

Single N-channel MOSFET

ELM13422CA-S

General description

ELM13422CA-S uses advanced trench technology to provide excellent $R_{ds(on)}$, low gate charge and low gate resistance.

Features

- $V_{ds}=55V$
- $I_d=2.1A$ ($V_{gs}=4.5V$)
- $R_{ds(on)} < 160m\Omega$ ($V_{gs}=4.5V$)
- $R_{ds(on)} < 200m\Omega$ ($V_{gs}=2.5V$)

Maximum absolute ratings

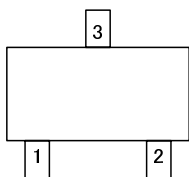
| Parameter | Symbol | Limit | Unit | Note | |
|--|----------------|------------------|------------|------|---|
| Drain-source voltage | V_{ds} | 55 | V | | |
| Gate-source voltage | V_{gs} | ± 12 | V | | |
| Continuous drain current | I_d | $T_a=25^\circ C$ | 2.1 | A | 1 |
| | | $T_a=70^\circ C$ | 1.7 | | |
| Pulsed drain current | I_{dm} | 10 | A | 2 | |
| Power dissipation | P_d | $T_a=25^\circ C$ | 1.25 | W | |
| | | $T_a=70^\circ C$ | 0.8 | | |
| Junction and storage temperature range | T_j, T_{stg} | -55 to 150 | $^\circ C$ | | |

Thermal characteristics

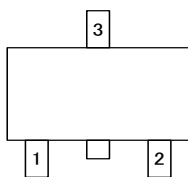
| Parameter | | Symbol | Typ. | Max. | Unit | Note |
|-----------------------------|--------------|----------------|------|------|--------------|------|
| Maximum junction-to-ambient | $t \leq 10s$ | $R\theta_{ja}$ | 75 | 100 | $^\circ C/W$ | 1 |
| Maximum junction-to-ambient | Steady-state | | 115 | 150 | $^\circ C/W$ | |
| Maximum junction-to-lead | Steady-state | $R\theta_{jl}$ | 48 | 60 | $^\circ C/W$ | 3 |

Pin configuration

SOT-23 (TOP VIEW)



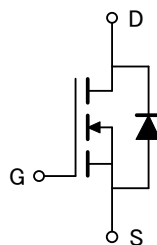
(Without extra bar)



(With extra bar)

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

Circuit



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Electrical characteristics

T_a=25°C

| Parameter | Symbol | Condition | Min. | Typ. | Max. | Unit |
|------------------------------------|---------------------|--|-----------------------|----------------------|-------|------|
| STATIC PARAMETERS | | | | | | |
| Drain-source breakdown voltage | BV _{dss} | I _d =10mA, V _{gs} =0V | 55 | | | V |
| Zero gate voltage drain current | I _{dss} | V _{ds} =44V | | | 1 | μA |
| | | V _{gs} =0V | | T _j =55°C | 5 | |
| Gate-body leakage current | I _{gss} | V _{ds} =0V, V _{gs} =±12V | | | ±100 | nA |
| Gate threshold voltage | V _{gs(th)} | V _{ds} =V _{gs} , I _d =250 μA | 0.6 | 1.3 | 2.0 | V |
| On state drain current | I _{d(on)} | V _{gs} =4.5V, V _{ds} =5V | 10 | | | A |
| Static drain-source on-resistance | R _{ds(on)} | V _{gs} =4.5V | | 125 | 160 | mΩ |
| | | I _d =2.1A | T _j =125°C | 175 | 210 | |
| | | V _{gs} =2.5V, I _d =1.5A | | 157 | 200 | mΩ |
| Forward transconductance | G _{fs} | V _{ds} =5V, I _d =2.1A | | 11 | | S |
| Diode forward voltage | V _{sd} | I _s =1A | | 0.78 | 1.00 | V |
| Max. body-diode continuous current | I _s | | | | 1 | A |
| DYNAMIC PARAMETERS | | | | | | |
| Input capacitance | C _{iss} | | | 214.0 | 300.0 | pF |
| Output capacitance | C _{oss} | V _{gs} =0V, V _{ds} =25V, f=1MHz | | 31.0 | | pF |
| Reverse transfer capacitance | C _{rss} | | | 12.6 | | pF |
| Gate resistance | R _g | V _{gs} =0V, V _{ds} =0V, f=1MHz | | 1.3 | 3.0 | Ω |
| SWITCHING PARAMETERS | | | | | | |
| Total gate charge | Q _g | V _{gs} =4.5V, V _{ds} =27.5V, I _d =2.1A | | 2.6 | 3.3 | nC |
| Gate-source charge | Q _{gs} | | | 0.6 | | nC |
| Gate-drain charge | Q _{gd} | | | 0.8 | | nC |
| Turn-on delay time | t _{d(on)} | | | 2.3 | | ns |
| Turn-on rise time | t _r | V _{gs} =10V, V _{ds} =27.5V | | 2.4 | | ns |
| Turn-off delay time | t _{d(off)} | R _l =12 Ω, R _{gen} =3 Ω | | 16.5 | | ns |
| Turn-off fall time | t _f | | | 2.0 | | ns |
| Body diode reverse recovery time | t _{rr} | I _f =2.1A, dI/dt=100A/μs | | 20 | 30 | ns |
| Body diode reverse recovery charge | Q _{rr} | I _f =2.1A, dI/dt=100A/μs | | 17 | | nC |

NOTE :

1. The value of R_{θja} is measured with the device mounted on 1in² FR-4 board of 2oz. Copper, in still air environment with T_a=25°C. The value in any given applications depends on the user's specific board design, The current rating is based on the t ≤ 10s thermal resistance rating.
2. Repetitive rating, pulse width limited by junction temperature.
3. The R_{θja} is the sum of the thermal impedance from junction to lead R_{θjl} and lead to ambient.
4. The static characteristics in Figures 1 to 6 are obtained using 80μs pulses, duty cycle 0.5%max.
5. These tests are performed with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with T_a=25°C. The SOA curve provides a single pulse rating.

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Typical electrical and thermal characteristics

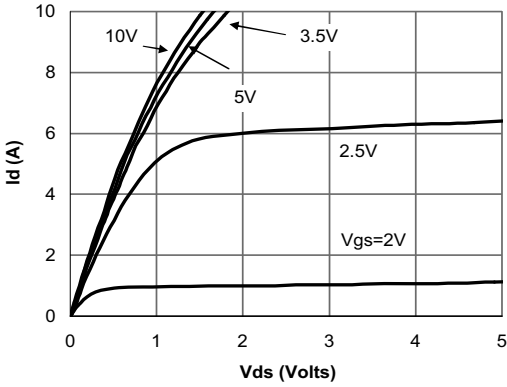


Fig 1: On-Region characteristics

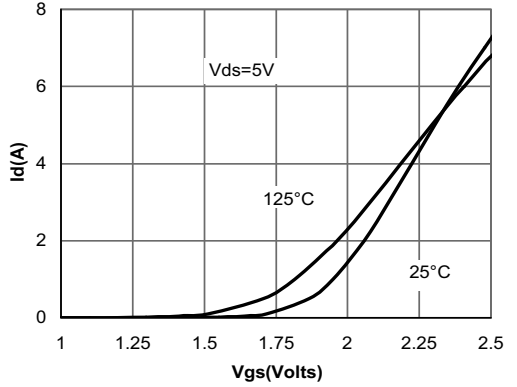


Figure 2: Transfer Characteristics

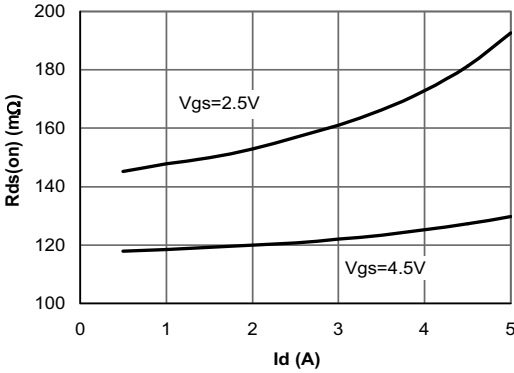


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

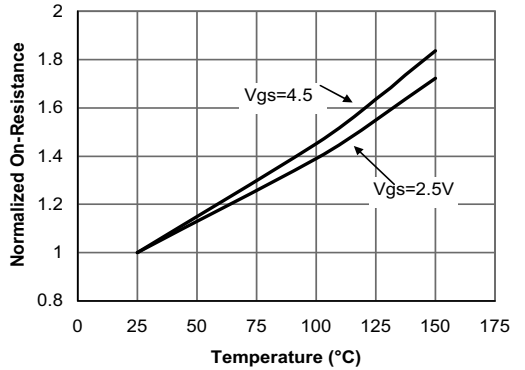


Figure 4: On-Resistance vs. Junction Temperature

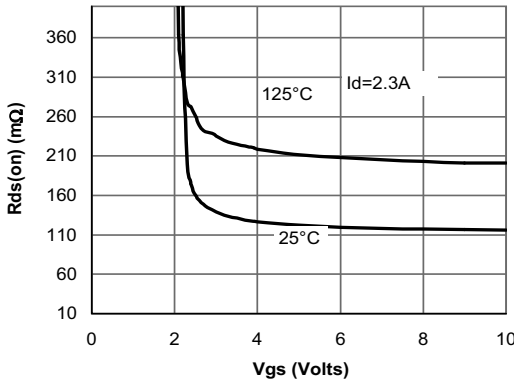


Figure 5: On-Resistance vs. Gate-Source Voltage

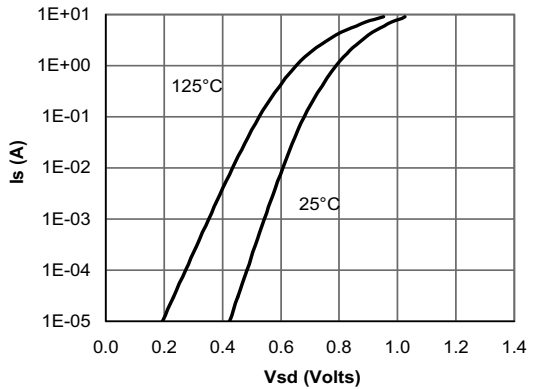


Figure 6: Body-Diode Characteristics

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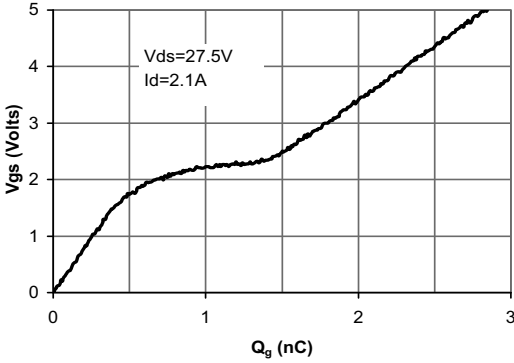


Figure 7: Gate-Charge Characteristics

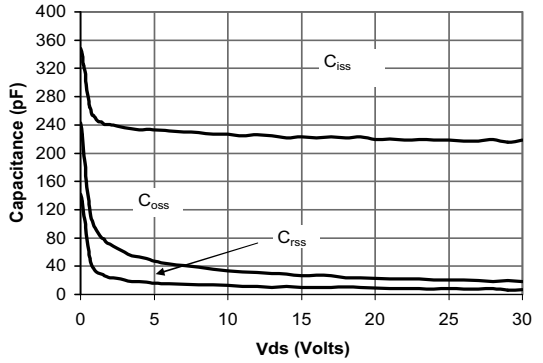


Figure 8: Capacitance Characteristics

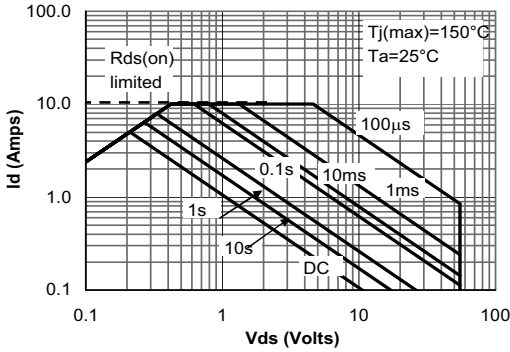


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

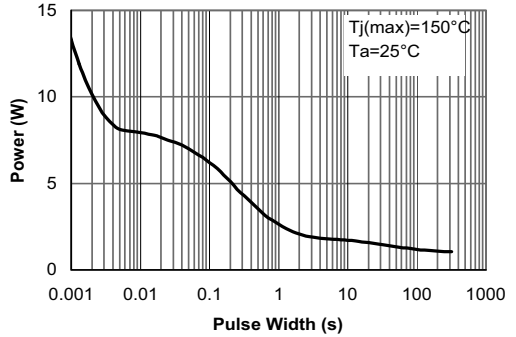


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

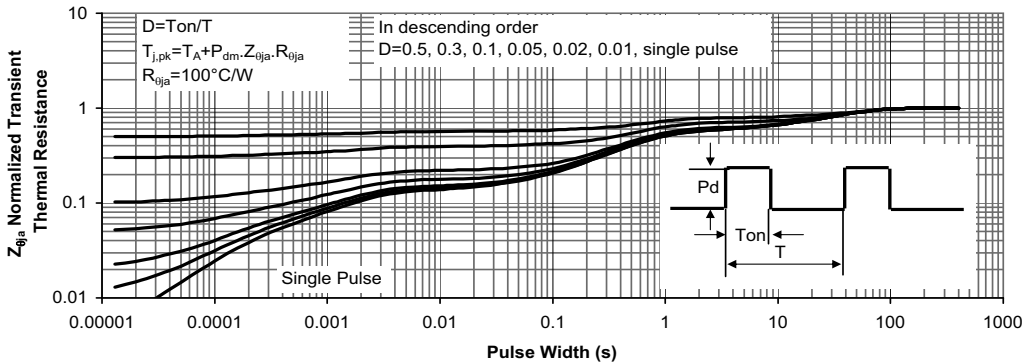


Figure 11: Normalized Maximum Transient Thermal Impedance