

## P-Channel 20-V (D-S) MOSFET

| <b>PRODUCT SUMMARY</b> |                               |                  |           |
|------------------------|-------------------------------|------------------|-----------|
| $V_{(BR)DSS}$ Min (V)  | $r_{DS(on)}$ Max ( $\Omega$ ) | $V_{GS(th)}$ (V) | $I_D$ (A) |
| -20                    | 1.4 @ $V_{GS} = -10$ V        | -1.3 to -3 V     | -0.41     |
|                        | 3.5 @ $V_{GS} = -4.5$ V       | -1.3 to -3 V     | -0.27     |

### FEATURES

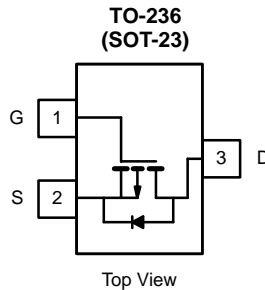
- High-Side Switching
- Low On-Resistance: 0.9  $\Omega$
- Low Threshold: -2.1 V
- Fast Switching Speed: 18 ns
- Low Input Capacitance: 55 pF

### BENEFITS

- Ease in Driving Switches
- Low Offset (Error) Voltage
- Low-Voltage Operation
- High-Speed Switching
- Easily Driven Without Buffer

### APPLICATIONS

- Drivers: Relays, Solenoids, Lamps, Hammers, Displays, Memories, Transistors, etc.
- Battery Operated Systems
- Power Supply, Converter Circuits
- Motor Control



Marking Code: P3w//

P3 = Part Number Code for TP0202T  
w = Week Code  
// = Lot Traceability

| <b>ABSOLUTE MAXIMUM RATINGS (<math>T_A = 25^\circ\text{C}</math> UNLESS OTHERWISE NOTED)</b> |                |                          |                    |
|--|----------------|--------------------------|--------------------|
| Parameter  | Symbol         | Limit                    | Unit               |
| Drain-Source Voltage   | $V_{DS}$       | -20                      | V                  |
| Gate-Source Voltage  | $V_{GS}$       | $\pm 20$                 |                    |
| Continuous Drain Current ( $T_J = 150^\circ\text{C}$ )                                       | $I_D$          | $T_A = 25^\circ\text{C}$ | -0.41              |
|  |                | $T_A = 70^\circ\text{C}$ | -0.26              |
| Pulsed Drain Current <sup>a</sup>  | $I_{DM}$       | -0.75                    | A                  |
| Power Dissipation  | $P_D$          | $T_A = 25^\circ\text{C}$ | 0.35               |
|  |                | $T_A = 70^\circ\text{C}$ | 0.22               |
| Thermal Resistance, Junction-to-Ambient  | $R_{thJA}$     | 357                      | $^\circ\text{C/W}$ |
| 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.

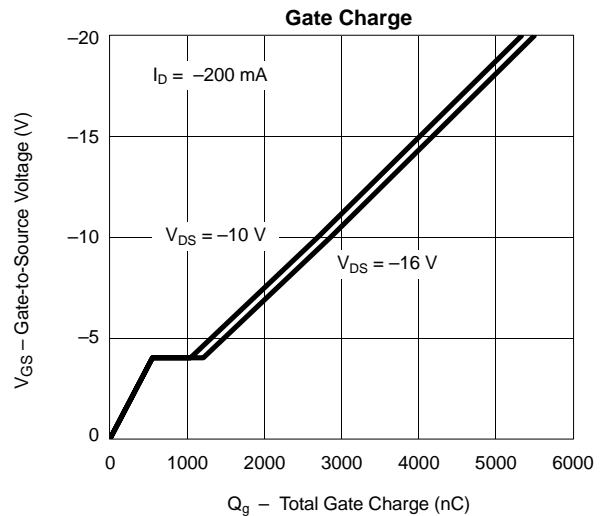
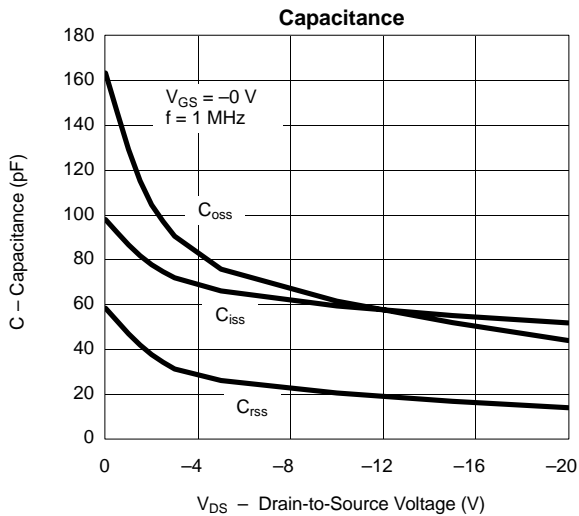
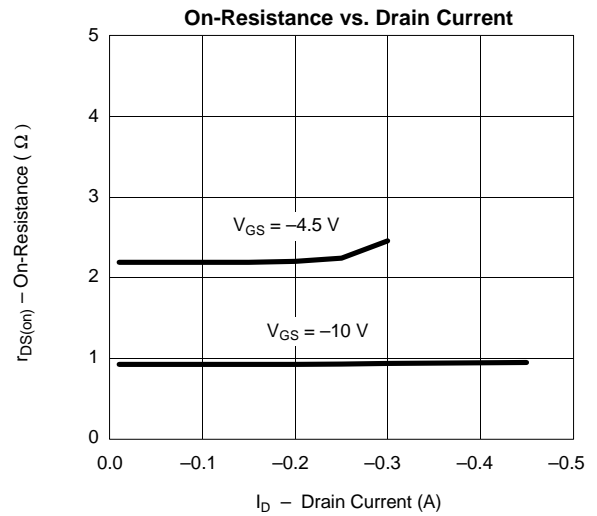
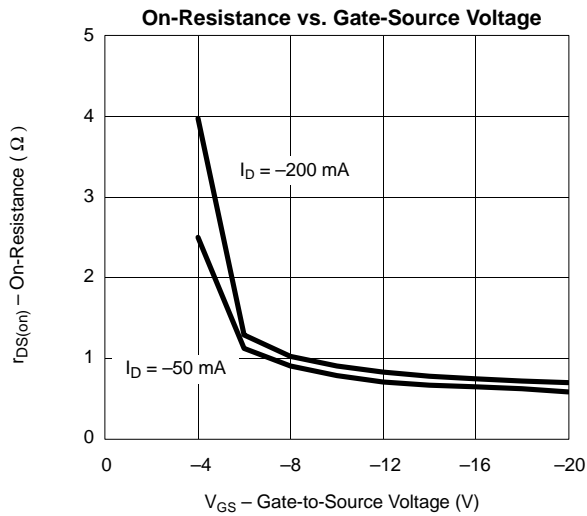
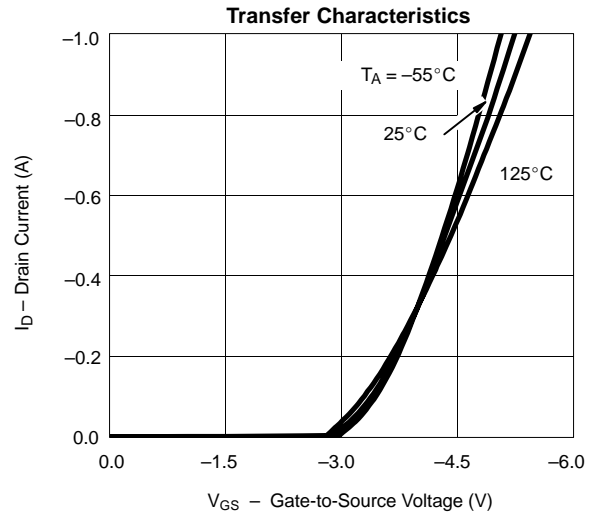
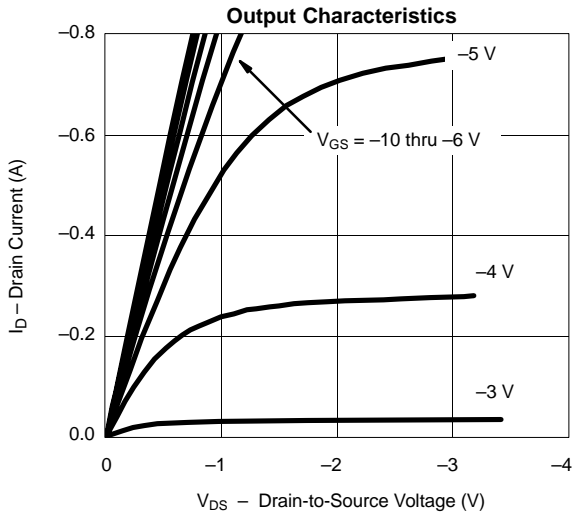
For applications information see AN804.

| <b>SPECIFICATIONS (T<sub>A</sub> = 25 °C UNLESS OTHERWISE NOTED)</b> |                      |   |        |                  |      |      |
|--|----------------------|---|--------|------------------|------|------|
| Parameter  | Symbol               | Test Conditions   | Limits |                  |      | Unit |
|  |                      |   | Min    | Typ <sup>a</sup> | Max  |      |
| <b>Static</b>  |                      |   |        |                  |      |      |
| Drain-Source Breakdown Voltage                                       | V <sub>(BR)DSS</sub> | V <sub>GS</sub> = 0 V, I <sub>D</sub> = -10 μA  | -20    | -25              |      | V    |
| Gate-Threshold Voltage   | V <sub>GS(th)</sub>  | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -0.25 mA   | -1.3   | -2.1             | -3   |      |
| Gate-Body Leakage  | I <sub>GSS</sub>     | V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ±20 V  |        |                  | ±100 | nA   |
| Zero Gate Voltage Drain Current                                      | I <sub>DSS</sub>     | V <sub>DS</sub> = -16 V, V <sub>GS</sub> = 0 V<br>T <sub>J</sub> = 55 °C  |        |                  | -1   | μA   |
|  |                      |   |        |                  | -10  |      |
| On-State Drain Current <sup>b</sup>                                  | I <sub>D(on)</sub>   | V <sub>DS</sub> = -10 V, V <sub>GS</sub> = -10 V  | -0.5   | -0.75            |      | A    |
| Drain-Source On-Resistance <sup>b</sup>                              | r <sub>DS(on)</sub>  | V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -0.05 A  |        | 1.7              | 3.5  | Ω    |
|  |                      | V <sub>GS</sub> = -10 V, I <sub>D</sub> = -0.2 A  |        | 0.9              | 1.4  |      |
| Forward Transconductance <sup>b</sup>                                | g <sub>fs</sub>      | V <sub>DS</sub> = -10 V, I <sub>D</sub> = -0.2 A  | 250    | 600              |      | mS   |
| Diode Forward Voltage  | V <sub>SD</sub>      | I <sub>S</sub> = -0.25 A, V <sub>GS</sub> = 0 V   |        | -0.9             | -1.5 | V    |
| <b>Dynamic</b>   |                      |   |        |                  |      |      |
| Total Gate Charge  | Q <sub>g</sub>       | V <sub>DS</sub> -16 V, V <sub>GS</sub> = -10 V, I <sub>D</sub> ≅ -200 mA  |        | 2700             |      | pC   |
| Gate-Source Charge   | Q <sub>gs</sub>      |   |        | 500              |      |      |
| Gate-Drain Charge  | Q <sub>gd</sub>      |   |        | 600              |      |      |
| Input Capacitance  | C <sub>iss</sub>     | V <sub>DS</sub> = -15 V, V <sub>GS</sub> = 0 V, f = 1 MHz   |        | 55               |      | pF   |
| Output Capacitance   | C <sub>oss</sub>     |   |        | 50               |      |      |
| Reverse Transfer Capacitance   | C <sub>rss</sub>     |   |        | 18               |      |      |
| <b>Switching<sup>c</sup></b>   |                      |   |        |                  |      |      |
| Turn-On Time   | t <sub>d(on)</sub>   | V <sub>DD</sub> = -15 V, R <sub>L</sub> = 75 Ω<br>I <sub>D</sub> ≅ -0.2 A, V <sub>GEN</sub> = -10 V<br>R <sub>G</sub> = 6 Ω |        | 8                | 12   | ns   |
|  | t <sub>r</sub>       |   |        | 20               | 30   |      |
| Turn-Off Time  | t <sub>d(off)</sub>  |   |        | 20               | 35   |      |
|  | t <sub>f</sub>       |   |        | 30               | 40   |      |

Notes

- For DESIGN AID ONLY, not subject to production testing.
- Pulse test: PW ≤ 300 μs duty cycle ≤ 2%.
- Switching time is essentially independent of operating temperature.

**TYPICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$  UNLESS OTHERWISE NOTED)**



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