

# TN2010T

## N-Channel Enhancement-Mode MOSFET Transistor

### Product Summary

| $V_{(BR)DSS}$ Min (V) | $r_{DS(on)}$ Max ( $\Omega$ ) | $V_{GS(th)}$ (V) | $I_D$ (A) |
|-----------------------|-------------------------------|------------------|-----------|
| 200                   | 11                            | 0.8 to 3.0       | 0.12      |

### Features

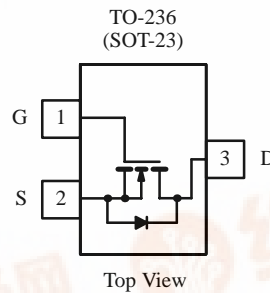
- Low On-Resistance: 9.5  $\Omega$
- Secondary Breakdown Free: 220 V
- Low Power/Voltage Driven
- Low Input and Output Leakage
- Excellent Thermal Stability

### 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



TN2010T (R1)\*

\*Marking Code for TO-236

### Absolute Maximum Ratings ( $T_A = 25^\circ\text{C}$ Unless Otherwise Noted)

| Parameter   | Symbol         | Limit                    | Unit                      |
|---|----------------|--------------------------|---------------------------|
| Drain-Source Voltage                                      | $V_{DS}$       | 200                      | V                         |
| Gate-Source Voltage                                       | $V_{GS}$       | $\pm 20$                 |                           |
| Continuous Drain Current<br>( $T_J = 150^\circ\text{C}$ ) | $I_D$          | $T_A = 25^\circ\text{C}$ | 0.12                      |
|   |                | $T_A = 70^\circ\text{C}$ | 0.08                      |
| Pulsed Drain Current <sup>a</sup>                         | $I_{DM}$       | 0.34                     | A                         |
| Power Dissipation   | $P_D$          | $T_A = 25^\circ\text{C}$ | 0.35                      |
|   |                | $T_A = 70^\circ\text{C}$ | 0.22                      |
| Maximum Junction-to-Ambient                               | $R_{thJA}$     | 357                      | $^\circ\text{C}/\text{W}$ |
| Operating Junction and Storage Temperature Range          | $T_J, T_{stg}$ | -55 to 150               | $^\circ\text{C}$          |

Notes  
a. Pulse width limited by maximum junction temperature.

Updates to this data sheet may be obtained via facsimile by calling Siliconix FaxBack, 1-408-970-5600. Please request FaxBack document #70203.

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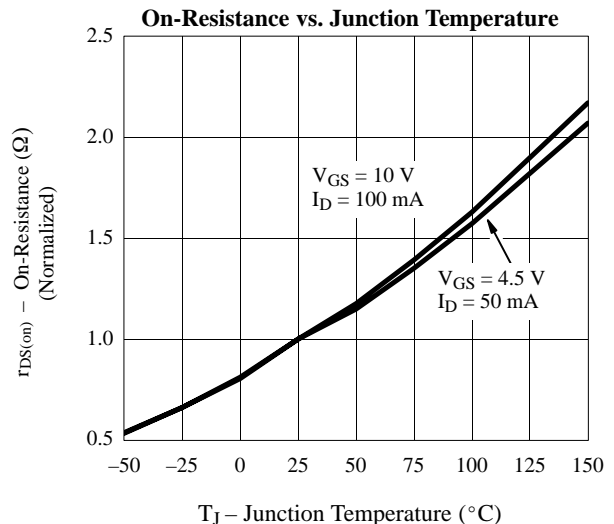
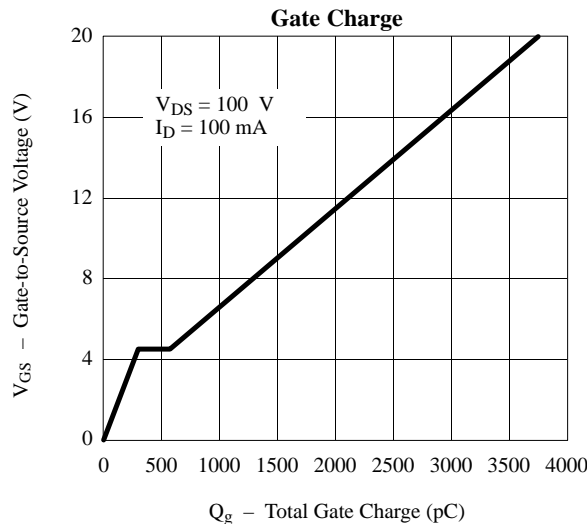
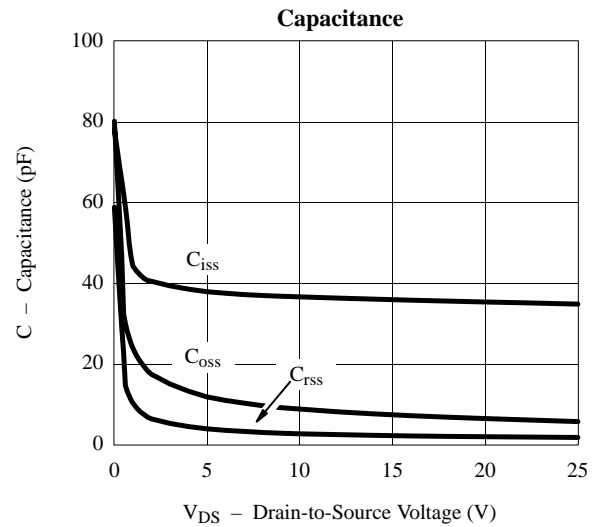
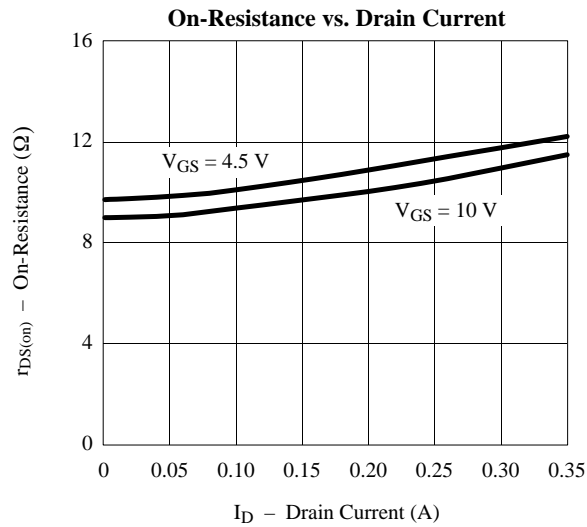
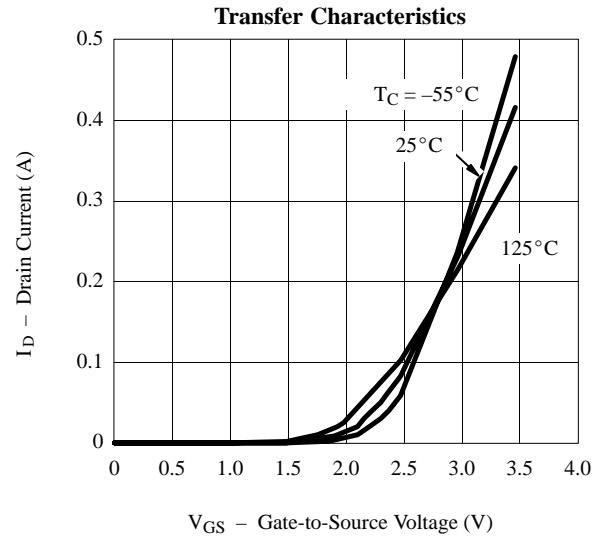
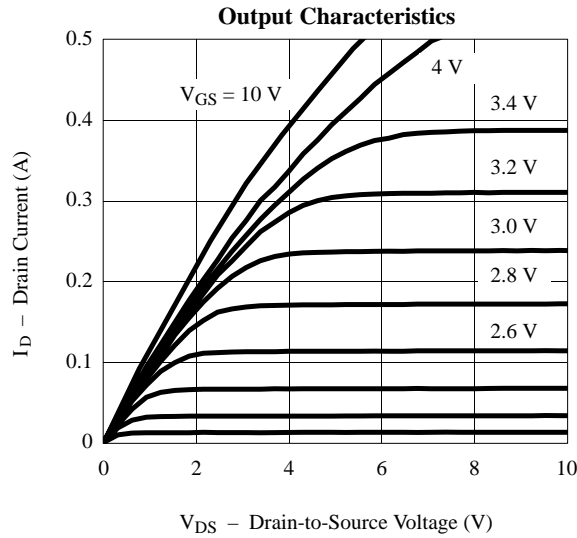
## Specifications<sup>a</sup>

| Parameter                               | Symbol        | Test Conditions  | Limits |                  |           | Unit          |
|---|---------------|--|--------|------------------|-----------|---------------|
|   |               |  | Min    | Typ <sup>b</sup> | Max       |               |
| <b>Static</b>                           |               |  |        |                  |           |               |
| Drain-Source Breakdown Voltage          | $V_{(BR)DSS}$ | $V_{GS} = 0\text{ V}, I_D = 100\ \mu\text{A}$  | 200    | 220              |           | V             |
| Gate-Threshold Voltage                  | $V_{GS(th)}$  | $V_{DS} = V_{GS}, I_D = 0.25\ \text{mA}$   | 0.8    | 1.6              | 3.0       |               |
| Gate-Body Leakage                       | $I_{GSS}$     | $V_{DS} = 0\ \text{V}, V_{GS} = \pm 20\ \text{V}$  |        |                  | $\pm 100$ | nA            |
| Zero Gate Voltage Drain Current         | $I_{DSS}$     | $V_{DS} = 160\ \text{V}, V_{GS} = 0\ \text{V}$<br>$T_J = -55^\circ\text{C}$  |        |                  | 1         | $\mu\text{A}$ |
|   |               |  |        |                  | 10        |               |
| On-State Drain Current <sup>c</sup>     | $I_{D(on)}$   | $V_{DS} = 10\ \text{V}, V_{GS} = 10\ \text{V}$   | 0.3    |                  |           | mA            |
| Drain-Source On-Resistance <sup>c</sup> | $r_{DS(on)}$  | $V_{GS} = 10\ \text{V}, I_D = 0.1\ \text{A}$   |        | 9.5              | 11        | $\Omega$      |
|   |               | $V_{GS} = 4.5\ \text{V}, I_D = 0.05\ \text{mA}$  |        | 10               | 15        |               |
| Forward Transconductance <sup>c</sup>   | $g_{fs}$      | $V_{DS} = 10\ \text{V}, I_D = 0.1\ \text{A}$   |        | 300              |           | mS            |
| Diode Forward Voltage                   | $V_{SD}$      | $I_S = 0.085\ \text{A}, V_{GS} = 0\ \text{V}$  |        | 0.8              |           | V             |
| <b>Dynamic</b>                          |               |  |        |                  |           |               |
| Total Gate Charge                       | $Q_g$         | $V_{DS} = 100\ \text{V}, V_{GS} = 10\ \text{V}, I_D \approx 0.1\ \text{A}$   |        | 1750             |           | pC            |
| Gate-Source Charge                      | $Q_{gs}$      |  |        | 275              |           |               |
| Gate-Drain Charge                       | $Q_{gd}$      |  |        | 300              |           |               |
| Input Capacitance                       | $C_{iss}$     | $V_{DS} = 25\ \text{V}, V_{GS} = 0\ \text{V}, f = 1\ \text{MHz}$   |        | 35               |           | pF            |
| Output Capacitance                      | $C_{oss}$     |  |        | 6                |           |               |
| Reverse Transfer Capacitance            | $C_{rss}$     |  |        | 2                |           |               |
| <b>Switching<sup>d</sup></b>            |               |  |        |                  |           |               |
| Turn-On Time                            | $t_{d(on)}$   | $V_{DD} = 60\ \text{V}, R_L = 600\ \Omega$<br>$I_D \approx 0.1\ \text{A}, V_{GEN} = 10\ \text{V}$<br>$R_G = 6\ \Omega$ |        | 4                |           | ns            |
|   | $t_r$         |  |        | 16               |           |               |
| Turn-Off Time                           | $t_{d(off)}$  |  |        | 16               |           |               |
|   | $t_f$         |  |        | 45               |           |               |

### Notes

- $T_A = 25^\circ\text{C}$  unless otherwise noted.
- For DESIGN AID ONLY, not subject to production testing.
- Pulse test:  $PW \leq 300\ \mu\text{s}$  duty cycle  $\leq 2\%$ .
- Switching time is essentially independent of operating temperature.

## Typical Characteristics (25°C Unless Otherwise Noted)



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