



XTP2021

Ultra-Low Power Consumption LDO

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1 μ A, 300mA Low Dropout Voltage Linear Regulator

General Description

The XTP2021 is a ultra-low-power, low-step-down linear regulator that supports a wide voltage input of 1.8V to 5.5V and a standby current of 1 μ A, making these devices ideal for battery-powered systems that spend most of their time in standby mode, requiring minimal standby power consumption to extend the life of the device. Integrated enable control mode that reduces current to only 100nA(typical) when the low level enable signal is turned off.

XTP2021 only needs 1 μ F ceramic capacitor to work normally. The XTP2021 integrated short-circuit current limiting and thermal shutdown protection. And has automatic discharge function, can be disabled in the state of rapid discharge V_{OUT} .

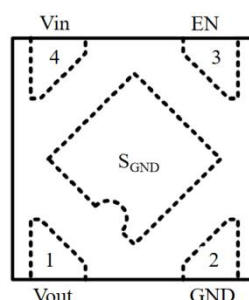
The operating temperature range is -40 $^{\circ}$ C~ +85 $^{\circ}$ C.

Applications

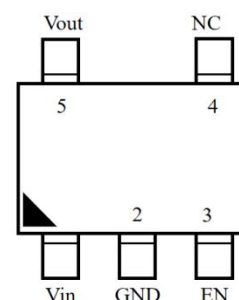
- Portable, Battery Powered Equipment
- Low Power Microcontrollers
- Laptop, Palmtops and PDAs
- Wireless Communication Equipment
- Audio/Video Equipment
- Car Navigation System

Features

- 1 μ A Ground Current at no Load
- $\pm 2\%$ Output Accuracy
- 300mA Output Current
- 10nA Shutdown Current
- Input Voltage Range: 1.8V to 5.5V
- Dropout Voltage: 0.18V at 300mA
- Fixed Output Voltage 0.9V, 1.05V, 1.2V, 1.5V, 1.8V, 1.9V, 2.5V, 2.7V, 2.8V, 2.85V, 2.9V, 3.0V, 3.3V
- Stable with Ceramic or Tantalum Capacitor
- Current Limit Protection
- Over-Temperature Protection
- DFN1x1-4L, SOT-23-5 Packages Available



DFN1x1-4L



SOT-23-5

Ordering Information

| MODEL | PACKAGE DESCRIPTION | ORDERING NUMBER | PACKAGE MARKING | PACKING OPTION |
|--------------|---------------------|------------------|-----------------|----------------------|
| XTP2021-0.9 | DFN1x1-4L | XTP2021-090AD1CT | 1A YW | Tape and Reel, 12000 |
| XTP2021-1.05 | DFN1x1-4L | XTP2021-105AD1CT | 1B YW | Tape and Reel, 12000 |
| XTP2021-1.2 | DFN1x1-4L | XTP2021-120AD1CT | 1C YW | Tape and Reel, 12000 |
| XTP2021-1.5 | DFN1x1-4L | XTP2021-150AD1CT | 1D YW | Tape and Reel, 12000 |
| XTP2021-1.8 | DFN1x1-4L | XTP2021-180AD1CT | 1E YW | Tape and Reel, 12000 |
| XTP2021-1.9 | DFN1x1-4L | XTP2021-190AD1CT | 1F YW | Tape and Reel, 12000 |
| XTP2021-2.5 | DFN1x1-4L | XTP2021-250AD1CT | 1G YW | Tape and Reel, 12000 |
| XTP2021-2.7 | DFN1x1-4L | XTP2021-270AD1CT | 1H YW | Tape and Reel, 12000 |
| XTP2021-2.8 | DFN1x1-4L | XTP2021-280AD1CT | 1I YW | Tape and Reel, 12000 |
| XTP2021-2.85 | DFN1x1-4L | XTP2021-285AD1CT | 1J YW | Tape and Reel, 12000 |
| XTP2021-2.9 | DFN1x1-4L | XTP2021-290AD1CT | 1K YW | Tape and Reel, 12000 |
| XTP2021-3.0 | DFN1x1-4L | XTP2021-300AD1CT | 1L YW | Tape and Reel, 12000 |
| XTP2021-3.3 | DFN1x1-4L | XTP2021-330AD1CT | 1M YW | Tape and Reel, 12000 |
| | | | | |
| XTP2021-0.9 | SOT-23-5 | XTP2021-090AS2CT | P2021A YWZZX | Tape and Reel, 3000 |
| XTP2021-1.05 | SOT-23-5 | XTP2021-105AS2CT | P2021B YWZZX | Tape and Reel, 3000 |
| XTP2021-1.2 | SOT-23-5 | XTP2021-120AS2CT | P2021C YWZZX | Tape and Reel, 3000 |
| XTP2021-1.5 | SOT-23-5 | XTP2021-150AS2CT | P2021D YWZZX | Tape and Reel, 3000 |
| XTP2021-1.8 | SOT-23-5 | XTP2021-180AS2CT | P2021E YWZZX | Tape and Reel, 3000 |
| XTP2021-1.9 | SOT-23-5 | XTP2021-190AS2CT | P2021F YWZZX | Tape and Reel, 3000 |
| XTP2021-2.5 | SOT-23-5 | XTP2021-250AS2CT | P2021G YWZZX | Tape and Reel, 3000 |
| XTP2021-2.7 | SOT-23-5 | XTP2021-270AS2CT | P2021H YWZZX | Tape and Reel, 3000 |
| XTP2021-2.8 | SOT-23-5 | XTP2021-280AS2CT | P2021I YWZZX | Tape and Reel, 3000 |
| XTP2021-2.85 | SOT-23-5 | XTP2021-285AS2CT | P2021J YWZZX | Tape and Reel, 3000 |
| XTP2021-2.9 | SOT-23-5 | XTP2021-290AS2CT | P2021K YWZZX | Tape and Reel, 3000 |
| XTP2021-3.0 | SOT-23-5 | XTP2021-300AS2CT | P2021L YWZZX | Tape and Reel, 3000 |
| XTP2021-3.3 | SOT-23-5 | XTP2021-330AS2CT | P2021M YWZZX | Tape and Reel, 3000 |

MARKING INFORMATION

NOTE:
 1X/P2021X: Device Code.
 YW : Date Code.
 ZZX: Inside Cod

Description of Functional Pins

| Pin No | Pin Name | Pin Function |
|-------------|------------------|---|
| DFN1x1-4L | | |
| 1 | V _{OUT} | Output of the Regulator |
| 2 | GND | Ground |
| 3 | EN | Enable Control Input |
| 4 | V _{IN} | Input of Supply Voltage |
| Exposed Pad | S _{GND} | Substrate of Chip. Leave floating or tie to GND |

| Pin No | Pin Name | Pin Function |
|-----------|------------------|-------------------------|
| SOT-23-5L | | |
| 1 | V _{IN} | Input of Supply Voltage |
| 2 | GND | Ground |
| 3 | EN | Enable Control Input |
| 4 | NC | No internal connection |
| 5 | V _{OUT} | Output of the Regulator |

Typical Application Circuit

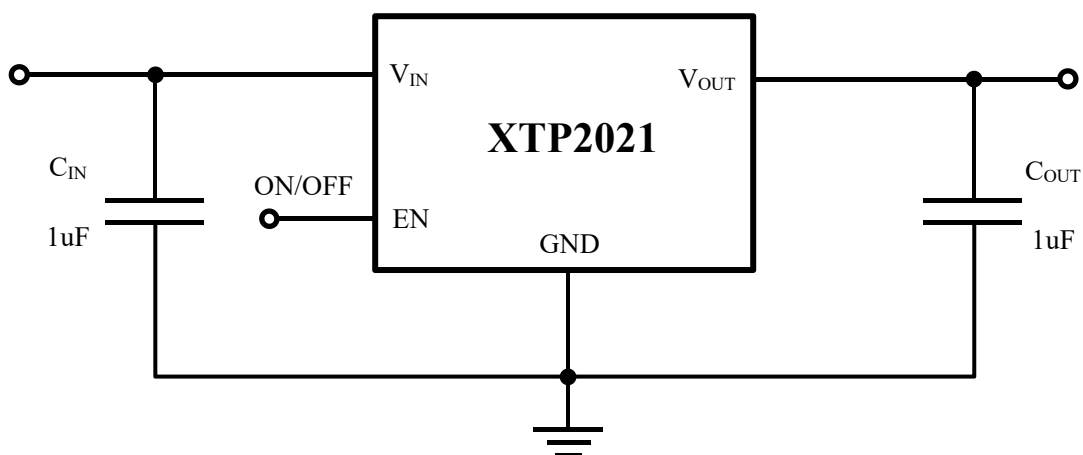
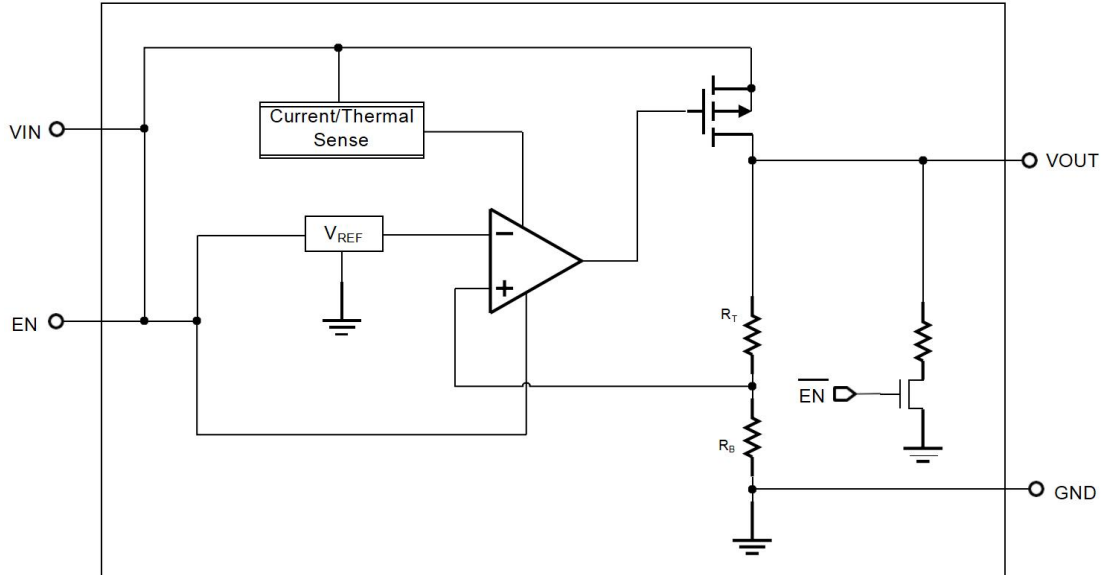


Figure 1: Application circuit of Fixed V_{OUT} LDO with enable function

Function Block Diagram



Absolute Maximum Ratings

| PARAMETER | | Min | Typ | Max | Unit |
|---|-----------|------|-----|-----|------|
| V_{IN} to GND | | -0.3 | | 6.5 | V |
| V_{OUT} , EN to GND | | -0.3 | | 6 | V |
| V_{OUT} to V_{IN} | | -6 | | 0.3 | V |
| Package Thermal Resistance, θ_{JA} | DFN1x1-4L | | 195 | | °C/W |
| | SOT-23-5L | | 200 | | °C/W |
| Lead Temperature (Soldering, 10 sec) | | | | 260 | °C |
| Junction Temperature | | -40 | | 150 | °C |
| Storage Temperature Range | | -60 | | 150 | °C |

ESD Susceptibility

| | Symbol | | Value | Unit |
|-------------------------|-----------|-----|-------|------|
| Electrostatic discharge | V_{ESD} | HBM | 2 | KV |
| | | MM | 200 | V |
| | | CDM | 1 | KV |

Recommended Operating Conditions

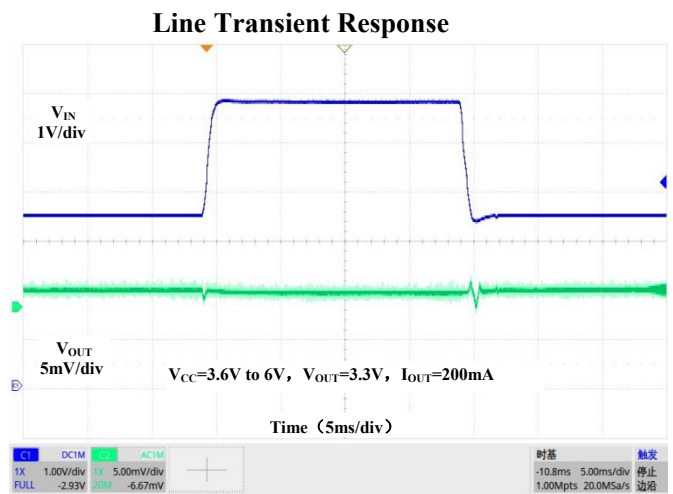
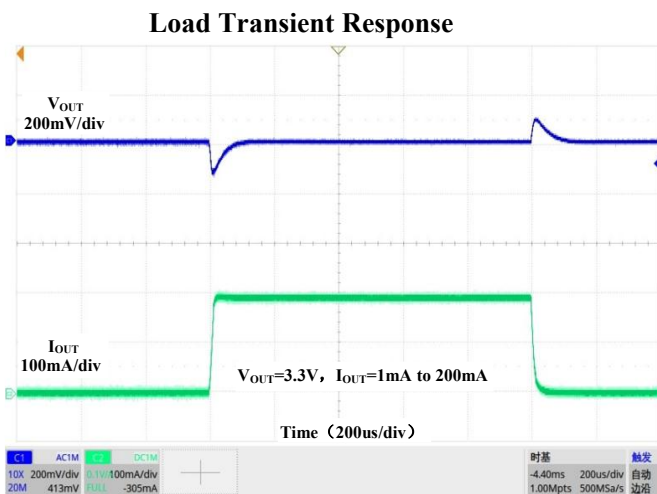
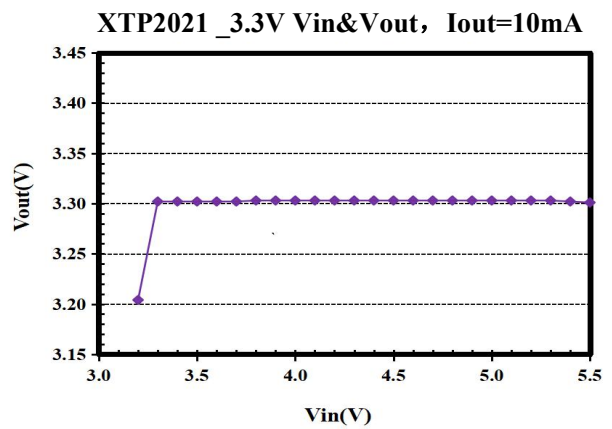
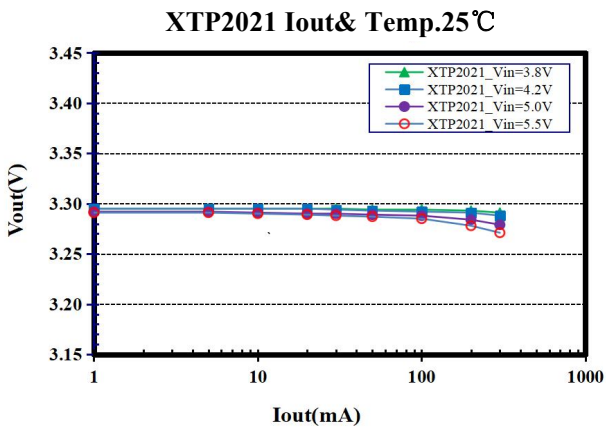
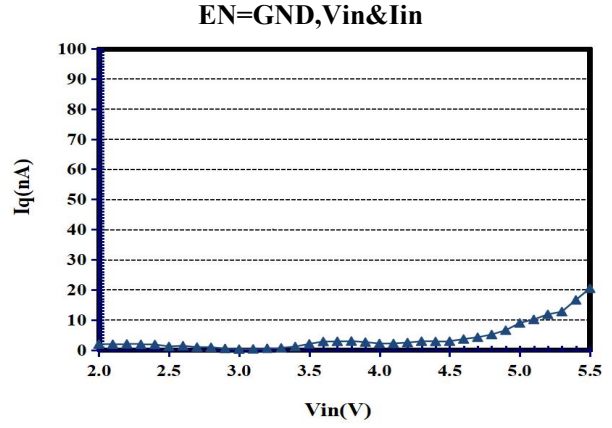
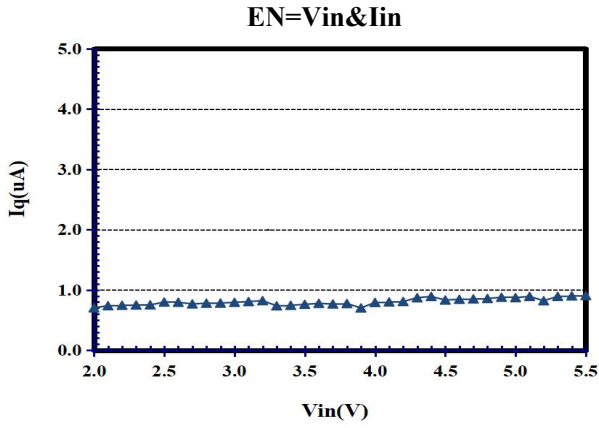
| | Symbol | Min | Typ | Max | Unit |
|----------------------------|----------|-----|-----|-----|------|
| Input Voltage | V_{IN} | 1.8 | | 5.5 | V |
| Junction Temperature Range | T_J | -40 | | 125 | °C |
| Ambient Temperature Range | T_A | -40 | | 85 | °C |

Electrical Characteristics

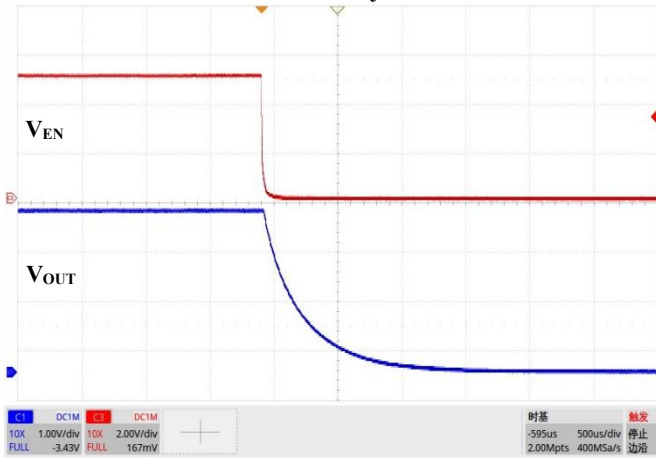
 ($V_{IN} = 5V$, $V_{EN} = 5V$ TA=25°C unless otherwise specified)

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit |
|--|-----------------|---|------------|------------------|-------|---------------|
| Supply Voltage | V_{IN} | | 1.8 | | 5.5 | V |
| DC Output Voltage Accuracy | | $I_{LOAD} = 0.1mA$ | -2 | | 2 | % |
| Dropout Voltage ($V_{out}=3.3V$) | V_{DROP} | $I_{LOAD} = 50mA$ | | 26 | | mV |
| | V_{DROP} | $I_{LOAD} = 150mA$ | | 80 | | |
| | V_{DROP} | $I_{LOAD} = 250mA$ | | 135 | | |
| Ground Current | I_Q | $I_{LOAD} = 0mA$ | | 1 | | μA |
| Shutdown Ground Current | I_{SD} | $V_{EN} = 0V$ | | | 0.01 | μA |
| Enable Threshold Voltage | V_{IH} | V_{EN} Rising | 0.9 | | | V |
| | V_{IL} | V_{EN} Falling | | | 0.60 | |
| EN Input Current | I_{EN} | $V_{EN} = 5V$ | 0.001 | 0.005 | 0.01 | μA |
| Line Regulation | Δ_{LINE} | $I_{LOAD} = 10mA$, $4V \leq V_{IN} \leq 5.5V$ | | 0.025 | 0.035 | % |
| Load Regulation | Δ_{LOAD} | $0.1mA \leq I_{LOAD} \leq 300mA$ | | 0.06 | 0.26 | % |
| Output Current Limit | I_{LIM} | $V_{OUT} = 0.9V \times V_{OUT(normal)}$ | | 410 | | mA |
| V_{OUT} Shutdown Leakage Current | I_{LEAK} | $V_{OUT} = 0V$ | | 255 | | mA |
| Power Supply Rejection Ratio($I_{LOAD} = 5mA$) | PSRR | $V_{OUT} = 3.3V$ $V_{IN} = 4.6V$ | f = 100kHz | | 50 | dB |
| | | | f = 1kHz | | 75 | |
| Output Voltage Noise(BW = 10Hz to 100kHz, $C_{OUT} = 1\mu F$) | | $V_{IN} = 3.5V$ $I_{LOAD} = 0.3A$ | | $V_{OUT} = 1.5V$ | 67 | μV_{RMS} |
| Thermal Shutdown Temperature | T_{SD} | $I_{LOAD} = 10mA$ | | 150 | | $^{\circ}C$ |
| Thermal Shutdown Hysteresis | ΔT_{SD} | | | 20 | | $^{\circ}C$ |
| Discharge Resistance | | $V_{EN} = 0V, V_{OUT} = 0.1V$ | | 130 | | Ω |

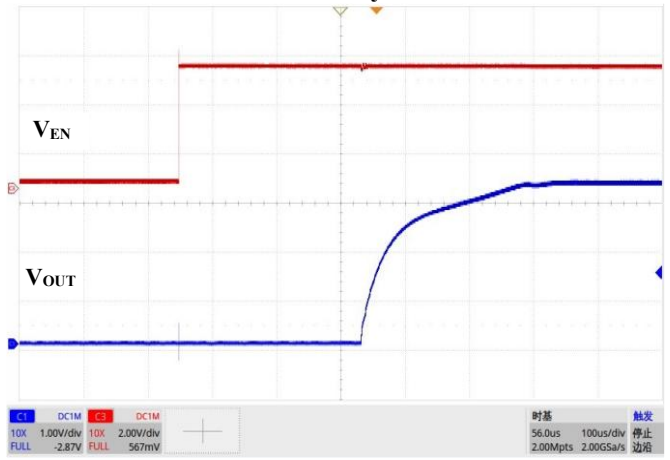
Typical Characteristics



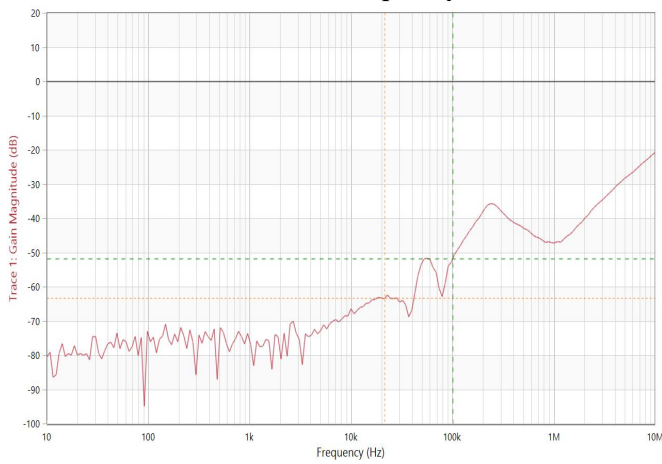
Turn Off by EN



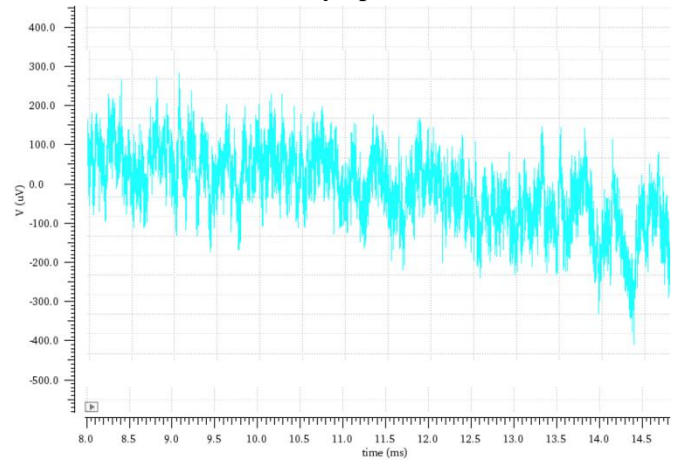
Turn On by EN



PSRR vs. Frequency

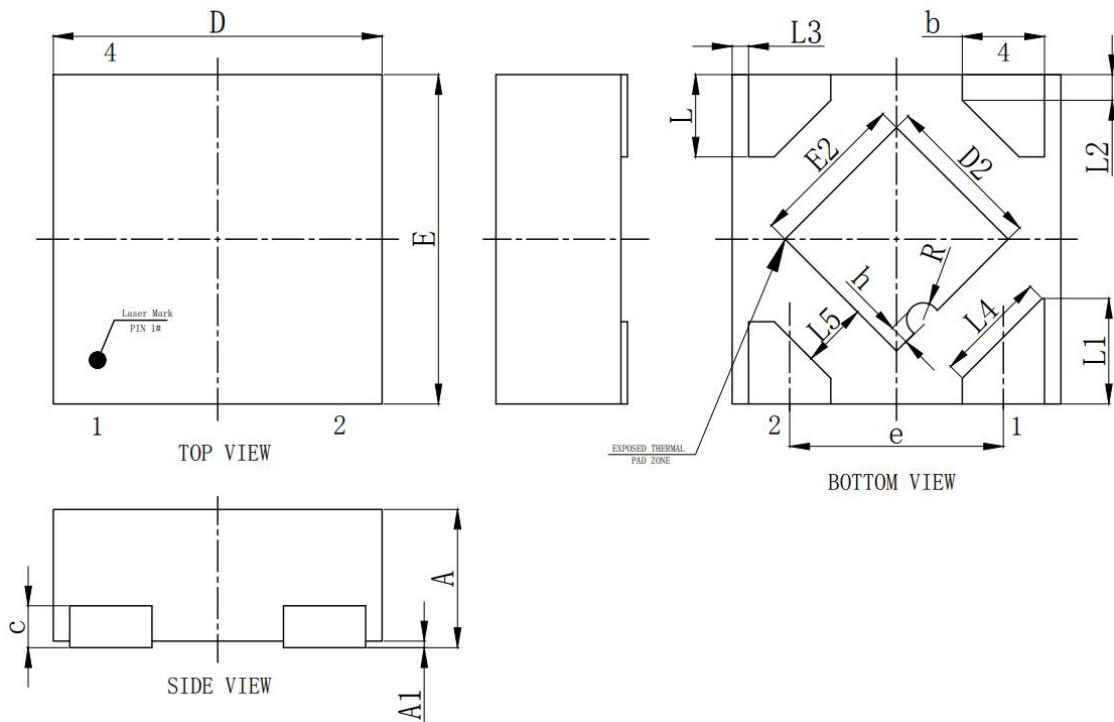


Noise Density Spectrum



Package Information

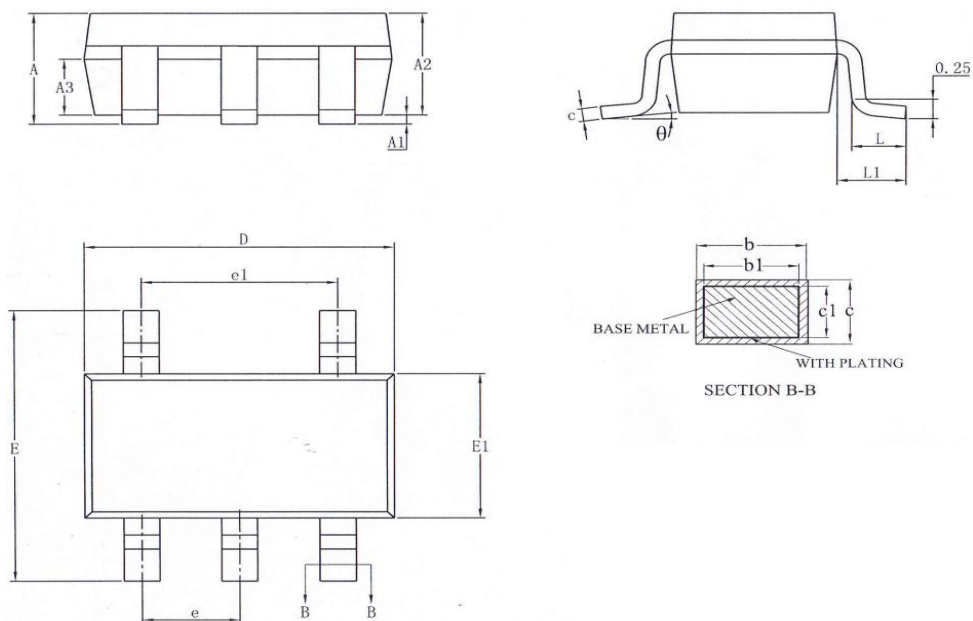
DFN1x1-4L



| Symbol | Millimeters | | |
|--------|-------------|------|------|
| | Min | Nom | Max |
| A | 0.35 | - | 0.40 |
| A1 | 0.00 | 0.02 | 0.05 |
| b | 0.20 | 0.25 | 0.30 |
| c | 0.07 | 0.12 | 0.17 |
| D | 0.95 | 1.00 | 1.05 |
| D2 | 0.38 | 0.48 | 0.58 |
| e | 0.65BSC | | |
| E | 0.95 | 1.00 | 1.05 |
| E2 | 0.38 | 0.48 | 0.58 |
| L | 0.20 | 0.25 | 0.30 |
| L1 | 0.27 | 0.32 | 0.37 |
| L2 | 0.077REF | | |
| L3 | 0.05REF | | |
| L4 | 0.34REF | | |
| L5 | 0.20REF | | |
| R | 0.05REF | | |
| h | 0.06REF | | |

Package Information

SOT-23-5L



| Symbol | Millimeters | | |
|----------|-------------|------|------|
| | Min | Nom | Max |
| A | - | - | 1.25 |
| A1 | 0.04 | - | 0.10 |
| A2 | 1.00 | 1.10 | 1.20 |
| A3 | 0.60 | 0.65 | 0.70 |
| b | 0.33 | - | 0.41 |
| b1 | 0.32 | 0.35 | 0.38 |
| c | 0.15 | - | 0.19 |
| c1 | 0.14 | 0.15 | 0.16 |
| D | 2.82 | 2.92 | 3.02 |
| E | 2.60 | 2.80 | 3.00 |
| E1 | 1.50 | 1.60 | 1.70 |
| e | 0.95BSC | | |
| e1 | 1.90BSC | | |
| L | 0.30 | - | 0.60 |
| L1 | 0.60REF | | |
| θ | 0 | - | 8° |