# FP6861J

## *Adjustable Current-Limit Single-Channel Power Distribution Switch*

## Description

FP6861J is a cost-effective, low voltage, adjustable current limit, single N-Channel MOSFET high-side power switch, optimized for self-powered and bus-powered Universal Serial Bus (USB) applications.

FP6861J 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. FP6861J also provides adjustable current limit threshold between 0.17A~3.76A through an external resistor.

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 FP6861J in single port in accordance with the USB power requirements. FP6861J will prevent reverse current with reverse voltage protection.

FP6861J is available in SOT-23-6, TSOT-23-6, and TDFN-6 (2mm×2mm) packages with smallest components.

## Features

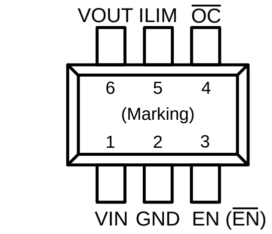
- Compliant to USB Specifications
- Adjustable Current Limit: 0.17A~3.76A
- Built-in Low $R_{DS(ON)}$ N-Channel MOSFET
- Output can be Forced Higher than Input
- Low Supply Current:
  80μA Typical at Switch On State ($R_{ILIM}$=20kΩ)
  0.1μA Typical at Switch Off State
- Wide Input Voltage Ranges: 2.7V to 6V
- Open-Drain Fault Flag Output
- Hot Plug-In Application (Soft-Start)
- 2.2V Typical Under-Voltage Lockout (UVLO)
- Thermal Shutdown Protection
- Reverse Current Flow Blocking (No Body Diode)
- Reverse Voltage Protection
- Logic Level Enable Pin
- SOT-23-6, TSOT-23-6, and TDFN-6 (2mm×2mm) Packages
- RoHS Compliant
- UL NO.E322418 (Approved model: FP6861J Series)
- CB Test Certified, Ref. Certif. No. DK-104880-M1-UL

## Applications

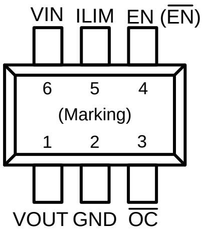
- USB Bus/Self Powered Hub
- USB Peripheral
- ACPI Power Distribution
- Notebook, Motherboard PC
- Battery-Charger Circuit

## Pin Assignments

**S6 Package: SOT-23-6**




**S9 Package: TSOT-23-6**




**D7 Package: TDFN-6 (2mm×2mm)**

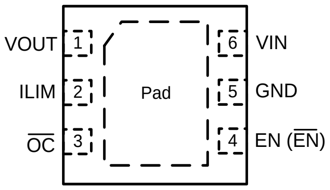



Figure1. Pin Assignment of FP6861J

## Ordering Information

FP6861J-□□

Package Type
S6: SOT-23-6
S9: TSOT-23-6
D7: TDFN-6 (2mm×2mm)

Enable Type
1: Active High
2: Active Low

**SOT-23-6 Marking**

| Part Number | Product Code |
|---|---|
| FP6861J-1S6 | **GC5** |
| FP6861J-2S6 | **GC6** |

**TSOT-23-6 Marking**

| Part Number | Product Code |
|---|---|
| FP6861J-1S9 | **GC7** |
| FP6861J-2S9 | **GC8** |

**TDFN-6 (2mm×2mm) Marking**

| Part Number | Product Code |
|---|---|
| FP6861J-1D7 | **GC9** |
| FP6861J-2D7 | **GD0** |

## Typical Application Circuit

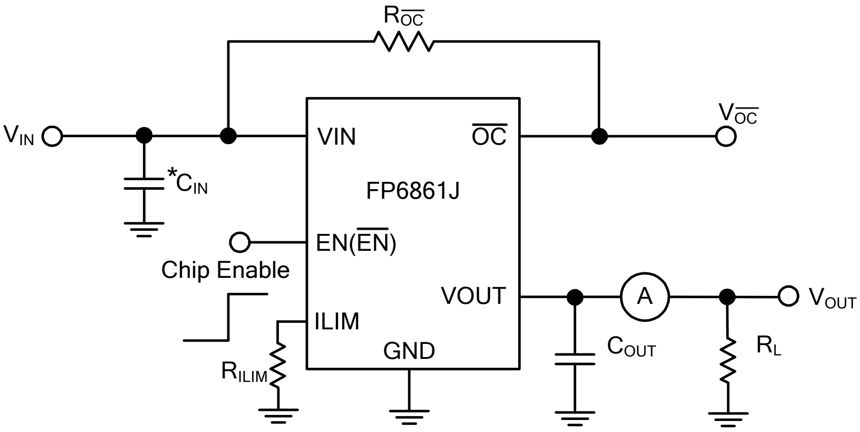
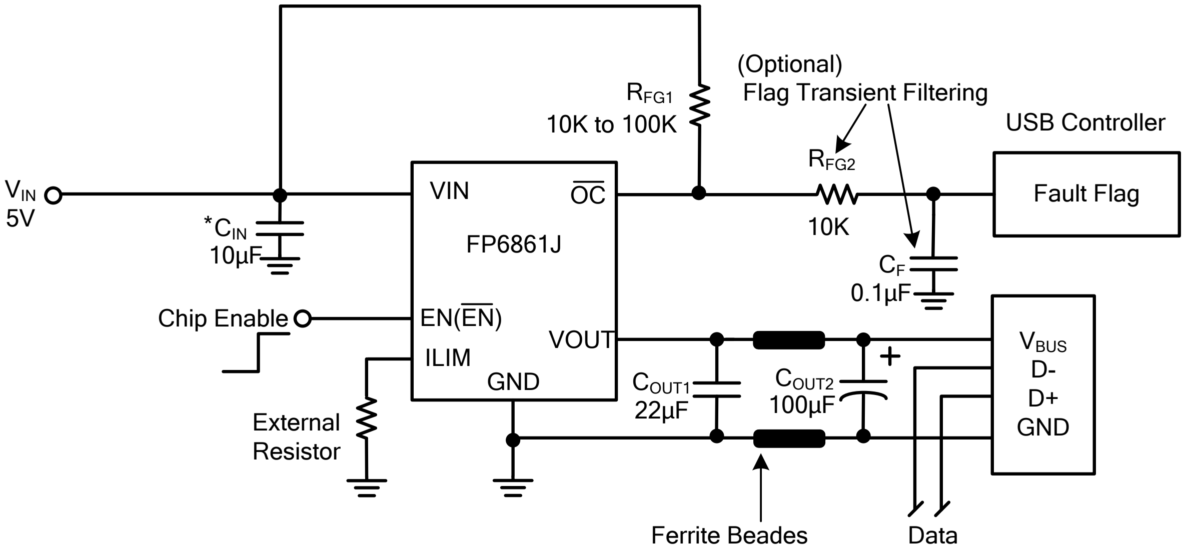



Figure 2. Electrical Characteristic Test Circuit




*Note: In most applications, adding one 10μF capacitor is enough. If the trace to VIN is long in PCB, placing larger input capacitor is needed.

Figure 3. Typical Application Circuit for USB Power Switch

## Functional Pin Description

| Pin Name | Pin No. (SOT-23-6) | Pin No. (TSOT-23-6) | Pin No. (TDFN-6) | Pin Function |
|---|---|---|---|---|
| VIN | 1 | 6 | 6 | Input power supply. |
| GND | 2 | 2 | 5 | Ground. Connect GND to exposed pad. |
| EN/$\overline{EN}$ | 3 | 4 | 4 | Chip enable/chip shutdown. Pull the pin high to enable IC; Pull the pin low to shutdown IC. Do not let the pin floating. |
| $\overline{OC}$ | 4 | 3 | 3 | Fault flag. Open-drain output. |
| ILIM | 5 | 5 | 2 | Use external resistor to set current-limit; recommended 6.98kΩ≦$R_{ILIM}$≦160kΩ. |
| VOUT | 6 | 1 | 1 | Switch output. |

## Block Diagram

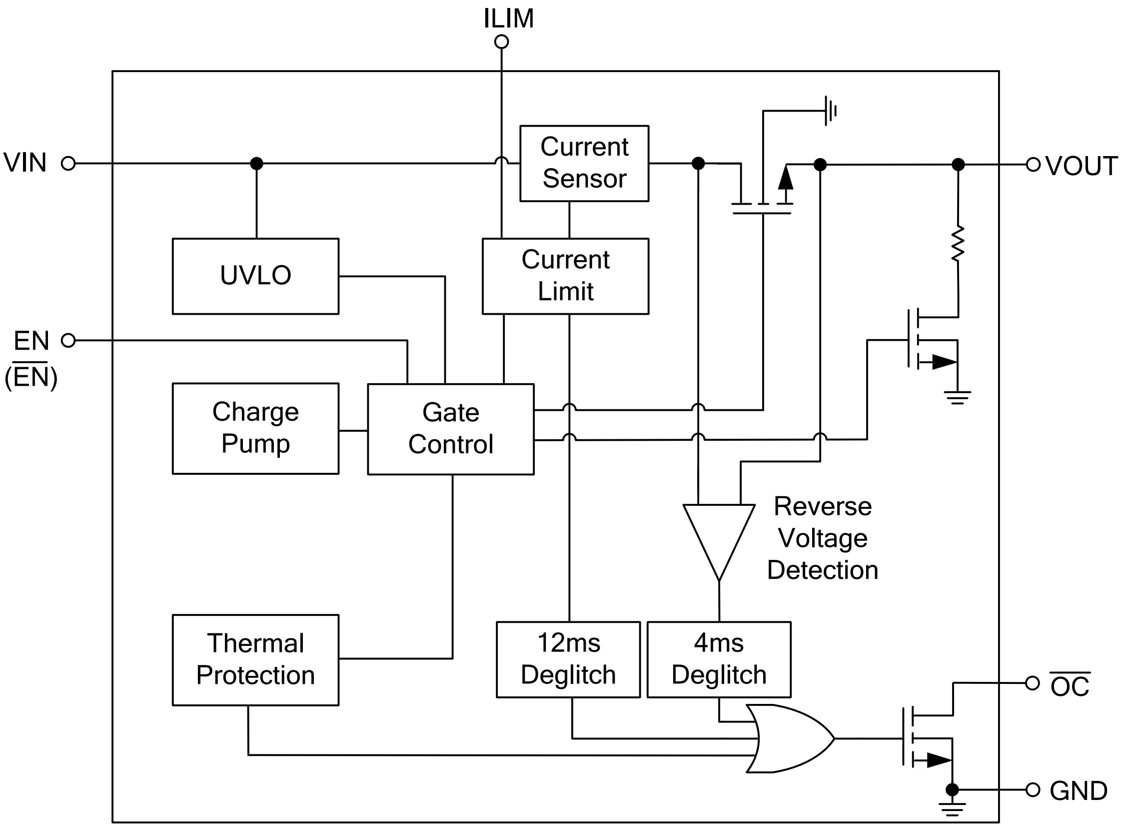



Figure 4. Block Diagram

## Absolute Maximum Ratings (Note 1)

- VIN, VOUT ------------------------------------------------------------------------------------------ -0.3V to +7V
- All Other Pins Voltage------------------------------------------------------------------------------- -0.3V to +7V
- Power Dissipation @$T_A$=25°C & $T_J$=125°C ($P_D$)
  - SOT-23-6 ------------------------------------------------------------------------------------- 0.4W
  - TSOT-23-6 ----------------------------------------------------------------------------------- 1.18W
  - TDFN-6 (2mm×2mm) -------------------------------------------------------------------------- 0.74W
- Package Thermal Resistance, ($\theta_{JA}$)
  - SOT-23-6 ------------------------------------------------------------------------------------- 250°C/W
  - TSOT-23-6 ----------------------------------------------------------------------------------- 85°C/W
  - TDFN-6 (2mm×2mm) -------------------------------------------------------------------------- 136ºC/W
- Package Thermal Resistance, ($\theta_{JC}$)
  - SOT-23-6 ------------------------------------------------------------------------------------- 110°C/W
  - TSOT-23-6 ----------------------------------------------------------------------------------- 20°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 ($V_{IN}$) ------------------------------------------------------------------------- +2.7V to +6V
- Junction Temperature------------------------------------------------------------------------------ -40°C to +125°C
- Operation Temperature Range ($T_{OPR}$) --------------------------------------------------------- -40°C to +85°C

## Electrical Characteristics

($V_{IN}$=5V, $T_A$=25°C, unless otherwise specified.)

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Switch On Resistance | $R_{DS(ON)}$ | $I_{OUT}$=1A (TSOT-23-6) | | 35 | 55 | mΩ |
| | | $I_{OUT}$=1A (SOT-23-6, TDFN-6) | | 55 | 80 | |
| Supply Current | $I_{SW\_ON}$ | $R_{ILIM}$=20kΩ | | 80 | | µA |
| | $I_{SW\_OFF}$ | Switch OFF, $V_{OUT}$=Open | | 0.1 | 1 | |
| EN Threshold | $V_{IH}$ | Switch ON | 1.8 | | | V |
| | $V_{IL}$ | Switch OFF | | | 0.7 | |
| EN Input Current | $I_{EN}$ | $V_{EN}$=5V | | 0.01 | 0.1 | µA |
| Current Limit | $I_{LIM}$ | $R_{ILIM}$=6.98kΩ | 3060 | 3683 | 4335 | mA |
| | | $R_{ILIM}$=10kΩ | 2156 | 2585 | 3019 | |
| | | $R_{ILIM}$=15.5kΩ | 1425 | 1700 | 1920 | |
| | | $R_{ILIM}$=20kΩ | 1095 | 1300 | 1500 | |
| | | $R_{ILIM}$=61.5kΩ | 342 | 417 | 490 | |
| | | $R_{ILIM}$=160kΩ | 88 | 170 | 262 | |
| | | $R_{ILIM}$ Shorted to $V_{IN}$ (Note 2) | 147 | 217 | 288 | |
| Short Circuit Fold-Back Current | $I_{SC\_FB}$ | $R_{ILIM}$=6.98kΩ | | 2256 | | mA |
| | | $R_{ILIM}$=10kΩ | | 1560 | | |
| | | $R_{ILIM}$=15.5kΩ | | 1020 | | |
| | | $R_{ILIM}$=20kΩ | | 777 | | |
| | | $R_{ILIM}$=61.5kΩ | | 240 | | |
| | | $R_{ILIM}$=160kΩ | | 75 | | |
| | | $R_{ILIM}$ Shorted to $V_{IN}$ (Note 2) | | 126 | | |
| Output Leakage Current | $I_{LEAKAGE}$ | $V_{EN}$=Disable, $R_L$=0Ω | | 0.5 | 1 | µA |
| Output Reverse Leakage Current | $I_{R\_LEAKAGE}$ | $V_{in}$=0V, $V_{EN}$=Disable, $V_{out}$=5V | | | 1 | µA |
| Output Turn-On Rise Time | $T_{ON\_RISE}$ | $R_{ILIM}$=20kΩ, $C_L$=1µF | | 2 | | ms |
| $\overline{OC}$ Output Resistance | $R_{\overline{OC}}$ | $I_{SINK}$=1mA | | 70 | | Ω |
| $\overline{OC}$ Off Current | $I_{\overline{OC}}$ | $V_{\overline{OC}}$=5V | | 0.01 | | µA |
| $\overline{OC}$ Deglitch Time | $t_D$ | From Fault Condition to $\overline{OC}$ Assertion or De-assertion | | 12 | | ms |

## Electrical Characteristics (Continued)

($V_{IN}$=5V, $T_A$=25°C, unless otherwise specified.)

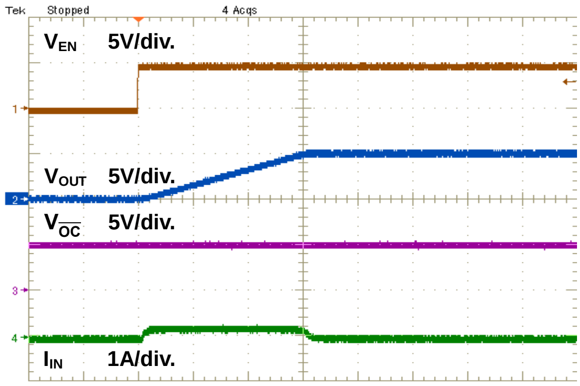
| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Under-Voltage Lockout | $V_{UVLO}$ | $V_{IN}$ Increasing | | 2.2 | | V |
| Under-Voltage Hysteresis | $\Delta V_{UVLO}$ | $V_{IN}$ Decreasing | | 0.2 | | V |
| $V_{OUT}$ Discharge Resistance | $R_{DIS}$ | $V_{EN}$=0V | | 70 | | Ω |
| Thermal Shutdown Threshold (Note 2) | $T_{SD}$ | | | 150 | | °C |
| | $\Delta T_{SD}$ | Hysteresis | | 20 | | °C |

Note 2: Guarantee by design.

## Typical Performance Curves

$V_{IN}$= $V_{OUT}$=5V, $C_{IN}$=100µF, $C_{OUT}$=120µF, $R_{ILIM}$=6.98kΩ, TA=+25°C, unless otherwise noted. This is measured by using FP6861J-1S6.

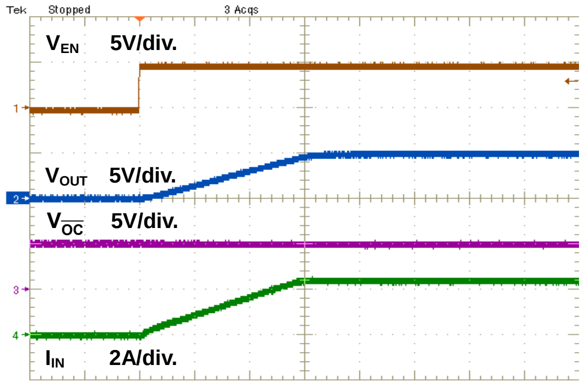
**$I_{OUT}$=0A**




**1ms/div.**

Figure 5. EN Start Up with No Load

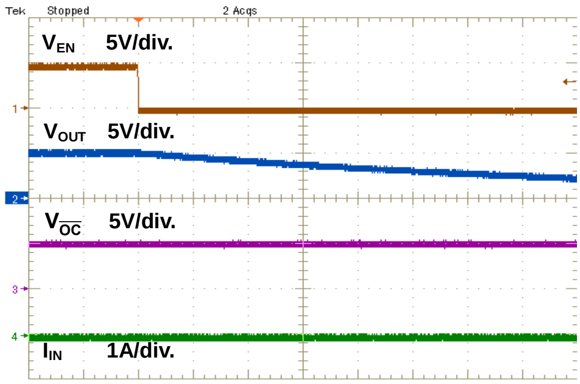
**$I_{OUT}$=2.5A ($R_L$=2Ω)**




**1ms/div.**

Figure 6. EN Start Up with Heavy Load

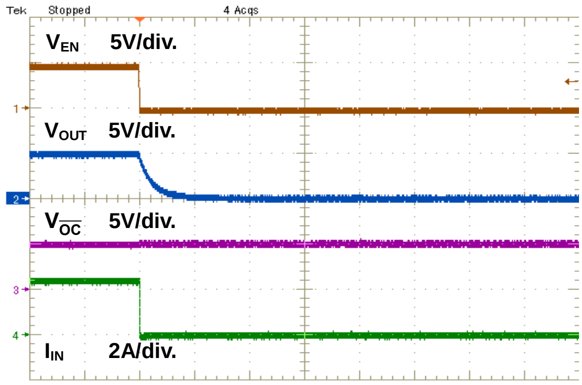
**$I_{OUT}$=0A**




**1ms/div.**

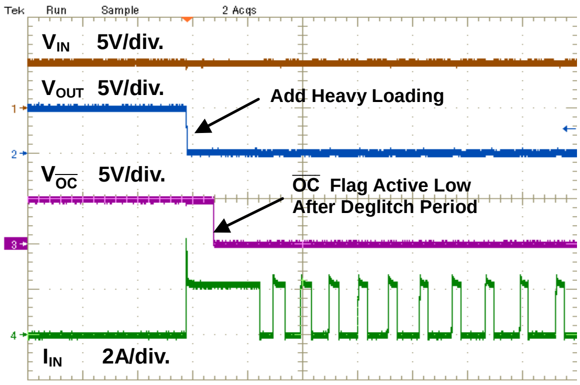
Figure 7. EN Power Off with No Load

**$I_{OUT}$=2.5A ($R_L$=2Ω)**



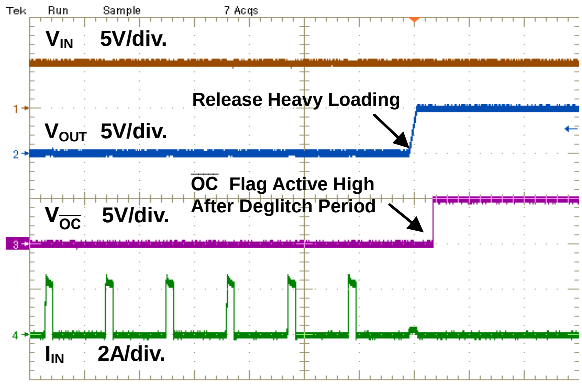

**1ms/div.**

Figure 8. EN Power Off with Heavy Load




**20ms/div.**

Figure 9. Short Circuit Transient Response




**20ms/div.**

Figure 10. Release Short Circuit Transient Response

## Typical Performance Curves (Continued)

$V_{IN}$= $V_{OUT}$=5V, $C_{IN}$=100μF, $C_{OUT}$=120μF, $R_{ILIM}$=6.98kΩ, TA=+25°C, unless otherwise noted. This is measured by using FP6861J-1S6.

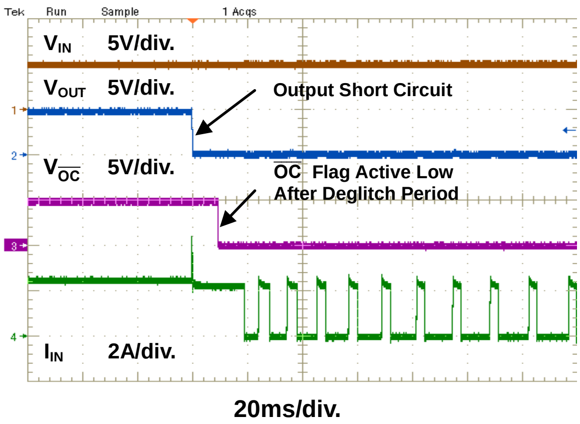



Figure 11. Heavy Loading to Short Circuit Transient Response

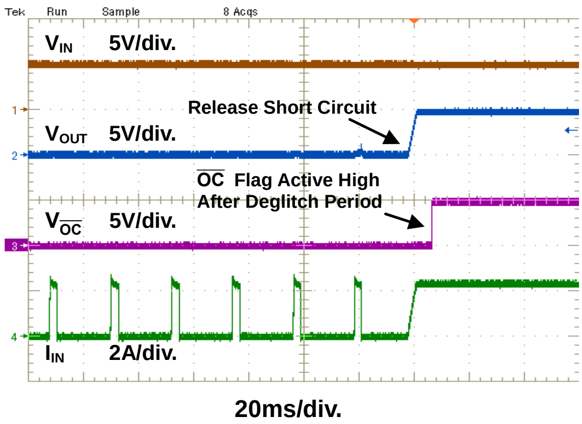



Figure 12. Short Circuit to Heavy Loading Transient Response

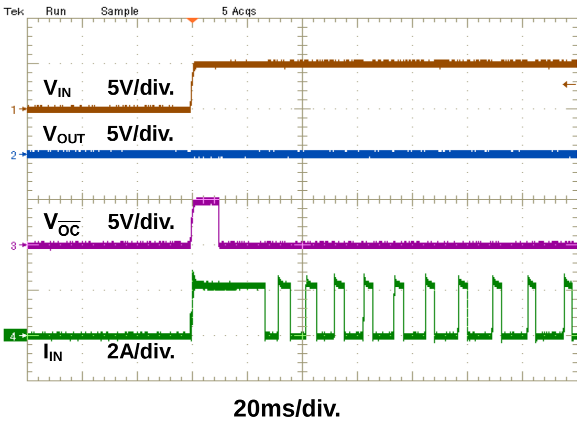



Figure 13. Short Circuit Response at Start Up

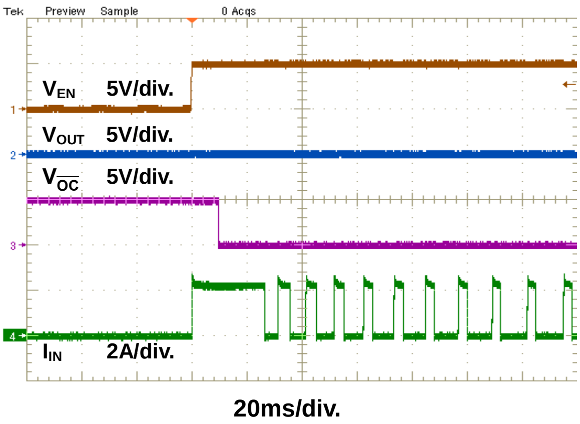



Figure 14. Short Circuit Response at Device Eable

## Typical Performance Curves (Continued)

$V_{IN}$= $V_{OUT}$=5V, $C_{IN}$=100μF, $C_{OUT}$=120μF, $R_{ILIM}$=6.98kΩ, TA=+25°C, unless otherwise noted. This is measured by using FP6861J-1S6.

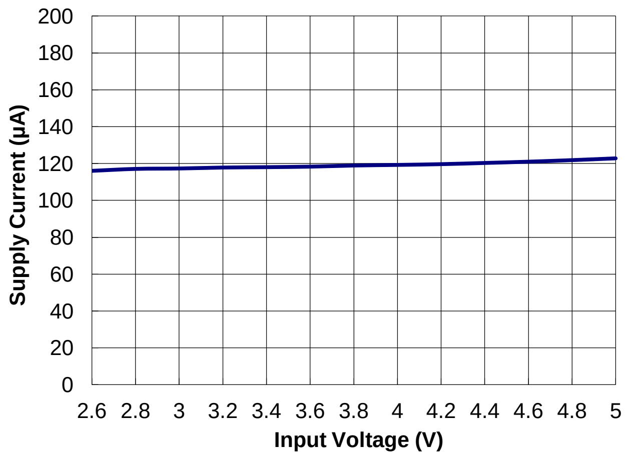



Figure 15. Supply Current vs. Input Voltage

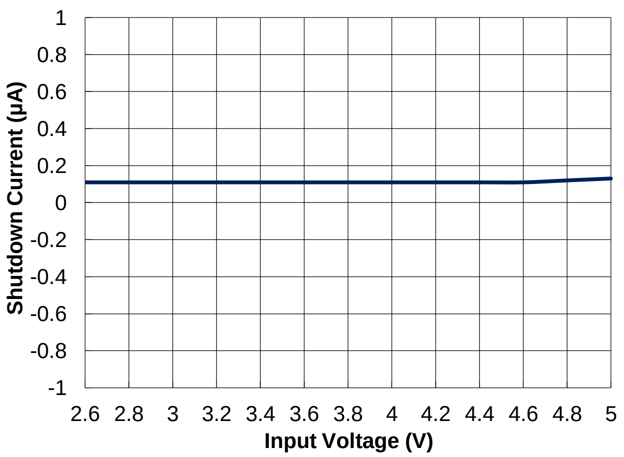



Figure 16. Shutdown Current vs. Input Voltage

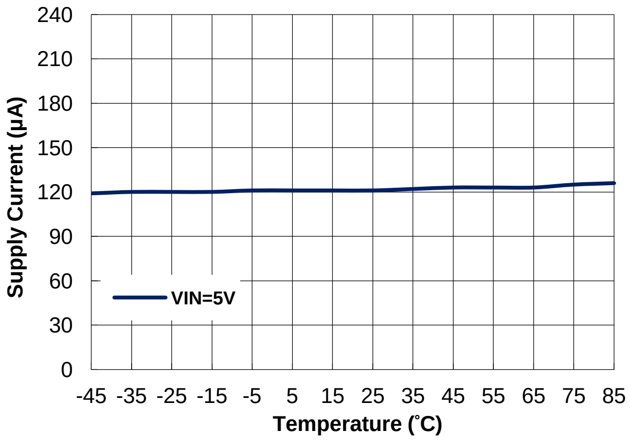



Figure 17. Supply Current vs. Temperature

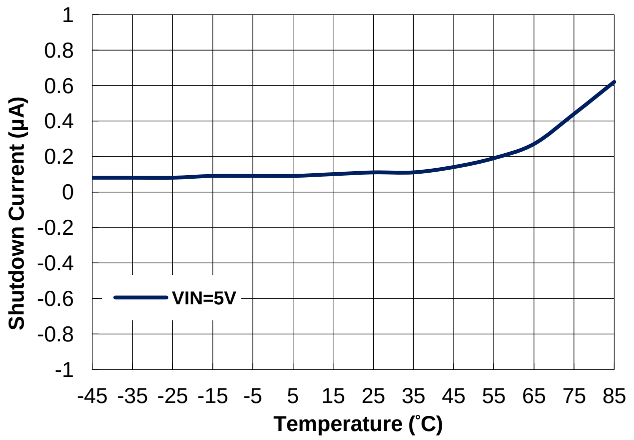



Figure 18. Shutdown Current vs. Temperature

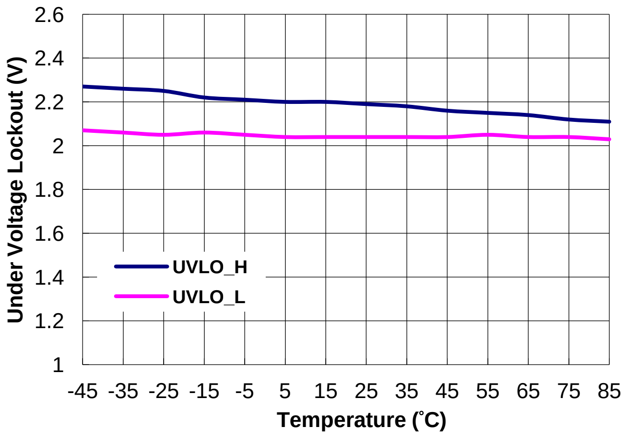



Figure 19. Under Voltage Lockout vs. Temperature

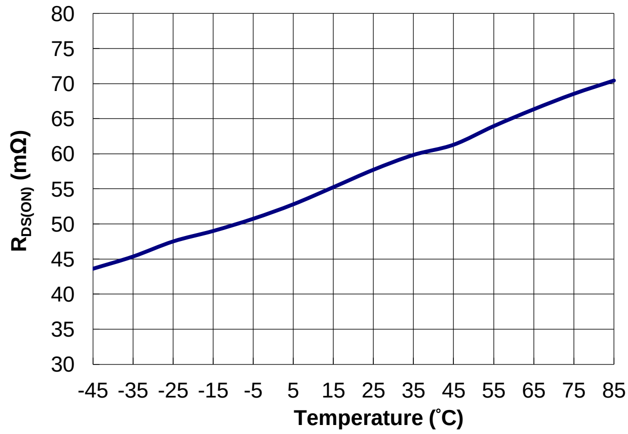



Figure 20. $R_{DS(ON)}$ vs. Temperature

## Application Information

The FP6861J is a single N-Channel MOSFET high-side power switch, optimized for self-powered and bus-powered Universal Serial Bus (USB) applications. The FP6861J operates from 2.7V to 6V input voltage range and provides low supply current. The switch's low $R_{DS(ON)}$ can meets USB voltage drop requirements. It has one switch with enable control input. The switch has an error flag output to notify the USB controller when the current-limit, short-circuit or thermal-shutdown occurs.

### Under Voltage-Lockout

Under-Voltage Lockout (UVLO) prevents the MOSFET switch from turning on until input voltage exceeds approximately 2.2V. If input voltage drops below approximately 2V, UVLO will turn off the MOSFET switch.

### Soft Start for Hot Plug-In Application

In order to eliminate the upstream voltage drop caused by the large inrush current during hot-plug events, the “soft-start” feature effectively isolates the power source from extremely large capacitive loads, satisfying the USB voltage drop requirements.

### Reverse Current Blocking

The USB specification does not allow an output device to source current back into the USB port. However, the FP6861J is designed to safely power noncompliant devices. When the device is disabled, the output will be switched to a high-impedance state, blocking reverse current flow from the output back to the input. The switch can pass the input to output when it is enabled.

### Reverse Voltage Protection

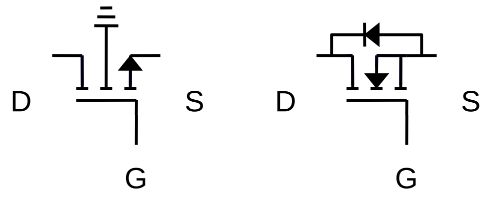
The reverse voltage protection will turn off N-channel MOSFET when output voltage is larger than input voltage 50mV for 4ms. Conversely, N-channel MOSFET will turn on when output voltage is lower than input voltage for 4ms.

### Supply Filter/Bypass Capacitor

The input capacitor must be at least 10μF low-ESR ceramic capacitor connected from VIN to GND, but can be increased without limit. Output short may cause sufficient ringing on the input (from source lead inductance) to destroy the internal control circuitry. The input transient must not exceed 6V of the absolute maximum supply voltage even for a short duration.

### Input and Output

VIN is the power source connection to the internal circuitry and the drain of the MOSFET. VOUT is the source of the MOSFET. In typical application, current flows through the switch from VIN to VOUT toward the load. If VOUT is greater than VIN, current will flow from VOUT to VIN since the MOSFET is bidirectional. There is no parasitic body diode between drain and source of the MOSFET, and the FP6861J will prevent reverse current flow if VOUT externally forces a higher voltage than VIN when the output is disabled.




FP6861J Normal MOSFET

### Output Filter Capacitor

Output is recommended to use a 10μF ceramic capacitor in parallel with a 100μF electrolytic capacitor. Standard bypass methods should be used to minimize inductance and resistance between the bypass capacitor and the downstream connector which reduce EMI and decouple voltage drop caused when downstream cables are hot-insertion transients. Ferrite beads in series with $V_{BUS}$, the ground line and the 0.1μF bypass capacitors at the power connector pins are recommended for EMI and ESD protection. The bypass capacitor should have a low dissipation factor to allow decoupling at higher frequencies.

### Error Flag

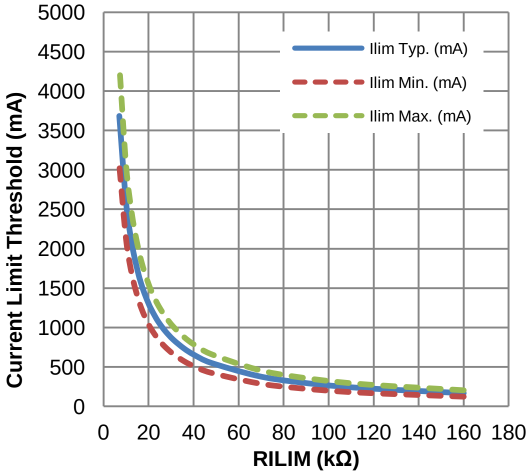
The FP6861J provides an open drain error flag output for the switch. For most applications, connect $\overline{OC}$ to VIN through a pull-up resistor. $\overline{OC}$ will go low when any following condition occurs:

1. The thermal shutdown occurs.
2. The switch is in current limit or short circuit conditions.
3. Reverse voltage protection occurs when output voltage exceeds the input voltage.

## Application Information (Continued)

### Adjustable Current Limit

The current limit circuitry prevents damage to the MOSFET switch but can deliver load current up to the current limit threshold through the switch. FP6861J provides adjustable current limit threshold between 0.17A~3.76A through an external resistor. The current limit threshold(Typ.) and $R_{ILIM}$ curve is show below：




Designer can use following equation to easy calculate the value of the external resistor for porposed typical current limit value：

$$I_{LIM(Typ.)}(A)=\frac{25121}{R_{ILIM}(k\Omega)^{0.988}}$$

$$I_{LIM(Min.)}(A)=\frac{22400}{R_{ILIM}(k\Omega)^{1.025}}$$

$$I_{LIM(Max.)}(A)=\frac{29020}{R_{ILIM}(k\Omega)^{0.978}}$$

To design above a minimum current-limit threshold, find the intersection of $R_{ILIM}$ and the maximum desired load current on the $I_{LIM(min)}$ curve and choose a value of $R_{ILIM}$ below this value. Programming the current limit above a minimum threshold is important to ensure start-up into full load or heavy capacitive loads. The minimum current limit threshold offset needs cautions, especially for $I_{LIM}$ < 400mA applications. Taking $R_{ILIM}$ = 160kohm as an example, the calculated of minimum value is 123.32mA higher then 88mA minimum threshold (40% error versus its target). The resulting current limit threshold is the selected 40% of the $I_{LIM(min)}$. The Connect a resistor between $I_{LIM}$ and ground to program the current limit threshold value for the FP6861J. The table below shows a recommended current limit value vs. $R_{ILIM}$ resistor.

The table below shows a recommended current limit value vs. $R_{ILIM}$ resistor.

| Design Current Limit (mA) | 1% Tolance Real $R_{ILIM}$ (kΩ) | Ilim Min. (mA) | Ilim Typ. (mA) | Ilim Max. (mA) |
|---|---|---|---|---|
| 170 ※ | 160 | 122.07 | 166.87 | 204.80 |
| 200 ※ | 113 | 174.35 | 235.29 | 287.78 |
| 300 ※ | 85.6 | 231.76 | 309.57 | 377.58 |
| 400 | 68 | 293.42 | 388.61 | 472.90 |
| 417 | 61.5 | 325.25 | 429.17 | 521.73 |
| 500 | 47.5 | 423.85 | 553.94 | 671.68 |
| 600 | 40.2 | 502.91 | 653.22 | 790.74 |
| 700 | 35.7 | 567.98 | 734.52 | 888.09 |
| 800 | 30.9 | 658.58 | 847.15 | 1022.79 |
| 900 | 27.4 | 744.95 | 953.98 | 1150.39 |
| 1000 | 24.9 | 821.70 | 1048.56 | 1263.23 |
| 1100 | 23.2 | 883.47 | 1124.44 | 1353.69 |
| 1200 | 21 | 978.46 | 1240.75 | 1492.23 |
| 1300 | 20 | 1028.64 | 1302.02 | 1565.16 |
| 1400 | 18.2 | 1133.04 | 1429.18 | 1716.39 |
| 1500 | 16.9 | 1222.46 | 1537.75 | 1845.41 |
| 1600 | 16.2 | 1276.63 | 1603.38 | 1923.36 |
| 1700 | 15.5 | 1335.76 | 1674.90 | 2008.27 |
| 2000 | 12.75 | 1631.81 | 2031.39 | 2430.96 |
| 2600 | 10 | 2093.24 | 2582.48 | 3082.95 |
| 3760 | 6.98 | 3025.99 | 3683.90 | 4382.03 |

※: For $I_{LIM}$ < 400mA applications is a certain amount of error, the current limit threshold is the selected 40% of $I_{LIM(min)}$ to design.

# Application Information (Continued)

### Power Dissipation

The device's junction temperature depends on several factors, such as the load, PCB layout, ambient temperature and package type. However, the maximum output current must be decreased at higher ambient temperature to ensure the junction temperature does not exceed 125°C. With all possible conditions, the junction temperature must be within the range specified under operating conditions. Power dissipation can be calculated based on the output current and the $R_{DS(ON)}$ of switch as below:

$$P_D=R_{DS(ON)}\times(I_{OUT})^2$$

Although the devices are rated by current limit, but the application may limit the amount of output current based on the total power dissipation and the ambient temperature. The final operating junction temperature for any set of conditions can be estimated by the following thermal equation:

$$P_{D(MAX)}=\frac{T_{J(MAX)}-T_A}{\theta_{JA}}$$

Where $T_{J(MAX)}$ is the maximum junction temperature 125°C, $T_A$ is the ambient temperature and the $\theta_{JA}$ is the junction to ambient thermal resistance.

The junction to ambient thermal resistance $\theta_{JA}$ is related to layout. For SOT-23-6 package, the thermal resistance $\theta_{JA}$ is 250°C/W on the standard JEDEC 51-3 single-layer thermal test board.

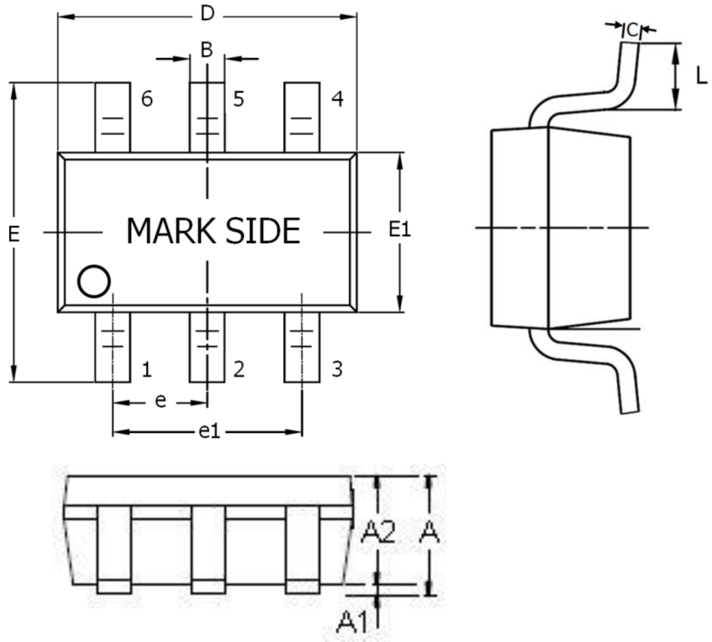
### PCB Layout

In order to meet the voltage drop and EMI requirements, careful PCB layout is necessary. The following guidelines must be considered:

1. Keep all $V_{BUS}$ traces as short as possible, and use at least 50-mil and 2 ounce copper for all $V_{BUS}$ traces.
2. Locate the FP6861J as close to the output port as possible to limit switching noise.
3. Locate the ceramic bypass capacitors as close to the VIN pins of the FP6861J as possible.
4. Avoid vias as much as possible. If vias are necessary, make them as large as feasible.
5. Place a ground plane under all circuitry to lower both resistance and inductance, and improve DC and transient performance (use a separate ground and power plans if possible).
6. Place cuts in the ground plane between ports to help reducing the coupling of transients between ports.
7. Locate the output capacitor and ferrite beads as close to the USB connectors as possible to lower impedance (mainly inductance) between the port and the capacitor, and improve transient load performance.

## Outline Information

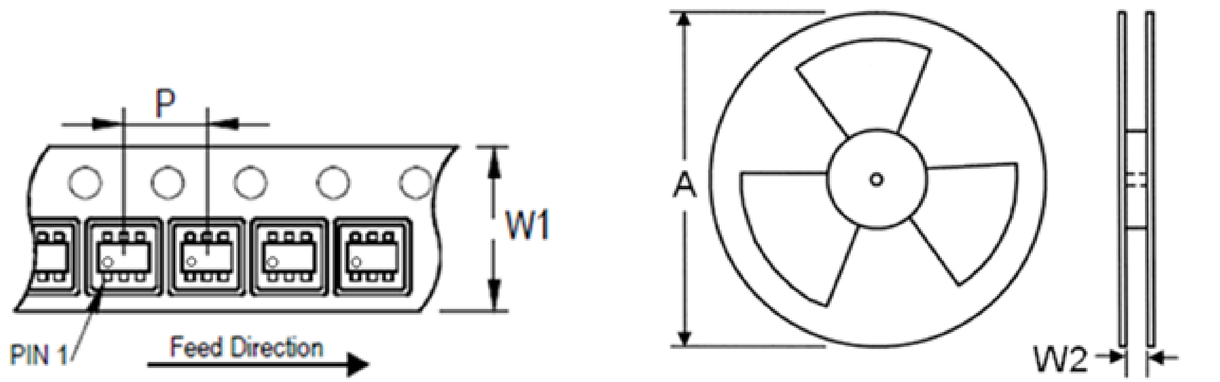
**SOT-23-6 Package (Unit: mm)**




| SYMBOLS UNIT | DIMENSION IN MILLIMETER | |
|---|---|---|
| | MIN | MAX |
| A | 0.90 | 1.30 |
| A1 | 0.00 | 0.15 |
| A2 | 0.90 | 1.15 |
| B | 0.28 | 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 |
| C | 0.08 | 0.20 |
| L | 0.30 | 0.60 |

Note 3: Body dimensions do not include mold flash or protrusion. Mold flash and protrusion shall not exceed 0.3mm.
Note 4: Reference JEDEC MO-178.

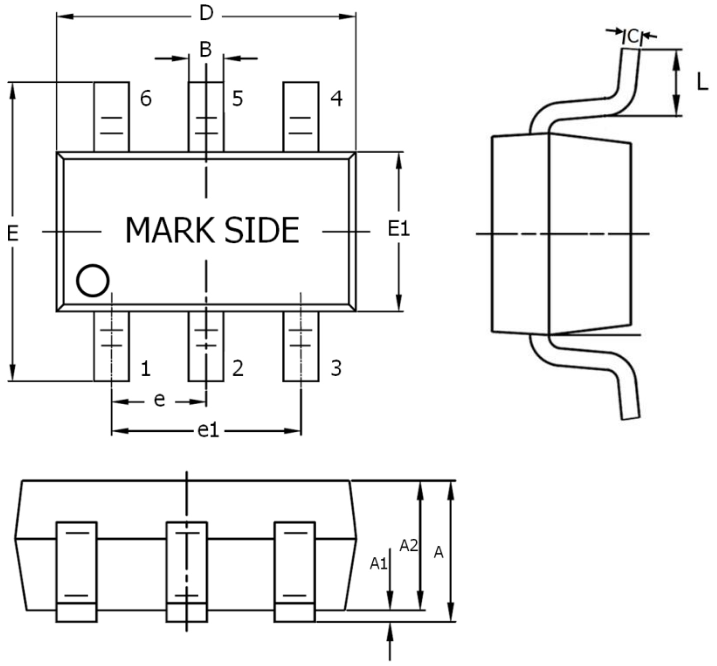
## Carrier Dimensions




| 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 |

## Outline Information (Continued)

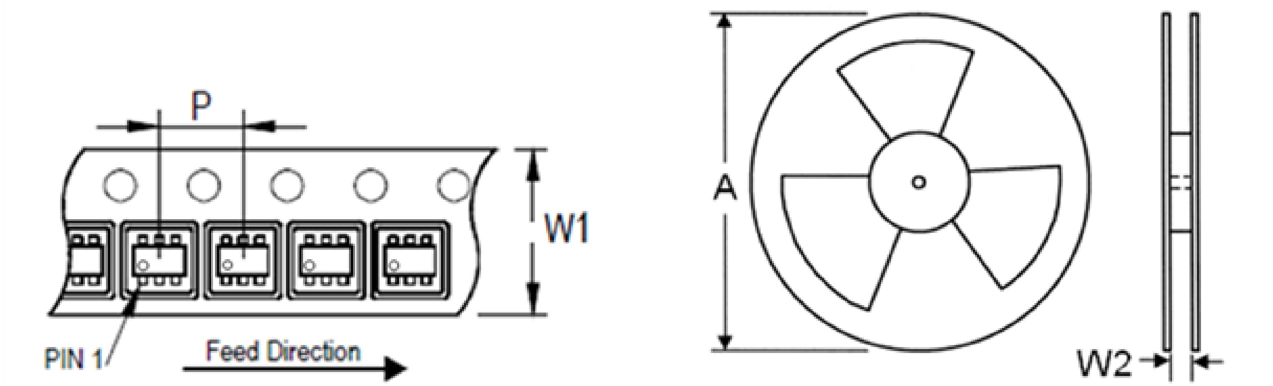
**TSOT-23-6 Package (Unit: mm)**




| SYMBOLS UNIT | DIMENSION IN MILLIMETER | |
|---|---|---|
| | MIN | MAX |
| A | 0.70 | 0.95 |
| A1 | 0.00 | 0.10 |
| A2 | 0.70 | 0.85 |
| 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 |
| C | 0.08 | 0.20 |
| L | 0.30 | 0.60 |

Note 5: Body dimensions do not include mold flash or protrusion. Mold flash and protrusion shall not exceed 0.3mm.

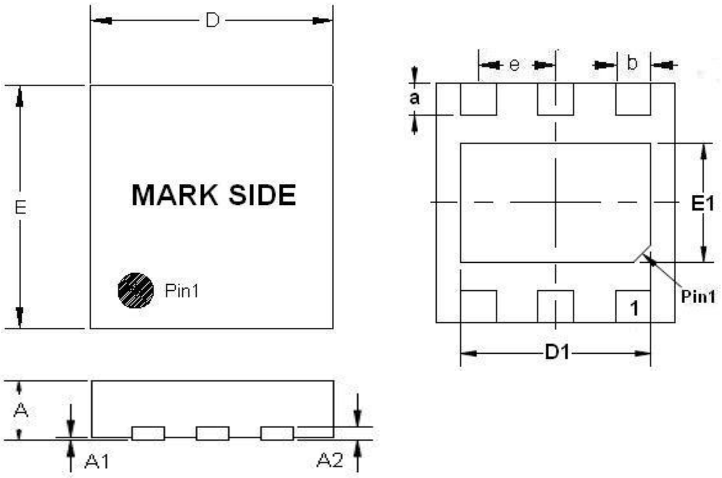
## Carrier Dimensions




| 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 |

## Outline Information (Continued)

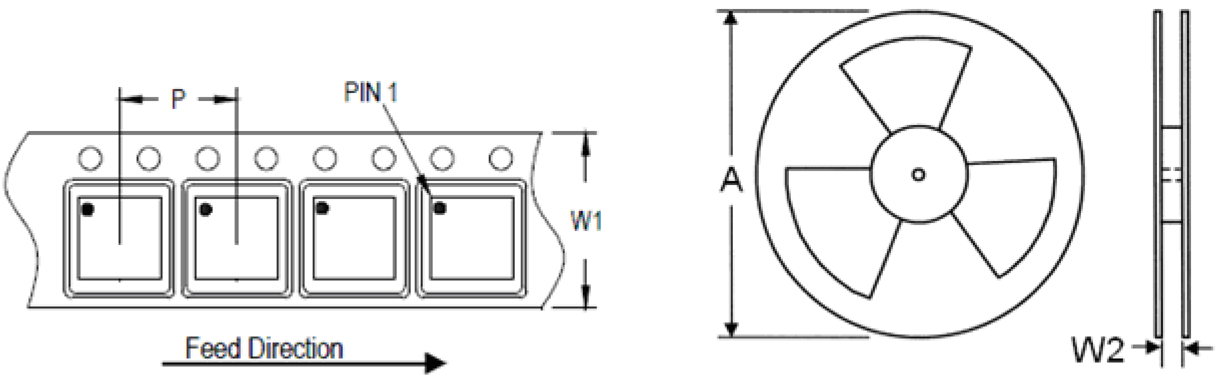
**TDFN-6 (2mm×2mm) (pitch: 0.65mm) Package (Unit: mm)**




| SYMBOLS UNIT | DIMENSION IN MILLIMETER | |
|---|---|---|
| | MIN | MAX |
| A | 0.70 | 0.80 |
| A1 | 0.00 | 0.05 |
| A2 | 0.18 | 0.25 |
| D | 1.90 | 2.10 |
| E | 1.90 | 2.10 |
| a | 0.20 | 0.40 |
| b | 0.20 | 0.40 |
| e | 0.65 BSC | |
| D1 | 1.00 | 1.50 |
| E1 | 0.50 | 0.86 |

Note 6: Followed From JEDEC MO-229.

## 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.