

**SuperMOS – SOT-23 20V  $V_{DSS}$ , 220m $\Omega$   $R_{DS(ON)}$ , N-channel MOSFET**

**1. Description**

The FDV303N-ES is N-Channel enhancement MOS Field Effect Transistor. Uses advanced trench technology and design to provide excellent  $R_{DS(ON)}$  with low gate charge. Device is suitable for use in DC-DC conversion, power switch and charging circuit. Standard Product FDV303N-ES is Pb-free.

**2. Features**

- 20V,  $R_{DS(ON)}=220m\Omega(Typ.) @V_{GS}=4.5V$
- $R_{DS(ON)}=290m\Omega(Typ.) @V_{GS}=2.5V$
- $R_{DS(ON)}=420m\Omega(Typ.) @V_{GS}=1.8V$
- Use trench MOSFET technology
- High density cell design for low  $R_{DS(on)}$
- Material: Halogen free
- Reliable and rugged
- Avalanche Rated
- Low leakage current

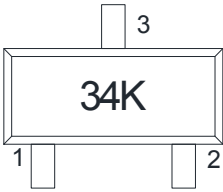
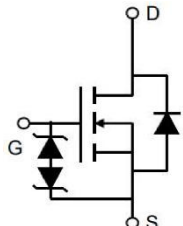
**3. Applications**

- PWM applications
- Load switch
- Power management in portable/desktop PCs
- DC/DC conversion

**4. Ordering Information**

| Part Number | Package | Marking | Material     | Packing     | Quantity per reel | Flammability Rating | Reel Size |
|-------------|---------|---------|--------------|-------------|-------------------|---------------------|-----------|
| FDV303N-ES  | SOT-23  | 34K     | Halogen free | Tape & Reel | 3,000 PCS         | UL 94V-0            | 7 inches  |

**5. Pin Configuration and Functions**

| Pin | Function | Outline   | Circuit Diagram   |
|-----|----------|---|---|
| 1   | Gate     |  |  |
| 2   | Source   |   |   |
| 3   | Drain    |   |   |

## 6. Specification

### Absolute Maximum Rating & Thermal Characteristics

Ratings at 25 °C ambient temperature unless otherwise specified.

| Parameter                      | Symbol     | Limit                  | Unit             |
|--------------------------------|------------|------------------------|------------------|
| Drain-Source Voltage           | $BV_{DSS}$ | 20                     | V                |
| Gate-Source Voltage            | $V_{GS}$   | $\pm 12$               | V                |
| Continuous Drain Current       | $I_D$      | $T_A=25^\circ\text{C}$ | 1.25             |
|                                |            | $T_A=75^\circ\text{C}$ | 0.97             |
| Maximum Power Dissipation      | $P_D$      | 0.71                   | W                |
| Pulsed Drain Current           | $I_{DM}$   | 5                      | A                |
| Operating Junction Temperature | $T_J$      | 150                    | $^\circ\text{C}$ |
| Lead Temperature               | $T_L$      | 260                    | $^\circ\text{C}$ |
| Storage Temperature Range      | $T_{stg}$  | -55 to 150             | $^\circ\text{C}$ |

### Thermal resistance ratings

| Single Operation                       |                     |                 |         |         |                    |
|--|---------------------|-----------------|---------|---------|--------------------|
| Parameter                              |                     | Symbol          | Typical | Maximum | Unit               |
| Junction-to-Ambient Thermal Resistance | $t \leq 10\text{s}$ | $R_{\theta JA}$ |         | 176     | $^\circ\text{C/W}$ |

## Electrical Characteristics

At TA = 25°C unless otherwise specified

| Parameter  | Symbol       | Test Conditions                                       | Min. | Typ. | Max.     | Unit       |
|--|--------------|---|------|------|----------|------------|
| <b>OFF CHARACTERISTICS</b>                       |              |   |      |      |          |            |
| Drain-to-Source Breakdown Voltage                | $BV_{DSS}$   | $V_{GS}=0V, I_D=250\mu A$                             | 20   |      |          | V          |
| Zero Gate Voltage Drain Current                  | $I_{DSS}$    | $V_{DS}=20V, V_{GS}=0V$                               |      |      | 1        | $\mu A$    |
| Gate-to-source Leakage Current                   | $I_{GSS}$    | $V_{DS}=0V, V_{GS}=\pm 10V$                           |      |      | $\pm 10$ | $\mu A$    |
| <b>ON CHARACTERISTICS</b>                        |              |   |      |      |          |            |
| Gate Threshold Voltage                           | $V_{GS(TH)}$ | $V_{GS}=V_{DS}, I_D=250\mu A$                         | 0.35 | 0.75 | 1.1      | V          |
| Drain-to-source On-resistance                    | $R_{DS(on)}$ | $V_{GS}=4.5V, I_D=0.9A$                               |      | 220  | 300      | m $\Omega$ |
|  |              | $V_{GS}=2.5V, I_D=0.45A$                              |      | 290  | 400      |            |
|  |              | $V_{GS}=1.8V, I_D=0.2A$                               |      | 420  | 700      |            |
| <b>CHARGES, CAPACITANCES AND GATE RESISTANCE</b> |              |   |      |      |          |            |
| Input Capacitance                                | $C_{ISS}$    | $V_{GS}=0V, f=1MHz,$<br>$V_{DS}=10V$                  |      | 33   |          | pF         |
| Output Capacitance                               | $C_{OSS}$    |   |      | 20   |          |            |
| Reverse Transfer Capacitance                     | $C_{RSS}$    |   |      | 10   |          |            |
| Total Gate Charge                                | $Q_{G(TOT)}$ | $V_{GS}=4.5V, V_{DS}=10V,$<br>$I_D=0.5A$              |      | 0.8  |          | nC         |
| Gate-to-Source Charge                            | $Q_{GS}$     |   |      | 0.3  |          |            |
| Gate-to-Drain Charge                             | $Q_{GD}$     |   |      | 0.15 |          |            |
| <b>SWITCHING CHARACTERISTICS</b>                 |              |   |      |      |          |            |
| Turn-On Delay Time                               | $t_{d(ON)}$  | $V_{GS}=4.5V, V_{DS}=10V,$<br>$I_D=0.5A, R_G=3\Omega$ |      | 4    |          | ns         |
| Rise Time  | $t_r$        |   |      | 18.8 |          |            |
| Turn-Off Delay Time                              | $t_{d(OFF)}$ |   |      | 10   |          |            |
| Fall Time  | $t_f$        |   |      | 23   |          |            |
| <b>BODY DIODE CHARACTERISTICS</b>                |              |   |      |      |          |            |
| Forward Voltage                                  | $V_{SD}$     | $V_{GS}=0V, I_S=0.9A$                                 |      |      | 1.5      | V          |

7. Typical Characteristic

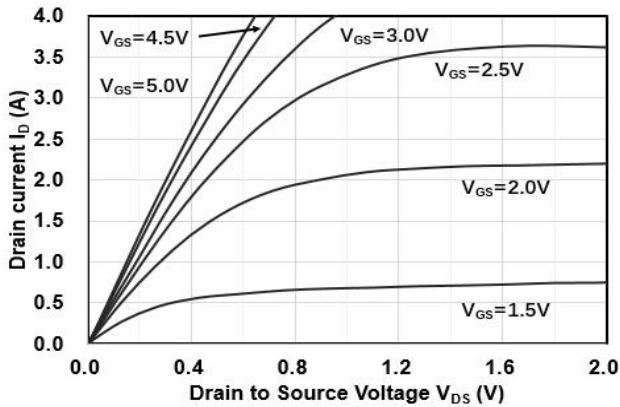


Figure1. Output Characteristics

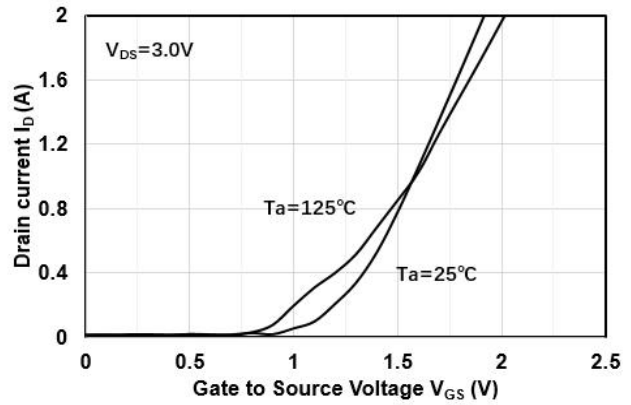


Figure2. Transfer Characteristics

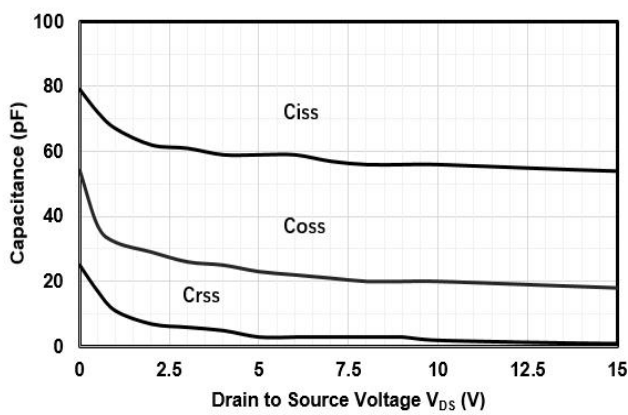


Figure3. Capacitance Characteristics

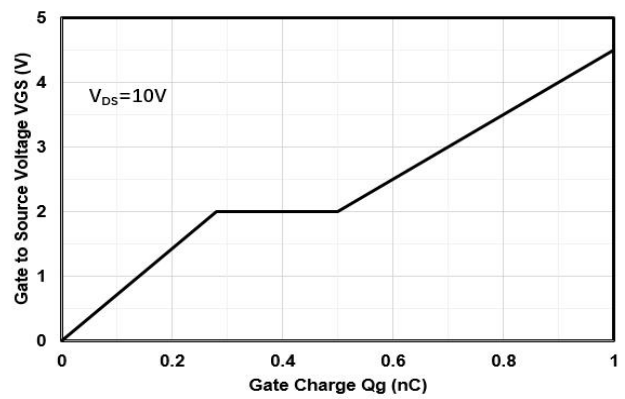


Figure4. Gate Charge

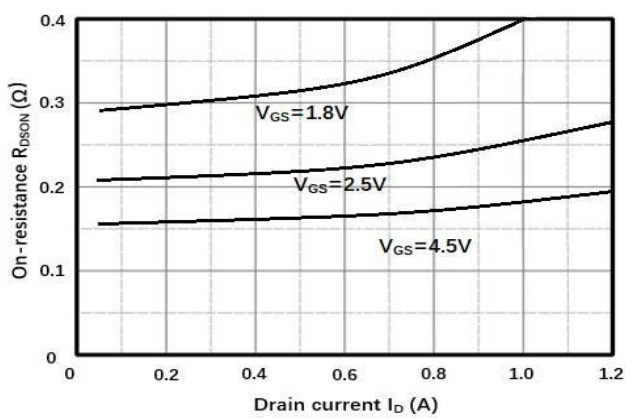


Figure5. Drain-Source on Resistance

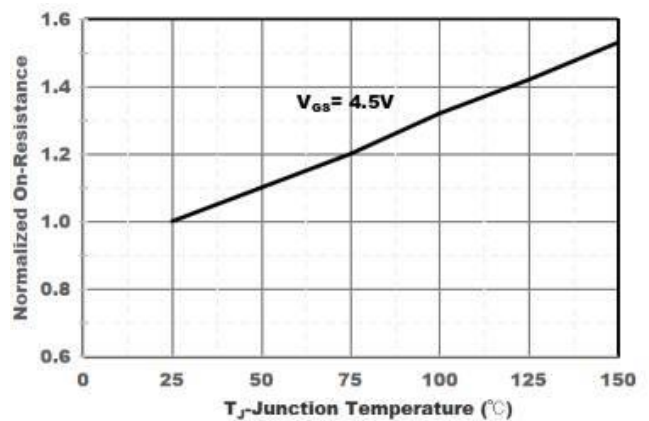


Figure6. Drain-Source on Resistance

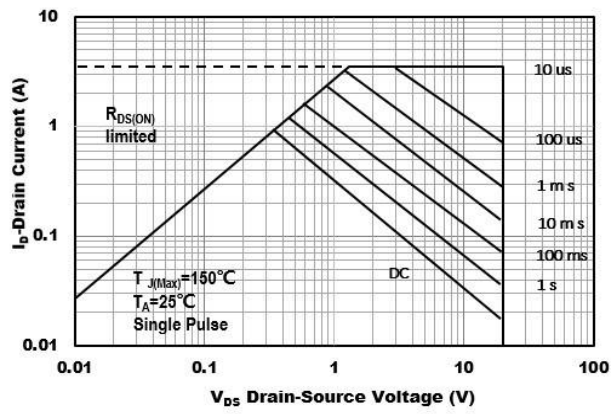
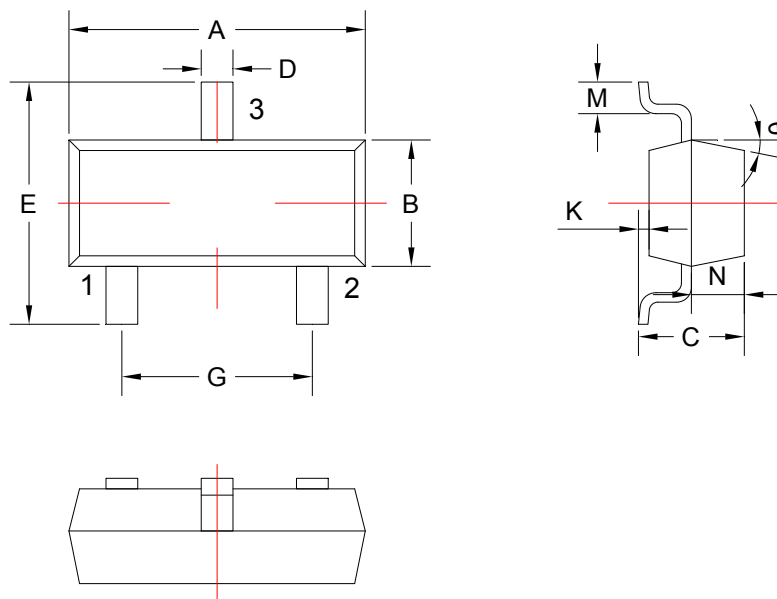


Figure7. Safe Operation Area

8. Dimension (SOT-23)



| COMMON DIMENSIONS CUNITS MEASURE=MILLIMETER |      |      |        |      |      |
|---|------|------|--------|------|------|
| SYMBOL                                      | MIN  | MAX  | SYMBOL | MIN  | MAX  |
| A   | 2.85 | 3.04 | G      | 1.80 | 2.00 |
| B   | 1.20 | 1.40 | K      | 0    | 0.10 |
| C   | 0.90 | 1.10 | M      | 0.20 | -    |
| D   | 0.40 | 0.50 | N      | 0.50 | 0.70 |
| E   | 2.25 | 2.55 | θ      | 5°   | 9°   |

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