

FEATURES

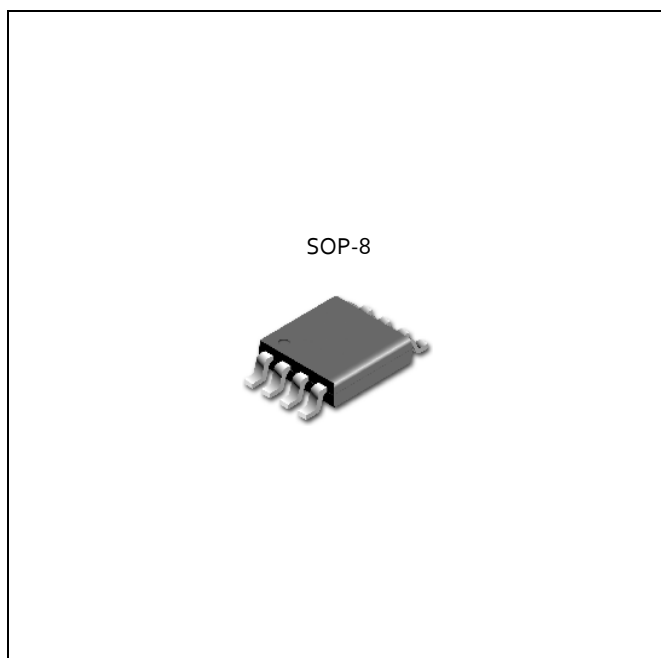
- 70mΩ High-Side MOSFET
- 2.8V to 5.5V Operating Range
- 2.5A Accurate Maximum Current Limiting
- Fold-back Short Circuit Protection
- 120uA Typical On-State Supply Current
- 5uA Maximum Standby Supply Current
- Independent Open-drain Fault Flag Pin
- Thermal Shutdown Protection
- Under Voltage Lockout(UVLO)
- Output Auto Discharge Function
- Reverse Current Protection
- TJ82034H : Active High version

APPLICATION

- USB Peripherals
- General Purpose Power Switching
- ACPI Power Distribution
- Notebook PCs
- PDAs
- Hot Plug-in Power Supplies

DESCRIPTION

The TJ82034 is single-channel High-Side MOSFET switch optimized for fixed current limited power distribution requiring circuit protection. The TJ82034 series support the following USB requirements. The TJ82034 series supply up to 2.5A as required by USB downstream devices. Maximum continuous current can be different on the types of package and ambient temperature. Switch's low on-resistance meets USB voltage drop requirement. Flag output indicate fault condition to the local USB controller. Soft-start prevents the transient voltage drop on the upstream port that can occur when the switch is enabled in bus-powered applications. Under voltage lockout feature disables the output switches until a valid input voltage. Auto discharge function quickly lowers the V_{OUT} to the ground level when the TJ82034 turns off. Also the TJ82034 include thermal shutdown to prevent switch failure from high-current loads and reverse current protection circuit to prevent the reverse current from V_{OUT} pin to V_{IN} pin.



ORDERING INFORMATION

Device	Package
TJ82034HGD	SOP-8
TJ82034LGD	SOP-8

Absolute Maximum Ratings (Note 1)

Characteristic	Symbol	Min	Max	Unit
Supply Voltage	V_{IN}	-0.3	6.5	V
Enable Input Voltage (Note 2)	V_{EN}	-0.3	6.5	V
Fault Flag Voltage	V_{FLG}	-	6.5	V
Fault Flag Current	I_{FLAG}	-	10	mA
Output Voltage	V_{OUT}		6.5	V
Output Current	I_{OUT}		Internally Limited	
Storage Temperature Range	T_{STG}	-65	150	°C

Operating Ratings (Note 3),(Note 4)

Characteristic	Symbol	Min	Max	Unit
Supply Voltage	V_{IN}	2.8	5.5	V
Ambient Temperature Range	T_A	-40	+80	°C
Operating Junction Temperature Range	T_J	-40	125	°C
Thermal Resistance Junction-to-Ambient	θ_{JA}		-	°C/W

Note:

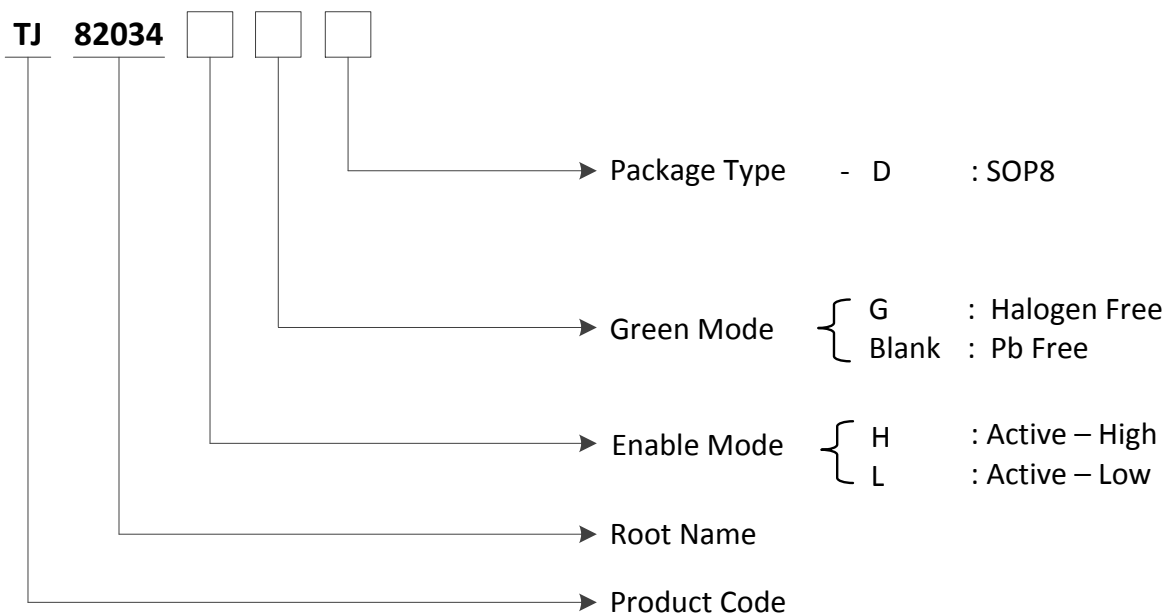
1. Exceeding the absolute maximum ratings may damage the device.
2. It is recommended for V_{EN} voltage not to exceed V_{IN} voltage.
3. The device is not guaranteed to function outside its operating rating.
4. Devices are ESD sensitive. Handling precautions are recommended.

2.5A Current Limited Power Distribution Switch

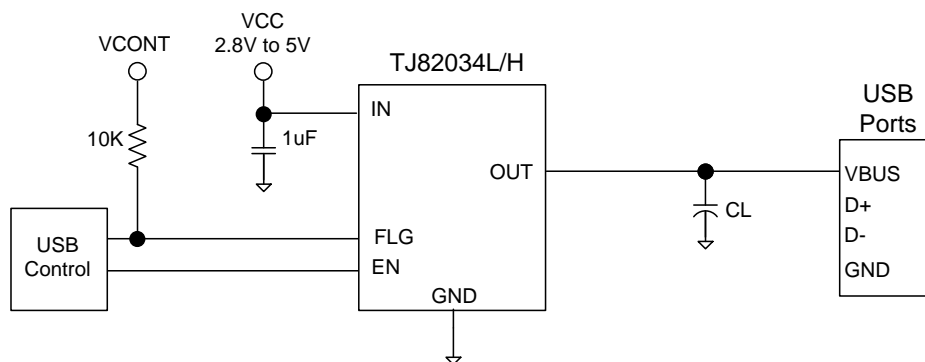
TJ82034

Ordering Information

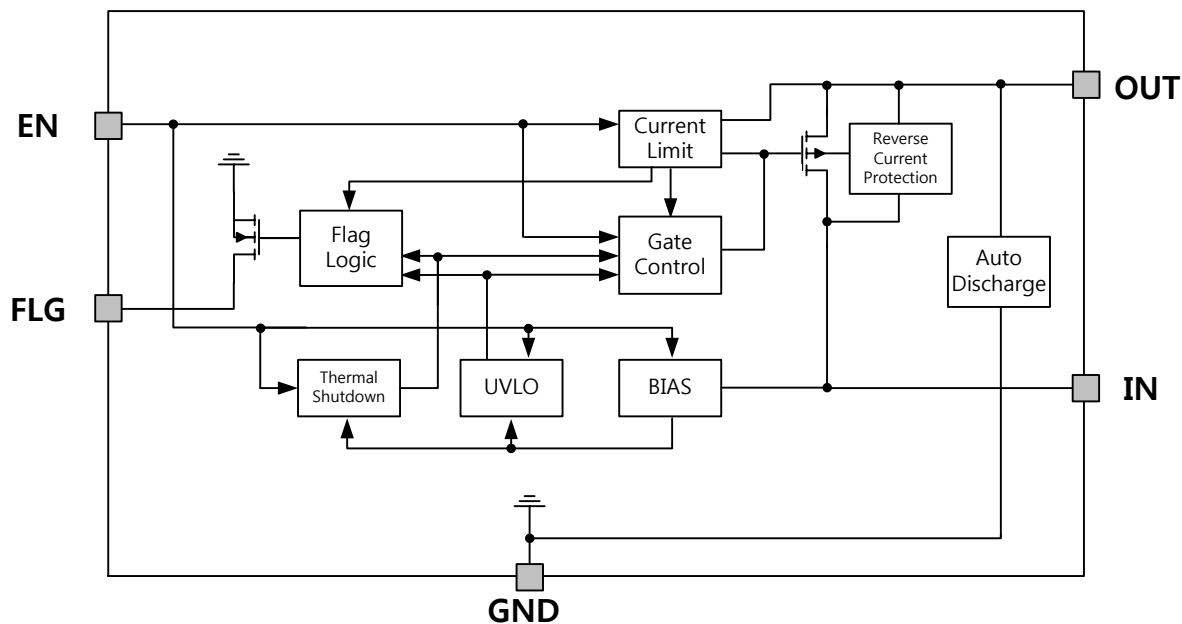
Package	Oder No.	Description	Marking	Compliance	Status
SOP8	TJ82034HGD	Fixed , Active High	TJ82034H	RoHS, Green	Active
SOP8	TJ82034LGD	Fixed , Active Low	TJ82034L	RoHS, Green	Contact Us



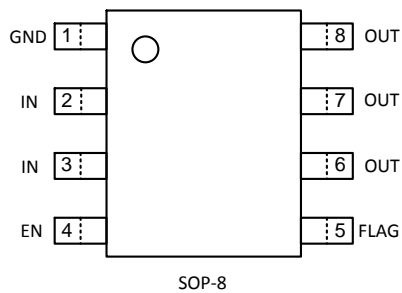
TYPICAL APPLICATION CIRCUIT



FUNCTION BLOCK DIAGRAM



PIN CONFIGURATION



PIN DESCRIPTION

Pin Name	Pin No.	Pin Description & Function
GND	1	Ground
IN	2, 3	Supply Input : Output MOSFET source. Also supplies IC's internal circuitry. Connect to positive supply.
EN	4	Enable : Logic-Compatible enable input (H: active high, L: active low), Do not float.
FLAG	5	Fault Flag : Active-low, open-drain output. Indicates Short circuit current and Thermal shutdown
OUT	6, 7, 8	Switch Output : Output MOSFET drain. Typically connect to switched side of load

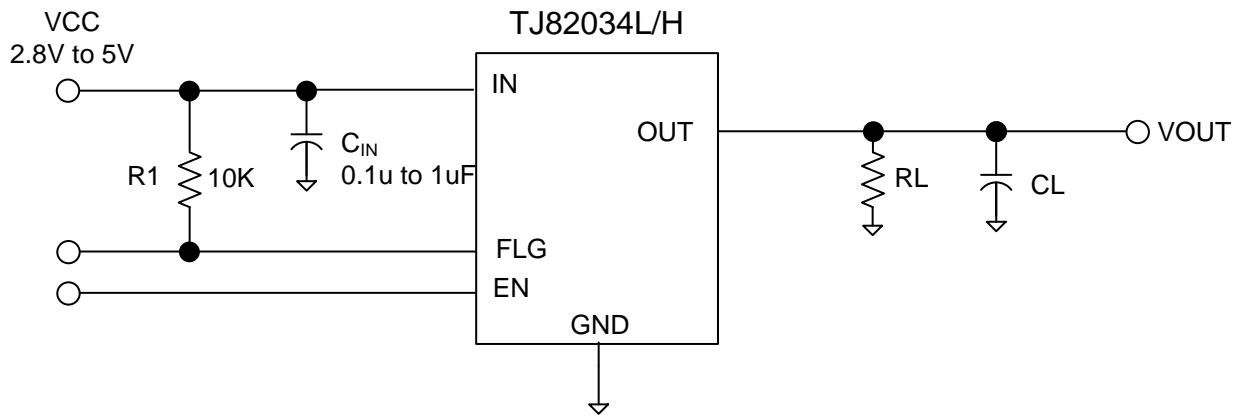
ELECTRICAL CHARACTERISTICS (Under the conditions of $V_{IN}=+5V$ and $T_A=25^{\circ}C$)

PARAMETER	Symbol	CONDITIONS	MIN	TYP	MAX	UNITS
Operating Voltage Range	V_{IN}		2.8		5.5	V
Recommended Maximum Continuous Current (Note 8)	I_{OUT}	SOP8 package		1.5		A
Supply Current	I_{CC}	Enable off ,OUT=Open		1	5	μA
		Enable on, OUT=Open		120	150	μA
Enable Input Threshold Voltage	V_{EN}	(Note 9)	0.8		2.0	V
Enable Input Current	I_{EN}	$V_{EN} = 0V$ to $5.5V$	-1	0.01	1	μA
Enable Input Capacitance	C_{EN}			1		pF
Switch Resistance	$R_{DS(ON)}$	$V_{IN}=5V, I_{OUT}=1.0A$		70	95	m Ω
Output Turn-On Delay	T_{DON}	$RL=10\Omega$ each output, $CL=1\mu F$		0.3		ms
Output Turn-On Rise Time	T_R	$RL=10\Omega$ each output, $CL=1\mu F$		0.2		ms
Output Turn-Off Delay	T_{DOFF}	$RL=10\Omega$ each output, $CL=1\mu F$		25		μs
Output Turn-On Fall Time	T_F	$RL=10\Omega$ each output, $CL=1\mu F$		20		μs
Output leakage Current	I_{LEAK}	$V_{EN}\leq 0.8V$		0.01	5	μA
Current Limit Threshold (Note 11)	I_{LIM}			2.5		A
Short Circuit Current Limit	I_{SC}			1.5		A
Over-Temperature Shutdown Threshold	T_{SD}	Thermal Shutdown Temperature		150		$^{\circ}C$
	T_{HYS}	Hysteresis		20		$^{\circ}C$
Error Flag Output Resistance	R_{FO}	$V_{IN}=5V, I_L=10mA$		20		Ω
Error Flag Off Current	I_{FOH}	$V_{FLAG}=5V$		0.01	10	μA
Output Discharge Resistance	R_{DISC}	$V_{IN}=5V, V_{EN}=0V$		110		Ω
UVLO Threshold	UVLO	V_{IN} = increasing	2.3	2.46	2.6	V
		V_{IN} = decreasing	2.1	2.34	2.4	V
Overcurrent Flag Response Delay	T_{DFOV}	$V_{IN}=5V,$ apply $V_{OUT}=0V$ until FLG low		7	15	ms
Current Limit Response Time	T_{LIM}	(Note 10)		5		μs

Note:

8. Maximum ambient temperature is a function of device junction temperature and system level considerations, such as load current, power dissipation and board layout.
9. OFF is $V_{EN}\leq 0.8V$ and ON is $V_{EN}\geq 2.0V$ for the TJ82034H.
10. T_{LIM} is the response time to operate current limit when the peak value of the current is increased more than set limit value.
11. It is recommended that current limit level set to 1.5 times more than constant current for a stable power supply.

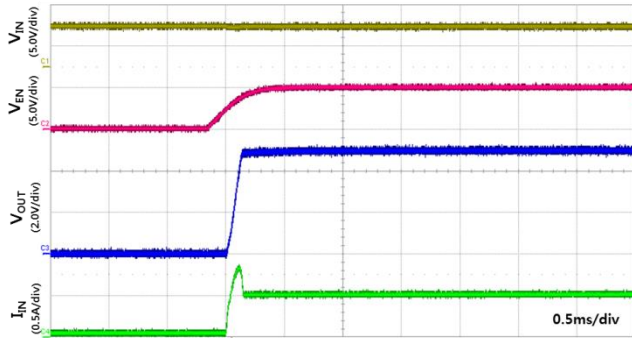
Test Circuit



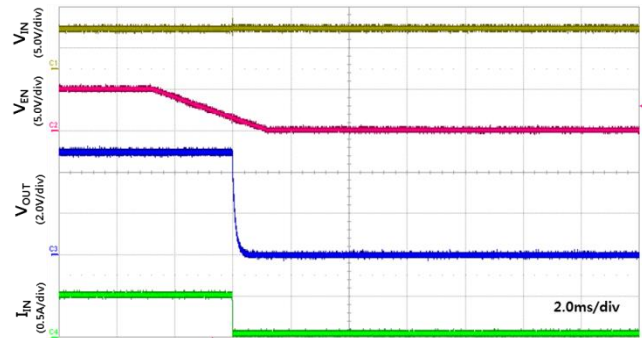
TYPICAL OPERATING CHARACTERISTICS

- $V_{IN}=5V$, $V_{EN}=5V$, $T_A=25^\circ C$, $C_{IN}=1\mu F$, $C_L=10\mu F$ unless otherwise noted.

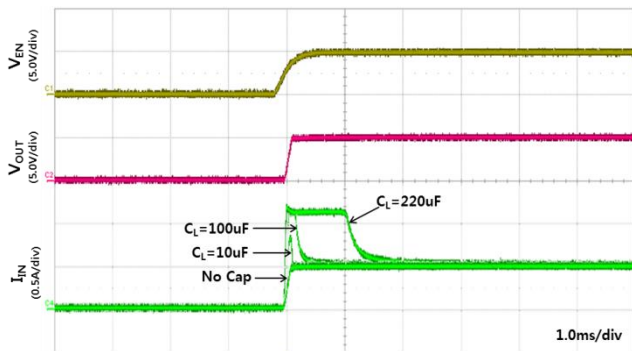
Turn - ON



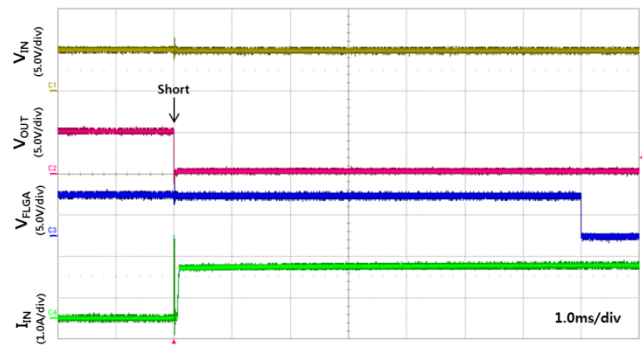
Turn - OFF



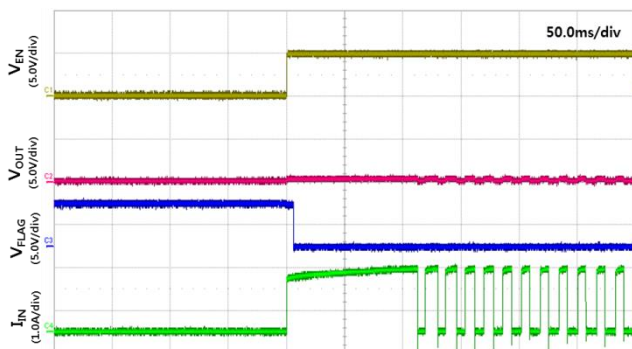
Inrush Current Response



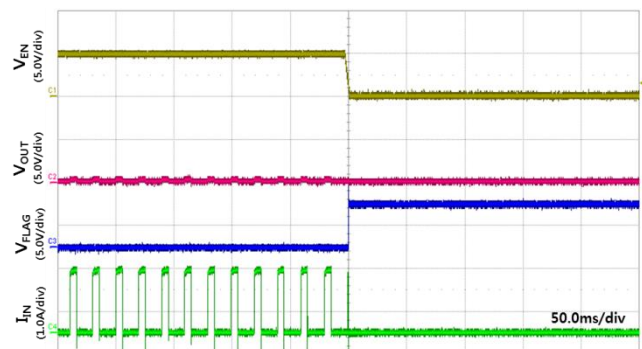
Short Circuit Response



Enable into Short Circuit



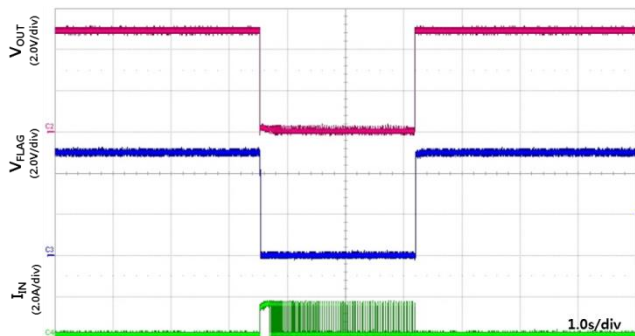
Disable from Short Circuit



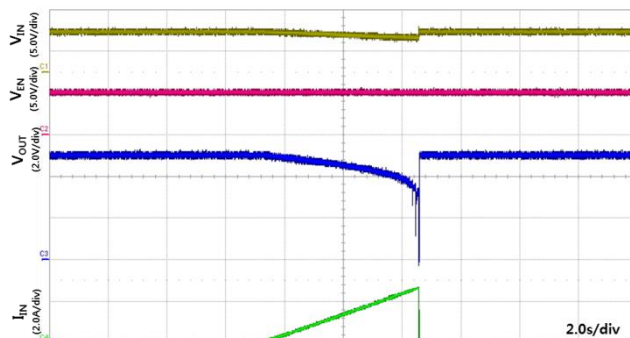
TYPICAL OPERATING CHARACTERISTICS

- $V_{IN}=5V$, $V_{EN}=5V$, $T_A=25^\circ C$, $C_{IN}=1\mu F$, $C_L=10\mu F$ unless otherwise noted.

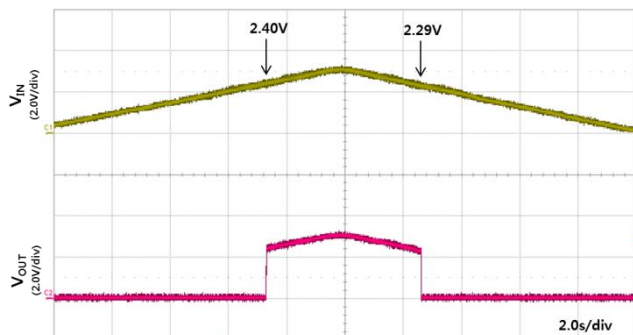
Output Short Response



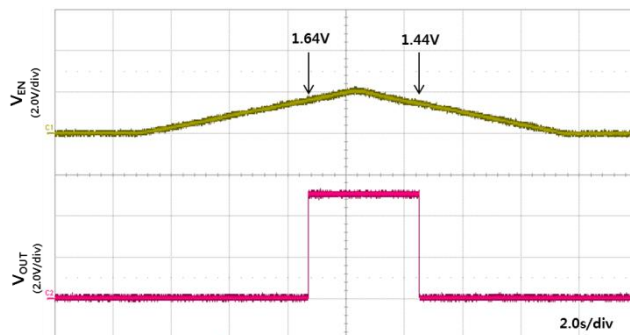
Over Current Protection



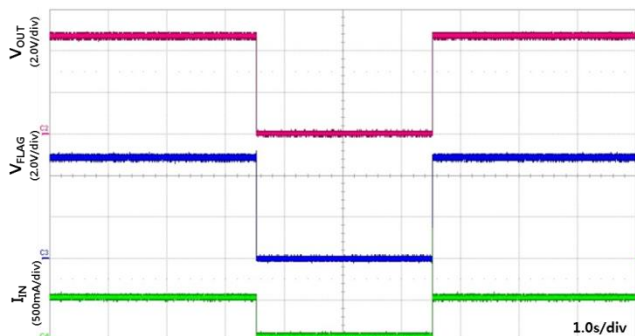
UVLO Threshold



Enable Threshold



Thermal Shutdown



Function Description

Supply Filtering

A 0.1uF to 10uF bypass capacitor from IN pin to GND pin is recommended to control power supply transients. Recommend X5R or X7R dielectrics when using ceramic capacitors for input/output. Without this bypass capacitor, an output short can cause ringing from supply lead inductance on the input and damage the internal control circuitry.

Input or output transients must not exceed the absolute maximum supply voltage ($V_{IN(MAX)} = 6.5V$).

Power Dissipation

The device's junction temperature depends on several factors such as the load, PCB layout, ambient temperature, and package type. Equations that can be used to calculate power dissipation of each channel and junction temperature are found below:

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

Total power dissipation of the device will be the summation of P_D for both channels. To relate this to junction temperature, the following equation can be used:

$$T_J = P_D \times \Theta_{JA} + T_A$$

Where:

T_J = Junction temperature

T_A = Ambient temperature

Θ_{JA} = Thermal resistance of the package

Enable/Shutdown

The EN control pin must be driven to a logic high or logic low for a clearly defined signal input. Floating these control lines may cause unpredictable operation.

Fault Flag

The FLG signal is open-drained output of N-channel MOSFET, the FLG output is pulled low to signal the following fault conditions: output short to GND and thermal shutdown.

Soft-Start Condition

The TJ82034 has high impedance when off, which gradually shifts to low impedance as the chip turns on. This prevents an inrush current from causing voltage drops that result from charging a capacitive load and can pull the USB voltage bus below specified levels. This satisfies the USB voltage droop requirements for bus-powered applications.

The TJ82034 can provide inrush current limiting for applications with large load capacitances where $C_L > 10\mu F$.

Current Sense

A sense MOSFET monitors the current supplied to the load. The sense MOSFET measures current more efficiently than conventional resistance methods. When an overload or short circuit is encountered, the current-sense circuitry sends a control signal to the driver. The driver in turn reduces the gate-source voltage and drives the power MOSFET into its saturation region, which switches the output into a constant-current mode and holds the current constant while varying the voltage on the load. When operating region of power MOSFET is close to saturation region, ON resistance of power MOSFET is made significantly increase. It can cause the operation of thermal protection before reaching to current limit level.

Over-Current and Short-Circuit Protection

The TJ82034 features an over-current protection circuitry to protect the device against overload conditions.

The current limit threshold is user programmable via an internal resistor. The TJ82034 provides an Fixed current limit threshold on 2.5A(Typ.). Also the TJ82034 is including a fold back current limiting function for short-circuit protection. In the event of an output short-circuit condition, the current flowing through the switch is about 25~40% smaller than the current limit threshold(I_{LIM}). A short circuit current limit condition will signal the error flag. These features can protect the load system effectively at any accidental circumstances.

Thermal Shutdown Protection

Thermal shutdown limits the TJ82034 junction temperature and protects the device from damage as a result of overheated.

Thermal protection turns off when the TJ82034's junction temperature 150°C reached, allowing it to cool down until 130°C. The TJ82034 is reactivated when a junction temperature drops to approximately 130°C. It depends on the power dissipation, thermal resistance, and ambient temperature.

Under Voltage Lockout

Under Voltage Lockout (UVLO) prevents the output MOSFET from turning on until V_{IN} exceeds approximately 2.46V. After the switch turns on, if the voltage drops below 2.34V typically, UVLO shuts off the output MOSFET. Under voltage detection functions only works when the switch is enabled.

Auto Discharge Function

When the switch is turned off from disable control input, UVLO or OTP, auto discharge function turns on. The auto-discharge function quickly lowers the V_{OUT} to the ground level by releasing the electrical charge accumulated in the external capacitor.

Reverse Current Protection

The Reverse Current Protection circuit prevents the reverse current from V_{OUT} pin to V_{IN} pin when V_{OUT} becomes higher than V_{IN} .

Printed Circuit Layout

The power circuitry of USB printed circuit boards requires a customized layout to maximize thermal dissipation and to minimize voltage drop and EMI.