



## 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 ( $\mu A$ )	$t_{ON}$ 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

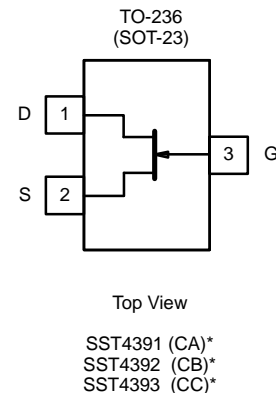
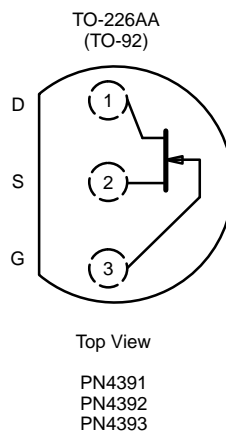
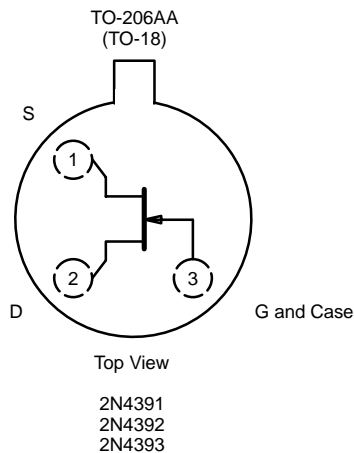
## APPLICATIONS

- 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

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 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 PN: T <sub>A</sub> = 100°C 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 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	
				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							

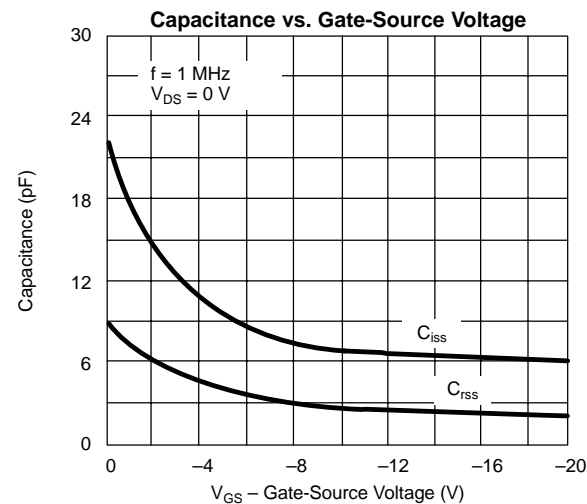
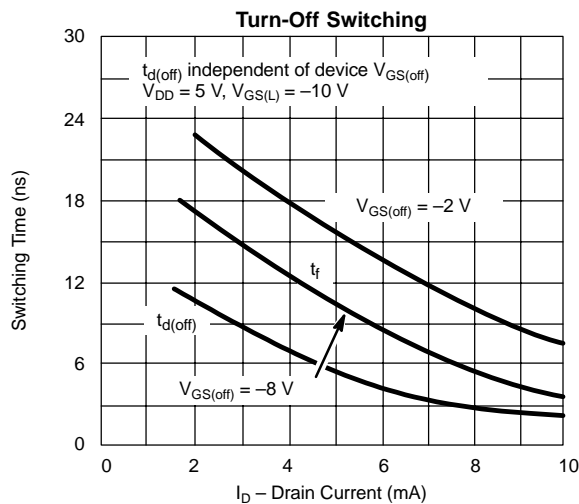
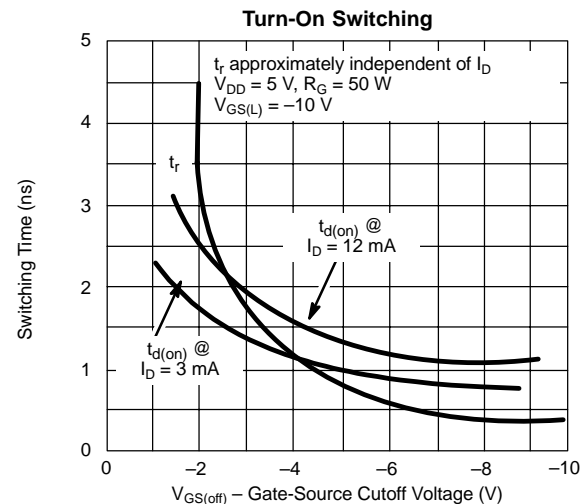
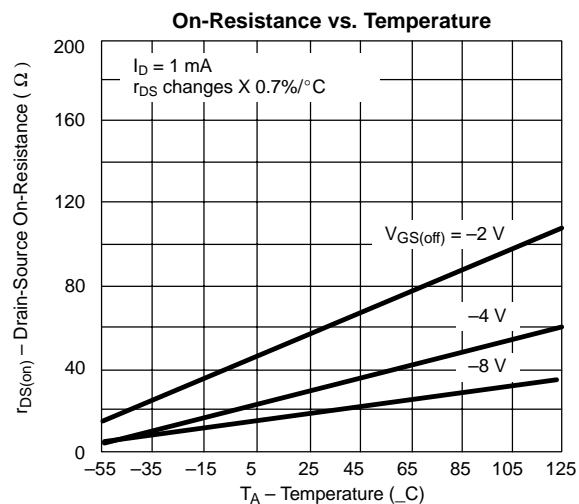
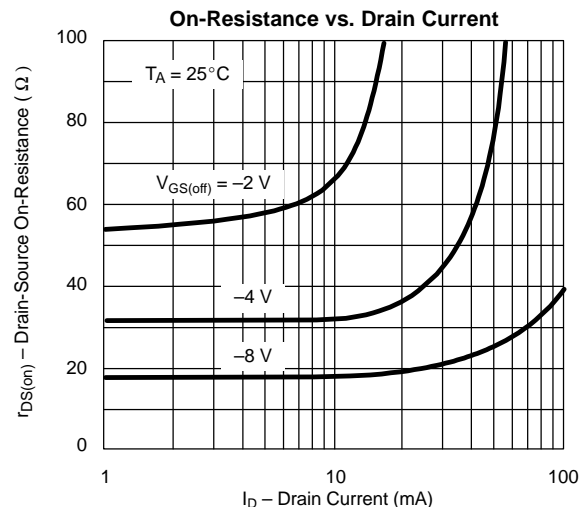
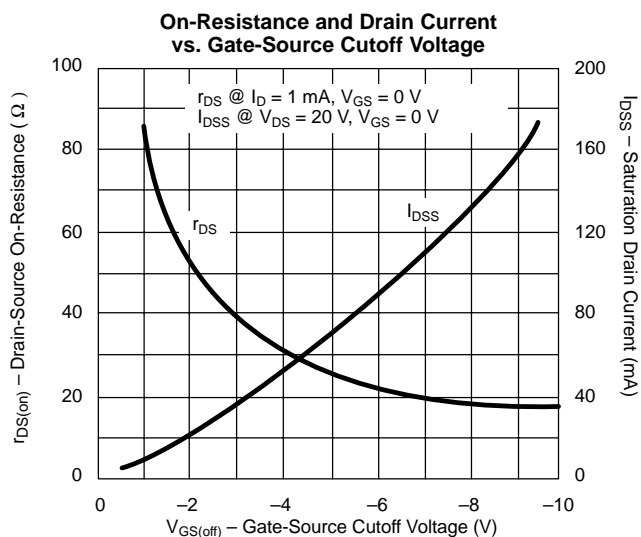


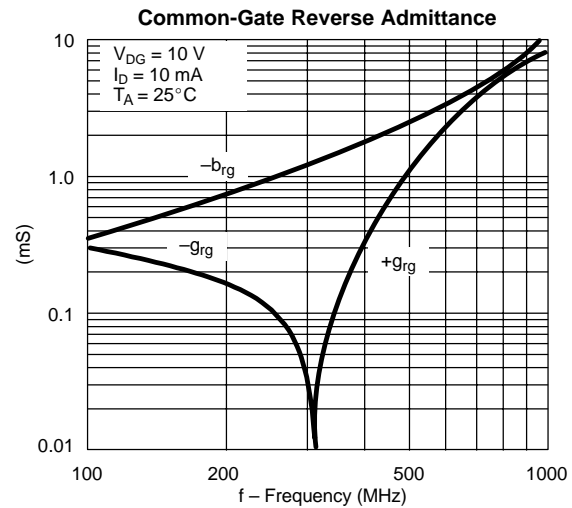
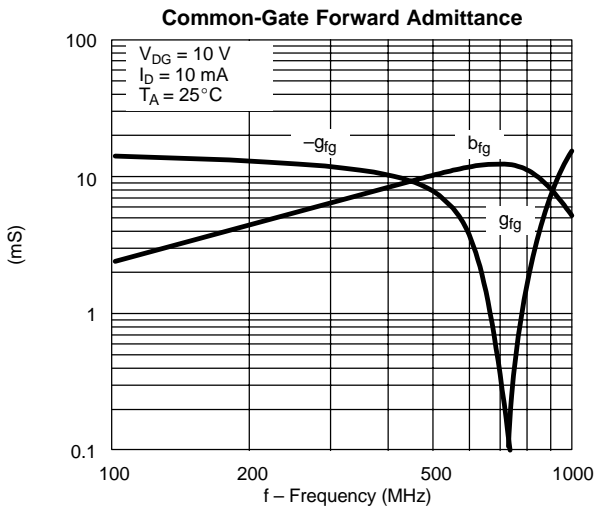
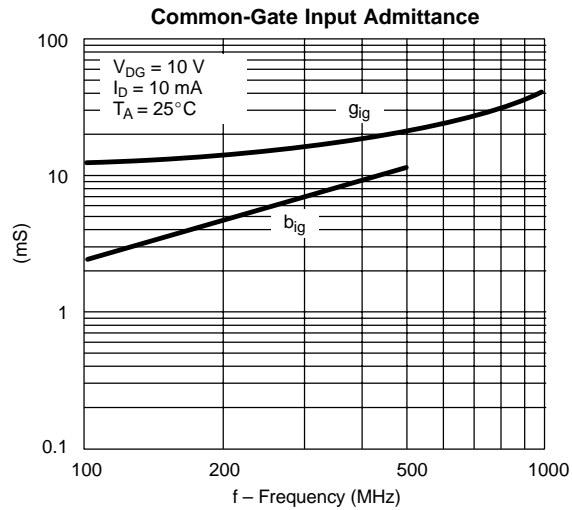
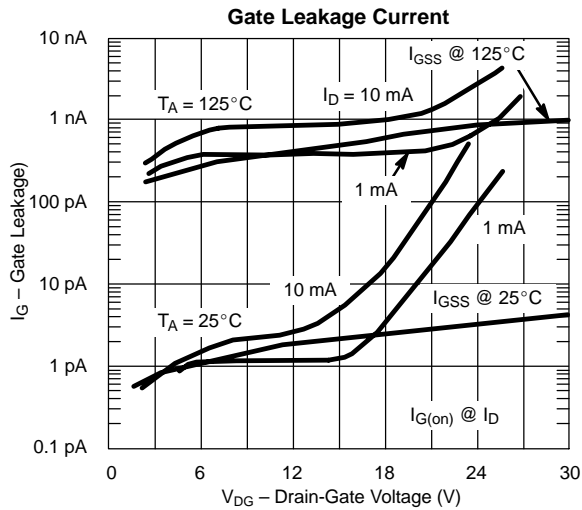
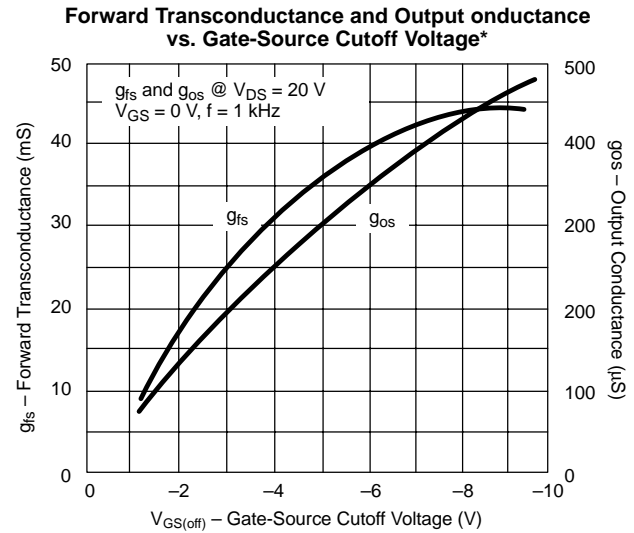
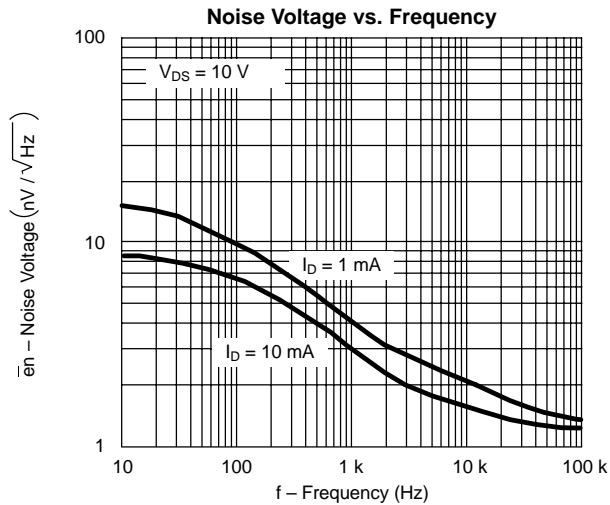
SPECIFICATIONS (T <sub>A</sub> = 25 °C UNLESS OTHERWISE NOTED)												
Parameter	Symbol	Test Conditions		Typ <sup>a</sup>	Limits						Unit	
					4391		4392		4393			
					Min	Max	Min	Max	Min	Max		
Dynamic												
Common-Source Forward Transconductance	g <sub>fs</sub>	V <sub>DS</sub> = 20 V, I <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 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 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 f = 1 kHz		3							nV/ √Hz	
Switching												
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
				SST	2							
	t <sub>r</sub>			2N/PN	2		5		5		5	
				SST	2							
Turn-Off Time	t <sub>d(off)</sub>			2N/PN	6		20		35		50	
				SST	6							
	t <sub>f</sub>			2N/PN	13		15		20		30	
				SST	13							

### Notes

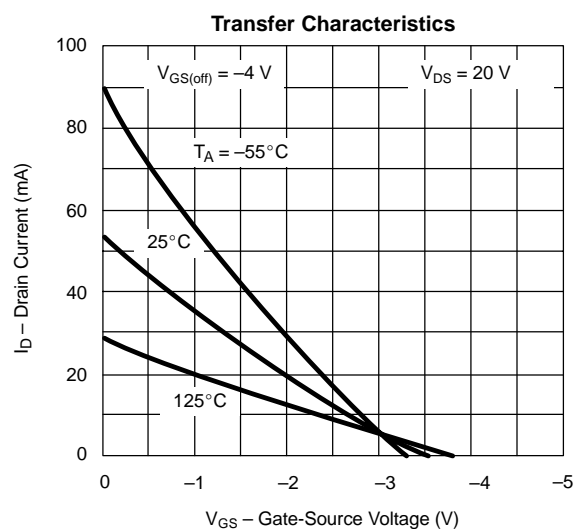
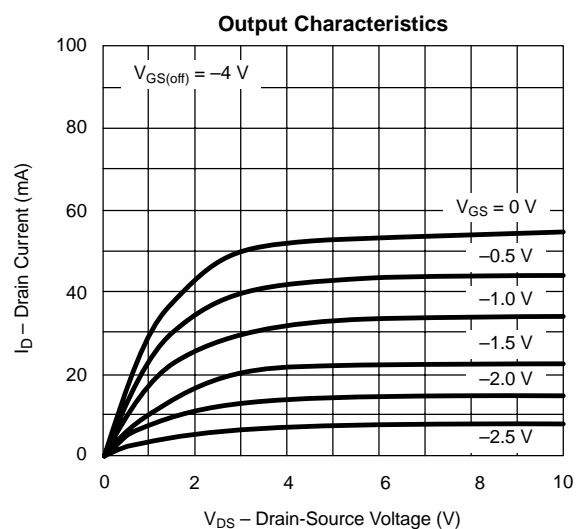
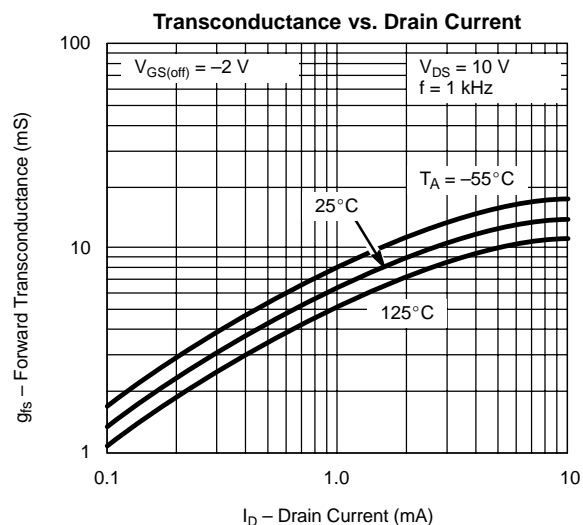
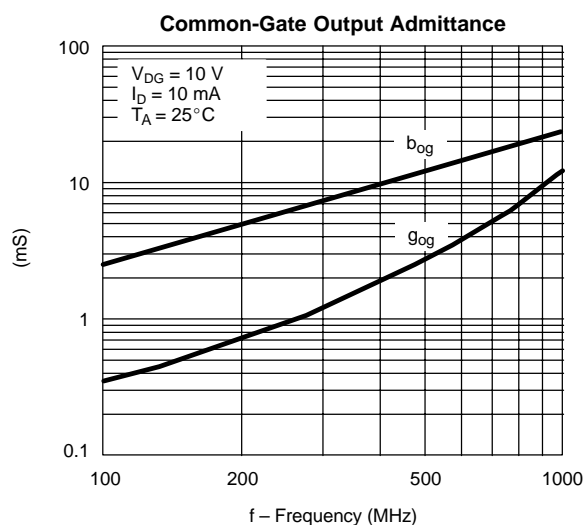
- Typical values are for DESIGN AID ONLY, not guaranteed nor subject to production testing.
- Pulse test: PW ≤ 300 μs duty cycle ≤ 3%.

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.

