Dual-Channel Power Distribution Switch

Description

The FP6861D is a cost-effective, low voltage, dual N-Channel MOSFET high-side power switch, optimized for self-powered and bus-powered Universal Serial Bus (USB) applications.

The FP6861D 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 USB 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 FP6861D in dual port in accordance with the USB power requirements. FP6861D will prevent reverse current when it is disabled and VOUT is higher than VIN.

The FP6861D is available in SOP-8 package with smallest components.

Features

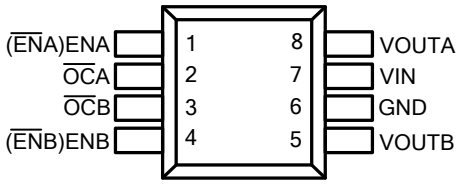
- Compliant to USB Specifications
- Built-In Low $R_{DS(ON)}$ N-Channel MOSFET
- Output Can Be Forced Higher Than Input (Off-State)
- Low Supply Current:
  130μA Typical at Switch On State
  0.2μA Typical at Switch Off State
- Wide Input Voltage Ranges: 2.7V to 5.5V
- Open-Drain Fault Flag Output
- Hot Plug-In Application (Soft-Start)
- 2.2V Typical Under-Voltage Lockout (UVLO)
- Current Limiting Protection
- Thermal Shutdown Protection
- Reverse Current Flow Blocking (No Body Diode)
- Logic Level Enable Pin
- SOP-8 Package
- RoHS Compliant
- UL NO.E322418 (Approved model: FP6861 series)

Applications

- USB Bus/Self Powered Hub
- USB Peripheral
- ACPI Power Distribution
- Notebook, Motherboard PC
- Battery-Charger Circuit

Pin Assignments

SO Package (SOP-8)



Ordering Information

FP6861D-□□□□□

- TR: Tape/Reel
- C: Green
- Package Type
  SO: SOP-8
- Enable
  1. Active High
  2. Active Low
- Typical Current Limit
  B: 1.75A

Available Product List:

FP6861D-B1SOCTR
FP6861D-B2SOCTR

Typical Application Circuit

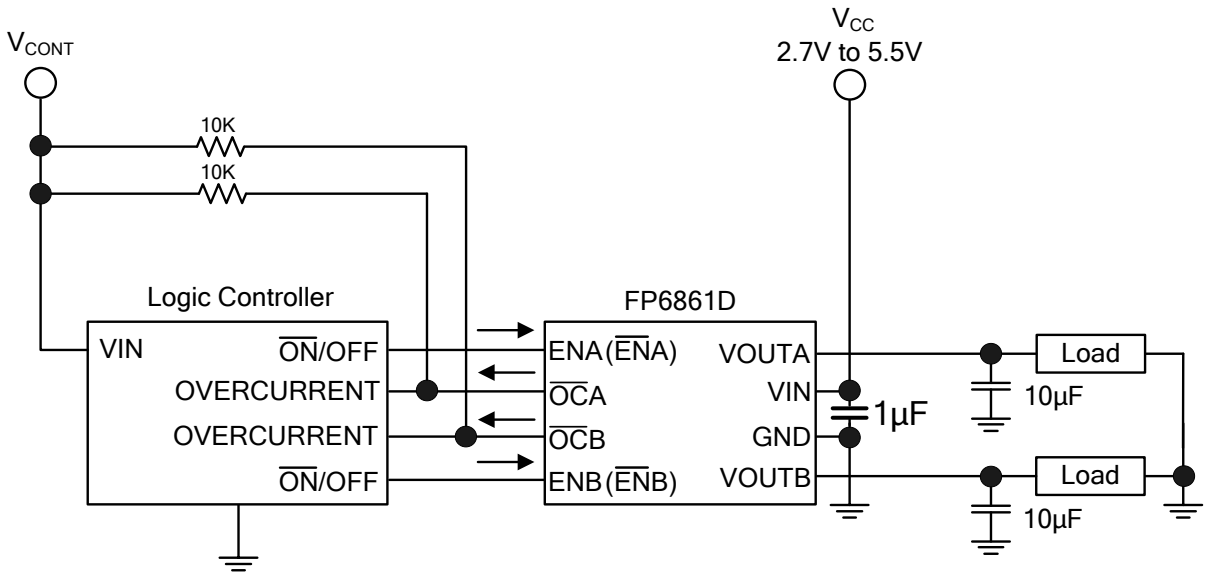


Figure 2. Typical Application Circuit

Functional Pin Description

Pin Name	Pin No.	Pin Function
VIN	7	Input Power Supply
VOUTA	8	Switch Output
VOUTB	5	Switch Output
GND	6	Ground
ENA/$\overline{\text{ENA}}$	1	ENA → Chip Enable. Pull the pin high to enable IC; pull the pin low to shutdown IC. Do not let the pin floating. $\overline{\text{ENA}}$ → Chip Shutdown. Pull the pin high to shutdown IC; Pull the pin low to enable IC. Do not let the pin floating.
ENB/$\overline{\text{ENB}}$	4	ENB → Chip Enable. Pull the pin high to enable IC; pull the pin low to shutdown IC. Do not let the pin floating. $\overline{\text{ENB}}$ → Chip Shutdown. Pull the pin high to shutdown IC; Pull the pin low to enable IC. Do not let the pin floating.
$\overline{\text{OCA}}$	2	Open-Drain Fault Flag Output
$\overline{\text{OCB}}$	3	Open-Drain Fault Flag Output

Block Diagram

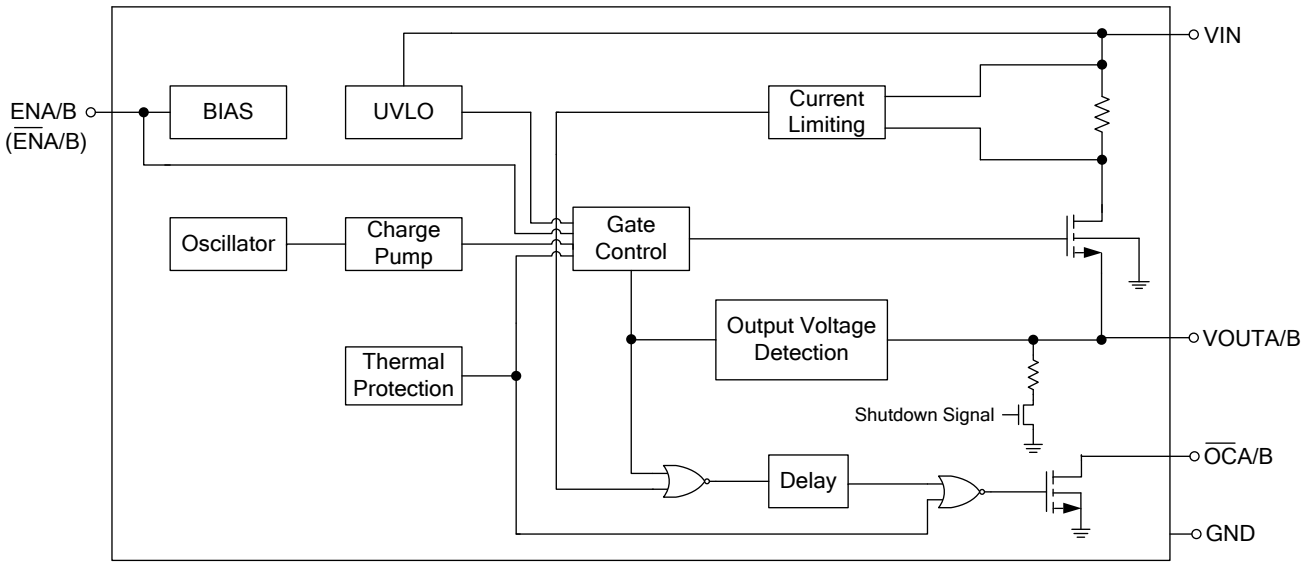


Figure 3. Block Diagram

Absolute Maximum Ratings

- VINA/B, VOUTA/B ---------- -0.3V to +6V
- ENA/B (**ENA/B**) ---------- -0.3V to +6V
- **OCA/B** ---------- -0.3V to +6V
- Power Dissipation @ T_A=25°C (P_D):

  SOP-8 ---------- +1.14W
- Package Thermal Resistance (θ_{JA}):

  SOP-8 ---------- +110°C/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}) ---------- +2.7V to +5.5V
- Operation Temperature Range (T_{OPR}) ---------- -40°C to +85°C

Electrical Characteristics

(V_{IN}=5V, C_{IN}=C_{OUT}=1μF, T_A=25°C, unless otherwise specified.)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Switch On Resistance	$R_{DS(ON)}$	I_{OUT}=70% minimum current limit	-	100	125	mΩ
Supply Current	I_{SW_ON}	Switch on, V_{OUT} = Open	-	130	-	μA
	I_{SW_OFF}	Switch off, V_{OUT} = Open	-	0.2	1	
EN Threshold	V_{IL}	Switch off	-	-	0.7	V
	V_{IH}	Switch on	1.8	-	-	
EN Input Current	I_{EN}	V_{EN} = Enable	-	0.01	0.1	μA
Current Limit	I_{LIM}	R_{LOAD} = 1Ω, FP6861D-B1	1.5	1.75	2	A
		R_{LOAD} = 1Ω, FP6861D-B2	1.5	1.75	2.1	
Short Circuit Fold-Back Current	I_{SC_FB}	V_{OUT} = 0V, measured prior to thermal shutdown	-	0.5	-	A
Output Leakage Current	$I_{LEAKAGE}$	V_{EN} = Disable, R_{LOAD} = 0Ω		0.5	1	μA
Output Turn-On Rise Time	T_{ON_RISE}	10% to 90% of V_{OUT} rising, CL=120μF		500		μs
$\overline{OC}$ 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		10		ms
Under-Voltage Lockout	V_{UVLO}	V_{IN} increasing		2.2		V
Under-Voltage Hysteresis	ΔV_{UVLO}	V_{IN} decreasing		0.2		V
Shutdown Pull Low Resistance	R_{PD}			80		Ω
Thermal Shutdown Threshold (Note2)	T_{SD}			135		°C
	ΔT_{SD}	Hysteresis		20		°C

Note 2：Guarantee by design.

Test Circuit

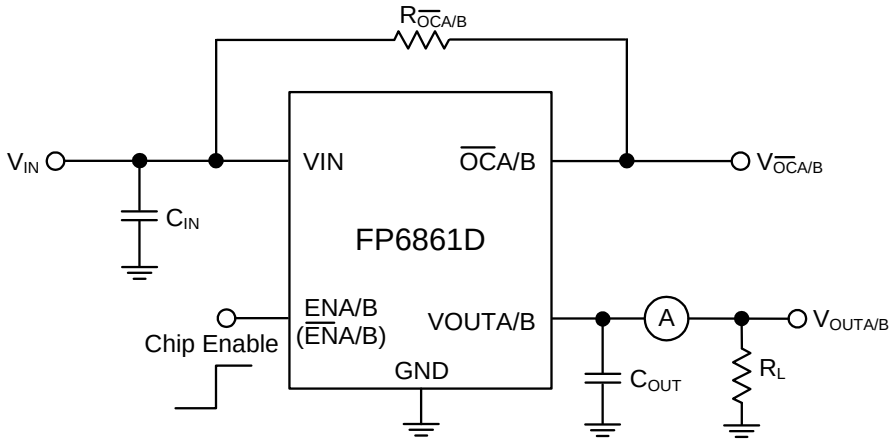
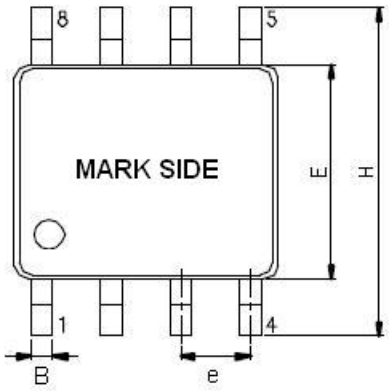
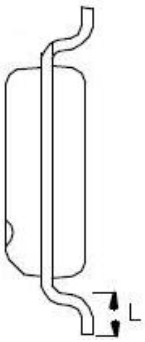


Figure 4. Electrical Characteristic Test Circuit of FP6861D

Outline Information

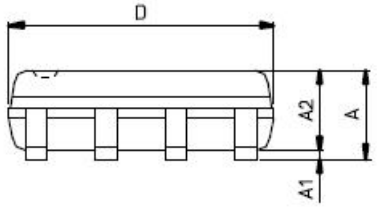
SOP-8 Package (Unit: mm)



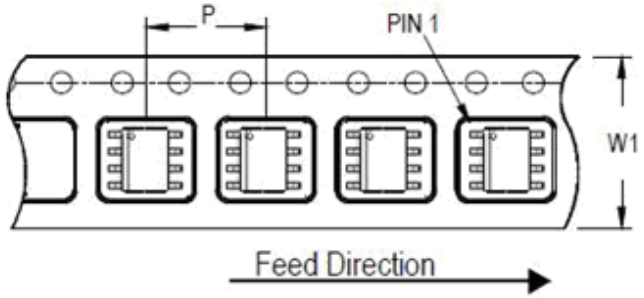


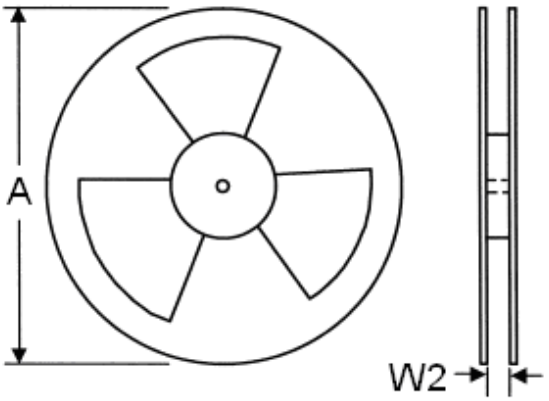
SYMBOLS UNIT	DIMENSION IN MILLIMETER	
	MIN	MAX
A	1.35	1.75
A1	0.10	0.25
A2	1.25	1.50
B	0.31	0.51
D	4.80	5.00
E	3.80	4.00
e	1.20	1.34
H	5.80	6.20
L	0.40	1.27

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