

LR38580

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

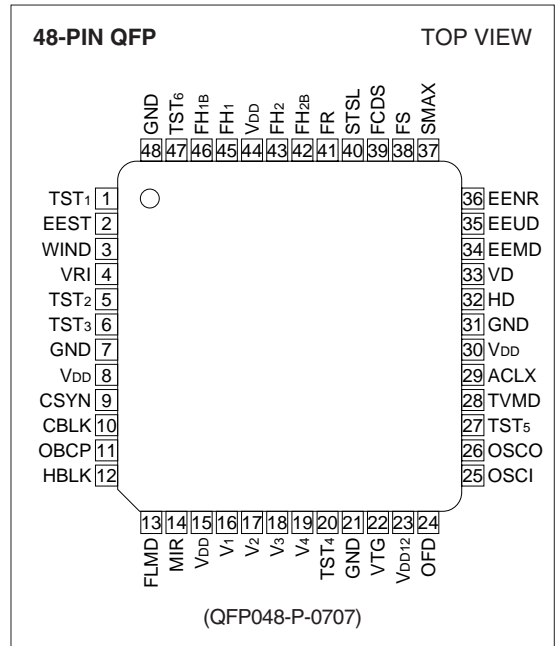
DESCRIPTION

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.

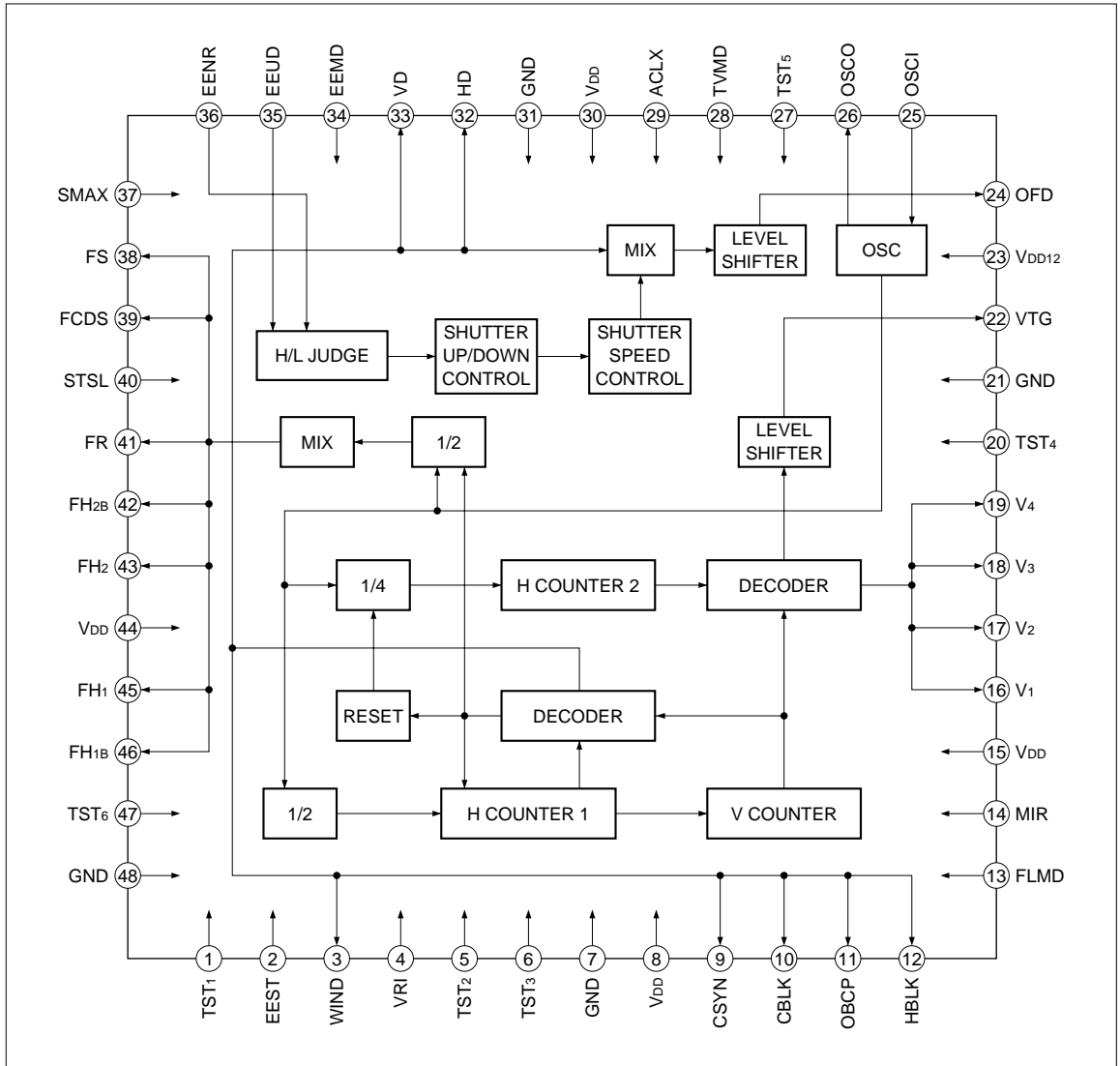
FEATURES

- 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









BLOCK DIAGRAM












PIN DESCRIPTION

PIN NO.	SYMBOL	I/O	POLARITY	PIN NAME	DESCRIPTION													
1	TST1	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 border="1"> <thead> <tr> <th>FLMD</th> <th>EEMD</th> <th>WIND</th> </tr> </thead> <tbody> <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> </tbody> </table> <p>WIND1 : When connected to EEST (pin 2), the operation of electronic exposure can be stopped at the upper side of monitor.</p> <p>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 V_{DD} with R (≥ 47 kΩ).</p>	FLMD	EEMD	WIND	L	L	WIND1 (vertical pulse)	H	L	L	H	WIND2 (composite pulse)	H	H
FLMD	EEMD	WIND																
L	L	WIND1 (vertical pulse)																
H	L																	
L	H	WIND2 (composite pulse)																
H	H																	
4	VRI	ICSU	–	Vertical reset input	An input pin for resetting internal vertical counter. The input pulse is VSYNC (negative polarity).													
5	TST2	ICD	–	Test pin 2	A test pin. Set open or to L level in the normal mode.													
6	TST3	ICD	–	Test pin 3	A test pin. Set open or to L level in the normal mode.													
7	GND	–	–	Ground	A grounding pin.													
8	V _{DD}	–	–	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.																				
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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																				
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15	VDD	-	-	Power supply	Supply of +5 V power.																				
16	V1	O4MA2		Vertical transfer pulse output 1	A pulse to drive vertical CCD shift register. Connect to ϕv_1 pin of CCD.																				
17	V2	O4MA2		Vertical transfer pulse output 2	A pulse to drive vertical CCD shift register. Connect to ϕv_2 pin of CCD.																				
18	V3	O4MA2		Vertical transfer pulse output 3	A pulse to drive vertical CCD shift register. Connect to ϕv_3 pin of CCD.																				
19	V4	O4MA2		Vertical transfer pulse output 4	A pulse to drive vertical CCD shift register. Connect to ϕv_4 pin of CCD.																				
20	TST4	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	VDD12	-	-	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 :																				
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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 OSC1 (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, flickerless 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. <table border="1"> <thead> <tr> <th>EEUD</th> <th>EENR</th> <th>Shutter Speed</th> </tr> </thead> <tbody> <tr> <td>H</td> <td>L</td> <td>up</td> </tr> <tr> <td>H</td> <td>H</td> <td>control stopped</td> </tr> <tr> <td>L</td> <td>H</td> <td>down</td> </tr> </tbody> </table>	EEUD	EENR	Shutter Speed	H	L	up	H	H	control stopped	L	H	down								
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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). <table border="1"> <thead> <tr> <th>SMAX</th> <th>STSL</th> <th>Maximum speed</th> <th>Initial Speed</th> </tr> </thead> <tbody> <tr> <td>H</td> <td>H</td> <td>≅ 1/ 32 000</td> <td>≅ 1/ 1 000</td> </tr> <tr> <td>L</td> <td>H</td> <td>≅ 1/ 56 000</td> <td>≅ 1/ 1 000</td> </tr> <tr> <td>H</td> <td>L</td> <td>≅ 1/101 000</td> <td>≅ 1/ 1 000</td> </tr> <tr> <td>L</td> <td>L</td> <td>≅ 1/101 000</td> <td>≅ 1/101 000</td> </tr> </tbody> </table>	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
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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). <table border="1"> <thead> <tr> <th>SMAX</th> <th>STSL</th> <th>Maximum Speed</th> <th>Initial Speed</th> </tr> </thead> <tbody> <tr> <td>H</td> <td>H</td> <td>≅ 1/ 32 000</td> <td>≅ 1/ 1 000</td> </tr> <tr> <td>L</td> <td>H</td> <td>≅ 1/ 56 000</td> <td>≅ 1/ 1 000</td> </tr> <tr> <td>H</td> <td>L</td> <td>≅ 1/101 000</td> <td>≅ 1/ 1 000</td> </tr> <tr> <td>L</td> <td>L</td> <td>≅ 1/101 000</td> <td>≅ 1/101 000</td> </tr> </tbody> </table>	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
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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 ϕ_R 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 ϕ_{H2B} pin of CCD.
43	FH ₂	O4MA3		Horizontal transfer pulse output 2	A pulse to drive horizontal CCD shift register. Connect to ϕ_{H2} 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 ϕ_{H1} pin of CCD.
46	FH _{1B}	O4MA2		Horizontal transfer pulse output 1B	A pulse to drive horizontal CCD shift register. Connect to ϕ_{H1B} 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	$\approx 1/ 60$ s	0	312H or 313H	$\approx 1/ 50$ s
1	252H + α	$\approx 1/ 62$ s	1	302H + β	$\approx 1/ 52$ s
•	(by 10H step)		•	(by 10H step)	
19	72H + α	$\approx 1/ 220$ s	24	72H + β	$\approx 1/ 220$ s
•	(by 4H step)		•	(by 4H step)	
30	28H + α	$\approx 1/ 555$ s	35	28H + β	$\approx 1/ 555$ s
•	(by 2H step)		•	(by 2H step)	
37	14H + α	$\approx 1/ 1\ 100$ s	42	14H + β	$\approx 1/ 1\ 090$ s
•	(by 1H step)		•	(by 1H step)	
44	7H + α	$\approx 1/ 2\ 140$ s	49	7H + β	$\approx 1/ 2\ 125$ s
•	(by 0.5H step)		•	(by 0.5H step)	
50	4H + α	$\approx 1/ 3\ 610$ s	55	4H + β	$\approx 1/ 3\ 590$ s
•	(by 0.25H step)		•	(by 0.25H step)	
62	1H + α	$\approx 1/ 11\ 570$ s	67	1H + β	$\approx 1/ 11\ 550$ s
•	(by 0.125H step)		•	(by 0.125H step)	
69	0.125H + α	$\approx 1/ 32\ 450$ s	74	0.125H + β	$\approx 1/ 32\ 690$ s
70	0.280H	$\approx 1/ 56\ 090$ s	75	0.275H	$\approx 1/ 56\ 800$ s
71	0.155H	$\approx 1/101\ 430$ s	76	0.152H	$\approx 1/102\ 720$ s

$$\alpha = 0.360H$$

$$\beta = 0.353H$$

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
H	H	69		$\approx 1/ 32\ 450$	74	$\approx 1/ 32\ 690$	37	$\approx 1/ 1\ 100$	37	$\approx 1/ 1\ 090$
L	H	70		$\approx 1/ 56\ 090$	75	$\approx 1/ 56\ 800$	37	$\approx 1/ 1\ 100$	37	$\approx 1/ 1\ 090$
H	L	71		$\approx 1/101\ 430$	76	$\approx 1/102\ 720$	37	$\approx 1/ 1\ 100$	37	$\approx 1/ 1\ 090$
L	L	71		$\approx 1/101\ 430$	76	$\approx 1/102\ 720$	76	$\approx 1/101\ 430$	76	$\approx 1/102\ 720$

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	I _{IL5-1}	V _I = 0 V			2.0	μA	3
Input "High" current	I _{IH5-1}	V _I = V _{DD}			2.0	μA	
Input "Low" current	I _{IL5-2}	V _I = 0 V	8.0		60	μA	4
Input "High" current	I _{IH5-2}	V _I = V _{DD}			2.0	μA	
Input "Low" current	I _{IL5-3}	V _I = 0 V			2.0	μA	5
Input "High" current	I _{IH5-3}	V _I = V _{DD}	8.0		60	μA	
Output "Low" voltage	V _{OL5-1}	I _{OL} = 4 mA			0.4	V	6
Output "High" voltage	V _{OH5-1}	I _{OH} = -2 mA	4.0			V	
Output "Low" voltage	V _{OL5-2}	I _{OL} = 3 mA			0.4	V	7
Output "High" voltage	V _{OH5-2}	I _{OH} = -3 mA	4.0			V	
Output "Low" voltage	V _{OL5-3}	I _{OL} = 8 mA			0.4	V	8
Output "High" voltage	V _{OH5-3}	I _{OH} = -6 mA	4.0			V	
Output "Low" voltage	V _{OL5-4}	I _{OL} = 12 mA			0.4	V	9
Output "High" voltage	V _{OH5-4}	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 _{OL5-5}	I _{OL} = 4 mA			0.4	V	11
Output leakage current	I _{OZ5-5}	High-Z			1.0	μA	

NOTES :

- Applied to inputs (IC, ICD, ICU, OSC1).
- Applied to input (ICSU).
- Applied to inputs (IC, OSC1).
- Applied to inputs (ICU, ICSU).
- Applied to input (ICD).
- Applied to output (O).
- Applied to output (OSC3M). (Output (OSC3M) measures on condition that input (OSC1) level is 0 V or V_{DD}).
- Applied to output (O4MA2).
- Applied to output (O4MA3).
- Applied to output (O12MHV).
- Applied to output (ON).

PACKAGE

(Unit : mm)

48 QFP (QFP048-P-0707)

