*New Product*

# N-Channel 20–V (D–S) MOSFET

| PRODUCT SUMMARY | | | | |
|---|---|---|---|---|
| $V_{(BR)DSS}$ Min (V) | $r_{DS(on)}$ Max (Ω) | $V_{GS(th)}$ (V) | $I_D$ (A) | |
| | | | TN0201K | TN0201KL |
| 20 | 1.0 @ $V_{GS}$ = 10 V | 1.0 to 3.0 | 0.42 | 0.64 |
| | 1.4 @ $V_{GS}$ = 4.5 V | | 0.35 | 0.53 |

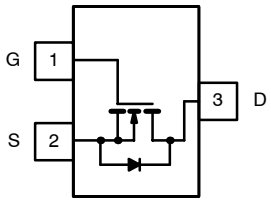
## FEATURES

- TrenchFET® Power MOSFET

## APPLICATIONS

- Direct Logic-Level Interface: TTL/CMOS
- Drivers: Relays, Solenoids, Lamps, Hammers, Displays, Memories, Transistors, etc.
- Battery Operated Systems
- Solid-State Relays

**TO-236**
**(SOT-23)**




Top View

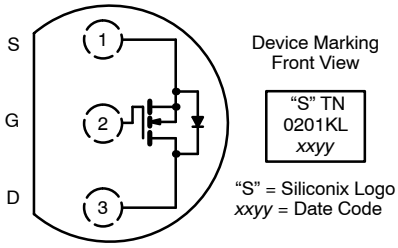
TN0201K

Marking Code: K3*ywl*

K3 = Part Number Code for TN0201K
*y* = Year Code
*w* = Week Code
*l* = Lot Traceability

Ordering Information: TN0201K-T1—E3 (Lead Free)

**TO-226AA**
**(TO-92)**




Top View

TN0201KL

Ordering Information: TN0201KL-TR1

| ABSOLUTE MAXIMUM RATINGS ($T_A$ = 25°C UNLESS OTHERWISE NOTED) | | | | | |
|---|---|---|---|---|---|
| Parameter | | Symbol | Limit | | Unit |
| | | | TN0201K | TN0201KL | |
| Drain-Source Voltage | | $V_{DS}$ | 20 | | V |
| Gate-Source Voltage | | $V_{GS}$ | ±20 | | |
| Continuous Drain Current ($T_J$ = 150°C) | $T_A$= 25°C | $I_D$ | 0.42 | 0.64 | A |
| | $T_A$= 70°C | | 0.33 | 0.51 | |
| Pulsed Drain Current[a] | | $I_{DM}$ | 0.8 | 1.5 | |
| Power Dissipation | $T_A$= 25°C | $P_D$ | 0.35 | 0.8 | W |
| | $T_A$= 70°C | | 0.22 | 0.51 | |
| Thermal Resistance, Junction-to-Ambient | | $R_{thJA}$ | 357 | 156 | °C/W |
| Operating Junction and Storage Temperature Range | | $T_J$, $T_{stg}$ | –55 to 150 | | °C |

Notes
a. Pulse width limited by maximum junction temperature.

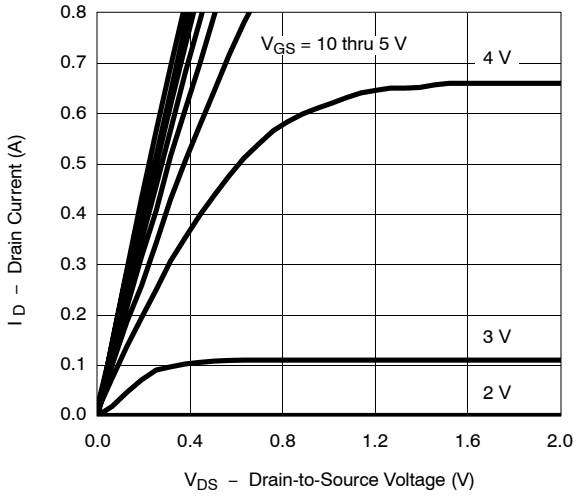
## SPECIFICATIONS ($T_A$ = 25°C UNLESS OTHERWISE NOTED)

| Parameter | Symbol | Test Conditions | | Limits Min | Limits Typ | Limits Max | Unit |
|---|---|---|---|---|---|---|---|
| **Static** | | | | | | | |
| Drain-Source Breakdown Voltage | $V_{(BR)DSS}$ | $V_{GS}$ = 0 V, $I_D$ = 10 μA | | 20 | | | V |
| Gate-Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$ = $V_{GS}$, $I_D$ = 0.25 mA | | 1.0 | 2.0 | 3.0 | V |
| Gate-Body Leakage | $I_{GSS}$ | $V_{DS}$ = 0 V, $V_{GS}$ = ±20 V | | | | ±100 | nA |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$ = 20 V, $V_{GS}$ = 0 V | | | | 1 | μA |
| | | $V_{DS}$ = 20 V, $V_{GS}$ = 0 V, $T_J$ = 55°C | | | | 10 | |
| On-State Drain Current[a] | $I_{D(on)}$ | $V_{DS}$ = 10 V, $V_{GS}$ = 10 V | TN0201K | 0.5 | | | A |
| | | | TN0201KL | 0.8 | | | |
| Drain-Source On-Resistance[a] | $r_{DS(on)}$ | $V_{GS}$ = 4.5 V, $I_D$ = 0.1 A | | | 0.8 | 1.4 | Ω |
| | | $V_{GS}$ = 10 V, $I_D$ = 0.3 A | | | 0.47 | 1.0 | |
| Forward Transconductance[a] | $g_{fs}$ | $V_{DS}$ = 10 V, $I_D$ = 0.3 A | | | 550 | | mS |
| Diode Forward Voltage | $V_{SD}$ | $I_S$ = 0.3 A, $V_{GS}$ = 0 V | | | 0.85 | 1.2 | V |
| **Dynamic[b]** | | | | | | | |
| Total Gate Charge | $Q_g$ | $V_{DS}$ = 16 V, $V_{GS}$ = 10 V<br>$I_D$ ≅ 0.3 A | | | 1000 | 1500 | pC |
| Gate-Source Charge | $Q_{gs}$ | | | | 205 | | |
| Gate-Drain Charge | $Q_{gd}$ | | | | 200 | | |
| Gate Resistance | $R_g$ | | | | 48 | | Ω |
| Turn-On Time | $t_{d(on)}$ | $V_{DD}$ = 15 V, $R_L$ = 50 Ω<br>$I_D$ ≅ 0.3 A, $V_{GEN}$ = 10 V<br>$R_G$ = 6 Ω | | | 4.5 | 8 | ns |
| | $t_r$ | | | | 8 | 15 | |
| Turn-Off Time | $t_{d(off)}$ | | | | 9 | 15 | |
| | $t_f$ | | | | 6.3 | 12 | |

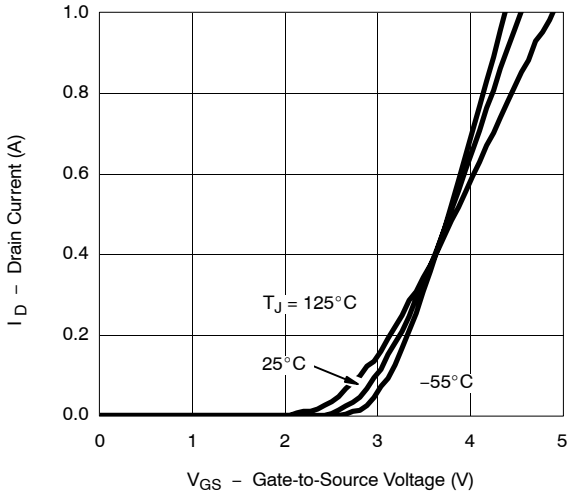
Notes
a. Pulse test: PW ≤300 μs duty cycle ≤2%.
b. Guaranteed by design, not subject to production testing.

## TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)

**Output Characteristics**

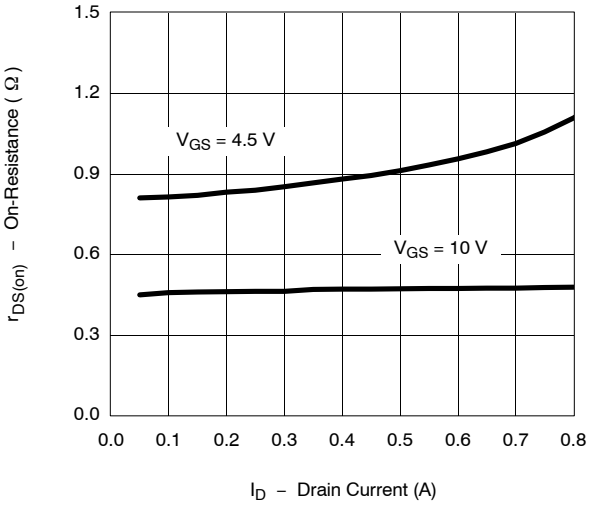



**Transfer Characteristics**

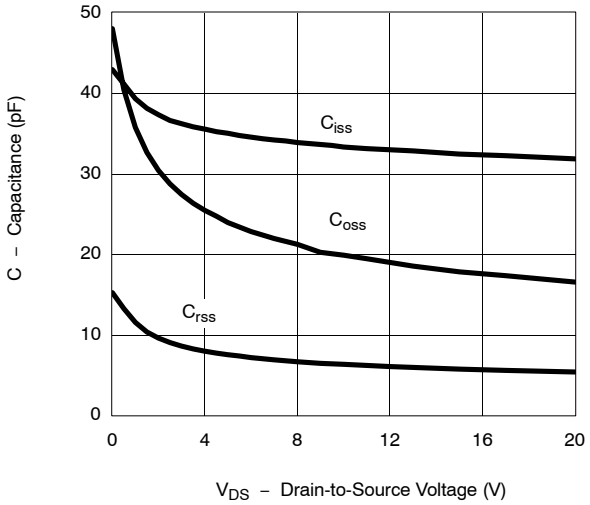


## TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)

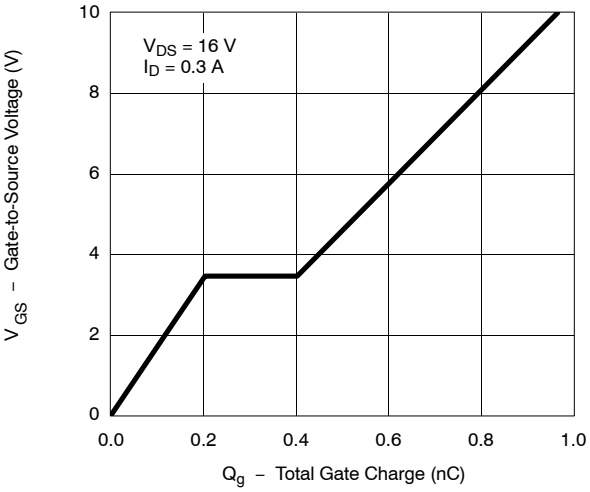
**On-Resistance vs. Drain Current**



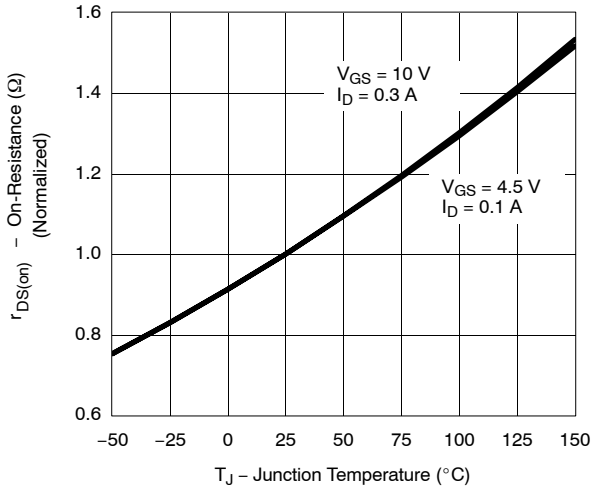

**Capacitance**



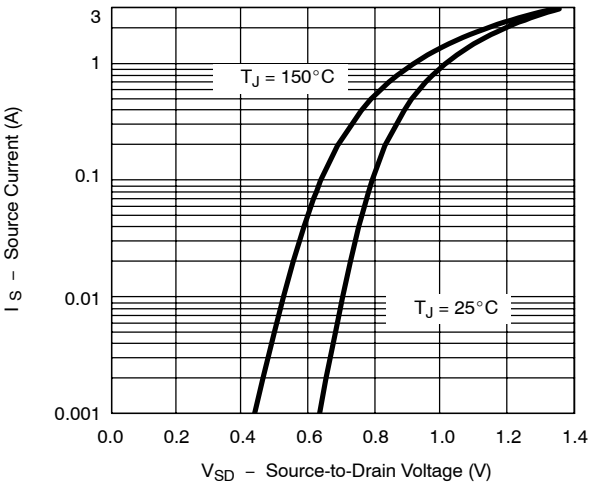

**Gate Charge**



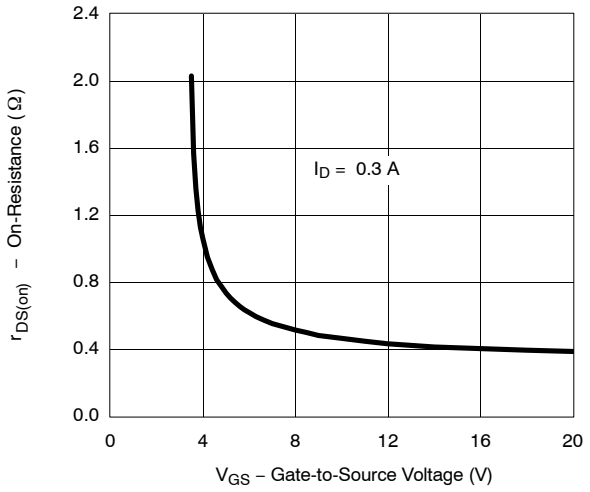

**On-Resistance vs. Junction Temperature**




**Source-Drain Diode Forward Voltage**

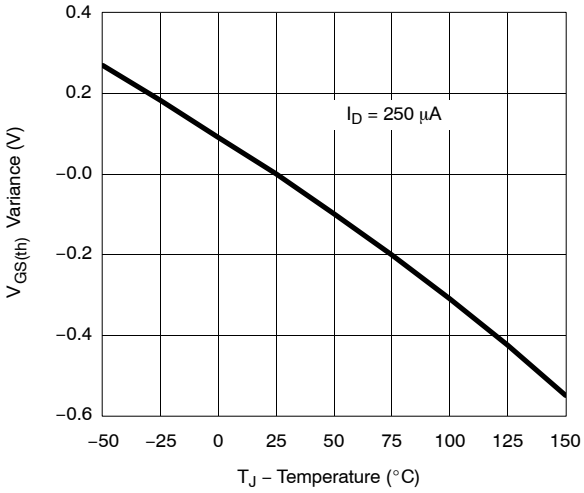



**On-Resistance vs. Gate-to-Source Voltage**

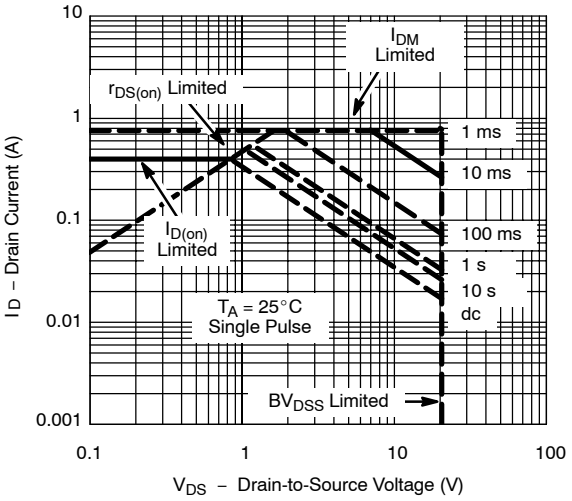


## TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)

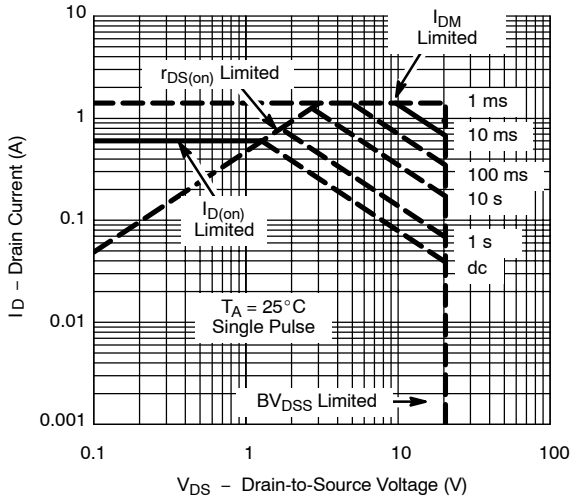
**Threshold Voltage**



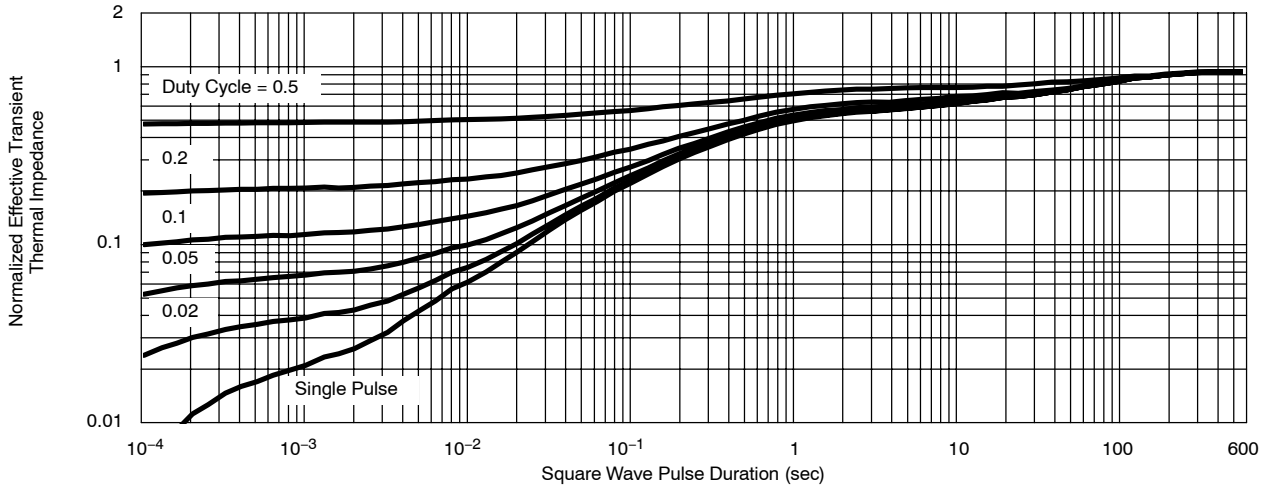

**Safe Operating Area (TO-236, TN0201K Only)**




**Safe Operating Area (TO-226AA, TN0201KL Only)**

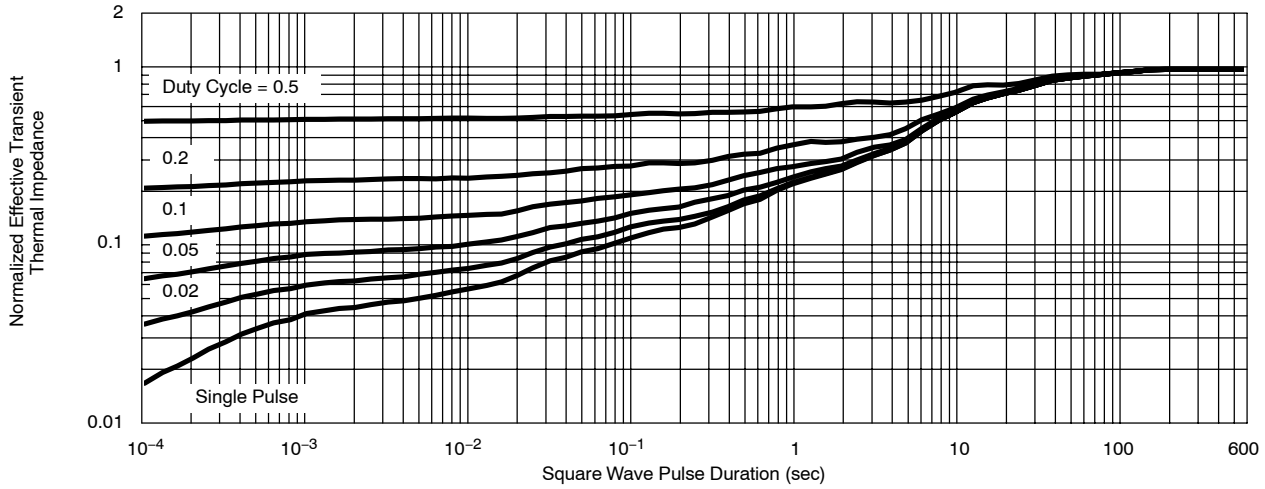



**Normalized Thermal Transient Impedance, Junction-to-Ambient (TO-236, TN0201K Only)**



## TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)

**Normalized Thermal Transient Impedance, Junction-to-Ambient (TO-226AA, TN0201KL Only)**



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