2N5114/5115/5116

P-Channel JFETs

Product Summary

Part Number	$V_{GS(off)}$ (V)	$r_{DS(on)}$ Max (Ω)	$I_{D(off)}$ Typ (pA)	t_{ON} Max (ns)
2N5114	5 to 10	75	−10	16
2N5115	3 to 6	100	−10	30
2N5116	1 to 4	150	−10	42

2N5116, For applications information see AN104, page 21.

Features

- Low On-Resistance: 2N5114 <75 Ω
- Fast Switching—t_{ON}: 16 ns
- High Off-Isolation—$I_{D(off)}$: −10 pA
- Low Capacitance: 6 pF
- Low Insertion Loss

Benefits

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

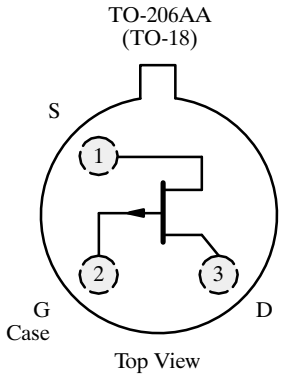
Applications

- Analog Switches
- Choppers
- Sample-and-Hold
- Normally "On" Switches
- Current Limiters

Description

The 2N5114 series consists of p-channel JFET analog switches designed to provide low on-resistance, good off-isolation, and fast switching. These JFETs are optimized for use in complementary switching applications with the Siliconix 2N4856A series.

The 2N5114 series is available with JAN, JANTX, or JANTXV level processing, (see 2N5114 JAN series data sheet).



Absolute Maximum Ratings

Gate-Drain Voltage . . . . . 30 V
Gate-Source Voltage . . . . . 30 V
Gate Current . . . . . −50 mA
Storage Temperature . . . . . −65 to 200°C
Operating Junction Temperature . . . . . −55 to 200°C
Lead Temperature ($^1/_{16}$" from case for 10 sec.) . . . . . 300°C
Power Dissipation[a] . . . . . 500 mW

Notes
a. Derate 3 mW/°C above 25°C

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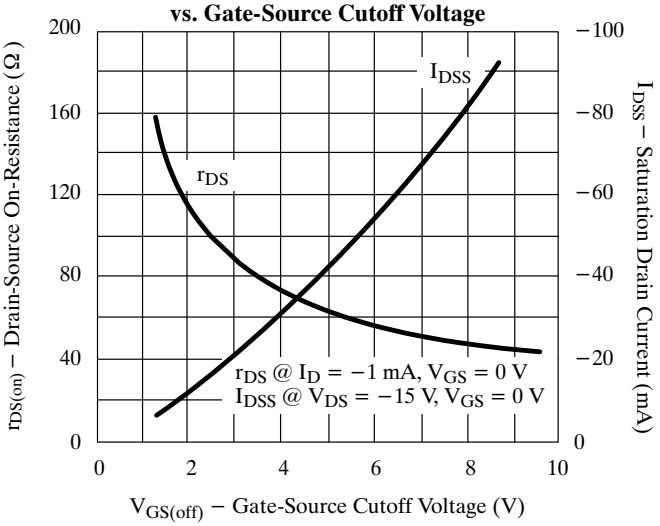
Specifications[a]

Parameter	Symbol	Test Conditions		Typ[b]	Limits 2N5114 Min	Limits 2N5114 Max	Limits 2N5115 Min	Limits 2N5115 Max	Limits 2N5116 Min	Limits 2N5116 Max	Unit
Static											
Gate-Source Breakdown Voltage	$V_{(BR)GSS}$	I_G = 1 µA , V_{DS} = 0 V		45	30		30		30		V
Gate-Source Cutoff Voltage	$V_{GS(off)}$	V_{DS} = −15 V, I_D = −1 nA			5	10	3	6	1	4	V
Saturation Drain Current[c]	I_{DSS}	V_{GS} = 0 V	V_{DS} = −18 V		−30	−90					mA
			V_{DS} = −15 V				−15	−60	−5	−25	
Gate Reverse Current	I_{GSS}	V_{GS} = 20 V, V_{DS} = 0 V		5		500		500		500	pA
			T_A = 150°C	0.01		1		1		1	µA
Gate Operating Current[d]	I_G	V_{DG} = −15 V, I_D = −1 mA		−5							pA
Drain Cutoff Current	$I_{D(off)}$	V_{DS} = −15 V	V_{GS} = 12 V	−10		−500					pA
			V_{GS} = 7 V	−10				−500			
			V_{GS} = 5 V	−10						−500	
		V_{DS} = −15 V, T_A = 150°C	V_{GS} = 12 V	−0.02		−1					µA
			V_{GS} = 7 V	−0.02				−1			
			V_{GS} = 5 V	−0.02						−1	
Drain-Source On-Voltage	$V_{DS(on)}$	V_{GS} = 0 V	I_D = −15 mA	−1.0		−1.3					V
			I_D = −7 mA	−0.7				−0.8			
			I_D = −3 mA	−0.5						−0.6	
Drain-Source On-Resistance	$r_{DS(on)}$	V_{GS} = 0 V, I_D = −1 mA				75		100		150	Ω
Gate-Source Forward Voltage	$V_{GS(F)}$	I_G = −1 mA , V_{DS} = 0 V		−0.7		−1		−1		−1	V
Dynamic											
Common-Source Forward Transconductance[d]	g_{fs}	V_{DS} = −15 V, I_D = −1 mA, f = 1 kHz		4.5							mS
Common-Source Output Conductance[d]	g_{os}			20							µS
Drain-Source On-Resistance	$r_{ds(on)}$	V_{GS} = 0 V, I_D = 0 mA , f = 1 kHz				75		100		150	Ω
Common-Source Input Capacitance	C_{iss}	V_{DS} = −15 V, V_{GS} = 0 V, f = 1 MHz		20		25		25		25	pF
Common-Source Reverse Transfer Capacitance	C_{rss}	V_{DS} = 0 V, f = 1 MHz	V_{GS} = 12 V	5		7					pF
			V_{GS} = 7 V	6				7			
			V_{GS} = 5 V	6						7	
Equivalent Input Noise Voltage[d]	$\bar{e}_n$	V_{DS} = 10 V, I_D = 10 mA, f = 1 kHz		20							$nV/\sqrt{Hz}$
Switching											
Turn-On Time	$t_{d(on)}$	See Switching Circuit				6		10		12	ns
	t_r					10		20		30	
Turn-Off Time	$t_{d(off)}$					6		8		10	
	t_f					15		30		50	

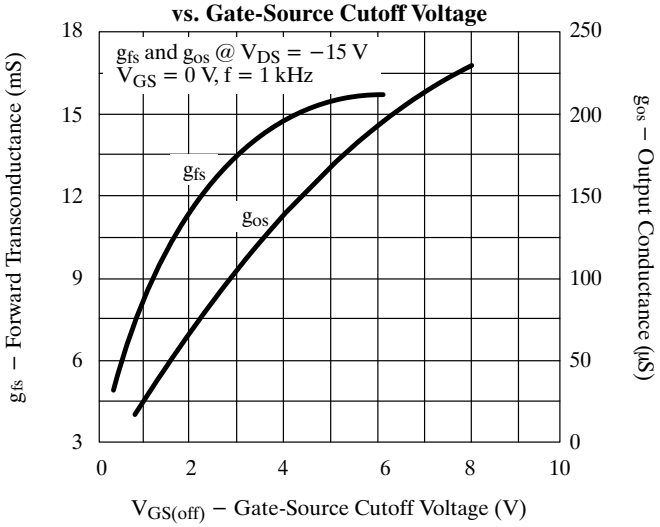
Notes
a. T_A = 25°C unless otherwise noted. PSCIA
b. Typical values are for DESIGN AID ONLY, not guaranteed nor subject to production testing.
c. Pulse test: PW ≤ 300 µs duty cycle ≤ 3%.
d. This parameter not registered with JEDEC.

Typical Characteristics

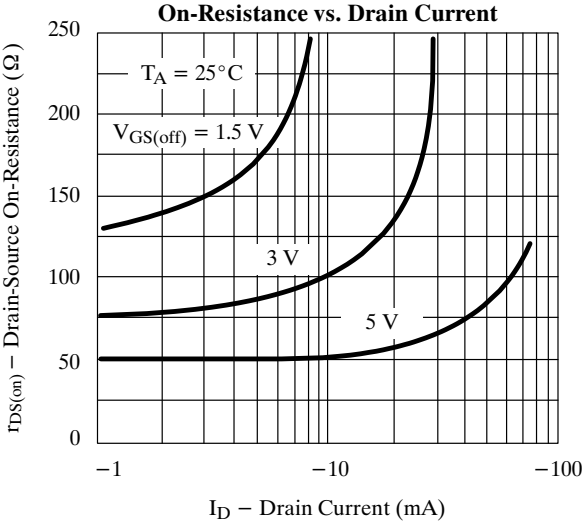
On-Resistance and Drain Current vs. Gate-Source Cutoff Voltage



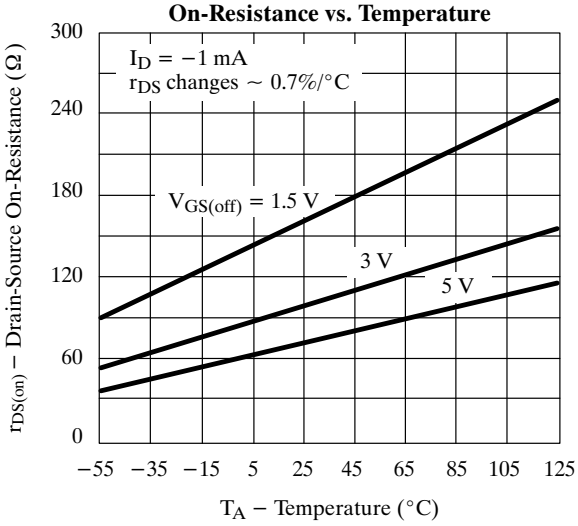
Forward Transconductance and Output Conductance vs. Gate-Source Cutoff Voltage



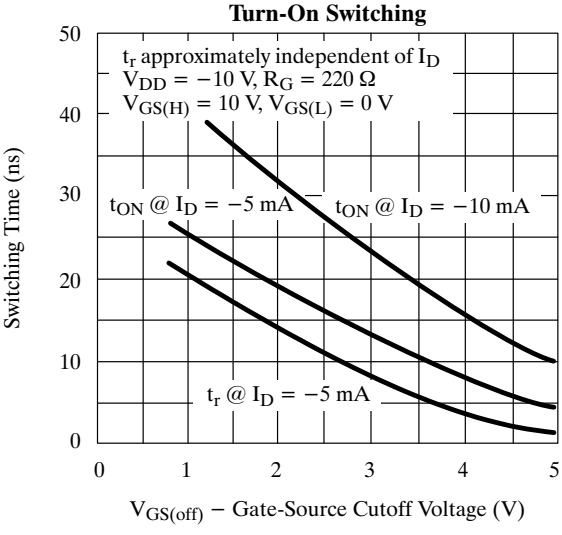
On-Resistance vs. Drain Current



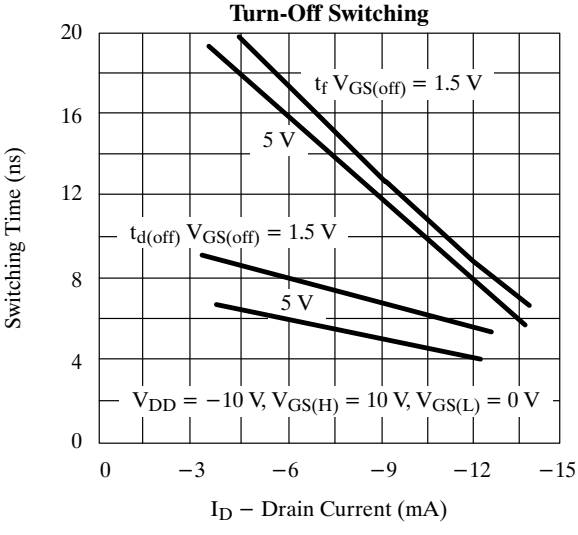
On-Resistance vs. Temperature



Turn-On Switching



Turn-Off Switching



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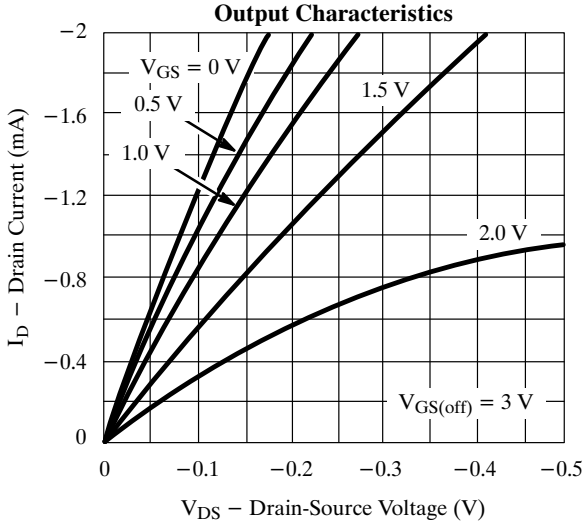
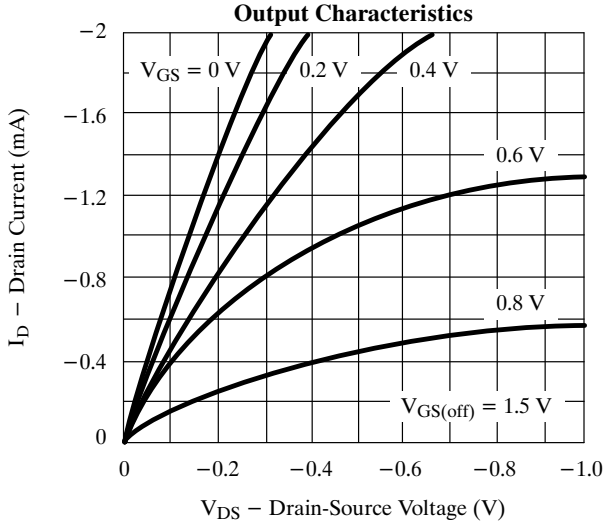
Typical Characteristics (Cont'd)

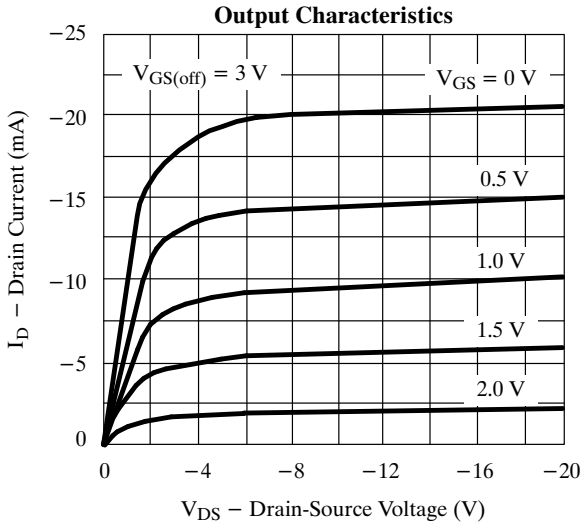
Output Characteristics



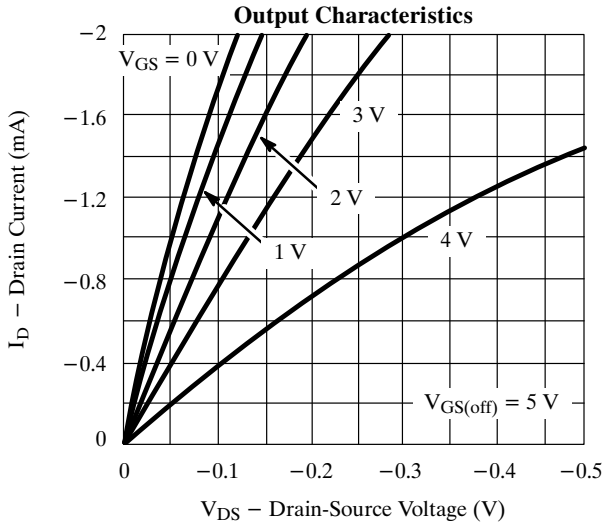
Output Characteristics



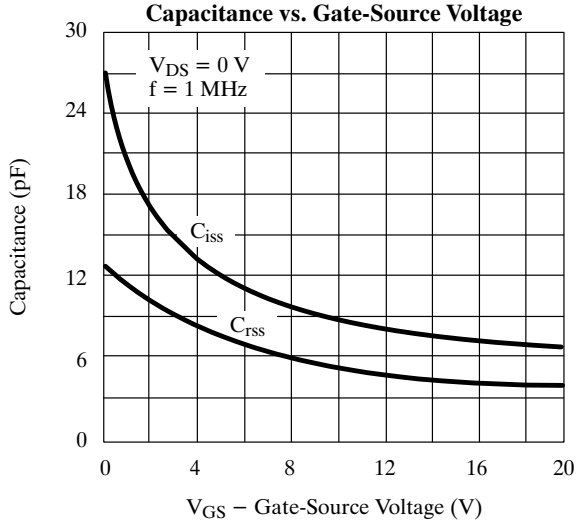
Output Characteristics



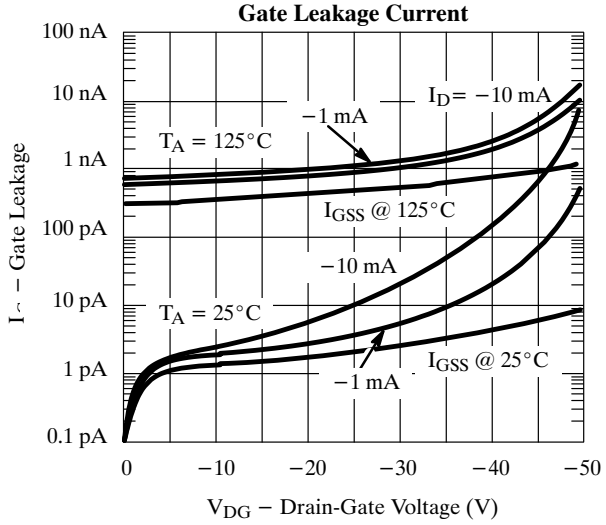
Output Characteristics



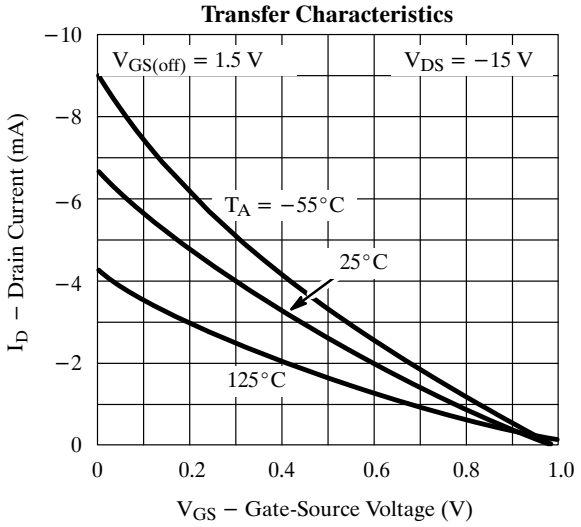
Capacitance vs. Gate-Source Voltage

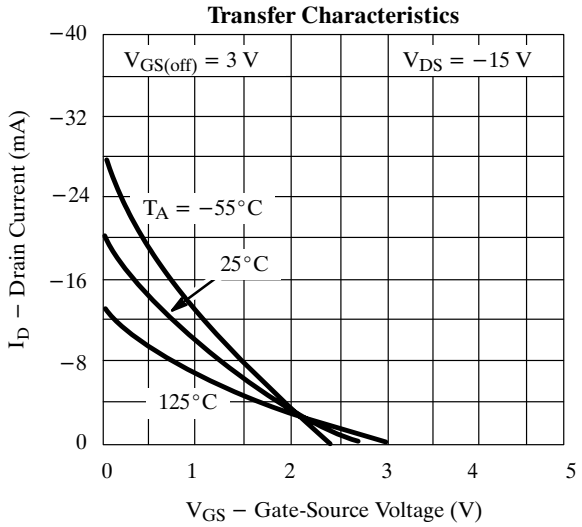


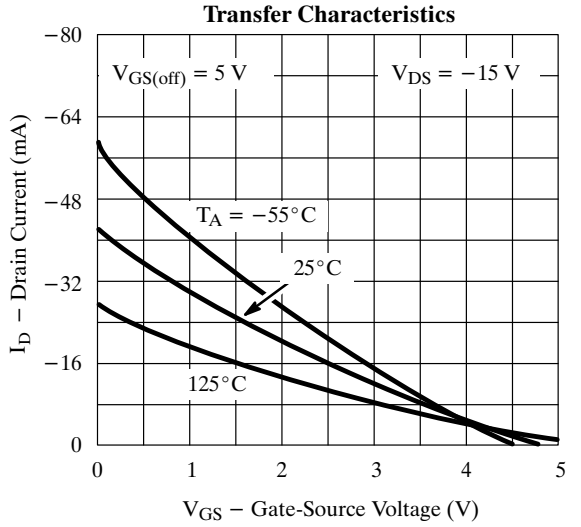
Gate Leakage Current

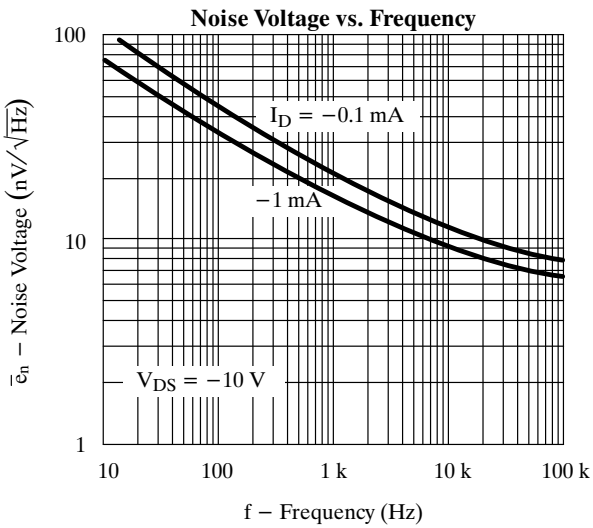


Typical Characteristics (Cont'd)









Switching Time Test Circuit

	2N5114	2N5115	2N5116
V_{DD}	−10 V	−6 V	−6 V
V_{GG}	20 V	12 V	8 V
R_L*	430 Ω	910 Ω	2 kΩ
R_G*	100 Ω	220 Ω	390 Ω
$I_{D(on)}$	−15 mA	−7 mA	−3 mA
$V_{GS(H)}$	0 V	0 V	0 V
$V_{GS(L)}$	−11 V	−7 V	−5 V

*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.