



# ACE345

## Adjustable USB Load Current Switch

### Description

The ACE345 is Adjustable USB Load Current Switch Current Limited designed for high-side load switching applications. The internal current-limiting circuit protects the input supply against large output short circuit current which may cause the supply to fall out of regulation.

The current limit threshold is programmed with an external resistor from ISET Pin to ground. The quiescent supply current is typically 150 $\mu$ A, making the device ideal for portable battery-operated equipment. In shutdown mode, the supply current decreases to less than 0.1 $\mu$ A.

Additional features include thermal shutdown and constant current output characteristics if current exceed its current limit

### Features

- 2.5 to 5.5V input voltage range
- Controlled turn-on
- 0.15-1.5A adjustable current limit
- +/-6% current limit accuracy
- 0.1ohm on resistance
- Fast current limit response time
- Logic Control Shutdown (IQ<1uA)
- Thermal shutdown and UVLO
- Reverse current blocking

### Application

- Portable Devices
- MID, MP4...
- Set top boxes
- Notebook and PC mother board
- USB supplied Devices

### Absolute Maximum Ratings

Parameter	Max	Unit
Max Input Voltage	6	V
Max Operating Junction Temperature(T <sub>J</sub> )	125	°C
Ambient Temperature(T <sub>A</sub> )	-40~85	°C
Maximum Power Dissipation	250	mW
Storage Temperature(T <sub>S</sub> )	-40~150	°C
ESD (HBM)	>4000	V

Note: Exceed these limits to damage to the device. Exposure to absolute maximum rating conditions may affect device reliability.

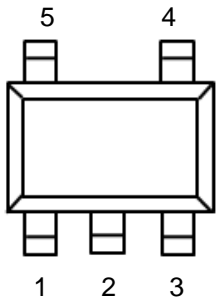


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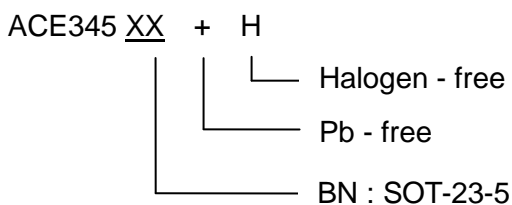
### Packaging Type

SOT-23-5



SOT-23-5	Description	Function
1	$V_{OUT}$	Switch Output, the output of power switch
2	GND	Ground
3	$I_{SET}$	Current limit setting pin. Connecting a resistor ( $R_{Iset}$ ) from this pin to ground will adjust the current limit
4	ON	Control input, enable pin, active high
5	$V_{IN}$	Supply input voltage

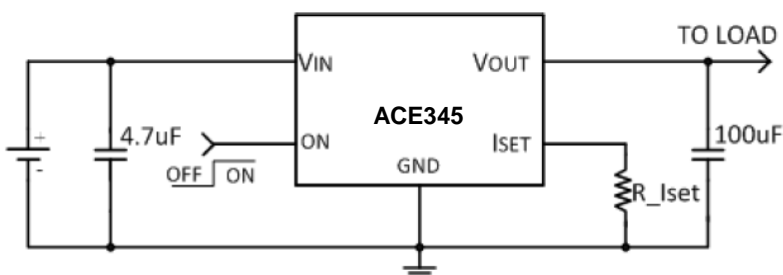
### Ordering information



### Recommended Work Conditions

Parameter	Max	Unit
Input Voltage Range	5.5	V
Operating Junction Temperature ( $T_j$ )	-20~125	°C

### Typical Application





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### Electrical Characteristics ( $V_{IN}=5V, T_A=25^{\circ}C$ .)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Input Voltage Range	Vin		2.6		5.5	V
Quiescent Current	Iq	Active, Vfb=0.65, No Switching		150	300	uA
		Shutdown			1	
Switch Rdson	Rdson	Iout=500mA		100	150	mΩ
Adjustable current limit	Llimit	R_lset=53K ohm		0.5		A
		R_lset=25K ohm		1.0		
		R_lset=17K ohm		1.5		
Reverse Voltage Leakage Current	Irevlk	Vout=5V, Vin=0V		0.1	5	uA
ON Input High Voltage	Vh_on		1.5			V
ON Input Low Voltage	VI_on				0.4	V
Thermal shutdown Temp	Tsd			155		°C

### Setting The Current Limit Threshold

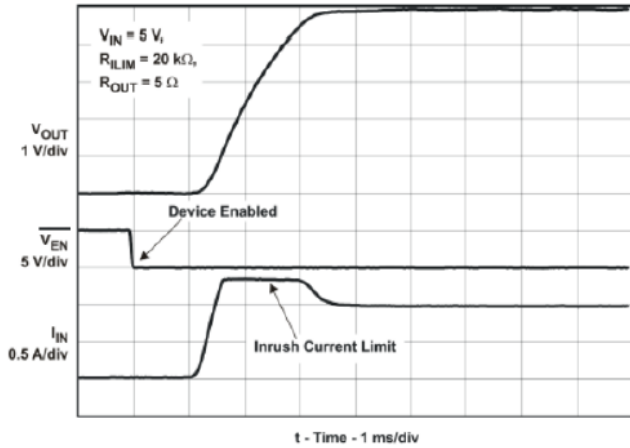
RILIM (KΩ)	Typical Current Limit (mA)	RILIM (KΩ)	Typical Current Limit (mA)
200	138	51	520
180	152	43	612
151	179	30	873
100	266	20	1295
82	324	15.1	1705
68	389		



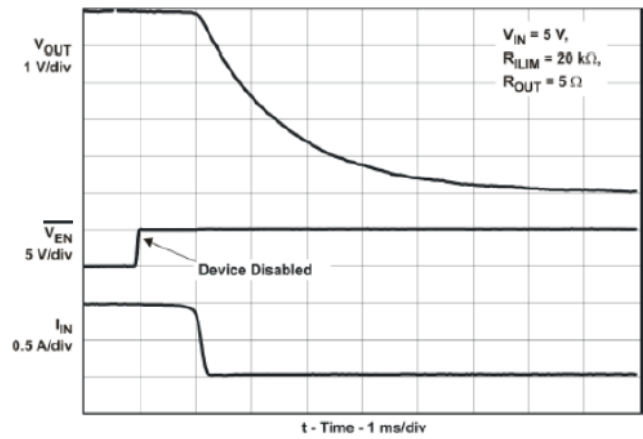
### Electrical Performance

Tested under  $T_A=25^\circ\text{C}$ , unless otherwise noted

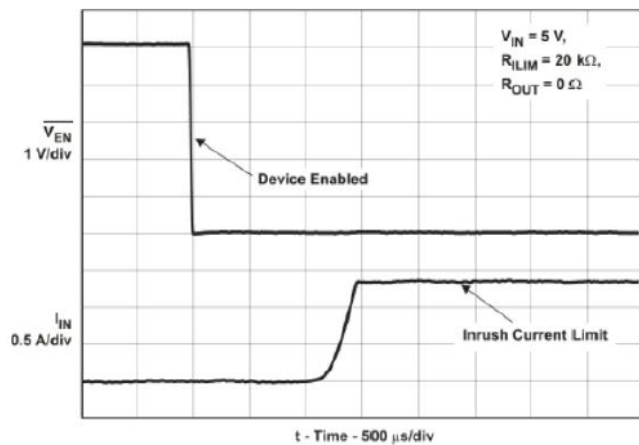
#### Turn on delay and rise time



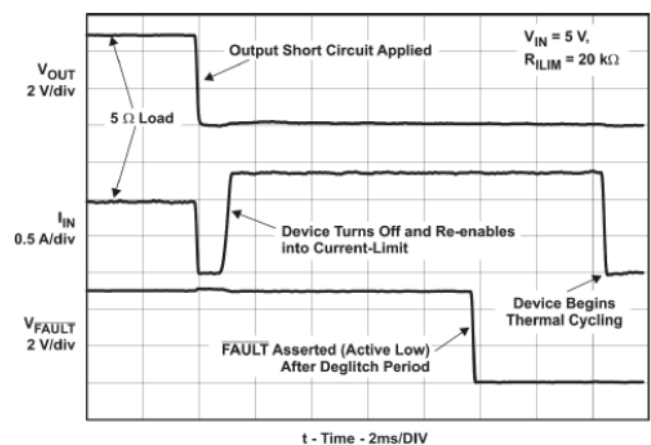
#### Turn off delay and fall time



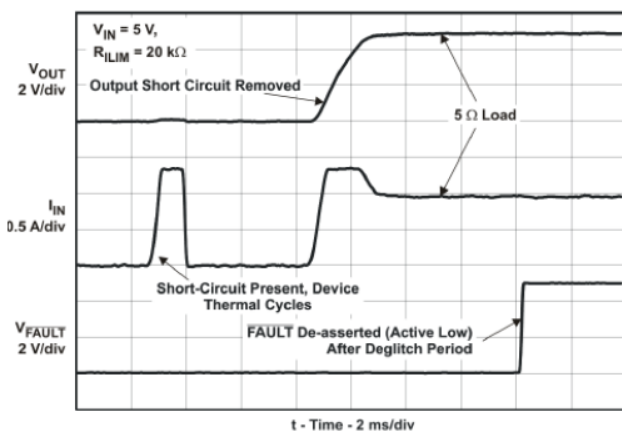
#### Device enabled into short circuit



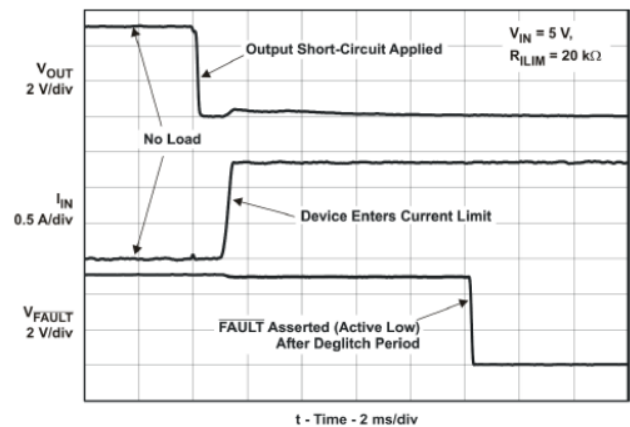
#### Full load to short circuit transient response



#### Short circuit to full load recovery response



#### No load to short circuit transient response





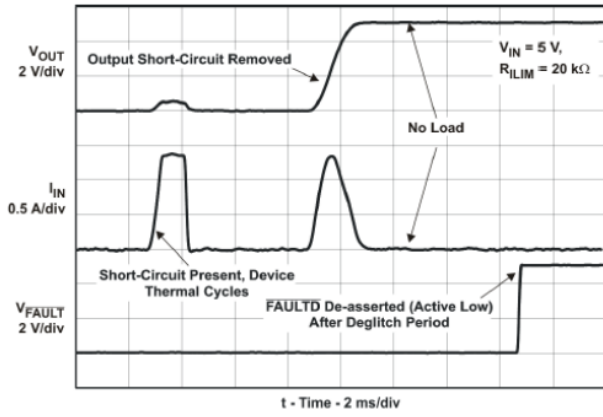
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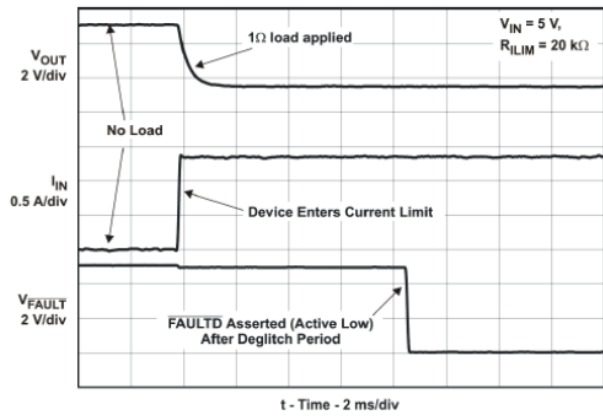
### Electrical Performance

Tested under  $T_A=25^\circ\text{C}$ , unless otherwise noted

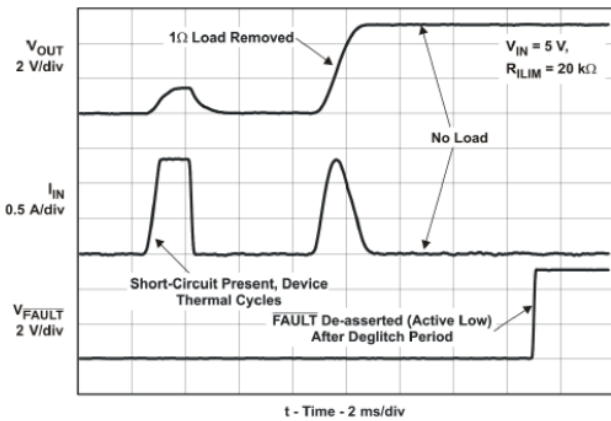
Short circuit to no load recovery response



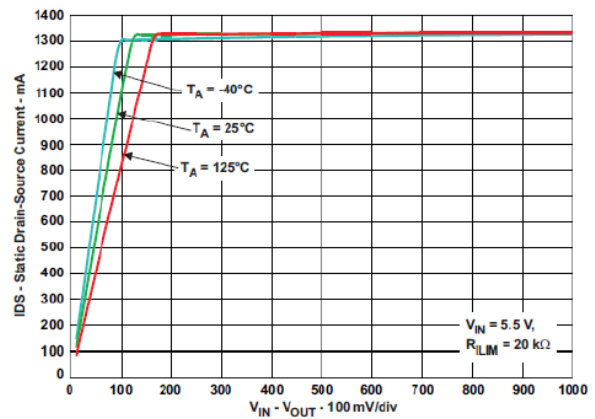
No load to 1Ω transient response



1Ω to no load transient response



Switch current Vs. dropout voltage

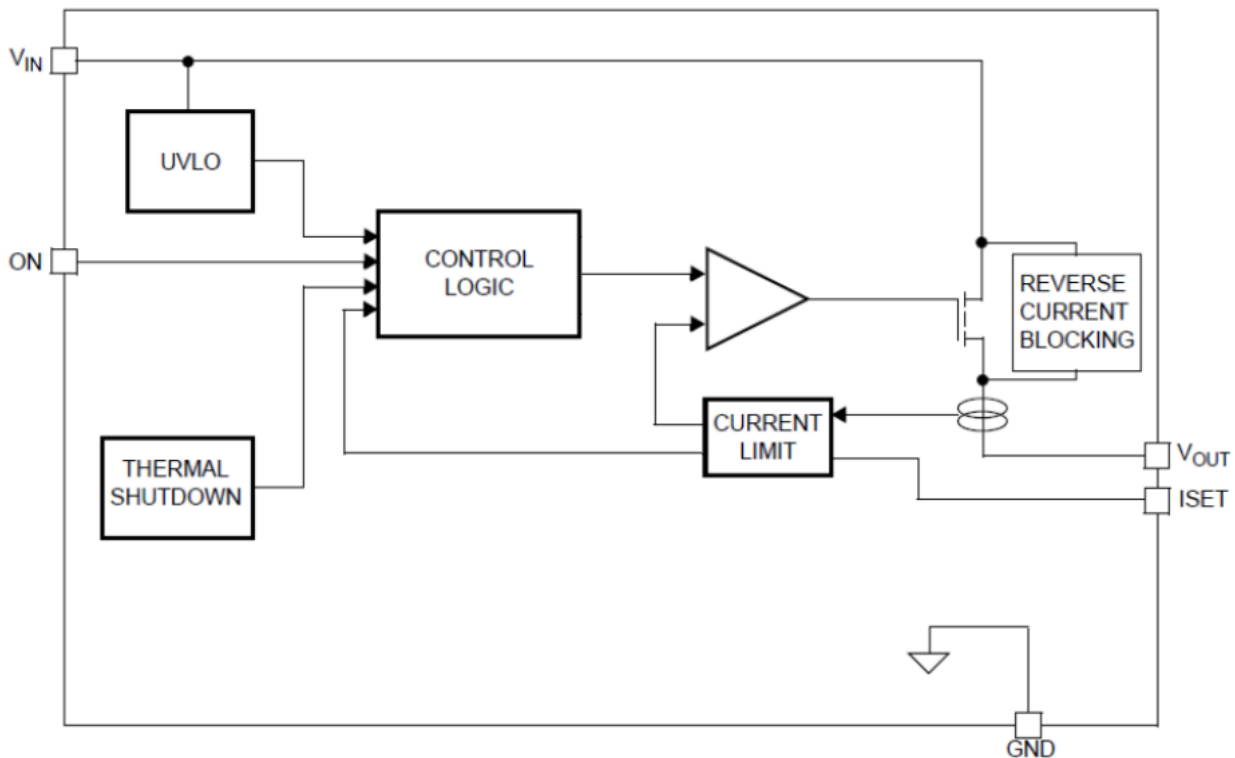




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### Block Diagram



### Detailed Description

#### Operation

The ACE345 is a current limited switch that protects systems and loads which can be damaged or disrupted by the application of high currents. The core of each device is a  $0.10\Omega$  P-channel MOSFET and a controller capable of functioning over a wide input operating range of 2.6-5.5V. The controller protects against system malfunctions through current limiting, undervoltage lockout and thermal shutdown. The current limit is adjustable from 0.15A to 1.5A through the selection of an external resistor.

#### On/Off control

The ON pin controls the state of the switch. When ON is high, the switch is in the on state. Activating ON continuously holds the switch in the on state so long as there is no fault. An undervoltage on VIN or a junction temperature in excess of  $155^{\circ}\text{C}$  overrides the ON control to turn off the switch. The ACE345 does not turn off in response to an over current condition but instead remains operating in a constant current mode so long as ON is active and the thermal shutdown or undervoltage lockout have not activated. The ON pin control voltage and VIN pin have independent and recommended operating ranges. The ON pin voltage can be driven by a voltage level higher than the input voltage.



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### Current limiting

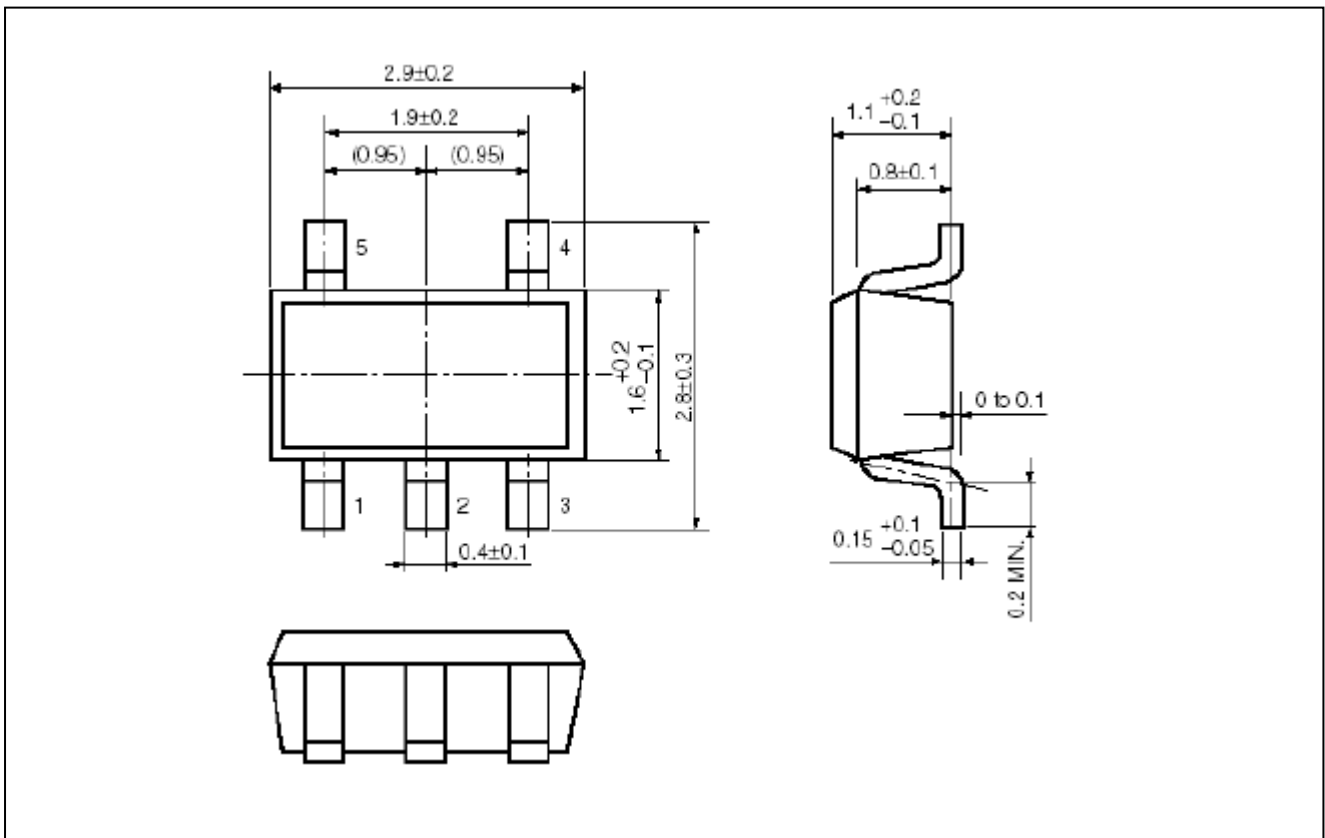
The current limit ensures that the current through the switch doesn't exceed a maximum value while not limiting at less than a minimum value. The current at which the parts will limit is adjustable through the selection of an external resistor connected to ISET. Information for selecting the resistor is found in the Application Info section. The ACE345 has no current limit blanking period so it will remain in a constant current state until the ON pin is deactivated or the thermal shutdown turns-off the switch.

### Thermal Shutdown

The thermal shutdown protects the die from internally or externally generated excessive temperatures. During an over-temperature condition the switch is turned-off. The switch automatically turns-on again if temperature of the die drops below the threshold temperature.

### Packing Information

#### SOT-23-5





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### Notes

ACE does not assume any responsibility for use as critical components in life support devices or systems without the express written approval of the president and general counsel of ACE Electronics Co., LTD. As sued herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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