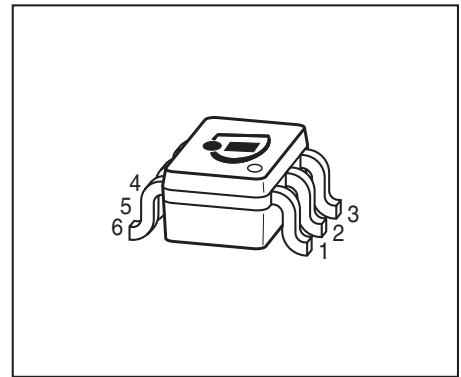
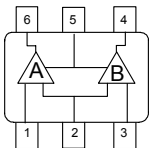


Dual N-Channel MOSFET Tetrode

- Designed for input stages of 2 band tuners
- Two AGC amplifiers in one single package, with on-chip internal switch
- Only one switching line to control both FETs
- Integrated gate protection diodes
- Ultra low noise figure
- Excellent cross modulation at gain reduction
- Integrated ESD gate protection diodes
- Pb-free (RoHS compliant) package
- Qualified according AEC Q101



Detailed functional diagram on page 5


BG5412K


ESD (Electrostatic discharge) sensitive device, observe handling precaution!

Type	Package	Pin Configuration						Marking
BG5412K	SOT363	1=G1*	2=G2	3=G1**	4=D**	5=S	6=D*	K2s

* For amp. A; ** for amp. B

180° rotated tape loading orientation available

Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-source voltage	V_{DS}	8	V
Continuous drain current amp. A	I_D	25	mA
amp. B		25	
Gate 1/ gate 2-source current	I_{G1S}, I_{G2S}	± 1	mA
Gate 1/ gate 2-source voltage	V_{G1S}, V_{G2S}	± 6	V
Total power dissipation $T_S \leq 94 \text{ }^\circ\text{C}$	P_{tot}	200	mW
Storage temperature	T_{stg}	-55 ... 150	$^\circ\text{C}$
Channel temperature	T_{ch}	150	

Thermal Resistance

Parameter	Symbol	Value	Unit
Channel - soldering point ¹⁾	R_{thchs}	≤ 280	K/W

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

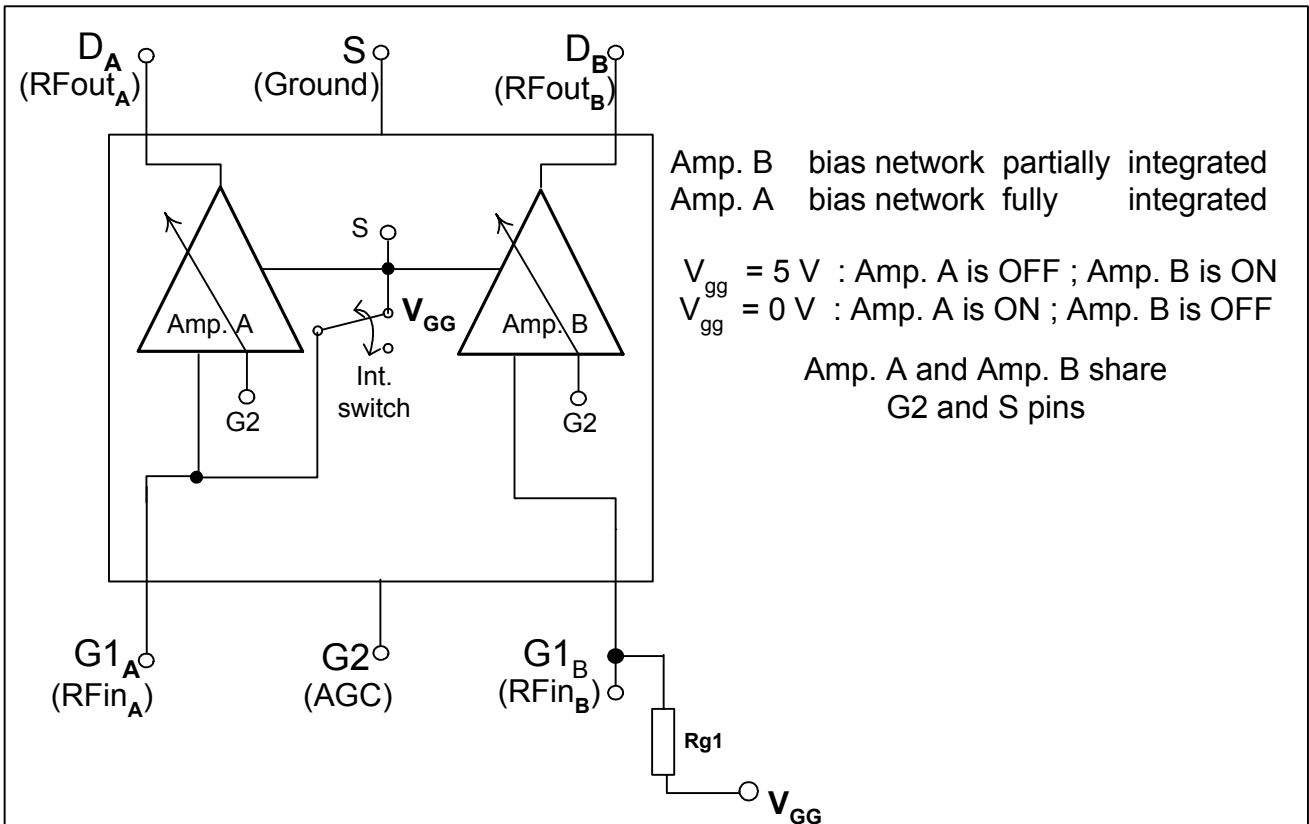
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC Characteristics					
Drain-source breakdown voltage $I_D = 100 \mu\text{A}$, $V_{G1S} = 0$, $V_{G2S} = 0$	$V_{(BR)DS}$	12	-	-	V
Gate1-source breakdown voltage $+I_{G1S} = 10 \text{ mA}$, $V_{G2S} = 0$, $V_{DS} = 0$	$+V_{(BR)G1SS}$	6	-	15	
Gate2-source breakdown voltage $+I_{G2S} = 10 \text{ mA}$, $V_{G1S} = 0$, $V_{DS} = 0$	$+V_{(BR)G2SS}$	6	-	15	
Gate1-source leakage current $V_{G1S} = 6 \text{ V}$, $V_{G2S} = 0$, $V_{DS} = 0$	$+I_{G1SS}$	-	-	50	nA
Gate2-source leakage current $V_{G2S} = 8 \text{ V}$, $V_{G1S} = 0$	$+I_{G2SS}$	-	-	50	
Drain current $V_{DS} = 5 \text{ V}$, $V_{G1S} = 0$, $V_{G2S} = 4 \text{ V}$	I_{DSS}	-	-	100	μA
Drain-source current $V_{DS} = 5 \text{ V}$, $V_{G2S} = 4 \text{ V}$, $R_{G1} = 120 \text{ k}\Omega$, amp. B $V_{DS} = 5 \text{ V}$, $V_{G2S} = 4 \text{ V}$, selfbiased, amp. A	I_{DSX}	-	14 18	-	mA
Gate1-source pinch-off voltage $V_{DS} = 5 \text{ V}$, $V_{G2S} = 4 \text{ V}$, $I_D = 100 \mu\text{A}$	$V_{G1S(p)}$	-	0.7	-	V
Gate2-source pinch-off voltage $V_{DS} = 5 \text{ V}$, $I_D = 100 \mu\text{A}$	$V_{G2S(p)}$	-	0.7	-	

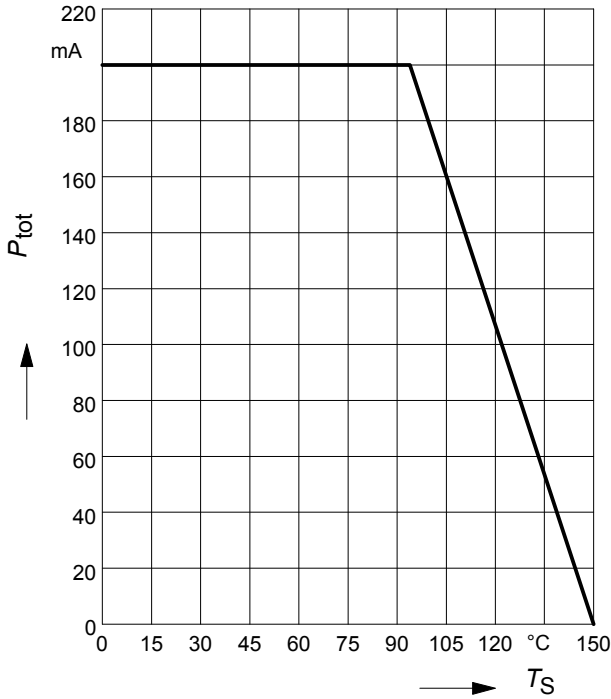
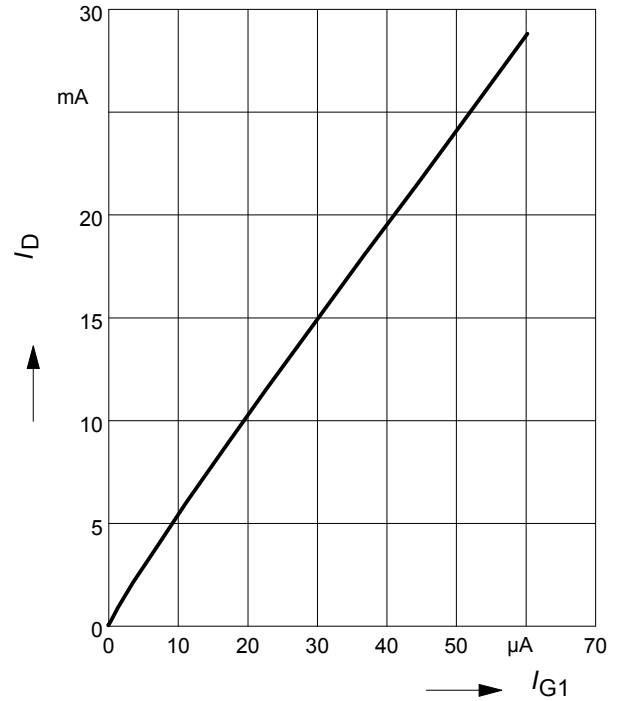
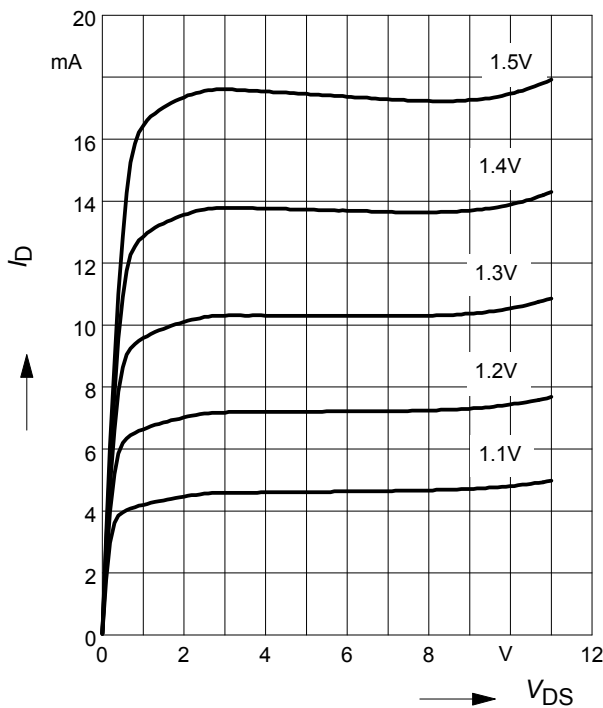
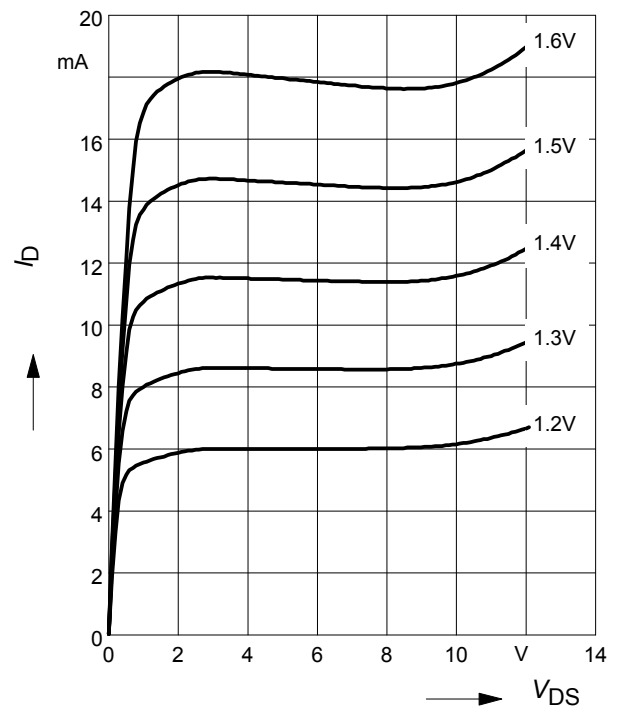
Electrical Characteristics at $T_A = 25^\circ\text{C}$, unless otherwise specified

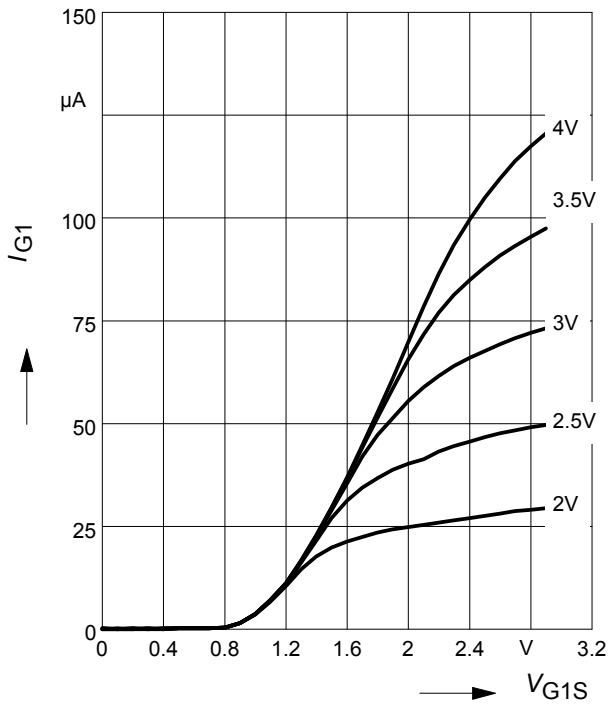
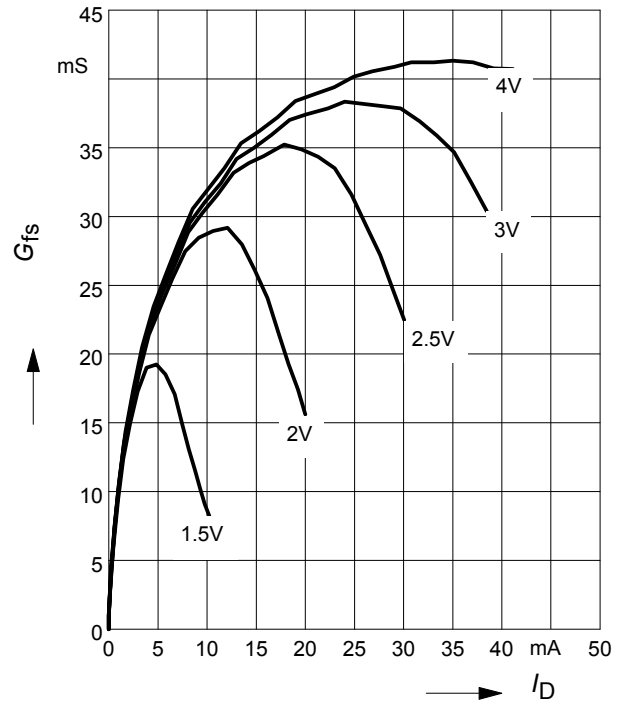
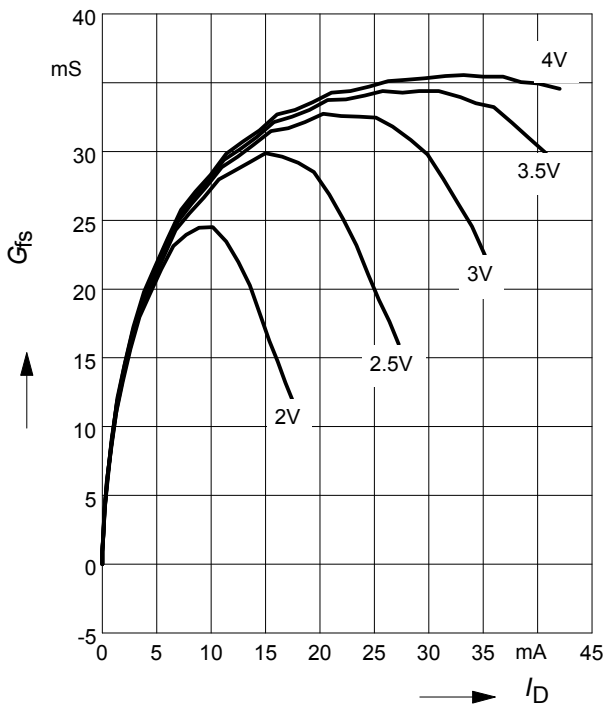
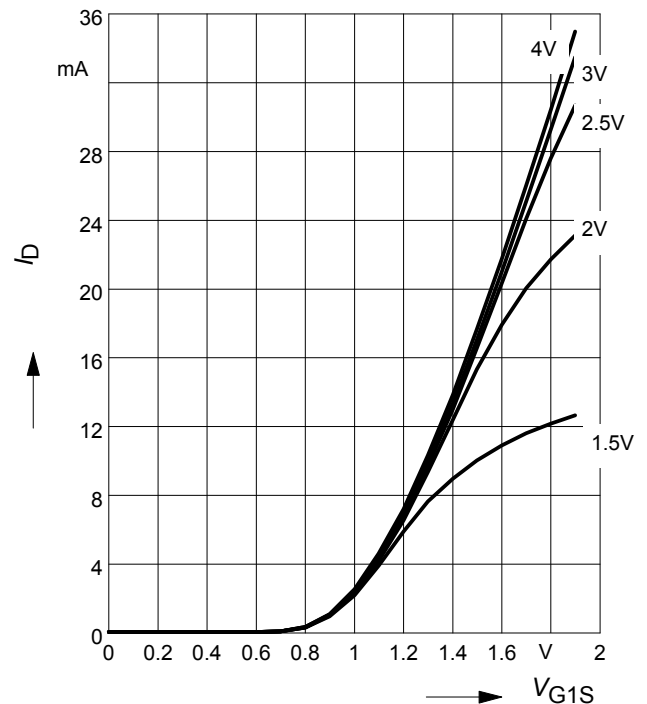
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC Characteristics $V_{DS} = 5\text{ V}$, $V_{G2} = 4\text{ V}$, $I_D = 10\text{ mA}$ (verified by random sampling)					
Forward transconductance amp. A amp. B	g_{fs}	- - -	33 30	- -	mS
Gate1 input capacitance amp. A amp. B	C_{g1ss}	- -	2.2 2	- -	pF
Output capacitance amp. A amp. B	C_{dss}	- -	0.9 0.8	- -	
Power gain $f = 800\text{ MHz}$, amp. A $f = 800\text{ MHz}$, amp. B $f = 45\text{ MHz}$, amp. A $f = 45\text{ MHz}$, amp. B	G_p	- - - -	24 24 34 31	- - - -	dB
Noise figure $f = 800\text{ MHz}$, amp. A $f = 800\text{ MHz}$, amp. B $f = 45\text{ MHz}$, amp. A $f = 45\text{ MHz}$, amp. B	F	- - - -	1.1 1.2 0.8 0.9	- - - -	dB
Gain control range $V_{G2S} = 4\dots 0\text{ V}$, $f = 800\text{ MHz}$	ΔG_p	-	45	-	
Cross-modulation $k=1\%$, $f_W=50\text{MHz}$, $f_{unw}=60\text{MHz}$ amp. A, AGC = 0 dB amp. B, AGC = 0 dB amp. A, AGC = 10 dB amp. B, AGC = 10 dB amp. A, AGC = 40 dB amp. B, AGC = 40 dB	X_{mod}	- - - - - -	97 96 94 91 105 103	- - - - - -	-

Functional diagram

shows pinning of BG5412K, switching pin at PIN 3



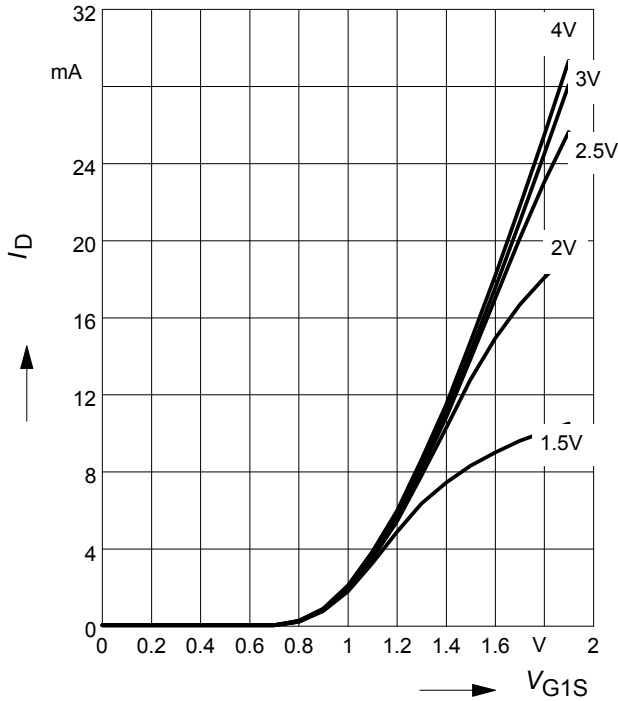
Total power dissipation $P_{tot} = f(T_S)$

Drain current $I_D = f(I_{G1})$
 $V_{G2S} = 4V, \text{ amp. B}$
 $V_{DS} = 5V$

Output characteristics $I_D = f(V_{DS})$
 $V_{G2} = 4V, \text{ amp. A}$
 $V_{G1} = \text{Parameter}$

Output characteristics $I_D = f(V_{DS})$
 $V_{G2} = 4V, \text{ amp. B}$
 $V_{G1} = \text{Parameter}$


Gate 1 current $I_{G1} = f(V_{G1S})$
 $V_{DS} = 5V$
 $V_{G2S} = \text{Parameter}$

Gate 1 forward transconductance
 $g_{fs} = f(I_D); \text{ amp. A}$
 $V_{DS} = 5V, V_{G2S} = \text{Parameter}$

Gate 1 forward transconductance
 $g_{fs} = f(I_D), \text{ amp. B}$
 $V_{DS} = 5V, V_{G2S} = \text{Parameter}$

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


Drain current $I_D = f(V_{G1S})$

$V_{DS} = 5V$, amp. B

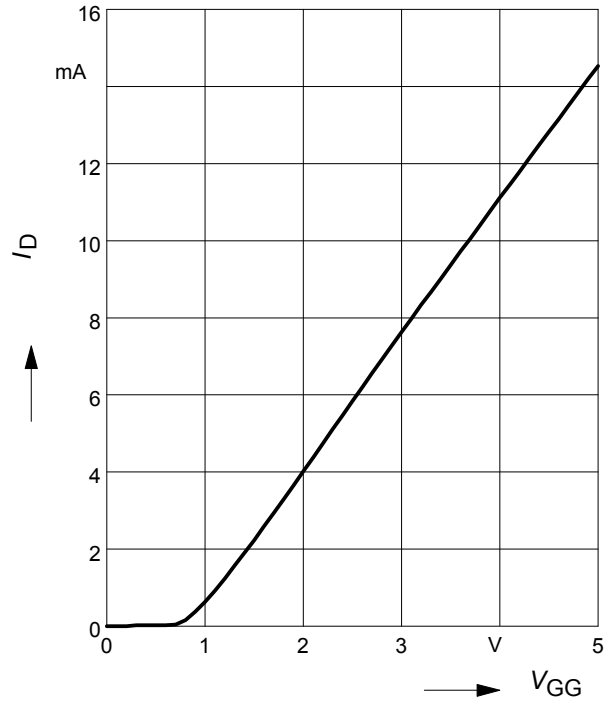
$V_{G2S} = \text{Parameter}$



Drain current $I_D = f(V_{GG})$, amp. B

$V_{DS} = 5V$, $V_{G2S} = 4V$, $R_{G1} = 100k\Omega$

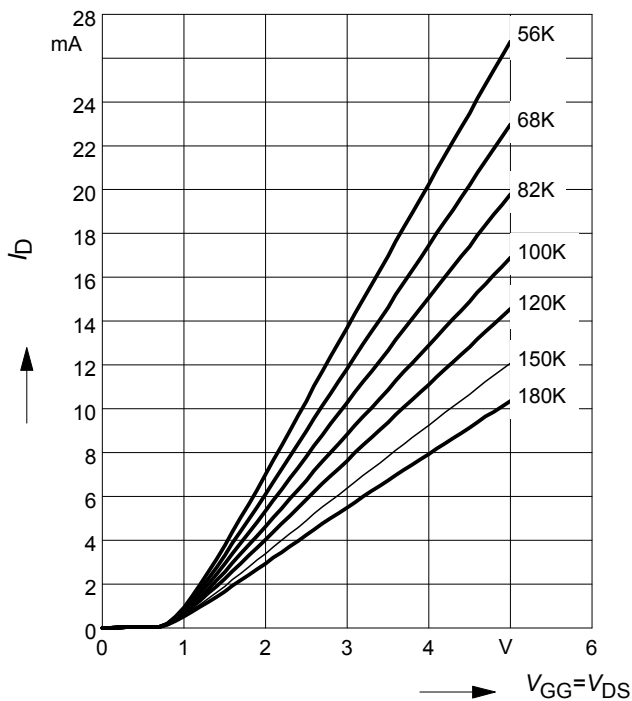
(connected to V_{GG} , $V_{GG}=\text{gate1 supply voltage}$)



Drain current $I_D = f(V_{GG})$, amp. B

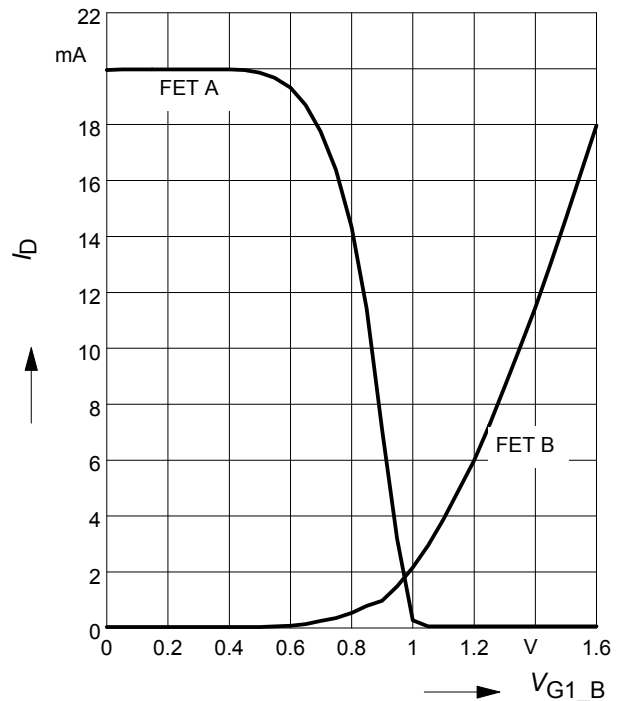
$V_{DS} = 5V$, $V_{G2S} = 4V$

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



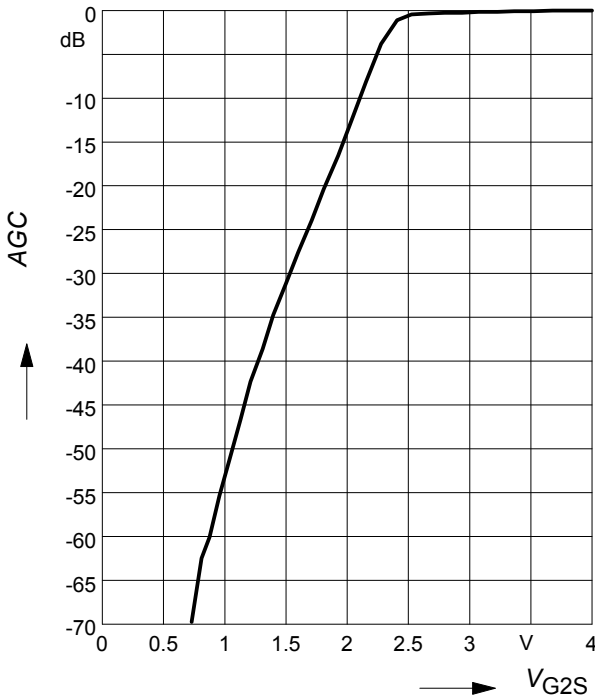
Drain current of FET A and FET B

as function of Gate 1 FET B



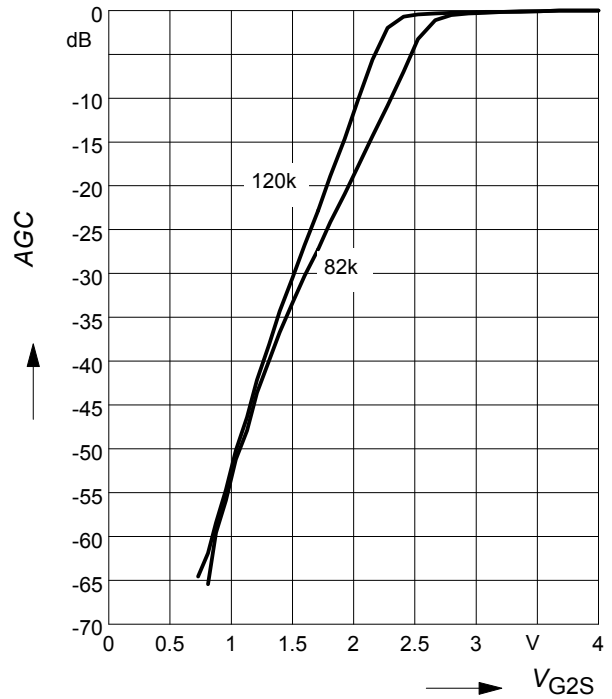
AGC characteristic $AGC = f(V_{G2S})$

$f = 45 \text{ MHz, amp. A}$



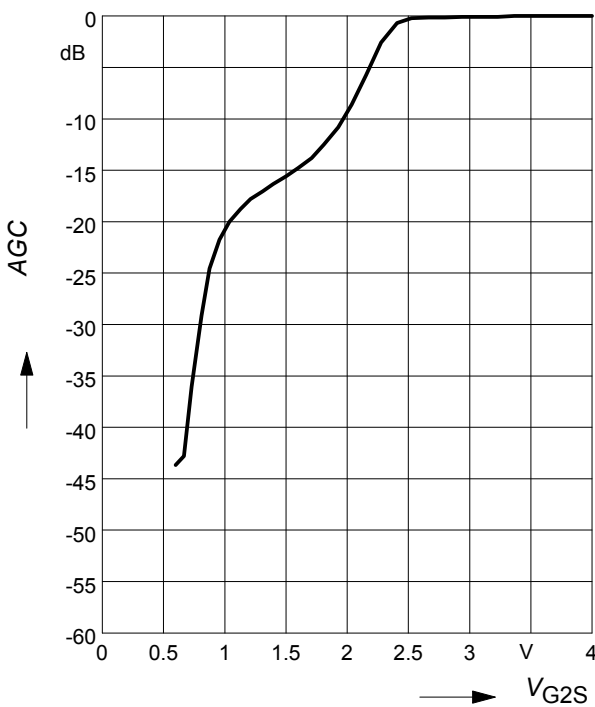
AGC characteristic $AGC = f(V_{G2S})$

$f = 45 \text{ MHz, amp. B}$



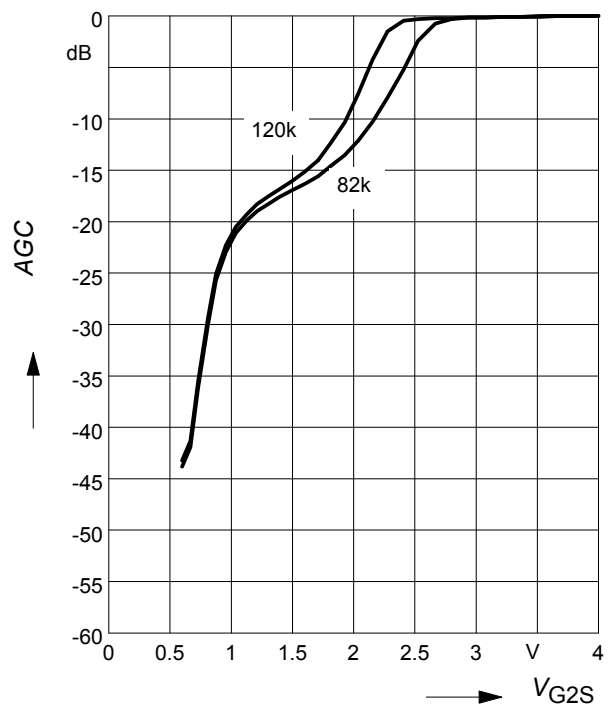
AGC characteristic $AGC = f(V_{G2S})$

$f = 800 \text{ MHz, amp. A}$



AGC characteristic $AGC = f(V_{G2S})$

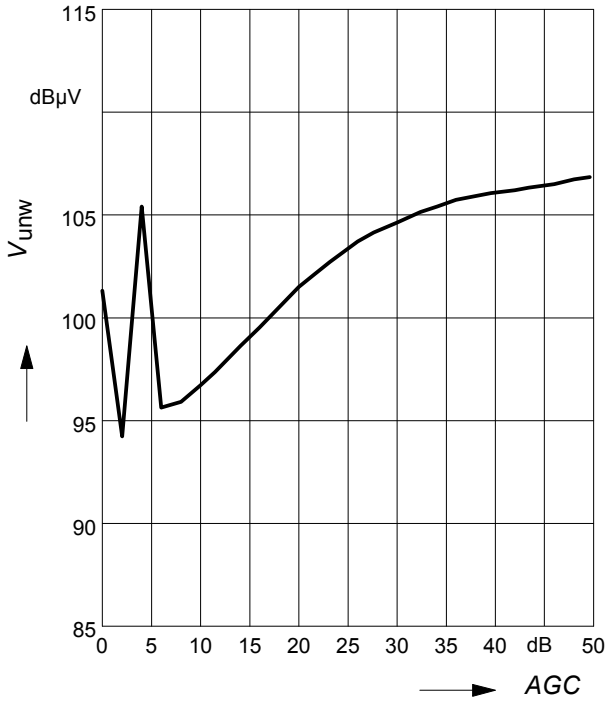
$f = 800 \text{ MHz, amp. B}$



Crossmodulation $V_{unw} = (AGC)$

$V_{DS} = 5\text{ V}$, $R_{g1} = 120\text{ k}\Omega$

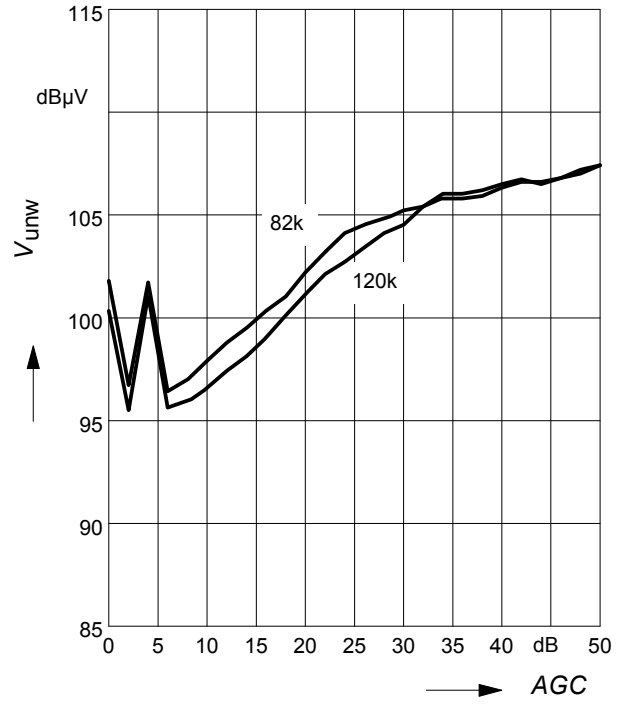
amp.A



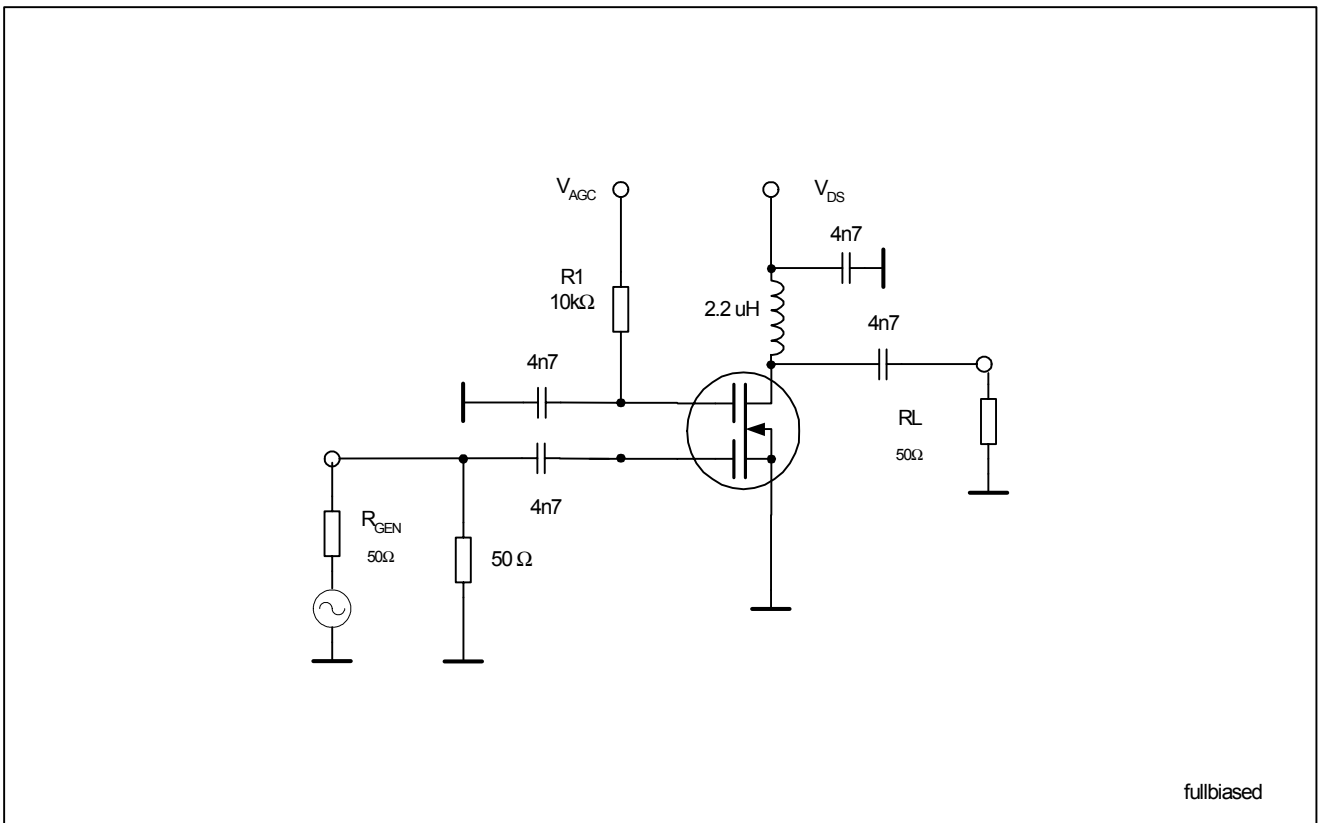
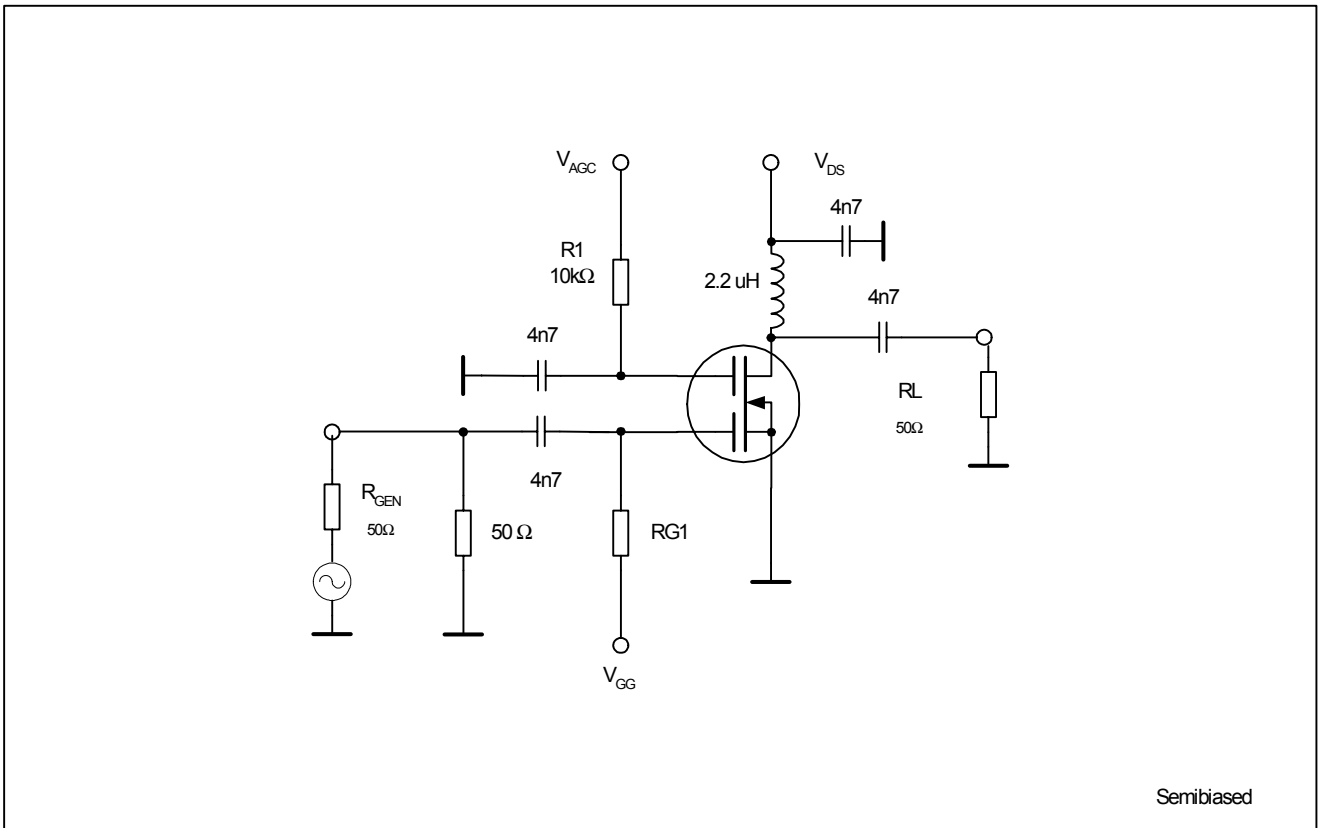
Crossmodulation $V_{unw} = (AGC)$

$V_{DS} = 5\text{ V}$, $R_{g1} = 56\text{ k}\Omega$

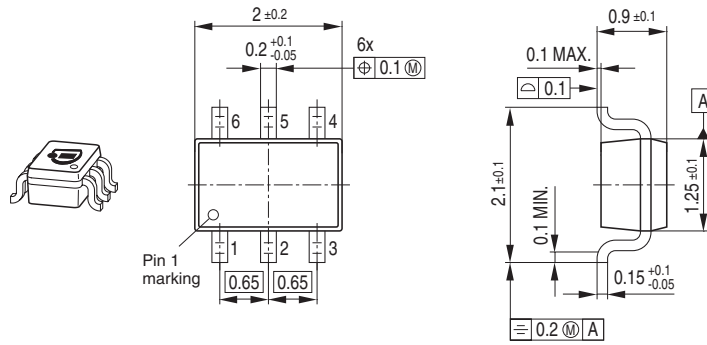
amp.B



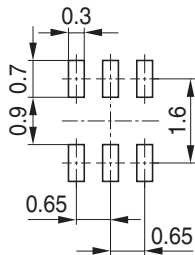
Crossmodulation test circuit



Package Outline

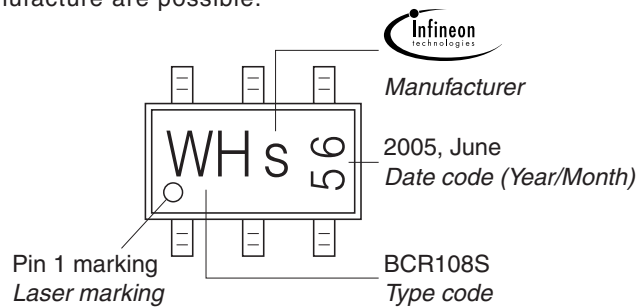


Foot Print



Marking Layout (Example)

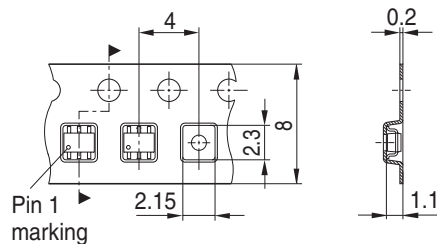
Small variations in positioning of Date code, Type code and Manufacture are possible.



Standard Packing

Reel ø180 mm = 3.000 Pieces/Reel
 Reel ø330 mm = 10.000 Pieces/Reel

For symmetric types no defined Pin 1 orientation in reel.



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