

# Single P-channel MOSFET

## ELM33413CA-S

### ■ General description

ELM33413CA-S uses advanced trench technology to provide excellent  $R_{ds(on)}$ , low gate charge and low gate resistance.

### ■ Features

- $V_{ds} = -30V$
- $I_d = -4A$
- $R_{ds(on)} < 64m\Omega$  ( $V_{gs} = -4.5V$ )
- $R_{ds(on)} < 80m\Omega$  ( $V_{gs} = -2.5V$ )
- $R_{ds(on)} < 120m\Omega$  ( $V_{gs} = -1.8V$ )

### ■ Maximum absolute ratings

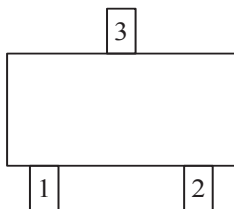
| Parameter                              | Symbol         | Limit              | Unit       | Note |  |
|--|----------------|--------------------|------------|------|--|
| Drain-source voltage                   | $V_{ds}$       | -30                | V          |      |  |
| Gate-source voltage                    | $V_{gs}$       | $\pm 12$           | V          |      |  |
| Continuous drain current               | $I_d$          | $T_a = 25^\circ C$ | -4.0       | A    |  |
|  |                | $T_a = 70^\circ C$ | -3.0       |      |  |
| Pulsed drain current                   | $I_{dm}$       | -20                | A          | 3    |  |
| Power dissipation                      | $P_d$          | $T_a = 25^\circ C$ | 1.25       | W    |  |
|  |                | $T_a = 70^\circ C$ | 0.80       |      |  |
| Junction and storage temperature range | $T_j, T_{stg}$ | -55 to 150         | $^\circ C$ |      |  |

### ■ Thermal characteristics

| Parameter                   |              | Symbol         | Typ. | Max. | Unit         | Note |
|-----------------------------|--------------|----------------|------|------|--------------|------|
| Maximum junction-to-ambient | Steady-state | $R\theta_{ja}$ | 75   | 100  | $^\circ C/W$ |      |

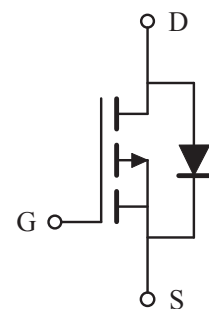
### ■ Pin configuration

SOT-23(TOP VIEW)



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

### ■ Circuit



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### ■Electrical characteristics

Ta=25°C

| Parameter                          | Symbol  | Condition                              | Min.  | Typ.  | Max.  | Unit | Note |
|------------------------------------|---------|--|-------|-------|-------|------|------|
| <b>STATIC PARAMETERS</b>           |         |  |       |       |       |      |      |
| Drain-source breakdown voltage     | BVdss   | Vgs=0V, Id=-250μA                      | -30   |       |       | V    |      |
| Zero gate voltage drain current    | Idss    | Vds=-24V, Vgs=0V                       |       |       | -1    | μA   |      |
|                                    |         | Vds=-20V, Vgs=0V, Tj=125°C             |       |       | -10   |      |      |
| Gate-body leakage current          | Igss    | Vds=0V, Vgs=±12V                       |       |       | ±100  | nA   |      |
| Gate threshold voltage             | Vgs(th) | Vds=Vgs, Id=-250μA                     | -0.45 | -0.80 | -1.20 | V    |      |
| On state drain current             | Id(on)  | Vgs=-4.5V, Vds=-5V                     | -20   |       |       | A    | 1    |
| Static drain-source on-resistance  | Rds(on) | Vgs=-4.5V, Id=-4A                      |       | 55    | 64    | mΩ   | 1    |
|                                    |         | Vgs=-2.5V, Id=-3A                      |       | 62    | 80    | mΩ   |      |
|                                    |         | Vgs=-1.8V, Id=-2A                      |       | 90    | 120   | mΩ   |      |
| Forward transconductance           | Gfs     | Vds=-5V, Id=-4A                        |       | 12    |       | S    | 1    |
| Diode forward voltage              | Vsd     | Is=-1A, Vgs=0V                         |       |       | -1.2  | V    | 1    |
| Max. body-diode continuous current | Is      |  |       |       | -1.6  | A    |      |
| Pulsed body-diode current          | Ism     |  |       |       | -3    | A    | 3    |
| <b>DYNAMIC PARAMETERS</b>          |         |  |       |       |       |      |      |
| Input capacitance                  | Ciss    |  |       | 950   |       | pF   |      |
| Output capacitance                 | Coss    | Vgs=0V, Vds=-15V, f=1MHz               |       | 115   |       | pF   |      |
| Reverse transfer capacitance       | Crss    |  |       | 75    |       | pF   |      |
| <b>SWITCHING PARAMETERS</b>        |         |  |       |       |       |      |      |
| Total gate charge                  | Qg      | Vgs=-4.5V, Vds=-15V<br>Id=-4A          |       | 9.4   |       | nC   | 2    |
| Gate-source charge                 | Qgs     |  |       | 2.0   |       | nC   | 2    |
| Gate-drain charge                  | Qgd     |  |       | 3.0   |       | nC   | 2    |
| Turn-on delay time                 | td(on)  | Vgs=-4.5V, Vds=-10V<br>Id≈-1A, Rgen=6Ω |       | 6.3   |       | ns   | 2    |
| Turn-on rise time                  | tr      |  |       | 3.2   |       | ns   | 2    |
| Turn-off delay time                | td(off) |  |       | 38.0  |       | ns   | 2    |
| Turn-off fall time                 | tf      |  |       | 12.0  |       | ns   | 2    |

NOTE :

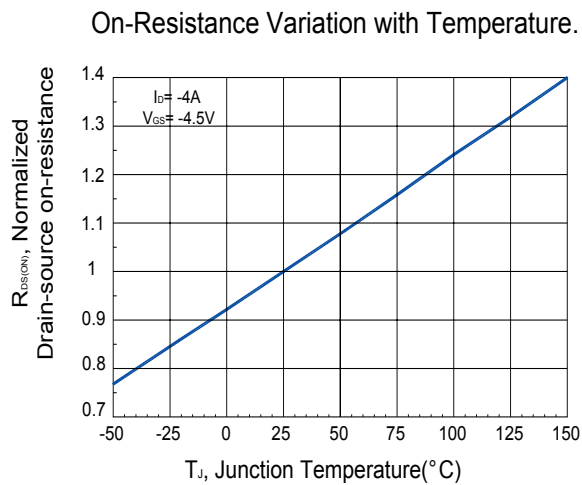
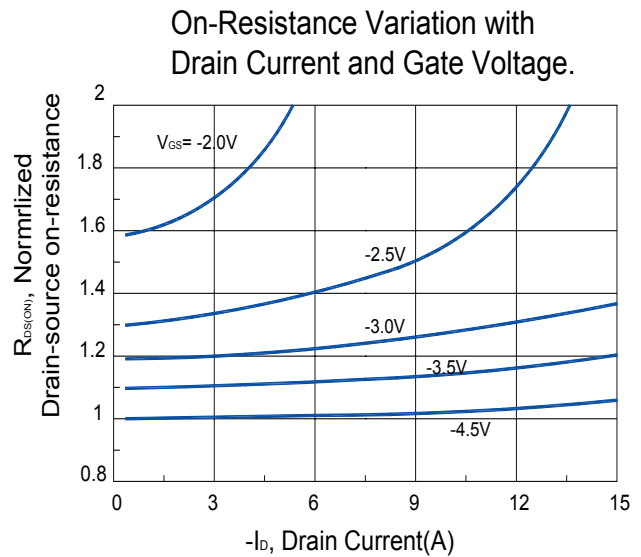
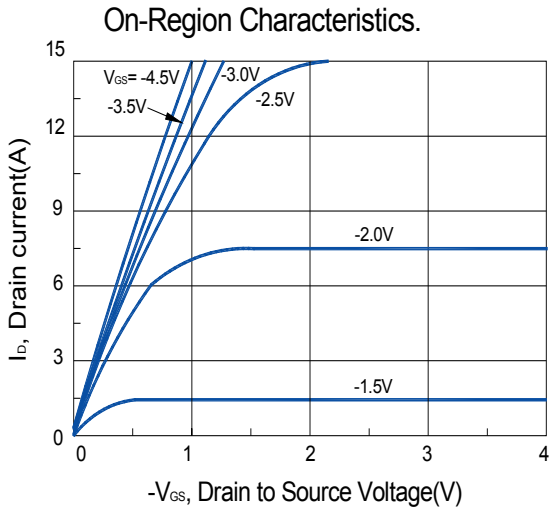
1. Pulsed width≤300μsec and Duty cycle≤2%.
2. Independent of operating temperature.
3. Pulsed width limited by maximum junction temperature.
4. Duty cycle ≤ 1%.

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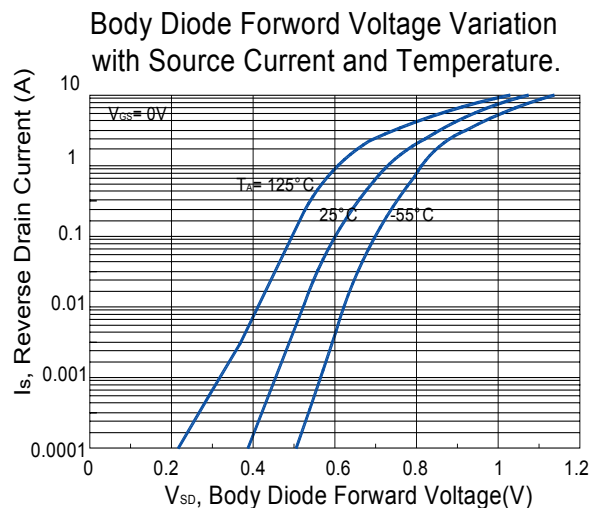
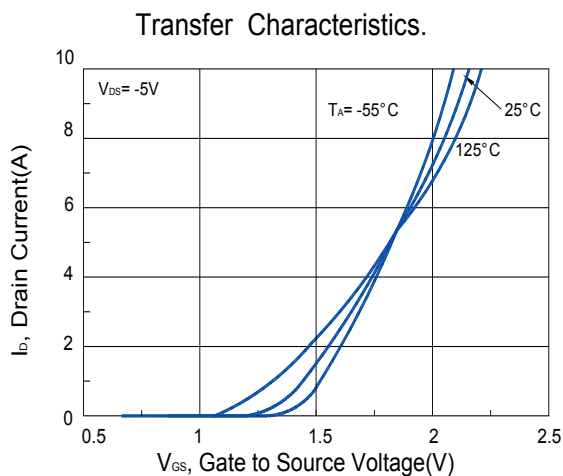
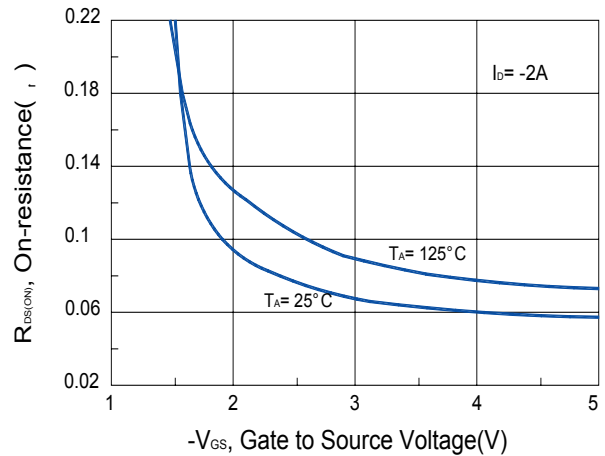
ELM33413CA-S

## ■ Typical electrical and thermal characteristics

### Typical Electrical Characteristics



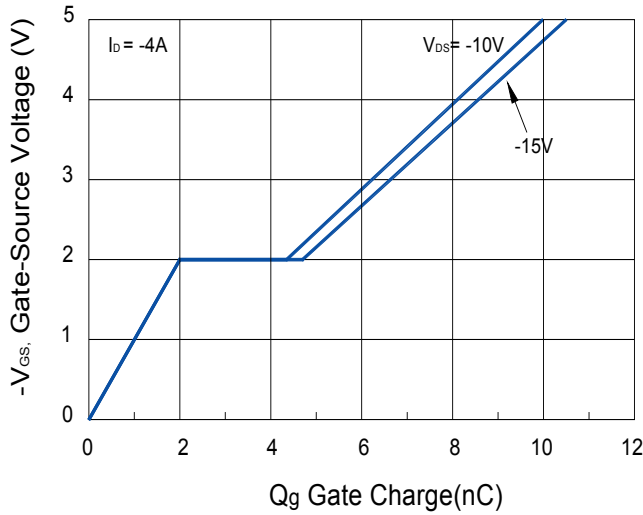
### On-Resistance Variation with Gate-to-Source Voltage.



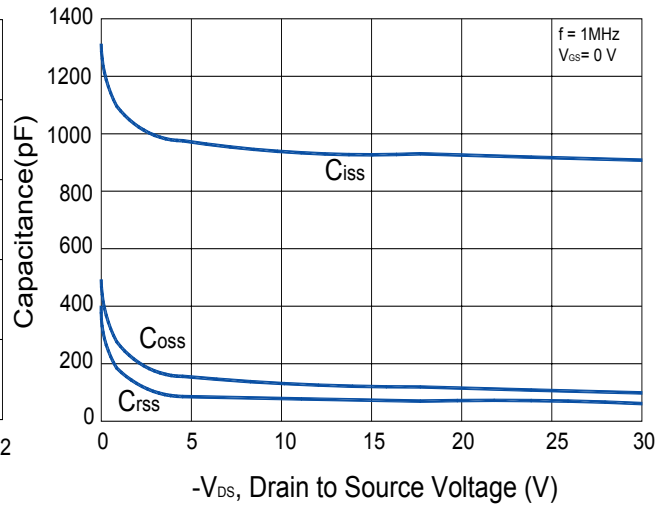
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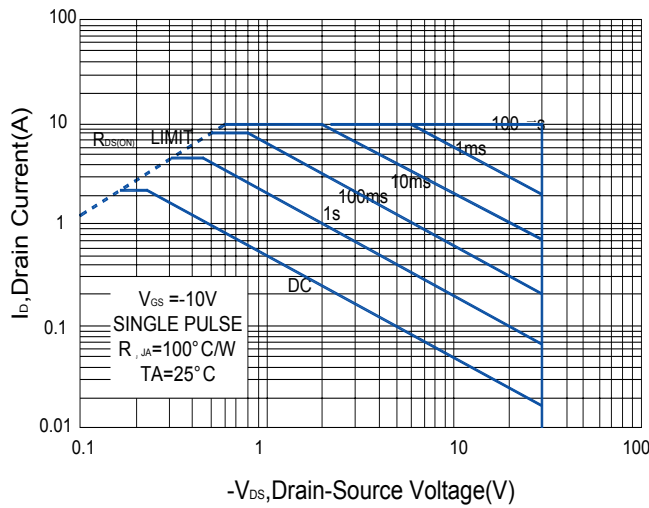
Gate-Charge Characteristics



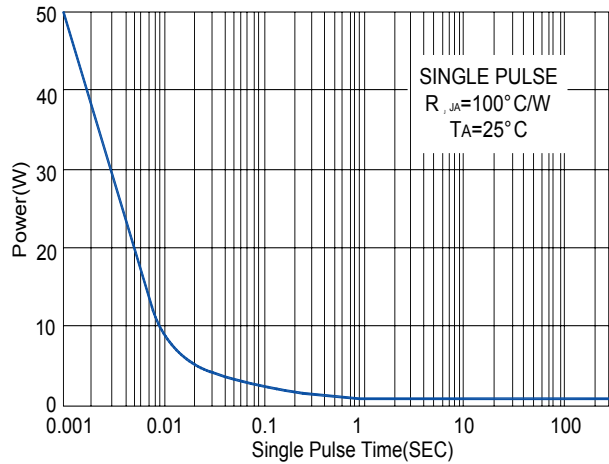
Capacitance Characteristics



Maximum Safe Operating Area.



Single Pulse Maximum Power Dissipation.



Transient Thermal Response Curve.

