LR38580

Single-chip Driver IC for 270 k/320 k-pixel B/W CCDs with Dual-power-supply Operation
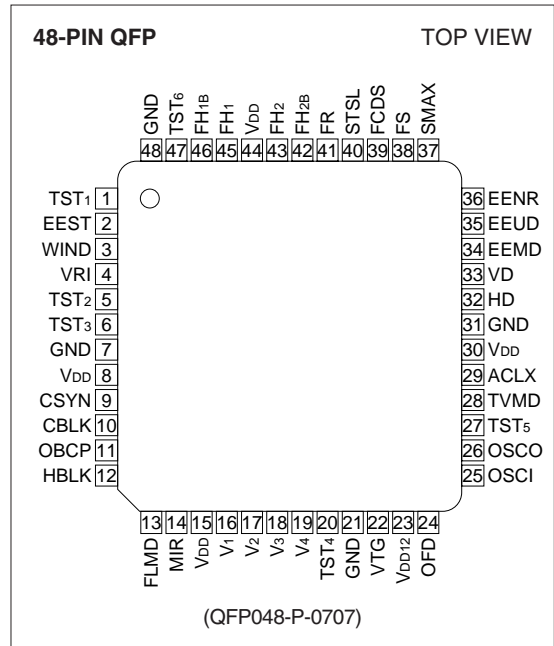
DESCRIPTION

The LR38580 is a CMOS single-chip driver IC which generates timing pulses for driving 270 k/320 k-pixel B/W CCD area sensors with a dual-power-supply operation, synchronous pulses for TV signals and processing pulses for video signals.
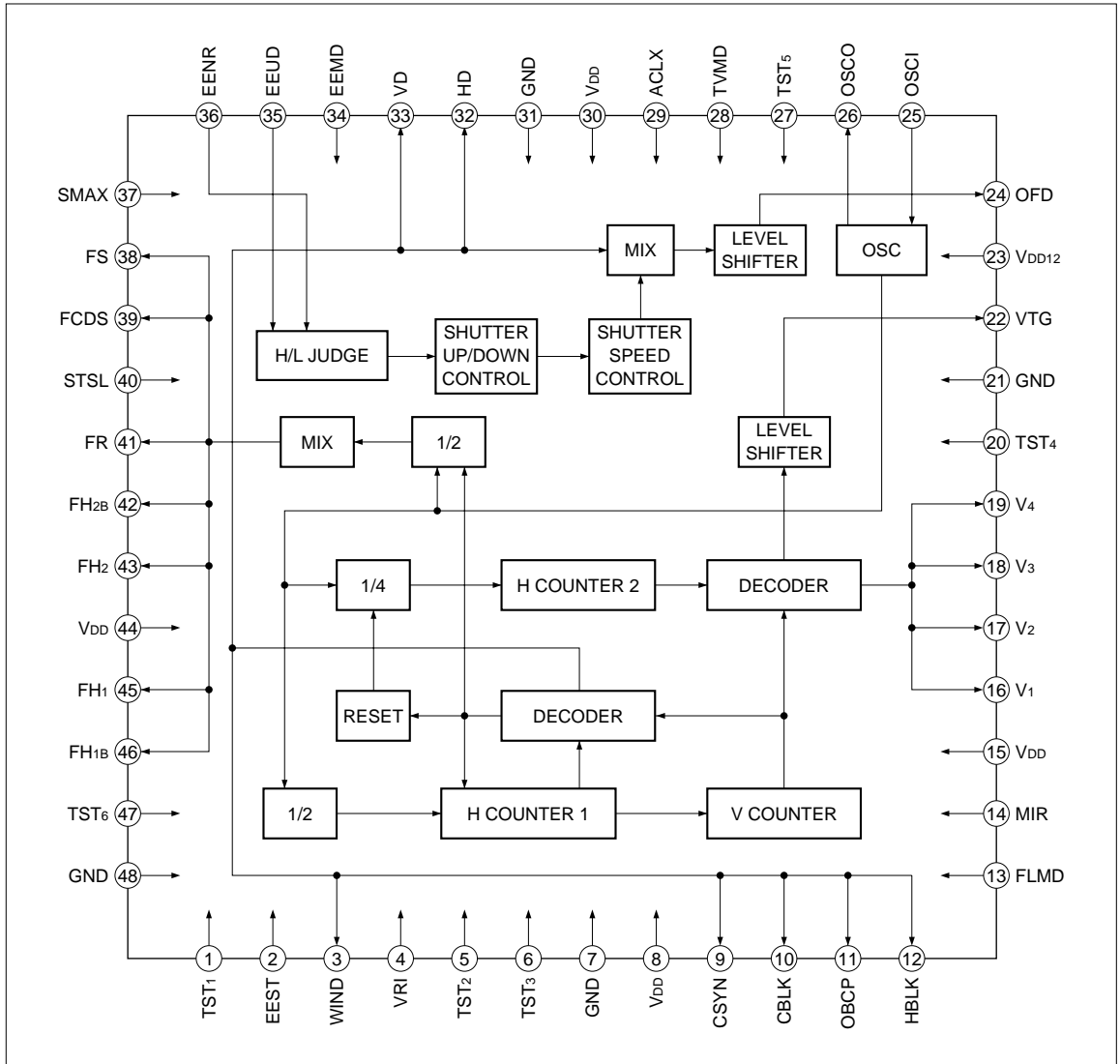
FEATURES

- Designed for 270 k/320 k-pixel B/W CCD area sensors with a dual-power-supply operation
- Switchable between EIA and CCIR modes
- Electronic shutter and EE control are possible
- Maximum shutter speed is selectable from approx. 1/100 000 s, 1/56 000 s and 1/32 000 s
- Starting shutter speed is selectable from approx. 1/100 000 s and 1/1 000 s
- Flicker-less function
- Switchable between normal and mirror images
- External synchronization is possible
- Level shifter for readout and shutter pulses included
- Dual +5 V and +12.5 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	TST$_1$	ICD	–	Test pin 1	A test pin. Set open or to L level in the normal mode.
2	EEST	ICU	–	Electronic exposure control input 1	An input pin to control electronic exposure using EEUD (pin 35) and EENR (pin 36). L level : Electronic exposure is stopped. H level or open : Electronic exposure is operated.
3	WIND	ON (N-ch Open Drain)	⊓	Window pulse output	An output pin for window pulse. <table><tr><td>FLMD</td><td>EEMD</td><td>WIND</td></tr><tr><td>L</td><td>L</td><td rowspan=2>WIND1 (vertical pulse)</td></tr><tr><td>H</td><td>L</td></tr><tr><td>L</td><td>H</td><td rowspan=2>WIND2 (composite pulse)</td></tr><tr><td>H</td><td>H</td></tr></table>WIND1 : When connected to EEST (pin 2), the operation of electronic exposure can be stopped at the upper side of monitor. WIND2 : A pulse that picks out the center of CCD output. At this time, set H level or open at EEST (pin 2). As the output circuit of WIND is N-ch open drain, connect to VDD with R ($\geq$ 47 kΩ).
4	VRI	ICSU	–	Vertical reset input	An input pin for resetting internal vertical counter. The input pulse is VSYNC (negative polarity).
5	TST$_2$	ICD	–	Test pin 2	A test pin. Set open or to L level in the normal mode.
6	TST$_3$	ICD	–	Test pin 3	A test pin. Set open or to L level in the normal mode.
7	GND	–	–	Ground	A grounding pin.
8	VDD	–	–	Power supply	Supply of +5 V power.
9	CSYN	O	⌐	Composite synchronizing pulse output	An output pin of composite synchronous signal pulse.
10	CBLK	O	⊓	Composite blanking pulse output	An output pin of composite blanking pulse.
11	OBCP	O	⊔	Optical black clamp pulse output	A pulse to clamp the optical black signal. This pulse stays low during the absence of effective pixels within the vertical blanking.
12	HBLK	O	⌐	Horizontal blanking pulse output	A pulse that corresponds to the cease period of the horizontal transfer pulse.

PIN NO.	SYMBOL	I/O	POLARITY	PIN NAME	DESCRIPTION
13	FLMD	ICU	–	Electronic exposure and WIND pulse control input 1	An input pin to control electronic exposure mode, flicker-less mode and WIND (pin 3) pulse output. | FLMD	EEMD	Electronic Shutter mode	WIND
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L	L	EIA : 1/60 s, CCIR : 1/50 s	WIND1
H	L	EIA : 1/100 s, CCIR : 1/120 s	WIND1
L	H	E/E operation	WIND1
H	H	E/E operation	WIND2	 WIND 1 : Vertical pulse WIND 2 : Composite pulse (vertical and horizontal)
14	MIR	ICU	–	Mirror mode selection input	An input pin to select mirror or normal image mode 　L level　　　　　　　: Normal image mode 　H level or open　　: Mirror image mode 	MIR	L (Normal mode)	H or open (Mirror mode)
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FH_{1B}	≒ FH_1	≒ FH_2
FH_{2B}	≒ FH_2	≒ FH_1	
15	V_{DD}	–	–	Power supply	Supply of +5 V power.
16	V_1	O4MA2	⎍	Vertical transfer pulse output 1	A pulse to drive vertical CCD shift register. Connect to ϕV_1 pin of CCD.
17	V_2	O4MA2	⎍	Vertical transfer pulse output 2	A pulse to drive vertical CCD shift register. Connect to ϕV_2 pin of CCD.
18	V_3	O4MA2	⎍	Vertical transfer pulse output 3	A pulse to drive vertical CCD shift register. Connect to ϕV_3 pin of CCD.
19	V_4	O4MA2	⎍	Vertical transfer pulse output 4	A pulse to drive vertical CCD shift register. Connect to ϕV_4 pin of CCD.
20	TST_4	ICD	–	Test pin 4	A test pin. Set open or to L level in the normal mode.
21	GND	–	–	Ground	A grounding pin.
22	VTG	O12MHV	⎍	Readout pulse output	A pulse that transfers the charge of the photo-diode to the vertical shift register. Connect to VTG pin of CCD.
23	V_{DD12}	–	–	Power supply	Supply of +12.5 V power.
24	OFD	O12MHV	⎍	OFD pulse output	A pulse that sweeps the charge of the photo-diode for the electronic shutter. Connect to OFD pin of CCD. Held at L level at normal mode.
25	OSCI	OSCI	–	Clock input	An input pin for reference clock oscillation. Connect to OSCO (pin 26) with R. The frequencies are as follows : 	TVMD	Frequency
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L	19.0699 MHz (1 212 fH)
H	19.3125 MHz (1 236 fH)	 fH = Horizontal frequency

PIN NO.	SYMBOL	I/O	POLARITY	PIN NAME	DESCRIPTION
26	OSCO	OSC3M	–	Clock output	An output pin for reference clock oscillation. The output is the inverse of OSCI (pin 25).
27	TST5	ICD	–	Test pin 5	A test pin. Set open or to L level in the normal mode.
28	TVMD	ICU	–	TV mode selection input	An input pin to select TV standards. L level : EIA mode; H level or open : CCIR mode
29	ACLX	ICU	–	All clear input	An input pin for resetting all internal circuits at power on. Connect VDD through the diode and GND through the capacitor.
30	VDD	–	–	Power supply	Supply of +5 V power.
31	GND	–	–	Ground	A grounding pin.
32	HD	O	⎍	Horizontal drive pulse output	The pulse occurs at the start of every line.
33	VD	O	⎍	Vertical drive pulse output	The pulse occurs at the start of every field.
34	EEMD	ICU	–	Electronic exposure and WIND pulse control input 2	An input pin to control electronic exposure mode, flicker-less mode and WIND (pin 3) pulse output, used with FLMD (pin 13).
35	EEUD	IC	–	Electronic exposure control input 2	An input pin to control electronic exposure. (see table below)
36	EENR	IC	–	Electronic exposure control input 3	
37	SMAX	ICU	–	Shutter speed control input 1	An input pin to control maximum and initial shutter speed with STSL (pin 40). (see table below)
38	FS	O4MA2	⫿	CDS pulse output 1	A pulse to sample-hold the signal from CCD.
39	FCDS	O4MA2	⫿	CDS pulse output 2	A pulse to clamp the feed-through level from CCD.
40	STSL	ICU	–	Shutter speed control input 2	An input pin to control maximum and initial shutter speed with SMAX (pin 37). (see table below)

Pin 35/36 (EEUD, EENR) — electronic exposure control:

EEUD	EENR	Shutter Speed
H	L	up
H	H	control stopped
L	H	down

Pin 37 (SMAX) — maximum and initial shutter speed with STSL (pin 40):

SMAX	STSL	Maximum speed	Initial Speed
H	H	≒ 1/ 32 000	≒ 1/ 1 000
L	H	≒ 1/ 56 000	≒ 1/ 1 000
H	L	≒ 1/101 000	≒ 1/ 1 000
L	L	≒ 1/101 000	≒ 1/101 000

Pin 40 (STSL) — maximum and initial shutter speed with SMAX (pin 37):

SMAX	STSL	Maximum Speed	Initial Speed
H	H	≒ 1/ 32 000	≒ 1/ 1 000
L	H	≒ 1/ 56 000	≒ 1/ 1 000
H	L	≒ 1/101 000	≒ 1/ 1 000
L	L	≒ 1/101 000	≒ 1/101 000

PIN NO.	SYMBOL	I/O	POLARITY	PIN NAME	DESCRIPTION
41	FR	O4MA3	⊓	Reset pulse output	A pulse to reset the charge of output circuit. Connect to ϕR pin of CCD through the DC offset circuit.
42	FH$_{2B}$	O4MA2	⊓⊓	Horizontal transfer pulse output 2B	A pulse to drive horizontal CCD shift register. Connect to ϕH2B pin of CCD.
43	FH$_2$	O4MA3	⊓⊓	Horizontal transfer pulse output 2	A pulse to drive horizontal CCD shift register. Connect to ϕH2 pin of CCD.
44	V$_{DD}$	–	–	Power supply	Supply of +5 V power.
45	FH$_1$	O4MA3	⊓⊓	Horizontal transfer pulse output 1	A pulse to drive horizontal CCD shift register. Connect to ϕH1 pin of CCD.
46	FH$_{1B}$	O4MA2	⊓⊓	Horizontal transfer pulse output 1B	A pulse to drive horizontal CCD shift register. Connect to ϕH1B pin of CCD.
47	TST$_6$	ICD	–	Test pin 6	A test pin. Set open or to L level in the normal mode.
48	GND	–	–	Ground	A grounding pin.

IC   : Input pin (CMOS level)
ICU   : Input pin (CMOS level with pull-up resistor)
ICD   : Input pin (CMOS level with pull-down resistor)
ICSU   : Input pin (CMOS schmitt-trigger level with pull-up resistor)
O   : Output pin (V$_{DD}$ = 5 V)

O4MA2   : Output pin (V$_{DD}$ = 5 V)
O4MA3   : Output pin (V$_{DD}$ = 5 V)
O12MHV : Output pin (V$_{DD12}$ = 12.5 V)
ON   : Output pin (N-ch open drain)
OSCI   : Input pin for oscillation
OSC3M   : Output pin for oscillation

SUPPLEMENTARY EXPLANATION

Shutter speed changes at electronic exposure control mode.

EIA			CCIR		
No.	Charge Time	Shutter Speed	No.	Charge Time	Shutter Speed
0	262H or 263H	≒ 1/ 60 s	0	312H or 313H	≒ 1/ 50 s
1	252H + α	≒ 1/ 62 s	1	302H + β	≒ 1/ 52 s
•	(by 10H step)		•	(by 10H step)	
19	72H + α	≒ 1/ 220 s	24	72H + β	≒ 1/ 220 s
•	(by 4H step)		•	(by 4H step)	
30	28H + α	≒ 1/ 555 s	35	28H + β	≒ 1/ 550 s
•	(by 2H step)		•	(by 2H step)	
37	14H + α	≒ 1/ 1 100 s	42	14H + β	≒ 1/ 1 090 s
•	(by 1H step)		•	(by 1H step)	
44	7H + α	≒ 1/ 2 140 s	49	7H + β	≒ 1/ 2 125 s
•	(by 0.5H step)		•	(by 0.5H step)	
50	4H + α	≒ 1/ 3 610 s	55	4H + β	≒ 1/ 3 590 s
•	(by 0.25H step)		•	(by 0.25H step)	
62	1H + α	≒ 1/ 11 570 s	67	1H + β	≒ 1/ 11 550 s
•	(by 0.125H step)		•	(by 0.125H step)	
69	0.125H + α	≒ 1/ 32 450 s	74	0.125H + β	≒ 1/ 32 690 s
70	0.280H	≒ 1/ 56 090 s	75	0.275H	≒ 1/ 56 800 s
71	0.155H	≒ 1/101 430 s	76	0.152H	≒ 1/102 720 s

α = 0.360H　　　　　　　　　　　　　　β = 0.353H

Select maximum shutter speed and initial shutter speed.

SMAX	STSL	MAXIMUM SHUTTER SPEED (s)				INITIAL SHUTTER SPEED (s)			
Pin 37	Pin 40	Step	EIA	Step	CCIR	Step	EIA	Step	CCIR
H	H	69	≒ 1/ 32 450	74	≒ 1/ 32 690	37	≒ 1/ 1 100	37	≒ 1/ 1 090
L	H	70	≒ 1/ 56 090	75	≒ 1/ 56 800	37	≒ 1/ 1 100	37	≒ 1/ 1 090
H	L	71	≒ 1/101 430	76	≒ 1/102 720	37	≒ 1/ 1 100	37	≒ 1/ 1 090
L	L	71	≒ 1/101 430	76	≒ 1/102 720	76	≒ 1/101 430	76	≒ 1/102 720

ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	RATING	UNIT
Supply voltage	V_{DD}	−0.3 to +6.0	V
	V_{DD12}	−0.3 to +15.0	V
Input voltage	V_I	−0.3 to V_{DD} + 0.3	V
Output voltage	V_O	−0.3 to V_{DD} + 0.3	V
	V_{O12}	−0.3 to V_{DD12} + 0.3	V
Operating temperature	T_{OPR}	−20 to +70	˚C
Storage temperature	T_{STG}	−55 to +150	˚C

ELECTRICAL CHARACTERISTICS

DC Characteristics

(V_{DD} = 5.0±0.5 V, V_{DD12} = 12.5±0.5 V, T_{OPR} = −20 to +70 ˚C)

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNIT	NOTE
Input "Low" voltage	V_{IL}				1.5	V	1
Input "High" voltage	V_{IH}		3.5			V	
Input "Low" voltage	V_{T+}				3.7	V	2
Input "High" voltage	V_{T-}		1.0			V	
Hysteresis voltage	$V_{T+} - V_{T-}$		0.2			V	
Input "Low" current	$\lvert I_{IL5\text{-}1} \rvert$	V_I = 0 V			2.0	µA	3
Input "High" current	$\lvert I_{IH5\text{-}1} \rvert$	V_I = V_{DD}			2.0	µA	
Input "Low" current	$\lvert I_{IL5\text{-}2} \rvert$	V_I = 0 V	8.0		60	µA	4
Input "High" current	$\lvert I_{IH5\text{-}2} \rvert$	V_I = V_{DD}			2.0	µA	
Input "Low" current	$\lvert I_{IL5\text{-}3} \rvert$	V_I = 0 V			2.0	µA	5
Input "High" current	$\lvert I_{IH5\text{-}3} \rvert$	V_I = V_{DD}	8.0		60	µA	
Output "Low" voltage	$V_{OL5\text{-}1}$	I_{OL} = 4 mA			0.4	V	6
Output "High" voltage	$V_{OH5\text{-}1}$	I_{OH} = −2 mA	4.0			V	
Output "Low" voltage	$V_{OL5\text{-}2}$	I_{OL} = 3 mA			0.4	V	7
Output "High" voltage	$V_{OH5\text{-}2}$	I_{OH} = −3 mA	4.0			V	
Output "Low" voltage	$V_{OL5\text{-}3}$	I_{OL} = 8 mA			0.4	V	8
Output "High" voltage	$V_{OH5\text{-}3}$	I_{OH} = −6 mA	4.0			V	
Output "Low" voltage	$V_{OL5\text{-}4}$	I_{OL} = 12 mA			0.4	V	9
Output "High" voltage	$V_{OH5\text{-}4}$	I_{OH} = −9 mA	4.0			V	
Output "Low" voltage	V_{OL12}	I_{OL} = 12 mA			0.5	V	10
Output "High" voltage	V_{OH12}	I_{OH} = −12 mA	12.0			V	
Output "Low" voltage	$V_{OL5\text{-}5}$	I_{OL} = 4 mA			0.4	V	11
Output leakage current	$\lvert I_{OZ5\text{-}5} \rvert$	High-Z			1.0	µA	

NOTES :

1. Applied to inputs (IC, ICD, ICU, OSCI).
2. Applied to input (ICSU).
3. Applied to inputs (IC, OSCI).
4. Applied to inputs (ICU, ICSU).
5. Applied to input (ICD).
6. Applied to output (O).
7. Applied to output (OSC3M). (Output (OSC3M) measures on condition that input (OSCI) level is 0 V or V_{DD}).
8. Applied to output (O4MA2).
9. Applied to output (O4MA3).
10. Applied to output (O12MHV).
11. Applied to output (ON).

PACKAGE

(Unit : mm)

48 QFP (QFP048-P-0707)