■ General Description

The AME8815 family of linear regulators feature low quiescent current (45μA typ.) with low dropout voltage, making them ideal for battery applications. It is available in D^2PAK and TO-220 packages. The space-efficient SOT-223 and DPAK package are attractive for "Pocket" and "Hand Held" applications.

Output voltages are set at the factory and trimmed to 1.5% accuracy.

These rugged devices have both Thermal Shutdown, and Current Fold-back to prevent device failure under the "Worst" of operating conditions.

The AME8815 is stable with an output capacitance of 4.7μF or greater.

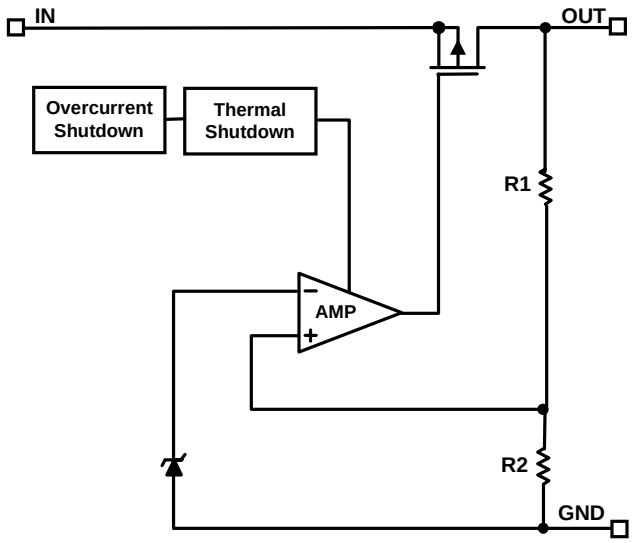
■ Features

- Very Low Dropout Voltage
- Guaranteed 1.5A Output
- Accurate to within 1.5%
- 45μA Quiescent Current Typically
- Over-Temperature Shutdown
- Current Limiting
- Short Circuit Current Fold-back
- Space-Saving DPAK and SOT223, TO-220 Package
- Low Temperature Coefficient

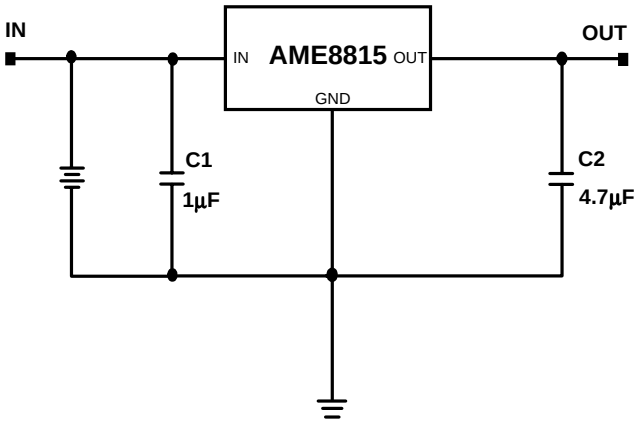
■ Applications

- Instrumentation
- Portable Electronics
- Wireless Devices
- PC Peripherals
- Battery Powered Widgets

■ Functional Block Diagram

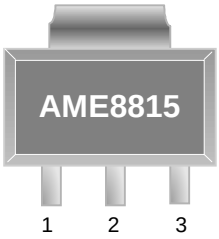


■ Typical Application



■ Pin Configuration

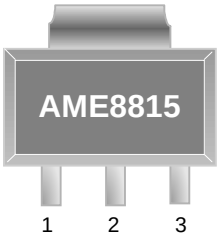
SOT-223
Top View



AME 8815AEGTxxx

1. V_{IN}
2. GND (heat sink)
3. V_{OUT}

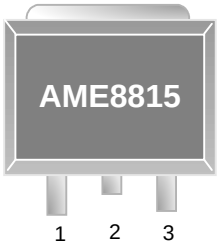
SOT-223
Top View



AME 8815BEGTxxx

1. GND
2. V_{OUT} (heat sink)
3. V_{IN}

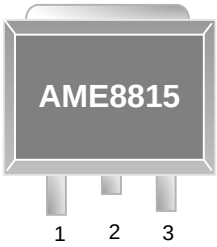
TO-252(DPAK-2)
Top View



AME 8815AECSxxx

1. V_{IN}
2. GND (heat sink)
3. V_{OUT}

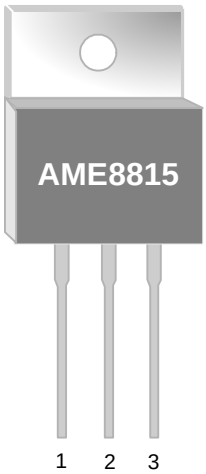
TO-252(DPAK-2)
Top View



AME 8815BECSxxx

1. GND
2. V_{OUT} (heat sink)
3. V_{IN}

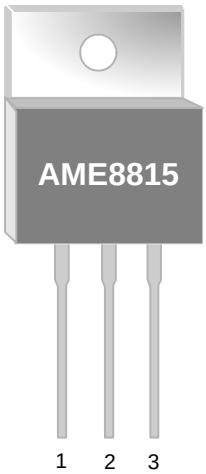
TO-220
Top View



AME 8815AEBTxxx

1. V_{IN}
2. GND (heat sink)
3. V_{OUT}

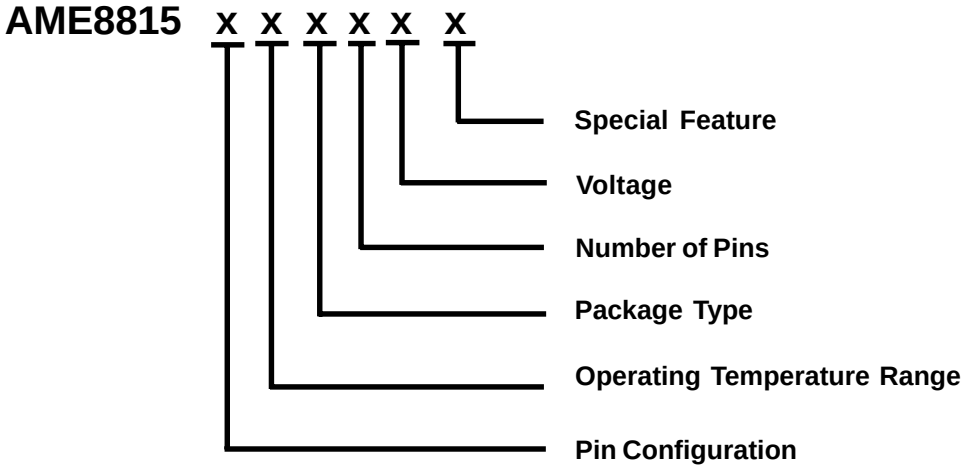
TO-220
Top View



AME 8815BEBTxxx

1. GND
2. V_{OUT} (heat sink)
3. V_{IN}

■ Ordering Information



Pin Configuration	Operating Temperature Range	Package Type	Number of Pins	Voltage	Special Feature
A: 1. VIN 2. GND 3. VOUT B: 1. GND 2. VOUT 3. VIN	E: -40°C to 85°C	B: TO-220 C: TO-252 (D PACK) D: TO-263 G: SOT223	S: 2 T: 3	150: V=1.5V 180: V=1.8V 250: V=2.5V 330: V=3.3V 475: V=4.75V 500: V=5.0V	Z: Lead Free

■ Ordering Information (contd.)

Part Number	Marking	Output Voltage	Package	Operating Temp. Range
AME8815AEBT150	AME8815 AEBT150 yyww	1.50	TO-220	- 40°C to + 85°C
AME8815AEBT180	AME8815 AEBT180 yyww	1.80	TO-220	- 40°C to + 85°C
AME8815AEBT250	AME8815 AEBT250 yyww	2.50	TO-220	- 40°C to + 85°C
AME8815AEBT330	AME8815 AEBT330 yyww	3.30	TO-220	- 40°C to + 85°C
AME8815AEBT475	AME8815 AEBT475 yyww	4.75	TO-220	- 40°C to + 85°C
AME8815AEBT500	AME8815 AEBT500 yyww	5.00	TO-220	- 40°C to + 85°C
AME8815AECS150	AME8815 AECS150 yyww	1.50	TO-252	- 40°C to + 85°C
AME8815AECS180	AME8815 AECS180 yyww	1.80	TO-252	- 40°C to + 85°C
AME8815AECS250	AME8815 AECS250 yyww	2.50	TO-252	- 40°C to + 85°C
AME8815AECS330	AME8815 AECS330 yyww	3.30	TO-252	- 40°C to + 85°C
AME8815AECS475	AME8815 AECS475 yyww	4.75	TO-252	- 40°C to + 85°C
AME8815AECS500	AME8815 AECS500 yyww	5.00	TO-252	- 40°C to + 85°C

■ Ordering Information (contd.)

Part Number	Marking	Output Voltage	Package	Operating Temp. Range
AME8815AEDS150	AME8815 AEDS150 yyww	1.50	TO-263	- 40°C to + 85°C
AME8815AEDS180	AME8815 AEDS180 yyww	1.80	TO-263	- 40°C to + 85°C
AME8815AEDS250	AME8815 AEDS250 yyww	2.50	TO-263	- 40°C to + 85°C
AME8815AEDS330	AME8815 AEDS330 yyww	3.30	TO-263	- 40°C to + 85°C
AME8815AEDS475	AME8815 AEDS475 yyww	4.75	TO-263	- 40°C to + 85°C
AME8815AEDS500	AME8815 AEDS500 yyww	5.00	TO-263	- 40°C to + 85°C
AME8815AEGT150	ASPyww	1.50	SOT-223	- 40°C to + 85°C
AME8815AEGT150Z	ASPyww	1.50	SOT-223	- 40°C to + 85°C
AME8815AEGT180	AQUyww	1.80	SOT-223	- 40°C to + 85°C
AME8815AEGT180Z	AQUyww	1.80	SOT-223	- 40°C to + 85°C
AME8815AEGT250	APRyww	2.50	SOT-223	- 40°C to + 85°C
AME8815AEGT250Z	APRyww	2.50	SOT-223	- 40°C to + 85°C
AME8815AEGT330	AKCyww	3.30	SOT-223	- 40°C to + 85°C
AME8815AEGT330Z	AKCyww	3.30	SOT-223	- 40°C to + 85°C
AME8815AEGT475	AQRyww	4.75	SOT-223	- 40°C to + 85°C
AME8815AEGT500	AQSyww	5.00	SOT-223	- 40°C to + 85°C

■ Ordering Information (contd.)

Part Number	Marking	Output Voltage	Package	Operating Temp. Range
AME8815BEBT150	AME8815 BEBT150 yyww	1.50	TO-220	- 40°C to + 85°C
AME8815BEBT180	AME8815 BEBT180 yyww	1.80	TO-220	- 40°C to + 85°C
AME8815BEBT250	AME8815 BEBT250 yyww	2.50	TO-220	- 40°C to + 85°C
AME8815BEBT330	AME8815 BEBT330 yyww	3.30	TO-220	- 40°C to + 85°C
AME8815BEBT475	AME8815 BEBT475 yyww	4.75	TO-220	- 40°C to + 85°C
AME8815BEBT500	AME8815 BEBT500 yyww	5.00	TO-220	- 40°C to + 85°C
AME8815BECS150	AME8815 BECS150 yyww	1.50	TO-252	- 40°C to + 85°C
AME8815BECS180	AME8815 BECS180 yyww	1.80	TO-252	- 40°C to + 85°C
AME8815BECS250	AME8815 BECS250 yyww	2.50	TO-252	- 40°C to + 85°C
AME8815BECS330	AME8815 BECS330 yyww	3.30	TO-252	- 40°C to + 85°C
AME8815BECS475	AME8815 BECS475 yyww	4.75	TO-252	- 40°C to + 85°C
AME8815BECS500	AME8815 BECS500 yyww	5.00	TO-252	- 40°C to + 85°C

■ Ordering Information (contd.)

Part Number	Marking	Output Voltage	Package	Operating Temp. Range
AME8815BEDS150	AME8815 BEDS150 yyww	1.50	TO-263	- 40°C to + 85°C
AME8815BEDS180	AME8815 BEDS180 yyww	1.80	TO-263	- 40°C to + 85°C
AME8815BEDS250	AME8815 BEDS250 yyww	2.50	TO-263	- 40°C to + 85°C
AME8815BEDS330	AME8815 BEDS330 yyww	3.30	TO-263	- 40°C to + 85°C
AME8815BEDS475	AME8815 BEDS475 yyww	4.75	TO-263	- 40°C to + 85°C
AME8815BEDS500	AME8815 BEDS500 yyww	5.00	TO-263	- 40°C to + 85°C
AME8815BEGT150	AJYyww	1.50	SOT-223	- 40°C to + 85°C
AME8815BEGT150Z	AJYyww	1.50	SOT-223	- 40°C to + 85°C
AME8815BEGT180	AJZyww	1.80	SOT-223	- 40°C to + 85°C
AME8815BEGT180Z	AJZyww	1.80	SOT-223	- 40°C to + 85°C
AME8815BEGT250	AKByww	2.50	SOT-223	- 40°C to + 85°C
AME8815BEGT250Z	AKByww	2.50	SOT-223	- 40°C to + 85°C
AME8815BEGT330	AKDyww	3.30	SOT-223	- 40°C to + 85°C
AME8815BEGT330Z	AKDyww	3.30	SOT-223	- 40°C to + 85°C
AME8815BEGT475	AMNyww	4.75	SOT-223	- 40°C to + 85°C
AME8815BEGT500	AQTyww	5.00	SOT-223	- 40°C to + 85°C

Please consult AME sales office or authorized Rep./Distributor for other output voltage and package type availability.

■ Absolute Maximum Ratings

Parameter	Maximum	Unit
Input Voltage	8	V
Output Current	P_D / (V_{IN} - V_O)	mA
Output Voltage	GND - 0.3 to V_{DD} + 0.3	V
ESD Classification	B	

Caution: Stress above the listed absolute maximum rating may cause permanent damage to the device

■ Recommended Operating Conditions

Parameter	Rating	Unit
Ambient Temperature Range	- 40 to + 85	^oC
Junction Temperature	- 40 to + 125	^oC

■ Thermal Information

Parameter		Maximum		Unit
Thermal Resistance (θ_{ja})	SOT-223	160		^oC / W
	TO-252 (DPAK)	90		
	TO-263 (D^2PAK)	60		
	TO-220	50		
Thermal Resistance (θ_{jc})	SOT-223	Conductive	7	^oC / W
		Non-Conductive	31	
	TO-252 (DPAK)	Conductive	7	
		Non-Conductive	30	
	TO-263 (D^2PAK)	Conductive	7	
		Non-Conductive	27	
	TO-220	Conductive	7	
		Non-Conductive	24	
Internal Power Dissipation (P_D) ($\Delta T = 100^oC$)	SOT-223	625		mW
	TO-252 (DPAK)	1200		
	TO-263 (D^2PAK)	2800		
	TO-220	3000		
Maximum Junction Temperature		150		^oC
Maximum Lead Temperature (10 Sec)		300		^oC

Note1:Conductive and Non-Conductive are die attach epoxy characteristics

■ Electrical Specifications

V_{IN} = $V_{O(Nom)}$ +2V, TA = 25°C unless otherwise noted

Parameter	Symbol	Test Condition		Min	Typ	Max	Units
Input Voltage	V_{IN}			Note 1		7	V
Output Voltage Accuracy	V_O	I_O=1mA		-1.5		1.5	%
Dropout Voltage	$V_{DROPOUT}$	I_O=1.5A V_O=$V_{O(NOM)}$ -2.0%	1.4V<$V_{O(NOM)}$<=2.0V		See chart	1300	mV
			2.0V<$V_{O(NOM)}$<=2.8V			800	
			2.8V<$V_{O(NOM)}$			600	
Output Current	I_O	V_O>1.2V		1500			mA
Current Limit	I_{LIM}	V_O>1.2V		1500	2000		mA
Short Circuit Current	I_{SC}	V_{IN}= $V_{O(NOM)}$+1V, V_O<0.4V			750		mA
Quiescent Current	I_Q	I_O=0mA			45	70	μA
Ground Pin Current	I_{GND}	I_O=1mA to 1500mA			45		μA
Line Regulation	REG_{LINE}	I_O=1mA V_{IN}=V_O+1 to V_O+2	V_O < 2.0V	-0.15		0.15	%
			4.0V > V_O >= 2.0V	-0.1	0.02	0.1	%
			4.0V <= V_O	-0.4		0.4	%
Load Regulation	REG_{LOAD}	I_O=1mA to 1500mA		-1	0.2	1	%
Over Temperature Shutdown	OTS				150		°C
Over Temperature Hysterisis	OTH				30		°C
V_O Temperature Coefficient	TC				30		ppm/°C
Power Supply Rejection	PSRR	I_O=100mA C_O=4.7μF	f=1kHz		50		dB
			f=10kHz		20		
			f=100kHz		15		
Output Voltage Noise	eN	f=10Hz to 100kHz I_O=10mA	Co=4.7μF		30		μVrms

Note1:$V_{IN(min)}$=V_{OUT}+$V_{DROPOUT}$

■ Detailed Description

The AME8815 family of CMOS regulators contain a PMOS pass transistor, voltage reference, error amplifier, over-current protection, and thermal shutdown.

The P-channel pass transistor receives data from the error amplifier, over-current shutdown, and thermal protection circuits. During normal operation, the error amplifier compares the output voltage to a precision reference. Over-current and Thermal shutdown circuits become active when the junction temperature exceeds 150^{o}C, or the current exceeds 2.2A. During thermal shutdown, the output voltage remains low. Normal operation is restored when the junction temperature drops below 120^{o}C.

The AME8815 behaves like a current source when the load reaches 2.2A. However, if the load impedance drops below 0.3 ohms, the current drops back to 600mA to prevent excessive power dissipation. Normal operation is restored when the load resistance exceeds 0.75 ohms.

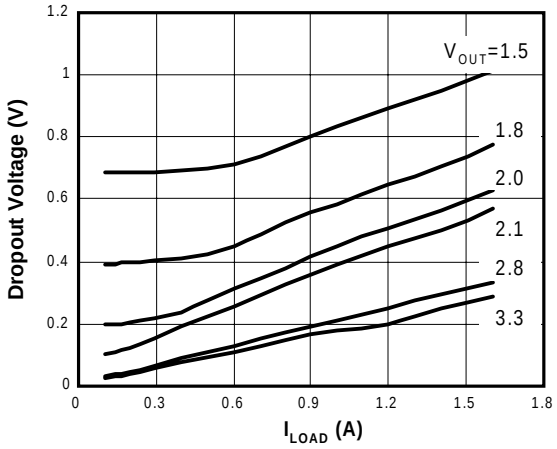
■ External Capacitors

The AME8815 is stable with an output capacitor to ground of 4.7µF or greater. Ceramic capacitors have the lowest ESR, and will offer the best AC performance. Conversely, Aluminum Electrolytic capacitors exhibit the highest ESR, resulting in the poorest AC response. Unfortunately, large value ceramic capacitors are comparatively expensive. One option is to parallel a 0.1µF ceramic capacitor with a 10µF Aluminum Electrolytic. The benefit is low ESR, high capacitance, and low overall cost.

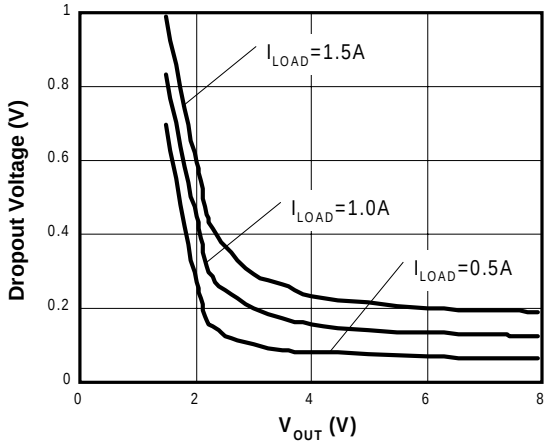
A second capacitor is recommended between the input and ground to stabilize Vin. The input capacitor should be at least 0.1µF to have a beneficial effect.

All capacitors should be placed in close proximity to the pins. A "Quiet" ground termination is desirable. This can be achieved with a "Star" connection.

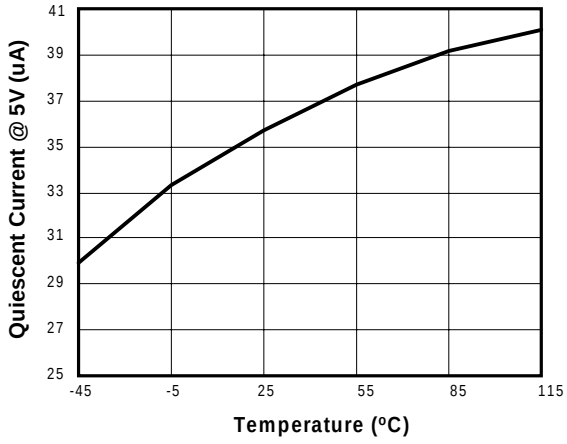
Dropout Voltage vs. I_{LOAD}



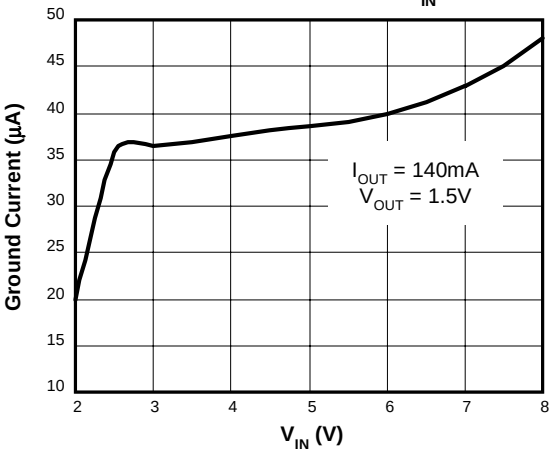
Dropout Voltage vs. V_{OUT}



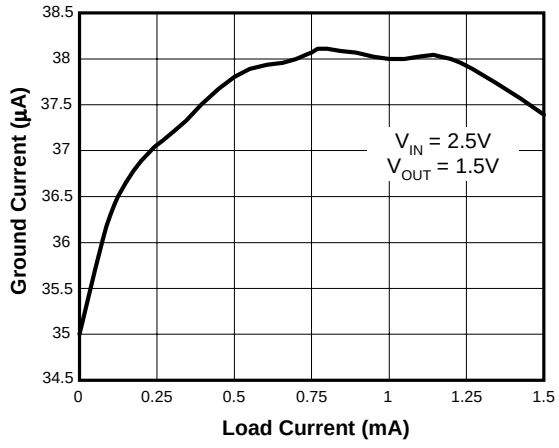
Quiescent Current vs. Temperature



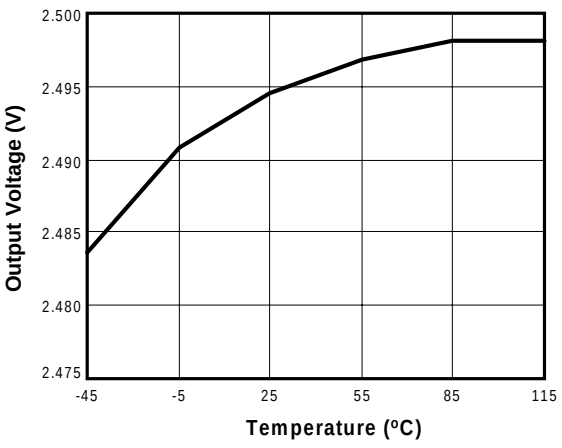
Ground Current vs. V_{IN}



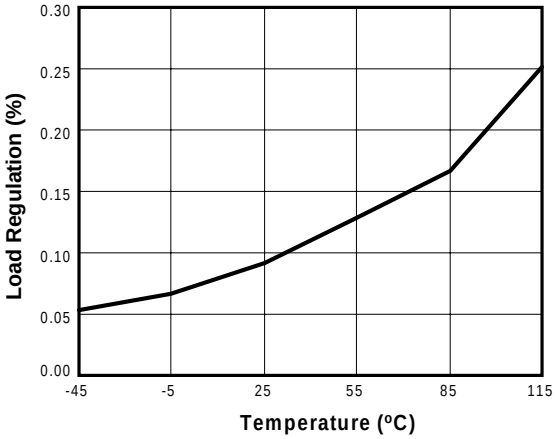
Ground Current vs. Load Current



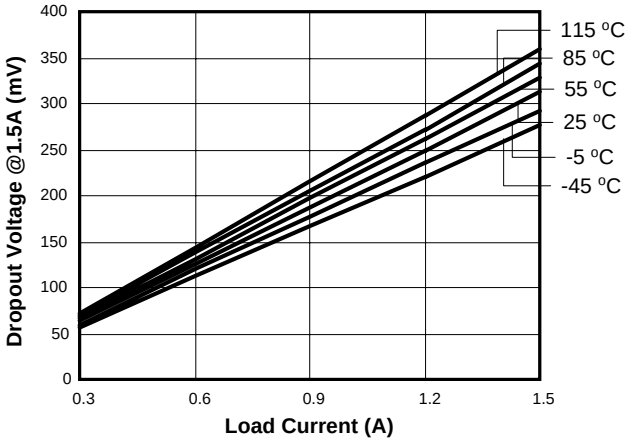
V_{OUT} vs. Temperature(2.5V)



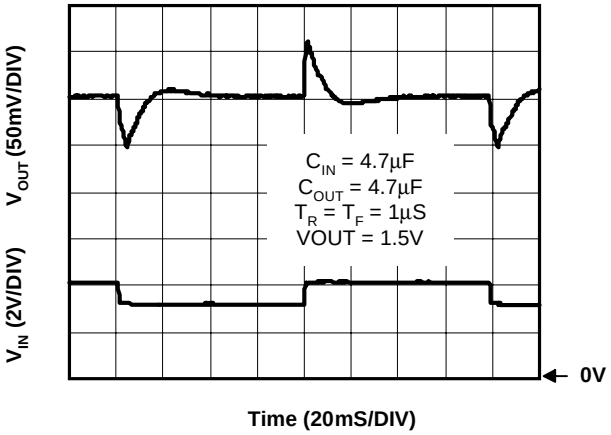
Load Regulation vs. Temperature



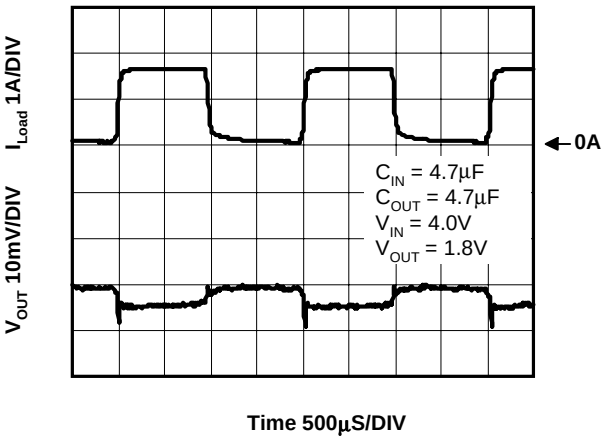
Dropout Voltage vs. Load Current(2.5V)



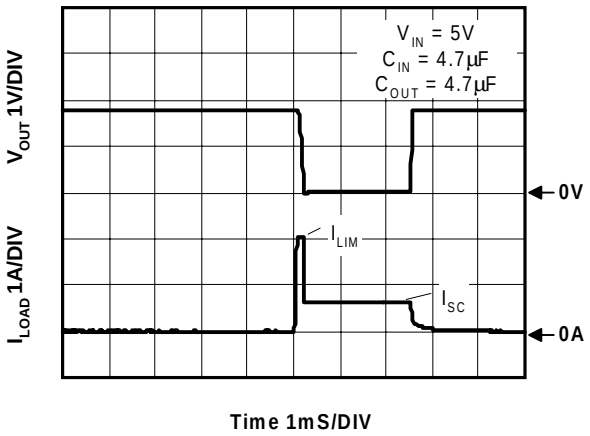
Line Transient Response



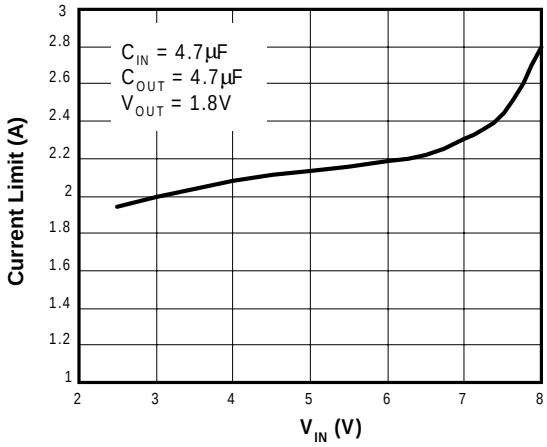
Load Step 40mA to 1.5A



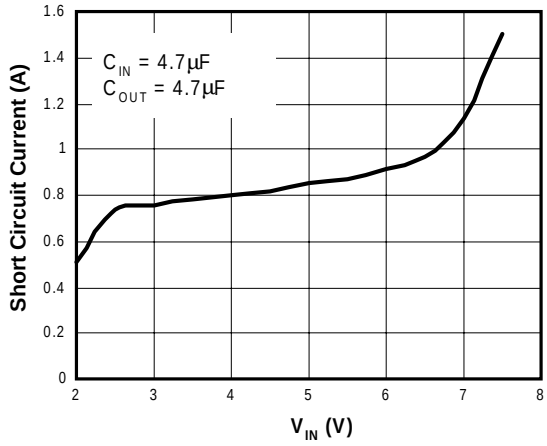
Current Limit Response



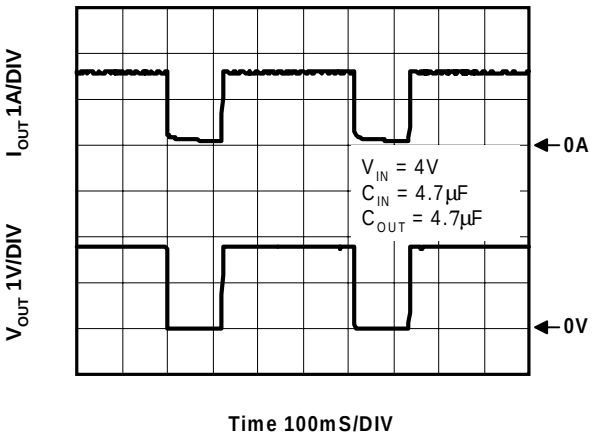
Current Limit vs. V_{IN}



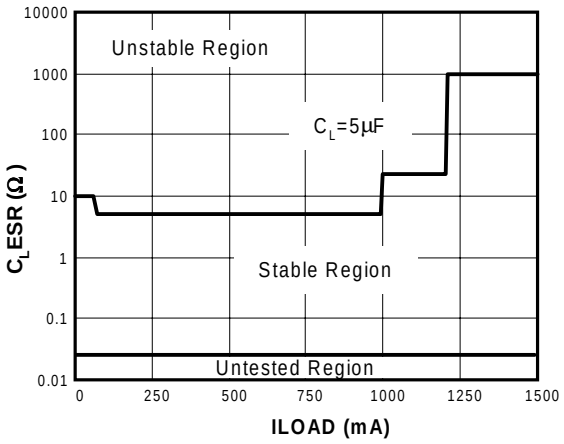
Short Circuit Current vs. V_{IN}



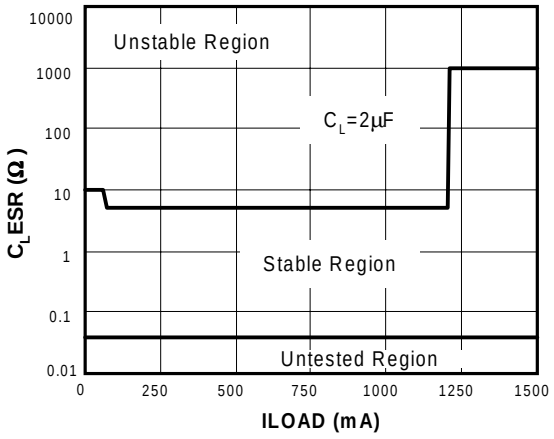
Overtemperature Shutdown



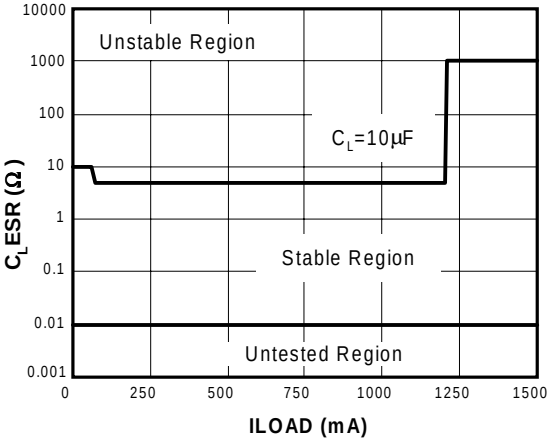
Stability vs. ESR vs. I_{Load}



Stability vs. ESR vs. I_{Load}

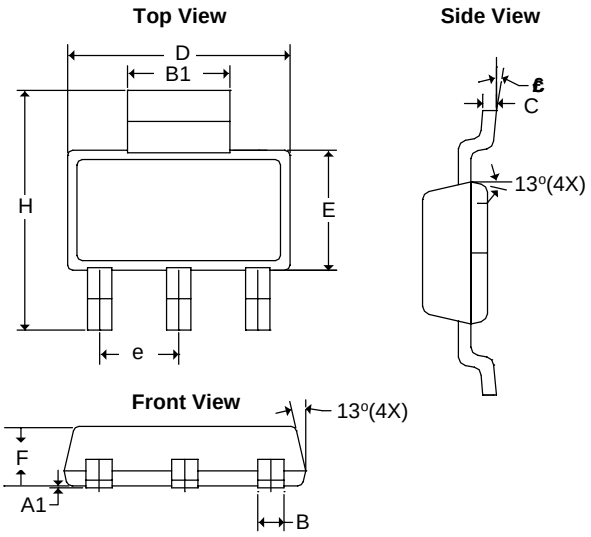


Stability vs. ESR vs. I_{Load}



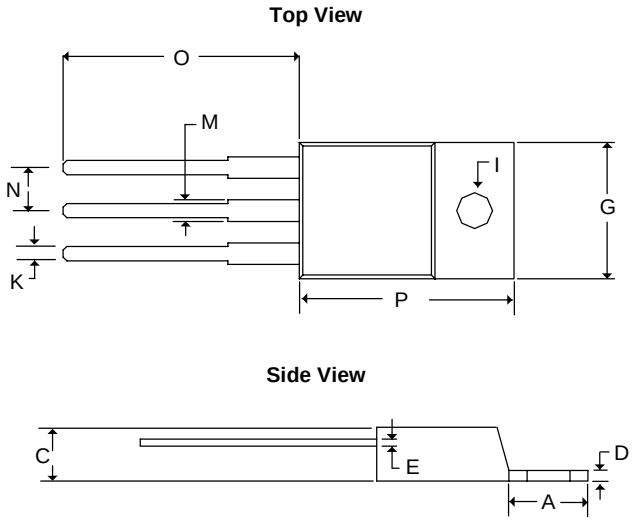
■ Package Dimension

SOT-223



SYMBOLS	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A_1	0.02	0.10	0.0008	0.0039
B	0.60	0.84	0.0236	0.0330
B_1	2.90	3.15	0.1140	0.1240
C	0.24	0.38	0.0094	0.0150
D	6.30	6.71	0.2480	0.2640
E	3.30	3.71	0.1299	0.1460
e	2.30 BSC		0.0906 BSC	
H	6.70	7.30	0.2638	0.2874
θ	0°	10°	0°	10°
F	1.40	1.80	0.0560	0.0702

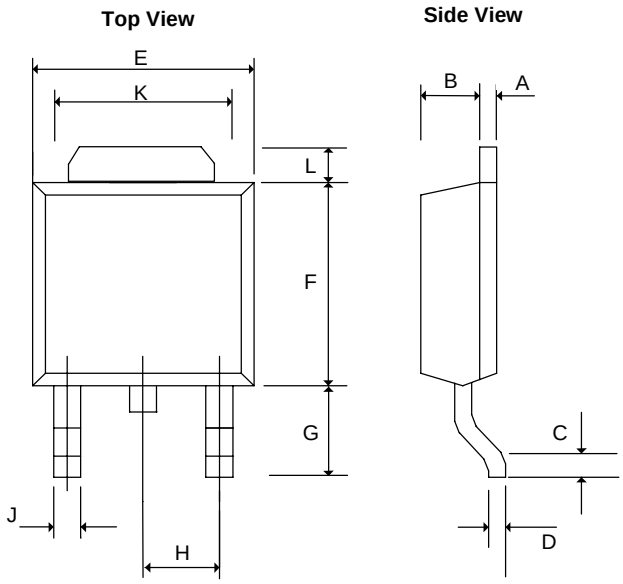
TO-220



SYMBOLS	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	5.58	7.49	0.2197	0.2949
C	3.55	4.83	0.1398	0.1900
D	0.50	1.40	0.0197	0.0550
E	0.30	1.15	0.0118	0.0453
G	9.65	10.67	0.3799	0.4200
I	3.53	4.09	0.1390	0.1610
K	0.50	1.15	0.0197	0.0453
M	1.14	1.78	0.0449	0.0700
N	2.28	2.80	0.0898	0.1102
O	12.70	14.74	0.5000	0.5803
P	14.22	16.51	0.5600	0.6500

■ Package Dimension

TO-252(DPAK)-EIAJ



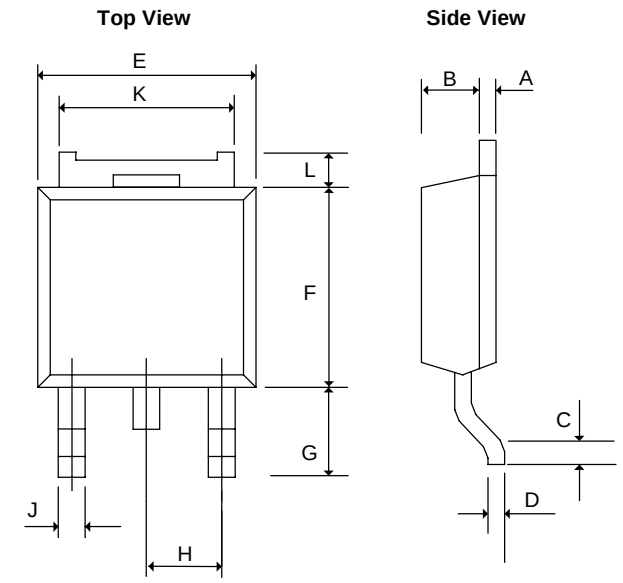
SYMBOLS	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	0.45	0.58	0.0177	0.0230
B	1.60	1.95	0.0630	0.0768
C	0.51	1.50	0.0201	0.0591
D	0.45	0.60	0.0177	0.0236
E	6.40	6.80	0.2520	0.2677
F	5.40	7.20	0.2126	0.2835
G	2.20	2.85	0.0866	0.1122
H	-	* 2.30	-	* 0.0906
J	-	0.97	-	0.0380
K	5.20	5.50	0.2047	0.2165
L	1.40REF		0.055REF	

***: Typical Value**

Notes:

1. Controlling dimension: Millimeters.
2. Maximum lead thickness includes lead finish thickness Minimum lead thickness is the minimum thickness of base material.

TO-252(DPAK)-JEDC



SYMBOLS	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	0.49	0.51	0.0192	0.0201
B	1.79	1.81	0.0704	0.0713
C	0.55	-	0.0216	-
D	0.49	0.51	0.0192	0.0201
E	6.58	6.62	0.259	0.2606
F	6.08	6.12	0.2393	0.2409
G	2.68	2.72	0.1055	0.1071
H	* 2.30REF		* 0.0906REF	
J	0.96		0.0377	
K	5.31	5.37	0.2090	0.2114
L	0.68	0.72	0.0267	0.0283

***: Typical Value**

Notes:

1. Controlling dimension: Millimeters.
2. Maximum lead thickness includes lead finish thickness Minimum lead thickness is the minimum thickness of base material.

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