

## 600mA LDO Linear Regulator with Shutdown

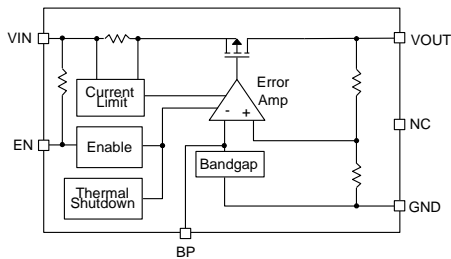
### ❖ GENERAL DESCRIPTION

The AX6607 is a low dropout, positive linear regulator with very low quiescent. It can supply 600mA output current. The BP pin with a 10nF bypass capacitor can help reduce the output noise level. The characteristics of low dropout voltage and less quiescent current make it good for some critical current application, for example, some battery powered devices. The typical quiescent current is approximately 50μA. In the shutdown mode, the maximum supply current is less than 2μA. The AX6607 regulator is able to operate with output capacitors as small as 1μF for stability. The AX6607 series are offering several fixed output voltage types including 1.2V, 1.5V, 1.8V, 2.5V, 2.6V, 2.7V, 2.8V, 3.0V, 3.3V and adjustable version. Built-in current-limit and thermal-shutdown functions prevent any fault condition from IC damage.

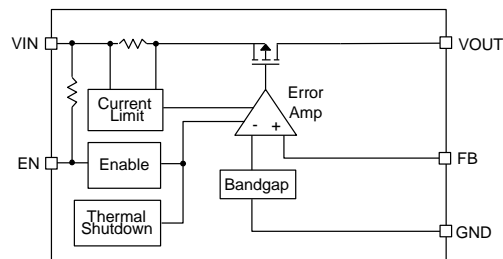
### ❖ FEATURES

- Input voltage range : 2.6V~5.5V
- Adjustable and 1.2/1.5/1.8/2.5/2.6/2.7/2.8/3.0/3.3V fixed output voltages
- VOUT adjust range from  $V_{FB}$  to 5.0V
- Guaranteed 600mA output current
- Very Low quiescent current at 50μA (typ.)
- Needs Only 1μF capacitor for Stability
- Maximum supply current in shutdown mode <2μA
- Current limit and thermal shutdown protection
- Short circuit current fold-back
- Available in the SOT-23-5L and TDFN-6L Pb-Free Packages

### ❖ BLOCK DIAGRAM



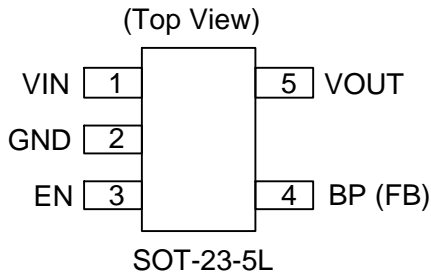
**Fixed Version**



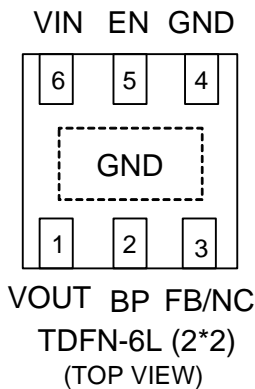
**Adjustable Version**

❖ **PIN ASSIGNMENT**

The packages of AX6607 are SOT-23-5L and TDFN-6L; the pin assignment is given by:



Adjustable Version: Pin 4 is FB  
Fixed Version: Pin 4 is BP



| Name  | Description   |
|-------|---|
| VIN   | Voltage input. The input capacitor in the range of 1μF to 10μF is sufficient.   |
| GND   | Ground  |
| EN    | Enable pin (Active High)  |
| BP    | Reference Noise Bypass (The Bypass capacitor ≥ 1nF)   |
| VOUT  | Output Voltage, The AX6607 is stable with an output capacitor 1μF for greater.  |
| FB/NC | For adjustable output voltage version only, the pin connects two resistances to decide output voltage. When use fixed output voltage version, this pin is NC pin. |

❖ **ORDER/MARKING INFORMATION**

| Order Information   |   |
|---|---|
| <b>AX6607- XX XX X</b><br>Output voltage    Package    Packing<br>Blank : ADJ    B : SOT-23-5L    Blank: Bag<br>12 : 1.2V    Z6 : TDFN-6L (2*2)    A : Taping<br>15 : 1.5V<br>18 : 1.8V<br>25 : 2.5V<br>26 : 2.6V<br>27 : 2.7V<br>28 : 2.8V<br>30 : 3.0V<br>33 : 3.3V |   |
| Top Marking (SOT-23-5L)   | Top Marking (TDFN-6L)   |
| <p><b>LLYWX</b> → ID code: internal</p> <p>↓ Identification code</p> <p>WW: 01~26(A~Z)<br/>27~52(a~z)</p> <p>Year: A= 2010<br/>1= 2011<br/>2= 2012<br/>⋮<br/>9= 2019</p>  | <p><b>LL</b> → Output type<br/>Refer Identification Code</p> <p><b>YWX</b> → ID Code: Internal</p> <p>Week: 01~26(A~Z)<br/>27~52(a~z)</p> <p>Year : A = 2010<br/>1 = 2011<br/>2 = 2012<br/>⋮<br/>9 = 2019</p> |

### Appendix

| Part Number | Identification Code | Part Number | Identification Code |
|-------------|---------------------|-------------|---------------------|
| AX6607-ADJ  | FA                  | AX6607-2.6V | Fj                  |
| AX6607-1.2V | Fh                  | AX6607-2.7V | Fp                  |
| AX6607-1.5V | Fi                  | AX6607-2.8V | Fn                  |
| AX6607-1.8V | Fk                  | AX6607-3.0V | Fr                  |
| AX6607-2.5V | Fm                  | AX6607-3.3V | Fs                  |

### ❖ ABSOLUTE MAXIMUM RATINGS (at T<sub>A</sub>=25 °C)

| Characteristics                             |           | Symbol           | Rating         | Unit |
|---|-----------|------------------|----------------|------|
| V <sub>IN</sub> Pin Voltage                 |           | V <sub>IN</sub>  | GND - 0.3 to 7 | V    |
| Output Voltage                              |           | V <sub>OUT</sub> | GND - 0.3 to 7 | V    |
| Enable Voltage                              |           | V <sub>EN</sub>  | GND - 0.3 to 7 | V    |
| Feedback Voltage                            |           | V <sub>FB</sub>  | GND - 0.3 to 7 | V    |
| Power Dissipation                           | SOT-23-5L | PD               | 400            | mW   |
|   | TDFN-6L   |                  | 830            |      |
| Storage Temperature Range                   |           | T <sub>ST</sub>  | -40 to +150    | °C   |
| Operating Temperature Range                 |           | T <sub>OP</sub>  | -40 to +85     | °C   |
| Junction Temperature                        |           | T <sub>J</sub>   | -40 to +125    | °C   |
| Thermal Resistance from Junction to case    | SOT-23-5L | θ <sub>JC</sub>  | 180            | °C/W |
|   | TDFN-6L   |                  | 25             |      |
| Thermal Resistance from Junction to ambient | SOT-23-5L | θ <sub>JA</sub>  | 250            | °C/W |
|   | TDFN-6L   |                  | 120            |      |

Note : θ<sub>JA</sub> is measured with the PCB copper area of approximately 1 in<sup>2</sup>(Multi-layer). That need connect to GND (exposed pad) pin.

**❖ ELECTRICAL CHARACTERISTICS** ( $V_{IN}=5V$ ,  $T_A=25\text{ }^\circ\text{C}$ , unless otherwise noted)

| Characteristics                                 | Symbol            | Conditions   | Min              | Typ   | Max   | Units            |    |
|---|-------------------|--|------------------|-------|-------|------------------|----|
| Input Voltage                                   | $V_{IN}$          | $I_{OUT}=30\text{mA}$ (Note1)  | 2.6              | -     | 5.5   | V                |    |
| Quiescent Current                               | $I_Q$             | $I_{OUT}=0\text{mA}$   | -                | 50    | 80    | $\mu\text{A}$    |    |
| Shutdown Current                                | $I_{SD}$          | $V_{IN}=3.6V$ , $I_{OUT}=0\text{mA}$ , $V_{EN}=0V$                           | -                | -     | 1     | $\mu\text{A}$    |    |
| Output Voltage Accuracy<br>(Fixed Version Only) | $\Delta V_{OUT}$  | $V_{IN}=V_{OUT}+0.1V$ to 5.5V<br>$V_{OUT}\geq 2.5V$ , $I_{OUT}=1\text{mA}$   | -2               | -     | +2    | %                |    |
|   |                   | $V_{IN}=2.6V$ to 5.5V<br>$2.5V > V_{OUT}\geq 1.2V$ , $I_{OUT}=1\text{mA}$    | -3               | -     | +3    |                  |    |
| Feedback Voltage                                | $V_{FB}$          | $V_{IN}=2.6V$ to 5.5V, $I_{OUT}=1\text{mA}$                                  | 0.784            | 0.8   | 0.816 | V                |    |
| FB Input Leakage Current                        | $I_{FB}$          | $V_{FB}=0.8V$  | -100             | -     | 100   | nA               |    |
| Dropout Voltage<br>(Note2)                      | $V_{DROP}$        | $I_{OUT}=600\text{mA}$ ,<br>$1.2V\leq V_{OUT}<1.5V$                          | -                | 1400  | 1500  | mV               |    |
|   |                   | $I_{OUT}=600\text{mA}$ ,<br>$1.5V\leq V_{OUT}\leq 2.1V$                      | -                | 1100  | 1200  |                  |    |
|   |                   | $I_{OUT}=600\text{mA}$ ,<br>$2.1V<V_{OUT}\leq 2.8V$                          | -                | 500   | 600   |                  |    |
|   |                   | $I_{OUT}=600\text{mA}$ ,<br>$2.8V<V_{OUT}\leq 3.3V$                          | -                | 300   | 500   |                  |    |
| Current Limit                                   | $I_{LIMIT}$       |  | 700              | -     | -     | mA               |    |
| Short Circuit Current                           | $I_{Short}$       | Output Voltage $< 0.375\cdot V_{OUT}$  | -                | 300   | -     | mA               |    |
| Line Regulation                                 | $\Delta V_{LINE}$ | $V_{IN}=2.6V$ to 5.5V, $I_{OUT}=1\text{mA}$                                  | -                | 0.2   | 0.5   | %                |    |
| Load Regulation (Note 3)                        | $\Delta V_{LOAD}$ | $I_{OUT}=10\text{m}\sim 0.6\text{A}$   | -                | 0.5   | 1     | %                |    |
| Ripple Rejection                                | PSRR              | $C_{IN}=1\mu\text{F}$ ,<br>$C_{OUT}=1\mu\text{F}$ ,<br>$I_{OUT}=10\text{mA}$ | $F=120\text{Hz}$ | -     | 65    | -                | dB |
|   |                   |  | $F=1\text{KHz}$  | -     | 55    | -                |    |
| Enable Input Threshold                          | $V_{ENH}$         |  | 1.5              | -     | -     | V                |    |
|   | $V_{ENL}$         |  | -                | -     | 0.4   |                  |    |
| Enable Pin Current                              | $I_{ENH}$         | $V_{EN}=V_{IN}$  | -                | 0.003 | 0.1   | $\mu\text{A}$    |    |
|   | $I_{ENL}$         | $V_{IN}=3.6V$ , $V_{EN}=0V$  | -                | 0.35  | 1     |                  |    |
| Temperature Shutdown                            | $T_S$             |  | -                | 140   | -     | $^\circ\text{C}$ |    |
| Temperature Shutdown Hysteresis                 | $T_{SH}$          |  | -                | 30    | -     | $^\circ\text{C}$ |    |

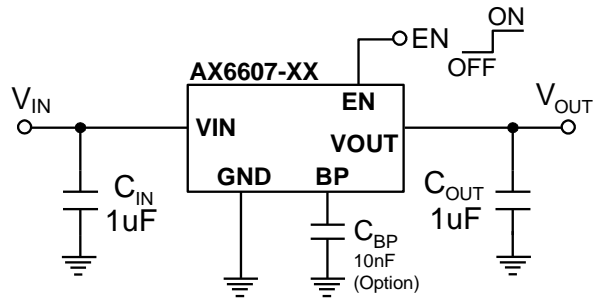
Note1. Minimum  $V_{IN}$  voltage is defined by output adds a dropout voltage.

Note2. The dropout voltage is defined as  $V_{IN}-V_{OUT}$ , which is measured when  $V_{OUT}$  drop about 100mV.

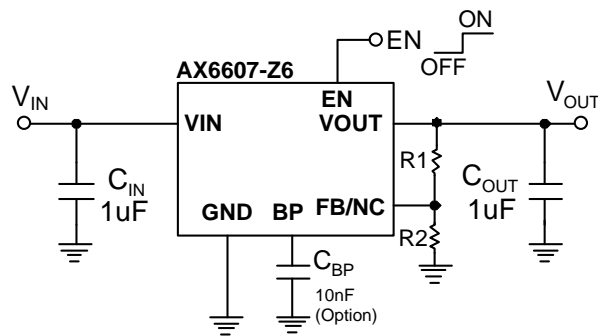
Note3. Regulation is measured at constant junction temperature by using pulsed testing with a low ON time.

❖ APPLICATION CIRCUIT

(1) Fixed Output Voltage Version



(2) Adjustable Output Voltage Version



$$V_{OUT} = V_{FB} * (1 + R1/R2)$$

$$V_{FB} = 0.8V$$

$$R2 \text{ Range} = 50K \sim 300K$$

## ❖ FUNCTION DESCRIPTIONS

A minimum of 1μF capacitor must be connected from V<sub>OUT</sub> to ground to insure stability. Typically a large storage capacitor is connected from V<sub>IN</sub> to ground to ensure that the input voltage does not sag below the minimum dropout voltage during the load transient response. This pin must always be dropout voltage higher than V<sub>OUT</sub> in order for the device to regulate properly.

## ❖ APPLICATION INFORMATION

Like any low-dropout regulator, the AX6607 requires input and output decoupling capacitors. The device is specifically designed for portable applications requiring minimum board space and smallest components. These capacitors must be correctly selected for good performance. Please note that linear regulators with a low dropout voltage have high internal loop gains which require care in guarding against oscillation caused by insufficient decoupling capacitance.

### Capacitor Selection

Normally, use a 1μF capacitor on the input and a 1μF capacitor on the output of the AX6607. Larger input capacitor values and lower ESR (X5R, X7R) provide better supply-noise rejection and transient response. A higher- value output capacitor (2.2μF) may be necessary if large, fast transients are anticipated and the device is located several inches from the power source.

### Input-Output (Dropout) Voltage

A regulator's minimum input-to-output voltage differential (dropout voltage) determines the lowest usable supply voltage. In battery-powered systems, this determines the useful end-of-life battery voltage. Because the device uses a PMOS, its dropout voltage is a function of drain-to source on-resistance, R<sub>DS (ON)</sub>, multiplied by the load current:

$$V_{\text{DROPOUT}} = V_{\text{IN}} - V_{\text{OUT}} = R_{\text{DS (ON)}} \times I_{\text{OUT}}$$

### Current Limit and Thermal Shutdown Protection

In order to prevent overloading or thermal condition from damaging the device, AX6607 regulator has internal thermal and current limiting functions designed to protect the device. It will rapidly shut off PMOS pass element during overloading or over temperature condition.

## Thermal Considerations

The AX6607 series can deliver a current of up to 600mA over the full operating junction temperature range. However, the maximum output current must be dated at higher ambient temperature to ensure the junction temperature does not exceed 125°C. With all possible conditions, the junction temperature must be within the range specified under operating conditions. Power dissipation can be calculated based on the output current and the voltage drop across regulator.

$$PD = (V_{IN} - V_{OUT}) I_{OUT}$$

The final operating junction temperature for any set of conditions can be estimated by the following thermal equation:

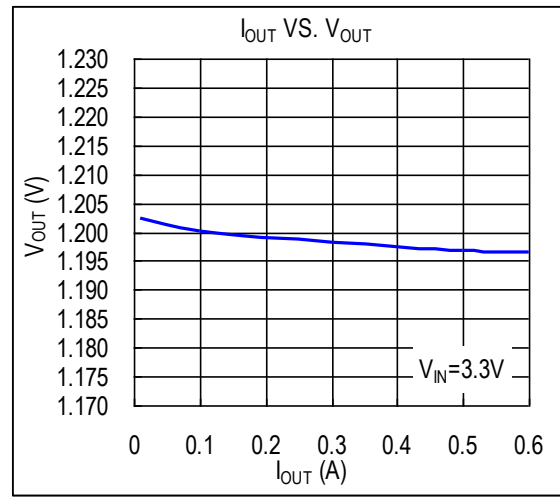
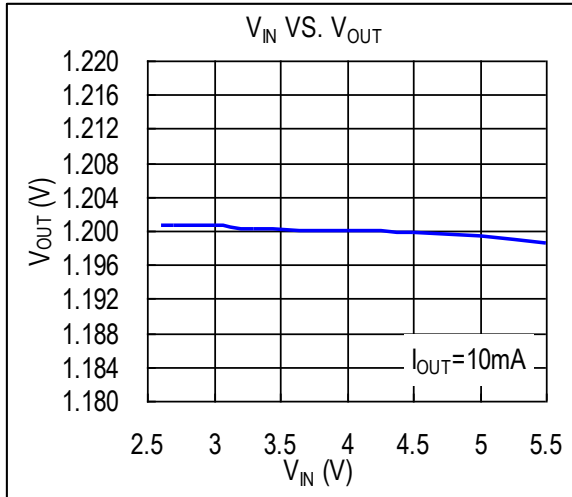
$$PD (MAX) = (T_{J(MAX)} - T_A) / \theta_{JA}$$

Where  $T_{J(MAX)}$  is the maximum junction temperature of the die (125°C) and  $T_A$  is the maximum ambient temperature. The junction to ambient thermal resistance ( $\theta_{JA}$ ) for TDFN-6L package at recommended minimum footprint is 120°C/W.

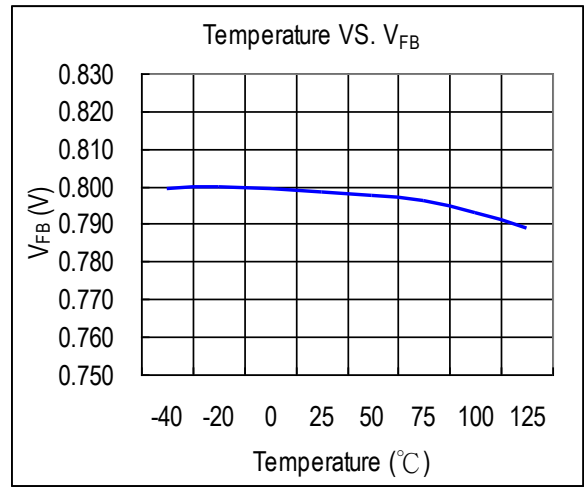
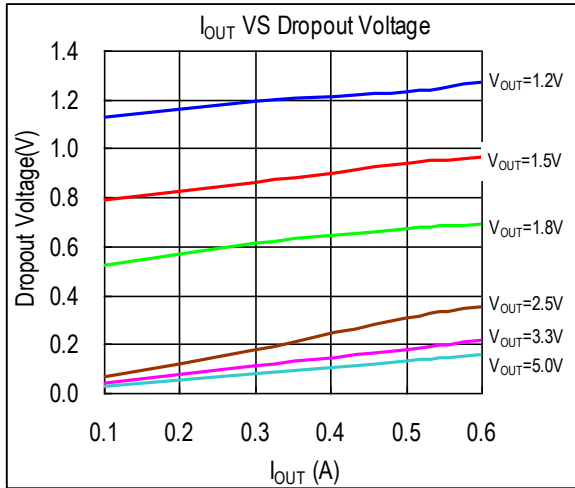
## PCB Layout

An input capacitance of  $\cong 1\mu F$  is required between the AX6607 input pin and ground (the amount of the capacitance may be increased without limit), this capacitor must be located a distance of not more than 1cm from the input and return to a clean analog ground. Input capacitor can filter out the input voltage spike caused by the surge current due to the inductive effect of the package pin and the printed circuit board's routing wire. Otherwise, the actual voltage at the VIN pin may exceed the absolute maximum rating. The output capacitor also must be located a distance of not more than 1cm from output to a clean analog ground. Because it can filter out the output spike caused by the surge current due to the inductive effect of the package pin and the printed circuit board's routing wire.

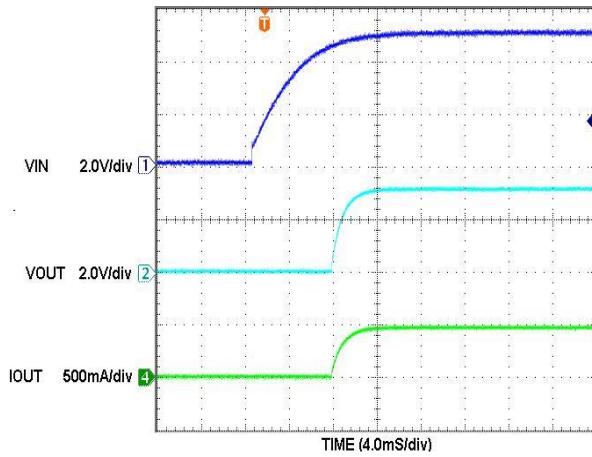
❖ TYPICAL CHARACTERISTICS



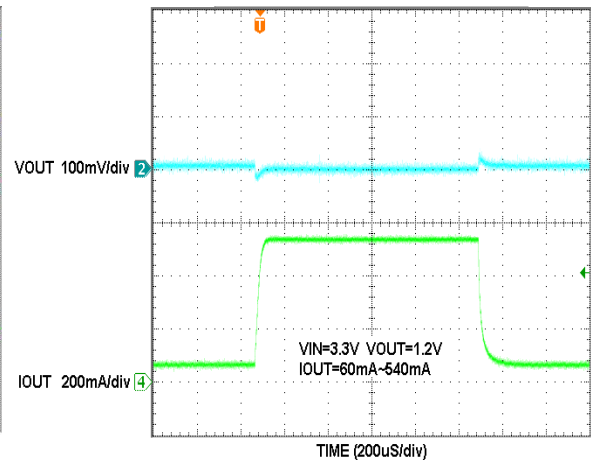




Power ON

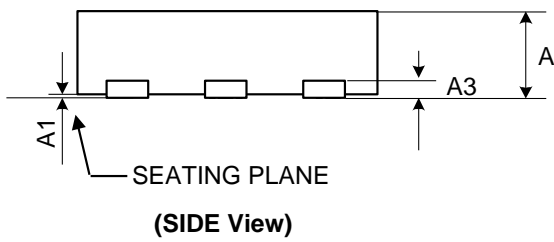
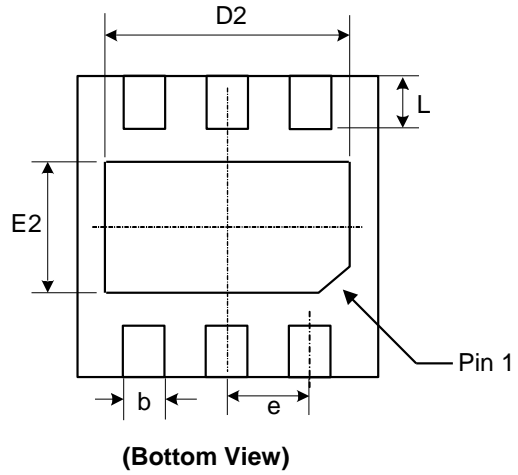
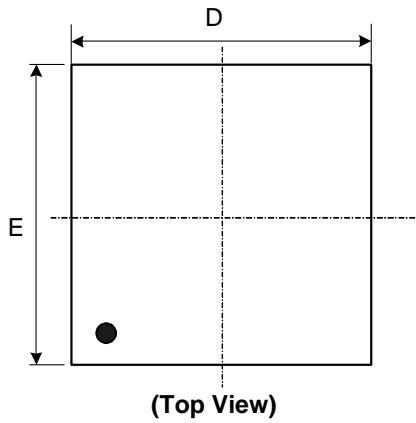


Load Transient



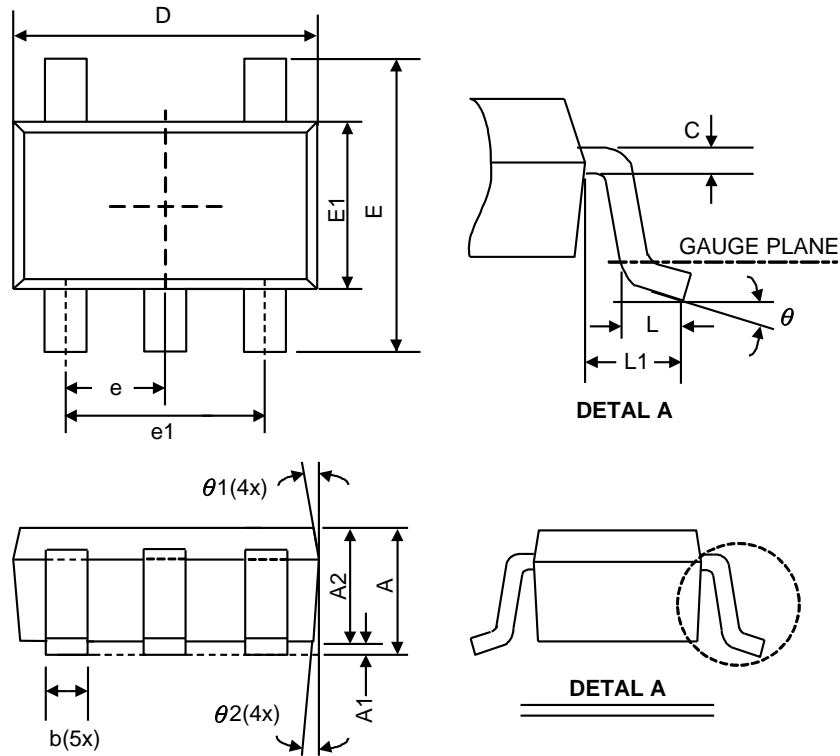
❖ PACKAGE OUTLINES

- (1) TDFN-6L (2\*2 0.75mm)



| Symbol | Dimensions in Millimeters |      |      | Dimensions in Inches |       |       |
|--------|---------------------------|------|------|----------------------|-------|-------|
|        | Min.                      | Nom. | Max. | Min.                 | Nom.  | Max.  |
| A      | 0.70                      | 0.75 | 0.80 | 0.028                | 0.030 | 0.031 |
| A1     | 0.00                      | 0.02 | 0.05 | 0.000                | 0.001 | 0.002 |
| A3     | 0.203 REF.                |      |      | 0.008 REF.           |       |       |
| b      | 0.20                      | 0.28 | 0.35 | 0.009                | 0.011 | 0.013 |
| D      | 1.95                      | 2.00 | 2.05 | 0.077                | 0.079 | 0.081 |
| D2     | 1.35                      | 1.50 | 1.65 | 0.055                | 0.059 | 0.063 |
| E      | 1.95                      | 2.00 | 2.05 | 0.077                | 0.079 | 0.081 |
| E2     | 0.75                      | 0.90 | 1.05 | 0.031                | 0.035 | 0.039 |
| e      | 0.65 BSC.                 |      |      | 0.026 BSC.           |       |       |
| L      | 0.20                      | 0.30 | 0.40 | 0.008                | 0.012 | 0.016 |

(2) SOT-23-5L



| Symbol     | Dimensions in Millimeters |      |      | Dimensions in Inches |       |       |
|------------|---------------------------|------|------|----------------------|-------|-------|
|            | Min.                      | Nom. | Max. | Min.                 | Nom.  | Max.  |
| A          | -                         | -    | 1.45 | -                    | -     | 0.057 |
| A1         | 0.00                      | 0.08 | 0.15 | 0                    | 0.003 | 0.006 |
| A2         | 0.90                      | 1.10 | 1.30 | 0.035                | 0.043 | 0.051 |
| b          | 0.30                      | 0.40 | 0.50 | 0.012                | 0.016 | 0.020 |
| C          | 0.08                      | 0.15 | 0.22 | 0.003                | 0.006 | 0.009 |
| D          | 2.70                      | 2.90 | 3.10 | 0.106                | 0.114 | 0.122 |
| E1         | 1.40                      | 1.60 | 1.80 | 0.055                | 0.063 | 0.071 |
| E          | 2.60                      | 2.80 | 3.00 | 0.102                | 0.110 | 0.118 |
| L          | 0.30                      | 0.45 | 0.60 | 0.012                | 0.018 | 0.024 |
| L1         | 0.50                      | 0.60 | 0.70 | 0.020                | 0.024 | 0.028 |
| e1         | 1.9 BSC                   |      |      | 0.075 BSC            |       |       |
| e          | 0.95 BSC                  |      |      | 0.037 BSC            |       |       |
| $\theta$   | 0°                        | 4°   | 8°   | 0°                   | 4°    | 8°    |
| $\theta 1$ | 5°                        | 10°  | 15°  | 5°                   | 10°   | 15°   |
| $\theta 2$ | 5°                        | 10°  | 15°  | 5°                   | 10°   | 15°   |

JEDEC outline: MO-178 AA

## X-ON Electronics

Largest Supplier of Electrical and Electronic Components

*Click to view similar products for [LDO Voltage Regulators](#) category:*

*Click to view products by [Axelite](#) manufacturer:*

Other Similar products are found below :

[AP7363-SP-13](#) [L79M05TL-E](#) [AP7362-HA-7](#) [PT7M8202B12TA5EX](#) [TCR3DF185,LM\(CT](#) [TCR3DF45,LM\(CT](#) [TLE4473G V52](#) [059985X](#)  
[NCP4687DH15T1G](#) [701326R](#) [NCV8170AXV250T2G](#) [AP7315-25W5-7](#) [AP2111H-1.2TRG1](#) [ZLDO1117QK50TC](#) [AZ1117ID-ADJTRG1](#)  
[TCR3DG12,LF](#) [MIC5514-3.3YMT-T5](#) [SCD7912BTG](#) [NCP154MX180270TAG](#) [SCD33269T-5.0G](#) [NCV8170BXV330T2G](#)  
[NCV8170BMX330TCG](#) [NCV8170AMX120TCG](#) [NCP706ABMX300TAG](#) [NCP153MX330180TCG](#) [NCP114BMX075TCG](#) [MC33269T-3.5G](#)  
[CAT6243-ADJCMT5T](#) [TCR3DG33,LF](#) [TCR4DG35,LF](#) [TAR5S15U\(TE85L,F\)](#) [TAR5S18U\(TE85L,F\)](#) [TCR3UG19A,LF](#) [TCR4DG105,LF](#)  
[MPQ2013AGG-5-P](#) [NCV8170AMX360TCG](#) [TLE4268GSXUMA2](#) [NCP715SQ15T2G](#) [MIC5317-3.0YD5-T5](#) [NCV563SQ18T1G](#)  
[NCP715MX30TBG](#) [NCV8702MX25TCG](#) [NCV8170BXV120T2G](#) [MIC5317-1.2YD5-T5](#) [NCV8170AMX150TCG](#) [NCV8170BMX150TCG](#)  
[AP2213D-3.3TRG1](#) [NCV8170BMX120TCG](#) [NCV8170BMX310TCG](#) [NCV8170BMX360TCG](#)