

SWITCHED-MODE POWER SUPPLY CONTROL CIRCUITS**SG1526A/2526A/3526A****Preliminary****DESCRIPTION**

SPECIFICALLY DESIGNED for use in fixed-frequency switching regulators and other power control applications, these Switched-Mode Power Supply Control Circuits can be used to implement single-ended or push-pull switching regulators of either polarity, both transformerless and transformer coupled.

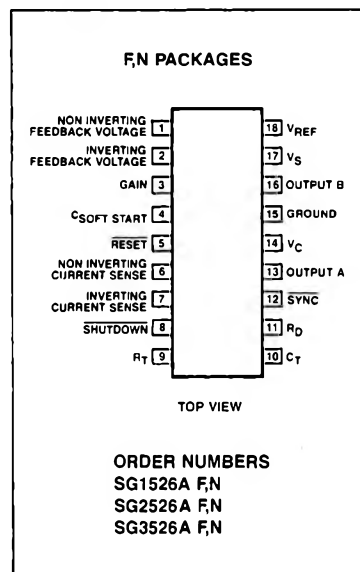
Included in these monolithic integrated circuits are a temperature-compensated voltage reference, sawtooth oscillator, error amplifier, pulse-width modulator, pulse metering and steering logic, and two 200 mA source/sink power drivers. Also included are housekeeping functions such as soft-start and low supply voltage lockout, digital current limiting, double-pulse inhibit, a data latch for single-pulse metering, adjustable deadtime, and provision for symmetry correction inputs.

For ease of interface, all digital inputs are TTL and CMOS compatible. Active LOW logic allows wired-OR connections for maximum flexibility.

The SG1526A is supplied in an 18-pin glass/ceramic (cer-DIP) hermetic package and is characterized for operation over the full temperature range of -55°C to $+125^{\circ}\text{C}$, allowing its use in military and aerospace applications. The SG2526A is rated for operation over the extended range of -40°C to $+85^{\circ}\text{C}$ recommending it for many industrial applications. The low-cost SG3526A is rated for continuous operation over the commercial temperature range of 0°C to $+70^{\circ}\text{C}$. The extended and commercial versions are furnished in either the cer-DIP package or a dual in-line plastic package with copper alloy lead frame for improved heat dissipation.

FEATURES

- 8 to 35 V Operation
- Dual 100 mA Source/Sink Outputs
- Stabilized Power Supply
- Current Limiting
- Temperature Compensated Reference Source
- Sawtooth Generator
- Low Supply Voltage Protection
- External Synchronization
- Double-Pulse Suppression
- Programmable Deadtime
- Programmable Soft Start
- 18-Pin Dual In-Line Plastic Package Or 18-Pin Cer-DIP Hermetic Package

PIN CONFIGURATION**ABSOLUTE MAXIMUM RATINGS**

PARAMETER	RATING	UNIT
Supply Voltage, V_{S}	40	V
Collector Supply Voltage, V_{C}	40	V
Logic Input Voltage Range, V_{IN}	-0.3 to +5.5	V
Analog Input Voltage Range, V_{IN}	-0.3 V to V_{S}	V
Output Current, I_{O}	± 200	mA
Reference Load Current, I_{REF}	50	mA
Logic Sink Current, I_{IN}	15	mA
Package Power Dissipation, P_{D} (Plastic DIP) (Cer-DIP)	2.3 1.9	W^{*1}
Storage Temperature Range, T_{S}	-65 to +150	$^{\circ}\text{C}$

NOTE:

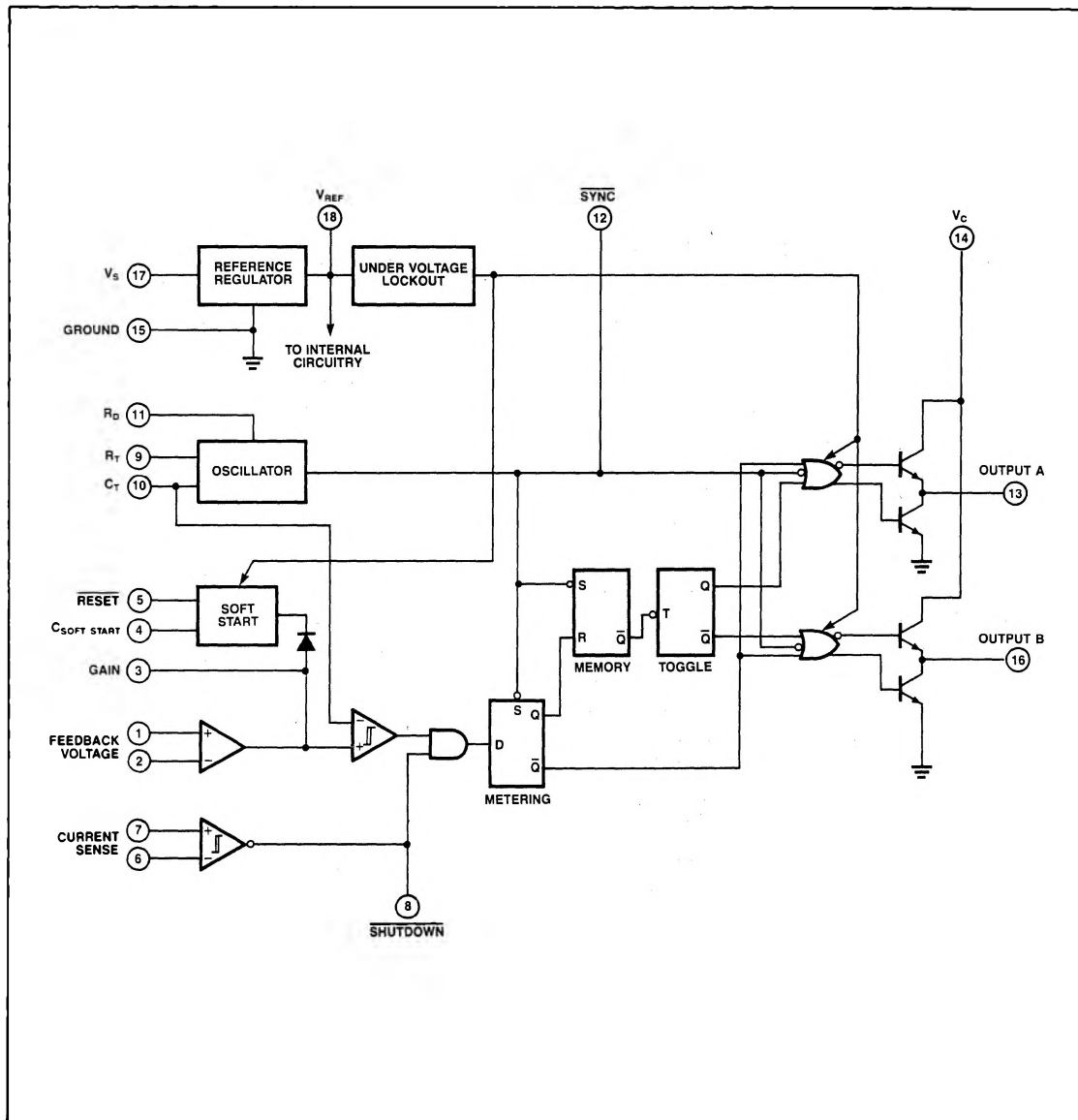
*¹Derate linearly to 0 watts at $T_{\text{A}} = +150^{\circ}\text{C}$.

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BLOCK DIAGRAM



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ELECTRICAL CHARACTERISTICS over operating temperature range, V_S 15 V (unless otherwise noted).

CHARACTERISTIC	TEST PINS	TEST CONDITIONS	LIMITS						UNITS
			SG1526A & SG2526A			SG3526A			
			Min.	Typ.	Max.	Min.	Typ.	Max.	
REFERENCE SECTION ($I_L = 0$ mA)									
Reference Voltage	18	$T_A = +25^{\circ}\text{C}$	4.95	5.00	5.05	4.90	5.00	5.10	V
		Over Recommended Conditions	4.90	5.00	5.10	4.85	5.00	5.15	V
Ref. Volt. Regulation	18	$V_S = 8$ to 35 V	—	10	20	—	10	30	mV
		$I_L = 0$ to 20 mA	—	10	30	—	10	50	mV
		Over Oper. Temp. Range	—	15	50	—	15	50	mV
Short Circuit Current	18	$V_{\text{REF}} = 0$ V	25	50	100	25	50	100	mA
Standby Current	17	$V_S = 35$ V, $R_T = 4.22$ k Ω , $V_S = 0.4$ V	—	18	—	—	18	—	mA
OSCILLATOR SECTION ($f = 40$ kHz, $R_T = 4.22$ k Ω , $C_T = 0.01$ μF , $R_D = 0$ Ω)									
Oscillator Frequency	9, 10	$R_T = 150\Omega$, $C_T = 20$ μF	—	—	1.0	—	—	1.0	Hz
		$R_T = 2\text{k}\Omega$, $C_T = 0.001$ μF	400	—	—	400	—	—	kHz
Initial Osc. Accuracy	9, 10	$T_A = +25^{\circ}\text{C}$	—	3.0	—	—	3.0	—	%
Osc. Stability	9, 10	$V_S = 8$ to 35 V	—	0.5	—	—	0.5	—	%
		Over oper. Temp. Range	—	1.0	—	—	1.0	—	%
		Other Recommended Conditions	—	2.0	—	—	2.0	—	%
Sawtooth Peak Voltage	12	$V_S = 35$ V	—	3.0	3.5	—	3.0	3.5	V
Sawtooth Valley Volt.	12	$V_S = 8.0$ V	0.5	1.0	—	0.5	1.0	—	V
Sync. Pulse Width	12	$C_L = 15$ pF	—	500	—	—	500	—	ns
ERROR AMPLIFIER ($V_{\text{CM}} = 0$ to 5.2 V)									
Input Offset Voltage	1, 2	$R_S = 2$ k Ω	—	2.0	5.0	—	2.0	5.0	mV
Input Bias Current	1, 2		—	–350	–1000	—	–350	–2000	nA
Input Offset Current	1, 2		—	35	100	—	35	200	nA
Error Amp Gain	1–3	Open Loop, $R_L = 10$ M Ω	64	72	—	60	72	—	dB
Small Signal BW	1–3	$C_L = 30$ pF	0.7	1.0	—	0.7	1.0	—	MHz
Output Voltage Swing	3	Positive Limit, $R_L = 50$ k Ω	3.6	4.2	—	3.6	4.2	—	V
		Negative Limit, $R_T = 50$ k Ω	—	0.2	0.4	—	0.2	0.4	V
Common Mode Range	1, 2	$V_S = 8.0$ V	0	—	5.2	0	—	5.2	V
Common Mode Rejection	1, 2	$R_S = 10$ k Ω	70	94	—	70	94	—	dB
Error Amp. V_S Rej.	3	$f = 120$ Hz, $\Delta V_S = 1$ Vrms	66	80	—	66	80	—	dB
HOUSEKEEPING FUNCTIONS									
Logic Voltage Levels	5, 8, 12	Logic HIGH, $I_{\text{SOURCE}} = -40$ μA	2.4	4.0	—	2.4	4.0	—	V
		Logic LOW, $I_{\text{SINK}} = 3.6$ mA	—	0.2	0.4	—	0.2	0.4	V
Input Current	5, 8, 12	$V_{\text{IN}} = 2.4$ V	—	–125	–200	—	–125	–200	μA
		$V_{\text{IN}} = 0.4$ V	—	–225	–360	—	–225	–360	μA
Shutdown Delay	8–13, 16	100mV step, 5mV overdrive, $R_S = 50\Omega$	—	300	—	—	300	—	ns
CURRENT LIMITING									
Common Mode Range	6, 7	$V_S = 18$ V	0	—	15	0	—	15	V
Sense Voltage	6, 7	$V_{\text{CM}} = 0$ to 15 V	—	100	—	—	100	—	mV
Input Current	6, 7	$V_{\text{CM}} = 0$ to 15 V	—	–3.0	—	—	–3.0	—	μA
Voltage Gain	7–8	$I_S = 360$ μA	—	68	—	—	68	—	dB

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ELECTRICAL CHARACTERISTICS over operating temperature range, V_S 15 V (unless otherwise noted). (Cont'd)

CHARACTERISTIC	TEST PINS	TEST CONDITIONS	LIMITS						UNITS
			SG1526A & SG2526A			SG3526A			
			Min.	Type.	Max.	Min.	Typ.	Max.	
SOFT START SECTION									
Error Clamp Voltage	—	V _S = 0.4 V	—	100	400	—	100	400	mV
C _S Charging Current	4	V _S = 2.4 V	—	100	—	—	100	—	μA
OUTPUT DRIVERS (V _C = 15 V)									
Output Voltage	12, 16	I _{OUT} = -20 mA	12.5	13.5	—	12.5	13.5	—	V
		I _{OUT} = -100 mA	—	13	—	—	13	—	V
		I _{OUT} = 20 mA	—	0.2	0.3	—	0.2	0.3	V
		I _{OUT} = 100 mA	—	1.2	—	—	1.2	—	V
Leakage Current	12, 16	V _C = 40 V	—	0.1	100	—	0.1	100	μA
Rise Time	12, 16	C _L = 1000 pF	—	300	—	—	300	—	ns
Fall Time	12, 16	C _L = 1000 pF	—	200	—	—	200	—	ns

NOTES:

Negative current is defined as coming out of (sourcing) the specified device pin.

*Commercial, extended, and full temperature range devices are defined on page 2.

RECOMMENDED OPERATING CONDITIONS

Logic Supply Voltage, V_S	8 V to 35 V
Collector Voltage, V_C	4.5 V to 35 V
Output Load Current, I_O	0 to ± 100 mA
Reference Load Current, I_L	0 to 20 mA
Oscillator Frequency, f	1 Hz to 400 kHz
Oscillator Timing Resistance, R_T	2 k Ω to 150 k Ω
Oscillator Timing Capacitance, C_T	0.001 μ F to 20 μ F
Programmed Deadtime	3% to 50%