

# SWITCHED-MODE POWER SUPPLY CONTROL CIRCUIT

SE/NE5562

**Preliminary**

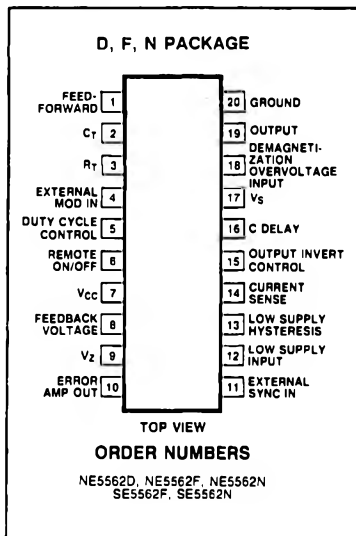
### DESCRIPTION

The SE/NE5562 is a single output control circuit for Switched Mode Power Supplies. This single monolithic IC contains all control and protection features needed for full featured Switched Mode Power Supplies.

### FEATURES

- Stabilized power supply
- Temperature compensated reference source
- Sawtooth generator
- Pulse width modulator
- Remote on/off switching
- Current limiting (2 levels)
- Low supply voltage, with adjustable hysteresis
- Loop fault protection
- Demagnetization/over voltage protection
- Duty cycle adjust and clamp
- Feed forward control
- External synchronization
- Total shutdown after adjustable number of overcurrent faults

### PIN CONFIGURATION



### ABSOLUTE MAXIMUM RATINGS

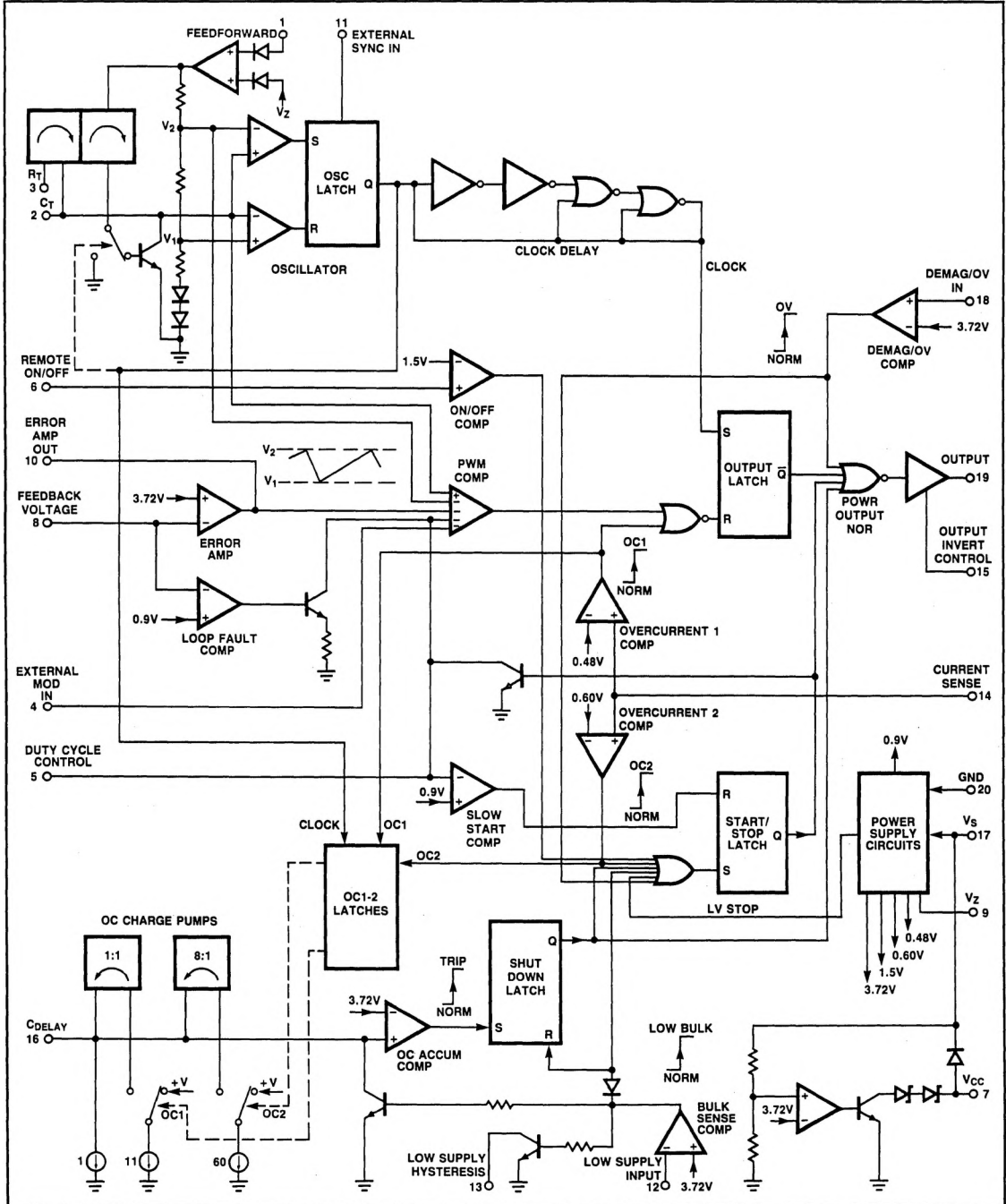
SYMBOL AND PARAMETER	RATING	UNIT
Supply (pin 15)		
Voltage sourced	+15	V
Current sourced	30	mA
Output transistor		
Output current	100	mA
Sync (pin 11) positive		
negative		
Remote on/off (pin 6) positive		
negative		
Feedback pin (pin 8) positive		
negative		
External mod in (pin 4) positive		
negative		
Feedforward (pin 1) positive		
negative		
Error amp out (pin 10) positive		
negative		
Demag/O.V. in (pin 18) positive		
negative		
Current sense (pin 14) positive		
negative		
Low supply sense and hysteresis (Pin 12, 13) positive		
negative		

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## BLOCK DIAGRAM



**SWITCHED-MODE POWER SUPPLY CONTROL CIRCUIT**

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**DC ELECTRICAL CHARACTERISTICS:**  $V_{CC} = 12V$  unless otherwise specified

SYMBOL AND PARAMETER	TEST CONDITIONS	SE5562			NE5562			UNIT
		Min	Typ	Max	Min	Typ	Max	
<b>REFERENCE SECTION</b>								
Reference Voltage $V_R$	$25^\circ C \pm 50 \text{ ppm}/^\circ C (\pm 1\%)$ Over Temp	3.68	3.72	3.76		3.72		V
Zener Voltage $V_Z$	$I_L = 7mA$	7.22	7.60	7.98		7.60		V
<b>OSCILLATOR SECTION</b>								
Frequency Range				300			300	kHz
<b>MODULATOR SECTION</b>								
Modulator Input Current	Over Temp $V_{IN} = 1V$		2	20		2	20	$\mu A$
<b>HOUSEKEEPING FUNCTIONS</b>								
Deltamax Input Current	Over Temp $V_{IN} = 1V$		2	20		2	20	$\mu A$
Accuracy of Duty Cycle Control	$f = 15kHz$ to $150kHz$ $V_{IN} = 55\%$ of $V_Z$		50			50		% of Duty Cycle
Low Supply Voltage Shutdown	$V_S$ for Restart Condition	$V_Z + .2$	$V_Z + .7$	$V_Z + 1.5$	$V_Z + .2$	$V_Z + .7$	$V_Z + 1.7$	V
Loop Fault Protection Threshold		.72	.9	.98	.72	.9	.98	V
Demag/Over Voltage Threshold Voltage		3.60	3.72	3.84	3.60	3.72	3.84	V
Over Voltage Input Bias Current			1	10		1	10	$\mu A$
<b>FEED FORWARD FUNCTION</b>								
Duty Cycle Reduction at 50% Duty Cycle	Feedforward Voltage $V_{FF}$ $V_{FF} = 2V_Z$		12.785			12.8		% of Duty Cycle
Feedforward Bias Current	Feedforward Voltage $V_{FF}$ $V_{FF} = 2V_Z$		.2	5		.2	5	$\mu A$
<b>EXTERNAL SYNC</b>								
"ON" Input voltage		.2		.8	.2		.8	V
"OFF" Input Voltage		2		$V_Z$	2		$V_Z$	V
Input Low Current	$V_{IN} = 0V$		1	10		1	10	$\mu A$
<b>ERROR AMPLIFIER SECTION</b>								
Amplifier Open Loop Gain	$R_L \geq 100K$	60	80		60	80		dB
Amplifier Bias Current			.5	5		5	5	$\mu A$
Amplifier Output Current		-1		+1	-1		+1	$\mu A$
Amplifier Output Swing		1		$V_Z - 1$	1		$V_Z - 1$	V
<b>REMOTE ON/OFF</b>								
"OFF" Input Voltage		0		.8	0		.8	V
"ON" Input Voltage		2		$V_Z$	2		$V_Z$	V
Input Low Current	$V_{IN} = 0V$		1	10		1	10	$\mu A$
<b>LOW SUPPLY SHUTDOWN</b>								
Comparator Input Bias Current	$V_{IN} = 0V$		2	10		2	10	$\mu A$
Comparator Threshold Voltage		3.50	3.72	3.90		3.72		V
$V_{CE}$ Sat. of Hysteresis Transistor	$I_{OUT} = 1.0mA$ $V_{IN} = 3.0V$		.3	.6		.3		V
$C_{DELAY}$ Discharge Current	$V_C = 1.0V$ $V_{IN} = 3.0V$	1	10		1	10		mA

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**Preliminary**DC ELECTRICAL CHARACTERISTICS:  $V_{CC} = 12V$  unless otherwise specified (cont)

SYMBOL AND PARAMETER	TEST CONDITIONS	SE5562			NE5562			UNIT
		Min	Typ	Max	Min	Typ	Max	
<b>CURRENT SENSE</b>								
OC1 Threshold Voltage		.456	.480	.504		.480		V
OC1 $C_{DELAY}$ Charge Current	$V_{ISENS} = .510V$		10			10		$\mu A$
OC2 Threshold Voltage		.570	.600	.630	.560	.600	.640	V
OC2 $C_{DELAY}$ Charge Current	$V_{ISENS} = .640V$		490			490		$\mu A$
$C_{DELAY}$ Discharge Current	$V_{ISENS} = 0V$	.5	1	1.5	.4	1	1.6	$\mu A$
<b>OUTPUT STAGE</b>								
$V_S - V_{OH}$	$11 \leq V_S \leq 15V$ $I_O = 100mA$						2	V
$V_{OL}$	$11 \leq V_S \leq 15V$ $I_O = 100mA$			1.5			1.5	V
$V_{OL}$	$11 \leq V_S \leq 15V$ $I_O = 2mA$			.4			.4	V
<b>SUPPLY VOLTAGE/CURRENT</b>								
$I_{CC}$	$I_Z = 0, V_S = 15V$		7.5			7.5		mA
<b>CURRENT FEED SHUNT REGULATOR</b>								
$V_S$	$I_{IN} = 10mA$	14.25			14			V
$V_S$	$I_{IN} = 20mA$			16			16	V