
Single Channel Bare-Bone USB Switch**■ FEATURES**

- 170mΩ High-Side MOSFET Switch.
- 0.5A Continuous Load Current.
- 40μA Quiescent Supply Current.
- 3.2V to 5.5V Input Voltage Range.
- Under-Voltage Lockout.
- Current-Limit / Short Circuit Protection.
- Thermal Shutdown Protection under Over Current Condition.
- Under Voltage Lockout Ensures that Switch is off at Start Up.
- No Reverse Current when Power off.
- Available in SOT-23 Packages.

■ DESCRIPTION

The AIC6191 is an integrated 170mΩ high-side power switch, the preferred circuit protection method for computer, consumer, multimedia and portable applications. AIC6191 can protect sensitive electronics from damage caused by both overcurrent and overtemperature events.

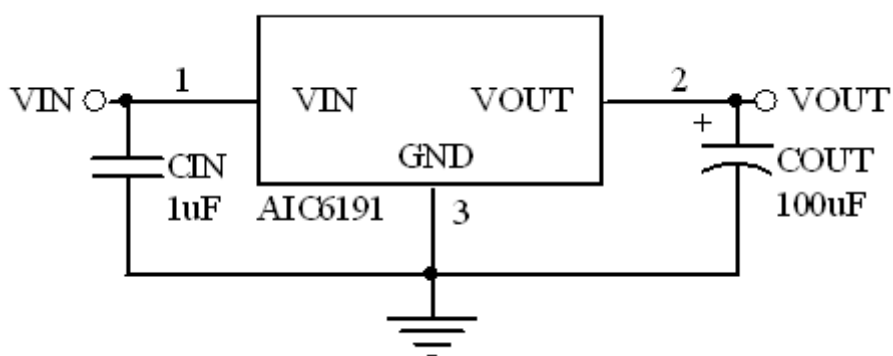
The protection includes current limiting with foldback, short circuit and thermal shutdown under overcurrent occurs.

Guaranteed minimum output rise time limits inrush current during hot plug-in as well as minimizing EMI and prevents the voltage at upstream port from dropping excessively.

■ APPLICATIONS

- USB Power Management
- High-Side Power Protection Switch
- Hot Plug-In Power Supplies
- Battery-Charger Circuits
- Portable Application.
- Digital televisions
- Computer
- Multimedia
- Mobile Phones

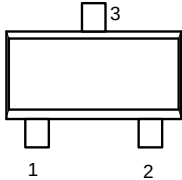
■ TYPICAL APPLICATION CIRCUIT



■ ORDERING INFORMATION

AIC6191XXXXX

- PACKING TYPE
TR: TAPE & REEL
BG: BAG
- PACKAGE TYPE
U3: SOT-23
- G: Green Package

Package Type	Configuration
U3 (SOT-23)	TOP VIEW 1: VIN 2: VOUT 3: GND 

Example: AIC6191GU3TR

→ In SOT-23 Green package and
TAPE & REEL packing.

- **Marking**

Part No.	Package Code	Package Type	Marking
AIC6191-x	GU3	SOT-23	6191G

■ ABSOLUTE MAXIMUM RATINGS

Supply Voltage (V_{IN}).....6.0V
 Operating Temperature Range.....-40°C~85°C
 Junction Temperature.....125°C
 Storage Temperature Range.....-65°C ~ 150°C
 Lead Temperature (Soldering, 10sec)260°C
 Thermal Resistance, θ_{JC} (Junction to Case) SOT-23.....115°C/W
 Thermal Resistance, θ_{JA} (Junction to Ambient) SOT-23.....250°C/W
 (Assume no Ambient Airflow, no Heatsink)

Absolute Maximum Ratings are those values beyond which the life of a device may be impaired.

■ ELECTRICAL CHARACTERISTICS

($V_{IN}=5V$, $C_{IN}=1\mu F$, $C_{OUT}=100\mu F$ (Note 2), $T_A=25^\circ C$, unless otherwise specified.) (Note 1)

PARAMETERS	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Input Voltage		3.2		5.5	V
Supply Current			40		μA
Current Limit Threshold		0.55	0.8	1	A
Output MOSFET Resistance			170		$m\Omega$
Output Turn-On Rise Time	$R_L = 10\Omega$ each Output		1000	2500	μS
Output Turn-Off Fall Time	$R_L = 10\Omega$ each Output		0.7	20	μS
Over Temperature Shutdown Threshold	T_J Increasing		145		$^\circ C$
	T_J Decreasing		125		
Under Voltage Lockout			2.5		V
Under Voltage Lockout Hysteresis			200		mV

Note1: Specifications are production tested at $T_A=25^\circ C$. Specifications over the $-40^\circ C$ to $85^\circ C$ operating temperature range are assured by design, characterization and correlation with Statistical Quality Controls (SQC).

Note2: Electrolytic Capacitor is recommended for C_{OUT} capacitor.

■ TYPICAL PERFORMANCE CHARACTERISTICS

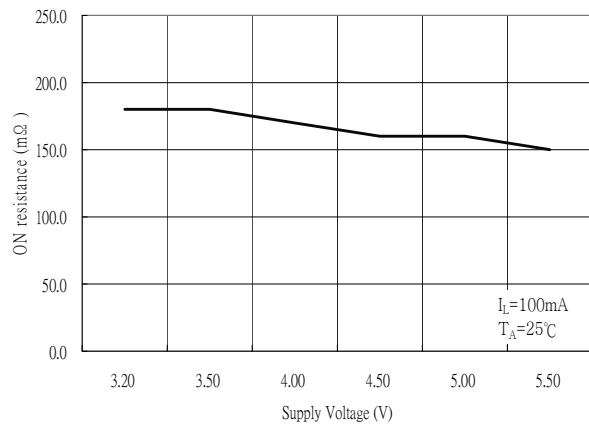


Fig. 1 ON Resistance vs. Supply voltage

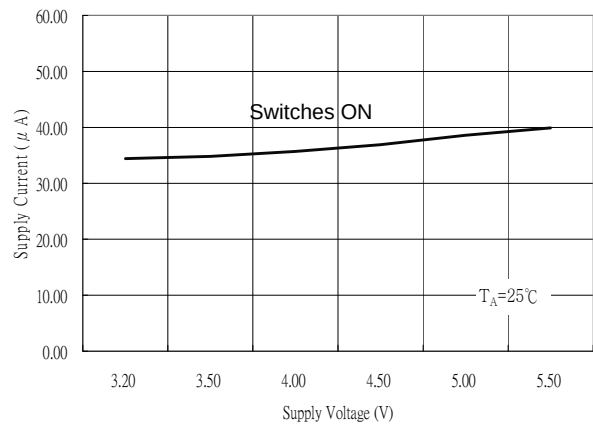


Fig. 2 ON-State Supply Current vs. Supply Voltage

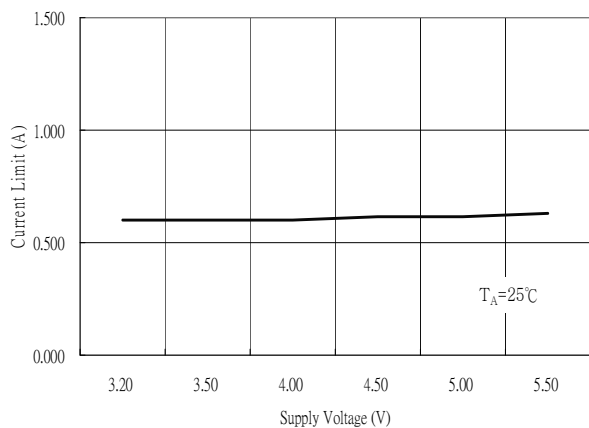


Fig. 3 Current Limit vs. Supply Voltage

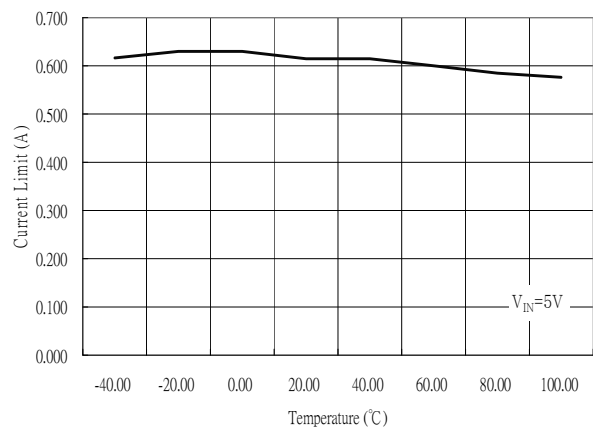


Fig. 4 Current Limit vs. Temperature

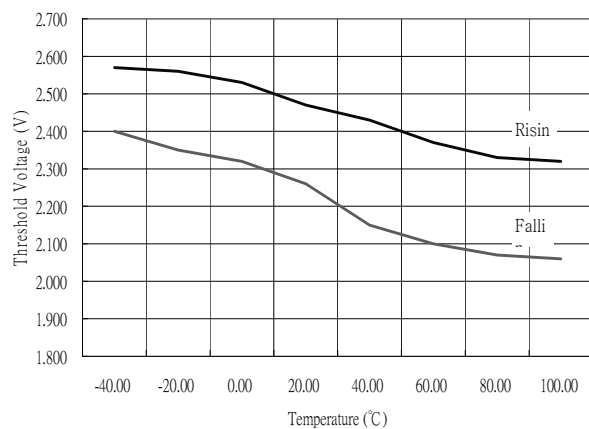


Fig. 5 UVLO Threshold Voltage vs. Temperature

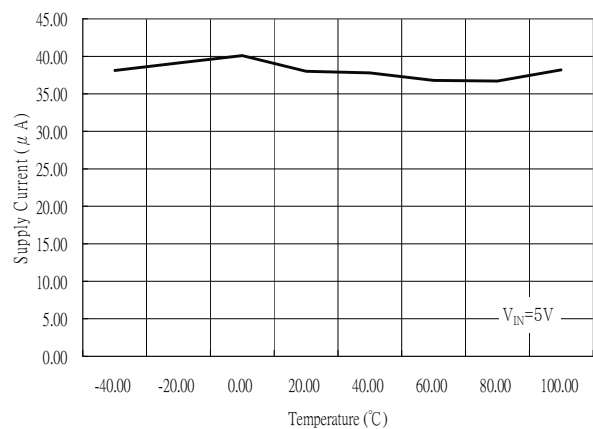


Fig. 6 Supply Current vs. Temperature

TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

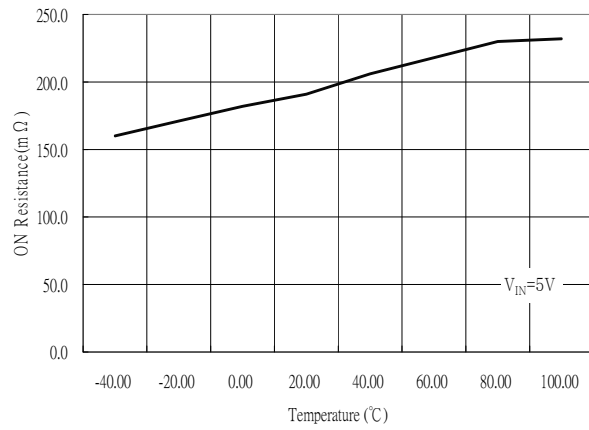
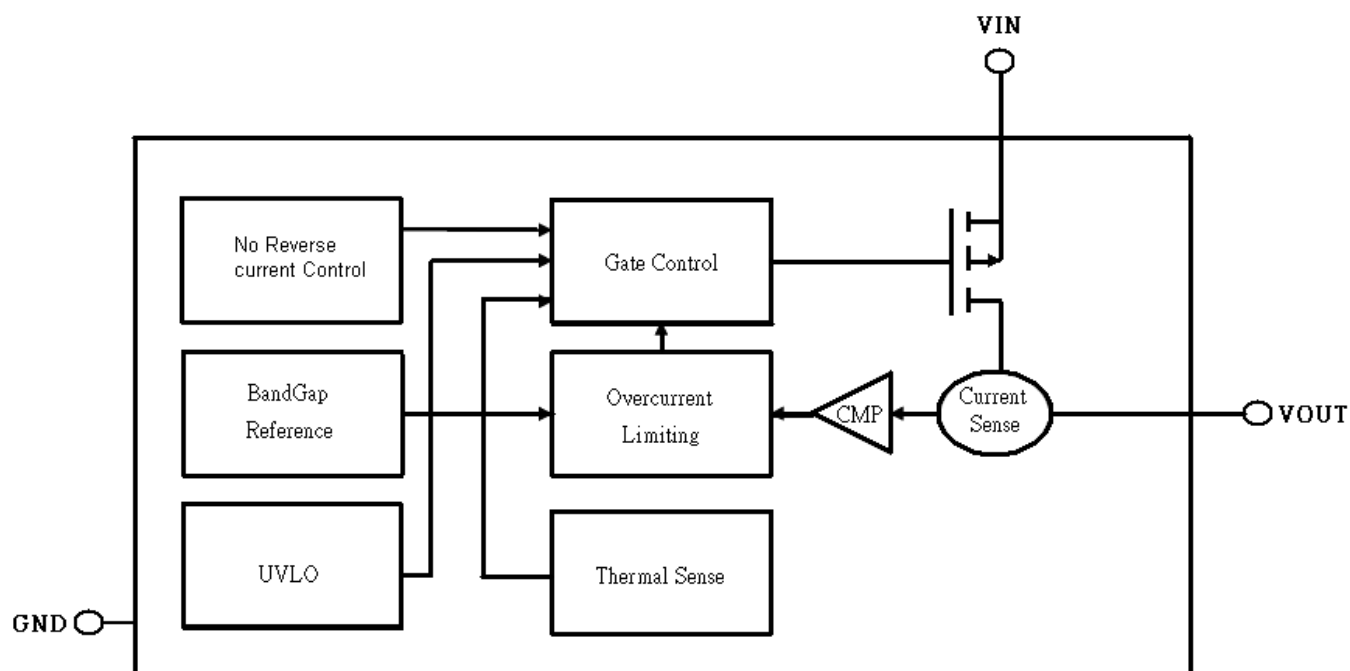


Fig. 7 ON resistance vs. Temperature

■ BLOCK DIAGRAM



■ PIN DESCRIPTIONS

PIN1 VIN: Power supply input.

PIN2 VOUT: MOSFET switch output.

PIN3 GND: Chip power ground.

■ APPLICATION INFORMATION

● Current Limit

Current limiting is invoked when the load exceeds the set over-current threshold. It protects the output MOSFET switches from damage resulting from undesirable short circuit conditions or excess inrush current, which is often encountered during hot plug-in.

● Thermal Shutdown

When junction temperature of AIC6191 exceeds 145°C for any reasons, the thermal shutdown function turns MOSFET switch off. A hysteresis of 20°C prevents the MOSFETs from turning back on until the chip temperature drops below 125°C. thermal shutdown circuit functions only when the switch is enabled.

● Under-voltage Lockout

UVLO prevents the MOSFET switch from turning on until input voltage exceeds 2.5V typically. After the switch turns on, if input voltage drops below 2.3V typically, UVLO shuts off the output MOSFET.

● Supply Filtering

A 0.1μF to 1μF bypass capacitor from IN to GND, located near the device, is strongly recommended to control supply transients. Without a bypass capacitor, an output short may cause sufficient ringing on the input (from supply lead inductance) to damage internal control circuitry. Input transients must not exceed the maximum V_{IN} voltage for a short duration.

● Transient Requirements

USB supports dynamic attachment (hot plug-in) of peripherals. A current surge is caused by the input capacitance of downstream device. Ferrite beads

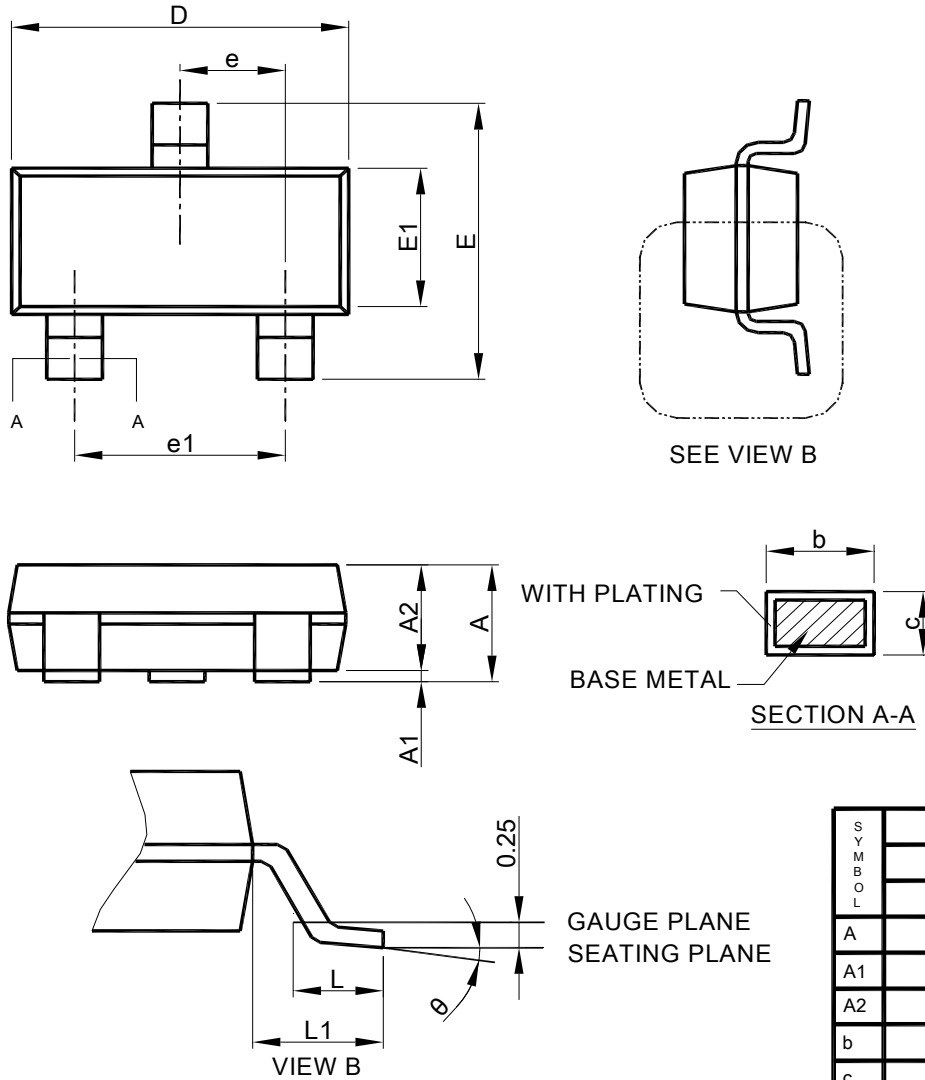
are recommended in series with all power and ground connector pins. Ferrite beads reduce EMI and limit the inrush current during hot-attachment by filtering high-frequency signals.

● 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.

PHYSICAL DIMENSIONS (unit: mm)

● SOT-23



Note: 1. Refer to JEDEC MO-178.

2. Dimension "D" does not include mold flash, protrusions or gate burrs. Mold flash, protrusion or gate burrs shall not exceed 10 mil per side.
3. Dimension "E1" does not include inter-lead flash or protrusions.
4. Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.

SYMBOL	SOT-23	
	MILLIMETERS	
	MIN.	MAX.
A	0.95	1.45
A1	0.00	0.15
A2	0.90	1.30
b	0.30	0.50
c	0.08	0.22
D	2.80	3.00
E	2.60	3.00
E1	1.50	1.70
e	0.95 BSC	
e1	1.90 BSC	
L	0.30	0.60
L1	0.60 REF	
θ	0°	8°

Note:

Information provided by AIC is believed to be accurate and reliable. However, we cannot assume responsibility for use of any circuitry other than circuitry entirely embodied in an AIC product; nor for any infringement of patents or other rights of third parties that may result from its use. We reserve the right to change the circuitry and specifications without notice.

Life Support Policy: AIC does not authorize any AIC product for use in life support devices and/or systems. Life support devices or systems are devices or systems which, (i) are intended for surgical implant into the body or (ii) 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.