

LR38580

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

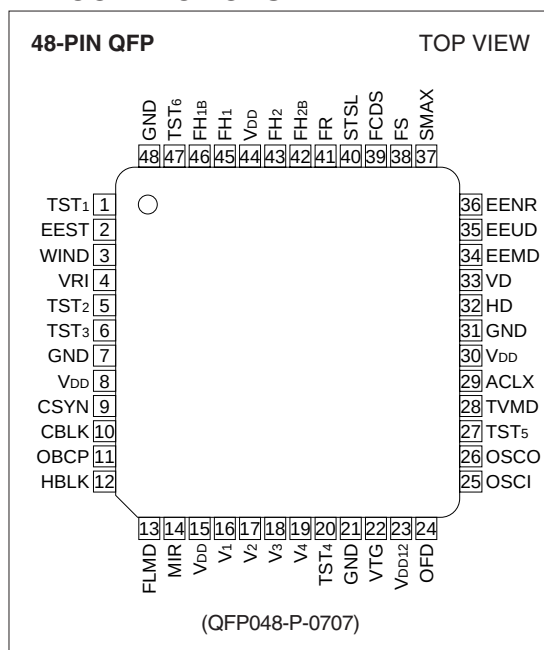
DESCRIPTION

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



The block diagram illustrates the internal architecture of the camera module. Key components include:

- Input/Output Pins:** 48 pins are shown, including TST1, EEST, WIND, VRI, TST2, TST3, GND, VDD, CSYN, CBLK, OBCP, HBLK, FLMD, MIR, VDD, V1, V2, V3, V4, TST4, GND, VTG, VDD12, OFD, OSC, OSCO, TST5, TVMD, ACLX, VDD, GND, HD, VD, EEMD, EEUD, EENR, SMAX, FS, FCDS, STSL, FR, FH2B, FH2, VDD, FH1, FH1B, TST6, and GND.
- Internal Blocks:**
 - H/L JUDGE:** Receives inputs from EENR, EEUD, and EEMD. It outputs to the SHUTTER UP/DOWN CONTROL block.
 - SHUTTER UP/DOWN CONTROL:** Receives input from the H/L JUDGE block and outputs to the SHUTTER SPEED CONTROL block.
 - SHUTTER SPEED CONTROL:** Receives input from the SHUTTER UP/DOWN CONTROL block and outputs to the MIX block.
 - MIX:** Receives inputs from the SHUTTER SPEED CONTROL block and the OSC block. It outputs to the LEVEL SHIFTER block.
 - LEVEL SHIFTER:** Receives input from the MIX block and outputs to the OSC block.
 - OSC:** Receives inputs from the LEVEL SHIFTER block and the OSCO pin. It outputs to the OSCO pin.
 - H COUNTER 1:** Receives inputs from the 1/2 block and the H COUNTER 2 block. It outputs to the V COUNTER block.
 - H COUNTER 2:** Receives inputs from the 1/4 block and the H COUNTER 1 block. It outputs to the DECODER block.
 - DECODER:** Receives inputs from the H COUNTER 2 block and the V COUNTER block. It outputs to the V COUNTER block.
 - V COUNTER:** Receives inputs from the H COUNTER 1 block and the DECODER block. It outputs to the V COUNTER block.
 - RESET:** Receives input from the 1/4 block and outputs to the DECODER block.
 - 1/2 and 1/4 Blocks:** These blocks receive inputs from the FR, FH2B, FH2, VDD, FH1, and FH1B pins and output to the H COUNTER 1 and H COUNTER 2 blocks.

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 border="1"><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 (≥ 47 kΩ).	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	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
					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)	
					FH1B	≡ FH1	≡ FH2	
FH2B	≡ FH2	≡ FH1						
15	VDD	—	—	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 ϕ_{v1} pin of CCD.			
17	V ₂	O4MA2		Vertical transfer pulse output 2	A pulse to drive vertical CCD shift register. Connect to ϕ_{v2} pin of CCD.			
18	V ₃	O4MA2		Vertical transfer pulse output 3	A pulse to drive vertical CCD shift register. Connect to ϕ_{v3} pin of CCD.			
19	V ₄	O4MA2		Vertical transfer pulse output 4	A pulse to drive vertical CCD shift register. Connect to ϕ_{v4} 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	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 :			
					TVMD	Frequency		
					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 OSC1 (pin 25).																				
27	TST ₅	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"><tr><td>EEUD</td><td>EENR</td><td>Shutter Speed</td></tr><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></table>	EEUD	EENR	Shutter Speed	H	L	up	H	H	control stopped	L	H	down								
EEUD	EENR	Shutter Speed																							
H	L	up																							
H	H	control stopped																							
L	H	down																							
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"><tr><td>SMAX</td><td>STSL</td><td>Maximum speed</td><td>Initial Speed</td></tr><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></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
SMAX	STSL	Maximum speed	Initial Speed																						
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L	H	≒ 1/ 56 000	≒ 1/ 1 000																						
H	L	≒ 1/101 000	≒ 1/ 1 000																						
L	L	≒ 1/101 000	≒ 1/101 000																						
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"><tr><td>SMAX</td><td>STSL</td><td>Maximum Speed</td><td>Initial Speed</td></tr><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></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
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 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	$\approx 1/550$ s
•	(by 2H step)		•	(by 2H step)	
37	14H + α	$\approx 1/1100$ s	42	14H + β	$\approx 1/1090$ s
•	(by 1H step)		•	(by 1H step)	
44	7H + α	$\approx 1/2140$ s	49	7H + β	$\approx 1/2125$ s
•	(by 0.5H step)		•	(by 0.5H step)	
50	4H + α	$\approx 1/3610$ s	55	4H + β	$\approx 1/3590$ s
•	(by 0.25H step)		•	(by 0.25H step)	
62	1H + α	$\approx 1/11570$ s	67	1H + β	$\approx 1/11550$ s
•	(by 0.125H step)		•	(by 0.125H step)	
69	0.125H + α	$\approx 1/32450$ s	74	0.125H + β	$\approx 1/32690$ s
70	0.280H	$\approx 1/56090$ s	75	0.275H	$\approx 1/56800$ s
71	0.155H	$\approx 1/101430$ s	76	0.152H	$\approx 1/102720$ 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	CCIR
H	H	69	$\approx 1/32450$	74	$\approx 1/32690$	37	$\approx 1/1100$	37	$\approx 1/1090$
L	H	70	$\approx 1/56090$	75	$\approx 1/56800$	37	$\approx 1/1100$	37	$\approx 1/1090$
H	L	71	$\approx 1/101430$	76	$\approx 1/102720$	37	$\approx 1/1100$	37	$\approx 1/1090$
L	L	71	$\approx 1/101430$	76	$\approx 1/102720$	76	$\approx 1/101430$	76	$\approx 1/102720$

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 :

1. Applied to inputs (IC, ICD, ICU, OSC1).
2. Applied to input (ICSU).
3. Applied to inputs (IC, OSC1).
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 (OSC1) 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).

(Unit : mm)

[illegible]