LR38617

Timing Generator IC for 3 300 k/3 370 k-pixel CCDs

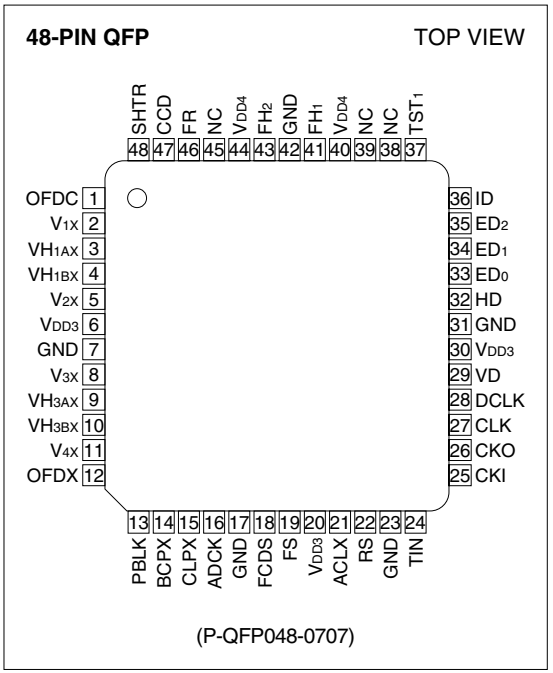
DESCRIPTION

The LR38617 is a CMOS timing generator IC which generates timing pulses for driving 3 300 k/ 3 370 k-pixel CCD area sensors and processing pulses.

FEATURES

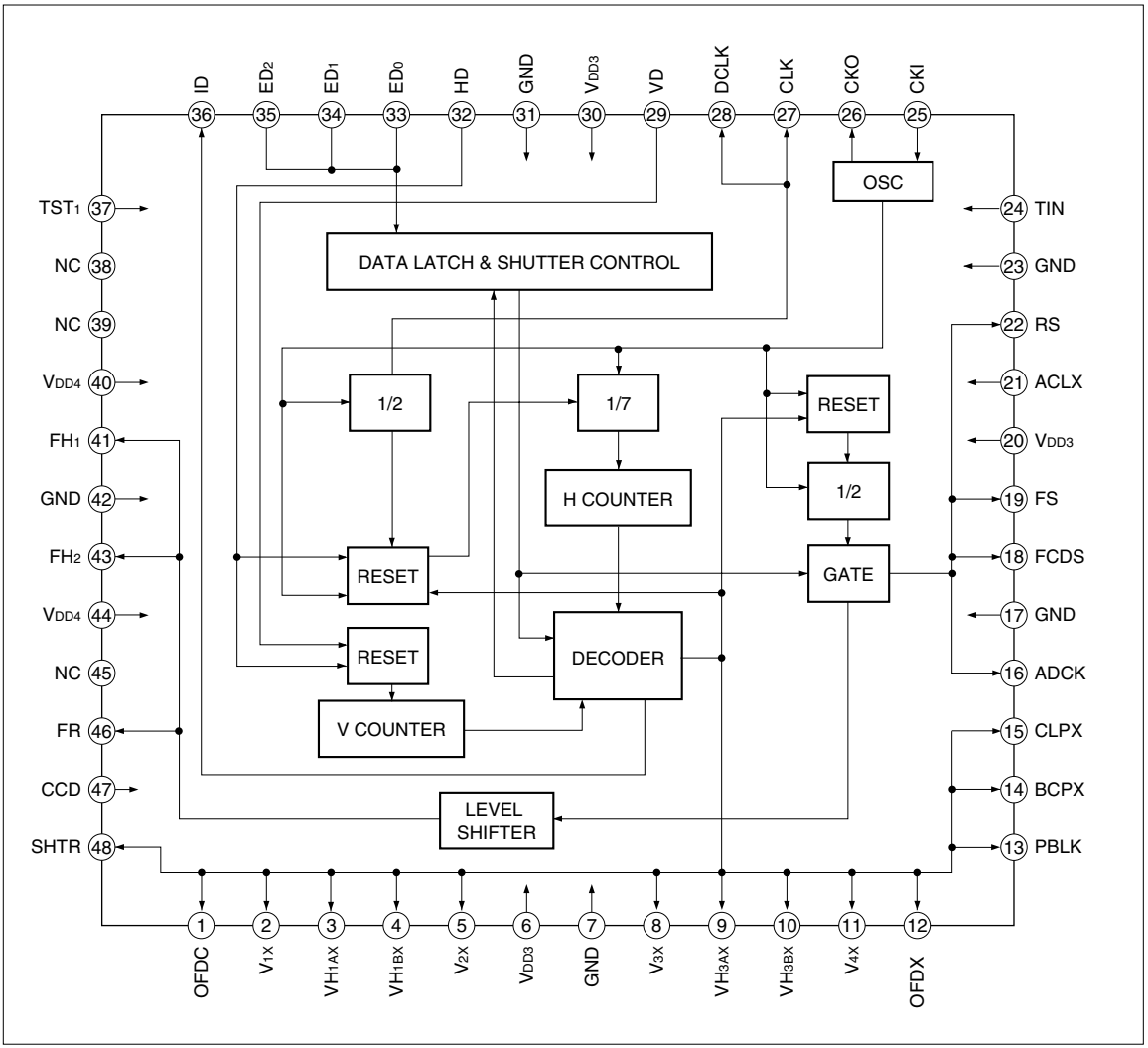
- Designed for 1/1.8-type 3 300 k/3 370 k-pixel CCD area sensors
- Frequency of driving horizontal CCD : 18.00 MHz
- In monitoring mode, it can be obtained 30 fields/s.
- External shutter control function with serial data input is possible
- +3.3 V and +4.5 V power supplies
- Package :
  48-pin QFP (P-QFP048-0707) 0.5 mm pin-pitch

PIN CONNECTIONS



(P-QFP048-0707)

BLOCK DIAGRAM



PIN DESCRIPTION

PIN NO.	SYMBOL	IO SYMBOL	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 the 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 the 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 the 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 the 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 the CCD through the vertical driver IC and DC offset circuit. Held at H level in normal mode.
13	PBLK	O3	⎎	Pre-blanking pulse output	A pulse for pre-blanking. This pulse is controlled by serial data BLKCNT. BLKCNT = H; This pulse stays low during the absence of effective pixels within the vertical blanking or during the sweepout signal. BLKCNT = L; Continuous pulse The output phase of PBLK is selected by serial data.

PIN NO.	SYMBOL	IO SYMBOL	POLARITY	PIN NAME	DESCRIPTION
14	BCPX	O3		Optical black clamp pulse output	A pulse to clamp the optical black signal. This pulse is controlled by serial data BCPCNT. BCPCNT = H; This pulse stays high during the absence of effective pixels within the vertical blanking or during the sweepout signal. BCPCNT = L; This pulse stays high during sweepout signal.
15	CLPX	O3		Clamp pulse output	A pulse to clamp the dummy outputs of the CCD signal. This pulse stays high during the sweepout period.
16	ADCK	O6MA3		AD clock output	An output pin for AD converter. The output phase of ADCK is selected by serial data in 90˚ steps.
17	GND	–	–	Ground	A grounding pin.
18	FCDS	O6MA3		CDS pulse output 1	A pulse to clamp the feed-through level for the CCD. The output phase and output polarity of FCDS are selected by serial data.
19	FS	O6MA3		CDS pulse output 2	A pulse to sample-hold the signal for the CCD. The output phase and output polarity of FS are 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_{DD3} through the diode and GND through the capacitor.
22	RS	O6MA3		S/H pulse output	A pulse to sample-hold the signal for the CDS circuit. The output phase and output polarity of RS are selected by serial data.
23	GND	–	–	Ground	A grounding pin.
24	TIN	IC3	–	Test input	A test pin. Set to L level in normal mode.
25	CKI	OSCI3	–	Clock input	An input pin for reference clock oscillation. The frequency is 36.00 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 18.00 MHz.
28	DCLK	O6MA3		Clock output	An output pin for DSP IC. The frequency is 18.00 MHz. The output phase of DCLK is selected by serial data in 90˚ steps.
29	VD	IC3		Vertical reference pulse input	An input pin for reference of vertical pulse. Connect to VD pin of DSP IC.
30	V_{DD3}	–	–	Power supply	Supply of +3.3 V power.
31	GND	–	–	Ground	A grounding pin.

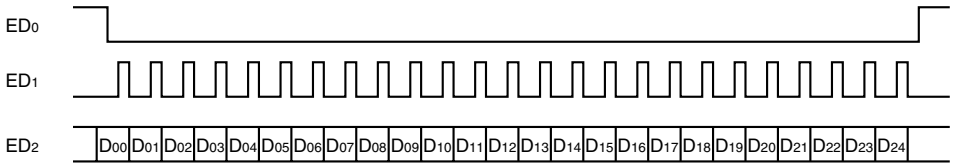
PIN NO.	SYMBOL	IO SYMBOL	POLARITY	PIN NAME	DESCRIPTION
32	HD	IC3		Horizontal drive pulse input	An input pin for reference of horizontal pulse. Connect to HD pin of DSP IC.
33	ED_0	ICSU3	–	Strobe pulse input	An input pin for the strobe pulse, to control the functions of LR38617. For details, see "**Serial 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 LR38617. For details, see "**Serial Data Control**".
35	ED_2	ICSU3	–	Shift register data input	An input pin for the data of the shift register, to control the functions of LR38617. For details, see "**Serial Data Control**".
36	ID	O3		Line index pulse output	The pulse is used in the 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 normal mode.
38	NC	–	–	No connection	No connection.
39	NC	–	–	No connection	No connection.
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 the CCD. Connect to ϕ_{H1} pin of the CCD.
42	GND	–	–	Ground	A grounding pin.
43	FH_2	O6MA43		Horizontal transfer pulse output 2	A horizontal transfer pulse for the CCD. Connect to ϕ_{H2} pin of the CCD.
44	V_{DD4}	–	–	Power supply	Supply of +4.5 V power.
45	NC	–	–	No connection	No connection.
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	CCD	ICU4	–	CCD selection input	An input pin to select CCD. L level : Aspect ratio 4 : 3 CCD H level or open : Aspect ratio 3 : 2 CCD
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 schmitt-trigger level with pull-up resistor)
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



ED_2 is shifted by the rising edge of ED_1, and is latched by the pulse #1 which is generated after 167 to 222 ns delay from the rising edge of ED_0. (See **Fig. 2**.)

The latched serial data are divided into two types by the data of D_{00}, and are relatched by the pulse #2 which is generated after 277 to 332 ns delay from the rising edge of ED_0. (See **Fig. 1**.)

INMD is effective at the start of #3 horizontal line, and shutter control data are effective at the start of #6 or #234 horizontal line at CCD = L, or #12 HD horizontal line at CCD = H, and other data are effective at pulse #2.

ED_0 should be at low level during data inputs of ED_1 and ED_2, or while ACLX is at low level.

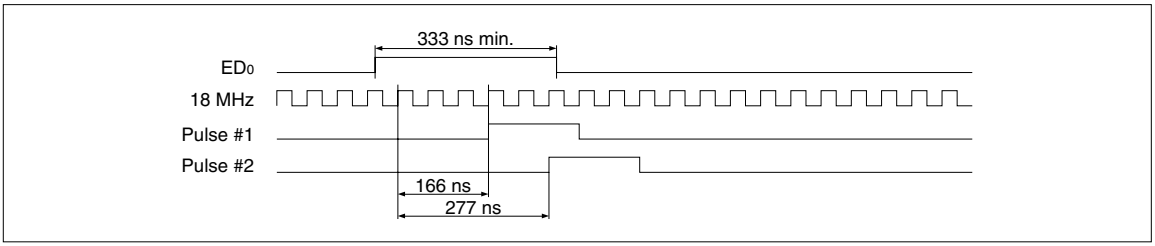


Fig. 1 Data Latch Timing

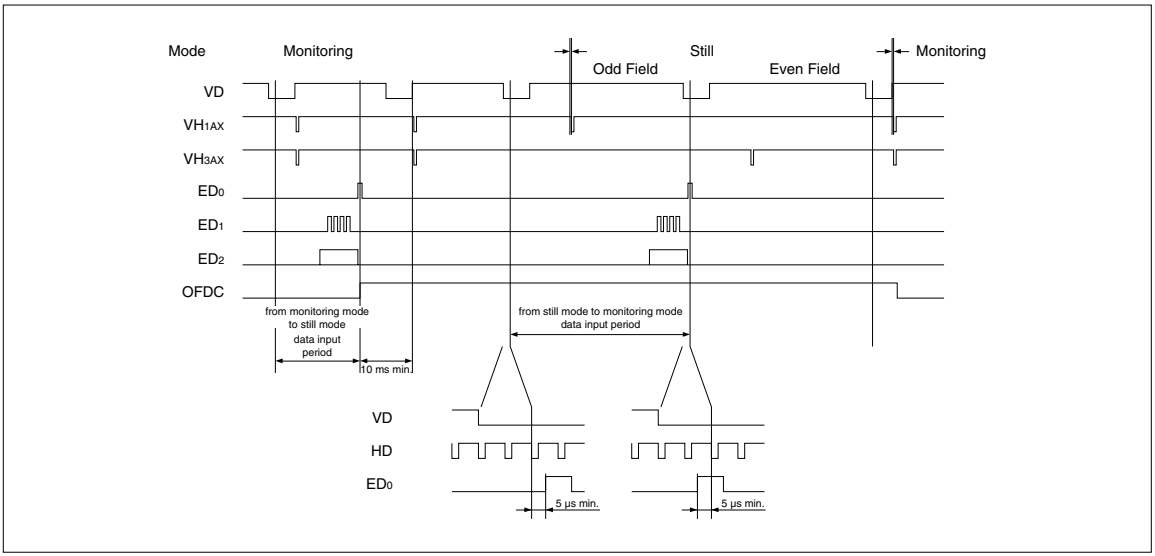


Fig. 2 Input Pulse Timing of ED_0, ED_1 and ED_2

SERIAL DATA INPUTS

D_{00} = L

DATA	NAME	FUNCTION	DATA = L	DATA = H	AT ACLX = L
D_{01}-D_{09}	SDV_0-SDV_8	Integration time control in field period step by horizontal period.	–		All L
D_{10}-D_{15}	SDH_0-SDH_5	Integration time control in horizontal period step by 112 CLK clock period.	–		All L
D_{16}	SDF_0	Integration time control by field period.	–		All L
D_{17}	SDF_1				
D_{18}	SDF_2				
D_{19}	SMD	Electronic shutter mode control	–		L
D_{20}	PWSA	Power save control	Normal	Power save	L
D_{21}	INMD	Integration mode control	Monitoring	Still	L
D_{22}	Dummy	Dummy	Fix to L level		L
D_{23}	BCPCNT	BCPX control	Discontinuous	Continuous	L
D_{24}	VHCNT	VH_{1AX} to VH_{3BX} control	Output	Held at H level	L

D_{00} = H

DATA	NAME	FUNCTION	DATA = L	DATA = H	AT ACLX = L
D_{01}	ML1	Phase control	–		All L
D_{02}	ML2				
D_{03}	MR1		–		All L
D_{04}	MR2				
D_{05}	MR3				
D_{06}	MC1		–		All L
D_{07}	MC2				
D_{08}	MC3				
D_{09}	MS1		–		All L
D_{10}	MS2				
D_{11}	MS3				
D_{12}	MF1		–		All L
D_{13}	MF2				
D_{14}	MF3				
D_{15}	MA1		–		All L
D_{16}	MA2				
D_{17}	MD1		–		All L
D_{18}	MD2				
D_{19}	MD3				
D_{20}	MP1		–		All L
D_{21}	MP2				
D_{22}	PLCH	Polarity control of FCDS, FS and RS pulses	Negative	Positive	L
D_{23}	BLKCNT	PBLK control	Continuous	Discontinuous	L
D_{24}	Dummy	Dummy	Fix to L level		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
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		60	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			2.0	µA	4
Input "High" current	$\lvert I_{IH4-1} \rvert$	$V_I = V_{DD4}$	4.0		60	µA	
Input "Low" current	$\lvert I_{IL4-2} \rvert$	V_I = 0 V	4.0		60	µA	5
Input "High" current	$\lvert I_{IH4-2} \rvert$	$V_I = V_{DD4}$			2.0	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 (ICD4).
5. Applied to input (ICU4).
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 OUTLINES

48 QFP (P-QFP048-0707)

(Unit : mm)