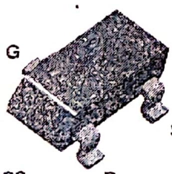
FAIRCHILD
SEMICONDUCTOR™

2N5484 2N5485 2N5486

MMBF5484 MMBF5485 MMBF5486

G S D

TO-92



G S D

SOT-23
Mark: 6B / 6M / 6H

NOTE: Source & Drain are interchangeable

N-Channel RF Amplifier

This device is designed primarily for electronic switching applications such as low On Resistance analog switching. Sourced from Process 50.

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
		2N5484-5486	*MMBF5484-5486	
P_D	Total Device Dissipation Derate above 25°C	350 2.8	225 1.8	mW mW/°C
$R_{\theta JC}$	Thermal Resistance, Junction to Case	125		°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	357	556	°C/W

*Device mounted on FR-4 PCB 1.6" X 1.6" X 0.06."

N-Channel RF Amplifier
(continued)

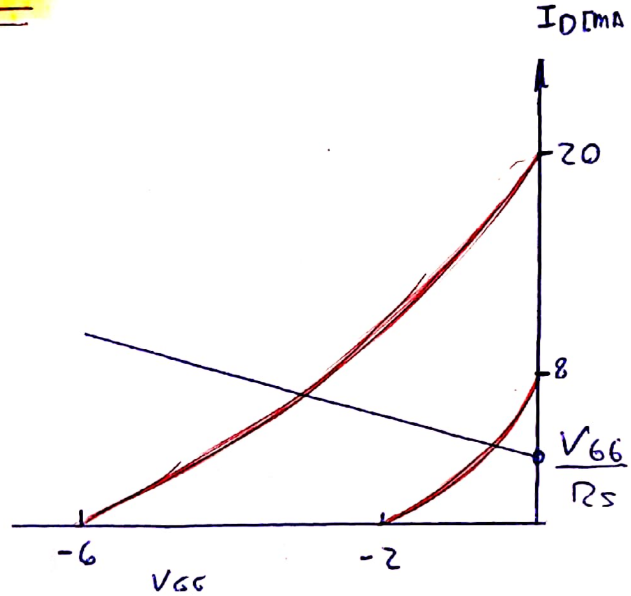
Electrical Characteristics

TA = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
OFF CHARACTERISTICS						
$V_{(BR)GSS}$	Gate-Source Breakdown Voltage	I_G = - 1.0 µA, V_{DS} = 0	- 25			V
I_{GSS}	Gate Reverse Current	V_{GS} = - 20 V, V_{DS} = 0			- 1.0	nA
		V_{GS}= - 20 V, V_{DS}= 0, T_A= 100°C			- 0.2	µA
$V_{GS(off)}$ VGSoff	Gate-Source Cutoff Voltage	V_{DS} = 15 V, I_D = 10 nA 5484	- 0.3		- 3.0	V
		5485	- 0.5		- 4.0	V
		5486	- 2.0		- 6.0	V
ON CHARACTERISTICS						
I_{DSS} IDSS MAX	Zero-Gate Voltage Drain Current*	V_{DS} = 15 V, V_{GS} = 0 5484	1.0		5.0	mA
		5485	4.0		10	mA
		5486	8.0		20	mA
SMALL SIGNAL CHARACTERISTICS						
g_{fs}	Forward Transfer Conductance	V_{DS} = 15 V, V_{GS} = 0, f = 1.0 kHz 5484	3000		6000	µmhos
		5485	3500		7000	µmhos
		5486	4000		8000	µmhos
$Re(y_{is})$ 1/rgs	Input Conductance	V_{DS} = 15 V, V_{GS} = 0, f = 100 MHz 5484			100	µmhos
		V_{DS} = 15 V, V_{GS} = 0, f = 400 MHz 5485 / 5486			1000	µmhos
g_{os}	Output Conductance	V_{DS} = 15 V, V_{GS} = 0, f = 1.0 kHz 5484			50	µmhos
		5485			60	µmhos
		5486			75	µmhos
$Re(y_{os})$	Output Conductance	V_{DS} = 15 V, V_{GS} = 0, f = 100 MHz 5484			75	µmhos
		V_{DS} = 15 V, V_{GS} = 0, f = 400 MHz 5485 / 5486			100	µmhos
$Re(y_{fs})$	Forward Transconductance	V_{DS} = 15 V, V_{GS} = 0, f = 100 MHz 5484	2500			µmhos
		V_{DS} = 15 V, V_{GS} = 0, f = 400 MHz 5485	3000			µmhos
		5486	3500			µmhos
C_{iss}	Input Capacitance	V_{DS} = 15 V, V_{GS} = 0, f = 1.0 MHz			5.0	pF
C_{rss}	Reverse Transfer Capacitance	V_{DS} = 15 V, V_{GS} = 0, f = 1.0 MHz			1.0	pF
C_{oss}	Output Capacitance	V_{DS} = 15 V, V_{GS} = 0, f = 1.0 MHz			2.0	pF
NF	Noise Figure	V_{DS}= 15 V, R_G = 1.0 kΩ, f = 100 MHz 5484			3.0	dB
		V_{DS}= 15 V, R_G = 1.0 kΩ, f = 400 MHz 5484		4.0		dB
		V_{DS}= 15 V, R_G = 1.0 kΩ, f = 100 MHz 5485 / 5486			2.0	dB
		V_{DS}= 15 V, R_G = 1.0 kΩ, f = 400 MHz 5485 / 5486			4.0	dB

*Pulse Test: Pulse Width ≤ 300 ms, Duty Cycle ≤ 2%

2N5486 - NJFE

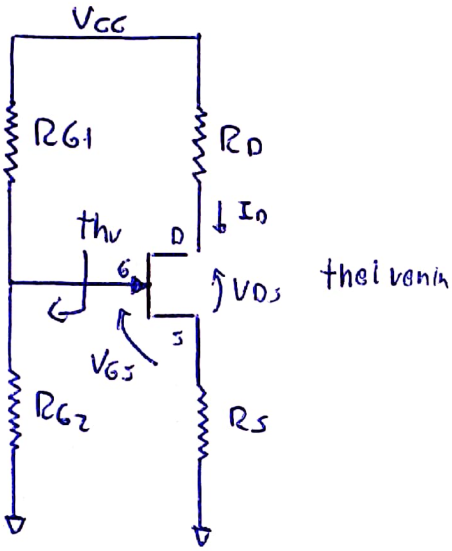


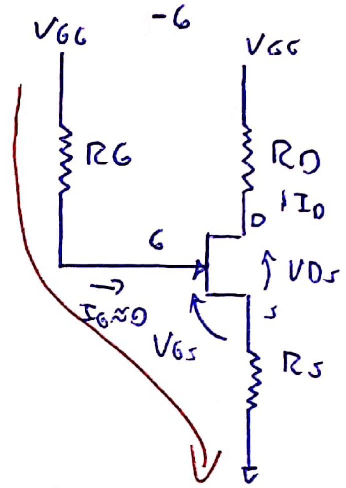
$I_{DSS} = [8, 20]\, mA$

$V_P = [-2, -6]\, V$

se pide:

I_D orden de la unidad $\approx 5\,mA$





$$V_{GG} = V_{CC} \cdot \frac{R_{G2}}{R_{G1} + R_{G2}} \qquad R_G = \frac{R_{G1} \cdot R_{G2}}{R_{G1} + R_{G2}}$$

Analizando malla de entrada

$$V_{GG} - V_{GS} - I_D R_S = 0$$

$$I_D = \frac{V_{GG} - V_{GS}}{R_S}$$

Una cota del circuito:

$$0 < \frac{V_{GG}}{R_S} < I_{DSS\,min}$$

Realizo los calculos para los valores minimos

$$0 < \frac{V_{CC}}{R_S} \cdot \frac{R_{G2}}{R_{G1} + R_{G2}} < I_{DSS\,min}$$

$$0 < \frac{R_{G2}}{R_{G1} + R_{G2}} < I_{DSS\,min} \cdot \frac{R_S}{V_{CC}}$$

Para $V_{CC} = 12$ | $R_S = 470$ | Para $V_{CC} = 18$

$$0 < \frac{R_{G2}}{R_{G1} + R_{G2}} < 0{,}31$$

si $R_{G1} = 820K$

$R_{G2} = 100K$

$$0 < 0{,}11 < 0{,}67$$

$R_G = 89K$

$V_{GG} = 1{,}30V$

$$0 < \frac{R_{G2}}{R_{G1} + R_{G2}} < 0{,}21$$

$$0 < 0{,}11 < 0{,}21$$

$R_G = 89K$

$V_{GG} = 1{,}95V$

$$I_{DQ} = I_{DSS} \cdot \left(1 - \frac{V_{GS}}{V_P}\right)^2$$

$$I_{DQ} = \frac{V_{GG} - V_{GS}}{R_S}$$

$$0 = I_{DQ}^2 \left(\frac{R_S}{V_P}\right)^2 + I_{DQ}\left(2 \cdot \frac{R_S}{V_P}\left(1 - \frac{V_{GG}}{V_P}\right) - \frac{1}{I_{DSS}}\right) + \left(1 - \frac{V_{GG}}{V_P}\right)$$

Para $V_{CC} = 12$

$I_{DQ} = 4{,}02mA$

$V_{GS} = -0{,}58V$

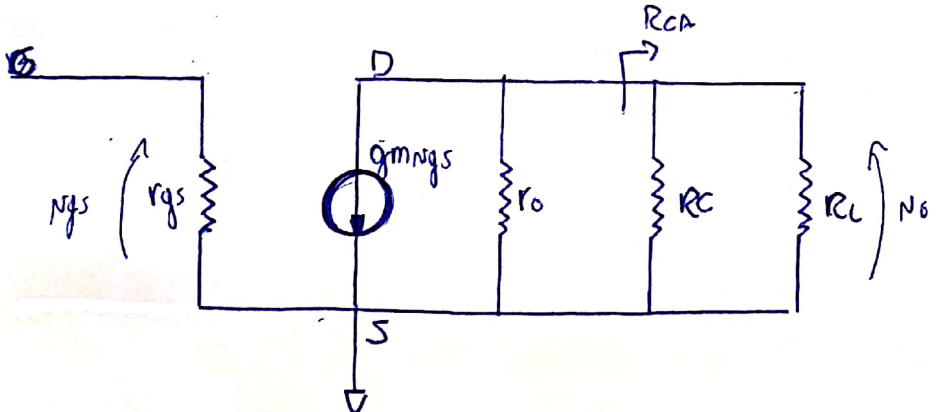
$g_m = 5{,}7$ msimes

Para $V_{CC} = 18$

$I_{DQ} = 5{,}04mA$

$V_{GS} = -0{,}41mA$

$g_m = 6{,}4$ msimes



$r_{GS} \approx M\Omega$

$r_o \to \infty$

$$A_V = \frac{V_o}{V_i} = -\frac{g_m \cdot \cancel{V_{gs}} \cdot R_{CA}}{\cancel{V_{gs}}}$$

Para maximizar R_{CA}

$R_C = 1k$

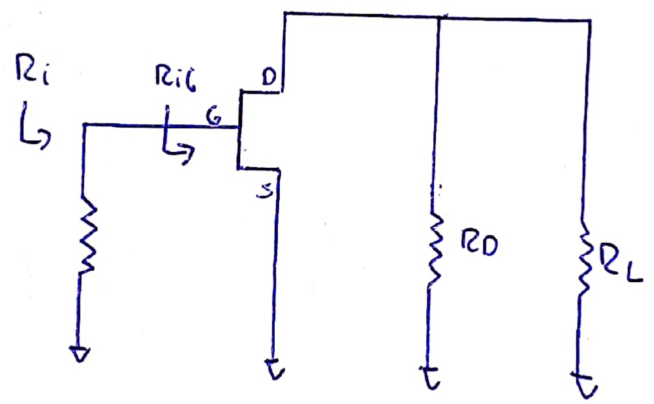
$R_L = 10k$

$A_V = -5{,}7m \cdot \frac{1k \cdot 10k}{1k + 10k}$

$A_V = -5{,}18$

$A_V = -6{,}4m \cdot \frac{1k \cdot 10k}{1k + 10k}$

$A_V = -5{,}81$



$R_{iG} = r_{GS} \approx 1M\Omega$

$R_i \approx R_B = 89K$

$r_{oD} = r_o$

r