Panasonic

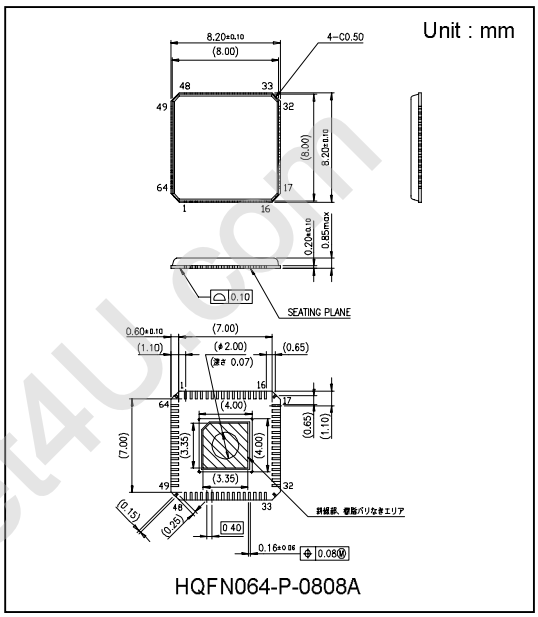
Product News

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

Power Control IC for Digital Still Cameras AN30211A

■ Overview

AN30211A is a having one channel of 5V output that can also be used for self-biasing and six 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.



HQFN064-P-0808A

■ 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	AN30211A
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)
LCD driving output	12V/40mA,10V/17mA (Step-up 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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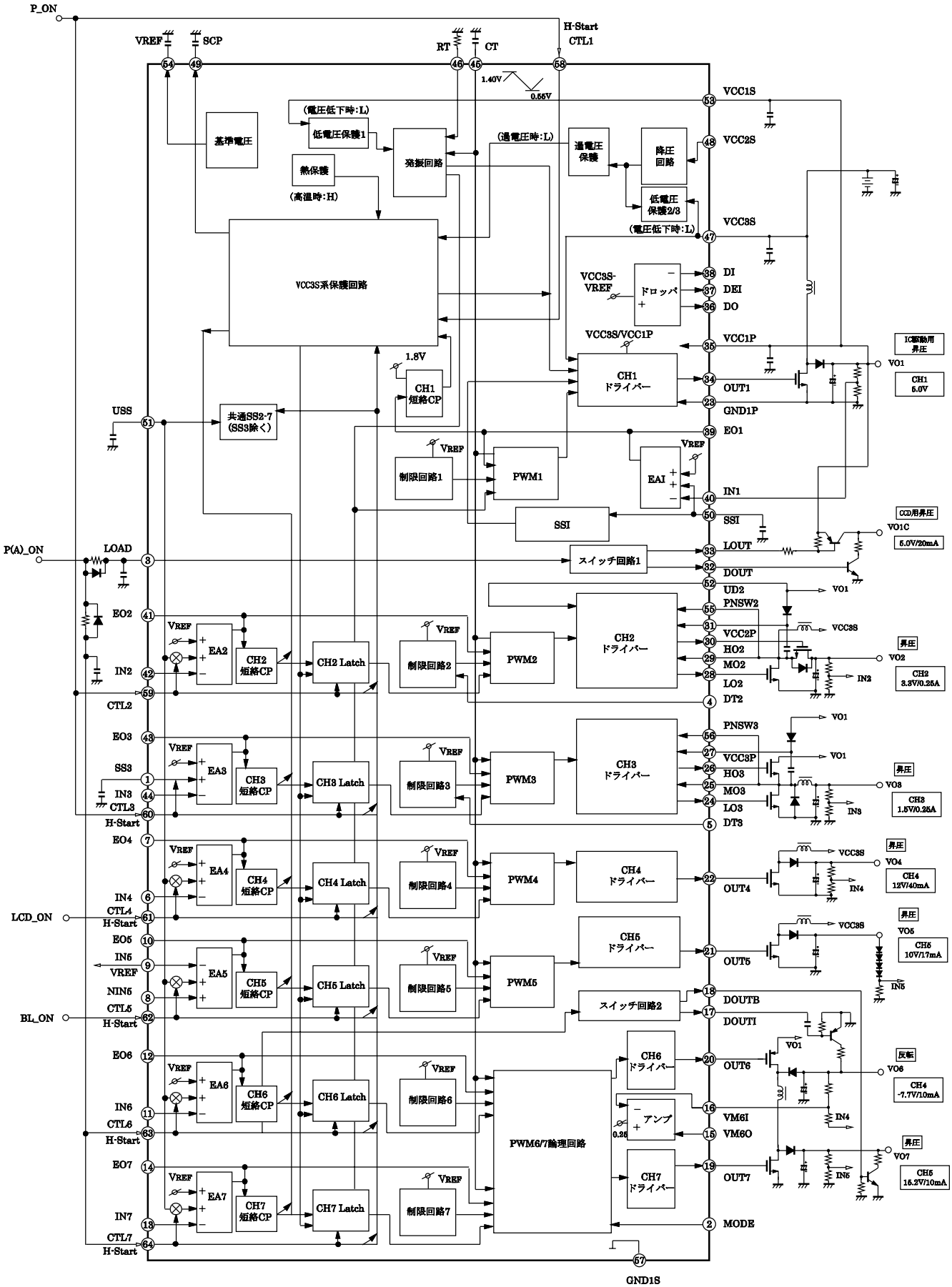
■ Block Diagram

Application circuit example :Tow AA type battary:VCC3S input,VCC3S=1.51V to 4.6V,CH2/CH3 Nch-MOS



■ Pin Description

Pin No.	Symbol	Description	Pin No.	Symbol	Description
1	SS3	Ch.3 Soft-start setting pin	33	LOUT	LOUT output pin
2	MODE	Time-sharing setting pin	34	OUT1	Ch.1 step-up output pin
3	LOAD	LOAD stop setting pin	35	VCC1P	Ch.1,2/L,3/L,4 to 7 driver Vcc
4	DT2	Max. duty setting pin	36	DO	Dropper error amp output pin
5	DT3	Max. duty setting pin	37	DEI	Dropper error amplifier inverting input pin
6	IN4	Ch.4 error amp inverting input pin	38	DI	Dropper output monitor pin
7	EO4	Ch.4 error amp output pin	39	EO1	Ch.1 error amp output pin
8	NIN5	Ch.5 error amp non inverting input pin	40	IN1	Ch.1 error amp inverting input pin
9	IN5	Ch.5 error amp inverting input pin	41	EO2	Ch.2 error amp output pin
10	EO5	Ch.5 error amp output pin	42	IN2	Ch.2 error amp inverting input pin
11	IN6	Ch.6 error amp inverting input pin	43	EO3	Ch.3 error amp output pin
12	EO6	Ch.6 error amp output pin	44	IN3	Ch.3 error amp inverting input pin
13	IN7	Ch.7 error amp inverting input pin	45	CT	Oscillator frequency setup capacitor connection pin
14	EO7	Ch.7 error amp output pin	46	RT	Oscillator frequency setup resistor connection pin
15	VM6O	Inverting amp output pin	47	VCC3S	Battery low-voltage application pin
16	VM6I	Inverting amp inverting input pin	48	VCC2S	Battery voltage application pin
17	DOUTI	DOUTI output pin	49	SCP	Short-circuit protection time constant setup capacitor connection pin for ch.1 to ch.7
18	DOUTB	DOUTB output pin	50	SS1	Ch.1 soft-start setting pin
19	OUT7	Ch.7 driver output pin	51	USS	Ch.2 to 7 common soft-start setting pin (without Ch.3)
20	OUT6	Ch.6 driver output pin	52	UD2	Ch.2 step-up/down switching pin
21	OUT5	Ch.5 driver output pin	53	VCC1S	Signal Vcc
22	OUT4	Ch.4 driver output pin	54	VREF	Reference voltage output pin
23	GND1P	Ground pin for ch.1,2/L,3/L,4 to 7 driver	55	PNSW2	Ch.2 high-side/Pch,Nch switching pin
24	LO3	Ch.3 low-side driver output pin	56	PNSW3	Ch.3 high-side/Pch,Nch switching pin
25	MO3	Ch.3 middle-side output pin	57	GND1S	Signal GND
26	HO3	Ch.3 high-side driver output pin	58	CTL1	Ch.1 ON-OFF start-up input pin
27	VCC3P	CH3 US driver Vcc	59	CTL2	Ch.2 ON-OFF start-up input pin
28	LO2	Ch.2 low-side driver output pin	60	CTL3	Ch.3 ON-OFF start-up input pin
29	MO2	Ch.2 middle-side output pin	61	CTL4	CH4 ON-OFF start-up input pin
30	HO2	Ch.2 high-side driver output pin	62	CTL5	Ch.5 ON-OFF start-up input pin
31	VCC2P	CH2 US driver Vcc	63	CTL6	Ch.6 ON-OFF start-up input pin
32	DOUT	DOUT output pin	64	CTL7	Ch.7 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	184	mW	2
Allowable voltage applied to power V_{CC1P}	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 1/2/3/4/5/6/7	$V_{CTL1/2/3/4/5/6/7}$	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 7 and N_{IN5})input pin	$V_{IN1/2/3/4/5/6/7/NIN5}$	-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_{CC2P} and MO3	PVMO3	V_{CC1S}+0.1	V	
Allowable voltage applied to MODE pin	V_{MODE}	V_{CC1S}+0.1	V	
Allowable voltage applied to LOAD pin	V_{LOAD}	V_{CC1S}+0.1	V	
Allowable voltage applied to UD2 pin	V_{UD2}	V_{CC1S}+0.1	V	
Allowable voltage applied to VM6I pin	V_{M6I}	-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 leakage 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.4,5,6,7)	$V_{H4/5/6/7}$	I_{OH}=-1mA	V_{CC1P} -0.1	–	–	V
Low-level output voltage (ch.1,4,5,6,7)	$V_{L1/4/5/6/7}$	I_{OL}=1mA	–	–	0.1	V
N-ch on resistance (ch.1,4,5,6,7)	$R_{N1/4/5/6/7}$	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.4,5,6,7)	$R_{P4/5/6/7}$	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

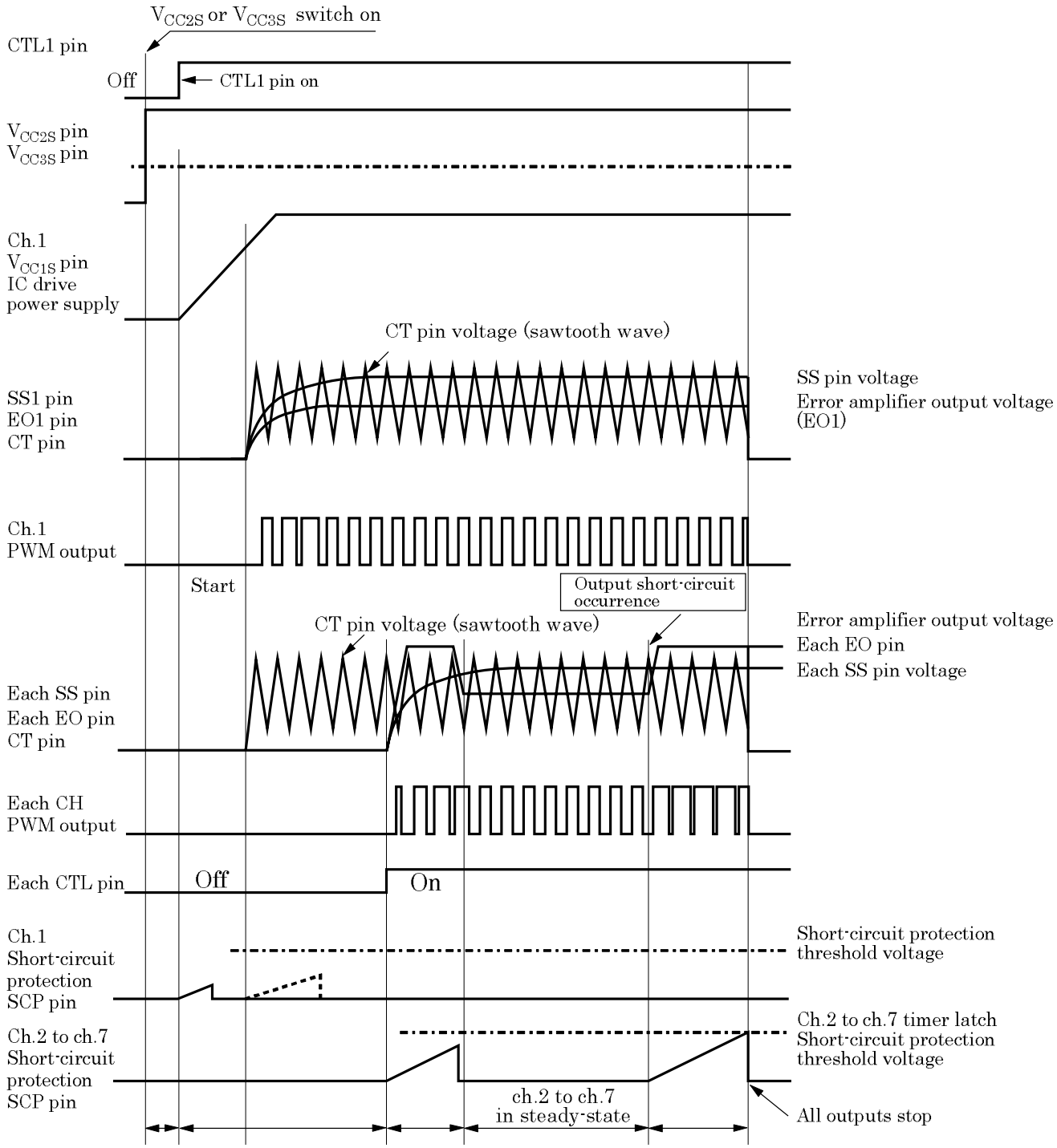
■ Electrical Characteristics (continued)

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	%
Ch.4,5 maximum output duty ratio	$D_{Umax4/5}$		87	93	99	%
Ch.6 maximum output duty ratio	D_{Umax6}	MODE=H ,without time-sharing	87	93	99	%
Ch.7 maximum output duty ratio	D_{Umax7}		87	93	99	%
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 7 oscillator frequency	$f_{OUT1/2/3/4/5/6/7}$	CT=180PF,RT=30kΩ MODE:H	465	525	585	kHz
Error amplifier ch.1 to ch.7						
Input threshold voltage IN1 /2/3/4/5/6/7	$V_{TH1/2/3/4/5/6/7}$		1.22	1.26	1.3	V
Input bias current IN1/2/3/4/5/6/7/NIN5	$I_{BO1/2/3/4/5/6/7/NIN5}$		-0.2	–	0.2	μA
High level output voltage EO1/2/3/4/5/6/7	$V_{EH1/2/3/4/5/6/7}$		1.0	–	–	V

■ Electrical Characteristics (continued)

Parameter	Symbol	condition	min	typ	max	Unit
Low level output voltage EO1/2/3/4/5/6/7	$V_{EL1/2/3/4/5/6/7}$		–	–	0.2	V
Output source current EO1/2/3/4/5/6/7	$I_{SO1/2/3/4/5/6/7}$		-28	-20	-12	μA
Output sink current EO1/2/3/4/5/6/7	$I_{SI1/2/3/4/5/6/7}$		40	–	–	μA
Short-circuit protection circuit ch.1 to ch.7						
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 CTL1/2/3/4/5/6/7	$I_{CTL1/2/3/4/5/6/7}$	V_{CTL}=2.7V	-1	–	10	μA
Pin current MODE/LOAD/UD2	$I_{MODE/LOAD/UD2}$	V=2.7V	-1	–	10	μA
High-level input voltage CTL2/3/4/5/6/7	$V_{CTLH2/3/4/5/6/7}$		2.7	–	–	V
Low-level input voltage CTL2/3/4/5/6/7	$V_{CTLL2/3/4/5/6/7}$		–	–	0.3	V
High-level input voltage MODE/LOAD/CTL1			1.5	–	–	V
Low-level input voltage MODE/LOAD/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.7 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 amp.						
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