

## Product Summary

| $V_{(BR)DSS}$ | $R_{DS(ON)}$ max                      | $I_D$ max<br>$T_A = +25^\circ\text{C}$ |
|---------------|---------------------------------------|--|
| 20V           | 45m $\Omega$ @ $V_{GS} = 4.5\text{V}$ | 4.9 A                                  |
|               | 65m $\Omega$ @ $V_{GS} = 2.5\text{V}$ | 4.1 A                                  |

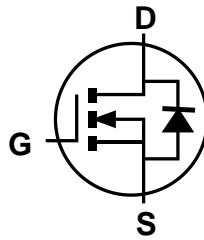
## Description and Applications

This MOSFET is designed to meet the stringent requirements of automotive applications. It is qualified to AEC-Q101, supported by a PPAP and is ideal for use in:

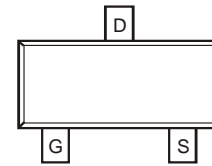
- LED Lighting
- Charging applications in portable equipment
- DC-DC Converters
- Motor Control



Top View



Internal Schematic



Top View

## Features and Benefits

- Low On-Resistance
- Low Input Capacitance
- Fast Switching Speed
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**
- **PPAP Capable (Note 4)**

## Mechanical Data

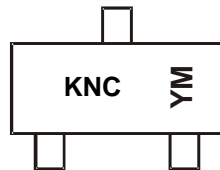
- Case: SOT23
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish —Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208
- Terminals Connections: See Diagram Below
- Weight: 0.009 grams (Approximate)

## Ordering Information (Note 5)

| Part Number   | Case  | Packaging         |
|---------------|-------|-------------------|
| ZXMN2F30FHQTA | SOT23 | 3,000/Tape & Reel |

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
  2. See [http://www.diodes.com/quality/lead\\_free.html](http://www.diodes.com/quality/lead_free.html) for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
  3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
  4. Automotive products are AEC-Q101 qualified and are PPAP capable. Refer to [http://www.diodes.com/quality/product\\_compliance\\_definitions/](http://www.diodes.com/quality/product_compliance_definitions/).
  5. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

## Marking Information



KNC = Product Type Marking Code  
 YM = Date Code Marking  
 Y or  $\bar{Y}$  = Year (ex: D = 2016)  
 M = Month (ex: 9 = September)

### Date Code Key

| Year | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 |
|------|------|------|------|------|------|------|------|------|
| Code | D    | E    | F    | G    | H    | I    | J    | K    |

| Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Code  | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | O   | N   | D   |

**Maximum Ratings** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

| Characteristic   |              |                        | Symbol           | Value | Units |
|--|--------------|------------------------|------------------|-------|-------|
| Drain-Source Voltage                                     |              |                        | V <sub>DSS</sub> | 20    | V     |
| Gate-Source Voltage                                      |              |                        | V <sub>GSS</sub> | ±12   | V     |
| Continuous Drain Current (Note 7) V <sub>GS</sub> = 4.5V | Steady State | T <sub>A</sub> = +25°C | I <sub>D</sub>   | 4.9   | A     |
|  |              | T <sub>A</sub> = +70°C |                  | 4.0   | A     |
| Maximum Continuous Body Diode Forward Current (Note 7)   |              |                        | I <sub>S</sub>   | 1.6   | A     |
| Pulsed Drain Current (10µs pulse, duty cycle = 1%)       |              |                        | I <sub>DM</sub>  | 22.6  | A     |

**Thermal Characteristics**

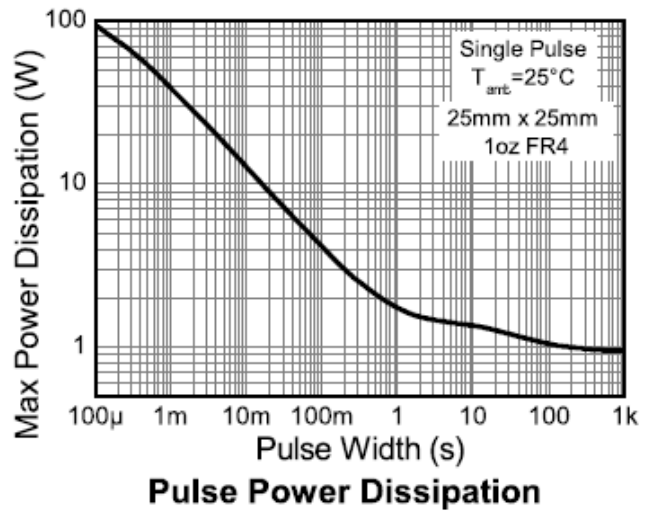
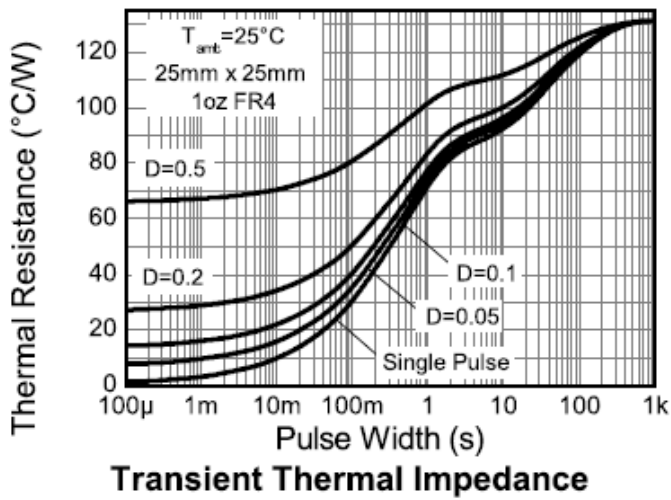
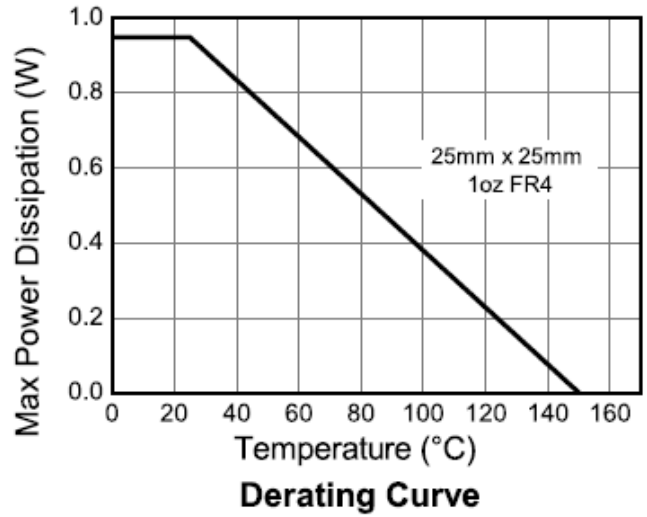
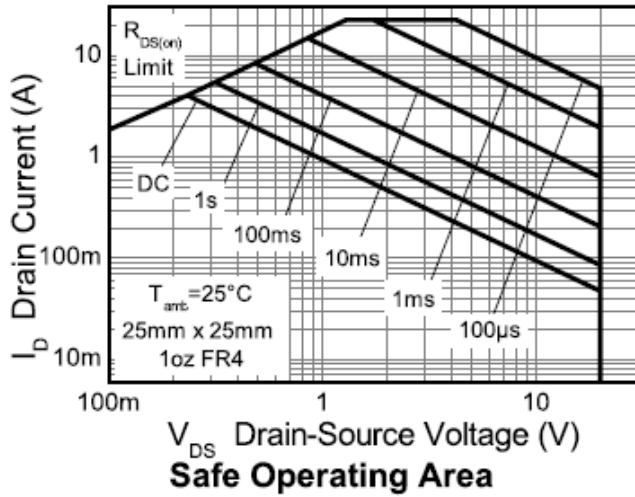
| Characteristic                                   |  |              | Symbol                            | Value       | Units |
|--|--|--------------|-----------------------------------|-------------|-------|
| Total Power Dissipation (Note 6)                 |  |              | P <sub>D</sub>                    | 0.96        | W     |
| Thermal Resistance, Junction to Ambient (Note 6) |  | Steady State | R <sub>θJA</sub>                  | 131         | °C/W  |
| Total Power Dissipation (Note 7)                 |  |              | P <sub>D</sub>                    | 1.4         | W     |
| Thermal Resistance, Junction to Ambient (Note 7) |  | Steady State | R <sub>θJA</sub>                  | 89          | °C/W  |
| Operating and Storage Temperature Range          |  |              | T <sub>J</sub> , T <sub>STG</sub> | -55 to +150 | °C    |

**Electrical Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

| Characteristic                          | Symbol              | Min | Typ  | Max  | Unit | Test Condition   |
|---|---------------------|-----|------|------|------|--|
| <b>OFF CHARACTERISTICS (Note 8)</b>     |                     |     |      |      |      |  |
| Drain-Source Breakdown Voltage          | BV <sub>DSS</sub>   | 20  | -    | -    | V    | V <sub>GS</sub> = 0V, I <sub>D</sub> = 250µA   |
| Zero Gate Voltage Drain Current         | I <sub>DSS</sub>    | -   | -    | 1    | µA   | V <sub>DS</sub> = 20V, V <sub>GS</sub> = 0V  |
| Gate-Source Leakage                     | I <sub>GSS</sub>    | -   | -    | ±100 | nA   | V <sub>GS</sub> = ±12V, V <sub>DS</sub> = 0V   |
| <b>ON CHARACTERISTICS (Note 8)</b>      |                     |     |      |      |      |  |
| Gate Threshold Voltage                  | V <sub>GS(TH)</sub> | 0.6 | 0.9  | 1.5  | V    | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250µA                                 |
| Static Drain-Source On-Resistance       | R <sub>DS(ON)</sub> | -   | -    | 45   | mΩ   | V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 2.5A  |
|   |                     |     | -    | 65   |      | V <sub>GS</sub> = 2.5V, I <sub>D</sub> = 2.0A  |
| Diode Forward Voltage                   | V <sub>SD</sub>     | -   | 0.75 | 1.2  | V    | V <sub>GS</sub> = 0V, I <sub>S</sub> = 1.25A   |
| <b>DYNAMIC CHARACTERISTICS (Note 9)</b> |                     |     |      |      |      |  |
| Input Capacitance                       | C <sub>ISS</sub>    | -   | 452  | -    | pF   | V <sub>DS</sub> = 10V, V <sub>GS</sub> = 0V<br>f = 1.0MHz                                  |
| Output Capacitance                      | C <sub>OSS</sub>    | -   | 102  | -    | pF   |  |
| Reverse Transfer Capacitance            | C <sub>RSS</sub>    | -   | 58   | -    | pF   |  |
| Total Gate Charge                       | Q <sub>g</sub>      | -   | 4.8  | -    | nC   | V <sub>DS</sub> = 10V, V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 3.5A                       |
| Gate-Source Charge                      | Q <sub>gs</sub>     | -   | 1    | -    | nC   |  |
| Gate-Drain Charge                       | Q <sub>gd</sub>     | -   | 1.2  | -    | nC   |  |
| Turn-On Delay Time                      | t <sub>D(ON)</sub>  | -   | 2.9  | -    | ns   |  |
| Turn-On Rise Time                       | t <sub>R</sub>      | -   | 5.6  | -    | ns   | V <sub>DS</sub> = 10V, V <sub>GS</sub> = 4.5V,<br>R <sub>G</sub> = 6Ω, I <sub>D</sub> = 1A |
| Turn-Off Delay Time                     | t <sub>D(OFF)</sub> | -   | 19.4 | -    | ns   |  |
| Turn-Off Fall Time                      | t <sub>F</sub>      | -   | 10.2 | -    | ns   |  |

- Notes:
6. Device mounted on FR-4 PCB, with minimum recommended pad layout.
  7. Device mounted on 1" x 1" FR-4 PCB with high coverage 2oz. Copper, single sided.
  8. Short duration pulse test used to minimize self-heating effect.
  9. Guaranteed by design. Not subject to product testing.

**Thermal characteristics**



**Typical Characteristics**

Fig1.  $I_D - V_{DS}$

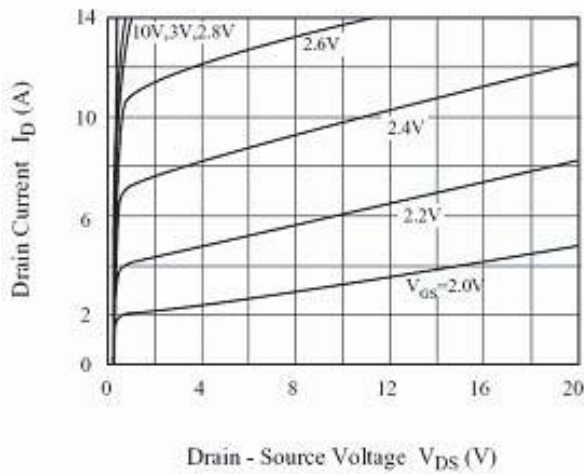


Fig2.  $R_{DS(on)} - I_D$

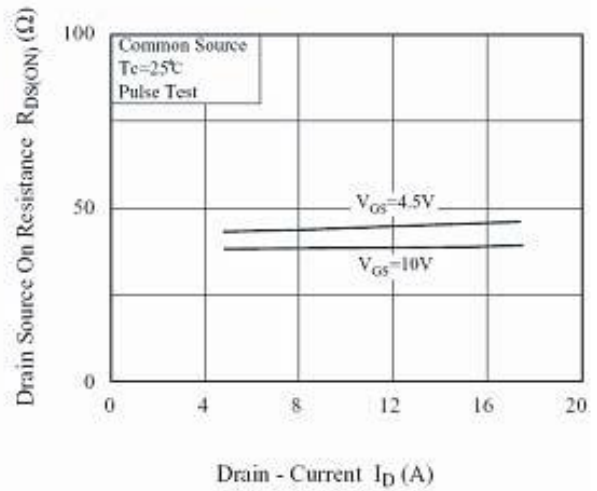


Fig3.  $I_D - V_{GS}$

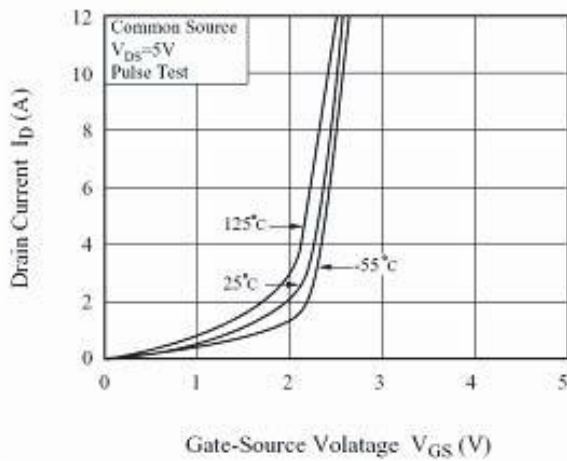


Fig4.  $R_{DS(on)} - T_j$

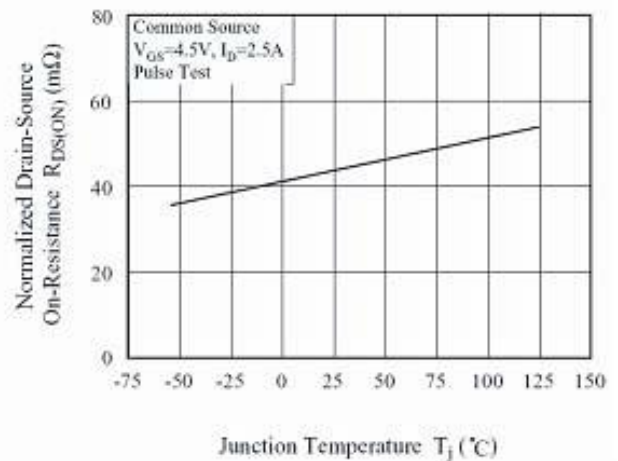


Fig5.  $V_{th} - T_j$

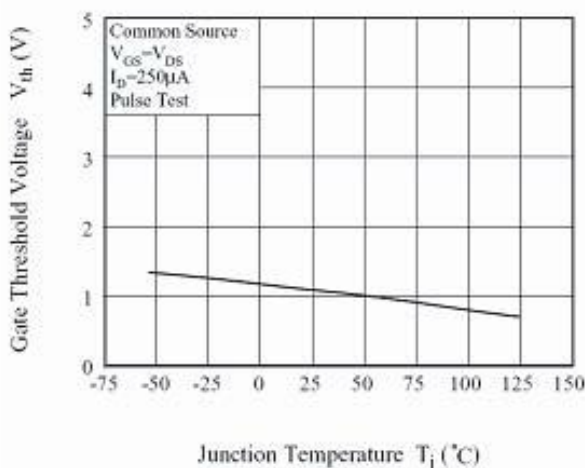
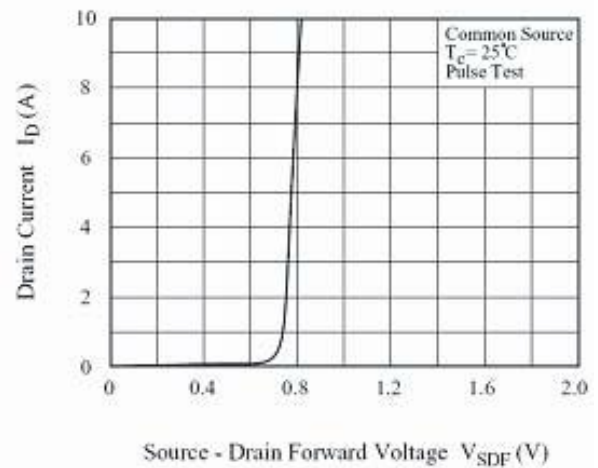


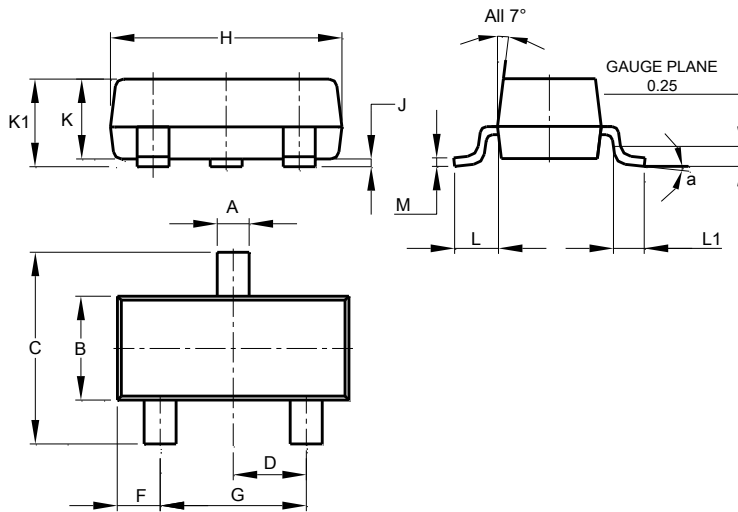
Fig6.  $I_S - V_{SDF}$



## Package Outline Dimensions

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

SOT23

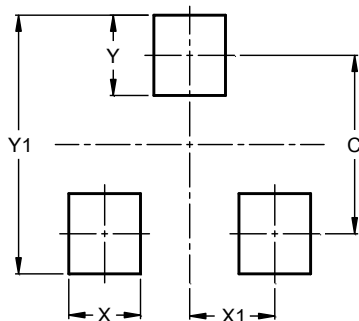


| SOT23                |       |       |       |
|----------------------|-------|-------|-------|
| Dim                  | Min   | Max   | Typ   |
| A                    | 0.37  | 0.51  | 0.40  |
| B                    | 1.20  | 1.40  | 1.30  |
| C                    | 2.30  | 2.50  | 2.40  |
| D                    | 0.89  | 1.03  | 0.915 |
| F                    | 0.45  | 0.60  | 0.535 |
| G                    | 1.78  | 2.05  | 1.83  |
| H                    | 2.80  | 3.00  | 2.90  |
| J                    | 0.013 | 0.10  | 0.05  |
| K                    | 0.890 | 1.00  | 0.975 |
| K1                   | 0.903 | 1.10  | 1.025 |
| L                    | 0.45  | 0.61  | 0.55  |
| L1                   | 0.25  | 0.55  | 0.40  |
| M                    | 0.085 | 0.150 | 0.110 |
| a                    | 0°    | 8°    | --    |
| All Dimensions in mm |       |       |       |

## Suggested Pad Layout

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

SOT23



| Dimensions | Value (in mm) |
|------------|---------------|
| C          | 2.0           |
| X          | 0.8           |
| X1         | 1.35          |
| Y          | 0.9           |
| Y1         | 2.9           |

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