AS2715

1.5A High Current Low Dropout Voltage Regulator Adjustable & Fixed Output, Fast Response

(ADVANCED INFORMATION)

FEATURES

- Adjustable Output Down To 1.2V
- 1% output accuracy @ 2.5V, 3.3V& 5.0V
- Output Current of 1.5A
- Low Dropout Voltage of 350mV @ 1.5A
- Extremely Tight Load And Line Regulation
- Extremely Fast Transient Response
- Reverse-battery and "Load Dump" Protection
- Standard 3-Terminal Low Cost TO-220, TO-263

APPLICATIONS

- Powering VGA & Sound Card
- LCD Monitors
- USB Power Supply
- Power PC™ Supplies
- SMPS Post-Regulator
- High Efficiency "Green" Computer Systems
- High Efficiency Linear Power Supplies
- Portable Instrumentation
- Constant Current Regulators
- Adjustable Power Supplies
- Battery Charger

PRODUCT DESCRIPTION

The AS2715 is a 1.5A high accuracy, low dropout voltage regulator with only 350mV(Typ.)@ 1.5A). The AS2715 is designed for low voltage application that requires lower dropout voltage and faster transient response. This device is an excellent choice for use in powering low voltage microprocessor that require a lower dropout, faster transient response to regulate from +2.5V to 3.8V supplies and as a post regulator for switching supplies applications.

The AS2715 offers full protection against over-current faults, reversed input polarity, reversed load insertion, and positive and negative transient voltage. On-Chip trimming adjusts the reference voltage to 1%. Features such as Enable pin, Error Flag pin are also included in the 5 pin packages.

The AS2715 is offered in a 3 & 5-pin TO-220 & TO-263 package compatible with other 3 terminal regulators. For a 3A low dropout regulator refer to the AS2730 data sheet.

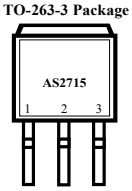
ORDERING INFORMATION

TO-220 3-PIN	TO-263 3-PIN
AS2715U-X	AS2715T-X

X = Output Voltage (2.5V, 3.3V, 5.0V or Blank for Adjustable.)
Consult with factory for other fixed output voltages.

PIN CONNECTIONS

TO-263-3 Package



V_{IN} GND V_{OUT}
Front View

TO-220-3 Package

V_{IN} GND V_{OUT}
Front View

ABSOLUTE MAXIMUM RATINGS

Lead Temperature (soldering, 5 seconds)……260°C
Storage Temperature Range……-65°C +150°C
Operating Junction Temperature Range……..-40°C +125°C
Input Voltage)……..260°C
Input Supply Voltage (Note 1) (Survival)……-20V to +60V

ELECTRICAL CHARACTERISTICS

at I_{OUT} = 10mA, T_A = 25°C, unless otherwise specified. The Boldface applies over the junction temperature range.

PARAMETER	CONDITIONS	Typ	AS2715 Min	AS2715 Max	Units
2.5V Version					
Output Voltage	I_{OUT} = 10mA 10mA ≤I_{OUT}≤1.5A, 4.3V≤V_{IN}≤16V	2.5 **2.5**	2.475 **2.450**	2.525 **2.550**	V
3.3V Version2.					
Output Voltage	I_{OUT} = 10mA 10mA ≤I_{OUT}≤1.5A, 4.3V≤V_{IN}≤16V	3.3 **3.3**	3.267 **3.234**	3.330 **3.366**	V
5.0V Version					
Output Voltage	I_{OUT} = 10mA 10mA ≤I_{OUT}≤1.5A, 5.5V≤V_{IN}≤16V	5.0 **5.0**	4.95 **4.90**	5.05 **5.10**	V
All Voltage Options					
Line Regulation	I_O = 10mA, (V_{OUT} + 1V) ≤ V_{IN}≤ 16V	0.1		0.5	%
Load Regulation	V_{IN} = V_{OUT} + 5V, 10mA ≤ I_{OUT}≤ $I_{FULLLOAD}$	0.2		1	%
$\frac{\Delta V}{\Delta T}$	Output Voltage Temperature Coef.	**50**		**100**	ppm/°C
Dropout Voltage (Note 1)	I_O = 100mA	90		**200**	mV
	I_O = 750mA	280			
	I_O = 1.5A	490		**690**	
Ground Current (Note 3)	I_O = 750mA, V_{IN} = V_{OUT}, +1V I_O = 1.5A	12 25		**25**	mA
I_{GNDDO} Ground Pin Current at Dropout	V_{IN} = 0.1V less than specified V_{OUT} I_{OUT} = 10mA	0.9			mA
Current Limit	V_{OUT} = 0V (Note 2)	2.2	1.7		A
Output Noise Voltage (10Hz to 100kHz) I_L = 100mA	C_L = 10µF C_L = 33µF	400 260			μV_{RMS}
Reference Voltage		1.240	1.228 **1.215**	1.252 **1.265**	V
Adjust Pin Bias Current		40		80 **120**	nA
Reference Voltage Temperature Coefficient	(Note 4)	50			ppm/°C
Adjust Pin Bias Current Temperature Coefficient		0.1			nA/°C

Upper Threshold Voltage	Device set for 3.3V (Note 5)	60	40 **25**		mV
Lower Threshold Voltage	Device set for 3.3V (Note 5)	75		95 **140**	mV
Hysteresis	Device set for 3.3V (Note 5)	15			mV

NOTES:

Note 1: Dropout voltage is defined as the input-to output differential when the output voltage drops to 95% of its nominal value.

Note 2: $V_{IN} = V_{OUT\ (NOMINAL)} + 1V$. For example, use V_{IN}= 4.3V for a 3.3V regulator. Employ pulse-testing procedures to minimize temperature rise.

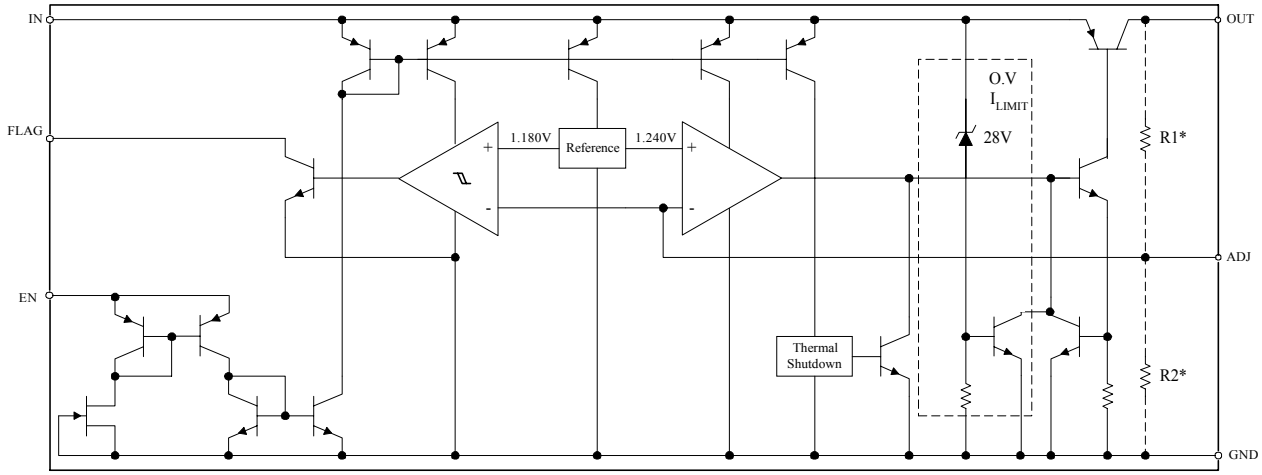
Note 3: Ground pin current is the regulator quiescent current. The total current drawn from the source is the sum of the load current to the ground current.

Note 4: Thermal regulation is defined as the change in the output voltage at a time T after a change in power dissipation is applied, excluding load or line regulation effects.

Note 5: Comparator threshold is expressed in terms of a voltage differential at the Adjust terminal below the nominal reference voltage measured 6V input. To express these thresholds in terms of output voltage change, multiply the error amplifier gain = V_{OUT}/V_{REF} = (R1 + R2)/R2. For example, at a programmable output voltage of 5V, the Error output is guaranteed to go low when the output drops by 95mVx 5V/ 1.240V = 38mV. Threshold remain constant as a percent of V_{OUT} as V_{OUT} is varied, with the dropout warning occurring at typically 5% below nominal, 7.7% guaranteed.

Note 6: $V_{EN} \leq 0.8V$ and $V_{IN} \leq 16V$, $V_{OUT} = 0$.

BLOCK DIAGRAM



APPLICATION HINTS

The AS2715 incorporates protection against over-current faults, reversed load insertion, over temperature operation, and positive and negative transient voltage. However, the use of an output capacitor is required in order to insure the stability and the performances.

Thermal Consideration

Although the AS2715 offers limiting circuitry for overload conditions, it is necessary not to exceed the maximum junction temperature, and therefore to be careful about thermal resistance. The heat flow will follow the lowest resistance path, which is the Junction-to-case thermal resistance. In order to insure the best thermal flow of the component, a proper mounting is required. Note that the case of the device is electrically connected to the output. The
case has to be electrically isolated, a thermally conductive spacer can be used. However do not forget to consider its contribution to thermal resistance.

Assuming:
V_{IN} = 10V, V_{OUT} = 5V, I_{OUT} = 1.5A, T_A = 50°C/W,
$\theta_{Heatsink\ Case}$= 6°C/W, $\theta_{Heatsink\ Case}$ = 0.5°C/W, θ_{JC} = 3°C/W

Power dissipation under this condition
$P_D = (V_{IN} - V_{OUT}) * I_{OUT}$ = 7.5W

Junction Temperature
$T_J = T_A + P_D * (\theta_{Case-HS} + \theta_{HS}\theta_{JC})$

For the Control Section
T_J = 50 + 7.5*(0.5 + 6=3) = 121.25°C
121.25°C < $T_{J\ (max)}$ for the Control & Power Sections.

In both case reliable operation is insured by adequate junction temperature.

Capacitor Requirements

The output capacitor is needed for stability and to minimize the output noise. The required value of the capacitor varies with the load. However, a minimum value of 10µF Aluminum will guarantee stability over load. A tantalum capacitor is recommended for a fast load transient response.

If the power source has high AC impedance, a 0.1µF capacitor between input & ground is recommended. This capacitor should have good characteristics up to 250 kHz.

Minimum Load Current

To ensure a proper behavior of the regulator at light load, a minimum load of 5mA for AS2715 is required.

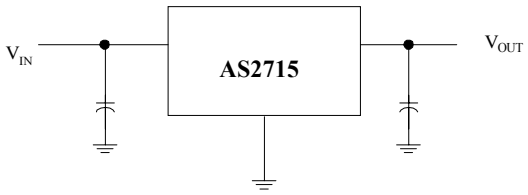
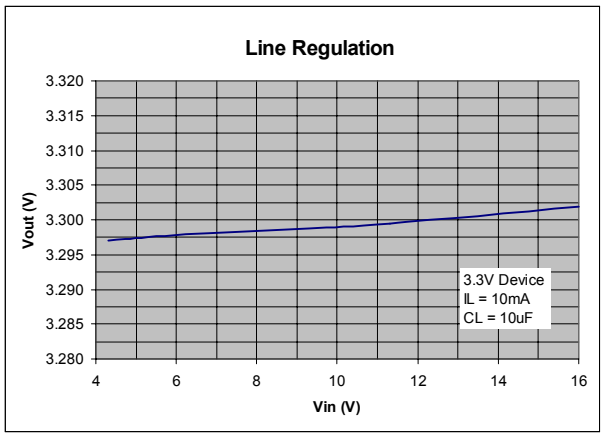
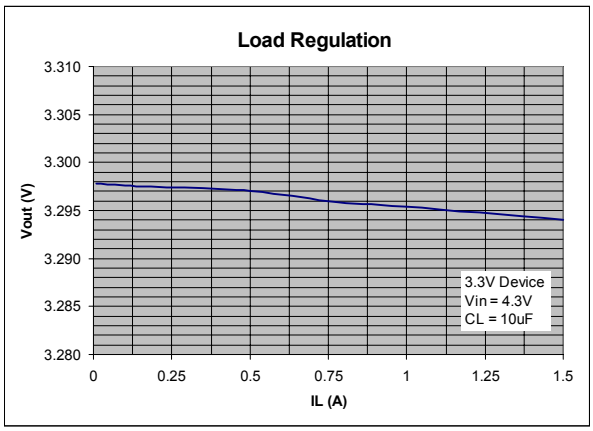
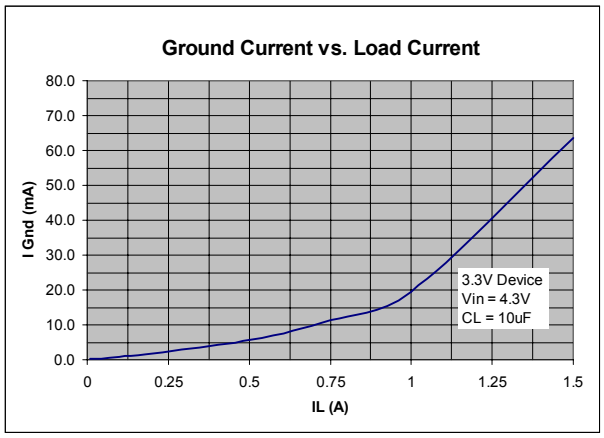
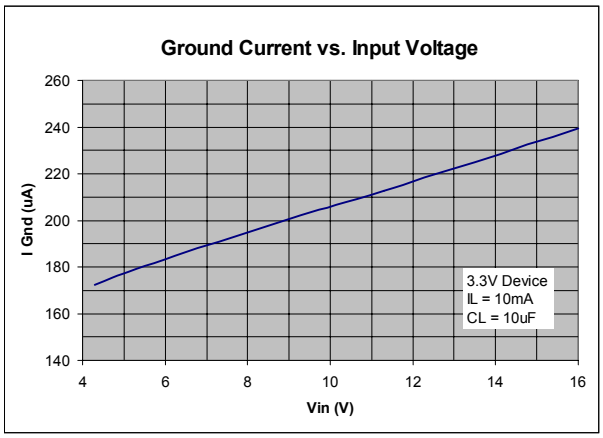


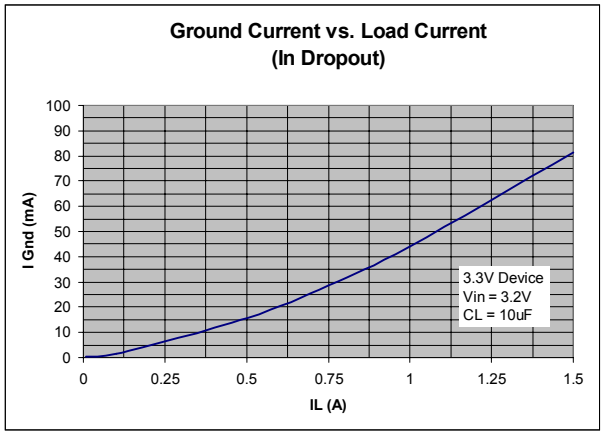
Fig.1 Basic Fixed Output Regulator

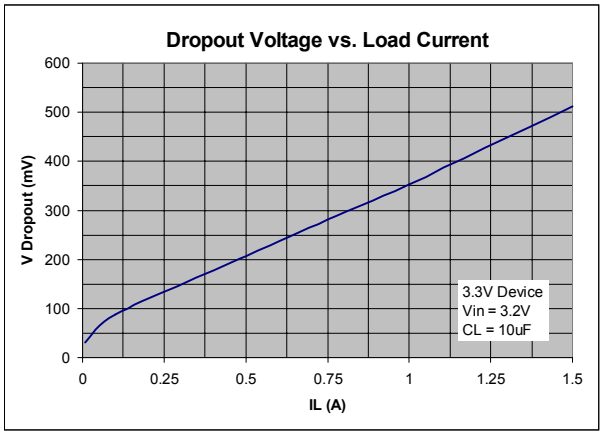

Line Regulation
Vout (V)
3.320
3.315
3.310
3.305
3.300
3.295
3.290
3.285
3.280
4
6
8
10
12
14
16
Vin (V)
3.3V Device
IL = 10mA
CL = 10uF

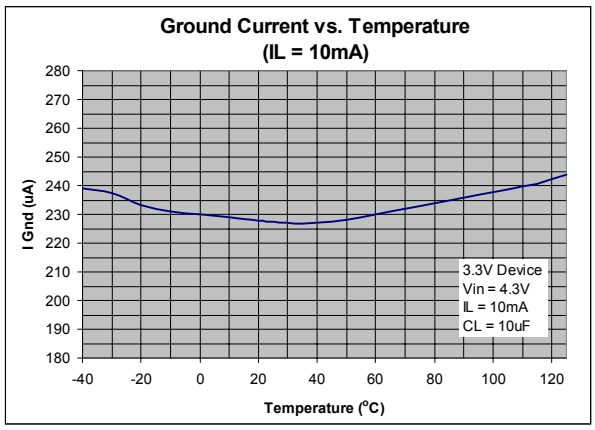

Load Regulation
Vout (V)
3.310
3.305
3.300
3.295
3.290
3.285
3.280
0
0.25
0.5
0.75
1
1.25
1.5
IL (A)
3.3V Device
Vin = 4.3V
CL = 10uF

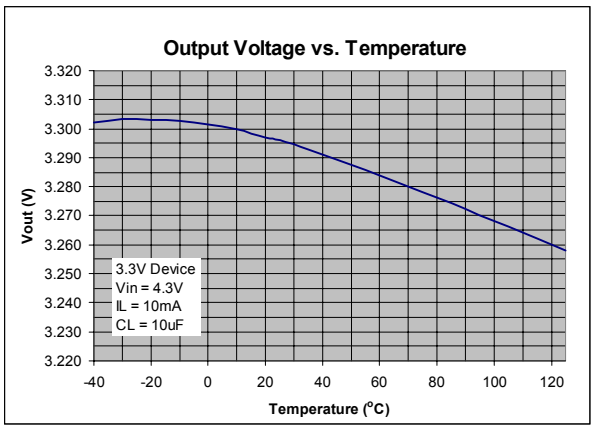

Ground Current vs. Load Current
I Gnd (mA)
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
0
0.25
0.5
0.75
1
1.25
1.5
IL (A)
3.3V Device
Vin = 4.3V
CL = 10uF

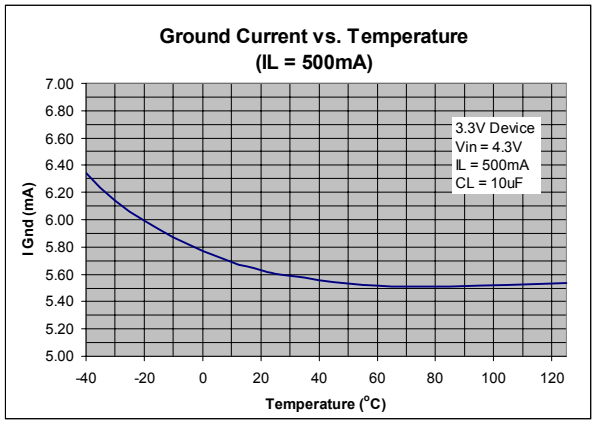

Ground Current vs. Input Voltage
I Gnd (uA)
260
240
220
200
180
160
140
4
6
8
10
12
14
16
Vin (V)
3.3V Device
IL = 10mA
CL = 10uF

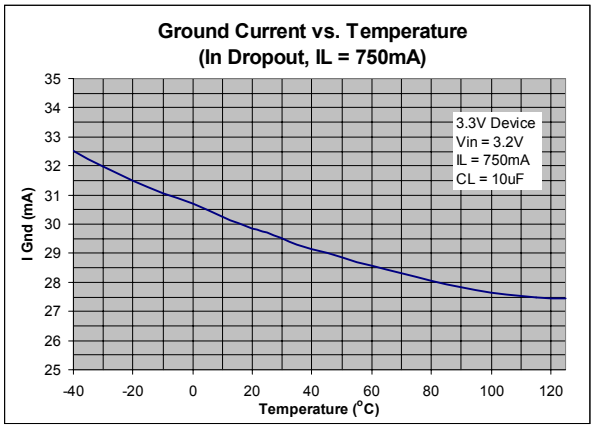

Ground Current vs. Load Current
(In Dropout)
I Gnd (mA)
100
90
80
70
60
50
40
30
20
10
0
0
0.25
0.5
0.75
1
1.25
1.5
IL (A)
3.3V Device
Vin = 3.2V
CL = 10uF

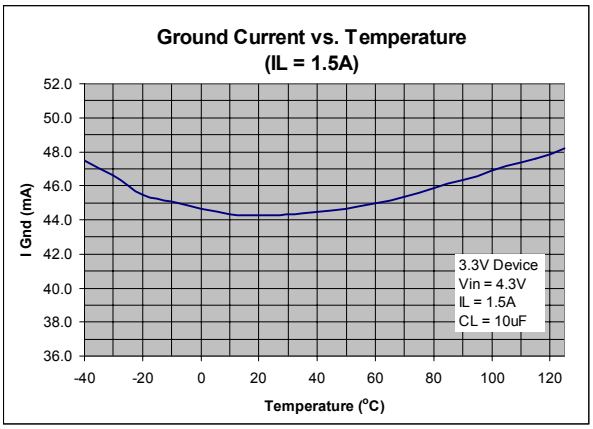

Dropout Voltage vs. Load Current
V Dropout (mV)
600
500
400
300
200
100
0
0
0.25
0.5
0.75
1
1.25
1.5
IL (A)
3.3V Device
Vin = 3.2V
CL = 10uF

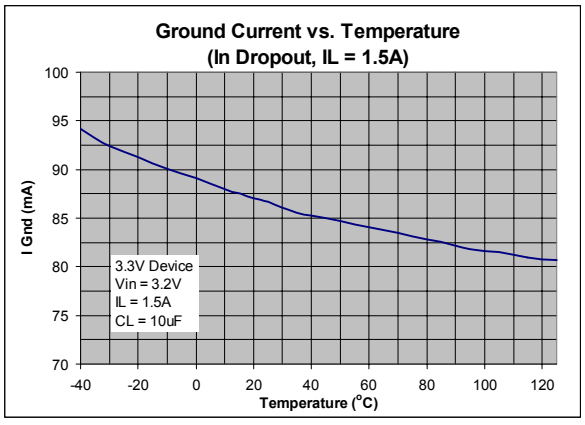

Ground Current vs. Temperature
(IL = 10mA)
I Gnd (uA)
280
270
260
250
240
230
220
210
200
190
180
-40 -20 0 20 40 60 80 100 120
Temperature (°C)
3.3V Device
Vin = 4.3V
IL = 10mA
CL = 10uF

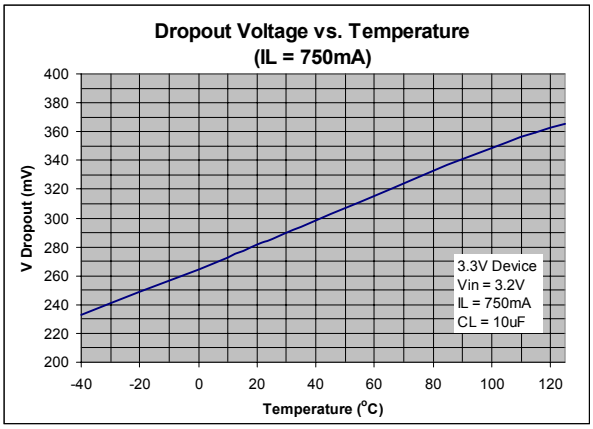

Output Voltage vs. Temperature
Vout (V)
3.320
3.310
3.300
3.290
3.280
3.270
3.260
3.250
3.240
3.230
3.220
-40 -20 0 20 40 60 80 100 120
Temperature (°C)
3.3V Device
Vin = 4.3V
IL = 10mA
CL = 10uF


Ground Current vs. Temperature
(IL = 500mA)
I Gnd (mA)
7.00
6.80
6.60
6.40
6.20
6.00
5.80
5.60
5.40
5.20
5.00
-40 -20 0 20 40 60 80 100 120
Temperature (°C)
3.3V Device
Vin = 4.3V
IL = 500mA
CL = 10uF

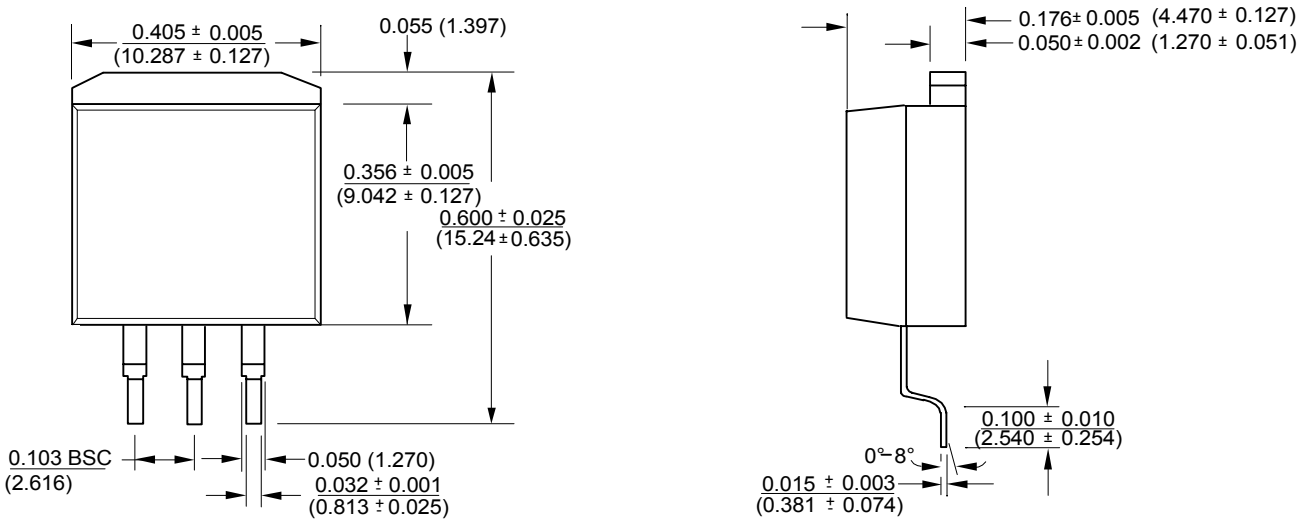

Ground Current vs. Temperature
(In Dropout, IL = 750mA)
I Gnd (mA)
35
34
33
32
31
30
29
28
27
26
25
-40 -20 0 20 40 60 80 100 120
Temperature (°C)
3.3V Device
Vin = 3.2V
IL = 750mA
CL = 10uF


Ground Current vs. Temperature
(IL = 1.5A)
I Gnd (mA)
52.0
50.0
48.0
46.0
44.0
42.0
40.0
38.0
36.0
-40 -20 0 20 40 60 80 100 120
Temperature (°C)
3.3V Device
Vin = 4.3V
IL = 1.5A
CL = 10uF


Ground Current vs. Temperature
(In Dropout, IL = 1.5A)
I Gnd (mA)
100
95
90
85
80
75
70
-40 -20 0 20 40 60 80 100 120
Temperature (°C)
3.3V Device
Vin = 3.2V
IL = 1.5A
CL = 10uF


Dropout Voltage vs. Temperature
(IL = 750mA)
V Dropout (mV)
400
380
360
340
320
300
280
260
240
220
200
-40
-20
0
20
40
60
80
100
120
Temperature (°C)
3.3V Device
Vin = 3.2V
IL = 750mA
CL = 10uF

PACKAGE DRAWING
TO-263-3L (T)



PACKAGE DRAWING
TO-220-3L (U)