

## N-Channel 20-V (D-S) MOSFETs

### PRODUCT SUMMARY

| $V_{DS}$ (V) | $r_{DS(on)}$ ( $\Omega$ ) | $I_D$ (A) |
|--------------|---------------------------|-----------|
| 20           | 0.4 at $V_{GS} = 4.5$ V   | 0.73      |
|              | 0.5 at $V_{GS} = 2.5$ V   | 0.65      |

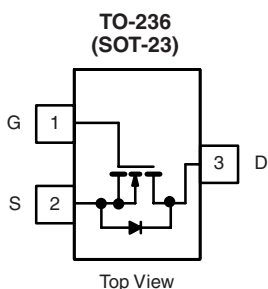
### FEATURES

- TrenchFET® Power MOSFET
- ESD Protected: 4000 V


**RoHS**  
COMPLIANT

### APPLICATIONS

- Direct Logic-Level Interface: TTL/CMOS
- Drivers: Relays, Solenoids, Lamps, Hammers
- Battery Operated Systems, DC/DC Converters
- Solid-State Relays
- Load/Power Switching-Cell Phones, Pagers

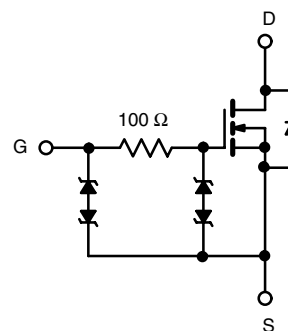

**Marking Code:** K2ywl

K2 = Part Number Code for TN0200K

y = Year Code

w = Week Code

l = Lot Traceability


**Ordering Information:** TN0200K-T1-E3 (Lead (Pb)-free)

### ABSOLUTE MAXIMUM RATINGS $T_A = 25$ °C, unless otherwise noted

| Parameter                                                 | Symbol         | Limit       | Unit |
|-----------------------------------------------------------|----------------|-------------|------|
| Drain-Source Voltage                                      | $V_{DS}$       | 20          | V    |
| Gate-Source Voltage                                       | $V_{GS}$       | $\pm 8$     |      |
| Continuous Drain Current ( $T_J = 150$ °C) <sup>b</sup>   | $I_D$          | 0.73        | A    |
|                                                           |                | 0.58        |      |
| Pulsed Drain Current <sup>a</sup>                         | $I_{DM}$       | 4           |      |
| Continuous Source Current (Diode Conduction) <sup>b</sup> | $I_S$          | 0.3         |      |
| Power Dissipation <sup>b</sup>                            | $P_D$          | 0.35        | W    |
|                                                           |                | 0.22        |      |
| Operating Junction and Storage Temperature Range          | $T_J, T_{stg}$ | - 55 to 150 | °C   |

### THERMAL RESISTANCE RATINGS

| Parameter                                | Symbol     | Limit | Unit |
|------------------------------------------|------------|-------|------|
| Maximum Junction-to-Ambient <sup>b</sup> | $R_{thJA}$ | 357   | °C/W |

Notes:

a. Pulse width limited by maximum junction temperature.

b. Surface Mounted on FR4 Board,  $t \leq 10$  sec.

**SPECIFICATIONS**  $T_A = 25\text{ }^{\circ}\text{C}$ , unless otherwise noted

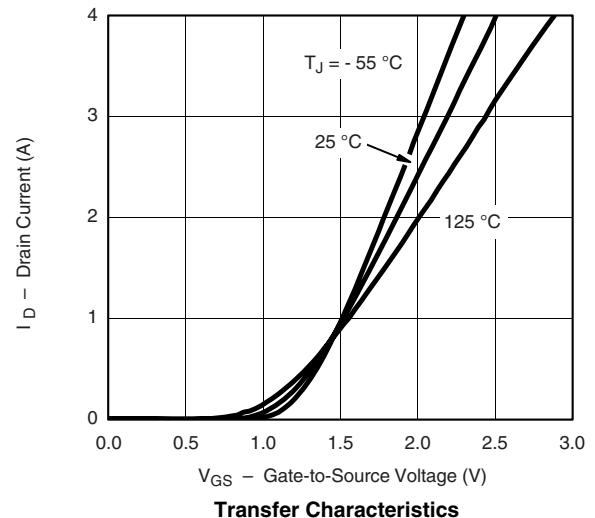
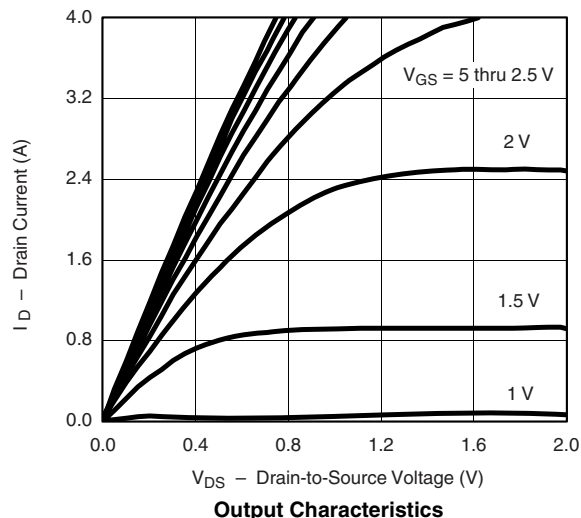
| Parameter                               | Symbol               | Test Conditions                                                                                                           | Limits |      |           | Unit |
|-----------------------------------------|----------------------|---------------------------------------------------------------------------------------------------------------------------|--------|------|-----------|------|
|                                         |                      |                                                                                                                           | Min    | Typ  | Max       |      |
| Static                                  |                      |                                                                                                                           |        |      |           |      |
| Drain-Source Breakdown Voltage          | V <sub>(BR)DSS</sub> | V <sub>GS</sub> = 0 V, I <sub>D</sub> = 10 μA                                                                             | 20     |      |           | V    |
| Gate-Threshold Voltage                  | V <sub>GS(th)</sub>  | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 50 μA                                                                | 0.45   | 0.6  | 1.0       |      |
| Gate-Body Leakage                       | I <sub>GSS</sub>     | V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ± 4.5 V                                                                          |        |      | ± 5       | μA   |
| Zero Gate Voltage Drain Current         | I <sub>DSS</sub>     | V <sub>DS</sub> = 20 V, V <sub>GS</sub> = 0 V<br>T <sub>J</sub> = 55 °C                                                   |        |      | 0.1<br>10 |      |
| On-State Drain Current <sup>a</sup>     | I <sub>D(on)</sub>   | V <sub>DS</sub> ≥ 5 V, V <sub>GS</sub> = 4.5 V                                                                            | 2.5    |      |           | A    |
|                                         |                      | V <sub>DS</sub> ≥ 5 V, V <sub>GS</sub> = 2.5 V                                                                            | 1.5    |      |           |      |
| Drain-Source On-Resistance <sup>a</sup> | r <sub>DS(on)</sub>  | V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 0.6 A                                                                           |        | 0.2  | 0.4       | Ω    |
|                                         |                      | V <sub>GS</sub> = 2.5 V, I <sub>D</sub> = 0.6 A                                                                           |        | 0.25 | 0.5       |      |
| Forward Transconductance <sup>a</sup>   | g <sub>fs</sub>      | V <sub>DS</sub> = 5 V, I <sub>D</sub> = 0.6 A                                                                             |        | 2.2  |           | S    |
| Diode Forward Voltage <sup>a</sup>      | V <sub>SD</sub>      | I <sub>S</sub> = 0.3 A, V <sub>GS</sub> = 0 V                                                                             |        | 0.8  | 1.2       | V    |
| Dynamic <sup>b</sup>                    |                      |                                                                                                                           |        |      |           |      |
| Total Gate Charge                       | Q <sub>g</sub>       | V <sub>DS</sub> = 10 V, V <sub>GS</sub> = 4.5 V<br>I <sub>D</sub> = 0.6 A                                                 |        | 1400 | 2000      | pC   |
| Gate-Source Charge                      | Q <sub>gs</sub>      |                                                                                                                           |        | 190  |           |      |
| Gate-Drain Charge                       | Q <sub>gd</sub>      |                                                                                                                           |        | 300  |           |      |
| Gate Resistance                         | R <sub>g</sub>       |                                                                                                                           |        | 105  |           | Ω    |
| Turn-On Delay Time                      | t <sub>d(on)</sub>   | V <sub>DD</sub> = 10 V, R <sub>L</sub> = 16 Ω<br>I <sub>D</sub> ≅ 0.6 A, V <sub>GEN</sub> = 4.5 V<br>R <sub>g</sub> = 6 Ω |        | 17   | 25        | ns   |
| Rise Time                               | t <sub>r</sub>       |                                                                                                                           |        | 20   | 30        |      |
| Turn-Off Delay Time                     | t <sub>d(off)</sub>  |                                                                                                                           |        | 55   | 85        |      |
| Fall Time                               | t <sub>f</sub>       |                                                                                                                           |        | 30   | 45        |      |

Notes:

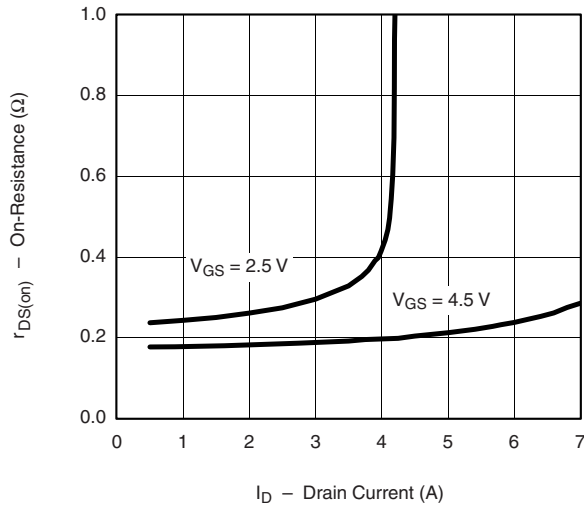
a. Pulse test:  $PW \leq 300\text{ }\mu\text{s}$  duty cycle  $\leq 2\%$ .

b. Guaranteed by design, not subject to production testing.

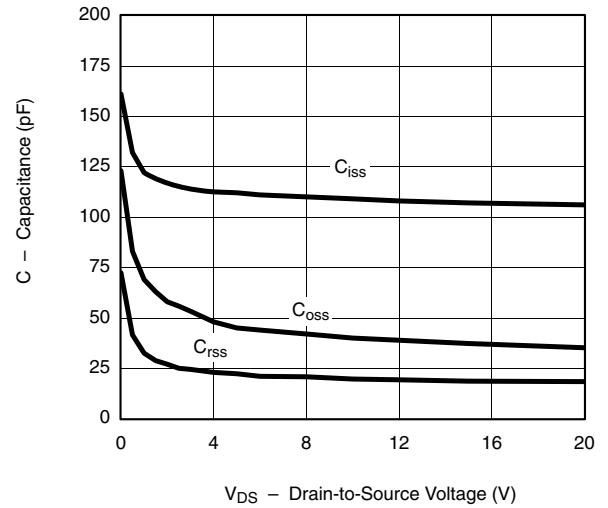
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

**TYPICAL CHARACTERISTICS**  $25\text{ }^{\circ}\text{C}$ , unless otherwise noted

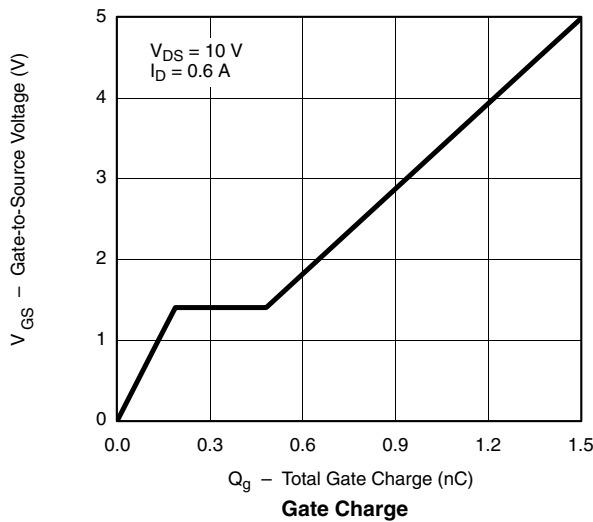
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



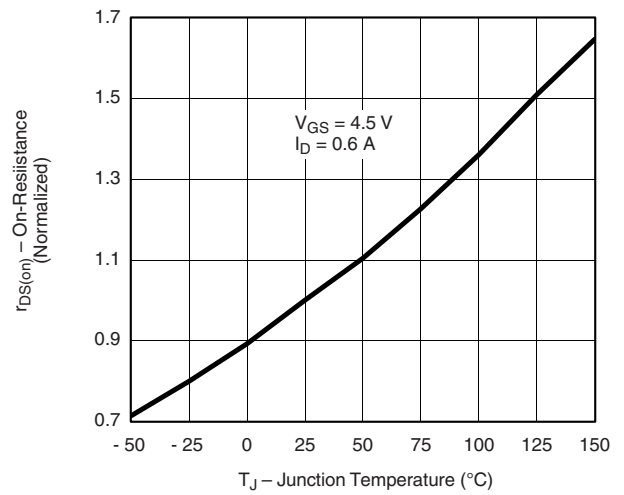
**On-Resistance vs. Drain Current**



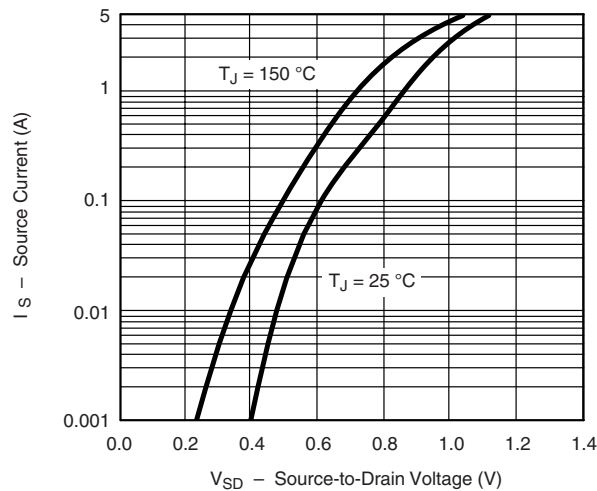
**Capacitance**



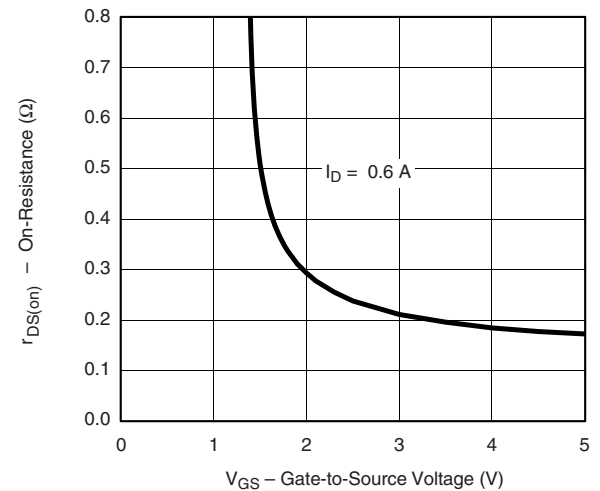
**Gate Charge**



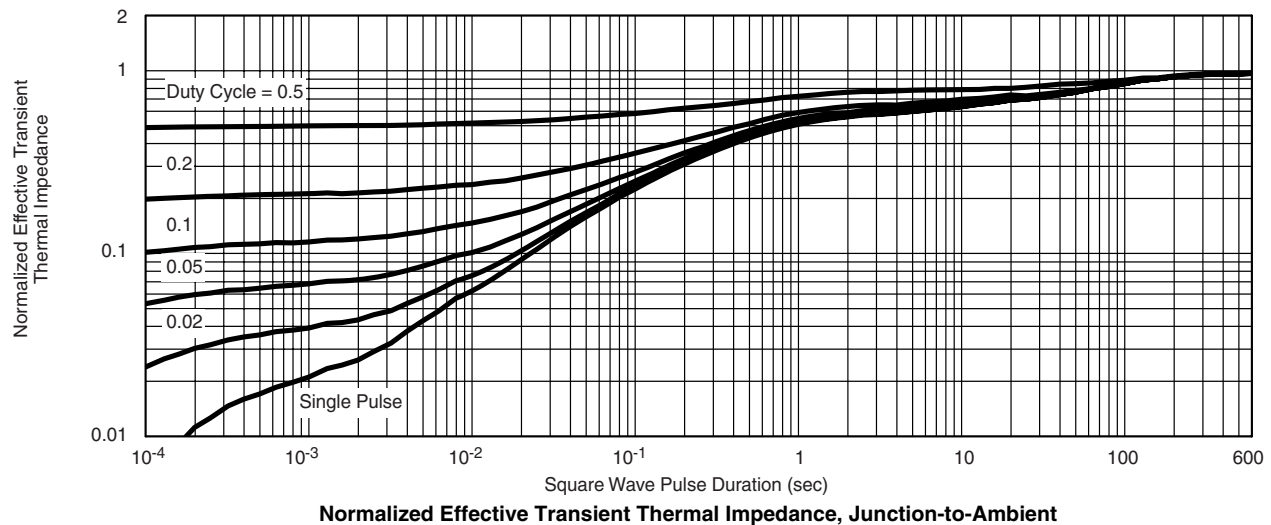
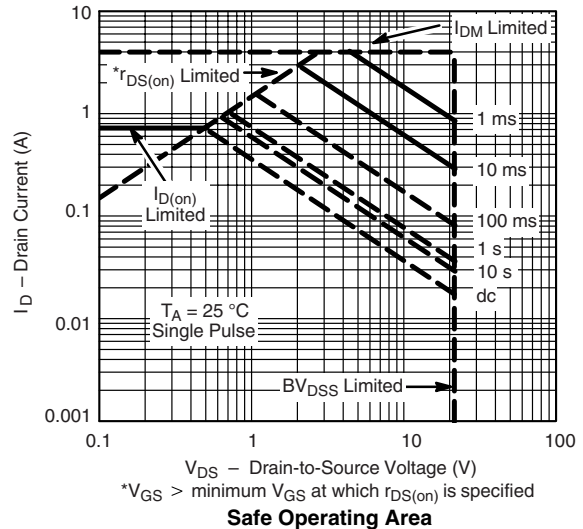
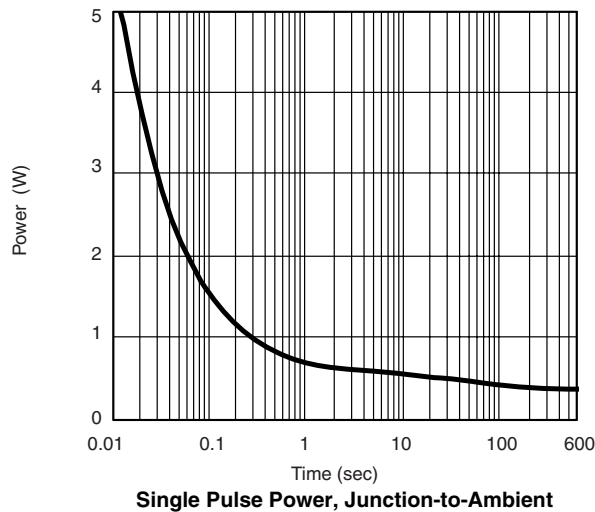
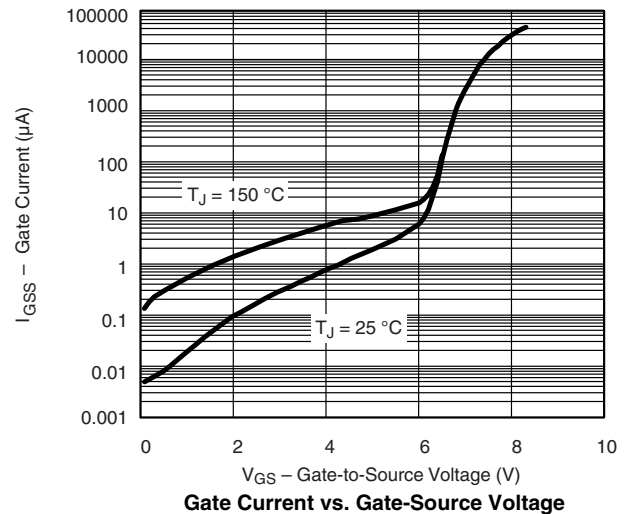
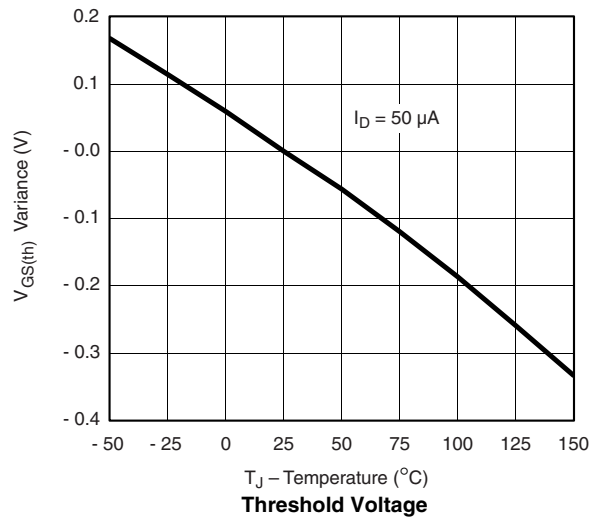
**On-Resistance vs. Junction Temperature**



**Source-Drain Diode Forward Voltage**



**On-Resistance vs. Gate-Source Voltage**

**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted

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