



## N-Channel JFETs

|        |        |         |
|--------|--------|---------|
| 2N4391 | PN4391 | SST4391 |
| 2N4392 | PN4392 | SST4392 |
| 2N4393 | PN4393 | SST4393 |

| PRODUCT SUMMARY |                   |                               |                       |                   |
|-----------------|-------------------|-------------------------------|-----------------------|-------------------|
| Part Number     | $V_{GS(off)}$ (V) | $r_{DS(on)}$ Max ( $\Omega$ ) | $I_{D(off)}$ Typ (pA) | $t_{ON}$ Typ (ns) |
| 2N/PN/SST4391   | -4 to -10         | 30                            | 5                     | 4                 |
| 2N/PN/SST4392   | -2 to -5          | 60                            | 5                     | 4                 |
| 2N/PN/SST4393   | -0.5 to -3        | 100                           | 5                     | 4                 |

### FEATURES

- Low On-Resistance: 4391 < 30  $\Omega$
- Fast Switching— $t_{ON}$ : 4 ns
- High Off-Isolation:  $I_{D(off)}$  with Low Leakage
- Low Capacitance: < 3.5 pF
- Low Insertion Loss

### BENEFITS

- Low Error Voltage
- High-Speed Analog Circuit Performance
- Negligible “Off-Error,” Excellent Accuracy
- Good Frequency Response, Low Glitches
- Eliminates Additional Buffering

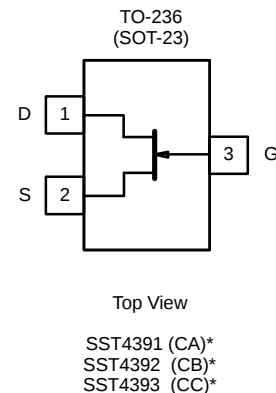
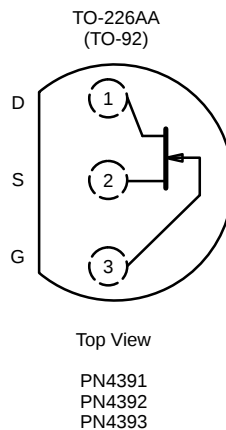
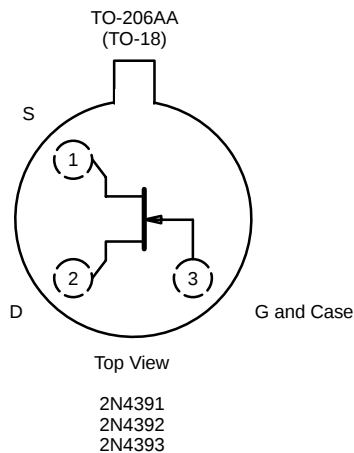
### APPLICATIONS

- Analog Switches
- Choppers
- Sample-and-Hold
- Normally “On” Switches
- Current Limiters
- Commutators

### DESCRIPTION

The 2N/PN/SST4391 series features many of the superior characteristics of JFETs which make it a good choice for demanding analog switching applications and for specialized amplifier circuits.

The 2N series hermetically-sealed TO-206AA (TO-18) can be available with processing per MIL-S-19500 (see Military Information). Both the PN, TO-226AA (TO-92), and SST, TO-236 (SOT-23), series are available in tape-and-reel for automated assembly (see Packaging Information). For similar dual products, see the 2N5564/5565/5566 data sheet.



\*Marking Code for TO-236

For applications information see AN104 and AN106

## ABSOLUTE MAXIMUM RATINGS

Gate-Drain, Gate-Source Voltage:

(2N/PN Prefixes) ..... -40 V  
(SST Prefix) ..... -35 V

Gate Current ..... 50 mA

Lead Temperature ..... 300 °C

Storage Temperature : (2N Prefix) ..... -65 to 200 °C  
(PN/SST Prefixes) ..... -55 to 150 °C

Operating Junction Temperature :

(2N Prefix) ..... -55 to 200 °C  
(PN/SST Prefixes) ..... -55 to 150 °C

Power Dissipation : (2N Prefix)<sup>a</sup> ..... (T<sub>C</sub> = 25 °C) 1800 mW  
(PN/SST Prefixes)<sup>b</sup> ..... 350 mW

Notes

a. Derate 10 mW/°C above 25 °C

b. Derate 2.8 mW/°C above 25 °C

SPECIFICATIONS (T<sub>A</sub> = 25 °C UNLESS OTHERWISE NOTED)

| Parameter                             | Symbol               | Test Conditions                                                                         |                              | Typ <sup>a</sup>       | Limits |     |       |     |       |     | Unit  |    |
|---------------------------------------|----------------------|-----------------------------------------------------------------------------------------|------------------------------|------------------------|--------|-----|-------|-----|-------|-----|-------|----|
|                                       |                      |                                                                                         |                              |                        | 4391   |     | 4392  |     | 4393  |     |       |    |
|                                       |                      |                                                                                         |                              |                        | Min    | Max | Min   | Max | Min   | Max |       |    |
| Static                                |                      |                                                                                         |                              |                        |        |     |       |     |       |     |       |    |
| Gate-Source Breakdown Voltage         | V <sub>(BR)GSS</sub> | I <sub>G</sub> = -1 μA, V <sub>DS</sub> = 0 V                                           |                              | -55                    | -40    |     | -40   |     | -40   |     | V     |    |
| Gate-Source Cutoff Voltage            | V <sub>GS(off)</sub> | V <sub>DS</sub> = 20 V                                                                  | 2N/PN: I <sub>D</sub> = 1 nA |                        | -4     | -10 | -2    | -5  | -0.5  | -3  |       |    |
|                                       |                      | V <sub>DS</sub> = 15 V                                                                  | SST: I <sub>D</sub> = 10 nA  |                        |        |     |       |     |       |     |       |    |
| Saturation Drain Current <sup>b</sup> | I <sub>DSS</sub>     | V <sub>DS</sub> = 20 V, V <sub>GS</sub> = 0 V                                           |                              | 2N                     |        | 50  | 150   | 25  | 75    | 5   | 30    | mA |
|                                       |                      |                                                                                         |                              | PN                     |        | 50  | 150   | 25  | 100   | 5   | 60    |    |
|                                       |                      |                                                                                         |                              | SST                    |        | 50  |       | 25  |       | 5   |       |    |
| Gate Reverse Current                  | I <sub>GSS</sub>     | V <sub>GS</sub> = -20 V<br>V <sub>DS</sub> = 0 V                                        |                              | 2N/SST                 | -5     |     | -100  |     | -100  |     | -100  | pA |
|                                       |                      |                                                                                         |                              | PN                     | -5     |     | -1000 |     | -1000 |     | -1000 |    |
|                                       |                      | 2N: T <sub>A</sub> = 150°C<br>PN: T <sub>A</sub> = 100°C<br>SST: T <sub>A</sub> = 125°C |                              |                        | -13    |     | -200  |     | -200  |     | -200  | nA |
|                                       |                      |                                                                                         |                              |                        | -1     |     | -200  |     | -200  |     | -200  |    |
|                                       |                      |                                                                                         |                              |                        | -3     |     |       |     |       |     |       |    |
| Gate Operating Current                | I <sub>G</sub>       | V <sub>DG</sub> = 15 V, I <sub>D</sub> = 10 mA                                          |                              | -5                     |        |     |       |     |       |     |       |    |
| Drain Cutoff Current                  | I <sub>D(off)</sub>  | V <sub>DS</sub> = 20 V                                                                  | 2N: V <sub>GS</sub> = -5 V   | 5                      |        |     |       |     |       |     | 100   | pA |
|                                       |                      |                                                                                         | 2N: V <sub>GS</sub> = -7 V   | 5                      |        |     |       | 100 |       |     |       |    |
|                                       |                      |                                                                                         | 2N: V <sub>GS</sub> = -12 V  | 5                      |        | 100 |       |     |       |     |       |    |
|                                       |                      |                                                                                         | PN: V <sub>GS</sub> = -5 V   | 0.005                  |        |     |       |     |       | 1   | nA    |    |
|                                       |                      |                                                                                         | PN: V <sub>GS</sub> = -7 V   | 0.005                  |        |     |       | 1   |       |     |       |    |
|                                       |                      |                                                                                         | PN: V <sub>GS</sub> = -12 V  | 0.005                  |        | 1   |       |     |       |     |       |    |
|                                       |                      | SST V <sub>DS</sub> = 10 V, V <sub>GS</sub> = -10 V                                     |                              | 5                      |        | 100 |       | 100 |       | 100 | pA    |    |
|                                       |                      | V <sub>DS</sub> = 20 V<br>T <sub>A</sub> = 150°C                                        | 2N: V <sub>GS</sub> = -5 V   | 13                     |        |     |       |     |       |     | 200   | nA |
|                                       |                      |                                                                                         | 2N: V <sub>GS</sub> = -7 V   | 13                     |        |     |       | 200 |       |     |       |    |
|                                       |                      |                                                                                         | 2N: V <sub>GS</sub> = -12 V  | 13                     |        | 200 |       |     |       |     |       |    |
|                                       |                      | V <sub>DS</sub> = 20 V<br>T <sub>A</sub> = 100°C                                        | PN: V <sub>GS</sub> = -5 V   | 1                      |        |     |       |     |       |     | 200   |    |
|                                       |                      |                                                                                         | PN: V <sub>GS</sub> = -7 V   | 1                      |        |     |       | 200 |       |     |       |    |
|                                       |                      |                                                                                         | PN: V <sub>GS</sub> = -12 V  | 1                      |        | 200 |       |     |       |     |       |    |
|                                       |                      | V <sub>DS</sub> = 10 V<br>T <sub>A</sub> = 125°C                                        | SST: V <sub>GS</sub> = -10 V | 3                      |        |     |       |     |       |     |       |    |
| Drain-Source On-Voltage               | V <sub>DS(on)</sub>  | V <sub>GS</sub> = 0 V                                                                   |                              | I <sub>D</sub> = 3 mA  | 0.25   |     |       |     |       |     | 0.4   |    |
|                                       |                      |                                                                                         |                              | I <sub>D</sub> = 6 mA  | 0.3    |     |       |     | 0.4   |     |       |    |
|                                       |                      |                                                                                         |                              | I <sub>D</sub> = 12 mA | 0.35   |     | 0.4   |     |       |     |       |    |
| Drain-Source On-Resistance            | r <sub>DS(on)</sub>  | V <sub>GS</sub> = 0 V, I <sub>D</sub> = 1 mA                                            |                              |                        |        | 30  |       | 60  |       | 100 | Ω     |    |
| Gate-Source Forward Voltage           | V <sub>GS(F)</sub>   | I <sub>G</sub> = 1 mA<br>V <sub>DS</sub> = 0 V                                          |                              | 2N                     | 0.7    |     | 1     |     | 1     |     | 1     | V  |
|                                       |                      |                                                                                         |                              | PN/SST                 | 0.7    |     |       |     |       |     |       |    |

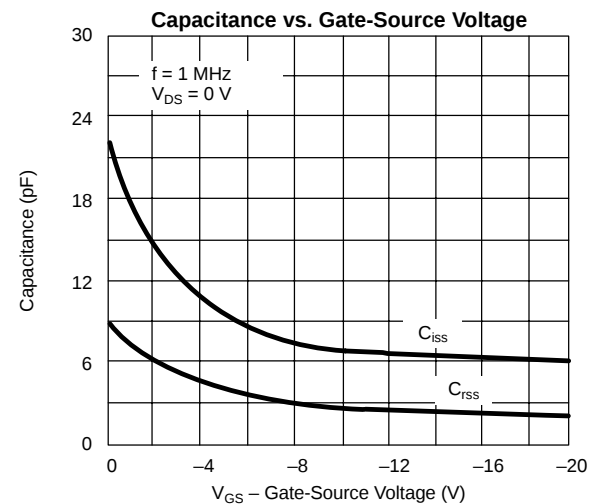
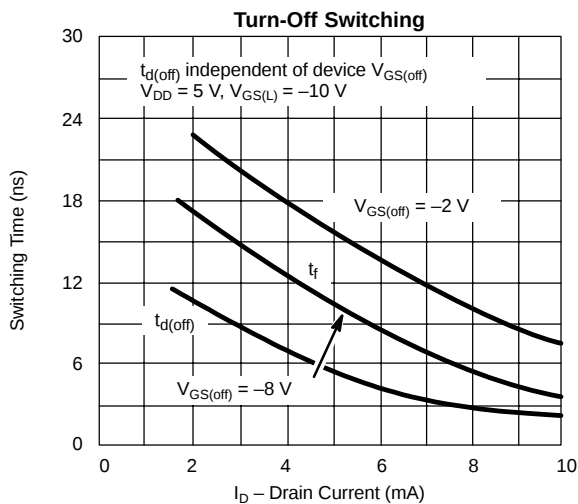
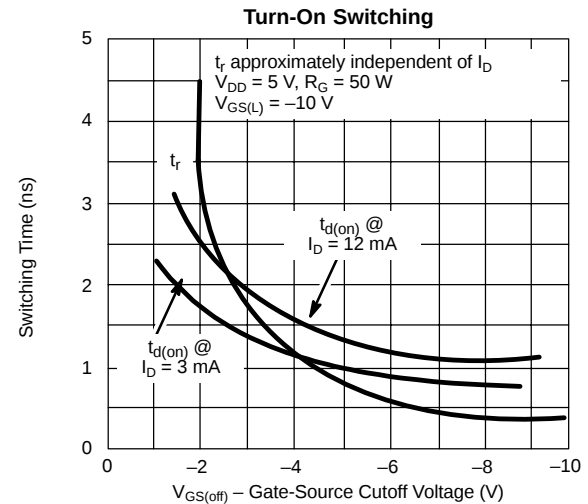
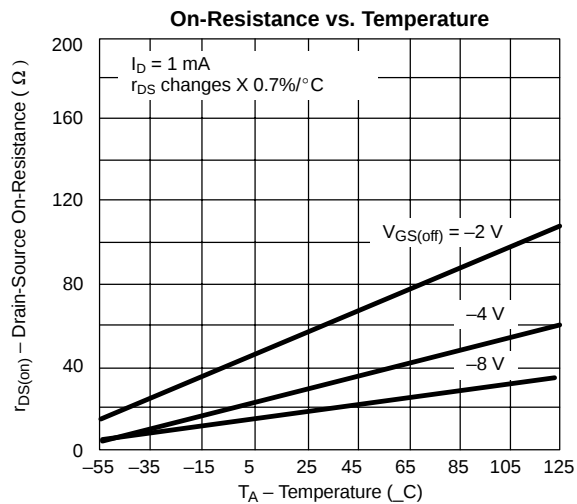
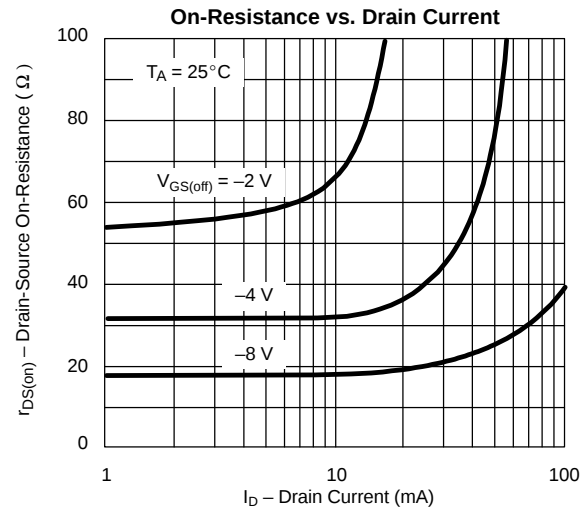
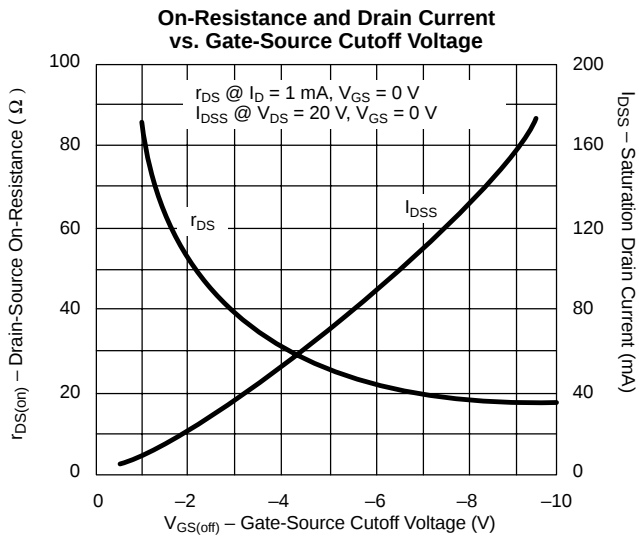


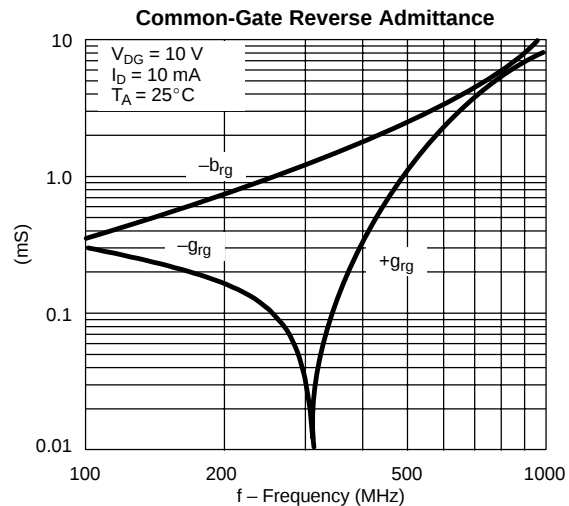
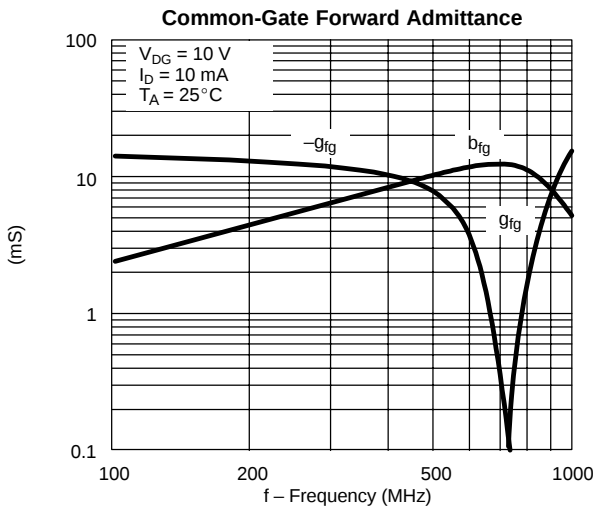
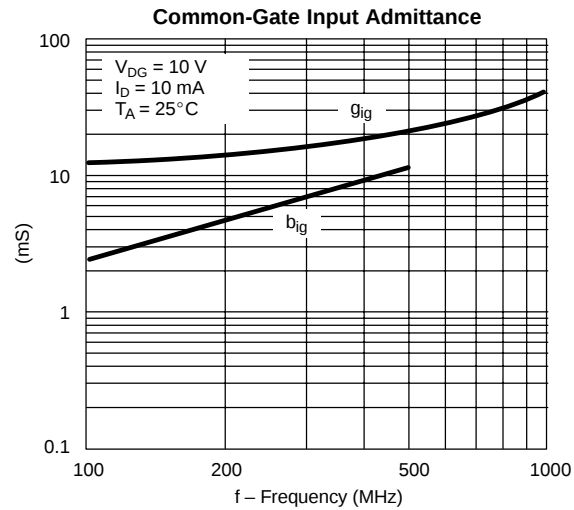
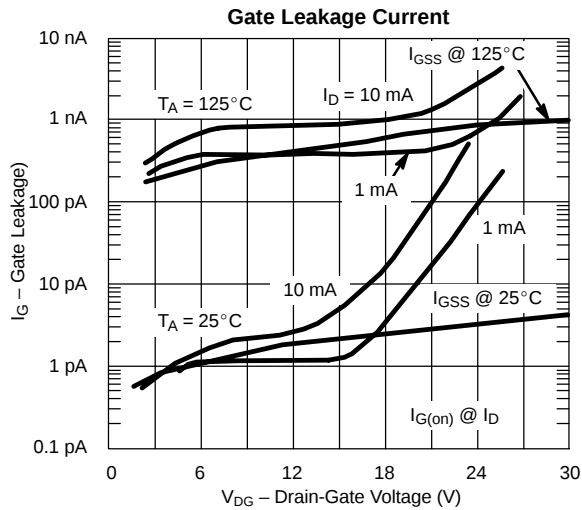
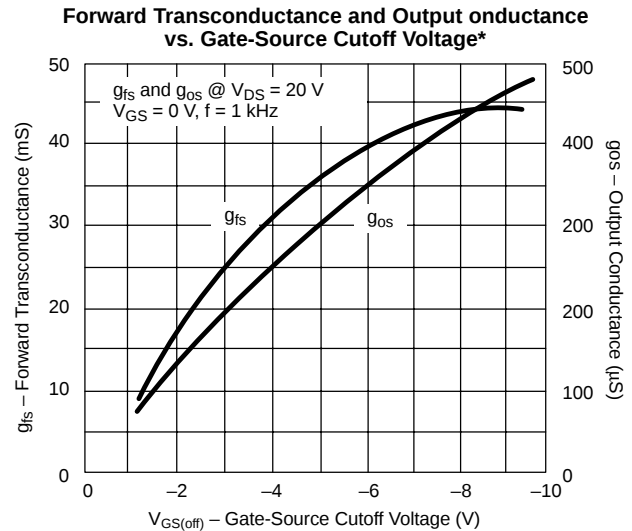
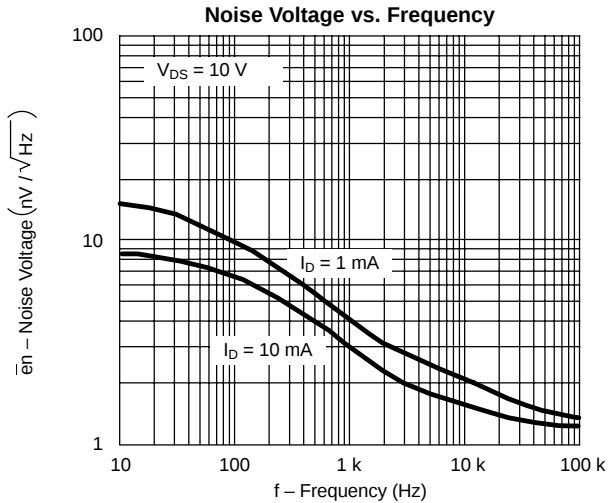
| SPECIFICATIONS (T <sub>A</sub> = 25 °C UNLESS OTHERWISE NOTED) |                     |                                                                             |                             |                     |        |     |      |     |      |     |            |    |
|----------------------------------------------------------------|---------------------|-----------------------------------------------------------------------------|-----------------------------|---------------------|--------|-----|------|-----|------|-----|------------|----|
| Parameter                                                      | Symbol              | Test Conditions                                                             |                             | Typ <sup>a</sup>    | Limits |     |      |     |      |     | Unit       |    |
|                                                                |                     |                                                                             |                             |                     | 4391   |     | 4392 |     | 4393 |     |            |    |
|                                                                |                     |                                                                             |                             |                     | Min    | Max | Min  | Max | Min  | Max |            |    |
| Dynamic                                                        |                     |                                                                             |                             |                     |        |     |      |     |      |     |            |    |
| Common-Source Forward Transconductance                         | g <sub>fs</sub>     | V <sub>DS</sub> = 20 V, I <sub>D</sub> = 1 mA, f = 1 kHz                    |                             | 6                   |        |     |      |     |      |     | mS         |    |
| Common-Source Output Conductance                               | g <sub>os</sub>     |                                                                             |                             | 25                  |        |     |      |     |      |     | μS         |    |
| Drain-Source On-Resistance                                     | r <sub>DS(on)</sub> | V <sub>GS</sub> = 0 V, I <sub>D</sub> = 0 mA , f = 1 kHz                    |                             |                     |        | 30  |      | 60  |      | 100 | Ω          |    |
| Common-Source Input Capacitance                                | C <sub>iss</sub>    | V <sub>DS</sub> = 20 V, V <sub>GS</sub> = 0 V<br>f = 1 MHz                  |                             | 2N                  | 12     |     | 14   |     | 14   |     | 14         | pF |
|                                                                |                     |                                                                             |                             | PN                  | 12     |     | 16   |     | 16   |     | 16         |    |
|                                                                |                     |                                                                             |                             | SST                 | 13     |     |      |     |      |     |            |    |
| Common-Source Reverse Transfer Capacitance                     | C <sub>rss</sub>    | V <sub>DS</sub> = 0 V<br>f = 1 MHz                                          | 2N: V <sub>GS</sub> = -5 V  | 3.3                 |        |     |      |     |      | 3.5 |            |    |
|                                                                |                     |                                                                             | 2N: V <sub>GS</sub> = -7 V  | 3.2                 |        |     |      | 3.5 |      |     |            |    |
|                                                                |                     |                                                                             | 2N: V <sub>GS</sub> = -12 V | 2.8                 |        | 3.5 |      |     |      |     |            |    |
|                                                                |                     |                                                                             | PN: V <sub>GS</sub> = -5 V  | 3.5                 |        |     |      |     |      | 5   |            |    |
|                                                                |                     |                                                                             | PN: V <sub>GS</sub> = -7 V  | 3.4                 |        |     |      | 5   |      |     |            |    |
|                                                                |                     |                                                                             | PN: V <sub>GS</sub> = -12 V | 3.0                 |        | 5   |      |     |      |     |            |    |
|                                                                |                     |                                                                             | SST: V <sub>GS</sub> = -5 V | 3.6                 |        |     |      |     |      |     |            |    |
|                                                                |                     |                                                                             | SST: V <sub>GS</sub> = -7 V | 3.5                 |        |     |      |     |      |     |            |    |
| SST: V <sub>GS</sub> = -12 V                                   | 3.1                 |                                                                             |                             |                     |        |     |      |     |      |     |            |    |
| Equivalent Input Noise Voltage                                 | ē <sub>n</sub>      | V <sub>DS</sub> = 10 V, I <sub>D</sub> = 10 mA<br>f = 1 kHz                 |                             | 3                   |        |     |      |     |      |     | nV/<br>√Hz |    |
| Switching                                                      |                     |                                                                             |                             |                     |        |     |      |     |      |     |            |    |
| Turn-On Time                                                   | t <sub>d(on)</sub>  | V <sub>DD</sub> = 10 V<br>V <sub>GS(H)</sub> = 0 V<br>See Switching Circuit |                             | 2N/PN               | 2      |     | 15   |     | 15   |     | 15         | ns |
|                                                                | t <sub>r</sub>      |                                                                             |                             | SST                 | 2      |     |      |     |      |     |            |    |
|                                                                |                     |                                                                             |                             | 2N/PN               | 2      |     | 5    |     | 5    |     | 5          |    |
|                                                                |                     |                                                                             |                             | SST                 | 2      |     |      |     |      |     |            |    |
| Turn-Off Time                                                  |                     |                                                                             |                             | t <sub>d(off)</sub> | 2N/PN  | 6   |      | 20  |      | 35  |            |    |
|                                                                | t <sub>f</sub>      |                                                                             |                             | SST                 | 6      |     |      |     |      |     |            |    |
|                                                                |                     |                                                                             |                             | 2N/PN               | 13     |     | 15   |     | 20   |     | 30         |    |
|                                                                |                     |                                                                             |                             | SST                 | 13     |     |      |     |      |     |            |    |

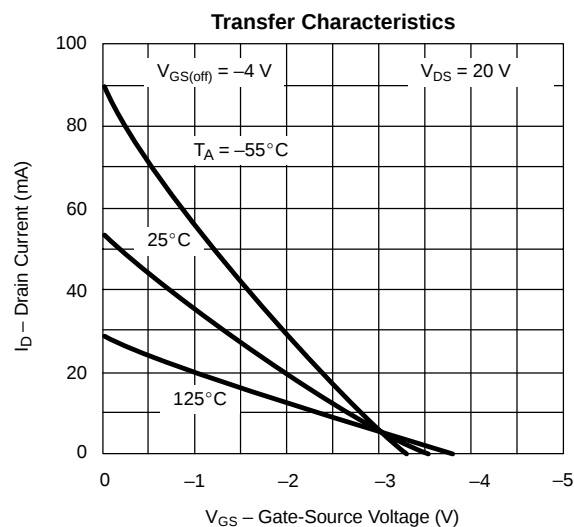
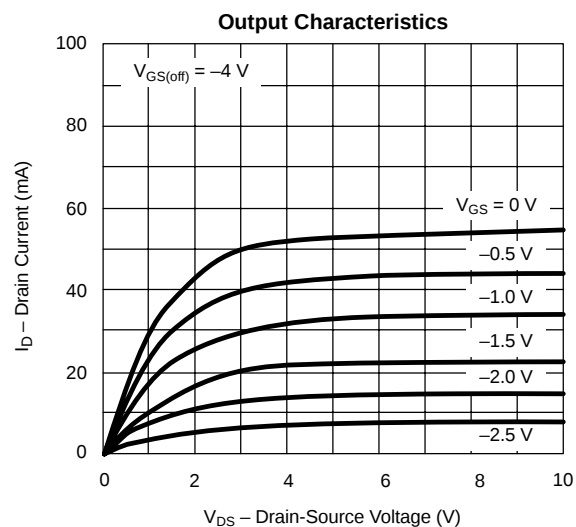
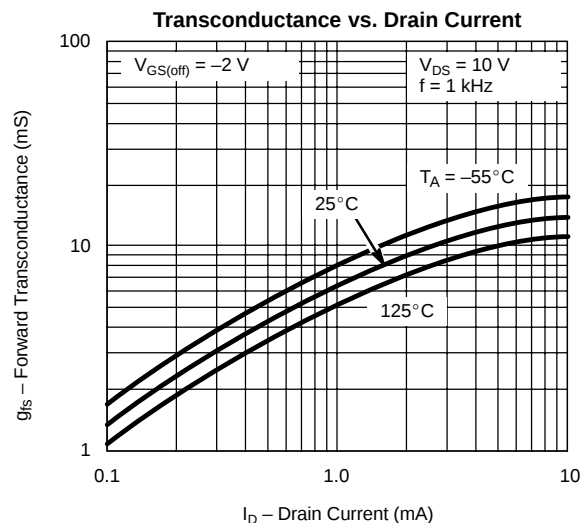
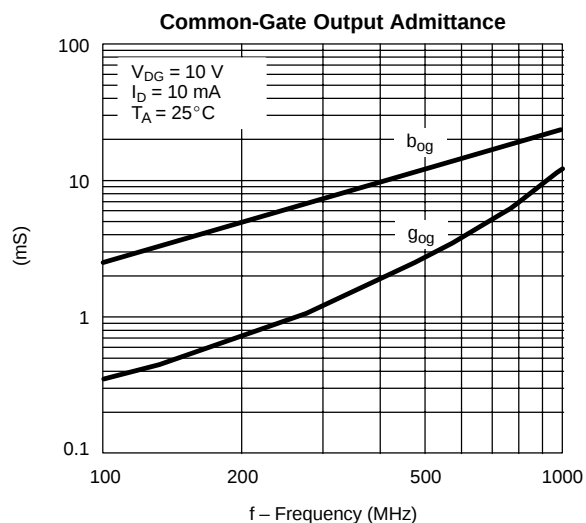
### Notes

- a. Typical values are for DESIGN AID ONLY, not guaranteed nor subject to production testing.  
b. Pulse test: PW ≤ 300 μs duty cycle ≤ 3%.

NCB

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


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

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

|             | 4391         | 4392          | 4393          |
|-------------|--------------|---------------|---------------|
| $V_{GS(L)}$ | -12 V        | -7 V          | -5 V          |
| $R_L^*$     | 800 $\Omega$ | 1600 $\Omega$ | 3000 $\Omega$ |
| $I_{D(on)}$ | 12 mA        | 6 mA          | 3 mA          |

\*Non-inductive

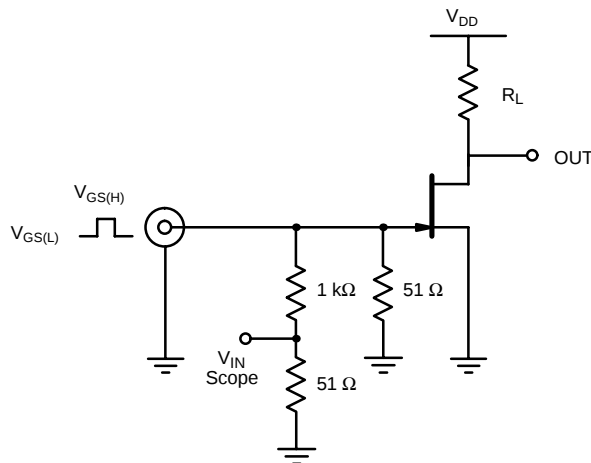
**INPUT PULSE**

Rise Time < 1 ns  
Fall Time < 1 ns  
Pulse Width 100 ns  
PRF 1 MHz

**SAMPLING SCOPE**

Rise Time 0.4 ns  
Input Resistance 10 M $\Omega$   
Input Capacitance 1.5 pF

See Typical Characteristics curves for changes.





### Disclaimer

All product specifications and data are subject to change without notice.

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