



## N-Channel JFETs

2N4856JAN	2N4856JANTX	2N4856JANTXV
2N4857JAN	2N4857JANTX	2N4857JANTXV
2N4858JAN	2N4858JANTX	2N4858JANTXV
2N4859JAN	2N4859JANTX	2N4859JANTXV
2N4860JAN	2N4860JANTX	2N4860JANTXV
2N4861JAN	2N4861JANTX	2N4861JANTXV

PRODUCT SUMMARY					
Part Number	$V_{GS(off)}$ (V)	$V_{(BR)GSS}$ Min (V)	$r_{DS(on)}$ Max ( $\Omega$ )	$I_{D(off)}$ Max (pA)	$t_{ON}$ Typ (ns)
2N4856	-4 to -10	-40	25	250	9
2N4857	-2 to -6	-40	40	250	10
2N4858	-0.8 to -4	-40	60	250	20
2N4859	-4 to -10	-30	25	250	9
2N4860	-2 to -6	-30	40	250	10
2N4861	-0.8 to -4	-30	60	250	20

### FEATURES

- Low On-Resistance: 2N4856 <25  $\Omega$
- Fast Switching— $t_{ON}$ : 4 ns
- High Off-Isolation— $I_{D(off)}$ : 5 pA
- Low Capacitance: 3 pF
- Low Insertion Loss
- N-Channel Majority Carrier FET

### BENEFITS

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

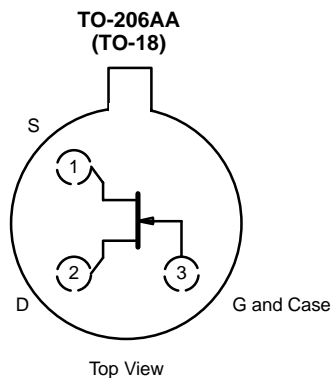
### APPLICATIONS

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

### DESCRIPTION

The 2N4856JAN/JANTX/JANTXV all-purpose JFET analog switches offer low on-resistance, low capacitance, good isolation, and fast switching.

Hermetically-sealed TO-206AA (TO-18) packaging allows full military processing (see Military Information). For similar products in TO-226AA (TO-92) and TO-236 (SOT-23) packages, see the J/SST111 series data sheet. For similar duals, see the 2N5564/5565/5566 data sheet.



## ABSOLUTE MAXIMUM RATINGS

Gate-Drain, Gate-Source Voltage :

(2N4856-58) ..... -40 V

(2N4859-61) ..... -30 V

Gate Current ..... 50 mA

Lead Temperature ( $1/16$ " from case for 10 seconds) ..... 300 °C

Storage Temperature ..... -65 to 200°C

Operating Junction Temperature ..... -65 to 200°C

Power Dissipation<sup>a</sup> ..... 1800 mW

Notes

a. Derate 10.3 mW/°C to  $T_C > 25^\circ\text{C}$ SPECIFICATIONS FOR 2N4856, 2N4857 AND 2N4858 ( $T_A = 25^\circ\text{C}$  UNLESS NOTED)

Parameter	Symbol	Test Conditions	Typ <sup>a</sup>	Limits						Unit
				2N4856		2N4857		2N4858		
				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> = 15 V, I <sub>D</sub> = 0.5 nA		−4	−10	−2	−6	−0.8	−4	
Saturation Drain Current <sup>b</sup>	I <sub>DSS</sub>	V <sub>DS</sub> = 15 V, V <sub>GS</sub> = 0 V		50	175	20	100	8	80	mA
Gate Reverse Current	I <sub>GSS</sub>	V <sub>GS</sub> = −20 V, V <sub>DS</sub> = 0 V	−5		−250		−250		−250	pA
		T <sub>A</sub> = 150°C	−13		−500		−500		−500	nA
Gate Operating Current <sup>c</sup>	I <sub>G</sub>	V <sub>DG</sub> = 15 V, I <sub>D</sub> = 10 mA	−5							pA
Drain Cutoff Current	I <sub>D(off)</sub>	V <sub>DS</sub> = 15 V, V <sub>GS</sub> = −10 V	5		250		250		250	
		T <sub>A</sub> = 150°C	13		500		500		500	nA
Drain-Source On-Voltage	V <sub>DS(on)</sub>	V <sub>GS</sub> = 0 V	I <sub>D</sub> = 5 mA	0.25					0.5	V
			I <sub>D</sub> = 10 mA	0.35			0.5			
			I <sub>D</sub> = 20 mA	0.5		0.75				
Drain-Source On-Resistance <sup>c</sup>	r <sub>DS(on)</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 1 mA			25		40		60	Ω
Gate-Source Forward Voltage <sup>c</sup>	V <sub>GS(F)</sub>	I <sub>G</sub> = 1 mA , V <sub>DS</sub> = 0 V	0.7							V
Dynamic										
Common-Source Forward Transconductance <sup>c</sup>	g <sub>fs</sub>	V <sub>DG</sub> = 20 V, I <sub>D</sub> = 1 mA f = 1 kHz	6							mS
Common-Source Output Conductance <sup>c</sup>	g <sub>os</sub>		25							μS
Common-Source Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = −10 V f = 1 MHz	7		18		18		18	pF
Common-Source Reverse Transfer Capacitance	C <sub>rss</sub>		3		8		8		8	
Equivalent Input Noise Voltage <sup>c</sup>	e <sub>n</sub>	V <sub>DG</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	2		6		6		10	ns
	t <sub>r</sub>		2		3		4		10	
Turn-Off Time	t <sub>OFF</sub>		13		25		50		100	

**SPECIFICATIONS FOR 2N4859, 2N4860 AND 2N4861 (T<sub>A</sub> = 25 °C UNLESS NOTED)**

Parameter	Symbol	Test Conditions	Typ <sup>a</sup>	Limits						Unit
				2N4859		2N4860		2N4861		
				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	−30		−30		−30		V
Gate-Source Cutoff Voltage	V <sub>GS(off)</sub>	V <sub>DS</sub> = 15 V, I <sub>D</sub> = 0.5 nA		−4	−10	−2	−6	−0.8	−4	
Saturation Drain Current <sup>b</sup>	I <sub>DSS</sub>	V <sub>DS</sub> = 15 V, V <sub>GS</sub> = 0 V		50	175	20	100	8	80	mA
Gate Reverse Current	I <sub>GSS</sub>	V <sub>GS</sub> = −15 V, V <sub>DS</sub> = 0 V	−5		−250		−250		−250	pA
		T <sub>A</sub> = 150°C	−13		−500		−500		−500	nA
Gate Operating Current <sup>c</sup>	I <sub>G</sub>	V <sub>DG</sub> = 15 V, I <sub>D</sub> = 10 mA	−5							pA
Drain Cutoff Current	I <sub>D(off)</sub>	V <sub>DS</sub> = 15 V, V <sub>GS</sub> = −10 V	5		250		250		250	
		T <sub>A</sub> = 150°C	13		500		500		500	nA
Drain-Source On-Voltage	V <sub>DS(on)</sub>	V <sub>GS</sub> = 0 V	I <sub>D</sub> = 5 mA	0.25					0.5	V
			I <sub>D</sub> = 10 mA	0.35			0.5			
			I <sub>D</sub> = 20 mA	0.5		0.75				
Drain-Source On-Resistance	r <sub>DS(on)</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 1 mA			25		40		60	Ω
Gate-Source Forward Voltage	V <sub>GS(F)</sub>	I <sub>G</sub> = 1 mA , V <sub>DS</sub> = 0 V	0.7							V
Dynamic										
Common-Source Forward Transconductance <sup>c</sup>	g <sub>fs</sub>	V <sub>DG</sub> = 20 V, I <sub>D</sub> = 1 mA f = 1 kHz	6							mS
Common-Source Output Conductance <sup>c</sup>	g <sub>os</sub>		25							μS
Common-Source Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = −10 V f = 1 MHz	7		18		18		18	pF
Common-Source Reverse Transfer Capacitance	C <sub>rss</sub>		3		8		8		8	
Equivalent Input Noise Voltage <sup>c</sup>	e <sub>n</sub>	V <sub>DG</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	2		6		6		10	ns
	t <sub>r</sub>		2		3		4		10	
Turn-Off Time	t <sub>OFF</sub>		19		25		50		100	

## Notes

- a. Typical values are for DESIGN AID ONLY, not guaranteed nor subject to production testing.  
b. Pulse test: PW ≤ 100 μs duty cycle ≤ 10%.  
c. This parameter not registered with JEDEC.

NCB

SWITCHING TIME TEST CIRCUIT			
	4856/4859	4857/4860	4858/4861
$V_{GS(L)}$	-10 V	-6 V	-4 V
$R_L^*$	464 $\Omega$	953 $\Omega$	1910 $\Omega$
$I_{D(on)}$	20 mA	10 mA	5 mA

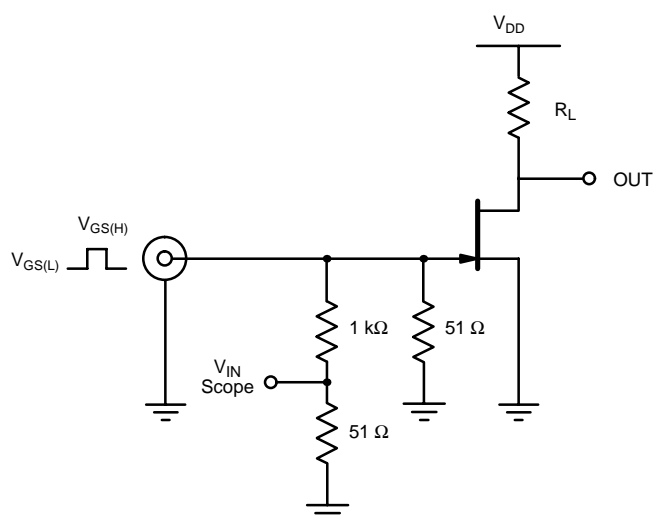
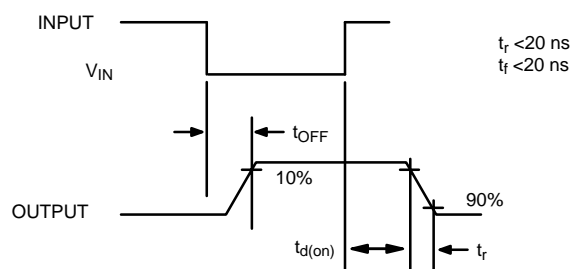
\*Non-inductive

### 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



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