

1.5A ULTRA LOW DROPOUT LINEAR REGULATOR

AZ39150

General Description

The AZ39150 is low dropout three-terminal regulator with a typical dropout of 375mV at 1.5A output current.

The AZ39150 provides current limit and thermal shutdown. On-chip thermal shutdown provides protection against any combination of high current and ambient temperature that would create excessive junction temperatures.

The AZ39150 is available for 3.3V, 5.0V and 12V versions now. It is available in the industry standard TO-220-3, TO-263-3, TO-252-2(1), TO-252-2(2), TO-252-2(3) and TO-252-2(4) power packages.

Features

- Minimum Guaranteed Output Current: 1.5A
- Dropout Voltage: 375mV at $I_{OUT}=1.5A$
- Output Accuracy: 1%
- Low Ground Current
- Internal Current Limit and Thermal Protection
- Reversed-battery and Reversed-lead Insertion Protection
- Fast Transient Response

Applications

- LCD TV
- Set Top Box
- LCD Monitor
- SMPS Post Regulator
- Laptop, Palmtop and Notebook
- Portable Instrumentation
- USB Power Supply

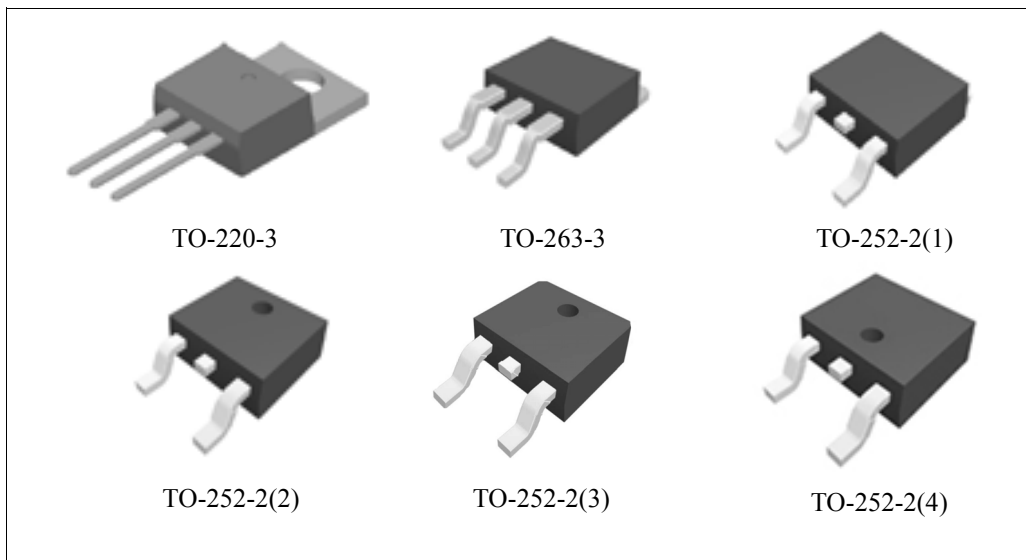


Figure 1. Package Types of AZ39150

1.5A ULTRA LOW DROPOUT LINEAR REGULATOR

AZ39150

Pin Configuration

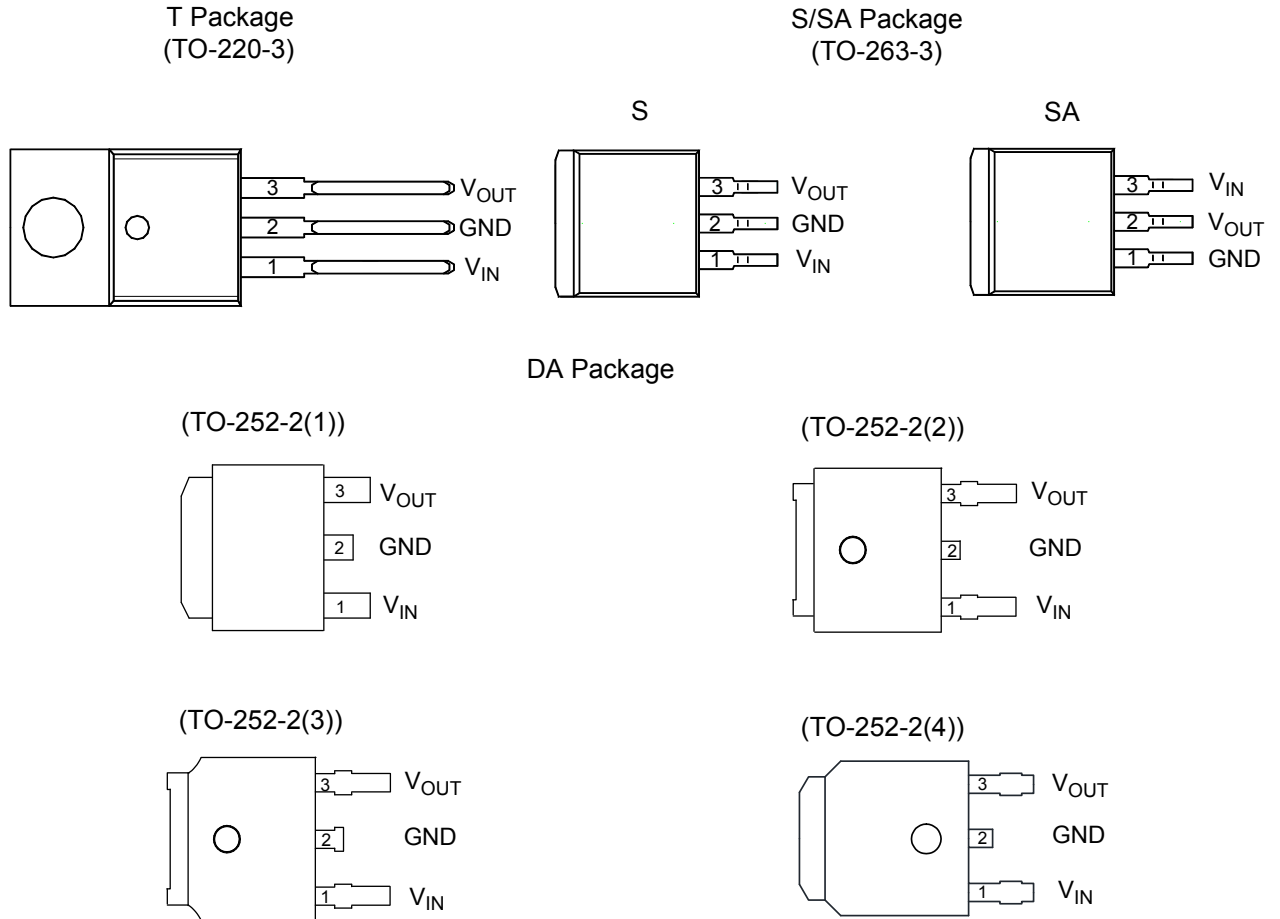


Figure 2. Pin Configuration of AZ39150 (Top View)

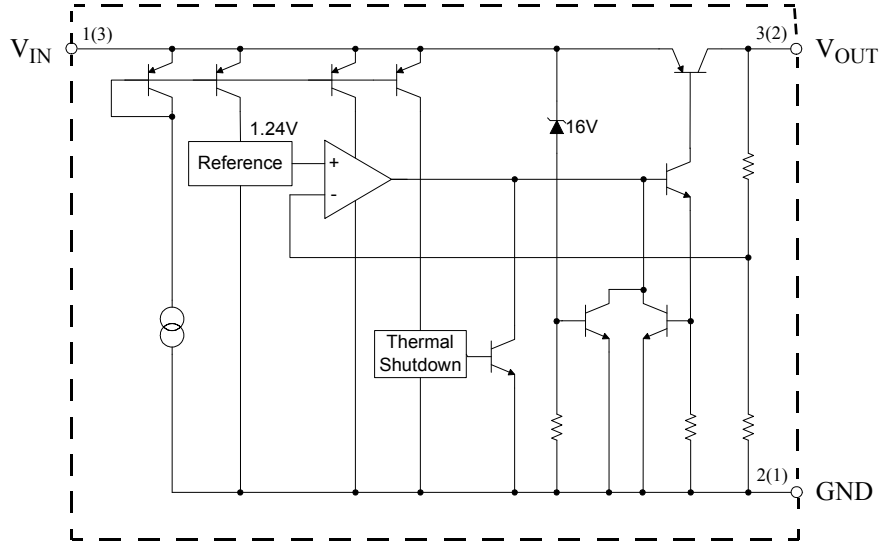
Pin Description

Pin Number		Pin Name	Function
TO-220-3/TO-263-3(S) TO-252-2(1)/(2)/(3)/(4)	TO-263-3(SA)		
1	3	V _{IN}	Unregulated input.
2	1	GND	The ground pin. This pin and TAB are internally connected.
3	2	V _{OUT}	Regulated Output.

1.5A ULTRA LOW DROPOUT LINEAR REGULATOR

AZ39150

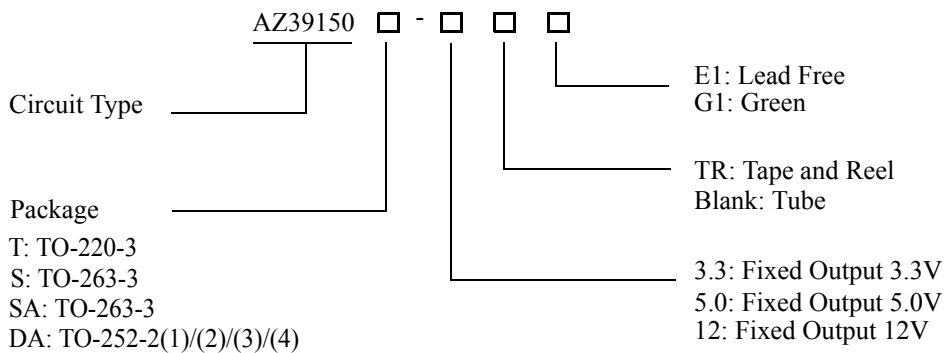
Functional Block Diagram



A(B)
 A: TO-220-3, TO-263-3(S), TO-252-2(1)/(2)/(3)/(4)
 B: TO-263-3(SA)

Figure 3. Functional Block Diagram of AZ39150

Ordering Information





1.5A ULTRA LOW DROPOUT LINEAR REGULATOR AZ39150

Ordering Information (Continued)

Package	Temperature Range	Part Number		Marking ID		Packing Type
		Lead Free	Green	Lead Free	Green	
TO-220-3	-40 to 125°C	AZ39150T-3.3E1	AZ39150T-3.3G1	AZ39150T-3.3E1	AZ39150T-3.3G1	Tube
		AZ39150T-5.0E1	AZ39150T-5.0G1	AZ39150T-5.0E1	AZ39150T-5.0G1	Tube
		AZ39150T-12E1		AZ39150T-12E1		Tube
TO-263-3 (S)	-40 to 125°C	AZ39150S-3.3E1	AZ39150S-3.3G1	AZ39150S-3.3E1	AZ39150S-3.3G1	Tube
		AZ39150S-3.3TRE1	AZ39150S-3.3TRG1	AZ39150S-3.3E1	AZ39150S-3.3G1	Tape & Reel
		AZ39150S-5.0E1	AZ39150S-5.0G1	AZ39150S-5.0E1	AZ39150S-5.0G1	Tube
		AZ39150S-5.0TRE1	AZ39150S-5.0TRG1	AZ39150S-5.0E1	AZ39150S-5.0G1	Tape & Reel
		AZ39150S-12E1		AZ39150S-12E1		Tube
		AZ39150S-12TRE1		AZ39150S-12E1		Tape & Reel
TO-263-3 (SA)	-40 to 125°C		AZ39150SA-3.3TRG1		AZ39150SA-3.3G1	Tape & Reel
			AZ39150SA-5.0TRG1		AZ39150SA-5.0G1	Tape & Reel
			AZ39150SA-12TRG1		AZ39150SA-12G1	Tape & Reel
TO-252-2 (1)/(2)/(3)/(4)	-40 to 125°C		AZ39150DA-3.3TRG1		AZ39150DA-3.3G1	Tape & Reel
			AZ39150DA-5.0TRG1		AZ39150DA-5.0G1	Tape & Reel
			AZ39150DA-12TRG1		AZ39150DA-12G1	Tape & Reel

BCD Semiconductor's Pb-free products, as designated with "E1" suffix in the part number, are RoHS compliant. Products with "G1" suffix are available in green packages.

**1.5A ULTRA LOW DROPOUT LINEAR REGULATOR****AZ39150****Absolute Maximum Ratings (Note 1)**

Parameter	Symbol	Value	Unit
Supply Voltage	V_{IN}	15	V
Maximum Operating Junction Temperature	T_J	150	°C
Storage Temperature Range	T_{STG}	-65 to 150	°C
Lead Temperature (Soldering, 10sec)	T_{LEAD}	300	°C
ESD (Machine Model)		300	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	Min	Max	Unit
Supply Voltage	V_{IN}		13.2	V
Operating Junction Temperature	T_J	-40	125	°C



1.5A ULTRA LOW DROPOUT LINEAR REGULATOR

AZ39150

Electrical Characteristics

AZ39150-3.3V Electrical Characteristics

Operating Conditions: $V_{IN}=4.3V$, $I_{OUT}=10mA$, $C_{IN}=10\mu F$, $C_{OUT}=10\mu F$, $T_J=25^\circ C$, unless otherwise specified. The **Boldface** applies over $-40^\circ C \leq T_J \leq 125^\circ C$.

Parameter	Symbol	Condition	Min	Typ	Max	Unit	
Output Voltage	V_{OUT}	$I_{OUT}=10mA$	3.27	3.3	3.33	V	
		$10mA \leq I_{OUT} \leq 1.5A$, $4.3V \leq V_{IN} \leq 8V$	3.23	3.3	3.37	V	
Line Regulation	V_{RLINE}	$I_{OUT}=10mA$, $4.3V \leq V_{IN} \leq 8V$		2	17	mV	
Load Regulation	V_{RLOAD}	$V_{IN}=4.3V$, $10mA \leq I_{OUT} \leq 1.5A$		6.6	33	mV	
Output Voltage Temperature Coefficient	$\Delta V_{OUT}/\Delta T$	$I_{OUT}=10mA$		66	330	$\mu V/^\circ C$	
Dropout Voltage (Note 2)	V_{DROP}	$\Delta V_{OUT}=1\%$	$I_{OUT}=100mA$		80	200	mV
			$I_{OUT}=750mA$		260		mV
			$I_{OUT}=1.5A$		375	500	mV
Ground Current	I_{GND}	$I_{OUT}=750mA$, $V_{IN}=4.3V$		4	20	mA	
		$I_{OUT}=1.5A$, $V_{IN}=4.3V$		17		mA	
Current Limit	I_{LIMIT}	$V_{OUT}=0V$ (Note 3)	2.0	2.8		A	
Minimum Load Current	$I_{LOAD (MIN)}$			7	10	mA	
Output Noise Voltage (rms)		10Hz to 100KHz, $I_{OUT}=100mA$, $C_{OUT}=10\mu F$		400		μV	

Note 2: Dropout voltage is defined as the input-to-output differential when the output voltage drops to 99% of its nominal value which is measured at $V_{OUT}+1V$ applied to V_{IN} .

Note 3: $V_{IN}=V_{OUT(NOMINAL)}+1V$.



1.5A ULTRA LOW DROPOUT LINEAR REGULATOR **AZ39150**

Electrical Characteristics (Continued)

AZ39150-5.0V Electrical Characteristics

Operating Conditions: $V_{IN}=6V$, $I_{OUT}=10mA$, $C_{IN}=10\mu F$, $C_{OUT}=10\mu F$, $T_J=25^\circ C$, unless otherwise specified. The **Boldface** applies over $-40^\circ C \leq T_J \leq 125^\circ C$.

Parameter	Symbol	Condition	Min	Typ	Max	Unit	
Output Voltage	V_{OUT}	$I_{OUT}=10mA$	4.95	5.0	5.05	V	
		$10mA \leq I_{OUT} \leq 1.5A$, $6V \leq V_{IN} \leq 8V$	4.90	5.0	5.10	V	
Line Regulation	V_{RLINE}	$I_{OUT}=10mA$, $6V \leq V_{IN} \leq 8V$		3	25	mV	
Load Regulation	V_{RLOAD}	$V_{IN}=6V$, $10mA \leq I_{OUT} \leq 1.5A$		10	50	mV	
Output Voltage Temperature Coefficient	$\Delta V_{OUT}/\Delta T$	$I_{OUT}=10mA$		100	500	$\mu V/^\circ C$	
Dropout Voltage (Note 2)	V_{DROP}	$\Delta V_{OUT}=1\%$	$I_{OUT}=100mA$		80	200	mV
			$I_{OUT}=750mA$		260		mV
			$I_{OUT}=1.5A$		375	500	mV
Ground Current	I_{GND}	$I_{OUT}=750mA$, $V_{IN}=6V$		4	20	mA	
		$I_{OUT}=1.5A$, $V_{IN}=6V$		17		mA	
Current Limit	I_{LIMIT}	$V_{OUT}=0V$ (Note 3)	2.0	2.8		A	
Minimum Load Current	$I_{LOAD (MIN)}$			7	10	mA	
Output Noise Voltage (rms)		10Hz to 100KHz, $I_{OUT}=100mA$, $C_{OUT}=10\mu F$		400		μV	

Note 2: Dropout voltage is defined as the input-to-output differential when the output voltage drops to 99% of its nominal value which is measured at $V_{OUT}+1V$ applied to V_{IN} .

Note 3: $V_{IN}=V_{OUT(NOMINAL)}+1V$.



1.5A ULTRA LOW DROPOUT LINEAR REGULATOR

AZ39150

Electrical Characteristics (Continued)

AZ39150-12V Electrical Characteristics

Operating Conditions: $V_{IN}=13V$, $I_{OUT}=10mA$, $C_{IN}=10\mu F$, $C_{OUT}=10\mu F$, $T_J=25^{\circ}C$, unless otherwise specified. The **Boldface** applies over $-40^{\circ}C \leq T_J \leq 125^{\circ}C$.

Parameter	Symbol	Condition	Min	Typ	Max	Unit	
Output Voltage	V_{OUT}	$I_{OUT}=10mA$	11.88	12.0	12.12	V	
		$10mA \leq I_{OUT} \leq 1.5A$, $13V \leq V_{IN} \leq 15V$	11.76	12.0	12.24	V	
Line Regulation	V_{RLINE}	$I_{OUT}=10mA$, $13V \leq V_{IN} \leq 15V$		3	25	mV	
Load Regulation	V_{RLOAD}	$V_{IN}=13V$, $10mA \leq I_{OUT} \leq 1.5A$		10	50	mV	
Output Voltage Temperature Coefficient	$\Delta V_{OUT}/\Delta T$	$I_{OUT}=10mA$		100	500	$\mu V/^{\circ}C$	
Dropout Voltage (Note 2)	V_{DROP}	$\Delta V_{OUT}=1\%$	$I_{OUT}=100mA$		80	200	mV
			$I_{OUT}=750mA$		260		mV
			$I_{OUT}=1.5A$		375	500	mV
Ground Current	I_{GND}	$I_{OUT}=750mA$, $V_{IN}=13V$		4	20	mA	
		$I_{OUT}=1.5A$, $V_{IN}=13V$		17		mA	
Current Limit	I_{LIMIT}	$V_{OUT}=0V$ (Note 3)	2.0	2.8		A	
Minimum Load Current	$I_{LOAD (MIN)}$			7	10	mA	
Output Noise Voltage (rms)		10Hz to 100KHz, $I_{OUT}=100mA$, $C_{OUT}=10\mu F$		400		μV	

Note 2: Dropout voltage is defined as the input-to-output differential when the output voltage drops to 99% of its nominal value which is measured at $V_{OUT}+1V$ applied to V_{IN} .

Note 3: $V_{IN}=V_{OUT(NOMINAL)}+1V$.



1.5A ULTRA LOW DROPOUT LINEAR REGULATOR

AZ39150

Typical Performance Characteristics

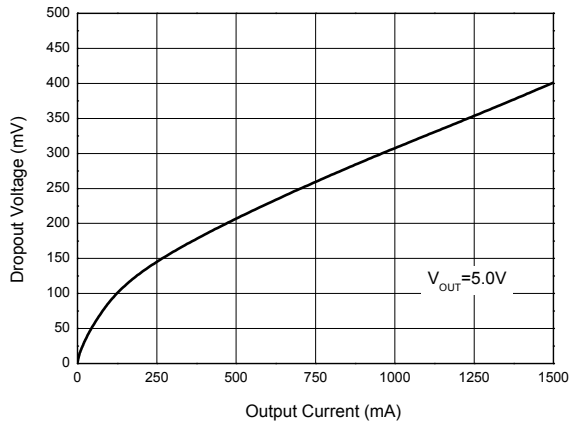


Figure 4. Dropout Voltage vs. Output Current

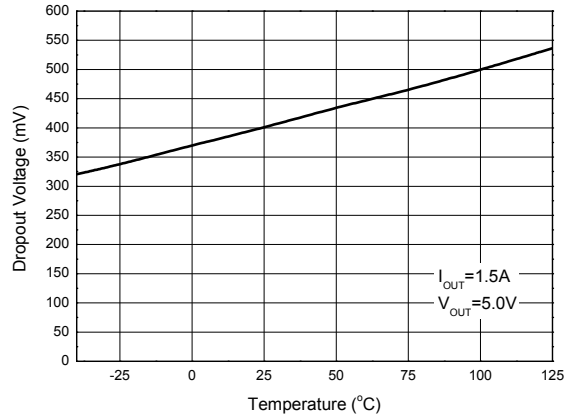


Figure 5. Dropout Voltage vs. Temperature

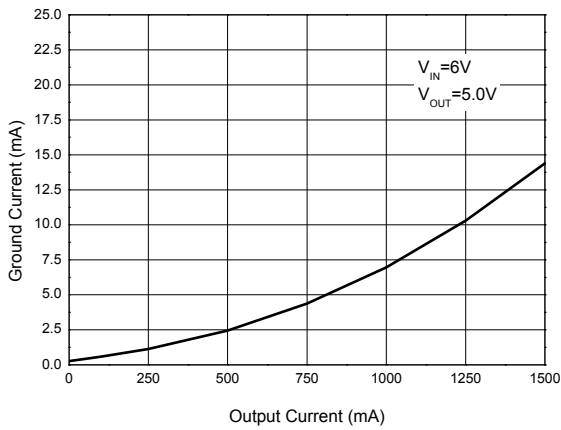


Figure 6. Ground Current vs. Output Current

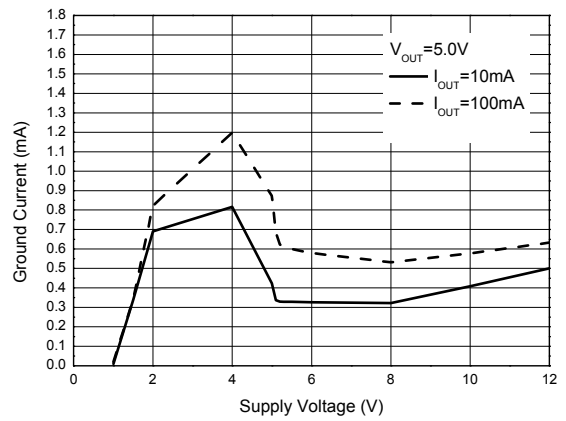


Figure 7. Ground Current vs. Supply Voltage



1.5A ULTRA LOW DROPOUT LINEAR REGULATOR

AZ39150

Typical Performance Characteristics (Continued)

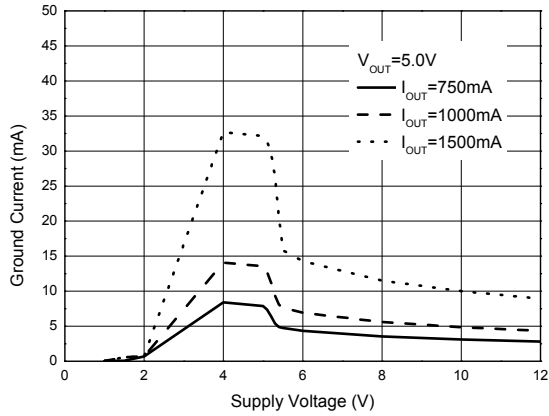


Figure 8. Ground Current vs. Supply Voltage

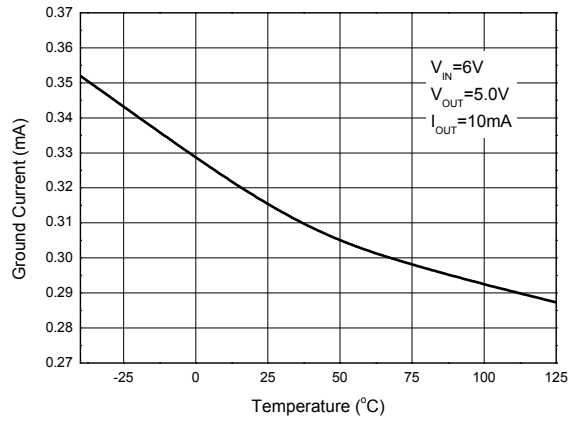


Figure 9. Ground Current vs. Temperature

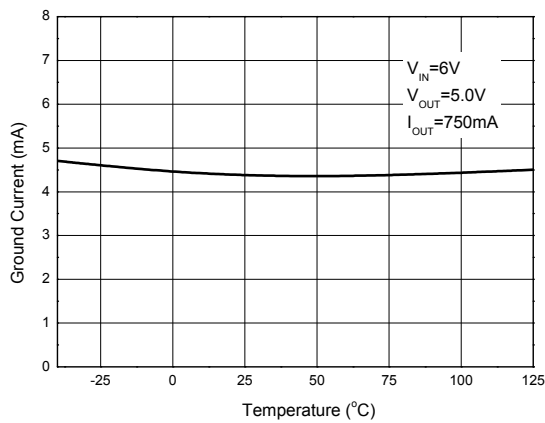


Figure 10. Ground Current vs. Temperature

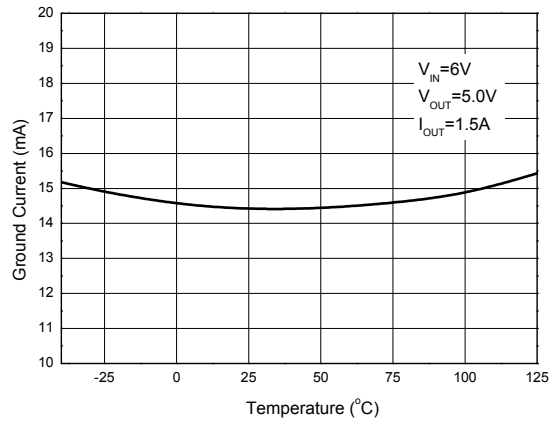


Figure 11. Ground Current vs. Temperature

1.5A ULTRA LOW DROPOUT LINEAR REGULATOR

AZ39150

Typical Performance Characteristics (Continued)

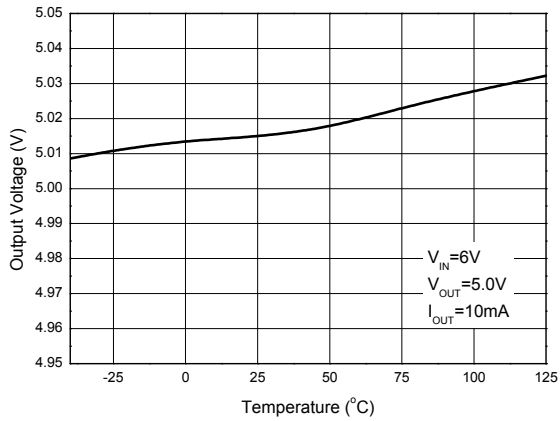


Figure 12. Output Voltage vs. Temperature

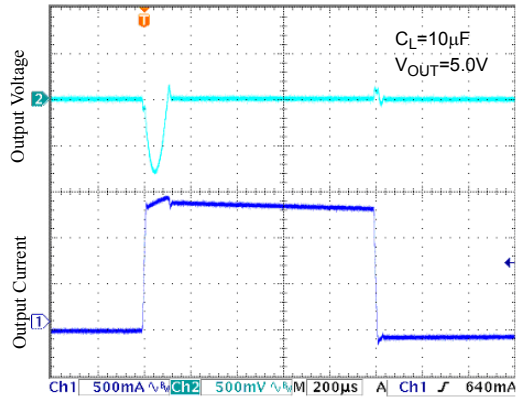


Figure 13. Load Transient

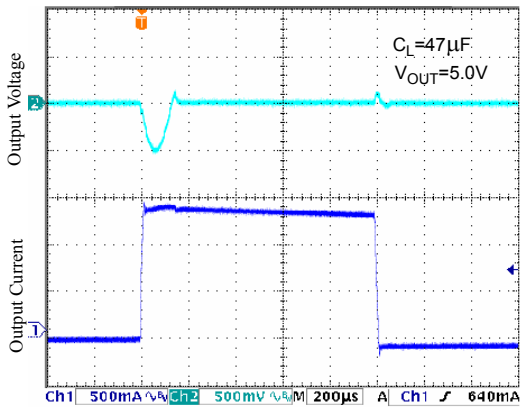


Figure 14. Load Transient

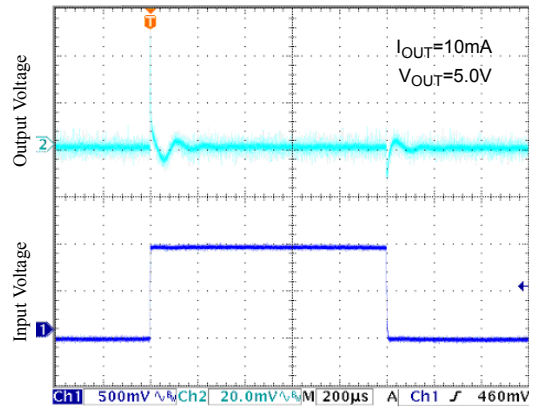
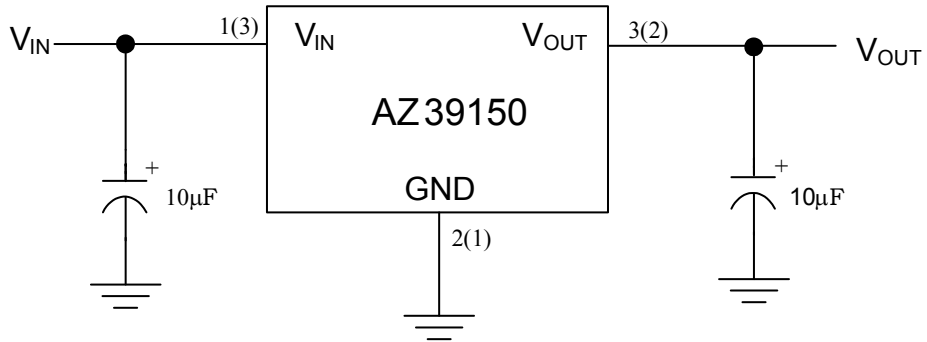


Figure 15. Line Transient

1.5A ULTRA LOW DROPOUT LINEAR REGULATOR

AZ39150

Typical Application



A(B)
 A: TO-220-3, TO-263-3(S), TO-252-2(1)/(2)/(3)/(4)
 B: TO-263-3(SA)

Figure 16. Typical Application of AZ39150



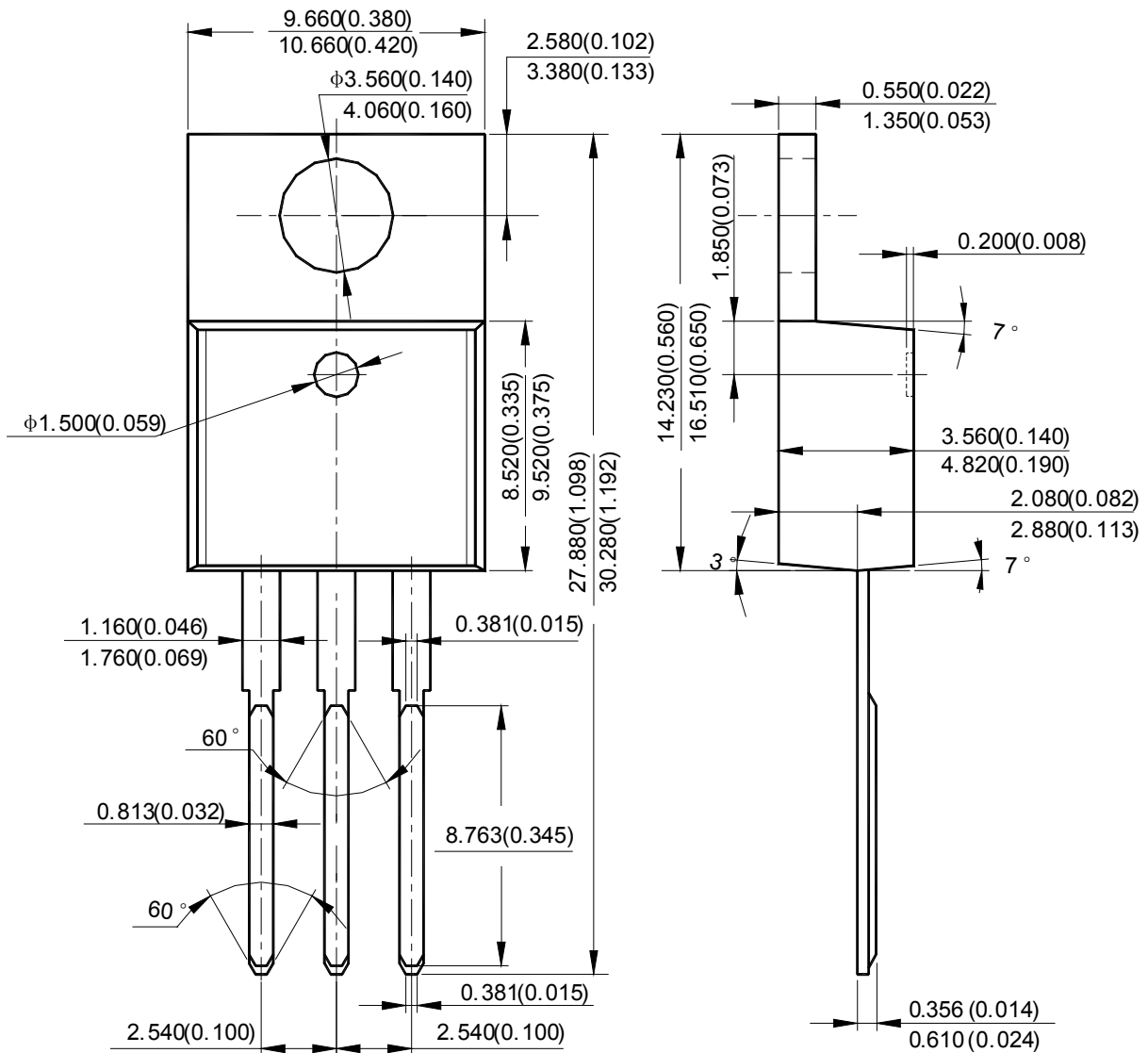
1.5A ULTRA LOW DROPOUT LINEAR REGULATOR

AZ39150

Mechanical Dimensions

TO-220-3

Unit: mm(inch)





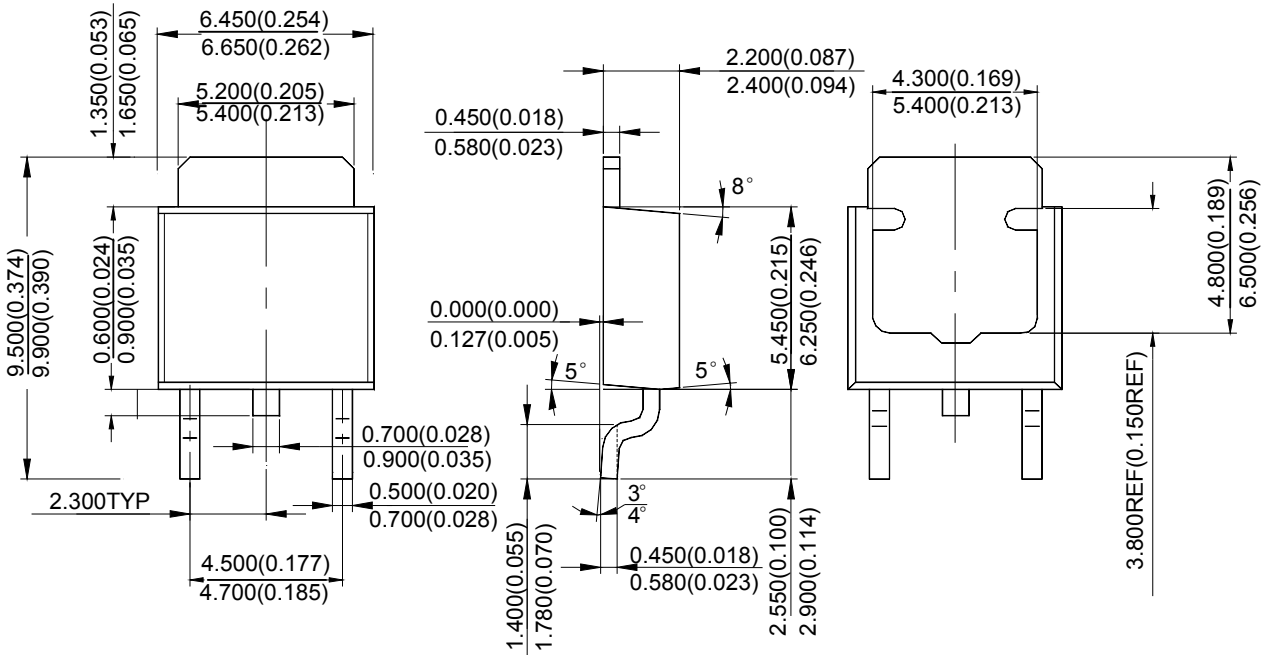
1.5A ULTRA LOW DROPOUT LINEAR REGULATOR

AZ39150

Mechanical Dimensions (Continued)

TO-252-2(1)

Unit: mm(inch)





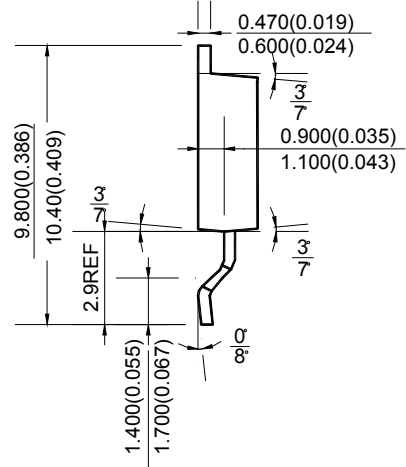
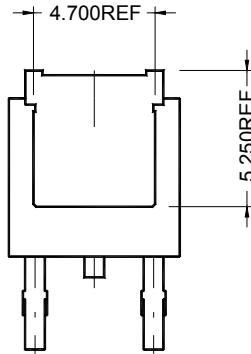
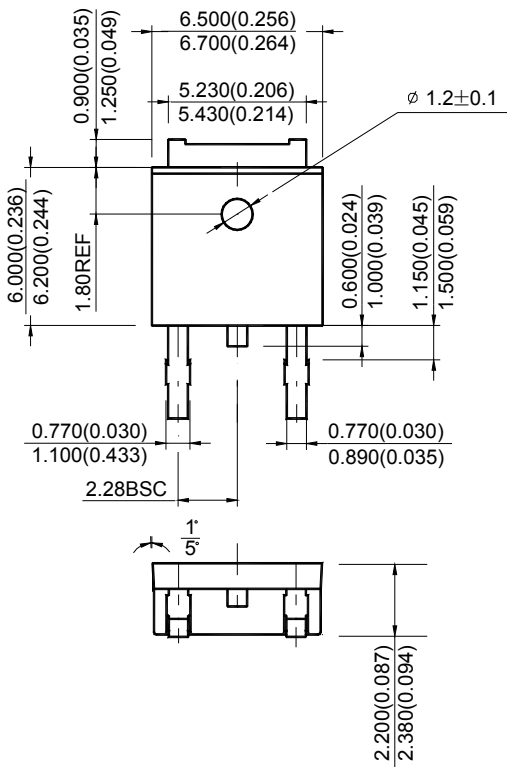
1.5A ULTRA LOW DROPOUT LINEAR REGULATOR

AZ39150

Mechanical Dimensions (Continued)

TO-252-2(2)

Unit: mm(inch)





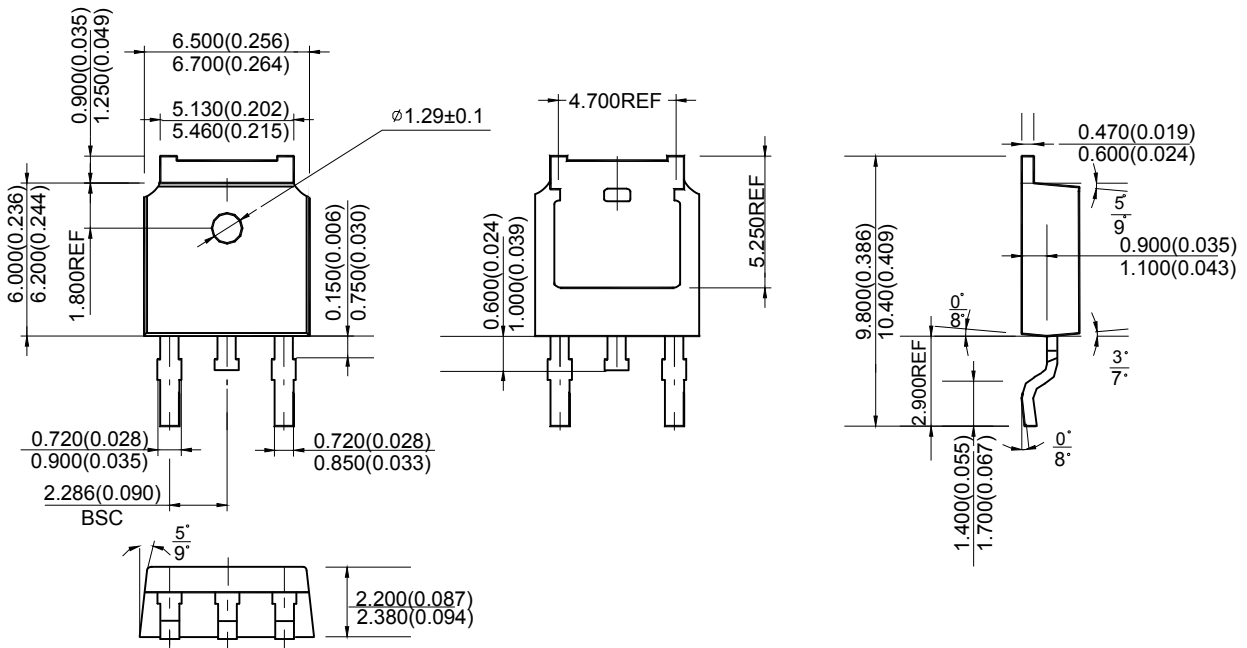
1.5A ULTRA LOW DROPOUT LINEAR REGULATOR

AZ39150

Mechanical Dimensions (Continued)

TO-252-2(3)

Unit: mm(inch)





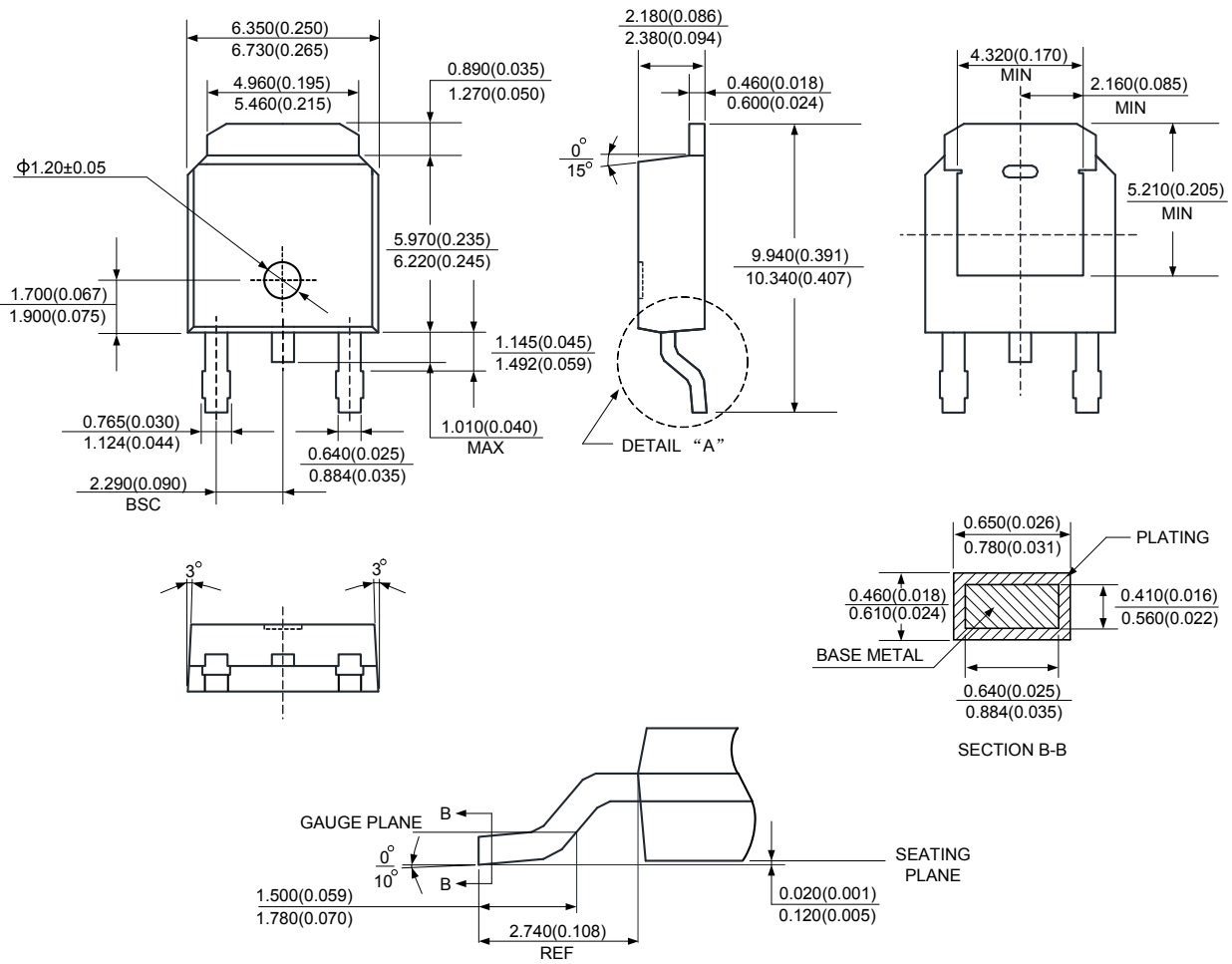
1.5A ULTRA LOW DROPOUT LINEAR REGULATOR

AZ39150

Mechanical Dimensions (Continued)

TO-252-2(4)

Unit: mm(inch)





BCD Semiconductor Manufacturing Limited

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