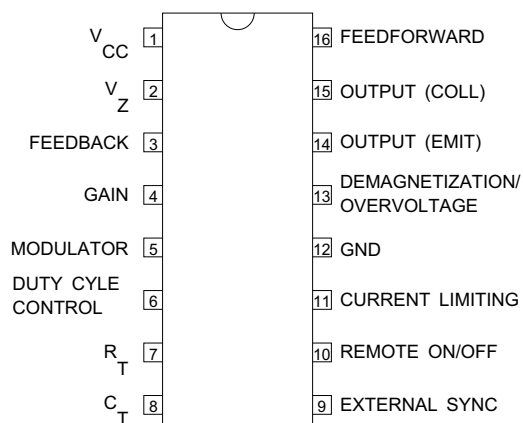


SWITCHED MODE POWER SUPPLY CONTROL CIRCUIT



FEATURES

- Stabilised Power Supply
- Temperature Compensated Reference Source
- Sawtooth Generator
- Pulse Width Modulator
- Remote on/off Switching
- Current Limiting
- Low Supply Voltage Protection
- Loop fault Protection
- Demagnetisation/Overvoltage Protection
- Maximum Duty Cycle Clamp
- Feed Forward Control
- External Synchronisation

Order Information

Part Number	Temperature Range	Package
IP1060BJ	-55°C to + 125°C	16 Pin Ceramic DIP
IP1060D	-25°C to + 85°C	16 Pin Plastic (150)SOIC
IP1060J	-25°C to + 85°C	16 Pin Ceramic DIP
IP1060N	-25°C to + 85°C	16 Pin Plastic DIP
IP1060AD	0°C to + 70°C	16 Pin Plastic (150)SOIC
IP1060AJ	0°C to + 70°C	16 Pin Ceramic DIP
IP1060AN	0°C to + 70°C	16 Pin Plastic DIP

DESCRIPTION

The IP1060 is a control circuit for use in switched mode power supplies. This single monolithic chip incorporates all the control and supervisory (protection) functions required in switched mode power supplies, including an internal temperature compensated reference source, sawtooth generator, pulse width modulator, output stage and various protection circuits.

ABSOLUTE MAXIMUM RATINGS (T_{case} = 25°C unless otherwise stated)

Supply	
Voltage Sourced	18V
Current Sourced	30mA
Output Transistor	
Output current	40mA
Collector Voltage (Pin 15)	18V
Max. Emitter Voltage (Pin 14)	5V
Operating Temperature (Ambient)	
IP1060B	-55°C to +125°C
IP1060	-25°C to + 85°C
IP1060A	0°C to 70°C
Storage Temperature Range	-65°C to +150°C
Operating Junction Temperature Range	150°C

ELECTRICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$ unless otherwise stated)

Parameter	Test Conditions ¹	IP1060 IP1060B			IP1060A			Units
		Min.	Typ.	Max.	Min.	Typ.	Max.	
REFERENCE SECTION								
Internal Reference Voltage (V_{REF})	$T_J = \text{Over Temp. Range}^2$	3.69	3.72	3.81	3.57	3.72	3.95	V
Temperature Coefficient of V_{REF}		± 100			± 100			ppm/ $^\circ\text{C}$
Internal Reference (V_Z)	$I_L = 0.7\text{mA}$	7.9	8.4	9.0	7.8	8.4	9.0	V
Temperature Coefficient of V_Z		± 200			± 200			ppm/ $^\circ\text{C}$
OSCILLATOR SECTION								
Frequency Range	$T_J = \text{Over Temp. Range}^2$	50		100k	50		100k	Hz
Initial Accuracy Oscillator	$R = 5\text{k}\Omega$	5			5			%
Duty Cycle Range	$f_O = 20\text{kHz}$	0-90	0-98		0-90	0-98		%
MODULATOR								
Modulator Input Current	$V_{Pin5} = 2\text{V}$ $T_J = \text{Over Temp. Range}^2$		-0.2	-5.0		-0.2	-5.0	μA
SUPERVISORY FUNCTIONS								
Pin 6, Input Current	At 2V O $T_J = \text{Over Temp. Range}^2$		-0.2	-6.0		-0.2	-6.0	μA
Pin 6, Duty Cycle Limit Control	For 50% Max. Duty Cycle 15kHz to 50kHz $V_{Pin6} = 0.4V_Z$	40	50	60	40	50	60	% Duty Cycle
Pin 1, Low Supply Voltage Protection Thresholds		8.85	9.0	10.8	8.85	9.0	10.8	V
Pin 3, Feedback Loop Protection Trip Thresholds		460	600	720	460	600	720	mV
Pin 3, Pull Up Current	At 2V $T_J = \text{Over Temp. Range}^2$	-7	-15	-35	-7	-15	-35	μA
Pin 13, Demag. / O.V. Protection Threshold		470	600	720	470	600	720	mV
Pin 13 Input Current	At 0.25V $T_J = \text{Over Temp. Range}^2$		-0.6	-7.0		-0.6	-7.0	μA
Pin 16, Feed Forward Duty Cycle Control	$V_{Pin16} = 2V_Z$	30	40	50	30	40	50	% Orig. Duty Cycle
Pin 16, Feed Forward Input Current	At 16V, $V_{CC} = 18\text{V}$		0.2	50		0.2	50	μA

NOTES

1. Test Conditions unless otherwise stated: $V_{CC} = 12\text{V}$, $T_J = 25^\circ\text{C}$.
2. Applies Over Full Temperature Range:

IP1060B	$T_A = -55$ to $+125^\circ\text{C}$
IP1060	$T_A = -25$ to $+85^\circ\text{C}$
IP1060A	$T_A = 0$ to $+70^\circ\text{C}$

ELECTRICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$ unless otherwise stated)

Parameter	Test Conditions ¹	IP1060 IP1060B			IP1060A			Units
		Min.	Typ.	Max.	Min.	Typ.	Max.	
EXTERNAL SYNCHRONISATION								
Pin 9 Off		0		0.8	0		0.8	V
Pin 9 On		2		V_Z	2		V_Z	
Pin 9, Sink Current	$V_{Pin9} = 0V$		-85	-120		-85	-120	μA
REMOTE ON/OFF								
Pin 10 Off		0		0.8	0		0.8	V
Pin 10 On		2		V_Z	2		V_Z	
Pin 10 Sink Current Pin 9 =0V to Pin 10 = 0V	$V_{Pin9} = 0V$		-85	-120		-85	-120	μA
CURRENT LIMITING								
Pin 11 I_{IN}	$V_{Pin11} = 250\text{mV}$		-2	-10		-2	-10	μA
Single Pulse Inhibit Delay	Inhibit Delay Time for 20% Overdrive at $I_{OUT} = 30\text{mA}$		0.7	0.8		0.7	0.8	Δs
Trip Levels: Shut Down, Slow Start		560	600	700	560	600	700	mV
Trip Levels: Current Limit		400	480	560	400	480	560	mV
ERROR AMPLIFIER								
Output Voltage Swing (V_{OH})		6.2		9.5	6.2		9.5	V
Output Voltage Swing (V_{OL})				0.7			0.7	
Open Loop Gain		54	60		54	60		dB
Feedback Resistor		10k			10k			Ω
Small Signal Bandwidth			3			3		MHz
OUTPUT STAGE								
$V_{CE(sat)}$	$I_C = 40\text{mA}$			0.4			0.4	V
Output Current	(Pin 15)			40			40	mA
Max. Emitter Voltage	(Pin 14)	5			5			V
SUPPLY VOLTAGE / CURRENT								
I_{CC}	Voltage Feed V6 = 5V R7 = 25k Ω $I_Z = 0$			10			10	mA
	$T_J = \text{Over Temp. Range}^2$			15			15	mA
V_{CC}	$I_{CC} = 10\text{mA}$, Current Feed	20		24	19		24	V
V_{CC}	$I_{CC} = 30\text{mA}$, Current Feed	20		30	20		30	

NOTES

- Test Conditions unless otherwise stated: $V_{CC} = 12V$, $T_J = 25^\circ\text{C}$.
- Applies Over Full Operating Temperature Range:

IP1060B	$T_A = -55$ to $+125^\circ\text{C}$
IP1060	$T_A = -25$ to $+85^\circ\text{C}$
IP1060A	$T_A = 0$ to $+70^\circ\text{C}$