

TX2304 Synchronous Step-Up DC-DC Converter with PFM Control

<http://www.txsemi.com>

Features

- External parts: Coil, capacitor
- Output voltage: Settable to between 2.0V to 5.0V in 0.1V steps
- Maximum Oscillation frequency :300KHz
- Accuracy of $\pm 2\%$
- High efficiency :95%
- Package: SOT23, SOT23-3, SOT23-5, SOT89 and DFN1*1

Applications

- Digital cameras
- Electronic notebooks and PDAS
- Portable CD/MD players
- Cameras, video equipment
- Communications equipment
- Power supply for microcomputers

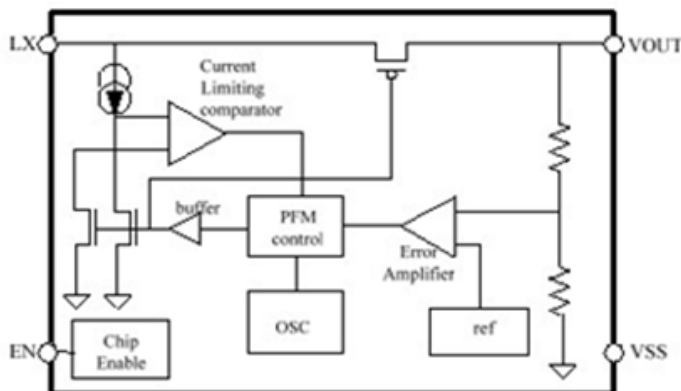
General Description

The TX2304 Series is a Synchronous step-up DC/DC Converter with PFM Control.

With the TX2304 Series, a step-up switching DC/DC converter can be configured by using

an external coil 、 capacitor. The built-in MOSFET is turned off by a protection circuit when the voltage at the LX pin exceeds the limit to prevent it from being damaged.

Block Diagram



Order Information

TX2304-①②③④

| Designator | Symbol | Description |
|------------|---------|--|
| ① ② | Integer | Output Voltage (2.0~5.0) e.g:3.0V=①: 3; ②: 0 |
| ③ | N | Package: SOT23 |
| | M | Package: SOT23-3 |
| | M5 | Package: SOT23-5 |
| | P | Package: SOT89 |
| | FC | Package: DFN1*1 |
| ④ | R | RoHS / Pb Free |
| | G | Halogen Free |

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Pin Assignment

SOT23 and SOT23-3 (Top View)

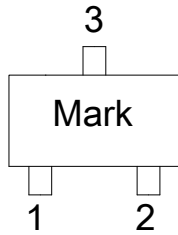


Table1 TX2304-XXNG/MG series (SOT23/SOT23-3 PKG)

| PIN NO. | PIN NAME | FUNCTION |
|---------|----------|----------------------------------|
| 1 | GND | GND pin |
| 2 | LX | External inductor connection pin |
| 3 | VOUT | Output voltage pin |

SOT23-5 (Top View)

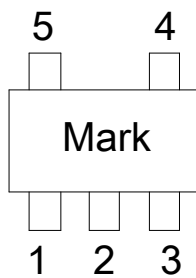


Table2 TX2304-XXM5G series (SOT23-5 PKG)

| PIN NO. | PIN NAME | FUNCTION |
|---------|----------|----------------------------------|
| 1 | EN | Shutdown pin |
| 2 | VOUT | Output voltage pin |
| 3 | NC | (N.C.) |
| 4 | GND | GND pin |
| 5 | LX | External inductor connection pin |

SOT89 (Top View)

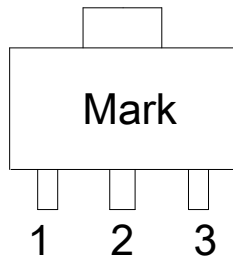


Table3 TX2304-XXPG series (SOT89 PKG)

| PIN NO. | PIN NAME | FUNCTION |
|---------|----------|----------------------------------|
| 1 | GND | GND pin |
| 2 | VOUT | Output voltage pin |
| 3 | LX | External inductor connection pin |

DFN1*1-4L (Top View)

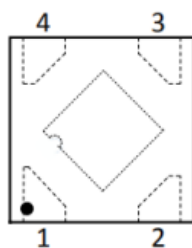


Table4 TX2304-XXFCG series (DFN1*1PKG)

| PIN NO. | PIN NAME | FUNCTION |
|---------|----------|----------------------------------|
| 1 | LX | External inductor connection pin |
| 2 | GND | GND pin |
| 3 | CE | Enable pin |
| 4 | VOUT | Output voltage pin |

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Marking Rule

①② product code: B1

③ output voltage code:

| Symbol | Voltage(V) | Symbol | Voltage(V) | Symbol | Voltage(V) | Symbol | Voltage(V) |
|--------|------------|--------|------------|--------|------------|--------|------------|
| a | 0.9 | A | 3.5 | n | 2.2 | N | 4.8 |
| b | 1.0 | B | 3.6 | o | 2.3 | O | 4.9 |
| c | 1.1 | C | 3.7 | P | 2.4 | P | 5.0 |
| d | 1.2 | D | 3.8 | q | 2.5 | Q | 5.1 |
| e | 1.3 | E | 3.9 | r | 2.6 | R | 5.2 |
| f | 1.4 | F | 4.0 | s | 2.7 | S | 5.3 |
| g | 1.5 | G | 4.1 | t | 2.8 | T | 5.4 |
| h | 1.6 | H | 4.2 | u | 2.9 | U | 5.5 |
| i | 1.7 | I | 4.3 | v | 3.0 | V | 5.6 |
| j | 1.8 | J | 4.4 | w | 3.1 | W | 5.7 |
| k | 1.9 | K | 4.5 | x | 3.2 | X | 5.8 |
| l | 2.0 | L | 4.6 | y | 3.3 | Y | 5.9 |
| m | 2.1 | M | 4.7 | z | 3.4 | Z | 6.0 |

④⑤:

The last two of them are based on the time of this product which is the first time into production, the fourth is the year of this product first time into production, such as expressed in "5" in 2015, in "6" in 2016 and the fifth is the month of this product first time into production, it can be in 1 ~ 9, which is expressed in "0" in October, in November with an "A", in December with "B"; . For example: B1y33 represents TX2304-33NG product is first put into production in March in 2023.

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Absolute Maximum Ratings

(Unless otherwise specified, Ta=25°C)

| PARAMETER | | SYMBOL | RATINGS | UNITS |
|-----------------------|-----------------|------------------|---|-------|
| VOUT Pin Voltage | | V _{OUT} | 0~ 8 | V |
| EN Pin Voltage | | EN | 0~V _{IN} | V |
| VIN Pin Voltage | | V _{IN} | 0~V _{OUT} | V |
| LX Pin Voltage | | V _{LX} | V _{SS} -0.3~V _{SS} +8 | V |
| LX Pin Current | | I _{LX} | 400 | mA |
| Power Dissipation | SOT23 | PD | 250 | mW |
| | SOT23-3/SOT23-5 | | 250 | mW |
| | SOT89-3 | | 500 | mW |
| | DFN1*1-4L | | 500 | mW |
| Operating Temperature | | T _{OPR} | -40~+85 | °C |
| Storage Temperature | | T _{STG} | -40~+125 | °C |

Note: These are stress ratings only. Stresses exceeding the range specified under “Absolute Maximum Ratings” may cause substantial damage to the device. Functional operation of this device at other conditions beyond those listed in the specification is not implied and prolonged exposure to extreme conditions may affect device reliability.

Electrical Characteristics

(Unless otherwise specified, Ta = 25°C)

| PARAMETER | SYMBOL | MIN | TYP | MAX | UNITS | CONDITION |
|-------------------------------------|------------------|------------------------------|------------------|------------------------------|-------|--|
| Output Voltage | V _{OUT} | V _{OUT(S)} X0.98 | V _{OUT} | V _{OUT(S)} X1.02 | V | - |
| Input Voltage | V _{IN} | - | - | V _{OUT} | V | - |
| Operation Start Voltage | V _{ST1} | - | 0.86 | - | V | I _{OUT} =1mA |
| Input Current At No Load | I _{SS1} | - | 8 | 25 | uA | V _{IN} =2.5V, V _{OUT} =3.3V |
| Current Consumption 2 | I _{SS2} | - | 5 | -- | uA | V _{OUT} =V _{OUT(S)} +0.5V |
| Current Consumption During Shutdown | I _{SSS} | - | - | 1.0 | uA | V _{EN} =0V |
| Maximum Oscillation Frequency | fosc | | 300 | | KHz | V _{OUT} =0.95xV _{OUT(S)} , measure Waveform at LX pin |
| Duty Ratio | Duty | 70 | 78 | 85 | % | V _{OUT} =0.95xV _{OUT(S)} |
| Efficiency | EFFI | | 85 | | % | |
| Shutdown Pin Input Voltage | V _{SH} | 0.75 | - | - | V | V _{OUT} =0.95xV _{OUT(S)} , judge Oscillation at LX pin |
| | V _{SL} | - | - | 0.3 | V | V _{OUT} =0.95xV _{OUT(S)} , judge stop at LX pin |
| Shutdown Pin input Current | I _{SH} | -0.1 | - | 0.1 | uA | V _{EN} =5V |
| | I _{SL} | -0.1 | - | 0.1 | uA | V _{EN} =0V |

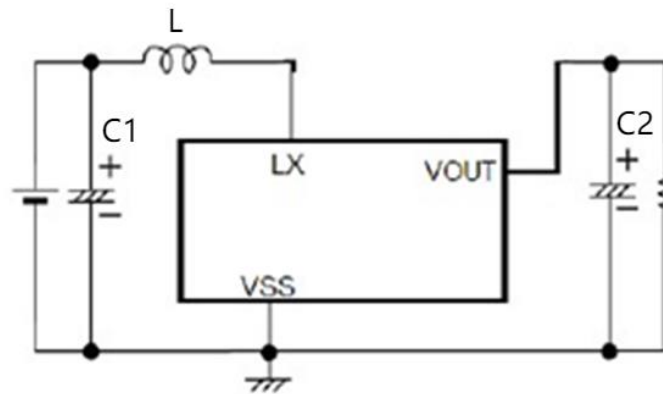
Remark: VOUT(S) specified above is the set output voltage value and VOUT is the typical value of the actual output voltage

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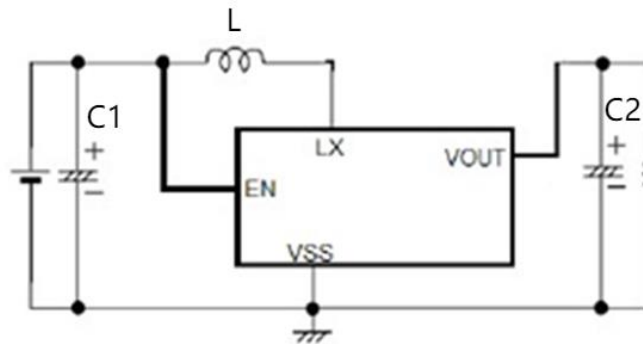
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Application Circuits

1) TX2304 without CE



2) TX2304 with CE



Note: External Component Recommendation:

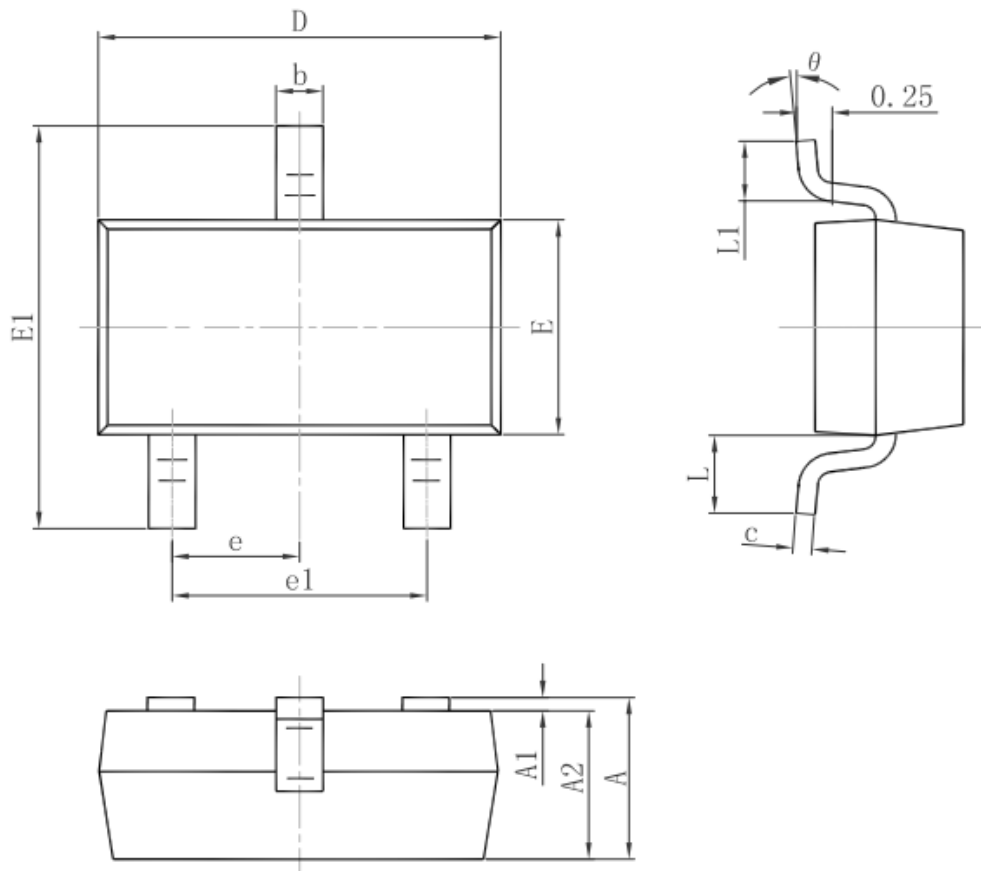
- 1) L=47uH(Sumida)
- 2) C=100uF/16V(Tantalum)

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Package Information

3-pin SOT23 Outline Dimensions

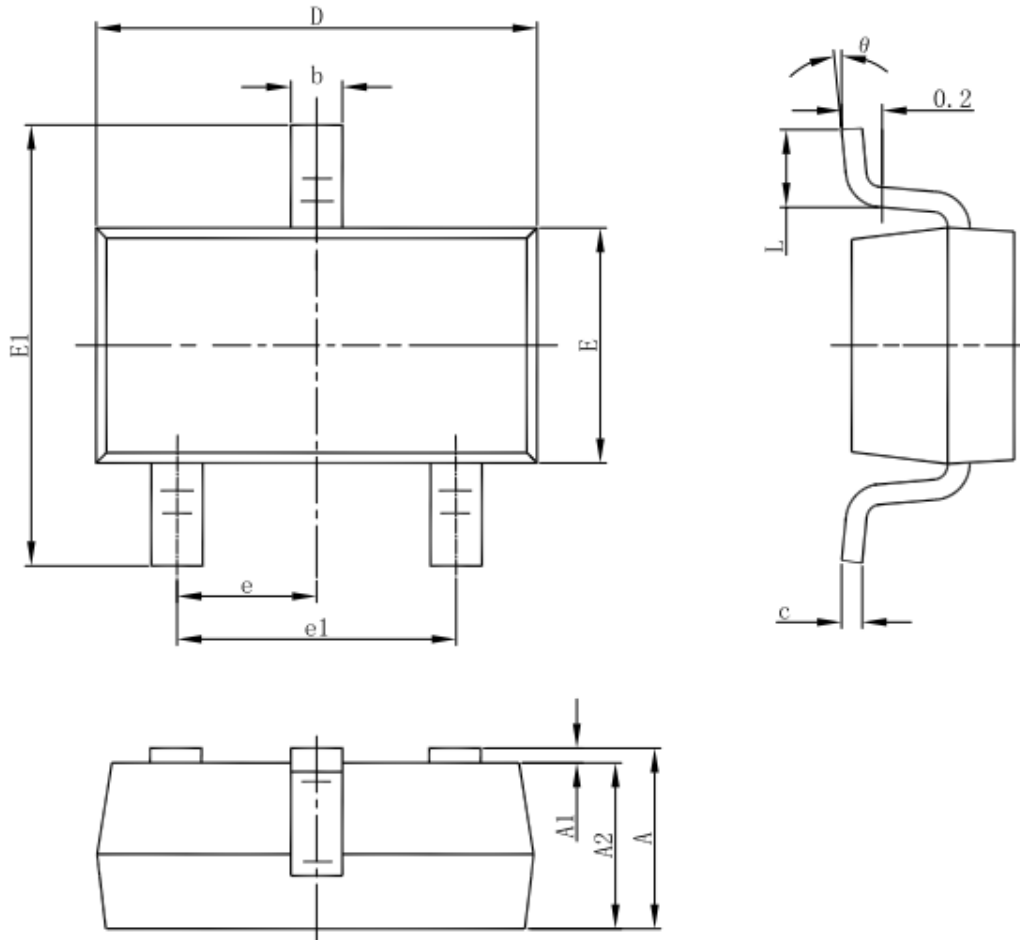


| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|-------|----------------------|-------|
| | Min. | Max. | Min. | Max. |
| A | 0.900 | 1.150 | 0.035 | 0.045 |
| A1 | 0.000 | 0.100 | 0.000 | 0.004 |
| A2 | 0.900 | 1.050 | 0.035 | 0.041 |
| b | 0.300 | 0.500 | 0.012 | 0.020 |
| c | 0.080 | 0.150 | 0.003 | 0.006 |
| D | 2.800 | 3.000 | 0.110 | 0.118 |
| E | 1.200 | 1.400 | 0.047 | 0.055 |
| E1 | 2.250 | 2.550 | 0.089 | 0.100 |
| e | 0.950 TYP. | | 0.037 TYP. | |
| e1 | 1.800 | 2.000 | 0.071 | 0.079 |
| L | 0.550 REF. | | 0.022 REF. | |
| L1 | 0.300 | 0.500 | 0.012 | 0.020 |
| θ | 0° | 8° | 0° | 8° |

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3-pin SOT23-3 Outline Dimensions

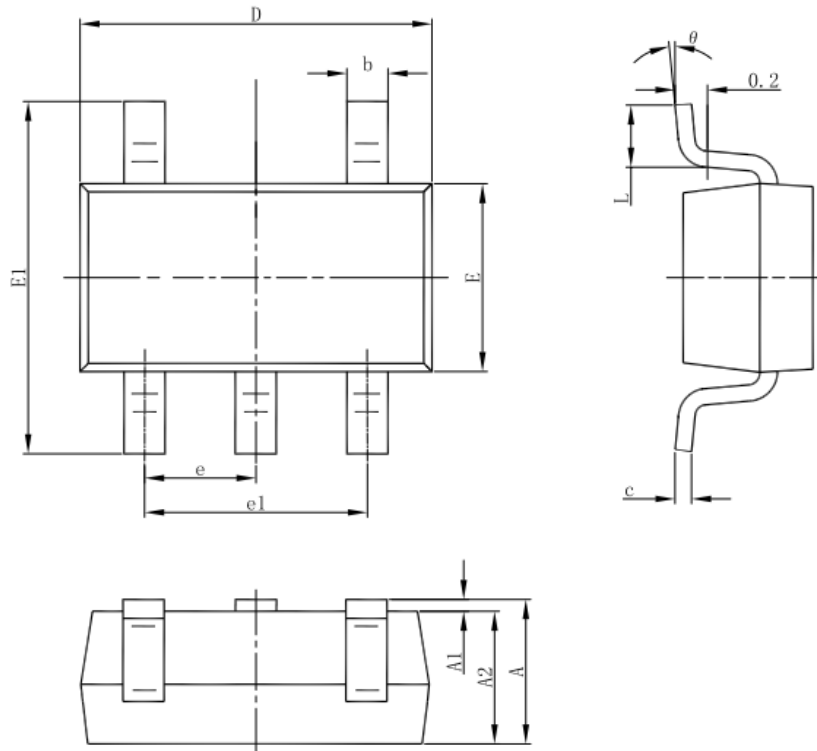


| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|-------|----------------------|-------|
| | Min | Max | Min | Max |
| A | 1.050 | 1.250 | 0.041 | 0.049 |
| A1 | 0.000 | 0.100 | 0.000 | 0.004 |
| A2 | 1.050 | 1.150 | 0.041 | 0.045 |
| b | 0.300 | 0.500 | 0.012 | 0.020 |
| c | 0.100 | 0.200 | 0.004 | 0.008 |
| D | 2.820 | 3.020 | 0.111 | 0.119 |
| E | 1.500 | 1.700 | 0.059 | 0.067 |
| E1 | 2.650 | 2.950 | 0.104 | 0.116 |
| e | 0.950(BSC) | | 0.037(BSC) | |
| e1 | 1.800 | 2.000 | 0.071 | 0.079 |
| L | 0.300 | 0.600 | 0.012 | 0.024 |
| theta | 0° | 8° | 0° | 8° |

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5-pin SOT23-5L Outline Dimensions

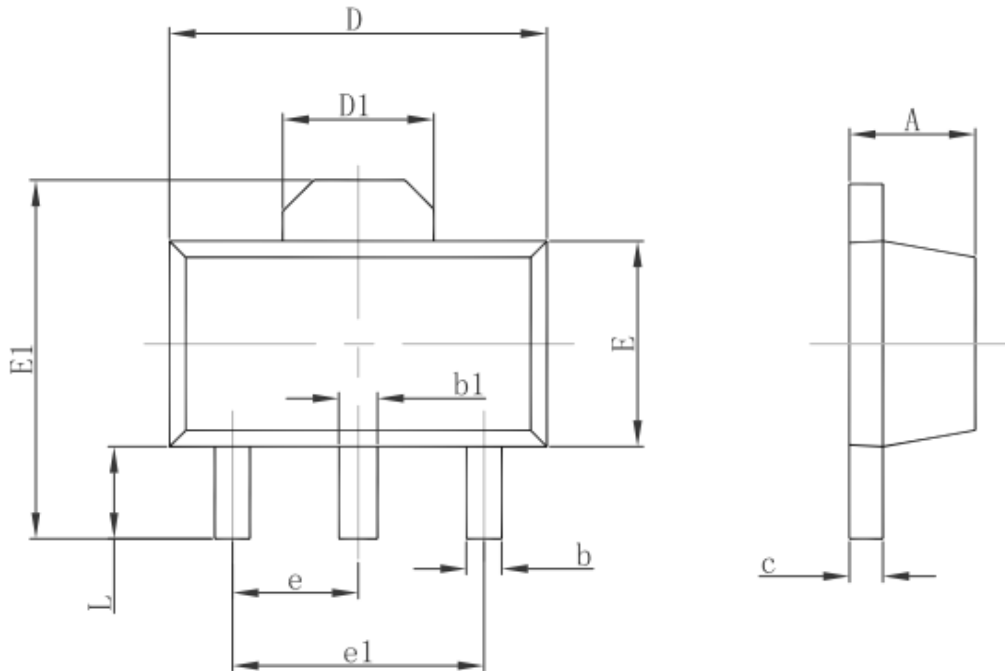


| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|-------|----------------------|-------|
| | Min | Max | Min | Max |
| A | 1.050 | 1.250 | 0.041 | 0.049 |
| A1 | 0.000 | 0.100 | 0.000 | 0.004 |
| A2 | 1.050 | 1.150 | 0.041 | 0.045 |
| b | 0.300 | 0.500 | 0.012 | 0.020 |
| c | 0.100 | 0.200 | 0.004 | 0.008 |
| D | 2.820 | 3.020 | 0.111 | 0.119 |
| E | 1.500 | 1.700 | 0.059 | 0.067 |
| E1 | 2.650 | 2.950 | 0.104 | 0.116 |
| e | 0.950(BSC) | | 0.037(BSC) | |
| e1 | 1.800 | 2.000 | 0.071 | 0.079 |
| L | 0.300 | 0.600 | 0.012 | 0.024 |
| theta | 0° | 8° | 0° | 8° |

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3-pin SOT89-3 Outline Dimensions

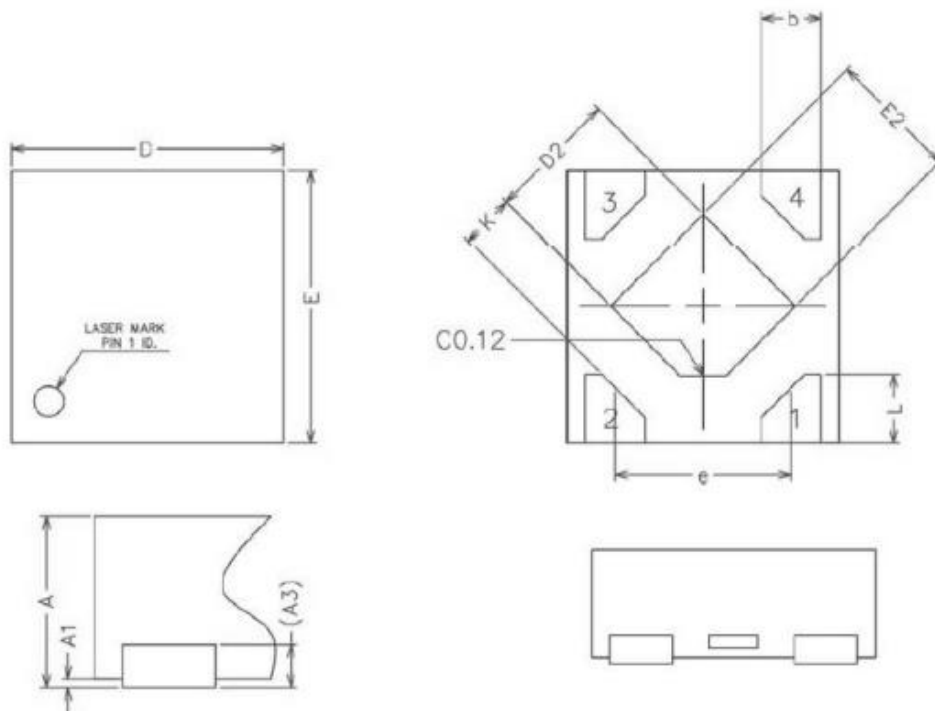


| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|-------|----------------------|-------|
| | Min. | Max. | Min. | Max. |
| A | 1.400 | 1.600 | 0.055 | 0.063 |
| b | 0.320 | 0.520 | 0.013 | 0.020 |
| b1 | 0.400 | 0.580 | 0.016 | 0.023 |
| c | 0.350 | 0.440 | 0.014 | 0.017 |
| D | 4.400 | 4.600 | 0.173 | 0.181 |
| D1 | 1.550 REF. | | 0.061 REF. | |
| E | 2.300 | 2.600 | 0.091 | 0.102 |
| E1 | 3.940 | 4.250 | 0.155 | 0.167 |
| e | 1.500 TYP. | | 0.060 TYP. | |
| e1 | 3.000 TYP. | | 0.118 TYP. | |
| L | 0.900 | 1.200 | 0.035 | 0.047 |

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DFN1*1-4L Outline Dimensions



COMMON DIMENSIONS (UNITS OF MEASURE=MILLIMETER)

| SYMBOL | MIN | NOM | MAX |
|--------|----------|------|------|
| A | 0.34 | 0.37 | 0.40 |
| A1 | 0.00 | 0.02 | 0.05 |
| A3 | 0.100REF | | |
| b | 0.17 | 0.22 | 0.27 |
| D | 0.95 | 1.00 | 1.05 |
| E | 0.95 | 1.00 | 1.05 |
| D2 | 0.43 | 0.48 | 0.53 |
| E2 | 0.43 | 0.48 | 0.53 |
| L | 0.20 | 0.25 | 0.30 |
| e | — | 0.65 | — |
| K | 0.15 | — | — |

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