# 20V N-Channel Trench Power MOSFET

## General Description

The SJK20ND170 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 4.5V. This device is suitable for use as a wide variety of applications.

## Features

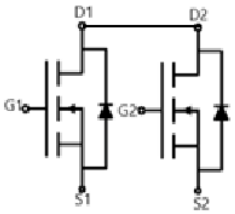
- Low Gate Charge
- High Power and current handing capability
- Lead free product is acquired

## Application

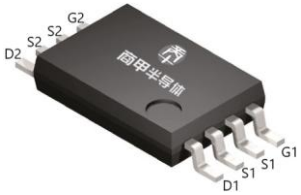
- DC/DC Converter
- Ideal for high-frequency switching and synchronous rectification

## Key Performance Parametes

| Parameter | Value | Unit |
|---|---|---|
| $V_{DS}$ | 20 | V |
| $R_{DS(ON)_TYP}$ | 17.8 | mΩ |
| $I_D$ | 7.9 | A |
| $Q_G$ | 19 | nC |




Schematic Diagram




TSSSOP-8 top view

RoHS

## Package Marking and Ordering Information

| Device/Ordering Code | Marking | Package | Packing | Reel Size | Tape width | Quantity |
|---|---|---|---|---|---|---|
| SJK20ND170 | SJK20ND170 | TSSOP-8 | Tape | \ | \ | 5000 Pcs |

## Table 1. Absolute Maximum Ratings ($T_A$=25℃ unless otherwise noted)

| Symbol | Parameter | Limit | Unit |
|---|---|---|---|
| $V_{DS}$ | Drain-Source Voltage ($V_{GS}$=0V) | 20 | V |
| $V_{GS}$ | Gate-Source Voltage ($V_{DS}$=0V) | ±12 | V |
| $I_D$ | Drain Current-Continuous($T_A$=25℃) | 7.9 | A |
| | Drain Current-Continuous($T_A$=100℃) | 5 | A |
| $I_{DM\ (pluse)}$ | Drain Current-Continuous@ Current-Pulsed (Note 1) | 31.6 | A |
| $P_D$ | Maximum Power Dissipation($T_A$=25℃) | 2 | W |
| | Maximum Power Dissipation($T_A$=100℃) | 0.8 | W |
| $E_{AS}$ | Avalanche energy (Note 2) | 25 | mJ |
| $T_J$, $T_{STG}$ | Operating Junction and Storage Temperature Range | -55 To 150 | ℃ |

## Table 2. Thermal Characteristic

| Symbol | Parameter | Typ | Max | Unit |
|---|---|---|---|---|
| $R_{\theta JA}$ | Thermal Resistance, Junction-to- Ambient | | 62 | ℃/W |

## Table 3. Electrical Characteristics ($T_J$=25℃ unless otherwise noted)

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **On/Off States** | | | | | | |
| $BV_{DSS}$ | Drain-Source Breakdown Voltage | $V_{GS}$=0V $I_D$=250μA | 20 | | | V |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$=20V, $V_{GS}$=0V $T_J$=25℃ | | | 1 | μA |
| | | $V_{DS}$=20V, $V_{GS}$=0V $T_J$=125℃ | | | 100 | μA |
| $I_{GSS}$ | Gate-Body Leakage Current | $V_{GS}$=±12V, $V_{DS}$=0V | | | ±100 | nA |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}$=$V_{GS}$, $I_D$=250μA | 0.4 | | 1 | V |
| $g_{FS}$ | Forward Transconductance | $V_{DS}$=5V, $I_D$=2A | | 69 | | S |
| $R_{DS(ON)}$ | Drain-Source On-State Resistance | $V_{GS}$=4.5V, $I_D$=3A $T_J$=25℃ | | 17.8 | 23.1 | mΩ |
| $R_{DS(ON)}$ | Drain-Source On-State Resistance | $V_{GS}$=2.5V, $I_D$=2A $T_J$=25℃ | | 20.8 | 27.7 | mΩ |
| **Dynamic Characteristics** | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{DS}$=4.5V,$V_{GS}$=0V, f=1.0MHz | | 785 | | pF |
| $C_{oss}$ | Output Capacitance | | | 129 | | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | | 108 | | pF |
| $R_g$ | Gate resistance | $V_{GS}$=0V, $V_{DS}$=0V, f=1.0MHz | | 3.4 | | Ω |
| **Switching Parameters** | | | | | | |
| $t_{d(on)}$ | Turn-on Delay Time | $V_{GS}$=4.5V, $V_{DS}$=10V, $R_L$=3Ω, $R_{GEN}$=3Ω | | 6.4 | | nS |
| $t_r$ | Turn-on Rise Time | | | 2.4 | | nS |
| $t_{d(off)}$ | Turn-Off Delay Time | | | 30.8 | | nS |
| $t_f$ | Turn-Off Fall Time | | | 3 | | nS |
| $Q_g$ | Total Gate Charge | $V_{GS}$=4.5V, $V_{DS}$=21V, $I_D$=3A | | 19 | | nC |
| $Q_{gs}$ | Gate-Source Charge | | | 1.5 | | nC |
| $Q_{gd}$ | Gate-Drain Charge | | | 2.7 | | nC |
| **Source-Drain Diode Characteristics** | | | | | | |
| $I_{SD}$ | Source-Drain Current (Body Diode) | | | | 7.9 | A |
| $V_{SD}$ | Forward on Voltage (Note 3) | $V_{GS}$=0V, $I_S$=3A | | | 1.2 | V |
| $t_{rr}$ | Reverse Recovery Time | $I_F$=3A, dI/dt=100A/μs | | 14 | | ns |
| $Q_{rr}$ | Reverse Recovery Charge | $I_F$=3A, dI/dt=100A/μs | | 5.2 | | nC |

Notes 1.Repetitive Rating: Pulse width limited by maximum junction temperature.
Notes 2.$E_{AS}$ condition: $T_J$=25℃,$V_{DD}$=40V,$V_G$=10V, Rg=25Ω, L=0.5mH.
Notes 3.Repetitive Rating: Pulse width limited by maximum junction temperature.

## Typical Electrical And Thermal Characteristics (Curves)

**Figure 1. Output Characteristics**

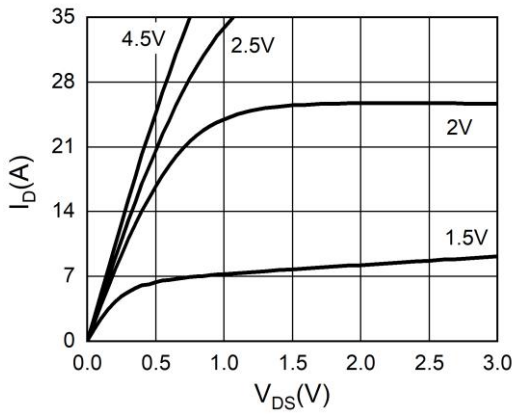



**Figure 2. Transfer Characteristics**

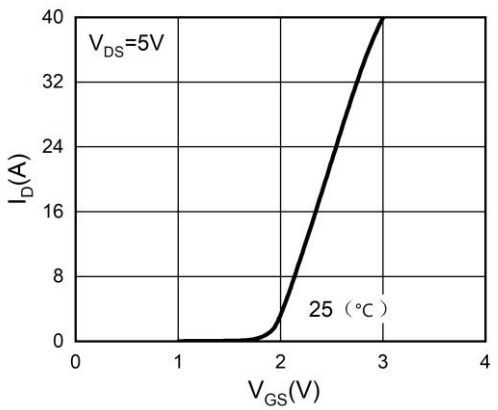



**Figure 3. Power Dissipation**

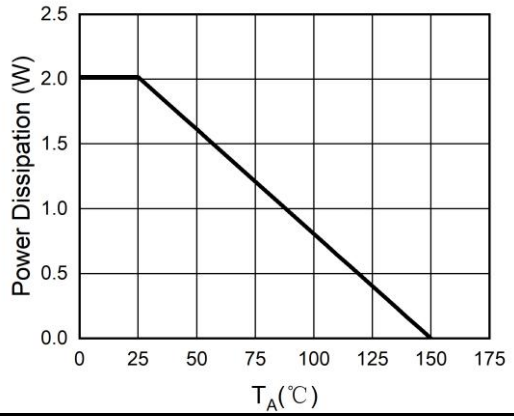



**Figure 4. Drain Current**

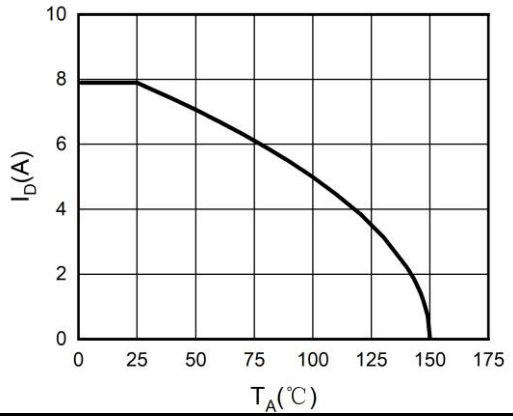



**Figure 5. $BV_{DSS}$ vs Junction Temperature**

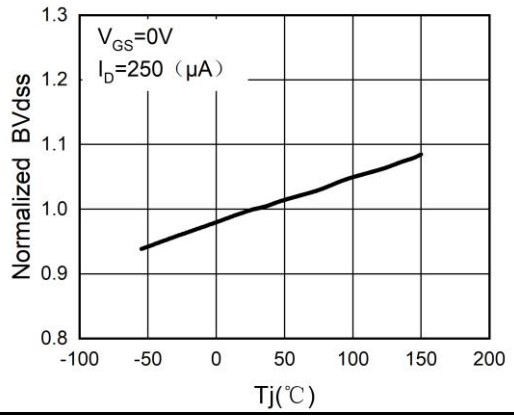
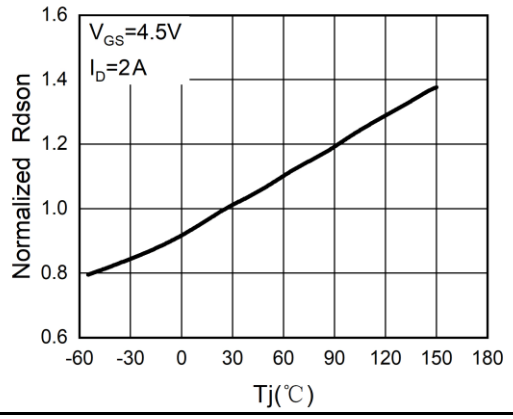



**Figure 6. $R_{DS(ON)}$ vs Junction Temperature**



## Typical Electrical And Thermal Characteristics (Curves)

**Figure 7. Gate Charge Waveforms**

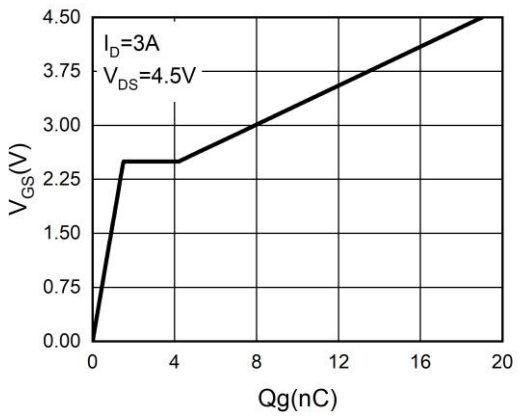



**Figure 8. Capacitance**

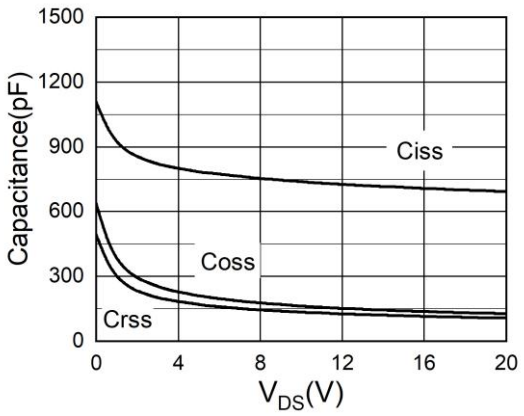



**Figure 9. Body-Diode Characteristics**

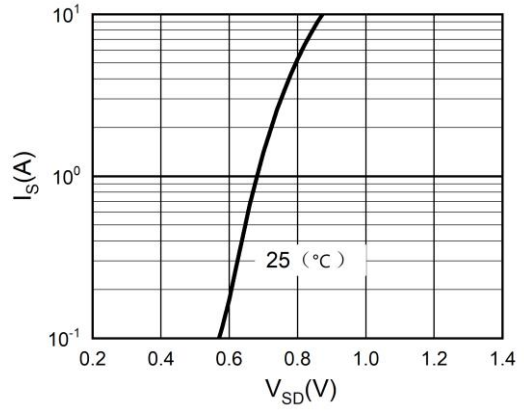
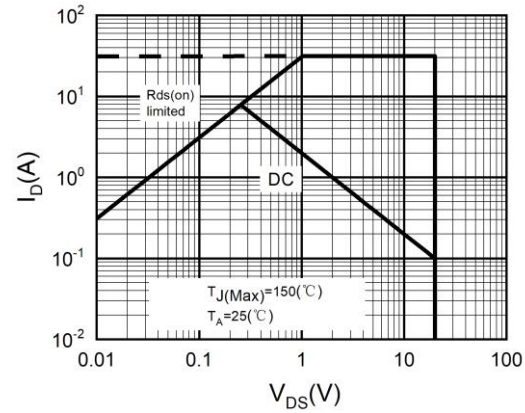
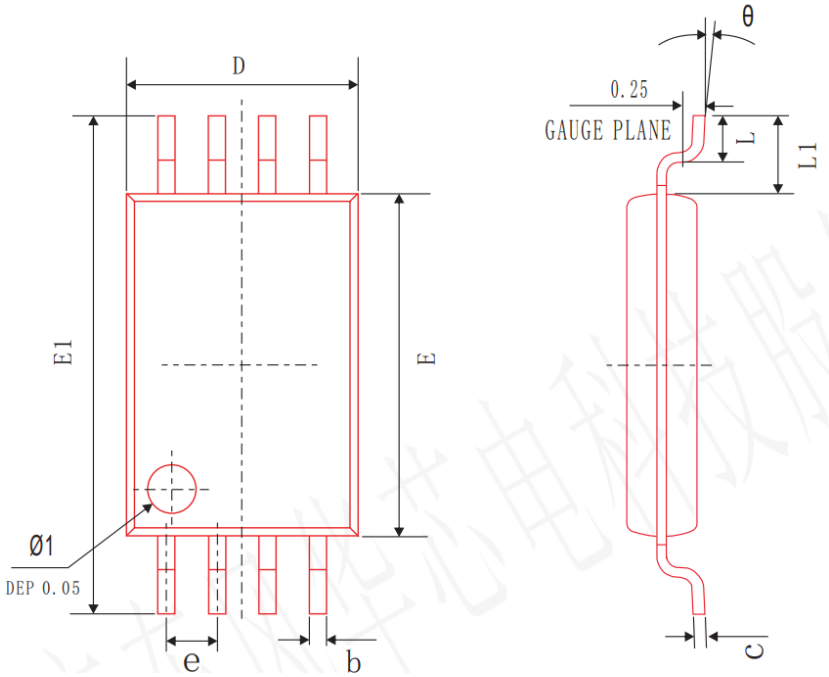



**Figure 10. Maximum Safe Operating Area**

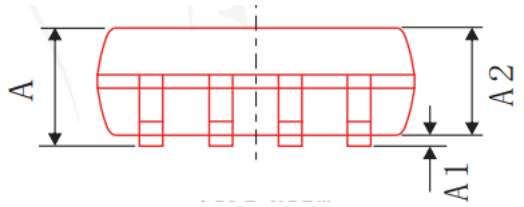


## TSSOP-8 Package Information




COMMON DIMENSIONS
(UNITS OF MEASURE=mm)

| SYMBOL | MIN | NOM | MAX |
|---|---|---|---|
| A | 1.00 | 1.10 | 1.20 |
| A1 | 0.02 | 0.10 | 0.18 |
| A2 | 0.90 | 1.00 | 1.10 |
| b | 0.17 | 0.22 | 0.27 |
| c | 0.122 | 0.127 | 0.132 |
| L | 0.40 | 0.60 | 0.80 |
| D | 2.87 | 2.97 | 3.07 |
| E | 4.30 | 4.40 | 4.50 |
| E1 | 6.20 | 6.40 | 6.60 |
| Ø1 | 0.50 | 0.60 | 0.70 |
| θ | 0° | 5° | 10° |
| L1 | 1.00 BSC | | |
| e | 0.65 BSC | | |



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