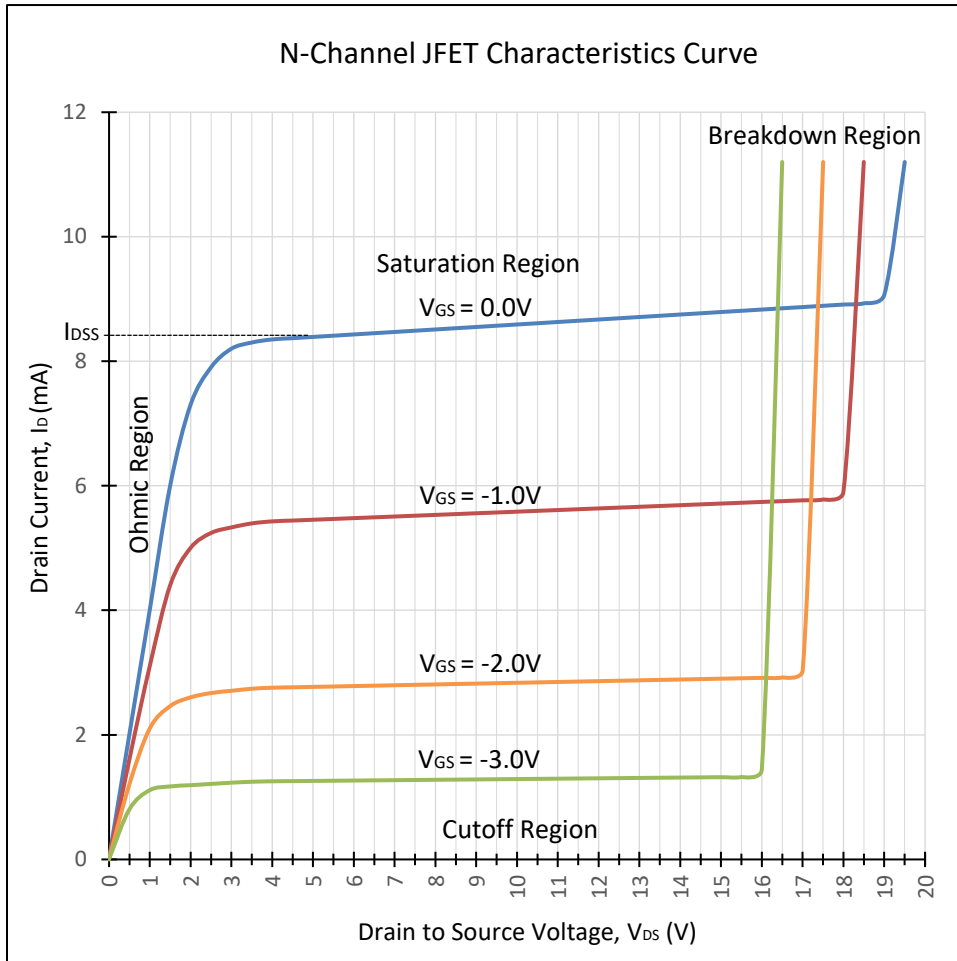


Application Note : Common Parameters & Equations



JFET Parameters

Equations	Description
$C_{ISS} = C_{GS} + C_{GD}$	Common Source Input Capacitance.
$C_{OSS} = C_{DS} + C_{GS} + C_{BD}$	Common Source Output Capacitance.
$C_{RSS} = C_{QD}$	Reverse Feedback Capacitance.
$G_{FSO} = \frac{K I_{DSS}}{I_{DSS(OFF)}}$	Forward transconductance as a function of I_{DSS} and $V_{GS(OFF)}$ at zero gate-source voltage ($K = 1.5$ to 2.5 , typically 2 for N-channel JFETs).
$G_{FS} = G_{FSO} \frac{(1 - V_{GS})}{V_{GS(OFF)}}$	Variation of G_{FS} with gate bias. Forward common source transconductance.
$G_{FS} = G_{FSO} \sqrt{I_D} / I_{DSS}$	Variation of G_{FS} with drain current. Forward common-source transconductance.

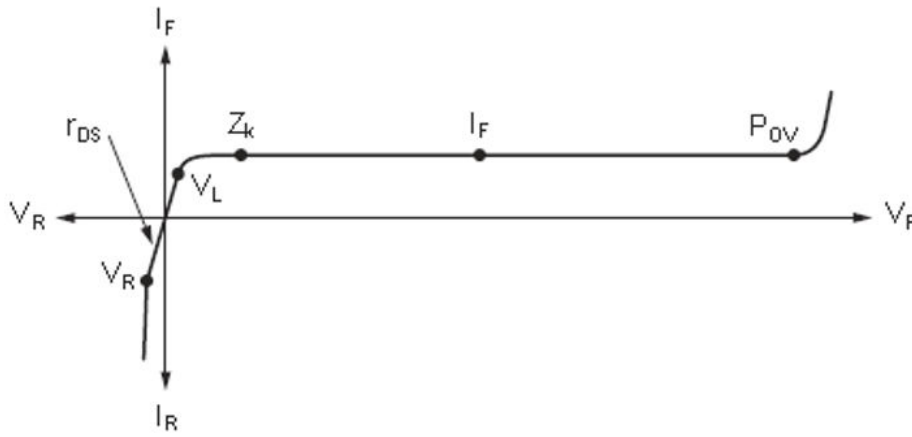


Disclaimer: It is the Buyers responsibility for designing, validating and testing the end application under all field use cases and extreme use conditions. Guaranteeing the application meets required standards, regulatory compliance, and all safety and security requirements is the responsibility of the Buyer. These resources are subject to change without notice.

JFET Parameters (Continued)

Equations	Description
I_{GSS}	Gate-Source cutoff voltage in terms of I_{DSS} and G_{FSO} .
$V_{GS(F)}$	Gate reverse current with the Drain shorted to the Source.
$V_{GS(OFF)} = \frac{2 I_{DSS}}{G_{FSO}}$	Gate-Source Forward Voltage.
$V_{DS} = \frac{V_{GS(OFF)}(I_D)^2}{G_{FSO}}$	Drain voltage at which drain current saturates.
$R_{DS} = 1/G_{FS}$	Reciprocal relationship between drain-source resistance and forward transconductance. Accurate when $V_{DS} < V_{GS(OFF)}$ (in the triode region).
$R_{DS} = \frac{(V_{GS(OFF)})^2}{K I_{DSS}(V_{GSS})^2}$	$K = 1.5$ to 2.5 , typically 2 for N-channel JFETs. (Variation of drain resistance in the triode region)
$I_D = \frac{I_{DSS}(1 - V_{GSS})^2}{V_{GS(OFF)}}$	Variation of drain current with gate-source voltage. The square law transfer characteristic.
$NF = 10 \text{ Log}_{10} \left(\frac{1 + e_N^2 + IN^2 R_G^2}{4kTR_G B} \right)$	Noise Figure in which R_G is the equivalent Gate resistance, T is absolute temperature, B is bandwidth in Hz, k is Boltzmann's constant $1.38E-23 \text{ J/}^\circ\text{K}$
$e_N^2 = \frac{(4kTB \cdot 0.63)^2}{V_{GS(OFF)}}$	Equivalent Short-Circuit Input Noise Voltage.
$V_P = V_{GS(OFF)}$	Pinch-off Voltage is very similar to Gate Source Cutoff Voltage – The Voltage at the transition point from the Linear Region to the Saturation Region.
$V_{(BR)GSS}$	Breakdown Voltage with the Gate short circuited to the Source. The maximum Voltage the device can be operated at without damage.
$I_{DZ} = I_{DSS} \frac{I_{DSS} (0.63)^2}{V_{GS(OFF)}}$	Drain Current at the Zero TC point. The biasing point on the I_D vs. V_{GS} Transfer Characteristic chart where the mobility factor and the depletion factor offset the changes in drain current relative to temperature.
$V_{GZ} = V_{GS(OFF)} + 0.7V$	The Zero temperature coefficient gate voltage is about 7/10th of a Volt above the Gate Source Cutoff Voltage.
I_{DSS}	Saturation drain current with the Gate shorted to the Source. (Max Drain Current)
$A_V = \frac{G_{FS} R_S}{1 + G_{FS} R_S}$	The Voltage Gain at the Source with a resistor R_S between the Source and Ground.

Current Regulator Diode Characteristic Curve



Current Regulator Diode Parameters

Equations	Description
P_{OV}	Peak Operating Voltage – Also known as the Breakdown Voltage
$I_{P_{OV}}$	Current at the Peak Operating Voltage
V_K	Knee Voltage – Also known as the Pinch-off Voltage – The Voltage at the transition point from the Linear Region to the Saturation Region.
I_K	Knee Current – Current at the Knee Voltage.
I_F	Forward Current – The Current flowing through the device in the Saturation region.
V_F	Forward Voltage – The Voltage across the device during operation.
$Z_D = \frac{I_{P_{OV}} - I_K}{P_{OV} - V_K}$	Dynamic Impedance – The slope of the I-V curve in the saturation region.
Z_K	Knee Impedance – The Impedance at the Knee point.