LR38616

Timing Generator IC for 2 140 k-pixel CCDs

DESCRIPTION

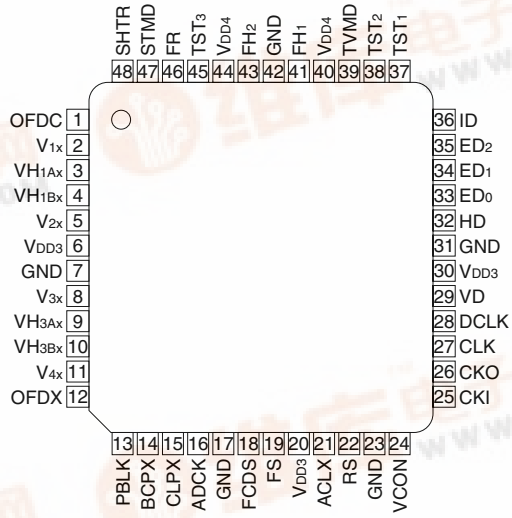
The LR38616 is a CMOS timing generator IC which generates timing pulses for driving 2 140 k-pixel CCD area sensors and processing pulses.

FEATURES

- Designed for 1/2-type 2 140 k-pixel CCD area sensors
- Frequency of driving horizontal CCD : 17.987 MHz
- Both double speed drive monitoring mode and still mode are possible
- Two still mode types :
  3 fields period and 4 fields period
- External shutter control function with serial data input is possible
- +3 V and +4.5 V power supplies
- Package :
  48-pin QFP (QFP048-P-0707) 0.5 mm pin-pitch

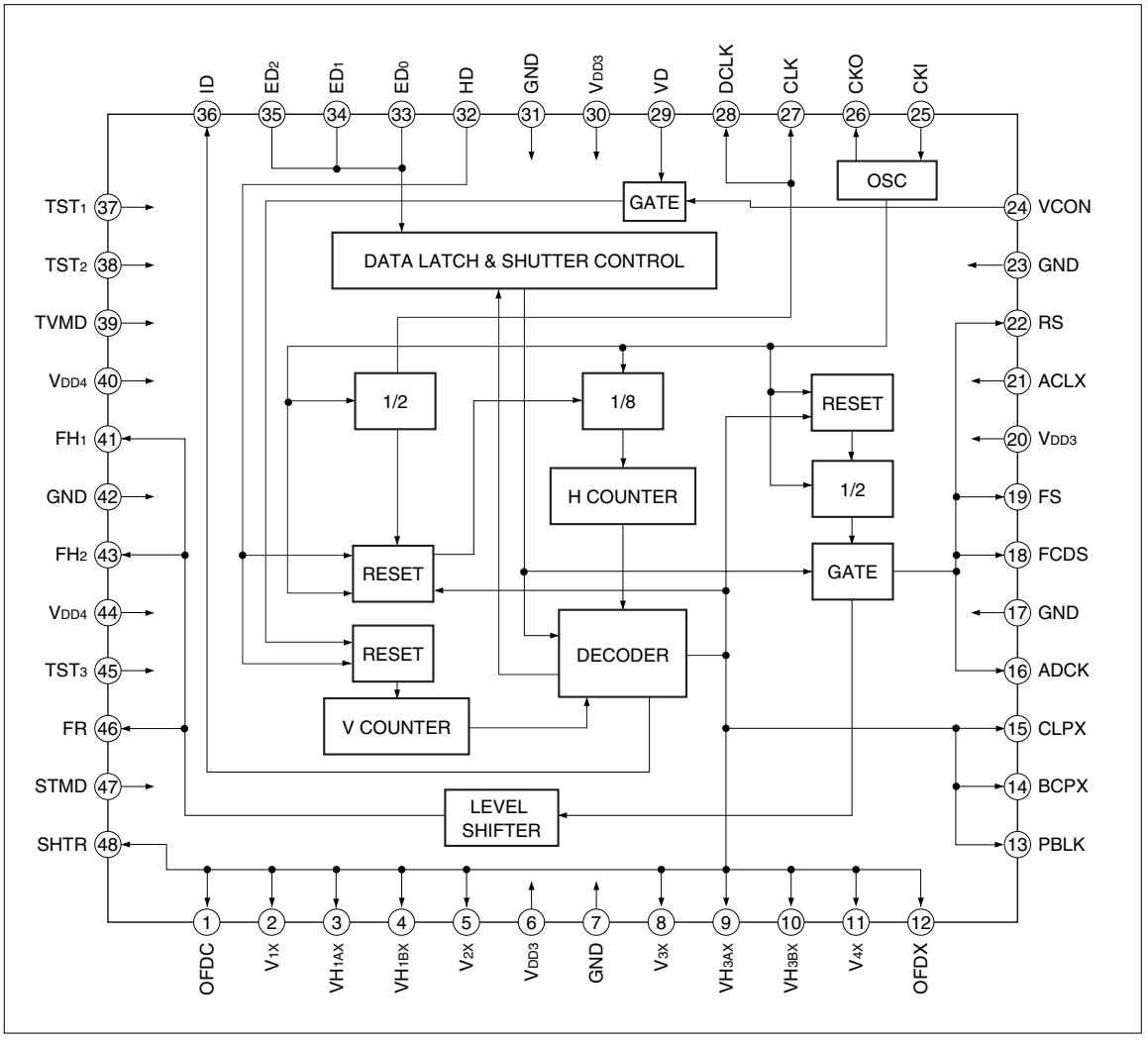
PIN CONNECTIONS

48-PIN QFP TOP VIEW



(QFP048-P-0707)

BLOCK DIAGRAM



PIN DESCRIPTION

PIN NO.	SYMBOL	I/O	POLARITY	PIN NAME	DESCRIPTION
1	OFDC	O3		Control pulse output for OFD voltage	A pulse to control OFD voltage.
2	V_{1X}	O3		Vertical transfer pulse output 1	A vertical transfer pulse for CCD. Connect to V_{1X} pin of vertical driver IC.
3	VH_{1AX}	O3		Readout pulse output 1A	A pulse that transfers the charge of the photo-diode to the vertical shift register. Connect to VH_{1AX} pin of vertical driver IC.
4	VH_{1BX}	O3		Readout pulse output 1B	A pulse that transfers the charge of the photo-diode to the vertical shift register. Connect to VH_{1BX} pin of vertical driver IC.
5	V_{2X}	O3		Vertical transfer pulse output 2	A vertical transfer pulse for CCD. Connect to V_{2X} pin of vertical driver IC.
6	V_{DD3}	–	–	Power supply	Supply of +3.3 V power.
7	GND	–	–	Ground	A grounding pin.
8	V_{3X}	O3		Vertical transfer pulse output 3	A vertical transfer pulse for CCD. Connect to V_{3X} pin of vertical driver IC.
9	VH_{3AX}	O3		Readout pulse output 3A	A pulse that transfers the charge of the photo-diode to the vertical shift register. Connect to VH_{3AX} pin of vertical driver IC.
10	VH_{3BX}	O3		Readout pulse output 3B	A pulse that transfers the charge of the photo-diode to the vertical shift register. Connect to VH_{3BX} pin of vertical driver IC.
11	V_{4X}	O3		Vertical transfer pulse output 4	A vertical transfer pulse for CCD. Connect to V_{4X} pin of vertical driver IC.
12	OFDX	O3		OFD pulse output	A pulse that sweeps the charge of the photo-diode for the electronic shutter. Connect to OFD pin of CCD through the vertical driver IC and DC offset circuit. Held at H level at normal mode.
13	PBLK	O3		Pre-blanking pulse output	A pulse that corresponds to the cease period of the horizontal transfer pulse.
14	BCPX	O3		Optical black clamp pulse output	A pulse to clamp the optical black signal. This pulse stays high during the absence of effective pixels within the vertical blanking or the period of sweep-out signal.
15	CLPX	O3		Clamp pulse output	A pulse to clamp the dummy outputs of CCD signal. This pulse stays high during the sweep-out period.
16	ADCK	O6MA3		AD clock output	An output pin for AD converter. The output phase of ADCK is selected by serial data step by 90˚.
17	GND	–	–	Ground	A grounding pin.

PIN NO.	SYMBOL	I/O	POLARITY	PIN NAME	DESCRIPTION
18	FCDS	O6MA3		CDS pulse output 1	A pulse to clamp the feed-through level from CCD. The output phase of FCDS is selected by serial data.
19	FS	O6MA3		CDS pulse output 2	A pulse to sample-hold the signal from CCD. The output phase of FS is selected by serial data.
20	V_{DD3}	–	–	Power supply	Supply of +3.3 V power.
21	ACLX	ICU3	–	All clear input	An input pin for resetting all internal circuits at power on. Connect to V_{DD} through the diode and GND through the capacitor.
22	RS	O6MA3		S/H pulse output	A pulse to sample-hold the signal. The output phase of RS is selected by serial data.
23	GND	–	–	Ground	A grounding pin.
24	VCON	ICU3	–	VD control input	An input pin to control internal vertical clock for long shutter speed. H level or open : VD L level : VD is masked by the pulse which is latched at the rising edge of VD. It's necessary to be set SMD = high and number of the fields data n ≥ 2 in serial data control at VCON operation.
25	CKI	OSCI3	–	Clock input	An input pin for reference clock oscillation. The frequency is 35.874 MHz.
26	CKO	OSCO3	–	Clock output	An output pin for reference clock oscillation. The output is the inverse of CKI (pin 25).
27	CLK	O6MA3		Clock output	An output pin to generate HD and VD pulses. The frequency is 17.937 MHz.
28	DCLK	O6MA3		Clock output	An output pin for DSP IC. The frequency is 17.937 MHz. The output phase of DCLK is selected by serial data step by 90˚.
29	VD	IC3		Vertical reference pulse input	An input pin for reference of vertical pulse. The length of low level is 9H. The period is following : Still mode : 656H Monitoring mode : 262.5H
30	V_{DD3}	–	–	Power supply	Supply of +3.3 V power.
31	GND	–	–	Ground	A grounding pin.
32	HD	IC3		Horizontal drive pulse input	An input pin for reference of horizontal pulse. Connect to HD pin of DSP IC.
33	ED_0	ICSU3	–	Strobe pulse input	An input pin for the strobe pulse, to control the functions of LR38616. For details, see **"Serial Data Control"**.
34	ED_1	ICSU3	–	Shift register clock input	An input pin for the clock of the shift register, to control the functions of LR38616. For details, see **"Serial Data Control"**.

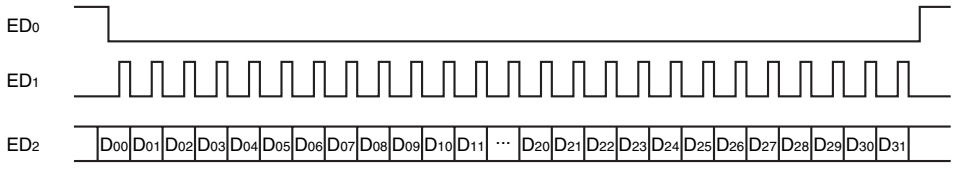
PIN NO.	SYMBOL	I/O	POLARITY	PIN NAME	DESCRIPTION
35	ED_2	ICSU3	–	Shift register data input	An input pin for the data of the shift register, to control the functions of LR38616. For details, see **"Serial Data Control"**.
36	ID	O3		Line index pulse output	The pulse is used in color separator. The signal switches between high and low at every line.
37	TST_1	ICD4	–	Test pin 1	A test pin. Set open or to L level in the normal mode.
38	TST_2	ICD4	–	Test pin 2	A test pin. Set open or to L level in the normal mode.
39	TVMD	ICD4	–	TV mode selection input	An input pin for TV mode selection.
40	V_{DD4}	–	–	Power supply	Supply of +4.5 V power.
41	FH_1	O6MA43		Horizontal transfer pulse output 1	A horizontal transfer pulse for CCD. Connect to ϕ_{H1} pin of CCD.
42	GND	–	–	Ground	A grounding pin.
43	FH_2	O6MA43		Horizontal transfer pulse output 2	A horizontal transfer pulse for CCD. Connect to ϕ_{H2} pin of CCD.
44	V_{DD4}	–	–	Power supply	Supply of +4.5 V power.
45	TST_3	ICD4	–	Test pin 3	A test pin. Set open or to L level in the normal mode.
46	FR	O6MA43		Reset pulse output	A pulse to reset the charge of output circuit. The output phase of FR is selected by serial data.
47	STMD	ICU4	–	Drive mode selection input	An input pin for setting the repetition to take the still picture. H level or open : 4 fields period L level : 3 fields period
48	SHTR	O3		Trigger output	A trigger pulse for effective signal period.

IC3 : Input pin (CMOS level)
ICU3 : Input pin (CMOS level with pull-up resistor)
ICSU3 : Input pin (CMOS level with schmitt-trigger)
ICU4 : Input pin (CMOS level with pull-up resistor)
ICD4 : Input pin (CMOS level with pull-down resistor)

O3 : Output pin (output high level is V_{DD3}.)
O6MA3 : Output pin (output high level is V_{DD3}.)
O6MA43 : Output pin (output high level is V_{DD4}.)
OSCI3 : Input pin for oscillation
OSCO3 : Output pin for oscillation

Serial Data Control

SERIAL DATA INPUT TIMING



The data is shifted at the rising edge of ED_1, and is latched at the rising edge of ED_0.

PWSA is effective at the rising edge of ED_0, but others are effective at the horizontal line in which VH_{1AX} to VH_{3BX} are active.

ED_0 should be low level during data inputs of ED_1 and ED_2.

As all internal data are set to low level by ACLX or PWSA, ED_0 to ED_1 should be input for desirable operations.

As all internal data except PWSA are set to low level by PWSA, ED_0 to ED_1 should be input for desirable operations.

SERIAL DATA INPUTS

DATA	NAME	FUNCTION	DATA = L	DATA = H	AT ACLX = L
D_{00}-D_{06}	SD_0-SD_6	Step of high speed shutter	–		All L
D_{07}	SD_7	Number of exposed fields	–		All L
D_{08}	SD_8				
D_{09}	SD_9				
D_{10}	SMD	Electronic shutter mode control	–		L
D_{11}	INMD	Integration mode control	Monitoring	Still	L
D_{12}	PWSA	Power save control	Normal	Power save	L
D_{13}	PLCH	Polarity control of FCDS, FS and RS pulses	Negative	Positive	L
D_{14}	DUMMY	Dummy	–		–
D_{15}	BCPCNT	BCP control	Uncontinuously	Continuously	L
D_{16}	ML_1	Phase control	–		L
D_{17}	ML_2				L
D_{18}	MR_1		–		L
D_{19}	MR_2				L
D_{20}	MR_3				L
D_{21}	MC_1		–		L
D_{22}	MC_2				L
D_{23}	MC_3				L
D_{24}	MS_1		–		L
D_{25}	MS_2				L
D_{26}	MS_3				L
D_{27}	MF_1		–		L
D_{28}	MF_2				L
D_{29}	MF_3				L
D_{30}	MA_1		–		L
D_{31}	MA_2				L

ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	RATING	UNIT
Supply voltage	V_{DD3}, V_{DD4}	−0.3 to 6.0	V
Input voltage	V_{I3}	−0.3 to V_{DD3} + 0.3	V
	V_{I4}	−0.3 to V_{DD4} + 0.3	V
Output voltage	V_{O3}	−0.3 to V_{DD3} + 0.3	V
	V_{O4}	−0.3 to V_{DD4} + 0.3	V
Operating temperature	T_{OPR}	−20 to +70	˚C
Storage temperature	T_{STG}	−55 to +150	˚C

ELECTRICAL CHARACTERISTICS

DC Characteristics

(V_{DD3} = 3.0 V to V_{DD4}, V_{DD4} = 4.2 to 5.5 V, T_{OPR} = −20 to +70 ˚C)

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNIT	NOTE
Input "Low" voltage	V_{IL3-1}				0.2V_{DD3}	V	1, 2
Input "High" voltage	V_{IH3-1}		0.8V_{DD3}			V	
Input "Low" voltage	V_{IL3-2}	Schmitt-buffer	0.2V_{DD3}			V	3
Input "High" voltage	V_{IH3-2}				0.75V_{DD3}	V	
Hysteresis voltage	$V_{T+} - V_{T-}$		0.08V_{DD3}			V	
Input "Low" voltage	V_{IL4}				0.2V_{DD4}	V	4, 5
Input "High" voltage	V_{IH4}		0.8V_{DD4}			V	
Input "Low" current	$\lvert I_{IL3-1} \rvert$	V_I = 0 V			1.0	µA	1
Input "High" current	$\lvert I_{IH3-1} \rvert$	V_I = V_{DD3}			1.0	µA	
Input "Low" current	$\lvert I_{IL3-2} \rvert$	V_I = 0 V	2.0		30	µA	2, 3
Input "High" current	$\lvert I_{IH3-2} \rvert$	V_I = V_{DD3}			2.0	µA	
Input "Low" current	$\lvert I_{IL4-1} \rvert$	V_I = 0 V	4.0		60	µA	4
Input "High" current	$\lvert I_{IH4-1} \rvert$	V_I = V_{DD4}			2.0	µA	
Input "Low" current	$\lvert I_{IL4-2} \rvert$	V_I = 0 V			2.0	µA	5
Input "High" current	$\lvert I_{IH4-2} \rvert$	V_I = V_{DD4}	4.0		60	µA	
Output "Low" voltage	V_{OL3-1}	I_{OL} = 2 mA			0.4	V	6
Output "High" voltage	V_{OH3-1}	I_{OH} = −1 mA	V_{DD3} − 0.5			V	
Output "Low" voltage	V_{OL3-2}	I_{OL} = 3 mA			0.4	V	7
Output "High" voltage	V_{OH3-2}	I_{OH} = −3 mA	V_{DD3} − 0.5			V	
Output "Low" voltage	V_{OL4}	I_{OL} = 10 mA			0.4	V	8
Output "High" voltage	V_{OH4}	I_{OH} = −10 mA	V_{DD4} − 0.5			V	

NOTES :

1. Applied to inputs (IC3, OSCI3).
2. Applied to input (ICU3).
3. Applied to input (ICSU3).
4. Applied to input (ICU4).
5. Applied to input (ICD4).
6. Applied to output (O3).
7. Applied to outputs (OSCO3, O6MA3). (Output (OSCO3) measures on condition that input (OSCI3) level is 0 V or V_{DD3}.)
8. Applied to output (O6MA43).

PACKAGE

(Unit : mm)

48 QFP (QFP048-P-0707)