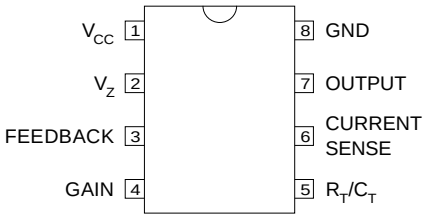
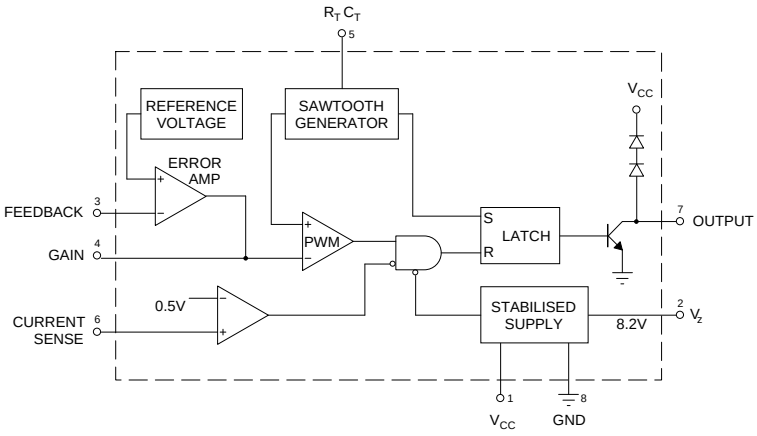
IP5661
IP5561C

TOP VIEW



J Package – 8 Pin Ceramic DIP
N Package – 8 Pin Plastic DIP
D Package – 8 Pin Plastic (150) SOIC

BLOCK DIAGRAM



SWITCHED–MODE POWER SUPPLY CONTROL CIRCUIT

FEATURES

- **STABILISED POWER SUPPLY**
- **TEMPERATURE COMPENSATED REFERENCE SOURCE**
- **SAWTOOTH GENERATOR**
- **PULSE WIDTH MODULATOR**
- **CURRENT LIMITING**
- **8 PIN DIP**

DESCRIPTION

The IP5561 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, internal zener reference, sawtooth generator, pulse width modulator, output stage and cycle by cycle current limit.

Order Information

Part Number	J–Pack 8 Pin	N–Pack 8 Pin	D–8 8 Pin	Temp. Range
IP5561	✔			-55 to +125°C
IP5561C	✔	✔	✔	0 to +70°C

Note:
To order, add the package identifier to the part number.
eg. IP5561J
IP5561CD–8

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 7)	18V
T_J	Operating Junction Temperature		See Ordering Information
T_{STG}	Storage Temperature Range		–55 to +150°C

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise stated)

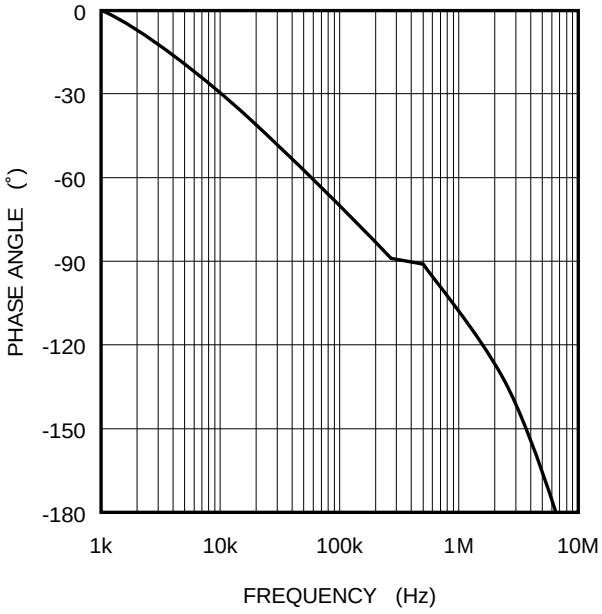
Parameter	Test Conditions	IP5561 Min.	IP5561 Typ.	IP5561 Max.	IP5561C Min.	IP5561C Typ.	IP5561C Max.	Units
REFERENCE SECTIONS								
Internal Reference Voltage (V_{REF})		3.69	3.75	3.84	3.57	3.75	3.96	V
	T_J = Over Temp. Range	3.65		3.88	3.55		3.98	
Temperature Coefficient of V_{REF}			±100			±100		ppm/°C
Internal Reference (V_Z)	I_L = -7mA	7.8	8.2	8.8	7.8	8.2	8.8	V
Temperature Coefficient of V_Z			±200			±200		ppm/°C
OSCILLATOR SECTION								
Frequency Range	T_J = Over Temp. Range	50		100k	50		100k	Hz
Initial Accuracy Oscillator	f_O = 20kHz		12			12		%
Duty Cycle Range	f_O = 20kHz	0–90	0–98		0–90	0–98		%
CURRENT LIMITING								
I_{IN}	V_{pin6} = 250mV		–2	–10		–2	–10	µA
	T_J = Over Temp. Range			-20			-20	
Single Pulse Inhibit Delay	Inhibit Delay Time for 20% overdrive, I_{OUT} = 20mA		0.88	1.10		0.88	1.10	µs
	Inhibit Delay Time for 20% overdrive, I_{OUT} = 40mA		0.7	0.8		0.7	0.8	µs
Current Limit Trip Level		0.40	0.50	0.60	0.40	0.50	0.60	V
ERROR AMPLIFIER								
Output Voltage Swing (V_{OH})		6.2			6.2			V
Output Voltage Swing (V_{OL})				0.7			0.7	V
Open Loop Gain			60			60		dB
Feedback Resistor		10k			10k			Ω
Small Signal Bandwidth			3			3		MHz
OUTPUT STAGE								
$V_{CE(sat)}$	I_C = 20mA T_J = Over Temp. Range			0.4			0.4	V
Output Current	T_J = Over Temp. Range	20			20			mA
SUPPLY VOLTAGE/CURRENT								
Supply Current (I_{CC})	I_Z = 0, Voltage Fed			10			10	mA
	T_J = Over Temp. Range			13			13	mA
Supply Voltage (V_{CC})	I_{CC} = 10mA, Voltage Fed	20	21	22	19	21	24	V
	I_{CC} = 30mA, Voltage Fed	20		30	20		30	V
LOW SUPPLY PROTECTION								
Pin 1 Threshold		8	9	10.5	8	9	10.5	V

NOTES

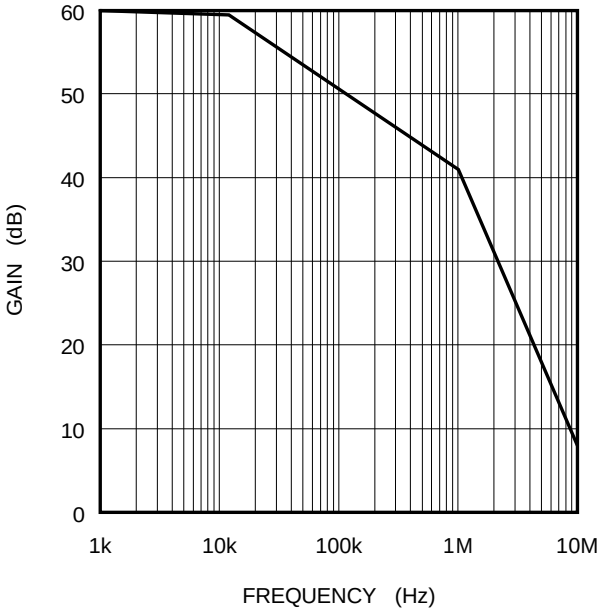
1) Test Conditions: V_{CC} = 12V , T_J = 25°C unless otherwise stated
2) Tests marked T_J = Over Temp. Range apply over the full temperature range
   ie. T_J = -55 to +125°C for IP5561
   T_J = 0 to +70°C for IP5561C

TYPICAL PERFORMANCE CHARACTERISTICS — ERROR AMPLIFIER

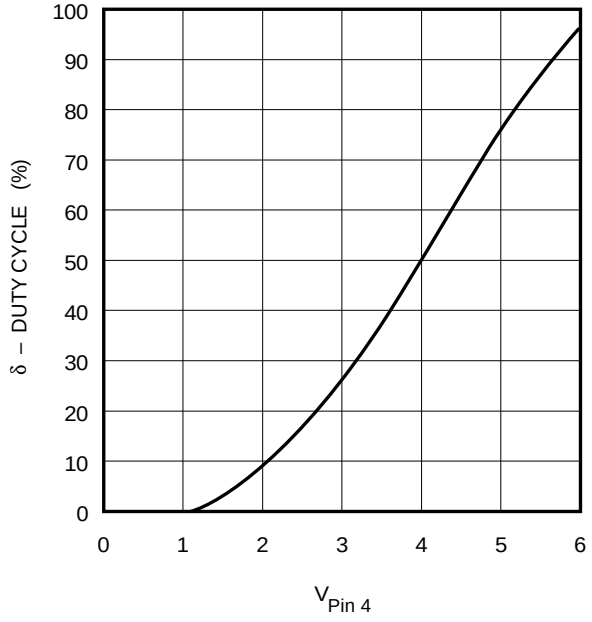
Open Loop Phase



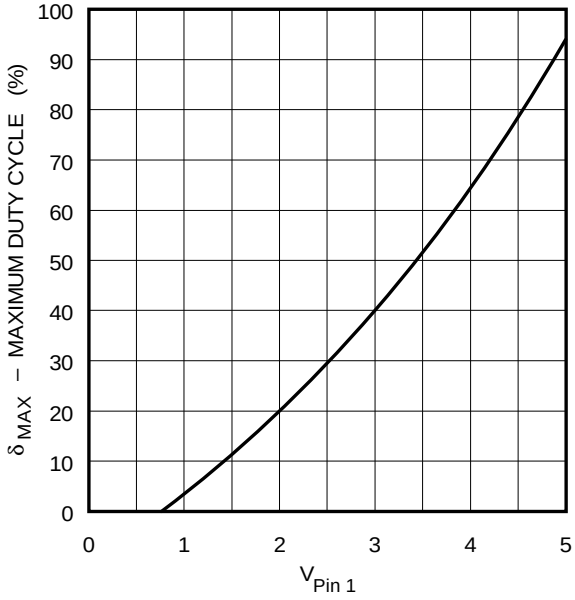
Open Loop Gain



Transfer Curve of Pulse Width Modulator Duty Cycle vs Input Voltage

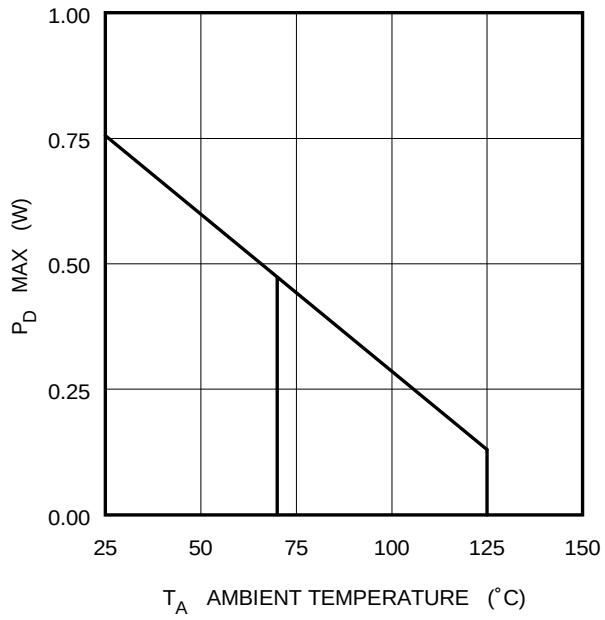


Maximum Duty Cycle vs Base Voltage on Q1



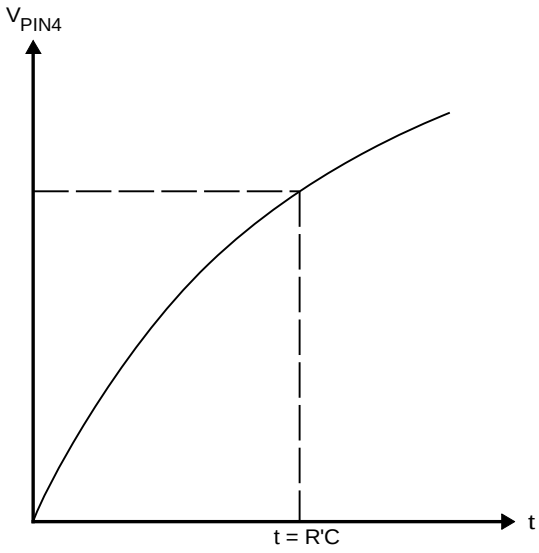
TYPICAL PERFORMANCE CHARACTERISTICS — ERROR AMPLIFIER

Power Derating Curve

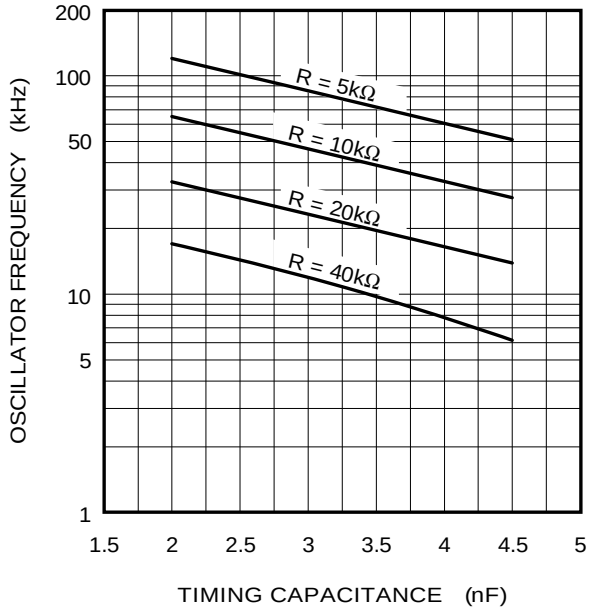


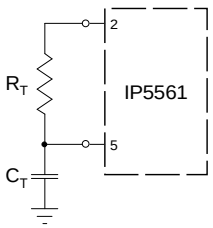
$$P_D = V_{CC} I_{CC} + (V_{CC} - V_Z) I_Z + (V_{pin7} I_{pin7} \times \delta)$$

Slow Start Voltage

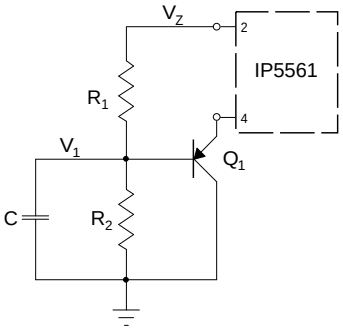


Typical Frequency Plot vs R_T and C_T





Start-up Circuit (Optional)



$$\delta_{max} = f\left(\frac{R_2}{R_1+R_2} V_Z + V_{BE\ Q1}\right)$$