

### 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	$V_{GS(off)}$ (V)	$r_{DS(on)}$ Max ( $\Omega$ )	$I_{D(off)}$ Typ ( $\mu$ A)	$t_{ON}$ 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

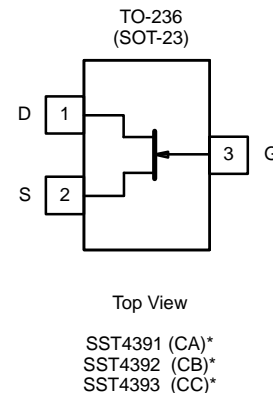
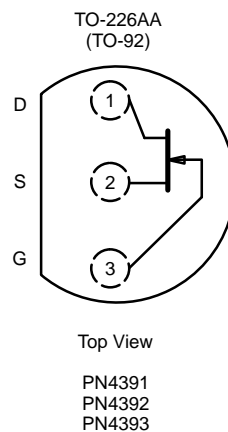
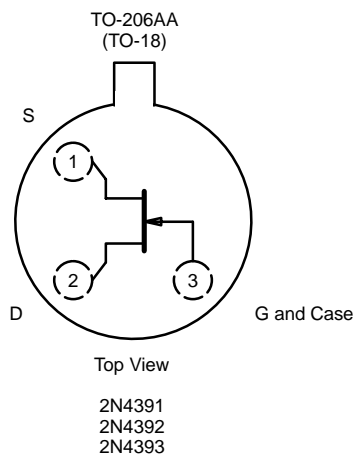
#### APPLICATIONS

- 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
- Derate 10 mW/°C above 25 °C
  - 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		
<b>Static</b>											
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	
		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 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 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 T <sub>A</sub> = 100 °C	PN: V <sub>GS</sub> = −5 V	1						200	nA		
	PN: V <sub>GS</sub> = −7 V	1				200					
	PN: V <sub>GS</sub> = −12 V	1		200							
V <sub>DS</sub> = 10 V 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					
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 V <sub>DS</sub> = 0 V	2N	0.7		1		1		1	V
			PN/SST	0.7							



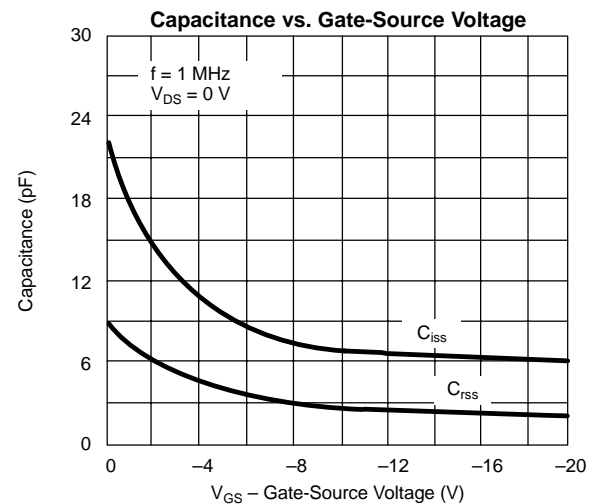
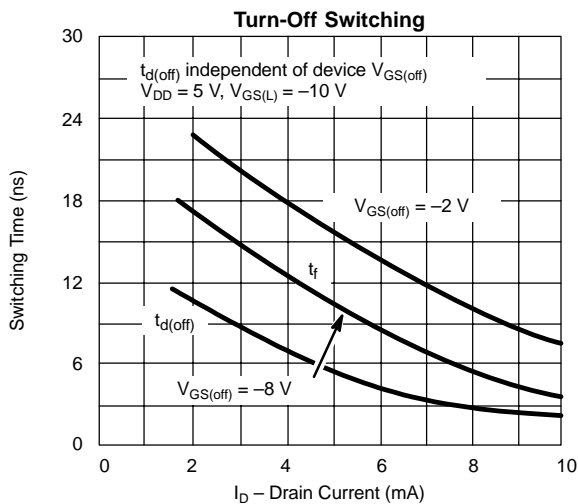
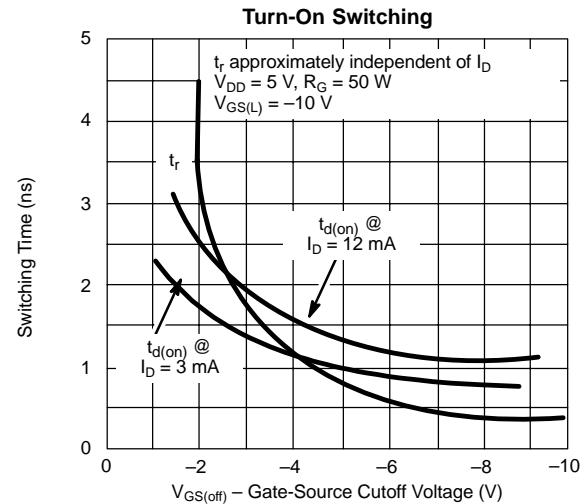
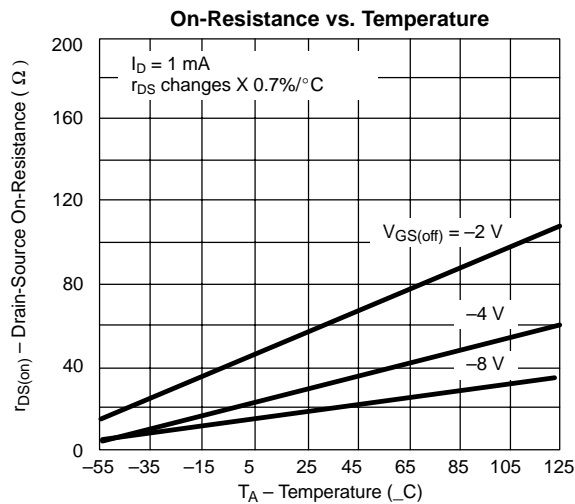
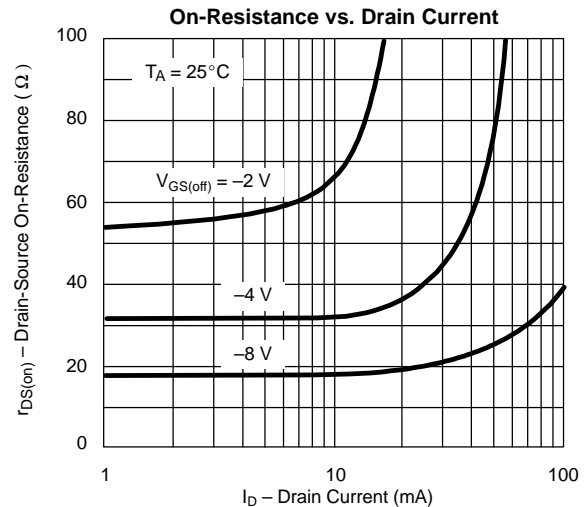
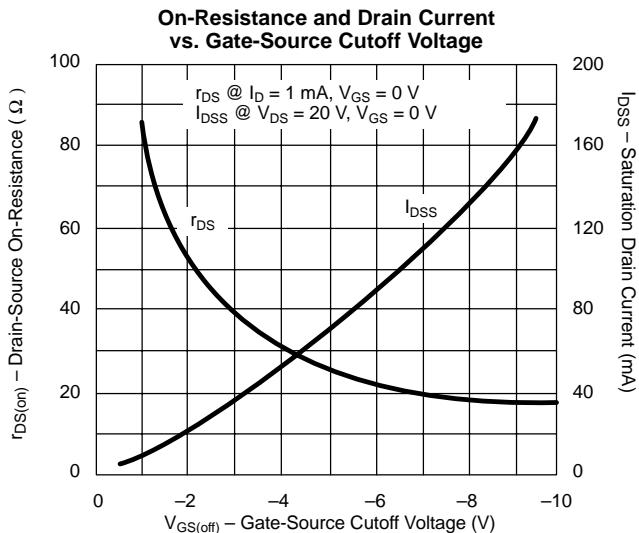
SPECIFICATIONS (T <sub>A</sub> = 25°C UNLESS OTHERWISE NOTED)											
Parameter	Symbol	Test Conditions	Typ <sup>a</sup>	Limits						Unit	
				4391		4392		4393			
				Min	Max	Min	Max	Min	Max		
<b>Dynamic</b>											
Common-Source Forward Transconductance	g <sub>fs</sub>	V <sub>DS</sub> = 20 V, I <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 f = 1 MHz	2N	12		14		14		14	
			PN	12		16		16		16	
			SST	13							
Common-Source Reverse Transfer Capacitance	C <sub>rss</sub>	V <sub>DS</sub> = 0 V f = 1 MHz	2N: V <sub>GS</sub> = -5 V	3.3						3.5	pF
			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	e <sub>n</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 10 mA f = 1 kHz	3							nV/ √Hz	
<b>Switching</b>											
Turn-On Time	t <sub>d(on)</sub>	V <sub>DD</sub> = 10 V V <sub>GS(H)</sub> = 0 V See Switching Circuit	2N/PN	2		15		15		15	ns
	t <sub>r</sub>		SST	2							
Turn-Off Time	t <sub>d(off)</sub>		2N/PN	2		5		5		5	
			SST	2							
	t <sub>f</sub>		2N/PN	6		20		35		50	
			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%.

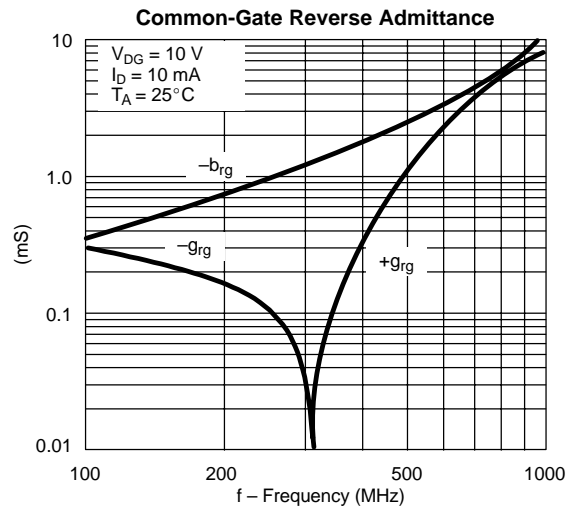
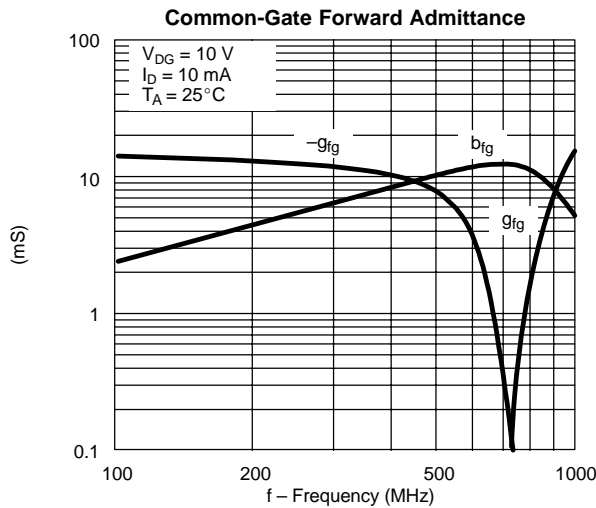
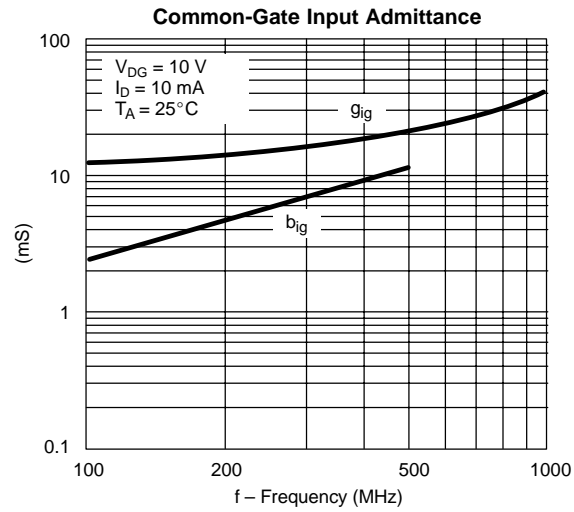
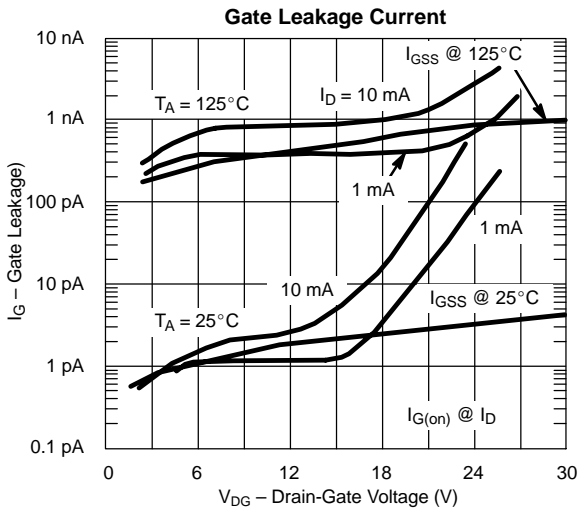
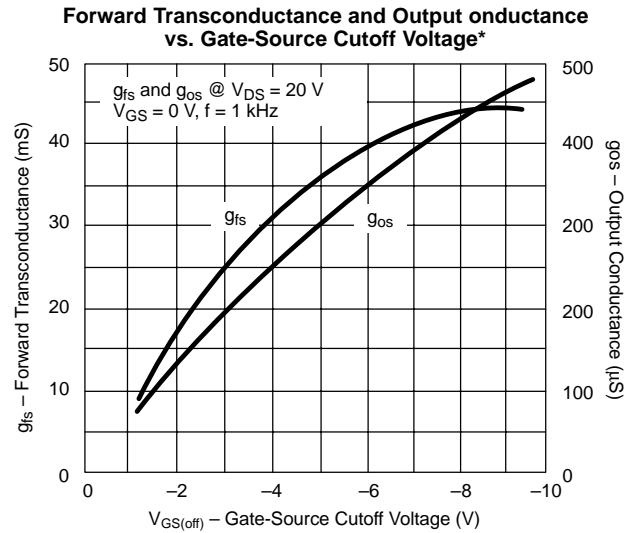
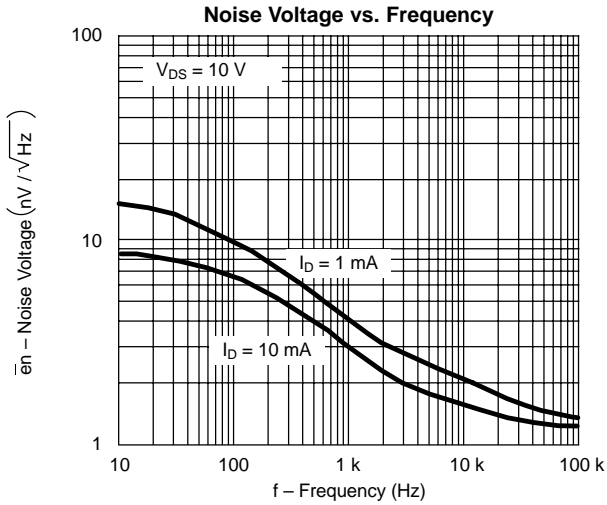
NCB

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

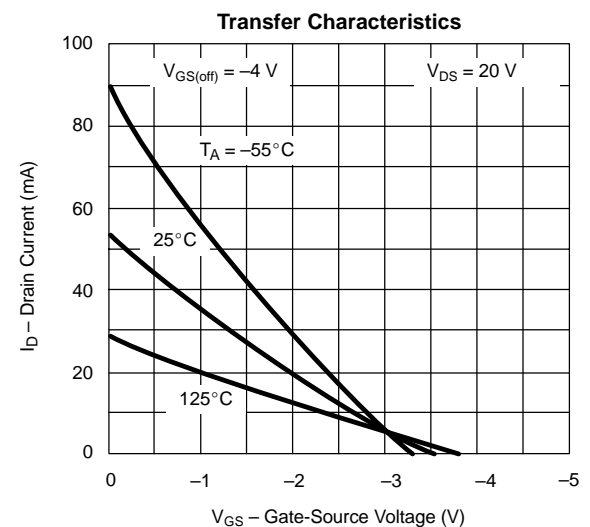
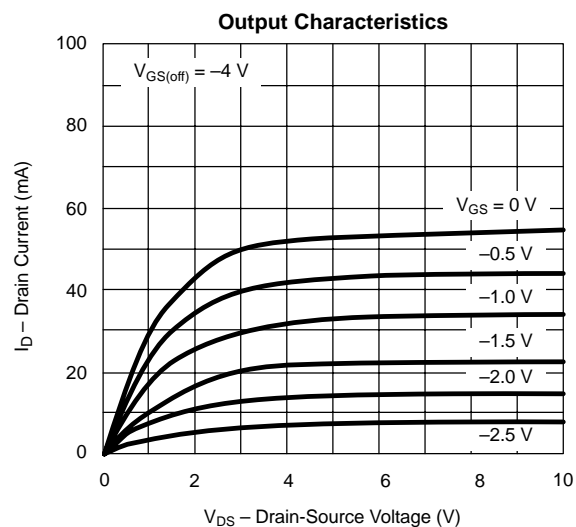
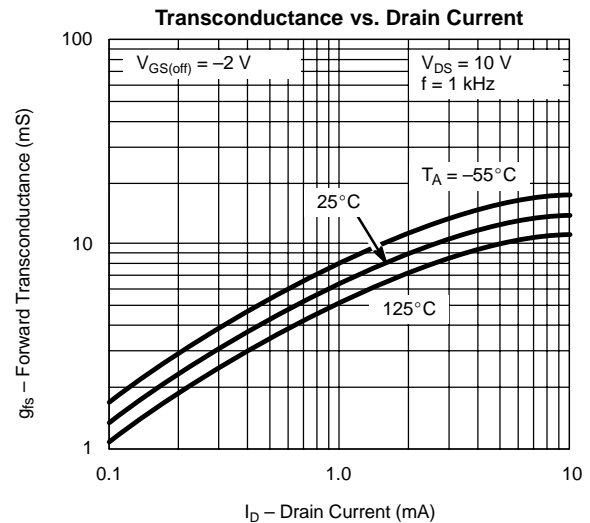
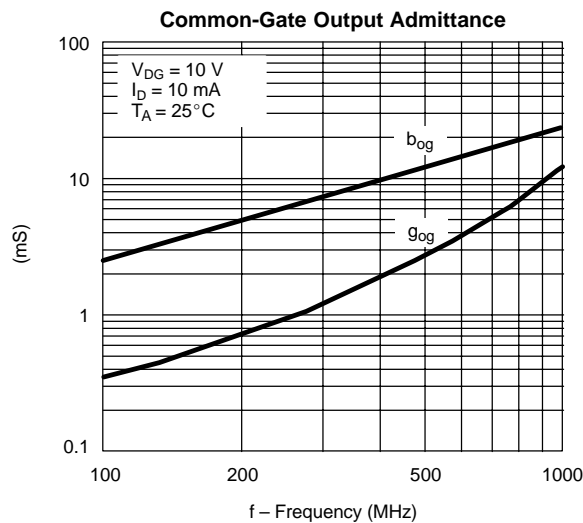




**TYPICAL CHARACTERISTICS (T<sub>A</sub> = 25°C UNLESS OTHERWISE NOTED)**



### 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

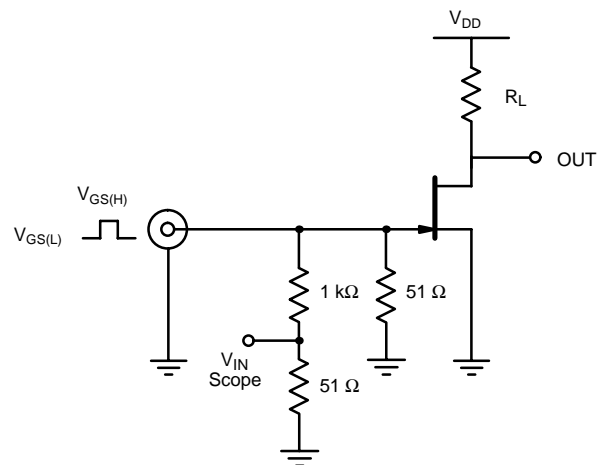
#### INPUT PULSE

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

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