

#### GENERAL DESCRIPTION

The PT1204 is a monolithic pulse-width-modulated (PWM) synchronous step-down switch mode regulator with two internal power MOSFETs. It achieves 3A continuous output current over a wide input supply range with excellent load and line regulation. Current mode operation provides fast transient response and eases loop stabilization. Fault condition protection includes cycle-by-cycle current limit and thermal shutdown.

The PT1204 requires a minimum number of external components, available in ESOP-8 package.

#### FEATURES

- 3A Output Current
- 0.085Ω Internal Power MOSFET Switch
- Stable with Low ESR Output Ceramic Capacitors
- Up to 93% Efficiency
- Fixed 350KHz Frequency
- Thermal Shutdown
- Cycle-by-Cycle Over Current Protection
- Wide 4.75V to 18V Operating Input Range
- Output Adjustable from 0.925V to 15V
- Available in ESOP8 Packages

#### APPLICATION

- PC Monitors
- LCD TV
- Distributed Power Systems
- Network Systems
- FPGA, DSP, ASIC Power Supplies
- Notebook Computers

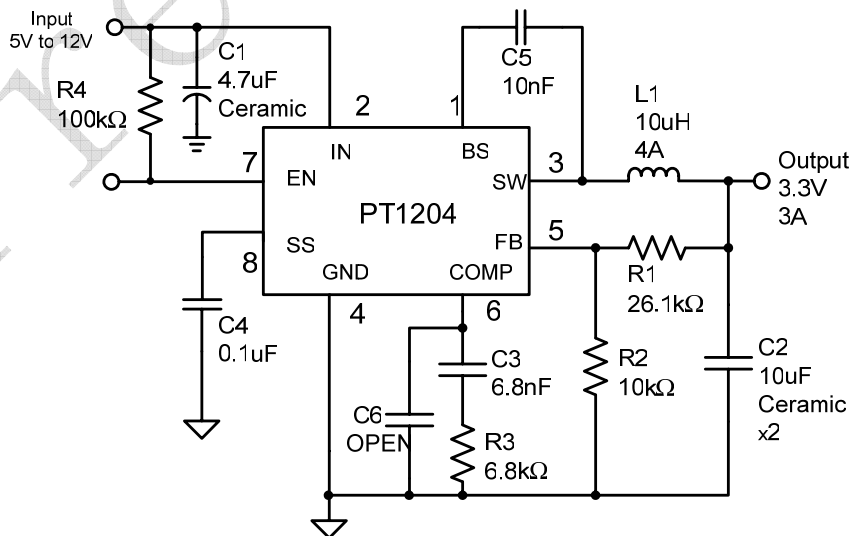
#### ORDERING INFORMATION

PACKAGE	TEMPERATURE RANGE	ORDERING PART NUMBER	TRANSPORT MEDIA	MARKING
ESOP-8	-40°C to 85°C	PT1204EESH	Tape and Reel 2500 units	PT1204 xxxxxX

**Note:**

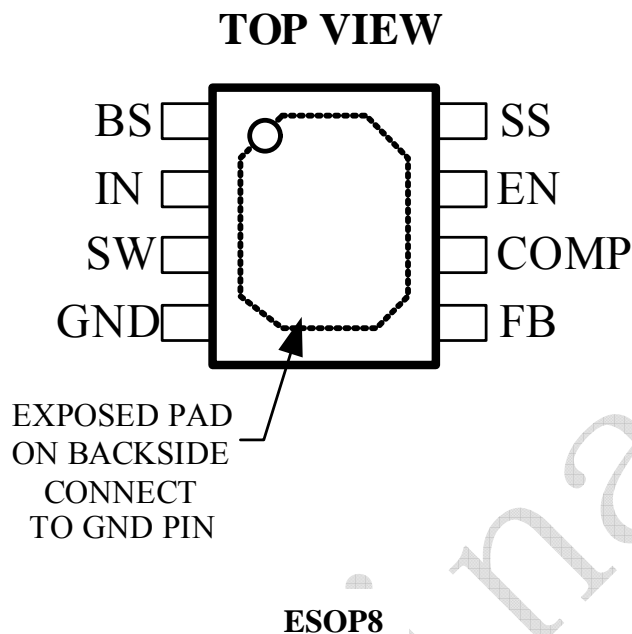


#### TYPICAL APPLICATION CIRCUIT



**Figure1** —PT1204 Typical application circuit

## PIN ASSIGNMENT



## PIN DESCRIPTIONS

SOP8 PIN No.	PIN NAMES	DESCRIPTION
1	BS	High-Side Gate Driver Boost Input. BS supplies the drive for the high-side N-channel MOSFET switch. Connect a 0.01uF or greater capacitor from SW to BS to power the high side switch.
2	IN	Supply Voltage. The PT1204 operates from a +4.75V to +18V unregulated input. C1 is needed to prevent large voltage spikes from appearing at the input.
3	SW	Power Switching Output. This PIN is connected to IN through M1 or to GND through M2.
4	GND	Ground
5	FB	Feedback Input. FB senses the output voltage through an external resistive divider which is connected from the output to GND.
6	COMP	Compensation Node. COMP compensates the control loop by connecting a serial RC network to ground. In some cases, an additional capacitor from COMP to GND is required.
7	EN	Enable Input. EN is digital input that turns the regulator on or off. Drive EN high to turn on the regulator, drive it low to turn it off. Pull up to IN with 100kΩ resistor for automatic startup.
8	SS	Soft-Start. Connect a capacitor from SS to GND to program the soft-start period. Leave it open if unused.

**ABSOLUTE MAXIMUM RATINGS** (Note 1)

SYMBOL	ITEMS	VALUE	UNIT
IN	Supply Voltage	-0.3~24	V
SW	Switch Node voltage	-0.3~24	V
BS	Bootstrap Voltage	$V_{sw}-0.3\sim V_{sw}+6$	V
FB	Feedback voltage	-0.3~6	V
EN	Enable/UVLO voltage	-0.3~6	V
COMP	Comp voltage	-0.3~6	V
TSTG	Storage temperature range	-65~+150	°C

**RECOMMENDED OPERATING RANGE**

SYMBOL	ITEMS	VALUE	UNIT
VIN	Supply voltage	4.75~18	V
TOPT	Operating temperature	-40~+85	°C

**Note 1:** Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Recommended Operating Range indicates conditions for which the device is functional, but do not guarantee specific performance limits. Electrical Characteristics state DC and AC electrical specifications under particular test conditions which guarantee specific performance limits. This assumes that the device is within the Operating Range. Specifications are not guaranteed for parameters where no limit is given, however, the typical value is a good indication of device performance.

**ELECTRICAL CHARACTERISTICS**

The following specifications apply for  $V_{IN}=12V$ ,  $V_{OUT}=3.3V$ , load=0.5A,  $T_A=25^\circ C$ , unless specified otherwise.

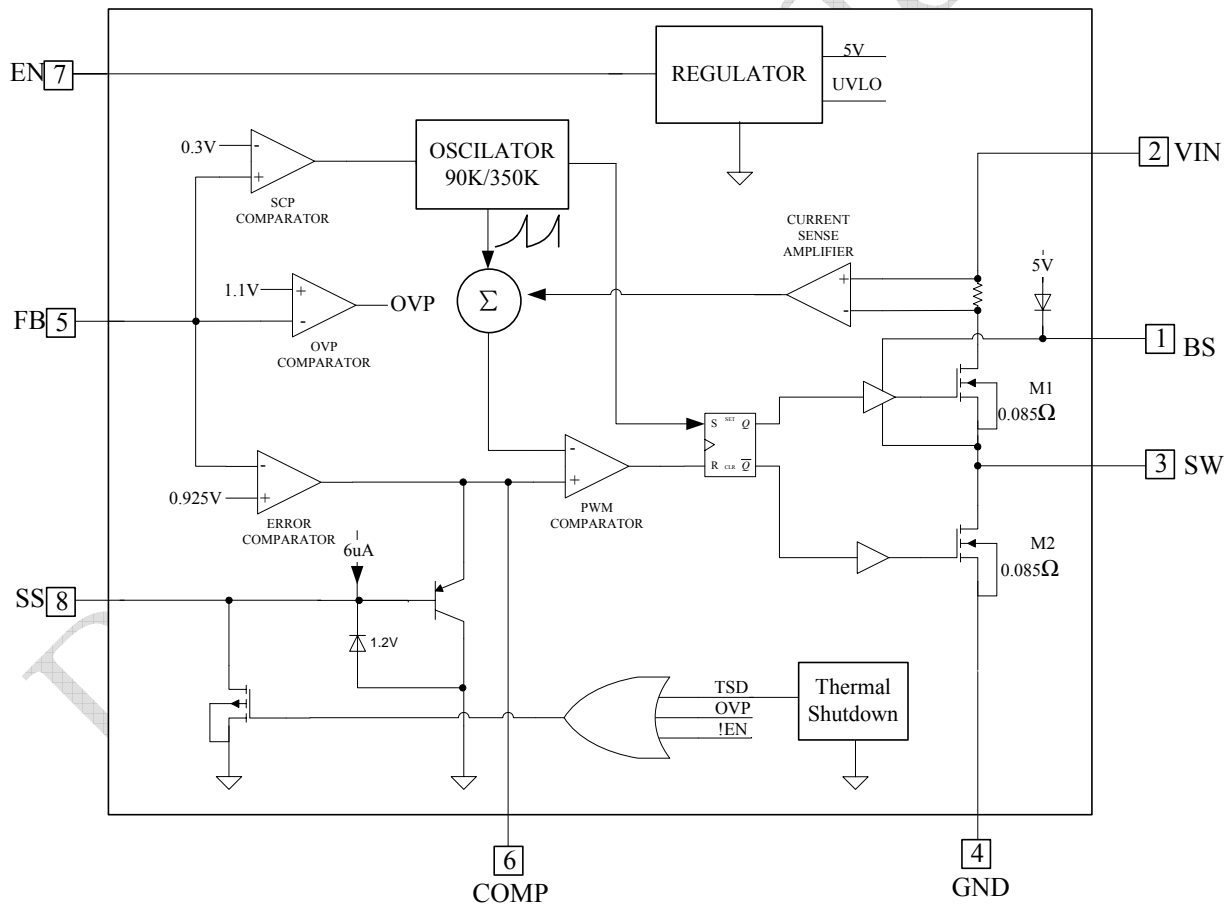
SYMBOL	ITEMS	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Iq	Supply current	EN=2V; Vfb=1v		1.5	2.0	mA
Vfb	Feedback voltage		0.900	0.925	0.946	V
Av	Error amplifier voltage gain			400		V/V
Gea	Error amplifier trans-conductance	$\Delta I_{comp}=\pm 10\mu A$		800		$\mu A/V$
R_dson1	High side switch on resistance			0.085		$\Omega$
R_dson2	Low side switch on resistance			0.085		$\Omega$
Ipd	Shutdown supply current	Ven = 0V		13	20	$\mu A$
I_leakage	High side switch leakage current <sup>(2)</sup>	Ven=0V; Vsw=0V		0	10	$\mu A$
I_clh	High side Switch Current limit <sup>(2)</sup>		3.8	5		A
I_cll	Low side Switch Current limit <sup>(2)</sup>			1.0		A
Gcomp	COMP to Current sense trans-conductance			5		A/V
Fosc1	Oscillation frequency			350		kHz

#### ELECTRICAL CHARACTERISTICS (Continued)

SYMBOL	ITEMS	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Fosc2	Short circuit oscillation frequency	Vfb=0.2V		90		kHz
Dmax	Maximum duty cycle	Vfb=0.8V		90		%
Ven	EN threshold voltage		1.1	1.5	2.0	V
Ven_hyst	EN threshold Voltage Hysteresis			0.2		V
TSD	Thermal shutdown			160		°C

**Note 2:** Guaranteed by design.

#### SIMPLIFIED BLOCK DIAGRAM



**Figure 2—Functional Block Diagram**

## OPERATION DESCRIPTION

The PT1204 is a synchronous rectified current mode step-down regulator. It regulates input voltage from 4.75V to 18V down to a voltage as low as 0.925V, and supplies up to 3A of load current.

On the rising edge of internal oscillator, the Low-Side MOSFET will be turned off and the High-Side MOSFET will be turned on if the PWM comparator output is low. The output voltage is measured at FB pin through a resistive voltage divider and amplified through the internal error amplifier, the voltage at the COMP pin is compared with the switch current. As the

switch current ramp up, the PWM comparator will output high, the High-Side MOSFET will be turned off and the Low-Side MOSFET will be turned on until the next rising edge of the internal oscillator.

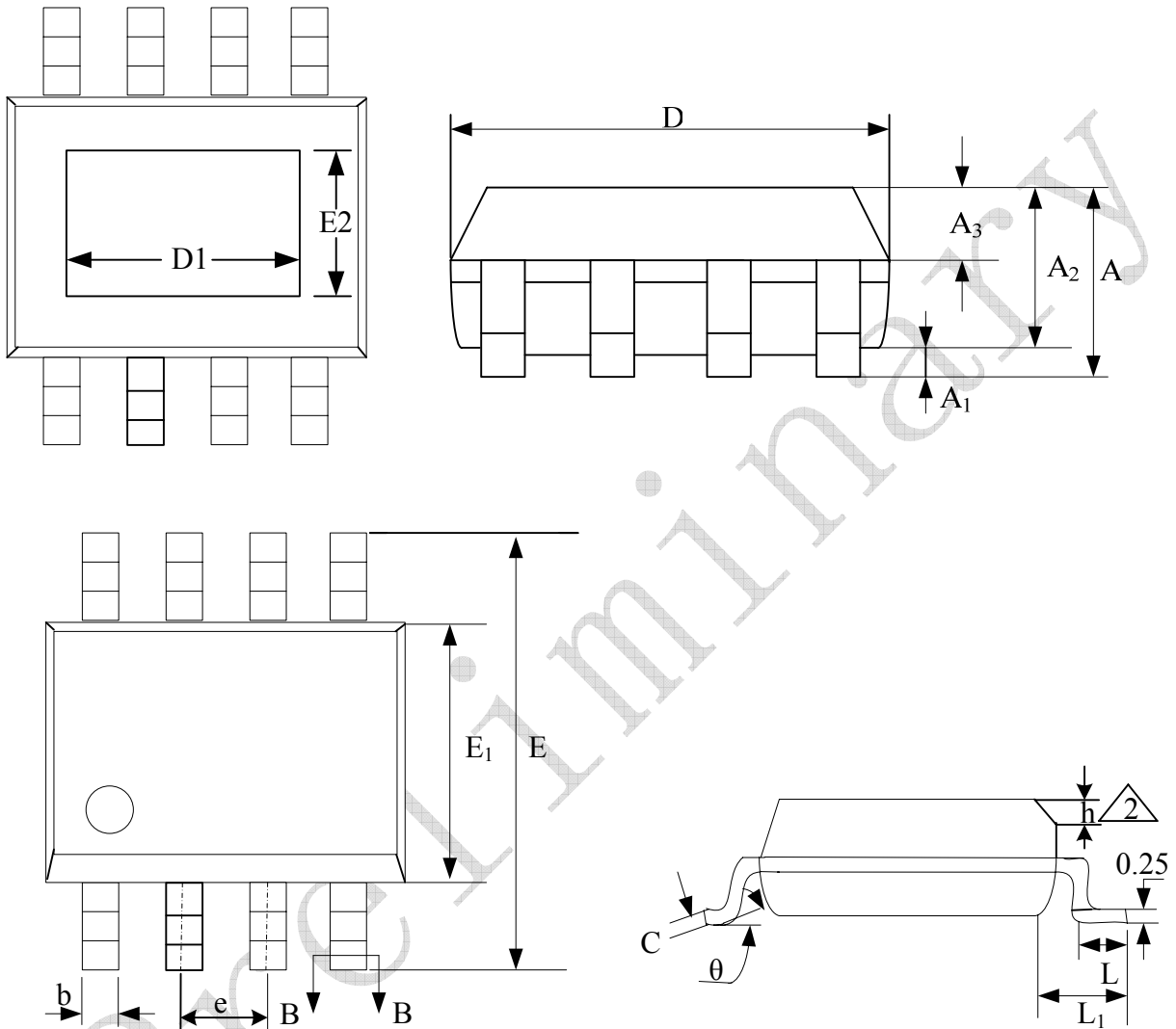
When the output voltage exceeds 20% of the nominal regulated voltage, the Over-Voltage comparator will be tripped and turn off the High-Side MOSFET by discharging the SS pin to GND.

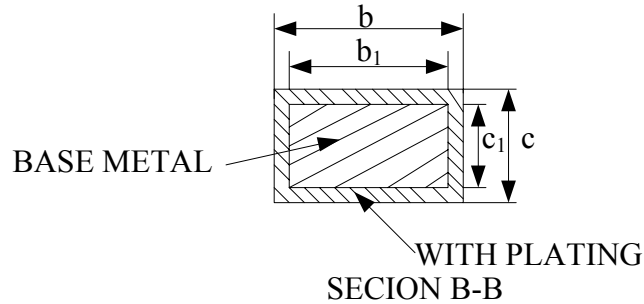
When the FB voltage is less than 0.3V, the frequency of the internal oscillator will be set to 90KHz to decrease the short circuit current.

Preliminary

PACKAGE INFORMATION

**ESOP8**





SYMBOL	MILLIMETERS		
	MIN	NOM	MAX
A	—	—	1.75
A1	0.05	—	0.15
A2	1.30	1.40	1.50
A3	0.60	0.65	0.70
b	0.39	—	0.48
b1	0.38	0.41	0.43
c	0.21	—	0.26
c1	0.19	0.20	0.21
D	4.70	4.90	5.10
E	5.80	6.00	6.20
E1	3.70	3.90	4.10
e	1.27(BSC)		
h	0.25	—	0.50
L	0.50	—	0.80
L1	1.05(BSC)		
θ	0°	—	8°
D1	2.13REF		2.90REF
E2	2.13REF		2.00REF