SG1549 / SG2549 / SG3549

DESCRIPTION

This monolithic integrated circuit is an analog latch device with digital reset. It was specifically designed to provide pulse-by-pulse current limiting for switch-mode power supply systems, but many other applications are also feasible. Its function is to provide a latching switch action upon sensing an input threshold voltage, with reset accomplished by an external clock signal. This device can be interfaced directly with many kinds of pulse width modulating control IC's, including the SG1524. SG1525A and SG1527A.

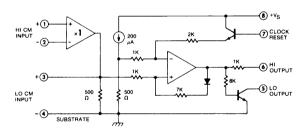
The input threshold for the latch circuit is 100mV, which can be referenced either to ground or to a wide-ranging positive voltage. There are high- and low-going output signals available, and both the supply voltage and clock signal can be taken directly from an associated PWM control chip.

With delays in the range of 200 nanoseconds, this latch circuit is ideal for fast-reaction sensing to provide overall current limiting, short circuit protection, or transformer saturation control.

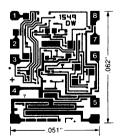
FEATURES

- · Current sensing with 100mV threshold
- Common-mode input at ground or to 40V
- Complementary outputs
- Automatic reset from PWM clock
- 180nS delay
- Interface direct to SG1524, SG1525A, SG1527A

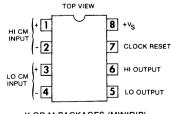
BLOCK DIAGRAM



CHIP LAYOUT



CONNECTION DIAGRAM



Y OR M PACKAGES (MINIDIP)

SG1549 / SG2549 / SG3549

ABSOLUTE MAXIMUM RATINGS

Input Supply Voltage, V _S	25V	Operating Temperature Range	
HI CM Input Voltage	40V	SG1549 Y	-55°C to +125°C
LO Output "off" voltage	40V	SG2549 Y or M	
LO Output "on" current	25mA	SG2549 Y OF M	-25°C to +85°C
Power Dissipation	600mW	SG3549 Y OF M	0°C to +70°C
Derate above 25°C	5.0 mW/°C	Storage Temperature Range	-65°C to +150°C

ELECTRICAL CHARACTERISTICS

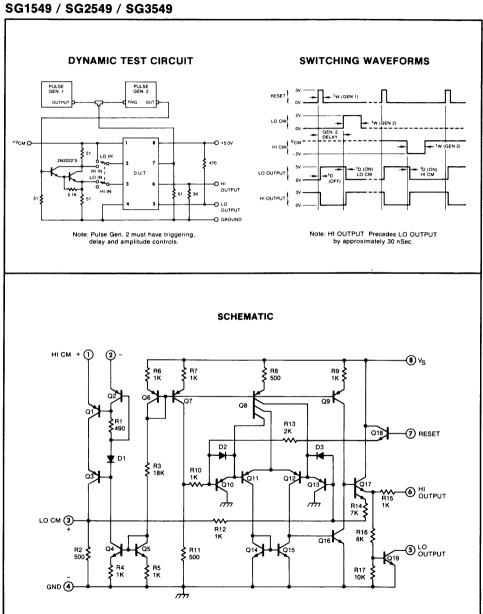
(Unless otherwise stated, these specifications apply over the operating temperature range, with $V_S = +5.0$ volts, and with the circuit unlatched, or reset.)

		SG1549/2549			SG3549			
PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	MIN	TYP	MAX	UNITS
CM Input	(Note 1)							
Threshold Voltage	Pin 1 & 2 shorted	90	100	110	80	100	120	mV
Input Impedance	V(Pin 3) = 50mV	400	500	600	400	500	600	Ω
HI CM Input	(Note 1)							
Threshold Voltage	VCM = 2V, Pin 3 open	90	100	110	80	100	120	mV
Threshold Voltage	VCM = 40V, Pin 3 open	90	100	110	80	100	120	mV
Input Current	V(Pin 1) = V(Pin 2) = 40V	_	200	300	_	200	300	μΑ
Clock Reset								
Min. Trigger Voltage		_	2.0	2.5	-	2.0	2.5	V
Input Current	V(Pin 7) = 4V	_	20	40	-	20	40	μΑ
HI Output								
Off Voltage		_	0	0.1	I -	0	0.1	V
On Voltage	IL = 1mA	2.8	3.2	_	2.8	3.2		V
LO Output								
Off Leakage	V(Pin 5) = 40V	_	.01	1.0	_	.01	1.0	μΑ
On Voltage	I _L = -10mA		.3	0.5	-	.3	0.5	V
Supply Current	V(Pin 8) = 5V	_	2	3	_	2	5	mA
Supply Current	V(Pin 8) = 20V	_	10	15	-	10	15	mA

Note 1: Input threshold voltages and supply current are directly proportional to supply voltage, V_S.

TYPICAL SWITCHING CHARACTERISTICS VS = 5V, TA = 25°C

PARAMETER	SYMBOL	CONDITIONS	TYPICAL	UNITS	
Reset Minimum Pulse Width	tw1	Amplitude = 3.0V	150	nSec	
Delay from Reset to LO Output	t _D (off)	$R_L = 470\Omega$ to V_S	300	nSec	
LO Input Minimum Pulse Width	tw2	Amplitude = 200mV	50	nSec	
Delay from LO Input to LO Output	t _D (on) LO CM	Amplitude = 200 mV R _L = 470Ω to V _S	180	nSec	
Delay from HI Input to LO Output	t _D (on) HI CM	Amplitude = 200mV V _{CM} = 5V	300	nSec	
Delay from HI Output to LO Output		LO CM Input = 200mV	30	nSec	



SG1549 / SG2549 / SG3549 APPLICATIONS

HIGH LINE SENSING — The SG1549 will provide current sensing in the positive supply line in the typical SG1524 single-ended switching regulator application shown in Figure 1. The HI CM sense circuitry can be used with input voltages between 2 and 40 volts.

A value for R_{SC} is determined by dividing the 100mV input threshold by the peak current desired. High-frequency noise, or switching transients, can usually be eliminated by a small capacitor between pins 3 and 4.

Current control may be accomplished by either the HI OUTPUT pin connected to the SG1524's Shutdown pin, or the LO OUTPUT pin connected directly to the Compensation Terminal. In either case, activation of the current sense latch will tend to discharge the compensation capacitor, CC, which may cause slow recovery from pulse limiting. If this feature is desired, the LO OUTPUT pin may be used to discharge a soft-start network instead of coupling directly to the SG1524. If it is not desired, the use of a small value of CC, and perhaps a diode across RC, will enhance recovery.

Another method of introducing the current shutdown signal is shown in Figure 2 where the SG1524 is used to activate a constant drive current to the high-current switch, in this case an SM600. The 2N2222 forms a constant current generator when driven from the SG1524's 5.0 volt reference through a 1K resistor. This transistor is then switched off by the LO OUTPUT transistor in the SG1549, achieving the fastest response to the output of the regulator.

LOW LINE SENSING — In many types of feed-forward or push-pull converters, current protection may be provided by sensing in an emitter resistor referenced to ground on the primary side of an output transformer. The fast-reacting SG1549 can easily sense secondary overload as reflected back to the primary and, additionally, provide protection from unbalanced transformer saturation.

When using the LO CM inputs, the HI CM inputs should be shorted together. While the LO CM inputs may be connected directly across a sense resistor, RSC, a small low-pass filter as shown in Figure 3 is often required to eliminate high frequency transients. It must be remembered that the 500 ohm input impedance at the LO CM terminals will cause the use of R1 to increase the effective threshold; however, this also offers the possibility of an easily adjustable threshold by incorporating a potentiometer at the input.

Coupling the output signal from the SG1549 to the control chip may be done in several ways including the use of either the Compensation or Shutdown pins on the SG1524 as described earlier.

Another convenient way to tie the output of the SG1549 into the PWM control in higher power applications is by using the SG1627 Dual Interface Driver and connecting the LO OUTPUT terminal of the SG1549 directly to the two Non-Inverting inputs of the SG1627 as shown in Figure 4.

And finally, keep in mind that the LO OUTPUT terminal of the SG1549 will easily drive most high-speed optical couplers should some type of isolation between current sense and shutdown control be required.

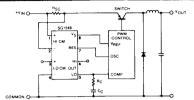


Figure 1 — High Line sensing with the SG1549 in conjunction with an SG1524 PWM control IC.

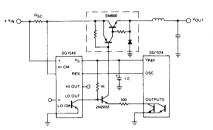


Figure 2 — Current control for a buck regulator with constant drive current.

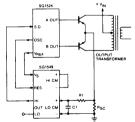


Figure 3 — A push-pull converter with low-line emitter current sensing.

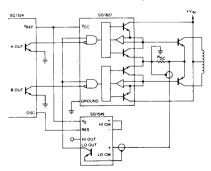


Figure 4 — Power Boost and current control with the SG1627.