**FAIRCHILD**
**SEMICONDUCTOR** ™

*Discrete POWER & Signal*
*Technologies*

**J105**
**J106**
**J107**

**JFTJ105**

**TO-92**

G
S
D

**SOT-223**

G

D
G
S

# N-Channel Switch

This device is designed for analog or digital switching applications where very low On Resistance is mandatory. Sourced from Process 59.

## Absolute Maximum Ratings*     TA = 25°C unless otherwise noted

| Symbol | Parameter | Value | Units |
|--------|-----------|-------|-------|
| $V_{DG}$ | Drain-Gate Voltage | 25 | V |
| $V_{GS}$ | Gate-Source Voltage | - 25 | V |
| $I_{GF}$ | Forward Gate Current | 10 | mA |
| $T_J$, $T_{stg}$ | Operating and Storage Junction Temperature Range | -55 to +150 | °C |

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

**NOTES**:
**1)** These ratings are based on a maximum junction temperature of 150 degrees C.
**2)** These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

## Thermal Characteristics     TA = 25°C unless otherwise noted

| Symbol | Characteristic | Max | Units |
|--------|----------------|-----|-------|
| | | **J105 / J106 / J107** | |
| $P_D$ | Total Device Dissipation | 350 | mW |
| | Derate above 25°C | 2.8 | mW/°C |
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case | 125 | °C/W |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient | 357 | °C/W |

## Electrical Characteristics

TA = 25°C unless otherwise noted

| Symbol | Parameter | Test Conditions | | Min | Max | Units |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | |
| $V_{(BR)GSS}$ | Gate-Source Breakdown Voltage | $I_G = -10\ \mu A$, $V_{DS} = 0$ | | - 25 | | V |
| $I_{GSS}$ | Gate Reverse Current | $V_{GS} = -15\ V$, $V_{DS} = 0$ | | | - 3.0 | nA |
| | | $V_{GS} = -15\ V$, $V_{DS} = 0$, $T_A = 100°C$ | | | - 200 | nA |
| $V_{GS(off)}$ | Gate-Source Cutoff Voltage | $V_{DS} = 15\ V$, $I_D = 10\ nA$ | **J105** | - 4.5 | - 10 | V |
| | | | **J106** | - 2.0 | - 6.0 | V |
| | | | **J107** | - 0.5 | - 4.5 | V |
| **ON CHARACTERISTICS** | | | | | | |
| $I_{DSS}$ | Zero-Gate Voltage Drain Current* | $V_{DS} = 15\ V$, $I_{GS} = 0$ | **J105** | 500 | | mA |
| | | | **J106** | 200 | | mA |
| | | | **J107** | 100 | | mA |
| $r_{DS(on)}$ | Drain-Source On Resistance | $V_{DS} \leq 0.1\ V$, $V_{GS} = 0$ | **J105** | | 3.0 | Ω |
| | | | **J106** | | 6.0 | Ω |
| | | | **J107** | | 8.0 | Ω |
| **SMALL SIGNAL CHARACTERISTICS** | | | | | | |
| $C_{dg(on)}$ $C_{sg(on)}$ | Drain Gate & Source Gate On Capacitance | $V_{DS} = 0$, $V_{GS} = 10\ V$, $f = 1.0\ MHz$ | | | 160 | pF |
| $C_{dg(off)}$ | Drain-Gate Off Capacitance | $V_{DS} = 0$, $V_{GS} = 10\ V$, $f = 1.0\ MHz$ | | | 35 | pF |
| $C_{sg(off)}$ | Source-Gate Off Capacitance | $V_{DS} = 0$, $V_{GS} = 10\ V$, $f = 1.0\ MHz$ | | | 35 | pF |

*Pulse Test: Pulse Width $\leq 300\ \mu s$, Duty Cycle $\leq 2.0\%$

## Typical Characteristics

**Common Drain-Source Characteristics**
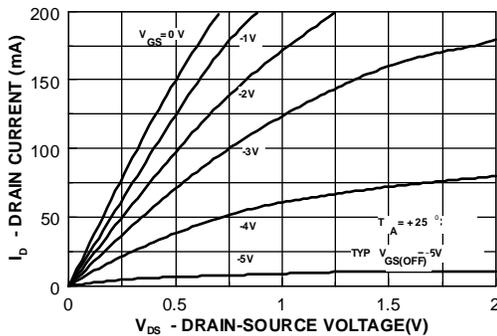
**Common Drain-Source Characteristics**
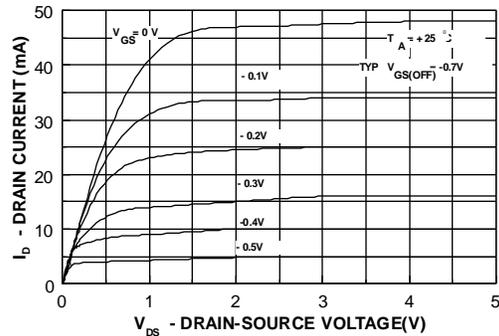
## Typical Characteristics (continued)

### Parameter Interactions

$r_{DS}$ - DRAIN "ON" RESISTANCE ($\Omega$)

$r_{DS}$ @ VDS=100MV, VGS = 0

$V_{GS(OFF)}$ @ VDS = 5.0V, ID =3nA

$I_{DSS}$

$r_{DS}$

$I_D$ - DRAIN CURRENT (mA)

$V_{GS}$ GATE CUT OFF VOLTAGE (V)

### Capacitance vs Voltage

Cis (Crs) - CAPACITANCE (pf)

f=0.1-1.0MHz

$C_{is}$ ( $V_{DS}$ = 5 V )

$C_{rs}$ ( $V_{DS}$ = 0 V )

$V_{GS}$ - GATE-SOURCE VOLTAGE (V)
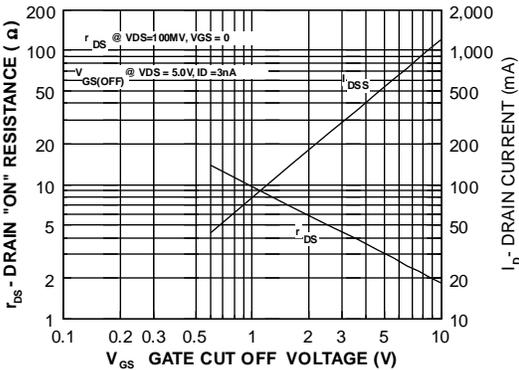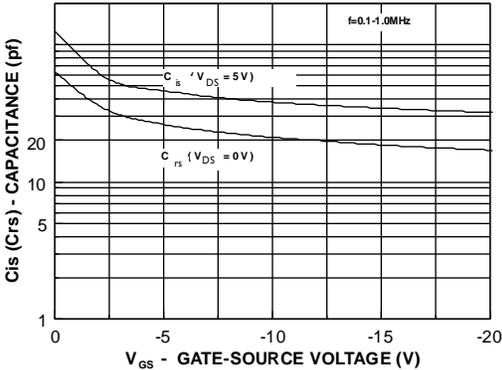
### Normalized Drain Resistance vs Bias Voltage

NORMALIZED RESISTANCE

$V_{GS(OFF)}$ @5V, 10uA

$$r_{DSb} = \frac{rDS}{1 - \frac{V_{GS}}{V_{GS(OFF)}}}$$

$r_{DSb}$

$V_{GS}$ / $V_{GS(OFF)}$ — NORMALIZED GATE TO SOURCE VOLTAGE (V)
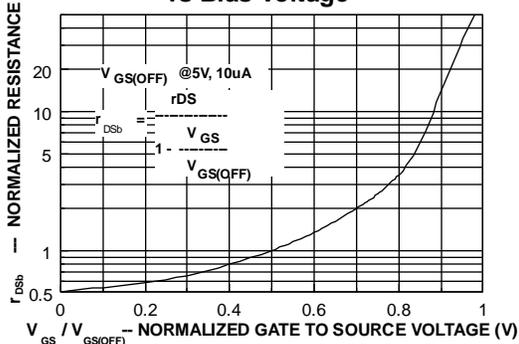
### On Resistance vs Drain Current
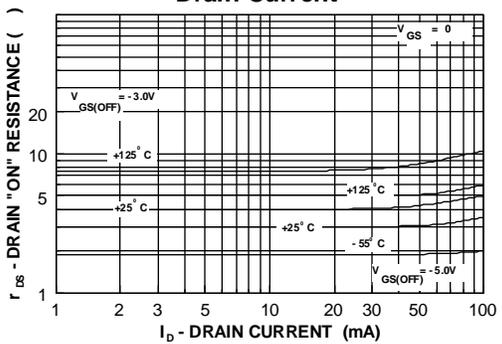
$r_{DS}$ - DRAIN "ON" RESISTANCE ( )

$V_{GS}$ = 0

$V_{GS(OFF)}$ = -3.0V

+125° C

+125° C

+25° C

+25° C

- 55° C

$V_{GS(OFF)}$ = -5.0V

$I_D$ - DRAIN CURRENT (mA)

### Output Conductance vs Drain Current

$g_{os}$ - OUTPUT CONDUCTANCE (u mhos)

V DG = 5.0V

5.0V

10V

15V

20V

$V_{GS(OFF)}$

-4.0V

10V

15V

20V

5.0V

10V

15V

20V

-2.0V

-1.0V

$T_A$ = +25° C

f = 1.0 K Hz

$I_D$ - DRAIN CURRENT (mA)

### Transconductance vs Drain Current

$g_{fs}$ - TRANSCONDUCTANCE (u mhos)

V DG = 10.0V

$T_A$ = +25° C

f = 1.0 k Hz

$T_A$ = - 55° C

$T_A$ = +25° C

$T_A$ = +125° C

$V_{GS(OFF)}$ = - 1.0V

$V_{GS(OFF)}$ = - 3.0V

$V_{GS(OFF)}$ = - 5.0V
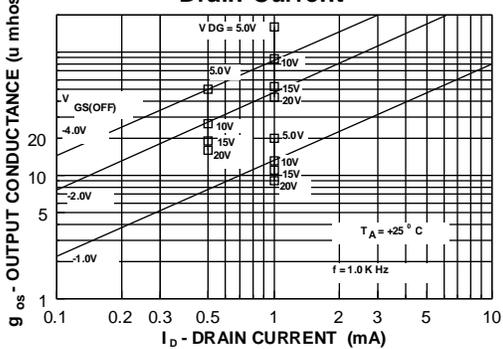
$I_D$ - DRAIN CURRENT (mA)
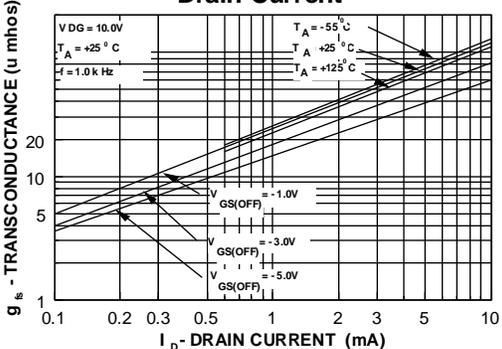
## Typical Characteristics (continued)

### Noise Voltage vs Frequency

en - NOISE VOLTAGE (nV/ √Hz )

$V_{DC}$ = 10 V

BW = 6.0 Hz @ f = 10Hz, 100 Hz
= 0.2f @ f > 1.0 k Hz

$I_D$ = 1 mA

$I_D$ = 10 mA

f - FREQUENCY (k Hz)
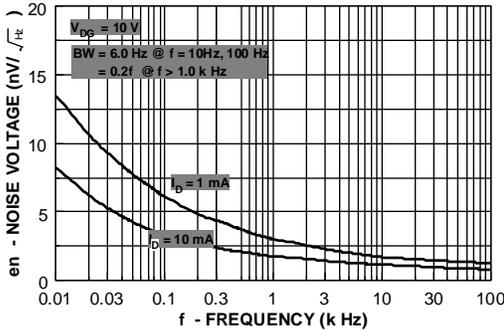
### Power Dissipation vs Ambient Temperature

$P_D$ - POWER DISSIPATION (mW)

TO-92

TEMPERATURE ( ºC)