

LR36685

Vertical Driver IC for CCD Area Sensors

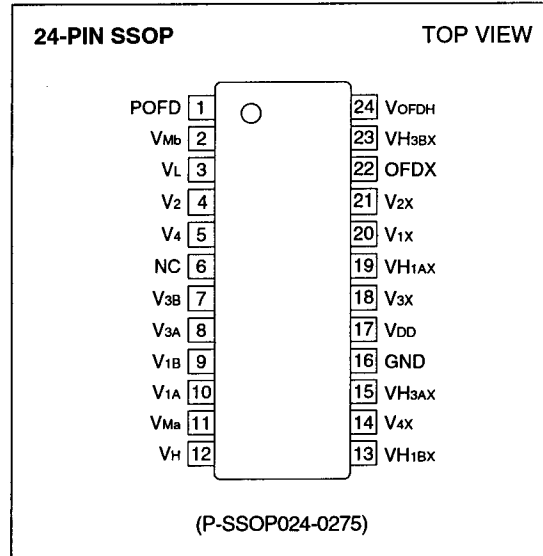
DESCRIPTION

The LR36685 is a CMOS vertical clock driver and shutter driver IC for CCD area sensors which provides the functions to convert the voltage and impedance from the CMOS level.

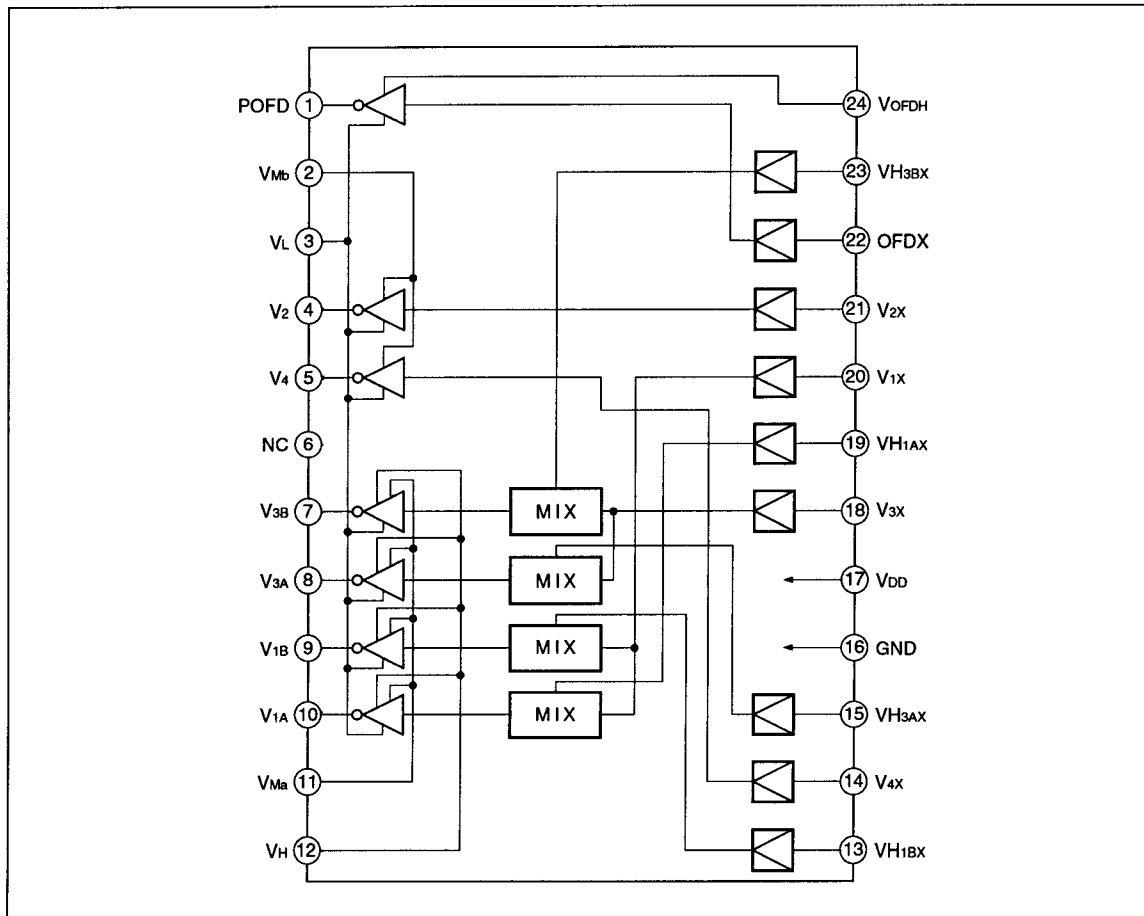
FEATURES

- Built-in seven circuits
 - 2-level output :
 - 2 circuits for vertical CCD clock driver
 - Output voltage level (TYP.) = -9 to 0 V
 - 3-level output :
 - 4 circuits for vertical CCD clock driver
 - Output voltage level (TYP.) = -9 to 0 to $+15$ V
 - 2-level output :
 - 1 circuit for shutter driver
 - Output voltage level (TYP.) = -9 to $+17$ V
- Switchable between NTSC (EIA) and PAL (CCIR) modes
- Package : 24-pin SSOP (P-SSOP024-0275)

PIN CONNECTIONS



BLOCK DIAGRAM



PIN DESCRIPTION

PIN NO.	SYMBOL	PIN NAME	DESCRIPTION
1	POFD	OFD pulse output	An electronic shutter pulse output. (high level = VO _{FDH} , low level = V _L)
2	V _{Mb}	Power supply	A power supply for high level of V ₂ and V ₄ .
3	V _L	Power supply	A power supply for low level of all output pulses.
4	V ₂	Vertical transfer pulse output 2	A pulse to drive vertical CCD shift register. Connect to ϕ V ₂ .
5	V ₄	Vertical transfer pulse output 4	A pulse to drive vertical CCD shift register. Connect to ϕ V ₄ .
6	NC	No connection	No connection
7	V _{3B}	Vertical transfer pulse output 3B	A pulse to drive vertical CCD shift register. Connect to ϕ V _{3B} .
8	V _{3A}	Vertical transfer pulse output 3A	A pulse to drive vertical CCD shift register. Connect to ϕ V _{3A} .
9	V _{1B}	Vertical transfer pulse output 1B	A pulse to drive vertical CCD shift register. Connect to ϕ V _{1B} .
10	V _{1A}	Vertical transfer pulse output 1A	A pulse to drive vertical CCD shift register. Connect to ϕ V _{1A} .
11	V _{Ma}	Power supply	A power supply for intermediate level of V _{1A} , V _{1B} , V _{3A} and V _{3B} .
12	V _H	Power supply	A power supply for high level of V _{1A} , V _{1B} , V _{3A} and V _{3B} .
13	VH _{1BX}	Readout pulse input 1B	A pulse that transfers the charge of the photo-diode to the vertical shift register.
14	V _{4X}	Vertical transfer pulse input 4	A vertical transfer pulse input.
15	VH _{3AX}	Readout pulse input 3A	A pulse that transfers the charge of the photo-diode to the vertical shift register.
16	GND	Ground	A grounding pin.
17	V _{DD}	Power supply	A power supply for input pulses.
18	V _{3X}	Vertical transfer pulse input 3	A vertical transfer pulse input.
19	VH _{1AX}	Readout pulse input 1A	A pulse that transfers the charge of the photo-diode to the vertical shift register.
20	V _{1X}	Vertical transfer pulse input 1	A vertical transfer pulse input.
21	V _{2X}	Vertical transfer pulse input 2	A vertical transfer pulse input.
22	OFDX	OFD pulse input	An electronic shutter pulse input.
23	VH _{3BX}	Readout pulse input 3B	A pulse that transfers the charge of the photo-diode to the vertical shift register.
24	VO _{FDH}	Power supply	A power supply for high level of POFD.

ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	RATING	UNIT	NOTE
Supply voltage	V _{DD}	GND – 0.3 to GND + 6.0	V	1
	V _H – V _L	29.0	V	
	V _{Ma} , V _{Mb}	V _L to V _H	V	
	V _O FDH – V _L	34.0	V	
Input voltage	V _{IN}	GND – 0.3 to V _{DD} + 0.3	V	
Storage temperature	T _{STG}	–55 to +150	°C	

NOTE :

1. V_H (MIN.) = V_{DD}, V_OFDH (MIN.) = V_{DD}, V_L (MAX.) = GND

RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply voltage	V _{DD}	3.0	3.3	5.5	V
	V _H – V _L	17.0	24.0	27.0	V
	V _H	12.0	15.0	20.0	V
	V _L	–10.0	–9.0	–5.0	V
	V _{Ma} , V _{Mb}		0.0		V
	V _O FDH – V _L	17.0	26.0	32.0	V
	V _O FDH	12.0	17.0	24.0	V
Input voltage	V _{IN} (Low)	0		0.25V _{DD}	V
	V _{IN} (High)	0.8V _{DD}		V _{DD} + 0.2	V
Operating frequency	NTSC		15.734		kHz
	PAL		15.625		kHz
Operating temperature	T _{OPR}	–20		+70	°C

ELECTRICAL CHARACTERISTICS

DC Characteristics

(V_{DD} = +3.3 V, V_H = +15.0 V, V_L = -9.0 V, V_{Ma} = V_{Mb} = 0 V, V_{OFDH} = +17.0 V, T_A = +25°C)

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNIT	NOTE
Input "Low" voltage	V _{IL}		0.0		0.25V _{DD}	V	
Input "High" voltage	V _{IH}		0.8V _{DD}		V _{DD} + 0.2	V	
Input "Low" current	I _{IL}	V _{IL} = 0 V			200	μA	
Input "High" current	I _{IH}	V _{IH} = 3.3 V			1.0	μA	
Output "Low" voltage	V _{OL}	I _{OL} < 1 μA			-8.9	V	1, 2, 3
Output "High" voltage	V _{OH}	I _{OH} < 1 μA	14.9			V	2
Output "High" voltage	V _{OFDH}	I _{OFDH} < 1 μA	16.9			V	3
Output "Intermediate" voltage	V _{OMLa}	I _{OMLa} < 1 μA	-0.1		0.1	V	2
	V _{OMHa}	I _{OMHa} < 1 μA	-0.1		0.1	V	
	V _{OMLb}	I _{OMLb} < 1 μA	-0.1		0.1	V	1
	V _{OMHb}	I _{OMHb} < 1 μA	-0.1		0.1	V	
Output "Low" current	I _{OL}	V _{OL} = V _L + 0.1 V	1.0			mA	1, 2, 3
Output "High" current	I _{OH}	V _{OH} = V _H - 0.1 V	1.0			mA	2
Output "High" current	I _{OFDH}	V _{OFDH} = V _{OFDH} - 0.1 V	1.0			mA	3
Output "Intermediate" current	I _{OMLa}	V _{OMLa} = V _M - 0.1 V	1.0			mA	2
	I _{OMHa}	V _{OMHa} = V _M + 0.1 V	1.0			mA	
	I _{OMLb}	V _{OMLb} = V _M - 0.1 V	1.0			mA	1
	I _{OMHb}	V _{OMHb} = V _M + 0.1 V	1.0			mA	
Output ON resistance	R _{ONH}	I _{OH} = 20 mA		30		Ω	2
	R _{ONOFH}	I _{OFDH} = 20 mA		20		Ω	3
	R _{ONM}	I _{OM} = 20 mA		25		Ω	1, 2
	R _{ONL}	I _{OL} = 20 mA		20		Ω	1, 2, 3
Static current	I _{DD}				2.0	mA	
	I _H				200	μA	
	I _{OFDH}				200	μA	
	I _M				200	μA	
	I _L				200	μA	

NOTES :

1. Applied to outputs (V₂, V₄).
2. Applied to outputs (V_{1A}, V_{1B}, V_{3A}, V_{3B}).
3. Applied to output (POFD).

AC Characteristics

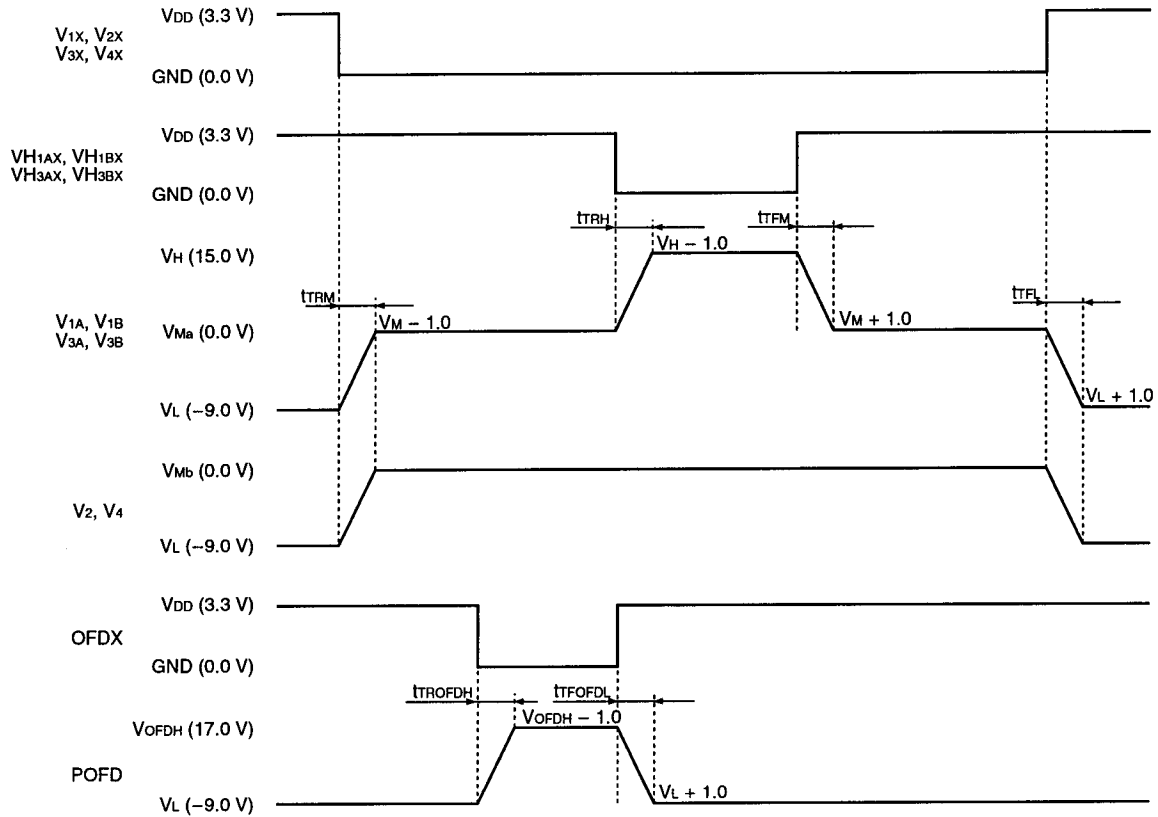
($V_{DD} = +3.3\text{ V}$, $V_H = +15.0\text{ V}$, $V_L = -9.0\text{ V}$, $V_{Ma} = V_{Mb} = 0\text{ V}$, $V_{OFDH} = +17.0\text{ V}$, $T_A = +25^\circ\text{C}$,
Shutter speed : 1/100 000 s)

PARAMETER	SYMBOL	CONDITIONS	TYP.	MAX.	UNIT
Sequential delay	t_{TRM} ($V_L \rightarrow V_M$)	V_{IN} to $V_M - 1.0\text{ V}$ ($V_{1A}, V_{1B}, V_2, V_{3A}, V_{3B}, V_4$)	600	1 200	ns
	t_{TFL} ($V_M \rightarrow V_L$)	V_{IN} to $V_L + 1.0\text{ V}$ ($V_{1A}, V_{1B}, V_2, V_{3A}, V_{3B}, V_4$)	600	1 200	ns
	t_{TRH} ($V_M \rightarrow V_H$)	V_{IN} to $V_H - 1.0\text{ V}$ ($V_{1A}, V_{1B}, V_{3A}, V_{3B}$)	800	1 600	ns
	t_{TFM} ($V_H \rightarrow V_M$)	V_{IN} to $V_M + 1.0\text{ V}$ ($V_{1A}, V_{1B}, V_{3A}, V_{3B}$)	800	1 600	ns
	t_{TROFDH} ($V_L \rightarrow V_{OFDH}$)	V_{IN} to $V_{OFDH} - 1.0\text{ V}$ (POFD)	80	160	ns
	t_{TFOFDL} ($V_{OFDH} \rightarrow V_L$)	V_{IN} to $V_L + 1.0\text{ V}$ (POFD)	80	160	ns
Dynamic current	I_{DYN}	During operation	5	10	mA

NOTE :

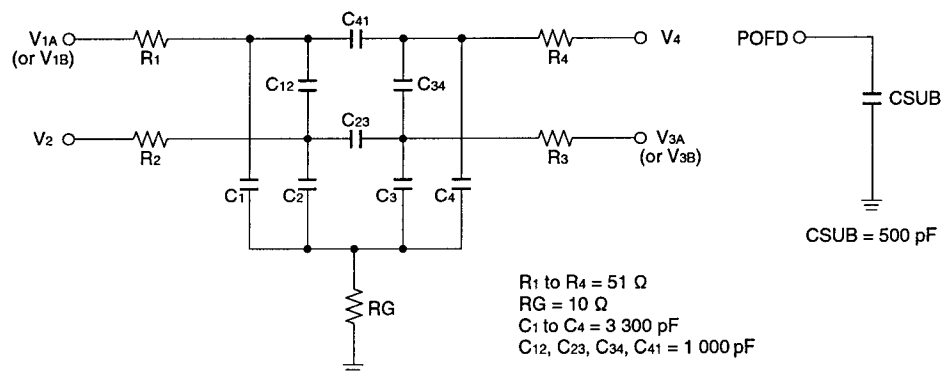
Refer to "Switching Characteristics Conditions" and "Equivalent Circuit".

Switching Characteristics Conditions



Equivalent Circuit

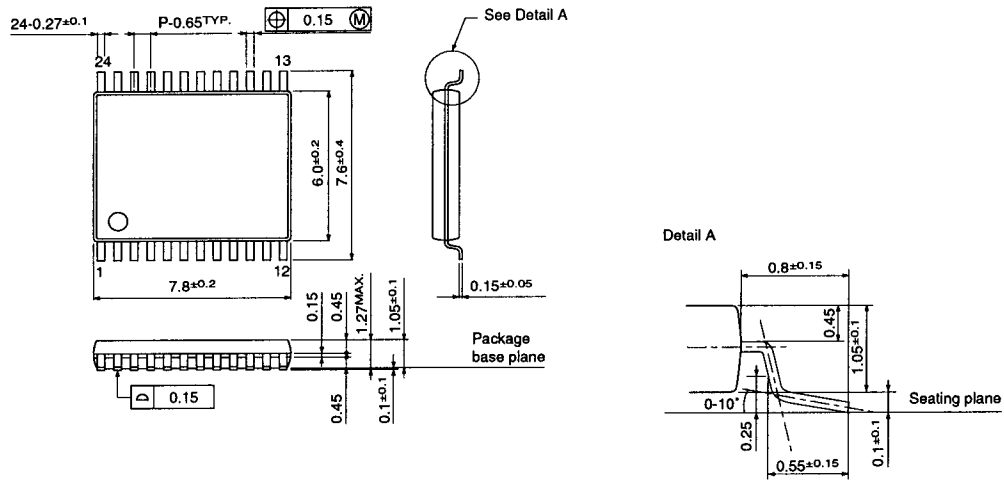
(While V_{1A} and V_{3A} [or V_{1B} and V_{3B}] are measured, V_{1B} and V_{3B} [or V_{1A} and V_{3A}] are open.)



PACKAGE OUTLINES

24 SSOP (P-SSOP024-0275)

(Unit : mm)



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