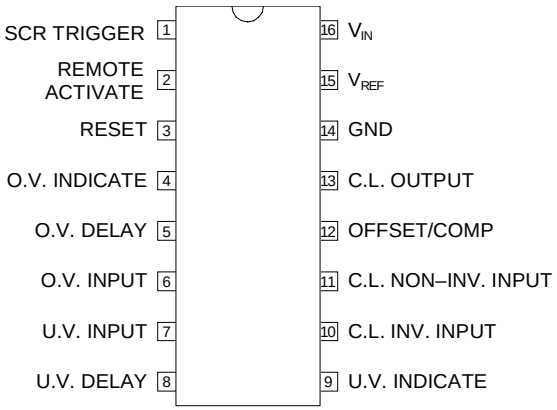
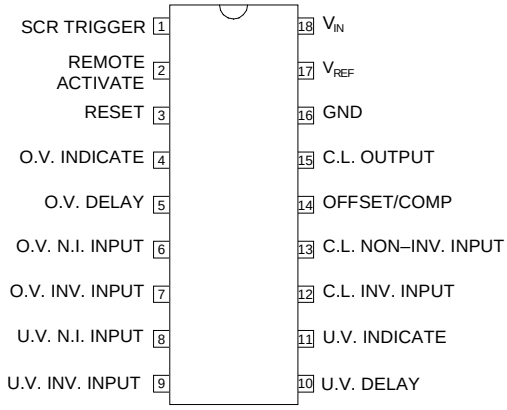
IP1543 SERIES
IP1544 SERIES

IP1543 SERIES



IP1544 SERIES



POWER SUPPLY SUPERVISORY CIRCUITS

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**
- **Uncommitted comparator inputs for low voltage sensing (IP1544 series only)**

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

$+V_{IN}$	Input Supply Voltage		40V
	Sense Inputs		V_{IN}
	SCR Trigger Current		Internally Limited
	Indicator Output Voltage		+40V
	Indicator Output Sink Current		50mA
P_D	Power Dissipation	T_A = 25°C	1W
		Derate @ T_A > 50°C	10mW/°C
P_D	Power Dissipation	T_C = 25°C	2W
		Derate @ T_C > 25°C	16mW/°C
T_J	Operating Junction Temperature		See Ordering Information
T_{STG}	Storage Temperature Range		–65 to +150°C
T_L	Lead Temperature	(soldering, 10 seconds)	+300°C

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IP1543 SERIES
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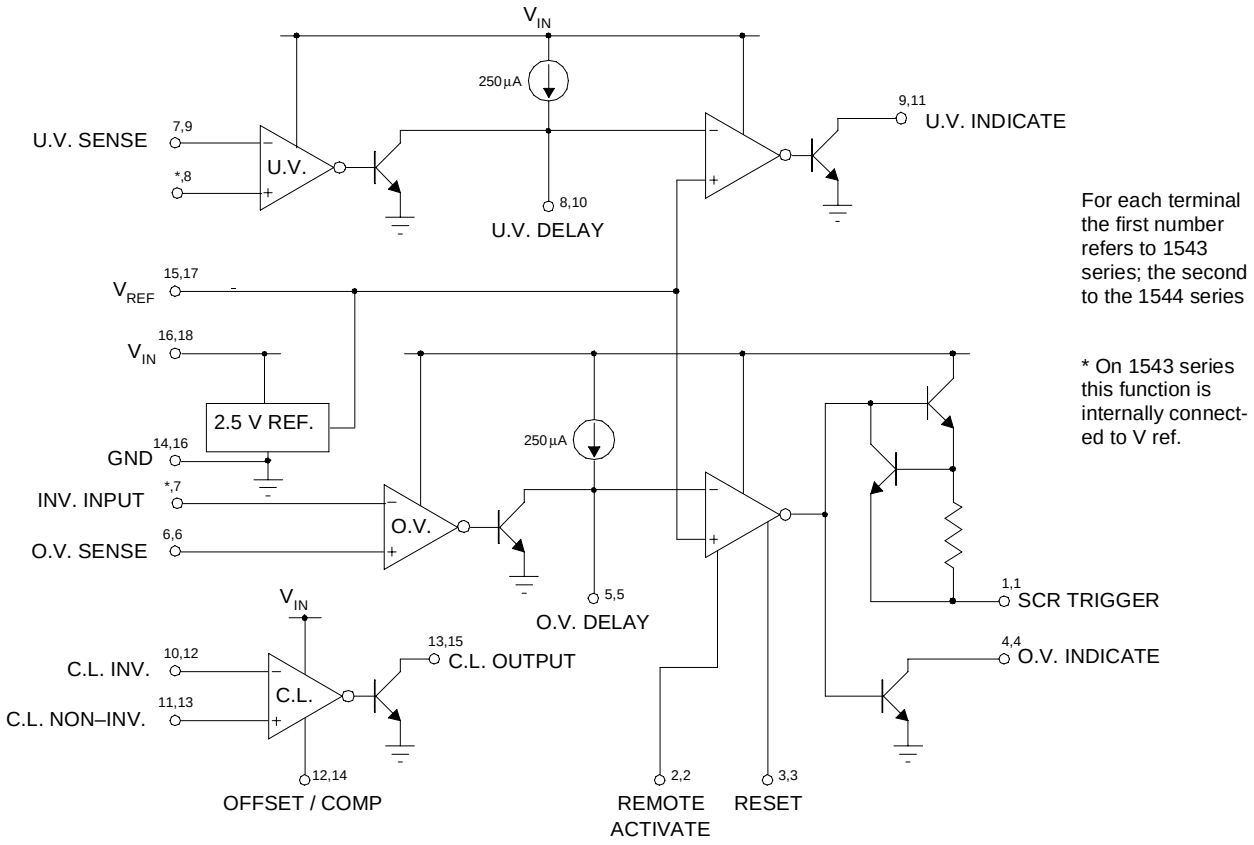
DESCRIPTION

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 ±1%.

The IP1544 and IP3544 circuits contain all of the features of the IP1543 series and have the added flexibilty of the completely uncommitted inputs to the O.V. and U.V. sensing comparators so that voltages less than 2.5V may be monitored by dividing down the reference voltage

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	IP1544	–55 to +125°C
		IP3543	IP3544	0 to +70°C

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

Parameter	Test Conditions	IP1543 / IP1544			IP3543 / IP3544			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
	REFERENCE SECTION							
Output Voltage	T_J = 25°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	Over Operating Range		50			50		ppm/°C
	SCR TRIGGER SECTION							
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 = 50Ω T_J = 25°C		400			400		mA/µs
Prop. Delay from Pin 2	C_D = 0 V_{PIN2} = 0.4V T_J = 25°C		300			300		ns
Prop. Delay from Pin 6	V_{PIN6} = 2.7V T_J = 25°C		500			500		ns
	COMPARATOR SECTIONS							
Input Threshold (Input Voltage Rising on Pin 6, Falling on Pin 7)	T_J = 25°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°C		25			25		mV
Input Bias Current	Sense Input = 0V		–0.3	–1		–0.3	–1	µA
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	µA

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

Parameter	Test Conditions	IP1543 / IP1544 Min.	IP1543 / IP1544 Typ.	IP1543 / IP1544 Max.	IP3543 / IP3544 Min.	IP3543 / IP3544 Typ.	IP3543 / IP3544 Max.	Units
COMPARATOR SECTIONS (cont.)								
Indicate Saturation	I_L = –10mA		0.2	0.5		0.2	0.5	V
Indicate Leakage	V_{IND} = 40V		0.01	1		0.01	1	µA
Propagation Display	V_{PIN6} = 2.7V, V_{PIN7} = 2.3V, C_D = 0, T_J = 25°C		400			400		ns
	V_{PIN6} = 2.7V, V_{PIN7} = 2.3V, C_D = 1µF, T_J = 25°C		10			10		ms
CURRENT LIMIT SECTION								
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	µA
Input Offset Voltage	Pin 12 = Open, V_{CM} = 0		0	10		0	15	mV
	10kΩ from Pin 12 to Gnd	70	100	130	70	100	130	
CMRR	V_{CM} = 0 to 12V, V_{IN} = 15V	60	70		60	70		dB
AVOL	Pin 12 = Open, V_{CM} = 0	72	80		72	80		
Output Saturation	I_L = –10mA		0.2	0.5		0.2	0.5	V
Output Leakage	V_{IND} = 40V		0.01	1		0.01	1	µA
Small Signal Bandwidth	A_V = 0dB, T_J = 25°C		5			5		MHz
Propagation Delay	$V_{overdrive}$ = 100mV, T_J = 25°C		200			200		ns

NOTES

1. Test Conditions unless otherwise stated:
   V_{IN} = 10V
   T_J = –55 to +125°C for IP1543 / IP1544
   T_J = 0 to +70°C for IP3543 / IP354

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
IP1544	✔			-55 to +125°C
IP3544	✔	✔	✔	0 to +70°C

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

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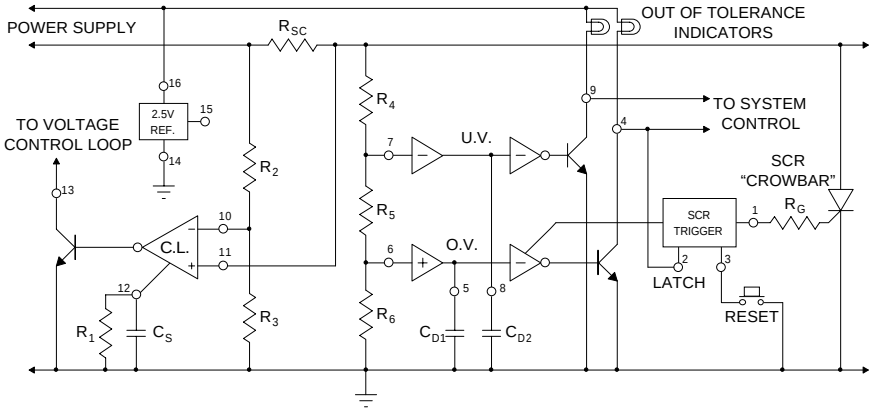
APPLICATIONS INFORMATION

Typical Application



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

C_S is determined by the current loop dynamics.

Peak Current to load $I_P \cong \frac{V_{TH}}{R_{SC}} + \frac{V_O}{R_{SC}} \left(\frac{R_2}{R_2 + R_3} \right)$

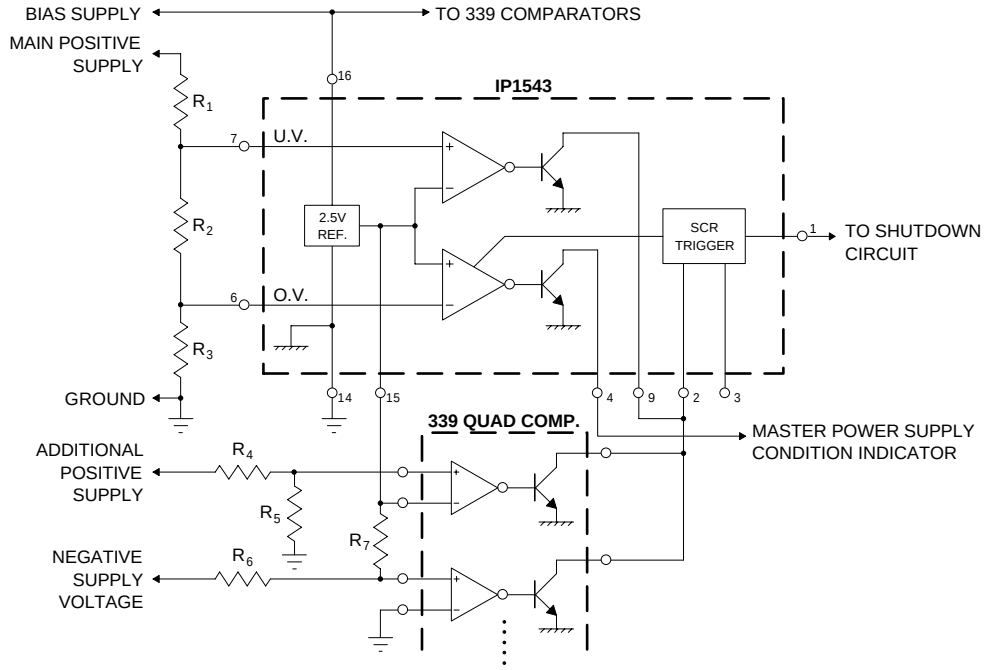
Low Output Voltage Limit $V_{O(low)} = \frac{2.5\,(R_4 + R_5 + R_6)}{R_5 + R_6}$

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

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



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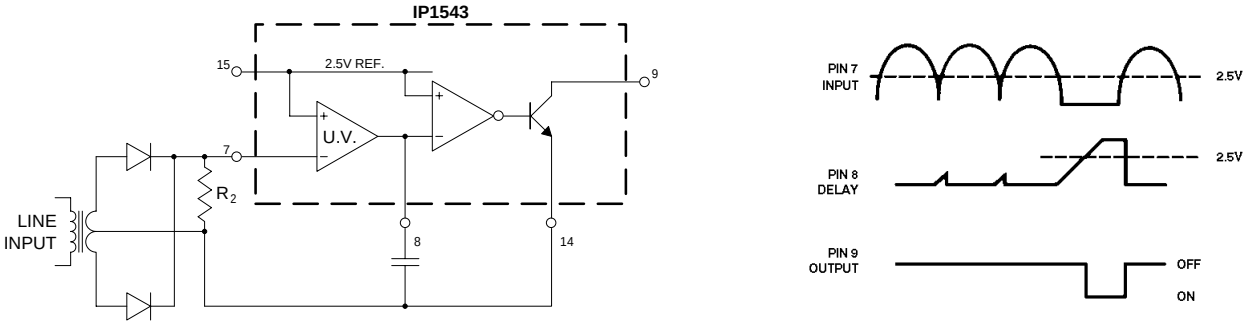
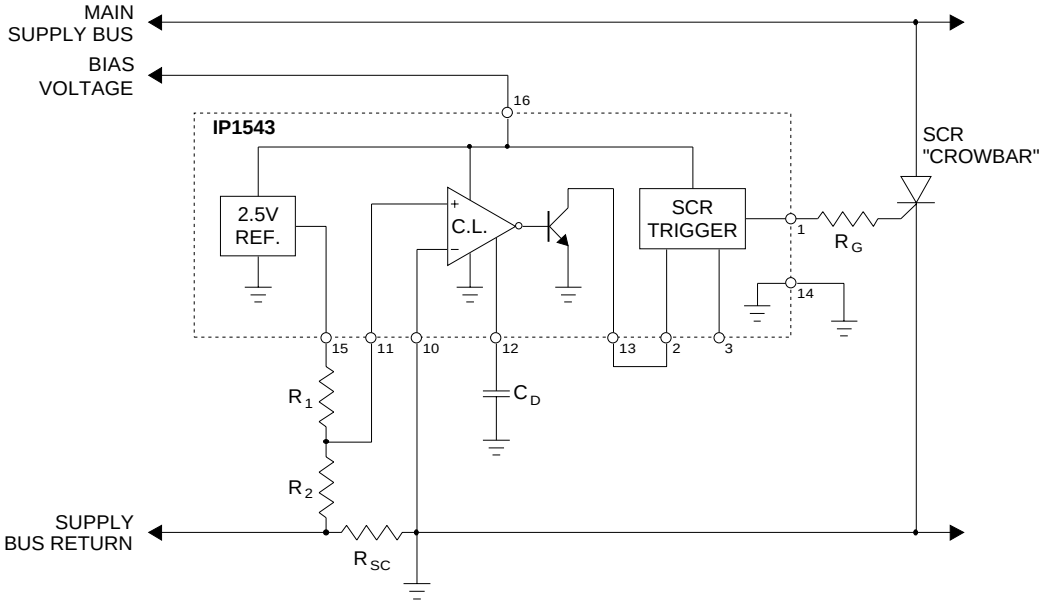
Input Line Monitor



Overcurrent Shutdown



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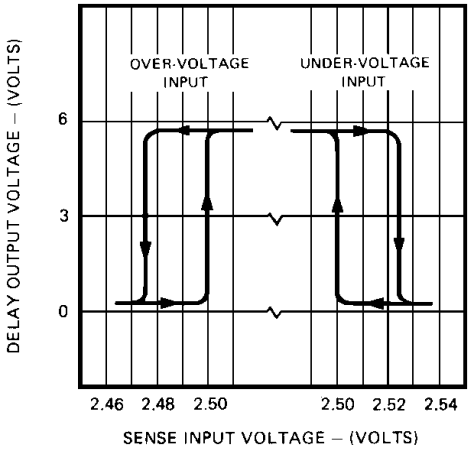
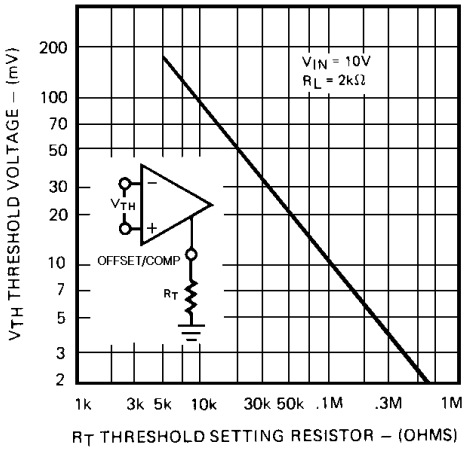
TYPICAL PERFORMANCE CHARACTERISTICS

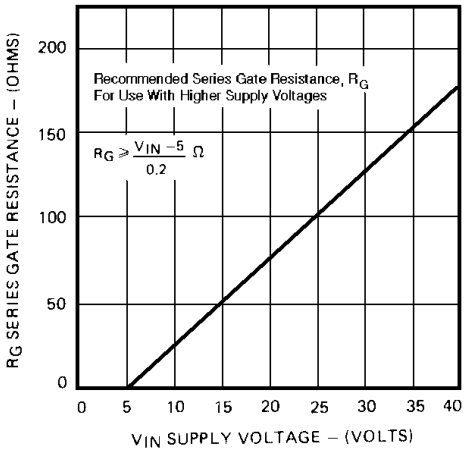
Comparator Input Hysteresis



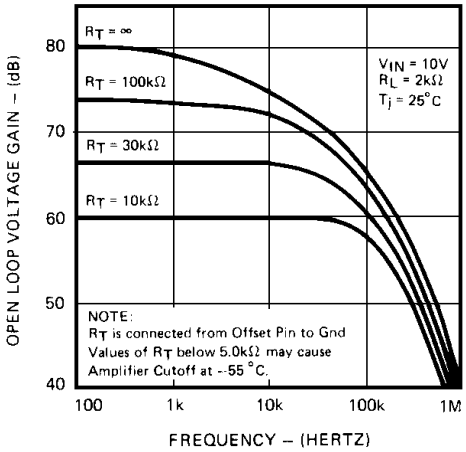
Comparator Input Hysteresis



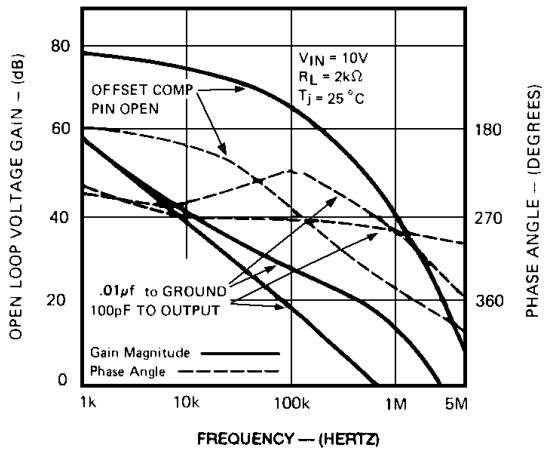
SCR Trigger Power Limiting



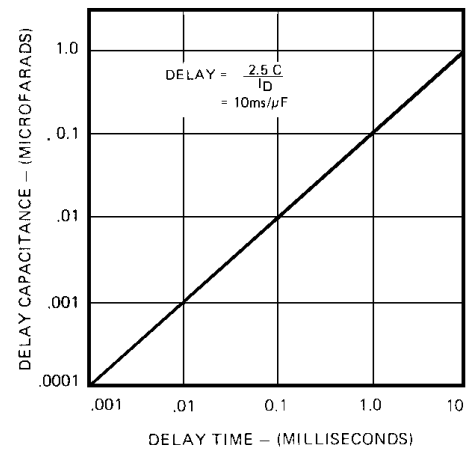
Current Limit Amplifier Gain



Current Limit Amplifier Frequency Response



Activation Delay vs Capacitor Value



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