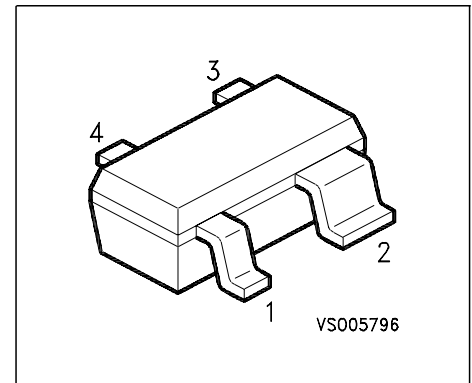
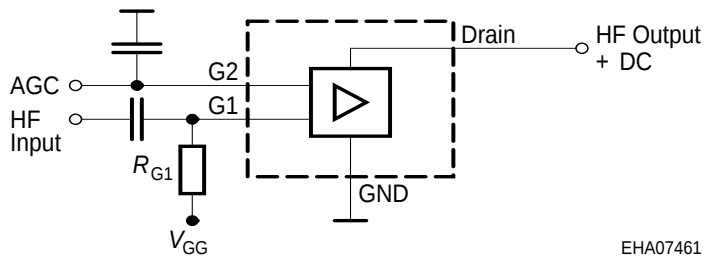


Silicon N-Channel MOSFET Tetrode

- For low noise, high gain controlled input stages up to 1GHz
- Operating voltage 5V



ESD: Electrostatic discharge sensitive device, observe handling precaution!

Class 2 (2000V - 4000V) pin to pin **Human Body Model**

Type	Marking	Pin Configuration				Package
BF2040R	NCs	1 = D	2 = S	3 = G1	4 = G2	SOT143R

Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-source voltage	V_{DS}	8	V
Continuous drain current	I_D	20	mA
Gate 1/gate 2 peak source current	$\pm I_{G1/2SM}$	10	
Gate 1 (external biasing)	$+V_{G1SE}$	7	V
Total power dissipation, $T_S = 76^\circ\text{C}$	P_{tot}	200	mW
Storage temperature	T_{stg}	-55 ... 150	$^\circ\text{C}$
Channel temperature	T_{ch}	150	

Thermal Resistance

Channel - soldering point ¹⁾	R_{thchs}	≤ 370	K/W
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¹⁾For calculation of R_{thJA} please refer to Application Note Thermal Resistance

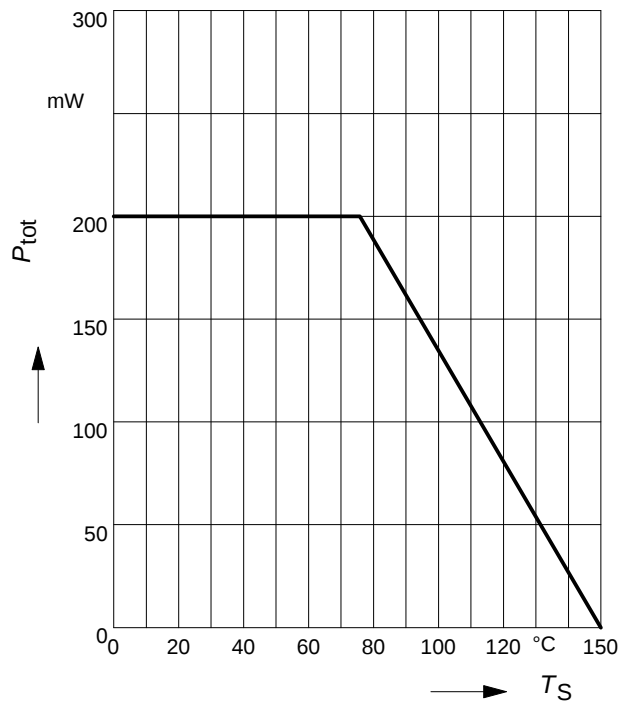
Electrical Characteristics at $T_A = 25^\circ\text{C}$, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Drain-source breakdown voltage $I_D = 20\ \mu\text{A}$, $V_{G1S} = 0\ \text{V}$, $V_{G2S} = 0\ \text{V}$	$V_{(\text{BR})\text{DS}}$	10	-	-	V
Gate 1 - source breakdown voltage $+I_{G1S} = 10\ \text{mA}$, $V_{G2S} = 0\ \text{V}$, $V_{\text{DS}} = 0\ \text{V}$	$+V_{(\text{BR})\text{G1SS}}$	6	-	15	
Gate 2 - source breakdown voltage $+I_{G2S} = 10\ \text{mA}$, $V_{G1S} = 0\ \text{V}$, $V_{\text{DS}} = 0\ \text{V}$	$+V_{(\text{BR})\text{G2SS}}$	6	-	15	
Gate 1 source leakage current $V_{G1S} = 5\ \text{V}$, $V_{G2S} = 0\ \text{V}$, $V_{\text{DS}} = 0\ \text{V}$	$+I_{\text{G1SS}}$	-	-	50	nA
Gate 2 source leakage current $V_{G2S} = 5\ \text{V}$, $V_{G1S} = 0\ \text{V}$, $V_{\text{DS}} = 0\ \text{V}$	$+I_{\text{G2SS}}$	-	-	50	nA
Drain current $V_{\text{DS}} = 5\ \text{V}$, $V_{G1S} = 0\ \text{V}$, $V_{G2S} = 4\ \text{V}$	I_{DSS}	-	-	50	μA
Drain-source current $V_{\text{DS}} = 5\ \text{V}$, $V_{G2S} = 4\ \text{V}$, $R_{\text{G1}} = 100\ \text{k}\Omega$	I_{DSX}	-	15	-	mA
Gate 2-source pinch-off voltage $V_{\text{DS}} = 5\ \text{V}$, $I_D = 20\ \mu\text{A}$	$V_{\text{G2S(p)}}$	0.3	0.7	-	V
Gate 1-source pinch-off voltage $V_{\text{DS}} = 5\ \text{V}$, $V_{G2S} = 4\ \text{V}$, $I_D = 20\ \mu\text{A}$	$V_{\text{G1S(p)}}$	0.3	0.6	-	

Electrical Characteristics at $T_A = 25\text{ °C}$, unless otherwise specified.

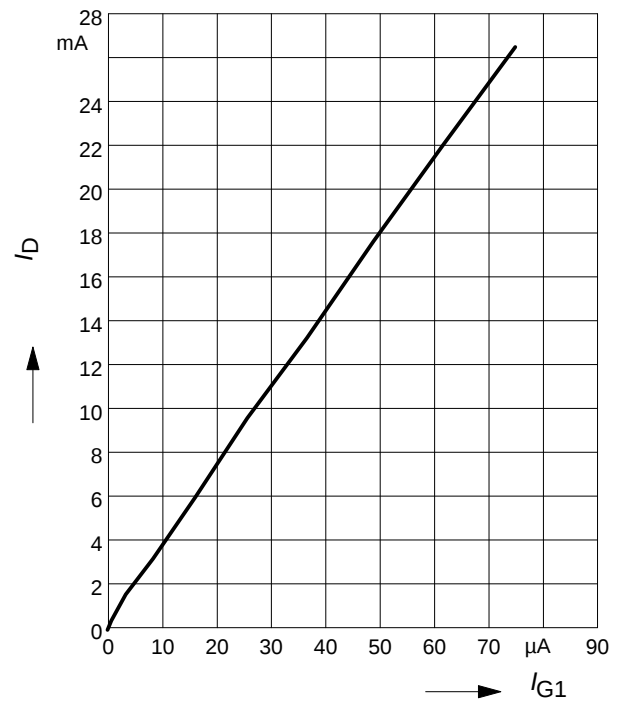
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC characteristics					
Forward transconductance $V_{DS} = 5\text{ V}$, $I_D = 15\text{ mA}$, $V_{G2S} = 4\text{ V}$	g_{fs}	-	42	-	mS
Gate 1 input capacitance $V_{DS} = 5\text{ V}$, $I_D = 15\text{ mA}$, $V_{G2S} = 4\text{ V}$, $f = 1\text{ MHz}$	C_{g1ss}	-	2.9	-	pF
Output capacitance $V_{DS} = 5\text{ V}$, $I_D = 15\text{ mA}$, $V_{G2S} = 4\text{ V}$, $f = 1\text{ MHz}$	C_{dss}	-	1.6	-	
Power gain $V_{DS} = 5\text{ V}$, $I_D = 15\text{ mA}$, $V_{G2S} = 4\text{ V}$, $f = 800\text{ MHz}$	G_{ps}	20	23	-	dB
Noise figure $V_{DS} = 5\text{ V}$, $I_D = 15\text{ mA}$, $V_{G2S} = 4\text{ V}$, $f = 800\text{ MHz}$	F	-	1.6	2.2	
Gain control range $V_{DS} = 5\text{ V}$, $V_{G2S} = 4 \dots 0\text{V}$, $f = 800\text{ MHz}$	ΔG_{ps}	45	50	-	

Total power dissipation $P_{\text{tot}} = f(T_S)$



Drain current $I_D = f(I_{G1})$

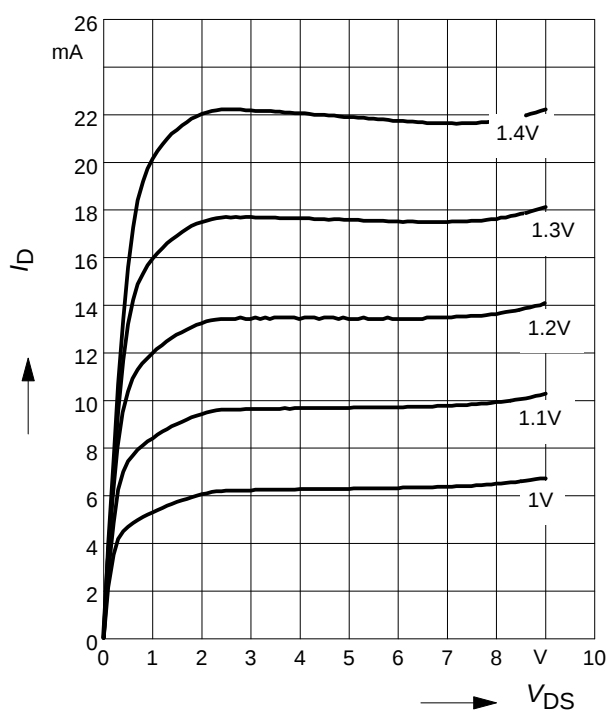
$V_{G2S} = 4 \text{ V}$



Output characteristics $I_D = f(V_{DS})$

$V_{G2S} = 4 \text{ V}$

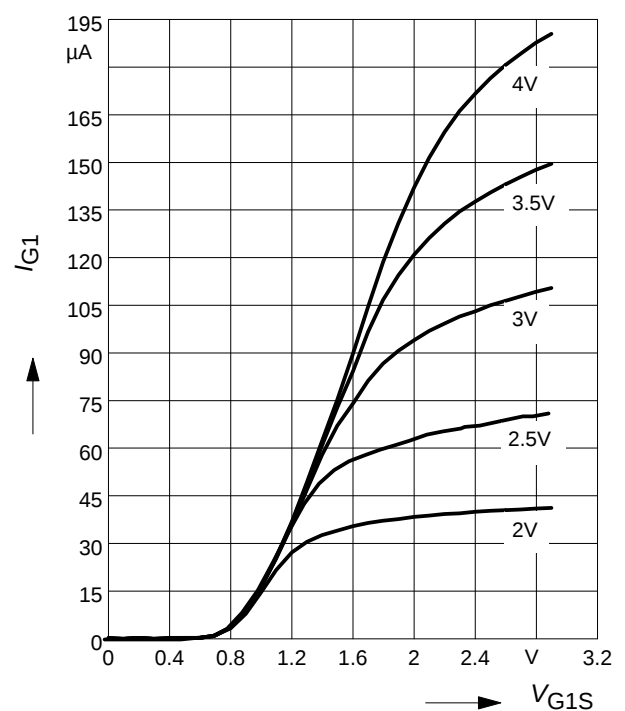
$V_{G1S} = \text{Parameter}$



Gate 1 current $I_{G1} = f(V_{G1S})$

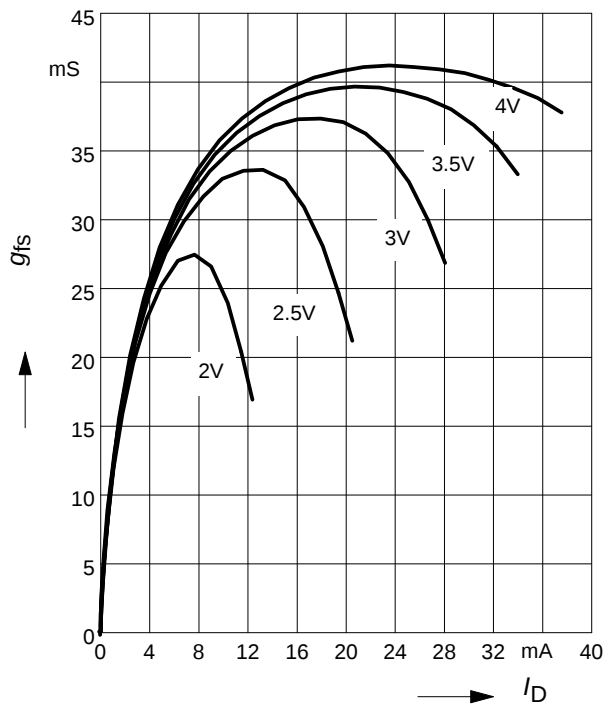
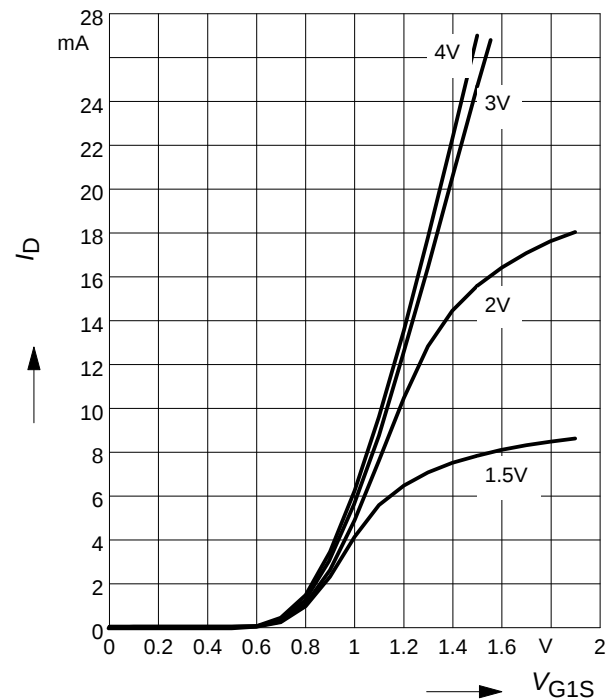
$V_{DS} = 5 \text{ V}$

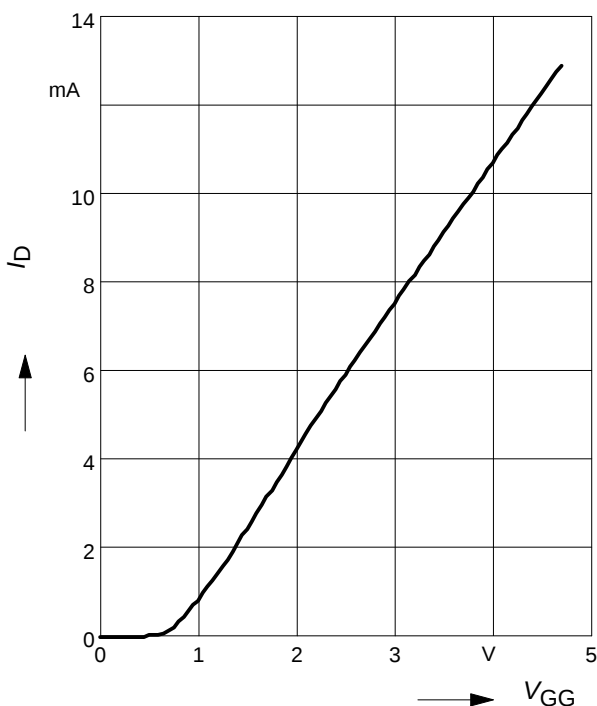
$V_{G2S} = \text{Parameter}$



Gate 1 forward transconductance

$$g_{fs} = f(I_D)$$

 $V_{DS} = 5 \text{ V}, V_{G2S} = \text{Parameter}$

Drain current $I_D = f(V_{G1S})$
 $V_{DS} = 5 \text{ V}$
 $V_{G2S} = \text{Parameter}$

Drain current $I_D = f(V_{GG})$
 $V_{DS} = 5 \text{ V}, V_{G2S} = 4 \text{ V}, R_{G1} = 100 \text{ k}\Omega$

 (connected to V_{GG} , $V_{GG} = \text{gate1 supply voltage}$)

Drain current $I_D = f(V_{GG})$
 $V_{G2S} = 4 \text{ V}$
 $R_{G1} = \text{Parameter in k}\Omega$
