# KSD20N04

**40V N-Channel MOSFET**

## General Description

The KSD20N04 eries are from Advanced Power innovated design and silicon process technology to achieve the lowest possible on-resistance and fast switching performance. It provides the designer with an extreme efficient device for use in a wide range of power applications.

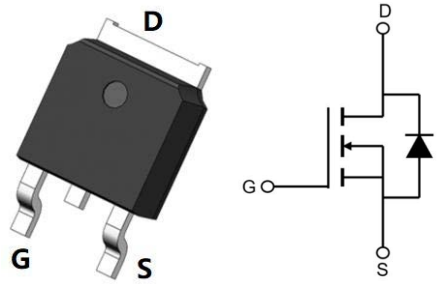
## Product Summary

| $V_{DS}$ (V) | $R_{DS(on)}$ (mΩ) | $I_D$ (A) |
|---|---|---|
| 40 | 25 at $V_{GS}$ = 10 V | 20 |
| | 40 at $V_{GS}$ = 4.5 V | 16 |

## Features

- High density cell design for ultra low Rdson
- Super Low Gate Charge
- Good stability and uniformity with high $E_{AS}$
- Excellent package for good heat dissipation

## **TO-252** Pin Configuration




## Applications

- Simple Drive Requirement
- Fast Switching Characteristic

## Absolute Maximum Ratings **Tc=25℃ unless otherwise noted**

| Symbol | Parameter | Rating | Units |
|---|---|---|---|
| $V_{DS}$ | Drain-Source Voltage | 40 | V |
| $V_{GS}$ | Gate-Source Voltage | ±20 | V |
| $I_D$ | Drain Current – Continuous ($T_C$=25℃) | 20 | A |
| | Drain Current – Continuous ($T_C$=100℃) | 10 | A |
| $I_{DM}$ | Drain Current – Pulsed[1] | 50 | A |
| $P_D$ | Power Dissipation ($T_C$=25℃) | 4.3 | W |
| | Power Dissipation ($T_C$=100℃) | 0.65 | W/℃ |
| $T_{STG}$ | Storage Temperature Range | -50 to 150 | ℃ |
| $T_J$ | Operating Junction Temperature Range | -50 to 150 | ℃ |

## Thermal Characteristics

| Symbol | Parameter | Typ. | Max. | Unit |
|---|---|---|---|---|
| $R_{\theta JA}$ | Thermal Resistance Junction to ambient | --- | 62 | ℃/W |
| $R_{\theta JC}$ | Thermal Resistance Junction to Case | --- | 1.8 | ℃/W |

## Electrical Characteristics ($T_J$=25 ℃, unless otherwise noted)

### Off Characteristics

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $BV_{DSS}$ | Drain-Source Breakdown Voltage | $V_{GS}$=0V , $I_D$=250uA | 40 | --- | --- | V |
| $I_{DSS}$ | Drain-Source Leakage Current | $V_{DS}$=40V , $V_{GS}$=0V , $T_J$=25℃ | --- | --- | 1 | uA |
| | | $V_{DS}$=40V , $V_{GS}$=0V , $T_J$=125℃ | --- | --- | 10 | uA |
| $I_{GSS}$ | Gate-Source Leakage Current | $V_{GS}$=±20V , $V_{DS}$=0V | --- | --- | ±100 | nA |

### On Characteristics

| | | | | | | |
|---|---|---|---|---|---|---|
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance | $V_{GS}$=10V , $I_D$=4A | --- | 25 | 30 | mΩ |
| | | $V_{GS}$=4.5V , $I_D$=3A | --- | 40 | 48 | mΩ |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{GS}$=$V_{DS}$ , $I_D$ =250uA | 1.0 | 1.5 | 2.2 | V |
| gfs | Forward Transconductance | $V_{DS}$=10V , $I_S$=5A | --- | 20 | --- | S |

### Dynamic and switching Characteristics

| | | | | | | |
|---|---|---|---|---|---|---|
| $Q_g$ | Total Gate Charge[2,3] | VDS=20V, ID=3A, VGS=10V | --- | 11 | --- | nC |
| $Q_{gs}$ | Gate-Source Charge[2,3] | | --- | 2 | --- | |
| $Q_{gd}$ | Gate-Drain Charge[2,3] | | --- | 2.5 | --- | |
| $T_{d(on)}$ | Turn-On Delay Time[2,3] | V DD=20V, ID=4A, RL=1Ω, RGEN=3Ω, VGS=10V | --- | 10 | --- | ns |
| $T_r$ | Rise Time[2,3] | | --- | 8 | --- | |
| $T_{d(off)}$ | Turn-Off Delay Time[2,3] | | --- | 29 | --- | |
| $T_f$ | Fall Time[2,3] | | --- | 12 | --- | |
| $C_{iss}$ | Input Capacitance | VDS=20V, VG S=0V, f=1.0MHz | --- | 545 | --- | pF |
| $C_{oss}$ | Output Capacitance | | --- | 103 | --- | |
| $C_{rss}$ | Reverse Transfer Capacitance | | --- | 53 | --- | |

## Drain-Source Diode Characteristics and Maximum Ratings

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $I_S$ | Continuous Source Current | $V_G$=$V_D$=0V , Force Current | --- | --- | 20 | A |
| $I_{SM}$ | Pulsed Source Current | | --- | --- | 40 | A |
| $V_{SD}$ | Diode Forward Voltage | $V_{GS}$=0V , $I_S$=5A , $T_J$=25℃ | --- | --- | 1.2 | V |

Note :

1. Pulse width limited by Max. junction temperature.
2. Pulse test
3. Starting $T_j$=25°C , $V_{DD}$=30V , L=0.1mH , $R_G$=25Ω, $V_{GS}$=10V
4. Surface mounted on 1 $in^2$ copper pad of FR4 board

## Typical Electrical and Thermal Characteristics (Curves)

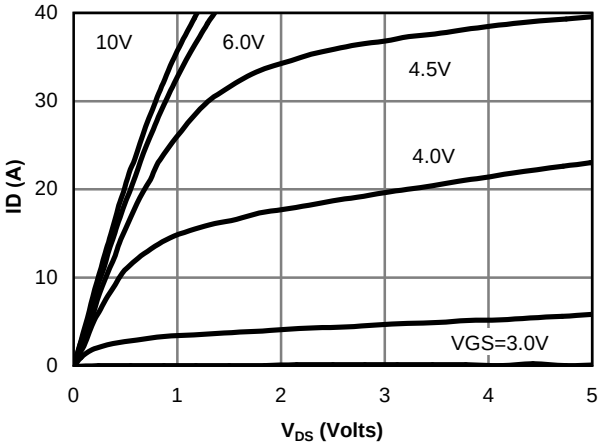



Figure 1: On-Region Characteristics

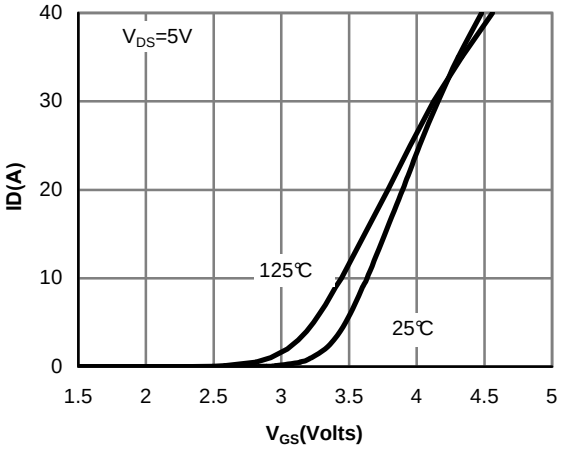



Figure 2: Transfer Characteristics

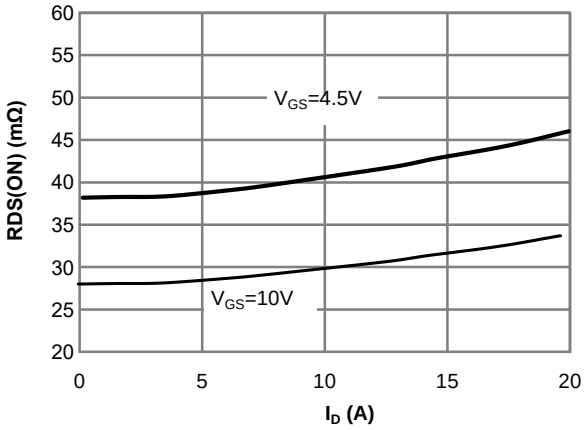



Figure 3: On-Resistance vs. Drain Current and Gate Voltage

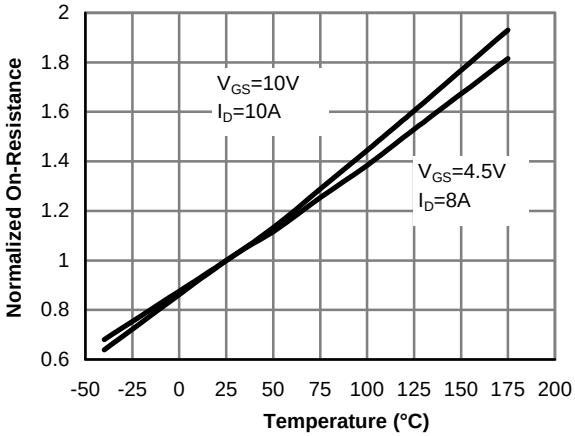



Figure 4: On-Resistance vs. Junction Temperature

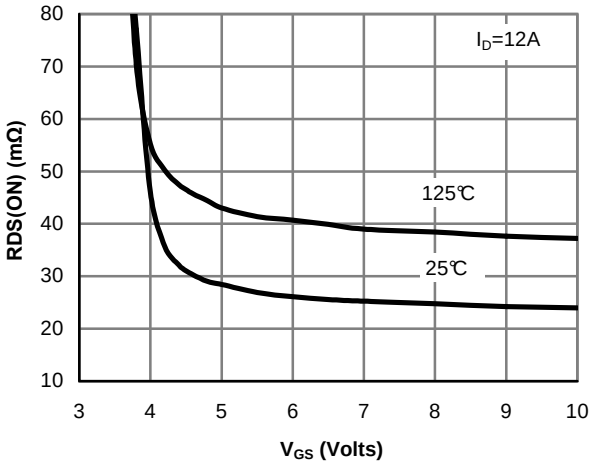



Figure 5: On-Resistance vs. Gate-Source Voltage

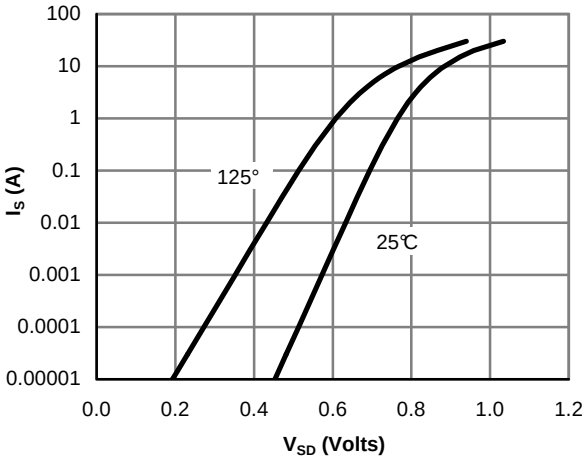



Figure 6: Body-Diode Characteristics

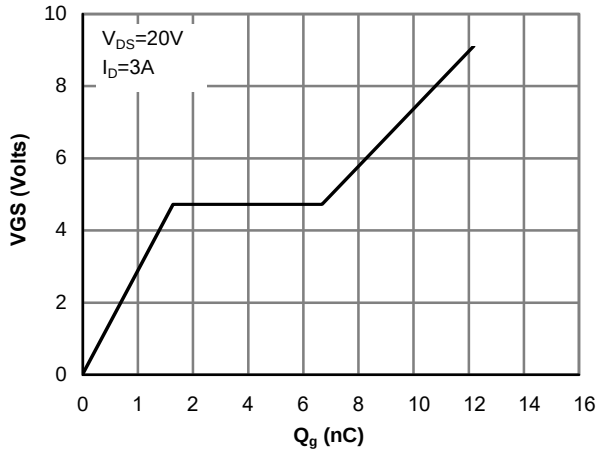



Figure 7: Gate-Charge Characteristics

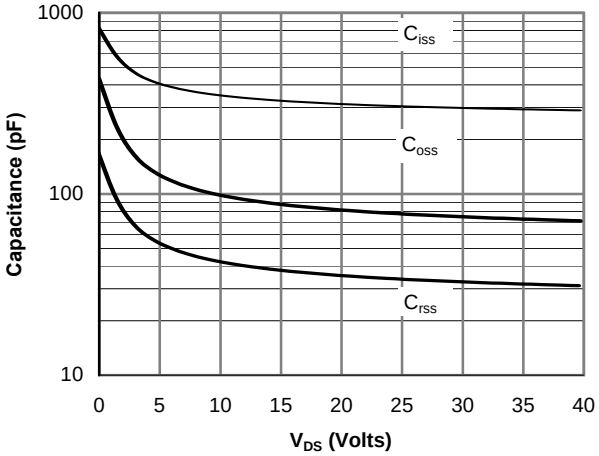



Figure 8: Capacitance Characteristics

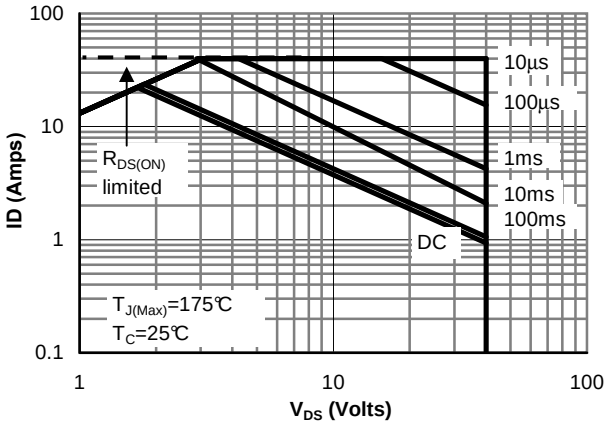



Figure 9: Maximum Forward Biased Safe Operating Area

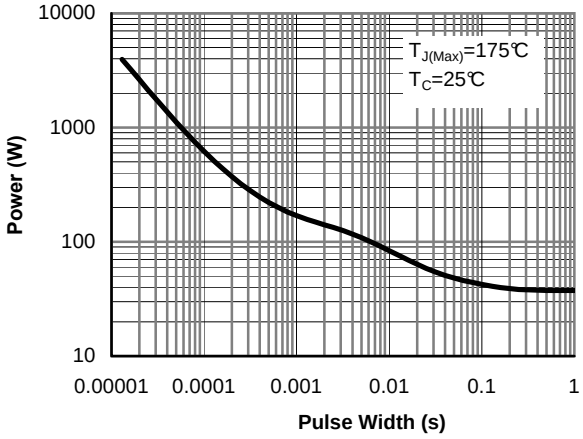



Figure 10: Single Pulse Power Rating Junction-to-Case

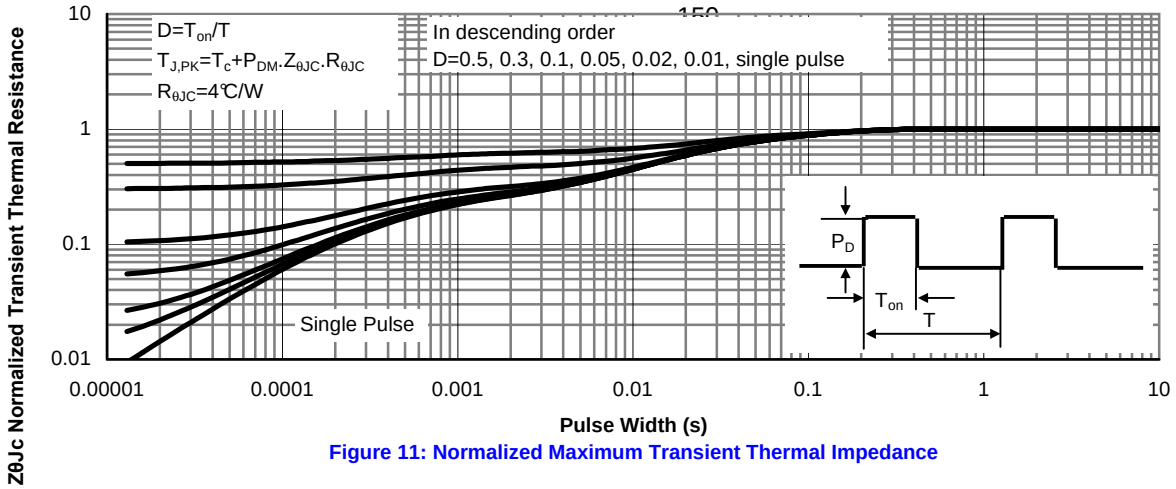



Figure 11: Normalized Maximum Transient Thermal Impedance

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