



## N-Channel JFETs

## PRODUCT SUMMARY

| Part Number | $V_{GS(off)}$ (V) | $V_{(BR)GSS}$ Min (V) | $I_{DSS}$ Min (mA) | $r_{DS(on)}$ Max ( $\Omega$ ) | $I_{D(off)}$ Typ (pA) | $t_{ON}$ Typ (ns) |
|-------------|-------------------|-----------------------|--------------------|-------------------------------|-----------------------|-------------------|
| 2N4856A     | -4 to -10         | -40                   | 50                 | 25                            | 5                     | 4                 |
| 2N4857A     | -2 to -6          | -40                   | 20                 | 40                            | 5                     | 4                 |
| 2N4858A     | -0.8 to -4        | -40                   | 8                  | 60                            | 5                     | 4                 |

## FEATURES

- Low On-Resistance: 2N4856A <25  $\Omega$
- Fast Switching— $t_{ON}$ : 4 ns
- High Off-Isolation— $I_{D(off)}$ : 5 pA
- Low Capacitance: 3 pF
- Low Insertion Loss

## BENEFITS

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

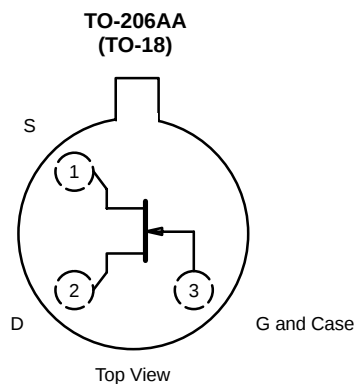
## APPLICATIONS

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

## DESCRIPTION

The 2N4856A/4857A/4858A 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 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 : (2N4856A-58A) ..... -40 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 ..... -55 to 200 °C  
 Power Dissipation<sup>a</sup> ..... 1.8 W

## Notes

a. Derate 10 mW/°C for  $T_J > 25$  °C

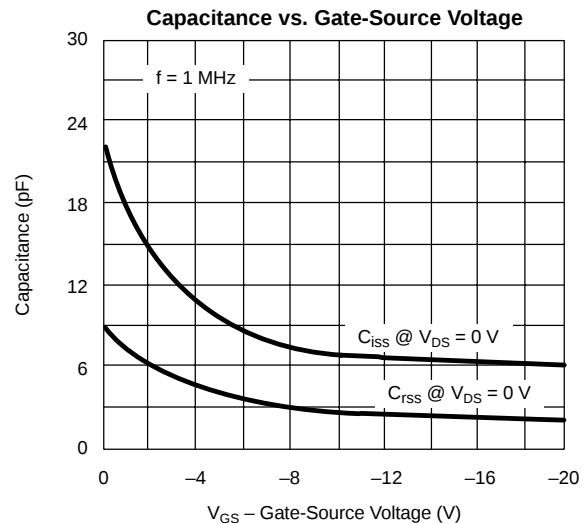
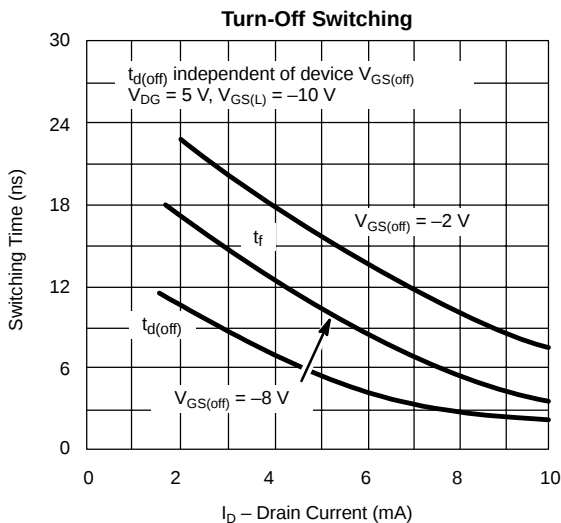
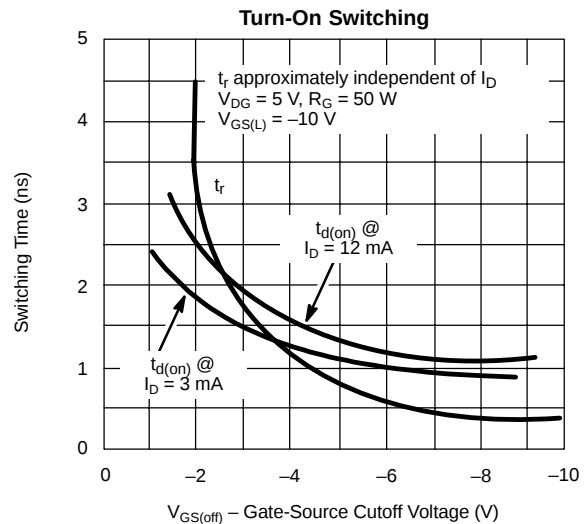
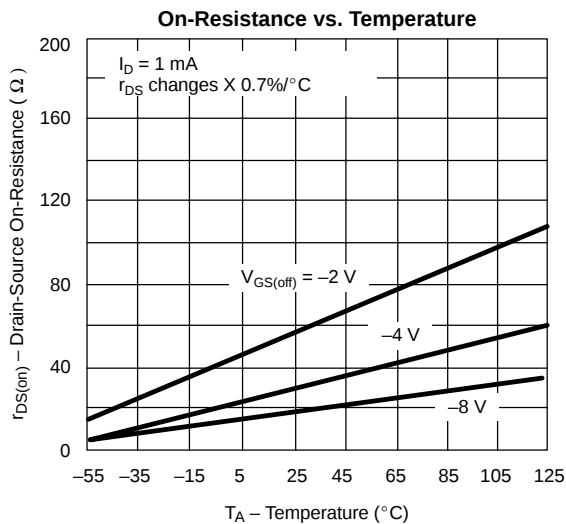
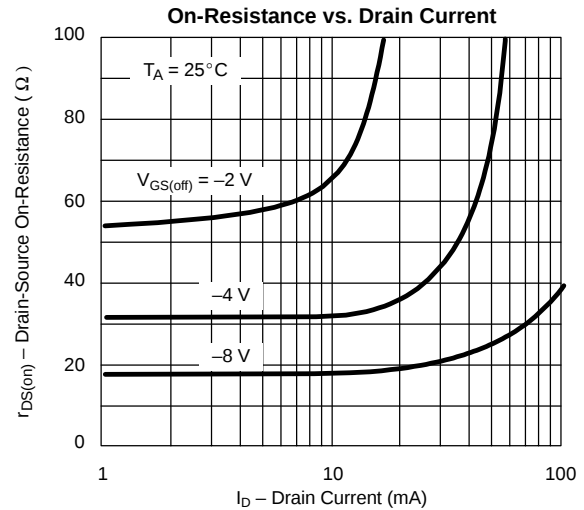
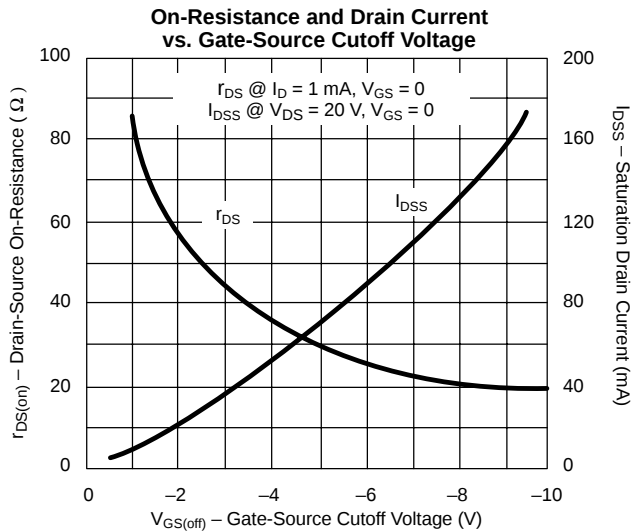
SPECIFICATIONS ( $T_A = 25$  °C UNLESS OTHERWISE NOTED)

| Parameter                                           | Symbol               | Test Conditions                                                         | Typ <sup>a</sup>       | Limits  |      |         |      |         |      | Unit       |
|-----------------------------------------------------|----------------------|-------------------------------------------------------------------------|------------------------|---------|------|---------|------|---------|------|------------|
|                                                     |                      |                                                                         |                        | 2N4856A |      | 2N4857A |      | 2N4858A |      |            |
|                                                     |                      |                                                                         |                        | 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      |      | 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>DS</sub> = 20 V, I <sub>D</sub> = 1 mA<br>f = 1 kHz              | 6                      |         |      |         |      |         |      | mS         |
| Common-Source Output Conductance <sup>c</sup>       | g <sub>os</sub>      |                                                                         | 25                     |         |      |         |      |         |      | μS         |
| Drain-Source On-Resistance                          | r <sub>ds(on)</sub>  | V <sub>GS</sub> = 0 V, I <sub>D</sub> = 0 mA<br>f = 1 kHz               |                        |         | 25   |         | 40   |         | 60   | Ω          |
| Common-Source Input Capacitance                     | C <sub>iss</sub>     | V <sub>DS</sub> = 0 V, V <sub>GS</sub> = −10 V<br>f = 1 MHz             | 7                      |         | 10   |         | 10   |         | 10   | pF         |
| Common-Source Reverse Transfer Capacitance          | C <sub>rss</sub>     |                                                                         | 3                      |         | 4    |         | 3.5  |         | 3.5  |            |
| Equivalent Input Noise Voltage <sup>c</sup>         | e <sub>n</sub>       | V <sub>DS</sub> = 10 V, I <sub>D</sub> = 10 mA<br>f = 1 kHz             | 3                      |         |      |         |      |         |      | nV/<br>√Hz |
| Switching                                           |                      |                                                                         |                        |         |      |         |      |         |      |            |
| Turn-On Time                                        | t <sub>d(on)</sub>   | V <sub>DD</sub> = 10 V, V <sub>GSH</sub> = 0 V<br>See Switching Circuit | 2                      |         | 5    |         | 6    |         | 8    | ns         |
|                                                     | t <sub>r</sub>       |                                                                         | 2                      |         | 3    |         | 4    |         | 8    |            |
| Turn-Off Time                                       | t <sub>OFF</sub>     |                                                                         | 12                     |         | 20   |         | 40   |         | 80   |            |

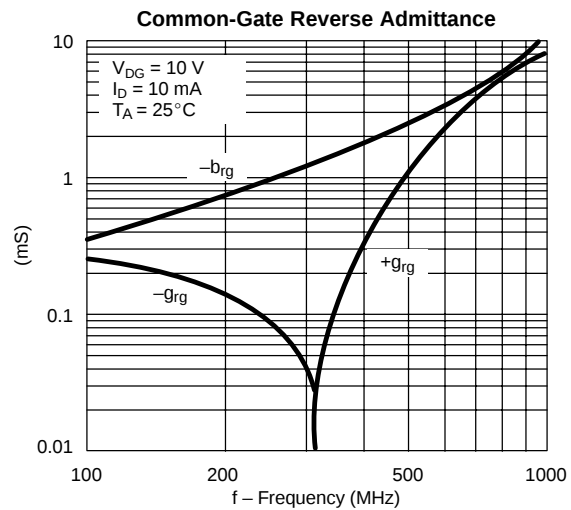
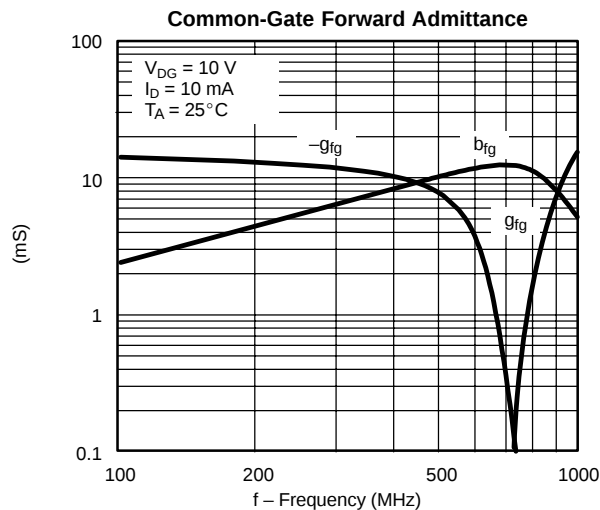
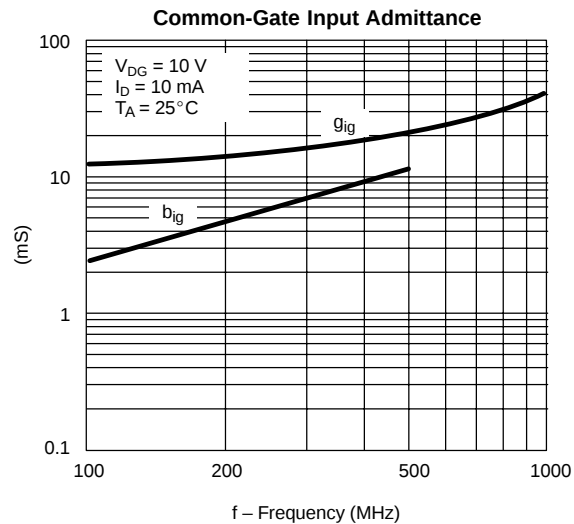
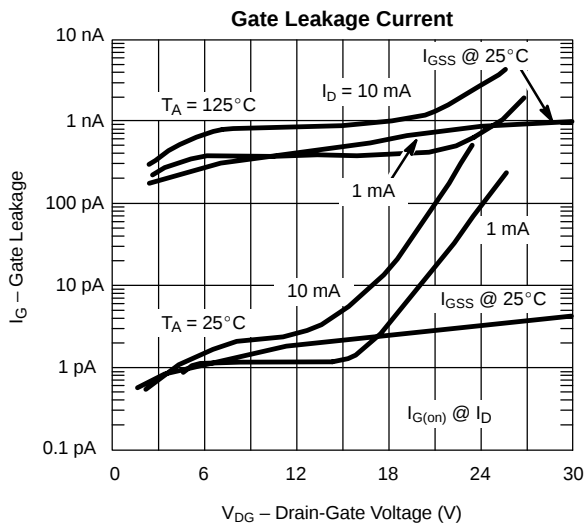
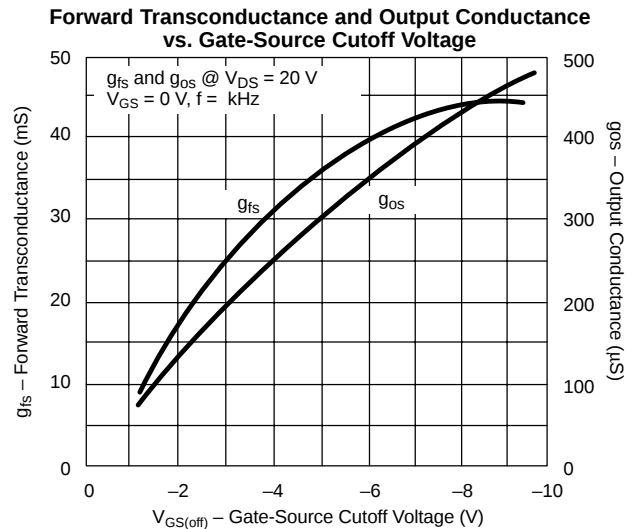
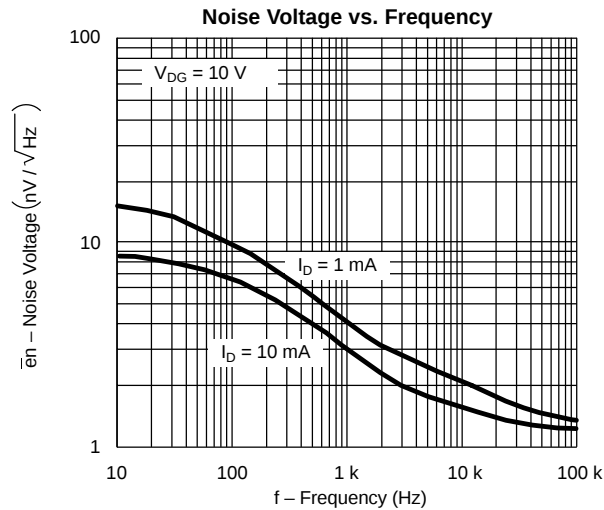
## Notes

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

NCB

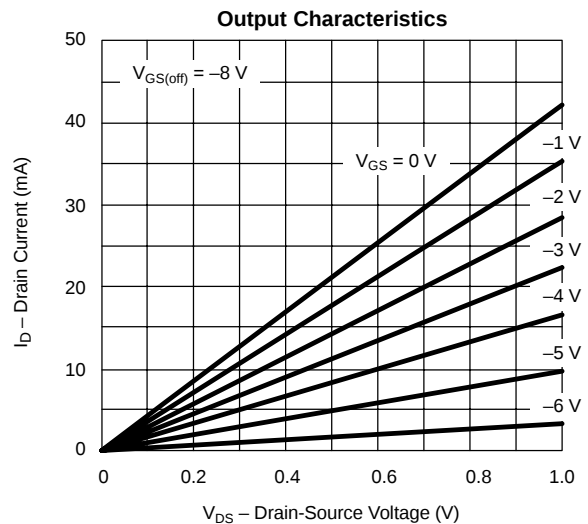
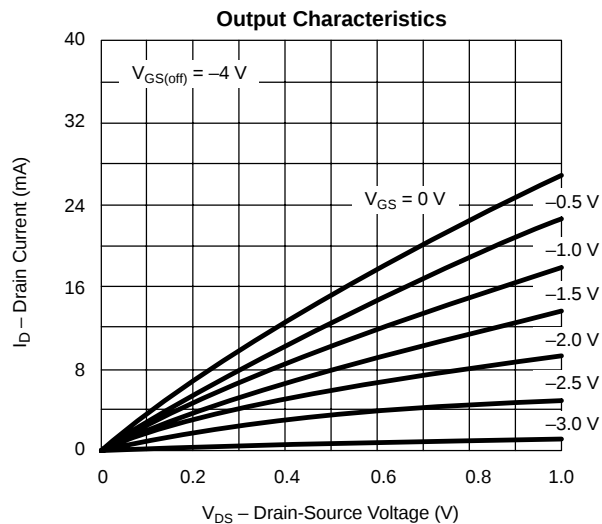
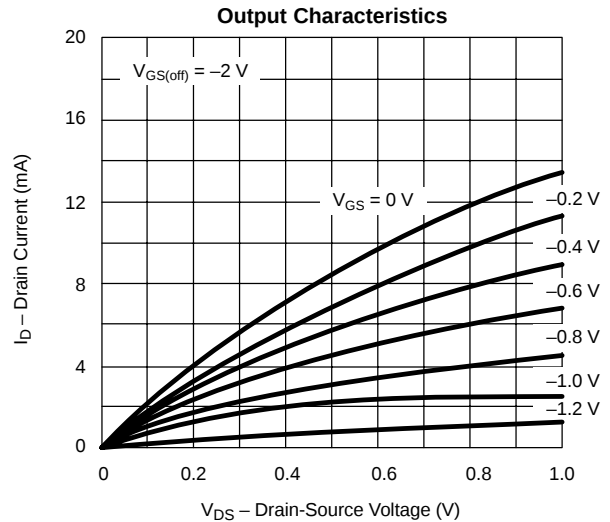
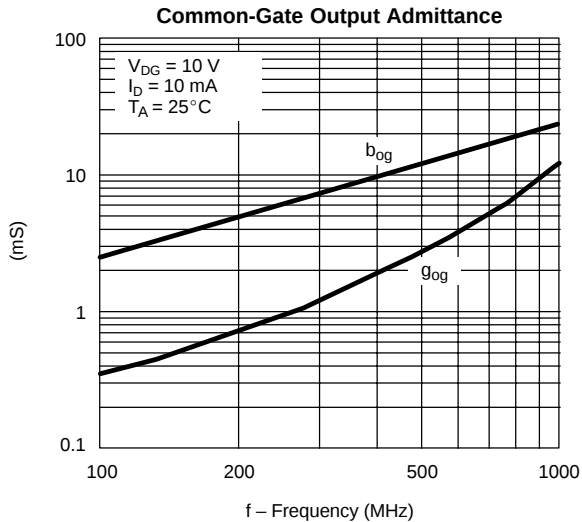
**TYPICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$  UNLESS OTHERWISE NOTED)**

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**SWITCHING TIME TEST CIRCUIT**

|             | 2N4856A      | 2N4857A      | 2N4858A       |
|-------------|--------------|--------------|---------------|
| $V_{GS(L)}$ | -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

