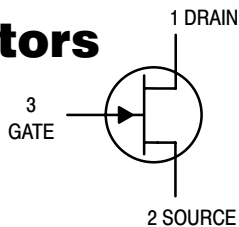


JFET Chopper Transistors

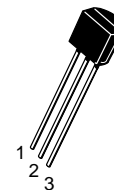
N-Channel — Depletion



J111
J112
J113

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Drain–Gate Voltage	V_{DG}	–35	Vdc
Gate–Source Voltage	V_{GS}	–35	Vdc
Gate Current	I_G	50	mAdc
Total Device Dissipation @ $T_A = 25^\circ\text{C}$ Derate above 25°C	P_D	350 2.8	mW mW/ $^\circ\text{C}$
Lead Temperature	T_L	300	$^\circ\text{C}$
Operating and Storage Junction Temperature Range	T_J, T_{stg}	–65 to +150	$^\circ\text{C}$



CASE 29–11, STYLE 5
TO–92 (TO–226AA)

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
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OFF CHARACTERISTICS

Gate–Source Breakdown Voltage ($I_G = -1.0 \mu\text{Adc}$)	$V_{(BR)GSS}$	35	—	Vdc
Gate Reverse Current ($V_{GS} = -15 \text{Vdc}$)	I_{GSS}	—	–1.0	nAdc
Gate Source Cutoff Voltage ($V_{DS} = 5.0 \text{Vdc}, I_D = 1.0 \mu\text{Adc}$)	$V_{GS(off)}$	J111 –3.0 J112 –1.0 J113 –0.5	–10 –5.0 –3.0	Vdc
Drain–Cutoff Current ($V_{DS} = 5.0 \text{Vdc}, V_{GS} = -10 \text{Vdc}$)	$I_{D(off)}$	—	1.0	nAdc

ON CHARACTERISTICS

Zero–Gate–Voltage Drain Current ⁽¹⁾ ($V_{DS} = 15 \text{Vdc}$)	I_{DSS}	J111 20 J112 5.0 J113 2.0	— — —	mAdc
Static Drain–Source On Resistance ($V_{DS} = 0.1 \text{Vdc}$)	$r_{DS(on)}$	J111 — J112 — J113 —	30 50 100	Ω
Drain Gate and Source Gate On–Capacitance ($V_{DS} = V_{GS} = 0, f = 1.0 \text{MHz}$)	$C_{dg(on)}$ + $C_{sg(on)}$	—	28	pF
Drain Gate Off–Capacitance ($V_{GS} = -10 \text{Vdc}, f = 1.0 \text{MHz}$)	$C_{dg(off)}$	—	5.0	pF
Source Gate Off–Capacitance ($V_{GS} = -10 \text{Vdc}, f = 1.0 \text{MHz}$)	$C_{sg(off)}$	—	5.0	pF

1. Pulse Width = 300 μs , Duty Cycle = 3.0%.

TYPICAL SWITCHING CHARACTERISTICS

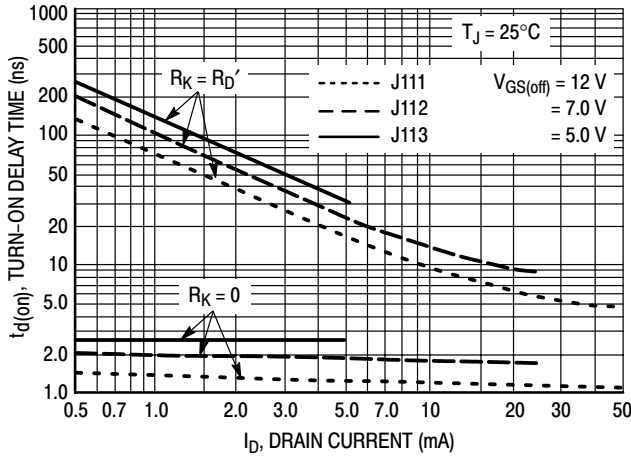


Figure 1. Turn-On Delay Time

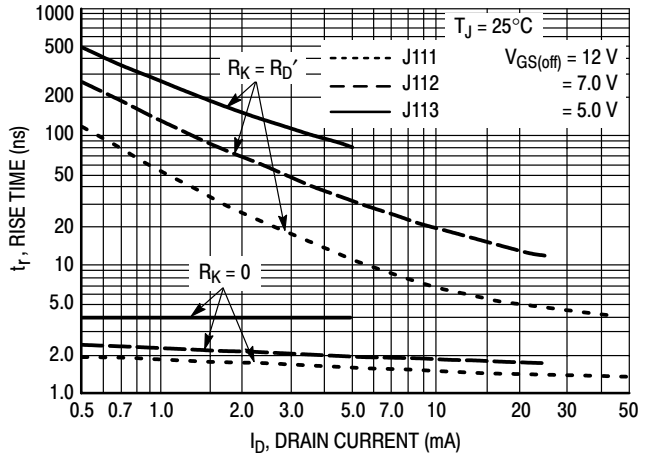


Figure 2. Rise Time

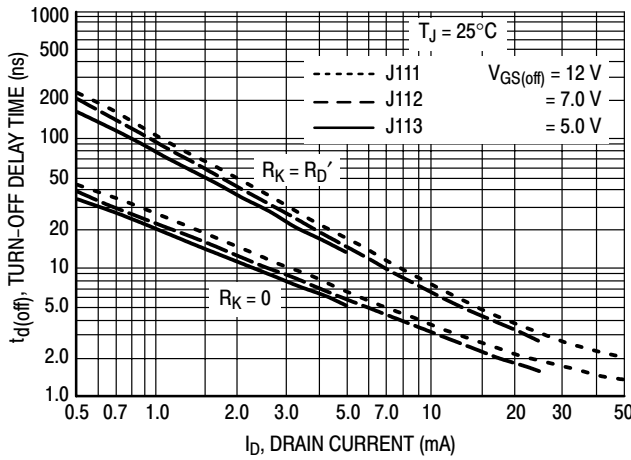


Figure 3. Turn-Off Delay Time

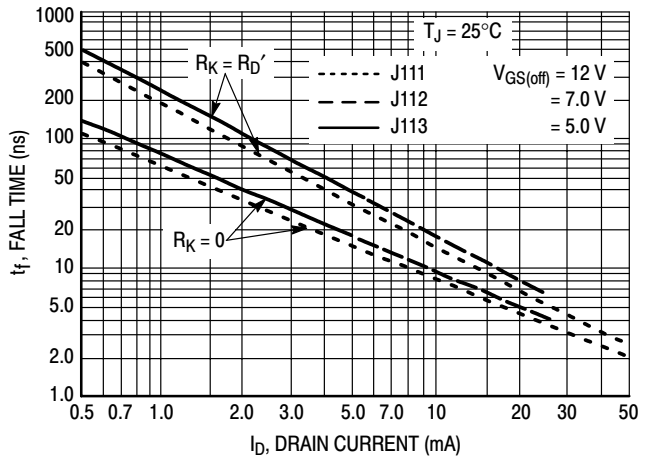


Figure 4. Fall Time

NOTE 1

The switching characteristics shown above were measured using a test circuit similar to Figure 5. At the beginning of the switching interval, the gate voltage is at Gate Supply Voltage ($-V_{GG}$). The Drain-Source Voltage (V_{DS}) is slightly lower than Drain Supply Voltage (V_{DD}) due to the voltage divider. Thus Reverse Transfer Capacitance (C_{rss}) or Gate-Drain Capacitance (C_{gd}) is charged to $V_{GG} + V_{DS}$.

During the turn-on interval, Gate-Source Capacitance (C_{gs}) discharges through the series combination of R_{GEN} and R_K . C_{gd} must discharge to $V_{DS(on)}$ through R_G and R_K in series with the parallel combination of effective load impedance (R'_D) and Drain-Source Resistance (r_{ds}). During the turn-off, this charge flow is reversed.

Predicting turn-on time is somewhat difficult as the channel resistance r_{ds} is a function of the gate-source voltage. While C_{gs} discharges, V_{GS} approaches zero and r_{ds} decreases. Since C_{gd} discharges through r_{ds} , turn-on time is non-linear. During turn-off, the situation is reversed with r_{ds} increasing as C_{gd} charges.

The above switching curves show two impedance conditions; 1) R_K is equal to R_D , which simulates the switching behavior of cascaded stages where the driving source impedance is normally the load impedance of the previous stage, and 2) $R_K = 0$ (low impedance) the driving source impedance is that of the generator.

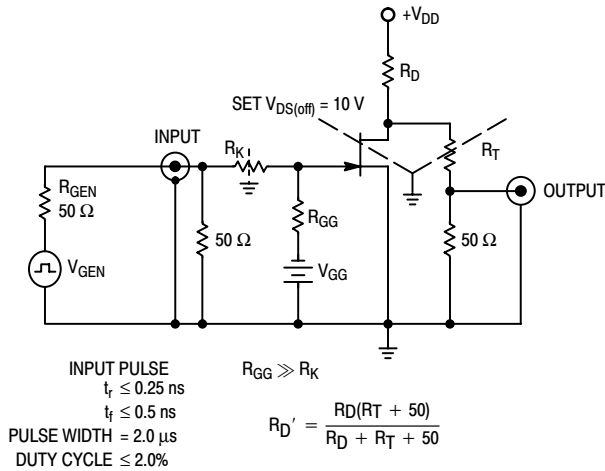


Figure 5. Switching Time Test Circuit

INPUT PULSE
 $t_f \leq 0.25$ ns
 $t_r \leq 0.5$ ns
 PULSE WIDTH = 2.0 μ s
 DUTY CYCLE $\leq 2.0\%$

$$R'_D = \frac{R_D(R_T + 50)}{R_D + R_T + 50}$$

J111 J112 J113

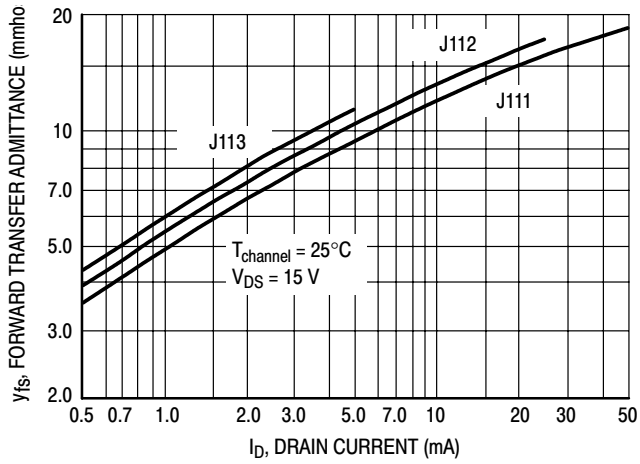


Figure 6. Typical Forward Transfer Admittance

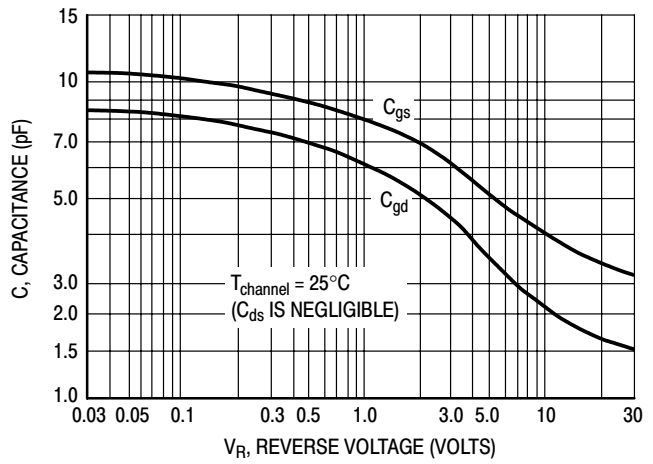


Figure 7. Typical Capacitance

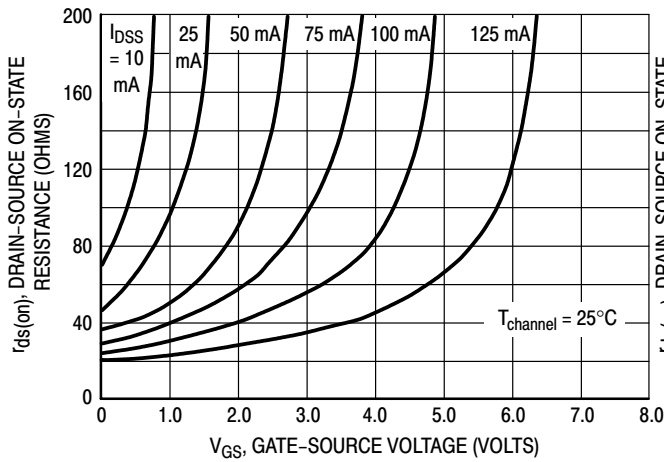


Figure 8. Effect of Gate-Source Voltage On Drain-Source Resistance

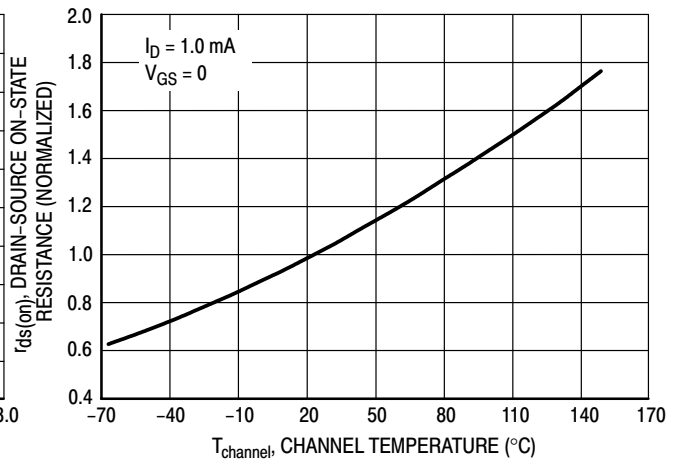


Figure 9. Effect of Temperature On Drain-Source On-State Resistance

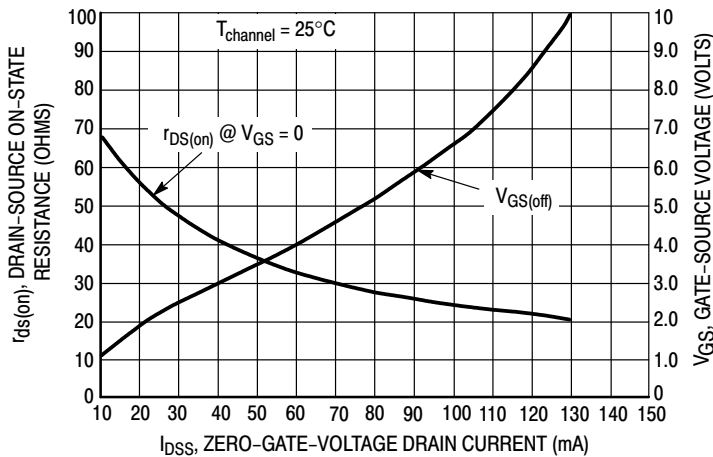


Figure 10. Effect of I_{DSS} On Drain-Source Resistance and Gate-Source Voltage

NOTE 2

The Zero-Gate-Voltage Drain Current (I_{DSS}), is the principle determinant of other J-FET characteristics. Figure 10 shows the relationship of Gate-Source Off Voltage ($V_{GS(off)}$) and Drain-Source On Resistance ($r_{ds(on)}$) to I_{DSS} . Most of the devices will be within $\pm 10\%$ of the values shown in Figure 10. This data will be useful in predicting the characteristic variations for a given part number.

For example:

Unknown

$r_{ds(on)}$ and V_{GS} range for an J112

The electrical characteristics table indicates that an J112 has an I_{DSS} range of 25 to 75 mA. Figure 10, shows $r_{ds(on)} = 52$ Ohms for $I_{DSS} = 25$ mA and 30 Ohms for $I_{DSS} = 75$ mA. The corresponding V_{GS} values are 2.2 volts and 4.8 volts.