Panasonic

Product News

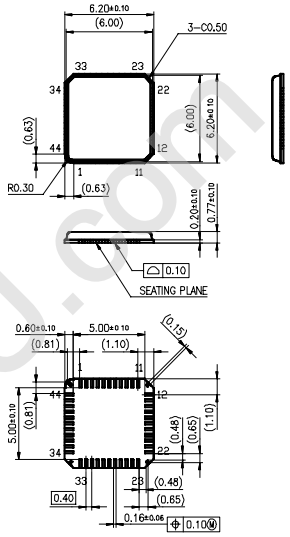
A time-sharing control system eliminates the need for a transformer

Power Control IC for Digital Still Cameras AN30212A

■ Overview

AN30212A is a having one channel of 5V output that can also be used for self-biasing and four channels of PWM-based DC-DC converter control outputs. With minimum operating voltage as low as 1.51V, this IC can be powered from two batteries. Use of a time-sharing system eliminates the need for a transformer for CCD power supply circuit. A built-in switched capacitor-type phase compensation filter and error amp controlled soft-start system help reduce the number of externally connected components to minimize the mounting area. This allows equipment to be designed more compactly and lighter in weight.

Unit : mm



QFN044-P-0606A

■ Feature

- Built-in synchronous rectification circuit.
- Built-in low-input voltage malfunction prevention function.
- Built-in timer latch-type protection circuit for short-circuit thermal and over voltage.
- Time-sharing control used for CCD power supply circuit.
- Built-in switched capacitor type phase compensation filter.
- Error amp controlled soft-start.
- Independent control for all channels.
- Ultra-small, slim package.

■ Applications

Digital still cameras

■ Electrical Characteristics

Parameter	AN30212A
Operating power supply voltage	1.51 to 4.6V (with two AA size batteries) 2.52V to 7.2V (with four AA size batteries, Lithium battery)
Self-biasing output	5V (Step-up 1-ch)
DSP driving output	3.3V/250mA,1.5V/250mA (synchronous rectification 2-ch)
CCD driving output	15V/10mA,-8V/10mA (Time-sharing 2-ch)

*Note : Output voltage/currents listed above are examples.
Self-biasing output can be used as 5V,20mA power supply.

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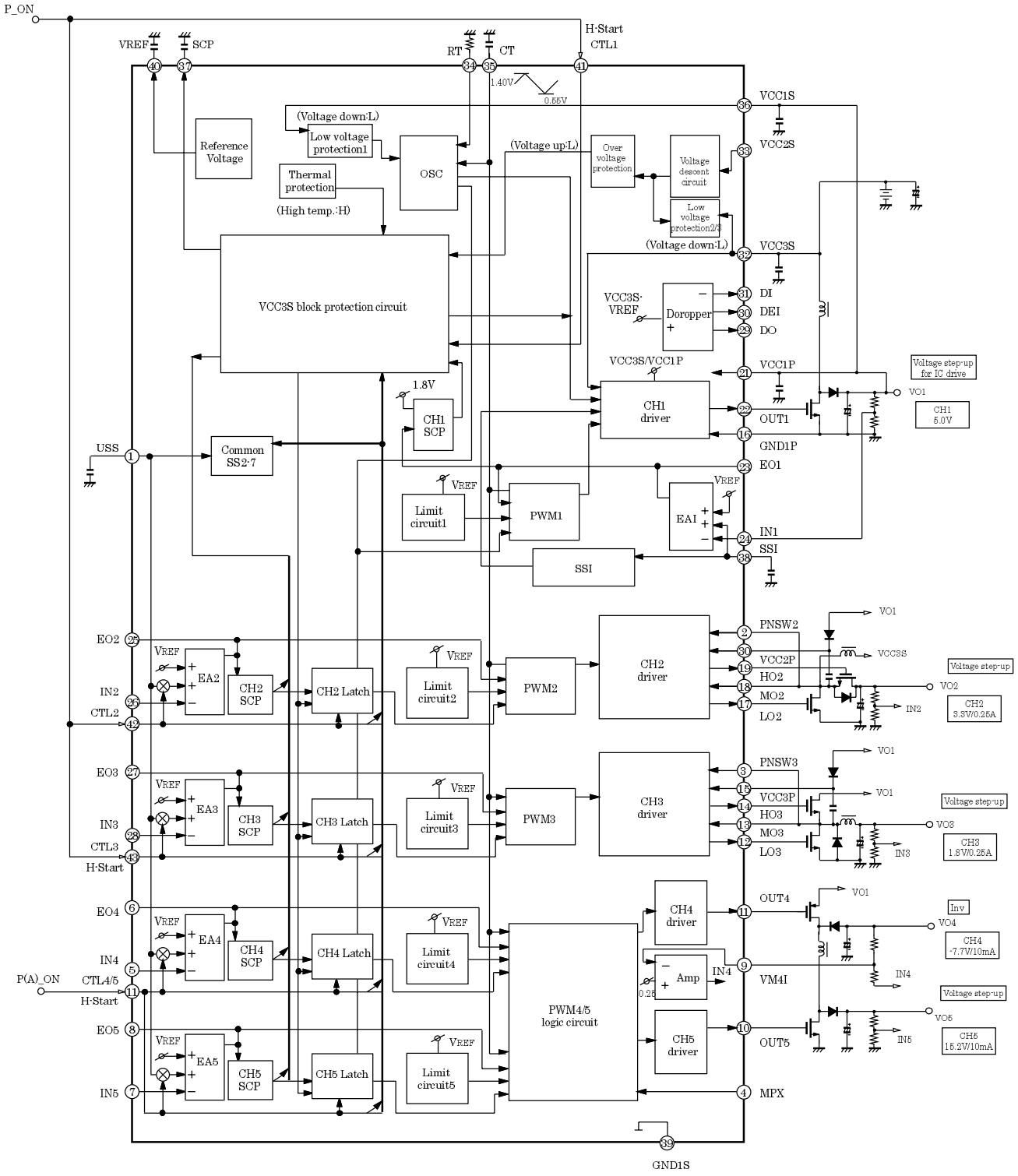
■ Block Diagram

Application circuit example :Tow AA type battary:VCC3S input,VCC3S=1.9V to 4.6V,CH2/CH3 Nch-MOS



■ Pin Description

Pin No.	Symbol	Description	Pin No.	Symbol	Description
1	USS	Ch.2 to 5 common soft-start setting pin	23	EO1	Ch.1 error amp output pin
2	PNSW2	Ch.2 High-side/Pch,Nch switching pin	24	IN1	Ch.1 error amp inverting input pin
3	PNSW3	Ch.3 High-side/Pch,Nch switching pin	25	EO2	Ch.2 error amp output pin
4	MPX	Time-sharing setting pin	26	IN2	Ch.2 error amp inverting input pin
5	IN4	Ch.4 error amp inverting input pin	27	EO3	Ch.3 error amp output pin
6	EO4	Ch.4 error amp output pin	28	IN3	Ch.3 error amp inverting input pin
7	IN5	Ch.5 error amp inverting input pin	29	DO	Dropper error amp output pin
8	EO5	Ch.5 error amp output pin	30	DEI	Dropper error amp inverting input pin
9	VM4I	Inverting amp inverting input pin	31	DI	Dropper output monitor pin
10	OUT5	Ch.5 driver output pin	32	VCC3S	Battery low-voltage application pin
11	OUT4	Ch.4 driver output pin	33	VCC2S	Battery voltage application pin
12	LO3	Ch.3 low-side driver output pin	34	RT	Oscillator frequency setup resistor connection pin
13	MO3	Ch.3 middle-side output pin	35	CT	Oscillator frequency setup capacitor connection pin
14	HO3	Ch.3 high-side driver output pin	36	VCC1S	Signal Vcc
15	VCC3P	Ch.3 US driver Vcc	37	SCP	Short-circuit protection time constant setup capacitor connection pin for ch.1 to ch.5
16	GND1P	Ground pin for Ch.1,2/L,3/L,4 to 5 driver	38	SS1	Ch.1 soft-start setting pin
17	LO2	Ch.2 low-side driver output pin	39	GND1S	Signal GND
18	MO2	Ch.2 middle-side output pin	40	VREF	Reference voltage output
19	HO2	Ch.2 high-side driver output pin	41	CTL1	Ch.1 ON-OFF start-up input pin
20	VCC2P	Ch.2 US driver Vcc	42	CTL2	Ch.2 ON-OFF start-up input pin
21	VCC1P	Ch.1,2/L,3/L,4 to 5 driver Vcc	43	CTL3	Ch.3 ON-OFF start-up input pin
22	OUT1	Ch.1 step-up output pin	44	CTL4	CH4 ON-OFF start-up input pin

■ Absolute Maximum Ratings

Parameter	Symbol	Rating	Unit	Note
Storage temperature	Tstg	–55 to 125	°C	1
Operating ambient temperature	Topr	–20 to 85	°C	1
Supply voltage	V_{CC1S}	6.9	V	
V_{CC2S} /V_{CC3S} voltage	V_{CC2S} /V_{CC3S}	7.5/6.9	V	
Supply current	I_{CC}	–	mA	
Power dissipation	Pd	158.5	mW	2
Allowable voltage applied to power V_{CC1}	V_{CC1P}	V_{CC1S}+0.1	V	
Allowable voltage applied to Ch.2 high-side transistor selection input	PNSW2	V_{CC1S}+0.1	V	
Allowable voltage applied to Ch.3 high-side transistor selection input	PNSW3	V_{CC1S}+0.1	V	
Allowable voltage applied to control input 1/2/3/4/5	$V_{CTL1/2/3/4/5}$	V_{CC1S}+0.1	V	
Allowable current applied to reference power supply	I_{REF}	-5	mA	
Allowable voltage applied to output voltage detection input DI	V_{DI}	V_{CC1S}	V	
Allowable voltage applied to error amplifier (1 to 5)input pin	$V_{IN1/2/3/4/5}$	-0.2 to V_{CC1S}	V	
Allowable voltage applied to Error amplifier (dropper) input pin	V_{DEI}	V_{CC1S}	V	
Allowable voltage applied between V_{CC2P} and MO2	PVMO2	V_{CC1S}+0.1	V	
Allowable voltage applied between V_{CC3P} and MO3	PVMO3	V_{CC1S}+0.1	V	
Allowable voltage applied to MPX pin	V_{MPX}	V_{CC1S}+0.1	V	
Allowable voltage applied to VM4I pin	V_{M4I}	-0.2 to V_{CC1S}	V	

Note1) Except for the operation ambient temperature and storage temperature, all ratings are for Ta=25 °C.
Note2) Ta=85 °C, Package only.

■ Operating Supply Voltage Range

Supply voltage	V_{CC2S}	2.52V to 7.2V
	V_{CC1S}	4.5V to 5.5V
	V_{CC3S}	1.51V to 4.6V

■ Electrical Characteristics (unless otherwise specified, ambient temperature is 25°C±2°C, V_{CC2S}(V_{CC3S})=3V, V_{CC1S}/$V_{CC1P/2P3P}$=5V, C_{REF}=0.1μF)

Parameter	Symbol	condition	min	typ	max	Unit
Reference voltage						
Reference voltage	V_{REF}	I_{REF}=-0.1mA	1.247	1.26	1.273	V
Line regulation	Line	V_{CC1S}=4.5 to 5.5V	–	3	15	mA
Load regulation	Load	I_{REF}=0 to -1.0mA	-24	-12	–	mV
V_{CC1S} U.V.L.O						
U.V.L.O start voltage	V_{CC1SON}		3.8	4.0	4.2	V
U.V.L.O stop voltage	$V_{CC1SOFF}$		3.6	3.8	4.0	V
V_{CC2S} /V_{CC3S} U.V.L.O						
U.V.L.O start voltage	V_{CC3SON}	At V_{CC3S} input	1.331	1.418	1.505	V
U.V.L.O stop voltage	$V_{CC3SOFF}$	At V_{CC3S} input	1.251	1.338	1.425	V
U.V.L.O start voltage	V_{CC2SON}	At V_{CC2S} input	2.05	2.28	2.51	V
U.V.L.O stop voltage	$V_{CC2SOFF}$	At V_{CC2S} input	2.0	2.23	2.46	V
Dropper amplifier						
Output sink current	I_{RS}	V_{CC3S}=3V	8	16	–	mA
Output leak current	I_{RL}	V_{CC3S}=3V	–	–	2	μA
Output block						
High-level output voltage (ch.1)	V_{H1}	I_{OH}=-1mA	V_{CC1P} -1.0	V_{CC1P} -0.7	V_{CC1P} -0.4	V
High-level output voltage (ch.4,5)	$V_{H4/5}$	I_{OH}=-1mA	V_{CC1P} -0.1	–	–	V
Low-level output voltage (ch.1,4,5)	$V_{L1/4/5}$	I_{OL}=1mA	–	–	0.1	V
N-ch on resistance (ch.1,4,5)	$R_{N1/4/5}$	I_O=30mA	–	3	10	Ω
P-ch on resistance (ch.1)	R_{P1}	I_O=-30mA	–	30	40	Ω
P-ch on resistance (ch.4,5)	$R_{P4/5}$	I_O=-30mA	–	3	10	Ω
Low-side high-level output voltage (ch.2)	V_{LOH2}	I_{OH}=-1mA	V_{CC1P} -0.1	–	–	V
Low-side low-level output voltage (ch.2)	V_{LOL2}	I_{OL}=1mA	–	–	0.1	V
High-side high-level output voltage (ch.2)	V_{HOH2}	I_{OH}=-1mA	V_{CC1P} -0.1	–	–	V
High-side low-level output voltage (ch.2)	V_{HOL2}	I_{OL}=1mA	–	–	MO2 +0.1	V

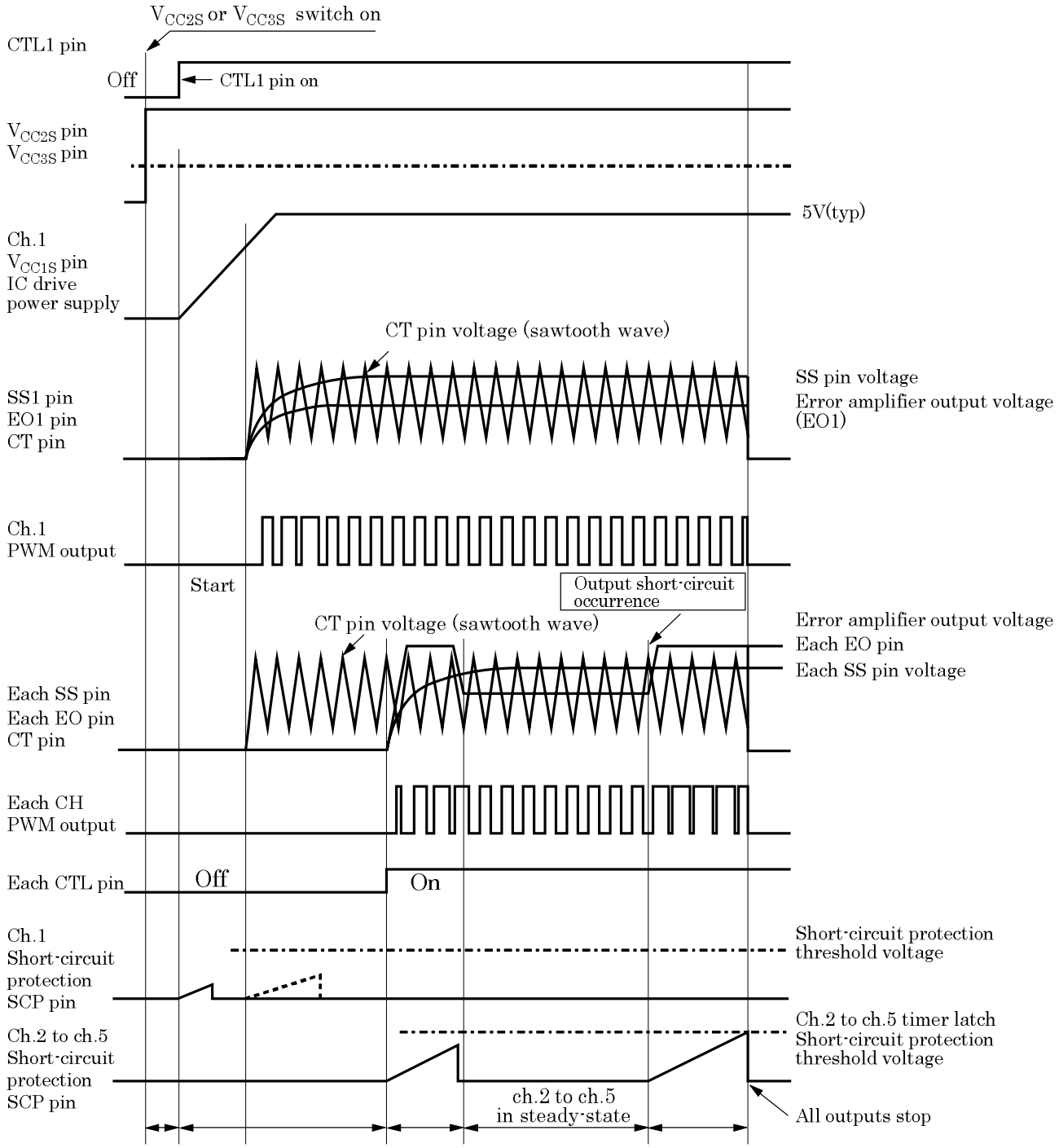
■ Electrical Characteristics (continued)

Parameter	Symbol	condition	min	typ	max	Unit
Output block						
LO2 pin N-ch. on resistance	R_{2LN}	I_O=30mA	–	3	10	Ω
LO2 pin P-ch. on resistance	R_{2LP}	I_O=-30mA	–	3	10	Ω
HO2 pin N-ch. on resistance	R_{2HN}	I_O=30mA	–	3	10	Ω
HO2 pin P-ch. on resistance	R_{2HP}	I_O=-30mA	–	3	10	Ω
Low-side high-level output voltage (ch.3)	V_{LOH3}	I_{OH}=-1mA	V_{CC1P} -0.1	–	–	V
Low-side low-level output voltage (ch.3)	V_{LOL3}	I_{OL}=1mA	–	–	0.1	V
High-side high-level output voltage (ch.3)	V_{HOH3}	I_{OH}=-1mA	V_{CC1P} -0.1	–	–	V
High-side low-level output voltage (ch.3)	V_{HOL3}	I_{OL}=1mA	–	–	MO3 +0.1	V
LO3 pin N-ch. on resistance	R_{3LN}	I_O=30mA	–	3	10	Ω
LO3 pin P-ch. on resistance	R_{3LP}	I_O=-30mA	–	3	10	Ω
HO3 pin N-ch. on resistance	R_{3HN}	I_O=30mA	–	3	10	Ω
HO3 pin P-ch. on resistance	R_{3HP}	I_O=-30mA	–	3	10	Ω
Ch.1 maximum output duty ratio	D_{Umax1}		82	88	94	%
Ch.2,3 maximum output duty ratio	$D_{Umax2/3}$		81	88	95	%
Oscillator						
Oscillator frequency 1 at the time ch.1 startup	f_{st1}	V_{CC3S}=3V	110	270	430	kHz
Oscillator frequency 2 at the time ch.1 startup	f_{st2}	V_{CC2S}=3V	110	270	430	kHz
Max. output duty ratio 1 at the time ch.1 startup	D_{Ust1}	V_{CC3S}=3V	76	86	95	%
Max. output duty ratio 2 at the time ch.1 startup	D_{Ust2}	V_{CC2S}=3V	72	82	92	%
Ch.1 to 3 oscillator frequency	$f_{OUT1/2/3}$	CT=180PF,RT=30kΩ	460	520	580	kHz
Error amplifier ch.1 to ch.7						
Input threshold voltage IN1 /2/3/4/5	$V_{TH1/2/3/4/5}$		1.22	1.26	1.3	V
Input bias current IN1/2/3/5	$I_{BO1/2/3/5}$		-0.2	–	0.2	μA
Input bias current IN4	I_{BO4}		4.8	–	11.2	μA
High-level output voltage EO1/2/3/4/5	$V_{EH1/2/3/4/5}$		1.0	–	–	V
Low-level output voltage EO1/2/3/4/5	$V_{EL1/2/3/4/5}$		–	–	0.2	V
Output source current EO1/2/3/4/5	$I_{SO1/2/3/4/5}$		-28	-20	-12	μA
Output sink current EO1/2/3/4/5	$I_{SI1/2/3/4/5}$		40	–	–	μA

■ Electrical Characteristics (continued)

Parameter	Symbol	condition	min	typ	max	Unit
Short-circuit protection circuit ch.1 to ch.5						
Pin voltage in standby mode	V_{SCPO}		–	–	0.1	V
Latch threshold voltage 1	V_{LTHO1}	V_{CC3S}=3V	1.12	1.24	1.36	V
Latch threshold voltage 2	V_{LTHO2}	V_{CC2S}=3V	1.07	1.217	1.31	V
Pin voltage after latch operation	V_{SLTO}		–	–	0.1	V
Charge current 1	I_{CHGO1}	V_{CC3S}=3V,V_{SCPO}=0V	-2.92	-2.22	-1.52	μA
Charge current 2	I_{CHGO2}	V_{CC2S}=3V,V_{SCPO}=0V	-3.16	-2.22	-1.28	μA
Control						
Pin current CTL1/2/3/4/5	$I_{CTL1/2/3/4/5}$	V_{CTL}=2.7V	-1	–	10	μA
Pin current MPX	I_{MPX}	V=2.7V	-1	–	10	μA
High-level input voltage CTL2/3/4/5	$V_{CTLH2/3/4/5}$		2.7	–	–	V
Low-level input voltage CTL2/3/4/5	$V_{CTLL2/3/4/5}$		–	–	0.3	V
High-level input voltage CTL1			1.5	–	–	V
Low-level input voltage CTL1			–	–	0.3	V
Current consumption						
Average quiescent current consumption current 1 at startup	I_{VCC3S}	SS1=0V with V_{CC3S} input and without ch.1 external transistor	–	500	700	μA
Average quiescent current consumption current 2 at startup	I_{VCC2S}	SS1=0V with V_{CC2S} input and without ch.1 external transistor	–	450	650	μA
Average quiescent current consumption	$I_{CC(AV)}$	Ch.1 to Ch.5 with output set to off	–	3	8	mA
Standby current 1	I_{SB3}	V_{CC3S}=3V,CTL1 to7=0V	–	5	10	μA
Standby current 2	I_{SB2}	V_{CC2S}=3V,CTL1 to7=0V	–	5	10	μA
Time-sharing control amplifier						
Input threshold voltage			0.228	0.25	0.272	V
High-level output voltage			1.0	–	–	V
Low-level output voltage			–	–	0.2	V

■ Timing Chart



■ Power Dissipation