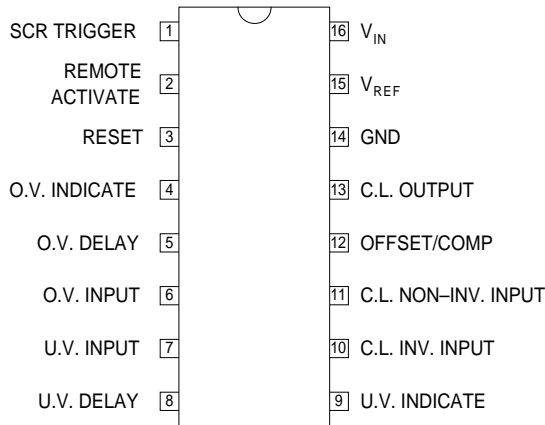


TOP VIEW



J Package – 16 Pin Ceramic DIP  
 N Package – 16 Pin Plastic DIP  
 D Package – 16 Pin Plastic (300) SOIC

## POWER SUPPLY SUPERVISORY CIRCUIT

### FEATURES

- 4.5 to 40V operation over full temperature range
- Reference voltage trimmed to 1% accuracy
- Includes over-voltage, under-voltage and current sensing
- Programmable time delays
- SCR “Crowbar” drive of 300mA
- Remote activation capability
- Optional over-voltage latch capability

### Order Information

Part Number	J-Pack 16 Pin	N-Pack 16 Pin	D-16 16 Pin	Temp. Range
IP1543	✓			-55 to +125°C
IP3543	✓	✓	✓	0 to +70°C

**Note:**  
 To order, add the package identifier to the part number.  
 eg. IP1543J  
 IP3543D-16

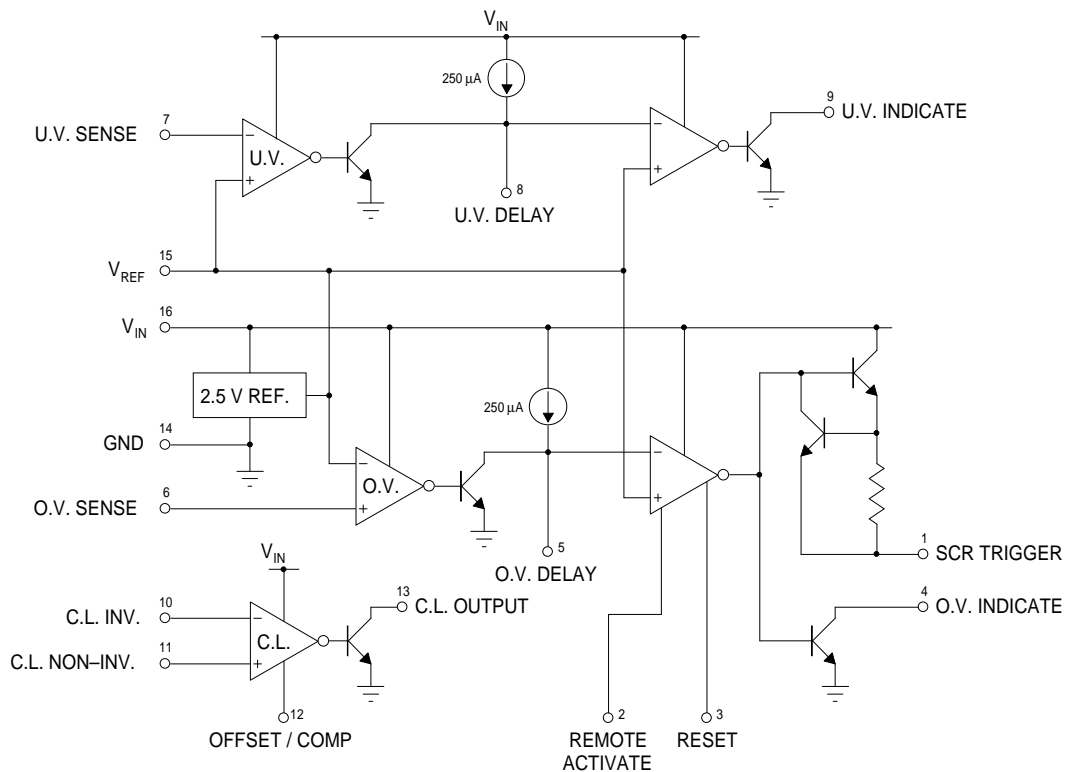
### ABSOLUTE MAXIMUM RATINGS (T<sub>case</sub> = 25°C unless otherwise stated)

+V <sub>IN</sub>	Input Supply Voltage	40V
	Sense Inputs	V <sub>IN</sub>
	SCR Trigger Current	Internally Limited
	Indicator Output Voltage	+40V
	Indicator Output Sink Current	50mA
P <sub>D</sub>	Power Dissipation	T <sub>A</sub> = 25°C Derate @ T <sub>A</sub> > 50°C
		1W 10mW/°C
P <sub>D</sub>	Power Dissipation	T <sub>C</sub> = 25°C Derate @ T <sub>C</sub> > 25°C
		2W 16mW/°C
T <sub>J</sub>	Operating Junction Temperature	See Ordering Information
T <sub>STG</sub>	Storage Temperature Range	-65 to +150°C
T <sub>L</sub>	Lead Temperature (soldering, 10 seconds)	+300°C

**DESCRIPTION**

The IP1543 and IP3543 power supply supervisory circuits contain all the functions necessary to monitor and control the output of a sophisticated power supply system. Included on the chip are over-voltage (O.V.) sensing with externally programmable delay used to trigger an external SCR "Crowbar", under-voltage (U.V.) sensing with externally programmable delay used to sense either the power supply output or the line input voltage, a third op-amp/comparator with provision for external compensation and/or offset programming used for either current limiting or as an additional voltage monitor, and a voltage reference trimmed to  $\pm 1\%$ .

**BLOCK DIAGRAM**



**RECOMMENDED OPERATING CONDITIONS**

$V_{IN}$	Input Supply Voltage		+4.5 to +40V
	Input Voltage Range		0 to $V_{IN} - 3$
	Reference Load Current		0 to 10mA
	Indicate Output Current		0 to 10mA
	Operating Ambient Temperature Range	IP1543	-55 to +125°C
		IP3543	0 to +70°C

**ELECTRICAL CHARACTERISTICS** ( $T_J$  = Over Operating Temperature Range unless otherwise stated)

Parameter	Test Conditions	IP1543			IP3543			Units
		Min.	Typ.	Max.	Min.	Typ.	Max.	
Input Voltage Range		4.5		40	4.5		40	V
Supply Current	$V_{IN} = 40V$		7	10		7	10	mA
<b>REFERENCE SECTION</b>								
Output Voltage	$T_J = 25^\circ C$	2.48	2.5	2.52	2.45	2.5	2.55	V
		2.45		2.55	2.4		2.6	
Line Regulation	$V_{IN} = 4.5$ to $30V$		1	5		1	5	mV
Load Regulation	$I_{REF} = 0$ to $10mA$		1	10		1	10	
Short Circuit Current	$V_{REF} = 0$	12	25	40	12	25	40	mA
Temperature Stability			50			50		ppm/ $^\circ C$
<b>SCR TRIGGER SECTION</b>								
Peak Output Current	$V_{IN} = 5V$ $R_G = 0$ $V_O = 0$	100	200	400	100	200	400	mA
Peak Output Voltage	$V_{IN} = 15V$ $I_O = 100mA$	12	13		12	13		V
Output Off Voltage	$V_{IN} = 40V$		0	0.1		0	0.1	
Remote Activate Current	Pin 2 = Gnd		-0.1	-0.8		-0.1	-0.8	mA
Remote Activate Voltage	Pin 2 = Open		1.5	6		1.5	6	V
Reset Current	Pin 3 = Gnd      Pin 2 = Gnd		-0.1	-0.8		-0.1	-0.8	mA
Reset Voltage	Pin 3 = Open      Pin 2 = Gnd		1.5	6		1.5	6	V
Output Current Rise Time	$R_L = 50\Omega$ $T_J = 25^\circ C$		400			400		mA/ $\mu s$
Prop. Delay from Pin 2	$C_D = 0$ $V_{PIN2} = 0.4V$ $T_J = 25^\circ C$		300			300		ns
Prop. Delay from Pin 6	$V_{PIN6} = 2.7V$ $T_J = 25^\circ C$		500			500		ns
<b>COMPARATOR SECTIONS</b>								
Input Threshold (Input Voltage Rising on Pin 6, Falling on Pin 7)	$T_J = 25^\circ C$	2.45	2.5	2.55	2.4	2.5	2.6	V
		2.4		2.6	2.35		2.65	
Input Hysteresis	$T_J = 25^\circ C$		25			25		mV
Input Bias Current	Sense Input = $0V$		-0.3	-1		-0.3	-1	$\mu A$
Delay Saturation			0.2	0.5		0.2	0.5	V
Delay High Level			6	8		6	8	
Delay Charging Current	$V_D = 0$	200	250	300	200	250	300	$\mu A$

**ELECTRICAL CHARACTERISTICS** ( $T_J$  = Over Operating Temperature Range unless otherwise stated)

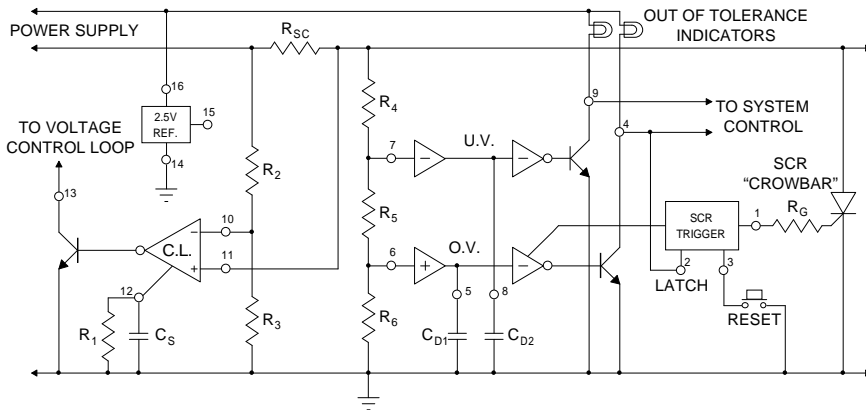
Parameter	Test Conditions	IP1543			IP3543			Units
		Min.	Typ.	Max.	Min.	Typ.	Max.	
<b>COMPARATOR SECTIONS (cont.)</b>								
Indicate Saturation	$I_L = -10\text{mA}$	0.2	0.5		0.2	0.5		V
Indicate Leakage	$V_{IND} = 40\text{V}$	0.01	1		0.01	1		$\mu\text{A}$
Propagation Delay	$V_{PIN6} = 2.7\text{V}$ $C_D = 0$	$V_{PIN7} = 2.3\text{V}$ $T_J = 25^\circ\text{C}$			400			ns
	$V_{PIN6} = 2.7\text{V}$ $C_D = 0$	$V_{PIN7} = 2.3\text{V}$ $T_J = 25^\circ\text{C}$			10			ms
<b>CURRENT LIMIT SECTION</b>								
Input Voltage Range		0		$V_{IN} - 3$	0		$V_{IN} - 3$	V
Input Bias Current	Pin 12 = Open $V_{CM} = 0$	-0.3	-1		-0.3	-1		$\mu\text{A}$
Input Offset Voltage	Pin 12 = Open $V_{CM} = 0$	0	10		0	15		mV
	10k $\Omega$ from Pin 12 to Gnd	70	100	130	70	100	130	
CMRR	$V_{CM} = 0$ to 12V $V_{IN} = 15\text{V}$	60	70		60	70		dB
AVOL	Pin 12 = Open $V_{CM} = 0$	72	80		72	80		
Output Saturation	$I_L = -10\text{mA}$	0.2	0.5		0.2	0.5		V
Output Leakage	$V_{IND} = 40\text{V}$	0.01	1		0.01	1		$\mu\text{A}$
Small Signal Bandwidth	$A_V = 0\text{dB}$ $T_J = 25^\circ\text{C}$	5			5			MHz
Propagation Delay	$V_{\text{overdrive}} = 100\text{mV}$ $T_J = 25^\circ\text{C}$	200			200			ns

**NOTES**

- Test Conditions unless otherwise stated:  
 $V_{IN} = 10\text{V}$   
 $T_J = -55$  to  $+125^\circ\text{C}$  for IP1543  
 $T_J = 0$  to  $+70^\circ\text{C}$  for IP3543

APPLICATIONS INFORMATION

Typical Application



$$\text{Current Limit } V_{TH} \approx \frac{1000}{R_1}$$

$C_S$  is determined by the current loop dynamics.

$$\text{Peak Current to load } I_p \approx \frac{V_{TH}}{R_{SC}} + \frac{V_D}{R_{SC}} \left( \frac{R_2}{R_2 + R_3} \right)$$

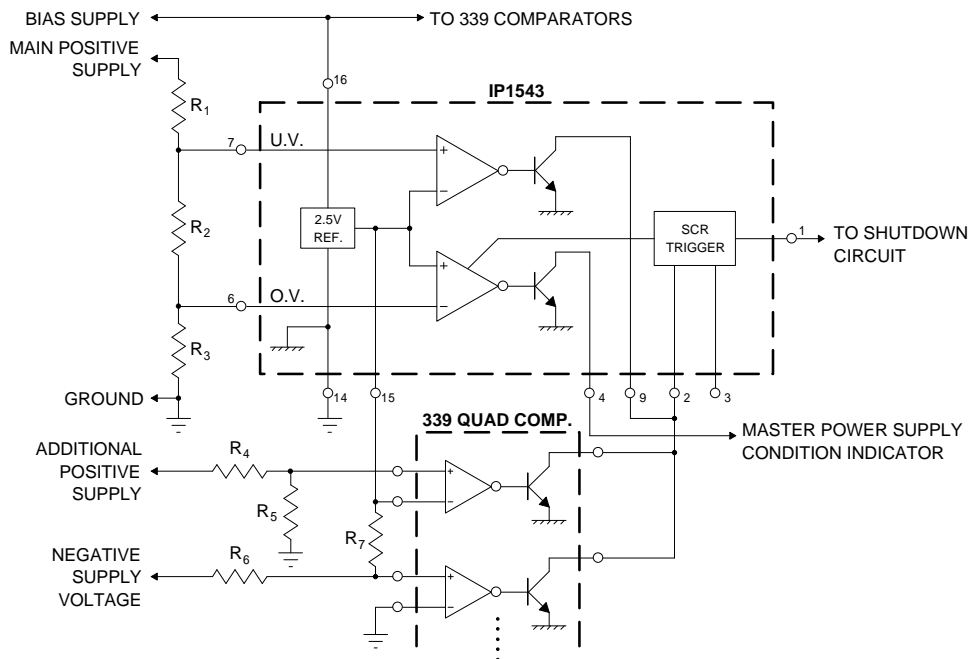
$$\text{Low Output Voltage Limit } V_{O(\text{low})} = \frac{2.5 (R_4 + R_5 + R_6)}{R_5 + R_6}$$

$$\text{High Output Voltage Limit } V_{O(\text{high})} = \frac{2.5 (R_4 + R_5 + R_6)}{R_6}$$

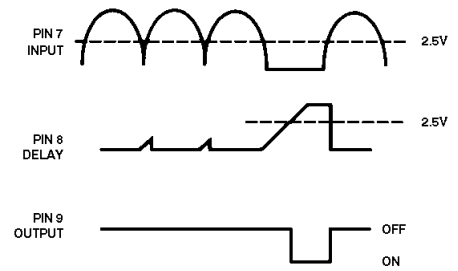
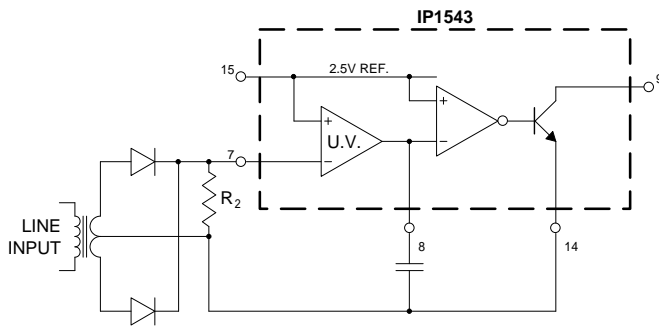
Voltage Sensing Delay  $T_D = 10000 C_D$

SCR trigger power limiting resistor  $R_G > \frac{V_{IN} - 5}{0.2}$

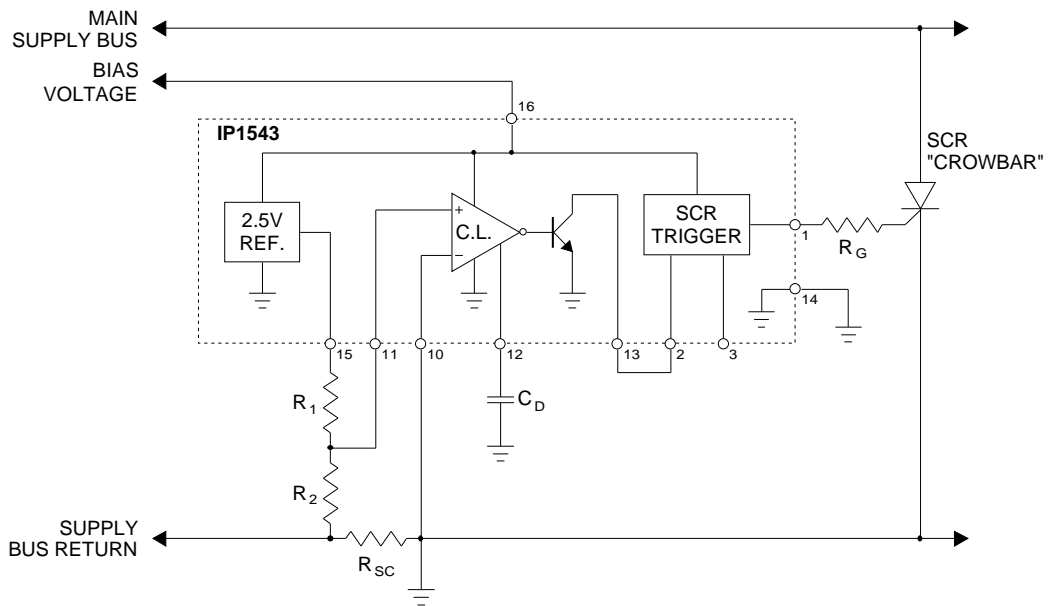
Sensing Multiple Supply Voltages



**Input Line Monitor**

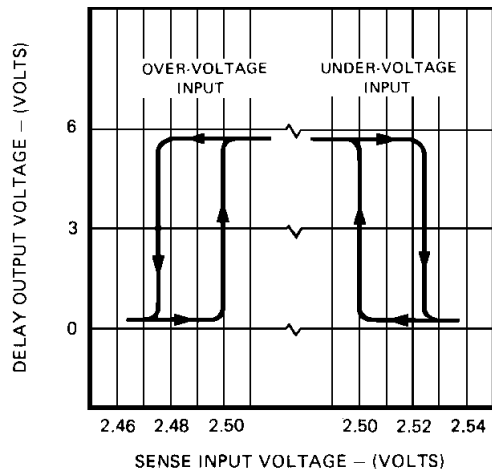


**Overcurrent Shutdown**

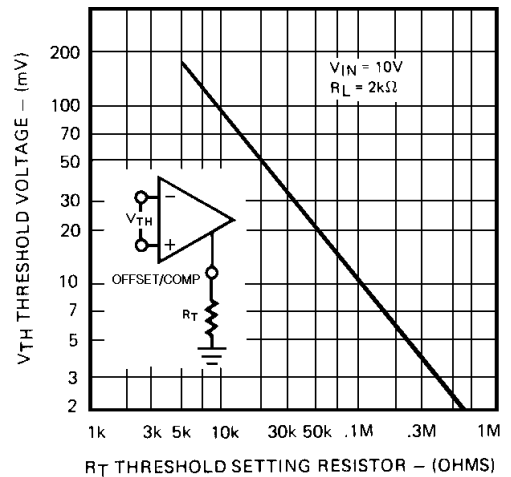


TYPICAL PERFORMANCE CHARACTERISTICS

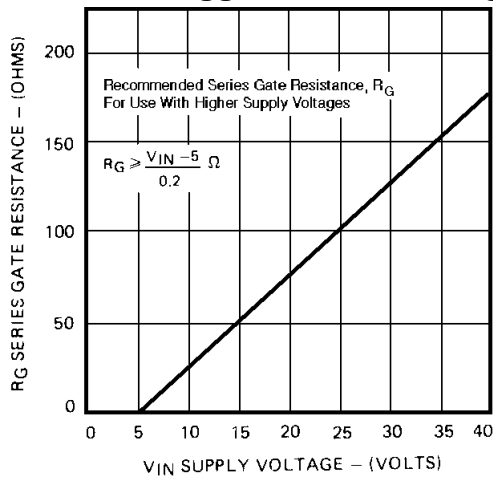
Comparator Input Hysteresis



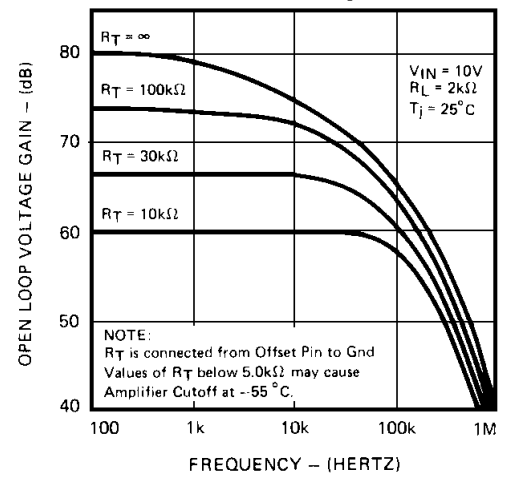
Comparator Input Hysteresis



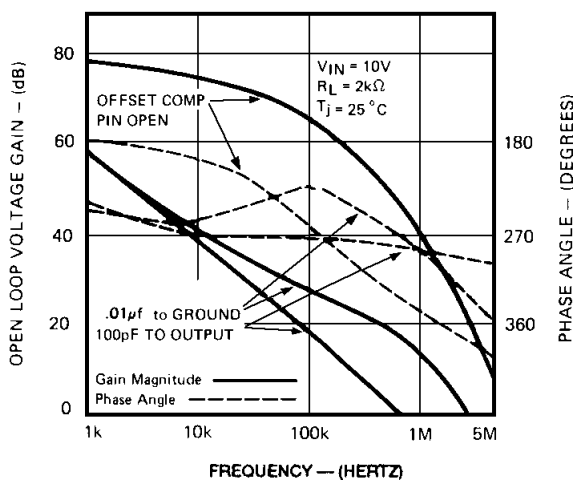
SCR Trigger Power Limiting



Current Limit Amplifier Gain



Current Limit Amplifier Frequency Response



Activation Delay vs Capacitor Value

