

75mΩ, Current Limited, Power Distribution Switches

Description

The P1482L series is a low voltage, single P-MOSFET high-side power switch, optimized for self-powered and bus-powered Universal Serial Bus (USB) applications. The switch's low RDS(ON), 75mΩ, meets USB voltage drop requirements; 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 the switch failure from high-current loads, under-voltage lockout (UVLO) to ensure that the device remains off unless there is a valid input voltage present.

The P1482L is available in SOT23-5L and SOT23-6L package with adjustable OCP current threshold.

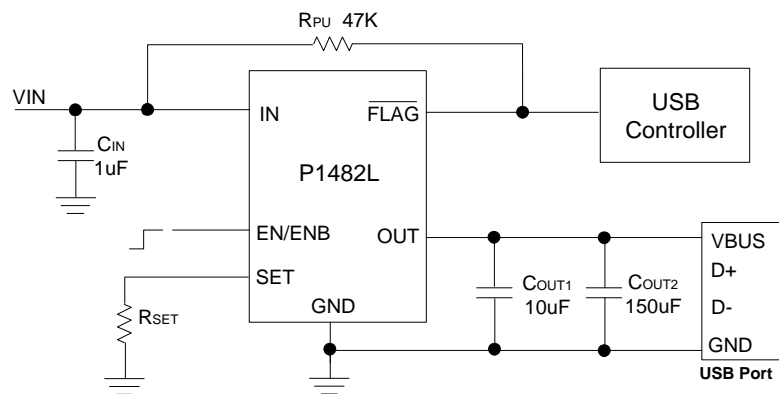


Figure 1: Typical Application

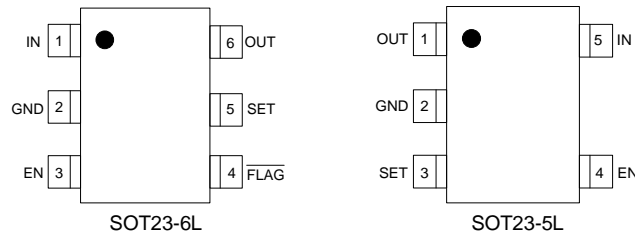


Figure 2: Pin order (Top view)

Features

- Wide Input Voltage Ranges : 2.5V to 5.5V
- Typical RDS(ON) : 75mΩ
- 1.7V Typical Under-Voltage Lockout (UVLO)
- Output Can Be Forced Higher Than Input
- Low Supply Current :
25uA Typical at Switch on State
1uA Typical at Switch off State
- Current limit programmable: 100mA to 3A, ±10%
- Open-Drain Fault Flag Output
- Hot Plug-In Application (Soft-Start)
- Thermal Shutdown Protection
- Reverse Current Flow Blocking (no body diode)

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Applications

- USB Bus/Self Powered Hubs
- USB Peripherals
- ACPI Power Distribution
- PC Card Hot Swap
- Notebook, Motherboard PCs

Pin Definitions

Pin No.		Symbol	Descriptions
SOT23-6L	SOT23-5L		
1	5	IN	Switch Input and Device Power Supply.
2	2	GND	Ground Terminal. Connect to the thermal pad and to the ground rail of the circuit.
3	4	EN	Enable Input. Pulling this pin to high will enable the device and pulling this pin to low will disable device. The EN pin cannot be left floating.
4	-	----- FLAG	Open-drain Fault FLAG Output. FLAG is pulled to GND with a 110Ω resistanst internally When any of current-limit or over-temperature protection occurs, the FLAG goes low. FLAG is high impedance during normal operation.
5	3	SET	Current limit adjustment. Connect a resistor to GND to set over current threshold. Short ILIM to GND will disable current limitation.
6	1	OUT	Switch output Terminal.

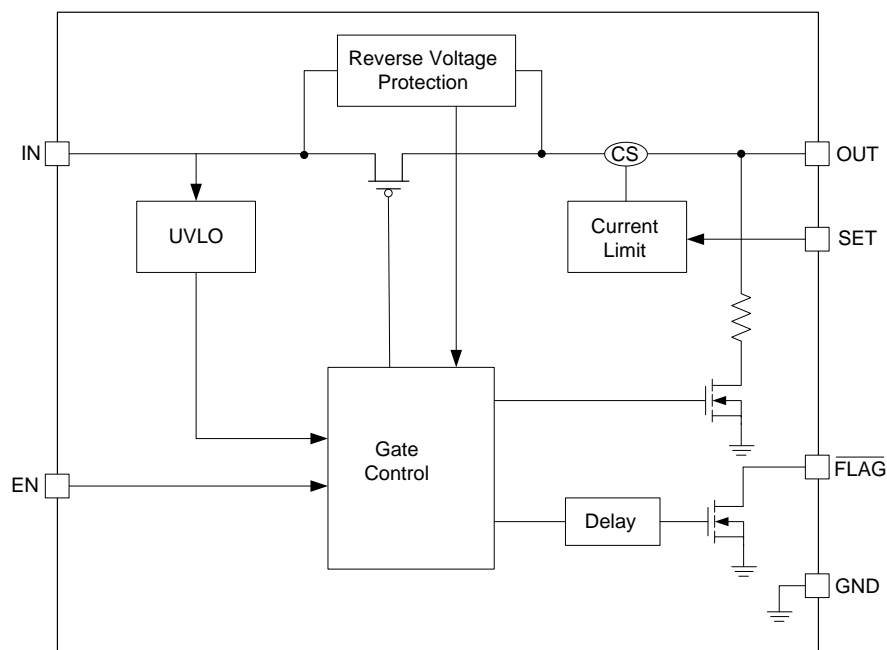


Figure 3: IC Block Diagram

75mΩ, Current Limited, Power Distribution Switches
Ordering Information

Part Number	Package	Enable Definition	Current Limit Setting
P1482LK3-S5	SOT23-5L	Active High	$I_{LIM} = 6.8k/R_{ILIM}$
P1482LK3-S6	SOT23-6L	Active High	$I_{LIM} = 6.8k/R_{ILIM}$

Absolute maximum rating

Parameter(Note1)	Symbol	Value	Units
Input voltage (IN pin)	V_{IN}	-0.3 ~ 6.0	V
Output voltage (OUT pin)	V_{OUT}	-0.3 ~ 6.0	V
Enable voltage (EN pin)	V_{EN}	-0.3 ~ 6.0	V
Flag voltage (FLAG pin)	V_{FLAG}	-0.3 ~ 6.0	V
Junction temperature	T_J	150	°C
Lead temperature(10s)	T_L	260	°C
Storage temperature	T_{STG}	-55~150	°C
ESD Ratings	HBM	±2000	V
	CDM	±500	V

Note 1: Stresses greater than those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "Recommended Operating Conditions" is not implied. Exposure to "Absolute Maximum Ratings" for extended periods may affect device reliability.

Recommended Operating Conditions

Parameter	Symbol	Value	Units
Input voltage	V_{IN}	2.5~5.5	V
MAX Continuous Output current	I_{OUT}	0~2	A
Ambient operating temperature	T_{OPR}	-40~85	°C
Junction temperature	T_J	-40~125	°C

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Electrical Characteristics

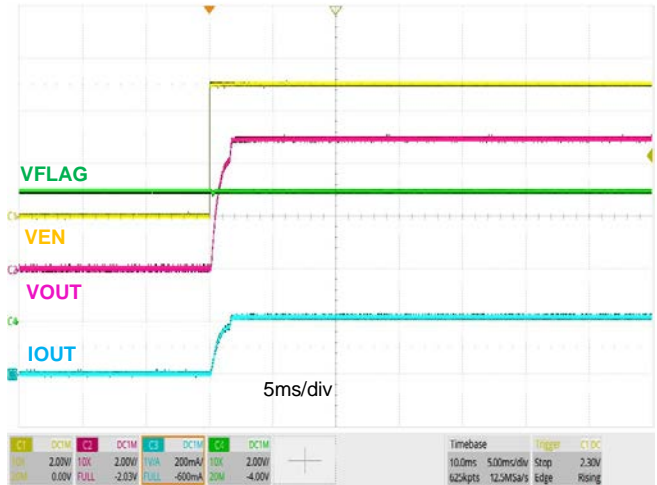
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Input voltage range	V_{IN}		2.5		5.5	V
Switch on resistance	R_{ON}	$V_{IN}=5V, I_{OUT}=1A$		75		mΩ
Quiescent current	I_Q	Switch on, NO LOAD		25	45	μA
Switch off leakage current	I_{OFF}	Switch off, NO LOAD		0.1	1	μA
EN high threshold voltage	V_{EN_H}	$V_{IN} = 2.5V$ to $5.5V$	2.0			V
EN low threshold voltage	V_{EN_L}	$V_{IN} = 2.5V$ to $5.5V$			0.6	V
EN Input current	I_{EN}	$V_{EN}=0V$ to $5.5V$			1	μA
Output Standby current	I_{SDY}	$V_{IN}=0V, V_{EN}=0V, V_{OUT}=5V$		14	25	μA
Input Leakage current	I_{IN_LEAK}	$V_{IN}=0V, V_{EN}=0V, V_{OUT}=5V$			1	μA
Output Turn-On Rise Time	t_{ON}	10% to 90% of V_{OUT} rising		470		μs
FLAG Output Resistance	R_{FLAG}	$I_{SINK}=1mA$		110		Ω
FLAG Off Current	I_{LEAK_FLAG}	$V_{FLAG}=5V$		0.01	1	μA
FLAG Delay Time	t_{D_FLAG}	From fault condition to FLAG assertion	5	12	20	ms
Power on delay time	t_{D_ON}		5	12	20	ms
Enable on delay time	t_{D_EN}			100		μs
Enable off delay time	t_{D_DIS}			5		μs
Response time of over current	t_{D_OCP}			100		μs
Shutdown Pull-Low Resistance	R_{DIS}	$V_{EN}=0V$		130		Ω
Under-Voltage Lockout	V_{UVLO}	V_{IN} increasing	1.3	1.7		V
Under-Voltage Hysteresis	V_{UVLO_HYS}	V_{IN} decreasing		0.1		V
Thermal Shutdown Protection				150		°C
Thermal Shutdown Hysteresis				20		°C

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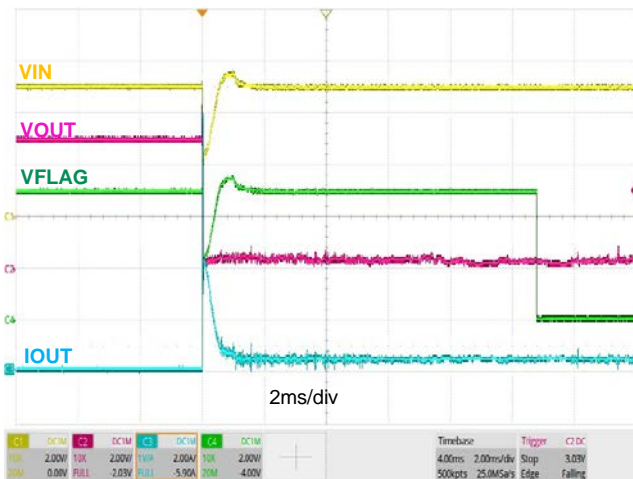
Typical Operating Performance



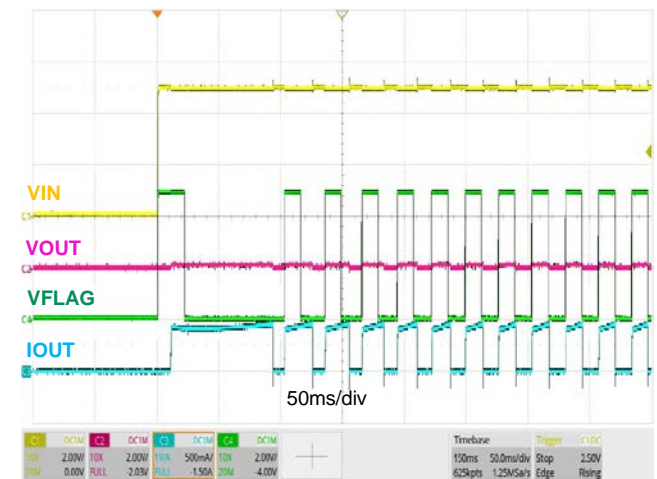
Power on Response($R_{SET}=20k\Omega$, No Load)



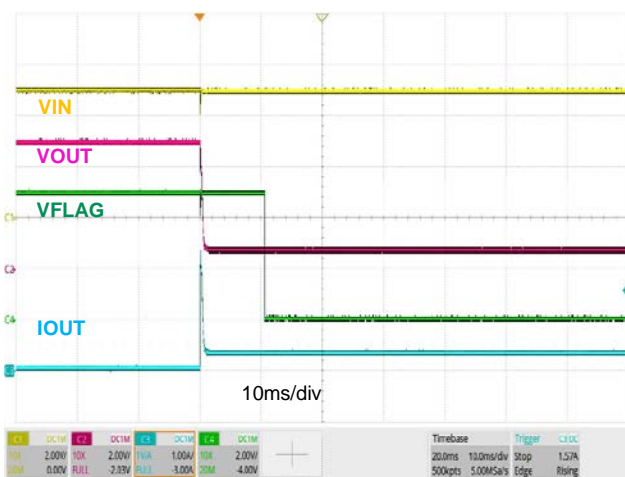
Enable Response($R_{SET}=20k\Omega$, $R_L=20\Omega$)



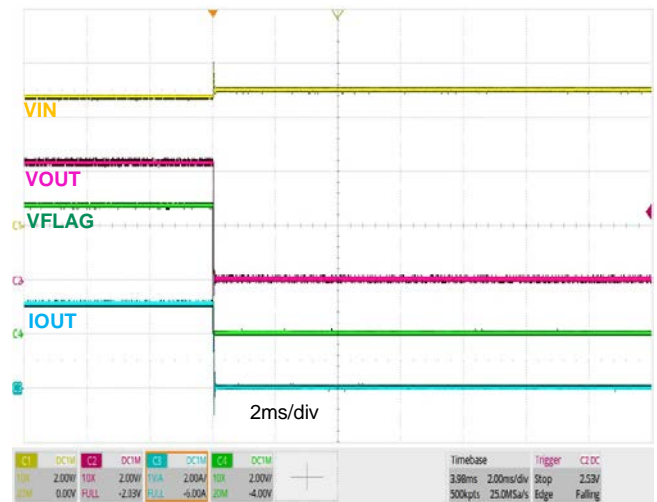
Output Short Response



Power on Response in Output Short($R_{SET}=20k\Omega$.)



OCP Response($R_{SET}=20k\Omega$, $R_L=60\Omega$ to 2Ω)



OTP Response

Function Descriptions**1. Under-voltage Lockout (UVLO)**

Under-voltage lockout (UVLO) prevents the MOSFET switch from turning on until input voltage exceeds approximately 1.7V. If input voltage drops below approximately 1.6V, UVLO turns off the MOSFET, FLG will be asserted accordingly.

2. Fault Flag

The P1482L series provides a FLAG signal pin which is an N-Channel open drain MOSFET output. This open drain output goes low when current limit, the die temperature exceeds 150°C approximately occurs. The /FLAG pin requires a pull-up resistor, this resistor should be large in value to reduce energy drain. A 47kΩ pull-up resistor works well for most applications. In the case of an over-current condition, FLG will be asserted only after the flag response delay time, t_{D_FLAG} , has elapsed. This ensures that FLG is asserted only upon valid over-current conditions.

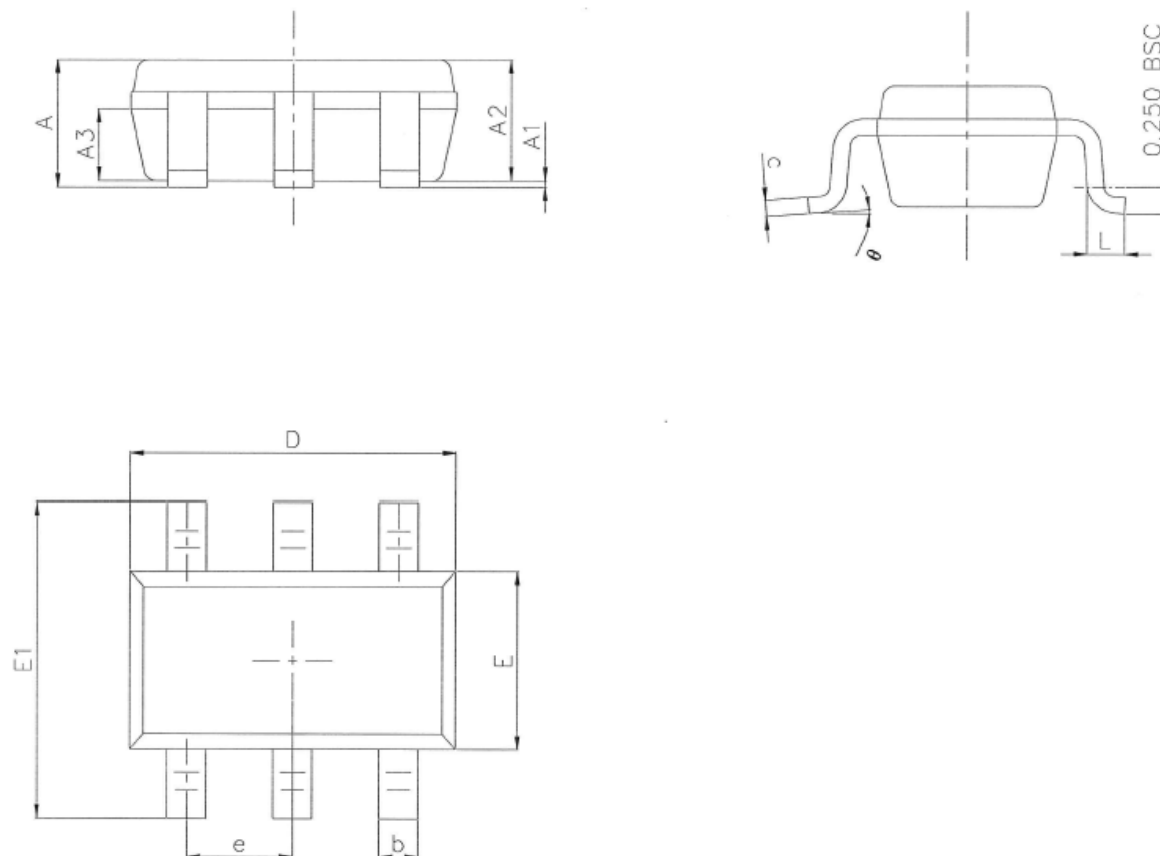
3. Current Limiting and Short-Circuit Protection

The current limit circuitry prevents damage to the MOSFET switch. When a heavy load or short circuit is applied to an enabled switch, a large transient current may flow until the current limit circuitry responds is about 100us. Once this current limit threshold is exceeded the device enters constant current mode until the thermal shutdown occurs or the fault is removed.

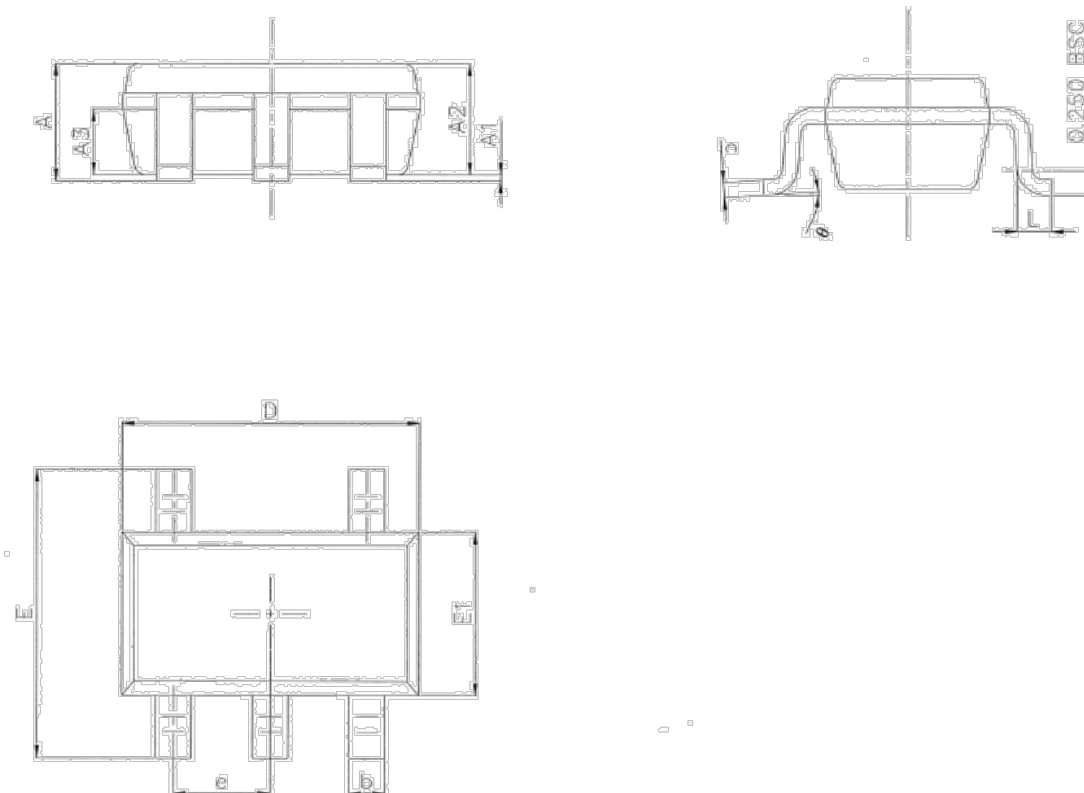
4. Thermal Shutdown

Thermal shutdown is employed to protect the device from damage if the die temperature exceeds approximately 150°C. When the device's junction temperature cools by 20°C, the internal thermal sense circuit will enable the device, resulting in a pulsed output during continuous thermal protection.. The output and FLG signal will continue to cycle on and off until the device is disabled or the fault is removed.

Product dimension (SOT23-6L)




Dim	Millimeters		
	MIN	NOM	MAX
A	1.050	1.150	1.250
A1	0.000	0.060	0.100
A2	1.000	1.100	1.200
A3	0.550	0.650	0.750
D	2.820	2.920	3.020
E1	1.510	1.610	1.700
E	2.650	2.800	2.950
b	0.300	0.400	0.500
e	0.950BSC		
θ	0°	4°	8°
L	0.300	0.420	0.570
c	0.100	0.152	0.200

Product dimension (SOT23-5L)


Dim	Millimeters		
	MIN	NOM	MAX
A	1.050	1.150	1.250
A1	0.000	0.060	0.100
A2	1.000	1.100	1.200
A3	0.550	0.650	0.750
D	2.820	2.920	3.020
E1	1.510	1.610	1.700
E	2.650	2.800	2.950
b	0.300	0.400	0.500
e	0.950BSC		
θ	0°	4°	8°
L	0.300	0.420	0.570
c	0.100	0.152	0.200


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