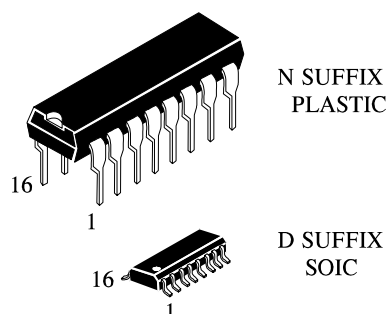


IL2010B

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.



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 t_{max} 125 mA

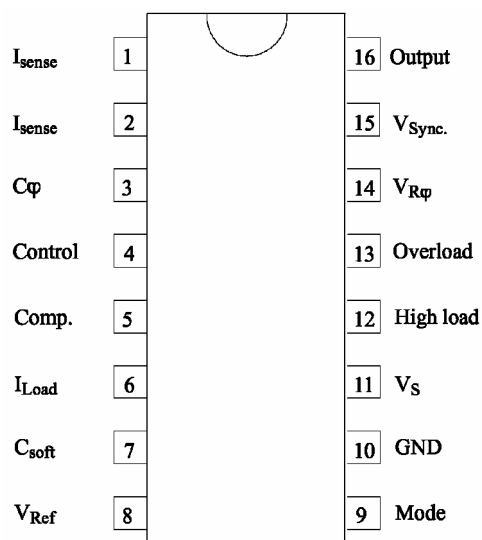
- Internal supply voltage monitoring
- Typical current requirement ≤ 3 mA
- Temperature compensated reference voltage

Applications

- Advanced motor control
- Grinder
- Drilling machine

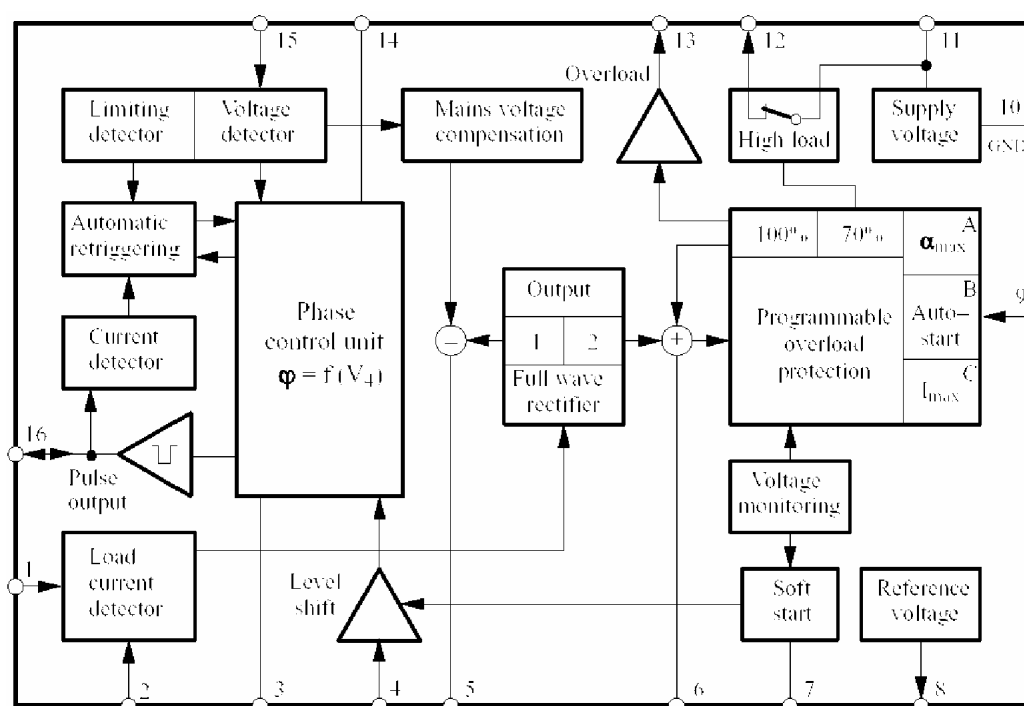
Pin Description

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	$V_{R\phi}$	Ramp current adjust
15	$V_{Sync.}$	Voltage synchronization
16	Output	Trigger output



IL2010B

Block Diagram



Absolute Maximum Ratings

Reference point Pin 10, unless otherwise specified

Reference point Pin 16, unless otherwise specified				
Parameters	Pin	Symbol	Value	Unit
Sink current t ≤10us	11	−I _S	30	mA
		−i _s	100	
Sync. currents t ≤10us	15	±I _{syncV}	5	mA
		±i _{syncV}	20	
Phase control				
Control voltage	4 and 8	−V _I	0 − V ₈	V
Input current	4	± I _I	500	uA
Charging current	14	− I _{φ 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 t ≤10us	8	I ₀	10	mA
		i ₀	30	mA
Load current sensing				
Input currents	1 and 2	± 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 t ≤10us	12	I _L	30	mA
		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

$V_S = -13\text{ V}$, $T_{amb} = 25^\circ\text{C}$, reference point Pin 10, unless otherwise specified

Parameters	Test Conditions	Pins	Symbol	Min.	Typ.	Max.	Unit
Supply							
Supply voltage limitation	$-I_S = 5.5\text{ mA}$	11	$-V_S$	14.5		16.5	V
	$-I_S = 30\text{ mA}$			14.6		16.8	
Current requirement	$-V_S = 13.0\text{ V}$ (Pins 1, 2, 8 and 15 open) Pin 11		$-I_S$		3.0		mA
Reference voltage source							
Reference voltage	$I_L = 10\text{ uA}$	8	$-V_{\text{Ref}}$	8.7	9.0	9.3	V
	$I_L = 2.5\text{ mA}$			8.5	8.8	9.2	
Temperature coefficient	$I_S = 2.5\text{ mA}$		$TC_{V\text{Ref}}$		-0.004		% /K
	$I_S = 10\text{ uA}$			+0.006			
Voltage monitoring							
Turn-on threshold		11	$-V_{\text{Son}}$		11.3	12.3	V
Phase control – synchronization							
Voltage limitation	$\pm I_L = 2\text{ mA}$		$\pm V_{\text{syncV}}$	8.0	8.5	9.0	V
Input current	Current sync.	16	$\pm I_{\text{syncI}}$	3		30	uA
Reference ramp, fig. 1							
Charging current		14	$-I_\phi$	1		100	uA
Start voltage		3	$-V_{\text{max}}$	2.00	2.15	2.20	V
Temperature coefficient of start voltage		3	TC_R		-0.003		% /K
Final voltage		3	$-V_{\text{min}}$	$(V_8 \pm 200\text{ mV})$			
R_ϕ reference voltage	$I_\phi = 10\text{ uA}$	14 and 11	$V_{R\phi}$	0.96	1.02	1.10	V
Temperature coefficient	$I_\phi = 10\text{ uA}$	14	$TC_{V R\phi}$		0.03		% /K
	$I_\phi = 1\text{ uA}$				0.06		
Pulse output current	$V_{16} = -1.2\text{ V}$, fig. 2,	16	I_0	-	-	150	mA
Output pulse width	$C_3 = 3.3\text{ nF}$, fig. 3	16	t_p		50		us
Automatic retriggering							
Repetition rate	$I_{15} = 150\text{ uA}$		t_{pp}	3	5	7	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	$V_{7-10} = -1\text{ V}$		$-I_0$	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 $R_1 = R_2 = 3\text{ k}\Omega$, $V_{15} = 0$, $V_5 = V_6 = V_8$, fig. 7							
Transfer gain	$I_5/150\text{ mV}$, $I_6/150\text{ mV}$		G_I	0.28	0.32	0.37	uA/mV
Output offset currents		5, 6 - 8	$-I_0$	0	3	6	uA
Reference voltage	$I_1, I_2 = 100\text{ uA}$	1 and 2	$-V_{\text{Ref}}$	300		450	mV
Shunt voltage amplitude			$\pm V_{(R6)}$			250	mV

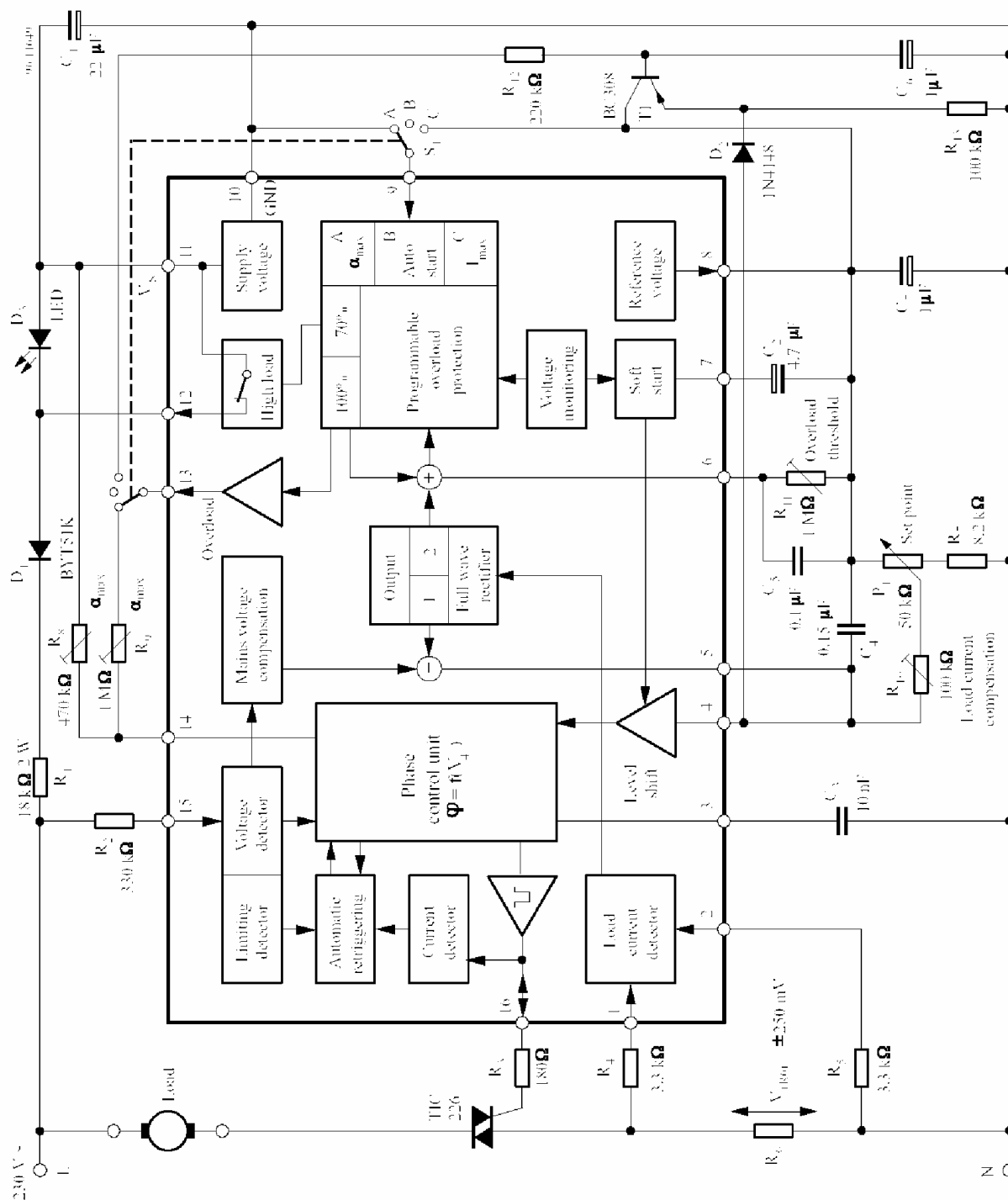


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Parameters	Test Conditions	Pins	Symbol	Min.	Typ.	Max.	Unit
Load current limitation figs. 8 to 13							
High load switching	Threshold V_{T70}	6-8	V_{T70}	4	4.35	4.7	V
Overload switching	Threshold V_{T100}		V_{T100}	5.8	6.2	6.6	V
Restart switching	Threshold 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	$V_{6-8} \leq V_{T70}$	11-12	V_{sat}	0.5	0.75	1.0	V
	$V_{6-8} \geq V_{T70}$		V_{lim}	7.3		8.1	
Overload output, V_{T100} , $V_9 =$ open or $V_9 = V_{10}$, fig. 10							
Leakage current	$V_{6-8} \geq V_{T25}$ $V_{13} = (V_{11}+1)V$	13	I_{lkg}			0.5	uA
Saturation voltages	$V_{6-8} \geq V_{T100}$, $I_{13} = 10$ 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	$V_6 \leq V_{T100}$	13	I_{lkg}			4	uA
Output impedance	Open collector $V_6 \leq V_{T100}$	13	R_0	2	4	8	kΩ



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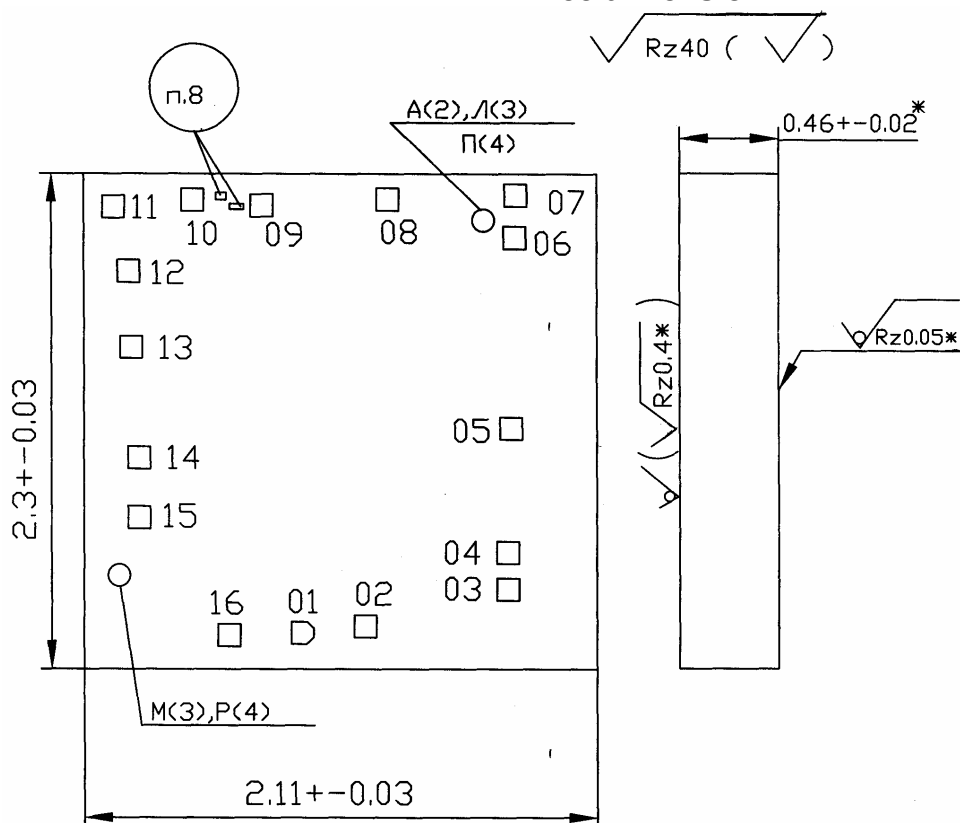


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Dice dimension



Pad location table

Pad number	Coordinates (with respect to left down corner), mm		Pad dimension, mm
	X	y	
01	0.928	0.111	0.120x0.120
02	1.209	0.141	0.120x0.120
03	1.853	0.307	0.120x0.120
04	1.853	0.472	0.120x0.120
05	1.867	1.026	0.120x0.120
06	1.883	1.877	0.120x0.120
07	1.888	2.065	0.120x0.120
08	1.311	2.047	0.120x0.120
09	0.748	2.019	0.120x0.120
10	0.440	2.044	0.120x0.120
11	0.085	2.013	0.120x0.120
12	0.153	1.728	0.120x0.120
13	0.165	1.389	0.120x0.120
14	0.200	0.894	0.120x0.120
15	0.200	0.628	0.120x0.120
16	0.602	0.101	0.120x0.120



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