LR38585

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

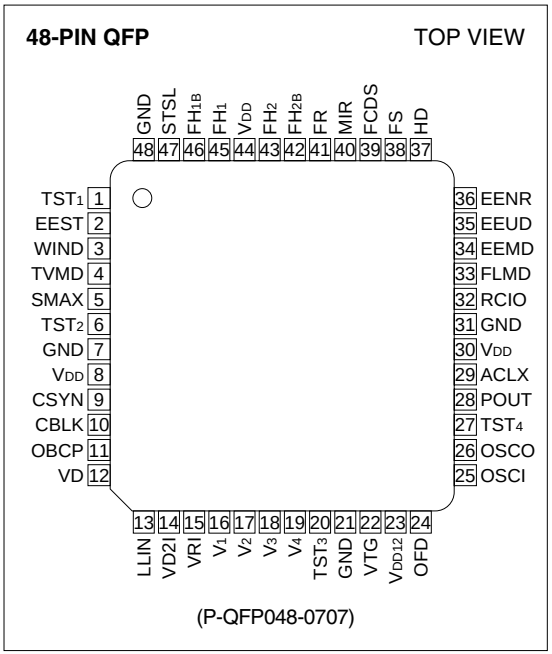
DESCRIPTION

The LR38585 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

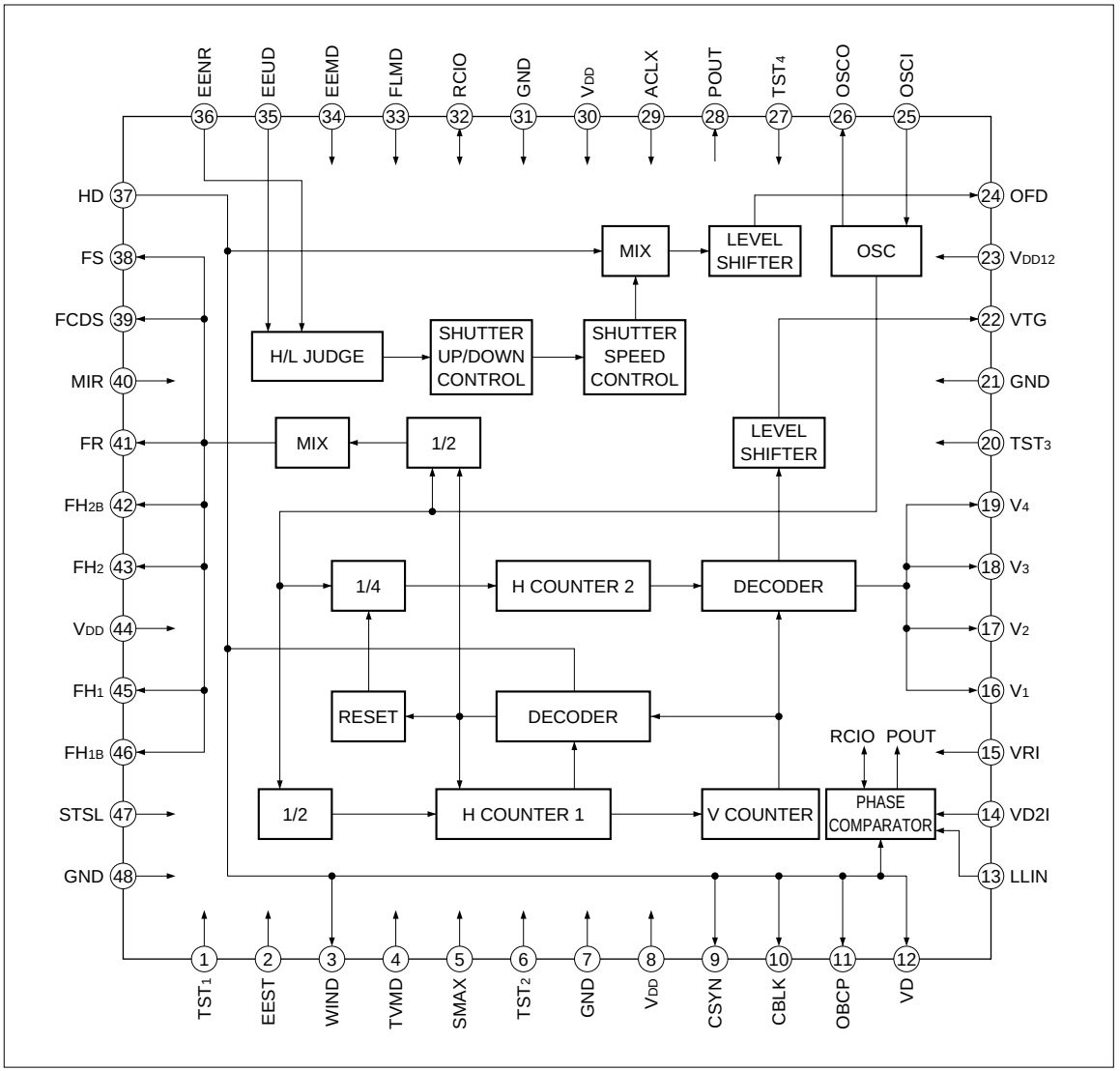
- Designed for 1/3-type 270 k/320 k-pixel B/W CCD area sensors with a dual-power-supply operation
- Switchable between EIA and CCIR modes
- Electronic shutter and EE control are possible
- Maximum shutter speed is selectable from approx. 1/100 000 s, 1/50 000 s and 1/30 000 s
- Starting shutter speed 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 V power supplies
- Package :
  48-pin QFP (P-QFP048-0707) 0.5 mm pin-pitch

PIN CONNECTIONS



(P-QFP048-0707)

BLOCK DIAGRAM



PIN DESCRIPTION

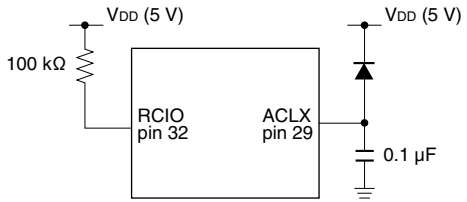
PIN NO.	SYMBOL	IO SYMBOL	POLARITY	PIN NAME	DESCRIPTION
1	TST_1	ICD	–	Test pin 1	A test pin. Set open or to L level in normal mode.
2	EEST	ICU	–	Electronic exposure control input 1	An input pin to control electronic exposure using EEUD (pin 35) and EENR (pin 36). L level : Electronic exposure is stopped. H level or open : Electronic exposure is operated.
3	WIND	ON (N-ch Open Drain)	⎍	Window pulse output	An output pin for window pulse. FLMD / EEMD / WIND: L / L / WIND1 (vertical pulse) H / L / WIND1 (vertical pulse) L / H / WIND1 (vertical pulse) H / H / WIND2 (composite pulse) 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 the 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, connected to V_{DD} with R (≥ 47 kΩ).
4	TVMD	ICU	–	TV mode selection input	An input pin to select TV standards. L level : EIA mode H level or open : CCIR mode
5	SMAX	ICU	–	Shutter speed control input 1	An input pin to control maximum and initial shutter speed with STSL (pin 40). SMAX / STSL / Maximum Speed / Initial Speed: H / H / ≒ 1/ 30 000 s / ≒ 1/ 1 000 s L / H / ≒ 1/ 49 000 s / ≒ 1/ 1 000 s H / L / ≒ 1/100 000 s / ≒ 1/ 1 000 s L / L / ≒ 1/100 000 s / ≒ 1/100 000 s
6	TST_2	ICD	–	Test pin 2	A test pin. Set open or to L level in 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.

PIN NO.	SYMBOL	IO SYMBOL	POLARITY	PIN NAME	DESCRIPTION
12	VD	O	⎍	Vertical drive pulse output	The pulse occurs at the start of every field.
13	LLIN	ICSU	–	Line-lock pulse input	An input pin for line-lock pulse. The priority is lower than VD2I (pin 14). The inner mono-multivibrator is operated by the falling-edge of LLIN. The width of mono-multivibrator output is determined by R and C which are connected with RCIO (pin 32).
14	VD2I	ICSU	–	External VD pulse input	An input pin for external VD pulse. The priority is higher than LLIN (pin 13).
15	VRI	ICSU	–	Vertical reset input	An input pin for resetting internal vertical counter. The input pulse is VSYNC (negative polarity).
16	V_1	O4MA2	⎎	Vertical transfer pulse output 1	A pulse to drive vertical CCD shift register. Connect to ϕV_1 pin of the CCD.
17	V_2	O4MA2	⎎	Vertical transfer pulse output 2	A pulse to drive vertical CCD shift register. Connect to ϕV_2 pin of the CCD.
18	V_3	O4MA2	⎍	Vertical transfer pulse output 3	A pulse to drive vertical CCD shift register. Connect to ϕV_3 pin of the CCD.
19	V_4	O4MA2	⎍	Vertical transfer pulse output 4	A pulse to drive vertical CCD shift register. Connect to ϕV_4 pin of the CCD.
20	TST_3	ICD	–	Test pin 3	A test pin. Set open or to L level in 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 the VTG pin of the 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 electronic shutter. Connect to OFD of the CCD. Held at L level in 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: L – 19.0699 MHz (1 212 fH); H – 19.3125 MHz (1 236 fH) fH = Horizontal frequency
26	OSCO	OSC3M	–	Clock output	An output pin for reference clock oscillation. The output is the inverse of OSCI (pin 25).
27	TST_4	ICD	–	Test pin 4	A test pin. Set open or to L level in normal mode.

<table>
<tr><th>PIN NO.</th><th>SYMBOL</th><th>IO SYMBOL</th><th>POLARITY</th><th>PIN NAME</th><th>DESCRIPTION</th></tr>
<tr><td>28</td><td>POUT</td><td>TO6M</td><td>–</td><td>Phase comparator output</td><td>An output pin of phase comparator. The pulse is generated by comparing the phase of the inner VSYNC pulse with mono-multivibrator output which is made from the falling edge of LLIN (pin 13) adjusted by mono-multi-vibrator or with the falling edge of VD2I (pin 14).
<table><tr><td>Advanced</td><td>H level</td></tr><tr><td>Delayed</td><td>L level</td></tr><tr><td>Same</td><td>High-impedance</td></tr></table></td></tr>
<tr><td>29</td><td>ACLX</td><td>ICU</td><td>–</td><td>All clear input</td><td>An input pin for resetting all internal circuits at power-on. Connect VDD through the diode and GND through the capacitor.</td></tr>
<tr><td>30</td><td>VDD</td><td>–</td><td>–</td><td>Power supply</td><td>Supply of +5 V power.</td></tr>
<tr><td>31</td><td>GND</td><td>–</td><td>–</td><td>Ground</td><td>A grounding pin.</td></tr>
<tr><td>32</td><td>RCIO</td><td>IO0</td><td>–</td><td>Pulse width control output/input</td><td>The pin for determining the width of the mono-multipulse to use LLIN (Line-locked circuit).
To be connected R to VDD, and C to GND.
To be connected R (= 100 kΩ) to VDD for input protection, when no use LLIN (Line-locked).</td></tr>
<tr><td>33</td><td>FLMD</td><td>ICU</td><td>–</td><td>Electronic exposure and WIND pulse control input 1</td><td>An input pin to control electronic exposure mode, flickerless mode and WIND (pin 3) pulse output.
<table><tr><td>FLMD</td><td>EEMD</td><td>Electronic Shutter Mode</td><td>WIND</td></tr><tr><td>L</td><td>L</td><td>EIA : 1/60 s, CCIR : 1/50 s</td><td>WIND1</td></tr><tr><td>H</td><td>L</td><td>EIA : 1/100 s, CCIR : 1/120 s</td><td>WIND1</td></tr><tr><td>L</td><td>H</td><td>E/E operation</td><td>WIND1</td></tr><tr><td>H</td><td>H</td><td>E/E operation</td><td>WIND2</td></tr></table>WIND1 : Vertical pulse
WIND2 : Composite pulse (vertical and horizontal)</td></tr>
<tr><td>34</td><td>EEMD</td><td>ICU</td><td>–</td><td>Electronic exposure and WIND pulse control input 2</td><td>An input pin to control electronic exposure mode, flicker-less mode and WIND (pin 3) pulse output, used with FLMD (pin 33).</td></tr>
<tr><td>35</td><td>EEUD</td><td>IC</td><td>–</td><td>Electronic exposure control input 2</td><td rowspan="2">An input pin to control electronic exposure.
<table><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></td></tr>
<tr><td>36</td><td>EENR</td><td>IC</td><td>–</td><td>Electronic exposure control input 3</td></tr>
<tr><td>37</td><td>HD</td><td>O</td><td>  </td><td>Horizontal drive pulse output</td><td>The pulse occurs at the start of every line.</td></tr>
<tr><td>38</td><td>FS</td><td>O4MA2</td><td>  </td><td>CDS pulse output 1</td><td>A pulse to sample-hold the signal for the CCD.</td></tr>
<tr><td>39</td><td>FCDS</td><td>O4MA2</td><td></td><td>CDS pulse output 2</td><td>A pulse to clamp the feed-through level for the CCD.</td></tr>
</table>

<table>
<tr><th>PIN NO.</th><th>SYMBOL</th><th>IO SYMBOL</th><th>POLARITY</th><th>PIN NAME</th><th>DESCRIPTION</th></tr>
<tr><td>40</td><td>MIR</td><td>ICU</td><td>–</td><td>Mirror mode selection input</td><td>An input pin to select mirror image mode or normal image mode.
L level : Normal image mode
H level or open : Mirror image mode
<table>
<tr><th>MIR</th><th>L (Normal mode)</th><th>H or open (Mirror mode)</th></tr>
<tr><td>FH1B</td><td>≒ FH1</td><td>≒ FH2</td></tr>
<tr><td>FH2B</td><td>≒ FH2</td><td>≒ FH1</td></tr>
</table></td></tr>
<tr><td>41</td><td>FR</td><td>O4MA3</td><td>⎍</td><td>Reset pulse output</td><td>A pulse to reset the charge of output circuit.
Connect to ϕ_R pin of the CCD through the DC offset circuit.</td></tr>
<tr><td>42</td><td>FH2B</td><td>O4MA2</td><td>⎍⎍</td><td>Horizontal transfer pulse output 2B</td><td>A pulse to drive horizontal CCD shift register.
Connect to ϕ_{H2B} pin of the CCD.</td></tr>
<tr><td>43</td><td>FH2</td><td>O4MA3</td><td>⎍⎍</td><td>Horizontal transfer pulse output 2</td><td>A pulse to drive horizontal CCD shift register.
Connect to ϕ_{H2} pin of the CCD.</td></tr>
<tr><td>44</td><td>VDD</td><td>–</td><td>–</td><td>Power supply</td><td>Supply of +5 V power.</td></tr>
<tr><td>45</td><td>FH1</td><td>O4MA3</td><td>⎍⎍</td><td>Horizontal transfer pulse output 1</td><td>A pulse to drive horizontal CCD shift register.
Connect to ϕ_{H1} pin of the CCD.</td></tr>
<tr><td>46</td><td>FH1B</td><td>O4MA2</td><td>⎍⎍</td><td>Horizontal transfer pulse output 1B</td><td>A pulse to drive horizontal CCD shift register.
Connect to ϕ_{H1B} pin of the CCD.</td></tr>
<tr><td>47</td><td>STSL</td><td>ICU</td><td>–</td><td>Shutter speed control input 2</td><td>An input pin to control maximum and initial shutter speed with SMAX (pin 37).
<table>
<tr><th>SMAX</th><th>STSL</th><th>Maximum Speed</th><th>Initial Speed</th></tr>
<tr><td>H</td><td>H</td><td>≒ 1/ 30 000 s</td><td>≒ 1/ 1 000 s</td></tr>
<tr><td>L</td><td>H</td><td>≒ 1/ 49 000 s</td><td>≒ 1/ 1 000 s</td></tr>
<tr><td>H</td><td>L</td><td>≒ 1/100 000 s</td><td>≒ 1/ 1 000 s</td></tr>
<tr><td>L</td><td>L</td><td>≒ 1/100 000 s</td><td>≒ 1/100 000 s</td></tr>
</table></td></tr>
<tr><td>48</td><td>GND</td><td>–</td><td>–</td><td>Ground</td><td>A grounding pin.</td></tr>
</table>

NOTE : How to use ACLX pin (pin 29).
And how to use RCIO pin (pin 32), when the LLIN pin (Line-locked) is not used.



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)
IO0 : Input and output pin (CMOS level input and output)
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)
TO6M : Tristate output pin
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	Ratio	No.	Charge Time	Shutter Speed	Ratio
0	262H or 263H	≒ 1/ 60 s		0	312H or 313H	≒ 1/ 50 s	
1	259H + α	≒ 1/ 61 s	2.8 to 3.4%	1	309H + β	≒ 1/ 51 s	3.3 to 3.9%
•	(by 7H step)			•	(by 10H step)		
9	203H + α	≒ 1/ 77 s		6	259H + β	≒ 1/ 60 s	
10	198H + α	≒ 1/ 79 s	2.5 to 3.0%	7	252H + β	≒ 1/ 62 s	2.8 to 3.4%
•	(by 5H step)			•	(by 7H step)		
15	173H + α	≒ 1/ 91 s		14	203H + β	≒ 1/ 77 s	
16	168H + α	≒ 1/ 93 s	2.4 to 3.0%	15	198H + β	≒ 1/ 79 s	2.5 to 3.0%
17	164H + α	≒ 1/ 96 s		•	(by 5H step)		
•	(by 4H step)			21	168H + β	≒ 1/ 93 s	
24	136H + α	≒ 1/ 115 s		22	164H + β	≒ 1/ 95 s	2.4 to 3.0%
25	132H + α	≒ 1/ 119 s	2.3 to 3.1%	•	(by 4H step)		
26	129H + α	≒ 1/ 122 s		30	132H + β	≒ 1/ 118 s	
•	(by 3H step)			31	129H + β	≒ 1/ 121 s	2.3 to 3.1%
36	99H + α	≒ 1/ 158 s		•	(by 3H step)		
37	96H + α	≒ 1/ 163 s	2.1 to 3.3%	42	96H + β	≒ 1/ 162 s	2.1 to 3.3%
38	94H + α	≒ 1/ 167 s		43	94H + β	≒ 1/ 166 s	
•	(by 2H step)			•	(by 2H step)		
55	60H + α	≒ 1/ 261 s		60	60H + β	≒ 1/ 259 s	
56	59H + α	≒ 1/ 265 s	1.7 to 9.6%	61	59H + β	≒ 1/ 263 s	1.7 to 9.6%
•	(by 1H step)			•	(by 1H step)		
99	16H + α	≒ 1/ 960 s		104	16H + β	≒ 1/ 955 s	
100	15H + α	≒ 1/ 1 020 s		105	15H + β	≒ 1/ 1 020 s	
•	(by 1H step)			•	(by 1H step)		
105	10H + α	≒ 1/ 1 520 s		110	10H + β	≒ 1/ 1 510 s	
106	t106n	≒ 1/ 1 540 s	1.6 to 5%	111	t111n	≒ 1/ 1 530 s	1.6 to 5%
•				•			
230	t230n	≒ 1/ 29 000 s		237	t237n	≒ 1/ 29 100 s	
231	t231n	≒ 1/ 29 800 s	2.9 to 4.6%	238	t238n	≒ 1/ 29 900 s	2.9 to 4.6%
•				•			
244	t244n	≒ 1/ 47 000 s		251	t251n	≒ 1/ 46 900 s	
245	t245n	≒ 1/ 49 150 s	5 to 9%	252	t252n	≒ 1/ 49 020 s	5 to 9%
•				•			
255	t255n	≒ 1/ 91 680 s		262	t262n	≒ 1/ 90 250 s	
256	t256n	≒ 1/100 370 s		263	t263n	≒ 1/ 98 600 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 5	Pin 47	Step	EIA	Step	CCIR	Step	EIA	Step	CCIR
H	H	231	≒ 1/ 29 800	238	≒ 1/ 29 900	100	≒ 1/ 1 020	105	≒ 1/ 1 020
L	H	245	≒ 1/ 49 150	252	≒ 1/ 49 020	100	≒ 1/ 1 020	105	≒ 1/ 1 020
H	L	256	≒ 1/100 370	263	≒ 1/ 98 600	100	≒ 1/ 1 020	105	≒ 1/ 1 020
L	L	256	≒ 1/100 370	263	≒ 1/ 98 600	256	≒ 1/100 370	263	≒ 1/ 98 600

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	$\lvert I_{IL1} \rvert$	V_I = 0 V			2.0	µA	3
Input "High" current	$\lvert I_{IH1} \rvert$	$V_I = V_{DD}$			2.0	µA	
Input "Low" current	$\lvert I_{IL2} \rvert$	V_I = 0 V			2.0	µA	4
Input "High" current	$\lvert I_{IH2} \rvert$	$V_I = V_{DD}$	8.0		60	µA	
Input "Low" current	$\lvert I_{IL3} \rvert$	V_I = 0 V	8.0		60	µA	5
Input "High" current	$\lvert I_{IH3} \rvert$	$V_I = V_{DD}$			2.0	µA	
Output "Low" voltage	V_{OL1}	I_{OL} = 4 mA			0.4	V	6
Output "High" voltage	V_{OH1}	I_{OH} = −2 mA	4.0			V	
Output "Low" voltage	V_{OL2}	I_{OL} = 3 mA			0.4	V	7
Output "High" voltage	V_{OH2}	I_{OH} = −3 mA	4.0			V	
Output "Low" voltage	V_{OL3}	I_{OL} = 8 mA			0.4	V	8
Output "High" voltage	V_{OH3}	I_{OH} = −6 mA	4.0			V	
Output "Low" voltage	V_{OL4}	I_{OL} = 12 mA			0.4	V	9
Output "High" voltage	V_{OH4}	I_{OH} = −9 mA	4.0			V	
Output "Low" voltage	V_{OL5}	I_{OL} = 12 mA			0.5	V	10
Output "High" voltage	V_{OH5}	I_{OH} = −12 mA	11.5			V	
Output "Low" voltage	V_{OL6}	I_{OL} = 4 mA			0.4	V	11
Output "Low" voltage	V_{OL7}	I_{OL} = 6 mA			0.4	V	12
Output "High" voltage	V_{OH7}	I_{OH} = −3 mA	4.0			V	
Output leakage current	$\lvert I_{OZ} \rvert$	High-Z			1.0	µA	11, 12

NOTES :

1. Applied to inputs (IC, ICD, ICSU, OSCI).
2. Applied to input (ICSU).
3. Applied to inputs (IC, OSCI, IO0).
4. Applied to input (ICD).
5. Applied to inputs (ICU, ICSU).
6. Applied to output (O, IO0).
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).
12. Applied to output (TO6M).

PACKAGE OUTLINES

48 QFP (P-QFP048-0707)

(Unit : mm)