



## N-Channel 20-V MOSFET

## PRODUCT SUMMARY

| $V_{DS}$ (V) | $r_{DS(on)}$ ( $\Omega$ ) | $I_D$ (mA) |
|--------------|---------------------------|------------|
| 20           | 2.0 @ $V_{GS} = 4.5$ V    | 250        |
|              | 2.5 @ $V_{GS} = 2.5$ V    | 150        |

## FEATURES

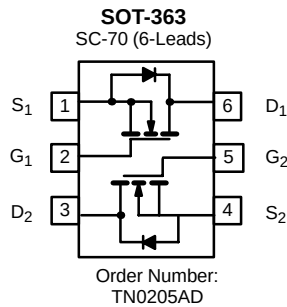
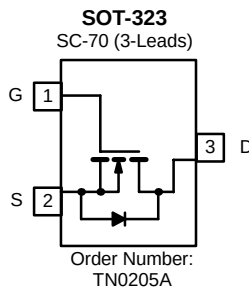
- Low On-Resistance: 2.0  $\Omega$
- Low Threshold: 0.9 V (typ)
- Fast Switching Speed: 35 ns
- 2.5-V or Lower Operation

## BENEFITS

- Ease in Driving Switches
- Low Offset (Error) Voltage
- Low-Voltage Operation
- High-Speed Circuits
- Low Battery Voltage Operation

## APPLICATIONS

- Drivers: Relays, Solenoids, Lamps, Hammers, Display, Memories
- Battery operated Systems
- Solid State Relay
- Load/Power Switching-Cell Phones, PDA



Marking Code:  
TN0205A: B/  
TN0205AD: Dwl  
w = Week Code  
l = Lot Traceability

ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$  UNLESS OTHERWISE NOTED)

| Parameter                                                      |                       | Symbol                            | TN0205A    | TN0205AD     | Unit |
|----------------------------------------------------------------|-----------------------|-----------------------------------|------------|--------------|------|
| Drain-Source Voltage                                           |                       | V <sub>DS</sub>                   | 20         |              | V    |
| Gate-Source Voltage                                            |                       | V <sub>GS</sub>                   | ± 8        |              |      |
| Continuous Drain Current (T <sub>J</sub> = 150°C) <sup>a</sup> | T <sub>A</sub> = 25°C | I <sub>D</sub>                    | 250        |              | mA   |
|                                                                | T <sub>A</sub> = 70°C |                                   | 200        |              |      |
| Pulsed Drain Current                                           |                       | I <sub>DM</sub>                   | 500        |              |      |
| Maximum Power Dissipation <sup>a</sup>                         | T <sub>A</sub> = 25°C | P <sub>D</sub>                    | 0.15       | 0.20 (Total) | W    |
|                                                                | T <sub>A</sub> = 70°C |                                   | 0.10       | 0.13 (Total) |      |
| Operating Junction and Storage Temperature Range               |                       | T <sub>J</sub> , T <sub>stg</sub> | −55 to 150 |              | °C   |

## THERMAL RESISTANCE RATINGS

| Parameter                                            | Symbol     | TN0205A | TN0205AD    | Unit               |
|------------------------------------------------------|------------|---------|-------------|--------------------|
| Thermal Resistance, Junction-to-Ambient <sup>a</sup> | $R_{thJA}$ | 833     | 625 (Total) | $^\circ\text{C/W}$ |

Notes

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

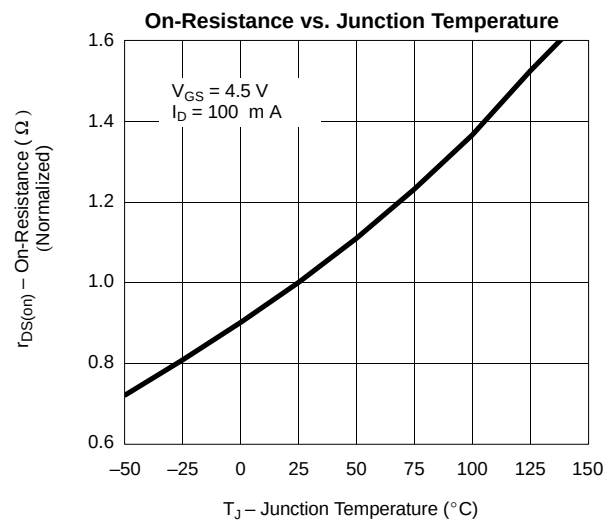
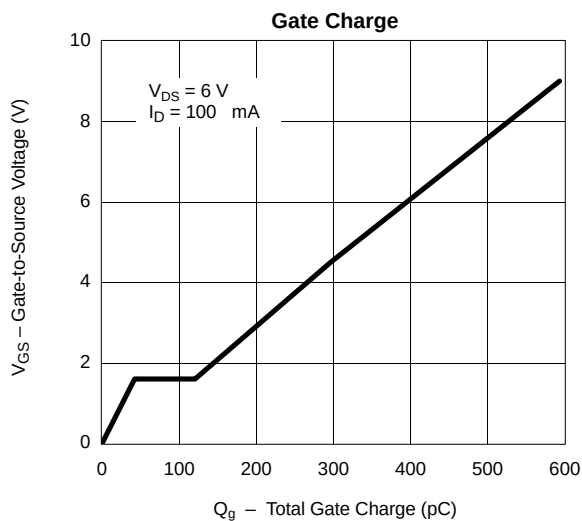
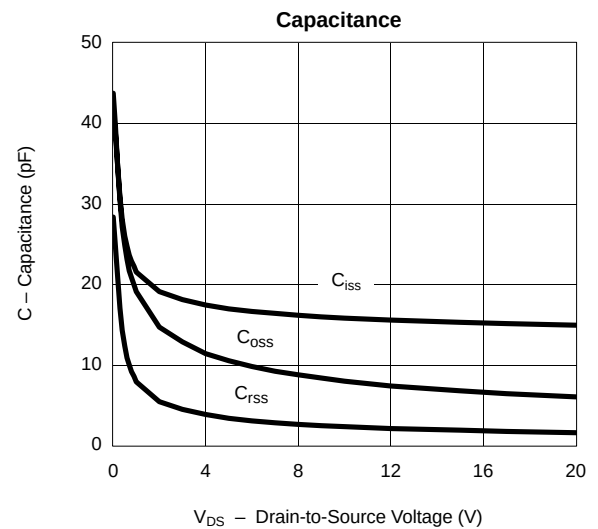
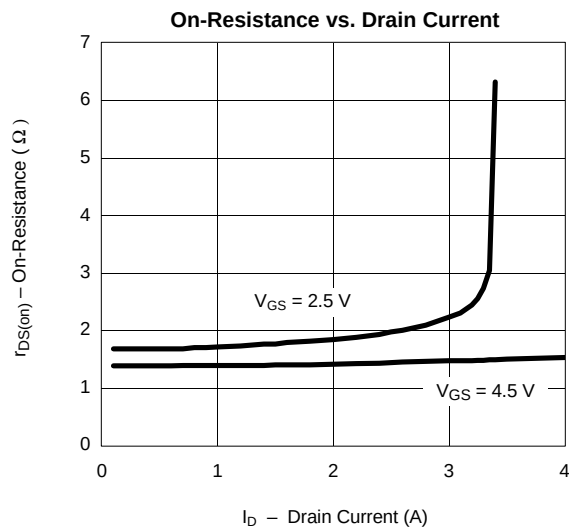
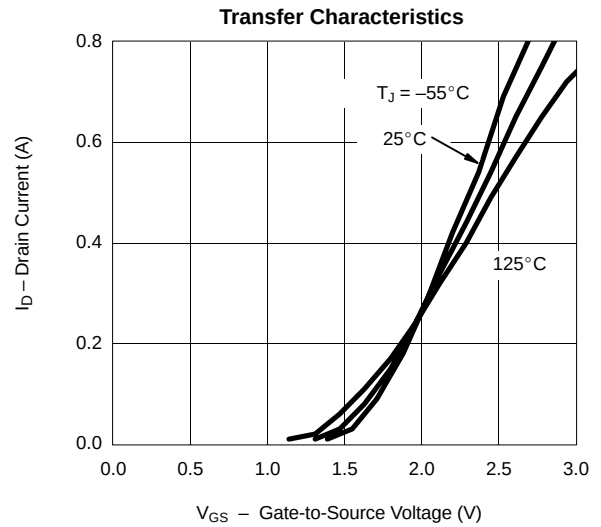
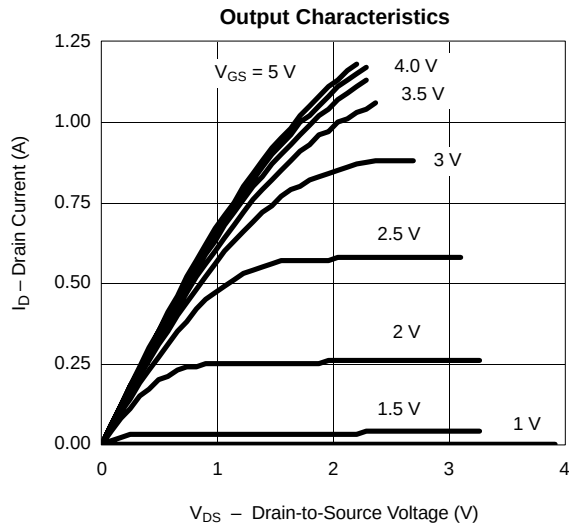


| SPECIFICATIONS (T <sub>A</sub> = 25 °C UNLESS OTHERWISE NOTED) |                      |                                                                                                                             |     |       |      |      |
|----------------------------------------------------------------|----------------------|-----------------------------------------------------------------------------------------------------------------------------|-----|-------|------|------|
| Parameter                                                      | Symbol               | Test Condition                                                                                                              | Min | Typ   | Max  | Unit |
| Static                                                         |                      |                                                                                                                             |     |       |      |      |
| Drain-Source Breakdown Voltage                                 | V <sub>(BR)DSS</sub> | V <sub>DS</sub> = 0 V, I <sub>D</sub> = 10 μA                                                                               | 20  | 24    |      | V    |
| Gate-Threshold Voltage                                         | V <sub>GS(th)</sub>  | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 50 μA                                                                  | 0.4 | 0.9   | 1.5  |      |
| Gate-Body Leakage                                              | I <sub>GSS</sub>     | V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ±8 V                                                                               |     | ±2    | ±100 | nA   |
| Zero Gate Voltage Drain Current                                | I <sub>DSS</sub>     | V <sub>DS</sub> = 20 V, V <sub>GS</sub> = 0 V                                                                               |     | 0.001 | 100  |      |
|                                                                |                      | V <sub>DS</sub> = 20 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 55 °C                                                       |     |       | 5    | μA   |
| On-State Drain Current <sup>a</sup>                            | I <sub>D(on)</sub>   | V <sub>DS</sub> = 5.0 V, V <sub>GS</sub> = 2.5 V                                                                            | 120 | 160   |      | mA   |
|                                                                |                      | V <sub>DS</sub> = 8.0 V, V <sub>GS</sub> = 4.5 V                                                                            | 400 | 800   |      |      |
| Drain-Source On-State Resistance <sup>a</sup>                  | r <sub>DS(on)</sub>  | V <sub>GS</sub> = 2.5 V, I <sub>D</sub> = 150 mA                                                                            |     | 1.6   | 2.5  | Ω    |
|                                                                |                      | V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 250 mA                                                                            |     | 1.2   | 2.0  |      |
| Forward Transconductance <sup>a</sup>                          | g <sub>fs</sub>      | V <sub>DS</sub> = 2.5 V, I <sub>D</sub> = 50 mA                                                                             |     | 200   |      | mS   |
| Diode Forward Voltage <sup>a</sup>                             | V <sub>SD</sub>      | I <sub>S</sub> = 50 mA, V <sub>GS</sub> = 0 V                                                                               |     | 0.7   | 1.2  | V    |
| Dynamic                                                        |                      |                                                                                                                             |     |       |      |      |
| Total Gate Charge                                              | Q <sub>g</sub>       | V <sub>DS</sub> = 5.0 V, V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 100 mA                                                   |     | 350   | 450  | pC   |
| Gate-Source Charge                                             | Q <sub>gs</sub>      |                                                                                                                             |     | 25    |      |      |
| Gate-Drain Charge                                              | Q <sub>gd</sub>      |                                                                                                                             |     | 100   |      |      |
| Input Capacitance                                              | C <sub>iss</sub>     | V <sub>DS</sub> = 5.0 V, V <sub>GS</sub> = 0 V, f = 1 MHz                                                                   |     | 20    |      | pF   |
| Output Capacitance                                             | C <sub>oss</sub>     |                                                                                                                             |     | 14    |      |      |
| Reverse Transfer Capacitance                                   | C <sub>rss</sub>     |                                                                                                                             |     | 5     |      |      |
| Switching <sup>b, c</sup>                                      |                      |                                                                                                                             |     |       |      |      |
| Turn-On Delay Time                                             | t <sub>d(on)</sub>   | V <sub>DD</sub> = 3.0 V, R <sub>L</sub> = 100 Ω<br>I <sub>D</sub> = 0.25 A, V <sub>GEN</sub> = 4.5 V, R <sub>G</sub> = 10 Ω |     | 7     | 12   | ns   |
| Rise Time                                                      | t <sub>r</sub>       |                                                                                                                             |     | 25    | 35   |      |
| Turn-Off Delay Time                                            | t <sub>d(off)</sub>  |                                                                                                                             |     | 19    | 30   |      |
| Fall Time                                                      | t <sub>f</sub>       |                                                                                                                             |     | 9     | 15   |      |

## Notes

- a. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .  
b. For design only, not subject to production testing.  
c. Switching time is essentially independent of operating temperature.

VNOJ

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

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