芯伯乐®
XINBOLE

# Product Specification

## XBLW MIC29302

High Current Low Dropout Voltage Regulators

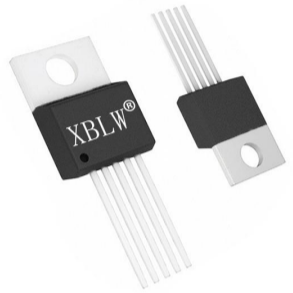
WEB | www.xinboleic.com

## Descriptions

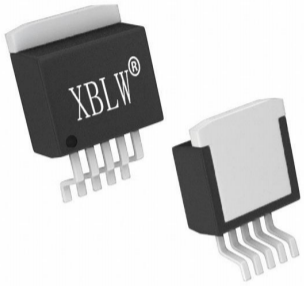
The MIC29302 is high current,high accuracy, low dropout voltage regulators.these regulators feature 370mV (full load 3A) typical dropout voltages and very low ground current(37mA TYP).Designed for high current loads, these devices also find applications in lower current, extremely low dropout-critical systems.

This device is fully protected against overcurrent faults, reversed input polarity, reversed lead insertion, overtemperature operation,and positive and negative transient voltage spikes.By setting the logic potential of the enabling end, the device can be controlled to work or flag state. In the flag state, the power consumption of the device is very low. The enabling end can also be directly connected with the power supply of the input end to make the device in working state.

It is available in TO-263-5 and TO-220-5 package.




TO-220-5L




TO-263-5L

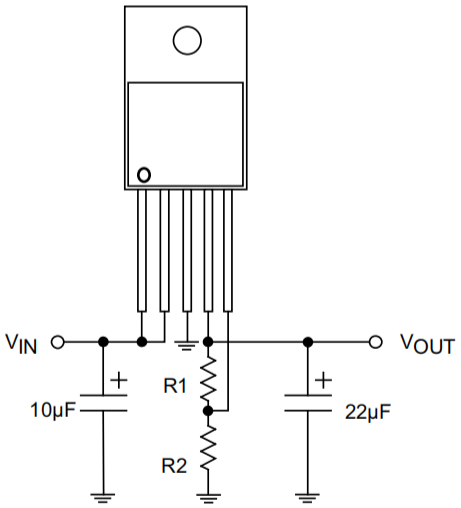
## Feature

- High Current Capability
- Low Dropout Voltage
- Low Ground Current
- High Accuracy
- Extremely Fast Transient Response
- Reverse-Battery and “Load Dump” Protection
- Zero-Current Shutdown Mode

## Applications

- Battery-Powered Equipment
- High-Efficiency Computer Systems
- High-Efficiency Linear Power Supplies
- High-Efficiency Post-Regulator for Switching Supply
- Automotive Electronics

## Typical Application

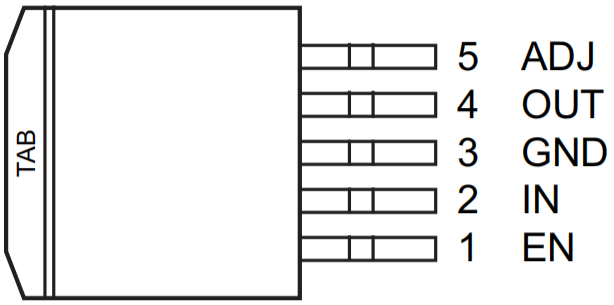



$$R1 = R2 \times \left(\frac{V_{OUT}}{1.240} - 1\right)$$

## Ordering Information

| Product Model | Package Type | Marking | Packing | Packing Qty |
|---|---|---|---|---|
| XBLW MIC29302N | TO-220-5L | MIC29302N | Tube | 1000pcs/Box |
| XBLW MIC29302DTR | TO-263-5L | MIC29302 | Tape | 750pcs/Reel |

## Pins Configuration




(TOP VIEW)

**Pin Function**

| No. | Name | Description |
|---|---|---|
| 1 | EN | Enabling end, compatible with CMOS logic level. When EN=H, the device works;<br>When EN=L, the device flags. |
| 2 | IN | Input voltage |
| 3 | GND | Ground |
| 4 | OUT | Output |
| 5 | ADJ | Adjust the feedback terminal, connected tothe output terminal and the ground terminal resistance voltage divider network, to set the output voltage value |

## Absolute Maximum Ratings Note 1

- Input Supply Voltage ($V_{IN}$) (Note 1). ： -20V~+60V
- Enable Input Voltage ($V_{EN}$) ： -0.3V~VIN
- Welding Temperature (5S)： 260℃
- Power Dissipation: Internally Limited
- Storage Temperature： -65℃~ 150℃
- ESD Rating：See Note 2

## Operation Extreme Ratings Note 2

- Operation Junction Temperature： -40℃~ 125℃
- Maximum Operating Input Voltage： 26V
- Thermal Resistor： 2℃/W

## Electrical Characteristics Note 4

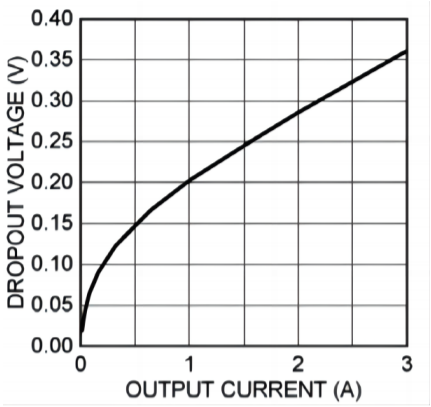
$V_{IN}=V_{OUT}+1V$ ， $T_J=25℃$ ， Values in bold indicate $-40℃ \le T_J \le +125℃$,unless otherwise specified.

| Parameter | Test Conditions | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Total Device | | | | | | |
| Output Voltage | $I_{OUT}$ = 10mA | | -1 | | 1 | % |
| | 10mA≤$I_{OUT}$ ≤$I_{FL}$ , ($V_{OUT}$+ 1V ) ≤$V_{IN}$≤26V | | -2 | | 2 | % |
| Line Regulation | $I_{OUT}$= 10mA ， ($V_{OUT}$+ 1V) ≤$V_{IN}$≤26V | | | 0.06 | 0.5 | % |
| Load Regulation | $V_{IN}$ = $V_{OUT}$ + 1V ， 10mA≤$I_{OUT}$≤1.5A | | | 0.2 | 1 | % |
| Output Voltage Temperature Coefficient | Note 5 | | | **20** | **100** | ppm/℃ |
| Dropout Voltage | △$V_{OUT}$=- 1%Note 6 | $I_{OUT}$= 100mA | | 80 | **175** | mV |
| | | $I_{OUT}$= 1.5A | | 250 | | mV |
| | | $I_{OUT}$= 3A | | 370 | **600** | mV |
| Ground Current | $V_{IN}$ = $V_{OUT}$ + 1V ， $I_{OUT}$= 1.5A | | | 10 | **35** | mA |
| | $V_{IN}$ = $V_{OUT}$ + 1V ， $I_{OUT}$=3A | | | 37 | | mA |
| Output Current Limit | $V_{OUT}$ =0V | Note 7 | | 4.5 | **5** | A |
| Output Noise Voltage | $I_{OUT}$= 100mA ， $C_L$= 10μF | | | 400 | | μV(rms) |
| | $I_{OUT}$= 100mA ， $C_L$=33μF | | | 260 | | μV(rms) |
| Reference | | | | | | |
| Reference Voltage | | | 1.228<br>**1.215** | 1.240 | 1.252<br>**1.265** | V |
| Adjust Pin Bias Current | | | | 40 | 80<br>**120** | nA |
| Reference Voltage Temperature Coefficient | | | | 20 | | ppm/℃ |
| Adjust Pin Bias Current Temperature Coefficient | | | | 0.1 | | nA/℃ |
| ENABLE Input - | | | | | | |
| Input Logic Voltage Low (OFF) | | | | | **0.8** | |
| Input Logic Voltage High (ON) | | | **2.4** | | | |
| Enable Pin Input Current | $V_{EN}$=26V | | | 100 | 600<br>**750** | μA |
| | $V_{EN}$=0.8V | | 0.7 | | 2<br>**4** | μA |
| Regulator Output Current in Shutdown | Note 8 | | | 10 | **500** | μA |

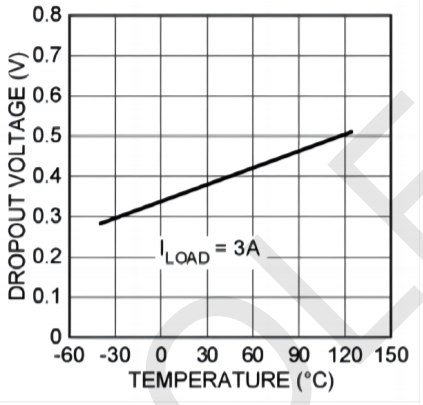
Note 1: Maximum positive supply voltage of 60V must be of limited duration (<100 ms) and duty cycle (≤1%). The maximum continuous supply voltage is 26V. Exceeding the absolute maximum rating may damage the device.
Note 2: Devices are ESD sensitive. Handling precautions recommended.
Note 3: The device is not guaranteed to function outside its operating ratings.
Note 4 ： Specification for packaged product only.； When used in dual supply systems where the regulator load is returned to a negative supply, the output voltage must be diode clamped to ground.
Note 5 ： Output voltage temperature coefficient is defined as the worst case voltage change divided by the total temperature range.
Note 6: Dropout voltage is defined as the input-to-output differential when the output voltage drops to 99% of its normal value with $V_{OUT}$ + 1V applied to $V_{IN}$.
Note 7 ： $V_{IN}=V_{OUT}+1V$ ， Employ pulse-testing procedures to pin current.
Note 8 ： $V_{EN}$≤0.8V ,and $V_{IN}$≤26V ， $V_{OUT}$=0V

## Typical Performance

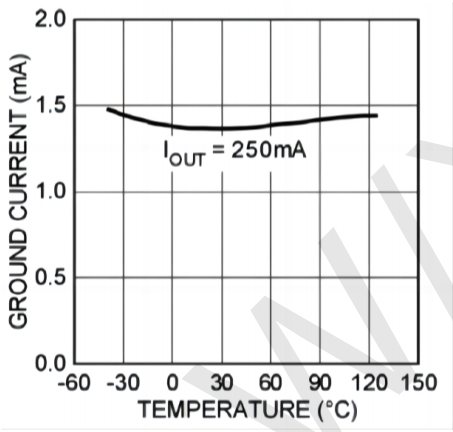
Dropout Voltage vs. Output Current



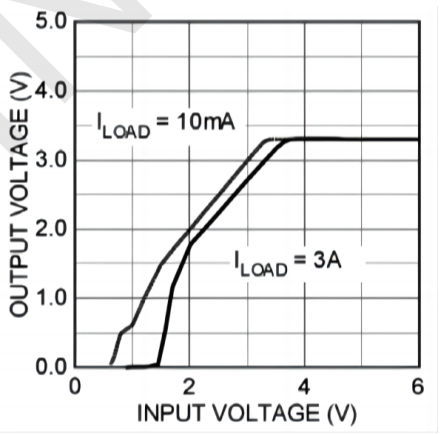

Dropout Voltage vs. Temperature.



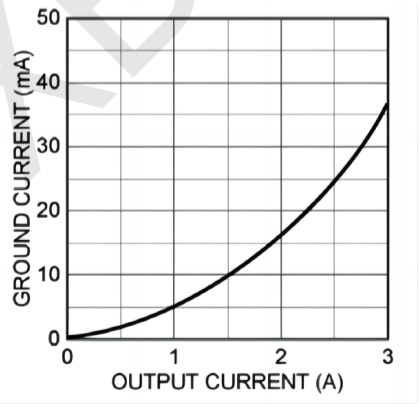

Ground Current vs. Temperature



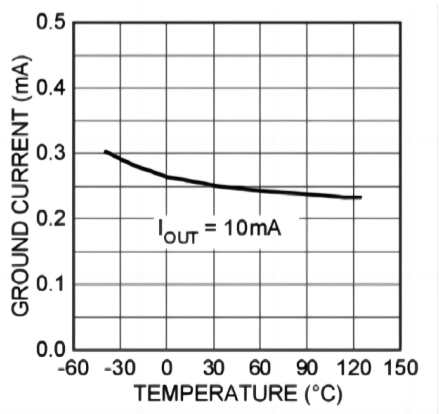

Dropout Characteristics



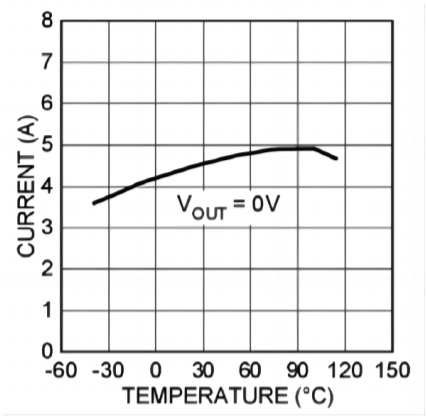

*Ground Current vs.Output Current*



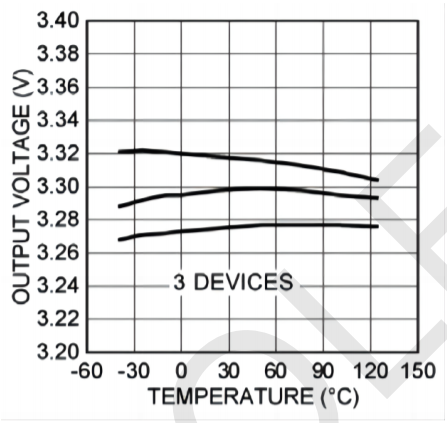

*Ground Current vs. Temperature.*



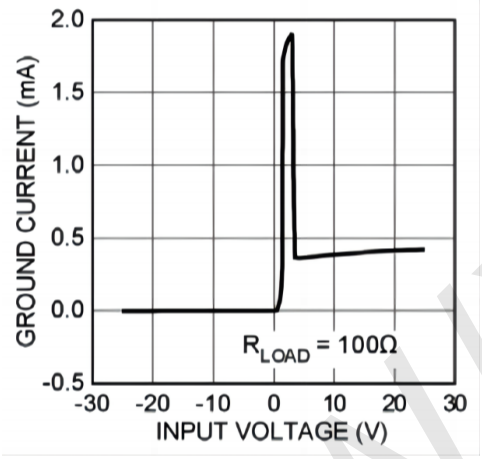
Short-Circuit Current vs. Temperature



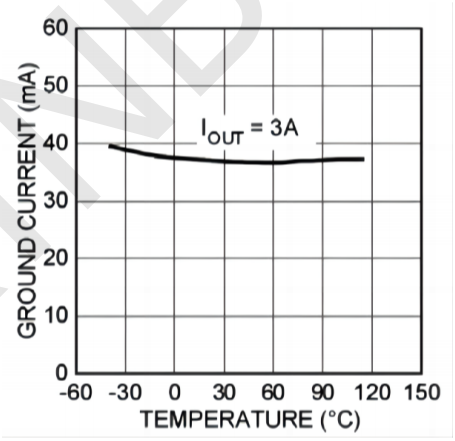

Output Voltage vs. Temperature



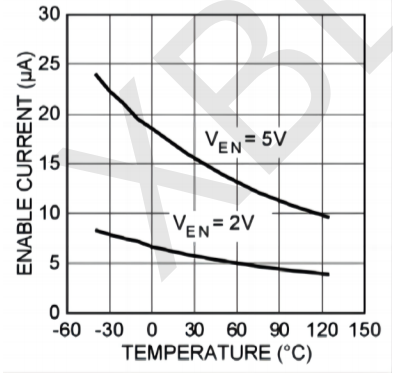

Ground Currentvs. Input Voltage



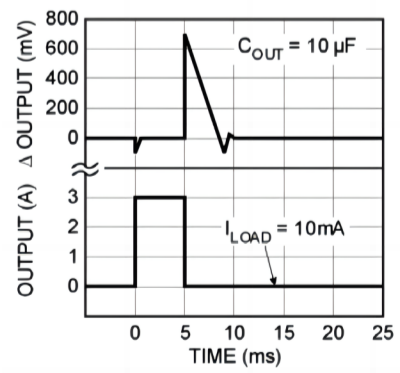

Ground Current vs. Temperature



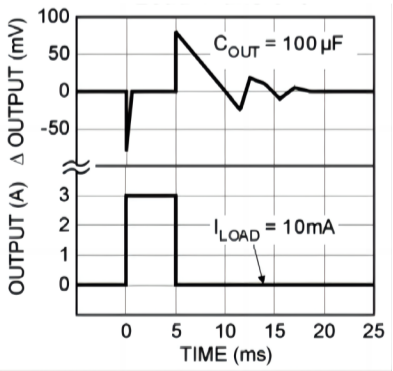

Output Voltage vs. Temperature



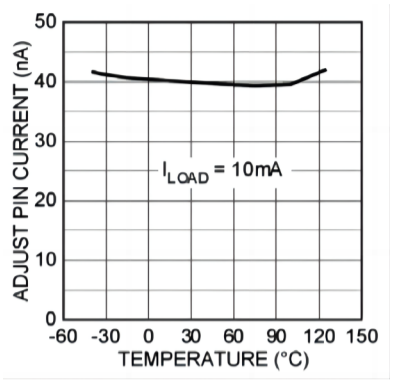

Enable Current vs. Temperature



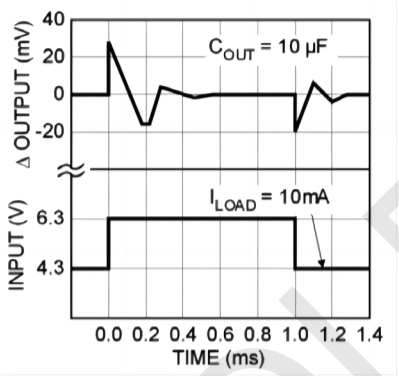

Load Transient



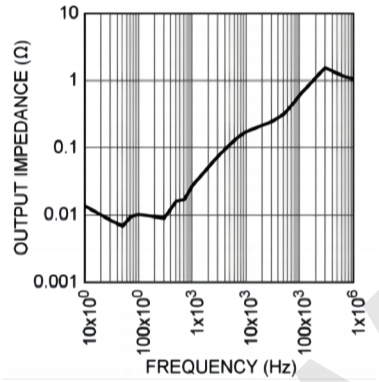
Adjust Pin Current vs. Temperature



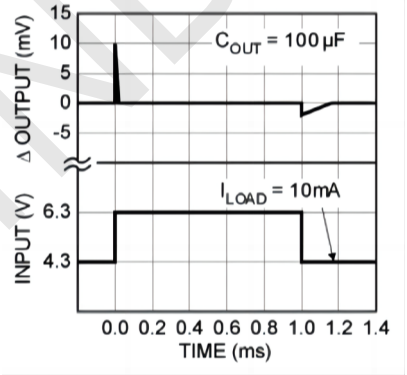

Line Transient



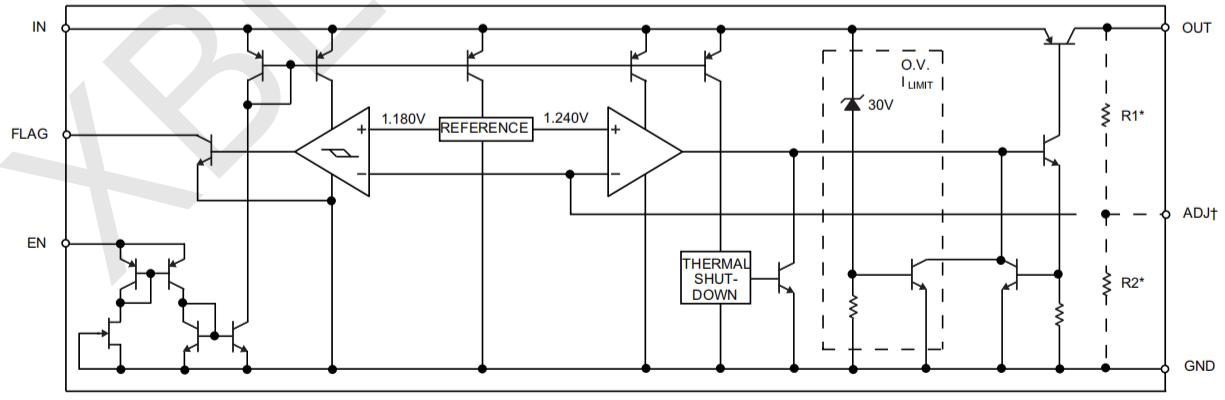

MOutput Impedance vs. Frequency




Line Transient




## Schematic Diagram




Note:FLAG is the undervoltage terminal, which is not cited in the MIC29302; for the fixed-voltage version of the device, the ADJ is connected to the connecting pin of the partial resistor network R1,R2 within the device.

## Application Information

### Protection

Current limiting is provided in MIC29302. This limiting is linear; output current under overload conditions is constant. Thermal shutdown disables the device when the die temperature exceeds the +150° C maximum safe operating temperature. Line transient protection allows device and load survival even when the input voltage spikes between －20V and +60V. When the input voltage exceeds approximately 32V, the overvoltage sensor disables the regulator. The output structure of these regulators allows voltages in excess of the desired output voltage to be applied without reverse current flow. MIC29xx1 and MIC29xx2 versions offer a logic-level ON/OFF control. When disabled, the devices draw nearly zero current.

### Thermal Design Example

MIC 29302 is simple to use. The most complicated design parameters to consider are thermal characteristics.For example:when $T_A$=50° C , with $V_{IN}$ = 5V, $V_{OUT}$ = 3.3V, and $I_{OUT}$ = 1A, $\theta$ JA=31.4 ℃/W,The ground current is about 0.01 of $I_{OUT}$

$$P_D = I_{OUT} \cdot (1.01\ V_{IN} - V_{OUT}) = 1.75W$$

$$T_J = T_A + P_D \cdot \theta J_A = 50 + 1.75 \cdot 31.4 = 104.95℃$$

It is less than the maximum junction temperature of 125℃, which can ensure the reliable operation of the device.

### Capacitor Requirements

For stability and minimum output noise, a capacitor on the regulator output is necessary. The value of this capacitor is dependent upon the output current; lower currents allow smaller capacitors.In the full load range, the selection of 10uF aluminum electrolytic capacitor can meet the application, in the application field requiring fast transient response of the load, tantalum capacitor is recommended.A capacitance of 0.1uF is recommended for filtering between the input and the ground.

### Minimum Load Current

If the load current is too small, the leakage current effect will increase the output voltage. Therefore, a minimum load current of 7mA is required to ensure the normal operation of MIC29302.

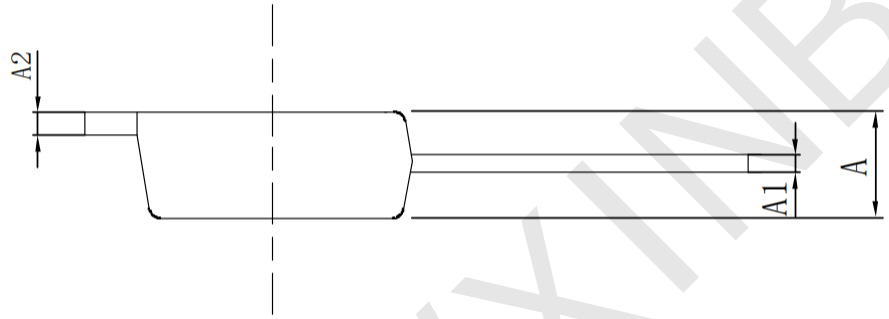
### Enable Input

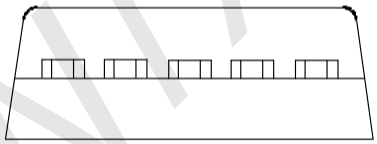
Enable the input potential to be compatible with TTL/CMOS level, and can be directly interfacing with logic devices, or directly connected to voltages below 30V. The enabling current of the device is about 20uA for normal operation.

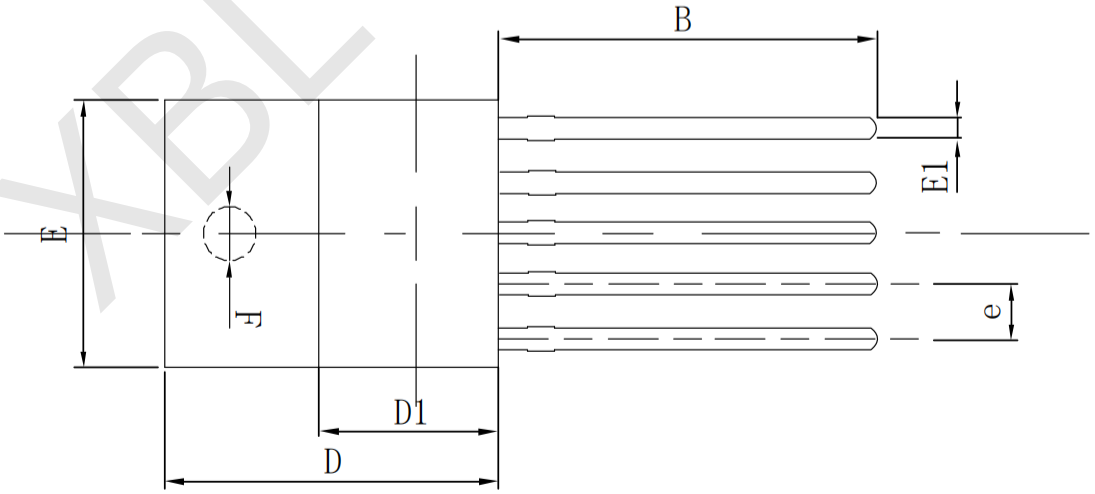
## Package Information

· TO-220-5L

| Size / Symbol | Dimensions In Millimeters | | Size / Symbol | Dimensions In Inches | |
|---|---|---|---|---|---|
| | Min(mm) | Max(mm) | | Min(in) | Max(in) |
| A | 4.300 | 4.700 | A | 0.169 | 0.185 |
| A1 | 0.450 | 0.600 | A1 | 0.017 | 0.023 |
| A2 | 1.250 | 1.400 | A2 | 0.049 | 0.055 |
| B | 12.88 | 13.38 | B | 0.507 | 0.527 |
| D | 15.50 | 15.90 | D | 0.610 | 0.626 |
| D1 | 9.000 | 9.400 | D1 | 0.354 | 0.370 |
| E | 9.700 | 10.10 | E | 0.381 | 0.398 |
| E1 | 0.660 | 0.914 | E1 | 0.025 | 0.036 |
| e | 1.702(BSC) | | e | 0.670(BSC) | |
| F | Φ3.500 | Φ3.700 | F | Φ0.137 | Φ0.146 |

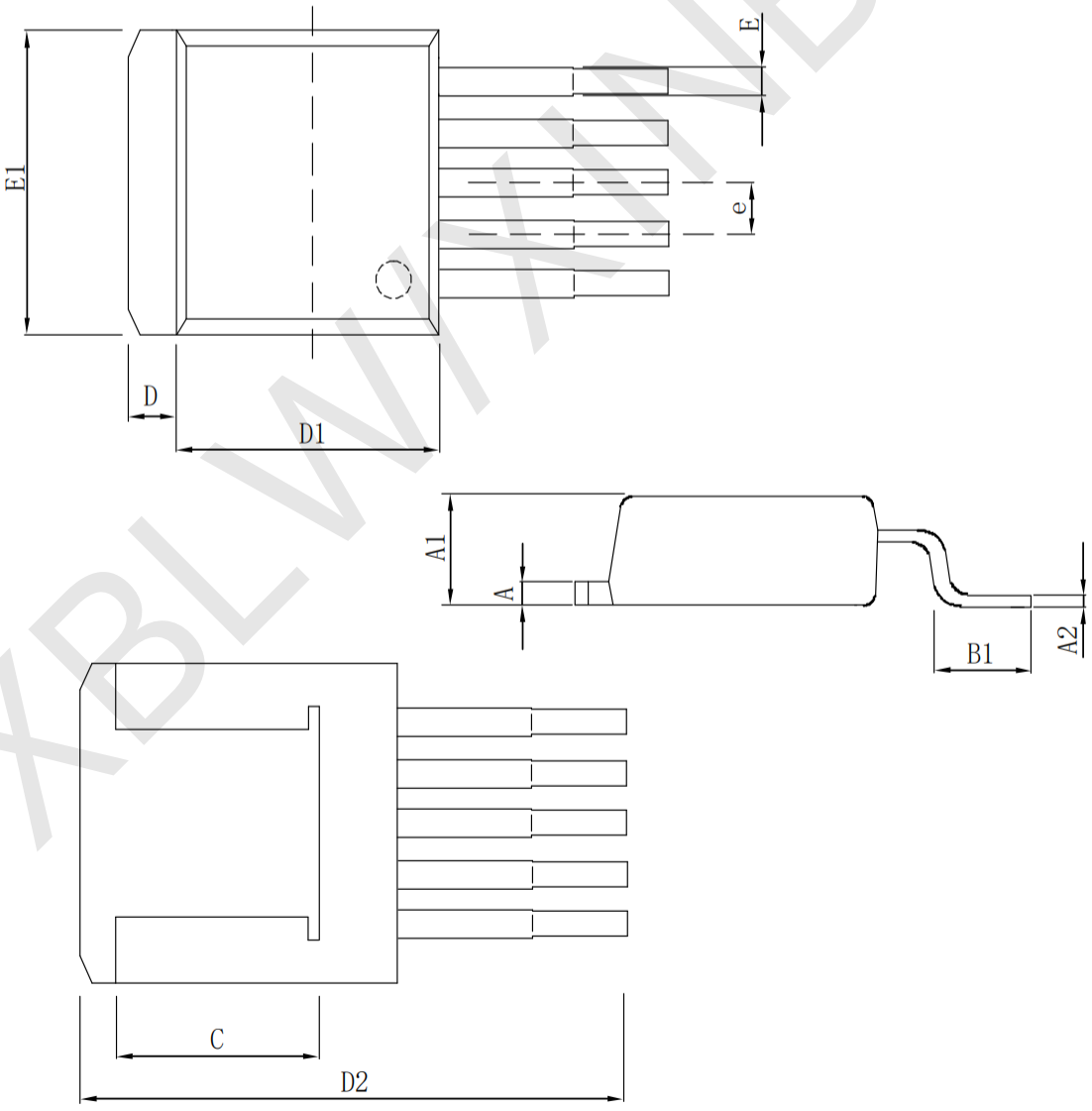




## · TO-263-5L

| Size / Symbol | Dimensions In Millimeters | | Size / Symbol | Dimensions In Inches | |
|---|---|---|---|---|---|
| | Min(mm) | Max(mm) | | Min(in) | Max(in) |
| A | 1.170 | 1.370 | A | 0.046 | 0.054 |
| A1 | 4.470 | 4.670 | A1 | 0.176 | 0.184 |
| A2 | 0.310 | 0.530 | A2 | 0.012 | 0.021 |
| B1 | 2.340 | 2.740 | B1 | 0.092 | 0.108 |
| C | 5.080(REF) | | C | 0.200(REF) | |
| D | 1.170 | 1.370 | D | 0.046 | 0.054 |
| D1 | 8.500 | 8.900 | D1 | 0.335 | 0.350 |
| D2 | 14.55 | 15.55 | D2 | 0.572 | 0.612 |
| E | 0.660 | 0.860 | E | 0.025 | 0.034 |
| E1 | 10.01 | 10.31 | E1 | 0.394 | 0.406 |
| e | 1.700(BSC) | | e | 0.067(BSC) | |



## Statement:

- XBLW reserves the right to modify the product manual without prior notice! Before placing an order, customers need to confirm whether the obtained information is the latest version and verify the completeness of the relevant information.
- Any semi-guide product is subject to failure or malfunction under specified conditions. It is the buyer's responsibility to comply with safety standards when using XBLW products for system design and whole machine manufacturing. And take the appropriate safety measures to avoid the potential in the risk of loss of personal injury or loss of property situation!
- XBLW products have not been licensed for life support, military, and aerospace applications, and therefore XBLW is not responsible for any consequences arising from the use of this product in these areas.
- If any or all XBLW products (including technical data, services) described or contained in this document are subject to any applicable local export control laws and regulations, they may not be exported without an export license from the relevant authorities in accordance with such laws.
- The specifications of any and all XBLW products described or contained in this document specify the performance, characteristics, and functionality of said products in their standalone state, but do not guarantee the performance, characteristics, and functionality of said products installed in Customer's products or equipment. In order to verify symptoms and conditions that cannot be evaluated in a standalone device, the Customer should ultimately evaluate and test the device installed in the Customer's product device.
- XBLW documentation is only allowed to be copied without any alteration of the content and with the relevant authorization. XBLW assumes no responsibility or liability for altered documents.
- XBLW is committed to becoming the preferred semiconductor brand for customers, and XBLW will strive to provide customers with better performance and better quality products.