



## N-Channel 60-V (D-S) MOSFET

## PRODUCT SUMMARY

| $V_{(BR)DSS}$ Min (V) | $r_{DS(on)}$ Max ( $\Omega$ ) | $V_{GS(th)}$ (V) | $I_D$ (A) |
|-----------------------|-------------------------------|------------------|-----------|
| 60                    | 5 @ $V_{GS} = 10$ V           | 0.8 to 2.5       | 0.31      |

Zener Gate  
Protected

## FEATURES

- Zener Diode Input Protected
- Low On-Resistance:  $3\ \Omega$
- Ultralow Threshold: 1.2 V
- Low Input Capacitance: 38 pF
- Low Input and Output Leakage

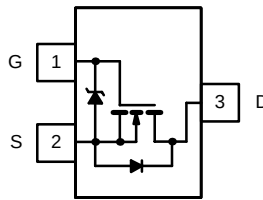
## BENEFITS

- Extra ESD Protection
- Low Offset Voltage
- Low-Voltage Operation
- High-Speed, Easily Driven
- Low Error Voltage

## APPLICATIONS

- Drivers: Relays, Solenoids, Lamps, Hammers, Displays, Memories, Transistors, etc.
- Battery Operated Systems
- Solid-State Relays
- Inductive Load Drivers

SC-59



Top View

VN10KC

Marking Code: F1w//

F1 = Part Number Code for VN10KC

w = Week Code

// = Lot Traceability

ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$  UNLESS OTHERWISE NOTED)

| Parameter                                              | Symbol         | Limits     | Unit               |
|--------------------------------------------------------|----------------|------------|--------------------|
| Drain-Source Voltage                                   | $V_{DS}$       | 60         | V                  |
| Gate-Source Voltage                                    | $V_{GS}$       | 15/-0.3    |                    |
| Continuous Drain Current ( $T_J = 150^\circ\text{C}$ ) | $I_D$          | 0.31       | A                  |
|                                                        |                | 0.20       |                    |
| Pulsed Drain Current <sup>a</sup>                      | $I_{DM}$       | 0.6        |                    |
| Power Dissipation                                      | $P_D$          | 0.6        | W                  |
|                                                        |                | 0.24       |                    |
| Maximum Junction-to-Ambient                            | $R_{thJA}$     | 208        | $^\circ\text{C/W}$ |
| Operating Junction and Storage Temperature Range       | $T_J, T_{stg}$ | -55 to 150 | $^\circ\text{C}$   |

Notes

a. Pulse width limited by maximum junction temperature.

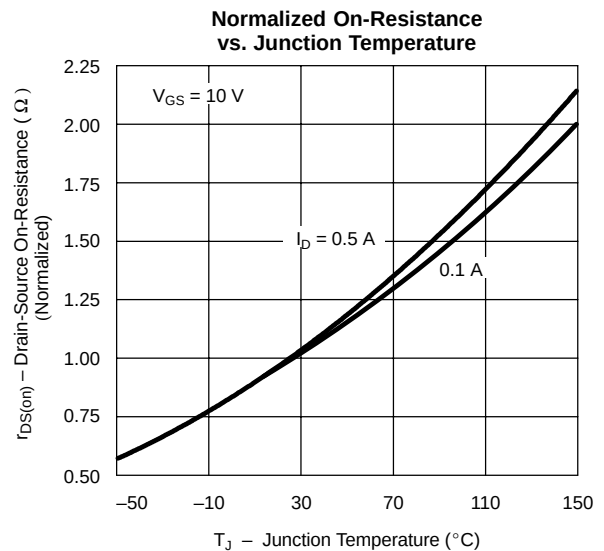
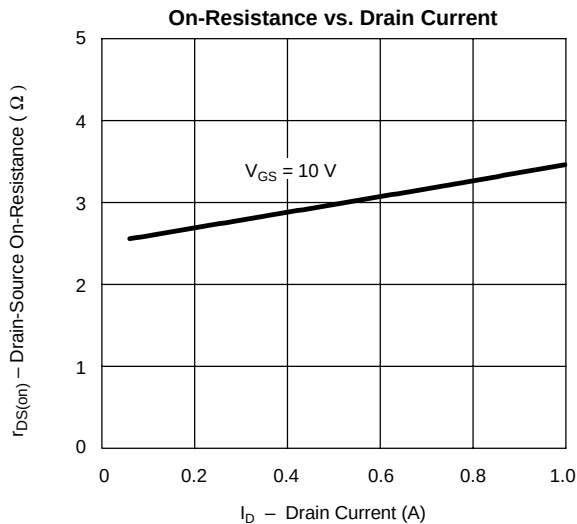
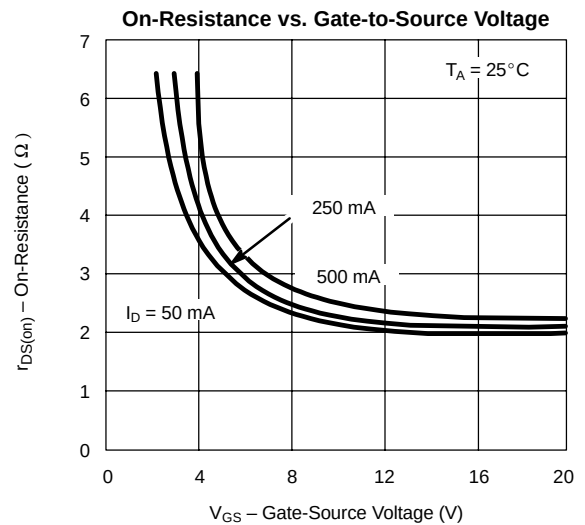
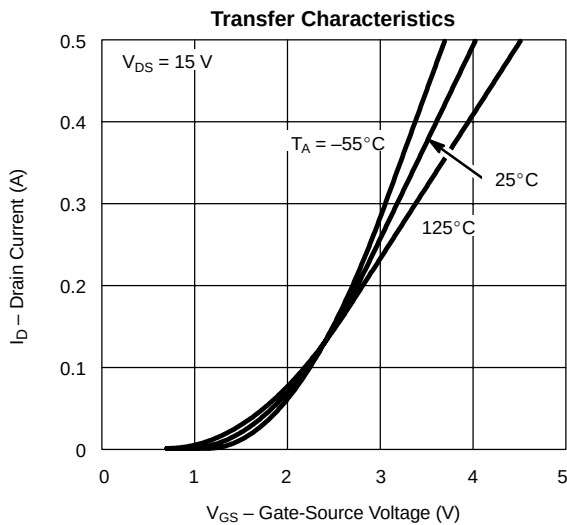
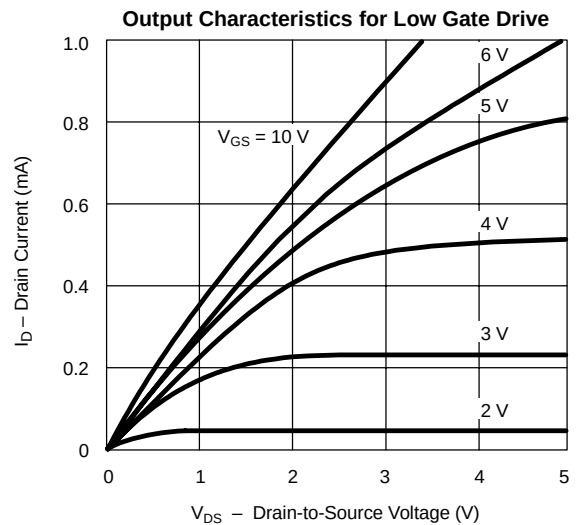
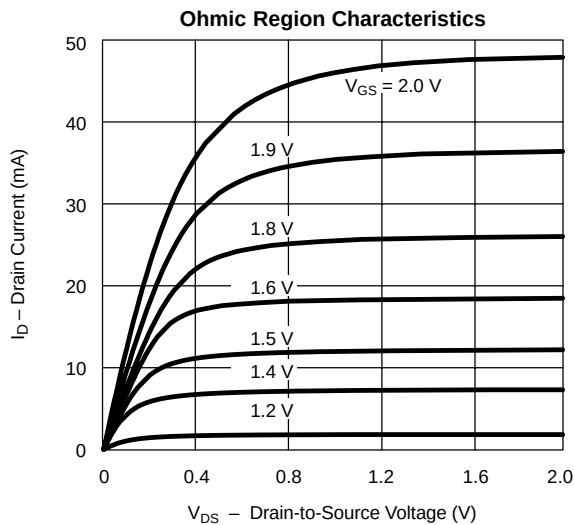
**SPECIFICATIONS ( $T_A = 25^\circ\text{C}$  UNLESS OTHERWISE NOTED)**

| Parameter                                     | Symbol               | Test Conditions                                                                                                           | Typ <sup>a</sup> | Limits |     | Unit |
|-----------------------------------------------|----------------------|---------------------------------------------------------------------------------------------------------------------------|------------------|--------|-----|------|
|                                               |                      |                                                                                                                           |                  | Min    | Max |      |
| Static                                        |                      |                                                                                                                           |                  |        |     |      |
| Drain-Source Breakdown Voltage                | V <sub>(BR)DSS</sub> | V <sub>GS</sub> = 0 V, I <sub>D</sub> = 100 μA                                                                            | 120              | 60     |     | V    |
| Gate-Threshold Voltage                        | V <sub>GS(th)</sub>  | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 1 mA                                                                 | 1.2              | 0.8    | 2.5 |      |
| Gate-Body Leakage                             | I <sub>GSS</sub>     | V <sub>DS</sub> = 0 V, V <sub>GS</sub> = 15 V                                                                             | 1                |        | 100 | nA   |
| Zero Gate Voltage Drain Current               | I <sub>DSS</sub>     | V <sub>DS</sub> = 48 V, V <sub>GS</sub> = 0 V                                                                             |                  |        | 10  | μA   |
|                                               |                      | T <sub>A</sub> = 125°C                                                                                                    |                  |        | 500 |      |
| On-State Drain Current <sup>b</sup>           | I <sub>D(on)</sub>   | V <sub>DS</sub> = 10 V, V <sub>GS</sub> = 10 V                                                                            | 1                | 0.75   |     | A    |
| Drain-Source On-Resistance <sup>b</sup>       | r <sub>DS(on)</sub>  | V <sub>GS</sub> = 5 V, I <sub>D</sub> = 0.2 A                                                                             | 4                |        | 7.5 | Ω    |
|                                               |                      | V <sub>GS</sub> = 10 V, I <sub>D</sub> = 0.5 A                                                                            | 3                |        | 5   |      |
|                                               |                      | T <sub>A</sub> = 125°C                                                                                                    | 5.6              |        | 9   |      |
| Forward Transconductance <sup>b</sup>         | g <sub>fs</sub>      | V <sub>DS</sub> = 10 V, I <sub>D</sub> = 0.5 A                                                                            | 300              | 100    |     | mS   |
| Common Source Output Conductance <sup>b</sup> | g <sub>os</sub>      | V <sub>DS</sub> = 7.5 V, I <sub>D</sub> = 0.05 A                                                                          | 0.2              |        |     |      |
| Dynamic                                       |                      |                                                                                                                           |                  |        |     |      |
| Input Capacitance                             | C <sub>iss</sub>     | V <sub>DS</sub> = 25 V, V <sub>GS</sub> = 0 V, f = 1 MHz                                                                  | 38               |        | 60  | pF   |
| Output Capacitance                            | C <sub>oss</sub>     |                                                                                                                           | 16               |        | 25  |      |
| Reverse Transfer Capacitance                  | C <sub>rss</sub>     |                                                                                                                           | 2                |        | 5   |      |
| Switching <sup>c</sup>                        |                      |                                                                                                                           |                  |        |     |      |
| Turn-On Time                                  | t <sub>ON</sub>      | V <sub>DD</sub> = 15 V, R <sub>L</sub> = 23 Ω<br>I <sub>D</sub> ≈ 0.6 A, V <sub>GEN</sub> = 10 V<br>R <sub>G</sub> = 25 Ω | 7                |        | 10  | ns   |
| Turn-Off Time                                 | t <sub>OFF</sub>     |                                                                                                                           | 9                |        | 10  |      |

## Notes

- a. For DESIGN AID ONLY, not subject to production testing.  
b. Pulse test:  $PW \leq 300\text{ }\mu\text{s}$  duty cycle  $\leq 2\%$ .  
c. Switching time is essentially independent of operating temperature.

VNPD06

**TYPICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$  UNLESS OTHERWISE NOTED)**

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