

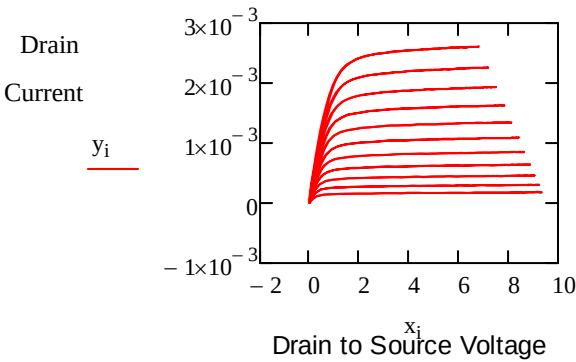
6.40E-01	7.85E-04
8.50E-01	8.80E-04
1.10E+00	9.35E-04
1.39E+00	9.70E-04
1.68E+00	9.90E-04
1.99E+00	1.00E-03
2.28E+00	1.01E-03
2.59E+00	1.02E-03
2.87E+00	1.03E-03
3.16E+00	1.04E-03
3.46E+00	1.04E-03
3.74E+00	1.04E-03
4.01E+00	1.04E-03
4.29E+00	1.05E-03
4.55E+00	1.06E-03
4.80E+00	1.06E-03
5.05E+00	1.06E-03
5.30E+00	1.06E-03
5.54E+00	1.06E-03
5.77E+00	1.06E-03
5.99E+00	1.07E-03
6.20E+00	1.07E-03
6.41E+00	1.07E-03
6.60E+00	1.07E-03
6.80E+00	1.07E-03
6.96E+00	1.08E-03
7.14E+00	1.08E-03
7.30E+00	1.08E-03
7.44E+00	1.08E-03
7.58E+00	1.08E-03
7.72E+00	1.08E-03
7.83E+00	1.08E-03
7.94E+00	1.08E-03
8.04E+00	1.08E-03
8.11E+00	1.08E-03
8.20E+00	1.09E-03
8.27E+00	1.09E-03
8.31E+00	1.09E-03

Curve Tracer Tektronix 370B

$N := \text{rows}(d) = 1.024 \times 10^3$

$i := 0 .. N - 1$

$x_i := d_{i,0} \qquad y_i := d_{i,1}$

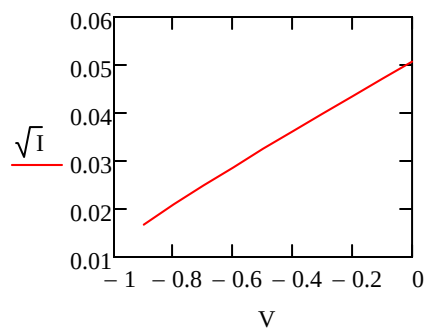


For VDS=7.5

d :=	8.35E+00	1.08E-03
	8.38E+00	1.09E-03
	8.40E+00	1.09E-03
	8.42E+00	1.09E-03
	8.41E+00	1.09E-03
	8.39E+00	1.08E-03
	8.37E+00	1.08E-03
	8.33E+00	1.09E-03
	8.28E+00	1.08E-03
	8.22E+00	1.08E-03
	8.15E+00	1.09E-03
	8.08E+00	1.08E-03
	7.98E+00	1.08E-03
	7.86E+00	1.08E-03
	7.76E+00	1.08E-03
	7.63E+00	1.08E-03
	7.51E+00	1.08E-03
	7.35E+00	1.08E-03
	7.20E+00	1.08E-03
	7.04E+00	1.08E-03
	6.87E+00	1.08E-03
	6.67E+00	1.07E-03
	6.48E+00	1.07E-03
	6.28E+00	1.07E-03
	6.07E+00	1.07E-03
	5.84E+00	1.07E-03
	5.62E+00	1.07E-03
	5.38E+00	1.07E-03
	5.15E+00	1.06E-03
	4.89E+00	1.06E-03
	4.64E+00	1.05E-03
	4.36E+00	1.05E-03
	4.09E+00	1.05E-03
	3.82E+00	1.04E-03
	3.54E+00	1.04E-03
	3.25E+00	1.04E-03
	2.96E+00	1.03E-03
	2.67E+00	1.02E-03

$$I := \begin{pmatrix} 0.00257 \\ 0.00222 \\ 0.00189 \\ 0.00159 \\ 0.00131 \\ 0.00106 \\ 0.00082 \\ 0.00062 \\ 0.00044 \\ 0.00028 \end{pmatrix} \quad V := \begin{pmatrix} 0 \\ -1 \\ -2 \\ -3 \\ -4 \\ -5 \\ -6 \\ -7 \\ -8 \\ -9 \end{pmatrix}$$

$$I_D = \beta \cdot (V_{GS} - V_{TO})^2$$



$$m := \text{slope}(V, \sqrt{I}) = 0.038 \quad b := \text{intercept}(V, \sqrt{I}) = 0.051$$

$$\beta := m^2 = 1.407 \times 10^{-3} \quad V_{TO} := \frac{-b}{\sqrt{\beta}} = -1.36$$

$$I_{DSS} := \beta \cdot V_{TO}^2 = 2.6 \times 10^{-3} \quad R_L := 10^5 \quad A_V := -5$$

2.67E+00	1.02E-03
2.37E+00	1.01E-03
2.07E+00	1.01E-03
1.75E+00	9.90E-04
1.47E+00	9.75E-04
1.18E+00	9.50E-04
9.10E-01	9.00E-04
6.70E-01	8.15E-04
4.70E-01	6.90E-04
3.20E-01	5.30E-04
1.80E-01	3.55E-04
6.00E-02	1.80E-04
-1.00E-02	2.50E-05
0.00E+00	1.00E-05
9.00E-02	1.20E-04
2.10E-01	2.85E-04
3.50E-01	4.45E-04
5.20E-01	5.80E-04
7.40E-01	6.75E-04
1.00E+00	7.30E-04
1.29E+00	7.50E-04
1.60E+00	7.70E-04
1.90E+00	7.80E-04
2.20E+00	7.85E-04
2.50E+00	8.00E-04
2.79E+00	7.95E-04
3.10E+00	8.00E-04
3.39E+00	8.10E-04
3.68E+00	8.15E-04
3.96E+00	8.15E-04
4.23E+00	8.20E-04
4.52E+00	8.25E-04
4.77E+00	8.20E-04
5.03E+00	8.20E-04
5.29E+00	8.30E-04
5.53E+00	8.30E-04
5.77E+00	8.30E-04
5.99E+00	8.30E-04

Bias Current	$I_D := \frac{I_{DSS}}{2} = 1.3 \times 10^{-3}$	6.22E+00	8.30E-04
		6.44E+00	8.35E-04
$V_{plus} := 15$	$V_{minus} := -15$	6.64E+00	8.35E-04
	Voltage across RD	6.83E+00	8.40E-04
$V_{DS} := 15$	$\frac{V_{plus}}{2} = 7.5$	7.02E+00	8.40E-04
		7.20E+00	8.35E-04
$V_{GS} := \sqrt{\frac{I_D}{\beta}} + V_{TO} = -0.398$	$V_S := -7.5$	7.36E+00	8.40E-04
		7.53E+00	8.40E-04
$R_D := \frac{7.5}{I_D} = 5.768 \times 10^3$	$V_G := V_{GS} + V_S = -7.898$	7.67E+00	8.45E-04
		7.81E+00	8.45E-04
		7.93E+00	8.45E-04
Pick sum of RG1 and RG2 to be 1 Meg		8.05E+00	8.45E-04
$1 - \frac{V_G}{V_{plus}}$		8.18E+00	8.45E-04
$R_{G1} := R \cdot \frac{1 - \frac{V_G}{V_{plus}}}{2} = 7.633 \times 10^5$		8.26E+00	8.50E-04
		8.34E+00	8.45E-04
		8.42E+00	8.45E-04
$R_{G2} := R - R_{G1} = 2.367 \times 10^5$		8.48E+00	8.45E-04
		8.54E+00	8.45E-04
$g_m := 2 \cdot \sqrt{I_D \cdot \beta} = 2.705 \times 10^{-3}$		8.58E+00	8.50E-04
		8.61E+00	8.50E-04
$r_s := \frac{1}{g_m} = 369.702$		8.63E+00	8.45E-04
		8.63E+00	8.50E-04
$R_{S1} := \left(\frac{R_D \cdot R_L}{R_D + R_L} \right) \cdot \frac{1}{-A_v} - r_s = 721.055$		8.64E+00	8.45E-04
		8.62E+00	8.45E-04
		8.60E+00	8.45E-04
$\frac{V_{plus}}{2}$		8.56E+00	8.45E-04
$R_S := \frac{2}{I_D} = 5.768 \times 10^3$		8.51E+00	8.50E-04
		8.46E+00	8.50E-04
		8.39E+00	8.50E-04
$R_{S2} := R_S - R_{S1} = 5.047 \times 10^3$		8.31E+00	8.45E-04
		8.22E+00	8.50E-04
		8.11E+00	8.50E-04
		8.00E+00	8.45E-04
		7.88E+00	8.45E-04
		7.73E+00	8.45E-04
		7.60E+00	8.40E-04
		7.45E+00	8.40E-04
		7.30E+00	8.40E-04

7.29E+00	8.40E-04
7.12E+00	8.40E-04
6.93E+00	8.35E-04
6.74E+00	8.35E-04
6.53E+00	8.30E-04
6.31E+00	8.30E-04
6.11E+00	8.35E-04
5.88E+00	8.30E-04
5.65E+00	8.30E-04
5.40E+00	8.25E-04
5.16E+00	8.25E-04
4.90E+00	8.25E-04
4.65E+00	8.15E-04
4.37E+00	8.20E-04
4.10E+00	8.15E-04
3.83E+00	8.15E-04
3.52E+00	8.10E-04
3.23E+00	8.00E-04
2.94E+00	8.00E-04
2.65E+00	7.95E-04
2.35E+00	7.90E-04
2.04E+00	7.85E-04
1.74E+00	7.70E-04
1.43E+00	7.55E-04
1.12E+00	7.40E-04
8.40E-01	7.00E-04
5.90E-01	6.30E-04
3.90E-01	5.15E-04
2.30E-01	3.60E-04
1.00E-01	1.95E-04
0.00E+00	4.50E-05
-1.00E-02	0.00E+00
8.00E-02	8.50E-05
1.90E-01	2.40E-04
3.60E-01	3.75E-04
5.70E-01	4.80E-04
8.30E-01	5.30E-04
1.12E+00	5.60E-04

1.43E+00	5.70E-04
1.73E+00	5.85E-04
2.05E+00	5.85E-04
2.36E+00	5.95E-04
2.67E+00	6.00E-04
2.96E+00	6.05E-04
3.25E+00	6.05E-04
3.54E+00	6.05E-04
3.85E+00	6.05E-04
4.13E+00	6.10E-04
4.41E+00	6.15E-04
4.68E+00	6.15E-04
4.95E+00	6.20E-04
5.21E+00	6.15E-04
5.48E+00	6.25E-04
5.72E+00	6.25E-04
5.95E+00	6.25E-04
6.19E+00	6.25E-04
6.41E+00	6.25E-04
6.63E+00	6.30E-04
6.84E+00	6.30E-04
7.03E+00	6.30E-04
7.22E+00	6.30E-04
7.40E+00	6.30E-04
7.57E+00	6.30E-04
7.73E+00	6.30E-04
7.88E+00	6.35E-04
8.02E+00	6.30E-04
8.15E+00	6.40E-04
8.28E+00	6.35E-04
8.38E+00	6.40E-04
8.49E+00	6.35E-04
8.58E+00	6.40E-04
8.65E+00	6.35E-04
8.72E+00	6.40E-04
8.78E+00	6.35E-04
8.81E+00	6.35E-04
8.85E+00	6.40E-04

8.85E+00	6.40E-04
8.87E+00	6.40E-04
8.88E+00	6.35E-04
8.88E+00	6.40E-04
8.87E+00	6.40E-04
8.84E+00	6.35E-04
8.80E+00	6.40E-04
8.76E+00	6.40E-04
8.71E+00	6.40E-04
8.63E+00	6.40E-04
8.55E+00	6.35E-04
8.46E+00	6.40E-04
8.36E+00	6.35E-04
8.25E+00	6.35E-04
8.13E+00	6.35E-04
8.00E+00	6.35E-04
7.85E+00	6.35E-04
7.69E+00	6.35E-04
7.54E+00	6.30E-04
7.35E+00	6.25E-04
7.17E+00	6.30E-04
6.98E+00	6.30E-04
6.78E+00	6.30E-04
6.57E+00	6.25E-04
6.36E+00	6.25E-04
6.12E+00	6.20E-04
5.88E+00	6.25E-04
5.64E+00	6.25E-04
5.40E+00	6.20E-04
5.13E+00	6.20E-04
4.87E+00	6.20E-04
4.59E+00	6.15E-04
4.33E+00	6.10E-04
4.04E+00	6.10E-04
3.75E+00	6.05E-04
3.46E+00	6.00E-04
3.17E+00	6.05E-04
2.85E+00	6.00E-04

2.55E+00	5.90E-04
2.25E+00	5.90E-04
1.93E+00	5.80E-04
1.62E+00	5.75E-04
1.32E+00	5.65E-04
1.00E+00	5.50E-04
7.10E-01	5.15E-04
4.60E-01	4.45E-04
2.70E-01	3.30E-04
1.10E-01	1.80E-04
1.00E-02	4.50E-05
0.00E+00	0.00E+00
8.00E-02	8.50E-05
2.20E-01	2.15E-04
4.20E-01	3.15E-04
6.80E-01	3.70E-04
9.80E-01	3.90E-04
1.28E+00	4.00E-04
1.59E+00	4.10E-04
1.90E+00	4.15E-04
2.22E+00	4.15E-04
2.52E+00	4.25E-04
2.84E+00	4.30E-04
3.14E+00	4.30E-04
3.44E+00	4.30E-04
3.73E+00	4.30E-04
4.03E+00	4.35E-04
4.31E+00	4.40E-04
4.59E+00	4.30E-04
4.86E+00	4.40E-04
5.13E+00	4.40E-04
5.39E+00	4.40E-04
5.64E+00	4.45E-04
5.89E+00	4.40E-04
6.12E+00	4.45E-04
6.35E+00	4.45E-04
6.59E+00	4.45E-04
6.78E+00	4.45E-04

6.79E+00	4.45E-04
7.01E+00	4.45E-04
7.21E+00	4.45E-04
7.39E+00	4.50E-04
7.57E+00	4.45E-04
7.74E+00	4.45E-04
7.91E+00	4.50E-04
8.06E+00	4.50E-04
8.19E+00	4.55E-04
8.33E+00	4.55E-04
8.44E+00	4.55E-04
8.56E+00	4.55E-04
8.64E+00	4.55E-04
8.74E+00	4.55E-04
8.82E+00	4.50E-04
8.89E+00	4.55E-04
8.94E+00	4.55E-04
8.99E+00	4.60E-04
9.02E+00	4.55E-04
9.04E+00	4.60E-04
9.05E+00	4.55E-04
9.05E+00	4.60E-04
9.05E+00	4.55E-04
9.02E+00	4.55E-04
8.98E+00	4.60E-04
8.93E+00	4.55E-04
8.88E+00	4.55E-04
8.82E+00	4.55E-04
8.73E+00	4.60E-04
8.64E+00	4.55E-04
8.55E+00	4.50E-04
8.43E+00	4.55E-04
8.32E+00	4.50E-04
8.18E+00	4.50E-04
8.04E+00	4.50E-04
7.89E+00	4.50E-04
7.73E+00	4.45E-04
7.56E+00	4.50E-04

7.37E+00	4.45E-04
7.18E+00	4.50E-04
6.99E+00	4.45E-04
6.77E+00	4.45E-04
6.56E+00	4.45E-04
6.33E+00	4.45E-04
6.10E+00	4.40E-04
5.86E+00	4.40E-04
5.60E+00	4.45E-04
5.35E+00	4.40E-04
5.09E+00	4.40E-04
4.82E+00	4.35E-04
4.55E+00	4.35E-04
4.27E+00	4.35E-04
3.98E+00	4.30E-04
3.68E+00	4.25E-04
3.39E+00	4.30E-04
3.09E+00	4.25E-04
2.79E+00	4.20E-04
2.48E+00	4.20E-04
2.17E+00	4.15E-04
1.85E+00	4.10E-04
1.55E+00	4.10E-04
1.23E+00	3.95E-04
9.20E-01	3.85E-04
6.20E-01	3.60E-04
3.70E-01	3.00E-04
1.60E-01	1.85E-04
3.00E-02	6.00E-05
-1.00E-02	-5.00E-06
7.00E-02	5.00E-05
2.30E-01	1.65E-04
4.50E-01	2.25E-04
7.50E-01	2.45E-04
1.05E+00	2.60E-04
1.37E+00	2.60E-04
1.69E+00	2.70E-04
2.00E+00	2.70E-04

2.00E+00	2.70E-04
2.31E+00	2.75E-04
2.63E+00	2.75E-04
2.94E+00	2.75E-04
3.24E+00	2.80E-04
3.54E+00	2.80E-04
3.85E+00	2.80E-04
4.13E+00	2.85E-04
4.42E+00	2.80E-04
4.71E+00	2.85E-04
4.98E+00	2.85E-04
5.25E+00	2.90E-04
5.51E+00	2.90E-04
5.78E+00	2.85E-04
6.02E+00	2.95E-04
6.27E+00	2.90E-04
6.50E+00	2.90E-04
6.73E+00	2.90E-04
6.94E+00	3.00E-04
7.15E+00	2.90E-04
7.35E+00	2.95E-04
7.54E+00	2.95E-04
7.73E+00	2.90E-04
7.90E+00	2.95E-04
8.06E+00	2.95E-04
8.21E+00	2.95E-04
8.36E+00	2.95E-04
8.48E+00	3.00E-04
8.61E+00	3.00E-04
8.72E+00	3.00E-04
8.82E+00	3.05E-04
8.92E+00	3.00E-04
8.99E+00	3.00E-04
9.05E+00	3.00E-04
9.12E+00	3.00E-04
9.16E+00	3.00E-04
9.20E+00	3.00E-04
9.22E+00	3.00E-04

9.23E+00	3.05E-04
9.23E+00	3.00E-04
9.23E+00	3.05E-04
9.20E+00	3.00E-04
9.17E+00	3.05E-04
9.12E+00	3.05E-04
9.07E+00	3.00E-04
9.00E+00	3.00E-04
8.92E+00	3.05E-04
8.83E+00	2.95E-04
8.72E+00	3.00E-04
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8.23E+00	3.00E-04
8.07E+00	2.95E-04
7.92E+00	2.95E-04
7.74E+00	2.95E-04
7.56E+00	2.90E-04
7.37E+00	2.90E-04
7.17E+00	2.95E-04
6.96E+00	2.95E-04
6.73E+00	2.95E-04
6.51E+00	2.85E-04
6.28E+00	2.90E-04
6.03E+00	2.90E-04
5.78E+00	2.85E-04
5.53E+00	2.85E-04
5.25E+00	2.85E-04
4.99E+00	2.85E-04
4.72E+00	2.85E-04
4.43E+00	2.85E-04
4.15E+00	2.85E-04
3.86E+00	2.80E-04
3.55E+00	2.80E-04
3.25E+00	2.80E-04
2.94E+00	2.75E-04
2.62E+00	2.75E-04

2.63E+00	2.75E-04
2.32E+00	2.70E-04
2.01E+00	2.70E-04
1.69E+00	2.65E-04
1.38E+00	2.60E-04
1.05E+00	2.55E-04
7.40E-01	2.45E-04
4.50E-01	2.25E-04
2.00E-01	1.55E-04
5.00E-02	5.00E-05
0.00E+00	0.00E+00
7.00E-02	4.00E-05
2.70E-01	1.10E-04
5.50E-01	1.40E-04
8.60E-01	1.45E-04
1.17E+00	1.50E-04
1.49E+00	1.55E-04
1.81E+00	1.55E-04
2.12E+00	1.55E-04
2.43E+00	1.55E-04
2.75E+00	1.60E-04
3.06E+00	1.65E-04
3.37E+00	1.60E-04
3.67E+00	1.60E-04
3.96E+00	1.70E-04
4.25E+00	1.65E-04
4.54E+00	1.65E-04
4.82E+00	1.65E-04
5.09E+00	1.65E-04
5.37E+00	1.65E-04
5.63E+00	1.70E-04
5.88E+00	1.70E-04
6.13E+00	1.70E-04
6.38E+00	1.65E-04
6.61E+00	1.70E-04
6.84E+00	1.70E-04
7.06E+00	1.70E-04
7.27E+00	1.70E-04

7.46E+00	1.70E-04
7.66E+00	1.70E-04
7.84E+00	1.70E-04
8.00E+00	1.70E-04
8.17E+00	1.75E-04
8.32E+00	1.75E-04
8.46E+00	1.75E-04
8.60E+00	1.70E-04
8.72E+00	1.75E-04
8.83E+00	1.75E-04
8.94E+00	1.75E-04
9.03E+00	1.75E-04
9.10E+00	1.80E-04
9.17E+00	1.90E-04
9.22E+00	1.80E-04
9.27E+00	1.75E-04
9.31E+00	1.75E-04
9.32E+00	1.80E-04
9.34E+00	1.75E-04
9.35E+00	1.75E-04
9.33E+00	1.80E-04
9.32E+00	1.75E-04
9.29E+00	1.80E-04
9.24E+00	1.75E-04
9.19E+00	1.80E-04
9.13E+00	1.80E-04
9.05E+00	1.80E-04
8.96E+00	1.80E-04
8.86E+00	1.80E-04
8.75E+00	1.75E-04
8.63E+00	1.70E-04
8.51E+00	1.75E-04
8.37E+00	1.70E-04
8.21E+00	1.70E-04
8.05E+00	1.70E-04
7.88E+00	1.70E-04
7.70E+00	1.70E-04
7.54E+00	1.70E-04

7.51E+00	1.70E-04
7.32E+00	1.70E-04
7.11E+00	1.70E-04
6.89E+00	1.70E-04
6.67E+00	1.70E-04
6.43E+00	1.65E-04
6.20E+00	1.65E-04
5.94E+00	1.65E-04
5.69E+00	1.65E-04
5.43E+00	1.65E-04
5.16E+00	1.65E-04
4.88E+00	1.65E-04
4.59E+00	1.65E-04
4.31E+00	1.70E-04
4.02E+00	1.65E-04
3.73E+00	1.60E-04
3.43E+00	1.65E-04
3.11E+00	1.60E-04
2.81E+00	1.60E-04
2.49E+00	1.55E-04
2.19E+00	1.55E-04
1.87E+00	1.55E-04
1.54E+00	1.50E-04
1.23E+00	1.50E-04
9.10E-01	1.45E-04
6.10E-01	1.40E-04
3.10E-01	1.15E-04
8.00E-02	5.50E-05