# P-Channel JFETs

**J174** **SST174**
**J175** **SST175**
**J176** **SST176**
**J177** **SST177**

| PRODUCT SUMMARY | | | | |
|---|---|---|---|---|
| Part Number | $V_{GS(off)}$ (V) | $r_{DS(on)}$ Max (Ω) | $I_{D(off)}$ Typ (pA) | $t_{ON}$ Typ (ns) |
| J/SST174 | 5 to 10 | 85 | –10 | 25 |
| J/SST175 | 3 to 6 | 125 | –10 | 25 |
| J/SST176 | 1 to 4 | 250 | –10 | 25 |
| J/SST177 | 0.8 to 2.25 | 300 | –10 | 25 |

## FEATURES

- Low On-Resistance: J174 <85 Ω
- Fast Switching—$t_{ON}$: 25 ns
- Low Leakage: –10 pA
- Low Capacitance: 5 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

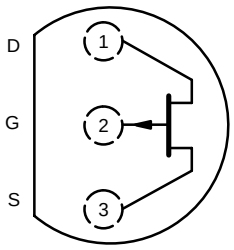
- Analog Switches
- Choppers
- Sample-and-Hold
- Normally “On” Switches
- Current Limiters

## DESCRIPTION

The J/SST174 series consists of p-channel analog switches designed to provide low on-resistance and fast switching. This series simplifies series-shunt switching applications when combined with the Siliconix J/SST111 series.

The TO-226AA (TO-92) plastic package provides a low-cost option, while the TO-236 (SOT-23) package provides surface-mount capability. Both the J and SST series are available in tape-and-reel for automated assembly (see Packaging Information).

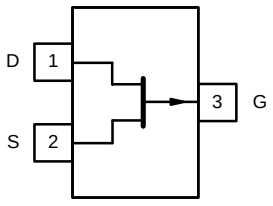
**TO-226AA**
**(TO-92)**




Top View

J174
J175
J176
J177

**TO-236**
**(SOT-23)**




Top View

SST174 (S4)*
SST175 (S5)*
SST176 (S6)*
SST177 (S7)*

*Marking Code for TO-236

For applications information see AN104.

### ABSOLUTE MAXIMUM RATINGS

Gate-Drain Voltage . . . . . 30 V
Gate-Source Voltage . . . . . 30 V
Gate Current . . . . . –50 mA
Storage Temperature . . . . . –55 to 150°C
Operating Junction Temperature . . . . . –55 to 150°C

Lead Temperature ($^1/_{16}$" from case for 10 sec.) . . . . . 300°C
Power Dissipation[a] . . . . . 350 mW

Notes
a. Derate 2.8 mW/°C above 25°C

### SPECIFICATIONS FOR J/SST174 AND J/SST175 ($T_A$ = 25°C UNLESS OTHERWISE NOTED)

| Parameter | Symbol | Test Conditions | Typ[a] | Limits J/SST174 Min | Limits J/SST174 Max | Limits J/SST175 Min | Limits J/SST175 Max | Unit |
|---|---|---|---|---|---|---|---|---|
| **Static** | | | | | | | | |
| Gate-Source Breakdown Voltage | $V_{(BR)GSS}$ | $I_G$ = 1 μA , $V_{DS}$ = 0 V | 45 | 30 | | 30 | | V |
| Gate-Source Cutoff Voltage | $V_{GS(off)}$ | $V_{DS}$ = –15 V, $I_D$ = –10 nA | | 5 | 10 | 3 | 6 | V |
| Saturation Drain Current[b] | $I_{DSS}$ | $V_{DS}$ = –15 V, $V_{GS}$ = 0 V | | –20 | –135 | –7 | –70 | mA |
| Gate Reverse Current | $I_{GSS}$ | $V_{GS}$ = 20 V, $V_{DS}$ = 0 V | 0.01 | | 1 | | 1 | nA |
| | | $T_A$ = 125°C | 5 | | | | | |
| Gate Operating Current | $I_G$ | $V_{DG}$ = –15 V, $I_D$ = –1 mA | 0.01 | | | | | nA |
| Drain Cutoff Current | $I_{D(off)}$ | $V_{DS}$ = –15 V, $V_{GS}$ = 10 V | –0.01 | | –1 | | –1 | nA |
| | | $T_A$ = 125°C | –5 | | | | | |
| Drain-Source On-Resistance | $r_{DS(on)}$ | $V_{GS}$ = 0 V, $V_{DS}$ = –0.1 V | | | 85 | | 125 | Ω |
| Gate-Source Forward Voltage | $V_{GS(F)}$ | $I_G$ = –1 mA , $V_{DS}$ = 0 V | –0.7 | | | | | V |
| **Dynamic** | | | | | | | | |
| Common-Source Forward Transconductance | $g_{fs}$ | $V_{DS}$ = –15 V, $I_D$ = –1 mA f = 1 kHz | 4.5 | | | | | mS |
| Common-Source Output Conductance | $g_{os}$ | | 20 | | | | | μS |
| Drain-Source On-Resistance | $r_{ds(on)}$ | $V_{GS}$ = 0 V, $I_D$ = 0 mA , f = 1 kHz | | | 85 | | 125 | Ω |
| Common-Source Input Capacitance | $C_{iss}$ | $V_{DS}$ = 0 V, $V_{GS}$ = 0 V, f = 1 MHz | 20 | | | | | pF |
| Common-Source Reverse Transfer Capacitance | $C_{rss}$ | $V_{DS}$ = 0 V, $V_{GS}$ = 10 V f = 1 MHz | 5 | | | | | pF |
| Equivalent Input Noise Voltage | $\overline{e}_n$ | $V_{DG}$ = –10 V, $I_D$ = –1 mA f = 1 kHz | 20 | | | | | $nV/\sqrt{Hz}$ |
| **Switching** | | | | | | | | |
| Turn-On Time | $t_{d(on)}$ | $V_{GS(L)}$ = 0 V, $V_{GS(H)}$ = 10 V See Switching Circuit | 10 | | | | | ns |
| | $t_r$ | | 15 | | | | | ns |
| Turn-Off Time | $t_{d(off)}$ | | 10 | | | | | ns |
| | $t_f$ | | 20 | | | | | ns |

Notes
a. Typical values are for DESIGN AID ONLY, not guaranteed nor subject to production testing.
b. Pulse test: PW ≤300 μs duty cycle ≤3%.

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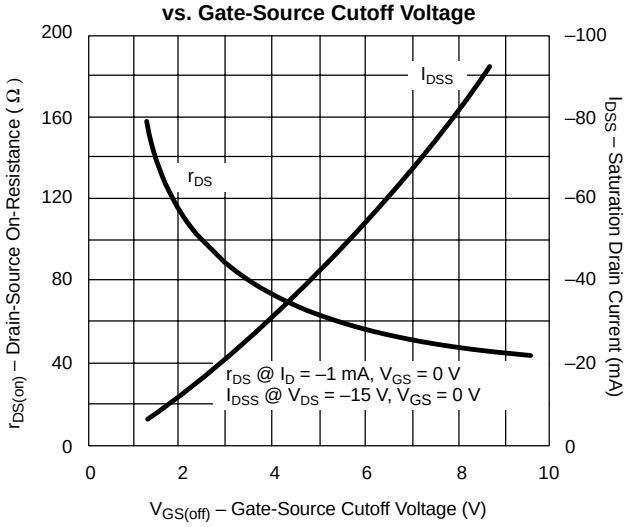
## SPECIFICATIONS FOR J/SST176 AND J/SST177 ($T_A$ = 25°C UNLESS OTHERWISE NOTED)

| Parameter | Symbol | Test Conditions | Typ[a] | Limits J/SST176 Min | Limits J/SST176 Max | Limits J/SST177 Min | Limits J/SST177 Max | Unit |
|---|---|---|---|---|---|---|---|---|
| **Static** | | | | | | | | |
| Gate-Source Breakdown Voltage | $V_{(BR)GSS}$ | $I_G$ = 1 µA , $V_{DS}$ = 0 V | 45 | 30 | | 30 | | V |
| Gate-Source Cutoff Voltage | $V_{GS(off)}$ | $V_{DS}$ = –15 V, $I_D$ = –10 nA | | 1 | 4 | 0.8 | 2.25 | V |
| Saturation Drain Current[b] | $I_{DSS}$ | $V_{DS}$ = –15 V, $V_{GS}$ = 0 V | | –2 | –35 | –1.5 | –20 | mA |
| Gate Reverse Current | $I_{GSS}$ | $V_{GS}$ = 20 V, $V_{DS}$ = 0 V | 0.01 | | 1 | | 1 | nA |
| | | $T_A$ = 125°C | 5 | | | | | |
| Gate Operating Current | $I_G$ | $V_{DG}$ = –15 V, $I_D$ = –1 mA | 0.01 | | | | | nA |
| Drain Cutoff Current | $I_{D(off)}$ | $V_{DS}$ = –15 V, $V_{GS}$ = 10 V | –0.01 | | –1 | | –1 | nA |
| | | $T_A$ = 125°C | –5 | | | | | |
| Drain-Source On-Resistance | $r_{DS(on)}$ | $V_{GS}$ = 0 V, $V_{DS}$ = –0.1 V | | | 250 | | 300 | Ω |
| Gate-Source Forward Voltage | $V_{GS(F)}$ | $I_G$ = –1 mA , $V_{DS}$ = 0 V | –0.7 | | | | | V |
| **Dynamic** | | | | | | | | |
| Common-Source Forward Transconductance | $g_{fs}$ | $V_{DS}$ = –15 V, $I_D$ = –1 mA f = 1 kHz | 4.5 | | | | | mS |
| Common-Source Output Conductance | $g_{os}$ | | 20 | | | | | µS |
| Drain-Source On-Resistance | $r_{ds(on)}$ | $V_{GS}$ = 0 V, $I_D$ = 0 mA , f = 1 kHz | | | 250 | | 300 | Ω |
| Common-Source Input Capacitance | $C_{iss}$ | $V_{DS}$ = 0 V, $V_{GS}$ = 0 V, f = 1 MHz | 20 | | | | | pF |
| Common-Source Reverse Transfer Capacitance | $C_{rss}$ | $V_{DS}$ = 0 V, $V_{GS}$ = 10 V f = 1 MHz | 5 | | | | | pF |
| Equivalent Input Noise Voltage | $\overline{e}_n$ | $V_{DG}$ = –10 V, $I_D$ = –1 mA f = 1 kHz | 20 | | | | | $nV/\sqrt{Hz}$ |
| **Switching** | | | | | | | | |
| Turn-On Time | $t_{d(on)}$ | $V_{GS(L)}$ = 0 V, $V_{GS(H)}$ = 10 V See Switching Circuit | 10 | | | | | ns |
| | $t_r$ | | 15 | | | | | ns |
| Turn-Off Time | $t_{d(off)}$ | | 10 | | | | | ns |
| | $t_f$ | | 20 | | | | | ns |

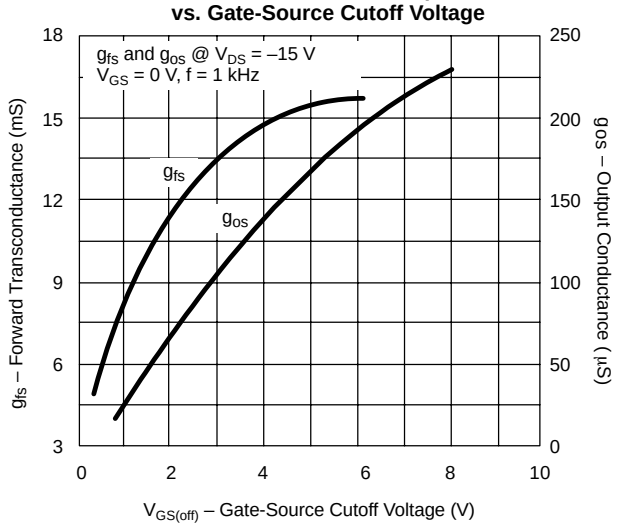
Notes
a. Typical values are for DESIGN AID ONLY, not guaranteed nor subject to production testing. PSCIA
b. Pulse test: PW ≤ 300 µs duty cycle ≤ 3%.

## TYPICAL CHARACTERISTICS ($T_A$ = 25°C UNLESS OTHERWISE NOTED)

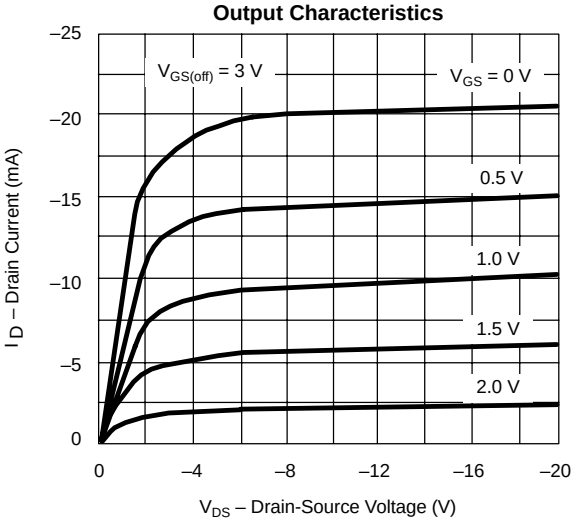
### On-Resistance and Drain Current vs. Gate-Source Cutoff Voltage



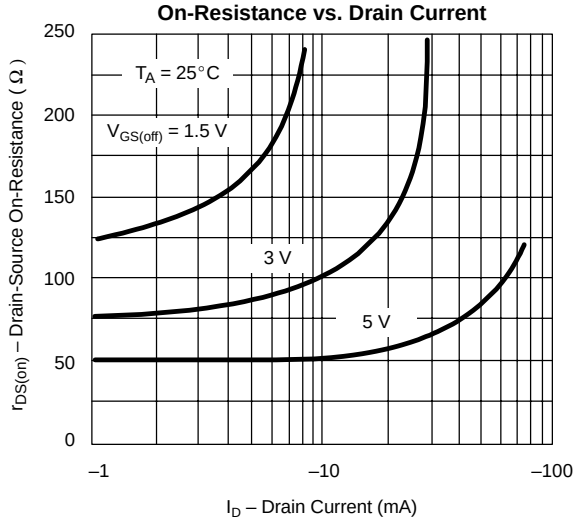

### Forward Transconductance and Output Conductance vs. Gate-Source Cutoff Voltage



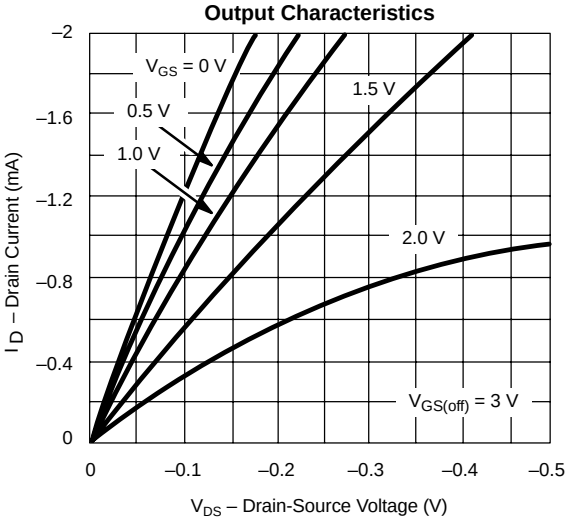

### Output Characteristics



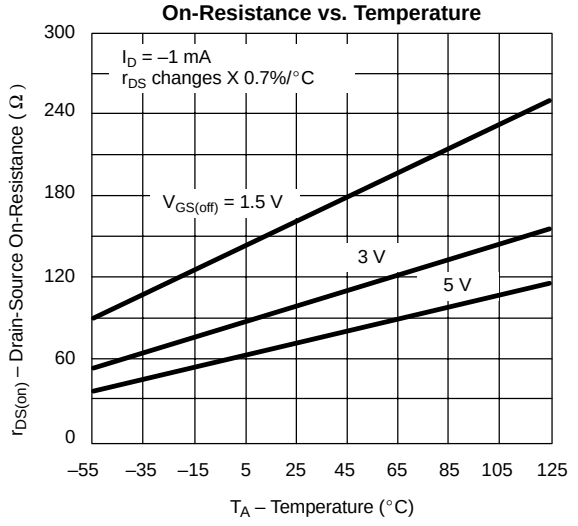

### On-Resistance vs. Drain Current




### Output Characteristics

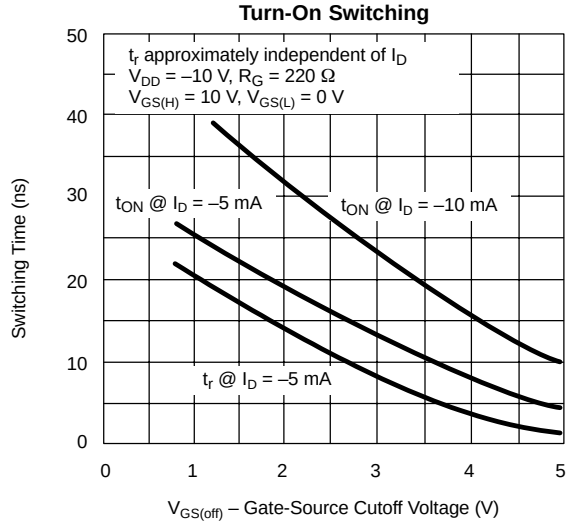



### On-Resistance vs. Temperature

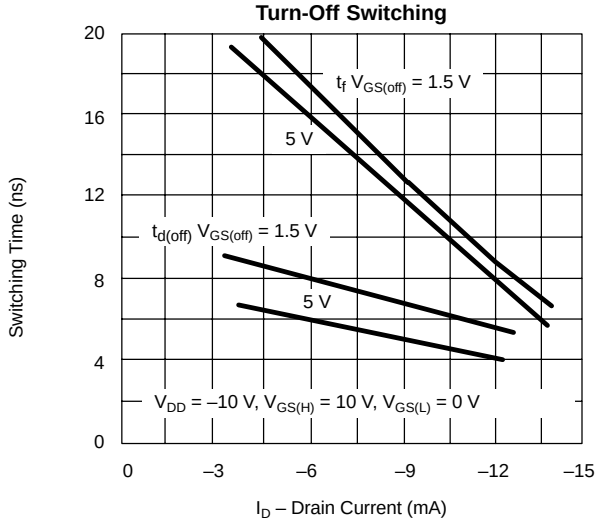


## TYPICAL CHARACTERISTICS ($T_A$ = 25°C UNLESS OTHERWISE NOTED)

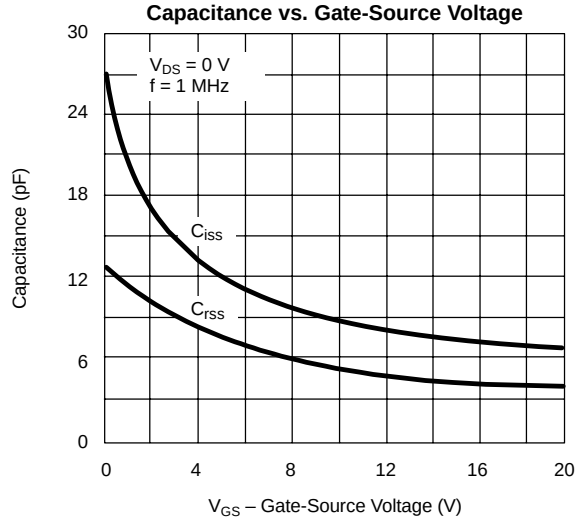
### Turn-On Switching



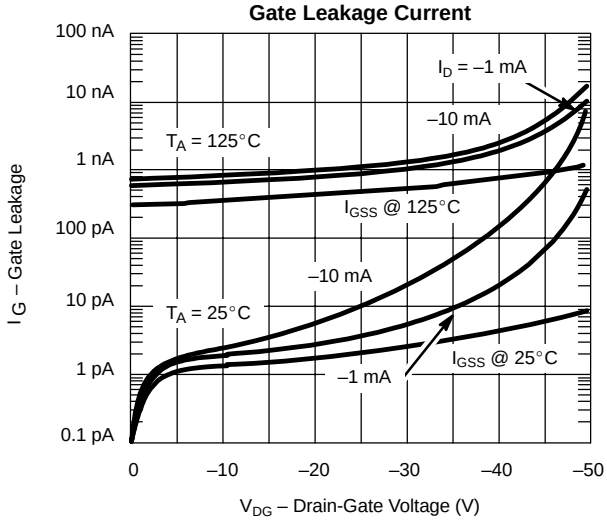

### Turn-Off Switching



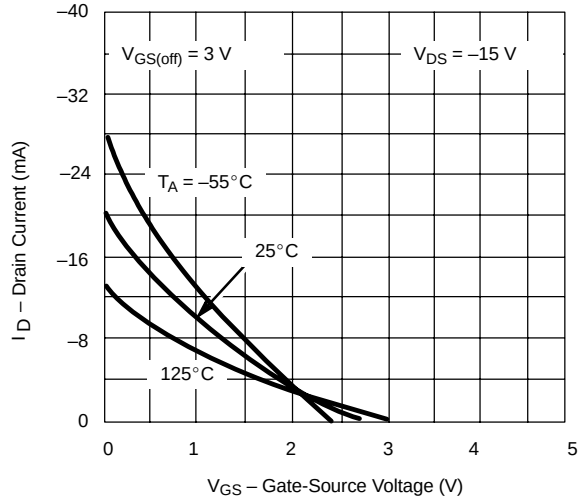

### Capacitance vs. Gate-Source Voltage



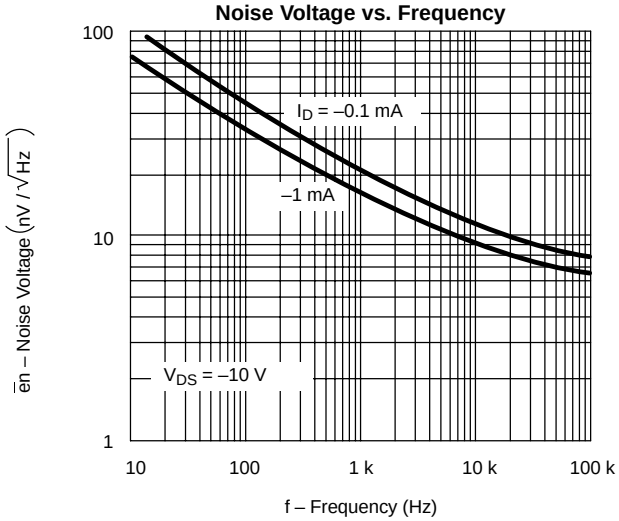

### Gate Leakage Current




### Transfer Characteristics




### Noise Voltage vs. Frequency



| SWITCHING TIME TEST CIRCUIT | | | | |
|---|---|---|---|---|
| | **174** | **175** | **176** | **177** |
| $V_{DD}$ | –10 V | –6 V | –6 V | –6 V |
| $V_{GG}$ | 20 V | 12 V | 8 V | 5 V |
| $R_L$* | 560 Ω | 750 Ω | 1800 Ω | 5600 Ω |
| $R_G$* | 100 Ω | 220 Ω | 390 Ω | 390 Ω |
| $I_{D(on)}$ | –15 mA | –7 mA | –3 mA | –1 mA |

*Non-inductive

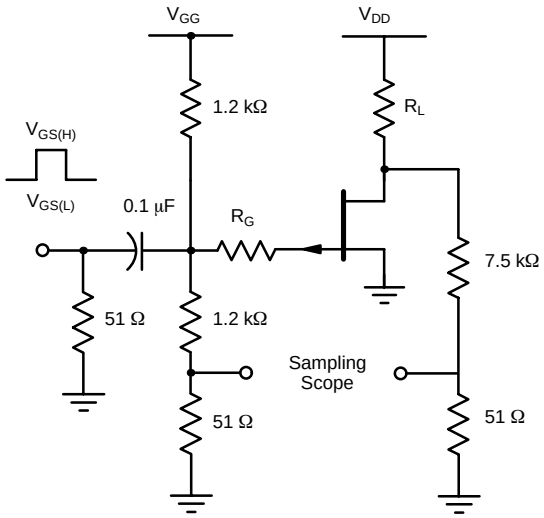
**INPUT PULSE**

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 MΩ
Input Capacitance 1.5 pF

See Typical Characteristics curves for changes.



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