

Single N-channel MOSFET

ELM4N20N15SFDA-N

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

■ General description

ELM4N20N15SFDA-N uses advanced trench technology to provide excellent $R_{ds(on)}$, low gate charge and low gate threshold voltage.

■ Features

- $V_{ds}=150V$
- $I_d=23A$
- $R_{ds(on)} = 56m\Omega$ ($V_{gs}=10V$)
- $R_{ds(on)} = 70m\Omega$ ($V_{gs}=4.5V$)

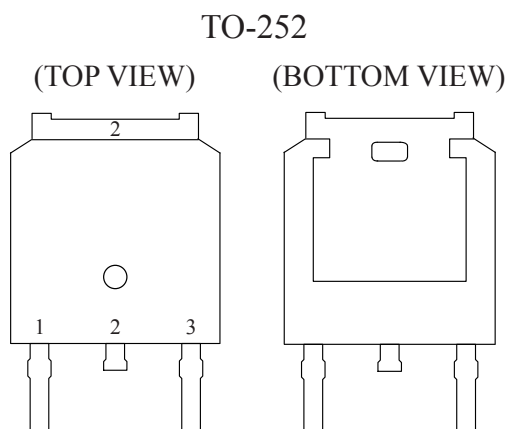
■ Maximum absolute ratings

| Parameter | Symbol | Limit | Unit | Note | |
|--------------------------------------|-----------|-------------------|------------|------|---|
| Drain-source voltage | V_{ds} | 150 | V | | |
| Gate-source voltage | V_{gs} | ± 20 | V | | |
| Continuous drain current | I_d | $T_c=25^\circ C$ | 23.0 | A | 1 |
| | | $T_c=100^\circ C$ | 16.0 | | |
| | | $T_a=25^\circ C$ | 4.5 | | |
| | | $T_a=70^\circ C$ | 3.8 | | |
| Pulsed drain current | I_{dm} | 60 | A | 2 | |
| Single pulsed avalanche energy | E_{as} | 61 | mJ | 3 | |
| Avalanche current | I_{as} | 35 | A | | |
| Total power dissipation | P_d | $T_c=25^\circ C$ | 72.6 | W | 4 |
| | | $T_a=25^\circ C$ | 2.7 | W | |
| Storage temperature range | T_{stg} | -55 to 175 | $^\circ C$ | | |
| Operating junction temperature range | T_j | -55 to 175 | $^\circ C$ | | |

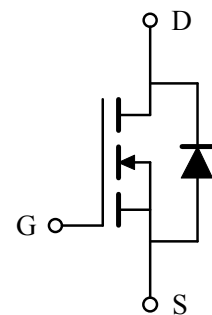
■ Thermal characteristics

| Parameter | Symbol | Typ. | Max. | Unit | Note |
|-------------------------------------|-----------------|------|------|--------------|------|
| Thermal resistance junction-ambient | $R_{\theta ja}$ | -- | 55 | $^\circ C/W$ | 1 |
| Thermal resistance junction-case | $R_{\theta jc}$ | -- | 2 | $^\circ C/W$ | 1 |

■ Pin configuration



■ Circuit



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■Electrical characteristics

T_j=25°C. Unless otherwise noted.

| Parameter | Symbol | Condition | Min. | Typ. | Max. | Unit | Note |
|-----------------------------------|---------------------|---|------------------------------------|------|------|------|------|
| STATIC PARAMETERS | | | | | | | |
| Drain-source breakdown voltage | BV _{dss} | V _{gs} =0V, I _d =250μA | 150 | -- | -- | V | |
| Static drain-source on-resistance | R _{ds(on)} | V _{gs} =10V, I _d =10A | -- | 47 | 56 | mΩ | 2 |
| | | V _{gs} =4.5V, I _d =10A | -- | 53 | 70 | | |
| Gate threshold voltage | V _{gs(th)} | V _{gs} =V _{ds} , I _d =250μA | 1.2 | -- | 2.5 | V | |
| Drain-source leakage current | I _{dss} | V _{ds} =120V, V _{gs} =0V | -- | -- | 1 | μA | |
| | | V _{ds} =120V, V _{gs} =0V, T _j =55°C | -- | -- | 5 | | |
| Gate-source leakage current | I _{gss} | V _{gs} =±20V, V _{ds} =0V | -- | -- | ±100 | nA | |
| Forward transconductance | G _{fs} | V _{ds} =5V, I _d =10A | -- | 25 | -- | S | |
| Continuous source current | I _s | V _{gs} =V _{ds} =0V, Force current | -- | -- | 20 | A | 1, 5 |
| Diode forward voltage | V _{sd} | V _{gs} =0V, I _s =1A | -- | -- | 1.2 | V | 2 |
| DYNAMIC PARAMETERS | | | | | | | |
| Input capacitance | C _{iss} | V _{ds} =25V, V _{gs} =0V, f=1MHz | -- | 1090 | -- | pF | |
| Output capacitance | C _{oss} | | -- | 93 | -- | pF | |
| Reverse transfer capacitance | C _{rss} | | -- | 6 | -- | pF | |
| SWITCHING PARAMETERS | | | | | | | |
| Total gate charge | Q _g | V _{ds} =75V, V _{gs} =10V, I _d =10A | -- | 19.0 | -- | nC | |
| Gate-source charge | Q _{gs} | | -- | 4.5 | -- | nC | |
| Gate-drain charge | Q _{gd} | | -- | 2.6 | -- | nC | |
| Turn-on delay time | t _{d(on)} | V _{dd} =75V, V _{gs} =10V R _{gen} =3.3Ω, I _d =10A | -- | 18.0 | -- | ns | |
| Turn-on rise time | t _r | | -- | 5.8 | -- | ns | |
| Turn-off delay time | t _{d(off)} | | -- | 26.5 | -- | ns | |
| Turn-off fall time | t _f | | -- | 4.5 | -- | ns | |
| Reverse recovery time | t _{rr} | | I _f =10A, di/dt=100A/μs | -- | 45 | -- | nS |
| Reverse recovery charge | Q _{rr} | -- | | 138 | -- | nC | |

NOTE :

1. The data tested by surface mounted on a 1 inch² FR-4 board with 2OZ copper.
2. The data tested by pulsed, pulse width ≤ 300μs and duty cycle ≤ 2%.
3. The Eas data shows Max. rating . The test condition is V_{dd}=25V, V_{gs}=10V, L=0.1mH, I_{as}=35A.
4. The power dissipation is limited by 150°C junction temperature.
5. The data is theoretically the same as I_d and I_{dm}, in real applications, should be limited by total power dissipation.

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■ Typical characteristics

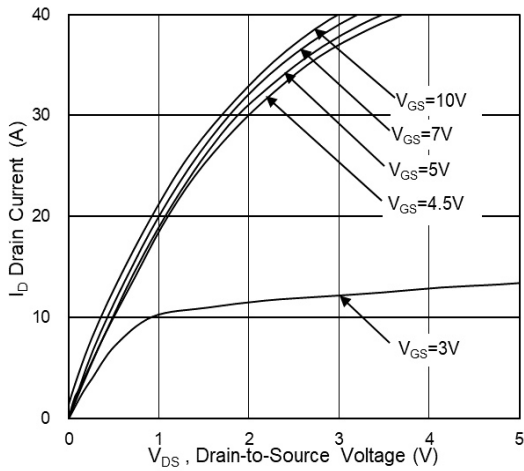


Fig.1 Typical Output Characteristics

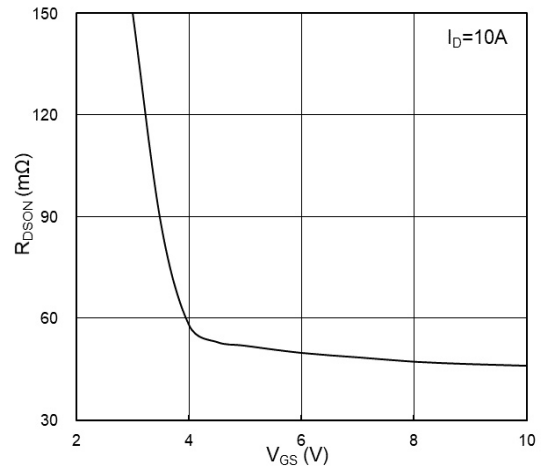


Fig.2 On-Resistance vs G-S Voltage

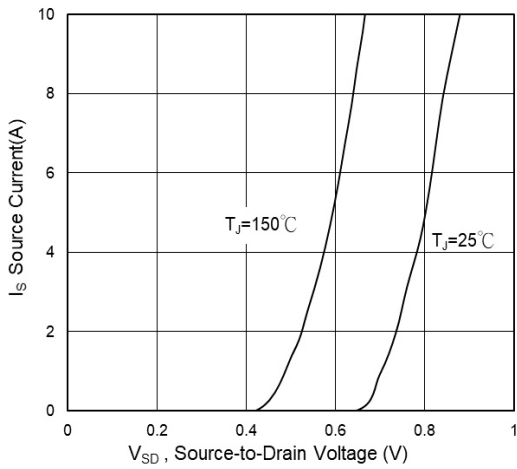


Fig.3 Source Drain Forward Characteristics

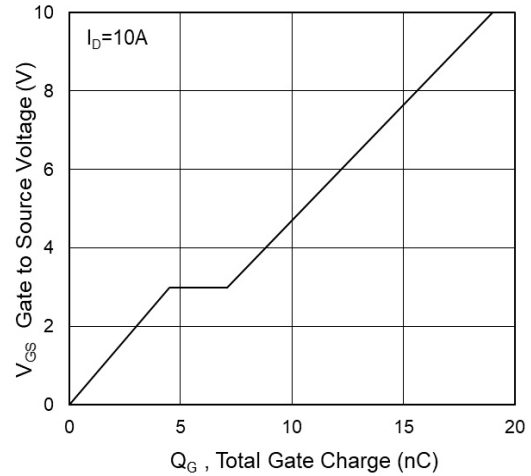


Fig.4 Gate-Charge Characteristics

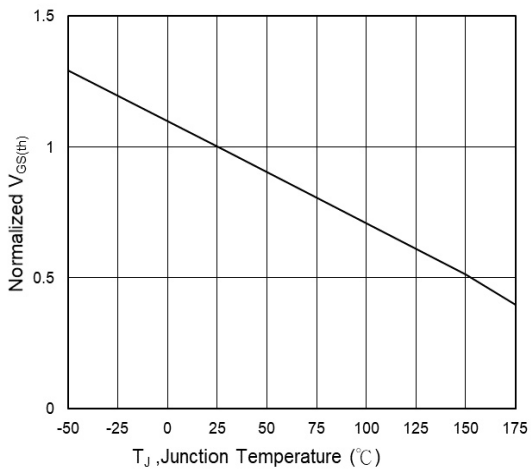


Fig.5 Normalized $V_{GS(th)}$ vs T_J

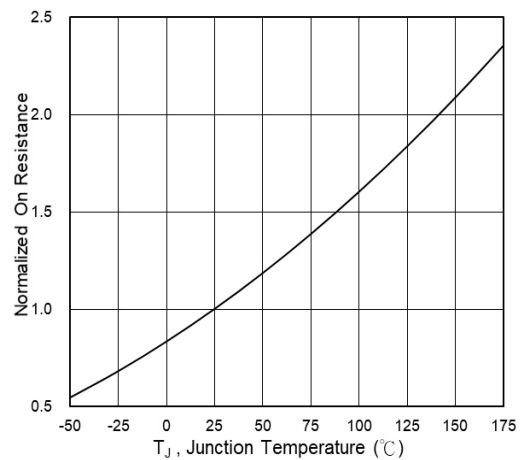


Fig.6 Normalized $R_{DS(on)}$ vs T_J

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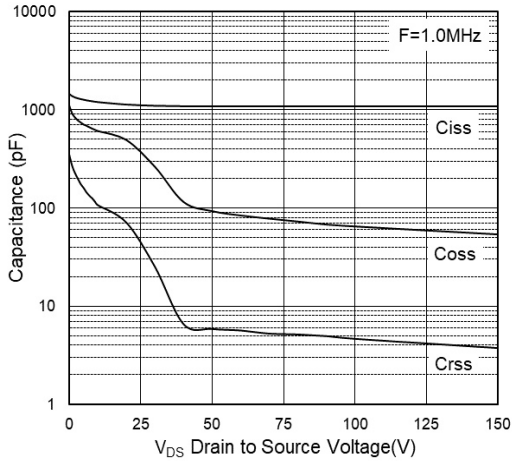


Fig.7 Capacitance

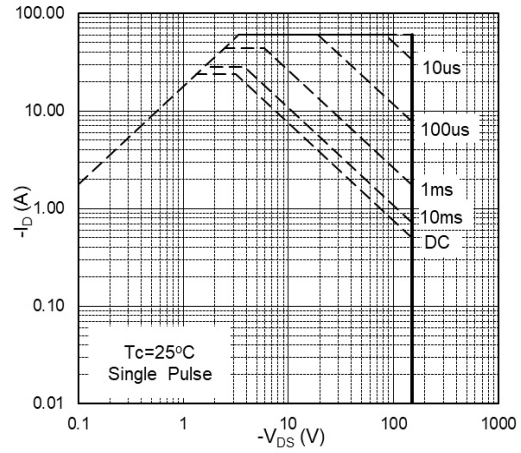


Fig.8 Safe Operating Area

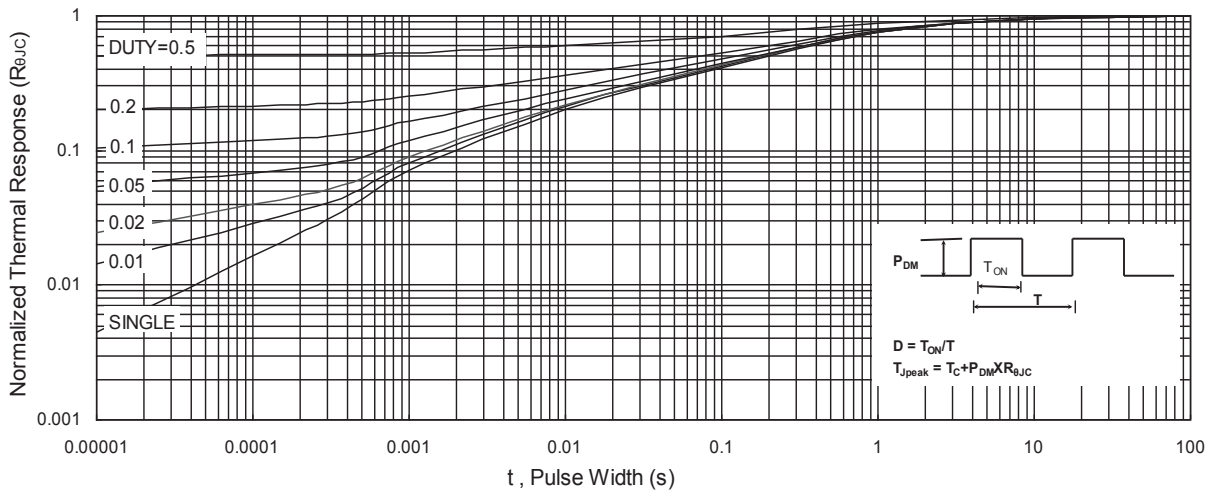


Fig.9 Normalized Maximum Transient Thermal Impedance

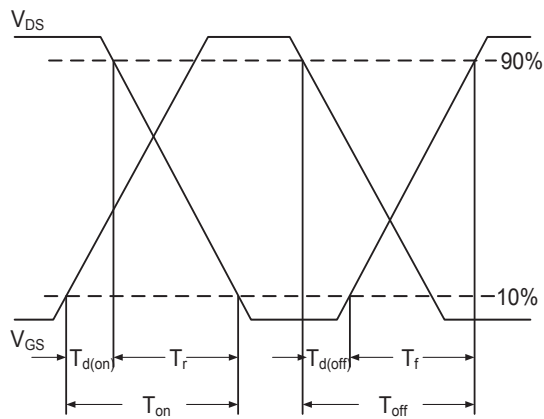


Fig.10 Switching Time Waveform

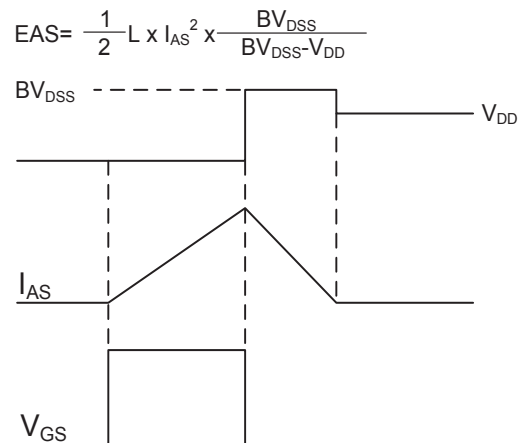


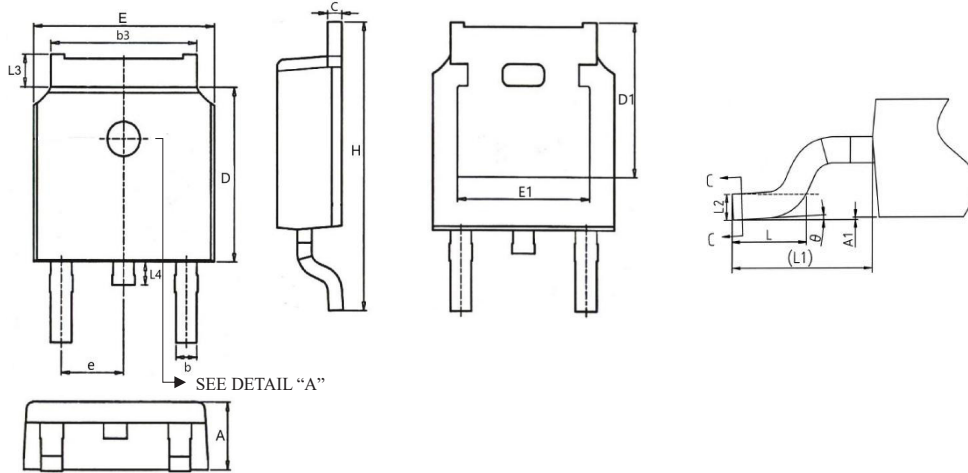
Fig.11 Unclamped Inductive Switching Waveform

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TO-252 dimension (2,500pcs/reel)

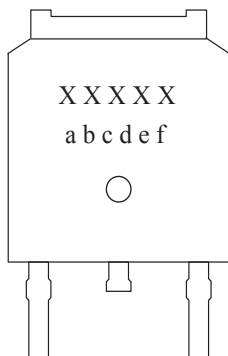


Detail "A"

| | Top | Bottom | | Top | Bottom |
|----------|-----|--------|----------|-----|--------|
| Option 1 | | | Option 3 | | |
| Option 2 | | | Option 4 | | |

| Symbols | Millimeters | | Inches | | Symbols | Millimeters | | Inches | |
|---------|-------------|------|-----------|-------|---------|-------------|-------|-----------|-------|
| | Min. | Max. | Min. | Max. | | Min. | Max. | Min. | Max. |
| A | 2.18 | 2.40 | 0.086 | 0.094 | e | 2.29 BSC | | 0.090 BSC | |
| A1 | 0.00 | 0.20 | 0.000 | 0.008 | H | 9.40 | 10.50 | 0.370 | 0.413 |
| b | 0.64 | 0.90 | 0.025 | 0.035 | L | 1.27 | 2.03 | 0.050 | 0.080 |
| b3 | 4.95 | 5.50 | 0.195 | 0.217 | L1 | 2.90 REF | | 0.114 REF | |
| c | 0.43 | 0.61 | 0.017 | 0.024 | L2 | 0.51 BSC | | 0.020 BSC | |
| D | 5.90 | 6.30 | 0.232 | 0.248 | L3 | 0.88 | 1.28 | 0.035 | 0.050 |
| D1 | 5.30 REF | | 0.209 REF | | L4 | 0.50 | 1.02 | 0.020 | 0.040 |
| E | 6.35 | 6.80 | 0.250 | 0.268 | θ | 0° | 10° | 0° | 10° |
| E1 | 4.32 | 4.95 | 0.170 | 0.195 | | | | | |

Marking



| Symbols | Content |
|---------|--|
| xxxxx | Product code |
| a | Yearly code: 2019=K, 2020=L, 2021=M... |
| b, c | Weekly code: 01 to 53 |
| d, e | Sequence: 01 to 99 or 0A to 0Z |
| f | Assembly code: A to Z (I, O excepted) |