N-Channel JFETs

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

PRODUCT SUMMARY				
Part Number	**$V_{GS(off)}$ (V)**	**$r_{DS(on)}$ Max (Ω)**	**$I_{D(off)}$ 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 Ω
- 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

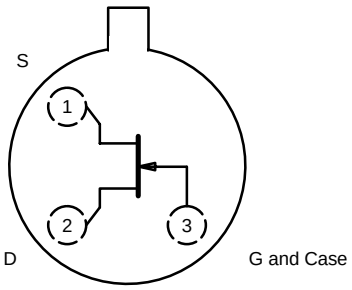
- Analog Switches
- Choppers
- Sample-and-Hold
- Normally “On” Switches
- Current Limiters
- Commutators

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 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.

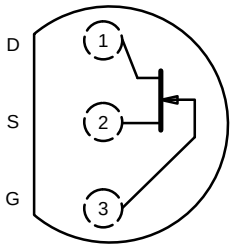
TO-206AA
(TO-18)



Top View

2N4391
2N4392
2N4393

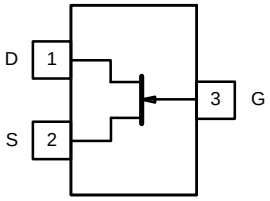
TO-226AA
(TO-92)



Top View

PN4391
PN4392
PN4393

TO-236
(SOT-23)



Top View

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

*Marking Code for TO-236

For applications information see AN104 and AN106

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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)[a] . . . . . (T_C = 25°C) 1800 mW
(PN/SST Prefixes)[b] . . . . . 350 mW

Notes
a. Derate 10 mW/°C above 25°C
b. Derate 2.8 mW/°C above 25°C

SPECIFICATIONS (T_A = 25°C UNLESS OTHERWISE NOTED)

Parameter	Symbol	Test Conditions		Typ[a]	Limits 4391 Min	4391 Max	4392 Min	4392 Max	4393 Min	4393 Max	Unit
Static											
Gate-Source Breakdown Voltage	$V_{(BR)GSS}$	I_G = –1 μA, V_{DS} = 0 V		–55	–40		–40		–40		V
Gate-Source Cutoff Voltage	$V_{GS(off)}$	V_{DS} = 20 V	2N/PN: I_D = 1 nA		–4	–10	–2	–5	–0.5	–3	V
		V_{DS} = 15 V	SST: I_D = 10 nA								
Saturation Drain Current[b]	I_{DSS}	V_{DS} = 20 V, V_{GS} = 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_{GSS}	V_{GS} = –20 V, V_{DS} = 0 V	2N/SST	–5		–100		–100		–100	pA
			PN	–5		–1000		–1000		–1000	
			2N: T_A = 150°C	–13		–200		–200		–200	nA
			PN: T_A = 100°C	–1		–200		–200		–200	
			SST: T_A = 125°C	–3							
Gate Operating Current	I_G	V_{DG} = 15 V, I_D = 10 mA		–5							
Drain Cutoff Current	$I_{D(off)}$	V_{DS} = 20 V	2N: V_{GS} = –5 V	5						100	pA
			2N: V_{GS} = –7 V	5				100			
			2N: V_{GS} = –12 V	5		100					
			PN: V_{GS} = –5 V	0.005						1	nA
			PN: V_{GS} = –7 V	0.005				1			
			PN: V_{GS} = –12 V	0.005		1					
		SST V_{DS} = 10 V, V_{GS} = –10 V		5		100		100		100	pA
		V_{DS} = 20 V, T_A = 150°C	2N: V_{GS} = –5 V	13						200	nA
			2N: V_{GS} = –7 V	13				200			
			2N: V_{GS} = –12 V	13		200					
		V_{DS} = 20 V, T_A = 100°C	PN: V_{GS} = –5 V	1						200	
			PN: V_{GS} = –7 V	1				200			
			PN: V_{GS} = –12 V	1		200					
		V_{DS} = 10 V, T_A = 125°C	SST: V_{GS} = –10 V	3							
Drain-Source On-Voltage	$V_{DS(on)}$	V_{GS} = 0 V	I_D = 3 mA	0.25						0.4	V
			I_D = 6 mA	0.3				0.4			
			I_D = 12 mA	0.35		0.4					
Drain-Source On-Resistance	$r_{DS(on)}$	V_{GS} = 0 V, I_D = 1 mA				30		60		100	Ω
Gate-Source Forward Voltage	$V_{GS(F)}$	I_G = 1 mA, V_{DS} = 0 V	2N	0.7		1		1		1	V
			PN/SST	0.7							

SPECIFICATIONS (T_A = 25°C UNLESS OTHERWISE NOTED)

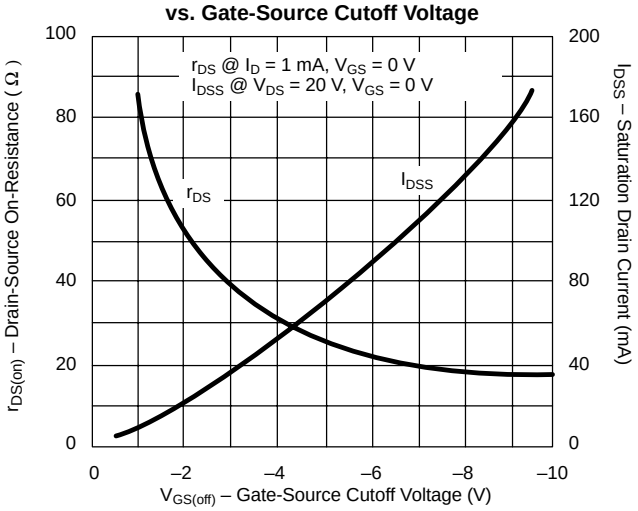
Parameter	Symbol	Test Conditions		Typ[a]	Limits 4391 Min	4391 Max	4392 Min	4392 Max	4393 Min	4393 Max	Unit
Dynamic											
Common-Source Forward Transconductance	g_{fs}	V_{DS} = 20 V, I_D = 1 mA, f = 1 kHz		6							mS
Common-Source Output Conductance	g_{os}	V_{DS} = 20 V, I_D = 1 mA, f = 1 kHz		25							μS
Drain-Source On-Resistance	$r_{DS(on)}$	V_{GS} = 0 V, I_D = 0 mA , f = 1 kHz				30		60		100	Ω
Common-Source Input Capacitance	C_{iss}	V_{DS} = 20 V, V_{GS} = 0 V f = 1 MHz	2N	12		14		14		14	pF
			PN	12		16		16		16	
			SST	13							
Common-Source Reverse Transfer Capacitance	C_{rss}	V_{DS} = 0 V f = 1 MHz	2N: V_{GS} = –5 V	3.3						3.5	
			2N: V_{GS} = –7 V	3.2				3.5			
			2N: V_{GS} = –12 V	2.8		3.5					
			PN: V_{GS} = –5 V	3.5						5	
			PN: V_{GS} = –7 V	3.4				5			
			PN: V_{GS} = –12 V	3.0		5					
			SST: V_{GS} = –5 V	3.6							
			SST: V_{GS} = –7 V	3.5							
			SST: V_{GS} = –12 V	3.1							
Equivalent Input Noise Voltage	$\overline{e}_n$	V_{DS} = 10 V, I_D = 10 mA f = 1 kHz		3							$\frac{nV}{\sqrt{Hz}}$
Switching											
Turn-On Time	$t_{d(on)}$	V_{DD} = 10 V $V_{GS(H)}$ = 0 V See Switching Circuit	2N/PN	2		15		15		15	ns
			SST	2							
	t_r		2N/PN	2		5		5		5	
			SST	2							
Turn-Off Time	$t_{d(off)}$		2N/PN	6		20		35		50	
			SST	6							
	t_f		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%.

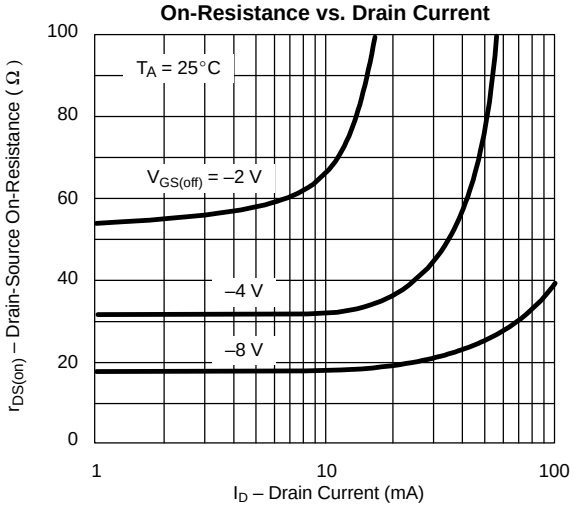
NCB

TYPICAL CHARACTERISTICS (T_A = 25°C UNLESS OTHERWISE NOTED)

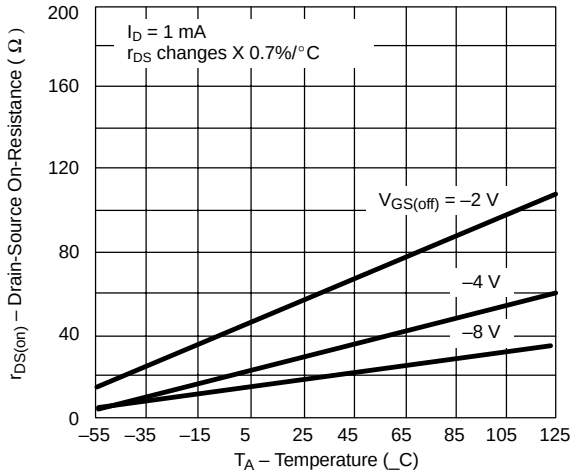
On-Resistance and Drain Current vs. Gate-Source Cutoff Voltage



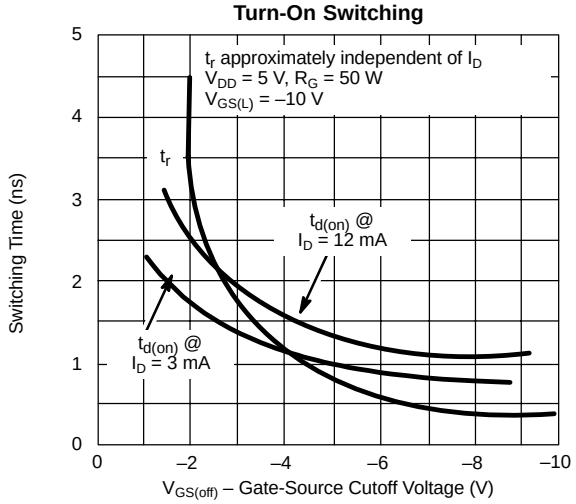
On-Resistance vs. Drain Current



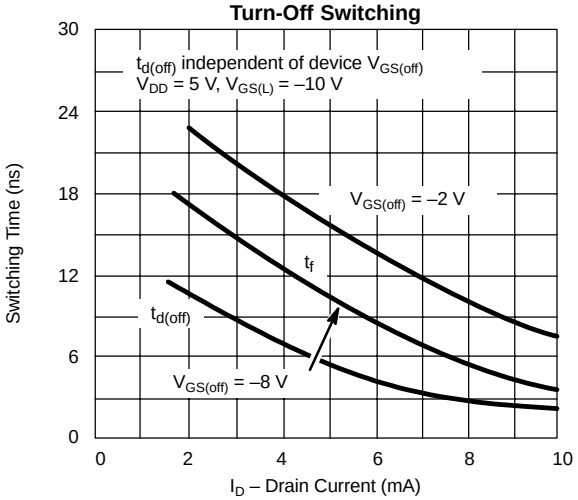
On-Resistance vs. Temperature



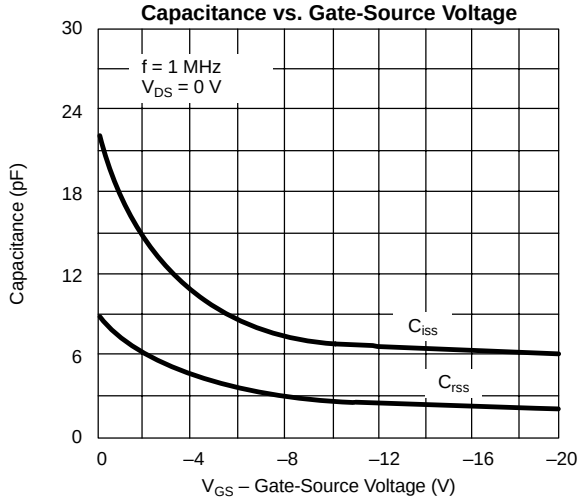
Turn-On Switching



Turn-Off Switching

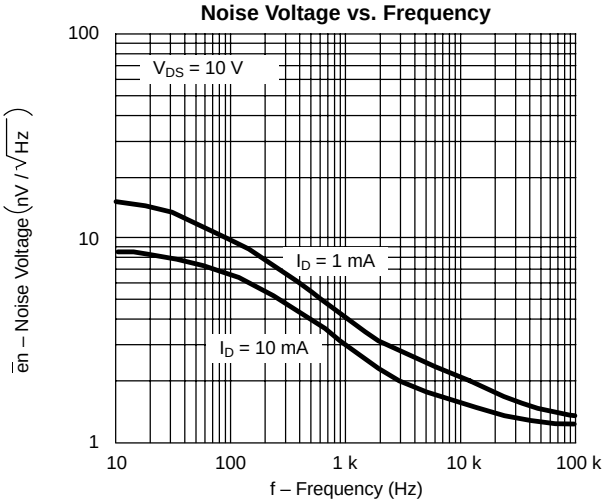


Capacitance vs. Gate-Source Voltage

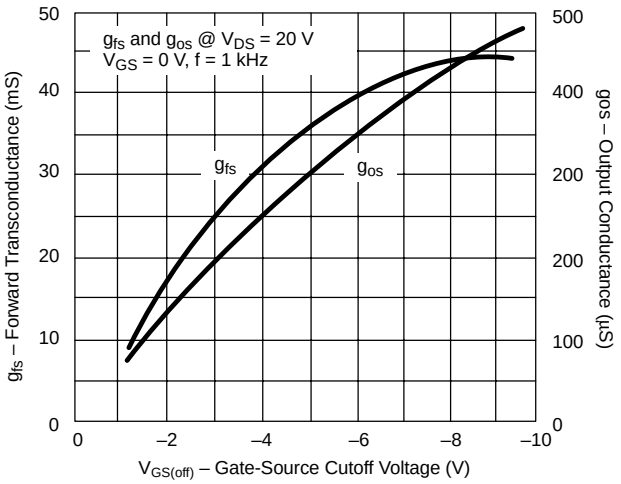


TYPICAL CHARACTERISTICS (T_A = 25°C UNLESS OTHERWISE NOTED)

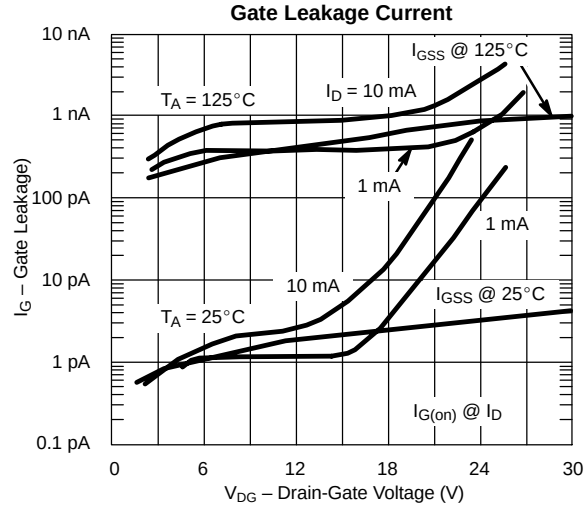
Noise Voltage vs. Frequency



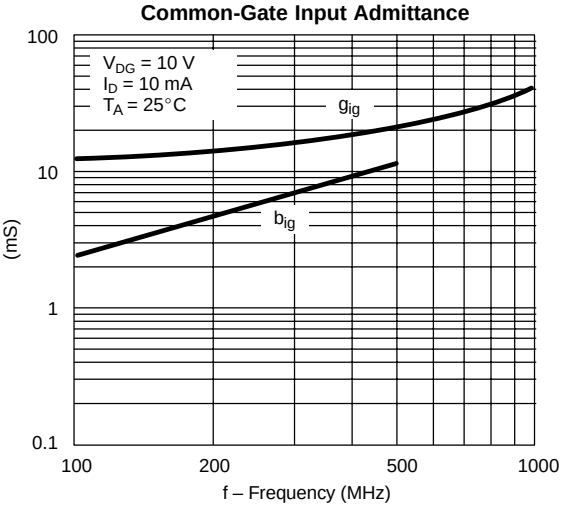
Forward Transconductance and Output onductance vs. Gate-Source Cutoff Voltage*



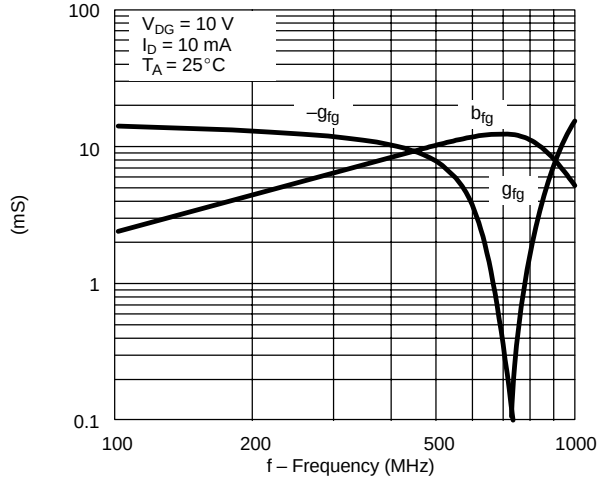
Gate Leakage Current



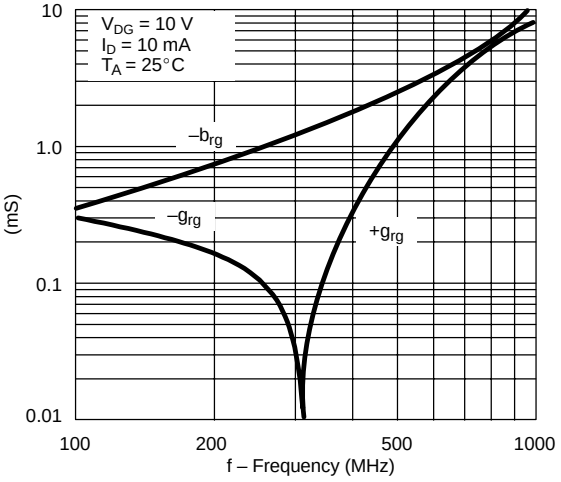
Common-Gate Input Admittance



Common-Gate Forward Admittance

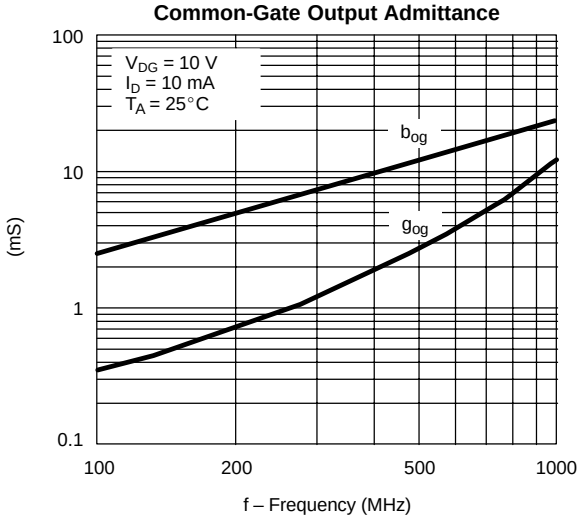


Common-Gate Reverse Admittance

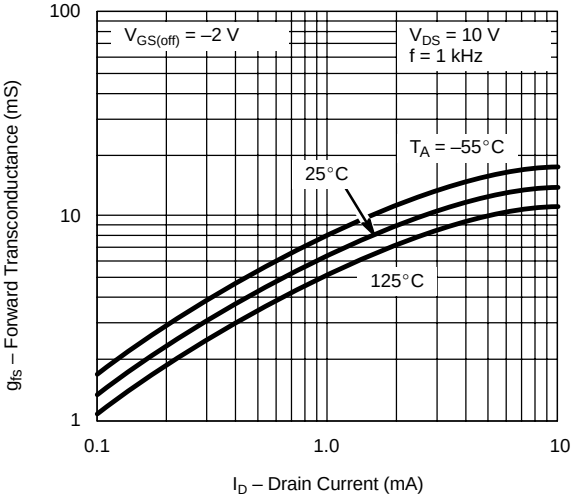


TYPICAL CHARACTERISTICS (T_A = 25°C UNLESS OTHERWISE NOTED)

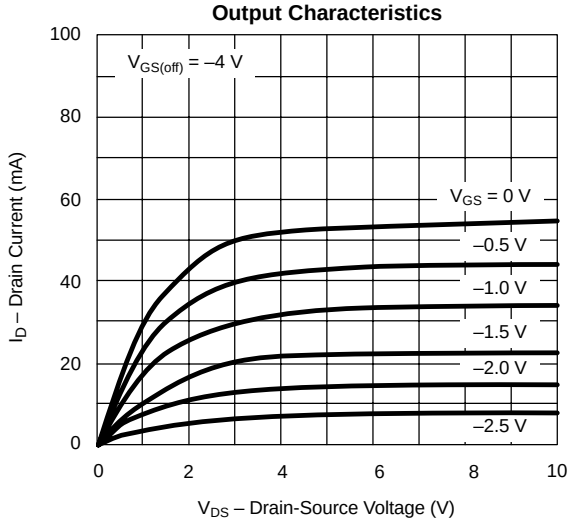
Common-Gate Output Admittance



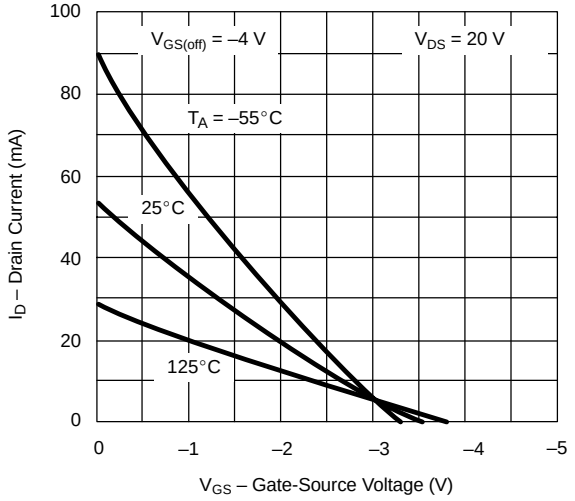
Transconductance vs. Drain Current



Output Characteristics



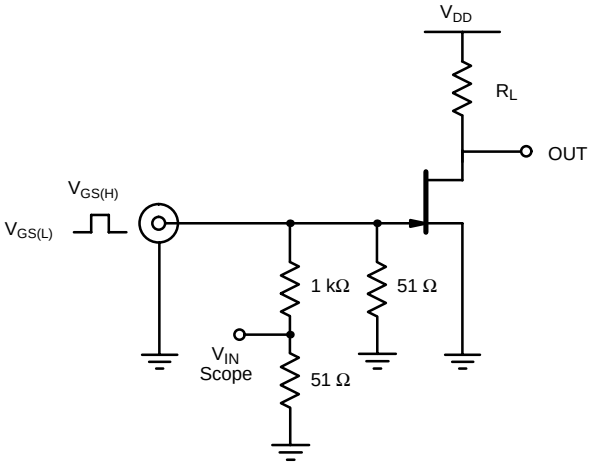
Transfer Characteristics



SWITCHING TIME TEST CIRCUIT

	4391	4392	4393
$V_{GS(L)}$	–12 V	–7 V	–5 V
R_L*	800 Ω	1600 Ω	3000 Ω
$I_{D(on)}$	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 MΩ
Input Capacitance 1.5 pF

See Typical Characteristics curves for changes.