TEMIC

Siliconix

U290/291

N-Channel JFETs

Product Summary

Part Number	$V_{GS(off)}$ (V)	$r_{DS(on)}$ Max (Ω)	$I_{D(off)}$ Typ (nA)	t_{ON} Typ (ns)
U290	−4 to −10	3	0.01	14
U291	−1.5 to −4.5	7	0.01	14

Features

- Low On-Resistance: U290 <3 Ω
- Fast Switching—t_{ON}: 14 ns
- High Off-Isolation: Low $I_{D(off)}$
- Low Capacitance: 20 pF
- Low Insertion Loss

Benefits

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

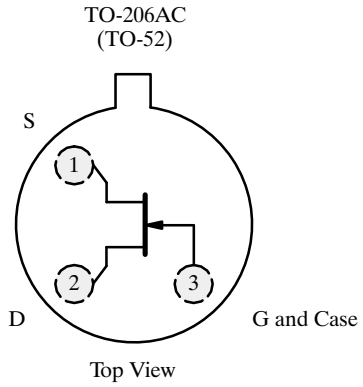
Applications

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

Description

The U290/291 are high performance JFET analog switches which offer ultra low on-resistance and fast switching. This series features the lowest on-resistance of any JFET in the industry today.

The TO-206AC (TO-52) hermetically sealed can makes this series suitable for military applications (see Military Information). For similar products in TO-226A (TO-92) packaging, see the J105/106/107 data sheet.



Absolute Maximum Ratings

Gate-Drain, Gate-Source Voltage . . . . . −30 V
Gate Current . . . . . 100 mA
Lead Temperature ($^1/_{16}$” from case for 10 sec.) . . . . . 300°C
Storage Temperature . . . . . −65 to 200°C
Operating Junction Temperature . . . . . −55 to 150°C
Power Dissipation[a] . . . . . 500 mW

Notes
a. Derate 4 mW/°C above 25°C

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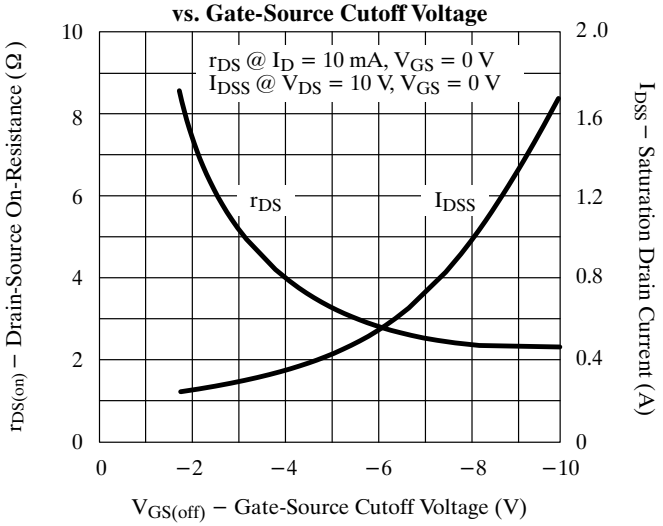
Specifications[a]

Parameter	Symbol	Test Conditions	Typ[b]	Limits U290 Min	Limits U290 Max	Limits U291 Min	Limits U291 Max	Unit
Static								
Gate-Source Breakdown Voltage	$V_{(BR)GSS}$	$I_G = -1$ µA , $V_{DS} = 0$ V	−35	−30		−30		V
Gate-Source Cutoff Voltage	$V_{GS(off)}$	$V_{DS} = 15$ V, $I_D = 3$ nA		−4	−10	−1.5	−4.5	V
Saturation Drain Current[c]	I_{DSS}	$V_{DS} = 10$ V, $V_{GS} = 0$ V		500		200		mA
Gate Reverse Current	I_{GSS}	$V_{GS} = -15$ V, $V_{DS} = 0$ V	−0.02		−1		−1	nA
		$T_A = 125°C$	−0.01		−1		−1	µA
Gate Operating Current	I_G	$V_{DG} = 10$ V, $I_D = 25$ mA	−0.01					nA
Drain Cutoff Current	$I_{D(off)}$	$V_{DS} = 5$ V, $V_{GS} = -10$ V	0.01		1		1	nA
		$T_A = 125°C$	0.005		1		1	µA
Drain-Source On-Voltage	$V_{DS(on)}$	$V_{GS} = 0$ V, $I_D = 10$ mA			30		70	mV
Drain-Source On-Resistance	$r_{DS(on)}$				3		7	Ω
Gate-Source Forward Voltage	$V_{GS(F)}$	$I_G = 1$ mA , $V_{DS} = 0$ V	0.7					V
Dynamic								
Common-Source Forward Transconductance	g_{fs}	$V_{DS} = 10$ V, $I_D = 25$ mA f = 1 kHz	55					mS
Common-Source Output Conductance	g_{os}		5					mS
Drain-Source On-Resistance	$r_{ds(on)}$	$V_{GS} = 0$ V, $I_D = 0$ mA, f = 1 kHz			3		7	Ω
Common-Source Input Capacitance	C_{iss}	$V_{DS} = 0$ V, $V_{GS} = 0$ V, f = 1 MHz	120		160		160	pF
Common-Source Reverse Transfer Capacitance	C_{rss}	$V_{DS} = 0$ V, $V_{GS} = -15$ V f = 1 MHz	20		30		30	pF
Equivalent Input Noise Voltage	$\bar{e}_n$	$V_{DS} = 10$ V, $I_D = 25$ mA f = 1 kHz	3					$nV/\sqrt{Hz}$
Switching								
Turn-On Time	$t_{d(on)}$	$V_{DD} = 1.5$ V, $V_{GS(H)} = 0$ V See Switching Circuit	6		15		15	ns
	t_r		8		20		20	ns
Turn-Off Time	$t_{d(off)}$		5		15		15	ns
	t_f		9		20		20	ns

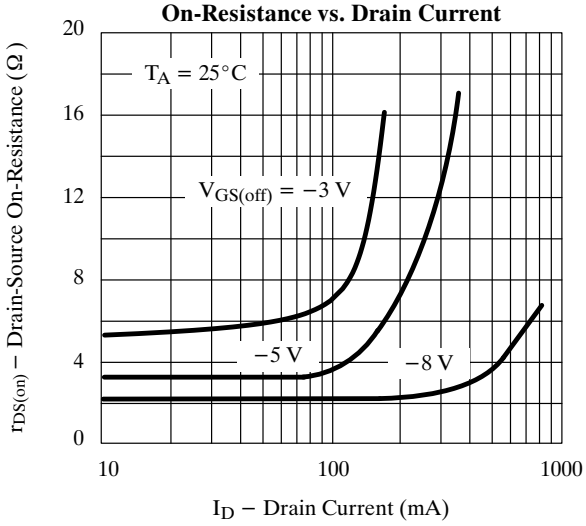
Notes
a. $T_A = 25°C$ unless otherwise noted. NVA
b. Typical values are for DESIGN AID ONLY, not guaranteed nor subject to production testing.
c. Pulse test: PW ≤ 300 µs duty cycle ≤ 3%.

Typical Characteristics

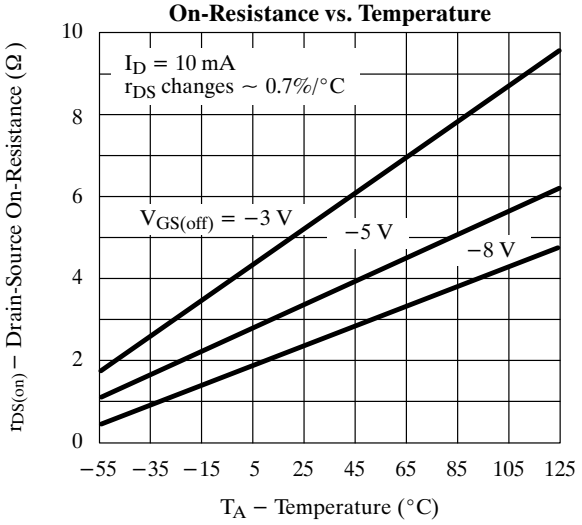
On-Resistance and Drain Current vs. Gate-Source Cutoff Voltage



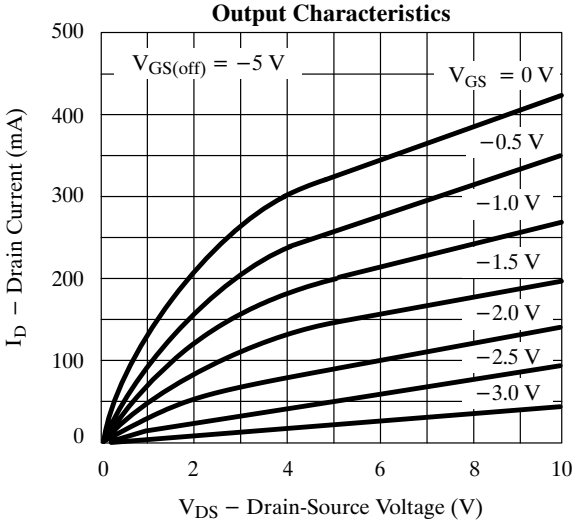
On-Resistance vs. Drain Current



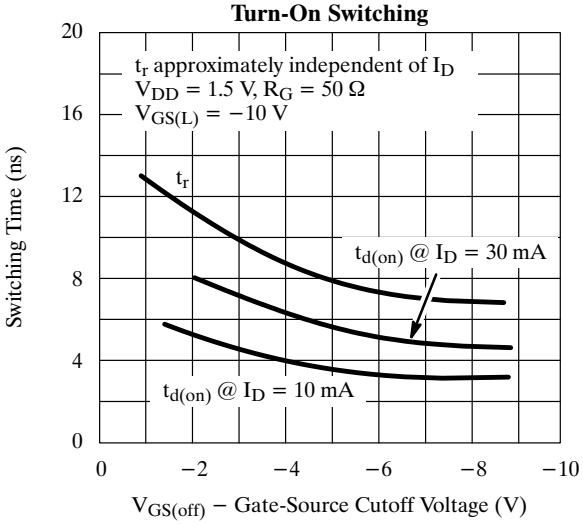
On-Resistance vs. Temperature



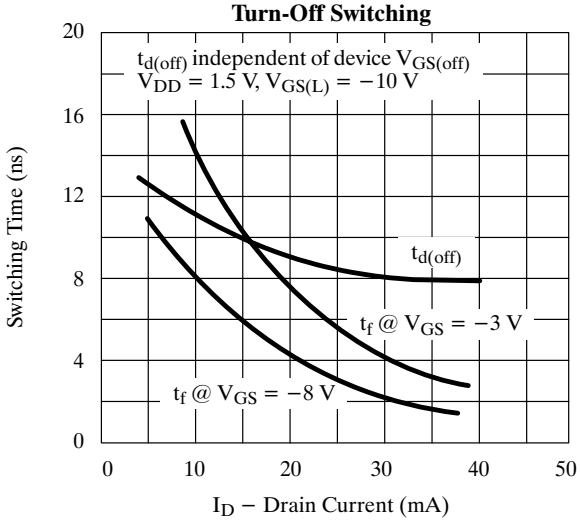
Output Characteristics



Turn-On Switching



Turn-Off Switching



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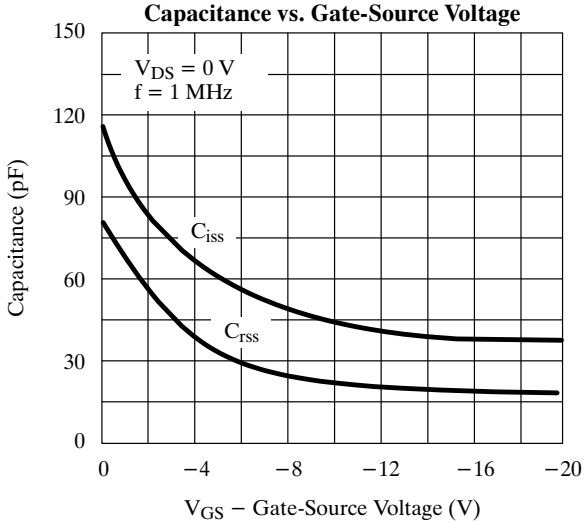
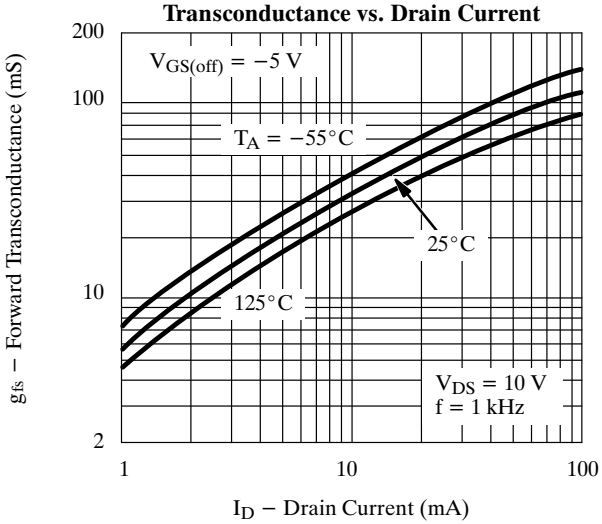
Typical Characteristics (Cont'd)

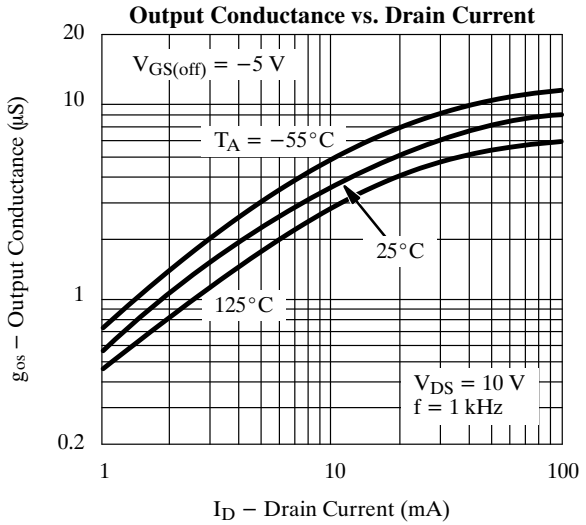
Capacitance vs. Gate-Source Voltage



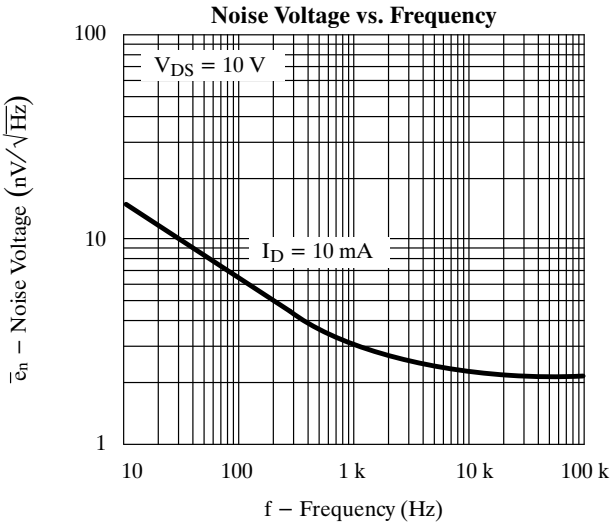
Transconductance vs. Drain Current



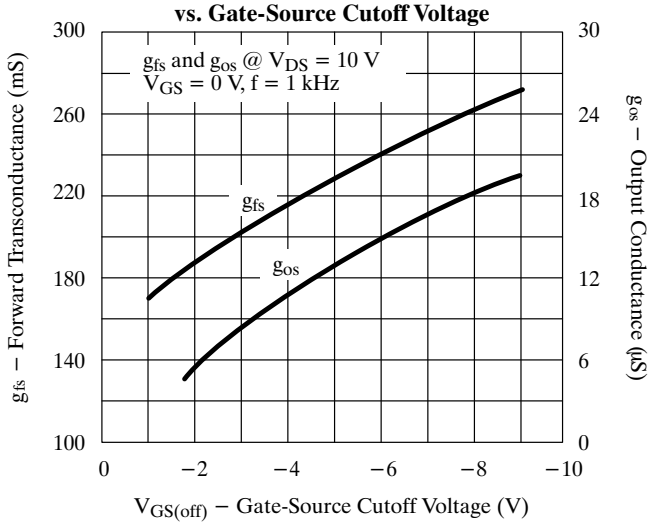
Output Conductance vs. Drain Current



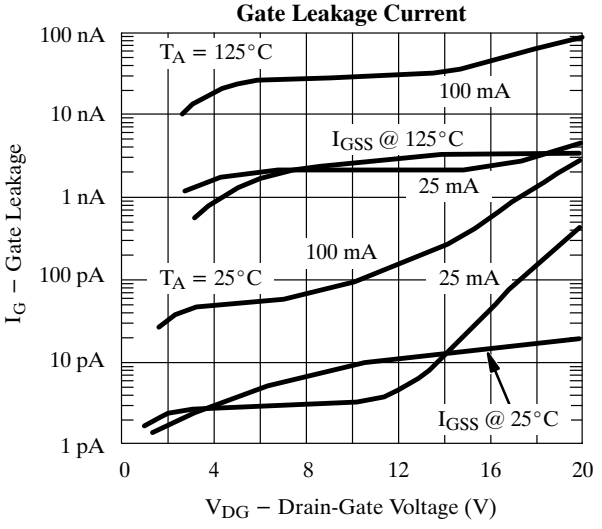
Noise Voltage vs. Frequency



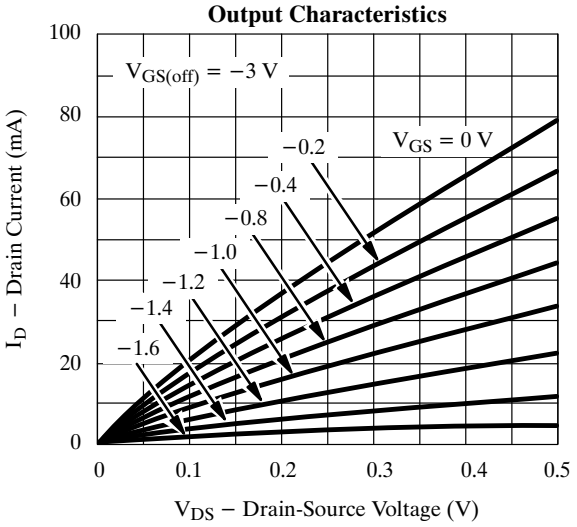
Forward Transconductance and Output Conductance vs. Gate-Source Cutoff Voltage

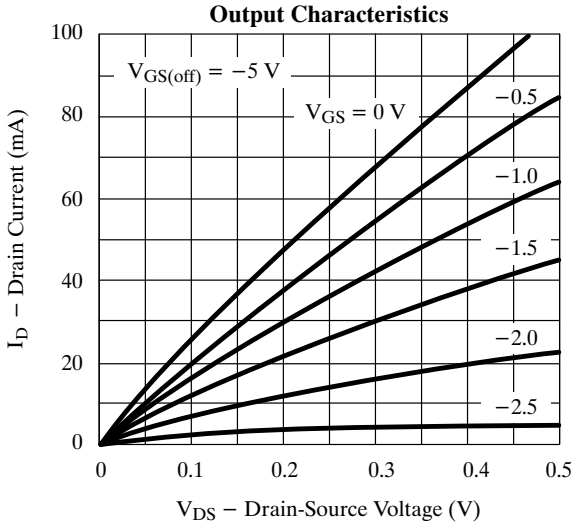


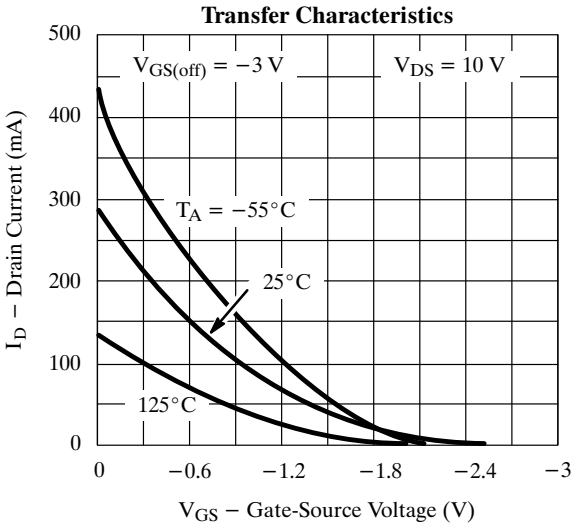
Gate Leakage Current

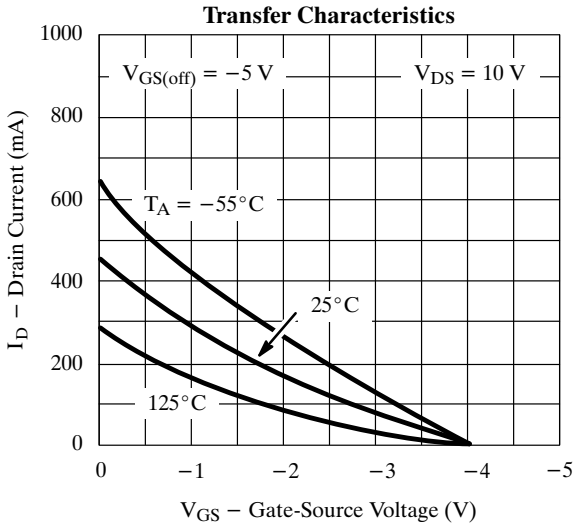


Typical Characteristics (Cont'd)









Switching Time Test Circuit

	U290	U291
V_{DD}	1.5 V	1.5 V
R_L*	50 Ω	50 Ω
$I_{D(on)}$	30 mA	30 mA
$V_{GS(L)}$	−12 V	−7 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.