High Voltage Single-Channel Power Distribution Switch

Description

The FP6861F is a cost-effective, high voltage, single N-Channel MOSFET high-side power switch, it support Quick Charger 2.0 class A technology to adjustable difference current limit with 5V/9V/12V.

The FP6861F is equipped with a charge pump circuitry to drive the internal MOSFET switch. The switch's low $R_{DS(ON)}$ meets USB voltage drop requirement, and a flag output is available to indicate fault conditions to the local Charger controller.

Additional features include soft-start to limit inrush current during plug-in, thermal shutdown to prevent catastrophic switch failure from high-current loads, and under-voltage lockout (UVLO) to ensure that the device remains off unless there is a valid input voltage present. Besides, fault current is limited to specific current for FP6861F in single port in accordance with the USB power requirements.

The FP6861F is available in SOP-8 and TDFN-6 (2mm×2mm) packages with smallest components.

Features

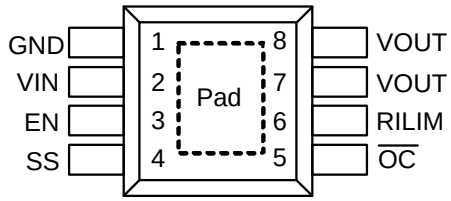
- Compliant to USB Specifications
- Built-In Low $R_{DS(ON)}$ N-Channel MOSFET (70mΩ)
- Low Supply Current:
  400μA Typical at Switch On State
- Wide Input Voltage Ranges: 5V to 12V
- VIN Overvoltage Protection at 16V
- Open-Drain Fault Flag Output (SOP8 only)
- Hot Plug-In Application (Soft-Start)
- Soft Start Control by External Cap (SOP8 only)
- 4.3V Typical Under-Voltage Lockout (UVLO)
- Adjustable Current Limit Protection
  VIN=5V, Current Limit：1.2A~2.5A
  VIN=9V, Current Limit：0.75A~2A
  VIN=12V, Current Limit：0.5A~1.44A
- Thermal Shutdown Protection
- Logic Level Enable Pin
- SOP-8 and TDFN-6 (2mm×2mm) Packages
- RoHS Compliant

Applications

- Battery-Charger Circuit
- Car Charger
- Wall Charging Adapters
- USB Bus/Self Powered Hub
- USB Peripheral
- Notebook, Motherboard PC

Pin Assignments

SP Package (SOP-8 Exposed Pad)



WD Package (TDFN-6) (2mm×2mm)

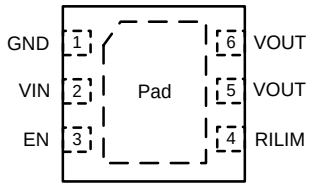
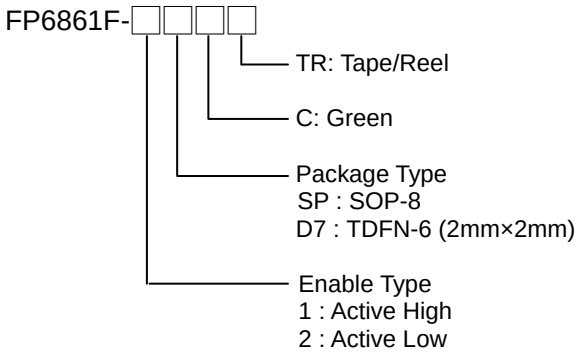


Figure1. Pin Assignment of FP6861F

Ordering Information



TDFN-6 (2mm×2mm) Marking

Part Number	Product Code
FP6861F-1D7CTR	**FP6**
FP6861F-2D7CTR	**FP7**

Typical Application Circuit

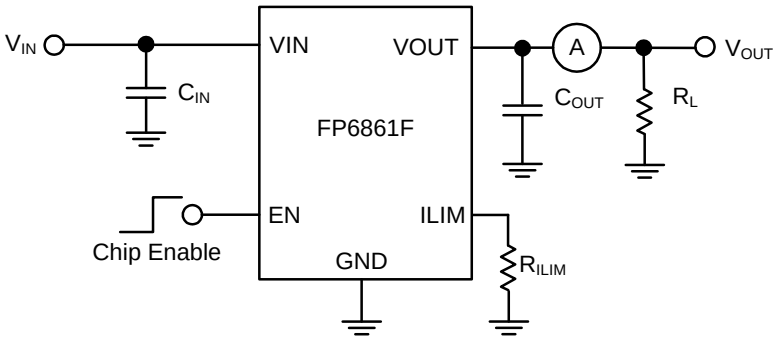


Figure2. Electrical Characteristic Test Circuit

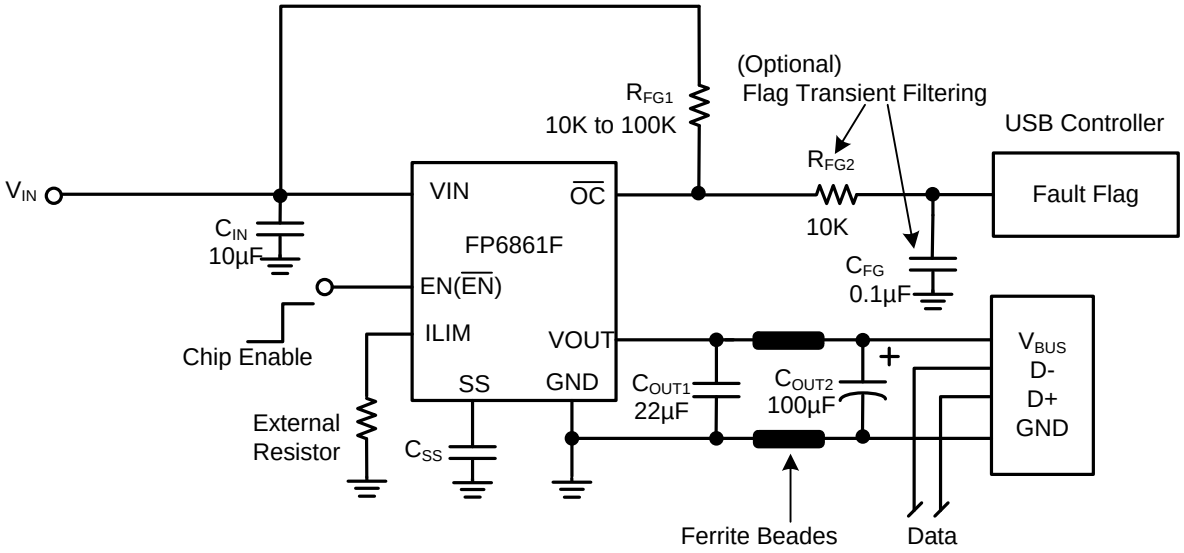


Figure3. Typical Application Circuit for USB Power Switch

Functional Pin Description

Pin Name	Pin No. (SOP-8)	Pin No. (TDFN-6)	Pin Function
GND	1	1	Ground. Connect GND to exposed pad.
VIN	2	2	Power supply input pin.
EN	3	3	Chip Enable/Chip Shutdown. Pull the pin high to enable IC; Pull the pin low to shutdown IC. Do not let the pin floating.
SS	4	--	Soft start time control. Desinger can add external cap to control soft start time.
$\overline{OC}$	5	--	Fault flag. Open-Drain output.
ILIM	6	4	Use external resistor to set current-limit; recommended 34kΩ≦R_{ILIM}≦96.5kΩ
VOUT	7,8	5,6	Switch output.

Block Diagram

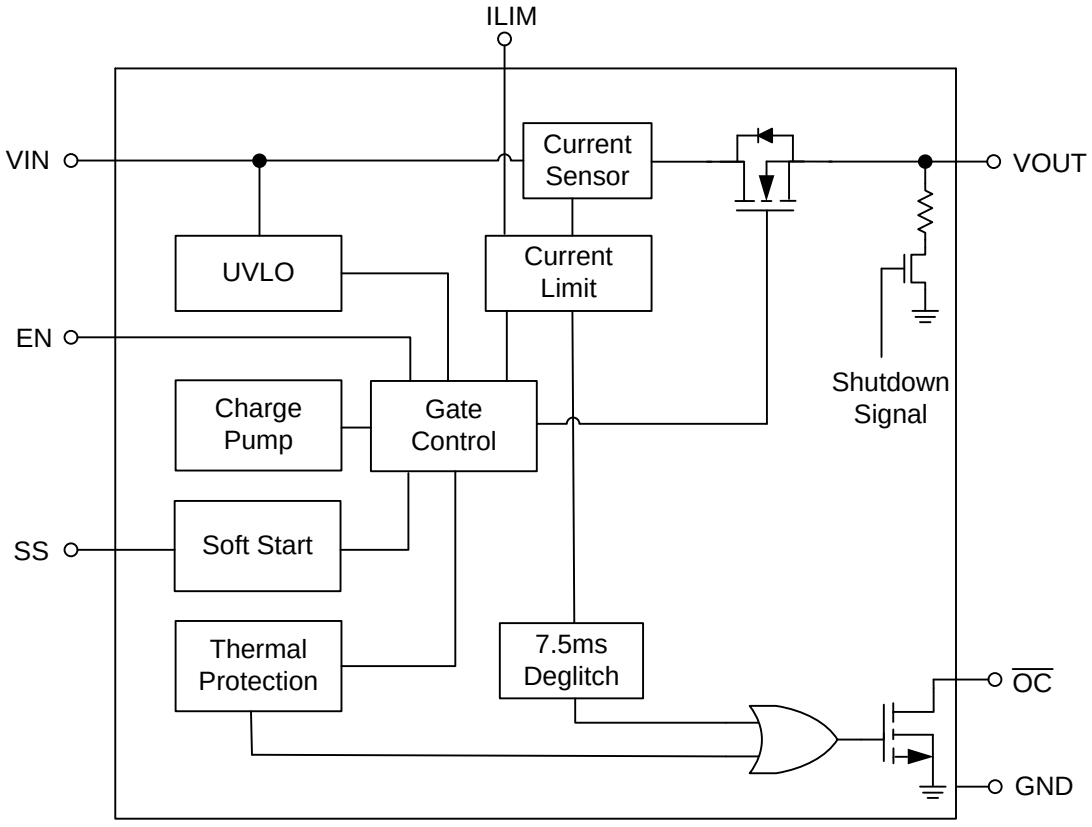


Figure4. Block Diagram

Output Voltage and Current Limit Curve

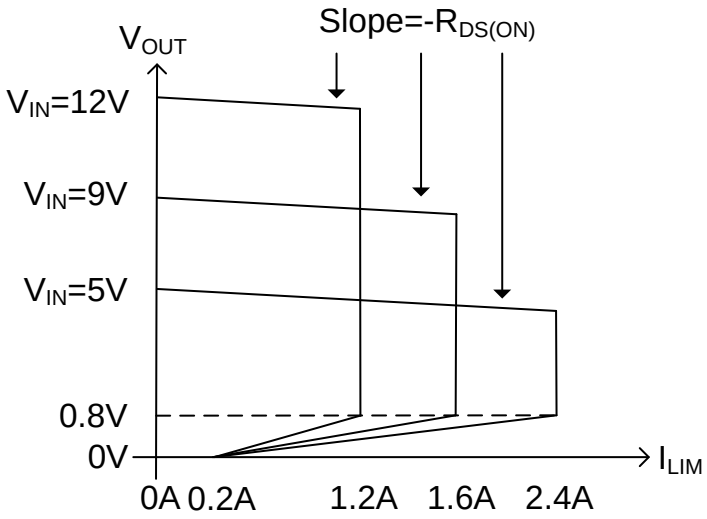


Figure5. Output Characteristic with Current Limit

R_{ILIM} and Current Limit Curve

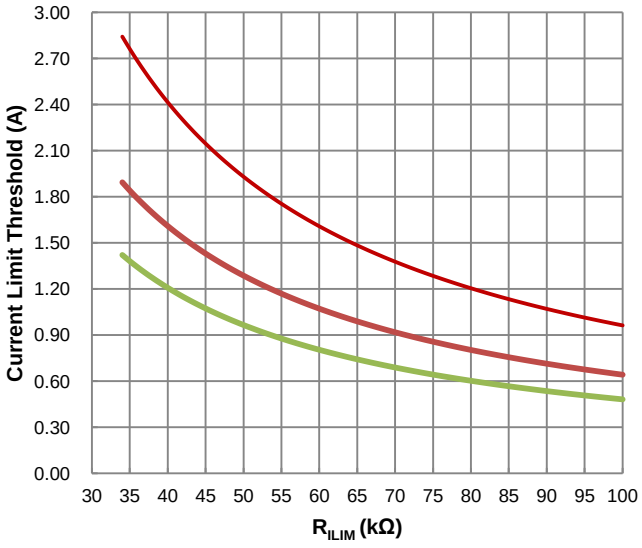


Figure6. Current Limit with R_{ILIM} value

Absolute Maximum Ratings

- VIN, VOUT ---------- -0.3V to +16V
- EN ($\overline{EN}$) ---------- -0.3V to +16V
- $\overline{OC}$ ---------- -0.3V to +16V
- All Other Pins Voltage---------- -0.3V to +6V
- Power Dissipation @T_J=125°C, T_A=25°C (P_D)
  - SOP-8 (Exposed Pad) ---------- +1.67W
  - TDFN-6 (2mm×2mm) ---------- +0.74W
- Package Thermal Resistance (θ_{JA})
  - SOP-8 (Exposed Pad) ---------- +60°C/W
  - TDFN-6 (2mm×2mm) ---------- +136ºC/W
- Package Thermal Resistance (θ_{JC})
  - SOP-8 (Exposed Pad) ---------- +15°C/W
  - TDFN-6 (2mm×2mm) ---------- +56ºC/W
- Junction Temperature ---------- +150°C
- Lead Temperature (Soldering,10 sec.) ---------- +260°C
- Storage Temperature Range ---------- -65°C to +150°C

Note 1：Stresses beyond those listed under “Absolute Maximum Ratings" may cause permanent damage to the device.

Recommended Operating Conditions

- Supply Voltage (V_{IN}) ---------- +5V to +12V
- Operation Temperature Range (T_{OPR}) ---------- -40°C to +85°C

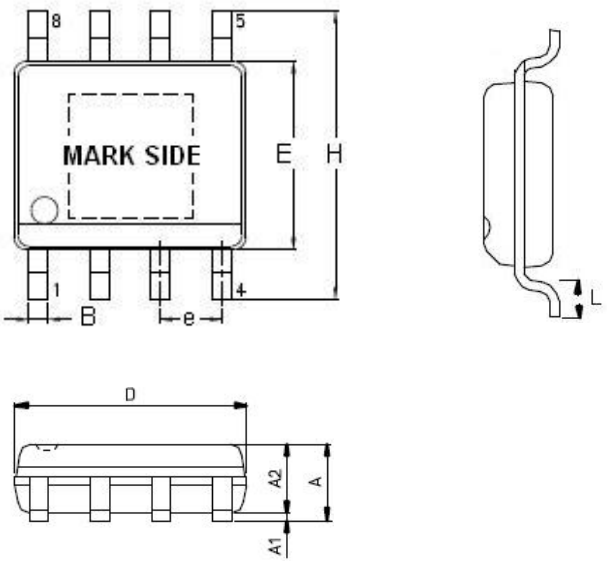
Electrical Characteristics

(V_{IN}=12V, T_A=25°C, unless otherwise specified.)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Supply Voltage	V_{IN}		5		12	V
Switch On Resistance	$R_{DS(ON)}$	I_{OUT}=100mA		70	100	mΩ
Supply Current	I_{SW_ON}	Switch on, V_{OUT}=Open		400		µA
	I_{SW_OFF}	Switch off, V_{OUT}=Open		0.1		
EN Threshold	V_{IL}	Switch off			0.7	V
	V_{IH}	Switch on	2			
EN Input Current	I_{EN}	V_{EN}=Enable		0.01	0.1	µA
Current Limit	I_{LIM}	V_{IN}=12V	0.5	Adj.	1.44	A
		V_{IN}=9V	0.75	Adj.	2	
		V_{IN}=5V	1.2	Adj.	2.5	
Output Leakage Current	$I_{LEAKAGE}$	V_{EN}=Disable, R_{LOAD}=0Ω		0.5	1	µA
$\overline{OC}$ Output Resistance	$R_{\overline{OC}}$	I_{SINK}=1mA		70		Ω
$\overline{OC}$ Off Current	$I_{\overline{OC}}$	$V_{\overline{OC}}$=5V		0.01		µA
$\overline{OC}$ Delay Time	t_D	From Fault Condition to $\overline{OC}$ Assertion		7.5		ms
Under-Voltage Lockout	V_{UVLO}	V_{IN} Increasing		4.3		V
Under-Voltage Hysteresis	ΔV_{UVLO}	V_{IN} Decreasing		0.2		V
Thermal Shutdown Threshold	T_{SD}			135		°C
	ΔT_{SD}	Hysteresis		20		°C

Outline Information

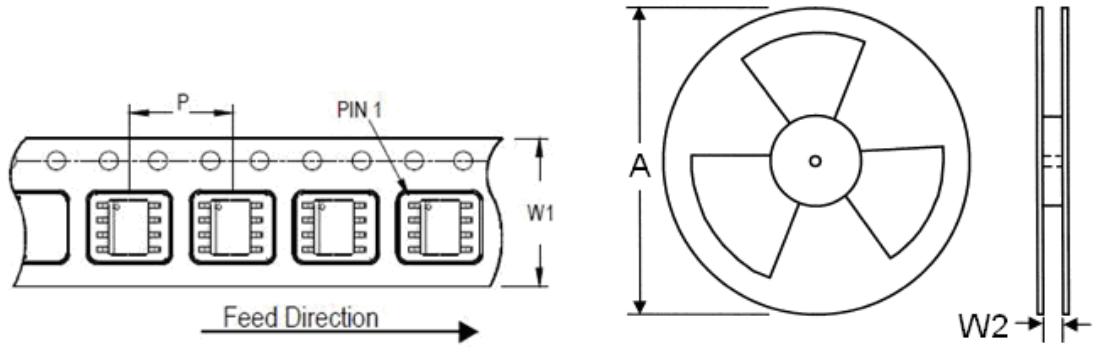
SOP-8 (Exposed Pad) Package (Unit: mm)



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	3.04	3.50
E	3.80	4.00
E1	2.15	2.41
e	1.20	1.34
H	5.80	6.20
L	0.40	1.27

Note：Followed From JEDEC MO-012-E.

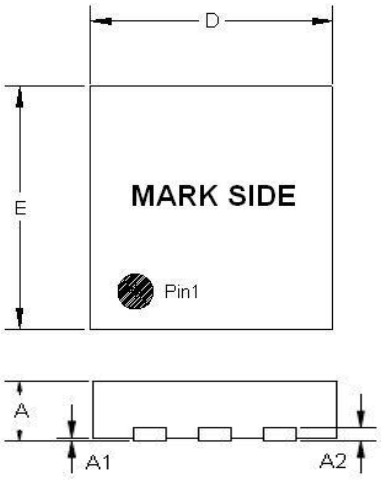
Carrier Dimensions

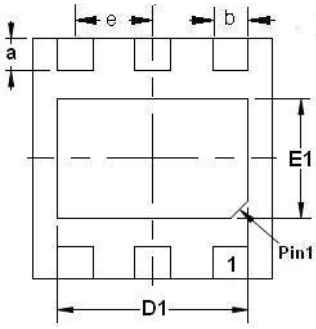


Tape Size (W1) mm	Pocket Pitch (P) mm	Reel Size (A)		Reel Width (W2) mm	Empty Cavity Length mm	Units per Reel
		in	mm			
12	8	13	330	12.4	400~1000	2,500

Outline Information (Continued)

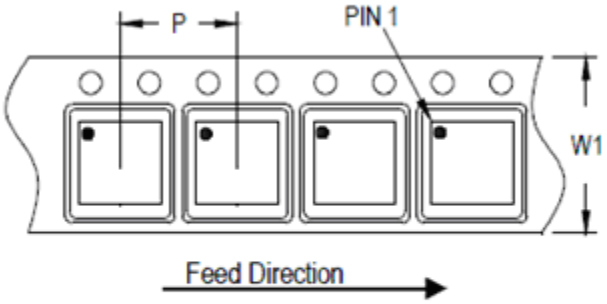
TDFN-6 (2mm×2mm) Package (Unit: mm)

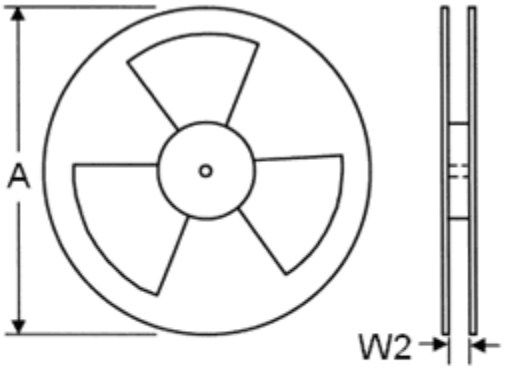




SYMBOLS UNIT	DIMENSION IN MILLIMETER	
	MIN	MAX
A	0.70	0.80
A1	0.00	0.05
A2	0.19	0.22
D	1.95	2.05
E	1.95	2.05
a	0.20	0.40
b	0.25	0.35
e	0.60	0.70
D1	1.15	1.65
E1	0.55	1.05

Carrier Dimensions





Tape Size (W1) mm	Pocket Pitch (P) mm	Reel Size (A)		Reel Width (W2) mm	Empty Cavity Length mm	Units per Reel
		in	mm			
8	4	7	180	8.4	400~1000	3,000

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