# N-Channel 240-V (D-S) MOSFET

| PRODUCT SUMMARY | | | | | |
|---|---|---|---|---|---|
| Part Number | $V_{DS}$ Min (V) | $r_{DS(on)}$ (Ω) | $V_{GS(th)}$ (V) | $I_D$ (A) | $Q_g$ (Typ) |
| TN2404K | 240 | 4 @ $V_{GS}$ = 10 V | 0.8 to 2.0 | 0.2 | 4.87 |
| TN2404KL/BS107KL | | 4 @ $V_{GS}$ = 10 V | 0.8 to 2.0 | 0.3 | |

## FEATURES

- Low On-Resistance: 4 Ω
- Secondary Breakdown Free: 260 V
- Low Power/Voltage Driven
- Low Input and Output Leakage
- Excellent Thermal Stability

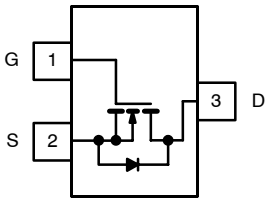
## BENEFITS

- Low Offset Voltage
- Full-Voltage Operation
- Easily Driven Without Buffer
- Low Error Voltage
- No High-Temperature "Run-Away"

## APPLICATIONS

- High-Voltage Drivers: Relays, Solenoids, Lamps, Hammers, Displays, Transistors, etc.
- Telephone Mute Switches, Ringer Circuits
- Power Supply, Converters
- Motor Control

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



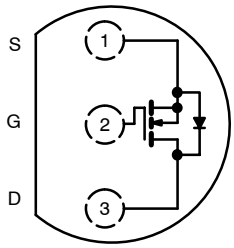

Top View

TN2404K

Marking Code: K1*ywl*

K1 = Part Number Code for TN2404K
*y* = Year Code
*w* = Week Code
*l* = Lot Traceability

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




Device Marking Front View

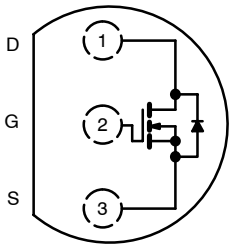
"S" TN
2404KL
*xxyy*

"S" = Siliconix Logo
*xxyy* = Date Code

Top View

TN2404KL

**TO-92-18RM (TO-18 Lead Form)**




Device Marking Front View

"S" BS
107KL
*xxyy*

"S" = Siliconix Logo
*xxyy* = Date Code

Top View

BS107KL

| ORDERING INFORMATION | | |
|---|---|---|
| Standard Part Number | Lead (Pb)-Free Part Number | Option |
| TN2404K-T1 | TN2404K-T1—E3 | With Tape and Reel Folding Option |
| TN2404KL-TR1 | TN2404KL-TR1—E3 | Spool Option |
| BS107KL-TR1 | BS107KL-TR1—E3 | |

| ABSOLUTE MAXIMUM RATINGS ($T_A$ = 25°C UNLESS OTHERWISE NOTED) | | | | | |
|---|---|---|---|---|---|
| Parameter | | Symbol | TN2404K | TN2404KL/BS107KL | Unit |
| Drain-Source Voltage | | $V_{DS}$ | 240 | | V |
| Gate-Source Voltage | | $V_{GS}$ | ±20 | | |
| Continuous Drain Current ($T_J$ = 150°C) | $T_A$= 25°C | $I_D$ | 0.2 | 0.3 | A |
| | $T_A$= 70°C | | 0.16 | 0.25 | |
| Pulsed Drain Current[a] | | $I_{DM}$ | 0.8 | 1.4 | |
| Power Dissipation | $T_A$= 25°C | $P_D$ | 0.36 | 0.8 | W |
| | $T_A$= 70°C | | 0.23 | 0.51 | |
| Thermal Resistance, Junction-to-Ambient | | $R_{thJA}$ | 350[b] | 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.
b. Surface mounted on an FR4 board.

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

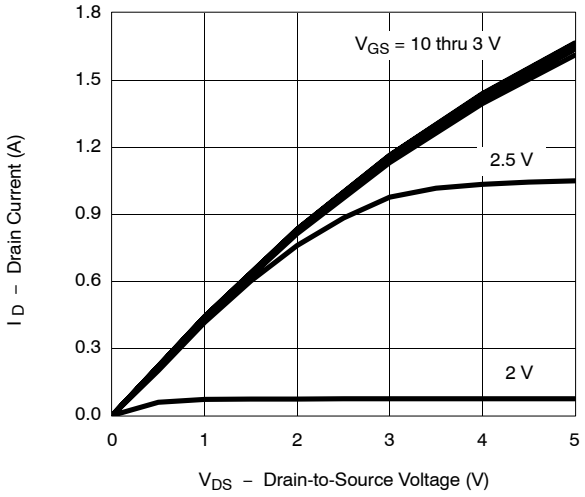
| Parameter | Symbol | Test Conditions | Limits Min | Limits Typ[a] | Limits Max | Unit |
|---|---|---|---|---|---|---|
| **Static** | | | | | | |
| Drain-Source Breakdown Voltage | $V_{(BR)DSS}$ | $V_{GS}$ = 0 V, $I_D$ = 100 μA | 240 | 257 | | V |
| Gate-Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$ = $V_{GS}$, $I_D$ = 250 μA | 0.8 | 1.65 | 2.0 | V |
| Gate-Body Leakage | $I_{GSS}$ | $V_{DS}$ = 0 V, $V_{GS}$ = ±20 V | | | ±100 | nA |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$ = 192 V, $V_{GS}$ = 0 V | | | 1 | μA |
| | | $T_J$ = 55°C | | | 10 | |
| On-State Drain Current[b] | $I_{D(on)}$ | $V_{DS}$ = 10 V, $V_{GS}$ =10 V | 0.8 | | | A |
| | | $V_{DS}$ = 10 V, $V_{GS}$ = 4.5 V | 0.5 | | | |
| Drain-Source On-Resistance[b] | $r_{DS(on)}$ | $V_{GS}$ = 10 V, $I_D$ = 0.3 A | | 2.2 | 4 | Ω |
| | | $V_{GS}$ = 4.5 V, $I_D$ = 0.2 A | | 2.3 | 4 | |
| | | $V_{GS}$ = 2.5 V, $I_D$ = 0.1 A | | 2.4 | 6 | |
| Forward Transconductance[b] | $g_{fs}$ | $V_{DS}$ = 10 V, $I_D$ = 0.3 A | | 1.6 | | S |
| Diode Forward Voltage | $V_{SD}$ | $I_S$ = 0.3 A, $V_{GS}$ = 0 V | | 0.8 | 1.2 | V |
| **Dynamic[a]** | | | | | | |
| Total Gate Charge | $Q_g$ | $V_{DS}$ = 192 V, $V_{GS}$ = 10 V, $I_D$ = 0.5 A | | 4.87 | 8 | nC |
| Gate-Source Charge | $Q_{gs}$ | | | 0.56 | | |
| Gate-Drain Charge | $Q_{gd}$ | | | 1.53 | | |
| Turn-On Time | $t_{d(on)}$ | $V_{DD}$ = 60 V, $R_L$ = 200 Ω<br>$I_D$ ≃ 0.3 A, $V_{GEN}$ = 10 V, $R_G$ = 25 Ω | | 5 | 10 | nS |
| | $t_r$ | | | 12 | 20 | |
| turn-Off Time | $t_{d(off)}$ | | | 35 | 60 | |
| | $t_r$ | | | 16 | 25 | |

Notes
a. For DESIGN AID ONLY, not subject to production testing.
b. Pulse test: PW ≤300 μs duty cycle ≤2%.

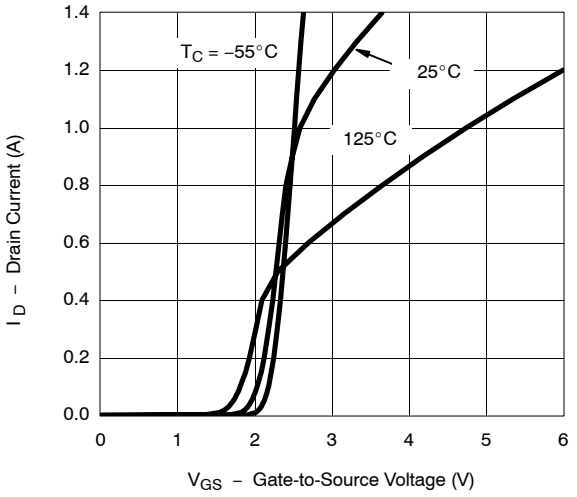
*Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

## TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)

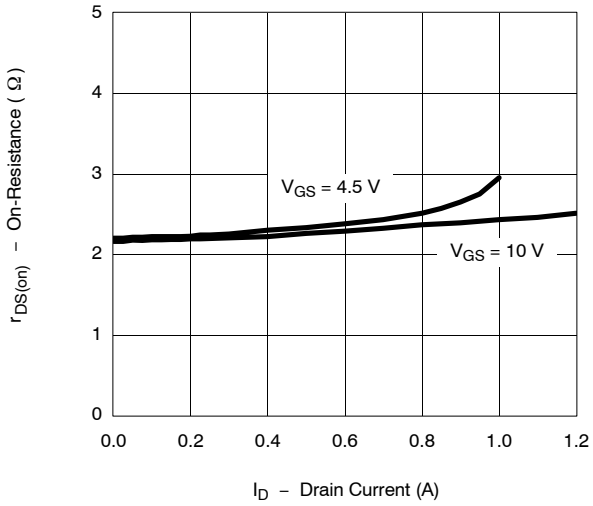
**Output Characteristics**



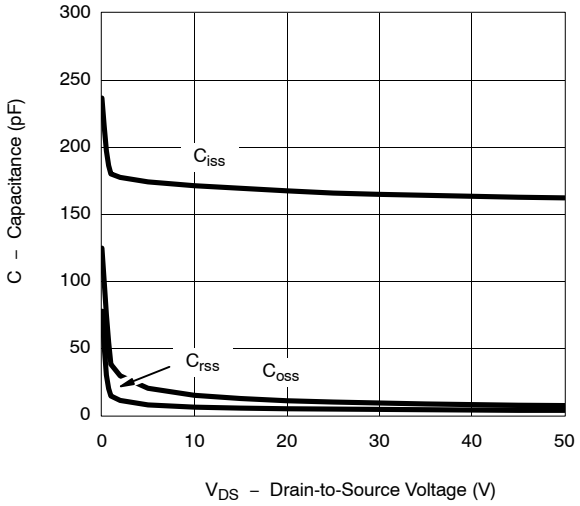

**Transfer Characteristics**



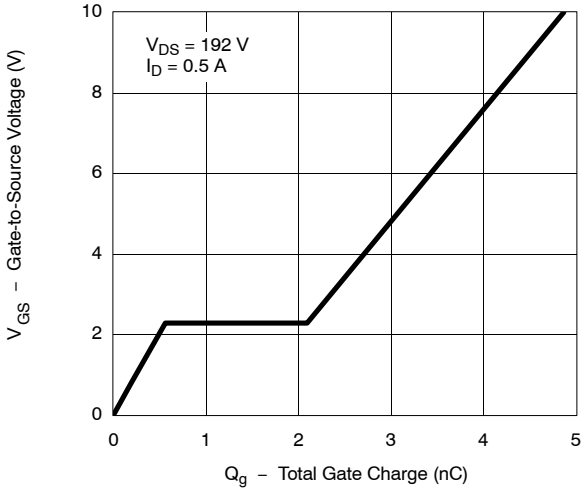

**On-Resistance vs. Drain Current**



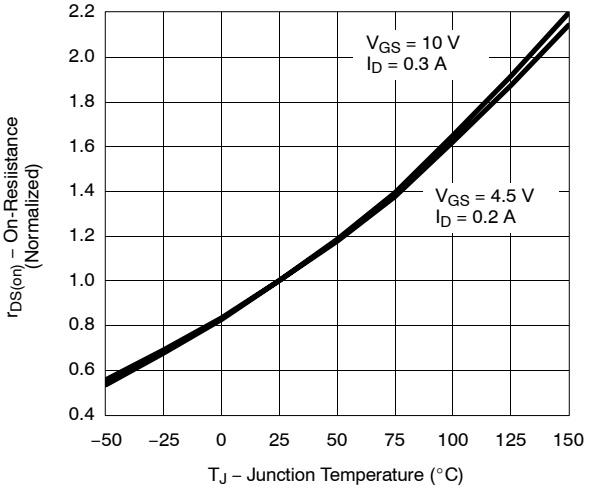

**Capacitance**




**Gate Charge**

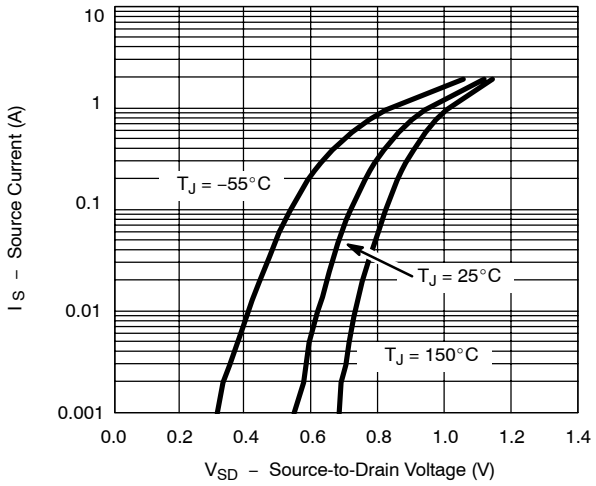



**On-Resistance vs. Junction Temperature**

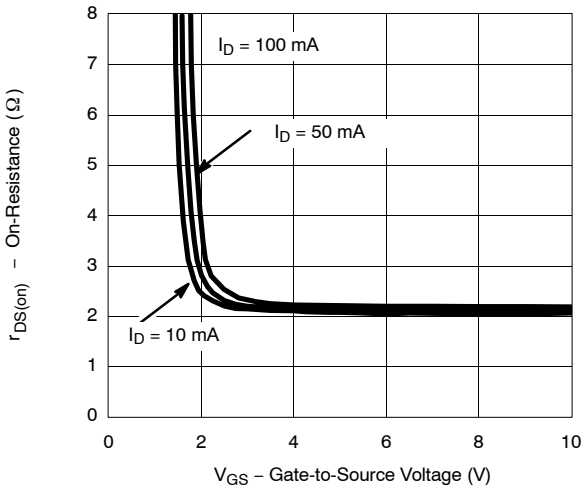


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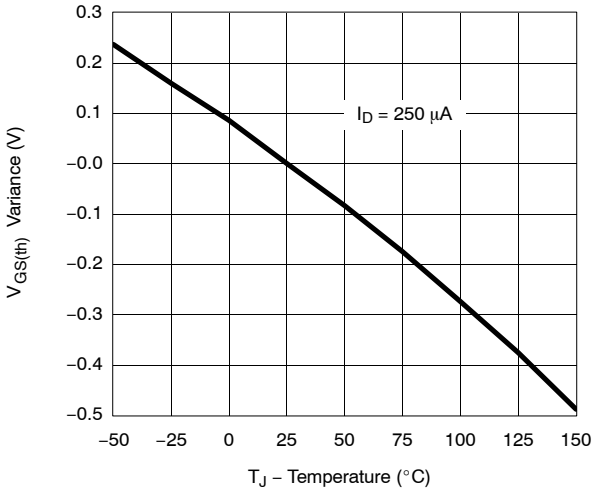
**Source-Drain Diode Forward Voltage**



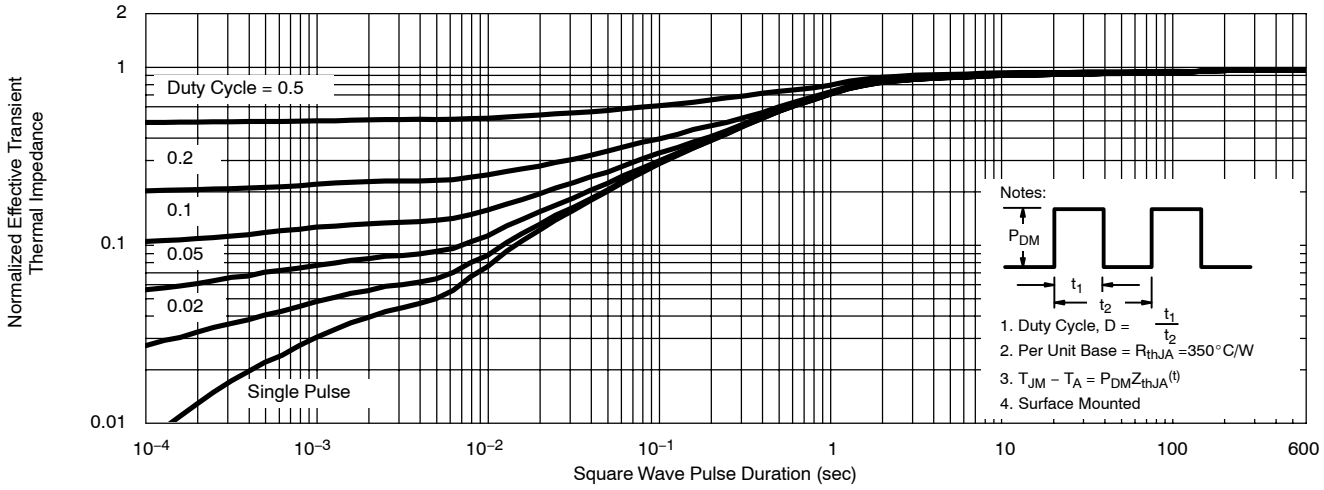

**On-Resistance vs. Gate-to-Source Voltage**




**Threshold Voltage**

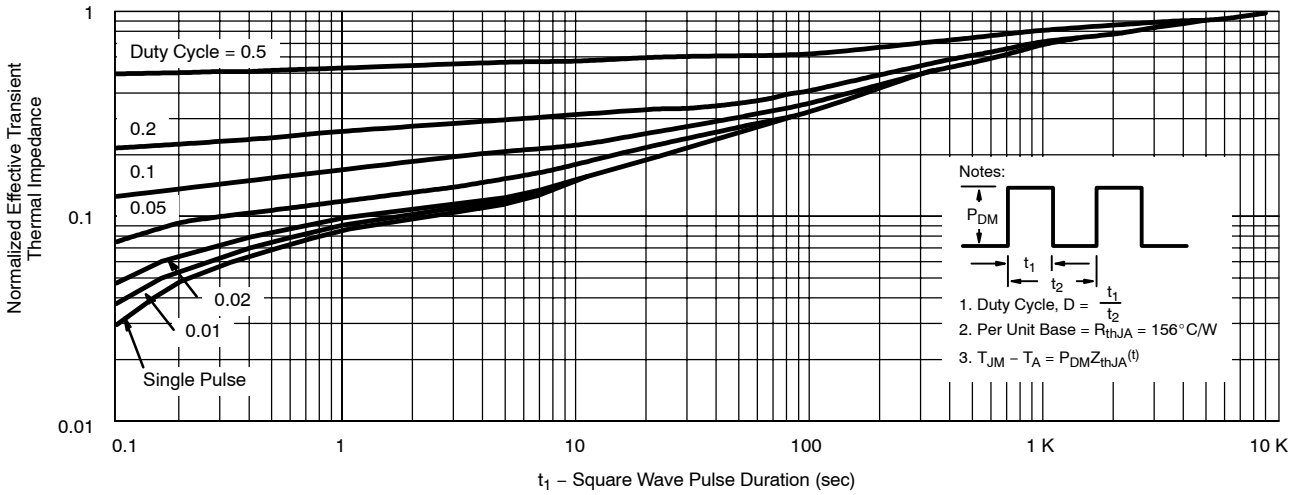



**Normalized Thermal Transient Impedance, Junction-to-Ambient (TO-236, TN2404K Only)**



## TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)

**Normalized Effective Transient Thermal Impedance, Junction-to-Ambient**
**(TO-226AA, TN2404KL and TO-92-18RM, BS107KL Only)**




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