〈SMALL-SIGNAL TRANSISTOR〉

2SC5168

DUAL TRANSISTOR
FOR LOW NOISE DIFFERENTIAL AMPLIFY APPLICATION
SILICON NPN EPITAXIAL TYPE

DESCRIPTION

2SC5168 is a silicon NPN epitaxial type transistor. It is designed for low noise defferential amplify application.

FEATURE

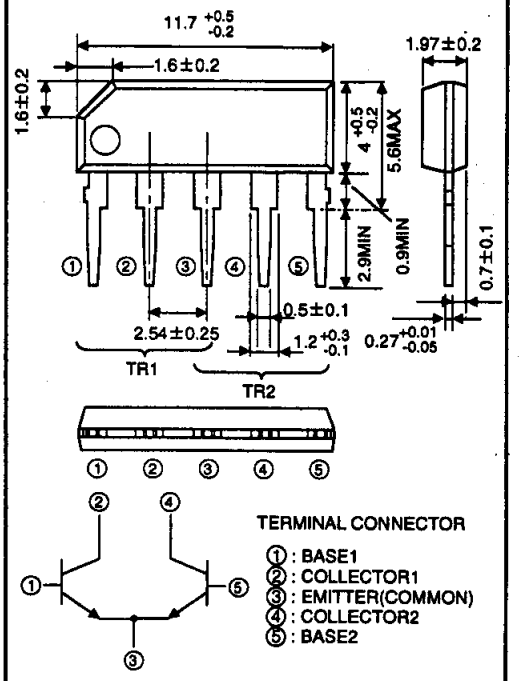
- ●High V_{CEO} V_{CEO}=50V
- ●Low noise NF=0.5dB typ NV=100mV typ
- ●High h_{FE} h_{FE}=250 to 800
- ●Good two elements characteristics
  - h_{FE1}/h_{FE2}=0.98 typ
  - $|V_{BE1}-V_{BE2}|$=1mV typ

APPLICATION

For low noise differential amplify application.

OUTLINE DRAWING

Unit:mm



TERMINAL CONNECTOR

① : BASE1
② : COLLECTOR1
③ : EMITTER(COMMON)
④ : COLLECTOR2
⑤ : BASE2

Note)
The dimension without tolerance represent central value.

MAXIMUM RATINGS (Ta=25℃)

Symbol	Parameter	Ratings	Unit
V_{CBO}	Collector to Base voltage	50	V
V_{EBO}	Emitter to Base voltage	5	V
V_{CEO}	Collector to Emitter voltage	50	V
I_C	Collector current	100	mA
P_C	Collector dissipation (Ta=25℃)	200	mW/unit
P_T	Total dissipation (Ta=25℃)	400	mW
T_j	Junction temperature	+125	℃
T_{stg}	Storage temperature	-55 to +125	℃

ELECTRICAL CHARACTERISTICS (Ta=25℃)

Symbol	Parameter		Test conditions	Limits			Unit
				Min	Typ	Max	
$V_{(BR)CEO}$	C to E break down voltage		I_C=100μA,R_{BE}=∞	50			V
$V_{(BR)EBO}$	E to B break down voltage		I_E=10μA,I_C=0	5			V
$V_{(BR)CBO}$	C to B break down voltage		I_C=10μA,I_E=0	50			V
I_{CBO}	Collector cut off current		V_{CB}=35V,I_E=0			0.1	μA
I_{EBO}	Emitter cut off current		V_{EB}=2V,I_C=0			0.1	μA
I_{CEO}	Collector cut off current		V_{CE}=35V,R_{BE}=∞			10	μA
h_{FE} *	DC forward current gain		V_{CE}=6V,I_C=1mA	250		800	—
$V_{CE(sat)}$	C to E saturation voltage		I_C=10mA,I_B=1mA			0.6	V
$\|V_{BE1}-V_{BE2}\|$	B-E voltage differential		V_{CE}=6V,I_C=1mA		1	10	mV
h_{FE1}/h_{FE2}	DC forward current gain ratio		V_{CE}=6V,I_C=1mA	0.8	0.98	1.0	—
f_T	Gain band width product		V_{CE}=6V,I_E=1mA		150		MHz
C_{ob}	Collector output capacitance		V_{CB}=6V,I_E=0,f=1MHz		2.5		pF
NF	Noise figure		V_{CB}=6V,I_E=-0.1mA,f=1kHz,R_G=10kΩ		0.5		dB
NV	Low frequency broadband noise voltage	effective value	V_{CE}=10V,I_E=-1mA,R_G=100kΩ,Gv=80dB, (Refer to test circuit)		100		mV
NV_M		peaked value			0.5		V

* : It shows h_{FE} (element 1) classification in right table.

Item	F	G
h_{FE}	250 to 500	400 to 800

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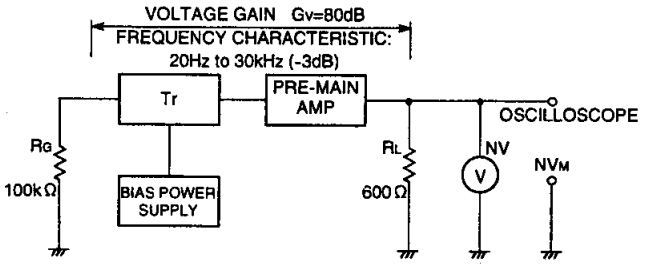
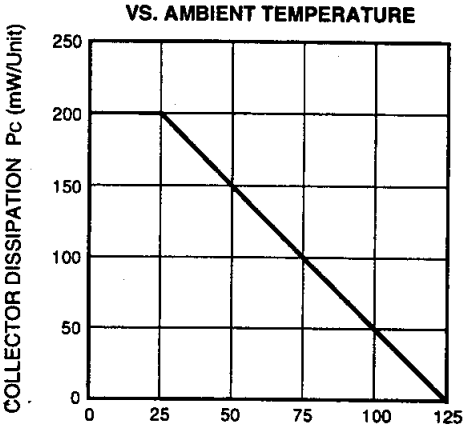
LOW FREQUENCY WIDE BAND NOISE VOLTAGE TEST CIRCUIT

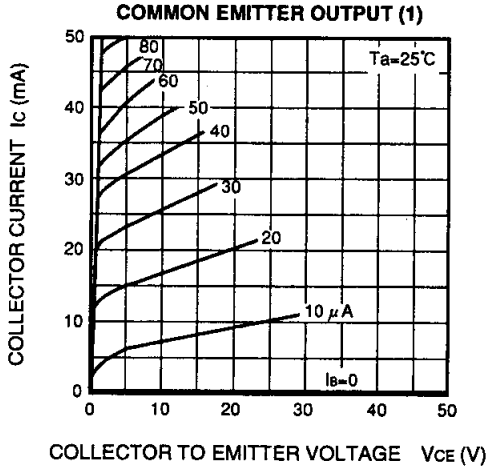


TYPICAL CHARACTERISTICS

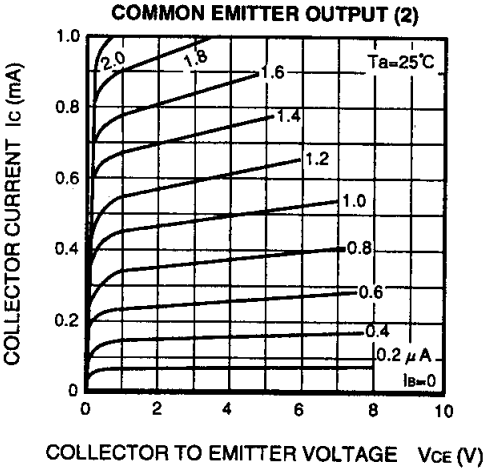
COLLECTOR DISSIPATION VS. AMBIENT TEMPERATURE



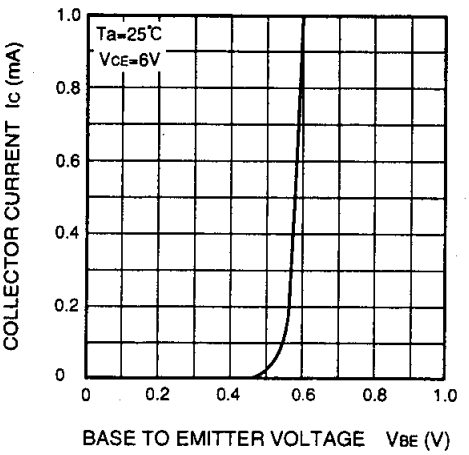
COMMON EMITTER OUTPUT (1)



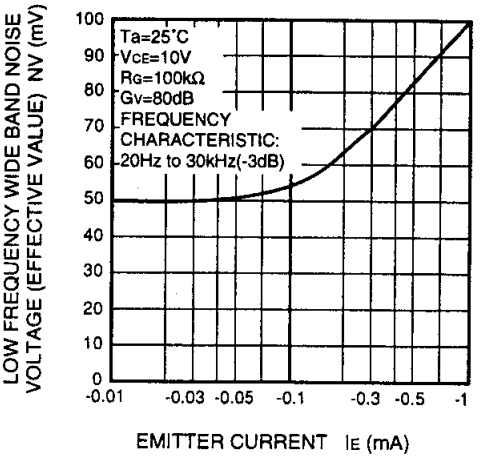
COMMON EMITTER OUTPUT (2)



COMMON EMITTER TRANSFER



LOW FREQUENCY WIDE BAND NOISE VOLTAGE (EFFECTIVE) VS. EMITTER CURRENT



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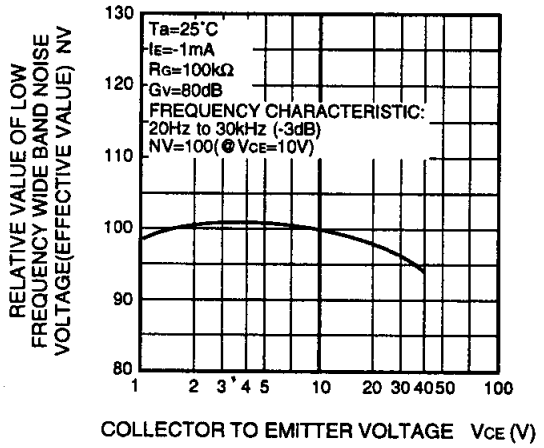
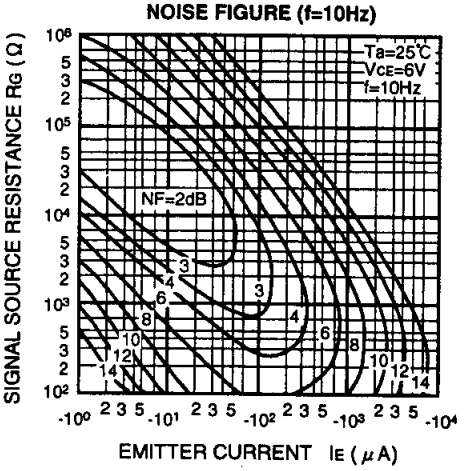
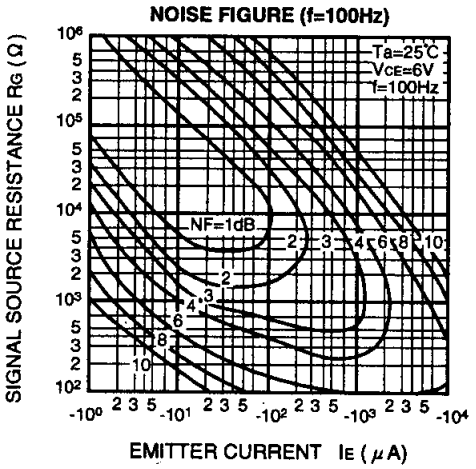
LOW FREQUENCY WIDE BAND NOISE VOLTAGE (EFFECTIVE) VS. COLLECTOR TO EMITTER VOLTAGE



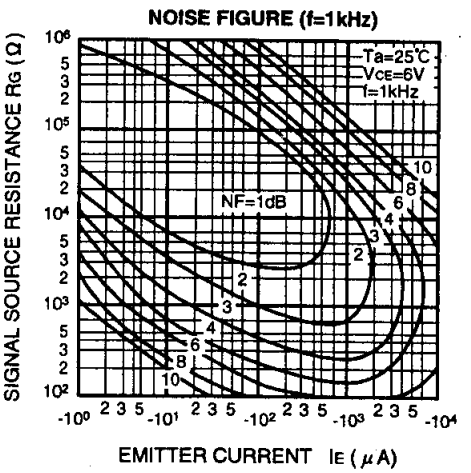
NOISE FIGURE (f=10Hz)



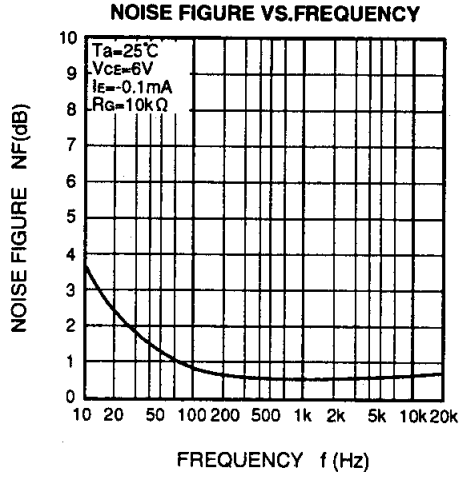
NOISE FIGURE (f=100Hz)



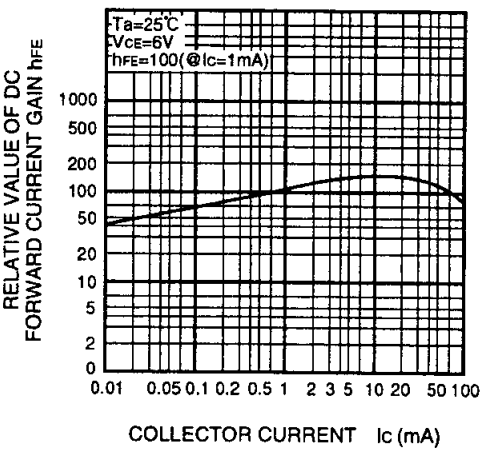
NOISE FIGURE (f=1kHz)



NOISE FIGURE VS.FREQUENCY



DC FORWARD CURRENT GAIN VS. COLLECTOR CURRENT



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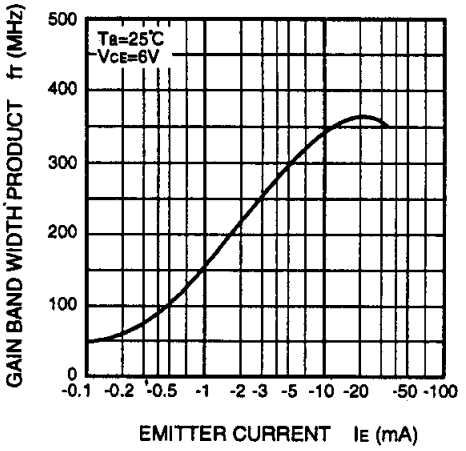
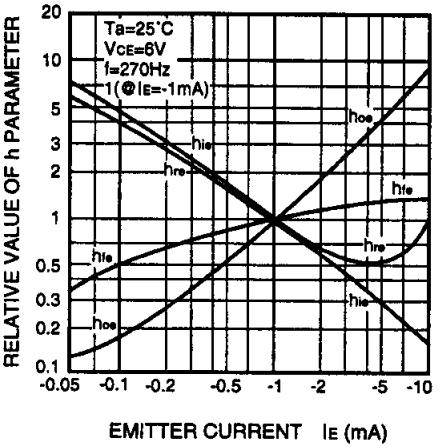
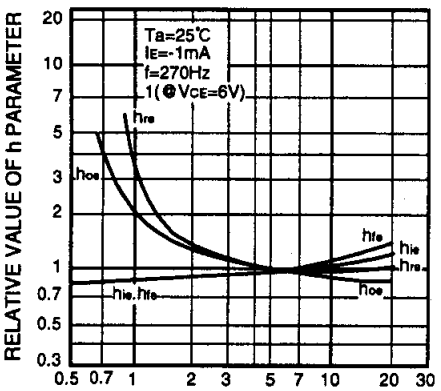
GAIN BAND WIDTH PRODUCT VS. EMITTER CURRENT



h PARAMETER VS. EMITTER CURRENT



h PARAMETER VS. COLLECTOR TO EMITTER VOLTAGE



COMMON EMITTER h PARAMETER (TYPICAL VALUE)

Symbol	Parameter	Test conditions	Limits	Unit
hie	Closed loop small signal input impedance	Ta=25°C VCE=6V IE=-1mA f=270Hz	16	kΩ
hre	Open loop small signal reverse voltage amplification factor		0.13	$\times 10^{-3}$
hfe	Closed loop small signal forward current amplification factor		600	—
hoe	Open loop small signal output admittance		20	μS

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