

### N-Channel JFETs

|               |               |                |
|---------------|---------------|----------------|
| <b>2N4391</b> | <b>PN4391</b> | <b>SST4391</b> |
| <b>2N4392</b> | <b>PN4392</b> | <b>SST4392</b> |
| <b>2N4393</b> | <b>PN4393</b> | <b>SST4393</b> |

### Product Summary

| Part Number   | V <sub>GS(off)</sub> (V) | r <sub>DS(on)</sub> Max (Ω) | I <sub>D(off)</sub> Typ (pA) | t <sub>ON</sub> 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                        |

2N4391, For applications information see AN104, page 21.

PN/SST4393, For applications information see AN106, page 28.

### Features

- Low On-Resistance: 4391 < 30 Ω
- Fast Switching—t<sub>ON</sub>: 4 ns
- High Off-Isolation: I<sub>D(off)</sub> 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

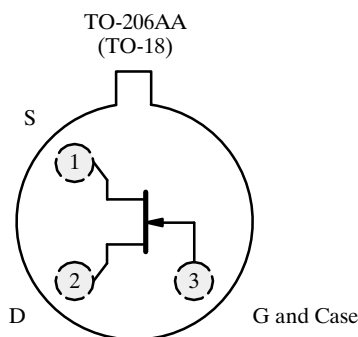
- Analog Switches
- Choppers
- Sample-and-Hold
- Normally “On” Switches
- Current Limiters
- Commutators

### 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.

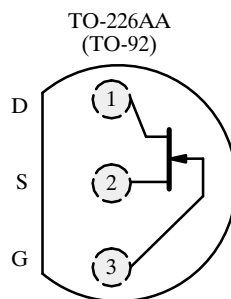
can is available with processing per MIL-S-19500 (see Military Information). Both the PN, TO-226AA (TO-92), and SST, TO-236 (SOT-23), series are available in tape-and-reel for automated assembly (see Packaging Information). For similar dual products, see the 2N5564/5565/5566 data sheet.

The 2N series hermetically-sealed TO-206AA (TO-18)



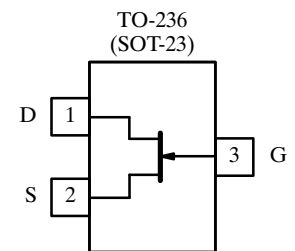
Top View

2N4391  
2N4392  
2N4393



Top View

PN4391  
PN4392  
PN4393



Top View

SST4391 (CA)\*  
SST4392 (CB)\*  
SST4393 (CC)\*

\*Marking Code for TO-236

# 2N/PN/SST4391 Series

# TEMIC

## Siliconix

### 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<sup>a</sup>

| Parameter  | Symbol                       | Test Conditions                                     | Typ <sup>b</sup>             | Limits |     |       |     |       |      | Unit  |    |
|--|------------------------------|---|------------------------------|--------|-----|-------|-----|-------|------|-------|----|
|  |                              |   |                              | 4391   |     | 4392  |     | 4393  |      |       |    |
|  |                              |   |                              | Min    | Max | Min   | Max | Min   | Max  |       |    |
| <b>Static</b>                                    |                              |   |                              |        |     |       |     |       |      |       |    |
| Gate-Source Breakdown Voltage                    | V <sub>(BR)GSS</sub>         | I <sub>G</sub> = -1 μA<br>V <sub>DS</sub> = 0 V     | 2N/PN                        | -55    | -40 |       | -40 |       | -40  |       | V  |
|  |                              |   | SST                          | -55    | -35 |       | -35 |       | -35  |       |    |
| 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  |
|  |                              | V <sub>DS</sub> = 15 V                              | SST: I <sub>D</sub> = 10 nA  |        |     |       |     |       |      |       |    |
| Saturation Drain Current <sup>c</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, 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   | -13    |     | -200  |     | -200  |      | -200  | nA |
|  |                              |   | PN: T <sub>A</sub> = 100°C   | -1     |     | -200  |     | -200  |      | -200  |    |
| SST: T <sub>A</sub> = 125°C                      | -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   | V  |
|  |                              |   | I <sub>D</sub> = 6 mA        | 0.3    |     |       |     | 0.4   |      |       |    |
|  |                              |   | I <sub>D</sub> = 12 mA       | 0.35   |     | 0.4   |     |       |      |       |    |

### Specifications<sup>a</sup>

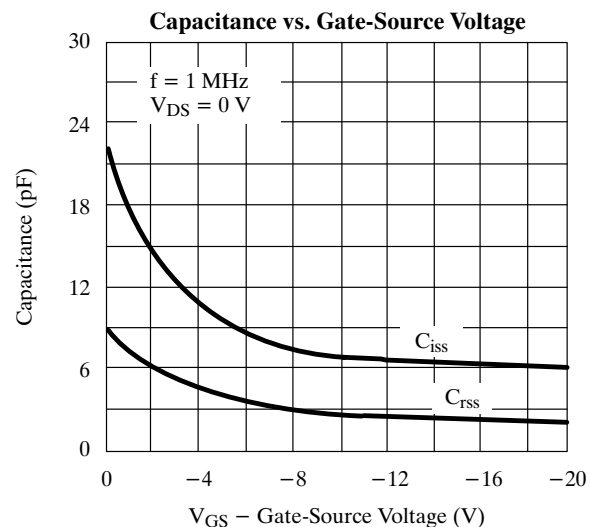
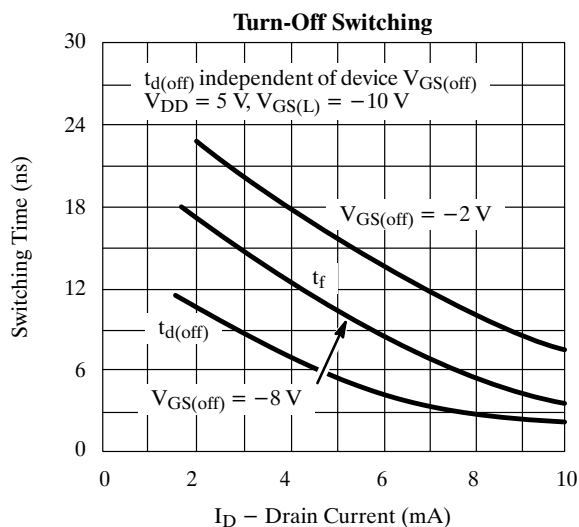
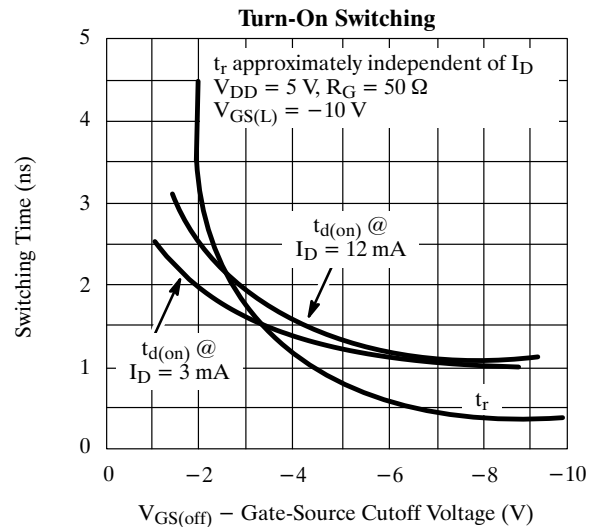
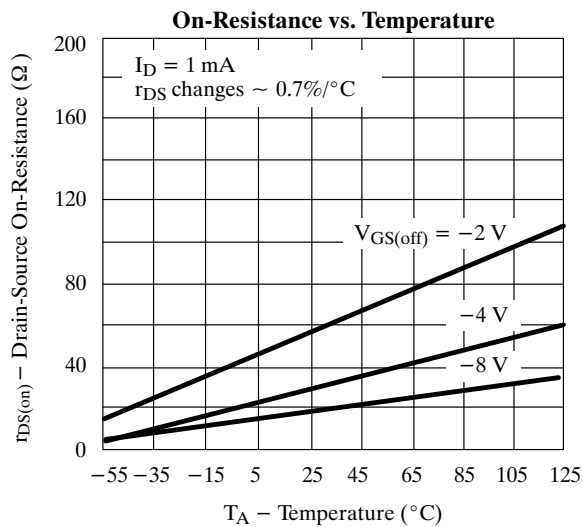
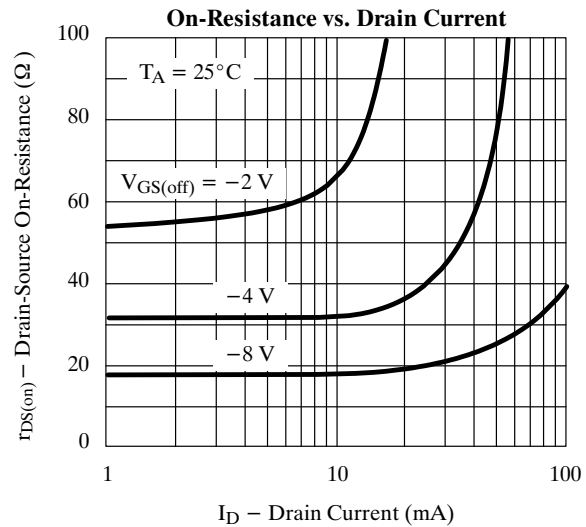
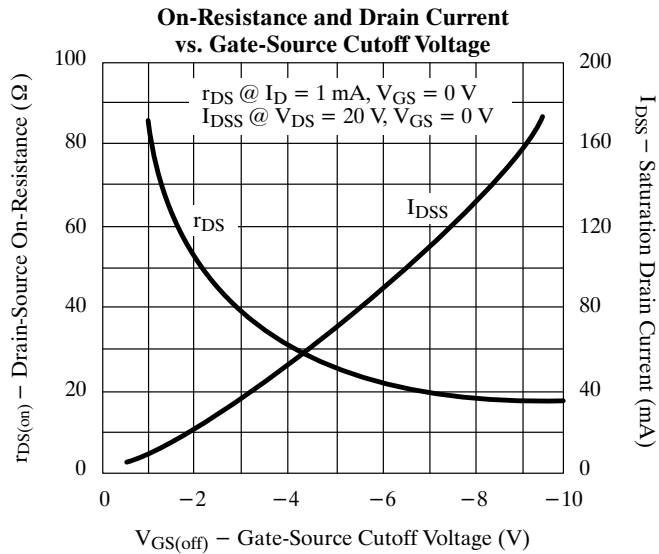
| Parameter                                  | Symbol       | Test Conditions   | Typ <sup>b</sup>            | Limits |     |      |     |      |     | Unit                         |               |
|--|--------------|---|-----------------------------|--------|-----|------|-----|------|-----|------------------------------|---------------|
|  |              |   |                             | 4391   |     | 4392 |     | 4393 |     |                              |               |
|  |              |   |                             | Min    | Max | Min  | Max | Min  | Max |                              |               |
| <b>Static (Cont'd)</b>                     |              |   |                             |        |     |      |     |      |     |                              |               |
| Drain-Source On-Resistance                 | $r_{DS(on)}$ | $V_{GS} = 0\text{ V}, I_D = 1\text{ mA}$                                    |                             |        | 30  |      | 60  |      | 100 | $\Omega$                     |               |
| Gate-Source Forward Voltage                | $V_{GS(F)}$  | $I_G = 1\text{ mA}$<br>$V_{DS} = 0\text{ V}$                                | 2N                          | 0.7    |     | 1    |     | 1    |     | 1                            | V             |
|  |              |   | PN/SST                      | 0.7    |     |      |     |      |     |                              |               |
| <b>Dynamic</b>                             |              |   |                             |        |     |      |     |      |     |                              |               |
| Common-Source Forward Transconductance     | $g_{fs}$     | $V_{DS} = 20\text{ V}, I_D = 1\text{ mA}, f = 1\text{ kHz}$                 |                             | 6      |     |      |     |      |     |                              | mS            |
| Common-Source Output Conductance           | $g_{os}$     |   |                             | 2.5    |     |      |     |      |     |                              | $\mu\text{S}$ |
| Drain-Source On-Resistance                 | $r_{DS(on)}$ | $V_{GS} = 0\text{ V}, I_D = 0\text{ mA}, f = 1\text{ kHz}$                  |                             |        | 30  |      | 60  |      | 100 | $\Omega$                     |               |
| Common-Source Input Capacitance            | $C_{iss}$    | $V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}$<br>$f = 1\text{ MHz}$           | 2N                          | 12     |     | 14   |     | 14   |     | 14                           | pF            |
|  |              |   | PN                          | 12     |     | 16   |     | 16   |     | 16                           |               |
|  |              |   | SST                         | 13     |     |      |     |      |     |                              |               |
| Common-Source Reverse Transfer Capacitance | $C_{rss}$    | $V_{DS} = 0\text{ V}$<br>$f = 1\text{ MHz}$                                 | 2N: $V_{GS} = -5\text{ V}$  | 3.3    |     |      |     |      |     | 3.5                          | pF            |
|  |              |   | 2N: $V_{GS} = -7\text{ V}$  | 3.2    |     |      |     | 3.5  |     |                              |               |
|  |              |   | 2N: $V_{GS} = -12\text{ V}$ | 2.8    |     | 3.5  |     |      |     |                              |               |
|  |              |   | PN: $V_{GS} = -5\text{ V}$  | 3.5    |     |      |     |      |     | 5                            |               |
|  |              |   | PN: $V_{GS} = -7\text{ V}$  | 3.4    |     |      |     | 5    |     |                              |               |
|  |              |   | PN: $V_{GS} = -12\text{ V}$ | 3.0    |     | 5    |     |      |     |                              |               |
|  |              |   | SST: $V_{GS} = -5\text{ V}$ | 3.6    |     |      |     |      |     |                              |               |
|  |              |   | SST: $V_{GS} = -7\text{ V}$ | 3.5    |     |      |     |      |     |                              |               |
| SST: $V_{GS} = -12\text{ V}$               | 3.1          |   |                             |        |     |      |     |      |     |                              |               |
| Equivalent Input Noise Voltage             | $\bar{e}_n$  | $V_{DS} = 10\text{ V}, I_D = 10\text{ mA}$<br>$f = 1\text{ kHz}$            |                             | 3      |     |      |     |      |     | $\text{nV}/\sqrt{\text{Hz}}$ |               |
| <b>Switching</b>                           |              |   |                             |        |     |      |     |      |     |                              |               |
| Turn-On Time                               | $t_{d(on)}$  | $V_{DD} = 10\text{ V}$<br>$V_{GS(H)} = 0\text{ V}$<br>See Switching Circuit | 2N/PN                       | 2      |     | 15   |     | 15   |     | 15                           | ns            |
|  | $t_r$        |   | SST                         | 2      |     |      |     |      |     |                              |               |
| Turn-Off Time                              | $t_{d(off)}$ |   | 2N/PN                       | 2      |     | 5    |     | 5    |     | 5                            |               |
|  |              |   | SST                         | 2      |     |      |     |      |     |                              |               |
|  | $t_f$        |   | 2N/PN                       | 6      |     | 20   |     | 35   |     | 50                           |               |
|  |              |   | SST                         | 6      |     |      |     |      |     |                              |               |
|  |              | 2N/PN   | 13                          |        | 15  |      | 20  |      | 30  |                              |               |
|  |              | SST   | 13                          |        |     |      |     |      |     |                              |               |

Notes

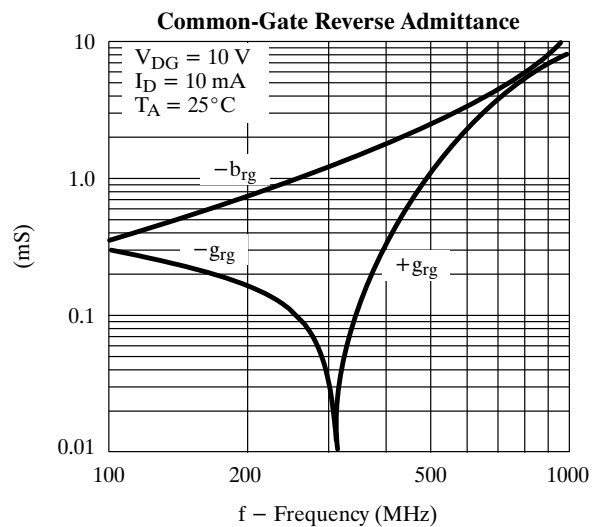
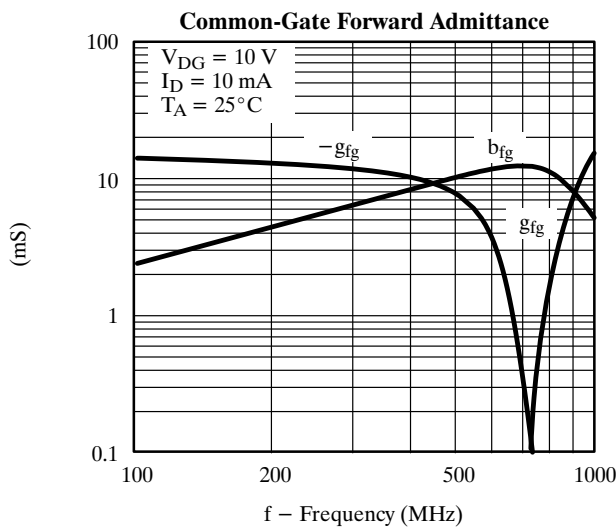
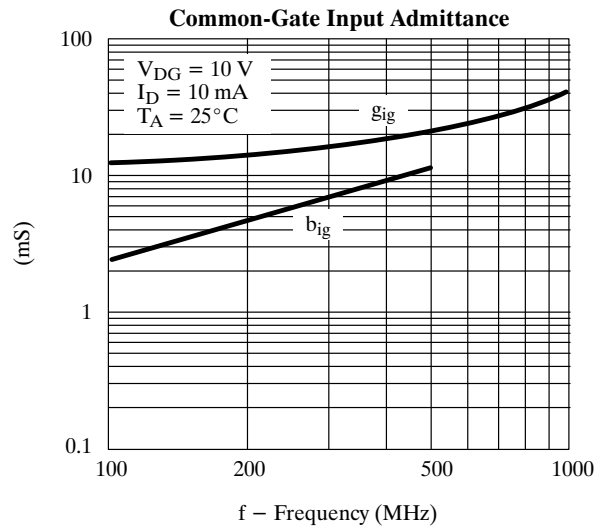
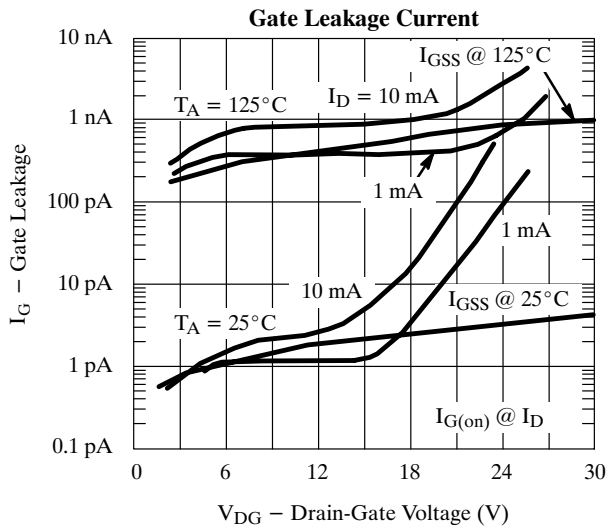
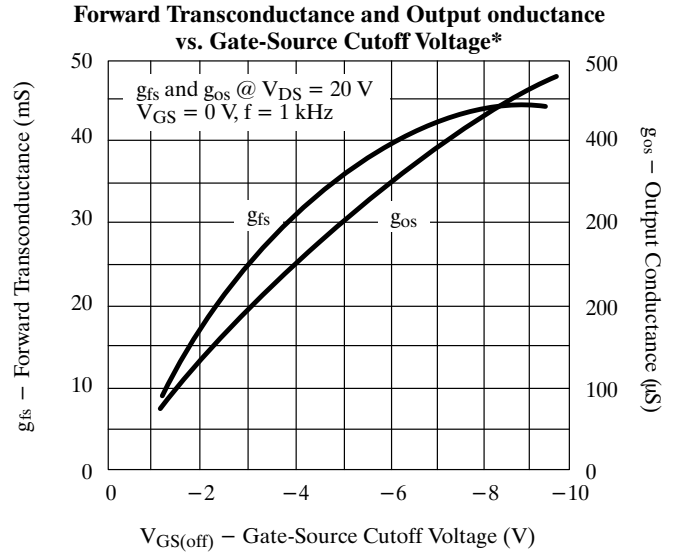
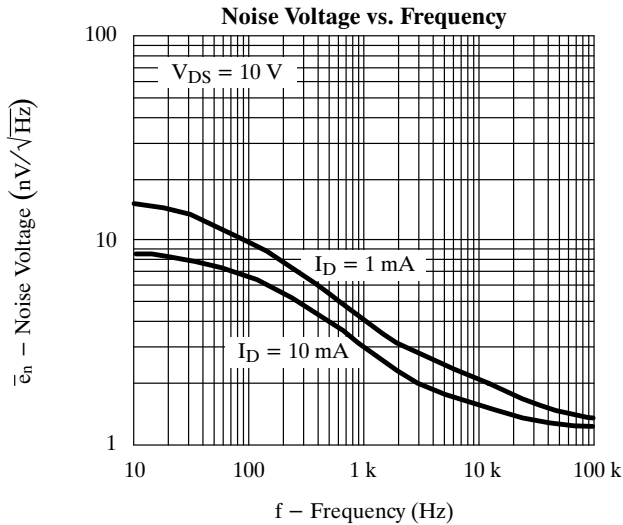
- $T_A = 25^\circ\text{C}$  unless otherwise noted.
- Typical values are for DESIGN AID ONLY, not guaranteed nor subject to production testing.
- Pulse test:  $PW \leq 300\ \mu\text{s}$  duty cycle  $\leq 3\%$ .

NCB

### Typical Characteristics



## Typical Characteristics (Cont'd)

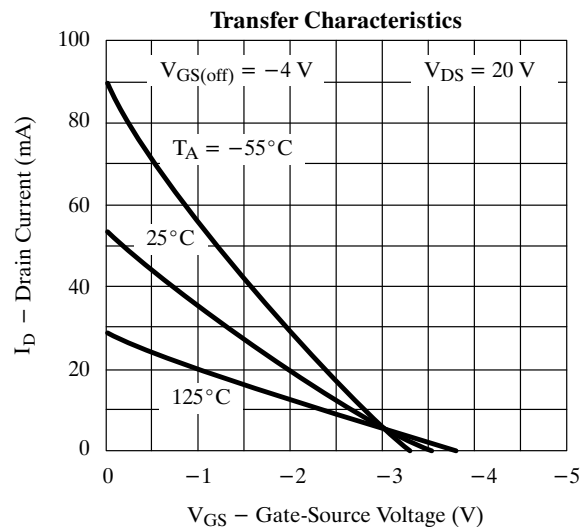
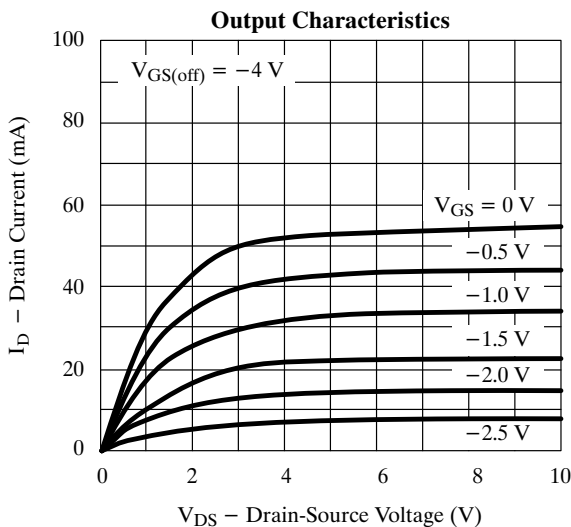
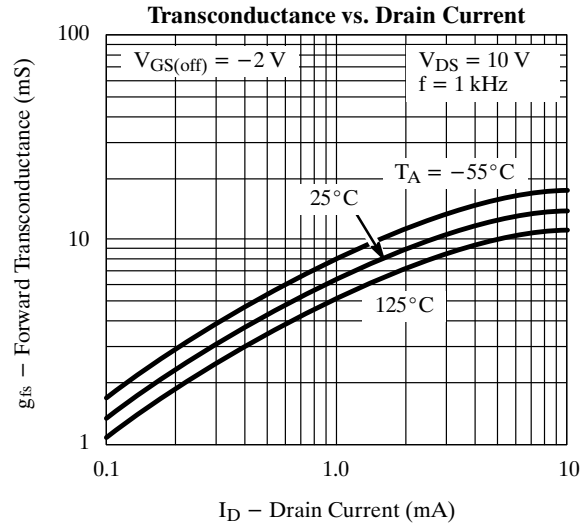
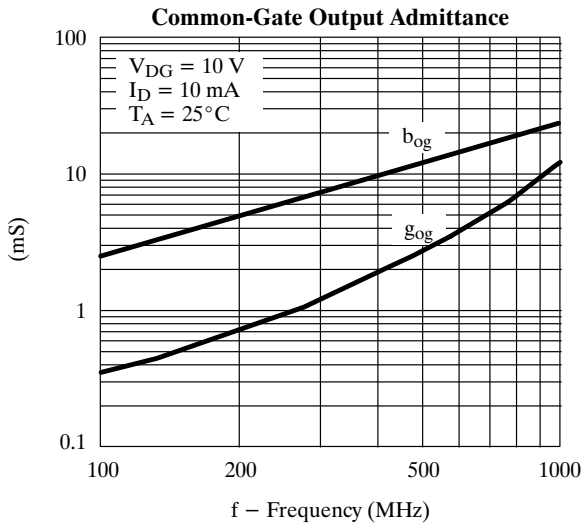


# 2N/PN/SST4391 Series

# TEMIC

Siliconix

## Typical Characteristics (Cont'd)



## 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

See Typical Characteristics curves for changes.

### Sampling Scope

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

