Description

The IL1117C is a series of low dropout voltage regulators which can provide up to 1A of output current. The IL1117C is available in eight fixed voltage, 1.2, 1.25, 1.5, 1.8, 2.5, 2.85, 3.3 and 5.0V. Additionally it is also available in adjustable version. On chip precision trimming adjusts the reference/ output voltage to within ± 2%. Current limit is also trimmed to ensure specified output current and controlled short-circuit current.

The IL1117C series is available in SOT-223, TO-252, TO-220 packages.

A minimum of 10uF tantalum capacitor is required at the output to improve the transient response and Stability.

Features

- Dropout Voltage – 1.2V(Typ)
- Reference/Output Voltage Trimmed to ± 2%
- Maximum Input Voltage – 15V
- Adjustable Output Voltage or Fixed
  1.2V, 1.25V, 1.5V, 1.8V, 2.5V, 2.85V, 3.3V, 5V
- Line Regulation typically at 0.2% max
- Load Regulation typically at 0.4% max
- Current Limiting and Thermal Protection
- Standard 3-Pin Power Packages
- Operating Junction Temperature Range
  -40 to +125°C
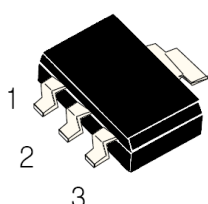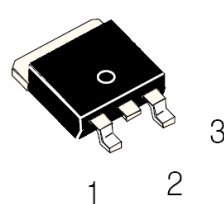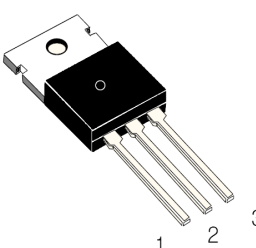
  (for IL1117C-1.2V - 0 to +150°C)

Applications

- Post Regulator for switching DC/DC Converter
- High Efficiency Linear Regulator
- Battery Chargers
- PC Add on Card
- Motherboard clock supplies
- LCD Monitor
- Set-top Box

SOT−223	TO−252
IL1117C-xxET	**IL1117C-xxD0T**

TO−220

IL1117C-xxKB

1. ADJ/GND
2. Output
3. Input

Pin#2 connected
with heat sink

ORDERING INFORMATION

Device	Package	Packing
IL1117CxxET	TO-223	Tape & Reel
IL1117CxxD0T	TO-252	Tape & Reel
IL1117C-xxKB	TO-220	Tube

Absolute Maximum Ratings

Symbol	Description	Max	Units
VIN	Input Voltage	15	V
IOUT	DC Output Current	PD/(VIN-VO)	mA
TJ	Operating Junction Temperature Range (* in case of IL1117C-1.2)	-40 to 125 (* 0 to 150)	°C
ΘJA	Thermal Resistance Junction-to-Ambient (SOT-223)	150	°C/W
ΘJA	Thermal Resistance Junction-to-Ambient (TO-252)	80	°C/W
ΘJA	Thermal Resistance Junction-to-Ambient (TO-220)	60	°C/W
ΘJC	Thermal Resistance Junction-to-Case (SOT-223)	35	°C/W
ΘJC	Thermal Resistance Junction-to-Case (TO-252)	22	°C/W
ΘJC	Thermal Resistance Junction-to-Case (TO-220)	15	°C/W

* Stresses beyond 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-rated conditions for extended periods may affect device reliability.

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Electrical Characteristics

Tj = -40°C to +125°C (for IL1117C-1.2 Tj = 0 to +150°C) unless otherwise specified

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNIT
OUTPUT VOLTAGE					
IL1117C-1.2	Io = 10mA to 1.0A, Vin = 2.7 to 12.0V	1.176	1.200	1.224	
IL1117C-1.25 (Adjustable)	Io = 10mA to 1.0A, Vin = 2.8 to 12.0V	1.225	1.250	1.280	
IL1117C-1.5	Io = 10mA to 1.0A, Vin = 3.0 to 12.0V	1.470	1.500	1.530	
IL1117C-1.8	Io = 10mA to 1.0A, Vin = 3.3 to 12.0V	1.764	1.800	1.836	
IL1117C-2.5	Io = 10mA to 1.0A, Vin = 4.0 to 12.0V	2.450	2.500	2.550	V
IL1117C-2.85	Io = 10mA to 1.0A, Vin = 4.4 to 12.0V	2.790	2.850	2.910	
IL1117C-3.3	Io = 10mA to 1.0A, Vin = 4.8 to 12.0V	3.240	3.300	3.360	
IL1117C-5.0	Io = 10mA to 1.0A, Vin = 6.5 to 12.0V	4.900	5.000	5.100	
LINE REGULATION					
IL1117C-1.2	Io =10mA, Vin = 2.7 to 12.0V		2.0	7.0	mV
IL1117C-1.25 (Adjustable)	Io =10mA, Vin = 2.8 to 12.0V		0.1	0.2	%
IL1117C-1.5	Io =10mA, Vin = 3.0 to 12.0V		2.0	7.0	mV
IL1117C-1.8	Io =10mA, Vin = 3.3 to 12.0V		2.0	7.0	mV
IL1117C-2.5	Io =10mA, Vin = 4.0 to 12.0V		2.0	7.0	mV
IL1117C-2.85	Io =10mA, Vin = 4.4 to 12.0V		2.0	7.0	mV
IL1117C-3.3	Io =10mA, Vin = 4.8 to 12.0V		3.0	7.0	mV
IL1117C-5.0	Io =10mA, Vin = 6.5 to 12.0V		4.0	10.0	mV
LOAD REGULATION					
IL1117C-1.2	Io = 10mA to 1.0A, Vin = 3.2V		3.0	10.0	mV
IL1117C-1.25 (Adjustable)	Io = 10mA to 1.0A, Vin = 3.3V		0.2	0.4	%
IL1117C-1.5	Io = 10mA to 1.0A, Vin = 3.5V		3.0	10.0	mV
IL1117C-1.8	Io = 10mA to 1.0A, Vin = 3.8V		3.0	10.0	mV
IL1117C-2.5	Io = 10mA to 1.0A, Vin = 4.5V		3.0	10.0	mV
IL1117C-2.85	Io = 10mA to 1.0A, Vin = 4.85V		3.0	10.0	mV
IL1117C-3.3	Io = 10mA to 1.0A, Vin = 5.3V		4.0	12.0	mV
IL1117C-5.0	Io = 10mA to 1.0A, Vin = 7.0V		5.0	15.0	mV
DROPOUT VOLTAGE (2)					
All Models	Io =1A (Tj = 25°C)		1.20	1.30	V
	Io =1A (Tj = -40°C to +125°C)		1.20	1.55	
CURRENT LIMIT	Vin - Vo = 5V (Tj = 25°C)	1000			mA
Minimum Load Current Adjustable Models	Vin = 13.75V			5	mA
QUIESCENT CURRENT	Vin - Vo = 1.5V		5.2	10	mA
Adjust Pin Current	Io = 10mA, Vin - Vo = 1.4 to 10V		50	120	uA
vs Load Current, IL1117C	Io = 10mA to 1A, Vin - Vo = 1.4 to 10V		0.5	5	uA
TEMPERATURE DRIFT	Tj = -40°C to +125°C		0.5		%
RMS Output Noise	Bandwidth of 10Hz to 10kHz at 25°C		0.003		%Vo
Ripple Rejection Ratio	120Hz input Ripple(Cadj for ADJ) = 25uF Vin -Vo = 5V, Io = 1.0A Tj = -40°C to +125°C	60	72		dB

NOTES: (1) IL1117C-x adjustable versions require a minimum load current for ±3% regulation.

(2) Dropout voltage is the input voltage minus output voltage that produces a 1% decrease in output voltage.

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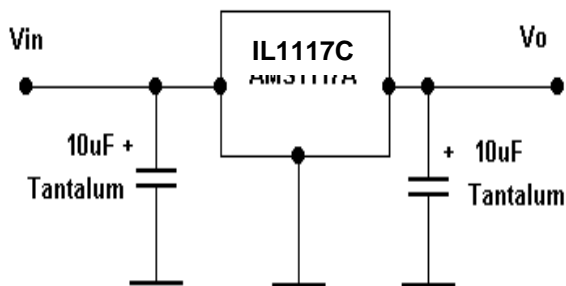**Block Diagram**
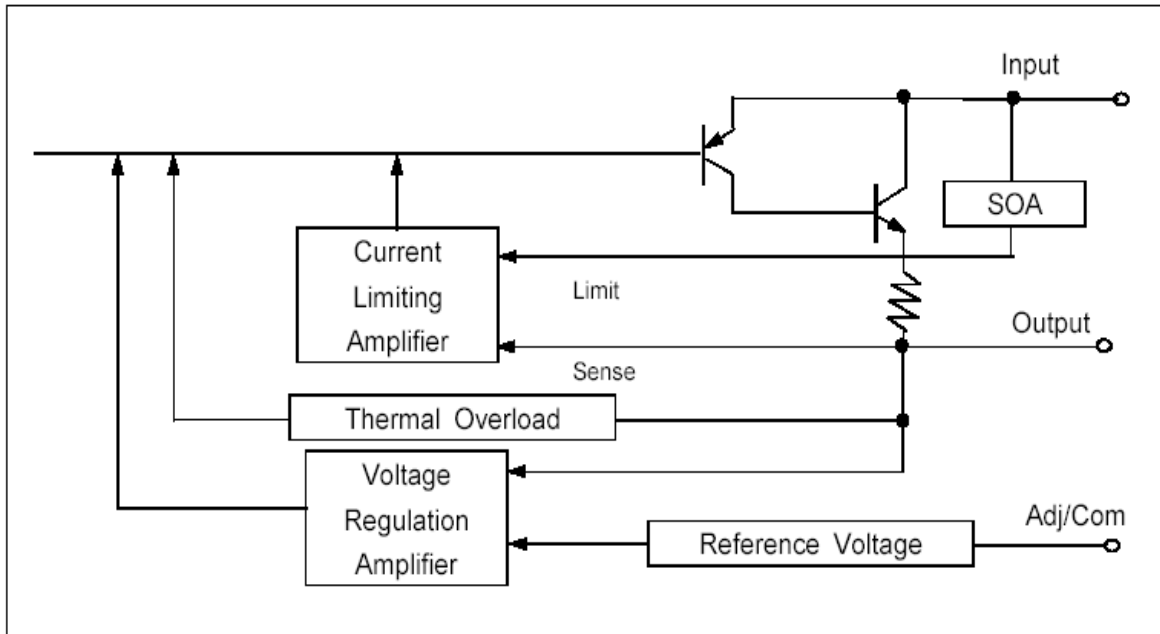
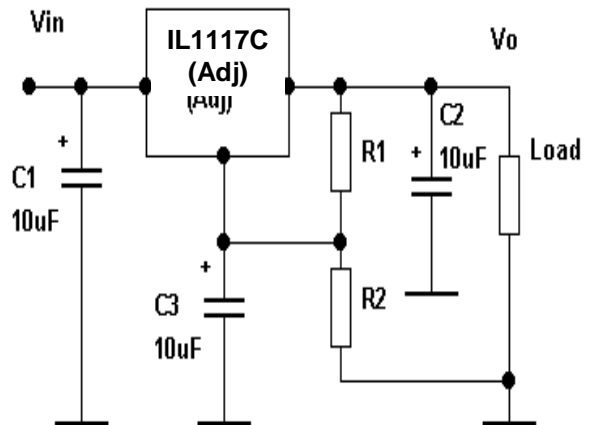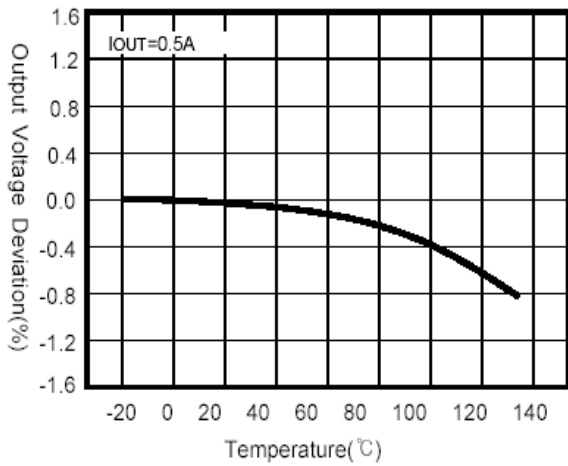**Application Information**

FIGURE 1. Fixed-Voltage Model
—Basic Connections.

FIGURE 2. Adjustable-Voltage Model
--Basic Connections.

$$Vo=Vref(1+R2/R1) + Iadj*R2$$

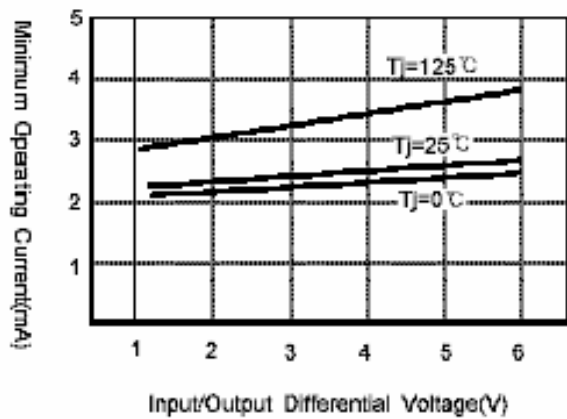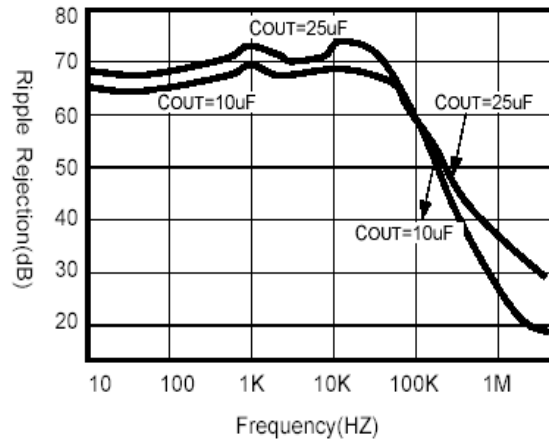IKSemicon

Typical Perfomance Characteristics

Temperature Stability

Ripple Rejection(with C_{adj} 25uF)
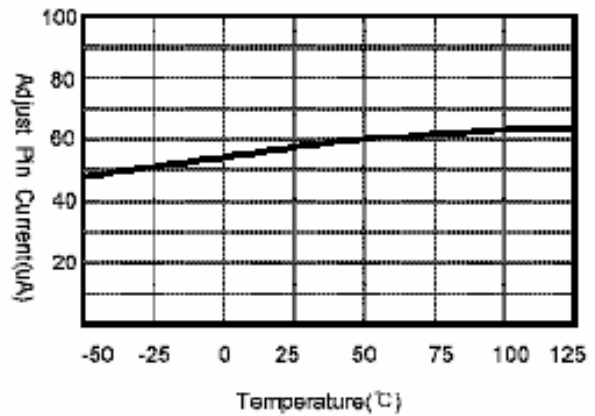
Dropout Voltage
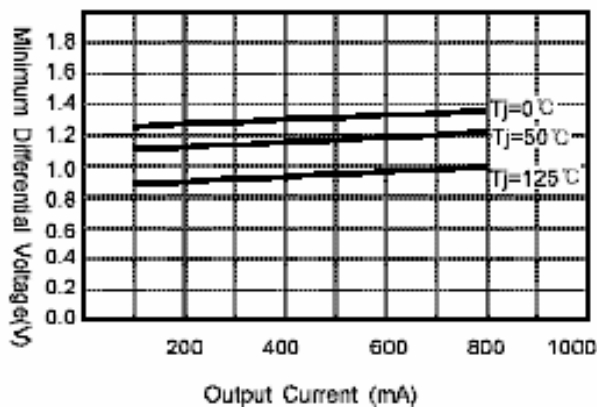
Dropout Voltage - Temperature

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Sep 11, 2018 Ver. 08
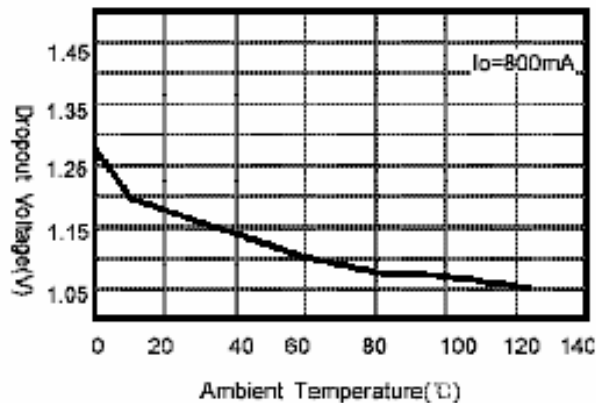
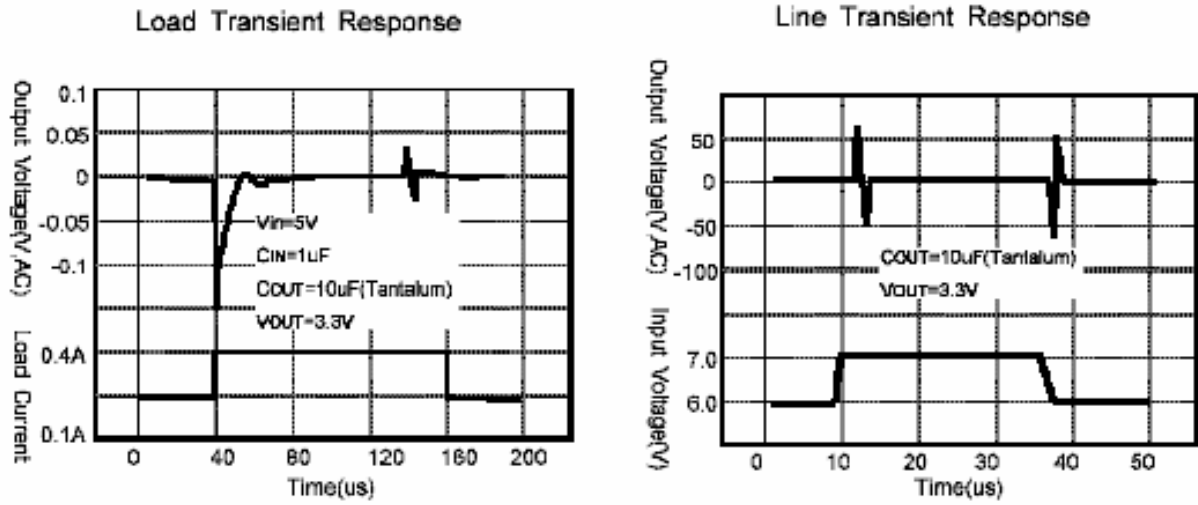## Typical Perfomance Characteristics (continue)

Figure 3.

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Application Information

Output voltage adjustment

Like most regulators, the IL1117C regulates the output by comparing the output voltage to an internally generated reference voltage. On the adjustable version as shown in Fig.4, the V_{REF} is available externally as 1.25V between V_{OUT} and ADJ. The voltage ratio formed by R1 and R2 should be set to conduct 10mA (minumum output load).
The output voltage is given by the following equation:
Vo=Vref(1+R2/R1)+Iadj*R2
On fixed versions of IL1117C, the voltage divider is provided internal-
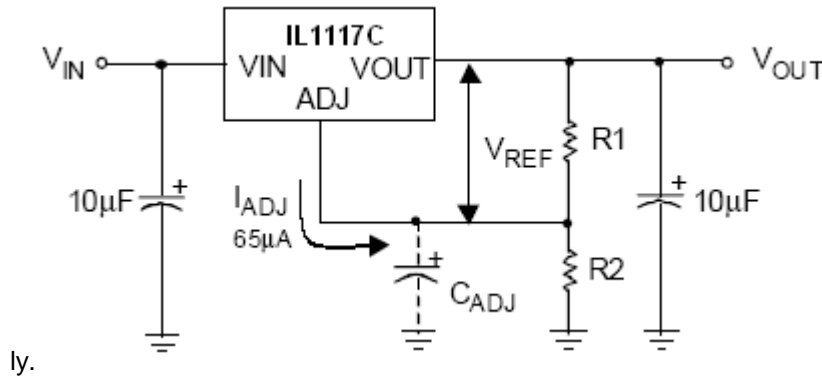

ly.

Figure 4. Basic Adjustable Regulator

Input Bypass Capacitor

An input capacitor is recommended. A 10µF tantalum on the input is a suitable input bypassing for almost all applications.

Adjust Terminal Bypass Capacitor

The adjust terminal can be bypassed to ground with a bypass capacitor (C_{ADJ}) to improve ripple rejection. This bypass capacitor prevents ripple from being amplified as the output voltage is increased. At any ripple frequency, the impedance of the C_{ADJ} should be less than R1 to prevent the ripple from being amplified:

$(2\pi * f_{RIPPLE} * C_{ADJ}) < R1$

The R1 is the resistor between the output and the adjust pin. Its value is normally in the range of 100- 200Ω. For example, with R1 = 124Ω and f_{RIPPLE} = 120Hz, the C_{ADJ} should be > 11µF.

Output Capacitor

IL1117C requires a capacitor from V_{OUT} to GND to provide compensation feedback to the internal gain stage. This is to ensure stability at the output terminal. Typically, a 10µF tantalum or 50µF aluminum electrolytic is sufficient.

Note: The ESR is typically 1.0 Ω.

The output capacitor does not have a theoretical upper limit and increasing its value will increase stability. C_{OUT} = 100µF or more is typical for high current regulator design.

Load Regulation

When the adjustable regulator is used (Fig.5), the best load regulation is accomplished when the top of the resistor divider (R1) is connected directly to the output pin of the IL1117C. When so connected, RP is not multiplied by the divider ratio. For Fixed output version, the top of R1 is internally connected to the output and ground pins can be connected to low side of the load.
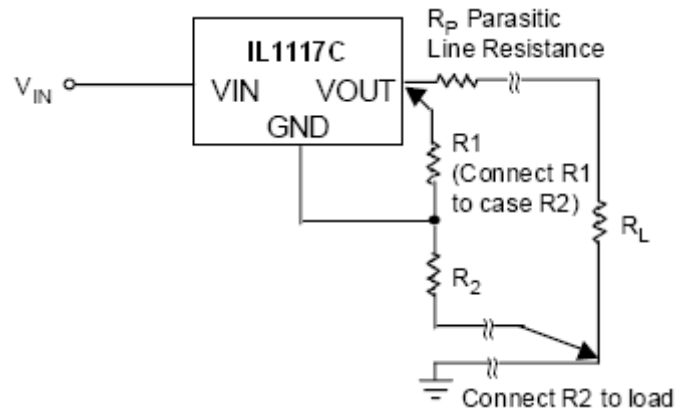
Figure 5. Best Load Regulation Using Adjustable Output Regulator

Thermal Protection

IL1117C has thermal protection which limits junction temperature to 150°C. However, device functionality is only guaranteed to a maximum junction temperature of +125°C. The power dissipation and junction temperature for IL1117C in DPAK package are given by

$$P_D = (V_{IN} - V_{OUT}) \times I_{OUT}$$

$$T_{JUNCTION} = T_{AMBIENT} + (P_D \times \theta_{JA})$$

Note: $T_{JUNCTION}$ must not exceed 125°C

Current Limit Protection

IL1117C is protected against overload conditions. Current protection is triggered at typically 1.6A.

Thermal Consideration

The IL1117C series contain thermal limiting circuitry designed to protect itself from over-temperature conditions. Even for normal load conditions, maximum junction temperature ratings must not be exceeded. As mention in thermal protection section, we need to consider all sources of thermal resistance between junction and ambient. It includes junction-tocase, case-to-heat-sink interface, and heat sink thermal resistance itself.

Junction-to-case thermal resistance is specified from the IC junction to the bottom of the case directly below the die. Proper mounting is required to ensure the best possible thermal flow from this area of the package to the heat sink. The case of all devices in this series is electrically connected to the output. Therefore, if the case of the device must be electrically isolated, a thermally conductive spacer is recommended.

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SOT-223 PACKAGE OUTLINE DIMENSIONS
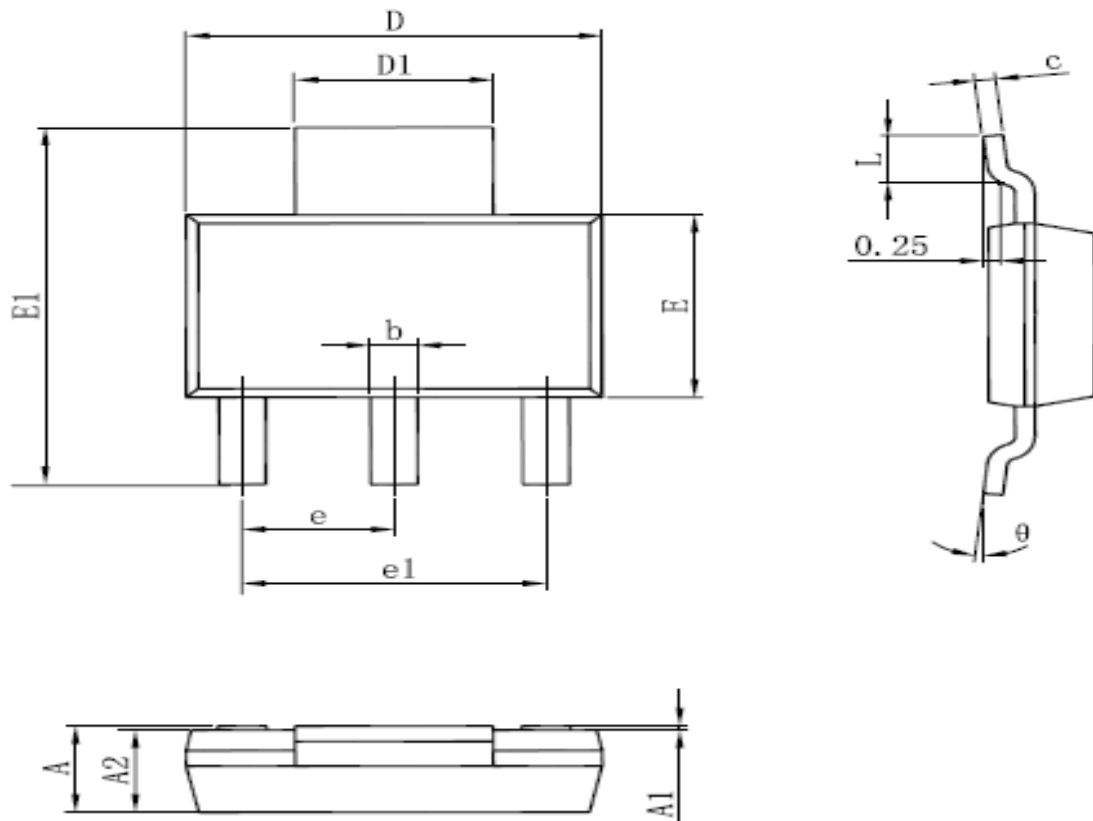
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.520	1.800	0.060	0.071
A1	0.02	0.100	0.001	0.004
A2	1.500	1.700	0.059	0.067
b	0.660	0.810	0.026	0.032
c	0.240	0.320	0.010	0.014
D	6.300	6.500	0.248	0.256
D1	2.900	3.100	0.114	0.122
E	3.300	3.700	0.130	0.146
E1	6.830	7.070	0.269	0.278
e	2.300(BSC)		0.091(BSC)	
e1	4.500	4.700	0.177	0.185
L	0.900	1.150	0.035	0.045
θ	0°	10°	0°	10°

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TO-220-3L PACKAGE OUTLINE DIMENSIONS
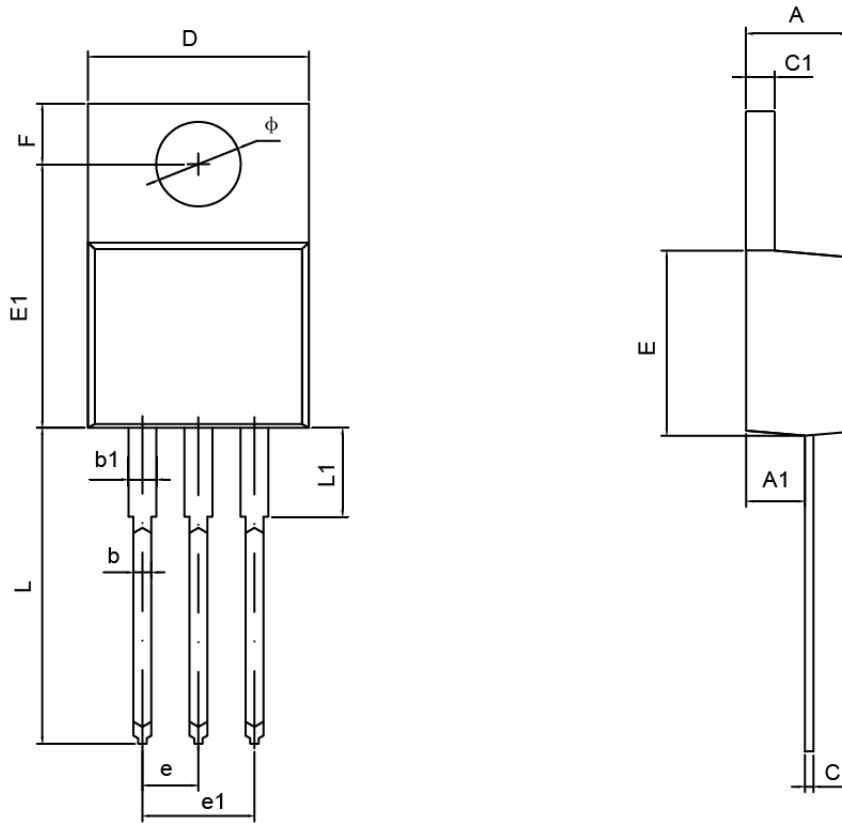
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	4.470	4.670	1.176	0.184
A1	2.520	2.820	0.099	0.111
b	0.710	0.910	0.028	0.036
b1	1.170	1.370	0.046	0.054
c	0.310	0.530	0.012	0.021
c1	1.710	1.370	0.046	0.054
D	10.010	10.310	0.394	0.406
E	8.500	8.900	0.335	0.350
E1	12.060	12.460	0.475	0.491
e	2.540TYP		0.100TYP	
e1	4.980	5.180	0.196	0.204
F	2.590	2.890	0.102	0.114
L	13.400	13.800	0.528	0.543
L1	3.560	3.960	0.140	0.156
φ	3.790	3.890	0.149	0.153

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TO-252-3L PACKAGE OUTLINE DIMENSION

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