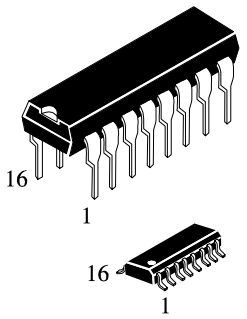
IL2010B

PHASE CONTROL CIRCUIT FOR CURRENT FEEDBACK

Description

The IL2010B is designed as a phase-control circuit in bipolar technology. It enables load-current detection and has a soft-start function as well as reference voltage output. Motor control with load-current feedback and overload protection are preferred applications.



N SUFFIX
PLASTIC

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Features

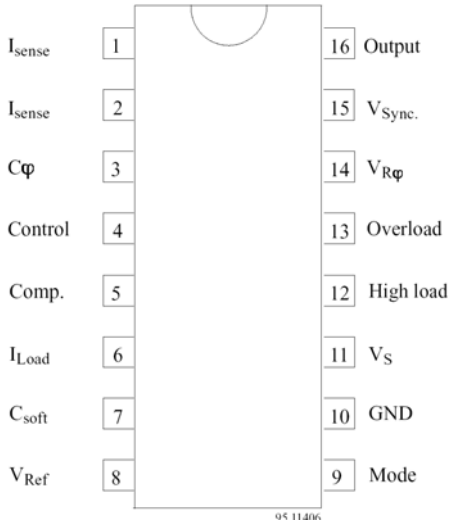
- Full wave current sensing
- Mains supply variation compensated
- Programmable load-current limitation with over- and high-load output
- Variable soft-start
- Voltage and current synchronization
- Automatic retriggering switchable
- Triggering pulse typical 125 mA
- Internal supply voltage monitoring
- Current requirement ≤ 3 mA
- Temperature compensated reference voltage

Applications

- Advanced motor control
- Grinder
- Drilling machine

Pin Description

Pin	Symbol	Function
1	I_{sense}	Load current sensing
2	I_{sense}	Load current sensing
3	C_{φ}	Ramp voltage
4	Control	Control input
5	Comp.	Compensation output
6	I_{Load}	Load current limitation
7	C_{soft}	Soft start
8	V_{Ref}	Reference voltage
9	Mode	Mode selection
10	GND	Ground
11	V_S	Supply voltage
12	High load	High load indication
13	Overload	Overload indication
14	$V_{R\varphi}$	Ramp current adjust
15	$V_{Sync.}$	Voltage synchronization
16	Output	Trigger output



Korzhenevskogo 12, Minsk, 220108, Republic of Belarus
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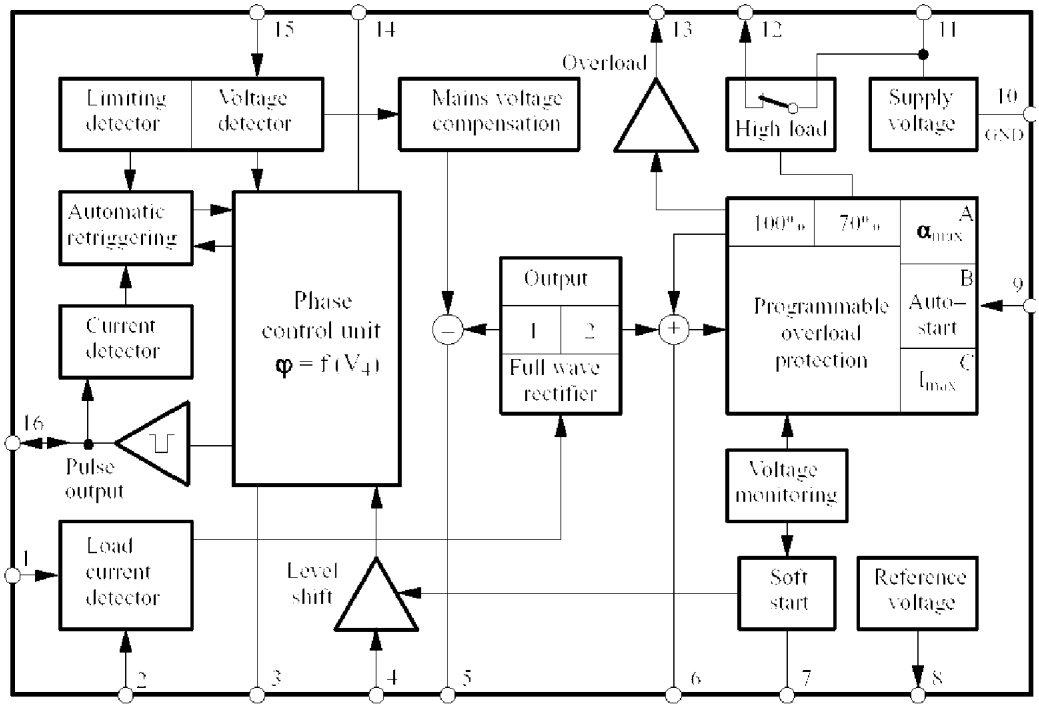
Block Diagram



Absolute Maximum Ratings

Reference point Pin 10, unless otherwise specified

Parameters	Pin	Symbol	Value	Unit
Sink current	11	$-I_S$	30	mA
t ≤10us		$-i_s$	100	
Sync. currents	15	$\pm I_{syncV}$	5	mA
t ≤10us		$\pm i_{syncV}$	20	
Phase control				
Control voltage	4 and 8	$-V_I$	0 – V_8	V
Input current	4	$\pm I_I$	500	uA
Charging current	14	$-I_{\varphi\ max}$	0.5	mA
Soft-start				
Input voltage	7 and 8	$-V_I$	0 – V_8	V
Pulse output				
Input voltage	16	$+V_I$	2	V
		$-V_I$	V_{11}	
Reference voltage source				
Output current	8	I_0	10	mA
t ≤10us		i_0	30	mA
Load current sensing				
Input currents	1 and 2	$\pm I_i$	1	mA
Input voltages	5 and 6	$-V_i$	0 – V_8	V
Overload output	13	I_L	1	mA
High-load output	12	I_L	30	mA
t ≤10us		i_L	100	mA
Storage temperature range		T_{stg}	-40 to +125	°C
Junction temperature range		T_j	125	°C
Ambient temperature range		T_{amb}	-10 to +100	°C

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Electrical Characteristics

V_S =–13 V, Tamb = 25°C, reference point Pin 10, unless otherwise specified

Parameters	Test Conditions	Pins	Symbol	Min.	Typ.	Max.	Unit
Supply							
Supply voltage limitation	$-I_S$ = 5.5 mA	11	$-V_S$	14.5		16.5	V
	$-I_S$ = 30 mA			14.6		16.8	
Current requirement	$-V_S$ = 13.0 V (Pins 1, 2, 8 and 15 open) Pin 11		$-I_S$			5.2	mA
Reference voltage source							
Reference voltage	I_L = 10 uA	8	$-V_{Ref}$	8.7	9.0	9.3	V
	I_L = 2.5 mA			8.5	8.8	9.2	
Temperature coefficient	I_S = 2.5 mA		TC_{VRef}		–0.004		%/K
	I_S = 10 uA				+0.006		
Voltage monitoring							
Turn-on threshold		11	$-V_{Son}$		11.3	12.3	V
Phase control – synchronization							
Voltage limitation	$\pm I_L$ = 2 mA		$\pm V_{syncV}$	8.0	8.5	9.0	V
Input current	Current sync.	16	$\pm I_{syncI}$	3		30	uA
Reference ramp, fig. 1							
Charging current		14	$-I_\varphi$	1		100	uA
Start voltage		3	$-V_{max}$	2.00	2.15	2.20	V
Temperature coefficient of start voltage		3	TC_R		–0.003		%/K
Final voltage		3	$-V_{min}$		($V_8 \pm$200 mV)		
R_φ reference voltage	I_φ=10uA	14 and 11	$V_{R\varphi}$	0.96	1.02	1.10	V
Temperature coefficient	I_φ=10 uA	14	$TC_{VR\varphi}$		0.03		%/K
	I_φ=1 uA				0.06		
Pulse output current	V_{16} = – 1.2 V, fig. 2,	16	I_0	100	125	150	mA
Output pulse width	C_3 = 3.3 nF, fig. 3	16	t_p		50		us
Automatic retriggering							
Repetition rate	I_{15} =150 uA		t_{pp}	3	5	7.5	t_p
Threshold voltage		16	$\pm V_I$	20		100	mV
Soft start, figure 7 and 8							
Starting current	$V_7 = V_8$	7	$-I_0$	5	10	20	uA
Final current	V_{7-10} = –1V		$-I_0$	20	25	50	uA
Discharge current			$+I_0$	0.5			mA
Output current		4	$+I_0$	0.2		2	mA
Supply voltage compensation,							
Transfer gain	fig. 6 I_{15}/ I_5 Pin 15/5 (Pins 1 and 2 open)		G_i	12		18	
Output offset current	$V_{(R6)} = V_{15} = V_5 = 0$		$\pm I_0$			2	uA
Load current detection, $R_1 = R_2$ = 3 kΩ, V_{15} = 0, $V_5 = V_6 = V_8$, fig. 7							
Transfer gain	I_5/150 mV, I_6/150 mV		G_I	0.28	0.32	0.37	uA/mV
Output offset currents		5, 6 - 8	$-I_0$	0	3	6	uA
Reference voltage	I_1, I_2 = 100 uA	1 and 2	$-V_{Ref}$	300		450	mV
Shunt voltage amplitude			$\pm V_{(R6)}$			250	mV

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Parameters	Test Conditions	Pins	Symbol	Min.	Typ.	Max.	Unit
Load current limitation figs. 8 to 13							
High load switching	Threshold V_{T70}	6-8	V_{T70}	4	4.35	4.7	V
Overload switching	Threshold V_{T100}		V_{T100}	5.8	6.2	6.6	V
Restart switching	Threshold V_{T25}		V_{T25}	1.25	1.55	1.85	V
Input current	Enquiry mode		I_i			1	uA
Output impedance	Switching mode		R_0	2	4	8	kΩ
Programming input							
Input voltage - auto-start	Pin 9 open	9	$-V_9$	3.8	4.3	4.7	V
Input current	$V_9 = 0$ (α_{max})		$-I_9$	5	10	20	uA
	$V_9 = V_8$ (I_{max})		I_9	5	10	20	
High load output, V_{T70}, fig. 9, I_{12} = –3 mA,							
Saturation voltages	$V_{6-8} \le V_{T70}$	11-12	V_{sat}	0.5	0.75	1.0	V
	$V_{6-8} \ge V_{T70}$		V_{lim}	7.3		8.1	
Overload output, V_{T100}, V_9 = open or $V_9 = V_{10}$, fig. 10							
Leakage current	$V_{6-8} \ge V_{T25}$ $V_{13} = (V_{11}+1)V$	13	I_{lkg}			0.5	uA
Saturation voltages	$V_{6-8} \ge V_{T100}$, I_{13} = 10 uA	11-13	V_{sat}			0.15	V
Output current, max. load	$V_9 = V_8$, fig. 10	13	I_{13}			1	mA
Leakage current	$V_6 \le V_{T100}$	13	I_{lkg}			4	uA
Output impedance	Open collector $V_6 \le V_{T100}$	13	R_0	2	4	8	kΩ

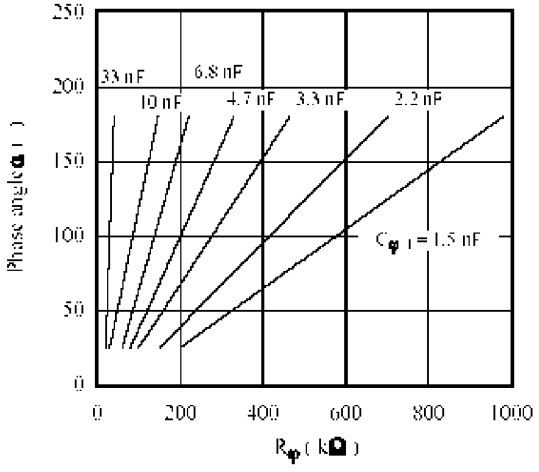

Fig.1

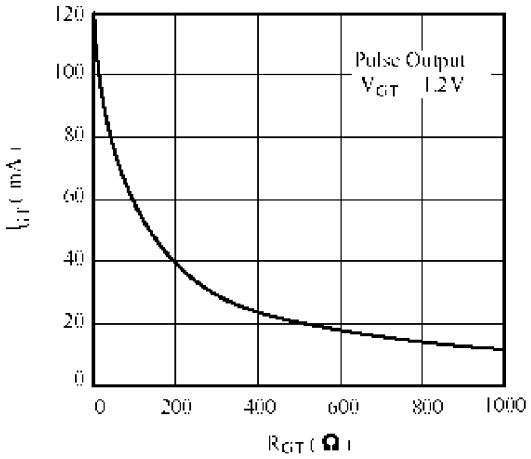

Fig.2

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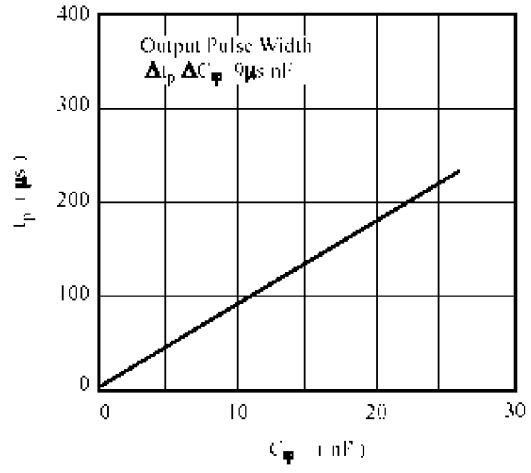

Fig.3

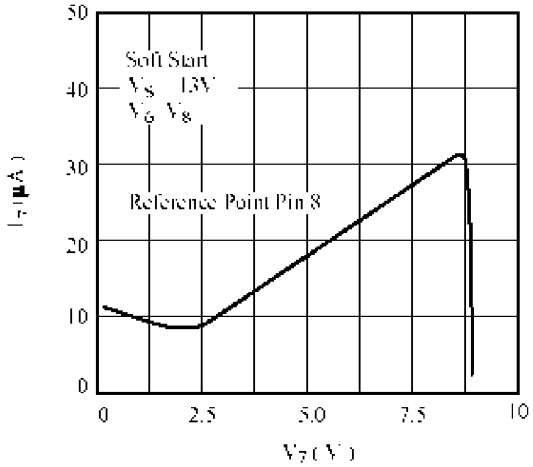

Fig.4

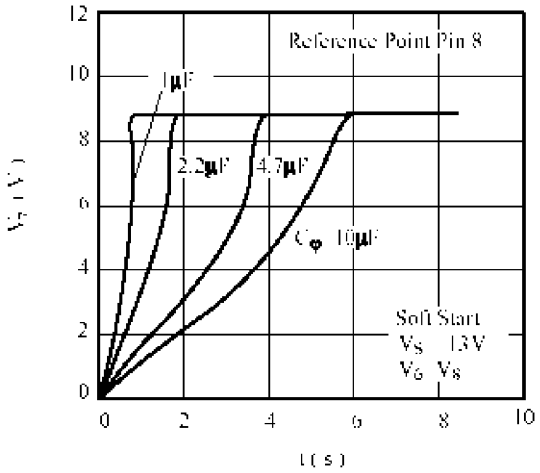

Fig.5

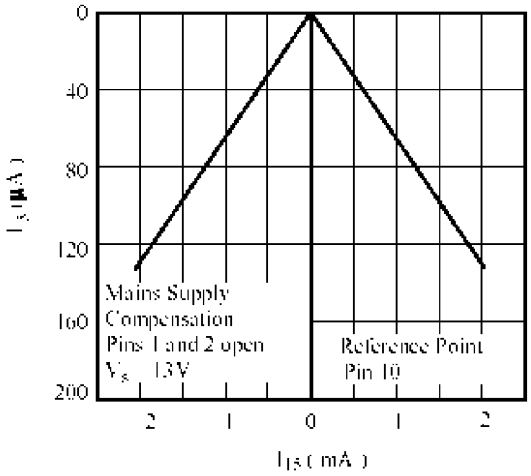

Fig.6

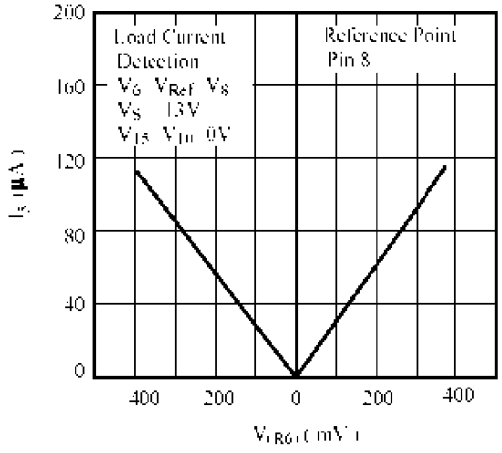

Fig.7

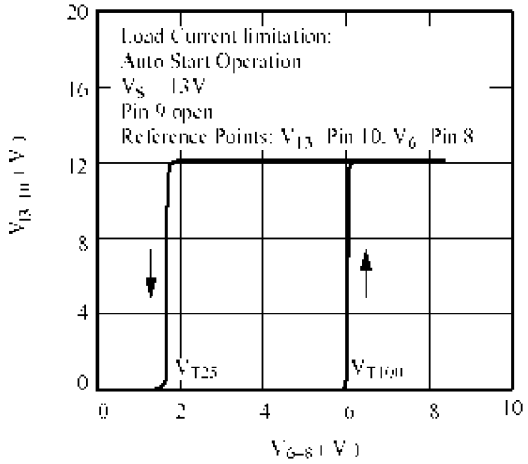

Fig.8

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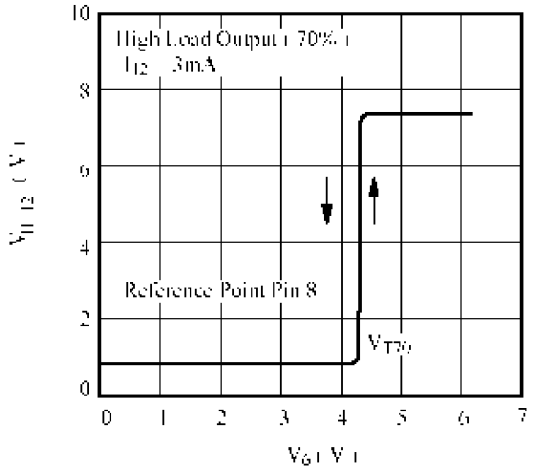

Fig.9

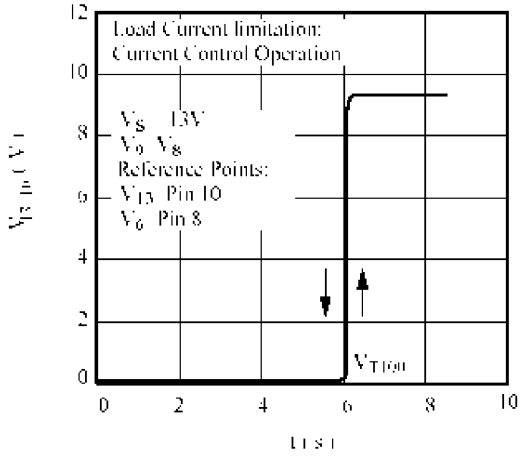

Fig.10

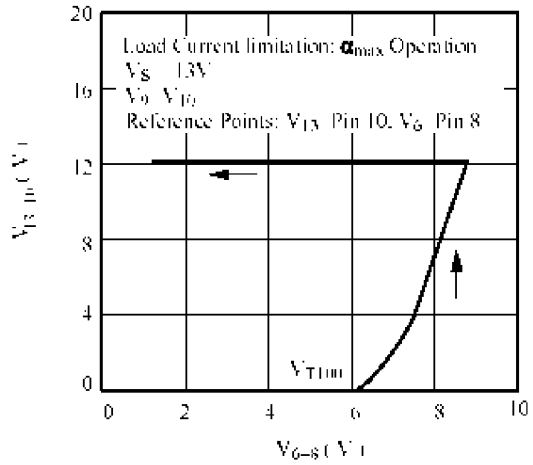

Fig.11

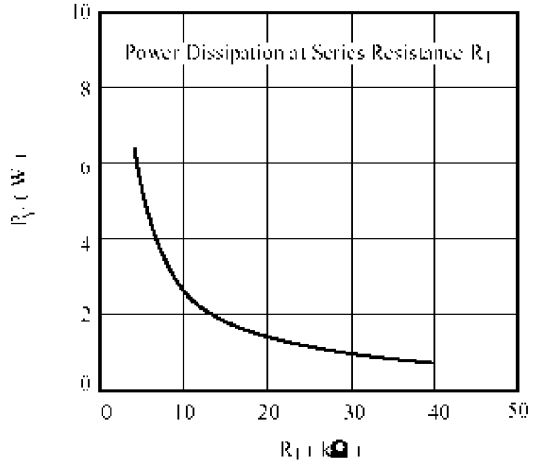

Fig.12

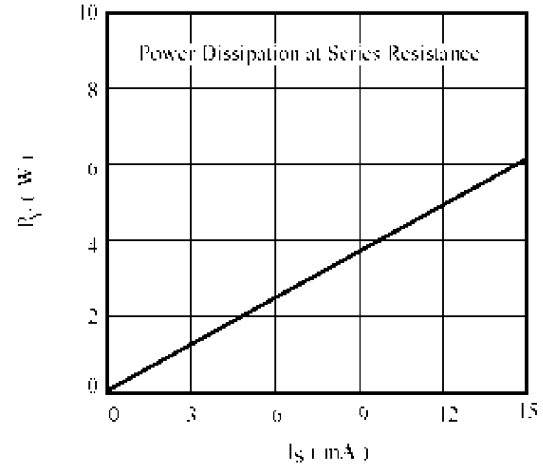

Fig.13

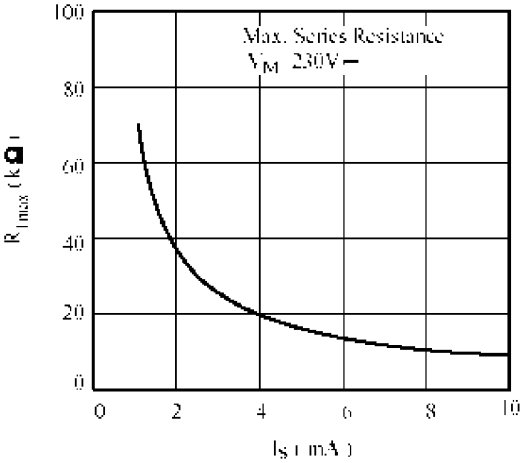

Fig.14

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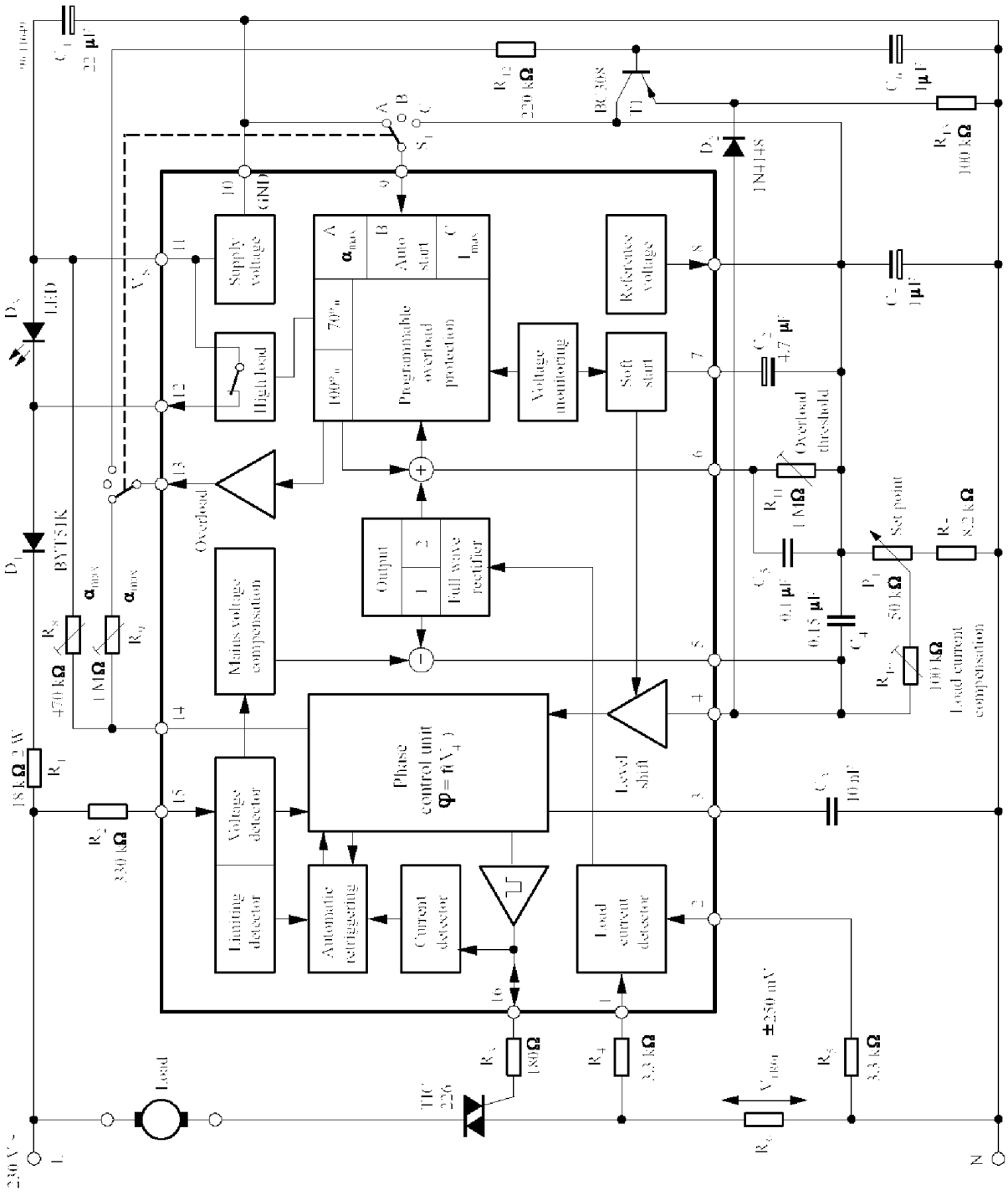

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