

# Single N-channel MOSFET

## ELM4N0008FCA-S

<https://www.elm-tech.com>

### ■ General description

ELM4N0008FCA-S uses advanced trench technology to provide excellent  $R_{ds(on)}$ , low gate charge and low gate threshold voltage.

### ■ Features

- $V_{ds}=100V$
- $I_d=1.2A$  ( $V_{gs}=10V$ )
- $R_{ds(on)} = 310m\Omega$  ( $V_{gs}=10V$ )
- $R_{ds(on)} = 320m\Omega$  ( $V_{gs}=4.5V$ )

### ■ Maximum absolute ratings

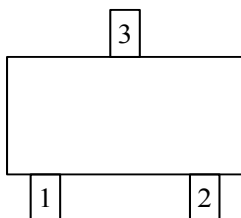
| Parameter                                    | Symbol    | Limit            | Unit       | Note |   |
|--|-----------|------------------|------------|------|---|
| Drain-source voltage                         | $V_{ds}$  | 100              | V          |      |   |
| Gate-source voltage                          | $V_{gs}$  | $\pm 20$         | V          |      |   |
| Continuous drain current<br>( $V_{gs}=10V$ ) | $I_d$     | $T_a=25^\circ C$ | 1.2        | A    | 1 |
|  |           | $T_a=70^\circ C$ | 1.0        |      |   |
| Pulsed drain current                         | $I_{dm}$  | 5                | A          | 2    |   |
| Total power dissipation                      | $P_d$     | 1                | W          | 3    |   |
| Storage temperature range                    | $T_{stg}$ | -55 to 150       | $^\circ C$ |      |   |
| Operating junction temperature range         | $T_j$     | -55 to 150       | $^\circ C$ |      |   |

### ■ Thermal characteristics

| Parameter                           | Symbol          | Typ. | Max. | Unit         | Note |
|-------------------------------------|-----------------|------|------|--------------|------|
| Thermal resistance junction-ambient | $R_{\theta ja}$ | --   | 125  | $^\circ C/W$ | 1    |
| Thermal resistance junction-case    | $R_{\theta jc}$ | --   | 80   | $^\circ C/W$ | 1    |

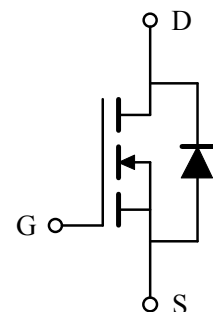
### ■ Pin configuration

SOT-23(TOP VIEW)



| Pin No. | Pin name |
|---------|----------|
| 1       | GATE     |
| 2       | SOURCE   |
| 3       | DRAIN    |

### ■ Circuit



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### ■ Electrical characteristics

T<sub>j</sub>=25°C. Unless otherwise noted.

| Parameter                                   | Symbol                               | Condition  | Min. | Typ.  | Max.  | Unit  | Note |
|---|--------------------------------------|--|------|-------|-------|-------|------|
| <b>STATIC PARAMETERS</b>                    |                                      |  |      |       |       |       |      |
| Drain-source breakdown voltage              | BV <sub>dss</sub>                    | V <sub>gs</sub> =0V, I <sub>d</sub> =250μA   | 100  | --    | --    | V     |      |
| BV <sub>dss</sub> temperature coefficient   | $\frac{\Delta BV_{dss}}{\Delta T_j}$ | Reference to 25°C, I <sub>d</sub> =1mA   | --   | 0.067 | --    | V/°C  |      |
| Static drain-source on-resistance           | R <sub>ds(on)</sub>                  | V <sub>gs</sub> =10V, I <sub>d</sub> =1.0A   | --   | 260   | 310   | mΩ    | 2    |
|   |                                      | V <sub>gs</sub> =4.5V, I <sub>d</sub> =0.5A  | --   | 270   | 320   |       |      |
| Gate threshold voltage                      | V <sub>gs(th)</sub>                  | V <sub>ds</sub> =V <sub>gs</sub> , I <sub>d</sub> =250μA                                 | 1.0  | 1.5   | 2.5   | V     |      |
| V <sub>gs(th)</sub> temperature coefficient | ΔV <sub>gs(th)</sub>                 |  | --   | -4.2  | --    | mV/°C |      |
| Drain-source leakage current                | I <sub>dss</sub>                     | V <sub>ds</sub> =80V, V <sub>gs</sub> =0V  | --   | --    | 1     | μA    |      |
|   |                                      | V <sub>ds</sub> =80V, V <sub>gs</sub> =0V, T <sub>j</sub> =55°C                          | --   | --    | 5     |       |      |
| Gate-source leakage current                 | I <sub>gss</sub>                     | V <sub>gs</sub> =±20V, V <sub>ds</sub> =0V   | --   | --    | ±100  | nA    |      |
| Forward transconductance                    | G <sub>fs</sub>                      | V <sub>ds</sub> =5V, I <sub>d</sub> =1A  | --   | 2.4   | --    | S     |      |
| Continuous source current                   | I <sub>s</sub>                       | V <sub>gs</sub> =V <sub>ds</sub> =0V, Force current                                      | --   | --    | 1.2   | A     | 1, 4 |
| Pulsed source current                       | I <sub>sm</sub>                      |  | --   | --    | 5     | A     | 2.4  |
| Diode forward voltage                       | V <sub>sd</sub>                      | V <sub>gs</sub> =0V, I <sub>s</sub> =1A  | --   | --    | 1.2   | V     | 2    |
| <b>DYNAMIC PARAMETERS</b>                   |                                      |  |      |       |       |       |      |
| Input capacitance                           | C <sub>iss</sub>                     | V <sub>ds</sub> =15V, V <sub>gs</sub> =0V, f=1MHz  | --   | 508.0 | 711.0 | pF    |      |
| Output capacitance                          | C <sub>oss</sub>                     |  | --   | 29.0  | 41.0  | pF    |      |
| Reverse transfer capacitance                | C <sub>rss</sub>                     |  | --   | 16.4  | 23.0  | pF    |      |
| Gate resistance                             | R <sub>g</sub>                       | V <sub>ds</sub> =0V, V <sub>gs</sub> =0V, f=1MHz   | --   | 2.8   | 5.6   | Ω     |      |
| <b>SWITCHING PARAMETERS</b>                 |                                      |  |      |       |       |       |      |
| Total gate charge (10V)                     | Q <sub>g</sub>                       | V <sub>ds</sub> =80V, V <sub>gs</sub> =10V, I <sub>d</sub> =1A                           | --   | 9.7   | 13.6  | nC    |      |
| Gate-source charge                          | Q <sub>gs</sub>                      |  | --   | 1.6   | 2.2   | nC    |      |
| Gate-drain charge                           | Q <sub>gd</sub>                      |  | --   | 1.7   | 2.4   | nC    |      |
| Turn-on delay time                          | t <sub>d(on)</sub>                   | V <sub>dd</sub> =50V, V <sub>gs</sub> =10V<br>R <sub>gen</sub> =3.3Ω, I <sub>d</sub> =1A | --   | 1.6   | 3.2   | ns    |      |
| Turn-on rise time                           | t <sub>r</sub>                       |  | --   | 19.0  | 34.0  | ns    |      |
| Turn-off delay time                         | t <sub>d(off)</sub>                  |  | --   | 13.6  | 27.0  | ns    |      |
| Turn-off fall time                          | t <sub>f</sub>                       |  | --   | 19.0  | 38.0  | ns    |      |
| Reverse recovery time                       | t <sub>rr</sub>                      | I <sub>f</sub> =1A, di/dt=100A/μs  | --   | 14.0  | --    | nS    |      |
| Reverse recovery charge                     | Q <sub>rr</sub>                      |  | --   | 9.3   | --    | nC    |      |

#### NOTE :

1. The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper.
2. The data tested by pulsed, pulse width ≤ 300μs and duty cycle ≤ 2%.
3. The power dissipation is limited by 150°C junction temperature.
4. The data is theoretically the same as I<sub>d</sub> and I<sub>dm</sub>, in real applications, should be limited by total power dissipation.

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## Typical characteristics

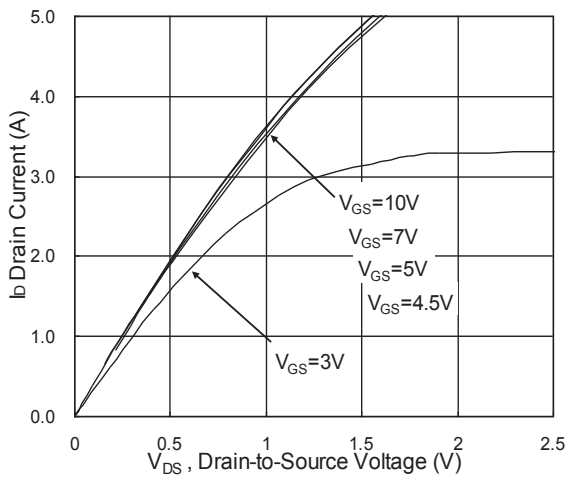


Fig.1 Typical Output Characteristics

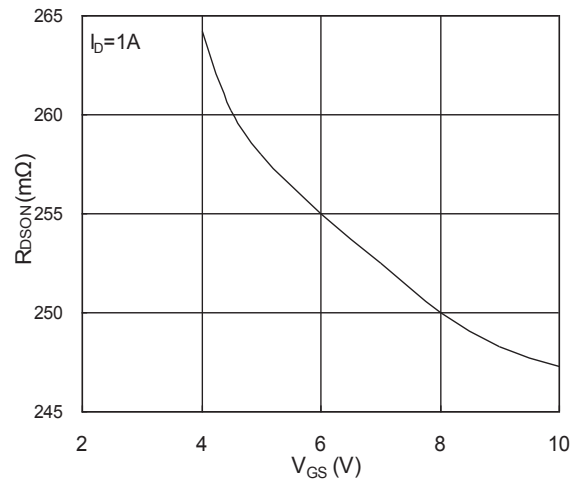


Fig.2 On-Resistance vs. Gate-Source

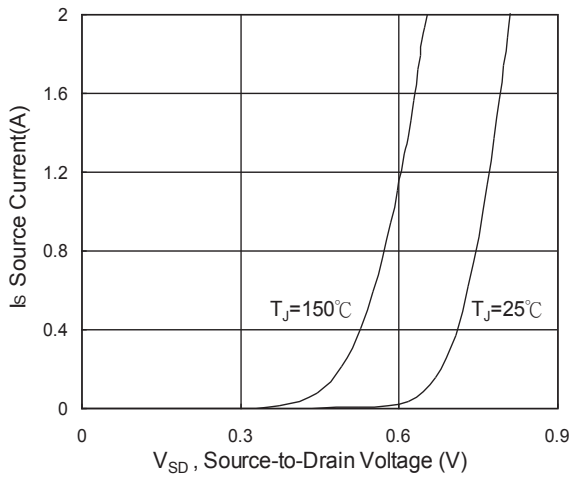


Fig.3 Forward Characteristics of Reverse

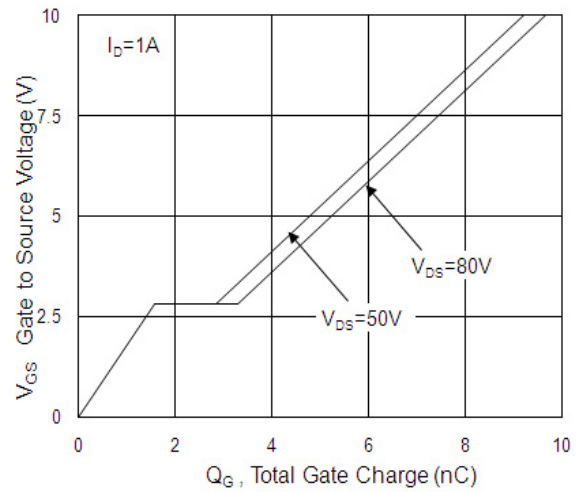


Fig.4 Gate-Charge Characteristics

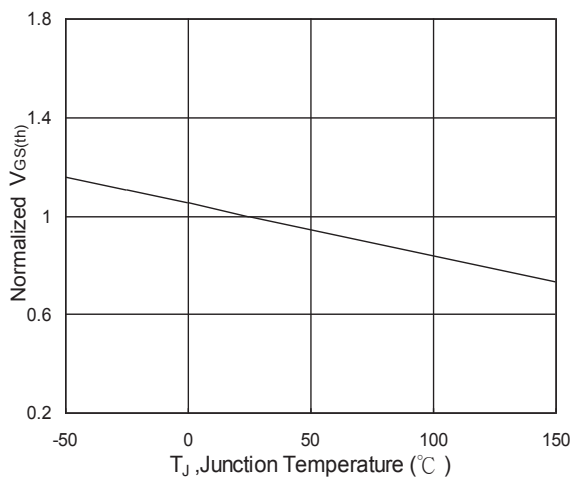


Fig.5 Normalized  $V_{GS(th)}$  vs.  $T_J$

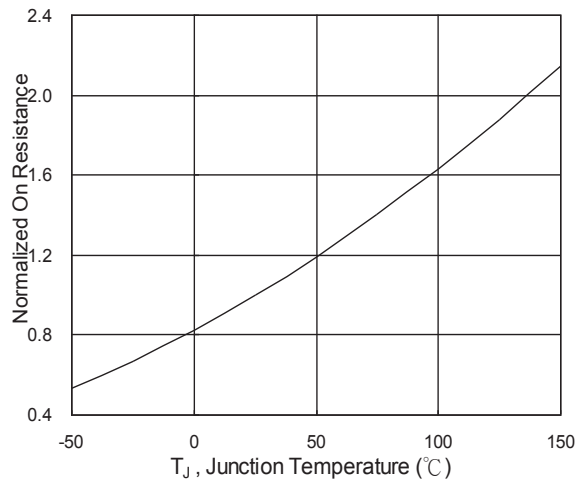


Fig.6 Normalized  $R_{DS(on)}$  vs.  $T_J$

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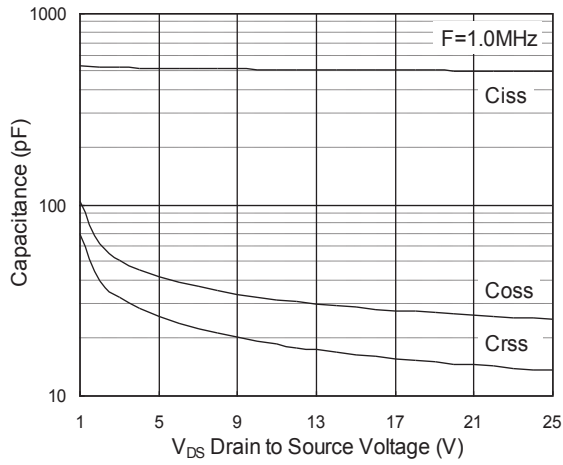


Fig.7 Capacitance

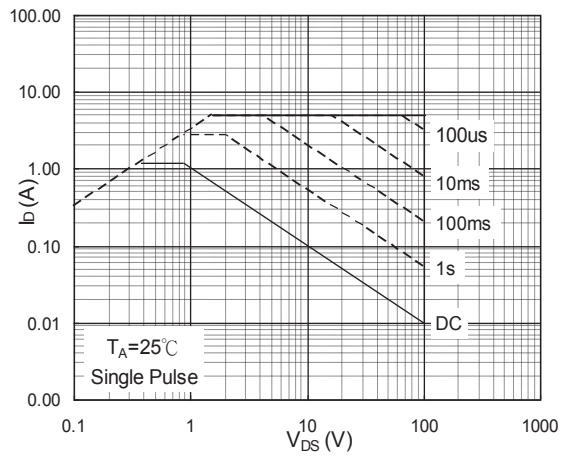


Fig.8 Safe Operating Area

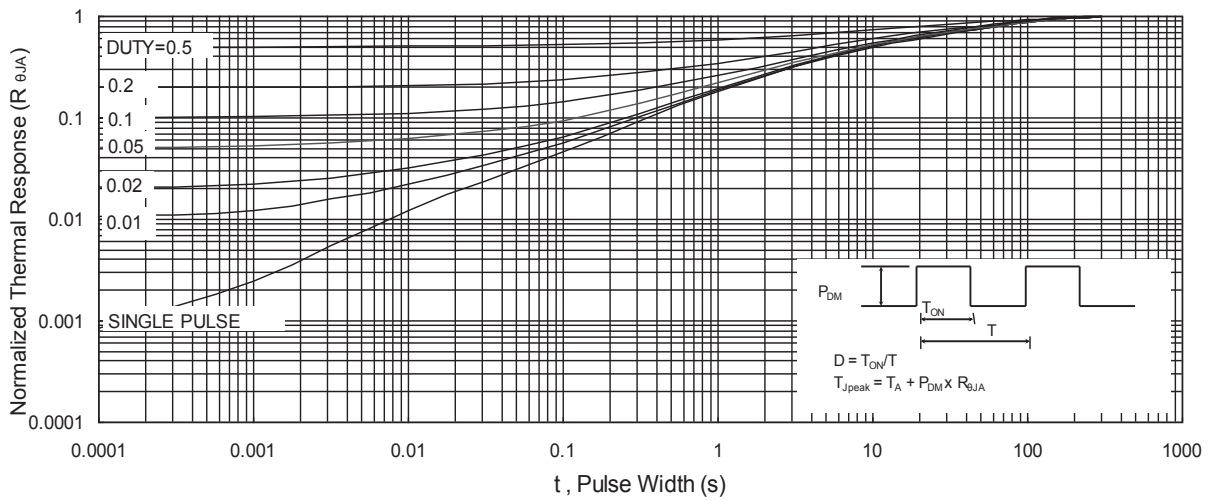


Fig.9 Normalized Maximum Transient Thermal Impedance

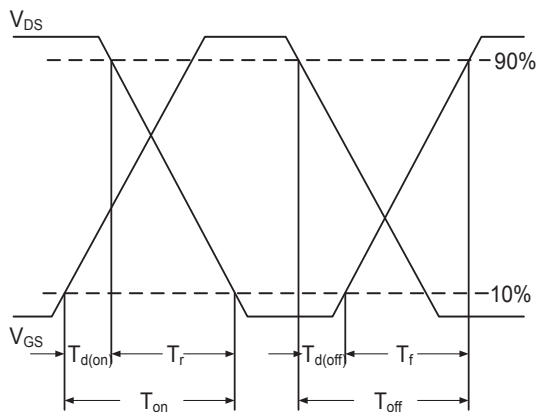


Fig.10 Switching Time Waveform

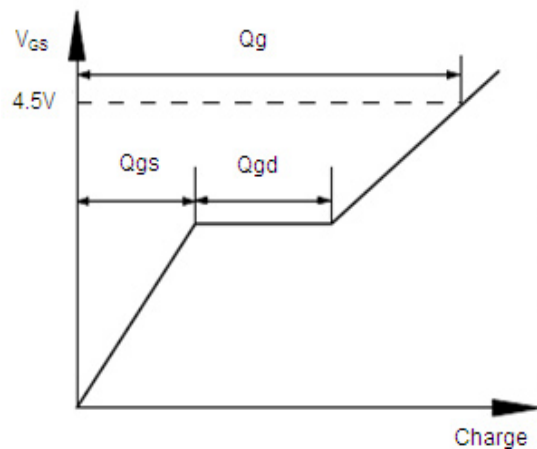


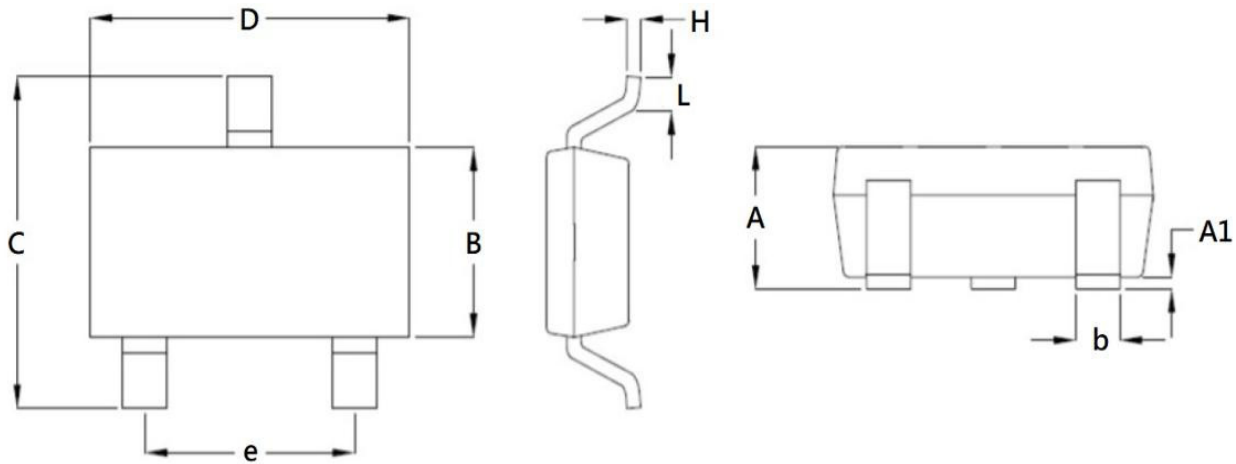
Fig.11 Gate Charge Waveform

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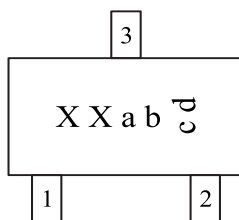
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## ■SOT-23 dimension (3,000pcs/reel)



| Symbols | Millimeters |      | Inches    |       |
|---------|-------------|------|-----------|-------|
|         | Min.        | Max. | Min.      | Max.  |
| A       | 0.85        | 1.25 | 0.033     | 0.049 |
| A1      | 0.00        | 0.15 | 0.000     | 0.006 |
| B       | 1.40        | 1.80 | 0.055     | 0.071 |
| b       | 0.30        | 0.50 | 0.012     | 0.020 |
| C       | 2.60        | 3.00 | 0.102     | 0.118 |
| D       | 2.80        | 3.10 | 0.110     | 0.122 |
| e       | 1.90 BSC    |      | 0.075 BSC |       |
| H       | 0.08        | 0.20 | 0.003     | 0.008 |
| L       | 0.30        | 0.60 | 0.012     | 0.024 |

## ■Marking



| Symbols | Content   |
|---------|---|
| xx      | XX : Product code                                 |
| a       | Yearly code : 2019=9, 2020=A, 2021=B, 2022=C..... |
| b       | Weekly code : A to Z, a to z (53 weeks in total)  |
| c       | Sequence : 1 to 9 or A to Z                       |
| d       | Assembly code : A to Z (I, O excepted)            |