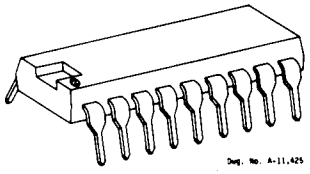
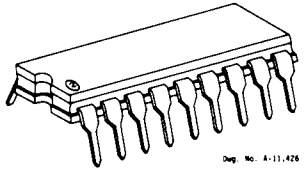
SERIES 8126
(SG3526J, SG2526J AND SG1526J)
SWITCHED-MODE POWER SUPPLY CONTROL CIRCUITS

FEATURES

- 8 V to 35 V Operation
- Dual 100 mA Source/Sink Outputs
- Internal Regulator
- Current Limiting
- Temperature-Compensated Reference Source
- Sawtooth Generator
- Low Supply-Voltage Protection
- External Synchronization
- Double-Pulse Suppression
- Programmable Dead-Time
- Programmable Soft-Start



ULN-8126A
ULQ-8126A



ULN-8126R/SG3526J
ULQ-8126R/SG2526J
ULS-8126R/SG1526J

THESE INTEGRATED CONTROLLERS of fixed-frequency switching regulators and similar power devices can be used with transformerless or transformer-coupled supplies with single-ended or push-pull, positive or negative output.

Types ULN-8126A/R, ULQ-8126A/R, and ULS-8126R have a temperature-compensated voltage reference, a sawtooth waveform generator, an error amplifier, a pulse-width modulator, pulse metering and steering logic and two 100 mA source/sink drivers. The devices perform housekeeping functions such as soft-start, low-voltage lockout, digital current limiting and double-pulse suppression. Other features include a data latch for single pulse metering, adjustable dead time and provision for symmetry correction.

(Continued on next page)

ABSOLUTE MAXIMUM RATINGS
at T_A = +25°C

Supply Voltage, V_S	40 V
Collector Supply Voltage, V_C	40 V
Logic Input Voltage Range, V_{IN}	−0.3 V to +5.5 V
Analog Input Voltage Range, V_{IN}	−0.3 V to V_S
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)	2.3 W*
(Cer-DIP)	1.9 W*
Operating Temperature Range, T_A	See Ordering Data
Storage Temperature Range, T_S	−65°C to +150°C

*Derate linearly to 0 watts at T_A = +150°C.

All digital inputs are TTL and CMOS compatible. Active-low logic allows use of wired-OR connections.

Type ULS-8126R is supplied in an 18-pin glass/ceramic hermetically sealed (cer-DIP) package. It is rated for operation over a temperature range that recommends its use in military and aerospace applications (−55°C to +125°C).

Types ULQ-8126A and ULQ-8126R operate over an extended temperature range of −40°C to +85°C that meets the demands of many industrial applications.

Low-cost Types ULN-8126A and ULN-8126R are rated for continuous operation over a temperature range that recommends them for commercial use (0°C to +70°C).

Control circuits with commercial and extended temperature ranges are available in both the hermetically sealed cer-DIP package (suffix "R") and a dual in-line plastic package (suffix "A") with a copper alloy lead frame that gives them enhanced power dissipation ratings.

Cer-DIP packaged parts normally are marked with original source part numbers shown below. Sprague part numbers appear on plastic packages. Sprague part numbers should be used on orders and correspondence concerning all Series 8126 devices.

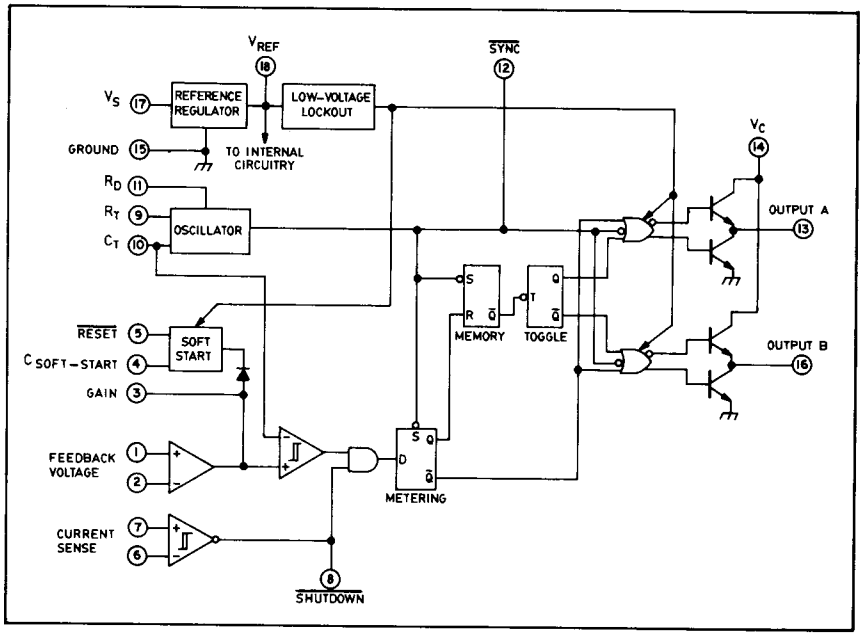
ORDERING INFORMATION

Operating Temperature Range	Package	Original Source Part Number	Sprague Part Number
Commercial 0°C to +70°C	Cer-DIP	SG3526J	ULN-8126R
	Plastic	–	ULN-8126A
Extended −40°C to +85°C	Cer-DIP	SG2526J	ULQ-8126R
	Plastic	–	ULQ-8126A
Full −55°C to +125°C	Cer-DIP	SG1526J	ULS-8126R

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 kΩ to 150 kΩ
Oscillator Timing Capacitance, C_T	0.001 μF to 20 μF
Programmed Deadtime	3% to 50%
Operating Temperature Range, T_A	See Ordering Data

FUNCTIONAL BLOCK DIAGRAM



Dwg. No. A-11,427

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

Characteristic	Test Pins	Test Conditions	Limits: Extended & Full Temperature Devices* Min.	Typ.	Max.	Commercial Temperature Devices* Min.	Typ.	Max.	Units
REFERENCE SECTION (I_L = 0 mA)									
Reference Voltage	18	T_A = +25°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
Reference Voltage 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 operating temperature range	–	15	50	–	15	50	mV
Short Circuit Current	18	V_{REF} = 0 V	25	50	100	25	50	100	mA
Standby Current	17	V_S = 35 V, R_T = 4.22 kΩ, V_8 = 0.4 V	–	18	–	–	18	–	mA
OSCILLATOR SECTION (f = 40 kHz, R_T = 4.22 kΩ, C_T = 0.01 μF, R_D = 0Ω)									
Oscillator Frequency	9,10	R_T = 150kΩ, C_T = 20 μF	–	–	1.0	–	–	1.0	Hz
		R_T = 2 kΩ, C_T = 0.001 μF	400	–	–	400	–	–	kHz
Initial Oscillator Accuracy	9,10	T_A = +25°C	–	3.0	–	–	3.0	–	%
Oscillator Stability	9,10	V_S = 8 to 35 V	–	0.5	–	–	0.5	–	%
		Over operating temperature range	–	1.0	–	–	1.0	–	%
		Over recommended conditions	–	2.0	–	–	2.0	–	%
Sawtooth Peak Voltage	10	V_S = 35 V	–	3.0	3.5	–	3.0	3.5	V
Sawtooth Valley Voltage	10	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
HOUSEKEEPING FUNCTIONS									
Logic Voltage Levels	5,8,12	Logic HIGH, I_{SOURCE} = −40 μA	2.4	4.0	–	2.4	4.0	–	V
		Logic LOW, I_{SINK} = 3.6 mA	–	0.2	0.4	–	0.2	0.4	V
Input Current	5,8,12	V_{IN} = 2.4 V	–	−125	−200	–	−125	−200	μA
		V_{IN} = 0.4 V	–	−225	−360	–	−225	−360	μA
Shutdown Delay	8-13, 16	100 mV step, 5mv overdrive, R_S = 50Ω	–	300	–	–	300	–	ns

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

*Commercial, extended, and full temperature-range devices are defined in preceding text and "Ordering Information" table.

ELECTRICAL CHARACTERISTICS (Continued)

Characteristic	Test Pins	Test Conditions	Limits						Units
			Extended & Full Temperature Devices*			Commercial Temperature Devices*			
			Min.	Typ.	Max.	Min.	Typ.	Max.	
ERROR AMPLIFIER (V_{CM} = 0 to 5.2 V)									
Input Offset Voltage	1,2	R_S = 2 kΩ	–	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 Amplifier Gain	1-3	Open loop, R_L = 10 MΩ	64	72	–	60	72	–	dB
Small Signal Bandwidth	1-3	C_L = 30 pF	0.7	1.0	–	0.7	1.0	–	MHz
Output Voltage Swing	3	Positive limit, R_L = 50 kΩ	3.6	4.2	–	3.6	4.2	–	V
		Negative limit, R_L = 50 kΩ	–	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 kΩ	70	94	–	70	94	–	dB
Error Amplifier V_S Rejection	3	f = 120 Hz, Δ V_S = 1.0 V_{rms}	66	80	–	66	80	–	dB
CURRENT LIMITING									
Common Mode Range	6,7	V_S = 18 V	0	–	15	0	–	15	V
Sense Voltage	6,7	V_{CM} = 0 to 15 V	–	100	–	–	100	–	mV
Input Current	6,7	V_{CM} = 0 to 15 V	–	−3.0	–	–	−3.0	–	μA
Voltage Gain	7-8	I_8 = 360 μA	–	68	–	–	68	–	dB
SOFT-START SECTION									
Error Clamp Voltage	–	V_5 = 0.4 V	–	100	400	–	100	400	mV
C_S Charging Current	4	V_5 = 2.4 V	–	100	–	–	100	–	μA
OUTPUT DRIVERS (V_C = 15 V)									
Output Voltage	13,16	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	13,16	V_C = 40 V	–	0.1	100	–	0.1	100	μA
Rise Time	13,16	C_L = 1000 pF	–	300	–	–	300	–	ns
Fall Time	13,16	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 in preceding text and "Ordering Information" table.

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