



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 (Ω) | 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 Ω
- 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

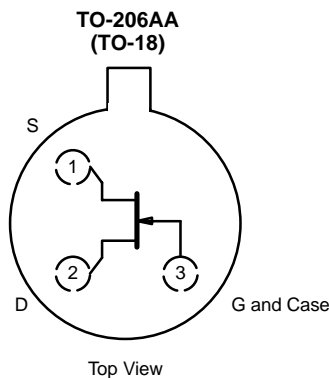
APPLICATIONS

- 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.





Vishay Siliconix

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 ^a | 1800 mW |

Notes

a. Derate 10.3 mW/°C to T_C > 25°C

SPECIFICATIONS FOR 2N4856, 2N4857 AND 2N4858 (T_A = 25 °C UNLESS NOTED)

| Parameter | Symbol | Test Conditions | Typ ^a | Limits | | | | | | Unit |
|---|----------------------|---|------------------------|--------|-----|--------|-----|--------|-----|------------|
| | | | | 2N4856 | | 2N4857 | | 2N4858 | | |
| | | | | Min | Max | Min | Max | Min | Max | |
| 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} = 15 V, I _D = 0.5 nA | | -4 | -10 | -2 | -6 | -0.8 | -4 | |
| Saturation Drain Current ^b | I _{DSS} | V _{DS} = 15 V, V _{GS} = 0 V | | 50 | 175 | 20 | 100 | 8 | 80 | mA |
| Gate Reverse Current | I _{GSS} | V _{GS} = -20 V, V _{DS} = 0 V | | -5 | | -250 | | -250 | | pA |
| | | | T _A = 150°C | -13 | | -500 | | -500 | | nA |
| Gate Operating Current ^c | I _G | V _{DG} = 15 V, I _D = 10 mA | -5 | | | | | | | pA |
| Drain Cutoff Current | I _{D(off)} | V _{DS} = 15 V, V _{GS} = -10 V | | 5 | | 250 | | 250 | | 250 |
| | | | T _A = 150°C | 13 | | 500 | | 500 | | 500 |
| Drain-Source On-Voltage | V _{DS(on)} | V _{GS} = 0 V | I _D = 5 mA | 0.25 | | | | | 0.5 | V |
| | | | I _D = 10 mA | 0.35 | | | 0.5 | | | |
| | | | I _D = 20 mA | 0.5 | | 0.75 | | | | |
| Drain-Source On-Resistance ^c | r _{DS(on)} | V _{GS} = 0 V, I _D = 1 mA | | | 25 | | 40 | | 60 | Ω |
| Gate-Source Forward Voltage ^c | V _{GS(F)} | I _G = 1 mA, V _{DS} = 0 V | 0.7 | | | | | | | V |
| Dynamic | | | | | | | | | | |
| Common-Source Forward Transconductance ^c | g _{fs} | V _{DG} = 20 V, I _D = 1 mA f = 1 kHz | 6 | | | | | | | mS |
| Common-Source Output Conductance ^c | g _{os} | | 25 | | | | | | | μS |
| Common-Source Input Capacitance | C _{iss} | V _{DS} = 0 V, V _{GS} = -10 V f = 1 MHz | 7 | | 18 | | 18 | | 18 | pF |
| Common-Source Reverse Transfer Capacitance | C _{rss} | | 3 | | 8 | | 8 | | 8 | |
| Equivalent Input Noise Voltage ^c | e _n | V _{DG} = 10 V, I _D = 10 mA f = 1 kHz | 3 | | | | | | | nV/ √Hz |
| Switching | | | | | | | | | | |
| Turn-On Time | t _{d(on)} | V _{DD} = 10 V, V _{GS(H)} = 0 V See Switching Circuit | 2 | | 6 | | 6 | | 10 | ns |
| | t _r | | 2 | | 3 | | 4 | | 10 | |
| Turn-Off Time | t _{OFF} | | 13 | | 25 | | 50 | | 100 | |



| SPECIFICATIONS FOR 2N4859, 2N4860 AND 2N4861 (T _A = 25 °C UNLESS NOTED) | | | | | | | | | | | |
|--|----------------------|---|-------------------------|------------------------|------|--------|------|--------|-----|------|------------|
| Parameter | Symbol | Test Conditions | Typ ^a | Limits | | | | | | Unit | |
| | | | | 2N4859 | | 2N4860 | | 2N4861 | | | |
| | | | | Min | Max | Min | Max | Min | Max | | |
| Static | | | | | | | | | | | |
| Gate-Source Breakdown Voltage | V _{(BR)GSS} | I _G = -1 μA, V _{DS} = 0 V | -55 | -30 | | -30 | | -30 | | V | |
| Gate-Source Cutoff Voltage | V _{GS(off)} | V _{DS} = 15 V, I _D = 0.5 nA | | -4 | -10 | -2 | -6 | -0.8 | -4 | | |
| Saturation Drain Current ^b | I _{DSS} | V _{DS} = 15 V, V _{GS} = 0 V | | 50 | 175 | 20 | 100 | 8 | 80 | mA | |
| Gate Reverse Current | I _{GSS} | V _{GS} = -15 V, V _{DS} = 0 V | | -5 | | -250 | | -250 | | -250 | pA |
| | | | T _A = 150 °C | -13 | | -500 | | -500 | | -500 | nA |
| Gate Operating Current ^c | I _G | V _{DG} = 15 V, I _D = 10 mA | -5 | | | | | | | pA | |
| Drain Cutoff Current | I _{D(off)} | V _{DS} = 15 V, V _{GS} = -10 V | | 5 | | 250 | | 250 | | 250 | pA |
| | | | T _A = 150 °C | 13 | | 500 | | 500 | | 500 | nA |
| Drain-Source On-Voltage | V _{DS(on)} | V _{GS} = 0 V | | I _D = 5 mA | 0.25 | | | | | 0.5 | V |
| | | | | I _D = 10 mA | 0.35 | | | 0.5 | | | |
| | | | | I _D = 20 mA | 0.5 | | 0.75 | | | | |
| Drain-Source On-Resistance | r _{DS(on)} | V _{GS} = 0 V, I _D = 1 mA | | | | 25 | | 40 | | 60 | Ω |
| Gate-Source Forward Voltage | V _{GS(F)} | I _G = 1 mA, V _{DS} = 0 V | 0.7 | | | | | | | | V |
| Dynamic | | | | | | | | | | | |
| Common-Source Forward Transconductance ^c | g _{fs} | V _{DG} = 20 V, I _D = 1 mA f = 1 kHz | 6 | | | | | | | | mS |
| Common-Source Output Conductance ^c | g _{os} | | 25 | | | | | | | | μS |
| Common-Source Input Capacitance | C _{iss} | V _{DS} = 0 V, V _{GS} = -10 V f = 1 MHz | 7 | | 18 | | 18 | | 18 | | pF |
| Common-Source Reverse Transfer Capacitance | C _{rss} | | 3 | | 8 | | 8 | | 8 | | |
| Equivalent Input Noise Voltage ^c | e _n | V _{DG} = 10 V, I _D = 10 mA f = 1 kHz | 3 | | | | | | | | nV/ √Hz |
| Switching | | | | | | | | | | | |
| Turn-On Time | t _{d(on)} | V _{DD} = 10 V, V _{GS(H)} = 0 V See Switching Circuit | 2 | | 6 | | 6 | | 10 | | ns |
| | t _r | | 2 | | 3 | | 4 | | 10 | | |
| Turn-Off Time | t _{OFF} | | 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 Ω | 953 Ω | 1910 Ω |
| $I_{D(on)}$ | 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 Ω
 Input Capacitance 1.5 pF

