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April 1st, 2010
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (<http://www.renesas.com>)

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M51998P/FP

Switching Regulator Control

REJ03D0837-0200

Rev.2.00

Jun 14, 2006

Description

M51998 is a primary side switching regulator control IC suitable for converting AC power supply to stabilized DC voltage.

Basic functions provided are from M51995A and limited to the indispensable. This device is housed in 10-pin SOP, 14-pin DIP.

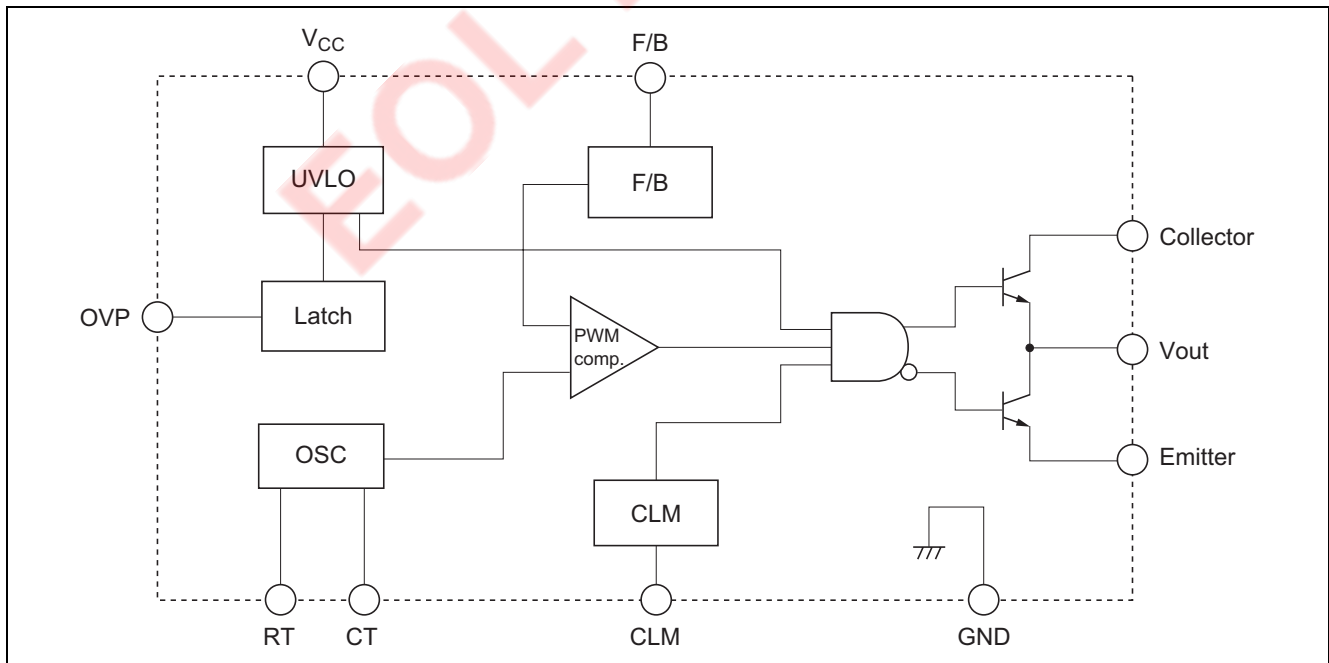
Features

- Output current (I_o peak): ± 1 A
- Totempole output
- Small start-up current: 100 μ A (typ.)
- Start-up threshold 16V. Stop voltage 10 V
- Output duty: 51% (internally fixed)
- Pulse-by-pulse current limit
- 10-pin SOP, 14-pin DIP package

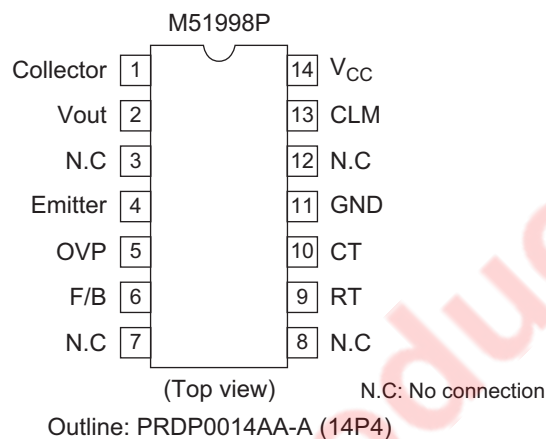
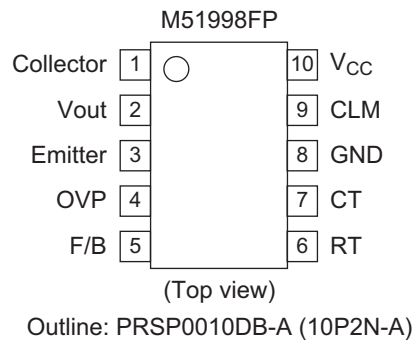
Application

Fly back regulator

Block Diagram



Pin Arrangement



Absolute Maximum Ratings

(T_a = 25°C, unless otherwise noted.)

Item	Symbol	Ratings	Unit	Condition
Supply voltage	V _{CC}	36	V	
Collector terminal voltage	V _C	36	V	
Output current	I _O	±1	A	Peak
		±0.15	A	Continuous
CLM terminal voltage	V _{CLM}	-0.3 to +4.0	V	
OVP terminal voltage	I _{OVP}	10	mA	
F/B terminal voltage	V _{FB}	0 to 10	V	
Power dissipation	P _d	440	mW	
Thermal derating ratio	K _θ	3.52	mW/°C	
Operating temperature	T _{opr}	-20 to 85	°C	
Storage temperature	T _{stg}	-40 to 125	°C	

Electrical Characteristics

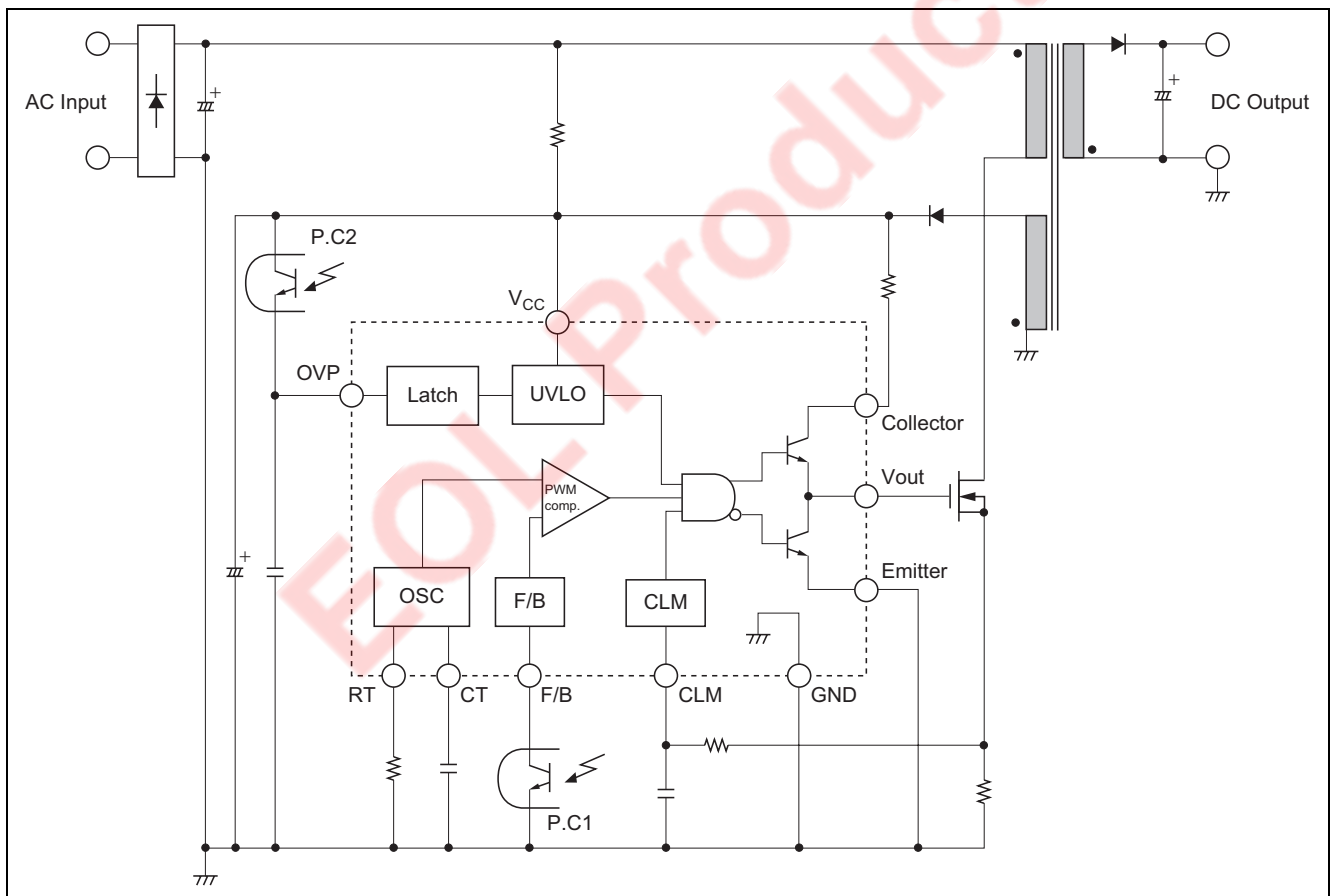
(Ta = 25°C, V_{CC} = 5 V, unless otherwise noted.)

Block	Item	Symbol	Limits			Unit	Test Conditions
			Min.	Typ.	Max.		
Supply voltage / Circuit current	Operating voltage range	V _{CC}	V _{CC(STOP)}	—	35	V	
	Operation start voltage	V _{CC(START)}	15.2	16.2	17.2	V	
	Operation stop voltage	V _{CC(STOP)}	9.0	9.9	10.9	V	
	Start/stop differential	ΔV _{CC}	5.0	6.3	7.6	V	ΔV _{CC} = V _{CC(START)} – V _{CC(STOP)}
	Start-up current	I _{CCL}	50	100	150	μA	V _{CC} = 14.5 V, Ta = 25°C
			40	100	200		V _{CC} = 14.5 V, –20 < Ta < 85°C
	Circuit current	I _{CCO}	8	12	21	mA	V _{CC} = 30 V
F/B	Circuit current in OVP state	I _{CC OVP}	1.3	2.0	3.0	mA	V _{CC} = 25 V
			125	210	320	μA	V _{CC} = 9.5 V
	Current at 0% duty	I _{FBMIND}	–2.10	–1.54	–1.00	mA	
	Current at maximum duty	I _{FBMAXD}	–0.90	–0.55	–0.40	mA	
	Max./0% differential	ΔI _{FB}	–1.35	–0.99	–0.70	mA	ΔI _{FB} = I _{FBMIND} – I _{FBMAXD}
OVP	F/B terminal voltage	V _{FB}	4.9	5.9	7.1	V	
	F/B terminal resistance	R _{FB}	420	600	780	Ω	
	OVP term. H threshold volt.	V _{THOVPH}	540	750	960	mV	
	OVP term. hysteresis volt.	ΔV _{THOVP}	—	30	—	mV	ΔV _{THOVP} = V _{THOVPH} – V _{THOVPL}
	OVP term. threshold current	I _{THOVP}	80	150	250	μA	
	OVP term. input current	I _{INOVP}	80	150	250	μA	
	OVP reset supply voltage	V _{CCOVPC}	7.5	9.0	10.0	V	
	Operation stop volt. –OVP reset supply voltage	V _{CC(STOP)} –V _{CCOVPC}	0.55	1.20	—	V	
	Current from OVP terminal for OVP reset	I _{THOVPC}	–480	–320	–213	μA	V _{CC} = 30 V
			–210	–140	–93		V _{CC} = 18 V
CLM	CLM terminal threshold volt	V _{THCLM}	180	200	220	mV	
	CLM terminal current	I _{INCLM}	–280	–200	–140	μA	
	Delay time from CLM to V _{out}	T _{PDCLM}	—	90	—	ns	
Oscillator	Oscillation frequency	f _{OSC}	68	75	82	kHz	R _T = 27 kΩ, C _T = 470 pF
	Maximum ON duty	T _{DUTY}	48	51	54	%	
	Upper limit volt. of OSC waveform	V _{OSCH}	3.97	4.37	4.77	V	
	Lower limit volt. of OSC waveform	V _{OSCL}	1.76	1.96	2.16	V	
	Upper/lower limit volt. difference	ΔV _{OSC}	2.11	2.41	2.71	V	
	RT terminal voltage	V _{RT}	3.80	4.50	5.40	V	R _T = 27 kΩ

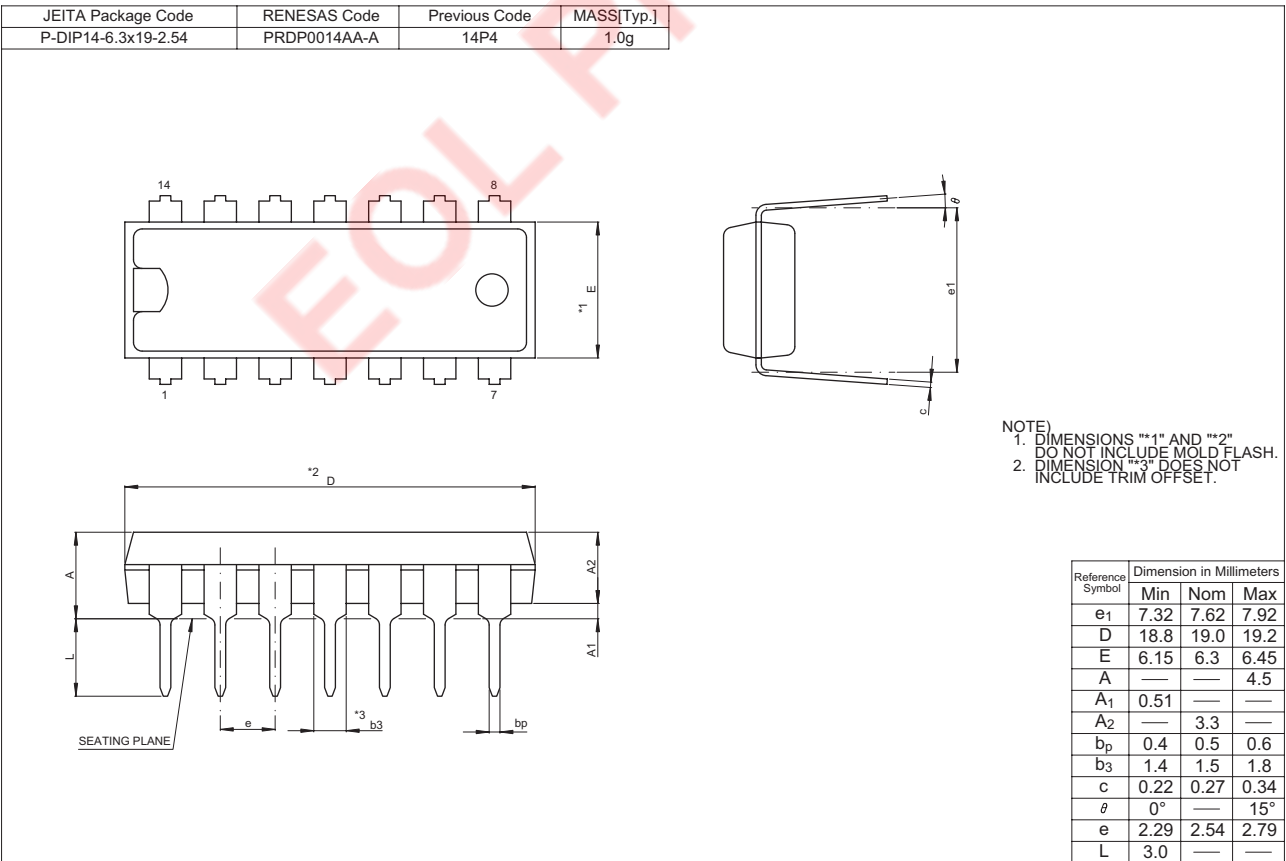
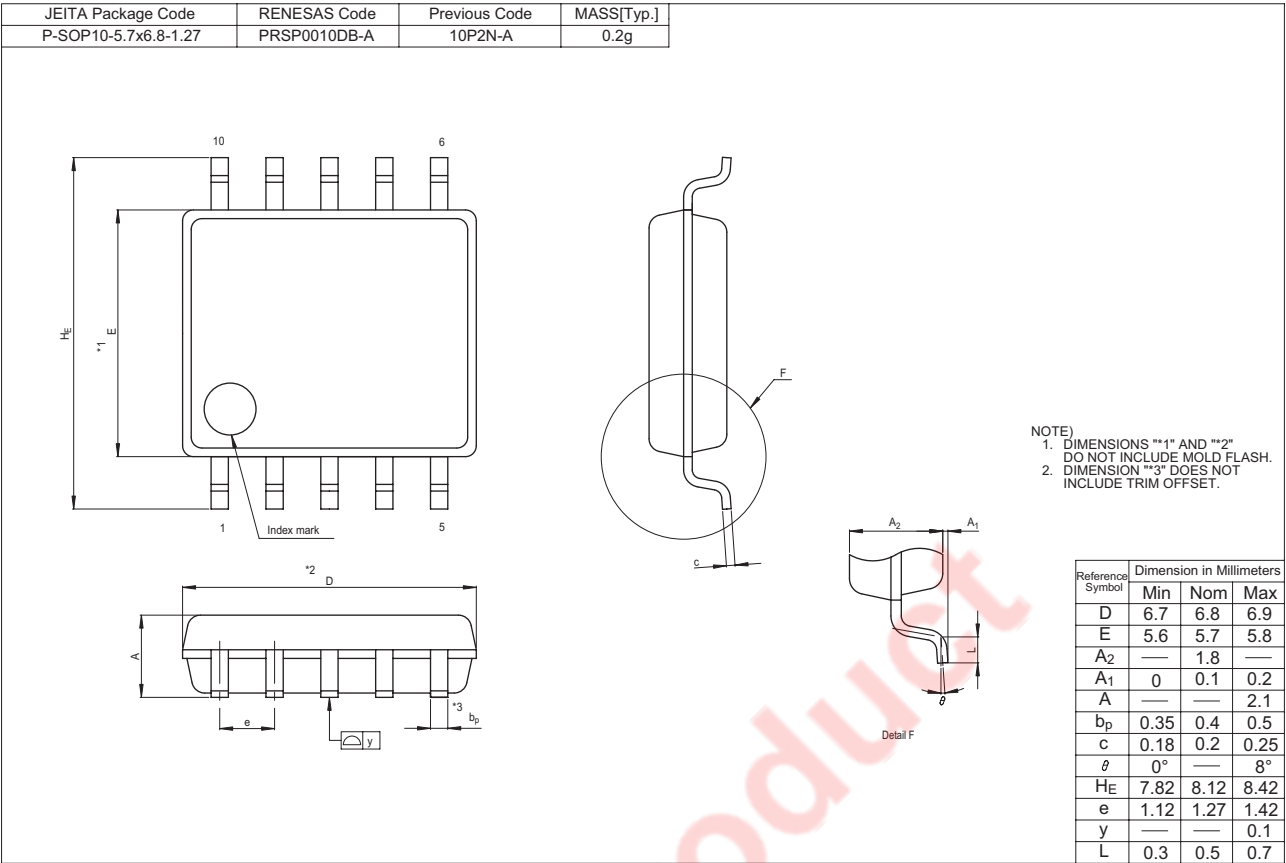
($T_a = 25^\circ\text{C}$, $V_{CC} = 5\text{ V}$, unless otherwise noted.)

Block	Item	Symbol	Limits			Unit	Test Conditions
			Min.	Typ.	Max.		
Output	Output low voltage	V _{OL1}	—	0.04	0.4	V	V _{CC} = 18 V, I _O = 10 mA
		V _{OL2}	—	0.7	1.4	V	V _{CC} = 18 V, I _O = 100 mA
		V _{OL3}	—	0.85	1.0	V	V _{CC} = 5 V, I _O = 1 mA
		V _{OL4}	—	1.3	2.0	V	V _{CC} = 5 V, I _O = 100 mA
	Output high voltage	V _{OH1}	16.0	16.7	—	V	V _{CC} = 18 V, I _O = −10 mA
		V _{OH2}	15.5	16.5	—	V	V _{CC} = 18 V, I _O = −100 mA
	Output voltage rise time	T _{RISE}	—	50	—	ns	
	Output voltage fall time	T _{FALL}	—	35	—	ns	

M51998 Example Application Circuit



Package Dimensions



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