# N-Channel Enhancement Mode Field Effect Transistor

## ■ General Description

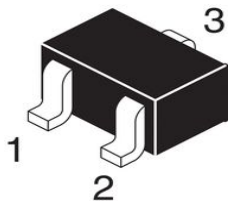
| Product Summary | | |
|---|---|---|
| $V_{DSS}$ | $I_D$ | $R_{DS(ON)}$(mΩ)TYP |
| 20V | 3.6A | 65 @ VGS= 4.5V |
| | | 90 @ VGS= 2.5V |

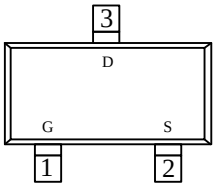
## ■ Features

- Super high dense cell design for low $R_{DS(ON)}$
- Rugged and reliable
- Simple drive requirement
- SOT-23-3L/B package

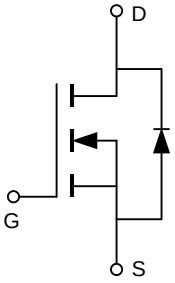
## ■ Package

- **SOT-23-3L/B**



SOT-23-3L/B
(Top View)




## ■ Ordering Information

| Part Number | Storage Temperature | Package | Devices Per Reel |
|---|---|---|---|
| LN2302 | -55°C to +150°C | SOT-23-3L/B | 3000 |

## ■ Absolute Maximum Ratings

**(TA=25℃ unless otherwise noted)**

| parameter | symbol | limit | unit |
|---|---|---|---|
| Drain-source voltage | $V_{DS}$ | 20 | V |
| Gate-source voltage | $V_{GS}$ | ±8 | V |
| Drain current-continuous[a]@Tj=125℃-pulse [b] | $I_D$ | 3.6 | A |
| | $I_{DM}$ | 12 | A |
| Drain-source Diode forward current | Is | 1.25 | A |
| Maximum power dissipation | $P_D$ | 1.25 | W |
| Operating junction Temperature range | $T_j$ | -55—150 | ℃ |

## ■ Electrical Characteristics

**(TA=25℃ unless otherwise noted)**

| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **OFF Characteristics** | | | | | | |
| Drain-source breakdown voltage | $BV_{DSS}$ | $V_{GS}$=0V, $I_D$=250μA | 20 | | | V |
| Zero gate voltage drain current | $I_{DSS}$ | $V_{DS}$=16V, $V_{GS}$=0V | | | 1 | μA |
| Gate-body leakage | $I_{GSS}$ | $V_{DS}$=0V, $V_{GS}$=±8V | | | ±100 | nA |
| **ON Characteristics** | | | | | | |
| Gate threshold voltage | $V_{GS(th)}$ | $V_{DS}$=$V_{GS}$, $I_D$=250μA | 0.5 | 0.8 | 1.5 | V |
| Drain-source on-state resistance | $R_{DS(ON)}$ | $V_{GS}$=4.5V, $I_D$=2.8A | | 65 | 80 | mΩ |
| | | $V_{GS}$=2.5V, $I_D$=2.0A | | 90 | 110 | |
| Forward transconductance | $g_{fs}$ | $V_{GS}$=5V, $I_D$=5A | | 5 | | S |
| **Dynamic Characteristics** | | | | | | |
| Input capacitance | $C_{ISS}$ | $V_{DS}$=10V ,$V_{GS}$=0V f=1.0MHz | | 586 | | pF |
| Output capacitance | $C_{OSS}$ | | | 101 | | |
| Reverse transfer capacitance | $C_{RSS}$ | | | 59 | | |
| **Switching Characteristics** | | | | | | |
| Turn-on delay time | $t_{D(ON)}$ | $V_{DD}$=10V $I_D$=3.6A, $V_{GEN}$=4.5V $R_L$=10ohm $R_{GEN}$=10ohm | | 6.5 | | ns |
| Rise time | tr | | | 32.1 | | |
| Turn-off delay time | $t_{D(OFF)}$ | | | 58.4 | | |
| Fall time | tf | | | 48 | | |
| Total gate charge | Qg | $V_{DS}$=10V,$I_D$=1A $V_{GS}$=4.5V | | 6 | | nC |
| Gate-source charge | Qgs | | | 1.35 | | |
| Gate-drain charge | Qgd | | | 1.5 | | |
| **Drain-Source Diode Characteristics** | | | | | | |
| Diode forward voltage | $V_{SD}$ | $V_{GS}$=0V,Is=1.25A | | 0.84 | 1.2 | V |

**Notes:**

a. surface mounted on FR4 board,t≤10sec

b. pulse test:pulse width≤300μs,duty≤2%

c. guaranteed by design, not subject to production testing

## ■ Thermal Characteristics

| | | | |
|---|---|---|---|
| Thermal Resistance junction-to ambient | Rth JA | 100 | ℃/W |

## ■ Typical Performance Characteristics

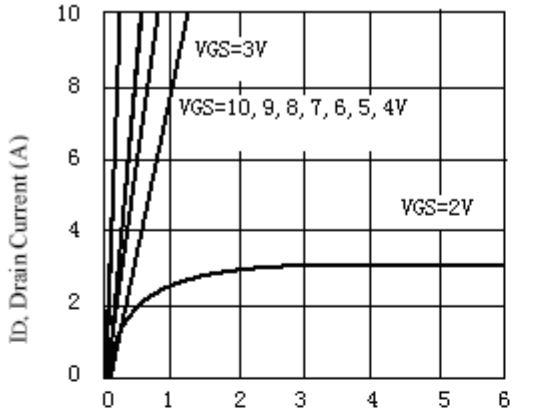



Figure 1. Output Characteristics

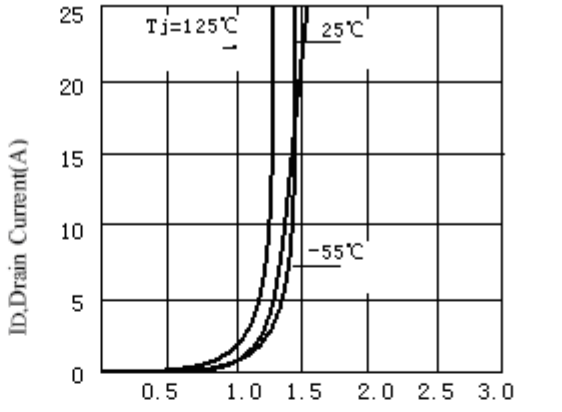



Figure 2. Transfer Characteristics

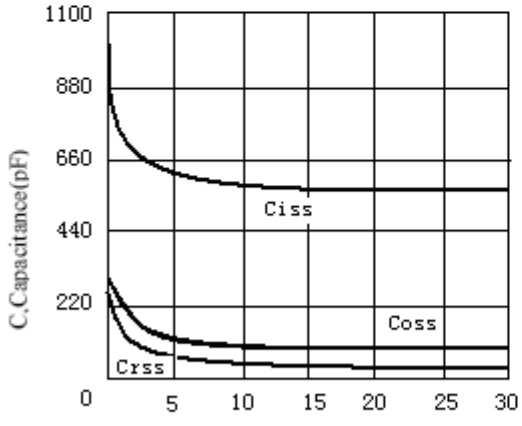



Figure3. Capacitance

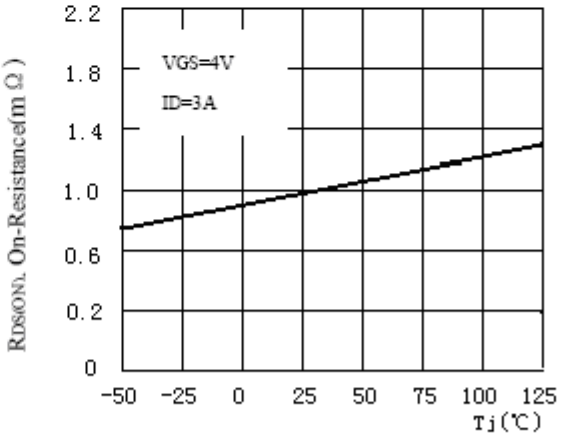



Figure4. On-Resistance Variation with Temperature

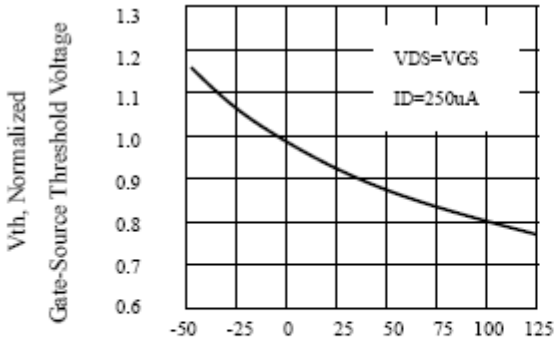



Figure5.Gate Threshold Variation With Temperature

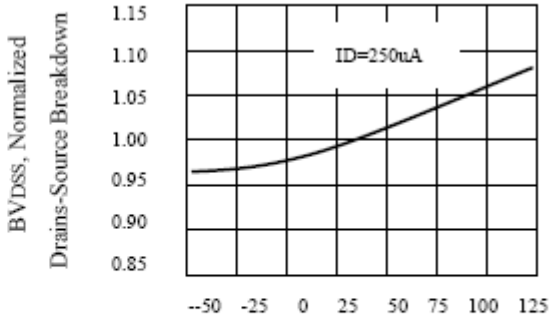



Figure6.Breakdown Voltage Variation With Temperature

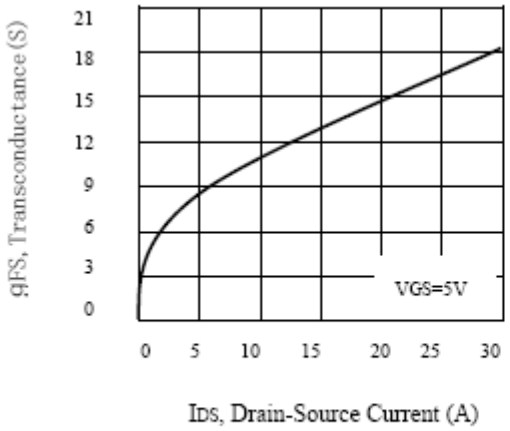



Figure7.Transconductance Variation With Drain Current

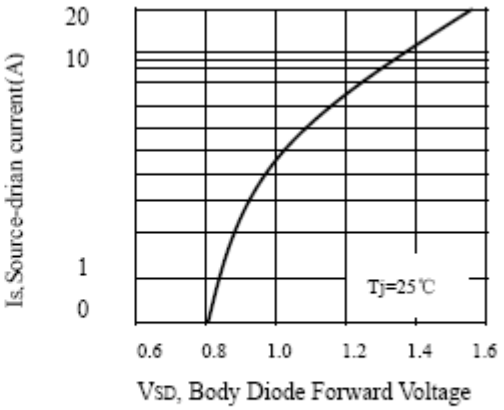



Figure8.Body Diode Forward Voltage Variation with Source Current

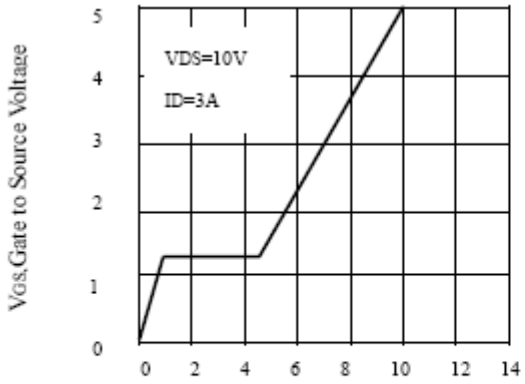



Figure9. Gate Charge

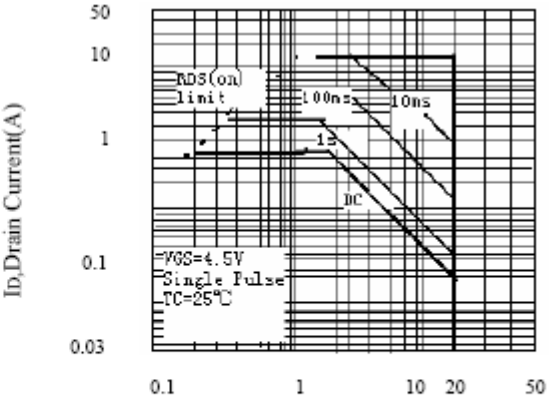
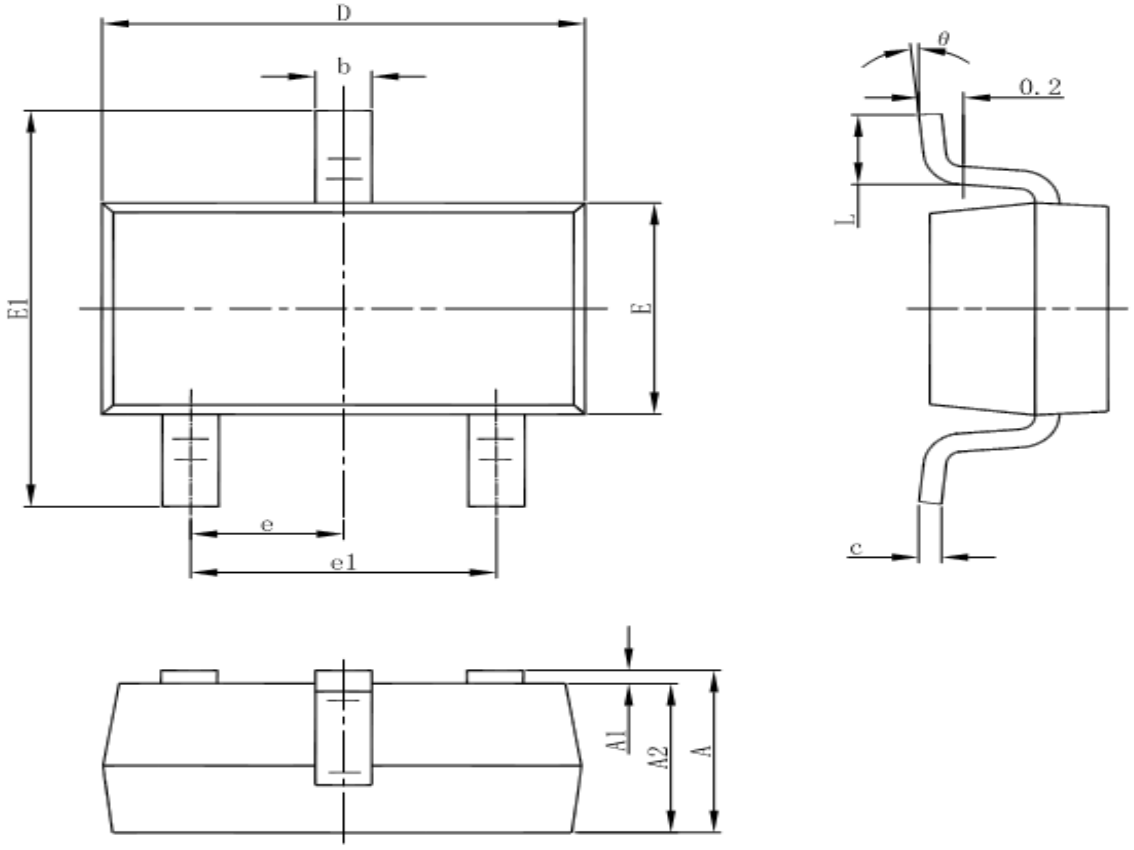



Figure10.Maximum Safe Operating Area

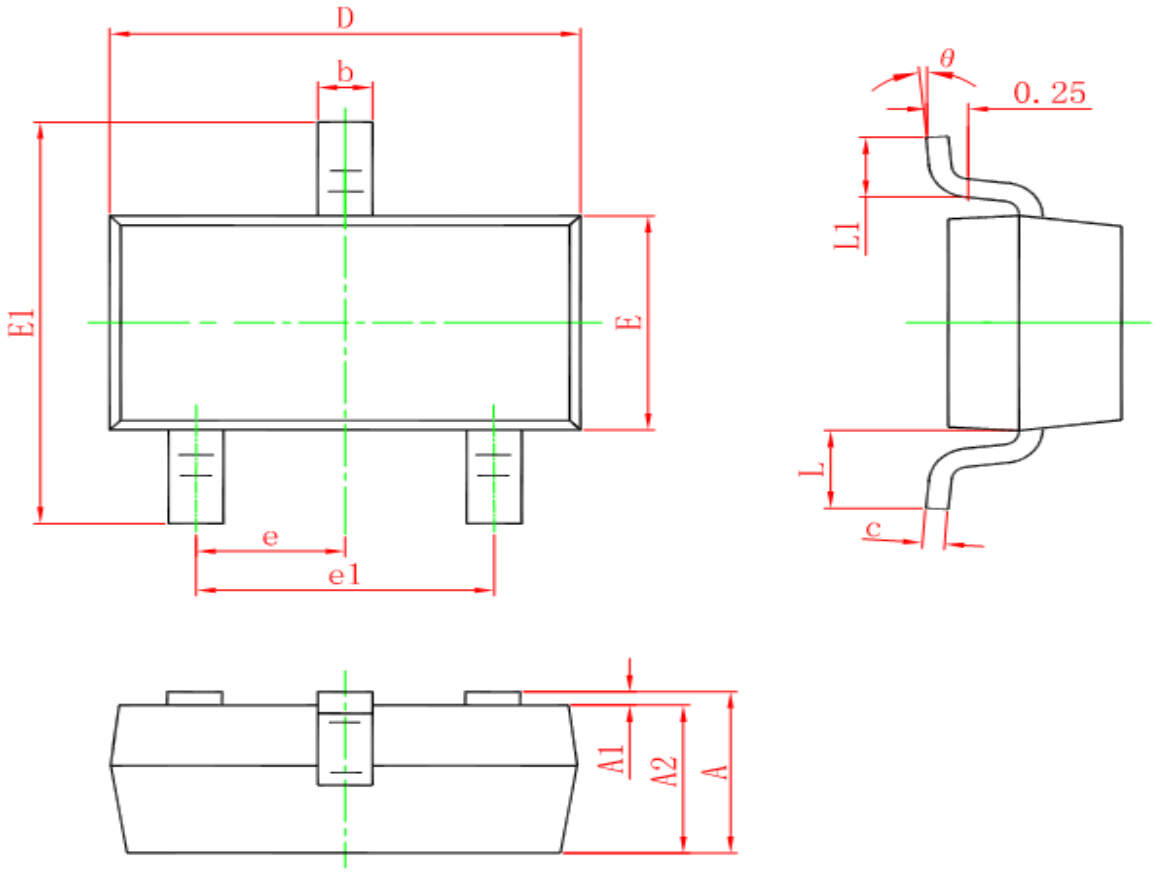
## ■ Package Information

- SOT-23-3L




| 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 |
| θ | 0° | 8° | 0° | 8° |

- SOT-23-3B




| 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° |