	Load open	V_{EE}		V_{EE}+0.05	V
Output current high (Pin Xo)	I_{XOH}	V_O=V_{DD}−1 V		−3.0	−2.0	mA
Output current low (Pin Xo)	I_{XOL}	V_O=V_{EE}+1 V	2.0	4.0		mA
Output current high (Pin P)	I_{PH}	V_O=V_{DD}−1 V		−3.0	−2.0	mA
Output current low (Pin P)	I_{PL}	V_O=V_{EE}+1 V	2.0	4.0		mA
Input leakage current	I_{IL}	V_I=0 V, 5 V			±1	μA
Input capacitance	C_I	T_a=25 °C			15	pF
Supply current	I_{DD}	f=15.7 kHz			600	μA
Output rise time	t_{TLH}	C_L=220 pF		100	250	ns
Output fall time	t_{THL}	C_L=220 pF		100	250	ns
Propagation delay time	t_P			350	700	ns
Maximum clock frequency	$f_{MAX.}$			15.7	100	kHz
Set up time	t_{su}		600			ns
Hold time	t_h		600			ns

Note: The absolute maximum ratings, recommended operating conditions, and electrical characteristics are determined with the conditions that the IC surface is clean, and protections from humidity and external light are made.

TIMING WAVEFORMS