3A Power Distribution Switch

GENERAL DESCRIPTION

PW1503 is ultra-low RDS(ON) switch with programmable current limit to protect the power source from over current and short circuit conditions. It incorporates over temperature protection and reverse blocking function.

The PW1503 is offered in a low profile (1mm) 5-pin, thin SOT package, and is available in an adjustable version.

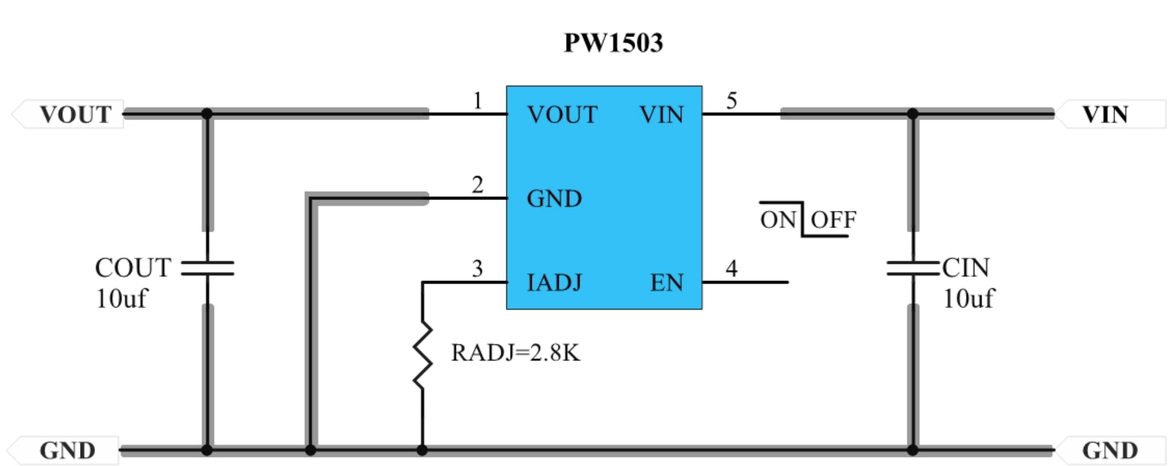
FEATURES

- Input Voltage: 2.4V to 6V
- 3A Load Current Capability
- Programmable Current Limit
- Over Temperature Protection
- Reverse Blocking (No Body Diode)
- VOUT Can be Forced Higher Than VIN at Shutdown
- RoHS Compliant and Halogen Free

APPLICATIONS

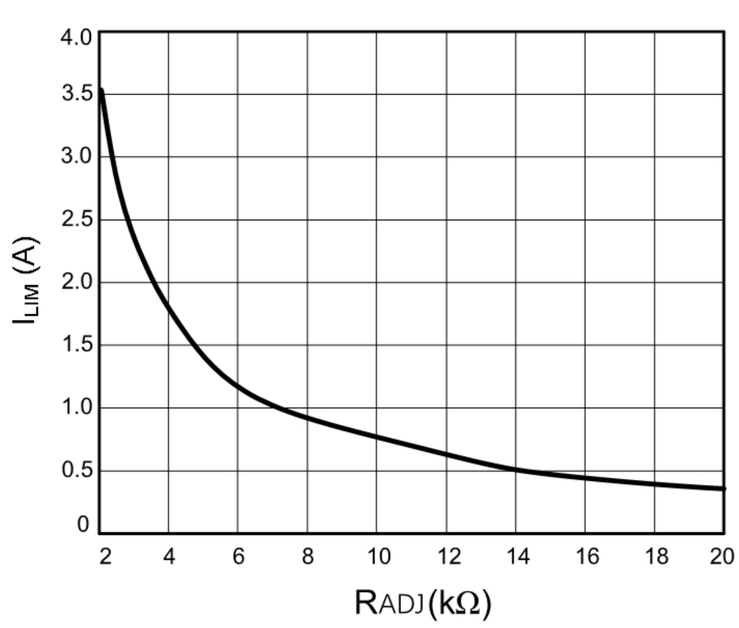
- USB Charger
- Public Place Multi-USB Charger
- USB Dongle
- MiniPCI Accessories

TYPICAL APPLICATION CIRCUIT

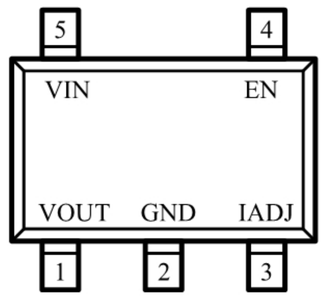


ILIM (A)=6.8 / RADJ (KΩ). RADJ=2.8K，ILIM=2.4A

The minimum current limit is 0.4A. Current limit beyond 3A is not recommended.



PIN ASSIGNMENT/DESCRIPTION



SOT-23-5L
(TOP VIEW)

Pin Number	Pin Name	Function
1	VOUT	Output pin, decoupled with a 10μF capacitor to GND.
2	GND	Ground pin.
3	IADJ	Current limit programming pin. Connect a resistor RADJ from this pin to ground to program the current limit
4	EN	ON/OFF control. Pull high to enable IC. Do not leave it floating.
5	VIN	Input pin, decoupled with a 10μF capacitor to GND.

Absolute Maximum Ratings (note1)

Parameter		VALUE	Unit
VIN, VOUT, EN, IADJ		-0.3 to 7	V
Power Dissipation, PD @ TA = 25°C		1.46	W
Package Thermal Resistance (Note 2)	θJA	68.5	°C/W
	θJC	10.9	°C/W
Junction Temperature Range		-40 to 150	°C
Lead Temperature (Soldering, 10 sec.)		260	°C
Storage Temperature Range		-65 to 150	°C

RECOMMANDED OPERATING Conditions (note3)

Parameter	VALUE	Unit
VIN	2.4 to 6	V
VOUT,IADJ	0 to 6	V
EN	0V to VIN	V
Junction Temperature Range	-40 to 125	°C
Ambient Temperature Range	-40 to 85	°C

Note 1: Stresses beyond the "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only. Functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Note 2: θJA is measured in the natural convection at TA = 25°C on a Silergy test board. Pin 2 of TSOT23-5 package is the case position for θJC measurement.

Note 3: The device is not guaranteed to function outside its operating conditions.

Layout Considerations

To achieve a better performance, the following guidelines must be strictly followed:

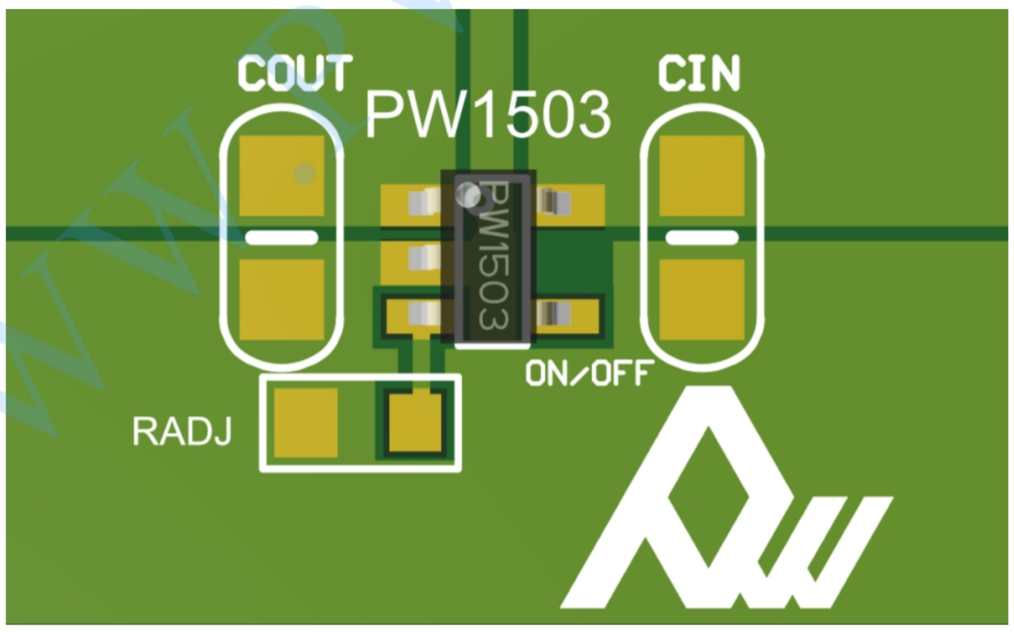
1, Keep all power traces as short and wide as possible and use at least 2 ounce copper for all power traces.

2, Place a ground plane under all circuitry to lower both resistance and inductance and improve DC and transient performance.

3, Locate the output capacitors as close to the connectors as possible to lower the impedance (mainly inductance) between the port and the capacitor and improve transient performance.

4, Input and output capacitors should be placed close to the IC and connected to the ground plane to reduce noise coupling.

5, Locate the ceramic bypass capacitors as close as possible to the VIN pin and VOUT pin of PW1503.



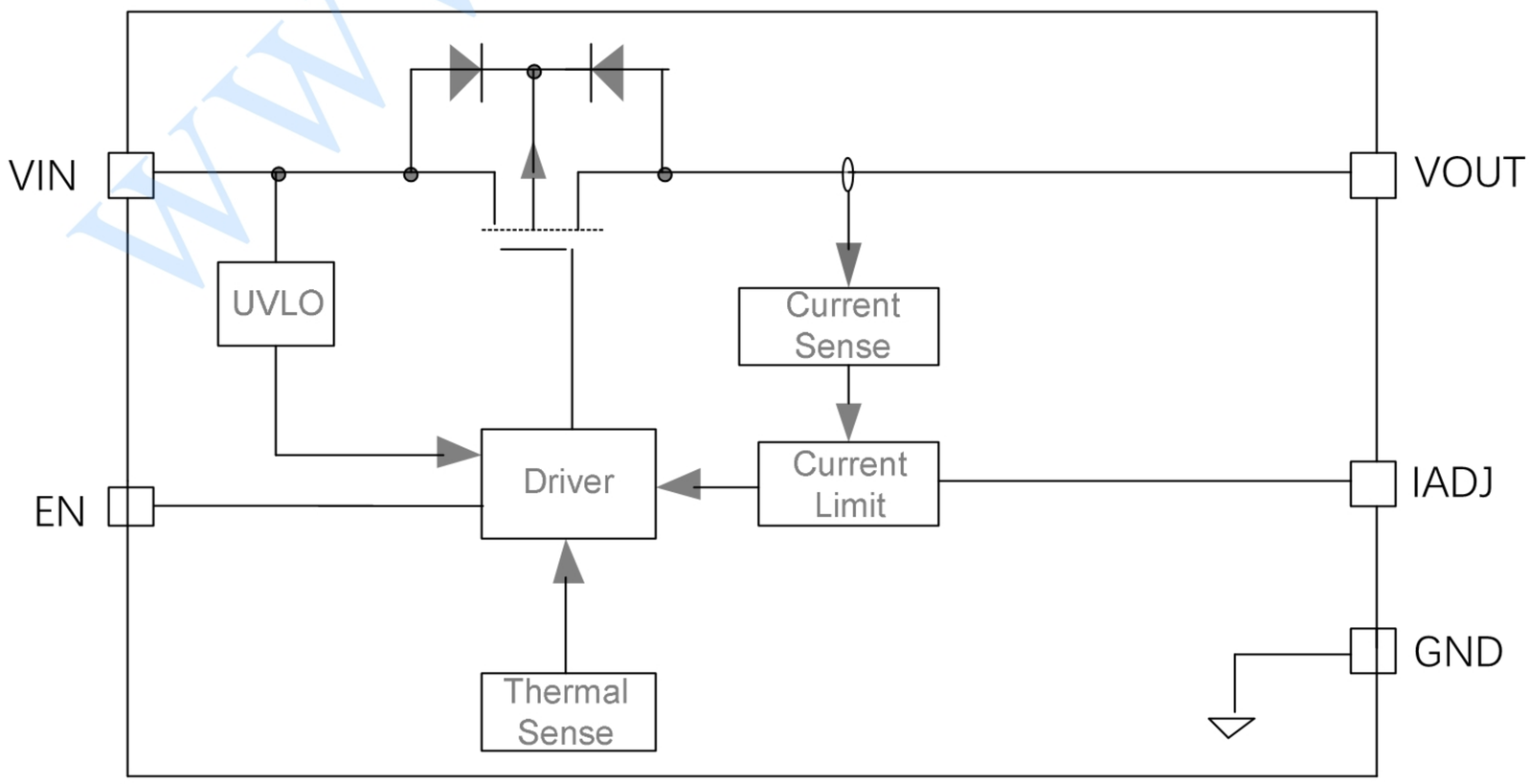
PCB Layout Suggestion

ELECTRICAL CHARACTERISTICS

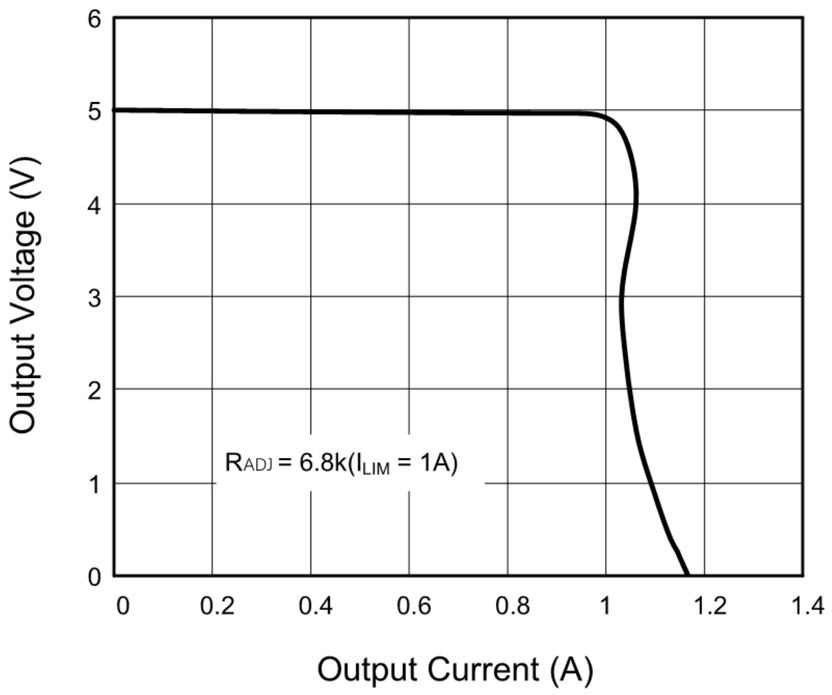
(VIN = 5V, COUT=10μF, TA = 25°C, unless otherwise specified.)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Input Voltage Range	VIN		2.4		6	V
Shutdown Input Current	ISHDN	Open load, IC disabled		0.2	1	μA
Quiescent Supply Current	IQ	Open load, IC enabled		38		μA
FET RON	RDS(ON)			50		mΩ
EN Rising Threshold	VEN(H)		2			V
EN Falling Threshold	VEN(L)				0.8	V
EN Leakage Current	IEN	VEN=5.0V			1	μA
VIN UVLO Threshold	VIN_UVLO				2.3	V
VIN UVLO Hysteresis	VIN_HYS			0.1		V
Over Current Limit	ILIM	RADJ=3.4kΩ	1.5	2	2.5	A
Programmable Current Limit Range	IRANGE		0.4		3.5	A
Turn-on Time	tON	RL=10Ω, COUT=1μF		130		μs
Turn-off Time	tOFF	RL=10Ω, COUT=1μF		20		μs
Thermal Shutdown Temperature	TSD			150		℃
Thermal Shutdown Hysteresis	TSD_HYS			20		℃

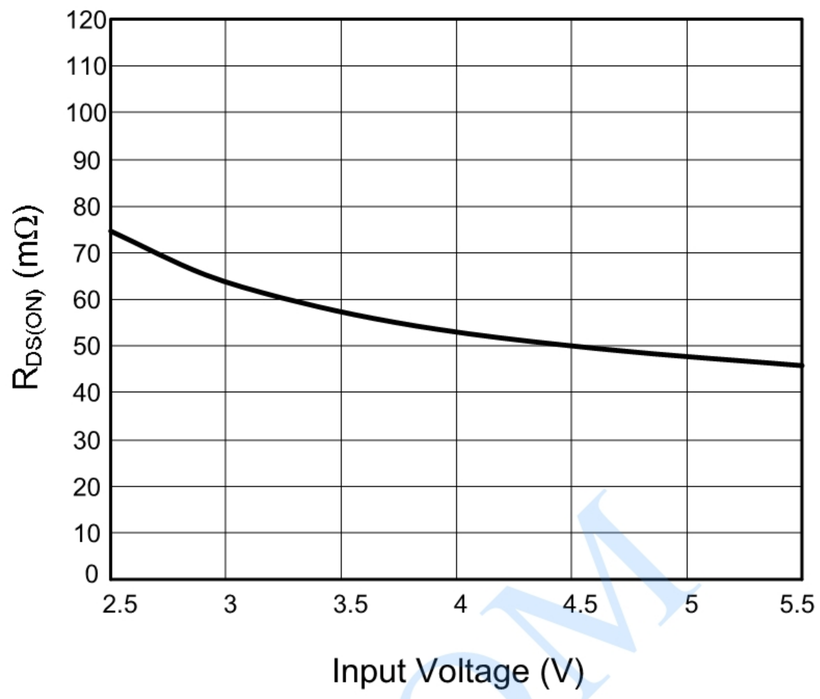
Block Diagram



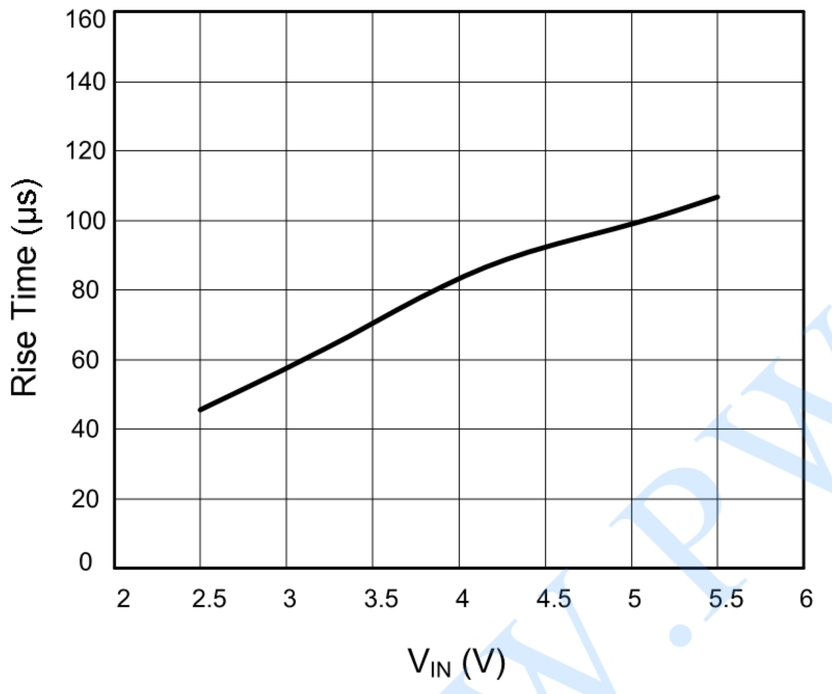
Typical Performance Characteristics



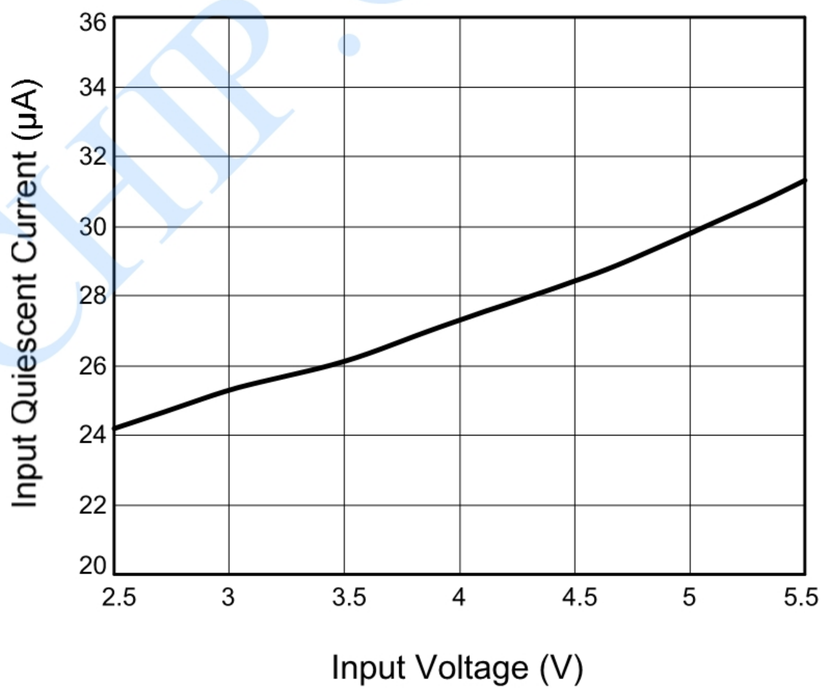
Output Voltage vs. Output Current



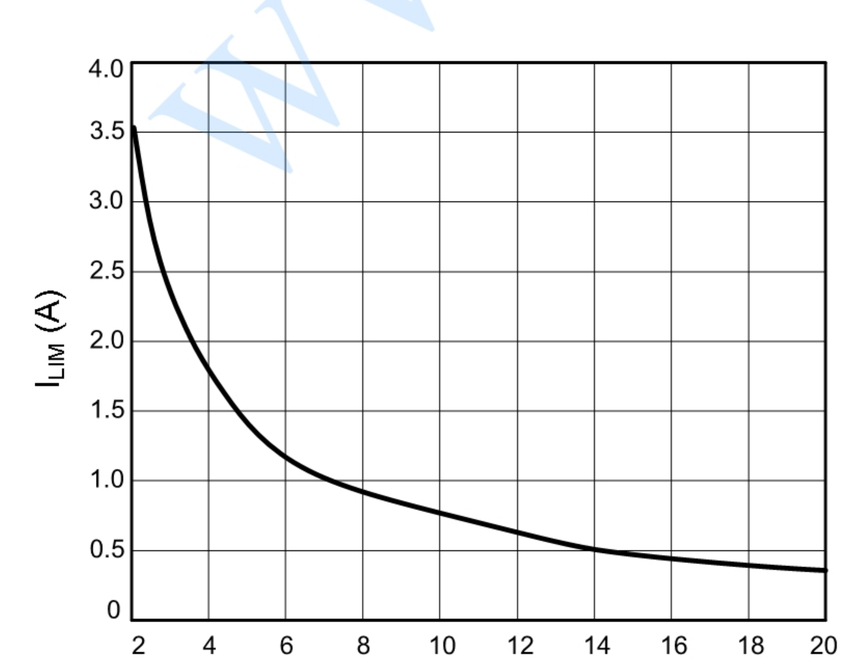
RDS(ON) vs. Input Voltage



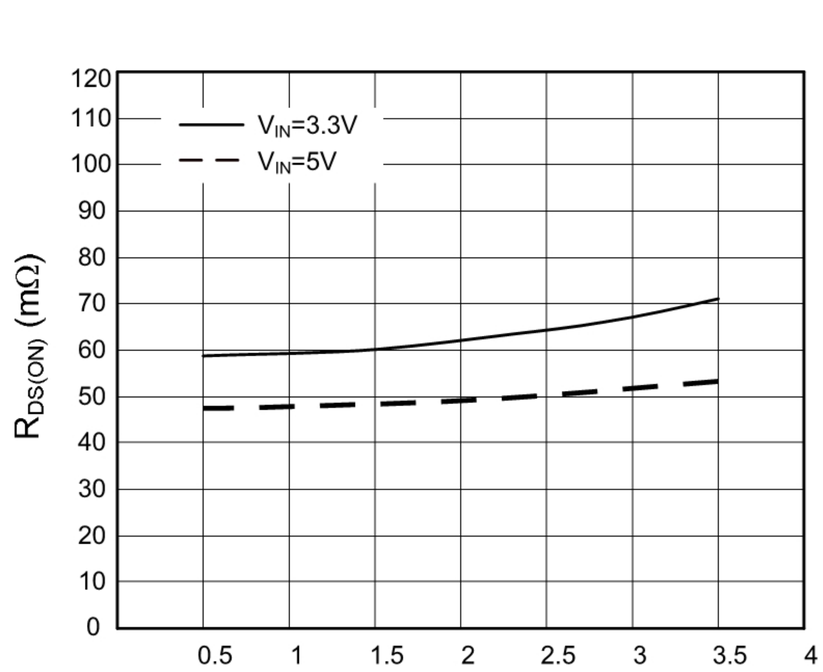
Rise Time vs. VIN



Input Quiescent Current vs. Input Voltage



RADJ vs. ILIM



RDS(ON) vs. Load Current

Application Information

PW1503 is a current limited P-channel MOSFET power switch with over current and over temperature protections. There is no body diode across the drain and the source of the MOSFET. It prevents the current flow from the output to the input after the chip is disabled.

Over Current Protection

When the over-current condition is detected, the switch is regulated to achieve constant output current. If the over current condition lasts for a long time, and results in a junction temperature over 150°C, the switch will be shutdown. Once the junction temperature drops to 130°C, the part will restart.

Supply Filter Capacitor

In order to prevent the input voltage from dropping during hot-plug condition, a 10μF ceramic capacitor from VIN to GND is strongly recommended. However, higher capacitance could help reduce the voltage drop. Furthermore, an output short will cause ringing on the input without the input capacitor. It could destroy the internal circuitry when the input transient voltage exceeds the absolute maximum supply voltage even for a short duration.

Current Limiting Setting

Current limit is programmable to protect the power source from over current and short circuit conditions. Connect a resistor RADJ from IADJ pin to GND to program the current limit:

$$\boldsymbol{ILIM\ (A) = 6.8/R_{ADJ}\ (K\Omega)}$$

The minimum current limit is 0.4A. Current limit beyond 3A is not recommended.

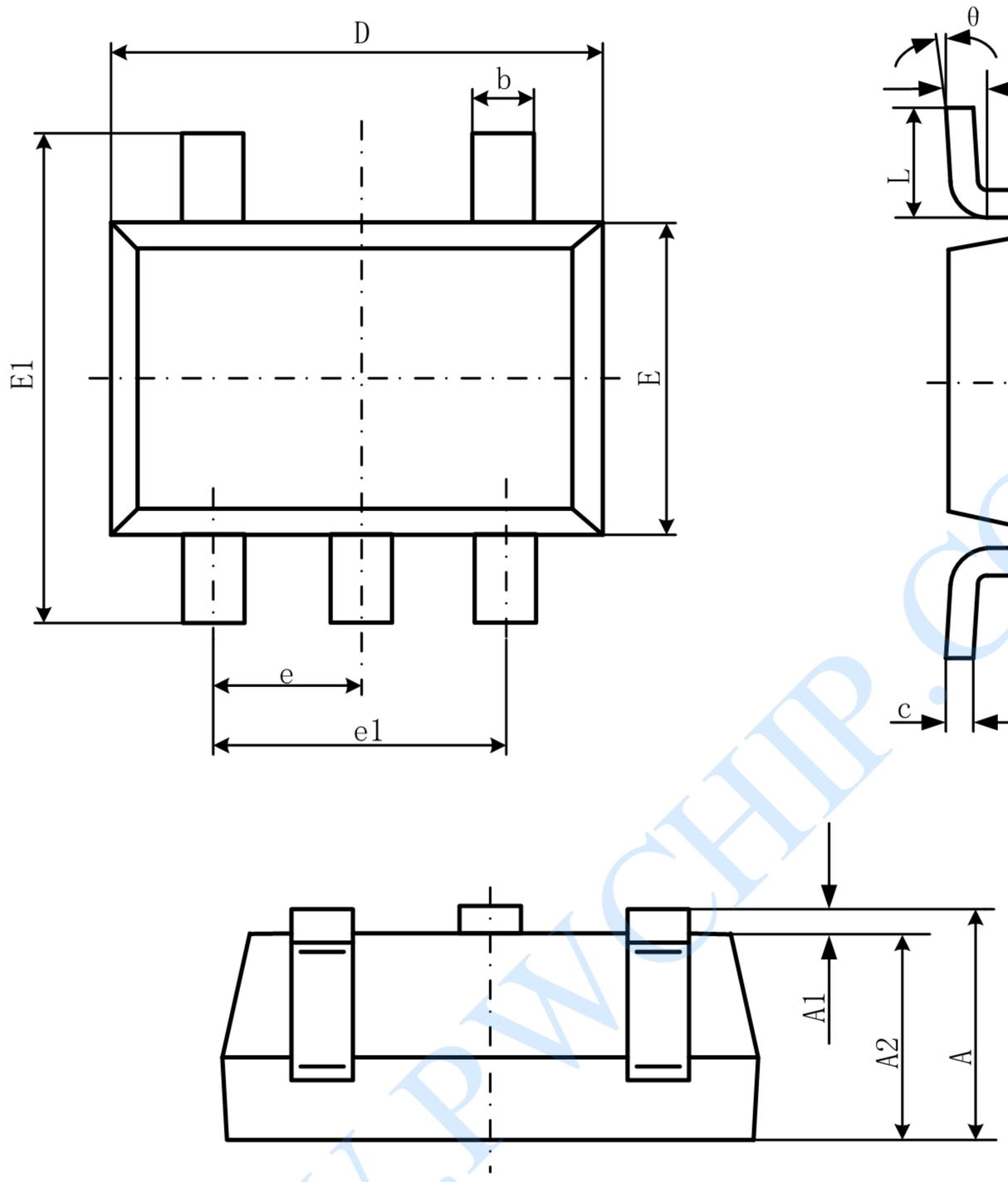
Maximum Input Voltage Consideration

For any application, input voltage for PW1503 should not be allowed to exceed the maximum recommended value (6V).

Some adapters may have poor output voltage tolerance,or may have large output voltage overshoot if the adapter is hot plug in directly. The voltage overshoot higher than VIN (6V) will significantly reduce the reliability of PW1503 and may even lead to IC EOS failure.

PACKAGE DESCRIPTION

SOT23-5L



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

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