

General Description

The TP6062FX is a low voltage, single P- MOSFET high- side Power switch, optimized for self- powered and bus-powered Universal Serial Bus (USB) applications. This switch operates with inputs ranging from 2.5V to 5.5V, making it ideal for both3V and 5V systems. The switch's low RDS(ON), $80m\Omega$ meets USB Voltage Drop requirements. A built-in P-channel MOSFET with true shutdown function to eliminate any reversed current flow across the switch when it is poweredoff.

When the output voltage is higher than input voltage, the power switch is turned off by internal outputreverse- voltage comparator. FLG is an open-drain output report over- current or over temperature event. In addition, FLG also has typical 2.5ms deglitch timeout period and reports output reverse- voltage condition.

Features

- Integrated 80mΩ Power MOSFET
- Low Supply Current
- 30uA Typical at Switch On State 0.1
- uA Typical at Switch Off State Wide
- Input Voltage Range:2.5V to 5.5V Reverse Current Flow Blocking
- Deglitched Open-Drain
- Over- Current FlagOutput(FLG) Continuous Load
- Current Thermal Shutdown
- Protection
- Hot Plug-In Application (Soft-Start)
- Output discharge function
- TP6062FX: Auto output discharge function
 - SOT23-5 Package
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Applications

- USB Bus/Self Powered
- Hubs Battery-Charger Circuits
- Personal Communication Devices
- Notebook Computer



Typical Application Circuit





Pin Configuration





Part Number	Mark	Description		
TP6062FX	TP6062F 或6KHxxx	Active High		



Pin Functions

PIN No.	NAME	FUNCTION
1	OUT	Switch Output: Output MOSFET Source of switch. Typically connect to switched side of load.
2	GND	IC ground connection
3	FLG	Over-Current: Open-Drain Fault Flag Output.
4	EN	Enable: Logic level enable input. Make sure EN pin never floating.
5	IN	Input Supply: Output MOSFET Drain, which also supplies IC's internal circuitry. Connect to positive supply.



Absolute Maximum Ratings (Note 1)

Input Supply Voltage	0.3V to 7V
Operating Temperature Range	40°C to +85°C
EN Voltages	0.3V to VIN+0.3V
Junction Temperature	125°C
VOUT Voltage	0.3V to (VIN+0.3V)
Lead Temperature(Soldering, 10s)	+300° C
Storage Temperature Range	65 to 150°C

Recommended Operating Conditions

IN	
EN/ENB	-0.3V to (VIN+0.3V)
OUT , FLG	0~5.5V
Junction Temperature Range	40°C to 125°C
Ambient Temperature Range	40°C to 85°C



Electrical Characteristics

Symbol	Parameter	Test Conditions	Min	Тур	Мах	Unit	
IN section							
Vin	Input voltage		2.5		5.5	V	
la	Supply current, Enable	VIN=5.5V, No load on OUT		30	60	μA	
Ishdn	Shutdown current, Disable	VIN=5.5V, No load on OUT		0.1	1	μA	
VUVLO_ ON	Under voltage lockout exit	V _{IN} rising from 0-5V			2.4	V	
VUVLO_ HYS	UVLO Hysteresis			100		m∨	
EN section							
Ven_h	High-level enable voltage		2			V	
Ven_l	High-level disable voltage				0.8	V	
IEN	EN input current	Ven=5.5V or 0V			1	μA	
Τον	Turn on time			0.75		ms	
OUT sect	ion						
Ілінт	Current Limit	Current Ramp(< 0. 1A/ms) On Vout	1.1	1.3	1.5	А	
Rdis	OUT Shutdown Discharge Resistance		25		45	Ω	
FLG(Fault	flag) section						
FLG_leakage		Off-state leakage			1	μA	
TFLG_ DELAY	FLG Delay Time			12		ms	
Rflg	FLG Low Resistance			30	50	Ω	
Power switch							
Rds(on)	FET RON	Ιουτ=1Α		80		mΩ	
Thermal Shutdown							
Tsd	Thermal Shutdown Temperature			150		°C	
Tsd_hys	Thermal Shutdown Hysteresis			20		°C	

Note 1: Absolute Maximum Ratings are those values beyond which the life of a device may be impaired.

Note 2: T_J is calculated from the ambient temperature T_A and power dissipation P_D according to the following formula: $T_J = TA + (PD) \times (250^{\circ}C/W)$.

Note 3: 100% production test at +25°C. Specifications over the temperature range are guaranteed by design and characterization.



Functional Block Diagram



Typical Operating Characteristics







Application Information

The TP6062FX is current-limited, power distribution switches using P-channel MOSFETS for applications where short circuits or heavy capacitive loads will be encountered and provide up to rated of continuous load current. Additional device shutdown features include over temperature protection and reversevoltage protection. The driver controls the gate voltage of the power switch. The driver incorporates circuitry that controls the rise and fall times of the output voltage to limit large current and voltage surges and provides built-in soft-start functionality. The TP6062FX enters constant current mode when the load exceeds the current-limit threshold.

Input and Output

IN (input) is the power supply connection to the logic circuitry and the drain of the output MOSFET.OUT(output) is the source of the output MOSFET. In a typical application, current flows through the witch from IN to OUT toward the load. OUT pin <u>must</u> be connected together to the load.

FLG Function

The FLG open-drain output is asserted temperature exceeds 150°C regardless of (active low) when an over current condition is encounte<u>red</u> after a 12ms deglitch timeout. The FLG output remains asserted until the over-current condition is removed. Over temperature condition is whether the power-switch is in current limit. Hysteresis is built into both thermal sensors, and the switch turns on after the device has cooled approximately 20°C (Thermal <u>shutd</u>own thresholdalso reported by FLG open-drain output.hysteresis in current-limit is 20°C). The In addition, FLG is also asserted (activeswitch continues to cycle off and on until low) in output reverse-voltage condition when the output reverse-voltage condition is removed. the fault is removed. The open-drain FLG is asserted (active low) immediately during an over temperature shutdown condition.

EN, the Enable Input

EN must be driven logic high or logic low for a clearly defined input. Floating the input may cause unpredictable operation. EN should not be allowed to go negative with respect to GND.

Soft Start for Hot Plug-In Applications

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

Thermal Considerations

The TP6062FX protects itself with two independent thermal sensing circuits that monitor the operating temperature of the power-switch and disables operation if the temperature exceeds recommended operating conditions. The device operates in constant-current mode during an over-current conditions, which increases the voltage drop across power-switch. The power dissipation in the package is proportional to the voltage drop across the power-switch, so the junction temperature rises during an over-current condition. The first thermal sensor turns off the power-switch when the die temperature

exceeds 130°C and the part is in currentlimit . The second thermal sensor turns off the power-switch when the die.

PCB Layout Guide

For best performance of the TP6062FX, the following guidelines must be strictly followed:

(1) Keep all VBUS traces as short and wide as possible and use at least 2 ounce copper for all VBUS traces.

(2)Place a ground plane under all the circuitry to lower both resistance and inductance for improving DC and transient performance.

(3)A low-ESR 100μ F aluminum electrolytic or tantalum capacitor between VOUT and GND is strongly recommended.

(4) Locate the output capacitor as close to the connectors as possible to lower the impedance (mainly inductance) between the port and the capacitor for improving the transient performance.

(5) The input and output capacitors should be placed closed to the IC and connected to the ground plane to reduce the noise coupling.
(6) Locate the ceramic bypass capacitors as close as possible to the VIN and VOUT pins of the TP6062FX.

Package Information

SOT23-5

Carrier Dimensions

Tape Size (W1) mm	Pocket Pitch (P) mm	Reel Size (A)		Reel Width	Empty Cavity	Units per Reel	
		in	mm	(W2) mm	Length mm	5	
8	4	7	180	8.4	300~1000	3,000	