3A Ultra Low Dropout Linear Regulator

Description

The FP6145 is a very low dropout linear regulator that can operate at input voltages down to 2.7V. The device is capable of supplying 3A of output current with a typical dropout voltage of only 200mV. Output current comes directly from the input supply to maximize efficiency.

The FP6145 regulator is stable with 10µF or greater ceramic output capacitors. The device has a low 0.8V reference voltage which is used to program the output voltage via two external resistors. The device also has internal current limit, over temperature shutdown and reverse output current protection. The FP6145 is available in an 8-pin SOIC package with an exposed pad, provides a very compact system solution and good thermal conductance.

Features

- 3A Low-Dropout Regulation
- 250mV Dropout Voltage @ 3A
- 2.7V to 5.5V VDD Input Voltage
- Power Good Detection and Output
- Output Pull Low Resistance when Shutdown
- Over Temperature Protection
- Over Current Protection
- Internal Soft-Start
- 0.8V Reference Voltage
- ±1.5% Output Voltage Accuracy
- <10uA Shutdown Current
- Available in SOP-8 Exposed Pad Package
- RoHS Compliant

Applications

- High Efficiency Linear Regulator
- Post Regulator for Switching Supplies
- Microprocessor Supply
- Graphic Cards
- Advanced Graphics Cards Supplies
- DSP Core and I/O Voltages

Pin Assignments

SP Package SOP- 8 (Exposed Pad)

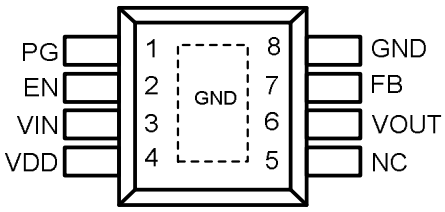
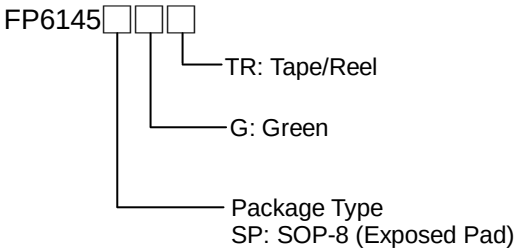


Figure 1. Pin Assignment of FP6145

Ordering Information



Typical Application Circuit

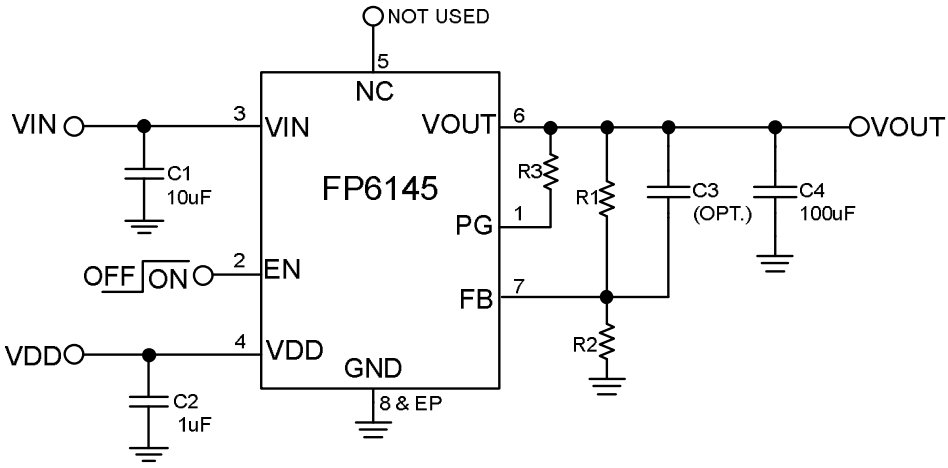


Figure 2. Typical application circuit

Functional Pin Description

Pin Name	Pin Function
EN	On/Off Control Input. Drive EN above 1.2V to turn the device on, Drive EN below 0.3V to turn the device off.
VIN	Unregulated MOSFET power supply pin.
PG	PG (Power Good) is an open drain sink pin when output is under 92% of VOUT and is high impedance pin once output over 92% of VOUT.
VDD	Power input for controller including error amplifier, reference and other protect circuits.
NC	No connection pin can be left floating or connected to GND for better heat dissipation.
GND	Ground. This pin is the voltage reference for the regulated output voltage.
VOUT	Regulated Voltage Output.
FB	Feedback. An external resistor divider from the output to GND, tapped to the FB pin sets the output voltage.
Exposed PAD(GND)	Should be soldered to the GND plane for increased thermal performance.

Block Diagram

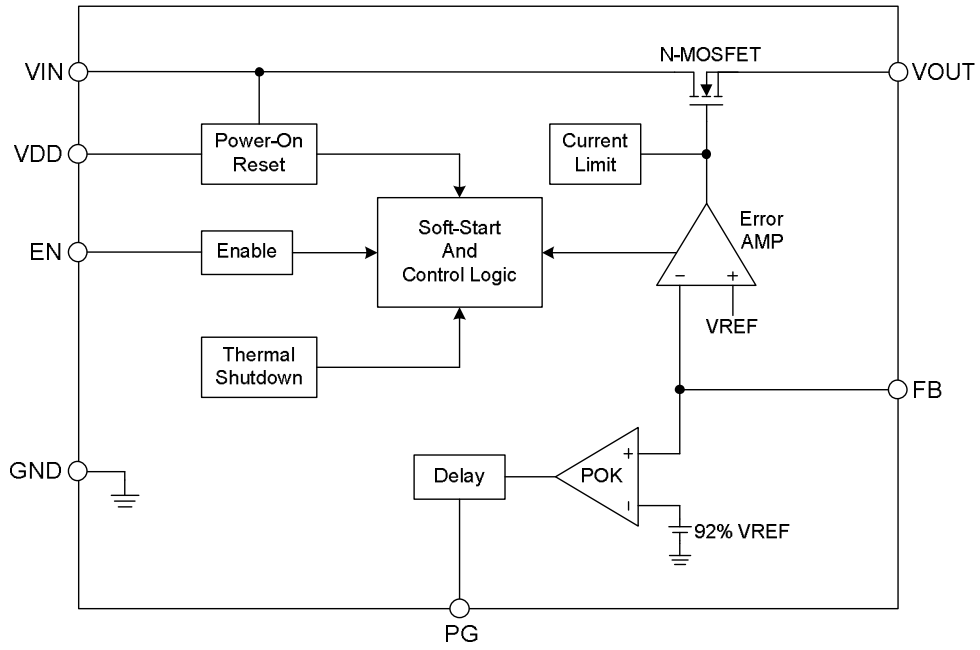


Figure 3. Block Diagram of FP6145

Absolute Maximum Ratings

- Supply Voltage V_{IN} /V_{DD} /GND ---------- -0.3V to +6V
- EN, FB, PG Voltage ---------- -0.3V to V_{IN}
- Output Voltage V_{OUT} ---------- -0.3V to V_{IN}
- Junction Temperature ---------- +125℃
- Lead Temperature (Soldering, 10sec.)---------- +260℃
- Storage Temperature (T_{STG})---------- -65℃ to +150℃
- ESD Classification (HBM) ---------- 2KV
- Power Dissipation @25℃ :

  SOP-8 Exposed Pad (P_D)---------- +1.25W
- Package Thermal Resistance, (θ_{JA}):

  SOP-8 Exposed Pad---------- 50°C/W
- Package Thermal Resistance, (θ_{JC}):

  SOP-8 Exposed Pad---------- 15°C/W

Note1：Stresses beyond those listed under “Absolute Maximum Ratings" may cause permanent damage to the device.

Recommended Operating Conditions

- Input Supply Voltage (V_{IN})---------- +2.7V to +5.5V
- Ambient Temperature TA ---------- -40℃ to +85℃

Electrical Characteristics

(V_{DD}= V_{IN}=V_{EN}= 5V, V_{OUT}= 1.2V, T_A= 25 ºC, unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Supply Voltage Range	V_{DD}		V_{OUT}+1.6		5.5	V
Feedback Voltage	V_{FB}	I_{OUT} = 0A	0.788	0.8	0.812	V
MOS Input Voltage	V_{IN}		V_{OUT}+0.2		5.5	V
Output Voltage Range	V_{OUT}	V_{DD} = 5V	V_{FB}		V_{IN}-0.2	V
		V_{IN} = 5V	V_{FB}		V_{DD}-1.6	V
Output Line Regulation	$V_{FB(LINE)}$	V_{OUT}+0.3 ≤ V_{IN} ≤ 5.5V I_{OUT} = 50mA		0.01	0.1	%/V
Output Load Regulation	$V_{FB(LOAD)}$	50mA ≤ I_{OUT} ≤ 3A		0.8	1.5	%/A
VDD Shutdown Current	$V_{DD(SD)}$	V_{DD} = V_{IN} = 5.5V, V_{EN} = 0V		1	10	uA
Dropout Voltage	V_{DROP}	I_{OUT} = 3A		250	320	mV
VOUT Pull Low Resistance		V_{EN} = 0V		300		Ω
EN Input Low Voltage	$V_{EN(LOW)}$				0.3	V
EN Input High Voltage	$V_{EN(HIGH)}$		1.2			V
EN Input Current	I_{EN}	V_{EN} = 5V		20	25	μA
EN Pull Low Resistance				250		KΩ
Power Good Threshold Voltage	$V_{PG(TH)}$	I_{OUT} = 0A		92		%VOUT
Power Good Hysteresis	$V_{PG(HYS)}$	I_{OUT} = 0A		8		%VOUT
Over current Protect Threshold (*)	I_{OCP}			4		A
Thermal Shutdown Threshold (*)	T_{SD}	I_{OUT} = 0A		165		℃
Thermal Shutdown Hysteresis (*)	T_{HYS}	I_{OUT} = 0A		30		℃

(*): Guarantee by design.

Function Description

The FP6145 is a linear regulator designed for delivering 3A output current on an N-type MOSFET. The use of the N-type MOSFET provides many critical advantages, including better loop stability with kinds of output capacitor, lower $R_{DS(ON)}$ and low dropout voltage than P-type MOSFET. The FP6145 also features internal soft-start, power good indicate, over current and over temperature protections.

Output Capacitor

A minimum output capacitance of 10uF, ceramic, is required for stability. The amount of output capacitance can be increased without limit. Tantalum capacitors will also provide stable operation across the entire operating temperature range. However, the effects of ESR may provide variations in the output voltage during fast load transients. Using the minimum recommended 10uF ceramic capacitor at the output will allow unlimited capacitance, Tantalum and/or Aluminum, to be added in parallel.

Input Capacitor

A minimum 10uF or larger ceramic capacitor is recommended. Its purpose is to provide low regulating power source impedance at VIN pin.
Also, the capacitor on the VDD pin must be at least 1uF, and can be any good quality capacitor (ceramic is recommended).

Internal Soft-Start

The FP6145 features an internal Soft-Start function, which reduces inrush current and overshoot of the output voltage. Soft-Start is achieved by ramping up the error amplifier output voltage. The typical Soft-Start time is about 1ms.

Current Limit and Short Circuit Protection

The FP6145 monitors the output current via the output NMOS and limits the maximum current to prevent load from damages during overload or short circuit conditions. In the meantime, the current limit is also reduced to lower the short current. Once the short condition is removed, the regulator will return to normal operation.

Over Temperature Protection

The FP6145 incorporates an over temperature protection circuit to protect itself from overheating. When the junction temperature exceeds the thermal shutdown threshold temperature, the regulator will be shutdown.

Setting Output Voltage

The external resistor divider R1/R2 is used to set the output voltage. FP6145 feedback resistors are unconcerned of compensation and provide an easy way to program output voltage. Table 1 shows a list of resistor selection for common output voltages:

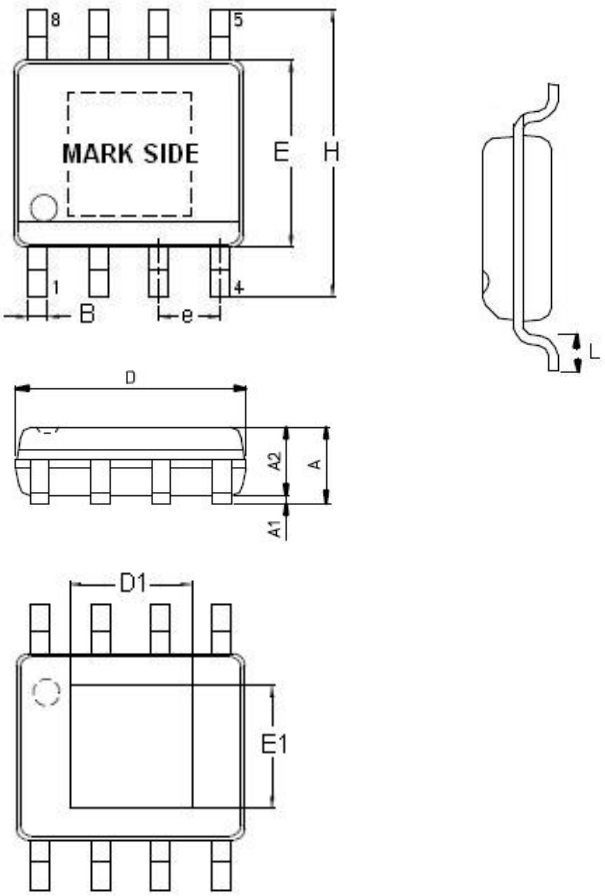
$$V_{OUT} = 0.8 \times \left(1 + \frac{R1}{R2}\right)$$

Table 1—Resistor Selection for Common Output Voltages

VOUT	R1	R2
3.3V	30.9 KΩ	10 KΩ
1.8V	12.4 KΩ	10 KΩ
1.2V	4.7 KΩ	10 KΩ

Outline Information

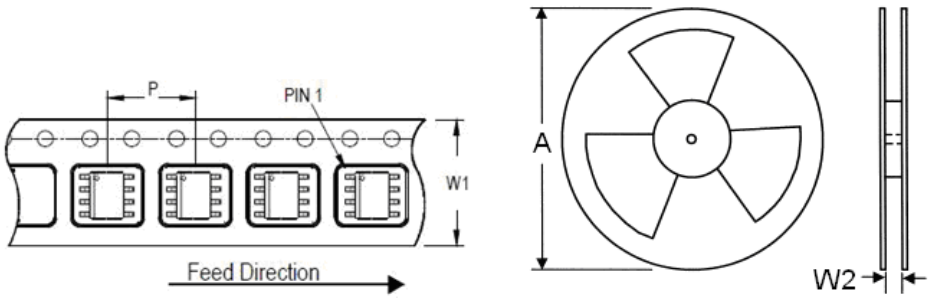
SOP- 8 (Exposed Pad) Package (Unit: mm)



SYMBOLS UNIT	DIMENSION IN MILLIMETER	
	MIN	MAX
A	1.25	1.70
A1	0.00	0.15
A2	1.25	1.55
B	0.31	0.51
D	4.80	5.00
D1	1.82	3.35
E	3.80	4.00
E1	1.82	2.41
e	1.20	1.34
H	5.80	6.20
L	0.40	1.27

Note：Followed From JEDEC MO-012-E.

Carrier dimensions



Tape Size (W1) mm	Pocket Pitch (P) mm	Reel Size (A) in	Reel Size (A) mm	Reel Width (W2) mm	Empty Cavity Length mm	Units per Reel
12	8	13	330	12.4	400~1000	2,500

Life Support Policy
Fitipower's products are not authorized for use as critical components in life support devices or other medical systems