

Power Distribution Switch

GENERAL DESCRIPTION

The PW1502 Power Distribution Switch features internal current limiting to prevent damage to host devices due to faulty load conditions. The PW1502 develops ultra-low on-resistance switch with programmable current limiting to protect the power source from over current and short circuit conditions. It integrates the over temperature protection and discharges the output capacitor during the shutdown. In case the output is pulled higher than the input voltage under the shutdown, the PW1502 can block the current flowing from the output to the input.

The PW1502 is offered in a low profile 5-pin, thin SOT package, and is available in an adjustable version.

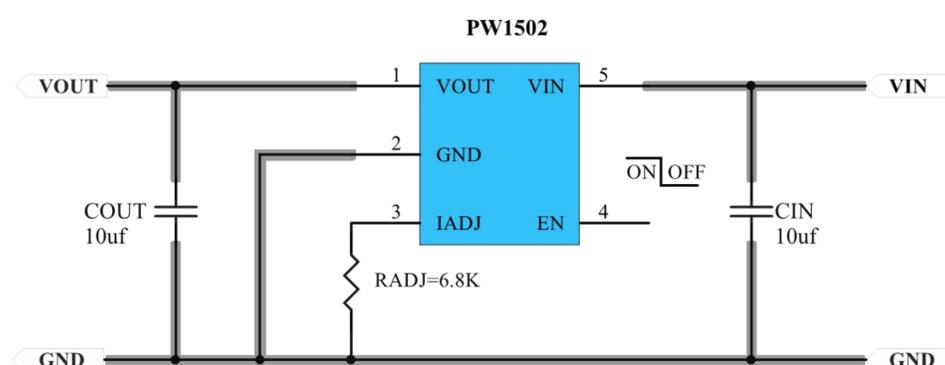
FEATURES

- Enable polarity: Active High
- 2.4V to 5.5V Supply Range
- Under-Voltage Lockout
- Accurate Current Limit
- 15 μ A Quiescent Current
- 80m Ω MOSFET
- Thermal-Shutdown Protection
- Built-In Soft Start
- Reverse Current Blocking (No Body Diode)

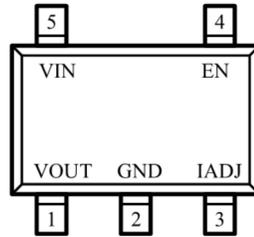
APPLICATIONS

- Wi-Fi Router/AP
- USB 3G Datascard/ USB Dongle
- High-Definition Digital TVs
- ONT Boxes

TYPICAL APPLICATION CIRCUIT



PIN ASSIGNMENT/DESCRIPTION



Pin Number	Pin Name	Function
1	VOUT	Output pin, decoupled with a 10 μ F 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 float.
5	VIN	Input pin, decoupled with a 10 μ F capacitor to GND.

Absolute Maximum Ratings (note1,2,3)

Parameter	VALUE	Unit
All Pins Voltage	-0.3 to 7	V
Package Thermal Resistance	Junction-to-ambient	200
	Junction-to-case	130
Junction Temperature Range	-40 to 150	$^{\circ}$ C
Lead Temperature (Soldering, 10 sec.)	260	$^{\circ}$ C
Storage Temperature Range (TS)	-55 to 150	$^{\circ}$ C

RECOMMENDED OPERATING Conditions (note3)

Parameter	VALUE	Unit
VIN	2.4 to 5.5	V
VOUT,IADJ	0 to 5.5	V
Junction Temperature Range	-40 to 125	$^{\circ}$ C
Ambient Temperature Range	-40 to 85	$^{\circ}$ C

Note 1: Exceeding these ratings may damage the device.

Note 2: The device is not guaranteed to function outside of its operating conditions.

Note 3: θ JA is measured in the natural convection at TA = 25 $^{\circ}$ C on a low effective single layer thermal conductivity test board of JEDEC 51-3 thermal measurement standard. Pin 2 of SOT23-5 packages is the case position for θ jc measurement.

**ELECTRICAL CHARACTERISTICS** (NOTE1)

(VIN = 5V, CL=1μF, per channel, TA = 25°C unless otherwise specified.)

Parameter	Symbol	Test Conditions	Min	Typ.	Max	Unit
Input Voltage Range	V _{IN}		2.4		5.5	V
Shutdown Input Current	I _{SHDN}	Open load, IC Disabled		0.6	1	μA
Quiescent Supply Current	I _Q	Open load, IC Enabled		20		μA
FET RON	R _{DS(ON)1}			80		mΩ
ENB Rising Threshold	V _{ENB(H)}		1.2			V
ENB Falling Threshold	V _{ENB(L)}				0.8	V
ENB Leakage	I _{ENB}	V _{ENB} =5.5V			1	μA
IN UVLO Threshold	V _{IN,UVLO}				2.3	V
IN UVLO Hysteresis	V _{IN,HYS}			0.1		V
Over Current Limit	I _{LIM}	R _{adj} =6.8kΩ	0.75	1.0	1.25	A
	I _{LIM(MIN)}			0.4		A
	I _{LIM(MAX)}			2		A
Turn-ON Time ^(NOTE 2)	T _{ON}	R _L =10Ω, C _L =1μF		120		μS
Turn-OFF Time ^(NOTE 2)	T _{OFF}	R _L =10Ω, C _L =1μF		10		μS
OUT Shutdown Discharge Resistance	R _{DIS}			150		Ω
Thermal Shutdown Temperature	T _{SD}			130		°C
Thermal Shutdown Hysteresis	T _{HYS}			20		°C

Note 1: The device is not guaranteed to function outside its operating conditions.

Note 2: Measured from (50%) EN signal to (90%) output signal



Functions Description

Input and Output

The PW1502 provides a constant current limit that can be programmed by an external resistor. Once the device reaches its current limit threshold, the internal circuit regulates the gate voltage to hold the current in the power MOSFET constant. Below table can be taken as a reference to choose RADJ to set the current limit threshold.

Current Limit Threshold Setting

RADJ(kΩ)	Typical Current Limit (mA)
5.1	1500
6.8	1180
10	820
15	580
20	480
30	340

Over Current

When the load exceeds trip current (minimum threshold current triggering constant-current mode) or short circuited, PW1502 switches into to constant-current mode (current limit value). PW1502 will be shut down only if the overcurrent condition stays long enough to trigger thermal protection.

Trigger overcurrent protection for different overload conditions occurring in applications:

- 1) The output has been shorted or overloaded before the device is enabled or input applied. PW1502 detects the short or overload and immediately switches into a constant-current mode.
- 2) A short or an overload occurs after the device is enabled. The device switches into constant current mode after the current-limit circuit has been tripped (reached the trip current threshold). However, high current may flow for a short period of time before the current-limit circuit can react.
- 3) Output current has been gradually increased beyond the recommended operating current. The load current rises until the trip current threshold is reached or until the thermal limit of the device is exceeded. Once the trip threshold has been reached, the device switches into its constant-current mode.

Thermal Protection

If the current limit block starts to regulate the output current, the power loss on power MOSFET will cause the IC temperature rise. The die temperature is internally monitored until the thermal limit is reached. Once this temperature is reached, the switch will turn off to allow the chip to cool until the over temperature fault remove. The over temperature threshold is 130°C and hysteresis is 20°C.



Under-voltage Lockout (UVLO)

This circuit is used to monitor the input voltage to ensure that the PW1502 is operating correctly. This UVLO circuit also ensures that there is no operation until the input voltage reaches the minimum spec.

Reverse Current Blocking

In case the output is pulled higher than the input voltage under the shutdown, the PW1502 can block the current flowing from the output to the input. This prevents damage to devices on the input side of the PW1502 by preventing significant current from sinking into the input capacitance.

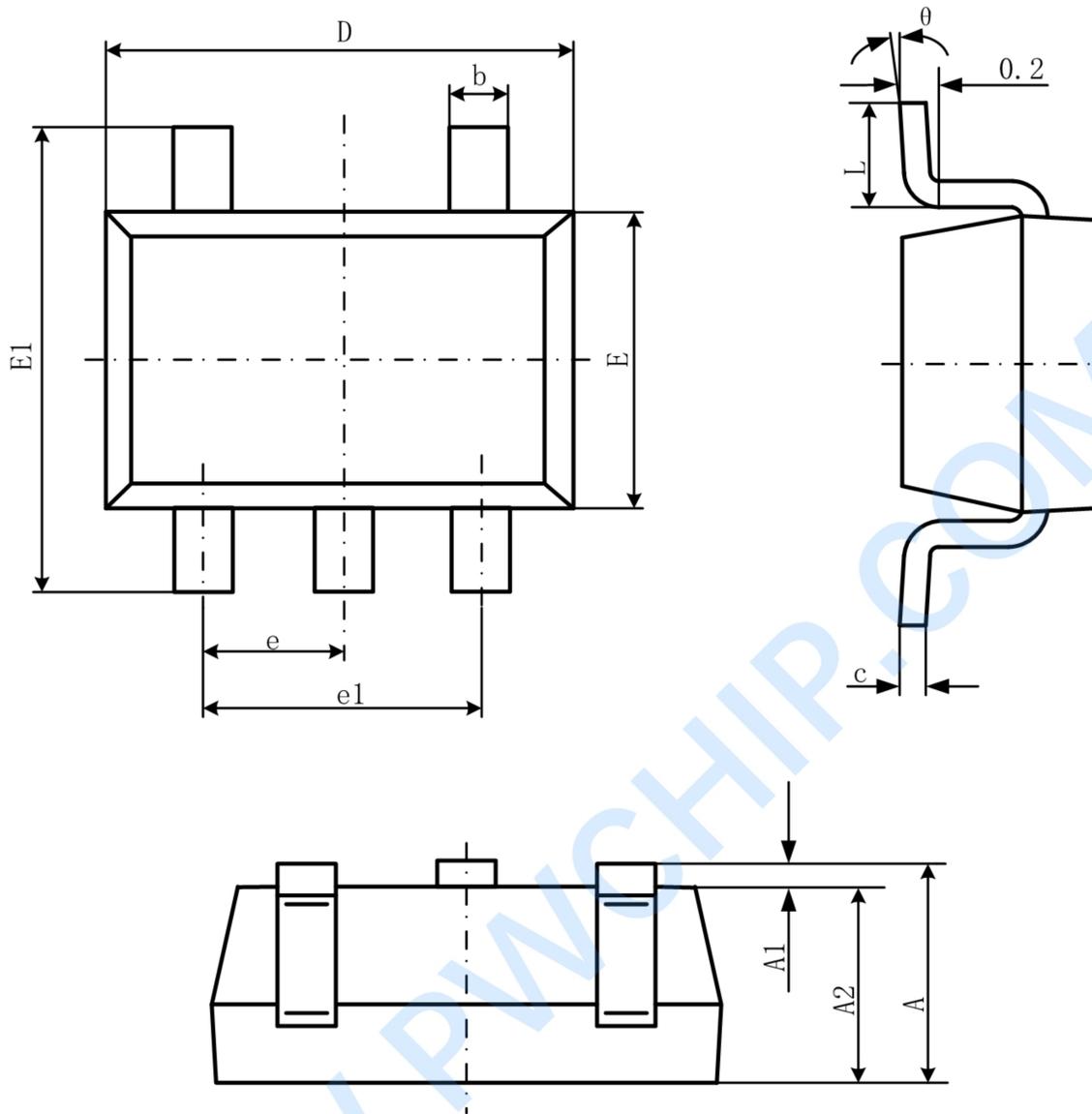
Output Discharge

PW1502 has output discharge function. It can discharge the output capacitor by internal pulldown resistance during shutdown.

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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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