

Single-Channel Power Distribution Switch

Description

The FP6861E-C/E/F/H is a cost-effective, low voltage, single N-Channel MOSFET high-side power switch, optimized for self-powered and bus-powered Universal Serial Bus (USB) applications.

The FP6861E-C/E/F/H 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 FP6861E-C/E/F/H in single port in accordance with the USB power requirements. FP6861E-C/E/F/H will prevent reverse current when it is disabled and VOUT is higher than VIN.

The FP6861E-C/E/F/H is available in MSOP-8, SOP-8 and SOT-23-5 packages with smallest components.

Features

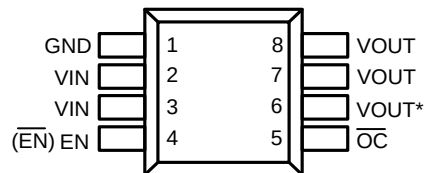
- Compliant to USB Specifications
- Built-In Low $R_{DS(ON)}$ N-Channel MOSFET
- Output can be Forced Higher than Input (Off-State)
- Low Supply Current:
 - 65 μ A Typical at Switch On State
 - 0.1 μ A Typical at Switch Off State
- Wide Input Voltage Ranges: 2.7V to 5.5V
- Open-Drain Fault Flag Output
- Hot Plug-In Application (Soft-Start)
- 2.2V Typical Under-Voltage Lockout (UVLO)
- Current Limit Protection
- Thermal Shutdown Protection
- Reverse Current Flow Blocking (No Body Diode)
- Logic Level Enable Pin
- MSOP-8, SOP-8 and SOT-23-5 Packages
- RoHS Compliant
- UL NO.E322418 (Approved model: FP6861 Series)
- CB Test Certified, Ref. Certif. No. JPTUV-041416

Applications

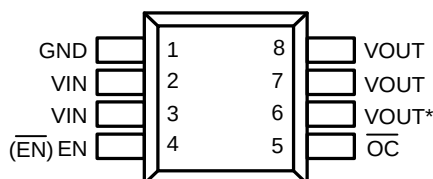
- USB Bus/Self Powered Hub
- USB Peripheral
- ACPI Power Distribution
- Notebook, Motherboard PC
- Battery-Charger Circuit

Pin Assignments

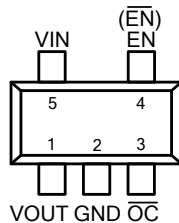
MS Package (MSOP-8)



SO Package (SOP-8)



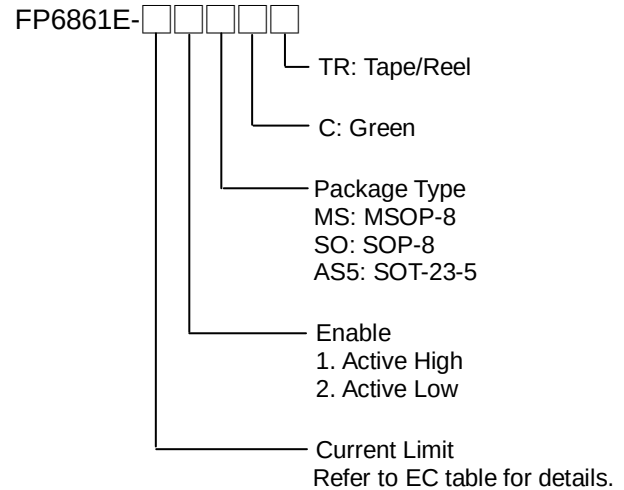
AS5 Package (SOT-23-5)



* The pin 6 should be considered as VOUT when circuit design and PCB layout, but it is NC pin actually.

Figure1. Pin Assignment of FP6861E-C/E/F/H

Ordering Information



Available Product List

FP6861E-C1MSCTR	FP6861E-F1MSCTR
FP6861E-C1SOCTR	FP6861E-F1SOCTR
FP6861E-C1AS5CTR	FP6861E-F1AS5CTR
FP6861E-C2MSCTR	FP6861E-F2MSCTR
FP6861E-C2SOCTR	FP6861E-F2SOCTR
FP6861E-C2AS5CTR	FP6861E-F2AS5CTR
FP6861E-E1MSCTR	FP6861E-H1MSCTR
FP6861E-E1SOCTR	FP6861E-H1SOCTR
FP6861E-E1AS5CTR	FP6861E-H1AS5CTR
FP6861E-E2MSCTR	FP6861E-H2MSCTR
FP6861E-E2SOCTR	FP6861E-H2SOCTR
FP6861E-E2AS5CTR	FP6861E-H2AS5CTR

SOT-23-5 Marking

Part Number	Product Code	Part Number	Product Code
FP6861E-C1AS5C	FG7	FP6861E-F1AS5C	FH2
FP6861E-C2AS5C	FG8	FP6861E-F2AS5C	FH3
FP6861E-E1AS5C	FG9	FP6861E-H1AS5C	FH4
FP6861E-E2AS5C	FH1	FP6861E-H2AS5C	FH5

Typical Application Circuit

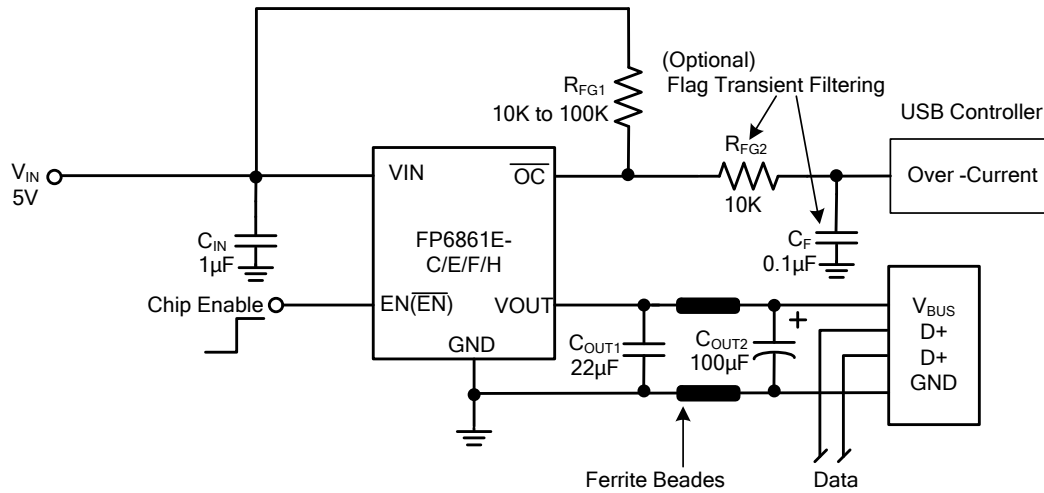


Figure 2. Typical Application Circuit

Functional Pin Description

Pin Name	Pin Function
VIN	Input Power Supply
VOUT	Switch Output
GND	Ground
EN	Chip Enable. Pull the pin high to enable IC; Pull the pin low to shutdown IC. Do not let the pin floating.
EN	Chip Shutdown. Pull the pin high to shutdown IC; Pull the pin low to enable IC. Do not let the pin floating.
OC	Open-Drain Fault Flag Output

Block Diagram

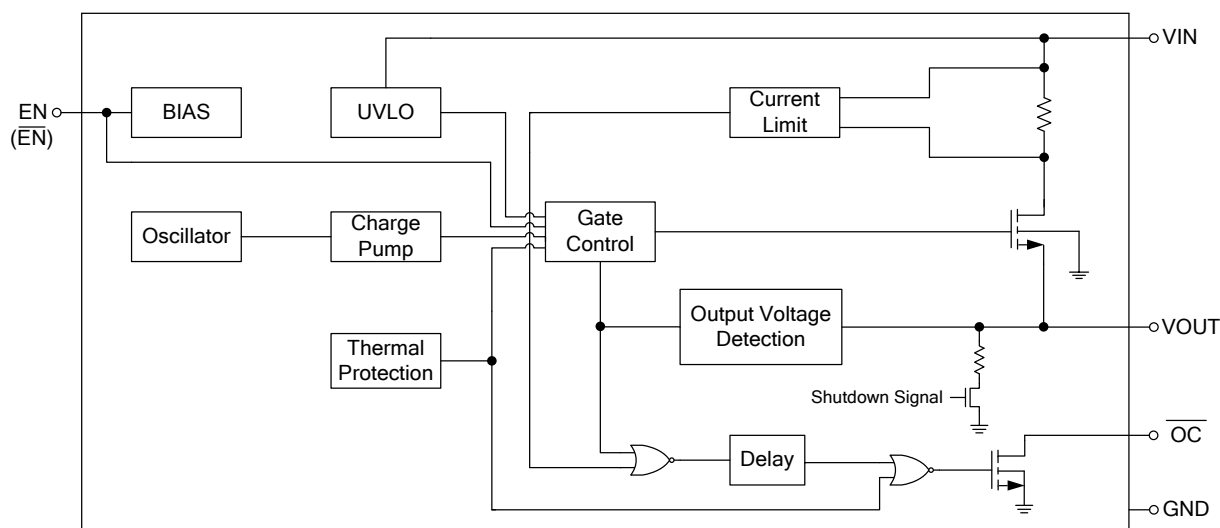


Figure 3. Block Diagram

Absolute Maximum Ratings

- VIN, VOUT ----- -0.3V to 6V
- EN ($\overline{\text{EN}}$) ----- -0.3V to 6V
- $\overline{\text{OC}}$ ----- -0.3V to 6V
- Power Dissipation @ $T_A=25^\circ\text{C}$, (P_D)
 - MSOP-8 ----- +0.78W
 - SOP-8 ----- +1.14W
 - SOT-23-5 ----- + 0.5W
- Package Thermal Resistance, (θ_{JA})
 - MSOP-8 ----- +160°CW
 - SOP-8 ----- +110°CW
 - SOT-23-5 ----- +250°CW
- 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

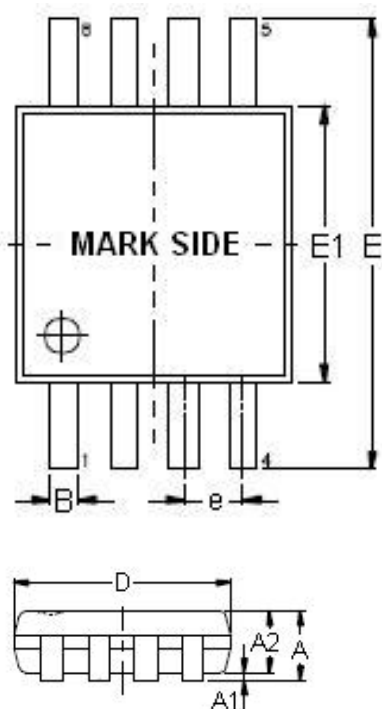
($V_{IN}=5V$, $C_{IN}=C_{OUT}=1\mu F$, $T_A=25^\circ C$, unless otherwise specified.)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Switch On Resistance	$R_{DS(ON)}$	$I_{OUT}=70\%$ minimum current limit, MSOP-8,SOP-8 package		110		m Ω
		$I_{OUT}=70\%$ minimum current limit, SOT-23-5 package		110		
Supply Current	I_{SW_ON}	Switch on, $V_{OUT} = \text{Open}$		65		μA
	I_{SW_OFF}	Switch off, $V_{OUT} = \text{Open}$		0.1	1	
EN Threshold	V_{IL}	Switch off			0.7	V
	V_{IH}	Switch on	1.8			
EN Input Current	I_{EN}	$V_{EN}=\text{Enable}$		0.01	0.1	μA
Current Limit	I_{LIM}	$R_{LOAD}=1\Omega$, FP6861E-C	2.1	2.45	2.8	A
		$R_{LOAD}=1\Omega$, FP6861E-E	1.5	1.75	2.1	A
		$R_{LOAD}=1\Omega$, FP6861E-F	0.7	1	1.35	A
		$R_{LOAD}=1\Omega$, FP6861E-H	1.1	1.4	1.7	A
Short Circuit Fold-Back Current	I_{SC_FB}	$V_{OUT}=0V$, Measured Prior to Thermal Shutdown, FP6861E-C		0.55		A
		$V_{OUT}=0V$, Measured Prior to Thermal Shutdown, FP6861E-E		0.5		A
		$V_{OUT}=0V$, Measured Prior to Thermal Shutdown, FP6861E-F		0.4		A
		$V_{OUT}=0V$, Measured Prior to Thermal Shutdown, FP6861E-H		0.45		A
Output Leakage Current	$I_{LEAKAGE}$	$V_{EN}=\text{Disable}$, $R_{LOAD}=0\Omega$		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		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		$^\circ C$
	ΔT_{SD}	Hysteresis		20		$^\circ C$

Note 2 : Guarantee by design.

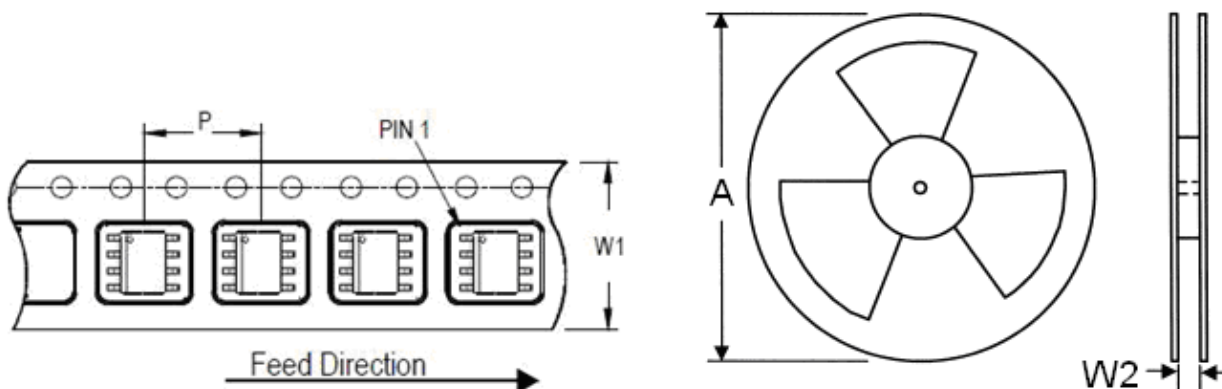
Outline Information

MSOP-8 Package (Unit: mm)



SYMBOLS UNIT	DIMENSION IN MILLIMETER	
	MIN	MAX
A	0.75	1.10
A1	0.00	0.15
A2	0.75	0.95
B	0.25	0.35
D	2.90	3.10
E	4.80	5.00
E1	2.90	3.10
e	0.60	0.70
L	0.40	0.80

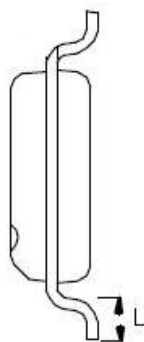
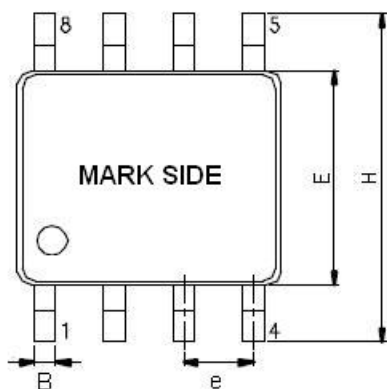
Carrier Dimensions



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	3,000

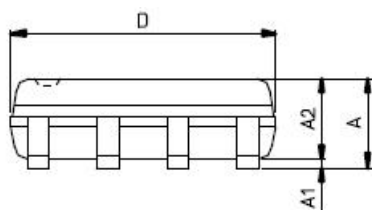
Outline Information (Continued)

SOP-8 Package (Unit: mm)

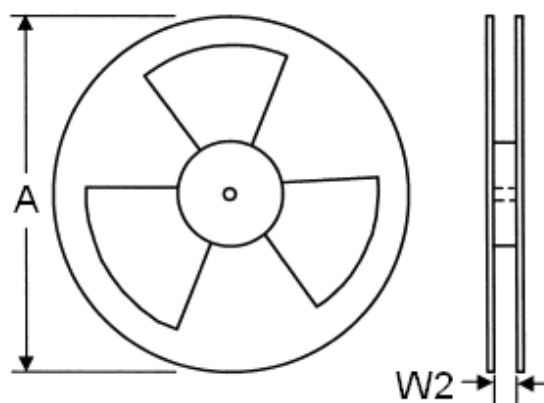
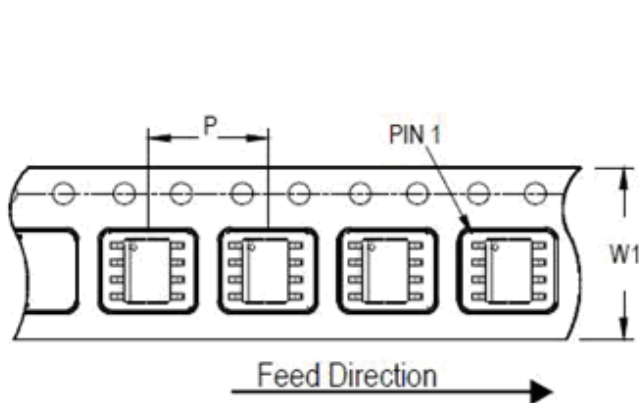


SYMBOLS UNIT	DIMENSION IN MILLIMETER	
	MIN	MAX
A	1.35	1.75
A1	0.10	0.25
A2	1.25	1.50
B	0.31	0.51
D	4.80	5.00
E	3.80	4.00
e	1.20	1.34
H	5.80	6.20
L	0.40	1.27

Note : Followed From JEDEC MO-012-E.



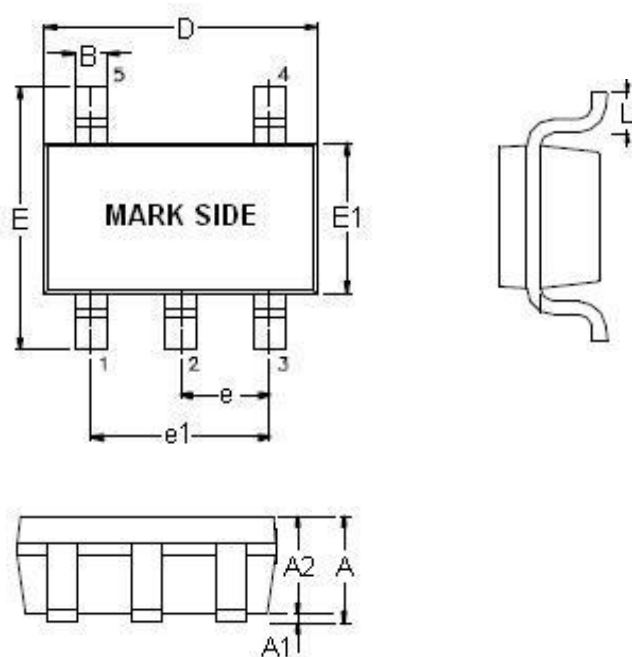
Carrier Dimensions



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

Outline Information (Continued)

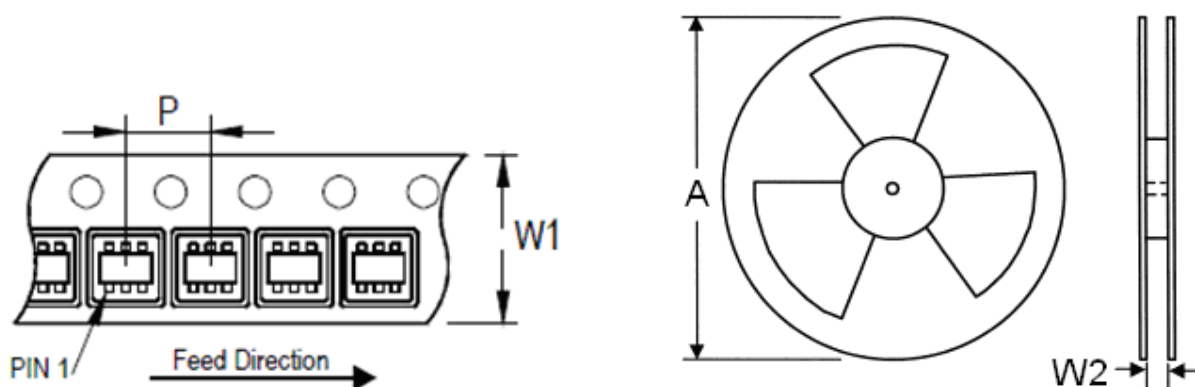
SOT-23-5 Package (Unit: mm)



SYMBOLS UNIT	DIMENSION IN MILLIMETER	
	MIN	MAX
A	0.90	1.45
A1	0.00	0.15
A2	0.90	1.30
B	0.30	0.50
D	2.80	3.00
E	2.60	3.00
E1	1.50	1.70
e	0.90	1.00
e1	1.80	2.00
L	0.30	0.60

Note : Followed From JEDEC MO-178-C.

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	300~1000	3,000

Life Support Policy

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